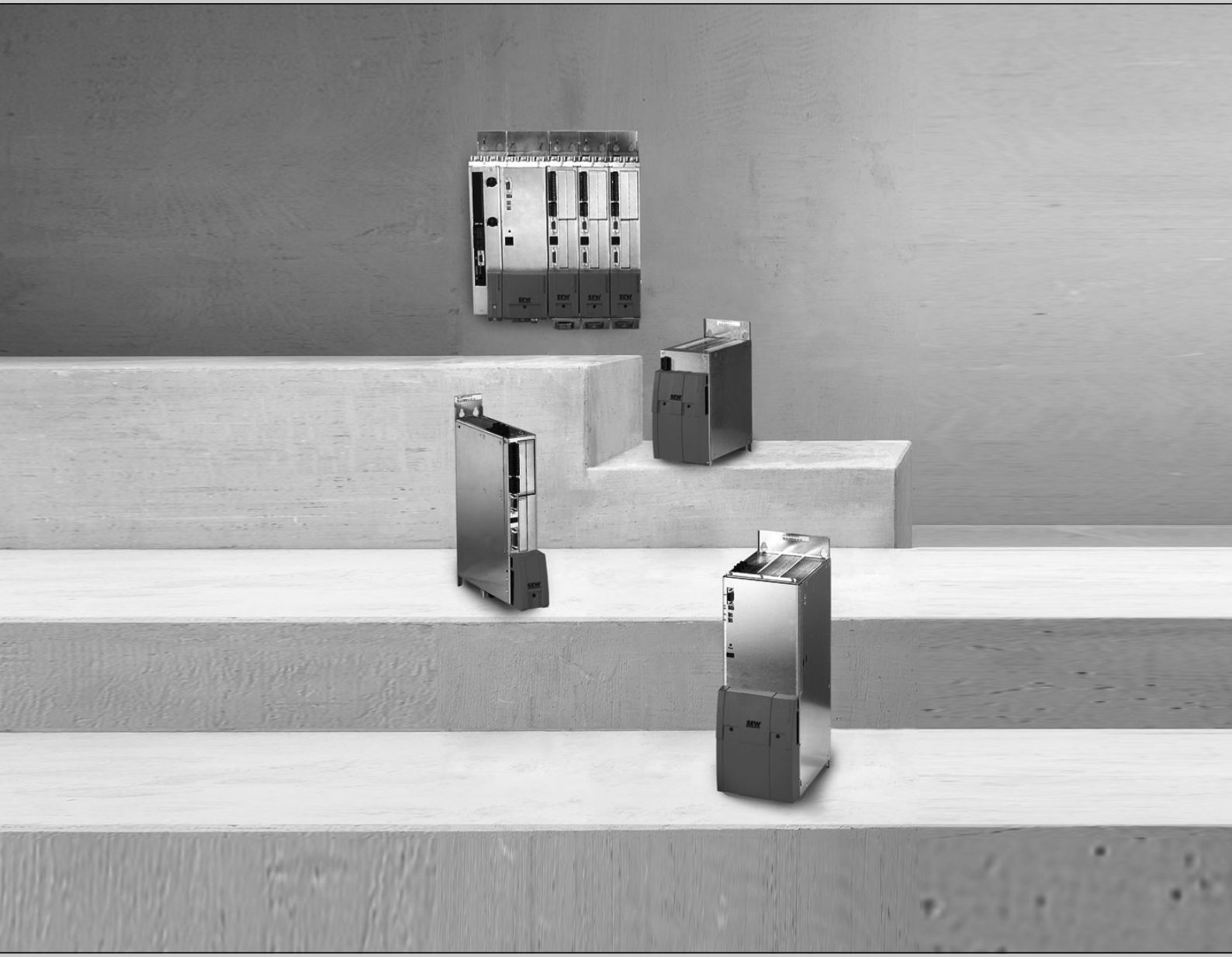
SEW EURODRIVE

Manual MXR80..



MXR80 Supply and Regenerative Module

MOVIAXIS® Multi-Axis Servo Inverter

Sine-Shaped Regeneration

Edition 04/2014

21219397 / EN

Contents

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1 General information

1.1 Other applicable documentation

This manual describes the specific features of the MXR supply and regenerative module.

For any other information and functions of MOVIAXIS®, please refer to the

- "MOVIAXIS® Multi-Axis Servo Inverter" operating instructions,
- "MOVIAXIS® Multi-Axis Servo Inverter" system manual.

1.2 Structure of safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes, damage to property warnings, and other notes.

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

1.2.2 Structure of the section-related safety notes

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

This is the formal structure of a section safety note:

⚠ SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

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1.2.3 Structure of the embedded safety notes

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

This is the formal structure of an embedded safety note:

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

  Possible consequence(s) if disregarded.

  – Measure(s) to prevent the hazard.

1.3 Rights to claim under limited warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in this manual as well as in the "MOVIAXIS® Multi-Axis Servo Inverter" operating instructions. Therefore, read the manual and the operating instructions before you start working with the unit.

Make sure that the manual and the operating instructions are available to persons responsible for the system and its operation as well as to persons who work independently on the unit. You must also ensure that the documentation is legible.

1.4 Exclusion of liability

You must comply with the information contained in this manual and in the "MOVIAXIS® Multi-Axis Servo Inverter" operating instructions to ensure safe operation of the MXR supply and regenerative module in conjunction with the MOVIAXIS® multi-axis servo inverter and to achieve the specified product characteristics and performance requirements. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of the manual and the operating instructions. In such cases, any liability for defects is excluded.

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2 Safety notes

The following basic safety notes must be read carefully to prevent injury to persons and damage to property. The user must ensure that the basic safety notes are read and observed. Make sure that persons responsible for the plant and its operation, as well as persons who work independently on the unit, have read through the operating instructions and manual carefully and understood them. If you are unclear about any of the information in this documentation, or if you require further information, please contact SEW-EURODRIVE.

INFORMATION

Observe the information about the other modules of a MOVIAXIS® axis system in the "MOVIAXIS® MX Multi-Axis Servo Inverter" operating instructions when installing, starting up, and operating the MXR regenerative supply module.

2.1 General information

Never install damaged products or put them into operation. Submit a complaint to the shipping company immediately in the event of damage.

During operation, multi-axis servo inverters can have live, bare and movable or rotating parts as well as hot surfaces, depending on their degree of protection.

Removing required covers without authorization, improper use or incorrect installation and operation may result in severe injury to persons, or damage to machinery.

Refer to the documentation for more information.

2.2 Target group

Only qualified electricians are authorized to install, start up or service the units or correct unit faults (observing IEC 60364 or CENELEC HD 384 or DIN VDE 0100 and IEC 60664 or DIN VDE 0110 as well as national accident prevention guidelines).

Qualified electricians in the context of these basic safety notes are all persons familiar with installation, assembly, startup and operation of the product who possess the necessary qualifications.

All persons involved in any other work, such as transportation, storage, operation and disposal, must be trained appropriately.

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2.3 Designated use

The MXR supply and regenerative module is designed for integration in the device network of the MOVIAXIS® MX multi-axis servo inverter.

MOVIAXIS® MX multi-axis servo inverters are units for use in industrial and commercial systems to operate permanent-field synchronous AC motors and asynchronous AC motors with encoder feedback. The motors must be suitable for operation with servo inverters. Do not connect other loads to the units without prior consultation of the manufacturer.

MOVIAXIS® MX multi-axis servo inverters are intended for use in metal control cabinets. These metal control cabinets represent the necessary degree of protection for the application as well as the grounding over a large area required for EMC purposes.

When installed in machines, startup of the multi-axis servo inverters (i.e. start of designated operation) is prohibited until it is determined that the machine meets the requirements stipulated in Directive 2006/42/EC (Machinery Directive); observe EN 60204.

Startup (i.e. the start of designated use) is only permitted under observance of the EMC directive (2004/108/EC).

Multi-axis servo inverters comply with the low voltage directive 2006/95/EC. The harmonized standards of the EN 61800-5-1/DIN VDE T105 series in connection with EN 60439-1/VDE 0660 part 500 and EN 60146/VDE 0558 are applied to these multi-axis servo inverters.

Adhere to the technical data and information on the connection requirements as provided on the nameplate and in the documentation.

2.3.1 Safety functions

MOVIAXIS® multi-axis servo inverters may not take on safety functions without a higher-level safety system. Use higher-level safety systems to ensure protection of equipment and personnel.

For safety applications, refer to the information in the following publication:

- "MOVIAXIS® Multi-Axis Servo Inverters – Functional Safety".

2.4 Transportation and storage

Observe the notes on transportation, storage and proper handling. Observe the climatic conditions as stated in the chapter "General technical data".

2.5 Installation

The units must be installed and cooled according to the regulations and specifications in the corresponding documentation.

Protect multi-axis servo inverters from excessive strain. Ensure that elements are not deformed and/or insulation spaces are maintained, particularly during transportation. Avoid contact with electronic elements and contacts.

Multi-axis servo inverters contain components that can be damaged by electrostatic energy and could be destroyed in case of improper handling. Prevent mechanical damage or destruction of electric components as this may pose a health risk.

The following applications are prohibited unless explicitly permitted:

- Use in potentially explosive atmospheres.

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- Use in areas exposed to harmful oils, acids, gases, vapors, dust, radiation, etc.
- Use in non-stationary applications which are subject to mechanical vibration and impact loads in excess of the requirements in EN 61800-5-1.

2.6 Electrical connection

Observe the applicable national accident prevention guidelines, such as GBV A3, when working on live components of multi-axis servo inverters.

Perform electrical installation according to the pertinent regulations (e.g. cable cross sections, fusing, protective conductor connection). For any additional information, refer to the applicable documentation.

You will find notes on EMC-compliant installation, such as shielding, grounding, arrangement of filters and routing of lines, in the documentation of the multi-axis servo inverter. Always observe these notes even for multi-axis servo inverters bearing the CE marking. The manufacturer of the system or machine is responsible for maintaining the limits established by EMC legislation.

Protective measures and protection devices must comply with the regulations in force, such as EN 60204 or EN 61800-5-1.

Required preventive measure: Grounding the unit.

Cables may only be connected and switches may only be operated in a de-energized state.

2.7 Safe disconnection

The unit meets all requirements for reliable isolation of power and electronics connections in accordance with EN 61800-5-1. All connected circuits must also meet the requirements for safe disconnection to ensure reliable isolation.

2.8 Operation

Systems with integrated multi-axis servo inverters might have to be equipped with additional monitoring and protection devices so they comply with applicable safety guidelines, such as the law governing technical equipment, accident prevention regulations, etc. Changes to the drive inverters using the software are permitted.

Do not touch live components or power connections immediately after disconnecting the multi-axis servo inverters from the supply voltage because there may still be some charged capacitors. Note the respective labels on the multi-axis servo inverter.

Cables may only be connected and switches may only be operated in a de-energized state.

Keep all covers and doors closed during operation.

The unit may still be live and connected to the power supply even if the operation LEDs and other display elements are no longer illuminated.

Mechanical blocking or internal safety functions of the unit can cause a motor standstill. Eliminating the cause of the problem or performing a reset may result in the drive re-starting automatically. If this is not permitted for the driven machine for safety reasons, disconnect the unit from the supply system before correcting the fault.

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2.9 Unit temperature

MOVIAXIS® multi-axis servo inverters are usually operated with braking resistors. The braking resistors can be installed in the housing of the supply modules.

The braking resistors can reach a surface temperature between 70 °C and 250 °C.

Never touch the housings of MOVIAXIS® modules or the braking resistors during operation or in the cool down phase after the unit has been switched off.

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3 Unit structure

3.1 Important information

Protective measures and **protection devices** must comply with the **regulations in force**.

INFORMATION

Adhere to the specific operating instructions when installing and starting up the motor and the brake.

⚠ WARNING

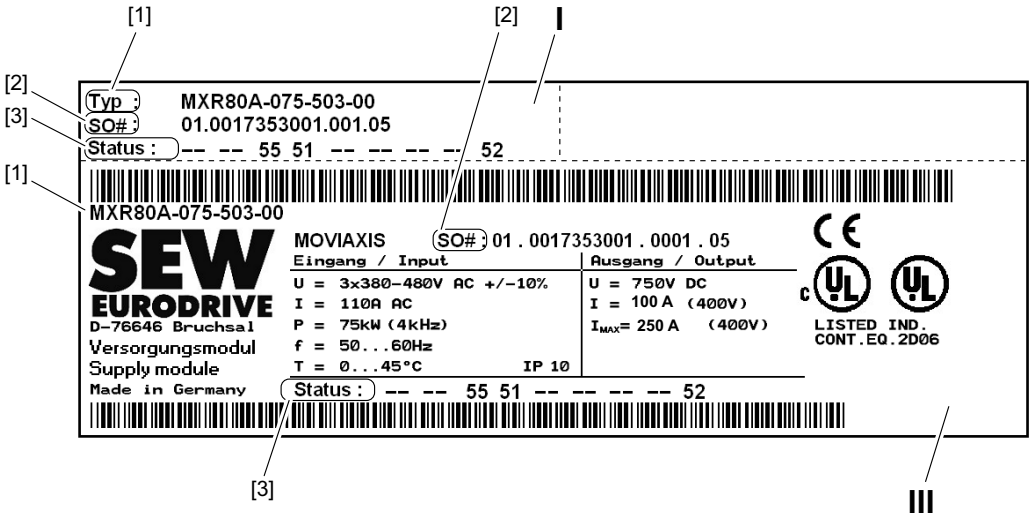
The following "unit structure" illustrations represent the units without the provided protection cover (touch guard). The protection cover protects the area of the line and braking resistor connections.

Uncovered power connections.

- Never start the unit if the covers are not installed.
- Install the covers according to the regulations.

3.2 Nameplate, type designation

3.2.1 Nameplate of supply and regenerative modules



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I Part "I" of the nameplate: Located on the upper fastening plate of the module

III Part "III" of the nameplate: Located on the side of the module housing

[1] Type designation

[2] Production number

[3] Status

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3.2.2 Type designation of supply and regenerative modules

Example: MXR80A-075-503-00		
Product name	MX	MOVIAXIS®
Unit type	R	Supply and regenerative module
Unit variant	80	• 80 = Sine-shaped regeneration • 81 = Block-shaped regeneration
Development status	A	Development status of the unit series
Power	075	• 050 = 50 kW • 075 = 75 kW
Supply voltage	50	U = AC 400 – 480 V
Connection type	3	3-phase
Design	00	• 00 = Standard design • xx = Special design

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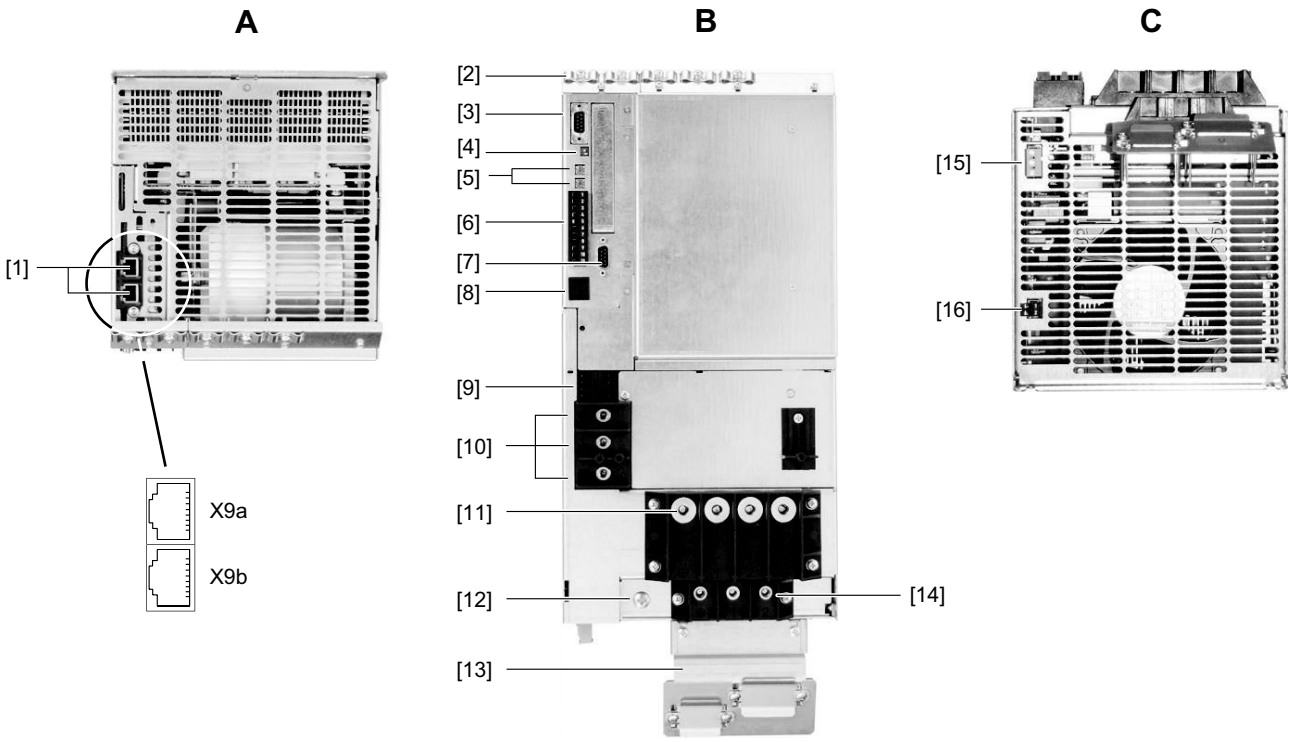
3.3 Unit structure of supply and regenerative modules

The following figure shows the unit without protective cover.

3.3.1 Supply and regenerative module



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A **View from top**

[1] Signaling bus
X9a: Input, green connector on cable
X9b: Output, red connector on cable

B View from front

[2] Electronics shield terminals

[3] X12: CAN system bus

[4] S1, S2: DIP switches

[5] S3, S4: Address switch

[6] X10: Digital inputs (pins 1 – 6)
X11: Digital outputs (pins 7 – 11)

[7] X17: CAN2 bus

[8] 2 x 7-segment display

[9] X5a, X5b: 24 V voltage supply

[10] X4: DC link connection

[11] X1: Line connection

[12] Housing grounding point

[13] Power shield clamp

[14] X3: Braking resistor connection

C **View from bottom**

[15] X18: Line voltage measurement

[16] X19: Enable contact for line contactor

3.4 Combinations of supply and regenerative modules with other units

Unit	Possible combination with MXR80	Quantity
MXP	–	–

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Unit	Possible combination with MXR80	Quantity
MXA	X	8
MXC	–	–
MXB	–[1)]	–[1)]
MXS	–	–
MXZ	–[1)]	–[1)]
MXM	X	1

1) Please consult SEW-EURODRIVE

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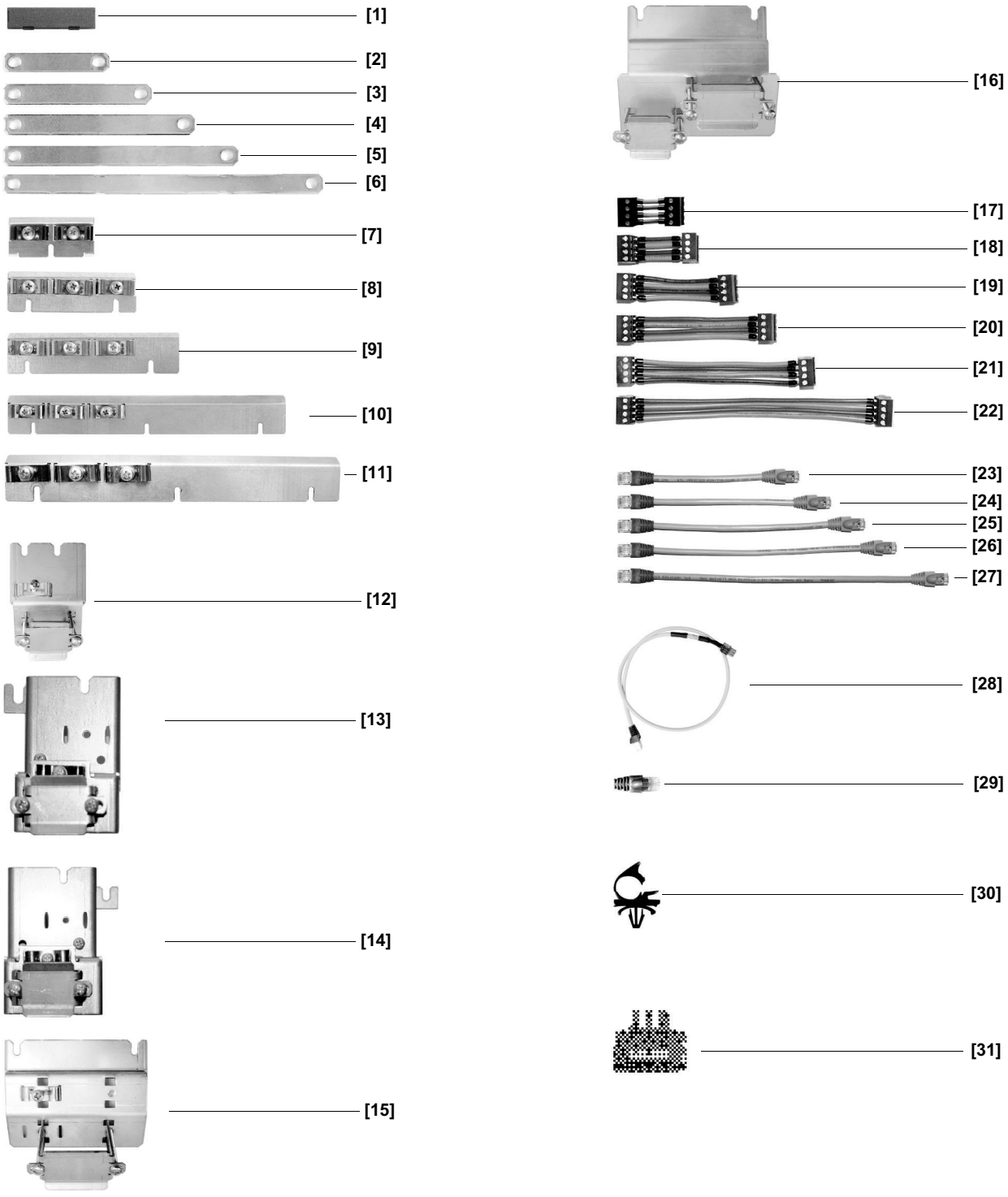
3.5 Standard accessories

Standard accessories are included with the basic unit at delivery.



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The mating connectors for all connectors are installed at the factory. An **exception** are D-sub connectors, which are supplied without mating connector.

3.5.1 Assignment table for standard accessories

No.	Dimension[1)]	MXR80
Touch guard		
[1]		–
DC link connection		
[2]	76 mm	–
[3]	106 mm	–
[4]	136 mm	–
[5]	160 mm	–
[6]	226 mm	3x
Electronics shield clamp		
[7]	60 mm	1x
[8]	90 mm	–
[9]	120 mm	–
[10]	150 mm	1x
[11]	210 mm	–
Power shield clamp		
[12]	60 mm	–
[13]	60 mm[2)]	–
[14]	60 mm[3)]	–
[15]	105 mm	–
[16]	105 mm	1x
24 V supply cable		
[17]	40 mm	–
[18]	50 mm	–
[19]	80 mm	–
[20]	110 mm	–
[21]	140 mm	–
[22]	200 mm	1x
Signal bus connection cable (suitable for CAN/EtherCAT®-compatible system bus)		
[23]	200 mm	–
[24]	230 mm	–
[25]	260 mm	–
[26]	290 mm	–
[27]	350 mm	1x
Connection cable between CAN and master module		
[28]	520 mm	–
CAN terminating resistor		
[29]		1x
Cable terminals		
[30]		–
Measuring line connector		
[31]		1x

1) Length of the cables: Length of the bulk cables without connectors

2) Terminal with short support, 60 mm wide

3) Terminal with long support, 60 mm wide

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4 Installation

4.1 Mechanical installation

⚠ CAUTION

Never install defective or damaged modules of the MOVIAXIS® MX multi-axis servo inverter as they can result in injuries or damage parts of the production system.

- Before installing modules of the MOVIAXIS® MX multi-axis servo inverter, check them for external damage. Replace any damaged modules.

⚠ CAUTION

Danger of burns on the surface of line chokes.

- Do not touch the hot surface of line chokes. Surface temperatures can exceed 100 °C during and after operation.
- Let the chokes cool down before touching them.

NOTICE

The mounting plate in the control cabinet must be conductive over a large area for the mounting surface of the inverter system (metallically pure, good conductivity). EMC compliant installation of the MOVIAXIS® MX multi-axis servo inverter can only be accomplished with a mounting plate that is conductive over a large area.

- Check to see that the delivery is complete.

4.2 UL-compliant installation

Note the following information for UL-compliant installation:

- Use only copper conductors with a temperature range of 60 / 75 °C as connection cable.
- Observe the permitted tightening torques (→ 🗎 19) of the MOVIAXIS® power terminals.

NOTICE

Possible damage to the supply and regenerative module.

- Use only the stipulated connection elements and adhere to the specified tightening torques. Else, excessive heat can develop which would damage the supply and regenerative module.

