Drive Technology \ Drive Automation \ System Integration \ Services

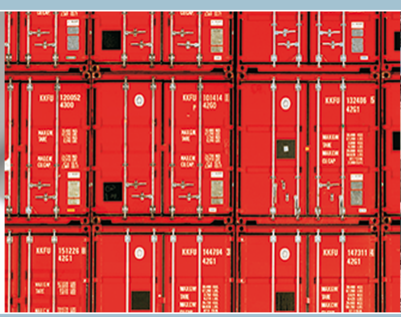
Product Manual

Application Inverter
MOVIDRIVE® modular

Edition 06/2018

25827146/EN



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1 Product description

With its brand MOVI-C®, SEW-EURODRIVE is launching a new generation of drive and automation technology. MOVI-C® is the modular automation system that enables the highest level of system and machine automation.

MOVI-C® comprises drive technology, MotionControl, control technology and visualization.

MOVIDRIVE® modular is the modular application inverter for all types of applications, ranging from simple open-loop speed control to servo drives with kinematic model.

MOVIDRIVE® modular consists of:

- Supply and energy recovery modules.
- Single-axis and double-axis modules.
- Capacitor and buffer modules.
- 24 V switched-mode power supply module.
- Assembly module for integrating MOVI-C® CONTROLLER advanced into the axis system.
- Accessories for EMC-compliant installation.
- Cards for connecting other I/Os or an additional encoder.
- Cards for functional safety in functionally different versions.
- Accessories for connecting and controlling of motors and brakes, as well as prefabricated motor and encoder cables.

For use in harsh environments, the inverters can be supplied with painted PCBs. The coating of the printed circuit boards increases their resistivity against environmental influences.

MOVIDRIVE® modular can be supplemented by connecting MOVIDRIVE® system single-axis devices. These possess functionalities comparable to those of axis modules, but have their own line connection.

Especially in the upper power range up to 588 A/315 kW, MOVIDRIVE® system supplements the modular application inverter. For additional information, refer to the MOVIDRIVE® system product manual.

The key features of MOVIDRIVE® modular and MOVIDRIVE® system are:

- A maximum of 15 axis modules at a power supply module, a maximum of 30 drives for double-axis modules.
- Control mode:
  - U/f: for simple applications with asynchronous motors.
  - VFC^{PLUS}: for precise control of asynchronous motors.
  - CFC: for asynchronous and synchronous servomotors.
  - ELSM®: for synchronous motors without encoders.
- Multi-encoder input in the basic device.
- Speed control, torque control, position control.
- Expansion slots for I/O, multi-encoder, functional safety.
- Very compact device size, reduced space requirements in the control cabinet.

For motors by SEW-EURODRIVE, all motor data is available and used during startup. For unknown motors, measurement functions for motor data and rotor orientation are available to allow for an easy and quick startup without expert knowledge.

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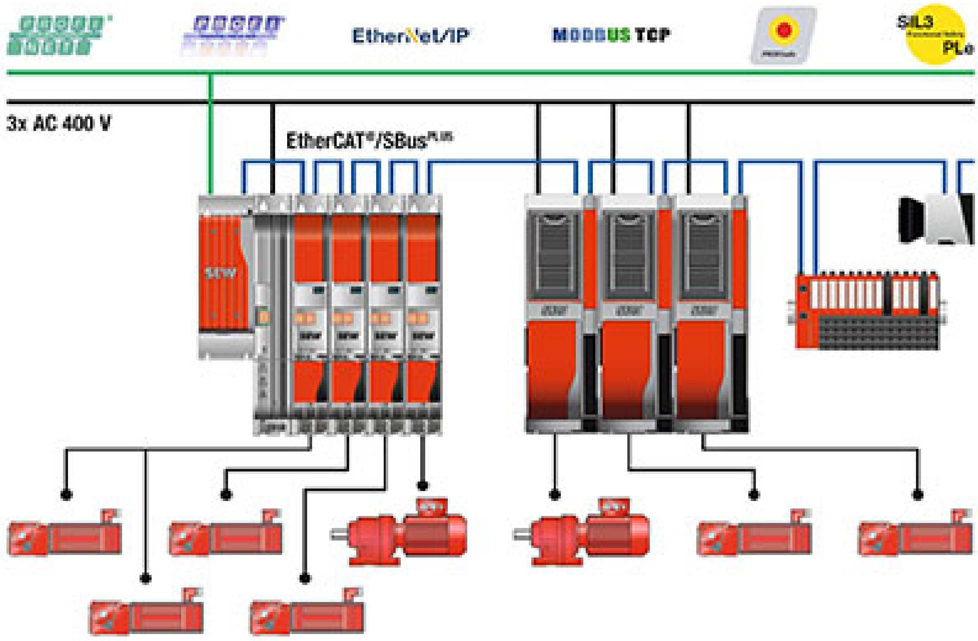
MOVIDRIVE® modular and MOVIDRIVE® system are intended for operation at the MOVI-C® CONTROLLER, the controller from SEW-EURODRIVE.

They offer a powerful clock-synchronous connection via the integrated EtherCAT®/SBus^PLUS communication interface. Other EtherCAT® clients from SEW-EURODRIVE or other manufacturers can be controlled and diagnosed by the MOVI-C® CONTROLLER.

The MOVI-C® CONTROLLER offers the following functionalities:

- Freely programmable sequence control in accordance with IEC 6-1131-3 for automating drive and logic tasks.
- Central data storage for all MOVI-C® inverters from SEW-EURODRIVE at the EtherCAT®/SBus^PLUS.
- Plug-and-play device replacement through automatic data recovery.
- Central setpoint input for clock-synchronous drives and for auxiliary drives.
- Motion functions: Speed control, torque specification, position specification, phase-synchronous operation, cams, application modules, kinematic models.
- EtherCAT®/SBus^PLUS master for SEW-EURODRIVE components and for third-party components.
- Fieldbus device connection to higher-level control systems.
- Diagnostics and visualization of the automation system.



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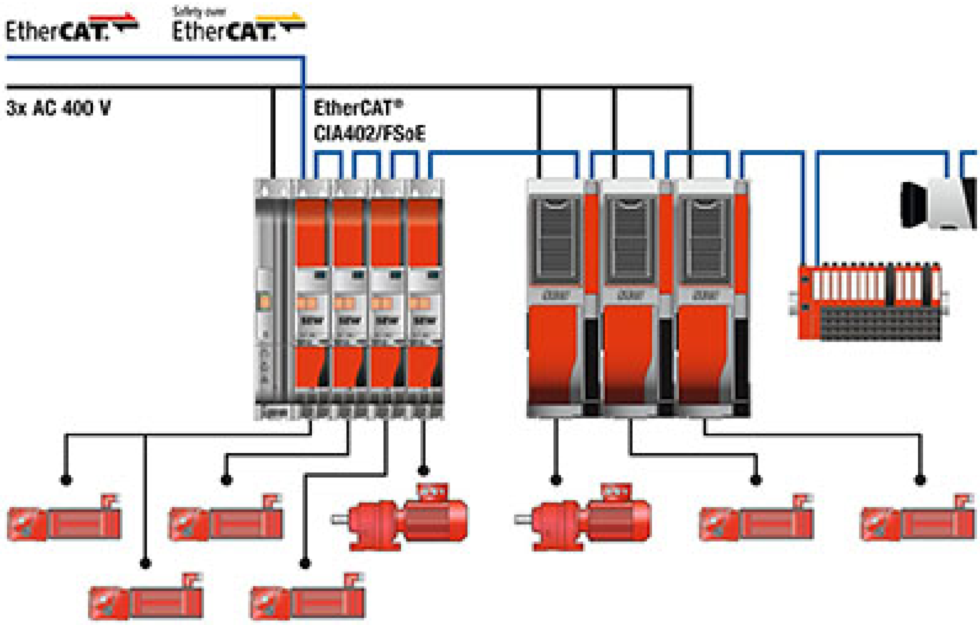
The CiA402 device profile for controlling inverters has established itself in plants with very individual motion control functions that are calculated in the external higher-level controller.

For control via CiA402, the MOVIDRIVE® modular and MOVIDRIVE® system application inverters can be directly connected to the higher-level controller using the integrated EtherCAT® interface. This means integration into the higher-level controller is particularly fast, simple, and without extensive conversion effort.

For applications with requirements on functional safety, the MOVISAFE® CS..A safety cards are available. They are controlled via the integrated inputs and outputs or via safe communication using Safety over EtherCAT® (FSoE).



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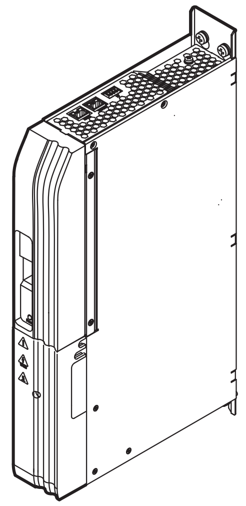
MOVIDRIVE® modular and MOVIDRIVE® system are available with device profile CiA402.

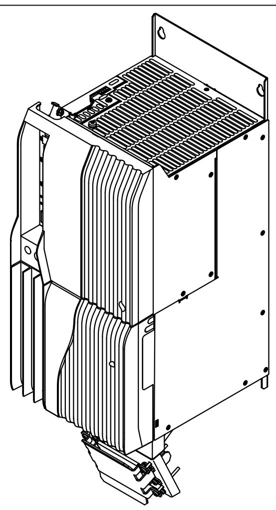
The new engineering software MOVISUITE® is the central module of the MOVI-C® modular automation system. MOVISUITE® allows for intuitive operation with modern operating concepts.

The central functions of MOVISUITE® are:

- Network scan.
- Device startup and parameterization.
- Data storage and data management.
- Scope and diagnostics.
- Programming environment for the MOVI-C® CONTROLLER.
- Parameterization for functional safety.
- Parameterization and diagnostics environment for application modules.

1.1 MOVIDRIVE® modular at a glance

Power supply modules	
MDP90A..	Description: (→ 🗎 16) Technical data: (→ 🗎 46) Dimension drawings: (→ 🗎 55)
	• Performance classes: 10/25/50/75/110 kW • Voltage range: 3 × 380 – 500 V, 50 – 60 Hz • Nominal DC link voltage: DC 560 V • Overload capacity: 250% of nominal power for 1 s For further information on this device, refer to the following documents: • "MOVIDRIVE® modular application inverter" operating instructions • "MOVIDRIVE® modular application inverter" product manual • "MOVI-C® – Automation with MOVI-C® CONTROLLER" manual • "Parameter Description MOVIDRIVE® modular" manual

Power supply modules with supply and energy recovery	
MDR91A..	Description: (→ 🗎 17)
	• Performance classes: 50/75 kW • Voltage range: 3 × 380 – 480 V, 50 – 60 Hz • Nominal DC link voltage: DC 560 V • Overload capacity: 225% of nominal power for 1 s • XSE31A EtherCAT®-compatible system bus For further information on this device, refer to the following documents: • "MOVIDRIVE® modular Application Inverters - Power supply module with supply and energy recovery " operating instructions • "MOVIDRIVE® modular Application Inverters - Power supply module with supply and energy recovery " product manual

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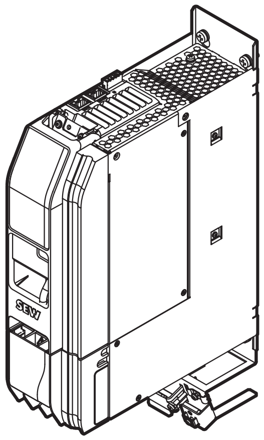
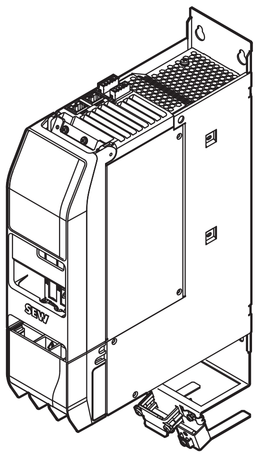
Axis modules	
Single-axis modules MDA90A.. 	Description: (→ 🗎 18) Technical data: (→ 🗎 48) Dimension drawings: (→ 🗎 60) • Axis sizes: 2 – 180 A • Overload capacity: 250% of the nominal output current for 1 s • System bus: EtherCAT®/SBus^{PLUS} • Control mode with and without encoder feedback For further information on this device, refer to the following documents: • "MOVIDRIVE® modular application inverter" operating instructions • "MOVIDRIVE® modular application inverter" product manual • "MOVI-C® – Automation with MOVI-C® CONTROLLER" manual • "Parameter Description MOVIDRIVE® modular" manual
Double-axis modules MDD90A.. 	Description: (→ 🗎 19) Technical data: (→ 🗎 50) Dimension drawings: (→ 🗎 60) • You can operate 2 motors with one module • Axis sizes: 2 × 2 A – 2 × 8 A • Overload capacity: 250% of the nominal output current for 1 s • System bus: EtherCAT®/SBus^{PLUS} • Control mode with and without encoder feedback For further information on this device, refer to the following documents: • "MOVIDRIVE® modular application inverter" operating instructions • "MOVIDRIVE® modular application inverter" product manual • "MOVI-C® – Automation with MOVI-C® CONTROLLER" manual • "Parameter Description MOVIDRIVE® modular" manual

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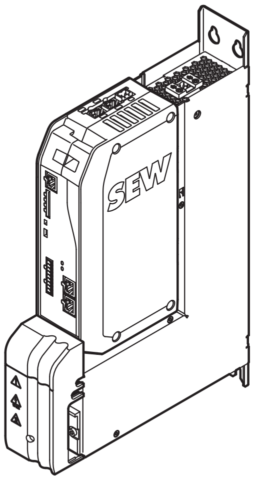
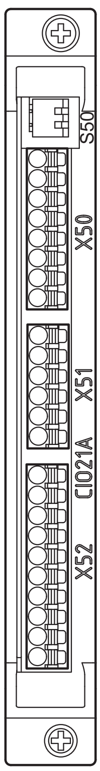
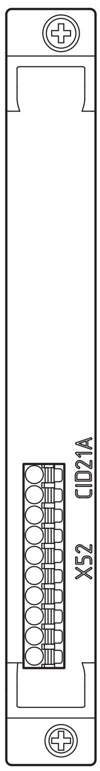
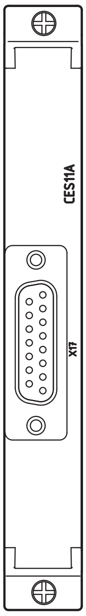
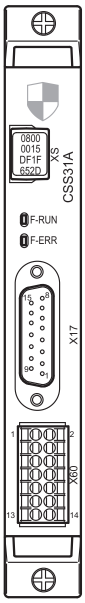
Master module	
Master module UHX45A/MD-M90A 	Description: (→ 🗎 21) Technical data: (→ 🗎 54) Dimension drawings: (→ 🗎 66) The master module MDM90A has 2 functions: 1. The quick and easy installation of the MOVI-C® CONTROLLER advanced as module of MOVIDRIVE® modular 2. The easy connection of the DC 24 V supply using large supply cable diameters The MDM90A master module is connected to the 24 V supply via a pluggable terminal. It supplies further modules, as well as the MOVI-C® CONTROLLER advanced installed in the master module with 24 V. For further information on this device, refer to the following documents: • "MOVIDRIVE® modular application inverter" operating instructions • "MOVIDRIVE® modular application inverter" product manual • "MOVI-C® – Automation with MOVI-C® CONTROLLER" manual • "MOVI-C® CONTROLLER advanced UHX45A" manual

Cards		
Input/output cards		Description: (→ 🗎 22), (→ 🗎 294) Technical data: (→ 🗎 67) CIO21A • 4 digital inputs • 4 digital outputs • 2 analog inputs • 2 analog outputs CID21A • 4 digital inputs • 4 digital outputs For further information on these cards, refer to the following documents: • "MOVIDRIVE® modular application inverter" operating instructions • "MOVIDRIVE® modular application inverter" product manual
CIO21A  	CID21A  	

Cards	
CES11A multi-encoder card 	Description: (→ 🗎 22), (→ 🗎 297) Technical data: (→ 🗎 69) The multi-encoder card enables evaluating an additional encoder. For information on this card, refer to the following document: • Manual "Multi-encoder card CES11A“
Safety cards CS..A 	Description: (→ 🗎 23) Technical data: (→ 🗎 70) The basic device already contains the drive safety function STO with activation via safe inputs. Higher-level functional safety requirements can be added by plugging in a CS..A safety card. Different higher-level functional safety requirements are realized via 4 different variants. Safety card properties: • SIL3 according to EN 61800-5-2, EN 61508 • PL e according to EN ISO 13849-1 • Connectible at any time subsequently, no additional external cables are required. Internal connection to motor encoder, safe communication, and STO • Safety card parameters are included in the device data set • Easy replacement during servicing due to pluggable safety key on the safety card • Parameterization and diagnostics using the MOVISUITE® engineering software • Process data and safety data in the same Scope recording • Safe output for activating functionally safe braking systems For information on this card, refer to the following document: • Manual "MOVISAFE® CS..A safety card"

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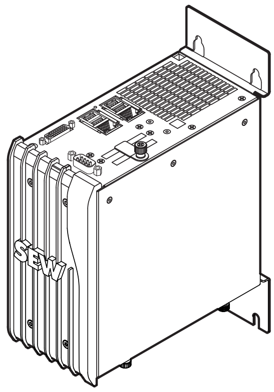
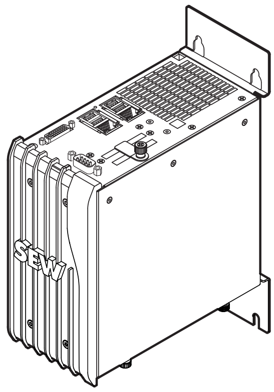
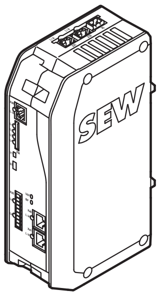
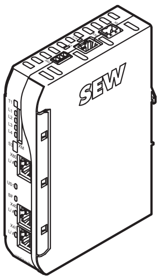
Controllers	
MOVI-C® CONTROLLER power UHX85A 	MOVI-C® CONTROLLER power is characterized by: • Intel Core2Duo 2.2 GHz processor. • Windows® Embedded Standard 7. • Ethernet interface for engineering tasks or TCP/IP and UDP via IEC 61131-3. • 16 MB program memory and 64 MB data memory. • A maximum of 32 interpolating axes that can be connected. • Another 32 auxiliary axes that can be connected. • System bus EtherCAT®/SBus^{PLUS}. • Optional slave connection via PROFIBUS DPV2. • Optional device connection via PROFINET. For further information on this device, refer to the following documents: • "MOVI-C® CONTROLLER power UHX85A and power eco UHX84A" manual • "MOVIDRIVE® modular application inverter" operating instructions • "MOVIDRIVE® modular application inverter" product manual • "MOVI-C® – Automation with MOVI-C® CONTROLLER" manual
MOVI-C® CONTROLLER power eco UHX84A 	MOVI-C® CONTROLLER power eco is characterized by: • Intel Core2Duo 2.2 GHz processor. • Windows® Embedded Standard 7. • Ethernet interface for engineering tasks or TCP/IP and UDP via IEC 61131-3. • 16 MB program memory and 64 MB data memory. • A maximum of 16 interpolating axes that can be connected. • Another 16 auxiliary axes that can be connected. • System bus EtherCAT®/SBus^{PLUS}. • Optional slave connection via PROFIBUS DPV2. • Optional device connection via PROFINET. For further information on this device, refer to the following documents: • "MOVI-C® CONTROLLER power UHX85A and power eco UHX84A" manual • "MOVIDRIVE® modular application inverter" operating instructions • "MOVIDRIVE® modular application inverter" product manual • "MOVI-C® – Automation with MOVI-C® CONTROLLER" manual

Controllers	
MOVI-C® CONTROLLER advanced UHX45A 	MOVI-C® CONTROLLER advanced is characterized by: • A maximum of 8 interpolating axes that can be connected • Another 8 auxiliary axes that can be connected For further information on this device, refer to the following documents: • "MOVI-C® CONTROLLER advanced UHX45A" manual (in development) • "MOVIDRIVE® modular application inverter" operating instructions • "MOVIDRIVE® modular application inverter" product manual • "MOVI-C® – Automation with MOVI-C® CONTROLLER" manual
MOVI-C® CONTROLLER standard UHX25A 	MOVI-C® CONTROLLER standard is characterized by: • A maximum of 2 interpolating axes that can be connected • Another 6 auxiliary axes that can be connected For further information on this device, refer to the following documents: • Manual "MOVI-C® CONTROLLER standard UHX25A" • "MOVIDRIVE® modular application inverter" operating instructions • "MOVIDRIVE® modular application inverter" product manual • "MOVI-C® – Automation with MOVI-C® CONTROLLER" manual

Accessories	
Prefabricated motor and encoder cables	Description and technical data: (→ 🗎 164)
Braking resistors	Description and technical data: (→ 🗎 73)
TCB thermal circuit breaker	TCB thermal circuit breaker option: (→ 🗎 78)
Line filter	Description and technical data: (→ 🗎 80)
Line choke	Description and technical data: (→ 🗎 82)
Valid motor encoders	(→ 🗎 91)

Engineering software	
MOVISUITE®	• MOVISUITE® standard

software platform	
MOVIRUN®	• MOVIRUN® smart • MOVIRUN® flexible

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Software modules	
MOVIKIT®	• Category DRIVE[1)] – MOVIKIT® Velocity – MOVIKIT® Positioning • MOTION category – MOVIKIT® MultiMotion[1)] – MOVIKIT® MultiMotion Camming[1)] – MOVIKIT® MultiAxesController – MOVIKIT® Robotics

1) Available

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1.2 Product overview MOVIDRIVE® modular

1.2.1 MDP90A.. power supply modules

A power supply module can supply up to 15 axis modules with energy, both single-axis and double-axis modules. Regenerative energy can be dissipated with a braking resistor.

Properties

- Cover a wide range of power ratings with finely graded performance classes: 10/25/50/75/110 kW.
- Universal use due to a wide voltage range for line connection: 3 × AC 380 – 500 V, 50 – 60 Hz.
- Suited for TN/TT and IT voltage supply systems.
- Communication to the axis modules via the module bus.
- Operation without a line contactor is possible for power ratings of 25 kW and higher.
- High overload capacity to 250% for 1 s.

Device data

Nominal line voltage According to EN 50160	3 × AC 380 – 500 V
Line frequency	50 – 60 Hz ± 10%
Nominal DC link voltage	DC 560 V
Overload capacity for max. 1 s	250%

Type designation	Nominal power	Rated DC link current	Maximum DC link current	Nominal line current	Size	Technical Data
	kW	A	A	A		
MDP90A-0100-503-4-000	10	21	52	16	1	(→ 🗎 46)
MDP90A-0100-503-4-C00	10	21	52	16	1A	
MDP90A-0250-503-4-000	25	51	127	40	2	
MDP90A-0500-503-4-000	50	102	255	80	3	
MDP90A-0750-503-4-000	75	153	382	120	3	
MDP90A-1100-503-4-000	110	224	560	175	4	

The MDP90A-...-C00 power supply module (size 1A) has an integrated braking resistor and an integrated energy storage device.

Depending on the application, an additional external braking resistor is no longer necessary due to the integrated braking resistor.

The energy storage device can store energy up to 250 J and release it again if required.

1.2.2 Power supply module with MDR91A.. supply and energy recovery

Up to 15 axis modules, single-axis as well as double-axis modules, can be connected to a power supply module with supply and energy recovery. Regenerative energy is fed back into the power supply. If the power supply fails, regenerative energy can be discharged via a braking resistor.

Characteristics

- Performance classes: 50/75 kW.
- Universal use due to a wide voltage range for line connection: 3 × AC 380 – 480 V, 50 – 60 Hz.
- Suited for TN/TT voltage supply systems.
- Communication to the axis modules via the module bus.
- High overload capacity to 225% for 1 s.

Device data

Nominal grid voltage According to EN 50160	3 × AC 380 – 480 V
Line frequency	50 – 60 Hz ±5%
Nominal DC link voltage	DC 560 V

Type designation	Nominal power	Nominal DC link current	Maximum DC link current	Nominal line current	Size	Technical data
	kW	A	A	A		
MDR91A-0500-503-4-000	50	94	235	80	4	Separate documenta-tion
MDR91A-0750-503-4-000	75	141	353	121	4	

For further information on this device, refer to the following documents:

- "MOVIDRIVE® modular Application Inverters - Power supply module with supply and energy recovery " operating instructions
- "MOVIDRIVE® modular Application Inverters - Power supply module with supply and energy recovery " product manual

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1.2.3 MDA90A..single-axis modules

Characteristics

- Finely stepped axes sizes, see the following table.
- High overload capacity of 250% of the nominal output current for a maximum of 1 s.
- Optimized control modes with and without encoder feedback for asynchronous and synchronous motors.
- An EtherCAT®/SBus^{PLUS} system bus is available for communication.
- Integrated flux optimization for partial load operation of asynchronous motors and standby mode.
- Integrated drive safety function for safe disconnection PLe according to EN 13849, see chapter "Functional safety" (→ 🗎 410).
- Simplified motor startup for unknown asynchronous motors and synchronous motors by measuring the motor parameters.
- Universal operation in user units.

Device data

Nominal DC link voltage	DC 560 V
Output voltage	0 – V_{line}
Overload capacity for max. 1 s at PWM = 4 kHz	250%

Type designation	Nominal output current			Maximum output current[1)]	Size	Technical data
	PWM = 4 kHz	PWM = 8 kHz	PWM = 16 kHz			
	A	A	A	A		
MDA90A-0020-503-X-S00	2	1.5	1	5	1	(→ 🗎 48)
MDA90A-0040-503-X-S00	4	3	2	10	1	
MDA90A-0080-503-X-S00	8	6	4	20	1	
MDA90A-0120-503-X-S00	12	9	6	30	1	
MDA90A-0160-503-X-S00	16	12	8	40	2	
MDA90A-0240-503-X-S00	24	18	12	60	2	
MDA90A-0320-503-X-S00	32	24	16	80	3	
MDA90A-0480-503-X-S00	48	36	17.7	120	3	
MDA90A-0640-503-X-S00	64	48	25.6	160	4	
MDA90A-1000-503-X-S00	100	75	40	250	5	
MDA90A-1400-503-X-S00	140	105	–	350	6	
MDA90A-1800-503-X-S00	180	125	–	450	6	

1) At PWM = 4 kHz

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1.2.4 MDD90A.. double-axis modules

Characteristics

- You can operate 2 motors independently of one another with one module.
- Finely stepped axes sizes, see the following table.
- High overload capacity of 250% of the nominal output current for a maximum of 1 s.
- Optimized control modes with and without encoder feedback for asynchronous and synchronous motors.
- An EtherCAT®/SBus^{PLUS} system bus is available for communication.
- Integrated flux optimization for partial load operation of asynchronous motors and standby mode.
- Integrated drive safety function for safe disconnection PLe according to EN 13849, see chapter "Functional safety" (→ 🗎 410).
- Simplified motor startup for unknown asynchronous motors and synchronous motors by measuring the motor parameters.
- Universal operation in user units.

Device data

Nominal DC link voltage	DC 560 V
Output voltage	0 – V_{line}
Overload capacity for max. 1 s at PWM = 4 kHz	250%

Type designation	Nominal output current PWM = 4 kHz	Nominal output current PWM = 8 kHz	Maximum output current[1]	Size	Technical data
	A	A	A		
MDD90A-0020-503-X-S00/X	2 × 2	2 × 1.5	2 × 5	1	(→ 🗎 50)
MDD90A-0040-503-X-S00/X	2 × 4	2 × 3	2 × 10	1	
MDD90A-0020-503-X-S00	2 × 2	2 × 1.5	2 × 5	2	
MDD90A-0040-503-X-S00	2 × 4	2 × 3	2 × 10	2	
MDD90A-0080-503-X-S00	2 × 8	2 × 6	2 × 20	2	

1) At PWM = 4 kHz

...-S00/X Without card slot
...-S00 With card slot

1.2.5 Axis modules with device profile CiA402

Characteristics

Characteristics of MDA single-axis modules and MDD double-axis modules:

- EtherCAT® with device profile CiA402 is available for communication.
- Finely stepped axes sizes, see the following table.
- High overload capacity of 250% of the nominal output current for a maximum of 1 s.
- Optimized control modes with and without encoder feedback for asynchronous and synchronous motors.
- Integrated flux optimization for partial load operation of asynchronous motors and standby mode.
- Integrated drive safety function for safe disconnection PLe according to EN 13849, see chapter "Functional safety" (→ 🗎 410).
- Easy motor startup for asynchronous motors by parameter estimation.

Device data of the single-axis module

Nominal DC link voltage	DC 560 V
Output voltage	0 – V_{line}
Overload capacity for max. 1 s at PWM = 4 kHz	250%

Type designation	Nominal output current			Maximum output current[1]	Size	Technical data
	PWM = 4 kHz	PWM = 8 kHz	PWM = 16 kHz			
	A	A	A	A		
MDA90A-0020-503-X-E00	2	1.5	1	5	1	(→ 🗎 48)
MDA90A-0040-503-X-E00	4	3	2	10	1	
MDA90A-0080-503-X-E00	8	6	4	20	1	
MDA90A-0120-503-X-E00	12	9	6	30	1	
MDA90A-0160-503-X-E00	16	12	8	40	2	
MDA90A-0240-503-X-E00	24	18	12	60	2	
MDA90A-0320-503-X-E00	32	24	16	80	3	
MDA90A-0480-503-X-E00	48	36	17.7	120	3	
MDA90A-0640-503-X-E00	64	48	25.6	160	4	
MDA90A-1000-503-X-E00	100	75	40	250	5	
MDA90A-1400-503-X-E00	140	105	–	350	6	
MDA90A-1800-503-X-E00	180	125	–	450	6	

1) At PWM = 4 kHz

Device data of the double-axis module

Nominal DC link voltage	DC 560 V
Output voltage	0 – V_{line}
Overload capacity for max. 1 s at PWM = 4 kHz	250%

Type designation	Nominal output current PWM = 4 kHz	Nominal output current PWM = 8 kHz	Maximum output current[1]	Size	Technical data
	A	A	A		
MDD90A-0020-503-X-E00/X	2 × 2	2 × 1.5	2 × 5	1	(→ 🗎 50)
MDD90A-0040-503-X-E00/X	2 × 4	2 × 3	2 × 10	1	
MDD90A-0020-503-X-E00	2 × 2	2 × 1.5	2 × 5	2	
MDD90A-0040-503-X-E00	2 × 4	2 × 3	2 × 10	2	
MDD90A-0080-503-X-E00	2 × 8	2 × 6	2 × 20	2	

1) At PWM = 4 kHz

For further information on this device, refer to the following document:

- "MOVIDRIVE® modular/system application inverter with device profile CiA402"

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1.2.6 Master module UHX45A/MDM90A

Properties

- Easy mechanical and electrical installation of MOVI-C® CONTROLLER advanced in the axis block MOVIDRIVE® modular.
- Connection to external 24 V supply via pluggable terminal.
- Uniform appearance of MOVI-C® CONTROLLER, power supply module and axis module.
- Type designation: UHX45A/MDM90A.

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1.3 Product overview accessories

The functionality and flexibility of MOVI-C® application inverters can be supplemented by many different cards.

1.3.1 CID21A input/output card

This input/output card is used to increase the number of digital inputs and outputs of the basic device.

- 4 digital inputs
- 4 digital outputs

1.3.2 CIO21A input/output card

This input/output card is used to increase the number of digital and analog inputs and outputs of the basic device.

- 4 digital inputs
- 4 digital outputs
- 2 analog inputs (current/voltage)
- 2 analog outputs (current/voltage)

1.3.3 CES11A multi-encoder card

The CES11A multi-encoder card enables evaluation of an additional encoder. The additional encoder can be used as distance encoder or as motor encoder.

The following encoders are supported:

HTL 12/24 V (differential)
TTL (differential)
RS422
SIN/COS 1 V_{SS} (differential)
HIPERFACE® with SIN/COS signals 1 V_{SS}
SEW encoder (RS485) with SIN/COS signals 1 V_{SS}, e.g. AS7W, AG7W
EnDat 2.1 with SIN/COS signals 1 V_{SS}
SSI encoder with/without SIN/COS signals 1 V_{SS}
CANopen encoder

Besides the encoders listed above, further encoders that can be used are described in chapter "Valid motor encoders from SEW-EURODRIVE".

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1.3.4 Safety cards CS..A

The MOVISAFE® CS..A safety cards provide further functional safety functions to EN IEC 61800-5-2 in addition to STO. The MOVISAFE® CS..A safety cards and the CES11A multi-encoder card are intended to be used in the same card slot and thus cannot be used simultaneously. For this reason, the CS.31A safety cards are available with an additional multi-encoder input.

For a detailed description, refer to the manual "MOVISAFE® CS..A safety card".

	MOVISAFE® CSB21A	**MOVISAFE® CSB31A**	**MOVISAFE® CSS21A**	**MOVISAFE® CSS31A**
Safe inputs	4	4	4	4
Safe outputs	—	2	2	2
Safe stop functions	STO, SS1c	STO, SS1c, SBC	STO, SS1c, SBC	STO, SS1c, SBC
Safe movement functions	—	—	SOS, SS1b, SS2, SLS, SSR, SLA, SSM	SOS, SS1b, SS2, SLS, SSR, SLA, SSM
Safe positioning functions	—	—	SLI, SDI	SLI, SDI
Safe communication	PROFIsafe	PROFIsafe	PROFIsafe	PROFIsafe
Additional multi-encoder input	—	yes	—	yes

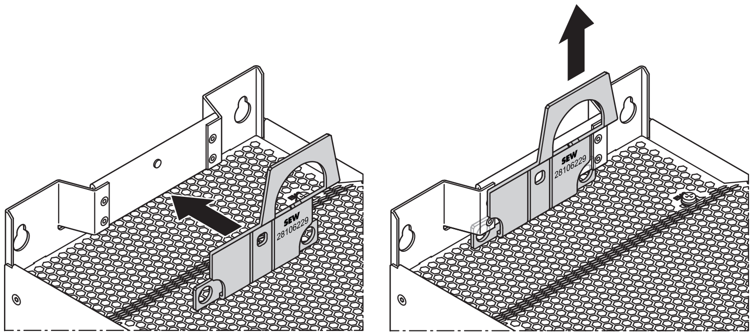
1.3.5 Lifting eye

Special aspects when transporting the devices

Due to the weight, the following devices are to be transported with a lifting eye:

- MDP90A-1100-..
- MDA90A-1400/1800-..

The lifting eye is attached to the top of the housing, see the following figure.



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The lifting eye can be attached to assembly stations using suitable slings.

The optional and reusable lifting eye CLH11A has the purchase order number 28106229.

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1.4 FCB concept

FCB = Function Control Block

The FCB concept describes the modular firmware design of MOVI-C® inverters. This feature ensures that a wide range of drive functions can be selected or deselected quickly and easily using control words.

All primary functions, i.e. functions that move or control the motors, are designed as individual FCBs that only have to be selected to perform a specific task, for example positioning.

You can switch between different FCBs any time. Switching to another FCB is performed with a maximum delay of 0.5 ms.

The FCBs are assigned to different priorities. If a FCB with a higher priority than the currently active FCB is selected, the FCB with the higher priority is activated.

The FCBs are sorted in descending order of their priority in the following list:

- FCB 01 Output stage inhibit
- FCB 14 Emergency stop
- FCB 13 Stop at application limits
- FCB 18 Rotor position identification
- FCB 25 Motor parameter measurement
- FCB 12 Reference travel
- FCB 04 Manual mode
- FCB 20 Jog mode
- FCB 19 Position hold control
- FCB 21 Brake test
- FCB 10 Interpolated position control
- FCB 09 Position control
- FCB 06 Interpolated speed control
- FCB 05 Speed control
- FCB 08 Interpolated torque control
- FCB 07 Torque control
- FCB 26 Stop at user limits
- FCB 02 Default stop

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1.4.1 Description of the FCBs

FCB 01 Output stage inhibit

Activating FCB 01 stops the connected motor via the motor brake. If no brake is installed, the motor coasts to a stop.

FCB 02 Default stop

FCB 02 stops the drive with the preset profile value "Maximum deceleration". This value is limited by the "Application limit – deceleration".

FCB 02 is active (default), when no other FCB is selected.

FCB 02 is selected by the system, not by the operator.

FCB 04 Manual mode

With the MOVISUITE® engineering software or the CBG.. keypad, manual mode can be selected and activated via the function "manual mode". Manual mode is used for startup or for teach mode without higher-level controller.

FCB 04 is selected by the system, not by the operator.

FCB 05 Speed control

The application inverter can be operated as speed-controlled axis.

The user can specify profile values for acceleration, deceleration, and jerk as the basic conditions for speed control. The actual speed setpoint for the drive controller is generated in the controller cycle by a profile generator integrated in the inverter using the specified limit values.

FCB 06 Interpolated speed control

FCB 06 is used for cyclic speed setpoint input from higher-level controllers.

In multi-axis applications, a controller usually calculates a path profile for several drive axes. The axis is only assigned setpoints (position/speed/torque and torque limits/precontrol values/inertia) that it has to follow. The axis limits the setpoints using the application limits. The course of the path curve profile is controlled by the controller.

The setpoint cycle of the controller usually does not correspond to the setpoint cycle of the axis. If the axis were to "see" the same setpoint for several cycles, a step-shaped actual value would result. To prevent this from happening, the axis interpolates intermediate values. To do so, the setpoint cycle of the controller has to be known.

FCB 07 Torque control

The application inverter can be run as a torque-controlled axis.

The user can specify profile values for speed, deceleration and jerk as the basic conditions for torque control. The actual torque setpoint for the drive controller is generated in the controller cycle by a profile generator integrated in the inverter using the specified limit values.

During torque control the maximum speed is restricted by the speed limits so that the drive cannot permanently accelerate with the preset setpoint torque while the countertorque is too low.

FCB 08 Interpolated torque control

FCB 08 is used for cyclic preselected torque setpoints of higher-level controllers.

This higher-level controller usually calculates a track profile for several drive axes. The axis is then assigned to one setpoint (position, speed, torque, torque limits, precontrol values, inertia) that it has to follow.

The inverter limits the setpoints using the application limits. The course of the path curve profile is controlled by the controller.

The cycle in which the controller sends the setpoints to the axis does not usually correspond with the setpoint processing cycle of the inverter. If the inverter were to "see" the same controller setpoint for several cycles, a step-shaped actual torque value would result.

To prevent this from happening, the axis can calculate intermediate values (interpolate) if it knows the controller cycle. The application inverter can be set to different cycle times of higher-level controllers.

FCB 09 Position control

FCB 09 is used to allow travel to the target position by using a position profile parameterized by the profile generator during positioning.

In addition, the application inverter has several positioning modes that are described in the following section:

Absolute positioning:

The position setpoint in user units is interpreted as an absolute target and is converted and executed in system units.

The travel range in system units is -2^{31} – 2^{31} -1 (2147483647). If the travel range is exceeded after calculation, the FCB issues a fault

Relative positioning:

The position setpoint in user units is interpreted as the offset for the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint.

If the time calculated in system units is outside the travel range of -2^{31} – 2^{31} -1 (2147483647), the FCB issues a fault.

Modulo in positive direction with absolute position specification:

The position setpoint in user units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo min."

Upper limit = "Modulo max."

If the position setpoint is outside this range, a fault is issued. The drive always turns in a positive direction to reach the position.

Modulo in negative direction with absolute position specification:

The position setpoint in user units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo min."

Upper limit = "Modulo max."

If the position setpoint is outside this range, a fault is issued. The drive always turns in a negative direction to reach the position.

Modulo with shortest distance with absolute position specification:

The position setpoint in user units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo min."

Upper limit = "Modulo max."

If the position setpoint is outside this range, a fault is issued.

The direction of the drive is determined using the last setpoint position (= current actual position after activation without an "In position" message) and the current setpoint position. This value is used to determine the shortest possible route and, therefore, the direction of rotation for positioning.

FCB 10 Interpolated position control

FCB 10 is used for cyclic preselected position setpoints of higher-level controllers.

In multi-axis applications, a higher-level controller usually calculates a track profile for several drive axes. The axis is only assigned setpoints (position, speed, torque, torque limits, precontrol values, inertia) that it has to follow. The axis limits the setpoints using the application limits. The course of the profile of the path curve is controlled by the controller.

The setpoint cycle of the controller does usually not correspond to the setpoint cycle of the axis. If the axis were to "see" the same setpoint for several cycles, a step-shaped actual value would result. To prevent this from happening, the axis can interpolate intermediate values. To do so, the setpoint cycle of the controller has to be known.

FCB 12 Reference travel

To perform positioning operations, a drive has to be referenced to a defined start or reference position within the permitted travel distance.

From this reference position, positions such as the machine zero can be specified and approached. With each restart of the inverter, referencing the position encoders is always necessary if position encoders do not have an absolute position detection. When using absolute encoders, the absolute position is immediately known upon the start of the system. An absolute encoder still has to be referenced to match the displayed position with the plant's reference system. Several reference travel types are available for referencing and for finding the reference point.

FCB 13 Stop at application limits

When FCB 13 is activated, the drive stops with speed control using the preset application limit deceleration.

FCB 14 Emergency stop

When FCB 14 is activated, the drive stops with the preset emergency stop deceleration.

FCB 18 Rotor position identification

For an optimum operation of synchronous AC motors, the exact position information of the rotor is required for closed-loop control. The inverter uses this position information to optimally control the motor.

FCB 18 is required for the commutation detection of rotary and linear synchronous motors with encoder, if the position information of the rotor is unknown. FCB 18 requires an electrical startup of the drive.

The drive must be disconnected from the load, which means also from the gear unit. If commutation is not possible, the drive can only be operated in ELSM® control mode.

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FCB 19 Position hold control

When FCB 19 is activated, the drive stops with speed control. After the standstill of the drive, the position is kept with position control as long as FCB 19 is active.

FCB 20 Jog mode

FCB 20 is used for setup mode when a higher-level controller is used.

FCB20 can only be activated in operating modes with encoder feedback.

FCB 20 allows the user to move an axis in positive and negative direction.

Control is performed via control signals that are specified by means of control words, via digital inputs of a higher-level controller or via input terminals.

For startup or for setup mode without higher-level controller, use the manual mode of the MOVISUITE® engineering software, see "FCB 04" (→ 🗎 26).

FCB 21 Brake test

FCB 21 is used to check the braking capability of a brake connected to the motor. A test torque is applied electrically via the motor when the brake is applied.

Even when the brake has passed the brake test, it does not take on any drive safety functions as far as machine safety is concerned in combination with the application inverter.

The brake is only tested in accordance with the set brake test torque. The actual breakaway torque of the brake is not measured. The actual brake breakaway torque is not measured.

There are 4 test modes:

- A higher-level controller provides the setpoints and monitoring function for the test.
- The application inverter performs a check in both directions compared to the set limit torques.
- The application inverter performs a check in positive direction compared to the set limit torques.
- The application inverter performs a check in negative direction compared to the set limit torques.

The test torque, test time and the direction of rotation of the test can be set. If a test is not passed, the breakaway torque is documented.

The braking torque is limited by the set "Torque" application limit.

Notice: The application torque must be considered for calculating the test torque, e.g. hoist test "downward".

FCB 25 Motor parameter measurement

FCB 25 is used for determining the necessary motor values from the electric equivalent wiring diagram during startup.

The nameplate data of the connected motor is required for the motor parameter measurement.

After the motor parameter measurement has been completed, the motor is completely started up electrically. Values that are not yet final at this stage, such as maximum speed and maximum torque, are estimated. The values have to be corrected at a later time to reach the full performance of the motor.

Calling FCB 25 is generally recommended. Afterward, FCB 18 is to be executed for encoder calibration with synchronous motors, if required.

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FCB 26 Stop at user limits

FCB 26 is used for stops at user limits. The user limits are either available as local setpoints or initiate the deceleration ramp set via the fieldbus.

You can choose between a speed-controlled ramp and a position-controlled ramp. In contrast to other stop FCBs (FCB 13/FCB 14), the FCB 26 has a very low priority.

This allows you to select FCB 26 as standard (e.g. bit in the control word that selects this FCB is always TRUE). If all other FCBs are deactivated, FCB 26 always becomes active. This makes it possible to always stop with position control.

FCB 26 has lag fault monitoring in position-controlled mode.

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1.5 Control mode

The following control modes are available for MOVIDRIVE® application inverters:

- V/f
- VFC^{PLUS}
- CFC
- ELSM®

1.5.1 Description of the control modes

The characteristics of the motor connected to the application inverter are influenced by the control modes used.

V/f

V/f control is intended for easy controlled operation of asynchronous motors without encoder feedback. The procedure operates an asynchronous machine on a parameterizable voltage/frequency characteristic. To keep the magnetizing current on a constant level, the voltage (U) is adjusted in proportion to the frequency (f).

The actual slip is estimated and can be compensated. The voltage drop at the stator resistance can be compensated by the I×R compensation and improves the control behavior in case of load. The Boost parameter allows to increase the voltage over the V/f characteristic for improving the torque at low speeds.

V/f control is suited for applications with a limited speed setting range, where no dynamic step changes in load occur and where there are small requirements regarding the control characteristics.

V/f control is suited for group drives. A group drive is an electrical parallel connection of several identical or different motors at one inverter. The motors do not have a rigid mechanical connection.

Speed control

The V/f mode is an encoder-less mode and calculates the actual speed value. The calculation is always based on the electrical values of the motors. Therefore, information from a potentially existing encoder system is not used.

If an encoder is parameterized in the encoder assignment as "Actual speed source", the speed measured by this encoder is issued as the actual speed by the inverter. Otherwise, the model speed calculated by the V/f method based on stator frequency and slip, is issued as the actual speed.

The V/f mode does not have a higher-level speed controller, speed controller parameterization is therefore not possible. An acceleration and torque precontrol is also not possible.

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VFC^{PLUS}

VFC^{PLUS} is a high-performance control mode that is able to operate asynchronous motors with very high torque dynamics with or without rotary encoder.

The control mode can be operated as speed or torque control.

This control mode calculates all important state variables for controlling the motor by using a motor model. As a result, optimal magnetic conditions are always achieved for the motor.

For applications with a large speed setting range (especially for low speeds up to standstill) and high requirements regarding the control characteristics or for drives with high dynamic step changes in load, a rotary encoder is absolutely necessary.

For applications with low requirements regarding the control characteristics and the torque dynamics, an encoder is not necessary. Without a rotary encoder, the electric rotor frequency is calculated in a model. In this case, stable stationary operation of the mode at < 0.5 Hz is not possible.

To also achieve enough torque with low currents, it is possible to raise the stator flux in the stator frequency < slip frequency range with the "Boost" parameter.

Due to the good torque dynamics, the VFC^{PLUS} control mode remains stable in case of load changes and has a high torque accuracy. Typical applications for the VFC^{PLUS} control mode are speed-controlled asynchronous machines with high demands on the speed and torque stability.

Speed control

A higher-level speed control loop that has to be parameterized accordingly is always used for speed control.

If the control mode is operated without an encoder, the actual speed of the motor is calculated by the control mode.

If an encoder is used, the angle information of this encoder is used for the control mode. The actual speed of the motor is calculated from this encoder. The maximum dynamics of the control loop are reached with a high-resolution encoder.

Torque control

The torque control operating mode can be selected independently of an encoder and does not need an encoder. With an encoder, however, stable stationary operation at stator frequency 0 Hz is also possible.

Position control

Position-controlled operation is only possible with an encoder as the actual position is calculated from the parameterized encoder. This encoder can either be mounted on the track or on the motor.

The accuracy of the position control can be increased with a motor encoder.

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CFC

The CFC control mode is a current-controlled control mode. The CFC control mode allows to operate asynchronous and synchronous motors with maximum torque dynamics. For this purpose, the current components for the magnetic flux and for the torque generation are controlled separately.

The control mode requires information about the rotor angle and the motor speed. For this reason, an encoder feedback (motor encoder) is always necessary.

For asynchronous motors, only the relative rotor angle is necessary. Thus, an incremental encoder is sufficient.

The control mode requires the absolute position for synchronous motors. In case of encoder types that do not provide an absolute value, a commutation must be performed before the first release after booting of the system (FCB 18).

The advantage of the CFC control mode is the very high dynamics that can be achieved, as a control reserve for reaching the dynamic maximum torque is always available. For this reason, the CFC control mode is suited for drives with highly dynamic motion control.

ELSM®

The ELSM® control mode allows for operation of permanent-field synchronous servomotors without encoder.

This procedure is exclusively intended for applications in horizontal materials handling technology with one single motor. It is not permitted to use it in vertical drives, inclining tracks or as group drive.

Observe that the inverter provides at least 150% I_0 of the motor during the adjustment process.

The maximum motor torque is limited to 1.5 M_0 with this procedure.

Switching to a rotating motor is possible (flying start function). Continuous operation is only permitted above a transition speed of approx. 2% of the nominal motor speed.

Rotor adjustment/rotor position measurement

When the inverter is enabled in ELSM® control mode, the rotor position of the permanent-field synchronous motors is unknown. For this reason, the rotor position has to be determined first or the rotor has to be adjusted by turning so that its angular position is defined.

Measuring the rotor position:

The rotor position of the synchronous motor is measured with test pulses for each enable. This occurs at standstill. If a brake is used, this brake remains applied. The measurement is finished after a maximum of 50 ms. After the measurement is completed, the synchronous motor accelerates to the setpoint speed. A prerequisite for the measurement is the one-time determination of the complete motor parameters with the FCB 25 motor parameter measurement.

SEW-EURODRIVE recommends measuring the rotor position.

Adjusting the rotor:

If the complete motor data is not known, the rotor is moved to a defined position at each enable. A small motor movement depending on the motor pole number takes place during the adjustment. If a brake is used, this brake is released. The adjustment is completed after 1 s.

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Speed control

The speed control operating mode can be activated in the ELSM® control mode. The control mode has to be distinguished speed-dependent in two different operating ranges:

- Open-loop control

  and
- speed-controlled operation.

Open-loop control takes place when starting from standstill and below a transition speed. This transition speed is calculated and set depending on the inverter and motor parameters during motor startup. It is about 2% of the nominal speed.

Above this transition speed, the speed control without encoder works.

Torque control

The ELSM® control mode enables the "Torque control" operating mode; however, only above the transition speed.

Practical meaning: The FCB 07 "Torque control" can only be activated when the flying start function is active and above the transition speed (example: winding drive). If the speed is too low, the system shuts down with a fault message.

Flying start function

If it cannot be ensured that the motor is at standstill during the start, the flying start function has to be activated. This way, the ELSM® control mode can also be enabled for a turning motor.

If the speed can be calculated plausibly, the control mode proceeds to speed-controlled operation. If this is not the case, the drive proceeds to the "rotor adjustment" or "rotor measurement" function and then to controlled operation.

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1.5.2 Characteristics of the control modes

Overview of the control modes

	V/f	VFC^PLUS		CFC		ELSM®
Principle	Voltage controlled according to characteristic curve	Field-oriented, voltage-controlled, stator flux controller, torque controller		Field-oriented, current controller		Field-oriented, current controller
Motor	ASM/LSPM	ASM	ASM	ASM	SM	SM
Encoder	without	without	with	with	with	without
Dynamics	+	+++	++++	+++++	+++++	++
Energy efficiency	+	+++	+++	++	+++++	++++++
Speed control	yes1)	yes		yes		yes
Torque control	no	yes		yes		yes
Positioning	no	no	yes	yes		no
Flying start	no2)	yes		yes		yes
Typical applications	Group drive, multi-motor drives	General materials handling technology, horizontal drives, vertical drives, pumps/fans, winding drives		Packaging technology, handling technology, highly-dynamic positioning		Horizontal materials handling technology
Marking	Maximum robustness	Maximum precision		Maximum dynamics		Maximum energy efficiency

1) Open-loop speed control
2) DC braking

ASM	Asynchronous motors
LSPM	Motors with LSPM technology (Line Start Permanent Magnet)
SM	Synchronous motors

Characteristic values for dynamics

	V/f	VFC^PLUS	CFC	ELSM®
Torque control time	–	Approx. 2 ms1)	Approx. 150 µs	Approx. 150 µs
Time constant speed controller	–	Approx. 3 – 6 ms	Approx. 0.5 ms	Approx. 6 ms
Speed ripple	Is mainly determined by the total mass moment of inertia, the torque ripple and the mechanical structure. It is therefore not possible to specify a general value.			

1) Valid in voltage control range, in field weakening range < 5 ms.

Characteristic values for setpoint resolution

	V/f	VFC^PLUS	CFC	ELSM®
Torque	—	32 bits 0.001% M_{NMot}	32 bits 0.001% M_{NMot}	32 bits 0.001% M_{NMot}

	V/f	VFC^PLUS	CFC	ELSM®
Rotational speed	32 bits 0.0001 1/min	32 bits 0.0001 1/min	32 bits 0.0001 1/min	32 bits 0.0001 1/min
Position (increment/revolution)	—	16 bits	16 bits	—
Position (absolute increment)	—	32 bits	32 bits	—

Characteristic values for accuracy of torque and speed

	VFC^PLUS without encoder	VFC^PLUS with encoder	CFC	ELSM®
Speed accuracy	Depending on motor parameters, typically: 0.2 × $f_{Nominal\ slip}$	Is mainly determined by the encoder resolution, approx. 1% of n	Is mainly determined by the total mass moment of inertia, the torque ripple and the mechanical structure. It is therefore not possible to specify a general value.	
Torque accuracy	< 10% M_N for n > 0.2 × n_N	< 5 % M_N	-	

Maximum output frequency

f_{PWM}	V/f	VFC^PLUS	CFC	ELSM®
	Operation is possible up to an output frequency of:			
2.5 kHz	250 Hz	250 Hz	250 Hz	250 Hz
4 kHz	400 Hz	250 Hz	400 Hz	400 Hz
≥ 8 kHz	599 Hz	250 Hz	500 Hz	500 Hz

FCBs that can be activated for selected control mode

FCB no.	Designation	V/f	VFC^PLUS	CFC	ELSM®
01	Output stage inhibit	+	+	+	+
02	Default stop	+	+	+	+
04	Manual mode	+	+	+	+
05	Speed control	+	+	+	+
06	Interpolated speed control	+	+	+	+
07	Torque control	-	+	+	+
08	Interpolated torque control	-	+	+	+
12	Reference travel	+	+	+	+
13	Stop at application limits	+	+	+	+
14	Emergency stop	+	+	+	+
25	Motor parameter measurement	+	+	+	+
26	Stop at user limits	+	+	+	+
FCBs requiring a position encoder					
09	Position control	-	+	+	-
10	Interpolated position control	-	+	+	-
19	Position hold control	-	+	+	-
20	Jog	-	+	+	-
21	Brake test	-	+	+	-
18	Rotor position identification	-	-	+	+

1.6 Energy-saving functions

1.6.1 Flux optimization

Flux optimization is a function that allows for operating an asynchronous motor in control mode VFC^{PLUS} with minimal losses. The magnetic flux is lead depending on the torque setpoint, so that the motor is operated with minimum current and thus with minimized losses. In partial load operation, as well as in case of overload, the total losses of the motor can be significantly reduced. This function has no influence in the range of the nominal torque or a bit below, as the motor is usually operated at almost optimum conditions.

For system-related reasons, the torque control times are longer with flux optimization than without flux optimization, due to necessary changes in flux. The flux optimization is especially suitable for applications with little dynamics, such as fans, pumps, escalators, and conveyor systems with constant speed.

The flux optimization can reduce magnetization losses in the motor by up to 70%.

1.6.2 Standby mode

The standby operation is designed for times in which the operation is paused. The significant difference between disconnection of the DC 24 V supply voltage and standby operation is that switching from standby operation to operation only takes approx. 500 ms, and that the bus communication is maintained. This allows for reducing the energy consumption even in short pauses.

The following functions are deactivated in standby operation:

- 7-segment display.
- STO function.
- Digital outputs at the basic device and cards.
- Analog outputs at the card.
- Power section controller.
- Fan in the power section.
- Optional: Encoder supply and encoder evaluation in the basic device and the card.

Standby operation can be activated via a digital input or via a control word bit.

The bus communication is active without restrictions in standby operation.

Energy consumption in standby operation

MOVIDRIVE® modular	DC 24 V power consumption in standby operation
MDA90A-0020 – 0120	4.7 W
MDA90A-0160 – 0240	5.1 W
MDA90A-0320 – 0480	8 W
MDA90A-0640 – 1000	10.4 W
MDA90A-1400 – 1800	
MDD90A-0020 – 0080	5.5 W

The energy-saving function "standby operation" can reduce the DC 24 V power consumption by 89%.

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1.7 Device replacement

The function "Update configuration" can be started using the MOVISUITE® engineering software at any time, but usually after the startup of application inverters and controller is complete.

Using this function, all parameter and configuration settings of application inverters and controller are saved on the memory card of the controller and are labeled with a checksum.

When the controller is switched on, the data on the memory card and the data on the connected device are compared in a test to see if they match. In case a defective application inverter has been replaced previously, the controller recognizes that the data on the memory card does not match the data of the new application inverter. In this case, the controller loads the memory card data to the application inverter.

In addition, changes in the application inverter that were not saved using the function "Update configuration", are overwritten. The procedure starts automatically.

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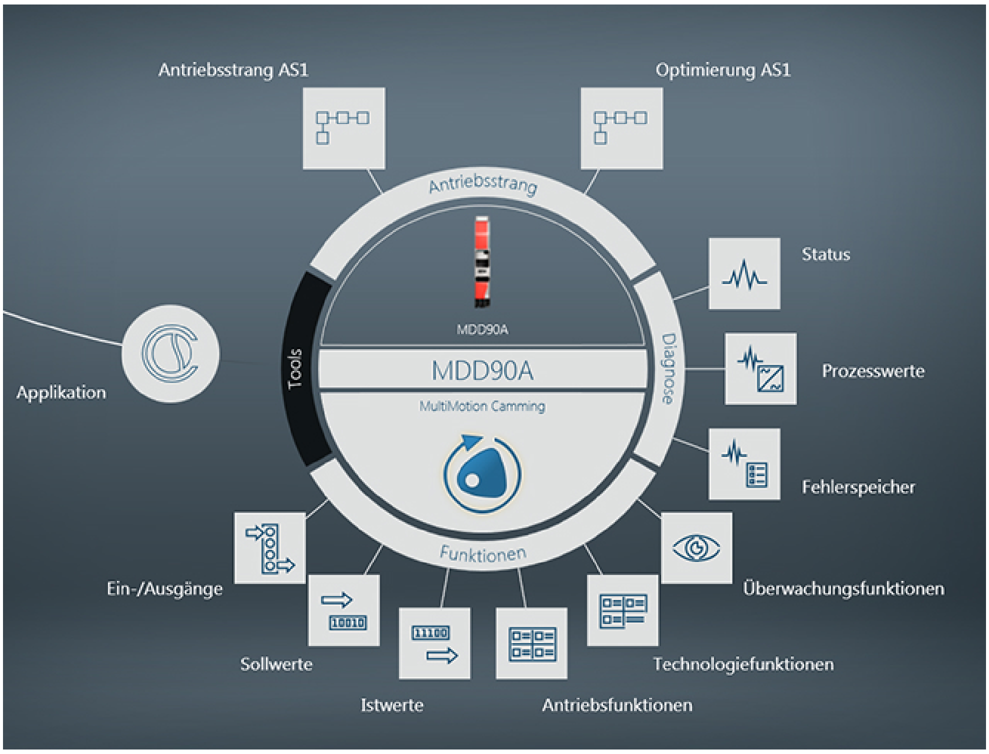
1.8 MOVISUITE® engineering software

MOVISUITE® is the new engineering software from SEW-EURODRIVE.

The engineering software excels by a new design of user interface and user guidance. This new interface concept allows for the users to configure, parameterize and startup their applications intuitively.

Using the various views, the users can switch to the suitable display mode depending on their requirements. In the circle view for example, single components can be edited in a clear structure.

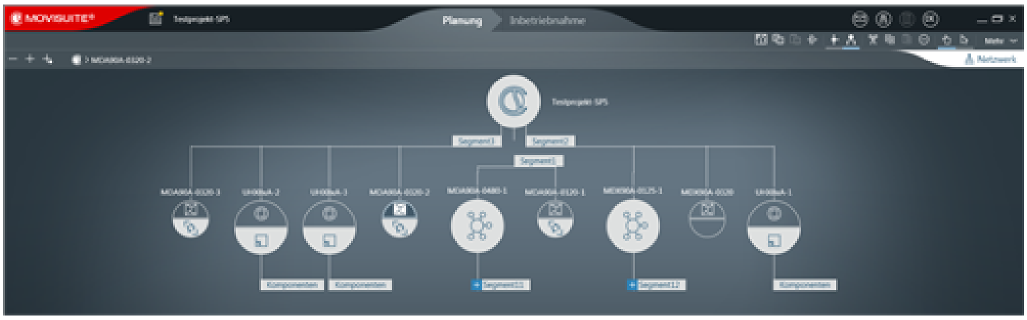
Circle view



24502901643

The tree view provides an overview of the entire network.

Tree view



9007218526745867

The view can be selected depending on application and personal preferences, the functionality is identical in both views.

The interface concept of MOVISUITE® makes it possible to visualize the system structure using structure nodes that can be named according to user preference. These structure nodes are displayed with a varying level of detail in the views mentioned above.

The data management has clearly marked transfer directions, and thus is clearly structured during data transmission.

The scan function enables the reading of available devices, and the creation of these devices as projects in MOVISUITE®.

The drive train can be built from motor to gear unit using the product catalog. Furthermore, encoders, brakes, control modes, and user units can be selected and parameterized.

The data required for the drive train can typically be read off the nameplates of the motor and gear unit and entered, or selected via a catalog function in the engineering software.

Another variant is automatic identification of the gear unit motor data by output of the electronic nameplate stored in the motor encoder. During startup, the engineering software checks whether an electronic nameplate is present in the encoder and suggests the use of this data.

The recording function Scope is available for diagnostic purposes. This enables a diagnostics overview of connected devices and functions. Long-term data acquisition on the engineering PC hard disk is also possible.

Manual operation can be intuitively used for each application via the new interface.

The startup is functionally divided into segments. The following steps illustrate in exemplary fashion the startup procedure for an application inverter.

For further information refer to the "Engineering-Software MOVISUITE® standard" manual.

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2 Technical data

2.1 Markings

2.1.1 Basic device

The MOVIDRIVE® modular application inverter complies with the following regulations and guidelines:

Marking	Definition
	The CE marking states the compliance with the following European guidelines: • 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 hazardous substances in electric and electronic equipment
	The EAC marking states compliance with the requirements of the technical regulations of the Customs Union of Russia, Kazakhstan, and Belarus.
	The RCM marking sates compliance with the technical regulations of the Australian Communications and Media Authority ACMA.
	The China RoHS marking states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
	The UL and cUL marking state the UL approval.[1)] cUL is equivalent to CSA approval.

1) The UL and cUL marking for the following devices are still in preparation at the time of publication of this document: MDA90A-0640 – 1800-… , MDP90A-0500 – 1100-… and UHX45A-N/MDM90A

2.1.2 Accessories

Braking resistors BW..

Marking	Definition
	The CE marking states the compliance with the following European guidelines: • Low Voltage Directive 2014/35/EU • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
	The China RoHS marking states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
	The cUR marking states the UL approval for this component.

TCB thermal circuit breaker

Marking	Definition
CE	The CE marking states the compliance with the following European guidelines: • Low Voltage Directive 2014/35/EU • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
25	The China RoHS marking states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
c US	The cUR marking states the UL approval for this component.

NF.. line filter

Marking	Definition
–	• Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
e	The China RoHS marking states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
c US	The cUR marking states the UL approval for this component.

ND.. line choke

Marking	Definition
CE	The CE marking states the compliance with the following European guidelines: • Low Voltage Directive 2014/35/EU • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
e	The China RoHS marking states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
c US	The cUR marking states the UL approval for this component.

2.2 General technical data

The following tables lists the technical data for all MOVIDRIVE® modular application inverters independent of

- Type
- Design
- Size
- Power

MOVIDRIVE® modular	
Interference immunity	Meets EN 61800-3; 2. Environment
Interference emission	Limit value category C2 to EN 61800-3
Ambient temperature ϑ_{amb}	0 °C to +45 °C without derating (→ 🗎 132)
Type of cooling	Increased air cooling due to an installed, temperature-controlled fan.

Environmental conditions	
Climatic requirements	• Extended storage: EN 60721-3-1 class 1K2 temperature -25 °C to +70 °C • Transportation: EN 60721-3-2 class 2K3 temperature -25 °C to +70 °C • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3K3 temperature 0 °C to +45 °C.
Chemically active substances	• Extended storage: EN 60721-3-1 class 1C2 • Transportation: EN 60721-3-2 class 2C2 • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3C2
Mechanically active substances	• Extended storage: EN 60721-3-1 class 1S1 • Transportation: EN 60721-3-1 class 2S1 • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3S1

Degree of protection according to EN 60529	
Power supply modules MDP90A-0100-... – MDP90A-1100-...	IP20
Axis modules MDA90A-0020-... – MDA90A-1800-... MDD90A-0020-... – MDD90A-0080-...	IP20

Pollution class	2 according to IEC 60664-1
Overvoltage category	III according to IEC 60664-1
Installation altitude	Up to h ≤ 1000 m without restrictions. The following restrictions apply to heights > 1000 m: • From 1000 m to max. 3800 m: I_N reduction by 1% per 100 m • From 2000 m to max. 3800 m To maintain protective separation and the air gaps and to comply with creepage distances according to EN 61800-5-1, an overvoltage protection device must be connected upstream to reduce the overvoltages from category III to category II.

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2.3 Technical data of MDP power supply modules

2.3.1 Performance data

MOVIDRIVE® modular	Unit	MDP90A-...-503-4-...					
Type		**0100**	**0100**	**0250**	**0500**	**0750**	**1100**
Size		1	1A	2	3		4
Nominal power P_N	kW	10		25	50	75	110
Input							
Nominal line voltage (to EN 50160) AC V_{line}	V	3 × 380 – 500 V					
Nominal line current AC I_{line}	A	16		40	80	120	175
Line frequency f_{line}	Hz	50 – 60 Hz ± 10%					
Controlled rectifier		No		Yes			
X1 connection		Plug connector - 1 core: 0.25 – 4 mm² - 2 cores: 0.25 – 2.5 mm² (Twin-AEH)[1)]		Screw M6 × 16 Max. 16 mm²	Screw M10 × 18 Max. 70 mm²		Screw M10 × 25 Max.120 mm²
PE connection				M6 × 16	M10 × 18		M10 × 25
Output (DC link)							
Nominal DC link voltage U_{NDCL}	V	DC 560					
Nominal DC link current DC I_{NDCL}	A	21		51	102	153	224
Max. DC link current DC $I_{DCL\ max}$	A	52		127	255	382	560
Additional capacitance	µF	–	1000	–	–	–	–
Overload capacity		250% × P_N: 1 s for cycle duration 10 s					
Connection for UZ-/UZ+		CU busbars					
		Screw M6 × 16					Right: Screw M8 × 20 Left: Screw M6 × 16
PE connection		Screw M6 × 16					
Brake chopper and braking resistor							
Minimum braking resistance value R_{BWmin}	Ω	26		12	4.7	3.6	2.3
Maximum brake chopper power	kW	250% × P_N					
Mean dischargable power in regenerative operation	kW	25% × P_N					
P_{eff} of the integrated braking resistance	kW	-	0.2	-	-	-	-
P_{max} of the integrated braking resistance	kW	-	25	-	-	-	-
X3 connection		Plug connector - 1 core: 0.25 – 4 mm² - 2 cores: 0.25 – 2.5 mm² (Twin-AEH)[1)]		Screw M6 × 16 Max. 10 mm²	Screw M6 × 16 Max. 35 mm²		Screw M10 × 25 Max. 70 mm²
		M6 × 16					M10 × 25
General							
Nominal power loss 24 V	W	15			20		30
Nominal power loss power section	W	40		90	190	290	420
Permitted number of times power may be switched on/off per minute		< 1					
Minimum switch-off time for power off	s	10					
Mass	kg	4	7.9	5.2	13	13	21
Dimensions							
Width	mm	60	120	60	150		210
Height	mm	324		424			
Depth	mm	250					

1) AEH: Conductor end sleeve

2.3.2 Electronics data – signal terminals

MDP.. power supply module	Terminal	General electronics data
DC 24 V voltage supply to IEC 61131-2	X5	DC 24 V
Contacts	X5	CU busbars
Evaluation of temperature sensor at braking resistor	X7.1	DC 24 V auxiliary voltage output to supply X7:2
	X7.2	Sensor input for temperature monitoring of the braking resistor. • Signal contact closed: No overtemperature. • Signal contact open: Overtemperature. Connect isolated signal contacts only.
	X7.3/4	Reserved
Port		Plug connector - 1 core: 0.25 – 0.5 mm^2

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2.4 Technical data for MDA and MDD axis modules

2.4.1 MDA performance data

MOVIDRIVE® modular	Unit	MDA90A-...-503-X-...												
Type		**0020**	**0040**	**0080**	**0120**	**0160**	**0240**	**0320**	**0480**	**0640**[1]	**0640**[2]	**1000**	**1400**	**1800**
Size		1				2		3		4	5		6	
Nominal output current I_N PWM = 4 kHz	A	2	4	8	12	16	24	32	48	64	64	100	140	180
Input														
Nominal DC link voltage U_{NDCL}		DC 560 V												
Nominal DC link current I_{NDCL}[3]	A	2	4	8	12	16	24	32	48	64	64	100	140	180
Connection for UZ-/UZ+		CU busbars												
		Screw M6 × 16											Screw M8 × 20	
PE connection		Screw M6 × 16												
Motor output														
Output voltage V_{out}	V	0 – max. V_{line}												
Motor power ASM P_{Mot}	kW	0.6	1.5	4	5.5	7.5	11	15	22	30	30	45	75	90
Nominal output current I_N PWM = 4 kHz	A	2	4	8	12	16	24	32	48	64	64	100	140	180
Max. output current at f = 0 Hz	A	125% × I_N: 1 s at PWM = 4 kHz												
Overload capacity		250%: 1 s at PWM = 4 kHz												
Apparent output power S_N[4]	kVA	1.4	2.8	5.5	8.5	11	17	22	33	44	44	69	97	125
PWM frequency f_{PWM}	kHz	4, 8, 16 (adjustable)											4, 8 (adjustable)	
Max. output frequency f_{max}	Hz	V/f: 599 VFC^{PLUS}: 250 CFC: 500 ELSM®: 500												
X2 connection		Plug connector - 1 core: 0.25 – 4 mm² - 2 cores: 0.25 – 2.5 mm² (Twin-AEH)[5]				Plug connector - 1 core: 0.5 – 16 mm² - 2 cores: 0.25 – 6 mm² (Twin-AEH)[5]		M6 bolt Max. 16 mm²		M10 screw Max. 70 mm² or 2 × 25 mm²			M10 screw Max. 120 mm²	
PE connection								Screw M6 × 16		Screw M6 × 18			Screw M10 × 25	
Brake output														
Nominal brake voltage V_{BR} (DB00)		DC 24 V, the tolerance depends on the DC 24 V supply												
X10 connection		Plug connector - 1 core: 0.25 – 2.5 mm² - 2 cores: 0.5 – 1 mm² (Twin-AEH)[5]												
General														
Nominal power loss 24 V	W	20				22	25	30		75	75		115	
Nominal power loss power section	W	15	35	65	90	110	185	240	360	430	430	670	980	1250
Mass	kg	4			4.1	5.3		7.1		14	14		18	
Dimensions														
Width	mm	60				90				120	150		210	
Height	mm	328						428						

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MOVIDRIVE® modular	Unit	MDA90A-...-503-X-...												
Type		**0020**	**0040**	**0080**	**0120**	**0160**	**0240**	**0320**	**0480**	**0640[1)]**	**0640[2)]**	**1000**	**1400**	**1800**
Depth	mm	265												

1) For installation in new systems, the MDA90A-0640-.. axis module in size 4 must be used
2) The MDA90A-0640-.. axis module in size 5 is only used as a spare part for the MDA90A-0640-.. axis module in size 5
3) The nominal DC link current is defined for cosφ = 0.82
4) In relation to PWM = 4 kHz
5) AEH: Conductor end sleeve

2.4.2 MDD performance data

MOVIDRIVE® modular	Unit	MDD90A-...-503-X-...		MDD90A-...-503-X-... With card slot		
Type		**0020**	**0040**	**0020**	**0040**	**0080**
Size		1		2		
Nominal output current I_N PWM = 4 kHz	A	2 × 2	2 × 4	2 × 2	2 × 4	2 × 8
Input						
Nominal DC link voltage U_{NDCL}		DC 560 V				
Nominal DC link current I_{NDCL} 1)	A	4	8	4	8	16
Connection for UZ-/UZ+		CU busbars				
		Screw M6 × 16				
PE connection		Screw M6 × 16				
Motor output						
Output voltage V_{out}	V	0 – max. V_{line}				
Motor power ASM P_{Mot}	kW	2 × 0.55	2 × 1.5	2 × 0.55	2 × 1.5	2 × 4
Nominal output current I_N PWM = 4 kHz	A	2 × 2	2 × 4	2 × 2	2 × 4	2 × 8
Max. output current at f = 0 Hz	A	125% × I_N: 1 s at PWM = 4 kHz				
Overload capacity		250%: 1 s at PWM = 4 kHz				
Apparent output power S_N 2)	kVA	2 × 1.4	2 × 2.8	2 × 1.4	2 × 2.8	2 × 5.5
PWM frequency f_{PWM}	kHz	4, 8 (adjustable)				
Max. output frequency f_{max}		V/f: 599 Hz VFC^{PLUS}: 250 Hz CFC: 500 Hz ELSM®: 500 Hz				
X2 connection		Plug connector - 1 core: 0.25 – 4 mm² - 2 cores: 0.25 – 2.5 mm² (Twin-AEH)3)				
PE connection						
Brake output						
Nominal brake voltage V_{BR} (DB00)		DC 24 V, the tolerance depends on the DC 24 V supply				
X10 connection		Plug connector - 1 core: 0.25 – 2.5 mm² - 2 cores: 0.5 – 1 mm² (Twin-AEH)3)				
General						
Nominal power loss 24 V	W	20				25
Nominal power loss power section	W	2 × 15	2 × 35	2 × 15	2 × 35	2 × 65
Mass	kg	4		4.85		
Dimensions						
Width	mm	60		90		
Height	mm	328				
Depth	mm	265				

1) The nominal DC link current is defined for cosφ = 0.82
2) In relation to PWM = 4 kHz
3) AEH: Conductor end sleeve

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2.4.3 Electronics data – Signal terminals

	Terminal designation		Specification
	Single-axis module	Double-axis module	
General			
Design			According to IEC 61131-2
Supply voltage			
Port	X5		External power supply 24 V according to IEC 61131
Port	X5		CU busbars
Digital inputs			
Cycle time I/O			1 ms
Quantity			6
Response time			100 µs plus cycle time
Assignment	X20: 1 – 6	X20_1: 1 – 6 X20_2: 1 – 6	DI00: "Output stage enable" fixedly assigned. DI01 – DI05: Selection option, see parameter menu. All 6 inputs are suitable for Touchprobe function. Latency period < 100 µs, max. 2 simultaneously. DI04, DI05: Connection HTL low-resolution encoder (only MDA).
	X20: 7	X20_1: 7 X20_2: 7	GND
	X20: 8	X20_1: 8 X20_2: 8	+24 V supply voltage Maximum output current = 50 mA
Port			Plug connector - 1 core: 0.25 – 2.5 mm² - 2 cores: 0.5 – 1.5 mm² (Twin-AEH)[1)] Shield terminals for control cables available.
Digital outputs			
Cycle time I/O			1 ms
Quantity			• MDA: 1 × 4 • MDD: 2 × 4
Response time			175 µs plus cycle time
Output current			I_{max} = 50 mA
Short-circuit protection			Yes
Assignment	X21: 1 – 4	X21_1: 1 – 4 X21_2: 1 – 4	DO00 – DO03: Selection option, see parameter menu.
	X21: 5	X21_1: 5 X21_2: 5	GND
Port			Plug connector - 1 core: 0.25 – 2.5 mm² - 2 cores: 0.5 – 1.5 mm² (Twin-AEH)[1)] Shield terminals for control cables available.
Brake control/temperature sensor motor			
Assignment	X10:DB0	X10_1:DB0 X10_2:DB0	DB00: Direct control is possible with selected brakes from SEW-EURODRIVE. See chapter "Project Planning" for more information.
	X10:GND	X10_1:GND X10_2:GND	GND
	X10:TF1	X10_1:TF1 X10_2:TF1	Sensor input for temperature monitoring of the motor
	X10:GND	X10_1:GND X10_2:GND	GND
Port			Plug connector - One core: 0.25 – 2.5 mm² - Two cores: 0.5 – 1 mm² (Twin-AEH)[1)] Shield terminals for control cables available.
Encoder supply			
	X15:13	X15:13_1 X15:13_2	X15:13 DC 24 V, I_{max} = 500 mA
	X15:15	X15:15_1 X15:15_2	X15:15 DC 12 V, I_{max} = 500 mA

1) AEH: Conductor end sleeve

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NOTICE

Connection of inductive loads to digital outputs

Damage to digital outputs.

If inductive loads are connected to the digital outputs, you must install an external protective element (freewheeling diode).

2.4.4 Electronics data – Drive safety functions

The table below shows the technical data of the application inverter relating to the integrated safety technology.

The safety-related digital inputs comply with type 3 according to IEC 61131-2.

Reference potential for the F_STO_P1 and F_STO_P2 is STO_M (contact at terminal X6:2).

	Terminal designation	General electronics data		
Safety contact STO	X6			
Electrical data of inputs F_STO_P1, F_STO_P2		**Minimum**	**Typical**	**Maximum**
Input voltage range	X6:1 and X6:3	DC -3 V	DC 24 V	DC 30 V
Input capacitance		–	1 nF	10 nF
Power consumption at DC 24 V		–	200 mW	300 mW
Input voltage for ON status (STO)		DC 11 V	–	DC 30 V
Input voltage for OFF status (STO)		DC -3 V	–	DC 5 V
Permitted leakage current of the external safety controller		–	–	1 mA
Technical Data				
Time from disconnecting the safety voltage until the deactivation of the rotating field		–	1.5 ms	10 ms
Time from connecting the safety voltage until the activation of the rotating field		–	–	110 ms
Connection		Plug connector - 1 core: 0.25 – 1.5 mm^2 - 2 cores: 0.25 – 0.5 mm^2 (Twin-AEH)[1]		

1) AEH: Conductor end sleeve

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2.4.5 Different functionality of the axis modules MDA/MDD

Functionality	MDA90A-.. single-axis module	MDD90A-..double-axis module
Cam switch	Yes	-
Number of drive trains per output stage	2	1
Encoder option	Yes	-
I/O option	Yes	-
PWM frequency constant	4 kHz/8 kHz/16 kHz	4 kHz/8 kHz
Process data processing basic cycle	500 µs/1 ms/1ms PLC	1 ms
Simple encoder evaluation via digital inputs (DI04/DI05)	Yes	-
Sampling cycle n/X control	0.25 ms/0.5 ms/1 ms/2 ms	0.5 ms/1 ms/2 ms

2.5 Technical data of the master module UHX45A/MDM90A

MOVIDRIVE® modular	Terminal	UHX45A/MDM90A
Input		
DC 24 V supply[1]	X5_A	40 A
Connecting contacts		2-pole plug connector • 1 core: 0.5 – 10 mm² • 2 core: 0.5 – 6 mm²
Output		
DC 24 V voltage output UHX45A[2]	X5_B	Maximum 40 A
Fuse for voltage output UHX45A		5 × 20, 4 A, 125 V, miniature fuse, slow-blow Part number: 18190464
DC 24 V connection		Maximum 40 A
General		
Power loss UHX45A		12 W
Mass		1.85 kg
Dimensions		
Width		60
Height		383
Depth		250

1) The master module can be used to supply the DC 24 V supply voltage for the entire axis system
2) Auxiliary output X5_B for supply of MOVI-C® CONTROLLER advanced UHX45A

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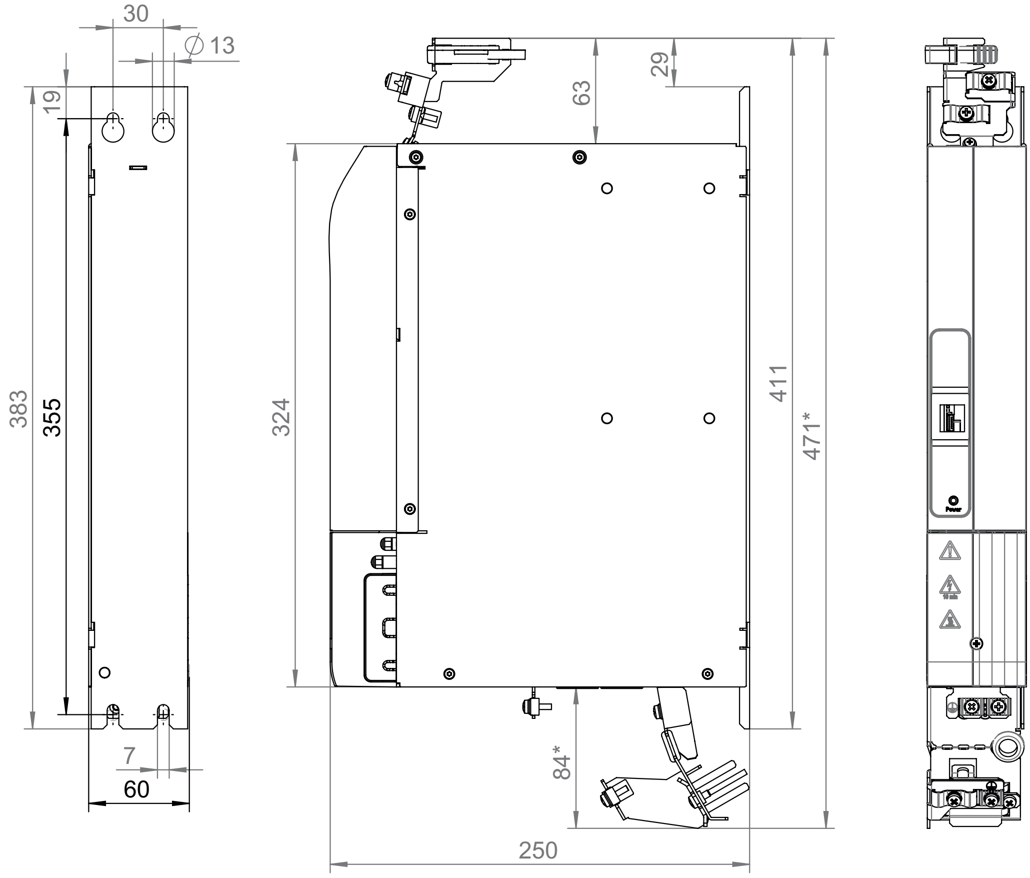
2.6 Dimension sheets of the modules

2.6.1 Dimension sheets of the power supply modules

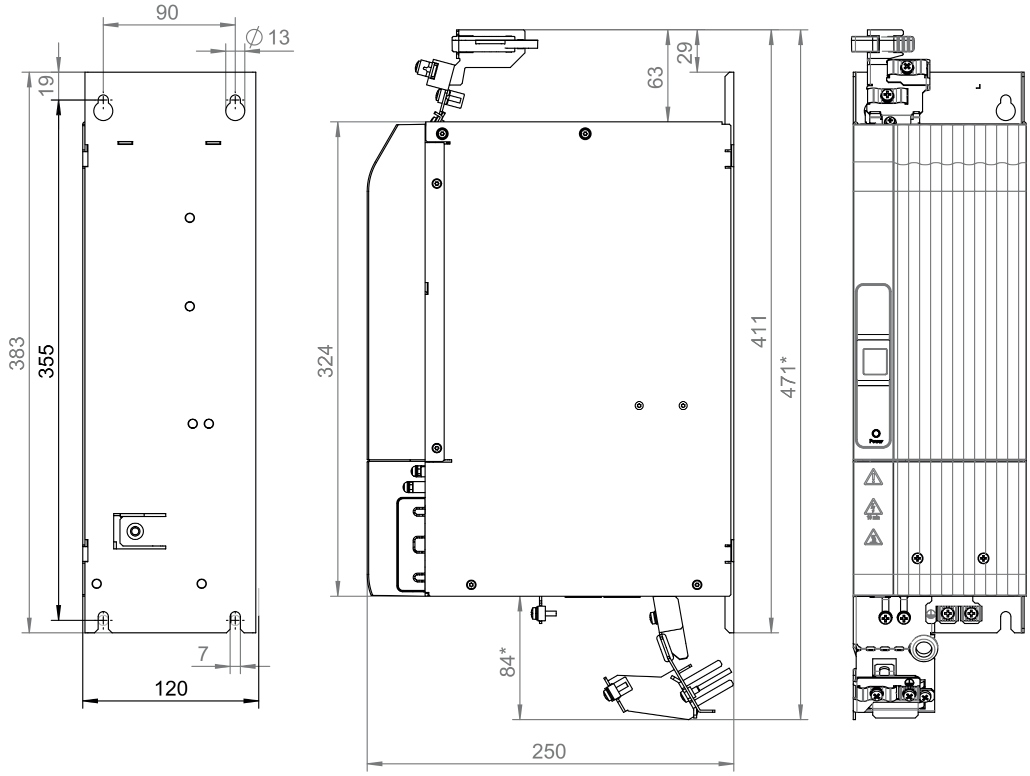
The dimensions marked with an *depend on the position of the shield plate.

MDP90A-0100-..
(size 1)



9007215213288715

MDP90A-0100-..-C00 (size 1A)



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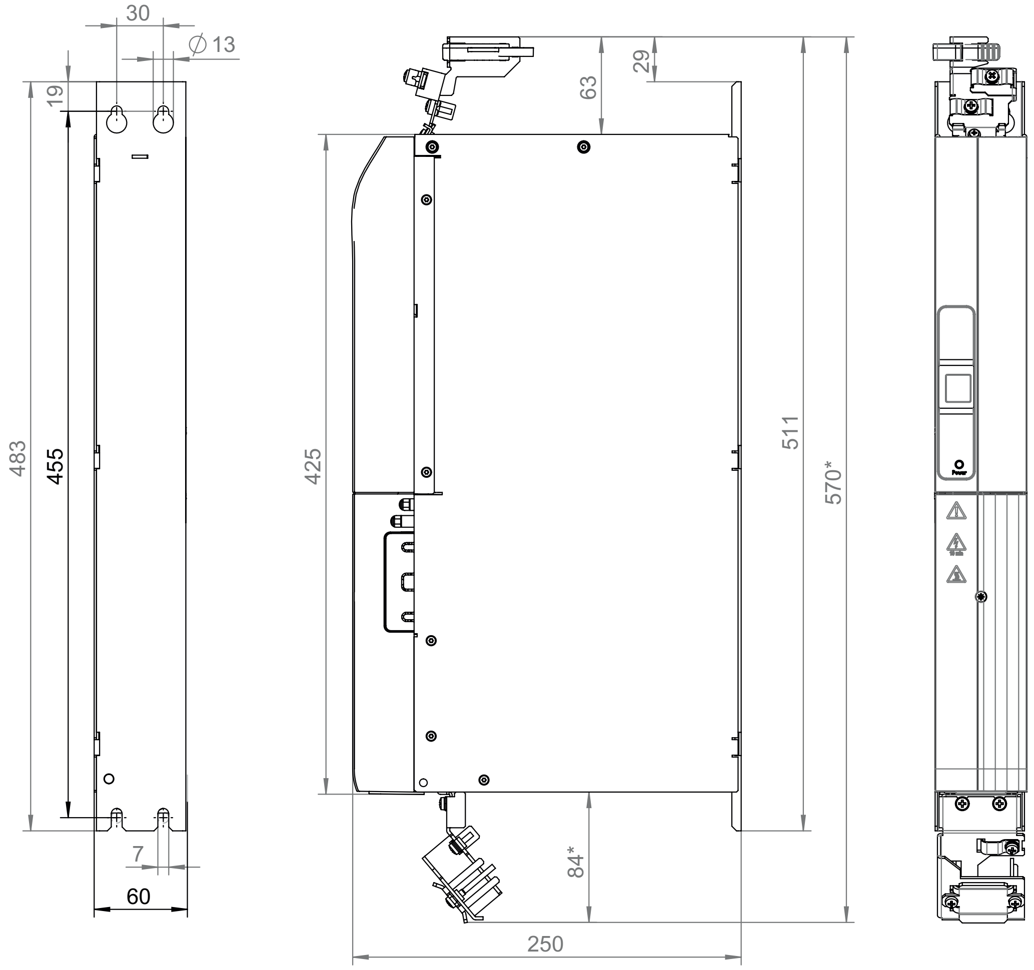
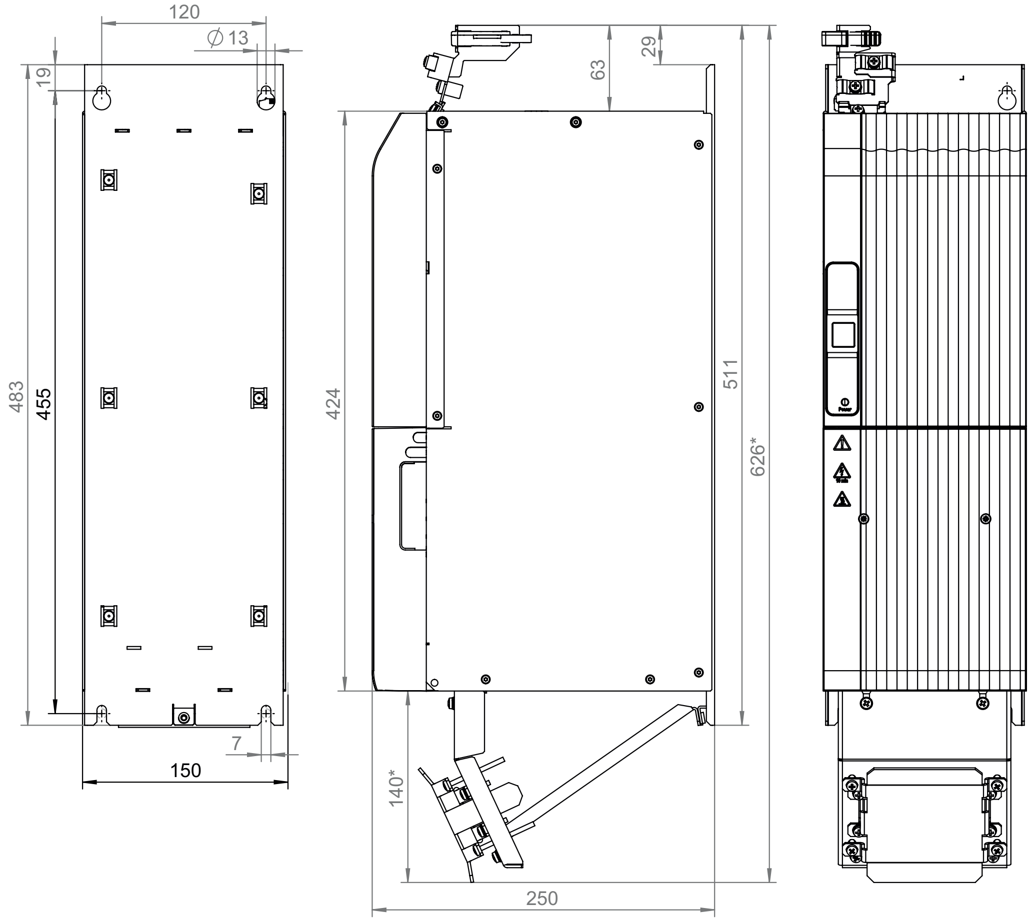
MDP90A-0250-..
(size 2)



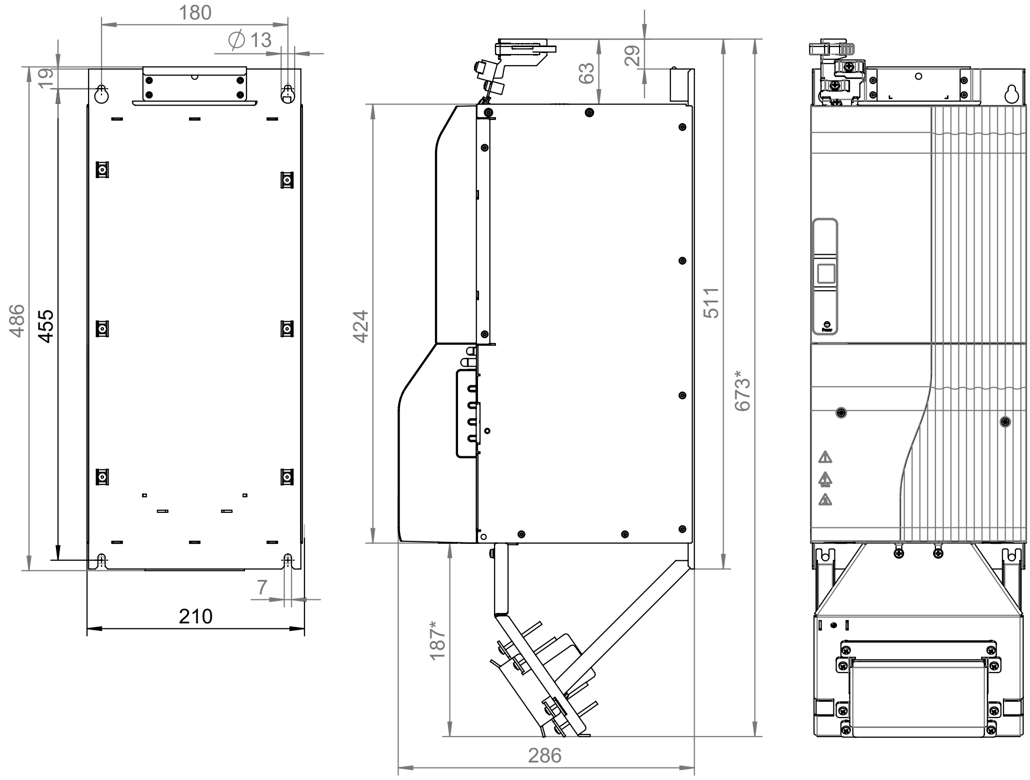
18014414468034571

MDP90A-0500 – 0750-.. (size 3)



9007217317195275

MDP90A-1100-..
(size 4)

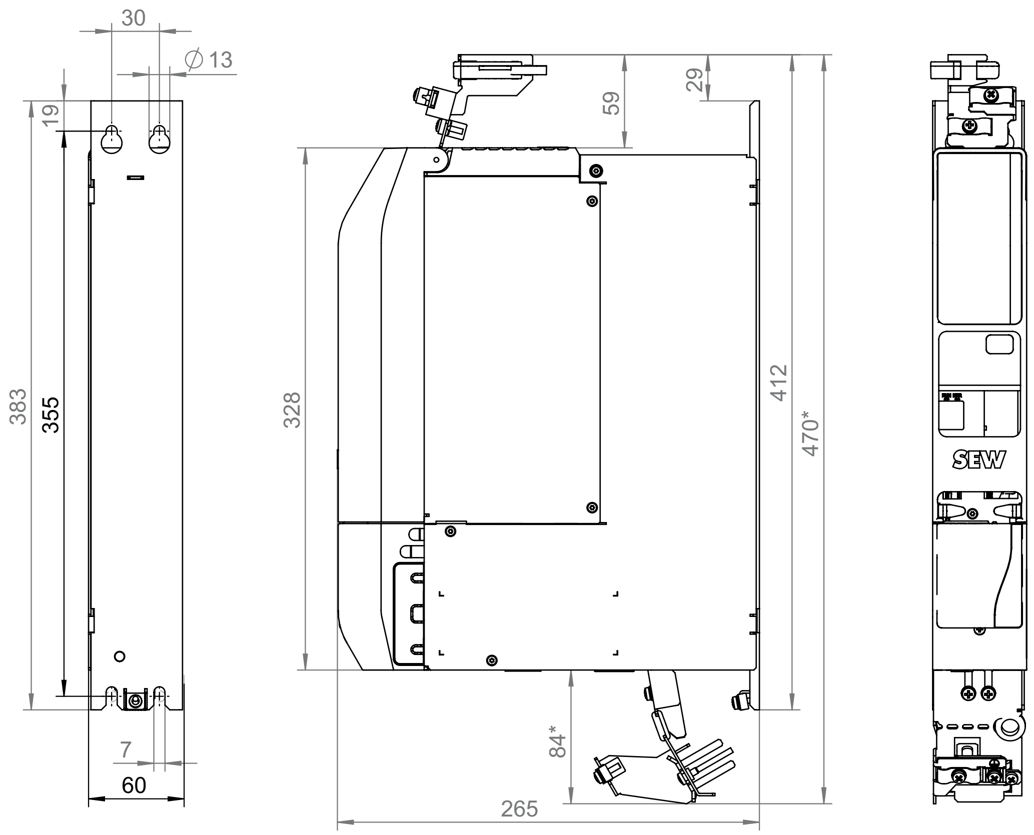


9007218299154443

2.6.2 Dimension sheets of the axis modules

The dimensions marked with an *depend on the position of the shield plate.

