



Product Manual



MOVIDRIVE® modular

Power and Energy Solutions

Power Supply for Multi-Axis Systems with Storage Technology



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1 Information on this documentation

This documentation describes the devices of the Power and Energy Solutions product range. The devices are part of the MOVIDRIVE® modular inverter series.

All device-specific properties and procedures of the devices of the Power and Energy Solutions product range are described in this documentation. All properties and procedures that also apply to the devices of the MOVIDRIVE® modular application inverter are described in the documentation "MOVIDRIVE® modular Application Inverters".

The present documentation is an addendum to the "MOVIDRIVE® modular Application Inverters" documentation.

2 Product description

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The Power and Energy Solutions product range expands SEW-EURODRIVE's current line of MOVIDRIVE® modular inverters to include intelligent power and energy management components.

This way, solutions in the field of system and machine automation meet the highest standards regarding energy and power efficiency as well as supply reliability. The system allows for significantly smaller and simpler connection solutions in terms of grid infrastructure. Compared to conventional supply units, there is a significant saving potential when it comes to installation and operation of the multi-axis systems.

By actively using the storage technology, you can establish supply reliability (uninterruptible power supply) in addition to normal operation of the system. This ensures safe operating states and rapid restarts in case of interferences in the supply system.

Besides, energy cost savings in the multi-axis system up to 20 to 30% can be achieved with the system.

The Power and Energy Solutions product series consists of:

- Power supply modules with controlled DC link voltage.
- Energy converter (DC/DC converter) for integrating external energy storage units.
- Capacitor modules and power interface to external energy storage units (double-layer capacitors).
- 24 V switched-mode power supply modules with AC and DC supply (in preparation).
- MOVIKIT® Power and Energy Solutions software modules for the control technology.

Also standard, electrical energy storage units such as capacitor modules and double-layer capacitor storages can be connected to MOVIDRIVE® modular application inverters.

Using Power and Energy Solutions has the following advantages:

- Peak load reduction by factor 4 to 15.
- Savings in the grid infrastructure of the customer through a smaller and more flexible design of all supply components in the control cabinet (smaller cable cross sections, more favorable safety and switching elements, smaller filter technology or no filter technology).
- Recovery and storage of regenerative power.
- System operation without braking resistor or with significantly smaller braking resistors.
- Freely scalable protection against power failure with uninterruptible power supply function without additional back-up battery when using the present, active devices.
- Power supply for control cabinet and multi-axis system for various line frequencies and voltages that is independent of line parameters, which allows for consistent drive selection worldwide.
- Grid-independent DC link voltage, which means independent drive selection worldwide.
- Power adjustment and power increase through dynamic variation of the DC link voltage.
- Energetic online monitoring of the application (DriveRadar®).
- Real time measuring of energy productivity index (energy per cycle or per unit).
- Monitoring of energetic consumption according to ISO 50001.

- Reduction of grid disturbances and improved grid quality by avoiding load peaks and by significantly lower harmonic emissions.
- Operation of the multi-axis system on pure DC grids (operation of the energy converter as supply unit). For example, on existing, external battery systems or future industrial DC grids.

The Power and Energy Solutions series can be operated with a controller to extend the range of functions of the basic device. For this purpose, a powerful and synchronous connection is available with the integrated communication interface EtherCAT®/SBus^{PLUS}. Other EtherCAT® stations from SEW-EURODRIVE or other manufacturers can be controlled and diagnosed by the MOVI-C® CONTROLLER.

The devices of the product series also include special MOVIKIT® software modules for optimum integration into the control software level.

2.1 Advantages of using Power and Energy Solutions

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1. Reduction of power peaks from the grid.

Cost reduction: Cable cross sections, components, filters, cable carriers, elimination of braking resistors. Using storage capacitors in the DC link makes available some of the required peak power from the capacitor.

2. Reduced energy costs due to energy recovery.

The energy used in regenerative operation is stored in the capacitor storage and used again for the next motor operation.

3. Uninterrupted system operation in the event of a power failure.

At the same time, the rotational energy combined with the energy in the storage capacitor serves as an uninterruptible power supply (UPS) for the system. This energy is used to power the drives, the motor brakes, and the 24 V level (even the control level of the controller).

4. Connection to external DC grids.

5. Performance and energy measurement data for ISO 50001 "energy management systems"

The power supply module measures performance data and provides energy counter values via the controller (MOVI-C® CONTROLLER). These can be integrated into ISO 50001 "energy management systems".

6. Reduced harmonic load in the supply system.

The power supply module can shift current consumption from the harmonics to the fundamental wave by measuring the line voltage and current and appropriate management of the storage capacitors (active PFC).

2.2 Possible applications

The devices of the Power and Energy Solutions series can be used in a wide range of applications. Examples of the most common applications are described in this chapter.

Typical applications include hoists or storage/retrieval systems. In these applications, high power peaks occur with lifting movements and a high degree of recuperation energy occurs with lowering movements. By using the MDP92A power supply module in conjunction with an energy storage unit, power peaks can be significantly reduced and recuperation energy can be stored temporarily. Previously used braking resistors can therefore be dimensioned smaller or can be omitted.

The MDE90A DC/DC converter module can be used universally. This module can be used to couple various DC sources and DC storage units to the DC link of the drive to reduce peak loads and to bridge power failures.

The module can also be used for mobile applications to enable operation without power grid. It is also suitable for coupling the application to an external DC supply system.

The components of the Power and Energy Solutions series are particularly suited for applications with high peak loads but comparatively low energy consumption. In these cases, the required storage unit can be designed significantly smaller and more cost-effective. It is recommended to use the MDC90A capacitor module in conjunction with an MDP92A power supply module. If necessary, several capacitor modules can be used in conjunction with only one power supply module. As a result, existing power loads can be reduced to a great extent and the required connection cross sections can be designed significantly smaller.

2.3 Operating modes

The Power and Energy Solutions devices can be operated in various operating modes depending on the application. Using MOVIKIT® software modules offers different functions depending on the operating mode.

The Power and Energy Solutions devices can be operated with a limited range of functions without MOVIKIT® software modules. Contact SEW-EURODRIVE in this case.

2.3.1 Direct mode

By using the MDP92A power supply module with controlled DC link voltage instead of the standard MDP90A power supply module, a higher voltage can be applied to the DC link.

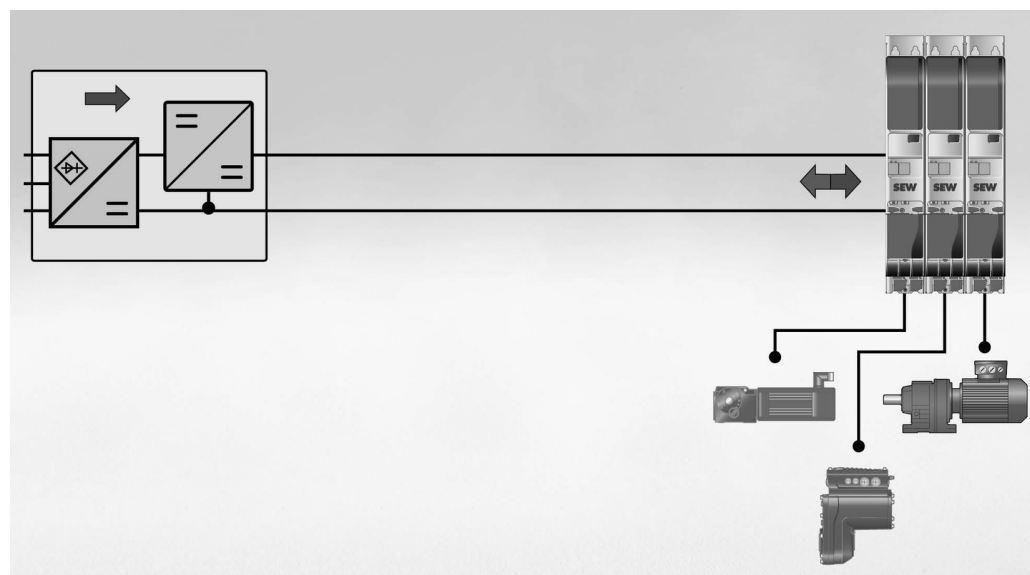
Through this increase, the performance in the axes can be increased even without using a storage unit.

Reducing the connected loads is not possible in this operating mode. All monitoring functions are available in combination with a controller from SEW-EURODRIVE, which allows for energy monitoring.

Advantages of direct mode:

- The power supply module can be operated within an input voltage range of $3 \times \text{AC } 200 \text{ V}$ to 500 V . The DC link voltage can be set independently of the input voltage.
- This enables short-term operation of drives with higher speeds.
- For application testing, the device is suitable for precise data collection. Regarding energy and power, the application can be measured in various operating modes. With the data recorded by the MDP92A power supply module, the application can be checked for optimum use of the possibly required storage unit.

The following figure shows the functional principle of the components of the Power and Energy Solutions in direct mode:



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2.3.2 Power mode

The MDP92A power supply module with controlled DC link voltage is directly connected to the grid and supplies energy to the DC link of the MOVIDRIVE® modular application inverter.

The current that flows into the DC link through the device and the voltage of the DC link are parameterizable. By using this component, energy storage units of variable size can be used in the DC link.

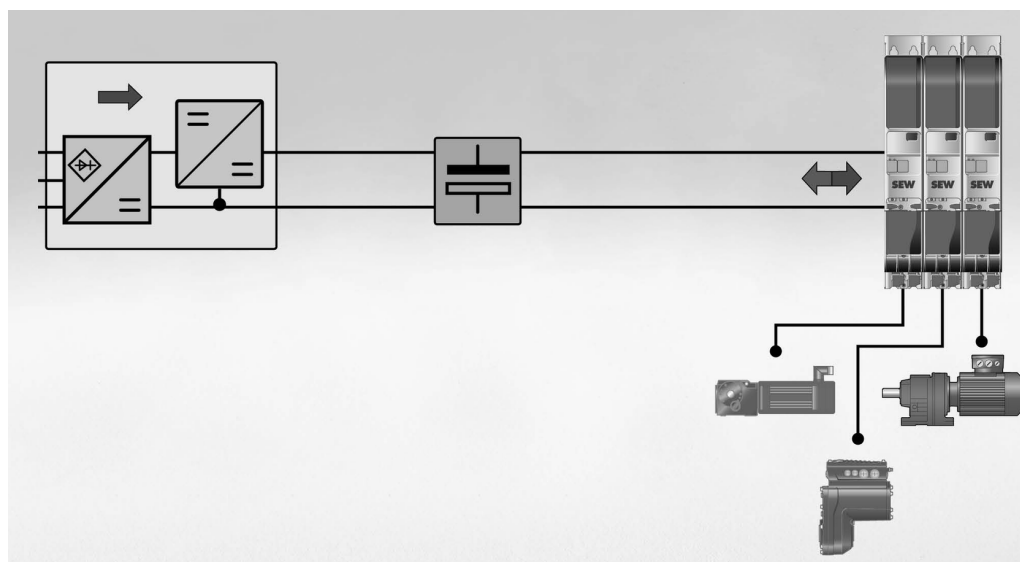
You can integrate up to 4 MDC90A capacitor modules into the network and install an external energy storage unit (DLC energy storage unit) at the corresponding connections of the power supply module. Load peaks of the motors can be supplied from the storage unit and do not place load on the grid. In addition, regenerative energy can be fed back into the storage unit. The energy storage units are connected directly to the DC link.

The voltage supply of the axis block and the external 24 V consumers is provided by the MDS90A 24 V switched-mode power supply module (in preparation). It is supplied with both AC voltage via the line connection and DC voltage via the DC link. If one of the supply voltages fails, the system automatically switches over to the remaining supply. The remaining energy of the storage units is used to keep the controller active, to bring the system to a controlled standstill or to keep the system operated for a certain period of time.

Advantages of power mode:

- Reduction of power peaks from the grid
- Reduction of energy costs
- Suitable for high power ratings
- Power fail-safe covering outages lasting several minutes
- Minimum conversion losses between storage unit and drive axis with energy consumption and recuperation.

The following figure shows the connection of the Power and Energy Solutions components in power mode:



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2.3.3 Energy mode

A standard MDP90A power supply module is used to supply the DC link of the application inverters in energy mode.

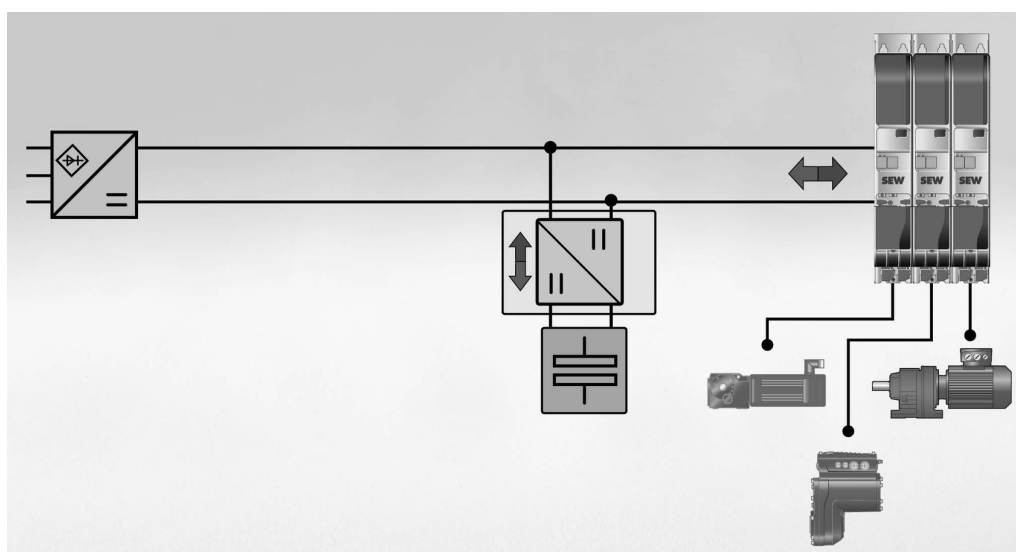
The MDE90A DC/DC converter module connects the external energy storage unit to the DC link. It is directly connected to the DC link and decouples the storage unit from its voltage. In this way the storage unit, such as a DLC network, can be designed for any voltage and does not depend on the voltage of the DC link.

The system can absorb regenerative energy from the DC link and make it available again later. A braking resistor is not required. Moreover, the 24 V switched-mode power supply module MDS90A (in preparation) that is dually supplied is able to supply all 24 V devices and is able to control the system behavior in case of a power failure.

Advantages of energy mode:


- Reduction of grid load.
- Reduction of energy costs.
- Suitable for large energy volumes.
- Power fail-safe covering outages lasting several minutes.
- The energy storage unit is decoupled from the DC link via the DC/DC converter module.

The following figure shows the functional principle of the components of the Power and Energy Solutions series in energy mode:



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2.3.4 Isolated operation

Isolated operation is used in mobile systems without permanent connection to an AC supply system or a DC voltage source. The system is supplied from an external energy storage unit. This provides sufficient energy to ensure mobile operation for a defined period of time before the storage unit has to be recharged. Regenerative energy is supplied to the storage unit and can be reused. The external energy storage unit is connected to the DC link of the drive system via the DC/DC converter MDE90A. Charging is performed either via an MDP90A/MDP92A power supply module or directly into the storage unit via a MOVITRANS® wireless charging system. For a sample wiring of isolated operation, refer to chapter "Wiring diagram isolated operation" (→  120).

2.4 MOVIKIT® modular system for the Power and Energy Solutions product series

MOVIKIT® software modules are standardized control programs with a defined process data interface and a user-friendly configuration and diagnostic interface that run on the controllers of the MOVI-C® CONTROLLER series from SEW-EURODRIVE.

Properties of the MOVIKIT® software modules:

- Wide range of functions.
- User-friendly user interface.
- It is only necessary to enter the parameters needed for the particular application.
- No lengthy training or familiarization, which means quick configuration and startup.

The tasks of the MOVIKIT® modular system for Power and Energy Solutions can be divided into 4 main areas:

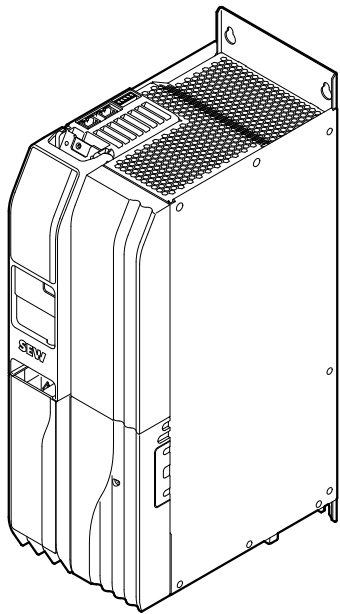
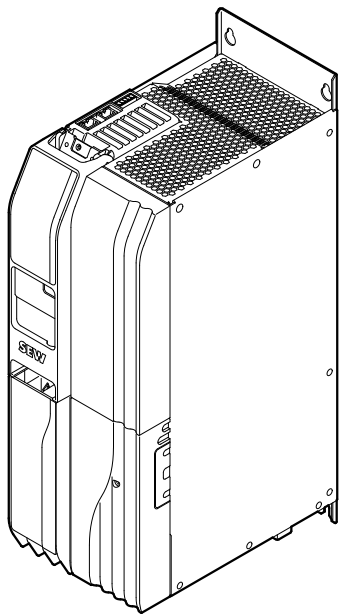
1. Collecting and analyzing power and energy data
 - Communication between the MOVIKIT® software module, the MDP92A power supply module, and the DC/DC converter module MDE90A to collect power and energy data at the connection to the supply system and the DC link or energy storage unit.
 - Communication between the MOVIKIT® software module and the axis modules for determining the power demand of the connected drives.
 - Flexible energy meter available directly on the controller.
2. Managing the DC link
 - Assigning voltage setpoints for the DC link.
 - DC link is defined as the central power node for supply and output power values.
 - Calculating the power of the energy storage unit connected to the DC link.
 - Discharge of the DC link via optional discharge resistor.
3. Managing the AC connection
 - Limiting the grid power by specifying the maximum power consumption (peak shaving).
 - Determining the phase-to-phase voltages.
 - Calculating the current consumption of the individual line phases in a symmetrical three-phase current grid.
 - Detecting phase failures and power failures.
 - Calculating the remaining runtime of the system after a power failure.
4. Managing the energy storage unit
 - Providing storage-relevant data such as temperature, voltage and overvoltage.
 - Aggregation of storage unit data from several modules, e.g. for the DLC network.
 - Transferring the storage status to the IEC application program for further processing.
 - Processing of diagnostic data for selected energy storage units.

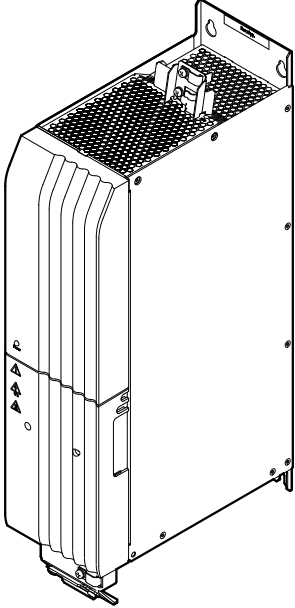
MOVIKIT® software modules are represented by ready-made IEC function blocks that are used to perform the individual tasks.

For detailed information on MOVIKIT® software modules, refer to the "MOVIKIT® Power and Energy Solutions" manual.

