SEW EURODRIVE

Product Manual

Standard Inverters
MOVITRAC® LTP-B

Edition 10/2023

31554814/EN

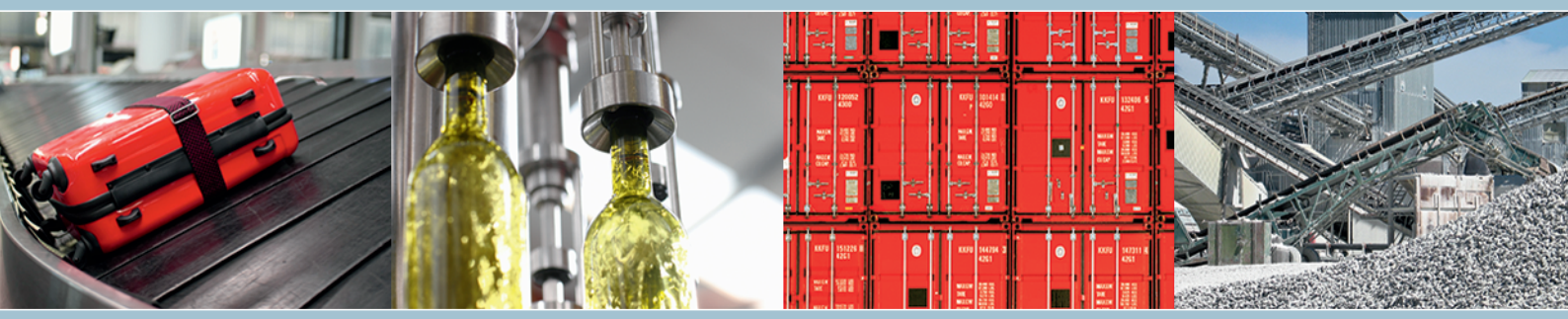


Table of Contents

31554814/EN – 10/2023

31554814/EN – 10/2023

31554814/EN – 10/2023

31554814/EN – 10/2023

31554814/EN – 10/2023

31554814/EN – 10/2023

1 General information

1.1 About this documentation

The documentation at hand is the original.

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

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

1.2 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 product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

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 Meaning of the hazard symbols

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

Hazard symbol	Meaning
	General hazard

31554814/EN – 10/2023

Hazard symbol	Meaning
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of automatic restart

1.2.4 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 Decimal separator in numerical values

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

Example: 30.5 kg

1.4 Rights to claim under limited warranty

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

1.5 Recycling, reprocessing, reuse

SEW-EURODRIVE GmbH & Co KG strives to use as few new natural resources as possible in the production of its products. An important aspect of this is the circular economy with the recycling of materials as well as the inspection and/or reprocessing of returned components and their reuse in new products. SEW-EURODRIVE GmbH & Co KG only uses these processes if the resulting materials and components are of the same quality as new parts.

1.6 Other applicable documentation

Observe the corresponding documentation for all additional components.

31554814/EN – 10/2023

1.7 Product names and trademarks

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

1.8 Copyright notice

31554814/EN – 10/2023

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.

31554814/EN – 10/2023

2.3 Target group

Specialist for mechanical work

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

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

Specialist for electrotechnical work

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

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

Additional qualifications

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

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

Instructed persons

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

2.4 IT security

2.4.1 Contact

If you need support with the configuration, contact SEW-EURODRIVE Service. You can obtain information about current security-related issues by e-mail or on the Product Security Management website. There you will find various contact options for reporting security-related problems.

2.4.2 IT security of the product

The product has no access levels.

The IT security of the product is only guaranteed when used in an environment secured by defense-in-depth strategies.

2.4.3 IT security of the environment

For drive and control components that are integrated in a network (e.g. fieldbus or Ethernet network), settings can even be made from more remote locations. This entails the risk of a parameter change not being visible externally, resulting in unexpected – but not uncontrolled – system behavior, and this may impact negatively on operational safety and reliability, system availability or data security.

31554814/EN – 10/2023

Ensure that unauthorized access is prevented, particularly with respect to Ethernet-based networked systems and engineering interfaces. Using IT-specific security standards, such as network segmentation, adds to the protection of access to the ports. For an overview of the ports and of the services provided by the communication interfaces, refer to Online Support. The IT security of the product is only guaranteed when used in an environment secured by defense-in-depth strategies.

Ensure that clear responsibility for security is ensured during operation. SEW-EURODRIVE recommends an IT security management system in accordance with ISO/IEC 27001 and ISO/IEC 62443-2-4.

2.5 Designated use

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

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

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

The systems can be mobile or stationary.

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
- Permanent-field AC synchronous motors

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

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

2.5.1 Lifting applications

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

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

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

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

2.5.3 Restrictions of use

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

31554814/EN – 10/2023

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

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

- The reduction of the nominal output current and/or the line voltage is considered according to the data in chapter "Technical data" (→ 🗎 25) in the documentation.
- Above 2000 m above sea level, the air and creepage distances are only sufficient for overvoltage class II according to EN 60664. At altitudes above 2000 m above sea level, limiting measures must therefore be taken that reduce the line side overvoltage from category III to category II for the entire system.
- If a protective electrical separation (in accordance with EN 61800-5-1 and EN 60204-1) is required, then implement this outside the product at altitudes of more than 2000 m above sea level.

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

2.6 Functional safety technology

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

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

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

2.7 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.

If necessary, use suitable, sufficiently dimensioned handling equipment.

Observe the information on climatic conditions in chapter "Technical data" (→ 🗎 25) of the documentation.

2.8 Installation/assembly

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

Protect the product from strong mechanical strain. Ensure that components are not deformed and insulation spaces are not changed, particularly during transportation and handling. Electrical components must not be mechanically damaged or destroyed.

Observe the notes in chapter "Mechanical installation".

31554814/EN – 10/2023

2.9 Electrical installation

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

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

2.9.1 Required preventive measure

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

2.9.2 Stationary application

Necessary preventive measure for the product:

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

2.9.3 Regenerative operation

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

2.10 Protective separation

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

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

31554814/EN – 10/2023

2.11 Startup/operation

Observe the safety notes in chapters "Startup" (→ 🗎 107) and "Operation" (→ 🗎 200) in this documentation.

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

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

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

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

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

10 minutes.

Observe the corresponding information signs on the product.

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

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

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

31554814/EN – 10/2023

3 Product description

3.1 Technology

The MOVITRAC® LTP-B device family is part of SEW-EURODRIVE's powerful portfolio of frequency inverters. The devices are characterized by a simple installation and startup philosophy, together with a powerful range of functions for this class.

The power spectrum ranges from 0.75 kW to a maximum rating of 250 kW.

The inverters are available with the IP66/NEMA 4X and IP55/NEMA 12 K degrees of protection for use in environments that are heavily subjected to dust and splash water. The inverters with the IP66/NEMA 4X degree of protection are alternatively available with or without an integrated switch option. The switch option is equipped with a main switch, direction switch, and potentiometer. Devices with the IP20/NEMA 1 degree of protection are also available for control cabinet installation.

All variants feature an integrated keypad as standard which, in combination with the removable "help card", enables simple and intuitive startup and operation.

The inverter supports a multitude of control modes for operating many different types of motors. As a result, motors can be operated with speed and torque control, as well as with an encoder to some extent.

Extensive diagnostics methods are available to the user to ensure smooth system operation and to minimize downtimes.

In addition to diagnostics parameters, MOVITRAC® LTP-B also offers a powerful scope function that can be operated using the LT Shell software.

The extensive functionality is rounded off by Modbus RTU, CANopen and SEW-EURODRIVE's SBus bus systems, which are included as standard, which means that the MOVITRAC® LTP-B can be easily integrated into the fieldbus network of the application via gateway.

3.2 Markets and applications

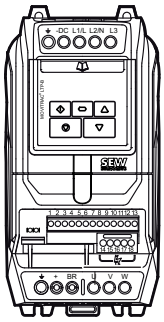
Frequency inverters of the MOVITRAC® LTP-B series are optimally tailored to meet the requirements of indoor applications outside a control cabinet.

They have been designed and developed for the open-loop speed control of asynchronous and synchronous motors without an encoder, and are particularly economical in conveyor applications, hoists, as well as in fans and pumps.

Depending on the application requirement, the frequency inverter is available in many different power ratings, voltages, and degrees of protection.

31554814/EN – 10/2023

3.3 Product overview of MOVITRAC® LTP-B

Frequency inverter	
LTP-B 	• Performance classes: 0.75 – 250 kW • Voltage range: – 1 × 200 – 240 V – 3 × 200 – 240 V – 3 × 380 – 480 V – 3 × 500 – 600 V – 3 × 480 – 525 V • Overload capacity: 150% for 60 s, 175% for 2 s • Integrated keypad: – *IP20*: 7-segment display – *IP66*: TFT display – *IP55*: OLED display • Integrated engineering interface • Integrated Modbus RTU and CANopen interface • Housing variants: – IP20/NEMA 1 – IP55/NEMA 12 K – IP66/NEMA 4X (with or without switch option) For information about this device, refer to the following documents: • Operating instructions "MOVITRAC® LTP-B frequency inverter"
Option cards	
LT OB 3ROUT A	Relay expansion card
LT OB IO A	Digital I/O expansion card
LT OB ENC A	TTL encoder card
LT OB ENH A	HTL encoder card
LT FP 11A	PROFIBUS DP (M30)
LT FE 32A	PROFINET IO (M30)
LT FE 34A	PROFINET IO (M40)
LT FE 33A	EtherNet/IP™ (M30)
LT FE 24A	EtherCAT® (M30)
LT FD 11A	DeviceNet™ (M30)
LT FE 31A	Modbus TCP (M30)
System components	
BW	Braking resistor
NF LT	Line filter
ND LT	Line choke
HD LT	Output choke
Remote keypads	
LT BG-C	7-segment display keypad
LT BG OLED A	Full-text OLED keypad
Accessories	
LT OP 003 A2	Basic package (cable set A)
LT OP 005 B2, LT OP 010 B2	Extension package (cable set B)
LT OP 003 C	PC engineering package (cable set C)
LT RJ CS 21 C	Cable splitter 1 to 2
LT RJ CS TR C	Terminating resistor
USM21A	USB/RS485/SBus/CAN interface adapter
CKS13A	RJ10/RJ45 connection cable
UOH65A	UOH65A housing
LT BP D	Bluetooth® parameter module

31554814/EN – 10/2023

Accessories	
LT OB LOCMO B	Control board with switch and potentiometer
LT SB 23 A	Shield plate for IP20 devices of size 2 + 3
Software	
MOVITOOLS® MotionStudio	Software for parameterization and data backup Connection possible via: • USB11A or USM21A via SEW gateway or MOVI-PLC® • USM21A with CKS13A (RJ10/RJ45 connection cable)
LT Shell	Software for parameterization, data backup, firmware updates, manual mode and scope Connection possible via: • USB11A or USM21A and cable set C • Parameter module and Bluetooth

3.4 The inverters at a glance

Line connection	Motor power	Nominal output current	Type designation	Degree of protection	Size
200 – 240 V 1-phase	0.75 kW/1 HP	4.3 A	MCLTPB0008-2B1-4-00	IP20	2
			MCLTPB0008-2B1-4-30	IP66	2
			MCLTPB0008-2B1-4-40	IP66	2
	1.5 kW/2 HP	7 A	MCLTPB0015-2B1-4-00	IP20	2
			MCLTPB0015-2B1-4-30	IP66	2
			MCLTPB0015-2B1-4-40	IP66	2
	2.2 kW/3 HP	10.5 A	MCLTPB0022-2B1-4-00	IP20	2
			MCLTPB0022-2B1-4-30	IP66	2
			MCLTPB0022-2B1-4-40	IP66	2

31554814/EN – 10/2023

Line connection	Motor power	Nominal output current	Type designation	Degree of protection	Size
200 – 240 V 3-phase	0.75 kW/1 HP	4.3 A	MCLTPB0008-2A3-4-00	IP20	2
			MCLTPB0008-2A3-4-30	IP66	2
			MCLTPB0008-2A3-4-40	IP66	2
	1.5 kW/2 HP	7 A	MCLTPB0015-2A3-4-00	IP20	2
			MCLTPB0015-2A3-4-30	IP66	2
			MCLTPB0015-2A3-4-40	IP66	2
	2.2 kW/3 HP	10.5 A	MCLTPB0022-2A3-4-00	IP20	2
			MCLTPB0022-2A3-4-30	IP66	2
			MCLTPB0022-2A3-4-40	IP66	2
	3 kW/4 HP	14 A	MCLTPB0030-2A3-4-00	IP20	3
			MCLTPB0030-2A3-4-30	IP66	3
			MCLTPB0030-2A3-4-40	IP66	3
	4 kW/5 HP	18 A	MCLTPB0040-2A3-4-00	IP20	3
			MCLTPB0040-2A3-4-30	IP66	3
			MCLTPB0040-2A3-4-40	IP66	3
	5.5 kW/7.5 HP	24 A	MCLTPB0055-2A3-4-00	IP20	3
			MCLTPB0055-2A3-4-30	IP66	3
			MCLTPB0055-2A3-4-40	IP66	3
			MCLTPB0055-2A3-4-10	IP55	4
	7.5 kW/10 HP	30 A	MCLTPB0075-2A3-4-30	IP66	4
			MCLTPB0075-2A3-4-40	IP66	4
			MCLTPB0075-2A3-4-10	IP55	4
	11 kW/15 HP	46 A	MCLTPB0110-2A3-4-30	IP66	4
			MCLTPB0110-2A3-4-40	IP66	4
			MCLTPB0110-2A3-4-10	IP55	4
	15 kW/20 HP	61 A	MCLTPB0150-2A3-4-10	IP55	5
	18.5 kW/25 HP	72 A	MCLTPB0185-2A3-4-10	IP55	5
	22 kW/30 HP	90 A	MCLTPB0220-2A3-4-10	IP55	6
	30 kW/40 HP	110 A	MCLTPB0300-2A3-4-10	IP55	6
	37 kW/50 HP	150 A	MCLTPB0370-2A3-4-10	IP55	6
	45 kW/60 HP	180 A	MCLTPB0450-2A3-4-10	IP55	6
	55 kW/75 HP	202 A	MCLTPB0550-2A3-4-10	IP55	7
	75 kW/100 HP	248 A	MCLTPB0750-2A3-4-10	IP55	7

31554814/EN – 10/2023

Line connection	Motor power	Nominal output current	Type designation	Degree of protection	Size
380 – 480 V 3-phase	0.75 kW/1 HP	2.2 A	MCLTPB0008-5A3-4-00	IP20	2
			MCLTPB0008-5A3-4-30	IP66	2
			MCLTPB0008-5A3-4-40	IP66	2
	1.5 kW/2 HP	4.1 A	MCLTPB0015-5A3-4-00	IP20	2
			MCLTPB0015-5A3-4-30	IP66	2
			MCLTPB0015-5A3-4-40	IP66	2
	2.2 kW/3 HP	5.8 A	MCLTPB0022-5A3-4-00	IP20	2
			MCLTPB0022-5A3-4-30	IP66	2
			MCLTPB0022-5A3-4-40	IP66	2
	4 kW/5 HP	9.5 A	MCLTPB0040-5A3-4-00	IP20	2
			MCLTPB0040-5A3-4-30	IP66	2
			MCLTPB0040-5A3-4-40	IP66	2
	5.5 kW/7.5 HP	14 A	MCLTPB0055-5A3-4-00	IP20	3
			MCLTPB0055-5A3-4-30	IP66	3
			MCLTPB0055-5A3-4-40	IP66	3
	7.5 kW/10 HP	18 A	MCLTPB0075-5A3-4-00	IP20	3
			MCLTPB0075-5A3-4-30	IP66	3
			MCLTPB0075-5A3-4-40	IP66	3
	11 kW/15 HP	24 A	MCLTPB0110-5A3-4-00	IP20	3
			MCLTPB0110-5A3-4-30	IP66	3
			MCLTPB0110-5A3-4-40	IP66	3
			MCLTPB0110-5A3-4-10	IP55	4
			MCLTPB0110-503-4-15	IP55	4
	15 kW/20 HP	30 A	MCLTPB0150-5A3-4-30	IP66	4
			MCLTPB0150-5A3-4-40	IP66	4
			MCLTPB0150-5A3-4-10	IP55	4
			MCLTPB0150-503-4-15	IP55	4
	18.5 kW/25 HP	39 A	MCLTPB0185-5A3-4-30	IP66	4
			MCLTPB0185-5A3-4-40	IP66	4
			MCLTPB0185-5A3-4-10	IP55	4
			MCLTPB0185-503-4-15	IP55	4
	22 kW/30 HP	46 A	MCLTPB0220-5A3-4-30	IP66	4
			MCLTPB0220-5A3-4-40	IP66	4
			MCLTPB0220-5A3-4-10	IP55	4
			MCLTPB0220-503-4-15	IP55	4
	30 kW/40 HP	61 A	MCLTPB0300-5A3-4-10	IP55	5
			MCLTPB0300-503-4-15	IP55	5
	37 kW/50 HP	72 A	MCLTPB0370-5A3-4-10	IP55	5
			MCLTPB0370-503-4-15	IP55	5
	45 kW/60 HP	90 A	MCLTPB0450-5A3-4-10	IP55	6
			MCLTPB0450-503-4-15	IP55	6
	55 kW/75 HP	110 A	MCLTPB0550-5A3-4-10	IP55	6
			MCLTPB0550-503-4-15	IP55	6
	75 kW/100 HP	150 A	MCLTPB0750-5A3-4-10	IP55	6
			MCLTPB0750-503-4-15	IP55	6
	90 kW/150 HP	180 A	MCLTPB0900-5A3-4-10	IP55	6
			MCLTPB0900-503-4-15	IP55	6
	110 kW/175 HP	202 A	MCLTPB1100-5A3-4-10	IP55	7
			MCLTPB1100-503-4-15	IP55	7
	132 kW/200 HP	240 A	MCLTPB1320-5A3-4-10	IP55	7
			MCLTPB1320-503-4-15	IP55	7
	160 kW/250 HP	302 A	MCLTPB1600-5A3-4-10	IP55	7
			MCLTPB1600-503-4-15	IP55	7
	200 kW/300 HP	370 A	MCLTPB2000-5A3-4-10	IP55	8
	250 kW/400 HP	480 A	MCLTPB2500-5A3-4-10	IP55	8

31554814/EN – 10/2023

Line connection	Motor power	Nominal output current	Type designation	Degree of protection	Size
500 – 600 V 3-phase	0.75 kW/1 HP	2.1 A	MCLTPB0008-603-4-00	IP20	2
			MCLTPB0008-603-4-30	IP66	2
			MCLTPB0008-603-4-40	IP66	2
	1.5 kW/2 HP	3.1 A	MCLTPB0015-603-4-00	IP20	2
			MCLTPB0015-603-4-30	IP66	2
			MCLTPB0015-603-4-40	IP66	2
	2.2 kW/3 HP	4.1 A	MCLTPB0022-603-4-00	IP20	2
			MCLTPB0022-603-4-30	IP66	2
			MCLTPB0022-603-4-40	IP66	2
	4.0 kW/5 HP	6.5 A	MCLTPB0040-603-4-00	IP20	2
			MCLTPB0040-603-4-30	IP66	2
			MCLTPB0040-603-4-40	IP66	2
	5.5 kW/7.5 HP	9 A	MCLTPB0055-603-4-00	IP20	2
			MCLTPB0055-603-4-30	IP66	2
			MCLTPB0055-603-4-40	IP66	2
	7.5 kW/10 HP	12 A	MCLTPB0075-603-4-00	IP20	3
			MCLTPB0075-603-4-30	IP66	3
			MCLTPB0075-603-4-40	IP66	3
	11 kW/15 HP	17 A	MCLTPB0110-603-4-00	IP20	3
			MCLTPB0110-603-4-30	IP66	3
			MCLTPB0110-603-4-40	IP66	3
	15 kW/20 HP	22 A	MCLTPB0150-603-4-00	IP20	3
			MCLTPB0150-603-4-30	IP66	3
			MCLTPB0150-603-4-40	IP66	3
			MCLTPB0150-603-4-10	IP55	4
	18.5 kW/25 HP	28 A	MCLTPB0185-603-4-30	IP66	4
			MCLTPB0185-603-4-40	IP66	4
			MCLTPB0185-603-4-10	IP55	4
	22 kW/30 HP	34 A	MCLTPB0220-603-4-30	IP66	4
			MCLTPB0220-603-4-40	IP66	4
			MCLTPB0220-603-4-10	IP55	4
	30 kW/40 HP	43 A	MCLTPB0300-603-4-30	IP66	4
			MCLTPB0300-603-4-40	IP66	4
			MCLTPB0300-603-4-10	IP55	4
	37 kW/50 HP	54 A	MCLTPB0370-603-4-10	IP55	5
	45 kW/60 HP	65 A	MCLTPB0450-603-4-10	IP55	5
	55 kW/75 HP	78 A	MCLTPB0550-603-4-10	IP55	6
	75 kW/100 HP	105 A	MCLTPB0750-603-4-10	IP55	6
	90 kW/125 HP	130 A	MCLTPB0900-603-4-10	IP55	6
	110 kW/150 HP	150 A	MCLTPB1100-603-4-10	IP55	6
480 – 525 V 3-phase	132 kW	185 A	MCLTPB1320-U03-4-10	IP55	6
	160 kW	205 A	MCLTPB1600-U03-4-10	IP55	6
	185 kW	255 A	MCLTPB1850-U03-4-10	IP55	6
	200 kW	275 A	MCLTPB2000-U03-4-10	IP55	6

31554814/EN – 10/2023

3.5 Controls/control signal source

The product includes the following control signal sources:

- Terminals
- Keypad
- Fieldbus

3.6 Operating modes / motor controls

The following operating modes apply for the MOVITRAC® LTP-B frequency inverter:

- U/f controller for asynchronous motors
- VFC speed and torque control for asynchronous motors
- PMVC speed and torque control for synchronous motors
- LSPM speed control for SEW-EURODRIVE motors with LSPM technology
- SYN-R speed control for synchronous reluctance motors
- BLDC speed control for brushless DC motors

3.7 Functions

The MOVITRAC® LTP-B frequency inverter has the following functions:

- Process control (PID controller)
- 8 fixed setpoints
- Flying start function
- Fire mode/emergency mode
- Fieldbus/manual mode switch
- Standby function/energy-saving function
- Parameter lock
- Parameter backup
- DC braking
- Master-slave speed/torque control
- Load distribution
- Hoist function
- Start and stop delay
- Overload management for pump warm-up
- 3-wire control
- Motor potentiometer

31554814/EN – 10/2023

4 Technical data

4.1 Markings

The following table explains all markings that can be shown on the nameplate or be appended to the motor.

Mark	Definition
	The CE mark indicates compliance with the following European directives: • Low Voltage Directive 2014/35/EU • EMC Directive 2014/30/EU • Machinery Directive 2006/42/EC • Directive 2011/65/EU for limiting the use of certain hazardous substances in electrical and electronic equipment
	The UKCA mark indicates compliance with British guidelines.
	The China RoHS mark indicates compliance with the directive SJ/T 11364-2014 regarding the restriction of use of certain hazardous substances in electrical and electronic equipment and its packaging.
	The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU.
	The NM mark states the compliance with the following Moroccan guidelines: • Low Voltage Directive No 2573-14 (16 July, 2015) • EMC Directive No 2574-14 (16 July, 2015)
	TÜV/FS mark with code number to identify functional safety relevant components
	The UL and cUL mark indicates UL approval. cUL is equally eligible for approval by the CSA.
	The EAC mark indicates compliance with the requirements of the technical regulations of the Customs Union (Eurasian Economic Union), Armenia, Belarus, Kazakhstan, Kyrgyzstan, and Russia.
	The RCM mark indicates compliance with the technical regulations of the Australian Communications and Media Authority (ACMA).

All products comply with the following international standards:

- UL 508C Power Conversion Equipment
- EN 61800-3:2004/A1:2012 Adjustable-Speed Electrical Drive Systems – Part 3
- EN ISO 13849-1 Safe Torque Off (STO) according to PL d
- Degree of protection according to NEMA 250, EN 60529
- Flammability class according to UL 94

- Protection against environmental influences according to IEC 60721-3-3, IP20 inverter: 3S2/3C2 IP55- & IP66 inverter: 3S3/3C3
- Shock resistance/vibration resistance according to: IEC 60068-2-29, IEC 60068-2-64, IEC 60068-2-6

4.2 Device data

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
- 500 – 600 V devices: NEC2002, table 430–150, 575 V

The uninfluenced short-circuit current according to EN 61800-5-1 is 100 kA.

4.2.1 Ambient conditions

The following table shows the ambient conditions for the MOVITRAC® LTP-B inverter:

Ambient temperature range during operation (for PWM frequency of 2 kHz)	-10 °C – +50 °C (IP20/NEMA 1) -10 °C – +40 °C (IP55/NEMA 12K) -20 °C – +40 °C (IP66/NEMA 4X)
Derating depending on the ambient temperature	2.5%/°C – 60 °C for inverters with degree of protection IP20/NEMA 1
	3%/°C – 50 °C for inverters with degree of protection IP66/NEMA 4X
	3%/°C – 50 °C for inverters with degree of protection IP55/NEMA 12K
Storage temperature	-40 °C – +60 °C
Maximum installation altitude for nominal operation	1000 m
Derating above 1000 m	1%/100 m – max. 2000 m with UL 1%/100 m – max. 4000 m without UL
Maximum relative humidity	95% (condensation not permitted)
Unit designs	IP20/NEMA 1 IP55/NEMA 12 K IP66/NEMA 4X

31554814/EN – 10/2023

4.2.2 Input voltage ranges

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

MOVITRAC® LTP-B			
Nominal voltage according to EN 50160	**Power**	**Connection type**	**Rated frequency**
200 – 240 V ±10%	0.75 – 2.2 kW	1-phase*	50 – 60 Hz ±5%
200 – 240 V ±10%	0.75 – 75 kW	3-phase	
380 – 480 V ±10%	0.75 – 250 kW		
500 – 600 V ±10%	0.75 – 110 kW		
480 – 525 V ±10%	132 – 200 kW		

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

* It is also possible to connect the single-phase inverter to 2 phases of a three-phase power supply system of 200 – 240 V.

INFORMATION

All inverters with degree of protection IP20/NEMA 1 and IP55/NEMA 12K with a 3-phase power supply can also be operated in a single-phase configuration with the corresponding line voltage at device terminals L1 and L2, taking into account a derating of 50% of the output current. Application example with SWER (Single-Wire Earth Return) supply systems.

Excluded from this rule:

- Inverters with degree of protection IP66/NEMA 4X
- Inverters with degree of protection IP55/NEMA 12 with the power ratings 200 kW and 250 kW
- Inverters with a voltage of 3 x AC 480 to 525 V

31554814/EN – 10/2023

4.2.3 Setting range

	Setting range without encoder card		Setting range with HTL/TTL encoder card	
Operating mode/ motor control (P4-01)	**Continuous setting range in relation to n_{max} = 3000 min^{-1}**	**Static control accuracy in relation to n_{max} = 3000 min^{-1}**	**Continuous setting range in relation to n_{max} = 3000 min^{-1}**	**Static control accuracy in relation to n_{max} = 3000 min^{-1}**
0: VFC speed control	1:50	± 0.5%	1:3000	± 0.03%
1: VFC torque control	1:50	± 0.5%	1:3000	± 0.03%
2: U/f open-loop speed control	1:20	± 0.5%	–	–
3: Synchronous motor speed control (PMVC)	1:20	± 0.5%	–	–
4: Synchronous motor torque control	1:20	± 0.5%	–	–
5: Synchronous motor position control	–	–	1:3000[1)]	± 0.03%[1)]
6: LSPM motor speed control	1:20	± 0.5%	–	–
7: Synchronous magnetic reluctance motor speed control (SYN-R)	1:20	± 0.5%	–	–
8: Brushless DC motor speed control (BLDC)	1:20	± 0.5%	–	–

1) With LTX only

31554814/EN – 10/2023

4.2.4 Overload capacity

Inverter

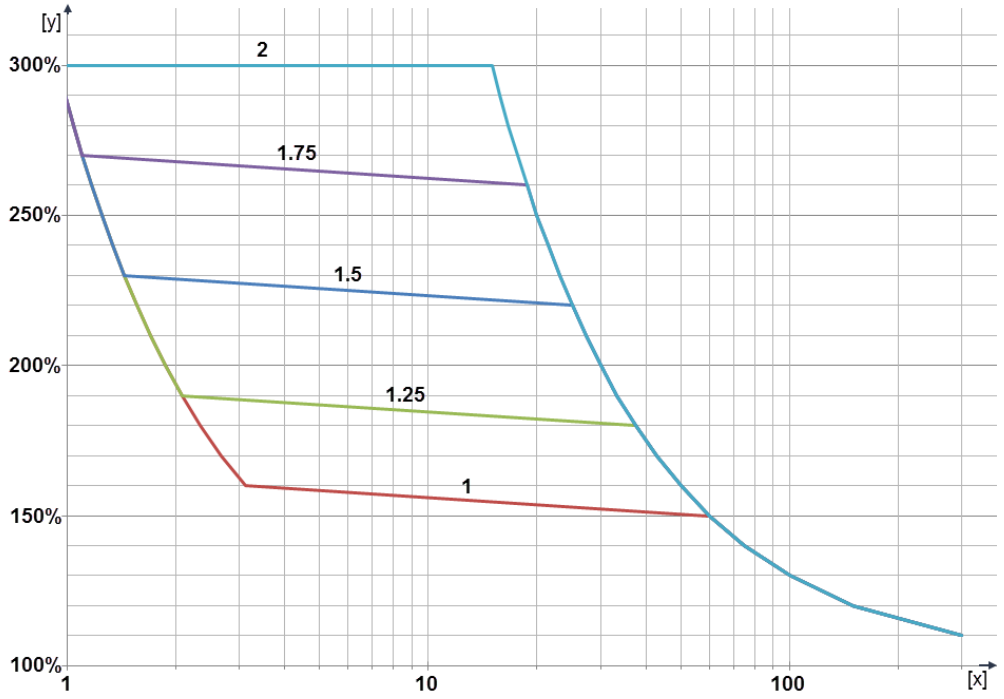
The inverter supplies a constant output current of 100%.

The following table shows the overload capacity based on the nominal inverter current:

Overload capacity based on nominal inverter current	60 seconds	2 seconds
MOVITRAC® LTP-B	150%	175%

Motors

The following chart shows the overload capacity of the inverter with regard to the ratio of rated inverter current to the rated motor current:



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[x] = Overload duration in s

[y] = Motor overload with regard to its rated current

4.2.5 Protection function

The MOVITRAC® LTP-B frequency inverter offers the following protection functions:

- Output short circuit, phase-phase, phase-ground
- Output overcurrent
- Overload protection
  - Inverter responds to overload as described in chapter "Overload capacity" (→ 🗎 29).
- Overvoltage fault
  - Set to 123% of the maximum nominal line voltage of the inverter.
- Undervoltage fault
- Overtemperature fault
- Undertemperature fault
  - The inverter is switched off at a temperature below the specified ambient temperature ("Ambient conditions" (→ 🗎 26)).
- Line phase failure
  - An enabled inverter switches off with delay depending on the load.
- Thermal motor overload protection according to NEC (National Electrical Code, US)
- Evaluation of TF, TH, KTY84, and PT1000
- Motor phase failure identification in all vector operating modes

31554814/EN – 10/2023

4.2.6 1-phase system AC 200 – 240 V

Power 0.75 to 2.2 kW (IP20/IP66)

MOVITRAC® LTPB – EMC filter class C1 according to EN 61800-3				
Power in kW		**0.75**	**1.5**	**2.2**
		IP20/NEMA 1		
MCLTPB..		0008-2B1-4-00	0015-2B1-4-00	0022-2B1-4-00
Part number		18251382	18251528	18251641
		IP66/NEMA 4X – housing without switches		
MCLTPB..		0008-2B1-4-30	0015-2B1-4-30	0022-2B1-4-30
Part number		18276512	18276520	18276539
		IP66/NEMA 4X – housing with switches		
MCLTPB..		0008-2B1-4-40	0015-2B1-4-40	0022-2B1-4-40
Part number		18276741	18276768	18276776
INPUT				
Nominal line voltage U_{line} according to EN 50160	V	1 × AC 200 – 240 ±10%		
Line frequency f_{line}	Hz	50/60 ±5%		
Line fuse	A	16 (15)[1]	16 (17.5)[1]	25
Nominal input current	A	8.6	12.9	19.2
OUTPUT				
Recommended motor power	kW	0.75	1.5	2.2
	HP	1	2	3
Output voltage U_{motor}	V	3 × 20 – U_{line}		
Output current	A	4.3	7	10.5
Apparent output power	kVA	1.7	2.8	4.2
PWM frequency	kHz	2/4/6/8/12/16		
Speed range	min^{-1}	-30000 – 0 – +30000		
Maximum output frequency	Hz	500		
Maximum motor cable length, shielded	m	100		
Maximum motor cable length, unshielded		150		
GENERAL				
Size		2		
Nominal power loss 24 V	W	8		
Minimum braking resistance value	Ω	27		
Maximum device terminal cross section	mm²	2 × 4 or (6)[2]		
Maximum control terminal cross section	mm²	0.05 – 2.5		

1) Recommended values for UL compliance

2) When using 6 mm², M4 forked cable lugs

31554814/EN – 10/2023

4.2.7 3-phase system AC 200 – 240 V

INFORMATION

All inverters with degree of protection IP20/NEMA 1 and IP55/NEMA 12K with a power supply of 3 × AC 200 to 240 V can also be operated with 1 × AC 200 to 240 V at device terminals L1 and L2, taking into account a derating of 50% of the output current. Application example with SWER (Single-Wire Earth Return) supply systems.

Inverters with IP66/NEMA 4X degree of protection are excluded from this rule.

Power 0.75 to 5.5 kW (IP20/IP66)

MOVITRAC® LTPB – EMC filter class C2 according to EN 61800-3							
Power in kW		**0.75**	**1.5**	**2.2**	**3**	**4**	**5.5**[1]
		IP20/NEMA 1					
MCLTPB..		0008-2A3-4-00	0015-2A3-4-00	0022-2A3-4-00	0030-2A3-4-00	0040-2A3-4-00	0055-2A3-4-00
Part number		18251358	18251471	18251617	18251722	18251765	18251846
		IP66/NEMA 4X – housing without switches					
MCLTPB..		0008-2A3-4-30	0015-2A3-4-30	0022-2A3-4-30	0030-2A3-4-30	0040-2A3-4-30	0055-2A3-4-30
Part number		18276547	18276555	18276563	18276571	18276598	18276601
		IP66/NEMA 4X – housing with switches					
MCLTPB..		0008-2A3-4-40	0015-2A3-4-40	0022-2A3-4-40	0030-2A3-4-40	0040-2A3-4-40	0055-2A3-4-40
Part number		18276784	18276792	18276806	18276814	18276822	18276830
INPUT							
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 200 – 240 ±10%					
Line frequency f_{line}	Hz	50/60 ±5%					
Line fuse	A	10	16 (15)[2]	16 (17.5)[2]	20 (30)[2]	32 (30)[2]	32 (35)[2]
Nominal input current	A	5.7	10.5	13.2	16.1	20.9	26.4
OUTPUT							
Recommended motor power	kW	0.75	1.5	2.2	3	4	5.5
	HP	1	2	3	4	5	7.5
Output voltage U_{motor}	V	3 × 20 – U_{line}					
Output current	A	4.3	7	10.5	14	18	24
Apparent output power	kVA	1.7	2.8	4.2	5.6	7.2	9.6
PWM frequency	kHz	2/4/6/8/12/16					2/4/6/8
Speed range	min^{-1}	-30000 – 0 – +30000					
Maximum output frequency	Hz	500					
Max. motor cable length, shielded	m	100					
Max. motor cable length, unshielded		150					
GENERAL							
Size		2			3		
Nominal power loss 24 V	W	8					
Minimum braking resistance value	Ω	27					
Maximum device terminal cross section	mm^2	2 × 4 or (6)[3]					
Maximum control terminal cross section	mm^2	0.05 – 2.5					

1) For compatibility reasons, this power rating is available in size 3 (IP66) + size 4 (IP55).

2) Recommended values for UL compliance

3) When using 6 mm², M4 forked cable lugs

31554814/EN – 10/2023

Power 5.5 – 18.5 kW (IP55/IP66)

MOVITRAC® LTPB – EMC filter class C2 according to EN 61800-3						
Power in kW		**5.5**[1]	**7.5**	**11**	**15**	**18.5**
		IP55/NEMA 12 K				
MCLTPB..		0055-2A3-4-10	0075-2A3-4-10	0110-2A3-4-10	0150-2A3-4-10	0185-2A3-4-10
Part number		18251854	18251919	18251978	18252036	18252060
		IP66/NEMA 4X – housing without switches				
MCLTPB..		[2]	0075-2A3-4-30	0110-2A3-4-30	–	–
Part number		[2]	18276628	18276636	–	–
		IP66/NEMA 4X – housing with switches				
MCLTPB..		[2]	0075-2A3-4-40	0110-2A3-4-40	–	–
Part number		[2]	18276849	18276857	–	–
INPUT						
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 200 – 240 ±10%				
Line frequency f_{line}	Hz	50/60 ±5%				
Line fuse	A	32 (35)[3]	40	63 (70)[3]	80	100 (90)[3]
Nominal input current	A	26.4	33.3	50.1	63.9	74
OUTPUT						
Recommended motor power	kW	5.5	7.5	11	15	18.5
	HP	7.5	10	15	20	25
Output voltage U_{motor}	V	3 × 20 – U_{line}				
Output current	A	24	30	46	61	72
Apparent output power	kVA	9.6	11.9	18.3	24.3	28.7
PWM frequency	kHz	2/4/6/8	2/4/6/8/12			
Speed range	min^{-1}	-30000 – 0 – +30000				
Maximum output frequency	Hz	500				
Maximum motor cable length, shielded	m	100				
Maximum motor cable length, unshielded		150				
GENERAL						
Size		4			5	
Nominal power loss 24 V	W	11			11.3	
Minimum braking resistance value	Ω	22		12		6
Maximum device terminal cross section	mm^2	16			35	
Maximum control terminal cross section	mm^2	0.05 – 2.5				

1) For compatibility reasons, this power rating is available in size 3 (IP66) + size 4 (IP55).

2) The IP66/NEMA 4X device with this power rating is listed in a previous table.

3) Recommended values for UL compliance

31554814/EN – 10/2023

Power 22 – 45 kW (IP55)

MOVITRAC® LTPB – EMC filter class C2 according to EN 61800-3					
Power in kW		**22**	**30**	**37**	**45**
		IP55/NEMA 12 K			
MCLTPB..		0220-2A3-4-10	0300-2A3-4-10	0370-2A3-4-10	0450-2A3-4-10
Part number		18252087	18252117	18252141	18252176
INPUT					
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 200 – 240 ±10%			
Line frequency f_{line}	Hz	50/60 ±5%			
Line fuse	A	125	160 (150)[1]	200	250 (225)[1]
Nominal input current	A	99.1	121	159.7	187.5
OUTPUT					
Recommended motor power	kW	22	30	37	45
	HP	30	40	50	60
Output voltage U_{motor}	V	3 × 20 – U_{line}			
Output current	A	90	110	150	180
Apparent output power	kVA	35.9	43.8	59.8	71.7
PWM frequency	kHz	2/4/6/8		2/4/6	2/4
Speed range	min^{-1}	-30000 – 0 – +30000			
Maximum output frequency	Hz	500			
Maximum motor cable length, shielded	m	100			
Maximum motor cable length, unshielded	m	150			
GENERAL					
Size		6			
Nominal power loss 24 V	W	11.6			
Minimum braking resistance value	Ω	6	3		
Maximum device terminal cross section		M10 stud with nut, max. 95 mm^2 M8 braking resistor connection, max. 70 mm^2 Crimp cable lug DIN 46235			
Maximum control terminal cross section	mm^2	0.05 – 2.5			

1) Recommended values for UL compliance

31554814/EN – 10/2023

Power 55 – 75 kW (IP55)

MOVITRAC® LTPB – EMC filter class C2 according to EN 61800-3			
Power in kW		**55**	**75**
		IP55/NEMA 12 K	
MCLTPB..		0550-2A3-4-10	0750-2A3-4-10
Part number		18252206	18252230
INPUT			
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 200 – 240 ±10%	
Line frequency f_{line}	Hz	50/60 ±5%	
Line fuse	A	250	315 (300)[1)]
Nominal input current	A	206.5	246.3
OUTPUT			
Recommended motor power	kW	55	75
	HP	75	100
Output voltage U_{motor}	V	3 × 20 – U_{line}	
Output current	A	202	248
Apparent output power	kVA	80.5	98.8
PWM frequency	kHz	2/4/6/8	2/4/6
Speed range	min^{-1}	-30000 – 0 – +30000	
Maximum output frequency	Hz	500	
Maximum motor cable length, shielded	m	100	
Maximum motor cable length, unshielded		150	
GENERAL			
Size		7	
Nominal power loss 24 V	W	11.9	
Minimum braking resistance value	Ω	3	
Maximum device terminal cross section		M10 stud with nut, max. 95 mm^2 M8 braking resistor connection, max. 70 mm^2 Crimp cable lug DIN 46235	
Maximum control terminal cross section	mm^2	0.05 – 2.5	

1) Recommended values for UL compliance

31554814/EN – 10/2023

4.2.8 3-phase system AC 380 – 480 V

INFORMATION

All inverters with degree of protection IP20/NEMA 1 and IP55/NEMA 12K with a power supply of 3 × AC 380 – 480 V can also be operated with 1 × AC 380 – 480 V at device terminals L1 and L2, taking into account a derating of 50% of the output current. Application example with SWER (Single-Wire Earth Return) supply systems.

Inverters with degree of protection IP66/NEMA 4X are excluded from this rule.

Inverters with degree of protection IP55/NEMA 12 with the power ratings 200 kW and 250 kW are excluded from this rule.

31554814/EN – 10/2023

Power 0.75 to 11 kW (IP20/IP66)

MOVITRAC® LTPB – EMC filter class C2 according to EN 61800-3								
Power in kW		**0.75**	**1.5**	**2.2**	**4**	**5.5**	**7.5**	**11**[1]
		IP20/NEMA 1						
MCLTPB..		0008-5A3-4-00	0015-5A3-4-00	0022-5A3-4-00	0040-5A3-4-00	0055-5A3-4-00	0075-5A3-4-00	0110-5A3-4-00
Part number		18251412	18251552	18251684	18251803	18251870	18251927	18251986
		IP66/NEMA 4X – housing without switches						
MCLTPB..		0008-5A3-4-30	0015-5A3-4-30	0022-5A3-4-30	0040-5A3-4-30	0055-5A3-4-30	0075-5A3-4-30	0110-5A3-4-30
Part number		18276644	18276652	18276660	18276679	18276687	18276695	18276709
		IP66/NEMA 4X – housing with switches						
MCLTPB..		0008-5A3-4-40	0015-5A3-4-40	0022-5A3-4-40	0040-5A3-4-40	0055-5A3-4-40	0075-5A3-4-40	0110-5A3-4-40
Part number		18276865	18276873	18276881	18276903	18276911	18276938	18276946
INPUT								
Nominal line voltage U_{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 (15)[2]	25	32 (30)[2]	40 (35)[2]
Nominal input current	A	3.5	5.6	7.5	11.5	17.2	21.8	27.5
OUTPUT								
Recommended motor power	kW	0.75	1.5	2.2	4	5.5	7.5	11
	HP	1	2	3	5	7.5	10	15
Output voltage U_{motor}	V	3 × 20 – U_{line}						
Output current	A	2.2	4.1	5.8	9.5	14	18	24
Apparent output power	kVA	1.5	2.8	4.0	6.6	9.7	12.5	16.6
PWM frequency	kHz	2/4/6/8/12/16				2/4/6/8/12		2/4/6/8
Speed range	min^{-1}	-30000 – 0 – +30000						
Maximum output frequency	Hz	500						
Max. motor cable length, shielded	m	100						
Max. motor cable length, unshielded		150						
GENERAL								
Size		2				3		
Nominal power loss 24 V	W	8				10		
Minimum braking resistance value	Ω	68				39		
Maximum device terminal cross section	mm^2	2 × 4 or (6)[3]						
Maximum control terminal cross section	mm^2	0.05 – 2.5						

1) For compatibility reasons, this power rating is available in size 3 (IP66) + size 4 (IP55).

2) Recommended values for UL compliance

3) When using 6 mm², M4 forked cable lugs

Power 11 – 37 kW (IP55/IP66)

MOVITRAC® LTPB – EMC filter class C2 according to EN 61800-3							
Power in kW		**11**[1]	**15**	**18.5**	**22**	**30**	**37**
		IP55/NEMA 12 K					
MCLTPB..		0110-5A3-4-10	0150-5A3-4-10	0185-5A3-4-10	0220-5A3-4-10	0300-5A3-4-10	0370-5A3-4-10
Part number		18251994	18252044	18252079	18252095	18252125	18252168
		IP66/NEMA 4X – housing without switches					
MCLTPB..		[2]	0150-5A3-4-30	0185-5A3-4-30	0220-5A3-4-30	–	–
Part number		[2]	18276717	18276725	18276733	–	–
		IP66/NEMA 4X – housing with switches					
MCLTPB..		[2]	0150-5A3-4-40	0185-5A3-4-40	0220-5A3-4-40	–	–
Part number		[2]	18276954	18276962	18276970	–	–
INPUT							
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 380 – 480 ±10%					
Line frequency f_{line}	Hz	50/60 ±5%					
Line fuse	A	40 (35)[3]	50 (45)[3]	63 (60)[3]	63 (70)[3]	80	100
Nominal input current	A	27.5	34.2	44.1	51.9	66.1	77.3
OUTPUT							
Recommended motor power	kW	11	15	18.5	22	30	37
	HP	15	20	25	30	40	50
Output voltage U_{motor}	V	3 × 20 – U_{line}					
Output current	A	24	30	39	46	61	72
Apparent output power	kVA	16.6	20.8	27.0	31.9	42.3	49.9
PWM frequency	kHz	2/4/6/8	2/4/6/8/12				
Speed range	min^{-1}	-30000 – 0 – +30000					
Maximum output frequency	Hz	500					
Max. motor cable length, shielded	m	100					
Max. motor cable length, unshielded	m	150					
GENERAL							
Size		4				5	
Nominal power loss 24 V	W	16.7				19.8	
Minimum braking resistance value	Ω	39	22			12	
Maximum device terminal cross section	mm^2	16				35	
Maximum control terminal cross section	mm^2	0.05 – 2.5					

1) For compatibility reasons, this power rating is available in size 3 (IP66) + size 4 (IP55).

2) The IP66/NEMA 4X device with this power rating is listed in a previous table.

3) Recommended values for UL compliance

31554814/EN – 10/2023

Power 45 – 90 kW (IP55)

MOVITRAC® LTPB – EMC filter class C2 according to EN 61800-3					
Power in kW		**45**	**55**	**75**	**90**
		IP55/NEMA 12 K			
MCLTPB..		0450-5A3-4-10	0550-5A3-4-10	0750-5A3-4-10	0900-5A3-4-10
Part number		18252184	18252214	18252249	18252273
INPUT					
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 380 – 480 ±10%			
Line frequency f_{line}	Hz	50/60 ±5%			
Line fuse	A	125	150 (175)[1)]	200	250
Nominal input current	A	102.7	126.4	164.7	192.1
OUTPUT					
Recommended motor power	kW	45	55	75	90
	HP	60	75	100	150
Output voltage U_{motor}	V	3 × 20 – U_{line}			
Output current	A	90	110	150	180
Apparent output power	kVA	62.4	76.2	103.9	124.7
PWM frequency	kHz	2/4/6/8		2/4/6	2/4
Speed range	min^{-1}	-30000 – 0 – +30000			
Maximum output frequency	Hz	500			
Max. motor cable length, shielded	m	100			
Max. motor cable length, unshielded		150			
GENERAL					
Size		6			
Nominal power loss 24 V	W	31.1			
Minimum braking resistance value	Ω	6			
Maximum device terminal cross section		M10 stud with nut, max. 95 mm^2 M8 braking resistor connection, max. 70 mm^2 Crimp cable lug DIN 46235			
Maximum control terminal cross section	mm^2	0.05 – 2.5			

1) Recommended values for UL compliance

31554814/EN – 10/2023

Power 110 – 160 kW (IP55)

MOVITRAC® LTPB – EMC filter class C2 according to EN 61800-3				
Power in kW		**110**	**132**	**160**
		IP55/NEMA 12 K		
MCLTPB..		1100-5A3-4-10	1320-5A3-4-10	1600-5A3-4-10
Part number		18252303	18252311	18252346
INPUT				
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 380 – 480 ±10%		
Line frequency f_{line}	Hz	50/60 ±5%		
Line fuse	A	250 (300)[1)]	315 (300)[1)]	400
Nominal input current	A	210.8	241	299
OUTPUT				
Recommended motor power	kW	110	132	160
	HP	175	200	250
Output voltage U_{motor}	V	3 × 20 – U_{line}		
Output current	A	202	240	302
Apparent output power	kVA	139.9	166.3	209.2
PWM frequency	kHz	2/4/6/8	2/4/6	2/4
Speed range	min^{-1}	-30000 – 0 – +30000		
Maximum output frequency	Hz	500		
Maximum motor cable length, shielded	m	100		
Maximum motor cable length, unshielded		150		
GENERAL				
Size		7		
Nominal power loss 24 V	W	38.5		
Minimum braking resistance value	Ω	6		
Maximum device terminal cross section		M10 stud with nut, max. 95 mm^2 M8 braking resistor connection, max. 70 mm^2 Crimp cable lug DIN 46235		
Maximum control terminal cross section	mm^2	0.05 – 2.5		

1) Recommended values for UL compliance

31554814/EN – 10/2023

Power 200 to 250 kW (IP55)

MOVITRAC® LTPB – EMC filter class C2 according to EN 61800-3			
Power in kW		**200**	**250**
		IP55/NEMA 12 K	
MCLTPB..		2000-5A3-4-10	2500-5A3-4-10
Part number		18290647	18290655
INPUT			
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 380 – 480 ±10%	
Line frequency f_{line}	Hz	50/60 ±5%	
Line fuse	A	500	600
Nominal input current	A	370	480
OUTPUT			
Recommended motor power	kW	200	250
	HP	300	400
Output voltage U_{motor}	V	3 × 20 – U_{line}	
Output current	A	370	480
Apparent output power	kVA	256	333
PWM frequency	kHz	2/4/6/8	
Speed range	min^{-1}	-30000 – 0 – +30000	
Maximum output frequency	Hz	500	
Maximum motor cable length, shielded	m	100	
Maximum motor cable length, unshielded		150	
GENERAL			
Size		8	
Nominal power loss 24 V	W	47	50
Minimum braking resistance value	Ω	3	
Maximum device terminal cross section		M12 stud with nut, max. 240 mm^2 M12 braking resistor connection, max. 240 mm^2 Crimp cable lug DIN 46235	
Maximum control terminal cross section	mm^2	0.05 – 2.5	

31554814/EN – 10/2023

4.2.9 3-phase system AC 380 – 480 V as an IT system version – device without filter

INFORMATION

The listed inverters have no EMC filter and are only suitable for IT systems.

The technical data corresponds to the 3 × 380 – 480 V standard devices with the exception of the filter class.

All inverters with degree of protection IP66/NEMA 4X can be directly converted by the user for operation on the IT system.

MOVITRAC® LTP-B – IT system version – devices without filter				
Power	**Size**	**Housing**	**Type designation**	**Part number**
11	4	IP55/NEMA 12K without switches	MCLTPB0110-503-4-15	18265650
15	4	IP55/NEMA 12K without switches	MCLTPB0150-503-4-15	18265669
18.5	4	IP55/NEMA 12K without switches	MCLTPB0185-503-4-15	18265677
22	4	IP55/NEMA 12K without switches	MCLTPB0220-503-4-15	18265685
30	5	IP55/NEMA 12K without switches	MCLTPB0300-503-4-15	18265693
37	5	IP55/NEMA 12K without switches	MCLTPB0370-503-4-15	18265707
45	6	IP55/NEMA 12K without switches	MCLTPB0450-503-4-15	18265715
55	6	IP55/NEMA 12K without switches	MCLTPB0550-503-4-15	18265723
75	6	IP55/NEMA 12K without switches	MCLTPB0750-503-4-15	18265731
90	6	IP55/NEMA 12K without switches	MCLTPB0900-503-4-15	18265758
110	7	IP55/NEMA 12K without switches	MCLTPB1100-503-4-15	18265766
132	7	IP55/NEMA 12K without switches	MCLTPB1320-503-4-15	18265774
160	7	IP55/NEMA 12K without switches	MCLTPB1600-503-4-15	18265782

Inverters of size 8 (200 to 250 kW) with degree of protection IP55/NEMA 12K without switches can be directly converted by the user for operation on the IT system.

31554814/EN – 10/2023

4.2.10 3-phase system AC 500 – 600 V

INFORMATION

All inverters with degree of protection IP20/NEMA 1 and IP55/NEMA 12K with a power supply of 3 × AC 500 to 600 V can also be operated with 1 × AC 500 to 600 V at device terminals L1 and L2, taking into account a derating of 50% of the output current. Application example with SWER (Single-Wire Earth Return) supply systems.

Inverters with IP66/NEMA 4X degree of protection are excluded from this rule.