MDA90A-0020 – 0120-.. (size 1)



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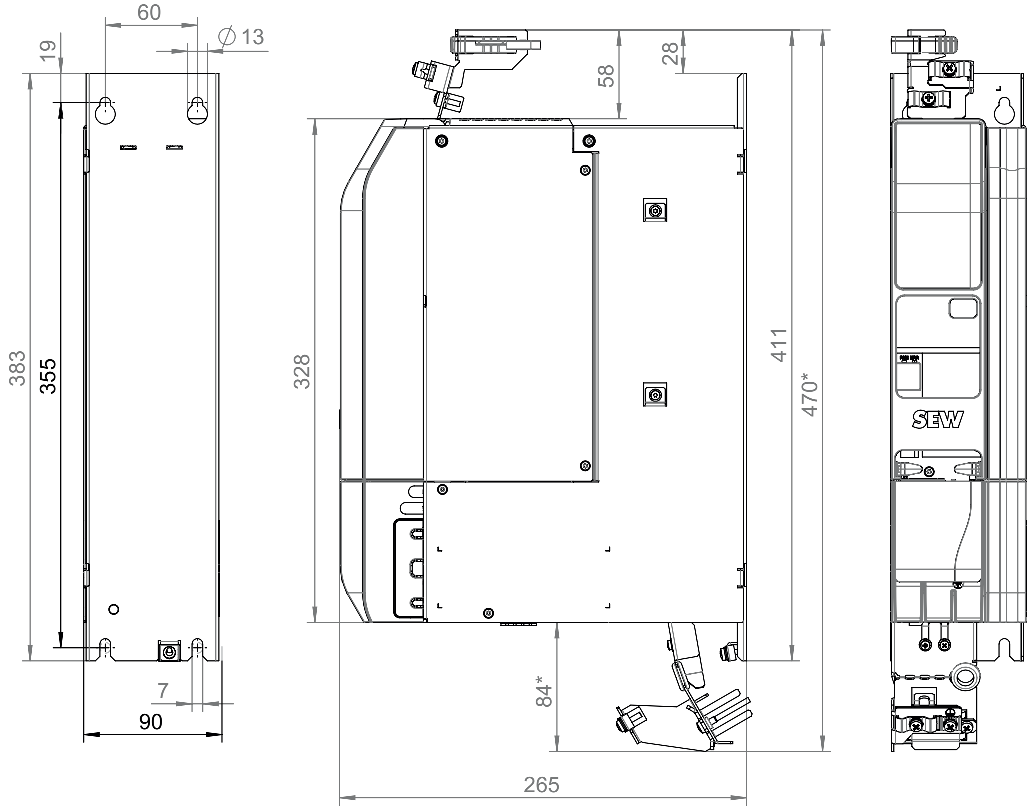
MDA90A-0160 – 0240-.. (size 2)



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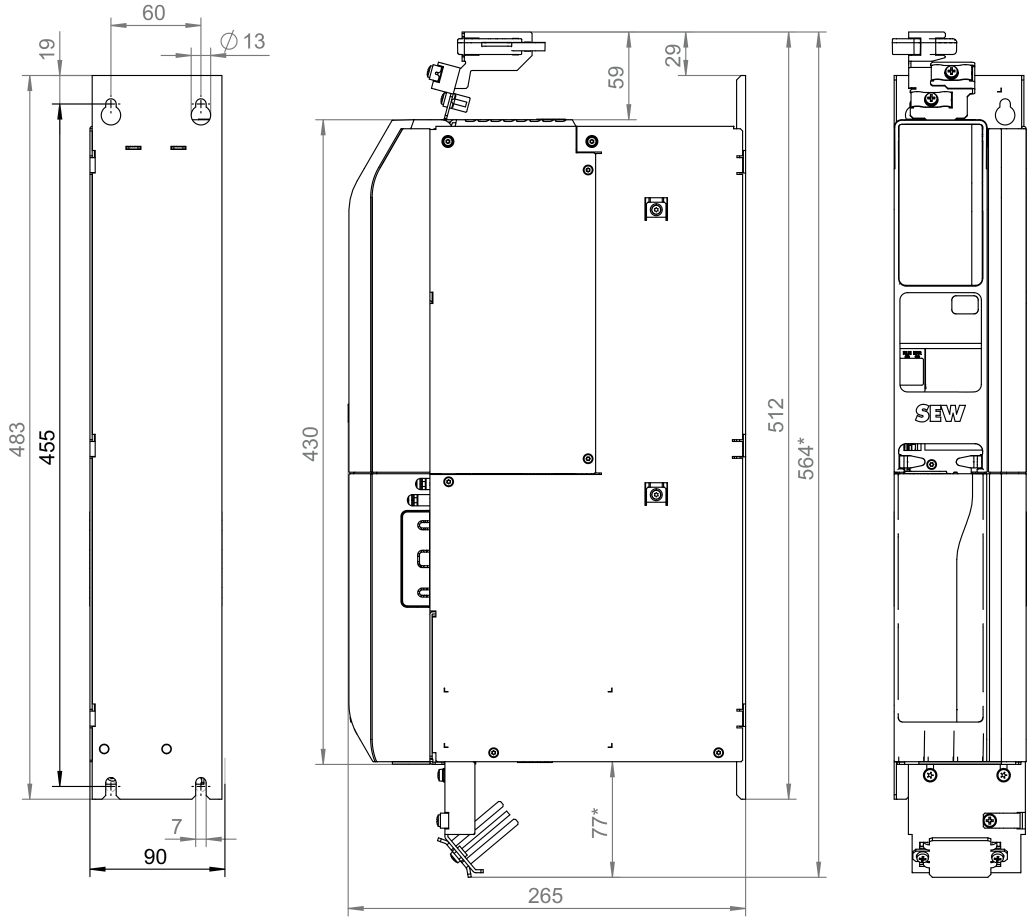
MDA90A- 0320 – 0480-.. (size 3)



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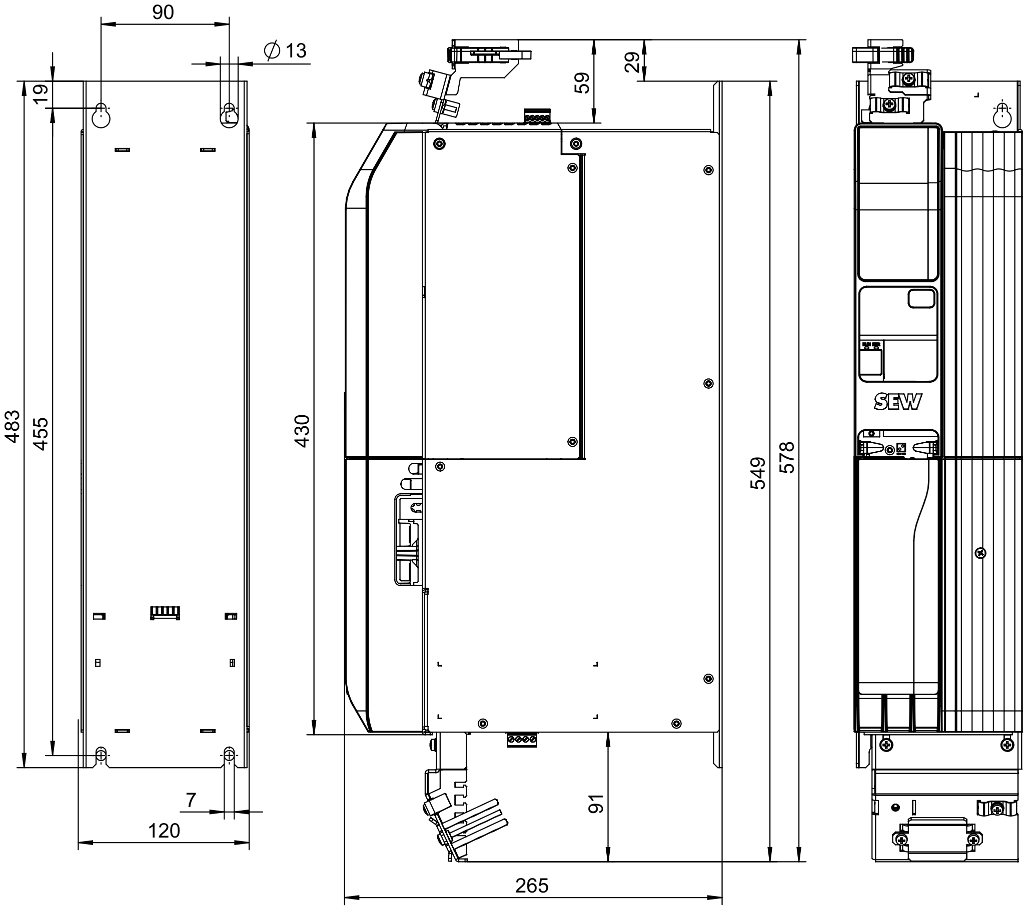
MDA90A-0640-..
(size 4)



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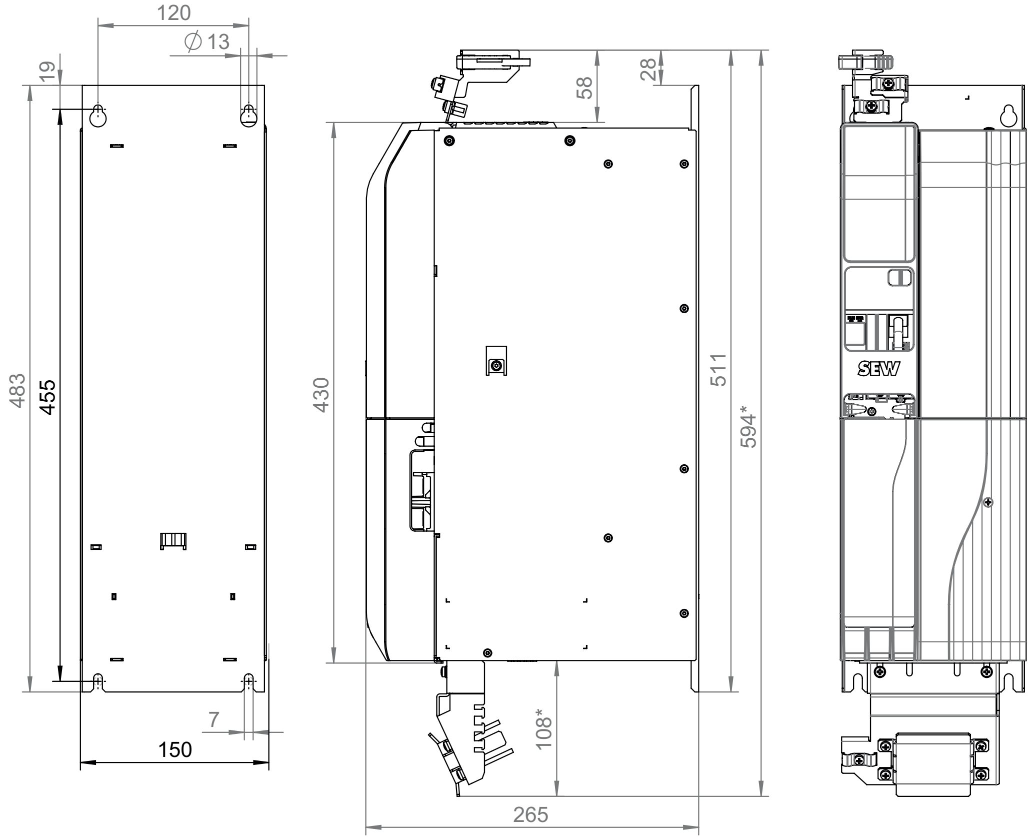
MDA90A-0640 – 1000.. (size 5)



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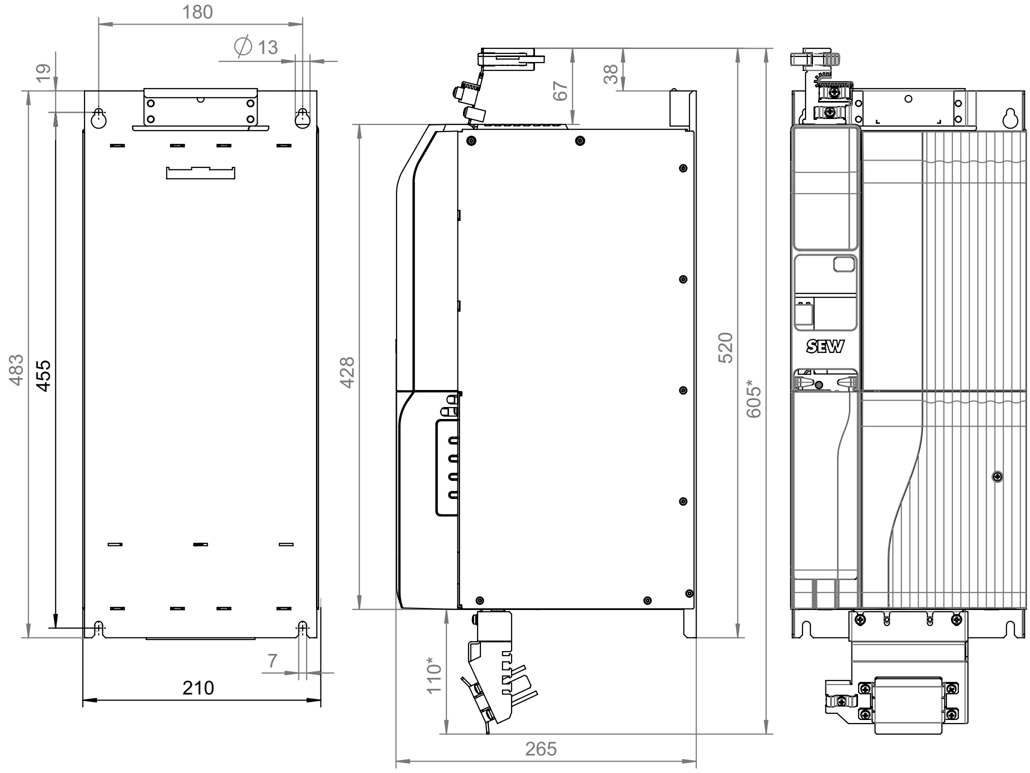
MDA90A-1400 – 1800-.. (size 6)



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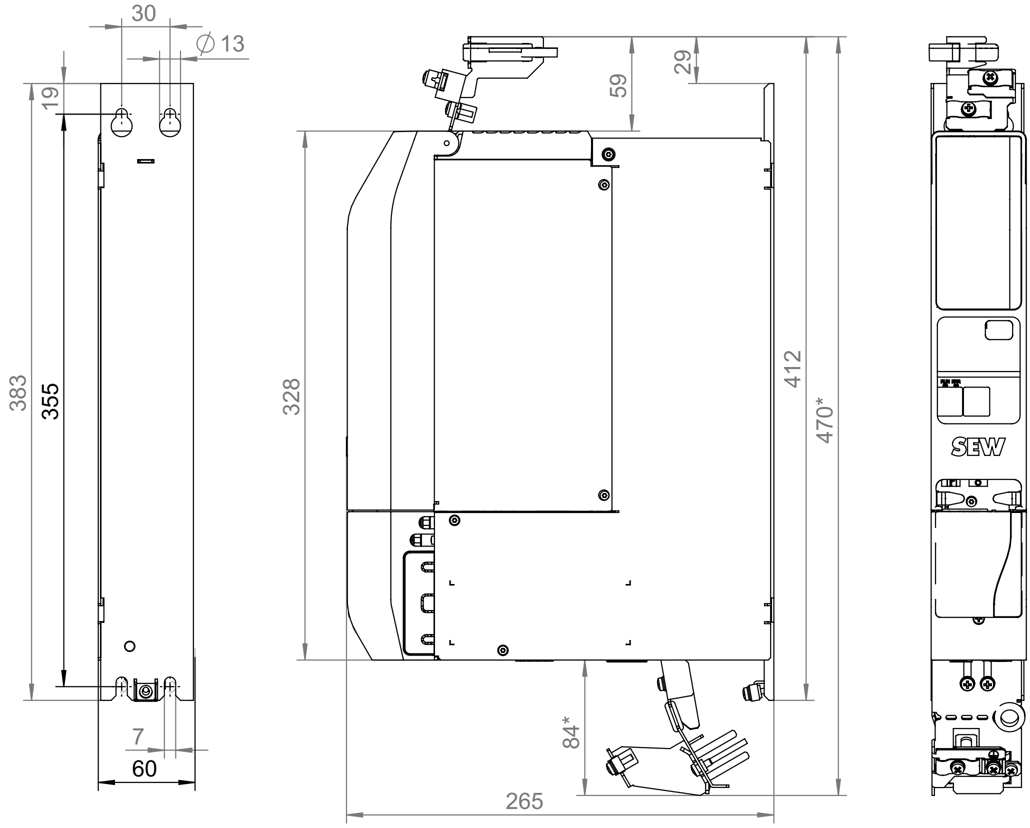
MDD90A-0020 – 0040-.. (size 1)



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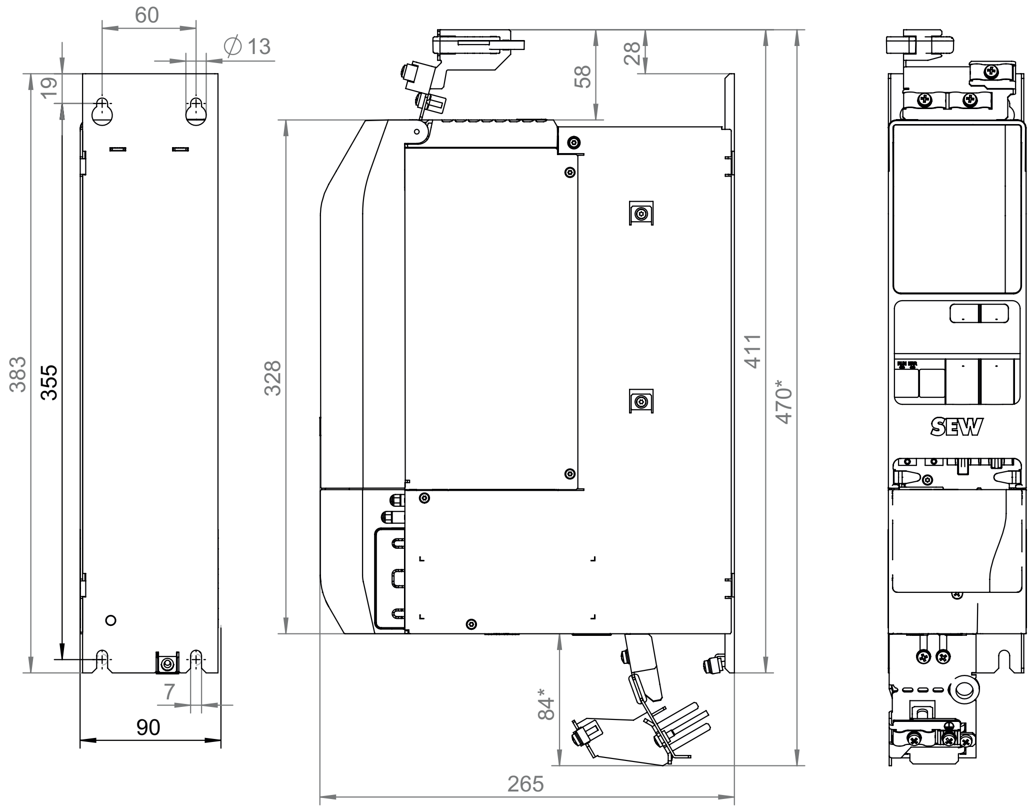
MDD90A-0020 – 0080-.. (size 2)



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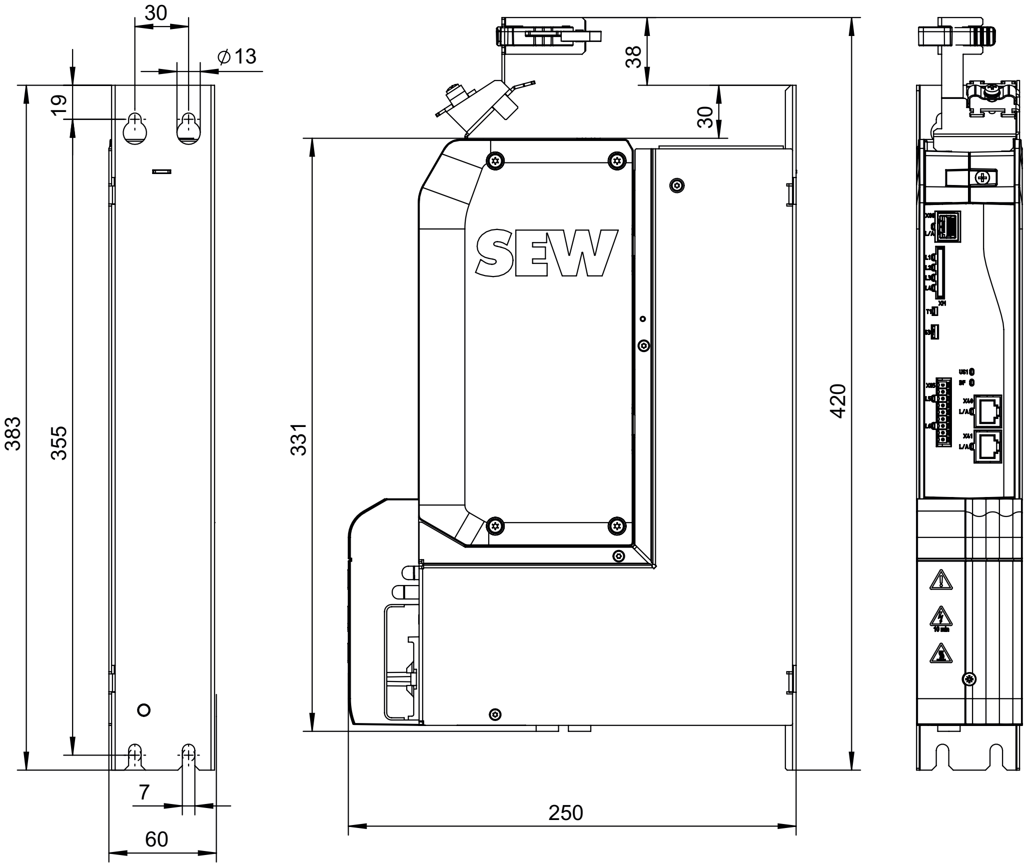
2.6.3 Dimension drawing of the master module



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2.7 Technical data of the cards

2.7.1 CIO21A and CID21A input/output cards

The CIO21A input/output card provides digital/analog inputs and outputs; the CID21A cards provide digital inputs and outputs.

	Terminal designation/ specification		Specification
	CIO21A	CID21A	
Part number	28229495	28229487	
General			
Design			According to IEC 61131-2 (type 3 for digital inputs)
Cycle time			1 ms
Power consumption	1.2 W	0.4 W	Base load (exclusively total power at outputs)
Connecting contacts			Plug connector - 1 core: 0.25 – 0.5 mm^2 Shield terminals for control cables available.
Digital inputs			
Quantity			4
Response time			160 µs plus cycle time
Assignment	X52: 1 – 4		DI10 – DI13: Selection option, see parameter menu.
	X52: 5		GND
Digital outputs			
Quantity			4
Response time			175 µs plus cycle time
Output current			I ≤ 50 mA
Capacitive load			≤ 300 nF
Inductive load			Not permitted
Protection device			Short-circuit proof, protected against external voltage DC 0 – 30 V
Assignment	X52: 6 – 9		DO10 – DO13: Selection option, see parameter menu.
	X52: 10		GND
Analog inputs			
Quantity			2
Type			Differential Switchable to current input
Value range			0 to +10 V, -10 V to +10 V 0(4) – 20 mA
Assignment	X50:2 X50:3		Analog input AI21 Reference of analog input AI21
	X50:4 X50:7		GND
	X50:5 X50:6		Analog input AI31 Reference of analog input AI31
Voltage input			
Resolution			0 to +10 V (11 Bits), -10 V to +10 V (12 Bits)
Tolerance			±0.5%
Overvoltage immunity			DC 20 V to DC +20 V
Input resistance			≥ 10 kΩ
Current input			
Resolution			0(4) – 20 mA (11 Bit)
Tolerance			± 2%
Load impedance			(Internal) 250 Ω
Overvoltage immunity			DC 10 V to DC +10 V
Analog outputs			
Quantity			2
Short-circuit protection			Yes

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	Terminal designation/ specification		Specification
	CIO21A	CID21A	
Assignment	X51:1 X51:4		Analog voltage output AOV2/AOV3
	X51:2 X51:5		Analog current output AOC2/AOC3
	X51: 3, 6		GND
Voltage output			
Tolerance			± 5%
Capacitive load			≤ 300 nF
Inductive load			< 500 µH
Load resistance			≥ 1 kΩ
Resolution			12 Bit
Reset state			0 V
Output value			-10 V to +10 V, ≤ 10 mA
Current output			
Tolerance			± 3%
Capacitive load			≤ 300 nF
Inductive load			None
Load resistance			≤ 500 Ω
Resolution			11 Bit
Reset state			0 mA
Measuring range			0(4) – 20 mA
Reference voltage output			
Short-circuit protection			Yes
Output voltage			DC -10 V, DC +10 V
Tolerance			± 0.5%
Noise			≤ 10 mA
Output current			≤ 3 mA
Capacitive load			≤ 300 nF
Inductive load			< 500 µH
Assignment	X50: 1		REF1 (DC +10 V)
	X50: 8		REF2 (DC -10 V)

NOTICE

Connection of inductive loads to digital outputs

Damage to digital outputs.

If inductive loads are connected to the digital outputs, you must install an external protective element (freewheeling diode).

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2.7.2 CES11A multi-encoder card

Voltage supply

The multi-encoder card is supplied by the basic device.

Technical data of encoder supply

	Terminal designation	Specification
Part number		28229479
Power consumption		
Nominal power loss 24 V		0.8 W
Maximum power consumption 24 V (card including encoder supply)		12.8 W
Encoder supply		
12 V	X17:15	DC 12 V ± 10%
24 V	X17:13	DC 24 V -10%, +20% to EN 61131
Nominal output current 12 V or 24 V		500 mA
Peak current I_{max} for 150 µs		1000 mA
Capacitive load		< 220 µF
Inductive load		< 500 µH
Short-circuit protection of 12 V supply		Yes, but a permanent short circuit is not permitted.
Short-circuit protection of 24 V supply		Yes, but a permanent short circuit is not permitted.
Evaluable temperature sensor		TF / TH / KTY84-130 / PT1000

Encoder connection

Encoder connection	Specification
Connection on encoder card end	15-pin socket
Maximum encoder cable length	- HTL encoder ES7C and EG7C: 300 m - Standard HTL encoder: 200 m - Other encoders: 100 m

2.7.3 Safety cards CS..A

General technical data

	Value
Ambient temperature for storage of the safety card	≥ 25 °C – ≤ 85 °C
Ambient temperature of MOVIDRIVE® system, all sizes (Derating, see "MOVIDRIVE® system" operating instructions)	• 0 °C – 40 °C without derating • 40 °C – 55 °C with derating
Ambient temperature of MOVIDRIVE® modular, all sizes	0 °C – 45 °C without derating
Installation altitude	Maximum 3800 m

Safe digital inputs

F-DI00 – F-DI03	Value/description
Properties	DC 24 V input pursuant to EN 61131-2, type 3
Signal level	• Logic "0" = LOW input: ≤ 5 V or ≤ 1.5 mA • Logic "1" = HIGH input: ≥ 11 V and ≥ 2 mA
Reference ground	GND
Power demand (typical)	0.21 W at DC 24 V
Input current	≤ 15 mA
Input resistance	≤ 4 kΩ at DC 24 V
Input filter time, parameterizable	4 ms – 250 ms
Permitted cable length	30 m
Error response time with single-pole connection	No greater than the response time without error.
Edge steepness of input signal	> 120 V/s
Input capacitance	< 500 pF

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Sensor supply

F-SS0, F-SS1	Value/description
Properties	• DC 24 V output pursuant to EN 61131-2 • Short circuit and overload protection • No galvanic isolation
Rated current	150 mA
Inrush current (≤ 10 ms)	300 mA
Short-circuit protection	1.2 A
Internal voltage drop	< DC 1.3 V
Pulsed voltage supply (if activated)	• 2 ms open (LOW) • Period duration, pulsed voltage supply: 8 ms
Permitted cable length	30 m (per sensor)
Leakage current (F-SSx blocked)	< 0.1 mA

Safe digital outputs

F-DO00_P/M, F-DO01_P/M	Value/description
Properties	• DC 24 V output pursuant to EN 61131-2 • Short circuit and overload protection
Rated current	150 mA
Inrush current (≤ 10 ms)	300 mA
Leakage current (F-DOx blocked)	< 0.1 mA
Maximum switching frequency	10 Hz
Overload protection	210 mA
Minimum current for wire break monitoring	15 mA
Permitted cable length	30 m
Load capacitance (max. test pulse duration)	≤ 300 nF
Load capacitance (1 ms test pulse duration)	50 nF
Capacitance to GND/PE (sourcing output only)	≤ 10 nF
Load capacitance with diode de-coupling	≤ 12 µF
Load inductance	≤ 100 µH
Load inductance with freewheeling diode	≤ 40 H
Minimum load resistance	> 130 Ω

2.8 Technical data of encoder interfaces

2.8.1 Basic device

	Terminal designation	Specification
encoder interface	X15:1 – 15	Supported encoders
		Resolver
		SIN/COS
		TTL/HTL
		HIPERFACE®
		Encoders with RS422 signals
Connecting contacts		15-pin socket
Encoder supply		
Nominal output voltage U_{S24VG} according to IEC 61131		DC 24 V
Nominal output voltage U_{S12VG} according to IEC 61131		DC 12 V
I_{max}		500 mA
I_{peak} for 150 µs		1000 mA
Short-circuit protection of 12 V supply		Yes, but a permanent short circuit is not permitted.
Short-circuit protection of 24 V supply		Yes, but a permanent short circuit is not permitted.

2.8.2 CES11A multi-encoder card

	Terminal designation	Specification
encoder interface	X17:1 – 15	Supported encoders
		SIN/COS
		TTL/HTL
		HIPERFACE®
		EnDat2.1 with sin/cos signals
		SSI
		CANopen
		Encoders with RS422 signals
Connecting contacts		15-pin socket
Encoder supply		
Nominal output voltage U_{S24VG} according to IEC 61131		DC 24 V
Nominal output voltage U_{S12VG} according to IEC 61131		DC 12 V
I_{max}		500 mA
I_{peak} for 150 µs		1000 mA

2.9 Technical data of braking resistors, filters and chokes

2.9.1 Braking resistors type BW.../BW...-T

General

The BW... / BW...-T braking resistors are adapted to the technical characteristics of the application inverter.

There are braking resistors with different continuous and peak braking power available.

The braking resistors can be protected against overload and overtemperature by the customer by using a thermal overload relay. The tripping current is set to the value I_F, see the following tables (→ 🗎 74).

The braking resistors of the series BW...-T are equipped with an integrated temperature switch that monitors the temperature. If the nominal operating temperature is exceeded, the temperature switch triggers a signal contact. The temperature switch does not switch off the braking resistor. This is why the temperature switch must be evaluated to avoid thermal overload of the braking resistor.

Another possibility to protect the braking resistor is the TCB thermal circuit breaker. The TCB thermal circuit breaker protects the braking resistor against continuous overload and power peaks over short periods.

INFORMATION

Use of protection devices

Only use the protection devices listed in the following section:

- TCB thermal circuit breaker
- Internal temperature switch -T
- External bimetallic relay

→ See also chapter "Protection against thermal overload of the braking resistor" (→ 🗎 305).

UL and cUL approval

The listed braking resistors have cRUus approvals independent of the application inverter.

Technical data and assignment to an inverter

Technical data

Braking resistor	Unit	BW047-002[1)]	BW047-010-T	BW027-016-T	BW027-024-T
Part number		08281661	17983207	17983215	17983231
Nominal power P_N	kW	0.2	1	1.6	2.4
Resistance value R_{BW}	Ω	47 ±10%	47 ±10%	27 ± 10%	
Tripping current I_{trip}	A	1.6	4.6	7.7	9.4
Design		Flat-type resistor	Wire resistor		
Power connections		-	0.75 – 10 mm²		
Tightening torque	Nm	-	1.5 – 1.8		
PE connection		-	M6 stud		
Tightening torque PE	Nm	-	1.8		
Degree of protection		IP65	IP20		
Ambient temperature ϑ_{amb}		-20 °C to +40 °C			
Mass	kg	0.6	4	5.8	8

1) In the documented assignment of inverter and flat-type resistor, flat-type resistors have a thermal protection (non-replaceable fuse) that interrupts the current circuit in the event of overload.

Assignment to an inverter

Braking resistor	Unit	BW047-002	BW047-010-T	BW027-016-T	BW027-024-T
Assignment to MDP90A-..		0100 – 1100			
Assignment to MDR91A-..		0500/0750			

Technical data

Braking resistor	Unit	BW012-016	BW012-024	BW012-050-T
Part number		18213243	17983894	18201407
Nominal power P_N	kW	1.6	2.4	5
Resistance value R_{BW}	Ω	12 ± 10%		
Tripping current I_{trip}	A	11.5	14.1	20.4
Design		Wire resistor		Grid resistor
Power connections		0.75 – 10 mm²		M8 stud
Tightening torque	Nm	1.5 – 1.8		6
PE connection		M6 stud		M6 stud
Tightening torque PE	Nm	1.8		3
Degree of protection		IP20		
Ambient temperature ϑ_{amb}		-20 °C to +40 °C		
Mass	kg	5.8	8	12

Assignment to an inverter

Braking resistor	Unit	BW012-016	BW012-024	BW012-050-T
Assignment to MDP90A-..		0250 – 1100		
Assignment to MDR91A-..		0500/0750		

Technical data

Braking resistor	Unit	BW106-T	BW206-T	BW005-070	BW004-050-01	BW002-070	BW003-420-T
Part number		18200834	18204120	17983282	18200133	17983304	13302345
Nominal power P_N	kW	13.5	18	7	5	7	42
Resistance value R_{BW}	Ω	6 ± 10%		4.7 ± 10%	3.6 ± 10%	2.3 ± 10%	2.5 ± 10%
Tripping current I_{trip}	A	47.4	54.7	38.6	37.3	55.2	135.1
Design		Grid resistor					
Power connections		M8 stud				M8 stud	M12 stud
Tightening torque	Nm	6				6	15.5
PE connection		M6 stud				M6 stud	M10 stud
Tightening torque PE	Nm	3				3	10

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Braking resistor	Unit	BW106-T	BW206-T	BW005-070	BW004-050-01	BW002-070	BW003-420-T
Degree of protection		IP20					
Ambient temperature ϑ_{amb}		-20 °C to +40 °C					
Mass	kg	30	40	13	12	33	93

Assignment to an inverter

Braking resistor	Unit	BW106-T	BW206-T	BW005-070	BW004-050-01	BW003-420-T	BW002-070
Assignment to MDP90A-..		0500 – 1100			0750 – 1100	1100	
Assignment to MDR91A-..		0500/0750			0750	-	-

Technical data BW..-T signal contact

Specifications for BW..-T signal contact	Design
Connection contacts	0.75 – 2.5 mm^2
Tightening torque	0.6 Nm
Switching capacity	DC 2 A / DC 24 V (DC11) AC 2 A / AC 230 V (AC11)
Switch contact (NC contact)	According to EN 61800-5-1

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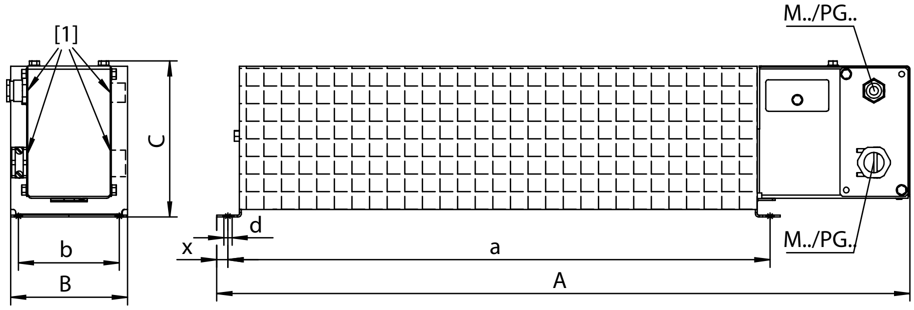
Dimension drawings and dimensions

Wire resistor



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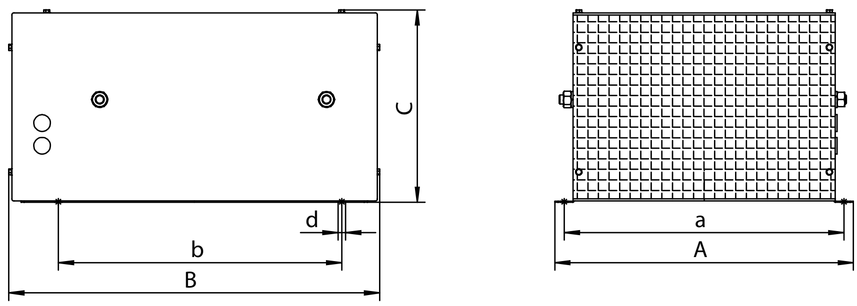
[1] Cable entry is possible from both sides.

Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BW47-010-T	749	92	125	630	80	6.5	8	M25+M12
BW027-016-T	649	185	125	530	150	6.5	8	M25+M12
BW027-024-T	649	275	125	530	240	6.5	8	M25+M12
BW012-016	649	185	120	530	150	6.5	8	M25
BW012-024	649	275	125	530	240	6.5	9	M25

Grid resistor mounting position 1



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Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BW012-050-T	395	490	260	370	380	10.5	-	-
BW106-T	795	490	270	770	380	10.5	-	-
BW206-T	995	490	270	970	380	10.5	-	-
BW005-070	395	490	260	370	380	10.5	-	-
BW004-050-01	395	490	260	370	380	10.5	-	-
BW002-070	395	490	260	370	380	10.5	-	-

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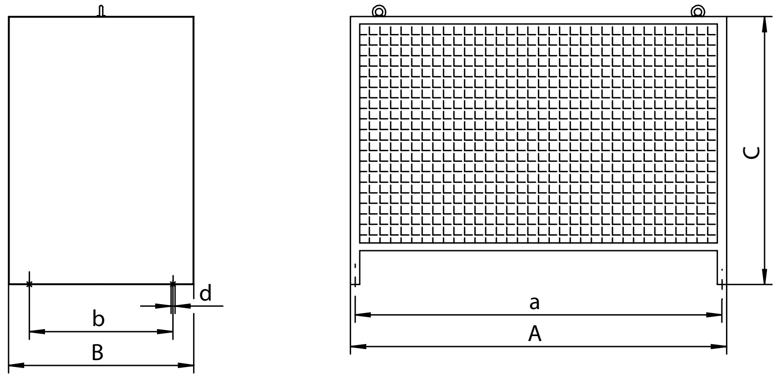
Grid resistor mounting position 2



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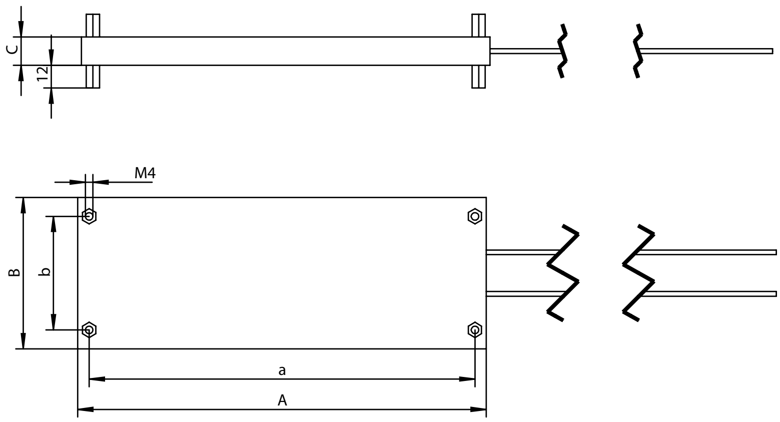
Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BW003-420-T	995	490	710	970	380	10.5	-	-

Flat type resistor



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Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BW047-002	110	80	15	98	60	-	-	-

2.9.2 TCB thermal circuit breaker option

General

The TCB thermal circuit breaker protects the braking resistor from constant overload and protects in case of a short circuit in the cable or the braking resistor.

The setting range of the thermal circuit breaker has to be selected in such a way that it corresponds to the tripping current I_F of the braking resistor.

The switch reacts to the following events:

- Thermal overload via current monitoring device.
- Short circuit.

In the event of a fault, the thermal circuit breaker switches off the braking resistor. The present fault is signaled via isolated NO and NC contacts.

After fault elimination, the thermal circuit breaker can be reconnected like a normal miniature circuit breaker.

The thermal circuit breaker is installed on DIN rails (TS35).

UL and cUL approval

The thermal circuit breaker has the cRUus approval, independent of the application inverter.

Technical data

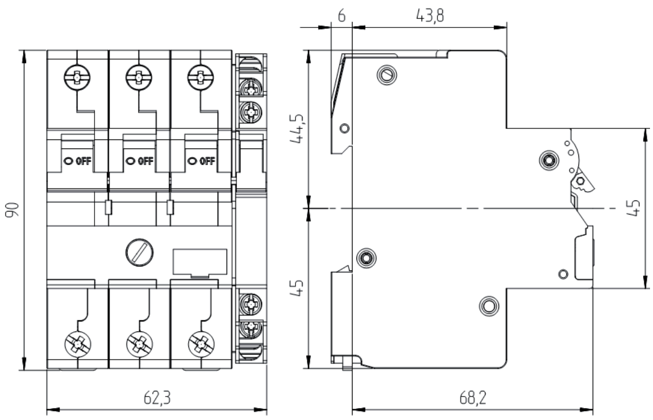
Circuit breaker type	Unit	TCB0040	TCB0063	TCB0100
Part number		19170424	19170432	19170440
Setting range	A	2.5 – 4	4 – 6.3	6.3 – 10
Connection cross section main contact	mm^2	1.5 – 16		
Tightening torque	Nm	2.5		
Signal contact connection cross section	mm^2	0.5 – 1.5		
Tightening torque	Nm	0.8		
Mechanical service life		20000 switching cycles		

Circuit breaker type	Unit	TCB0160	TCB0200	TCB0250	TCB0320	TCB0400
Part number		19170459	19148658	19170467	19170475	19170483
Setting range	A	10 – 16	16 – 20	20 – 25	25 – 32	32 – 40
Connection cross section main contact	mm^2	2.5 – 16	4 – 16		6 – 16	10 – 16
Tightening torque	Nm	2.5				
Signal contact connection cross section	mm^2	0.5 – 1.5				
Tightening torque	Nm	0.8				
Mechanical service life		20000 switching cycles				

Technical data of signal contact

Specifications of the signal contacts	Design
Connecting contacts	0.5 – 1.5 mm^2
Tightening torque	0.8 Nm
Switching capacity	DC 5 A / DC 24 V AC 10 A / AC 230 V

Dimension drawing



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2.9.3 Line filter

Line filters are used to suppress interference emission on the line side of inverters.

UL and cUL approval

The listed line filters have cRUus approvals independent of the application inverter.

Technical data

Line filter	NF0420-513	NF0420-523
Part number	17983789	17983797
Nominal line voltage V_N	Maximum 3 × AC 500 V, 50/60 Hz	
Nominal current I_N	42 A	
Nominal power loss	30 W	37 W
Ambient temperature ϑ_{amb}	0 °C to 45 °C	
Terminal contacts L1/L2/L3 - L1'/L2'/L3'	2.5 – 16 mm^2	
Tightening torque L1/L2/L3 - L1'/L2'/L3'	2 – 4 Nm	2 – 2.3 Nm
PE terminal contact	M6	
Tightening torque PE	6 Nm	
Degree of protection	IP20 according to EN 60529	
Weight	3 kg	4.5 kg

Line filter	NF0910-523	NF1800-523
Part number	17987504	17987865
Nominal line voltage V_N	Maximum 3 × AC 500 V, 50/60 Hz	
Nominal current I_N	91 A	180 A
Nominal power loss	51.5 W	89 W
Ambient temperature ϑ_{amb}	0 °C to 45 °C	
Terminal contacts L1/L2/L3 - L1'/L2'/L3'	25 – 50 mm^2	16 – 120 mm^2
Tightening torque L1/L2/L3 - L1'/L2'/L3'	6 – 8 Nm	12 – 20 Nm
PE terminal contact	M8	M10
Tightening torque PE	12 Nm	23 Nm
Degree of protection	IP20 according to EN 60529	
Weight	5 kg	9 kg

Assignment to an inverter

Line filter	NF0420-513	NF0420-523
Assignment to MDP90A-..	0100, 0250	

Line filter	NF0910-523	NF1800-523
Assignment to MDP90A-..	0500	0750, 1100
Assignment to MDR91A-..	0500	0750

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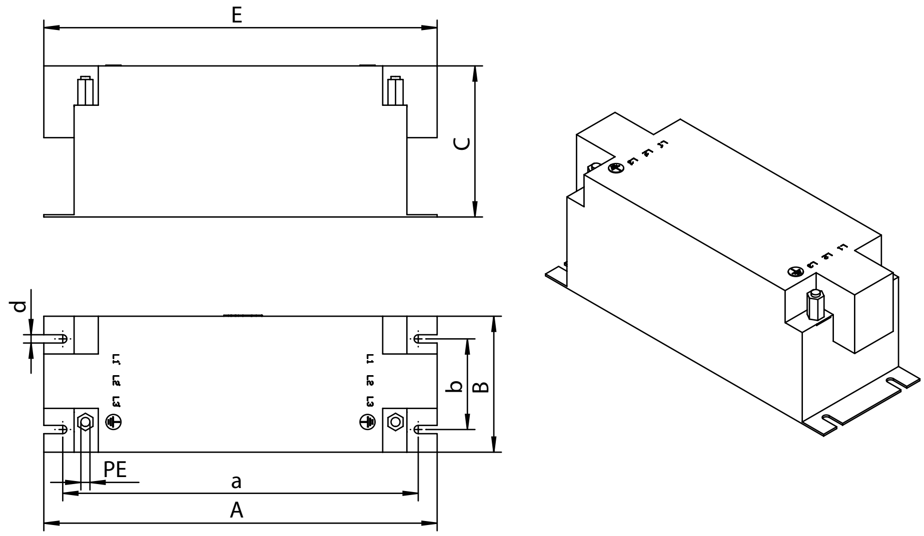
Dimension drawings and dimensions



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Line filter	Main dimensions in mm				Mounting dimensions in mm			
	A	B	C	E	a	b	d	PE
NF0420-513	250	88	97	255	235	60	5.5	M6
NF0420-523	330	83	187	340	314	55	6.5	M6
NF0910-523	270	100	152	320	255	65	6.5	M8
NF1800-523	380	132	185	465	365	102	6.5	M10

2.9.4 Line choke

Using line chokes is optional:

- To support overvoltage protection.
- To smoothen the line current, to reduce harmonics.
- For protection in the event of distorted line voltage.
- For limiting the inrush current.

UL and cUL approval

The listed line chokes have cRUus approvals independent of the application inverter.

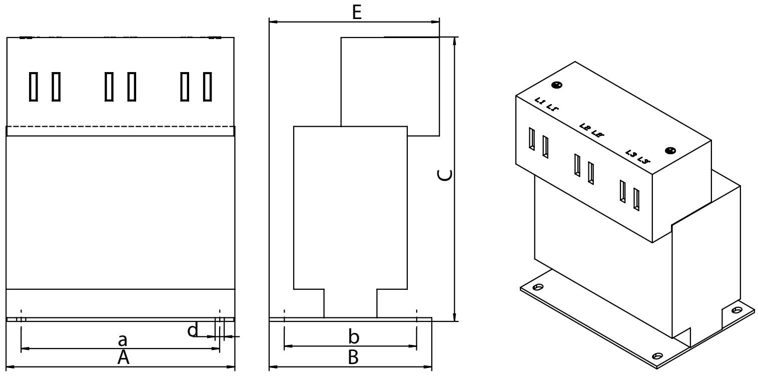
Technical data

Line choke	ND0300-503	ND0420-503	ND0910-503	ND1800-503
Part number	17983800	17983819	17987520	17987539
Nominal line voltage V_N	Maximum 3 × AC 230 V - 500 V, 50/60 Hz			
Nominal current I_N	30 A	42 A	91 A	180 A
Nominal inductance	0.1 mH	0.045 mH	0.035 mH	0.018 mH
Nominal power loss	11 W	13 W	53 W	116 W
Ambient temperature ϑ_{amb}	-10 °C to 45 °C			
Terminal contacts L1/L2/L3 - L1'/L2'/L3'	0.2 – 10 mm²	2.5 – 16 mm²	25 – 50 mm²	16 - 120 mm²
Tightening torque L1/L2/L3 - L1'/L2'/L3'	1.2 – 2 Nm	2.5 Nm	3 - 6 Nm	12 - 20 Nm
PE terminal contact	M5		M8	M10
Tightening torque PE	3 Nm		12	20
Degree of protection	IPXXB according to EN 60529			IPXXA according to EN 60529
Weight	1.95 kg	1.82 kg	4.4 kg	10 kg

Assignment to an inverter

Line choke	ND0300-503	ND0420-503	ND0910-503	ND1800-503
Assignment to MDP90A-	0100	0250	0500	0750, 1100

Dimension drawings and dimensions



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Line choke	Main dimensions in mm				Mounting dimensions in mm			
	A	B	C	E	a	b	d	PE
ND0300-503	121	86	145	86	105	70	4.8	M5
ND0420-503	121	86	150	90	105	70	4.8	M5

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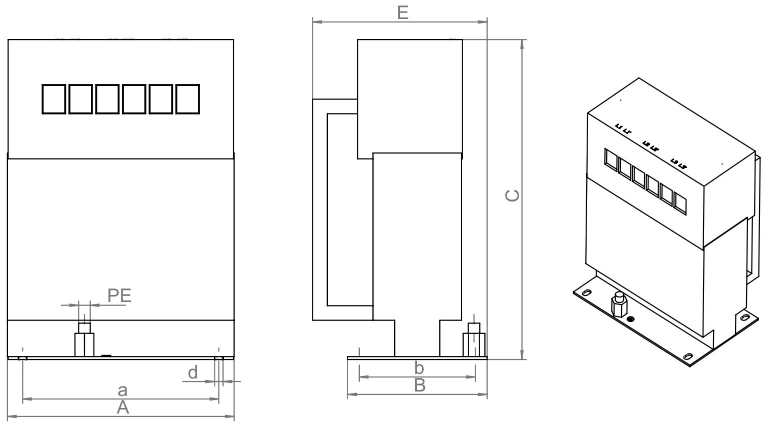

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Line choke	Main dimensions in mm				Mounting dimensions in mm			
	A	B	C	E	a	b	d	PE
ND0910-503	156	96	220	120	135	80	5.8	M8
ND1800-503	187	121	260	153	166	93	6.2	M10

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3 Configuration

3.1 SEW-Workbench

The SEW-Workbench is the central configuration software for inverters by SEW-EURODRIVE.

All necessary configurations can be processed, from entering the application to gear unit, motor and inverter calculations. Other features are optimization of the various axis cycles including the selection of accessories and a fault check of the entire drive system configuration.

Of course, the Workbench can also be used to select and dimension all other products from SEW-EURODRIVE (such as decentralized drives and gearmotors). This means the SEW-Workbench allows for specifying drive solutions from the entire range of products from SEW-EURODRIVE. The straightforward operation saves a lot of time and minimizes complexity.

The key features of the SEW-Workbench are:

- Application selection.
- Calculation of gear unit and motor.
- Price-optimized project planning.
- Comparison of different solutions.
- Inverter calculation.
- Multi-axis optimization.
- Parameterization of cable and accessories selection.
- Dimensioning faults check.
- Parts list generation.
- Electronic catalog with all products.

The project planning software SEW-Workbench is available for download from the official SEWEURODRIVE website.

To use SEW-Workbench, all you need to do is to register via the Online Support once you have downloaded and installed the software or received the data DVD. An Internet update service ensures that products and functions are always up-to-date.

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3.2 Schematic workflow for project planning

The following flow diagram illustrates the drive selection procedure for a positioning drive. The drive consists of a gearmotor that is controlled by an application inverter.

Necessary information regarding the machine to be driven
- Technical data and ambient conditions.
- Positioning accuracy.
- Speed setting range.
- Travel cycle calculation.

↓

Calculation of the relevant application data
- Travel diagram.
- Speeds.
- Static, dynamic torques.
- Regenerative power.

↓

Gear unit selection
- Determining gear unit design, gear unit size, gear unit ratio.
- Checking the positioning accuracy.
- Checking the gear unit load.
- Checking the input speed.

↓

Motor Selection
- Maximum torque.
- With dynamic drives: effective torque at medium speed.
- Maximum speed.
- Observe dynamic and thermal torque curves.
- Motor equipment (brake, plug connector, thermal motor protection, etc.).

↓

Axis module selection (perform procedure for every axis module)
- Determining the control mode.
- Motor/inverter assignment.
- Checking if the axis modules fulfill the duration and overload requirements.

↓

Power supply module selection
- Checking if the power supply module fulfills the duration and overload requirements.
- Checking the regenerative continuous power.
- Checking the power supply module - axis module combination.

↓

Selecting the braking resistor
- Checking if the braking resistor fulfills the duration and overload requirements.
- Checking the power supply module - braking resistor combination.

↓

Selection of other system components
- Cards.
- Motor and supply system cables.
- Signal and encoder cables.
- EMC measures.

↓

24 V voltage supply selection
- Determine the current demand of the 24 V voltage supply.
- Observe the requirements for the voltage tolerance.
- Check if a one- or two-sided supply is necessary.

↓

Arrangement of the modules within the axis system
- $I_{MDA1} \geq I_{MDA2} \geq I_{MDA3} \geq I_{MDA4} \geq ..... \geq I_{MDA15}$

↓

Make sure that all requirements have been met.

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3.3 Drive selection

For drive selection, in addition to the travel diagram that describes the exact travel cycle, a large number of additional specifications must be made about the operating and ambient conditions.

It is first necessary to have data for the machine to be driven such as mass, setting range, speed, information about the mechanical design and so on in order to select the drive correctly. The appropriate drive can be determined with the calculated torques and speeds of the drive while taking other mechanical requirements such as environmental and operating conditions into account.

For selecting the drive, a decision is to be taken if an asynchronous motor or a synchronous motor is to be used. The extensive product range of SEW-EURODRIVE is available for this purpose.

3.3.1 General requirements for motors

Motors that can be connected

- Asynchronous motors with squirrel-cage rotor.
- Permanent-field synchronous motors.

When third-party motors are operated with inverters, SEW-EURODRIVE cannot ensure that the specified performance data is reached.

Dielectric strength of the motor

The operation of an AC motor with a frequency inverter places a much greater load on the motor winding than in the case of operation on the supply system. All AC motors by SEW-EURODRIVE have the required voltage endurance.

At a line voltage of AC 3 x 400 V, the nominal DC link voltage is DC 560 V. In regenerative operation, the DC link voltage can rise to 970 V.

For operation of third-party motors at SEW-EURODRIVE's application inverters, their suitability has to be checked.

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Requirements on third-party motors

The connected third-party motor has to be designed for these DC link voltages.

The inverters pulse the DC voltage of the DC link U_{DC} to the supply cables to the motor. At SEW-EURODRIVE, the pulsed voltage supply is available with 2.5 kHz, 4 kHz, 8 kHz or 16 kHz. As a result, the motor is loaded with voltage peaks, high amplitude and very short rise times.

The technical data of the motors must lie within the following range:

Nominal motor speed	0 – 36000 min^{-1}
Nominal motor current	0 – 10000 A
Nominal motor torque	0 – 50000 Nm
Rated motor frequency[1)]	0 – 20 kHz
Number of pole pairs asynchronous/synchronous motor	1 – 64

1) The maximum output frequency depends on the selected control mode

Thermal motor protection

Thermal motor protection avoids overheating and, therefore, prevents irreparable damage from being caused to the motor. For this purpose, temperature sensors detect the winding temperature. As standard, the MOVIDRIVE® application inverters can evaluate the following temperature sensors:

Motor protection	Number of sensors:	SEWEURODRIVE designation
PTC thermistor	3	TF
Bimetallic temperature switch	3	TH
Semiconductor temperature sensor KTY84-130	1	KY/KTY
Platinum temperature sensor PT1000	1	PK

Motor series	Temperature sensor	Motor protection
CM..	TF, KTY84-130, PT1000	Comprehensive protection
DR..	TF, TH	Comprehensive protection
DR..	KTY84-130	Limited protection
Third-party motors	PTC thermistor, Bimetallic temperature switch	Comprehensive protection
Third-party motors	KTY84-130, PT1000	Limited protection

For additional information on the thermal motor protection, refer to the documentation of the motors.

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3.3.2 Startup of third-party motors

Startup of third-party motor is supported by the engineering software MOVISUITE®.

Asynchronous motors

The nameplate data must be entered during the startup, a calibration function then determines further data not specified on the nameplate. While the calibration function is running, the rotor does not turn and the brake is not released.

In case of asynchronous motors, at least the nameplate data must be known. The parameters required for startup are calculated based on the nameplate data and the motor is taken into operation.

An additional parameter measurement can be performed for enhanced control characteristics. In case of asynchronous motors, the measurement is performed while the motor is at standstill, if a brake is available, it can be and should remain applied. The duration of the measurement depends on the motor parameters.

Synchronous motors

In case of synchronous motors without encoder, the startup procedure is performed in the same way as with asynchronous motors.

In case of synchronous motors with encoder, the encoder offset must be calibrated after the startup procedure. This is automatically performed by the function "Rotor position identification". The rotor turns during the rotor position identification. Make sure that the rotor can turn freely. For this reason, the motor must be separated from the gear unit or system.

In case of synchronous motors the nameplate data alone is not sufficient, but an additional parameter calibration must be performed. In addition to the nameplate data, other values must also be known, such as the number of pole pairs, maximum speed, maximum current, or maximum torque and mass moment of inertia.

With synchronous motors, the brake is released (if available) during the measurement to align the rotor electrically. No load must be attached to the motor during the measurement, i.e. the motor must be in no-load operation. Otherwise, a correct calibration of the motor parameters cannot be guaranteed. The entire measurement only takes a few seconds with synchronous motors. After the measurement has been successfully performed, the motor is taken into operation electrically.

In case of drives with permanent magnet synchronous motors, encoder operation always requires knowledge of the absolute rotor position. The knowledge of the initial rotor position angle offset is called "commutation". The offset of the rotor position angle can be determined using FCB18 and saved to the inverter. No load must be attached to the motor during the calibration, otherwise, a correct commutation cannot be guaranteed.

3.3.3 Group drive and multi-motor drive

Group drive of asynchronous motors

A group drive is a group of asynchronous motors of any power rating. The motors do not have a rigid mechanical connection or only a connection that is subject to slip and are connected to an inverter electrically parallel.

After a suitable startup, operation in V/f control mode is possible.

If motors with different power ratings are operated at the inverter in parallel, the motor with the largest power rating has to be set up.

- The total of the motor currents must not exceed the nominal output current of the inverter.
- Note the permitted length of all motor leads connected in parallel:

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

  I_{tot} = Maximum total length of the motor leads connected in parallel

  I_{max} = Permitted motor lead length

  n = Number of motors connected in parallel

Multi-motor drive of asynchronous motors

Multi-motor drive means the electrical parallel connection of several identical asynchronous motors at 1 inverter, that are rigidly and mechanically coupled and drive a load.

Parallel operation of several identical asynchronous motors is possible provided the strict compliance with the following conditions.

- Only use gearmotors of the same type and with the same winding data.
- The rotor position of the individual motors must not differ in more than the following mechanical angle:

  $Z_p \times \Delta\varphi_{mech\_max} < 20°$

  Z_p = Number of motor pole pairs

  $\Delta\varphi_{mech\_max}$ = Maximum torsion angle of the shaft connection in regard of the motor shaft

  This must be ensured by the mechanics even for maximally different torque loads of the motor shafts. The motor has to be equipped with an encoder for the encoder feedback.
- Note the permitted length of all motor leads connected in parallel:

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

  I_{tot} = Maximum total length of the motor leads connected in parallel

  I_{max} = Permitted motor lead length

  n = Number of motors connected in parallel
- Make sure the speed sensor is installed on the gearmotor which has the greatest clearance or elasticity with respect to the load inertia.

3.3.4 Connecting explosion-proof AC motors

Observe the following instructions when connecting explosion-proof AC motors to application inverter:

- The inverter must be installed outside of the potentially explosive atmosphere.

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- Observe industry and country-specific regulations.
- Observe the regulations and information of the motor manufacturer with regard to operation on a frequency inverter, e.g. mandatory sine filter.
- All operating resources used in potentially explosive atmospheres must adhere to the relevant standards, such as Directive 94/9/EC (ATEX 100a) or IEC 60079.
- The sensor input of the motor's temperature monitoring must not be used in potentially-explosive areas. For thermal monitoring use a monitoring device approved for potentially explosive atmospheres.
- In case of motors with speed feedback the speed sensor must also be approved for potentially explosive atmospheres. The speed sensor can be directly connected to the inverter.

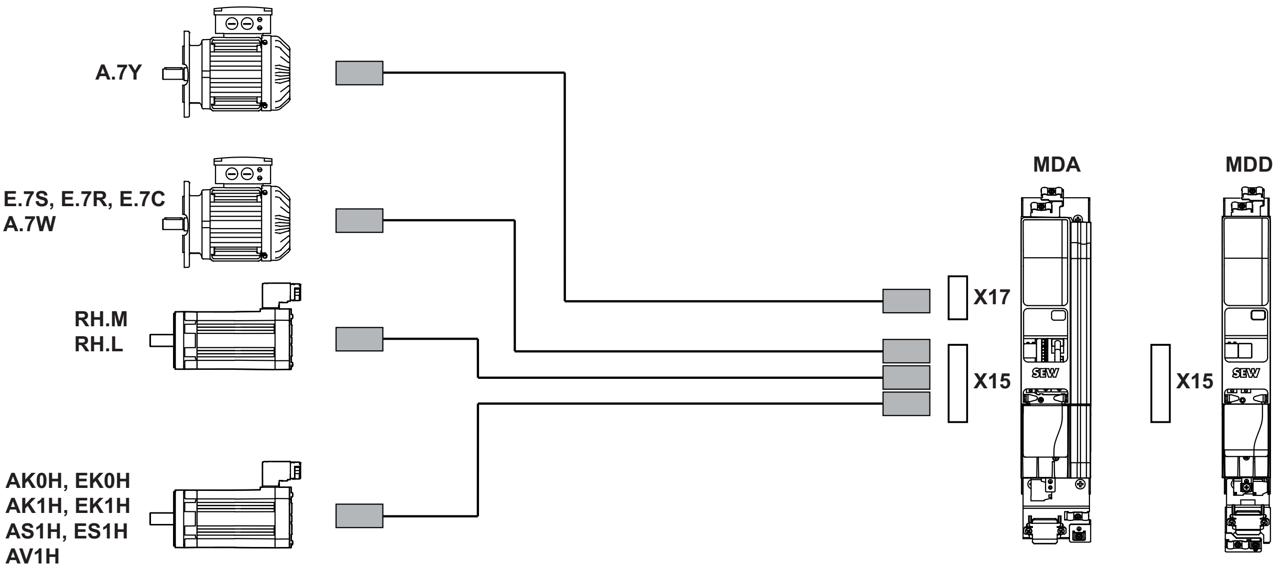
INFORMATION

For more information on the operation of explosion-proof AC motors, refer to the "Explosion-Proof AC Motors, Asynchronous Servomotors" operating instructions. You can order the operating instructions from SEW-EURODRIVE.

3.3.5 General requirements for encoders

Valid motor encoders from SEW-EURODRIVE

The following overview shows the motor encoders that are valid for use with MOVIDRIVE® modular. For information on the respective encoder cables, refer to chapter "Prefabricated cables" (→ 🗎 164).



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Encoder with electronic nameplate

The following motor encoder have the electronic nameplate data by SEW-EURODRIVE store on them at the factory and enable the automatic identification of the drive:

- Synchronous motors: E.0H, A.0H, E.1H, A.1H
- Asynchronous motors: E.7S, A.7W

The electronic encoder nameplate allows for automatic identification of the drive. Advantage of automatic identification:

- Complete and correct identification of motor and gear unit.
- No manual data entry necessary
- Easy drive identification, even with drives that are difficult to access.
- Significant time savings during startup

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3.3.6 General requirements for the brake control

Refer to the motor catalogs for extensive information and technical data regarding the brakes.

Brake control

Brakes and brake control units may only be controlled via the digital input X10:1 DB00 at the axis module. It is not permitted to control them via other electronic devices or via controllers.

Three-wire brake with accelerator coil (BE, BM, BMG)

The three-wire brake with accelerator coil can be used for DR.., CMPZ, and CFM brakemotors. With this brake type, the brakes are controlled using brake control units.

24 V holding brake (BP, BK)

The 24 V holding brake can be used for CMP motors.

In every application, a holding brake can be controlled via a customer relay with varistor overvoltage protection or via the BMV brake control unit from SEW-EURODRIVE.

Direct brake control (BP, BK)

If the system complies with the following specifications for direct brake control, a BK or BP brake (holding brake) can also be controlled directly via the brake output of an application inverter.

Specifications for direct brake control:

- Only the BK brakes of the CMP40 – 63 motor and the BP brake of the CMP71 motor are permitted.
- Expressly excluded are brakes of the motor types CMP80 and greater, CMPZ motors, and all non-SEW brakes.
- Only prefabricated brakemotor cables from SEW-EURODRIVE must be used.
- The brakemotor cable must be shorter than 25 m.
- The shielding of the brake cable must be connected to the shielding plate.

Permitted load of brake control and brake

One complete switching sequence (opening and closing) must not be repeated more often than a maximum of every 2 seconds. The brake must remain switched off for at least 100 ms before it is switched on again.

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3.4 Recommendations for motor and inverter selection

The basis for motor selection are the limit characteristic curves of the motors in inverter operation. The limit characteristic curve states the torque characteristic of the motor depending on the speed.

The dynamic and thermal limits must be observed when selecting the motor.

3.4.1 Thermal limit characteristic curve

The mean motor speed and the effective torque are calculated during drive selection to determine the thermal utilization of the motor. The operating point of the motor must lie below the thermal limit characteristic curve of the motor; otherwise the motor will be thermally overloaded.

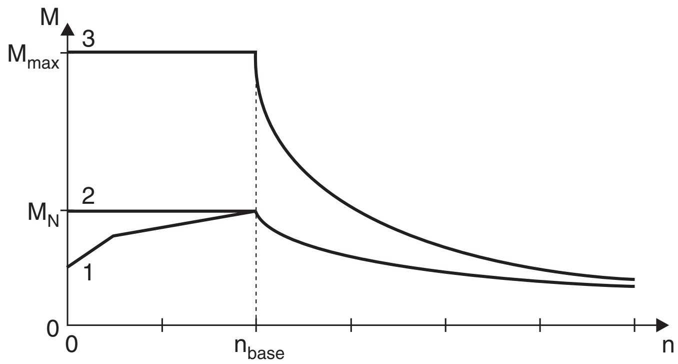
3.4.2 Dynamic limit characteristic curve

The dynamic limit characteristic curve depicts the maximum torque the motor can generate at a certain speed. Note that the inverter must supply sufficient current for the motor to reach its maximum torque.

The base speed is especially important for project planning. The base speed is the available speed up to the maximum motor torque. In inverter operation, field weakening begins at the rated speed. The motor torque is limited by the voltage limit characteristic curve in the field-weakening range, and decreases with increasing speed.

M_N is determined by the motor. M_{max} and n_{base} depend on the motor/inverter combination. For the values for M_{max} and n_{base} in control modes VFC^PLUS, CFC, ELSM®, refer to the motor selection tables in chapter "Motor/inverter assignment" (→ 🗎 98).

Typical characteristic curve of asynchronous motors



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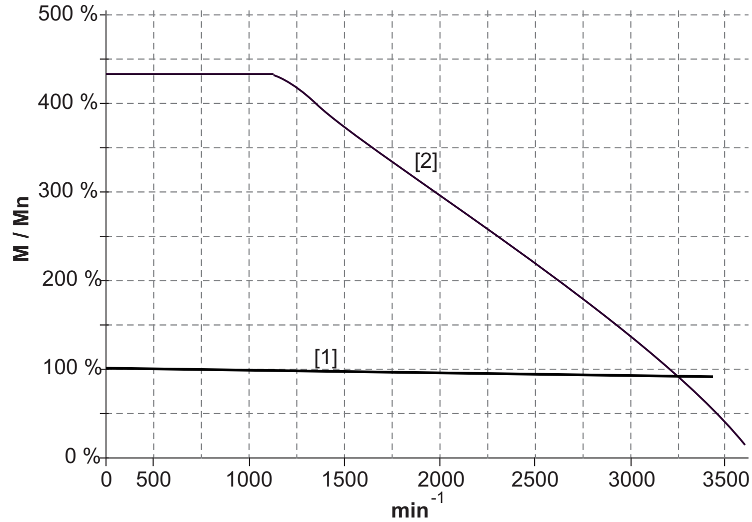
[1] S1 operation with self-cooling

[2] S1 operation with external cooling

[3] Mechanical limit for gearmotors

Typical characteristic curve of synchronous motors



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[1] Thermal limit characteristic curve S1 operation

[2] Dynamic limit torque

3.4.3 Motor selection for asynchronous motors

The mechanical resistance of the motor against the overload, which might exceed the permitted limit values, must be strictly checked.

M_{pk} and n_{base} depend on the motor/inverter combination, as well as on the used control mode.

Asynchronous motors are mainly operated in control mode VFC^{PLUS}. The control mode efficiently adjusts the motor magnetization to the respective operating point. Simultaneously it allows for dynamic responses to load shocks at the drive train.

3.4.4 Asynchronous motors in control mode VFC^{PLUS}

The control mode VFC^{PLUS} without encoder allows dynamic use of the entire speed range of the drive. Reversing and moving through the speed 0 are also possible.

But continuous operation of asynchronous motors without encoder at low speeds is not possible. The minimum speeds that must not be permanently undercut during operation without encoder are:

- Motor mode: 1% of the asynchronous motor nominal speed.
- Regenerative operation: 10% of the asynchronous motor nominal speed.

INFORMATION

Lifting application with encoder

The control must be designed in such a way that the direction of rotation of the drive can only be reversed when it is at a standstill (with the brake applied).

If the direction of rotation should be changed without standstill, a motor encoder must be used.

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The described restrictions do not apply in control mode VFC^{PLUS} with encoder. In comparison to operation without encoder, higher dynamic properties can be achieved with an encoder.

When determining the maximum speed, observe that the breakdown torque M_K is reduced in an quadratic relationship in the field weakening range.

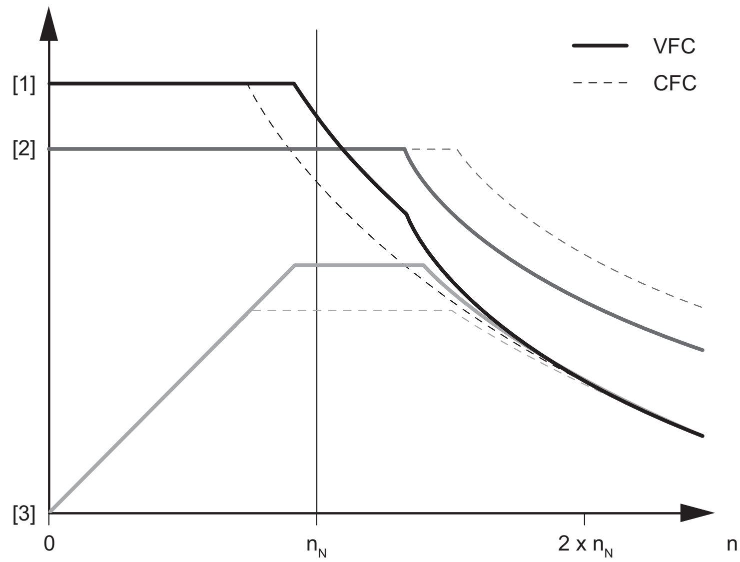
3.4.5 Asynchronous motors in control mode CFC

Either standard asynchronous motors (e.g. DRN.. motors) or asynchronous servomotors (e.g. DRL.. motors) can be used in control mode CFC. SEW-EURODRIVE recommends using asynchronous servomotors to achieve optimum benefit from the advantages of the control mode CFC.

Standard asynchronous motors in control mode CFC

In comparison to control mode VFC^{PLUS}, higher dynamic properties can be achieved using CFC. The full motor magnetization is maintained in each operating state, so that the highest requirements on dynamics are met. Due to the voltage reserves required for this, standard asynchronous motors are operated with a lower base speed in this operating mode than in operating mode VFC^{PLUS}. Power yield and energy efficiency are thus lower.

Speed/torque characteristic for VFC^{PLUS} and CFC in comparison.



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[1] Torque [2] Current [3] Power rating

Asynchronous servomotors in control mode CFC

The high-quality mechanic design of the DRL.. series asynchronous AC servomotors allows for dynamic overload values that exceed the values of the standard asynchronous motors in line or inverter operation. Due to these characteristics the values of a synchronous servomotor are almost reached.

SEW-EURODRIVE offers DRL.. motors in 2 dynamics packages:

Package	Overload capacity in relation to the nominal torque
Dynamics 1 (D1)	190% – 220%

Package	Overload capacity in relation to the nominal torque
Dynamics 2 (D2)	300% – 350%

To obtain an optimal adjustment of the motor speed to the required controller output limit of the application, SEW-EURODRIVE offers DRL.. servomotors with the following 4 rated speeds:

- 1200 min^{-1}
- 1700 min^{-1}
- 2100 min^{-1}
- 3000 min^{-1}

3.4.6 Synchronous servomotors in control mode CFC

In general, synchronous servomotors and the corresponding inverters are designed for a high short-time overload capacity. This allows a multiple of the nominal torque.

When using the following CMP.. motors in the higher speed ranges, it is recommended to only set the PWM frequencies 8 kHz or 16 kHz.

- CMP40 – 63 for speed class 6000 min^{-1},
- CMP71 – 100 for speed classes 4500 min^{-1} and 6000 min^{-1}.

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3.4.7 Synchronous servomotors in control mode ELSM®

The control mode ELSM® allows dynamic use of the entire speed range of the drive. Reversing and moving through the speed 0 are also possible. The speed must not permanently drop below the minimum speed of approx. 2% of the nominal motor speed.

When the control mode ELSM® is operated without encoder, the maximum motor torque is 150% M_0 of the connected motor.

The nominal output current of the inverter must not be lower than 1.5 × I_0 of the connected motor.

The maximum speed must not be dimensioned higher than the rated speed of the motor.

The control mode ELSM® may only be used when the motors are equipped with one of the following temperature sensors.

- KTY84 – 130 (SEW-EURODRIVE designation: KY/KTY)
- PT1000 (SEW-EURODRIVE designation: PK)

Using the ELSM® control mode for hoists and inclining tracks is not permitted.

3.5 Motor-inverter assignments

3.5.1 Technical data DRN.. motors

Key

P_N	Rated power
M_N	Rated torque
n_N	Rated speed
I_N	Rated current
cosφ	Power factor
IE	Short for "International Efficiency" (international efficiency classes IE1 – IE4)
$\eta_{50\%}$	Efficiency at 50% of the rated power
$\eta_{75\%}$	Efficiency at 75% of the rated power
$\eta_{100\%}$	Efficiency at 100% of the rated power
I_A/I_N	Starting current ratio
M_A/M_N	Starting torque ratio
M_H/M_N	Ramp-up torque ratio
M_K/M_N	Breakdown torque ratio
m	Mass of the motor
J_{Mot}	Mass moment of inertia of the motor
BE..	Brake used
Z_0 BG	Starting frequency for operation with BG brake control
Z_0 BGE	Starting frequency for operation with BGE brake control
M_B	Braking torque
m_B	Mass of the brakemotor
J_{MOT_BE}	Mass moment of inertia of the brakemotor

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IE3 DRN.. motors, 400 V, 50 Hz, 4-pole

Information on motors

Motor	P_N kW	M_N Nm	n_N min^{-1}	I_N A	cosφ	$\eta_{50\%}$ %	$\eta_{75\%}$ %	$\eta_{100\%}$ %	I_A/I_N	M_A/M_N M_H/M_N	M_K/M_N
DRN63MS4	0.12	0.83	1380	0.4	0.64	58.3	63.9	64.8	3.6	2.7 2.6	2.7
DRN63M4	0.18	1.25	1375	0.57	0.65	65.1	69.4	69.9	3.7	2.6 2.6	2.6
DRN71MS4	0.25	1.7	1405	0.72	0.66	70.1	73.5	73.5	4.3	2.5 2.3	2.5
DRN71M4	0.37	2.5	1415	1.02	0.66	74.3	77.3	77.3	4.8	2.8 2.4	2.8
DRN80MK4	0.55	3.65	1435	1.29	0.75	78.6	81.0	80.8	6.1	2.7 2.1	3.1
DRN80M4	0.75	4.95	1440	1.75	0.74	80.7	82.9	82.9	6.7	3.1 2.7	3.4
DRN90S4	1.1	7.2	1455	2.55	0.73	83.5	85.0	84.5	6.9	2.7 2.1	3.3
DRN90L4	1.5	9.8	1461	3.4	0.74	84.6	86.1	85.6	7.5	2.7 2.0	3.3
DRN100LS4	2.2	14.5	1450	4.75	0.76	86.4	87.5	86.9	7.1	2.9 2.2	3.3
DRN100L4	3	19.7	1456	6.4	0.76	87.3	88.3	87.8	8.2	3.4 2.3	3.7
DRN112M4	4	26	1464	7.9	0.81	88.6	89.4	88.7	8.2	2.4 1.6	3.6
DRN132S4	5.5	36	1461	10.5	0.84	90.6	90.6	89.6	8.3	2.8 2.2	3.5
DRN132M4	7.5	49	1468	15.2	0.78	90.8	91.1	90.4	7.8	3.1 2.4	3.3
DRN132L4	9.2	60	1470	18.7	0.77	90.8	91.6	91.0	8.4	3.7 1.8	3.7
DRN160M4	11	71	1473	21	0.81	91.1	91.7	91.4	7.3	2.6 2.2	3.0
DRN160L4	15	97	1474	29	0.80	91.9	92.5	92.1	8.0	3.0 2.0	3.4
DRN180M4	18.5	120	1478	33.5	0.85	92.8	93.1	92.6	9.5	3.6 2.9	3.6
DRN180L4	22	142	1477	38.5	0.87	93.4	93.6	93.0	9.6	3.5 2.1	3.4
DRN200L4	30	194	1480	56	0.82	93.3	93.9	93.6	8.2	2.9 2.5	3.3
DRN225S4	37	240	1482	64	0.88	94.3	94.4	93.9	8.4	3.0 2.3	2.7
DRN225M4	45	290	1482	81	0.85	94.1	94.5	94.2	8.8	3.0 2.2	2.7
DRN250M4	55	355	1482	104	0.80	94.4	94.8	94.6	8.2	4.0 2.5	2.9
DRN280S4	75	485	1482	143	0.79	94.9	95.3	95.0	7.6	3.7 2.6	2.9
DRN280M4	90	580	1481	161	0.84	95.4	95.6	95.2	7.7	3.6 2.0	2.7
DRN315S4	110	710	1488	189	0.87	95.4	95.7	95.5	6.7	2.9 2.1	3.1
DRN315M4	132	850	1487	230	0.87	95.6	95.9	95.6	6.5	2.7 2.0	2.9
DRN315L4	160	1030	1486	275	0.87	95.9	96.1	95.9	6.5	2.7 2.0	2.8
DRN315H4	200	1280	1489	355	0.84	95.4	96.0	96.0	8.1	3.7 2.8	3.8

Further information on motors and brakemotors

Motor	P_N kW	M_N Nm	n_N min^{-1}	m_{Mot} kg	J_{Mot} 10^{-4} kgm^2	BE..	Z_0 BG BGE 1/h	M_B Nm	m_{BMot} kg	J_{BMot} 10^{-4} kgm^2
DRN63MS4	0.12	0.83	1380	4.9	2.95	BE03	1000 1000	1.7	6.8	3.63
DRN63M4	0.18	1.25	1375	5.8	3.76	BE03	1000 1000	2.7	7.6	4.44
DRN71MS4	0.25	1.7	1405	6.8	5.42	BE03	6200 9700	3.4	8.6	6.11
DRN71M4	0.37	2.5	1415	8	7.14	BE05	5000 9000	5	10	8.44
DRN80MK4	0.55	3.65	1435	11	17.1	BE1	3500 8500	7	14	18.6
DRN80M4	0.75	4.95	1440	14	24.7	BE1	3200 8200	10	18	26.2
DRN90S4	1.1	7.2	1455	20	54	BE2	2300 6000	14	24	58.7
DRN90L4	1.5	9.8	1461	23	67.2	BE2	2200 5800	20	27	71.9
DRN100LS4	2.2	14.5	1450	27	81.4	BE5	- 6100	28	33	87.4
DRN100L4	3	19.7	1456	34	112	BE5	- 3700	40	40	118
DRN112M4	4	26	1464	45	178	BE5	- 2900	55	52	183
DRN132S4	5.5	36	1461	56	241	BE11	- 420	80	71	251
DRN132M4	7.5	49	1468	73	381	BE11	- 1100	110	91	403
DRN132L4	9.2	60	1470	81	439	BE20	- 980	150	110	490
DRN160M4	11	71	1473	115	817	BE20	- 900	150	145	877
DRN160L4	15	97	1474	130	1040	BE20	- 800	200	165	1100
DRN180M4	18.5	120	1478	155	1630	BE30	- 510	300	195	1770
DRN180L4	22	142	1477	170	1950	BE30	- 470	300	210	2090
DRN200L4	30	194	1480	280	2660	BE32	- 500	400	335	2890
DRN225S4	37	240	1482	310	4350	BE32	- 230	500	365	4580
DRN225M4	45	290	1482	310	4350	BE32	- 200	600	365	4580
DRN250M4	55	355	1482	460	7360	BE62	- 180	800	550	7960
DRN280S4	75	485	1482	520	8940	BE62	- 150	1000	600	9530
DRN280M4	90	580	1481	630	12000	BE62	- 79	1200	720	12600
DRN315S4	110	710	1488	870	23400	BE122	- 53	1600	1000	24400
DRN315M4	132	850	1487	890	24800	BE122	- 46	2000	1020	25800
DRN315L4	160	1030	1486	1020	28600	BE122	- 34	2000	1150	29600
DRN315H4	200	1280	1489	1140	35200	BE122	- 23	2000	1270	36200

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3.5.2 Motor-inverter assignments DRN.. motors, PWM 4 kHz

Key

I_N	Nominal output current of the inverter
I_{max}	Maximum output current of inverter
M_{pk}	Peak torque of the motor
n_{base}	Base speed of the motor

MOVIDRIVE® modular – 400 V, 50 Hz, VFC^PLUS

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRN63MS4	M_{pk}	Nm	2.24											
	n_{base}	min^{-1}	930											
	I_{max}	%	41											
DRN63M4	M_{pk}	Nm	3.25											
	n_{base}	min^{-1}	953											
	I_{max}	%	58											
DRN71MS4	M_{pk}	Nm	4.25											
	n_{base}	min^{-1}	1105											
	I_{max}	%	72											
DRN71M4	M_{pk}	Nm	6.98											
	n_{base}	min^{-1}	1080											
	I_{max}	%	111											
DRN80MK4	M_{pk}	Nm	11.3											
	n_{base}	min^{-1}	1076											
	I_{max}	%	181											
DRN80M4	M_{pk}	Nm	16.9											
	n_{base}	min^{-1}	1009											
	I_{max}	%	250											
DRN90S4	M_{pk}	Nm	17.6	23.8										
	n_{base}	min^{-1}	1196	1149										
	I_{max}	%	250	171										
DRN90L4	M_{pk}	Nm		32.4										
	n_{base}	min^{-1}		1152										
	I_{max}	%		232										
DRN100LS4	M_{pk}	Nm		35.8	47.8									
	n_{base}	min^{-1}		1177	1105									
	I_{max}	%		250	166									
DRN100L4	M_{pk}	Nm			69.3									
	n_{base}	min^{-1}			1101									
	I_{max}	%			234									
DRN112M4	M_{pk}	Nm			74.5	81.3								
	n_{base}	min^{-1}			1187	1165								
	I_{max}	%			250	181								
DRN132S4	M_{pk}	Nm			74.6	110								
	n_{base}	min^{-1}			1243	1161								
	I_{max}	%			250	240								
DRN132M4	M_{pk}	Nm				106	120							
	n_{base}	min^{-1}				1265	1245							
	I_{max}	%				250	211							

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRN132L4	M_{pk}	Nm					140	144						
	n_{base}	min^{-1}					1264	1260						
	I_{max}	%					250	171						
DRN160M4	M_{pk}	Nm					147	196						
	n_{base}	min^{-1}					1293	1256						
	I_{max}	%					250	221						
DRN160L4	M_{pk}	Nm						220	273					
	n_{base}	min^{-1}						1291	1264					
	I_{max}	%						250	232					
DRN180M4	M_{pk}	Nm						225	297	310				
	n_{base}	min^{-1}						1307	1275	1269				
	I_{max}	%						250	250	175				
DRN180L4	M_{pk}	Nm							303	352				
	n_{base}	min^{-1}							1287	1268				
	I_{max}	%							250	195				
DRN200L4	M_{pk}	Nm								435				
	n_{base}	min^{-1}								1297				
	I_{max}	%								248				
DRN225S4	M_{pk}	Nm								452	530			
	n_{base}	min^{-1}								1315	1300			
	I_{max}	%								250	222			
DRN225M4	M_{pk}	Nm									599	735		
	n_{base}	min^{-1}									1315	1296		
	I_{max}	%									250	197		
DRN250M4	M_{pk}	Nm										937	1027	
	n_{base}	min^{-1}										1309	1337	
	I_{max}	%										250	201	
DRN280S4	M_{pk}	Nm											1309	1400
	n_{base}	min^{-1}											1305	1353
	I_{max}	%											250	216
DRN280M4	M_{pk}	Nm											1318	1423
	n_{base}	min^{-1}											1302	1295
	I_{max}	%											250	211
DRN315S4	M_{pk}	Nm											1348	1713
	n_{base}	min^{-1}											1338	1324
	I_{max}	%											250	250
DRN315M4	M_{pk}	Nm												1696
	n_{base}	min^{-1}												1334
	I_{max}	%												250
DRN315L4	M_{pk}	Nm												1727
	n_{base}	min^{-1}												1339
	I_{max}	%												250

3.5.3 Technical data of DRL.. motors

Key to the technical data for asynchronous DRL.. servomotors

The following table lists the short symbols used in the "Technical data" tables.

n_N	Rated speed
M_N	Rated torque
I_N	Rated current
J_{Mot}	Mass moment of inertia of the motor
M_{pk} D1	Maximum limit torque (dynamics package 1)
M_{pk} D2	Maximum limit torque (dynamics package 2)
m	Mass of the motor
BE..	Brake used
m_B	Mass of the brake motor
J_{MOT_BE}	Mass moment of inertia of the brake motor
M_B D1	Braking torque (dynamics package 1)
M_B D2	Braking torque (dynamics package 2)

Asynchronous DRL.. servomotors

4-pole DRL.. servomotors for 400 V, 50 Hz

n_N	Motor type	M_N	I_N	I_{q_n}	I_{d_n}	c_T	M_{pk} D1	M_{pk} D2	m	J_{mot}
		Nm	A	A	A	Nm/A	Nm	Nm	kg	10^{-4} kgm²
1200	DRL71S4	2.7	1.18	1.02	0.62	2.66	5	8.5	8.6	4.9
	DRL71M4	4	1.6	1.36	0.80	2.93	7	14	10	7.1
	DRL80S4	6.5	2.15	1.95	0.88	3.33	10	25	11.5	14.9
	DRL80M4	9.5	2.9	2.64	1.10	3.60	14	30	15.2	21.5
	DRL90L4	15	4.8	4.14	2.21	3.63	25	46	22.5	43.5
	DRL100L4	26	8.5	8.05	2.68	3.23	40	85	30	68
	DRL132S4	42	12.6	11.9	4.07	3.52	80	150	45.5	190
	DRL132MC4	56	17.6	15.4	7.50	3.63	130	200	65	340
	DRL160M4	85	25.5	24.2	8.05	3.51	165	280	93	450
	DRL160MC4	90	28	25.1	10.9	3.58	185	320	95	590
	DRL180S4	120	34.5	33.2	10.8	3.62	210	380	122	900
	DRL180M4	135	38	36.1	11.3	3.74	250	430	143	1110
	DRL180L4	165	47	44.9	14.8	3.67	320	520	154	1300
	DRL180LC4	175	52	46.8	17.1	3.74	420	600	163	1680
	DRL200L4	200	58.5	56.0	17.8	3.57	475	680	260	2360
	DRL225S4	250	72	68.1	23.4	3.67	520	770	295	2930
	DRL225MC4	290	89	78.6	29.2	3.69	770	1100	330	4330

n_N	Motor type	M_N	I_N	I_{q_n}	I_{d_n}	c_T	M_{pk} D1	M_{pk} D2	m	J_{mot}
		Nm	A	A	A	Nm/A	Nm	Nm	kg	10^{-4} kgm^2
1700	DRL71S4	2.7	1.63	1.40	0.86	1.92	5	8.5	8.6	4.9
	DRL71M4	4	2.2	1.90	1.11	2.11	7	14	10	7.1
	DRL80S4	6.5	2.96	2.71	1.22	2.40	10	25	11.5	14.9
	DRL80M4	9.5	4	3.65	1.52	2.60	14	30	15.2	21.5
	DRL90L4	15	6.6	5.67	3.02	2.65	25	46	22.5	43.5
	DRL100L4	26	11.4	11.00	3.66	2.36	40	85	30	68
	DRL132S4	42	17.8	16.9	5.75	2.49	80	150	45.5	190
	DRL132MC4	56	24.9	21.9	10.6	2.56	130	200	65	340
	DRL160M4	85	35	33.5	11.1	2.54	165	280	93	450
	DRL160MC4	90	36	32.3	14.0	2.78	185	320	95	590
	DRL180S4	120	47.5	45.6	14.8	2.63	210	380	122	900
	DRL180M4	135	52	50.1	15.7	2.70	250	430	143	1110
	DRL180L4	165	63	61.3	20.2	2.69	320	520	154	1300
	DRL180LC4	175	72	65.7	24.1	2.66	420	600	163	1680
	DRL200L4	200	80.6	78.4	25.0	2.55	475	680	260	2360
	DRL225S4	245	97	92	32.2	2.66	520	770	295	2930
	DRL225MC4	280	130	114	43.9	2.45	770	1100	330	4330
2100	DRL71S4	2.6	2	1.70	1.08	1.53	5	8.5	8.6	4.9
	DRL71M4	3.8	2.7	2.25	1.39	1.69	7	14	10	7.1
	DRL80S4	6.2	3.59	3.22	1.52	1.92	10	25	11.5	14.9
	DRL80M4	9.5	5	4.60	1.91	2.07	14	30	15.2	21.5
	DRL90L4	15	8.4	7.21	3.84	2.08	25	46	22.5	43.5
	DRL100L4	25	14	13.4	4.63	1.87	40	85	30	68
	DRL132S4	41	21.4	20.3	7.07	2.02	80	150	45.5	190
	DRL132MC4	52	28.8	25.0	13.0	2.08	130	200	65	340
	DRL160M4	85	44	42.1	14.0	2.02	165	280	93	450
	DRL160MC4	88	48	42.8	18.9	2.06	185	320	95	590
	DRL180S4	110	55.3	52.7	18.7	2.09	210	380	122	900
	DRL180M4	130	64	60.4	19.6	2.15	250	430	143	1110
	DRL180L4	160	78	75.8	25.8	2.11	320	520	154	1300
	DRL180LC4	170	87	79.1	29.8	2.15	420	600	163	1680
	DRL200L4	195	99	94.6	30.9	2.06	475	680	260	2360
	DRL225S4	235	119	111	40.6	2.11	520	770	295	2930
	DRL225MC4	265	142	125	50.8	2.12	770	1100	330	4330
3000	DRL71S4	2.5	2.68	2.26	1.49	1.11	5	8.5	8.6	4.9
	DRL71M4	3.6	3.55	2.96	1.93	1.21	7	14	10	7.1
	DRL80S4	6	4.82	4.32	2.10	1.39	10	25	11.5	14.9
	DRL80M4	8.8	6.5	5.86	2.63	1.50	14	30	15.2	21.5
	DRL90L4	14	11	9.19	5.25	1.52	25	46	22.5	43.5
	DRL100L4	21	16.6	15.4	6.35	1.36	40	85	30	68
	DRL132S4	35	25.5	24.4	10.0	1.43	80	150	45.5	190
	DRL132MC4	42	34.8	28.4	18.4	1.48	130	200	65	340
	DRL160M4	79	57	53.9	19.3	1.47	165	280	93	450
	DRL160MC4	83	59	51.8	24.3	1.60	185	320	95	590
	DRL180S4	100	70.1	65.9	25.7	1.52	210	380	122	900
	DRL180M4	105	73	67.6	27.2	1.55	250	430	143	1110
	DRL180L4	130	90	83.8	35.0	1.55	320	520	154	1300
	DRL180LC4	140	105	91	41.8	1.53	420	600	163	1680
	DRL200L4	165	118	112	43.3	1.47	475	680	260	2360
	DRL225S4	195	139	127	56.0	1.53	520	770	295	2930
	DRL225MC4	220	188	156	76	1.41	770	1100	330	4330

4-pole DRL.. servomotors/brakemotors for 400 V, 50 Hz

n_N	Motor type	M_N	I_N	BE..	M_B	M_B	m_B	J_{Mot_BE}
					D1	D2		
		Nm	A		Nm	Nm	kg[1)]	10^{-4} kgm^2
1200	DRL71S4	2.7	1.18	BE05	5	5	11	6.2
	DRL71M4	4	1.6	BE1	7	10	12.6	8.4
	DRL80S4	6.5	2.15	BE2	10	20	15.2	19.4
	DRL80M4	9.5	2.9	BE2	14	20	18.9	26
	DRL90L4	15	4.8	BE5	20	40	28.5	49.5
	DRL100L4	26	8.5	BE5	40	55	36	74
	DRL132S4	42	12.6	BE11	80	110	60	200
	DRL132MC4	56	17.6	BE11	110	110	79	355
	DRL160M4	85	25.5	BE20	150	200	120	500
	DRL160MC4	90	28	BE20	150	200	122	640
	DRL180S4	120	34.5	BE30	200	300	162	1030
	DRL180M4	135	38	BE30	200	300	183	1250
	DRL180L4	165	47	BE30	300	300	194	1440
	DRL180LC4	175	52	BE32	400	400	210	1910
	DRL200L4	200	58.5	BE32	400	600	315	2590
	DRL225S4	250	72	BE32	500	500	350	3160
	DRL225MC4	290	89	BE32	600	600	385	4560
1700	DRL71S4	2.7	1.63	BE05	5	5	11	6.2
	DRL71M4	4	2.2	BE1	7	10	12.6	8.4
	DRL80S4	6.5	2.96	BE2	10	20	15.2	19.4
	DRL80M4	9.5	4	BE2	14	20	18.9	26
	DRL90L4	15	6.6	BE5	20	40	28.5	49.5
	DRL100L4	26	11.4	BE5	40	55	36	74
	DRL132S4	42	17.8	BE11	80	110	60	200
	DRL132MC4	56	24.9	BE11	110	110	79	355
	DRL160M4	85	35	BE20	150	200	120	500
	DRL160MC4	90	36	BE20	150	200	122	640
	DRL180S4	120	47.5	BE30	200	300	162	1030
	DRL180M4	135	52	BE30	200	300	183	1250
	DRL180L4	165	63	BE30	300	300	194	1440
	DRL180LC4	175	72	BE32	400	400	210	1910
	DRL200L4	200	80.6	BE32	400	600	315	2590
	DRL225S4	245	97	BE32	500	500	350	3160
	DRL225MC4	280	130	BE32	600	600	385	4560
2100	DRL71S4	2.6	2	BE05	5	5	11	6.2
	DRL71M4	3.8	2.7	BE1	7	10	12.6	8.4
	DRL80S4	6.2	3.59	BE2	10	20	15.2	19.4
	DRL80M4	9.5	5	BE2	14	20	18.9	26
	DRL90L4	15	8.4	BE5	20	40	28.5	49.5
	DRL100L4	25	14	BE5	40	55	36	74
	DRL132S4	41	21.4	BE11	80	110	60	200
	DRL132MC4	52	28.8	BE11	110	110	79	355
	DRL160M4	85	44	BE20	150	200	120	500
	DRL160MC4	88	48	BE20	150	200	122	640
	DRL180S4	110	55.3	BE30	200	300	162	1030
	DRL180M4	130	64	BE30	200	300	183	1250
	DRL180L4	160	78	BE30	300	300	194	1440
	DRL180LC4	170	87	BE32	400	400	210	1910
	DRL200L4	195	99	BE32	400	600	315	2590
	DRL225S4	235	119	BE32	500	500	350	3160
	DRL225MC4	265	142	BE32	600	600	385	4560

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n_N	Motor type	M_N	I_N	BE..	M_B	M_B	m_B	J_{Mot_BE}
					D1	D2		
		Nm	A		Nm	Nm	kg[1)]	10^{-4} kgm²
3000	DRL71S4	2.5	2.68	BE05	5	5	11	6.2
	DRL71M4	3.6	3.55	BE1	7	10	12.6	8.4
	DRL80S4	6	4.82	BE2	10	20	15.2	19.4
	DRL80M4	8.8	6.5	BE2	14	20	18.9	26
	DRL90L4	14	11	BE5	20	40	28.5	49.5
	DRL100L4	21	16.6	BE5	40	55	36	74
	DRL132S4	35	25.5	BE11	80	110	60	200
	DRL132MC4	42	34.8	BE11	110	110	79	355
	DRL160M4	79	57	BE20	150	200	120	500
	DRL160MC4	83	59	BE20	150	200	122	640
	DRL180S4	100	70.1	BE30	200	300	162	1030
	DRL180M4	105	73	BE30	200	300	183	1250
	DRL180L4	130	90	BE30	300	300	194	1440
	DRL180LC4	140	105	BE32	400	400	210	1910
	DRL200L4	165	118	BE32	400	600	315	2590
	DRL225S4	195	139	BE32	500	500	350	3160
	DRL225MC4	220	188	BE32	600	600	385	4560

1) Applies for foot-mounted motor with brake (DRL...BE../FI..)