The Power and Energy Solutions devices can be operated with a limited range of functions without MOVIKIT® software modules. Contact SEW-EURODRIVE in this case.

2.5 Power and Energy Solutions at a glance

Power supply module with controlled DC link	
MDP92A-..	<p>Description: (→ 19)</p> <p>Technical data: (→ 32)</p> <p>Dimension drawings: (→ 34)</p> <ul style="list-style-type: none"> Nominal power: 25 kW Voltage range AC: 3 × 200 – 500 V, 50 – 60 Hz Voltage range DC link: 0 – 800 V Nominal current DC 50 A continuous duty, 80 A for 60 s Power: 25 kW continuous duty, 40 kW for 60 s System types: TN, TT, IT <p>For further information on this device, refer to the following documents:</p> <ul style="list-style-type: none"> "MOVIDRIVE® modular - Power and Energy Solutions" operating instructions "MOVIDRIVE® modular - Power and Energy Solutions" product manual
	
DC/DC converter module	
MDE90A-..	<p>Description: (→ 19)</p> <p>Technical data: (→ 35)</p> <p>Dimension sheets: (→ 37)</p> <ul style="list-style-type: none"> Nominal current: 75 A continuous duty, 120 A for 60 s Voltage range B-side 0 – 800 V Voltage range A-side DC link: 0 – 800 V Nominal power: 42 kW at U_A and $U_B = 560$ V System types: TN, TT, IT, DC stand-alone <p>For further information on this device, refer to the following documents:</p> <ul style="list-style-type: none"> "MOVIDRIVE® modular - Power and Energy Solutions" operating instructions "MOVIDRIVE® modular - Power and Energy Solutions" product manual
	

Capacitor module	
MDC90A-..	<p>Description: (→ 19)</p> <p>Technical data: (→ 38)</p> <p>Dimension drawings: (→ 39)</p> <ul style="list-style-type: none"> • Voltage range: DC 0 – 800 V • Capacitance: 11.8 mF • Total energy: 3.1 kW with 720 V • Usable energy content: 2 kW in the range from 500 V – 800 V • Can be connected in parallel (not more than 4) <p>For further information on this device, refer to the following documents:</p> <ul style="list-style-type: none"> • "MOVIDRIVE® modular - Power and Energy Solutions" operating instructions • "MOVIDRIVE® modular - Power and Energy Solutions" product manual
	
Software modules	
MOVIKIT®	<p>Description: (→ 15)</p> <ul style="list-style-type: none"> • MOVIKIT® Power and Energy Solutions PowerMode • MOVIKIT® Power and Energy Solutions DirectMode • MOVIKIT® Power and Energy Solutions EnergyMode <p>For information on the software modules, refer to the following documents:</p> <ul style="list-style-type: none"> • "MOVIKIT® Power and Energy Solutions DirectMode" manual • "MOVIKIT® Power and Energy Solutions PowerMode" manual • "MOVIKIT® Power and Energy Solutions EnergyMode" manual • "MOVIKIT® Power and Energy Solutions DataLogging" manual

2.6 Product overview

2.6.1 MDP92A-.. power supply module with controlled DC link voltage

2

The power supply module with controlled DC link is used to supply the axis modules from the AC supply system. Furthermore, it can provide an adjustable DC link voltage. The device can set a higher voltage in the DC link than by using a bridge rectifier. This way, storage units used in the DC link can be further charged and a higher level of energy can be used.

The device has a nominal power of 25 kW (50 A) and a peak power of 40 kW (80 A) for 60 s.

2.6.2 DC/DC converter MDE90A-..

The DC/DC converter module can be used universally. In a DC grid, it can be used analog to a power supply module to supply the axis units and can provide an adjustable DC link voltage independent of the supply system. It is also able to feed regenerative energy back into the DC grid when required.

Another function of the DC/DC converter module is the ability to connect an energy storage unit to the DC link of a drive. In this constellation, it can absorb regenerative energy to charge the energy storage unit and, if necessary, make it available again to support the DC link of the drive. In this way, the peak load can be reduced and the system can continue to operate without power grid or in the event of a power failure.

In isolated operation, the DC/DC converter module is the EtherCAT® master of the system and is used instead of the power supply module for energy supply.

The device provides the following nominal powers and peak powers:

- 42 kW at 75 A
- 96 kW at 120 A for 60 s

2.6.3 MDC90A-.. capacitor module

In the field of energy storage units, the capacitor module is the smallest energy storage unit.

It can be operated directly in the DC link in power mode and flexible mode, and has a capacitance to store energy. It serves to smoothen short, highly dynamic power peaks and it ensures the function of peak shaving to a limited extent.

In the event of a power failure, the stored energy can be used to bring the application into a safe state and to shut down the application in a controlled manner.

A single capacitor module with a capacity of approx. 12 mF can absorb and release energy of approx. 2 kW in the voltage range from 500 V and 800 V of the DC link.

The internal resistance of the device is so low that a power limitation is only defined by the performance of the axis.

2.6.4 External energy storage units

For detailed information on external energy storage units, refer to the manual "External energy store units".

2.7 FCB concept

2

FCB = Function Control Block

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

All primary functions, i.e. functions that control the energy flow, are designed as individual FCBs. They can be selected to perform a specific task, for example to control the voltage at the DC link of the inverter.

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

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

FCBs can also be activated by a firmware-internal function, for example, due to a fault response.

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

- FCB 52 Inhibit brake chopper
- FCB 51 Output stage inhibit
- FCB 55 Voltage control

2.7.1 Description of the FCBs

FCB 51 Output stage inhibit

The output stage is inhibited by activating the FCB 51. If the device is equipped with a brake chopper, the brake chopper is not inhibited.

FCB 52 Inhibit brake chopper

FCB 52 also inhibits the brake chopper of the device in addition to the output stage.

FCB 55 Voltage control

The device controls the voltage on one of the two output stage sides.

The user can specify profile values on both sides for the maximum positive and negative current, the maximum and minimum voltage and the maximum power rating in both directions as the basic conditions for voltage control.

2.7.2 Setpoints and limits in the FCBs

The following tables show which FCB uses which setpoints and profile values.

MDP92A-..

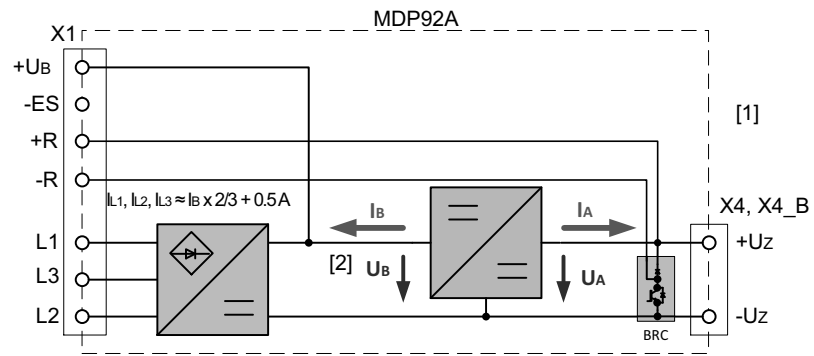
	Index		FCB		
			51	52	55
Setpoint connection	8802				
Voltage A-side – actual value		.4			x
Profile value connection	8803				
Maximum voltage A-side – actual value		.4			x
Maximum voltage B-side – actual value		.8			x
Minimum voltage A-side – actual value		.36			x
Minimum voltage B-side – actual value		.40			x
Maximum current A-side positive – actual value		.12			x
Maximum current A-side negative – actual value		.16			x
Maximum current B-side positive – actual value		.20			x
Maximum current B-side negative – actual value		.24			x
Maximum power B-A – actual value		.28			x
Maximum power A-B – actual value		.32			x

MDE90A-..

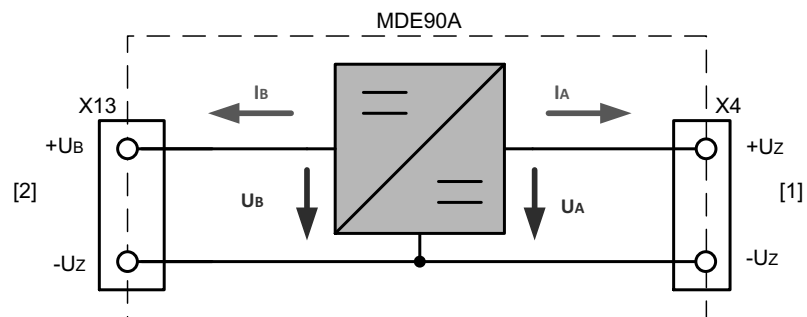
	Index		FCB		
			51	52	55
Setpoint connection	8802				
Voltage A-side – actual value		.4			x
Profile value connection	8803				
Maximum voltage A-side – actual value		.4			x
Maximum voltage B-side – actual value		.8			x
Minimum voltage A-side – actual value		.36			x
Minimum voltage B-side – actual value		.40			x
Maximum current A-side positive – actual value		.12			x
Maximum current A-side negative – actual value		.16			x
Maximum current B-side positive – actual value		.20			x
Maximum current B-side negative – actual value		.24			x
Maximum power B-A – actual value		.28			x
Maximum power A-B – actual value		.32			x

Definition of the terms "A-side" and "B-side":

- [1] Side A: DC link busbar, input end, storage end, DC grid
- [2] Side B: Rectified line voltage or storage end, DC grid



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2.8 Module bus

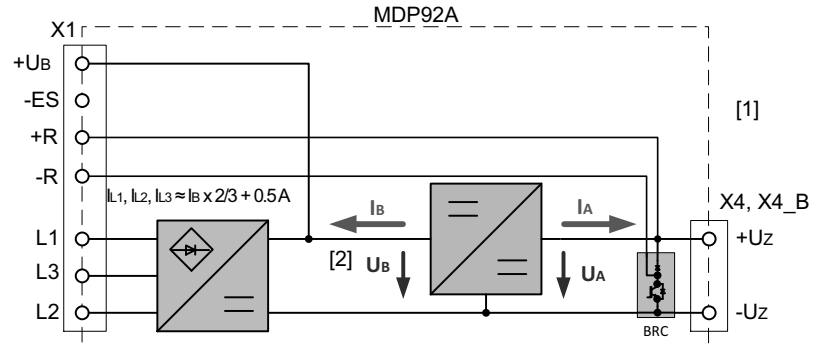
The module bus serves as connection of individual system components from SEW-EURODRIVE. These can be inverters, power supply modules, coupling modules, etc. Status and fault messages are exchanged between the system components using this connection. Depending on the fault, a specific fault response is triggered. The module bus at the power supply module can be configured as "Module bus master" or "Module bus slave". The module bus master is always in first position in the network. There may only be one module bus master in the network.

The module bus is configured using parameter group 8627 "Module bus".

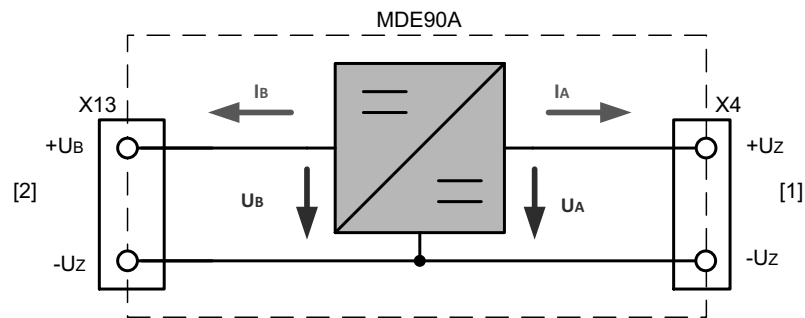
2.9 Device functions

Definition of the terms "A-side" and "B-side":

- [1] Side A: DC link busbar, input end, storage end, DC grid
- [2] Side B: Rectified line voltage or storage end, DC grid



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2.9.1 Basic settings

The default FCB can be selected here. The default FCB is activated when no other FCB has been selected.

2.9.2 FCB55 Voltage control

The voltage controller regulates the voltage on the MDP92A-... on side A and on the MDE90A-... on side A or B (parameterizable), see chapter "FCB concept" (→ 21).

Boost mode function

If the minimum voltage on side A or B is underrun, only the respective application limit is active on this side for the power limit and current limit, but not the profile value.

Boost mode is deactivated if the profile values for current and performance are under-run and the minimum voltage is exceeded.

Boost mode must not be activated during operation with a controller and when using MOVIKIT® software modules.

2.10 Monitoring functions

2.10.1 Reference signals

The devices offer the possibility of triggering signals when certain voltages on side A or B are reached. The values can be set in the MOVISUITE® engineering software. Contactors and other accessories can be controlled by mapping the signals to digital outputs.

2.10.2 Limit values

The device provides application limits under parameter group "8800 limit values – power supply".

Limits of the application can be set using limit values, for example, to protect the external periphery from high currents. That means the limits are active throughout all device functions.

The device itself always works within these limits or attempts to maintain the values within the set range. This means you additionally limit the setpoint and profile values of the device, see chapter "Setpoints and limits in the FCBs" (→ 22).

You can set limits and check whether a limit is active using the MOVISUITE® engineering software.

2.10.3 Control functions

Monitoring the voltage

The brake chopper can be parameterized here for the MDP92A-... power supply module.

Monitoring the output stage temperature

If the maximum permitted output stage temperature is exceeded, the system inhibits the output stage and signals a fault.

A warning is issued before a fault message occurs. You can determine when the warning is to be issued using a hysteresis.

Monitoring the control electronics temperature

If the maximum permitted temperature of the control electronics is exceeded, the system inhibits the output stage and signals fault "E11.9 Signal electronics overtemperature".

No warning is issued.

2.10.4 Power supply monitoring

Power supply monitoring is only effective for devices with AC connection.

For more information, refer to chapter "Monitoring functions" (→ 148).

The line frequency of the connected AC grid must be set correctly so that the line voltages can be measured correctly. This is done by using parameters.

The phase-to-phase voltage of the grid is monitored.

If the device is configured as module bus slave, the grid condition itself is not monitored, but is read out of the module bus data of the master.

Phase failure cannot be parameterized. If a phase failure is detected, it is signaled, and the grid condition is adjusted accordingly.

A module bus slave, regardless of whether it has an AC connection or not, receives a phase failure transmitted by the module bus master and evaluates it accordingly.

Rapid undervoltage detection

The voltage on the output stage of the A- or B-side is monitored. If a grid is detected as "ON" during monitoring, the respective bit for the grid condition is set. Rapid undervoltage detection can be set using parameters.

DC link monitoring

The grid is monitored by means of the DC voltages of the A-side and/or B-side depending on the setting.

With DC link monitoring, no fault is triggered. The device changes its status from "Ready" to "Not ready" in case of undervoltage, inhibiting the monitored output stage end.

The device display shows "00".

Insulation monitoring for DC/DC converter

The voltages $+U_B$ and $-U_Z$ are measured against PE to detect ground faults. Insulation monitoring can be activated on the MDE90A by means of control bits (parameter 8809.90).

Insulation monitoring only runs from $U_B > 100 \text{ V}$. If a ground fault is detected, fault E03.01 is displayed. Only ground faults on side B are monitored and detected.

The measuring circuit causes a high-resistance balancing of the two voltages $+U_B$ and $-U_Z$ against PE. At low U_B voltage and high U_A voltage, this can lead to an impermissibly high voltage $+U_A$ against PE. See also chapter "Line voltage dependency of the nominal output voltage" (→ 50).

Insulation monitoring is mandatory for DC isolated operation. This can also be ensured via an external insulation monitor.

If insulation monitoring according to EN 61557-8 is required, an external insulation monitor must be used.

Short circuit monitoring

Short circuit monitoring comprises the following subfunctions:

- Short circuit monitoring during charging.
- Short circuit monitoring during operation.

It is active by default for MDP92A and MDE90A but can be deactivated by Service via parameters. Monitoring can only detect the short circuit if the device is currently feeding current into this short circuit.

2.11 Control technology

2.11.1 Current control

"LVRT" function

In the event of voltage dips on the non-controlled side of voltage control that fall below a defined value from the previous average value, the setpoint value of the output current is set to 0%.

After recovery of the non-controlled voltage, the device automatically increases the setpoint of the output current to the original setpoint with a delay. This function can be enabled or disabled.

"Impedance adjustment" function

At supply points with increased impedance, distortion of the supply voltage can occur with pulse-shaped power consumption. This is the non-controlled side of voltage control.

If larger deviations of the supply voltage are detected during power consumption, the device reduces or increases the output current. This behavior can lead to slight deviations in the output voltage of the A-side that is to be controlled.

This option can also be parameterized at supply points with low impedance or if a particularly accurate output voltage of the controlled side is required under all connection conditions.

2.12 Device replacement

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

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

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




In addition, changes in the device that have not been saved using the "Update configuration" function are overwritten. The process is performed automatically.

3 Technical data

3.1 Markings





3.1.1 Basic device

The modules from Power and Energy Solutions comply with the following regulations and directives:


Marking	Definition
	The CE mark states compliance with the following European directives: <ul style="list-style-type: none"> • Low Voltage Directive 2014/35/EU • EMC Directive 2014/30/EU • Directive 2011/65/EU for limiting the use of certain hazardous substances in electric and electronic equipment
	The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU.
	The China RoHS marking declares compliance with the SJ/T 11364-2014 Directive concerning the restriction of use of certain hazardous substances in electrical and electronic devices and their packaging.



3.1.2 Accessories

Braking resistors BR..





Mark	Definition
	The CE mark states the compliance with the following European guidelines: <ul style="list-style-type: none"> • Low Voltage Directive 2014/35/EU • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
	Waste disposal of this product must be in compliance with the WEEE directive 2012/19/EU.
	The China RoHS mark states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment and their packaging.
	The cUR mark states the UL approval for this component.

TCB thermal circuit breaker

Mark	Definition
	The CE mark states the compliance with the following European guidelines: <ul style="list-style-type: none"> • Low Voltage Directive 2014/35/EU • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment

Mark	Definition
	The China RoHS mark states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment.
	The cUR mark states the UL approval for this component.

NF.. line filter

Mark	Definition
	The CE mark states the compliance with the following European guidelines: <ul style="list-style-type: none"> • Directive 2011/65/EU for limiting the use of hazardous substances in electric and electronic equipment
	Waste disposal of this product must be in compliance with the WEEE directive 2012/19/EU.
	The China RoHS mark states compliance with directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment and their packaging.
	The cUR mark states the UL approval for this component.