Power 0.75 – 5.5 kW (IP20/IP66)

MOVITRAC® LTP-B						
Power in kW		**0.75**	**1.5**	**2.2**	**4**	**5.5**
		IP20/NEMA 1				
MCLTPB..		0008-603-4-00	0015-603-4-00	0022-603-4-00	0040-603-4-00	0055-603-4-00
Part number		18251447	18251587	18251714	18410812	18410839
		IP66/NEMA 4X – housing without switches				
MCLTPB..		0008-603-4-30	0015-603-4-30	0022-603-4-30	0040-603-4-30	0055-603-4-30
Part number		18277551	18277578	18277586	18277594	18277608
		IP66/NEMA 4X – housing with switches				
MCLTPB..		0008-603-4-40	0015-603-4-40	0022-603-4-40	0040-603-4-40	0055-603-4-40
Part number		18277675	18277683	18277691	18277705	18277713
INPUT						
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 500 – 600 ±10%				
Line frequency f_{line}	Hz	50/60 ±5%				
Line fuse	A	10 (6)[1].		10		16 (15)[1].
Nominal input current	A	2.5	3.7	4.9	7.8	10.8
OUTPUT						
Recommended motor power	kW	0.75	1.5	2.2	4	5.5
	HP	1	2	3	5	7.5
Output voltage U_{motor}	V	3 × 20 – U_{line}				
Output current	A	2.1	3.1	4.1	6.5	9
Apparent output power	kVA	2.1	3.1	4.1	6.5	9.0
PWM frequency	kHz	2/4/6/8/12				
Speed range	min^{-1}	-30000 – 0 – +30000				
Maximum output frequency	Hz	500				
Max. motor cable length, shielded	m	100				
Max. motor cable length, unshielded	m	150				
GENERAL						
Size		2				
Nominal power loss 24 V	W	8				
Minimum braking resistance value	Ω	68				
Maximum device terminal cross section	mm^2	2 × 4 or (6)[2]				
Maximum control terminal cross section	mm^2	0.05 – 2.5				

1) Recommended values for UL compliance

2) When using 6 mm², M4 forked cable lugs

Power 7.5 – 15 kW (IP20/IP66)

MOVITRAC® LTP-B				
Power in kW		**7.5**	**11**	**15**[1]
		IP20/NEMA 1		
MCLTPB..		0075-603-4-00	0110-603-4-00	0150-603-4-00
Part number		18410855	18410863	18410871
		IP66/NEMA 4X – housing without switches		
MCLTPB..		0075-603-4-30	0110-603-4-30	0150-603-4-30
Part number		18277616	18277624	18277632
		IP66/NEMA 4X – housing with switches		
MCLTPB..		0075-603-4-40	0110-603-4-40	0150-603-4-40
Part number		18277721	18277748	18277756
INPUT				
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 500 – 600 ±10%		
Line frequency f_{line}	Hz	50/60 ±5%		
Line fuse	A	16 (20)[2]	25 (30)[2]	32 (35)[2]
Nominal input current	A	14.4	20.6	26.7
OUTPUT				
Recommended motor power	kW	7.5	11	15
	HP	10	15	20
Output voltage U_{motor}	V	3 × 20 - U_{line}		
Output current	A	12	17	22
Apparent output power	kVA	12.0	16.9	21.9
PWM frequency	kHz	2/4/6/8/12		
Speed range	min^{-1}	-30000 – 0 – +30000		
Maximum output frequency	Hz	500		
Max. motor cable length, shielded	m	100		
Max. motor cable length, unshielded		150		
GENERAL				
Size		3		
Nominal power loss 24 V	W	10		
Minimum braking resistance value	Ω	39		
Maximum device terminal cross section	mm^2	2 × 4 or (6)[3]		
Maximum control terminal cross section	mm^2	0.05 – 2.5		

1) For compatibility reasons, this power rating is available in size 3 (IP66) + size 4 (IP55).

2) Recommended values for UL compliance

3) When using 6 mm², M4 forked cable lugs

31554814/EN – 10/2023

Power 15 – 30 kW (IP55/IP66)

MOVITRAC® LTP-B					
Power in kW		**15**[1]	**18.5**	**22**	**30**
		IP55/NEMA 12 K			
MCLTPB..		0150-603-4-10	0185-603-4-10	0220-603-4-10	0300-603-4-10
Part number		18252052	18410898	18252109	18252133
		IP66/NEMA 4X – housing without switches			
MCLTPB..		[2]	0185-603-4-30	0220-603-4-30	0300-603-4-30
Part number		[2]	18277640	18277659	18277667
		IP66/NEMA 4X – housing with switches			
MCLTPB..		[2]	0185-603-4-40	0220-603-4-40	0300-603-4-40
Part number		[2]	18277764	18277772	18277780
INPUT					
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 500 – 600 ±10%			
Line frequency f_{line}	Hz	50/60 ±5%			
Line fuse	A	32(35)[3]	40(45)[3]	50(60)[3]	63(60)[3]
Nominal input current	A	26.7	34	41.2	48
OUTPUT					
Recommended motor power	kW	15	18.5	22	30
	HP	20	25	30	40
Output voltage U_{motor}	V	3 × 20 - U_{line}			
Output current	A	22	28	34	43
Apparent output power	kVA	21.9	27.9	33.9	42.8
PWM frequency	kHz	2/4/6/8/12			
Speed range	min^{-1}	-30000 – 0 – +30000			
Maximum output frequency	Hz	500			
Max. motor cable length, shielded	m	100			
Max. motor cable length, un-shielded		150			
GENERAL					
Size		4			
Nominal power loss 24 V	W	16.7			
Minimum braking resistance value	Ω	39	22		
Maximum device terminal cross section	mm^2	16			
Maximum control terminal cross section	mm^2	0.05 – 2.5			

1) For compatibility reasons, this power rating is available in size 3 (IP66) + size 4 (IP55).

2) The IP66/NEMA 4X device with this power rating is listed in a previous table.

3) Recommended values for UL compliance

31554814/EN – 10/2023

Power 37 – 110 kW (IP55)

MOVITRAC® LTP-B							
Power in kW		**37**	**45**	**55**	**75**	**90**	**110**
		IP55/NEMA 12 K					
MCLTPB..		0370-603-4-10	0450-603-4-10	0550-603-4-10	0750-603-4-10	0900-603-4-10	1100-603-4-10
Part number		18410901	18252192	18252222	18252257	18252281	18410928
INPUT							
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 500 – 600 ±10%					
Line frequency f_{line}	Hz	50/60 ±5%					
Line fuse	A	80	100	125	125 (150)[1].	160 (175)[1].	200
Nominal input current	A	62.2	75.8	90.9	108.2	127.7	160
OUTPUT							
Recommended motor power	kW	37	45	55	75	90	110
	HP	50	60	75	100	125	150
Output voltage U_{motor}	V	3 × 20 – U_{line}					
Output current	A	54	65	78	105	130	150
Apparent output power	kVA	53.8	64.7	77.7	104.6	129.5	149.4
PWM frequency	kHz	2/4/6/8/12		2/4/6/8		2/4/6	
Speed range	min^{-1}	-30000 – 0 – +30000					
Maximum output frequency	Hz	500					
Max. motor cable length, shielded	m	100					
Max. motor cable length, unshielded		150					
GENERAL							
Size		5		6			
Nominal power loss 24 V	W	19.8		31.1			
Minimum braking resistance value	Ω	22		12		6	
Maximum device terminal cross section	mm^2	35		M10 stud with nut, max. 95 mm^2 M8 braking resistor connection, max. 70 mm^2 Crimp cable lug DIN 46235			
Maximum control terminal cross section	mm^2	0.05 – 2.5					

1) Recommended values for UL compliance

31554814/EN – 10/2023

4.2.11 3-phase system AC 480 – 525 V

INFORMATION

The following devices do not have UL/cUL approval. The recommended motor power is therefore not specified in HP.

Power 132 – 200 kW (IP55)

MOVITRAC® LTP-B					
Power in kW		**132**	**160**	**185**	**200**
		IP55/NEMA 12 K			
MCLTPB..		1320-U03-4-10	1600-U03-4-10	1850-U03-4-10	2000-U03-4-10
Part number		18298699	18298702	18298710	18298729
INPUT					
Nominal line voltage U_{line} according to EN 50160	V	3 × AC 480 – 525 ±10%			
Line frequency f_{line}	Hz	50/60 ±5%			
Line fuse	A	250	315	315	400
Nominal input current	A	192	215	262	275
OUTPUT					
Recommended motor power	kW	132	160	185	200
	HP	Not specified; see information.			
Output voltage U_{motor}	V	3 × 20 – U_{line}			
Output current	A	185	205	255	275
Apparent output power	kVA	168.2	186.4	231.9	250.1
PWM frequency	kHz	2/4/6/8	2/4/6	2/4	
Speed range	min^{-1}	-30000 – 0 – +30000			
Maximum output frequency	Hz	500			
Max. motor cable length, shielded	m	100			
Max. motor cable length, unshielded		150			
GENERAL					
Size		7			
Nominal power loss 24 V	W	29.7			
Minimum braking resistance value	Ω	7			
Maximum device terminal cross section	mm^2	M10 stud with nut, max. 95 mm^2 M8 braking resistor connection, max. 70 mm^2 Crimp cable lug DIN 46235			
Maximum control terminal cross section	mm^2	0.05 – 2.5			

31554814/EN – 10/2023

4.3 Housing variants and dimensions

4.3.1 Housing variants

The inverter is available with the following housing variants:

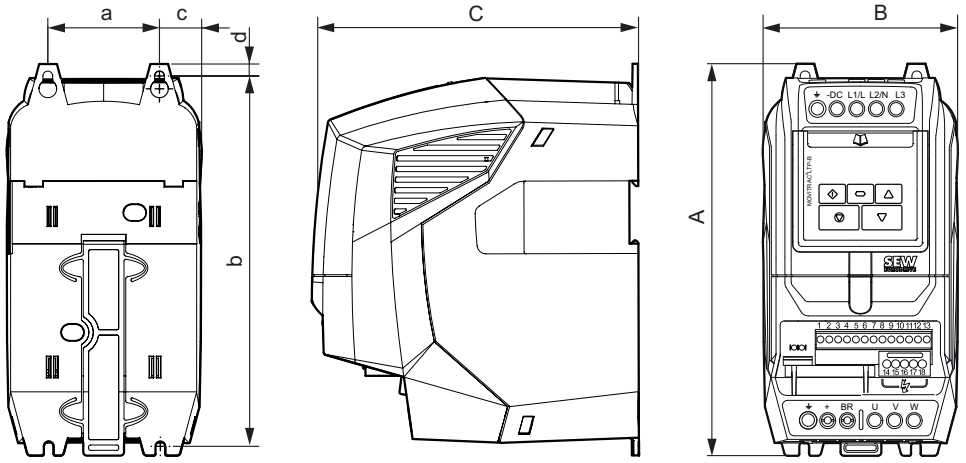
- IP20/NEMA-1 housing for use in control cabinets
- IP66/NEMA-4X housing without switch option
- IP66/NEMA-4X housing with switch option
- IP55/NEMA-12K housing

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

The device variant IP66/NEMA-4X housing with switch options is fitted with a main switch, a direction of rotation switch, and a potentiometer.

The IP55/NEMA-12K housing also protects against moisture and dust according to the IP degree of protection. These frequency inverters can also be operated indoors outside the control cabinet.

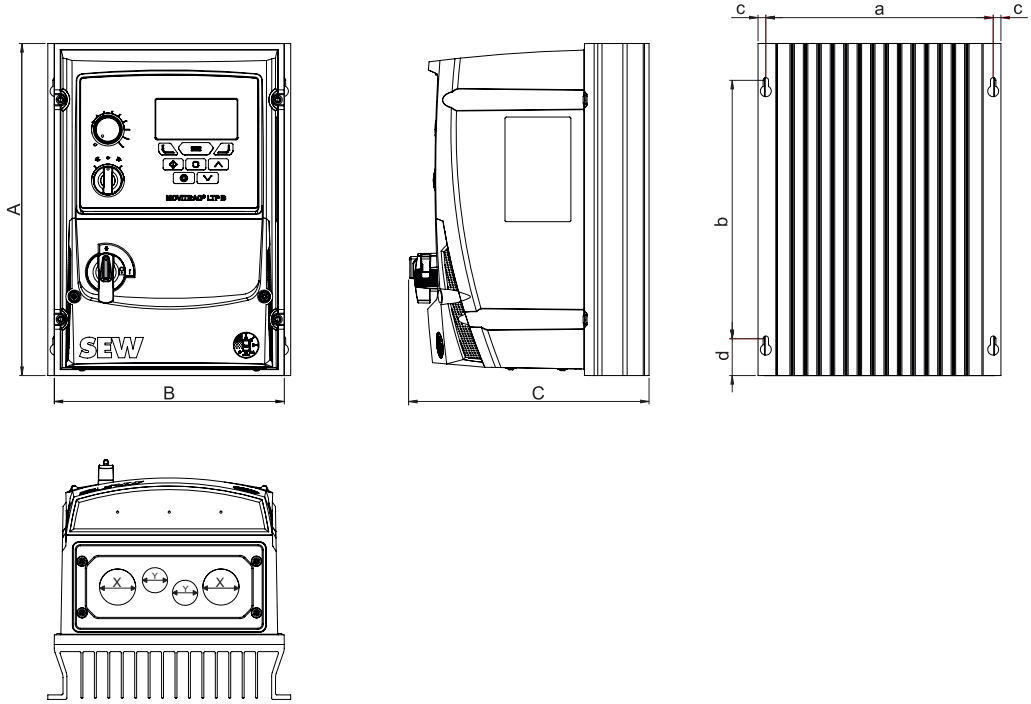
4.3.2 Dimensions of IP20/NEMA 1 housings (LTP xxx -00)



Dimension		230 V: 0.75 – 2.2 kW 400 V: 0.75 – 4 kW 575 V: 0.75 – 5.5 kW	230 V: 3 – 5.5 kW 400 V: 5.5 – 11 kW 575 V: 7.5 – 15 kW
Height (A)	mm	221	261
Width (B)	mm	110	131
Depth (C)	mm	185	205
Mass	kg	1.8	3.5
a	mm	63	80
b	mm	209	247
c	mm	23.5	25.5
d	mm	6	7
Recommended screw size		4 × M4	

31554814/EN – 10/2023

4.3.3 Dimensions of IP66/NEMA-4X housings (LTP xxx -30 and -40)



Dimension		230 V: 0.75 – 2.2 kW 400 V: 0.75 – 4 kW 575 V: 0.75 – 5.5 kW	230 V: 3 – 5.5 kW 400 V: 5.5 – 11 kW 575 V: 7.5 – 15 kW	230 V: 7.5 – 11 kW 400 V: 15 – 22 kW 575 V: 18.5 – 30 kW
Size		2	3	4
Height (A)	mm	257	310	360
Width (B)	mm	188	211	240
Depth (C)	mm	182[1)]	235[1)]	271[1)]
Mass	kg	4.3	7.9	9.6
a	mm	176	197	227
b	mm	200	252	300
c	mm	5	7	6.5
d	mm	28.5	33.5	33
Recommended screw size		4 × M4		
X[2)]	mm	27.2	27.2	37
	PG/M[3)]	PG21/M25	PG21/M25	PG29/M32
Y[4)]	mm	20.4		
	PG/M[3)]	PG13.5/M20	PG13.5/M20	PG13.5/M20

1) Devices without a switch option are 10 mm shorter in depth.
2) Cable bushing X is open ex works. Additional rubber seals are included for metric screw fittings.
3) The specified data refers to plastic screw fittings.
4) Cable bushing Y is open ex works but sealed with a cover.

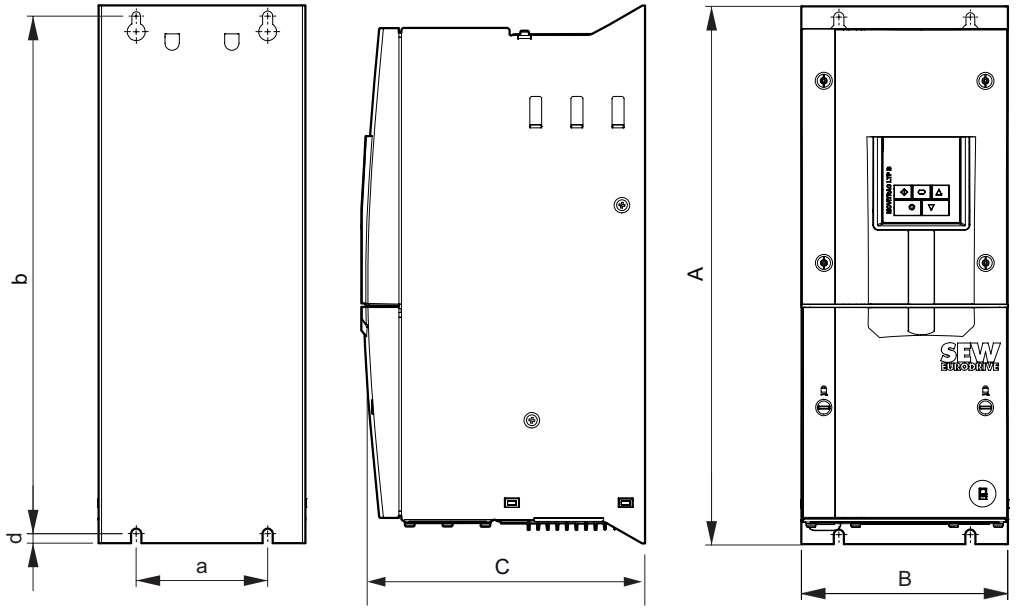
4.3.4 Dimensions of IP55/NEMA 12K housings (LTP xxx -10 and -15)

NOTICE

Residual particles after drilling the cable entires can damage the device.

Device can be damaged by a short circuit

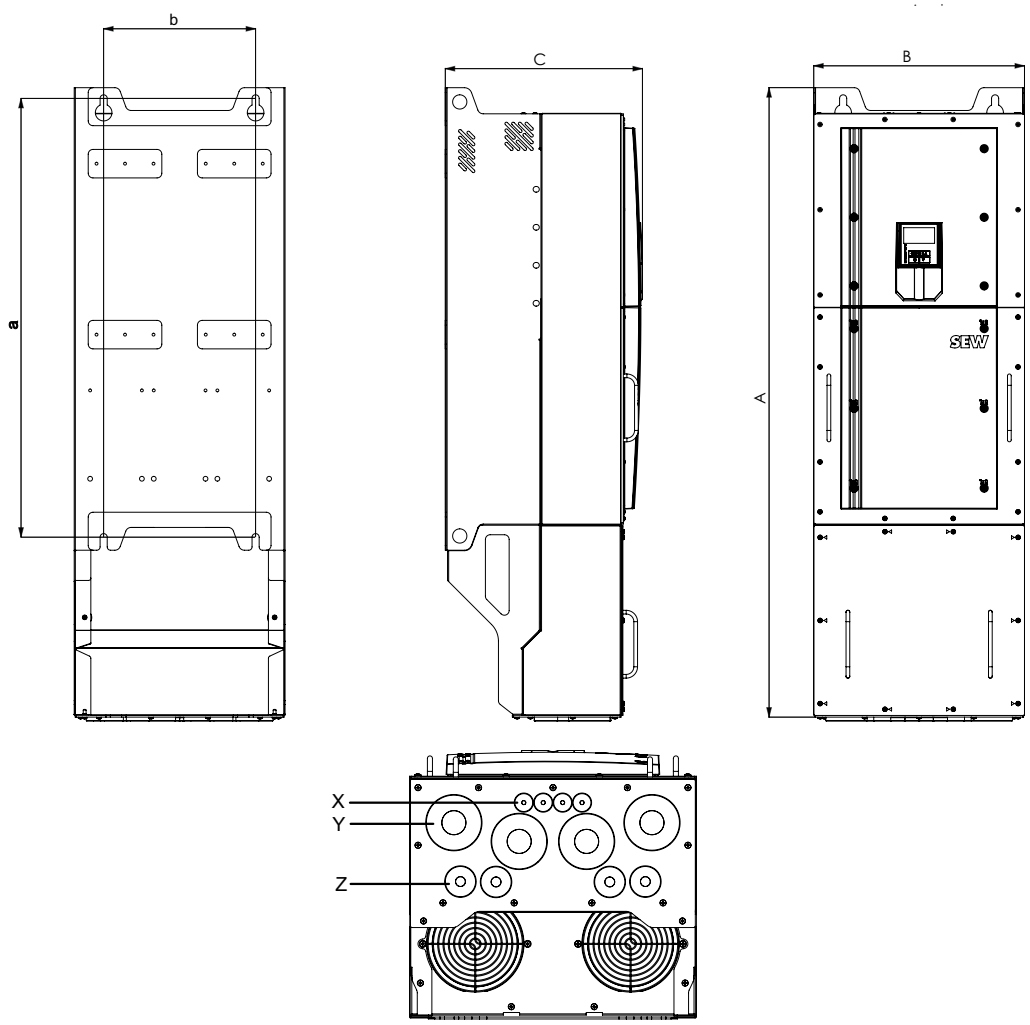
- Carefully remove all particles on and in the inverter after drilling.



There are no holes in the cable entry plate of devices of sizes 4 – 7. These must be drilled or punched by the user.

Dimension		230 V: 5.5 – 11 kW 400 V: 11 – 22 kW 575 V: 15 – 30 kW	230 V: 15 – 18.5 kW 400 V: 30 – 37 kW 575 V: 37 – 45 kW	230 V: 22 – 45 kW 400 V: 45 – 90 kW 575 V: 55 – 110 kW	230 V: 55 – 75 kW 400 V: 110 – 160 kW 525 V: 132 – 200 kW
Size		4	5	6	7
Height (A)	mm	450	540	865	1280
Width (B)	mm	171	235	330	330
Depth (C)	mm	250	268	335	365
Mass	kg	11.5	23	55	89
a	mm	110	175	200	200
b	mm	433	520	840	1255
c	mm	30.5	30	65	65
d	mm	11	10	12.5	12.5
Recommended screw size		4 × M8		4 × M10	

31554814/EN – 10/2023



Cable bushings X, Y, and Z are open ex works and sealed with rubber bushings.

Dimension		400 V: 200 – 250 kW
Height [A]	mm	1325
Width [B]	mm	444
Depth [C]	mm	415
Size		8
Mass	kg	130
a	mm	924
b	mm	320
Recommended screw size	mm	4 × M12
X	mm	22.5
Y	mm	76.5
Z	mm	40.5

[X] Signal and communication cables
[Y] Line and motor connections
[Z] Braking resistor connections and other cables

31554814/EN – 10/2023

5 Project planning for inverter

5.1 Project planning flowchart

Clarification of
- Technical data and requirements
- Boundary conditions
- System interfacing

↓

Calculation of the relevant application data
- Stationary, dynamic, regenerative power
- Speeds

↓

Gear unit selection

Determining
- Gear unit design, gear unit size, gear unit ratio

Check for gear unit utilization ($M_{amax} \geq M_a(t)$)

↓

Motor selection
- Convert torque and speed for the motor shaft
- Define the motor

↓

Check
- Max. torque which can occur $M_{max} < 1.5 \times M_N$
- Required motor speed < n_N
- Thermal load with regard for the setting range and cyclic duration factor

↓

Selection of theMOVITRAC® LTP-B frequency inverter
- Motor/inverter assignment
- Continuous power, peak power
- Installation conditions

↓

Selection of the braking resistor
- On the basis of the calculated regenerative power and the cyclic duration factor

↓

Options selection
- External display, cable sets, etc.

↓

Check whether all requirements are met.

31554814/EN – 10/2023

5.2 Information regarding UL

INFORMATION

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

5.2.1 Ambient Temperature

The units in IP20 are suitable for an ambient temperature of 50 °C, max. 60 °C.

The units in IP55/IP66 are suitable for an ambient temperature of 40 °C, max 50 °C.

5.2.2 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 *P4-17*.
- 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:

- *P4-17* 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 *P4-17* is disabled, thermal memory retention is reset upon shutdown or power loss.
- When *P4-17* is enabled, thermal memory retention is maintained upon shutdown or power loss.

31554814/EN – 10/2023

5.2.3 Branch Circuit Protection

1 × 200 – 240 V devices			
Devices	**Non semiconductor fuses (currents are maximum values)**	**Max. supply short circuit current**	**Max. line voltage**
0008	15 A	100 kA rms (AC)	240 V
0015	17.5 A		
0022	25 A		

3 × 200 – 240 V devices			
Devices	**Non semiconductor fuses (currents are maximum values)**	**Max. supply short circuit current**	**Max. line voltage**
0008	10 A	100 kA rms (AC)	240 V
0015	15 A		
0022	17.5 A		
0030	30 A		
0040	30 A		
0055	35 A		
0075	40 A		
0110	70 A		
0150	80 A		
0185	90 A		
0220	125 A		
0300	150 A		
0370	200 A		
0450	225 A		
0550	250 A		
0750	300 A		

3 × 380 – 480 V devices			
Devices	**Non semiconductor fuses (currents are maximum values)**	**Max. supply short circuit current**	**Max. line voltage**
0008	6 A	100 kA rms (AC)	480 V
0015	10 A		
0022	10 A		
0040	15 A		
0055	25 A		
0075	30 A		
0110	35 A		
0150	45 A		
0185	60 A		
0220	70 A		
0300	80 A		
0370	100 A		
0450	125 A		
0550	175 A		
0750	200 A		
0900	250 A		
1100	300 A		
1320	300 A		
1600	400 A		
2000	500 A		
2500	600 A		

31554814/EN – 10/2023

3 × 500 – 600 V devices			
Devices	**Non semiconductor fuses (currents are maximum values)**	**Max. supply short circuit current**	**Max. line voltage**
0008	6 A	100 kA rms (AC)	600 V
0015	6 A		
0022	10 A		
0040	10 A		
0055	15 A		
0075	20 A		
0110	30 A		
0150	35 A		
0185	45 A		
0220	60 A		
0300	60 A		
0370	80 A		
0450	100 A		
0550	125 A		
0750	150 A		
0900	175 A		
1100	200 A		

31554814/EN – 10/2023

6 Project planning for functional safety

6.1 Integrated safety technology

The safety technology of MOVITRAC® LTP-B described below has been developed and tested in accordance with the following safety requirements:

Underlying standards	Safety class
EN 61800-5-2:2016	SIL 2
EN ISO 13849-1:2015	PL d
EN 61508 (Parts 1 – 7):2010	SIL 2
EN 60204-1:2006 +A1:2009 + AC:2010	Stop category 0
EN 62061:2005/A2:2015	SIL CL 2

STO certification was conducted by TÜV Rheinland. It is valid only for devices that have the TÜV logo imprinted on the nameplate. Copies of the TÜV certificate can be obtained from SEW-EURODRIVE.

6.1.1 Safe condition

For the safety-related use of MOVITRAC® LTP-B, "Safe Torque Off" is defined as a safe state. The underlying safety concept is based on this.

6.1.2 Safety concept

- In the event of danger, any potential risk related to a machine must be eliminated as quickly as possible. Idle state with restart prevention is generally the safe state for preventing dangerous movements.
- The STO function is available independently of the operating mode or parameter settings.
- The inverter offers the possibility of connecting an external safety relay. This safety relay activates the STO function when a connected command device (e.g. emergency stop button with latching function) is actuated. The motor coasts to a halt and is now in the "Safe Torque Off" state.
- The active STO function prevents the inverter from supplying a torque-generating rotating field to the motor.

Safe disconnection function (STO)

The safe disconnection function locks the output stage of the inverter. This prevents a torque-generating rotating field from being connected to the motor. The motor coasts to a stop.

Restarting the motor is possible only if:

- A voltage of 24 V is present between STO+ and STO-.
- All fault messages are acknowledged.

Using the STO function makes it possible to integrate the drive into a safety system in which the STO function must be fully compliant.

The STO function makes the use of electro-mechanical protection with self-checking auxiliary contacts for implementing safety functions redundant.

31554814/EN – 10/2023

Safe Torque Off function

INFORMATION

The deactivated STO function does not prevent the inverter from restarting unintentionally. An automatic restart may occur as soon as the STO inputs obtain a valid "high" signal (depending on the parameter settings). For this reason, do not use this deactivated STO function to carry out brief non-electrical work (for example, cleaning or maintenance).

The STO function integrated into the inverter meets the definition of "Safe Torque Off" in accordance with IEC 61800-5-2:2016.

The STO function corresponds to an uncontrolled stop in accordance with category 0 (emergency off) of IEC 60204-1. If the STO function is activated, the motor coasts to a stop. This stop procedure must be in accordance with the system that drives the motor.

The inverter is tested in accordance with the safety standards specified below:

	SIL Safety integrity level	**PFH_D Probability of dangerous failure per h**	**SFF Safe failure fraction**	**Service life**
EN 61800-5-2	2	1.23×10^{-9} 1/h (0.12% of SIL 2)	50%	20 years

	PL Performance level	**CCF (%) Common cause failure**
EN ISO 13849-1	PL d	1

	SILCL
EN 62061	SILCL 2

Information: The above values are not achieved if the inverter is installed in an environment whose limit values lie outside the values specified in chapter "Ambient conditions" (→ 🗎 26).

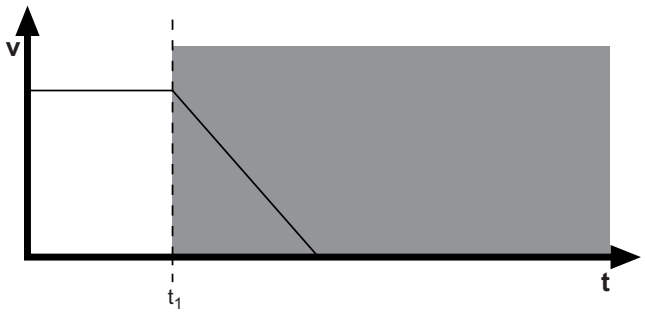
INFORMATION

Some applications require additional measures to satisfy the requirements of the system's safety function. The STO function does not have a motor brake. If a motor brake is required, it is necessary to use a delayed safety relay and/or a mechanical braking device or similar. It is necessary to establish which protection function is required when braking. The brake control in the inverter has not been evaluated from a safety technology perspective and therefore cannot be used to safely control the brake without the use of additional measures.

31554814/EN – 10/2023

Safety functions

The following figure shows the STO function:



2463228171

v Speed
t Time
t_1 Time at which STO is triggered
Switch-off range

STO status and diagnostics

Inverter display

Inverter display **"Inhibit"**: The STO function is active due to signals present at the STO inputs. If, at the same time, the inverter switches to a fault status, the relevant fault message is displayed instead of "Inhibit".

Inverter display **"STo-F"**: See chapter "Fault list" (→ 🗎 204).

Inverter output relay

Inverter relay 1: If *P2-15* is set to "9", the relay opens when the STO function is activated.

Inverter relay 2: If *P2-18* is set to "9", the relay opens when the STO function is activated.

Response times of STO function

The entire response time is the time from when a safety-relevant event occurs on the system components (total) until they are in a safe state (stop category 0 in accordance with IEC 60204-1).

Response time	Description
< 1 ms	From the time • when the STO inputs are no longer energized Until the time • when the motor can no longer generate torque.
< 20 ms	From the time • when the STO inputs are no longer energized Until the time • when the STO monitoring status changes.
< 20 ms	From detection • of a fault in the STO circuit Until display • of the fault in the inverter display or the digital output. Status: "Frequency inverter fault"

31554814/EN – 10/2023

6.1.3 Restrictions

⚠ WARNING

The safety concept is only suitable for performing mechanical work on driven system/machine components.

If the STO signal is disconnected, the line voltage is still present at the inverter DC link.

- Before working on the electric part of the drive system, disconnect it from the supply system using an appropriate external disconnecting device and secure it against unintentional reconnection to the voltage supply.
- The STO function does not prevent an unintended restart. As soon as the STO inputs receive the corresponding signal, the drive can restart automatically. The STO function must not be used for maintenance and repair work.

- The STO function does not have a motor brake. A possible coasting down of the motor may not result in a further hazard. This must be taken into account in a risk assessment of the system/machine. Additional safety measures might have to be implemented (e.g. safety brake system).

  The inverter cannot be used alone without an additional brake system for application-specific safety functions that require active deceleration (braking) of the dangerous movement!
- When using a permanent-field motor and a multiple output stage error occurs – which is extremely rare –, the rotor could rotate by 180°/p (p = number of pole pairs).

INFORMATION

In case of safety-related disconnection of the DC 24 V supply voltage at terminal 12 (STO activated), the brake is always applied. The brake control in the inverter is not safety-related.

6.2 Safety conditions

The requirement for safe operation is that the safety functions of the inverter are properly integrated into an application-specific, higher-level safety function. A system/machine-specific risk assessment must always be carried out by the system/machine manufacturer and taken into account for the use of the drive system with the inverter.

The system/machine manufacturer and the user are responsible for compliance of the system/machine with applicable safety regulations.

Approved devices:

All available MOVITRAC® LTP-B inverters have the STO function.

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

6.2.1 Storage requirements

To avoid accidental damage, SEW-EURODRIVE recommends keeping the inverter in its original packaging until you are going to install it. The storage location must be dry and clean. The temperature range at the storage location must be between –40°C and + 60°C.

31554814/EN – 10/2023

6.2.2 Installation requirements

NOTICE

The STO wiring must be protected against accidental short circuits or external influences. Otherwise, it may cause the STO input signal to fail.

In addition to the wiring guidelines for the STO circuit, section "Electromagnetic compatibility" (→ 🗎 81) must also be observed.

Shielded twisted-pair cables are always recommended here.

Requirements:

- The safety-related DC 24 V supply voltage must be EMC-compliant and routed as follows:
  - Outside an electrical installation space, shielded cables must be routed permanently (fixed) and protected against external damage, or other equivalent measures have to be taken.
  - Inside an electrical installation space: Single conductors can be routed.
  - Adhere to the regulations in force for the application.
- Make sure that you apply shielding for the safety-related DC 24 V supply cable at both ends.
- Power cables and safety-related control cables must be installed in separate cables.
- Make sure that no parasitic voltages can be generated in the safety-related control cables.
- Wiring technology must comply with EN 60204-1.
- Use only grounded voltage sources with protective extra-low voltage (PELV) according to VDE0100 and EN 60204-1. In case of a single fault, the voltage between the outputs or between any output and grounded parts must not exceed a DC voltage of 60 V.
- The safety-related DC 24 V supply voltage may not be used for feedback.
- You can supply power to the 24 V STO input either via an external 24 V supply or via the internal 24 V supply of the inverter. If an external voltage source is used, its cable length to the inverter must not exceed 25 meters.
  - Nominal voltage: DC 24 V
  - STO Logic High: DC 18 – 30 V (Safe Torque Off in standby)
  - Maximum current consumption: 100 mA
- When planning the installation, observe the technical data of the inverter.
- Observe the values specified for safety components when designing the safety circuits.
- Inverters with degree of protection IP20 must be installed in an IP54 control cabinet (minimum requirement) in an environment with degree of pollution 1 or 2.
- The safe 24 V must be connected between the safety relay and STO+ input in such a way that a fault can be ruled out.

  The fault assumption "short circuit between any 2 conductors" can be excluded according to EN ISO 13849-2: 2008 under the following conditions.

  The conductors are:

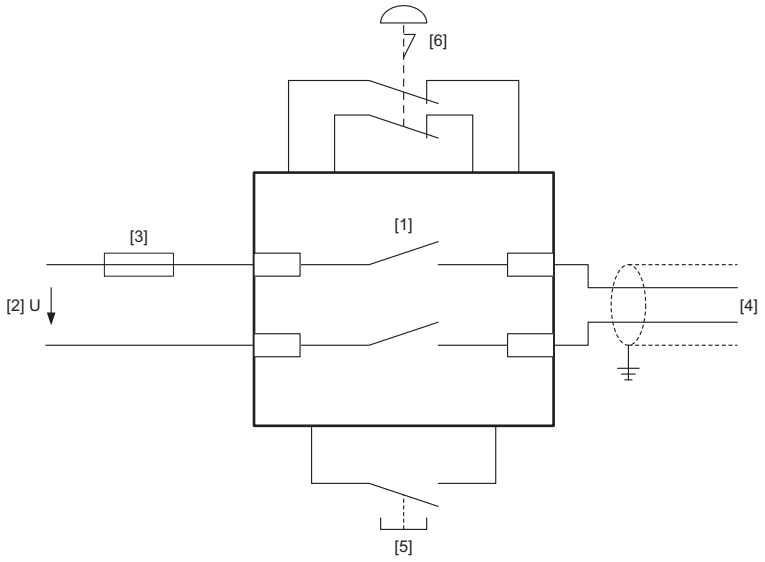
31554814/EN – 10/2023

– Permanently (fixed) installed and protected against external damage (for example, using a cable duct or armored conduit)
– Installed in different light plastic-sheathed cables in an electrical installation space provided that both the lines and the installation space meet the relevant requirements, see EN 60204-1.
– Protected individually by a ground connection.

The fault assumption "short circuit between any conductor and an exposed conductive part or ground or a protective conductor" can be excluded under the following condition:

– Short circuits between a conductor and any exposed conductive part within an installation space.

6.2.3 Requirements of the external safety controller



27021599358181899

[1] Safety relay with approval
[2] DC 24 V voltage supply
[3] Fuses according to the manufacturer's specifications for the safety relay
[4] Safety-related DC 24 V voltage supply
[5] Reset button for manual reset
[6] Approved EMERGENCY STOP actuating device

A safety relay can be used as an alternative to a safety controller. The following requirements apply mutatis mutandis.

- The safety controller and all other safety-related subsystems must be approved for at least the safety class required in the overall system for the respective application-related safety function.

  The following table shows an example of the required safety class of the safety controller:

Application	Requirement for safety controller
Performance level d according to EN ISO 13849-1	Performance level d according to EN ISO 13849-1 SIL 2 according to EN 61508

- The wiring of the safety controller must be suitable for the endeavored safety class (see manufacturer's documentation).
  - In a disconnected state, there must be no test pulses on the supply line.
- The values specified for the safety controller must be strictly adhered to when designing the circuit.
- The switching capacity of the safety relays or the relay outputs of the safety controller must correspond at least to the maximum permitted, limited output current of the 24 V supply voltage.

  Observe the manufacturer's instructions concerning the permitted contact loads and fusing that may be required for the safety contacts. If the manufacturer provides no specific information, the contacts must be protected with 0.6 times the nominal value of the maximum contact rating specified by the manufacturer.
- To ensure protection against an unexpected restart in accordance with EN ISO 14118, the safe control system must be designed and connected in such a way that resetting the command device alone does not lead to a restart. This means that a restart may only be carried out after a manual reset of the safety circuit.

INFORMATION

It is not possible to control the STO inputs via pulsed signals such as self-testing digital outputs of safety controllers, for example.

31554814/EN – 10/2023

6.2.4 Requirements for safety relays

The requirements of the manufacturers of safety relays, such as protecting the output contacts against welding or other safety components, must be strictly observed. For cable routing, the basic requirements apply as described in this documentation.

Other information by the manufacturer on the use of safety relays for specific applications must also be observed.

Choose the safety relay in such a way that it has at least the same safety standards as the required PL/SIL of the application.

Minimum requirements	SIL2 or PLd SC3 or higher (with positively-driven contacts).
Number of output contacts	2 independent
Rated switching voltage	DC 30 V
Switching current	100 mA

6.2.5 Requirements on startup

- To validate the implemented safety functions, they must be documented and checked after successful startup (validation).

  Observe the limitations for safety functions in chapter "Limitations" (→ 🗎 59) for this. Non-safety-related parts and components that affect the result of the validation (e.g. motor brake) must be deactivated, if necessary.
- For using MOVITRAC® LTP-B in safety-relevant applications, it is essential that you perform and record startup checks for the disconnecting device and correct wiring.

6.2.6 Requirements on operation

- Operation is only permitted within the limits specified on the data sheets. This applies to both the external safety control as well as to MOVITRAC® LTP-B and permitted options.
- The fans must be able to rotate freely. Keep the heat sink free of dust and dirt.
- The space in which the inverter is installed must be free from dust and condensation. Check the fan and air filters regularly for proper functioning.
- All electrical connections and the correct tightening torque of the terminals must be checked regularly.
- Check power cables checked for damage caused by heat.

Testing the STO function

Before starting up the system, perform the following tests to ensure that the STO function is working properly. Here, the configured enable source must be taken into account in accordance with the settings in *P1-15*.

- 1. Initial situation:

  The inverter is not enabled. Therefore, the motor is in an idle state.

  – The STO inputs are no longer energized ("Inhibit" displayed on the inverter display).

– Enable the inverter. Since the STO inputs continue to not be energized, "Inhibit" continues to be displayed on the inverter display.

- 2. Initial situation:

  The inverter is enabled. The motor rotates.

  – Disconnect the STO inputs from the power supply.

  – Check whether "Inhibit" is displayed on the inverter display, the motor is stopped, and the operation runs in accordance with sections "Safe disconnection function (STO)" (→ 🗎 56) and "STO status and diagnostics" (→ 🗎 58).

Maintaining the STO function

Test the safety functions at regular intervals (at least once per year) to ensure that they are working properly. The test intervals must be specified on the basis of the risk assessment.

Furthermore, test the integrity of the STO function after each change to the safety system or following any maintenance work.

If error messages occur, determine their significance under section "Service and error codes" (→ 🗎 225).

6.3 Connection variants

6.3.1 General information

Generally, all the connection variants listed in this documentation are permitted for safety-relevant applications as long as the basic safety concept is met. This means you must ensure under all circumstances that the safe digital input is switched by an external safety relay or a safety controller. This must also prevent an automatic restart.

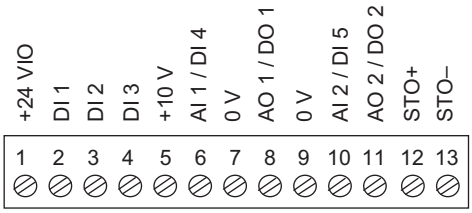
All safety conditions mentioned in sections 2, 3 and 4 of the present documentation must be met for the basic selection, installation, and application of the safety components, such as safety relay, EMERGENCY STOP switch, etc., and the approved connection variants.

The wiring diagrams are block diagrams whose only purpose is to show the safety function(s) with the relevant components. Circuit-related measures, which usually always have to be implemented additionally, are not shown in the diagrams to enhance clarity. Such measures are taken, for example, to ensure protection against contact, to handle overvoltage and undervoltage, to detect insulation faults, line-to-ground faults and short circuits, which can occur on externally installed lines, or to ensure the necessary immunity against electromagnetic interference.

31554814/EN – 10/2023

Connections on MOVITRAC® LTP-B

The following illustration shows an overview of the signal terminals.



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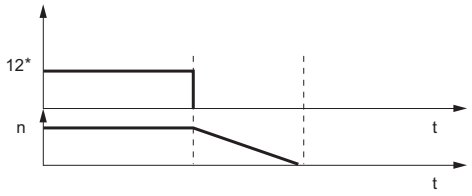
6.3.2 Disconnection of a single drive

STO according to PL d (EN ISO 13849-1)

The process is as follows:

- The safe digital input 12 is disconnected.
- The motor coasts down if there is no brake installed.

STO – Safe Torque Off (EN 61800-5-2)



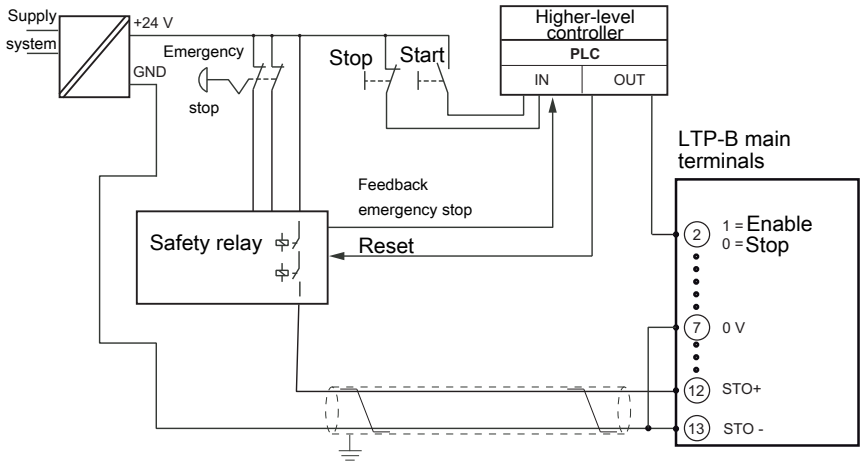
18014406471159051

* Safe digital input (terminal 12)
n Speed

INFORMATION

The shown STO disconnections can be used up to PL d in accordance with EN ISO 13849-1 and in consideration of chapter "Requirements for safety relays" (→ 🗎 63).

Control with safety relay with external 24 V supply



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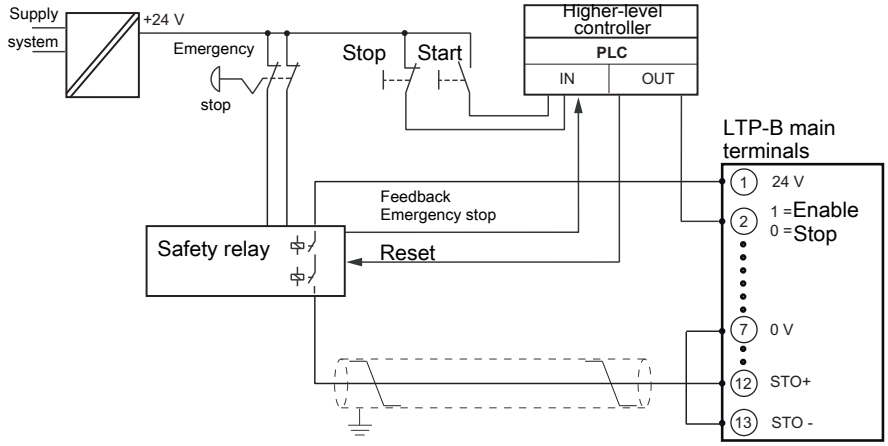
Control with safety relay with internal 24 V supply



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INFORMATION

Certain presumptions of faults must be made in case of a single-channel disconnection. These can be controlled by means of by fault exclusion. See chapter "Requirements for safety relays" (→ 🗎 63).

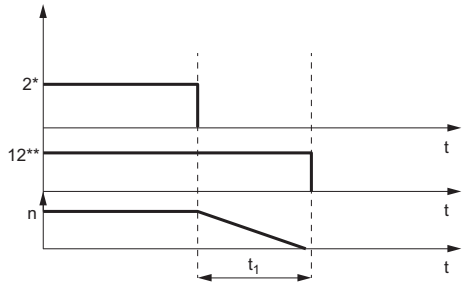
31554814/EN – 10/2023

SS1-t according to PL d (EN ISO 13849-1)

The process is as follows:

- Terminal 2 is disconnected, e.g. in the event of an emergency stop.
- During the safety time t_1, the motor runs its speed along the ramp until it reaches the idle state.
- The safety relay disconnects terminal 12 after t_1 has elapsed. The safe time t_1 must be configured so that the motor comes to a standstill during that time.

SS1-t – Safe Stop 1 (EN 61800-5-2)



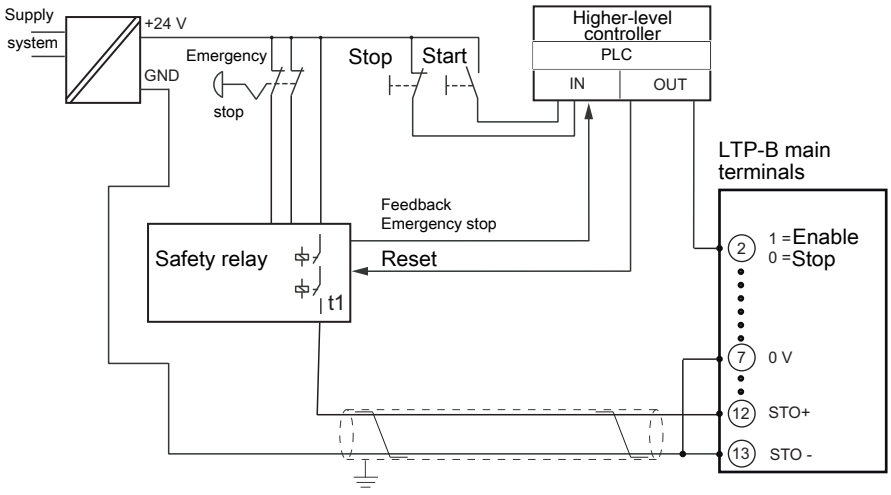
18014407035653003

* Digital input 1 (terminal 2)
** Safe digital input (terminal 12)
n Speed

INFORMATION

The shown SS1-t disconnections can be used up to PL d according to EN ISO 13849-1 in consideration of chapter "Requirements for safety relays" (→ 🗎 63).

Control with safety relay with external 24 V supply



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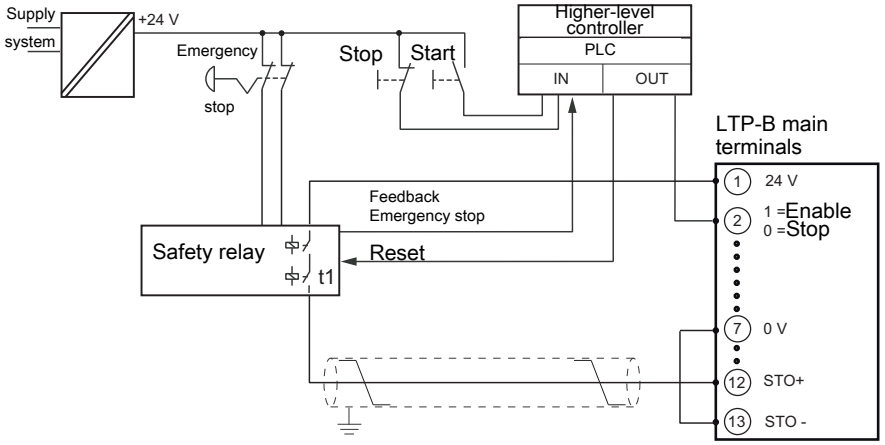
Control with safety relay with internal 24 V supply



44978741643

INFORMATION

Certain fault assumptions are be made for the single-channel disconnection and to be controlled by fault exclusion. See chapter "Requirements for safety relays" (→ 🗎 63).

6.4 Safety characteristics

Characteristic values acc. to:	EN 61800-5-2	EN ISO 13849-1	EN 62061
Classification/underlying standards	SIL 2 (Safety Integrity Level)	PL d (Performance Level)	SILCL 2
(PFH_D value)[1]	1.23×10^{-9} 1/h		
Mission time/service life	20 years, after which the component must be replaced with a new one.		
Proof test interval	20 years	–	20 years
Safe state	Safe torque off (STO)		
Safety sub-functions	STO, SS1[2] according to EN 61800-5-2		

1) Probability of dangerous failure per hour.

2) With suitable external control

31554814/EN – 10/2023

6.5 Safe digital input for STO

MOVITRAC® LTP-B	Terminal	Function	General electronics data
Safe digital input	12	STO+	DC +24 V input, max. 100 mA
	13	STO-	GND reference potential for safe digital input
Permitted cable cross section			One conductor per terminal: 0.05 – 2.5 mm^2

	Min.	Typical	Max.
Input voltage range	DC 18 V	DC 24 V	DC 30 V
Time until output stage inhibit	–	–	1 ms
Time until Inhibit appears on the display with active STO	–	–	20 ms
Time until an STO switching time error is detected and displayed	–	–	20 ms

INFORMATION

It is not possible to control the STO inputs via pulsed signals such as self-testing digital outputs of safety controllers, for example.

7 Device structure

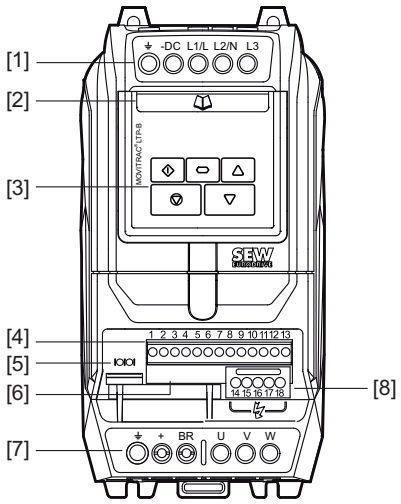
7.1 Device structure of the inverter

The frequency inverters of the MOVITRAC® LTP-B product series are available in degree of protection IP20 for installation in a control cabinet and in degrees of protection IP55 and IP66 for installation in the field.

7.1.1 Inverters with degree of protection IP20/NEMA 1

The following inverters have the housing shown below:

Nominal line voltage	Inverter power rating
200 – 240 V	0.75 – 5.5 kW
380 – 480 V	0.75 – 11 kW
500 – 600 V	0.75 – 15 kW



17957766667

[1] Connecting terminal strip PE, -DC, 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 (pluggable)

[5] RJ45 communication socket

[6] Option card slot

[7] Connecting terminal strip PE, +, BR, U, V, W

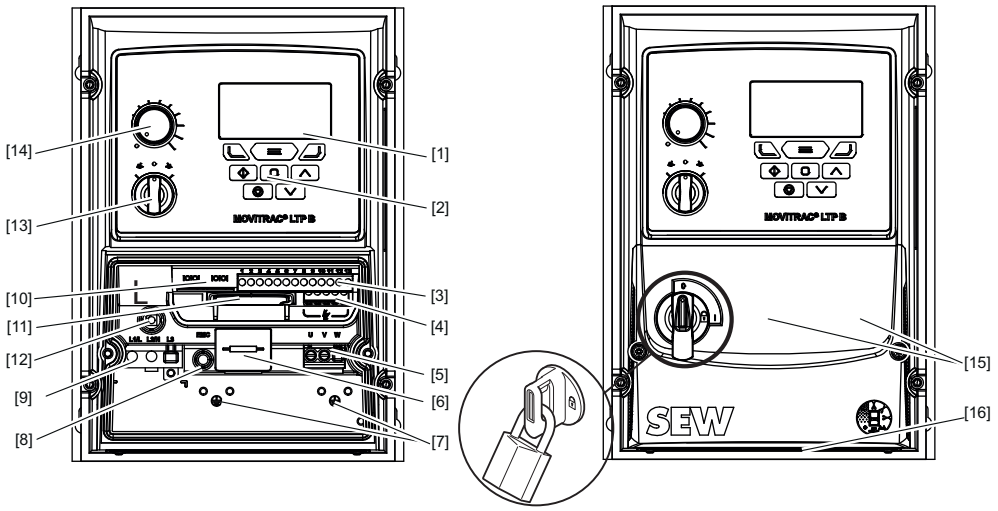
[8] Relay terminal strip (pluggable)

31554814/EN – 10/2023

7.1.2 Inverters with degree of protection IP66/NEMA 4X

The following inverters have the housing shown below:

Nominal line voltage	Inverter power rating
200 – 240 V	0.75 – 11 kW
380 – 480 V	0.75 – 22 kW
500 – 600 V	0.75 – 30 kW



9007233336984843

[1] Full text display (TFT display)

[2] Keypad

[3] Control terminal strip (pluggable)

[4] Relay terminal strip (pluggable)

[5] Connecting terminal strip U, V, W

[6] Terminal strip braking resistor +, BR, -DC

[7] PE connections

[8] EMC screw

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

[10] RJ45 communication socket (dual implementation)

[11] Option card slot

The following items are only present in the unit design with switch option:

[12] Main switch for supply system separation (main switch is lockable)

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

[14] Rotary potentiometer for speed

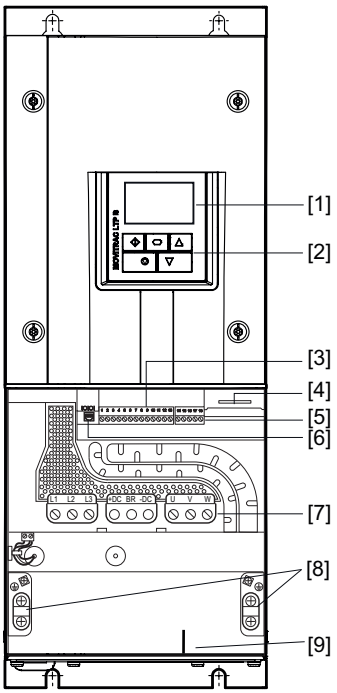
Optional, customer-specific extension of the front cover:

The front cover of the terminal space [15] can be expanded with two additional buttons or switches. For this purpose, it is necessary to drill holes in the cover. The position of these bore holes is marked with punching on the rear side. The front cover of the terminal space can be extended at the bottom with three additional screw fittings. For this purpose, it is necessary to drill holes in the cover. The position of these bore holes [16] is marked with punching on the underside.

