



SEW
EURODRIVE

Product Manual



Frequency Inverters **MOVITRAC® LTE-B+**



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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

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.

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

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2 Safety notes

2.1 Preliminary information

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

2.2 Duties of the user

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

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

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

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

- The national and regional regulations governing safety and the prevention of accidents
- Product safety label on the product
- All other associated project planning documents, installation and startup instructions, as well as wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and regulations

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.

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

2.4 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 into a network (e.g. a fieldbus, WLAN, or Ethernet network), it is possible to make settings even more remotely. This brings with it the risk of a parameter change that is not visible externally resulting in unexpected, but not uncontrolled system behavior, and this may impact negatively on operational security, system availability, or data security.

Make sure that unauthorized access is not possible, especially for WLAN- or 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 guaranteed 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.

Only connect ohmic/inductive loads.

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

- AC asynchronous motors
- AC synchronous motors

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

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

2.5.1 Lifting applications

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

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:

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

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

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

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

2.6 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" (→ 23) of the documentation.

2.7 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".

2.8 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).

2.8.1 Required preventive measure

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

2.8.2 Stationary application

The necessary preventive measure for the product is:

Type of energy transfer	Preventive measure
Direct power supply	Ground connection

2.8.3 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.

2.9 Protective separation

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

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

2.10 Startup/operation

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

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

Additional preventive measures may be required for applications with increased hazard potential. Be sure to check the effectiveness of the protection devices after every modification.

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

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

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

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

10 minutes.

Observe the corresponding information signs on the product.

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

Mechanical blocking or internal protective functions of the product can cause a motor standstill. Removing the cause of this problem or performing a reset can result in the machine or the system re-starting on its own. First, disconnect the product from the supply system before you start troubleshooting.

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

3 Product description

3.1 Technology

The MOVITRAC®-LTE-B+ device family is the entry level product series of the powerful frequency inverter portfolio from SEW-EURODRIVE. 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 0.37 kW up to a maximum rating of 37 kW for the IP20 design.

Inverters with a power rating of 0.37 kW to 22 kW are available with an IP66 degree of protection for use in environments that are heavily subjected to dust and splash water. The devices are available with or without integrated switches.

All variants feature an integrated keypad as standard, which, in combination with the removable "Helpcard", enables simple and intuitive startup and operating procedures.

In addition to a simple V/f voltage control system, all LTE-B+ devices are also equipped with a field-oriented open-loop vector control unit, which enables both the optimized operation of AC asynchronous motors, as well as the additional operation of other motor types, such as the LSPM (Line Start Permanent Magnet Motor) IE4 drive from SEW-EURODRIVE:

Extensive diagnostics methods are available to the user to ensure smooth system operation and to minimize downtimes. In addition to 50 diagnostics parameters, MOVITRAC® LTE-B+ also offers a powerful scope function, which can be operated via the LT Shell software.

The extensive functionality is rounded off by the standard bus systems, namely Modbus RTU, CANopen, and SEW-EURODRIVE SBus, which enable the MOVITRAC® LTE-B+ to be easily integrated into the fieldbus network on the system side.

3.2 Markets and applications

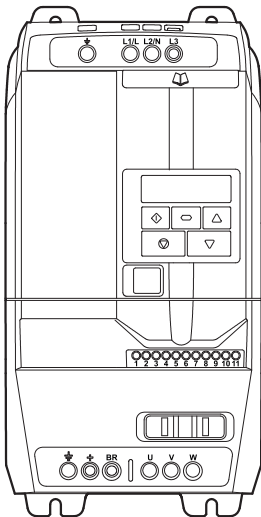
The MOVITRAC® LTE-B+ product series is intended for a wide market that requires general speed control. End customers with large quantities as well as OEMs benefit from this series, as the time needed for startup is reduced significantly due to the user-friendliness and the innovative mechanical design.

The simple but powerful functions as well as the available accessories make MOVITRAC® LTE-B+ suited for a wide variety of applications.

Typical applications are:

- Pumps for water supply systems, the paper industry, and sewage systems
- Temperature control systems for air-conditioners, energy efficient applications, and refrigeration systems
- Compressors for refrigeration systems and compressed-air systems
- Conveyor belts

3.3 Product overview of MOVITRAC® LTE-B+

Frequency inverter	
LTE-B+	- Performance classes: 0.37 – 37 kW - Voltage range: – 1 × 110 – 115 V – 1 × 200 – 240 V – 3 × 200 – 240 V – 3 × 380 – 480 V - Overload capacity: 150% for 60 s, 175% for 2 s - Integrated keypad (keypad with 7-segment display) - Integrated engineering interface - Integrated Modbus RTU and CANopen interface - Housing designs IP20 and IP66 – IP20/NEMA 1 – IP66/NEMA 4X (with and without switch option) For information about this device, refer to the following documents: "MOVITRAC® LTE-B+ Frequency Inverters" operating instructions
	
Option cards	
LTWP140-A	Angle board for option cards IP66/NEMA 4K housing, size 1
OB LT 2ROUT B	Second relay output
OB LT HAVAC-B	Second signal relay
OB LT VCON A	110 V/24 V converter card
OB LT VCON B	230 V/24 V converter card
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 005 A2	Basic package (cable set A)
LT OP 005 B2, LT OP 010 B2	Extension package (cable set B)

Accessories	
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
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

3.4.1 MOVITRAC® LTE-B+ without filter

Line connection	Motor power	Nominal output current	Type designation	Degree of protection	Size
110 – 115 V 1-phase	0.37 kW	2.3 A	MCLTEB0004-101-1-00	IP20	1
			MCLTEB0004-101-1-30	IP66	1
			MCLTEB0004-101-1-40	IP66	1
	0.75 kW	4.3 A	MCLTEB0008-101-1-00	IP20	1
			MCLTEB0008-101-1-30	IP66	1
			MCLTEB0008-101-1-40	IP66	1
	1.1 kW	5.8 A	MCLTEB0011-101-4-00	IP20	2
			MCLTEB0011-101-4-30	IP66	2
			MCLTEB0011-101-4-40	IP66	2

3.4.2 MOVITRAC® LTE-B+ with filter

Line connection	Motor power	Nominal output current	Type designation	Degree of protection	Size
200 – 240 V 1-phase	0.37 kW	2.3 A	MCLTEB0004-2B1-1-00	IP20	1
			MCLTEB0004-2B1-1-30	IP66	1
			MCLTEB0004-2B1-1-40	IP66	1
	0.75 kW	4.3 A	MCLTEB0008-2B1-1-00	IP20	1
			MCLTEB0008-2B1-1-30	IP66	1
			MCLTEB0008-2B1-1-40	IP66	1
	1.5 kW	7 A	MCLTEB0015-2B1-1-00	IP20	1
			MCLTEB0015-2B1-1-30	IP66	1
			MCLTEB0015-2B1-1-40	IP66	1
	1.5 kW	7 A	MCLTEB0015-2B1-4-00	IP20	2
			MCLTEB0015-2B1-4-30	IP66	2
			MCLTEB0015-2B1-4-40	IP66	2
	2.2 kW	10.5 A	MCLTEB0022-2B1-4-00	IP20	2
			MCLTEB0022-2B1-4-30	IP66	2
			MCLTEB0022-2B1-4-40	IP66	2
	4 kW	16 A	MCLTEB0040-2B1-4-00	IP20	3
			MCLTEB0040-2B1-4-30	IP66	3
			MCLTEB0040-2B1-4-40	IP66	3
200 – 240 V 3-phase	1.5 kW	7 A	MCLTEB0015-2A3-4-00	IP20	2
			MCLTEB0015-2A3-4-30	IP66	2
			MCLTEB0015-2A3-4-40	IP66	2
	2.2 kW	10.5 A	MCLTEB0022-2A3-4-00	IP20	2
			MCLTEB0022-2A3-4-30	IP66	2
			MCLTEB0022-2A3-4-40	IP66	2
	4.0 kW	18 A	MCLTEB0040-2A3-4-00	IP20	3
			MCLTEB0040-2A3-4-30	IP66	3
			MCLTEB0040-2A3-4-40	IP66	3
	5.5 kW	24 A	MCLTEB0055-2A3-4-00	IP20	3
			MCLTEB0055-2A3-4-30	IP66	3
			MCLTEB0055-2A3-4-40	IP66	3
	7.5 kW	30 A	MCLTEB0075-2A3-4-00	IP20	4
			MCLTEB0075-2A3-4-30	IP66	4
			MCLTEB0075-2A3-4-40	IP66	4
	11 kW	46 A	MCLTEB0110-2A3-4-00	IP20	4
			MCLTEB0110-2A3-4-30	IP66	4
			MCLTEB0110-2A3-4-40	IP66	4
	15 kW	61 A	MCLTEB0150-2A3-4-00	IP20	5
	18.5 kW	72 A	MCLTEB0185-2A3-4-00	IP20	5

Line connection	Motor power	Nominal output current	Type designation	Degree of protection	Size
380 – 480 V 3-phase	0.75 kW	2.2 A	MCLTEB0008-5A3-1-00	IP20	1
			MCLTEB0008-5A3-1-30	IP66	1
			MCLTEB0008-5A3-1-40	IP66	1
	1.5 kW	4.1 A	MCLTEB0015-5A3-1-00	IP20	1
			MCLTEB0015-5A3-1-30	IP66	1
			MCLTEB0015-5A3-1-40	IP66	1
	1.5 kW	4.1 A	MCLTEB0015-5A3-4-00	IP20	2
			MCLTEB0015-5A3-4-30	IP66	2
			MCLTEB0015-5A3-4-40	IP66	2
	2.2 kW	5.8 A	MCLTEB0022-5A3-4-00	IP20	2
			MCLTEB0022-5A3-4-30	IP66	2
			MCLTEB0022-5A3-4-40	IP66	2
	4 kW	9.5 A	MCLTEB0040-5A3-4-00	IP20	2
			MCLTEB0040-5A3-4-30	IP66	2
			MCLTEB0040-5A3-4-40	IP66	2
	5.5 kW	14 A	MCLTEB0055-5A3-4-00	IP20	3
			MCLTEB0055-5A3-4-30	IP66	3
			MCLTEB0055-5A3-4-40	IP66	3
	7.5 kW	18 A	MCLTEB0075-5A3-4-00	IP20	3
			MCLTEB0075-5A3-4-30	IP66	3
			MCLTEB0075-5A3-4-40	IP66	3
	11 kW	24 A	MCLTEB0110-5A3-4-00	IP20	3
			MCLTEB0110-5A3-4-30	IP66	3
			MCLTEB0110-5A3-4-40	IP66	3
	15 kW	30 A	MCLTEB0150-5A3-4-00	IP20	4
			MCLTEB0150-5A3-4-30	IP66	4
			MCLTEB0150-5A3-4-40	IP66	4
	18.5 kW	39 A	MCLTEB0185-5A3-4-00	IP20	4
			MCLTEB0185-5A3-4-30	IP66	4
			MCLTEB0185-5A3-4-40	IP66	4
	22 kW	46 A	MCLTEB0220-5A3-4-00	IP20	4
			MCLTEB0220-5A3-4-30	IP66	4
			MCLTEB0220-5A3-4-40	IP66	4
	30 kW	61 A	MCLTEB0300-5A3-4-00	IP20	5
	37 kW	72 A	MCLTEB0370-5A3-4-00	IP20	5

3.5 Controls/control signal source

You can control the inverters via the following control signal sources:

- Terminals
- Keypad
- Fieldbus

3.6 Operating modes/motor controls

You can operate the inverters in the following ways:

- V/f control for asynchronous motors
- LVFC speed control for asynchronous motors
- PMVC speed control for synchronous motors
- LSPM speed control for SEW motors with LSPM technology
- SYN-R speed control for synchronous reluctance motors
- BLDC speed control for brushless DC motors

3.7 Functions

The MOVITRAC® LTE-B+ inverters have the following functions:

- Process controller (PI controller)
- 4 fixed setpoints
- Flying start function
- Fire mode/emergency mode
- Fieldbus/manual mode switch
- Standby function/energy-saving function
- Parameter lock
- DC braking
- Master/slave speed control
- 3-wire-control
- Motor potentiometer

4 Technical data

4.1 Markings

The following table contains an explanation of all markings that might be shown on the nameplate or attached to the motor.

Mark	Definition
	The CE mark states 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 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 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 UL and cUL mark indicates UL approval. cUL is equally eligible for approval by the CSA.
	The RCM mark indicates compliance with the technical regulations of the Australian Communications and Media Authority (ACMA).
	The UKCA mark indicates compliance with British guidelines.
	The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU.
	CMIM mark to confirm compliance with the technical regulations of Morocco. The CMIM mark is currently in preparation.

All products meet the following international standards:

- UL 508C for power conversion equipment
- EN 61800-3:2004/A1:2012 Adjustable speed electrical power drive systems – Part 3
- Degree of protection 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 inverters: 3S3/3C3
- Shock resistance/vibration resistance according to: IEC 60068-2-29, IEC 60068-2-64, IEC 60068-2-6

4.2 General technical data

Derating depending on the ambient temperature	4%/°C to 55 °C for inverters with degree of protection IP20/NEMA 1
	3%/°C to 50 °C for inverters with degree of protection IP66/NEMA 4X
Maximum installation altitude for nominal operation	1000 m
Derating above 1000 m	1%/100 m to max. 2000 m with UL
	1%/100 m to max. 4000 m without UL
Unit designs	IP20/NEMA 1
	IP66/NEMA 4X

4.3 Environmental conditions

4.3.1 Climatic conditions

Extended storage	Weatherproof IEC 60721-3-1 class 1K21, non-condensing, no condensation Deviating from the standard: Temperature -40 °C to +60 °C
Transport	Weatherproof IEC 60721-3-2 class 2K11, non-condensing, no condensation Deviating from the standard: Temperature -40 °C to +60 °C
Operation ¹⁾ Protection class IP20	Stationary use, weatherproof IEC 60721-3-3 class 3K22, non-condensing, no condensation Deviating from the standard: • Temperature -20 °C to +50 °C • Maximum relative humidity 95%
Operation ¹⁾ Protection class IP66	Stationary use, weatherproof IEC 60721-3-3 class 3K22, non-condensing, no condensation Deviating from the standard: • Temperature -20 °C to +40 °C • Maximum relative humidity 95%

1) at the lowest possible PWM frequency

4.3.2 Special climatic conditions

Extended storage	Weatherproof IEC 60721-3-1 class 1Z1
Operation	Stationary use, weatherproof IEC 60721-3-3 class 3Z1

4.3.3 Biological conditions

Extended storage	Weatherproof IEC 60721-3-1 class 1B1
Transport	Weatherproof IEC 60721-3-2 class 2B1
Operation	Stationary use, weatherproof IEC 60721-3-3 class 3B1

4.3.4 Chemically active substances

Extended storage	Weatherproof IEC 60721-3-1 class 1C2 Deviating from the standard: no corrosive gases, no salt mist
Transport	Weatherproof IEC 60721-3-2 class 2C2, no sea water Deviating from the standard: no corrosive gases, no salt mist
Operation Protection class IP20	Stationary use, weatherproof ISO 9223 class C3 Deviating from the standard: no corrosive gases, no salt mist
Operation Protection class IP66	Stationary use, weatherproof ISO 9223 class C4 Deviating from the standard: no corrosive gases, no salt mist

4.3.5 Mechanically active substances

Extended storage	Weatherproof IEC 60721-3-1 class 1S10, no conductive dust
Transport	Weatherproof IEC 60721-3-2 class 2S1, no conductive dust
Operation Protection class IP20	Stationary use, weatherproof IEC 60721-3-3 class 3S5, no conductive dust
Operation Protection class IP66	Stationary use, weatherproof IEC 60721-3-3 class 3S6

4.3.6 Mechanical conditions

The specifications are characteristic values for the device test. The specifications are based on the test characteristic values according to IEC 60721-3-3 and correspond to class 3M5 according to EN 60721-3-3:1995.

Vibration (sinusoidal)	2 – 200 Hz: 1 g
Vibration (noise)	10 – 200 Hz: 0.3 m ² /s ³ 200 – 500 Hz: 0.1 m ² /s ³ Corresponds to approx. 0.95 g _{rms} (g _{rms} = r.m.s. acceleration value)
Shocks (half sine)	10 g at 11 ms shock duration

4.4 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

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

4.4.1 Input voltage ranges

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

MOVITRAC® LTE-B			
Nominal voltage according to EN 50160	Power	Connection type	Rated frequency
110 – 115 V ± 10%	0.37 – 1.1 kW	1-phase	50 – 60 Hz ± 5%
200 – 240 V ± 10%	0.37 – 4 kW	1-phase ¹⁾	
200 – 240 V ± 10%	1.5 – 18.5 kW	3-phase	
380 – 480 V ± 10%	0.75 – 37 kW	3-phase	

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

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



All 3-phase inverters can also be operated in 1-phase mode at device connection L1 and L2, taking into account a derating of 50% of the output current. Application example with SWER (Single-Wire Earth Return) supply systems. Size 4 inverters with degree of protection IP66/NEMA 4X are excluded from this rule.

4.4.2 Setting range

Operating mode/motor control (P-51)	Continuous setting range in relation to $n_{\max} = 3000 \text{ min}^{-1}$	Static control accuracy in relation to $n_{\max} = 3000 \text{ min}^{-1}$
0: LVFC speed control	1:20	±0.5%
1: V/f open-loop speed control	1:10	
2: Synchronous motor speed control (PMVC)	1:10	
3: Brushless DC motor speed control (BLDC)	1:10	
4: Synchronous reluctance motor speed control (SYN-R)	1:10	
5: LSPM speed control	1:10	

4.4.3 Overload capacity

The inverter supplies a constant output current of 100%.

All inverter types of MOVITRAC® LTE-B+ have the following overload capacity:

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

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

4.4.4 Protection function

The MOVITRAC® LTE-B+ inverters have the following protective functions:

- Output short circuit, phase-phase, phase-ground
- Output overcurrent
- Overload protection
 - the inverter responds to an overload as described in chapter "Overload capacity" (→ 28).
- Overvoltage fault
 - set to 123% of the maximum nominal line voltage of the inverter.
- Undervoltage fault
- Overtemperature fault
- Undertemperature fault
 - the inverter is shut down at a temperature below -20 °C.
- Line phase failure
 - an enabled inverter switches off with delay depending on the load.
- Thermal motor overload protection in accordance with NEC (National Electrical Code, US), UL508C
- Evaluation of TF, TH

4.4.5 1-phase system AC 110 – 115 V for 3-phase AC 230 V motors (voltage doubler)

Power 0.37 – 1.1 kW (IP20/IP66), device without filter

IP20/NEMA 1	Power in kW		
	0.37	0.75	1.1
MCLTEB..	0004-101-1-00	0008-101-1-00	0011-101-4-00
Part number	18261663	18261671	18261868

IP66/NEMA 4X – housing without switches	Power in kW		
	0.37	0.75	1.1
MCLTEB..	0004-101-1-30	0008-101-1-30	0011-101-4-30
Part number	18277497	18277500	18277519

IP66/NEMA 4X – housing with switches	Power in kW		
	0.37	0.75	1.1
MCLTEB..	0004-101-1-40	0008-101-1-40	0011-101-4-40
Part number	18277527	18277535	18277543

Input	Unit	Power in kW		
		0.37	0.75	1.1
Nominal line voltage V_{line} according to EN 50160	V	1 × AC 110 – 115 ± 10%		
Line frequency f_{line}	Hz	50/60 ± 5%		
Line fuse	A	10	25 (20) ¹⁾	32 (30) ¹⁾
Nominal input current	A	7.8	15.8	21.9

1) Recommended values for UL compliance.

Output	Unit	Power in kW		
		0.37	0.75	1.1
Recommended motor power	kW	0.37	0.75	1.1
Output voltage V_{motor}	V	$3 \times 20 - V_{line}$		
Output current	A	2.3	4.3	5.8
Apparent output power	kVA	0.9	1.7	2.3
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	50		100
Maximum motor cable length, un-shielded	m	75		150

General	Unit	Power in kW		
		0.37	0.75	1.1
Size		1		2
Nominal power loss 24 V	W	3.1		4.5
Minimum braking resistance value	Ω	–		47
Maximum device terminal cross section	mm ²	2.5 (6) ¹⁾		
Maximum control terminal cross section	mm ²	0.05 – 2.5		

1) When using 6 mm², M4 forked cable lugs

4.4.6 1-phase system AC 200 – 240 V for 3-phase motors

Power 0.37 – 4 kW (IP20/IP66), EMC filter class C1 in accordance with EN 61800-3

IP20/NEMA 1	Power in kW					
	0.37	0.75	1.5	2.2	4 ¹⁾	
MCLTEB..	0004-2B1-1-00	0008-2B1-1-00	0015-2B1-1-00	0015-2B1-4-00	0022-2B1-4-00	0040-2B1-4-00
Part number	18261728	18261752	18261787	18261892	18261930	18262139

1) C1 only with external line filter

IP66/NEMA 4X – housing without switches	Power in kW					
	0.37	0.75	1.5	2.2	4	
MCLTEB..	0004-2B1-1-30	0008-2B1-1-30	0015-2B1-1-30	0015-2B1-4-30	0022-2B1-4-30	0040-2B1-4-30
Part number	18276016	18276024	18276032	18276040	18276059	18276067

IP66/NEMA 4X – housing with switches	Power in kW					
	0.37	0.75	1.5	2.2	4	
MCLTEB..	0004-2B1-1-40	0008-2B1-1-40	0015-2B1-1-40	0015-2B1-4-40	0022-2B1-4-40	0040-2B1-4-40
Part number	18276253	18276261	18276288	18276296	18276318	18276326

Input	Unit	Power in kW				
		0.37	0.75	1.5	2.2	4
Nominal line voltage V_{line} according to EN 50160	V	1 × AC 200 – 240 ± 10%				
Line frequency f_{line}	Hz	50/60 ± 5%				
Line fuse	A	10 (6) ¹⁾	10	16 (17.5) ¹⁾	25	40
Nominal input current	A	3.7	7.5	12.9	19.2	29.2

1) Recommended values for UL compliance.

Output	Unit	Power in kW				
		0.37	0.75	1.5	2.2	4
Recommended motor power	kW	0.37	0.75	1.5	2.2	4
Output voltage V_{motor}	V	3 × 20 – U_{line}				
Output current	A	2.3	4.3	7	10.5	16
Apparent output power	kVA	0.9	1.7	2.3	4.2	6.4
PWM frequency	kHz	2/4/8/12/16				2/4/6/8/12
Speed range	min ⁻¹	-30000 – 0 – 30000				
Maximum output frequency	Hz	500				
Maximum motor cable length, shielded	m	50			100	
Maximum motor cable length, unshielded	m	75			150	

General	Unit	Power in kW				
		0.37	0.75	1.5	2.2	4
Size		1			2	3
Nominal power loss 24 V	W	3.1			4.5	5.2
Minimum braking resistance value	Ω	–			47	
Maximum device terminal cross section	mm ²	2 × 4 or (6) ¹⁾				2.5 (10) ²⁾
Maximum control terminal cross section	mm ²	0.05 – 2.5				

1) When using 6 mm², M4 forked cable lugs.

4.4.7 3-phase system AC 200 – 240 V for 3-phase motors

INFORMATION



All inverters with a power supply of $3 \times \text{AC } 200 - 240 \text{ V}$ can also be operated with $1 \times \text{AC } 200 - 240 \text{ V}$ at device connections L1 and L2 when observing a derating of 50% of the output current. Application example with SWER (Single-Wire Earth Return) supply systems.

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

Power 1.5 – 5.5 kW (IP20/IP66), EMC filter class C2 in accordance with EN 61800-3

IP20/NEMA 1	Power in kW			
	1.5	2.2	4	5.5
MCLTEB..	0015-2A3-4-00	0022-2A3-4-00	0040-2A3-4-00	0055-2A3-4-00
Part number	18261884	18261922	18262058	18267416

IP66/NEMA 4X – housing without switches	Power in kW			
	1.5	2.2	4	5.5
MCLTEB..	0015-2A3-4-30	0022-2A3-4-30	0040-2A3-4-30	0055-2A3-4-30
Part number	18276075	18276083	18276091	18276105

IP66/NEMA 4X – housing with switches	Power in kW			
	1.5	2.2	4	5.5
MCLTEB..	0015-2A3-4-40	0022-2A3-4-40	0040-2A3-4-40	0055-2A3-4-40
Part number	18276334	18276342	18276350	18276369

Input	Unit	Power in kW			
		1.5	2.2	4	5.5
Nominal line voltage V_{line} according to EN 50160	V	$3 \times \text{AC } 200 - 240 \pm 10\%$			
Line frequency f_{line}	Hz	$50/60 \pm 5\%$			
Line fuse	A	16 (15) ¹⁾	16 (17.5) ¹⁾	32 (30) ¹⁾	40 (35) ¹⁾
Nominal input current	A	9.5	12.1	20.9	26.4

1) Recommended values for UL compliance.

Output	Unit	Power in kW			
		1.5	2.2	4	5.5
Recommended motor power	kW	1.5	2.2	4	5.5
Output voltage V_{motor}	V	$3 \times 20 - V_{\text{line}}$			
Output current	A	7	10.5	18	24
Apparent output power	kVA	2.8	4.2	7.2	9.6
PWM frequency	kHz	2/4/6/8/12/16		2/4/6/8/12	
Speed range	min ⁻¹	-30000 – 0 – 30000			
Maximum output frequency	Hz	500			
Maximum motor cable length, shielded	m	100			
Maximum motor cable length, unshielded	m	150			

General	Unit	Power in kW			
		1.5	2.2	4	5.5
Size		2		3	
Nominal power loss 24 V	W	4.5		5.2	

4 Technical data

Device data

General	Unit	Power in kW			
		1.5	2.2	4	5.5
Minimum braking resistance value	Ω	47			22
Maximum device terminal cross section	mm ²	2 × 4 or (6) ¹⁾			
Maximum control terminal cross section	mm ²	0.05 – 2.5			

1) When using 6 mm², M4 forked cable lugs

Power 7.5 – 18.5 kW (IP20/IP66), EMC filter class C2 in accordance with EN 61800-3

IP20/NEMA 1	Power in kW			
	7.5	11	15	18.5
MCLTEB..	0075-2A3-4-00	0110-2A3-4-00	0150-2A3-4-00	0185-2A3-4-00
Part number	18267424	18267432	18267440	18267459

IP66/NEMA 4X – housing without switches	Power in kW			
	7.5	11	15	18.5
MCLTEB..	0075-2A3-4-30	0110-2A3-4-30	–	–
Part number	18276113	18276121	–	–

IP66/NEMA 4X – housing with switches	Power in kW			
	7.5	11	15	18.5
MCLTEB..	0075-2A3-4-40	0110-2A3-4-40	–	–
Part number	18276377	18276385	–	–

Input	Unit	Power in kW			
		7.5	11	15	18.5
Nominal line voltage V_{line} according to EN 50160	V	3 × AC 200 – 240 ± 10%			
Line frequency f_{line}	Hz	50/60 ± 5%			
Line fuse	A	40 (45) ¹⁾	63 (70) ¹⁾	80 (70) ¹⁾	80
Nominal input current	A	33.3	50.1	54.6	64.8

1) Recommended values for UL compliance.