3.2 General technical data

The following table lists the technical data for all modules from Power and Energy Solutions, regardless of

- Type
- Design
- Size
- Power rating

Power and Energy Solutions	
Interference immunity	Meets EN 61800-3; 2. Environment
Interference emission	Limit value category C2 to EN 61800-3
Ambient temperature ϑ_{amb}	0 °C to +45 °C without derating; MDP92A, MDE90A: Shutdown caused by overtemperature

Climatic requirements	<ul style="list-style-type: none"> • Extended storage (weatherproof): EN 60721-3-1 class 1K2 Temperature -25 °C to +70 °C (deviating from norm) Non-condensing; no moisture condensation • Transport (weatherproof): EN 60721-3-2 class 2K3 temperature -25 °C to +70 °C Non-condensing; no moisture condensation • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3K3 temperature 0 °C to +45 °C (deviating from norm) Non-condensing; no moisture condensation
Chemically active substances	<ul style="list-style-type: none"> • Extended storage (weatherproof): EN 60721-3-1 class 2C2, no corrosive gases, no salt mist (deviating from norm) • Transport (weatherproof): EN 60721-3-2 class 2C2, no corrosive gases, no salt mist, no sea water (deviating from norm) • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3C2, no corrosive gases, no salt mist
Mechanically active substances	<ul style="list-style-type: none"> • Extended storage (weatherproof): EN 60721-3-1 class 1S1, no conductive dust • Transport (weatherproof): EN 60721-3-2 class 2S1 • Operation (fixed installation, weatherproof): EN 60721-3-3 class 3S1, no conductive dust
Vibration testing to EN 61800-5-1	
All modules	Load capacity complies with EN 61800-5-1
Degree of protection to EN 60529	
All modules	IP20
Pollution class	2 in accordance with IEC 60664-1
Overvoltage category	III in accordance with IEC 60664-1
Installation altitude	<p>Up to $h \leq 1000$ m without restrictions. The following restrictions apply to $h > 1000$ m:</p> <ul style="list-style-type: none"> • From 1000 m to max. 3800 m: I_N reduction by 1% per 100 m • From 2000 m to max. 3800 m: To maintain protective separation and the air gaps and creepage distances in accordance with EN 61800-5-1, you have to connect an over-voltage protection device in order to reduce the overvoltages from category III to category II.

3.3 MDP92A power supply module with controlled DC link voltage

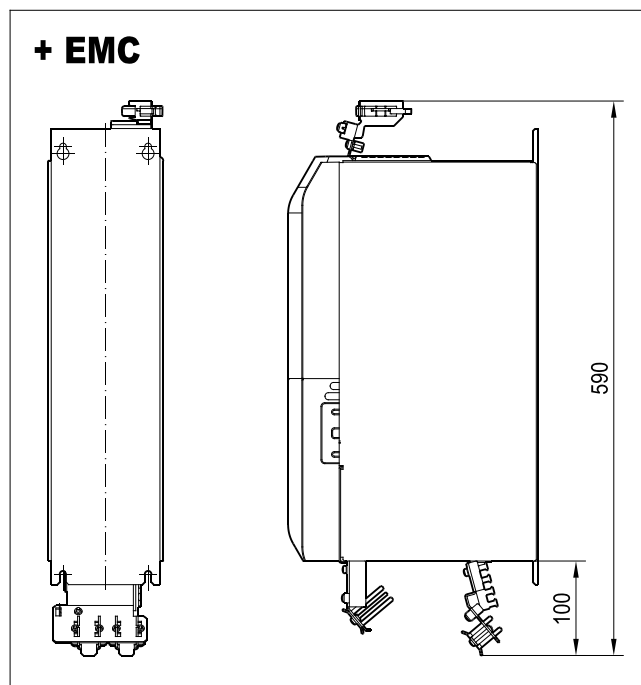
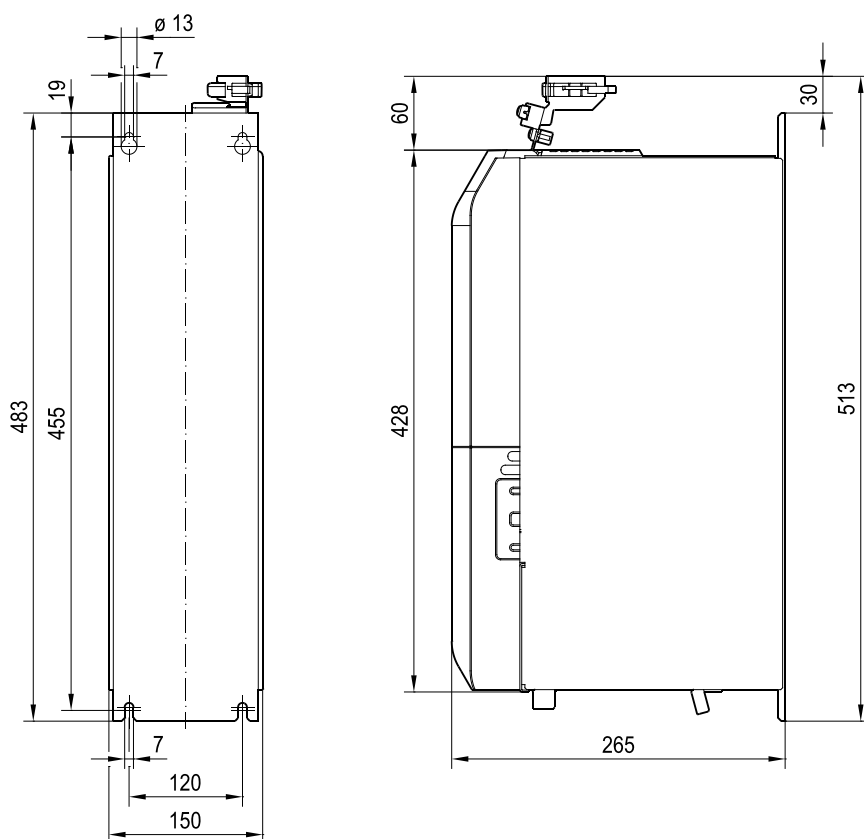
3.3.1 Performance data

MOVIDRIVE® modular	MDP92A-0250-503-4-S00
Nominal power P_N	25 kW
Input	
Nominal line voltage (to EN 50160) AC U_{line}	3 × 200 – 500 V
Nominal line current AC I_{line}	40 A
Line frequency f_{line}	50 – 60 Hz ± 10%
X1 connection	Plug connector, 0.75 – 16 mm ²
PE connection	M6 screw × 16, max. 35 mm ²
Output (DC link)	
Nominal DC link voltage U_{NDCL}	DC 560 V
Adjustable range	0 – 800 V
Maximum voltage	1000 V
Nominal DC link current DC I_{NDCL}	50 A
Max. DC link current DC $I_{DCL\ max}$	80 A (for 60 s)
DC link capacity	350 µF
Overload capacity	160% I_N for 60 s
Connection for -UZ/+UZ	CU busbars
	M6 screw × 16
PE connection	M6 screw × 16
Connection external energy storage unit	M6 screw × 16, max. 35 mm ²
Brake chopper and braking resistor	
Minimum braking resistance value R_{BWmin}	12 Ω
Maximum brake chopper power	250% × P_N
Mean dischargeable power in regenerative operation	100% × P_N
X1 connection	Plug connector 0.75 – 16 mm ²
PE connection	M6 screw × 16
General	
Nominal power loss 24 V	15 W
Power section nominal power loss	300 W
Mass	14 kg
Dimensions	
Width	150 mm
Height	428 mm
Depth	265 mm

3.3.2 Electronics data – signal terminals

	Terminal designation	Specification
General		
Design		In accordance with IEC 61131-2
Supply voltage		
Connection	X5	DC 24 V -10%, +20% according to EN 61131
Connection contacts		CU bars 2 x 5 mm ² , M4 screw fitting
Braking resistor temperature monitoring		
Evaluation of temperature sensor at braking resistor	X7:1	DC 24 V auxiliary voltage output to supply X7: 2
	X7: 2	Sensor input for temperature monitoring of the braking resistor. • Signal contact closed: No overtemperature • Signal contact open: Overtemperature Connect isolated signal contacts only.
	X7: 3 – 4	Reserved
Connection contacts		Plug connectors 1 core: 0.14 – 1.5 mm ²
Digital inputs		
Cycle time I/O		1 ms
Quantity		3
Response time		100 µs + cycle time
Assignment	X20: 1	DC 24 V auxiliary voltage output, max. 50 mA
	X20: 8 – 10	DI02: For the selection option, see the parameter menu. DI01: For the selection option, see the parameter menu. DI00: Pre-assigned with "Output stage enable".
	X20: 11	GND
Connection contacts		Plug connectors 1 core: 0.14 – 1.5 mm ²
Digital outputs		
Cycle time I/O		1 ms
Quantity		5
Response time		175 µs + cycle time
Output current		I _{max} = 50 mA
Short-circuit protection		Yes
Assignment	X20: 2 – 3	DOR-C: Relay contact DOR-NO: NO contact I _{max} = 2 A U _{max} = 30 V P _{max} = 60 W
	X20: 4 – 7	DO00 – DO03: For the selection option, see the parameter menu.
	X20: 11	GND
Connection contacts		Plug connectors 1 core: 0.14 – 1.5 mm ²
Signal interface for external energy storage units		
	X33: 1	DC 24 V auxiliary voltage output
	X33: 2	DC 5 V auxiliary voltage output I _{max} = 800 mA
	X33: 3	0 – 5 V analog input
	X33: 4 – 5	0 – 5 V digital input
	X33: 6 – 7	Reserved for CAN
	X33: 8	GND
Connection contacts		Plug connectors 1 core: 0.14 – 1.5 mm ²

3.3.3 Dimension sheet



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3.4 DC/DC converter module MDE90A

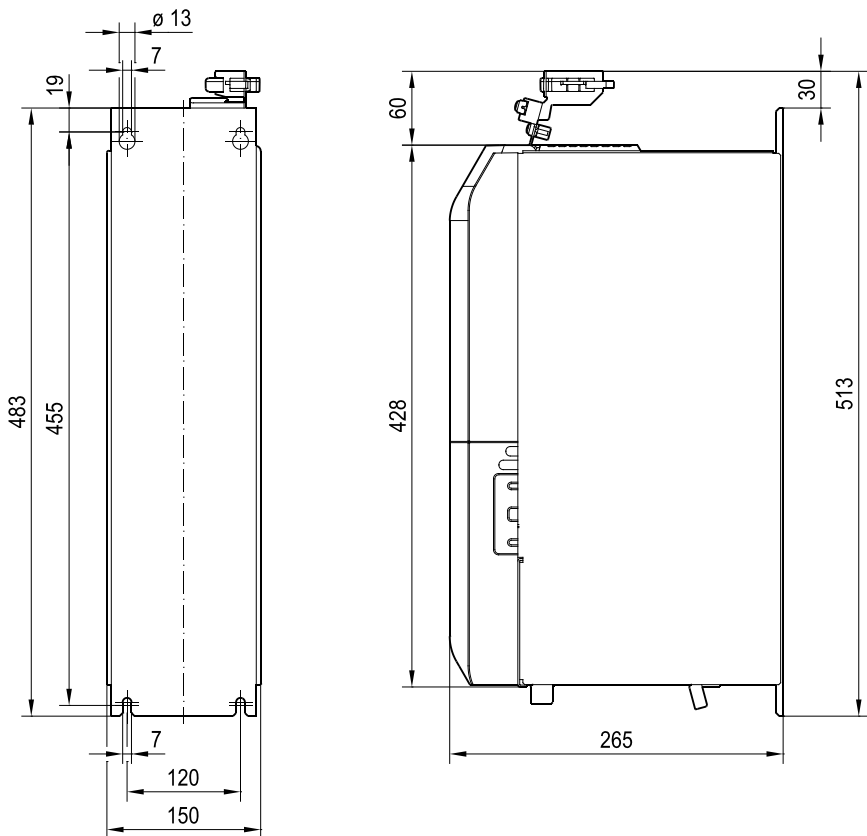
3.4.1 Performance data

DC/DC converter module	MDE90A-0750-500-X-S00
Input (DC link)	
Nominal DC link voltage U_{NDCL}	DC 560 V
Adjustable range	0 – 800 V
Maximum voltage	1000 V
Nominal DC link current DC I_{NDCL}	75 A
Max. DC link current I_{DCL_max}	120 A
Voltage ratio	Any, 4-quadrant operation
Connection	M6 screw, max. 35 mm ²
PE connection	M6 screw × 16, max. 35 mm ²
Output (storage connection)	
Operating voltage range	DC 0 V – 800 V
Maximum voltage	DC 1000 V
Nominal current DC I_N	75 A with continuous duty
Maximum current DC I_{max}	120 A for maximum 60 s
Connection	M6 screw, max. 35 mm ²
PE connection	M6 screw × 16, max. 35 mm ²
"Varying load duty" mode	
I_1 = overload	160 % I_N for 60 s
I_2 = recovery time	50 % I_N for 120 s
Maximum power with U_N	67.2 kW
Efficiency	> 99 %
DC link capacity	105 µF
General	
Nominal power loss 24 V	15 W
Power section nominal power loss	300 W
Mass	14 kg
Dimensions	
Width	150 mm
Height	473 mm
Depth	265 mm

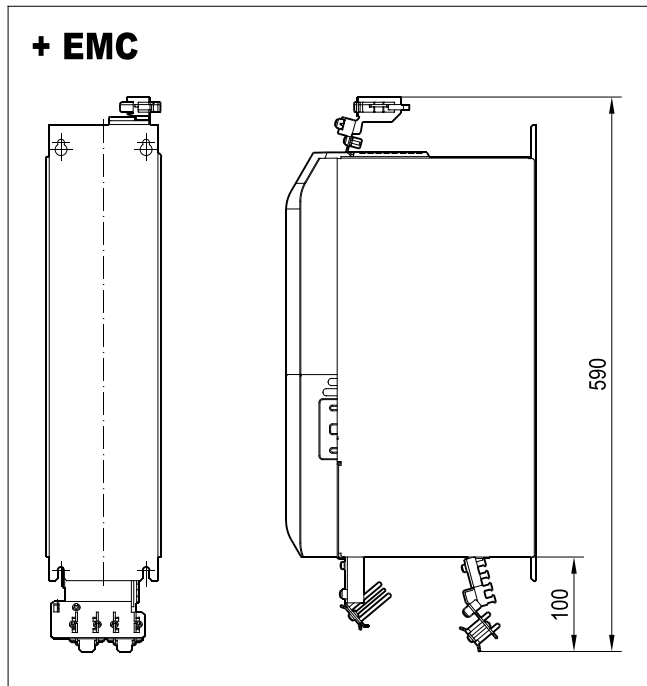
3.4.2 Electronics data – signal terminals

	Terminal designation	Specification
General		
Design		In accordance with IEC 61131-2
Supply voltage		
Connection	X5	DC 24 V -10%, +20% according to EN 61131
Connection contacts		CU bars 2 x 5 mm², M4 screw fitting
Digital inputs		
Assignment	X21:1	DC 24 V auxiliary voltage output
	X21: 2	DI03: For the selection option, see parameter menu
	X21: 3 – 4	Reserved
Cycle time I/O		1 ms
Quantity		1
Response time		100 µs + cycle time
Connection contacts		Plug connectors 1 core: 0.14 – 1.5 mm²
Digital inputs		
Cycle time I/O		1 ms
Quantity		3
Response time		100 µs + cycle time
Assignment	X20: 1	DC 24 V auxiliary voltage output, max. 50 mA
	X20: 8 – 10	DI02: For the selection option, see the parameter menu. DI01: For the selection option, see the parameter menu. DI00: Pre-assigned with "Output stage enable".
	X20: 11	GND
Connection contacts		Plug connectors 1 core: 0.14 – 1.5 mm²
Digital outputs		
Cycle time I/O		1 ms
Quantity		5
Response time		175 µs + cycle time
Output current		I _{max} = 50 mA
Short-circuit protection		Yes
Assignment	X20: 2 – 3	DOR-C: Relay contact DOR-NO: NO contact I _{max} = 2 A U _{max} = 30 V P _{max} = 60 W
	X20: 4 – 7	DO00 – DO02: For the selection option, see the parameter menu. DO03: reserved
	X20: 11	GND
Connection contacts		Plug connectors 1 core: 0.14 – 1.5 mm²
Signal interface for external energy storage units		
	X33: 1	DC 24 V auxiliary voltage output
	X33: 2	DC 5 V auxiliary voltage output I _{max} = 800 mA
	X33: 3	0 – 5 V analog input
	X33: 4 – 5	0 – 5 V digital input
	X33: 6 – 7	Reserved for CAN
	X33: 8	GND
Connection contacts		Plug connectors 1 core: 0.14 – 1.5 mm²

3.4.3 Dimension sheet



3



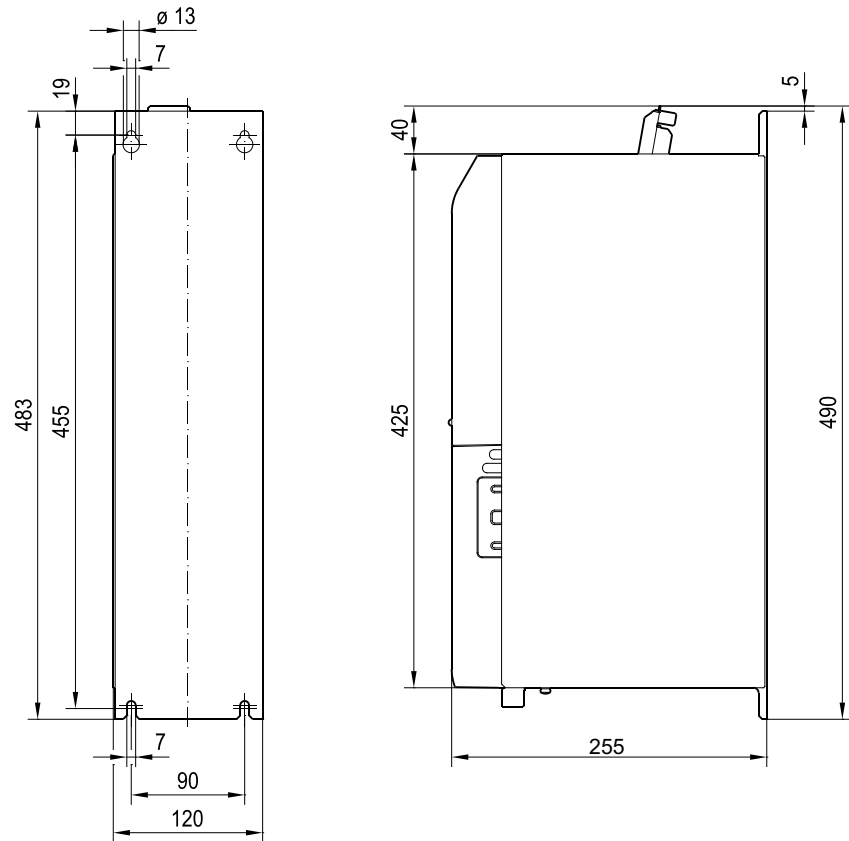
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3.5 MDC90A capacitor module

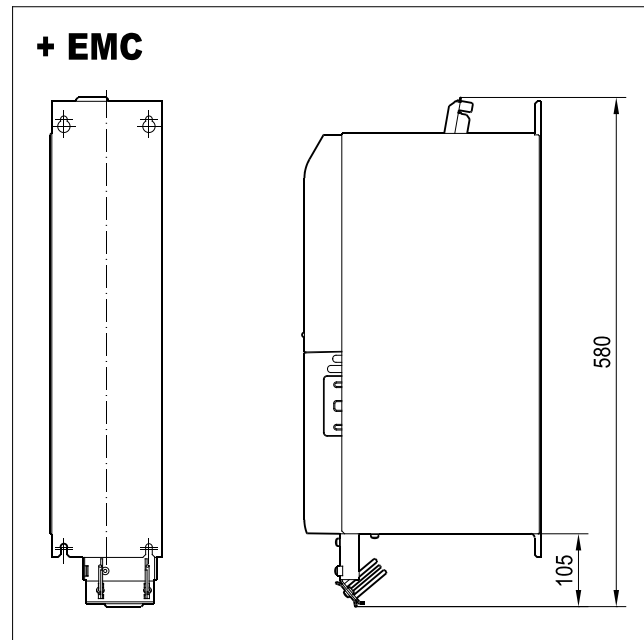
3.5.1 Performance data

Capacitor module	MDC90A-0120-50X-X-000
DC link connection	
Nominal DC link voltage U_{line}	DC 560 V
Operating voltage range	DC 0 V – 800 V
Maximum voltage	DC 900 V
Nominal capacitance	11.8 mF \pm 20%
Usable energy	2 kW in the range from 500 V – 800 V
Connection for -UZ/+UZ	CU bars
Connection of external energy storage unit or discharge unit	M6 screw \times 16, max. 35 mm ²
PE connection	M6 screw \times 16
General	
Mass	11 kg
Dimensions	
Width	120 mm
Height	425 mm
Depth	255 mm

3.5.2 Dimension sheet



3



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3.6 Technical data of braking resistors and filters

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

General

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

Braking resistors with different continuous and peak braking powers are available.