7.1.3 Inverters with degree of protection IP55/NEMA 12K

The following inverters have the housing shown below:

Nominal line voltage	Inverter power rating
200 – 240 V	5.5 – 75 kW
380 – 480 V	11 – 160 kW
500 – 600 V	15 – 110 kW
480 – 525 V	132 – 200 kW



9007217212704523

[1] Full text display (OLED display)

[2] Keypad

[3] Control terminal strip (pluggable)

[4] Option card slot

[5] Relay terminal strip (pluggable)

[6] RJ45 communication socket

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

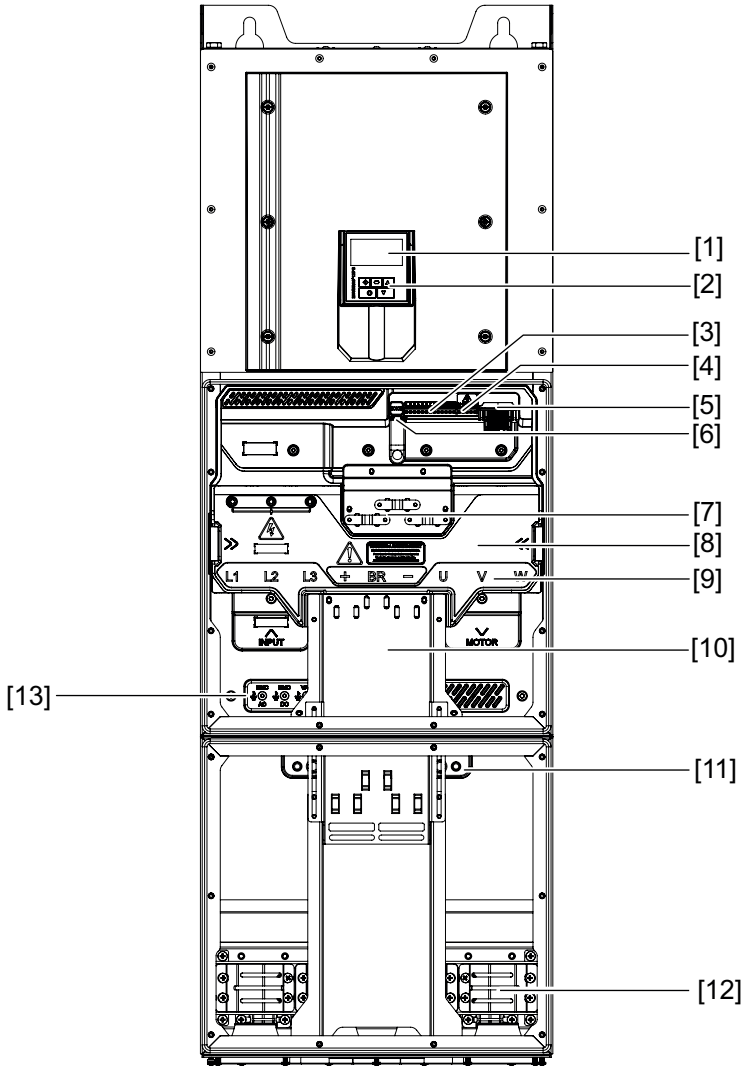
[8] Additional PE connections

[9] Additional stud bolt on the cable entry plate for connection to the PE of the inverter

31554814/EN – 10/2023

The following inverters have the housing shown below:

Nominal line voltage	Inverter power rating
380 – 480 V	200 kW, 250 kW



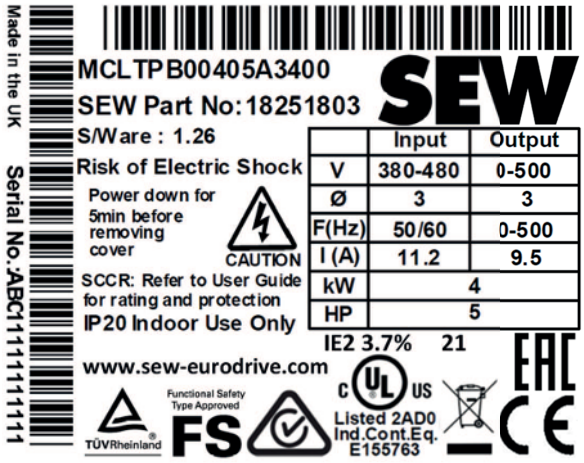
9007235944396683

[1] Full text display (TFT display)
[2] Keypad
[3] Control terminal strip (pluggable)
[4] Relay terminal strip (pluggable)
[5] Option card slot
[6] RJ45 communication socket
[7] Shield clips and strain relief for signal and communication cables
[8] Removable touch guard for the power terminals
[9] Terminal strip L1, L2, L3, +, BR, -, U, V, W
[10] Signal line shield plates
[11] PE connections (3 × M12)
[12] Shield clips and strain relief for power cables
[13] EMC AC, EMC DC, and VAR screw

7.2 Nameplate and type designations

7.2.1 Nameplate

The following figure shows an example of a nameplate.



7.2.2 Type designation

Example: MCLTPB0015-2B1-4-00 (60 Hz)		
Product name	MCLTP	MOVITRAC® LTP-B
Version	B	Version status of device series
Recommended motor power	0015	0015 = 1.5 kW
Connection voltage	2	2 = 200 to 240 V 5 = 380 to 480 V U = 480 to 525 V 6 = 500 to 600 V
Interference suppression on the input	B	0 = Device without filter (no interference suppression) A = Class C2 B = Class C1
Connection type	1	1 = 1-phase 3 = 3-phase
Quadrants	4	4 = 4-quadrant operation
Design	00	00 = Standard IP20 housing 10 = IP55/NEMA-12K housing 15 = IP55/NEMA-12K housing for operation on IT systems 30 = IP66/NEMA-4X housing without switch 40 = IP66/NEMA-4X housing with switch xH = High-frequency version
Country-specific variant	(60 Hz)	60-Hz design

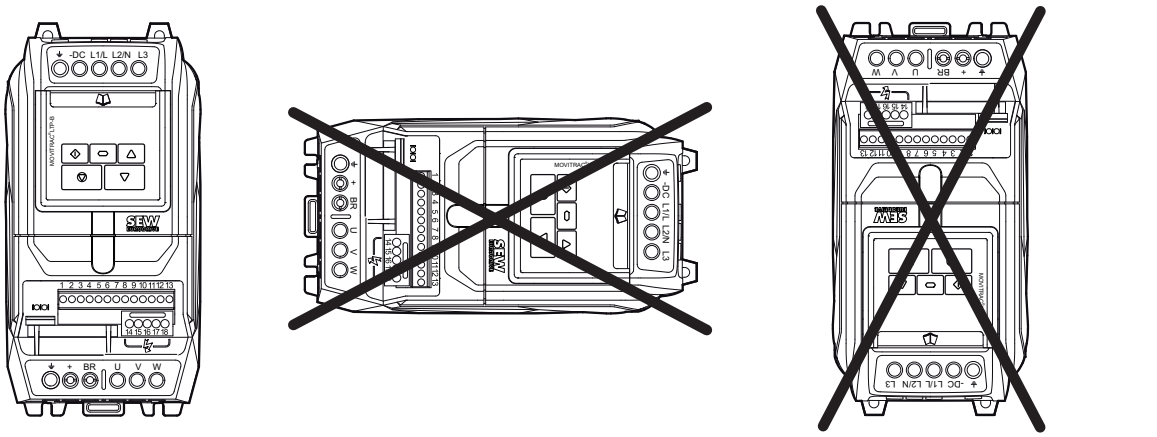
31554814/EN – 10/2023

8 Mechanical installation

8.1 Installation notes

Please note the following information for mechanical installation:

- Carefully check the inverter for damage before the installation.
- Store the inverter in its original packaging until it is used. The storage location must be clean and dry with an ambient temperature between -40 °C and +60 °C.
- Install the inverter in a suitable housing on a level, vertical, non-flammable, and vibration-free surface. If a certain IP degree of protection is required, observe EN 60529.
- Keep flammable materials away from the inverter.
- Prevent the ingress of conductive or flammable foreign objects.
- The relative humidity must be kept below 95% (condensation is not permitted).
- Protect the IP55/IP66 inverter from direct sunlight. Use a cover when using the inverter outdoors.
- Inverters can be installed next to each other. Ensure sufficient ventilation space between the individual devices. If the inverter is to be installed above another 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" (→ 🗎 76).
- The permitted ambient temperatures are defined in chapter "Ambient conditions" (→ 🗎 26).
- The mounting rail can only be installed for the following inverters with IP20 degree of protection.
  - 200 to 240 V: 0.75 to 2.2 kW
  - 380 to 480 V: 0.75 to 4 kW
  - 500 to 600 V: 0.75 to 5.5 kW
- The mounting rail must have the dimensions 35 × 15 mm or 35 × 7.5 mm and be designed in accordance with EN 50022.



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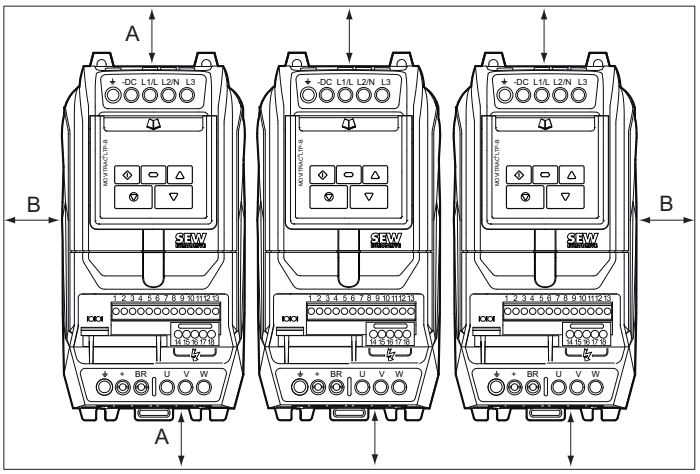
8.2 Installing the inverter

8.2.1 IP20 housing: Installation and installation space

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

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



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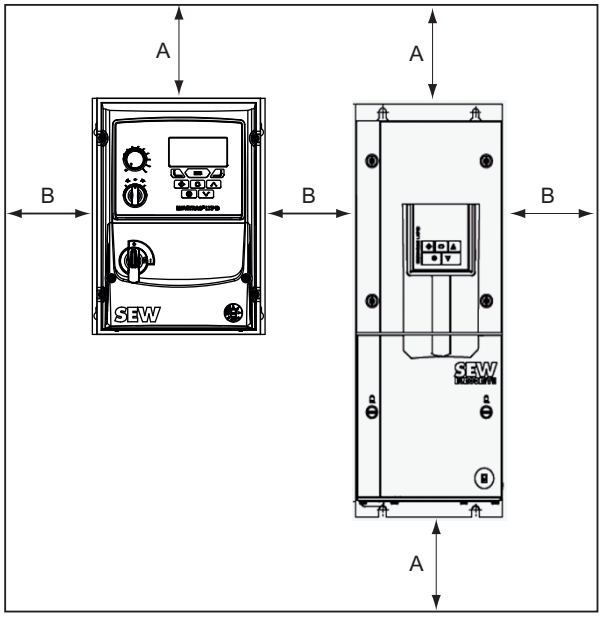
Inverter power rating	A in mm	B in mm	Air flow rate per inverter
230 V: 0.75 – 2.2 kW (IP20) **400 V**: 0.75 – 4 kW (IP20) **575 V**: 0.75 – 5.5 kW (IP20)	75	10	>18 m³/h
230 V: 3 – 5.5 kW (IP20) **400 V**: 5.5 – 11 kW (IP20) **575 V**: 7.5 – 15 kW (IP20)	100	10	>54 m³/h

31554814/EN – 10/2023

8.2.2 IP55/IP66 housing: Installation and control cabinet dimensions

Inverters with IP55/IP66 degree of protection can be used indoors.

The minimum distances in control cabinets or in the field must not be less than the ones shown here.



Power rating of the inverter	A in mm	B in mm	Cooling
200 to 240 V			
0.75 to 4 kW (IP66)	200	10	Convection
5.5 to 11 kW (IP66)	200	10	Fan
5.5 to 75 kW (IP55)	200	10	Fan
380 to 480 V			
0.75 to 7.5 kW (IP66)	200	10	Convection
11 to 22 kW (IP66)	200	10	Fan
11 to 160 kW (IP55)	200	10	Fan
200 to 250 kW (IP55)	350	50	Fan
500 to 600 V			
0.75 to 11 kW (IP66)	200	10	Convection
15 to 30 kW (IP66)	200	10	Fan
15 to 110 kW (IP55)	200	10	Fan
480 to 525 V			
132 to 200 kW (IP55)	200	10	Fan

INFORMATION

If the IP55/IP66 inverter is installed in a control cabinet, it must be ensured that the control cabinet is sufficiently ventilated. The control cabinet ventilation is dimensioned by the control cabinet manufacturer in consideration of all heat sources.

31554814/EN – 10/2023

8.3 Tightening torques

Tighten the terminal screws with the following tightening torques:

Power rating of the inverter	Tightening torque in Nm	
	Control terminals	Power terminals
Nominal line voltage 200 to 240 V		
0.75 to 2.2 kW (IP20)	0.5	1
3 to 5.5 kW (IP20)		1
0.75 to 2.2 kW (IP66)		1
3 to 5.5 kW (IP66)		1
7.5 to 11 kW (IP66)		2
5.5 to 11 kW (IP55)		2
15 to 18.5 kW (IP55)		4
22 to 45 kW (IP55)		15
55 to 75 kW (IP55)		15
Nominal line voltage 380 to 480 V		
0.75 to 4 kW (IP20)	0.5	1
5.5 to 11 kW (IP20)		1
0.75 to 4 kW (IP66)		1
5.5 to 11 kW (IP66)		1
15 to 22 kW (IP66)		2
11 to 22 kW (IP55)		2
30 to 37 kW (IP55)		4
45 to 90 kW (IP55)		15
110 to 160 kW (IP55)		15
200 to 250 kW (IP55)		60
Nominal line voltage 500 to 600 V		
0.75 to 5.5 kW (IP20)	0.5	1
7.5 to 15 kW (IP20)		1
0.75 to 5.5 kW (IP66)		1
7.5 to 15 kW (IP66)		1
18.5 to 30 kW (IP66)		2
15 to 30 kW (IP55)		2
37 to 45 kW (IP55)		4
55 to 110 kW (IP55)		15
Nominal line voltage 480 to 525 V		
132 to 200 kW (IP55)	0.5	15

31554814/EN – 10/2023

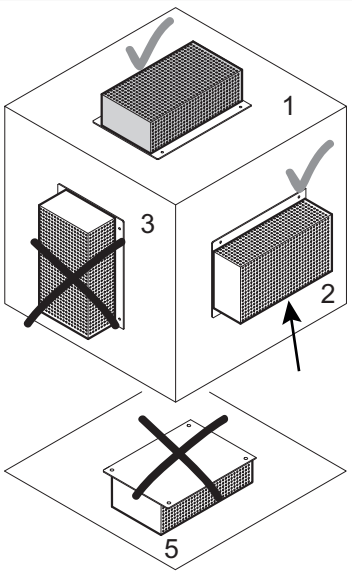
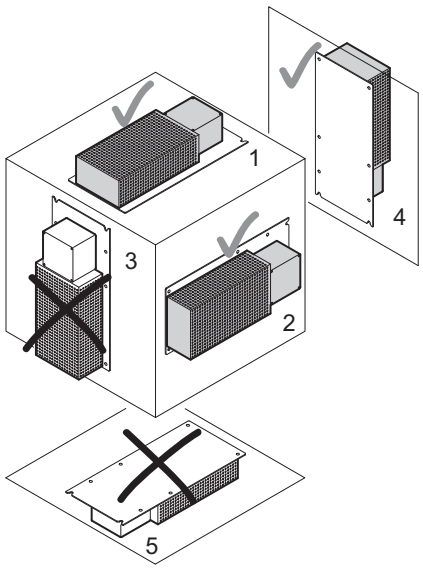
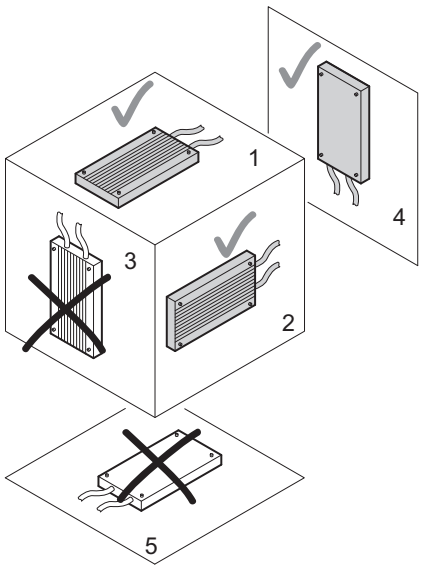
8.4 Installing braking resistors

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

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

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

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

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

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

9 Electrical installation

⚠ WARNING

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

Severe or fatal injuries.

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

⚠ WARNING

Danger of fatal injury from falling hoist.

Severe or fatal injuries.

- Do not use the inverter as a safety device for lifting applications. Use monitoring systems or mechanical protection devices as safety equipment.

- Only trained electricians may install the inverter in observation of the applicable rules and regulations.
- The grounding cable must be dimensioned for the maximum line fault current that is normally limited by fuses or motor circuit breakers.
- The inverter has the IP20 degree of protection. For a higher IP degree of protection, use a suitable enclosure or the IP55/NEMA 12K or IP66/NEMA 4X variants.
- Make sure that the devices are properly grounded. Adhere to the wiring diagram in chapter "Connecting the inverter and motor" (→ 🗎 103).

31554814/EN – 10/2023

9.1 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.

9.1.1 Interference immunity

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

9.1.2 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).

To ensure the best possible electromagnetic compatibility, install the inverters as described in chapter "Installation". In doing so, make sure there are good grounding connections for the inverters. Use shielded motor cables to comply with the specifications on interference emission.

The following table defines the conditions for use in drive applications:

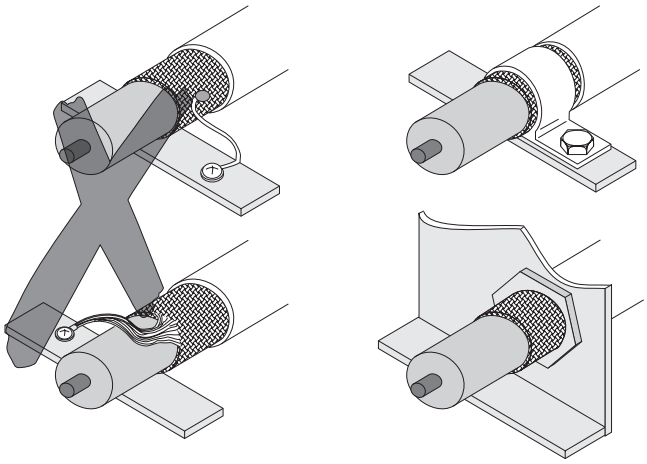
<table>
<tr><th rowspan="2">Inverter type</th><th>Cat. C1 (class B)</th><th>Cat. C2 (class A)</th><th>Cat. C3</th></tr>
<tr><th colspan="3">according to EN 61800-3</th></tr>
<tr><td>230 V, 1-phase
LTPBxxxx-2B1-x-xx</td><td colspan="3">No additional filtering required.
Use a shielded motor cable.</td></tr>
<tr><td>230 V, 3-phase
LTPBxxxx-2A3-x-xx
400 V, 3-phase
LTPBxxxx-5A3-x-xx</td><td>Use an external filter of type NF LTxxx xxx.
Use a shielded motor cable.</td><td colspan="2">No additional filtering required.
Use a shielded motor cable.</td></tr>
<tr><td>575 V, 3-phase
LTPBxxxx-603-x-xx
525 V, 3-phase
LTPBxxxx-U03-x-xx</td><td colspan="3">These devices are not covered by the EMC standard.
Use an external line filter, if necessary, to minimize electromagnetic interference emissions.
However, compliance with the aforementioned limit classes cannot be guaranteed.
Use a shielded motor cable.</td></tr>
</table>

31554814/EN – 10/2023

9.1.3 General information about connecting the motor shield

In all applications where a higher EMC load is to be expected, it is recommended to use shielded cables. Connect these as follows:

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



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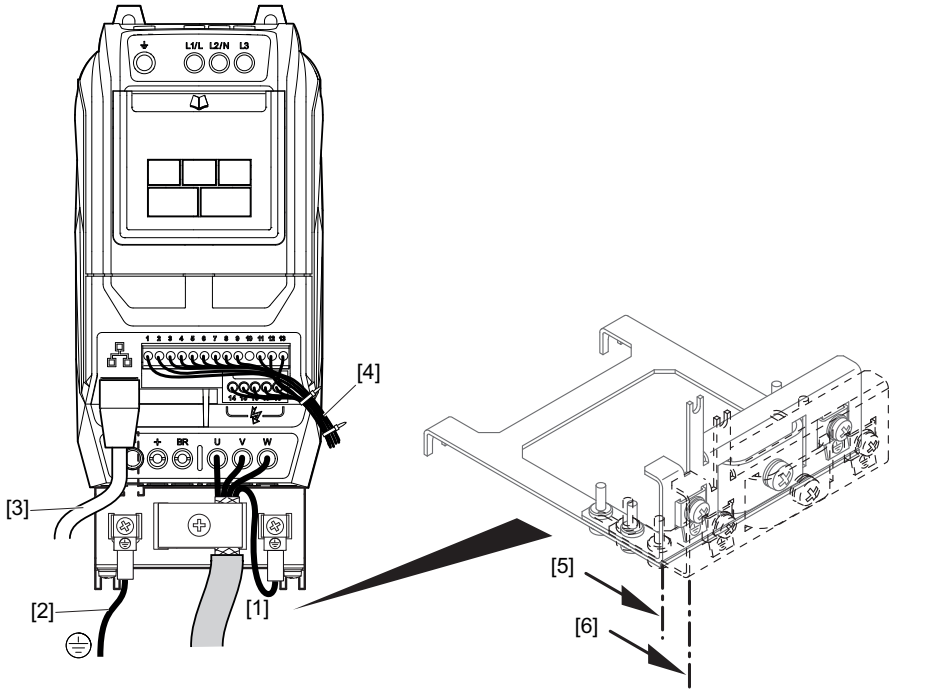
Recommendation for applying the motor shield to inverters with IP20

The following inverters have the housing shown below:

Nominal line voltage	Inverter power rating
200 – 240 V	0.75 – 5.5 kW
380 – 480 V	0.75 – 11 kW
500 – 600 V	0.75 – 15 kW

31554814/EN – 10/2023



34190400395

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

The shield plate can be used optionally for the inverters in IP20 design listed above. Proceed as follows to adjust:

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

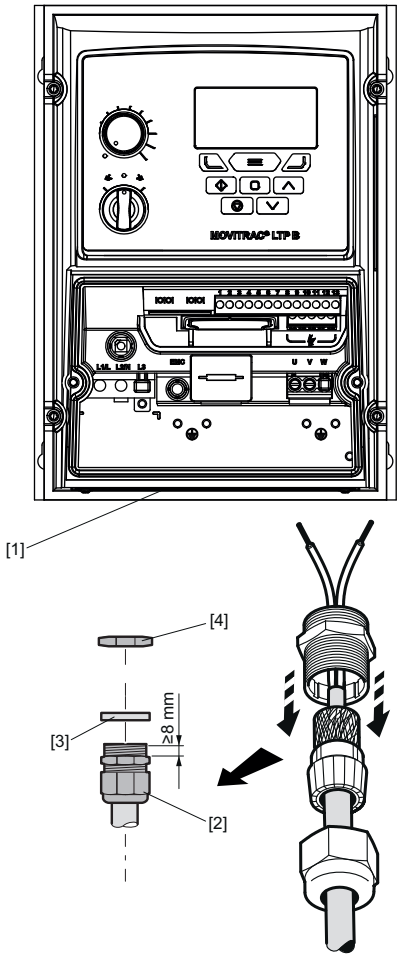
Make sure that the sheet metal is correctly attached to the PE connection.

Recommendation for applying the motor shield to inverters with IP66

The cable bushing on the device is made of metal. You can fasten a corresponding metal screw fitting directly.

The following inverters have the housing shown below:

Nominal line voltage	Inverter power rating
200 – 240 V	0.75 – 11 kW
380 – 480 V	0.75 – 22 kW
500 – 600 V	0.75 – 30 kW



34206896523

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

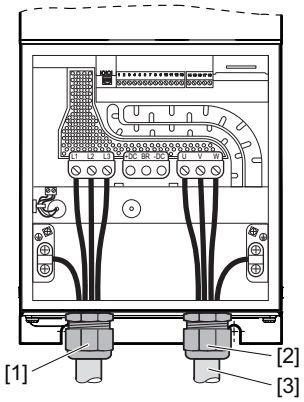
It is recommended to use metal screw fittings to connect the motor shield to the device. The thread must be at least 8 mm long.

Recommendation for applying the motor shield to inverters with IP55

The cable bushing on the device is made of metal. You can fasten a corresponding metal screw fitting directly.

The following inverters have the housing shown below:

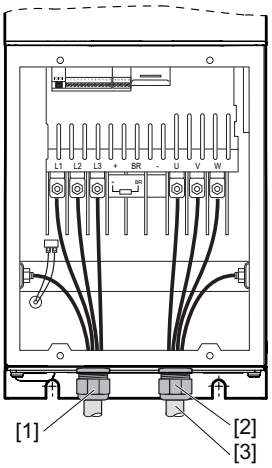
Nominal line voltage	Inverter power rating
200 – 240 V	5.5 – 18.5 kW
380 – 480 V	11 – 37 kW
500 – 600 V	15 – 45 kW



[1] Supply system cable
[2] Metal screw fitting
[3] Motor cable

The following inverters have the housing shown below:

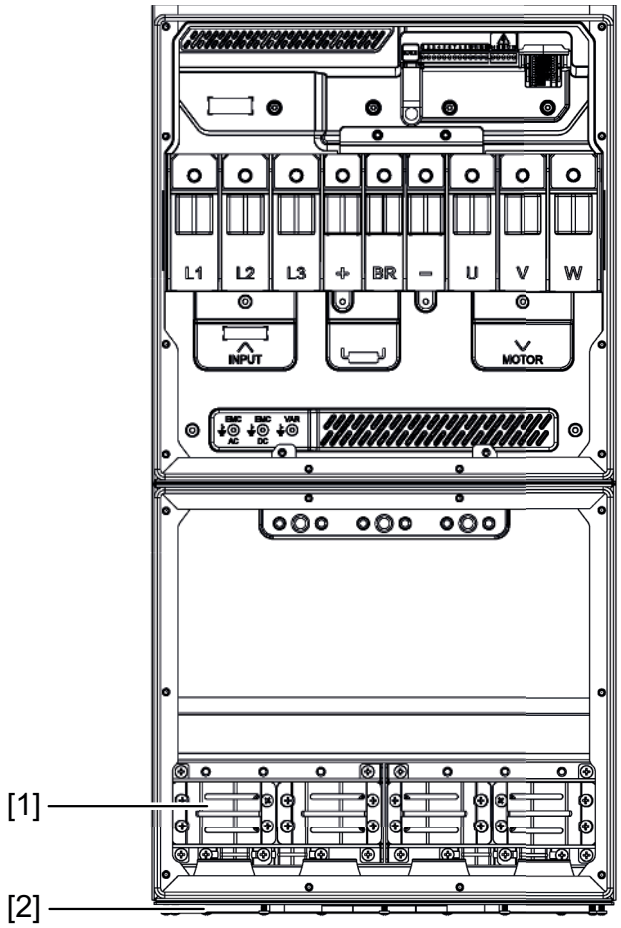
Nominal line voltage	Inverter power rating
200 – 240 V	22 – 75 kW
380 – 480 V	45 – 160 kW
500 – 600 V	55 – 110 kW
480 – 525 V	132 – 200 kW



[1] Supply system cable
[2] Metal screw fitting
[3] Motor cable

The following inverters have the housing shown below:

Nominal line voltage	Inverter power rating
380 – 480 V	200 – 250 kW



[1] Shield clips and strain relief for power cables
[2] Cable bushing for metal screw fittings

31554814/EN – 10/2023

9.2 Installation instructions

9.2.1 Before installation

- Make sure that the supply voltage, frequency and the number of phases (one or three-phase) correspond to the nominal values of the inverter on delivery.
- A circuit breaker or similar disconnector must be installed between the voltage supply and the inverter.
- Never connect the power supply to the output terminals U, V or W of the inverter.
- Do not install any contactors between the inverter and the motor. Where control cables and high-voltage power lines are installed close to each other, keep a minimum distance of 100 mm and an angle of 90° for crossing cables.
- The cables are protected only by inactive high-breaking-capacity fuses or a motor circuit breaker. For more information, refer to the section "Permitted voltage supply systems" (→ 🗎 87).
- Use a 4-core PVC-insulated and shielded cable as the motor cable. Lay this cable in compliance with the national industry regulations and according to these rules. Use conductor end sleeves to connect the motor cable to the inverter.
- Make sure that shieldings and sheaths of the motor cable are designed according to the wiring diagram in section "General specifications for connection of the motor shield" (→ 🗎 82).
- Make sure that the grounding terminal of each inverter is connected separately and **directly**, and if present via a filter, to the ground busbar (ground) of the installation site.
- Do not loop the ground connections of the inverter from inverter to inverter. You must also not lead the ground connections from other inverters to the inverters.
- Make sure that the impedance of the grounding circuit conforms to the local industry safety regulations.
- Make sure that all terminals are tightened with the respective tightening torques, see chapter "Permitted tightening torques" (→ 🗎 78).
- To fulfill the UL requirements, implement all ground connections with UL-listed crimp ring cable lugs.

Unlike direct operation in the supply system, inverters on the motor usually generate 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, which 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.

9.2.2 Permitted voltage supply systems

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

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

31554814/EN – 10/2023

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

  The following inverters can be used on supply systems with a non-grounded star point (e.g. IT systems) after a corresponding conversion (see chapter "Operation in IT Systems" (→ 🗎 89)):

  – All devices with degree of protection IP20/NEMA 1
  – All devices with degree of protection IP66/NEMA 4X
  – Devices with 200/250 kW with the IP55/NEMA 12K degree of protection
  – Inverters of sizes 4 to 7 with IP55 degree of protection in the LTP-B....-...-.-15 device variant can be operated directly on an IT system, see chapter "3-phase system AC 380 to 480 V as IT system version – device without filter" (→ 🗎 42).

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

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

31554814/EN – 10/2023

9.2.3 Operation on an IT system

⚠ WARNING

Danger of electric shock. Dangerous voltage levels can occur inside the inverter and at the terminals for up to 10 minutes after disconnection from the supply system.

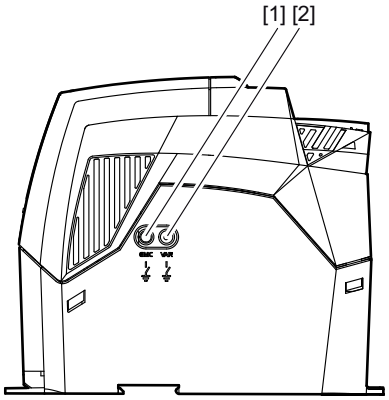
Severe or fatal injuries.

- Before unscrewing the EMC and VAR screws, disconnect the inverter from the power supply and wait for at least 10 minutes.

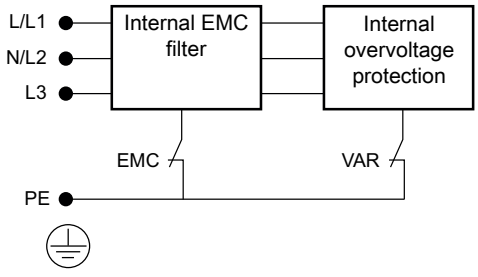
- Convert inverters with IP20 and IP66 degree of protection before operation on an IT system.
- The user must convert inverters of size 8 with IP55 degree of protection before operation on an IT system.
- You cannot convert inverters of sizes 4 to 7 with IP55 degree of protection.
- For the 3 × 380 to 480-V devices with the IP55 degree of protection, use the LTP-B....–...–.–15 IT system version without filter, see chapter "3-Phase System AC380 to 480 V as IT System Version – device without filter" (→ 🗎 42).
- For all other inverters with IP55 degree of protection, contact SEW-EURODRIVE.
- Deactivate the integrated EMC filter to operate a MOVITRAC® LTP-B on the IT system.

IP20 devices

- On IP20 devices, unscrew the EMC screw and the VAR screw on the side of the device.



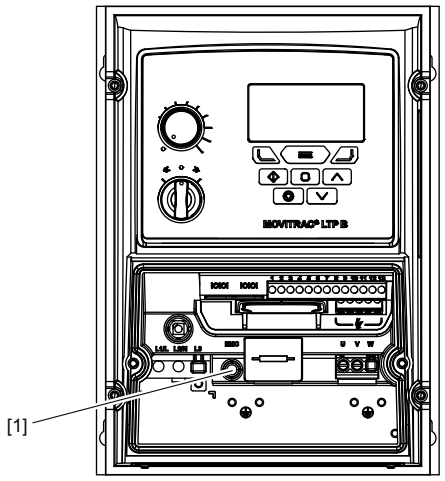
[1] EMC screw
[2] VAR screw



31554814/EN – 10/2023

IP66 devices

- On IP66 devices, unscrew the EMC screw in the terminal connection under the cover.

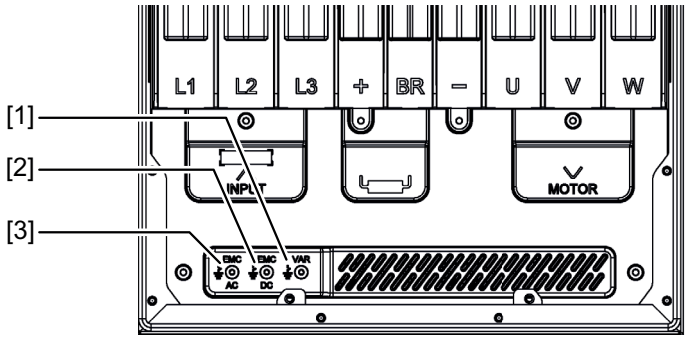


IP55 devices

The IT system conversion with degree of protection IP55 is only possible for the following devices:

- LTP-B 2000-5A3-4-10 (3 × AC 380 to 480 V with 200 kW)
- LTP-B 2500-5A3-4-10 (3 × AC 380 to 480 V with 250 kW)

On size 8, unscrew the screws [1], [2], and [3] in the terminal box under the middle front cover.



[1] VAR
[2] EMC DC
[3] EMC AC

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

31554814/EN – 10/2023

9.2.4 Selecting the residual current device

The inverter can cause a direct current in the protective earthing conductor.

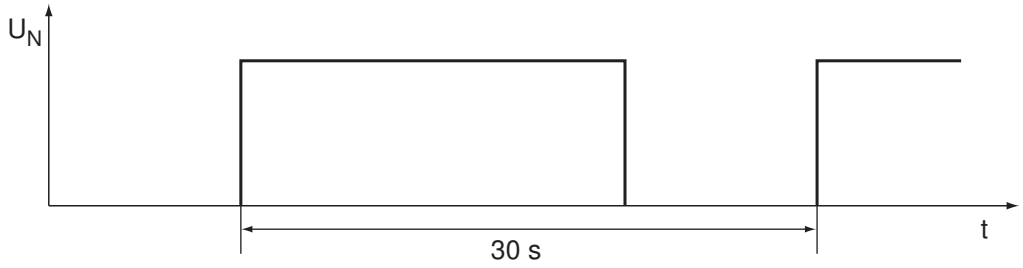
Proceed as follows when selecting the residual current device:

1. If using a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not using a residual current device.
2. ⚠ **WARNING!** No protection against electric shock if an incorrect type of residual current device is used. Severe or fatal injuries.
   If a residual current device (residual current protection device RCD or residual current monitor RCM) is required, use a universal current sensitive type B RCD or RCM.
3. If a residual current device is required, then select the residual current device according to the requirements for personnel, fire, or system protection. During selection, be mindful of the trigger characteristic, the delay, and the trigger rated current of the residual current device.
4. During project planning, make sure that operation-related leakage currents are kept as low as possible in the system.
5. If the operation-related leakage currents are too high, then you can divide the current supply among several residual current devices.

9.2.5 Using the line contactor

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

Wait for at least 30 seconds between two switching cycles.



9.2.6 Line fuses

Fuse types:

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

31554814/EN – 10/2023

9.2.7 Motor cable

Cable length

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

Cable cross section

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

9.2.8 Multi-motor drive/group drive

- The total of motor currents must not exceed the nominal current of the inverter. The maximum permissible cable length for the group is limited to the values of the individual connection. See chapter "Technical data".
- The motor group is limited to 5 motors that must not differ from each other by more than 3 sizes.
- Multi-motor drive is possible only with AC asynchronous motors and 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.

Maximum motor cable length

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

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

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l_{tot} = Maximum permissible total length of the motor cables connected in parallel: $l_{tot} = l1 + l2 + ... + ln$ (l1, l2, ... ln = line from inverter to motor 1, 2, ...)

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

n = Number of motors connected in parallel.

Fusing

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

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

31554814/EN – 10/2023

9.3 Terminal assignment

9.3.1 Opening the front cover

To access the terminals of inverters with IP55/IP66 degree of protection, remove the red front cover of the inverter. Only use cross-head or slot screwdrivers to open the terminal cover.

You gain access to the terminals by loosening the marked screws on the front side of the product.

Proceed in reverse order to remount the front cover.

INFORMATION

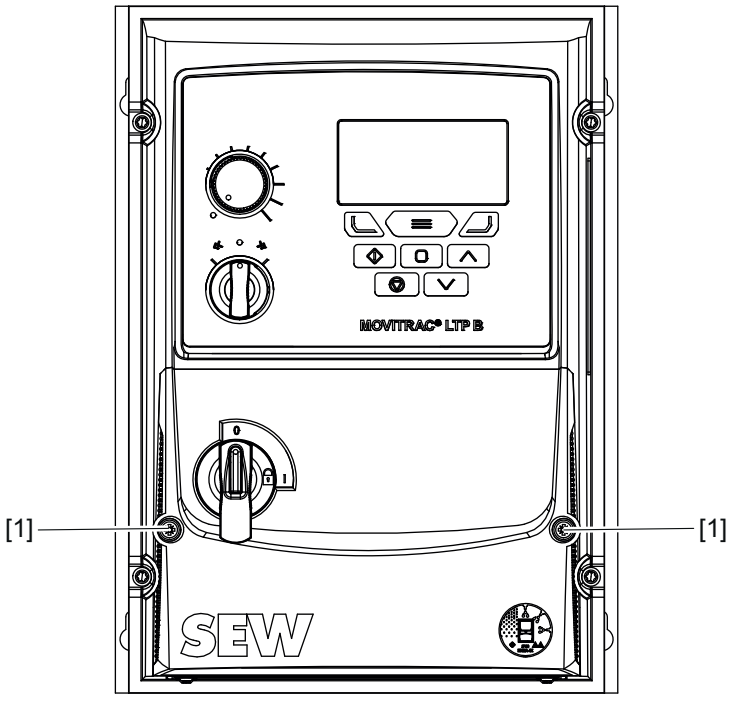
The front cover must be closed during operation for thermal reasons.

Inverters with degree of protection IP66/NEMA 4X

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

The following inverters have the housing shown below:

Nominal line voltage	Power rating of the inverter
200 to 240 V	0.75 to 11 kW
380 to 480 V	0.75 to 22 kW
500 to 600 V	0.75 to 30 kW



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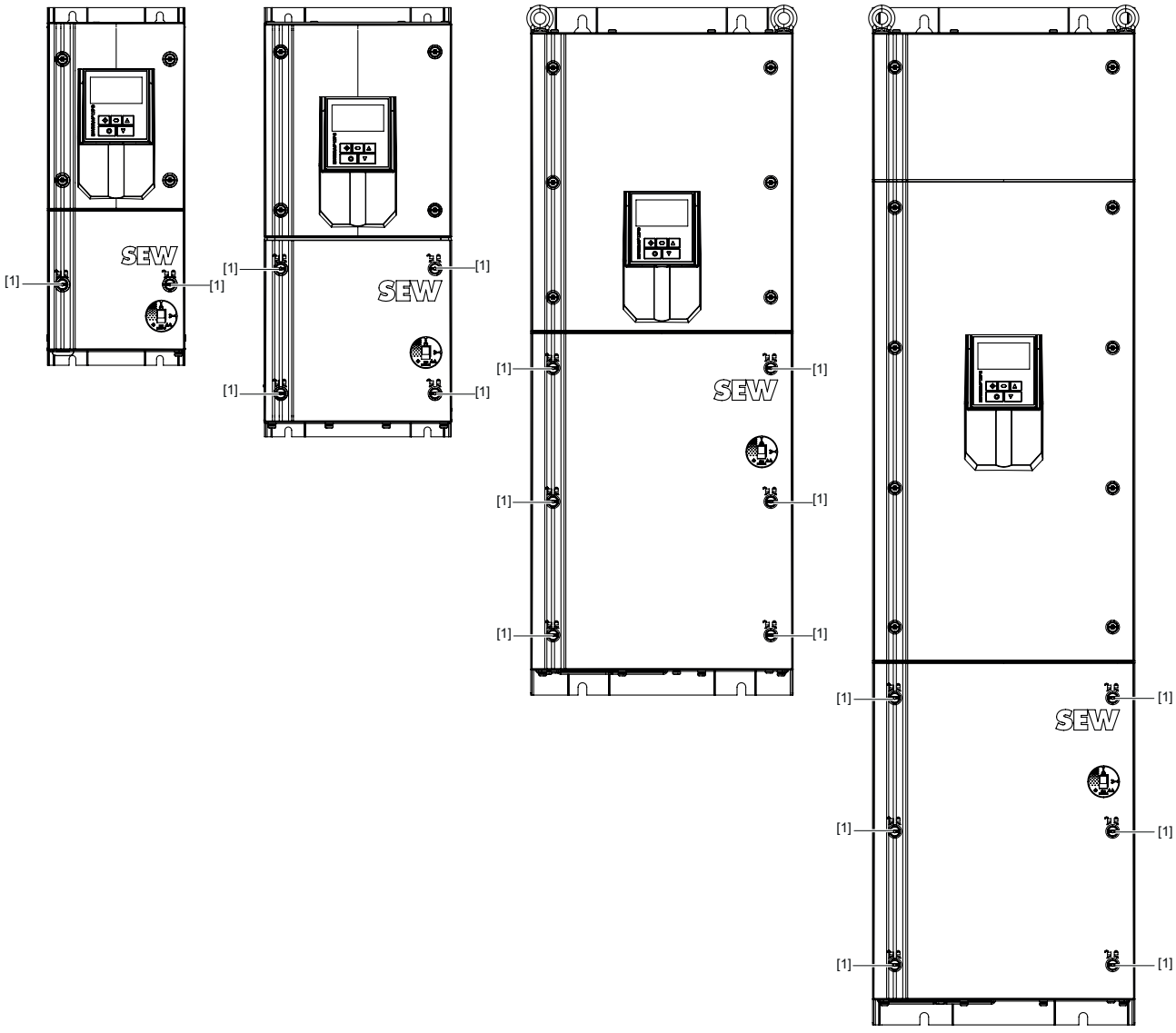
[1] Screws of the front cover

Inverters with degree of protection IP55/NEMA 12K

To open the front cover, remove the marked screws on the front side of the inverter. The screws to be removed for each size are marked in the picture below.

The following inverters have the housing shown below:

Nominal line voltage	Power rating of the inverter
200 to 240 V	5.5 to 75 kW
380 to 480 V	11 to 160 kW
500 to 600 V	15 to 110 kW
480 to 525 V	132 to 200 kW

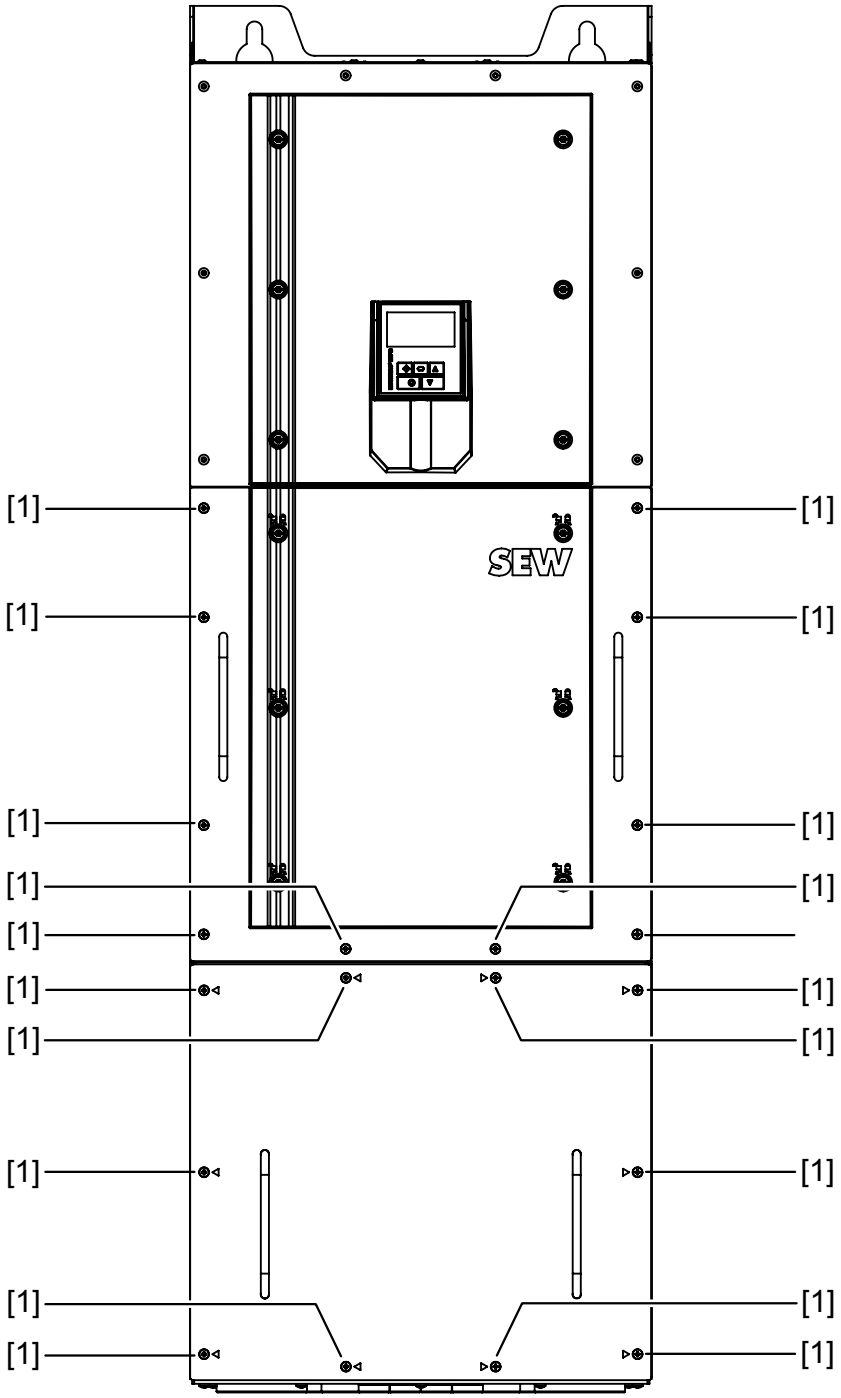


[1] Screws of the front cover

Remove all marked screws of the type cross PH to open the middle and lower front covers.

The following inverters have the housing shown below:

Nominal line voltage	Power rating of the inverter
380 to 480 V	200 to 250 kW



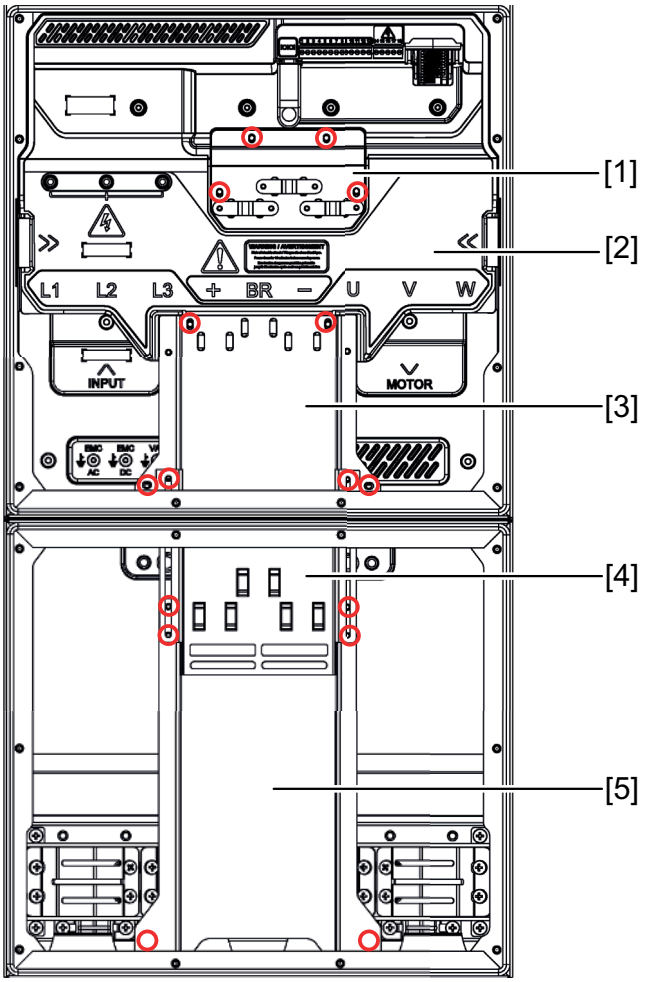
[1] Screws of the front cover (type: cross PH 2)

Removing the signal cable shield plates and terminal cover on size 8

1. To gain access to the terminals, first unscrew all marked screws of the type cross PZ 2.
2. Remove the signal cable shield plates in the order [5], [4], [3].

31554814/EN – 10/2023

3. You can now release the terminal cover [2] according to the arrow direction and swing it out upward with a rotary movement.
4. After the installation, first re-install the terminal cover [2].
5. Re-install the signal cable shield plates in the order [3], [4], [5].
6. Fasten all screws.



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[1] Shield clip plate for signal and communication cables
[2] Terminal cover made of plastic
[3] to [5] Signal cable shield clips made of metal

9.3.2 Help card

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

In the IP55/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.

9.3.3 Connection of the motor temperature protection TF, TH, KTY84, PT1000

Motors with an internal temperature sensor (TF, TH, KTY84, PT1000 or equivalent) can be connected directly to the frequency inverter.

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

31554814/EN – 10/2023

For motor protection monitoring, the following types can be selected:

- PTC-th for thermal sensor TF or bimetallic switch TH with trigger threshold 2.5 kΩ
- KTY84 in temperature classes B (120 °C), F(155 °C) and H (180 °C)
- PT1000 in temperature classes B (120 °C), F(155 °C) and H (180 °C)

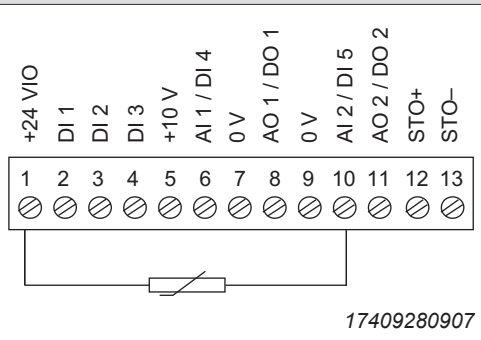
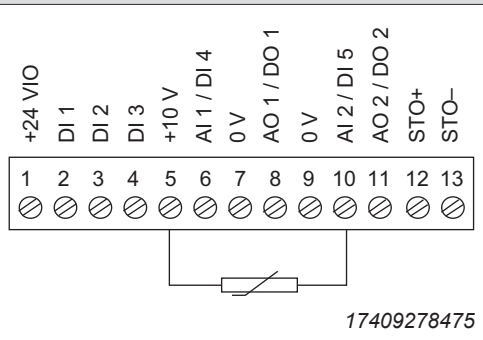
Use a shielded cable for the motor sensor lead.

The motor temperature can be read out using index 11234.

INFORMATION

First configure the connected temperature sensor using parameter P2-33 before connecting the temperature sensor. Then connect the temperature sensor according to the wiring diagram. Incorrect connection may lead to damage of sensor or inverter.

Connection example of the different temperature sensors and their parameterization:

TF temperature sensor TH bimetallic switch	KTY84 PT1000
	
P2-33 = PTC-th	P2-33 = KTY84 or PT1000 (B, F, H)
P1-15 = 0[1], 6, 7, 16, 17	P1-15 = 0[1]

1) For the setting P1-15 = 0 (free terminal assignment), the terminal assignment must be made via the parameter group 9. No function may be assigned to input DI5/AI2 in this case.