Output	Unit	Power in kW			
		7.5	11	15	18.5
Recommended motor power	kW	7.5	11	15	18.5
Output voltage V_{motor}	V	3 × 20 – V_{line}			
Output current	A	30	46	61	72
Apparent output power	kVA	11.9	18.3	24.3	28.7
PWM frequency	kHz	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	m	150			

General	Unit	Power in kW			
		7.5	11	15	18.5
Size		4		5	
Nominal power loss 24 V	W	7.5		8.8	
Minimum braking resistance value	Ω	22	12	6	
Maximum device terminal cross section	mm²	16		35	
Maximum control terminal cross section	mm²	0.05 – 2.5			

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4.4.8 3-phase system AC 380 – 480 V for 3-phase motors

INFORMATION



All inverters with a power supply of $3 \times \text{AC } 380 - 480 \text{ V}$ can also be operated with $1 \times \text{AC } 380 - 480 \text{ V}$ at device connections L1 and L2 when observing a derating of 50% of the output current. Application example with SWER (Single-Wire Earth Return) supply systems.

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

Power 0.75 – 4 kW (IP20/IP66), EMC filter class C2 in accordance with EN 61800-3

IP20/NEMA 1	Power in kW				
	0.75	1.5	2.2	4	
MCLTEB..	0008-5A3-1-00	0015-5A3-1-00	0015-5A3-4-00	0022-5A3-4-00	0040-5A3-4-00
Part number	18261809	18261825	18261957	18261973	18262007

IP66/NEMA 4X – housing without switches	Power in kW				
	0.75	1.5	2.2	4	
MCLTEB..	0008-5A3-1-30	0015-5A3-1-30	0015-5A3-4-30	0022-5A3-4-30	0040-5A3-4-30
Part number	18276148	18276156	18276164	18276172	18276180

IP66/NEMA 4X – housing with switches	Power in kW				
	0.75	1.5	2.2	4	
MCLTEB..	0008-5A3-1-40	0015-5A3-1-40	0015-5A3-4-40	0022-5A3-4-40	0040-5A3-4-40
Part number	18276393	18276407	18276415	18276423	18276431

Input	Unit	Power in kW			
		0.75	1.5	2.2	4
Nominal line voltage V_{line} according to EN 50160	V	$3 \times \text{AC } 380 - 480 \pm 10\%$			
Line frequency f_{line}	Hz	$50/60 \pm 5\%$			
Line fuse	A	6	10	16 (10) ¹⁾	16 (15) ¹⁾
Nominal input current	A	3.5	5.6	7.5	11.5

1) Recommended values for UL compliance.

Output	Unit	Power in kW			
		0.75	1.5	2.2	4
Recommended motor power	kW	0.75	1.5	2.2	4
Output voltage V_{motor}	V	$3 \times 20 - V_{\text{line}}$			
Output current	A	2.2	4.1	5.8	9.5
Apparent output power	kVA	1.5	2.8	4.0	6.6
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	50	100		
Maximum motor cable length, unshielded	m	75	150		

General	Unit	Power in kW			
		0.75	1.5	2.2	4
Size		1	2		
Nominal power loss 24 V	W	4.6	6.4		

4 Technical data

Device data

General	Unit	Power in kW			
		0.75	1.5	2.2	4
Minimum braking resistance value	Ω	—		100	
Maximum device terminal cross section	mm ²	2 × 4 or (6) ¹⁾			
Maximum control terminal cross section	mm ²	0.05 – 2.5			

1) When using 6 mm², M4 forked cable lugs

Power 5.5 – 11 kW (IP20/IP66), EMC filter class C2 in accordance with EN 61800-3

IP20/NEMA 1	Power in kW		
	5.5	7.5	11
MCLTEB..	0055-5A3-4-00	0075-5A3-4-00	0110-5A3-4-00
Part number	18262074	18262090	18262112

IP66/NEMA 4X – housing without switches	Power in kW		
	5.5	7.5	11
MCLTEB..	0055-5A3-4-30	0075-5A3-4-30	0110-5A3-4-30
Part number	18276199	18276202	18276210

IP66/NEMA 4X – housing with switches	Power in kW		
	5.5	7.5	11
MCLTEB..	0055-5A3-4-40	0075-5A3-4-40	0110-5A3-4-40
Part number	18276458	18276466	18276474

Input	Unit	Power in kW		
		5.5	7.5	11
Nominal line voltage V_{line} according to EN 50160	V	3 × AC 380 – 480 ± 10%		
Line frequency f_{line}	Hz	50/60 ± 5%		
Line fuse	A	25	32 (30) ¹⁾	40 (35) ¹⁾
Nominal input current	A	17.2	21.2	27.5

1) Recommended values for UL compliance.

Output	Unit	Power in kW		
		5.5	7.5	11
Recommended motor power	kW	5.5	7.5	11
Output voltage V_{motor}	V	3 × 20 – V_{line}		
Output current	A	14	18	24
Apparent output power	kVA	9.7	12.5	16.6
PWM frequency	kHz	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	m	150		

General	Unit	Power in kW		
		5.5	7.5	11
Size		3		
Nominal power loss 24 V	W	6.4		
Minimum braking resistance value	Ω	47		
Maximum device terminal cross section	mm ²	2 × 4 or (6) ¹⁾		
Maximum control terminal cross section	mm ²	0.05 – 2.5		

1) When using 6 mm², M4 forked cable lugs

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Power 15 – 22 kW (IP20/IP66), EMC filter class C2 in accordance with EN 61800-3

IP20/NEMA 1	Power in kW		
	15	18.5	22
MCLTEB..	0150-5A3-4-00	0185-5A3-4-00	0220-5A3-4-00
Part number	18262147	18262155	18262163

IP66/NEMA 4X – housing without switches	Power in kW		
	15	18.5	22
MCLTEB..	0150-5A3-4-30	0185-5A3-4-30	0220-5A3-4-30
Part number	18276229	18276237	18276245

IP66/NEMA 4X – housing with switches	Power in kW		
	15	18.5	22
MCLTEB..	0150-5A3-4-40	0185-5A3-4-40	0220-5A3-4-40
Part number	18276482	18276490	18276504

Input	Unit	Power in kW		
		15	18.5	22
Nominal line voltage V_{line} according to EN 50160	V	3 × AC 380 – 480 ± 10%		
Line frequency f_{line}	Hz	50/60 ± 5%		
Line fuse	A	40 (45) ¹⁾	50 (60) ¹⁾	63 (70) ¹⁾
Nominal input current	A	34.2	44.1	51.9

1) Recommended values for UL compliance.

Output	Unit	Power in kW		
		15	18.5	22
Recommended motor power	kW	15	18.5	22
Output voltage V_{motor}	V	3 × 20 – V_{line}		
Output current	A	30	39	46
Apparent output power	kVA	20.8	27.0	31.9
PWM frequency	kHz	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	m	150		

General	Unit	Power in kW		
		15	18.5	22
Size		4		
Nominal power loss 24 V	W	14.6		
Minimum braking resistance value	Ω	39		
Maximum device terminal cross section	mm ²	16		
Maximum control terminal cross section	mm ²	0.05 – 2.5		

Power 30 – 37 kW (IP20), EMC filter class C2 in accordance with EN 61800-3

IP20/NEMA 1	Power in kW	
	30	37
MCLTEB..	0300-5A3-4-00	0370-5A3-4-00
Part number	18267394	18267408

Input	Unit	Power in kW	
		30	37
Nominal line voltage V_{line} according to EN 50160	V	$3 \times AC\ 380 - 480 \pm 10\%$	
Line frequency f_{line}	Hz	$50/60 \pm 5\%$	
Line fuse	A	80 (70) ¹⁾	100 (90) ¹⁾
Nominal input current	A	56.3	67.6

1) Recommended values for UL compliance.

Output	Unit	Power in kW	
		30	37
Recommended motor power	kW	30	37
Output voltage V_{motor}	V	$3 \times 20 - V_{line}$	
Output current	A	61	72
Apparent output power	kVA	42.3	49.9
PWM frequency	kHz	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	m	150	

General	Unit	Power in kW	
		30	37
Size		5	
Nominal power loss 24 V	W	18.6	
Minimum braking resistance value	Ω	12	
Maximum device terminal cross section	mm ²	35	
Maximum control terminal cross section	mm ²	0.05 – 2.5	

4.5 Housing variants and dimensions

4.5.1 Housing variants

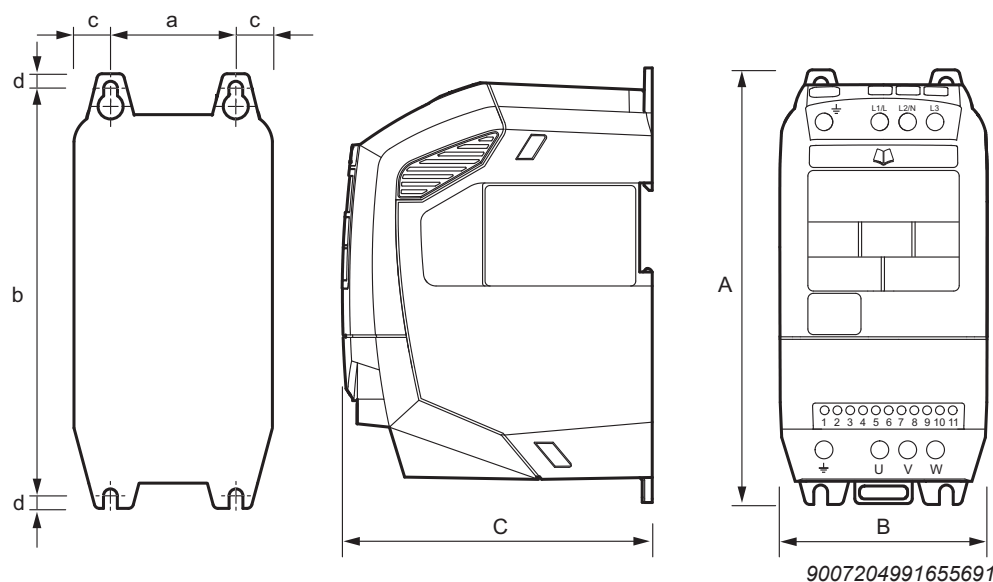
MOVITRAC® LTE-B+ is available with the following housing variants:

- IP20/NEMA-1 housing for installation in control cabinets
- IP66/NEMA-4X housing without switch option
- IP66/NEMA-4X housing with switch option

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

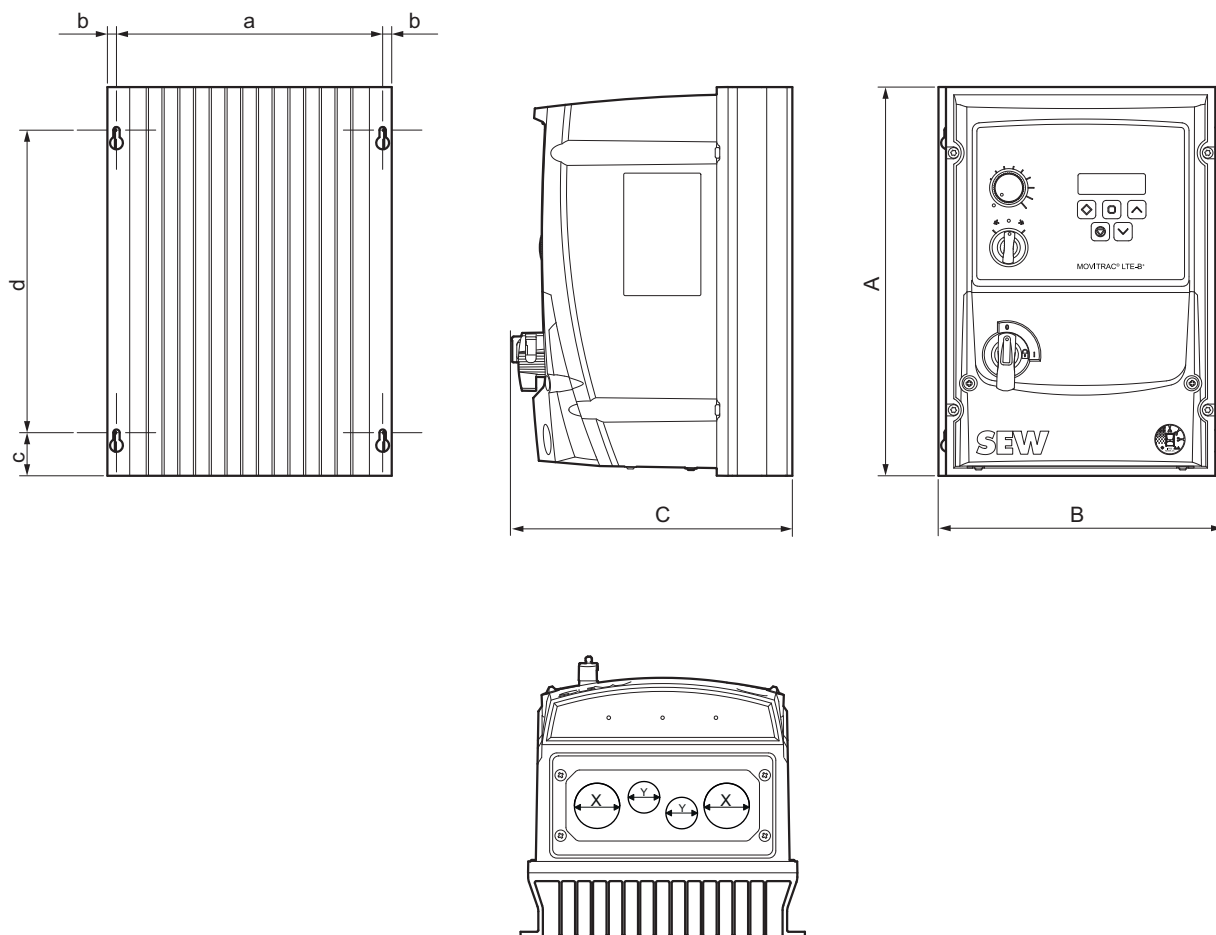
The device variant IP66/NEMA-4X housing with switch options is fitted with a main switch, a direction of rotation switch, and a potentiometer.

4.5.2 Dimensions of IP20/NEMA 1 housings (LTE xxx -00)



Dimensions	Unit	Size 1	Size 2	Size 3	Size 4	Size 5
Height (A)	mm	173	221	261	420	486
Width (B)	mm	83	110	131	171	222
Depth (C)	mm	123	150	175	212	226
Mass	kg	1.0	1.7	3.2	9.1	18.1
a	mm	50	63	80	125	175
b	mm	162	209	247	400	463
c	mm	16.5	23.5	25.5	23	24
d	mm	6	6	7	10	11.5
Recommended screws		4 × M4	4 × M4	4 × M4	4 × M8	4 × M8

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



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Dimensions		Size 1	Size 2	Size 3	Size 4
Height (A)	mm	232	257	310	360
Width (B)	mm	161	188	211	240
Depth (C)	mm	162 ¹⁾	182 ¹⁾	235 ¹⁾	271 ¹⁾
Mass	kg	2.3	3.5	6.6	9.5
a	mm	148.5	176	197	227
b	mm	8	8.5	8.5	6.5
c	mm	25	28.5	33.4	30
d	mm	189	200	252	300
Recommended screw size		4 × M4	4 × M4	4 × M4	4 × M4
X ²⁾	mm	22	29	29	37
	PG/M ³⁾	PG13.5/M20	PG21/M25	PG21/M25	PG29/M32
Y ⁴⁾	mm	22	22	22	22
	PG/M ²⁾	PG13.5/M20	PG13.5/M20	PG13.5/M20	PG13.5/M20

1) Devices without a switch option are 10 mm shorter in depth.

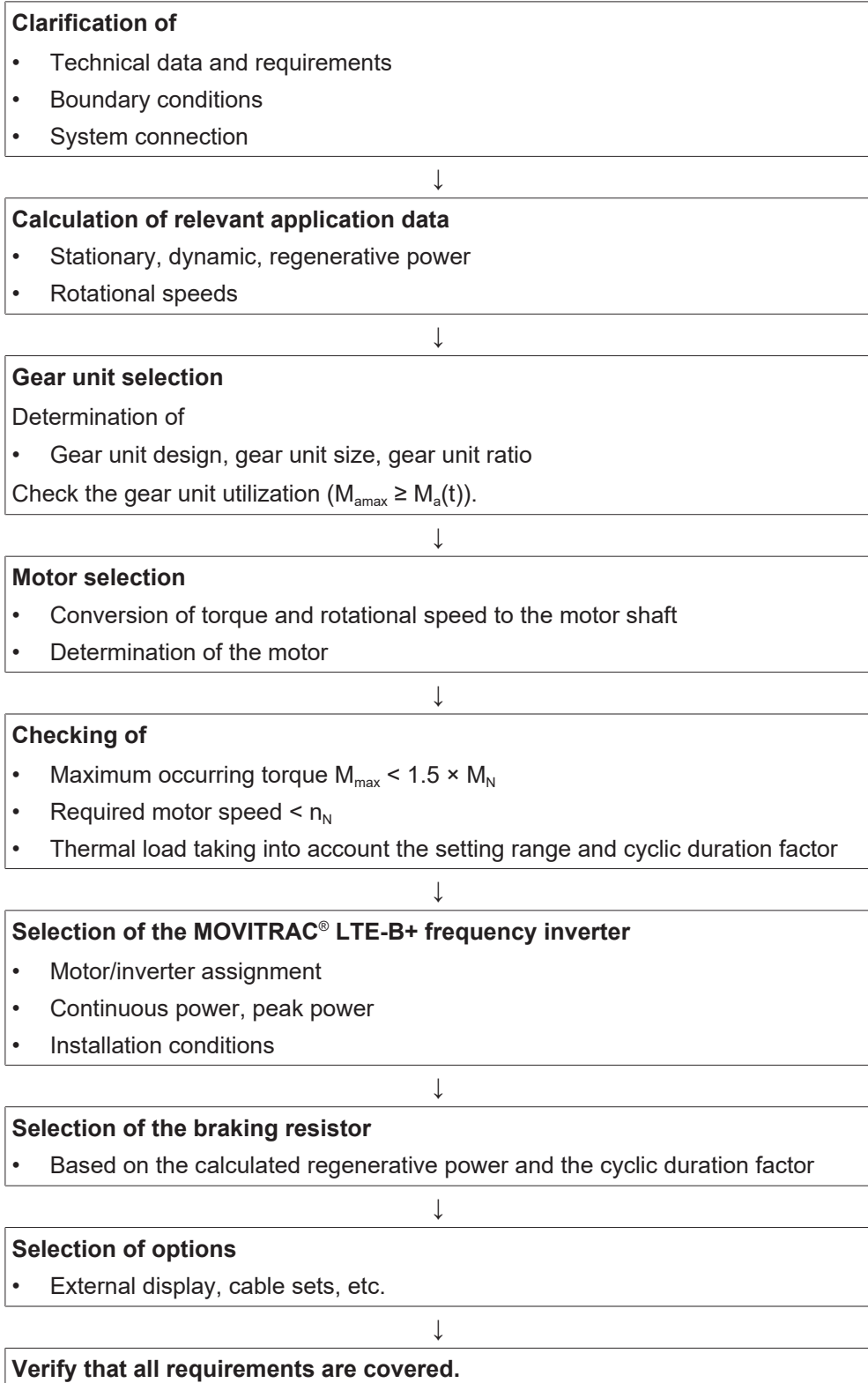
2) Cable bushing X is open ex works. Additional rubber seals are supplied for metric screw fittings.

3) The specified data refers to plastic screw fittings.

4) Cable bushing Y is open ex works but sealed with a cover.

5 Project planning of the inverter

5.1 Project planning flowchart



5.2 UL-compliant installation

INFORMATION



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

5.2.1 Field wiring power terminals

- Use 75 °C copper wire only.
- Tighten terminals to Nm as described in chapter "Tightening torques" (→ 52).

5.2.2 Ambient temperature

The units in IP20 are suitable for an ambient temperature of 40 °C, max. 50 °C¹⁾.

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

1) 200 – 240 V, 2.2 kW, max. 45 °C

5.2.3 Thermal motor protection

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

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

Parameter

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

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

Functional principle

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

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

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

5.2.4 Branch Circuit Protection

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes (US) or Canadian Electrical Code, Part 1 (CA).

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

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

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

1 × 110 – 115 V devices			
Devices	Non semiconductor fuses (currents are maximum values)	Max. supply short circuit current	Max. line voltage
0004	10 A	100 kA rms (AC)	115 V
0008	20 A		
0011	30 A		
1 × 200 – 240 V devices			
Devices	Non semiconductor fuses (currents are maximum values)	Max. supply short circuit current	Max. line voltage
0004	6 A	100 kA rms (AC)	240 V
0008	10 A		
0015	17.5 A		
0022	25 A		
0040	40 A		
3 × 200 – 240 V devices			
Devices	Non semiconductor fuses (currents are maximum values)	Max. supply short circuit current	Max. line voltage
0015	15 A	100 kA rms (AC)	240 V
0022	17.5 A		
0040	30 A		
0055	35 A		
0075	45 A		
0110	70 A		
0150	70 A		
0185	80 A		

5 Project planning of the inverter

UL-compliant installation

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

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6 Device structure

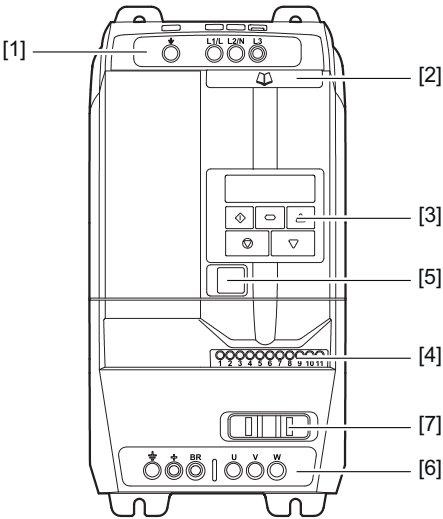
6.1 Inverter

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

6.1.1 Inverters with degree of protection IP20/NEMA 1

The following inverters have the housing shown below:

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

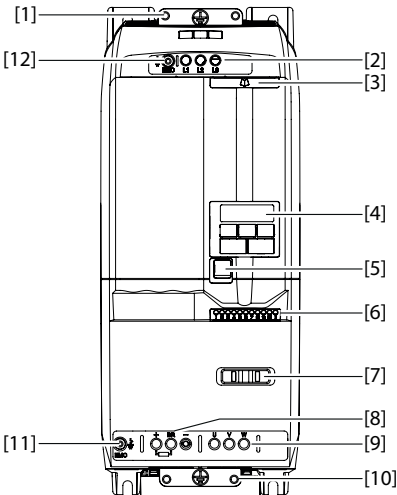


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- [1] Connecting terminal strip PE, L1/L, L2/N, L3
- [2] Help card with terminal assignment and basic parameters
- [3] Keypad with 6-digit 7-segment display
- [4] Control terminal strip
- [5] RJ45 communication socket
- [6] Connecting terminal strip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

The following inverters have the housing shown below:

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

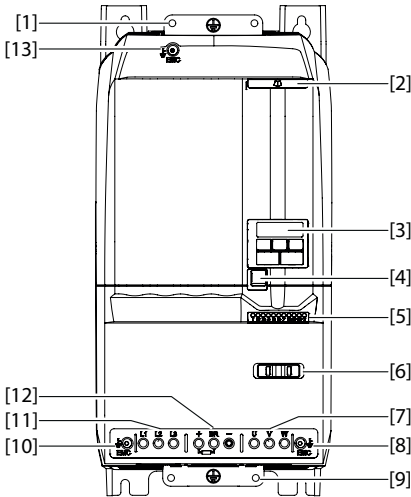


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- [1] PE connection (2 connection options)
- [2] Connecting terminal strip L1, L2, L3
- [3] Help card with terminal assignment and basic parameters
- [4] Keypad with 6-digit 7-segment display
- [5] RJ45 communication socket
- [6] Control terminal strip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

The following inverters have the housing shown below:

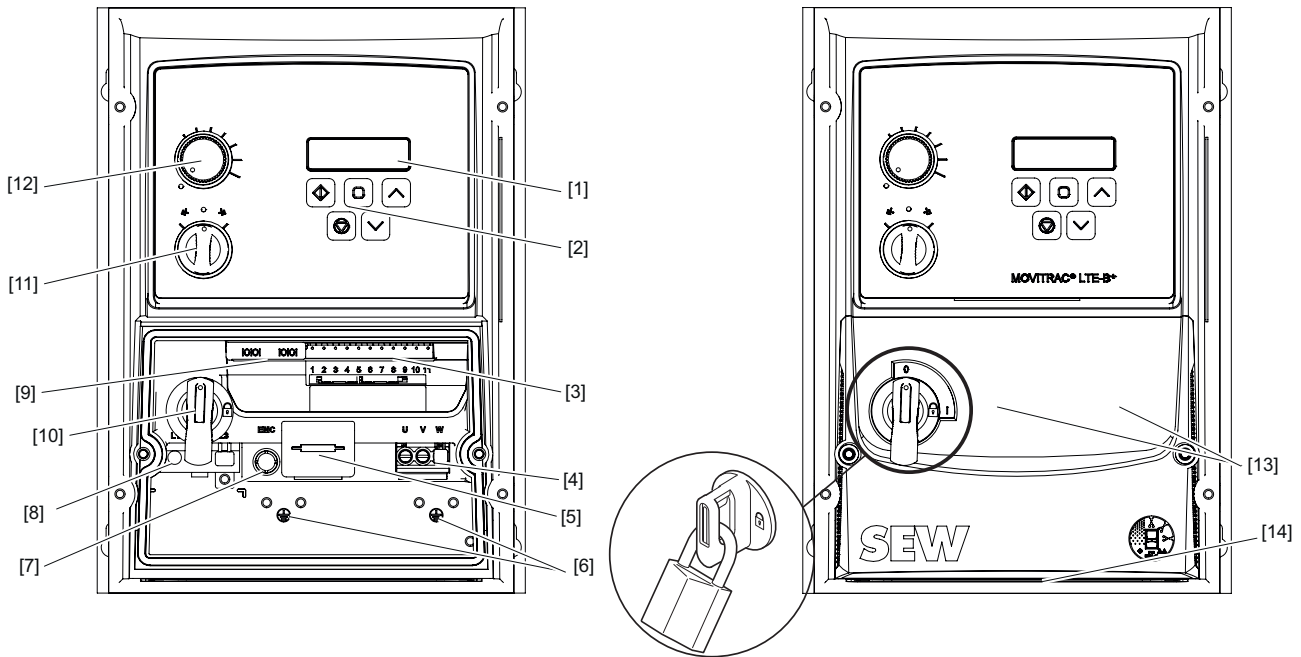
Nominal line voltage	Inverter power
200 – 240 V	15 – 18.5 kW
380 – 480 V	30 – 37 kW