- MOVIAXIS® MX multi-axis servo inverters are suitable for operation in voltage networks with earthed star point (TN and TT networks), a maximum line current of 42000 A and a maximum line voltage of AC 480 V.
- Maximum permitted value of the line fuse:

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MXR80 supply and regenerative module		
	PWM 8 kHz	**PWM 4 kHz**
P_N	50 kW	75 kW
I_N	73 A	110 A
Line fuse	80 A	125 A

- Select the cross section of the supply system lead in such a way that it matches the nominal unit current, see the "Technical Data" chapter.
- Comply with the country-specific installation regulations in addition to the above notes.
- The plug-in connections of the 24 V supply are limited to 10 A.

INFORMATION

Observe the technical data required for operating line filters (→ 🗎 77), line chokes (→ 🗎 81), and EcoLine filters (→ 🗎 84).

The cross section of the measuring line X18 of the line filter must be as follows:

- 4 mm^2 (AWG12)

→ Also observe the wiring diagrams (→ 🗎 23)

Please observe the document "Information regarding UL" on the SEW website **www.sew-eurodrive.com**.

4.2.1 Permitted tightening torques

The permitted tightening torques are:

- Line connection X1: 6.0 – 10.0 Nm
- Emergency braking resistor/braking resistor terminals: 3.0 – 4.0 Nm
- X10, X11 signal terminals for all units: 0.5 – 0.6 Nm
- DC link connection X4: 3.0 – 4.0 Nm
- Terminals for 24 V voltage supply: 0.5 – 0.6 Nm

4.3 Installing/removing the supply and regenerative module

Refer to the "MOVIAXIS® MX Multi-Axis Servo Inverter" operating instructions for a description of how to install a module in an axis system and how to remove it. Adhere to these instructions when installing/removing a module.

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4.4 Electrical installation

⚠ WARNING

Dangerous voltage levels may still be present inside the unit and at the terminal strips up to 10 minutes after the complete axis system has been disconnected from the supply system.

Severe or fatal injuries from electric shock.

- Disconnect the axis system from the supply system and wait 10 minutes before removing the protective covers.
- After maintenance work, do not operate the axis system unless you have replaced the protective cover and the touch guard. Without protective cover, the unit only has degree of protection IP00.

⚠ WARNING

A leakage current > 3.5 mA can occur during operation of the MOVIAXIS® MX multi-axis servo inverter.

Severe or fatal injuries from electric shock.

- If the supply system lead is < 10 mm^2, route a second PE conductor with the same cross section as the supply system lead via separate terminals. Alternatively, you can use a PE conductor with a copper cross section ≥ 10 mm^2 or aluminum ≥ 16 mm^2.
- With an incoming supply line ≥ 10 mm^2, it is sufficient to install a PE conductor with a copper cross section ≥ 10 mm^2 or aluminum ≥ 16 mm^2.
- If an earth leakage circuit breaker can be used for protection against direct and indirect contact, it must be universal current sensitive (RCD type B).

INFORMATION

Safe disconnection.

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

4.4.1 Line contactor and cable cross sections

NOTICE

- Use a line contactor in **utilization category AC-3** (IEC 158-1) or better. **For information on the current carrying capacity, refer to chapter** "Control section of MXR supply and regenerative module" (→ 🗎 73).

- Line cable: **Cross section according to nominal input current** I_{line} at nominal load.

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4.4.2 Connecting the braking resistor/emergency braking resistor

NOTICE

When using a braking resistor, observe the notes in chapter "Project Planning".

- SEW-EURODRIVE recommends to connect the emergency/braking resistor as shown in chapter "Wiring diagrams" (→ 🗎 22). Install switch F16 close to the unit network. If you use an unshielded cable for connecting switch F16 with the supply and regenerative module, keep the length as short as possible. Preferably use a shielded line cable or twisted individual lines as connection cable to the braking resistor/emergency braking resistor. The cross section must be selected depending on the nominal current of the braking resistor/emergency braking resistor.
- Protect the braking resistor/emergency braking resistor with an **overload relay**. Set the **tripping current** according to the **technical data of the emergency braking resistor**, see "MOVIAXIS® MX Multi-Axis Servo Inverter" operating instructions.
- Observe the notes in chapter "UL compliant installation" (→ 🗎 18).

4.4.3 Operating the braking resistor/emergency braking resistor

- The connection lead to the braking resistor/emergency braking resistor carries a **high DC voltage of up to 970 V** during nominal operation.

⚠ WARNING

The surfaces of the braking resistors/emergency braking resistors reach temperatures of up to 250 °C when the braking resistors are subject to a load of P_N.

Risk of burns and fire.

- Choose a suitable installation location. Braking resistors/emergency braking resistors are usually mounted on top of the control cabinet.
- Do not touch any braking resistor.

4.4.4 Permitted voltage supply systems

- MOVIAXIS® is intended for operation on voltage supply systems with a directly grounded star point (TN and TT power systems).
- Operation on voltage supply systems with a non-grounded star point (for example IT power systems) is not permitted.
- Autonomous power systems are not permitted.

An autonomous power system has no connection to the public grid.

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4.5 Wiring diagrams

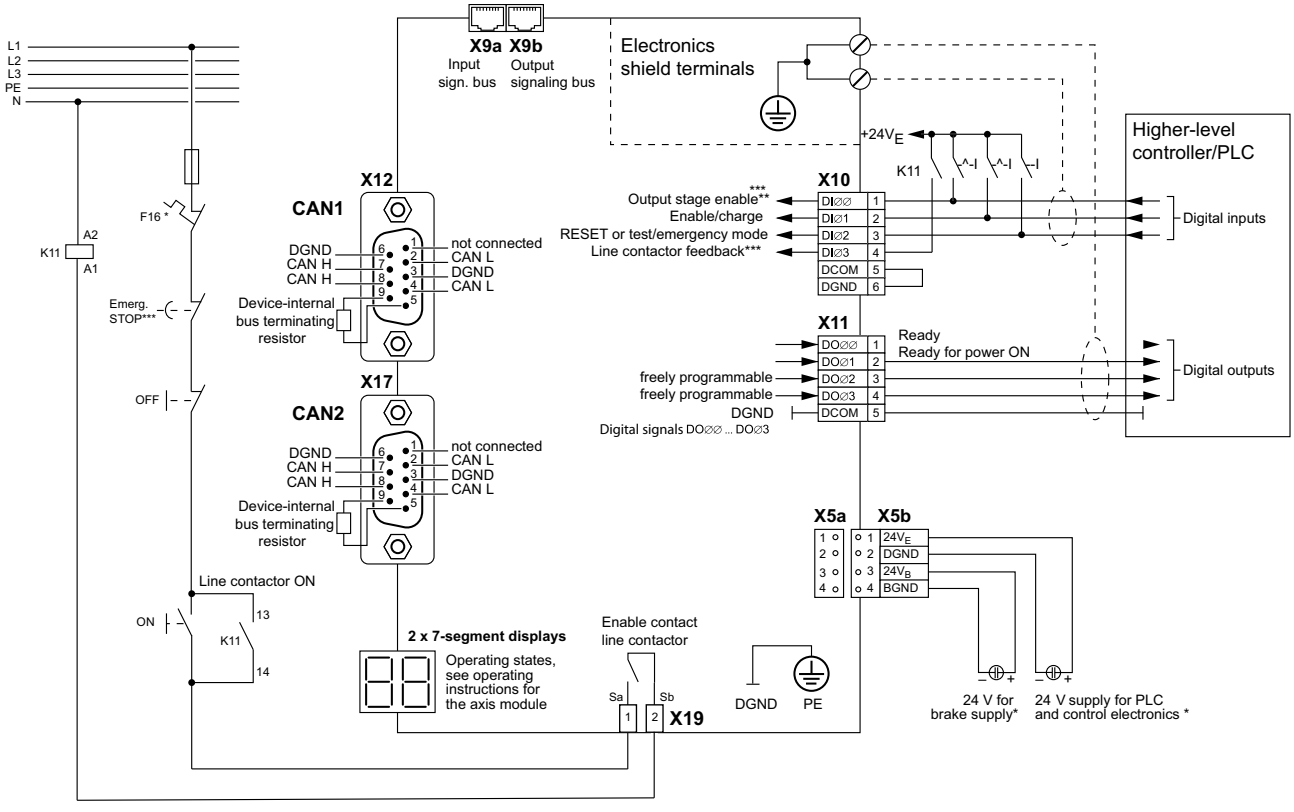
4.5.1 General information on the wiring diagrams

INFORMATION

The technical data of the power and control electronics connections are described in chapter "Technical Data" in this manual and in the "MOVIAXIS® MX Multi-Axis Servo Inverter" operating instructions.

- All units within the axis system have to be connected to each other via the DC link bus connection (PE, + U_z, –U_z), the 24 V voltage supply (X5a, X5b) and the signaling bus (X9a, X9b).
- The line contactor "K11" must be installed between the supply system and the line filter.

4.5.2 Wiring the control electronics



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* F16 only with optional braking resistor

** Connection via supplied prefabricated cables

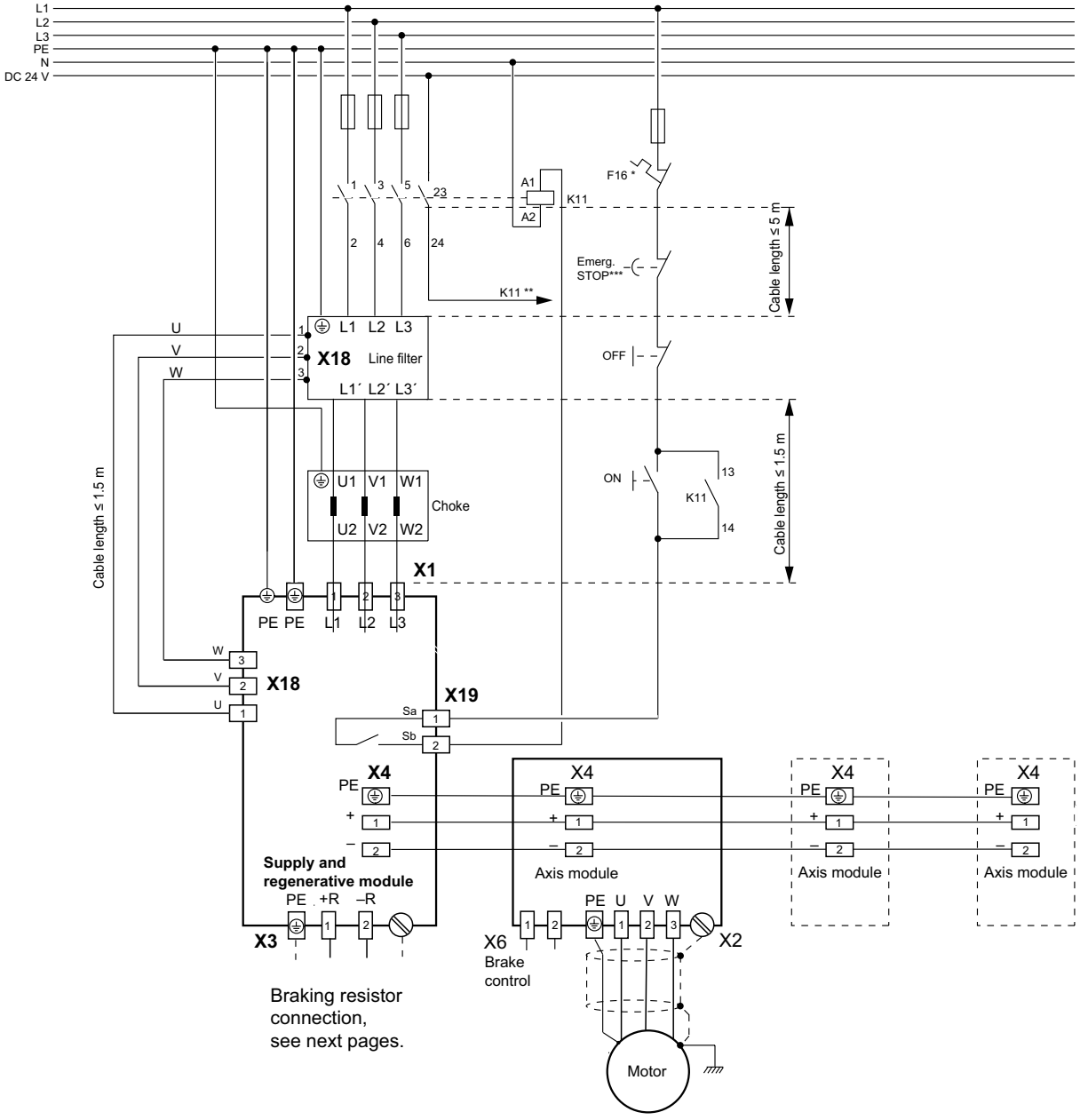
*** The signal must also be connected to the hardware if control is realized via fieldbus.

4.5.3 Wiring the power connections without NFH EcoLine filter

NOTICE

Irreparable damage to the supply and regenerative modules

Except for the line filter and the choke, no further components must be installed between the line contactor K11 and the supply and regenerative module. Otherwise, the switch-on sequence cannot be performed correctly.



⏚ = PE (housing grounding point)

⊘ = Power shield terminal

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* When F16 (trip contact at overload relay) trips, K11 must open and "Output stage enable" must receive a "0" signal. F16 is a signal contact, which means the resistor circuit must not be interrupted.

** Emergency swichting off release delay only in line with applicable system- and country-specific safety regulations.

See MXR switch-on sequence (→ 🗎 41)

NOTICE

If the entire system should be disconnected from the supply system with a line disconnector (e.g. via main switch), proceed as follows:

- Decelerate and lock the axes, withdraw the "enable / charge" signal of the supply and regenerative module.
- Interrupt the control of the line contactor K11 of the supply and regenerative module.

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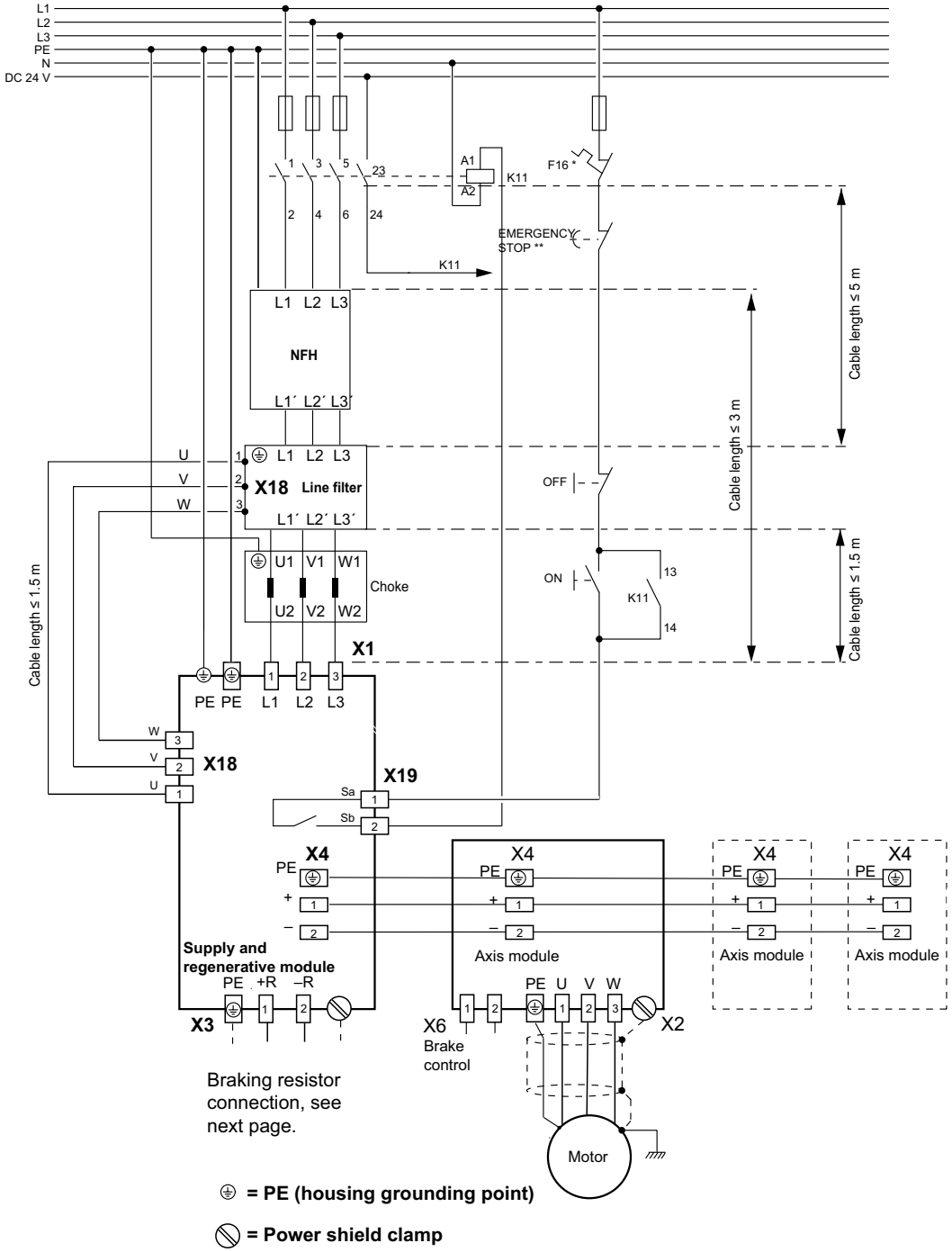
4.5.4 Wiring the power connections with NFH EcoLine filter

NOTICE

Irreparable damage to the supply and regenerative modules

Except for the NFH EcoLine filter, the line filter and the choke, no further components must be installed between the line contactor K11 and the supply and regenerative module. Otherwise, the switch-on sequence cannot be performed correctly.



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* When F16 (trip contact at overload relay) trips, K11 must open and "Output stage enable" must receive a "0" signal. F16 is a signal contact, which means the resistor circuit must not be interrupted.

** Emergency swichting off release delay only in line with applicable system- and country-specific safety regulations.

See MXR switch-on sequence (→ 🗎 41)

NOTICE

If the entire system should be disconnected from the supply system with a line disconnector (e.g. via main switch), proceed as follows:

- Decelerate and lock the axes, withdraw the "enable / charge" signal of the supply and regenerative module.
- Interrupt the control of the line contactor K11 of the supply and regenerative module.

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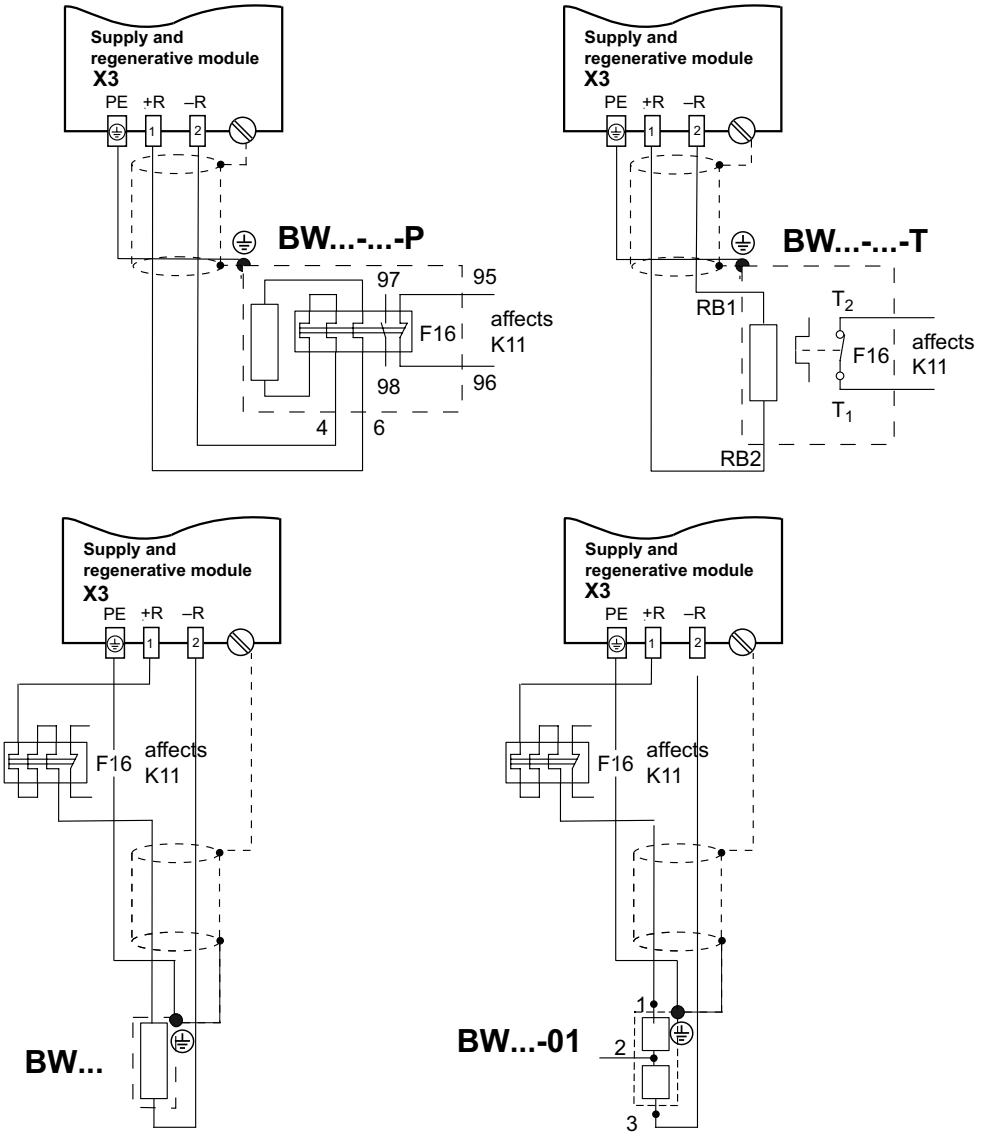
4.5.5 Braking resistor connection



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BW...-...-P	BW...-...-T	BW... , BW...-01
When the signal contact F16 trips, K11 must open. When F16 (trip contact at overload relay or temperature switch) trips, K11 must open and "Output stage enable" must receive a "0" signal. F16 is a signal contact, which means the resistor circuit must not be interrupted.	When the internal temperature switch trips, K11 must open. When F16 (trip contact at overload relay or temperature switch) trips, K11 must open and "Output stage enable" must receive a "0" signal. F16 is a signal contact, which means the resistor circuit must not be interrupted.	When the external bimetal relay (F16) trips, K11 must open. When F16 (trip contact at overload relay or temperature switch) trips, K11 must open and "Output stage enable" must receive a "0" signal. F16 is a signal contact, which means the resistor circuit must not be interrupted. If you want to use a DC link discharge module, it is essential that you contact SEW-EURODRIVE.

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Braking resistor type	Overload protection
BW..	through external bimetal relay F16
BW...-01	through external bimetal relay F16
BW..-..-T	• through internal temperature switch, or • through external bimetal relay F16
BW..-..-P	through internal bimetal relay F16

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4.6 Terminal assignment

INFORMATION

Reference potentials inside the unit:

The designation of the reference potentials is listed in the following table:

Designation	Meaning
DGND PE	General reference potential of control electronics. There is a metallic connection to PE.
BGND	Reference potential for brake connection
RGND	Reference potential for safety relay
DCOM	Reference potential for digital inputs

INFORMATION

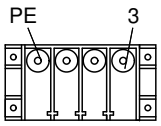
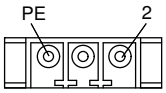
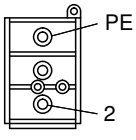
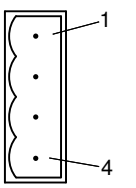
Connection elements:

All connection elements are represented in the following tables as viewed from top.

4.6.1 Terminal assignment of the supply and regenerative module

INFORMATION

The technical data of the power and control electronics connections are described in chapter "Technical Data" in this manual and in the "MOVIAXIS® Multi-Axis Servo Inverter" operating instructions.

	Terminal	Assignment	Brief description
	X1:PE X1:1 X1:2 X1:3	PE L1 L2 L3	Line connection (MXR)
	X3:PE X3:1 X3:2	PE +R -R	Braking resistor connection
	X4:PE X4:1 X4:2	PE +V_{DCL} -V_{DCL}	DC link connection
	X5a:1 X5a:2	+24 V_E DGND	Voltage supply for electronics
	X5a:3 X5a:4	+24 V_B BGND	Voltage supply for brake

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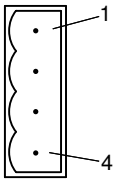
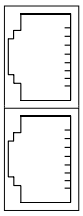
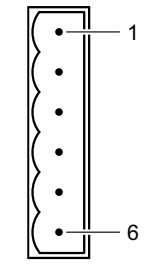
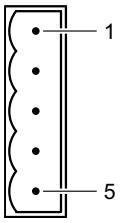
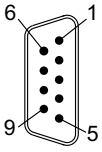
	Terminal	Assign-ment	Brief description	
	X5b:1 X5b:2	+24 V_E DGND	Voltage supply for electronics	
	X5b:3 X5b:4	+24 V_B BGND	Voltage supply for brake	
	X9a X9b		a = input: Signaling bus, with green connector b = output: Signaling bus, with red connector	
 *18014401455736203*	X10:1 X10:2 X10:3 X10:4 X10:5 X10:6	DIØØ DIØ1 DIØ2 DIØ3 DCOM DGND	Digital input 1; with fixed assignment "Output stage enable" Digital input 2; with fixed assignment "Enable/ charge" Digital input 3; freely programmable, default: "Reset" Digital input 4; freely programmable, default: "Line contactor feedback" Reference potential for digital inputs DIØØ – DIØ3 General reference potential of control electronics	Electrically isolated via optocoupler with reference to DCOM (X10:5).
	X11:1 X11:2 X11:3 X11:4 X11:5	DOØØ DOØ1 DOØ2 DOØ3 DGND	Digital output 1, with fixed assignment "Ready for operation" Digital output 2; fixed assignment with "Ready for power on " Digital output 3; freely programmable Digital output 4; freely programmable Reference potential for digital outputs DOØØ – DOØ3	
	X12:1 X12:2 X12:3 X12:4 X12:5 X12:6 X12:7 X12:8 X12:9	n.c.CAN_L CAN_H CAN_L DGND $R_{Abschluss}$ DGND CAN_H $R_{termination}$	– CAN1 bus low Reference potential CAN1 bus CAN1 bus low Unit-internal bus terminating resistor Reference potential CAN bus CAN1 bus high CAN1 bus high Unit-internal bus terminating resistor	

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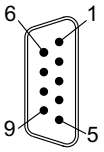
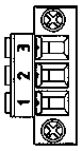
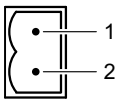
	Terminal	Assign-ment	Brief description
	X17:1 X17:2 X17:3 X17:4 X17:5 X17:6 X17:7 X17:8 X17:9	n.c. CAN_L CAN_H DGND $R_{Abschluss}$ DGND CAN_H $R_{termination}$	– CAN2 bus low Reference potential CAN2 bus CAN2 bus low Unit-internal bus terminating resistor Reference potential CAN2 bus CAN2 bus high CAN2 bus high Unit-internal bus terminating resistor
	X18:1 X18:2 X18:3	U V W	Line voltage measurement
	X19:1 X19:2	Sa Sb	Enable contact for line contactor

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5 Startup

This chapter describes in particular the startup of the MXR supply and regenerative module.