31554814/EN – 10/2023

9.3.4 Connection of the signal terminals

Main terminals

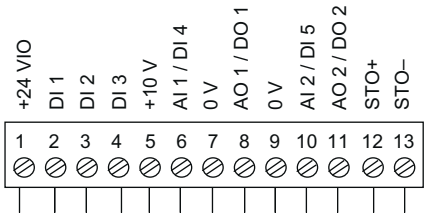
NOTICE

Application of impermissible voltages.

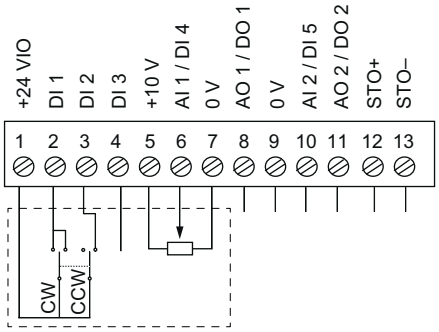
Possible damage to property.

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

IP20, IP55, and IP66



IP66 with switch option



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INFORMATION

In the device variant IP66 with switch and potentiometer, the assignment to the corresponding terminal functions is connected internally. In the case of the external use of terminals 2, 3, and 6, you can deactivate the internally fitted switches and potentiometers.

For the relevant procedure, refer to chapter "Configuration parameters" (→ 🗎 199).

31554814/EN – 10/2023

Signal connections of the signal terminal block

INFORMATION

- If the inputs of the inverter are supplied by an external 24 V voltage supply or PLC, connect the GND reference potential to the terminals 7 and 9. The control electronics of the inverter work in isolated fashion.
- If the STO of an external voltage supply system is actuated, wire it according to the connection examples given in chapter "Disconnection of single drive" (→ 🗎 65).
- If a TTL- or HTL-encoder is used, do not connect its GND signal to terminal 7 or 9.

Terminal no.	Signal	Connection	Description [1]
1	+24 VIO	+24 V: Reference voltage/ backup voltage	Reference voltage for controlling the digital inputs (max. 100 mA)[2]
2	DI 1	Digital input 1	
3	DI 2	Digital input 2	
4	DI 3	Digital input 3	Is also used as a frequency input (max. 20 kHz).
5	+10 V	Output +10 V: Reference voltage	10 V: Reference voltage for analog input (Potential supply +, 10 mA max., 1 to 10 kΩ)
6	AI 1 / DI 4	Analog input 1 (12 bits) Digital input 4	Analog: 0 to 10 V, 10 to 0 V, -10 to 10 V, 0 to 20 mA, 4 to 20 mA, 20 to 4 mA Digital: 0/24 V
7	0 V	0 V: Reference potential	
8	AO 1 / DO 1	Analog output 1 (10 bits) Digital output 1	Analog: 0 to 10 V, 10 to 0 V, 0 to 20 mA, 20 to 0 mA, 4 to 20 mA, 20 to 4 mA Digital: 0/24 V, max.: 20 mA
9	0 V	0 V: Reference potential	
10	AI 2 / DI 5	Analog input 2 (12 bits) Digital input 5/thermistor contact	Analog: 0 to 10 V, 10 to 0 V, PTC-th, 0 to 20 mA, 4 to 20 mA, 20 to 4 mA, KTY84, PT1000 Digital: 0/24 V
11	AO 2 / DO 2	Analog output 2 (10 bits) Digital output 2	Analog: 0 to 10 V, 10 to 0 V, 0 to 20 mA, 20 to 0 mA, 4 to 20 mA, 20 to 4 mA Digital: 0 / 24 V, max.: 20 mA
12	STO+	STO input	Safe digital input: DC +24 V input, max. 100 mA current consumption, high = DC 18 to 30 V
13	STO-		GND reference potential for safe digital input

1) Function assignment via P1-15

2) If the inverter is operated with the fieldbus option, terminal 1 can be used to supply the backup voltage.

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

Logical "1" input voltage range 8 to 30 V

Logical "0" input voltage range 0 to 2 V

Response time of the digital inputs: < 4 ms

	Analog inputs	Analog outputs
Resolution	12 bit	10 bit
Accuracy	+/- 2%[1)]	+/- 1%[1)]
Response time	< 4 ms	64 ms

1) Related to the set maximum scaling.

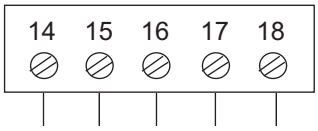
	Input impedance
Digital inputs	100 kΩ
Analog inputs in voltage mode	100 kΩ
Analog inputs in current mode	500 Ω

Relay terminals

NOTICE

Do not connect any inductive loads to the relay contact.

Possible damage to property.



Terminal no.	Signal	Relay function selection	Description
14	Relay output 1 supply	*P2-15*	Relay contact (AC 250 V / DC 30 V, max. 5 A) A brake control must be implemented via a contactor or a brake rectifier.
15	Relay output 1 NO contact		
16	Relay output 1 NC contact		
17	Relay output 2 supply	*P2-18*	
18	Relay output 2 NO contact		

31554814/EN – 10/2023

9.3.5 RJ45 communication socket

NOTICE

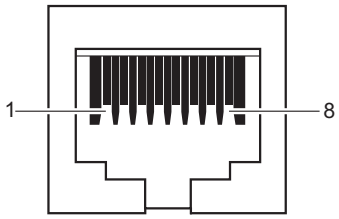
Voltage at socket contact not suitable for PCs.

Damage to PC when connected directly to RJ45 communication socket.

- Use the engineering adapters as described in chapter "Startup with the LT Shell engineering software" (→ 🗎 111).

- Inverters with degree of protection IP20/IP55 have one RJ45 socket contact for engineering and communication.
- Inverters with degree of protection IP66 have two RJ45 socket contacts for engineering and communication.

Socket contact on the device



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

9.3.6 Connection of the 24 V backup voltage

Terminal control

Control via terminals does not require an external DC 24 V backup for the inverter.

Field bus connection via field bus card or SEW fieldbus gateway

If communication is to be maintained during a network outage, the inverter must be provided with external DC 24 V backup.

Requirements

Firmware version ≥ 1.20 (can be found in *P0-28*).

Range of functions

- Parameter access to parameter groups 1 to 9 (read-only access)
- Field bus communication (process data)

31554814/EN – 10/2023

Setting up 24 V backup mode

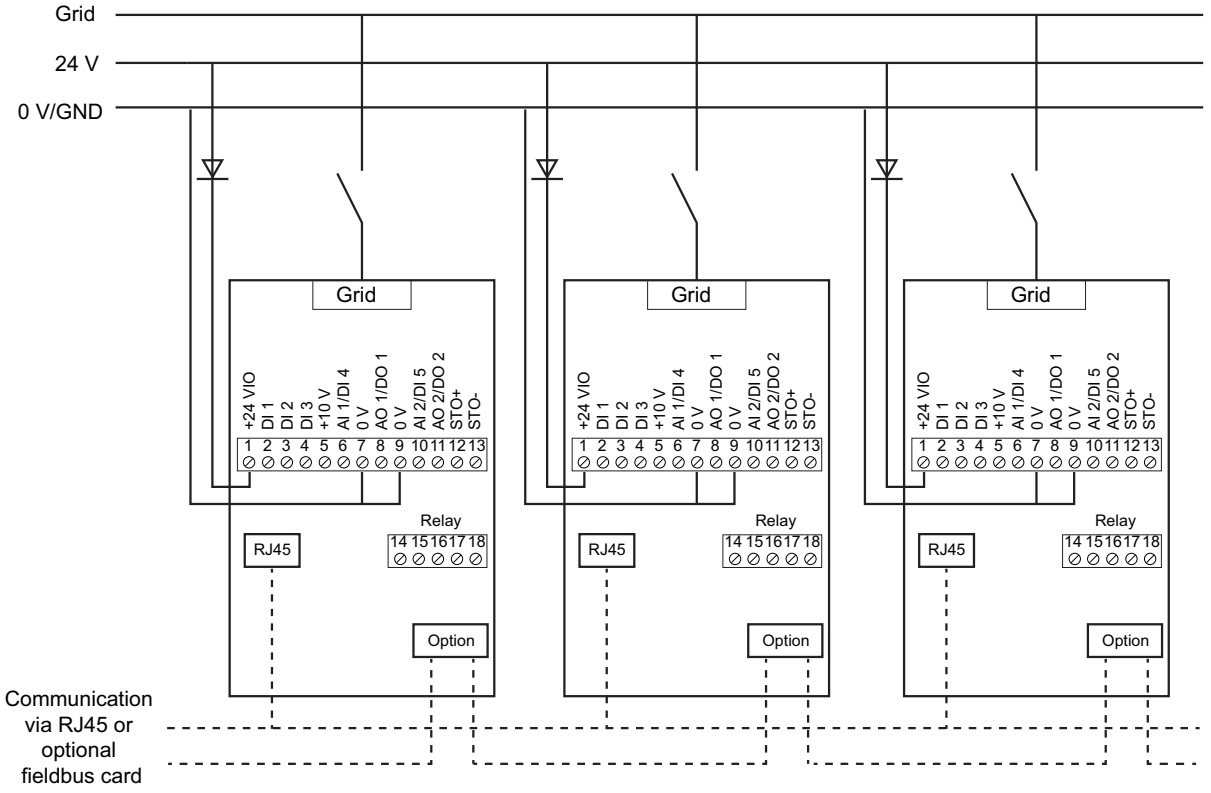
All inverters that are connected to each other in a communication network and use the 24 V backup mode have to be supplied simultaneously with external 24 V. Make sure that individual devices that are connected in the network are not separated from the 24 V supply.

INFORMATION

Errors in the fieldbus network may occur if the inverters are not supplied by the power supply and individual devices that are in the RJ45 network or the optional fieldbus network are separated from the external 24 V supply. Make sure that all connected inverters are always supplied with external 24 V at the same time.

The 24 V supply to the inverters must come via a diode terminal since the inverters could also supply other devices with 24 V, which can subsequently cause an overload of the internal switched-mode power supply and, under certain circumstances, cause damage as well.

Example of a wiring diagram



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9.4 Wiring diagram

⚠ WARNING

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

Severe or fatal injuries.

- Adhere to the following points.

For the following applications, always switch off the brake on the AC and DC side:

- For all lifting applications.
- For all applications that require a quick brake reaction time.

Please note the following information:

- The following inverters with degree of protection IP66/NEMA 4X already have openings for supply system, motor and control cables.
  - 200 to 240 V: 0.75 to 11 kW
  - 380 to 480 V: 0.75 to 22 kW
  - 500 to 600 V: 0.75 to 30 kW

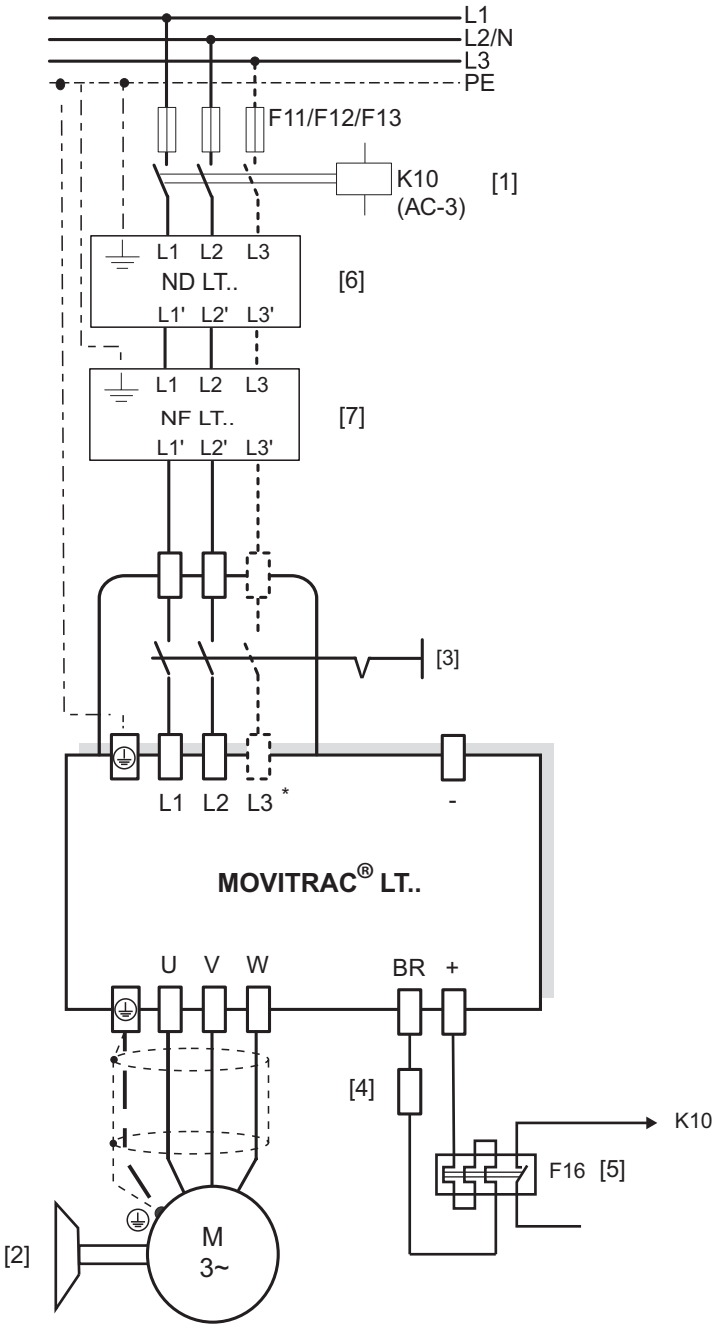
  The following inverters with degree of protection IP55/NEMA 12K are equipped with a metal entry board. The user can drill the cable bushings according to the requirements.
  - 200 to 240 V: 5.5 to 75 kW
  - 380 to 480 V: 11 to 160 kW
  - 500 to 600 V: 15 to 110 kW
  - 480 to 525 V: 132 to 200 kW

  The following inverters with degree of protection IP55/NEMA 12K already have openings for supply system, motor, braking resistor, communication, and control cables.
  - 380 to 480 V: 200 to 250 kW
- Connect the brake rectifier via a separate supply system cable.
- Supply via the motor voltage is not permitted!

INFORMATION

In case of a new device, the DC-, + (DC+) and BR terminal slots are initially provided with break-out covers. These must be broken out if necessary.

31554814/EN – 10/2023



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[1] Line contactor between supply system and inverter
[2] Brake
[3] Main switch (only for unit design IP66/NEMA 4X housing with switch (MC LTP-B..-40))
[4] Connection of braking resistor BW../BW..T
[5] Bimetallic relay for the protection of the braking resistor
[6] Line choke (optional)
[7] Line filter (optional)

* not with 1-phase 230 V

31554814/EN – 10/2023

9.4.1 Connecting AC brakemotors

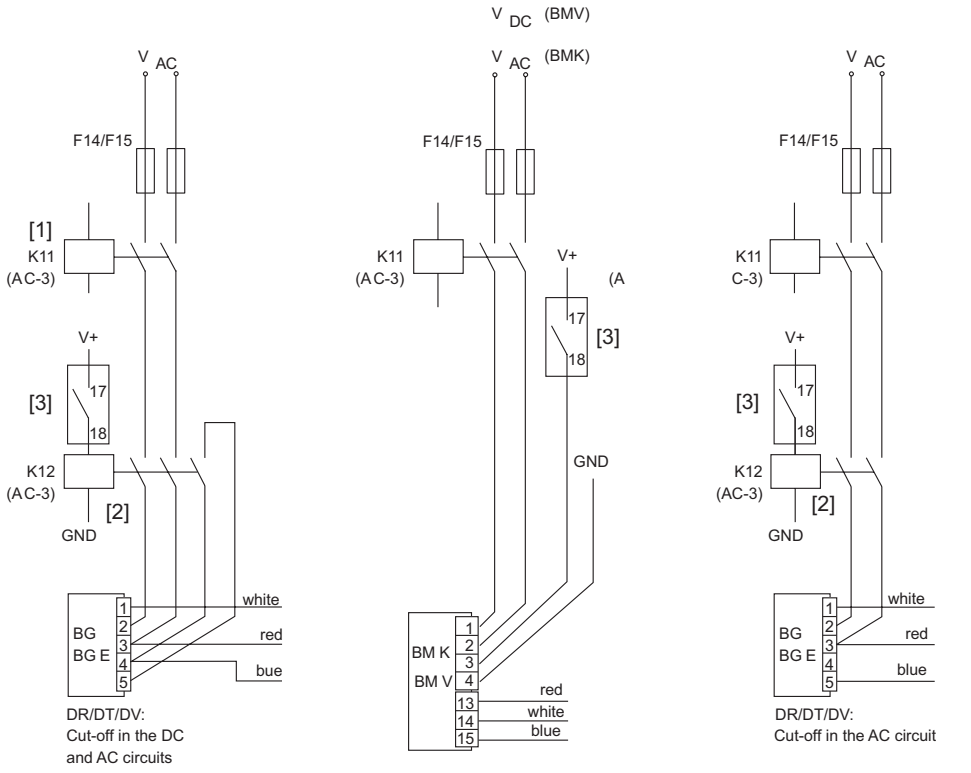
For detailed information about the SEW-EURODRIVE brake system, refer to the "AC Motors" catalog, which you can order from SEW-EURODRIVE.

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

INFORMATION

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

9.4.2 Brake control connection



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[1] Power supply of the brake rectifier, switched simultaneously via K10.
[2] Control contactor/control relay, draws voltage from 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.

9.4.3 Connection of the DC link connection

The DC link is routed on terminals for all power ratings. It is thus possible to couple all devices with a DC link connection or to directly supply them with DC voltage.

Contact SEW-EURODRIVE in such a case.

31554814/EN – 10/2023

9.4.4 Braking resistor connection

⚠ WARNING

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

Severe or fatal injuries.

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

⚠ CAUTION

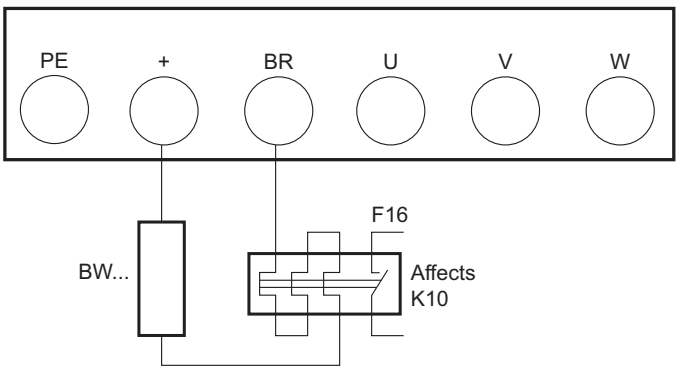
Risk of burns. The surfaces of the braking resistors reach high temperatures under a load of P_N.

Minor injuries.

- Select a suitable installation site.
- Do not contact the braking resistors.
- Mount a suitable touch guard.

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

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



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31554814/EN – 10/2023

10 Startup

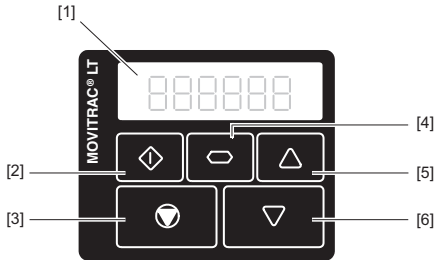
10.1 Keypads

The inverters in IP20 design are equipped with a standard keypad.

The inverters in IP55/IP66 design are equipped with a full text display with language switching function.

Both keypads allow for operation and setup of the inverter without additional devices.

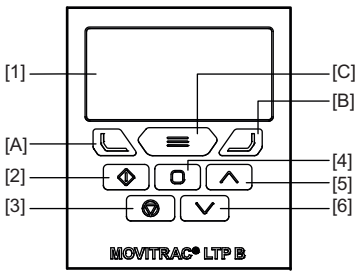
10.1.1 Standard keypad



27021600697887371

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

10.1.2 Keypad with full text display



34354222219

[1] Full text display (multilingual)
[2] Start button
[3] Stop/Reset button
[4] Navigate button
[5] Up button
[6] Down button

The following keys are only available on IP66 devices with TFT display:

[A] F1 function key
[B] F2 function key
[C] Info/help menu

31554814/EN – 10/2023

10.1.3 Operation

Both keypads have 5 keys with the following functions:

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

The following keys are only available on IP66 devices with TFT display:

Key 	F1 function [A]	• Language selection
Key 	F2 function [B]	• Standby display brightness
Key 	Info/help [C]	• Display of information in the operating state (inverter without faults) • Detailed description of the pending fault (inverter in fault state)

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 *P1-10*. Otherwise, the electrical rotating field speed is displayed.

31554814/EN – 10/2023

10.1.4 Switching the language at the keypad with full text display

To switch the language in the full text display, press the <Start> key and the <Up> key simultaneously. The inverter must not be enabled during this operation.

Then select one of the available languages and confirm the selection with the <Navigate> key.

For IP66 inverters with TFT screen, the language selection can also be accessed directly using the F1 function key [A].

10.1.5 Standby display brightness for keypads with TFT display (IP66 devices)

If the inverter is not operated or parameterized via the keys on the keypad, the display automatically switches to standby brightness after 320 seconds. The default setting is 50%. The setting range can be changed by the user between 5-100% using the F2 function key [B]. As soon as a key on the keypad is pressed, the brightness immediately increases to 100% again.

10.1.6 Info/help menu of keypads with TFT display (IP66 devices)

The various states of the inverter are displayed here in fault-free state (chapter "Status of the inverter" (→ 🗎 200)). A detailed description of the pending fault is displayed here if the inverter indicates a fault (chapter "6.4 Fault list" (→ 🗎 204)).

10.1.7 Resetting parameters to default settings

The following preconditions must be satisfied for the parameters to be reset to the factory setting:

- The inverter must not be enabled.
- The inverter must not be in fire mode/emergency mode.
- The display of the inverter must show "Inhibit".

1. Press the 3 keys  , simultaneously for at least 2 sec.

   "P-deF" appears on the display.

2. Press the  key to acknowledge the "P-deF" message.

31554814/EN – 10/2023

10.1.8 Key combinations

Function	The device displays:	Press:	Result	Example
Quick parameter group selection[1)]	Px-xx	<Navigate> + <Up> keys 	The next higher parameter group is selected.	"P1-10" is displayed: • Press the <Navigate> + <Up> keys. • Now, "P2-01" is displayed.
	Px-xx	<Navigate> + <Down> keys 	The next lower parameter group is selected.	"P2-26" is displayed: • Press the <Navigate> + <Down> keys. • "P1-01" is now displayed.
Selection of the lowest group parameter	Px-xx	<Up> + <Down> keys 	The first parameter of a group is selected.	"P1-10" is displayed: • Press the <Up> + <Down> keys. • "P1-01" is now displayed.
Set the parameter to the lowest value	Numerical value (when changing a parameter value)	<Up> + <Down> keys 	The parameter is set to the lowest value.	When changing *P1-01*: • "50.0" is displayed. • Press the <Up> + <Down> keys. • "0.0" is now displayed.
Changing individual digits of a parameter value	Numerical value (when changing a parameter value)	<Stop/reset> + <Navigate> keys 	The individual parameter digits can be modified.	When changing *P1-10*: • “0” is displayed. • Press the <Stop/reset> + <Navigate> keys. • "_0" is now displayed. • Press the <Up> key. • "10" is now displayed. • Press the <Stop/reset> + <Navigate> keys. • "_10" is now displayed. • Press the <Up> key. • "110" is now displayed etc.
Switching languages	Select language	<Start> and <Up> 	The desired language can be selected now.	• English • German • French • Spanish • Portuguese • Russian • Swedish • Norwegian • Finnish
Fan and display test	The complete display lights up	Hold all the keys down at the same time	The display can be checked for possible damage. The function of the fans can be checked.	This can be checked during maintenance.

1) Parameter group access must be activated: Set P1-14 to "101" or "201".

31554814/EN – 10/2023

10.2 PC connection

10.2.1 Startup with the LT Shell engineering software

The LT Shell software enables simple and fast startup of the inverters. It can be downloaded from the SEW-EURODRIVE website. After installation of the software, perform software updates at regular intervals.

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

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

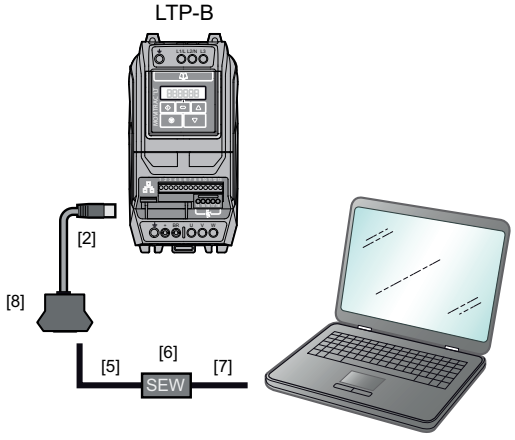
The software can be used to carry out the following tasks:

- Monitor, upload and download parameters
- Parameter printout
- Firmware update (manual and automatic)
- Export inverter parameters to Microsoft Word
- Monitor the state of the inputs and outputs and the motor
- Control inverter / manual mode
- Scope
- Offline startup with subsequent parameter set upload is possible in the 24 V backup mode

Connection to the LT Shell engineering software

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

Connection to LT Shell via RS485

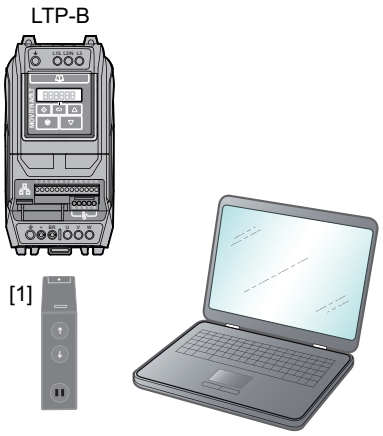


44574682379

[2] RJ45 to RJ45 cable
[5] RJ10 to RJ10 cable
[6] USB11A or USM21A
[7] USB A-B cable
[8] RJ adapters (2 x RJ45, 1 x RJ10)

31554814/EN – 10/2023

Connection to LT Shell via Bluetooth parameter module



18014415695300747

[1] Parameter module

10.2.2 Startup with the MOVITOOLS® MotionStudio engineering software

The software can be connected to the inverter as follows:

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

The following functions are available in MOVITOOLS® MotionStudio:

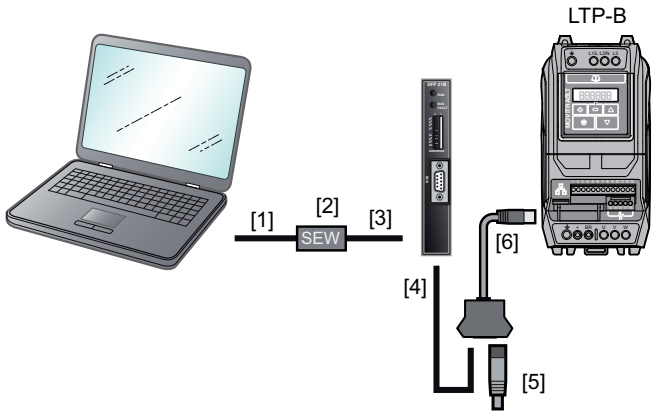
- Monitor, upload and download parameters
- Parameter printout
- Monitor the state of inputs/outputs and of the motor.

Connection to the MOVITOOLS® MotionStudio engineering software

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

31554814/EN – 10/2023

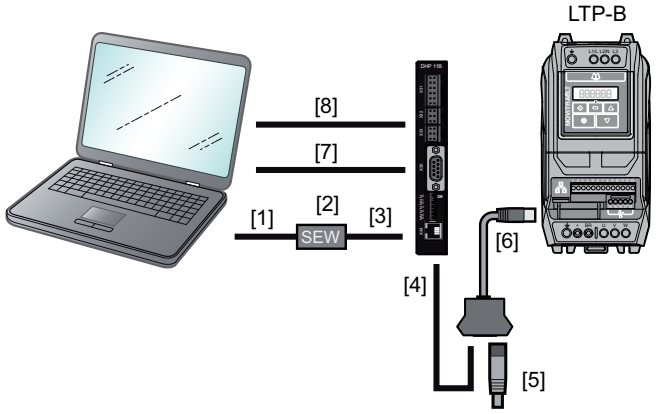
Connection to MOVITOOLS® MotionStudio via gateway



17186235147

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

Connection to MOVITOOLS® MotionStudio via SEW-EURODRIVE controller



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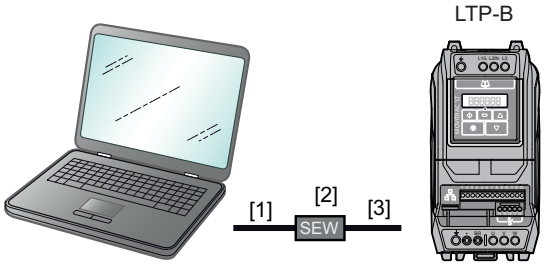
[1] USB A-B cable
[2] USB11A or USM21A
[3] RJ10 to RJ10 cable
[4] RJ45 cable with open end
[5] Terminating connector (120 Ω)
[6] Cable distributor
[7] USB A-B cable
[8] RJ45 Ethernet cable

Connection to MOVITOOLS® MotionStudio via SBus with USM21A



34210070411

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

10.3 "Auto-tune" automatic measuring procedure

With the automatic measuring procedure, the inverter can measure almost any motor to determine the motor data.

- Start the measuring procedure via the display on the inverter.
- After a reset to the factory settings, the measuring procedure starts automatically after the first enable and takes up to 2 minutes depending on the control type. Do not interrupt the measuring procedure.
- You can also start the "Auto-tune" automatic measuring procedure manually with the parameter *P4-02* after entering the motor data. Only enable the inverter after you have entered all motor data correctly in the parameters.
- For STO, the terminals 12 and 13 must be supplied with voltage. An enable is not required. "Stop" must be displayed.

INFORMATION

Perform an "Auto-tune" automatic measuring procedure after the initial startup or after changing the control mode in *P4-01* when the motor is cold. You can also start auto tuning manually via the parameter *P4-02* at any time.

10.4 Startup for motors

⚠ WARNING

If parameter *P4-02* is set to "1" (auto tune), the motor may start automatically.

Severe or fatal injuries.

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

31554814/EN – 10/2023

10.4.1 Startup with asynchronous motors with U/f control

1. Connect the motor to the inverter. During the connection, notice the nominal motor voltage.
2. Enter the motor data indicated on the motor nameplate:
   - *P1-07* = Nominal voltage of the motor
   - *P1-08* = Rated current of the motor
   - *P1-09* = Rated frequency of the motor
   - *P1-10* = Rated speed of the motor
     - Value = 0: Slip compensation deactivated
     - Value ≠ 0: Slip compensation activated
   - *P1-14* = 201 (extended parameter menu)
   - *P4-01* = 2 (U/f open-loop speed control)
3. Set the maximum and minimum speed using *P1-01* and *P1-02*.
4. Set the acceleration and deceleration ramps using *P1-03* and *P1-04*.
5. Start the "auto-tune" automatic motor measurement procedure as described in chapter "Auto-tune" (→ 🗎 114).

10.4.2 Startup with asynchronous motors with VFC speed control

1. Connect the motor to the inverter. Adhere to the nominal motor voltage when connecting.
2. Enter the motor data indicated on the motor nameplate:
   - *P1-07* = Nominal voltage of the motor
   - *P1-08* = Rated current of the motor
   - *P1-09* = Rated frequency of the motor
   - *P1-10* = Rated speed of the motor
   - *P1-14* = 201 (extended parameter menu)
   - *P4-01* = 0 (VFC speed control)
   - *P4-05* = Power factor
3. Set the maximum and minimum speed using *P1-01* and *P1-02*.
4. Set the acceleration and deceleration ramps using *P1-03* and *P1-04*.
5. Start the "auto-tune" automatic motor measuring procedure as described in chapter "Auto-tune automatic measuring procedure" (→ 🗎 114).
6. In case of insufficient control performance, the control behavior can be optimized via the parameter *P7-10*.

31554814/EN – 10/2023

10.4.3 Startup with asynchronous motors or torque motors with VFC torque control

1. Connect the motor to the inverter. Adhere to the nominal motor voltage when connecting.
2. Enter the motor data indicated on the motor nameplate:
   - *P1-07* = Nominal voltage of the motor
   - *P1-08* = Rated current of the motor
   - *P1-09* = Rated frequency of the motor
   - *P1-10* = Rated speed of the motor
   - *P1-14* = 201 (extended parameter menu)
   - *P4-01* = 1 (VFC torque control)
   - *P4-05* = Power factor
3. Set the maximum and minimum speed using *P1-01* and *P1-02*.
4. Set the acceleration and deceleration ramps using *P1-03* and *P1-04*.
5. Start the "auto-tune" automatic motor measuring procedure as described in chapter "Auto-tune automatic measuring procedure" (→ 🗎 114).
6. In case of insufficient control performance, the control behavior can be optimized via the parameter *P7-10*.

Example of speed and torque input via analog inputs

In the following example, analog input 2 is used as torque reference source, analog input 1 is used to set the speed:

- *P1-15* = 3 (input terminal assignment)
- *P4-06* = 2 (torque reference via analog input 2)
- *P6-07* = 100% (deactivating speed monitoring)
- *P6-17* = 0 (switching off the torque timeout threshold)
  = > 0 (possible application-dependent adjustment)

Example of speed and torque input via fieldbus

In the following example, the torque setpoint and the speed setpoint are specified via fieldbus:

- *P1-12* = 5, 6, 7 (selection of the control signal source)
- *P4-06* = 3 (torque reference via fieldbus)
- *P6-07* = 100% (deactivating speed monitoring)
- *P6-17* = 0 (switching off the torque timeout threshold)
  = > 0 (possible application-dependent adjustment)
- *P5-09* = 0, 1 (velocity control in min^{-1} or %) Parameter description "P5-09-P5-11 Fieldbus process data (POx) definition" (→ 🗎 177)
- *P5-10* = 2 (torque input in %) Parameter description "P5-09-P5-11 Fieldbus process data (POx) definition" (→ 🗎 177)

31554814/EN – 10/2023

10.4.4 Startup with synchronous motors without encoder feedback (PMVC control)

The synchronous motors are permanent magnet motors.

INFORMATION

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

1. Connect the motor to the inverter. During the connection, notice the nominal motor voltage.
2. Enter the motor data indicated on the motor nameplate:
   - *P1-07* = internal voltage/idle voltage [V/min^{-1}] with rated motor speed
   - *P1-08* = Rated current of the motor
   - *P1-09* = Rated frequency of the motor
   - *P1-10* = Rated speed of the motor
   - *P1-14* = 201 (extended parameter menu)
   - *P4-01* = 3 (PMVC speed control)
   - *P2-24* = PWM frequency (at least 8 to 16 kHz)
3. Set the maximum speed with *P1-01* to the maximum rated motor speed and the minimum speed with *P1-02* to a minimum of 10% of the rated motor speed.
4. Set the acceleration and deceleration ramps using *P1-03* and *P1-04*.
5. Start the "auto-tune" automatic motor measurement procedure as described in chapter "Auto-tune" (→ 🗎 114).
6. Check the magnetizing current (*P0-14*) at half nominal speed without load.
   - If the value is greater than +0.3 A, the nominal motor voltage *P1-07* must be reduced.
   - If the value is smaller than -0.3 A, the nominal motor voltage *P1-07* must be increased.
7. Adjust the stiffness in *P7-10* to optimize the control behavior:
   - Increasing *P7-10* increases the stiffness of the motor. Decreasing the parameter has the opposite effect.
   - The setting range should be between 8 and 15, but may differ.
8. To adjust the rotor on enable and to achieve more torque in the lower speed range, set *P7-14* and *P7-15* to 10% first. Individual adjustment might be necessary. Note that the motor may heat up significantly due to the increased current flow.

In rare cases, it can be helpful to compare the parameters determined in the automatic motor measurement procedure to the parameters of the motor data. Correct them, if necessary. Note that the values may deviate in case of long motor cables.

A repeated measuring procedure is not required.

10.4.5 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, notice the nominal motor voltage.

31554814/EN – 10/2023

2. Enter the motor data indicated on the motor nameplate:
   - *P1-07* = internal voltage/idle voltage [V/min^{-1}] with rated motor speed
   - *P1-08* = Rated current of the motor
   - *P1-09* = Rated frequency of the motor
   - *P1-10* = Rated speed of the motor
   - *P1-14* = 201 (extended parameter menu)
   - *P4-01* = 6 (LSPM speed control).
3. Set the maximum speed *P1-01* and minimum speed *P1-02* = 300 min^{-1}.
4. Set the acceleration and deceleration ramps using *P1-03* and *P1-04*.
5. Start the "auto-tune" automatic motor measurement procedure as described in chapter "Auto-tune" (→ 🗎 114).
6. Adjust the boost parameters. A default setting is:
   - *P7-14* = 10%
   - *P7-15* = 10%.
7. In case of insufficient control performance, the control behavior can be optimized via the parameter *P7-10*.

31554814/EN – 10/2023

10.4.6 Startup with synchronous reluctance motors (SYN-R control)

INFORMATION

Check the operation of synchronous reluctance motors by means of a test application. Stable operation in this operating mode cannot be ensured for all application cases.

1. Connect the motor to the inverter. During the connection, notice the nominal motor voltage.
2. Enter the motor data indicated on the motor nameplate:
   - *P1-07* = Nominal voltage of the motor
   - *P1-08* = Rated current of the motor
   - *P1-09* = Rated frequency of the motor
   - *P1-10* = Rated speed of the motor
   - *P1-14* = 201 (extended parameter menu)
   - *P4-01* = 7 (SYN-R speed control).
   - *P4-05* = Power factor
3. Set the maximum speed *P1-01* and minimum speed *P1-02*.
4. Set the acceleration and deceleration ramps using *P1-03* and *P1-04*.
5. Start the "auto-tune" automatic motor measurement procedure as described in chapter "Auto-tune" (→ 🗎 114).
6. In case of insufficient control performance, the control behavior can be optimized via the parameter *P7-10*.

10.4.7 Startup with brushless DC motors (BLDC control)

1. Connect the motor to the inverter. During the connection, notice the nominal motor voltage.
2. Enter the motor data indicated on the motor nameplate:
   - *P1-07* = internal voltage/idle voltage [V/min^{-1}] with rated motor speed
   - *P1-08* = Rated current of the motor
   - *P1-09* = Rated frequency of the motor
   - *P1-10* = Rated speed of the motor
   - *P1-14* = 201 (extended parameter menu)
   - *P4-01* = 8 (BLDC speed control).
   - *P4-05* = Power factor
3. Set the maximum speed *P1-01* and minimum speed *P1-02*.
4. Set the acceleration and deceleration ramps using *P1-03* and *P1-04*.
5. Start the "auto-tune" automatic motor measurement procedure as described in chapter "Auto-tune" (→ 🗎 114).
6. In case of insufficient control performance, the control behavior can be optimized via the parameter *P7-10*.

31554814/EN – 10/2023

10.4.8 Startup with preset motors from SEW-EURODRIVE

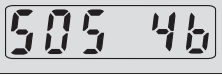
Startup can be performed if one of the following CMP.. motors (speed class 4500 min^{-1}) or MGF..-DSM motors (speed class 2000 min^{-1}) is connected to the inverter:

Motor type	Display
CMP40M	40M
CMP50S/CMP50M/CMP50L	50S/50M/50L
CMP63S/CMP63M/CMP63L	63S/63M/63L
CMP71S/CMP71M/CMP71L	71S/71M/71L
MGF..2-DSM-B	gF-2
MGF..4-DSM-B	gF-4
MGF..4-DSM-B/XT	gF-4Ht
MGF..1-DSM-C	gF-1c
MGF..2-DSM-C	gF-2c
MGF..4-DSM-C	gF-4c
MGF..4-DSM-C/XT	gF4cHt

Procedure

- Set *P1-14* to "201" for access to LTX-specific parameters.
- Set *P1-16* to the preset motor, see chapter "Parameter group 1: Servo-specific parameters (level 1)" (→ 🗎 154)

Example

Example: 		
CMP.. size	50S	40M, 50S, 50M, 50L, 63S, 63M, 63L, 71S, 71M, 71L
Motor system voltage	4	• 2 = 230 V • 4 = 400 V
Brakemotors	b	b = Flashes for brakemotors

All the required parameters (voltage, current, etc.) are set automatically.

INFORMATION

"Auto Tune" is not necessary for preset motors.

If a CMP.. motor with an electronic nameplate is connected to the inverter, *P1-16* is selected automatically.

If a MGF..-DSM is selected, the upper torque limit in *P4-07* is automatically set to 200%. This value has to be adapted in accordance with the gear unit ratio according to the documentation "Addendum to the Operating Instructions, Drive Unit MGF..-DSM on LTP-B Inverter".

The corresponding motor temperature sensor must be connected and parameterized as described in chapter "Connection of the motor temperature protection TF, TH, KTY84, PT1000" (→ 🗎 96).

31554814/EN – 10/2023

10.5 Startup of the control signal source

⚠ WARNING

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

Severe or fatal injuries.

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

10.5.1 Terminal mode (factory setting) *P1-12* = 0

For operation in terminal mode (factory setting):

- *P1-12* must be set to "0" (factory setting).
- Change the input terminal configuration according to your requirements in *P1-15*. For the possible settings, see chapter "P1-15 Digital input function selection" (→ 🗎 150).
- 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.
- Connect terminals 12 and 13 of the STO input as described in chapter "Disconnection of a single drive" (→ 🗎 65).
- Enable the inverter by establishing a connection between terminals 1 and 2.
- Set the speed using the potentiometer.

10.5.2 Keypad mode (*P1-12* = 1 or 2)

For operation in keypad mode:

- Set *P1-12* to "1" (unidirectional) or "2" (bidirectional).
- Connect a wire link or a switch on the terminal block between terminal 1 and terminal 2 to enable the inverter.
- Connect terminals 12 and 13 of the STO input as described in chapter "Disconnection of a single drive" (→ 🗎 65).
- Now press the <Start> key. The inverter is then enabled with 0.0 Hz.
- To increase the speed, press the <Up> key. To reduce the speed, press the <Down> key.
- Press the <Stop/Reset> key to stop the inverter.
- After the <Start> key is pressed, the inverter starts according to the setting in *P2-37*. If bidirectional mode is enabled (*P1-12* = 2), the direction is reversed by pressing the <Start> key again.

INFORMATION

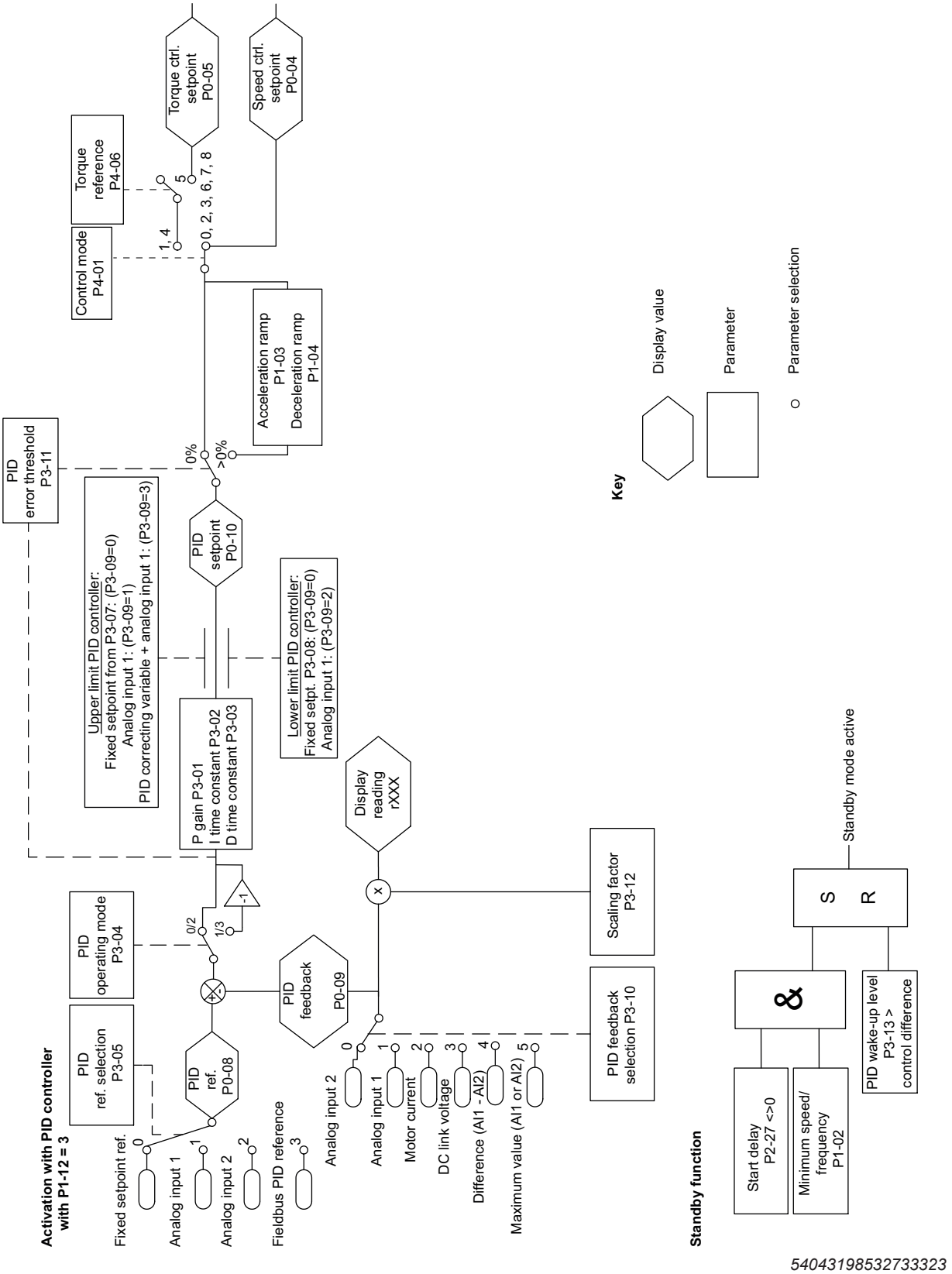
The desired setpoint speed can be preconfigured by pressing the <Stop/Reset> key in idle state. If you then press the <Start> key, the drive will start up along the configured ramp until this speed is reached.

31554814/EN – 10/2023

10.5.3 PID controller mode (*P1-12* = 3)

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

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



General information on use

Connect the sensor for the controlled variable to analog input 1 or 2 depending on *P3-10*. The sensor value can be scaled using parameter *P3-12* in such a way that the user can see the value correctly displayed on the inverter display, for example 0 to 10 bar.

The target reference for the PID controller can be set using *P3-05*.

The setting of the speed ramp times has no effect when the PID controller is active. Acceleration and deceleration ramps can be activated depending on the control deviation (target value to actual value) using *P3-11*.

Fixed setpoint reference

The fixed setpoint reference entered in *P3-06* is used with the setting *P3-05* = 0. When the parameters *P9-34* and *P9-35* have a value other than "OFF", 3 additional fixed setpoint references *P3-14* to *P3-16* are activated and are selected according to the table below:

Terminal selection via *P9-34*	Terminal selection via *P9-35*	Fixed setpoint reference
0 (LOW)	0 (LOW)	*P3-06*
1 (HIGH)	0 (LOW)	*P3-14*
0 (LOW)	1 (HIGH)	*P3-15*
1 (HIGH)	1 (HIGH)	*P3-16*

P1-12 = 3 (control signal source: PID controller)

P1-15 = 0 (free terminal assignment via P9-xx)

P3-05 = 0 (PID reference selection: fixed setpoint reference)

P9-09 = 1 (source for activating terminal control)

P9-10 = 4 (setpoint source: PID)

P9-34 = (PID fixed setpoint reference selection input 0) e.g. DI2

P9-35 = (PID fixed setpoint reference selection input 1) e.g. DI3

Fieldbus PID reference

The following parameters must be set for operating the PID controller with fieldbus PID reference:

P1-12 = 5 (e.g. SBus control signal source)

P1-14 = 201 (extended parameter menu)

P1-15 = 0 (free function selection of the digital inputs)

P3-05 = 3 (PID reference selection: fieldbus PID reference)

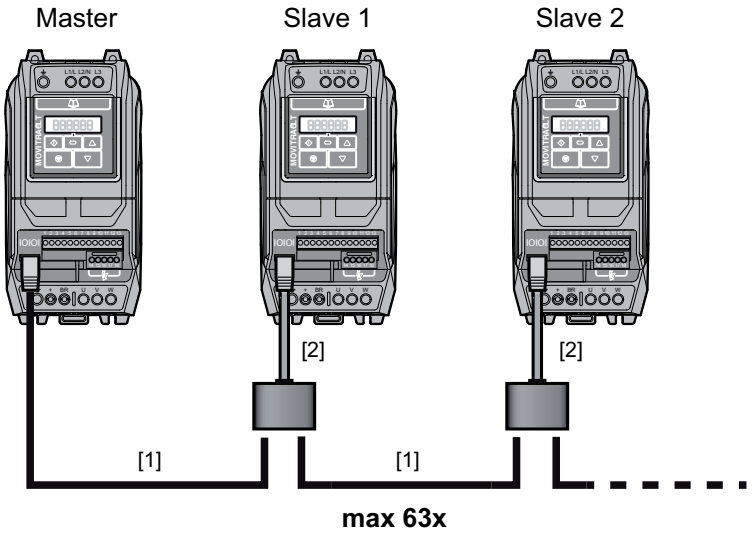
P5-09 to *P5-11* = 4 (selection of the process output data word for the PID reference)

P9-01 = Input source enable

P9-10 = 4 (setpoint source: PID)

31554814/EN – 10/2023

10.5.4 Master-slave mode (*P1-12* = 4)



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

The inverter has an integrated master-slave function.

Depending on the operating mode, the master-slave function supports two different configuration options:

- Speed synchronism
- Load distribution

The two tables below describe the respective configuration of the inverters of both operating modes.

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. The maximum length of the communication network is 1000 m.

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 (e.g. activated, deactivated) and its actual motor speed every 30 ms. The slave inverters then follow the state of the master inverter.

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.

31554814/EN – 10/2023

Configuration for speed synchronism

In the configuration for speed synchronization, the actual speed value of the master acts as the speed setpoint of the slave inverters. The speed setpoint of the slave inverters is also scalable.

Speed synchronism is supported only in the following operating modes/motor controls:

P4-01 = 0, 2, 3, 6, 7, 8

Parameter description	Master settings	Slave settings
P1-03 (acceleration ramp)	User-defined	≤ master ramps
P1-04 (deceleration ramp)		
P1-12 (control signal source)	0, 1, 2, 3, 5, 6, 7, 8	4
P1-14 (extended parameter menu)	201	201
P4-19 (master-slave torque reference)	0	0
P5-01 (inverter address communication)	1	2 – 63
P2-28 (speed scaling)	–	User-defined
P2-29 (scaling factor)	–	User-defined

Configuration for load distribution

In the configuration for load distribution, the actual torque value of the master (*P0-12*) acts as the torque setpoint of the slave inverters (*P0-05*).

The speed setpoint of the master (*P0-04*) acts as a speed limit value of the slave (*P0-04*), but the slave always follows the current actual value of the master.

The load distribution is only supported in the positive rotation direction of the master and only in the following operating modes and/or with the following motor settings:

P4-01 = 0, 3, 6, 7, 8

Parameter description	Master settings	Slave settings
P1-03 (acceleration ramp)	user-defined	0.1 sec.[1)]
P1-04 (deceleration ramp)		
P1-12 (control source)	0, 1, 2, 3, 5, 6, 7, 8	4
P1-14 (extended parameter menu)	201	201
P4-06 (torque reference/limit value source)	0, 1, 2, 3, 5	4
P4-19 (master-slave torque reference)	1	0
P5-01 (inverter address communication)	1	2 – 63

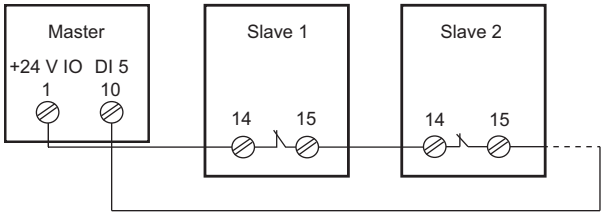
1) If the drive oscillates, the value must be increased slightly

General wiring of the slave error message

In the event of a fault in the master, the slaves stop automatically.

In order to detect a fault in the slaves at the master, relay 1 of the slaves must be configured to "Inverter ready" and a digital input of the master must be configured to "External fault input". They must be connected as follows:

In the following example, DI5 is used with the function selection *P1-15* = 6, 7, 16 or 17.



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10.5.5 Fieldbus mode (P1-12 = 5, 6 or 7)

See chapter "Fieldbus mode" (→ 🗎 211).

10.5.6 MultiMotion mode (P1-12 = 8)

See "Addendum to the MOVITRAC® LTX operating instructions".

10.6 Startup of the brake control

The brake control is installed via relay 2.

- For horizontal applications, set the function of relay 2 (*P2-18*) to 0 or 3 as needed.
- For hoists, activate the function of the motor brake control (*P4-12*). It locks the selection into *P2-18*, see chapter "Hoist function" (→ 🗎 127).

31554814/EN – 10/2023

10.7 Hoist function

The hoist function enables the pre-tensioning of the motor against the locked brake to prevent sagging during the start-up. At the same time, the proper operation is monitored by various functions.

10.7.1 Project planning

- SEW-EURODRIVE recommends that you refrain from operating the motor below 1.5-times the rated motor slip speed.
- A sufficiently dimensioned braking resistor is necessarily required for fault-free operation.
- Dimension the motor according to the requirements of the application.

10.7.2 Installation

The motor brake control must be implemented by relay 2 of the inverter.

10.7.3 Startup for hoist function

1. First, perform a motor startup with VFC speed control according to chapter "Start-up of asynchronous motors with VFC speed control" (→ 🗎 115).
2. Activate brake control for lifting applications *P4-12* = 1.
3. Set the ramp times for *P1-03* and *P1-04* as short as possible.
4. Set the minimum speed *P1-02* to at least 1.5 times the rated motor slip.
5. If no sensor is used for protecting the braking resistor, you can use the following parameters optionally for protection against overtemperature of the braking resistor. However, only a sensor provides adequate protection.
   - *P6-19*: Braking resistance value
   - *P6-20*: Braking resistance output
6. Observe the motor's direction of rotation:
   - Positive speed on the display = raise hoist.
   - Negative speed on the display = lower hoist

10.7.4 Operation

INFORMATION

Start the inverter by pressing enable while the hoist mode is activated. If you activate the enable command simultaneously or earlier than the STO, the inverter stays in "STOP" mode.