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3.5.4 Motor-inverter assignments DRL.. motors, PWM 4 kHz

Key

I_N	Nominal output current of the inverter
I_{max}	Maximum output current of inverter
M_{pk}	Peak torque of the motor
n_{base}	Base speed of the motor

MOVIDRIVE® modular – rated motor speed 1200 min^{-1}, dynamics package 1, CFC

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL71S4	M_{pk}	Nm	5											
	n_{base}	min^{-1}	737											
	I_{max}	%	103											
DRL71M4	M_{pk}	Nm	7											
	n_{base}	min^{-1}	903											
	I_{max}	%	142											
DRL80S4	M_{pk}	Nm	10											
	n_{base}	min^{-1}	876											
	I_{max}	%	171											
DRL80M4	M_{pk}	Nm	14											
	n_{base}	min^{-1}	985											
	I_{max}	%	248											
DRL90L4	M_{pk}	Nm		25										
	n_{base}	min^{-1}		1157										
	I_{max}	%		249										
DRL100L4	M_{pk}	Nm			40									
	n_{base}	min^{-1}			1383									
	I_{max}	%			249									
DRL132S4	M_{pk}	Nm				80								
	n_{base}	min^{-1}				1151								
	I_{max}	%				250								
DRL132MC4	M_{pk}	Nm				96.3	130	130						
	n_{base}	min^{-1}				1213	1143	1418						
	I_{max}	%				250	250	250						
DRL160M4	M_{pk}	Nm						165						
	n_{base}	min^{-1}						1264						
	I_{max}	%						250						
DRL160MC4	M_{pk}	Nm						185	185					
	n_{base}	min^{-1}						1221	1415					
	I_{max}	%						250	250					
DRL180S4	M_{pk}	Nm						210	210					
	n_{base}	min^{-1}						1116	1281					
	I_{max}	%						250	250					
DRL180M4	M_{pk}	Nm							250	250				
	n_{base}	min^{-1}							1249	1404				
	I_{max}	%							250	243				
DRL180L4	M_{pk}	Nm							295	320				
	n_{base}	min^{-1}							1110	1320				
	I_{max}	%							250	250				

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL180LC4	M_{pk}	Nm								420	420			
	n_{base}	min^{-1}								1114	1266			
	I_{max}	%								250	249			
DRL200L4	M_{pk}	Nm								449	475	475		
	n_{base}	min^{-1}								1068	1258	1395		
	I_{max}	%								250	250	235		
DRL225S4	M_{pk}	Nm								437	520	520		
	n_{base}	min^{-1}								1164	1267	1596		
	I_{max}	%								250	250	250		
DRL225MC4	M_{pk}	Nm									564	770	770	
	n_{base}	min^{-1}									1164	1245	1442	
	I_{max}	%									250	250	250	

MOVIDRIVE® modular – rated motor speed 1700 min^{-1}, dynamics package 1, CFC

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL71S4	M_{pk}	Nm	5											
	n_{base}	min^{-1}	1312											
	I_{max}	%	156											
DRL71M4	M_{pk}	Nm	7											
	n_{base}	min^{-1}	1546											
	I_{max}	%	224											
DRL80S4	M_{pk}	Nm		10										
	n_{base}	min^{-1}		1536										
	I_{max}	%		142										
DRL80M4	M_{pk}	Nm		14										
	n_{base}	min^{-1}		1686										
	I_{max}	%		212										
DRL90L4	M_{pk}	Nm			25									
	n_{base}	min^{-1}			1874									
	I_{max}	%			210									
DRL100L4	M_{pk}	Nm			40	40								
	n_{base}	min^{-1}			1863	2275								
	I_{max}	%			250	250								
DRL132S4	M_{pk}	Nm				72.1	80	80						
	n_{base}	min^{-1}				1575	1751	1936						
	I_{max}	%				250	250	241						
DRL132MC4	M_{pk}	Nm						130	130					
	n_{base}	min^{-1}						1808	2149					
	I_{max}	%						250	250					
DRL160M4	M_{pk}	Nm						149	165	165				
	n_{base}	min^{-1}						1603	1821	2101				
	I_{max}	%						250	250	250				
DRL160MC4	M_{pk}	Nm						150	185	185				
	n_{base}	min^{-1}						1603	1671	2013				
	I_{max}	%						250	250	250				
DRL180S4	M_{pk}	Nm							208	210				
	n_{base}	min^{-1}							1568	1908				
	I_{max}	%							250	250				

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Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL180M4	M_{pk}	Nm								250	250			
	n_{base}	min^{-1}								1892	2084			
	I_{max}	%								250	250			
DRL180L4	M_{pk}	Nm								320	320			
	n_{base}	min^{-1}								1584	1890			
	I_{max}	%								250	250			
DRL180LC4	M_{pk}	Nm								302	420	420		
	n_{base}	min^{-1}								1673	1548	1925		
	I_{max}	%								250	250	250		
DRL200L4	M_{pk}	Nm									425	475		
	n_{base}	min^{-1}									1562	1937		
	I_{max}	%									250	250		
DRL225S4	M_{pk}	Nm									420	520	520	
	n_{base}	min^{-1}									1651	1964	2320	
	I_{max}	%									250	250	250	
DRL225MC4	M_{pk}	Nm										592	770	770
	n_{base}	min^{-1}										1767	1842	2143
	I_{max}	%										250	250	250

MOVIDRIVE® modular – rated motor speed 2100 min^{-1}, dynamics package 1, CFC

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL71S4	M_{pk}	Nm	5											
	n_{base}	min^{-1}	1886											
	I_{max}	%	214											
DRL71M4	M_{pk}	Nm	7											
	n_{base}	min^{-1}	2063											
	I_{max}	%	250											
DRL80S4	M_{pk}	Nm		10										
	n_{base}	min^{-1}		2181										
	I_{max}	%		197										
DRL80M4	M_{pk}	Nm		14										
	n_{base}	min^{-1}		2322										
	I_{max}	%		250										
DRL90L4	M_{pk}	Nm			25									
	n_{base}	min^{-1}			2557									
	I_{max}	%			250									
DRL100L4	M_{pk}	Nm				40	40							
	n_{base}	min^{-1}				2782	3205							
	I_{max}	%				250	250							
DRL132S4	M_{pk}	Nm					79.3	80						
	n_{base}	min^{-1}					1937	2443						
	I_{max}	%					250	250						
DRL132MC4	M_{pk}	Nm						112	130	130				
	n_{base}	min^{-1}						2172	2416	2934				
	I_{max}	%						250	250	250				
DRL160M4	M_{pk}	Nm							160	165				
	n_{base}	min^{-1}							2017	2587				
	I_{max}	%							250	250				

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Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL160MC4	M_{pk}	Nm							149	185	185			
	n_{base}	min^{-1}							2219	2499	2844			
	I_{max}	%							250	250	250			
DRL180S4	M_{pk}	Nm								210	210			
	n_{base}	min^{-1}								2287	2516			
	I_{max}	%								250	250			
DRL180M4	M_{pk}	Nm								250	250			
	n_{base}	min^{-1}								2076	2507			
	I_{max}	%								250	250			
DRL180L4	M_{pk}	Nm									320	320		
	n_{base}	min^{-1}									2146	2614		
	I_{max}	%									250	250		
DRL180LC4	M_{pk}	Nm									330	420		
	n_{base}	min^{-1}									2061	2279		
	I_{max}	%									250	250		
DRL200L4	M_{pk}	Nm									329	475	475	
	n_{base}	min^{-1}									2096	2163	2568	
	I_{max}	%									250	250	250	
DRL225S4	M_{pk}	Nm										520	520	520
	n_{base}	min^{-1}										2095	2685	3020
	I_{max}	%										250	250	250
DRL225MC4	M_{pk}	Nm										498	742	770
	n_{base}	min^{-1}										2137	1945	2314
	I_{max}	%										250	250	250

MOVIDRIVE® modular – rated motor speed 3000 min^{-1}, dynamics package 1, CFC

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL71S4	M_{pk}	Nm	4.91	5										
	n_{base}	min^{-1}	2795	3002										
	I_{max}	%	250	166										
DRL71M4	M_{pk}	Nm		7										
	n_{base}	min^{-1}		3414										
	I_{max}	%		242										
DRL80S4	M_{pk}	Nm		10										
	n_{base}	min^{-1}		3358										
	I_{max}	%		250										
DRL80M4	M_{pk}	Nm			14									
	n_{base}	min^{-1}			3756									
	I_{max}	%			228									
DRL90L4	M_{pk}	Nm			25	25								
	n_{base}	min^{-1}			3146	3872								
	I_{max}	%			250	250								
DRL100L4	M_{pk}	Nm				40	40	40						
	n_{base}	min^{-1}				3111	3968	4987						
	I_{max}	%				250	250	250						
DRL132S4	M_{pk}	Nm						80	80	80				
	n_{base}	min^{-1}						2993	3571	3951				
	I_{max}	%						250	250	249				

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL132MC4	M_{pk}	Nm						77.7	105	130	130			
	n_{base}	min^{-1}						3288	3200	3688	4293			
	I_{max}	%						250	250	250	250			
DRL160M4	M_{pk}	Nm								165	165	165		
	n_{base}	min^{-1}								3011	3653	4146		
	I_{max}	%								250	250	250		
DRL160MC4	M_{pk}	Nm								177	185	185		
	n_{base}	min^{-1}								2783	3355	3969		
	I_{max}	%								250	250	250		
DRL180S4	M_{pk}	Nm								175	210	210		
	n_{base}	min^{-1}								2977	3168	3626		
	I_{max}	%								250	250	244		
DRL180M4	M_{pk}	Nm									250	250		
	n_{base}	min^{-1}									2817	3758		
	I_{max}	%									250	250		
DRL180L4	M_{pk}	Nm									241	320	320	
	n_{base}	min^{-1}									2985	3283	3714	
	I_{max}	%									250	250	250	
DRL180LC4	M_{pk}	Nm										374	420	
	n_{base}	min^{-1}										2844	3274	
	I_{max}	%										250	250	
DRL200L4	M_{pk}	Nm										376	475	475
	n_{base}	min^{-1}										2870	3089	3507
	I_{max}	%										250	250	240
DRL225S4	M_{pk}	Nm										370	520	520
	n_{base}	min^{-1}										3027	2972	3507
	I_{max}	%										250	250	239
DRL225MC4	M_{pk}	Nm											457	619
	n_{base}	min^{-1}											3322	3089
	I_{max}	%											250	250

MOVIDRIVE® modular – rated motor speed 1200 min^{-1}, dynamics package 2, CFC

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL71S4	M_{pk}	Nm	8.5											
	n_{base}	min^{-1}	272											
	I_{max}	%	162											
DRL71M4	M_{pk}	Nm	14											
	n_{base}	min^{-1}	353											
	I_{max}	%	240											
DRL80S4	M_{pk}	Nm	16.8	25										
	n_{base}	min^{-1}	470	102										
	I_{max}	%	250	175										
DRL80M4	M_{pk}	Nm	17	30										
	n_{base}	min^{-1}	822	431										
	I_{max}	%	250	198										
DRL90L4	M_{pk}	Nm		32.7	46									
	n_{base}	min^{-1}		904	709									
	I_{max}	%		250	173									

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL100L4	M_{pk}	Nm			72.5	85								
	n_{base}	min^{-1}			787	733								
	I_{max}	%			250	216								
DRL132S4	M_{pk}	Nm				106	144	150						
	n_{base}	min^{-1}				890	753	768						
	I_{max}	%				250	250	192						
DRL132MC4	M_{pk}	Nm				96.3	132	200	200					
	n_{base}	min^{-1}				1213	1115	994	1120					
	I_{max}	%				250	250	250	250					
DRL160M4	M_{pk}	Nm						215	280					
	n_{base}	min^{-1}						977	921					
	I_{max}	%						250	250					
DRL160MC4	M_{pk}	Nm						201	276	320				
	n_{base}	min^{-1}						1110	995	1088				
	I_{max}	%						250	250	250				
DRL180S4	M_{pk}	Nm						216	300	380				
	n_{base}	min^{-1}						1074	942	914				
	I_{max}	%						250	250	247				
DRL180M4	M_{pk}	Nm							311	430				
	n_{base}	min^{-1}							1004	982				
	I_{max}	%							250	250				
DRL180L4	M_{pk}	Nm							295	475	520			
	n_{base}	min^{-1}							1110	933	1017			
	I_{max}	%							250	250	250			
DRL180LC4	M_{pk}	Nm								445	600	600		
	n_{base}	min^{-1}								1039	959	1095		
	I_{max}	%								250	250	236		
DRL200L4	M_{pk}	Nm								449	616	680		
	n_{base}	min^{-1}								1068	986	1162		
	I_{max}	%								250	250	250		
DRL225S4	M_{pk}	Nm								437	613	770	770	
	n_{base}	min^{-1}								1164	1062	1223	1390	
	I_{max}	%								250	250	250	250	
DRL225MC4	M_{pk}	Nm									564	934	1100	1100
	n_{base}	min^{-1}									1164	1027	1142	1258
	I_{max}	%									250	250	250	250

MOVIDRIVE® modular – rated motor speed 1700 min^{-1}, dynamics package 2, CFC

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL71S4	M_{pk}	Nm	8.5											
	n_{base}	min^{-1}	762											
	I_{max}	%	227											
DRL71M4	M_{pk}	Nm	9.97	14										
	n_{base}	min^{-1}	1162	856										
	I_{max}	%	250	168										
DRL80S4	M_{pk}	Nm		25										
	n_{base}	min^{-1}		582										
	I_{max}	%		243										

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL80M4	M_{pk}	Nm		26.9	30									
	n_{base}	min^{-1}		975	890									
	I_{max}	%		250	141									
DRL90L4	M_{pk}	Nm			46									
	n_{base}	min^{-1}			1215									
	I_{max}	%			250									
DRL100L4	M_{pk}	Nm			49.4	79.7	85							
	n_{base}	min^{-1}			1479	1209	1310							
	I_{max}	%			250	250	250							
DRL132S4	M_{pk}	Nm				72.1	99.8	150						
	n_{base}	min^{-1}				1575	1419	1250						
	I_{max}	%				250	250	250						
DRL132MC4	M_{pk}	Nm						141	193	200				
	n_{base}	min^{-1}						1634	1497	1846				
	I_{max}	%						250	250	250				
DRL160M4	M_{pk}	Nm						149	207	280	280			
	n_{base}	min^{-1}						1603	1453	1477	1625			
	I_{max}	%						250	250	250	250			
DRL160MC4	M_{pk}	Nm						150	209	320	320			
	n_{base}	min^{-1}						1603	1462	1319	1540			
	I_{max}	%						250	250	250	250			
DRL180S4	M_{pk}	Nm							208	331	380			
	n_{base}	min^{-1}							1568	1330	1388			
	I_{max}	%							250	250	250			
DRL180M4	M_{pk}	Nm								340	430	430		
	n_{base}	min^{-1}								1418	1424	1617		
	I_{max}	%								250	250	233		
DRL180L4	M_{pk}	Nm								331	463	520		
	n_{base}	min^{-1}								1515	1365	1547		
	I_{max}	%								250	250	249		
DRL180LC4	M_{pk}	Nm								302	421	600		
	n_{base}	min^{-1}								1673	1532	1531		
	I_{max}	%								250	250	250		
DRL200L4	M_{pk}	Nm									425	680	680	
	n_{base}	min^{-1}									1562	1437	1746	
	I_{max}	%									250	250	250	
DRL225S4	M_{pk}	Nm									420	710	770	770
	n_{base}	min^{-1}									1651	1452	1780	2012
	I_{max}	%									250	250	250	250
DRL225MC4	M_{pk}	Nm										592	870	1100
	n_{base}	min^{-1}										1767	1616	1609
	I_{max}	%										250	250	250

MOVIDRIVE® modular – rated motor speed 2100 min^{-1}, dynamics package 2, CFC

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL71S4	M_{pk}	Nm	7.24	8.5										
	n_{base}	min^{-1}	1409	1229										
	I_{max}	%	250	145										

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Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL71M4	M_{pk}	Nm	7.63	14										
	n_{base}	min^{-1}	1890	1322										
	I_{max}	%	250	220										
DRL80S4	M_{pk}	Nm		19.9	25									
	n_{base}	min^{-1}		1256	1006									
	I_{max}	%		250	153									
DRL80M4	M_{pk}	Nm		20.4	30									
	n_{base}	min^{-1}		1656	1358									
	I_{max}	%		250	196									
DRL90L4	M_{pk}	Nm			38.8	46								
	n_{base}	min^{-1}			1738	1791								
	I_{max}	%			250	250								
DRL100L4	M_{pk}	Nm				61.4	84.1	85						
	n_{base}	min^{-1}				1808	1632	2004						
	I_{max}	%				250	250	250						
DRL132S4	M_{pk}	Nm					79.3	124	150					
	n_{base}	min^{-1}					1937	1693	1729					
	I_{max}	%					250	250	250					
DRL132MC4	M_{pk}	Nm						112	155	200	200			
	n_{base}	min^{-1}						2172	2006	2172	2453			
	I_{max}	%						250	250	250	250			
DRL160M4	M_{pk}	Nm							160	252	280	280		
	n_{base}	min^{-1}							2017	1779	2015	2234		
	I_{max}	%							250	250	250	232		
DRL160MC4	M_{pk}	Nm							149	235	320	320		
	n_{base}	min^{-1}							2219	1981	1848	2340		
	I_{max}	%							250	250	250	250		
DRL180S4	M_{pk}	Nm								255	352	380		
	n_{base}	min^{-1}								1893	1700	1890		
	I_{max}	%								250	250	236		
DRL180M4	M_{pk}	Nm								262	366	430		
	n_{base}	min^{-1}								1955	1788	2060		
	I_{max}	%								250	250	250		
DRL180L4	M_{pk}	Nm									351	520	520	
	n_{base}	min^{-1}									1937	1882	2093	
	I_{max}	%									250	250	249	
DRL180LC4	M_{pk}	Nm									330	545	600	
	n_{base}	min^{-1}									2061	1805	2066	
	I_{max}	%									250	250	250	
DRL200L4	M_{pk}	Nm									329	554	680	680
	n_{base}	min^{-1}									2096	1836	2006	2260
	I_{max}	%									250	250	250	250
DRL225S4	M_{pk}	Nm										544	770	770
	n_{base}	min^{-1}										1979	1911	2328
	I_{max}	%										250	250	250
DRL225MC4	M_{pk}	Nm										498	742	971
	n_{base}	min^{-1}										2137	1945	1856
	I_{max}	%										250	250	250

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MOVIDRIVE® modular – rated motor speed 3000 min^{-1}, dynamics package 2, CFC

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL71S4	M_{pk}	Nm	4.91	8.5										
	n_{base}	min^{-1}	2795	2133										
	I_{max}	%	250	219										
DRL71M4	M_{pk}	Nm		11.8	14									
	n_{base}	min^{-1}		2360	2288									
	I_{max}	%		250	174									
DRL80S4	M_{pk}	Nm		13.4	25									
	n_{base}	min^{-1}		2583	1874									
	I_{max}	%		250	236									
DRL80M4	M_{pk}	Nm			30									
	n_{base}	min^{-1}			2169									
	I_{max}	%			250									
DRL90L4	M_{pk}	Nm			26.4	43.3	46							
	n_{base}	min^{-1}			2959	2466	2757							
	I_{max}	%			250	250	250							
DRL100L4	M_{pk}	Nm				40.8	59.5	85	85					
	n_{base}	min^{-1}				3041	2654	2627	3146					
	I_{max}	%				250	250	250	250					
DRL132S4	M_{pk}	Nm						84.9	117	150				
	n_{base}	min^{-1}						2798	2583	2748				
	I_{max}	%						250	250	250				
DRL132MC4	M_{pk}	Nm						77.7	105	165	200	200		
	n_{base}	min^{-1}						3288	3200	2906	3119	3862		
	I_{max}	%						250	250	250	250	250		
DRL160M4	M_{pk}	Nm								176	242	280		
	n_{base}	min^{-1}								2792	2580	3134		
	I_{max}	%								250	250	250		
DRL160MC4	M_{pk}	Nm								177	245	320	320	
	n_{base}	min^{-1}								2783	2580	2860	3238	
	I_{max}	%								250	250	250	250	
DRL180S4	M_{pk}	Nm								175	246	380	380	
	n_{base}	min^{-1}								2977	2704	2516	2773	
	I_{max}	%								250	250	250	248	
DRL180M4	M_{pk}	Nm									251	414	430	
	n_{base}	min^{-1}									2800	2492	3002	
	I_{max}	%									250	250	250	
DRL180L4	M_{pk}	Nm									241	411	520	520
	n_{base}	min^{-1}									2985	2589	2702	2984
	I_{max}	%									250	250	250	250
DRL180LC4	M_{pk}	Nm										374	545	600
	n_{base}	min^{-1}										2844	2598	2886
	I_{max}	%										250	250	250
DRL200L4	M_{pk}	Nm										376	554	680
	n_{base}	min^{-1}										2870	2630	2711
	I_{max}	%										250	250	250
DRL225S4	M_{pk}	Nm										370	555	739
	n_{base}	min^{-1}										3027	2753	2596
	I_{max}	%										250	250	250

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
DRL225MC4	M_{pk}	Nm											457	619
	n_{base}	min^{-1}											3322	3089
	I_{max}	%											250	250

3.5.5 Technical data of CMP.. motors

Key to the technical data

n_N	Rated speed
M_0	Standstill torque (thermal continuous torque at low speeds)
I_0	Standstill current
M_{pk}	Dynamic limit torque
I_{max}	Maximum permitted motor current
M_{0VR}	Standstill torque with forced cooling fan
I_{0VR}	Standstill current with forced cooling fan
J_{mot}	Mass moment of inertia of the motor
J_{bmot}	Mass moment of inertia of the brakemotor
$M_{1m,100°C}$	Maximum dynamic braking torque in case of emergency off
M_{1max}	Minimal averaged dynamic braking torque in case of emergency off at 100 °C
$M_{2,\ 20\ °C}$	Nominal torque for slipping brake disk (relative speed between brake disk and friction surface: 1 m/s) at 20 °C
$M_{4,100\ °C}$	Minimum holding torque at 100 °C
W_{max1}	Maximum permitted braking work per braking operation
W_{max2}	Maximum permitted braking work per braking operation with optional braking torque
L_1	Inductance between connection phase and star point
R_1	Resistance between connection phase and star point
V_{p0} cold	Internal voltage at 1000 min^{-1}
m_{mot}	Mass of the motor
m_{bmot}	Mass of the brakemotor

CMP40 – CMP112, 400 V system voltage

n_N	Motor	M_0	I_0	M_{pk}	I_{max}	M_{0VR}	I_{0VR}	m	J_{mot}
min^{-1}		Nm	A	Nm	A	Nm	A	kg	10^{-4} kgm^2
2000	CMP71S	6.4	3.4	19.2	17	8.7	4.6	7	3.04
	CMP71M	9.4	5	30.8	26	13.7	7.3	8.4	4.08
	CMP71L	13.1	6.3	46.9	39	21	10.1	11.4	6.18
	CMP80S	13.4	6.9	42.1	33	18.7	9.5	12.8	8.78
	CMP80M	18.7	9.3	62.6	48	27	13.4	16.5	11.9
	CMP80L	27.5	12.5	107	72	44	20	21.4	18.1
	CMP100S	25.5	13.3	68.3	49	36	18.8	19.8	19.59
	CMP100M	31	14.7	108	69	47	22.3	24.8	26.49
	CMP100L	47	21.8	178.8	113	70	32.5	34.6	40.24
	CMP112S	30	14.3	88	51	43	21	38.4	74
	CMP112M	45	21	136	74	68	32	46.2	103
	CMP112L	69	33	225	124	109	52	62.56	163
	CMP112H	83	38	270	148	123	57	70.43	193
	CMP112E	95	44.5	320	175	150	71	78.2	222
3000	CMP40S	0.5	1.2	1.9	6.1	–	–	1.3	0.1
	CMP40M	0.8	0.95	3.8	6.0	–	–	1.6	0.15
	CMP50S	1.3	0.96	5.2	5.1	1.7	1.25	2.3	0.42
	CMP50M	2.4	1.68	10.3	9.6	3.5	2.45	3.3	0.67
	CMP50L	3.3	2.2	15.4	13.6	4.8	3.2	4.1	0.92
	CMP63S	2.9	2.15	11.1	12.9	4	3	4.0	1.15
	CMP63M	5.3	3.6	21.4	21.6	7.5	5.1	5.7	1.92
	CMP63L	7.1	4.95	30.4	29.7	10.3	7.2	7.5	2.69
	CMP71S	6.4	4.9	19.2	25	8.7	6.7	7	3.04
	CMP71M	9.4	7.5	30.8	39	13.7	10.9	8.4	4.08
	CMP71L	13.1	9.4	46.9	58	21	15.1	11.4	6.18
	CMP80S	13.4	10	42.1	47	18.5	13.8	12.8	8.78
	CMP80M	18.7	13.4	62.6	69	27	19.3	16.5	11.9
	CMP80L	27.5	18.7	107	107	44	30	21.4	18.1
	CMP100S	25.5	19.6	68.3	73	36	27.5	19.8	19.59
	CMP100M	31	21.8	108	102	47	33	24.8	26.49
	CMP100L	47	32.3	178.8	167	70	48	34.6	40.24
	CMP112S	30	21	88	74	43	30.5	38.4	74
	CMP112M	45	32	136	113	68	49	46.2	103
	CMP112L	69	49	225	183	105	77	62.56	163
	CMP112H	83	57	270	220	123	84	70.43	193
	CMP112E	95	65	320	255	150	104	78.2	222

n_N	Motor	M_0	I_0	M_{pk}	I_{max}	M_{0VR}	I_{0VR}	m	J_{mot}
min^{-1}		Nm	A	Nm	A	Nm	A	kg	10^{-4} kgm²
4500	CMP40S	0.5	1.2	1.9	6.1	–	–	1.3	0.1
	CMP40M	0.8	0.95	3.8	6.0	–	–	1.6	0.15
	CMP50S	1.3	1.32	5.2	7.0	1.7	1.7	2.3	0.42
	CMP50M	2.4	2.3	10.3	13.1	3.5	3.35	3.3	0.67
	CMP50L	3.3	3.15	15.4	19.5	4.8	4.6	4.1	0.92
	CMP63S	2.9	3.05	11.1	18.3	4	4.2	4.0	1.15
	CMP63M	5.3	5.4	21.4	32.4	7.5	7.6	5.7	1.92
	CMP63L	7.1	6.9	30.4	41.4	10.3	10	7.5	2.69
	CMP71S	6.4	7.3	19.2	38	8.7	9.9	7	3.04
	CMP71M	9.4	10.9	30.8	57	13.7	15.9	8.4	4.08
	CMP71L	13.1	14.1	46.9	87	21	22.5	11.4	6.18
	CMP80S	13.4	15.3	42.1	73	18.5	21	12.8	8.78
	CMP80M	18.7	20.1	62.6	103	27	29	16.5	11.9
	CMP80L	27.5	27.8	107	159	44	44.5	21.4	18.1
	CMP100S	25.5	30	68.3	111	36	42.5	19.8	19.59
	CMP100M	31	33.1	108	154	47	50	24.8	26.49
	CMP100L	47	48.4	178.8	251	70	72	34.6	40.24
	CMP112S	30	31.5	88	112	43	45.5	38.4	74
	CMP112M	45	47	136	168	68	72	46.2	103
	CMP112L	69	73	225	275	107	114	62.56	163
	CMP112H	83	86	270	335	123	128	70.43	193
	CMP112E	95	98	320	385	150	156	78.2	222
6000	CMP40S	0.5	1.2	1.9	6.1	–	–	1.3	0.1
	CMP40M	0.8	1.1	3.8	6.9	–	–	1.6	0.15
	CMP50S	1.3	1.7	5.2	9.0	1.7	2.2	2.3	0.42
	CMP50M	2.4	3	10.3	17.1	3.5	4.4	3.3	0.67
	CMP50L	3.3	4.2	15.4	26	4.8	6.1	4.1	0.92
	CMP63S	2.9	3.9	11.1	23.4	4	5.4	4.0	1.15
	CMP63M	5.3	6.9	21.4	41.4	7.5	9.8	5.7	1.92
	CMP63L	7.1	9.3	30.4	55.8	10.3	13.5	7.5	2.69
	CMP71S	6.4	9.6	19.2	50	8.7	13.1	7	3.04
	CMP71M	9.4	14.7	30.8	76	13.7	21.5	8.4	4.08
	CMP71L	13.1	18.8	46.9	115	21	30	11.4	6.18
	CMP80S	13.4	20	42.1	95	18.5	27.5	12.8	8.78
	CMP80M	18.7	26.4	62.6	135	27	38	16.5	11.9
	CMP80L	27.5	37.6	107	215	44	60	21.4	18.1

3.5.6 Motor-inverter assignments CMP.. motors, PWM 4 kHz

Key

I_N	Nominal output current of the inverter
I_{max}	Maximum output current of inverter
M_{pk}	Peak torque of the motor
n_N	Nominal motor speed

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MOVIDRIVE® modular – rated speed 2000 min^{-1}, non-ventilated

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP71S	M_{pk}	Nm	9.34	15.7	19.2									
	n_N	min^{-1}	2000	2000	2000									
	I_{max}	%	250	250	214									
CMP71M	M_{pk}	Nm		17.6	27.4	30.8								
	n_N	min^{-1}		2000	2000	2000								
	I_{max}	%		250	250	219								
CMP71L	M_{pk}	Nm		20.2	36.1	43.9	46.9							
	n_N	min^{-1}		2000	2000	2000	2000							
	I_{max}	%		250	250	250	242							
CMP80S	M_{pk}	Nm			34	40.5	42.1							
	n_N	min^{-1}			2000	2000	2000							
	I_{max}	%			250	250	204							
CMP80M	M_{pk}	Nm			38.2	51.1	58.7	62.6						
	n_N	min^{-1}			2000	2000	2000	2000						
	I_{max}	%			250	250	250	197						
CMP80L	M_{pk}	Nm			42.6	61.3	77	98.7	107					
	n_N	min^{-1}			2000	2000	2000	2000	2000					
	I_{max}	%			250	250	250	250	225					
CMP100S	M_{pk}	Nm			37.6	52.2	62.2	68.3						
	n_N	min^{-1}			2000	2000	2000	2000						
	I_{max}	%			250	250	250	206						
CMP100M	M_{pk}	Nm				61.4	78	101	108					
	n_N	min^{-1}				2000	2000	2000	2000					
	I_{max}	%				250	250	250	215					
CMP100L	M_{pk}	Nm					85.1	121	148	179				
	n_N	min^{-1}					2000	2000	2000	2000				
	I_{max}	%					250	250	250	235				
CMP112S	M_{pk}	Nm				60.3	75.5	88						
	n_N	min^{-1}				2000	2000	2000						
	I_{max}	%				250	250	211						
CMP112M	M_{pk}	Nm				65.9	85.2	118	136					
	n_N	min^{-1}				2000	2000	2000	2000					
	I_{max}	%				250	250	250	231					
CMP112L	M_{pk}	Nm						126	161	219	225			
	n_N	min^{-1}						2000	2000	2000	2000			
	I_{max}	%						250	250	250	195			
CMP112H	M_{pk}	Nm						129	168	234	270			
	n_N	min^{-1}						2000	2000	2000	2000			
	I_{max}	%						250	250	250	232			
CMP112E	M_{pk}	Nm							170	241	299	320		
	n_N	min^{-1}							2000	2000	2000	2000		
	I_{max}	%							250	250	250	175		

MOVIDRIVE® modular – rated speed 3000 min^{-1}, non-ventilated

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP40S	M_{pk}	Nm	1.7	1.9										
	n_N	min^{-1}	3000	3000										
	I_{max}	%	250	151										
CMP40M	M_{pk}	Nm	3.44	3.8										
	n_N	min^{-1}	3000	3000										
	I_{max}	%	250	149										
CMP50S	M_{pk}	Nm	5.13	5.2										
	n_N	min^{-1}	3000	3000										
	I_{max}	%	250	128										
CMP50M	M_{pk}	Nm	6.54	10.3										
	n_N	min^{-1}	3000	3000										
	I_{max}	%	250	239										
CMP50L	M_{pk}	Nm	7.25	12.8	15.4									
	n_N	min^{-1}	3000	3000	3000									
	I_{max}	%	250	250	169									
CMP63S	M_{pk}	Nm	6.17	9.83	11.1									
	n_N	min^{-1}	3000	3000	3000									
	I_{max}	%	250	250	161									
CMP63M	M_{pk}	Nm		13.3	20.7	21.4								
	n_N	min^{-1}		3000	3000	3000								
	I_{max}	%		250	250	180								
CMP63L	M_{pk}	Nm		13.9	24.1	30.4								
	n_N	min^{-1}		3000	3000	3000								
	I_{max}	%		250	250	247								
CMP71S	M_{pk}	Nm		12.1	18.1	19.2								
	n_N	min^{-1}		3000	3000	3000								
	I_{max}	%		250	250	208								
CMP71M	M_{pk}	Nm			22	27.5	30.8							
	n_N	min^{-1}			3000	3000	3000							
	I_{max}	%			250	250	244							
CMP71L	M_{pk}	Nm			26.5	36.3	42.3	46.9						
	n_N	min^{-1}			3000	3000	3000	3000						
	I_{max}	%			250	250	250	240						
CMP80S	M_{pk}	Nm			25.8	34.6	39.2	42.1						
	n_N	min^{-1}			3000	3000	3000	3000						
	I_{max}	%			250	250	250	198						
CMP80M	M_{pk}	Nm				39.4	48.7	59.5	62.6					
	n_N	min^{-1}				3000	3000	3000	3000					
	I_{max}	%				250	250	250	214					
CMP80L	M_{pk}	Nm				42.6	55.4	77	92.8	107				
	n_N	min^{-1}				3000	3000	3000	3000	3000				
	I_{max}	%				250	250	250	250	225				
CMP100S	M_{pk}	Nm				38.2	48.5	62.7	68.3					
	n_N	min^{-1}				3000	3000	3000	3000					
	I_{max}	%				250	250	250	228					
CMP100M	M_{pk}	Nm					56	78.9	95.6	108				
	n_N	min^{-1}					3000	3000	3000	3000				
	I_{max}	%					250	250	250	212				

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP100L	M_{pk}	Nm						86	111	149	175	179		
	n_N	min^{-1}						3000	3000	3000	3000	3000		
	I_{max}	%						250	250	250	250	167		
CMP112S	M_{pk}	Nm					55.7	76.8	88					
	n_N	min^{-1}					3000	3000	3000					
	I_{max}	%					250	250	231					
CMP112M	M_{pk}	Nm						83.8	106	136				
	n_N	min^{-1}						3000	3000	3000				
	I_{max}	%						250	250	235				
CMP112L	M_{pk}	Nm							115	163	204	225		
	n_N	min^{-1}							3000	3000	3000	3000		
	I_{max}	%							250	250	250	184		
CMP112H	M_{pk}	Nm								169	216	270		
	n_N	min^{-1}								3000	3000	3000		
	I_{max}	%								250	250	220		
CMP112E	M_{pk}	Nm								173	223	313	320	
	n_N	min^{-1}								3000	3000	3000	3000	
	I_{max}	%								250	250	250	184	

MOVIDRIVE® modular – rated speed 4500 min^{-1}, non-ventilated

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP40S	M_{pk}	Nm	1.7	1.9										
	n_N	min^{-1}	4500	4500										
	I_{max}	%	250	151										
CMP40M	M_{pk}	Nm	3.44	3.8										
	n_N	min^{-1}	4500	4500										
	I_{max}	%	250	149										
CMP50S	M_{pk}	Nm	4.18	5.2										
	n_N	min^{-1}	4500	4500										
	I_{max}	%	250	177										
CMP50M	M_{pk}	Nm	5.03	8.75	10.3									
	n_N	min^{-1}	4500	4500	4500									
	I_{max}	%	250	250	163									
CMP50L	M_{pk}	Nm	5.17	9.61	15.4									
	n_N	min^{-1}	4500	4500	4500									
	I_{max}	%	250	250	244									
CMP63S	M_{pk}	Nm	4.66	7.96	11.1									
	n_N	min^{-1}	4500	4500	4500									
	I_{max}	%	250	250	228									
CMP63M	M_{pk}	Nm		9.57	16.4	20.7	21.4							
	n_N	min^{-1}		4500	4500	4500	4500							
	I_{max}	%		250	250	250	201							
CMP63L	M_{pk}	Nm		10.2	18.7	25.2	29.8	30.4						
	n_N	min^{-1}		4500	4500	4500	4500	4500						
	I_{max}	%		250	250	250	250	173						
CMP112S	M_{pk}	Nm						55.5	70.3	88				
	n_N	min^{-1}						4500	4500	4500				
	I_{max}	%						250	250	233				

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP112M	M_{pk}	Nm							76.5	107	132	136		
	n_N	min^{-1}							4500	4500	4500	4500		
	I_{max}	%							250	250	250	167		
CMP112L	M_{pk}	Nm								115	148	210	225	
	n_N	min^{-1}								4500	4500	4500	4500	
	I_{max}	%								250	250	250	198	
CMP112H	M_{pk}	Nm									150	220	270	
	n_N	min^{-1}									4500	4500	4500	
	I_{max}	%									250	250	239	
CMP112E	M_{pk}	Nm									155	231	298	320
	n_N	min^{-1}									4500	4500	4500	4500
	I_{max}	%									250	250	250	214

3.5.7 Motor-inverter assignments CMP.. motors, PWM 8 kHz

Key

I_N	Nominal output current of the inverter
I_{max}	Maximum output current of inverter
M_{pk}	Peak torque of the motor
n_N	Nominal motor speed

MOVIDRIVE® modular – rated speed 2000 min^{-1}, PWM 8 kHz, non-ventilated

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP71S	M_{pk}	Nm	9.34	15.7	19.2									
	n_N	min^{-1}	2000	2000	2000									
	I_{max}	%	250	250	214									
CMP71M	M_{pk}	Nm		17.6	27.4	30.8								
	n_N	min^{-1}		2000	2000	2000								
	I_{max}	%		250	250	219								
CMP71L	M_{pk}	Nm		20.2	36.1	43.9	46.9							
	n_N	min^{-1}		2000	2000	2000	2000							
	I_{max}	%		250	250	250	242							
CMP80S	M_{pk}	Nm			34	40.5	42.1							
	n_N	min^{-1}			2000	2000	2000							
	I_{max}	%			250	250	204							
CMP80M	M_{pk}	Nm			38.2	51.1	58.7	62.6						
	n_N	min^{-1}			2000	2000	2000	2000						
	I_{max}	%			250	250	250	197						
CMP80L	M_{pk}	Nm			42.6	61.3	77	98.7	107					
	n_N	min^{-1}			2000	2000	2000	2000	2000					
	I_{max}	%			250	250	250	250	225					
CMP100S	M_{pk}	Nm			37.6	52.2	62.2	68.3						
	n_N	min^{-1}			2000	2000	2000	2000						
	I_{max}	%			250	250	250	206						

Inverter			**0020**	**0040**	**0080**	**0120**	**0160**	**0240**	**0320**	**0480**	**0640**	**1000**	**1400**	**1800**
	I_N	**A**	**2**	**4**	**8**	**12**	**16**	**24**	**32**	**48**	**64**	**100**	**140**	**180**
	I_{max}	**A**	**5**	**10**	**20**	**30**	**40**	**60**	**80**	**120**	**160**	**250**	**350**	**450**
Motor														
CMP100M	M_{pk}	Nm				61.4	78	101	108					
	n_N	min^{-1}				2000	2000	2000	2000					
	I_{max}	%				250	250	250	215					
CMP100L	M_{pk}	Nm					85.1	121	148	179				
	n_N	min^{-1}					2000	2000	2000	2000				
	I_{max}	%					250	250	250	235				
CMP112S	M_{pk}	Nm				60.3	75.5	88						
	n_N	min^{-1}				2000	2000	2000						
	I_{max}	%				250	250	211						
CMP112M	M_{pk}	Nm				65.9	85.2	118	136					
	n_N	min^{-1}				2000	2000	2000	2000					
	I_{max}	%				250	250	250	231					
CMP112L	M_{pk}	Nm						126	161	219	225			
	n_N	min^{-1}						2000	2000	2000	2000			
	I_{max}	%						250	250	250	195			
CMP112H	M_{pk}	Nm						129	168	234	270			
	n_N	min^{-1}						2000	2000	2000	2000			
	I_{max}	%						250	250	250	232			
CMP112E	M_{pk}	Nm							170	241	299	320		
	n_N	min^{-1}							2000	2000	2000	2000		
	I_{max}	%							250	250	250	175		

MOVIDRIVE® modular – rated speed 3000 min^{-1}, PWM 8 kHz, non-ventilated

Inverter			**0020**	**0040**	**0080**	**0120**	**0160**	**0240**	**0320**	**0480**	**0640**	**1000**	**1400**	**1800**
	I_N	**A**	**2**	**4**	**8**	**12**	**16**	**24**	**32**	**48**	**64**	**100**	**140**	**180**
	I_{max}	**A**	**5**	**10**	**20**	**30**	**40**	**60**	**80**	**120**	**160**	**250**	**350**	**450**
Motor														
CMP40S	M_{pk}	Nm	1.7	1.9										
	n_N	min^{-1}	3000	3000										
	I_{max}	%	250	151										
CMP40M	M_{pk}	Nm	3.44	3.8										
	n_N	min^{-1}	3000	3000										
	I_{max}	%	250	149										
CMP50S	M_{pk}	Nm	5.13	5.2										
	n_N	min^{-1}	3000	3000										
	I_{max}	%	250	128										
CMP50M	M_{pk}	Nm	6.54	10.3										
	n_N	min^{-1}	3000	3000										
	I_{max}	%	250	239										
CMP50L	M_{pk}	Nm	7.25	12.8	15.4									
	n_N	min^{-1}	3000	3000	3000									
	I_{max}	%	250	250	169									
CMP63S	M_{pk}	Nm	6.17	9.83	11.1									
	n_N	min^{-1}	3000	3000	3000									
	I_{max}	%	250	250	161									
CMP63M	M_{pk}	Nm		13.3	20.7	21.4								
	n_N	min^{-1}		3000	3000	3000								
	I_{max}	%		250	250	180								
CMP63L	M_{pk}	Nm		13.9	24.1	30.4								
	n_N	min^{-1}		3000	3000	3000								
	I_{max}	%		250	250	247								

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP71S	M_{pk}	Nm		12.1	18.1	19.2								
	n_N	min^{-1}		3000	3000	3000								
	I_{max}	%		250	250	208								
CMP71M	M_{pk}	Nm			22	27.5	30.8							
	n_N	min^{-1}			3000	3000	3000							
	I_{max}	%			250	250	244							
CMP71L	M_{pk}	Nm			26.5	36.3	42.3	46.9						
	n_N	min^{-1}			3000	3000	3000	3000						
	I_{max}	%			250	250	250	240						
CMP80S	M_{pk}	Nm			25.8	34.6	39.2	42.1						
	n_N	min^{-1}			3000	3000	3000	3000						
	I_{max}	%			250	250	250	198						
CMP80M	M_{pk}	Nm				39.4	48.7	59.5	62.6					
	n_N	min^{-1}				3000	3000	3000	3000					
	I_{max}	%				250	250	250	214					
CMP80L	M_{pk}	Nm				42.6	55.4	77	92.8	107				
	n_N	min^{-1}				3000	3000	3000	3000	3000				
	I_{max}	%				250	250	250	250	225				
CMP100S	M_{pk}	Nm				38.2	48.5	62.7	68.3					
	n_N	min^{-1}				3000	3000	3000	3000					
	I_{max}	%				250	250	250	228					
CMP100M	M_{pk}	Nm					56	78.9	95.6	108				
	n_N	min^{-1}					3000	3000	3000	3000				
	I_{max}	%					250	250	250	212				
CMP100L	M_{pk}	Nm						86	111	149	175	179		
	n_N	min^{-1}						3000	3000	3000	3000	3000		
	I_{max}	%						250	250	250	250	167		
CMP112S	M_{pk}	Nm					55.7	76.8	88					
	n_N	min^{-1}					3000	3000	3000					
	I_{max}	%					250	250	231					
CMP112M	M_{pk}	Nm						83.8	106	136				
	n_N	min^{-1}						3000	3000	3000				
	I_{max}	%						250	250	235				
CMP112L	M_{pk}	Nm							115	163	204	225		
	n_N	min^{-1}							3000	3000	3000	3000		
	I_{max}	%							250	250	250	184		
CMP112H	M_{pk}	Nm								169	216	270		
	n_N	min^{-1}								3000	3000	3000		
	I_{max}	%								250	250	220		
CMP112E	M_{pk}	Nm								173	223	313	320	
	n_N	min^{-1}								3000	3000	3000	3000	
	I_{max}	%								250	250	250	184	

MOVIDRIVE® modular – rated speed 4500 min^{-1}, PWM 8 kHz, non-ventilated

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP40S	M_{pk}	Nm	1.7	1.9										
	n_N	min^{-1}	4500	4500										
	I_{max}	%	250	151										

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Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP40M	M_{pk}	Nm	3.44	3.8										
	n_N	min^{-1}	4500	4500										
	I_{max}	%	250	149										
CMP50S	M_{pk}	Nm	4.18	5.2										
	n_N	min^{-1}	4500	4500										
	I_{max}	%	250	177										
CMP50M	M_{pk}	Nm	5.03	8.75	10.3									
	n_N	min^{-1}	4500	4500	4500									
	I_{max}	%	250	250	163									
CMP50L	M_{pk}	Nm	5.17	9.61	15.4									
	n_N	min^{-1}	4500	4500	4500									
	I_{max}	%	250	250	244									
CMP63S	M_{pk}	Nm	4.66	7.96	11.1									
	n_N	min^{-1}	4500	4500	4500									
	I_{max}	%	250	250	228									
CMP63M	M_{pk}	Nm		9.57	16.4	20.7	21.4							
	n_N	min^{-1}		4500	4500	4500	4500							
	I_{max}	%		250	250	250	201							
CMP63L	M_{pk}	Nm		10.2	18.7	25.2	29.8	30.4						
	n_N	min^{-1}		4500	4500	4500	4500	4500						
	I_{max}	%		250	250	250	250	173						
CMP71S	M_{pk}	Nm			14.9	18.1	19.2							
	n_N	min^{-1}			4500	4500	4500							
	I_{max}	%			250	250	233							
CMP71M	M_{pk}	Nm			16.4	22.4	26.4	30.8						
	n_N	min^{-1}			4500	4500	4500	4500						
	I_{max}	%			250	250	250	238						
CMP71L	M_{pk}	Nm				26.5	33.5	42.3	45.9	46.9				
	n_N	min^{-1}				4500	4500	4500	4500	4500				
	I_{max}	%				250	250	250	250	180				
CMP80S	M_{pk}	Nm				25.3	31.7	38.9	42.1					
	n_N	min^{-1}				4500	4500	4500	4500					
	I_{max}	%				250	250	250	227					
CMP80M	M_{pk}	Nm					35.7	48.7	56.8	62.6				
	n_N	min^{-1}					4500	4500	4500	4500				
	I_{max}	%					250	250	250	214				
CMP80L	M_{pk}	Nm						56	71.1	93.4	107			
	n_N	min^{-1}						4500	4500	4500	4500			
	I_{max}	%						250	250	250	250			
CMP100S	M_{pk}	Nm						47.9	58.3	68.3				
	n_N	min^{-1}						4500	4500	4500				
	I_{max}	%						250	250	231				
CMP100M	M_{pk}	Nm						55.4	71.2	95	108			
	n_N	min^{-1}						4500	4500	4500	4500			
	I_{max}	%						250	250	250	241			
CMP100L	M_{pk}	Nm							77.1	111	138	179	179	
	n_N	min^{-1}							4500	4500	4500	4500	4500	
	I_{max}	%							250	250	250	250	179	
CMP112S	M_{pk}	Nm						55.5	70.3	88				
	n_N	min^{-1}						4500	4500	4500				
	I_{max}	%						250	250	233				

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP112M	M_{pk}	Nm							76.5	107	132	136		
	n_N	min^{-1}							4500	4500	4500	4500		
	I_{max}	%							250	250	250	167		
CMP112L	M_{pk}	Nm								115	148	210	225	
	n_N	min^{-1}								4500	4500	4500	4500	
	I_{max}	%								250	250	250	198	
CMP112H	M_{pk}	Nm									150	220	270	
	n_N	min^{-1}									4500	4500	4500	
	I_{max}	%									250	250	239	
CMP112E	M_{pk}	Nm									155	231	298	320
	n_N	min^{-1}									4500	4500	4500	4500
	I_{max}	%									250	250	250	214

MOVIDRIVE® modular – rated speed 6000 min^{-1}, PWM 8 kHz, non-ventilated

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP40S	M_{pk}	Nm	1.7	1.9										
	n_N	min^{-1}	6000	6000										
	I_{max}	%	250	151										
CMP40M	M_{pk}	Nm	3.12	3.8										
	n_N	min^{-1}	6000	6000										
	I_{max}	%	250	173										
CMP50S	M_{pk}	Nm	3.46	5.2										
	n_N	min^{-1}	6000	6000										
	I_{max}	%	250	228										
CMP50M	M_{pk}	Nm	3.94	7.16	10.3									
	n_N	min^{-1}	6000	6000	6000									
	I_{max}	%	250	250	214									
CMP50L	M_{pk}	Nm		7.5	13.1	15.4								
	n_N	min^{-1}		6000	6000	6000								
	I_{max}	%		250	250	217								
CMP63S	M_{pk}	Nm		6.68	10.4	11.1								
	n_N	min^{-1}		6000	6000	6000								
	I_{max}	%		250	250	194								
CMP63M	M_{pk}	Nm		7.67	13.7	18	21	21.4						
	n_N	min^{-1}		6000	6000	6000	6000	6000						
	I_{max}	%		250	250	250	250	173						
CMP63L	M_{pk}	Nm			14.6	20.4	25.1	30.4						
	n_N	min^{-1}			6000	6000	6000	6000						
	I_{max}	%			250	250	250	233						
CMP71S	M_{pk}	Nm			12.3	16.1	18.2	19.2						
	n_N	min^{-1}			6000	6000	6000	6000						
	I_{max}	%			250	250	250	203						
CMP71M	M_{pk}	Nm				18	22.3	27.7	30.8					
	n_N	min^{-1}				6000	6000	6000	6000					
	I_{max}	%				250	250	250	239					
CMP71L	M_{pk}	Nm				20.4	26.5	36.3	42.3	46.9				
	n_N	min^{-1}				6000	6000	6000	6000	6000				
	I_{max}	%				250	250	250	250	240				

Inverter			0020	0040	0080	0120	0160	0240	0320	0480	0640	1000	1400	1800
	I_N	A	2	4	8	12	16	24	32	48	64	100	140	180
	I_{max}	A	5	10	20	30	40	60	80	120	160	250	350	450
Motor														
CMP80S	M_{pk}	Nm					25.8	34.6	39.2	42.1				
	n_N	min^{-1}					6000	6000	6000	6000				
	I_{max}	%					250	250	250	198				
CMP80M	M_{pk}	Nm					28	39.9	49.2	59.9	62.6			
	n_N	min^{-1}					6000	6000	6000	6000	6000			
	I_{max}	%					250	250	250	250	210			
CMP80L	M_{pk}	Nm						42.6	55.4	77	92.8	107		
	n_N	min^{-1}						6000	6000	6000	6000	6000		
	I_{max}	%						250	250	250	250	216		

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3.6 Selecting an axis module

INFORMATION

Always use the SEW-Workbench for selecting MOVIDRIVE® modular components. The following explanations are not exhaustive and are only intended for conveying a basic understanding.

The selection of the axis module is made over the course of the output current over time. The required current has to be determined from the required torque characteristic of the connected motor.

- The axis modules are dimensioned for a nominal output current of 100% I_N.
- In many applications, there is a demand for short-time overload operation. For this purpose, the axis modules can be operated with up to 250% I_N for a short period of time.

For overload operation, make sure that the axis module is not thermally overloaded.

For protecting the power components, the axis modules have several monitoring mechanisms such as dynamic utilization, thermal utilization, electromechanical utilization (I^2t utilization).

Due to the complexity of the utilization curves, the calculation can only be performed using software. The SEW Workbench software offers supports for dimensioning an axis module.

For a rough selection of the axis module without using software, characteristic load cycles are given in the following section. For other load cycles, the device utilization can only be determined using SEW-Workbench.

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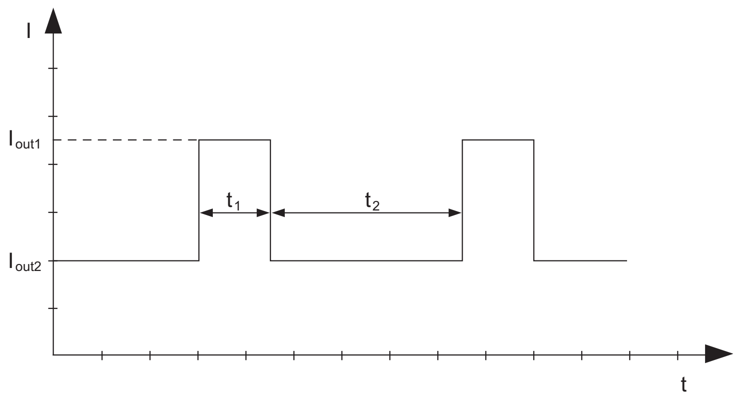
3.6.1 Overload capacity

Load cycle with base load current – typical for the selection of asynchronous and servomotors

The characteristic load cycle consists of a load and a load relief period. In the load relief period, the output current must not exceed the specified value. After this load relief period, overload is possible again.



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Examples of permitted current profiles

Overload capacity at PWM = 4 kHz, f_{out} ≥ 3 Hz

Overload current $I_{out\,1}/I_N$ for the duration t_1	Overload time t_1	Base load current $I_{out\,2}/I_N$ for the duration t_2	Base load time t_2
250%	1 s	50%	9 s
200%	3 s	50%	17 s
150%	30 s	50%	90 s

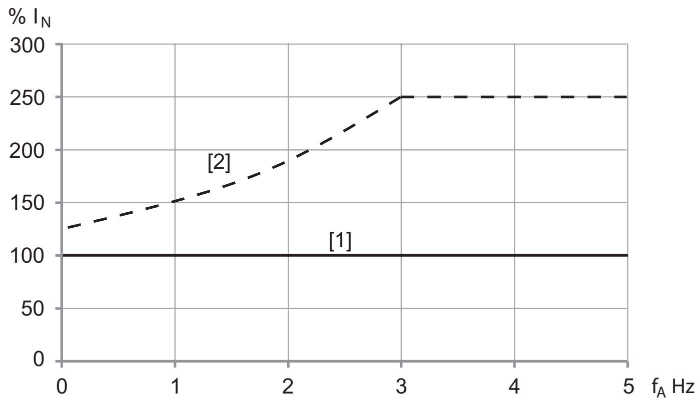
3.6.2 Derating

Due to the following operating and ambient conditions, a reduction of the output current may be necessary.

Derating due to the rotary field frequency

The specified nominal output current I_N of the application inverter is the rms value. The increased load on the power semiconductors has to be considered especially for slow rotating fields and rotating fields at standstill. In case of a rotating field at standstill, direct current that can correspond to the peak value of the sine current depending on the phase position is flowing.

This consideration is particularly important for output frequencies f_A < 3 Hz (e.g. for small speeds or standstill).



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[1] Continuous output current with PWM = 4 kHz

[2] Temporary overload current for 1 s

Derating due to the installation altitude

SEW-EURODRIVE frequency inverters are designed for overvoltage category III and for altitudes up to 2000 m according to EN 61800-5-1. The air pressure and the air density decrease depending on the installation altitude. This leads to a reduced cooling capacity and to a reduced electrical isolation effect of the air.

Installation altitude	Restrictions
Up to 1000 m	None
1001 to 3800 m	Nominal output current I_N reduction by 1% per 100 m.
Additionally: 2000 to 3800 m	To maintain protective separation and the air gaps and creepage distances according to EN 61800-5-1, you have to connect an overvoltage protection device in order to reduce the overvoltages from category III to category II.

Derating due to the line voltage

Switching losses in the power semiconductors rise with increasing line voltage and increasing PWM. Observe the following derating characteristic values:

<table>
<tr><th>Line voltage V_{line}</th><th>PWM</th><th>$I_{duration}$ /I_N</th></tr>
<tr><td rowspan="6">400 V</td><td>4 kHz</td><td>100%</td></tr>
<tr><td>8 kHz</td><td>75%</td></tr>
<tr><td rowspan="4">16 kHz</td><td>50%</td></tr>
<tr><td>45% for MDA90A-0480-..</td></tr>
<tr><td>40% for MDA90A-0640-..</td></tr>
<tr><td>40% for MDA90A-1000-..</td></tr>
<tr><td rowspan="6">500 V</td><td>4 kHz</td><td>92%</td></tr>
<tr><td>8 kHz</td><td>65%</td></tr>
<tr><td rowspan="4">16 kHz</td><td>43%</td></tr>
<tr><td>39% for MDA90A-0480-..</td></tr>
<tr><td>32% for MDA90A-0640-..</td></tr>
<tr><td>32% for MDA90A-1000-..</td></tr>
</table>

3.7 Power supply module selection

INFORMATION

Always use the SEW Workbench for selecting MOVIDRIVE® modular components. The following explanations are not exhaustive and are only intended for conveying a basic understanding.

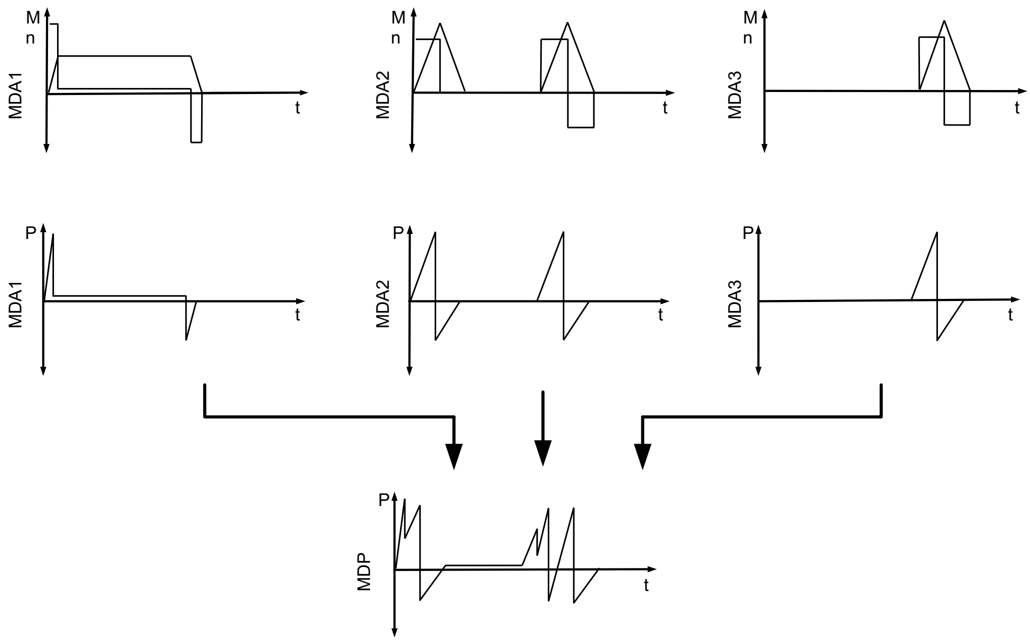
The selection of the power supply module is made over the power curve of the DC link over time. The power curve results from the overlaying travel profiles of all connected axis modules.

- The power supply modules are dimensioned for a nominal power of 100% P_N.
- In many applications, there is a demand for short-time overload operation. For this purpose, the power supply modules can be operated with up to 250% P_N for a short period of time.

For overload operation, make sure that the power supply module is not thermally overloaded.

3.7.1 Power curve of the DC link

- The total power (DC link power) is the result of the overlapping cycles of the individual axis modules.
- Changing the assignment of cycles with respect to time strongly influences the motor and regenerative load of the power supply module.
- If no time reference can be made, it is necessary to take a worst-case scenario into account.



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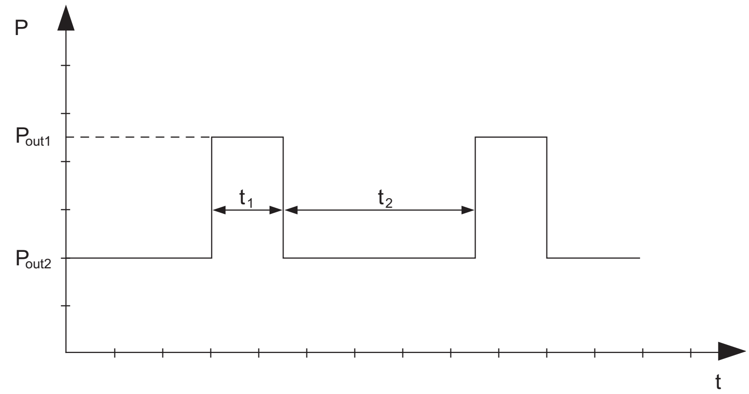
Due to the complexity of the utilization curves, the calculation can only be performed using software. The SEW-Workbench software offers supports for dimensioning a power supply module.

For a rough selection of the power supply module without using software, characteristic load cycles are given in the following section.

3.7.2 Overload capacity

Load cycle with base load

The characteristic load cycle consists of a load and a load relief period. In the load relief period, the DC link power must not exceed the specified value. After this load relief period, overload is possible again.



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Examples of permitted power profiles:

Overload P_{out1}/P_N for the duration t_1	Overload time t_1	Base load P_{out2}/P_N for the duration t_2	Base load time t_1
250%	1 s	50%	9 s
200%	3 s	50%	17 s
150%	30 s	50%	90 s

3.7.3 Sum of the nominal DC link current of the connected axis modules

The power supply module has to provide the charging current of the DC link capacities of the connected axis modules.

To limit the inrush current, a line choke has to be used for a certain number of axis modules and a combination of axis and power supply module.

The total sum of all nominal DC link currents of the axis modules must not exceed three times the nominal DC link current (300% I_{NDC}) of the supply module.

INFORMATION

If the supply system conditions are uncertain, e.g. in case of high harmonic content, SEW-EURODRIVE recommends using a line choke.

MDP90A-0100-503-4.-. (10 kW)

Depending on whether a line choke is used or not, only a certain number of points may be connected to the 10 kW power supply module, according to a points system.

Line choke	Sum of the nominal DC link currents of the axis modules	Maximum permitted points
No	300%	8
Yes	300%	not relevant

Operation without line choke

Depending on the output current, a certain number of points is assigned to the MDA and MDD axis modules. The following table shows the assigned number of points per drive inverter.

Axis module	Point(s)
MDA90A-0020, 0040, 0080, 0120	1
MDA90A-0160 – 0240	2
MDD90A-0020, 0040, 0080	1

Example calculation for operation without line choke.

Axis module	Current	Points
• 4 × MDA 2 A • 4 × MDA 8 A	• 4 × 2 A • 4 × 8 A	• 4 × 1 = 4 points • 4 × 1 = 4 points
Total: Maximum permitted:	40 A 300% I_{DCL} MDP 10 kW = 63 A	8 points MDP 10 kW = 8 points

The sum of the nominal DC link current of the connected axis modules does not exceed 300% of the nominal DC link current of the power supply module. The maximum number of evaluation points is not exceeded; the combination is permitted.

Operation with line choke

If a line choke is used, the points system must not be observed.

MDP90A-0250-503-4-.. and larger

Irrespective of whether a line choke is used or not, project planning on three times the DC link current is carried out.

The points system needs not be observed.

3.7.4 Assignment of the maximum axis size to the power supply module

The assignment of the maximum axis module size to the power supply modules is as follows:

- MDP90A-0100-…: MDA90A-0240
- MDP90A-0250-…: MDA90A-0640
- MDP90A-0500-...: MDA90A-1000
- MDP90A-0750-...: MDA90A-1400
- MDP90A-1100-...: MDA90A-1800

Double-axis modules can be combined with all power supply modules.

3.7.5 Maximum number of axis modules and total cable length

In one axis system, up to 15 axis modules can be used, both as single-axis modules and double-axis modules.

Depending on the used line filter, the number of output stages and the combined cable length in the axis block are limited in order to achieve interference emission category C2, see chapter "EMC-compliant installation according to EN 61800-3" (→ 🗎 146).

3.7.6 Current-carrying capacity of the integrated braking resistor for MDP90-..-C00

The MDP90A-...-C00 power supply module (size 1A) has an integrated braking resistor and is capable of converting an effective regenerative power of 220 W. The continuously processed regenerative peak energies depend on 2 operating conditions. During dimensioning observe the following operating conditions.

Operating condition 1 – Operation under constant load

The internal braking resistor can absorb peak energy pulses of 11 kJ. There are no restrictions in terms of delay or wait times after power on or off.

Operating condition 2 – Operation under maximum load

After the DC 24 V supply is switched on (also after the device is switched on after an operating pause) a general waiting time of 2 minutes applies. After this time peak energy pulses of 25 kJ can be absorbed. In case the DC 24 V supply is interrupted during the 2 minutes, the waiting time of 2 minutes after switch-on applies again.

The connection frequency regulations apply to the restart sequence of the DC 24 V supply.

3.8 Braking resistor selection

3.8.1 General Information

MDP90A-0100-../0250-../1100-.. power supply modules

Using a braking resistor is only required if generator mode is reached during operation. A braking resistor is not required if the device is operated solely in motor mode.

MDP90A-0500-../0750-.. power supply modules

It is not permitted to operate a power supply module without a braking resistor. A braking resistor must also be connected to applications without regenerative parts.

3.8.2 Table of braking resistors

The following braking resistors are intended for use with MOVIDRIVE® modular. The technical data is valid in the temperature range -20 °C to +40 °C.

For ambient temperatures of more than +40°C, the continuous power must be reduced by 4% for every 10 K. The tripping current must be reduced by 2% for every 10 K. Do not exceed a maximum ambient temperature of 80 °C.

Braking resistor	Part number	Resistance	Continuous power	Peak power	Tripping current
		Ω	kW	kW	A
BW047-002	08281661	47	0.2	14	1.6
BW047-010-T	17983207	47	1	14	4.6
BW027-016-T	17983215	27	1.6	25	7.7
BW027-024-T	17983231	27	2.4	25	9.4
BW012-016	18213243	12	1.6	56	12
BW012-024	17983894	12	2.4	56	14.1
BW012-050-T	18201407	12	5	56	20
BW106-T	18200834	6	13.5	112	47
BW206-T	18204120	6	18	112	55
BW005-070	17983282	4.7	7	143	39
BW004-050-01	18200133	3.6	5	187	33
BW003-420-T	13302345	2.5	42	269	135
BW002-070	17983304	2.3	7	292	55

3.8.3 Selection criteria

The selection of the braking resistor takes place via the SEW Workbench. The necessary selection parameters for the braking resistor are calculated during the project planning procedure. Depending on these selection parameters, a braking resistor is selected from the table.

The following selection parameters are the basis for selecting the braking resistor.

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3.8.4 Continuous braking power

The continuous braking power is specified by the mechanical structure of the braking resistor.

The continuous braking power required by the application must be lower than the continuous braking power of the braking resistor according to the technical data.

3.8.5 Peak braking power

The permitted peak braking power is specified by the resistor and the DC link voltage.

The peak braking power required by the application results from the maximum of individual regenerative parts within a cycle.

The peak braking power required by the application must be lower than the permitted peak braking power of the braking resistor.

The permitted peak braking power of the braking resistor is calculated as follows:

$$P_{\text{max}} = \frac{U_{ZK\ max}^2}{R \times 1.4}$$

P_{max}	Maximum peak braking power that the braking resistor can absorb
$U_{DC\ max}$	Maximum DC link voltage for MOVIDRIVE® modular: DC 970 V
R	Braking resistance value

The peak braking power for each braking resistor is listed in the table.

3.8.6 Current-carrying capacity of the brake chopper

The ohmic resistance of the braking resistor must not be smaller than the minimum permitted braking resistor according to the technical data of the power supply module. This ensures that the brake chopper is not damaged.

The continuous braking power must not exceed 25% of the nominal power of the power supply module.

3.8.7 Permitted installation of braking resistors

The surfaces of the resistors get very hot if loaded with nominal power. Make sure that you select an installation site that will accommodate these high temperatures. For this reason, braking resistors are usually mounted on top of the control cabinet.

NOTICE

Braking resistors can overheat.

Non-permissible installation might lead to an accumulation of heat in the braking resistor due to reduced convection. A tripping temperature contact or an overheated braking resistor can lead to a system standstill.

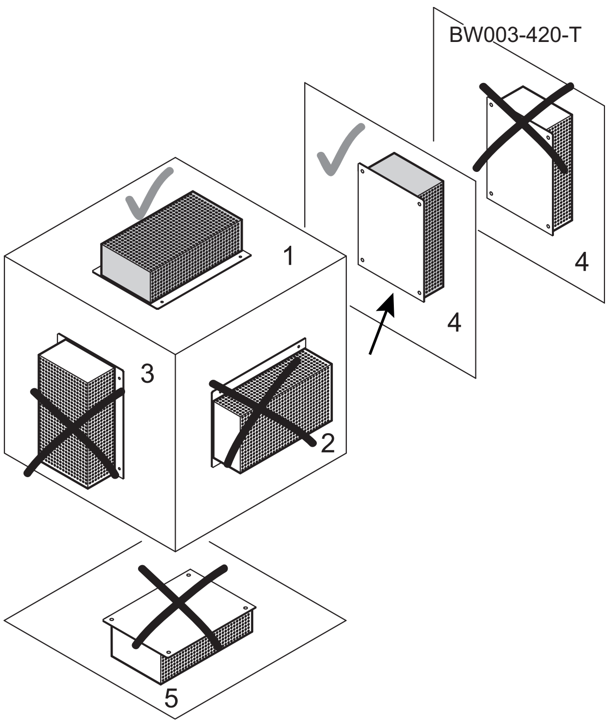
Adhere to the following minimum clearances:

- 200 mm to adjacent components and walls

- 300 mm to above components/ceilings

Observe the following permitted mounting positions when installing the resistors:

- Grid resistor



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The arrow marks the connection side.

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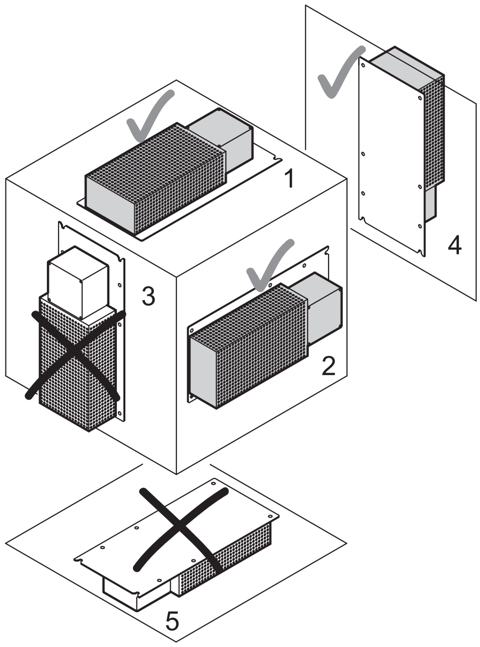
- Wire resistor



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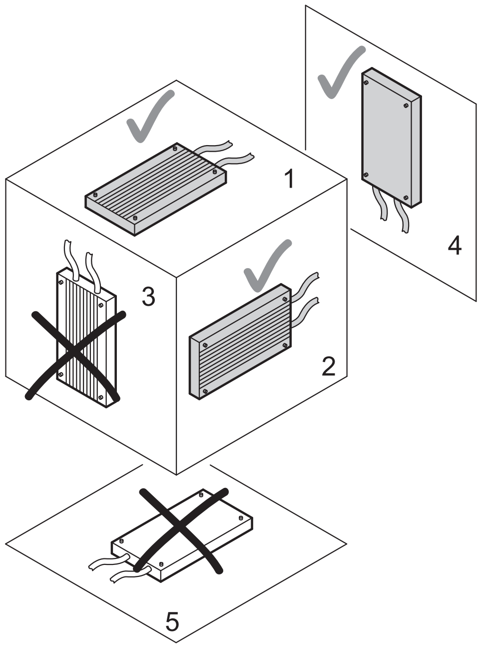
- Flat type resistor



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3.8.8 Supply cable for braking resistor

Use only shielded cables.

The cable cross section depends on the tripping current I_F.

The rated voltage of the cable must amount to at least V_0/V = 300 V / 500 V.

The maximum permitted cable length between application inverter and braking resistor is 100 m.

3.8.9 Protection against thermal overload of the braking resistor

To avoid thermal damage of the braking resistor as well as subsequent damage, the braking resistor has to be thermally monitored. SEW-EURODRIVE suggests the following options:

- TCB thermal circuit breaker

  The TCB thermal circuit breaker is installed in the control cabinet, connected to the supply cable to the braking resistor and set to the tripping current of the braking resistor. If the measured mean current exceeds the tripping current, an NC contact switches and reports overload of the braking resistor. Simultaneously the connection of braking resistor and inverter is separated, thus ending the generator mode.
- Integrated temperature switch –T

  Braking resistors with the label –T are equipped with an integrated temperature switch. The temperature switch is thermally coupled to the braking resistor and switches an NC contact in case of overtemperature of the braking resistor. The braking resistor-inverter connection is not interrupted. In case of thermal overload, the regenerative operation has to be terminated. SEW-EURODRIVE recommends to shield the connection cable of the temperature switch.
- Thermal overload relay

  A thermal overload relay is installed in the control cabinet, connected to the supply cable to the braking resistor and set to the tripping current of the braking resistor. If the measured mean current exceeds the tripping current, an NC contact switches and reports overload of the braking resistor. The braking resistor-inverter connection is not interrupted. In case of thermal overload, the regenerative operation has to be terminated.

For wiring diagrams regarding the matters described above, refer to chapter "Protection against thermal overload of the braking resistor" (→ 🗎 305).

3.9 Supply system cable and motor cable

3.9.1 Supply system cable

Dimensioning of the supply system cable generally takes place plant-specific and depends on the design of the line connection. Observe the country-specific and plant-specific regulations when selecting the cross section of the supply system cable.

Recommended cross section for nominal operation

The cross section of the supply system cable has to be dimensioned based on the nominal line current I_N of the power supply module MDP at nominal load P_N.

SEW-EURODRIVE suggests the cable cross sections listed in the table. The suggestions are valid under the following conditions:

- The single-core cables are made of copper with PVC insulation.
- The cables are routed according to IEC 60204-1 installation type C at 40 °C ambient temperature.

Power supply module MDP90A-…-503	**0100**	**0250**	**0500**	**0750**	**1100**
Nominal power P_N	10 kW	25 kW	50 kW	75 kW	110 kW
Nominal line current AC I_{line}	16 A	40 A	80 A	120 A	175 A
Supply system cable L1/L2/L3	2.5 mm^2	10 mm^2	35 mm^2	70 mm^2	95 mm^2
Fuse/miniature circuit breaker	20 A	50 A	100 A	160 A	200 A

INFORMATION

If required, observe the notes in chapter "UL-compliant installation".

INFORMATION

Securing the supply system cable

Secure the supply system cable with appropriate safety elements.

When selecting the supply system cable, make sure that the selected cross section is in the range of the connectable cross section of the terminals.

3.9.2 Motor cable

Cable length

The motor cable length and the total length of all motor cables must not exceed a maximum length for the MOVIDRIVE® modular application inverter.

The following project planning guidelines must be observed:

- Irrespective of the PWM frequency, the permitted length of a motor cables in the axis system is:
  - Maximum 100 m.
  - Direct brake control: maximum 25 m.
- An increased combined cable length is permitted if only motor cables with low conductor/shield capacitance are used. Motor cables with low conductor/shield capacitance have the following characteristic values:

Cable cross section in mm²	Maximum capacitance in pF/m
≤ 2.5	150
≤ 16	300
> 16	No special requirements

- The total sum of the motor cable length in the axis block to the assigned filters is:

Power supply module	Line filter	Maximum number		Total cable length	
		Axis modules (MDA/MDD)	Axes[1] (output stages)	Cable from SEW-EURODRIVE	Cables from other manufacturers
MDP90A-0100-...	NF0420-513	15	16	600 m	400 m
MDP90A-0250-...					
MDP90A-0100-...	NF0420-523	15	30	800 m	400 m
MDP90A-0250-...					

1) A double-axis module is rated as 2 single-axis modules.

Cables from SEW-EURODRIVE: Motor cables with low capacitance.

Cables from other manufacturers: Motor cables with standard capacitance.

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Recommended cross section for nominal operation

SEW-EURODRIVE suggests the cable cross sections listed in the table. The suggestions are valid under the following conditions:

- The single-core cables are made of copper with PVC insulation.
- The cables are routed according to IEC 60204-1 installation type C at 40 °C ambient temperature.

Axis module **MDA90A-…-503** **MDD90A-...-503**	**0020**	**0040**	**0080**	**0120**	**0160**	**0240**	**0320**	**0480**	**0640**	**1000**	**1400**	**1800**
Nominal output current I_N in A	2	4	8	12	16	24	32	48	64	100	140	180
Motor cable U/V/W in mm^2	1.5	1.5	1.5	1.5	2.5	4	6	10	16	35	70	95

INFORMATION

The values in the table are only recommendations. They are no substitute for the detailed project planning of the cables depending on the concrete application considering the applicable regulations. Observe the voltage drop that occurs along the cable in particular with the DC 24 V brake coil when dimensioning the cross sections for the brake cable. Observe the project planning notes in the motor catalog and the requirements in chapter "24 V supply voltage selection" (→ 🗎 151).

Voltage drop

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

3.10 Signal lines

3.10.1 Encoder cables

Connection/Encoder	Cable length
HTL encoder ES7C and EG7C	300 m
Standard HTL encoder	200 m
Other encoders	100 m

3.10.2 Digital inputs/outputs and DC 24 V supply

The maximum cable length of connections on the inputs and outputs is 30 m.

3.11 EMC-compliant installation according to EN 61800-3

MOVIDRIVE® application inverters are designed for use as components for installation in machinery and systems. They comply with the EMC product standard EN 61800-3 "Variable-speed electrical drives".

Provided the EMC-compliant installation is observed, the appropriate requirements for a CE marking are met on the basis of the EMC Directive 2014/30/EU.

3.11.1 Interference emission

To comply with limit classes C2 according to EN 61800-3, the measures listed in the tables must be taken.

Depending on the used line filter, the number of output stages and the combined cable length in the axis block are limited in order to achieve interference emission category C2, see the following table.

Power supply module	Line filter	Maximum number		Total cable length	
		Axis modules (MDA/MDD)	Axes[1] (output stages)	Cable from SEW-EURODRIVE	Cables from other manufacturers
MDP90A-0100-...	NF0420-513	15	16	600 m	400 m
MDP90A-0250-...					
MDP90A-0100-...	NF0420-523	15	30	800 m	400 m
MDP90A-0250-...					
MDP90A-0750-..	NF0910-523	15	30	800 m	400 m
MDP90A-1100-..	NF1800-523	15	30	800 m	400 m

1) A double-axis module is rated as 2 single-axis modules.

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3.12 Line components

3.12.1 Line fuses, fuse types

Line fuses and miniature circuit breakers are used for fusing the supply system cables of the axis block. In case of a fault, these components protect the power supply module against short-circuits. For fusing, use fuses and miniature circuit breakers with the following properties:

Type class	Prerequisite
Fuses in utilization categories gL, gG	Fusing voltage ≥ nominal line voltage
Miniature circuit breaker with characteristics B, C, D	• Nominal miniature circuit breaker voltage ≥ nominal line voltage • Nominal miniature circuit breaker currents must be at least 10% above the nominal line current of the power supply module

Adhere to the country-specific and system-specific regulations when carrying out the fusing. If required, observe the notes in chapter UL-compliant installation.

3.12.2 Line contactor

A line contactor is used for galvanic separation of the axis system and the supply system. The separation from the supply system is necessary for electrical work on the axis system or due to an overtemperature of the braking resistor, for example.

Note the following requirements:

- Only use line contactors in utilization category AC-3 (IEC 158-1) or better.
- The line contactor must be installed before the line filter and the line choke.
- Do not use the line contactor for jog mode.
- Observe a minimum switch-off time of 10 s for the line contactor.

MDP power supply module 10 kW

Operation of the MDP power supply module with 10 kW is only permitted with a line contactor. Observe the permitted connection types in chapter "Protection against thermal overload of the braking resistor" (→ 🗎 142).

MDP power supply module ≥ 25 kW

Operation of the MDP power supply module ≥ 25 kW is possible without a line contactor. In case of a defective brake chopper, the supply system rectifier is locked internally and the energy flow to the braking resistor is interrupted. Observe the permitted connection types in chapter "Protection against thermal overload of the braking resistor" (→ 🗎 142).

INFORMATION

The integrated lock of the supply system rectifier for MDP power supply modules ≥ 25 kW does not galvanically separate the axis block from the supply system and therefore does not de-energize it. If it is necessary to de-energize the axis block, e.g. for electrical work, you have to switch it off with a main switch, for example. The switch-off design is always done system-specific depending on the specific application considering the applicable regulations.

3.12.3 NF line filter

A line filter reduces interference emission via the supply system cable, which is generated by the application inverter. The line filter mainly serves to meet interference voltage limit requirements in the frequency range from 150 kHz to 30 MHz at the line connection. In addition, a line filter dampens the interference from the supply system affecting the application inverter. The selection of the line filter depends on the nominal line current and the line voltage of the frequency inverter.

To achieve interference emission category C2 according to EN 61800-1, a line filter must be installed.

Do not switch between the NF.. line filter and inverter.

For further information on line filter selection, refer to chapter "Maximum number of axis modules and total cable length" (→ 🗎 137).

The line filter has to be selected according to the following table.

Technical data

Line filter	NF0420-513	NF0420-523
Part number	17983789	17983797
Nominal line voltage V_N	Maximum 3 × AC 500 V, 50/60 Hz	
Nominal current I_N	42 A	
Nominal power loss	30 W	37 W
Ambient temperature ϑ_{amb}	0 °C to 45 °C	
Terminal contacts L1/L2/L3 - L1'/L2'/L3'	2.5 – 16 mm²	
Tightening torque L1/L2/L3 - L1'/L2'/L3'	2 – 4 Nm	2 – 2.3 Nm
PE terminal contact	M6	
Tightening torque PE	6 Nm	
Degree of protection	IP20 according to EN 60529	
Weight	3 kg	4.5 kg

Line filter	NF0910-523	NF1800-523
Part number	17987504	17987865
Nominal line voltage V_N	Maximum 3 × AC 500 V, 50/60 Hz	
Nominal current I_N	91 A	180 A
Nominal power loss	51.5 W	89 W
Ambient temperature ϑ_{amb}	0 °C to 45 °C	
Terminal contacts L1/L2/L3 - L1'/L2'/L3'	25 – 50 mm²	16 – 120 mm²
Tightening torque L1/L2/L3 - L1'/L2'/L3'	6 – 8 Nm	12 – 20 Nm
PE terminal contact	M8	M10
Tightening torque PE	12 Nm	23 Nm
Degree of protection	IP20 according to EN 60529	
Weight	5 kg	9 kg

Assignment to an inverter

Line filter	NF0420-513	NF0420-523
Assignment to MDP90A-..	0100, 0250	

Line filter	NF0910-523	NF1800-523
Assignment to MDP90A-..	0500	0750, 1100
Assignment to MDR91A-..	0500	0750

3.12.4 ND line choke

The main reason for using line chokes is the reduction of grid disturbances that may occur due to harmonic currents. In addition, line chokes improve the overvoltage protection.

The line choke has to be selected according to the following table.

Technical data

Line choke	ND0300-503	ND0420-503	ND0910-503	ND1800-503
Part number	17983800	17983819	17987520	17987539
Nominal line voltage V_N	Maximum 3 × AC 230 V - 500 V, 50/60 Hz			
Nominal current I_N	30 A	42 A	91 A	180 A
Nominal inductance	0.1 mH	0.045 mH	0.035 mH	0.018 mH
Nominal power loss	11 W	13 W	53 W	116 W
Ambient temperature ϑ_{amb}	-10 °C to 45 °C			
Terminal contacts L1/L2/L3 - L1'/L2'/L3'	0.2 – 10 mm^2	2.5 – 16 mm^2	25 – 50 mm^2	16 - 120 mm^2
Tightening torque L1/L2/L3 - L1'/L2'/L3'	1.2 – 2 Nm	2.5 Nm	3 - 6 Nm	12 - 20 Nm
PE terminal contact	M5		M8	M10
Tightening torque PE	3 Nm		12	20
Degree of protection	IPXXB according to EN 60529			IPXXA according to EN 60529
Weight	1.95 kg	1.82 kg	4.4 kg	10 kg

Assignment to an inverter

Line choke	ND0300-503	ND0420-503	ND0910-503	ND1800-503
Assignment to MDP90A-	0100	0250	0500	0750, 1100

3.12.5 Residual current device

⚠ WARNING

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

Severe or fatal injuries.

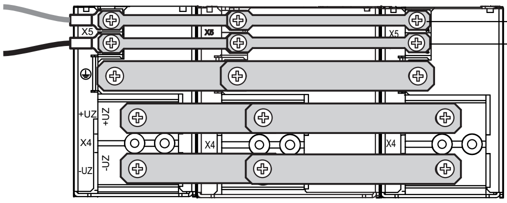
- The product can cause direct current in the PE conductor. If a residual current device (RCD) or a residual current monitoring device (RCM) is used for protection in the event of a direct or indirect contact, only a type B RCD or RCM is permitted on the supply end of the product.

- If the use of a residual current device is not mandatory according to the standards, SEWEURODRIVE recommends not to use a residual current device.

3.13 24 V supply voltage selection

The modules of the axis system require an external 24 V voltage supply for the electronics and the brake supply.

The 24 V voltage supply takes place via the integrated DC 24 V connection. The supply of the 24 V voltage supply takes place via the X5 connection.



[1] X5: Connection DC 24 V supply voltage

[2] X5: GND connection

INFORMATION

The current carrying capacity of the integrated DC 24 V connection (X5) is max. 40 A.

INFORMATION

Observe the applicable installation specifications for fusing the 24 V supply.

3.13.1 Project planning for 24 V supply power

For dimensioning the 24 V supply voltage, it is necessary to know the power consumption of the entire axis system. The 24 V voltage supply must provide the sum of all power ratings of the supplied units in the axis system.

INFORMATION

The power peaks during switch-on (caused by internal capacitances present in the devices) must not be taken into consideration as those capacitances are very small. Commercially available switched-mode power supplies can reliably switch on the maximally occurring capacities in the axis system.

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3.13.2 Supply of the 24 V supply voltage

Depending on the determined current demand, one- or two-sided supply is required.

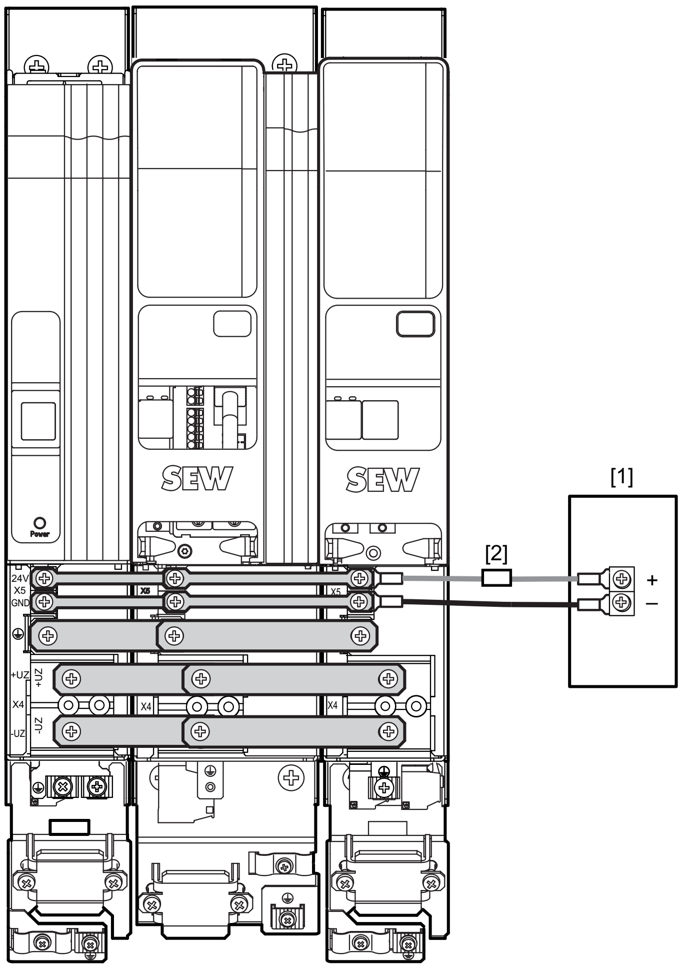
- For currents ≤ 40 A one-sided supply applies.
- For currents > 40 A two-sided supply applies.

The current demand is calculated via the total power consumption of the modules in the axis system (on 24 V level).

$I = P_{total}/U_{external}$

For the calculation of the total power consumption, see chapter "Power consumption of the 24 V supply" (→ 🗎 155).

One-sided supply



18014414154541451

[1] External DC 24 V voltage supply

[2] DC 24 V fuse

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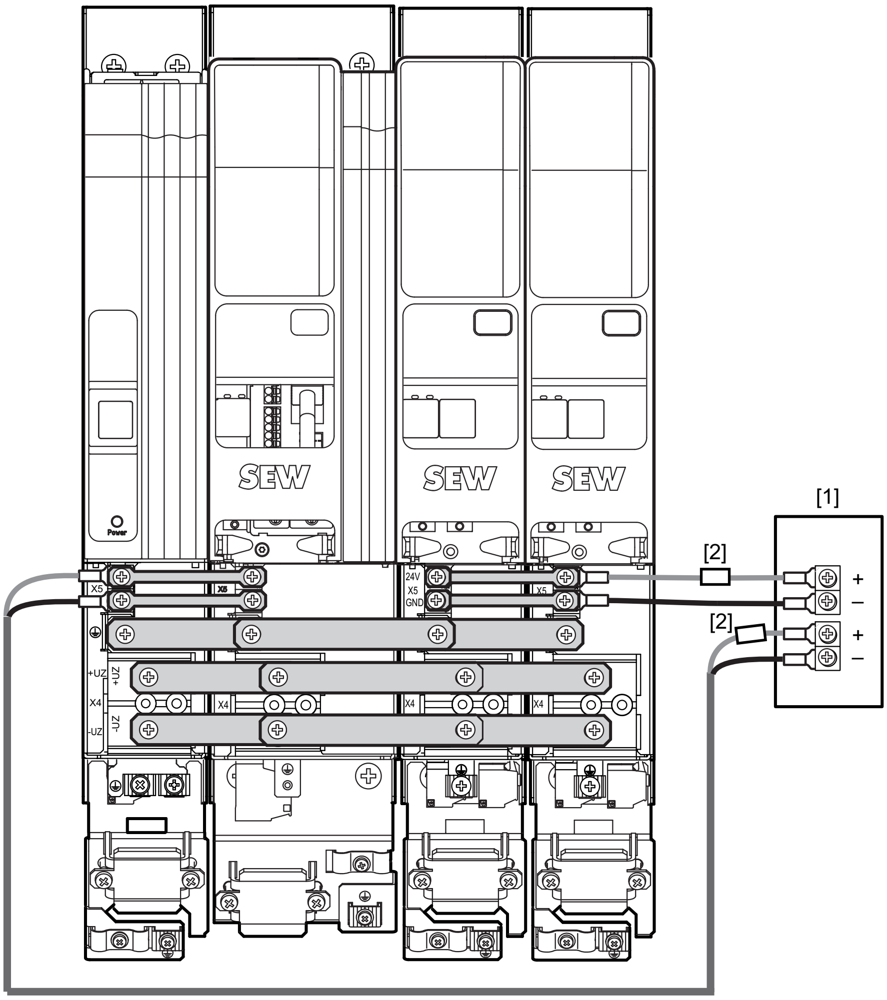
Two-sided supply



18014414154550283

[1] External DC 24 V voltage supply

[2] DC 24 V fuse

The breakpoint of the electronics supply with two-sided supply must be arranged so that the current loads of the two segments are split evenly.

If you use 2 separate power supply units, make sure that both power supply outputs have the same reference potential.

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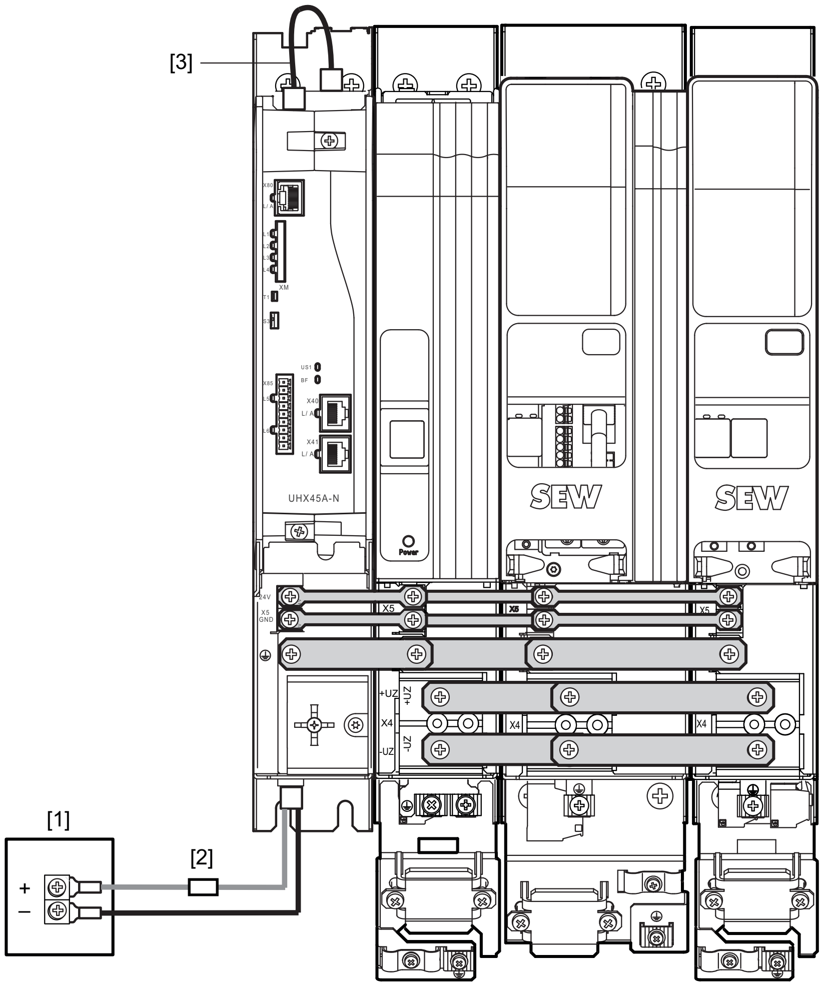
3.13.3 Supply of the 24 V supply voltage at the master module

The following figure depicts the connection of the 24 V supply voltage to X5. If a MOVI-C® CONTROLLER advanced with master module is used, the supply voltage is fed in the master module at connection X5_A.



9007220204831115

[1] External DC 24 V supply at X5_A

[2] DC 24 V fuse

[3] X5_B → X5: DC 24 V supply voltage UHX45A

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3.13.4 Power consumption of the 24 V supply

Tables for the power consumption of the 24 V supply depending on the used modules and the installed options.

Power consumption of the modules

Module	Power consumption (without I/O, motor encoder, motor brake)
Axis modules	
MDA90A-0020, 0040, 0080, 0120	20 W
MDA90A-0160	22 W
MDA90A-0240	25 W
MDA90A-0320, 0480	30 W
MDA90A-0640, 1000	75 W
MDA90A-1400, 1800	115 W
MDD90A-0020, 0040	20 W
MDD90A-0020, 0040	
MDD90A-0080	25 W
Power supply modules	
MDP90A-0100, 0250	15 W
MDP90A-0500, 0750	20 W
MDP90A-1100	30 W
Master module	
UHX45A/MDM90A	12 W

Power consumption of the cards

Card	Power consumption
CIO21A	1.2 W
CID21A	0.4 W
CES11A	0.8 W
CSB21A	5.1 W
CSS21A	12.3 W
CSB31A	24.3 W
CSS31A	24.3 W

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3.13.5 Power consumption of the directly connected 24 V brakes

Brake type:	BP1	BS2	BK01	BK02	BK03	BK04	BK07
CMP motor assignment	CMP71S/M/L		CMP40S/M	CMP50S/M	CMP63S	CMP50L	CMP63M/L
CMSB motor assignment	CMSB71 S/M/L	CMS71L		–	–	CMSB50S/M/L	CMSB63S/M
CMSMB motor assignment	CMSMB71 with CMP71S/M/L			CMSMB50 with CMP50S/M	CMSMB63 with CMP63S	CMSMB50 with CMP50L	CMSMB63 with CMP63M/L
Power consumption in W	20	17	9	7	14	14	15

It is not necessary to consider a DC 24 V power reserve for releasing the brake.

3.13.6 Requirements on the tolerance of the 24 V voltage supply

Three cases have to be distinguished when configuring the 24 V voltage supply.

1. The control of the BP and BK holding brake takes place directly via the brake output of the axis module.

   The following servo brakemotors are connected or there is a mixed mode with the motors mentioned in case 2. The brake cable length is < 25 m:

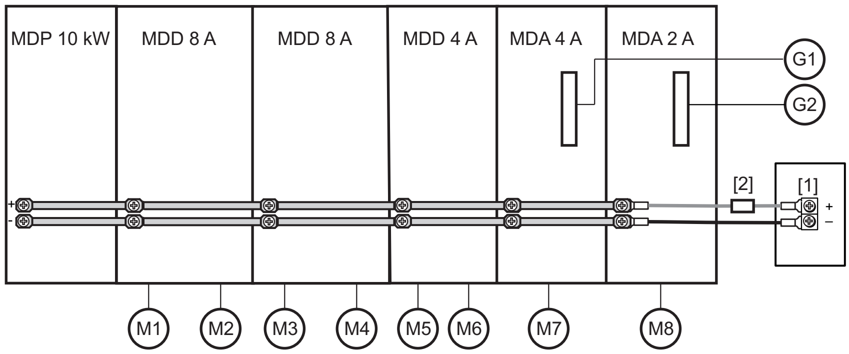
   - CMP40 / 50 / 63 / 71 and CMS / CMSB50 – 71
2. The brake output is used as control output (e.g. brake control via a BMK, BME brake rectifier).
3. No motor with brake connected.

	Case 1	Case 2	Case 3
Voltage supply	24 V - 0%, +10%	24 V -10%, +20%	24 V -10%, +20%

For detailed information about direct 24 V brake supply, refer to chapter "Direct control DC 24 V brake" (→ 🗎 342).

3.13.7 Project planning example

The following example shows the configuration of the 24 V voltage supply of an axis system.



18014417353521291

[1]	24 V voltage supply	[2]	DC 24 V fuse

Modules and devices used in the axis system:

- 8 brakemotors – 4 × CMP63S with BK03, 4 × CMP50M with BK02
- 8 motor encoders in the basic device
- 2 external encoders with CES11A option
- 8 × 4 digital outputs in the axis modules
- MDP power supply module 10 kW
- 2 MDD double-axis modules 8 A
- 1 MDD double-axis module 4 A
- 1 MDA single-axis module 4 A
- 1 MDA single-axis module 2 A

The total power consumption is calculated from the total power consumption of all used modules, cards, and externally connected devices.

- 4 × brake BK03: 4 × 14 W = 56 W
- 4 × brake BK02: 4 × 7 W = 28 W
- 8 × motor encoder: 8 × 5 W = 40 W
- 2 × external encoder: 2 × 12 W = 24 W
- 2 × CES11A card: 2 × 0.8 W = 1.6 W
- 8 × 4 digital outputs in the axis modules 8 × 4 × 1.2 W = 38.4 W
- 1 MDP power supply module 10 kW: 15 W
- 2 MDD double-axis modules 8 A: 2 × 22 W = 44 W
- 1 MDD double-axis module 4 A: 20 W
- 1 MDA single-axis module 4 A: 20 W
- 1 MDA single-axis module 2 A: 20 W

The external 24 V supply must be selected to ensure that the sum of the individual power levels is 307 W, and the resulting current is 12.8 A.

Check of one or two-sided supply: 12.8 A < 40 A → one-sided supply.

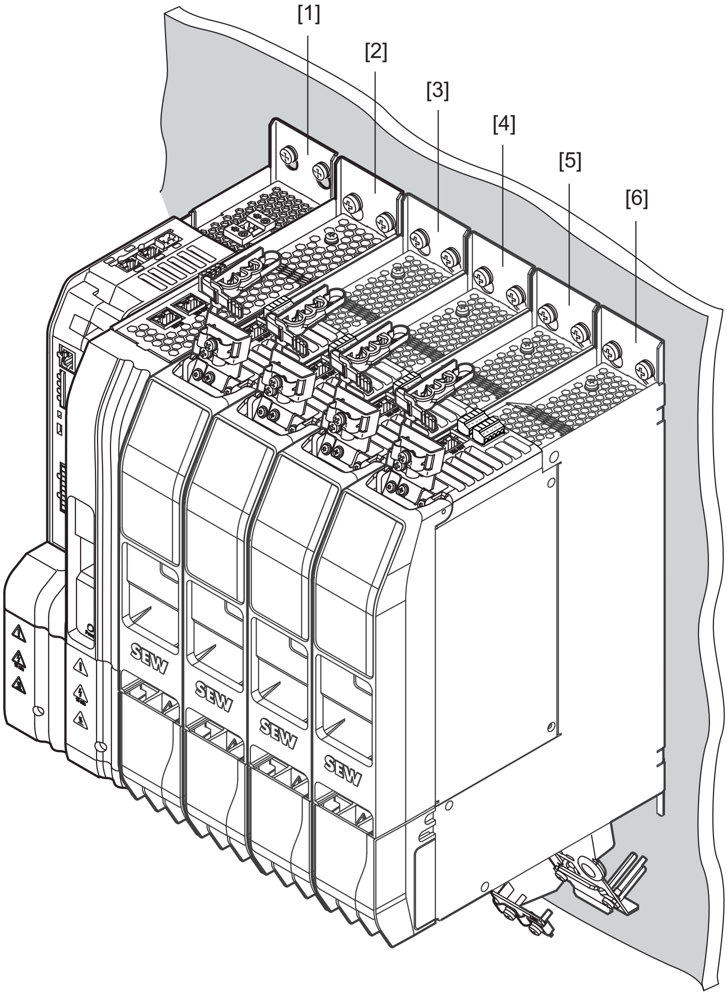
3.14 Arrangement of the modules within the axis system

3.14.1 Arrangement of the axis modules within the axis system

When arranging the axis system, observe that the nominal DC link current of the axis modules must decrease from left to right. The axis module with the highest nominal output current must be on the right side of the power supply module. All remaining axis modules are installed in descending order regarding their nominal DC link current.

The axis modules must always be installed on the right of the power supply module.

The master module must always be installed on the left of the power supply module.



20806249227

[1] Master module

[2] Power supply module

[3] Example: MDA90A-0120... single-axis module: I_{NDCL} = 12 A

[4] Example: MDD90A-0040... double-axis module: I_{NDCL} = 8 A

[5] Example: MDA90A-0040... single-axis module: I_{NDCL} = 4 A

[6] Example: MDA90A-0020... single-axis module: I_{NDCL} = 2 A

In one axis system, up to 15 axis modules can be used, both as single-axis modules and double-axis modules.

3.15 Particularities of the DC link connection

3.15.1 Use of axis modules ≤ MDA90A-1000-.. at the MDP90A-1100-.. power supply module.

INFORMATION

If axis modules ≤ MDA90A-1000-.. are operated on a MDP90A-1100-.. power supply module, either directly or to the right of an axis module ≥ MDA90A-1400-…, the total of the nominal DC link currents I_{NDCL} of the axis modules ≤ MDA90A-100-… must not exceed 153 A.

Example 1:

MDP90A-1100-..

MDA90A-0640-.. I_{NDCL} = 64 A

MDA90A-0640-.. I_{NDCL} = 64 A

MDA90A-0240-.. I_{NDCL} = 24 A

Total of I_{NDCL} = 152 A→ Set-up is permitted

Example 2:

MDP90A-1100-..

MDA90A-1400-..

MDA90A-0640-.. I_{NDCL} = 64 A

MDA90A-0640-.. I_{NDCL} = 64 A

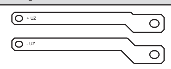
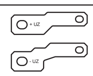
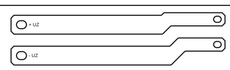
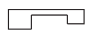
MDA90A-0640-.. I_{NDCL} = 64 A

Total of I_{NDCL} = 192 A→ Set-up is not permitted

3.15.2 Adapter connectors of the DC link connection

To be able to establish an axis system in which modules with DC link bars of different widths are used, adapter connectors must be used at the transition from wide to narrow or narrow to wide. These adapter connectors are listed in the following table.

The necessary closing covers are included with the adapter connectors.

From module	To module	Adapter connectors	Part number
MDP90A-0750-..	MDA90A-1400-..		28244052
MDP90A-1100-..	• MDA90A-0020-.. – MDA90A-1000-.. • MDD90A-0020.. – MDD90A-0080-..		28244079
MDA90A-1400-.. – MDA90A-1800-..	• MDA90A-0020-.. – MDA90A-1000-.. • MDD90A-0020.. – MDD90A-0080-..		28244060
		Closing cover	
MDA90A-1400-.. – MDA90A-1800-..	• MDA90A-0020-.. – MDA90A-0240-.. • MDD90A-0020.. – MDD90A-0080-..		18183751

The closing cover 18183751 is included with the adapter connectors 28244060.

Adapter connectors are not included in the scope of delivery and must be ordered.

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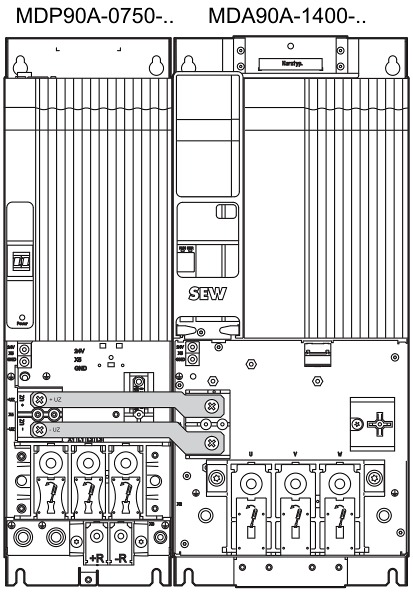
3.15.3 Examples of the DC link busbar with different bar widths

Example 1

Axis system with MDP90A-0750-.. power supply module, MDA90A-1400-.. axis module

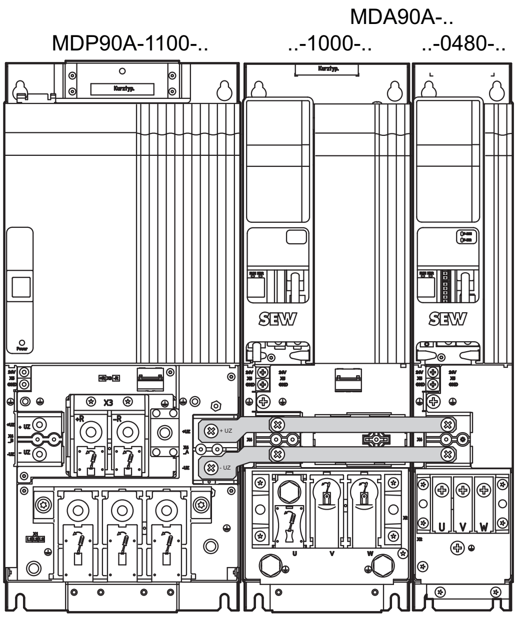


23268391819

Adapter connectors with the part number 28244052 must be ordered for this arrangement.

Example 2

Axis system with MDP90A-1100-.. power supply module, MDA90A-1000-.. axis module, MDA90A-0480-..

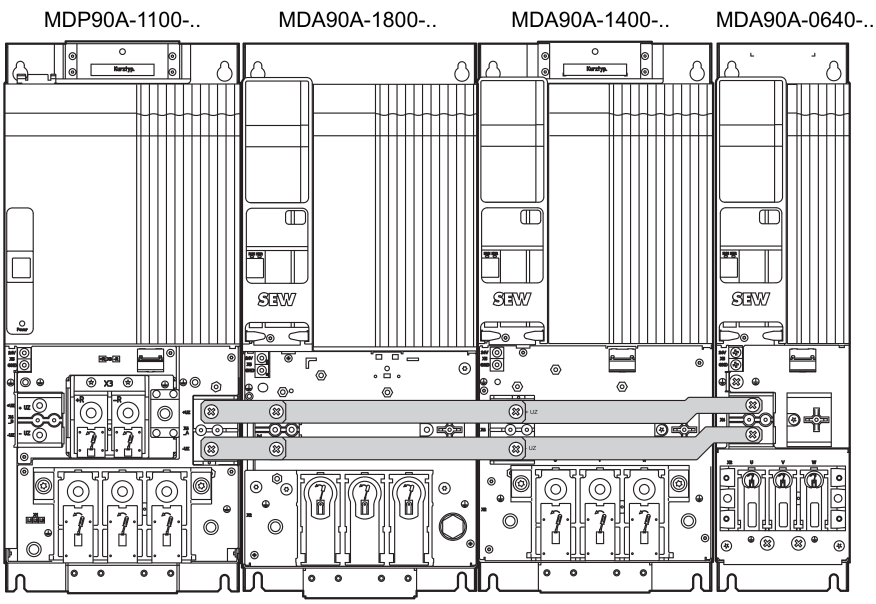


23268386955

Adapter connectors with the part number 28244079 must be ordered for this arrangement.

Example 3

Axis system with MDP90A-1100-.. power supply module, MDA90A-1800-.. axis module, MDA90A-1400-.., MDA90A-0640-..



23268389387

Adapter connectors with the part number 28244060 must be ordered for this arrangement.

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3.16 Connecting a safe brake module to the DC link

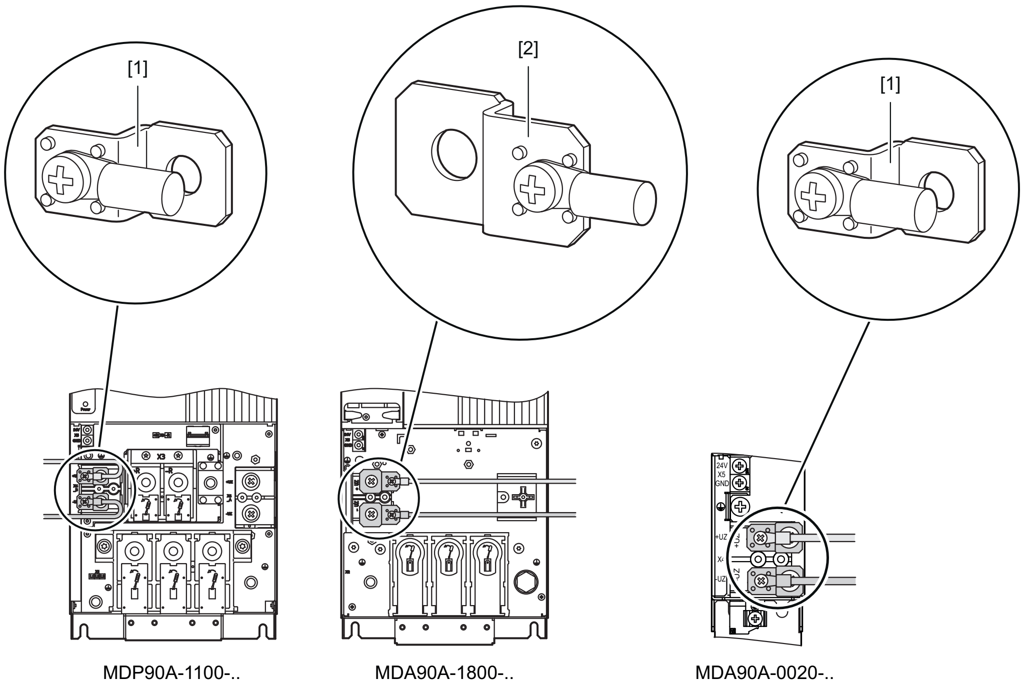
The safe BST brake module is directly supplied from the DC link. For connecting the safe brake module to the DC link, a set of angled bars is available in 2 sizes.

Axis module	Set of angled bars	Part number
MDP90A-..	Small	28249674
MDA90A-0020 .. 0100..	Small	28249674
MDD90A-0020 .. 0080..	Small	28249674
MDA90A-1400 .. 1800..	Large	28249682

Observe the following installation requirements:

- Use cables with a cross section of 2.5 mm^2.
- Use suitable cable lugs for M4 screws.
- Connect a maximum number of 8 BST brake modules to a DC link output.
- Only BST brake modules may be connected to the angled bars.
- Protect the outgoing DC link with
  - 2 fuses. SEW-EURODRIVE recommends: At least DC 750 V, utilization category gG,

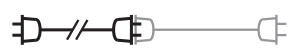
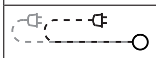
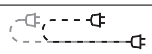
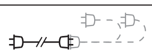
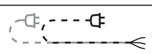
    or
  - 1 thermal circuit breaker TCB0100, set to 10 A.
- Limit the total cable length of the connection to a maximum of 5 m – to be measured between tapping of the DC link and connection to the BST brake module).



24312535051

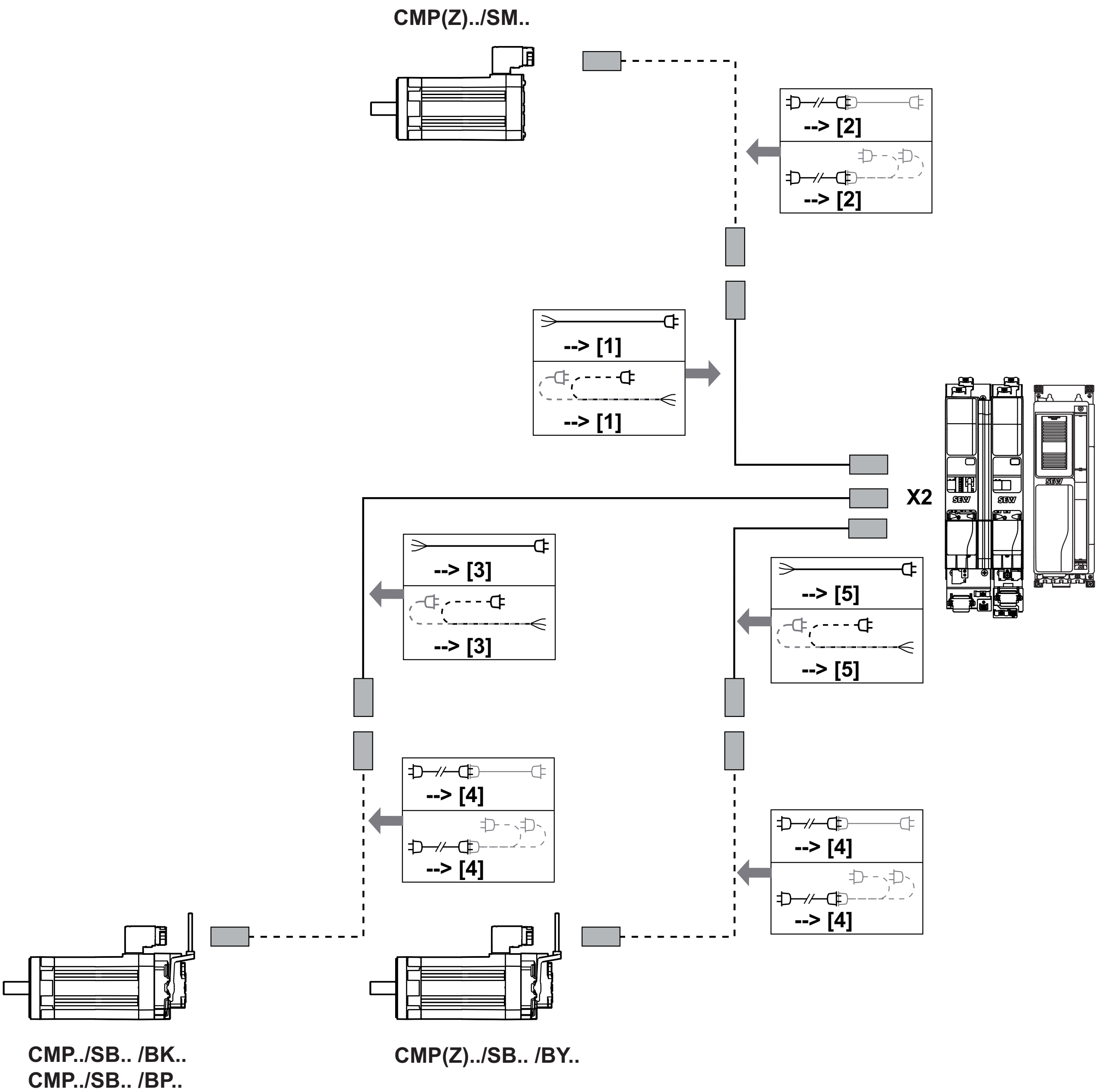
4 Prefabricated cables

4.1 Meaning of the symbols

Icon	Meaning
	Connection cables: Connector → connector for fixed installation
	Connection cable extension: Connector → connector for fixed installation
	Connection cables: Connector → encoder connection cover for fixed installation
	Connection cables: Connector → encoder connection cover for cable carrier installation
	Connection cables: Connector → connector for cable carrier installation
	Connection cable extension: Connector → connector for cable carrier installation
	Connection cables: Connector → open end for fixed installation
	Connection cables: Connector → open end for cable carrier installation

4.2 Power cables for CMP.. motors

4.2.1 Overview



9007214010255627

[1] Motor cable ../SM.. (→ 🗎 166)

[2] Motor extension cable ../SM.. (→ 🗎 167)

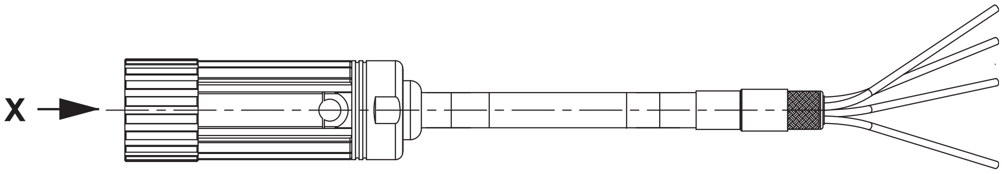
[3] Brakemotor cable ../SB.. for brake /BK and /BP (→ 🗎 168)

[4] Brakemotor extension cable ../SB.. for /BK, /BP and /BY brake (→ 🗎 170)

[5] Brakemotor cable ../SB.. for brake /BY (→ 🗎 169)

4.2.2 Motor cable with connector on motor end

Motor cable illustration



4818831115

Types of CMP.. motor cables

Plug connector	Number of cores and cable cross section	Part number	Installation type
SM11	4 × 1.5 mm^2	05904544	Fixed installation
SM11	4 × 1.5 mm^2	05906245	Cable carrier installation
SM12	4 × 2.5 mm^2	05904552	Fixed installation
SM12	4 × 2.5 mm^2	05906253	Cable carrier installation
SM14	4 × 4 mm^2	05904560	Fixed installation
SM14	4 × 4 mm^2	05904803	Cable carrier installation
SMB6	4 × 6 mm^2	13350269	Fixed installation
SMB6	4 × 6 mm^2	13350293	Cable carrier installation
SMB10	4 × 10 mm^2	13350277	Fixed installation
SMB10	4 × 10 mm^2	13350307	Cable carrier installation
SMB16	4 × 16 mm^2	13350285	Fixed installation
SMB16	4 × 16 mm^2	13350315	Cable carrier installation
SMC16	4 × 16 mm^2	18148476	Fixed installation
SMC16	4 × 16 mm^2	18148484	Cable carrier installation
SMC25	4 × 25 mm^2	18148581	Cable carrier installation
SMC35	4 × 35 mm^2	18148697	Cable carrier installation

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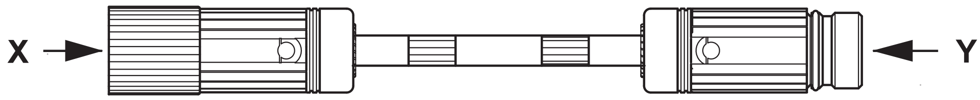
Illustration of motor extension cable



4818839179

Types of CMP.. motor extension cables

Plug connector	Number of cores and cable cross section	Part number	Installation type
SM11	4 × 1.5 mm^2	13332457	Cable carrier installation
SM12	4 × 2.5 mm^2	13332465	Cable carrier installation
SM14	4 × 4 mm^2	13332473	Cable carrier installation
SMB6	4 × 6 mm^2	13350021	Cable carrier installation
SMB10	4 × 10 mm^2	13350048	Cable carrier installation
SMB16	4 × 16 mm^2	13350056	Cable carrier installation
SMC16	4 × 16 mm^2	18156819	Cable carrier installation
SMC25	4 x 25 mm^2	18156827	Cable carrier installation
SMC35	4 x 35 mm^2	18156835	Cable carrier installation

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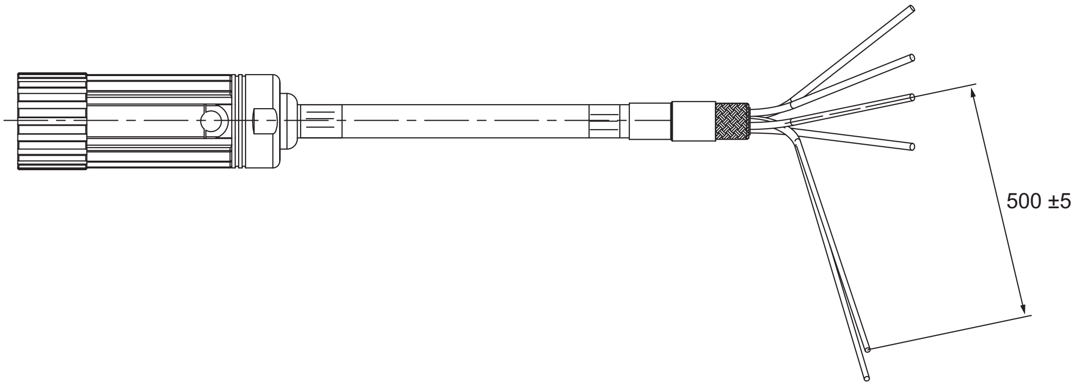
4.2.3 Brakemotor cables for BP/BK brake with connector at motor end

Figure of CMP.. brakemotor cables



24323160075

Types of CMP.. brakemotor cables

Plug connector	Number of cores and cable cross section	Part number	Installation type
SB11	4 × 1.5 mm² + 3 × 1 mm²	13354345	Fixed installation
SB11	4 × 1.5 mm² + 3 × 1 mm²	13354388	Cable carrier installation
SB12	4 × 2.5 mm² + 3 × 1 mm²	13354353	Fixed installation
SB12	4 × 2.5 mm² + 3 × 1 mm²	13354396	Cable carrier installation
SB14	4 × 4 mm² + 3 × 1 mm²	13354361	Fixed installation
SB14	4 × 4 mm² + 3 × 1 mm²	13421603	Cable carrier installation
SBB6	4 × 6 mm² + 3 × 1.5 mm²	13350196	Fixed installation
SBB6	4 × 6 mm² + 3 × 1.5 mm²	13350234	Cable carrier installation
SBB10	4 × 10 mm² + 3 × 1.5 mm²	13350218	Fixed installation
SBB10	4 × 10 mm² + 3 × 1.5 mm²	13350242	Cable carrier installation
SBB16	4 × 16 mm² + 3 × 1.5 mm²	13350226	Fixed installation
SBB16	4 × 16 mm² + 3 × 1.5 mm²	13350250	Cable carrier installation

INFORMATION

As for the power cables for brakemotors with BP/BK brake only two signal cables are required, the third signal core is cut off during cable assembly.