For detailed information on the startup of the MOVIAXIS® axis system, refer to the "MOVIAXIS® MX Multi-Axis Servo Inverter" operating instructions.

5.1 General information

⚠ WARNING

Uncovered power connections.

Severe or fatal injuries from electric shock.

- Never start the unit without protective covers and touch guards.
- Install protective covers and touch guards as instructed.

NOTICE

The MXR supply and regenerative module may only be switched on when the drives are at standstill.

5.1.1 Requirements

Correct project planning for the drive is a prerequisite for successful startup. For detailed project planning information and an explanation of the parameters, refer to the "MOVIAXIS® Multi-Axis Servo Inverter" system manual.

For starting up the entire axis system, observe the "Startup" chapter in the "MOVIAXIS® Multi-Axis Servo Inverter" operating instructions.

INFORMATION

In addition to the requirements specified in the operating instructions and the system manual for MOVIAXIS®, the MXA8... axis modules must be equipped with firmware . 24 or higher.

5.2 Settings on the supply and regenerative module with CAN-based system bus

The following settings are required:

- The CAN transmission rate is set using the two DIP switches S1 and S2 on the supply and regenerative module, see the "MOVIAXIS® Multi-Axis Servo Inverter" operating instructions, chapter "Assigning the CAN transmission rate".
- The address of the supply and regenerative module is set using the two address switches S3 and S4. The other axis addresses are set automatically based on the set device address.

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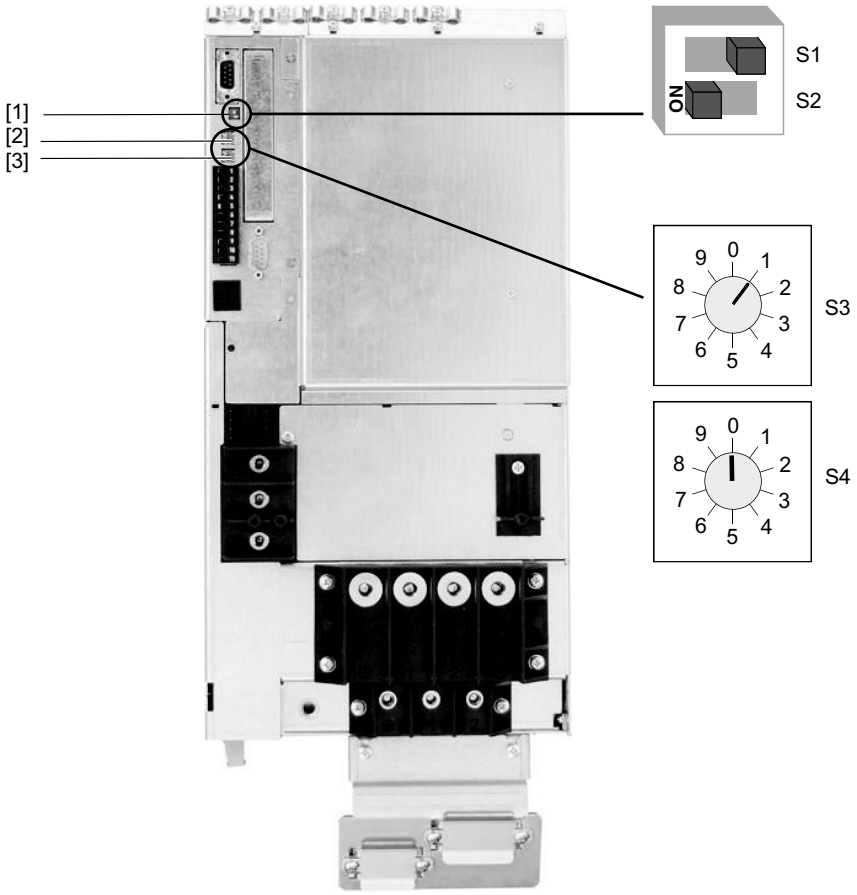
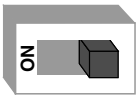
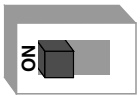
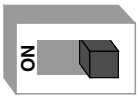
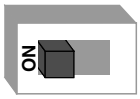
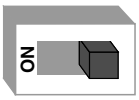
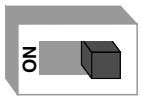
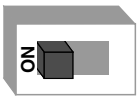
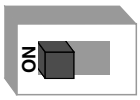


2946599179

[1] S1, S2: DIP switches for setting the CAN1 transmission rate

[2] S3: Axis address switch 10^0 (setting at delivery: 1×10^0)

[3] S4: Axis address switch 10^1 (setting at delivery: 0×10^1)

	125 kBit/s	250 kBit/s	500 kBit/s	1 Mbit/s
S1				
S2				

INFORMATION

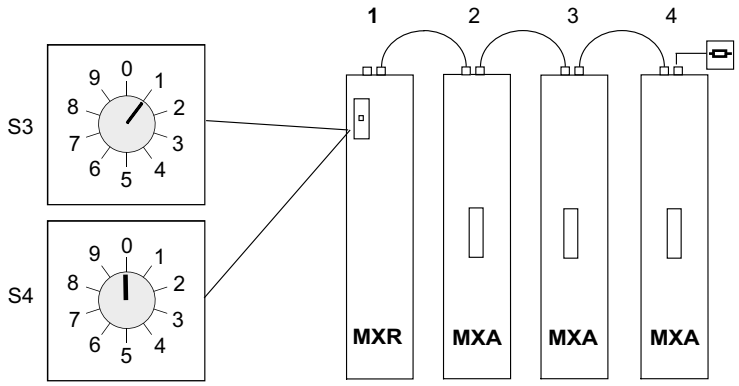
The default setting at delivery is 500 kbit/s.

5.2.1 Example

Axis address "1" is set on the MXR supply and regenerative module, see the following figure.

The axis addresses of all other modules are based on this setting.

Figure: Axis address setting



MXR Supply and regenerative module

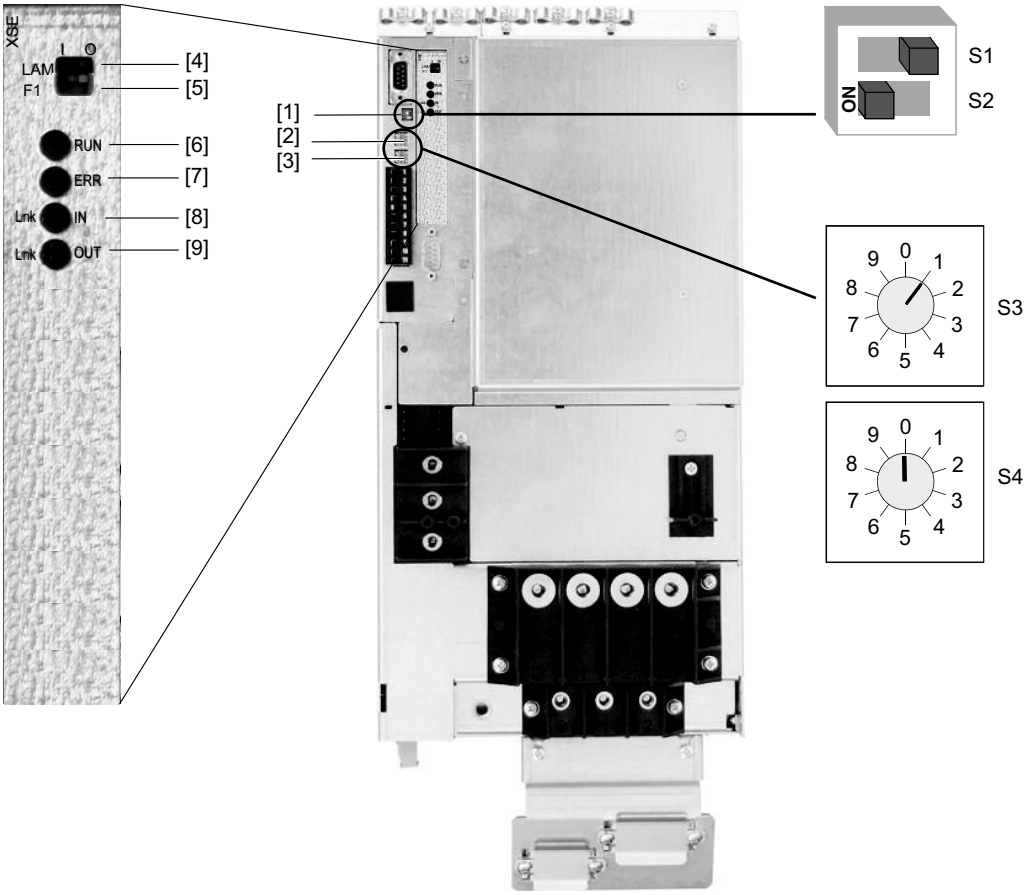
MXA Axis module

5.3 Settings on the supply and regenerative module with EtherCAT® compatible system bus XSE24A

For information on the EtherCAT®-compatible system bus XSE24A, refer to the "MOVIAXIS® MX Multi-Axis Servo Inverter" operating instructions.

Modules that are supplied with EtherCAT® compatible system bus XSE24A are pre-configured at the factory.

When using an EtherCAT® compatible based system bus, the DIP switches [1] and the axis address switches [2, 3] are not active.



2946642571

[1] S1, S2: DIP switches for setting the CAN transmission rate: **Not active**

[2] S3: Axis address switch 10^0: **Not active**

[3] S4: Axis address switch 10^1: **Not active**

[4] LAM switch
- Switch position 0

[5] F1 switch
- Switch position 0: Delivery state
- Switch position 1: Reserved for added functions

[6] RUN LED; color: green/orange

[7] LED ERR; color: red

[8] LED Link IN; color: green

[9] LED Link OUT; color: green

For setting the transmission rate and axis address, see chapter "Settings on the supply and regenerative module with CAN based system bus" (→ 🗎 32).

INFORMATION

When using the XSE24A card in the axis modules, also the MXR80 supply and regenerative module must be equipped with an XSE24A card.

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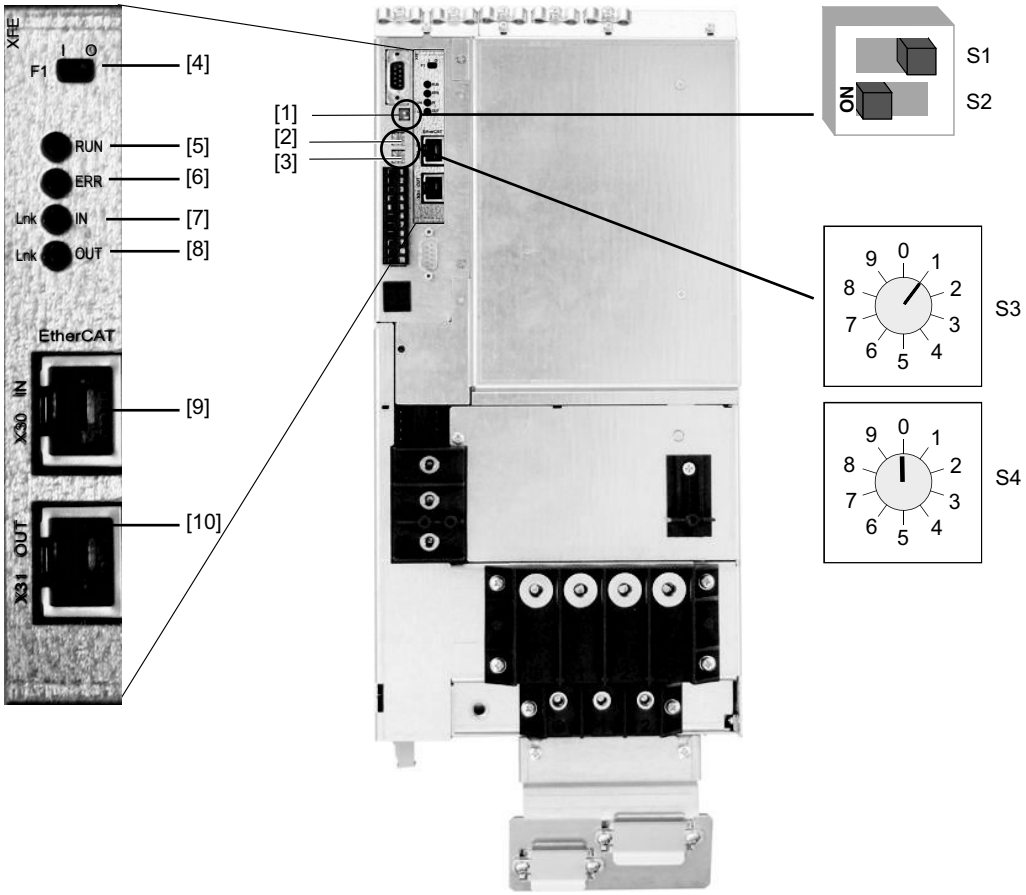
5.4 Settings on the supply and regenerative module with EtherCAT® XFE24A fieldbus interface

For information on the EtherCAT® XFE24A fieldbus interface, refer to the "MOVIAXIS® Multi-Axis Servo Inverter" operating instructions.



2946676235

[1] S1, S2: DIP switches for setting the CAN transmission rate

[2] S3: Axis address switch 10^0

[3] S4: Axis address switch 10^1

[4] LAM switch
- Switch position 0

F1 switch
- Switch position 0: Delivery state
- Switch position 1: Reserved for added functions

[5] RUN LED; color: green/orange

[6] LED ERR; color: red

[7] LED Link IN; color: green

[8] LED Link OUT; color: green

[9] Bus input

[10] Bus output

For setting the transmission rate and axis address, see chapter "Settings on the supply and regenerative module with CAN based system bus".

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5.5 Starting up MXR80 with MOVITOOLS® MotionStudio

Selection and setup of the communication between PC and MOVIAXIS® is described in the "MOVIAXIS® Multi-Axis Servo Inverter" operating instructions in chapter "Communication selection".

5.5.1 Unit selection / opening the parameter tree

Step 1

In the device tree, select the MXR80A... supply and regenerative module.

Step 2

Open the context menu by clicking the right mouse button and select "Startup / Parameter tree" (online).

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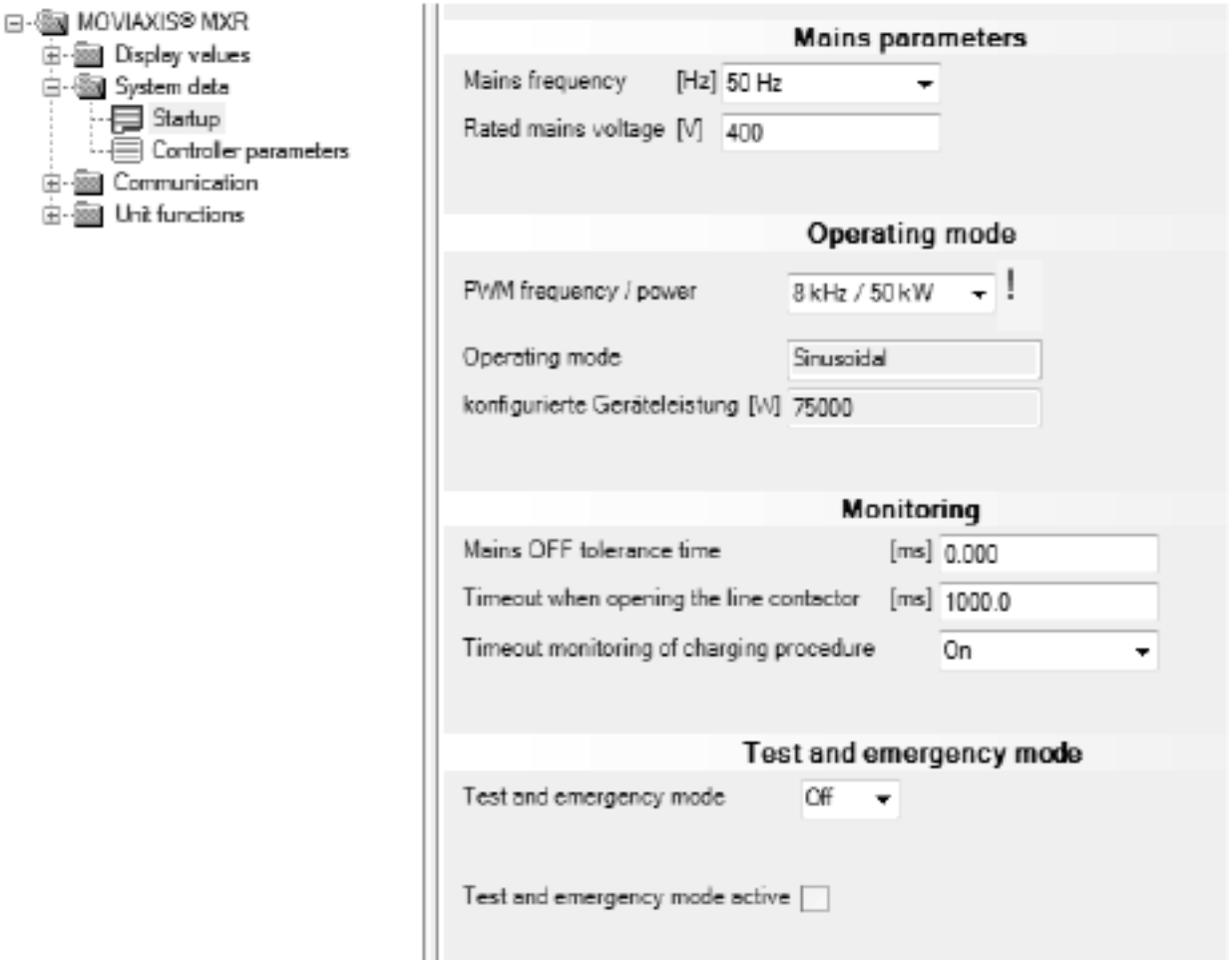
5.5.2 Startup

Step 3

In the parameter tree, select the group "System data\Startup" and check the settings of the startup parameters.

The following values are set by default:



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- **Line frequency [Hz]**: Set the line frequency of the power supply: **50 Hz** / 60 Hz
- **Nominal line voltage [V]**: Here you set the nominal voltage of the power supply: 380 – **400** – 480 V.

NOTICE

Incorrect setting of the nominal line voltage might result in malfunctions and damages to the unit.

- **PWM frequency**: Set the PWM frequency [kHz] for the MXR supply and regenerative module.

NOTICE

Depending on the projected unit power of 50 or 75 kW, the "PWM frequency" parameter must be set to 8 or 4 kHz:

See also the Parameter description (→ 🗎 49) chapter.

- 4 kHz for 75 kW rated unit output
- 8 kHz for 50 kW rated unit output

SEW-EURODRIVE recommends to keep the default settings of the parameters described below.

- **Power off tolerance time [ms]**: The power off tolerance time can be used to set when an error is triggered after a line voltage failure. **0** – 20 ms. A value above zero must be entered according to the application.
- **Timeout when opening the line contactor [ms]**: Monitors the time after the enable signal is revoked until the "Line contactor feedback" signal is no longer pending. An error is triggered when the monitoring time set here is exceeded. 0 – **1000** ms.
- **Charging timeout monitoring [ms]**: After the enable signal is issued, this function monitors whether the DC link voltage reaches 300 V within the timeout interval of 10 s. The function also monitors whether the DC link voltage reaches the setpoint value within a timeout interval of 5 s after the controller has been enabled. **On**/off.

INFORMATION

After having checked and, if necessary, adjusted the above described parameters, MXR is started up and ready for normal operation.

Deviating parameter settings for applications with special requirements are listed in chapter Parameter description (→ 🗎 49). Consult SEW-EURODRIVE if required.

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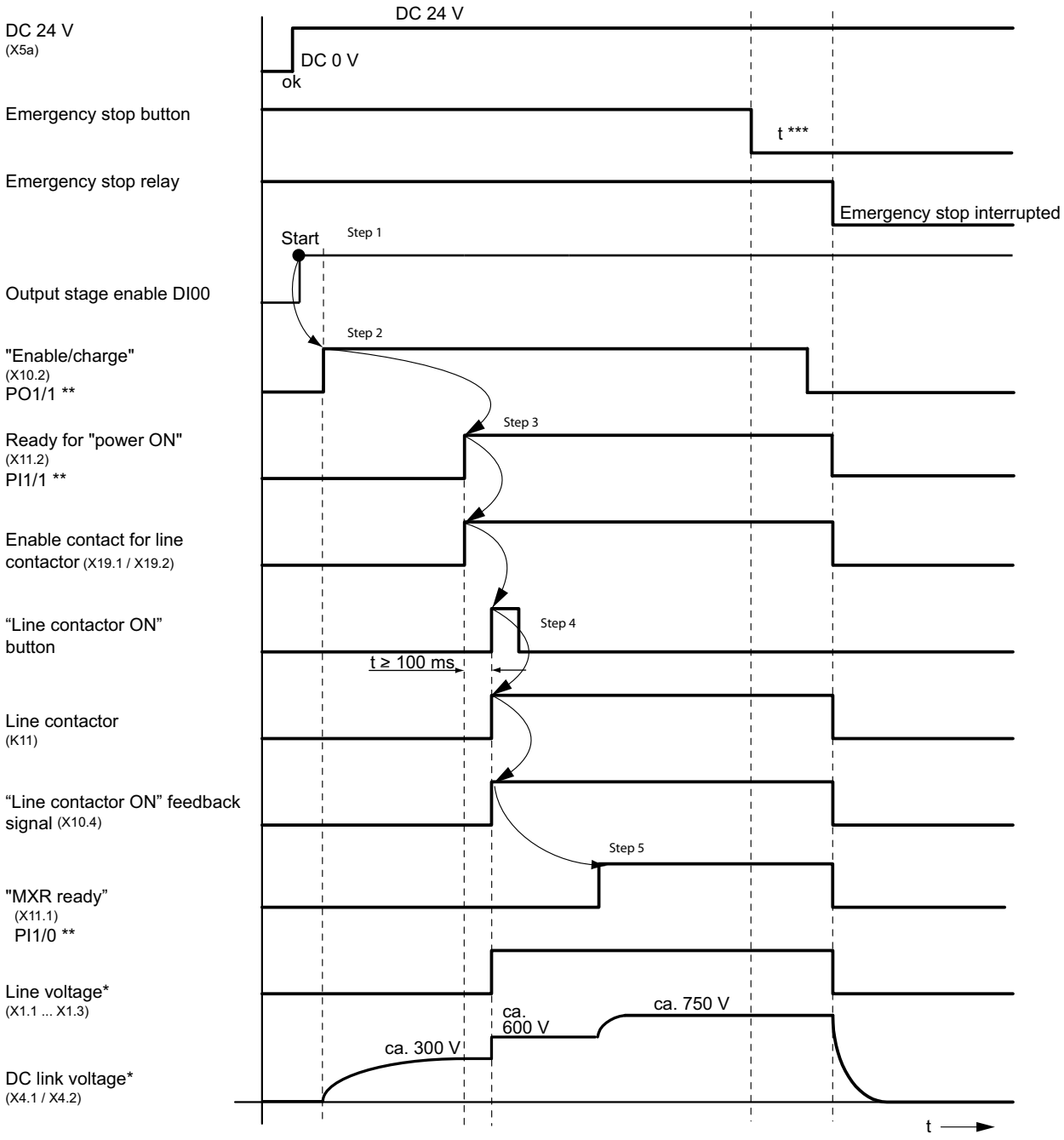
5.6 Switch-on/off sequence of the supply and regenerative module

NOTICE

The following switch-on/switch-off sequence is mandatory.



36028800007954443

* With a line voltage of AC 400 V

** With control via fieldbus

*** Emergency swichting off release delay only in line with applicable system- and country-specific safety regulations and customer specifications.

INFORMATION

Observe a wait time of t ≥ 100 ms after the "Ready for power on" signal. Do not activate the line contactor before this wait time has elapsed.