45918871947

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

6.1.2 Inverters with degree of protection IP66/NEMA 4X



18014419945142923

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

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

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

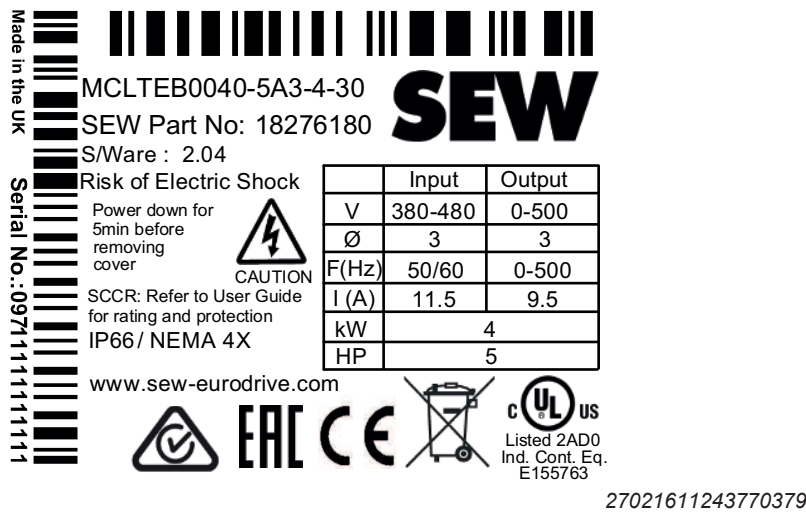
Optional, customer-specific extension of the front cover:

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

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

6.2 Nameplate

The following figure shows an example of a nameplate:



6.3 Type designation

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

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

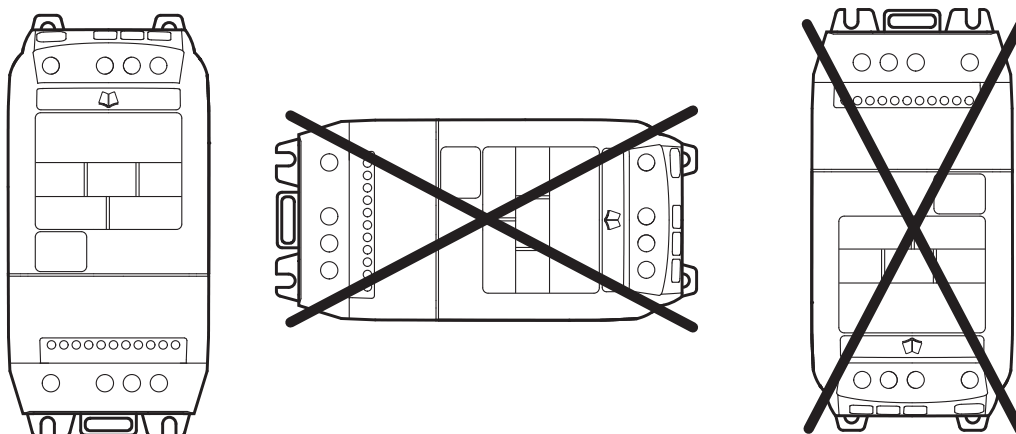
7 Mechanical installation

7.1 Installation notes

- Carefully check the inverter for damage prior to installation.
- Store the inverter in its original packaging until it is used. The storage location must be clean and dry with an ambient temperature between -40 °C and +60 °C.
- Install the inverter in a suitable housing on a level, vertical, non-flammable, and vibration-free surface. If a certain degree of protection is required, observe EN 60529.
- Keep flammable substances away from the inverter.
- Prevent the ingress of conductive or flammable foreign objects.
- The relative humidity must be kept below 95% (condensation not permitted).
- Protect the IP66 inverter from direct sunlight. Use a cover outdoors.
- Inverters can be installed next to each other. Ensure sufficient ventilation space between the individual devices. If the inverter is installed above another inverter or another heat-emitting device, the minimum vertical clearance is 150 mm. To enable self-cooling, the control cabinet must either be cooled through forced ventilation, or dimensioned accordingly. See chapter "IP20 housing: Installation and installation space" (→ 50).
- The permitted ambient temperatures are defined in chapter "Environmental conditions".
- The mounting rail can only be installed for the following inverters with IP20 degree of protection:
 - 100 – 115 V: 0.37 – 1.1 kW
 - 200 – 240 V: 0.37 – 2.2 kW
 - 380 – 480 V: 0.75 – 4 kW

The mounting rail must have the dimensions 35 × 15 mm or 35 × 7.5 mm and be designed in accordance with EN 50022.

- The inverter may only be installed as shown in the following figure:



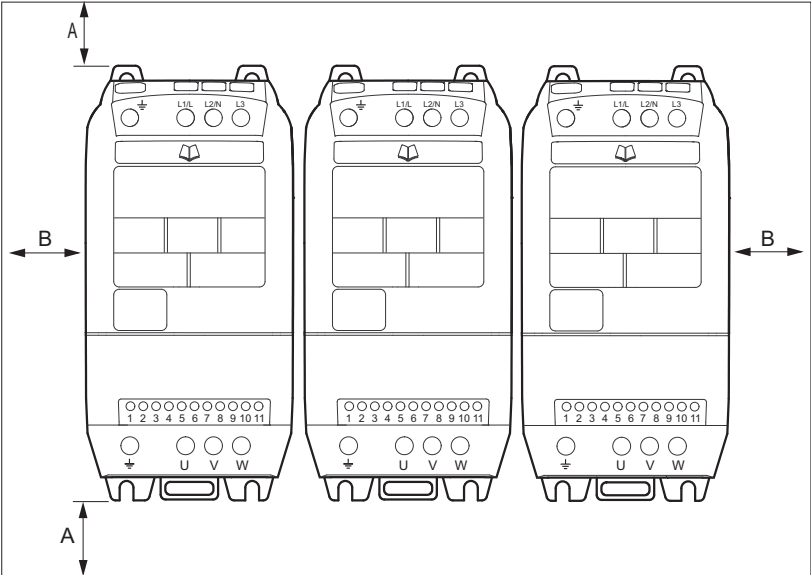
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7.2 Installing the inverter

7.2.1 IP20 housing: Installation and installation space

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

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



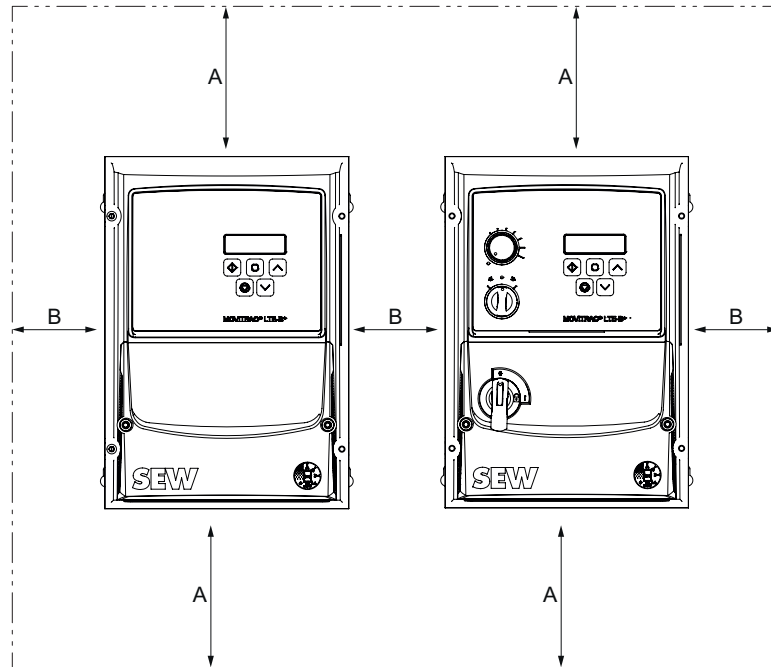
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Size	A in mm	B in mm	Air flow rate per inverter
1	50	50	> 18 m³/h
2	75	50	> 37 m³/h
3	100	50	> 100 m³/h
4	100	50	> 200 m³/h
5	200	25	> 350 m³/h

7.2.2 IP66 housing: Installation and control cabinet dimensions

Inverters with degree of protection IP66 can be used indoors.

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



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

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

INFORMATION



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

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

7.3 Tightening torques

Tighten the clamping screw with the following tightening torques:

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

7.4 Installing braking resistors

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

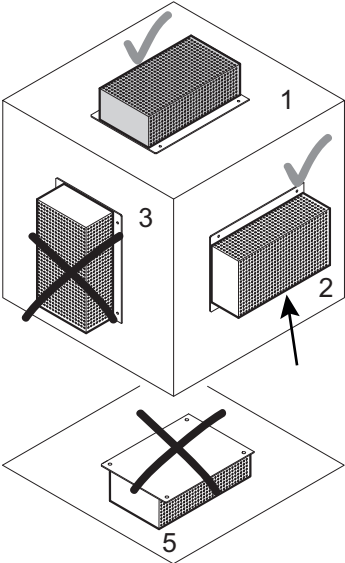
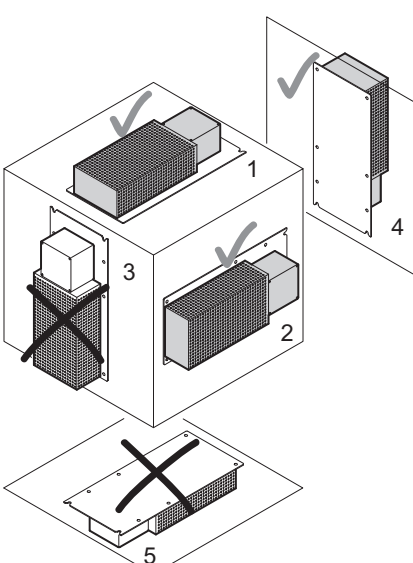
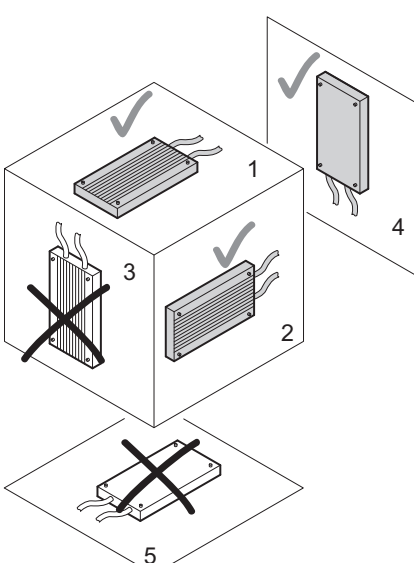
The following minimum clearances must be observed for convection cooling depending on the continuous braking power and the mounting position:

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

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

2) Corresponds to mounting position 3, 4.

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

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.

8 Electrical installation



⚠ WARNING

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

Severe or fatal injuries.

- Wait 10 minutes after you have de-energized the inverter and disconnected the line voltage and the DC-24 V voltage.
 - Make sure that the device is de-energized.
 - Only then must you commence any work on the device.
-
- Only trained electricians may install the inverter in observation of the applicable rules and regulations.
 - The grounding cable must be dimensioned for the maximum line fault current that is normally limited by fuses or motor circuit breakers.

8.1 EMC-compliant installation according to EN 61800-3

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

8.1.1 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).

8.1.2 Interference emission

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

To ensure the best possible electromagnetic compatibility, the inverters must be installed according to the specifications in chapter "Electrical installation" (→ 54). Make sure that the inverters have good ground connections. Use shielded motor cables to comply with the specifications on interference emission.

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

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

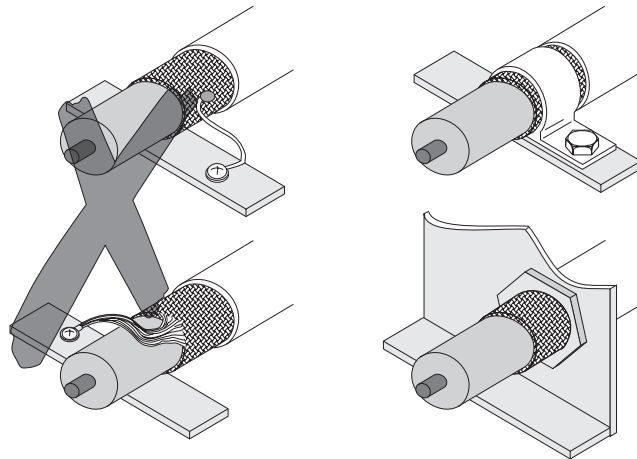
Inverter type	Cat. C1 (class B)	Cat. C2 (class A)	Cat. C3
	according to EN 61800-3		
230 V/400 V, 3-phase LTEBxxxx-2A3-x-xx LTEBxxxx-5A3-x-xx	Use an external filter of the type NF LT xxx xxx.	No additional filtering is required.	
	Use a shielded motor cable.		

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

8.1.3 General information about connecting the motor shield

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

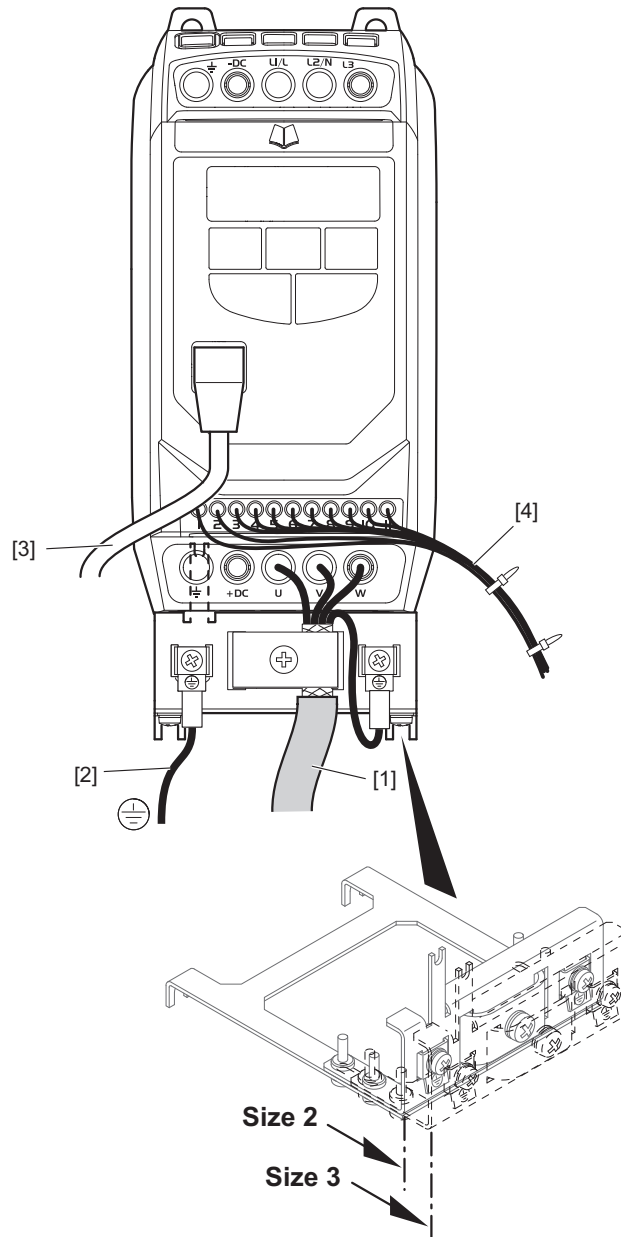
Connect the shield by the shortest possible route and make sure it is grounded over a wide area at both ends. This also applies to cables with several shielded core strands.



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Recommendation for applying the motor shield to inverters with IP20

Size 2 and 3



17304181003

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

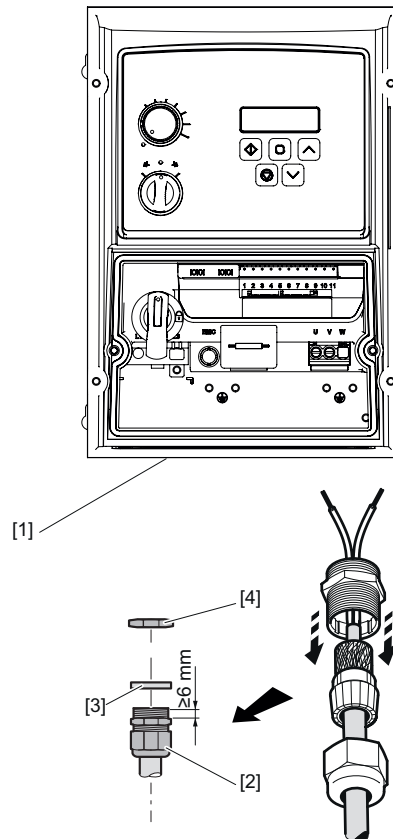
The shield plate can be used optionally for size 2 and 3 of the IP20 design. Proceed as follows to adjust:

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

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

Recommendation for applying the motor shield to inverters with IP66

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



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

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

8.2 Installation instructions

8.2.1 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 disconnecter must be installed between the voltage supply and the inverter.
- Never connect the power supply to the output terminals U, V or W of the inverter.
- Do not install any contactors between the inverter and the motor. Where control cables and high-voltage power lines are installed close to each other, keep a minimum distance of 100 mm and an angle of 90° for crossing cables.
- The cables are only protected by slow-blow high-power fuses or a motor circuit breaker. For further information, refer to section "Permitted voltage supply systems" (→ 59).
- Use a 4-core PVC-insulated and shielded cable as the motor cable. Route this cable according to the applicable national regulations of the industry sector and in accordance with the rule set. Use conductor end sleeves to connect the motor cable to the inverter.
- Make sure that shieldings and sheaths of the motor cable are designed according to the wiring diagram in section "General information about connecting the motor shield".
- Make sure that the grounding terminal of each inverter is connected individually and **directly** to the ground busbar (ground) of the installation site, via a filter if available.
- Do not loop the ground connections of the inverter from one inverter to the other. Do not route the ground connections to the inverters from other inverters either.
- The impedance of the ground circuit must comply with the local safety regulations of the industry sector.
- Make sure that all of the terminals are tightened to the corresponding tightening torque, see chapter "Tightening torques" (→ 52).
- To comply with UL regulations, all ground connections must be designed with UL-listed crimp ring cable lugs.

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

INFORMATION



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

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

8.2.2 Permitted voltage supply systems

- **Voltage supply systems with grounded star point**
Inverters with all degrees of protection are intended for operation on TN and TT systems with directly grounded star point.
- **Voltage supply systems with non-grounded star point**
All inverters can be used on supply systems with non-grounded star point (e.g. IT systems) after appropriate modification. Refer to chapter "Operation on IT system" (→ 59).
- **Voltage supply systems with grounded outer conductor**
Inverters with all degrees of protection may only be operated on supply systems with a maximum phase-to-ground AC voltage of 300 V.

8.2.3 Operation on IT system



⚠ WARNING

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

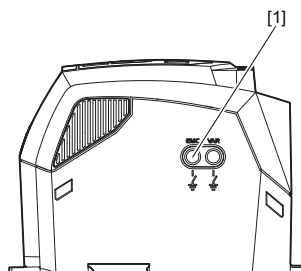
Severe or fatal injuries.

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

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

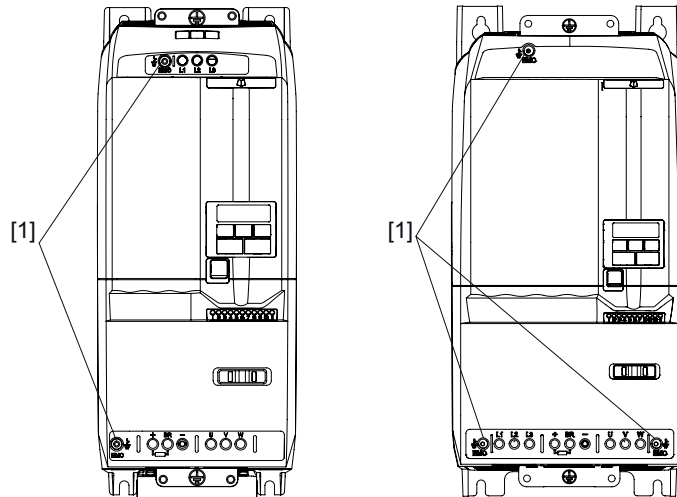
IP20 devices:

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



[1] EMC screw

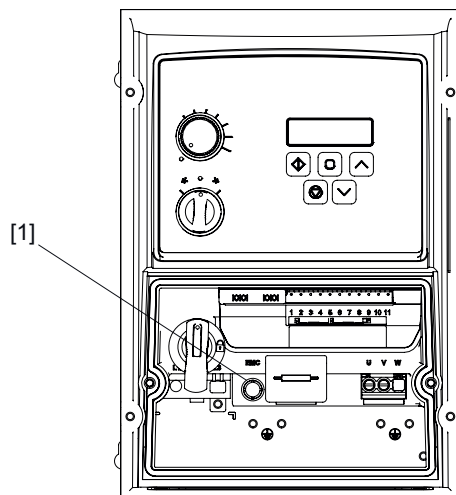
- On sizes 4 – 5, unscrew the EMC screws at the marked points.



[1] EMC screw

IP66 devices:

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



[1] EMC screw

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

8.2.4 Selecting the residual current device

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

Proceed as follows to select the residual current device:

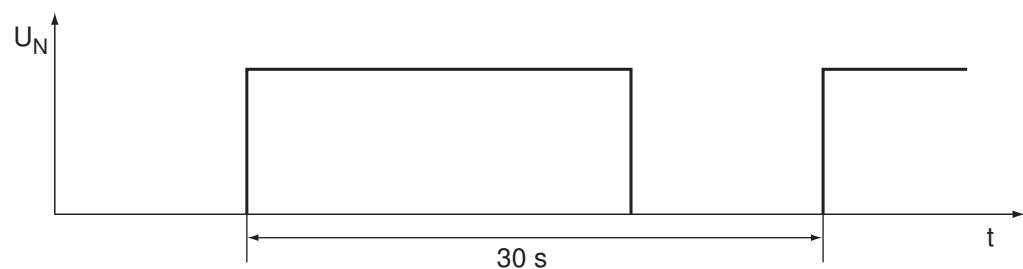
1. If using a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not using a residual current device.
2. **⚠ WARNING!** No protection against electric shock if an incorrect type of residual current device is used. Severe or fatal injuries.
If a residual current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

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

8.2.5 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.



8.2.6 Line fuses

Fuse types:

- Line protection types in operation classes gL, gG:
 - Nominal fusing voltage $\geq$ 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 $\geq$ nominal line voltage
 - The nominal currents of the power circuit breakers must be 10% higher than the nominal inverter current.

8.2.7 Motor cable

Cable length

For the maximum length of the motor cable, refer to the respective device listed in chapter "Technical data" ($\rightarrow$ 23).

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.

8.2.8 Multi-motor drive/group drive

- The sum of the motor currents must not exceed the nominal inverter current. The maximum permitted cable length for the group is limited to the values of the single connection. See chapter "Technical data" (→ 23).
- The motor group is limited to 5 motors and must not differ by more than 3 sizes.
- Multi-motor operation is only possible with AC asynchronous motors, not with synchronous motors.
- SEW-EURODRIVE recommends using a "HD LT xxx" output choke, additionally unshielded cables, and a maximum permitted output frequency of 4 kHz for groups of more than 3 motors.

Maximum motor cable length

The permitted total length of all motor cables connected in parallel (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 permitted total length of the motor cables connected in parallel:

$l_{tot} = l_1 + l_2 + \dots + l_n$ ($l_1, l_2, \dots, l_n$ = cable from inverter to motor 1, 2, ...)

l_{max} = Maximum motor cable length (see chapter "Technical data" (→ 23))

n = Number of motors connected in parallel.

Fusing

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

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

8.3 Terminal assignment

8.3.1 Opening the front cover

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

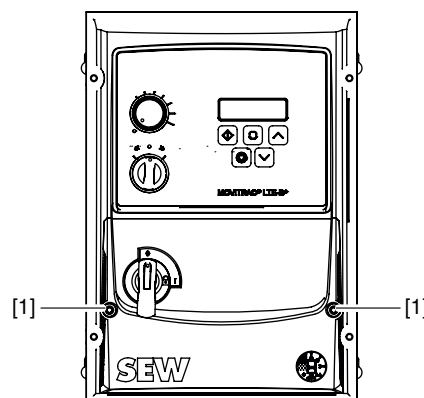
INFORMATION



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

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

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



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[1] Screws of the front cover

8.3.2 Help card

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

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

8.3.3 Connection of thermal motor protection TF, TH

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

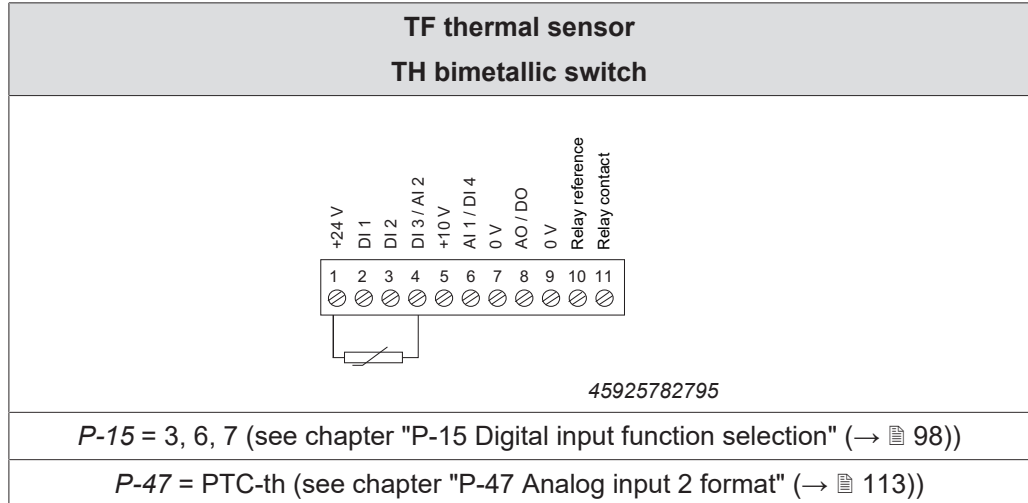
If the thermal protection is triggered, the inverter displays the fault "F-PTC".

