

Compact Operating Instructions



Application Inverter MOVIDRIVE[®] technology

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1 General information

1.1 Scope of this documentation

This documentation comprises the general safety notes and selected information on the inverter.

- Please note that this documentation does not replace the detailed operating instructions.
- Read the detailed operating instructions before you start working with the inverter.
- Observe the information, instructions and notes in the detailed operating instructions. This is essential for fault-free operation of the device and fulfillment of any rights to claim under guarantee.

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	
	Imminent hazard	Severe or fatal injuries	
	Possible dangerous situation	Severe or fatal injuries	
	Possible dangerous situation	Minor injuries	
NOTICE	Possible damage to property	Damage to the product or its envi- ronment	
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.

Meaning of the hazard symbols

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

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

1.2.3 Structure of embedded safety notes

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

This is the formal structure of an embedded safety note:

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



2 Safety notes

2.1 Preliminary information

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

2.2 Duties of the user

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

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

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

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

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

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



2.3 Target group

Specialist for me- chanical work	Any mechanical work may be performed only by adequately qualified specialists. Spe- cialists in the context of this documentation are persons who are familiar with the design, mechanical installation, troubleshooting, and maintenance of the product who possess the following qualifications:
	• Qualifications in the field of mechanics in accordance with the national regulations
	Familiarity with this documentation
Specialist for elec- trotechnical 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 who possess the following qualifications:
	• Qualifications in the field of electrical engineering in accordance with the national regulations
	Familiarity with this documentation
Additional qualifi- cations	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, pro- gram, 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 Network security and access protection

A bus system makes it possible to adapt electronic drive technology components to the particulars of the machinery within wide limits. There is a risk that a change of parameters that cannot be detected externally may result in unexpected but not uncontrolled system behavior and may have a negative impact on operational safety, system availability, or data security.

Ensure that unauthorized access is prevented, especially with respect to Ethernetbased networked systems and engineering interfaces.

Use IT-specific safety standards to increase access protection to the ports. For a port overview, refer to the respective technical data of the device in use.



2.5 Designated use

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

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

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

The systems can be mobile or stationary.

Do not connect any other loads to the product. Never connect capacitive loads to the product.

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

- AC asynchronous motors with squirrel-cage rotor
- Permanent-field AC synchronous motors

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

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

2.5.1 Hoist applications

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

Use mechanical protection devices.

Application in ELSM[®] control mode

When the inverter is operated in ELSM[®] control mode, using it in lifting applications is not permitted. In this control mode only applications of horizontal materials handling are permitted.

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.

2.6 Functional safety technology

The product must not perform any safety functions without a higher-level safety system unless explicitly allowed by the documentation.



2.7 Transport

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

Observe the following notes when transporting the device:

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

If necessary, use suitable, sufficiently dimensioned handling equipment.

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

2.8 Installation/assembly

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

Protect the product from excessive mechanical strain. Ensure that elements are not deformed or insulation spaces are maintained, particularly during transportation. Electric components must not be mechanically damaged or destroyed.

Observe the notes in the chapter "Mechanical installation".

2.8.1 Restrictions of use

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

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

- Taking the reduced continuous rated current into consideration, see the chapter "Technical data" of the documentation.
- Above 2000 m above sea level, the air and creeping distances are only sufficient for overvoltage class II according to EN 60664. If the installation requires overvoltage category III according to EN 60664 you have to reduce the overvoltages on the system side from category III to II using additional external overvoltage protection.
- If a protective electrical separation is required, then implement this outside the product at altitudes of more than 2000 m above sea level (protective separation in accordance with EN 61800-5-1 and EN 60204-1).

2.9 Electrical installation

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

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

2.9.1 Required preventive measure

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

2.9.2 Stationary application

Necessary preventive measure for the product:

Type of energy transfer	Preventive measure	
Direct power supply	Ground connection	

2.9.3 Regenerative operation

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

2.10 Protective separation

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

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



2.11 Startup/operation

Observe the safety notes in chapters "Startup" (\rightarrow \cong 53) and "Operation" (\rightarrow \cong 55) in this documentation.

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

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

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

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

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

10 minutes.

Observe the corresponding information signs on the product.

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

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

Risk of burns: The surface temperature of the product can exceed 60 $^{\circ}$ C during operation. Do not touch the product during operation. Let the product cool down before touching it.

2.11.1 Energy storage unit

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

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



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3 MOVIDRIVE® technology type code

Example: MDX90A-0125-5E3-X-T00				
Product family	MD	MOVIDRIVE®		
Device type	Х	X = Single-axis inverter		
Series	90	90 = Without DC 24 V switched-mode power supply		
		91 = With DC 24 V switched-mode power supply		
Version	А	 A = Version status of the device series 		
Power class	0.125	 0125 = Nominal output current – e.g. 0125 = 12.5 A 		
Connection voltage	5	• 2 = AC 200 – 240 V		
		• 5 = AC 380 – 500 V		
Power section variant	Е	 0 = Basic interference suppression integrated 		
EMC		• E = EMC filter limit value category C2 in accordance with EN 61800-3		
Connection type	3	3 = 3-phase connection type		
Operating mode	Х	 4 = 4-quadrant operation 		
		X = Not relevant		
Device variant	Т	• 0 = Not relevant		
		 T = MOVIDRIVE[®] technology: Control via fieldbus 		
L = Inverter with POWERLINK C		L = Inverter with POWERLINK CiA402		
Technology level	0	0 = Standard design		
Application level	0	 0 = Standard/MOVIKIT[®] Velocity Drive 		
		 1 = MOVIKIT[®] Positioning Drive 		
		2 = Customized solution		
Options		 /L = Design with coated printed circuit boards 		
		The following list is an example:		
		 /CES11A = Multi-encoder card 		
		 /CID21A, /CIO21A = Input/output cards 		
		 /CFE21A = EtherNet/IP[™] and Modbus TCP 		
		/CFN21A = PROFINET		
		 /CFP21A = PROFIBUS 		
		 /CFL21A = POWERLINK 		

4 Installation

4.1 Special aspects when transporting the devices

NOTICE

Improper lifting and transportation of the inverter.

Improper lifting and transportation of the inverter on the plastic parts or on the covers will cause damage.

- Observe the following notes before lifting and transporting the inverter:
- Hold inverters of size 5 by the handling points provided on the rear panel of the housing.
- Transport inverters of sizes 6 7 using the supporting aids provided for this purpose.