INFORMATION

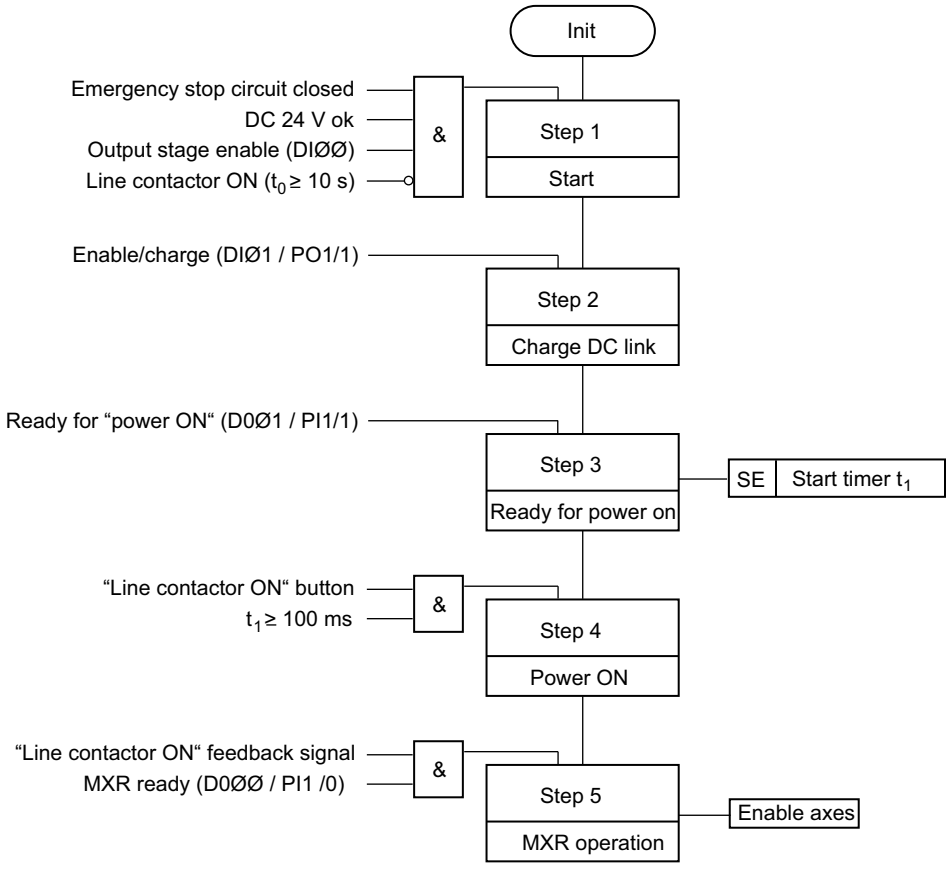
Do not enable the axes before MXR has signaled "MXR ready".

INFORMATION

Before switching off, the "Enable/Charge" signal must be disabled and the axes (motors) must be decelerated to zero speed and inhibited. Only then are you allowed to deactivate the line contactor.

Comply with operator specific as well as country specific regulations.

Step diagram for the switch-on sequence.



SE: Set response delay

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5.6.1 Addendum to the diagram

Enable/charge

The enable signal is required for operating the MXR module. It pre-charges the DC link to about 300 V, see Switch-on sequence diagram (→ 🗎 41).

The in-phase wiring of the components on the line end and the line voltage measurement are checked. See also the table of errors: Error 107 (→ 🗎 60).

After the "Ready for power on" signal is received, the line contactor can be activated.

Switching off the MXR module:

In normal operation, the MXR module is switched off by withdrawing the "Enable/charge" signal. As a result, the "Enable contact for line contactor" is revoked, which causes the line contactor to drop out.

Ready for power on

The MXR module sets this signal as soon as the line contactor can be energized.

Enable contact for line contactor

Enable contact for X19 line contactor.

The time until which the "Line contactor on" control switch may be activated must be longer than 100 ms.

MXR ready

The MXR module signals "Ready" as soon as the DC link voltage reaches approximately 750 V and no error is present. This signal means that the axes can be enabled.

5.6.2 Troubleshooting

If one of the errors described in chapter "Table of MXR errors" (→ 🗎 60) occurs, the "MXR ready" signal is revoked (X11.1 / PI1/0[1)]).

In this case, the system must be brought to a standstill in an application-specific emergency mode.

If the emergency braking resistor option is installed, the axes can be decelerated in a controlled manner. Else, the "Output stage enable" of the axes must be revoked.

The error responses of the axis modules are listed in the "MOVIAXIS® Multi-Axis Servo Inverter" operating instructions.

1) Fieldbus operation

5.7 Process data assignment for fieldbus operation

5.7.1 Controlling the supply and regenerative module

The servo inverter is controlled via up to 16 process data input words and process data output words.

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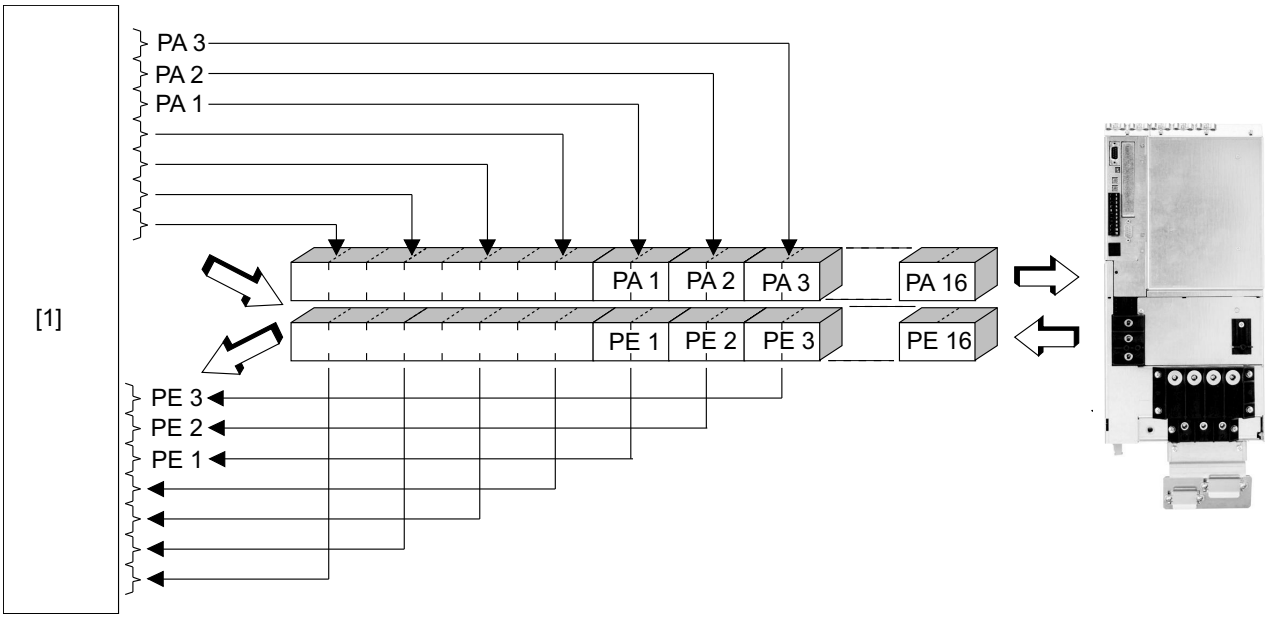
Example:



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[1]	Process image of the controller (master)
PI1 – PI16	Process input data
PO1 – PO16	Process output data

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5.7.2 Process output data PO

Number of process data words: 1 – 16

Process data assignment PO1 (control word) and PO2

Bit no.	Meaning
0	Output stage enable
1	Enable/charge ("1" = Enable/charge) *
2	Error reset
3	Not connected
4	Activate test and emergency mode
5	Not connected
6	Not connected
7	Not connected
8	Not connected
9	Not connected
10	Not connected
11	Not connected
12	Not connected
13	Not connected
14	Not connected
15	Not connected

* Fixed assignment

Process data assignment PO3 – PO16

Process data words PO3 – PO16 are not assigned.

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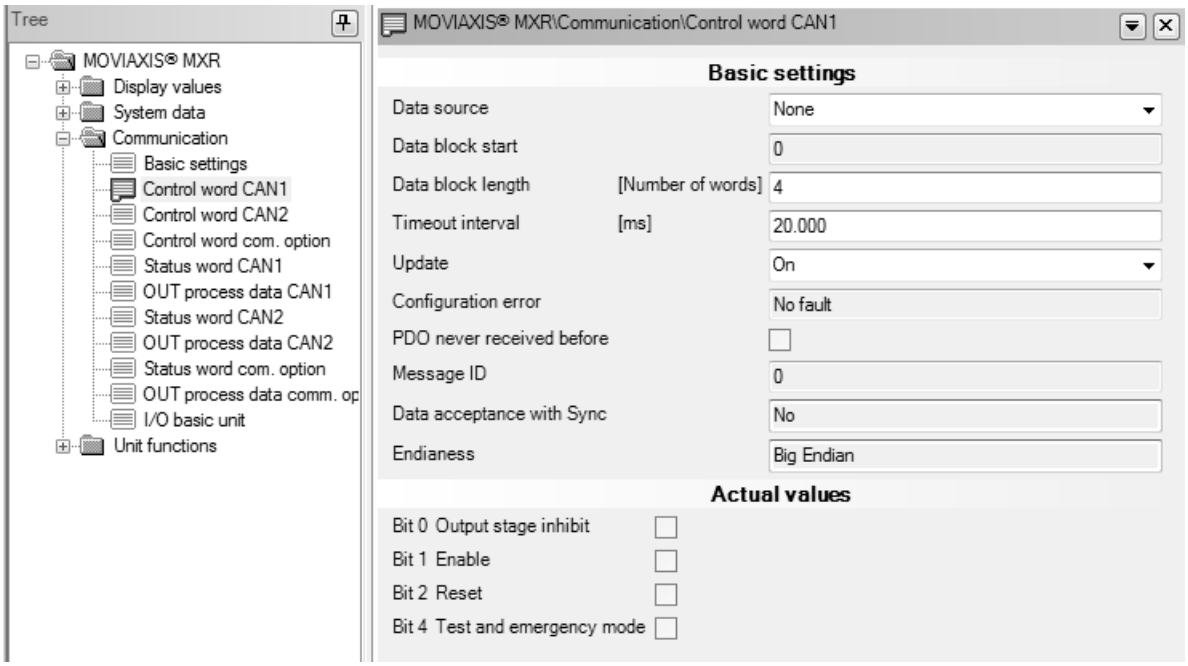
Control word input window



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5.7.3 Process input data PI

Process data assignment PI1 (status word) and PI2

Bit no.	Meaning
0	Ready ("1" = Ready) *
1	Ready for power on *
2	Error reset or test and emergency mode active
3	Parameterizable
4	Parameterizable
5	Parameterizable
6	Parameterizable
7	Parameterizable
8	Parameterizable
9	Parameterizable
10	Parameterizable
11	Parameterizable
12	Parameterizable
13	Parameterizable
14	Parameterizable
15	Parameterizable

* Default

Process data assignment PI3 – PI16

Process data words PI3 – PI16 are not assigned.

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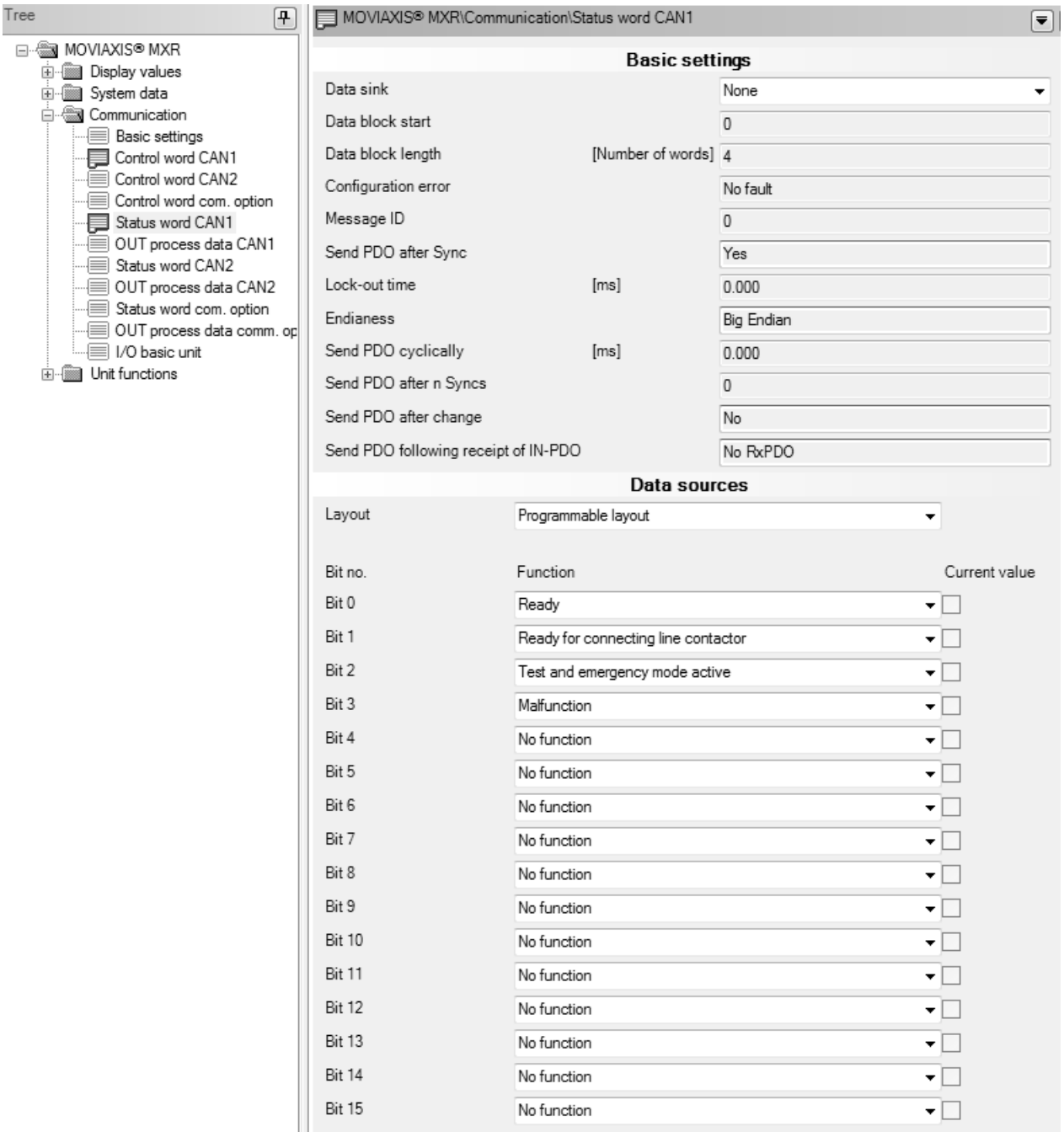
Status word input window



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5.8 Parameter description

5.8.1 Display values

Output stage process values

8325.0 DC link voltage

Unit: V

Current value of the DC link voltage V_{DC}

9786.1 Output current

Unit: %

Present value of the output current of MXR in relation to the nominal device current.

8326.0 Filtered output current

Unit: A

Current filtered value of the output current on the line end.

10467.40 Effective power

Unit: kW

Current effective power of the MXR supply and regenerative module; negative values indicate the regenerative power that is fed back into the supply system. Positive values specify the effective power input from the supply system.

10467.42 Filtered effective power

Unit: kW

Current filtered effective power of the MXR supply and regenerative module; negative values indicate the regenerative power that is fed back into the supply system. Positive values specify the effective power input from the supply system.

10467.41 Regenerated energy

Unit: kWh

Displays the amount of energy regenerated since the last reset. The last parameter value is stored in a non-volatile memory. The parameter can be reset by writing the value "0" to it.

In the parameter tree of MotionStudio, the value is displayed with the resolution [kWh]. If the value is read directly from the unit, e.g. via fieldbus, the resolution is [Wh].

10467.14 U_d setpoint

Unit: V

Active voltage setpoint.

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10467.15 Uq setpoint

Unit: V

Reactive voltage setpoint.

10467.8 Id setpoint

Unit: A

Active current setpoint.

10467.9 Iq setpoint

Unit: A

Reactive current setpoint.

9859.1 Thermal current limit

Unit: %

Displays the actual thermal current limit in % of the MXR supply and regenerative module.

The MXR module has a brief overload capacity up to this maximum limit (maximum operating point). The thermal current limit is dynamically adjusted according to the utilization of MXR. It starts at 250% and becomes smaller depending on the utilization.

9811.5 Total utilization

Unit: %

Current unit utilization based on the rated power of MXR.

9811.1 Dynamic utilization chip rise

Unit: %

Dynamic utilization of the chip rise in percent (Ixt utilization).

The parameter is unfiltered.

9811.4 Heat sink utilization

Unit: %

Current heat sink utilization.

9795.1 Heat sink temperature

Unit: °C

Current heat sink temperature.

9811.3 Electromechanical utilization

Unit: %

Current electromechanical utilization.

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Unit status

In the "Unit status" parameter group, you can read all the information about the present unit state.

Device data

In the "Unit data" parameter group, you can read information about the unit variant and option cards. The unit status and the version number of the firmware are displayed here.

10483.2 Configured unit power

Unit: W

Unit nameplate

In the "Unit nameplate" parameter group, you can read information such as the serial number and status information of the hardware and software of MXR and the option subassembly.

Error history

The error history consists of 6 error ring memories in which the most recent errors are stored. In addition, each error ring memory saves process values and the states of the binary inputs and outputs at the time of the error.

Line process values

10467.16 U_{alpha}

Unit: V

Real part of voltage phasor.

10467.17 U_{alpha}

Unit: V

Imaginary part of voltage phasor.

10467.3 I_{alpha}

Unit: A

Real part of current phasor.

10467.4 I_{beta}

Unit: A

Imaginary part of current phasor.

10467.12 U_{d}

Unit: V

Active voltage.

10467.13 U_{q}

Unit: V

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Reactive voltage.

10467.50 I_d

Unit: A

Active current.

10467.51 I_q

Unit: A

Reactive current.

5.8.2 System data

Startup

10470.10 Line frequency

Unit: Hz

Value range: **50 Hz**, 60 Hz

This parameter can be used to set the line frequency of the supply system.

10470.14 Line voltage

Unit: V

Value range: 380 – **400** – 480

This parameter can be used to set the nominal voltage of the supply system.

10470.4 Control settings

Value range:

- 0 = operating mode sine-shaped
- 1 = operating mode block-shaped

This parameter is used to set the operating mode.

10470.2 PWM frequency

Unit: kHz

Value range: **50 kW: 8 kHz**, 75 kW: 4 kHz

The parameter sets the PWM frequency [kHz] for the MXR supply and regenerative module. The parameter must be set depending on the projected unit power of 50 or 75 kW:

50 kW: 8 kHz

75 kW: 4 kHz

Due to the upstream choke and the line filter, the PWM frequency cannot be selected freely, but is determined by the project planning.

See also page 41 and subsequent pages.

To change the PWM frequency, it is necessary to replace these upstream units and in some cases to adapt the installed cable cross sections, the fuses and the line contactor.

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10469.4 Power OFF tolerance

Unit: ms

Value range: **0** – 20

The power off tolerance can be used to set the time after which an error is triggered in the event of a line voltage failure.

Note that during regenerative operation an error can be triggered before the set power off tolerance time has elapsed if the DC link capacitors are fully charged, no more regenerative power can be absorbed, and no optional braking resistor is connected.

10472.11 Timeout when opening the line contactor

Unit: ms

Value range: 0 – **1000**

Monitors the time after the enable signal is revoked until the "Line contactor feedback" signal is no longer pending. An error is triggered when the monitoring time set here is exceeded.

10472.1 Charging timeout monitoring

Unit: ms

Value range: **On**/off

After the enable signal is issued, this function monitors whether the DC link voltage reaches 300 V within the timeout interval of 10 s. The function also monitors whether the DC link voltage reaches the setpoint value within a timeout interval of 5 s after the controller has been enabled.

10472.7 Test and emergency mode

Value range:

- 0 = Off
- 1 = On

This parameter can be used to toggle between test and emergency mode.

Controller parameters

10467.2 U_z setpoint

Unit: V

This parameter shows the setpoint for the controlled DC link voltage.

Basic settings

See "MOVIAXIS® Multi-Axis Servo Inverter" system manual, chapter "Communication parameter description"

5.8.3 Communication

Control word CAN1 / CAN2 / communication options

9514.1 CAN1 / 9515.1 CAN2 / 9516.1 Communication option data source

Value range: **None** / CAN1

Here you can set the source of the control word information.

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9514.3 CAN1 / 9515.3 CAN2 / 9516.3 Communication option data block start

See "MOVIAXIS® Multi-Axis Servo Inverter" system manual, parameter 9514.3

9514.4 CAN1 / 9515.4 CAN2 / 9516.4 Communication option data block length

Unit: Number of words

Value range: 0 – **4** – 16

This parameter can be used to set the length of the data block.

9514.19 CAN1 / 9515.19 CAN2 / 9516.19 Communication option timeout interval

Unit: ms

Value range: 0 – **20** – 10000

Here you can set the monitoring time after which an error is triggered if no telegrams are received any longer. Setting the value to 0 ms deactivates the monitoring function.

9514.5 CAN1 / 9515.5 CAN2 / 9516.5 Communication option update

See "MOVIAXIS® Multi-Axis Servo Inverter" system manual, parameter 9514.5

9514.16 CAN1 / 9515.16 CAN2 / 9516.16 Communication option configuration error

See "MOVIAXIS® Multi-Axis Servo Inverter" system manual, parameter 9514.16

9514.2 CAN1 / 9515.2 CAN2 message ID

Here you can set the ID of the CAN message received.

9514.14 CAN1 / 9515.14 CAN2 data acceptance with sync

Here you can set whether the data is accepted with a sync message.

9514.14 CAN1 / 9515.14 CAN2 nEndianess

Value range: **Big endian** (Motorola format) / little endian (Intel format)

Indicates the data format set for the CAN messages.

Status word CAN1 / CAN2 / communication options

9563.3 CAN1 / 9564.3 CAN2 / 9565.3 Communication option data sink

Value range: **None** / CAN1 system bus

This parameter determines the communication channel used for transmitting status information.

9563.5 CAN1 / 9564.5 CAN2 / 9565.5 Communication option data block start

See "MOVIAXIS® Multi-Axis Servo Inverter" system manual, parameter 9563.5

9563.6 CAN1 / 9564.6 CAN2 / 9565.6 Communication option data block length

Unit: Number of words

Value range: 0 – **4** – 16

This parameter can be used to set the length of the data block.

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9563.16 CAN1 / 9564.16 CAN2 / 9565.16 Communication option configuration error

Indicates a configuration error.

9563.4 CAN1 / 9564.4 CAN2 message ID

Indicates the ID of the sent CAN message.

9563.1 CAN1 / 9564.1 CAN2 Send PDO after sync

Indicates whether messages with status information are sent after the sync message.

9563.17 CAN1 / 9564.17 CAN2 blocking time

See "MOVIAXIS® Multi-Axis Servo Inverter" system manual, parameter 9563.17

9563.21 CAN1 / 9564.21 CAN2 endianess

Indicates the data format set for the CAN messages: **Big endian** (Motorola format) / little endian (Intel format).

9563.2 CAN1 / 9564.2 CAN2 Send PDO cyclically

Unit: ms

Indicates the intervals for sending the process data objects (PDOs).

9563.22 CAN1 / 9564.22 CAN2 Send PDO after n sync

Indicates the number of sync messages after which PDOs are sent.

9563.23 CAN1 / 9564.23 CAN2 Send PDO following change

Indicates whether PDOs are only sent after the data to be sent has been changed.

9563.19 CAN1 / 9564.19 CAN2 Send PDO following receipt of IN-PDO

Indicates whether out-PDOs are sent after PDOs have been received.

9856.2 CAN1 / 9856.3 CAN2 Layout

Determines the layout to be used for the status word:

Programmable layout:

The assignment of the individual status bits is determined by the user.

Progr. layout / error code:

- Bit 0 – 7 is specified by the user
- Bit 8 – 15 transmit the error code

8334.0 / 8334.1 / 8349.0 / 8349.1 / 9559.3 / 9559.4 I/O basic unit

The assignments and states of the binary inputs/outputs are displayed. The function of the binary outputs DO-2 and DO-3 can also be set. The assignment of the inputs/ outputs is fixed:

- DI-0: Output stage enable DI-1: Enable (index 8334.0,0)
- DI-3: Line contactor feedback (Index 8334.0,1)

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- DO-0: Ready for operation (Index 8349.0,0)
- DO-1: Ready for power on (Index 8349.0,1)
- DO-2: N. fct. (default) / function can be set by the user (index 9559.3)
- DO-3: N. fct. (default) / function can be set by the user (index 9559.4)

5.8.4 Unit functions

Setup

See "MOVIAXIS® Multi-Axis Servo Inverter" system manual, chapter "Unit functions parameter description"

Reset behavior

See "MOVIAXIS® Multi-Axis Servo Inverter" system manual, chapter "Unit functions parameter description"

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6 Operation

6.1 General information

⚠ WARNING

Dangerous voltages present at cables and motor terminals.

Severe or fatal injuries from electric shock.