Protect the braking resistors using the thermal circuit breaker TCB.

INFORMATION



Use of protection devices

Use only the protection device listed in the following section:

- TCB thermal circuit breaker

→ See also chapter Protection against thermal overload of the braking resistor.

UL and cUL approval

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

Technical data and assignment to an inverter

Technical data

Braking resistor	Unit	BW047-002 ¹⁾	BR047-010-T	BR027-016-T	BW027-024-T
Part number		08281661	17983207	17983215	17983231
Nominal power P _N	kW	0.2	1	1.6	2.4
Resistance value R _{BW}	Ω	47 ±10%	47 ±10%	27 ± 10%	
Tripping current I _{trip}	A	1.6	4.6	7.7	9.4
Design		Flat-type resistor	Wire resistor		
Power connections		-	0.75 – 10 mm ²		
Tightening torque	Nm	-	1.5 – 1.8		
PE connection		-	M6 stud		
Tightening torque PE	Nm	-	1.8		
Degree of protection		IP65	IP20		
Ambient temperature θ _{amb}		-20 °C to +40 °C			
Mass	kg	0.6	4	5.8	8

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

Assignment to an inverter

Braking resistor		BW047-002	BR047-010-T	BR027-016-T	BW027-024-T
Assignment to MDP90A-..		0100 – 1100			
Assignment to MDR91A-..		0500/0750			
Assignment to MDP92A-..		0250			

Technical data

Braking resistor	Unit	BW012-016	BW012-024	BW012-050-T
Part number		18213243	17983894	18201407
Nominal power P_N	kW	1.6	2.4	5
Resistance value R_{BW}	Ω	12 \pm 10%		
Tripping current I_{trip}	A	11.5	14.1	20.4
Design		Wire resistor		Grid resistor
Power connections		0.75 – 10 mm ²		M8 stud
Tightening torque	Nm	1.5 – 1.8		6
PE connection		M6 stud		M6 stud
Tightening torque PE	Nm	1.8		3
Degree of protection		IP20		
Ambient temperature ϑ_{amb}		-20 °C to +40 °C		
Mass	kg	5.8	8	12

Assignment to an inverter

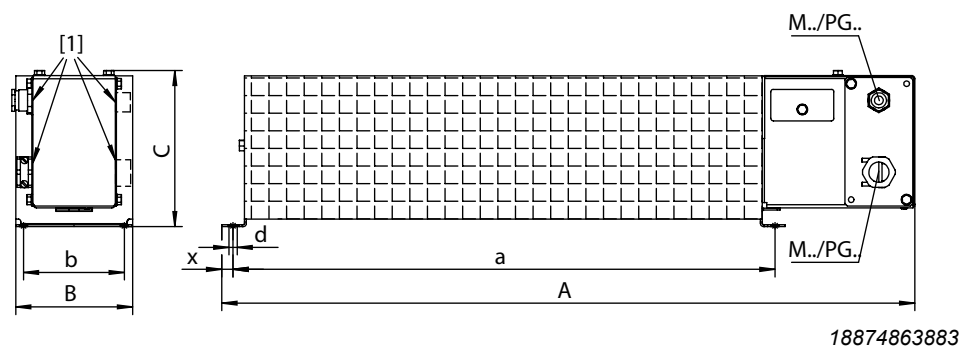
Braking resistor		BW012-016	BW012-024	BW012-050-T
Assignment to MDP90A-..		0250 – 1100		
Assignment to MDR91A-..		0500/0750		
Assignment to MDP92A-..		0250		

Technical data BW...-T signal contact

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

Dimension sheets and dimensions

Wire resistor

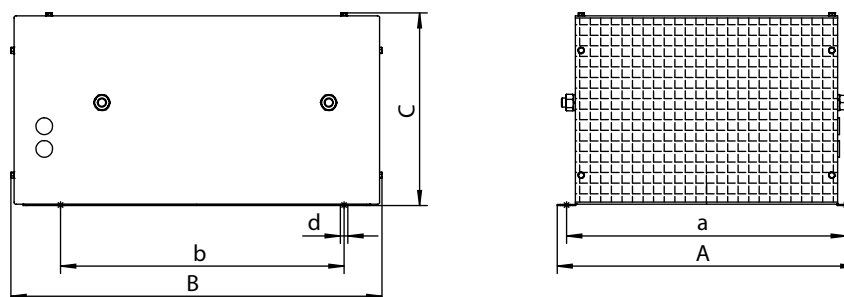


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[1] Cable entry is possible from both sides.

Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BR047-010-T	749	92	125	630	80	6.5	8	M25+M12
BR027-016-T	649	185	125	530	150	6.5	8	M25+M12
BR027-024-T	649	275	125	530	240	6.5	8	M25+M12
BW012-016	649	185	120	530	150	6.5	8	M25
BW012-024	649	275	125	530	240	6.5	9	M25

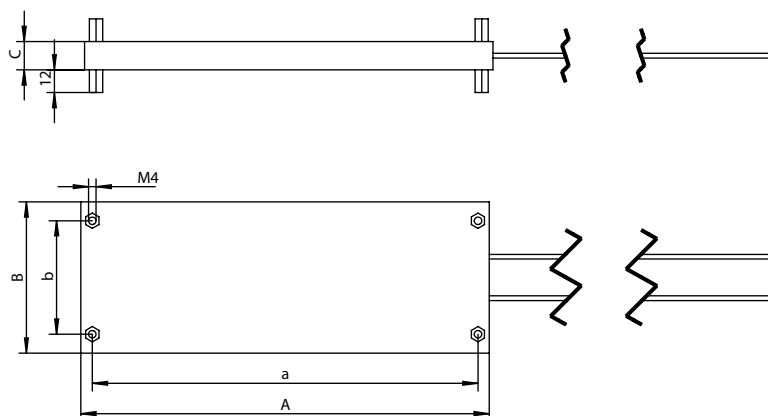
Grid resistor mounting position 1



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Braking resistor	Main dimensions in mm			Mounting dimensions in mm				Cable gland
	A	B	C	a	b	d	x	
BW012-050-T	395	490	260	370	380	10.5	-	-

Flat type resistor



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

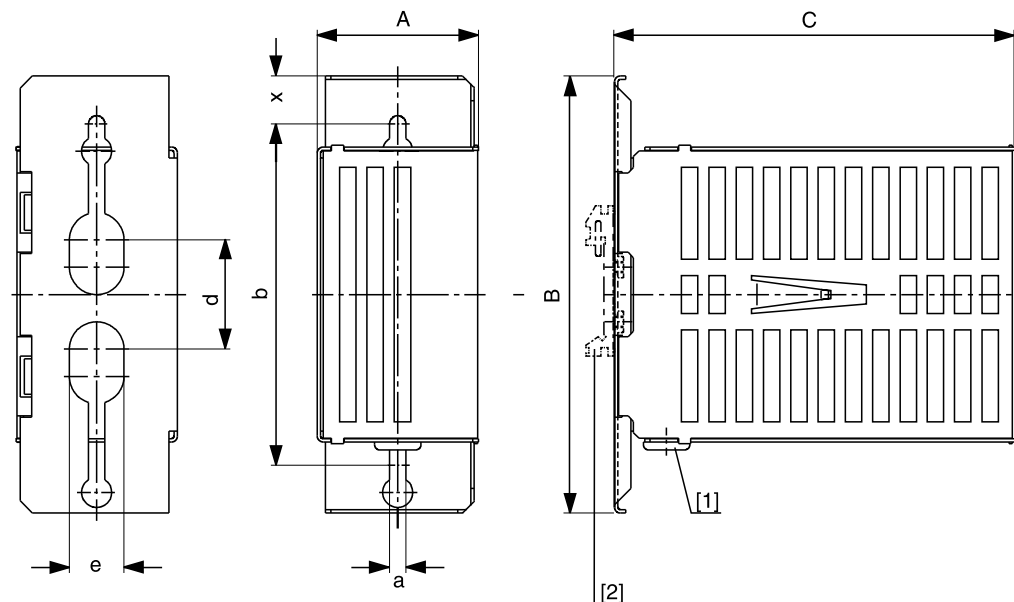
Touch guard BS..

Description

A BS.. touch guard is available for braking resistors in flat design.

Touch guard	BS005
Part number	0813152X
for braking resistor	BW047-002

Dimension sheet BS..



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[1] Grommet

[2] Support rail mounting

Type	Main dimensions in mm			Mounting dimensions mm					Mass kg
	A	B	C	b	d	e	a	x	
BS-005	60	160	252	125	4	20	6	17.5	0.5

Mounting rail installation

A mounting rail attachment HS001 is available from SEW-EURODRIVE, part number 8221944, for mounting the touch guard on a mounting rail.

3.6.2 TCB thermal circuit breaker option

General

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

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

The switch reacts to the following events:

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

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

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

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

UL and cUL approval

The listed thermal circuit breakers have a cRUus approval independent of the inverter.

Technical data

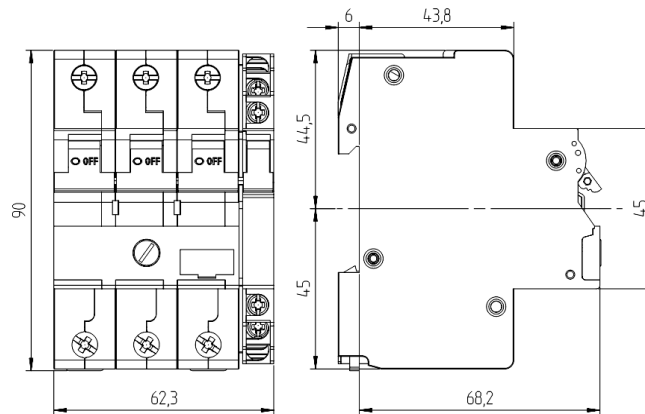
Circuit breaker type	Unit	TCB0040	TCB0063	TCB0100
Part number		19170424	19170432	19170440
Setting range	A	2.5 – 4	4 – 6.3	6.3 – 10
Connection cross section main contact	mm ²	1.5 – 16		
Tightening torque	Nm	2.5		
Signal contact connection cross section	mm ²	0.5 – 1.5		
Tightening torque	Nm	0.8		
Mechanical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

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

Technical data of signal contact

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

Dimension sheet



17195255435

3.6.3 Line filters

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

UL and cUL approval

The listed line filters have a cRUus approval independent of the inverter.

Technical data

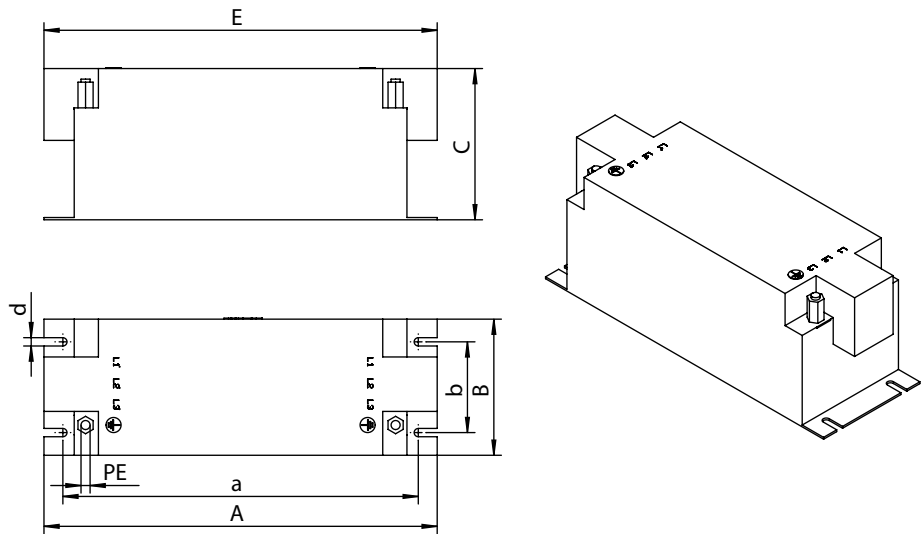
Line filter	NF0420-513	NF0420-523
Part number	17983789	17983797
Nominal line voltage U_N	Maximum 3 × AC 500 V, 50/60 Hz	
Nominal current I_N	42 A	
Nominal power loss	30 W	37 W
Ambient temperature ϑ_{amb}	0 °C to 45 °C	
Connection contacts L1/L2/L3 – L1'/L2'/L3'	2.5 – 16 mm ²	
Tightening torque L1/L2/L3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

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

Assignment to an inverter

Line filter	NF0420-513	NF0420-523
Assignment to MDP90A-..	0100, 0250	
Assignment to MDP90A-..	0500	0750, 1100
Assignment to MDR91A-..	0500	0750

Dimension sheets and dimensions



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Line filter	Main dimensions in mm				Mounting dimensions in mm			
	A	B	C	E	a	b	d	PE
NF0420-513	250	88	97	255	235	60	5.5	M6

3.7 Accessories

3.7.1 Temperature sensor for MDC90A

The capacitor module can be monitored using a PT1000 temperature sensor. By using a PT1000 temperature sensor, you can protect the device from excessive load, which, as a result, leads to a longer service life of the energy storage unit. The temperature sensor can be monitored by the application program via the MOVI-C® CONTROLLER. This requires additional hardware, such as I/O modules.

All required parts are included as accessories:

- Mounting panel with retaining screw
- Strain relief (also shield terminal)
- PT1000 temperature sensor

Part number of the accessory pack: 28259009

Temperature sensor	Description
Sensor	
Sensor type	Platinum resistor, PT1000
Nominal resistance	1000 Ω at 0 °C
Operating temperature range	-200 °C to 400 °C
Tolerance class	B
Insulation (heat shrink tubing)	
Temperature range	-67 °C to 190 °C
Cable	
Structure	3 × 0.22 mm ² stranded copper wire, tinned and shielded
Nominal voltage	300/500 V
Operating temperature range	-90 °C to 205 °C
Length of the sensor cable	3 m, with an open end

4 Project planning

SEW-EURODRIVE handles the project planning of the modules for the Power and Energy Solutions.

Drive project planning with the SEW-Workbench serves as the basis for the project planning process.

For the procedure of drive project planning, refer to the product manual "MOVIDRIVE® modular Application Inverter".

4

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

The following axis modules can be operated at the MDP92A-0250-503-4-S00 power supply module with controlled DC link voltage:

- MDA90A-0020-..
- MDA90A-0040-..
- MDA90A-0080-..
- MDA90A-0120-..
- MDA90A-0160-..
- MDA90A-0240-..
- MDA90A-0320-..
- MDA90A-0480-..
- MDA90A-0640-..
- MDA90A-1000-..
- MDD90A-0020-..
- MDD90A-0040-..
- MDD90A-0080-..

4.2 Assignment of the maximum axis size to the DC/DC converter

The following axis modules can be operated on the DC/DC converter module MDE90A-0750-500-X-S00:

- MDA90A-0020-..
- MDA90A-0040-..
- MDA90A-0080-..
- MDA90A-0120-..
- MDA90A-0160-..
- MDA90A-0240-..
- MDA90A-0320-..
- MDD90A-0020-..
- MDD90A-0040-..
- MDD90A-0080-..

If the DC/DC converter module MDE90A-... is used in combination with an MDC90A capacitor module, the following axis modules can also be used:

- MDA90A-0480-..

- MDA90A-0640-..
- MDA90A-1000-..

When combining power supply modules MDP9_A- with a DC/DC converter module MDE90A-.. (flexible mode/energy mode), the permissible axis size is based on the axis size of the power supply module.

4.3 Inrush current limiting

The inrush current must be limited when connecting DC grids or charged DC storage units to the DC inputs of the MDP92A-... power supply module or the DC/DC converter module MDE90-...

When connecting a charged storage unit using appropriate DC contactors, the storage synchronization operating mode included in the MOVIKIT® modules Power Mode, Energy Mode and Flexible Mode can be used. You find the corresponding wiring in chapter "Wiring diagrams" (→ 117) and in the "External Energy Storage Units" product manual. For information on setting the inrush current limitation in the respective MOVIKIT® module, refer to the corresponding MOVIKIT® manuals.

To connect an MDE90A-... to a DC grid, the inrush current can flow via a power resistor, which must be bridged after the grid capacitance has been charged. The power stage enable of the MDE90-... must be revoked until the power resistor is bridged. Other consumers, such as the 24 V switched-mode power supply module must not consume any power during this time either.

SEW-EURODRIVE recommends using the resistor with part number 18125832 for inrush current limitation.

4.4 Line voltage dependency of the nominal output voltage

The output voltage must be limited at low line voltages to meet the requirements of the safety distances:

Line voltage U_{line} (phase-to-phase voltage):	Output voltage U_{out}
200 V	683 V
230 V	704 V
240 V	710 V
> 376 V	800 V

4.5 Dependency of the DC link voltage on the storage voltage

In an isolated DC grid, the voltage of the B-side is kept symmetrical to ground by leakage currents. This limits the DC link voltage depending on the voltage U_A . This limitation does not apply to regenerative energy.

Voltage U_B	Voltage U_A
> 500 V	800 V
300 V	700 V
100 V	600 V
0 V	550 V

4.6 Using controllers

MOVIKIT® software modules from the Power and Energy Solutions series support the MOVI-C® CONTROLLERS UHX45A, UHX65A and UHX85A.

Devices of the Power and Energy Solutions series can be operated without controller and therefore without MOVIKIT® software modules.

SEW-EURODRIVE recommends using the MOVIKIT® Power and Energy Solutions software modules to monitor an energy storage unit.

4.7 Selecting the braking resistor

4.7.1 General Information

MDP92A-0250 power supply module

Using a braking resistor is only required if generator mode is reached during operation and the regenerative energy cannot be absorbed completely by the energy storage units in all operating states. A braking resistor is not required if the device is operated solely in motor mode.

Alternatively, the braking resistor can also be used to discharge the energy storage unit. This is useful, for example, if the energy storage unit must be discharged quickly and easily for system reasons or for servicing purposes.

4.7.2 Table of braking and discharge resistors

The following braking and discharge resistors are intended for the devices from the Power and Energy Solutions series. Other braking and discharge resistors than those listed here are not permitted.

The technical data is valid in the temperature range -20 °C to +40 °C.