4.1.1 Size 5

The rear panel of the housing of size 5 inverters is designed in such a way that you can grip them securely by hand to lift and transport the inverters without damaging them.



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4.1.2 Sizes 6 – 7

Due to their weight, the following inverters must be transported using a supporting aid:

• Lifting eye for size 6 inverters

The lifting eye is attached to the top of the housing and can be attached to lifting devices using suitable lifting equipment.



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• Carrying bar for size 7 inverters



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If a crane is not available, you can push a carrying bar [1] through the rear panel to facilitate installation (included in the delivery). Secure the carrying bar against axial displacement using the two split pins [2].

4.2 Mechanical installation

A CAUTION



Risk of injury to persons and damage to property.

Never install defective or damaged products.

• Before installing any products, check them for external damage. Replace any damaged products.



NOTICE

Risk of damage to property due to mounting surfaces with poor conductivity.

Inverter damage can occur.

• The mounting plate in the control cabinet must be conductive over a large area for the mounting surface of the inverter (metallically pure, good conductivity). An EMC-compliant installation of the inverter can only be achieved with a mounting plate that is conductive over a large area.

4.2.1 Minimum clearance and mounting position

When installing the inverters in the control cabinet, observe the following:

- To ensure unobstructed cooling, leave a minimum clearance of 100 mm above and below the inverter housings. Ensure that the air circulation in this clearance is not impaired by cables or other installation equipment.
- Make sure that the inverters are not within the area of the warm exhaust air of other devices.
- Install the inverters only vertically. Do not install them horizontally, tilted or upside down.
- Clearance at the side is not necessary. The units can be arranged directly next to one another.

INFORMATION

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Special bending spaces are required according to EN 61800-5-1 for cables with a cross section of 10 mm^2 and larger. This means the clearance must be increased if required.

4.2.2 Bore patterns

Size	Dimensions of the device base plate in mm						
	Α	В	С	D	E	F	G
Size 1	95	50	350	325	12	6	18
Size 2	105	50	350	325	12	6	18
Size 3	105	80	350	325	12	6	18
Size 4	135	80	350	325	12	6	18
Size 5	196	160	471	440	13	7	18
Size 6	240	200	544	510	13	7	18
Size 7	320	220	990	950	23	11	25



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4.3 Electrical installation



A DANGER

Dangerous voltage levels may still be present inside the device and at the terminal strips up to 10 minutes after the application inverter has been disconnected from the power supply.

Severe or fatal injuries from electric shock.

To prevent electric shocks:

• Disconnect the application inverter from the power supply and wait 10 minutes before removing the protective covers.

A DANGER

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A leakage current > 3.5 mA can occur during operation of the application inverter.

Severe or fatal injuries from electric shock.

To avoid dangerous shock currents in accordance with EN 61800-5-1, strictly observe the following:

- Supply system cable < 10 mm²:
 - Route a second PE conductor with the cable cross-section of the supply system cable in parallel to the protective earth via separate terminals or use a copper PE conductor with a cable cross-section of 10 mm².
- Supply system cable 10 mm² 16 mm²:
 - Route a copper PE conductor with the cable cross-section of the supply system cable.
- Supply system cable 16 mm² 35 mm²:
 - Route a copper protective earth conductor with a cable cross-section of 16 mm².
- Supply system cable > 35 mm²:
 - Route a copper protective earth conductor with half the cross-section of the supply system cable.
- If an earth leakage circuit breaker is used for protection against direct and indirect contact in isolated cases, it must be universal current-sensitive (RCD type B).

INFORMATION

Installation with protective separation.

The application inverter meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. The connected signal circuits must meet requirements according to SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) to ensure protective separation. The installation must meet the requirements for protective separation.





4.3.1 General information

- Take suitable measures to prevent the motor starting up inadvertently, for example by removing the electronics terminal block X20. Take additional safety measures depending on the application to prevent possible injuries to people and damage to machinery.
- Only use closed cable lugs or conductor end sleeves for connection to the screws to prevent litz strands from emerging.

4.3.2 Permitted voltage systems

Information on voltage systems	Information on permissibility		
TN and TT systems – voltage systems with di- rectly grounded star point.	Use is possible without restrictions.		
IT systems – voltage systems with non- grounded star point.	Use is only permitted adhering to specific measures. The measures are described in chapter "Use in IT systems".		
Voltage systems with grounded outer con- ductor.	Use only for nominal line voltages up to max. 240 V.		

4.3.3 Line fuses

Type class	Requirement		
Fuses in utilization categories gL, gG	Fusing voltage ≥ nominal line voltage		
Miniatura airauit brookor with	Nominal miniature circuit breaker voltage ≥ nominal line voltage		
characteristics B, C, D	Nominal currents of the miniature circuit breaker must be 10% higher than the nominal line current of the in- verter		



4.3.4 Special aspects for connecting power terminals

Note that for inverters from size 5 upwards, degree of protection IP20 is only achieved if the connection bolts (for connecting the grid, motor, braking resistor, and DC link) are protected against contact with plastic covers. The plastic covers can be ordered optionally, see chapter "Installation accessories".

1. Connect the cables.



2. The plastic covers must be removed in different ways depending on the cross section used.



3. Attach the plastic covers at the individual connections.





4.3.5 Line connection

- The line contactor must always be located upstream of the line filter.
- Use only line contactors of utilization category AC-3 (EN 60947-4-1) or higher.
- Do not use the line contactor for jog mode, but only for switching the inverter on and off. The FCB 20 "Jog" must be used for jog mode.
- Observe the required dimensioning of the cable cross-section for UL-compliant installing.

For the terminal assignment for line connection of the various sizes, refer to chapter "Terminal assignment".

Observe a minimum switch-off time of 10 s for the inverter. Do not switch the power on more than once per minute.

NOTICE

Non-compliance with the minimum switch-on/switch-off times

Inverter damage.

- Observe a minimum switch-off time of 10 s before switching on the power supply again.
- Do not switch on the supply system more than once per minute/every 2 minutes.



4.3.6 24 V supply voltage

The MDX90A-... application inverter requires an external 24 V voltage supply for the electronics.

The MDX9.A-... application inverter has an internal 24 V voltage supply (80 W) that can also be supported externally.

The maximum cable cross section is 2.5 $\rm mm^2.$ The maximally permitted length of the 24 V supply cable is 30 m.

Whether an external 24 V supply is required for MDX91A-.. depends on the load, e.g. the encoder supply and the outputs.