- In the encoder-free mode, never keep the load at zero rotation speed without the brake being engaged. Always stop the drive by canceling the enable command.
- To reverse the direction of rotation, stop the drive by canceling the enable command. The brake will engage automatically. Then enable the drive in the opposite direction.

31554814/EN – 10/2023

10.7.5 Troubleshooting and optimizing the hoist function

The following hoist parameters are already predefined for motors of the same performance class. However, you can adjust the hoist parameters at any time for optimization of the system:

- *P2-07*: Fixed target speed 7 becomes the brake release speed:
  - Reference value for operation without encoder: 2-times the motor slip
  - Reference value for operation with encoder: 1.5-times the motor slip
- *P2-08*: Fixed target speed 8 becomes the brake engagement speed:
  - Reference value for operation without encoder: 2-times the motor slip
  - Reference value for operation with encoder: 1.5-times the motor slip
- *P4-15*: Torque limit for brake release:
  - Increase the value when the hoist sags.
- *P4-16*: Torque limit for timeout:
  - Reference value = pre-magnetization time (*P7-12*) of the motor
- *P4-13*: Brake release time:
  - Adjust the value according to the technical brake data.
- *P4-14*: Brake engagement time:
  - Adjust the value according to the technical brake data.
- *P2-23*: Zero-speed holding time:
  - This is used for post-magnetization.
- P7-07: Expanded generator control
  - Activate with very high generator loads.
- *P7-10*: Stiffness:
  - Higher values make the application stiffer
- *P7-14*/*P7-15*: Boost parameters for torque servo control:
  - Increase the values slightly when the hoist sags.

10.7.6 Additional information

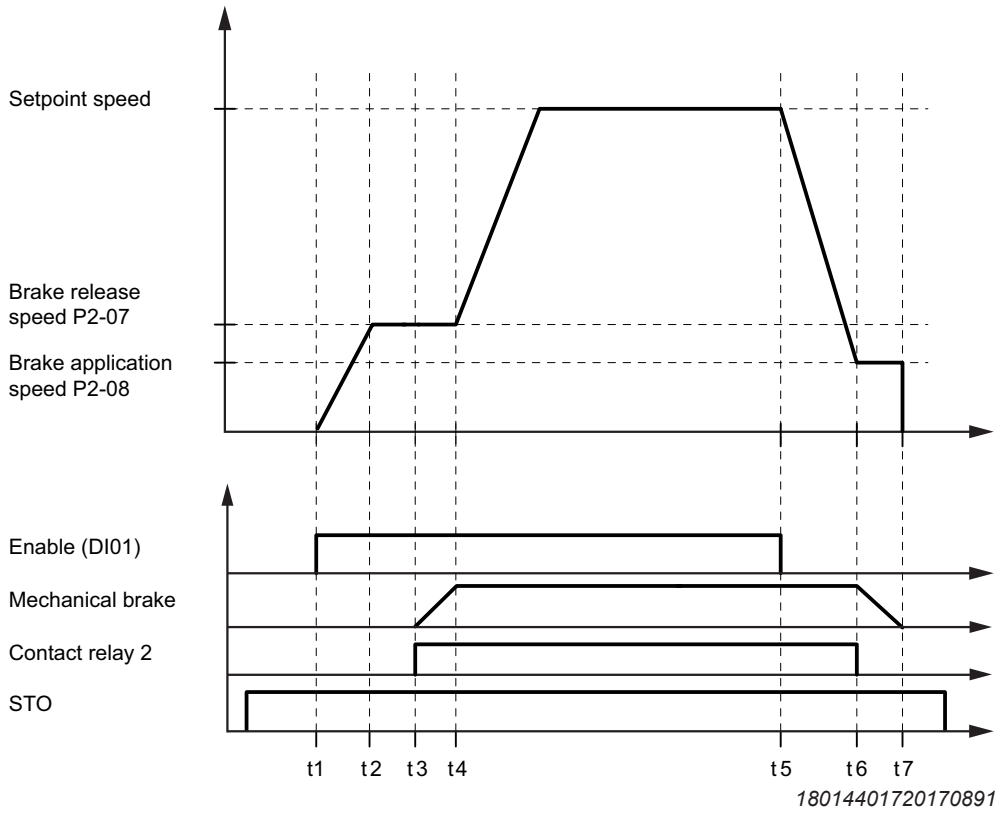
To ensure safe operation , the following parameters are preset, locked or ignored while the hoist function is active:

- *P1-06*: Energy-saving function is deactivated
- *P2-09/P2-10*: Skip frequencies are ignored.
- *P2-18*: Relay contactor 2 is locked for control of the brake rectifier.
- *P2-26*: The flying start function is deactivated.
- *P2-27*: Standby mode is deactivated.
- *P2-36*: The start mode is edge-triggered (Edgr-r).
- *P2-38*: Voltage failure results in coast to a stop.
- *P4-07*: The upper torque limit is set to 200%.
- *P4-08*: The bottom torque limit is set to 0%.
- *P4-09*: The upper limit of the generator torque is set to 200%.

31554814/EN – 10/2023

10.7.7 Cycle diagram for the hoist mode

The following diagram shows the hoist mode.



t_1 Inverter enable

t_1 - t_2 The motor runs up to brake release speed (fixed setpoint speed 7).

t_2 Brake release speed is reached.

t_2 - t_3 Torque threshold *P4-15* verified. The inverter indicates a fault if the torque threshold exceeds the timeout set in *P4-16*.

t_3 Relay opens.

t_3 - t_4 Brake opens within brake release time *P4-13*.

t_4 Brake is released. The drive runs up to the setpoint speed.

t_4 - t_5 Normal operation

t_5 Inverter lock

t_5 - t_6 Drive slows down to brake application speed (fixed setpoint speed 8).

t_6 Relay closes.

t_6 - t_7 Brake applied within brake application time *P4-14*.

t_7 Brake is closed and drive stopped.

31554814/EN – 10/2023

10.8 Fire mode/emergency mode

In "Fire mode/emergency mode", the inverter drives the motor at the speed defined in *P6-14*. The inverter automatically resets all faults and ignores all setpoints, control signal sources and shutdowns (e.g.: external fault or enable signal revoked). Operation of the inverter is maintained for as long as possible. Active emergency mode is indicated by the message "FirE" on the display.

Set the fire mode/emergency mode as follows:

- Perform a motor startup.
- Set parameter *P1-14* to "201" to access further parameters.
- Set parameter *P1-15* to "0" to configure the digital inputs.
- Configure the inputs depending on the requirements in parameter group *P9-xx*. For control via terminals, set parameter *P9-09* to "9 = terminal control".
- Set parameter *P9-33 Fire mode/emergency mode input selection* to the desired input.
- Set parameter *P6-13* to "0" or "1", depending on the wiring.
- Set parameter *P6-14* to the speed that will be used in fire mode/emergency mode. You can specify a positive or a negative speed setpoint.

For evaluating the fire mode/emergency mode, the following two indices can be readout via index communication:

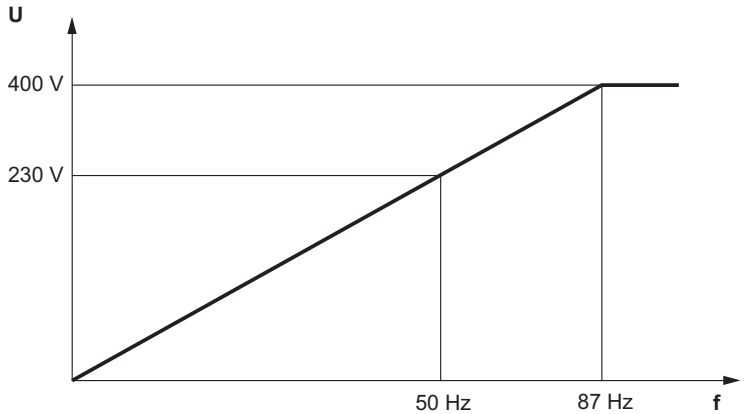
- SBus index 11358 is the fire mode/emergency mode start time: Time stamp related to (*P0-65*) at the time of activation of the fire mode/emergency mode.
- SBus index 11359 is the fire mode/emergency mode runtime in minutes. It specifies how long the fire mode/emergency mode was active.

INFORMATION

A reset to factory settings cannot be carried out during active emergency mode.

10.9 Operation at the 87 Hz characteristic (50 Hz motors)

The U/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 *P1-07* to star voltage (data on the motor nameplate).

31554814/EN – 10/2023

- Set parameter *P1-08* to delta current (data on the motor nameplate).
- Set parameter *P1-09* to "87 Hz".
- Set parameter *P1-10* to "(synchronous speed at nominal frequency) × (87 Hz / 50 Hz) – (slip speed at nominal frequency)".
- Select an operating mode suitable for the motor in P4-01.
- Set the cos phi in *P4-05*
- Start the automatic motor measuring procedure "Auto Tune" as described in chapter "Auto-tune automatic measuring procedure" (→ 🗎 114).

Example of calculating P1-10:

DRN80M4: 0.75 kW, 50 Hz

Nominal speed 1440 min^{-1}

P1-10 = 1500 min^{-1} × (87 Hz / 50 Hz) - (1500 min^{-1} - 1440 min^{-1}) = 2550 min^{-1}

INFORMATION

Set *P1-01 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.

31554814/EN – 10/2023

10.10 Examples of analog input scaling and offset setting

Analog input format, scaling and offset are connected to each other.

Inverter setting:

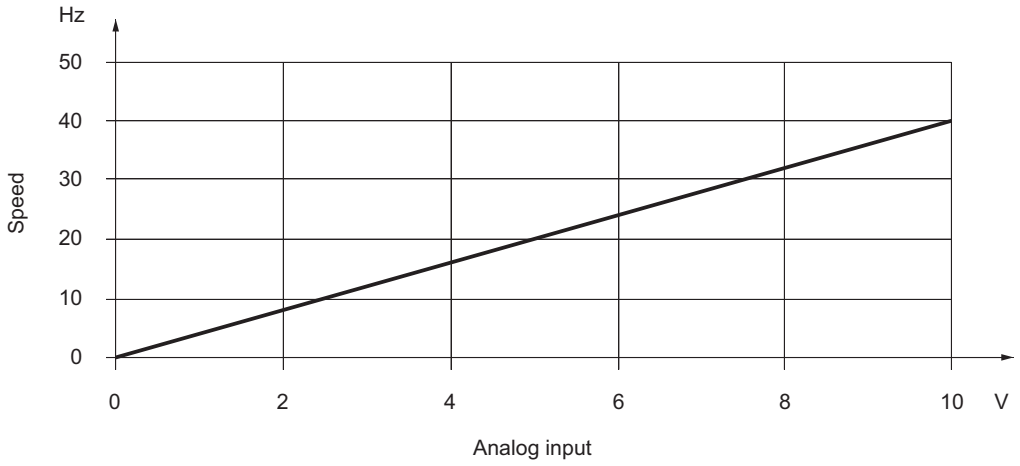
P1-01 = 50 Hz

10.10.1 Example 1: Analog input scaling

Control 0 – 40 Hz with analog input 0 – 10 V:

n_1 = 0 Hz, n_2 = 40 Hz

P2-31 = 80%



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$$P2\text{-}31 = \frac{n_2 - n_1}{P1\text{-}01} \times 100\% = \frac{40\,Hz - 0\,Hz}{50\,Hz} \times 100\% = 80\%$$

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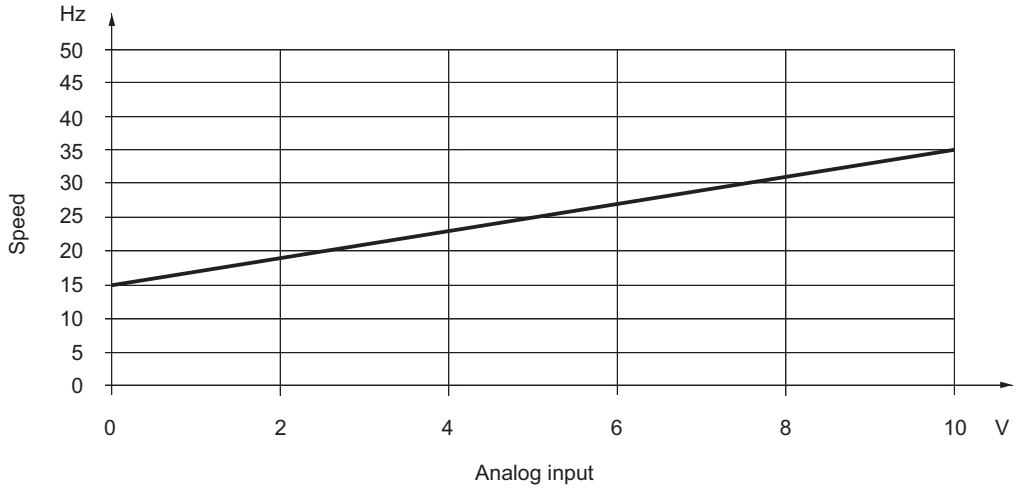
10.10.2 Example 2: Analog input offset

Control 15 – 35 Hz with analog input 0 – 10 V:

$n_1 = n_{Offset}$ = 15 Hz, n_2 = 35 Hz

P2-31 = 40%, P2-32 = -75%



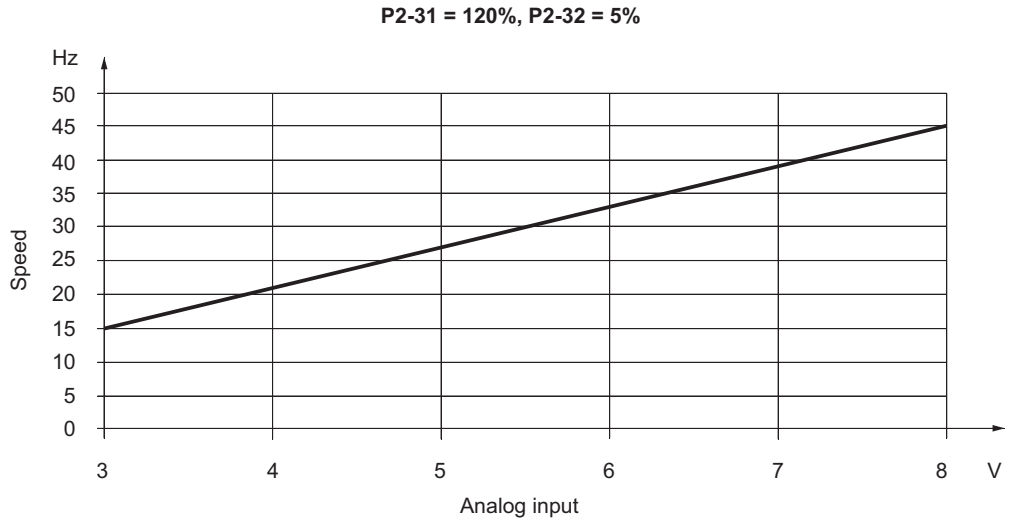
31554814/EN – 10/2023

$$P2\text{-}31 = \frac{n_2 - n_1}{P1\text{-}01} \times 100\% = \frac{35\,Hz - 15\,Hz}{50\,Hz} \times 100\% = 40\%$$

$$P2\text{-}32 = \frac{\frac{-n_{Offset}}{P1\text{-}01} \times 100\%}{P2\text{-}31} = \frac{\frac{-15\,Hz}{50\,Hz} \times 100\%}{0.40} = -75\%$$

10.10.3 Example 3: Analog input scaling and offset

Control 15 to 45 Hz with analog input 3 to 8 V: n_1 is the difference from the minimum speed.



$$P2-31 = \frac{n_2 - n_1}{P1-01} \times 100\% \times \frac{AI_{full\_range}}{AI_{control\_range}}$$

$$P2-31 = \frac{45Hz - 15Hz}{50Hz} \times 100\% \times \frac{100\%}{50\%}$$

$$P2-31 = 120\%$$

$$P2-32 = AI_{min}(\%) - \frac{n_1 \times AI_{control\_range}}{(n_2 - n_1)}$$

$$P2-32 = 30\% - \frac{15Hz \times 50\%}{(45Hz - 15Hz)}$$

$$P2-32 = 5\%$$

10.11 Fan and pumps

Startup of pumps and fans

1. Start up the connected motor type according to the control mode and parameterization intended for this purpose, see chapter "Startup with motors" (→ 🗎 114). For asynchronous motors, use the U/f control.
   ⇨ The slip compensation must stay deactivated (*P1-10* = 0).
2. Set the ramps *P1-03* and *P1-04* to the most reasonable values possible.
   ⇨ The difference between acceleration and brake delay should be as small as possible.
3. For freely rotating fans or pumps, always activate the flying start function *P2-26* = 1, provided they are operated with asynchronous motors.
4. If the process does not require overload, limit *P4-07* and *P4-09* to 110%. Individual adjustment to at most 150% may be necessary.
5. Do not change any values in parameter group 7 manually. These parameters may only be changed if needed and only by experts.

Further functions for applications with pumps or fans

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

- Voltage boost *(P1-11*)
- Adjustment of the U/f characteristic curve (*P4-10, P4-11*)
- Energy-saving function (*P1-06*)
- Overload management (*P4-18*)
- Zero speed holding time (*P2-23*)
- Standby mode (*P2-27*)
- Skip frequency with resonance vibrations (*P2-09*, *P2-10*)
- PID controller, see "Parameter group 3: PID controller (level 2)" (→ 🗎 167)
- Fire mode/emergency mode, see "Fire mode/emergency mode" (→ 🗎 130)

10.12 Motor potentiometer

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

If the digital inputs are activated that increase or decrease the speed, the speed changes along the preset ramps *P1-03* and *P1-04*.

If both digital inputs are activated at the same time, the inverter stops along the rapid stop ramp *P2-25*. If none of the two inputs are activated, the current speed and direction of rotation are maintained.

The enable is superordinate to this function and is necessary for the function.

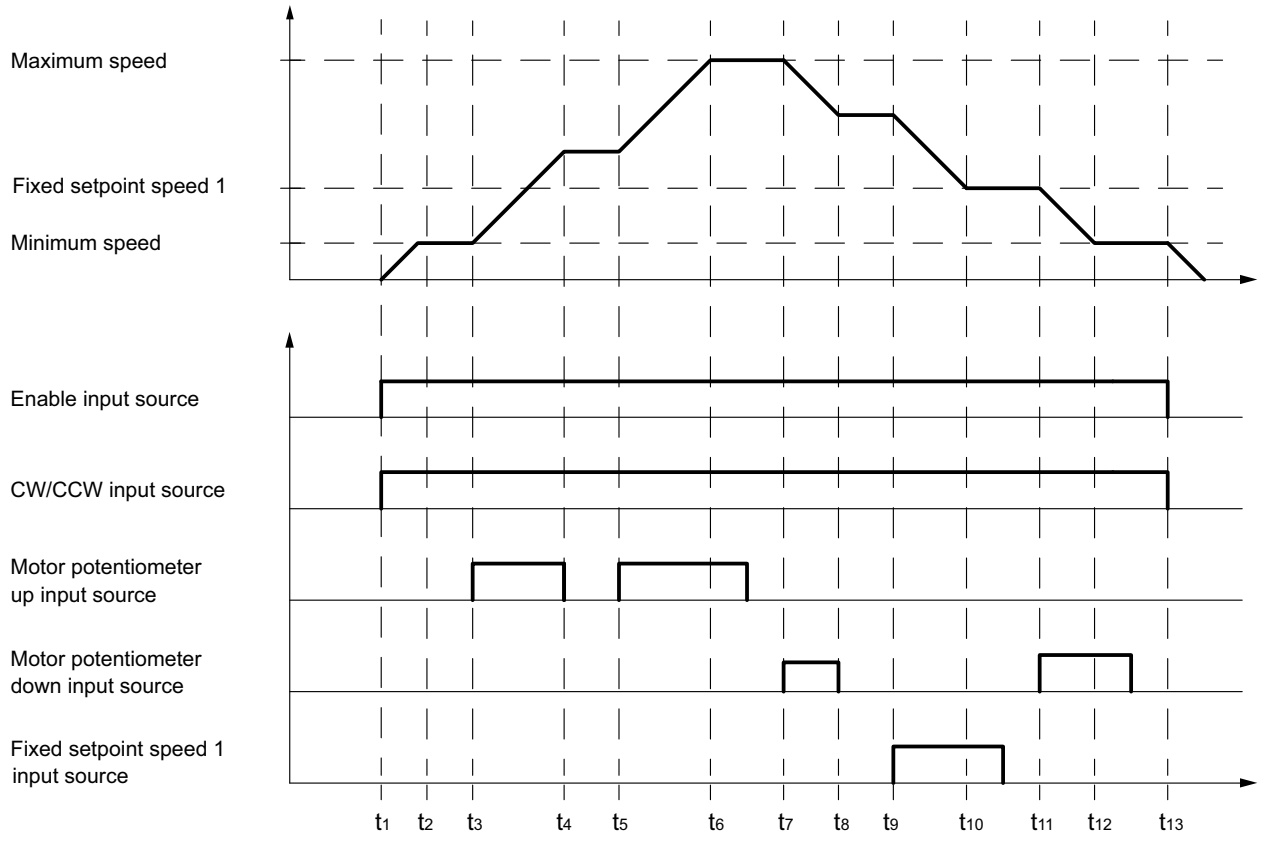
To use the motor potentiometer function, select one of the possible function selections of the digital inputs with *P1-15* = 10 or 20. Also refer to chapter "P1-15 Digital input function selection" (→ 🗎 150).

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

After power OFF or revoking the enable, the inverter operates according to the setting in *P2-36*.

31554814/EN – 10/2023

The following figure shows the basic function of the motor potentiometer.



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t_1 Inverter enable

t_1 - t_2 Motor accelerates to the set minimum speed (*P1-02*).

t_2 - t_3 Motor maintains minimum speed.

t_3 Motor potentiometer up is activated.

t_3 - t_4 As long as the signal "Motor potentiometer up" is present, the motor speed is increased along acceleration ramp *P1-03*.

t_4 - t_5 If the signal "Motor potentiometer up" is no longer present, the current speed is maintained.

t_5 Motor potentiometer up is activated.

t_5 - t_6 As long as the signal "Motor potentiometer up" is present, the motor speed is increased further along the acceleration ramp (*P1-03*) until it reaches maximum speed (*P1-01*).

t_6 - t_7 The maximum speed is not exceeded and is maintained, even if the signal "Motor potentiometer up" is no longer present.

t_7 "Motor potentiometer down" is activated.

t_7 - t_8 As long as the signal "Motor potentiometer down" is present, the motor speed is decreased along deceleration ramp *P1-04*.

t_8 - t_9 When signal "Motor potentiometer down" is no longer present, the current speed is maintained.

t_9 Fixed setpoint speed is activated.

t_9 - t_{11} As long as the signal is present at fixed setpoint speed, the motor speed is decreased along deceleration ramp *P1-04* until it reaches the fixed setpoint speed. This speed is then maintained.

t_{11} "Motor potentiometer down" is activated.

t_{11} - t_{12} As long as the signal "Motor potentiometer down" is present, the motor speed is decreased along deceleration ramp *P1-04* but not below the minimum speed *P1-02*.

31554814/EN – 10/2023

10.13 3-wire control

The function is activated via the digital input function selection *P1-15* = 21.

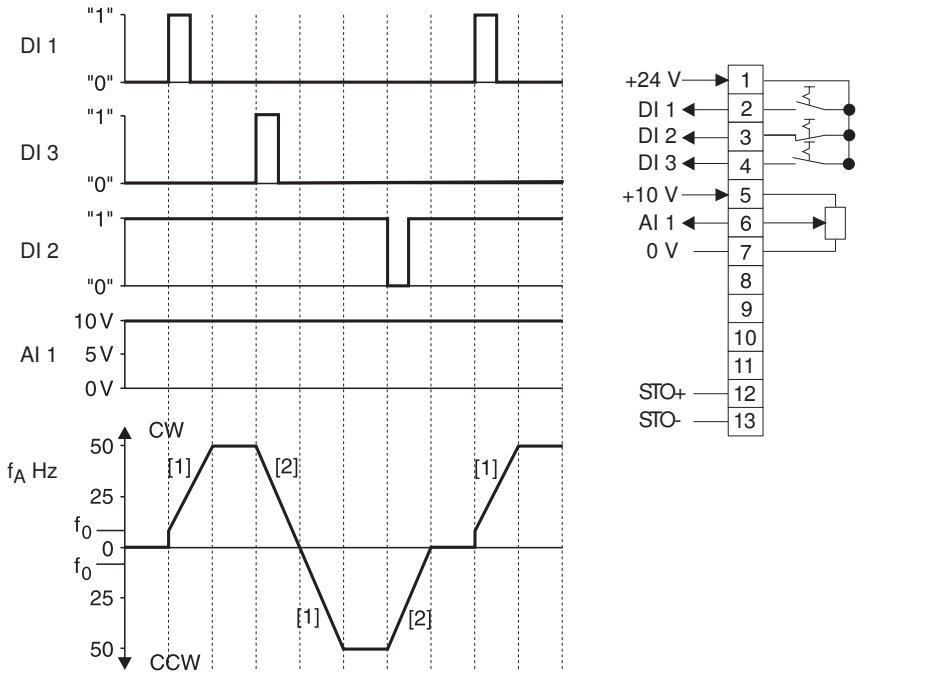
The 3-wire control principle determines the control.

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

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

If you connect <CW> and <CCW> at the same time, the drive decelerates along the rapid stop ramp *P2-25*.

10.13.1 Control signal source 3-wire control



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DI 1	Right/stop	CW	Clockwise rotation
DI 3	Left/stop	CCW	Counterclockwise rotation
DI 2	Enable/stop	[1]	Ramp up (*P1-03*)
AI 1	Setpoint input AI	[2]	Ramp down (*P1-04*)
f_A	Output frequency		
f_0	Start/stop frequency		

31554814/EN – 10/2023

11 Parameters

11.1 Overview of parameters

11.1.1 Configuration parameters

Parameter	CANopen/ SBus index	Modbus register	Description	Indicating range	Explanation
P0-00	255	–	–	SEt-1 – SEt-8	P-00 Configuration parameters for IP66/ NEMA-4X devices with switch option ("9.2.11 Configuration parameters" (→ 199))

11.1.2 Parameters for realtime monitoring (read only)

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

Parameter group 0 is visible if *P1-14* is set to "101" or "201".

Parameter	CANopen/SBus index	Modbus register	Description	Indicating range	Explanation
P0-01	11210	20	Value of analog input 1	0 – 100%	Index value 1000 = 100% ≙ max. input voltage or input current.
P0-02	11211	21	Value of analog input 2	0 – 100%	Index value 1000 = 100% ≙ max. input voltage or input current.
P0-03	11212	11	Status of digital inputs	Binary value	Status of the digital inputs of the basic device and option DI8*; DI7*; DI6*; DI5; DI4; DI3; DI2; DI1 * Only available with the matching option module.
P0-04	11213	22	Speed controller setpoint	*P1-02 – P1-01*	Speed display in Hz when *P1-10* = 0, otherwise in min^{-1}
P0-05	11214	41	Torque control setpoint	0 – 500%	Torque display in %, depending on the setting in *P4-06* 100% = nominal motor torque
P0-06	11215		Digital speed setpoint in keypad mode	*-P1-01 – P1-01*	Speed display in Hz when *P1-10* = 0, otherwise in min^{-1}
P0-07	11216		Speed setpoint via communication connection	*-P1-01 – P1-01*	Speed display in Hz when P1-10 = 0, otherwise in min^{-1}
P0-08	11217		PID reference	0 – 100%	
P0-09	11218		Actual PID value	0 – 100%	
P0-10	11219		PID output	0 – 100%	
P0-11	11270		Present motor voltage	AC 0 – 600 V	Inverter output voltage effective value
P0-12	11271		Motor torque	0 – 500%	
P0-13	11272 – 11281		Fault history	4 values	Displays the last 4 faults. You can toggle between the sub-items by pressing the <Up>/<Down> key.
P0-14	11282		Magnetizing current (Id)	A	
P0-15	11283		Torque-generating current (Iq)	A	
P0-16	11284		Magnetic field strength	0 – 100%	
P0-17	11285		Reserved		
P0-18	11286		Reserved		
P0-19	11287		Reserved		
P0-20	11220	23	DC link voltage ($U_{DC\ link}$)	DC 0 – 1000 V	$U_{DC\ link} = U_{line} \times \sqrt{2}$ Minimum DC link voltage for operation: AC 200 – 240 V device = min. DC 240 V AC 380 – 480 V device = min. DC 480 V AC 500 – 600 V device = min. DC 540 V
P0-21	11221, 11222	24	Power electronics/heat sink temperature	°C	40 = 40 °C
P0-22	11288		DC link voltage ripple	0 – 1000 V	

31554814/EN – 10/2023

Parameter	CANopen/SBus index	Modbus register	Description	Indicating range	Explanation
P0-23	11289, 11290		Total runtime above 85 °C (power electronics/heat sink)	Hours and minutes	
P0-24	11237, 11238		Total runtime above 60 °C (control electronics)	Hours and minutes	
P0-25	11291		Rotor speed (calculated via motor model)	Hz/min^{-1}	Speed display in Hz when *P1-10* = 0, otherwise in min-1
P0-26	11292, 11293	30	kWh counter (can be reset via *P6-23*)	0.0 – 999.9 kWh	100 = 10.0 kWh (cumulative energy consumption)
		32	kWh counter		
P0-27	11294, 11295	31	MWh counter	0.0 – 65535 MWh	100 = 10.0 MWh (cumulative energy consumption)
		33	MWh counter (can be reset via *P6-23*)		
P0-28	11247 – 11250		Firmware version and checksum	e.g. "1 1.00", "1 4F3C" "2 1.00", "2 Ed8A"	Firmware and checksum of the control electronics and power section
P0-29	11251 – 11254		Inverter type	e.g. "HP 2", "2 400", "3-PhASE"	Power rating/connection and voltage/motor connection
P0-30	11255	25	Inverter serial number 4	000000 – 000000 (SN grp 1) 000-00 – 999-99 (SN grp 2, 3)	31 → 561723/01/**031**
		26	Inverter serial number 3		1 → 561723/**01**/031
		27	Inverter serial number 2		1723 → 56**1723**/01/031
		28	Inverter serial number 1		56 → **56**1723/01/031
P0-31	11296, 11297	34, 35	Operating hours counter (inverter enabled)	Value 1: Hours Value 2: Minutes, seconds	Total enable time of the inverter since manufacturing. Value cannot be reset
P0-32	11298, 11299		Runtime since the last fault (1)	Hour/min./sec.	Operating time since last fault or power off. The timer is reset at the next enable or power off.
P0-33	11300, 11301		Runtime since the last fault (2)	Hour/min./sec.	Operating time since the last fault. The timer is reset at the next enable or power off.
P0-34	11302, 11303	36, 37	Inverter runtime since last enable	Value 1: Hours Value 2: Minutes, seconds	The value is reset at each enable
P0-35	11304, 11305		Runtime of the internal inverter fan	Hour/min./sec.	The internal inverter fan is installed only on IP55/IP66 devices.
P0-36	11306 – 11313		DC link voltage protocol	0 – 1000 V	Log of the last 8 values prior to a fault. Sampling cycle 256 ms
P0-37	11314 – 11321		Log of DC link voltage ripple	0 – 1000 V	Log of the last 8 values prior to a fault. Sampling cycle 20 ms
P0-38	11322 – 11329		Log of the power electronics/heat sink temperature (*P0-21*)	°C	Log of the last 8 values prior to a fault. Sampling cycle 30 sec
P0-39	11239 – 11246		Log of the control electronics temperature (*P0-72*)	°C	Log of the last 8 values prior to a fault. Sampling cycle 30 sec
P0-40	11330 – 11337		Motor current protocol	A	Log of the last 8 values prior to a fault. Sampling cycle 256 ms
P0-41	11338		Counter for overcurrent faults: O-I	–	see "Fault list" (→ 🗎 204)
P0-42	11339		Counter for overvoltage faults: O-Volt	–	see "Fault list" (→ 🗎 204)
P0-43	11340		Counter for undervoltage faults: U-Volt	–	see "Fault list" (→ 🗎 204)
P0-44	11341		Counter for overtemperature faults: O-t	–	see "Fault list" (→ 🗎 204)
P0-45	11342		Counter for braking resistor overcurrent/overload: OI-b	–	see "Fault list" (→ 🗎 204)
P0-46	11343		Counter for overtemperature faults: O-heat	–	see "Fault list" (→ 🗎 204)
P0-47	11223		Counter for internal I/O communication errors	0 – 65535	–
P0-48	11344		Counter for internal DSP communication errors	0 – 65535	–

31554814/EN – 10/2023

Parameter	CANopen/SBus index	Modbus register	Description	Indicating range	Explanation
P0-49	11224		Counter for Modbus communication errors	0 – 65535	–
P0-50	11225		Counter for CAN bus communication errors	0 – 65535	–
P0-51	11256 – 11258		Incoming process data PI1, PI2, PI3, PI4	Hex value	4 entries; incoming process data from the perspective of the controller.
P0-52	11259 – 11261		Outgoing process data PO1, PO2, PO3, PO4	Hex value	4 entries; outgoing process data from the perspective of the controller.
P0-53			Current voltage offset – phase U	Internal value	Entry 1: Reference value Entry 2: Current measured value
P0-54			Current voltage offset – phase V	Internal value	Entry 1: Reference value Entry 2: Current measured value
P0-55			Current voltage offset – phase W	Internal value (availability depends on power output)	Entry 1: Reference value Entry 2: Current measured value
P0-56			Max. power-applied time and working cycle of the brake chopper	Internal value	Entry 1: Maximum power-applied time [ms] Entry 2: Working cycle Pause time [ms] = working cycle × maximum power-applied time
P0-57			Ud/Uq	Internal value	2 entries
P0-58	11345		Encoder speed	Hz, min^{-1}	Display in Hz when *P1-10* = 0, otherwise in min^{-1}
P0-59	11226		Setpoint frequency/setpoint speed/frequency input	Hz, min^{-1}	Display in Hz when *P1-10* = 0, otherwise in min^{-1}
P0-60	11346		Calculated slip speed value	min^{-1}	Only with U/f control and activated slip compensation (*P1-10* > 0)
P0-61	11235		IO output status	Decimal display	Status display of the relays as well as of digital and analog outputs. The value is displayed in decimal notation. Analog outputs: 0 V/0 mA/4 mA are indicated with 0. Other values are indicated with 1. Bit 0: Relay 1 Bit 1: Relay 2 Bit 2: Relay 3 Bit 3: Relay 4 Bit 4: Relay 5 Bit 5: AO1/DO1 Bit 6: AO2/DO2
P0-62	11347, 11348		Speed droop/load distribution	Hz, min^{-1}	Current speed reduction, depending on the setting in *P6-09*. Display in Hz when *P1-10* = 0, otherwise in min^{-1}
P0-63	11349		Speed setpoint (ramp generator output, speed controller input)	Hz, min^{-1}	Display in Hz when *P1-10* = 0, otherwise in min^{-1}
P0-64	11350		Current PWM frequency	4 – 16 kHz	The PWM frequency displayed can differ from the setting in *P2-24* due to derating. 0 = 2 kHz 1 = 4 kHz 2 = 6 kHz 3 = 8 kHz 4 = 12 kHz 5 = 16 kHz
P0-65	11351, 11352		Operating hours counter (inverter connected to line voltage)	Value 1: Hours Value 2: Minutes, seconds	Inverter on power supply since manufacture. Value cannot be reset.
P0-66	11353		I.t_trip counter	0 – 100%	The value increases as soon as the i.t model is effective. When reaching 100%, the inverter switches off with "I.t_trp".
P0-67	11228		Fieldbus torque setpoint/limit value	Internal value	4096 = 100% nominal motor torque
P0-68	11229		Fieldbus speed ramp setpoint	Seconds	
P0-69	11230		Counter for I^2C errors		Internal bus error

Parameter	CANopen/SBus index	Modbus register	Description	Indicating range	Explanation
P0-70	11231		Module identification code		PL-HFA: HIPERFACE® encoder module PL-Enc: Encoder module PL-EIO: IO expansion module PL-BUS: HMS fieldbus module PL-UnF: No module connected PL-UnA: Unknown module connected
P0-71			Fieldbus module ID / Fieldbus module status	Value 1: ID Value 2: Status	Fieldbus ID: N.A.: No fieldbus module connected. Prof-b: PROFIBUS module M30 dE-nEt: DeviceNet™ module M30 Eth-IP: EtherNet/IP™ module M30 CAN-OP: CANopen module M30 SErCOS: Sercos III module M30 bAc-nt: BACnet module M30 nu-nEt: Module of a new type (not recognized). Eth-cAt: EtherCAT® module M30 PrF-nEt: PROFINET module M30 Po-Lin: POWERLINK module M40 ModbuS: Modbus TCP module M30 Pn-40: PROFINET module M40 Et-40: EtherNet/IP™ module M40 Fieldbus module status: 0 = SETUP: Module switched on and in setup state 1 = NW_INIT: Module initializes line operation 2 = WAIT_PROCESS: Module waits for process data connection 3 = IDLE: Module in idle state 4 = PROCESS_ACTIVE: Module process data connection active 5 = FAULT: Module in fault state 6 = (reserved): Module provider ID discrepancy 7 = EXCEPTION: Module exception state (serious error)
P0-72	11232	39	Control electronics temperature	°C	40 = 40 °C
P0-73	11354		Encoder status/error codes		For incremental encoders: • 1=EnC-04 Signal A/A error • 2=EnC-05 Signal B/B error • 3=EnC-06 Signal A+B error For LTX HIPERFACE® encoders: • 1=EnC-04 analog signal error (sin/cos) • 2=EnC-07 RS485 communication error • 4=EnC-08 IO communication error • 8=EnC-09 encoder type not supported • 16=EnC-10 KTY error • 32=Wrong motor combination • 64=System referenced • 128=System ready
P0-74			L1 input voltage		
P0-75			L2 input voltage		
P0-76			L3 input voltage	Internal value	
P0-77	11262 11263		Position feedback	Internal value	Position feedback 11262: High word 11263: Low word
P0-78			Position reference	Internal value	Position reference
P0-79	11355, 11356		IO version and DSP bootloader version for motor controller	Example: L 4.71 Example: b 1.00	Entry 1: lib version of the motor controller Entry 2: DSP bootloader version
P0-80	11233, 11357		Code for valid motor data Servo module version		Entry 1: 1 = Valid motor data available. 0 = Motor data invalid Entry 2: Firmware version of the LTX encoder card
	11234		Temperature KTY84/ PT1000	-40 °C - 215 °C	• Temperature KTY84 = value/2 • Temperature Pt1000 = value
	11358		Fire mode/emergency mode start time		Timestamp related to (P0-65) at the time of activation of the fire mode/emergency mode

31554814/EN – 10/2023

Parameter	CANopen/SBus index	Modbus register	Description	Indicating range	Explanation
	11359		Fire mode/emergency mode		Runtime in minutes how long the fire mode/emergency mode was active
		10	Output power		100 = 1.00 kW
		18	Scope channel 1		Selected channel assignment LT shell scope (permanent).
		19	Scope channel 2		Selected channel assignment LT shell scope (permanent).
		29	Status relay output		− ; − ; − ; RL5; RL4; RL3; RL2; RL1 The relay status is also displayed without relay option depending on the setting in *P5-15* to *P5-20*.
	8314.0		Device name	16bit	
	8317.0		Signature	16bit	

11.1.3 Parameter register

The following table lists all parameters together with their factory settings (indicated in bold). Numerical values are displayed with the complete setting range.

Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P1-01	11020	101	Maximum speed (→ 🗎 146)	*P1-02* – **50.0 Hz** – 5 × *P1-09*
P1-02	11021	102	Minimum speed (→ 🗎 147)	**0** – P1-01 Hz
P1-03	11022	103	Acceleration ramp time (→ 🗎 147)	See parameter description
P1-04	11023	104	Deceleration ramp time (→ 🗎 147)	See parameter description
P1-05	11024	105	Stop mode (→ 🗎 147)	**0: Stop ramp**/1: Coasting
P1-06	11025	106	Energy-saving function (→ 🗎 147)	**0: OFF**/1: ON
P1-07	11012	107	Rated motor voltage (→ 🗎 148)	230 V inverter: 20 – **230** − 250 V 400 V inverter: 20 – **400** – 500 V 575 V inverter: 20 – **575** – 600 V
P1-08	11015	108	Rated motor current (→ 🗎 148)	20 − 100%
P1-09	11009	109	Rated motor frequency (→ 🗎 148)	25 – **50/60** – 500 Hz
P1-10	11026	110	Rated motor speed (→ 🗎 149)	**0** – 30000 min^{-1}
P1-11	11027	111	Voltage increase, boost (→ 🗎 149)	0 – 30% (power-dependent)
P1-12	11028	112	Control signal source (→ 🗎 150)	**0** – 8
P1-13	11029	113	Error log (→ 🗎 150)	Log of the last 4 errors
P1-14	11030	114	Advanced parameter access (→ 🗎 150)	**0** – 30000
P1-15	11031	115	Digital input function selection (→ 🗎 150)	0 – **1** – 26
P1-16	11006	116	Motor type (→ 🗎 154)	In-Syn
P1-17	11032	117	Servo module function selection (→ 🗎 155)	0 – **1** – 8
P1-18	11033	118	Motor thermistor selection (→ 🗎 156)	**0: Deactivated**
P1-19	11105	119	Inverter address (→ 🗎 156)	0 – **1** – 63
P1-20	11106	120	SBus baud rate (→ 🗎 156)	125, 250, **500**, 1000 kBaud
P1-21	11017	121	Stiffness (→ 🗎 156)	0.50 – **1.00** – 2.00
P1-22	11034	122	Inertia ratio between motor and load (→ 🗎 156)	0 – **1** – 30
P2-01	11036	201	Fixed setpoint speed 1 (→ 🗎 157)	-P1-01 – **5.0 Hz** – P1-01
P2-02	11037	202	Fixed setpoint speed 2 (→ 🗎 157)	-P1-01 – **10.0 Hz** – P1-01
P2-03	11038	203	Fixed setpoint speed 3 (→ 🗎 157)	-P1-01 – **25.0 Hz** – P1-01
P2-04	11039	204	Fixed setpoint speed 4 (→ 🗎 157)	-P1-01 – **50.0 Hz** – P1-01
P2-05	11040	205	Fixed setpoint speed 5 (→ 🗎 157)	-P1-01 – **0.0 Hz** – P1-01
P2-06	11041	206	Fixed setpoint speed 6 (→ 🗎 157)	-P1-01 – **0.0 Hz** – P1-01
P2-07	11042	207	Fixed setpoint speed 7 (→ 🗎 157) /Brake release time	-P1-01 − 0.0 Hz − P1-01
P2-08	11043	208	Fixed setpoint speed 8 (→ 🗎 157) /Brake application time	-P1-01 − 0.0 Hz − P1-01
P2-09	11044	209	Skip frequency (→ 🗎 157)	P1-02 – P1-01
P2-10	11045	210	Skip frequency band (→ 🗎 157)	**0.0 Hz** – P1-01
P2-11	11046	211	Function selection analog output 1 (→ 🗎 158)	0 – **8** – 13
P2-12	11047	212	Analog output 1 format (→ 🗎 158)	**0 – 10 V**
P2-13	11048	213	Function selection analog output 2 (→ 🗎 159)	0 – **9** – 13
P2-14	11049	214	Analog output 2 format (→ 🗎 159)	**0 – 10 V**
P2-15	11050	215	User relay output 1 function selection (→ 🗎 160)	0 – **1** – 11
P2-16	11051	216	Upper user relay limit 1: Analog output (→ 🗎 160)	0.0 – **100.0** – 200.0%
P2-17	11052	217	Lower user relay limit 1: Analog output (→ 🗎 160)	**0.0** – P2-16
P2-18	11053	218	User relay output 2 function selection (→ 🗎 160)	0 – **3** – 11
P2-19	11054	219	Upper user relay limit 2: Analog output 2 (→ 🗎 160)	0.0 – **100.0** – 200.0%
P2-20	11055	220	Lower user relay limit 2: Analog output 2 (→ 🗎 160)	**0.0** – P2-19

31554814/EN – 10/2023

Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P2-21	11056	221	Display of scaling factor (→ 🗎 161)	-30000 – **0.000** – 30000
P2-22	11057	222	Display of scaling source (→ 🗎 161)	0 – 2
P2-23	11058	223	Zero speed holding time (→ 🗎 161)	0.0 – **0.2** – 60.0 s
P2-24	11003	224	PWM switching frequency (→ 🗎 161)	2 – 16 kHz (power-dependent)
P2-25	11059	225	Second deceleration ramp, rapid stop ramp (→ 🗎 161)	See parameter description
P2-26	11060	226	Enable flying start function (→ 🗎 161)	**0: Deactivated**
P2-27	11061	227	Standby mode (→ 🗎 162)	**0.0** – 250 s
P2-28	11062	228	Slave speed scaling (→ 🗎 162)	**0: Deactivated**
P2-29	11063	229	Slave speed scaling factor (→ 🗎 162)	-500 – **100** – 500%
P2-30	11064	230	Analog input 1 format (→ 🗎 162)	**0 – 10 V**
P2-31	11065	231	Analog input 1 scaling (→ 🗎 163)	0 – **100** – 500%
P2-32	11066	232	Analog input 1 offset (→ 🗎 163)	-500 – **0** – 500%
P2-33	11067	233	Analog input 2 format / motor protection (→ 🗎 164)	**0 – 10 V**
P2-34	11068	234	Analog input 2 scaling (→ 🗎 164)	0 – **100** – 500%
P2-35	11069	235	Analog input 2 offset (→ 🗎 164)	-500 – **0** – 500%
P2-36	11070	236	Start mode selection (→ 🗎 164)	**Auto – 0**
P2-37	11071	237	Enable behavior/changeover behavior (→ 🗎 166)	0 – **1** – 7
P2-38	11072	238	Power failure stop control (→ 🗎 166)	**0** – 3
P2-39	11073	239	Parameter lock (→ 🗎 167)	**0: Deactivated**
P2-40	11074	240	Advanced parameter access code definition (→ 🗎 167)	0 – **101** – 9999
P3-01	11075	301	PID proportional gain (→ 🗎 167)	0.0 – **1.0** – 30
P3-02	11076	302	PID-integrating time constant (→ 🗎 167)	0.0 – **1.0** – 30 s
P3-03	11077	303	PID-differentiating time constant (→ 🗎 167)	**0.00** – 1.00 s
P3-04	11078	304	PID operating mode (→ 🗎 167)	**0: Direct mode (continuous)**
P3-05	11079	305	PID reference selection (→ 🗎 168)	**0** – 4
P3-06	11080	306	PID fixed setpoint reference 1 (→ 🗎 168)	**0.0** – 100.0%
P3-07	11081	307	PID controller upper limit (→ 🗎 168)	P3-08 – **100.0%**
P3-08	11082	308	PID controller lower limit (→ 🗎 168)	**0.0%** – P3-07
P3-09	11083	309	PID correcting variable limitation (→ 🗎 168)	**0** – 3
P3-10	11084	310	PID feedback selection (→ 🗎 168)	**0** – 5
P3-11	11085	311	PID control difference threshold for ramp activation (→ 🗎 169)	**0.0** – 25.0%
P3-12	11086	312	PID actual value display scaling factor (→ 🗎 169)	**0.000** – 50.000
P3-13	11087	313	PID control difference wake-up level (→ 🗎 169)	**0.0** – 100.0%
P3-14	11088	314	PID fixed setpoint speed 2 (→ 🗎 169)	**0.0** – 100.0%
P3-15	11376	315	PID fixed setpoint speed 3 (→ 🗎 169)	**0.0** – 100.0%
P3-16	11377	316	PID fixed setpoint speed 4 (→ 🗎 169)	**0.0** – 100.0%
P4-01	11089	401	Operating mode/motor control (→ 🗎 169)	0 – **2** – 8
P4-02	11090	402	"Auto tune" (→ 🗎 170)	**0: Locked**
P4-03	11091	403	Speed controller proportional gain (→ 🗎 171)	0.1 – **50** – 400%
P4-04	11092	404	Speed controller integrating time constant (→ 🗎 171)	0.010 – **0.100** – 1.000 s
P4-05	11093	405	Motor power factor (→ 🗎 171)	0.50 – 0.99 (power-dependent)
P4-06	11094	406	Torque reference/limit value source (→ 🗎 171)	**0: Fixed torque reference/limit value**
P4-07	11095	407	Max. torque limit (→ 🗎 172)	P4-08 – **200** – 500%
P4-08	11096	408	Min. torque limit (→ 🗎 173)	**0.0%** – P4-07
P4-09	11097	409	Upper limit of regenerative torque (→ 🗎 173)	P4-08 – **200** – 500%
P4-10	11098	410	U/f characteristic adjustment frequency (→ 🗎 174)	**0.0** – 100.0% of P1-09

Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P4-11	11099	411	U/f characteristic adjustment voltage (→ 🗎 174)	**0.0** – 100.0% of P1-07
P4-12	11100	412	Motor brake control (→ 🗎 174)	**0: Deactivated**
P4-13	11101	413	Brake release time (→ 🗎 175)	0.0 – 5.0 s
P4-14	11102	414	Brake application time (→ 🗎 175)	0.0 – 5.0 s
P4-15	11103	415	Torque threshold for brake release (→ 🗎 175)	0.0 – 200%
P4-16	11104	416	Hoist torque threshold timeout (→ 🗎 175)	0.0 – 25.0 s
P4-17	11357	417	Thermal motor protection to UL508C (→ 🗎 175)	**0: Deactivated**
P4-18	11379	418	Overload management (→ 🗎 175)	**0** – 1
P4-19	11380	419	Master-slave torque reference/load distribution (→ 🗎 176)	**0** – 1
P5-01	11105	501	Inverter address (→ 🗎 176)	0 – **1** – 63
P5-02	11106	502	SBus/CANopen baud rate (→ 🗎 176)	125 – **500** – 1000 kBd
P5-03	11107	503	Modbus RTU baud rate (→ 🗎 176)	9.6 – **115.2 / 115200 Bd**
P5-04	11108	504	Modbus RTU data format (→ 🗎 176)	**n-1: no parity, 1 stop bit**
P5-05	11109	505	Response to communication failure/timeout (→ 🗎 176)	**2: Stop ramp (without fault)**
P5-06	11110	506	Timeout communication failure for SBus and Modbus (→ 🗎 177)	0.0 – **1.0** – 5.0 s
P5-07	11111	507	Ramp specified via fieldbus (→ 🗎 177)	**0: Deactivated**
P5-08	11112	508	Synchronization duration (→ 🗎 177)	**0**, 5 – 20 ms
P5-09	11369	509	Fieldbus PO2 definition (→ 🗎 178)	0 – 7
P5-10	11370	510	Fieldbus PO3 definition (→ 🗎 178)	0 – 7
P5-11	11371	511	Fieldbus PO4 definition (→ 🗎 178)	0 – 7
P5-12	11372	512	Fieldbus PI2 definition (→ 🗎 178)	0 – 11
P5-13	11373	513	Fieldbus PI3 definition (→ 🗎 178)	0 – 11
P5-14	11374	514	Fieldbus PI4 definition (→ 🗎 179)	0 – 11
P5-15	11360	515	Expansion relay 3 function selection (→ 🗎 179)	0 – 10
P5-16	11361	516	Relay 3 maximum limit (→ 🗎 179)	0.0 – **100.0** – 200.0%
P5-17	11362	517	Relay 3 minimum limit (→ 🗎 179)	**0.0** – 200.0%
P5-18	11363	518	Expansion relay 4 function selection (→ 🗎 179)	as *P5-15*
P5-19	11364	519	Relay 4 maximum limit (→ 🗎 179)	0.0 – **100.0** – 200.0%
P5-20	11365	520	Relay 4 minimum limit (→ 🗎 179)	**0.0** – 200.0%
P6-01	11115	601	Firmware upgrade activation (→ 🗎 179)	**0: Deactivated**
P6-02	11116	602	Automatic thermal management (→ 🗎 180)	**1: Activated**
P6-03	11117	603	Auto-reset delay time (→ 🗎 180)	1 – **20** – 60 s
P6-04	11118	604	Hysteresis band user relay/analog outputs (→ 🗎 180)	0.0 – **0.3** – 25.0%
P6-05	11119	605	Activation of encoder feedback (→ 🗎 180)	**0: Deactivated**
P6-06	11120	606	PPR count (→ 🗎 181)	**0** – 65535 PPR
P6-07	11121	607	Trigger threshold speed error/speed monitoring (→ 🗎 181)	1.0 – **5.0** – 100%
P6-08	11122	608	Max. frequency for speed setpoint (→ 🗎 181)	0; **5** – 20 kHz
P6-09	11123	609	Speed droop/load distribution control (→ 🗎 181)	**0.0** – 25.0%
P6-10	11124	610	Reserved (→ 🗎 182)	
P6-11	11125	611	Speed holding time on enable (→ 🗎 182)	**0.0** – 250 s
P6-12	11126	612	Speed holding time on barring (→ 🗎 182)	**0.0** – 250 s
P6-13	11127	613	Fire mode logic/emergency mode (→ 🗎 182)	**0: Open trigger: Fire mode**
P6-14	11128	614	Fire mode/emergency mode speed (→ 🗎 182)	-P1-01 – **0** – P1-01 Hz
P6-15	11129	615	Analog output 1 scaling (→ 🗎 182)	0.0 – **100.0** – 500.0%
P6-16	11130	616	Analog output 1 offset (→ 🗎 184)	-500.0 – **0.0** – 500.0%

31554814/EN – 10/2023

Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P6-17	11131	617	Max. torque limit timeout (→ 🗎 184)	0.0 – **0.5** – 25.0 s
P6-18	11132	618	DC braking voltage level (→ 🗎 184)	Auto, **0.0** – 30.0%
P6-19	11133	619	Braking resistance value (→ 🗎 184)	**0**, Min-R – 200 Ω
P6-20	11134	620	Braking resistor power (→ 🗎 185)	**0.0** – 200 kW
P6-21	11135	621	Brake chopper operating cycle at undertemperature (→ 🗎 185)	**0.0** – 20.0%
P6-22	11136	622	Reset fan runtime (→ 🗎 185)	**0: Deactivated**
P6-23	11137	623	Reset kWh counter (→ 🗎 185)	**0: Deactivated**
P6-24	11138	624	Parameter factory settings (→ 🗎 185)	**0: Deactivated**
P6-25	11139	625	Access code level 3 (→ 🗎 186)	0 – **201** – 9 999
P6-26	11378	626	Parameter backup (→ 🗎 186)	0: Basic setting of the parameter
P7-01	11140	701	Motor stator resistance (Rs) (→ 🗎 187)	depending on the motor
P7-02	11141	702	Motor rotor resistance (Rr) (→ 🗎 187)	depending on the motor
P7-03	11142	703	Motor stator inductance (Lsd) (→ 🗎 187)	depending on the motor
P7-04	11143	704	Motor magnetizing current (Id rms) (→ 🗎 187)	10% × P1-08 − 80% × P1-08
P7-05	11144	705	Motor leakage loss coefficient (sigma) (→ 🗎 187)	0.025 – **0.10** – 0.25
P7-06	11145	706	Motor stator inductance (Lsq) − only for synchronous motors (→ 🗎 187)	depending on the motor
P7-07	11146	707	Enhanced generator control (→ 🗎 188)	**0: Deactivated**
P7-08	11147	708	Parameter adjustment (→ 🗎 188)	**0: Deactivated**
P7-09	11148	709	Overvoltage current limit (→ 🗎 188)	0.0 – **1.0** – 100%
P7-10	11149	710	Stiffness (for vector control) (→ 🗎 188)	0 – **10** – 600
P7-11	11150	711	Pulse width min. limit (→ 🗎 188)	0 – 500
P7-12	11151	712	Premagnetization time (→ 🗎 189)	0 – 5000 ms
P7-13	11152	713	D-gain vector speed controller (→ 🗎 189)	**0.0** – 400%
P7-14	11153	714	Low-frequency torque increase (→ 🗎 189)	**0.0** – 100%
P7-15	11154	715	Frequency limit for torque increase (→ 🗎 189)	**0.0** – 50%
P7-16	11155	716	Speed according to motor nameplate (→ 🗎 189)	**0.0** – 6000 min^{-1}
P8-01	11156	801	Simulated encoder scaling (→ 🗎 190)	$\mathbf{2}^0$ – 2^3
P8-02	11157	802	Input pulse scaling value (→ 🗎 190)	2^0 – $\mathbf{2}^{16}$
P8-03	11158	803	Lag error low word (→ 🗎 190)	0 – **65535**
P8-04	11159	804	Lag error high word (→ 🗎 190)	**0** – 65535
P8-05	11160	805	Reference travel type (→ 🗎 190)	**0: Deactivated**
P8-06	11161	806	Position controller proportional gain (→ 🗎 190)	0.0 – **1.0** – 400%
P8-07	11162	807	Touchprobe trigger mode (→ 🗎 190)	**0: TP1 P edge TP2 P edge**
P8-08	11163	808	Reserved (→ 🗎 190)	
P8-09	11164	809	Speed precontrol gain (→ 🗎 190)	0 – **100** – 400%
P8-10	11165	810	Acceleration precontrol gain (→ 🗎 191)	**0** – 400%
P8-11	11166	811	Low-word reference offset (→ 🗎 191)	**0** – 65535
P8-12	11167	812	High-word reference offset (→ 🗎 191)	**0** – 65535
P8-13	11168	813	Reserved (→ 🗎 191)	
P8-14	11169	814	Reference enable torque (→ 🗎 191)	0 – **100** – 500%
P9-01	11171	901	Input source enable (→ 🗎 193)	SAFE, din-1 – din-8
P9-02	11172	902	Rapid stop input source (→ 🗎 193)	OFF, din-1 – din-8, On
P9-03	11173	903	Input source for clockwise rotation (CW) (→ 🗎 193)	OFF, din-1 – din-8, On
P9-04	11174	904	Input source for counterclockwise rotation (CCW) (→ 🗎 193)	OFF, din-1 – din-8, On
P9-05	11175	905	Latch function enable (→ 🗎 193)	OFF, ON
P9-06	11176	906	Direction of rotation reversal (→ 🗎 193)	OFF, din-1 – din-8, On
P9-07	11177	907	Reset input source (→ 🗎 194)	OFF, din-1 – din-8, On

Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P9-08	11178	908	External fault input source (→ 194)	OFF, din-1 – din-8, On
P9-09	11179	909	Source for activating terminal control (→ 194)	OFF, din-1 – din-8, On
P9-10	11180	910	Setpoint source 1 (→ 194)	Ain-1, Ain-2, speed 1–8, d-Pot, PID, Sub-dr, F-bus, user, pulse
P9-11	11181	911	Setpoint source 2 (→ 194)	Ain-1, Ain-2, speed 1–8, d-Pot, PID, Sub-dr, F-bus, user, pulse
P9-12	11182	912	Setpoint source 3 (→ 194)	Ain-1, Ain-2, speed 1–8, d-Pot, PID, Sub-dr, F-bus, user, pulse
P9-13	11183	913	Setpoint source 4 (→ 194)	Ain-1, Ain-2, speed 1–8, d-Pot, PID, Sub-dr, F-bus, user, pulse
P9-14	11184	914	Setpoint source 5 (→ 194)	Ain-1, Ain-2, speed 1–8, d-Pot, PID, Sub-dr, F-bus, user, pulse
P9-15	11185	915	Setpoint source 6 (→ 195)	Ain-1, Ain-2, speed 1–8, d-Pot, PID, Sub-dr, F-bus, user, pulse
P9-16	11186	916	Setpoint source 7 (→ 195)	Ain-1, Ain-2, speed 1–8, d-Pot, PID, Sub-dr, F-bus, user, pulse
P9-17	11187	917	Setpoint source 8 (→ 195)	Ain-1, Ain-2, speed 1–8, d-Pot, PID, Sub-dr, F-bus, user, pulse
P9-18	11188	918	Input 0 for setpoint source selection (→ 195)	OFF, din-1 – din-8, On
P9-19	11189	919	Input 1 for setpoint source selection (→ 195)	OFF, din-1 – din-8, On
P9-20	11190	920	Input 2 for setpoint source selection (→ 195)	OFF, din-1 – din-8, On
P9-21	11191	921	Input 0 for fixed setpoint speed selection (→ 196)	OFF, din-1 – din-8, On
P9-22	11192	922	Input 1 for fixed setpoint speed selection (→ 196)	OFF, din-1 – din-8, On
P9-23	11193	923	Input 2 for fixed setpoint speed selection (→ 196)	OFF, din-1 – din-8, On
P9-24	11194	924	Positive jog mode input (→ 196)	OFF, din-1 – din-8
P9-25	11195	925	Negative jog mode input (→ 196)	OFF, din-1 – din-8
P9-26	11196	926	Input for reference travel enable (→ 196)	OFF, din-1 – din-8
P9-27	11197	927	Reference cam input (→ 196)	OFF, din-1 – din-8
P9-28	11198	928	Motor potentiometer up input source (→ 197)	OFF, din-1 – din-8
P9-29	11199	929	Motor potentiometer down input source (→ 197)	OFF, din-1 – din-8
P9-30	11200	930	Positive limit switch CW (→ 197)	OFF, din-1 – din-8
P9-31	11201	931	Negative limit switch CCW (→ 197)	OFF, din-1 – din-8
P9-32	11202	932	Selection of the deceleration ramp/rapid stop ramp (→ 197)	OFF, din-1 – din-8
P9-33	11203	933	Fire mode/emergency mode input selection (→ 197)	OFF, din-1 – din-5
P9-34	11204	934	PID fixed setpoint reference selection input 0 (→ 197)	**OFF**, din-1 – din-8
P9-35	11205	935	PID fixed setpoint reference selection input 1 (→ 197)	**OFF**, din-1 – din-8

11.2 Explanation of the parameters

11.2.1 Parameter group 1: Basic parameters (level 1)

P1-01 Maximum speed

Setting range: *P1-02* – **50.0 Hz** – 5 × *P1-09* (max 500 Hz)

31554814/EN – 10/2023

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 *P1-10*, this parameter will be displayed in rpm.