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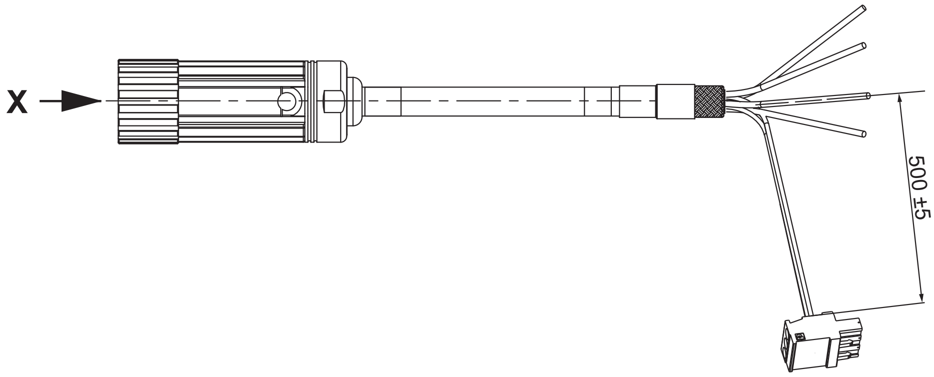
4.2.4 Brakemotor cables for BY brake with connector at motor end

Figure of CMP.. brakemotor cables



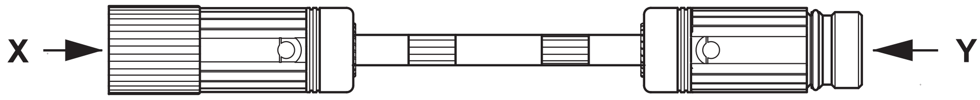
14824163467

Types of CMP.. brakemotor cables

Plug connector	Number of cores and cable cross section	Part number	Installation type
SB11	4 × 1.5 mm² + 3 × 1 mm²	13354272	Fixed installation
SB11	4 × 1.5 mm² + 3 × 1 mm²	13354302	Cable carrier installation
SB12	4 × 2.5 mm² + 3 × 1 mm²	13354280	Fixed installation
SB12	4 × 2.5 mm² + 3 × 1 mm²	13354310	Cable carrier installation
SB14	4 × 4 mm² + 3 × 1 mm²	13354299	Fixed installation
SB14	4 × 4 mm² + 3 × 1 mm²	13354329	Cable carrier installation
SBB6	4 × 6 mm² + 3 × 1.5 mm²	13350129	Fixed installation
SBB6	4 × 6 mm² + 3 × 1.5 mm²	13350153	Cable carrier installation
SBB10	4 × 10 mm² + 3 × 1.5 mm²	13350137	Fixed installation
SBB10	4 × 10 mm² + 3 × 1.5 mm²	13350161	Cable carrier installation
SBB16	4 × 16 mm² + 3 × 1.5 mm²	13350145	Fixed installation
SBB16	4 × 16 mm² + 3 × 1.5 mm²	13350188	Cable carrier installation
SBC16	4 × 16 mm² + 3 × 1.5 mm²	18148514	Fixed installation
SBC16	4 × 16 mm² + 3 × 1.5 mm²	18148522	Cable carrier installation

4.2.5 Extension cables BP/BK and BY brakes

Illustration of brakemotor extension cable



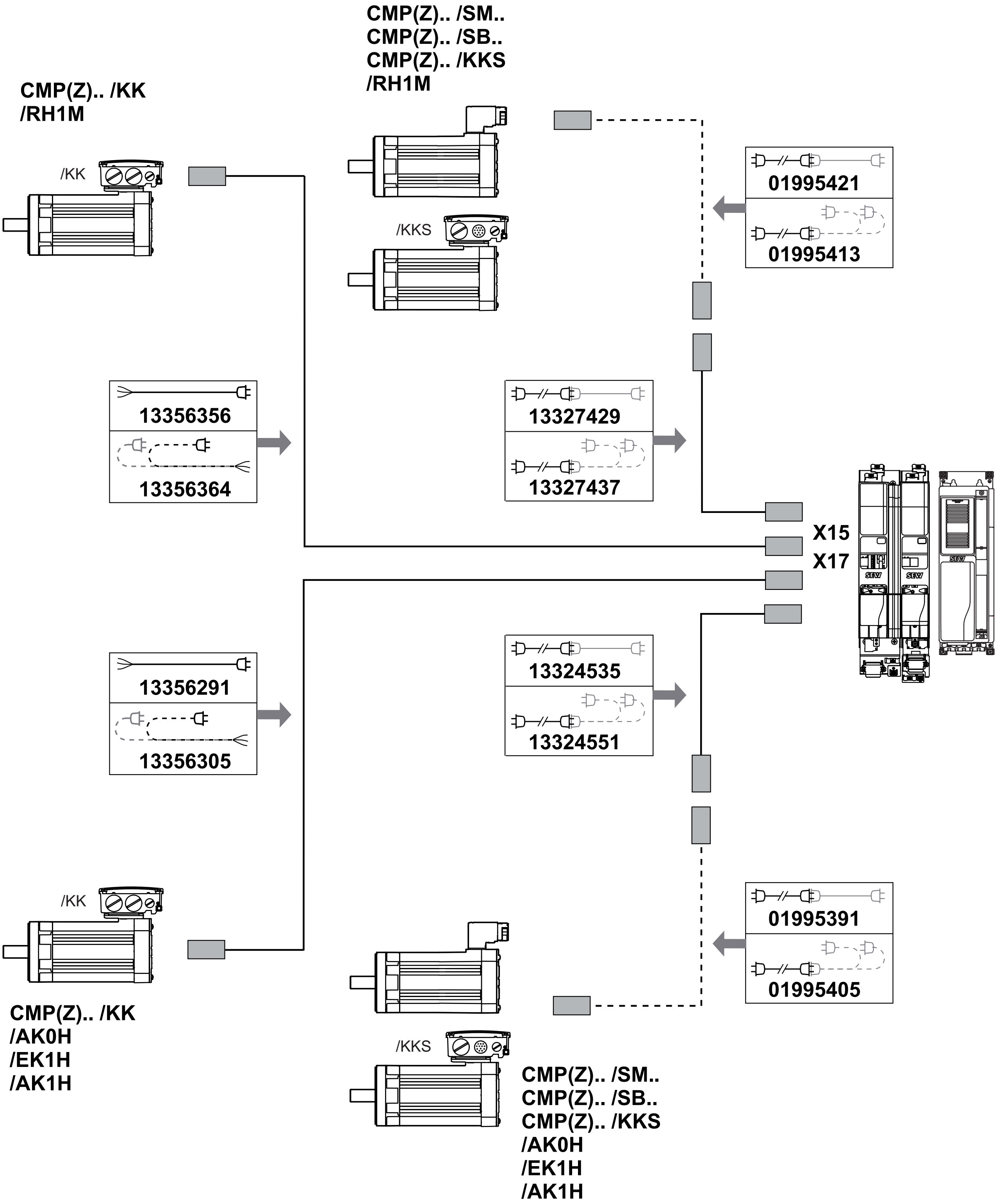
4818839179

Types of CMP.. brakemotor extension cables

Plug connector	Number of cores and cable cross section	Part number	Installation type
SB11	$4 \times 1.5\ mm^2 + 3 \times 1\ mm^2$	13354221	Cable carrier installation
SB12	$4 \times 2.5\ mm^2 + 3 \times 1\ mm^2$	13354248	Cable carrier installation
SB14	$4 \times 4\ mm^2 + 3 \times 1\ mm^2$	13354337	Cable carrier installation
SBB6	$4 \times 6\ mm^2 + 3 \times 1.5\ mm^2$	13350099	Cable carrier installation
SBB10	$4 \times 10\ mm^2 + 3 \times 1.5\ mm^2$	13350102	Cable carrier installation
SBB16	$4 \times 16\ mm^2 + 3 \times 1.5\ mm^2$	13350110	Cable carrier installation
SBC16	$4 \times 16\ mm^2 + 3 \times 1.5\ mm^2$	18156843	Cable carrier installation

4.3 Encoder cables for CMP.. motors

4.3.1 Overview



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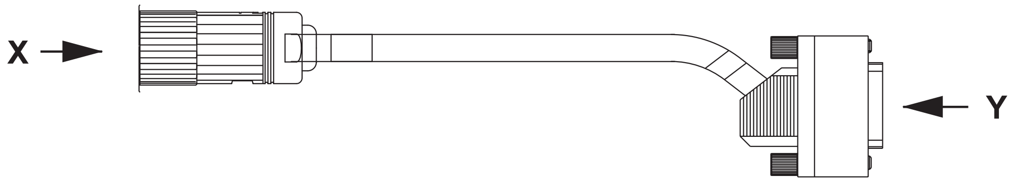
4.3.2 Resolver

Illustration of RH1M resolver cable

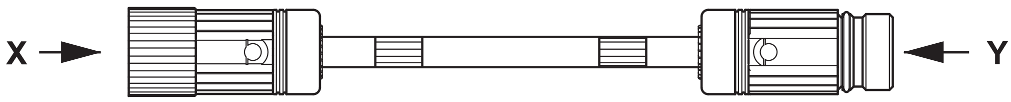


4819185931

Types of RH1M resolver cables

Number of cores and cable cross section	Part number	Installation type
5 × 2 × 0.25 mm²	13327429	Fixed installation
5 × 2 × 0.25 mm²	13327437	Cable carrier installation

Illustration of RH1M extension cable

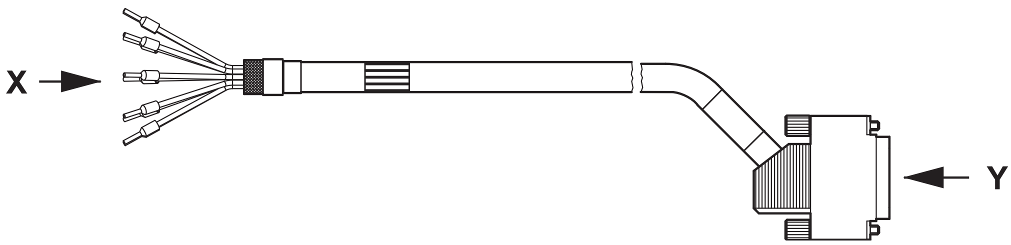


4819192715

Types of RH1M extension cables

Number of cores and cable cross section	Part number	Installation type
5 × 2 × 0.25 mm²	01995421	Fixed installation
5 × 2 × 0.25 mm²	01995413	Cable carrier installation

Illustration of RH1M resolver cable for terminal box



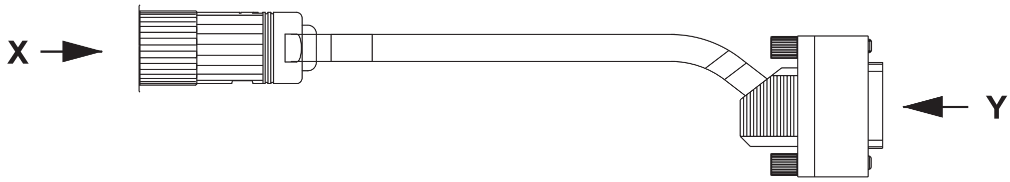
4838463371

RH1M resolver cables for terminal box

Number of cores and cable cross section	Part number	Installation type
5 × 2 × 0.25 mm²	13356356	Fixed installation
5 × 2 × 0.25 mm²	13356364	Cable carrier installation

4.3.3 HIPERFACE® encoders

Illustration of HIPERFACE® encoder cable

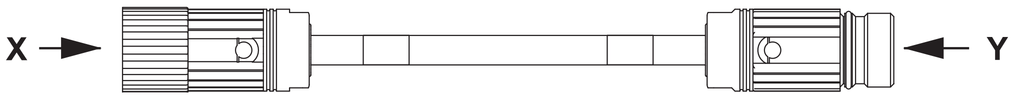


4819185931

Types of HIPERFACE® encoder cables

Number of cores and cable cross section	Part number	Installation type
4 × 2 × 0.25 mm² + 2 × 0.5 mm²	13324535	Fixed installation
4 × 2 × 0.25 mm² + 2 × 0.5 mm²	13324551	Cable carrier installation

Illustration of HIPERFACE® encoder extension cable

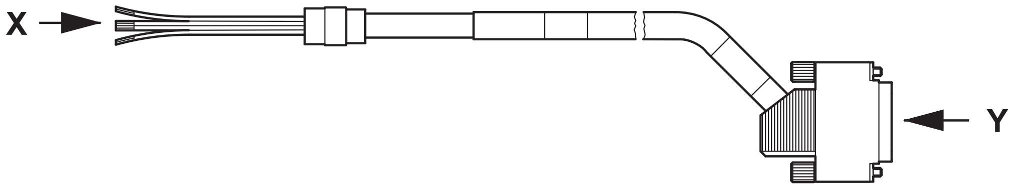


4819207051

Types of HIPERFACE® encoder extension cables

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm²	01995391	Fixed installation
6 × 2 × 0.25 mm²	01995405	Cable carrier installation

Illustration of HIPERFACE® encoder cable for terminal box



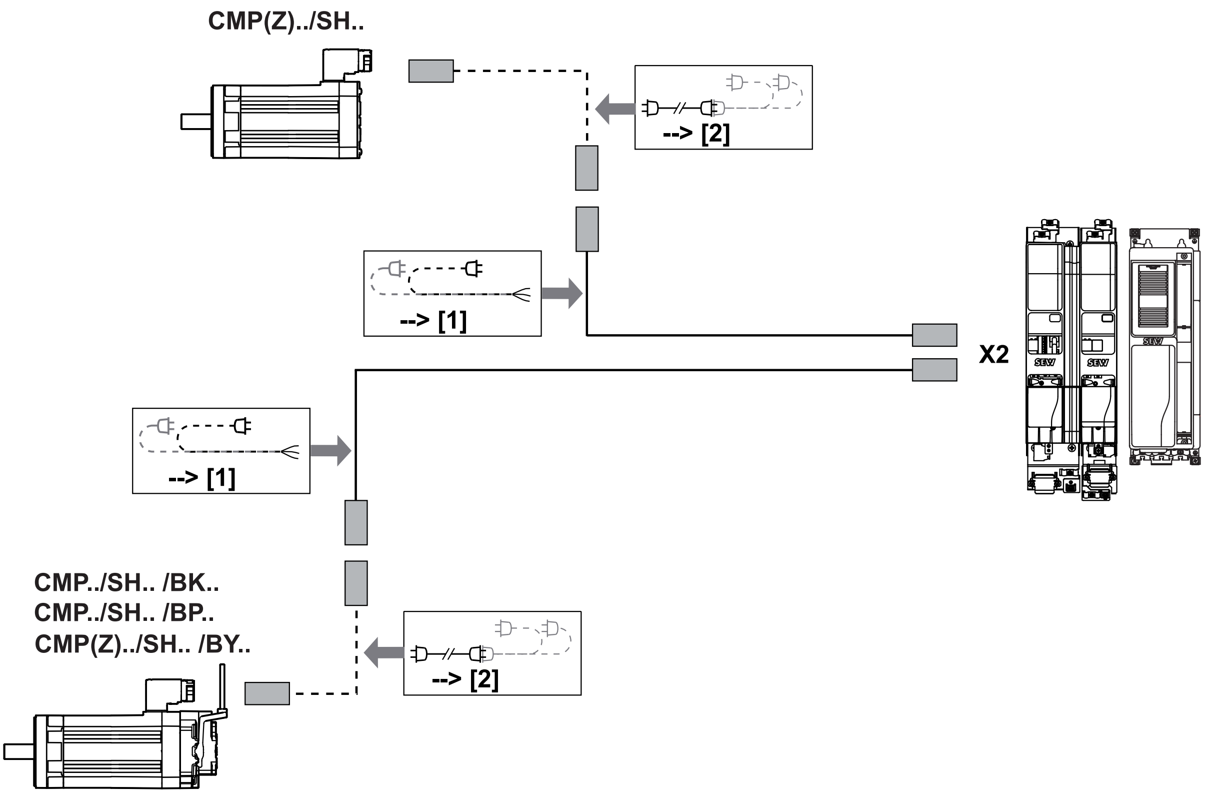
4838486411

Types of HIPERFACE® encoder cables for terminal box

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm²	13356291	Fixed installation
6 × 2 × 0.25 mm²	13356305	Cable carrier installation

4.4 Single-cable technology for CMP.. motors

4.4.1 Overview



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[1] Motor/brakemotor cable [2] Extension cable

4.4.2 Types of motor/brakemotor cable

Plug connector	Number of cores and cable cross section	Part number	Installation type
SH11	4 × 1.5 mm² + 3 × 1 mm² + 4 × 0.34 mm²	18177018	Cable carrier installation
SH12	4 × 2.5 mm² + 3 × 1 mm² + 4 × 0.34 mm²	18177026	
SH14	4 × 4 mm² + 3 × 1 mm² + 4 × 0.34 mm²	18177034	
SHB6	4 × 6 mm² + 3 × 1.5 mm² + 4 × 0.34 mm²	18177042	
SHB10	4 × 10 mm² + 3 × 1.5 mm² + 4 × 0.34 mm²	18177050	

4.4.3 Types of extension cables

Plug connector	Number of cores and cable cross section	Part number	Installation type
SH11	4 × 1.5 mm² + 3 × 1 mm² + 4 × 0.34 mm²	18177069	Cable carrier installation
SH12	4 × 2.5 mm² + 3 × 1 mm² + 4 × 0.34 mm²	18177077	
SH14	4 × 4 mm² + 3 × 1 mm² + 4 × 0.34 mm²	18177085	
SHB6	4 × 6 mm² + 3 × 1.5 mm² + 4 × 0.34 mm²	18177093	
SHB10	4 × 10 mm² + 3 × 1.5 mm² + 4 × 0.34 mm²	18177107	

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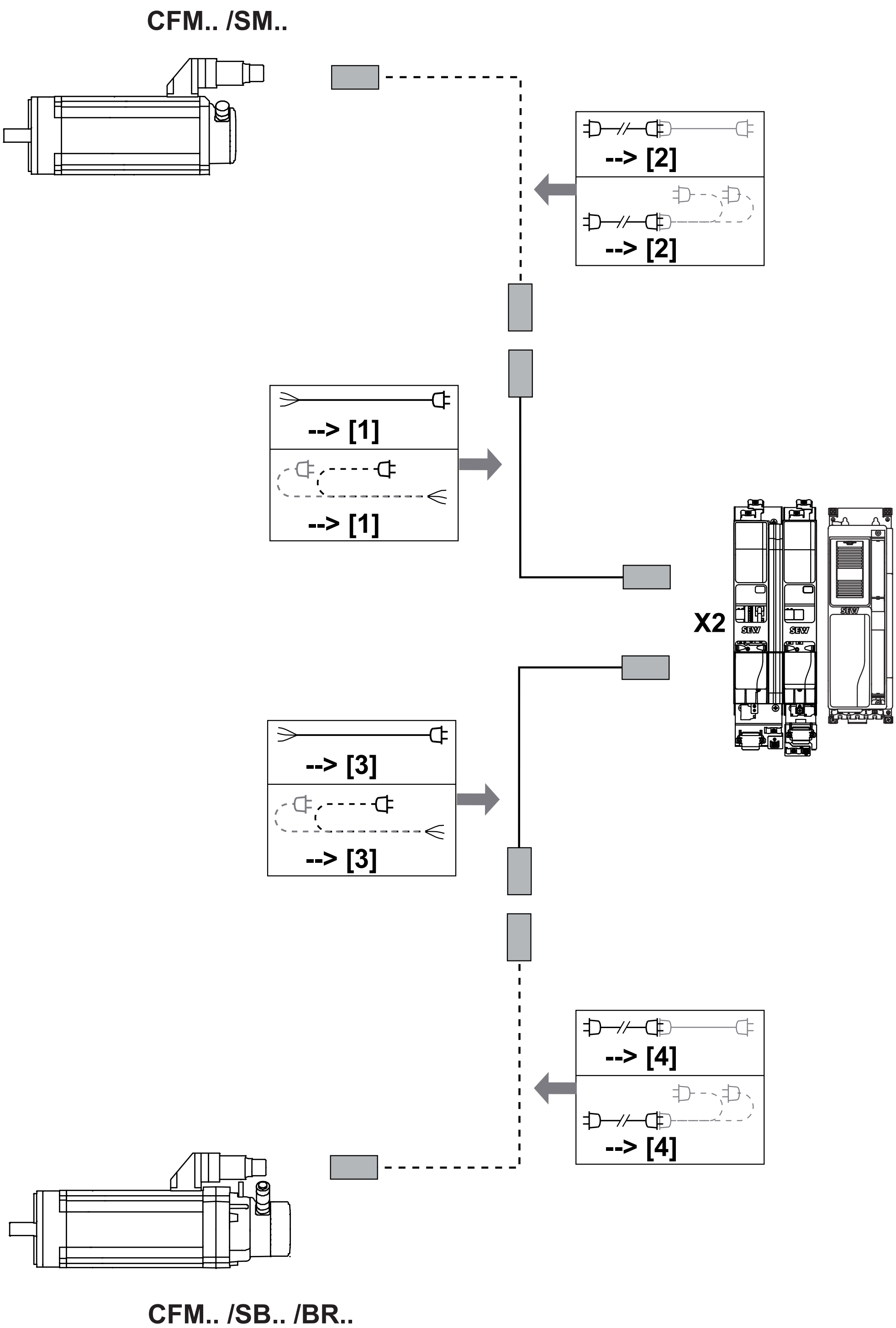
4.5 Power cables for CFM.. motors

4.5.1 Overview



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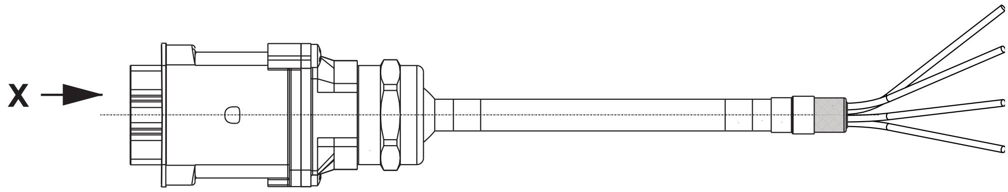
[1]	Motor cable ../SM.. (→ 🗎 176)	[3]	Brakemotor cable ../SB.. /BR (→ 🗎 178)
[2]	Motor extension cable ../ SM.. (→ 🗎 177)	[4]	Brakemotor extension cable ../SB.. /BR (→ 🗎 179)

4.5.2 Motor cable

Motor cable illustration



4836649099

Motor cable types

The cables are equipped with a connector for motor connection and conductor end sleeves for inverter connection.

Plug connector	Number of cores and cable cross section	Part number	Installation type
SM51/SM61	4 × 1.5 mm²	01991795	Fixed installation
SM51/SM61	4 × 1.5 mm²	13331140	Cable carrier installation
SM52/SM62	4 × 2.5 mm²	01991817	Fixed installation
SM52/SM62	4 × 2.5 mm²	13331159	Cable carrier installation
SM54/SM64	4 × 4 mm²	01991833	Fixed installation
SM54/SM64	4 × 4 mm²	01991841	Cable carrier installation
SM56/SM66	4 × 6 mm²	0199185X	Fixed installation
SM56/SM66	4 × 6 mm²	01991868	Cable carrier installation
SM59/SM69	4 × 10 mm²	01991876	Fixed installation
SM59/SM69	4 × 10 mm²	01991884	Cable carrier installation

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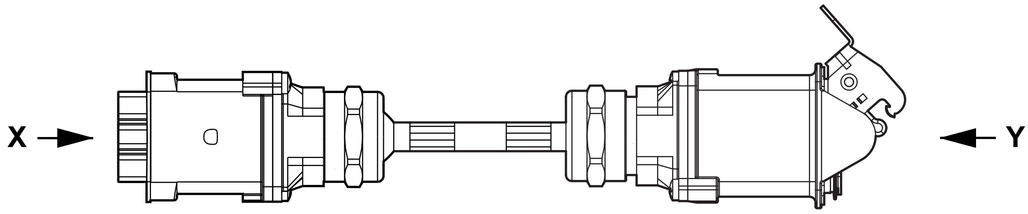
4.5.3 Motor extension cable

Illustration of motor extension cable



4838345099

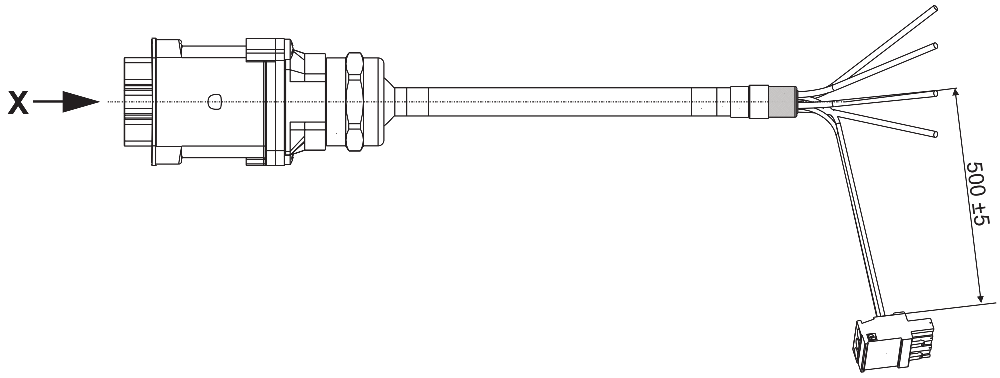
Types of motor extension cables

The cables are equipped with a connector and adapter for extending the CFM.. motor cable.

Plug connector	Number of cores and cable cross section	Part number	Installation type
SM51/SM61	4 × 1.5 mm²	01995499	Fixed installation
SM51/SM61	4 × 1.5 mm²	13331183	Cable carrier installation
SM52/SM62	4 × 2.5 mm²	01995510	Fixed installation
SM52/SM62	4 × 2.5 mm²	13331191	Cable carrier installation
SM54/SM64	4 × 4 mm²	01995537	Fixed installation
SM54/SM64	4 × 4 mm²	01995545	Cable carrier installation
SM56/SM66	4 × 6 mm²	01995553	Fixed installation
SM56/SM66	4 × 6 mm²	01995561	Cable carrier installation
SM59/SM69	4 × 10 mm²	0199557X	Fixed installation
SM59/SM69	4 × 10 mm²	01995588	Cable carrier installation

4.5.4 Brakemotor cable

Illustration of brakemotor cable



4838352907

Types of brakemotor cables

Plug connector	Number of cores and cable cross section	Part number	Installation type
SB51/SB61	4 × 1.5 mm² + 3 × 1.0 mm²	01991892	Fixed installation
SB51/SB61	4 × 1.5 mm² + 3 × 1.0 mm²	13331167	Cable carrier installation
SB52/SB62	4 × 2.5 mm² + 3 × 1.0 mm²	01991914	Fixed installation
SB52/SB62	4 × 2.5 mm² + 3 × 1.0 mm²	13331175	Cable carrier installation
SB54/SB64	4 × 4 mm² + 3 × 1.0 mm²	01991930	Fixed installation
SB54/SB64	4 × 4 mm² + 3 × 1.0 mm²	01991949	Cable carrier installation
SB56/SB66	4 × 6 mm² + 3 × 1.5 mm²	01991957	Fixed installation
SB56/SB66	4 × 6 mm² + 3 × 1.5 mm²	01991965	Cable carrier installation
SB59/SB69	4 × 10 mm² + 3 × 1.5 mm²	01991973	Fixed installation
SB59/SB69	4 × 10 mm² + 3 × 1.5 mm²	01991981	Cable carrier installation

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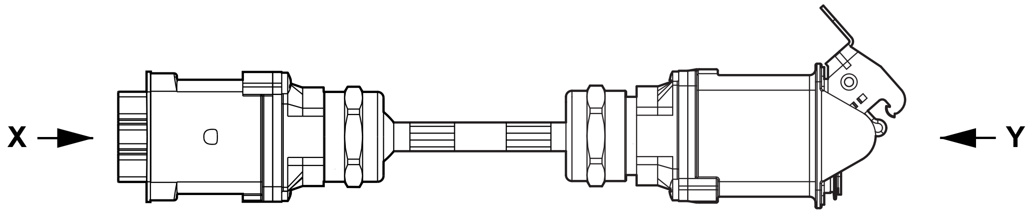
4.5.5 Brakemotor extension cables

Illustration of brakemotor extension cable



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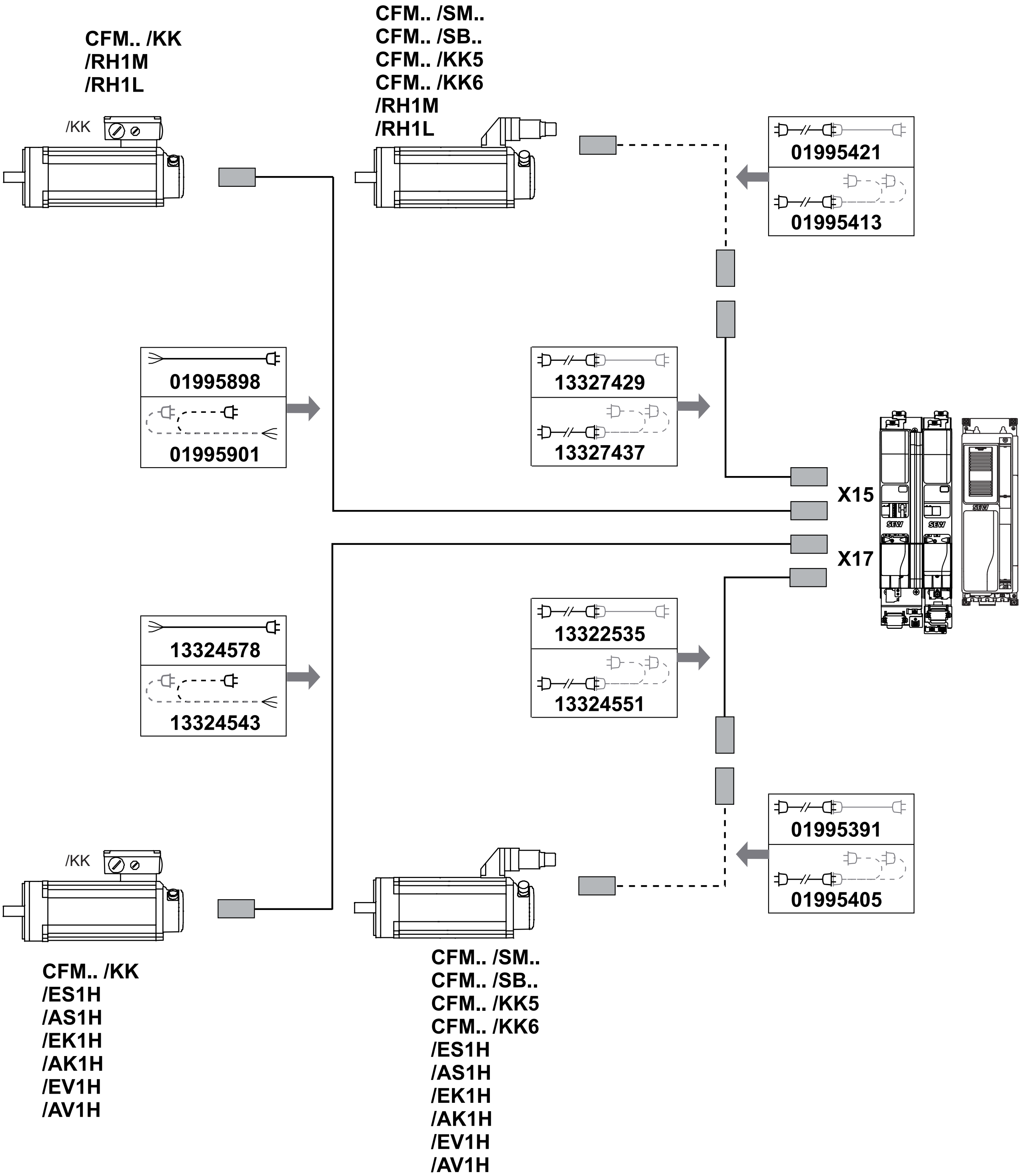
Types of brakemotor extension cables

Plug connector	Number of cores and cable cross section	Part number	Installation type
SK51/SK61	4 × 1.5 mm^2 + 3 × 1.0 mm^2	0199199X	Fixed installation
SK51/SK61	4 × 1.5 mm^2 + 3 × 1.0 mm^2	13331205	Cable carrier installation
SK52/SK62	4 × 2.5 mm^2 + 3 × 1.0 mm^2	01992015	Fixed installation
SK52/SK62	4 × 2.5 mm^2 + 3 × 1.0 mm^2	13331213	Cable carrier installation
SK54/SK64	4 × 4 mm^2 + 3 × 1.0 mm^2	01992031	Fixed installation
SK54/SK64	4 × 4 mm^2 + 3 × 1.0 mm^2	0199204X	Cable carrier installation
SK56/SK66	4 × 6 mm^2 + 3 × 1.5 mm^2	01992058	Fixed installation
SK56/SK66	4 × 6 mm^2 + 3 × 1.5 mm^2	01992066	Cable carrier installation
SK59/SK69	4 × 10 mm^2 + 3 × 1.5 mm^2	01992074	Fixed installation
SK59/SK69	4 × 10 mm^2 + 3 × 1.5 mm^2	01992082	Cable carrier installation

4.6 Encoder cables for CFM.. motors

4.6.1 Overview



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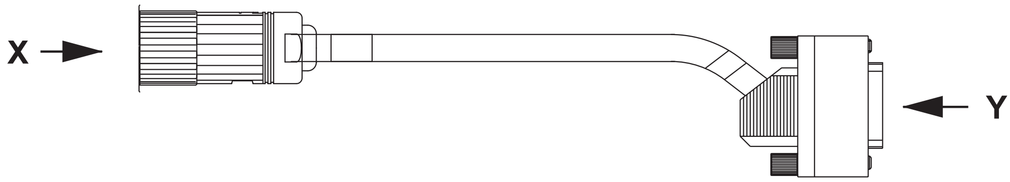
4.6.2 Resolver

Illustration of RH1M/RH1L resolver cable

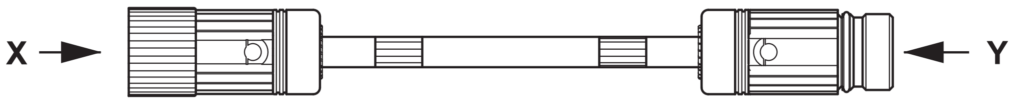


4819185931

Types of RH1M/RH1L resolver cables

Number of cores and cable cross section	Part number	Installation type
5 × 2 × 0.25 mm^2	13327429	Fixed installation
5 × 2 × 0.25 mm^2	13327437	Cable carrier installation

Illustration of RH1M/RH1L extension cable

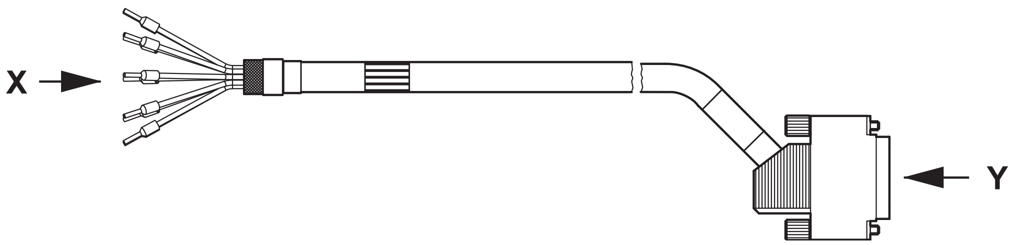


4819192715

Types of RH1M/RH1L extension cables

Number of cores and cable cross section	Part number	Installation type
5 × 2 × 0.25 mm^2	01995421	Fixed installation
5 × 2 × 0.25 mm^2	01995413	Cable carrier installation

Illustration of RH1M/RH1L resolver cable for terminal box



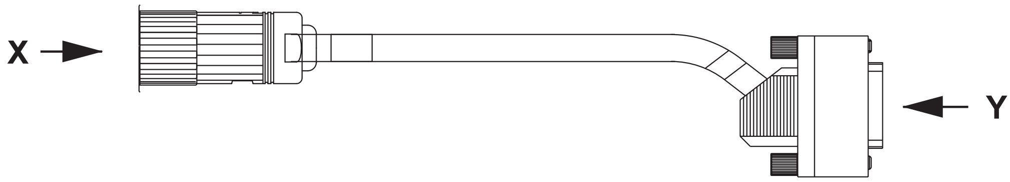
4838463371

Types of RH1M/RH1L resolver cables for terminal box

Number of cores and cable cross section	Part number	Installation type
5 × 2 × 0.25 mm^2	13327623	Fixed installation
5 × 2 × 0.25 mm^2	13327631	Cable carrier installation

4.6.3 HIPERFACE® encoders

Illustration of HIPERFACE® encoder cable

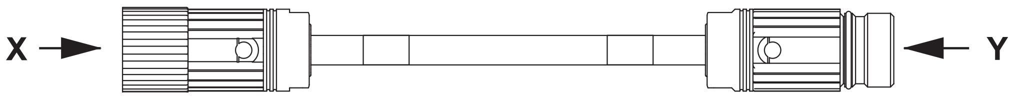


4819185931

Types of HIPERFACE® encoder cables

Number of cores and cable cross section	Part number	Routing
6 × 2 × 0.25 mm²	13324535	Fixed installation
6 × 2 × 0.25 mm²	13324551	Cable carrier installation

Illustration of HIPERFACE® encoder extension cable

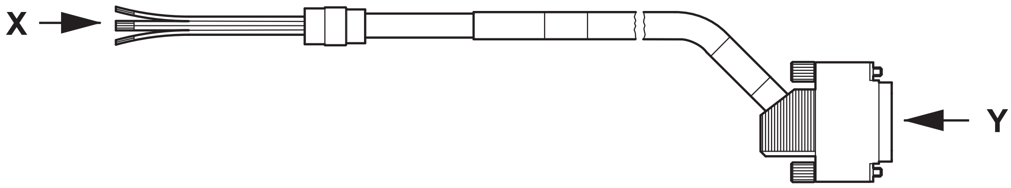


4819207051

Types of HIPERFACE® encoder extension cables

Number of cores and cable cross section	Part number	Routing
6 × 2 × 0.25 mm²	01995391	Fixed installation
6 × 2 × 0.25 mm²	01995405	Cable carrier installation

Illustration of HIPERFACE® encoder cable for terminal box



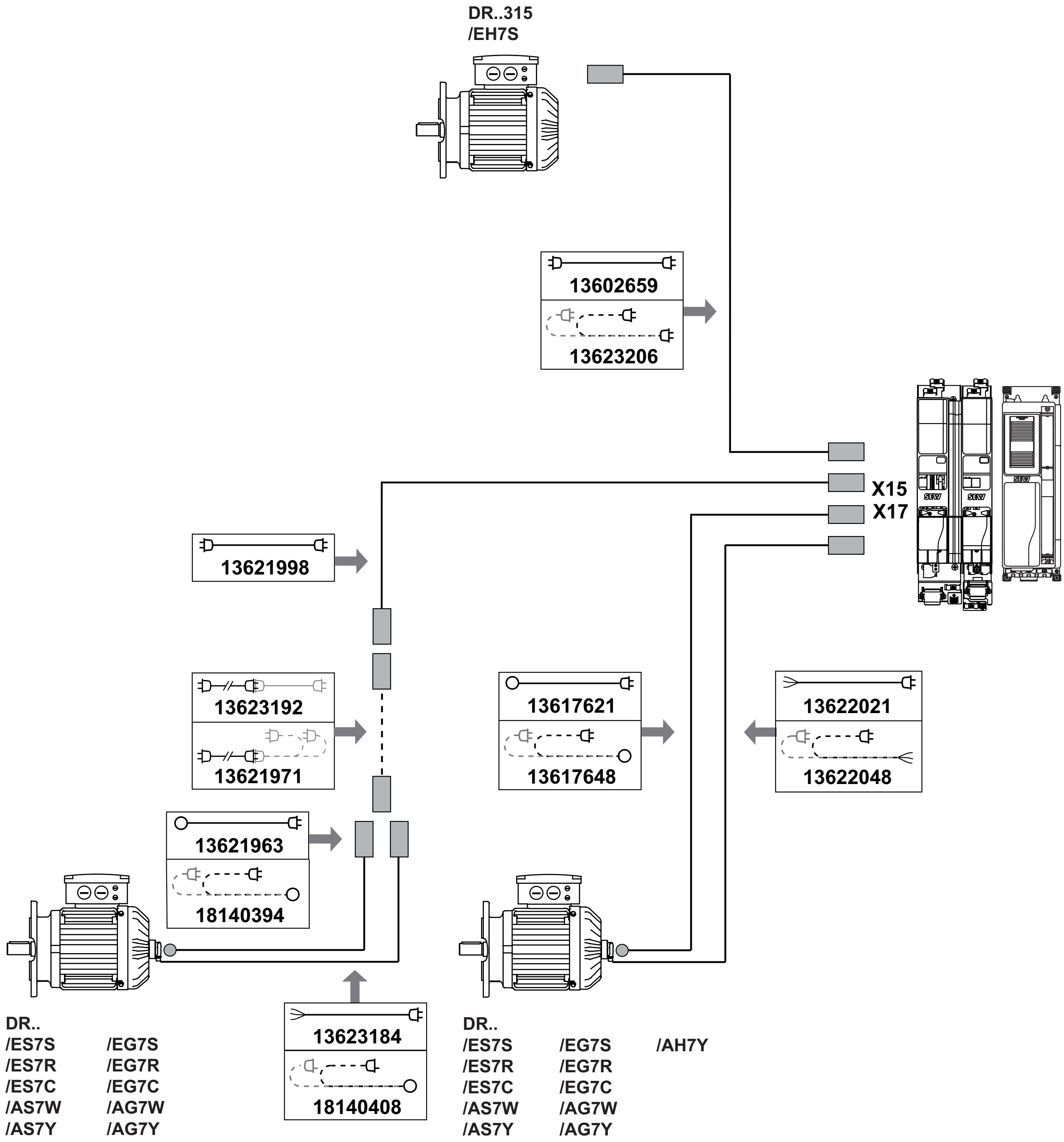
4838486411

Types of HIPERFACE® encoder cables for terminal box

Number of cores and cable cross section	Part number	Routing
5 × 2 × 0.25 mm²	13356291	Fixed installation
5 × 2 × 0.25 mm²	13356305	Cable carrier installation

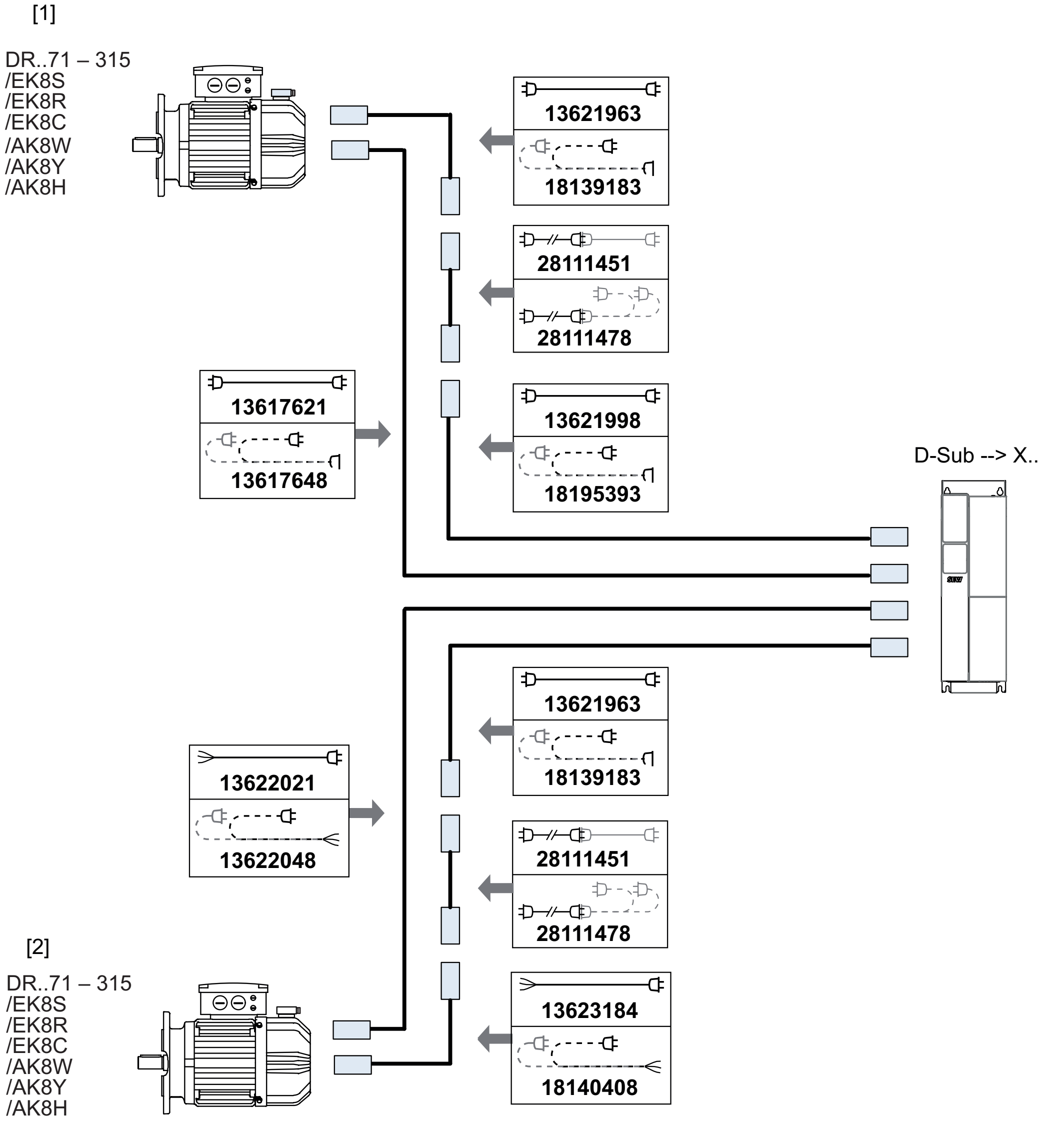
4.7 Encoder cables for DR.. motors

4.7.1 Overview



27021612580532619

SSI encoders can only be evaluated with the CES11A (X17) multi-encoder card.



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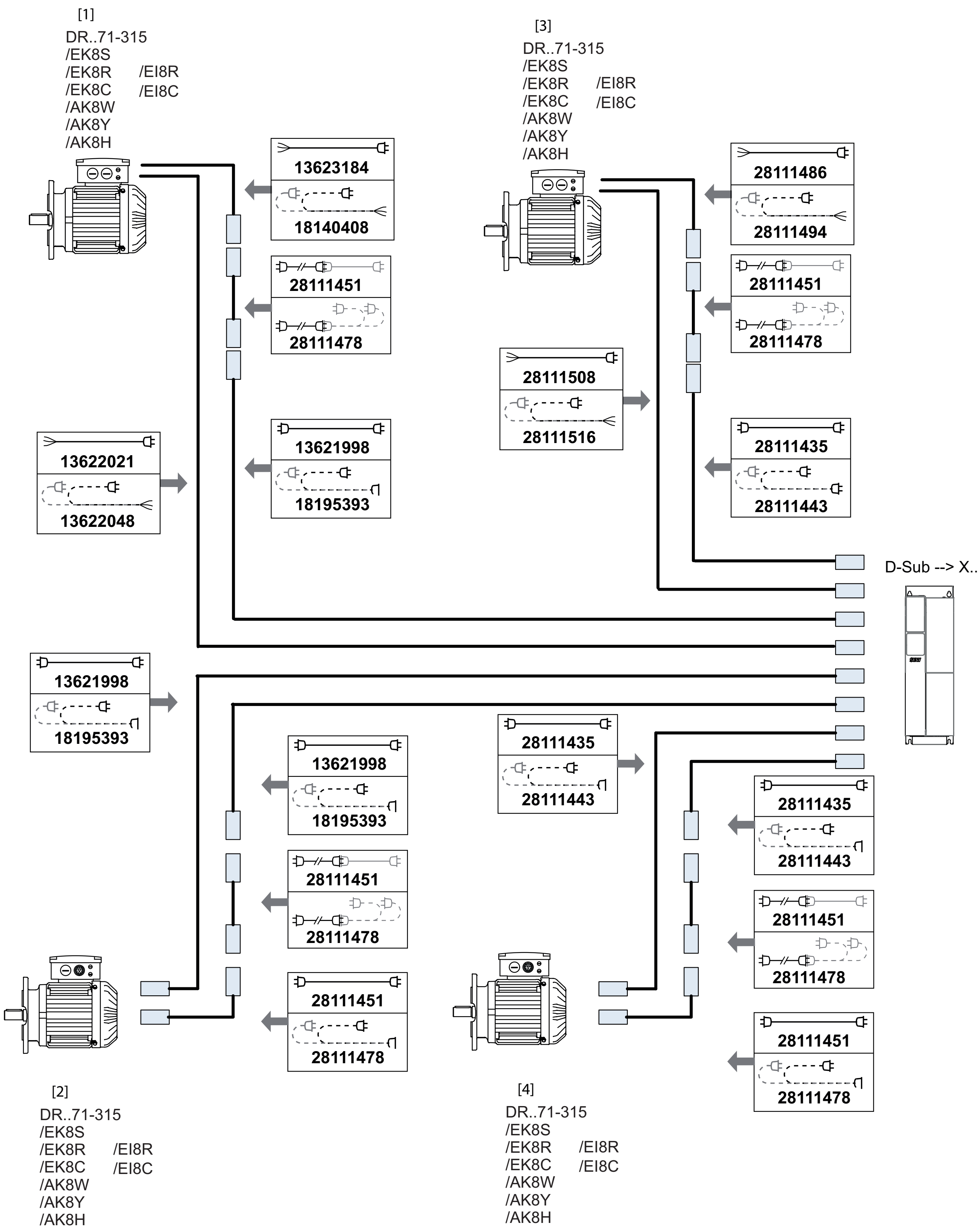
D-Sub --> X.. MOVIDRIVE® modular/system/technology
Basic device: X15
CES11A multi-encoder card: X17
AK8Y encoders can only be connected to the CES11A multi-encoder card.

[1] Motors with integrated plug connector for encoder signals without connection cover, connection type A2GB.
The signals for thermal monitoring of the motor are not located in the encoder cable.

[2] Motors with integrated plug connector for encoder signals with connection cover, connection type A1GA.
The signals for thermal monitoring of the motor are not located in the encoder cable.



9007223738033163

D-Sub --> X.. MOVIDRIVE® modular/system/technology
Basic device: X15
CES11A multi-encoder card: X17
AK8Y encoders can only be connected to the CES11A multi-encoder card.

[1] Motors with terminal strip in the terminal box for encoder signals and thermal monitoring.
The signals for thermal monitoring of the motor are not located in the encoder cable.

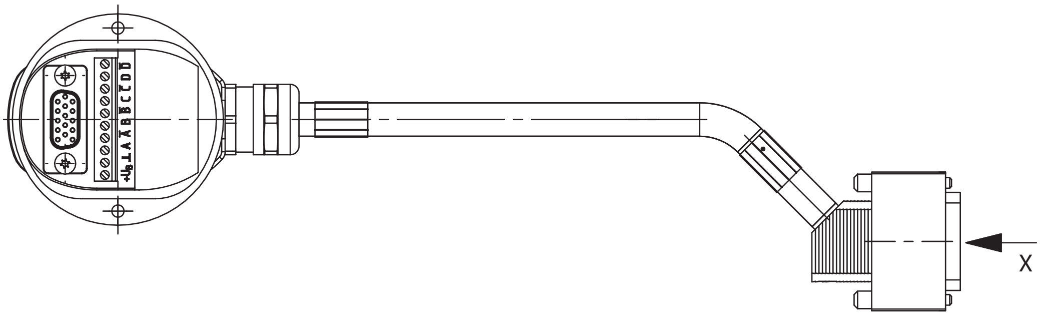
[2] Motors with M23 plug connector at terminal box for encoder signals, connection type AIGB.
The signals for thermal monitoring of the motor are not located in the encoder cable.

[3] Motors with terminal strip in the terminal box for encoder signals and thermal monitoring.
The signals for thermal monitoring of the motor are located in the encoder cable.

[4] Motors with M23 plug connector at the terminal box for encoder signals and thermal monitoring, connection type AIGA.
The signals for thermal monitoring of the motor are located in the encoder cable.

4.7.2 Encoder cable with connection cover and D-sub

Illustration of encoder cable



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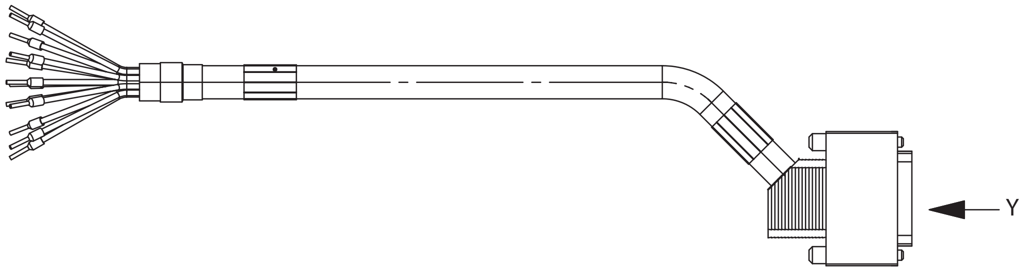
Types of encoder cables and encoders

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm^2	13617621	Fixed installation
6 × 2 × 0.25 mm^2	13617648	Cable carrier installation

Encoder types	DR.71 – 132	DR.160 – 280
Sine encoder	ES7S	EG7S
TTL	ES7R	EG7R
RS485	AS7W	AG7W

4.7.3 Encoder cable with conductor end sleeves and D-sub

Illustration of encoder cable



14818291467

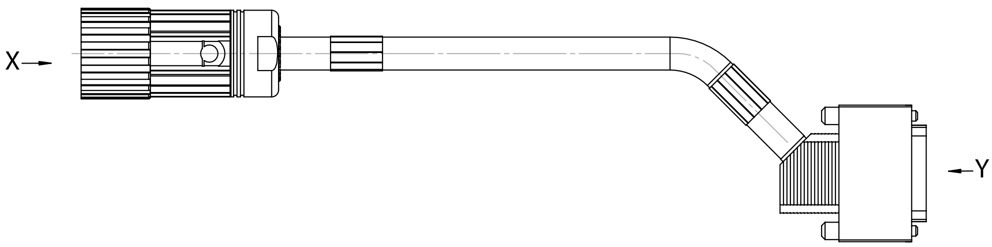
Types of encoder cables and encoders

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm²	13622021	Fixed installation
6 × 2 × 0.25 mm²	13622048	Cable carrier installation

Encoder types	DR.71 – 132	DR.160 – 280
Sine encoder	ES7S	EG7S
TTL	ES7R	EG7R
RS485	AS7W	AG7W

4.7.4 Encoder cable with M23 and D-sub

Illustration of encoder cable



14818370059

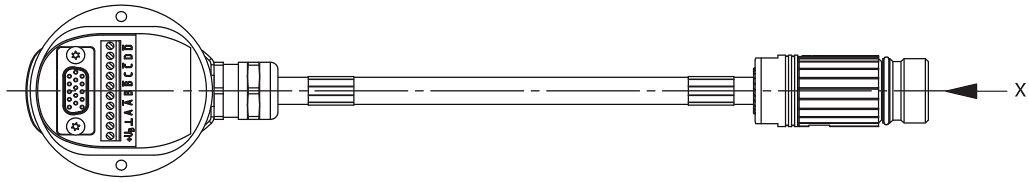
Types of encoder cables

Number of cores and cable cross section	Part number	Installation type
5 × 2 × 0.25 mm²	13602659	Fixed installation
5 × 2 × 0.25 mm²	13623206	Cable carrier installation

Encoder types	DR.315
Sine encoder	EH7S

4.7.5 Encoder extension cable with connection cover and M23

Illustration of encoder extension cable



14818380043

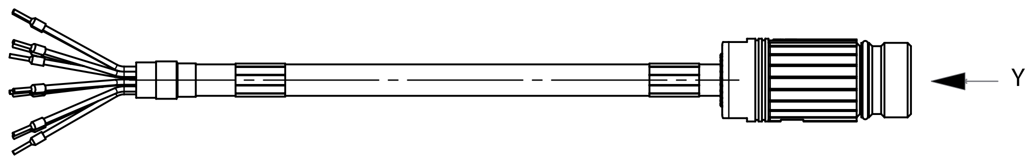
Types of encoder extension cables

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm^2	13621963	Fixed installation

Encoder types	DR.71 – 132	DR.160 – 280
Sine encoder	ES7S	EG7S
TTL	ES7R	EG7R
RS485	AS7W	AG7W

4.7.6 Encoder extension cable with conductor end sleeves and M23

Illustration of encoder extension cable



14818388875

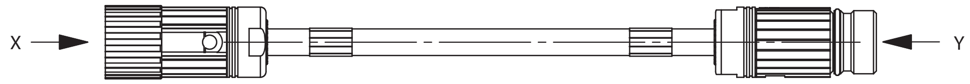
Types of encoder extension cables

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm^2	13623184	Fixed installation

Encoder types	DR.71 – 132	DR.160 – 280
Sine encoder	ES7S	EG7S
TTL	ES7R	EG7R
RS485	AS7W	AG7W

4.7.7 Encoder extension cable with two M23

Illustration of encoder extension cable



14818397963

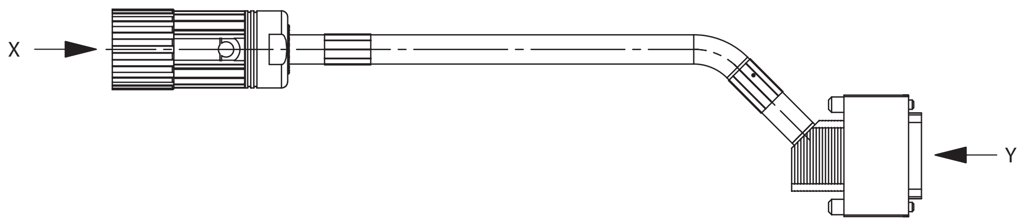
Types of encoder extension cables

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm^2	13623192	Fixed installation
6 × 2 × 0.25 mm^2	13621971	Cable carrier installation

Encoder types	DR.71 – 132	DR.160 – 280
Sine encoder	ES7S	EG7S
TTL	ES7R	EG7R
RS485	AS7W	AG7W

4.7.8 Encoder extension cable with M23 and D-sub

Illustration of encoder extension cable



14818406795

Types of encoder extension cables

Number of cores and cable cross section	Part number	Installation type
6 × 2 × 0.25 mm^2	13621998	Fixed installation

Encoder types	DR.71 – 132	DR.160 – 280
Sine encoder	ES7S	EG7S
TTL	ES7R	EG7R
RS485	AS7W	AG7W

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4.8 System bus and module bus cable

The RJ45 connectors of the system bus and module bus cables and the sockets in the application inverters have been checked for mechanical stability and contact reliability by SEW-EURODRIVE. SEW-EURODRIVE recommends to use the system bus and module bus cables listed below, and the connectors that can be preassembled in the field. If other cables and connectors are used, SEW-EURODRIVE does not make any statements regarding the quality of the plug-in connection.

NOTICE

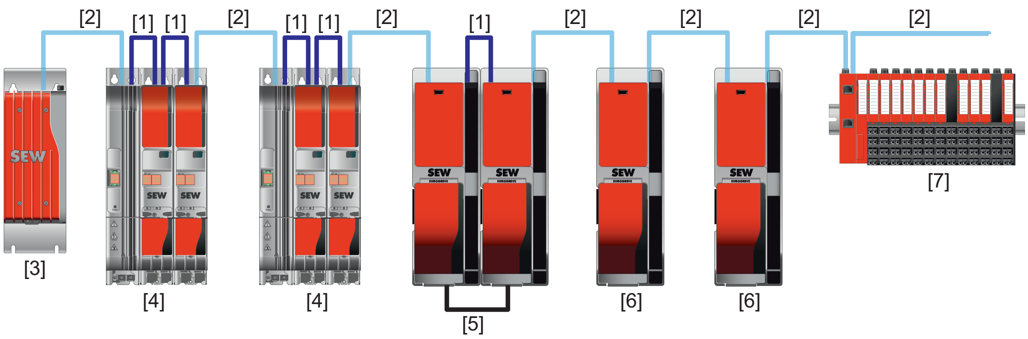
Use of wrong cables

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.

4.8.1 System bus and module bus cabling

Example of a system bus and module bus cabling



9007217271733643

[1] Module bus cable, 8-pin, color: anthracite gray.

[2] System bus cable, 4-pin, color: light gray.

[3] MOVI-C® CONTROLLER power UHX8x

[4] MOVIDRIVE® modular

[5] MOVIDRIVE® system with DC link connection

[6] MOVIDRIVE® system

[7] Other EtherCAT® stations at the EtherCAT®/SBus^{PLUS}

4.8.2 System bus cable

Figure of the cable

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[1] Connector red   [2] Connector red

The 4-pole system bus cable [2] is used between automation components, see figure (→ 🗎 191). Some of these components are listed here as examples:

- MOVI-C® CONTROLLER
- MOVIDRIVE® modular application inverter
- PC with MOVISUITE® engineering software
- MOVI-PLC® I/O system
- Other EtherCAT® stations at the EtherCAT®/SBus^{PLUS}

The following lengths of the system bus cable are available for fixed installation.

Cable length	Part number	Cable assignment for MOVIDRIVE® system
0.29 m	18179959	MDX9_A-0020 – 0160-.. with devices directly next to each other
0.75 m	18167039	MDX9_A-0460 – 1130-.. with devices directly next to each other
1.5 m	18179975	MDX9_A-.. with devices not directly next to each other
3.0 m	18167047	MDX9_A-.. with devices not directly next to each other
5 m	18179983	MDX9_A-.. with devices not directly next to each other
10 m	18179991	MDX9_A-.. with devices not directly next to each other

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Pin assignment

The prefabricated system bus cables are assigned according to EIA/TIA-568A. Also use this assignment for prefabrication in the field.

Pin	Color coding
1	White/green
2	Green
3	White/orange
4	Reserved
5	Reserved
6	Orange
7	Reserved
8	Reserved

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4.8.3 Module bus cable

Figure

18027071371

[1] Connector black [2] Connector red

For MOVIDRIVE® modular, the 8-core module bus cable [1] connects the power supply module to the first axis module and the axis modules to each other, see figure (→ 🗎 191).

For MOVIDRIVE® system/technology, the module bus cable is used when 2 application inverters are connected in the DC link.

In the case of MOVIDRIVE® modular, in addition to the system bus communication, the module bus is routed in the cable for information inside the device. The module bus cable is delivered in the length required as part of the accessories for the axis modules.

A module bus cable for MOVIDRIVE® system/technology in the required length must be ordered separately.

If the module bus cable for MOVIDRIVE® modular is needed as a spare part, it can be ordered with the following part numbers.

Cable length	Part number	Replacement cable for MOVIDRIVE® modular	Cable assignment for MOVIDRIVE® system
0.23 m	18166989	MDA90A-0020 – 0120-.. MDD90A-0020 – 0040-..	-
0.26 m	18166997	MDA90A-0160 – 0240-.. MDD90A-0020 – 0080-..	-
0.29 m	18167004	MDP90A-0100-...-C00 MDA90A-0320 – 0480-..	MDX9_A-0020 – 0160-.. to install the devices directly next to each other
0.35 m	18167012	MDP90A-0500 – 0750-.. MDA90A-0640 – 1000-..	-
0.44 m	18167020	MDA90A-1400 – 1800-..	MDX9_A-0460 – 1130-.. to install the devices directly next to each other
1.6 m	18174205	-	MDX9_A-.. with devices not directly next to each other

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5 General information

5.1 About this documentation

The current version of the documentation is the original.

This documentation is an integral part of the product. The documentation is written for all employees who assemble, install, start up, and service this product.

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

5.2 Structure of the safety notes

5.2.1 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.	

5.2.2 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

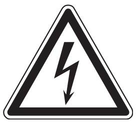
Type and source of hazard.

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 risk of crushing
	Warning of suspended load
	Warning of automatic restart

5.2.3 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.

5.3 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.

5.4 Content of the documentation

This documentation contains additional safety-related information and conditions for operation in safety-related applications.

5.5 Other applicable documentation

Observe the corresponding documentation for all further components.

5.6 Product names and trademarks

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

5.7 Copyright notice

6 Safety notes

6.1 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.

6.2 Duties of the user

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

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

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

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

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

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

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6.3 Target group

Specialist for mechanical work

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

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

Specialist for electrotechnical work

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

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

Additional qualification

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

Instructed persons

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

6.4 Designated use

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

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

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

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

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

- AC asynchronous motors with squirrel-cage rotor
- 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.

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6.4.1 Hoist applications

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

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

Application in ELSM® control mode

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

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6.5 Functional safety technology

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

6.6 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.
- Before transportation, cover the connections with the supplied protection caps.
- Only place the product on the cooling fins or on the side without connectors during transportation.
- Always use lifting eyes if available.

If necessary, use suitable, sufficiently dimensioned handling equipment.

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

6.7 Installation/assembly

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

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

Observe the notes in chapter Mechanical installation in the documentation.

6.7.1 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:

- The reduction of the nominal output current and/or the line voltage is considered according to the data in chapter Technical data in the documentation.

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

6.8 Electrical installation

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

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

6.8.1 Required preventive measure

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

6.8.2 Stationary application

Necessary preventive measure for the product is:

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

6.8.3 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.

6.9 Protective separation

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

6.10 Startup/operation

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

Make sure that the present transport protection is removed.

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

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

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

Additional preventive measures may be required for applications with increased hazard potential. You have to check the protection devices after each modification.

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

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

Do not separate the connection to the product during operation.

This may result in dangerous electric arcs damaging the product.

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

10 minutes.

Observe the corresponding information signs on the product.

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

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

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

Do not touch the product during operation.

Let the product cool down before touching it.

6.10.1 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 chapter "Service" > "Shutdown".

7 Device structure, axis system structure

7.1 Connection variants

The MOVIDRIVE® modular application inverter can be used in the following connection variants:

- As axis system in connection with a MOVI-C® CONTROLLER power/power eco
- As axis system in connection with a master module UHX45A/MDM90A
- As axis system in connection with a MOVI-C® CONTROLLER advanced
- As axis system in connection with a MOVI-C® CONTROLLER standard

In one axis system, up to 15 axis modules can be used, both as single-axis modules and double-axis modules.

NOTICE

Damage to the MOVIDRIVE® modular application inverter when opening the DC link (separate operation).

Separate operation of individual modules will damage the application inverter and is not permitted.

Only operate the application inverter when installed in a system as illustrated above.

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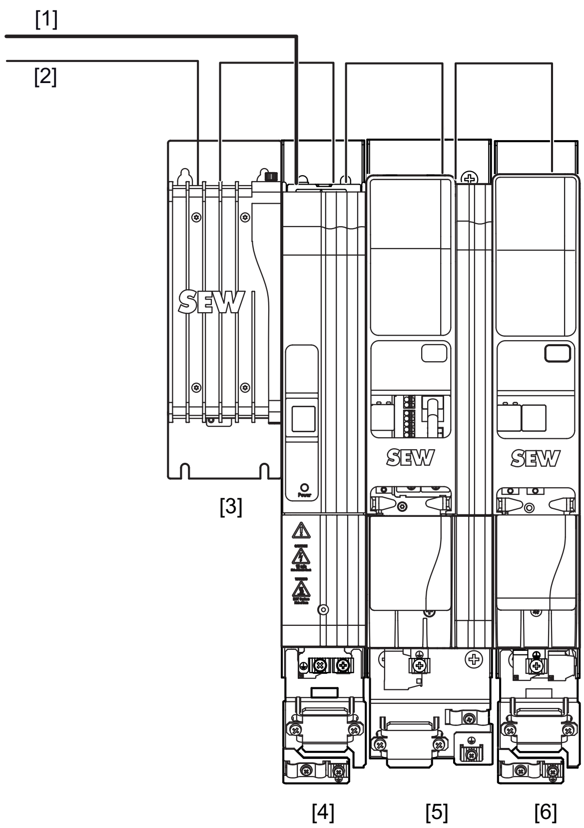
7.1.1 Axis system with MOVI-C® CONTROLLER power/power eco

MOVIDRIVE® modular



27021610677277835

[1] Line voltage 3 × AC 380 – 500 V

[2] Industrial Communication

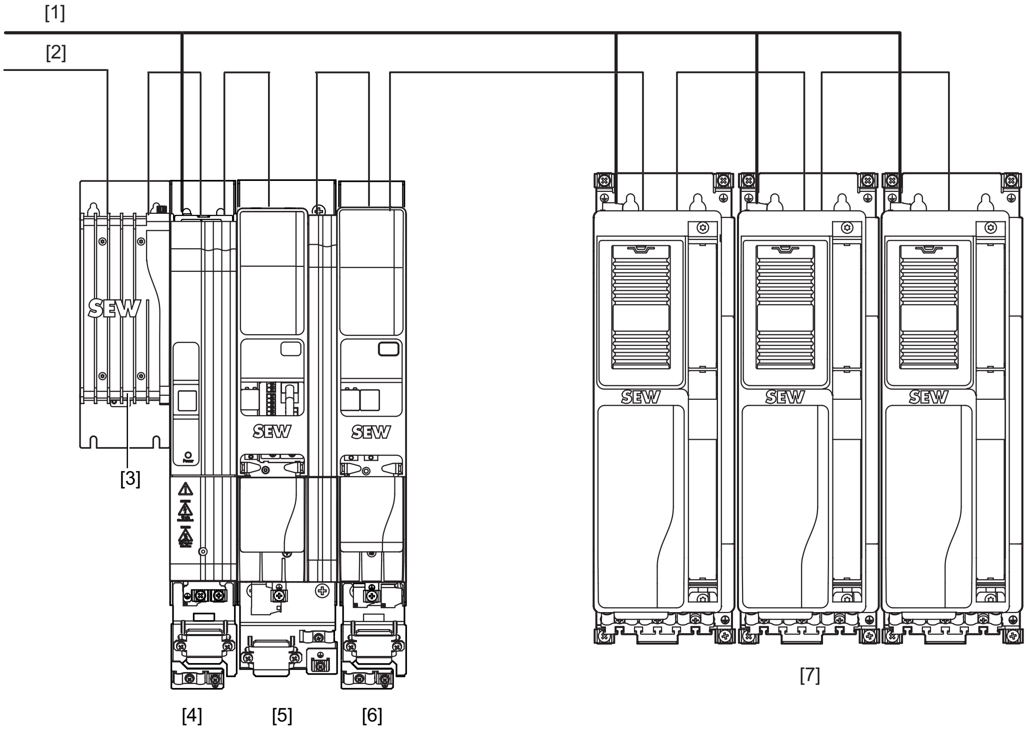
[3] MOVI-C® CONTROLLER

[4] MOVIDRIVE® modular power supply module MDP..

[5] MOVIDRIVE® modular single-axis module MDA.

[6] MOVIDRIVE® modular double-axis module MDD..

MOVIDRIVE® modular and MOVIDRIVE® system



27021613583815051

[1] Line voltage 3 × AC 380 – 500 V

[2] Industrial Communication

[3] MOVI-C® CONTROLLER

[4] MOVIDRIVE® modular power supply module MDP..

[5] MOVIDRIVE® modular single-axis module MDA.

[6] MOVIDRIVE® modular double-axis module MDD..

[7] MOVIDRIVE® system

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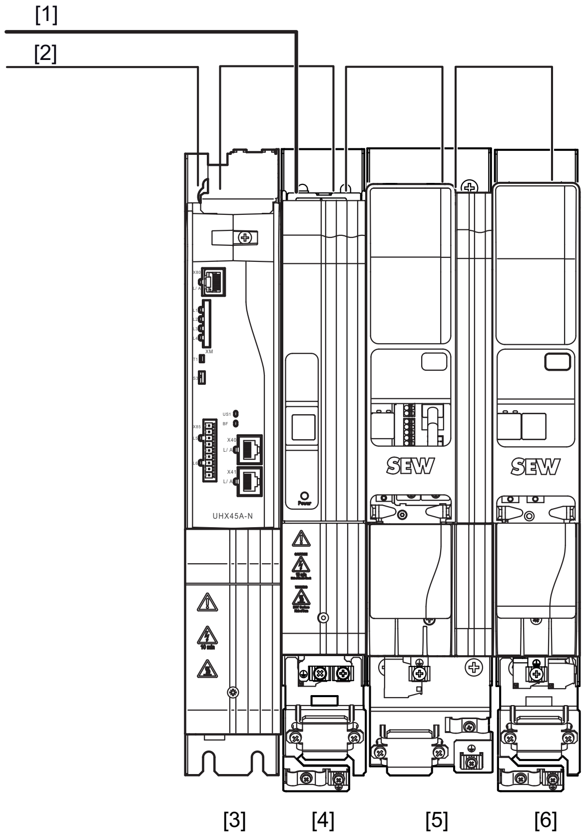
7.1.2 Axis system with master module UHX45A/MDM90A

MOVIDRIVE® modular



20841212939

[1] Line voltage 3 × AC 380 – 500 V

[2] Industrial Communication

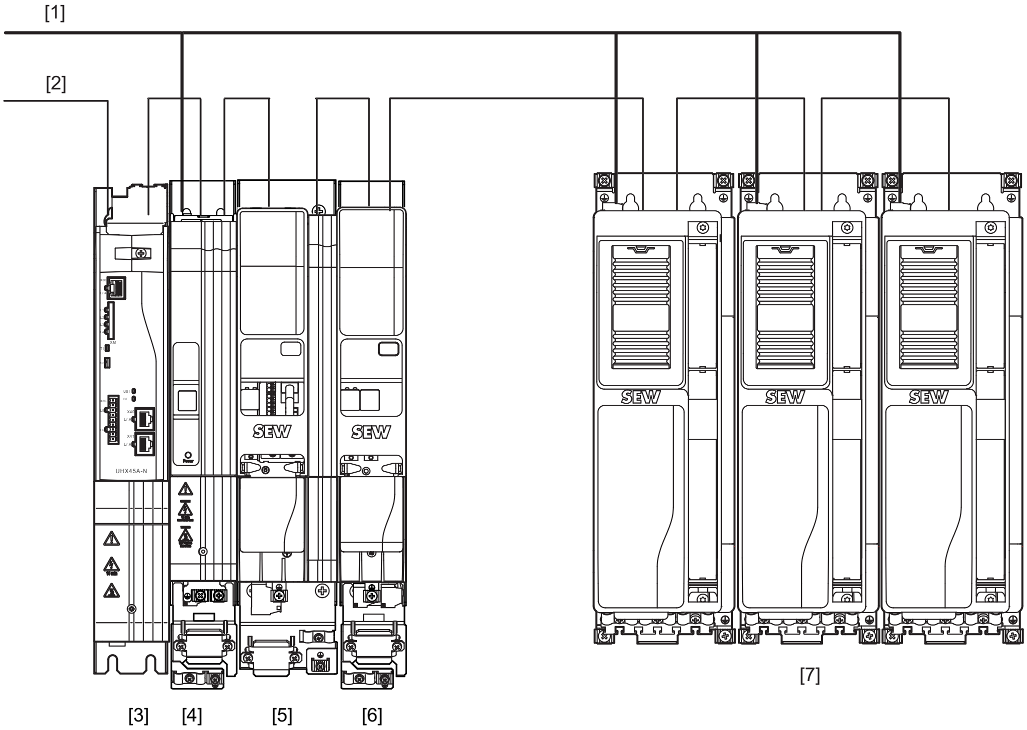
[3] MOVIDRIVE® modular master module UHX45A/MDM90A

[4] MOVIDRIVE® modular power supply module MDP..

[5] MOVIDRIVE® modular single-axis module MDA.

[6] MOVIDRIVE® modular double-axis module MDD..

MOVIDRIVE® modular and MOVIDRIVE® system



20841205643

[1] Line voltage 3 × AC 380 – 500 V

[2] Industrial Communication

[3] MOVIDRIVE® modular master module UHX45A/MDM90A

[4] MOVIDRIVE® modular power supply module MDP..

[5] MOVIDRIVE® modular single-axis module MDA.

[6] MOVIDRIVE® modular double-axis module MDD..

[7] MOVIDRIVE® system

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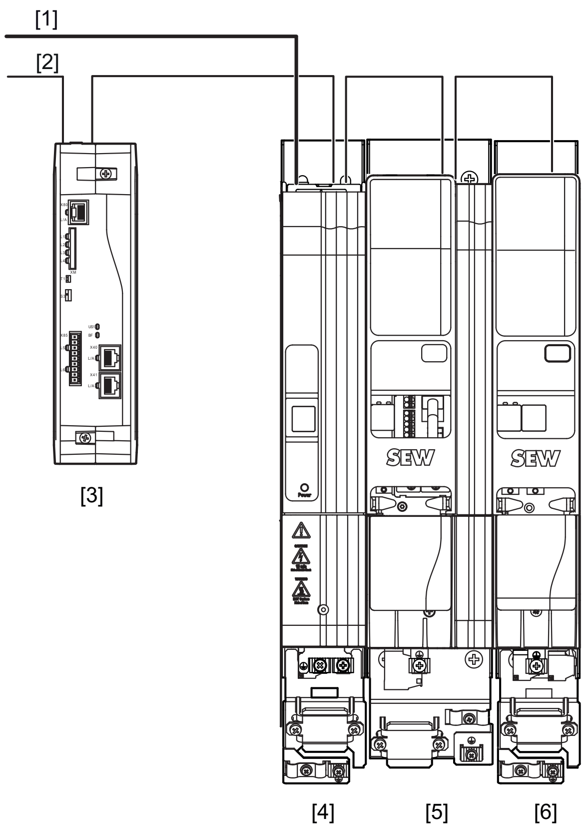
7.1.3 Axis system with MOVI-C® CONTROLLER advanced

MOVIDRIVE® modular



20841208075

[1] Line voltage 3 × AC 380 – 500 V

[2] Industrial Communication

[3] MOVI-C® CONTROLLER advanced

[4] MOVIDRIVE® modular power supply module MDP..

[5] MOVIDRIVE® modular single-axis module MDA.

[6] MOVIDRIVE® modular double-axis module MDD..

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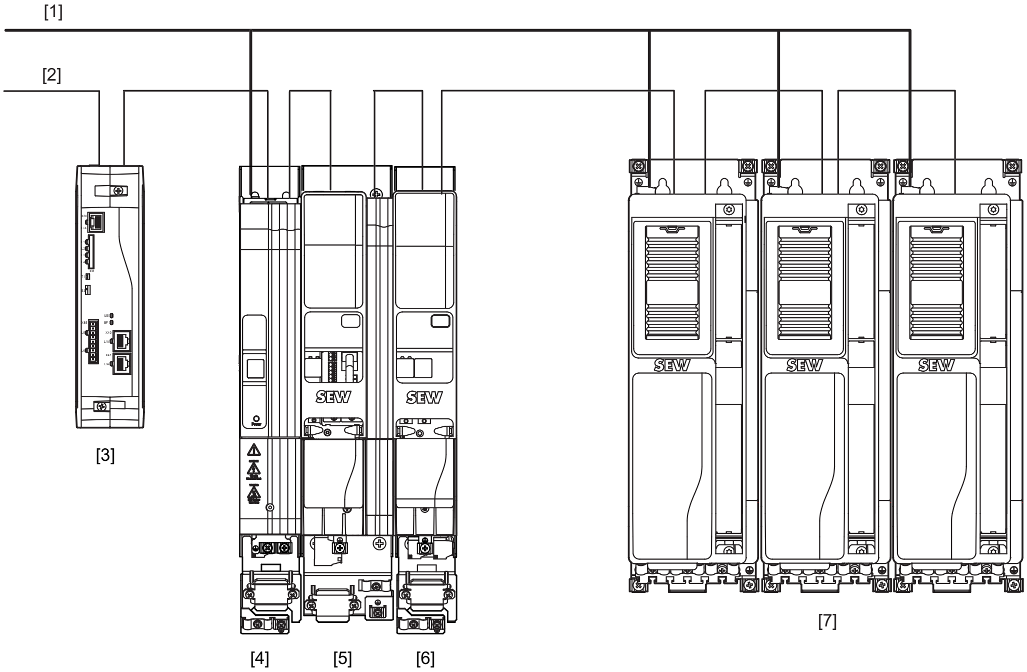
MOVIDRIVE® modular and MOVIDRIVE® system



20840829579

[1] Line voltage 3 × AC 380 – 500 V

[2] Industrial Communication

[3] MOVI-C® CONTROLLER advanced

[4] MOVIDRIVE® modular power supply module MDP..

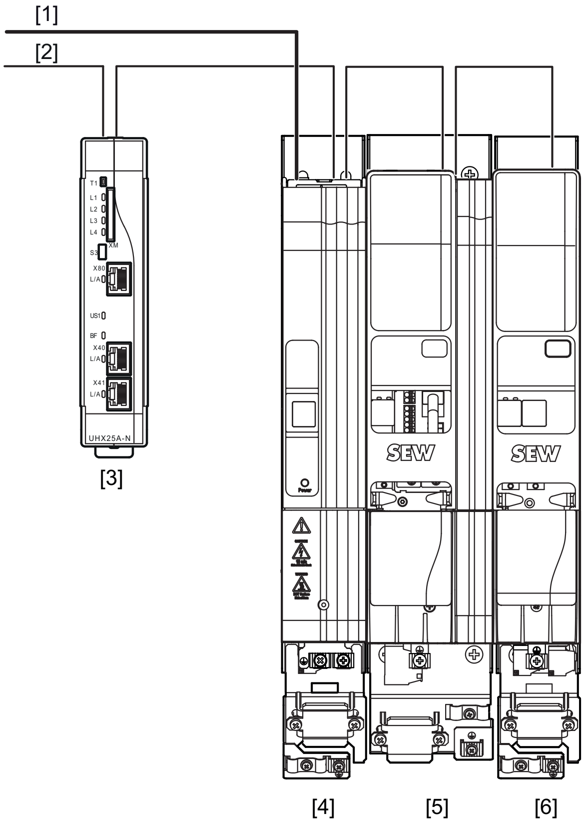
[5] MOVIDRIVE® modular single-axis module MDA.

[6] MOVIDRIVE® modular double-axis module MDD..

[7] MOVIDRIVE® system

7.1.4 Axis system with MOVI-C® CONTROLLER standard

MOVIDRIVE® modular



20841210507

[1] Line voltage 3 × AC 380 – 500 V

[2] Industrial Communication

[3] MOVI-C® CONTROLLER standard

[4] MOVIDRIVE® modular power supply module MDP..

[5] MOVIDRIVE® modular single-axis module MDA.

[6] MOVIDRIVE® modular double-axis module MDD..

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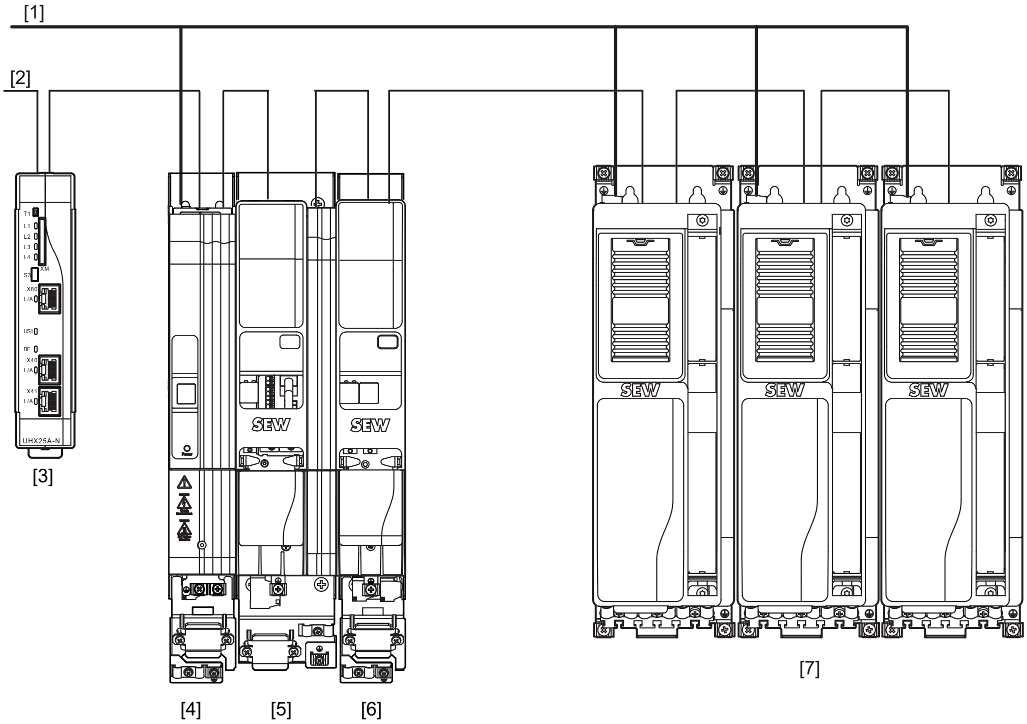
MOVIDRIVE® modular and MOVIDRIVE® system



20841203211

[1] Line voltage 3 × AC 380 – 500 V

[2] Industrial Communication

[3] MOVI-C® CONTROLLER standard

[4] MOVIDRIVE® modular power supply module MDP..

[5] MOVIDRIVE® modular single-axis module MDA.

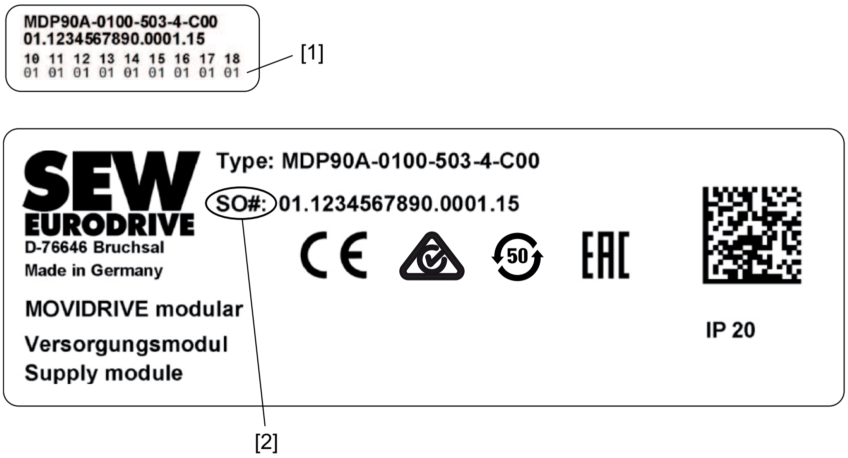
[6] MOVIDRIVE® modular double-axis module MDD..

[7] MOVIDRIVE® system

7.2 Nameplates of MOVIDRIVE® modular

7.2.1 Power supply module

System nameplate

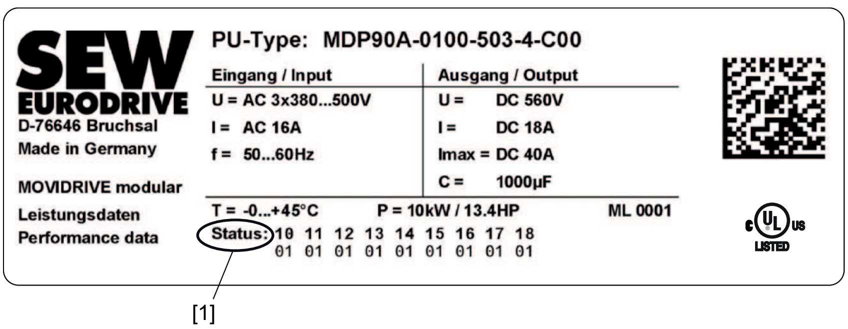


9007214313636491

[1] Device status

[2] Serial number

Performance data nameplate

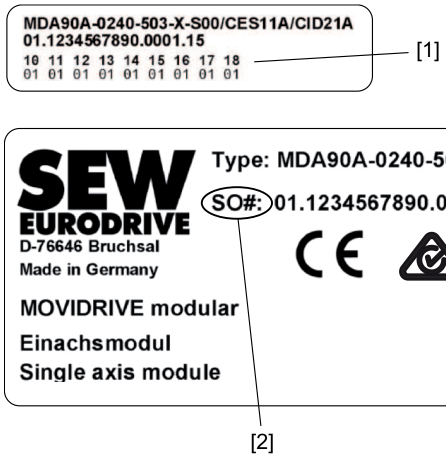


9007214313645451

[1] Device status

7.2.2 Single-axis module

System nameplate

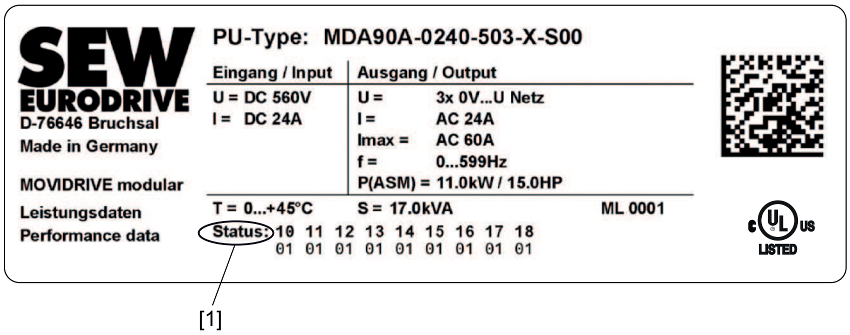


9007214313687563

[1] Device status

[2] Serial number

Performance data nameplate



9007214313691915

[1] Device status

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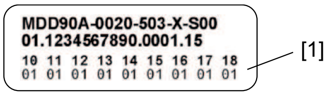
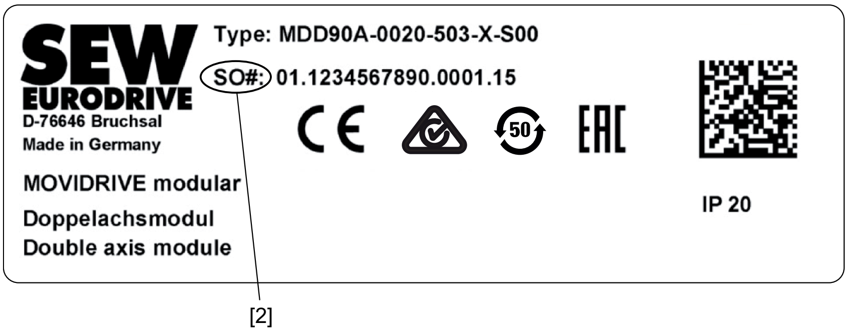
7.2.3 Double-axis module

System nameplate



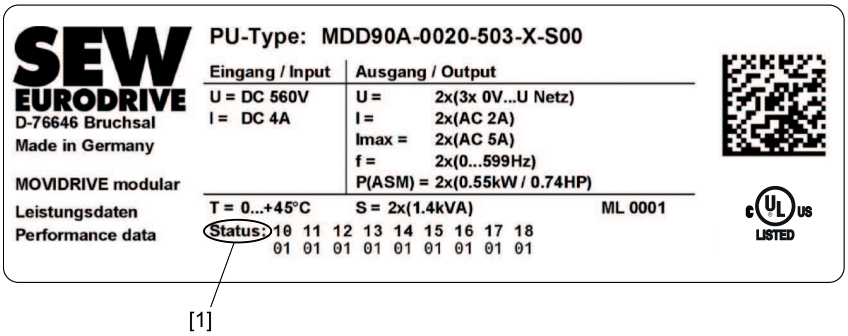


9007214313696523

[1] Device status

[2] Serial number

Performance data nameplate



9007214314814475

[1] Device status

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7.3 Type code of MOVIDRIVE® modular

The following type code applies to MOVIDRIVE® modular.

Example: MDA90A-0080-503-X-S00		
Product name	MD	• MD = MOVIDRIVE®
Device type	A	• A = Single-axis module • D = Double-axis module • P = Power supply module with brake chopper • M = Master module UHX45A/MDM90A
Series	90	• 90 = Standard design
Version	A	• A = Version status A
Performance class	0080	• MDA: Nominal output current – e.g. 0080 = 8 A • MDD: Nominal output current – e.g. 0020 = 2 × 2 A • MDP: Nominal power – e.g. 0100 = 10 kW
Connection voltage	5	• 5 = AC 380 – 500 V
EMC variant of power section	0	• 0 = Basic interference suppression integrated
Number of phases	3	• 3 = 3-phase connection type
Operating mode	X	• 4 = 4Q operation (with brake chopper) • X = Not relevant
Designs	0	• 0 = Not relevant • S = Control MOVI-C® CONTROLLER • C = Power supply module with integrated braking resistor and capacitor • E = Inverter with device profile CiA402
Designs	00	• 00 = Standard design • 01 = Axis module MDA90A-0640-.. in size 5
Options		• /X = MOVIDRIVE® modular without card slots • /L = Design with coated printed circuit boards The following list serves as an example: • /CES11A = Multi-encoder card • /CID21A, /CIO21A = I/O expansion card • /CS..A = Safety card

7.4 Device structure of the MDP power supply module

⚠ WARNING

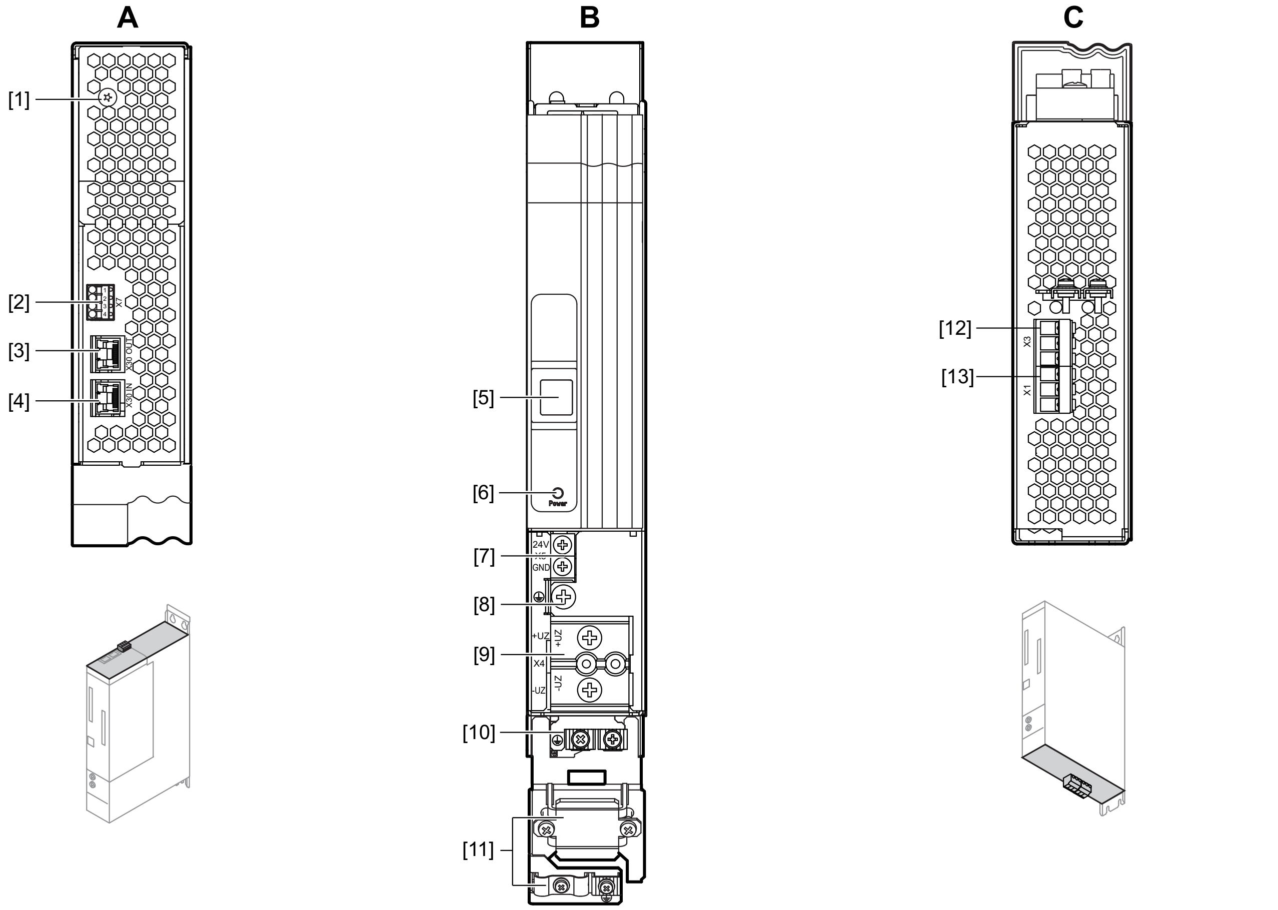
Uncovered power connections.

Some of the modules shown in this chapter are depicted without touch guards. Touch guards secure the live parts such as DC link, line connections and braking resistor connections.

Severe or fatal injuries from electric shock

- Never start up the application inverter without installed closed touch guards.