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Select the cross section of the supply cable according to the power demand of the devices to be supplied.



4.3.7 System bus EtherCAT[®]/SBus^{PLUS}

For connecting the EtherCAT[®]/SBus^{PLUS} system bus, SEW-EURODRIVE recommends using only prefabricated cables from SEW-EURODRIVE.

NOTICE

Use of wrong cables

Damage to the application inverter

Only 4-pole cables are permitted to be used as system bus cables [2]. If an 8-pole cable is used, malfunctions or failures may occur at the connected devices.

INFORMATION

The mounting plates on which the axis systems are mounted must have a sufficiently large ground connection, e.g. using a ground strap.

Correct cabling

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The 4-pole system bus cable is used between automation components, see figure " ".





4.4 BW.. braking resistors

The supply cables to the braking resistors carry a high pulsed DC voltage during operation.

A DANGER

Dangerous pulsed DC voltage of up to 980 V.

Severe or fatal injuries from electric shock.

- Disconnect the inverter from the power supply and wait 10 minutes before working on a braking resistor or its supply cables.
- Never operate the inverter without touch guards and installed closing covers.

WARNING

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The surfaces of the braking resistors will reach temperatures of up to 250 °C when the braking resistors are loaded with the nominal power.

Severe burns.

- Do not touch any braking resistor.
- Select a suitable installation location for the braking resistors such as the control cabinet roof.

4.4.1 Protection against thermal overload of the braking resistor

INFORMATION

PTC braking resistor

A PTC braking resistor goes to high resistance in the event of overload.

INFORMATION

Flat-type resistor

Flat-type resistors have internal thermal protection (fuse cannot be replaced) that interrupts the current circuit in the event of overload. The configuration guidelines and the documented assignments of the drive inverter and braking resistor must be adhered to.

Parallel connection of braking resistors

It is permitted to connect several identical braking resistors in parallel. The following applies:

- The power connections of the braking resistors must be connected to +R and -R in parallel.
- Each braking resistor requires a separate protection against thermal overload.
- The signal contacts (NC contacts) of the protection devices must be connected in series.



Internal temperature switch -T

Inverters of size 1-3



If a BW...-T braking resistor with internal temperature switch is used with these application inverters, there are 3 possible connections.

Note that the reference potential GND of the digital inputs on the controller must be the same as the reference potential of the application inverter when connection 1 is used.

[3]

[4]

Inverter

PLC

Connection 1

Braking resistor

[1]

[2]

The digital input of the application inverter connected to the signal contact of the internal temperature switch must be parameterized to the function "External braking resistor error".

- If the thermal circuit breaker trips, the signal is evaluated in the application inverter and the PLC.
- If the thermal circuit breaker trips, the PLC must interrupt the power supply.
- If the thermal circuit breaker trips, the application inverter switches to "Output stage inhibit".
- Connection 2
 - If the thermal circuit breaker trips, the signal is evaluated only in the PLC.
 - If the thermal circuit breaker trips, the PLC must interrupt the power supply.
 - If the thermal circuit breaker trips, there is no direct response in the application inverter.



- With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.
- Connection 3
 - If the thermal circuit breaker trips, the signal directly affects the line contactor.
 - This does not require a response by the PLC.
 - If the thermal circuit breaker trips, there is no direct response in the application inverter.

Inverters of size 4 and larger



If a BW...-T braking resistor with internal temperature switch is used with these application inverters, there are 3 possible connections.

- Line contactor [1] [3]
- PLC Braking resistor [4] [2]
- Connection 1

The digital input of the application inverter connected to the signal contact of the internal temperature switch must be parameterized to the function "External braking resistor error".

- If the thermal circuit breaker trips, the signal is evaluated in the application inverter.
- This does not require a response by the PLC.
- It is not required to disconnect the supply system connection with an external _ switching device.
- If an internal short circuit in the brake chopper is detected by the application inverter, the application inverter interrupts the energy supply by inhibiting the rectifier.
- If the thermal circuit breaker trips, the application inverter switches all axis modules to "Output stage inhibit".

INFORMATION

When using connection variant 1 (connection of braking resistor without line contactor), the application inverter must be supplied with external DC 24 V.

- **Connection 2**
 - If the thermal circuit breaker trips, the signal is evaluated only in the PLC.
 - If the thermal circuit breaker trips, the PLC must interrupt the power supply.

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- If the thermal circuit breaker trips, there is no direct response in the application inverter.
- With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.
- Connection 3
 - If the thermal circuit breaker trips, the signal directly affects the line contactor.
 - This does not require a response by the PLC.
 - If the thermal circuit breaker trips, there is no direct response in the application inverter.

External bimetallic relay

Inverters of size 1 – 3



If an external bimetallic relay is used with the application inverter, there are 3 possible connections.

Note that the reference potential GND of the digital inputs on the controller must be the same as the reference potential of the application inverter when connection 1 is used.

[4]

PLC

Connection 1

[2]

Braking resistor

The digital input of the application inverter connected to the signal contact of the external bimetallic relay must be parameterized to the function "External braking resistor error".

- If the thermal circuit breaker trips, the signal is evaluated in the application inverter and the PLC.
- If the thermal circuit breaker trips, the PLC must interrupt the power supply.
- If the thermal circuit breaker trips, the application inverter switches to "Output stage inhibit".
- Connection 2
 - If the thermal circuit breaker trips, the signal is evaluated only in the PLC.
 - If the thermal circuit breaker trips, the PLC must interrupt the power supply.
 - If the thermal circuit breaker trips, there is no direct response in the application inverter.



- With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.
- Connection 3
 - If the thermal circuit breaker trips, the signal directly affects the line contactor.
 - This does not require a response by the PLC.
 - If the thermal circuit breaker trips, there is no direct response in the application inverter.

Inverters of size 4 and larger

If an external bimetallic relay is used with the application inverter, there are 3 possible connections.



- [2] Braking resistor [4] PLC
- Connection 1

The digital input of the application inverter connected to the signal contact of the external bimetallic relay must be parameterized to the function "External braking resistor error".

- If the thermal circuit breaker trips, the signal is evaluated in the application inverter.
- This does not require a response by the PLC.
- It is not required to disconnect the supply system connection with an external switching device.
- If the thermal circuit breaker trips, the application inverter switches to the operating state "Output stage inhibit".
- If an internal short circuit in the brake chopper is detected by the application inverter, the application inverter interrupts the energy supply by inhibiting the rectifier.