The maximum speed is also limited by the switching frequency set in *P2-24*. The limit is determined by the maximum output frequency to the motor = *P2-24*: *16*.

P1-02 Minimum speed

Setting range: **0** – *P1-01* 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 rpm in *P1-10*, 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.

P1-03 Acceleration ramp time

Setting range:

Sizes 2 + 3: 0.00 – **5.0** – 600 sec.

Sizes 4 – 7: 0.0 – **5.0** – 6000 sec.

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 *P1-01*/*P1-02.*

P1-04 Deceleration ramp time

Setting range:

Sizes 2 + 3: Coast – 0.01 – **5.0** – 600 sec.

Sizes 4 – 7: Coast – 0.1 – **5.0** – 6000 sec.

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 *P1-01*/*P1-02.*

A ramp of 0 sec. is displayed as "coast" as this value leads to coasting to a stop.

P1-05 Stop mode

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

- 0: Stop ramp along the process P1-04
- 1: Coast, the motor runs down to an idle state in a non-controlled manner.

P1-06 Energy saving function

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

31554814/EN – 10/2023

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. 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.

P1-07 Rated motor voltage

Setting range:

- 230 V inverter: 20 – **230** − 250 V
- 400 V inverter: 20 – **400/460**[1] – 500 V
- 575 V inverter: 20 – **575** – 600 V

Specifies the nominal voltage of the motor connected to the inverter (in accordance with the motor nameplate). The parameter value is used in U/f speed control for controlling the output voltage applied to the motor. In U/f speed control, the output voltage of the inverter amounts to the value set in *P1-07* if the output speed corresponds to the motor base frequency set in *P1-09*.

"0V" = DC link compensation is disabled. When braking, the U/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 American version only

P1-08 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.

P1-09 Rated motor frequency

Setting range: 25 – **50/60**[1] – 500[2] 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 (American version only)
2) The adjustable maximum frequency depends on the PWM frequency set in P2-24. It might be necessary to increase P2-24.

31554814/EN – 10/2023

P1-10 Rated motor speed

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

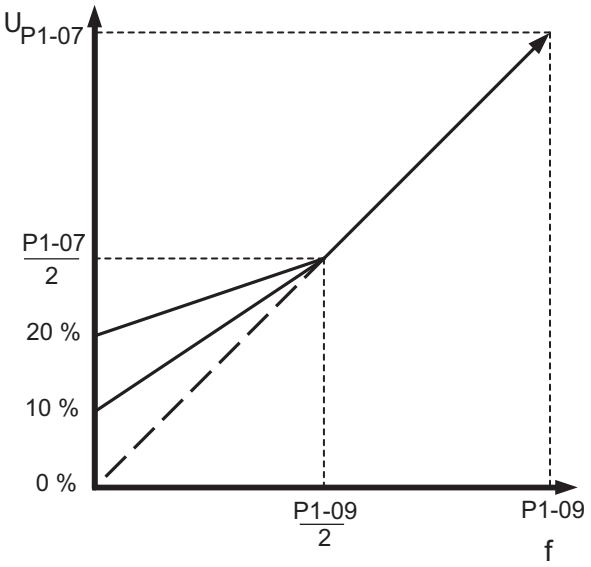
Specifies the rated speed of the motor. When the parameter is ≠ 0, all speed-related parameters, such as minimum speed and maximum speed, are displayed in "min^{-1}".

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.

P1-11 Voltage increase, boost

Setting range: Auto / 0 to 30% (voltage and power-dependent)

Determines the voltage increase at low speeds in order to facilitate the removal of applied loads. Modifies the U/f limit values by ½ *P1-07* and ½ *P1-09*.



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A value is automatically set with the setting "Auto". This is based on the motor data measured during the dimensioning process.

P1-12 Control signal source

- **0: Terminal mode**
- 1: Keypad mode unipolar
- 2: Keypad mode bipolar
- 3: PID controller mode
- 4: Slave mode
- 5: SBus MOVILINK®
- 6: CANopen
- 7: Modbus RTU or fieldbus interface
- 8: MultiMotion

INFORMATION

As soon as you use a communication option or an encoder card in the option card slot, communication via Modbus is no longer possible.

P1-13 Error history

Ring memory of the last 4 errors.

You can toggle between sub-items by pressing the <Up>/<Down> keys. Multiple consecutive undervoltage errors are only listed once as these inevitably occur at each power OFF.

P1-14 Extended parameter access

Setting range: **0** to 30000

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

- **0: P1-01 – P1-15** (basic parameters)
- 1: *P1-01* – *P1-22* (basis + servo parameter)
- 101[1)]: *P0-01* – *P5-20* (extended parameters)
- 201[2)]: *P0-01* – *P9-33* (extended parameter menu → full access)

1) Code defined in P2-40
2) Code defined in P6-25

P1-15 Digital input function selection

Setting range: 0 – **1** – 26

Users can configure 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 *P1-12* (terminal/keypad/SBus control) and *P1-15* (selection of the digital input functions).

31554814/EN – 10/2023

INFORMATION

Individual configuration of the digital inputs:

To individually configure the digital inputs, set parameter *P1-15* to "0". The input terminals for DI1 to DI5 (with option DI1 to DI8) are thus set to "no function" and can be freely assigned via parameter group 9.

P1-15	Digital input 1	Digital input 2	Digital input 3	Analog input 1/digital input 4	Analog input 2/digital input 5	Comments
0	Free terminal assignment via P9-xx					Function assignment via parameter group P9-xx
1	**0: Stop 1: Enable + start**	**0: Clockwise rotation 1: Counterclockwise rotation**	**0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1, 2**	**Speed setpoint analog 1**	**0: Fixed setpoint speed 1 1: Fixed setpoint speed 2**	**–**
2	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Open	0: Open	0: Open	Fixed setpoint speed 1
			1: Closed	0: Open	0: Open	Fixed setpoint speed 2
			0: Open	1: Closed	0: Open	Fixed setpoint speed 3
			1: Closed	1: Closed	0: Open	Fixed setpoint speed 4
			0: Open	0: Open	1: Closed	Fixed setpoint speed 5
			1: Closed	0: Open	1: Closed	Fixed setpoint speed 6
			0: Open	1: Closed	1: Closed	Fixed setpoint speed 7
			1: Closed	1: Closed	1: Closed	Fixed setpoint speed 8
3	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1	Speed setpoint analog 1	Torque reference analog. Set *P4-06* = 2 for this purpose.	–
4	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1	Speed setpoint analog 1	0: Decel. ramp P1-04 1: Decel. ramp P2-25	–
5	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Selected speed setpoint (P1-12) 1: Speed setpoint analog input 2	Speed setpoint analog 1	Speed setpoint analog 2	–
6	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1	Speed setpoint analog 1	External error[1)] 0: Error 1: Start	–
7	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Open	0: Open	External error[1)] 0: Error 1: Start	Fixed setpoint speed 1
			1: Closed	0: Open		Fixed setpoint speed 2
			0: Open	1: Closed		Fixed setpoint speed 3
			1: Closed	1: Closed		Fixed setpoint speed 4

P1-15	Digital input 1	Digital input 2	Digital input 3	Analog input 1/digital input 4	Analog input 2/digital input 5	Comments
8	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Open	0: Open	0: Decel. ramp P1-04 1: Decel. ramp P2-25	Fixed setpoint speed 1
			1: Closed	0: Open		Fixed setpoint speed 2
			0: Open	1: Closed		Fixed setpoint speed 3
			1: Closed	1: Closed		Fixed setpoint speed 4
9	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Open	0: Open	Setpoint changeover 0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1 to 4	Fixed setpoint speed 1
			1: Closed	0: Open		Fixed setpoint speed 2
			0: Open	1: Closed		Fixed setpoint speed 3
			1: Closed	1: Closed		Fixed setpoint speed 4
10	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	Speed pushbutton up (NO contact)	Speed pushbutton down (NO contact)	Setpoint changeover 0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1	Motor potentiometer mode when P1-12 = 0
			If both inputs are active, deceleration is along ramp P1-04.			
11	0: Stop 1: Enable + start CW rotation	0: Stop 1: Enable + start CCW rotation	0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1, 2	Speed setpoint analog 1	0: Fixed setpoint speed 1 1: Fixed setpoint speed 2	–
	When both inputs are active, rapid stop ramp (P2-25) is activated.					
12	0: Stop 1: Enable + start CW rotation	0: Stop 1: Enable + start CCW rotation	0: Open	0: Open	0: Open	Fixed setpoint speed 1
			1: Closed	0: Open	0: Open	Fixed setpoint speed 2
			0: Open	1: Closed	0: Open	Fixed setpoint speed 3
			1: Closed	1: Closed	0: Open	Fixed setpoint speed 4
			0: Open	0: Open	1: Closed	Fixed setpoint speed 5
			1: Closed	0: Open	1: Closed	Fixed setpoint speed 6
	When both inputs are active, rapid stop ramp (P2-25) is activated.		0: Open	1: Closed	1: Closed	Fixed setpoint speed 7
			1: Closed	1: Closed	1: Closed	Fixed setpoint speed 8
13	0: Stop 1: Enable + start CW rotation	0: Stop 1: Enable + start CCW rotation	0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1	Speed setpoint analog 1	Torque reference analog Set *P4-06* = 2 for this purpose.	–
	When both inputs are active, rapid stop ramp (P2-25) is activated.					
14	0: Stop 1: Enable + start CW rotation	0: Stop 1: Enable + start CCW rotation	0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1	Speed setpoint analog 1	0: Decel. ramp P1-04 1: Decel. ramp P2-25	–
	When both inputs are active, rapid stop ramp (P2-25) is activated.					
15	0: Stop 1: Enable + start CW rotation	0: Stop 1: Enable + start CCW rotation	0: Selected speed setpoint (P1-12) 1: Speed setpoint analog input 2	Speed setpoint analog 1	Speed setpoint analog 2	–
	When both inputs are active, rapid stop ramp (P2-25) is activated.					
16	0: Stop 1: Enable + start CW rotation	0: Stop 1: Enable + start CCW rotation	0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1	Speed setpoint analog 1	External error[1)] 0: Error 1: Start	–
	When both inputs are active, rapid stop ramp (P2-25) is activated.					

31554814/EN – 10/2023

P1-15	Digital input 1	Digital input 2	Digital input 3	Analog input 1/digital input 4	Analog input 2/digital input 5	Comments
17	0: Stop 1: Enable + start CW rotation	0: Stop 1: Enable + start CCW rotation	0: Open	0: Open	External error[1)] 0: Error 1: Start	Fixed setpoint speed 1
			1: Closed	0: Open		Fixed setpoint speed 2
	When both inputs are active, rapid stop ramp (P2-25) is activated.		0: Open	1: Closed		Fixed setpoint speed 3
			1: Closed	1: Closed		Fixed setpoint speed 4
18	0: Stop 1: Enable + start CW rotation	0: Stop 1: Enable + start CCW rotation	0: Open	0: Open	0: Decel. ramp P1-04 1: Decel. ramp P2-25	Fixed setpoint speed 1
			1: Closed	0: Open		Fixed setpoint speed 2
	When both inputs are active, rapid stop ramp (P2-25) is activated.		0: Open	1: Closed		Fixed setpoint speed 3
			1: Closed	1: Closed		Fixed setpoint speed 4
19	0: Stop 1: Enable + start CW rotation	0: Stop 1: Enable + start CCW rotation	0: Open	0: Open	Setpoint changeover 0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1 to 4	Fixed setpoint speed 1
			1: Closed	0: Open		Fixed setpoint speed 2
	When both inputs are active, rapid stop ramp (P2-25) is activated.		0: Open	1: Closed		Fixed setpoint speed 3
			1: Closed	1: Closed		Fixed setpoint speed 4
20	0: Stop 1: Enable + start CW rotation	0: Stop 1: Enable + start CCW rotation	Speed pushbutton up (NO contact)	Speed pushbutton down (NO contact)	Setpoint changeover 0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1	Motor potentiometer mode when P1-12 = 0
	When both inputs are active, rapid stop ramp (P2-25) is activated.		If both inputs are active, deceleration is along ramp P1-04.			
21	Enable + start pushbutton CW rotation (NO contact)	Stop pushbutton (NC contact)	Enable + start pushbutton CCW rotation (NO contact)	Speed setpoint analog 1	Setpoint changeover 0: Selected speed setpoint (P1-12) 1: Fixed setpoint speed 1	3-Wire control when P1-12 = 0
22	0: Normal operation 1: Reference cam	0: Normal operation 1: Jog speed +	0: Normal operation 1: Jog speed –	Speed setpoint	0: Normal operation 1: Start of reference travel	Only in combination with LTX encoder card
23	0: Normal operation 1: Reference cam	0: Limit switch + 1: Normal operation	0: Limit switch – 1: Normal operation	Speed setpoint	0: Normal operation 1: Start of reference travel	Only in combination with LTX encoder card
24	0: Controller inhibit 1: Enable	0: Normal operation 1: Jog speed +	0: Normal operation 1: Jog speed –	Speed setpoint	0: Normal operation 1: Reference cam	Only in combination with LTX encoder card
25	0: Controller inhibit 1: Enable	0: Limit switch + 1: Normal operation	0: Limit switch – 1: Normal operation	Speed setpoint	0: Normal operation 1: Reference cam	Only in combination with LTX encoder card
26	0: Stop (controller inhibit) 1: Enable	No function	No function	Speed setpoint	Speed setpoint	Only in combination with LTX encoder card

1) The external error is defined in parameter P2-33.

INFORMATION

When using a TF/TH, KTY or PT1000, set *P2-33* to PTC-th, KTY or PT1000. See also the connection information in chapter "Connection of the motor temperature protection TF, TH, KTY84, PT1000" (→ 🗎 96).

11.2.2 Parameter group 1: Servo-specific parameters (level 1)

P1-16 Motor type

This parameter is intended only for startup of the Smart Servo package (LTX) or MGF..-DSM.

The parameter must not be used in all other cases.

This parameter is available for the following inverters:

IP20	IP66
• 230 V: 0.75 – 5.5 kW • 400 V: 0.75 – 11 kW	• 230 V: 0.75 – 4 kW • 400 V: 0.75 – 7.5 kW

Setting the motor type:

Display value	Motor type	Explanation
In-Syn	Induction motor	Default setting. Do not change if none of the selection options match. Choose induction motor or permanent magnet motor in parameter *P4-01*.
Syn	Undefined servomotor	Undefined servomotor. You must set special servo parameters during startup. In this case, you must set *P4-01* to synchronous motor control.
40M 2 40M 4	230 V / 400 V CMP40M	Preset CMP motors from SEW-EURODRIVE. Selecting one of those motor types will automatically set all the motor-specific parameters. The overload behavior is set to 200% for 60 s and 250% for 2 s. Only motor data of CMP.. motors of speed class 4500 min^{-1} with an AK0H encoder are included. Observe the Smart Servo Package.
40M 2b 40M 4b	230 V / 400 V CMP40M with brake	
50S 2 50S 4	230 V / 400V CMP50S	
50S 2b 50S 4b	230 V / 400 V CMP50S with brake	
50M 2 50M 4	230 V / 400 V CMP50M	
50M 2b 50M 4b	230 V / 400 V CMP50M with brake	
50L 2 50L 4	230 V / 400 V CMP50L	
50L 2b 50L 4b	230 V / 400 V CMP50L with brake	
63S 2 63S 4	230 V / 400 V CMP63S	
63S 2b 63S 4b	230 V / 400 V CMP63S with brake	
63M 2 63M 4	230 V / 400 V CMP63M	
63M 2b 63M 4b	230 V / 400 V CMP63M with brake	
63L 2 63L 4	230 V / 400 V CMP63L	
63L 2b 63L 4b	230 V / 400 V CMP63L with brake	
71S 2 71S 4	230 V / 400 V CMP71S	
71S 2b 71S 4b	230 V / 400 V CMP71S with brake	
71M 2 71M 4	230 V / 400 V CMP71M	
71M 2b 71M 4b	230 V / 400 V CMP71M with brake	
71L 2 71L 4	230 V / 400 V CMP71L	
71L 2b 71L 4b	230 V / 400 V CMP71L with brake	

31554814/EN – 10/2023

Display value	Motor type	Explanation
gF-2	MGF..2-DSM-B	If a MGF..-DSM is selected, the torque limit in *P4-07* is automatically set to 200%. This value has to be adapted in accordance with the gear unit ratio according to the documentation "Addendum to the Operating Instructions, Drive Unit MGF..-DSM on LTP-B Inverter". All necessary motor data are set automatically.
gF-4	MGF..4-DSM-B	
gF-4Ht	MGF..4-DSM-B/XT	
gF-1c	MGF..1-DSM-C	
gF-2c	MGF..2-DSM-C	
gF-4c	MGF..4-DSM-C	
gF4cHt	MGF..4-DSM-C/XT	

P1-17 Servo module function selection (for LTX only)

Setting range: 0 − **1** – 8

Determines the function of the servo module I/O. See chapter "*P1-17* Servomodule function selection" in the addendum to the MOVITRAC® LTX operating instructions.

Only use in connection with the LTX encoder card.

31554814/EN – 10/2023

P1-18 Motor thermistor selection (for LTX only)

- **0: Deactivated**
- 1: KTY

If a motor is selected via *P1-16*, this parameter will be activated.

Only use in connection with the LTX encoder card.

P1-19 Inverter address

Setting range: 0 − **1** – 63

Mirror parameter of *P5-01*. Changing *P1-19* will have an immediate effect on *P5-01*.

Only use in connection with the LTX encoder card.

P1-20 SBus baud rate

Setting range: 125, 250, **500**, 1000 kBd

Mirror parameter of *P5-02*. Changing *P1-20* will have an immediate effect on *P5-02*.

Only use in connection with the LTX encoder card.

P1-21 Stiffness (for LTX only)

Setting range: 0.50 – **1.00** – 2.00

Always use *P7-10* in the open control loop.

Only use in connection with the LTX encoder card.

P1-22 Inertia ratio between motor and load (for LTX only)

Setting range: 0.0 – **1.0** – 30.0

The inertia ratio between motor and connected load can be specified in this parameter. This value can usually remain set to the default value "1.0". However, the inertia ratio is used by the control algorithm as precontrol value for CMP../synchronous motors from *P1-16* to provide the optimal torque/current for accelerating the load. This is why the exact setting of the inertia ratio improves the response characteristics and the dynamics of the system. For a closed control loop, the value is calculated as follows:

$$P1-22 = \frac{J_{ext}}{J_{mot}}$$

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If you do not know the value, keep the default setting "1.0".

Only use in connection with the LTX encoder card.

31554814/EN – 10/2023

11.2.3 Parameter group 2: Extended parameter setting (level 2)

P2-01 – P2-08

If parameter *P1-10* is set to "0", the following parameters *P2-01* to *P2-08* can each be changed in steps of 0.1 Hz.

If parameter *P1-10 ≠ 0*, the following parameters *P2-01* to *P2-08* can be changed in the following steps:

- *P1-09* ≤ 100 Hz → in 1 (min^{-1})
- 100 Hz < *P1-09* ≤ 200 Hz → in 2 (min^{-1})
- *P1-09* > 200 Hz → in 4 (min^{-1}).

Negative speeds or frequencies can also be set.

P2-01 Fixed setpoint speed 1

Setting range: -*P1-01* – **5.0 Hz** – *P1-01*

Is also used as jog speed.

P2-02 Fixed setpoint speed 2

Setting range: -*P1-01* – **10.0 Hz** – *P1-01*

P2-03 Fixed setpoint speed 3

Setting range: -*P1-01* – **25.0 Hz** – *P1-01*

P2-04 Fixed setpoint speed 4

Setting range: -*P1-01* – **50.0 Hz** – *P1-01*

P2-05 Fixed setpoint speed 5

Setting range: -*P1-01* – **0.0 Hz** – *P1-01*

Is also used as reference travel speed.

P2-06 Fixed setpoint speed 6

Setting range: -*P1-01* – **0.0 Hz** – *P1-01*

Is also used as reference travel speed.

P2-07 Fixed setpoint speed 7

Setting range: -*P1-01* – 0.0 Hz – *P1-01*

Also used for brake release speed in hoist mode.

P2-08 Fixed setpoint speed 8

Setting range: -*P1-01* – 0.0 Hz – *P1-01*

Also used for brake application speed in hoist mode.

P2-09/P2-10 Skip frequency/skip frequency band

Setting range *P2-09*: **P1-02** – *P1-01*

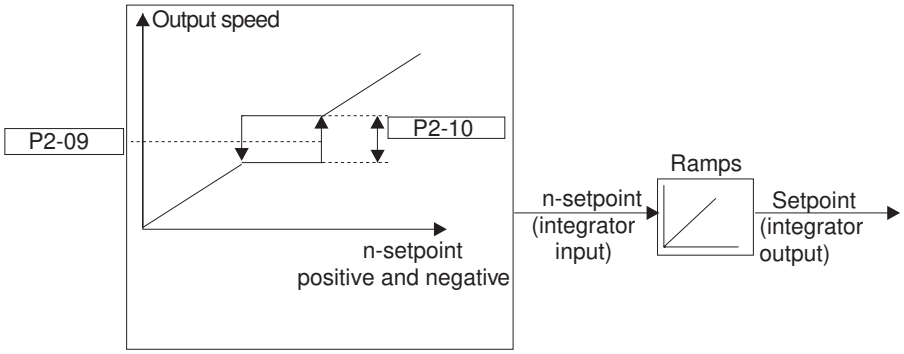
Setting range *P2-10*: **0.0 Hz** – *P1-01*

31554814/EN – 10/2023

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 input speed performs the hysteresis depicted in the figure with the ramps specified in *P1-03* and *P1-04*.

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.



P2-11/P2-13 Analog outputs

Digital output mode: 0 V / 24 V

Setting	Function	Explanation
0	Inverter enabled (digital)	Logic 1 if the inverter is enabled.
1	/Failure. Inverter ready (digital)	Logic 1 when the inverter is ready. (No error)
2	Motor at setpoint speed (digital)	Logic 1 if output frequency = setpoint frequency (hysteresis *P6-04*).
3	Motor speed > 0 (digital)	Logic 1 if output frequency > speed 0 min^{-1} (hysteresis *P6-04*).
4	Motor speed ≥ limit value (digital)	Logic 1 if the level is greater than or equal to the value set in parameter "Upper user relay limit/analog output". Logic 0 if the level is below the value set in parameter "Lower user relay limit/analog output".
5	Motor current ≥ limit value (digital)	
6	Motor torque ≥ limit value (digital)	
7	Analog input 2 ≥ limit value (digital)	
13	Fieldbus/SBus (digital)	Control of the digital output via fieldbus/SBus. Logic 1 if 0x0001 via fieldbus. Logic 0 with all other values.

Analog output mode: 0 to 10 V or 0 / 4 to 20 mA

Setting	Function	Explanation
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 *P1-01*.
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 *P1-08*.
10	Motor torque (analog)	
11	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.
12	Fieldbus/SBus (analog)	Control of the analog output via fieldbus/SBus. 0x1000 = 100% of the format setting.

P2-11 Analog output 1 function selection

Setting range: 0 – **8** – 13

See table "P2-11/P2-13 Analog outputs" (→ 🗎 158).

P2-12 Analog output 1 format

- **0: 0 – 10 V**
- 1: 10 – 0 V
- 2: 0 – 20 mA

31554814/EN – 10/2023

- 3: 20 – 0 mA
- 4: 4 – 20 mA
- 5: 20 – 4 mA

P2-13 Analog output 2 function selection

Setting range: 0 – **9** – 13

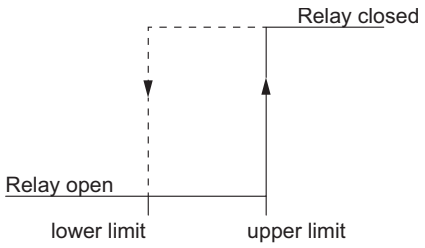
See table "P2-11/P2-13 Analog outputs" (→ 🗎 158).

P2-14 Analog output 2 format

- **0: 0 – 10 V**
- 1: 10 – 0 V
- 2: 0 – 20 mA
- 3: 20 – 0 mA
- 4: 4 – 20 mA
- 5: 20 – 4 mA

P2-15/P2-18 Relay outputs

The function of the relay outputs can be selected according to the table below. If a relay is controlled depending on a limit value, it reacts as follows:



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Settings	Function	Explanation
0	Inverter enabled	Relay contact closed when the inverter is enabled.
1	/Failure. Inverter ready	Relay contact closed when inverter is operable (no error).
2	Motor at setpoint speed	Relay contact closed if output frequency = setpoint frequency (hysteresis *P6-04*).
3	Motor speed ≥ 0	Relay contact closed if output frequency > speed 0 min^{-1} (hysteresis *P6-04*).
4	Motor speed ≥ limit value	Relay contact closed if the level is greater than or equal to the value set in parameter "Upper user relay limit/analog output". Relay contact open if the level is below the value set in parameter "Lower user relay limit/analog output".
5	Motor current ≥ limit value	
6	Motor torque ≥ limit value	
7	Analog input 2 ≥ limit value	
8	Hoist (for *P2-18* only)	This setting is made automatically if the hoist function is activated via *P4-12*. The inverter controls the relay according to the hoist function.
9	STO status	Relay contacts closed if STO circuit is supplied with 24 V. Relay contacts open if STO circuit is open (inverter indicates "inhibit").
10	PID error ≥ limit value	Relay contact closed when the control error is greater than or equal to the value set in parameter "User relay upper limit". Relay contact open when the control error is less than the value set in parameter "User relay lower limit". The relay opens also with negative control errors.

31554814/EN – 10/2023

Settings	Function	Explanation
11[1)]	Drive referenced	Relay contacts closed when the inverter is referenced. This option is available only with LTX servo module and only for the following inverters: • 230 V: 0.75 to 5.5 kW • 400 V: 0.75 to 11 kW

1) Only in connection with LTX.

P2-15 User relay output 1 function selection

Setting range: 0 – **1** – 11

See table "P2-15/P2-18 Relay outputs" (→ 🗎 159).

P2-16 Upper user relay limit 1/analog output 1

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

P2-17 Lower user relay limit 1/analog output 1

Setting range: **0.0** – P2-16%

P2-18 User relay output 2 function selection

Setting range: 0 – **3** – 11

See table "P2-15/P2-18 Relay outputs" (→ 🗎 159).

P2-19 Upper user relay limit 2/analog output 2

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

P2-20 Lower user relay limit 2/analog output 2

Setting range: **0.0** – P2-19%

P2-21/P2-22 Display scaling

A user-defined display value can be scaled and shown on the display with the following two parameters *P2-21/P2-22*.

This value is marked by a small "c" in the display and can be called up by briefly pressing the "Navigate" key.

Scaled display value = *P2-21* × *P2-22*

31554814/EN – 10/2023

P2-21 Display scaling factor

Setting range: -30.000 – **0.000** – 30.000

In inverter mode, the setting serves as the scaling factor.

In operation with an SEW-EURODRIVE controller CCU/PLC, the setting serves to reverse the direction of rotation. If the value is negative, the velocity control is inverted. A restart of the controller is necessary after changing the value.

P2-22 Display scaling source

- 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.

P2-23 Zero speed holding time

Setting range: 0.0 – **0.2** – 60.0 s

As soon as the inverter is locked, the output frequency is decreased along the ramp to speed 0 and remains there for the time defined here before the output stage is switched off.

If *P2-23* = 0, the output stage of the inverter is switched off immediately once speed 0 is reached.

P2-24 PWM switching frequency

Setting range: 2 to 16 kHz (power-dependent)

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 when the heat sink temperature is excessively high. This automatic protection function can be deactivated with *P6-02*.

P2-25 Second deceleration ramp, rapid stop ramp

Setting range:

Sizes 2 + 3: Coast – 0.01 – **2.0** – 600 s

Sizes 4 – 7: Coast – 0.1 – **2.0** – 6000 s

Is selected automatically in the event of a power failure if *P2-38* = 2.

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

P2-26 Flying start enable

When the flying start function is enabled, the 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. The flying start function is possible only in the operating modes U/f and VFC.

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

31554814/EN – 10/2023

P2-27 Standby mode

Setting range: **0.0** to 250 s

When *P2-27* > 0, the inverter goes to standby mode if the minimum speed is maintained beyond the time specified in *P2-27*. This function is deactivated when *P2-23* > 0 or *P4 – 12* = 1.

P2-28 Slave speed scaling

- **0: Deactivated**
- 1: Slave setpoint speed = master actual speed × *P2-29*
- 2: Slave setpoint speed = master actual speed × *P2-29* + analog input 1 reference
- 3: Slave setpoint speed = master actual speed × *P2-29* × analog input 1 reference

P2-29 Slave speed scaling factor

Setting range: -500 – **100** – 500%

P2-30 Analog input 1 format

- **0: 0 – 10 V / unipolar voltage range**
- 1: 10 – 0 V / unipolar voltage range
- 2: -10 – 10 V / bipolar voltage input
- 3: 0 – 20 mA / current input
- 4: t4 – 20 mA / current input
- 5: r4 – 20 mA / current input
- 6: t20 – 4 mA / current input
- 7: 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

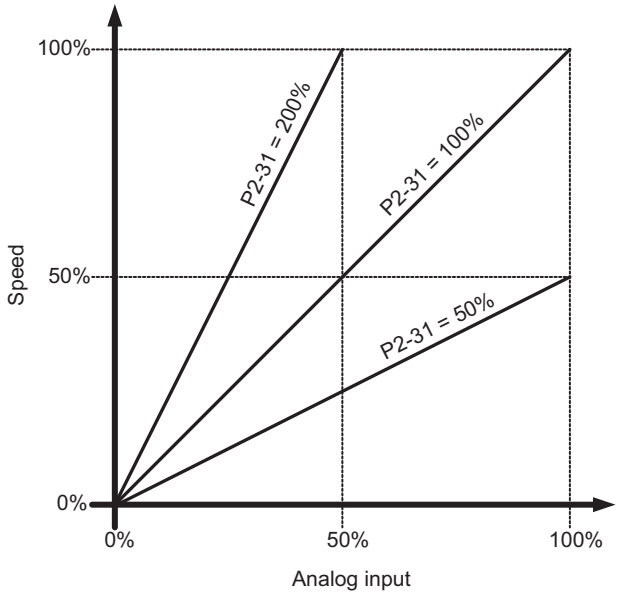
"r.." indicates that the inverter moves along a ramp to *P2-08* when the signal is removed while the inverter is enabled. r4 – 20 mA, r20-4 mA

31554814/EN – 10/2023

P2-31 Analog input 1 scaling

Setting range: 0 – **100** – 500%

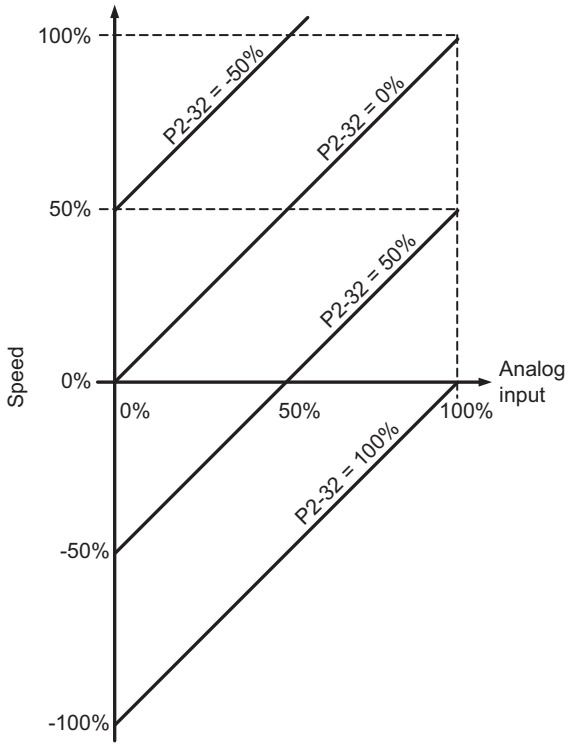
Additional scaling and offset examples can be found in chapter "Examples of analog input scaling and offset setting" (→ 🗎 132)



P2-32 Analog input 1 offset

Setting range: -500 – **0** – 500%

Additional scaling and offset examples can be found in chapter "Examples of analog input scaling and offset setting" (→ 🗎 132)



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P2-33 Analog input 2 format/motor protection

- **0: 0 – 10 V**/unipolar voltage input
- 1: 10 – 0 V/unipolar voltage input
- 2: PTC-th/motor thermistor input TF/TH (trigger threshold 2.5 kΩ)
- 3: 0 – 20 mA/current input
- 4: t4 – 20 mA/current input
- 5: r4 – 20 mA/current input
- 6: t20 – 4 mA/current input
- 7: r20 – 4 mA/current input
- 8: ty-b/KTY84 motor temperature sensor (120 °C trigger, 100 °C reset)
- 9: ty-F/KTY84 motor temperature sensor (155 °C trigger, 125 °C reset)
- 10: ty-H/KTY84 motor temperature sensor (180 °C trigger, 160 °C reset)
- 11: Pt-b/PT1000 motor temperature sensor (120 °C trigger, 100 °C reset)
- 12: Pt-F/PT1000 motor temperature sensor (155 °C trigger, 125 °C reset)
- 13: Pt-H/PT1000 motor temperature sensor (180 °C trigger, 160 °C reset)

"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 *P2-08* when the signal is removed while the inverter is enabled. r4 – 20 mA, r20-4 mA

P2-34 Analog input 2 scaling

Setting range: 0 – **100** – 500%

Additional scaling and offset examples can be found in chapter "Examples of analog input scaling and offset setting" (→ 🗎 132)

P2-35 Analog input 2 offset

Setting range: -500 – **0** – 500%

Additional scaling and offset examples can be found in chapter "Examples of analog input scaling and offset setting" (→ 🗎 132)

P2-36 Start mode selection

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

This function can only be used to a limited extent during fieldbus operation (P1-12=5,6,7). Also refer to the description of the fieldbus mode under parameter *P2-37*.

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

Edge-r

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

Auto-0

31554814/EN – 10/2023

⚠ WARNING

With the "Auto-0" setting and the enable signal set, there is a risk of the drive restarting automatically after a fault message is acknowledged (reset) or after switching 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 rectification is not permitted for safety reasons.
- Note that, in the event of a reset, the drive can start up again automatically depending on the setting.
- Prevent the drive from starting up inadvertently, for example by activating STO.

- **Auto-0**: After activation or resetting, the inverter starts automatically if an enable signal is present at the relevant digital input.

Auto-1 – 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 supply system 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.

- Auto-1 – Auto-5: Following an error shutdown (trip), the inverter makes up to 5 attempts to restart at intervals of 20 seconds. The duration of the intervals is defined in *P6-03*. To reset the counter, the inverter must be de-energized. The number of attempted restarts is counted. If the 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.

31554814/EN – 10/2023

P2-37 Enable behavior/changeover behavior

Keypad mode (P1-12 = 1, 2):

Defines the inverter switching and enable behavior when controlled via the integrated keypad (*P1-12* = 1 or 2).

The selection depends on the setting in *P1-15*.

Setting range: 0 – **1** – 7

Changeover behavior when the setpoint source switches to keypad mode:	
0	The motor speed changes to the minimum speed from *P1-02*.
1	The motor speed changes to the last keypad speed set.
2	The current motor speed is applied during changeover.
3	The motor speed changes to the fixed setpoint speed from *P2-08*.
4[1)]	The motor speed changes to the minimum speed from *P1-02*.
5[1)]	The motor speed changes to the last keypad speed set.
6[1)]	The current motor speed is applied during changeover.
7[1)]	The motor speed changes to the fixed setpoint speed from *P2-08*.

Changeover behavior when the inverter is enabled in keypad mode:	
0	The motor starts at the minimum speed from *P1-02*.
1	The motor starts at the last keypad speed set.
2	The motor starts at the minimum speed from *P1-02*.
3	The motor starts at the fixed setpoint speed from *P2-08*.
4[1)]	The motor starts at the minimum speed from *P1-02*.
5[1)]	The motor starts at the last keypad speed set.
6[1)]	The motor starts at the minimum speed from *P1-02*.
7[1)]	The motor starts at the fixed setpoint speed from *P2-08*.

1) With the setting 4 to 7, the inverter is started with the corresponding enable digital input. The <Start> and <Stop> keys on the keypad have no function. You can modify the speed with the <Up> and <Down> keys.

Fieldbus mode (P1-12 = 5, 6, 7):

Applies both when changing over the setpoint source and also when enabling the inverter. With the setting 0 to 3, the inverter is started with the fieldbus enable and an additional hardware enable. The setpoint speed is transferred from the fieldbus.

With the setting 4 to 7, the inverter is started only with the hardware enable (the fieldbus enable is not required). The setpoint speed is transferred from the fieldbus.

P2-38 Mains loss stop control

The control behavior of the inverter as response to a power failure while the inverter is enabled.

- **0**: The inverter attempts to continue operation by recovering energy from the motor under load. If the power failure lasts only briefly and if sufficient energy can be recovered before control electronics shuts down, the inverter will restart as soon as the power supply is resumed.

31554814/EN – 10/2023

- 1: The inverter immediately disables the output to the motor resulting in the load coasting to a stop or freewheeling. If you use this setting for loads with a high inertia, it might be necessary to activate the flying start function (*P2-26*).
- 2: The inverter stops along the rapid stop ramp set in *P2-25*.
- 3: DC bus supply, if the inverter is supplied directly via the DC+ and DC-terminal, the power failure detection can be deactivated with this function.

P2-39 Parameter lock

No parameters can be changed when the lock is activated. The 7-segment display shows an "L", the full text display shows the picture of a padlock.

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

P2-40 Extended parameter access code definition

Setting range: 0 – **101** – 9999

The set value determines the code for the parameter access (parameter groups 0 to 5) in *P1-14*.

11.2.4 Parameter group 3: PID controller (level 2)

P3-01 PID proportional gain

Setting range: 0.0 – **1.0** – 30.0

PID 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.

P3-02 PID integral time constant

Setting range: 0.0 – **1.0** – 30.0 sec.

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

P3-03 PID differential time constant

Setting range: **0.00** – 1.00 sec.

P3-04 PID operating mode

When selecting direct operation, the motor speed decreases when the feedback signal increases. When selecting inverse operation, the motor speed increases when the feedback signal increases.

- 0: Direct operation continuous (PID control active even when inverter is inhibited)
- 1: Inverse operation continuous (PID control active even when inverter is inhibited)
- 2: Direct operation (PID output is cleared when inverter is inhibited)
- 3: Inverse operation (PID output is cleared when inverter is inhibited)

31554814/EN – 10/2023

P3-05 PID reference selection

Selects the source for the PID reference/setpoint.

- **0**: **Fixed setpoint reference P3-06** (up to 4 fixed setpoint references are possible, depending on the PID controller setting: *P3-06*, *P3-14* – *P3-16*)
- 1: Analog input 1
- 2: Analog input 2
- 3: Fieldbus PID reference see "P5-09 – P5-11 Fieldbus process output data (PAx) definition" (→ 🗎 177).

P3-06 PID fixed setpoint reference 1

Setting range: **0.0** – 100.0%

Sets the preset digital PID reference/setpoint.

P3-07 PID controller upper limit

Setting range: P3-08 – **100.0%**

This parameter specifies the maximum output value of the PID controller. The upper limit is calculated as follows:

Upper limit = *P3-07* × *P1-01*

A value of 100% corresponds to the maximum speed limit defined in *P1-01*.

P3-08 PID controller lower limit

Setting range: **0.0%** − *P3-07*

This parameter specifies the minimum output value of the PID controller. The lower limit is calculated as follows:

Lower limit = *P3-08* × *P1-01*.

A value of 0.0% corresponds to the maximum speed limit defined in *P1-02*.

P3-09 PID correcting variable limitation

- **0: Fixed setpoint limit**/PID output range limited by *P3-07* and *P3-08*.
- 1: Analog input 1 variable upper limit/PID maximum output limited by the signal present at analog input 1.
- 2: Analog input 1 variable lower limit/PID minimum output limited by the signal present at analog input 1.
- 3: PID output + analog input 1/PID output is added to the speed reference present at analog input 1.

P3-10 PID feedback selection

Selects the source for the PID feedback signal.

- **0: Analog input 2**
- 1: Analog input 1
- 2: Motor current (*P1-08* corresponds to 100%)
- 3: DC link voltage $U_{DC\ link}$ (1000 V = 100%)
- 4: Difference (AI1 – AI2)
- 5: Maximum value (AI1 or AI2)

31554814/EN – 10/2023

P3-11 PID control difference threshold for ramp activation

Setting range: **0.0** – 25.0%

With a control difference larger than *P3-11*, the ramp times set in *P1-03/04* are ignored in order to compensate the control difference with the greatest possible acceleration/deceleration.

P3-12 PID actual value display scaling factor

Setting range: **0.000** – 50.000

A user-defined display value can be scaled and shown on the display with this parameter.

This value is marked by a small "r" in the display and can be called up by briefly pressing the <Navigate> key.

Scaled display value = *P3-13* × PID feedback value (= actual value)

P3-13 PID feedback wake-up level

Setting range: **0.0** – 100.0%

With a control difference less than *P3-13*, the system quits standby mode.

P3-14 PID fixed setpoint reference 2

Setting range: **0.0** – 100%

Sets the preset digital PID reference/setpoint.

P3-15 PID fixed setpoint reference 3

Setting range: **0.0** – 100%

Sets the preset digital PID reference/setpoint.

P3-16 PID fixed setpoint reference 4

Setting range: **0.0** – 100%

Sets the preset digital PID reference/setpoint.

11.2.5 Parameter group 4: Motor control (level 2)

P4-01 Operating mode/motor controller

- 0: VFC speed 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 effectively provides a simple closed-loop control system without a physical encoder. For optimal control, "auto-tune" (*P4-02*) should be carried out prior to first operation.

- 1: VFC torque control

  Instead of the motor speed, the motor torque is controlled directly. In this operating mode, the speed is not specified but changes depending on the load. The maximum speed is limited by *P1-01*. This operating mode is often used for winding applications where a constant torque is required to maintain cable tension. For optimal control, "auto-tune" (*P4-02*) should be carried out prior to first operation.

31554814/EN – 10/2023

- **2: U/f open-loop speed control**

  With the operating mode U/f control, 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 with regard to motor control mode, torque stability and speed range, the VFC control mode should be used.

  – Slip compensation

    If *P1-10* ≠ 0 is set, the calculated slip speed is added to the output frequency.

    If *P1-10* = 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.

- 3: Synchronous motor speed control (PMVC)

  Speed control for synchronous motors. The same properties apply as for VFC speed control.

- 4: Synchronous motor torque control

  Torque control for synchronous motors. The same properties apply as for VFC torque control.

- 5: Synchronous motor position control

  Position control for synchronous motors. Speed and torque setpoints are provided via process data in Motion Protocol (*P1-12 = 8*). An encoder is required for this purpose.

- 6: LSPM speed control

  LSPM control is designed for asynchronous motors with synchronous characteristics such as motors of type DR..J with LSPM technology from SEW-EURODRIVE.

- 7: Synchronous magnetic reluctance motor speed control (SYN-R)

  Speed control for synchronous reluctance motors.

- 8: Brushless DC motor speed control (BLDC)

  Speed control for brushless DC motors

INFORMATION

"Auto-tune" must be performed after each operating mode/motor control change.

If the "auto-tune" is not performed, motor control becomes poor due to the equivalent wiring diagram data not being measured.

P4-02 "Auto tune"

- **0: Locked**
- 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.

After a reset to the factory setting, the measuring procedure starts automatically after the first enable and takes up to 2 minutes depending on the control type.

INFORMATION

After changing the nominal motor data, auto tune has to be started again. The inverter must not be in "inhibit" mode.

31554814/EN – 10/2023

P4-03 Speed controller proportional gain

Setting range: 0.1 – **50** – 400%

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.

INFORMATION

Controller optimization should always initially take place via parameter *P7-10*. This parameter affects parameters *P4-03/P4-04* internally.

P4-04 Speed controller integral time constant

Setting range: 0.010 – **0.100** – 1.000 sec.

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.

INFORMATION

Controller optimization should always initially take place via parameter *P7-10*. This parameter affects parameters *P4-03/P4-04* internally.

P4-05 Motor power factor (cos phi)

Setting range: 0.00, 0.50 – 0.99

Power factor on the motor nameplate

P4-06 Torque reference/limit value source

Function of the parameter, depending on operating mode/motor control

Operating mode/motor controller	Torque limit value (% of rated motor torque)	Torque reference (% of rated motor torque)	Current limit (% of rated motor current)
P4-01 = 0, 3, 6, 7, 8	X	–	–
P4-01 = 1, 4	–	X	–
P4-01 = 2	–	–	X

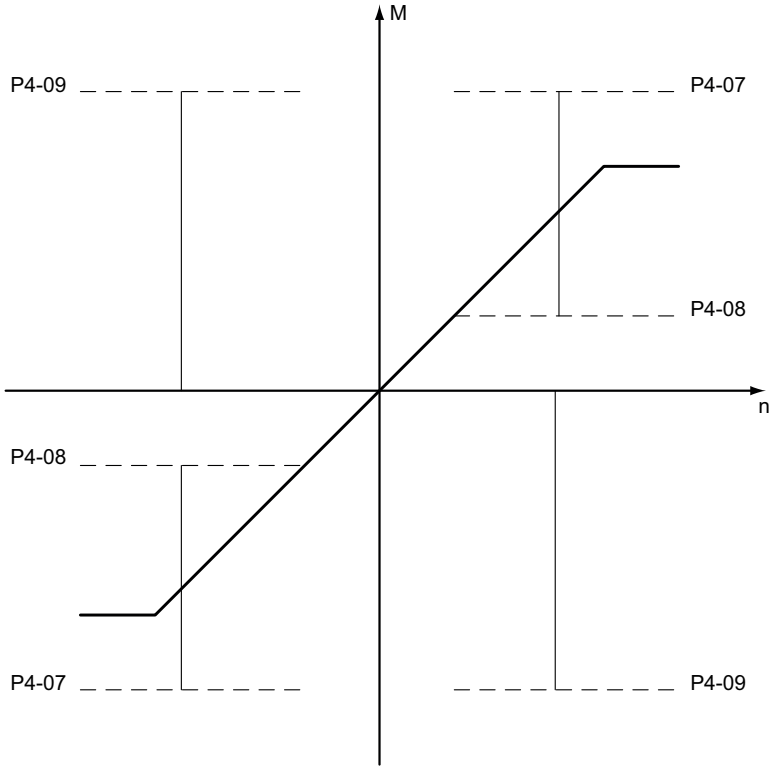
- **0: P4-07 defines the torque reference/limit**.
- 1: Analog input 1 determines the torque reference/limit. (0 – 100% of *P4-07*)
- 2: Analog input 2 determines the torque reference/limit. (0 – 100% of *P4-07*)
- 3: Fieldbus process data word determines the torque reference/limit (0 – 100% of *P4-07*)

31554814/EN – 10/2023

- 4: Master/slave (make setting in slave):
  The slave inverter takes over the torque reference/limit from the master inverter.
- 5: PID output determines the torque reference/limit (0 – 100% of *P4-07*)

P4-07 to P4-09 settings for motor torque limits

These parameters are used to adjust the torque limits of the motor.