7.4.1 MDP90A-0100-.. (size 1)



18014411422564235

A: View from top

[1] Terminal screw for TN/TT systems

[2] X7: Temperature monitoring braking resistor

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] 7-segment display

[6] Standby display (Power)

[7] X5: Connection +24 V supply voltage

[8] PE connection

[9] X4: DC link connection

[10] PE connection housing

[11] Shield terminal

C: View from bottom

[12] X3: Braking resistor connection

[13] X1: Line connection

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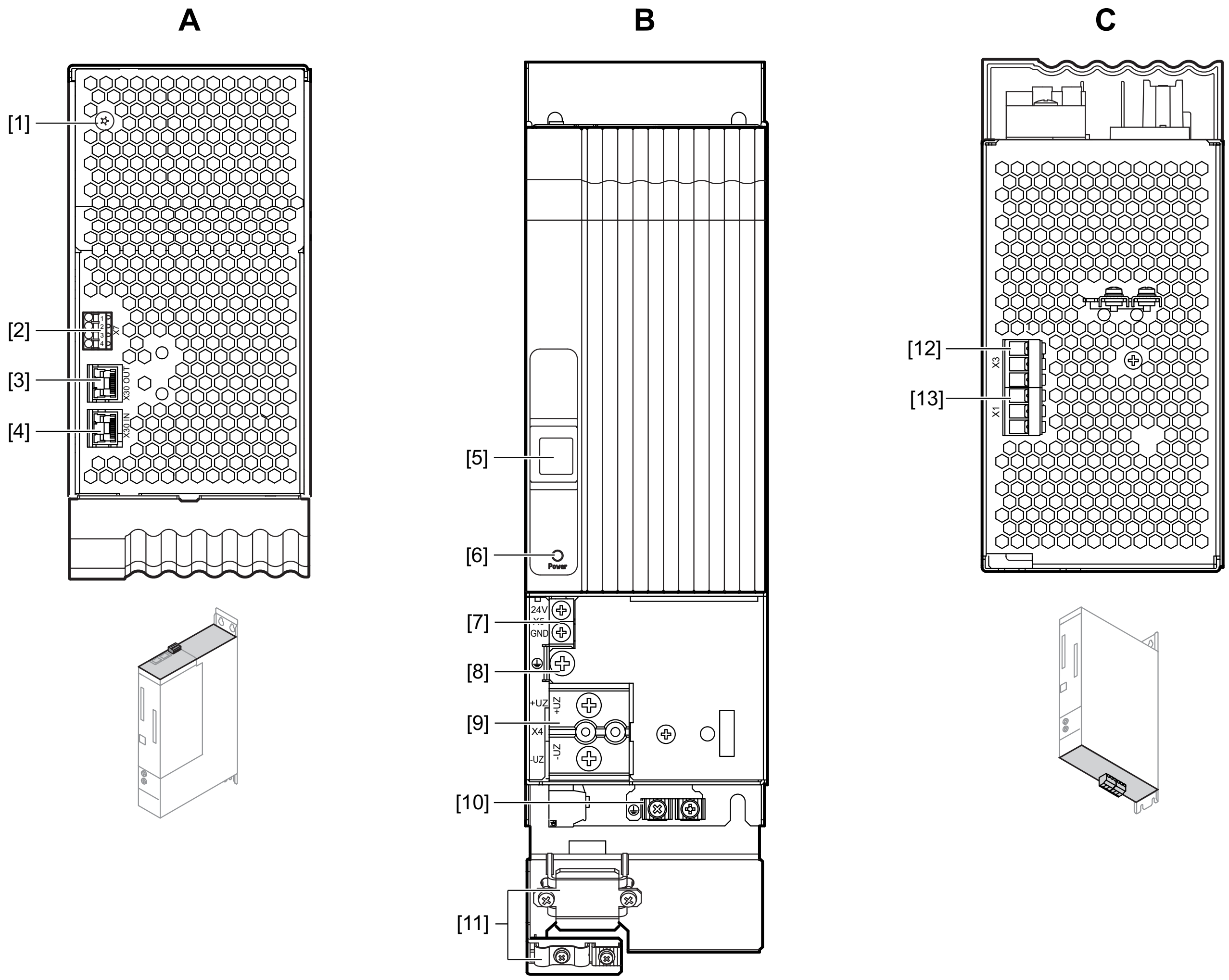
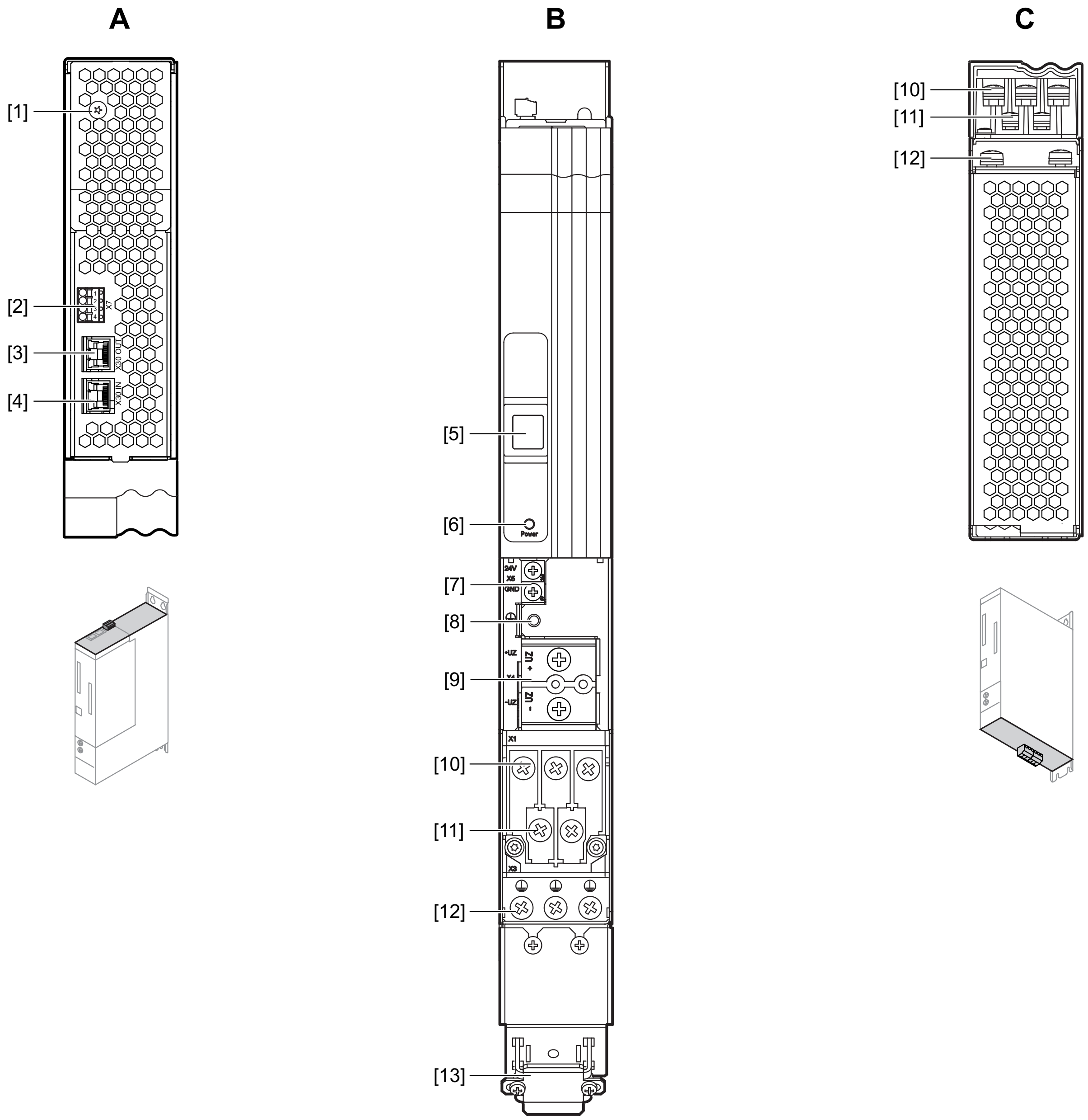
7.4.2 MDP90A-0100-.. with integrated braking resistance (size 1A)



18014411422566667

A: View from top	B: View from front	C: View from bottom
[1] Terminal screw for TN/TT systems	[5] 7-segment display	[12] X3: Braking resistor connection
[2] X7: Braking resistor temperature monitoring	[6] Standby display (Power)	[13] X1: Line connection
[3] X30 OUT: System bus	[7] X5: Connection +24 V supply voltage	
[4] X30 IN: System bus	[8] PE connection	
	[9] X4: DC link bus connection	
	[10] PE connection housing	
	[11] Shield terminal	

7.4.3 MDP90A-0250-.. (size 2)



18014411422569099

A: View from top

[1] Terminal screw for TN/TT systems

[2] X7: Control DC link discharge module, temperature monitoring braking resistor

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] 7-segment display

[6] Standby display (Power)

[7] X5: Connection +24 V supply voltage

[8] PE connection

[9] X4: DC link connection

[10] X1: Line connection

[11] X3: Braking resistor connection

[12] 3 × PE connection housing

[13] Shield terminal

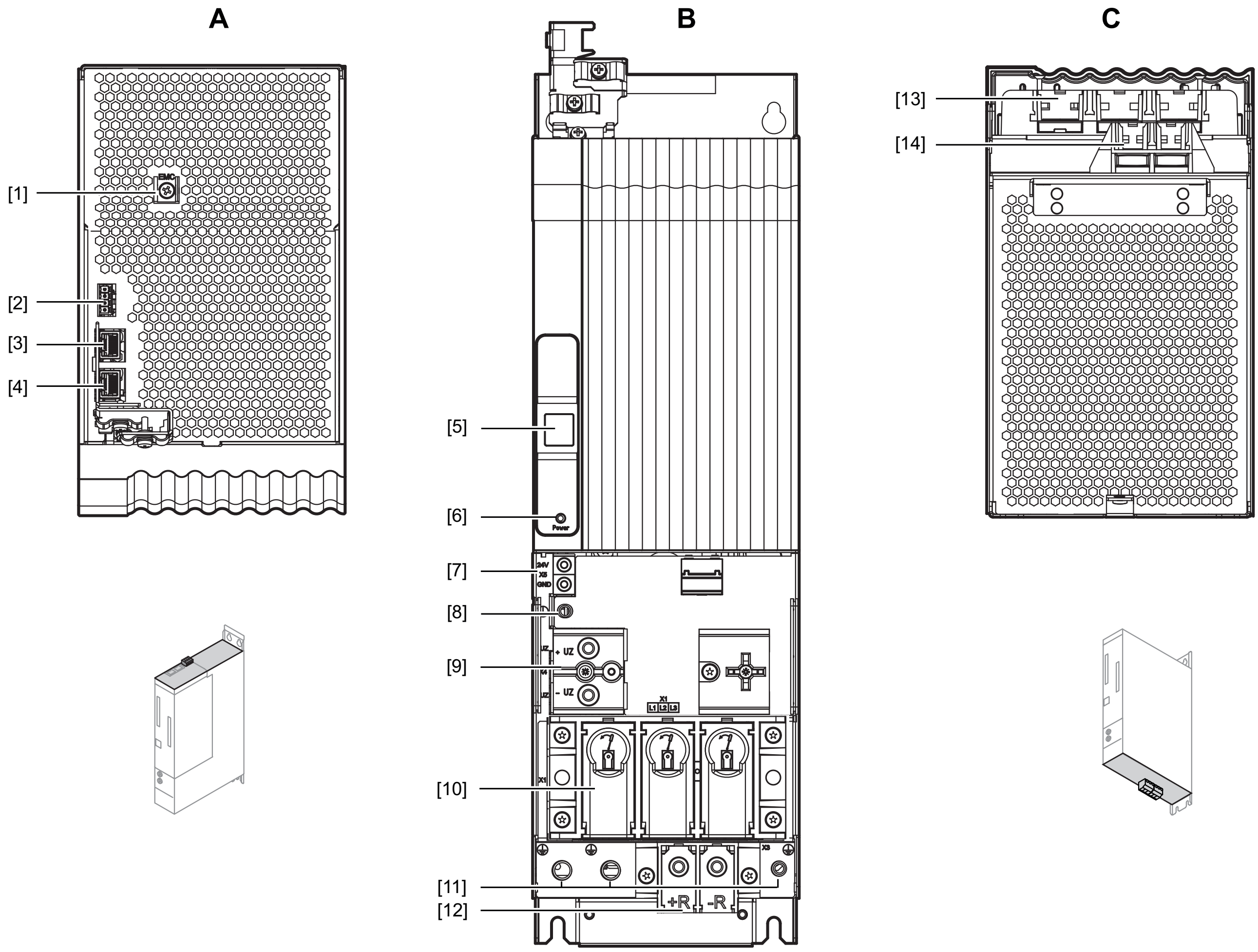
C: View from bottom

[10] X1: Line connection

[11] X3: Braking resistor connection

[12] 3 × PE connection housing

7.4.4 MDP90A-0500, 0750-.. (size 3)



900721936076749

A: View from top

[1] Terminal screw for TN/TT systems
[2] X7: Control DC link discharge module, temperature monitoring braking resistor
[3] X30 OUT: System bus
[4] X30 IN: System bus

B: View from front

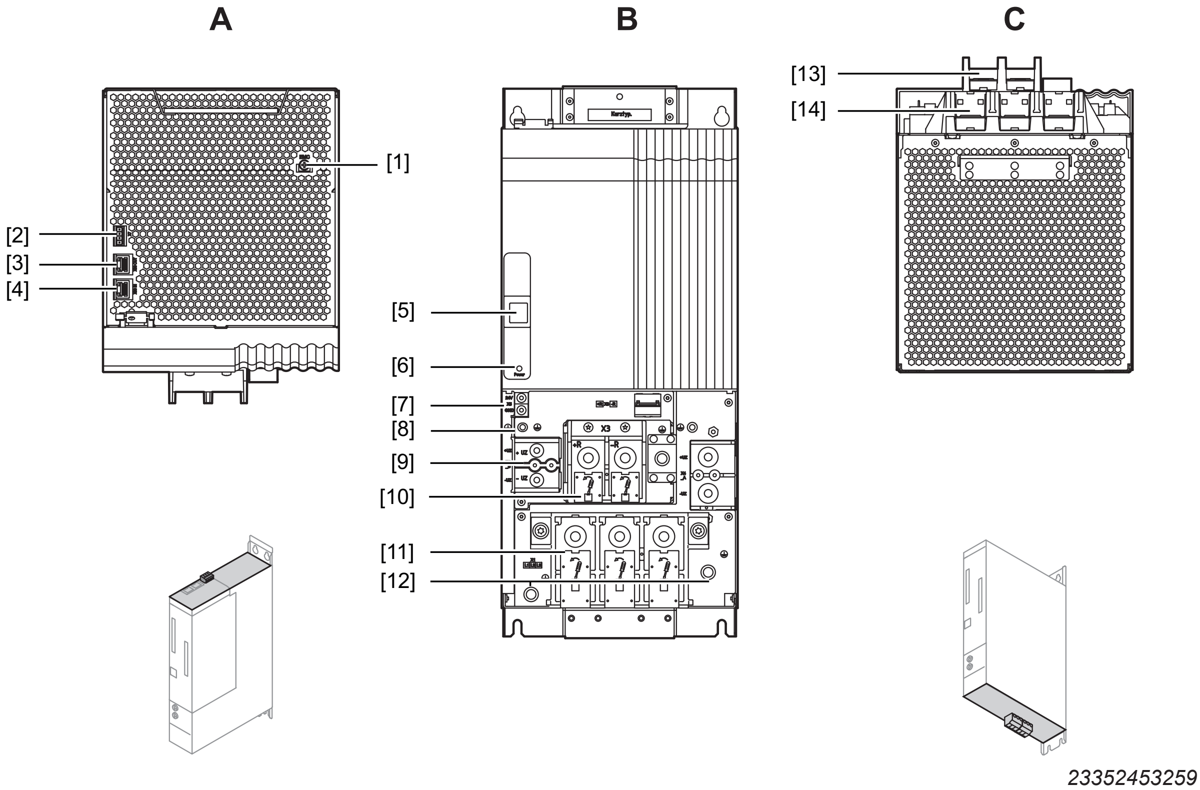
[5] 7-segment display
[6] Standby display (Power)

[7] X5: Connection +24 V supply voltage
[8] PE connection
[9] X4: DC link bus connection
[10] X1: Line connection
[11] 3 × PE connection housing
[12] X3: Braking resistor connection

C: View from bottom

[13] X1: Line connection
[14] X3: Braking resistor connection

7.4.5 MDP90A-1100-.. (size 4)



A: View from top

[1] Terminal screw for TN/TT systems

[2] X7: Control DC link discharge module, temperature monitoring braking resistor

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] 7-segment display

[6] Standby display (Power)

[7] X5: Connection +24 V supply voltage

[8] PE connection

[9] X4: DC link bus connection

[10] X3: Braking resistor connection

[11] X1: Line connection

[12] 2 × PE connection housing

C: View from bottom

[13] X3: Braking resistor connection

[14] X1: Line connection

7.5 Device structure of the MDA and MDD axis modules

⚠ WARNING

Uncovered power connections.

Some of the modules shown in this chapter are depicted without touch guards. Touch guards secure the live parts such as DC link, line connections and braking resistor connections.

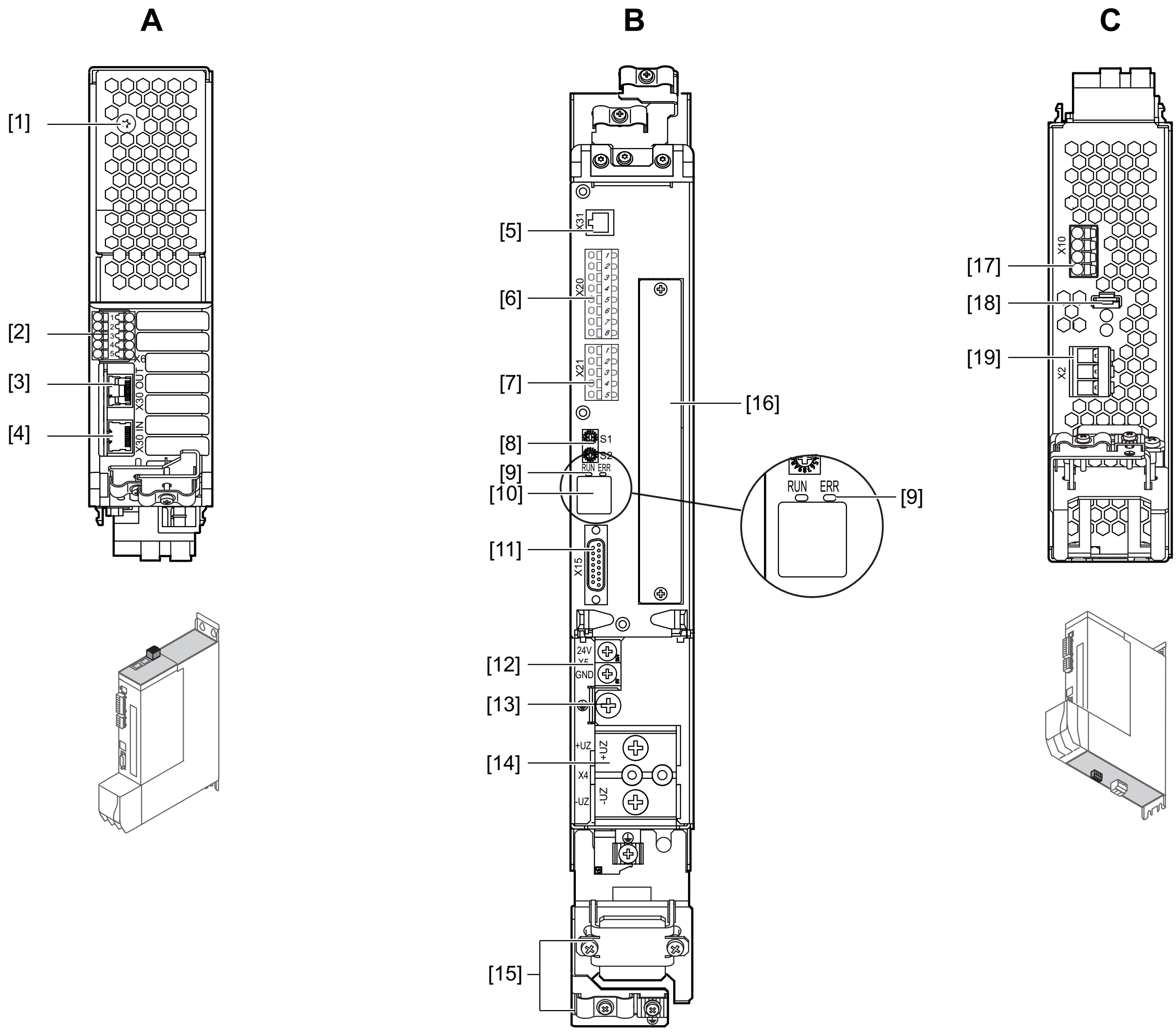
Severe or fatal injuries from electric shock

- Never start up the application inverter without installed closed touch guards.

MDA: Single-axis module

MDD: Double-axis module

7.5.1 MDA90A-0020, 0040, 0080, 0120 (size 1) – Single-axis module



27021610677285131

A: View from top

[1] Terminal screw for TN/TT systems

[2] X6: Connection for Safe Torque Off (STO)

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] X31: SEW-EURODRIVE Service interface

[6] X20: Digital inputs

[7] X21: Digital outputs

[8] EtherCAT® ID switch

[9] Status LEDs EtherCAT®/SBus^{PLUS} "RUN", "ERR"

[10] 7-segment display

[11] X15: Motor encoder connection

[12] X5: Connection +24 V supply voltage

[13] PE connection

[14] X4: DC link bus connection

[15] Shield plate

[16] Card slot

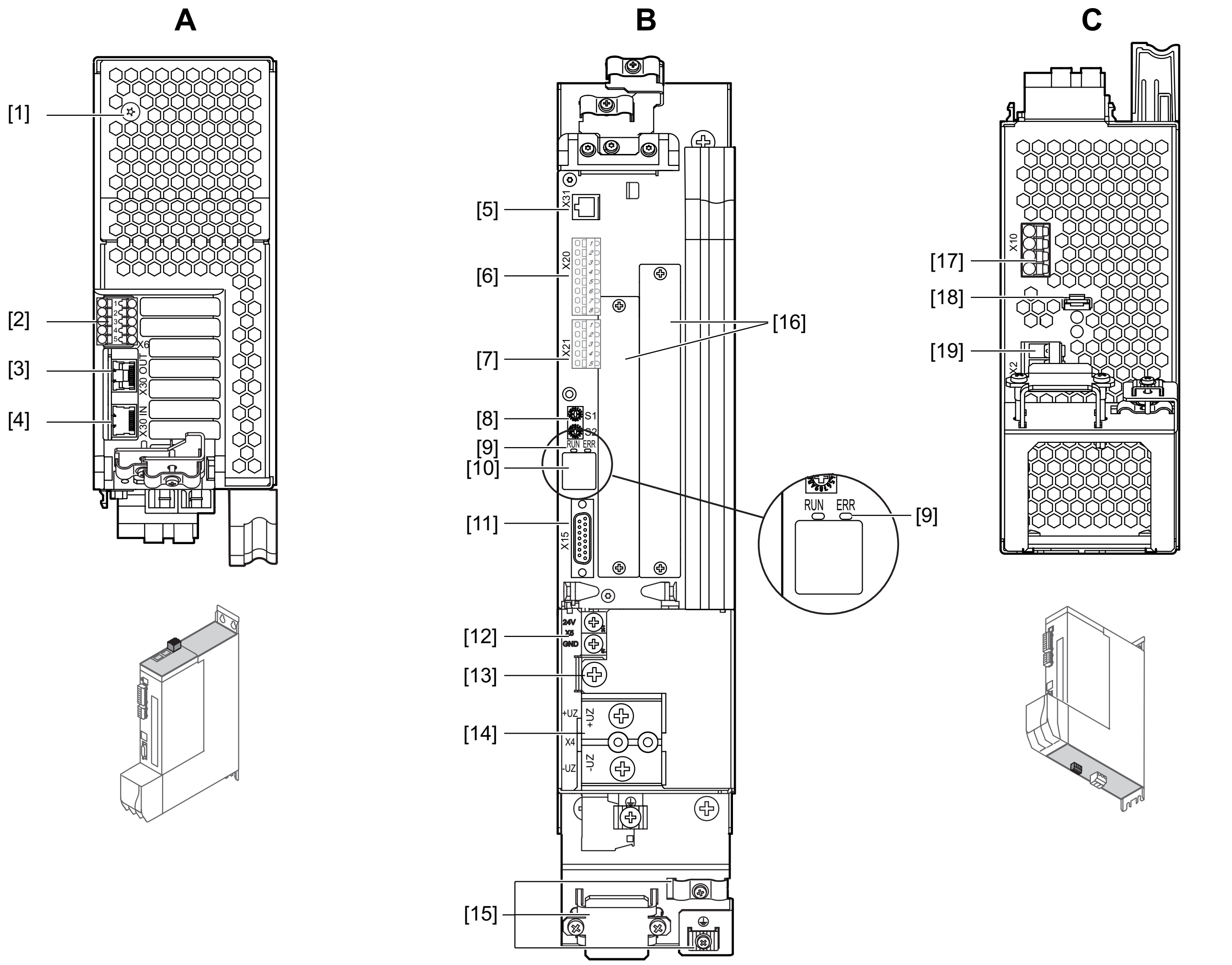
C: View from bottom

[17] X10: Brake control and temperature monitoring motor

[18] PE connection housing

[19] X2: Motor connection

7.5.2 MDA90A-0160, 0240 (size 2) – Single-axis module



27021610677287563

A: View from top

[1] Terminal screw for TN/TT systems

[2] X6: Connection for Safe Torque Off (STO)

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] X31: SEW-EURODRIVE Service interface

[6] X20: Digital inputs

[7] X21: Digital outputs

[8] EtherCAT® ID switch

[9] Status LEDs EtherCAT®/SBus^{PLUS} "RUN", "ERR"

[10] 7-segment display

[11] X15: Motor encoder connection

[12] X5: Connection +24 V supply voltage

[13] PE connection

[14] X4: DC link bus connection

[15] Shield plate

[16] Card slots

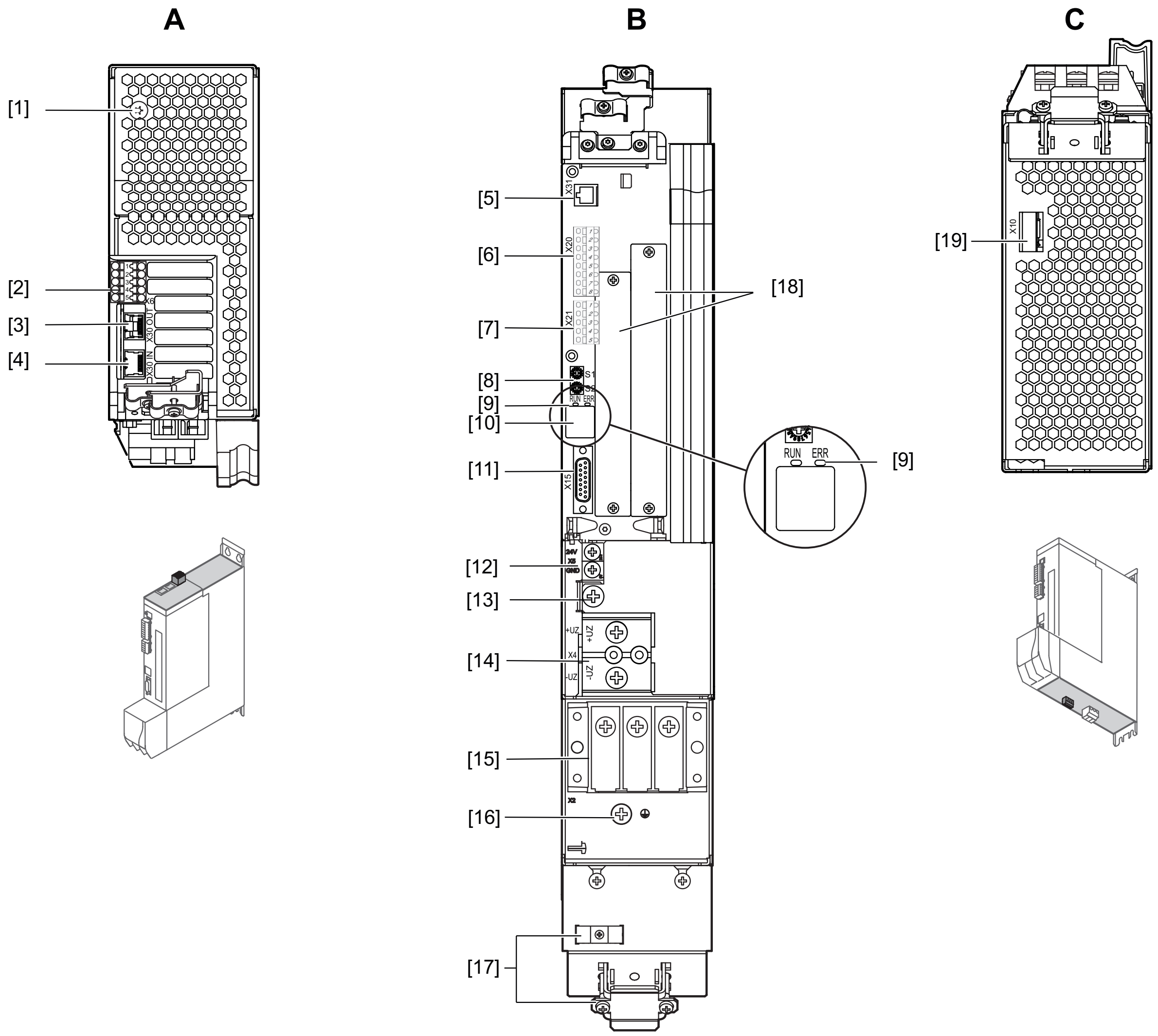
C: View from bottom

[17] X10: Brake control and temperature monitoring motor

[18] PE connection housing

[19] X2: Motor connection

7.5.3 MDA90A0-320, 0480 (size 3) – Single-axis module



27021610677302795

A: View from top

[1] Terminal screw for TN/TT systems

[2] X6: Connection for Safe Torque Off (STO)

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] X31: SEW-EURODRIVE Service interface

[6] X20: Digital inputs

[7] X21: Digital outputs

[8] EtherCAT® ID switch

[9] Status LEDs EtherCAT®/SBus^{PLUS} "RUN", "ERR"

[10] 7-segment display

[11] X15: Motor encoder connection

[12] X5: Connection +24 V supply voltage

[13] PE connection

[14] X4: DC link bus connection

[15] X2: Motor connection

[16] PE connection housing

[17] Shield plate

[18] Card slots

C: View from bottom

[19] X10: Brake control and temperature monitoring motor

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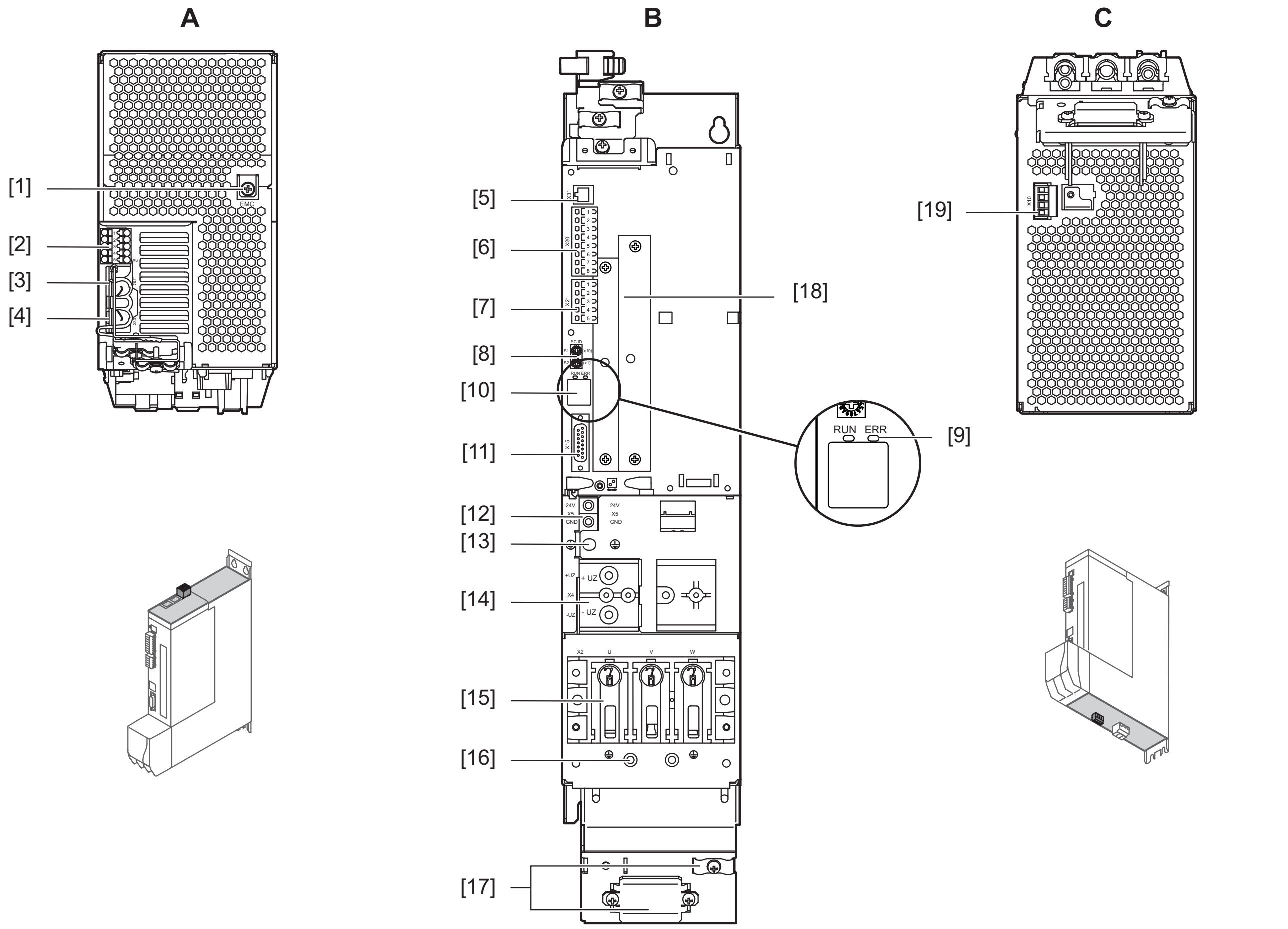
7.5.4 MDA90A0-0640 (size 4) – single-axis module



24304932235

A: View from top

[1] Terminal screw for TN/TT systems

[2] X6: Connection for Safe Torque Off (STO)

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] X31: SEW-EURODRIVE Service interface

[6] X20: Digital inputs

[7] X21: Digital outputs

[8] EtherCAT® ID switch

[9] Status LEDs EtherCAT®/SBus^{PLUS} "RUN", "ERR"

[10] 7-segment display

[11] X15: Motor encoder connection

[12] X5: Connection +24 V supply voltage

[13] PE connection

[14] X4: DC link bus connection

[15] X2: Motor connection

[16] PE connection housing

[17] Shield plate

[18] Card slots

C: View from bottom

[19] X10: Brake control and temperature monitoring motor

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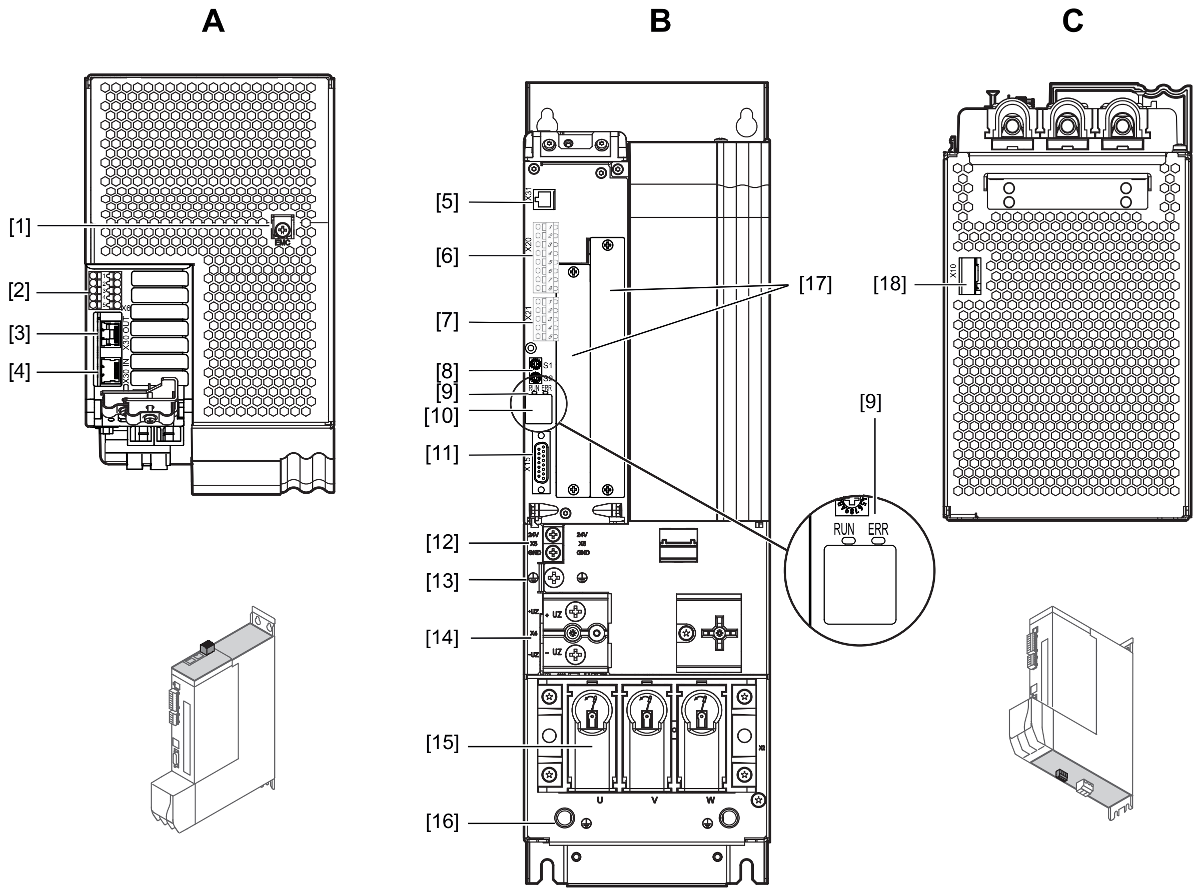
7.5.5 MDA90A-0640, 1000 (size 5) – Single-axis module



9007219360762635

A: View from top

[1] Terminal screw for TN/TT systems

[2] X6: Connection for Safe Torque Off (STO)

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] X31: SEW-EURODRIVE Service interface

[6] X20: Digital inputs

[7] X21: Digital outputs

[8] EtherCAT® ID switch

[9] Status LEDs EtherCAT®/SBus PLUS "RUN", "ERR"

[10] 7-segment display

[11] X15: Motor encoder connection

[12] X5: Connection +24 V supply voltage

[13] PE connection

[14] X4: DC link bus connection

[15] X2: Motor connection

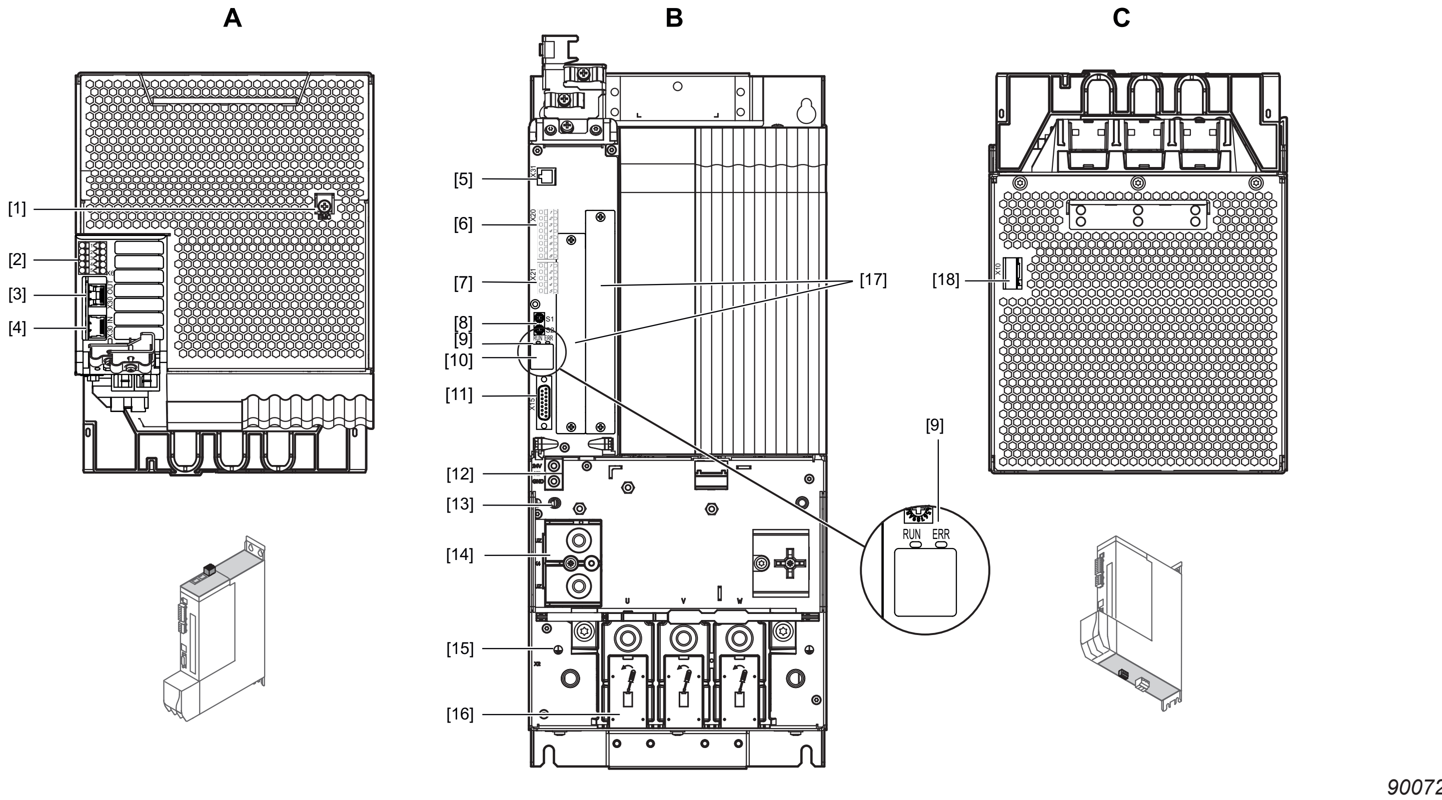
[16] PE connection housing

[17] Card slots

C: View from bottom

[18] X10: Brake control and temperature monitoring motor

7.5.6 MDA90A-1400, 1800 (size 6) – Single-axis module



A: View from top

[1] Terminal screw for TN/TT systems

[2] X6: Connection for Safe Torque Off (STO)

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] X31: SEW-EURODRIVE Service interface

[6] X20: Digital inputs

[7] X21: Digital outputs

[8] EtherCAT® ID switch

[9] Status LEDs EtherCAT®/SBus^PLUS "RUN", "ERR"

[10] 7-segment display

[11] X15: Motor encoder connection

[12] X5: Connection +24 V supply voltage

[13] PE connection

[14] X4: DC link bus connection

[15] PE connection housing

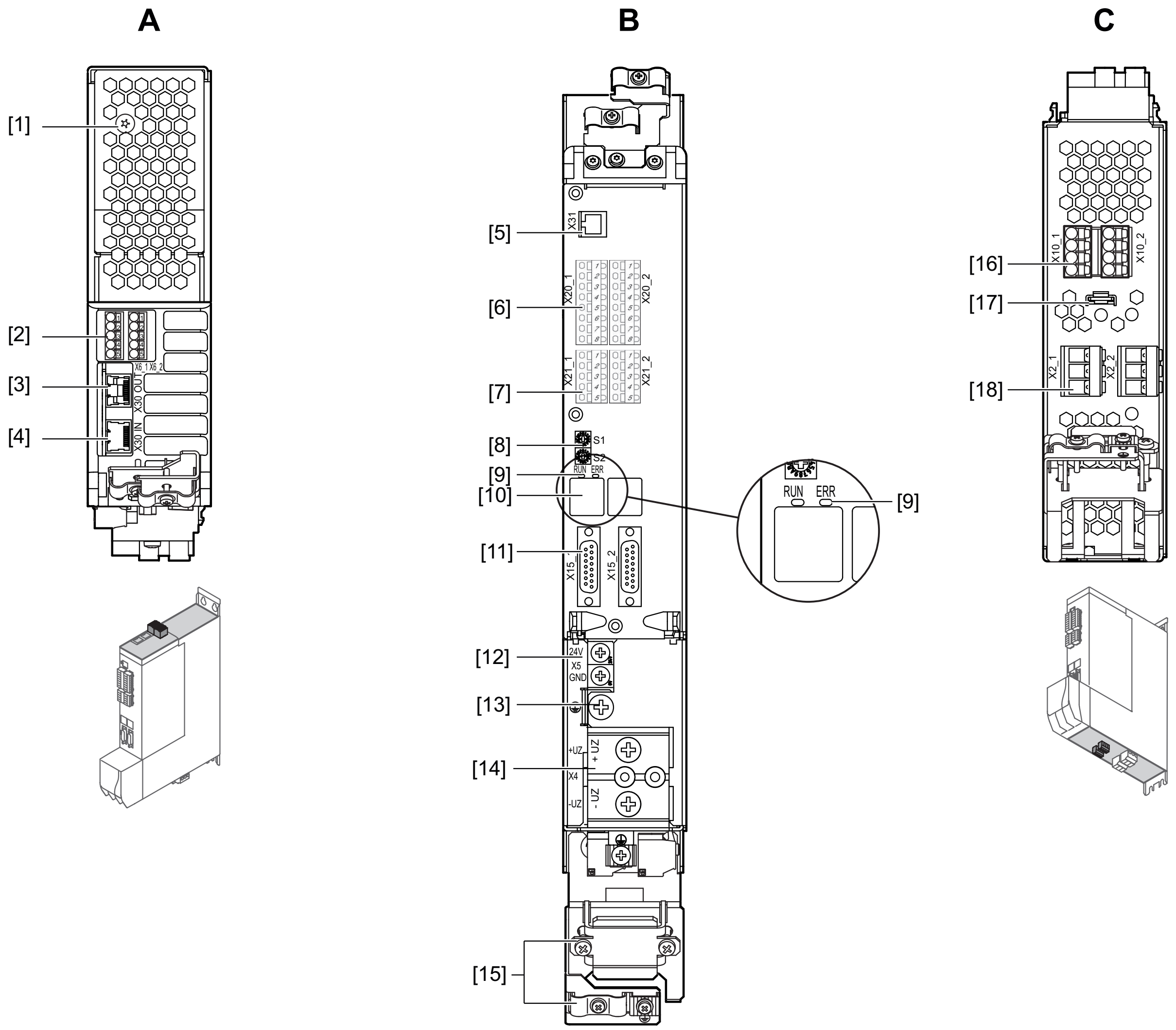
[16] X2: Motor connection

[17] Card slots

C: View from bottom

[18] X10: Brake control and temperature monitoring motor

7.5.7 MDD90A-0020, 0040 (size 1) – Double-axis module



36028809932021259

A: View from top

[1] Terminal screw for TN/TT systems

[2] X6: 2 × connection for safe disconnection (STO)

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] X31: SEW-EURODRIVE Service interface

[6] X20: 2 × digital inputs

[7] X21: 2 × digital outputs

[8] EtherCAT® ID switch

[9] Status LEDs EtherCAT®/SBusPLUS "RUN", "ERR"

[10] 2 × 7-segment display

[11] X15: 2 × motor encoder connection

[12] X5: Connection +24 V supply voltage

[13] PE connection

[14] X4: DC link bus connection

[15] Shield plate

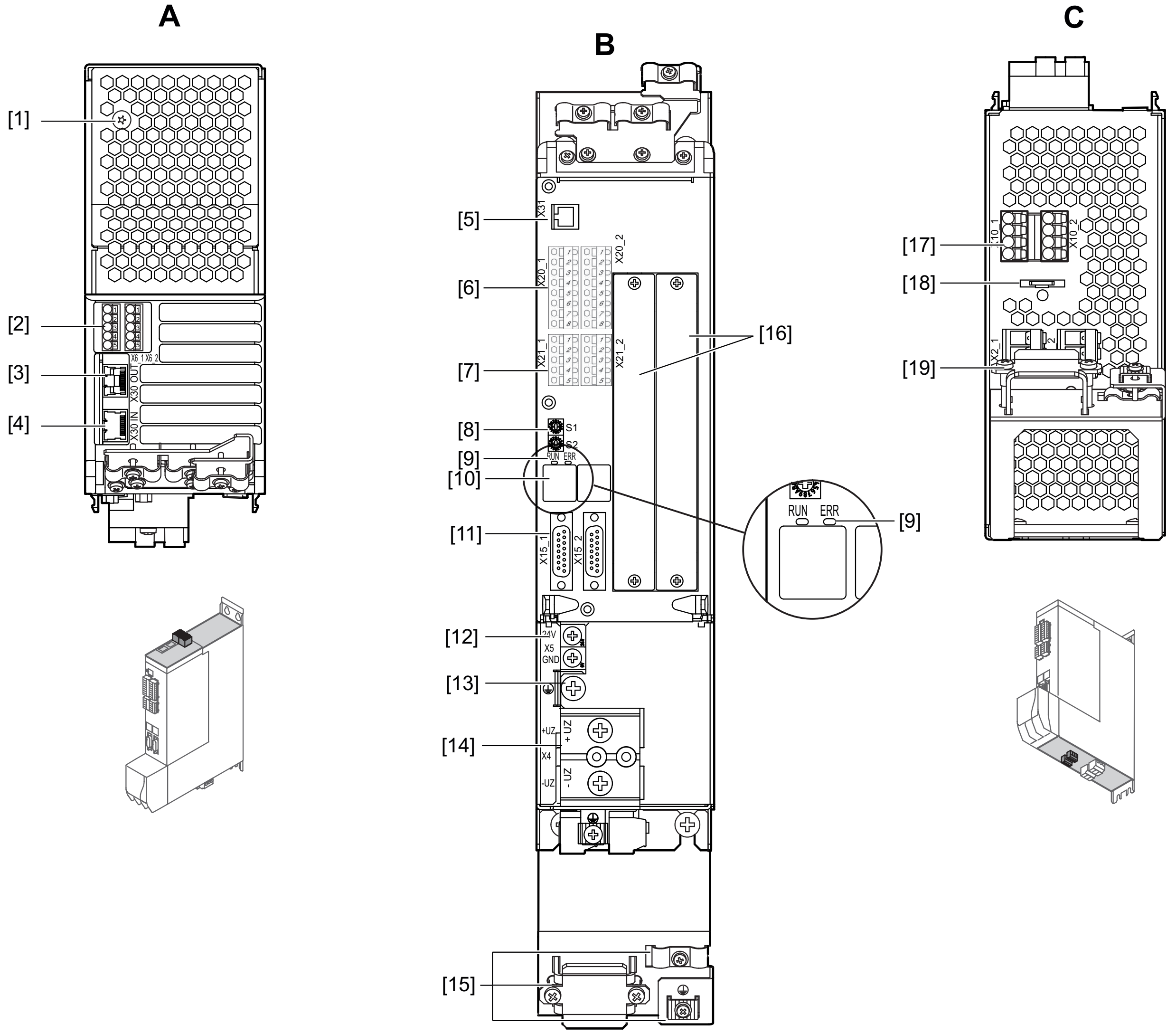
C: View from bottom

[16] X10: 2 × brake control and temperature monitoring motor

[17] PE connection housing

[18] X2: 2 × motor connection

7.5.8 MDD90A-0020, 0040, 0080 (size 2) – Double-axis module



36028809932023691

A: View from top

[1] Terminal screw for TN/TT systems

[2] X6: 2 × connection for safe disconnection (STO)

[3] X30 OUT: System bus

[4] X30 IN: System bus

B: View from front

[5] X31: SEW-EURODRIVE Service interface

[6] X20: 2 × digital inputs

[7] X21: 2 × digital outputs

[8] EtherCAT® ID switch

[9] Status LEDs EtherCAT®/SBus^PLUS "RUN", "ERR"

[10] 2 × 7-segment display

[11] X15: 2 × motor encoder connection

[12] X5: Connection +24 V supply voltage

[13] PE connection

[14] X4: DC link bus connection

[15] Shield plate

[16] Card slots

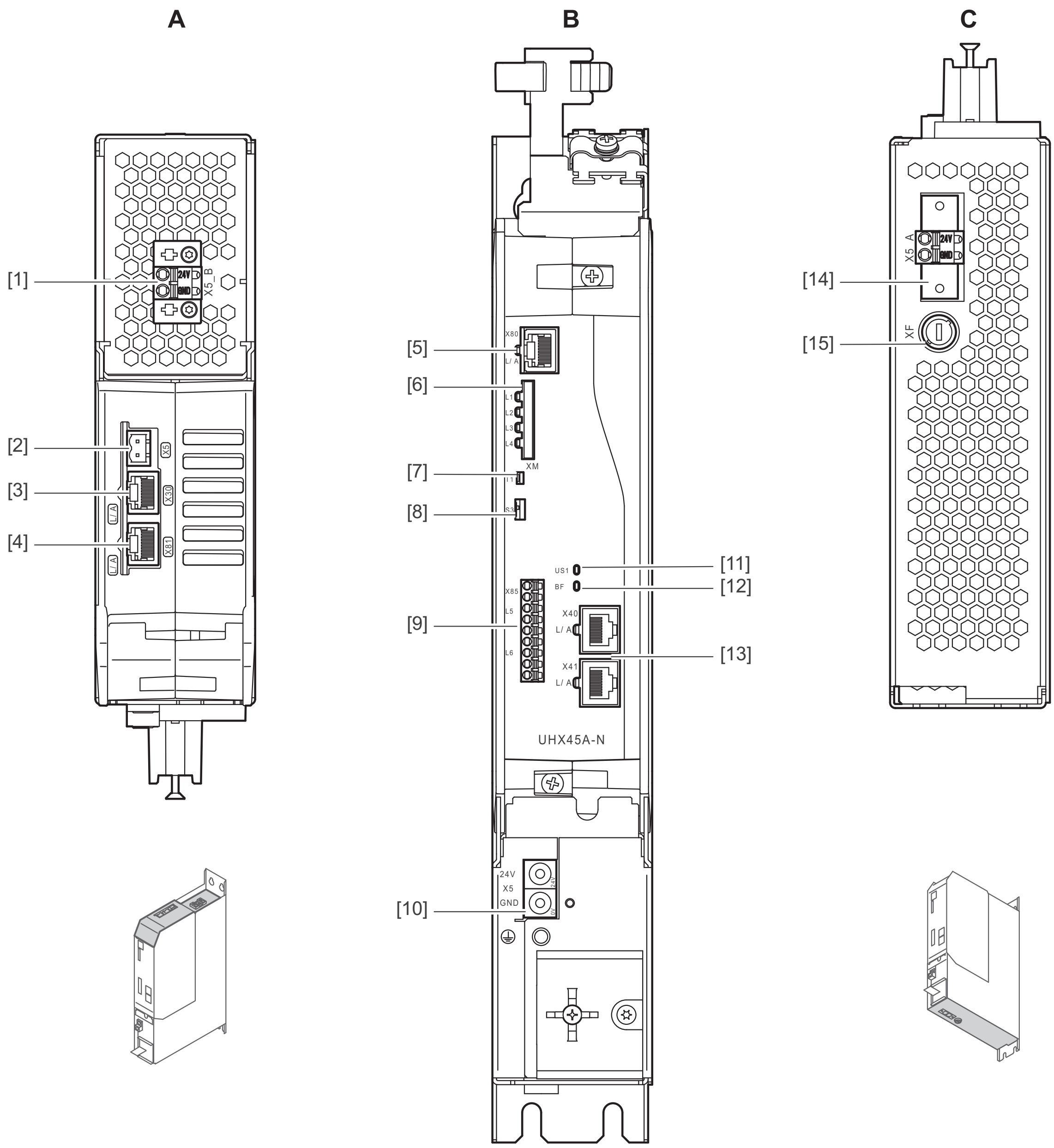
C: View from bottom

[17] X10: 2 × brake control and temperature monitoring motor

[18] PE connection housing

[19] X2: 2 × motor connection

7.6 Device structure of master module UHX45A/MDM90A



9007220061654411

A: View from top

[1] X5_B: Output of DC 24 V supply voltage of MDM90A

[2] X5: Input of DC 24 V supply voltage UHX45A

[3] X30: EtherCAT®/SBus^{PLUS} master

[4] X81: Ethernet port (reserved)

B: View from front

[5] X80: Engineering via Ethernet

[6] SD removable data storage

[7] Reset of UHX45A

[8] IP address of the engineering port

[9] X85: CAN bus/RS485 interface

[10] X5: Connection +24 V supply voltage

[11] US1: Operating state of the fieldbus

[12] BF: Bus error

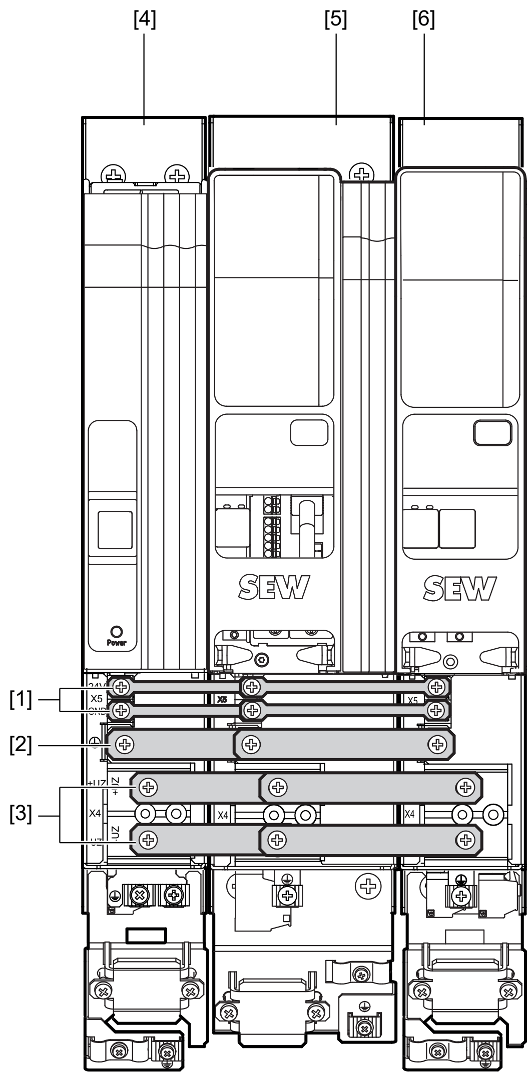
[13] X41: Fieldbus - slave interface

C: View from bottom

[14] X5_A: External 24 V supply voltage

[15] Fuse for DC 24 V supply UHX45A

7.7 Example for axis system connection without master module



18014411422534411

[1] X5: Connection +24 V supply voltage
[2] PE connection
[3] X4: DC link connection
[4] MDP.. power supply module
[5] MDA.. single-axis module
[6] MDD.. double-axis module

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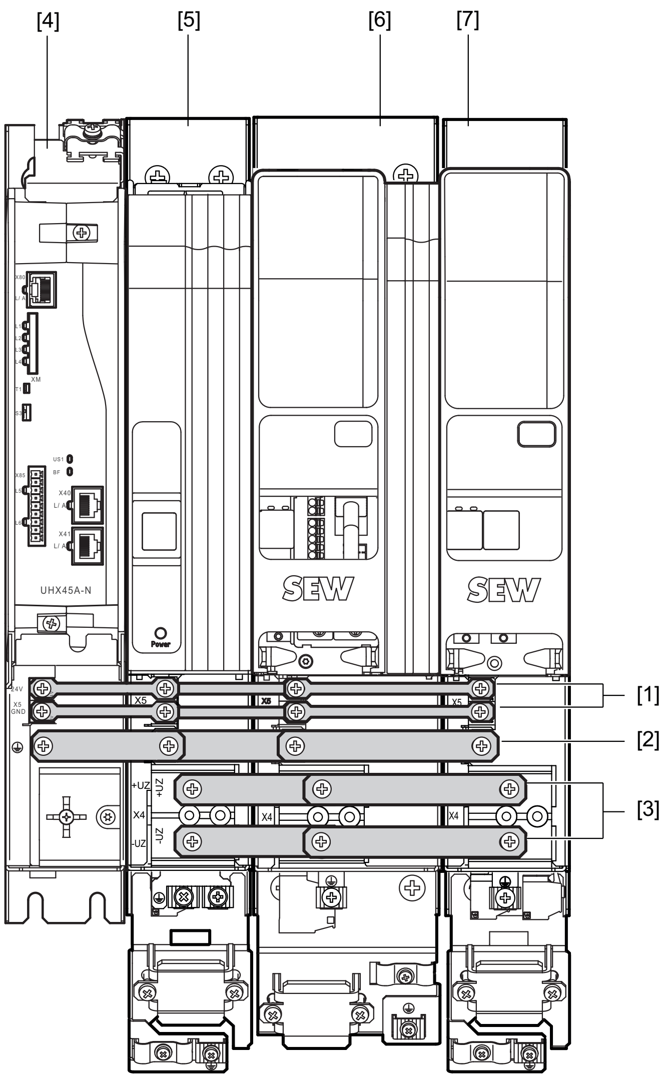
7.8 Example for axis system connection with master module



20848770571

[1] X5: Connection +24 V supply voltage

[2] PE connection

[3] X4: DC link bus connection

[4] Master module UHX45A/MDM90A

[5] MDP.. power supply module

[6] MDA.. single-axis module

[7] MDD.. double-axis module

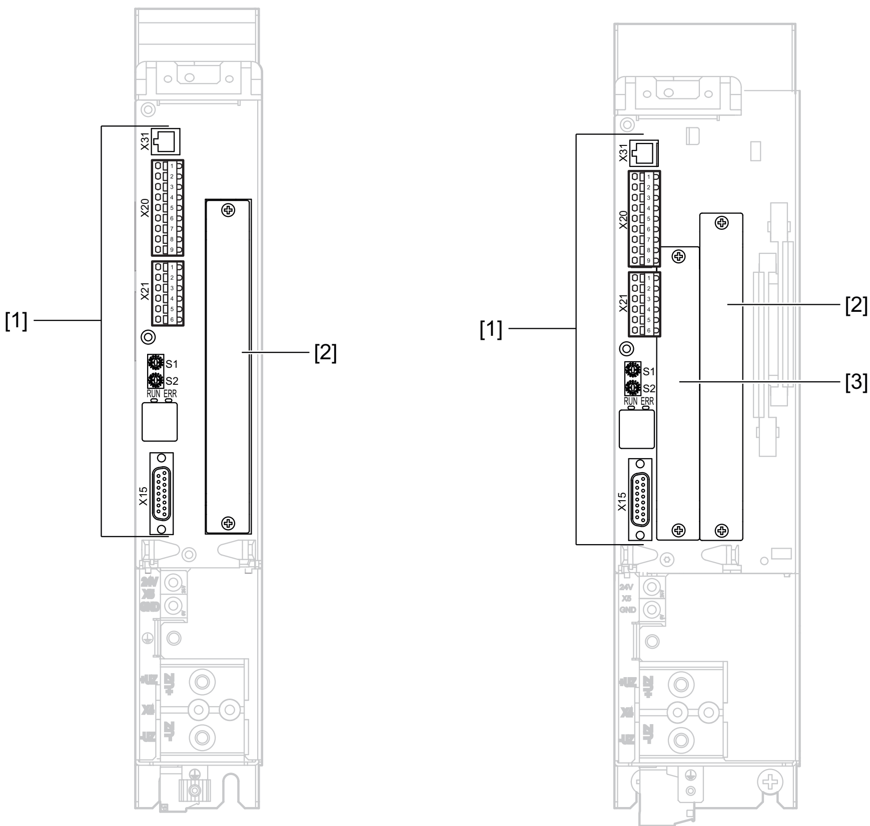
7.9 Card slots

The application inverters can have up to 2 cards installed. The following section describes the assignment of the slots and possible combinations of cards.

Type designation	Description	Slot in			
		MDA90A-... single-axis module		MDD90A-... double-axis module	
		0020 – 0120	0160 – 1800	0020 – 0040 (size 1)	0020 – 0080 (Size 2)
CES11A	Multi-encoder card	[2]	[2]	-	-
CID21A, CIO21A	Input/output cards	-	[3]	-	-
CS.21A	Safety card	[2]	[2]	-	[2]
CS.31A	Safety card	[2]	[2]	-	-

7.9.1 Single-axis modules

MDA90A-0020, 0040, 0080, 0120 MDA90A-0160 – 1800



9007212169660939

[1] Connector panel of basic device

[2] Safety card/additional encoder slot

[3] I/O expansion slot

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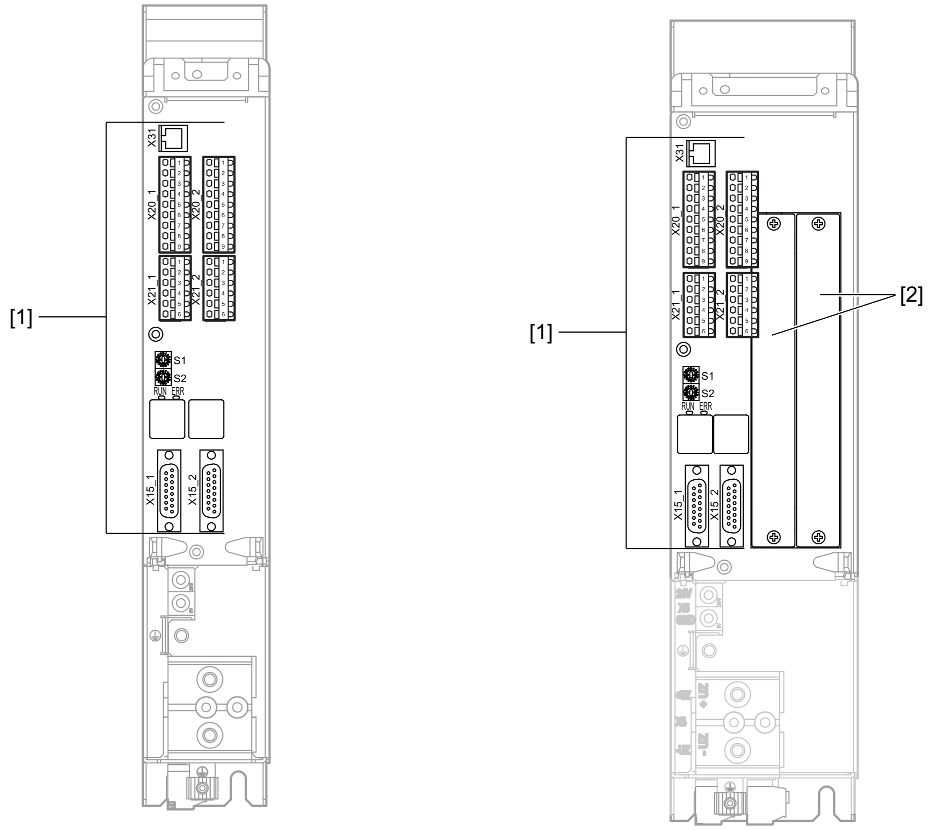
7.9.2 Double-axis modules

MDD90A-0020, 0040 (size 1) MDD90A-0020, 0040, 0080 (size 2)



9007212170096139

[1] Connector panel of basic device for the 1st and 2nd Axis

[2] Slot for safety card

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8 Installation

MOVIDRIVE® modular application inverters are exclusively suitable for control cabinet installation according to the degree of protection.

8.1 Installation accessories

8.1.1 Standard accessories

The listed standard accessories are included in the scope of delivery.

Standard accessories – mechanical accessories

Type designation	Electronics shield clamps Quantity
Power supply modules	1
MDP90A-0100-.. – MDP90A-1100-..	
Single-axis modules	
MDA90A-0020-.. – MDA90A-1800-..	
Double-axis modules	
MDD90A-0020-.. – MDD90A-0080-..	
Master module	
MDM90A	

Type designation	Power shield clamps Quantity
Power supply modules	1
MDP90A-0100-.. – MDP90A-1100-..	
Single-axis modules	
MDA90A-0020-.. – MDA90A-1800-..	
Double-axis modules	
MDD90A-0020-.. – MDD90A-0080-..	

The mechanical accessories can be ordered with the following part numbers:

Type designation	Part number accessory pack
Power supply module	
MDP90A-0100-.. (size 1)	28223756
MDP90A-0100-.. (size 1A)	28225198
MDP90A-0250-..	28224507
MDP90A-0500-.. – MDPA90A-1100-..	28232984
Single-axis modules	
MDA90A-0020-.. – MDA90A-0120-..	28223756
MDA90A-0160-.. – MDA90A-0240-..	28233530
MDA90A-0320-.. – MDA90A-0480-..	28220714
MDA90A-0640-..	28231635
MDA90A-1000-.. – MDA90A-1400-..	28231635
MDA90A-1800-..	28233190
Double-axis module	
MDD90A-0020-.. – MDD90A-0040-.. (size 1)	28223756
MDD90A-0020-.. – MDD90A-0080-.. (Size 2)	28220455
Master module	
UHX45A/MDM90A	28244389

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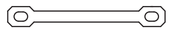
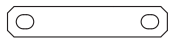
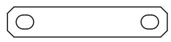
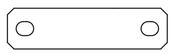
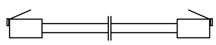
Standard accessories – electrical accessories

Type designation	Bar 24 V supply	Quantity
Power supply modules		2
MDP90A-0100-.. – MDP90A-1100-..		
Single-axis modules		
MDA90A-0020-.. – MDA90A-1800-..		
Double-axis modules		
MDD90A-0020-.. – MDD90A-0080-..		
Master module		
MDM90A		

Type designation	PE busbar	Quantity
Power supply modules		1
MDP90A-0100-.. – MDP90A-1100-..		
Single-axis modules		
MDA90A-0020-.. – MDA90A-1800-..		
Double-axis modules		
MDD90A-0020-.. – MDD90A-0080-..		
Master module		
MDM90A		

Type designation	DC link bar small	Quantity
Power supply modules		2
MDP90A-0100-.. – MDP90A-0750-..		
Single-axis modules		
MDA90A-0020-.. – MDA90A-1000-..		
Double-axis modules		
MDD90A-0020-.. – MDD90A-0080-..		

Type designation	DC link bar large	Quantity
Power supply modules		2
MDP90A-1100-..		
Single-axis modules		
MDA90A-1400-.. – MDA90A-1800-..		

Type designation	8-pole module bus cable, system bus EtherCAT®/SBus^{PLUS}	Quantity
Power supply modules		1
MDP90A-0100-.. – MDP90A-1100-..		
Single-axis modules		
MDA90A-0020-.. – MDA90A-1800-..		
Double-axis modules		
MDD90A-0020-.. – MDD90A-0080-..		

Type designation	DC link closing cover	Quantity
Power supply modules		2
MDP90A-0100-.. – MDP90A-1100-..		

Type designation	Power connection closing cover	Quantity
Power supply modules		1
MDP90A-0250-.. – MDP90A-1100-..		
Single-axis modules		
MDA90A-0480-.. – MDA90A-1800-..		

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The electrical accessories can be ordered using the following part numbers:

Module	Part number	
	Accessory pack[1]	Module bus cable
Power supply module		
MDP90A-0100-.. (size 1)	28224876	18166989
MDP90A-0100-.. (size 1A)	28225201	18167004
MDP90A-0250-..	8230027	18166989
MDP90A-0500-.. – MDP90A-0750-..	28232992	18167012
MDP90A-1100-..	28234324	18167020
Single-axis module		
MDA90A-0020-.. – MDA90A-0120-..	28223764	18166989
MDA90A-0160-.. – MDA90A-0240-..	28220463	18166997
MDA90A-0320-.. – MDA90A-0480-..	28225236	18167004
MDA90A-0640-.. – MDA90A-1000-..	28231643	18167012
MDA90A-1400-.. – MDA90A-1800-..	28233212	18167020
Double-axis module		
MDD90A-0020-.. – MDD90A-0040-.. (size 1)	28223764	18166989
MDD90A-0020-.. – MDD90A-0080-.. (Size 2)	28220463	18166997
Master module		
UHX45A/MDM90A	28244397	18166989

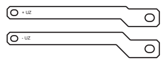
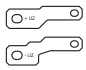
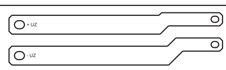
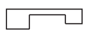
1) Accessory pack contains module bus cable

8.1.2 Available accessories

Adapter connectors of the DC link connection

To be able to establish an axis system in which modules with DC link bars of different widths are used, adapter connectors must be used at the transition from wide to narrow or narrow to wide. These adapter connectors are listed in the following table.

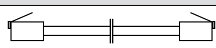
The necessary closing covers are included with the adapter connectors.

From module	To module	Adapter connectors	Part number
MDP90A-0750-..	MDA90A-1400-..		28244052
MDP90A-1100-..	• MDA90A-0020-.. – MDA90A-1000-.. • MDD90A-0020.. – MDD90A-0080-..		28244079
MDA90A-1400-.. – MDA90A-1800-..	• MDA90A-0020-.. – MDA90A-1000-.. • MDD90A-0020.. – MDD90A-0080-..		28244060
		Closing cover	
MDA90A-1400-.. – MDA90A-1800-..	• MDA90A-0020-.. – MDA90A-0240-.. • MDD90A-0020.. – MDD90A-0080-..		18183751

The closing cover 18183751 is included with the adapter connectors 28244060.

Adapter connectors are not included in the scope of delivery and must be ordered.

Cable

Designation	Length	Connector	Part number
			
4-pole system bus cable, system bus EtherCAT®/SBus^{PLUS}	• 0.75 m • 1.5 m • 3 m • 5 m • 10 m	2 × RJ45	• 18167039 • 18179975 • 18167047 • 18179983 • 18179991

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8.2 Permitted tightening torques

Screw connection		Tightening torque in Nm				
		MDP90A-				
		0100 (size 1)	0100 (size 1A)	0250	0500, 0750	1100
Line connection	X1	0.5 – 0.6		3 – 4	18 – 22	
Braking resistor connection	X3	0.5 – 0.6		3 – 4		11 – 12
DC link connection	X4	3 – 4				-
	X4_A	-				3 – 4
	X4_B	-				11 – 12
PE connection	X4	3 – 4				
Connection 24 V voltage supply	X5	1.2 – 1.5				
Terminal screw for TN/IT systems	EMC	1 – 1.2				
Safety cover		0.6 – 0.8				1 – 1.2

Screw connection		Tightening torque in Nm							
		MDA90A-. single-axis module					Double-axis module MDD90A-		Master module MDM90A
		0020, 0040, 0080, 0120	0160, 0240	0320, 0480	0640, 1000	1400, 1800	0020, 0040 (size 1)	0020, 0040, 0080 (size 2)	
Motor connection	X2	0.5 – 0.6	1.5 – 1.7	3 – 4	18 – 22		0.5 – 0.6		-
DC link connection	X4	3 – 4				11 – 12	3 – 4		-
PE connection	X4	3 – 4					3 – 4		3 – 4
Connection 24 V voltage supply	X5	1.2 – 1.5					1.2 – 1.5		-
	X5_A	-							
	X5_B	-							1.2 – 1.5
Terminal screw for TN/TT systems	EMC	1 – 1.2					1 – 1.2		-
PE connections - M4 - M6		1 – 1.2 3 – 4					1 – 1.2 3 – 4		-
Safety cover		0.8				1 – 1.2	0.8		0.8
Fastening the cards		0.6 – 0.8					0.6 – 0.8		-

NOTICE

Non-compliance with the stipulated tightening torques.

Possible damage to the application inverter.

- Always adhere to the stipulated tightening torques. Otherwise, excessive heat can develop which would damage the application inverter.
- An excessively high tightening torque may cause damage.

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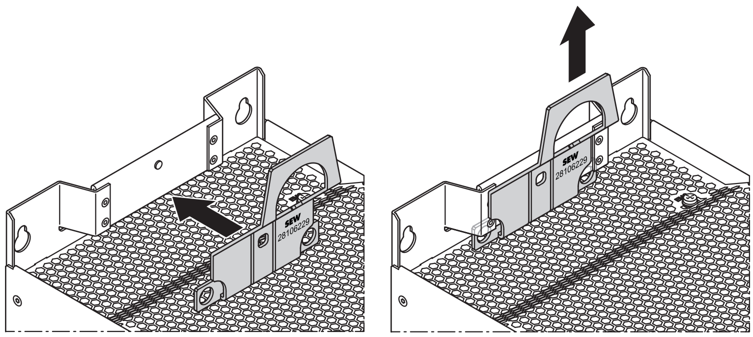
8.3 Special aspects when transporting the devices

Due to the weight, the following devices are to be transported with a lifting eye:

- MDP90A-1100-..
- MDA90A-1400/1800-..

The lifting eye is attached to the top of the housing, see the following figure.



24550948491

The lifting eye can be attached to assembly stations using suitable slings.

The optional and reusable lifting eye CLH11A has the purchase order number 28106229.

8.4 Mechanical installation

⚠ CAUTION

Risk of injury to persons and damage to property.

Never install defective or damaged application inverters.

- Before installing modules, check them for external damage. Replace any damaged modules.

NOTICE

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

Damage to the application inverter.

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

8.4.1 Hole pattern

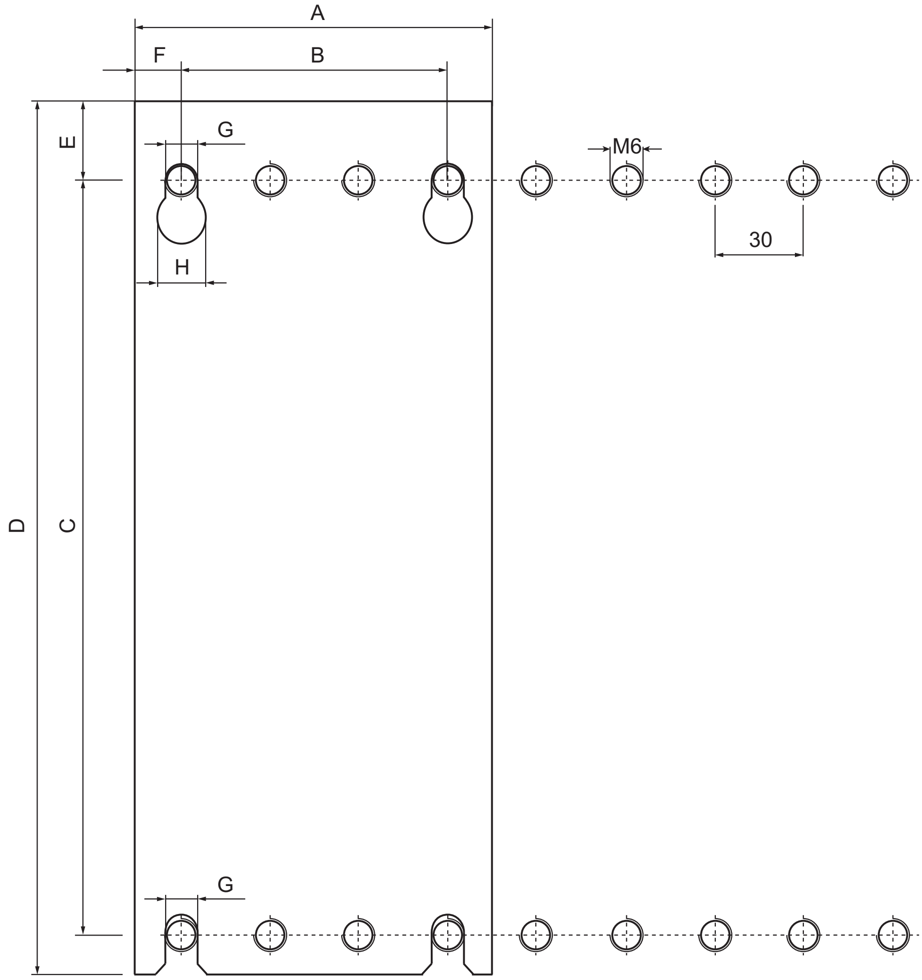
Preparing the control cabinet

You can prepare the control cabinet for the installation of differently assembled axis systems by drilling tapped holes every 30 mm for mounting the modules. The modules can be attached to this grid irrespective of their width, see figure below.

Dimensions
Device base plate

Modules	Dimensions of the device base plate in mm							
	A	B	C	D	E	F	G	H
MDP90A-0100 (size 1)	60	30	355	383	19	15	7	13
MDP90A-0100 (size 1a)	120	90	355	383	19	15	7	13
MDP90A-0250 (size 2)	60	30	455	483	19	15	7	13
MDP90A-0500, 0750 (size 3)	150	120	455	483	19	15	7	13
MDP90A-1100 (BG4)	210	180	455	483	19	15	7	13
MDA90A-0020, 0040, 0080, 0120 (size 1)	60	30	355	383	19	15	7	13
MDA90A-0160, 0240 (size 2)	90	60	355	383	19	15	7	13
MDA90A-0320, 0480 (size 3)	90	60	455	483	19	15	7	13
MDA90A-0640 (BG 4)	120	90	455	483	19	15	7	13
MDA90A-0640, 1000 (size 5)	150	120	455	483	19	15	7	13
MDA90A-1400, 1800 (size 6)	210	180	455	483	19	15	7	13
MDD90A-0020, 0040 (size 1)	60	30	355	383	19	15	7	13
MDD90A0020, 0040, 0080 (size 2)	90	60	355	383	19	15	7	13
MDM90A	60	30	355	383	19	15	7	13

Mounting grid



27021610488337547

For dimension sheets of the application inverter, refer to chapter Technical data.

8.4.2 Minimum clearance and mounting position

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

- To ensure unobstructed cooling, leave a minimum clearance of 100 mm above and below the module housings. Make sure air circulation in the clearance is not impaired by cables or other installation equipment.
- Make sure that the devices are not subjected to heated exhaust air from nearby components.
- The axis system must be assembled without gaps.
- Install the modules only vertically. You must not install them horizontally, tilted or upside down.

INFORMATION

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.

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8.5 Covers

For transportation, the safety covers of the power supply modules MDP90A 25 kW and larger, and of the axis modules MDA90A 64 A and larger are protected with cardboard.

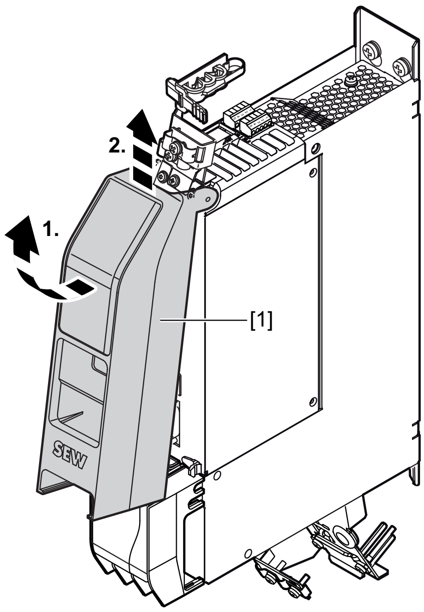
Remove this protection before startup.

Observe that the devices must not be gripped at the safety covers when lifting the devices.

8.5.1 Covers

All MDA and MDD axis modules of the application inverter are equipped with a safety cover [1], see following figures.

Removing the safety cover



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- The safety cover [1] has a latching mechanism at the bottom. Put your finger in one of the openings of the safety cover and pull it away from the application inverter to unlatch it.
- Pivot the safety cover forward and lift it to remove it from the application inverter.

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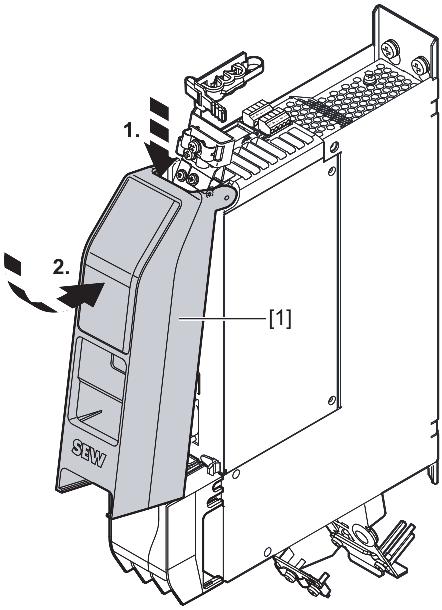
Installing the safety cover



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- Place the safety cover [1] into the upper recess and move it towards the application inverter until it clicks into place.

Reinstall all safety covers [1] after installation work.

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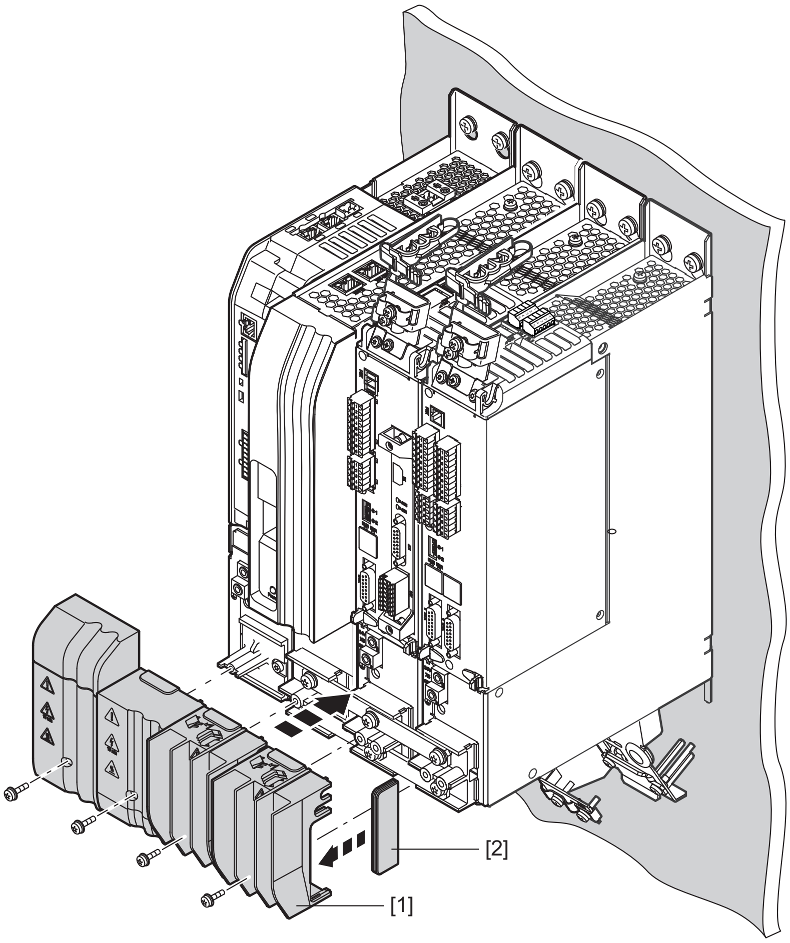
8.5.2 Touch guards

Axis system with master module



20918974091

1. Insert the closing covers [2] into the touch guards covers [1] of the first and last module in the axis system.
2. Attach the touch guard covers [1] to the modules. Insert the screws and tighten them securely with the specified tightening torque (→ 🗎 239).

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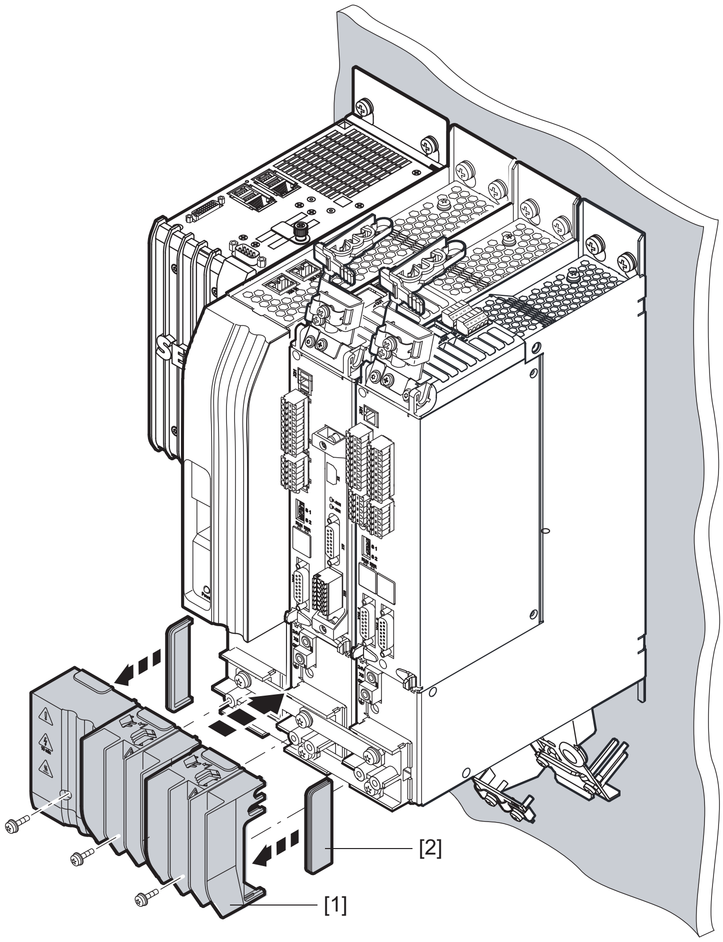
Axis system without master module



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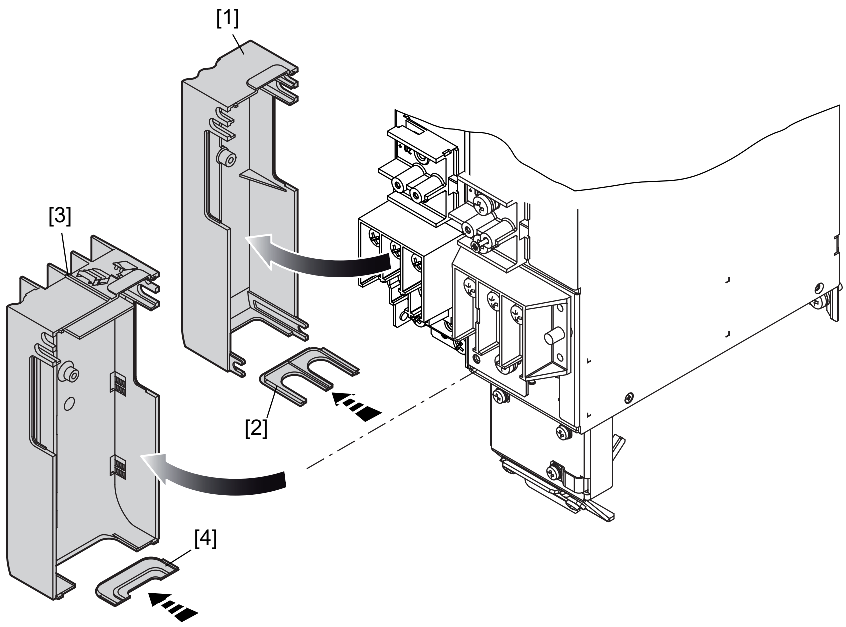
1. Insert closing covers [2] into the touch guards covers [1] of the first and last module in the axis system.
2. Attach the touch guard covers [1] to the modules. Insert the screws and tighten them securely with the specified tightening torque (→ 🗎 239).

8.5.3 Power connection closing cover

To achieve degree of protection IP20 according to EN 60529 with the following modules, a closing cover must be inserted into the touch guard at the power connection.

- Power supply module MDP90A-0250-.. (X1 connection)
- Axis modules MDA90A-0320-.. and MDA90A-0480-.. (X2 connection)



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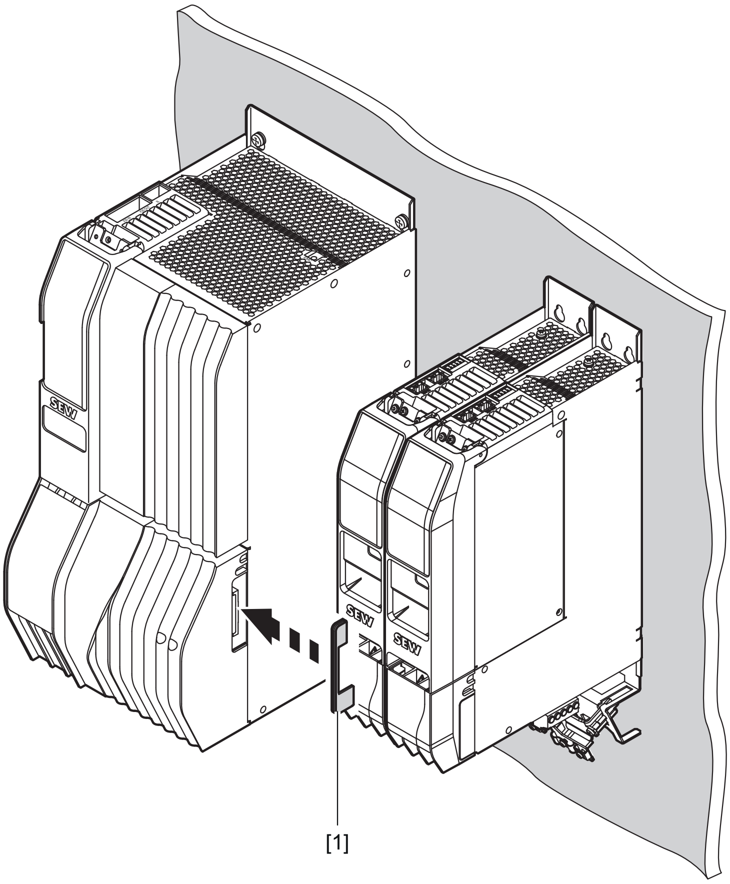
[1] Power supply module touch guard
[2] Power supply module closing cover
[3] Axis module touch guard
[4] Axis module closing cover

1. Remove the touch guard [1], [3] from the respective module.
2. Insert the closing cover [2], [4] into the touch guard.
3. Install the touch guard on the respective module. Insert the screws and tighten them securely with the specified tightening torque (→ 🗎 239).

The closing covers are included in the delivery.

8.5.4 Closing cover between MDA90A-1400 – 1800-.. and MDA90A-0020 – 0240-..

If a MDA90A-0020 – 0240-.. axis module comes after a MDA90A-1400 – 1800-.. axis module, a gap arises at the touch guard of the MDA90A-1400 – 1800, which must be closed with the closing cover [1]. The closing cover is included with the adapter connectors of the DC link connection.



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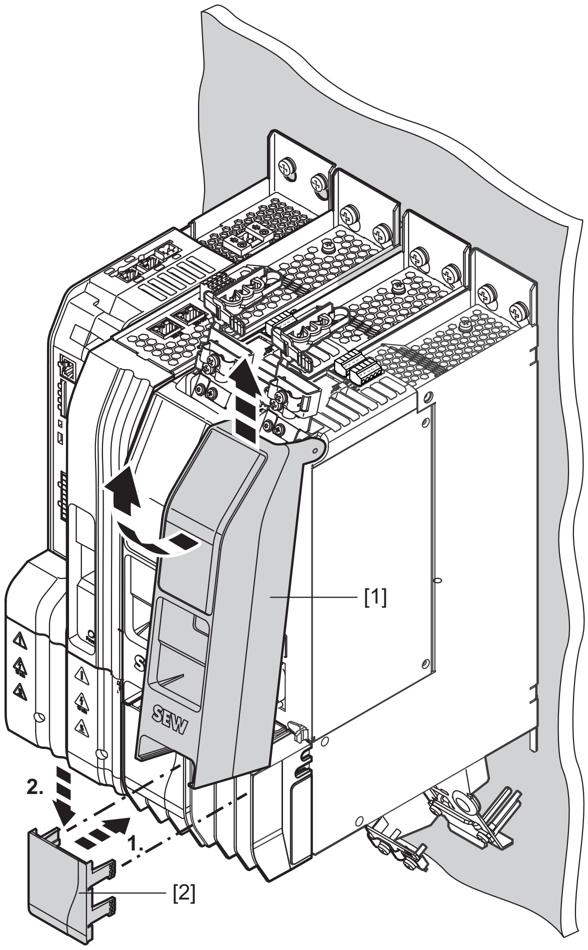
To achieve the degree of protection IP20, the gap must be closed using the closing cover.

8.5.5 Front cover



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1. Remove the safety cover [1].
2. Push the front cover [2] forwards and downwards.
3. Re-install the safety cover [1].

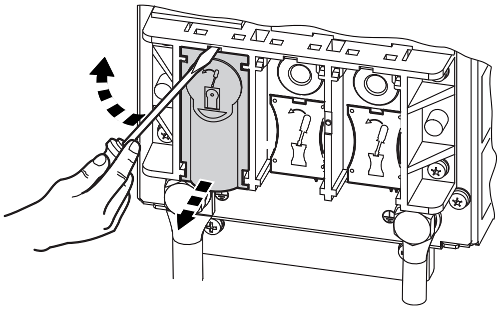
8.5.6 Protection caps

To achieve degree of protection IP20 according to EN 60529 with the following modules, a protection cap must be used to secure the connectors against being touched. The protection caps are included in the accessory bag.

- Power supply modules MDP90A-0500-.. and larger, line connection X1, braking resistor connection X3
- Power supply modules with energy recovery, MDR91A-0500-.. and larger
- Axis modules MDA90A-0640-.. and larger: Motor connection X2

Attached protection caps can be remove as depicted in the following figures.

Line connection, motor connection



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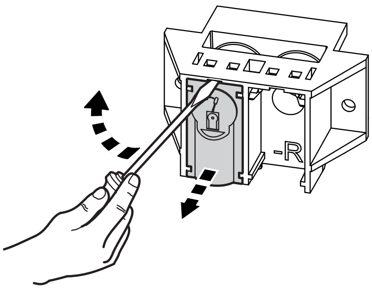
Braking resistor connection



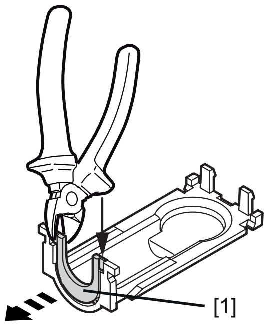
20109663883

To ensure degree of protection IP20, the protection caps must be reinstalled after the cables are connected.

Breaking out templates

In order to attach the protection caps in case of cables with large cross section or in case of connection with 2 cables, the template in the protection caps must be broken out.

- Cut out the plastic templates [1] in the protection cap using diagonal cutting pliers as depitcted in the figure.



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8.6 Control cabinet installation

The following steps are depicted at the example of an axis system with 1 power supply module, several axis modules, and 1 MOVI-C® CONTROLLER.

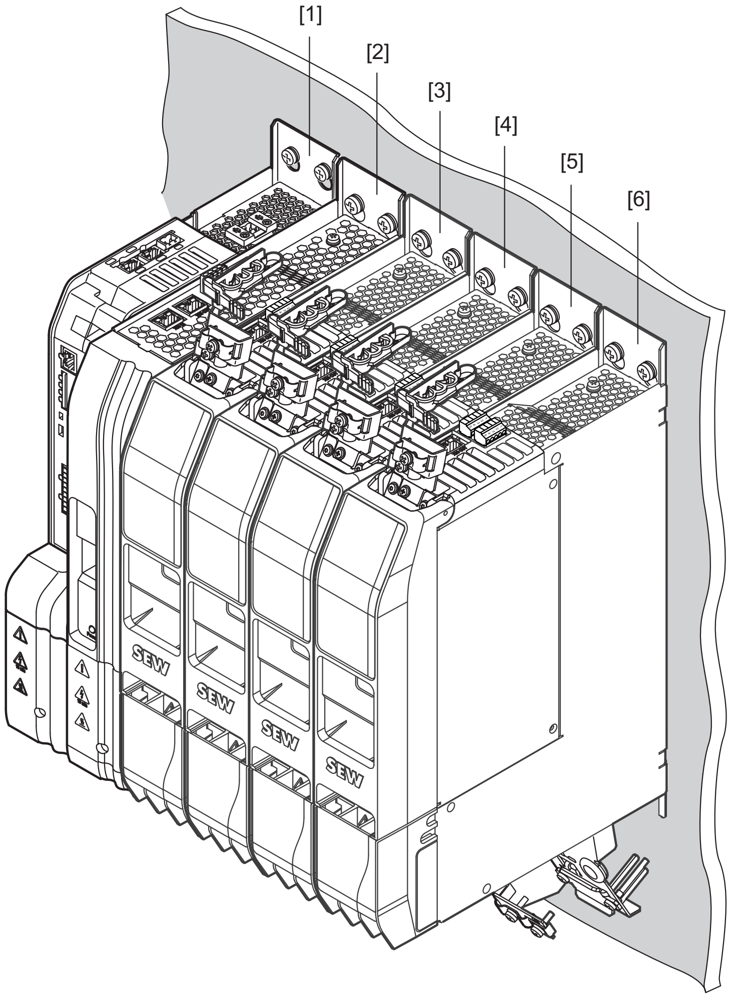
Other modules are used analogously to the instructions described in this chapter.

8.6.1 Arrangement of the axis modules within the axis system

When arranging the axis system, observe that the nominal DC link current of the axis modules must decrease from left to right. The axis module with the highest nominal output current must be on the right side of the power supply module. All remaining axis modules are installed in descending order regarding their nominal DC link current.

The axis modules must always be installed on the right of the power supply module.

The master module must always be installed on the left of the power supply module.



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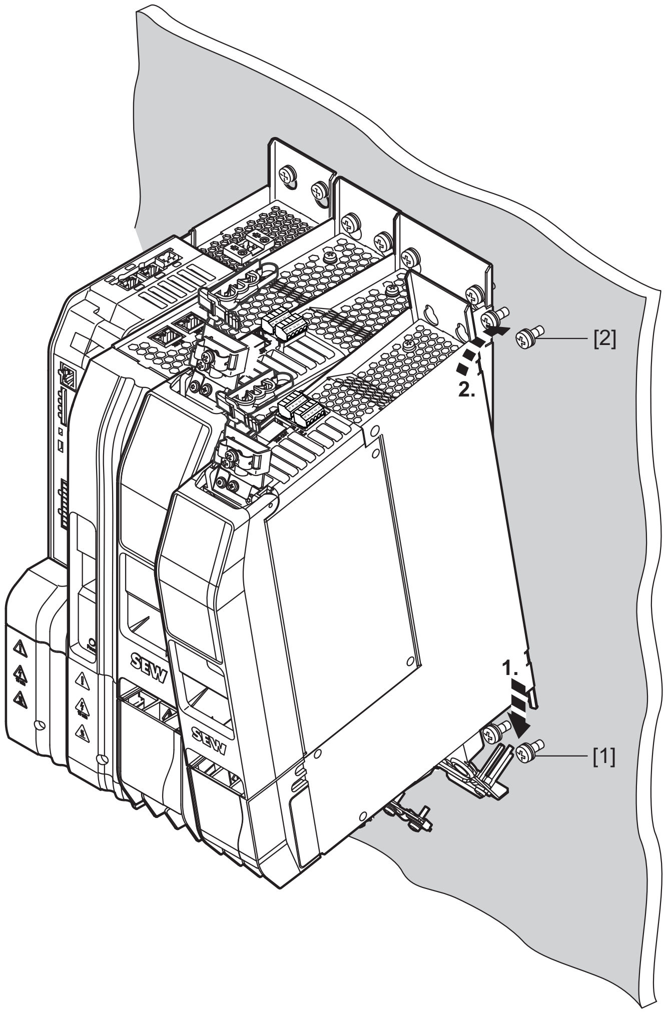
[1]	Master module	[4]	Example: MDD90A-0040... double-axis module: I_{NDCL} = 8 A
[2]	Power supply module	[5]	Example: MDA90A-0040... single-axis module: I_{NDCL} = 4 A
[3]	Example: MDA90A-0120... single-axis module: I_{NDCL} = 12 A	[6]	Example: MDA90A-0020... single-axis module: I_{NDCL} = 2 A

In one axis system, up to 15 axis modules can be used, both as single-axis modules and double-axis modules.

8.6.2 Installing a module

The retaining screws [1] and [2] are screwed into the prepared mounting grid in the control cabinet but not tightened.

1. Place the module with the slotted holes on the unit base plate onto the retaining screws [1] from the top.



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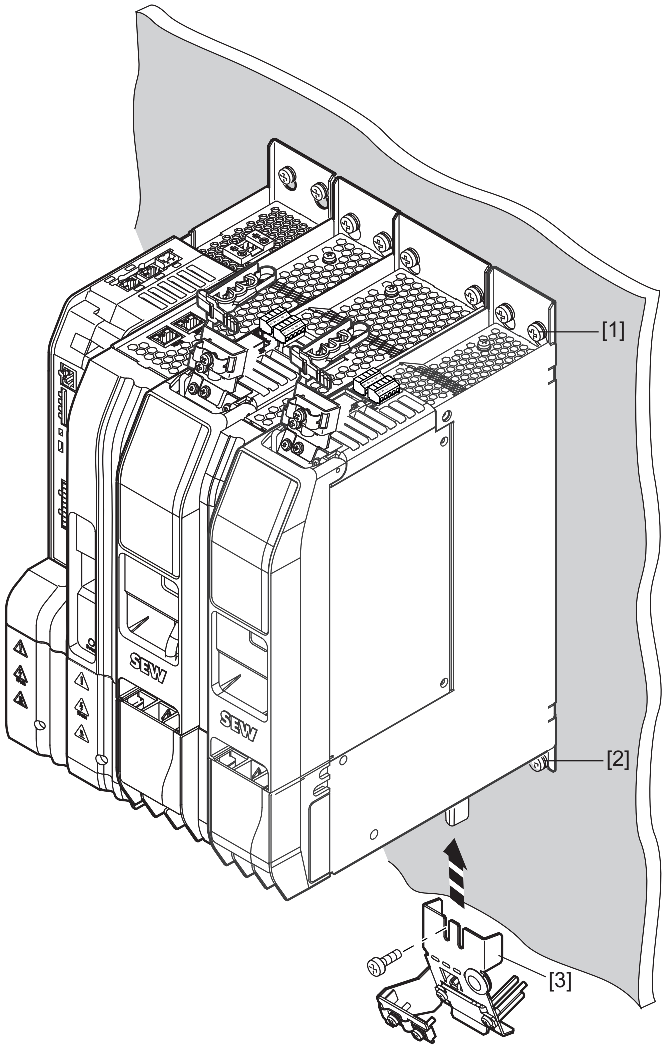
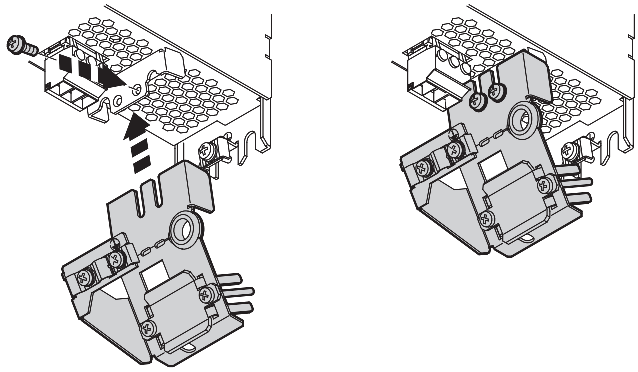
2. Push the module backwards to insert the retaining screws [2] into the upper holes in the unit base plate.
3. Lower the module.
4. Tighten the retaining screws [1] and [2].

8.6.3 Installing shield plates

Bottom shield plate





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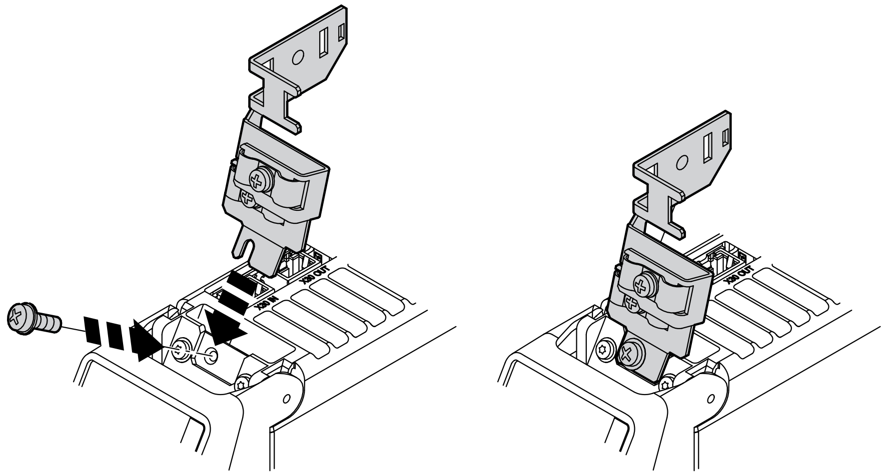
1. Install the shield plate [3] from below.