INFORMATION

When using connection variant 1 (connection of braking resistor without line contactor), the application inverter must be supplied with external DC 24 V.

- Connection 2
 - If the thermal circuit breaker trips, the signal is evaluated only in the PLC.
 - If the thermal circuit breaker trips, the PLC must interrupt the power supply.

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- If the thermal circuit breaker trips, there is no direct response in the application inverter.
- With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.
- Connection 3
 - If the thermal circuit breaker trips, the signal directly affects the line contactor.
 - This does not require a response by the PLC.
 - If the thermal circuit breaker trips, there is no direct response in the application inverter.

4.5 Terminal assignment of basic unit

INFORMATION

Reference potentials inside the device.

The device-internal reference potential is designated as GND in the following table. All reference potentials GND are internally connected to PE.

INFORMATION

The assignment "Reserved" means that no cable may be connected to this connection.

INFORMATION

The technical data for the power and control electronics connections is provided in chapter "Technical data".

4.5.1 Sizes 1 – 3

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Illustration	Terminal	Connection	Assignment	
	X1:L1	L1		
	X1:L2	L2	Line connection	
	X1:L3	L3		
Ð	X1:-U _z	-U _z	DC link connection	
(+)	X1:+U _z	+Uz		
	÷	PE	PE connection	
	X2:U	U		
	X2:V	V	Motor connection	
® HHHH	X2:W	W		
	X2:+R	+R	Proking register connection	
	X2:-R	-R		
	ŧ	PE	PE connection	

4.5.2 Size 4

Illustration	Terminal	Connection	Assignment
	X1:L1	L1	
	X1:L2	L2	Line connection
	X1:L3	L3	
Ð	X1:-U _z	-U _z	DC link connection
	X1:+U _z	+Uz	
	÷	PE	PE connection

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Illustration	Terminal	Connection	Assignment
	X2:U	U	
	X2:V	V	Motor connection
	X2:W	W	
Ð	X2:+R	+R	Braking register connection
	X2:-R	-R	
	÷	PE	PE connection

4.5.3 Sizes 5 – 8

INFORMATION



Size 8 is not yet available.

Illustration	Terminal	Connection	Assignment	
	X1:L1	L1	Line connection	
	X1:L2	L2		
	X1:L3	L3		
	X1:-U _z	-U _z	DC link connection	
	X1:+U _z	+Uz		
	÷	PE	PE connection	
<u> </u>	X2:U	U	Motor connection	
	X2:V	V		
	X2:W	W		
	X2:+R	+R	Draking register connection	
	X2:-R	-R	DIAKING TESISION CONTRECTION	
	÷	PE	PE connection	

4.5.4 Sizes 7 – 8

INFORMATION



Size 8 is not yet available.

	Illustration	Terminal	Connection	Assignment
		-U _z *	-Uz	Connection in front of DC link shake
		+U _z *	+Uz	

4.5.5 Sizes 1 – 8

INFORMATION

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Size 8 is not yet available.

Illustration	Terminal	Connection	Assignment
24V D	X5:24 V	V ₁ 24 V	DC 24 V supply voltage
	X5:GND	GND	Reference potential
	X10:DB0	DB00	Brake control
	X10:DB00		
GND	X10:GND	GND	Reference potential
ФО рво	X10:TF1	TF1	Sensor input for temperature evaluation of the motor
	X10:GND	GND	Reference potential
	X30 OUT		
X30 UUT	X30 IN		EtherCAT®/SBus ^{PLUS} system bus
$\bigcirc \circ \\ \circ $			SEW-EURODRIVE Service interface
	X32		Interface for keypad
$ \underbrace{ \bigcirc } $			
	X20:1	D100	Digital input 1, with fixed assignment "Output stage en- able"
	X20:2	DI01	Digital input 2, fixed setpoints – positive direction of rota- tion
	X20:3	DI02	Digital input 3, fixed setpoints – negative direction of rota- tion
0 5 0	X20:4	DI03	Digital input 4, fixed speed setpoint bit 0
	X20:5	DI04	Digital input 5, fixed speed setpoint bit 1
	X20:6	DI05	Digital input 6, fault reset
0 9 0	X20:7	Reserved	-
	X20:8	Reserved	-
	X20:9	GND	Reference potential
	X21:1	+24 V	DC 24 V voltage output
	X21:2	DO00	Digital output 1, operational
0 3 5	X21:3	DO01	Digital output 2, output stage enable
	X21:4	DO02	Fault at digital output 3
	X21:5	DO03	Digital output 4, STO active
	X21:6	GND	Reference potential



4

Illustration	Terminal	Connection	Assignment
	X22:1	DOR-C	Shared relay contact
	X22:2	DOR-NO	NO contact
	X22:3	DOR-NC	NC contact
0 5 0	X22:4	Reserved	-
	X22:5	GND	GND
	X6:1	F_STO_P1	DC +24 V input F_STO_P1
	X6:2	F_STO_M	DC 0 V input F_STO_M
	X6:3	F_STO_P2	DC +24 V input F_STO_P2
5	X6:4	GND	Reference potential
	X6:5	24 V STO_OUT	U _{out} = DC 24 V supply of F_STO_P1 and F_STO_P2

4.5.6 X15: Motor encoder – resolver

Display	Terminal	Connection	Assignment
	X15:1	S2 (sin+)	Signal track
	X15:2	S1 (cos+)	Signal track
	X15:3	Reserved	-
	X15:4	Reserved	-
	X15:5	R1 (REF+)	Supply voltage of resolver
\bigcirc	X15:6	-TEMP_M	Motor temperature evaluation
15 °	X15:7	Reserved	-
	X15:8	Reserved	-
9-0-1	X15:9	S4 (sin-)	Signal track
	X15:10	S3 (cos-)	Signal track
	X15:11	Reserved	-
	X15:12	Reserved	-
	X15:13	R2 (REF-)	Supply voltage of resolver
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	Reserved	-



4.5.7	X15: Motor	encoder -	sin/cos	encoder
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Display	Terminal	Connection	Assignment
	X15:1	A (cos+) (K1)	Signal track A (cos+) (K1)
	X15:2	B (sin+) (K2)	Signal track B (sin+) (K2)
	X15:3	C (K0)	Signal track C (K0)
	X15:4	DATA+ ¹⁾	Data cable for electronic nameplate
	X15:5	Reserved	-
\frown	X15:6	-TEMP_M	Motor temperature evaluation
15	X15:7	Reserved	-
9	X15:8	GND	Reference potential
	X15:9	Ā (cos -) (K1)	Negated signal track \overline{A} (cos-) ($\overline{K1}$)
5	X15:10	B (sin-) (K2)	Negated signal track \overline{B} (sin-) ($\overline{K2}$)
	X15:11		Negated signal track \overline{C} ($\overline{K0}$)
	X15:12	DATA-2)	Data cable for electronic nameplate
	X15:13	V _{S24VG}	Encoder supply 24 V
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	V _{S12VG}	Encoder supply 12 V

1) For encoders from SEW-EURODRIVE with electronic nameplate.