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

Braking/discharge resistor	Part number	Resistance	Continuous power	Peak power	Tripping current
		Ω	kW	kW	A
BW047-002	08281661	47	0.2	14	1.6
BR047-010-T	17983207	47	1	14	4.6
BR027-016-T	17983215	27	1.6	25	7.7
BW027-024-T	17983231	27	2.4	25	9.4
BW012-016	18213243	12	1.6	56	12
BW012-024	17983894	12	2.4	56	14.1
BW012-050-T	18201407	12	5	56	20

4.7.3 Selection criteria

SEW-EURODRIVE selects the braking resistor within the energetic simulation with the Power and Energy Solutions simulator.

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

4.7.4 Continuous braking power

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

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

4.7.5 Supply cable for braking resistor

Use only shielded cables.

The cable cross section depends on the tripping current I_F .

The nominal voltage of the cable must amount to at least $V_0/V = 450 \text{ V} / 750 \text{ V}$.

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

When connecting the braking resistor to the TCB, the shield of the supply cable must be continued via an additional shield clamp.

4.7.6 Protection of braking resistor against thermal overload

To avoid thermal damage of the braking resistor as well as subsequent damage, the braking resistor has to be thermally monitored. A thermal circuit breaker TCB must be used for that purpose.

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

For the wiring diagram regarding the situation described above, refer to chapter "Protecting braking resistors against thermal overload" (→ 102).

4.8 Signal lines

4.8.1 Digital inputs/outputs and DC 24 V supply

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

4.9 EMC-compliant installation according to EN 61800-3

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

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

4.9.1 Interference emission

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

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

Power supply module	Line filter	Maximum number		Total cable length	
		Axis modules (MDA/MDD)	Axes ¹⁾ (output stages)	Cable from SEW-EURODRIVE	Cables from other manufacturers
MDP92A-0250-503-4-S00	NF0420-513	15	16	600 m	400 m

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

4.10 Line components

4.10.1 Line fuses, fuse types

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

Type class	Requirement
Fuses in utilization categories gL, gG	Fusing voltage \geq nominal line voltage
Miniature circuit breaker with characteristics B, C, D	<ul style="list-style-type: none"> Nominal miniature circuit breaker voltage \geq nominal line voltage Nominal miniature circuit breaker currents must be at least 10% above the nominal line current of the power supply module

Adhere to the country-specific and system-specific regulations when carrying out the fusing.

The maximum line current can be limited by the power supply module. This results in the phase current I_L : $I_{L1}, I_{L2}, I_{L3} = I_B \times 2/3 + 0.5 \text{ A}$

The phase current on the supply system end can be limited. The limit can be set using the parameter P8800.6, see manual "Parameter description".

4.10.2 Line contactor

A line contactor is used for galvanic separation of the axis system and the supply system. The separation from the grid is necessary for electrical work on the axis system, for example.

Note the following requirements:

- Only use line contactors in utilization category AC-3 (IEC 158-1) or better.
- The line contactor must be located upstream of the line filter.
- Do not use the line contactor for jog mode.
- Formula for calculating the phase current I_L : $I_{L1}, I_{L2}, I_{L3} = I_B \times 2/3 + 0.5 \text{ A}$

Operation of the MDP92A power supply module is possible without a line contactor.

INFORMATION



The integrated lock of the DC/DC converter for MDP92A power supply modules does not galvanically separate the axis block from the grid and therefore does not de-energize it. If it is necessary to de-energize the axis block, e.g. for electrical work, you have to switch it off with a main switch, for example. The switch-off design is always done system-specific depending on the specific application considering the applicable regulations.

4.10.3 Line filters

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

UL and cUL approval

The listed line filters have a cRUus approval independent of the inverter.

4

Technical data

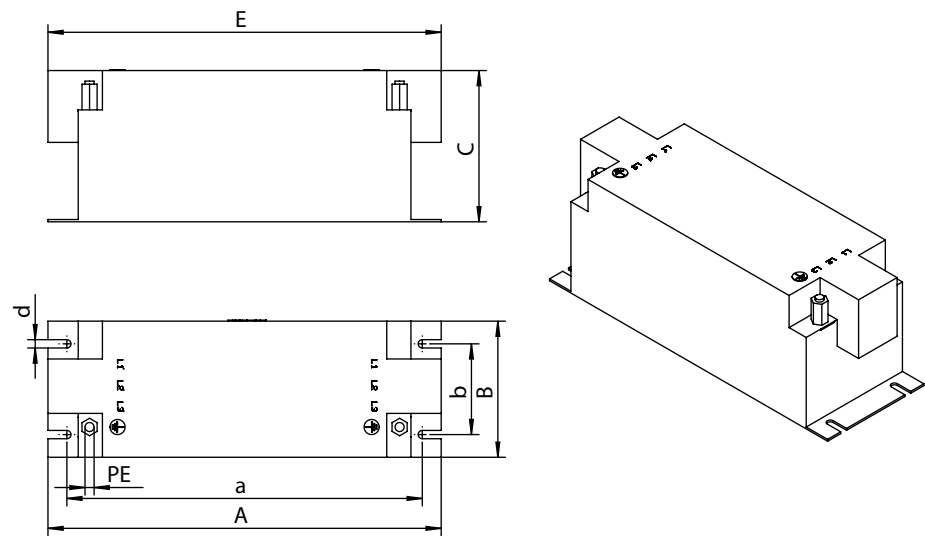
Line filter	NF0420-513	NF0420-523
Part number	17983789	17983797
Nominal line voltage U_N	Maximum 3 × AC 500 V, 50/60 Hz	
Nominal current I_N	42 A	
Nominal power loss	30 W	37 W
Ambient temperature ϑ_{amb}	0 °C to 45 °C	
Connection contacts L1/L2/L3 – L1'/L2'/L3'	2.5 – 16 mm ²	
Tightening torque L1/L2/L3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

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

Assignment to an inverter

Line filter	NF0420-513	NF0420-523
Assignment to MDP90A-..	0100, 0250	
Assignment to MDP90A-..	0500	0750, 1100
Assignment to MDR91A-..	0500	0750

Dimension sheets and dimensions



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Line filter	Main dimensions in mm				Mounting dimensions in mm			
	A	B	C	E	a	b	d	PE
NF0420-513	250	88	97	255	235	60	5.5	M6

4.10.4 Line choke

When using a MDP92A power supply module, a line choke is not required. Harmonic currents are reduced by the device topology.

4.10.5 Residual current device

4



⚠ WARNING

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

Severe or fatal injuries.

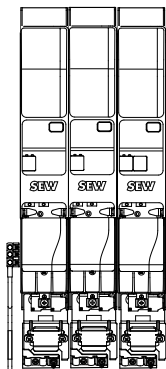
- The product can cause direct current in the PE conductor. If a residual current device (RCD) or a residual current monitoring device (RCM) is used for protection in the event of a direct or indirect contact, only a type B RCD or RCM is permitted on the supply end of the product.
- If the use of a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not to use a residual current device.

4.11 Two-row design

4.11.1 Connection variants

If, for reasons of space, the modules of an axis system cannot be set up in one row, some of the modules must be installed in a second row. There are 3 design variants for the two-row design, which are described below.

Variant 1



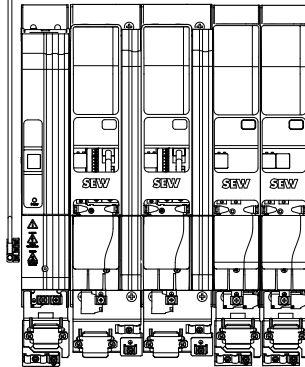
Auxiliary row

-
- MDA90A-0020 – 0120-..
 - MDD9.A-0020 – 0080-..
-
- Maximum 8 modules

Total nominal DC link current in auxiliary row: Max. 46 A

Connection of main row and auxiliary row:

- Connection via cable lug
- Cable set DCP34A
- Degree of protection IP10

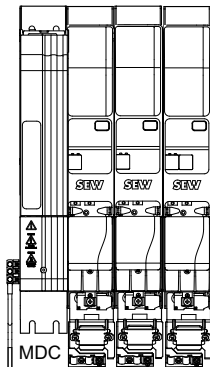


Main row

- MDP90A-0250 – 1100-..
- MDR91A-0500 – 0750-..
- MDA90A-0020 – 0180-..
- MDD9.A-0020 – 0080-..
- MDP92A-..
- MDE90A-..
- MDC90A-..

Variant 2

Auxiliary row



MDC90A-0001-50X-X-000

Use is mandatory

- MDA90A-0020 – 0120-..

Maximum 8 modules

- MDD9.A-0020 – 0080-..

- MDA90A-0160 – 0240-..

Maximum 2 modules

- MDA90A-0320-..

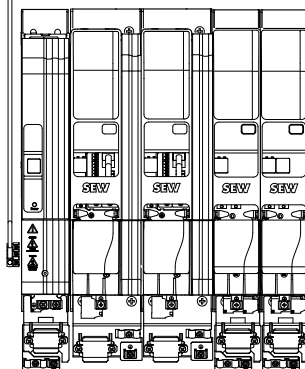
Maximum 1 module

Total nominal DC link current in auxiliary row: Max. 46 A

Connection of main row and auxiliary row:

- Connection via cable lug
- Cable set DCP34A
- Degree of protection IP10

Main row



- MDP90A-0250 – 1100-..

- MDR91A-0500 – 0750-..

- MDA90A-0020 – 0180-..

- MDD9.A-0020 – 0080-..

- MDP92A-..

- MDE90A-..

- MDC90A-..

Variant 3

Auxiliary row

MDC90A-0001-50X-X-000 Use is mandatory

- | | |
|-------------------------|-------------------|
| - MDA90A-0020 – 0120-.. | Maximum 8 modules |
| - MDD9.A-0020 – 0080-.. | |
| - MDA90A-0160 – 0240-.. | Maximum 4 modules |
| - MDA90A-0320 – 0480-.. | Maximum 2 modules |

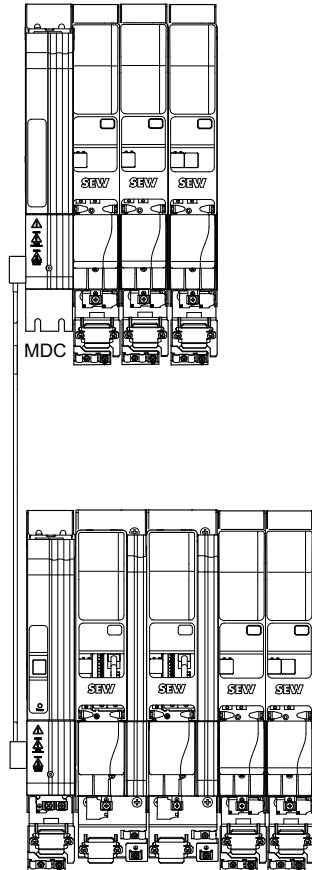
Total nominal DC link current in auxiliary row: Max. 109 A

Connection of main row and auxiliary row:

- Connection via connection units
- DCP35A cable set
- With MDP92A, MDP90A and MDE90A in the main row: MDP connection unit set, 28261666
- With MDR91A in the main row: MDR connection unit set, 28261674
- Degree of protection IP20

Main row

- MDP90A-0250 – 1100-..
- MDR91A-0500 – 0750-..
- MDA90A-0020 – 0180-..
- MDD9.A-0020 – 0080-..
- MDP92A-..
- MDE90A-..
- MDC90A-..



24 V supply

Supply the main row and the auxiliary row separately with 24 V. Connect the 24 V supply in both rows to the last module on the far right.

4.12 Temperature monitoring MDC90A capacitor module

The temperature sensor can be used to protect the system from overtemperatures. Overtemperature can shorten the service life of the capacitor module or destroy the device:

- From 65 °C (T_{internal}): Reduction of the service life (by half at over 60 °C)
- From 80 °C (T_{internal}): System must be switched off. A further increase in temperature can destroy the device!

5 Prefabricated cables

5.1 System bus and module bus cables

The RJ45 connectors of the system bus and module bus cables, the connectors that are preassembled in the field, and the sockets in the application inverters were tested by SEW-EURODRIVE for mechanical stability and contact reliability. SEW-EURODRIVE recommends using the system bus and module bus cables listed below. If other cables and connectors are used, SEW-EURODRIVE makes no statement about the quality of the plug-in connection.

NOTICE

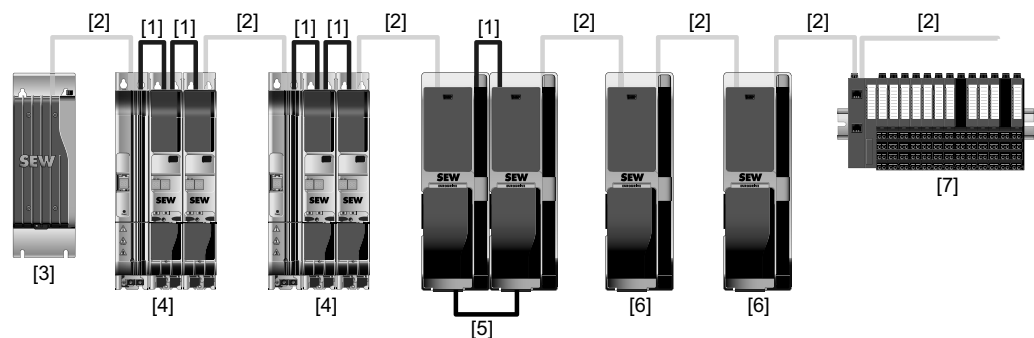
Using wrong cables.

Damage to the application inverter.

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

5.1.1 System bus and module bus cabling

Example of a system bus and module bus cabling



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- [1] Module bus cable: EtherCAT®/SBus^{PLUS} and internal signals, 8-pole, color: anthracite
- [2] System bus cable: EtherCAT®/SBus^{PLUS}, 4-pole, color: light gray
- [3] MOVI-C® CONTROLLER power UHX85A
- [4] MOVIDRIVE® modular
- [5] MOVIDRIVE® system/technology with DC link connection
- [6] MOVIDRIVE® system/technology
- [7] Other EtherCAT® stations at the EtherCAT®/SBus^{PLUS}

5.1.2 System bus cable

Figure of the cable



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[1] Connector, red

[2] Connector, red

The 4-pole system bus cable [2] for EtherCAT® and SBus^{PLUS} is used between the automation components; see figure (→ 64). Some of these components are listed here as examples:

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

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

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

If you use system bus cables from other manufacturers, it is necessary to comply with the relevant requirements of the "EtherCAT® Technology Group" (ETG). On this subject, note the "EtherCAT® Installation Guideline" from the ETG.

Data cable

If the assembled system bus cable cannot be used, field assembly is possible. The reasons for this can be different cable lengths or different raw cable qualities.

If other data cables are used, the following requirements must be complied with:

- Data cable according to transmission category Cat. 5, Class D.
- Outside diameter 6.1 – 6.9 mm.
- Core cross section depending on connector variant.
- 2-paired (only 2 pairs are used in 4-paired cables).
- UL approval if the system is used in a UL-relevant manner.

RJ45 connector

SEW-EURODRIVE recommends the use of the following plug connectors from Harting if the ready-made cables from SEW-EURODRIVE are not used.

Harting order designation	Description	Core cross section
RJ45 CONNECTOR, PLUG, 4P4C, CAT5, 09451511100	RJ45 connector to IEC 60603-7, 4-pin	<ul style="list-style-type: none"> Litz wire: AWG 22 – AWG 24 Wire: AWG 22 – AWG 23 Cable jacket: Ø 6.1 – 6.9 mm
RJ45 CONNECTOR, PLUG, 8P4C, CAT5, IDC09451511109		<ul style="list-style-type: none"> Litz wire: AWG 26 Wire: AWG 24 Cable jacket: Ø 6.1 – 6.9 mm

Plug connector characteristics:

- Can be preassembled in the field without tools.
- Transmission category CAT 5.
- Suitable for connecting litz wires and wires.
- UL approval.

Pin assignment

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

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

5.1.3 Module bus cable

Figure



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[1] Connector, black

[2] Connector, red

For MOVIDRIVE® modular, the 8-pole module bus cable [1] for EtherCAT®/SBus^{PLUS} and internal signals connects the power supply module to the first axis module and the axis modules to each other.

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

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

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

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

Cable length	Part number	Cable assignment for MDP92A to MDA90A/MDD90A when using
0.44 m	18167020	1 MDC90A
0.59 m	28124251	2 MDC90A
0.75 m	28118618	3 MDC90A
1.6 m	18174205	4 MDC90A

6 General information

6.1 About this documentation

The documentation at hand is the original.

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

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

6.2 Information on this documentation

This documentation describes the devices of the Power and Energy Solutions product range. The devices are part of the MOVIDRIVE® modular inverter series.

All device-specific properties and procedures of the devices of the Power and Energy Solutions product range are described in this documentation. All properties and procedures that also apply to the devices of the MOVIDRIVE® modular application inverter are described in the documentation "MOVIDRIVE® modular Application Inverters".

The present documentation is an addendum to the "MOVIDRIVE® modular Application Inverters" documentation.

6.3 Structure of the safety notes

6.3.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

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

6.3.2 Structure of section-related safety notes

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

This is the formal structure of a safety note for a specific section:



SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

Meaning of the hazard symbols

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

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning about suspended load

6.3.3 Structure of embedded safety notes

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

This is the formal structure of an embedded safety note:

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

6.4 Rights to claim under limited warranty

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

6.5 Other applicable documentation

Observe the corresponding documentation for all further components.

6.6 Product names and trademarks

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

6.6.1 Trademark of Beckhoff Automation GmbH

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.



6.7 Copyright notice

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7 Safety notes

7.1 Preliminary information

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

7

7.2 Duties of the user

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

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

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

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

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

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

7.3 Target group

Specialist for mechanical work	<p>Any mechanical work may be performed only by adequately qualified specialists. Specialists in the context of this documentation are persons who are familiar with the design, mechanical installation, troubleshooting, and maintenance of the product who possess the following qualifications:</p> <ul style="list-style-type: none"> • Qualification in the mechanical area in accordance with the national regulations • Familiarity with this documentation
Specialist for electrotechnical work	<p>Any electrotechnical work may be performed only by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons who are familiar with electrical installation, startup, troubleshooting, and maintenance of the product who possess the following qualifications:</p> <ul style="list-style-type: none"> • Qualification in the electrotechnical area in accordance with the national regulations • Familiarity with this documentation
Additional qualification	<p>In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives, and laws specified in this documentation.</p> <p>The persons must have the express authorization of the company to operate, program, parameterize, label, and ground devices, systems, and circuits in accordance with the standards of safety technology.</p>
Instructed persons	<p>All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately. The purpose of the instruction is to give persons the ability to perform the required tasks and work steps in a safe and correct manner.</p>

7.4 Designated use

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

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

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

The systems can be mobile or stationary.

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

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

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

7.4.1 Hoist applications

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

- Use mechanical protection devices.

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

You may use options and accessories from SEW-EURODRIVE exclusively in connection with products from SEW-EURODRIVE.

7.5 Functional safety technology

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

7.6 Transport

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

Observe the following notes when transporting the device:

- Ensure that the product is not subject to mechanical impact.
- Before transportation, cover the connections with the supplied protection caps.
- Only place the product on the cooling fins or on the side without connectors during transportation.
- Always use all attachment points if available. The attachment points are designed to carry only the mass of the product. Severe or fatal injuries. Do not apply any additional loads.

If necessary, use suitable, sufficiently dimensioned handling equipment.

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

7.7 Installation/assembly

Ensure that the product is installed and cooled in accordance with the regulations in the documentation.