The following options can be selected for motor protection monitoring:

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

Use a shielded cable for the motor sensor lead.

Connection example for the temperature sensors:



8.3.4 Signal terminal overview

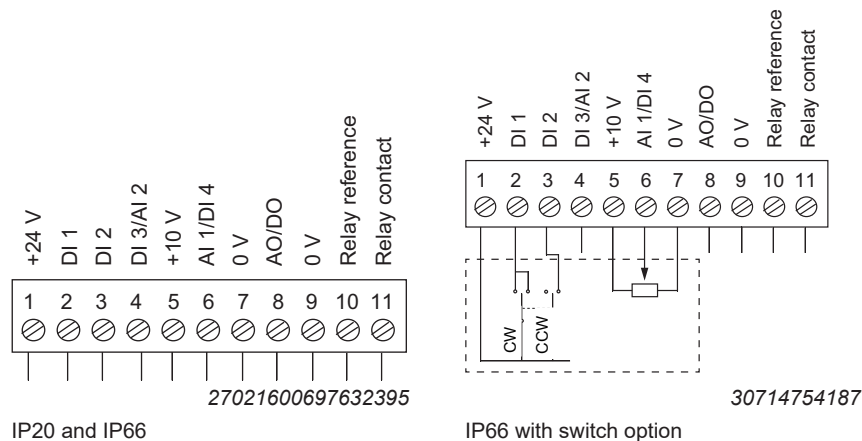


NOTICE

Application of impermissible voltages.

Possible damage to property.

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



INFORMATION



In the IP66 device variant with switches and potentiometers, the assignment to the corresponding terminal functions is connected internally. In the case of the external use of terminals 2, 3, and 6, the internally fitted switches and potentiometers can be deactivated. For the relevant procedure, refer to chapter "Configuration parameters" (→ 116).

Signal connections of the signal terminal block

INFORMATION



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

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

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

1) Function assignment takes place via P-15.

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

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

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

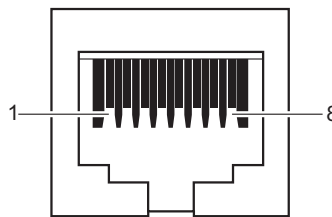
8.3.5 RJ45 communication socket

NOTICE

Voltage at socket contact not suitable for PCs.

Damage to PC when connected directly to RJ45 communication socket.

- Use the engineering adapters as described in chapter "Startup with LT Shell engineering software" (→ 73).
- Inverters with degree of protection IP20 have one RJ45 socket contact for engineering and communication.
- Inverters with degree of protection IP66 have two RJ45 socket contacts for engineering and communication.

Socket contact on the device

9007212770640779

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

8.4 Wiring diagram



⚠ WARNING

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

Severe or fatal injuries.

- Adhere to the following points.

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

- Applications that require a quick brake reaction time.

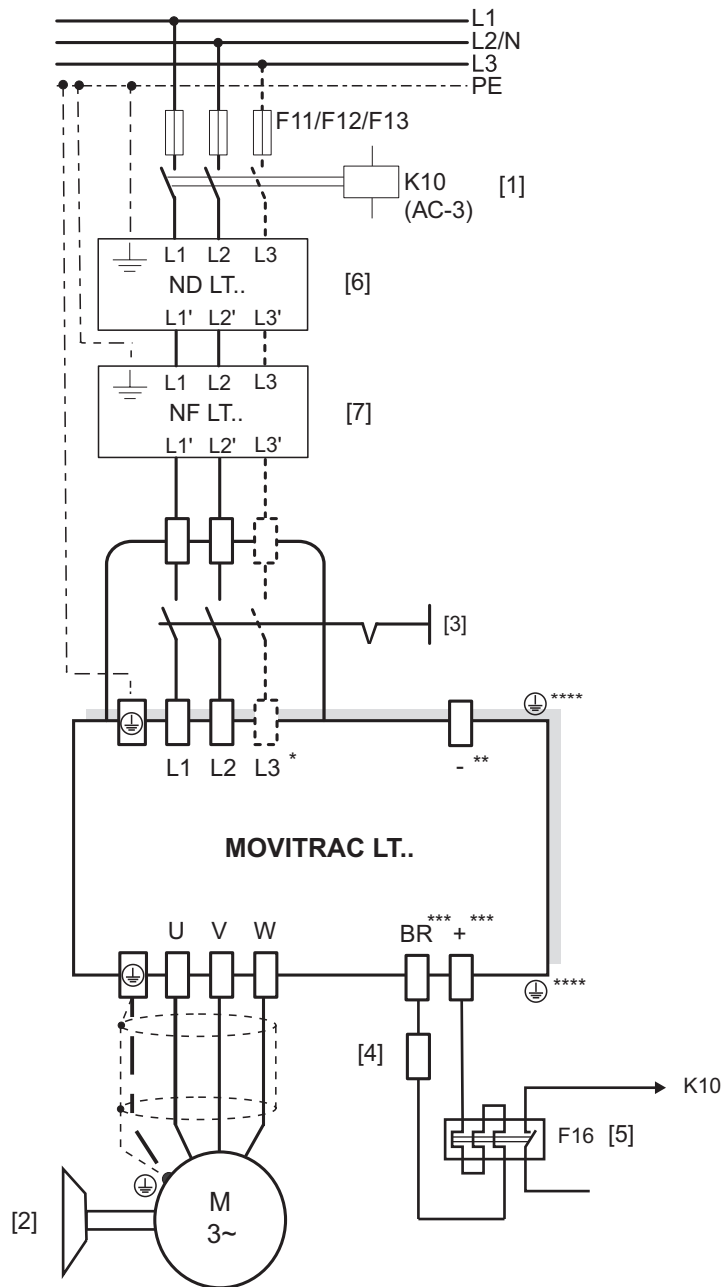
Observe the following information:

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

INFORMATION



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



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

8.4.1 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.

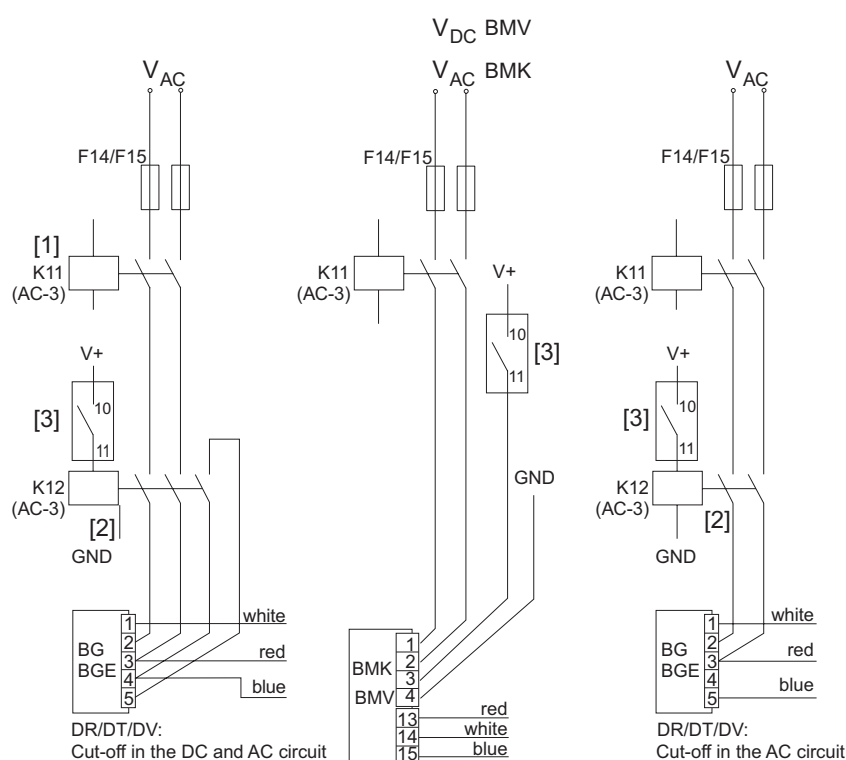
SEW-EURODRIVE brake systems are disk brakes with a DC coil that release electrically and brake using spring force. A brake rectifier supplies the brake with DC voltage.

INFORMATION



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

8.4.2 Brake control connection



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

8.4.3 Connection of the DC link connection

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

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

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

8.4.4 Braking resistor connection



⚠ WARNING

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

Severe or fatal injuries.

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



⚠ CAUTION

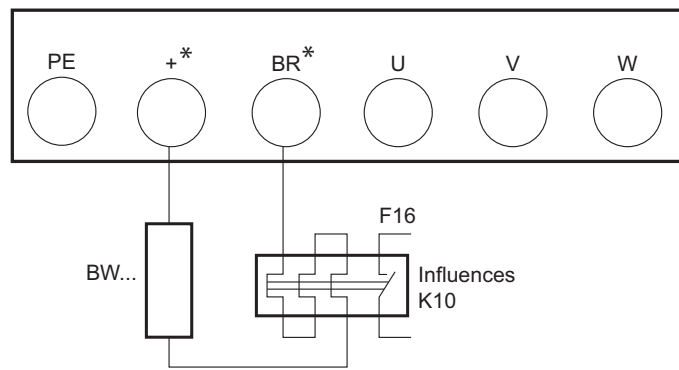
Risk of burns. The surfaces of the braking resistors reach high temperatures under a load of P_N .

Minor injuries.

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

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

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



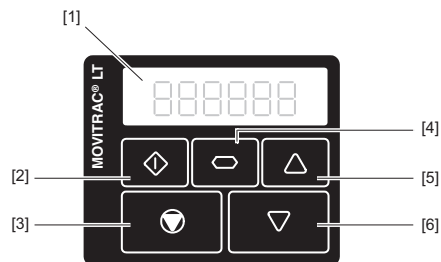
* No + and BR connection in size 1

9 Startup

9.1 Keypads

The inverters are equipped with a standard keypad.

9.1.1 Standard keypad



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

9.1.2 Operation

Both keypads have 5 keys with the following functions:

- | | | |
|----------|---|---|
| Start | key [2] | <ul style="list-style-type: none"> • Enable drive • Change direction of rotation |
| Stop |  key [3] | <ul style="list-style-type: none"> • Stop drive • Acknowledge fault |
| Navigate |  key [4] | <ul style="list-style-type: none"> • Switch the menu • Save parameter values • Display real-time information |
| Up |  key [5] | <ul style="list-style-type: none"> • Increase speed • Increase parameter values |
| Down |  key [6] | <ul style="list-style-type: none"> • Decrease speed • Decrease parameter values |

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

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

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

9.2 Resetting parameters to default settings

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

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

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

9.3 PC connection

9.3.1 Startup using LT Shell engineering software

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

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

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

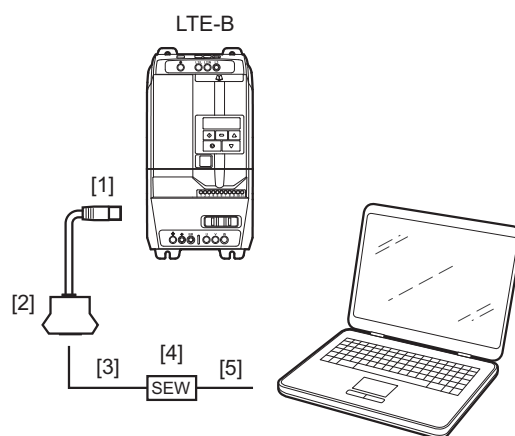
The software can be used to carry out the following tasks:

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

Connection to LT Shell engineering software

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

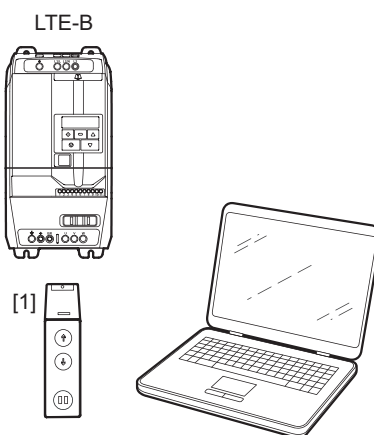
Connection to LT Shell via RS485



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

Connection to LT Shell via Bluetooth parameter module



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- | | |
|-----|------------------|
| [1] | Parameter module |
|-----|------------------|

9.3.2 Startup with MOVITOOLS® MotionStudio engineering software

The software can be connected to the inverter as follows:

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

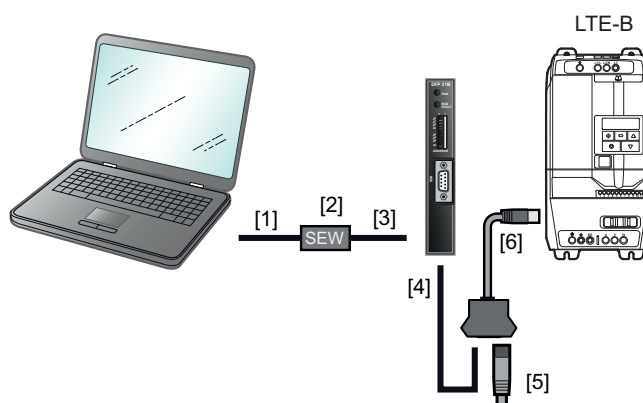
The following functions are available in MOVITOOLS® MotionStudio:

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

Connection to the MOVITOOLS® MotionStudio engineering software

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

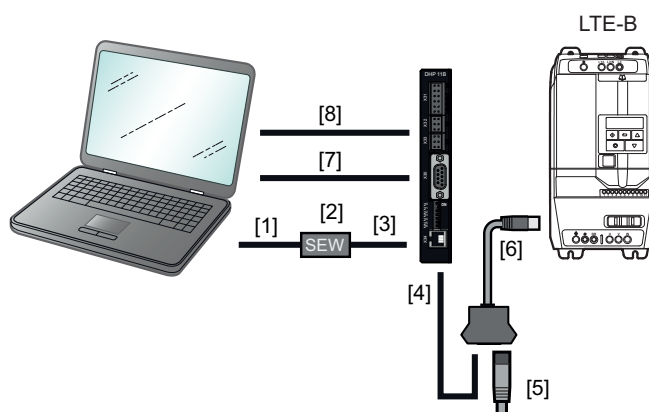
Connection to MOVITOOLS® MotionStudio via gateway



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

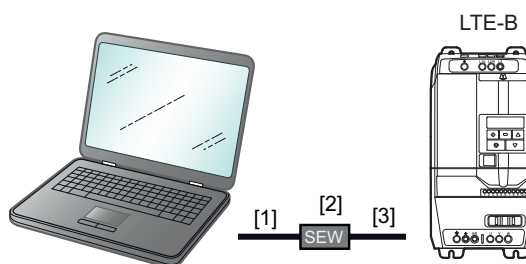
Connection to MOVITOOLS® MotionStudio via controller



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

Connection to MOVITOOLS® MotionStudio via SBus with USM21A



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

9.4 "Auto tune" automatic measuring procedure

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

Do not interrupt the measuring procedure.

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

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

9.5 Startup with motors



⚠ WARNING

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

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



INFORMATION

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

9.5.1 Startup with asynchronous motors with V/f control

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

9.5.2 Startup with asynchronous motors with LVFC speed control

1. Connect the motor to the inverter. Adhere to the nominal motor voltage when connecting.
2. Enter the motor data indicated on the motor nameplate:
 - *P-07* = Nominal voltage of the motor
 - *P-08* = Rated current of the motor
 - *P-09* = Rated frequency of the motor
 - *P-10* = Rated speed of the motor
 - *P-14* = 101 (extended parameter access)
 - *P-51* = 0 (LVFC speed control)
3. Set the maximum and minimum speed using *P-01* and *P-02*.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the "Auto-tune" automatic motor measuring procedure as described in chapter "Auto-tune automatic measuring procedure" (→ 77).
6. In case of insufficient control performance, the control behavior can be optimized via the parameters *P-53 Level 1 + 2* (P component, I component).

9.5.3 Startup with LSPM motors from SEW-EURODRIVE

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

1. Connect the motor to the inverter. Adhere to the nominal motor voltage when connecting.
2. Enter the motor data indicated on the motor nameplate:
 - *P-07* = Internal voltage/no-load voltage [V/min^{-1}] at nominal motor speed
 - *P-08* = Rated current of the motor
 - *P-09* = Rated frequency of the motor
 - *P-10* = Rated speed of the motor
 - *P-14* = 101 (extended parameter access)
 - *P-51* = 5 (LSPM speed control).
3. Set the maximum speed *P-01* and minimum speed *P-02* to 300 min^{-1} .
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the "Auto-tune" automatic motor measuring procedure as described in chapter "Auto-tune automatic measuring procedure" (→ 77).
6. Adjust the boost with *P-11*.
7. In case of insufficient control performance, the control behavior can be optimized via the parameters *P-53 Level 1 + 2* (P component, I component).

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

INFORMATION



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

1. Connect the motor to the inverter. Pay attention to the nominal motor voltage when connecting.
2. Enter the motor data indicated on the motor nameplate:
 - *P-07* = Internal voltage/no-load voltage [V/min^{-1}] at nominal motor speed
 - *P-08* = Rated motor current
 - *P-09* = Rated motor frequency
 - *P-10* = Rated speed of the motor
 - *P-14* = 101 (extended parameter access)
 - *P-17* = PWM frequency (at least 8 – 16 kHz)
 - *P-51* = 2 (PMVC speed control)
3. Set the maximum speed to the maximum rated motor speed using *P-01* and the minimum speed to a minimum of 10% of the rated motor speed using *P-02*.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the "Auto-tune" automatic motor measuring procedure as described in chapter "Auto tune" (→ 77).
6. Check the magnetizing current (P00-31) value 1 at half nominal speed without load.
 - If the value is greater than +0.3 A, the nominal motor voltage *P-07* must be reduced.
 - If the value is less than -0.3 A, the nominal motor voltage *P-07* must be increased.
7. Adjust the boost with *P-11*.
8. In case of insufficient control performance, the control behavior can be optimized via the parameters *P-53 Level 1 + 2* (P component, I component).

9.5.5 Startup with brushless DC motors (BLDC speed control)

1. Connect the motor to the inverter. Adhere to the nominal motor voltage when connecting.
2. Enter the motor data indicated on the motor nameplate:
 - *P-07* = Internal voltage/no-load voltage [V/min-1] at nominal motor speed
 - *P-08* = Rated current of the motor
 - *P-09* = Rated frequency of the motor
 - *P-10* = Rated speed of the motor
 - *P-14* = 101 (extended parameter access)
 - *P-51* = 3 (BLDC speed control)
3. Set the maximum and minimum speed using *P-01* and *P-02*.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the "Auto-tune" automatic motor measuring procedure as described in chapter "Auto tune" (→ 77).
6. Adjust the boost with *P-11*.
7. In case of insufficient control performance, the control behavior can be optimized via the parameters *P-53 Level 1 + 2* (P component, I component).

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

1. Connect the motor to the inverter. During the connection, adhere to the nominal motor voltage.
2. Enter the motor data indicated on the motor nameplate:
 - *P-07* = Rated voltage of the motor
 - *P-08* = Rated current of the motor
 - *P-09* = Rated frequency of the motor
 - *P-10* = Rated speed of the motor
 - *P-14* = 101 (extended parameter access)
 - *P-51* = 4 (SYN-R speed control)
3. Set the maximum and minimum speed using *P-01* and *P-02*.
4. Set the acceleration and deceleration ramps using *P-03* and *P-04*.
5. Start the "Auto tune" automatic motor measurement procedure as described in chapter "Auto tune" (→ 77).
6. Adjust the boost with *P-11*.
7. If the control performance is not adequate, you can optimize the control behavior using the parameters *P-53 Level 1 + 2* (P-share, I-share).

9.6 Startup of the control signal source



⚠ WARNING

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

Severe or fatal injuries.

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

9.6.1 Terminal mode (factory setting) $P-12 = 0$

For operation in terminal mode (factory setting):

- $P-12$ must be set to "0" (factory setting).
- Change the input terminal configuration according to your requirements in $P-15$. For the possible settings, refer to chapter "P-15 Digital input function selection" (→ 98).
- Connect a switch between terminals 1 and 2 on the user terminal block.
- Connect a potentiometer (1 k – 10 k) between terminals 5, 6 and 7. The center tap is connected to terminal 6.
- Enable the inverter by establishing a connection between terminals 1 and 2.
- Set the speed using the potentiometer.

9.6.2 Keypad mode ($P-12 = 1$ or 2)

For operation in keypad mode:

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

INFORMATION



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

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

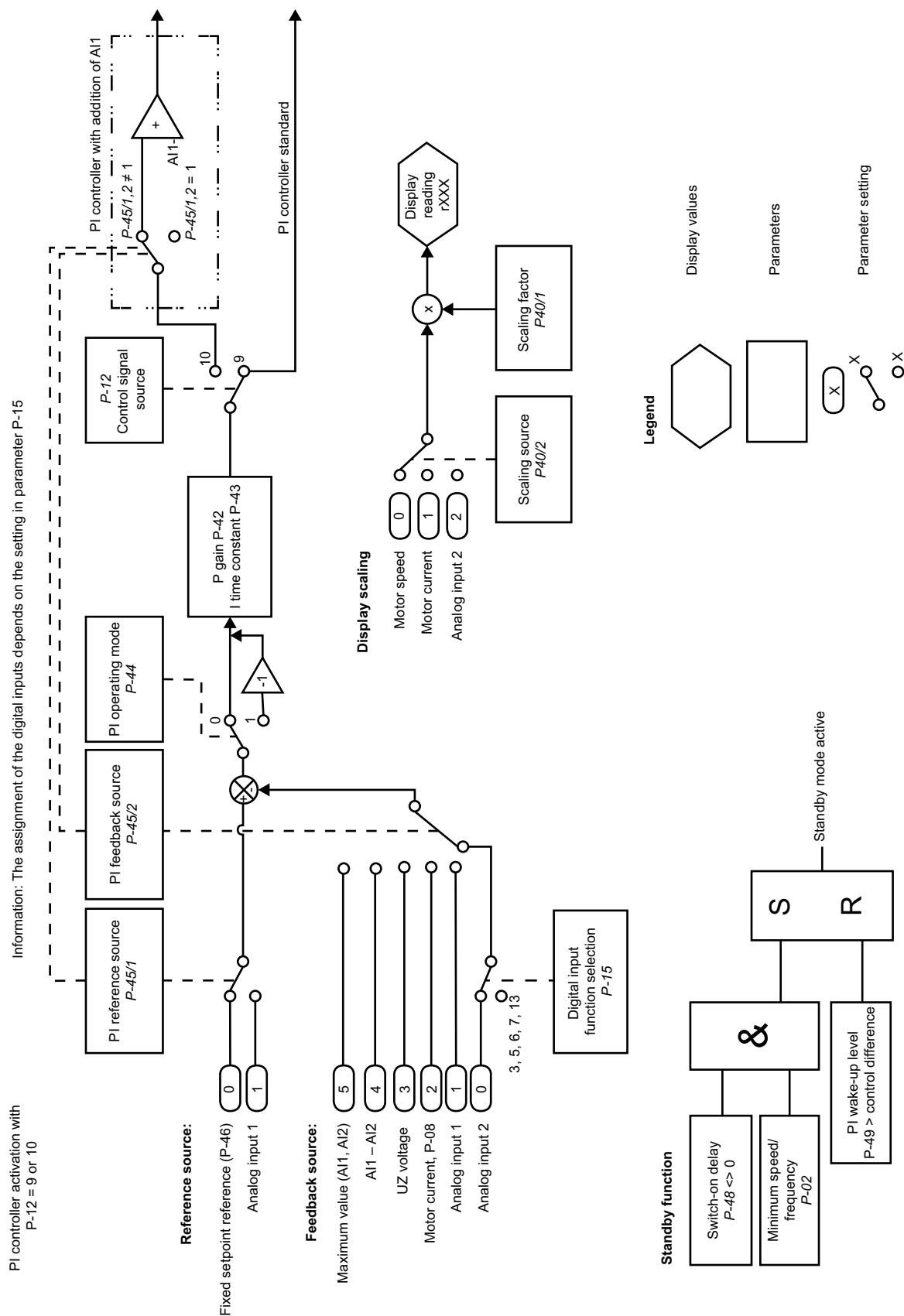
The implemented PI controller can be used for temperature, pressure control or other applications.

General information on use

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

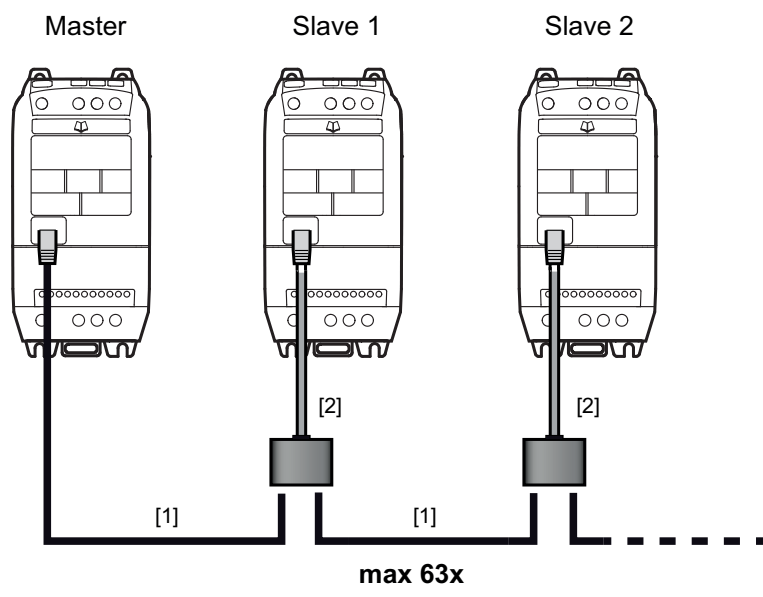
Set the setpoint frequency for the PI controller with *P-45 Level/ 1*.

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



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



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

The inverter has an integrated master-slave function.

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

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

Configuration of the inverters for speed synchronism

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

INFORMATION



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

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

See chapter "Fieldbus operation" (→ 124).

9.7 Startup of the brake control

The brake control is installed via the relay.