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P4-07 Max. motor torque limit

Setting range: *P4-08* – **200** – 500%

This parameter is used to set the upper torque limit. The limit value source is specified with parameter *P4-06*.

Example 1: Asynchronous motors in U/f control

In U/f control, the apparent output current is limited as a percentage, depending on *P1-08*.

Example 2: Asynchronous motors in VFC control

Setting and verifying the torque limit (*P4-07*) for asynchronous motors:

Data of the asynchronous motor:

P_n = 1.1 kW, I_n = I_s = 2.4 A, n_n = 1420 min^{-1}, cos φ = 0.79

$$M_n = \frac{1.1\,kW \times 9550}{1420\ \text{min}^{-1}} = 7.4\ Nm$$

The torque is limited to M_{max} = 8.1 Nm.

$$P407 = \frac{M_{max}}{M_n} \times 100\ \% = 109.45\ \%$$

31554814/EN – 10/2023

For verification of the torque-generating inverter current in *P0-15*:

$I_q = \cos(\varphi) \times I_s = \cos(0.79) \times 2.4\ A = 1.89\ A$

For a calculated torque limit of 109.45%, *P0-15* should display the following

$$P0\text{-}15 = \frac{M_{max}}{M_n} \times I_q = 2.06\ A$$

Example 3: Synchronous motors in PMVC control

Setting and verifying the torque limit (*P4-07*) for synchronous motors:

The torque is limited to M_{max} = 1.6 Nm.

Data of the synchronous motor: I_0 = 1.5 A, M_0 = 0.8 Nm

$$P407 = \frac{M_{max}}{M_0} \times 100\ \% = 200\ \%$$

For verification of the torque-generating inverter current in *P0-15*:

I_d = 0, standard for synchronous motors with vector control, this results in $I_q \approx M$.

For a calculated torque limit of 200%, *P0-15* should display the following:

P0-15 = I_0 × 200% = 3 A

P4-08 Min. torque limit

Setting range: **0.0** – P4-07 %

Sets the minimum torque limit. As long as the motor speed is below the maximum speed defined in *P1-01*, the inverter attempts to maintain this torque at any time during operation on the motor.

If this parameter is set >0 and the maximum speed of the inverter is additionally increased to a value that is not reached during the travel cycle, the inverter is always in motor mode. Depending on the application, a braking resistor is thus not necessary.

INFORMATION

Use this parameter with the utmost care because the output frequency of the inverter will increase (to reach the torque) and the selected setpoint speed might be exceeded.

P4-09 Max. regenerative torque limit

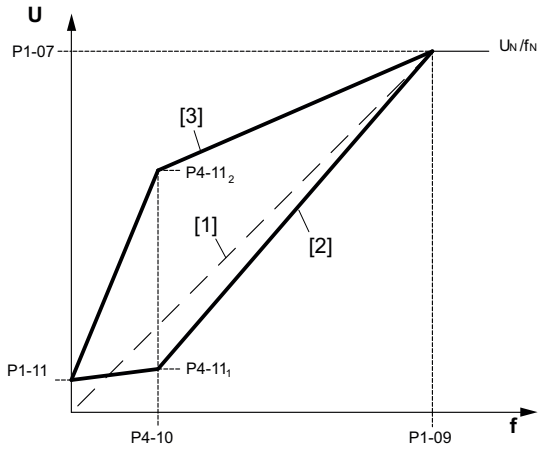
Setting range: *P4-08* – **200** – 500%

Defines the current limit in regenerative mode. The value of this parameter represents the percentage value of the rated motor current defined in *P1-08*. The current limit specified in this parameter overrides the normal torque-generating current limit when the motor operates in regenerative mode. If the value is too high, the result is an excessive motor current distortion causing the motor to behave unstable in regenerative mode. If the value is too small, the output torque of the motor might drop in regenerative mode.

P4-10/P4-11 U/f characteristic settings

The voltage/frequency characteristic curve determines the voltage level applied to the motor at the respective specified frequency. You can change the U/f characteristic as needed using parameters *P4-10* and *P4-11*.

You can set parameter *P4-10* to any frequency between 0 and the base frequency (*P1-09*). It represents the frequency at which the percentage adjustment level set in *P4-11* is used. This function is only active when *P4-01* = 2.



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[1] Normal U/f characteristic
[2] Adjusted U/f characteristic (example 1)
[3] Adjusted U/f characteristic (example 2)
P1-07 = Rated motor voltage
P1-09 = Rated motor frequency
P1-11 = Boost (x% of *P1-07*)
P4-10 = Frequency value of the U/f characteristic curve adjustment
P4-11 = Voltage value of the U/f characteristic curve adjustment

P4-10 U/f characteristic adjustment frequency

Setting range: **0.0** – 100.0% of *P1-09*

P4-11 U/f characteristic adjustment voltage

Setting range: **0.0** – 100.0% of *P1-07*

P4-12 Motor brake control

Enables the hoist function of the inverter.

Parameters *P4-13* through *P4-16* are enabled.

Relay contact 2 is set to hoist. The function cannot be changed.

- **0: Disabled**
- 1: Activated

For examples, refer to chapter "Hoist function" (→ 🗎 127).

31554814/EN – 10/2023

P4-13 Brake release time

Setting range: 0.0 – 5.0 s

This parameter is used to set the time required for the mechanical brake to release. This parameter prevents a sagging of the drive especially in hoists.

P4-14 Brake application time

Setting range: 0.0 – 5.0 s

This parameter is used to set the time required for the mechanical brake to apply. This parameter prevents a sagging of the drive in particular in hoists.

P4-15 Torque threshold for brake release

Setting range: 0.0 – 200%

Defines the torque in % of the maximum torque. This percentage torque must be generated before the motor brake is released.

This is to ensure that the motor is connected and torque is generated to prevent the load from dropping when the brake is released. For U/f control, the torque proof is not activated.

P4-16 Hoist torque threshold timeout

Setting range: 0.0 – 25.0 sec.

This parameter is used to set the time the inverter takes after a start command to attempt to generate enough motor torque to exceed the brake release threshold set in *P4-15*. If the torque threshold is not reached within this time, the inverter signals an error (U-Torq).

P4-17 Thermal motor protection to UL508C

- 0: Disabled
- 1: Activated

The inverters come equipped with a thermal motor protection function according to NEC to protect the motor from overload. In an internal memory, the motor current is accumulated over 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 *P4-17* is disabled, the thermal overload memory is reset when switching power off and on again.

When *P4-17* is enabled, the memory is maintained even after power off and on again.

For inverters that are operated with a line frequency of 50 Hz, the factory setting is 0 = disabled.

For inverters that are operated with a line frequency of 60 Hz, the factory setting is 1 = enabled.

P4-18 Overload management

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

31554814/EN – 10/2023

When the function is activated, the I*t error (I.t-trp) is prevented by limiting the motor overload to 100%.

The limit kicks in as soon as the I.t_Trip counter (*P0-66*) reaches a value of 90%.

If the value in *P0-66* drops below 10%, the full overload is available again until *P0-66* reaches 90% again (hysteresis).

This function enables freeing or warming up without error in the event of sticking loads or cold gear unit oil.

P4-19 Master-slave torque reference/load distribution

For the use of this parameter, see chapter "Master-slave mode (P1-12 = 4)" (→ 🗎 124).

- **0: Slave setpoint speed = master actual speed**
  Slave torque limit = master torque limit
- 1: Slave setpoint torque = master actual torque
  Slave speed limit = master setpoint speed

11.2.6 Parameter group 5: Fieldbus communication (level 2)

P5-01 Inverter address

Setting range: 0 − **1** – 63

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

P5-02 SBus/CANopen baud rate

- 0: 125: 125 kBd
- 1: 250: 250 kBd
- **2: 500: 500 kBd**
- 3: 1000: 1000 kBd

P5-03 Modbus RTU baud rate

- 0: 9.6: 9600 Bd
- 1: 19.2: 19200 Bd
- 2: 38.4: 38400 Bd
- 3: 57.6: 57600 Bd
- **4: 115.2: 115200 Bd**

P5-04 Modbus RTU data format

- **0: n-1: no parity, 1 stop bit**
- 1: n-2: no parity, 2 stop bits
- 2: O-1: odd parity, 1 stop bit
- 3: E-1: even parity, 1 stop bit

P5-05 Response to communication failure/timeout

- 0: Error and coast to a stop

31554814/EN – 10/2023

- 1: Stop ramp and error
- **2: Stop ramp (without fault)**
- 3: Fixed setpoint speed 8

P5-06 Communication failure timeout for SBus and Modbus

Setting range: 0.0 – **1.0** – 5.0 s

Specifies the time in seconds after which the inverter performs the response set in *P5-05*. When set to "0.0 s", the inverter maintains the actual speed even if communication fails.

P5-07 Ramp specified via fieldbus

With the setting "activated", the inverter takes over the external ramp times via fieldbus.

The process data word for the fieldbus ramp must be defined via parameter *P5-09* – *P5-11*.

With the setting "deactivated", the inverter takes over the internal ramps from *P1-03* and *P1-04*.

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

P5-08 Synchronization duration

Setting range: **0**, 5 – 20 ms

Defines the duration of the sync message from MOVI-PLC®. This value must correspond to the one set in MOVI-PLC®. When *P5-08* = 0, the inverter ignores synchronization.

P5-09 – P5-11 Fieldbus process output data (POx) definition

Definition of the process data words to be sent from the PLC or the gateway to the inverter.

- 0: Speed min^{-1} (1 = 0.2 min^{-1}) → only possible if *P1-10* ≠ 0.
- 1: Speed % (0x4000 = 100% in relation to the maximum speed *P1-01*)
- 2: Torque setpoint/limit value % (1 = 0.1%[1)]) → *P4-06* = 3
- 3: Ramp time (1 = 1 ms) to max. 65535 ms. Set → *P5-07* = 1.
- 4: PID reference (0x1000 = 100%) → *P1-12* = 3 (control signal source)
- 5: Analog output 1 (0x1000 = 100%)[2)]

  Digital output 1 (0x0001 = 24 V, other values = 0 V)[3)]
- 6: Analog output 2 (0x1000 = 100%)[2)]

  Digital output 2 (0x0001 = 24 V, other values = 0 V)[3)]
- 7: No function

1) The percentage reference comes from the table for P4-06.
2) If the analog outputs are controlled by fieldbus or SBus, parameter P2-11 or P2-13 = 12 (fieldbus/SBus (analog)) must be set additionally.
3) If the digital outputs are controlled by fieldbus or SBus, parameter P2-11 or P2-13 = 13 (fieldbus/SBus (digital)) must be set additionally.

31554814/EN – 10/2023

P5-09 Fieldbus PO2 definition

Definition of output 2, 3, 4 for transmitted process data

Parameter description like *P5-09 – P5-11*

P5-10 Fieldbus PO3 definition

Definition of output 2, 3, 4 for transmitted process data

Parameter description like *P5-09 – P5-11*

P5-11 Fieldbus PO4 definition

Definition of output 2, 3, 4 for transmitted process data

Parameter description like *P5-09 – P5-11*

P5-12 – P5-14 Fieldbus process input data (PIx) definition

Definition of the process data words sent from the inverter to the PLC or to the gateway.

- 0: Speed min^{-1} (1 = 0.2 min^{-1}) → only possible if *P1-10* ≠ 0.
- 1: Speed % (0x4000 = 100% in relation to the maximum speed *P1-01*)
- 2: Current % (1 = 0.1% in relation to the nominal inverter current)
- 3: Torque % (1 = 0.1% in relation to the nominal motor torque, calculated from *P1-08*)
- 4: Power % (1 = 0.1% in relation to the rated inverter power)
- 5: Power electronics temperature (1 = 0.01 °C)
- 6: DC link voltage (1 = 1 V)
- 7: Analog input 1 (0x1000 = 100%)
- 8: Analog input 2 (0x1000 = 100%)
- 9: IO status of basic device and option

High byte								Low byte							
–	–	–	RL5*	RL4*	RL3*	RL2	RL1	DI8*	DI7*	DI6*	DI5	DI4	DI3	DI2	DI1

*Only available with suitable option module.

RL = relay

- 10[1)]: LTX position low byte (number of increments within one revolution)
- 11[1)]: LTX position high byte (number of revolutions)

1) Only with inserted LTX module.

P5-12 Fieldbus PI2 definition

Definition of input 2, 3, 4 for transmitted process data

Parameter description like *P5-12 – P5-14*.

P5-13 Fieldbus PI3 definition

Definition of input 2, 3, 4 for transmitted process data

Parameter description like *P5-12 – P5-14*

31554814/EN – 10/2023

P5-14 Fieldbus PI4 definition

Definition of input 2, 3, 4 for transmitted process data

Parameter description like *P5-12 – P5-14*

P5-15 Expansion relay 3 function selection

INFORMATION

The use of this parameter is only possible if the I/O expansion module is connected.

Defines the function of expansion relay 3. For a functional description, see table "P2-15/P2-18 Relay outputs" (→ 🗎 159).

P5-16 Relay 3 upper limit

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

P5-17 Relay 3 lower limit

Setting range: **0.0** – 200.0%

P5-18 Expansion relay 4 function selection

INFORMATION

The use of this parameter is only possible if the I/O expansion module is connected.

Defines the function of expansion relay 4. For a functional description, see table in chapter "P2-15" (→ 🗎 160) and "P2-18" (→ 🗎 160).

P5-19 Relay 4 upper limit

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

P5-20 Relay 4 lower limit

Setting range: **0.0** – 200.0%

INFORMATION

The function of expansion relay 5 is fixed to "Motor speed > 0".

11.2.7 Parameter group 6: Extended parameters (level 3)

P6-01 Firmware upgrade enable

Activates the firmware upgrade mode for the control electronics and/or the power electronics. This parameter is automatically activated with the software LT Shell V4.

- **0: Deactivated**
- 1: Enabled (DSP + I/O)
- 2: Enabled (I/O only)
- 3: Enabled (DSP only)

P6-02 Automatic thermal management

Enables automatic thermal management. The inverter automatically reduces the output switching frequency in the event of an excessive heat sink temperature to reduce the risk of an overtemperature fault.

- 0: Deactivated (PWM fixed - depending on the setting in *P2-24*)
- **1: Activated** (PWM varies, depending on the following table)

Heat sink temperature	Inverter behavior
70 °C	Automatic reduction from 16 kHz to 12 kHz.
75 °C	Automatic reduction from 12 kHz to 8 kHz.
80 °C	Automatic reduction from 8 kHz to 6 kHz.
85 °C	Automatic reduction from 6 kHz to 4 kHz.
90 °C	Automatic reduction from 4 kHz to 2 kHz.
97 °C	Error message overtemperature

P6-03 Auto-reset delay time

Setting range: 1 – **20** – 60 s

Sets the delay time that elapses between consecutive reset attempts of the inverter, if auto reset is enabled in *P2-36*.

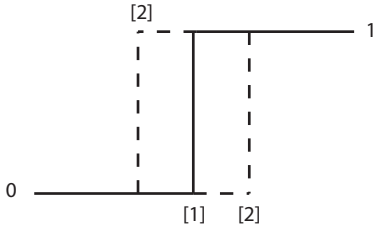
P6-04 Hysteresis band user relay/analog outputs

Setting range: 0.0 – **0.3** – 25.0%

This parameter functions together with the function selection 2 (motor at setpoint speed) or 3 (motor speed > 0) in parameter *P2-11* (DO1), *P2-13* (DO2), *P2-15* (relay 1) and *P2-18* (relay 2).

If the speed lies within the set hysteresis band (+/- *P6-04* of *P1-01*), depending on the function selection, the respective digital output or the corresponding relay is active (1).

If the value is too small, the digital output or relay “bounces”.



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[1] Depending on the setting in *P2-11, P2-13, P2-15, P2-18*

[2] Percentage hysteresis of *P6-04* referred to *P1-01*

P6-05 Encoder feedback enable

When set to "1", encoder feedback is enabled. This parameter is enabled automatically as soon as an LTX module is connected.

31554814/EN – 10/2023

When using a TTL or HTL encoder card, check before activation whether the value in P0-58 is also displayed positively when the speed is positive. Otherwise, swap encoder tracks A and B.

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

P6-06 Encoder PPR

Setting range: **0** – 65535 PPR (Pulses Per Revolution)

Set the number of encoder increments (pulses per revolution). Also activate P6-05. This parameter is set automatically as soon as the LTX module is connected.

INFORMATION

For HTL/TTL encoders, a minimum of 512 increments are necessary for operation.

P6-07 Trigger threshold speed error/speed monitoring

Setting range: 1.0 – **5.0** – 100%

This parameter specifies the maximum permitted speed error between the speed setpoint and the actual speed value.

The parameter is active in all operating modes (except U/f control) with and without encoder feedback. If the speed error lies outside the set limit value, the inverter switches off with speed error (SP-Err or Enc-02). When set to "100%", speed monitoring is deactivated.

P6-08 Max. frequency for speed setpoint

Setting range: 0; **5** – 20 kHz

This parameter defines the frequency of the frequency input (DI3) at which the motor speed setpoint corresponds to the maximum speed (*P1-01*).

An individual configuration of the digital inputs with *P1-15* = 0 and parameter group 9 is necessary to be able to use this function.

Select the option "Pulse" at one of the corresponding speed sources (*P9-10* – *P9-17*).

When set to 0, this function is deactivated.

P6-09 Droop speed/load distribution control

Setting range: **0.0** – 25.0%

This function requires one motor for each inverter. In applications where several motors drive a common load, but different motor loads occur due to mechanical reasons, this function can balance the load of individual motors. Group drives are not possible.

This function is available in all speed-controlled vector operating modes.

With the setting P6-09 = 0.0, this function is deactivated. With setting P6-09 > 0.0, this function induces a reduction of the actual speed compared to the setpoint speed for increased load.

Droop speed = setpoint speed - P6-09 × P1-09 × M_A/M_N

M_A = current application torque

M_N = nominal motor torque

31554814/EN – 10/2023

In most cases, a small value in P6-09 is sufficient to achieve an adequate load distribution. If the value is too high, the actual speed controls towards 0 for small setpoint speeds or high loads.

P6-10 Reserved

P6-11 Speed holding time on enable

Setting range: **0.0** to 250 s

When the enable is activated, the inverter assumes the fixed setpoint speed 7 (*P2-07*) for the time defined here before the speed setpoint of the user is assumed.

This function thus defines a time-delayed adoption of the speed setpoint after the enable.

When set to "0.0", this function is deactivated.

P6-12 Speed holding time on inhibit

Setting range: **0.0** to 250 s

When the enable is deactivated, the inverter assumes the fixed setpoint speed 8 (*P2-08*) for the time defined here before the inverter stops along the deceleration ramp.

This function thus defines a time-delayed stop.

When set to "0.0", this function is deactivated.

INFORMATION

Setting this parameter to a value > 0 lets the inverter continue to run at the fixed setpoint speed for the set time after having removed the enable signal. It is important that you make sure that this operating mode is safe before you use this function.

P6-13 Fire mode logic/emergency mode

This parameter defines the logic of the wiring for activation of fire mode/emergency mode.

See also the description of the function in chapter "Fire mode/emergency mode" (→ 🗎 130).

Do not use this function for servo applications or lifting applications.

- **0: NC switching contact: The function is activated with logic 0.**
- 1: NO switching contact: The function is activated with logic 1.

P6-14 Fire mode/emergency mode speed

Setting range: *-P1-01* – **0** – *P1-01* Hz

This parameter defines the speed when fire mode/emergency mode is activated.

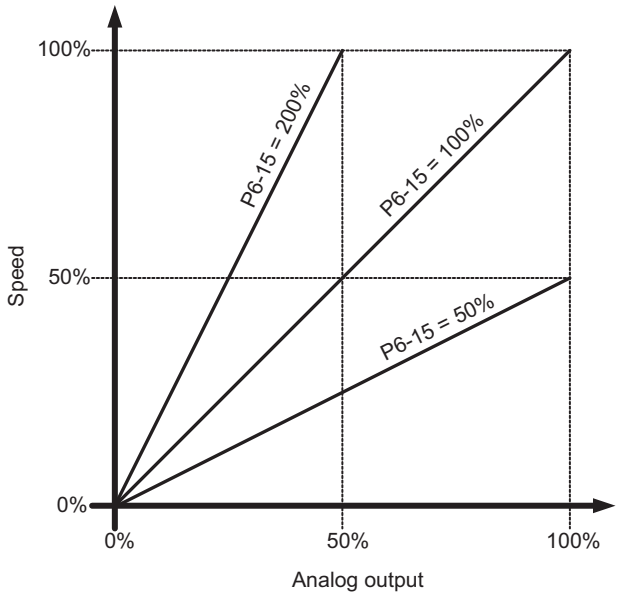
See also the description of the function in chapter "Fire mode/emergency mode" (→ 🗎 130).

P6-15 Analog output 1 scaling

Setting range: 0.0 – **100.0** – 500.0%

31554814/EN – 10/2023

Specifies the scaling factor in % used for analog output 1.



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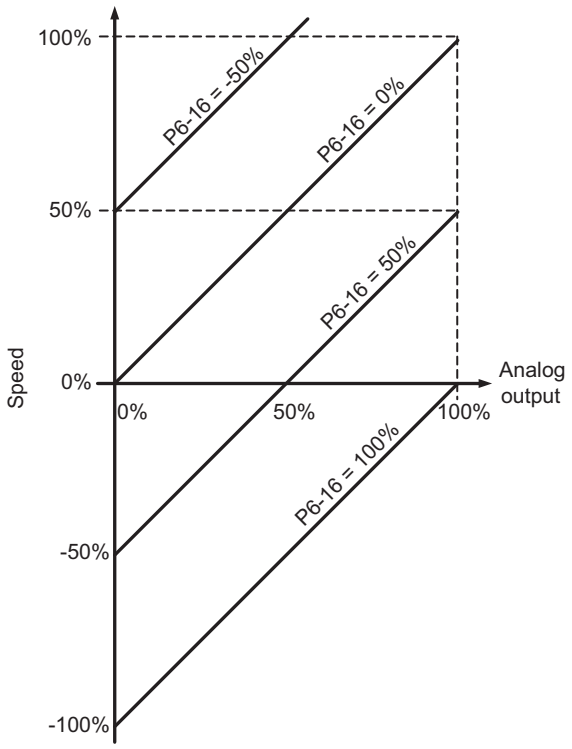
P6-16 Analog output 1 offset

Setting range: -500.0 – **0.0** – 500.0%

This parameter specifies the offset in % used for analog output 1.



13089606539

P6-17 Max. torque limit timeout

Setting range: 0.0 – **0.5** − 25.0 s

This parameter defines how long the motor is operated above the torque limits (*P4-07*; *P4-09*) before the inverter is switched off by the torque monitoring (O-Torq).

The parameter is active in all vector operating modes.

When set to "0.0", this function is deactivated.

P6-18 DC braking voltage level

Setting range: Auto, **0.0** – 30.0%

This parameter activates the DC braking function in relation to the rated motor voltage (*P1-07*).

The motor is decelerated with the deceleration ramp (*P1-04*) and the braking energy is thereby fed back into the motor winding.

An excessive value will cause the motor to jerk.

P6-19 Braking resistor value

Setting range: **0**; R_min – 200 Ω

Sets the braking resistor value in ohms. This value is used for thermal protection of the braking resistor. R_min depends on the inverter.

The thermal protection of the braking resistor is calculated depending on *P6-19* and *P6-20* and displayed in *P0-56*.

31554814/EN – 10/2023

P0-56 Entry 1: Maximum power-applied time [ms]

P0-56 Entry 2: Working cycle

Pause time [ms] = working cycle × maximum power-applied time

When set to "0", the protection function for the braking resistor is deactivated.

P6-20 Braking resistor power

Setting range: **0.0** – 200.0 kW

Sets the braking resistor power in kW with a resolution of 0.1 kW. This value is used for thermal protection of the braking resistor.

The thermal protection of the braking resistor is calculated depending on *P6-19* and *P6-20* and displayed in *P0-56*.

P0-56 Entry 1: Maximum power-applied time [ms]

P0-56 Entry 2: Working cycle

Pause time [ms] = working cycle × maximum power-applied time

When set to "0.0", the protection function for the braking resistor is deactivated.

P6-21 Brake chopper operating cycle at undertemperature

Setting range: **0.0** – 20.0%

A value > 0 activates the heating function of the inverter.

The brake chopper is thereby active at temperatures below 0 °C (even with low temperature error U-Temp) and heats the connected braking resistor to the set value.

For this, the braking resistor must be installed directly on the heat sink to ensure optimum thermal conductivity.

Use only the braking resistors provided for this.

Contact SEW-EURODRIVE Service, if necessary.

An excessive value can overload the braking resistor.

Use an external thermal protection device for the braking resistor.

When set to "0.0", this function is deactivated.

P6-22 Reset fan runtime

- **0: Deactivated**
- 1: Reset fan runtime (*P0-35*)

P6-23 Reset kWh counter and MWh counter

- **0: Deactivated**
- 1: Reset kWh counter (*P0-26*) and MWh counter (*P0-27*).

P6-24 Parameter default settings

Inverter factory settings:

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

- **0: Disabled**
- 1: Factory settings except for bus parameters.
- 2: Factory settings for all parameters.

31554814/EN – 10/2023

P6-25 Access code level 3

Setting range: 0 – **201** – 9999

The set value determines the code for the full parameter access (parameter groups 0 to 9) in *P1-14*.

P6-26 Parameter backup

- **0: Output value**
- 1: Save parameters
- 2: Deleting parameters

Selection 0: The output value is always displayed.

Selection 1: Saving the current parameterization.

The entire parameter settings are saved to a secured memory. Upon successful completion of the backup, the display shows "USr-PS".

The memory content is preserved, even when the device is de-energized and when the factory settings are activated.

Selection 2: Deleting the saved parameterization from the secure memory.

The internal memory is deleted again. The display shows "USr-cL".

Restoring the saved parameterization from the memory:

By pressing the 4 keys "Start + Stop + Up + Down" simultaneously for at least 2 seconds, the saved parameter setting can be restored. This overwrites the parameter data in the device and resets it to the value at the time of the backup. The display shows "U-dEF" upon successful completion of the restoring.

Establishing the delivery state (no change to preceding versions):

To reset the inverter to the factory setting (delivery state), press the 3 keys "Stop + Up + Down" for at least 2 seconds until "P-dEF" appears on the display. This process overwrites the current parameterization without deleting the saved data in the secure memory with the parameter backup.

11.2.8 Parameter group 7: Motor control parameters (level 3)

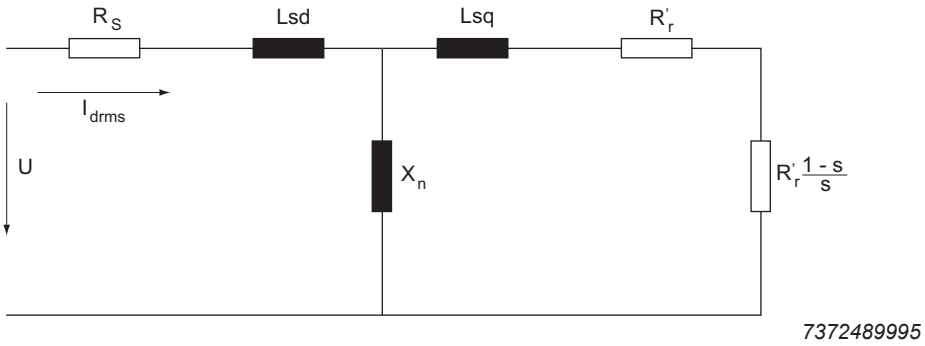
NOTICE

Possible inverter damage

The following parameters are used internally by the inverter to enable optimum motor control. Incorrect settings of the parameters can result in poor performance and unexpected behavior of the motor. Adjustments may be made only by experienced users who fully understand the functions of these parameters.

31554814/EN – 10/2023

Equivalent wiring diagram for AC motors.



P7-01 Motor stator resistance (Rs)

Setting range: (power-dependent) (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.

P7-02 Motor rotor resistance (Rr)

Setting range: (Power range) (Ω)

For induction motors: Phase-to-phase rotor resistance value in ohms.

For synchronous motors: Value has to be set to 0 ohm.

P7-03 Motor stator inductance (Lsd)

Setting range: (power-dependent) (H)

For induction motors: Phase stator inductance value.

For synchronous motors: Phase d-axis stator inductance in henry.

P7-04 Motor magnetization current (Id rms)

Setting range: 10% × *P1-08* − 80% × *P1-08* (A)

For induction motors: Magnetizing current/no-load current. Before auto tune, this value is approximated to 60% of the rated motor current (*P1-08*) assuming a motor power factor of 0.8.

P7-05 Motor leakage loss coefficient (sigma)

Setting range: 0.025 − **0.10** − 0.25

For induction motors: Leakage loss coefficient of the motor.

P7-06 Motor stator inductance (Lsq) − only for synchronous motors

Setting range: depends on the motor (H)

For synchronous motors: Phase q-axis stator inductance in henry.

31554814/EN – 10/2023

P7-07 Enhanced generator control

Use this parameter when stability problems occur in extremely regenerative applications. When this function is enabled, regenerative operation is possible at low speeds.

- **0: Disabled**
- 1: Enabled

P7-08 Parameter adjustment

Use this parameter for small motors (P < 0.75 kW) with high impedance. When this function is enabled, the thermal motor model can adjust rotor and stator resistance during operation. In this way, impedance effects occurring with vector control and caused by heating are compensated.

- **0: Disabled**
- 1: Enabled

P7-09 Overvoltage current limit

Setting range: 0.0 – **1.0** – 100%

This function discharges the DC link in generator mode. The maximum motor speed is limited here to 120% of *P1-01* or 120% of *P1-09* (the highest limit value is used in each case).

When set to "0.0", this function is deactivated.

Procedure:

- The motor with high inertia is decelerated. Regenerative energy flows back to the inverter.
- The DC link voltage increases and reaches the U_{DCmax} level.
- To discharge the DC link, the inverter delivers current (*P7-09*) and the motor accelerates again.
- The DC link voltage falls below U_{DCmax} again.
- The motor is further decelerated.

P7-10 Stiffness (for vector control)

Setting range: 0 – **10** – 600

P7-10 is used to improve the control response for control modes without encoder feedback. *P7-10* has an internal effect on the P and I components of the control. This value can usually remain set to the default value "10".

Increasing *P7-10* increases the stiffness of the motor. Decreasing this parameter has the opposite effect.

This parameter must be set, depending on the inertia.

P7-11 Pulse width min. limit

Setting range: 0 to 500

This parameter is used to limit the minimum output pulse width (number of voltage flanks).

With long motor leads, increasing the value of this parameter can reduce the risk of overcurrent errors (O-I or hO-I).

An increase in this value reduces the maximum available output voltage.

Time = value × 16.67 ns

31554814/EN – 10/2023

P7-12 Premagnetization time

Setting range: 0 – 5000 ms

Use this parameter to define a premagnetization time. Consequently, there is a corresponding start delay when the inverter is enabled. If the value is too small, the inverter might generate an overcurrent fault (O-I or hO-I) if the acceleration ramp is too short.

In the case of operating modes for synchronous motors, this parameter, together with *P7-14*, is used for the initial rotor adjustment. In particular, it must be adjusted for high moments of mass inertia.

P7-13 D-gain vector speed controller

Setting range: **0.0** – 400%

This parameter is used to set the differential gain (%) for the speed controller in vector mode operation.

P7-14 Low-frequency torque boost

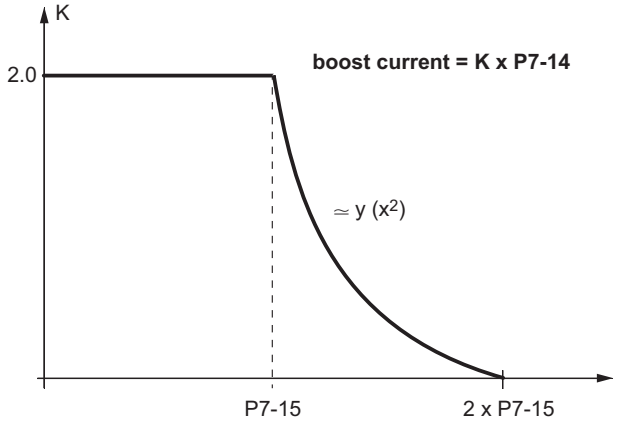
Setting range: **0.0** to 100%

With synchronous motors, this parameter permits a boost current in % of the rated motor current (*P1-08*) on enable or if the frequencies are too low.

If the value is too high, this can cause overcurrent errors (O-I or hO-I).

The torque increase is limited by *P7-15*.

In addition, this parameter functions together with *P7-12* to align the rotor.



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P7-15 Torque boost frequency limit

Setting range: **0.0** – 50%

Frequency range for the applied boost current (*P7-14*) in % of the rated motor frequency (*P1-09*).

This parameter functions as shown in the corresponding chart in the parameter description for *P7-14*.

P7-16 Motor nameplate speed

The parameter has no function.

11.2.9 Parameter group 8: Application-specific parameters (only LTX) (level 3)

INFORMATION

For further information refer to the "MOVITRAC® LTX Servo Module for MOVITRAC® LTP-B" addendum for the operating instructions, chapter "LTX function parameter set (level 3)".

P8-01 Simulated encoder scaling

Setting range: **2^0** – 2^3

P8-02 Input pulse scaling value

Setting range: 2^0 – **2^{16}**

P8-03 Lag error low word

Setting range: 0 – **65535**

Number of increments within a revolution.

P8-04 Lag error high word

Setting range: **0** – 65535

Number of revolutions.

P8-05 Reference travel type

- **0: Disabled**
- 1: Zero pulse with negative travel direction
- 2: Zero pulse with positive travel direction
- 3: End of reference cam negative travel direction
- 4: End of reference cam positive travel direction
- 5: No reference travel; only possible without enabled drive
- 6: Fixed stop positive direction of travel
- 7: Fixed stop negative direction of travel

P8-06 Position controller proportional gain

Setting range: 0.0 – **1.0** – 400%

P8-07 Touch probe trigger mode

- **0: TP1 P edge TP2 P edge**
- 1: TP1 N edge TP2 P edge
- 2: TP1 N edge TP2 N edge
- 3: TP1 P edge TP2 N edge

P8-08 Reserved

P8-09 Velocity precontrol gain

Setting range: 0 – **100** – 400%

31554814/EN – 10/2023

Defines the command source for using terminal mode.

This parameter takes effect only when *P1-12* > 0. It allows the control signal source defined in *P1-12* to be overwritten.

High: The sources defined in parameters *P9-02* to *P9-07* control the inverter.

Low: The control signal source set in *P1-12* is effective.

The control signal sources of the inverter are prioritized as follows:

- STO deactivation
- External fault
- Rapid stop
- Enable
- *P9-09*
- Run forward/run reverse/reverse
- Reset

P8-10 Acceleration precontrol gain

Setting range: **0** – 400%

P8-11 Reference offset low word

Setting range: **0** – 65535

P8-12 Reference offset high word

Setting range: **0** – 65535

P8-13 Reserved

P8-14 Reference enable torque

Setting range: 0 – **100** – 500%

11.2.10 Parameter group 9: User-defined function assignment of digital inputs (level 3)

The purpose of parameter group 9 is to give the user full flexibility to control the inverter behavior in complex applications that require specific parameter settings. Use the parameters of this group with utmost care. Only users that are absolutely familiar with the use of the inverter and its control functions should adjust the parameters of this group.

Overview of functions

Parameter group 9 allows for the advanced programming of the inverter including user defined functions for the digital and analog inputs of the inverter as well as control of the speed setpoint source.

The following rules apply to parameter group 9:

- The parameters of this group cannot be changed unless *P1-15* = 0.
- Changing the value of *P1-15* clears all the previous settings made in parameter group 9.
- Parameter group 9 has to be configured individually by the user.

31554814/EN – 10/2023

INFORMATION

Write down your settings.

Logic source selection parameters

The parameters for selecting a logic source let users directly define the source for a control function in the inverter. These parameters can only be linked to digital values, which either enable or disable the function depending on their state.

Parameters defined as logic sources have the following range of possible settings:

Inverter display	Setting	Function
SAFE	STO input	Linked to the status of STO inputs, if allowed.
OFF	Always OFF	Function permanently disabled.
On	Always ON	Function permanently enabled.
din-1	Digital input 1	Function linked to status of digital input 1.
din-2	Digital input 2	Function linked to status of digital input 2.
din-3	Digital input 3	Function linked to status of digital input 3.
din-4	Digital input 4	Function linked to status of digital input 4 (analog input 1).
din-5	Digital input 5	Function linked to status of digital input 5 (analog input 2).
din-6	Digital input 6	Function linked to status of digital input 6 (requires extended I/O option).
din-7	Digital input 7	Function linked to status of digital input 7 (requires extended I/O option).
din-8	Digital input 8	Function linked to status of digital input 8 (requires extended I/O option).

The control sources for the inverter are handled in the following order of priority (from highest to lowest priority):

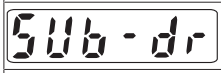
- STO circuit
- External error
- Rapid stop
- Enable
- Terminal control override
- CW/CCW rotation
- Reset

Setpoint source selection parameters

Parameters for selecting a setpoint source define the signal source for setpoint source 1 to 8. Parameters defined as data sources have the following range of possible settings:

Inverter display	Setting	Function
Ain-1	Analog input 1	Analog input 1 signal level (*P0-01*).

31554814/EN – 10/2023

Inverter display	Setting	Function
	Analog input 2	Analog input 2 signal level (*P0-02*).
	Fixed setpoint speed	Selected fixed setpoint speed.
	Keypad (motorized potentiometer)	Keypad speed setpoint (*P0-06*).
	PID controller output	PID controller output (*P0-10*).
	Master speed setpoint	Master speed setpoint (master/slave operation).
	Fieldbus speed setpoint	Fieldbus speed setpoint PI2.
	User-defined speed setpoint	User-defined speed setpoint (PLC function).
	Frequency input	Pulse frequency input reference.

P9-01 Enable input source

Setting range: SAFE, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

This parameter specifies the source for the enable.

P9-02 Rapid stop input source

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

This parameter specifies the source for the rapid stop. With a High signal, the motor stops along the ramp from *P2-25*.

P9-03 Input source for clockwise rotation (CW)

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

This parameter specifies the source for clockwise rotation (CW).

P9-04 Input source for counterclockwise rotation (CCW)

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

This parameter specifies the source for counterclockwise rotation (CCW).

INFORMATION

When the CW rotation and CCW rotation signals are set simultaneously, the inverter executes a rapid stop.

P9-05 Latch function enable

Setting range: OFF, ON

This parameter activates the stop function for clockwise rotation or counterclockwise rotation. The direction of rotation is thus flank-controlled without the input signal having to be permanently present. When using this function, an input with NC contact must be defined for Stop in *P9-01*.

P9-06 Direction of rotation reversal

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

31554814/EN – 10/2023

This parameter specifies the source for the direction of rotation reversal.

P9-07 Reset input source

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

This parameter specifies the source for the error reset.

P9-08 External fault input source

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

This parameter specifies the source for the external error. The contact is an NC contact with wire break monitoring.

P9-09 Terminal control enable source

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

This parameter specifies the source for the activation of terminal control. When the defined digital input is activated, the selected control signal source in *P1-12* is deactivated and terminal control is activated.

P9-10 – P9-17 Setpoint source

Up to 8 setpoint sources can be defined for the inverter and can be selected during operation using *P9-18 – P9-20*. When changing the setpoint source, the new source is applied immediately during ongoing operation. The inverter does not have to be stopped for this.

P9-10 Setpoint source 1

Setting range: Ain-1, Ain-2, fixed setpoint speed 1 – 8, d-Pot, PID, Sub-dr, F-bus, user, pulse

Defines setpoint source 1.

P9-11 Setpoint source 2

Setting range: Ain-1, Ain-2, fixed setpoint speed 1 – 8, d-Pot, PID, Sub-dr, F-bus, user, pulse

Defines setpoint source 2.

P9-12 Setpoint source 3

Setting range: Ain-1, Ain-2, fixed setpoint speed 1 – 8, d-Pot, PID, Sub-dr, F-bus, user, pulse

Defines setpoint source 3.

P9-13 Setpoint source 4

Setting range: Ain-1, Ain-2, fixed setpoint speed 1 – 8, d-Pot, PID, Sub-dr, F-bus, user, pulse

Defines setpoint source 4.

P9-14 Setpoint source 5

Setting range: Ain-1, Ain-2, fixed setpoint speed 1 – 8, d-Pot, PID, Sub-dr, F-bus, user, pulse

31554814/EN – 10/2023

Defines setpoint source 5.

P9-15 Setpoint source 6

Setting range: Ain-1, Ain-2, fixed setpoint speed 1 – 8, d-Pot, PID, Sub-dr, F-bus, user, pulse

Defines setpoint source 6.

P9-16 Setpoint source 7

Setting range: Ain-1, Ain-2, fixed setpoint speed 1 – 8, d-Pot, PID, Sub-dr, F-bus, user, pulse

Defines setpoint source 7.

P9-17 Setpoint source 8

Setting range: Ain-1, Ain-2, speed setpoint 1 to 8, d-Pot, PID, Sub-dr, F-bus, user, pulse

Defines setpoint source 8.

P9-18 – P9-20 Setpoint source selection input

The active setpoint source can be selected and switched during operation with parameters *P9-18 – P9-20*:

P9-20	P9-19	P9-18	Setpoint source
0	0	0	1 (*P9-10*)
0	0	1	2 (*P9-11*)
0	1	0	3 (*P9-12*)
0	1	1	4 (*P9-13*)
1	0	0	5 (*P9-14*)
1	0	1	6 (*P9-15*)
1	1	0	7 (*P9-16*)
1	1	1	8 (*P9-17*)

P9-18 Input 0 for setpoint source selection

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

Logic source "Bit 0" for selection of the setpoint source.

P9-19 Input 1 for setpoint source selection

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

Logic source "Bit 1" for selection of the setpoint source.

P9-20 Input 2 for setpoint source selection

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

Logic source "Bit 2" for selection of the setpoint source.

31554814/EN – 10/2023

P9-21 to P9-23 Preset fixed setpoint speed input

The fixed setpoint speeds can be selected and switched with parameters *P9-21* to *P9-23*:

P9-23	P9-22	P9-21	Fixed setpoint speed
0	0	0	1 (*P2-01*)
0	0	1	2 (*P2-02*)
0	1	0	3 (*P2-03*)
0	1	1	4 (*P2-04*)
1	0	0	5 (*P2-05*)
1	0	1	6 (*P2-06*)
1	1	0	7 (*P2-07*)
1	1	1	8 (*P2-08*)

P9-21 Input 0 for preset fixed setpoint speed selection

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

Logic source "Bit 0" for selection of the fixed setpoint speed.

P9-22 Input 1 for preset fixed setpoint speed selection

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

Logic source "Bit 1" for selection of the fixed setpoint speed.

P9-23 Input 2 for preset fixed setpoint speed selection

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8, On

Logic source "Bit 2" for selection of the fixed setpoint speed.

P9-24 Positive jog mode input

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

This parameter specifies the source for the positive jog mode.

The jog speed is specified in the parameter *P2-01*.

P9-25 Negative jog mode input

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

This parameter specifies the source for the negative jog mode.

The jog speed is specified in the parameter *P2-01*.

P9-26 Reference travel enable input (LTX parameter)

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

This parameter specifies the source for the release of the reference run.

P9-27 Reference cam input (LTX parameter)

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

This parameter specifies the source for the reference cams.

31554814/EN – 10/2023

P9-28 Motor potentiometer up input source

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

This parameter specifies the source for the speed increase at the keypad/motor potentiometer. As long as a signal (logic 1) is present at the selected digital input, the speed is increased with the ramp defined in *P1-03*.

P9-29 Motor potentiometer down input source

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

This parameter specifies the source for the speed decrease at the keypad/motor potentiometer. As long as a signal (logic 1) is present at the selected digital input, the speed is decreased with the ramp defined in *P1-04*.

P9-30 Positive limit switch CW

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

The parameter defines the digital input for the positive limit switch. The switch must be wired as an NC contact with wire break monitoring. As soon as the limit switch is tripped, the inverter reduces the speed along ramp P1-04 to 0 Hz.

As long as the enable persists at the inverter, the inverter stays enabled at 0 Hz.

The status of the limit switch is also depicted in the status word.

P9-31 Negative limit switch CCW

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

The parameter defines the digital input for the negative limit switch. The switch must be wired as an NC contact with wire break monitoring. As soon as the limit switch is tripped, the inverter reduces the speed along ramp P1-04 to 0 Hz.

As long as the enable persists at the inverter, the inverter stays enabled at 0 Hz.

The status of the limit switch is also depicted in the status word.

P9-32 Selection of deceleration ramp/rapid stop ramp

Setting range: OFF, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

This parameter defines which ramp is used when the enable is canceled.

Logic 0: Deceleration ramp *P1-04*

Logic 1: Second deceleration ramp/rapid stop ramp *P2-25*

P9-33 Fire mode/emergency mode input selection

Setting range: OFF, din-1, din-2, din-3, din-4, din-5.

This parameter defines the digital input for selection of fire mode/emergency mode.

P9-34 PID fixed setpoint reference selection input 0

Setting range: **OFF**, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

P9-35 PID fixed setpoint reference selection input 1

Setting range: **OFF**, din-1, din-2, din-3, din-4, din-5, din-6, din-7, din-8

31554814/EN – 10/2023

INFORMATION

Parameters *P3-14 − P3-16* cannot be used while *P9-34* and *P9-35* are set to "OFF".

31554814/EN – 10/2023

11.2.11 Configuration parameters

P0-00 Configuration parameters for IP66/NEMA-4X devices with switch option

Setting range: **SEt-1** – SEt-8

The functionality of the switch and the potentiometer can be assigned as follows.

IP66/NEMA-4X housing with switch				
Selection	**Setting**	**Potentiometer**	**Switch setting CW**	**Switch setting CCW**
0	**SEt-1**	**Activated**	**Activated**	**Activated**
1	SEt-2	Activated	Activated	Deactivated
2	SEt-3	Activated	Deactivated	Activated
3	SEt-4	Activated	Deactivated	Deactivated
4	SEt-5	Deactivated	Activated	Activated
5	SEt-6	Deactivated	Activated	Deactivated
6	SEt-7	Deactivated	Deactivated	Activated
7	SEt-8	Deactivated	Deactivated	Deactivated

Procedure:

1. Stop the inverter. The display must show "STOP" or "INHIBIT". No error messages may be present.
2. Set the password in *P1-14* (Advanced parameter access) (default = 101 or 201).
3. Press the "Up" or "Down" key until one of the parameters of parameter group 0 *P0-xx* appears on the display.
4. Press the "Stop" key for at least 1 second until the selections are displayed.
5. Press the "Up" or "Down" key to set the required function.
6. Press the "Stop" key again to save the selection and to exit the menu.

31554814/EN – 10/2023

12 Operation

12.1 Inverter status

12.1.1 Static inverter status

The following list 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. The inverter is not enabled.
P-deF	Parameter factory settings have been loaded. This message appears when the user issues the command for loading the parameter factory settings. To put the inverter into operation again, press the <Stop/reset> key.
Standby	The inverter is in standby mode. This message is displayed when the inverter runs at the minimum speed for the time parameterized in *P2-27* and the speed setpoint is also 0.
Inhibit/ Inhibit	Is displayed when 24 V and/or GND are not present at the STO contacts. The output stage is inhibited.
ETL 24	External 24 V voltage supply is connected. The functions are limited, see also chapter "Connection of the 24 V backup voltage" (→ 🗎 101).

12.1.2 Operating state of the inverter

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

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

Message 7-segment display	Message Full text display	Description
H xxx	xxx Hz	Output frequency of the frequency inverter (in Hz) This is displayed when the inverter is enabled.
A xxx	xxx A	Output current of the frequency inverter (in Ampere) This is displayed when the inverter is enabled.
P xxx	xxx kW	Output power of the motor (in kW) This is displayed when the inverter is enabled.
L xxx	A padlock appears in the full text display	The parameter is locked for changes. Please ensure that: • The parameter lock in *P2-39* is not activated. • The inverter is not enabled. • The inverter is supplied with line voltage.
xxxx	xxx rpm	Output speed of the inverter (in min^{-1}) If the inverter is enabled and a value of > 0 has been set in the parameter *P1-10*, this is displayed.
C xxx	Scaled value	This is the scaled value, depending on (*P2-21/P2-22*).

31554814/EN – 10/2023

Message 7-segment display	Message Full text display	Description
Auto-t	Auto tuning	An automatic measurement of the motor parameters is being performed. This process can take up to 2 minutes. As soon as the auto-tuning has completed, the display will revert to STOP.
. . . . . . (flashing dot)	OL (= Over-Load)	The output current of the inverter exceeds the current value entered in *P1-08*. The inverter monitors the extent and the duration of the overload. The inverter triggers error message "I.t-trP", depending on the overload.
. . (alternately flashing dots)	ML (=Main Loss)	Line phase failure or supply voltage outside of specification
FirE	Fire mode	Fire mode/emergency mode activated. The message is displayed alternately with the current operating state.
dELAy.t	Delay-t	Time-delayed reset for i.t-trP, O-I, hO-I, OI-b, see also error description O-I (→ 🗎 204)
	Select language	List to select one of the available languages. To select a language, use the <Navigate> key.
Ho-run	Ho-run	Reference travel started. Wait until the inverter has reached the reference position. After a successful reference travel, the display will show "stop".

12.1.3 Status displays of the parameter module

The parameter module status is displayed on the inverter.

Display	Description
PASS-r	The parameter module has successfully read/saved the inverter parameters.
OS-Loc	The parameter module is locked. Attempt to read parameter from the frequency inverter with activated parameter module lock.
FAiL-r	The parameter module could not read any parameters from the inverter.
PASS-t	The parameter module successfully transferred the parameters to the inverter. Writing of parameters to the inverter.
FAiL-P	The power ratings of the parameter stored in the parameter module do not match the power ratings of the inverter to be programmed.
FAiL-t	The parameter module could not transfer the parameter set to the inverter.
no-dAt	No parameter data was saved in the parameter module.
dr-Loc	The inverter parameters were locked. No new parameter settings could be transferred. Unlock the parameter set of the inverter.
dr-rUn	Inverter is running and cannot accept any new parameter settings. Stop the inverter before programming.
tyPE-E	The parameters for the inverter type that are saved in the parameter module do not match the inverter type to be programmed (write process only).
tyPE-F	The parameter module does not yet support the inverter type to be programmed.

31554814/EN – 10/2023

12.2 IT security

12.2.1 Hardening measures

Perform the following hardening measures:

- Regularly check if updates are available for your products.
- Report incidents concerning IT security by e-mail to cert@sew-eurodrive.com.
- Regularly check which Security Advisories are available in the Online Support of SEW-EURODRIVE.
- Evaluate the fault memories and diagnostics information of your products regularly and check whether there are entries that affect IT security.

12.2.2 Guidelines for secure operation

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

To prevent misuse of these service accesses, network access must be restricted according to the state of the art. For more information, refer to section "IT security of the environment" (→ 🗎 13).

12.2.3 Guidelines for user account management

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

31554814/EN – 10/2023

12.3 Troubleshooting

Symptom	Cause and solution
Overload or overcurrent fault 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. If a mechanical brake is installed, make sure that it is released.
No enable for the inverter – display remains at "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 *P1-12* 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 does not start if the ambient temperature is below the specified ambient temperature range (see chapter "Ambient conditions" (→ 🗎 26)). Under such conditions, provide an on-site heat source that keeps the ambient temperature above the specified temperature.
No access to advanced menus	*P1-14* must be set to the advanced access code. The value is "101" unless the user has changed the code in *P2-40*.

12.4 Fault history

The parameter *P1-13* archives the last 4 faults. Each fault is displayed in abbreviated form. The most recent fault is shown first (when calling *P1-13*). The oldest fault will be deleted from the log.

The parameter *P0-13* archives the last 4 faults plus the timestamp in reference to the inverter runtime *P0-31*. The timestamp can only be seen in the LT Shell engineering software.

INFORMATION

If the last fault in the error log is an undervoltage fault, no further undervoltage faults will be saved in the error log. This prevents the error log from being filled with undervoltage faults that invariably occur on each shutdown of the inverter.

31554814/EN – 10/2023

12.5 Fault reset

By pressing the <Stop> key or with a rising edge at digital input 1, you can reset an error in the event of a fault response; see chapter "Fault list" (→ 🗎 204).