Protect the product from excessive mechanical strain. The product and its mounted components must not protrude into the path of persons or vehicles. Ensure that no components are deformed or no insulation spaces are modified, particularly during transportation. Electrical components must not be mechanically damaged or destroyed.

Observe the notes in chapter "Mechanical installation" in the documentation.

7.8 Electrical installation

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

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

7.8.1 Required preventive measure

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

7.8.2 Stationary application

Necessary preventive measure for the product:

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

7.9 Protective separation

The product meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. To ensure protective separation, all connected circuits must also meet the requirements for protective separation.

7.10 Startup/operation

Observe the safety notes in chapters "Startup and Operation" in this documentation.

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

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

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

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

If you disconnect the product from the voltage supply, do not touch any live components or power connections because energy storage devices might still be charged.

Observe the corresponding information signs on the product.

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

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

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

7.10.1 Energy storage unit

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

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

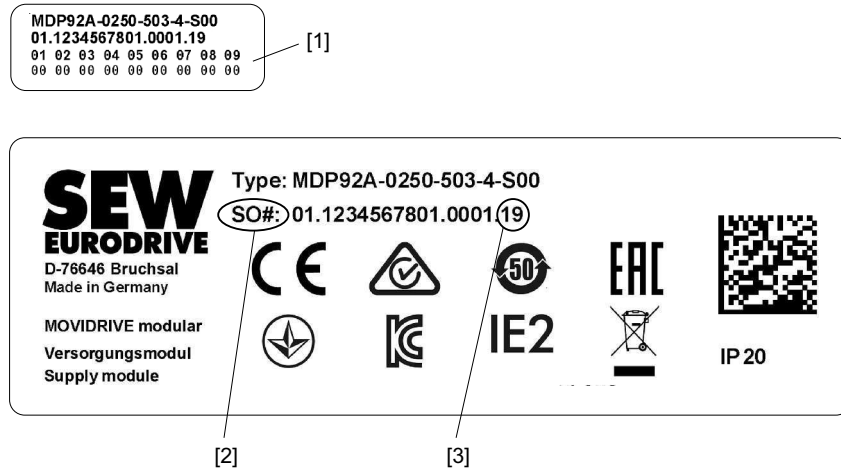
8 Device structure

8.1 Nameplates

The shown nameplates serve as examples.

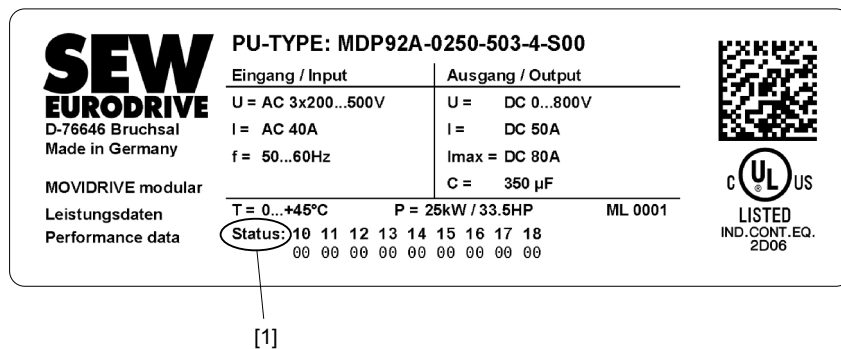
8.1.1 MDP92A power supply module with controlled DC link voltage

System nameplate



- 1 Device status
- 2 Serial number
- 3 Year of manufacture

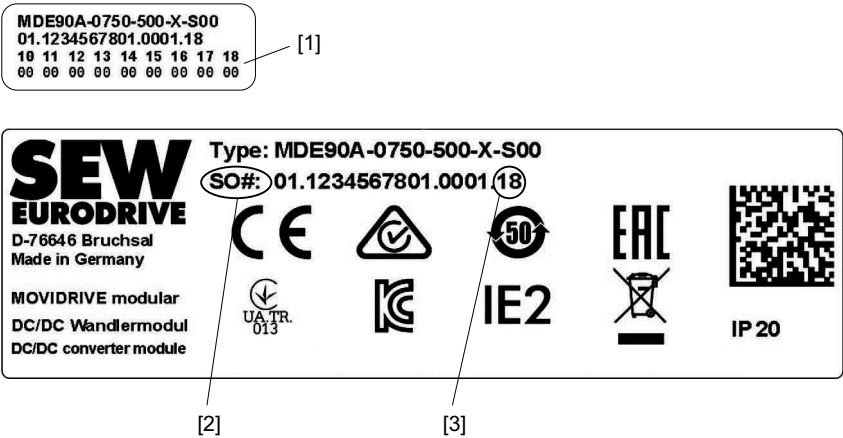
Performance data nameplate



- 1 Device status

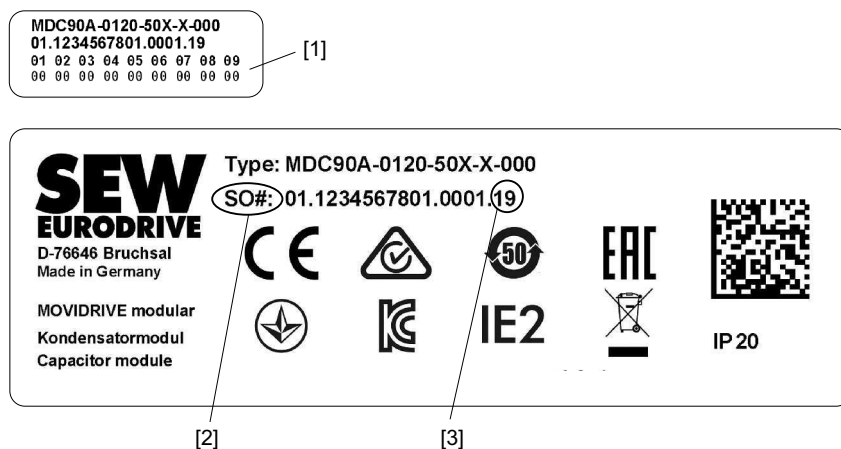
8.1.2 DC/DC converter module MDE90A

System nameplate



8.1.3 MDC90A capacitor module

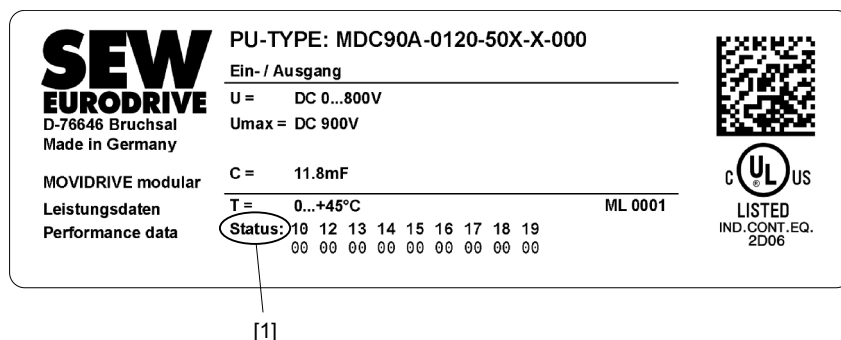
System nameplate



9007227752713227

- 1 Device status
- 2 Serial number
- 3 Year of manufacture

Performance data nameplate



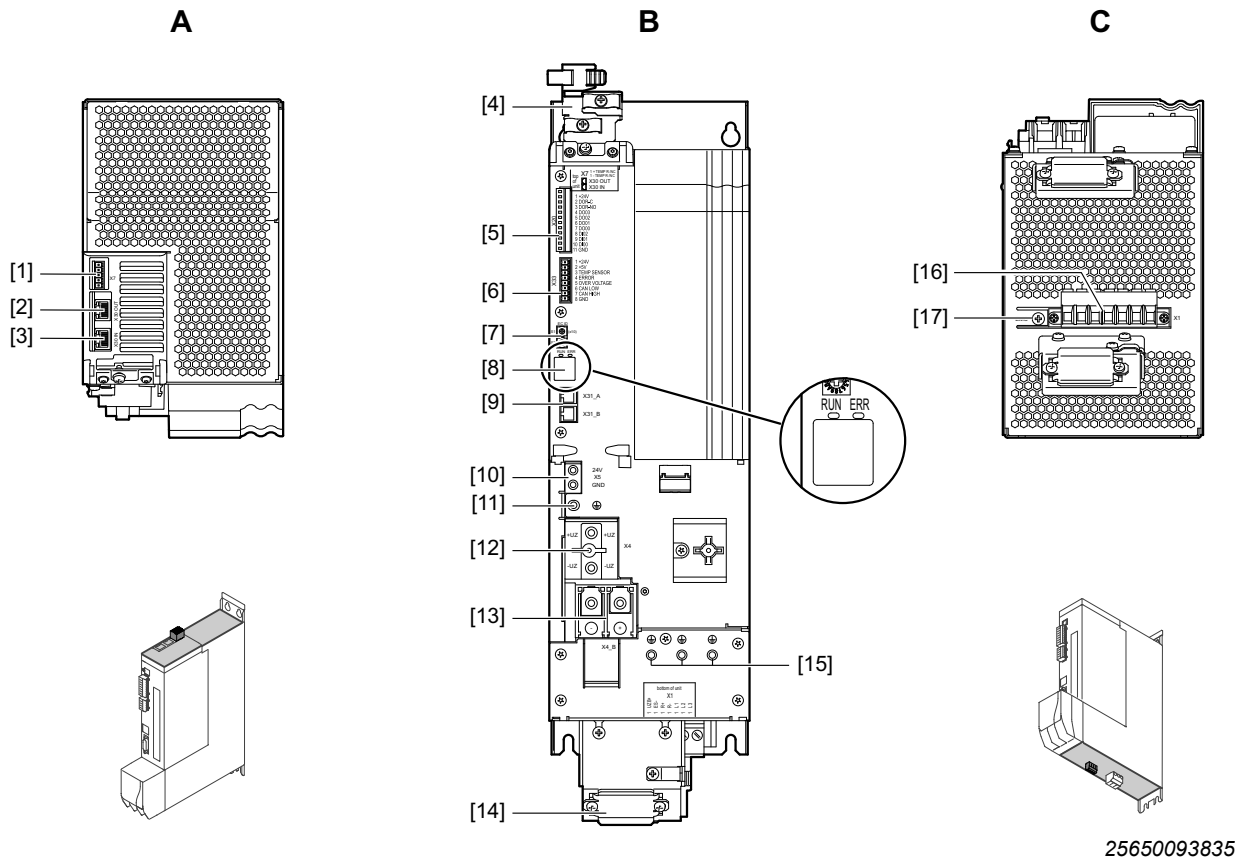
28497967371

- 1 Device status

8.2 MOVIDRIVE® modular Power and Energy Solutions type code

Example: MDP92A-0250-503-4-S00		
Product name	MD	<ul style="list-style-type: none"> MD = MOVIDRIVE®
Device type	P	<ul style="list-style-type: none"> C = Capacitor module E = DC/DC converter module P = Power supply module with brake chopper R = Supply and regenerative power supply module S = Switched-mode power supply module with AC and DC supply
Series	92	<ul style="list-style-type: none"> 90 = Standard design 92 = With controlled DC link voltage
Version	A	<ul style="list-style-type: none"> A = Version status A
Performance class	0250	<ul style="list-style-type: none"> MDC: Capacitance – e.g. 0120 = 12 mF MDE: Nominal output current – e.g. 0750 = 75 A MDP: Nominal power – e.g. 0250 = 25 kW MDR: Nominal power – e.g. 0250 = 25 kW MDS: Nominal power – e.g. 0054 = 540 W
Connection voltage	5	<ul style="list-style-type: none"> MDP92A, MDS90A: 5 = AC 200 – 500 V MDC90A, MDE90A: 5 = DC 0 – 800 V
EMC variants of power section	0	<ul style="list-style-type: none"> 0 = Basic interference suppression integrated E = EMC filter limit value category C2 in accordance with EN 61800-3
Number of phases	3	<ul style="list-style-type: none"> X = Not relevant 0 = DC connection 3 = 3 phases
Operating mode	4	<ul style="list-style-type: none"> X = Not relevant 2 = Without brake chopper 4 = With brake chopper
Variants	S	<ul style="list-style-type: none"> 0 = Not relevant S = MOVI-C® CONTROLLER control
Designs	00	<ul style="list-style-type: none"> 00 = Standard design
Options		<ul style="list-style-type: none"> /L = Variant with coated printed circuit boards

8.3 Device structure of MDP92A-0250-503-4-S00 power supply module with controlled DC link voltage



25650093835

A: View from top

- [1] X7: Braking resistor temperature monitoring
- [2] X30 OUT: System bus
- [3] X30 IN: System bus

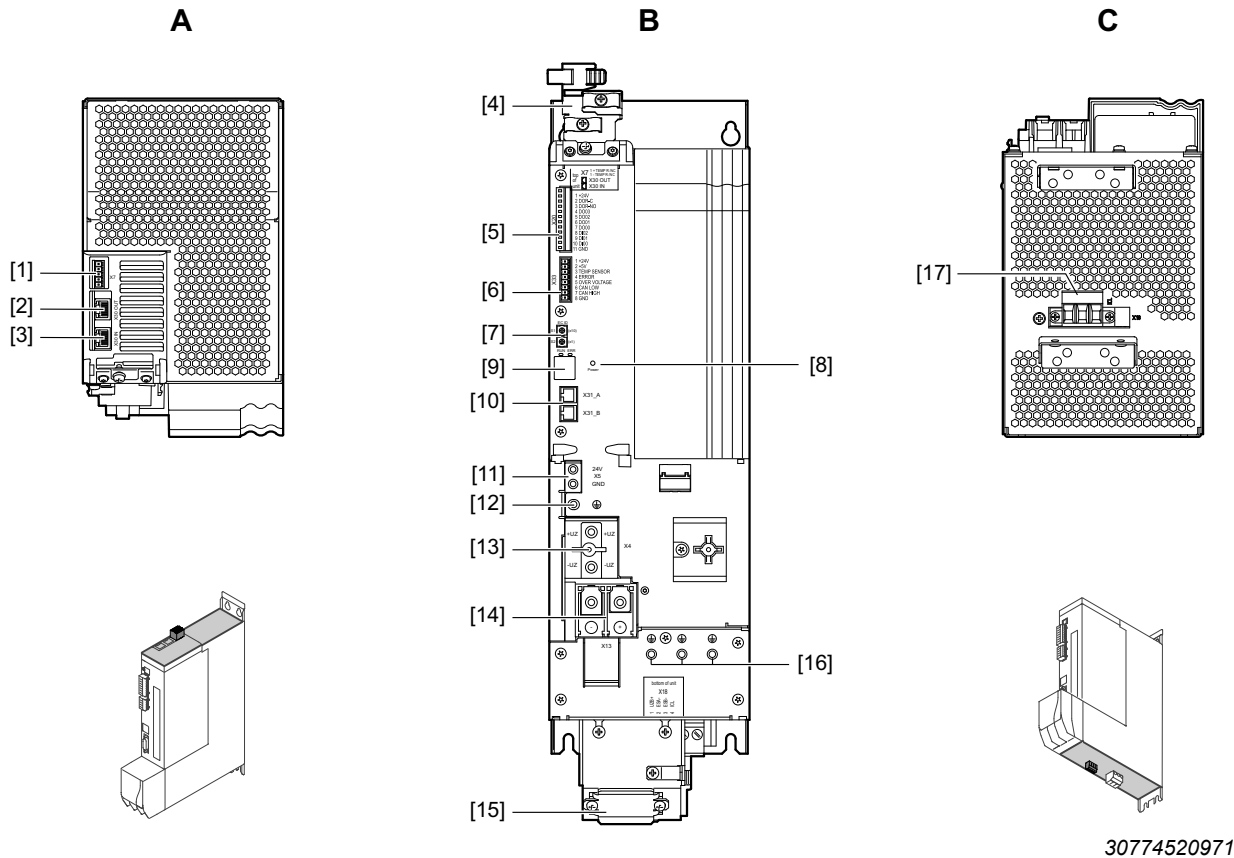
B: View from front

- [4] Shield terminal
- [5] X20: Digital inputs/outputs
- [6] X33: Interface for external energy storage unit
- [7] EtherCAT® ID switch
- [8] 7-segment display
- [9] X31: SEW-EURODRIVE Service interface
- [10] X5: Connection +24 V supply voltage
- [11] PE connection
- [12] X4: DC link busbar
- [13] X4_B: DC link connection for external energy storage units
- [14] Shield terminal
- [15] PE connection housing

C: View from bottom

- [16] X1: Line connection, braking resistor, measuring input for external energy storage unit
- [17] Terminal screw for TN/TT systems

8.4 Device structure of DC/DC converter module MDE90A-0750-500-X-S00



A: View from top

- [1] X21: Digital input
- [2] X30 OUT: System bus
- [3] X30 IN: System bus

B: View from front

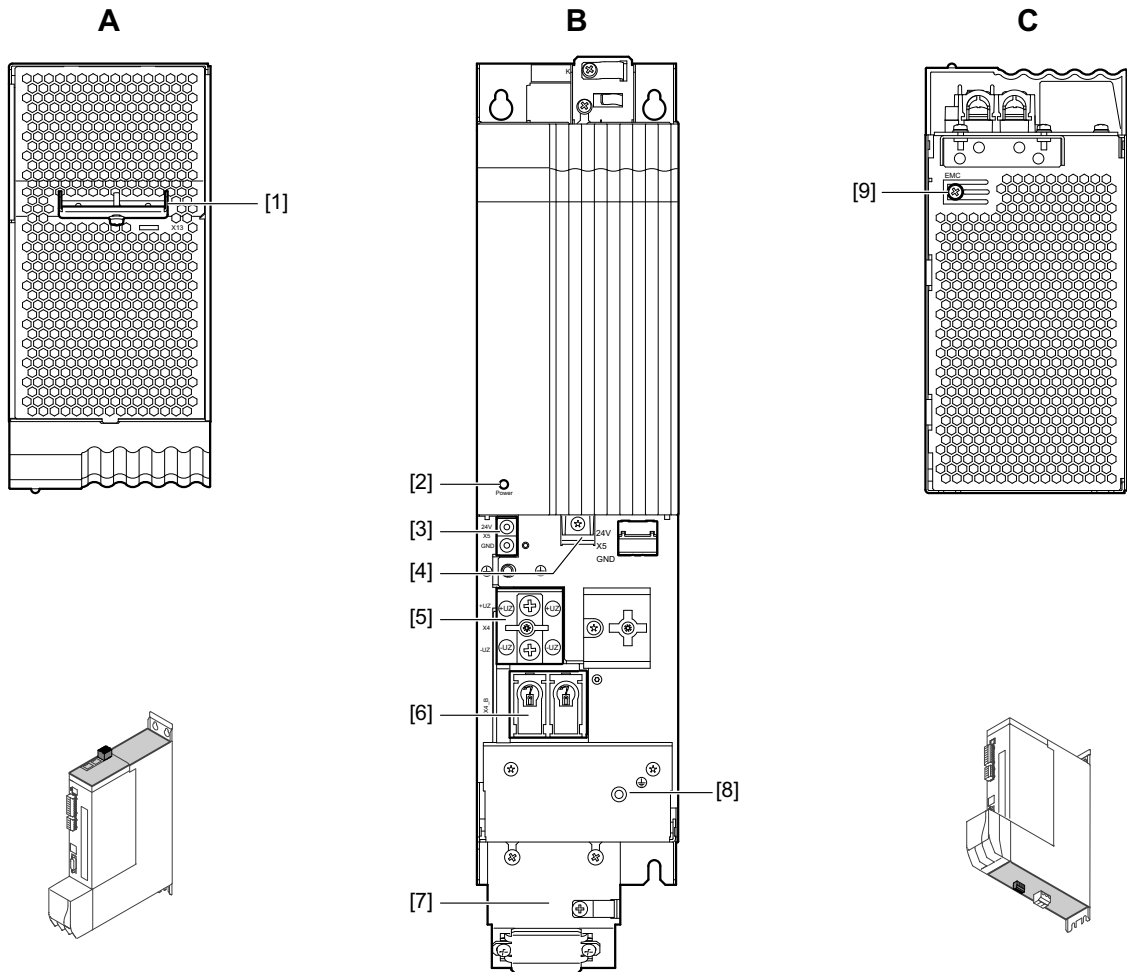
- [4] Shield terminal
- [5] X20: Digital inputs/outputs
- [6] X33: Storage unit interface
- [7] EtherCAT® ID switch
- [8] Power LED
- [9] 7-segment display
- [10] X31_A/X31_B: SEW-EURODRIVE Service interface
- [11] X5: Connection +24 V supply voltage
- [12] PE connection
- [13] X4: DC link busbar
- [14] X13: Energy storage unit connection
- [15] Shield terminal
- [16] PE connection housing

C: View from bottom

- [17] X12: Storage voltage measuring

30774520971

8.5 Device structure of MDC90A-0120-50X-X-000 capacitor module



28624631307

A: View from top

- [1] Fastening for temperature sensor

B: View from front

- [2] LED display DC link voltage
 [3] X5: Connection +24 V supply voltage
 [4] PE connection
 [5] X4: DC link busbar
 [6] X4_B: DC link connection for external energy storage units
 [7] Shield terminal
 [8] PE connection housing

C: View from bottom

- [9] Terminal screw for TN/TT systems

9 Installation

The devices from the Power and Energy Solutions series are exclusively intended for control cabinet installation according to their degree of protection.