- When the unit is switched on, dangerous voltages are present at the output terminals as well as at any connected cables. This also applies even when the unit is inhibited and the motor is at standstill.
- The fact that the operation LED on a module is no longer illuminated does not indicate that the unit has been disconnected from the supply system and no longer carries any voltage.
- Before touching the power terminals, check to see that the MXR supply and regenerative module is disconnected from the power supply.
- Observe the general safety notes in chapter 2 as well as the safety notes in chapter "Electrical Installation" in the "MOVIAXIS® Multi-Axis Servo Inverters" operating instructions.

NOTICE

The MXR supply and regenerative module may only be switched on when the drives are at standstill.

6.2 Operating modes

6.2.1 Normal operation

Normal operation means production operation.

6.2.2 Test/emergency mode

In test/emergency mode, the connected axes of a machine or system can be moved, for example, for test purposes during the startup phase, or in emergency cases.

The operating mode test/emergency mode results in a power reduction due to the lower DC link voltage, see chapter "Technical data (→ 🗎 71).

In this operating mode, MXR80A does not feed back regenerative energy into the power grid but converts the energy into heat energy via a braking resistor.

Requirements:

- A sufficiently dimensioned braking resistor is connected.
- Test/emergency mode can be activated after the switch-on/off sequence, i.e.:
  - output stage enable is withdrawn, DIØØ = 0 (low)
  - the digital input is enabled, DIØ2 = 1 (high) or PEn bit 2 = 1 (high)

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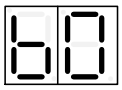
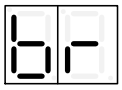
When using DIØ2, it has first be set to the function "test/emergency mode". With this setting, the digital input is no longer available for the RESET function. The RESET signal can be set via process data.

- Next, MXR80A signals "test/emergency mode" active (DØ02 / PIn bit 2 = "1" (high) and at the same time "MXR ready" (DØ00 = "1" (high) / PI 1/0 = "1" (high)). The axes may now be enabled again. The signal "output stage enable" DIØØ does not have to be enabled but can remain "0" (low).

6.3 Operating displays and errors of the supply and regenerative module

6.3.1 Table of displays

	Description	State	Comment / action
Displays during boot process			
  	Unit passes through several states when loading the firmware (boot) to get ready for operation.	• Status: Not ready. • Output stage is inhibited. • No communication possible.	• Waiting for boot process to finish. • Unit stays in this condition: Unit defective.
Displays of different unit states			

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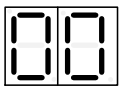
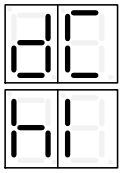
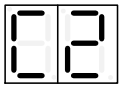
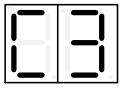
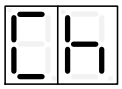
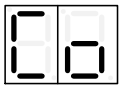
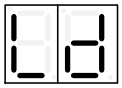
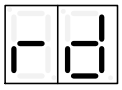
	Description	State	Comment / action
	DC link voltage missing.	• Status: Not ready. • Output stage is inhibited. • Communication is possible.	Check supply system.
 Flashing alternately	Dangerous voltage in the DC link (> 20 V).		No enable, line contactor open.
	24 V supply of the supply and regenerative module or internal switched-mode power supply unit of regeneration not ready for operation.		Check 24 V or unit defective.
	Incorrect synchronization with bus. Process data processing not available.		• Check bus connection. • Check synchronization setting at unit and controller. • Check process data settings at unit and controller. • Check for missing PDO.
	Regenerative power module not ready and DC link pre-charge active.		Waiting for charging to finish.
	Regenerative power module not ready, line contactor can be energized.		–
	Regenerative power module not ready, line contactor energized and DC link charging active.		Output stage still inhibited.
	Regenerative supply module ready.		–
Displays during initialization processes (parameters will be reset to default values)			

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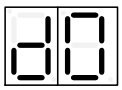
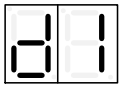
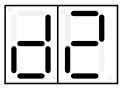
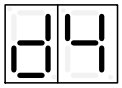
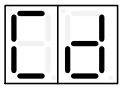
	Description	State	Comment / action
	Basic initialization.	• Status: Not ready. • Output stage is inhibited. • Communication is possible.	Waiting for initialization to finish.
	Initialization of delivery state.		
	Initialization of factory setting.		
	Initialization of customer-specific set 1.		
	Initialization of customer-specific set 2.		
 flashing	Parameter download (via Vardata) active.		

6.3.2 Table of MXR errors

INFORMATION

The following table lists all the errors issued by the MXR module. For errors of the axis modules, refer to the "MOVIAXIS® Multi-Axis Servo Inverters" operating instructions.

A "P" in the column "Error response" indicates that the response is programmable. The factory set error response is listed in the column "Error response".

The following abbreviations are used for the module designations:

- "AM" for axis module
- "SM" for supply module

Error		Sub error	Error		System state Measures Reset type	Digital output signal[1]
Code	Signal	Code	Cause	Response[2]		
00	No error (this display is an operating display -> see operating displays)	---	---	---	---	Ready = 1 (depending on system state) Fault = 1
01	"Overcurrent" error		• Output short circuit • Motor too large • Defective output stage	Output stage inhibit	System waiting Warm start	Ready = 1 Fault = 0

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Error		Sub error	Error		System state Measures Reset type	Digital output signal[1]
Code	Signal	Code	Cause	Response[2]		
02	"UCE monitoring" error		The error is an additional kind of overcurrent, measured at the collector-emitter voltage of the output stage. The possible cause of the error is identical with error 01. The distinction serves only for internal purposes.	Output stage inhibit	System waiting Warm start	Ready = 1 Fault = 0
03	"Ground fault" error		Ground fault • in the motor cable • in the inverter • in the motor	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0
04	"Brake chopper" error		Error message from power supply module via signaling bus. • Too much regenerative power • Braking resistor circuit interrupted • Short circuit in the braking resistor circuit • Braking resistance too high • Brake chopper defective	Output stage inhibit	System waiting Warm start	Ready = 1 Fault = 0
05	"Timeout HW info system" error		The connection between power supply module and axis module via signaling bus has been interrupted	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0
		01	Connection to signaling bus interrupted			
		02	Signaling bus timeout flag cannot be reset			
06	"Line phase failure" error		Error message from power supply module via signaling bus. A missing line phase was detected.	Output stage inhibit	System waiting Warm start	Ready = 1 Fault = 0
07	"DC link" error		Error message by supply module via signaling bus when DC link voltage is too high.	Output stage inhibit	System waiting Warm start	Ready = 1 Fault = 0
		00	DC link overvoltage. The DC link voltage has exceeded 900 V. This can be caused by too dynamic load changes from motoring operation and regenerative operation or by previous errors such as line phase failure or "power off" in regenerative operation.	Inhibit output stage immediately	System waiting Always save history	
		04	Permitted tolerance range of the voltage V_z to PE exceeded	Inhibit output stage immediately	System waiting Always save history	
		05	DC link undervoltage: The DC link voltage has dropped below 350 V (MXR80A) / 200 V (MXR81A). This can be caused by too dynamic load changes from regenerative operation and motoring operation or by previous errors such as line phase failure or "power off" in motoring operation.	Open output stage inhibit and line contactor	System waiting Always save history	
16	"Startup" error		Error during startup	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0
		01	Denominator of pole pair number of resolver not equal to 1			
		02	Numerator of pole pair number of resolver too large			
		03	Numerator of pole pair number of resolver too small, i.e. = 0			
		04	Denominator of emulation PPR count for resolver not equal to 1			

Error		Sub error	Error		System state Measures Reset type	Digital output signal[1]
Code	Signal	Code	Cause	Response[2]		
		05	Numerator of emulation PPR count for resolver too small			
		06	Numerator of emulation PPR count for resolver too great			
		07	Numerator of emulation PPR count for resolver is not a power of two			
		08	Denominator of emulation PPR count for sine encoder is not equal to 1			
		09	Denominator of emulation PPR count for sine encoder too small			
		10	Numerator of emulation PPR count for sine encoder too great			
		11	Numerator of emulation PPR count for sine encoder is not a power of two			
		100	The motor/inverter combination cannot reach the required test torque with the present limit values		Check limit values, adjust test torque	
		512	Invalid motor type taken into operation			
		513	Set current limit exceeds maximum current of axis			
		514	Set current limit is less than nominal magnetizing current of the motor			
		515	CFC: Factor for calculating the q-current cannot be displayed			
		516	Invalid parameter setting for PWM frequency			
		517	"Final speed flux table" parameter not within permitted range			
		518	"Final flux ID table" parameter not within permitted range			
		519	Output stage enable requested without valid motor startup			
		520	Motor startup not possible with enabled output stage			
		521	Factor for torque limit cannot be displayed (A)			
		522	Factor for torque limit cannot be displayed (B)			
		525	Factors for current setpoint filter cannot be displayed			
		526	Factors for current increase limit cannot be displayed			
		527	Position FIR filter cannot show the encoder delay			
		528	Speed FIR filter cannot show the encoder delay			
		529	Thermal motor monitoring I2t: Two curve points with identical speed in the speed-torque characteristics		Increase distance between curve points	
		530	Maximum motor current parameter set incorrectly			
		531	Rotor position identification: Forward correction table does not increase in strict monotonous manner			
		532	Rotor position identification: CMMin too small		Nominal axis current too high compared to motor	
		533	Rotor position identification not permitted for started-up motor			

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Error		Sub error	Error		System state Measures Reset type	Digital output signal[1]
Code	Signal	Code	Cause	Response[2]		
		534	PWM frequency for FCB 25 must be 8 kHz		Set PWM frequency to 8 kHz	
		535	TMU-Init index not set		Set TMU-Init index	
		1024	NV memory parameter of nominal unit current is greater than NV memory parameter of current measuring range			
		1025	NV memory parameter of current measuring range is zero			
		1026	NV memory parameter of current measuring range is zero			
		1027	NV memory parameter of current measuring range is too large			
		1028	System limits for speed are greater than max. possible speed			
		1029	Application limits for speed are greater than max. possible speed			
		1030	Invalid sensor type set for output stage temperature			
		1031	CFC: No absolute encoder used as motor encoder for synchronous motors.			
		1032	CFC: No absolute encoder used as motor encoder for synchronous motors			
		1033	Position range in position detection mode "without overflow counter" exceeded		Correct the project planning of the travel distance	
		1034	FCB dual drive: Lag error window adjustment must not be smaller than "standard" lag error window			
		1035	FCB dual drive: Lag error window may not be smaller than adjustment threshold			
		1036	Modulo reference offset is not within modulo limit		Perform error-free startup	
		1037	Position values of software; Limit switches reversed, positive < negative			
		1038	Encoder system: Denominator factor (system unit) larger than or equal to numerator factor (system unit)		• Perform startup • Increase numerator factor (system unit)	
		1039	Encoder option 1 unable to evaluate set encoder type		Encoder must be operated on XGS11A	
		1040	Encoder option 2 unable to evaluate set encoder type		Use corresponding option card or connect the required encoder to the proper hardware	
		1041	The unit or option is unable to evaluate the set encoder type		Use corresponding option card or connect the required encoder to the proper hardware	
		1042	No commutation present		Set commutation with FCB25	
		1043	Standstill current not permitted for synchronous motor		Disable standstill current function	
17	Internal processor error (traps)		CPU has detected internal error	Output stage inhibit	System waiting Warm start	Ready = 1 Fault = 0
18	Internal software error		The software has detected a non-permissible state.	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0

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Error		Sub error	Error		System state Measures Reset type	Digital output signal[1]
Code	Signal	Code	Cause	Response[2]		
25	"Non-volatile parameter memory" error		An error was detected during access to non-volatile parameter memory	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0
		01	NV memory address access			
		02	NV memory runtime error (Memory-Device)			
		03	Error reading data from non-volatile memory. Data cannot be used due to faulty identification or checksum.			
		04	Initialization error of memory system.			
		05	The read-only memory contains invalid data.			
		06	The read-only memory contains incompatible data of another device (in case of exchangeable data memories)			
		07	NV memory initialization error			
		08	NV memory internal error			
		09	NV memory JFLASH error			
		10	NV memory FLASH error			
28	"Fieldbus timeout" error		Process data communication is interrupted.	Stop with emergency stop delay (D), (P)	System waiting Warm start	Ready = 1 Fault = 0
		01	Fieldbus timeout error			
40	"Boot synchronization" error		Synchronization with an option card could not be executed properly	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0
		01	Option bus not ready or option card faulty			
		02	Timeout during boot synchronization with option or option card faulty			
		03	New boot synchronization required for NG-DPRAM option			
		04	Timeout during boot synchronization with option or encoder option card faulty		Check connection to option bus	
41	"Watchdog timer to option" error		Connection between main processor and option card processor no longer exists	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0
		01	Burst on option bus aborted by single access			
		02	Too many options in total or too many options of one kind			
		03	Resource management subsystem option error			
		04	Error in an option driver			
		05	Invalid burst length			
		06	Option found with address selection switch set to 0		Set address selection switch so that it matches the option card slot	
		07	Two options with same address selection switch found		Set address selection switch so that it matches the option card slot	
		08	CRC error XIA11A		Replace XIA11A option	
		09	Watchdog occurred at XIA11A		Replace XIA11A option	
		10	Alleged XIA11A system tick cycle violation		Inform developer	
		11	SERR on option bus		Replace option	
		12	5-volt reset on XFP11A option			

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Error		Sub error	Error		System state Measures Reset type	Digital output signal[1]
Code	Signal	Code	Cause	Response[2]		
		13	Watchdog error on CP923X		Replace option or replace firmware of option	
		14	Timeout while accessing option bus		Replace option	
		15	Error interrupt for which no cause could be determined			
		18	Error on option bus		Check option card (possibly defective)	
		19	Error message from option bus connection		Report firmware error	
		21	No sync signal within a certain wait time			
		22	Sync period not divisible as whole number by basic period			
		23	Invalid sync/basic period ratio			
		24	Sync period duration not within permitted range			
		25	Timer overflow in the area of writing the timer register			
		26	Reference lost between EncEmu and count timer			
		27	Speed too high (max. counts exceeded)			
		28	Illegal parameter (emu. source, emu. hysteresis, emu. resolution)			
		29	Phase controller in setpoint limitation			
		30	No capture occurred			
		31	Encoder option 1 or 2: CRC error in the internal flash of XC161		Replace XGH / XGS	
		32	Maximum angle difference exceeded			
		33	XGS/XGH option 1: Position mode not supported		Firmware update of the option	
		34	XGS/XGH option 2: Position mode not supported		Firmware update of the option	
42	"Lag distance positioning" error		A preset, maximum permitted lag error was exceeded during positioning • Rotary encoder connected incorrectly • Acceleration ramps too short • P component of positioning controller too small • Incorrect speed controller parameters • Value of lag error tolerance too small	Output stage inhibit	System waiting Warm start	Ready = 1 Fault = 0
		01	FCB Positioning lag error			
		02	FCB Jog lag error			
		03	FCB standard lag error			
43	"Remote timeout" error		An interruption has occurred during control via a serial interface	Stop with application limits	System waiting Warm start	Ready = 1 Fault = 0
		01	FCB jog mode: Communication timeout during direction control			

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Error		Sub error	Error		System state Measures Reset type	Digital output signal[1]
Code	Signal	Code	Cause	Response[2]		
		02	The watchdog for secure parameter communication has been activated, but was not re-triggered in time. (No connection to the device or connection too slow)		1. Check connection to device 2. Extend timeout interval of watchdog (max 500 ms) 3. Decrease utilization of computer to be controlled, close additional programs, such as MotionStudio plug-ins you no longer need	
44	"Ixt utilization“ error		Inverter overloaded	Output stage inhibit	System waiting Warm start	Ready = 1 Fault = 0
		01	Ixt current limit less than required D current			
		02	Chip temperature rise limit exceeded			
		03	Chip temperature limit exceeded			
		04	Limit of el. / mech. utilization exceeded			
		05	Short circuit of sensor detected			
		06	Motor current limit exceeded			
46	"Timeout SBUS #2" error		Communication via SBUS#2 is interrupted	Shutdown with emergency stop delay [P]	System waiting Warm start	Ready = 1 Fault = 0
		01	Timeout CANopen, CAN2: Control failure, cable breakage			
50	24 V supply voltage error		Error in the 24 V supply voltage	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0
		01	24 V signals faulty or switched-mode power supply module defective		Check the 24 V supply	
		04	Internal AD converter: No conversion performed			
53	"CRC flash" error		A CRC error occurred while checking the program code by flash in code RAM or resolver DSP.	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0
		01	CRC32 error in flash EEPROM section "Initial Boot Loader"			
		02	CRC32 error in flash EEPROM section "Boot Loader"			
		03	CRC32 error in flash EEPROM section "DSP firmware"			
		04	CRC32 error in code RAM (firmware) after copying from flash EEPROM			
		05	CRC32 error in code RAM (firmware) with ongoing control during operation			
		06	CRC32 error in code RAM (firmware) following a software or watchdog reset (CPU error triggered by code inconsistency)			
		07	CRC32 error in code RAM (firmware): Repeated reading of same memory cell yielded different result			
		09	Correctable bit error detected in Boot Loader Package			
		10	Correctable bit error detected in Boot Support Package			
		11	Correctable bit error detected in firmware			
55	"FPGA configuration" error		Internal error in logic module (FPGA)	Output stage inhibit	System blocked / CPU reset	Ready = 0 Fault = 0
56	"External RAM" error		Internal error in RAM module	Output stage inhibit	System blocked / CPU reset	Ready = 0 Fault = 0

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Error		Sub error	Error		System state Measures Reset type	Digital output signal[1]
Code	Signal	Code	Cause	Response[2]		
		01	Asynchronous DRAM read&write check error			
		02	Asynchronous burst-RAM read & write check error			
		03	Synchronous burst-RAM read check error (burst mode failure)			
		04	FRAM error			
		05	FRAM consistency management error detected			
66	"Process data configuration" error		Process data configuration error	Stop with emergency stop delay	System blocked System restart	Ready = 0 Fault = 0
		01	The process data configuration has been changed. The entire process data subsystem has to be restarted by means of an inverter reset.			
		102	Process data configuration error: Incorrect input process data length of communication option			
		201	Process data configuration error: 2 I/O PDOs connected to one option		I/O PDOs must be connected with different options	
		301	Two PDO mapper channels linking to the same target		Eliminate conflict of PDO mapper channels.	
		1001	Software error in process data subsystem: Process data buffer stack overflow			
		1002	Software error in process data subsystem: Process data buffer stack underflow			
		1003	Software error in process data subsystem: Too many users for process data buffer stack			
		1004	Software error in process data subsystem: 1004			
		1005	Software error in process data subsystem: 1005			
		1006	Software error in process data subsystem: 1006			
		1007	Software error in process data subsystem: Too many PDO users			
		1008	Software error in process data subsystem: Too many PDO user nodes			
		1009	Software error in process data subsystem: 1009			
		1010	Firmware error: Permitted number of PDO mapper channels exceeded			
		2000	Software		Perform factory setting	
		2001	Address is equal to 0 or higher than 127		Address 1 to 127 assigned	
		2002	Invalid PDO mapping			
		10001	A PDO configured to CAN has an ID located in the area used by the SBus for parameter setting (0x200-0x3ff und 0x600-0x7ff).			
		10002	A PDO configured to CAN has an ID located in the area used by CANopen for parameter setting (0x580-0x67f).			
		10003	A PDO configured to CAN is to transmit more than 4 PD. Only 0 - 4 PD are possible for CAN.			

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Error		Sub error	Error		System state Measures Reset type	Digital output signal[1)]
Code	Signal	Code	Cause	Response[2)]		
		10004	Two or more PDOs configured to the same CAN bus use the same ID.			
		10005	Two PDOs configured to the same CAN bus use the same ID.			
		10006	Process data configuration error: Too many PDOs set to CAN (missing mem.)			
		10007	Process data configuration error: Too many PDOs set to CAN (missing CAN res.)			
		10008	Invalid transmission mode entered for a PDO configured to CAN.			
		10009	Process data configuration error: CAN ID has already been used by scope on the same CAN			
		10010	Process data configuration error: CAN ID has already been used by sync on the same CAN			
		10011	Process data configuration error: Send problems on CAN (double send err.)			
		10012	Process data configuration error: Send problems on system bus (double send err.)			
		10013	Process data configuration error: Send problems on application CAN (double send err.)			
		10014	The inhibit time is not a whole-numbered multiple of the current process data processing		Adjust inhibit time or change current process data processing	
		10015	The event timer is not a whole-numbered multiple of the current process data processing		Adjust event timer or current process data processing	
		10016	The CAN setpoint cycle is not a whole-numbered multiple of the current process data processing		Adjust CAN setpoint cycle or current process data processing	
		10017	The CAN sync period is not a whole-numbered multiple of the current process data processing		Adjust CAN sync period or current process data processing	
		10018	The CAN sync offset is not a whole-numbered multiple of the current process data processing		Adjust CAN sync offset or current process data processing	
		10019	Data acceptance time of synchronous out-PDOs greater than or equal to CAN setpoint processing cycle. This means out-PDOs are no longer sent		Set the time of data acceptance of synchronous out-PDOs to a smaller value than the CAN setpoint processing cycle	
		20001	Configuration conflict with the master			
		20002	Process data configuration error: Bus master has deactivated OUT PDO or specified invalid offset			
		20003	Process data configuration error: Bus master has deactivated IN PDO or specified invalid offset			
		20004	Process data configuration error: More input PDO on K-net than permitted			
		20005	Process data configuration error: More output PDO on K-net than permitted			

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Error		Sub error	Error		System state Measures Reset type	Digital output signal[1)]
Code	Signal	Code	Cause	Response[2)]		
		20006	"Process data configuration" error: more PDO words on K-net than permitted			
67	"PDO timeout" error		An input PDO whose timeout interval is not 0, that has not been set to "Offline" and that has already been received once has exceeded its timeout interval	Stop with application delay (D), (P)	System waiting Warm start	Ready = 1 Fault = 0
		0	PDO 0			
		1	PDO 1			
		2	PDO 2			
		3	PDO 3			
		4	PDO 4			
		5	PDO 5			
		6	PDO 6			
		7	PDO 7			
		8	PDO 8			
		9	PDO 9			
		10	PDO 10			
		11	PDO 11			
		12	PDO 12			
		13	PDO 13			
		14	PDO 14			
		15	PDO 15			
68	“External synchronization“ error			Stop with emergency stop delay	System waiting Warm start	Ready = 1 Fault = 0
		01	Time limit for expected synchronization signal exceeded			
		02	Synchronization lost, synchronization period outside tolerance range			
		03	Synchronization to synchronization signal not possible			
		04	Duration of sync. signal is not an integer multiple of the PDO system duration			
		05	Time limit for synchronization signal exceeded			
		06	Synchronization lost, invalid period of synchronization signal			
		07	No synchronization of the synchronization signal possible			
		08	Duration of system interval too short			
		09	Duration of system interval too long			
		10	Duration of system interval is a multiple of the base interval			
82	"I²xt monitoring SM" prewarning		Utilization of supply module has reached prewarning level	No response (D), (P)	--------	Ready = 1 Fault = 1
		01	SM: Ixt utilization prewarning			
83	"I²xt monitoring SM" error		Utilization of supply module has reached or exceeded the switch-off threshold	Output stage inhibit	System waiting Warm start	Ready = 1 Fault = 0
		01	SM: Ixt utilization error			
85	"Temperature monitoring SM" prewarning		The temperature of the supply module is approaching the switch-off threshold	No response (D), (P)	---------	Ready = 1 Fault = 1
		01	SM: Temperature prewarning			

Error		Sub error	Error		System state Measures Reset type	Digital output signal[1]
Code	Signal	Code	Cause	Response[2]		
86	"Overtemperature SM" error		The temperature of the SM has reached or exceeded the switch-off threshold.	Output stage inhibit	System waiting Warm start	Ready = 1 Fault = 0
		01	SM: Temperature error			
94	"Device configuration data" error		An error has occurred in the device configuration data block during testing in the reset phase	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0
		01	Device configuration data: Checksum error			
		02	Device configuration data: Invalid version of the configuration data set			
		03	Device configuration data: Unexpected nominal unit current		Rectify configuration or adjust firmware	
97	Fault “Parameter set”		Parameter set could not be copied correctly	Output stage inhibit	System blocked System restart	Ready = 0 Fault = 0
		01	Download of parameter set to unit canceled		Repeat download or restore delivery condition	
107	"Line components" error		The firmware has detected an error in one of the line components (choke, line filter, line contactor)	Display only	---------	
197	"Power failure" error		The firmware has detected a power failure	Display only	---------	
199	"DC link charging" error		An error has occurred in the sequence control for DC link charging	Inhibit output stage + open line contactor	Inhibited, software reset	
		01	Time exceeded for precharging DC link to voltage setpoint			
		02	Timeout upon reaching the voltage setpoint (energized line contactor)			
		03	Time exceeded for charging DC link to voltage setpoint			

1) Valid for default response

2) P = programmable, D = default response

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7 Technical data

7.1 Technical data of supply and regenerative modules

7.1.1 General technical data

		Unit	Supply and regenerative module
Environmental conditions			
Ambient temperature (MXR)		°C	0 to +45
Storage temperature		°C	-25 to +70
Climate class		–	EN 60721-3-3, class 3K3
Degree of protection EN 60529 (NEMA1) [1]		–	IP10 according to EN 60529
Operating mode		–	DB (EN 60146-1-1 and 1-3)
Type of cooling		–	DIN 41751 forced cooling (temperature-controlled fan)
Overvoltage category		–	III according to IEC 60664-1 (VDE0110-1)
Pollution class		–	II according to IEC 60664-1 (VDE 0110-1)
Installation altitude		–	Up to h ≤ 1000 m without restrictions. The following restrictions apply to heights ≥ 1000 m: • From 1000 m to max. 2000 m: I_N reduction by 1% per 100 m
Storage period		–	Up to 2 years without any special measures, after that see chapter "Service" in the "MOVIAXIS® MX Multi-Axis Servo Inverters" operating instructions.
Operating conditions			
Interference immunity		–	Meets EN 61800-3
Interference emission with EMC-compliant installation		–	Category "C2" according to 61800-3
			When using an NFH EcoLine filter: Category "C3" according to 61800-3 See chapter "Select additional components" (→ 🗎 91)
Power loss at nominal capacity		W	1000
Number of times power may be switched on/off		rpm	< 1
Mminimum switch-off time for "power off"		s	> 10
Ready for operation after "power on"		s	≤ 20
Mass		kg	22
Dimensions:	B	mm	210
	H	mm	400
	T	mm	254

1) The covers on the left and right end of the unit system must be equipped with touch guard covers. All cable lugs must be insulated.