4.5.8 X15: Motor encoder – TTL encoder

Display	Terminal	Connection	Assignment	
	X15:1	A (K1)	Signal track A (K1)	
	X15:2	B (K2)	Signal track B (K2)	
	X15:3	C (K0)	Signal track C (K0)	
	X15:4	Reserved	-	
	X15:5	Reserved	-	
\square	X15:6	-TEMP_M	Motor temperature evaluation	
15 °	X15:7	Reserved	-	
	X15:8	GND	Reference potential	
9	X15:9	Ā (K1)	Negated signal track \overline{A} ($\overline{K1}$)	
	X15:10	B (K2)	Negated signal track \overline{B} ($\overline{K2}$)	
	X15:11	C (KO)	Negated signal track \overline{C} ($\overline{K0}$)	
	X15:12	Reserved	-	
	X15:13	V _{S24VG}	Encoder supply 24 V	
	X15:14	+TEMP_M	Motor temperature evaluation	
	X15:15	V _{S12VG}	Encoder supply 12 V	
Display	Terminal	Connection (RS485)	Assignment	
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	X15:1	A (cos+) (K1)	Signal track A (cos+) (K1)	
	X15:2	B (sin+) (K2)	Signal track B (sin+) (K2)	
	X15:3	Reserved	-	
	X15:4	DATA+	Data line RS485	
	X15:5	Reserved	-	
\bigcirc	X15:6	-TEMP_M	Motor temperature evaluation	
15 - ° °	X15:7	Reserved	_	
	X15:8	GND	Reference potential	
9	X15:9	Ā (cos -) (K1)	Negated signal track \overline{A} (cos-) ($\overline{K1}$)	
	X15:10	B (sin-) (K2)	Negated signal track \overline{B} (sin-) ($\overline{K2}$)	
	X15:11	Reserved	-	
	X15:12	DATA-	Signal cable	
	X15:13	V _{S24VG}	Encoder supply 24 V	
	X15:14	+TEMP_M	Motor temperature evaluation	
	X15:15	V _{S12VG}	Encoder supply 12 V	

159	X15. HIDEREACE®	motor encoder	SEW-EURODRIVE	oncodor
4.5.9	A15: HIPERFACE	motor encoder	SEW-EURUDRIVE	encoder

4.5.10 X15: SEW-EURODRIVE encoder with RS485 interface

Display	Terminal	Connection (RS485)	Assignment
	X15:1	A (cos+) (K1)	Signal track A (cos+) (K1)
	X15:2	B (sin+) (K2)	Signal track B (sin+) (K2)
	X15:3	Reserved	-
	X15:4	DATA+	Data line RS485
	X15:5	Reserved	-
\bigcirc	X15:6	-TEMP_M	Motor temperature evaluation
15—°	X15:7	Reserved	-
	X15:8	GND	Reference potential
9	X15:9	Ā (cos -) (K1)	Negated signal track \overline{A} (cos-) ($\overline{K1}$)
	X15:10	B (sin-) (K2)	Negated signal track \overline{B} (sin-) ($\overline{K2}$)
	X15:11	Reserved	-
	X15:12	DATA-	Signal cable
	X15:13	V _{S24VG}	Encoder supply 24 V
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	V _{S12VG}	Encoder supply 12 V



4.5.11 X16: MOVILINK® DDI interface

Display	Terminal	Connection	Assignment
\bigcirc	X16	Coaxial connection	MOVILINK [®] DDI



4.6 Wiring diagrams

4.6.1 General information on the wiring diagrams

- For technical data of the power electronics and the control electronics, refer to chapter "Technical data".

4.6.2 Power connection

Wiring of the power connections with line contactor, line choke, line filter, and output choke



Braking resistor (optional)

Output choke and/or output filter (both optional)

[5]

[6]

[7]

Motor

63050408662092427

- [1] Fuses
- [2] Line contactor
- [3] Line choke (optional)
- [4] Line filter (optional)

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Wiring of the power connections with line choke, line filter, output choke, without line contactor

Refer to the table in chapter "Line contactor" to find out which application inverters can be operated without a line contactor.

NOTICE

Operation without line contactor.

If the required measures are not taken, operation of an application inverter with connected braking resistor without line contactor may result in severe damage to property.

Refer to the chapter "Line contactor" for the necessary measures.

INFORMATION

For line connection without line contactor, the temperature evaluation of the braking resistor must be ensured via a digital input on the application inverter. The connected digital input must be parameterized for monitoring the braking resistor temperature evaluation.





- [1] Fuses
- [2] Line choke (optional)

L1 L2 L3 PE

[3] Line filter (optional)

- 54043209407696267
- [4] Braking resistor (optional)[5] Output choke and/or output filter (both optional)
- [6] Motor

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4.6.3 Brake control

Key:



INFORMATION

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The selection of the brake control and the shown connection diagrams only represent one of the many possibilities. Observe the catalogs and operating instructions of the motors for more information and installation notes.



BMK. brake control



BMV brake control – 2 coils



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BMV brake control – 1 coil



BMS, BME brake control



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BMP brake control



14324544523

BG, BGE brake control







BSG brake control



Brake control SBM with 1 control cable



- [1] Connection of the brake with 3-wire technology (standard)
- [2] Connection of the brake with 2-wire technology (optional). In this case, there is no connection from terminal X14:14 of the brake module to terminal 3a of the auxiliary terminal strip.



Brake control SBM with 2 control cables



- [1] Connection of the brake with 3-wire technology (standard)
- [2] Connection of the brake with 2-wire technology (optional). In this case, there is no connection from terminal X14:14 of the brake module to terminal 3a of the auxiliary terminal strip.





4.6.4 Electronics connection

For the assignment of the signal terminals and connections, refer to chapter "Terminal assignment of basic unit" ($\rightarrow B$ 32).

Wiring of the control electronics - front

The assignment of the digital inputs and outputs shown here is the factory setting.