9.1 Installation accessories

The listed standard accessories are included in the scope of delivery for the basic device.

9.1.1 Standard accessories

Type designation	Electronics shield clamps Number
Power supply module with controlled DC link voltage	
MDP92A-0250-503-4-S00	1
DC/DC converter module	
MDE90A-0750-500-X-S00	1
Capacitor module	
MDC90A-0120-503-X-000	–

Type designation	Power shield clamps Number
Power supply module with controlled DC link voltage	
MDP92A-0250-503-4-S00	2
DC/DC converter module	
MDE90A-0750-500-X-S00	2
Capacitor module	
MDC90A-0120-503-X-000	1

The mechanical accessories can be ordered with the following part numbers:

Type designation	Part numbers of accessory pack (shield plates and screws)
Power supply module with controlled DC link voltage	
MDP92A-0250-503-4-S00	28257596
DC/DC converter module	
MDE90A-0750-500-X-S00	28257596
Capacitor module	
MDC90A-0120-503-X-000	28252705

Type designation	Part numbers of accessory pack (covers, conductor rails, screws)
Power supply module with controlled DC link voltage	
MDP92A-0250-503-4-S00	28257618
DC/DC converter module	
MDE90A-0750-500-X-S00	28257618
Capacitor module	
MDC90A-0120-503-X-000	28252713
Ferrite sleeve and temperature sensor	
Ferrite sleeve for external energy storage unit	25665308
Temperature sensor for MDC90A-..	28259009

9.2 Permitted tightening torques

Screw connection		Tightening torque in Nm		
		MDP92A-	MDE90A-	MDC90A-
		0250	0750	0120
Line connection	X1	1.7 – 1.8	–	–
DC link connection	X4	3 – 4	3 – 4	3 – 4
PE connection	PE	3 – 4	3 – 4	3 – 4
PE housing	PE	3 – 4	3 – 4	3 – 4
Connection 24 V voltage supply	X5	1.2 – 1.5	1.2 – 1.5	1.2 – 1.5
Terminal screw for TN/IT systems	EMC	1 – 1.2	–	1 – 1.2
Multifunction connection	X12	–	1.7 – 1.8	–
DC link connection B-side	X13	–	3 – 4	–
Safety cover		0.6 – 0.8	0.6 – 0.8	0.6 – 0.8

NOTICE

Non-compliance with the stipulated tightening torques.

Possible damage to the device.

- Always adhere to the stipulated tightening torques. Otherwise, excessive heat can develop which would damage the device.
- An excessively high tightening torque may cause damage.

9.3 Requirements when combining the devices in a network

This chapter includes the conditions for using the devices and combination examples for the operating modes "power mode" and "direct mode". The examples show how the individual devices are arranged in the network. The structure of a network of devices consisting of power supply module and axis modules is described in the documentation "MOVIDRIVE® modular application inverter".

Structure of a device network

- A maximum of 16 devices with module bus connection can be combined in a network. Devices with module bus connection are power supply modules and axis modules.
- Axis modules MDA90A/MDD9.A must be installed to the right of the MDP92A power supply module or the MDC90A capacitor module.
- MDC90A capacitor modules must be installed to the right of the MDP92A power supply module or the DC/DC converter module MDE90A. An MDC90A capacitor module can only be used in combination with an MDP92A power supply module or a DC/DC converter module MDE90A. A maximum of 4 capacitor modules can be used in a network of devices.
- If a DC/DC converter module MDE90A is used in combination with an MDP92A/MDP90A power supply module, the MDE90A must be mounted to the left of the power supply module.

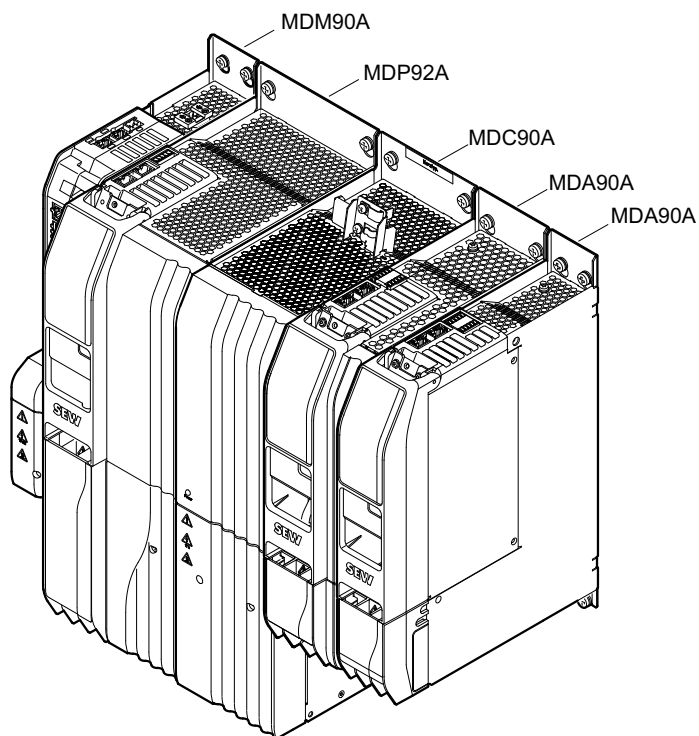
Assignment of devices to the axis modules

MDP92A-0250-..	max. MDA90A-1000-..
MDE90A-0750-..	max. MDA90A-0320-..

If larger axis modules than MDA90A-0320-... are to be operated on an MDE90A-0750-..., an additional power supply module or capacitor module must be used.

9.3.1 Examples**Power mode**

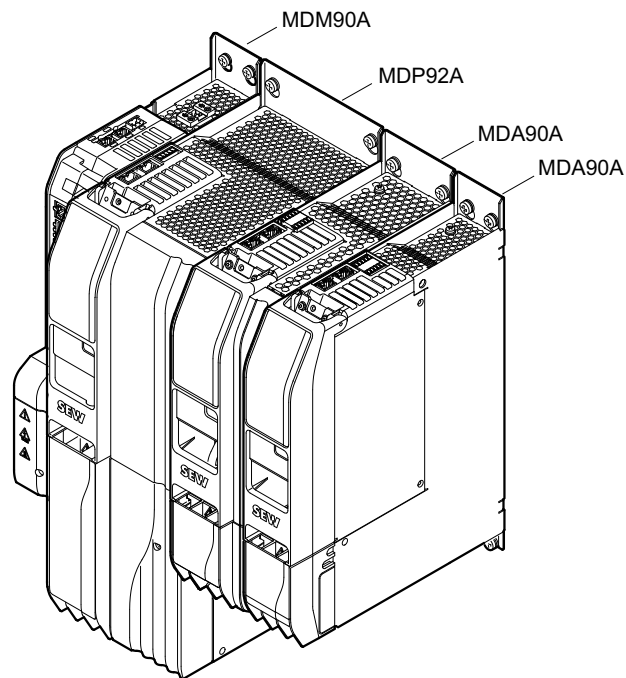
MDM90A-..., MDP92A-..., to 4 MDC90A-..., axis modules (from left to right in descending order of size).



31399001995

Direct mode

MDM90A-..., MDP92A-..., axis modules (from left to right in descending order of size).



31399007755

9.4 Mechanical installation



⚠ CAUTION

Risk of injury to persons and damage to property.

Never install defective or damaged application inverters.

- Before installing modules, check them for external damage. Replace any damaged modules.

NOTICE

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

Damage to the application inverter.

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

9.4.1 Minimum clearance and mounting position

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

- To ensure unobstructed cooling, leave a minimum clearance of 100 mm above and below the module housings. Make sure air circulation in the clearance is not impaired by cables or other installation equipment.
- Make sure that the devices are not subjected to heated exhaust air from nearby components.
- The axis system must be assembled without gaps.
- Install the modules only vertically. You must not install them horizontally, tilted or upside down.

INFORMATION



Special bending spaces are required according to EN 61800-5-1 for cables with a cross section of 10 mm² and larger. This means the clearance must be increased if required.

9.4.2 Mounting grid

Preparing the control cabinet

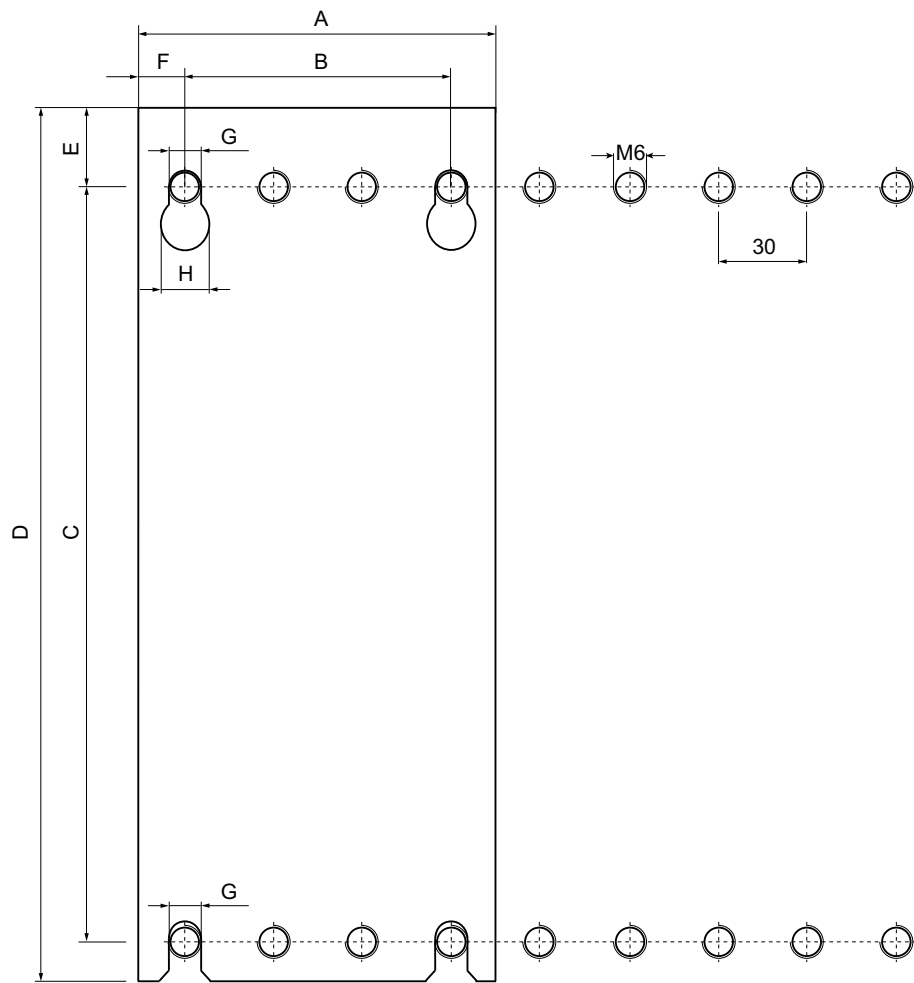
You can prepare the control cabinet for the installation of differently assembled axis systems by drilling tapped holes every 30 mm for mounting the modules. The modules can be attached to this grid irrespective of their width, see figure below.

Dimensions

Device base plate

Modules	Dimensions of the device base plate in mm							
	A	B	C	D	E	F	G	H
Power supply module with controlled DC link voltage								
MDP92A-0250-503-4-S00	150	120	455	483	19	15	7	13
DC/DC converter module								
MDE90A-0750-500-X	150	120	455	483	19	15	7	13
Capacitor module								
MDC90A-0120-50X-X-000	120	90	455	483	19	15	7	13

Mounting grid



27021610488337547

For dimension sheets of the devices, refer to chapter "Technical data".

9.5 Electrical installation



⚠ DANGER

There might be dangerous voltages inside the devices and at the terminal strips after the complete axis system has been disconnected from the power supply.

Severe or fatal injuries from electric shock.

To prevent electric shocks:

- Observe the labels on the devices and the waiting times until discharge of the energy storage units before you start working on the power connections.
- If you discharge the energy storage units with the discharge unit, observe the information in chapter "Discharging the energy storage units using the discharge unit" (→ 154).
- After maintenance work, do not operate the axis system unless you have re-mounted the safety covers, because the device has only a IP00 degree of protection with the safety cover removed.



⚠ DANGER

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

Severe or fatal injuries from electric shock.

To avoid shock currents according to EN 61800-5-1, observe the following:

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



⚠ WARNING

With the MDP92A on the AC grid, voltage is present between PE and DC link even in deactivated state.

Severe or fatal injuries from electric shock.

All work on the DC link may only be carried out after complete disconnection from the grid.

NOTICE

Interchanging the poles when connecting a DC source/sink.

The devices are damaged if you interchange poles while connecting an external DC source/sink to an MDP92A, MDE90A and/or MDC90A.

INFORMATION



Installation with protective separation.

The application inverter meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. The connected signal circuits and the DC 24 V voltage supply must meet the requirements according to SELV (**S**afety **E**xtra **L**ow **V**oltage) or PELV (**P**rotective **E**xtra **L**ow **V**oltage) to ensure protective separation. The installation must meet the requirements for protective separation.

9.5.1 Discharge times of the energy storage units

Device	Discharging time
MDA90A, MDD90A axis modules MDP92A, MDP90A power supply modules DC/DC converter module MDE90A	10 minutes
MDC90A capacitor module	17 hours
External energy storage units (DLC modules)	See "External energy storage units" manual

9.5.2 General information

- Take suitable measures to prevent the motor starting up inadvertently, for example by removing the electronics terminal block X20 on the axis module. You must provide additional safety features depending on the application, to prevent possible injuries and damage to machines.
- SEW-EURODRIVE recommends using closed cable lugs for connection to the screws in order to prevent litz strands from escaping.
- SEW-EURODRIVE recommends using 10 mm-long conductor end sleeves when connecting to plug connectors.

9.5.3 Permitted voltage systems

Information on voltage systems	Information on permissibility
TN and TT systems – voltage systems with directly grounded star point.	Use is possible without restrictions.
IT systems – voltage systems with non-grounded star point.	Use is only permitted adhering to specific measures. For measures, refer to chapter "Use in IT systems".
Voltage systems with grounded outer conductor.	Not permitted.
DC voltage grids.	Maximum voltage to ground = 550 V.

9.5.4 Line fuses, fuse types

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

Type class	Requirement
Fuses in utilization categories gL, gG	Fusing voltage \geq nominal line voltage
Miniature circuit breaker with characteristics B, C, D	<ul style="list-style-type: none"> Nominal miniature circuit breaker voltage \geq nominal line voltage Nominal miniature circuit breaker currents must be at least 10% above the nominal line current of the power supply module

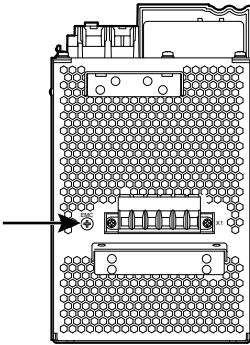
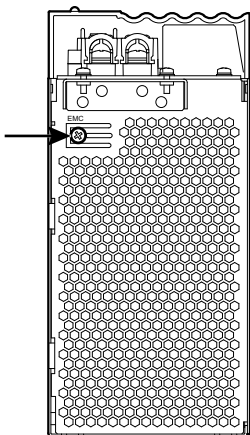
Adhere to the country-specific and system-specific regulations when carrying out the fusing.

The maximum line current can be limited by the power supply module. This results in the phase current I_L : $I_{L1}, I_{L2}, I_{L3} = I_B \times 2/3 + 0.5 \text{ A}$

The phase current on the supply system end can be limited. The limit can be set using the parameter P8800.6, see manual "Parameter description".

9.5.5 Use in IT systems

To ensure IT system capability, the terminal screw shown in the following figures must be removed from the bottom of the modules.

	<p>MDP92A power supply module</p>
	<p>MDC90A capacitor module</p>

INFORMATION



EMC limit values.

No EMC limits are specified for interference emission in voltage supply systems without a grounded star point (IT systems). The effectiveness of line filters is severely limited.

9.5.6 Line connection

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

For operation without line contactor, observe the specifications in the chapter "Protection of braking resistor against thermal overload".

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

9.5.7 Power connections

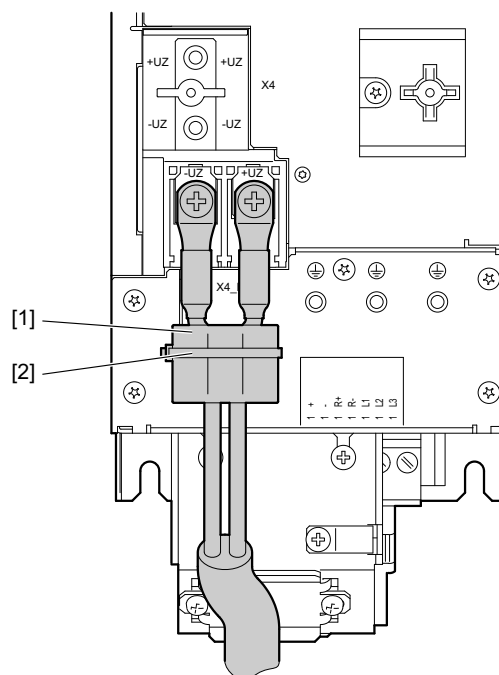
For information on this topic, refer to the "MOVIDRIVE® modular Application Inverters" operating instructions.

9.5.8 Special aspects when connecting an external storage unit

If an external energy storage unit, which is not installed in the control cabinet, is connected to one of the following devices, a ferrite sleeve must be attached to the connection cables.