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

9.8 Fire mode/emergency mode

Set the fire mode/emergency mode as described below:

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

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

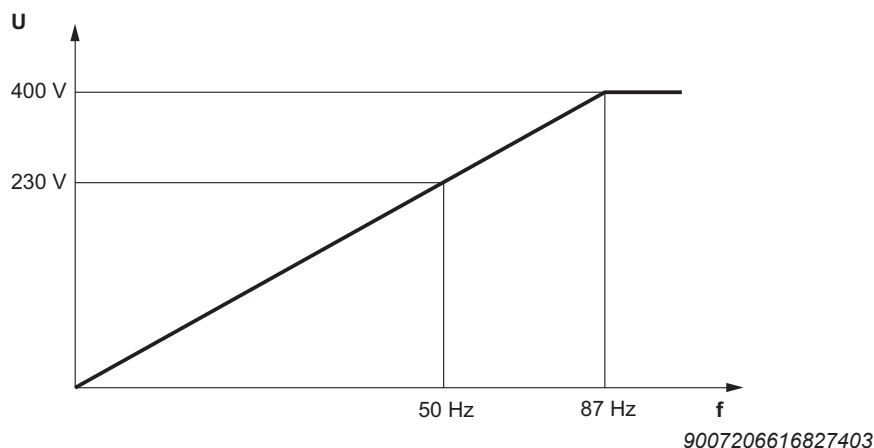
INFORMATION



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

9.9 Operation at 87 Hz characteristic (50 Hz motors)

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



Set the "87 Hz characteristic" operation as follows:

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

Example for calculating P-10:

DRN80M4: 0.75 kW, 50 Hz

Nominal speed 1440 min⁻¹

$$P-10 = 1500 \text{ min}^{-1} \times (87 \text{ Hz}/50 \text{ Hz}) - (1500 \text{ min}^{-1} - 1440 \text{ min}^{-1}) = 2550 \text{ min}^{-1}$$

INFORMATION



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

9.10 Fans and pumps

9.10.1 Startup of pumps and fans

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

9.10.2 Other functions for applications with pumps or fans

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

- Voltage increase/boost ($P-11$)
- Adjustment of the V/f characteristic curve ($P-28$, $P-29$)
- Energy-saving function ($P-06$)
- Flying start function ($P-33$)
- DC current holding function ($P-32$)
- Standby mode ($P-48$)
- PI controller
- Fire mode/emergency mode, see chapter "Fire mode/emergency mode" (→ 86)
- Deactivating slip compensation via rated motor speed ($P-10$)
- Skip function ($P-26/P-27$)

9.11 Motor potentiometer

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

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

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

To be able to use the motor potentiometer function, select a function in parameter $P-15$ that uses the digital inputs for increasing or reducing the speed. See chapter "P-15 Digital input function selection" (→ 98).

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

9.12 3-wire control

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

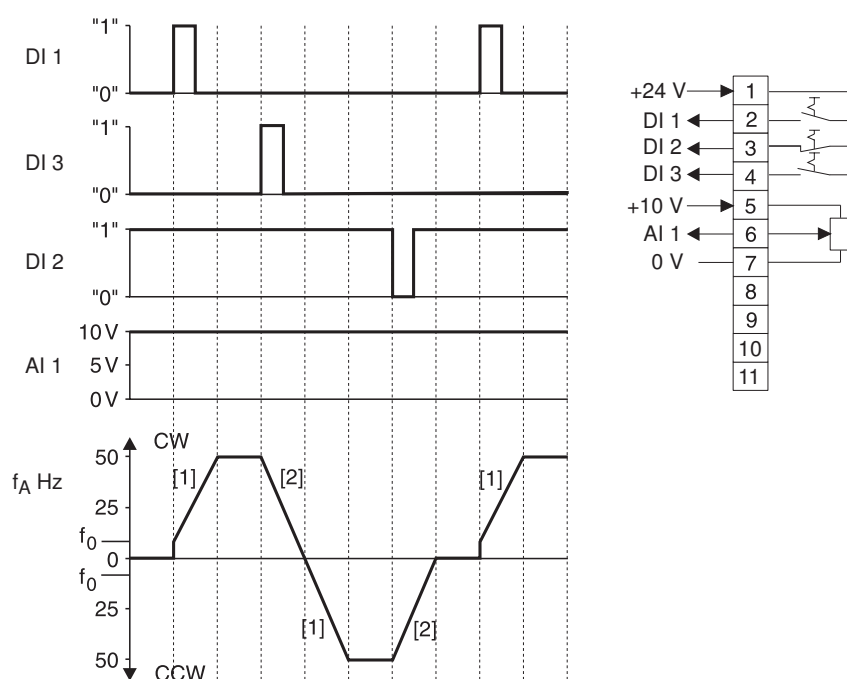
The 3-wire control principle determines the control.

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

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

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

9.12.1 Control signal source 3-wire control



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

10 Parameters

10.1 Parameter overview

10.1.1 Configuration parameters

Parameter	CANopen/ SBus index	Modbus register	Description	Indicating range	Explanation
P00	–	–	–	SEt-1 – SEt-8	"P-00 Configuration parameters for IP66/NEMA-4X devices with switch option" (→ 116)

10.1.2 Parameters for realtime monitoring (read only)

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

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

Access to parameter group 0

To gain access to parameter group 0, proceed as follows:

- Press the <Menu> key for 2 s to access the parameter menu.
- Set *P-14* to "101" or, if there is a user-defined password, to the value from *P-37*.
- Use the <Up> or <Down> key to set the *P-00* parameter value.
- Press the <Menu> key for 1 s to switch to the *P00-xy* parameter group.
- Use the <Up> or <Down> key to select the desired parameter.
- Press the <Menu> key again for 1 s to display the value (<Up>/<Down> key for several levels)
- To return to the parameter menu, press the <Menu> key for 1 s.
- To exit the parameter menu, press the <Menu> key for 2 s.

Description of parameter group 0

Parameter	CANopen/ SBus index	Modbus register	Description	Indicating range	Explanation
P00-01	11210	20	Value of analog input 1	0 – 100%	Index value 1000 = 100% ± max. input voltage or input current.
P00-02	11211	21	Value of analog input 2	0 – 100%	Index value 1000 = 100% ± max. input voltage or input current.
P00-03	11213	22, 40	Speed controller setpoint	P-02 – P-01	Speed display in Hz when <i>P-10</i> = 0, otherwise in min ⁻¹
P00-04	11212	11	Status of digital inputs	Binary value	Status of the digital inputs DI1; DI2; DI3; DI4
P00-05	11232	39	Temperature of control electronics	-25 °C – 125 °C	40 = 40 °C
P00-06	11288		DC link voltage ripple	0 – 1000 V	Voltage ripple of the DC link
P00-07	11270	43	Present motor voltage	AC 0 – 600 V	Inverter output voltage effective value
P00-08	11220	23	DC link voltage (U _Z)	DC 0 – 1000 V	600 = 600 V (internal DC link voltage)
P00-09	11221	24	Temperature of power electronics/heat sink	-20 °C – 100 °C	40 = 40 °C
P00-10	11296 – 11297	25, 26	Operating hours counter (inverter enabled)	Value 1: Hours Value 2: Minutes, seconds	General enable of the inverter since manufacture (enable). Value cannot be reset

Parameter	CANopen/ SBus index	Modbus register	Description	Indicating range	Explanation
P00-11	11298 – 11299	–	Runtime since the last fault 1	Value 1: Hours Value 2: Minutes, seconds	Operating time since the last fault or power off. The timer is reset at the next enable or power off.
P00-12	11300 – 11301	–	Runtime since the last fault 2	Value 1: Hours Value 2: Minutes, seconds	Operating time since the last fault. The timer is reset at the next enable or power off.
P00-13	11302 – 11303	28	Operating time since the last enable	Value 1: Hours Value 2: Minutes, seconds	Displays the operating time of an enable interval. The timer is reset at each following enable
P00-14	11350	–	Current PWM switching frequency	2 – 16 kHz	The value may be below the setting in <i>P-17</i> , as it is automatically reduced by the inverter in the event of thermal overload.
P00-15	11305 – 11313	–	DC link voltage protocol	8 values 0 – 1000 V	Shows the last 8 values prior to the fault shutdown
P00-16	11322 – 11329	–	Power electronics/heat sink temperature protocol (P00-09)	8 values -20 °C – 120 °C	Shows the last 8 values prior to the fault shutdown
P00-17	11330 – 11337	–	Motor current protocol	8 values 0 – 2 × nominal motor current	Shows the last 8 values prior to the fault shutdown
P00-18	11247 – 11250	15, 16	Firmware version and checksum	4 values, e.g.: "1 2.01", "1 1703" "2 2.01", "2 ECdA"	Firmware and checksum of the control electronics and the power section.
P00-19	11251 – 11254	34 – 37	Serial number	2 values xxxxxx xx-xxx	Serial number of the inverter
P00-20	11255	12 – 14, 17	Inverter type	3 values, e.g.: 0.75/F1 230/3P-out	Power rating/connection and voltage/motor connection
P00-21	11259 – 11261	–	Outgoing process data (CANopen, SBus)	4 values: PO1 – PO4	4 entries; outgoing process data from the perspective of the controller.
P00-22	11256 – 11258	–	Incoming process data (CANopen, SBus)	4 values: PI1 – PI4	4 entries; incoming process data from the perspective of the controller.
P00-23	11289 – 11290	–	Total runtime > 85 °C (power electronics/heat sink)	Value 1: Hours Value 2: Minutes, seconds	Time during which a temperature of > 85 °C was measured at the heat sink
P00-24	11237 – 11238	–	Total runtime > 60 °C (control electronics)	Value 1: Hours Value 2: Minutes, seconds	Time in which the inverter was operated at > 60 °C
P00-25	11291	–	Rotor speed (calculated via motor model)	Hz/min-1	Speed display in Hz when <i>P-10</i> = 0, otherwise in min ⁻¹
P00-26	11292 – 11293	32, 33	kWh counter/MWh counter	kWh/MWh	The values are reset in the event of a factory setting.
P00-27	11304 – 11305	–	Inverter fan runtime	Value 1: Hours Value 2: Minutes, seconds	Runtime clock for internal fan.
P00-28	11272 – 11281	–	Fault history	4 values	Displays the last 4 faults. You can toggle between the sub-items by pressing the <Up>/<Down> key
P00-29	11219	–	PI controller output	0 – 100%	PI controller output
P00-30	11314 – 11321	–	DC link voltage ripple protocol	8 values 0 – 1000 V	Shows the last 8 values prior to the fault shutdown
P00-31	11282 – 11283	–	Magnetizing current Id and torque current Iq	2 values d x.xA q x.xA	Magnetizing current/torque-forming current
P00-32	11239 – 11246	–	Control electronics temperature protocol (P00-05)	8 values -25 °C – 125 °C	Shows the last 8 values prior to the fault shutdown
P00-33	11338	–	Counter for overcurrent faults: O-I	0 – 65000	Counter for overcurrent faults

Parameter	CANopen/ SBus index	Modbus register	Description	Indicating range	Explanation
P00-34	11339	–	Counter for over-voltage faults: O-Volt	0 – 65000	Counter for overvoltage faults
P00-35	11340	–	Counter for under-voltage faults: U-Volt	0 – 65000	Counter for undervoltage faults. Also during power off.
P00-36	11341	–	Counter for over-temperature faults: O-t	0 – 65000	Counter for overtemperature faults on the heat sink
P00-37	11342	–	Counter for braking resistor overload: OL-b	0 – 65000	Counter for short-circuit faults on the brake chopper.
P00-38	11343	–	Counter for over-temperature faults: O-heat	0 – 65000	Counter for overtemperature faults due to high ambient temperature.
P00-39	11224	–	Counter for Modbus communication errors	0 – 65000	
P00-40	11225	–	Counter for CANopen communication errors	0 – 65000	
P00-41	11223	–	Counter for internal I/O communication errors	0 – 65000	
P00-42	11344	–	Counter for internal DSP communication errors of the power section	0 – 65000	Counter for communication errors between the processors of the power electronics
P00-43	11351 – 11352	–	Operating hours counter (inverter connected to line voltage)	Value 1: Hours Value 2: Minutes, seconds	Total switch-on time of the inverter since manufacture (supply system on). Value cannot be reset.
P00-44	–	–	Current phase offset and reference value for U	Internal value	Value 1: Reference value Value 2: Measured value
P00-45	–	–	Current phase offset and reference value for V	Internal value	Value 1: Reference value Value 2: Measured value
P00-46	–	–	Current phase offset and reference value for W	Internal value	Value 1: Reference value Value 2: Measured value
P00-47	11294 – 11295	–	Total cyclic duration factor, fire mode	Value 1: Hours Value 2: Minutes, seconds	Total cyclic duration factor of the fire mode in [h]
P00-48	11226 – 11227	18, 19	Display values for channel 1 and 2, internal oscilloscope	Channel 1 Channel 2	Current value of the latest oscilloscope measurement. Unit refers to the set size
P00-49	11228 – 11229	–	Display values for channel 3 and 4, internal oscilloscope	Channel 3 Channel 4	Current value of the latest oscilloscope measurement. Unit refers to the set size
P00-50	11355 – 11356	–	Lib version and DSP bootloader version for motor controller	Value 1: L 3.04 Value 2: b 1.00	Value 1: Version of the motor controller Value 2: DSP bootloader version

10.1.3 Basic parameters

Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P-01	11020	129	Maximum speed (→ 95)	$P-02 - 50.0 \text{ Hz} - 5 \times P-09^{1)}$
P-02	11021	130	Minimum speed (→ 95)	$0 - P-01 \text{ Hz}^{1)}$
P-03	11022	131	Acceleration ramp time (→ 95)	0.00 – 5.0 – 600 s
P-04	11023	132	Deceleration ramp time (→ 95)	0.00 – 5.0 – 600 s
P-05	11024	133	Stop mode (→ 95)	0 – 2
P-06	11025	134	Energy-saving function (→ 96)	0 – 1
P-07	11012	135	Rated motor voltage (→ 96)	0 – 230 – 250 V 0 – 400 ²⁾ – 500 V
P-08	11015	136	Rated motor current (→ 96)	20 – 100%
P-09	11009	137	Rated motor frequency (→ 97)	25 – 50/60 ²⁾ Hz – 500 Hz
P-10	11026	138	Rated motor speed (→ 97)	0 – 30 000 min ⁻¹
P-11	11027	139	Voltage increase, boost (→ 97)	0 – 25% ³⁾
P-12	11028	140	Control signal source (→ 98)	0 – 11
P-13	11029	141	Reserved	–
P-14	11030	142	Advanced parameter access (→ 98)	0 – 9999

1) Note the explanation under P-10.

2) 460 V in American version only

3) Power-dependent.

10.1.4 Advanced parameters

Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P-15	11031	143	Digital input function selection (→ 98)	0 – 13
P-16	11064	144	Analog input 1 format (→ 101)	U0 – 10 b0 – 10 A0 – 20 t4 – 20 r4 – 30 t20 – 4 r20 – 4
P-17	11003	145	PWM switching frequency (→ 102)	2 – 4 – 16 kHz ¹⁾
P-18	11050	146	User relay output function selection (→ 103)	0 – 1 – 8
P-19	11051	147	Limit value for relay/analog output (→ 104)	0.0 – 100.0 – 200.0%
P-20	11036	148	Fixed setpoint speed 1 (→ 104)	$-P-01 - 5.0 \text{ Hz} - P-01^{2)}$
P-21	11037	149	Fixed setpoint speed 2 (→ 104)	$-P-01 - 25.0 \text{ Hz} - P-01^{2)}$
P-22	11038	150	Fixed setpoint speed 3 (→ 104)	$-P-01 - 40.0 \text{ Hz} - P-01^{2)}$
P-23	11039	151	Fixed setpoint speed 4 (→ 104)	$-P-01 - P-01^{2)}$
P-24	11059	152	Second deceleration ramp, rapid stop ramp (→ 104)	0.00 – 2.0 – 25 s
P-25	11046	153	Analog output/digital output function selection (→ 104)	0 – 8 – 10
P-26	11045	154	Skip frequency band (→ 105)	0 Hz – $P-01^{2)}$
P-27	11044	155	Skip frequency (→ 105)	$P-02 - P-01^{2)}$
P-28	11099	156	V/f characteristic curve adjustment (voltage value) (→ 106)	0 – $P-07$ [V]
P-29	11098	157	V/f characteristic curve adjustment (frequency value) (→ 106)	0 – $P-09$ [Hz]
P-30	11070	158	Start mode selection (→ 106)	Edge-r, Auto-0 – Auto-5
P-31	11071	159	Keypad/fieldbus enabling behavior (→ 107)	0 – 1 – 7
P-32	11133	160	Direct current hold function Level 1: Current holding time (→ 108)	0.0 – 25 s
	11132		Direct current hold function Level 2: Current holding mode (→ 108)	0 – 2
P-33	11060	161	Enable flying start function (→ 108)	0 – 2

Parameter	CANopen/ SBus index	Modbus register	Description	Setting range Factory setting
P-34	11131	162	Activation of brake chopper (→ 109)	0 – 2
P-35	11065	163	Analog input 1/slave scaling (→ 109)	0.0 – 100.0 – 2000%
P-36	11105	164	Fieldbus setting Level 1: Inverter address (→ 110)	0 – 1 – 63
	11106		Fieldbus setting Level 2: Baud rate (→ 110)	0 – 1 – 5
	11107		Fieldbus setting Level 3: Timeout behavior (→ 110)	0 – 8
P-37	11074	165	Extended parameter access code definition (→ 111)	0 – 101 – 9999
P-38	11073	166	Parameter lock (→ 111)	0 – 1
P-39	11066	167	Analog input 1 offset (→ 111)	-500 – 0.0 – 500%
P-40	11056	168	Actual display value scaling factor Level 1: Display scaling factor (→ 111)	0.000 – 16.000
	11057		Actual display value scaling factor Level 2: Display scaling source (→ 111)	0 – 2
P-41	–	169	Thermal motor protection according to UL508C (→ 112)	0 – 1
P-42	11075	170	PI proportional gain (→ 112)	0.0 – 1.0 – 30.0
P-43	11076	171	PI-integrating time constant (→ 112)	0.0 – 1.0 – 30.0 s
P-44	11078	172	PI operating mode (→ 112)	0 – 1
P-45	11079	173	PI reference selection Level 1: PI reference source (→ 112)	0 – 1
	11080		PI reference selection Level 2: PI feedback source (→ 112)	0 – 5
P-46	11081	174	PI fixed setpoint reference (→ 113)	0.0 – 100.0%
P-47	11067	175	Analog input 2 format (→ 113)	U0 – 10 A0 – 20 t4 – 20 r4 – 30 t20 – 4 r20 – 4 PTC – th
P-48	11061	176	Standby mode (→ 113)	0.0 – 25 s
P-49	11087	177	PI control difference wake-up level (→ 113)	0.0 – 5.0 – 100%
P-50	11052	178	Hysteresis band user relay (→ 113)	0.0 – 100%
P-51	11089	179	Operating mode/motor control (→ 114)	0 – 1 – 5
P-52	11090	180	Auto-tune (→ 114)	0 – 1
P-53	11091	181	Speed controller Level 1: Proportional gain	0 – 250%
	11092		Speed controller Level 2: Integrating time constant	0.00 – 2.50 s
P-54	11095	182	Current limit (→ 115)	0.0 – 150 – 175%
P-55	11140	183	Stator resistance of the motor (Rs) (→ 116)	0.00 – 655.35 Ω
P-56	11142	184	Stator inductance of the motor (Lsd) (→ 116)	0.0 – 6553.5 mH
P-57	11145	185	Stator inductance of the motor (Lsq) (→ 116)	0.0 – 6553.5 mH
P-58	11134	186	Speed of direct current braking (→ 116)	0.0 – <i>P-01</i>
P-59	11135	187	Current strength of direct current braking (→ 116)	0.0 – 20.0 – 100%
P-60	11128	188	Fire mode/emergency mode speed (→ 116)	- <i>P-01</i> – 0 – <i>P-01</i> Hz

1) Power-dependent

2) Note the explanations under P-10

10.2 Explanation of the parameters

10.2.1 Basic parameters

P-01 Maximum speed

Setting range: $P-02 - 50.0 \text{ Hz} - 5 \times P-09$ (maximum 500 Hz)

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

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

P-02 Minimum speed

Setting range: $0 - P-01 \text{ Hz}$

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

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

P-03 Acceleration ramp time

Setting range: $0.00 - 5.0 - 600 \text{ s}$

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

P-04 Deceleration ramp time

Setting range: $0.00 - 5.0 - 600 \text{ s}$

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

P-05 Stop mode

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

Setting range: $0 - 2$

In the event of power failure:

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

Normal stop:

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

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

P-06 Energy-saving function

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

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

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

This function is only applicable for asynchronous motors.

P-07 Rated motor voltage

Setting range:

- 230 V inverter: 20 – **230** – 250 V
- 400 V inverter: 20 – **400/460¹⁾** – 500 V

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

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

¹⁾ 460 V in American version only.

P-08 Rated motor current

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

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

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

P-09 Rated motor frequency

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

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

1) 60 Hz (American version only).

P-10 Rated motor speed

Setting range: **0** – 30 000 min⁻¹

Specifies the rated speed of the motor. When the parameter is $\neq 0$, all speed-related parameters such as minimum and maximum speed are displayed in "min⁻¹".

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

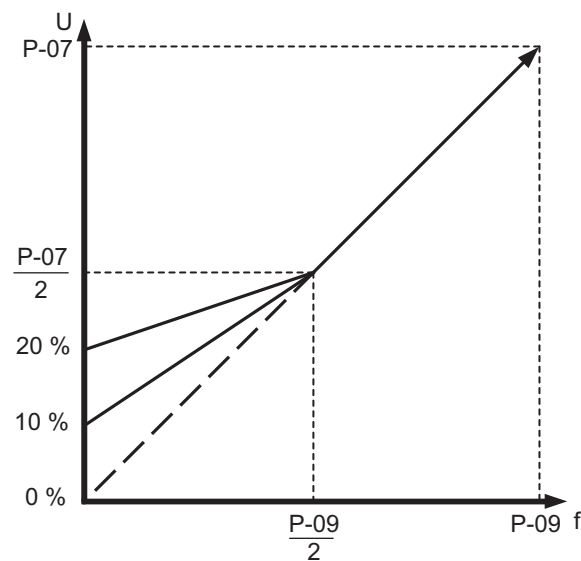
P-11 Voltage increase, boost

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

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

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

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



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For continuous duty at low speeds, a motor with a forced cooling fan must be used.

P-12 Control signal sourceSetting range: **0** – 11

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

P-13 Reserved

Parameter reserved

P-14 Extended parameter accessSetting range: **0** – 9999

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

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

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

10.2.2 Advanced parameters**P-15 Digital input function selection**Setting range: **0** – 13

Users can configure the function of the digital inputs of the inverter, i.e. the user can select functions required for the application.

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

Terminal mode**INFORMATION**

An error reset can be performed using a rising edge: at digital input 1.

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

P-15	Digital input 1	Digital input 2	Digital input 3/ Analog input 2	Analog input 1/ Digital input 4	Comments
0	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Speed setpoint, analog 1: Fixed setpoint speed 1	Speed setpoint, analog	—
1	0: Stop 1: Enable + start	0: Speed setpoint, analog 1: Fixed setpoint speed 1, 2	0: Fixed setpoint speed 1 1: Fixed setpoint speed 2	Speed setpoint, analog	—
2	0: Stop 1: Enable + start	0: Open	0: Open	0: Fixed setpoint speed 1 – 4 1: Max. speed (<i>P-01</i>)	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
3	0: Stop 1: Enable + start	0: Speed setpoint, analog 1: Fixed setpoint speed 1	External error 0: Error 1: No error	Speed setpoint, analog	When using a TF/TH, you must also set <i>P-47</i> to "Ptc-th".
4	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Speed setpoint, analog 1: Fixed setpoint speed 1	Speed setpoint, analog	—
5	0: Stop 1: Enable + start CW rotation When both inputs are active, the stop ramp (<i>P-24</i>) is activated.	0: Stop 1: Enable + start CCW rotation	0: Speed setpoint, analog 1: Fixed setpoint speed 1	Speed setpoint, analog	—
6	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	External error 0: Error 1: No error	Speed setpoint, analog	When using a TF/TH, you must also set <i>P-47</i> to "Ptc-th".
7	0: Stop 1: Enable + start CW rotation When both inputs are active, the rapid stop ramp (<i>P-24</i>) is activated.	0: Stop 1: Enable + start CCW rotation	External error 0: Error 1: No error	Speed setpoint, analog	When using a TF/TH, you must also set <i>P-47</i> to "Ptc-th".
8	0: Stop 1: Enable + start	0: Clockwise rotation 1: Counterclockwise rotation	0: Open	0: Open	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 CW rotation When both inputs are active, the rapid stop ramp (<i>P-24</i>) is activated.	0: Stop 1: Enable + start CCW rotation	0: Open	0: Open	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	Enable + start pushbutton (NO contact)	Stop pushbutton (NC contact)	0: Speed setpoint, analog 1: Fixed setpoint speed 1	Speed setpoint, analog	Edge controller
11	Enable + start pushbutton, CW rotation (NO contact)	Stop pushbutton (NC contact)	Enable + start pushbutton CCW rotation (NO contact)	Speed setpoint, analog	When DI1 and DI3 are active simultaneously, the rapid stop ramp (<i>P-24</i>) is activated.
12	0: Stop 1: Enable + start	0: Rapid stop ramp <i>P-24</i> 1: Operation	0: Speed setpoint, analog 1: Fixed setpoint speed 1	Speed setpoint, analog	—
13	0: Stop 1: Enable + start	0: Fixed setpoint speed 1 1: Speed setpoint, analog	0: Emergency mode/fire mode 1: Normal operation	Speed setpoint, analog	Fire mode/emergency mode

Keypad mode

INFORMATION



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

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

P-15	Digital input 1	Digital input 2	Digital input 3/ Analog input 2	Analog input 1/ Digital input 4	Comments	<Up> key 	<Down> key 
0, 5, 8–12	0: Stop 1: Enable	Speed <Up> key (NO contact) ¹⁾	Speed <Down> key (NO contact) ¹⁾	0: Clockwise rotation 1: Counterclockwise rotation	–	Increase speed	Reduce speed
1	0: Stop 1: Enable	No function	PI controller function depending on <i>P-45</i>		–	No function	No function
2	0: Stop 1: Enable	Speed <Up> key (NO contact) ¹⁾	Speed <Down> key (NO contact) ¹⁾	0: Speed setpoint keypad 1: Fixed setpoint speed 1	–	Increase speed	Reduce speed
3	0: Stop 1: Enable	Speed <Up> key (NO contact) ¹⁾	External fault 0: Fault 1: No fault	Speed <Down> key (NO contact) ¹⁾	When using a TF/TH, you must also set <i>P-47</i> to PTC-th.	Increase speed	Reduce speed
4	0: Stop 1: Enable	Speed Up key (NO contact)	0: Speed setpoint keypad 1: Speed setpoint, analog	Speed setpoint, analog	–	Increase speed	Reduce speed
6	0: Stop 1: Enable	0: Clockwise rotation 1: Counterclockwise rotation	External fault 0: Fault 1: No fault	0: Speed setpoint keypad 1: Fixed setpoint speed 1	When using a TF/TH, you must also set <i>P-47</i> to PTC-th.	Increase speed	Reduce speed
7	0: Stop 1: Enable clockwise rotation ²⁾	0: Stop 1: Enable counterclockwise rotation ²⁾	External fault 0: Fault 1: No fault	0: Speed setpoint keypad 1: Fixed setpoint speed 1	When using a TF/TH, you must also set <i>P-47</i> to PTC-th.	Increase speed	Reduce speed
13	0: Stop 1: Enable	0: Fixed setpoint speed 1, 2 1: Speed setpoint keypad	0: Emergency mode/fire mode 1: Normal operation	0: Fixed setpoint speed 1 1: Fixed setpoint speed 2	Fire mode/emergency mode	Increase speed	Reduce speed

1) If you press both keys simultaneously, the drive is started/enabled.