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Note the minimum switch-off time for "power off".

7.1.2 Power section of supply and regenerative module

MOVIAXIS® MX Supply and regenerative module	Nameplate information	Unit	Supply and regenerative module
INPUT			

MOVIAXIS® MX Supply and regenerative module		Name-plate in-forma-tion	Unit	Supply and regenerative module
Supply voltage AC V_{line}		U	V	3 × 400 V – 3 × 480 V ±10%
Nominal line voltage		U	V	400
Nominal line current[1]	75 kW	I	A	110 (@ 4 kHz PWM)
	50 kW	I	A	73 (@ 8 kHz PWM)
Performance in normal operation				
Nominal power (motor/regenerative)	75 kW	P	kW	75 (@ 4 kHz PWM)
	50 kW	P	kW	50 (@ 8 kHz PWM)
Performance in test/emergency mode				
Nominal and peak power[2] Test/emergency mode – motoring operation		P	kW	60 (@ 4 kHz PWM)
		P	kW	40 (@ 8 kHz PWM)
Nominal and peak power in test/emergency mode – regenerative operation		P	kW	37.5
Line frequency f_{line}		f	Hz	50 – 60 ±5%
Permitted voltage supply systems		–	–	TT and TN
Cross section and contacts of connections		–	mm^2	M8 threaded bolts max. 70
Cross section and contacts at shield terminal		–	mm^2	max. 4 × 50 shielded
Line voltage measurement				
Measurement			–	All 3 phases are picked off between line filter and choke
Cross section and contacts			mm^2	Combicon 7.62 3-pole / one conductor max. 2.5;
OUTPUT (DC LINK)				
DC link V_{DCL}[3]		$V_{DC\ link}$	V	• V_{line} up to 400 V: $V_{DC\ link}$ = 750 V controlled • 400 V < V_{line} < 480 V: V_{DCL} increases linearly from 750 V to 800 V
Nominal DC link current[4] DC I_{DCL}		$I_{DC\ link}$	A	100 (at 75 kW) 67 (at 50 kW)
Max. DC link current[4] DC $I_{DC\ L\ max}$		I_{max}	A	200 (at 75 kW) 134 (at 50 kW)
Overload capacity for max. 1 s[4]		–	–	200%
BRAKING RESISTOR / EMERGENCY BRAKING RESISTOR				
Brake chopper power		–	kW	Peak power: 250% × P_N Continuous power: 0.5 × 75 kW
Minimum permitted braking resistance value R (4-quadrant operation)		–	Ω	3.5
Cross section[5] and contacts on connections		–	mm^2	M6 threaded bolt max. 16
Cross section[5] and contacts at shield terminal		–	mm^2	max. 4 x 16

1) Applies to nominal line voltage of 400 V

2) Nominal and peak power during motoring operation at nominal line voltage = 400 V (DC link voltage = 560 V). Regenerative performance depends on the connected braking resistor

3) Applies to nominal line voltage of 400 V

4) see chapter "Project Planning"

5) Material thickness [mm] × width [mm]

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7.1.3 Control section of a supply and regenerative module

MOVIAXIS® MX **Supply and regenerative module**	**General electronics data**		
INPUT			
DC 24 V voltage supply	DC 24 V ± 25% (EN 61131)		
Cross section and contacts	COMBICON 5.08		
	One conductor per terminal: max. 1.5 mm² (with conductor end sleeve)		
INPUTS/OUTPUTS			
4 digital inputs Internal resistance	Isolated (optocoupler), PLC-compatible (EN 61131), sampling cycle 1 ms R_i = 3.0 kΩ, I_E ≈ 10 mA		
Signal level	+13 V – +30 V = "1" = contact closed -3 V – +5 V = "0" = contact open	According to EN 61131	
Function	DIØ1 – DIØ4: Fixed assignment		
2 digital outputs	PLC-compatible (EN 61131-2), response time 1 ms, short-circuit-proof, I_{max} = 50 mA		
Signal level	"0"=0 V, "1"=+24 V, **Important: Do not apply external voltage!**		
Function	DOØØ and DOØ1: Fixed assignment DOØ2: Freely programmable DOØ3: Not connected		
Cross section and contacts	COMBICON 5.08 One conductor per terminal: 0.20 – 2.5 mm² 2 conductors per terminal: 0.25 – 1 mm²		
Shield terminals	Shield terminals for control lines available		
Maximum cable cross section that can be connected to the shield terminal	10 mm (with insulating sheath)		
Enable contact for line contactor (line contactor control)	Relays		
	Relay contact (NO contact) AC 230 V (max. 300 VA pickup power of line contactor)		
	Pickup current:	at AC 230 V	2 A
		at DC 24 V	0.5 A
	Permitted continuous current:	at AC 230 V	0.5 A
		at DC 24 V	
	Number of switching cycles	200000	
Cross section and contacts	COMBICON 5.08		
	One conductor per terminal: max. 1.5 mm² (with conductor end sleeve)		

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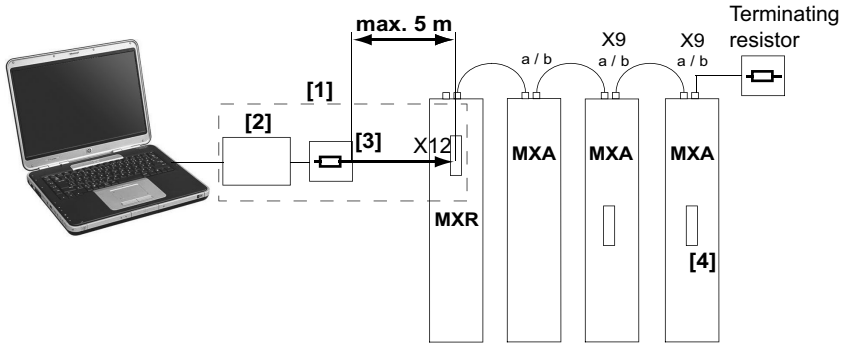
7.1.4 Bus communication

MOVIAXIS® MX Supply and regenerative module	General electronics data	
Signaling bus	CAN-based or EtherCAT® compatible For the EtherCAT® variant, an XSE24A or XFE24A option card is installed	
CAN 1 interface (system bus, not with XSE24A)	**CAN**: 9-pin D-sub connector	CAN bus to CAN specification 2.0, parts A and B, transmission technology to ISO 11898, max. 64 stations. Terminating resistor (120 Ω) has to be implemented externally, baud rate can be set from 125 kBaud to 1 MBaud. Extended MOVILINK® protocol, see chapter "Communication via CAN adapter" in the "MOVIAXIS® MX Multi-Axis Servo Inverter" operating instructions.
CAN 2 interface	See "MOVIAXIS® MX Multi-Axis Servo Inverter" operating instructions.	



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[1] Connection cable between PC and CAN interface on the axis module. The connection cable consists of the USB-CAN interface [2] and the cable with integrated terminating resistor [3].

[2] USB-CAN interface

[3] Cable with integrated terminating resistor (120 Ω between CAN_H and CAN_L)

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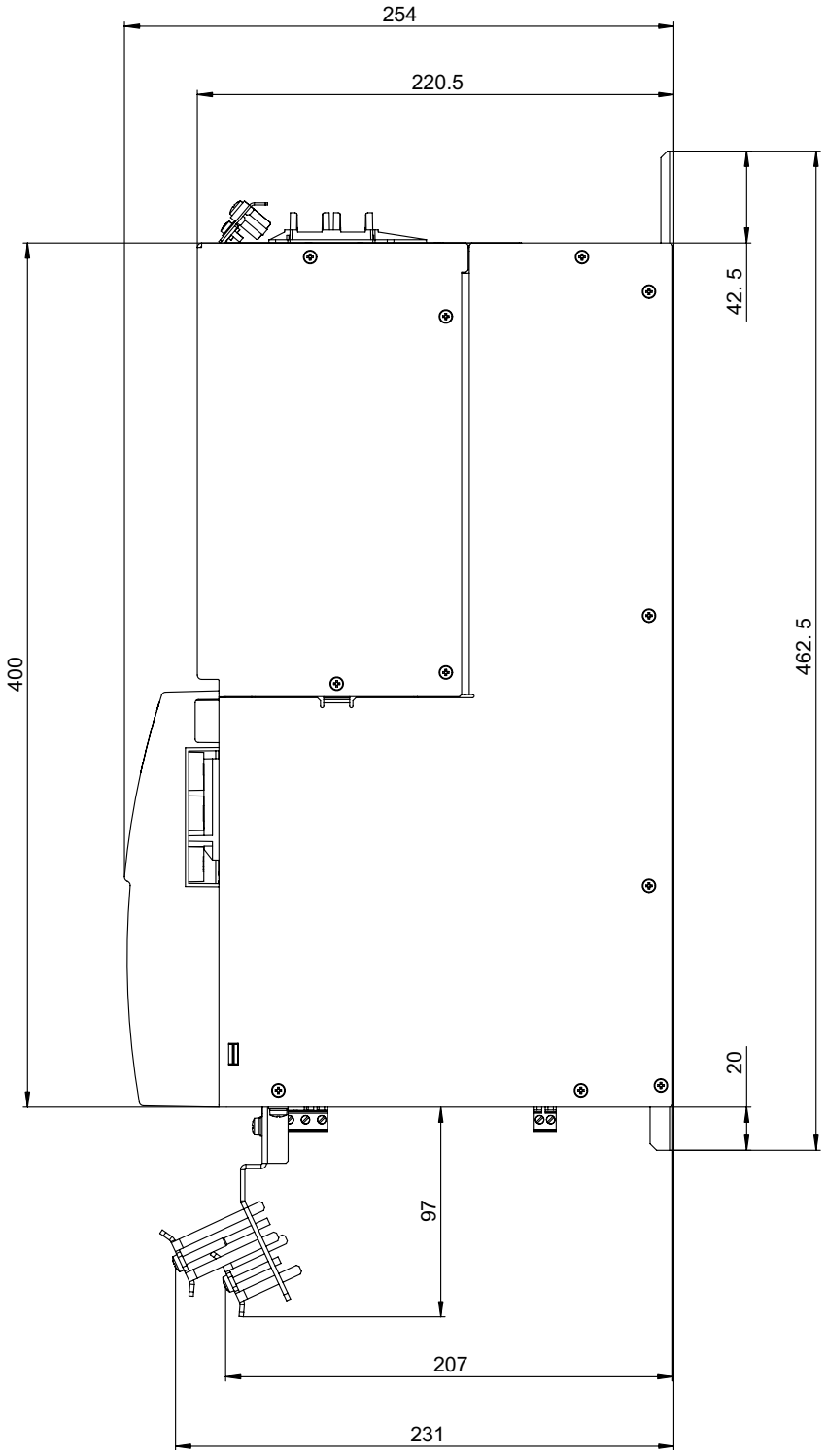
7.2 Dimension sheet of supply and regenerative modules



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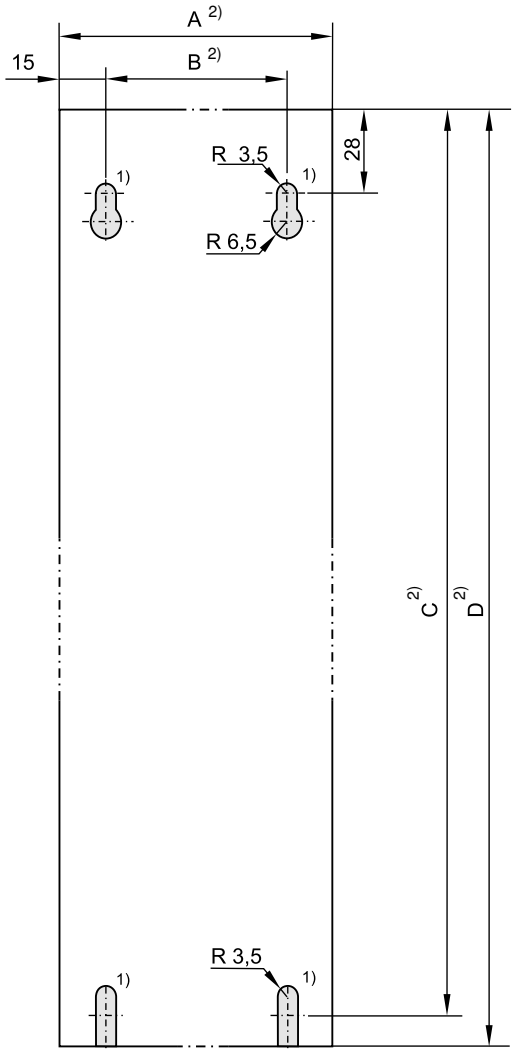
7.3 Hole pattern of supply and regenerative modules



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[1] Position of tapped hole

[2] The dimensions are listed in the following table

MOVIAXIS® MX	Rear view dimensions of MOVIAXIS® MX housing			
	A	B	C	D
	[mm]	[mm]	[mm]	[mm]
MXR supply and regenerative module	210	180	453	462.5

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7.4 Technical data of additional components

7.4.1 NFR.. line filter for 3-phase systems

Structure	• 3-conductor filter • Metal housing
Features	• Design according to UL1283, IEC 60939, CSA 22.2 No. 8
Applications	• Frequency inverters for motor drives • Frequency inverters with regenerative operation
Connections	• Touch-safe connection terminals

Technical data

NFR.. line filters have a component approval independent of the MOVIAXIS® multi-axis servo inverter. SEW-EURODRIVE provides proof of approval on request.

		Unit	Line filter	
			NFR 075-503 (50 kW)	NFR 111-503 (75 kW)
Connection voltage AC[1] V_{line}		V_{AC}	3 × 380 V – 3 × 480 V ±10%	
Nominal line voltage[2] V_N		V_{AC}	3 × 500	3 × 500
Nominal current I_N		A_{AC}	73	110
Power loss[3]		W	60	105
Regenerative cycle frequency f		kHz	8	4
Leakage current current I_{leak}		mA	< 60 mA at AC 500 V 50 Hz in nominal operation	< 20 mA at AC 500 V 50 Hz in nominal operation
Ambient temperature		°C	0 to +45	0 to +45
Degree of protection EN 60529		–	IP20	IP20
Connections L1 – L3 ; L1' – L3'		mm^2	Up to 50 (screw terminals)	Up to 50 (screw terminals)
Connections U, V, W PE (supply system voltage measurement)		mm^2	Screw terminals 0.2 – 4	Screw terminals 0.2 – 4
Mass		kg	31	39
Dimensions	A	mm	150	210
	B	mm	400	400
	C	mm	300	300
Connection dimensions	a	mm	120	180
	b	mm	422	422

1) Max. operating voltage in conjunction with MXR

2) Max. operating voltage of the filters

3) Rule of three applied for partial loads

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Mounting position

The preferred mounting positions are suspended and horizontal, see the following schematic diagrams:

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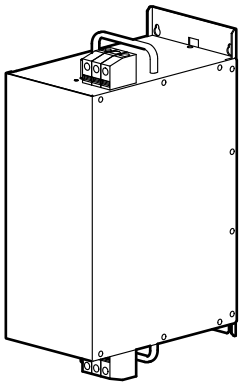
For installation, observe the required minimum clearance of 100 mm above and below the connecting terminals and the ventilation openings.

Suspended



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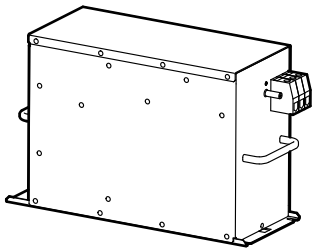
Horizontal



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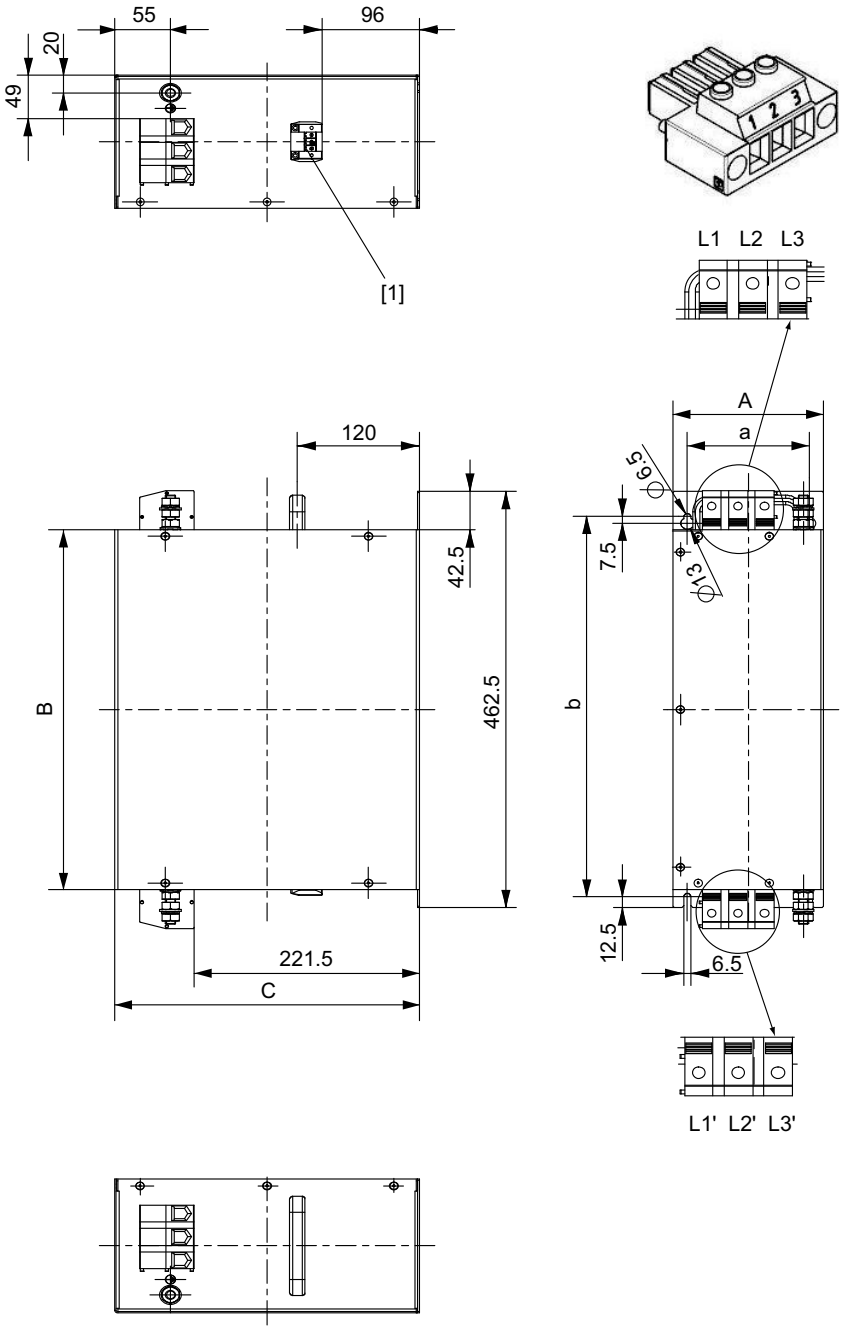
Dimension drawing for NFR 075-503 (50 kW)



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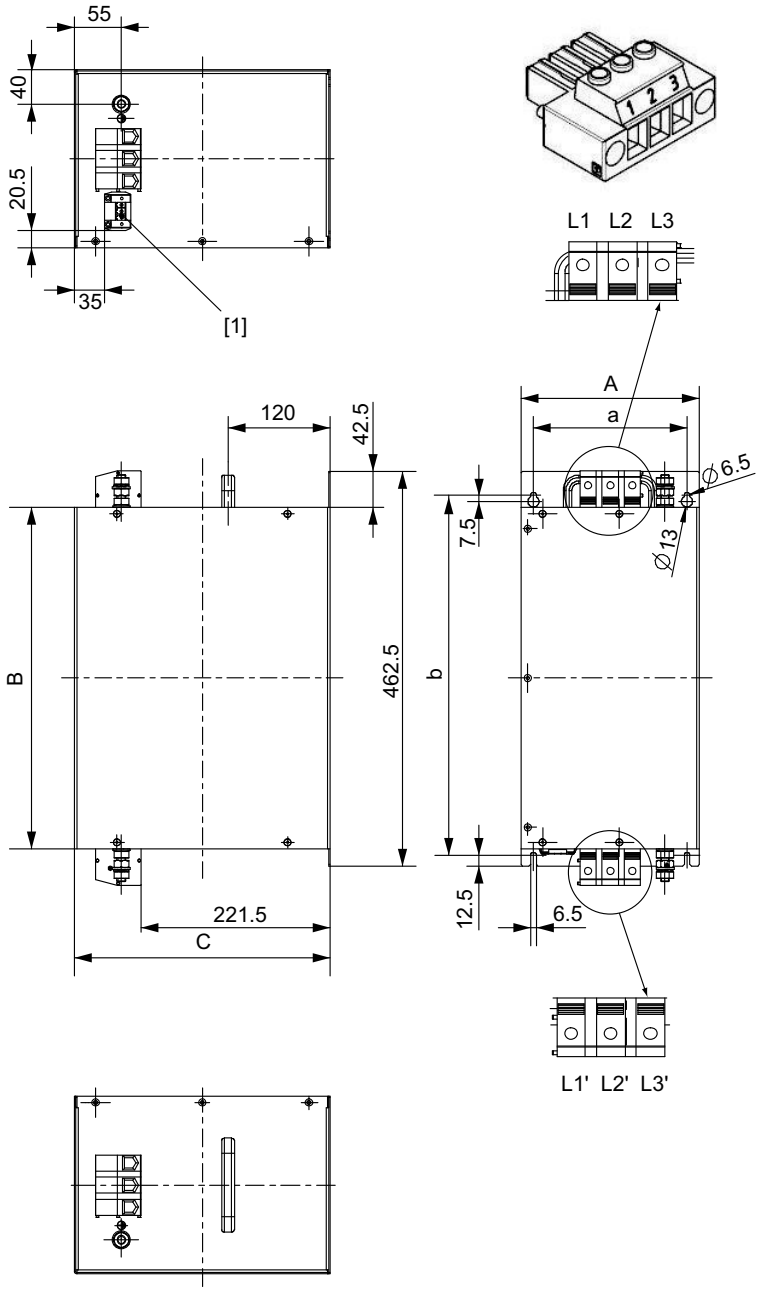
[1] Terminals for line phase measurement

Dimension drawing for NFR 111-503 (75 kW)



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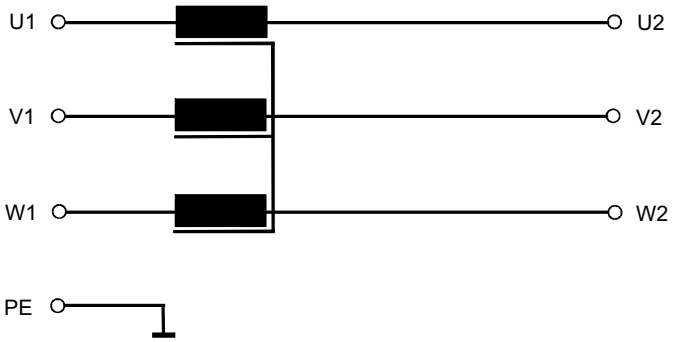
[1] Terminals for line phase measurement

7.4.2 NDR.. line choke

Wiring diagram



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Technical data

NDR.. line chokes have a component approval independent of the MOVIAXIS® multi-axis servo inverter. SEW-EURODRIVE provides proof of approval on request.