- S3 Module bus operating mode
- X20 Digital inputs
- X21 Digital outputs
- X22 Isolated relay contact



Wiring of the control electronics - top and bottom



The assignment of the digital inputs and outputs shown here is the factory setting.

9007223162791691

- X5 24 V supply voltage
- X6 Connection for Safe Torque Off (STO)
 With installed CS.A card, the cable bridges are removed at the factory.
 If no CS.A card is installed upon delivery, the cable bridges are installed at the factory.
- X10 Connection of brake control and motor temperature monitoring
- X15 Motor encoder connection
- X16 Connection of MOVILINK® DDI digital motor integration
- X30 SBus^{PLUS}/EtherCAT[®] system bus





4.6.5 Connection diagram CIO21A and CID21A input/output card

Digital inputs and outputs



[1] Higher-level controller

Voltage input



9007213575393675

Connection to the terminals Al31 and Al32 is carried out analogously to the connection to the terminals Al21 and Al22 shown in the wiring diagrams.





Connection to the terminals REF2 and Al31 is carried out analogously to the connection to the terminals REF1 and Al21 shown in the wiring diagrams.

Current input



9007213575398539

Observe the switch position of "DIP switch S50" when activating the current input.





Voltage output



Connection to the terminals AOV2 and GND is carried out analogously to the connection to the terminals AOV1 and GND shown in the wiring diagram.

Current output



18014412830272395

Connection to the terminals AOC2 and GND is carried out analogously to the connection to the terminals AOC1 and GND shown in the wiring diagram.



5 Startup

5.1 Setting the EtherCAT[®] ID

An EtherCAT[®] ID can be permanently assigned to the application inverter using the hexadecimal switches S1 and S2. With these switches, you can set a decimal EtherCAT[®] ID between 1 and 255 in hexadecimal notation.

The ID serves as a unique device identification of the respective EtherCAT[®] slave for the EtherCAT[®] master. The EtherCAT[®] ID is not an EtherCAT[®] address.

In the delivery state of the application inverter, the ID is set to 0 by default (S1 = 0 and S2 = 0).

Setting an EtherCAT $^{\otimes}$ ID is not mandatory. The slaves are automatically addressed by the master by default.

The EtherCAT[®] ID must only be set at the application inverter if the use of EtherCAT[®] IDs was preset in the hardware configuration of the master.

Required ID, decimal	ID, hexadecimal	Setting S1 (× 10)	Setting S2 (× 1)
3	03	0	3
18	12	1	2
25	19	1	9
100	64	6	4
110	6E	6	E
255	FF	F	F

S1 EtherCAT® ID (×10)



S2 EtherCAT® ID (×1)



The EtherCAT[®] ID "110" is set as an example in the illustration above.



5.2 Startup requirements

The following requirements apply to startup:

- You have installed the application inverter correctly, both mechanically and electrically.
- You have configured the application inverter and connected drives correctly.
- Safety measures prevent accidental startup of the drive.
- Safety precautions prevent danger to persons or machines.

You can perform the startup in different ways:

- If you use a power-adjusted motor, you can dispense with startup (operation without startup), depending on the requirements.
- You can perform startup using the MOVISUITE[®] engineering software.

5.2.1 Required hardware for startup with MOVISUITE®

- USM21A interface adapter (28231449)
- Serial interface cable RJ10 ↔ D-sub 9 (18123864) or
- Keypad CBG11A , CBG21A or CBG22A
- USB cable A \leftrightarrow mini B
 - or
- Ethernet cable (category 6) and access via EtherCAT[®]/Ethernet/PROFINET

Part number	Scope of delivery	
28231449	USM21A interface adapter	
	 Serial interface cable with 2 × RJ10 connectors 	
	• USB cable (A-B)	
18123864	Serial interface cable RJ10 ↔ D-sub 9	



6 Operation

6.1 General information



A DANGER

Dangerous voltages present at cables and motor terminals

Severe or fatal injuries from electric shock.

- Dangerous voltages are present at the output terminals and the cables and motor terminals connected to them when the device is switched on. This also applies even when the device is inhibited and the motor is at standstill.
- The fact that the operation LED is no longer illuminated does not indicate that the inverter has been disconnected from the power supply and no longer carries any voltage.
- Before you touch the power terminals, check that the inverter has been disconnected from the power supply.

A DANGER



Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

- Ensure that the motor cannot start inadvertently, for example by removing the electronics terminal block X20.
- Additional safety precautions must be taken, depending on the application, to avoid injury to personnel and damage to machinery.

NOTICE

Switching the motor output at the inverter with enabled output stage.

Damage to the inverter.

• The motor output of the inverter may only be switched or disconnected when the output stage is inhibited.



6.2 Operating displays

6.2.1 7-segment display

Display	Description	State	Comment/action
Displays	during boot process		
b0 b1 b2 b3 br	Device passes through several states when load- ing firmware (boot) to be- come ready for operation	 Status: Not ready Output stage is inhibited. Communication is not yet possible. 	 Waiting for boot process to finish. Device stays in this condition: Device is defective.
Display	Description	State	Comment/action
Displays	of different device states		
•	Energy-saving mode		Energy-saving mode active
00	DC link voltage missing	 Status: Not ready Output stage is inhibited. Communication is possible. 	Check the supply system.
C0 Flashing	Module bus not ready		Check the module bus connection.
C1 Flashing	Startup state		Startup state is active.
C2 Flashing	STO active	Status: Not readyOutput stage is inhibited.	The Safe Torque Off function is ac- tive.
C3 Flashing	Synchronization with bus incorrect. Process data processing not ready.	 Communication is pos- sible. 	 Check the bus connection. Check the synchronization setting at the device and controller. Check the process data settings at the device and controller.
C4 Flashing	Encoder evaluation not ready		 Encoders are being initialized. Device stays in this condition: No encoder selected. "Source actual speed" or "Actual position" parameter shows an encoder that does not exist.
C5 Flashing	Motor management not ready		
C6 Flashing	Internal device supply in- complete		
C7 Flashing	Power section not ready		



Display	Description		State	Comment/action
C8	External device not ready			
Flashing				
C9	Data flexibilization layer not			
Flashing	ready			
Cd	Parameter download run-			
Flashing	ning			
CA	MOVILINK [®] DDI not ready			MOVILINK [®] DDI interface not ready.
Display	Description		State	Comment/action
Displays	during initialization proces	ses	(parameters will be reset t	to default values)
d0	Basic initialization	•	Status: Not ready	Waiting for initialization to finish.
Flashing		•	Output stage is inhibited.	
d1	Initialization at delivery	•	Communication is pos-	
Flashing	state		SIDIE.	
Display	Description		Stata	Commont/action
Display	Description		State	Comment/action
Displays	in normal operation			
01	Output stage inhibit	•	Output stage is inhibited.	The drive is not actuated by the out- put stage. The brake is applied; without the brake, the motor coasts to

			without the brake, the motor coasts to a halt. FCB 01 can be selected from various sources.
AC	Auto Configuration	Data is transferred to the in- verter via MOVILINK [®] DDI interface.	The motor is started up via the MOVILINK [®] DDI interface.