12.6 Fault list

Code (Inverter display)	Code (MotionStudio in P0-13)	Error code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
4-20 F	18	0x71	0x1012	Signal loss 4 to 20 mA (> 500 ms)	• Check whether the input current falls within the range defined in *P2-30* and *P2-33*. • Check the connection cable.
AtF-01	40	0x51	0x1028	The measured stator resistance fluctuates between the phases.	The measured stator resistance of the motor is unsymmetrical. Check to see whether: • The motor is connected and fault-free. • The windings have the correct resistance and symmetry.
AtF-02	41	0x51	0x1029	The measured stator resistance is too high.	The measured stator resistance of the motor is too high. Check to see whether: • The motor is connected and fault-free. • The motor's power rating is consistent with the power rating of the connected inverter.
AtF-03	42	0x51	0x102A	Measured motor inductance is too low.	The measured motor inductance is too low. Check whether the motor is connected correctly and if it is fault-free.
AtF-04	43	0x51	0x102B	Measured motor inductance is too high.	The measured motor inductance is too high. Check to see whether: • The motor is connected and fault-free. • The motor's power rating is consistent with the power rating of the connected inverter.
AtF-05	44	0x51	0x102C	Timeout of inductance measurement	The measured motor parameters are not convergent. Check to see whether: • The motor is connected and fault-free. • The motor's power rating is consistent with the power rating of the connected inverter.
dAtA-E	19	0x62	0x1013	Internal memory error (DSP)	Contact SEW-EURODRIVE Service.
dAtA-F	17	0x62	0x1011	Internal memory error (IO)	Contact SEW-EURODRIVE Service.
E-triP	11	0x1A	0x100B	External error at digital input 5.	NC contact was opened. • Check the motor thermistor (if connected).
Enc-01	30	0x0E	0x101E	Communication error between encoder card and inverter.	The encoder feedback is activated in *P6-05*, and no encoder card is plugged in or the encoder card is not recognized.
ENC02	31	0x0E	0x101F	Speed fault (*P6-07*)	The difference between the actual speed and setpoint speed is larger than the percentage value set in *P6-07*. This fault applies only to vector control or control with encoder feedback. Set a higher value in *P6-07*. If you wish to deactivate speed monitoring, set *P6-07* to 100%.
Enc-03	32	0x0E	0x1020	Incorrect PPR count parameterized.	Check the parameter settings in *P6-06* and *P1-10*.
Enc-04	33	0x0E	0x1021	Fault on encoder channel A	The A track of the encoder feedback is not present. Check the wiring.
Enc-05	34	0x0E	0x1022	Fault on encoder channel B	The B track of the encoder feedback is not present. Check the wiring.
Enc-06	35	0x0E	0x1023	Fault on encoder channels A and B	The A and B tracks of the encoder feedback are not present. Check the wiring.

31554814/EN – 10/2023

Code (Inverter display)	Code (MotionStudio in P0-13)	Error code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
Enc-07	36	0x0E	0x1024	RS485 data channel fault, HIPERFACE® data channel error	Communication error between encoder card and encoder. Check the encoder card for proper fit and contact.
Enc-08	37	0x0E	0x1025	HIPERFACE® IO communication channel error	Communication error between encoder card and inverter. Check the encoder card for proper fit and contact.
Enc-09	38	0x0E	0x1026	HIPERFACE® type is not supported.	During the use of Smart Servo Package, a wrong motor/inverter combination was used. Check to see whether: • The speed class of the CMP.. motor is 4500 min^{-1}. • The nominal motor voltage equals the nominal inverter voltage. • A HIPERFACE® encoder is being used.
Enc-10	39	0x0E	0x1027	Trigger: KTY	KTY has been triggered or is not connected.
Er-LED				Display error	Contact SEW-EURODRIVE Service.
Err-SC				The keypad lost the communication connection to the inverter.	
EtI-24				External 24 V supply.	Line voltage supply not connected. The inverter is externally supplied with 24 V.
FAULtY				The communication between the controller and the power section is interrupted	Contact SEW-EURODRIVE Service.
F-Ptc	21	0x1F	0x1015	Motor protection triggered	The connected motor protection sensor is defined in *P2-33* (PTC, TF, TH, KTY or PT1000) and connected to analog input 2 (terminal 10).
FAN-F	22	0x32	0x1016	Internal fan error.	Contact SEW-EURODRIVE Service.
FLt-dc	13	0x07	0x320D	DC link ripple is too high.	Check the current supply
Ho-trP	27	0x27	0x101B	Error during reference travel.	• Check reference cams • Check the connection of the limit switch • Check the setting of the reference travel type and the required parameters
Inhibit				STO safety circuit is open.	Check to see if the terminals 12 and 13 are connected correctly.
Lag-Er	28	0x2A	0x101C	Lag error	Check for: • The encoder connection • The wiring of encoder, motor, and line phases • Whether mechanical components can move freely and ensure that they not blocked. • Extend the ramps. • Set a higher P component. • Parameterize the speed controller again. • Extend the lag error tolerance. • Set PLC Prog Task Priority to 10 ms • The inverter is operated in the derating and can no longer provide the current for acceleration/constant travel.

31554814/EN – 10/2023

Code (Inverter display)	Code (MotionStudio in P0-13)	Error code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
I.t-trp	04	0x08	0x1004	Overload of inverter/motor (I2t error)	Make sure that: • The motor nameplate parameters are correctly inserted in *P1-07*, *P1-08*, and *P1-09*. • In vector mode (*P4-01* = 0 or 1), the motor power factor in P4-05 is correct. • Auto-tuning has been performed correctly. Check to see whether: • The decimals are flashing (inverter overloaded) and then increase the acceleration ramp (*P1-03*) or decrease the motor load. • The cable length corresponds to the requirements. • The load can be moved freely and there are no obstructions or other mechanical failures (check the load mechanically). • The thermal motor protection to UL508C is activated in P4-17. • See also "Fault reset delay in the case of an O-I and hO-I error"
IO DSP COMM loss				The communication between the controller and the power section is interrupted	Contact SEW-EURODRIVE Service.
ML				Line phase failure	Input phase missing or voltage is outside the specified range

31554814/EN – 10/2023

Code (Inverter display)	Code (MotionStudio in P0-13)	Error code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
O-I	03	0x01	0x2303	Short-term overcurrent at the inverter output. Strong overload on the motor.	**Fault during the stopping process:** Check for premature brake application. **Fault when enabling the inverter:** Check to see whether: • The motor nameplate parameters are correctly inserted in *P1-07*, *P1-08*, and *P1-09*. • In vector mode (*P4-01* = 0 or 1), the motor power factor in *P4-05* is correct. • Auto-tuning has been performed correctly. • The load can be moved freely and there are no obstructions or other mechanical failures (check the load mechanically). • 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 released when the motor has a holding brake. • There is a dielectric breakdown on the motor between the motor phases or to the stator. Disconnect the motor cable directly at the inverter and measure using a high-voltage meter with at least 1000 V. **Fault during operation:** Check for: • Sudden overload or malfunction. • The cable connection between the inverter and motor. The acceleration/deceleration time might be too short and require too much power. If you cannot increase *P1-03* or *P1-04*, use a larger inverter. **Measures:** Reduce the setting of the voltage enhancement in *P1-11*. Set a longer run-up time in *P1-03*. Disconnect the motor from the inverter. Enable the inverter again. If this fault recurs, replace the inverter completely after you check the complete system. **Fault reset delay (dELAy.t)** If the fault 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 4 seconds • Second reset after 8 seconds • Third reset after 16 seconds • Fourth reset after 32 seconds • Further resets after 64 seconds The delay is reset to 4 seconds if no further fault occurs within the delay time.
hO-I	15	0x01	0x230F	Hardware overcurrent error at the inverter output (IGBT self-protection in case of overload).	
O-hEAt	23	0x7C	0x4117	Ambient temperature too high.	Check if the ambient conditions are within the range specified for inverters.
OL				Overload	The output current is higher than the nominal motor current
O-t	8	0x0B		Heat sink overtemperature	The heat sink temperature can be displayed via *P0-21*. A history log is saved in parameter *P0-38* in 30-sec. intervals before a switch off with error. This error message is displayed at a heat sink temperature of ≥90 °C. Check for: • 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 *P2-24*, or the load at the motor/inverter.
O-torq	24	0x34	0x1018	Upper torque limit for timeout.	Check the motor load. Set a higher value in *P6-17*, if necessary. If you wish to deactivate torque monitoring, set *P6-17* to 0.0 sec.

Code (Inverter display)	Code (MotionStudio in P0-13)	Error code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
O-Volt	06	0x07	0x3206	Overvoltage in the DC link	The fault occurs if a high flywheel load or overhauling load is connected, and the excess regenerative energy is transferred back to the inverter. If a fault occurs while stopping or during deceleration, increase the deceleration ramp time *P1-04* or connect a suitable braking resistor to the inverter. The proportional gain in *P4-03* is reduced in vector mode. In PID control mode, ensure that the ramps are active by reducing *P3-11*. Additionally check if the supply voltage is within the specified range. Information: The value of the DC bus voltage can be displayed in *P0-20*. A history log is saved in parameter *P0-36* at 256-ms intervals prior to a switch off with error.
OI-b	01	0x04	0x2301	Overcurrent on the brake channel, braking resistor overload	Make sure that the connected braking resistor does not fall below the minimum value approved for the inverter (see technical data). Check the braking resistor and the cabling for possible short-circuits. See also fault reset delay for O-I and hO-I errors
OL-br	02	0x04	0x1002	Braking resistor overload	The thermal overload protection to protect the braking resistor is active (*P6-19* and *P6-20*). The protection function has detected an overload of the braking resistor. • Check the values in *P6-19* and *P6-20*. • Check if the calculated work cycle in *P0-56* corresponds to the project planning of the application. • Make sure that the braking resistor is operated within its physical limits. • To reduce the generator energy, you can, e.g. increase the deceleration ramp. • Alternatively, use a larger braking resistor or switch an additional braking resistor in parallel. Observe the minimum braking resistance value for the inverter.
OF-01	60	0x1C	0x103C	Internal connection to option module error.	Check if all optional fieldbus cards correspond to the same fieldbus type. Contact SEW-EURODRIVE Service
OF-02	61	0x1C	0x103D	Option module fault	Contact SEW-EURODRIVE Service.
Out-F	26	0x52	0x101A	Inverter output stage fault	• Motor phase failure detection: One or more motor phases were disconnected at the inverter output. Check the motor lead. • Check the EMC-compliant wiring of any external control cables. Use shielded cables. • As a test, use the internal 24 V supply directly at the digital inputs, to rule out errors in the signal cable. • As a test, use the internal 24 V supply directly at the STO inputs to rule out malfunctions at the STO circuit. • The safety relay at the STO inputs must not send pulsed signals. • Check STO for correct wiring. • As a test, disconnect the temperature sensor to rule out errors in the sensor cable. • As a test, disconnect the motor cable from the inverter to rule out errors originating in the inverter. • Contact SEW-EURODRIVE
P-LOSS	14	0x06	0x310E	Line phase failure	An input phase has been separated or interrupted at an inverter planned for a 3-phase supply.
P-dEF	10	0x09	0x100A	Factory settings have been applied.	
Ph-lb				Unequal voltage on the line phases	• Check the device input voltage. • Check the values in *P0-22, P0-23, P0-24*. The values may deviate by a maximum ±10%. Use an input choke if required.
Ph-SEq	45	0x51		Line phases confused	The inverter requires the correct line phase sequence for the internal control of the fan. Swap any two line phases.

31554814/EN – 10/2023

Code (Inverter display)	Code (MotionStudio in P0-13)	Error code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
PS-trP	05	0xC8	0x1005	Output stage error (IGBT self-protection in case of overload)	See error **O-I**.
SC-0b5	12	1D		Connection between inverter and control unit interrupted.	Check if there is a connection between the inverter and keypad.
SC-F01	50	0x2B	0x1032	Modbus communication error	Check the communication settings.
SC-F02	51	0x2F	0x1033	SBus/CANopen communication error	Check for: • The communication connection between inverter and external devices. • The assigned, unique address per inverter in the network.
SC-F03	52	0x29	0x1034	Fieldbus module communication error (fieldbus side)	Contact SEW-EURODRIVE Service.
SC-F04	53	0x29	0x1035	IO option card communication error	Contact SEW-EURODRIVE Service.
SC-F05	54	0x29	0x1036	LTX module communication error	Contact SEW-EURODRIVE Service.
SC-LoS				The communication between the controller and the power section is interrupted	Contact SEW-EURODRIVE Service.
SC-OBS				Communication failure with other devices	• A keypad has lost the communication connection to the inverter. • The communication connection has been disconnected in the master-slave network. • Check the addresses of all inverters in the network.
SF				Switching frequency decreased	The PWM frequency was automatically decreased due to the heat sink temperature.
SP-Err	31	0x0E	0x101F	Speed fault (*P6-07*)	The difference between the actual speed and setpoint speed is larger than the percentage value set in *P6-07*. This fault applies only to vector control or control with encoder feedback. Set a higher value in *P6-07*. If you wish to deactivate speed monitoring, set *P6-07* to 100%.
Sto-F	29	0x73	0x101D	STO circuit fault	The safety relay must not transmit test pulses. Check the voltage source. STO+ at terminal 12 must be > 18 V.
StoP				The inverter is not enabled.	Activate the enable command. Make sure that enable is activated after the STO is activated for the hoist function.
th-Flt	16	0x1F	0x1010	Defective thermistor on the heat sink.	Contact SEW-EURODRIVE Service.
type-f				Parameter module and inverter are not compatible.	The parameter module used is not of type LT BP C
U-dEF				User settings loaded.	The parameter set saved in *P6-26* has been restored.
U-torq	25	0x34	0x1019	Bottom torque limit for timeout (hoist).	The torque threshold has not been exceeded in time. Increase the time in *P4-16* according to the pre-magnetization time (*P7-12*). Check the torque limit in *P4-15*.
U-t	09	0x75	0x4209	Insufficient temperature	The ambient temperature is below the specified ambient temperature range ("10.2 Ambient conditions" (→ 26)). Provide a suitable heat source.

Code (Inverter display)	Code (MotionStudio in P0-13)	Error code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
U-Volt	07	0xC6	0x3207	DC link undervoltage	Occurs routinely when switching off the inverter. Check the line voltage if this occurs while the inverter is running.
USr-cL				Parameter backup successfully deleted	The parameter set has been successfully deleted using *P6-26*.
USr-PS				Parameter backup has been completed successfully.	The parameter set has been successfully saved using *P6-26*.

31554814/EN – 10/2023

13 Fieldbus mode

A bus system makes it possible to adapt electronic drive technology components to the particulars of the machinery within wide limits. There is a risk that a change of parameters that cannot be detected externally may result in unexpected (but not uncontrolled) system behavior and may have a negative impact on operational safety, system availability, or data security. Ensure that unauthorized access is prevented, especially with respect to Ethernet-based networked systems and engineering interfaces. Use IT-specific security standards to increase access protection to the ports. For a port overview, refer to the respective technical data of the device in use.

13.1 General information

Maximum possible number of process data words:

- SEW controller (S-Bus 3PD)
- SEW gateway (S-Bus 3PD)
- Modbus RTU 4PD
- CANopen 4PD
- Optional fieldbus interfaces 4PD

13.1.1 Structure and settings of process data words

Control and status words have a fixed assignment. All the other process data words can be freely configured as required using parameter group *P5-xx*.

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 (*P2-25*)	0: Rapid stop 1: Start
		2	Stop along process ramp *P1-03*/ *P1-04* or PO3	0: Stop 1: Start
		3 to 5	Reserved	0
		6	Fault reset	Edge 0 set to 1 = fault reset
		7 to 15	Reserved	0
PO2	Setpoint speed in % (default setting), freely configurable with *P5-09*			
PO3	No function, freely configurable with *P5-10*			

31554814/EN – 10/2023

Description		Bit		Settings	Byte
PO4	No function, freely configurable with *P5-11*				

Process input words

Description		Bit		Settings	Byte
PI1	Status word	0	Output stage enable	0: Locked 1: Enabled	Low byte
		1	Inverter ready	0: Not ready for operation 1: Ready	
		2	PO data enabled	1, if *P1-12* = 5	
		3 – 4	Reserved		
		5	Fault/warning	0: No fault 1: Error	
		6	Positive limit switch active (limit switch assignment can be set in *P1-15* or via *P9-30/P9-31*).[1)]	0: Locked 1: Enabled	
		7	Negative limit switch active (limit switch assignment can be set in *P1-15* or via *P9-30/P9-31*)[1)].	0: Locked 1: Enabled	
		8 – 15	Inverter status if bit 5 = 0 0x01 = STO – Safe Torque Off active 0x02 = No enable 0x05 = Speed control 0x06 = Torque control 0x0A = Technology function 0x0C = Reference travel		High byte
			Inverter status if bit 5 = 1		
PI2	Actual speed	Freely configurable with *P5-12*			
PI3	Actual current	Freely configurable with *P5-13*			
PI4	No function, freely configurable with *P5-14*				

1) Refer to the addendum to the operating instructions "MOVITRAC® LTX Servo Module for MOVITRAC® LTP-B".

31554814/EN – 10/2023

13.1.2 Communication example

The following information is transmitted to the inverter when:

- 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 (*P2-25*).
		0x0001	Coast to a stop
		0x0002	Stop along the process ramp (*P1-04)* or (PO3).
		0X0003 - 0x0005	Reserved
		0x0006	Accelerate along a ramp (*P1-03*) or (PO3) and run at setpoint speed (PO2).
PO2	Setpoint speed	0x4000	= 16384 dec. = maximum speed, e.g. 50 Hz (*P1-01*) CW
		0x2000	= 8192 dec. = 50% of the maximum speed, e.g. 25 Hz CW
		0x0000	= 0 dec. = minimum speed, set in *P1-02*
		0xE000[1)]	= -8192 dec. = 50% of the maximum speed, e.g. 25 Hz CCW
		0xC000[1)]	= -16384 dec. = maximum speed, e.g. 50 Hz (*P1-01*) CCW

1) Representation in two's complement

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

Description		Value	Description
PI1	Status word	0x05C7	Status = running, output stage enabled; inverter ready, PO data enabled
PI2	Actual speed	Should correspond to PO2 (setpoint speed)	
PI3	Actual current	Dependent on rotational speed and load	

13.1.3 Parameter settings for the inverter

- Put the inverter into operation as described in chapter "Simple startup" (→ 🖹 114).
- Set the following parameters depending on the bus system used:

Parameter	SBus/CANopen	Modbus RTU[1)]	Fieldbus via option card
P1-12 (control signal source)	SBus: 5 CANopen: 6	7	
P1-14 (extended parameter access)	201		
P1-15 (digital input function selection)	1[2)]		
P5-01 (inverter address)	1 – 63		--[3)]
P5-02 (SBus/CANopen baud rate)	Baud rate	--	--
P5-03 (Modbus baud rate)	--	Baud rate	--
P5-04 (Modbus data format)	--	File format	--
P5-05[4)] (response to communication failure)	0-1-2-3		--[3)]
P5-06[4)] (communication failure timeout)	SBus: 0.0 – 5.0 s CANopen: [5)]	0.0 – 5.0 s	--[3)]
P5-07[4)] (ramp specified via fieldbus)	0 = Specified via *P1-03/04* 1 = Specified via fieldbus[6)]		
P5-XX (fieldbus parameter)	Additional setting options[7)]		

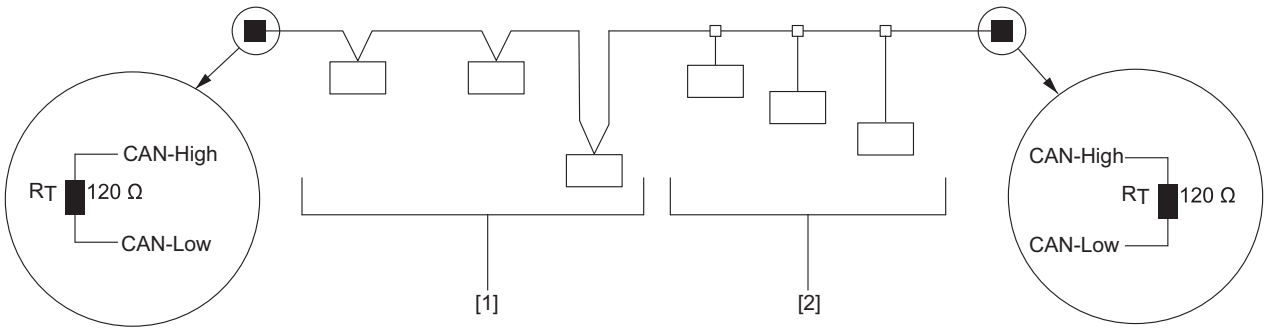
1) Modbus RTU is not available when the LTX encoder module is installed.
2) Default setting; for more setting options, refer to the description of parameter P1-15.
3) This setting is dependent on the fieldbus system. See "Option Cards" manual.
4) These parameters can remain set to their default values for the time being.
5) The CANopen function "Node guarding" must be used for communication monitoring. The timeout time is thereby defined via the guard time (0x100C) and the lifetime factor (0x100D).
6) For ramp specification via fieldbus, P5-10=3 must be set (PO3 = ramp time).
7) Additional fieldbus settings and the detailed definition of the process data can be made in parameter group P5-xx, see chapter "Parameter group 5".

13.1.4 Connecting the signal terminals at the inverter

For bus mode, you can connect the signal terminals using the default setting of *P1-15* as described in chapter "Connection of the signal terminals" (→ 🗎 98). When the DI3 signal level changes, the system toggles between the speed setpoint source fieldbus (low) and fixed setpoint 1 (high).

13.1.5 Setup of a network for CANopen/SBus/Modbus RTU

A network as shown in the following figure should always be designed as a linear bus structure without [1] or only with very short stubs [2]. It must have exactly one terminating resistor R_T = 120 Ω at each end of the bus. The cable sets described in the catalog "MOVITRAC® LTP-B" are available for the simple setup of such a network.



7338031755 *9007206592772747*

Cable length

The permitted total cable length depends on the baud rate set in parameter *P5-02*:

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

31554814/EN – 10/2023

13.2 Connecting a gateway or controller (SBus MOVILINK®)

13.2.1 Specification

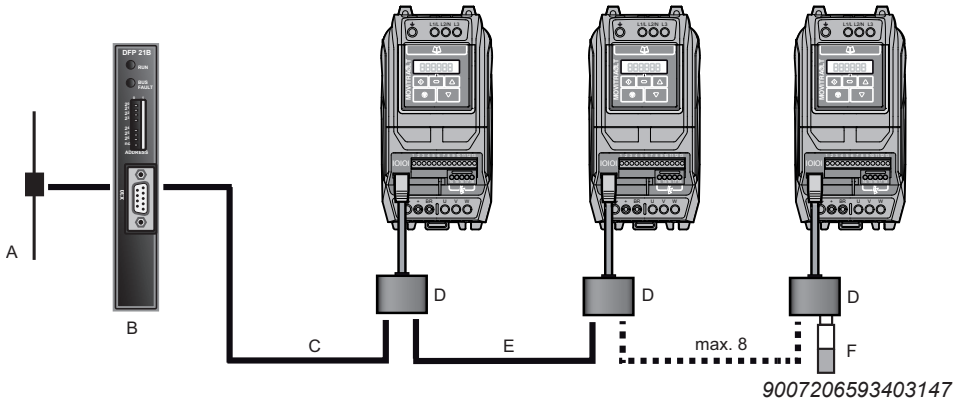
The MOVILINK® profile via CAN/SBus is an application profile specifically coordinated to inverters from SEW-EURODRIVE. For detailed information, refer to the manual "MOVIDRIVE® MDX60B/61B Communication and Fieldbus Device Profile".

To use SBus, you must configure the inverter as described in chapter "Parameter settings for the inverter" (→ 🗎 213). Status and control words are fixed; the other process data words can be configured as required in parameter group *P5-xx*.

For detailed information on the structure of process data words, refer to chapter "Structure and settings of process data words" (→ 🗎 211). For a detailed list of all parameters including the necessary indexes as well as the scaling, refer to chapter "Parameter register" (→ 🗎 142).

13.2.2 Connection of a gateway or controller (SBus MOVILINK®)

Connection of a gateway and MOVI-PLC®.



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

INFORMATION

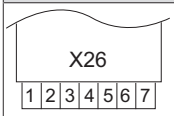
As of firmware version 1.20, a backup mode for maintaining communication in the event of a power failure is possible; this is not possible with older versions. Please also see chapter "Connection of the 24 V backup voltage" (→ 🗎 101) about this.

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, the Y-adapter of the engineering cable set C can also be used. It also includes a terminating resistor. For detailed information on the cable sets, refer to the "MOVITRAC® LTP-B" catalog.

Only use shielded cables for the communication connections and also apply the shielding at the gateway over a large surface area.

Wiring from the control to the "RJ45 communication socket" (→ 🗎 101) of the inverter:

Side view	Designation	Terminal on CCU / PLC	Signal	RJ45 socket contact[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		
	Non-SEW controller	X:?[2]	Modbus RTU+	8	RS485+ (Modbus RTU)
		X:?[2]	Modbus RTU-	7	RS485- (Modbus RTU)
		X:?[2]	DGND	3	GND

1) Please note: The terminal assignment for the socket of the inverter, not for the connector, is specified above.

2) Assignment depends on the third-party controller

13.2.3 Startup at gateway

- Connect the gateway as described in chapter "Electrical installation" (→ 🗎 215).
- 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" (→ 🗎 213). 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.

13.2.4 Startup at a CCU

Before taking the inverter into operation with "Drive Startup" in MotionStudio, you have to set the following parameters directly on the inverter:

- Set parameter *P1-14* to "1" to obtain access to the LTX-specific parameter group *P1-01 – P1-20*.
- If a HIPERFACE® encoder is connected to the encoder card, then *P1-16* must indicate the proper motor type. If not, select the proper motor type using the <Up> and <Down> keys.
- Assign a unique inverter address in *P1-19*. Changing these parameters will directly affect parameters *P5-01* and *P5-02*.
- Set the SBus baud rate (*P1-20*) to 500 kBaud.

31554814/EN – 10/2023

13.2.5 MOVI-PLC® motion protocol (*P1-12 = 8*)

If you operate the inverter with or without LTX encoder module, with MOVI-PLC® or CCU, the following parameters have to be set on the inverter:

- Set *P1-14* to "1" for access to the LTX-specific parameter group. Parameters *P1-01* – *P1-20* are then visible.
- If a HIPERFACE® encoder is connected to the encoder card, then *P1-16* indicates the proper motor type. If not, select the respective motor type using the "Up" and "Down" keys.
- Assign a unique inverter address in *P1-19*.
- Set the SBus baud rate (*P1-20*) to "1000 kBaud".
- Perform a Drive Startup with the MOVITOOLS® MotionStudio software.

13.3 Modbus RTU

The inverters support communication via Modbus RTU. Use the function "Read Holding Register (03)" for reading and the function "Write Single Register (06)" for writing. The function "Write Multiple Register (16)" is also available for PO data words 1-5. To use Modbus RTU, you must configure the inverter as described in chapter "Parameter settings for the inverter" (→ 🗎 213).

13.3.1 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

13.3.2 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" (→ 🗎 101).

13.3.3 Register allocation of the process data words

The process data words are allocated to the Modbus registers shown in the table. The status and control words have a fixed allocation. The other process data words can be freely configured in parameter group *P5-xx*.

The table shows the standard assignment of process data words. All other registers are usually allocated in such a way that they correspond to the parameter number (101 = *P1-01*). However, this does not apply to parameter group 0.

Register	Upper byte	Lower byte	Command	Type
1	PO1 control word (fixed)		03, 06, 16	Read/Write

31554814/EN – 10/2023

Register	Upper byte	Lower byte	Com-mand	Type
2	PO2 (default setting in *P5-09 =1*; speed setpoint)		03, 06, 16	Read/Write
3	PO3 (default setting in *P5-10 =7*; no function)		03, 06, 16	Read/Write
4	PO4 (default setting in *P5-11 =7*; no function)		03, 06, 16	Read/Write
5	Reserved	-	03	Read
6	PI1 status word (fixed)		03	Read
7	PI2 (default setting in *P5-12 =1*; actual speed)		03	Read
8	PI3 (default setting in *P5-13 =2*; actual current)		03	Read
9	PI4 (default setting in *P5-14 =4*; power)		03	Read
…	For more registers, see chapter "Parameter registers" (→ 🗎 142).			

The complete allocation of parameters and registers as well as the scaling of data can be found in the memory allocation plan of chapter "Parameter registers" (→ 🗎 142).

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.

13.3.4 Data flow example

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

- *P1-07* (rated motor voltage, modbus register 107)
- *P1-08* (rated motor current, modbus register 108).

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	6A	00	02	E4 17

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

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 = 0x006A = 106
Number of registers	Number of requested registers from start address (register 107/108).
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

31554814/EN – 10/2023

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.

Request master → slave (Tx)

Sending register information

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 PO2)
Information	0700 (setpoint speed)
2 × CRC bytes	CRC_high, CRC_low

13.4 CANopen

The inverters support communication via CANopen. To use CANopen, you must configure the inverter as described in chapter "Parameter settings for the inverter" (→ 🗎 213).

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

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

13.4.1 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.

13.4.2 Electrical installation

See chapter "Setup of a network for CANopen/SBus/Modbus RTU" (→ 🗎 214).

31554814/EN – 10/2023

13.4.3 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 premapped and activated by default. PDO2 is premapped and activated by default. Transmission mode (synchronous, asynchronous, event), COB ID and mapping can be configured freely.
PDO1 (Rx)	200h + device address	
PDO2 (Tx)	280h + device address	
PDO2 (Rx)	300h + device address	
SDO (Tx)[2]	580h + device address	SDO channel for the exchange of parameter data 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 "premapped" 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

If speed, current, or similar values that change quickly are sent via Tx-PDO, this 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 the perspective of the slave.

13.4.4 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.

31554814/EN – 10/2023

13.4.5 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	2001h	Unsigned 16	PO1 control word (fixed)	1
	2	2002h	Integer 16	PO2 (default setting in *P5-09* =1; speed setpoint)	
	3	2003h	Unsigned 16	PO3 (default setting in *P5-10* =7; no function)	
	4	2004h	Unsigned 16	PO4 (default setting in *P5-11* =7; no function)	
Tx PDO1	1	2101h	Unsigned 16	PI1 status word (fixed)	1
	2	2102h	Integer 16	PI2 (default setting in *P5-12* =1; actual speed)	
	3	2103h	Unsigned 16	PI3 (default setting in *P5-13* =2; actual current)	
	4	2104h	Integer 16	PI4 (default setting in *P5-14* =4; power)	
Rx PDO 2	1	2016h	Unsigned 16	Fieldbus analog output 1	1
	2	2017h	Unsigned 16	Fieldbus analog output 2	
	3	2015h	Unsigned 16	Fieldbus PID reference	
	4	0006h	Unsigned 16	Dummy	
Tx PDO2	1	2118h	Unsigned 16	Analog input 1	1
	2	2119h	Integer 16	Analog input 2	
	3	211Ah	Unsigned 16	State of inputs and outputs	
	4	2116h	Unsigned 16	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.

13.4.6 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 7	Byte 8	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

31554814/EN – 10/2023

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 address
3	0x201	Rx-PDO1 + device address 1	–	–	Ramp specification		Setpoint speed		Control word	
4	0x080	SYNC telegram	–	–	–	–	–	–	–	–
5	0x181	Tx PDO1 + device address	Output power		Output current		Actual speed		Status word	
6	0x281	Tx PDO2 + device address	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.

13.4.7 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	LTPB
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. 1.12)
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	Depends on inverter
	3	Revision number	RO	Unsigned 32	N	x.xx (IDL version: 0.33)
	4	Serial number	RO	Unsigned 32	N	e.g. 1234/56/789 [1]
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	00000200h+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	00000300h+Node ID
	2	Rx PDO2 transmission type	RW	Unsigned 8	N	1

31554814/EN – 10/2023

CANopen-specific objects						
Index	**Sub index**	**Function**	**Access**	**Type**	**PDO map**	**Default value**
1600h	0	Rx PDO1 mapping / no. of entries	RW	Unsigned 8	N	4
	1	Rx PDO1 1st mapped object	RW	Unsigned 32	N	20010010h
	2	Rx PDO1 2nd mapped object	RW	Unsigned 32	N	20020010h
	3	Rx PDO1 3rd mapped object	RW	Unsigned 32	N	20030010h
	4	Rx PDO1 4th mapped object	RW	Unsigned 32	N	20040010h
1601h	0	Rx PDO2 mapping / no. of entries	RW	Unsigned 8	N	4
	1	Rx PDO2 1st mapped object	RW	Unsigned 32	N	20160010h
	2	Rx PDO2 2nd mapped object	RW	Unsigned 32	N	20170010h
	3	Rx PDO2 3rd mapped object	RW	Unsigned 32	N	20150010h
	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 [100µs]	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 [100µs]	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	21010010h
	2	Tx PDO1 2nd mapped object	RW	Unsigned 32	N	21020010h
	3	Tx PDO1 3rd mapped object	RW	Unsigned 32	N	21030010h
	4	Tx PDO1 4th mapped object	RW	Unsigned 32	N	21040010h
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

1) Output of the last 9 numbers of the serial number.

13.4.8 Table of manufacturer-specific objects

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

Manufacturer-specific objects						
Index	**Sub index**	**Function**	**Access**	**Type**	**PDO map**	**Note**
2000h	0	Reserved / no function	RW	Unsigned 16	Y	Read as 0, writing not possible
2001h	0	PO1	RW	Integer 16	Y	Defined as command
2002h	0	PO2	RW	Integer 16	Y	Configured by *P5-09*
2003h	0	PO3	RW	Integer 16	Y	Configured by *P5-10*
2004h	0	PO4	RW	Integer 16	Y	Configured by *P5-11*
2010h	0	Control command register	RW	Unsigned 16	Y	
2011h	0	Speed reference (RPM)	RW	Integer 16	Y	1 = 0.2 RPM
2012h	0	Speed reference (percentage)	RW	Integer 16	Y	4000HEX = 100% *P1-01*
2013h	0	Torque reference	RW	Integer 16	Y	1000DEC = 100%
2014h	0	User ramp reference	RW	Unsigned 16	Y	1 = 1 ms (reference to 50 Hz)
2015h	0	Fieldbus PID reference	RW	Integer 16	Y	1000HEX = 100%
2016h	0	Fieldbus analog output 1	RW	Integer 16	Y	1000HEX = 100%
2017h	0	Fieldbus analog output 2	RW	Integer 16	Y	1000HEX = 100%
2100h	0	Reserved / no function	RO	Unsigned 16	Y	Read as 0
2101h	0	PI1	RO	Integer 16	Y	Defined as status
2102h	0	PI2	RO	Integer 16	Y	Configured by *P5-12*

Manufacturer-specific objects						
Index	**Sub index**	**Function**	**Access**	**Type**	**PDO map**	**Note**
2103h	0	PI3	RO	Integer 16	Y	Configured by *P5-13*
2104h	0	PI4	RO	Integer 16	Y	Configured by *P5-14*
2110h	0	Drive status register	RO	Unsigned 16	Y	
2111h	0	Speed reference (RPM)	RO	Integer 16	Y	1 = 0.2 RPM
2112h	0	Speed reference (percentage)	RO	Integer 16	Y	4000HEX = 100 % *P1-01*
2113h	0	Motor current	RO	Integer 16	Y	1000DEC = rated inverter current
2114h	0	Motor torque	RO	Integer 16	Y	1000DEC = rated motor torque
2115h	0	Motor power	RO	Unsigned 16	Y	1000DEC = inverter nominal power
2116h	0	Inverter temperature	RO	Integer 16	Y	1DEC = 0.01 °C
2117h	0	DC bus value	RO	Integer 16	Y	1DEC = 1 V
2118h	0	Analog input 1	RO	Integer 16	Y	1000HEX = entire range
2119h	0	Analog input 2	RO	Integer 16	Y	1000HEX = entire range
211Ah	0	Digital input & output status	RO	Unsigned 16	Y	LB= input, HB = output
211Bh	0	Analog output 1	RO	Integer 16	Y	
211Ch	0	Analog output 2	RO	Integer 16	Y	
2121h	0	Scope channel 1	RO	Unsigned 16	Y	
2122h	0	Scope channel 2	RO	Unsigned 16	Y	
2123h	0	Scope channel 3	RO	Unsigned 16	Y	
2124h	0	Scope channel 4	RO	Unsigned 16	Y	
2AF8h[1)]	0	SBus parameter start index	RO	-	N	11000d
…	0	SBus parameters	RO/RW	-	N	…
2C6F	0	SBus parameter end index	RW	-	N	11375d

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

13.4.9 Emergency code objects

See chapter "Fault list" (→ 🗎 204).

31554814/EN – 10/2023

14 Service

To ensure fault-free operation, SEW-EURODRIVE recommends that you check the ventilation openings in the housing at regular intervals and clean them if necessary.

14.1 SEW-EURODRIVE Service

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

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

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

31554814/EN – 10/2023

14.2 Extended storage

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

Procedure in the event of omitted maintenance:

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

In the event of omitted maintenance, SEW-EURODRIVE recommends that you slowly increase the line voltage up to the maximum voltage. This can be done, for example, using a variable transformer whose output voltage is set according to the following overview.

The following graduations are recommended:

AC-200 to 240-V devices:

- Stage 1: AC 0 V to AC 170 V within a few seconds
- Stage 2: AC 170 V for 15 minutes
- Stage 3: AC 200 V for 15 minutes
- Stage 4: AC 240 V for 1 hour

AC-380 to 480-V devices:

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

AC 500 to 600-V devices:

- Stage 1: AC 0 V to AC 350 V within a few seconds
- Stage 2: AC 350 V for 15 minutes
- Stage 3: AC 420 V for 15 minutes
- Stage 4: AC 500 V for 15 minutes
- Stage 5: AC 600 V for 1 hour

AC-480 to 525-V devices:

- Stage 1: AC 0 V to AC 350 V within a few seconds
- Stage 2: AC 350 V for 15 minutes
- Stage 3: AC 420 V for 15 minutes
- Stage 4: AC 525 V for 1 hour

After this regeneration, the device can be used immediately or put back into storage with maintenance.

31554814/EN – 10/2023

14.3 Shutdown

⚠ WARNING

Risk of burns due to hot surfaces.

Severe injuries.

- Let the devices cool down before touching them.

⚠ WARNING

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

Severe or fatal injuries.

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

To shut down the device, de-energize the device using appropriate measures. Disconnect the 400 V line voltage and the 24 V backup voltage from the device.

14.4 IT security guidelines for secure disposal

14.4.1 Removing the product from its intended environment

If the data stored on the product is considered relevant for IT security, remove it as described in the section "Secure removal of data stored in the product." (→ 🗎 227)

14.4.2 Removing reference and configuration data in the environment

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

14.4.3 Secure removal of data stored in the product

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

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

- Configuration of the device
- Scope recording of the device
- Fault memory
  - Fault number

31554814/EN – 10/2023

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

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

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

14.4.4 Removing a customer data backup

The product does not create local customer data backups.

31554814/EN – 10/2023

14.5 Waste disposal

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

- Iron, steel or cast iron
- Stainless steel
- Magnets
- Aluminum
- Copper
- Electronic parts
- Plastics

The following materials are hazardous to health and the environment. These materials must be collected and disposed of separately:

- Oil and grease

  Collect used oil and grease separately according to type. Ensure that the used oil is not mixed with solvent. Dispose of used oil and grease correctly.
- Screens
- Capacitors

Waste disposal according to WEEE Directive 2012/19/EU

This product and its accessories may fall within the scope of the country-specific application of the WEEE Directive. Dispose of the product and its accessories according to the national regulations of your country.

For further information, contact the responsible SEW-EURODRIVE branch or an authorized partner of SEW-EURODRIVE.

31554814/EN – 10/2023

15 Address list

Argentina			
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
Australia			
Assembly Sales Service	Melbourne	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. +61 3 9933-1000 Fax +61 3 9933-1003 http://www.sew-eurodrive.com.au enquires@sew-eurodrive.com.au
	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au
Service	Tomago	SEW-EURODRIVE PTY. LTD. 8 Epson Drive Tomago, New South Wales, 2322	Tel. +61 2 49505585 mail@sew-eurodrive.com.au
Austria			
Assembly Sales Service	Vienna	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Straße 24 1230 Wien	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://www.sew-eurodrive.at sew@sew-eurodrive.at
Bangladesh			
Sales	Bangladesh	SEW-EURODRIVE INDIA PRIVATE LIMITED 345 DIT Road East Rampura Dhaka-1219, Bangladesh	Tel. +88 01729 097309 salesdhaka@seweurodrivebangladesh.com
Belgium			
Assembly Sales Service	Brussels	SEW-EURODRIVE n.v./s.a. Researchpark Haasrode 1060 Evenementenlaan 7 3001 Haasrode	Tel. +32 16 386-311 Fax +32 16 386-336 http://www.sew-eurodrive.be info@sew-eurodrive.be
Service Competence Center	Industrial Gears	SEW-EURODRIVE n.v./s.a. Rue du Parc Industriel, 31 6900 Marche-en-Famenne	Tel. +32 84 219-878 Fax +32 84 219-879 http://www.sew-eurodrive.be info@sew.be
Brazil			
Production Sales Service	São Paulo	SEW-EURODRIVE Brasil Ltda. Estrada Municipal José Rubim, 205 – Rodovia Santos Dumont Km 49 Indaiatuba – 13347-510 – SP	Tel. +55 19 3835-8000 sew@sew.com.br
Assembly Sales Service	Rio Claro	SEW-EURODRIVE Brasil Ltda. Rodovia Washington Luiz, Km 172 Condomínio Industrial Conpark Caixa Postal: 327 13501-600 – Rio Claro / SP	Tel. +55 19 3522-3100 Fax +55 19 3524-6653 montadora.rc@sew.com.br
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31554814/EN – 10/2023

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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
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2001 Ch. de l'Aviation Dorval Quebec H9P 2X6	Tel. +1 514 367-1124 Fax +1 514 367-3677 n.paradis@sew-eurodrive.ca
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	Wuhan	SEW-EURODRIVE (Wuhan) Co., Ltd. 10A-2, 6th Road No. 59, the 4th Quanli Road, WEDA 430056 Wuhan	Tel. +86 27 84478388 Fax +86 27 84478389 wuhan@sew-eurodrive.cn
	Xi'An	SEW-EURODRIVE (Xi'An) Co., Ltd. No. 12 Jinye 2nd Road Xi'An High-Technology Industrial Development Zone Xi'An 710065	Tel. +86 29 68686262 Fax +86 29 68686311 xian@sew-eurodrive.cn
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31554814/EN – 10/2023

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31554814/EN – 10/2023

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31554814/EN – 10/2023

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	Ulm	SEW-EURODRIVE GmbH & Co KG Dieselstraße 18 89160 Dornstadt	Tel. +49 7348 9885-0 Fax +49 7348 9885-90 dc-ulm@sew-eurodrive.de
	Würzburg	SEW-EURODRIVE GmbH & Co KG Nürnbergerstraße 118 97076 Würzburg-Lengfeld	Tel. +49 931 27886-60 Fax +49 931 27886-66 dc-wuerzburg@sew-eurodrive.de
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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 https://vov.is/ vov@vov.is
India			
Registered Office Assembly Sales Service	Vadodara	SEW-EURODRIVE India Private Limited 302, NOTUS IT PARK, Sarabhai Campus, Beside Notus Pride, Genda Circle, Vadodara 390023 Gujarat	Tel. +91 265 3045200 Fax +91 265 3045300 https://www.seweurodriveindia.com salesvadodara@seweurodriveindia.com
Assembly Sales Service	Chennai	SEW-EURODRIVE India Private Limited Plot No. K3/1, Sipcot Industrial Park Phase II Mambakkam Village Sriperumbudur - 602105 Kancheepuram Dist, Tamil Nadu	Tel. +91 44 37188888 Fax +91 44 37188811 saleschennai@seweurodriveindia.com
	Pune	SEW-EURODRIVE India Private Limited Plant: Plot No. D236/1, Chakan Industrial Area Phase- II, Warale, Tal- Khed, Pune-410501, Maharashtra	Tel. +91 21 35 628700 Fax +91 21 35 628715 salespune@seweurodriveindia.com
	Tapukara	SEW-EURODRIVE India Private Limited Plot No SP-6-46, Tapukara, Karoli Industrial Area, No. 1, district : Alwar , Rajasthan - 301707	Tel. +91 265 3045200 Fax +91 265 3045300 tapukara.plant@seweurodriveindia.com

31554814/EN – 10/2023

India			
Sales	Gurgaon	SEW-EURODRIVE India Private Limited Global Business Park, Sector -26, M.G. Road, Sikanderpur Unit No. 205, 2nd Floor, Tower – D Gurugram 122002, Haryana	Tel. +91 9958376669 salesgurgaon@seweurodriveindia.com
Drive Center	Raipur	SEW-EURODRIVE India Private Limited Plot unit no. 129/17 P.O. GSI-Mandhar District: Raipur, State: Chhattisgarh	Tel. +91 8294630772 salesraipur@seweurodriveindia.com
Indonesia			
Registered Office Sales Service	Jakarta	PT SEW EURODRIVE INDONESIA Palma Tower, 16th Floor, Unit H & I, Jl R.A. Kartini II-S Kav 06 Pondok Pinang, Kebayoran Lama Jakarta Selatan 12310	Tel. +62 21 7593 0272 Fax +62 21 7593 0273 sales.indonesia@sew-eurodrive.com https://www.sew-eurodrive.com.sg
Sales	Medan	PT. Serumpun Indah Lestari Jl.Pulau Solor no. 8, Kawasan Industri Medan II Medan 20252	Tel. +62 61 687 1221 Fax +62 61 6871429 / +62 61 6871458 / +62 61 30008041 sil@serumpunindah.com serumpunindah@yahoo.com http://www.serumpunindah.com
	Jakarta	PT. Cahaya Sukses Abadi Komplek Rukan Puri Mutiara Blok A no 99, Sunter Jakarta 14350	Tel. +62 21 65310599 Fax +62 21 65310600 csajkt@cbn.net.id
	Jakarta	PT. Agrindo Putra Lestari JL.Pantai Indah Selatan, Komplek Sentra Industri Terpadu, Pantai indah Kapuk Tahap III, Blok E No. 27 Jakarta 14470	Tel. +62 21 2921-8899 Fax +62 21 2921-8988 aplindo@indosat.net.id http://www.aplindo.com
	Surabaya	PT. TRIAGRI JAYA ABADI Jl. Sukosemolo No. 63, Galaxi Bumi Permai G6 No. 11 Surabaya 60111	Tel. +62 31 5990128 Fax +62 31 5962666 sales@triagri.co.id http://www.triagri.co.id
	Surabaya	CV. Multi Mas Jl. Raden Saleh 43A Kav. 18 Surabaya 60174	Tel. +62 31 5458589 Fax +62 31 5317220 sianhwa@sby.centrin.net.id http://www.cvmultimas.com
Ireland			
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
Israel			
Sales	Tel Aviv	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 http://www.liraz-handasa.co.il office@liraz-handasa.co.il
Italy			
Assembly Sales Service	Milan	SEW-EURODRIVE S.a.s. di SEW S.r.l. & Co. Via Bernini,12 20033 Solaro (Milano)	Tel. +39 02 96 980229 Fax +39 02 96 980 999 http://www.sew-eurodrive.it milano@sew-eurodrive.it
Ivory Coast			
Sales	Abidjan	SEW-EURODRIVE SARL Ivory Coast Rue des Pêcheurs, Zone 3 26 BP 916 Abidjan 26	Tel. +225 27 21 21 81 05 Fax +225 27 21 25 30 47 info@sew-eurodrive.ci http://www.sew-eurodrive.ci
Japan			
Assembly Sales Service	Iwata	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 http://www.sew-eurodrive.co.jp sewjapan@sew-eurodrive.co.jp

31554814/EN – 10/2023

Kazakhstan			
Sales Service	Almaty	SEW-EURODRIVE LLP 291-291A, Tole bi street 050031, Almaty	Tel. +7 (727) 350 5156 Fax +7 (727) 350 5156 http://www.sew-eurodrive.com kazakhstan@sew-eurodrive.com
	Tashkent	Representative Office SEW-EURODRIVE Representative office in Uzbekistan 95A Amir Temur ave, office 401/3 100084 Tashkent	Tel. +998 97 134 01 99 http://www.sew-eurodrive.uz sew@sew-eurodrive.uz
	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230, MN	Tel. +976-77109997 Fax +976-77109997 imt@imt.mn
Latvia			
Sales	Riga	SIA Alas-Kuul Katlakalna 11C 1073 Riga	Tel. +371 6 7139253 Fax +371 6 7139386 http://www.alas-kuul.lv info@alas-kuul.com
Lebanon			
Sales (Lebanon)	Beirut	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 510 532 Fax +961 1 494 971 ssacar@inco.com.lb
Sales (Jordan, Kuwait , Saudi Arabia, Syria)	Beirut	Middle East Drives S.A.L. (offshore) Sin El Fil. B. P. 55-378 Beirut	Tel. +961 1 494 786 Fax +961 1 494 971 http://www.medrives.com info@medrives.com
Lithuania			
Sales	Alytus	UAB Irseva Statybininku 106C 63431 Alytus	Tel. +370 315 79204 Fax +370 315 56175 http://www.irseva.lt irmantas@irseva.lt
Luxembourg			
Representation: Belgium			
Macedonia			
Sales	Skopje	Boznos DOOEL Dime Anicin 2A/7A 1000 Skopje	Tel. +389 23256553 Fax +389 23256554 http://www.boznos.mk
Malaysia			
Assembly Sales Service	Johor	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my
Mexico			
Assembly Sales Service	Quéretaro	SEW-EURODRIVE MEXICO S.A. de C.V. SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Quéretaro C.P. 76220 Querétaro, México	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
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
Mongolia			
Technical Office	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230, MN	Tel. +976-77109997 Tel. +976-99070395 Fax +976-77109997 http://imt.mn/ imt@imt.mn

31554814/EN – 10/2023

Morocco			
Sales Service Assembly	Bouskoura	SEW-EURODRIVE Morocco SARL Parc Industriel CFCIM, Lot. 55/59 27182 Bouskoura Grand Casablanca	Tel. +212 522 88 85 00 Fax +212 522 88 84 50 http://www.sew-eurodrive.ma sew@sew-eurodrive.ma
Namibia			
Sales	Swakopmund	DB MINING & INDUSTRIAL SUPPLIES CC Einstein Street Strauss Industrial Park Unit1 Swakopmund	Tel. +264 64 462 738 Fax +264 64 462 734 anton@dbminingnam.com
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
New Zealand			
Assembly Sales Service	Auckland	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 30 Lodestar Avenue, Wigram Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz
Nigeria			
Sales	Lagos	Greenpeg Nig. Ltd 64C Toyin Street Opebi-Allen Ikeja Lagos-Nigeria	Tel. +234-701-821-9200-1 http://www.greenpegltd.com sales@greenpegltd.com
Norway			
Assembly Sales Service	Moss	SEW-EURODRIVE A/S Hornebergvegen 11 B 7038 Trondheim	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 Nu Guazu No. 642 casi Campo Esperanza Santisima Trinidad Asuncion	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

31554814/EN – 10/2023

Poland			
	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 http://www.sialco.ro sialco@sialco.ro
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. 9, Tuas Drive 2 Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com
Slovakia			
Drive Technology Center	Bernolákovo	SEW-Eurodrive SK s.r.o. Priemyselná ulica 6267/7 900 27 Bernolákovo	Tel.+421 2 48 212 800 http://www.sew-eurodrive.sk sew@sew-eurodrive.sk
Slovenia			
Representation: Austria			
South Africa			
Assembly Sales Service	Johannesburg	SEW-EURODRIVE (PROPRIETARY) LIMITED 32 O'Connor Place Eurodrive House Aeroton Johannesburg 2190 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

31554814/EN – 10/2023

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
	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
Assembly Service	Siheung	SEW-EURODRIVE Korea Co., Ltd. 35, Emtibeui 26-ro 58beon-gil, Siheung-si, Gyeonggi-do	http://www.sew-eurodrive.kr
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 Simunye street Matsapha, Manzini	Tel. +268 7602 0790 Fax +268 2 518 5033 charles@cgtrading.co.sz www.cgtradingswaziland.com
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 AG Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 61 417 17 17 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 https://www.sew-eurodrive.co.th
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

31554814/EN – 10/2023

Turkey			
Assembly Sales Service	Kocaeli-Gebze	SEW-EURODRIVE Ana Merkez 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
Ukraine			
Assembly Sales Service	Dnipropetrovsk	SEW-EURODRIVE, LLC Robochya str., bld. 23-B, office 409 49008 Dnipro	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua
United Arab Emirates			
Drive Technology Center	Dubai	SEW-EURODRIVE FZE PO Box 263835 Jebel Ali Free Zone – South, P.O. Box Dubai, United Arab Emirates	Tel. +971 (0)4 8806461 Fax +971 (0)4 8806464 info@sew-eurodrive.ae
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 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. 202 W. Danieldale Rd. DeSoto, TX 75115	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
		SEW-EURODRIVE INC. 220 Finch Rd. Wellford, S.C. 29385-9630	
	Additional addresses for service provided on request!		
Vietnam			
Sales	Ho Chi Minh City	SEW-EURODRIVE PTE. LTD. RO at Hochiminh City Floor 8, KV I, Loyal building, 151-151 Bis Vo Thi Sau street, ward 6, District 3, Ho Chi Minh City, Vietnam	Tel. +84 937 299 700 huytam.phan@sew-eurodrive.com
	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
Zambia			
Representation: South Africa			

31554814/EN – 10/2023

Index

Numerical

A

B

C

D

E

F

G

H

31554814/EN – 10/23

I

K

L

M

N

O

P

31554814/EN – 10/23

31554814/EN – 10/23

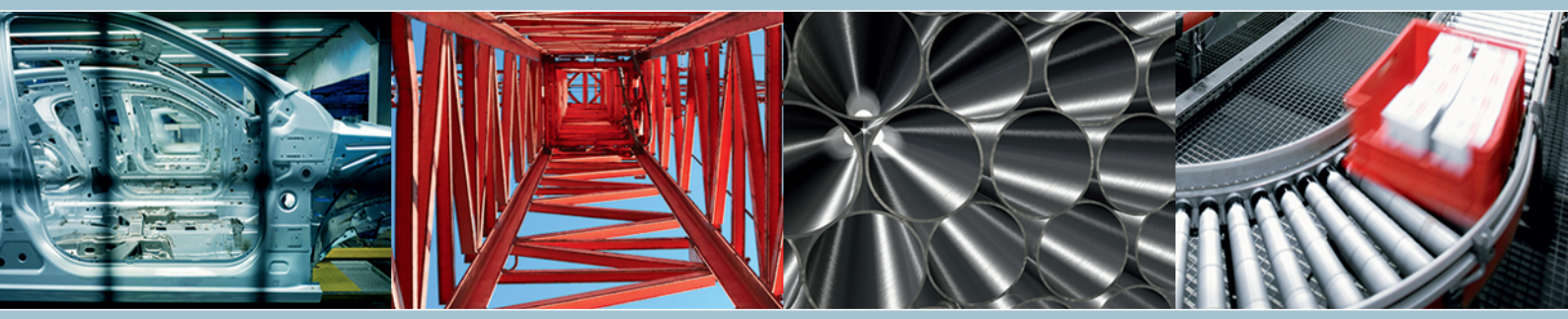
31554814/EN – 10/23

R

S

31554814/EN – 10/23

31554814/EN – 10/23



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