2) If both inputs are active, the rapid stop ramp (*P-24*) is activated.

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

INFORMATION



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

The hardware enable is a prerequisite for the fieldbus enable.

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

The setpoint changeover (DI2) functions also in the case of CAN, Modbus/RTU, and slave mode only with the hardware enable (DI1), without an imminent fieldbus enable.

If parameter *P-12* = 3 or 4 (SBus MOVILINK®) or *P-12* = 5 or 6 (Modbus RTU) or *P-12* = 7 or 8 (CANopen) or *P-12* = 11 (slave operation), the following table applies:

P-15	Digital input 1	Digital input 2	Digital input 3	Analog input	Comments
0, 2, 4, 8–12	0: Stop 1: Enable	No function	No function	No function	–
1	0: Stop 1: Enable	No function	PI controller function depending on <i>P-45</i>		–
3	0: Stop 1: Enable	0: Fieldbus/master speed setpoint 1: Fixed setpoint speed 1	External fault 0: Fault 1: No fault	No function	When using a TF/TH, you must also set <i>P-47</i> to PTC-th.

P-15	Digital input 1	Digital input 2	Digital input 3	Analog input	Comments
5	0: Stop 1: Enable	0: Fieldbus/master speed setpoint 1: Fixed setpoint speed 1, 2	0: Fixed setpoint speed 1 1: Fixed setpoint speed 2	No function	–
6	0: Stop 1: Enable	0: Fieldbus/master speed setpoint 1: Speed setpoint, analog	External fault 0: Fault 1: No fault	Speed setpoint, analog	When using a TF/TH, you must also set P-47 to PTC-th.
7	0: Stop 1: Enable	0: Fieldbus/master speed setpoint 1: Speed setpoint keypad	External fault 0: Fault 1: No fault	No function	When using a TF/TH, you must also set P-47 to PTC-th.
13	0: Stop 1: Enable	0: Fixed setpoint speed 1, 2 1: Fieldbus/master speed setpoint	0: Emergency mode/fire mode 1: Normal operation	0: Fixed setpoint speed 1 1: Fixed setpoint speed 2	Fire mode/emergency mode

PI controller control mode

P-15	Digital input 1	Digital input 2	Digital input 3/ Analog input 2	Analog input 1/ Digital input 4	Comments
0, 2, 9 – 12	0: Stop 1: Enable + Start	0: PI controller 1: Fixed setpoint speed 1	See comments	See comments	The setpoint and actual value sources of the PI controller must be set via P-45 Level 1 and 2.
1	0: Stop 1: Enable + Start	0: PI controller 1: Setpoint source of analog input 1	See comments	See comments	
3, 7	0: Stop 1: Enable + Start	0: PI controller 1: Fixed setpoint speed 1	External fault 0: Fault 1: No fault	See comments	The setpoint and actual value sources of the PI controller must be set via P-45 Level 1 and 2. When using a TF/TH, you must also set P-47 to PTC-th.
4	Enable + Start key (NO contact)	Stop key (NC contact)	See comments	See comments	The setpoint and actual value sources of the PI controller must be set via P-45 Level 1 and 2.
5	Enable + Start key (NO contact)	Stop key (NC contact)	0: PI controller 1: Fixed setpoint speed 1	See comments	
6	Enable + Start key (NO contact)	Stop key (NC contact)	External fault 0: Fault 1: No fault	See comments	The setpoint and actual value sources of the PI controller must be set via P-45 Level 1 and 2. When using a TF/TH, you must also set P-47 to PTC-th.
8	0: Stop 1: Enable + Start	0: Clockwise rotation 1: Counterclockwise rotation	See comments	See comments	The setpoint and actual value sources of the PI controller must be set via P-45 Level 1 and 2.
13	0: Stop 1: Enable + Start	0: Fixed setpoint speed 1 1: PI controller	0: Emergency mode/fire mode 1: Normal operation	See comments	The setpoint and actual value sources of the PI controller must be set via P-45 Level 1 and 2. Fire mode/emergency mode

P-16 Analog input 1 format

Setting range:

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

"t.." indicates that the inverter shuts down when the signal is removed while the inverter is enabled. $t_4 = 20 \text{ mA}$, $t_{20} = 4 \text{ mA}$.

"r.." indicates that the inverter moves along a ramp to $P-20$ when the signal is removed while the inverter is enabled. $r_4 = 20 \text{ mA}$, $r_{20} = 4 \text{ mA}$.

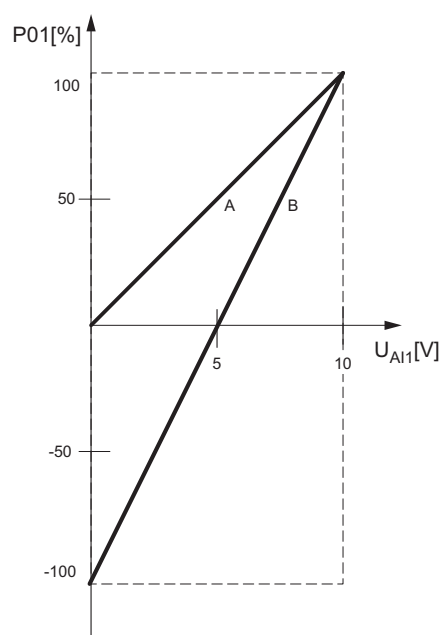
INFORMATION



The analog input can be scaled with the parameters $P-35$ ($\rightarrow$ 109) and $P-39$.

Example of bipolar speed with unipolar voltage source

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



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Characteristic curve [A] (unipolar speed):

Input voltage signal:

0 – 10 V

Setting:

$P-16 = U_0 = 10 \text{ V}$ (unipolar)

$P-35 = 100\%$ (default)

$P-39 = 0\%$ (default)

Characteristic curve [B] (bipolar speed):

Input voltage signal:

0 – 10 V

Setting:

$P-16 = b_0 = 10 \text{ V}$ (bipolar)

$P-35 = 200\%$

$P-39 = 50\%$

P-17 PWM switching frequency

Setting range: 2 – 4 – 16 kHz (power-dependent)

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

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

- Heat sink temperature

- Output frequency
- Overload

Heat sink temperature	Output frequency (lower and upper threshold)	Overload Output current	Inverter behavior
70 °C	7 – 9 Hz	–	Reduction to 12 kHz
75 °C	5 – 7 Hz	–	Reduction to 8 kHz
80 °C	3 – 5 Hz	–	Reduction to 6 kHz
85 °C	1 – 3 Hz	>140% >110% ¹⁾	Reduction to 4 kHz
95 °C	–	–	Overtemperature error message

1) MCLTEB0040-5x3-4-x0

P-18 User relay output function selection

Setting range: 0 – 1 – 8

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

If a relay is controlled depending on a limit value, it reacts according to the curve in P-50 (→ 113).

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

Set-tings	Function	Explanation
8	Analog input 2 > limit value <i>P-19</i> The switching hysteresis can be set in <i>P-50</i> .	Relay contacts closed if the value of the second analog input is greater than the value set in the parameter "Limit value for relay/analog output". Relay contacts opened if the value is lower than the "Limit value for relay/analog output".

P-19 Limit value for relay/analog outputSetting range: 0.0 – **100.0** – 200.0%Specifies the limit values for *P-18* and *P-25*.**P-20 Fixed setpoint speed 1**Setting range: *-P-01* – **5.0 Hz** – *P-01***P-21 Fixed setpoint speed 2**Setting range: *-P-01* – **25.0 Hz** – *P-01***P-22 Fixed setpoint speed 3**Setting range: *-P-01* – **40.0 Hz** – *P-01***P-23 Fixed setpoint speed 4**Setting range: *-P-01* – **P-01****P-24 Second deceleration ramp, rapid stop ramp**Setting range: 0.00 – **2** – 25 sIs selected automatically in the event of a power failure if *P-05* = 2.

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

P-25 Analog output/digital output function selectionSetting range: 0 – **8** – 10

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

If P-25 is selected as the digital output, it behaves according to the curve in *P-50*.
(→  113)

Set-tings	Function	Explanation
0	Inverter enabled (digital)	Logical 1 if the inverter is enabled.
1	Frequency inverter is ready for operation (digital)	Logical 1 if the inverter is ready for operation (no error).
2	Motor at setpoint speed (digital)	Logical 1 if the output frequency = setpoint frequency ±0.1 Hz.
3	Frequency inverter is in error status (digital)	Logical 1 if the inverter is in error status.

Set-tings	Function	Explanation
4	Motor speed $\geq$ limit value <i>P-19</i> in relation to <i>P-01</i> (digital) The switching hysteresis can be set in <i>P-50</i> .	Logical 1 if the output frequency is greater than the value set in the parameter "Limit value for relay/analog output". Relay contacts opened if the value is lower than the "Limit value for relay/analog output".
5	Motor current $\geq$ limit value <i>P-19</i> in relation to <i>P-08</i> (digital) The switching hysteresis can be set in <i>P-50</i> .	Logical 1 if the motor current/torque is greater than the current limit value set in the parameter "Limit value for relay/analog output". Relay contacts opened if the value is lower than the "Limit value for relay/analog output".
6	Motor speed $<$ limit value <i>P-19</i> in relation to <i>P-01</i> (digital) The switching hysteresis can be set in <i>P-50</i> .	Logical 1 if the output frequency is lower than the value set in the parameter "Limit value for relay/analog output". Relay contacts opened if the value is greater than the "Limit value for relay/analog output".
7	Motor current $<$ limit value <i>P-19</i> in relation to <i>P-08</i> (digital) The switching hysteresis can be set in <i>P-50</i> .	Logical 1 if the motor current/torque is lower than the current limit value set in the parameter "Limit value for relay/analog output". Relay contacts opened if the value is greater than the "Limit value for relay/analog output".
8	Motor speed (analog)	The amplitude of the analog output signal represents the motor speed. It is scaled from 0 to the maximum speed limit defined in <i>P-01</i> .
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 <i>P-08</i> .
10	Motor power (analog)	The amplitude of the analog output signal represents the apparent output power of the inverter. It is scaled from 0 to 200% of the inverter nominal power.

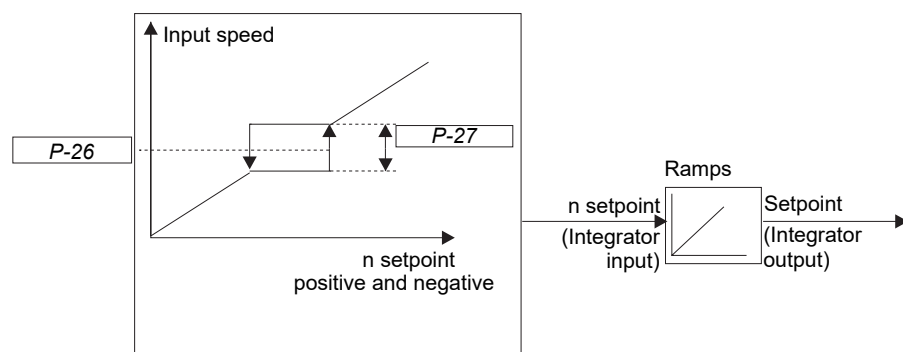
P-26/P-27 Skip frequency band/skip frequency

Setting range *P-26*: 0 Hz – *P-01*

Setting range *P-27*: **P-02** – *P-01*

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 *P-03* and *P-04*.

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



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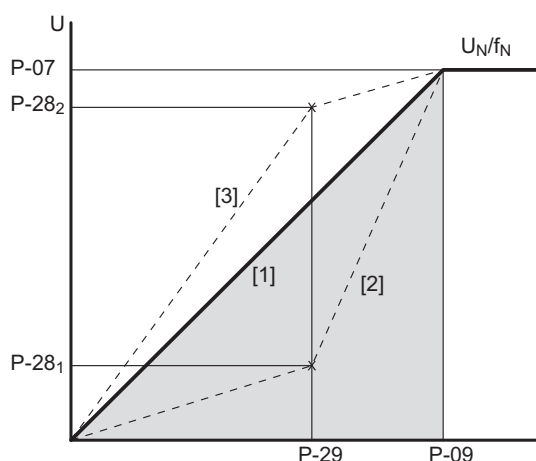
P-28/P-29 V/f characteristic curve adjustment

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

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

The voltage/frequency characteristic curve determines the voltage level applied to the motor at the respective specified frequency. You can change the V/f characteristic as needed using parameters *P-29* and *P-28*.

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



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- [1] Normal V/f characteristic
- [2] Adjusted V/f characteristic (example 1)
- [3] Adjusted V/f characteristic (example 2)

P-07 = Rated motor voltage

P-09 = Rated motor frequency

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

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

P-30 Start mode selection

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

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

Edge-r

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

Auto-0:



⚠ WARNING

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

Fatal or severe injuries and damage to property.

- Disconnect the device from the power supply before rectifying an error if automatic restart of the driven machine after error 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 system from performing an unintentional startup.

- After activation or resetting, the frequency 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 power supply before rectifying an error if automatic restart of the driven machine after error 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 system from performing an unintentional startup.

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

P-31 Enable behavior/changeover behavior for keypad/fieldbus

Keypad:

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

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

Setting range: 0 – 1 – 7

Changeover behavior when switching the setpoint source of keypad mode:

0	The motor speed continues at the minimum speed set in <i>P-02</i> .
1	The motor speed changes to the previously set keypad speed.
2	The motor speed continues at the minimum speed set in <i>P-02</i> .
3	The motor speed changes to the previously set keypad speed.
4	The current motor speed is applied during changeover.

Changeover behavior when switching the setpoint source of keypad mode:

5	The motor speed continues at the fixed setpoint speed set in <i>P-23</i> .
6	The current motor speed is applied during changeover.
7	The motor speed continues at the fixed setpoint speed set in <i>P-23</i> .

Enable behavior when the inverter is enabled in keypad mode:

0	The motor starts up at the minimum speed set in <i>P-02</i> .
1	The motor starts up at the previously set keypad speed.
2	The motor starts up at the minimum speed set in <i>P-02</i> .
3	The motor starts up at the previously set keypad speed.
4	The motor starts up at the minimum speed set in <i>P-02</i> .
5	The motor starts up at the fixed setpoint speed set in <i>P-23</i> .
6	The motor starts up at the minimum speed set in <i>P-02</i> .
7	The motor starts up at the fixed setpoint speed set in <i>P-23</i> .

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

The <Start> and <Stop> keys on the keypad are out of function.

You can modify the speed with the <Up> and <Down> keys.

Fieldbus:

Applies both when changing over the setpoint source and also when enabling the inverter.

In the setting 0, 1, 4, or 5, the inverter is started with the fieldbus enable and an additional hardware enable. The speed setpoint is transferred from the fieldbus.

In the setting 2, 3, 6, or 7, the inverter is started only with the hardware enable. The fieldbus enable is not necessary. The speed setpoint is transferred from the fieldbus.

P-32 DC hold function

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

Level 1: Current holding time

Setting range: **0.0** – 25 s

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

Level 2: Current holding mode

Setting range: **0** – 2

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

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

P-33 Enable flying start function

Setting range: **0** – 2

When the flying start function is enabled, the frequency inverter first determines the current rotor speed. This causes a minor delay between the enable and the startup. This function protects the inverter from overcurrent errors when connecting to rotating motors.

The flying start function is possible only in the operating modes V/f and LVFC.

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

P-34 Brake chopper activation

Setting range: 0 – 2

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

P-35 Analog input 1/slave scaling

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

Slave scaling (P-12 = 11)

$$P-35 = (n_{\text{Slave}}/n_{\text{Master}}) \times 100\%$$

Scaling analog input (P-12 ≠ 11)

The analog input can be scaled using the parameter P-35/P-39. The scaling describes the slope of the straight sections. You can calculate the parameters with the following formulae, depending on the desired characteristic curve:

Calculation of the scaling parameters:

P-01 = Amount of the larger value of n_1 and n_2

P-02 = 0

P-16 = $U_0 - 10 \text{ V}$, when $n_1 \geq 0$

P-16 = $b_0 - 10 \text{ V}$, when $n_1 < 0$

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

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

with:

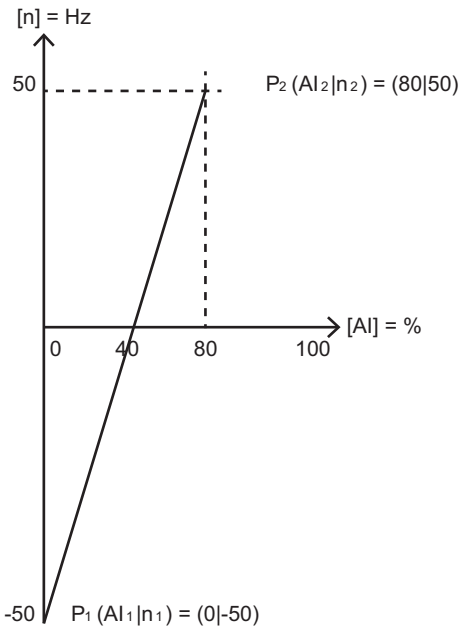
$[AI_1]; [AI_2] = \%$

$100\% \triangleq AI_{\text{max}}$ (10 V or 20 mA)

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

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

$$P-01 = 50 \text{ Hz, as } |n_2| > |n_1|$$
$$P-02 = 0 \text{ Hz}$$
$$P-16 = b0 - 10 \text{ V, as } n_1 < 0$$
$$P-35 = 10000 * \frac{(50 - (-50))}{50(80 - 0)} = 250 \%$$
$$P-39 = 0 - \frac{-50(80 - 0)}{(50 - (-50))} = 40 \%$$



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P-36 Fieldbus settings

The parameter is divided into three levels and depends on the setting specified in $P-12$.

Level 1: Inverter address

Setting range: 1 – 63
Defines the general inverter address for SBus, Modbus, the fieldbus and master/slave.

Level 2: Baud rate

Setting range: 0 – 1 – 5
Defines the baud rate depending on the bus system.

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

Level 3: Timeout behavior

Setting range: 0 – 8

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Defines the time in seconds after which the inverter performs the set response in the event of a communication failure.

- 0: The last setpoint is retained. There is no switch off with fault.
- 1: t30 ms
- 2: t100 ms
- 3: t1000 ms
- 4: t3000 ms
- 5: r30 ms
- 6: r100 ms
- 7: r1000 ms
- 8: r3000 ms

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

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

P-37 Extended parameter access code definition

Setting range: 0 – **101** – 9999

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

P-38 Parameter lock

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

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

P-39 Analog input 1 offset

Setting range: -500 – **0.0** – 500%

The offset describes the percentage offset of the analog input signal on the characteristic curve in X-direction.

For a calculation example, see *P-35* (→ 109).

P-40 Actual speed value scaling factor

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

Level 1: Display scaling factor

Setting range: **0.000** – 16.000

Level 2: Display scaling source

Setting range: **0** – 2

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

P-41 Thermal motor protection according to UL508C

- 0: Disabled
- **1: Activated**

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

The frequency inverter goes to error state as soon as the thermal limit is exceeded (I_{trP}).

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

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

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

P-42 PI proportional gain

Setting range: 0.0 – **1.0** – 30.0

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

P-43 PI integral time constant

Setting range: 0.0 – **1.0** – 30.0 s

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

P-44 PI operating mode

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

P-45 PI reference selection

The parameter is divided into two levels.

Level 1: PI reference source

Setting range: **0** – 1

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

Level 2: PI feedback source

Setting range: **0** – 5

- **0: Analog input 2**
- 1: Analog input 1
- 2: Motor current
- 3: DC link voltage $U_{DC \text{ link}}$

- 4: Difference ($AI1 - AI2$)
- 5: Maximal value ($AI1$ or $AI2$)

P-46 PI fixed setpoint reference

Setting range: **0.0** – 100.0%

Sets the preset digital PI reference/setpoint.

P-47 Analog input 2 format

Setting range:

- **0: U0 – 10 V/unipolar voltage input**
- 1: A0 – 20 mA/current input
- 2: t4 – 20 mA/current input
- 3: r4 – 20 mA/current input
- 4: t20 – 4 mA/current input
- 5: r20 – 4 mA/current input
- 6: PTC-th/motor thermistor input TF/TH (trigger threshold 2.5 kΩ)

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

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

P-48 Standby mode

Setting range: **0.0** – 25 s

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

P-49 PI control difference wake-up level

Setting range: 0.0 – **5.0** – 100%

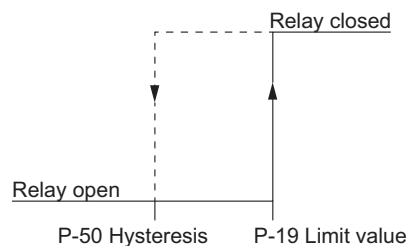
Sets a programmable level. When the drive is in standby or PI mode, the selected feedback signal must fall below this threshold before the inverter returns to normal operation.

P-50 Hysteresis band user relay

Setting range: **0.0** – 100%

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

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



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P-51 Operating mode/motor control

Setting range: 0 – 1 – 5

- 0: LVFC speed control (Light Vector Flux Control)

Vector speed control for induction motors with calculated rotor speed 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 system without a physical encoder. For optimal control, "Auto tune" (P-52) should be carried out prior to first operation.

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

In the operating mode V/f control, the output voltage and the frequency are controlled proportionally in an equal ratio. Almost all asynchronous motors can be controlled in this way. If a better performance is required with regard to control mode, torque stability, and speed range, the LVFC control mode should be used.

- Slip compensation

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

If P-10 = 0 is set, the slip is not included in the calculation. As a result, the motor controller reacts very softly to any change of load and does not tend to oscillate. SEW-EURODRIVE recommends using this motor controller in fans, pumps, and applications with direct drive.

- 2: Synchronous motor speed control (PMVC)

Speed control for synchronous motors. This control has the same characteristics as the LVFC speed control.

- 3: Brushless DC motor speed control (BLDC)

Speed control for brushless DC motors

- 4: Synchronous reluctance motor speed control (SYN-R)

Speed control for synchronous reluctance motors

- 5: LSPM speed control (Line Start Permanent Magnet motors)

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

P-52 Auto tune

- 0: Inhibited
- 1: Enable

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

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

INFORMATION



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

P-53 Controller parameter

The parameter is divided into two levels.

Level 1: Speed controller proportional gain

Setting range: 0 – 250%

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

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

Level 2: Speed controller integrating time constant

Setting range: 0.00 – 2.50 s

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

P-54 Current limit

Setting range: 0.0 – **150** – 175%

The set value relates to the nominal motor current *P-08* and defines the maximum current limit of the inverter. When set to 0, no current limit is active.

P-55 – P-57



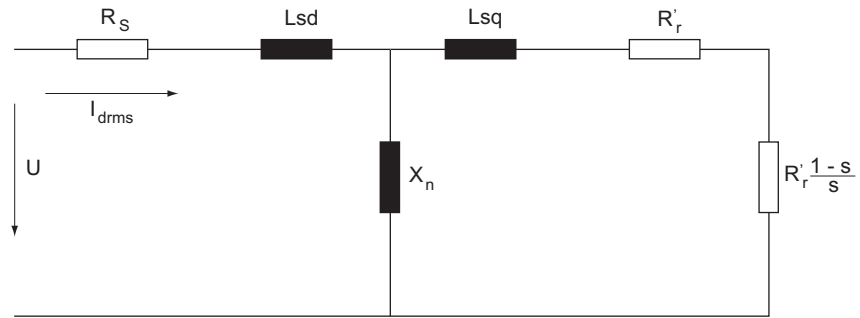
NOTICE

Possible damage to the frequency inverter in the case of incorrect settings of the internal parameters.

Damage to property.

- To allow the most effective possible motor control, the following parameters are used internally by the inverter. Incorrect settings of the parameters can impair the performance and cause unexpected behavior of the motor.
- Adjustments may be made only by experienced users who fully understand the functions of these parameters.

Equivalent wiring diagram for AC motors.



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P-55 Motor stator resistance (Rs)

Setting range: depends on the motor (Ω)

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

Instead, you can enter this value manually.

P-56 Motor stator inductance (Lsd)

Setting range: depends on the motor (H)

For induction motors: Phase stator inductance value.

For synchronous motors: Phase d-axis stator inductance.

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

Setting range: depends on the motor (H)

For synchronous motors: Phase q-axis stator inductance.

P-58 DC braking speed

Setting range: **0.0** – P-01

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

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

P-59 Current strength of DC holding function

Setting range: 0 – **20.0** – 100%

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

P-60 Fire mode/emergency mode speed

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

The speed used in fire mode/emergency mode.

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

10.2.3 Configuration parameters**P-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			
Setting	Potentiometer	Switch setting CW	Switch setting CCW
SEt-1	Activated	Activated	Activated
SEt-2	Activated	Activated	Deactivated
SEt-3	Activated	Deactivated	Activated
SEt-4	Activated	Deactivated	Deactivated
SEt-5	Deactivated	Activated	Activated
SEt-6	Deactivated	Activated	Deactivated
SEt-7	Deactivated	Deactivated	Activated
SEt-8	Deactivated	Deactivated	Deactivated

Procedure:

1. Stop the inverter. "STOP" must be displayed. No error messages may be present.
2. Set the password in *P-14 (extended parameter access)* (default = 101).
3. Press the "Up" or "Down" key until *P-00* appears in the display.
4. Press the "Stop" key for at least 1 second until SEt-x appears.
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.