		Unit	Line choke	
			NDR 075-083 (50 kW)	**NDR 110-063 (75 kW)**
Connection voltage AC[1] V_{line}		V_{AC}	3 × 380 V – 3 × 480 V ±10%	
Nominal line voltage[2] V_N		V_{AC}	3 x 500 V, 50 Hz	3 x 500 V, 50 Hz
Nominal current I_N		A	75	110
Power loss at • 0 % I_N • 100% I_N		W	. • 135 • 270	. • 220 • 440
Operating temperature at • 0 % I_N • 100% I_N		. °C	. • 85 • 140	. • 85 • 140
Ambient temperature		°C	0 to +45	0 to +45
Inductance		mH	3 x 0.8	3 x 0.55
Degree of protection according to EN 60529		–	IP00	IP00
Mass		kg	40	47
Max. connection cross section		mm^2	50	50
Dimensions	B	mm	240	300
	H	mm	410	420
Mounting dimensions	L1	mm	190	240
	L3	mm	130	165

1) Max. operating voltage in conjunction with MXR

2) Max. operating voltage of the choke

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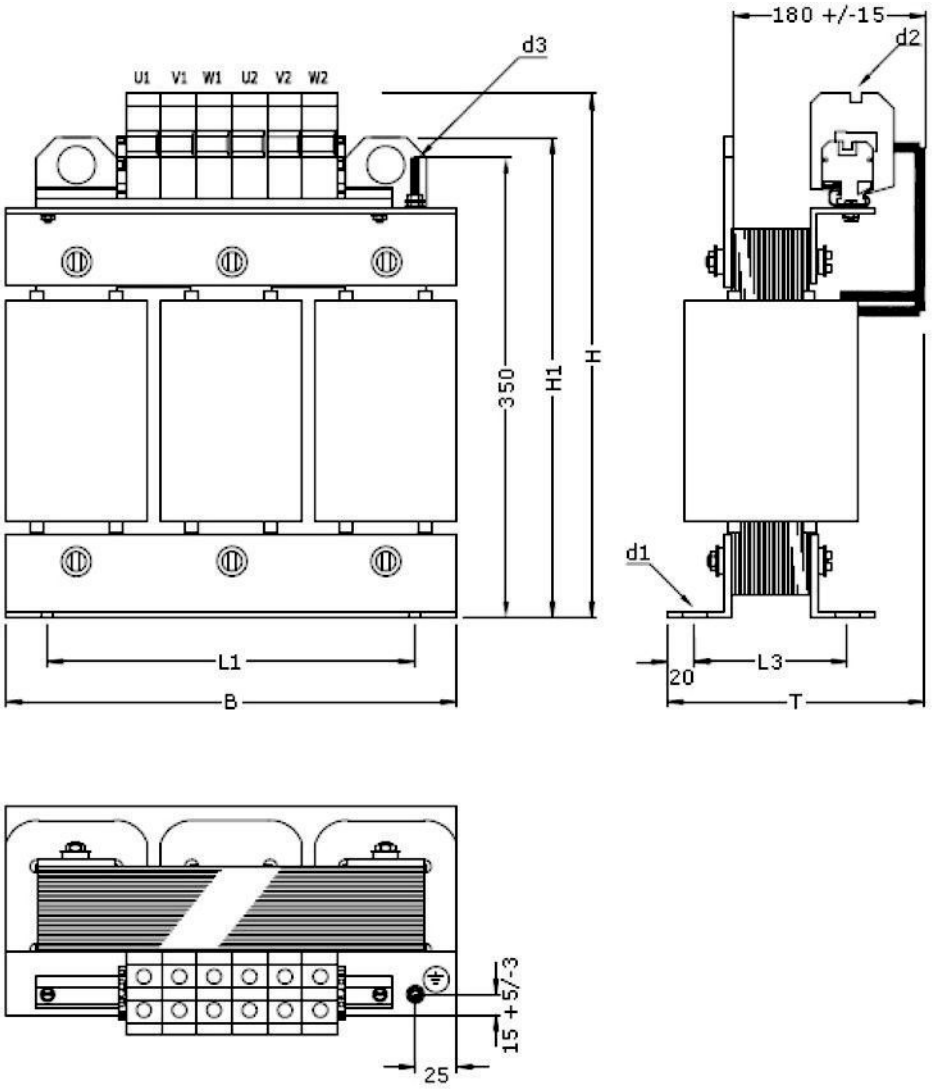
Dimension drawing for NDR 075-083 (50 kW)



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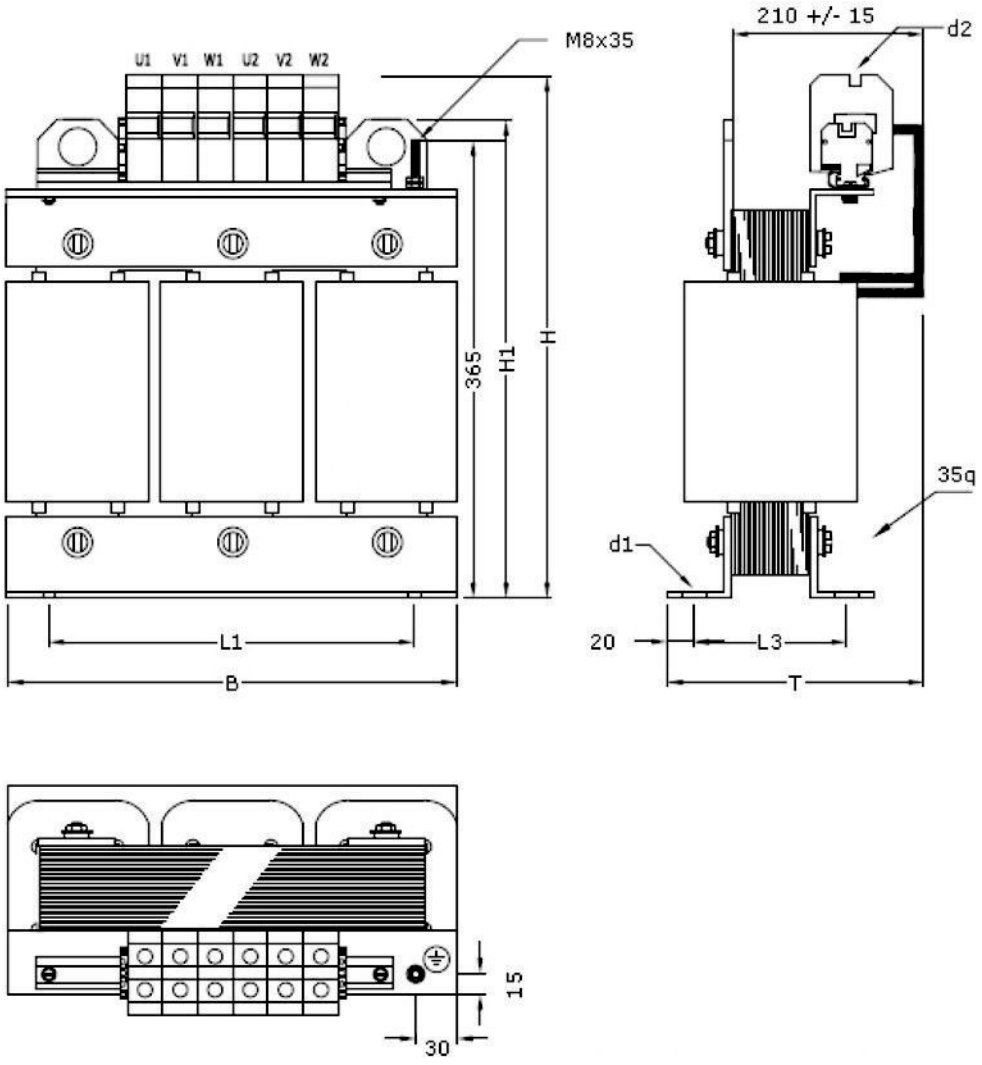
Dimension drawing for NDR 110-063 (75 kW)



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7.4.3 NFH EcoLine filter

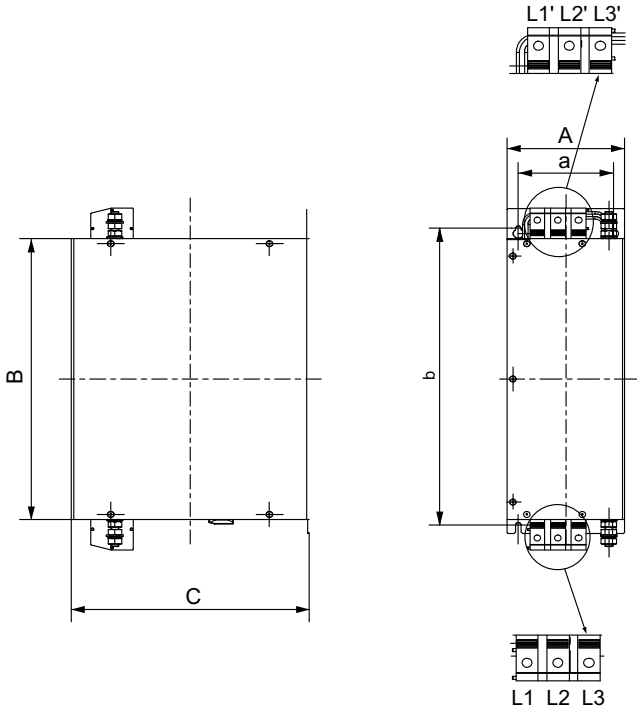
Technical data

In conjunction with MXR units, the NFH line filter is an UL-listed accessory.

	Unit	EcoLine filter	
		NFH 075-503 (50 kW)	NFH 110-503 (75 kW)
Connection voltage AC[1] V_{line}	V_{AC}	3 × 380 V – 3 × 480 V ±10%	
Nominal line voltage U_N	V_{AC}	3 × 500	3 × 500
Nominal current I_N	A_{AC}	73	110
Power loss	W	65	100
Regenerative cycle frequency f	kHz	8	4
Ambient temperature	°C	0 to +45	0 to +45
Degree of protection EN 60529 (NEMA1)	–	IP20 to EN 60529	IP20 to EN 60529
Connections L1 – L3 ; L1' – L3'	mm^2	Up to 50 (screw terminals)	Up to 50 (screw terminals)
Mass	kg	20	24

1) Max. operating voltage in conjunction with MXR

Dimension drawing of NFH EcoLine filter



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		Unit	EcoLine filter	
			NFH 075-503 (50 kW)	NFH 110-503 (75 kW)
Dimensions	A	mm	180	180
	B	mm	320	400
	C	mm	225	300
Mounting dimensions	a	mm	150	150
	b	mm	342	422

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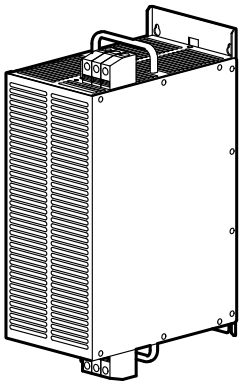
Mounting positions

The preferred mounting positions are suspended and horizontal, see the following schematic diagrams:

Suspended



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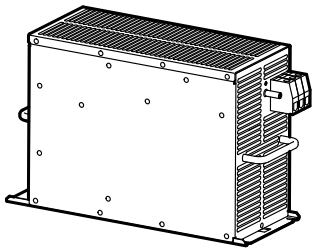
Horizontal



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INFORMATION

For installation, observe the required minimum clearance of 100 mm above and below the connecting terminals and the ventilation openings.

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7.4.4 Braking resistors BW..., BW...-01, BW...-T, BW...-P

Technical data

Braking resistor type	Unit	BW027-006	BW027-012	BW247	BW247-T	BW347	BW347-T	BW039-050
Part number		8224226	8224234	8207143	1820082	8207984	1820130	8216916
Power class of the power supply module	kW	10, 25, 50, 75						
Load capacity 100% cdf[1]	kW	0.6	1.2	2		4		5
Resistance value R_{BW}	Ω	27 ± 10%		47 ± 10%				39 ± 10%
Tripping current (of F16) I_F	A_{RMS}	4.7	6.7	6.5		9.2		11.3
Design		Wire resistor						Grid resistor
Connections	mm^2	Ceramic terminals 2.5						
Permitted electric loading of the terminals at 100 % cdf	A	DC 20						
Permitted electric loading of the terminals at 40% cdf	A	DC 25						
Amount of energy that can be absorbed	kWs	10	28	64		84		600
Degree of protection		IP20 (when installed)						
Ambient temperature ϑ_{amb}	°C	-20 to +45						
Type of cooling		KS = natural cooling						

1) cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration TD ≤ 120 s

Braking resistor type	Unit	BW012-015	BW012-015-01[1]	BW012-025	BW12-025-P	BW012-050	BW012-100-T	BW915-T
Part number		8216797	18200109	8216800	1820417	8216819	1820145	1820419
Power class of the power supply module	kW	25, 50, 75						
Load capacity 100% cdf[2]	kW	1.5	1.5	2.5		5.0	10	16
Resistance value R_{BW}	Ω	12 ± 10%						15 ± 10%
Tripping current (of F16) I_F	A_{RMS}	11.2	11.2	14.4		20.4	28.8	31.6
Design		Wire resistor	Grid resistor					
Connections	mm^2	Ceramic terminals 2.5						
Permitted electric loading of the terminals at 100 % cdf	A	DC 20						
Permitted electric loading of the terminals at 40% cdf	A	DC 25						
Amount of energy that can be absorbed	kWs	34	240	360		600	1260	1920
Degree of protection		IP20 (when installed)						
Ambient temperature ϑ_{amb}	°C	-20 to +45						
Type of cooling		KS = natural cooling						

1) Braking resistors have a 1 Ω tap

2) cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration TD ≤ 120 s

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Braking resistor type	Unit	BW006-025-01[1)]	BW006-050-01	BW106-T	BW206-T	BW004-050-01
Part number		18200117	18200125	18200834	18204120	18200133
Power class of the power supply module	kW	50, 75				75
Load capacity 100% cdf[2)]	kW	2.5	5.0	13	18	5.0
Resistance value R_{BW}	Ω	5.8 ± 10%		6 ± 10%		3.6 ± 10%
Tripping current (of F16) I_F	A_{RMS}	20.8	29.4	46.5	54.7	37.3
Design		Grid resistor				
Connections		M8 stud				
Permitted electric loading of the terminal stud at 100% cdf	A	DC 115				
Permitted electric loading of the terminal stud at 40% cdf	A	DC 143				
Amount of energy that can be absorbed	kWs	300	600	1620	2160	600
Degree of protection		IP20 (when installed)				
Ambient temperature ϑ_{amb}	°C	-20 to +45				
Type of cooling		KS = natural cooling				

1) Braking resistors have a 1 Ω tap

2) cdf = Cyclic duration factor of the braking resistor in relation to a cycle duration TD ≤ 120 s

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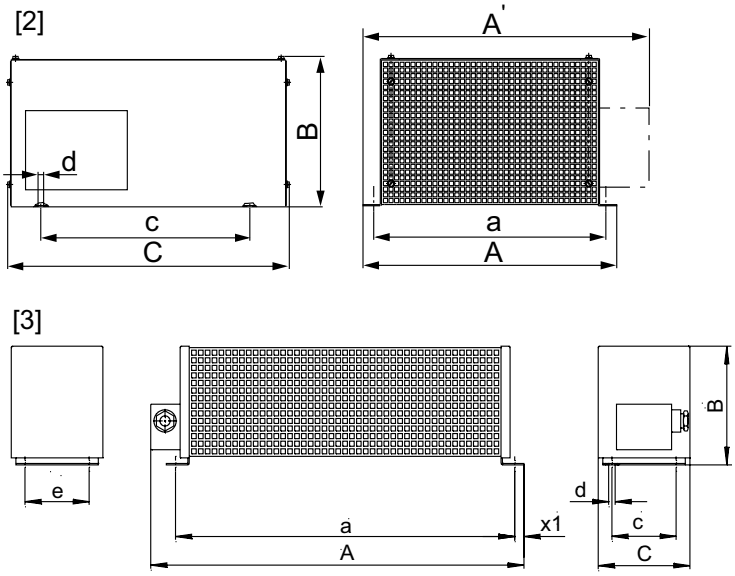
Dimension drawing of BW.. braking resistors

Dimension drawing of BW braking resistors, [2] grid resistor / [3] wire resistor



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Flat-type resistors: The connection lead is 500 mm long. The scope of delivery includes four M4 threaded bushings each of type 1 and 2.

Type	Mounting position	Main dimensions mm			Fastening mm				Mass kg
BW..		A/A'	B	C	a	c/e	x1	d	
BW027-006	3	486	120	92	430	64	10	6.5	2.2
BW027-012	3	486	120	185	426	150	10	6.5	4.3
BW247	3	665	120	185	626	150		6.5	6.1
BW247-T	4	749	120	185	626	150		6.5	9.2
BW347	3	670	145	340	630	300		6.5	13.2
BW347-T	3	749	210	185	630	150		6.5	12.4
BW039-050	2	395	260	490	370	380		10.5	12
BW012-015	2	600	120	92	544	64	10	6.5	4
BW012-015-01	2	195	260	490	170	380		10.5	7
BW012-025	2	295	260	490	270	380	-	10.5	8
BW012-025-P	2	295/355	260	490	270	380		10.5	8
BW012-050	2	395	260	490	370	380	-	10.5	11
BW012-100-T	2	595	270	490	570	380		10.5	21
BW915-T	2	795	270	490	770	380		10.5	30
BW006-025-01	2	295	260	490	270	380	-	10.5	9.5
BW006-050-01	2	395	260	490	370	380	-	10.5	13
BW106-T	2	795	270	490	770	380		10.5	32
BW206-T	2	995	270	490	970	380		10.5	40
BW004-050-01	2	395	260	490	370	380	-	10.5	13

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8 Project planning

8.1 Components for EMC-compliant installation

MOVIAXIS® servo inverters are designed for use as components for installation in machinery and systems. The components comply with the EMC product standard EN 61800-3 "Variable-speed electrical drives". Provided the information relating to EMC-compliant installation is observed, they satisfy the appropriate requirements for CE marking of the entire machine/system in which they are installed, on the basis of the EMC Directive 2004/108/EC.

8.1.1 Interference immunity

With regard to interference immunity, MOVIAXIS® meets all the requirements stipulated in EN 61000-6-2 and EN 61800-3.

8.1.2 Interference emission

Higher levels of interference than in residential environments are permitted in industrial environments. In industrial environments, it may be possible to dispense with the measures listed below depending on the situation of the supply system (grid) and the system configuration.

Interference emission category

Compliance with category "C2" or "C3" according to EN 61800-3 (see also chapter "Technical Data" (→ 🗎 71)) has been tested on a specified test setup. SEW-EURODRIVE provides detailed information on request.

⚠ CAUTION

This product can cause high-frequency interferences in residential areas which can require measures for interference suppression.

8.2 Project planning for supply and regenerative modules

The size of the supply and regenerative module is defined by the following factors:

- Maximum operating point: $P_{max} < 200\% P_N$
- Total effective power of all axis modules: $P_{rms} < P_N$, motoring and regenerative.
- Continuous power toward the braking resistor (if installed): The continuous power must not exceed 50% of the nominal power of the supply and regenerative module.
- Sum rule: The sum of all rated currents of the axis modules must not exceed more than 300% of 1.35 times the rated DC link voltage of the regenerative power module.
  - 50 kW (8kHz): 67 A × 1,35 × 3 = 271 A maximum
  - 75 kW (4 kHz): 100 A × 1,35 × 3 = 405 A maximum

The nominal power of the supply and regenerative module refers to the effective power. This means the magnetization currents of the motors need not be taken into account in this case.

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INFORMATION

Important: The total power (DC link power) is the result of the overlapping cycles of the individual connected axis modules.

Changing the assignment of cycles with respect to time significantly influences the motor and regenerative load of the supply and regenerative module.

It is necessary to take a worst-case scenario into account.

Due to the complexity, the calculation can only be made using software. The software is a tool of the "SEW Workbench".

8.3 Project planning for axis modules and motors

MRX80 has a controlled and a increased DC link (750 V) allowing for a enhanced power yield of the motors.

The project planning of the axis modules is carried out with SEW Workbench.

Observe the project planning notes in the "Synchronous Servomotors" and "AC Motors" catalogs as well as the characteristic curve manual during project planning of the motors.

8.4 Line contactors and line fuses

8.4.1 Line contactor

- Use only line contactors in utilization category AC-3 (IEC 158-1).
- The K11 contactor is only intended for switching the MXR on and off.

NOTICE

- Observe a minimum switch-off time of 10 s for the K11 contactor.
- **Do not** turn the power on or off **more than once per minute**!
- The line contactor must always be located before the line filter.

8.4.2 Line fuse types

Line protection types in operation classes gL, gG:

- Rated fusing voltage ≥ rated line voltage

Miniature circuit breakers with characteristics B, C and D:

- Nominal circuit breaker voltage ≥ nominal line voltage
- The nominal current of power circuit breakers must lie above 10% of the nominal line current of the supply and regenerative module.

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8.5 Projecting the power supply

You find information on permitted voltage systems in chapter "Permitted voltage systems (→ 🗎 21)".

NOTICE

Operating one or several MXR supply and regenerative modules on supply systems with power factor correction equipment **without** chokes is not permitted.

Power supply requirements		50 kW / 8 kHz	75 kW / 4 kHz
Minimal short circuit power of the supply system at the regenerative power supply unit input [1]	Without NFH[2]	≥ 3.4 MVA	[3]
	With NFH[4]	≥ 1.25 MVA	≥ 1.9 MVA
Permitted voltage distortion according to EN 61000-2-4, class 3		THD ≤ 10%	
Permitted frequency change Δf/t	Hz/s	±1% × f_{line}/1s	
Permitted voltage asymmetry		3% of the negative-sequence component	

1) Input means the input of the NFR.. line filter, impedance of the supply cable must be taken into account.
2) Corresponds to Rsc > 67 and uk ≤ 1.5%
3) not permitted without NFH
4) Using the additional component NFH EcoLine filter means a reduction of power supply requirements. This corresponds to an Rsc > 25 and uk ≤ 4%.

8.5.1 Select additional components

Additional component	MXR 50 kW	MXR 75 kW
NFR line filter	x	x
NDR line choke	x	x
NFH EcoLine filter	o	x

x The additional component is mandatory

o The additional component is optional

NOTICE

The NFH EcoLine filter is mandatory when using the MXR 75 kW supply and regenerative module.

The NFH EcoLine filter is optional when using MXR 50 kW.

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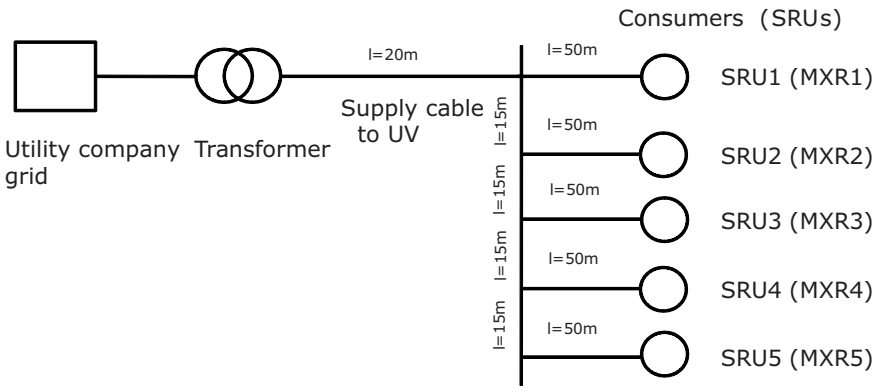
8.5.2 Project planning example

The following example shows the project planning for five MXR 75 kW supply and regenerative modules.



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Requirements

- Data of the supply transformer at the system operator:

Nominal voltage primary winding U_{Pri}	kV	10
Nominal voltage secondary winding U_N	V	400
Rated frequency f_R	Hz	50
Rated power S_r	kVA	1000
Relative short-circuit voltage u_{k_Trafo}	%	6

Calculation

The required apparent transformer power is calculated by summing up the individual power values of the devices:

In the example, the cable length of the last aisle is 130 m, see illustration:

20 m + 4 × 15 m + 50 m = 130 m

To simplify calculation, the same cable length is used five times.

A value of 0.35 µH/m is assumed as a typical average value for the cable inductance. This results in the following k values:

Frequency	k value
50 Hz	1.099557×10^{-4}
60 Hz	1.311946×10^{-4}

$$k = 2 \times \pi \times f \times L$$

k Calculation factor for average line inductance in Ω/m

f Nominal line frequency in Hz

L Average cable inductance in µH/m

Short circuit impedance:

MXR type	Short circuit impedance Z_{sc} in Ω
MXR 75 kW with EcoLine NFH filter	0,084

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MXR type	Short circuit impedance Z_{SC} in Ω
MXR 50 kW with EcoLine NFH filter	0,123
MXR 50 kW without EcoLine NFH filter	0,047

Calculating the required apparent transformer power:

$$S_{total\_required\_transf.} = \sum S_{MXR} = \sum \left(u_{k\ \ transf.} \times \frac{U_N{}^2}{Z_{SC} - k \times l} \right)$$

u_{k_Trafo}	Short-circuit voltage of the transformer
V_N	Nominal line voltage
Z_{SC}	Short circuit impedance
k	k value
l	Cable length

$$S_{total\_required\_transf.} = \sum S_{MXR} = 5 \times \left(0.06 \times \frac{400V^2}{0.084\Omega - 1.099557 \times 10^{-4} \frac{\Omega}{m} \times 130m} \right)$$

$$S_{total\_required\_transf.} = 689kVA$$

Requirement:

689 kVA ≤ 1000 kVA

Requirement fulfilled.

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8.6 Projecting the cable cross sections

8.6.1 Special regulations

Comply with the **regulations issued by specific countries and for specific machines** regarding fusing and the selection of cable cross sections. Also comply with the instructions for **UL-compliant installation** as applicable.

8.6.2 Power cable length

The cable length between the supply and regenerative module and the line filter must not exceed 1.5 m, see wiring diagrams (→ 🗎 23) and (→ 🗎 25).

The cable length between the line contactor and the line filter must not exceed 5 m, see wiring diagrams (→ 🗎 23) and (→ 🗎 25).

8.6.3 Cable cross sections and fusing

SEW-EURODRIVE suggests the following line cross-sections and fusing for single-core copper cables with PVC insulation laid in cable ducts, an ambient temperature of 40 °C and nominal system currents of 100% of the nominal unit current.