Top shield plate

1. Install the top shield plate as shown.



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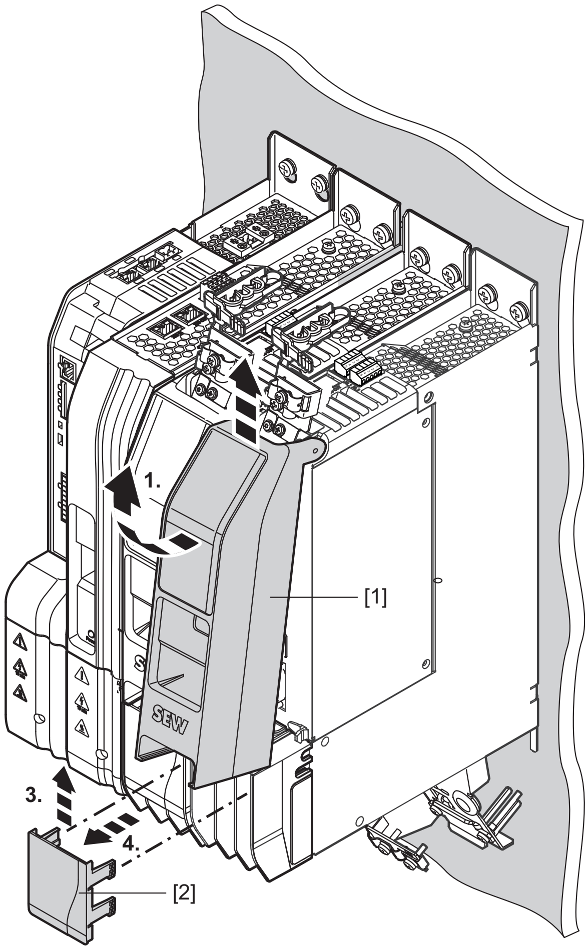
8.6.4 Removing the covers



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1. Pivot the safety cover [1] forward and lift it to remove it from the application inverter.
2. Move the front cover [2] upwards and remove them by pulling them away from the application inverter.

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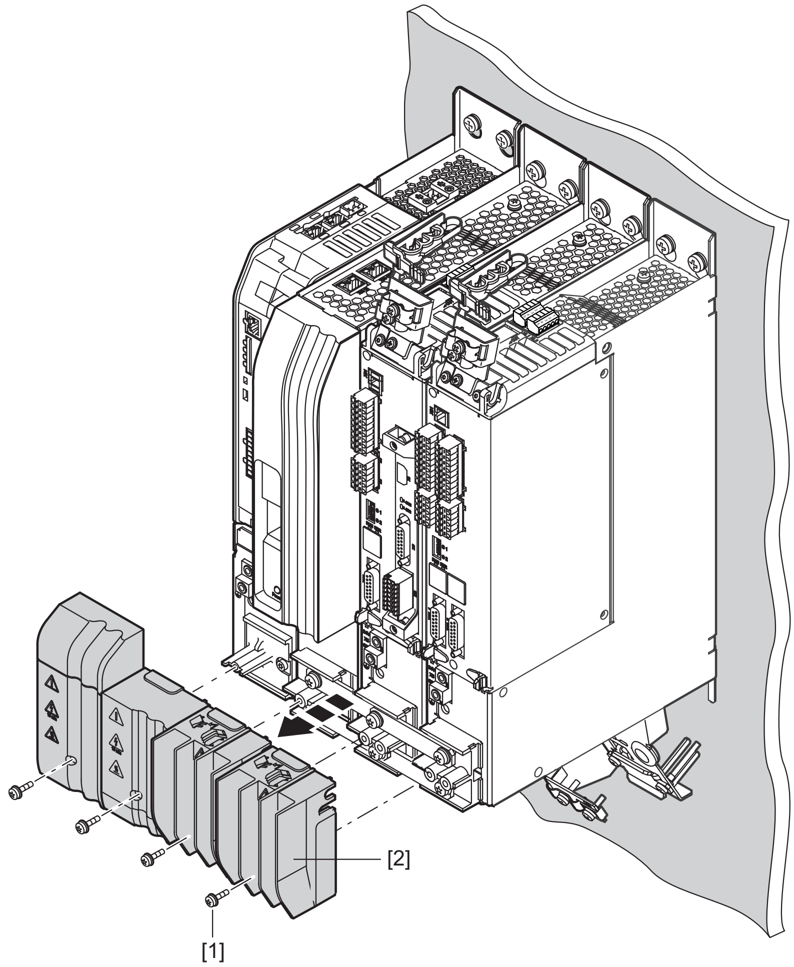
8.6.5 Removing the touch guards



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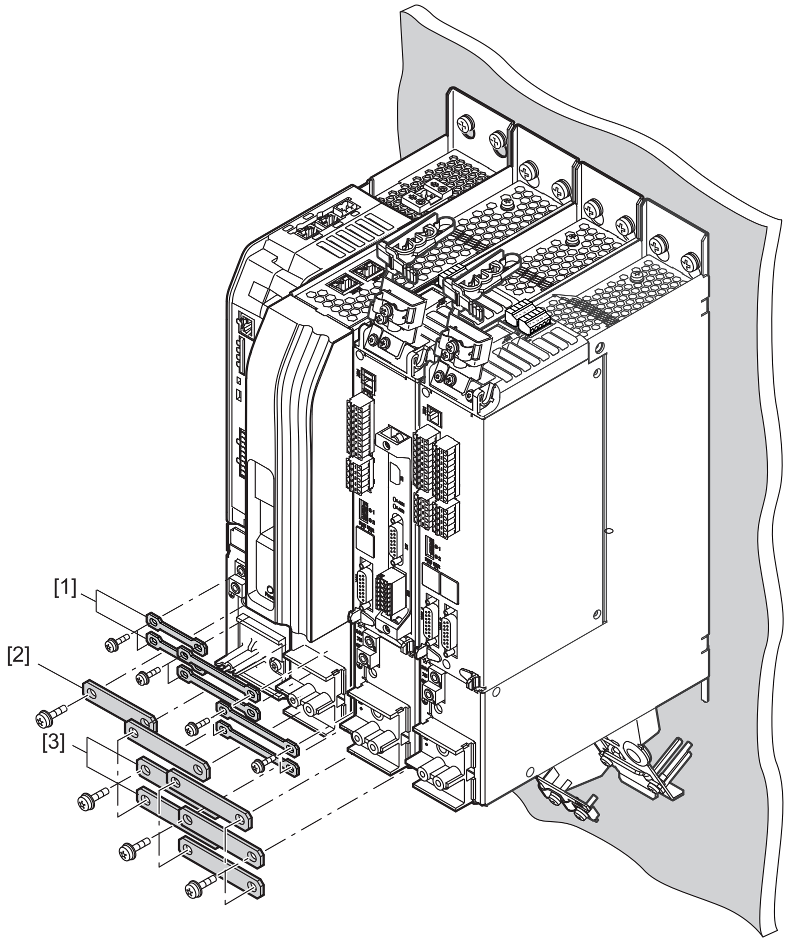
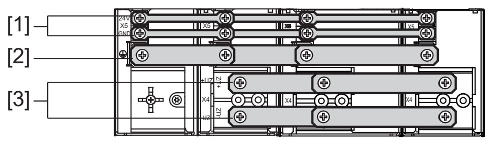
1. Remove the screws [1] of the touch guards of all modules.
2. Remove the touch guards [2] from all modules.

8.6.6 Installing the busbar





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1. Install the busbar [1] for the 24 V supply voltage as shown in the figure. Tighten the screws with the specified tightening torque (→ 🗎 239).
2. Install the busbar [2] for the PE connection as shown in the figure. Tighten the screws with the specified tightening torque (→ 🗎 239).
3. Install the busbar [3] for the DC link connection X4 as shown in the figure. Tighten the screws with the specified tightening torque (→ 🗎 239).

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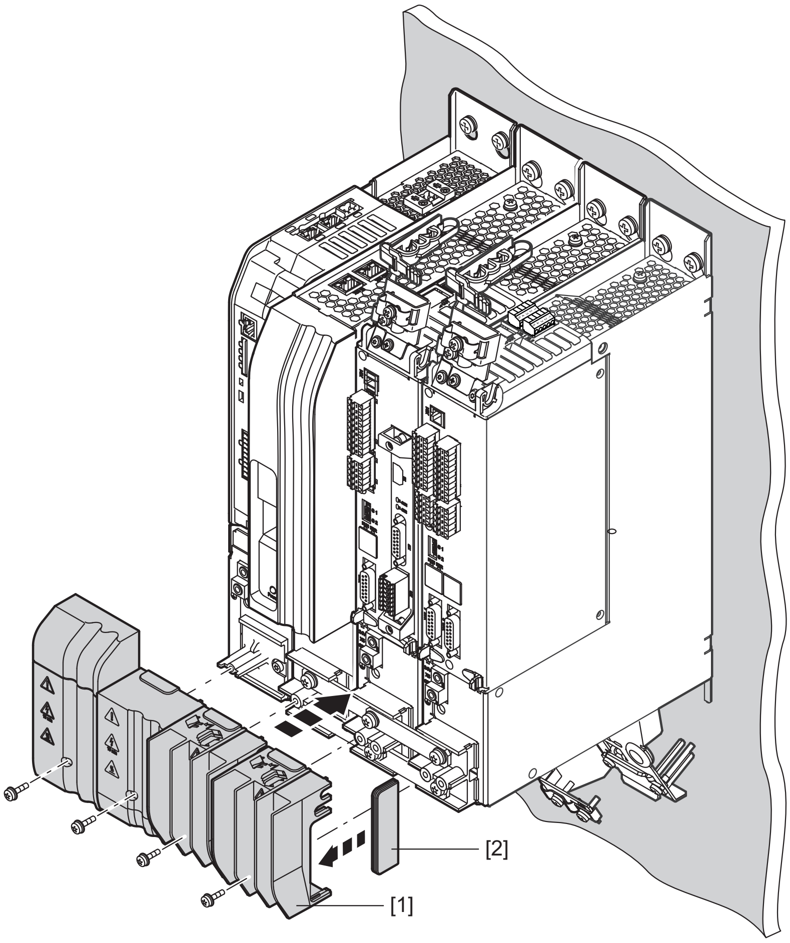
8.6.7 Installing touch guards

All modules of the application inverter are equipped with touch guards [1] and the outer modules of the axis system have closing covers [2], see the following figure. If the axis system contains a master module, the closing cover [2] only needs to be attached at the last module in the axis system.

Axis system with master module



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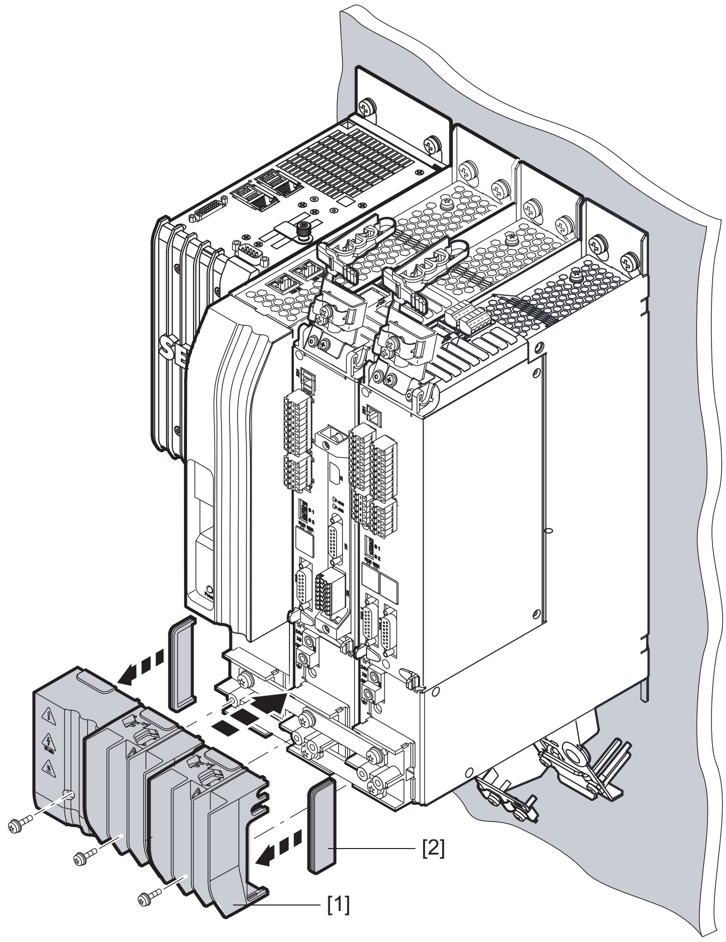
Axis system without master module



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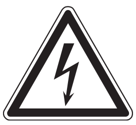
[1] Touch guard

[2] Closing cover

Reinstall all touch guards [1] after installation work.

1. Insert the closing cover [2] into the touch guard [1].
2. Install the touch guard [1] on the respective module. Insert the screws and tighten them securely with the specified tightening torque (→ 🗎 239).

Install one closing cover [2] each at the outer modules of the axis system. The closing covers prevent the DC link from being touched. Two closing covers are included with each power supply module.



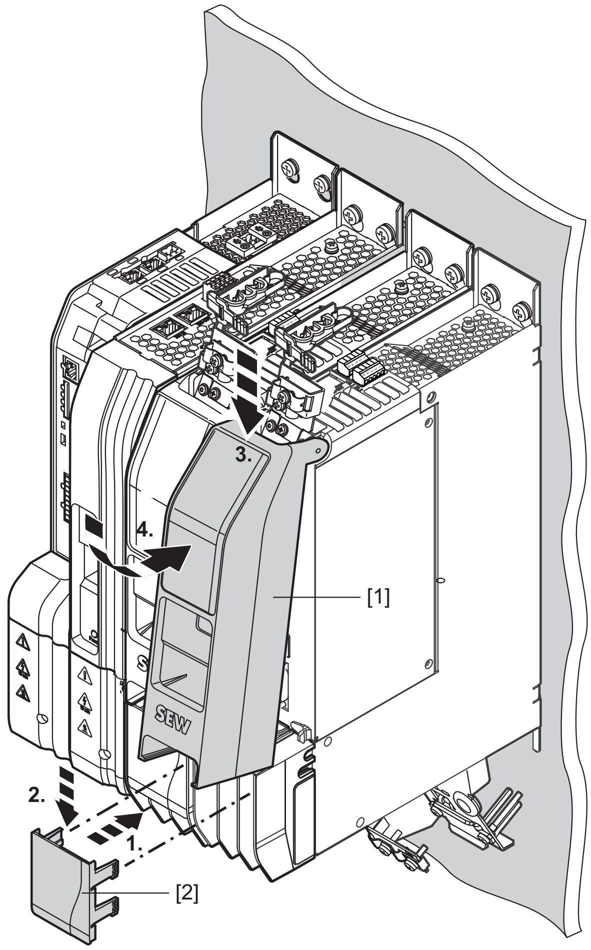
⚠ WARNING

Missing touch guards and closing covers

Severe or fatal injuries from electric shock

- Install all touch guards.
- Install closing covers at the first and last module in the axis system.

8.6.8 Installing front covers and covers



20807031691

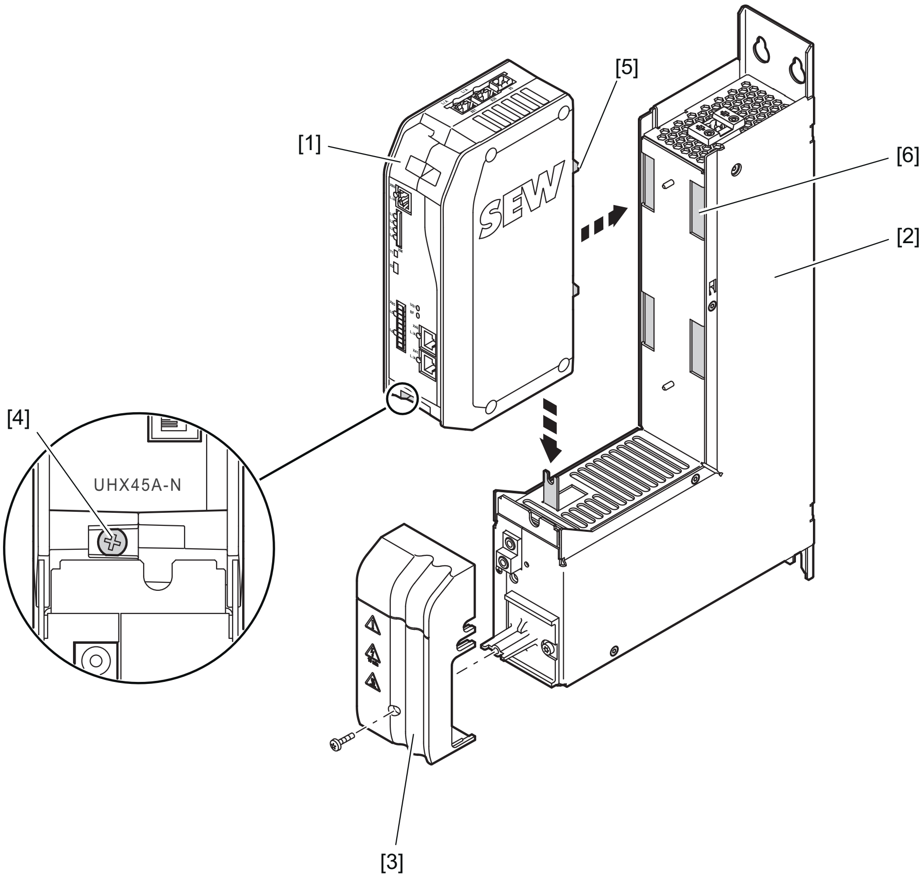
1. Push the front cover [2] forwards and downwards.
2. Place the cover [1] into the recess and pivot it into position.

8.6.9 Removing an axis module

To remove an axis module from the axis system proceed in the opposite order compared to installation, see chapter "Control cabinet installation" (→ 🗎 253).

Also observe the safety notes in chapter "Electrical installation" (→ 🗎 265).

8.6.10 Installation/removal of the UHX45A



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[1]	UHX45A	[4]	Screw
[2]	Housing of the master module MDM90A	[5]	4 cams
[3]	Touch guard	[6]	4 recesses

Installation

1. Remove the touch guard [3] at the housing of the master module [2]
2. Install the housing of the UHX45A [1] so that the cams [5] fit into the recesses [6] at the housing of the master module [2].
3. Push the housing of the UHX45A [1] downward until it touches the housing of the master module.
4. Tighten the screw [4]
5. Install the touch guard [3] again

Disassembly

1. Remove the touch guard [3] at the housing of the master module [2]
2. Loosen the screw [4]
3. Pull the housing of the UHX45A [1] upward and remove it toward the front

8.7 Electrical installation

⚠ DANGER

Dangerous voltage levels may still be present inside the device and at the terminal strips up to at least 10 minutes after the complete axis system has been disconnected from the supply system.

Severe or fatal injuries from electric shock.

To prevent electric shocks:

- After disconnecting from the supply system, wait at least 10 minutes and establish zero voltage before you start working on the power connections.
- After maintenance work, do not operate the axis system unless you have remounted the safety covers, because the device has only a IP00 degree of protection with the safety cover removed.

⚠ DANGER

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

Severe or fatal injuries from electric shock.

To avoid shock currents according to EN 61800-5-1, 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 (**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.

8.7.1 General information

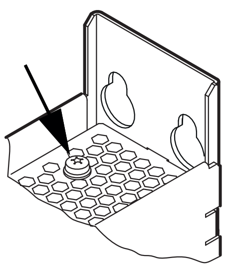
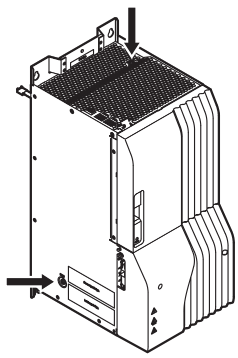
- Take suitable measures to prevent the motor starting up inadvertently, for example by removing the electronics terminal block X20 on the axis module. Take additional safety measures depending on the application to prevent possible injuries to people and damage to machinery.
- SEW-EURODRIVE recommends to use only closed cable lugs for connection to the bolts in order to prevent litz strands from escaping.

8.7.2 Permitted voltage systems

Information on the voltage systems	Information on permissibility
TN and TT systems – voltage systems with directly 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" (→ 🗎 266).
Voltage systems with grounded outer conductor.	This is not permitted.

8.7.3 Use in IT systems

To ensure IT system-capability, the terminal screw(s) shown in the following figure must be removed from all modules in the axis system.

 12924056459	• All axis modules • All double-axis modules • Power supply modules up to MDP90A-0750-..
	• Power supply modules as of MDP90A-1100-..

INFORMATION

EMC limit values

No EMC limits are specified for interference emission in voltage supply systems without a grounded star point (IT systems). The effectiveness of line filters is severely limited.

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8.7.4 Line fuses, fuse types

Line fuses and miniature circuit breakers are used for fusing the supply system cables of the axis block. In case of a fault, these components protect the power supply module against short-circuits. For fusing, use fuses and miniature circuit breakers with the following properties:

Type class	Prerequisite
Fuses in utilization categories gL, gG	Fusing voltage ≥ nominal line voltage
Miniature circuit breaker with characteristics B, C, D	• Nominal miniature circuit breaker voltage ≥ nominal line voltage • Nominal miniature circuit breaker currents must be at least 10% above the nominal line current of the power supply module

Adhere to the country-specific and system-specific regulations when carrying out the fusing. If required, observe the notes in chapter UL-compliant installation.

8.7.5 Line connection

For the terminal assignment for line connection of the various size, refer to the chapter "Terminal assignment" (→ 🗎 321).

For operation without line contactor, observe the specifications in chapter "Protection against thermal overload of the braking resistor" (→ 🗎 305).

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

NOTICE

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

The specified times and intervals must be observed.

- Observe the minimum switch-off time of 10 s before switching the power back on.
- Do not turn the power of the supply system on or off more than once per minute.

- The line contactor must always be located before 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 application inverter on and off. For jog mode, the FCB 20 "Jog" must be used.
- Observe the required dimensioning of the cable cross-section for UL-compliant installing.

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8.7.6 Power connections

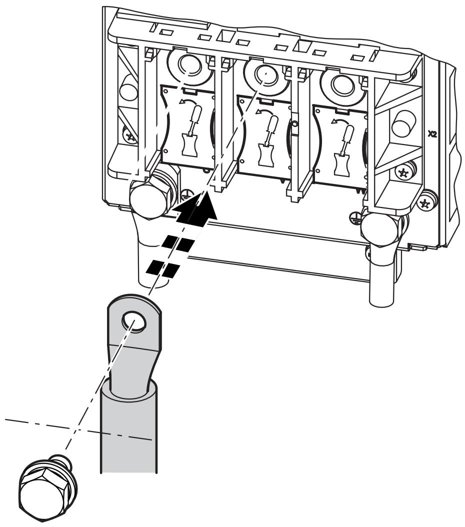
For the terminal assignment for the power connection of the various sizes, refer to the chapter "Terminal assignment" (→ 🗎 321).

To achieve degree of protection IP20 according to EN 60529 with larger modules, the connectors must be secured against touch using a protection cap. The protection caps are included in the accessory bag. The ring lugs must be insulated using a heat shrink tubing.

- Power supply modules MDP90A-0500-.. and larger, line connection X1, braking resistor connection X3
- Axis modules MDA90A-0640-.. and larger: Motor connection X2

The power connection can be designed either with 1 or 2 parallel cables.

Connection with 1 cable



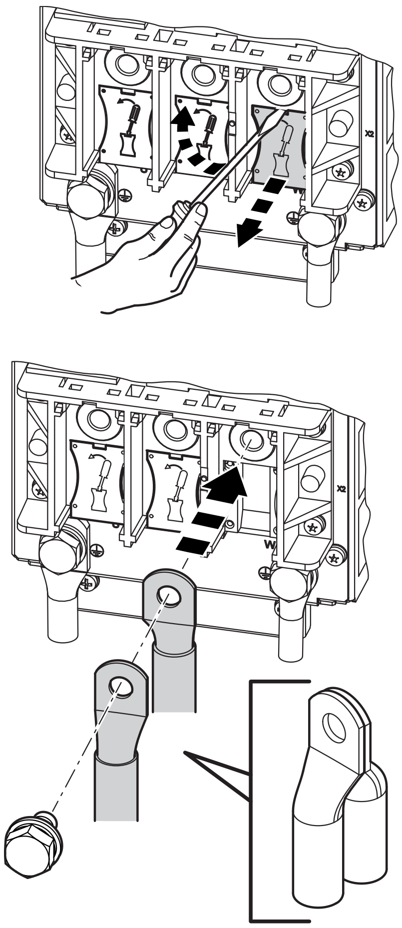
20119705995

1. Attach the heat shrink tubing at the ring lug.
2. Connect the cable as depicted in the figure.
3. Attach the protection caps, see chapter "Protection caps" (→ 🗎 251).

INFORMATION

If the device is connected using 1 cable, the plastic plate in the connection block must not be removed.

Connection with 2 cables



20119708427

1. Remove the plastic plate in the connection block as depicted in the figure above.
2. Attach a heat shrink tubing at the ring lugs.
3. Connect the 2 cables as depicted in the figure above.
4. Attach the protection caps, see chapter "Protection caps" (→ 🗎 251).

8.7.7 24 V supply voltage

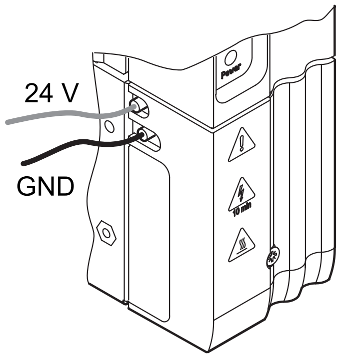
24 V supply voltage without master module

MOVIDRIVE® modular requires an external 24 V supply voltage. Us the following installation material for the connection:

- M4 fork-type or ring lugs with insulating collar and a cable cross-section of maximum 4 mm²,

  or

- M4 tubular cable lugs with insulating heat shrink tubing and a cable cross-section of maximum 6 mm².



14476866443

Select the cross-section of the supply cable according to the power demand of the device to be supplied. Note the additionally required power of the directly supplied 24 V brakes for CMP motors with BK or BP brake without brake control.

The maximally permitted length of the 24 V supply cable is 30 m.

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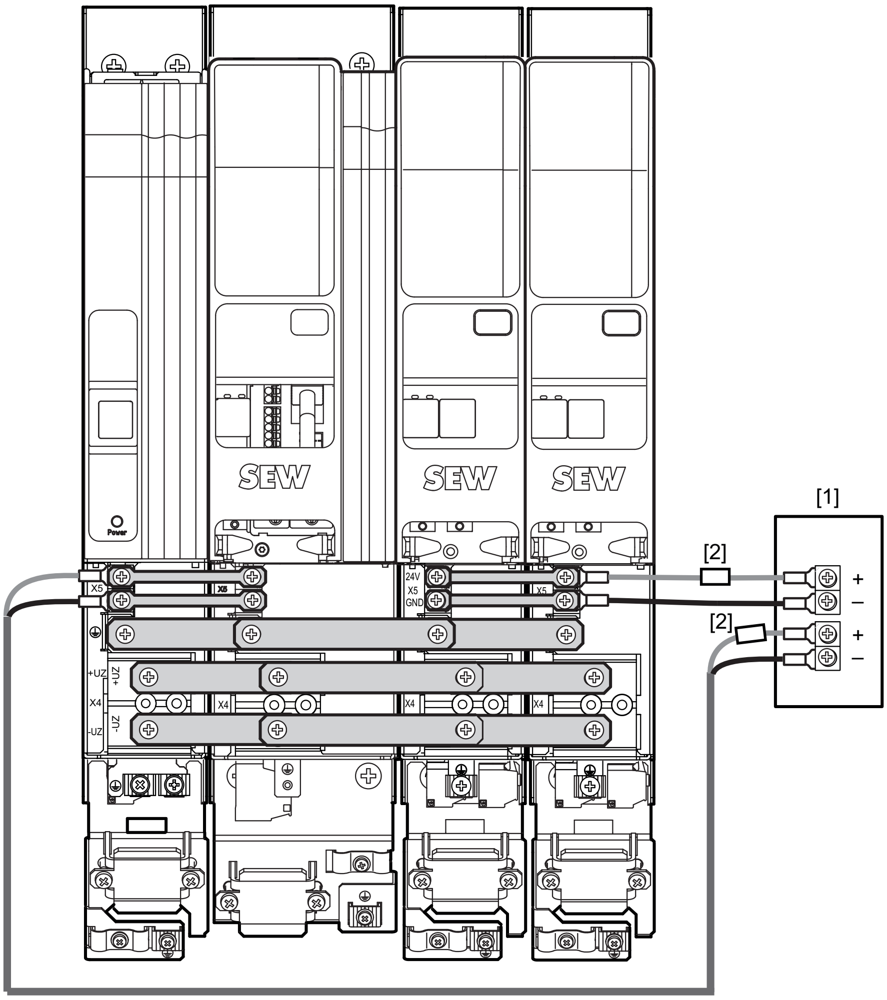
The connection is established either one-sided at the power supply module, or two-sided at the power supply module and the last axis module in the axis system, see the following figure for more details.



18014414154550283

[1]	External DC 24 V voltage supply
[2]	DC 24 V fuse

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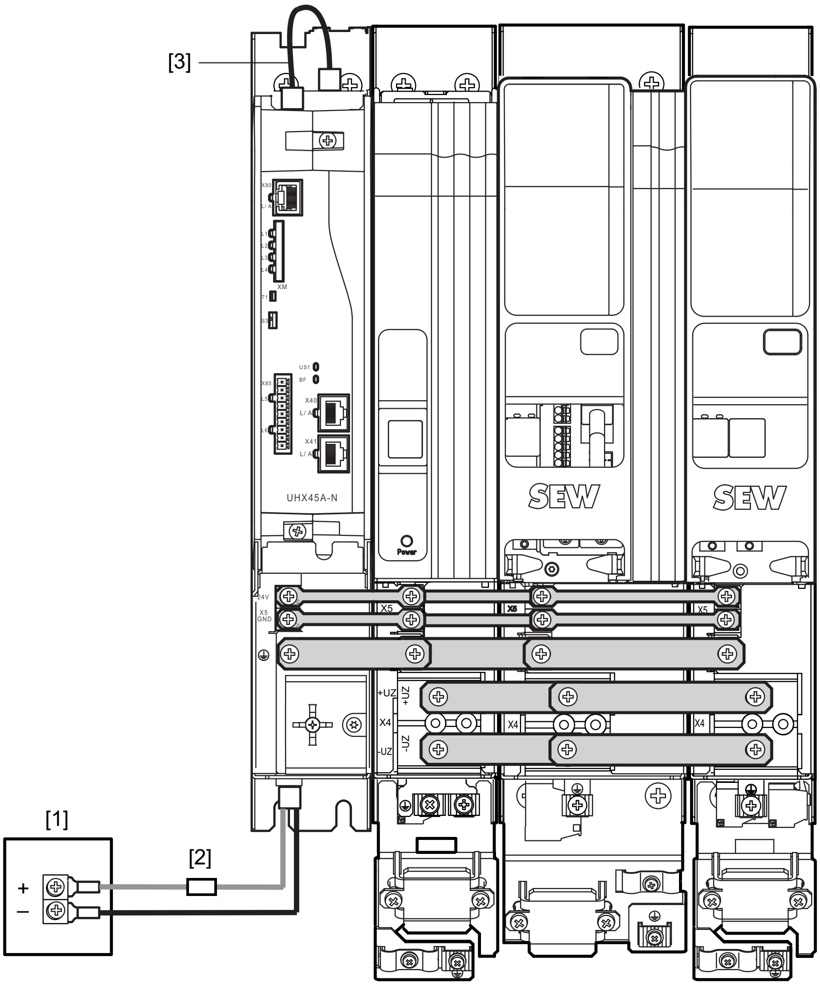
24 V supply voltage with master module UHX45A/MDM90A



9007220204831115

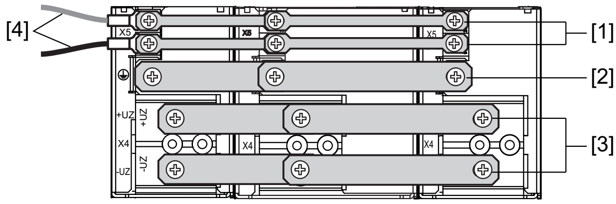
[1] External DC 24 V supply at X5_A

[2] DC 24 V fuse

[3] X5_B → X5: DC 24 V supply voltage UHX45A

Only use the connection cable included in the delivery to connect the 24 V supply of the MOVI-C CONTROLLER® advanced.

8.7.8 Connection of an axis system



27021611563769099

[1] Connection +24 V supply voltage

[2] PE connection

[3] X4: DC link connection

[4] Connection external 24 V supply voltage

For information on how to connect a DC link, refer to chapter "Installing the busbar" (→ 🗎 260).

Particularities of the DC link connection

Use of axis modules ≤ MDA90A-1000-.. at the MDP90A-1100-.. power supply module.

INFORMATION

If axis modules ≤ MDA90A-1000-.. are operated on a MDP90A-1100-.. power supply module, either directly or to the right of an axis module ≥ MDA90A-1400-…, the total of the nominal DC link currents I_{NDCL} of the axis modules ≤ MDA90A-100-… must not exceed 153 A.

Example 1:

MDP90A-1100-..

MDA90A-0640-.. I_{NDCL} = 64 A

MDA90A-0640-.. I_{NDCL} = 64 A

MDA90A-0240-.. I_{NDCL} = 24 A

Total of I_{NDCL} = 152 A→ Set-up is permitted

Example 2:

MDP90A-1100-..

MDA90A-1400-..

MDA90A-0640-.. I_{NDCL} = 64 A

MDA90A-0640-.. I_{NDCL} = 64 A

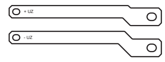
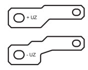
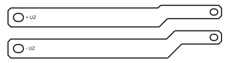
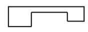
MDA90A-0640-.. I_{NDCL} = 64 A

Total of I_{NDCL} = 192 A→ Set-up is not permitted

Adapter connectors of the DC link connection

To be able to establish an axis system in which modules with DC link bars of different widths are used, adapter connectors must be used at the transition from wide to narrow or narrow to wide. These adapter connectors are listed in the following table.

The necessary closing covers are included with the adapter connectors.

From module	To module	Adapter connectors	Part number
MDP90A-0750-..	MDA90A-1400-..		28244052
MDP90A-1100-..	• MDA90A-0020-.. – MDA90A-1000-.. • MDD90A-0020.. – MDD90A-0080-..		28244079
MDA90A-1400-.. – MDA90A-1800-..	• MDA90A-0020-.. – MDA90A-1000-.. • MDD90A-0020.. – MDD90A-0080-..		28244060
		Closing cover	
MDA90A-1400-.. – MDA90A-1800-..	• MDA90A-0020-.. – MDA90A-0240-.. • MDD90A-0020.. – MDD90A-0080-..		18183751

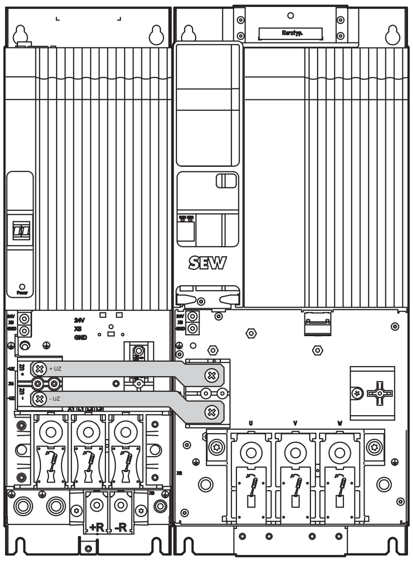
The closing cover 18183751 is included with the adapter connectors 28244060.

Adapter connectors are not included in the scope of delivery and must be ordered.

Examples of the DC link busbar with different bar widths

Example 1

Axis system with MDP90A-0750-.. power supply module, MDA90A-1400-.. axis module

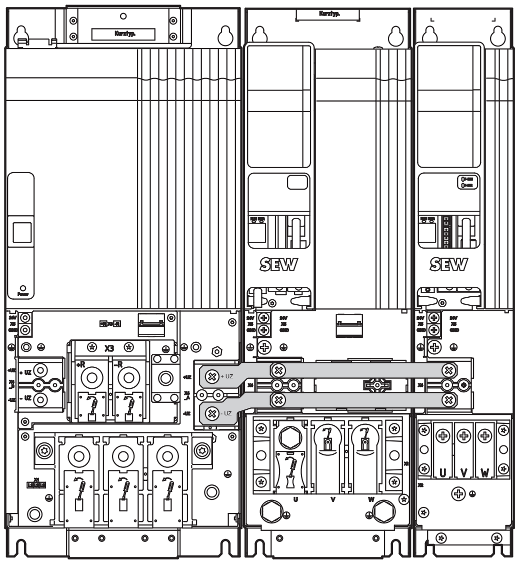


23268391819

Adapter connectors with the part number 28244052 must be ordered for this arrangement.

Example 2

Axis system with MDP90A-1100-.. power supply module, MDA90A-1000-.. axis module, MDA90A-0480-..



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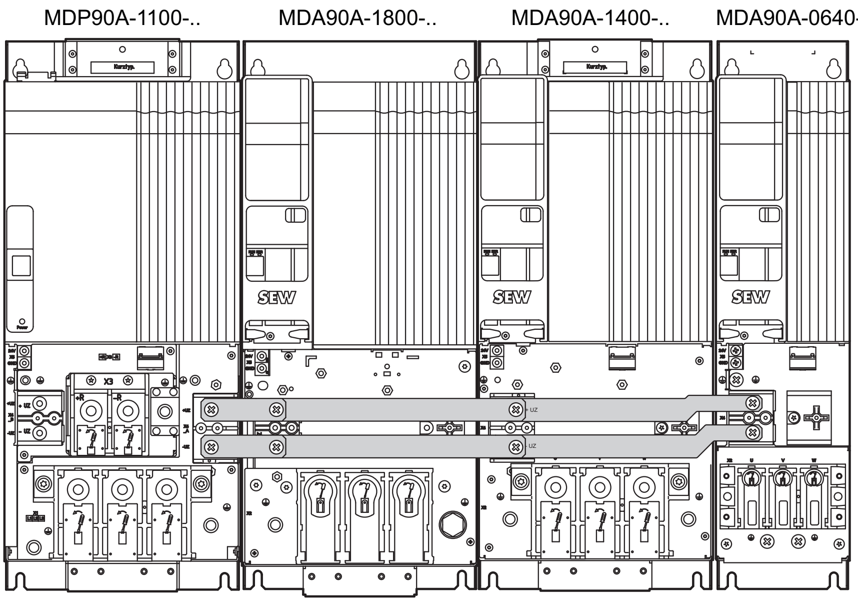
Adapter connectors with the part number 28244079 must be ordered for this arrangement.

Example 3

Axis system with MDP90A-1100-.. power supply module, MDA90A-1800-.. axis module, MDA90A-1400-.., MDA90A-0640-..



23268389387

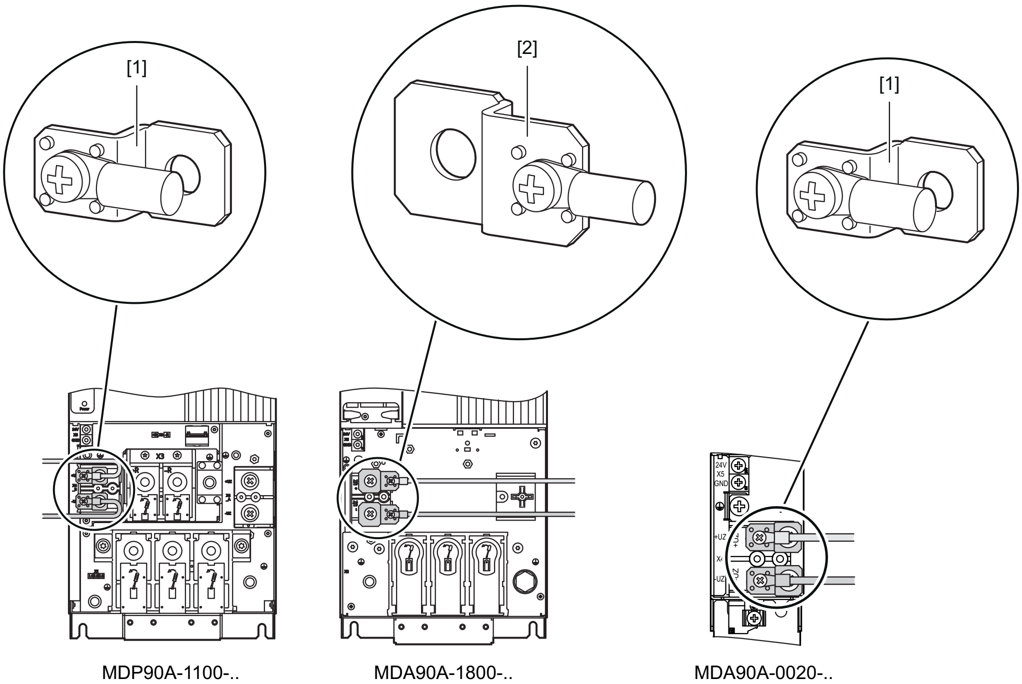
Adapter connectors with the part number 28244060 must be ordered for this arrangement.

8.7.9 Connecting a safe brake module to the DC link

The safe BST brake module is directly supplied from the DC link. For connecting the safe brake module to the DC link, a set of angled bars is available in 2 sizes.

Axis module	Set of angled bars	Part number
MDP90A-..	Small	28249674
MDA90A-0020 .. 0100..	Small	28249674
MDD90A-0020 .. 0080..	Small	28249674
MDA90A-1400 .. 1800..	Large	28249682

The angled bars are screwed to the DC link bars in the last axis module on the right side or in the power supply module on the left side. Use a M4 screw to fasten a ring cable lug.



24312535051

⚠ DANGER

Dangerous voltages of up to DC 970 V can occur.

Severe or fatal injuries from electric shock.

To prevent electric shocks:

- After disconnecting from the supply system, wait at least 10 minutes and establish zero voltage before you start working on the power connections.
- After maintenance work, do not operate the axis system unless you have remounted the safety covers, because the device has only a IP00 degree of protection with the safety cover removed.

Observe the "Safety-related BST brake module" operating instructions for installation and the following installation notes:

- Comply with country-specific installation regulations.
- Use cables with a cross section of 2.5 mm^2.

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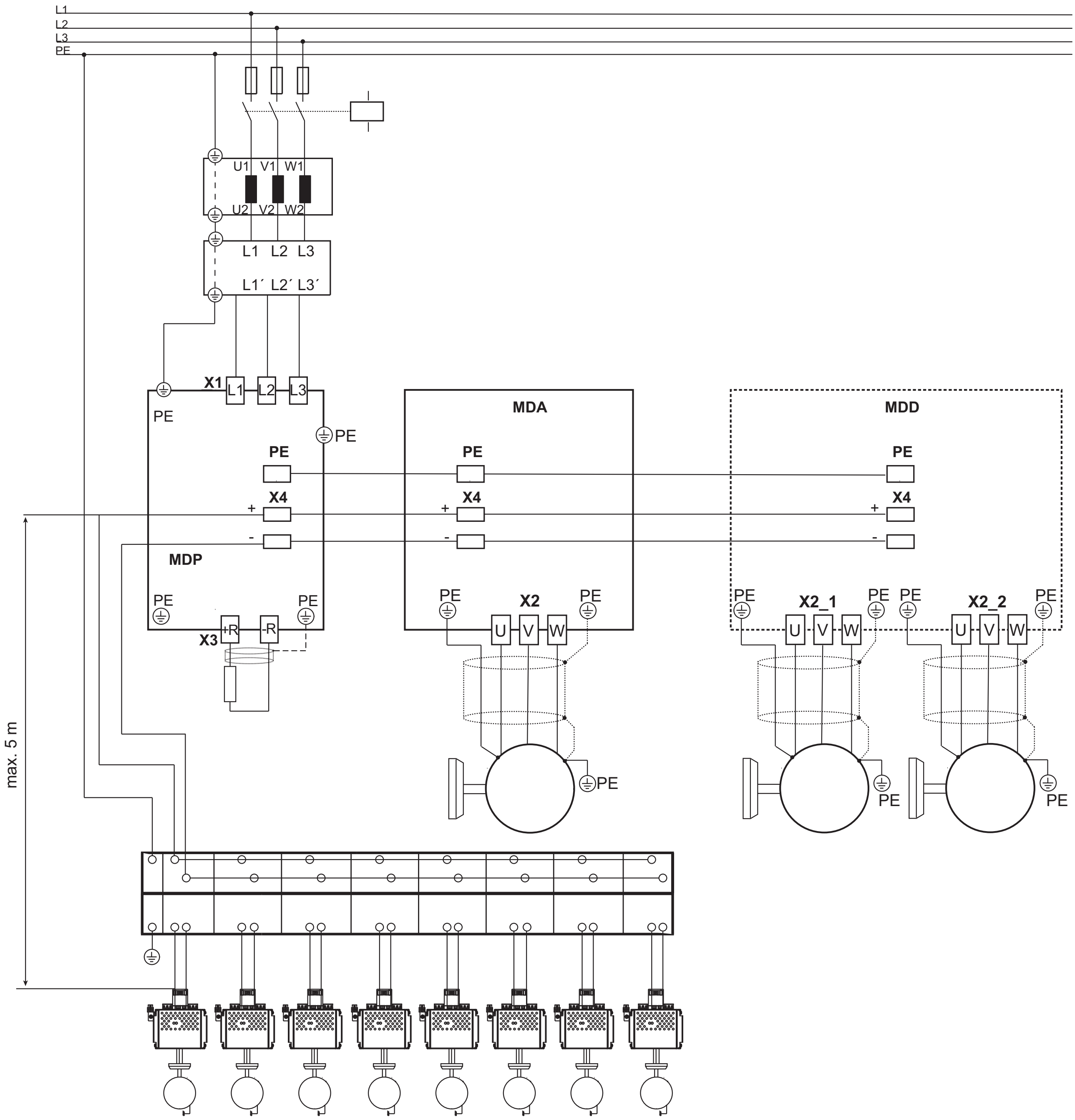
- Use suitable cable lugs for M4 screws.
- Connect a maximum number of 8 BST brake modules to a DC link output.
- Only BST brake modules may be connected to the angled bars.
- Protect the outgoing DC link with
  – 2 fuses. SEW-EURODRIVE recommends: At least DC 750 V, utilization category gG,

    or

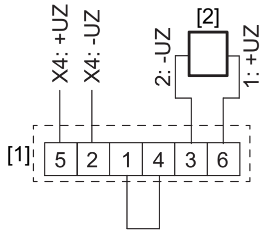
  – 1 thermal circuit breaker TCB0100, set to 10 A.
- Limit the total cable length of the connection to a maximum of 5 m – to be measured between tapping of the DC link and connection to the BST brake module), see also the following wiring diagram.

Wiring diagram



24783342987

Wiring diagram when using a TCB thermal circuit breaker



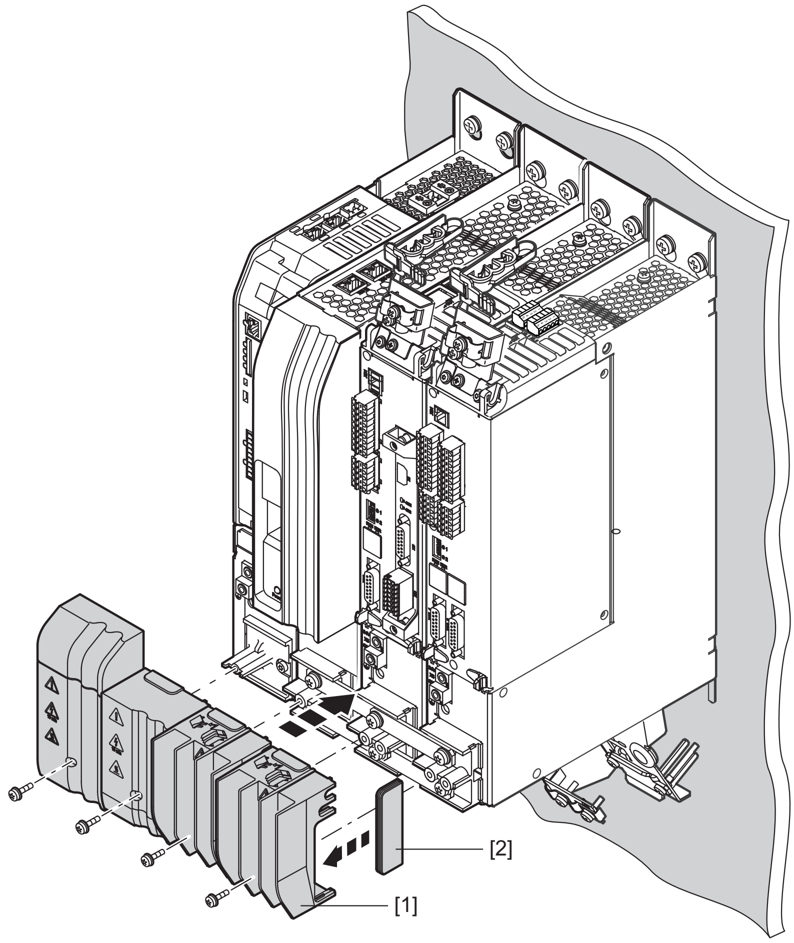
24809204619

[1] TCB thermal circuit breaker
[2] BST safe brake module

8.7.10 Installing touch guards and closing covers

All modules of the application inverter are equipped with touch guards [1] and the outer modules of the axis system have closing covers [2], see the following figure. If the axis system contains a master module, the closing cover [2] only needs to be attached at the last module in the axis system.

With master module



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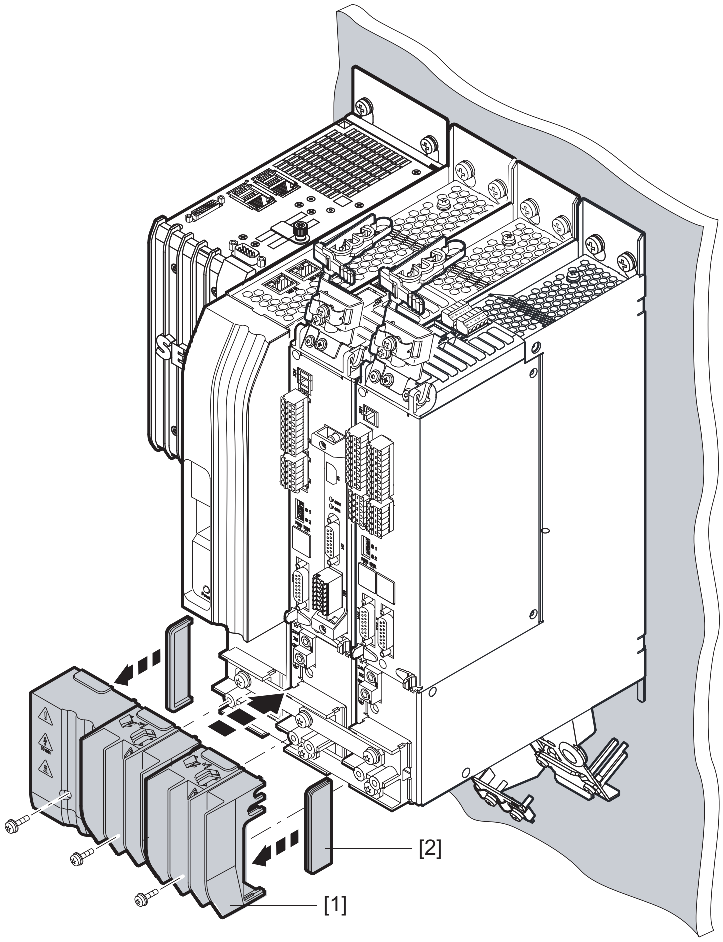
Without master module



18014412466136331

[1] Touch guard

[2] Closing cover

Reinstall all touch guards [1] after installation work.

1. Insert the closing cover [2] into the touch guard [1].
2. Install the touch guard [1] on the respective module. Insert the screws and tighten them securely with the specified tightening torque (→ 🗎 239).

Install one closing cover [2] each at the outer modules of the axis system. The closing covers prevent the DC link from being touched. Two closing covers are included with each power supply module.

⚠ WARNING

Missing touch guards and closing covers

Severe or fatal injuries from electric shock

- Install all touch guards.
- Install closing covers at the first and last module in the axis system.

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8.7.11 Motor output

NOTICE

Connecting capacitive loads to an axis module.

Destruction of the axis module.

- Only connect ohmic/inductive loads (motors).
- Never connect capacitive loads.

8.7.12 Output brake chopper

NOTICE

Connecting capacitive loads to the power supply module.

Connecting inductive loads to the power supply module.

Destruction of the power supply module.

- Only connect ohmic loads (braking resistors).
- Never connect capacitive or inductive loads.

8.7.13 Temperature evaluation of the motor

The temperature evaluation can be connected in 2 ways:

- The encoder cable includes the cables of the temperature evaluation.
- The temperature evaluation is connected via terminal X10.

⚠ WARNING

Dangerous contact voltages at the signal terminals of the application inverter when connecting the wrong temperature sensors.

Severe or fatal injuries from electric shock.

- Connect only temperature sensors with protective separation from the motor winding to the temperature evaluation. Otherwise, the requirements for protective separation are not met. Dangerous contact voltages may occur at the signal terminals of the application inverter via the signal electronics in case of an error.

8.7.14 Brake output

INFORMATION

- If the brake connection and the motor connection are combined in one power cable, the brake cable must be shielded separately. The shielding of the power cable and the brake cable must be connected to the motor and application inverter over a large area.
- SEW-EURODRIVE recommends to also use a shielded brake cable for separate brake cable routing.
- Note the different project planning criteria to determine the length of brake cable and motor cable.

8.7.15 Inputs/outputs

NOTICE

Damage to the digital inputs and digital outputs.

The digital inputs and digital outputs are not electrically isolated. Incorrectly applied voltages can damage the digital inputs and digital outputs.

- Do not apply external voltages to the digital outputs.
- The digital inputs and outputs are dimensioned according to IEC 61131-2.

- The cable length must not exceed 30 m.
- Cables outside the control cabinet must be shielded.

8.7.16 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

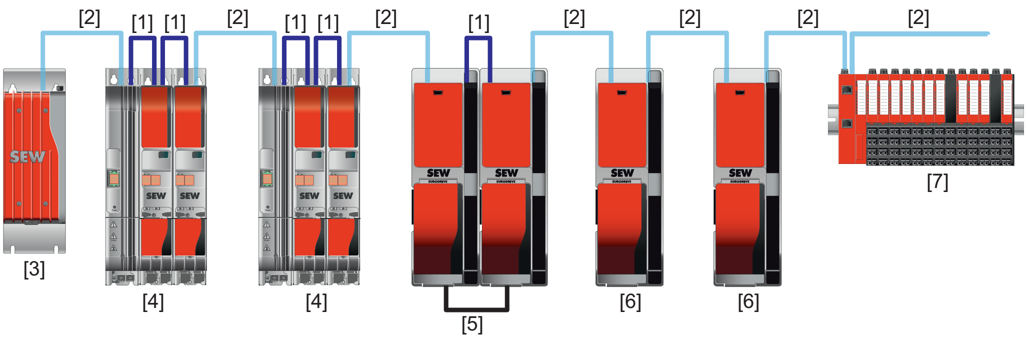
Only 4-pole cables are permitted to be used as system bus cables [2]. If an 8-pole cable is used, malfunctions or failures may occur at the connected devices.

INFORMATION

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

System bus and module bus cabling

Example of a system bus and module bus cabling



9007217271733643

[1] Module bus cable, 8-pin, color: anthracite gray.

[2] System bus cable, 4-pin, color: light gray.

[3] MOVI-C® CONTROLLER power UHX8x

[4] MOVIDRIVE® modular

[5] MOVIDRIVE® system with DC link connection

[6] MOVIDRIVE® system

[7] Other EtherCAT® stations at the EtherCAT®/SBus^{PLUS}

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Correct cabling

Module bus cable

In the case of MOVIDRIVE® modular, the 8-core module bus cable connects the power supply module to the first axis module and the axis modules to one another; see figure (→ 🗎 286).

In the case of MOVIDRIVE® modular, in addition to the system bus communication, the module bus is routed in the cable for information inside the device. The module bus cable is delivered in the length required as part of the accessories for the axis modules.

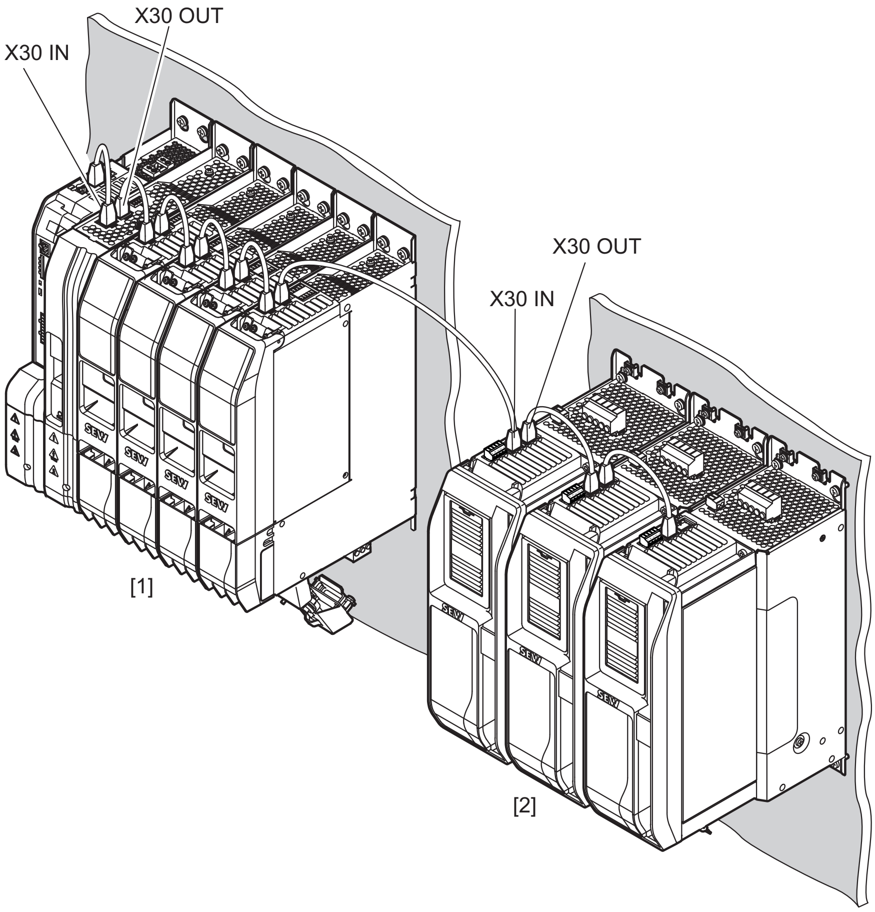
The connectors of the module bus cables are red and black to simplify correct attachment of the cables; see the following figure.

- The black connectors must be plugged into the bus input X30 IN.
- The red connectors must be plugged into the bus output X30 OUT.

System bus cable

The 4-pole system bus cable is used between automation components; see figure (→ 🗎 286). Some of these components are listed here as examples:

- MOVI-C® CONTROLLER
- MOVIDRIVE® modular/system application inverter
- PC with MOVISUITE® engineering software
- MOVI-PLC® I/O system
- Other EtherCAT® stations at the EtherCAT®/SBus^PLUS



9007220061843339

[1] MOVIDRIVE® modular [2] MOVIDRIVE® system

8.7.17 Encoder

The encoder cable may include the cables of the temperature evaluation.

For information on the pin assignment, refer to chapter "Terminal assignment at MDA single-axis module" (→ 🗎 324).

⚠ WARNING

Dangerous contact voltages at the terminals of the application inverter when connecting the wrong temperature sensors.

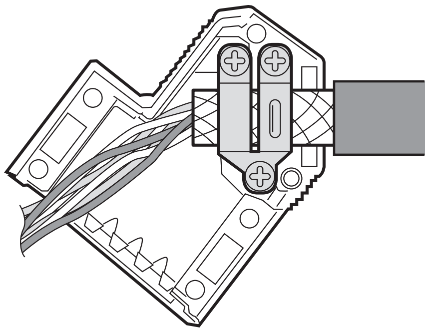
Severe or fatal injuries from electric shock.

- Connect only temperature sensors with protective separation from the motor winding to the temperature evaluation. Otherwise, the requirements for protective separation are not met. Dangerous contact voltages may occur at the terminals of the application inverter via the signal electronics in case of an fault.

Installation notes for encoder connection

Encoder cable

- Use shielded cables with twisted pair cores. Connect the shield over a wide area at both ends:
  - At the encoder in the cable gland or in the encoder plug,
  - At the application inverter in the housing of the D-sub connector.



13887834891

- Route the encoder cable separately from the power cables.
- Connect the shield on the inverter end in the housing of the D-sub connector over a large area.

On the encoder/resolver

- To ensure a flawless shield connection, an EMC screw fitting must be used for the cable entry of the signal line.
- For drives with a plug connector, connect the shield on the encoder plug.

Prefabricated cables

SEW-EURODRIVE offers pre-fabricated cables for connecting encoders. SEW-EURODRIVE recommends to use these prefabricated cables.

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Encoder connection/cable lengths

Connection/Encoder	Cable length
HTL encoder ES7C and EG7C	300 m
Standard HTL encoder	200 m
Other encoders	100 m

INFORMATION

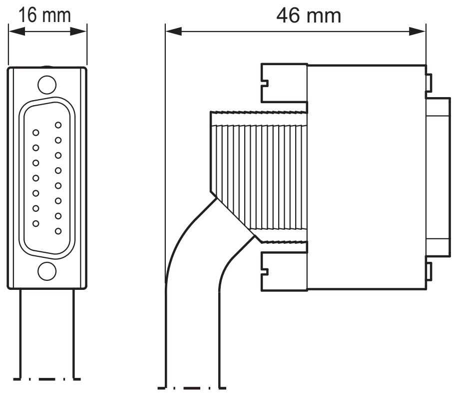
The maximum cable length might be reduced depending on the technical data of the respective encoder. Observe the manufacturer specifications.

8.7.18 Self-assembled encoder cables

If self-assembled encoder cables are used, make sure to dimension the connector and the route the cable in a way that the safety cover of the application inverter can be closed.

The maximum permitted width of the connector is 16 mm.

The maximum permitted height of the connector up to the highest point of the cable routing is 46 mm.



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Minimum requirements for encoder cables

Make sure that self-assembled cables fulfilled the following requirements:

- Cross section of voltage supply cable:
  - At least 0.25 mm^2 for cable lengths up to 50 m.
  - At least 0.5 mm^2 for cable lengths up to 100 m.
- Cross section of the signal wire:
  - At least 0.25 mm^2.
- Capacitance per unit length:
  - Maximum 70 pF/m - core/core.
  - Maximum 120 pF/m - core/shield.
- The cable must be shielded.
- Differential signals must be routed via twisted wires e.g. Data+ and Data-.

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8.8 Installing options and accessories

8.8.1 Installing a card

Observe the safety notes in chapter "Electrical installation" (→ 🗎 265).

INFORMATION

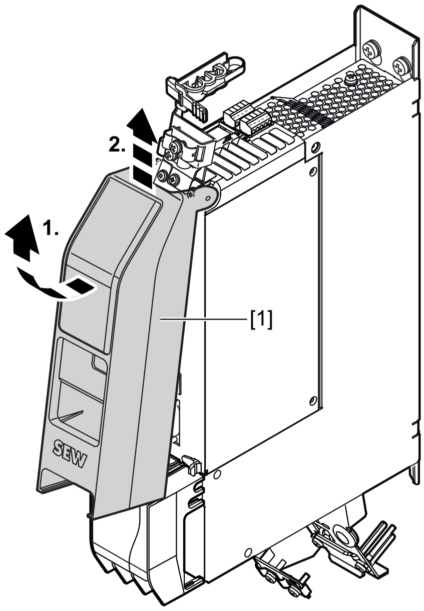
Requirements for installation.

Cards can only be installed in axis modules suitable for option cards.

8

For information on which option card can be installed in which slot, refer to chapter "Card slots" (→ 🗎 234).

1. Disconnect the application inverter from the power supply. Disconnect the DC 24 V supply and the line voltage.
2. Ensure electrostatic discharge with suitable measures before starting the work. Suitable measures for equipotential bonding are e.g. the use of a discharge strap or wearing conductive shoes.
3. Remove the safety cover [1] from the front of the application inverter.



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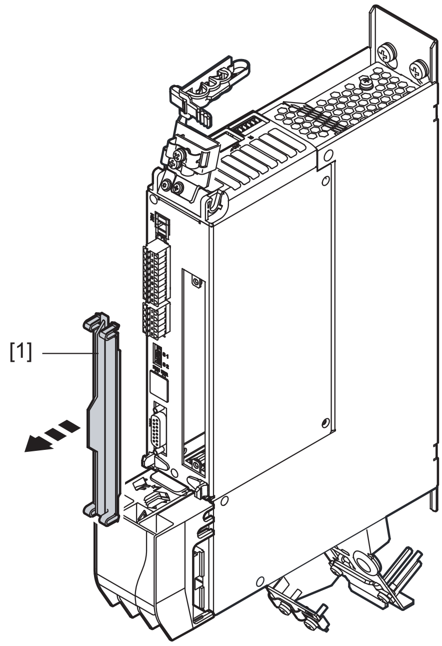
4. Remove the plastic cover [1] at the card slot.



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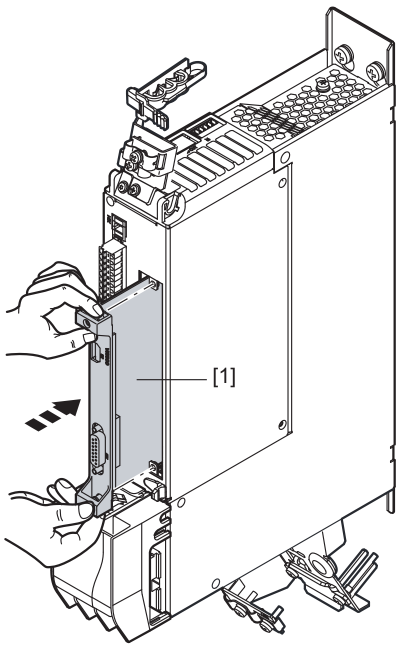
INFORMATION

Handling the card

Hold the card by its edges only.

5. Take the card [1] and insert it in the slot with slight pressure.



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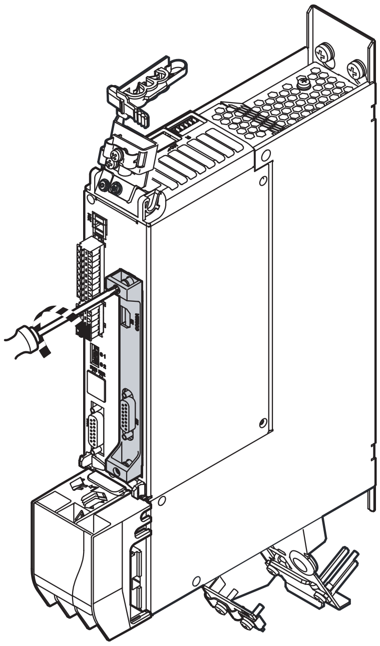
6. Screw in the card with the specified tightening torque (→ 🗎 239).



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7. Install the safety cover at the front of the application inverter.

8.8.2 CIO21A and CID21A input/output card

INFORMATION

Technical data of the option cards

For technical data and a detailed description of the encoder interface, refer to chapter "Technical data of the option cards".

Voltage supply

The I/O cards are supplied by the basic unit via the 24 V voltage supply.

Short-circuit behavior of digital outputs

The digital outputs are short-circuit-proof.

As soon as the short circuit is remedied, the target output voltage is output, meaning the output does not switch off.

Short circuit behavior of analog outputs

The analog outputs are short-circuit-proof.

In the event of a short circuit, the output current is limited to a maximum value of 30 mA. The short circuit current is not pulsating.

As soon as the short circuit is remedied, the target output voltage is output, meaning the output does not switch off.

Connecting inductive loads at digital outputs

The digital outputs can switch inductive loads up to an energy content of maximum 500 mJ 10 times per seconds at the maximum without any additional measures. For larger energy contents an external protective element (freewheeling diode) is required.

Connecting 2 digital outputs in parallel

Connecting digital outputs in parallel is possible. The possible output current is doubled. Ensure identical parameterization of the digital outputs.

Cable lengths

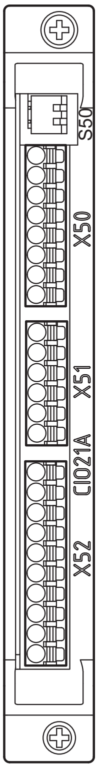
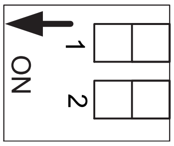
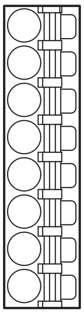
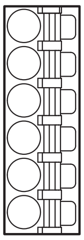
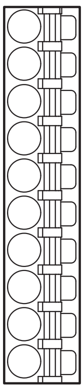
The maximum cable length of connections on the inputs and outputs is 30 m.

INFORMATION

Shielding the cables.

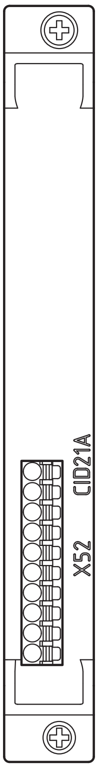
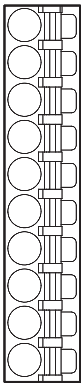
Cables outside the control cabinet must be shielded.

CIO21A terminal assignment

	Terminal		Connec-tion	Short description
				S50/1 on: Current input active for AI2x S50/2 on: Current input active for AI3x S50/1 off[1)] : Voltage input active for AI2x S50/2 off[1)]: Voltage input active for AI3x
		X50:1	REF1	+10 V reference voltage output
		X50:2	AI21	Analog current and voltage input
		X50:3	AI22	Analog current and voltage input, reference for AI21
		X50:4	GND	Reference potential
		X50:5	AI31	Analog current and voltage input
		X50:6	AI32	Analog current and voltage input, reference for AI31
		X50:7	GND	Reference potential
		X50:8	REF2	-10 V reference voltage output
		X51:1	AOV2	Analog voltage output 1, freely programmable
		X51:2	AOC2	Analog current output 1, freely programmable
		X51:3	GND	Reference potential for the outputs AOV2 and AOC2
		X51:4	AOV3	Analog voltage output 2, freely programmable
		X51:5	AOC3	Analog current output 2, freely programmable
		X51:6	GND	Reference potential for the outputs AOV3 and AOC3
		X52:1	DI10	Digital input 1, freely programmable
		X52:2	DI11	Digital input 2, freely programmable
		X52:3	DI12	Digital input 3, freely programmable
		X52:4	DI13	Digital input 4, freely programmable
		X52:5	GND	Reference potential for the digital inputs DI10 – DI13
		X52:6	DO10	Digital output 1, freely programmable
		X52:7	DO11	Digital output 2, freely programmable
		X52:8	DO12	Digital output 3, freely programmable
		X52:9	DO13	Digital output 4, freely programmable
		X52:10	GND	Reference potential for the digital outputs DO10 – DO13

1) Delivery state

CID21A terminal assignment

	Terminal		Connec-tion	Short description
		X52:1	DI10	Digital input 1, freely programmable
		X52:2	DI11	Digital input 2, freely programmable
		X52:3	DI12	Digital input 3, freely programmable
		X52:4	DI13	Digital input 4, freely programmable
		X52:5	GND	Reference potential for the digital inputs DI10 – DI13
		X52:6	DO10	Digital output 1, freely programmable
		X52:7	DO11	Digital output 2, freely programmable
		X52:8	DO12	Digital output 3, freely programmable
		X52:9	DO13	Digital output 4, freely programmable
		X52:10	GND	Reference potential for the digital outputs DO10 – DO13

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8.8.3 CES11A multi-encoder card

INFORMATION

Technical data of the cards

For technical data and a detailed description of the encoder interface, refer to chapter "Technical data of the cards".

Overview of functions

The CES11A multi-encoder card expands the functionality of the application inverter in a way that an additional encoder can be evaluated. The encoder connected to the CES11A multi-encoder card can be used as motor encoder or external encoder.

Supported encoder types

The following encoder types can be evaluated by the CES11A multi-encoder card:

HTL 12/24 V (differential)
TTL (differential)
RS422
SIN/COS 1 V_{SS} (differential)
HIPERFACE® with SIN/COS signals 1 V_{SS}
SEW encoder (RS485) with SIN/COS signals 1 V_{SS}, e.g. AS7W, AG7W
EnDat 2.1 with SIN/COS signals 1 V_{SS}
SSI encoder with/without SIN/COS signals 1 V_{SS}
CANopen encoder

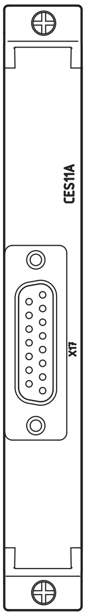
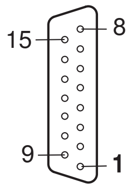
Encoder connection/cable lengths

Connection/Encoder	Cable length
HTL encoder ES7C and EG7C	300 m
Standard HTL encoder	200 m
Other encoders	100 m

INFORMATION

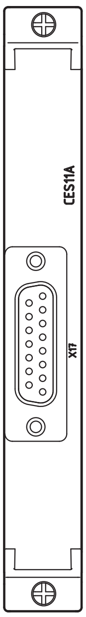
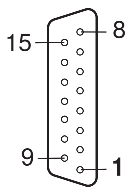
The maximum cable length might be reduced depending on the technical data of the respective encoder. Observe the manufacturer specifications.

Terminal assignment of TTL, HTL, SIN/COS encoder

card	Terminal		Connection	Short description
		X17:1	A (COS+) (K1)	Signal track A (COS+) (K1)
		X17:2	B (SIN+) (K2)	Signal track B (SIN+) (K2)
		X17:3	C	Signal track C (K0)
		X17:4	DATA+[1)]	Data cable for electronic nameplate
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	$\overline{A}$ (COS-) ($\overline{K1}$)	Negated signal track $\overline{A}$ (COS-) ($\overline{K1}$)
		X17:10	$\overline{B}$ (SIN-) ($\overline{K2}$)	Negated signal track $\overline{B}$ (SIN-) ($\overline{K2}$)
		X17:11	$\overline{C}$	Negated signal track $\overline{C}$ ($\overline{K0}$)
		X17:12	DATA-[1)]	Data cable for electronic nameplate
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

1) For encoders from SEW-EURODRIVE with electronic nameplate in type E.7S

Terminal assignment HIPERFACE® and encoder from SEW-EURODRIVE (RS485)

card	Terminal		Connection	Short description
		X17:1	A (COS+) (K1)	Signal track A (COS+) (K1)
		X17:2	B (SIN+) (K2)	Signal track B (SIN+) (K2)
		X17:3	Reserved	–
		X17:4	DATA+	Data line
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	$\overline{A}$ (COS-) ($\overline{K1}$)	Negated signal track $\overline{A}$ (COS-) ($\overline{K1}$)
		X17:10	$\overline{B}$ (SIN-) ($\overline{K2}$)	Negated signal track $\overline{B}$ (SIN-) ($\overline{K2}$)
		X17:11	Reserved	–
		X17:12	DATA-	Data line
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

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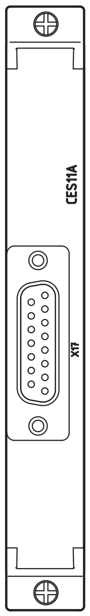
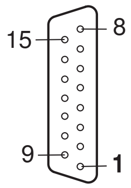
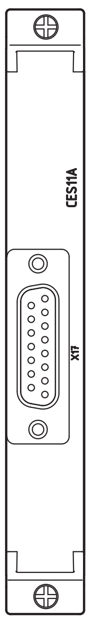
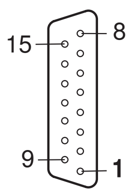
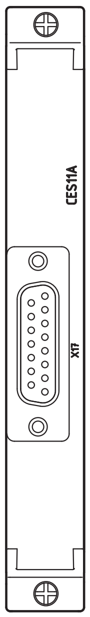
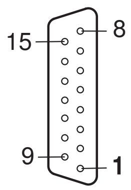
Terminal assignment EnDat encoder

Card	Terminal		Connection	Brief description
		X17:1	A (COS+)	Signal track A (COS+)
		X17:2	B (SIN+)	Signal track B (SIN+)
		X17:3	PULSE+	Clock signal
		X17:4	DATA+	Data line
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	$\overline{A}$ (COS-)	Negated signal track $\overline{A}$ (COS-)
		X17:10	$\overline{B}$ (SIN-)	Negated signal track $\overline{B}$ (SIN-)
		X17:11	PULSE-	Clock signal
		X17:12	DATA-	Data line
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	–
		X17:15	V_{S12VG}	12 V encoder supply

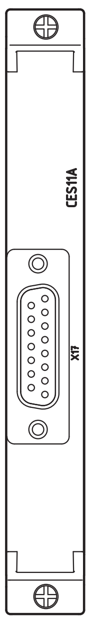
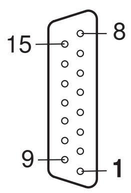
Terminal assignment SSI encoder

Card	Terminal		Connection	Brief description
		X17:1	Reserved	–
		X17:2	Reserved	–
		X17:3	PULSE+	Clock signal
		X17:4	DATA+	Data line RS485
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	Reserved	–
		X17:10	Reserved	–
		X17:11	PULSE-	Clock signal
		X17:12	DATA-	Data line
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

Terminal assignment SSI and SIN/COS combination encoders

Card	Terminal		Connection	Brief description
		X17:1	A (COS+)	Signal track A (COS+)
		X17:2	B (SIN+)	Signal track B (SIN+)
		X17:3	PULSE+	Clock signal
		X17:4	DATA+	Data line
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	$\overline{A}$ (COS-)	Negated signal track $\overline{A}$ (COS-)
		X17:10	$\overline{B}$ (SIN-)	Negated signal track $\overline{B}$ (SIN-)
		X17:11	PULSE-	Clock signal
		X17:12	DATA-	Data line
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

Terminal assignment CANopen encoder

Card	Terminal		Connection	Brief description
		X17:1	Reserved	–
		X17:2	Reserved	–
		X17:3	Reserved	–
		X17:4	CAN_H	CAN high data cable
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	Reserved	–
		X17:10	Reserved	–
		X17:11	Reserved	–
		X17:12	CAN_L	CAN low data cable
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

8.8.4 Safety cards CS..A

For detailed information on the safety card CS..A, refer to the manual "MOVISAFE® CS..A safety card".

8.9 Braking resistors

Observe the following points if braking resistors are installed:

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

⚠ DANGER

Dangerous pulsed DC voltage of up to 970 V.

Severe or fatal injuries from electric shock.

To prevent electric shocks:

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

- Braking resistors get very hot during operation.

⚠ WARNING

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.

To prevent burns:

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

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8.9.1 Permitted installation of braking resistors

The surfaces of the resistors get very hot if loaded with nominal power. Make sure that you select an installation site that will accommodate these high temperatures. For this reason, braking resistors are usually mounted on top of the control cabinet.

NOTICE

Braking resistors can overheat.

Non-permissible installation might lead to an accumulation of heat in the braking resistor due to reduced convection. A tripping temperature contact or an overheated braking resistor can lead to a system standstill.

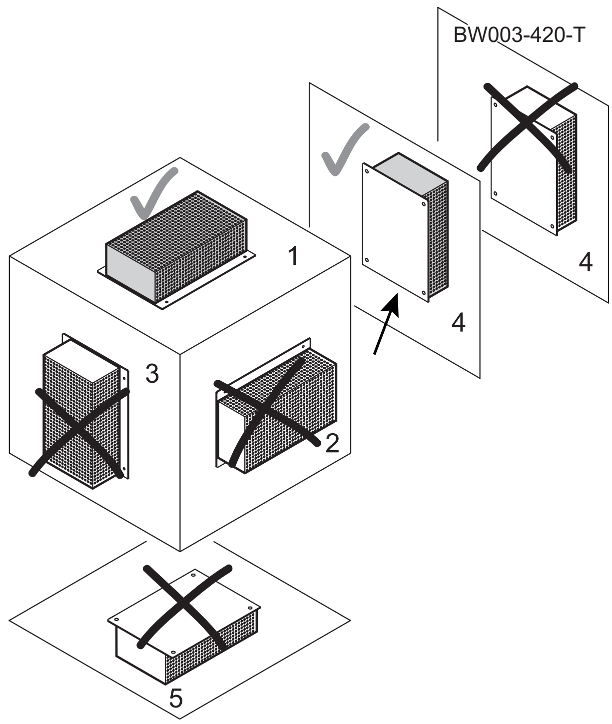
Adhere to the following minimum clearances:

- 200 mm to adjacent components and walls

- 300 mm to above components/ceilings

Observe the following permitted mounting positions when installing the resistors:

- Grid resistor



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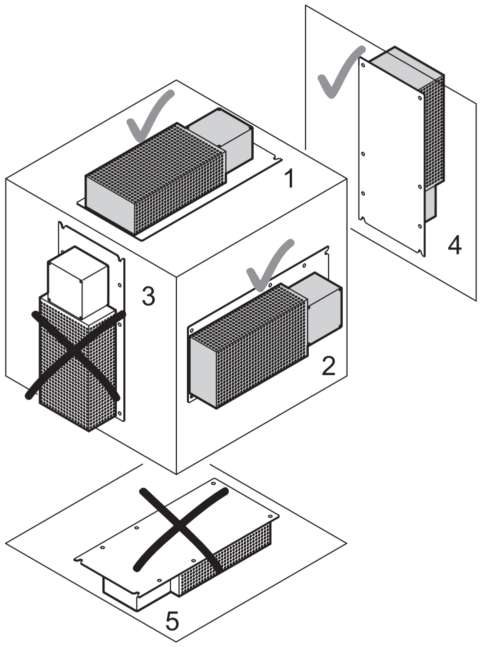
The arrow marks the connection side.

- Wire resistor



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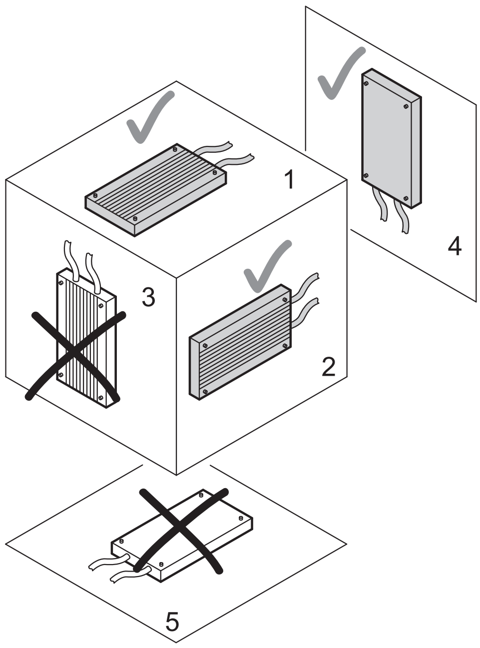
- Flat type resistor



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8.9.2 Thermal protection with flat-type resistors

In the documented assignment of inverter and flat-type resistor, flat-type resistors have a thermal protection (non-replaceable fuse) that interrupts the current circuit in the event of overload.

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8.9.3 Protection against thermal overload of the braking resistor

INFORMATION

Guards for power supply modules with a nominal power of 50 kW and 75 kW

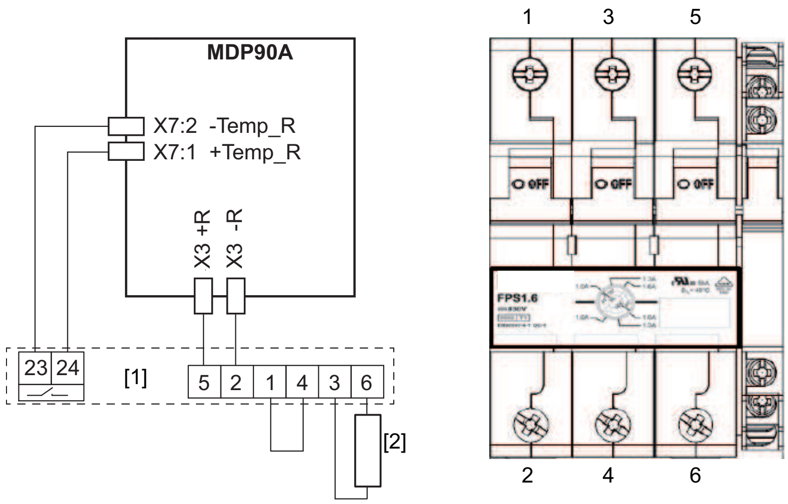
It is not permitted to separate the connection between power supply module and braking resistor. Guards, such as fuses or miniature circuit breakers are not permitted.

External thermal circuit breaker TCB

Power supply module MDP90A 10 kW, 25 kW, 110 kW

If an external TCB thermal circuit breaker is used, the following connection applies.

Connection



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[1] TCB thermal circuit breaker

[2] Braking resistor

INFORMATION

The polarity of the connections 5 (+R) and 2 (-R) must be strictly adhered to during connection of the TCB circuit breaker to the inverter.

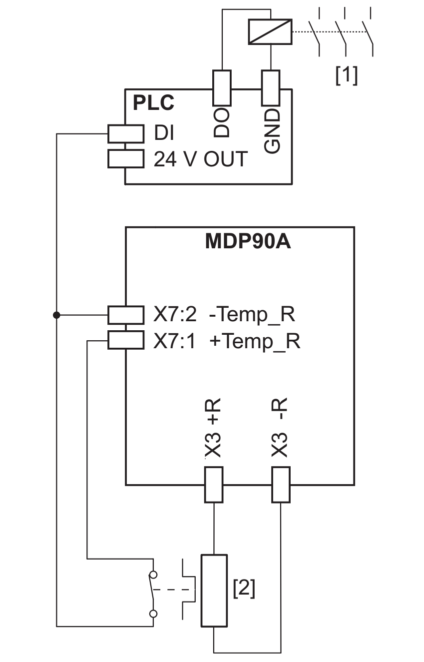
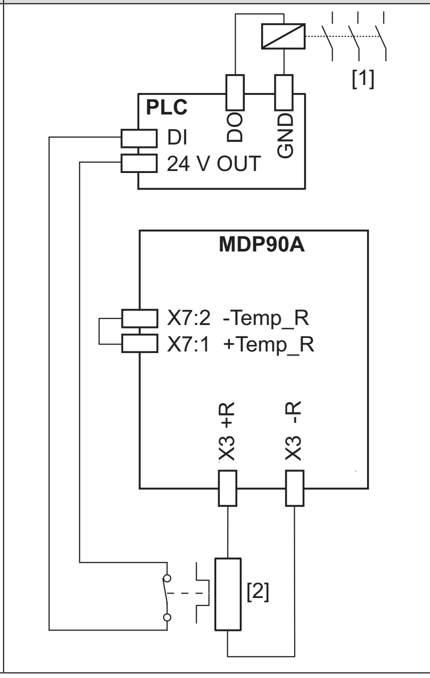
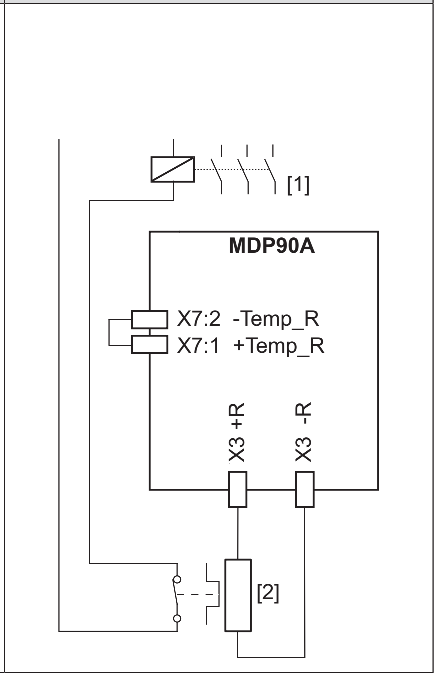
- If the thermal circuit breaker trips, the signal contact is set (23-24 connection is opened) and evaluated in the power supply module.
- The connection between power supply module and braking resistor is disconnected.
- This does not require a response by the PLC.
- It is not required to disconnect the supply system connection with an external switching device.
- If the thermal circuit breaker trips, the power supply module switches all axis modules to "Output stage inhibited".

- Set the control knob of the thermal circuit breaker TCB to the tripping current I_F of the connected braking resistor. Set the scaling 40 °C.
- After all cables are connected, the 3 upper screw holes must be covered with 3 touch guard caps. The touch guard caps are included in the delivery.

Internal temperature switch -T

MDP90A-0100-.. power supply module

If an BW...-T braking resistor with internal temperature switch is used with a 10 kW power supply module, there are 3 possible connections.

Connection 1	Connection 2	Connection 3
		

[1] Line contactor

[2] Braking resistor

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

- Connection 1
  - If the thermal circuit breaker trips, the signal in the power supply module and in the PLC is evaluated.
  - If the thermal circuit breaker trips, the PLC must interrupt the power supply.
  - If the thermal circuit breaker trips, the power supply module switches all axis modules to "Output stage inhibited".
- 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 response in the power supply module and the axis modules.
  - 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 response in the power supply module and the axis modules.

INFORMATION

The braking resistor integrated in the MDP90A-0100-...-C00 power supply module is protected by the thermal protection.

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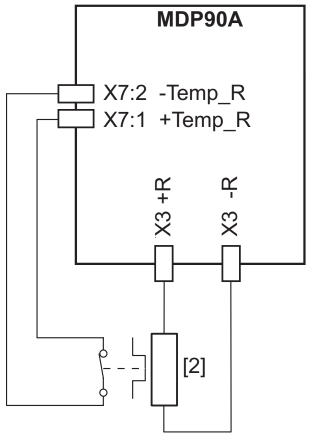
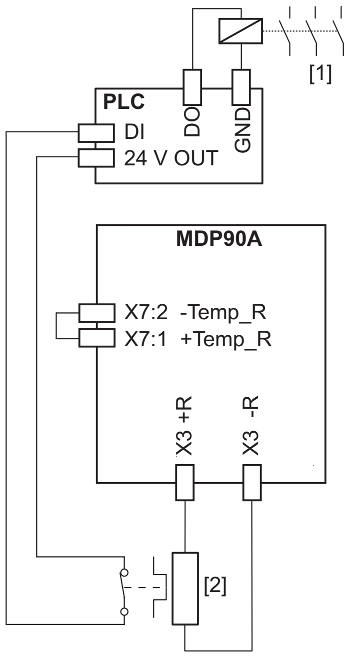
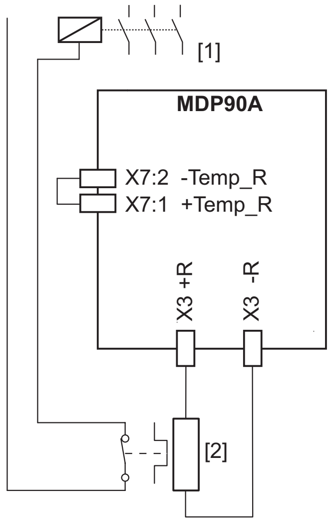
MDP90A-0250, 0500, 0750, 1100 power supply module

If an BW...-T braking resistor with internal temperature switch is used with a 25 – 110 kW power supply module, there are 3 possible connections.

Connection 1	Connection 2	Connection 3
		

[1] Line contactor

[2] Braking resistor

- Connection 1
  - If the thermal circuit breaker trips, the signal in the power supply module is evaluated.
  - 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 power supply module switches all axis modules to "Output stage inhibited".
- 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 response in the power supply module and the axis modules.
  - 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.

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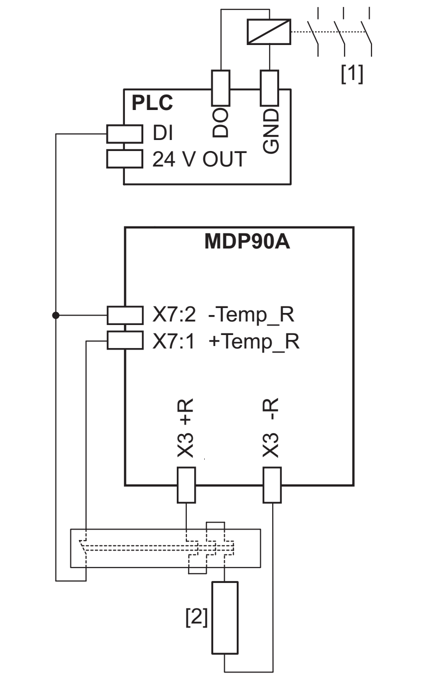
External bimetallic relay

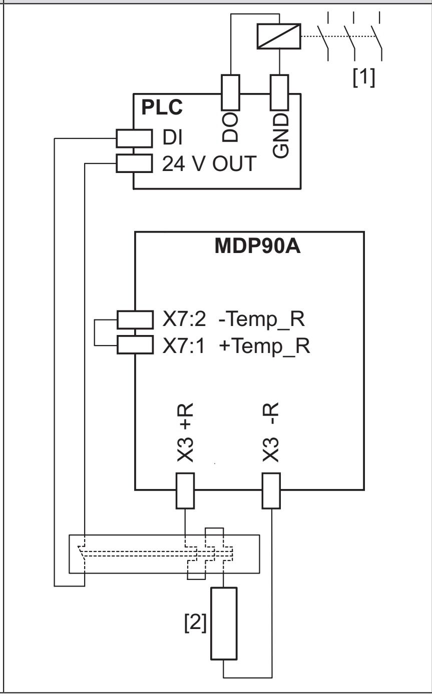
MDP90A-0100-.. power supply module

If an external bimetallic relay is used with a 10 kW power supply module, there are 3 possible connections.

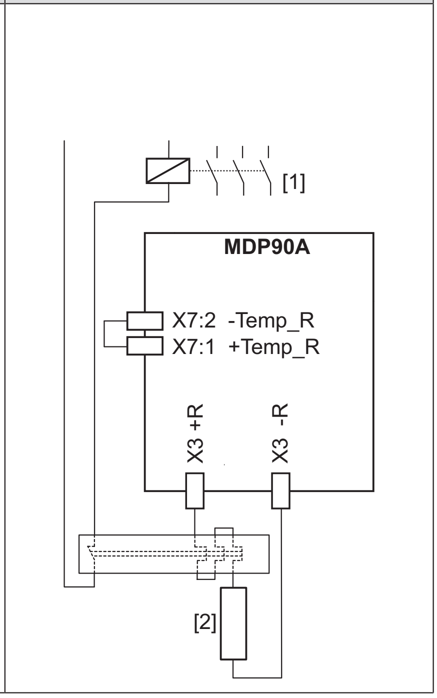
Connection 1



Connection 2



Connection 3



[1] Line contactor

[2] Braking resistor

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

- Connection 1
  - If the thermal circuit breaker trips, the signal in the power supply module and in the PLC is evaluated.
  - If the thermal circuit breaker trips, the PLC must interrupt the power supply.
  - If the thermal circuit breaker trips, the power supply module switches all axis modules to "Output stage inhibited".
- 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 response in the power supply module and the axis modules.
  - 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.

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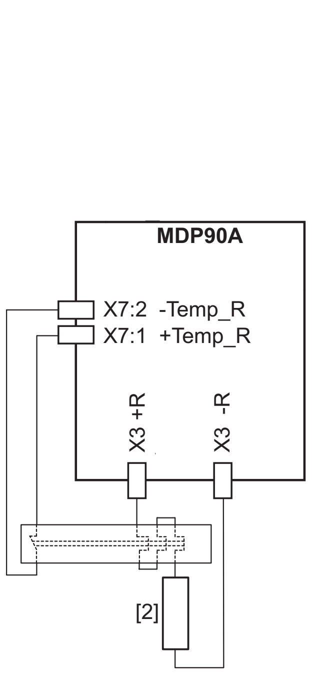
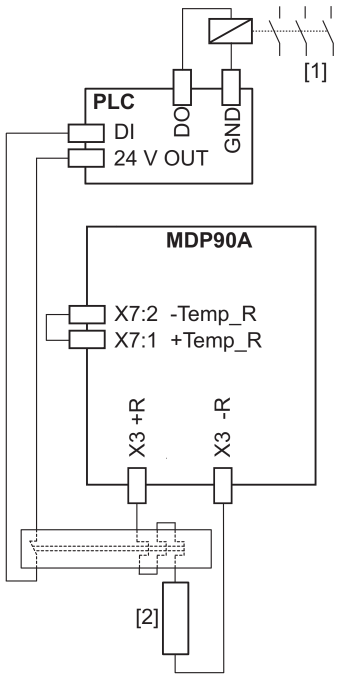
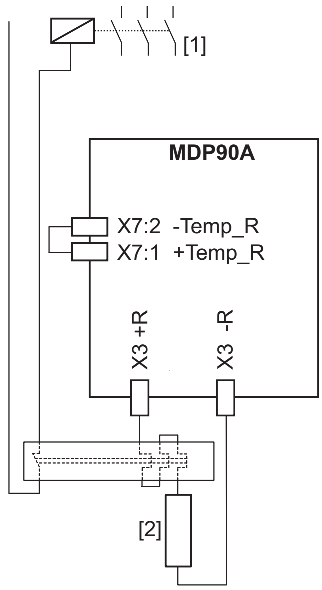
– This does not require a response by the PLC.
– If the thermal circuit breaker trips, there is no response in the power supply module and the axis modules.

MDP90A-0250, 0500, 0750, 1100 power supply module

If an external bimetallic relay is used with a 25 – 110 kW power supply module, there are 3 possible connections.

Connection 1	Connection 2	Connection 3
		

[1] Line contactor

[2] Braking resistor

- Connection 1
  - If the thermal circuit breaker trips, the signal in the power supply module is evaluated.
  - 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 power supply module switches all axis modules to "Output stage inhibited".
- 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 response in the power supply module and the axis modules.
  - 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.

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– If the thermal circuit breaker trips, there is no direct response in the application inverter.

8.10 Line choke

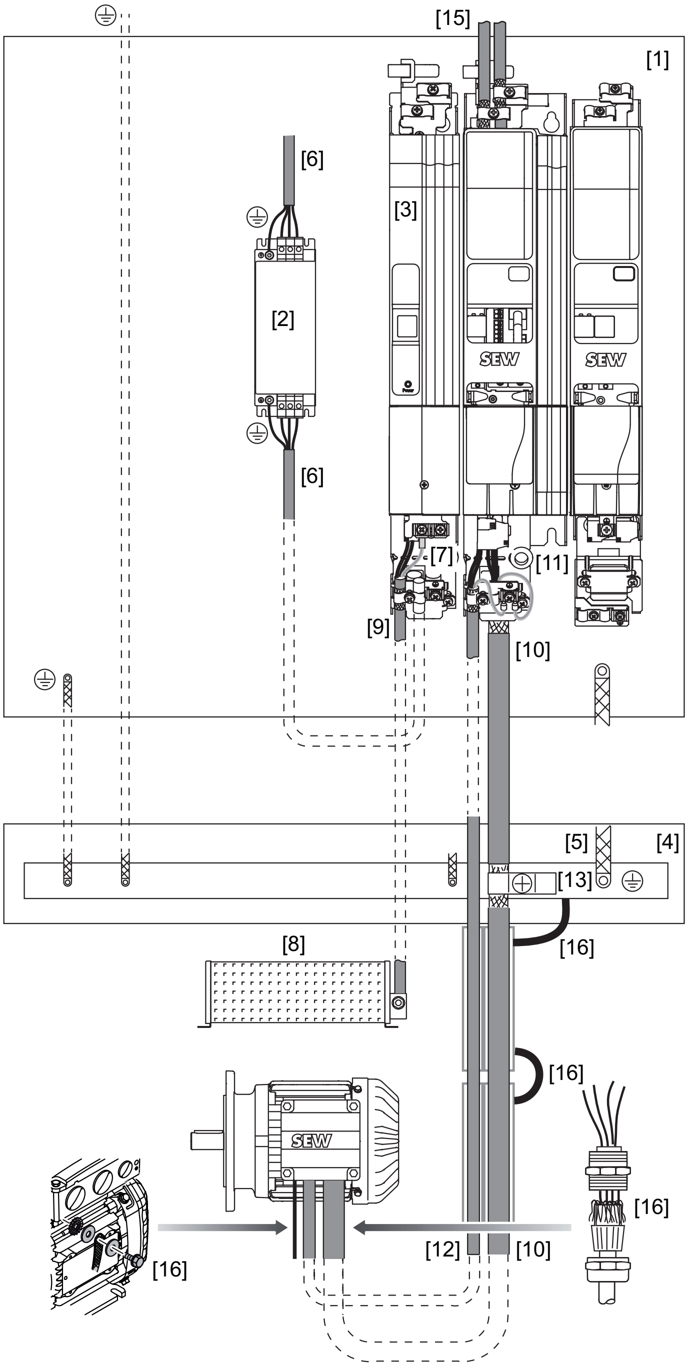
Install the line choke close to the application inverter but outside the minimum clearance for cooling. The line choke must not be heated by the exhaust air of the application inverter.

- Install the line choke before the line filter.
- The connection cable between line choke and line filter does not have to be shielded.
- Limit the length of the cable between the line choke and the line filter to the absolute minimum needed.

8.11 Line filter

- Install the line filter close to the application inverter but outside the minimum clearance for cooling. The line filter must not be heated by the exhaust air of the application inverter.
- Do not wire any other consumers between the line filter and the application inverter.
- The connection cable between line filter and application inverter does not have to be shielded.
- Limit the length of the cable between the line filter and the application inverter to the absolute minimum needed.
- Do not switch between the line filter and application inverter.

8.12 EMC-compliant installation



19501899787

[1] Zinc-coated mounting plate
[2] Line filter
[3] MDP power supply module
[4] PE busbar
[5] HF connection of PE busbar/mounting plate
[6] Supply system cable
[7] Power shield plate at the power supply module
[8] Braking resistor
[9] Braking resistor performance
[10] Motor cable
[11] Power shield plate at the axis module
[12] Brake cable
[13] Grounding clamp
[15] Electronics shield plate
[16] HF connection

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The information in this chapter will help you to optimize the system in regard of electromagnetic compatibility, or to eliminate already existing EMC interferences.

The notes in this chapter are not legal regulations; they are merely recommendations for improving the electromagnetic compatibility of your plant.

For further notes on EMC-compliant installation, refer to the publication Drive Engineering - Practical Implementation, edition "EMC in Drive Engineering – Basic Theoretical Principles – EMC-Compliant Installation in Practice".

8.12.1 Control cabinet

Use a control cabinet with conducting (galvanized) mounting plate. In cased more than one mounting plate is used, connect the plate over a large area.

Mount line filter and inverter on a shared mounting plate. Make sure they are connected over a large area and with good conductivity.

8.12.2 HF equipotential bonding in the system

In general, a suitable equipotential bonding between system, control cabinet, machine structure, cable ducts, and drives must be ensured.

Connect the individual sections in a HF-compatible manner.

From an electrical safety perspective, the PE busbar is the star point. The PE conductor replaces neither HF grounding nor shielding.

In terms of EMC, it is advantageous if the mounting plate is used as a star point with respect to HF equipotential bonding.

Perform the following measures for a suitable HF equipotential bonding:

- Connect the PE busbar to the mounting plate in a HF-compatible manner.
- Connect the shield metal cable ducts to the control cabinet in a HF-compatible manner.
- Connect the cable ducts with the mounting plate in the control cabinet using an HF litz wire.
- Connect the parts of the shield metal cable ducts in a HF-compatible manner.
- Connect the shield metal cable ducts to the gearmotor in a HF-compatible manner.

8.12.3 Cable installation

Route the power cables, such as motor cable and brake cable separated from the supply system cable and control cable.

Route all cables as close to the reference potential as possible, e.g. the mounting plate.

All cables must be as short as possible. Avoid spare loops.

8.12.4 Supply system cable connection

The supply system cable can be connected to the line choke and/or line filter using twisted unshielded single conductors, or using unshielded cables.

If necessary, shielded cables can increase the EMC.