11 Operation

11.1 Status of the inverter

11.1.1 Static inverter status

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

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

11.1.2 Operating state of the inverter

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

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

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

11.2 IT security

11.2.1 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.

11.2.2 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).

11.2.3 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.

11.3 Troubleshooting

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

11.4 Fault history

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

- **NOTE**

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

11.5 Fault reset

You can reset a fault in the event of a fault response, see chapter "Fault list" (→ 120), by pressing the <Stop> key or with a rising edge at digital input 1.

11.6 Fault list

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

Code (inverter display)	Code (MOVITOOLS [®] MotionStudio in P00-28)	Fault code status word if Bit5 = 1	CANopen emergency code	Meaning	Measure
Err-SC				The keypad has lost the communication connection to the inverter.	Press the STOP key to reset. Check the address of the frequency inverter.
F-PTC	21	0x1F	0x1015	Motor protection triggered	The motor protection sensor (TF, TH) is connected to analog input 2 (terminal 4).
FAN-F	22	0x32	0x1016	Internal fan fault.	Contact SEW-EURODRIVE.
FAULtY				Communication between the controller and power section is interrupted	Contact SEW-EURODRIVE.
FLt-dc	13	0x07	0x320D	DC link ripple too high.	Check the current supply
l.t-trp	04	0x08	0x1004	Overload of inverter/motor (l2t fault)	Make sure that: - the motor nameplate parameters are correctly inserted in <i>P-07</i>, <i>P-08</i> and <i>P-09</i>. - Auto-tuning has been performed correctly. Check whether: - The decimals flash (inverter overloaded) and increase the acceleration ramp (<i>P-03</i>) or decrease the motor load. - The cable length meets the requirements. - The load can move freely and there are no blockages or other mechanical faults (mechanically check the load). - The thermal motor protection to UL508C is activated in <i>P-41</i>. See also Fault reset delay in the case of an O-I and hO-I fault.
no-Flt	0	0x0	0x0	No fault	- The empty fault memory has these entries. - If this message is displayed, EMC interference is the cause. Check your application for EMC-compliant installation.

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

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

12 Fieldbus operation

12.1 General information

12.1.1 Structure and settings of process data words

The process data assignment is set as standard.

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

	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 2nd deceleration ramp/rapid stop ramp (<i>P-24</i>)	0: Rapid stop 1: Start
		2	Stop along the process ramp <i>P-03/P-04</i> or PO3	0: Stop 1: Start
		3 – 5	Reserved	0
		6	Fault reset	Edge 0 to 1 = fault reset
		7 – 15	Reserved	0
PO2	Setpoint speed	Clockwise rotation: 0 – 16384 dec $\triangleq$ 0 – 100% of <i>P-01</i> Counterclockwise rotation (formation of the two's complement): 49152 dec – 65535 dec $\triangleq$ -100% – 0 of <i>P-01</i>		
PO3	Ramp time if <i>P-12</i> = 4, 6, 8	1 digit = 1 ms (100 ms – 65535 ms)		
	if <i>P-12</i> = 3, 5, 7	No function Ramp specification via <i>P-03</i> , <i>P-04</i>		

Process input words

Description		Bit		Settings	Byte
PI1	Status word	0	Output stage enable	0: Inhibited 1: Enabled	Low byte
		1	Inverter ready for operation	0: Not ready 1: Ready	
		2	PO data enabled	1 if <i>P-12</i> = 3 or 4	
		3 – 4	Reserved		
		5	Fault/warning	0: No fault 1: Fault	
		6 – 7	Reserved		
		8 – 15	Status of the inverter if bit 5 = 0 0x01 = Output stage inhibited 0x02 = Not enabled/not running 0x04 = Enabled/running 0x05 = Factory setting activated.		High byte
		8 – 15	Inverter status if bit 5 = 1 See chapter "Fault list" (→  120).		
PI2	Actual speed	Scaling corresponds to PO2			
PI3	Actual current	Scaling: 0x4000 = 100% (in relation to <i>P-08</i>)			

12.1.2 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 2nd deceleration ramp (<i>P-24</i>).
		0x0001	Coast to a stop
		0x0002	Stop along the process ramp (<i>P-04</i>) or (PO3).
		0x0003 – 0x0005	Reserved
		0x0006	Accelerate along a ramp (<i>P-03</i>) or (PO3) and run at setpoint speed (PO2).
PO2	Setpoint speed	0x4000	= 16384 dec = maximum speed, e.g. 50 Hz (<i>P-01</i>) CW
		0x2000	= 8192 dec = 50% of the maximum speed, e.g. 25 Hz CW
		0x0000	= 0 dec = minimum speed, set in <i>P-02</i>
		0xE000 ¹⁾	= -8192 dec = 50% of the maximum speed, e.g. 25 Hz CCW
		0xC000 ¹⁾	= -16384 dec = maximum speed, e.g. 50 Hz (<i>P-01</i>) CCW

1) Display in two's complement

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

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

12.1.3 Parameter settings for the inverter

- Put the inverter into operation as described in chapter "Startup with motors" (→ 77).
- Set the following parameters depending on the bus system used:

Parameter	SBus	CANopen	Modbus RTU
P-12 (control signal source)	3, 4 ¹⁾	7, 8 ¹⁾	5, 6 ¹⁾
P-14 (extended parameter access)	101	101	101
P-15 (digital input function selection)	1 ²⁾	1 ²⁾	1 ²⁾
P-36/1 (inverter address)	1 – 63	1 – 63	1 – 63
P-36/2 (baud rate)	Baud rate	Baud rate	Baud rate
P-36/3 (timeout and response in event of communication failure)	t _x : Coast to a stop after x ms r _x : Stop ramp after x ms	Communication monitoring is covered by the Lifetime function integrated in CANopen.	t _x : Coast to a stop after x ms r _x : Stop ramp after x ms

1) With ramp specified via fieldbus

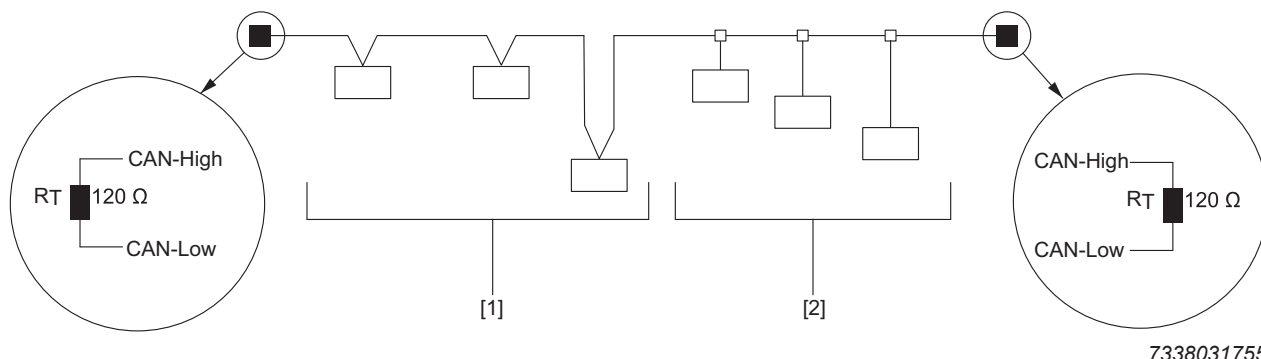
2) Default setting; for more setting options, refer to the description of parameter P-15.

12.1.4 Connecting the signal terminals at the inverter

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

12.1.5 Establishing a CANopen/SBus network

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



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Cable length

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

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

12.2 Connecting a gateway or controller (SBus MOVILINK®)

12.2.1 Specification

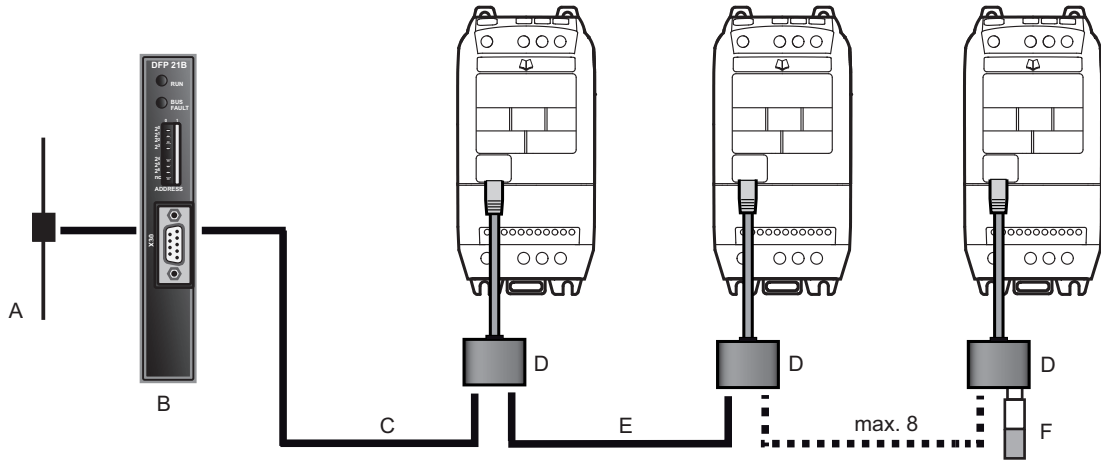
The MOVILINK® profile via CAN/SBus is an application profile specifically coordinated to inverters from SEW-EURODRIVE. For detailed information, refer to the manual "MOVIDRIVE® MDX60B/61B Communication and Fieldbus Device Profile".

To use SBus, you must configure the inverter as described in chapter "Parameter settings for the inverter" (→ 126).

For detailed information on the structure of process data words, refer to chapter "Structure and settings of process data words" (→ 124). For a detailed list of all parameters including the necessary indexes as well as the scaling, refer to chapter "Parameter overview" (→ 90).

12.2.2 Electrical installation

Connection of gateway and MOVI-PLC®.



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

INFORMATION



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

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

Wiring from the controller to the RJ45 communication socket of the inverter:

Side view	Designation	Terminal at 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		

Side view	Designation	Terminal at CCU/PLC	Signal	RJ45 socket contact ¹⁾	Signal
	Third-party controller	X:? ²⁾	Modbus RTU+	8	RS485+ (Modbus RTU)
		X:? ²⁾	Modbus RTU-	7	RS485- (Modbus RTU)
		X:? ²⁾	DGND	3	GND

1) Note: The terminal assignment for the socket contact of the inverter, not for the connector, is specified above.

2) Assignment depends on the third-party controller

12.2.3 Startup at gateway

- Connect the gateway according to chapter "Electrical installation" (→ 127).
- Reset all gateway settings to the factory settings.
- If required, set all connected inverters to SBus MOVILINK® mode as described in chapter "Parameter settings for the inverter" (→ 126). Assign unique SBus addresses (≠ 0!) and set a baud rate matching the gateway (default = 500 kBaud).
- Set the 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 out completely. If the "H1" LED lights up, the gateway or one of the inverters on the SBus has been incorrectly connected or incorrectly put into operation.

- The setup of fieldbus communication between the DFX/UOH gateway and the bus master is described in the corresponding DFX manual.

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.

12.3 Modbus RTU

The inverters support communication via Modbus RTU. The Holding Registers (03) are used for reading and the Write Single Registers (06) for writing. To use Modbus RTU, you must configure the inverter as described in chapter "Parameter settings for the inverter" (→ 126).

12.3.1 Specification

Protocol	Modbus RTU
Error check	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

12.3.2 Electrical installation

The structure is the same as for the CAN/SBus network. The maximum number of bus stations is 32. The permitted cable length depends on the baud rate. At a baud rate of 115200 bps and when using a 0.5 mm² cable, the maximum cable length is 1200 m. The pin assignment of the RJ45 communication socket can be found in chapter "RJ45 communication socket" (→ 66).

12.3.3 Register allocation of the process data words

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

The table below shows the default assignment of the process data words. All other parameter register assignments and the scaling of the data can be found in the tables of the "Parameter overview" (→ 90).

Register	Upper byte	Lower byte	Command	Type
1	PO1 Control word		03, 06	Read/Write
2	PO2 Setpoint speed		03, 06	Read/Write
3	PO3 Ramp time		03, 06	Read/Write
4	Reserved		03, 06	Read/Write
5	Reserved	-	03	Read
6	PI1 Status word		03	Read
7	PI2 Actual speed		03	Read
8	PI3 Actual current		03	Read
9	PI4 Motor torque		03	Read
...	For more registers, see chapter "Parameters" (→ 90).			

INFORMATION



Many bus masters address the first register as register 0, so it may be necessary to subtract the value "1" from the register number specified below in order to obtain the correct register address.

12.3.4 Data flow example

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

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

Request master → slave (Tx)

Reading register information

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

Response slave → master (Rx)

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

Explanation of 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 = 0x0086A = 134
Number of registers	Number of requested registers from start address (register 135/136).
2 × CRC bytes	CRC_high, CRC_low

Rx = receive from perspective of the bus master.

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

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

Process output 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 of 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	0x0700 (setpoint speed)
2 × CRC bytes	CRC_high, CRC_low

12.4 CANopen

The inverters support communication via CANopen. To use CANopen, you must configure the inverter as described in chapter "Parameter settings for the inverter" (→ 126).

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".

12.4.1 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.

12.4.2 Electrical installation

See chapter "Establishing a CANopen/SBus network" (→ 126).

12.4.3 COB IDs and functions in the inverter

The following COB-ID (Communication Object Identifier) and functions are available in the CANopen profile:

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	An SDO channel for the exchange of parameter data with the CANopen master
SDO (Rx) ²⁾	600h + device address	
Error Control	700h + device address	Guarding and heartbeat function are supported. COB-ID can be set to a different 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 each 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 CANopen specification DS301.

INFORMATION



If speed, current or similar rapidly changing variables are sent via Tx-PDO, this leads to a very high bus load.

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 shown here from the perspective of the slave.

12.4.4 Supported transmission modes

The different transmission types can be selected for each process data object (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 is transmitted to the inverter as soon as the next synchronization message is received.
254, 255	asynchronous	The received data is transmitted to the inverter without braking deceleration.

The following transmission types are supported for Tx-PDOs:

Tx-PDO transmission mode		
Transmission type	Mode	Description
0	acyclical synchronous	Tx PDO is only transmitted if the process data has changed and a SYNC object has been received.
1 – 240	cyclical synchronous	Tx PDOs are sent synchronously and cyclically. The transmission type displays the number of the SYNC object that is required to trigger the sending of the Tx-PDO.
254	asynchronous	Tx-PDOs are only transmitted if the corresponding Rx-PDO has been received.
255	asynchronous	Tx PDOs are always transmitted as soon as the PDO data has changed.

12.4.5 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	1
	2	2002h	Integer 16	PO2 Setpoint speed	
	3	2006h	Unsigned 16	Reserved	
	4	2014h	Unsigned 16	PO3 Ramp time	
Tx PDO1	1	2110h	Unsigned 16	PI1 Status word	1
	2	2112h	Integer 16	PI2 Actual speed	
	3	2113h	Unsigned 16	PI3 Actual current	
	4	2114h	Integer 16	PI4 Motor torque	
Rx PDO 2	1	0006h	Unsigned 16	Reserved	1
	2	0006h	Unsigned 16	Reserved	
	3	0006h	Unsigned 16	Reserved	
	4	0006h	Unsigned 16	Reserved	
Tx PDO2	1	2118h	Unsigned 16	Status of analog input 1	1
	2	2119h	Integer 16	Status of analog input 2	
	3	211Ah	Unsigned 16	Status of the inputs and outputs	
	4	2116h	Unsigned 16	Frequency inverter temperature	

INFORMATION



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

Note: Modified default settings are not saved when the power is switched off. This means that the default values are restored when the power is switched on again.

12.4.6 Data flow example

Process data communication example in 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

Explanation of the data:

	COB-ID	Explanation of the COB-ID	word 4		word 3		word 2		word 1	
			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	Motor torque		Output current		Actual speed		Status word	
6	0x281	Tx-PDO2 + device address	Inverter temperature		IO status		Analog input 2		Analog input 1	

Example for reading the index assignment with the help of Service Device Objects (SDO):

Request controller → inverter (index: 1A00h)

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

Explanation of the response:

→ 2101 = index in the manufacturer-specific object table

→ 00h = subindex

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

12.4.7 Emergency code objects

See chapter "Fault list" (→ 120).

12.4.8 Table of CANopen-specific objects

CANopen-specific objects						
Index	Sub index	Function	Access	Type	PDO Map	Default value
1000h	0	Device type	RO	Unsigned 32	N	0
1001h	0	Error register	RO	Unsigned 8	N	0
1002h	0	Manufacturer status register	RO	Unsigned 16	N	0
1005h	0	COB-ID Sync	RW	Unsigned 32	N	00000080h
1008h	0	Manufacturer device name	RO	String	N	"LTEB" or "LT1B"
1009h	0	Manufacturer hardware version	RO	String	N	x.xx (e.g. 1.00)
100Ah	0	Manufacturer software version	RO	String	N	x.xx (e.g. 1.00)
100Ch	0	Guard time [1 ms]	RW	Unsigned 16	N	0
100Dh	0	Life time factor	RW	Unsigned 8	N	0
1014h	0	COB-ID EMCY	RW	Unsigned 32	N	00000080h+Node ID
1015h	0	Inhibit time emergency [100 µs]	RW	Unsigned 16	N	0
1017h	0	Producer heart beat time [1 ms]	RW	Unsigned 16	N	0
1018h	0	Identity object No. of entries	RO	Unsigned 8	N	4
	1	Vendor ID	RO	Unsigned 32	N	0x00000059
	2	Product code	RO	Unsigned 32	N	Dependent on inverter
	3	Revision number	RO	Unsigned 32	N	x.xx
	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	40000200h+Node ID
	2	Rx PDO1 transmission type	RW	Unsigned 8	N	1
1401h	0	Rx PDO2 comms param No. of entries	RO	Unsigned 8	N	2
	1	Rx PDO2 COB-ID	RW	Unsigned 32	N	40000300h+Node ID
	2	Rx PDO2 transmission type	RW	Unsigned 8	N	1
1600h	0	Rx PDO1 mapping/No. of entries	RW	Unsigned 8	N	4
	1	Rx PDO1 1st mapped object	RW	Unsigned 32	N	20100010h
	2	Rx PDO1 2nd mapped object	RW	Unsigned 32	N	20120010h
	3	Rx PDO1 3rd mapped object	RW	Unsigned 32	N	00060010h
	4	Rx PDO1 4th mapped object	RW	Unsigned 32	N	20140010h
1601h	0	Rx PDO2 mapping/No. of entries	RW	Unsigned 8	N	4
	1	Rx PDO2 1st mapped object	RW	Unsigned 32	N	00060010h
	2	Rx PDO2 2nd mapped object	RW	Unsigned 32	N	00060010h
	3	Rx PDO2 3rd mapped object	RW	Unsigned 32	N	00060010h
	4	Rx PDO2 4th mapped object	RW	Unsigned 32	N	00060010h
1800h	0	Tx PDO1 comms param No. of entries	RO	Unsigned 8	N	3
	1	Tx PDO1 COB-ID	RW	Unsigned 32	N	40000180h+Node ID
	2	Tx PDO1 transmission type	RW	Unsigned 8	N	1
	3	Tx PDO1 Inhibit time [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

CANopen-specific objects						
Index	Sub index	Function	Access	Type	PDO Map	Default value
1A00h	0	Tx PDO1 mapping / no. of entries	RW	Unsigned 8	N	4
	1	Tx PDO1 1st mapped object	RW	Unsigned 32	N	21100010h
	2	Tx PDO1 2nd mapped object	RW	Unsigned 32	N	21120010h
	3	Tx PDO1 3rd mapped object	RW	Unsigned 32	N	21130010h
	4	Tx PDO1 4th mapped object	RW	Unsigned 32	N	21140010h
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 digits of the serial number.

12.4.9 Table of manufacturer-specific objects

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

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

Manufacturer-specific objects						
Index	Subindex	Function	Access	Type	PDO map	Note
2C6Fh ¹⁾	0	SBus parameter end index	RW	–	N	11375d

1) Objects 2AF8h – 2C6EF correspond to SBus parameter indexe 11000d – 11375d; some of which are read-only.

12.4.10 Emergency code objects

See chapter "Fault list" (→ 120).

13 Service

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

13.1 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

13.2 Extended storage

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

Procedure when maintenance has been neglected:

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

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

The following stages are recommended:

AC 115 V devices:

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

AC 230 V devices:

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

AC 400 V devices:

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

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

13.3 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.

13.4 IT security guidelines for secure disposal

13.4.1 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." (→ 138)

13.4.2 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.

13.4.3 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
 - 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

13.4.4 Removing a customer data backup



The product does not create local customer data backups.

13.5 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.

14 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
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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
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Bangladesh

Sales	Bangladesh	SEW-EURODRIVE INDIA PRIVATE LIMITED 345 DIT Road East Rampura Dhaka-1219, Bangladesh	Tel. +88 01729 097309 salesdhaka@seweurodrivebangladesh.com
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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
	Joinville	SEW-EURODRIVE Brasil Ltda. Jvl / Ind Rua Dona Francisca, 12.346 – Pirabeiraba 89239-270 – Joinville / SC	Tel. +55 47 3027-6886 Fax +55 47 3027-6888 filial.sc@sew.com.br

Bulgaria

Sales	Sofia	BEVER-DRIVE GmbH Bogdanovetz Str.1 1606 Sofia	Tel. +359 2 9151160 Fax +359 2 9151166 bever@bever.bg
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Cameroon

Sales	Douala	SEW-EURODRIVE SARLU Ancienne Route Bonabéri P.O. Box B.P 8674 Douala-Cameroun	Tel. +237 233 39 12 35 Fax +237 233 39 02 10 www.sew-eurodrive.ci/ info@sew-eurodrive.cm
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Canada			
Assembly Sales Service	Toronto	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, ON L6T 3W1	Tel. +1 905 791-1553 Fax +1 905 791-2999 http://www.sew-eurodrive.ca l.watson@sew-eurodrive.ca
	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
Chile			
Assembly Sales Service	Santiago de Chile	SEW-EURODRIVE CHILE LTDA Las Encinas 1295 Parque Industrial Valle Grande LAMP Santiago de Chile P.O. Box Casilla 23 Correo Quilicura - Santiago - Chile	Tel. +56 2 2757 7000 Fax +56 2 2757 7001 http://www.sew-eurodrive.cl ventas@sew-eurodrive.cl
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	Guangzhou	SEW-EURODRIVE (Guangzhou) Co., Ltd. No. 9, JunDa Road East Section of GETDD Guangzhou 510530	Tel. +86 20 82267890 Fax +86 20 82267922 guangzhou@sew-eurodrive.cn
	Shenyang	SEW-EURODRIVE (Shenyang) Co., Ltd. 10A-2, 6th Road Shenyang Economic Technological Development Area Shenyang, 110141	Tel. +86 24 25382538 Fax +86 24 25382580 shenyang@sew-eurodrive.cn
	Taiyuan	SEW-EURODRIVE (Taiyuan) Co., Ltd. No.3, HuaZhang Street, TaiYuan Economic & Technical Development Zone ShanXi, 030032	Tel. +86-351-7117520 Fax +86-351-7117522 taiyuan@sew-eurodrive.cn
	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
	Tianjin	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 66, 10th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25322611 http://www.sew-sew-eurodrive.cn info@sew-eurodrive.cn
Sales Service	Hong Kong	SEW-EURODRIVE LTD. Unit No. 801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. +852 36902200 Fax +852 36902211 contact@sew-eurodrive.hk

Colombia			
Assembly Sales Service	Bogota	SEW-EURODRIVE COLOMBIA LTDA. Calle 17 No. 132-18 Interior 2 Bodega 6, Manzana B Santafé de Bogotá	Tel. +57 1 54750-50 Fax +57 1 54750-44 http://www.sew-eurodrive.com.co sew@sew-eurodrive.com.co
Croatia			
Sales Service	Zagreb	KOMPEKS d. o. o. Zeleni dol 10 10 000 Zagreb	Tel. +385 1 4613-158 Fax +385 1 4613-158 kompeks@inet.hr
Czech Republic			
Assembly Sales Service	Hostivice	SEW-EURODRIVE CZ s.r.o. Floriánova 2459 253 01 Hostivice	Tel. +420 255 709 601 Fax +420 235 350 613 http://www.sew-eurodrive.cz sew@sew-eurodrive.cz
Denmark			
Assembly Sales Service	Copenhagen	SEW-EURODRIVE A/S Geminivej 28-30 2670 Greve	Tel. +45 43 95 8500 Fax +45 43 9585-09 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk
Service	Vejle	SEW-EURODRIVE A/S Bødkervej 2 7100 Vejle	Tel. +45 43 9585 00 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk
Egypt			
Technical Office	Cairo	SEW-EURODRIVE Representative Office in Egypt REGUS Paramount Business Complex, Block 1258M, Unit 1, Ground Floor, Sheraton Heli- opolis Cairo	Tel. +20 2 2503 2807 Fax +20 2 2503 2801 info@sew-eurodrive.eg
Estonia			
Sales	Tallin	ALAS-KUUL AS Loomäe tee 1, Lehmja küla 75306 Rae vald Harjumaa	Tel. +372 6593230 Fax +372 6593231 http://www.alas-kuul.ee info@alas-kuul.ee
Finland			
Assembly Sales Service	Hollola	SEW-EURODRIVE OY Vesimäentie 4 15860 Hollola	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi
Service	Hollola	SEW-EURODRIVE OY Keskikankaantie 21 15860 Hollola	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi
	Tornio	SEW-EURODRIVE Oy Lossirannankatu 5 95420 Tornio	Tel. +358 201 589 300 Fax +358 3 780 6211 http://www.sew-eurodrive.fi sew@sew.fi
Production Assembly	Karkkila	SEW Industrial Gears Oy Santasalonkatu 6, PL 8 03620 Karkkila, 03601 Karkkila	Tel. +358 201 589-300 Fax +358 201 589-310 http://www.sew-eurodrive.fi sew@sew.fi
France			
Production Sales	Haguenau	SEW USOCOME 48-54 route de Soufflenheim B. P. 20185 67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 http://www.usocom.com sew@usocom.com
Production	Forbach	SEW USOCOME Zone industrielle Technopôle Forbach Sud B. P. 30269 57604 Forbach Cedex	Tel. +33 3 87 29 38 00