8.6.4 MOVIAXIS® supply and regenerative module

MOVIAXIS® MXR	**MXR80A-...**	
Nominal power in kW	50	75
Line connection		
Nominal line current AC in A	see technical data	
Fuses F11/F12/F13 I_N	Dimensioning according to nominal line current	
Cross section and contacts of the line connection	M8 screw bolts, max. 70 mm²	
Cross section and contacts at shield terminal	max. 4 × 50 mm², shielded	
Connection of emergency braking resistor		
Brake cable +R/-R	Dimensioning according to nominal current of braking resistor	
Cross sections and contacts of connections	M6 threaded bolts, max. 16 mm²	
Cross section and contacts at shield terminal	max. 4 × 16 mm²	
Cross section and contacts of braking resistor	Technical data of braking resistors (→ 🗎 86)	

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8.6.5 Measuring line X18 of the line filter

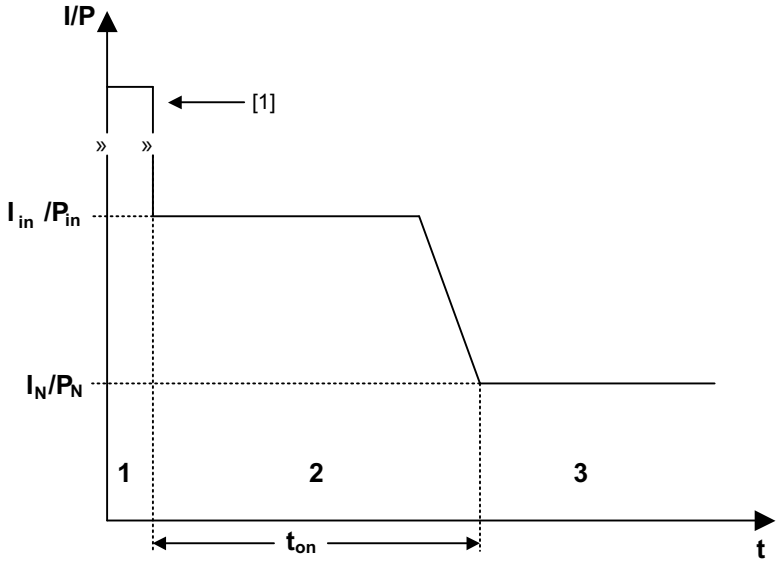
For the measuring cable X18, we recommend a cross section of 2.5 mm^2.

The requirements for UL-compliant installation of the measuring cable X18 are listed in chapter "UL-Compliant Installation" (→ 🗎 18).

8.7 Selecting the 24 V supply

The current path and power ratios present when switching on the 24 V voltage supply are shown in the figure below.

The current path is basically divided into 3 time ranges.



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[1] Charging current due to internal input capacitance C_{input}

1. Describes the charging process of the input capacitors in each unit. A time period cannot be specified because the charging time is significantly influenced by the property of the power supply and the cable dimensioning. You therefore have to calculate the total of all unit capacitances using the table below. Manufacturers of switched-mode power supplies usually specify technical data about the loadable capacitances. The charging time 1 is very short in comparison with time range 2. The voltage source must be capable of reliably activating the combination of units with the highest possible capacitance.
2. This is the time interval when the unit's internal switched-mode power supplies start up. The total of the maximum power consumption must be calculated for this time period. The power supply must be capable of providing this total power for at least 100 ms.
3. Nominal power range. The required rated power of the supply source results from the total rated power of all connected devices.

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Table for project planning according to points 1 - 3 (→ 🗎 95).

Unit type	Supply voltage Electronics in V	Nominal current I_N [A] / nominal power P_N [W]	Max. switch-on current [A] / power P_{on} [W]	Switch-on pulse duration t_{on} [ms]	Input capacitance C_{input} [µF]
MXA BG1	18 - 30	0.7 / 17	2 / 48	60	600
MXA BG2		0.95 / 23	2.2 / 53	70	600
MXA BG3		1.3 / 23	2.1 / 50	90	600
MXA BG4		2.2 / 53	2 / 48	80	700
MXA BG5		2.3 / 55	2 / 48	80	700
MXA BG6		3.2 / 77	2.5 / 60	60	1000
MXP BG1	18 - 30	0.5 / 12	0.3 / 7	40	100
MXP BG3		0.8 / 19	0.6 / 14	60	500
MXR	18 - 30	3.8 / 91	3.5 / 84	90	1000
MXZ	18 - 30	0.1 / 2.5	0.3 / 7	60	50
MXC		1 / 24	2.7 / 65	400	300
MXM[1]	18 - 30	0.1 / 2.5	0.2 / 5	30	50
		P in W			
XFE	is part of the basic unit				
XFP	Power supply via basic unit	3	Is taken into account in the specifications of the basic unit		
XFA		2			
XIO		1			
XIA		1			
XGH[2]		2			
XGS[3]		2			

1) Valid in combination with DHP11B

2) Specifications without encoder connected. Maximum power that can be connected: 12 W

3) Specifications without encoder connected. Maximum power that can be connected: 12 W

INFORMATION

For more information, refer to the "MOVIAXIS® Multi-Axis Servo Inverter" project planning manual.

8.8 Project planning for emergency braking resistor and braking resistor

Just like with an MXP supply module, the MXR supply and regenerative module can be operated with a braking resistor or an emergency braking resistor.

The decision whether to use a braking resistor or an emergency braking resistor is made during project planning.

A resistor designed as a braking resistor can also be used as an emergency braking resistor if the requirements on the amount of energy that can be absorbed are met. Refer to the technical data of braking resistors.

The project planning for the emergency braking resistor as well as specific information is provided in the following chapters.

For project planning information for the braking resistor, see chapter "Overload capacity" and the MOVIAXIS® system manual.

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⚠ WARNING

The connection leads to the emergency braking resistor or braking resistor carry a high DC voltage of about 970 V during rated operation.

Severe or fatal injuries.

- The emergency braking resistor and braking resistor cables must be suitable for this high DC voltage.
- Install the cables of the emergency braking resistor or braking resistor according to the regulations.

⚠ WARNING

The surfaces of emergency braking resistors or braking resistors reach temperatures of 100 °C or more when the braking resistor is loaded with P_N. Emergency braking resistors and braking resistors usually deliver their rated power for an extended period of time.

Risk of burns and fire.

- Choose a suitable installation location. Emergency braking resistors and braking resistors are usually mounted on the control cabinet.
- Do not touch the emergency braking resistor or braking resistor.
- Adhere to the necessary cooling-off time of at least 5 minutes.
- This means the ventilation, size of the installation site and distance to components and parts at risk must be provided for accordingly.

NOTICE

- The **maximum permitted cable length** between **MOVIAXIS®** and emergency braking resistor or braking resistor is **100 m**.

8.8.1 Notes regarding emergency braking resistors

NOTICE

- The data given in this chapter apply to BW... braking resistors if they are used as emergency braking resistors.

INFORMATION

Under normal operating conditions, the MXR supply and regenerative module feeds back regenerative energy that exceeds the DC link buffer into the supply system. **In practice, however, operating states can occur which prevent the MXR supply and regenerative module from feeding back energy into the supply system**, for example in the following cases:

- Power failure,
- Failure of individual line phases (also intermittently).

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Without supply voltage, motor operation of the drives is not possible and the DC link can absorb regenerative energy only to a limited extent. The above described operating states can therefore cause the drives to coast to a halt, or the motor brake (if installed) is applied and stops the drive.

To prevent an uncontrolled stop of the drives, an optional emergency braking resistor can be connected to MOVIAXIS® MXR which brings the axes to a controlled stop in the event of such an emergency. The kinetic energy in the drives will then be dissipated as heat via the braking resistor.

INFORMATION

Under normal operating conditions, this optional braking resistor is not cyclically loaded but only in an emergency as described above. The braking resistor can therefore be designed as an emergency braking resistor.

Following a description of the procedure for projecting an emergency braking resistor for MOVIAXIS® MXR.

8.8.2 Selecting the emergency braking resistor

Selection criteria

The emergency braking resistor is selected based on the following criteria:

- Peak braking power
- Thermal braking power

Peak braking power

The DC link voltage and the emergency resistance value determine the maximum braking power P_{max} that can be dissipated from the DC link.

The peak braking power is calculated as follows:

$$P_{max} = \frac{U^2_{DC}}{R}$$

V_{DC} is the maximum DC link voltage that is DC 970 V for MOVIAXIS®.

The peak braking power P_{peak} for each braking resistor is listed in the table of emergency braking resistors.

Determining the maximum emergency braking resistor power

Condition 1

The maximum power of the emergency braking resistor P_{peak} is larger than the maximum regenerative power P_{max} that is generated during emergency braking.

$$P_{peak} \geq P_{max}$$

P_{peak}	Max. power according to the table (power which the emergency braking resistor can convert to heat).
P_{max}	Max. power that the emergency braking resistor has to dissipate from the DC link.

Condition 2

The previously determined amount of regenerative energy $W_{regenerative}$ is the basis for checking whether the emergency braking resistor can dissipate this amount without thermal overload.

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$W_{max} \geq W_{regenerative}$

W_{max}	Max. amount of energy that the emergency braking resistor can absorb
$W_{regenerative}$	Total amount of energy of the application regenerated during emergency braking.

Thermal emergency braking power

The thermal load on the emergency braking resistor must be taken into account in the project planning for the emergency braking resistor.

The thermal load is calculated using the energy content of the emergency braking sequence.

This condition takes account of the heating of the emergency braking resistor during the entire emergency braking operation.

- Calculating the maximum regenerative energy from the sum of the travel profiles of all connected axes (taking into account the set emergency stop ramps and time sequences).

Protecting the emergency braking resistor

NOTICE

SEW-EURODRIVE recommends to use a thermal overload relay to protect the emergency braking resistor against overload. When using an external thermal overload relay, set the tripping current to the nominal current of the resistor, see selection table (→ 🗎 100).

Do not use a motor protection switch.

Important: Do not open the power contacts of the braking resistors in the event of thermal overload. The connection between braking resistor DC link must not be interrupted. Instead, the control contact of the overload relay opens relay K11, see wiring diagrams.

Operating the supply and regenerative module in the event of supply system failure

NOTICE

Supply system failures, such as power failures, can cause the brake chopper to respond and load the braking resistor. This happens if the DC link cannot buffer any more regenerative energy. As a result, the mean utilization of the connected resistor might be exceeded, which will trigger the bimetallic protective relay (protection of the braking resistor).

The supply system quality, for example, can be a reason for this. The supply system quality influences project planning for the braking resistor, especially if the resistor is designed as an emergency braking resistor.

If the braking resistor is designed as an emergency braking resistor, the following can happen depending on the amount of regenerative energy:

- The trip contact of the bimetallic protective relay trips in normal operation,
- Due to this load, the emergency braking resistor is no longer capable of dissipating the regenerative energy in the event of an actual emergency. In this case, the bimetallic protective relay trips.

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Selection table

Taking the max. regenerative braking power and regenerative energy generated in the machine or system into account, you can select an emergency braking resistor from the resistors listed in the table. The project planning is carried out with SEW Workbench.

Type	Part number	Resistance in Ω	Tripping current I_F [A]	$P_{Duration}$ in kW	P_{Peak} in kW	W_{max} Amount of energy that can be absorbed in kWs
BW027-006[1)]	8224226	27	4.7	0.6	34.8	10
BW027-012[2)]	8224234	27	6.7	1.2	34.8	28
BW012-015[3)]	8216797	12	11.2	1.5	78.4	34
BW012-015-01	18200109	12	11.2	1.5	78.4	240
BW012-025-P	8216800	12	14.4	2.5	78.4	360
BW012-050	8216819	12	20.4	5	78.4	600
BW006-025-01	18200117	6	20.76	2.5	156	300
BW006-050-01	18200125	6	29.4	5	156	600
BW004-050-01	18200133	4	37.3	5	235	600

1) Tubular fixed resistor
2) Tubular fixed resistor
3) Tubular fixed resistor

NOTICE

The data listed in the table only apply to resistors used as emergency braking resistors, which must not be loaded cyclically.

NOTICE

Wait at least 5 minutes following emergency braking before another emergency braking can be performed.

8.8.3 Notes regarding braking resistors

For information on braking resistors, refer to the MOVIAXIS® system manual.

8.8.4 Selecting the braking resistor

For project planning information for the braking resistor, see chapter "Overload capacity" and the MOVIAXIS® system manual.

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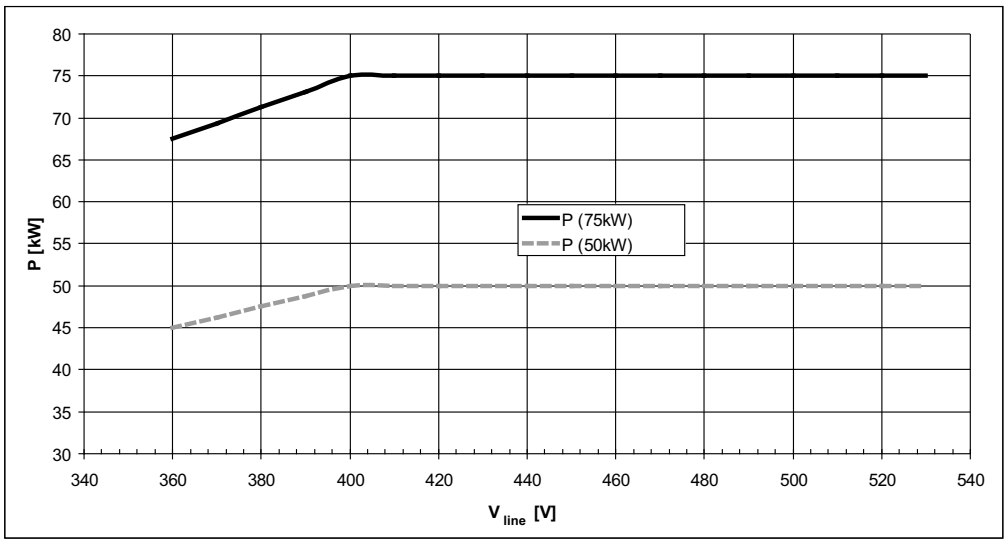
8.9 Output power with low line voltage

If the line voltage drops below the line voltage of 400 V, the output power of MXR is reduced.



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8.10 Overload capacity

The overload requirement of the application results from the projected axis modules.

The following values are determined using the Graphical Workbench:

- The required power,
- The necessity to use a braking resistor,
- The technical data of the braking resistor.

SEW-EURODRIVE recommends the following braking resistors:

MXR 50 kW	MXR 75 kW
BW012-015	BW006-025-01

For further information on braking resistors, refer to the MOVIAXIS® system manual.

The following table shows the overload capacity:

Performance level	Voltage in V	Overload in %
MXR 50 kW	360 – 380	≤ 160
	381 – 480	≤ 200
MXR 75 kW	360 – 380	≤ 110
	381 – 480	≤ 200

8.11 Projecting the power supply taking account of simultaneities

This chapter deals with the operation of several MXR supply and regenerative modules on one supply system in consideration of simultaneity aspects.

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8.11.1 Introduction

The project planning information in chapter "Projecting the power supply" (→ 🗎 91) are based on the assumption that each supply and regenerative module is operated independently of all others. This type of project planning allows for simultaneous operation of all supply and regenerative modules on one supply line.

INFORMATION

Please contact SEW-EURODRIVE before starting up several supply and regenerative modules on one supply system.

If simultaneities are taken into account, the following project planning regulations allow for installing several supply and regenerative modules on an existing supply system (transformer) or the use of a smaller supply system (transformer).

The output stage enable DI00 of the connected supply and regenerative modules can be activated or deactivated to dimension the supply system (transformer) as economical as possible. This means the minimum rated power of the joint supply system must only be determined for the currently active (enabled) supply and regenerative modules.

8.11.2 Switching sequence between enabled and inhibited output stage

Input "DI00 output stage enable" is used to activate or deactivate the enabling of the supply and regenerative modules.

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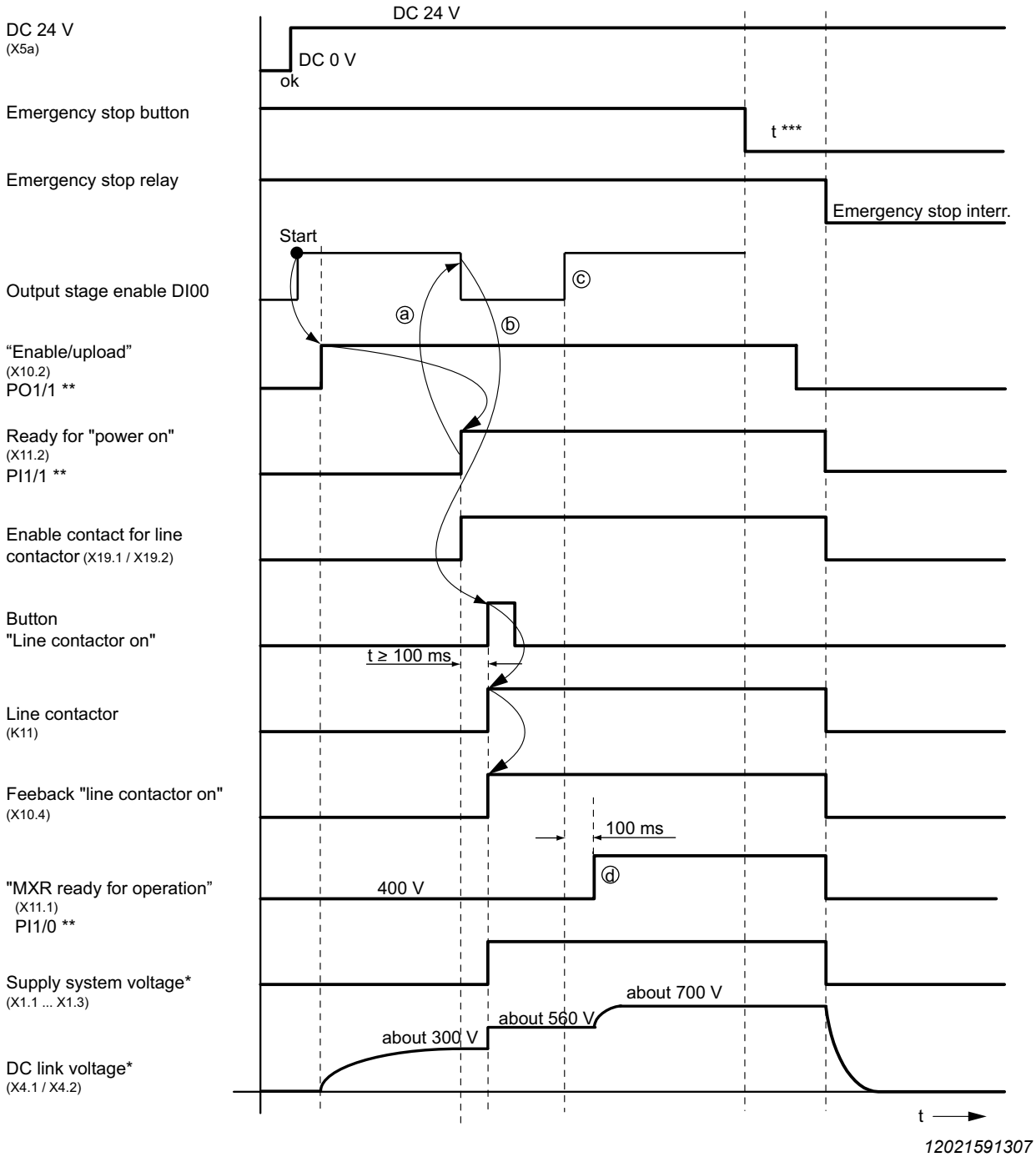
The following diagram shows the switching sequence:



a The output stage enable signal can be withdrawn directly after "Ready for power on".

b After revoking the output stage enable, the line contactor can be activated. The supply and regenerative module is now in "standby" mode and need not be taken into account for calculating the relative short-circuit voltage V_K.

c Output stage enable sets the unit to "ready for operation" state.

d The "MXR ready for operation" signal is sent with a delay of 100 ms. It must be received before the drives are enabled.

Key for table continued on next page.

* With a line voltage of AC 400 V

** With control via fieldbus

*** Emergency swichting off release delay only in line with applicable system- and country-specific safety regulations and customer specifications.

INFORMATION

Make sure the supply system (the transformer) is neither overloaded by the instantaneous power (up to 200%) nor by the total power of all enabled supply and regenerative modules.

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8.12 Checklist for project planning

Using a regenerative power supply unit places certain demands on the quality of the supply system to ensure fault-free operation. The checklist includes the most important requirements. This checklist supplements the product-specific documentation. Its objective is to verify the basic requirements for operating of a MOVIDRIVE® MDR or MOVIAXIS® MXR regenerative power module.

This document offers additional information to the product-specific documentation. It does not replace any product-specific documentation. The information in the product-specific documentation must be observed irrespective of this document.

8.12.1 Checklist

Technical data of the supply system (the transformer) on which the supply and regenerative module is to be operated:

Power supply / transformer		
Rated power	kVA	:
Nominal line voltage	V	:
Nominal line frequency	Hz	:
Rated short-circuit voltage V_k	%	:
Network configuration, e.g. TT, TN		:
THD value (contact your utility company, if necessary)	%	:
Are other supply and regenerative modules operated on this supply system (transformer)?		:
If yes • How many? • What is their total power?		:
Reactive current compensation equipment installed?		:
If yes, it is equipped with chokes?		
Cable length to supply system (transformer)	m	:
Ambient conditions		
Installation location (city, country)		:
Ambient conditions	°C	:
Installation altitude (above sea level)	m	:
Relative humidity	%	:
General information		
What experiences have you made with the operation of supply and regenerative modules?		:

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Is a generator (such as emergency diesel generator) or a UPS installed in the supply system that is/are operated at the same time as the regenerative modules?	:
Other, comments	

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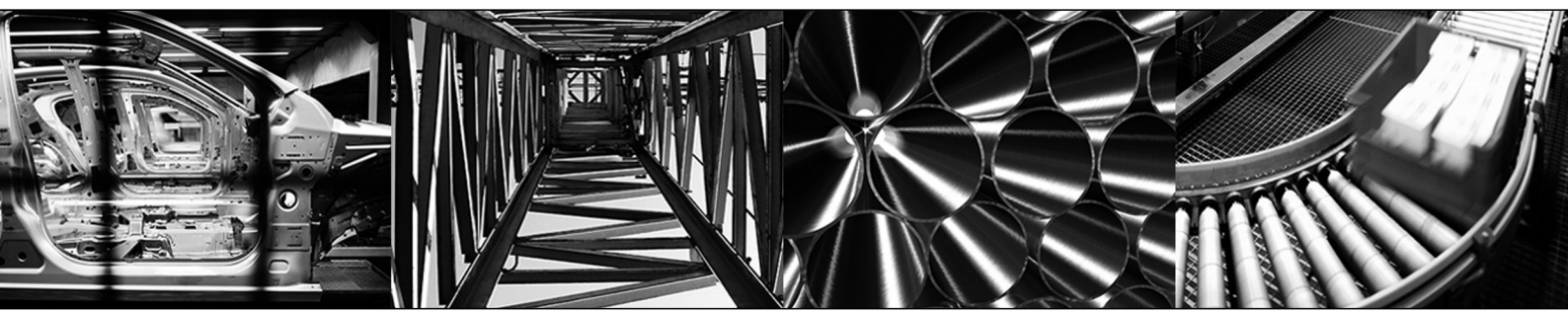

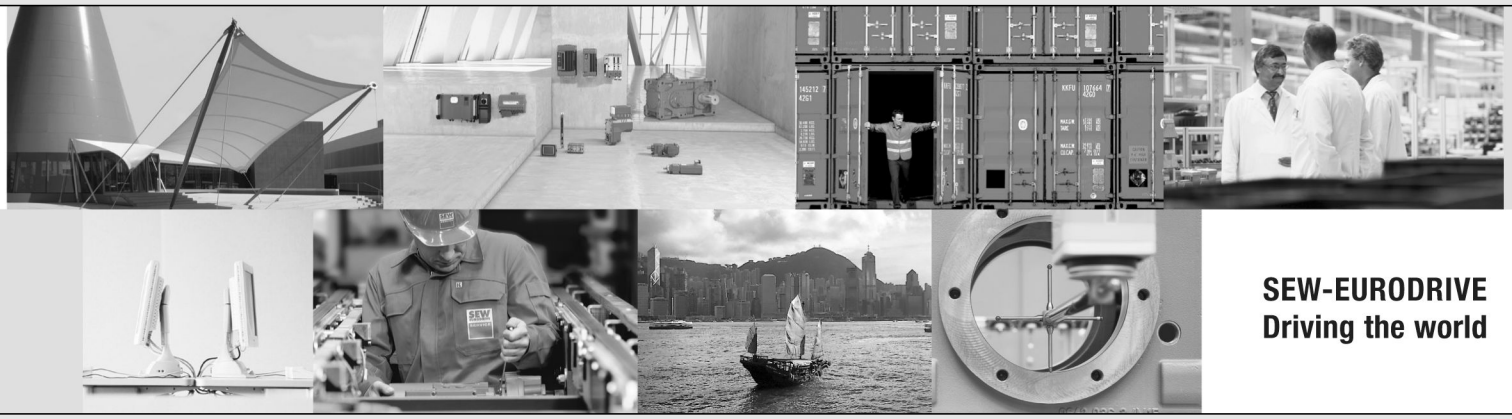

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