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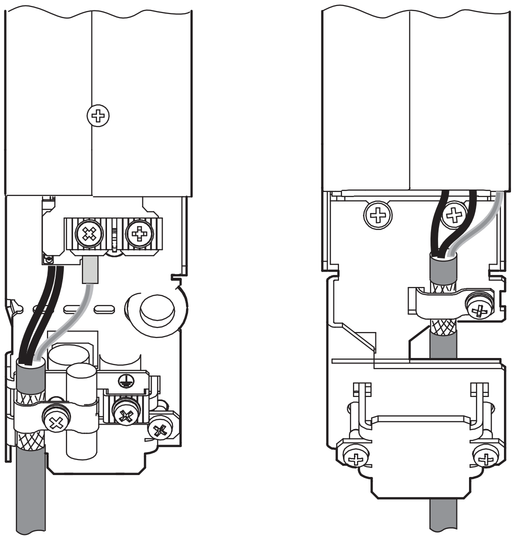
8.12.5 Line filter connection

Limit the length of connection cables between line filter and inverter to the absolute minimum needed.

In general, filtered and unfiltered cables must not be routed together. For this reason, route incoming and outgoing line filter cables separately.

8.12.6 Braking resistor connection

For connecting braking resistors, use 2 closely twisted conductors or a shielded power cable. Connect the braided shields of shielded cables over the entire circumference. Use the designated shield plates at the basic device to connect the shield.



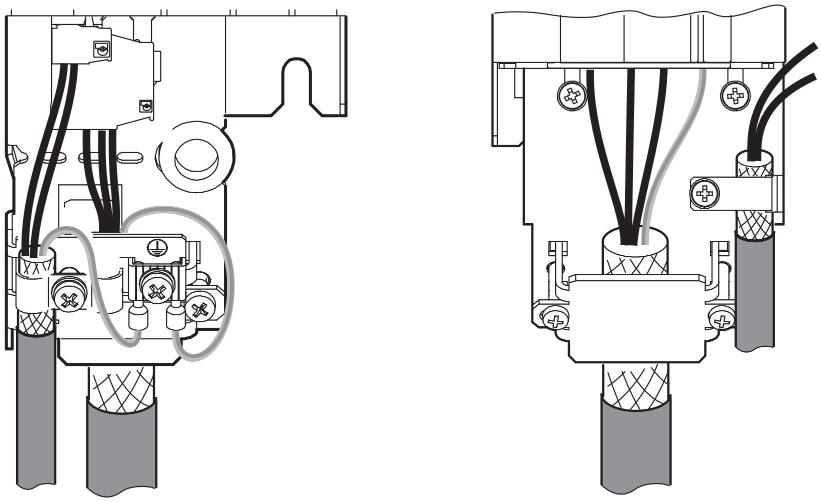
19500969867

8.12.7 Motor and brake connection

Only use shielded motor cables. Connect the braided shield of the motor cable at both ends over its entire circumference to the power shield plate at the inverter.

Shielded cables must be selected for the brake supply. The shield of the brake cable can be connected to the power shield plate at the inverter.

In case motor cable and brake cable are combined in a shared cable, the cable must have an inner shield separating the brake cable from the motor conductors. In addition, the cables have an overall shield.



9007218755713291

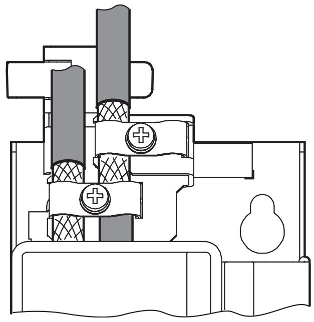
SEW-EURODRIVE recommends to use prefabricated cables.

In case of especially high requirements, an additional connection point for the shield is recommended. To limit the emitted interference the motor shield can additionally be grounded to the control cabinet outlet using commercial installation materials (grounding clamps or EMC screw fittings).

8.12.8 Control cable connection

The digital inputs can be connected using an unshielded single conductor. Shielded cables increase the EMC. Use the designated shield plates to connect the shield.

For routing outside of the control cabinet shielded cables must be used.



19500974731

8.12.9 Encoder connection

SEW-EURODRIVE recommends to use prefabricated encoder cables.

The shield of prefabricated cables by SEW-EURODRIVE is connected via the connector.

8.12.10 Shielding connection

Ensure a shield connection suitable for HF, e.g. by using grounding clamps, or EMC cable glands, so that the braided shield has a large connection surface.

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8.13 Terminal assignment

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 must be connected to this connection.

INFORMATION

The technical data for the connection of power electronics and control electronics are listed in chapter Technical Data.

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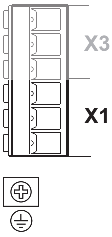
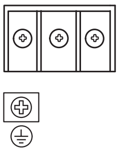
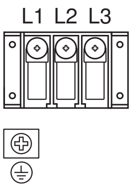
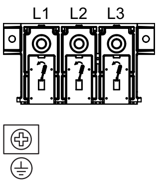
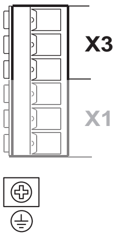
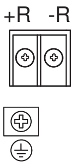
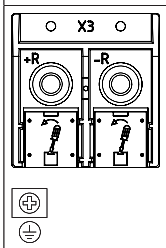
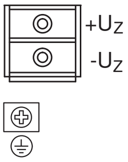
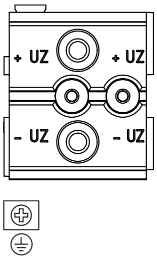
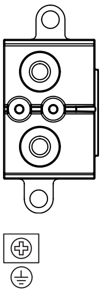
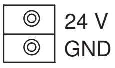
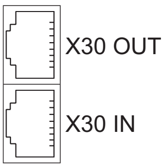
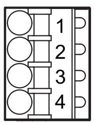
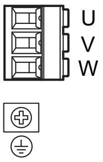
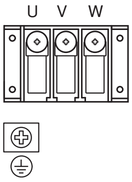
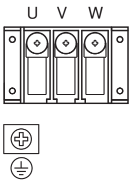
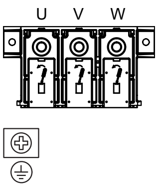
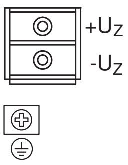
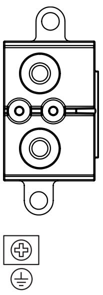
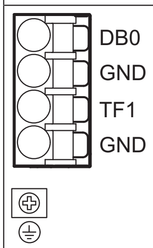
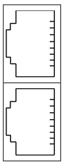
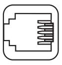
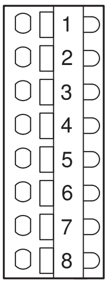
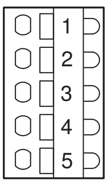
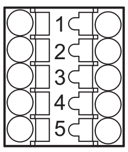
8.13.1 Terminal assignment at MDP power supply module

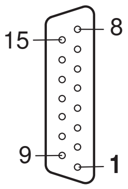
Representation	Terminal	Connection	Short description
	X1:L1	L1	Line connection MDP90A-0100-.. (size 1)
	X1:L2	L2	
	X1:L3	L3	
	⏚	PE	PE connection
	X1:L1	L1	Line connection MDP90A-0250-.. (size 2)
	X1:L2	L2	
	X1:L3	L3	
	⏚	PE	PE connection
	X1:1	L1	Line connection MDP90A-0500 – 0750-.. (size 3)
	X1:2	L2	
	X1:3	L3	
	⏚	PE	PE connection
	X1:1	L1	Line connection MDP90A-1100-.. (size 4)
	X1:2	L2	
	X1:3	L3	
	⏚	PE	PE connection
	X3:+R	+R	Braking resistance connection MDP90A-0100-.. (size 1)
	X3:-R	-R	
	X3:R_i	R_i	Reserved with size 1 as no R_i available
			Connection of internal braking resistor to MDP..C00 (R_i)
	⏚	PE	PE connection
	X3:+R	+R	Braking resistance connection MDP90A-0250 – 0750-.. (Sizes 2, 3)
	X3:-R	-R	
	⏚	PE	PE connection
	X3:+R	+R	Braking resistance connection MDP90A-1100-.. (size 4)
	X3:-R	-R	
	⏚	PE	PE connection

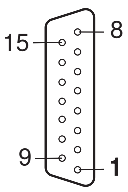
Representation	Terminal	Connection	Short description
	X4: $+V_{DC\ link}$	$+V_{DC\ link}$	DC link connection
	X4: $-V_{DC\ link}$	$-V_{DC\ link}$	
	⏚	PE	PE connection
	X4: $+V_{DC\ link}$	$+V_{DC\ link}$	DC link connection left side MDP90A-1100-.. (size 4)
	X4: $-V_{DC\ link}$	$-V_{DC\ link}$	
	⏚	PE	PE connection
	X4: $+V_{DC\ link}$	$+V_{DC\ link}$	DC link connection right side MDP90A-1100-.. (size 4)
	X4: $-V_{DC\ link}$	$-V_{DC\ link}$	
	⏚	PE	PE connection
	X5:24 V	V_I24 V	+24 V supply voltage
	X5:GND	GND	
	X30 OUT		System bus
	X30 IN		
	X7:1	+TEMP_R	DC 24 V auxiliary voltage output
	X7:2	-TEMP_R	Sensor input for temperature monitoring of the braking resistor
	X7:3	Reserved	–
	X7:4	Reserved	–

8.13.2 Terminal assignment at MDA single-axis module

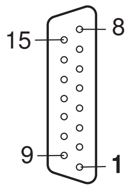
Representation	Terminal	Port	Short description
	X2:U	U	Motor connection MDA90A-0020 – 0120-.. (Sizes 1, 2)
	X2:V	V	
	X2:W	W	
	⏚	PE	PE connection
	X2:U	U	Motor connection MDA90A-0160 – 0240-.. (size 3)
	X2:V	V	
	X2:W	W	
	⏚	PE	PE connection
	X2:U	U	Motor connection MDA90A-0640 – 1000-.. (Sizes 4, 5)
	X2:V	V	
	X2:W	W	
	⏚	PE	PE connection
	X2:U	U	Motor connection MDA90A-1400 – 1800 (size 6)
	X2:V	V	
	X2:W	W	
	⏚	PE	PE connection
	X4:+$V_{DC\ link}$	+$V_{DC\ link}$	DC link connection
	X4:-$V_{DC\ link}$	-$V_{DC\ link}$	
	⏚	PE	PE connection
	X4:+$V_{DC\ link}$	+$V_{DC\ link}$	DC link connection MDA90A-1400 – 1800-.. (size 6)
	X4:-$V_{DC\ link}$	-$V_{DC\ link}$	
	⏚	PE	PE connection
	X5:24 V	V_I24 V	DC 24 V supply voltage
	X5:GND	GND	Reference potential
	X10:DB0	DB00	Brake control
	X10:GND	GND	Reference potential
	X10:TF1	TF1	Sensor input for temperature monitoring of the motor
	X10:GND	GND	Reference potential
	⏚	PE	PE connection

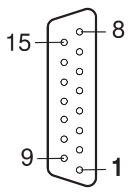
Representa-tion	Terminal	Port	Short description
 X30 OUT X30 IN	X30 OUT		System bus
	X30 IN		
	X31		SEW-EURODRIVE Service interface
	X20:1	DI00	Digital input 1, with fixed assignment "Output stage enable"
	X20:2	DI01	Digital input 2, freely programmable
	X20:3	DI02	Digital input 3, freely programmable
	X20:4	DI03	Digital input 4, freely programmable
	X20:5	DI04	Digital input 5, freely programmable
	X20:6	DI05	Digital input 6, freely programmable
	X20:7	GND	Reference potential
	X20:8	+24 V	DC 24 V voltage output
	X21:1	DO00	Digital output 1, freely programmable
	X21:2	DO01	Digital output 2, freely programmable
	X21:3	DO02	Digital output 3, freely programmable
	X21:4	DO03	Digital output 4, freely programmable
	X21:5	GND	Reference potential
	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
	X6:4	GND	Reference potential
	X6:5	24 V STO_OUT	V_{out} = DC 24 V supply of F_STO_P1 and F_STO_P2

Representa-tion	Terminal	Port	Brief description motor encoder resolver
	X15:1	S2 (SIN +)	Signal track
	X15:2	S1 (COS +)	Signal track
	X15:3	Reserved	-
	X15:4	Reserved	-
	X15:5	R1 (REF +)	Supply voltage resolver
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	-
	X15:8	Reserved	-
	X15:9	S4 (SIN -)	Signal track
	X15:10	S3 (COS -)	Signal track
	X15:11	Reserved	-
	X15:12	Reserved	-
	X15:13	R2 (REF -)	Supply voltage resolver
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	Reserved	-

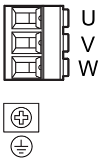
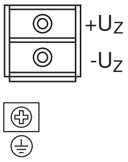
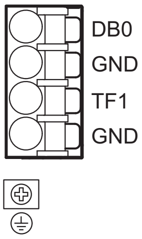
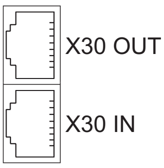
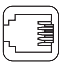
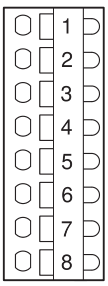
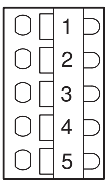
Representa-tion	Terminal	Port	Brief description motor encoder Sin/Cos encoder, TTL encoder
	X15:1	A (COS +) (K1)	Signal track A (COS+) (K1)
	X15:2	B (SIN +) (K2)	Signal track B (SIN+) (K2)
	X15:3	C (K0)	Signal track C (K0)
	X15:4	DATA+[1)]	Data cable for electronic nameplate
	X15:5	Reserved	–
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	–
	X15:8	GND	Reference potential
	X15:9	$\overline{A}$ (COS -) ($\overline{K1}$)	Negated signal track $\overline{A}$ (COS-) ($\overline{K1}$)
	X15:10	$\overline{B}$ (SIN -) ($\overline{K2}$)	Negated signal track $\overline{B}$ (SIN-) ($\overline{K2}$)
	X15:11	$\overline{C}$ ($\overline{K0}$)	Negated signal track $\overline{C}$ ($\overline{K0}$)
	X15:12	DATA-[1)]	Data cable for electronic nameplate
	X15:13	V_{S24VG}	24 V encoder supply
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	V_{S12VG}	Encoder supply 12 V

1) For encoders from SEW-EURODRIVE with electronic nameplate in type E.7S

Representa-tion	Terminal	Port	Brief description motor encoder HTL encoder
	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	–
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	–
	X15:8	GND	Reference potential
	X15:9	$\overline{A}$ ($\overline{K1}$)	Negated signal track $\overline{A}$ ($\overline{K1}$)
	X15:10	$\overline{B}$ ($\overline{K2}$)	Negated signal track $\overline{B}$ ($\overline{K2}$)
	X15:11	$\overline{C}$ ($\overline{K0}$)	Negated signal track $\overline{C}$ ($\overline{K0}$)
	X15:12	Reserved	–
	X15:13	V_{S24VG}	24 V encoder supply
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	V_{S12VG}	Encoder supply 12 V

Representa-tion	Terminal	Port	Brief description motor encoder HIPERFACE® and SEW-EURODRIVE encoder (RS485)
	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	–
	X15:6	-TEMP_M	Motor temperature evaluation
	X15:7	Reserved	–
	X15:8	GND	Reference potential
	X15:9	$\overline{A}$ (COS -) ($\overline{K1}$)	Negated signal track $\overline{A}$ (COS-) ($\overline{K1}$)
	X15:10	$\overline{B}$ (SIN -) ($\overline{K2}$)	Negated signal track $\overline{B}$ (SIN-) ($\overline{K2}$)
	X15:11	Reserved	–
	X15:12	DATA-	Data line
	X15:13	V_{S24VG}	24 V encoder supply
	X15:14	+TEMP_M	Motor temperature evaluation
	X15:15	V_{S12VG}	Encoder supply 12 V

8.13.3 Terminal assignment at MDD double-axis module

Representation	Terminals		Port	Short description
	X2_1:U	X2_2:U	U	Motor connection MDD90A-0020 – 0080-.. (Sizes 1, 2)
	X2_1:V	X2_2:V	V	
	X2_1:W	X2_2:W	W	
	⏚		PE	PE connection
	X4:+$V_{DC\ link}$		+$V_{DC\ link}$	DC link connection
	X4:-$V_{DC\ link}$		-$V_{DC\ link}$	
	⏚		PE	PE connection
	X5:24 V		V_I24	DC 24 V supply voltage
	X5:GND		GND	Reference potential
	X10_1:DB0	X10_2:DB0	DB00	Brake control
	X10_1:GND	X10_2:GND	GND	Reference potential
	X10_1:TF1	X10_2:TF1	TF1	Sensor input for temperature monitoring of the motor
	X10_1:GND	X10_2:GND	GND	Reference potential
	⏚		PE	PE connection
	X30 OUT			System bus
	X30 IN			
	X31			SEW-EURODRIVE Service interface
	X20_1:1	X20_2:1	DI00	Digital input 1, with fixed assignment "Output stage enable"
	X20_1:2	X20_2:2	DI01	Digital input 2, freely programmable
	X20_1:3	X20_2:3	DI02	Digital input 3, freely programmable
	X20_1:4	X20_2:4	DI03	Digital input 4, freely programmable
	X20_1:5	X20_2:5	DI04	Digital input 5, freely programmable
	X20_1:6	X20_2:6	DI05	Digital input 6, freely programmable
	X20_1:7	X20_2:7	GND	Reference potential
	X20_1:8	X20_2:8	+24 V	DC 24 V voltage output
	X21_1:1	X21_2:1	DO00	Digital output 1, freely programmable
	X21_1:2	X21_2:2	DO01	Digital output 2, freely programmable
	X21_1:3	X21_2:3	DO02	Digital output 3, freely programmable
	X21_1:4	X21_2:4	DO03	Digital output 4, freely programmable
	X21_1:5	X21_2:5	GND	Reference potential

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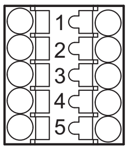
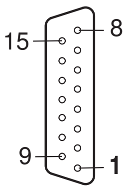
Representa-tion	Terminals		Port	Short description
	X6_1:1	X6_2:1	F_STO_P1	DC +24 V input F_STO_P1
	X6_1:2	X6_2:2	F_STO_M	DC 0 V input F_STO_M
	X6_1:3	X6_2:3	F_STO_P2	DC +24 V input F_STO_P2
	X6_1:4	X6_2:4	GND	Reference potential
	X6_1:5	X6_2:5	24 V STO_OUT	V_{out} = DC 24 V supply of F_STO_P1 and F_STO_P2

Representa-tion	Terminals		Port	Brief description motor encoder resolver
	X15_1:1	X15_2:1	S2 (SIN +)	Signal track
	X15_1:2	X15_2:2	S1 (COS +)	Signal track
	X15_1:3	X15_2:3	Reserved	-
	X15_1:4	X15_2:4	Reserved	-
	X15_1:5	X15_2:5	R1 (REF +)	Supply voltage resolver
	X15_1:6	X15_2:6	-TEMP_M	Motor temperature evaluation
	X15_1:7	X15_2:7	Reserved	-
	X15_1:8	X15_2:8	Reserved	-
	X15_1:9	X15_2:9	S4 (SIN -)	Signal track
	X15_1:10	X15_2:10	S3 (COS-)	Signal track
	X15_1:11	X15_2:11	Reserved	-
	X15_1:12	X15_2:12	Reserved	-
	X15_1:13	X15_2:13	R2 (REF -)	Supply voltage resolver
	X15_1:14	X15_2:14	+TEMP_M	Motor temperature evaluation
	X15_1:15	X15_2:15	Reserved	-

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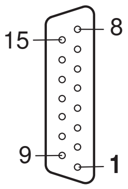
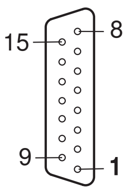
Representa-tion	Terminals		Port	Brief description motor encoder Sin/Cos encoder, TTL encoder
	X15_1:1	X15_2:1	A (COS +) (K1)	Signal track A (COS+) (K1)
	X15_1:2	X15_2:2	B (SIN +) (K2)	Signal track B (SIN+) (K2)
	X15_1:3	X15_2:3	C (K0)	Signal track C (K0)
	X15_1:4	X15_2:4	DATA+[1]	Data cable for electronic nameplate
	X15_1:5	X15_2:5	Reserved	–
	X15_1:6	X15_2:6	-TEMP_M	Motor temperature evaluation
	X15_1:7	X15_2:7	Reserved	–
	X15_1:8	X15_2:8	GND	Reference potential
	X15_1:9	X15_2:9	$\overline{A}$ (COS -) ($\overline{K1}$)	Negated signal track $\overline{A}$ (COS-) ($\overline{K1}$)
	X15_1:10	X15_2:10	$\overline{B}$ (SIN -) ($\overline{K2}$)	Negated signal track $\overline{B}$ (SIN-) ($\overline{K2}$)
	X15_1:11	X15_2:11	$\overline{C}$ ($\overline{K0}$)	Negated signal track $\overline{C}$ ($\overline{K0}$)
	X15_1:12	X15_2:12	DATA-[1]	Data cable for electronic nameplate
	X15_1:13	X15_2:13	V_{S24VG}	24 V encoder supply
	X15_1:14	X15_2:14	+TEMP_M	Motor temperature evaluation
	X15_1:15	X15_2:15	V_{S12VG}	Encoder supply 12 V

1) For encoders from SEW-EURODRIVE with electronic nameplate in type E.7S

Representa-tion	Terminals		Port	Brief description motor encoder HTL en-coder
	X15_1:1	X15_2:1	A (K1)	Signal track A (K1)
	X15_1:2	X15_2:2	B (K2)	Signal track B (K2)
	X15_1:3	X15_2:3	C (K0)	Signal track C (K0)
	X15_1:4	X15_2:4	Reserved	–
	X15_1:5	X15_2:5	Reserved	–
	X15_1:6	X15_2:6	-TEMP_M	Motor temperature evaluation
	X15_1:7	X15_2:7	Reserved	–
	X15_1:8	X15_2:8	GND	Reference potential
	X15_1:9	X15_2:9	$\overline{A}$ ($\overline{K1}$)	Negated signal track $\overline{A}$ ($\overline{K1}$)
	X15_1:10	X15_2:10	$\overline{B}$ ($\overline{K2}$)	Negated signal track $\overline{B}$ ($\overline{K2}$)
	X15_1:11	X15_2:11	$\overline{C}$ ($\overline{K0}$)	Negated signal track $\overline{C}$ ($\overline{K0}$)
	X15_1:12	X15_2:12	Reserved	–
	X15_1:13	X15_2:13	V_{S24VG}	24 V encoder supply
	X15_1:14	X15_2:14	+TEMP_M	Motor temperature evaluation
	X15_1:15	X15_2:15	V_{S12VG}	Encoder supply 12 V

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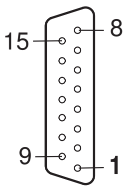
Representa-tion	Terminals		Port	Brief description motor encoder HIPERFACE® and SEW-EURODRIVE en-coder (RS485)
	X15_1:1	X15_2:1	A (COS +) (K1)	Signal track A (COS+) (K1)
	X15_1:2	X15_2:2	B (SIN +) (K2)	Signal track B (SIN+) (K2)
	X15_1:3	X15_2:3	Reserved	–
	X15_1:4	X15_2:4	DATA+	Data line RS485
	X15_1:5	X15_2:5	Reserved	–
	X15_1:6	X15_2:6	-TEMP_M	Motor temperature evaluation
	X15_1:7	X15_2:7	Reserved	–
	X15_1:8	X15_2:8	GND	Reference potential
	X15_1:9	X15_2:9	$\overline{A}$ (COS -) ($\overline{K1}$)	Negated signal track $\overline{A}$ (COS-) ($\overline{K1}$)
	X15_1:10	X15_2:10	$\overline{B}$ (SIN -) ($\overline{K2}$)	Negated signal track $\overline{B}$ (SIN-) ($\overline{K2}$)
	X15_1:11	X15_2:11	Reserved	–
	X15_1:12	X15_2:12	DATA-	Data line
	X15_1:13	X15_2:13	V_{S24VG}	24 V encoder supply
	X15_1:14	X15_2:14	+TEMP_M	Motor temperature evaluation
	X15_1:15	X15_2:15	V_{S12VG}	Encoder supply 12 V

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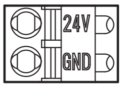
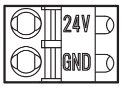
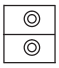
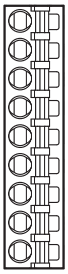
8.13.4 Terminal assignment at master module UHX45A/MDM90A

Representation	Terminal	Connection	Short description
	X5_A:24V	V_I24 V	External DC 24 V supply voltage from housing MDM90A
	X5_A:GND	GND	Reference potential housing MDM90A
	X5_B:24V	V_I24 V	Output of DC 24 V supply voltage from housing MDM90A
	X5_B:GND	GND	Reference potential housing MDM90A
 24 V GND	X5:24 V	V_I24 V	DC 24 V supply voltage UHX45A
	X5:GND	GND	Reference potential UHX45A
	X85:1-3	RS485	RS485 interface (in preparation)
	X85:4-6	CAN1	System bus CAN 1 – non-floating (in preparation)
	X85:7-9	CAN2	System bus CAN 2 – non-floating (in preparation)

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8.14 Wiring diagrams

8.14.1 General information on the wiring diagrams

- For technical data of the power electronics and the control electronics, refer to chapter "Technical data" (→ 🗎 43).
- For the terminal assignment and connections, refer to chapter "Terminal assignment" (→ 🗎 321).

8.14.2 Power connection

NOTICE

Incorrectly placed components.

Destruction of the power supply module.

- Do not install any other components between the line filter and the power supply module.

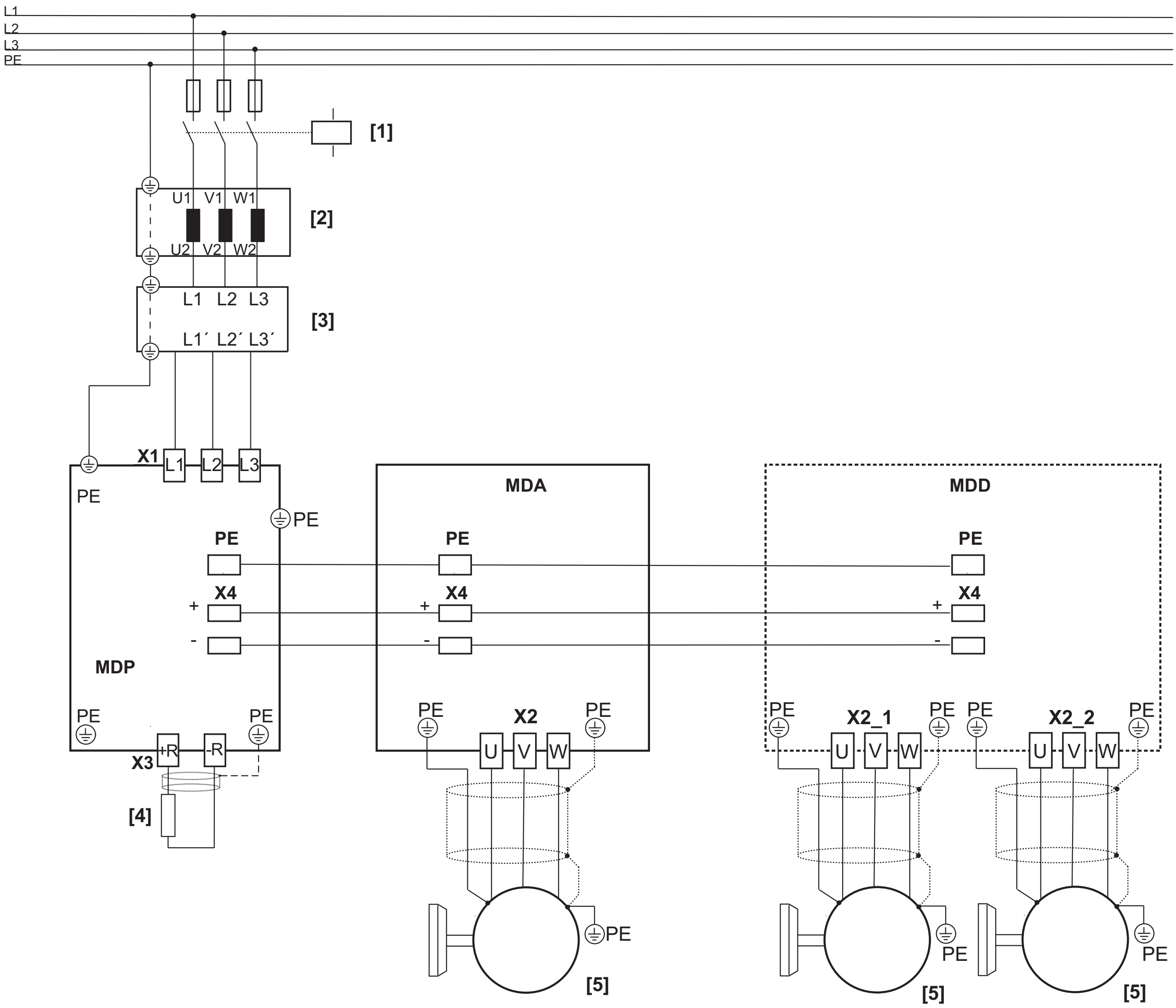
NOTICE

Overtemperature of line filter and line choke.

Destruction of line filter and line choke.

- Make sure line filter and line choke are not heated by warm exhaust air of other devices.

Exemplary wiring of the MDP90A.. power connections with line contactor, line choke, and line filter



36028806497163019

[1]	Line contactor
[2]	Line choke (optional)
[3]	Line filter
[4]	Connection of the braking resistor.
[5]	Motor
MDP	Power supply module
MDA	Single-axis module
MDD	Double-axis module

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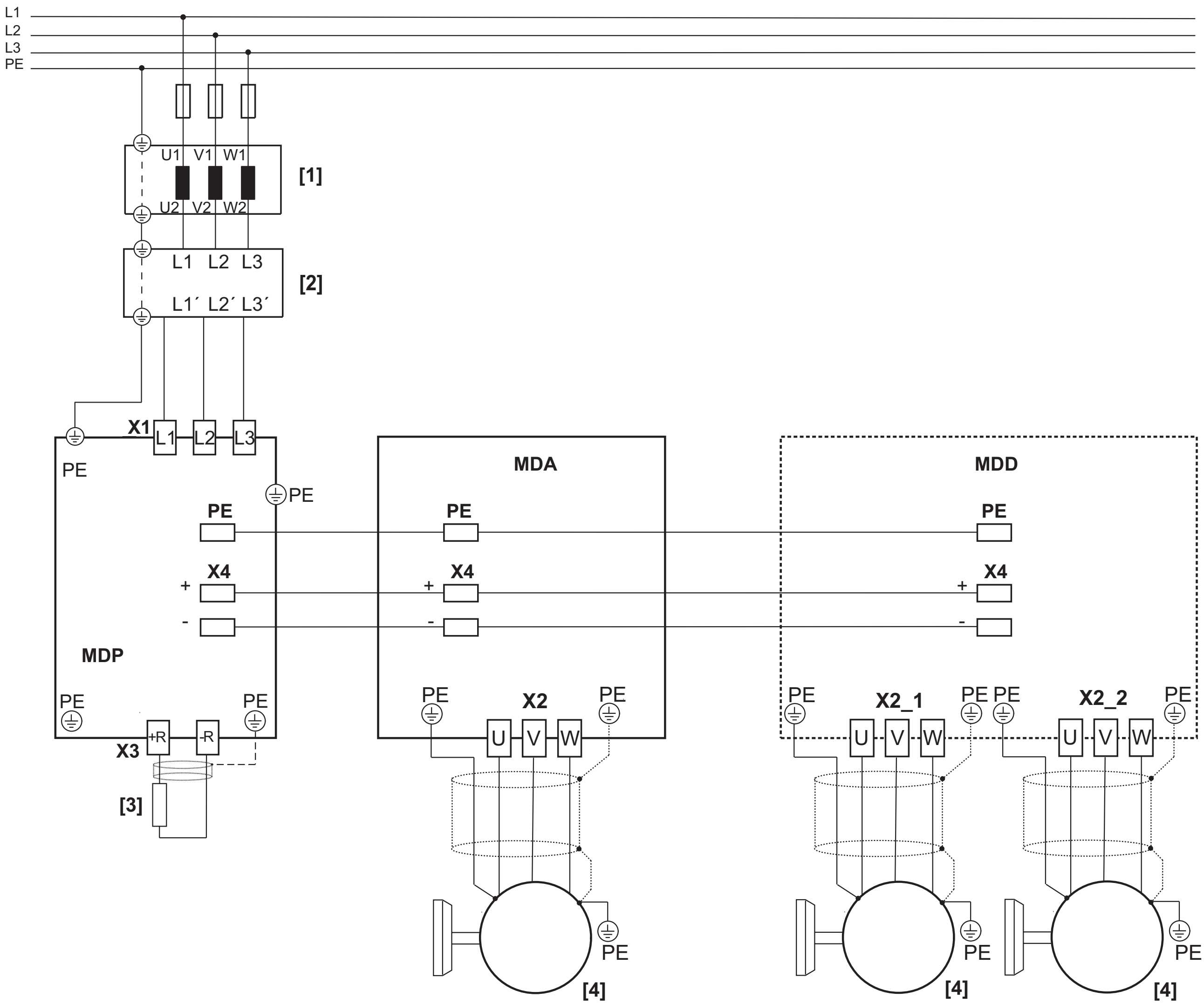
Wiring the MDP90A-0250, 0500, 0750, 1100 power connections without line contactor

Operation without line contactor is only possible for power supply modules of 25 kW of higher.



27021609848822539

[1]	Line choke (optional)
[2]	Line filter
[3]	Connection of the braking resistor.
[4]	Motor
MDP	Power supply module
MDA	Single-axis module
MDD	Double-axis module

INFORMATION

In case of a line connection without line contactor, the temperature evaluation of the braking resistor via connection X7 of the power supply module must be ensured. The temperature evaluation is evaluated as error message in each axis.

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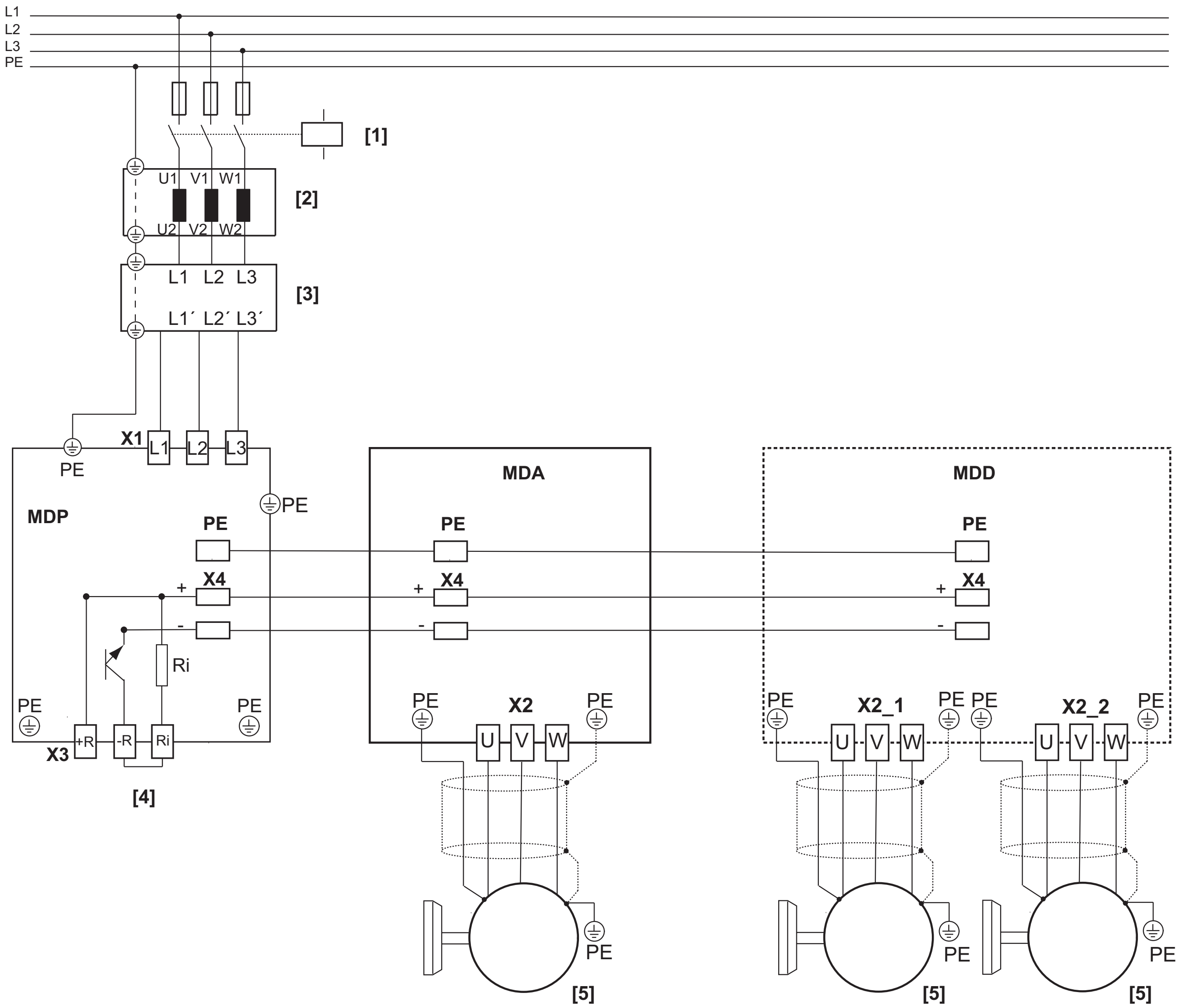
Wiring of the MDP90A-..-C00 power connections using the integrated braking resistor



27021607242286475

[1]	Line contactor
[2]	Line choke (optional)
[3]	Line filter
[4]	Connection of the braking resistor.
[5]	Motor
MDP	Power supply module
MDA	Single-axis module
MDD	Double-axis module

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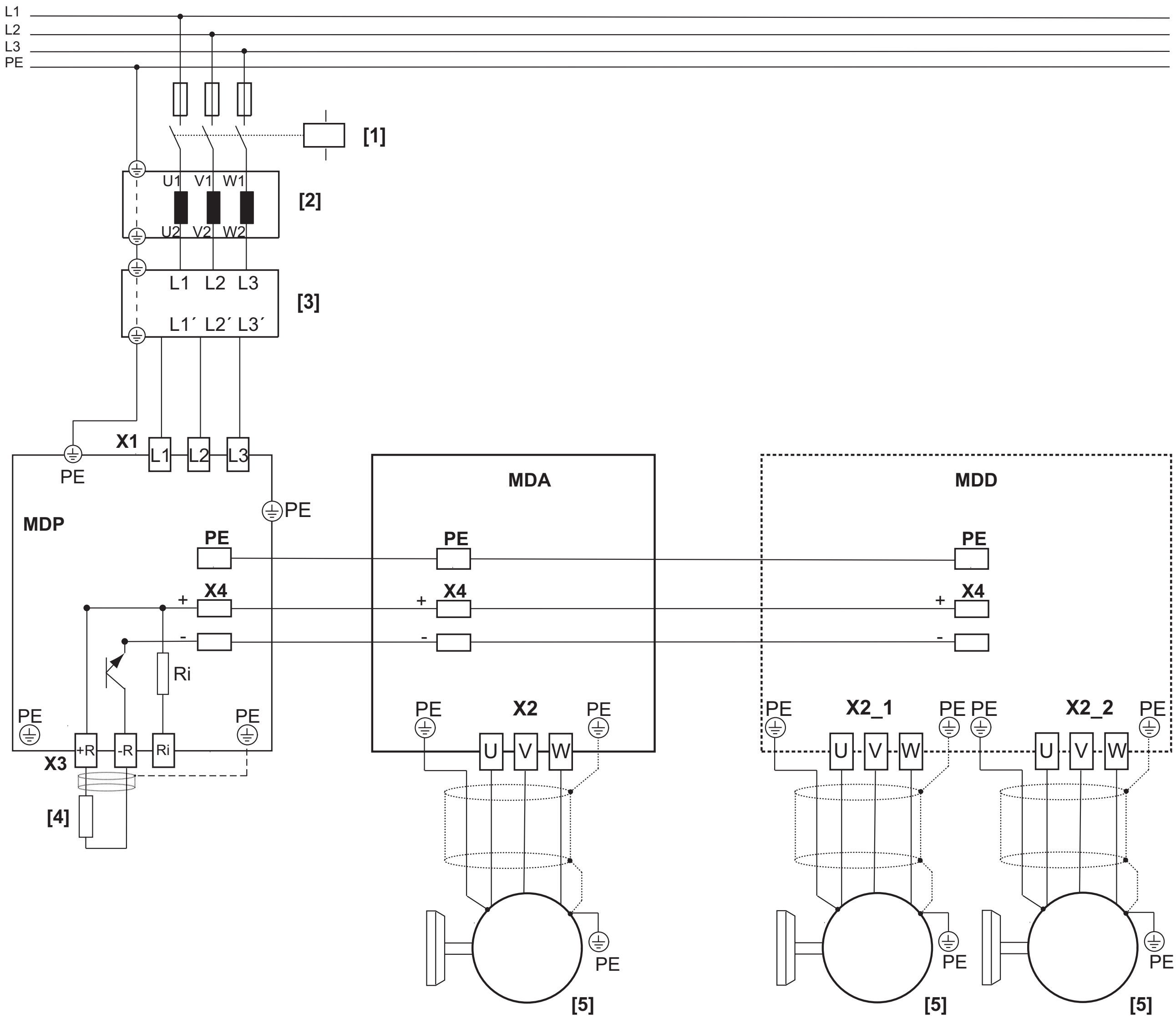
Wiring of the MDP90A-..-C00 power connections using the external braking resistor



36028806505258635

[1]	Line contactor
[2]	Line choke (optional)
[3]	Line filter
[4]	Connection of the braking resistor.
[5]	Motor
MDP	Power supply module
MDA	Single-axis module
MDD	Double-axis module

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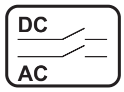
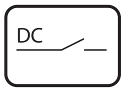
8.14.3 Brake control

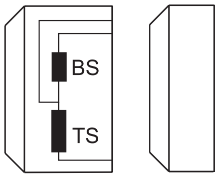
Legend:



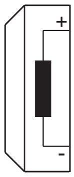
Cut-off in the DC and AC circuits
(rapid brake application)



Cut-off in the DC circuit



Brake
BS = accelerator coil
TS = coil section



DC brake with one brake coil

Auxiliary terminal strip in terminal box

Control cabinet limit

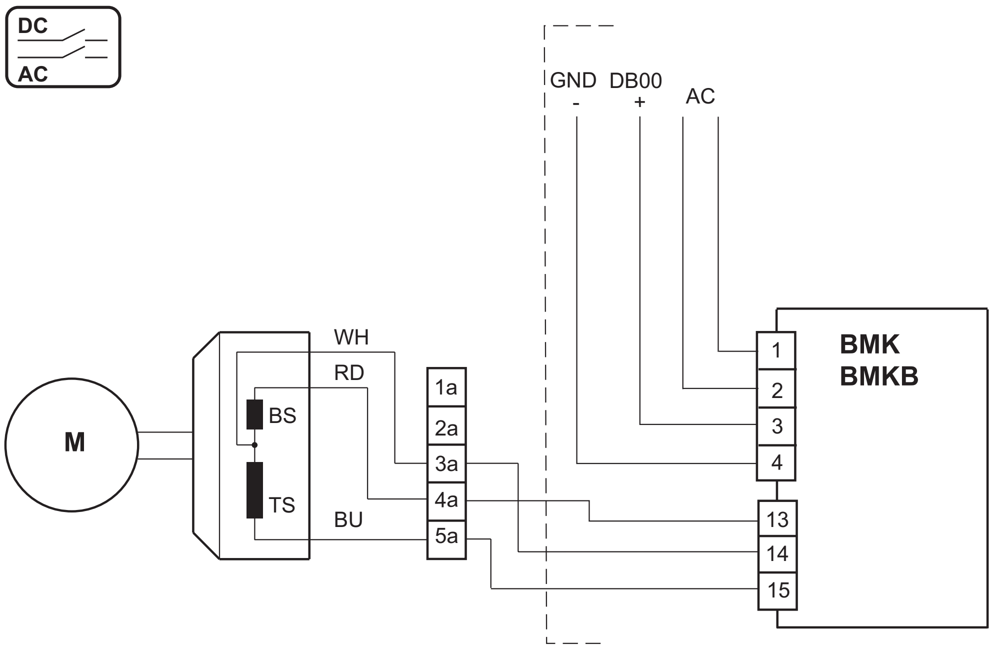
WH	White
RD	Red
BU	Blue

INFORMATION

Type and source of the hazard

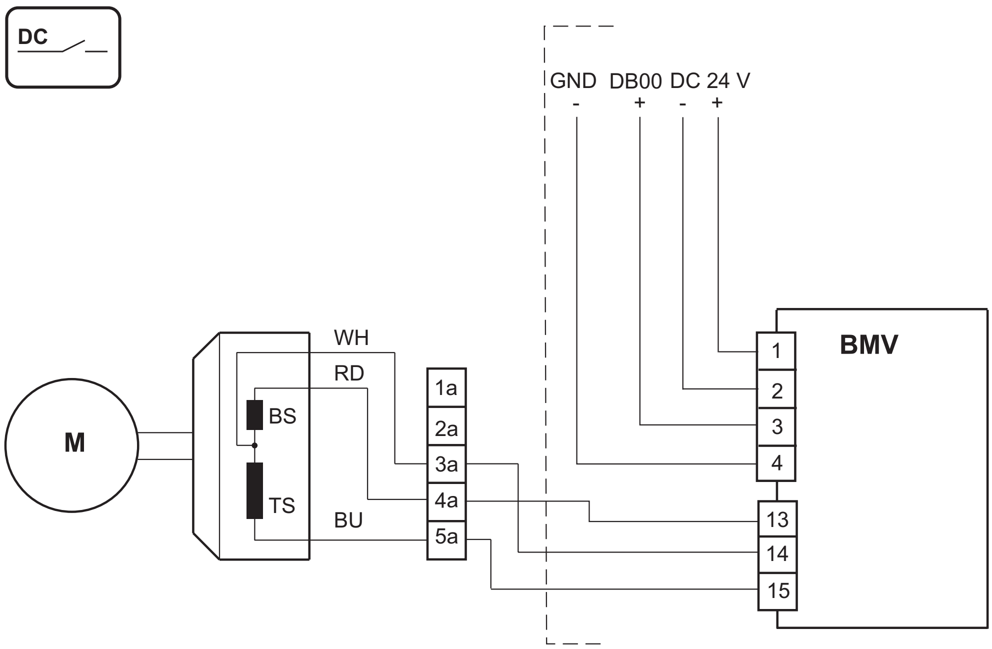
The selection of the brake control and the shown connection diagrams only represent one of the many possibilities. Observe the catalogs and operating instructions of the motors for more information and installation notes.

BMK. brake control



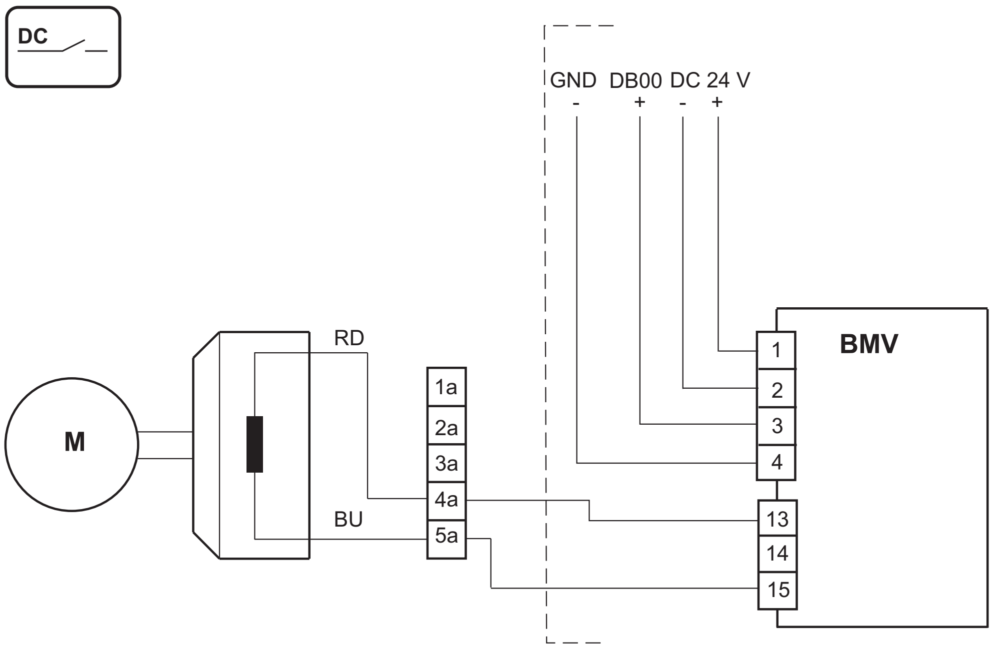
14324495755

BMV brake control – 2 coils



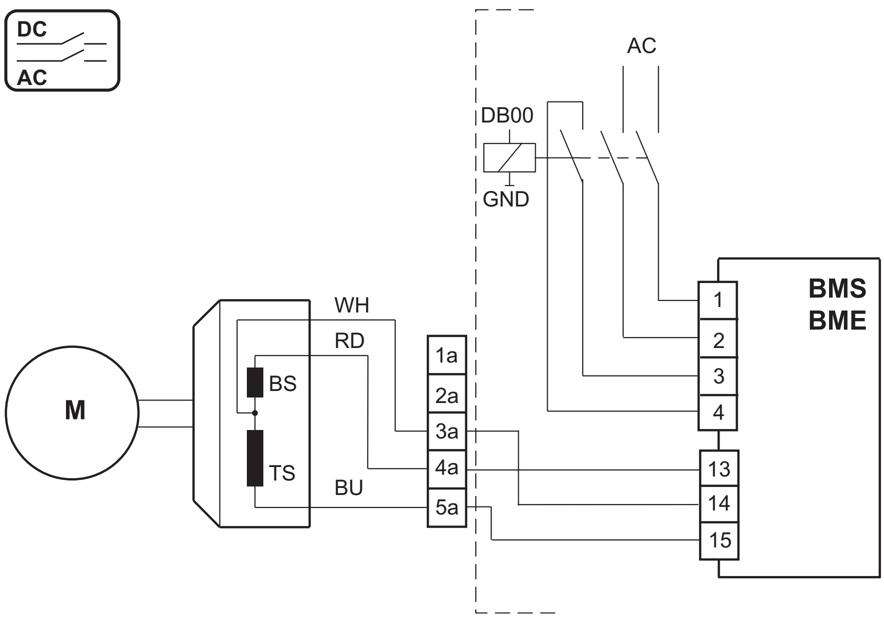
14373482507

BMV brake control – 1 coil



14373494923

BMS, BME brake control



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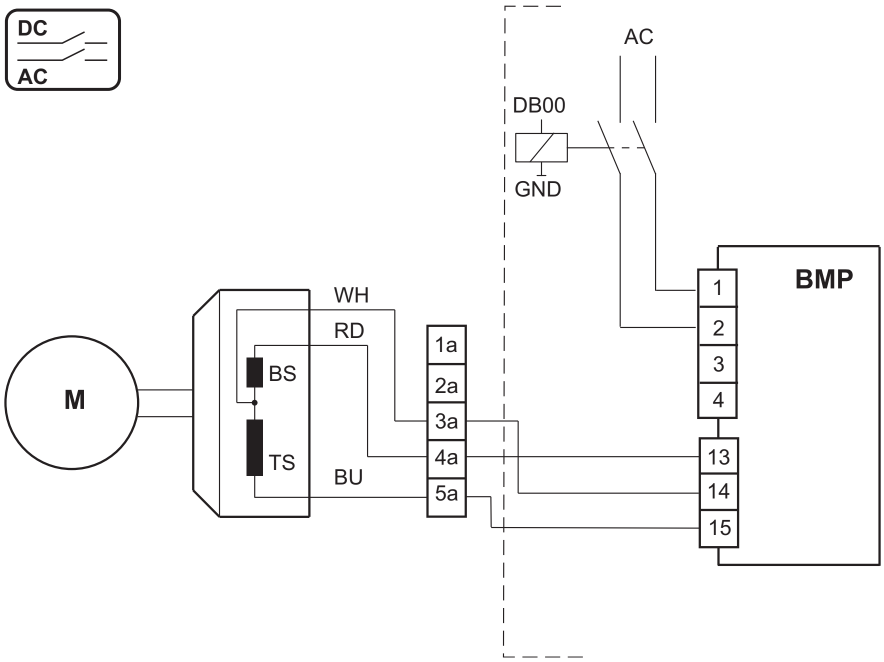
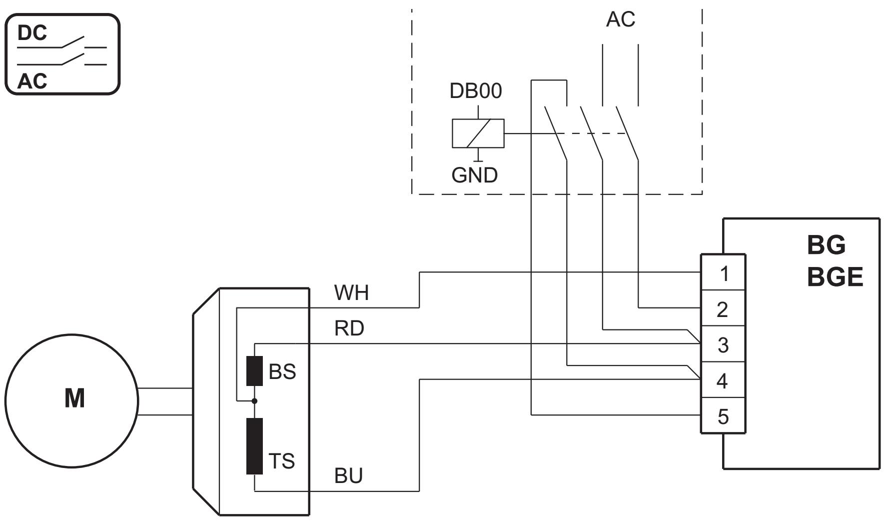
BMP brake control



14324544523

BG, BGE brake control



14324565259

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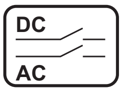
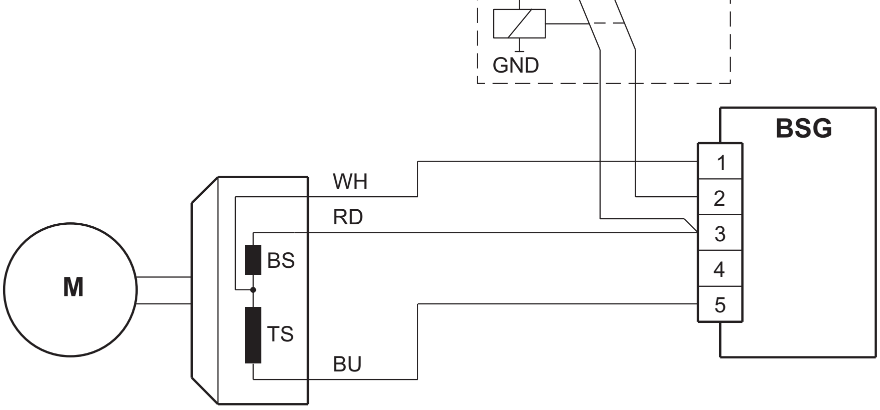
BSG brake control





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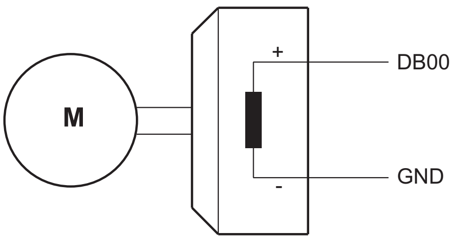
Direct control DC 24 V brake

If the system complies with the following specifications for direct brake control, a BK or BP brake (holding brake) can also be controlled directly via the brake output of an application inverter.

Specifications for direct brake control:

- Only the BK brakes of the CMP40 – 63 motor and the BP brake of the CMP71 motor are permitted.
- Expressly excluded are brakes of the motor types CMP80 and greater, CMPZ motors, and all non-SEW brakes.
- Only prefabricated brakemotor cables from SEW-EURODRIVE must be used.
- The brakemotor cable must be shorter than 25 m.
- The shielding of the brake cable must be connected to the shielding plate.

Observe additional information in the "Synchronous Servomotors" catalog.



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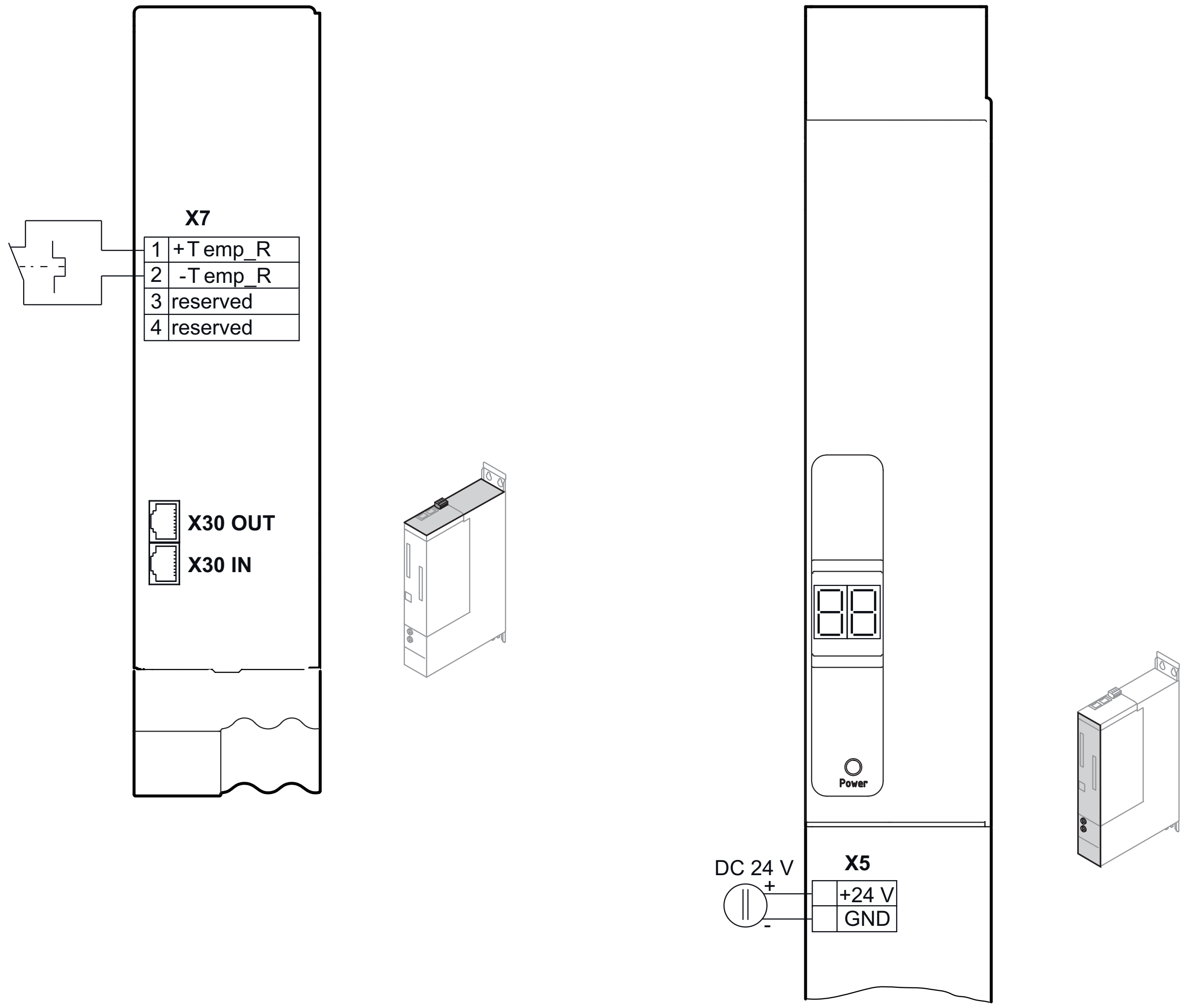
8.14.4 Electronics connection MDP90A.. power supply module

Wiring the control electronics

For the terminal assignment and connections, refer to chapter "Terminal assignment" (→ 🗎 321).



45036010587573515

X5	Connection +24 V supply voltage
X7	Braking resistor temperature monitoring
X30	System bus

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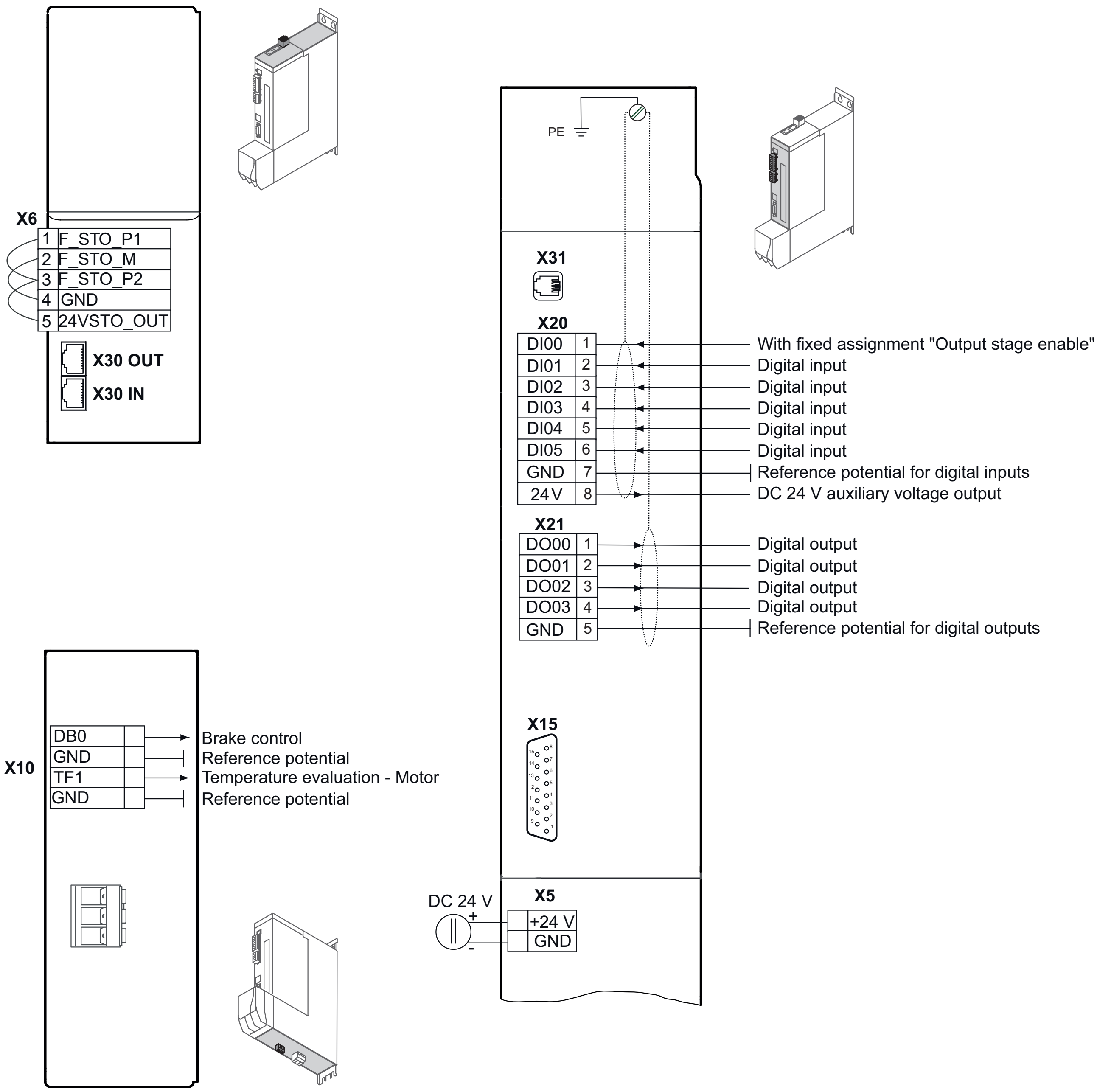
8.14.5 Electronics connection MDA90A.. single-axis module

Wiring the control electronics

For the terminal assignment and connections, refer to chapter "Terminal assignment" (→ 🗎 321).



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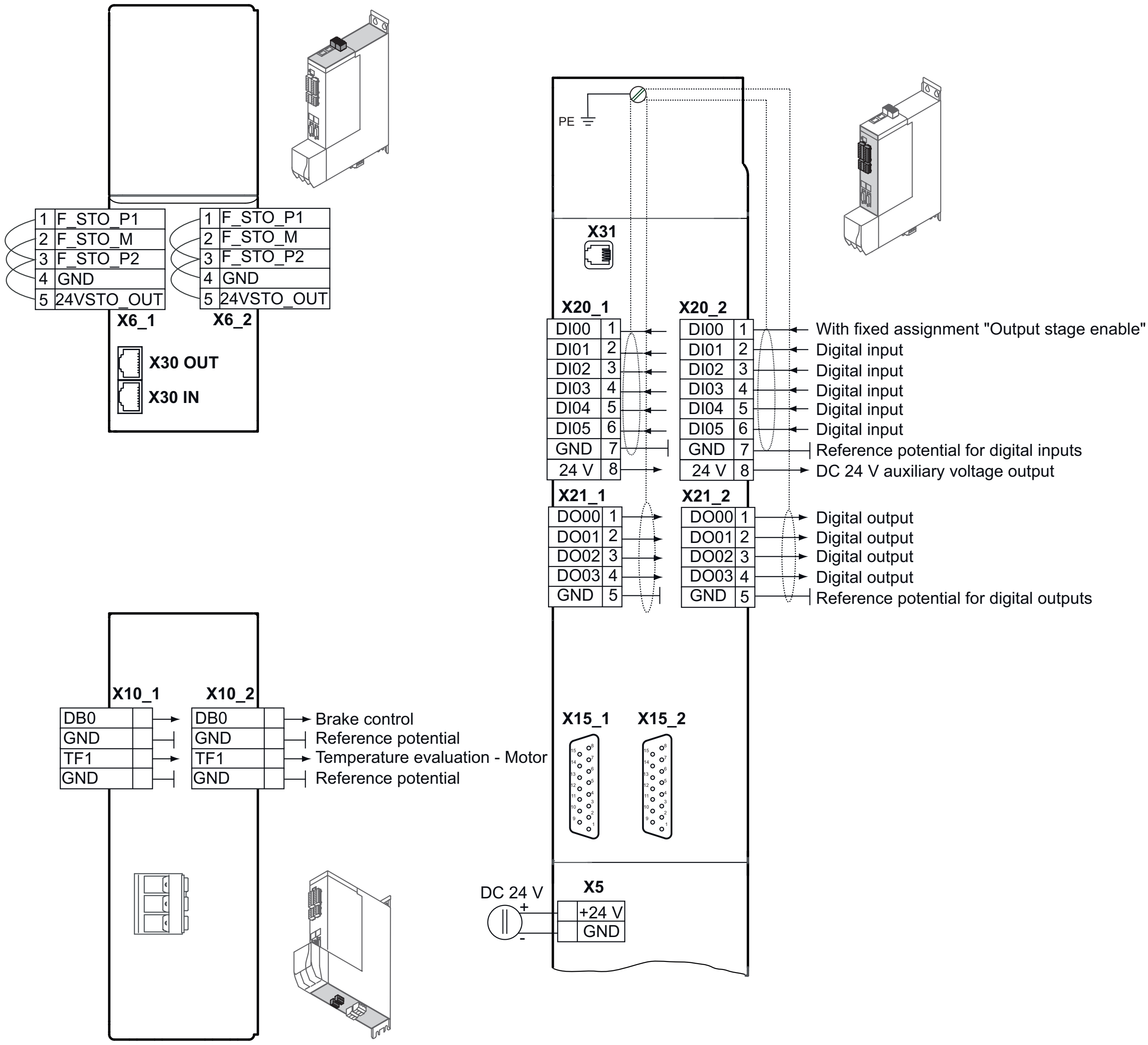
X5	Connection +24 V supply voltage	X20	Digital inputs
X6	Connection for Safe Torque Off (STO). With installed CS.A card, the cable bridges are removed at the factory. If no CS.A card is installed upon delivery, the cable bridges are installed at the factory.	X21	Digital outputs
X10	Brake control and temperature monitoring motor	X30	System bus
X15	Motor encoder connection	X31	SEW-EURODRIVE Service interface

8.14.6 Electronics connection MDD90A.. double-axis module

Wiring the control electronics

For the terminal assignment and connections, refer to chapter "Terminal assignment" (→ 🗎 321).



36028812162556811

X5 Connection +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 Brake control and temperature monitoring motor

X15 Motor encoder connection

X20 Digital inputs

X21 Digital outputs

X30 System bus

X31 SEW-EURODRIVE Service interface

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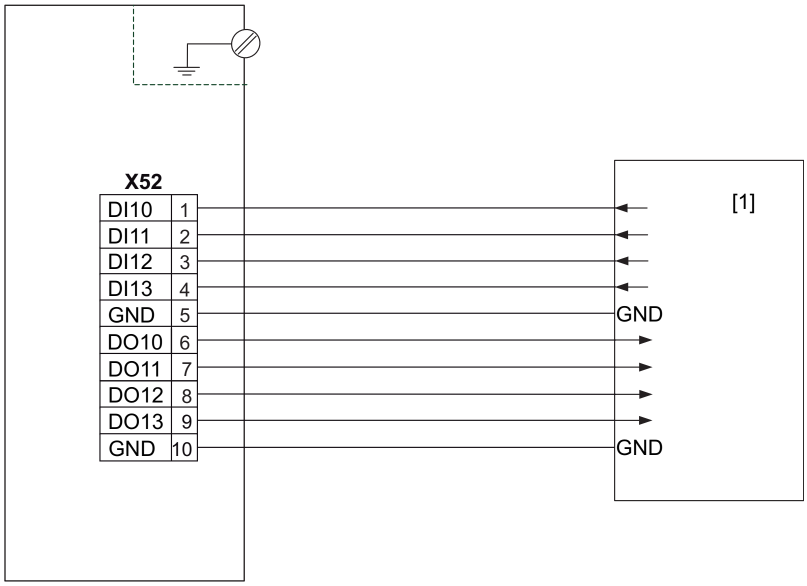
8.14.7 Connection diagram CIO21A and CID21A input/output card

Digital inputs and outputs



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[1] Higher-level controller

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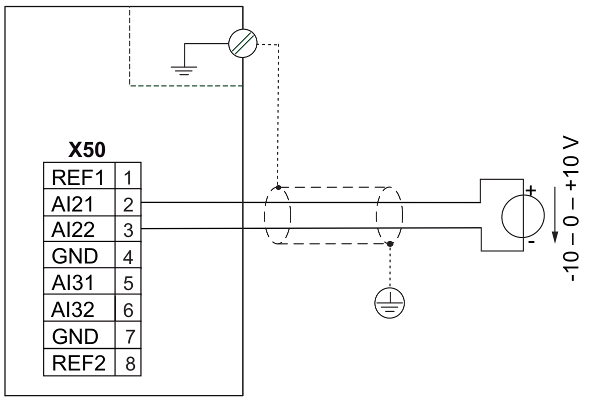
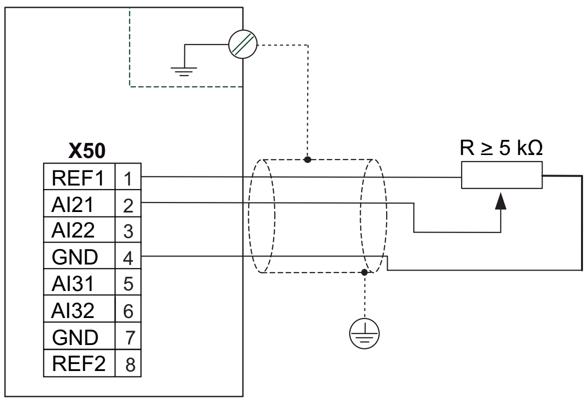
Voltage input



9007213575393675

Connection to the terminals AI31 and AI32 is carried out analogously to the connection to the terminals AI21 and AI22 shown in the wiring diagrams.



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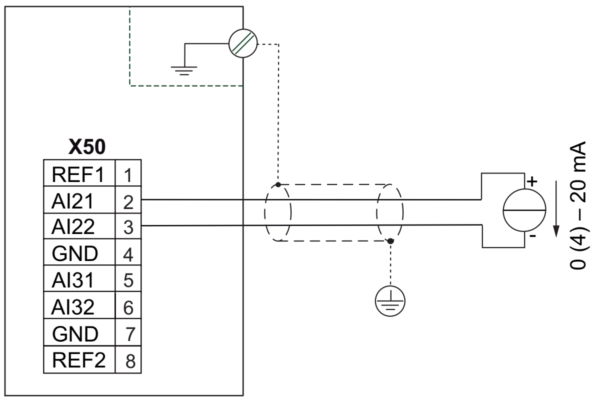
Connection to the terminals REF2 and AI31 is carried out analogously to the connection to the terminals REF1 and AI21 shown in the wiring diagrams.

Current input



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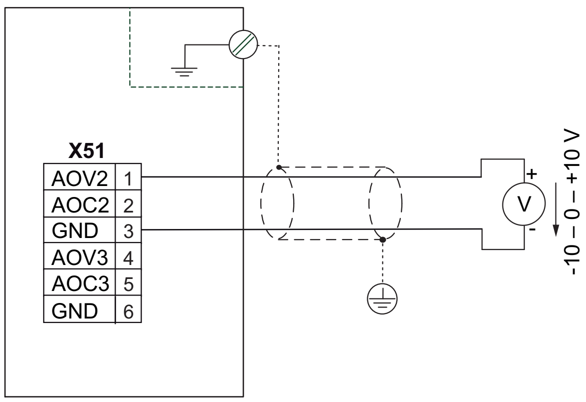
Connection to the terminals AI31 and AI32 is carried out analogously to the connection to the terminals AI21 and AI22 shown in the wiring diagrams.

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

Voltage output



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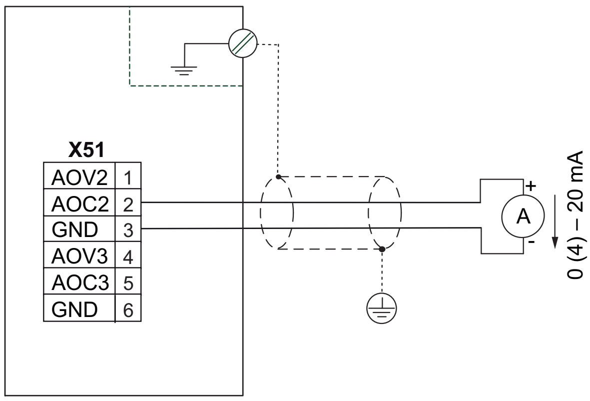
Connection to the terminals AOV3 and GND is carried out analogously to the connection to the terminals AOV2 and GND shown in the wiring diagram.

Current output



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Connection to the terminals AOC3 and GND is carried out analogously to the connection to the terminals AOC2 and GND shown in the wiring diagram.

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8.15 Information regarding UL

INFORMATION

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

8.15.1 Field Wiring Power Terminals

- Use 60/75 °C solid or stranded copper wire only sized at 14 AWG minimum. Suitable for 1 wire per terminal.
- For double axis modules use wire size 12 – 14 AWG.
- Tighten terminals to in-lbs (Nm) as follows

	Tightening torque in-lbs (Nm)			
MDP90A-...-	Power supply module			
	Line connection		Braking resistor terminals	
0100 (size 1)	X1	4.4254 – 5.3105 (0.5 – 0.6)	X3	4.4254 – 5.3105 (0.5 – 0.6)
0100 (size 1A)	X1	4.4254 – 5.3105 (0.5 – 0.6)	X3	4.4254 – 5.3105 (0.5 – 0.6)
0250	X1	23.552 – 35.403 (3.0 – 4.0)	X3	23.552 – 35.403 (3.0 – 4.0)
MDA90A-...-	Single-axis module			
	Motor connection		-	
0020 – 0120	X2	4.4254 – 5.3105 (0.5 – 0.6)	-	-
0160 – 0240	X2	13.276 – 15.046 (1.5 – 1.7)	-	-
0320 – 0480	X2	23.552 – 35.403 (3.0 – 4.0	-	-
MDD90A-...-	Double-axis module			
	Motor connection		-	
0020 – 0040	X2	4.4254 – 5.3105 (0.5 – 0.6)	-	-
0020 – 0080	X2	13.276 – 15.046 (1.5 – 1.7)	-	-
	All modules			
	DC link connection		PE connection	
	X4	23.552 – 35.403 (3.0 – 4.0		23.552 – 35.403 (3.0 – 4.0

8.15.2 Short Circuit Current Rating

Suitable for use on a circuit capable of delivering not more than

- 5000 rms symmetrical amperes when protected by fuses and circuit breakers as described in the tables below.

Max. voltage is limited to 500 V.

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8.15.3 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.

Power supply module MDP90A-..	SCCR: 5 kA/ 500 V		SCCR: 18 kA/ 500 V		SCCR: 5 kA/ 500 V SCCR: 18 kA/ 500 V
	when protected by:				
	Non semiconductor fuses (currents are maximum values)	Inverse-time circuit breaker (currents are maximum values)	Non semiconductor fuses (currents are maximum values)	Inverse-time circuit breaker (currents are maximum values)	Type E Combination Motor Controller
0100 (size 1)	20 A/600 V Class: K5	20 A/500 V min.	20 A/600 V Class: CA, CB, CC, CD, CF, G, J, K1, K5, T	20 A/500 V min.	Siemens Sirius 3RV2011-4AA10 (11 – 16 A)
0100 (size 1A)	20 A/600 V Class: K5	20 A/500 V min.	20 A/600 V Class: CA, CB, CC, CD, CF, G, J, K1, K5, T	20 A/500 V min.	Siemens Sirius 3RV2011-4AA10 (11 – 16 A)
0250	50 A/600 V Class: K5	50 A/500 V min.	50 A/600 V Class: CA, CD, CF, G, J, K1, T	50 A/500 V min.	Siemens Sirius 3RV1031-4HA10 (40 – 50 A)

- If you use cable cross sections that are dimensioned for a smaller current than the rated current of the unit, make sure that the fuse is dimensioned for the used cable cross section.
- For information on selecting cable cross sections, refer to the project planning manual.
- Comply with the country-specific installation regulations in addition to the above notes.
- Single- and double-axis modules are intended for installation with the supply modules.

8.15.4 Motor Overload Protection

The units are provided with load and speed-sensitive overload protection and thermal memory retention upon shutdown or power loss.

The trip current is adjusted to 150 % of the rated motor current.

8.15.5 Ambient Temperature

The units are suitable for an ambient temperature of 45 °C.

INFORMATION

UL certification does not apply to operation in voltage supply systems without earthed star point (IT systems).

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9 Startup

9.1 General

⚠ DANGER

Uncovered power connections.

Severe or fatal injuries from electric shock.

- Install the touch guards at the modules, see chapter "Covers" (→ 🗎 244).
- Install the closing covers according to the regulations, see chapter "Covers" (→ 🗎 244).
- Never start up the application inverter without installed closed touch guards and closing covers.

9.1.1 Lifting applications

⚠ WARNING

Danger of fatal injury if the hoist falls.

Severe or fatal injuries.

- The application inverter is not designed for use as a safety device in lifting applications. Use monitoring systems or mechanical protection devices to ensure safety.

9.1.2 Connecting power

NOTICE

Undercutting the minimum switch-off time of the line contactor.

Irreparable damage to the application inverter or unforeseeable malfunctions.

The specified times and intervals must be observed.

- After disconnection from the supply system, observe a minimum switch-off time of 10 s.
- Do **not** turn the power of the supply system on or off **more than once per minute**.

9.1.3 Connecting cables

NOTICE

Disconnecting lines under voltage.

Irreparable damage to the application inverter or unforeseeable malfunctions.

- The following plug-in connections must always be disconnected in a de-energized state: Motor, supply system, braking resistor, brake, encoder.

9.2 Setting the EtherCAT®/SBus^{PLUS} ID

The hexadecimal switches S1 and S2 must be set to "0".

9.3 Startup requirements

The following conditions apply to startup:

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

Required hardware:

- PC or laptop with Ethernet interface.
- Standard Ethernet cables for connection between PC and MOVI-C® CONTROLLER.
- MOVI-C® CONTROLLER with completed startup

Required software:

- Engineering software MOVISUITE® standard from SEW-EURODRIVE.

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9.4 Startup procedure

The application inverters are taken into operation using the MOVISUITE® engineering software from SEW-EURODRIVE.

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The startup is functionally divided into segments. The following steps illustrate in exemplary fashion the startup procedure for an application inverter.

Drive train segment

Drive train		Configuring drive trains.

Interfaces segment

Default		Basic settings of the installed interfaces • EtherCAT® • Standard I/O • Encoder 1
Optional		Basic settings of the options • Fieldbus • I/O card • Encoder 2 • MOVISAFE® CS..

Functions segment

Inputs/outputs		• Standard I/O • I/O card DI/DO • I/O card AI/AO
Setpoints		• Basic settings • PO data • Setpoint buffer • Fixed setpoints • Control word 1 – 3

Actual values		• PI data • Status word 1 – 3
Drive functions		• FCB 05 Speed control • FCB 06 Interpolated speed control • FCB08 Interpolated torque control • FCB 09 Positioning • FCB10 Interpolated position control • FCB12 Reference travel • FCB 01 Output stage inhibit • FCB 20 Jog mode • FCB21 Brake test • FCB 26 Stop at user limit
Extended functions		• Parameter set • Auto reset • Standby mode
Monitoring functions		• Reference signals • Limit values 1 • Limit values 2 • Output stage • Monitoring functions 1 • Monitoring functions 2 • Energy-saving function

Information on the application inverter

Device data is available via the project nodes.

Device data		• Device identification • Main component • Subcomponent • Production label
Overview of fault responses		• Axis module • Power supply monitoring • Functions
Setup		• Permissions • Resetting device parameters.

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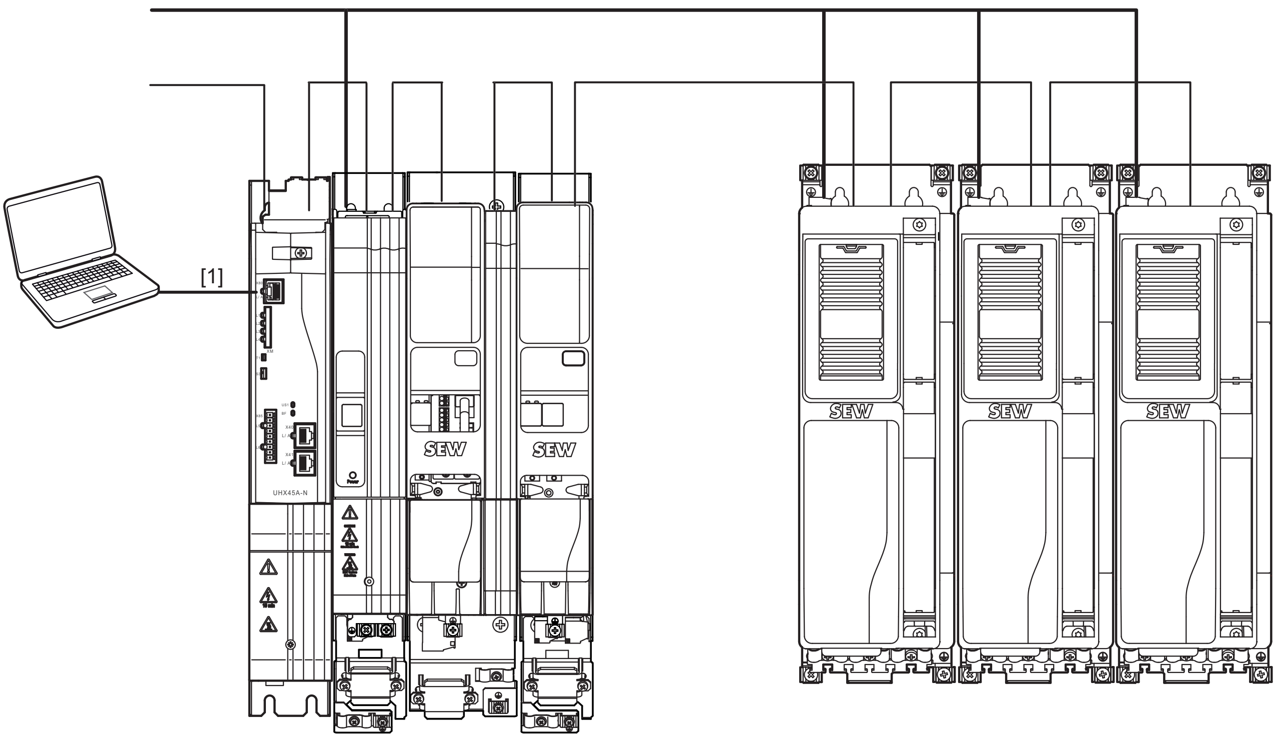
9.4.1 Check list for startup

The following checklist lists the necessary steps for complete startup.

Step	Startup step	Done
1	Motor installation	
2	Install MOVI-C® component	
3	Start MOVISUITE®	
4	Start up the drive train	
5	Parameterize setpoints and FCBs	
6	Configure digital inputs and outputs	
7	Configure PD	
8	Configure software module (MOVIKIT®)	
9	Test drives/application	

9.5 Connection to the engineering software

The following figure shows the connection of the application inverter to the MOVISUITE® engineering software using a PC.



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[1] Ethernet

10 Operation

10.1 General information

⚠ 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.
- Check whether the device is disconnected from the supply system before you start work on the power connections.
- After disconnecting from the supply system, wait at least 10 minutes and establish zero voltage before you start working on the power connections.
- The fact that the operation LEDs are no longer illuminated does not indicate that the application inverter no longer carries any voltage.
- Observe the general safety notes in chapter "Safety notes" (→ 🗎 198).

⚠ 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 application inverter with enabled output stage.

Damage to the application inverter.

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

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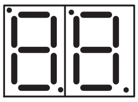
10.2 7-segment display

10.2.1 Operating displays



- The two 7-segment displays indicate the operating state of the power supply modules and axis modules.
- The displays for the axis modules and the power supply modules are therefore described separately.

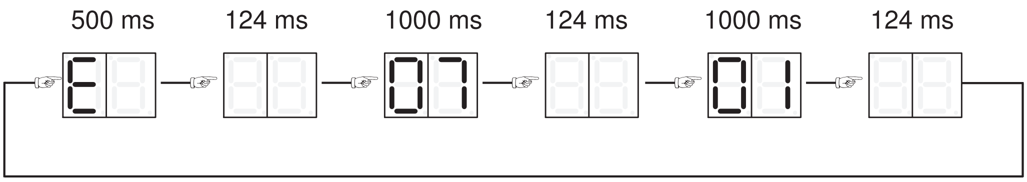
10.2.2 Fault display

The application inverter detects any faults that occur and displays them as fault code. Each fault is clearly defined by its fault code and corresponding attributes, as shown below:

- Fault response
- Final state after executing the fault response
- Type of reset response.

The fault codes are indicated as flashing numeric values in the axis and power supply module.

The fault code is displayed in the following display sequence:



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In the example, a 2-digit fault code with subfault is shown at the axis module, fault 07.01 in this example.

Fault display at the double-axis module

The double-axis module has one two-digit 7-segment display for each of the two integrated axes. They are located horizontally next to each other. The left display applies to axis 1, the right one to axis 2.

10.3 Operating displays

10.3.1 Operating displays at the power supply module

Display	Description	State	Comment/action
Displays during normal operation			
rd	Ready for operation (ready).	No fault/warning: V_{DCL} ≥ 100 V.	Only status display.

Display	Description	State	Comment/action
Displays of different device statuses			
00	DC link voltage missing or below 100 V.	24 V backup mode	Check supply system.

10.3.2 Operating displays at the axis module

Display	Description	State	Comment / action
Displays during boot process			
b0 b1 b3 br	Device passes through several states when loading the firmware (boot) in order to become ready for operation.	• Status: Not ready. • Output stage is inhibited. • No communication possible.	• Waiting for boot process to finish. • Device stays in this condition: Device is defective.

Display	Description	State	Comment / action
Displays of different device statuses			
.	Energy-saving mode		Energy-saving mode active.
C0 Flashing	Module bus is not ready		Check the module bus connection.
C1 Flashing	Startup state		Startup state is active.
C2 Flashing	STO active		The function Safe Torque Off is active.
C3 Flashing	Synchronization with bus is incorrect. Process data processing not available.		• Check the bus connection. • Check synchronization setting at device and controller. • Check process data settings at device and controller.
C4 Flashing	The encoder evaluation is 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 is not ready.		The motor control system is not ready.
C6 Flashing	Internal device supply incomplete.		• Supply voltage fault of SMPS • 24 V supply not ready.
C7 Flashing	Power section not ready.		The power section is not ready.
C8 Flashing	External device not ready.		The message "Not ready" was detected at the digital input.
C9 Flashing	Data flexibilization layer not ready.		Flexibility level is not ready yet.
Cd Flashing	Parameter download running.		One parameter set is being downloaded.

Display	Description	State	Comment / action
Displays during initialization processes (parameters will be reset to default values)			
d0 Flashing	Basic initialization.	• Status: Not ready. • Output stage is inhibited. • Communication is possible.	Waiting for initialization to finish.
d1 Flashing	Initialization at delivery state.		

Display	Description	State	Comment / action
Displays in normal operation			

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Display	Description	State	Comment / action
01	Output stage inhibited	• Output stage is inhibited.	The drive is not actuated by the output stage. Brake is applied. The motor coasts without brake. This FCB is permanently selected with terminal DI00. But it can be selected by other sources.
02	Stop default	For further information refer to the FCB description.	Drive function (FCB) "Default stop" active, if not other FCB is selected and the system is "ready".
04	Manual mode		Manual mode 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 cyclically via bus.
09	Position control		Position mode with internal ramp generator.
10	Interpolated position control		Positioning mode with setpoints cyclically 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. This FCB also becomes active if no other FCB is selected as default FCB.
14	Emergency stop		Deceleration at emergency stop limit.
18	Rotor position identification		Encoder commutation for synchronous motors.
19	Position hold control		Position control on current position.
20	Jog		Jog mode active.
21	Brake test		Brake is tested by applying torque while brake is closed.
25	Motor parameter measurement		Motor parameter measurement active
26	Stop at user limits		Serves to stop at user limits.

10.4 Faults at the power supply module

10.4.1 Fault 49 Power supply module

Subfault: 49.1
Description: Unknown supply unit

Response: Remote – critical fault

Cause	Measure
Failed to identify supply unit.	Contact SEW-EURODRIVE Service.

Subfault: 49.2
Description: EEPROM memory – hardware faulty

Response: Remote – critical fault

Cause	Measure
EEPROM cannot be read; initialization error.	Contact SEW-EURODRIVE Service.

Subfault: 49.3
Description: Internal voltage supply

Response: Remote – critical fault

Cause	Measure
At least one internal supply voltage is faulty.	Switch the power off and on again. Contact the SEW-EURODRIVE Service if the error is still present.

Subfault: 49.4
Description: DC 24 V supply voltage

Response: Remote – critical fault

Cause	Measure
24 V supply below min. specified 24 V input voltage.	Check the 24 V supply, switch power supply off and on again. Contact the SEW-EURODRIVE Service if the error is still present.

Subfault: 49.5
Description: Fault in hardware component of analog to digital conversion

Response: Remote – critical fault

Cause	Measure
Measured DC link values outside valid range or voltage supply of the transducers is defective.	Contact SEW-EURODRIVE Service.

Subfault: 49.6
Description: CRC error – power section data

Response: Remote – critical fault

Cause	Measure
Device not calibrated yet.	Contact SEW-EURODRIVE Service.
Initialization error	Contact SEW-EURODRIVE Service.

Subfault: 49.7
Description: EEPROM data error

Response: Remote – critical fault

Cause	Measure
Calibration data not plausible.	Contact SEW-EURODRIVE Service.

Subfault: 49.8
Description: DC link overvoltage

Response: Remote – critical fault

Cause	Measure
Maximum permitted DC link voltage limit exceeded.	– Check brake chopper function, braking resistor, and regenerative energy. – Check project planning of the axis system.

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Subfault: 49.9 **Description: DC link overcurrent**	
Response: Remote – critical fault	
Cause	Measure
DC link current too high in motor or regenerative operation.	– Motoring operation: load too high / check project planning. – Regenerative operation: Braking resistance too low-impedance or short circuit in braking resistor.

Subfault: 49.10 **Description: Brake chopper short circuit**	
Response: Remote – critical fault	
Cause	Measure
A failed brake chopper was detected in the device. For units with half-controlled bridge, the thyristors are inhibited.	– Check brake chopper circuit connections --> Switch the power off and on again. – If the fault is still present, replace the device. Contact SEW-EURODRIVE Service.

Subfault: 49.11 **Description: Collector emitter voltage monitoring**	
Response: Remote – critical fault	
Cause	Measure
– The voltage supply for the brake chopper is defective.	Check the connection of the braking resistor.
UCE monitoring of brake chopper trips.	Switch the power off and on again. Contact the SEW-EURODRIVE Service if the error is still present.
Short circuit in braking resistor.	Check the braking resistor and supply cable.
Too much regenerative power.	Check the project planning for the axis system.

Subfault: 49.12 **Description: Temperature sensor (internal) defective**	
Response: Remote – critical fault	
Cause	Measure
Temperature sensor does not respond (e.g. wire break).	Contact SEW-EURODRIVE Service.

Subfault: 49.13 **Description: Overtemperature 105%**	
Response: Remote – critical fault	
Cause	Measure
The maximum permitted heat sink temperature has been exceeded.	Check the project planning and installation of the axis system. Contact SEW-EURODRIVE Service.

Subfault: 49.14 **Description: Temperature evaluation defective**	
Response: Remote – critical fault	
Cause	Measure
Failed to transfer temperature signals.	Contact SEW-EURODRIVE Service.

Subfault: 49.15 **Description: Capacity utilization 105%**	
Response: Remote – critical fault	
Cause	Measure
Electromechanical utilization of > 105% detected by I2xT model.	– Check the project planning and installation of the axis system. – Contact SEW-EURODRIVE Service.

Subfault: 49.16 **Description: Braking resistor temperature monitoring**	
Response: Remote – critical fault	
Cause	Measure
– Monitoring of the external braking resistor has tripped. – The temperature of the externally connected braking resistor is too high.	Check the project planning for the axis system.
Incorrect wiring	Check braking resistor installation.

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Subfault: 49.17 **Description: Internal braking resistor utilization 105%**		
	Response: Remote – critical fault	
	Cause	Measure
	The utilization of the internal braking resistor has reached the switch-off threshold of > 105%.	Check the project planning and installation of the axis system.

Subfault: 49.18 **Description: Internal device temperature**		
	Response: Remote – critical fault	
	Cause	Measure
	Impermissible high device temperature detected.	– Clarify the temperature condition of the axis system. – Check ventilation of the control cabinet. – Check mounting position, fan function. – Check heat sink and fan for dirt and clean them.

Subfault: 49.19 **Description: External fault**		
	Response: Remote – critical fault	
	Cause	Measure
	Another module bus station has requested external emergency shutdown.	Eliminate emergency shutdown condition at the module bus station.

Subfault: 49.20 **Description: Capacity utilization 100%**		
	Response: Remote – standard fault	
	Cause	Measure
	Electromechanical utilization of > 100% detected by I2xT model.	– Check the project planning and installation of the axis system. – Contact SEW-EURODRIVE Service.

Subfault: 49.21 **Description: Internal braking resistor utilization 100%**		
	Response: Remote – standard fault	
	Cause	Measure
	The utilization of the internal braking resistor has reached the switch-off threshold of > 100%.	Check the braking resistor installation and the project planning of the axis system. – Contact SEW-EURODRIVE Service.

Subfault: 49.22 **Description: Overtemperature 100%**		
	Response: Remote – standard fault	
	Cause	Measure
	Permitted heat sink temperature exceeded.	– Check mounting position and fan function. – Check heat sink and fan for dirt and clean them. – Check the project planning and installation of the axis system.

Subfault: 49.23 **Description: Module bus timeout**		
	Response: Remote – standard fault	
	Cause	Measure
	Slave does not receive telegrams.	Check the module bus cable.

Subfault: 49.24 **Description: Module bus initialization**		
	Response: Remote – warning	
	Cause	Measure
	Module bus system not yet initialized.	Check the module bus cable.

Subfault: 49.25 **Description: Module bus CRC error**		
	Response: Remote – standard fault	
	Cause	Measure
	CRC error	Check the module bus cable.

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Subfault: 49.26 Description: Module bus station error		
	Response: Remote – warning	
	Cause	Measure
	More than 15 module bus stations (axes) connected to module bus master.	Connect a maximum of 15 module bus stations.

Subfault: 49.27 Description: Fan function fault		
	Response: Remote – warning	
	Cause	Measure
	One of the fans is not connected, or is blocked mechanically.	– Check the fan plug connector. – Check the fan for mechanical blockage. – Replace the fan.

Subfault: 49.28 Description: Temperature prewarning		
	Response: Remote – warning	
	Cause	Measure
	The temperature of the heat sink has reached the prewarning threshold.	– Check mounting position and fan function. – Check heat sink and fan for dirt and clean them. – Check the project planning and installation of the axis system.

Subfault: 49.29 Description: Utilization prewarning		
	Response: Remote – warning	
	Cause	Measure
	Electromechanical utilization greater than electromechanical utilization of prewarning threshold detected by I2xT model.	Check the project planning and installation of the axis system.

Subfault: 49.30 Description: Internal braking resistor utilization prewarning		
	Response: Remote – warning	
	Cause	Measure
	Utilization of internal braking resistor reached prewarning threshold.	Check the connection and project planning of the braking resistor.

Subfault: 49.31 Description: Braking resistor connection monitoring		
	Response: Remote – warning	
	Cause	Measure
	Connection monitoring has not detected a connected braking resistor.	Check the connection of the braking resistor.
	Connected braking resistor not within configured range.	Check the connection and project planning of the braking resistor.
	Short circuit in braking resistor.	Check the connection of the braking resistor.

Subfault: 49.32 Description: Thermal overload of additional capacity		
	Response: Remote – warning	
	Cause	Measure
	Additional capacity at full thermal capacity. Braking resistor converters regenerative energy into heat.	Check device utilization and project planning.

10.5 Fault at the single-axis module/double-axis module

10.5.1 Fault 1 Output stage monitoring

Subfault: 1.1
Description: Short circuit in motor output terminals

Response: Output stage inhibit

Cause	Measure
Overcurrent in output stage or a fault in the output stage control detected, and output stage inhibited by hardware.	Possible causes for overcurrent are short circuit at the output, excessive motor current, or a defective power output stage.

Subfault: 1.2
Description: Overcurrent in output stage

Response: Output stage inhibit

Cause	Measure
Motor current too high.	Connect a smaller motor.
Current supply	Check the current supply.
Current transformer	Check the current transformer.
Ramp limit deactivated and set ramp time too short.	Increase the ramp time.
Phase module defective.	Check the phase module.
DC 24 V supply voltage instable.	Check the DC 24 V supply voltage.
Interruption or short circuit on signal lines of phase modules.	Check the signal lines.

10.5.2 Fault 3 Ground fault

Subfault: 3.1
Description: Ground fault

Response: Output stage inhibit

Cause	Measure
Ground fault in the motor lead.	Eliminate ground fault in motor lead.
Ground fault in the inverter.	Eliminate ground fault in inverter.
Ground fault in the motor.	Eliminate ground fault in motor.
Ground fault in line components.	Eliminate ground fault in line components.

10.5.3 Fault 4 Brake chopper

Subfault: 4.1
Description: Brake chopper overcurrent

Response: Output stage inhibit

Cause	Measure
Excessive regenerative operation power.	Extend deceleration ramps.
Short circuit detected in braking resistor circuit.	Check supply cable to braking resistor.
Braking resistance too high-impedance.	Check technical data of braking resistor.

Subfault: 4.2
Description: Brake chopper defective

Response: Output stage inhibit

Cause	Measure
Output stage of brake chopper defective.	Replace the defective brake chopper.

10.5.4 Fault 6 line fault

Subfault: 6.1
Description: Line phase failure

Response: Line phase failure

Cause	Measure
Missing line phase detected.	Check the supply system cable.
DC link voltage periodically too low.	Check the project planning of the supply system.
Inadequate line voltage quality.	Check the supply (fuses, contactor).

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10.5.5 Fault 7 DC link

Subfault: 7.1
Description: DC link overvoltage

Response: Output stage inhibit

Cause	Measure
The maximum permitted DC link voltage limit has been exceeded, and the output stage has been inhibited by the hardware.	– Extend deceleration ramps. – Check supply cable to the braking resistor. – Check technical data of the braking resistor.

10.5.6 Fault 8 Speed monitoring

Subfault: 8.1
Description: Speed monitoring – motor mode

Response: Output stage inhibit

Cause	Measure
The speed controller operates at setting limit (mechanical overload or phase failure in supply system or motor).	Increase the delay time set for speed monitoring, or reduce the load.
The encoder is not connected correctly.	Check encoder connection and direction of rotation. If necessary, increase current limiting or reduce acceleration values.
Encoder has incorrect direction of rotation.	– Check encoder connection and direction of rotation. If necessary, increase current limiting or reduce acceleration values. – Check motor lead and motor, check line phases.

Subfault: 8.2
Description: Speed monitoring – generator mode

Response: Output stage inhibit

Cause	Measure
Speed controller operating at setting limit (mechanical overload or phase failure in the supply system or the motor).	Increase the delay time set for speed monitoring, or reduce the regenerative load.
The encoder is not connected correctly.	Check encoder connection and direction of rotation. If necessary, increase current limiting or reduce deceleration values.
Encoder has incorrect direction of rotation.	– Check encoder connection and direction of rotation. If necessary, increase current limiting or reduce deceleration values. – Check motor cable and motor. Check line phases.

Subfault: 8.3
Description: Maximum speed at motor shaft

Response: Output stage inhibit

Cause	Measure
Actual speed exceeded "Maximum speed at motor shaft" limit value (index 8360.9 / 8361.9). This limit value is set at startup matching motor and gear unit.	Reduce the maximum speed that occurs.

10.5.7 Fault 9 Control mode

Subfault: 9.1
Description: Magnetization of motor not possible

Response: Output stage inhibit

Cause	Measure
User-defined current limit or output stage monitoring reduced possible maximum current to such a degree that required magnetizing current cannot be set.	Reduce output stage utilization, e.g., by reducing the PWM frequency or reducing the load. – Increase user-defined current limit.

Subfault: 9.2
Description: Requested operating mode not possible with active control mode

Response: Output stage inhibit

Cause	Measure
The current FCB has activated an operating mode. The active control mode does not support this operating mode, for example "position control" or "torque control" with V/f control mode.	Start up control mode that supports the required operating mode. Connect encoder if necessary. Select an operating mode that is supported by the current control mode.

Subfault: 9.3 Description: Absolute rotor position not available	
Response: Output stage inhibit	
Cause	Measure
The current control mode requires an absolute rotor position. The encoder selected for "Source is actual speed" does not provide an absolute rotor position.	Use an absolute encoder, or identify the rotor position using FCB 18.

Subfault: 9.4 Description: Correct current supply of motor not possible	
Response: Output stage inhibit	
Cause	Measure
Failed to set required current during premagnetization.	Check the cabling, or disable the function "current monitoring during premagnetization".

Subfault: 9.5 Description: Maximum output frequency exceeded	
Response: Output stage inhibit	
Cause	Measure
Maximum output frequency exceeded.	Reduce the maximum rotational speed.

Subfault: 9.6 Description: Maximum model speed exceeded	
Response: Output stage inhibit	
Cause	Measure
Speed of drive calculated in ELSM® control mode too high for motor control.	If possible minimize the "Speed/position controller sampling cycle", or reduce the speed.

Subfault: 9.8 Description: Flux model fault	
Response: Output stage inhibit	
Cause	Measure
Rotor flux calculated by motor model not plausible, or calculated internal voltage too small.	– Check configuration data. – Check motor data. – Check machine: Idle state or too low speed. – Check the connection cable between inverter and motor – Contact SEW-EURODRIVE Service.

Subfault: 9.9 Description: Parameter measurement not possible with active motor type	
Response: Output stage inhibit	
Cause	Measure
Parameter measurement is only possible with "asynchronous" and "synchronous" motor types. No magnetic reluctance and LSPM motors.	Select the correct motor type.

Subfault: 9.10 Description: Rotor stall monitoring	
Response: Output stage inhibit	
Cause	Measure
The current control cannot hold the load torque. The deviation between stationary setpoint voltage and actual voltage is too large.	Reduce the load torque (hoist) in the controlled system.

10.5.8 Fault 10 Data Flexibility

Subfault: 10.1 Description: Initialization	
Response: Application stop + output stage inhibit	
Cause	Measure
Fault during init task.	The init task has issued a return code != 0. Check the program.

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Subfault: 10.2 Description: Illegal operation code		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Illegal opcode in Data Flexibility program.	Contact SEW-EURODRIVE Service.