France			
	Brumath	SEW USOCOME 1 Rue de Bruxelles 67670 Mommenheim Cedex	Tel. +33 3 88 37 48 00
Assembly Sales Service	Bordeaux	SEW USOCOME Parc d'activités de Magellan 62 avenue de Magellan – B. P. 182 33607 Pessac Cedex	Tel. +33 5 57 26 39 00 dtcbordeaux@usocome.com
	Haguenau	SEW USOCOME 48-54 route de Soufflenheim B. P. 20185 67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 dtchaguenau@usocome.com
	Lyon	SEW USOCOME 75 rue Antoine Condorcet 38090 Vaulx-Milieu	Tel. +33 4 74 99 60 00 dtclyon@usocome.com
	Nantes	SEW USOCOME Parc d'activités de la forêt 4 rue des Fontenelles 44140 Le Bignon	Tel. +33 2 40 78 42 00 dtcnantes@usocome.com
	Paris	SEW USOCOME Zone industrielle 2 rue Denis Papin 77390 Verneuil l'Étang	Tel. +33 1 64 42 40 80 dtcparis@usocome.com
Gabon			
Representation: Cameroon			
Germany			
Headquarters Production Sales	Bruchsal	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 http://www.sew-eurodrive.de sew@sew-eurodrive.de
Production / Industrial Gears	Bruchsal	SEW-EURODRIVE GmbH & Co KG Christian-Pähr-Str. 10 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-2970
Production / Precision Gear Units	Bruchsal	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 sew@sew-eurodrive.de
Production	Graben	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 76676 Graben-Neudorf	Tel. +49 7251 75-0 Fax +49 7251-2970
Service Competence Center	Mechanics / Mechatronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 76676 Graben-Neudorf	Tel. +49 7251 75-1710 Fax +49 7251 75-1711 scc-mechanik@sew-eurodrive.de
	Electronics	SEW-EURODRIVE GmbH & Co KG Christian-Pähr-Straße 12 76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 scc-elektronik@sew-eurodrive.de
	MAXOLU- TION® Factory Automation	SEW-EURODRIVE GmbH & Co KG Eisenbahnstraße 11 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 sew@sew-eurodrive.de
Drive Technology Center	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 43 30823 Garbsen (Hannover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 dtc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg 1 08393 Meerane (Zwickau)	Tel. +49 3764 7606-0 Fax +49 3764 7606-20 dtc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 85551 Kirchheim (München)	Tel. +49 89 909551-21 Fax +49 89 909551-50 dtc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 40764 Langenfeld (Düsseldorf)	Tel. +49 2173 8507-10 Fax +49 2173 8507-50 dtc-west@sew-eurodrive.de
Drive Center	Berlin	SEW-EURODRIVE GmbH & Co KG Melitta-Schiller-Straße 8 12526 Berlin	Tel. +49 306331131-30 Fax +49 306331131-36 dc-berlin@sew-eurodrive.de

Germany

Bremen	SEW-EURODRIVE GmbH & Co KG Allerkai 4 28309 Bremen	Tel. +49 421 33918-10 Fax +49 421 33918-22 dc-bremen@sew-eurodrive.de
Hamburg	SEW-EURODRIVE GmbH & Co KG Hasselbinnen 11 22869 Schenefeld	Tel. +49 40298109-60 Fax +49 40298109-70 dc-hamburg@sew-eurodrive.de
Saarland	SEW-EURODRIVE GmbH & Co KG Gottlieb-Daimler-Straße 4 66773 Schwalbach Saar – Hülzweiler	Tel. +49 6831 48946 10 Fax +49 6831 48946 13 dc-saarland@sew-eurodrive.de
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

Drive Service Hotline / 24 Hour Service

0 800 SEWHELP
0 800 7394357**Great Britain**

Assembly Sales Service	Normanton	SEW-EURODRIVE Ltd. DeVilliers Way Trident Park Normanton West Yorkshire WF6 1GX	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk
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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
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Hungary

Sales Service	Budapest	SEW-EURODRIVE Kft. Csillaghegyi 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
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Iceland

Sales	Reykjavik	Varma & Vélaverk ehf. Knarrarvogi 4 104 Reykjavík	Tel. +354 585 1070 Fax +354 585)1071 https://vov.is/ vov@vov.is
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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

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

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 , Beirut Saudi Arabia, Syria)		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

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 Com- mercial 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

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 info@sew@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

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.cgtradingwaziland.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			
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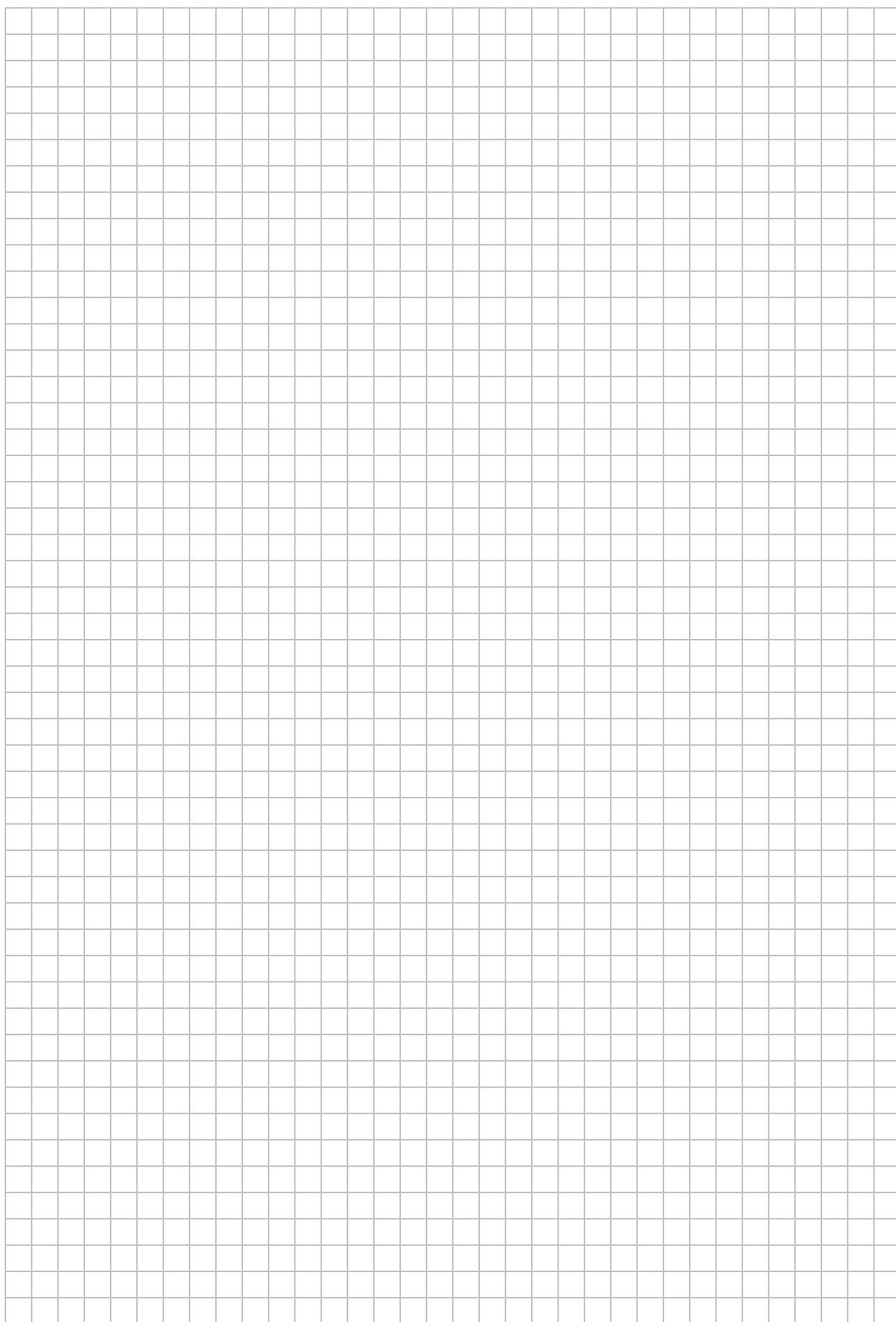
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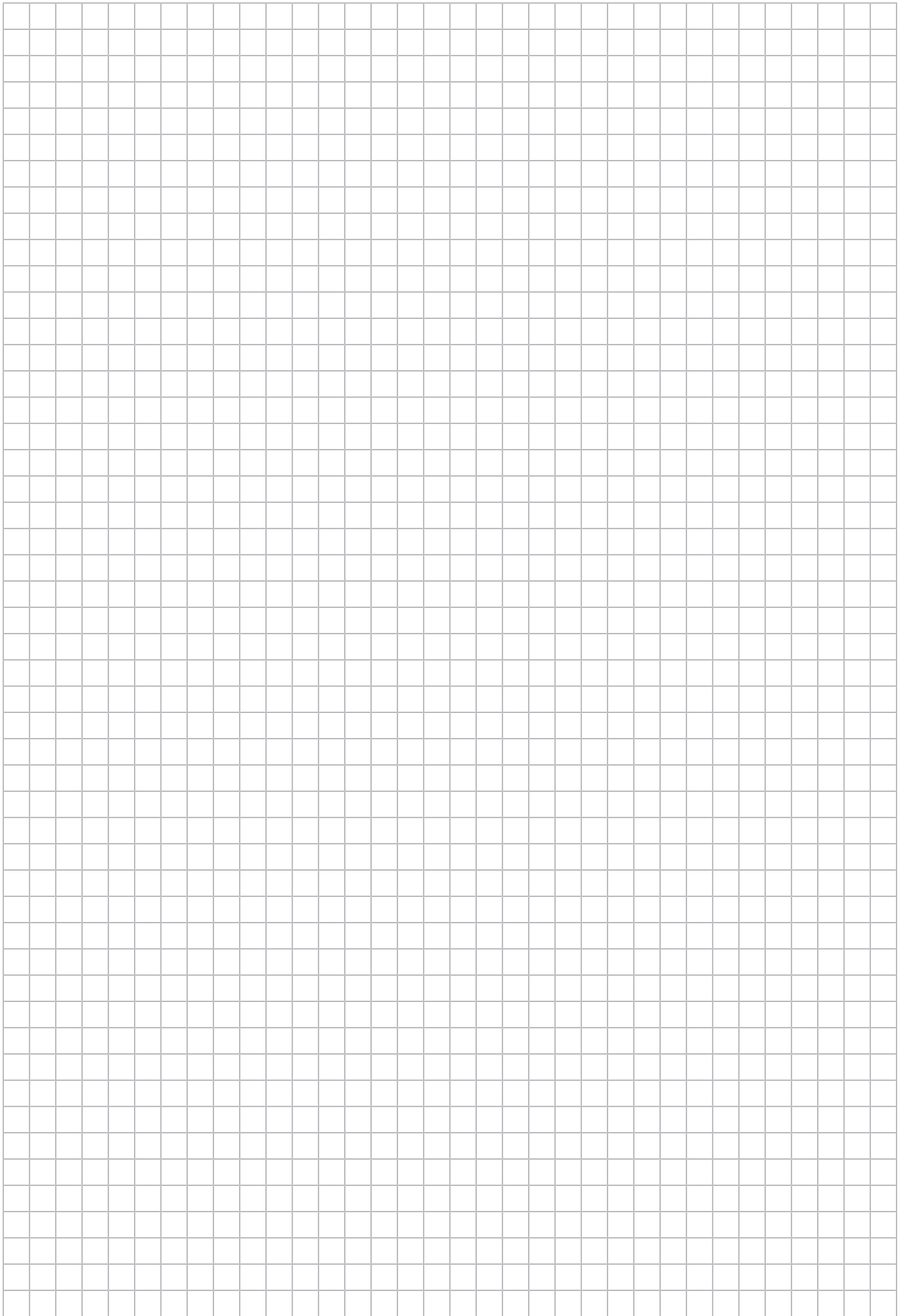
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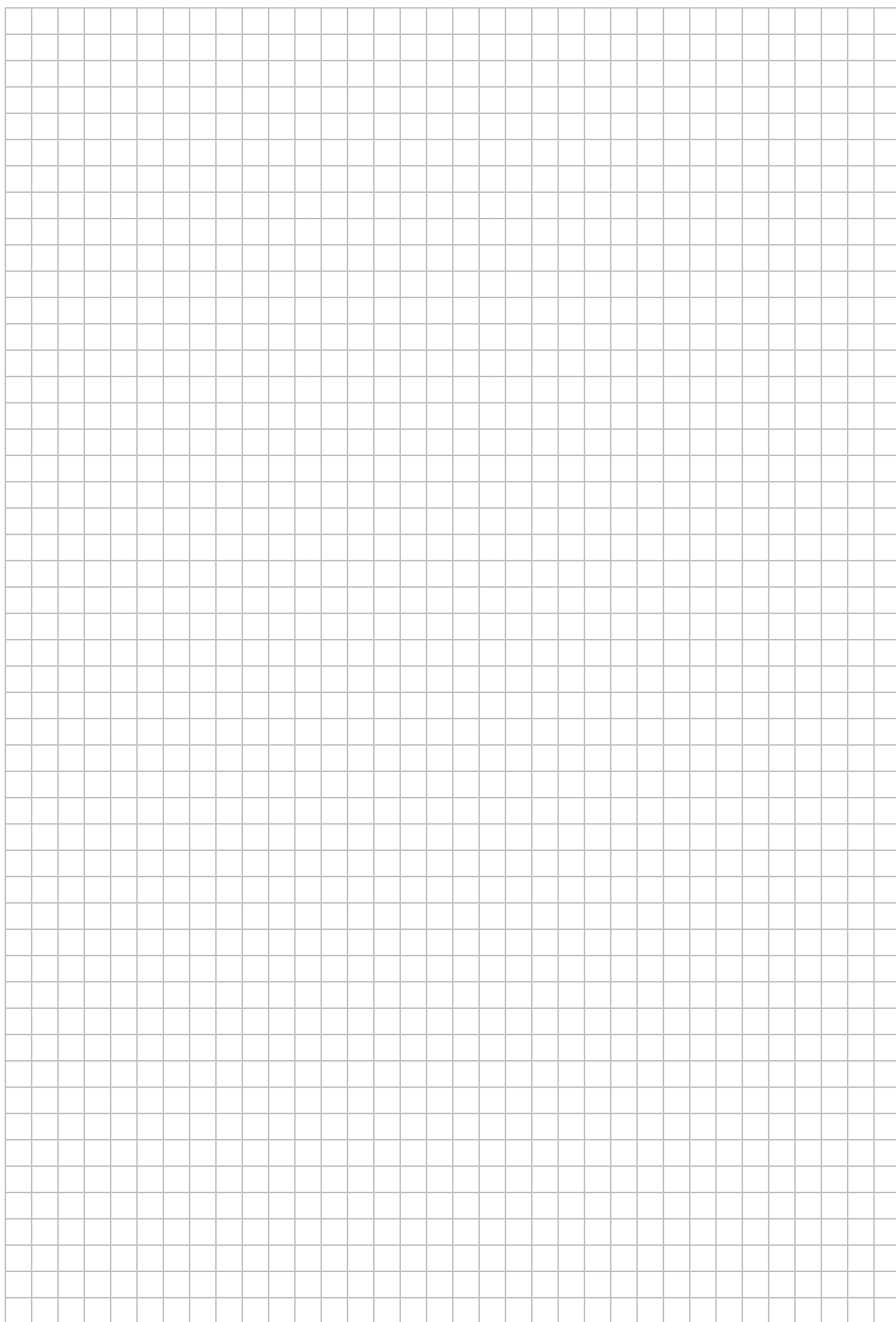
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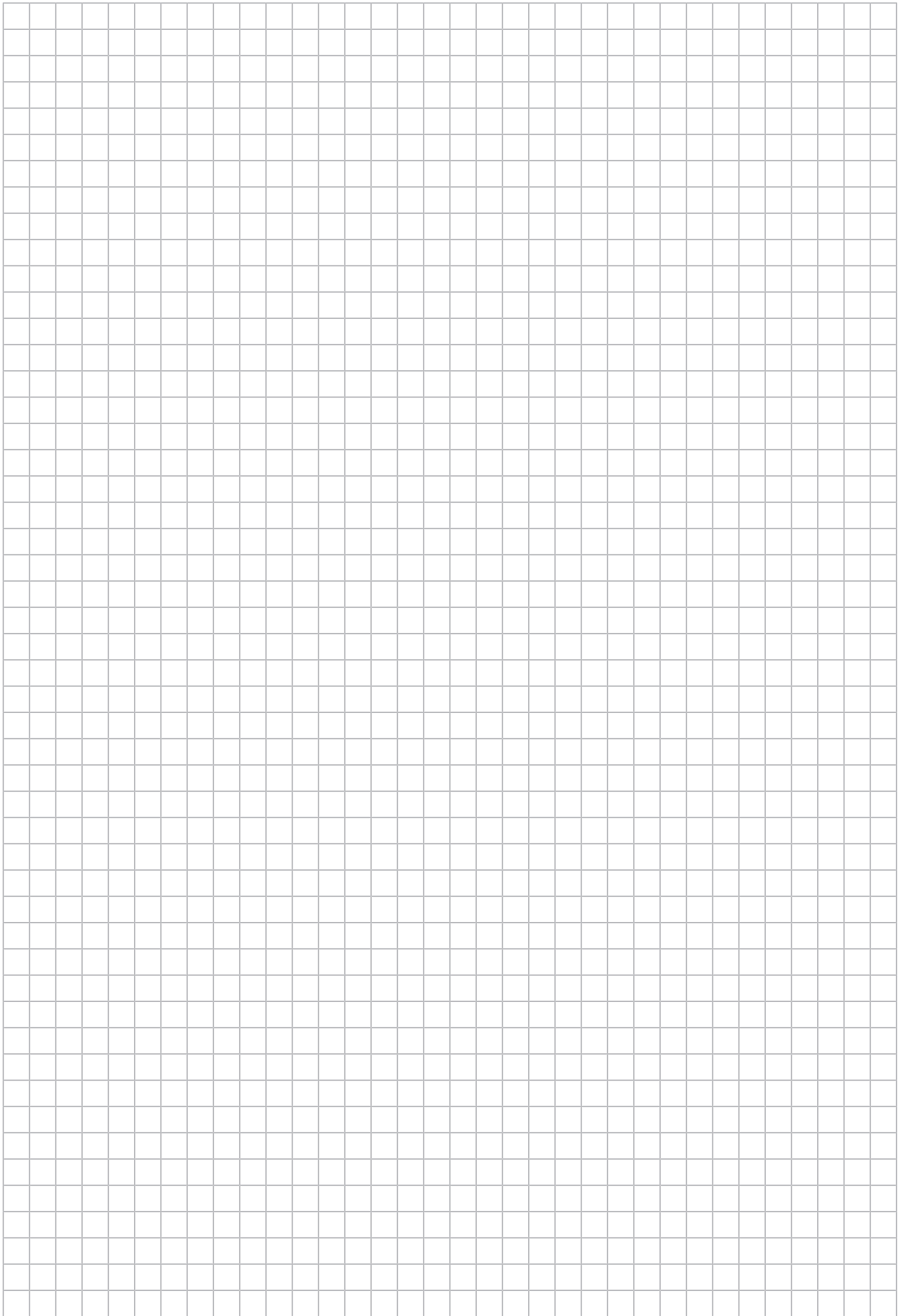
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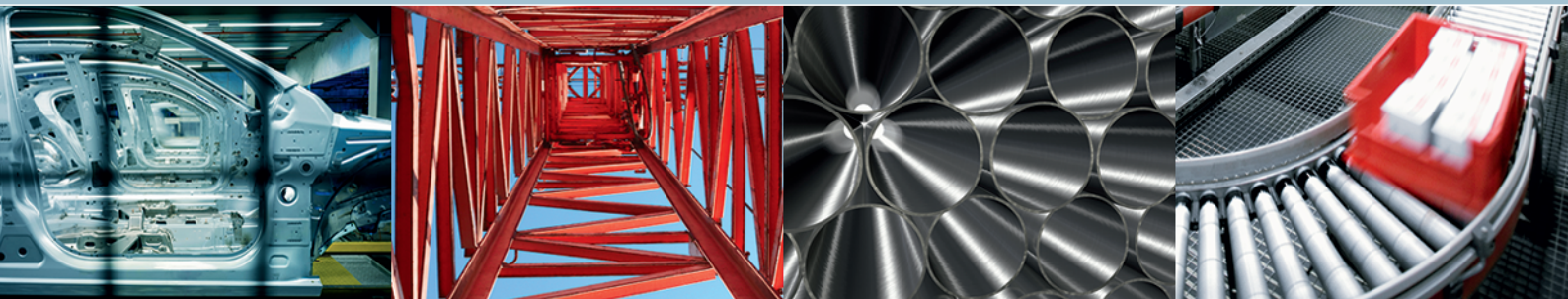
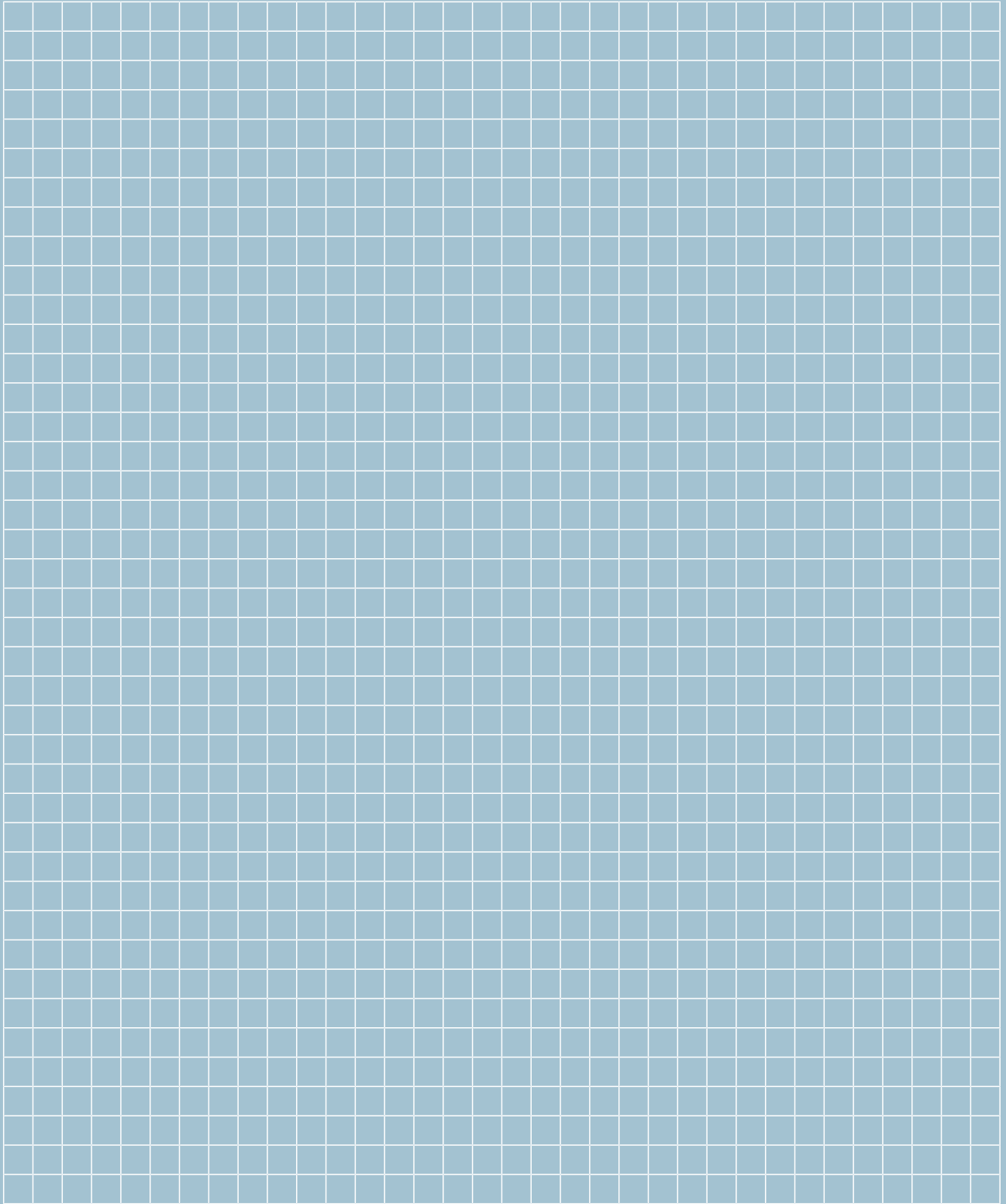
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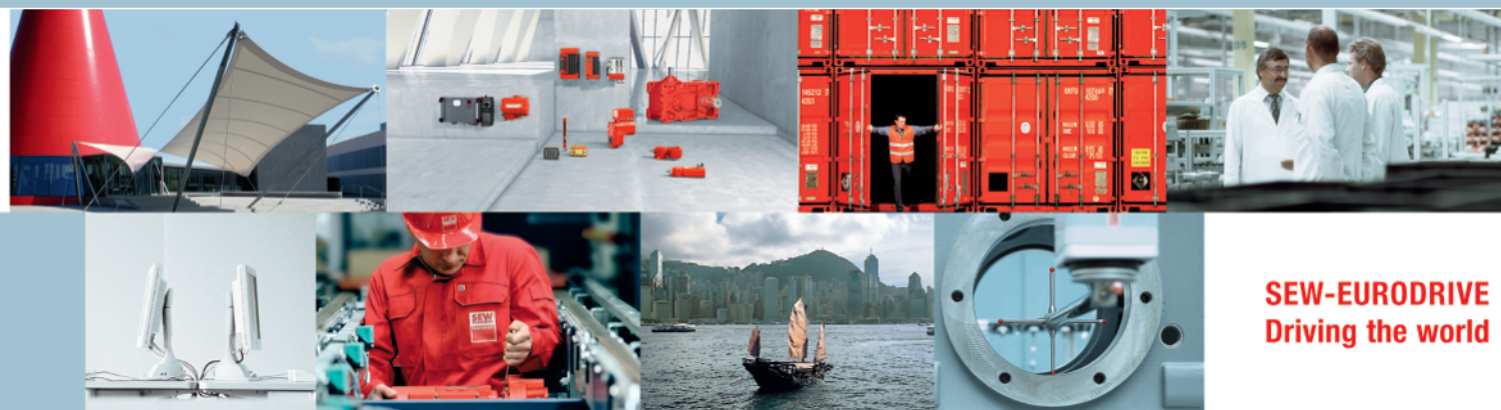












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