6

Display	Description	State	Comment/action
02	Default stop	For further information, refer to the description of the FCBs.	Drive function (FCB) "Default stop" active, if not other FCB is selected and the system is ready.
04	Manual mode	-	Manual mode is active.
05	Speed control	-	Speed control with internal ramp generator.
06	Interpolated speed control		Speed control with setpoints cyclically via bus. The ramp generator is located externally, e.g. in the higher-level controller.
07	Torque control		Torque control.
08	Interpolated torque control		Torque control with setpoints cycli- cally via bus.
09	Positioning control	-	Positioning mode with internal ramp generator.
10	Interpolated positioning control		Positioning mode with setpoints cycli- cally via bus. The ramp generator is located externally, e.g. in the higher- level controller.
12	Reference travel	-	The drive performs reference travel.
13	Stop at application limits	-	Deceleration at the application limit. FCB 13 is active if no other FCB is selected with the default FCB 02.
14	Emergency stop		Deceleration at the emergency stop limit.
18	Rotor position identification	-	Encoder commutation for synchro- nous motors.
19	Position hold control		Position control on current position.
20	Jog		Jog mode is active.
21	Brake test		Brake is tested by applying a torque when the brake is applied.
25	Motor parameter measure- ment		Motor parameter measurement is ac- tive.
26	Stop at user limits		Serves to stop at user limits.



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6.2.2 LED displays – basic unit

"RUN" LED

LED	Meaning
Off	"INIT" state
	The interface is in the "INIT" state.
Green	"PRE_OPERATIONAL" state
Flashing	Mailbox communication is possible.
	Process data communication is not possible.
Green	"SAFE_OPERATIONAL" state
Flashing once	Mailbox and process data communication is possible.
	Safety-related output signals are not output.
Green	"OPERATIONAL Mode" state
Illuminated	Mailbox and process data communication is possible.

"ERR" LED

LED	Meaning
Off	No error
	The interface is in operating state.
Red	Boot error
Flickering	A BOOT error has occurred.
	"INIT" state has not been reached.
	However the "Change" parameter is set to "0x01:change/error".
Red	Invalid configuration
Flashing	A general configuration error has occurred.
Red	Unprompted state change
Flashing once	The slave application has changed the state automatically.
	The "Change" parameter is set to "0x01:change/error".
Red	Application watchdog timeout
Flashing twice	A watchdog timeout error has occurred in the application.
Red	PDI ¹⁾ Watchdog Timeout
Illuminated	A PDI watchdog timeout error has occurred.

1) PDI = Process Data Interface

"LNK/ACT" LED

LED	Meaning	
Off	No link available.	
	No physical connection to a neighboring device was detected.	
Green	Link available, no bus activity.	
Illuminated	A physical connection to a neighboring device was detected.	
	No data is being exchanged via the Ethernet port.	
Green	Link available, bus activity.	
Flickering	A physical connection to a neighboring device was detected.	
	Data is being exchanged via the Ethernet port.	

6.2.3 PROFINET CFN21A fieldbus card

"BF" LED

This LED indicates the status of the PROFINET interface. The state includes communication link, bus error and process data configuration.

Status	Possible cause	Measure
Off	Fault-free operating state.	_
	The PROFINET device is exchanging data with the PROFINET controller (Data Exchange state).	
Red Permanently lit	Connection to the PROFINET control- ler has failed.	Check the PROFINET connection of the PROFINET device.
	Bus communication has been inter- rupted.	Check all the cables in the PROFINET network.
	The PROFINET controller is not in operation.	Check the PROFINET controller.
	The PROFINET device does not detect a PROFINET baud rate.	Check the configuration of the PROFINET controller.
Yellow Permanently lit	There is a connection to the PROFINET controller, but the configu- ration of the PROFINET network is faulty.	Check the configuration of the PROFINET controller.
	The following faults may have oc- curred:	
	 A hardware module was selected that does not support the PROFINET interface. 	
	 The standard process data and the safe process data have been as- signed mixed to the PROFINET device. 	

"US1" LED

This LED indicates the status of the PROFINET interface. The state includes the startup, normal operation, error mode and energy-saving operation operating modes.

Status	Possible cause	Measure
Yellow, flashing	The PROFINET interface box is just start-	_
Cyclic duration factor: 250 ms	ing up after a reset.	
Switch-off time: 250 ms		
Green	The PROFINET interface is operating	-
Permanently lit	without faults.	
Green, flashing	The PROFINET interface is in energy-sav-	_
Cyclic duration factor: 500 ms	ing mode (PROFlenergy mode).	
Switch-off time: 3000 ms		
Red	The PROFINET interface box has detect-	Switch the device off and back on
Permanently lit	ed a fault.	again.
	Information: A timeout of the PROFINET connection is not an internal fault.	If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

"LNK/ACT" LED

Status	Meaning		
All LEDs	A physical connection to another Ethernet node was detected.		
Green	Currently, no data is being exchanged via the Ethernet port.		
Permanently lit			
All LEDs	The blink test has been activated to localize the Ethernet		
Flashing green	nodes visually.		
Cyclic duration factor: 500 ms			
Switch-off time: 500 ms			
All LEDs	No physical connection to further Ethernet nodes was detect-		
Off	ed.		
LED at the respective Ethernet port	Data is being sent or received via the Ethernet port.		
Green/yellow, flashing			

6.2.4 EtherNet/IP[™] and Modbus TCP CFE fieldbus card

"NS" LED

LED	Meaning	Me	asure
– Off	Device is switched off. No DC 24 V supply. The IP address is not set.	•	Check the DC 24 V voltage supply. Switch on the device again. Set the IP address.
Green Flashing	The connection to the Ethernet master has failed. The device does not detect a connection to the Ethernet master (bus error).	•	Check the Ethernet connection of the device. Check all Ethernet connections.
Green Illuminated	The IP address is set. The Ethernet con- nection has been established.	_	
Red Flashing	Timeout delay of the controlling connection has expired. The state is reset by restarting communica- tion.	•	Check the fieldbus connection. Check the master/scanner. Check all Ethernet connections.
Red Illuminated	Conflict detected in IP address assignment.	•	Check whether there is another device with the same IP address in the network. Change the IP address of the device. Check the DHCP settings for IP ad- dress assignment of the DHCP server (only when using a DHCP server).
Red/green Flashing	The device performs a LED test. This state may only be active for a short time during startup. The device has received the designated target unit network ID (TUNID). The LED will keep flashing until the device has received the APPLY_TUNID service and the validation is successfully com- pleted.		