Subfault: 10.3 Description: Memory access		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Memory area violated while accessing array.	For example an array access results in writing beyond the permitted memory range. Check the program.

Subfault: 10.4 Description: Stack		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Overflow of Data Flexibility stack detected.	Check the program.

Subfault: 10.5 Description: Division by 0		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Division by 0.	Check the program.

Subfault: 10.6 Description: Runtime		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Runtime error/watchdog	Check the program. The program execution time exceeds the permitted time.
	PDI or PDO tasks.	Check the program. The execution time of the PDI or PDO task exceeds the permitted time.

Subfault: 10.7 Description: Calculation result of multiplication/division command too large		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The calculation result of a multiplication/division command exceeds 32 bits.	Check the program.
	The calculation result of a multiplication/division command cannot be written into the result variable.	Check the program.

Subfault: 10.8 Description: Illegal connection		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The index used in connect not allowed.	Check the program. The index used either does not exist or is not permitted for access via process data, see parameter list.

Subfault: 10.9 Description: CRC code		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Wrong CRC checksum of the code.	Load the program again. The program memory is corrupt. An unauthorized write access has been carried out on the program memory.

Subfault: 10.10 Description: Setpoint cycle time not supported		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	A non-supported setpoint cycle time has been parameterized.	Set the setpoint cycle time to the default value 1 ms.

Subfault: 10.11 Description: No application program loaded	
Response: Output stage inhibit	
Cause	Measure
No data flexibility application program loaded.	Load the program or disable Data Flexibility.

Subfault: 10.99 Description: Unknown fault	
Response: Application stop + output stage inhibit	
Cause	Measure
Unknown Data Flexibility error.	Contact SEW-EURODRIVE Service.

10.5.9 Fault 11 Temperature monitoring

Subfault: 11.1 Description: Heat sink overtemperature	
Response: Output stage inhibit	
Cause	Measure
The maximum permitted heat sink temperature has been exceeded. The capacity utilization is possibly too high.	– Reduce the load. – Reduce the rms value of the current. – Reduce the PWM frequency. – Ensure sufficient cooling. – Reduce the ambient temperature.

Subfault: 11.2 Description: Heat sink utilization – prewarning	
Response: Heat sink utilization – prewarning	
Cause	Measure
High thermal load on heat sink of device, and prewarning threshold reached.	– Reduce the load. – Reduce the rms value of the output current. – Reduce the PWM frequency. – Ensure sufficient cooling. – Reduce the ambient temperature.

Subfault: 11.3 Description: Device utilization	
Response: Output stage inhibit	
Cause	Measure
The temperature has reached or exceeded the switch-off threshold. Possible causes: Mean output current too high.	Reduce the load.
PWM frequency too high.	Reduce the PWM frequency.
Ambient temperature too high.	Ensure sufficient cooling.
Unfavorable air convection.	Check the air convection.
Fan is defective.	Check fan and replace if necessary.

Subfault: 11.5 Description: Electromechanical capacity utilization	
Response: Output stage inhibit	
Cause	Measure
Electromechanical components of device overloaded by excessively high continuous current.	Reduce the load. If necessary, reduce the rms value of the current.

Subfault: 11.6 Description: Electromechanical capacity utilization – prewarning	
Response: Electromechanical capacity utilization – prewarning	
Cause	Measure
High load on electromechanical components of device due to high continuous current. Prewarning threshold reached.	– Reduce the load. – Reduce the PWM frequency. – Reduce the rms value of the current. – Reduce the ambient temperature.

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Subfault: 11.7 Description: Wire break at temperature sensor of the heat sink		
	Response: Output stage inhibit	
	Cause	Measure
	Wire break at temperature sensor of the heat sink.	Contact SEW-EURODRIVE Service.

Subfault: 11.8 Description: Short circuit at the temperature sensor of the heat sink		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit at the temperature sensor of the heat sink.	Contact SEW-EURODRIVE Service.

10.5.10 Fault 12 Brake

Subfault: 12.1 Description: Brake output		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	No brake connected.	Check the connection of the brake.
	Brake cable disconnected in switched on state.	Check the connection of the brake.
	Overload due to overcurrent > 2 A	Check the sequential profile of the brake control.
	Overload due to excessive connection (> 0.5 Hz)	Check the sequential profile of the brake control.
	Monitoring works only with parameter setting "Brake installed" and "Brake applied".	Make sure that the connected brake is permitted.

Subfault: 12.2 Description: DC 24 V brake voltage		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	DC 24 V supply voltage not within permitted tolerance of ±10%.	Check the DC 24 V supply voltage.
	Monitoring is only active with parameter settings “Brake installed” and “Brake applied”	Check parameter setting.

10.5.11 Fault 13 Encoder 1

Subfault: 13.1 Description: Position comparison check		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Faulty comparison between raw position and track counter of absolute encoders.	– Check the track signal wiring. – Check interference sources (e.g. from EMC). – Replace encoder. – Replace card. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.2 Description: Unknown encoder type		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder type not known and not supported by the device.	– Check encoder type. – Contact SEW-EURODRIVE Service. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.3 Description: Invalid data	
Response: Encoder 1 – latest critical fault	
Cause	Measure
Invalid encoder nameplate data (measuring steps/pulses per revolution/multi-turn).	– Check startup parameters. – Replace encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.4 Description: Track measurement fault	
Response: Encoder 1 – latest critical fault	
Cause	Measure
Fault during track measurement.	– Switch the device off and on again. – Check the wiring. – Check interference sources (e.g., from EMC). – Check the encoder. Replace if necessary. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.5 Description: Internal warning	
Response: Encoder – warning	
Cause	Measure
The encoder has reported a warning.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Clean sensor.

Subfault: 13.6 Description: Signal level too low	
Response: Encoder 1 – latest critical fault	
Cause	Measure
Vector below permitted limit during signal level monitoring.	– Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.7 Description: Signal level too high	
Response: Encoder 1 – latest critical fault	
Cause	Measure
Vector exceeds permitted limit during signal level monitoring.	Check the gear ratio of the resolver in use. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.8 Description: Signal level monitoring	
Response: Encoder 1 – latest critical fault	
Cause	Measure
Vector exceeds permitted limit during signal level monitoring.	Check the resolver mounting position. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

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Subfault: 13.9 **Description: Quadrant check**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Fault detected while checking quadrants (sine encoder).	– Switch the device off and on again. – Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Replace if necessary. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.10 **Description: Position tolerance range monitoring**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The position is outside of the tolerance range.	– Check startup parameters. – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.11 **Description: Data timeout**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder process data timeout.	– Check interference sources (e.g. from EMC). – Check startup parameters. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.12 **Description: Emergency**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The encoder has reported an emergency.	– Check interference sources (e.g. from EMC). – Check startup parameters. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.13 **Description: Fault during initialization**		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	A communication fault has been detected during initialization.	– Check parameterization. – Check baud rate. – Ensure that the CANopen interface on the encoder (Node-ID) is correctly adjusted. – Check the wiring. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.14 **Description: Communication**		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	A fault has been detected in the communication with the encoder.	– Check voltage supply. – Check interference sources (e.g. from EMC). – Check the wiring. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.15
Description: System fault

Response: Encoder 1 – latest critical fault

Cause	Measure
A system fault has been detected while evaluating the encoder.	– Ensure that the multi-turn encoder is within the projected path range. – Check limits. – Check correct settings of encoder numerator/denominator factors. – Check interference sources (e.g. from EMC). – Check startup parameters. – Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.16
Description: Permanent high level in data line – critical

Response: Encoder 1 – latest critical fault

Cause	Measure
Permanent high level of data signal has been detected.	– Check the wiring. – Check the encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.17
Description: Permanent high level in data line

Response: Encoder 1 – latest fault

Cause	Measure
Permanent high level of data signal has been detected.	– Check the wiring. – Check the encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.18
Description: Permanent low level in data line – critical

Response: Encoder 1 – latest critical fault

Cause	Measure
Permanent low level of data signal has been detected.	– Check the wiring. – Check the encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.19
Description: Permanent low level in data line

Response: Encoder 1 – latest fault

Cause	Measure
Permanent low level of data signal has been detected.	– Check the wiring. – Check the encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.20 Description: SSI fault bit – critical	
Response: Encoder 1 – latest critical fault	
Cause	Measure
Fault bit set in SSI protocol.	– Check startup parameters. – Check the settings at the SSI encoder (fault bit). – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In the "emergency mode" manual mode, you can move the drive even with a fault in the external position encoder.

Subfault: 13.21 Description: SSI fault bit	
Response: Encoder 1 – latest fault	
Cause	Measure
Fault bit set in SSI protocol.	– Check startup parameters. – Check the settings at the SSI encoder (fault bit). – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In the "emergency mode" manual mode, you can move the drive even with a fault in the external position encoder.

Subfault: 13.22 Description: Internal fault – critical	
Response: Encoder 1 – latest critical fault	
Cause	Measure
The encoder has reported an internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.23 Description: Internal fault	
Response: Encoder 1 – latest fault	
Cause	Measure
The encoder has reported an internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.24 Description: Travel range exceeded	
Response: Encoder 1 – latest fault	
Cause	Measure
Current position mode (index 8381.10) does not allow for larger travel range.	Check travel range. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 13.25 Description: Fault during encoder startup	
Response: Output stage inhibit	
Cause	Measure
Fatal fault during encoder startup.	Switch the device off and on again. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

10.5.12 Fault 14 Encoder 2

Subfault: 14.1
Description: Position comparison check

Response: Encoder 2 – latest critical fault

Cause	Measure
Faulty comparison between raw position and track counter of absolute encoders.	– Check the track signal wiring. – Check interference sources (e.g. from EMC). – Replace encoder. – Replace card. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.2
Description: Unknown encoder type

Response: Encoder 2 – latest critical fault

Cause	Measure
Encoder type not known and not supported by the device.	– Check encoder type. – Contact SEW-EURODRIVE Service. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.3
Description: Invalid data

Response: Encoder 2 – latest critical fault

Cause	Measure
Invalid encoder nameplate data (measuring steps/pulses per revolution/multi-turn).	– Check startup parameters. – Replace encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.4
Description: Track measurement fault

Response: Encoder 2 – latest critical fault

Cause	Measure
Fault during track measurement.	– Switch the device off and on again. – Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Replace if necessary. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.5
Description: Internal warning

Response: Encoder – warning

Cause	Measure
Encoder signaled warning.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Clean sensor.

Subfault: 14.6
Description: Signal level too low

Response: Encoder 2 – latest critical fault

Cause	Measure
Vector below permitted limit during signal level monitoring.	– Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

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Subfault: 14.7 Description: Signal level too high	
Response: Encoder 2 – latest critical fault	
Cause	Measure
Vector exceeds permitted limit during signal level monitoring.	Check the gear ratio of the resolver in use. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.8 Description: Signal level monitoring	
Response: Encoder 2 – latest critical fault	
Cause	Measure
Vector below permitted limit during signal level monitoring.	Check the resolver mounting position. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.9 Description: Quadrant check	
Response: Encoder 2 – latest critical fault	
Cause	Measure
Fault detected while checking quadrants (sine encoder).	– Switch the device off and on again. – Check the wiring. – Check interference sources (e.g. from EMC). – Check the encoder. Replace if necessary. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.10 Description: Position tolerance range monitoring	
Response: Encoder 2 – latest critical fault	
Cause	Measure
The position is outside of the tolerance range.	– Check startup parameters. – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.11 Description: Data timeout	
Response: Encoder 2 – latest critical fault	
Cause	Measure
Encoder process data timeout.	– Check interference sources (e.g. from EMC). – Check startup parameters. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.12 Description: Emergency	
Response: Encoder 2 – latest critical fault	
Cause	Measure
The encoder has reported an emergency.	– Check interference sources (e.g. from EMC). – Check startup parameters. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.13 Description: Fault during initialization		
	Response: Encoder 2 – latest fault	
	Cause	Measure
	A communication fault has been detected during initialization.	– Check parameterization. – Check baud rate. – Ensure that the CANopen interface on the encoder (Node-ID) is correctly adjusted. – Check the wiring. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.14 Description: Communication		
	Response: Encoder 2 – latest fault	
	Cause	Measure
	A fault has been detected in the communication with the encoder.	– Check voltage supply. – Check interference sources (e.g. from EMC). – Check the wiring. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.15 Description: System error		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	A system fault has been detected while evaluating the encoder.	– Make sure that multi-turn encoder is within the configured track area. – Check limits. – Check correct settings of encoder numerator/denominator factors. – Check interference sources (e.g. from EMC). – Check startup parameters. – Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.16 Description: Permanent high level in data line – critical		
	Response: Encoder 2 – latest critical fault	
	Cause	Measure
	Permanent high level of data signal has been detected.	– Check the wiring. – Check the encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.17 Description: Permanent high level in data line		
	Response: Encoder 2 – latest fault	
	Cause	Measure
	Permanent high level of data signal has been detected.	– Check the wiring. – Check the encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.18 Description: Permanent low level in data line – critical	
Response: Encoder 2 – latest critical fault	
Cause	Measure
Permanent low level of data signal has been detected.	– Check the wiring. – Check the encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.19 Description: Permanent low level in data line	
Response: Encoder 2 – latest fault	
Cause	Measure
Permanent low level of data signal has been detected.	– Check the wiring. – Check the encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.20 Description: SSI fault bit – critical	
Response: Encoder 2 – latest critical fault	
Cause	Measure
Fault bit set in SSI protocol.	– Check startup parameters. – Check the settings at the SSI encoder (fault bit). – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In the "emergency mode" manual mode, you can move the drive even with a fault in the external position encoder.

Subfault: 14.21 Description: SSI fault bit	
Response: Encoder 2 – latest fault	
Cause	Measure
Fault bit set in SSI protocol.	– Check startup parameters. – Check the settings at the SSI encoder (fault bit). – Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In the "emergency mode" manual mode, you can move the drive even with a fault in the external position encoder.

Subfault: 14.22 Description: Internal fault – critical	
Response: Encoder 2 – latest critical fault	
Cause	Measure
The encoder has reported an internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.23 Description: Internal fault	
Response: Encoder 2 – latest fault	
Cause	Measure
The encoder has reported an internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, data cables, etc.). – Replace encoder. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.24 Description: Travel range exceeded	
Response: Encoder 2 – latest fault	
Cause	Measure
Current position mode (index 8381.10) does not allow for larger travel range.	Check travel range. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

Subfault: 14.25 Description: Fault during encoder startup	
Response: Output stage inhibit	
Cause	Measure
Fatal fault during encoder startup.	Switch the device off and on again. Note: In "emergency mode" manual mode, you can move the drive using the motor encoder if the external position encoder is faulty.

10.5.13 Fault 16 Startup

Subfault: 16.1 Description: Motor not started up yet	
Response: Output stage inhibit	
Cause	Measure
Motor not yet started up completely.	Perform complete motor startup.

Subfault: 16.2 Description: Cannot calculate controller parameters	
Response: Output stage inhibit	
Cause	Measure
The delay of the encoder in use is too long to calculate the required filter coefficients.	Use an encoder with a shorter dead time, or contact SEW-EURODRIVE Service.

Subfault: 16.3 Description: Thermal motor model not possible	
Response: Output stage inhibit	
Cause	Measure
Invalid parameters for thermal motor model or for drive enable although starting up thermal model not completed yet.	Check the parameters of the thermal motor model, and perform startup.

Subfault: 16.5 Description: Current limit smaller than magnetizing current of the motor.	
Response: Output stage inhibit	
Cause	Measure
Current limit smaller than magnetizing current of the motor calculated by active control mode.	Increase current limit. Required magnetizing current: See diagnostics parameters of control mode.

Subfault: 16.6 Description: Control mode not possible	
Response: Output stage inhibit	
Cause	Measure
Wrong control mode selected for motor.	Choose a control mode that matches the selected motor.

Subfault: 16.7 Description: PWM frequency not possible	
Response: Output stage inhibit	
Cause	Measure
The specified PWM frequency is not allowed for this power output stage.	Select different PWM frequency. Possible PWM frequencies; see device configuration data.

Subfault: 16.8 Description: Temperature sensor motor 1	
Response: Output stage inhibit	
Cause	Measure
Faulty startup of temperature sensor for motor 1.	Perform startup again.

Subfault: 16.9 Description: Temperature sensor motor 2	
Response: Output stage inhibit	
Cause	Measure
Faulty startup of temperature sensor for motor 2.	Perform startup again.

Subfault: 16.10 Description: Actual position source not assigned	
Response: Application stop + output stage inhibit	
Cause	Measure
Active control mode requires encoder for position mode.	– Assign actual position source in encoder assignment of the active drive train (Index 8565.3 or 8566.3). – If no encoder is installed, activate the FCBs only using "torque control" or "speed control" operating mode.

Subfault: 16.11 Description: Motor data calculation fault	
Response: Output stage inhibit	
Cause	Measure
Motor startup is not possible because of inconsistent motor data or wrong device configuration data.	Check the motor data for plausibility, or contact SEW-EURODRIVE Service.

Subfault: 16.12 Description: Motor data write sequence	
Response: Output stage inhibit	
Cause	Measure
Subindex 1 not written to zero before writing electrical startup parameters (index 8357, 8360, 8394, 8420 or 8358, 8361, 8395, 8421).	Reset fault. Set parameters 8360/1 or 8361/1 to "0" before writing additional parameters.

Subfault: 16.20 Description: Nominal rotational speed too high or nominal frequency too low.	
Response: Output stage inhibit	
Cause	Measure
During startup using nameplate data: Nominal speed too high or nominal frequency too low. The resulting number of pole pairs is 0.	Enter plausible motor data (nominal rotational speed and nominal frequency).

Subfault: 16.21 Description: Nominal slip negative	
Response: Output stage inhibit	
Cause	Measure
During startup using nameplate data, the calculated nominal slip is negative: Nominal frequency too low or nominal speed too high or number of pole pairs too high.	Enter plausible motor data (nominal frequency, nominal rotational speed, number of pole pairs).

Subfault: 16.22 Description: Specify the number of pole pairs	
Response: Output stage inhibit	
Cause	Measure
During startup using nameplate data: It is not possible to calculate the number of pole pairs accurately from nominal frequency and nominal speed.	Enter the number of pole pairs.

Subfault: 16.23 Description: Plausibility check failed.		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data: the estimated nominal power does not match the entered nominal power.	Check entered nameplate data for plausibility.

Subfault: 16.24 Description: Speed controller sampling cycle not possible with current PWM frequency or current control mode		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	At PWM frequency "2.5 kHz", only the speed controller sampling cycle of 2 ms is permitted. For the ELSM® control mode, the only permitted speed controller sampling cycles are 1 ms and 2 ms.	Increase PWM frequency or increase sampling cycle of speed controller to 2 ms. Set the sampling cycle to 1 ms or 2 ms for ELSM® control mode.

Subfault: 16.25 Description: User-defined current limit too low for standstill current.		
	Response: Output stage inhibit	
	Cause	Measure
	User-defined current limit value too small for minimum standstill current.	Increase the user-defined current limit, or disable the standstill current function.

Subfault: 16.26 Description: Nominal values incomplete or implausible		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data: Nominal voltage, nominal current, nominal speed or nominal torque are not entered or not plausible.	Enter or check nominal voltage, nominal current, nominal rotational speed, and nominal torque.

Subfault: 16.27 Description: Maximum current or maximum torque not plausible.		
	Response: Output stage inhibit	
	Cause	Measure
	During startup using nameplate data: Maximum current or maximum torque not entered, or maximum current and maximum torque not plausible.	Check maximum current and maximum torque.

Subfault: 16.30 Description: Faulty EtherCAT® EEPROM configuration status.		
	Response: Warning	
	Cause	Measure
	Faulty EtherCAT®/SBusPLUS EEPROM configuration status. EEPROM not loaded, binary file not loaded.	Contact SEW-EURODRIVE Service.
	Faulty EEPROM loading procedure.	Contact SEW-EURODRIVE Service.
	Faulty EEPROM checksum.	Contact SEW-EURODRIVE Service.

10.5.14 Fault 17 Internal processor fault

Subfault: 17.7 Description: Exception fault		
	Response: Output stage inhibit	
	Cause	Measure
	Exception trap in CPU.	Contact SEW-EURODRIVE Service.

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10.5.15 Fault 18 Software error

Subfault: 18.1 Description: Motor management		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Fault detected at motor management interface.	– Switch the device off and on again. – Contact the SEW-EURODRIVE Service if the fault persists.

Subfault: 18.3 Description: Task system warning		
	Response: Warning	
	Cause	Measure
	A fault was detected during the processing of the internal task system. This can for example be a timeout for cyclic tasks.	– Acknowledge the warning. – Contact SEW-EURODRIVE Service if the warning occurs regularly.

Subfault: 18.4 Description: Task system		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	A fault was detected during the processing of the internal task system. This can for example be a timeout for cyclic tasks.	– Switch the device off and on again. – Contact the SEW-EURODRIVE Service if the fault persists.

Subfault: 18.7 Description: Fatal fault		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	A fatal software error occurred.	– Switch the device off and on again. – If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service.

Subfault: 18.8 Description: Invalid fault code		
	Response: Output stage inhibit	
	Cause	Measure
	Invalid fault code requested.	– Switch the device off and on again. – Contact the SEW-EURODRIVE Service if the fault persists.

Subfault: 18.9 Description: Internal software fault		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The software signals an unexpected event.	– Switch the device off and on again. – If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service.

Subfault: 18.10 Description: Watchdog		
	Response: Output stage inhibit	
	Cause	Measure
	Software no longer operates within intended cycle time.	– Switch the device off and on again. – Contact the SEW-EURODRIVE Service if the fault persists.

Subfault: 18.12 Description: Configuration data		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Configuration data not plausible or cannot be interpreted by active firmware version.	Perform a firmware update or load valid configuration data.

Subfault: 18.13 **Description: Calibration data**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Calibration data not plausible.	Load valid calibration data.

10.5.16 Fault 19 Process data

Subfault: 19.1 **Description: Torque violation**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Specified torque values not plausible.	Adjust torque values.

Subfault: 19.2 **Description: Position setpoint violation**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The position setpoint is outside the software limit switches.	Check the position setpoint.
	The position setpoint is outside the modulo range.	Check the position setpoint.
	Position in user unit generates number overflow in system unit.	Check position in user unit.

Subfault: 19.3 **Description: Rotational speed setpoint violation**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Specified rotational speed setpoints not plausible.	Adjust rotational speed setpoints.

Subfault: 19.4 **Description: Acceleration setpoint violation**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The specified acceleration setpoints are not plausible. Only a value range of >= 0 is permitted.	Adjust acceleration setpoints.

Subfault: 19.5 **Description: Drive function does not exist**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Non-existing drive function (FCB) selected via process data.	Specify an existing FCB number for FCB activation via process data.

Subfault: 19.7 **Description: Referencing missing**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The activated function is permitted only with referenced encoder.	Reference the encoder first, then activate the function.

Subfault: 19.8 **Description: Drive train changeover not allowed**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Drive train changeover requested while output stage is enabled.	Inhibit the output stage before changing to another drive train.

Subfault: 19.9 **Description: Jerk setpoint violation**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Implausible jerk values.	Adjust jerk setpoints.

10.5.17 Fault 20 Device monitoring

Subfault: 20.1
Description: Supply voltage fault

Response: Output stage inhibit
System state: Fault acknowledgment with CPU reset

Cause	Measure
Internal electronics supply voltage or externally connected DC 24 V standby supply voltage outside permitted voltage range.	Check the voltage level of the external DC 24 V standby supply voltage and check for correct port. If required, correct. – Acknowledge the fault. – If fault occurs repeatedly, replace device. For further support, contact SEW-EURODRIVE Service.

Subfault: 20.2
Description: Supply voltage overload

Response: Output stage inhibit

Cause	Measure
For MOVIDRIVE® system, the current load of the current paths of the DC 24 V standby supply voltage inside the device is too high. The device signal output of the device was de-energized because of the fault message.	Identify consumers which are overloading the internal supply voltage: 1. Remove all external consumers: – At the digital outputs of the basic device. - at options that may be present. - at all encoder connections. - at other consumers at the DC 24 V output voltage terminals. 2. Acknowledge fault. 3. Reconnect the consumers with the device, one after the other, until the fault message appears once again. 4. To eliminate the fault, connect a consumer with a lower current consumption or eliminate the short circuit.

Subfault: 20.7
Description: Internal hardware fault

Response: Output stage inhibit

Cause	Measure
Fault detected in device hardware.	– Acknowledge the fault. – If fault occurs repeatedly, replace device. For further support, contact SEW-EURODRIVE Service.

Subfault: 20.8
Description: Fan warning

Response: Warning with self-reset

Cause	Measure
– The function of the fan is impaired.	Check fan for proper functioning.

Subfault: 20.9
Description: Fan fault

Response: Application stop + output stage inhibit

Cause	Measure
Fan defective.	Contact SEW-EURODRIVE Service.

Subfault: 20.10
Description: Fan supply voltage fault

Response: Emergency stop + output stage inhibit

Cause	Measure
Supply voltage of fan missing.	Check the connection or establish a connection.

Subfault: 20.11
Description: STO – switching delay

Response: Output stage inhibit

Cause	Measure
Switching delay between STO signals F-STO_P1 and F-STO_P2.	– Check STO wiring. – Check the STO wiring before acknowledging the fault, make sure that both STO signals are switched to low level.

10.5.18 Fault 23 Power section

Subfault: 23.1
Description: Warning

Response: Warning with self-reset

Cause	Measure
Power section fault with fault response of the type "warning".	See also "power section subcomponent" fault status.

Subfault: 23.2
Description: Error

Response: Emergency stop + output stage inhibit

Cause	Measure
Power section fault with fault response of the type "standard".	See also "power section subcomponent" fault status.

Subfault: 23.3
Description: Critical fault

Response: Output stage inhibit

Cause	Measure
Power section fault with fault response of the type "critical fault".	See also "power section subcomponent" fault status.

Subfault: 23.4
Description: Hardware fault

Response: Output stage inhibit

Cause	Measure
A fault occurred in a hardware component of the power section, e.g.: Overcurrent hardware comparator.	– Check current supply. – Increase ramp time. – Check for correct motor size (the motor current is too high). – Contact SEW-EURODRIVE Service.
Switched-mode power supply fault, hardware fault.	– Check current supply. – Check the DC 24 V supply voltage.
Fault at the gate driver of an IGBT.	Defect in the power output stage. Contact SEW-EURODRIVE Service.
Invalid process data configuration. Status of control section and power section are not compatible.	Contact SEW-EURODRIVE Service.

Subfault: 23.5
Description: Invalid process data configuration

Response: Output stage inhibit

Cause	Measure
Invalid process data configuration.	Contact SEW-EURODRIVE Service.

Subfault: 23.6
Description: Process data timeout

Response: Emergency stop + output stage inhibit

Cause	Measure
The power section communication interface has detected a process data timeout.	If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Subfault: 23.7
Description: Parameter communication timeout

Response: Emergency stop + output stage inhibit

Cause	Measure
Power section communication interface detected timeout in parameter communication.	If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Subfault: 23.8
Description: Parameter communication fault

Response: Emergency stop + output stage inhibit

Cause	Measure
The power section communication interface detected an error in the parameter communication.	If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

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10.5.19 Fault 24 Cam switch

Subfault: 24.1 Description: Cam window limits interchanged		
	Response: Warning	
	Cause	Measure
	Left cam window limit larger than right limit.	Check cam window limits and adjust.

Subfault: 24.2 Description: Cam window limit not within modulo range		
	Response: Warning	
	Cause	Measure
	Cam window limits outside modulo range.	Check cam window limits and adjust.

Subfault: 24.3 Description: Cam windows of a track overlap.		
	Response: Warning	
	Cause	Measure
	Cam window limits of a track overlap.	Adjust the cam window limits in such a way that they are flush.

10.5.20 Fault 25 Parameter memory monitoring

Subfault: 25.2 Description: NV memory — runtime fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error of non-volatile memory system.	– Reset the device. If this occurs repeatedly, replace device. Contact SEW-EURODRIVE Service.

Subfault: 25.6 Description: NV memory – incompatible data		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Incompatible data detected while reading non-volatile memory.	The data on the (mobile) non-volatile memory might have been formatted for another device. You can rectify the fault by re-formatting the data (basic initialization).

Subfault: 25.7 Description: NV memory initialization – fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Error while initializing non-volatile memory system.	– Reset the device. If this occurs repeatedly, replace device. Contact SEW-EURODRIVE Service.

Subfault: 25.10 Description: Power section configuration data – version conflict		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Wrong version of configuration data of power section.	Contact SEW-EURODRIVE Service.

Subfault: 25.12 Description: Power section configuration data – CRC fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Faulty configuration data of power section.	Contact SEW-EURODRIVE Service.

Subfault: 25.13 Description: Configuration data of control electronics – CRC fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Faulty configuration data of the control electronics.	Contact SEW-EURODRIVE Service.

Subfault: 25.14 Description: Calibration data of power section – version conflict		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Wrong version of calibration data of the power section.	Contact SEW-EURODRIVE Service.

Subfault: 25.15 Description: Calibration data of control electronics – version conflict		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Wrong version of calibration data of control electronics.	Contact SEW-EURODRIVE Service.

Subfault: 25.16 Description: Power section calibration data – CRC fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Faulty calibration data of the power section.	Contact SEW-EURODRIVE Service.

Subfault: 25.17 Description: Control electronics calibration data – CRC fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Faulty calibration data of control electronics.	Contact SEW-EURODRIVE Service.

Subfault: 25.18 Description: QA data power section – CRC fault		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of the power section.	Contact SEW-EURODRIVE Service.

Subfault: 25.19 Description: QA data control electronics – CRC fault		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of the control electronics.	Contact SEW-EURODRIVE Service.

Subfault: 25.20 Description: Initialization fault – basic device memory		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Initialization fault of basic device memory.	Contact SEW-EURODRIVE Service.

Subfault: 25.21 Description: Runtime fault – basic device memory		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime fault in basic device memory.	Contact SEW-EURODRIVE Service.

Subfault: 25.30 Description: Initialization fault – replaceable memory module		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Initialization fault of replaceable memory module.	Contact SEW-EURODRIVE Service.

Subfault: 25.31 Description: Runtime fault – replaceable memory module		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Runtime fault of the replaceable memory module.	Contact SEW-EURODRIVE Service.

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Subfault: 25.50 Description: Runtime fault – replaceable safety memory module		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Runtime fault of the replaceable safety memory module.	Contact SEW-EURODRIVE Service.

Subfault: 25.51 Description: Initialization fault – replaceable safety memory module		
	Response: Warning	
	Cause	Measure
	Initialization fault of replaceable safety memory module.	Contact SEW-EURODRIVE Service.

Subfault: 25.61 Description: Fault – restore point		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Restore point could not be created.	Delete restore point.

Subfault: 25.70 Description: NV memory – incompatible option card configuration		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Incompatible option card configuration detected. The current configuration of the option card does not match the state of the stored startup. An option card that was installed during startup has been removed, for example.	– Restore initial option setup. – Acknowledge changed configuration in MOVISUITE®: Diagnostics/Status/Fault status/Reset = "With parameter acceptance". Reset the device to delivery state in MOVISUITE®: Setup/reset device parameters/delivery state = "Yes".

10.5.21 Fault 26 External fault

Subfault: 26.1 Description: Terminal		
	Response: External fault	
	Cause	Measure
	Fault message via external fault source.	Programmable via 8622.5 (Default: Application stop (+ES)).

Subfault: 26.2 Description: Emergency shutdown		
	Response: Output stage inhibit	
	Cause	Measure
	Another module bus station has requested external emergency shutdown.	Check other module bus stations for faults.

Subfault: 26.3 Description: Power section emergency shutdown		
	Response: Output stage inhibit	
	Cause	Measure
	Power section requested external emergency shutdown.	The power section has detected a critical fault.

Subfault: 26.4 Description: External braking resistor fault		
	Response: Response to external braking resistor fault	
	Cause	Measure
	External braking resistor's temperature switch connected to terminal tripped.	– Check the resistor mounting position. – Clean the resistor. – Check the project planning of the resistor. – Install a larger resistor. – Check the trip switch settings. – Optimize travel cycle so that less regenerative operation energy arises.

10.5.22 Fault 28 FCB drive functions

Subfault: 28.1
Description: FCB 12 – Timeout while searching zero pulse

Response: Emergency stop + output stage inhibit

Cause	Measure
Failed to find the zero pulse of the encoder's C track within the specified search time during reference travel.	Check encoder wiring.

Subfault: 28.2
Description: FCB 12 – Hardware limit switch before reference cam

Response: Emergency stop + output stage inhibit

Cause	Measure
The hardware limit switch was reached during reference travel. The reference cam was not detected.	Make sure that the reference cam is not installed behind the hardware limit switch.

Subfault: 28.3
Description: FCB 12 – Hardware limit switch and reference cam not flush

Response: Emergency stop + output stage inhibit

Cause	Measure
Hardware limit switch and reference cam are not mounted flush with one another.	Make sure that reference cam and hardware limit switch are installed so they overlap.

Subfault: 28.4
Description: FCB 12 – Reference offset fault

Response: Emergency stop + output stage inhibit

Cause	Measure
– An error occurred while determining the reference offset.	– Make sure that the reference offset is not set to a larger value than the "Modulo maximum" limit value. When using a single-turn absolute encoder, make sure that the reference offset is not set to a larger value than one encoder revolution.

Subfault: 28.5
Description: FCB 12 – Referencing not possible

Response: Emergency stop + output stage inhibit

Cause	Measure
In the active drive train, the "Actual position source" parameter is set to "No encoder".	Assign "Actual position source", or do not perform referencing.

Subfault: 28.6
Description: FCB 12 – Limit switch/reference cam not flush/overlapping with fixed stop

Response: Emergency stop + output stage inhibit

Cause	Measure
Hardware limit switch or reference cam that has not been selected was hit during reference travel to fixed stop.	Check whether the parameters set for reference travel are correct.
During reference travel to fixed stop with selected hardware limit switch or reference cam, the fixed stop has been reached without hitting the hardware limit switch or reference cam.	Check whether the parameters set for reference travel are correct.

Subfault: 28.7
Description: FCB 21 – Test torque greater than maximum torque at motor shaft

Response: Output stage inhibit

Cause	Measure
The required test torque for the brake test is higher than the maximum torque. It cannot be generated by the motor/inverter combination.	Reduce the test torque.

Subfault: 28.8
Description: FCB 21 – Test torque not reached

Response: Output stage inhibit

Cause	Measure
Test torque required for brake test exceeds valid limit values.	– Reduce the test torque. – Check limit values.

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Subfault: 28.9 Description: FCB 18 – Rotor position identification not possible		
	Response: Output stage inhibit	
	Cause	Measure
	– Rotor position identification was started with an incremental encoder but was aborted prematurely.	– Restart the rotor position identification. – Check whether the encoder is connected correctly. – Check whether encoder is defective.
	Result of rotor position identification cannot be stored in encoder.	Select "inverter" as storage location.
	The combination of "Automatic" operating mode and "Encoder" storage location is not permitted.	Set the operating mode to "Manual" or the storage location to "Inverter".

Subfault: 28.10 Description: FCB 25 – Asymmetrical motor phases		
	Response: Output stage inhibit	
	Cause	Measure
	When measuring stator resistances, significantly different values were determined in the 3 phases.	– Check whether the motor is connected correctly. – Check all contact points on the motor and inverter. – Check the motor and motor cable for damage.

Subfault: 28.11 Description: FCB 25 – At least one phase with high resistance		
	Response: Output stage inhibit	
	Cause	Measure
	– At least one motor phase could not be measured during motor parameter measurement.	– Check whether the motor is connected correctly. – Check all contact points on the motor and inverter. – Check the motor and motor cable for damage.

Subfault: 28.12 Description: FCB 25 – Timeout during stator resistance measurement		
	Response: Output stage inhibit	
	Cause	Measure
	Motor parameter measurement was activated while motor is turning.	– Stop motor. – Start motor parameter measurement when the motor is at standstill.

Subfault: 28.13 Description: FCB 25 – Characteristic curve identification not possible		
	Response: Output stage inhibit	
	Cause	Measure
	Motor parameter measurement does not allow for unique identification of the characteristic curve.	Contact SEW-EURODRIVE Service.

Subfault: 28.14 Description: Modulo min. and max. swapped		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	In active data set, value for "Modulo minimum" is greater than value for "Modulo maximum", see Monitoring functions\Limit values 1 or Monitoring functions\Limit values 2.	Swap the values for modulo minimum and modulo maximum.

10.5.23 Fault 29 HW limit switch

Subfault: 29.1 Description: Positive limit switch hit		
	Response: HW limit switches – current drive train	
	Cause	Measure
	Positive hardware limit switch hit.	– Check hardware limit switch wiring. – Check target position. – Move clear of hardware limit switch with negative speed.

Subfault: 29.2 Description: Negative limit switch hit		
	Response: HW limit switches – current drive train	
	Cause	Measure
	Negative hardware limit switch hit.	– Check hardware limit switch wiring. – Check target position. – Move clear of hardware limit switch with positive speed.

Subfault: 29.3 Description: Limit switch missing		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Both hardware limit switches (positive and negative) were hit at the same time.	– Check hardware limit switch wiring. – Check the parameter setting of digital inputs. – Check the parameter setting of PO data.

Subfault: 29.4 Description: Limit switches reversed		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The positive hardware limit switch was hit at negative speed, or the negative hardware limit switch was hit at positive speed.	Check whether hardware limit switch connections are swapped.

10.5.24 Fault 30 software limit switch

Subfault: 30.1 Description: Positive limit switch hit		
	Response: SW limit switches – current drive train	
	Cause	Measure
	Positive software limit switch hit.	– Check software limit switch position. – Check target position. – Move clear of software limit switch with negative speed.

Subfault: 30.2 Description: Negative limit switch hit		
	Response: SW limit switches – current drive train	
	Cause	Measure
	– Negative software limit switch hit.	– Check software limit switch position. – Check target position. – Move clear of software limit switch with positive speed.

Subfault: 30.3 Description: Limit switches reversed		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The position value of the negative software limit switch is greater than the position value of the positive software limit switch.	Check software limit switch positions.

10.5.25 Fault 31 Thermal motor protection

Subfault: 31.1 Description: Wire break temperature sensor – motor 1		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The connection to the temperature sensor of motor 1 has been interrupted.	Check temperature sensor wiring.

Subfault: 31.2 Description: Temperature sensor short circuit – motor 1		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Short circuit in connection to temperature sensor of motor 1.	Check temperature sensor wiring.

Subfault: 31.3 Description: Temperature sensor overtemperature – motor 1		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature sensor of motor 1 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. - Check whether the correct temperature sensor KY (KTY) has been parameterized instead of PK (PT1000).

Subfault: 31.4 Description: Temperature model overtemperature – motor 1		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature model of motor 1 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. - Check whether the correct temperature sensor KY (KTY) has been parameterized instead of PK (PT1000).

Subfault: 31.5 Description: Temperature sensor prewarning – motor 1		
	Response: Thermal motor protection 1 – prewarning threshold	
	Cause	Measure
	The temperature reported by the temperature sensor of motor 1 exceeds the prewarning threshold.	– Check for motor overload.

Subfault: 31.6 Description: Temperature model prewarning – motor 1		
	Response: Thermal motor protection 1 – prewarning threshold	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 1 exceeds prewarning threshold.	– Check for motor overload.

Subfault: 31.7 Description: UL temperature monitoring		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature model of the active motor reports overtemperature.	Check for motor overload.

Subfault: 31.9 Description: Temperature too low – temperature sensor – motor 1		
	Response: Warning with self-reset	
	Cause	Measure
	The temperature reported by the temperature sensor of motor 1 is below -50 °C.	– Check if a KTY temperature sensor is installed in the motor but the parameterization has been carried out for a PT1000 temperature sensor. – Heat the motor.

Subfault: 31.11 Description: Wire break temperature sensor – motor 2		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The connection to the temperature sensor of motor 2 has been interrupted.	Check temperature sensor wiring.

Subfault: 31.12 Description: Temperature sensor short circuit – motor 2		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Short circuit in connection to temperature sensor of motor 2.	Check temperature sensor wiring.

Subfault: 31.13 **Description: Temperature sensor overtemperature – motor 2**		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature sensor of motor 2 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. - Check whether the correct temperature sensor KY (KTY) has been parameterized instead of PK (PT1000).

Subfault: 31.14 **Description: Temperature model overtemperature – motor 2**		
	Response: Output stage inhibit	
	Cause	Measure
	Temperature model of motor 2 signals overtemperature.	– Allow motor to cool down. – Check for motor overload. - Check whether the correct temperature sensor KY (KTY) has been parameterized instead of PK (PT1000).

Subfault: 31.15 **Description: Temperature sensor prewarning – motor 2**		
	Response: Thermal motor protection 2 – prewarning threshold	
	Cause	Measure
	The temperature reported by the temperature sensor of motor 2 exceeds the prewarning threshold.	– Check for motor overload.

Subfault: 31.16 **Description: Temperature model prewarning – motor 2**		
	Response: Thermal motor protection 2 – prewarning threshold	
	Cause	Measure
	Temperature signaled by temperature sensor of motor 2 exceeds prewarning threshold.	– Check for motor overload.

Subfault: 31.19 **Description: Temperature too low – temperature sensor – motor 2**		
	Response: Warning with self-reset	
	Cause	Measure
	The temperature reported by the temperature sensor of motor 2 is below -50 °C.	– Check if a KTY temperature sensor is installed in the motor but the parameterization has been carried out for a PT1000 temperature sensor. – Heat the motor.

10.5.26 Fault 32 Communication

Subfault: 32.2 **Description: EtherCAT®/SBusPLUS process data timeout**		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Process data timeout during EtherCAT®/SBusPLUS communication.	– Check the wiring of the system bus and module bus. – Check that the EtherCAT®/SBusPLUS configuration is correctly set in the MOVI-C® CONTROLLER. – Check EtherCAT®/SBusPLUS timeout configuration in the device.

Subfault: 32.3 **Description: Faulty synchronization signal**		
	Response: External synchronization	
	Cause	Measure
	Faulty synchronization signal period.	Check that the EtherCAT®/SBusPLUS configuration is correctly set in the MOVI-C® CONTROLLER.

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Subfault: 32.4 Description: No synchronization signal	
Response: External synchronization	
Cause	Measure
No synchronization signal present.	Check that the EtherCAT®/SBusPLUS configuration is correctly set in the MOVI-C® CONTROLLER.

Subfault: 32.5 Description: Synchronization timeout	
Response: External synchronization	
Cause	Measure
Timeout while synchronizing to synchronization signal.	Check that the EtherCAT®/SBusPLUS configuration is correctly set in the MOVI-C® CONTROLLER.

Subfault: 32.6 Description: Copy parameter set	
Response: Output stage inhibit	
Cause	Measure
Fault while downloading the parameter set into the device.	– Check the wiring of the system bus and module bus. – Restart download.

Subfault: 32.7 Description: Application heartbeat timeout	
Response: Application heartbeat – timeout response	
Cause	Measure
The communication between IEC program in the MOVI-C® CONTROLLER and device has been interrupted.	– Check status of the IEC program. – Restart IEC program.

Subfault: 32.12 Description: Manual mode timeout	
Response: Manual mode – timeout response	
Cause	Measure
Communication connection to device interrupted in manual mode.	– Check whether too many programs are open on the operator PC. – Increase the timeout time in manual mode.
New Scope project created.	– Reset fault. – Restart manual operation.
Scope measurement loaded from device.	– Reset fault. – Restart manual operation.

10.5.27 Fault 33 System initialization

Subfault: 33.1 Description: Motor current measurement	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
– Motor current measurement has detected a fault.	Contact SEW-EURODRIVE Service.

Subfault: 33.2 Description: Firmware CRC check	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
Fault detected while checking the firmware.	Contact SEW-EURODRIVE Service.

Subfault: 33.6 Description: FPGA configuration	
Response: Output stage inhibit	
Cause	Measure
Fault detected while checking FPGA configuration.	Contact SEW-EURODRIVE Service.

Subfault: 33.7 Description: Function block compatibility fault		
	Response: Output stage inhibit	
	Cause	Measure
	Fault detected while checking the compatibility of the function block.	Contact SEW-EURODRIVE Service.

Subfault: 33.8 Description: SW function block configuration		
	Response: Output stage inhibit	
	Cause	Measure
	Fault detected while checking the configuration of the software function block.	Contact SEW-EURODRIVE Service.

Subfault: 33.10 Description: Boot timeout		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Timeout during system boot.	Contact SEW-EURODRIVE Service.

Subfault: 33.11 Description: Hardware compatibility fault		
	Response: Output stage inhibit	
	Cause	Measure
	The firmware does not match the device.	Contact SEW-EURODRIVE Service.

Subfault: 33.12 Description: Memory module plugged		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	A plugged in memory module was detected during device start. The setting for the device parameter source is set to "Internal memory".	– Switch off the device. Remove the memory module and restart the device. – Change the parameter "Non-volatile memory source" to "Arbitrary" or "Replaceable memory module". Switch the device off and on again.

Subfault: 33.13 Description: Memory module removed		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The device was started without a memory module. The setting for the device parameter source is set to "Replaceable memory module".	Switch off the device. Insert the memory module and restart the device.
	The replaceable memory module was removed during ongoing operation.	Change parameter "Non-volatile memory source" to "Internal memory". Switch the device off and on again.

10.5.28 Fault 34 Process data configuration

Subfault: 34.1 Description: Process data configuration change		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The configuration of process data was changed during active process data operation.	– Stop the process data and make your changes. Then start the process data again. – Perform a reset. Doing so will stop the process data, apply the changes, and restart the process data.

10.5.29 Fault 35 Function activation

Subfault: 35.1
Description: Invalid TAN

Response: Emergency stop + output stage inhibit

Cause	Measure
Incorrect TAN entered.	Enter TAN again.
The TAN was not created for this device.	Check the TAN.
When using a double axis, the TAN was generated for the wrong subaddress in the device.	Enter a TAN for the assigned subaddress.

Subfault: 35.2
Description: Application requires a higher license

Response: Emergency stop + output stage inhibit

Cause	Measure
Activated application module requires higher license.	Enter a TAN for higher application activation.

Subfault: 35.3
Description: Technology activation missing

Response: Emergency stop + output stage inhibit

Cause	Measure
An activated technology function requires a technology activation that is not available.	– Enter a TAN to activate the required technology function. – Activate technology function that can be operated with the current technology activation.

Subfault: 35.4
Description: Technology activation for wrong device variant

Response: Emergency stop + output stage inhibit

Cause	Measure
This device does not support the technology activation included in this TAN.	– Enable a technology function that is supported by this device. – Use a device that supports the required technology function.

10.5.30 Fault 42 Lag fault

Subfault: 42.1
Description: Positioning lag fault

Response: Positioning lag fault

Cause	Measure
A lag fault occurred during positioning. Incorrect encoder connection.	Check the encoder connection.
Position encoder inverted or not installed correctly at the track.	Check the installation and connection of the position encoder.
Wiring faulty.	Check wiring of encoder, motor, and line phases.
Acceleration ramps too short.	Extend acceleration ramps.
P component of position controller too small.	Set P component of position controller to a larger value.
Incorrectly set speed controller parameters.	Check controller parameters.
Value of lag fault tolerance too small.	Increase lag fault tolerance.
Mechanical components cannot move freely or are blocked.	Make sure mechanical parts can move freely, check whether they are blocked.

Subfault: 42.2 Description: Jog mode lag fault		
	Response: Output stage inhibit	
	Cause	Measure
	A lag fault occurred in jog mode (FCB 20). Incorrect encoder connection.	Check the encoder connection.
	Position encoder inverted or not installed correctly at the track.	Check the installation and connection of the position encoder.
	Wiring faulty.	Check wiring of encoder, motor, and line phases.
	Acceleration ramps too short.	Extend acceleration ramps.
	P component of position controller too small.	Set P component of position controller to a larger value.
	Incorrectly set speed controller parameters.	Check controller parameters.
	Value of lag fault tolerance too small.	Increase lag fault tolerance.
	Mechanical components cannot move freely or are blocked.	Make sure mechanical parts can move freely, check whether they are blocked.

Subfault: 42.3 Description: Standard lag fault		
	Response: Output stage inhibit	
	Cause	Measure
	A lag fault has occurred outside a positioning process. Incorrect encoder connection.	Check the encoder connection.
	Position encoder inverted or not installed correctly at the track.	Check the installation and connection of the position encoder.
	Wiring faulty.	Check wiring of encoder, motor, and line phases.
	Acceleration ramps too short.	Extend acceleration ramps.
	P component of position controller too small.	Set P component of position controller to a larger value.
	Incorrectly set speed controller parameters.	Check controller parameters.
	Value of lag fault tolerance too small.	Increase lag fault tolerance.

10.5.31 Fault 46 Safety card

Subfault: 46.1 Description: Not accessible		
	Response: Output stage inhibit	
	Cause	Measure
	Failed to synchronize with subcomponent.	– Check device assignment of basic device and option. – Check card slot and installation and correct if necessary. – Restart the device. – Contact SEW-EURODRIVE Service.

Subfault: 46.2 Description: Invalid variant		
	Response: Output stage inhibit	
	Cause	Measure
	Plugged safety card design does not match inverter type.	– Remove safety card. – Use the correct safety card design.
	For double axes, only variants without encoder interface can be used.	– Remove option. – Use the design without encoder interface.
	For double axes, no encoder option must be plugged in.	Remove safety card.

Subfault: 46.3 Description: Internal communication timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Communication interrupted between inverter and safety card.	Check card slot and installation and correct if necessary. Contact the SEW-EURODRIVE Service if the error is still present.
	Safety card reports subcomponent fault of the type "warning".	Check card slot and installation and correct if necessary. Contact the SEW-EURODRIVE Service if the error is still present.

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Subfault: 46.50 Description: Warning		
	Response: Warning with self-reset	
	Cause	Measure
	Safety card reports subcomponent fault of the type "warning".	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).

Subfault: 46.51 Description: Error		
	Response: Emergency stop + output stage inhibit with self reset	
	Cause	Measure
	Safety card reports subcomponent fault of the type "standard fault".	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).

Subfault: 46.52 Description: Critical fault		
	Response: Output stage inhibit with self-reset	
	Cause	Measure
	Safety card reports subcomponent fault of the type "critical fault".	– For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3). – If the jumper plug is plugged at terminal "X6", remove the jumper plug.

10.5.32 Fault 47 Supply unit

Subfault: 47.1 Description: Supply unit – warning		
	Response: Warning with self-reset	
	Cause	Measure
	The supply unit signals a fault with response type "warning". The fault is only displayed.	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).

Subfault: 47.2 Description: Supply unit – standard fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The supply unit signals a fault with response type "standard". The fault response is determined by the driver implemented on the axis. The axis performs the fault response.	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).

Subfault: 47.3 Description: Supply unit – critical fault		
	Response: Output stage inhibit	
	Cause	Measure
	The supply unit signals a fault with response type "critical error". The fault response is determined by the driver implemented on the axis. The axis performs the fault response.	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent (index 8365.3).

10.5.33 Fault 48 Module bus

Subfault: 48.1 Description: Incompatible		
	Response: Output stage inhibit	
	Cause	Measure
	Module bus slave and module bus master not compatible.	Update the firmware of the module bus at the supply unit or the axis module to a compatible version.

Subfault: 48.2 **Description: Timeout**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Timeout detected by module bus.	Check cable connections and voltage supply of module bus stations.

10.5.34 Fault 50 I/O card

Subfault: 50.1 **Description: Boot synchronization timeout**		
	Response: Output stage inhibit	
	Cause	Measure
	Card plugged in device but cannot be accessed.	– Check device assignment of basic device and option. – Check card slot and installation and correct if necessary. – Restart device.

Subfault: 50.2 **Description: CRC error of FPGA driver**		
	Response: Output stage inhibit	
	Cause	Measure
	Communication between FPGA and option card does not work, or is interrupted.	– Check card slot and installation and correct if necessary. – Check for EMC-compliant installation. – Restart device.

Subfault: 50.3 **Description: CRC fault of option card**		
	Response: Output stage inhibit	
	Cause	Measure
	Option card signals CRC error on SPI bus.	– Check card slot and installation and correct if necessary. – Check for EMC-compliant installation. – Restart device.

Subfault: 50.4 **Description: Option card timeout error**		
	Response: Output stage inhibit	
	Cause	Measure
	Option card signals timeout error on SPI bus.	– Check card slot and installation and correct if necessary. – Check for EMC-compliant installation. – Restart device.

Subfault: 50.5 **Description: Watchdog error of option card**		
	Response: Output stage inhibit	
	Cause	Measure
	Micro controller of the option card signals a watchdog error.	– Check card slot and installation and correct if necessary. – Check for EMC-compliant installation. – Restart device.

Subfault: 50.6 **Description: Ready signal timeout**		
	Response: Output stage inhibit	
	Cause	Measure
	Card booted but cyclic communication not possible.	– Check card slot and installation and correct if necessary. – Check for EMC-compliant installation. – Restart device.

Subfault: 50.7 **Description: Frame error of option card**		
	Response: Output stage inhibit	
	Cause	Measure
	Faulty communication between option card and basic device.	–

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10.5.35 Fault 51 Analog processing

Subfault: 51.1 Description: Analog current input 4 mA limit		
	Response: Warning with self-reset	
	Cause	Measure
	Input current below 4 mA.	Check input current.

10.5.36 Fault 52 Explosion protection category 2 function

Subfault: 52.1 Description: Startup fault		
	Response: Output stage inhibit	
	Cause	Measure
	No valid startup available.	Perform startup.

Subfault: 52.2 Description: Illegal system function		
	Response: Output stage inhibit	
	Cause	Measure
	Illegal system function activated.	Disable impermissible functions when Ex protection function is active, such as "Activate standstill current" = "On" in the active control mode.

Subfault: 52.3 Description: Inverter too large		
	Response: Output stage inhibit	
	Cause	Measure
	Ratio of inverter current and nominal motor current too large.	– Check the assignment of motor and inverter. – Check the dimensioning of the system.

Subfault: 52.4 Description: Parameterization of current limit characteristic		
	Response: Output stage inhibit	
	Cause	Measure
	Fault detected during parameterization of the current limit characteristic.	- Parameterize the current limit characteristic. - Perform startup again.

Subfault: 52.5 Description: Time duration exceeded f < 5 Hz		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Duration of 60 s for f < 5 Hz exceeded.	Check the dimensioning of the system: If speed control = FCB05, increase the speed. If speed = 0, inhibit output stage / with stop FCBs, activate the brake function if a brake is installed.

10.6 Fault at the master module UHX45A/MDM90A

Description: The master module is not connected to voltage, all LEDs are extinguished.		
	Response:	
	Cause	Measure
	The fuse of the master module has tripped.	The UHX45 module must be replaced. Contact the SEW-EURODRIVE Service.

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10.7 Responses to error acknowledgement

10.7.1 Error acknowledgement at the power supply module

faults that are detected and displayed at the power supply module are acknowledged by switching off the fault source. The fault messages of the power supply module are transferred to the axis modules.

10.7.2 Error acknowledgement at the axis modules

During fault acknowledgement, the final fault status determines which reset type will be executed, see following table.

Software reset

Response	Effect
System restart with start of the CPU	Behavior equal to device start
	Reference is lost
	Fieldbus interface is restarted
	EtherCAT®/SBus^{PLUS} is restarted
	The active "fault message" is reset (digital output = 1, system status = 0).

Software restart

A software restart is **no** real reset of the micro controller.

Response	Effect
Software restart	The firmware will be restarted, without the boot loader becoming active (no display "b0"!).
	Reference positions of incremental encoder systems will be lost.
	Any existing fieldbus interfaces are not affected.
	The interface between options and firmware system is initialized again. A new boot synchronization to the fieldbus or control option takes place.
	The active "fault message" is reset (digital output = 1, system status = 0).

The ready signal is set again depending on the system state after the reset by the system state control.

Warm start

A warm start only resets the fault code.

Response	Effect
Warm start	The firmware system is not rebooted.
	All reference positions will be maintained.
	Communication is not interrupted.
	The active "fault message" is reset (digital output = 1, system status = 0).

Fieldbus timeout

After manual reset of a fault, the fault message is deleted. The system changes to the state "Waiting for data".

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10.8 Fault responses

10.8.1 Default – fault response

Fault response	Description
No response	The inverter ignores the event
Warning with self-reset	The inverter sends a warning message with self-reset. The fault is automatically reset after the cause of fault is eliminated.
Warning	The inverter issues a warning message.
Application stop (with output stage inhibit)	The inverter stops with the deceleration set for the application limit. Parameter set 1 Index 8375.0-13 Parameter set 2 Index 8375.8-13 For n=0: Brake "applied" and output stage "off".
Application stop (with output stage inhibit) with self reset	
Emergency stop (with output stage inhibit)	The inverter stops with the set emergency stop deceleration. Parameter set 1 Index 8375.0-20 Parameter set 2 Index 8375.8-20
Emergency stop (with output stage inhibit) with self-reset	
Inhibit output stage with self reset	The output stage is deactivated and the brake is applied.
Inhibit output stage	

Self-reset means: Eliminating the cause of the fault acknowledges the fault. The inverter automatically resumes the operation performed before the fault. The drive restarts automatically.

10.8.2 Parameterizable faults

Parameterizable faults	Description	Index no.	Possible fault response
Manual mode – timeout response	This parameter is used to set the response to a bus timeout during manual mode.	8504.3	• Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Heat sink overtemperature – prewarning	Here, you can set the device response when the prewarning threshold for heat sink utilization is exceeded (index 8336.1).	8622.2	• No response • Warning
Positioning lag fault	This parameter is used to set the device response to a lag error (lag error window exceeded, index 8509.4).	8622.3	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Line phase failure	This parameter is used to set the device response to a line phase failure (values below threshold defined by the user, index 8351.5).	8622.4	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
External fault	This parameter is used to set the device response to an external fault (e.g. triggered by terminal or control word).	8622.5	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage

Parameterizable faults	Description	Index no.	Possible fault response
Fieldbus – timeout	This parameter is used to set the device response to an EtherCAT®/SBus^{PLUS} timeout (timeout time, index 8455.3).	8622.6	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage • Warning with self reset • Application stop (with output stage inhibit) with self reset • Emergency stop (with output stage inhibit) with self reset • Inhibit output stage with self reset
External synchronization	This parameter is used to set the device response to loss of external synchronization.	8622.7	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage • Warning with self reset • Application stop (with output stage inhibit) with self reset • Emergency stop (with output stage inhibit) with self reset • Inhibit output stage with self reset
Motor temperature prewarning – current parameter set	Motor temperature active parameter set – prewarning.	8622.8	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Electromechanical utilization – prewarning	This parameter is used to set the device response to an exceeded prewarning threshold for electromechanical utilization (index 8336.2).	8622.10	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
HW limit switches – current parameter set		8622.11	• No response • Emergency stop (with output stage inhibit) • Emergency stop (with output stage inhibit) with self reset
SW limit switches – current parameter set		8622.12	• No response • Emergency stop (with output stage inhibit) • Emergency stop (with output stage inhibit) with self reset
Encoder – warning	This parameter is used to set the device response to an encoder warning.	8622.13	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Encoder – fault	This parameter is used to set the device response to an encoder fault.	8622.14	• Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Additional encoder	This parameter is used to set the device response to a fault of an encoder that is not used for control (speed or positioning control).	8622.15	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Encoder 1 – latest fault		8622.16	• No response
Encoder 2 – latest fault		8622.17	• No response

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Parameterizable faults	Description	Index no.	Possible fault response
Encoder 1 – latest critical fault		8622.18	• No response • Inhibit output stage
Encoder 2 – latest critical fault		8622.19	• No response • Inhibit output stage
Response to external braking resistor fault	External braking resistor fault	8622.20	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Application heartbeat timeout	This parameter is used to set the device response to a timeout of the application heartbeat.	8622.21	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage

11 Service

11.1 Electronics Service by SEW-EURODRIVE

If you are unable to rectify a fault, contact SEW-EURODRIVE Service. For the addresses, refer to www.sew-eurodrive.com.

When contacting the SEW-EURODRIVE service, always specify the following information so that our service personnel can assist you more effectively:

- Information on the device type 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
- Nature of the fault
- Accompanying circumstances
- Any unusual events preceding the problem

11.2 Extended storage

The following table shows the time intervals and maintenance works that are relevant for extended storage of the application inverter modules.

Modules	Time interval	Maintenance
MDP90A...-C00/0[1]	Every 2 years	Line connections: Connect the device to the line voltage for 5 minutes.
MDP90A.... for extended storage above 40 °C		

1) Power supply module with integrated braking resistor and capacitor

For all modules other than the ones listed, no maintenance is required.

⚠ DANGER

Uncovered power connections.

Severe or fatal injuries from electric shock.

- Install the touch guards at the modules, see chapter "Touch guards" (→ 🗎 246).
- Install the closing covers according to the regulations, see chapter "Touch guards" (→ 🗎 246).
- Never start up the application inverter without installed closed touch guards and closing covers.

11.2.1 Procedure in case maintenance has been neglected

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. After you have completed the regeneration process, the device can be used immediately or stored again.

The following steps are recommended:

AC 400/500 V devices:

- Step 1: 0 V to AC 350 V within a few seconds.
- Step 2: AC 350 V for 15 minutes.
- Step 2: AC 420 V for 15 minutes.
- Step 3: AC 500 V for 1 hour.

11.3 Shutdown

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

⚠ WARNING

Electric shock from capacitors that have not been fully discharged.

Severe or fatal injuries.

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

11.4 Waste disposal

Observe the applicable national regulations.

Dispose of the following materials separately in accordance with the country-specific regulations in force, such as:

- Electronics scrap (circuit boards)
- Plastics
- Sheet metal
- Copper
- Aluminum

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12 Functional safety

12.1 General information

12.1.1 Underlying standards

The safety assessment of the application inverter is based on the following standards and safety classes:

Underlying standards	
Safety class/underlying standard	• Performance level (PL) according to EN ISO 13849-1:2008 • Safety Integrity Level (SIL) according to EN 61800-5-2:2007 • Safety Integrity Level Claim Limit (SIL_{CL}) according to EN 62061:2005/A1:2013

12.2 Integrated Safety Technology

The safety technology of the application inverter described below has been developed and tested in accordance with the following safety requirements:

- Safety Integrity Level 3 according to EN 61800-5-2:2007, EN 61508:2010.
- PL e according to EN ISO 13849-1: 2008.

This was certified by TÜV Rheinland. Copies of the TÜV certificate and the corresponding report are available from SEW-EURODRIVE on request.

12.2.1 Safe condition

For safety-related operation of the application inverter, Safe Torque Off is defined as safe state (see STO drive safety function). The safety concept is based on this definition.

12.2.2 Safety concept

The application inverter is supposed to be able to perform the drive safety function "Safe Torque Off" according to EN 61800-5-2:

- The application inverter is characterized by the optional connection of a safety relay/external safety controller. This external safety controller/safety relay disconnects the safety-related STO input via a 2-pole 24 V switching signal (sourcing/sinking) when a connected command device (e.g. emergency stop button with latching function) is activated. This activates the STO function of the application inverter.
- An internal, dual-channel structure with diagnostics prevents the generation of pulse trains at the power output stage (IGBT).
- Instead of galvanic isolation of the drive from the supply system by means of contactors or switches, the disconnection of the STO input described here safely prevents the control of the power semiconductors in the output stage. The rotary-field generation for the respective motor is deactivated even though the line voltage is still present.
- When the STO drive safety function is activated, the PWM signals generated by the application inverter are interrupted and not transmitted to the IGBTs.

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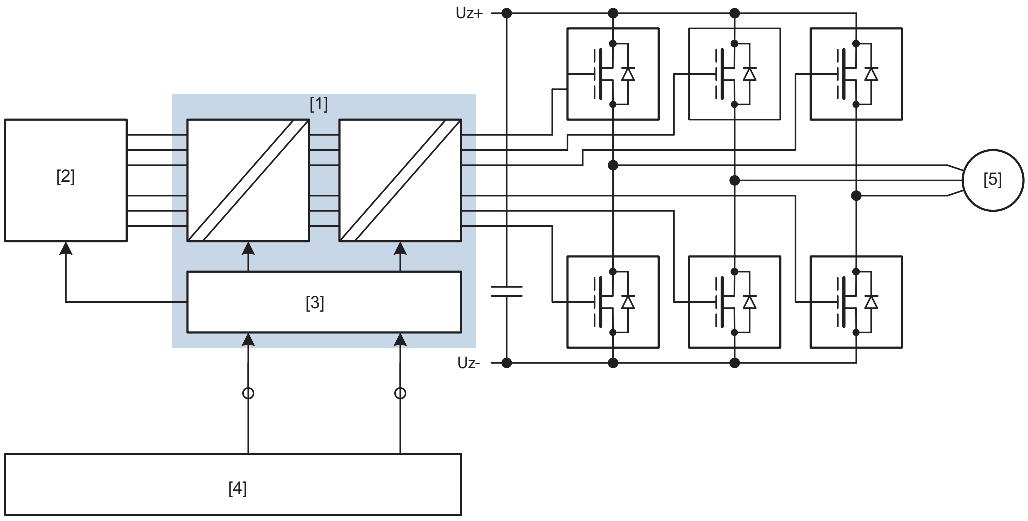
- If the STO function detects a discrepancy between both channels, the PWM signals are inhibited. The inhibit can be revoked by a 24 V reset, or by a device reset if F_STO_P1 and F_STO_P2 are not controlled with 24 V.
- The STO drive safety function can be activated externally e.g. via an external safety device via the STO input.

12.2.3 Schematic representation of the safety concept



9007214467507851

[1] STO function

[2] Drive controller

[3] Diagnostics and inhibiting unit

[4] Safety-related connection

[5] Motor

12.2.4 Drive safety functions

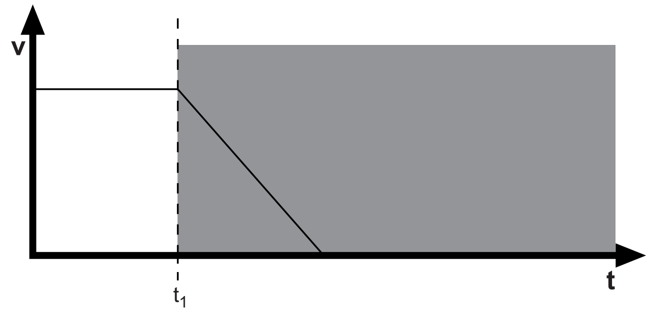
The following drive-related safety functions can be used:

- **STO** (Safe Torque Off according to EN 61800-5-2) by disconnecting the STO input.

  If the STO function is activated, the frequency inverter no longer supplies power to the motor for generating torque. This drive safety function corresponds to a non-controlled stop according to EN 60204-1, stop category 0.

  The STO input must be disabled by a suitable external safety controller/safety relay.

  The following figure shows the STO function:



2463228171

v	Speed
t	Time
t_1	Point of time when STO is triggered
	Disconnection range

- **SS1(c)** (safe stop 1, function variant c according to EN 61800-5-2) by means of suitable external control (e.g. safety relay with delayed disconnection).

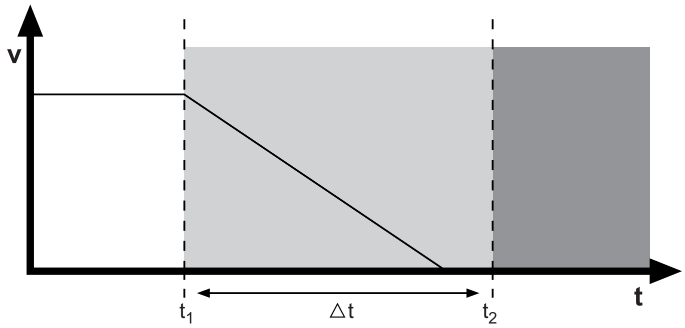
  The following sequence is mandatory:

  – Decelerate the drive using an appropriate brake ramp specified via setpoints.

  – Disconnect the STO input (= triggering the STO function) after a specified safety-related time delay.

  This drive safety function corresponds to a controlled stop according to EN 60204-1, stop category 1.

  The following figure illustrates the SS1(c) function:



2463226251

v	Speed
t	Time

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t_1	Point of time when brake ramp is initiated
t_2	Point of time when STO is triggered
Δt	Delay time until STO is triggered
	Safe time delay range
	Disconnection range

12.2.5 Restrictions

- Note that if the drive does not have a mechanical brake, or if the brake is defective, the drive may coast to a halt (depending on the friction and mass moment of inertia of the system). In case of regenerative loads, or with axes that are loaded with gravitational forces or driven externally, the drive can even accelerate. This must be taken into account in a risk assessment of the system/machine. Additional safety measures might have to be implemented (e.g. safety brake system).

  The application inverter cannot be used without an additional brake system for application-specific drive safety functions that require active deceleration (braking) of the dangerous movement.
- When using the SS1(c) function as described in chapter "Drive safety functions" (→ 🗎 412), the brake ramp of the drive is not monitored with respect to safety. In case of a fault, the drive might not be decelerated after the delay time, or it might be accelerated in the worst case. In this case, the STO function is only activated after the set time delay has passed, see chapter "Drive safety functions" (→ 🗎 412). The resulting danger must be taken into account in the risk assessment of the system/machine. Additional safety measures might have to be implemented.
- The STO function cannot prevent a possible jerk or DC braking.

⚠ WARNING

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

Result

When the STO signal is disconnected, the line voltage is still present at the DC link of the application inverter.

- Before working on the electric part of the drive system, disconnect it from the supply voltage using an appropriate external disconnecting device and secure it against unintentional reconnection to the voltage supply.

⚠ WARNING

Electric shock due to charged capacitors.

Severe or fatal injuries.

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

INFORMATION

In case of safety-related disconnection of the DC 24 V supply voltage at X6 (STO activated), the brake controller is switched off. The brake control in the application inverter is not safety-related.

12.3 Safety Conditions

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

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

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

- Approved devices.
- Installation requirements.
- Requirements on external safety controllers and safety relays.
- Startup requirements.
- Operation requirements.

12.3.1 Approved devices

The following unit variants of MOVIDRIVE® modular are permitted for safety-related applications:

Application inverter	Module	Nominal output current
MOVIDRIVE® modular	Single-axis module	2 – 180 A
	Double-axis module	2 – 8 A

12.3.2 Requirements on the installation

- The components must be protected against conductive dirt, e.g. by installing them in a control cabinet with degree of protection IP54 according to IEC 60529.

  If conductive dirt can be excluded at the installation site, a control cabinet with lower degree of protection is permitted under observance of the applicable standards, e.g. EN 60204-1.

  The same applies to temporary condensation, e.g. due to rapid changes of the ambient temperature.
- The wiring technology used must comply with the standard EN 60204-1.
- The STO control cables must be routed according to EMC guidelines and as follows:
  – Inside an electrical installation space: Individual cores can be routed.
  – Adhere to the regulations in force for the application.
  – The sinking and sourcing cables from the external safety device to the axis must be routed right next to each other with a cable length of ≤ 30 m.
  – The sinking and sourcing cables from the external safety device to the axis must have the same cable length. A difference in length ≤ 3% of the two cables is permitted.
  – The STO control cable must be routed separately to the power lines of the drive.
- The STO function does not detect short circuits or interference voltage in the supply line. This is why you must make sure that:
  – No parasitic voltages can occur in the STO control cables.

    or
  – The external safety controller can detect a crossfault from an external potential to the STO control lines.
- Observe the values specified for safety components when designing the safety circuits.
- The STO signal (F_STO_P1, F_STO_P2, and F_STO_M) may not be used for feedback.
- For safety controller/safety relays, you must only use grounded voltage sources with protective electrical separation (PELV) according to EN 61131-2 and EN 60204-1.
- If several voltage sources are used, each voltage source must be connected to a PE system.
- When planning the installation, observe the technical data of the application inverter.
- Do not use the 24-V-STO_Out of the application inverter for safety-related applications. Voltage is only permitted to supply the connection for safe disconnection X6 with plugged jumper plug.
- For safety-related applications with the application inverter, the jumper plug at the STO input X6 must be removed.

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12.3.3 Requirements on the external safety controller

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

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

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

Application	Safety controller requirements
Performance level d according to EN ISO 13849-1, SIL 2 according to EN 62062	Performance Level d according to EN ISO 13849-1, SIL 2 according to EN 61508
Performance level e according to EN ISO 13849-1, SIL 3 according to EN 62061	Performance level e according to EN ISO 13849-1, SIL 3 according to EN 61508

- The wiring of the safety controller must be suitable for the required safety class, (see manufacturer documentation). The STO input of the application inverter can be switched with 2 poles (sourcing output, sourcing/sinking, or serial sourcing) or with 1 pole (sourcing).
- The values specified for the safety controller must be strictly adhered to when designing the circuit.
- Electro-sensitive protective equipment (such as light grid or scanner) according to EN 61496-1 and emergency stop buttons must not be directly connected to the STO input. The connection must be realized using safety relays, safety controllers etc.
- To ensure protection against unintended restart in accordance with EN 1037, the safe control system must be designed and connected in such a way that resetting the command device alone does not lead to a restart. A restart may only be carried out after a manual reset of the safety circuit.
- If no fault exclusion is used for the STO wiring according to EN ISO 13849-2 or DIN EN 61800-5-2, the external safety device must detect the following faults in the STO wiring within 20 s depending on the connection type:
  - 2-pole sourcing:

    Short circuit of 24 V at F_STO_P1 or F_STO_P2 (Stuck-at 1)

    Crossfault between F_STO_P1 and F_STO_P2
  - 2-pole sourcing/sinking:

    Short circuit of 24 V at F_STO_P1 (Stuck-at 1)

    Short circuit of 0 V at F_STO_M (Stuck-at 0)
  - 2-pole serial sourcing:

    Fault exclusion is mandatory
  - 1-pole sourcing:

    Short circuit of 24 V at F_STO_P (Stuck-at 1)

2-pole sourcing:

- In disconnected state, no switch-on test pulses must occur in the sourcing cables.
- In connected state:

- The switch-off test pulses on both sourcing channels must be switched with a time delay. However, additional switch-off test pulses may occur simultaneously.
- The switch-off test pulses in both sourcing channels must not exceed 1 ms.
- The next switch-off test pulse in one sourcing channel must only occur after a 2 ms time period.
- The signal levels must be played back by the safety controller and compared to the expected value.

2-pole sourcing/sinking:

- In disconnected state, no switch-on test pulses must occur in the sourcing cable.
- In connected state:
  - The switch-off test pulses in the sourcing and sinking channel must not exceed 1 ms.
  - The next switch-off test pulse in the sourcing or sinking channel must only occur after a 2 ms time period.
  - The signal levels must be played back by the safety controller and compared to the expected value.

2-pole serial sourcing:

- Fault exclusion in the connection lead is mandatory if no external test pulses are possible.

1-pole sourcing:

- In disconnected state, no switch-on test pulses must occur in the sourcing cable.
- In connected state:
  - The switch-off test pulse in the sourcing channel must not exceed 1 ms.
  - The next switch-off test pulse may only occur after a time period of 2 ms.
  - The signal levels must be played back by the safety controller and compared to the expected value.

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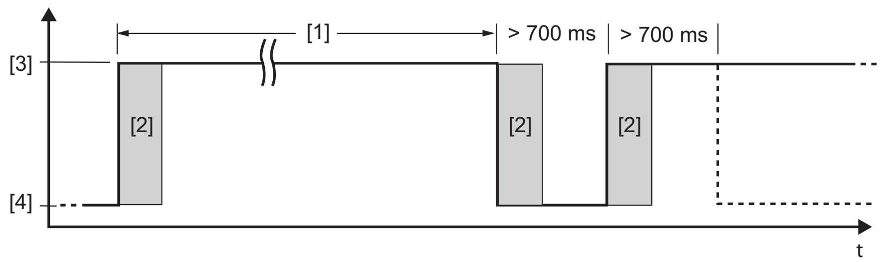
12.3.4 Requirements on startup

- To validate the implemented drive safety functions, they must be documented and checked after successful startup (validation).
- Observe the restrictions for drive safety functions in chapter "Restrictions" for the validation of the safety functions. Non-safety-related parts and components that affect the result of the verification test (e.g. motor brake) must be deactivated, if necessary.
- For using the application inverter in safety-relevant applications, it is essential that you perform and record startup checks for the disconnecting device and correct wiring.

12.3.5 Requirements on operation

- Operation is only allowed within the limits specified in the data sheets. This principle applies to the external safety controller as well as the application inverter and approved options.
- The built-in diagnostic function is limited in case of a permanently enabled or permanently disabled STO input. Only with a level change of the STO signal, extended diagnostic functions are performed. This is why the drive safety function via STO input must be triggered with connected line voltage at least once every 12 months for PL d according to EN ISO 13849-1 and SIL 2 EN 61800-5-2 and at least once every 3 months for PL e according to EN ISO 13849-1 and SIL 3 EN 61800-5-2 to achieve a complete test coverage. Adhere to the following test procedure.



15205932683

[1] Maximum 12 months with PL d/SIL 2

Maximum 3 months with PL e/SIL 3

[2] Internal diagnostics

[3] High: No STO

[4] Low: STO active

- To achieve complete test coverage after a device reset (e.g. after connecting the line voltage), the test transition (STO active → not active) can only be started > 700 ms later. The device signals "ready for operation" or "STO – Safe Torque Off" if it is not in fault state.
- A detected hardware fault in the internal switch-off channels for STO will lead to a locking fault state of the application inverter. If the fault is reset (e.g. by switching the line voltage on/off or by a low level at the STO input for at least 30 ms), a complete test with internal diagnostics according to the above mentions test procedure must be performed. If the fault occurs again, replace the device or contact the SEW-EURODRIVE Service.

12.4 Connection variants

12.4.1 General information

Generally, all the connection variants listed in this documentation are permitted for safety-relevant applications as long as the basic safety concept is met. This means you have to make sure that the DC 24 V safety inputs are operated by an external safety relay or a safety controller, thus preventing an automatic restart.

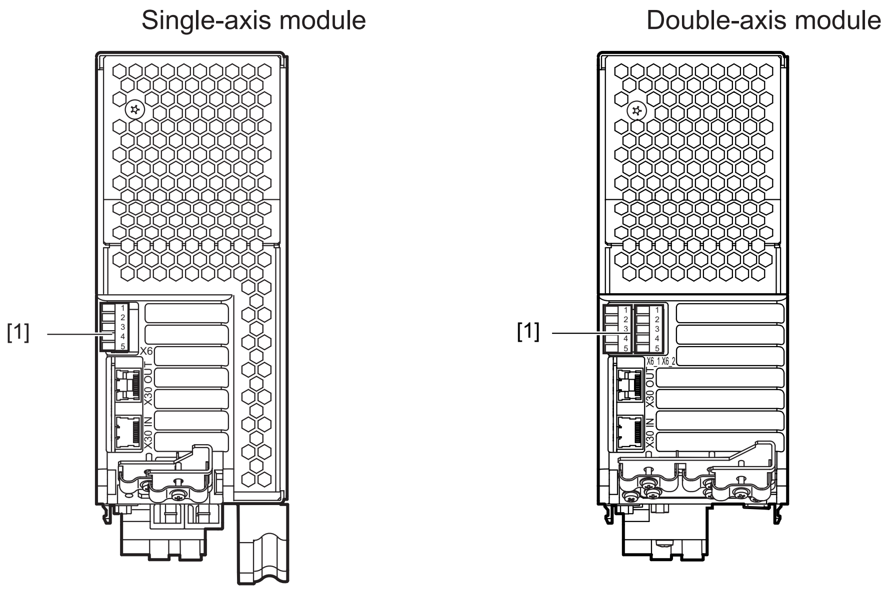
All safety conditions mentioned in chapter "Integrated Safety Technology" (→ 🗎 410), "Safety Conditions" (→ 🗎 415) and "Connection variants" must be met for the basic selection, installation, and application of the safety components, such as safety relay, emergency stop switch, etc., and the approved connection variants.

The wiring diagrams are block diagrams whose only purpose is to show the drive safety function(s) with the relevant components. For reasons of clarity, circuit-related measures that usually always have to be implemented are not shown in the diagram. These measures are e.g.:

- Ensuring touch guards.
- Handling overvoltages and undervoltages.
- Avoiding installation errors.
- Detecting ground faults or short circuits in externally installed lines.
- Guaranteeing the required interference immunity against electromagnetic interference.

Connection X6 at the application inverter

The following figure shows the X6 terminal at the top of the axis modules.



[1] X6: Connection for safe disconnection (STO)

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12.4.2 Requirements

Use of safety relays

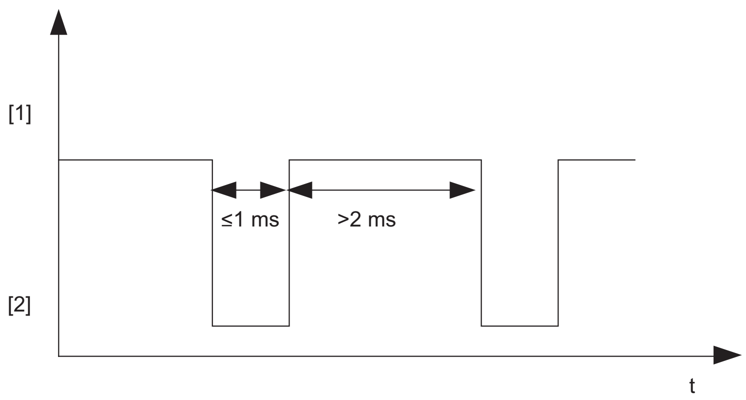
The requirements of the manufacturers of safety relays (such as protecting the output contacts against welding) or other safety components must be strictly observed. For cable routing, the basic requirements apply as described in this documentation.

For connecting the application inverter with the safety relays, observe the installation requirements in chapter "Requirements on the installation" (→ 🗎 416).

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

Use of safety controllers

The switch-off test pulse of the used safe digital outputs (F-DO) must be ≤ 1 ms and another switch-off test pulse must only occur 2 ms later.



15214338827

[1] High

[2] Low

INFORMATION

If the safety-related control voltage at X6 is switched off (STO activated), the specifications in chapter "Requirements on the external safety controller" (→ 🗎 417) must be adhered to in regard to the test pulses.

INFORMATION

If F_STO_P1 (X6:1), F_STO_P2 (X6:3) is connected to DC 24 V, and F_STO_M is connected to GND, STO is deactivated.

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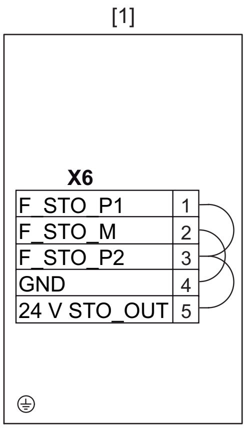
Wiring diagrams

Delivery state

In delivery state, the terminals at the connection for safe disconnection X6 are jumpered.

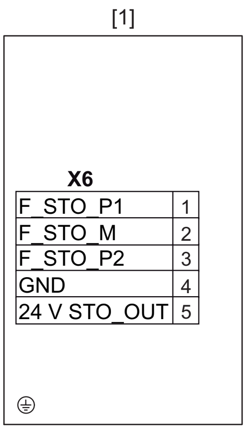


9007214807030283

[1] Axis module

Delivery state with installed MOVISAFE® CS..A safety card

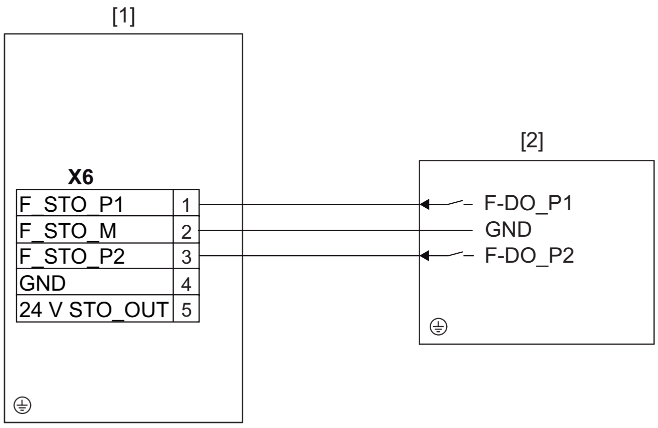
In the delivery state with installed MOVISAFE® CS..A safety card, the terminals at the connection for safe disconnection X6 are not wired. No other voltage may be connected as well.



24809256331

[1] Axis module

2-pole sourcing

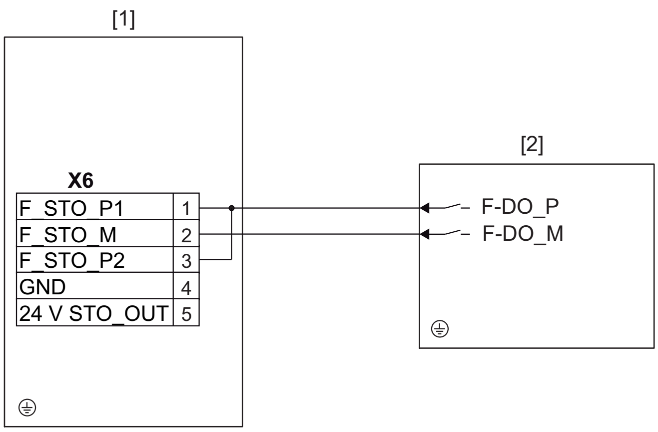


9007214803886091

[1] Axis module

[2] External safety device

2-pole sourcing/sinking



9007214805120139

[1] Axis module

[2] External safety device

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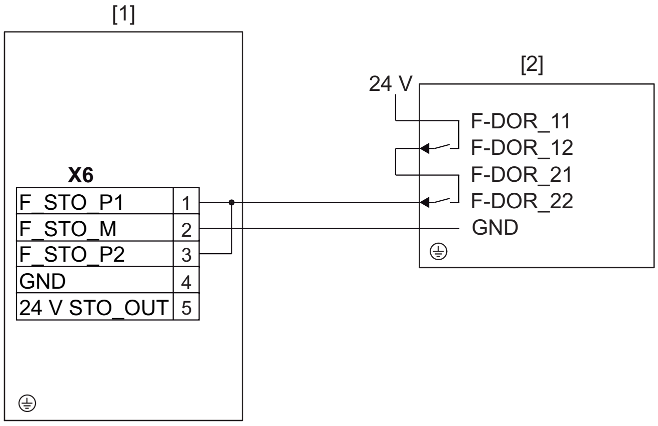
2-pole serial sourcing

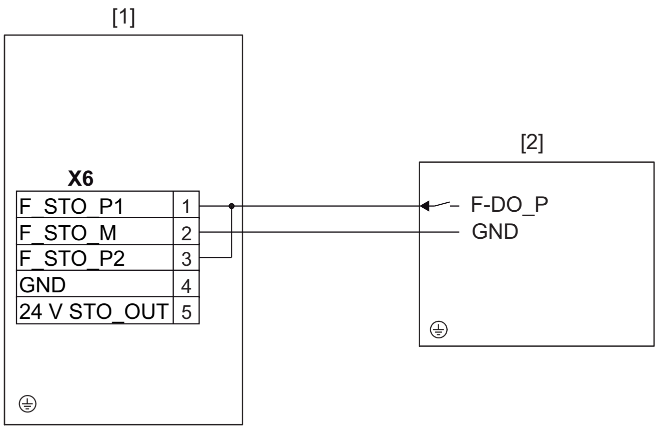


15991307275

[1] Axis module

[2] External safety device

1-pole sourcing



9007214805125643

[1] Axis module

[2] External safety device

12.4.3 STO signal for group disconnection

For group drives, the STO signal for several application inverters can be provided by a single safety relay. The following requirements must be met:

- The cable length is limited to 30 m. Other instructions published by the manufacturer on the use of the safety device (for the respective application) must also be observed.
- The maximum output current and the maximally permitted contact load of the safety device must be observed.
- You must comply with the permitted signal levels at the STO input and all other technical data of the application inverter. The routing of the STO control cables and the voltage drop must be considered.
- Other requirements of the safety manufacturer (such as protecting the output contacts against welding) must be strictly observed. The basic cable routing requirements apply.
- A calculation based on the technical data of the application inverter must be performed separately for each case of group drive disconnection.
- A maximum of 20 axes of the application inverter must be used in a group disconnection.

12.5 Safety characteristics

	Characteristic values according to	
	EN 61800-5-2	**EN ISO 13849-1**
Tested safety class/underlying standards	Safety integrity level 3	Performance level e
Probability of a dangerous failure per hour (PFH value)	2.5×10^{-9} 1/h	
Service life	20 years, after which the component must be replaced with a new one.	
Proof test interval	> 20 years	-
Safe state	Safe Torque Off (STO)	
Drive safety function	STO, SS1[1] according to EN 61800-5-2	

1) With suitable external control

INFORMATION

With 1-pole wiring, the realizable performance level according to EN ISO 13849 is reduced to PL d. For the wiring between safety relay and STO input, an fault exclusion is necessary.

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13 Appendix

13.1 Abbreviation key

The following table lists the abbreviations that are used in this document together with their unit and meaning.

Abbreviation	Information on the nameplate	Unit	Meaning
ASM			Asynchronous motor
C	C	µF	Additional capacitance
f_{max}	f	Hz	Maximum output frequency
f_{line}	f	Hz	Line frequency
f_{PWM}		kHz	Frequency of the pulse width modulation
h		m	Installation altitude
I_{trip}		A	Tripping current (braking resistor)
I_{max}	Imax	A	Max. DC link current (specification on the nameplate)
I_{max}		A	Maximum output current (encoder cards)
I_{peak}		A	Output peak current (encoder cards)
$I_{A\ max}$		A	Max. output current
I_{Appl}		A	Total current of the application
I_{N2}		A	Nominal output current/nominal current (filter, choke)
I_{line}	I	A	Nominal line current
I_{NDCL}	I	A	Rated DC link current
L_N		mH	Inductance
LSPM			Line Start Permanent Magnet
P_{eff}		kW	Effective power (braking resistor)
P_{max}		kW	Maximum power (braking resistor)
P_{Mot}	P(ASM)	kW	Motor power of the asynchronous motor
P_N		kW	Nominal motor power (rated power)
P_V		W	Power loss
PWM			Pulse width modulation
R_{BW}		Ω	Value of the braking resistor
R_{BW_min}		Ω	Minimum value of the braking resistor
S_N	S	kVA	Apparent output power
SM			Synchronous motor
U_2	U	V	Output voltage motor
U_{BR}		V	Brake supply voltage
U_N		V	Nominal line voltage (filter, choke)
U_{line}	U	V	Connection voltage
U_{NDCL}	U	V	Nominal DC link voltage

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Abbreviation	Information on the nameplate	Unit	Meaning
U_{OUT}		V	DC 24 V to supply STO_P1 and STO_P2
U_{S}		V	Supply voltage of encoder
U_{S12VG}		V	DC 12 V supply voltage of encoder
U_{S24VG}		V	DC 24 V supply voltage of encoder
U_{I24}		V	Voltage supply for electronics and brake
ϑ_{A}	T	°C	Ambient temperature
(+ES)			... with output stage inhibit

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14 Address list

Algeria			
Sales	Algiers	REDUCOM Sarl 16, rue des Frères Zaghnoune Bellevue 16200 El Harrach Alger	Tel. +213 21 8214-91 Fax +213 21 8222-84 http://www.reducom-dz.com info@reducom-dz.com
Argentina			
Assembly Sales	Buenos Aires	SEW EURODRIVE ARGENTINA S.A. Ruta Panamericana Km 37.5, Lote 35 (B1619IEA) Centro Industrial Garín Prov. de Buenos Aires	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 http://www.sew-eurodrive.com.ar sewar@sew-eurodrive.com.ar
Australia			
Assembly Sales Service	Melbourne	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. +61 3 9933-1000 Fax +61 3 9933-1003 http://www.sew-eurodrive.com.au enquires@sew-eurodrive.com.au
	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au
Austria			
Assembly Sales Service	Vienna	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Straße 24 1230 Wien	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://www.sew-eurodrive.at sew@sew-eurodrive.at
Bangladesh			
Sales	Bangladesh	SEW-EURODRIVE INDIA PRIVATE LIMITED 345 DIT Road East Rampura Dhaka-1219, Bangladesh	Tel. +88 01729 097309 salesdhaka@seweurodrivebangladesh.com
Belarus			
Sales	Minsk	Foreign unitary production enterprise SEW-EURODRIVE RybalkoStr. 26 220033 Minsk	Tel. +375 17 298 47 56 / 298 47 58 Fax +375 17 298 47 54 http://www.sew.by sales@sew.by
Belgium			
Assembly Sales Service	Brussels	SEW-EURODRIVE n.v./s.a. Researchpark Haasrode 1060 Evenementenlaan 7 3001 Leuven	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 de Parc Industriel, 31 6900 Marche-en-Famenne	Tel. +32 84 219-878 Fax +32 84 219-879 http://www.sew-eurodrive.be service-IG@sew-eurodrive.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. 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

Cameroon			
Sales	Douala	SEW-EURODRIVE S.A.R.L. Ancienne Route Bonabéri P.O. Box B.P 8674 Douala-Cameroun	Tel. +237 233 39 02 10 Fax +237 233 39 02 10 sew@sew-eurodrive-cm
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. 2555 Rue Leger Lasalle, PQ H8N 2V9	Tel. +1 514 367-1124 Fax +1 514 367-3677 a.peluso@sew-eurodrive.ca
Chile			
Assembly Sales Service	Santiago de Chile	SEW-EURODRIVE CHILE LTDA Las Encinas 1295 Parque Industrial Valle Grande LAMPA 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
China			
Production Assembly Sales Service	Tianjin	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 78, 13th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25323273 http://www.sew-eurodrive.cn info@sew-eurodrive.cn
Assembly Sales Service	Suzhou	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021	Tel. +86 512 62581781 Fax +86 512 62581783 suzhou@sew-eurodrive.cn
	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
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
	Drive Service Hotline / 24 Hour Service	+420 800 739 739 (800 SEW SEW)	Service Tel. +420 255 709 632 Fax +420 235 358 218 servis@sew-eurodrive.cz
Denmark			
Assembly Sales Service	Copenhagen	SEW-EURODRIVEA/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
Egypt			
Sales Service	Cairo	Copam Egypt for Engineering & Agencies Building 10, Block 13005, First Industrial Zone, Obour City Cairo	Tel. +202 44812673 / 79 (7 lines) Fax +202 44812685 http://www.copam-egypt.com copam@copam-egypt.com
Estonia			
Sales	Tallin	ALAS-KUUL AS Reti tee 4 75301 Peetri küla, Rae vald, Harjumaa	Tel. +372 6593230 Fax +372 6593231 http://www.alas-kuul.ee veiko.soots@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
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 Service	Hagenau	SEW-USOCOME 48-54 route de Soufflenheim B. P. 20185 67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 Fax +33 3 88 73 66 00 http://www.usocome.com sew@usocome.com
Production	Forbach	SEW-USOCOME Zone industrielle Technopôle Forbach Sud B. P. 30269 57604 Forbach Cedex	Tel. +33 3 87 29 38 00
	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 Fax +33 5 57 26 39 09

France			
	Lyon	SEW-USOCOME 75 rue Antoine Condorcet 38090 Vaulx-Milieu	Tel. +33 4 74 99 60 00 Fax +33 4 74 99 60 15
	Nantes	SEW-USOCOME Parc d'activités de la forêt 4 rue des Fontenelles 44140 Le Bignon	Tel. +33 2 40 78 42 00 Fax +33 2 40 78 42 20
	Paris	SEW-USOCOME Zone industrielle 2 rue Denis Papin 77390 Verneuil I'Étang	Tel. +33 1 64 42 40 80 Fax +33 1 64 42 40 88
Gabon			
Sales	Libreville	SEW-EURODRIVE SARL 183, Rue 5.033.C, Lalala à droite P.O. Box 15682 Libreville	Tel. +241 03 28 81 55 +241 06 54 81 33 http://www.sew-eurodrive.cm sew@sew-eurodrive.cm
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	Graben	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 76676 Graben-Neudorf	Tel. +49 7251 75-0 Fax +49 7251-2970
	Östringen	SEW-EURODRIVE GmbH & Co KG, Werk Östringen Franz-Gurk-Straße 2 76684 Östringen	Tel. +49 7253 9254-0 Fax +49 7253 9254-90 oestringen@sew-eurodrive.de
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 Ernst-Blickle-Straße 42 76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 scc-elektronik@sew-eurodrive.de
Drive Technology Center	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 40-42 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 7606-30 dtc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 85551 Kirchheim (München)	Tel. +49 89 909552-10 Fax +49 89 909552-50 dtc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 40764 Langenfeld (Düsseldorf)	Tel. +49 2173 8507-30 Fax +49 2173 8507-55 dtc-west@sew-eurodrive.de
Drive Center	Berlin	SEW-EURODRIVE GmbH & Co KG Alexander-Meißner-Straße 44 12526 Berlin	Tel. +49 306331131-30 Fax +49 306331131-36 dc-berlin@sew-eurodrive.de
	Ludwigshafen	SEW-EURODRIVE GmbH & Co KG c/o BASF SE Gebäude W130 Raum 101 67056 Ludwigshafen	Tel. +49 7251 75 3759 Fax +49 7251 75 503759 dc-ludwigshafen@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

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Germany			
	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
	Drive Service Hotline / 24 Hour Service		Tel. 01924 896911
Greece			
Sales	Athens	Christ. Boznos & Son S.A. 12, K. Mavromichali Street P.O. Box 80136 18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr
Hungary			
Sales Service	Budapest	SEW-EURODRIVE Kft. Csillaghegyí út 13. 1037 Budapest	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 http://www.sew-eurodrive.hu office@sew-eurodrive.hu
Iceland			
Sales	Reykjavik	Varma & Vélaverk ehf. Knarrarvogi 4 104 Reykjavík	Tel. +354 585 1070 Fax +354 585)1071 http://www.varmaverk.is vov@vov.is
India			
Registered Office Assembly Sales Service	Vadodara	SEW-EURODRIVE India Private Limited Plot No. 4, GIDC POR Ramangamdi • Vadodara - 391 243 Gujarat	Tel. +91 265 3045200 Fax +91 265 3045300 http://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
Indonesia			
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

Indonesia			
	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 di R. Blickle & Co.s.a.s. Via Bernini,14 20020 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 21 21 81 05 Fax +225 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 hamamatsu@sew-eurodrive.co.jp
Kazakhstan			
Sales	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.kz sew@sew-eurodrive.kz
	Tashkent	SEW-EURODRIVE LLP Representative office in Uzbekistan 96A, Sharaf Rashidov street, Tashkent, 100084	Tel. +998 71 2359411 Fax +998 71 2359412 http://www.sew-eurodrive.uz sew@sew-eurodrive.uz
	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230	Tel. +976-77109997 Fax +976-77109997 imt@imt.mn
Kenya			
Sales	Nairobi	SEW-EURODRIVE Pty Ltd Transnational Plaza, 5th Floor Mama Ngina Street P.O. Box 8998-00100 Nairobi	Tel. +254 791 398840 http://www.sew-eurodrive.co.tz info@sew.co.tz
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

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Lebanon			
Sales (Lebanon)	Beirut	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 510 532 Fax +961 1 494 971 ssacar@inco.com.lb
Sales (Jordan, Kuwait , Saudi Arabia, Syria)	Beirut	Middle East Drives S.A.L. (offshore) Sin El Fil. B. P. 55-378 Beirut	Tel. +961 1 494 786 Fax +961 1 494 971 http://www.medrives.com info@medrives.com
Lithuania			
Sales	Alytus	UAB Irseva Statybininku 106C 63431 Alytus	Tel. +370 315 79204 Fax +370 315 56175 http://www.irseva.lt irmantas@irseva.lt
Luxembourg			
representation: Belgium			
Macedonia			
Sales	Skopje	Boznos DOOEL Dime Anicin 2A/7A 1000 Skopje	Tel. +389 23256553 Fax +389 23256554 http://www.boznos.mk
Malaysia			
Assembly Sales Service	Johor	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my
Mexiko			
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	Tel. +976-77109997 Tel. +976-99070395 Fax +976-77109997 http://imt.mn/ imt@imt.mn
Morocco			
Sales Service	Bouskoura	SEW-EURODRIVE Morocco Parc Industriel CFCIM, Lot 55 and 59 Bouskoura	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 Services 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 Plot 296A, Adeyemo Akapo Str. Omole GRA Ikeja Lagos-Nigeria	Tel. +234-701-821-9200-1 http://www.greenpegltd.com bolaji.adekunle@greenpegltd.com
Norway			
Assembly Sales Service	Moss	SEW-EURODRIVE A/S Solgaard skog 71 1599 Moss	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no
Pakistan			
Sales	Karachi	Industrial Power Drives Al-Fatah Chamber A/3, 1st Floor Central Commercial Area, Sultan Ahmed Shah Road, Block 7/8, Karachi	Tel. +92 21 452 9369 Fax +92-21-454 7365 seweurodrive@cyber.net.pk
Paraguay			
Sales	Fernando de la Mora	SEW-EURODRIVE PARAGUAY S.R.L De la Victoria 112, Esquina nueva Asunción Departamento Central Fernando de la Mora, Barrio Bernardino	Tel. +595 991 519695 Fax +595 21 3285539 sewpy@sew-eurodrive.com.py
Peru			
Assembly Sales Service	Lima	SEW EURODRIVE DEL PERU S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe
Philippines			
Sales	Makati	P.T. Cerna Corporation 4137 Ponte St., Brgy. Sta. Cruz Makati City 1205	Tel. +63 2 519 6214 Fax +63 2 890 2802 mech_drive_sys@ptcerna.com http://www.ptcerna.com
Poland			
Assembly Sales Service	Łódź	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 92-518 Łódź	Tel. +48 42 293 00 00 Fax +48 42 293 00 49 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
	Service	Tel. +48 42 293 0030 Fax +48 42 293 0043	24 Hour Service Tel. +48 602 739 739 (+48 602 SEW SEW) serwis@sew-eurodrive.pl
Portugal			
Assembly Sales Service	Coimbra	SEW-EURODRIVE, LDA. Av. da Fonte Nova, n.º 86 3050-379 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Romania			
Sales Service	Bucharest	Sialco Trading SRL str. Brazilia nr. 36 011783 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro
Russia			
Assembly Sales Service	St. Petersburg	ЗАО «СЕВ-ЕВРОДРАЙФ» а. я. 36 195220 Санкт-Петербург	Tel. +7 812 3332522 / +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru

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

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

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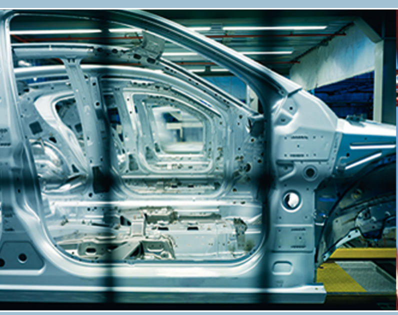
United Arab Emirates			
Sales Service	Dubai	SEW-EURODRIVE FZE PO Box 263835 Office No. S3A1SR03 Jebel Ali Free Zone – South, Dubai, United Arab Emirates	Tel. +971 (0)4 8806461 Fax +971 (0)4 8806464 http://www.sew-eurodrive.ae info@sew-eurodrive.ae

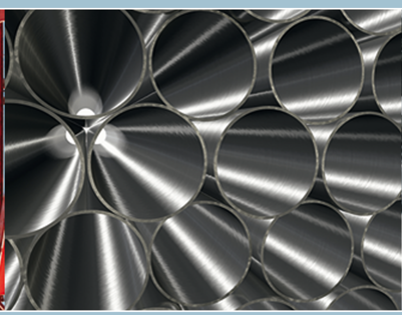
Ukraine			
Assembly Sales Service	Dnipropetrovsk	ООО «СЕВ-Евродрайв» ул. Рабочая, 23-В, офис 409 49008 Днепр	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua

Uruguay			
Assembly Sales	Montevideo	SEW-EURODRIVE Uruguay, S. A. Jose Serrato 3569 Esqina Corumbe CP 12000 Montevideo	Tel. +598 2 21181-89 Fax +598 2 21181-90 sewuy@sew-eurodrive.com.uy

USA			
Production Assembly Sales Service	Southeast Region	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Production +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly Sales Service	Northeast Region	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 332-0038 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Wellford	SEW-EURODRIVE INC. 148/150 Finch Rd. Wellford, S.C. 29385	Tel. +1 864 439-7537 Fax +1 864 661 1167 IGOrders@seweurodrive.com
	Additional addresses for service provided on request!		

Vietnam			
Sales	Ho Chi Minh City	Nam Trung Co., Ltd Huế - South Vietnam / Construction Materials 250 Binh Duong Avenue, Thu Dau Mot Town, Binh Duong Province HCM office: 91 Tran Minh Quyen Street District 10, Ho Chi Minh City	Tel. +84 8 8301026 Fax +84 8 8392223 khanh-nguyen@namtrung.com.vn http://www.namtrung.com.vn
	Hanoi	MICO LTD Quảng Trị - North Vietnam / All sectors except Construction Materials 8th Floor, Ocean Park Building, 01 Dao Duy Anh St, Ha Noi, Viet Nam	Tel. +84 4 39386666 Fax +84 4 3938 6888 nam_ph@micogroup.com.vn http://www.micogroup.com.vn






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