"MS" LED

LED	Meaning	Me	easure
-	No power supply or DC 24 V supply.	•	Check the voltage supply.
Off			
Green	The device has not been configured yet.	•	Configure the device.
Flashing		•	Check the DHCP server connection (only if DHCP is activated and in persistent status).

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LED	Meaning	Measure
Green	Device OK.	_
Illuminated		
Red	A correctable fault has occurred on the	Check whether there is another device with the same IP address in
Flashing		the network.
		 Change the IP address of the device.
		 Check the DHCP settings for IP ad- dress assignment of the DHCP server (only when using a DHCP server).
Red	A fault that cannot be corrected has oc-	Switch on the device again.
Illuminated	curred on the device.	 Reset the device to the factory set- tings.
		 If this fault occurs repeatedly, re- place the device or contact SEW-EURODRIVE Service.
Red/green	The device performs a LED test.	_
Flashing	This state may only be active for a short time during startup.	
	The device is waiting for a target unit net- work ID (TUNID).	Assign a target unit network ID (TUNID) to the device.
	Device parameter setting is required.	Check the parameterization of the CSB51A/CSL51A safety option.

"LNK/ACT" LED

Status	Meaning	
All LEDs	A physical connection to another Ethernet node was detected.	
Green	Currently, no data is being exchanged via the Ethernet port.	
Permanently lit		
All LEDs	The blink test has been activated to localize the Ethernet	
Flashing green	nodes visually.	
Cyclic duration factor: 500 ms		
Switch-off time: 500 ms		
All LEDs	No physical connection to further Ethernet nodes was detect-	
Off	ed.	
LED at the respective Ethernet port	Data is being sent or received via the Ethernet port.	
Green/yellow, flashing		



6.2.5 CFL21A POWERLINK fieldbus card

"BS" LED

LED	Meaning	
Off	"INIT" state	
	The interface is in "INIT" state.	
Green	"BASIC ETHERNET Mode" state	
Flickering	None of the SoA, SoC, PReq, or PRes message types detected.	
Green	"PRE_OPERATIONAL_1Mode" state	
Flashing once	Only acyclic communication is possible.	
Green	"PRE_OPERATIONAL_2Mode" state	
Flashing twice	Acyclic and cyclic communication are possible.	
	Process data are not valid.	
Green	"READY_TO_OPERATE_Mode" state	
Flashing three times		
Green	"STOPPED_Mode" state	
Flashing		
Green	"OPERATIONAL Mode" state	
Illuminated		

"BE" LED

LED	Meaning	Measure
Off	Transition to "OPERA- TIONAL_Mode" state	-
	Software reset of the NMT state ma- chine (start basic node initialization)	_
	Transition to "BASIC_ETHER- NET_Mode" state after a timeout of the SoC, PReq, Pres, and SoA mes- sage types.	_
Red	POWERLINK cycle time exceeded.	Check/adjust the network.
Illuminated	The number of managing nodes	Check/adjust the network.
	(MN) in the POWERLINK network is > 1.	Configure only 1 managing node.
	Invalid Ethernet frame format,	Check/adjust the network.
	e.g. wrong Ethernet CRC (redund- ancy checksum)	
	Loss of frame	Check/adjust the network.
	Frame collision	Check/adjust the network.
	Invalid IP address	Set a valid IP address.



"LNK/ACT" LED

Status	Meaning		
All LEDs	A physical connection to another Ethernet node was detected.		
Green	Currently, no data is being exchanged via the Ethernet port.		
Permanently lit			
All LEDs	The blink test has been activated to localize the Ethernet nodes visually.		
Flashing green			
Cyclic duration factor: 500 ms			
Switch-off time: 500 ms			
All LEDs	No physical connection to further Ethernet nodes was detected.		
Off			
LED at the respective Ethernet port	Data is being sent or received via the Ethernet port.		
Green/yellow, flashing			

6.2.6 PROFIBUS CFP21A fieldbus card

"BF" LED

		Measure
Off	Error-free operating state.	-
	The device is exchanging data with the PROFIBUS master (data exchange state).	
Red Illuminated	 PROFIBUS master not in operation. The connection to the PROFIBUS master has failed. The device does not detect a PROFIBUS baud rate. Bus communication has been interrupted. 	 Check the PROFIBUS connection of the device. Check all the cables in the PROFIBUS network. Check the configuration of the PROFIBUS master.
Red Flashing with 2 Hz	 The device detects the PROFIBUS baud rate but is not addressed by the PROFIBUS master. The device was not configured or was configured incorrectly in the PROFIBUS master. 	 Check the PROFIBUS address set in the device and in the engineering tool of the PROFIBUS master. Check the configuration of the PROFIBUS master. Check to see that you use the matching device description file ().

"RUN" LED

The "RUN" LED indicates whether the bus electronics is functioning properly.

		Measure
Green	PROFIBUS hardware OK.	_
	Bus electronics without faults.	

		Measure
Red Illuminated	The hardware of the bus electronics is faulty.	Switch the device off and back on again.
		If the fault occurs repeatedly, contact SEW-EURODRIVE Service.
Red Flashing with 2 Hz	The PROFIBUS address is set to 0 or to a value greater than 125.	Check the PROFIBUS address set in the device.
		Reset the device.



7 Service

7.1 Extended storage

The device is maintenance-free.

7.2 Shutdown

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

A WARNING



Electric shock due to incompletely discharged capacitors.

Severe or fatal injuries.

Observe a minimum switch-off time of 10 minutes after disconnecting the power supply.

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SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Str. 42 76646 BRUCHSAL GERMANY Tel. +49 7251 75-0 Fax +49 7251 75-1970 sew@sew-eurodrive.com → www.sew-eurodrive.com