- MDP92A-...: X4_B
- MDE90A-...: X13
- MDC90A-...: X4_B

9



9007228301719435

- [1] Ferrite sleeve
[2] Cable tie to fix the ferrite sleeve to the sheet metal

The ferrite sleeve is included with the device as a standard accessory.

9.5.9 Connection of an axis system

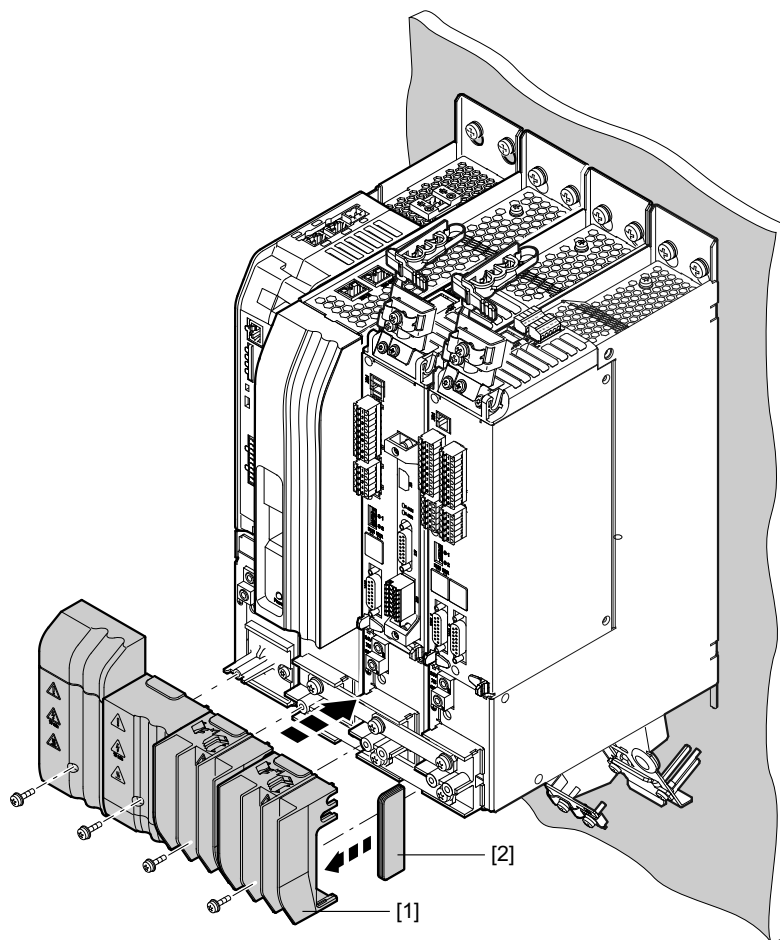
For information on this topic, refer to the "MOVIDRIVE® modular Application Inverters" operating instructions.

9.5.10 Installing touch guards and closing covers

All modules of the application inverter are equipped with touch guards [1] and the first and last modules of the axis system have closing covers [2]; see the following figure. If the axis system contains a master module, the closing cover [2] must be attached only to the final module in the axis system.

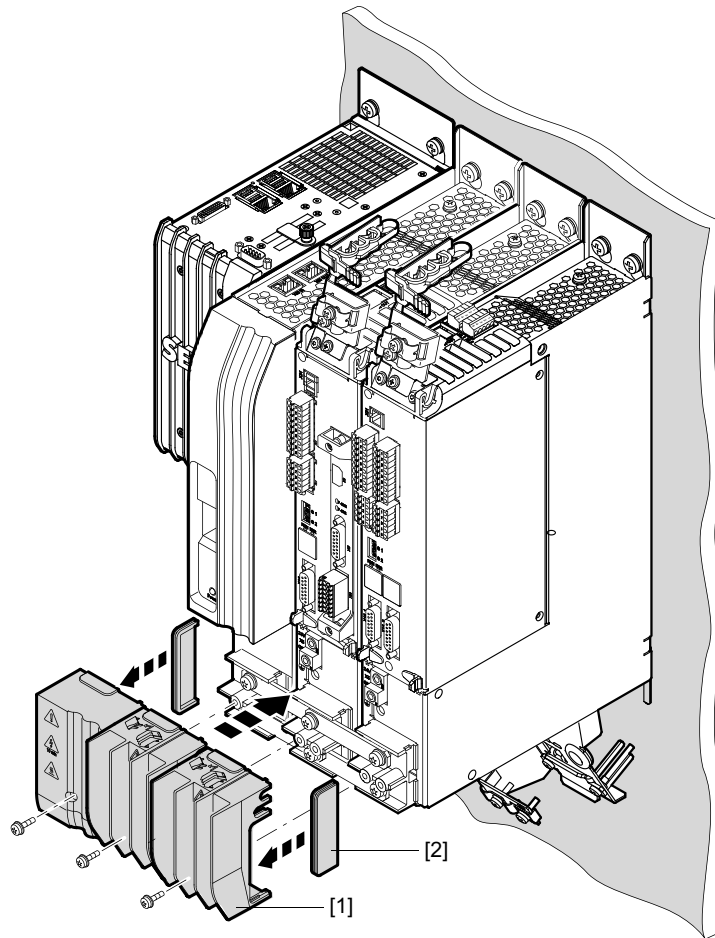
For the MDP92A-... power supply module, connector X1 and for the DC/DC converter MDE90A-..., connector X12 must always be plugged in and screwed tightly. These connectors are part of the protection against accidental contact that is necessary to achieve IP20 degree of protection.

With master
module



20918974091

Without master
module



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- [1] Touch guard
- [2] Closing cover

Install all touch guards [1] after installation work.

1. Insert the closing cover [2] into the touch guard [1].
2. Install the touch guard [1] on the respective module. Insert the screws and tighten them securely with the specified tightening torque.

Install one closing cover [2] each on the first and final modules of the axis system. The closing covers prevent any contact with the DC link. Two closing covers are included with each power supply module.

▲ WARNING

Missing touch guards and closing covers.
Severe or fatal injuries from electric shock.

- Install all touch guards.
- Install closing covers on the first and final module in the axis system.



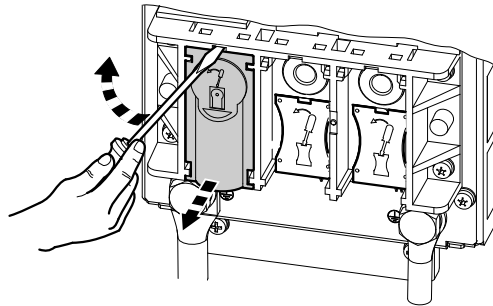
9.5.11 Protection caps

To achieve degree of protection IP20 according to EN 60529 with the following modules, a protection cap must be used to secure the connectors against being touched. The protection caps are included in the accessory bag.

- Power supply modules MDP90A-0500-.. and larger, line connection X1, braking resistor connection X3
- MDP92A-0250-.. power supply modules: Energy storage unit connection X4_B
- DC/DC converter MDE90A-0750-..: Energy storage unit connection X13
- Power supply modules with energy recovery, MDR91A-0500-.. and larger: Line connection X1, braking resistor connection X3
- Axis modules MDA90A-0640-.. and larger: Motor connection X2
- MDC90A-.. capacitor modules: Energy storage unit connection X4_B

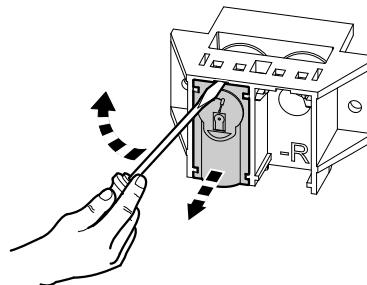
Attached protection caps can be removed as depicted in the following figures.

Line connection,
motor connection



20109660043

Braking resistor
connection



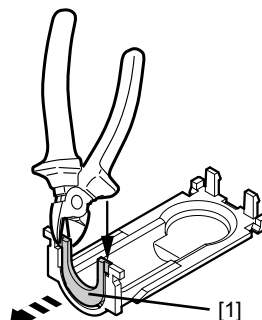
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To ensure degree of protection IP20, the protection caps must be replaced after connecting the cables.

Breaking out templates

In order to attach the protection caps in case of cables with large cross section or in case of connection with 2 cables, the template in the protection caps must be broken out.

- Cut out the plastic templates [1] in the protection cap using diagonal cutting pliers as depicted in the figure.



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9.5.12 Output brake chopper

NOTICE

Connect capacitive or inductive loads to the output of the brake chopper.
Destruction of the brake chopper.

- Only connect ohmic loads (braking resistors).
- Never connect capacitive or inductive loads.

9.5.13 Inputs/outputs

NOTICE

Damage to the digital inputs and digital outputs.

The digital inputs and digital outputs are not electrically isolated. Incorrectly applied voltages can damage the digital inputs and digital outputs.

- Do not apply external voltages to the digital outputs.
- The digital inputs and outputs are dimensioned according to IEC 61131-2.

- The cable length must not exceed 30 m.
- Cables outside the control cabinet must be shielded.

9.5.14 EtherCAT®/SBus^{PLUS} system bus

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

NOTICE

Using wrong cables.

Damage to the application inverter.

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

INFORMATION

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

Correct cabling**Module bus cable**

In the case of MOVIDRIVE® modular, the 8-core module bus cable connects the power supply module to the first axis module and the axis modules to one another.

In the case of MOVIDRIVE® modular, in addition to the system bus communication, the module bus is routed in the cable for information inside the device. If one or several MDC90A capacitor modules are used, an additional module bus cable must be selected.

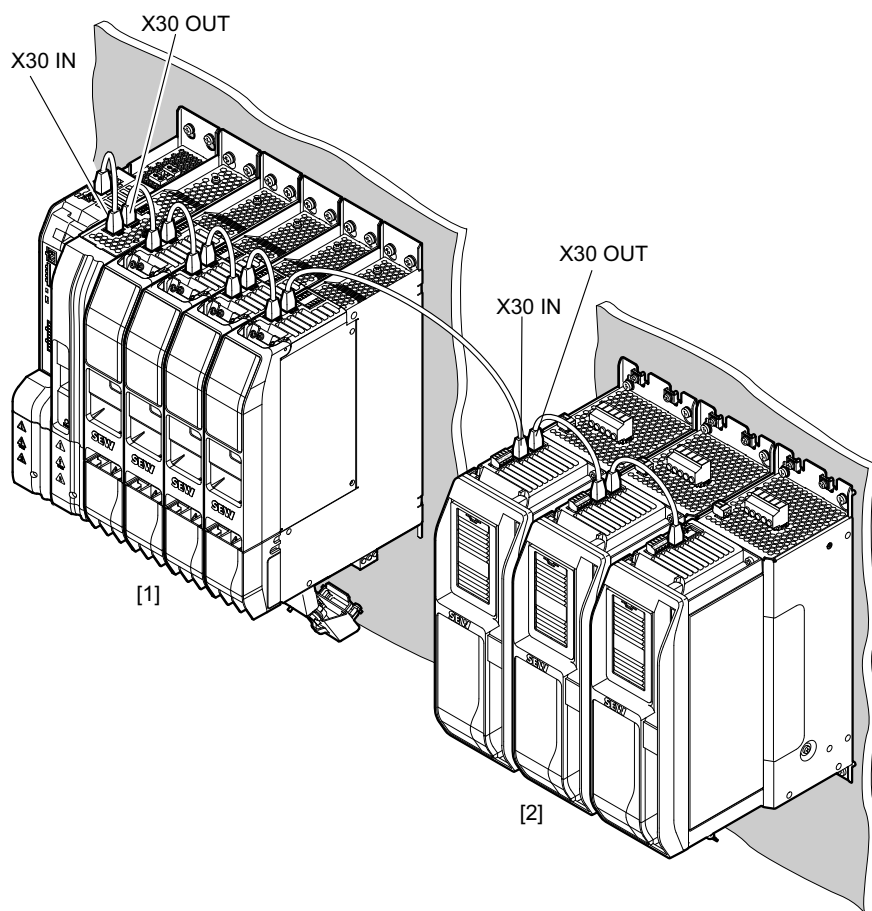
The connectors of the module bus cables are red and black to simplify correct installation.

- The black connectors must be plugged into the bus input X30 IN.
- The red connectors must be plugged into the bus output X30 OUT.

System bus cable

The 4-pole system bus cable is used between automation components, see the following figure. Some of these components are listed here as examples:

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



[1] MOVIDRIVE® modular

[2] MOVIDRIVE® system

9.5.15 Two-row design

For a sample installation of a 2-row structure, refer to the operating instructions and the "MOVIDRIVE® modular application inverter" product manual.

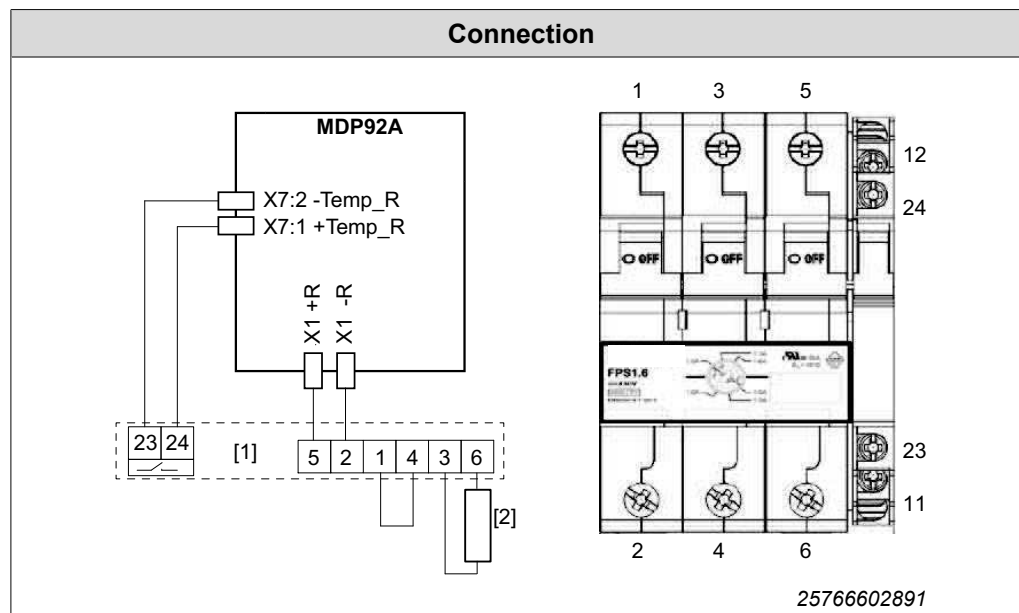
9.6 Braking resistors

9.6.1 Protecting braking resistors against thermal overload

External thermal circuit breaker TCB

MDP92A power supply module

If an external TCB thermal circuit breaker is used, the following connection applies.



[1] TCB thermal circuit breaker

[2] Braking resistor

INFORMATION



The polarity of the connections 5 (+R) and 2 (-R) must be strictly adhered to during connection of the TCB circuit breaker to the inverter.

- If the thermal circuit breaker trips, the signal contact is set (23-24 connection is opened) and evaluated in the power supply module.
- The connection between power supply module and braking resistor is disconnected.
- This does not require a response by the PLC.
- It is not required to disconnect the supply system connection with an external switching device.
- If the thermal circuit breaker trips, the power supply module switches all axis modules to "Output stage inhibited".
- Set the control knob of the thermal circuit breaker TCB to the tripping current I_F of the connected braking resistor. Use the scaling 40 °C.
- After all cables are connected, the 3 upper screw holes must be covered with 3 touch guard caps. The touch guard caps are included in the delivery.

9.7 Line contactor

A line contactor is used for galvanic separation of the axis system and the supply system. The separation from the grid is necessary for electrical work on the axis system, for example.



⚠ DANGER

The integrated lock of the DC/DC converter for MDP92A power supply modules does not galvanically separate the axis block from the grid and therefore does not de-energize it.

Severe or fatal injuries.

To de-energize the axis block, you have to switch it off with a main switch, for example. The switch-off design is always done system-specific depending on the specific application considering the applicable regulations.

9.8 DC power inputs

If an external storage unit is connected to X4_B of the MDP92A-... power supply module or X13 of the DC/DC converter module MDE90A-... that is to be connected via an automatic circuit breaker, DC switch or DC contactor, then the storage unit must be connected using the "storage synchronization" function in the MOVIKIT® PowerMode, EnergyMode, and FlexibleMode modules.

The corresponding wiring is described in the wiring diagrams "Wiring diagrams" (→ 117) (PowerMode, EnergyMode and FlexibleMode). Storage synchronization can be omitted if it is ensured that the storage unit can only be activated when discharged.

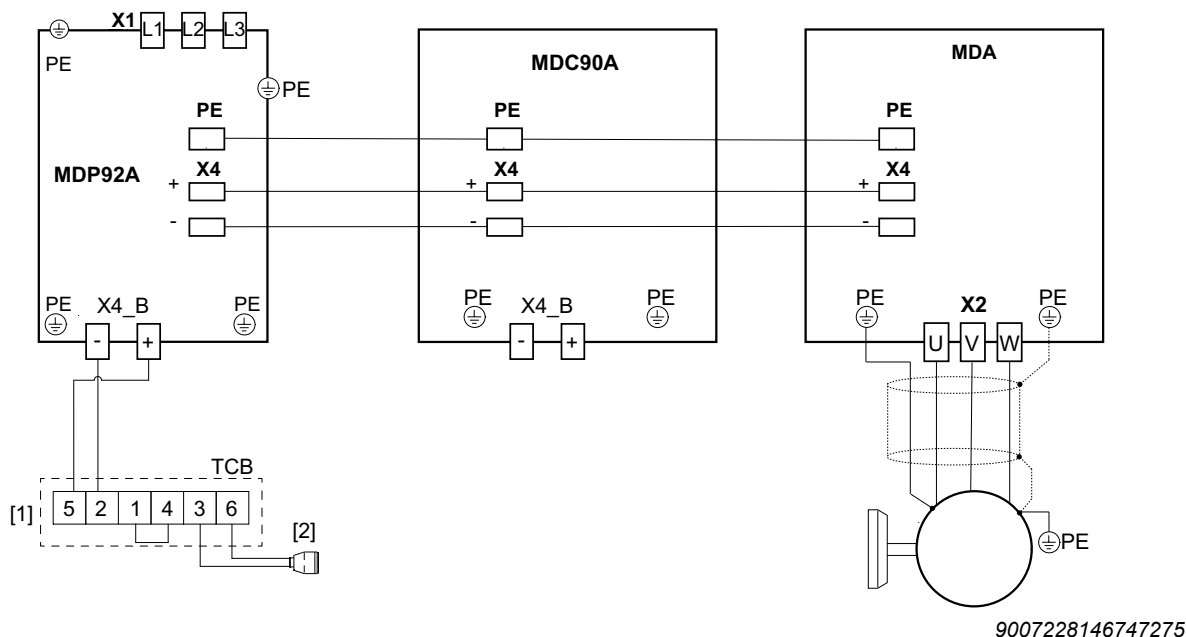
If a DC grid is to be connected to the DC power input X13 of a DC/DC converter module MDE90A-..., the inrush current must be limited when activating the DC grid.

This can be achieved by means of a power resistor that can be bridged once the input capacitance on the grid end has been charged. The power stage enable of the MDE90-... must be revoked until the power resistor is bridged. Other consumers, such as the 24 V switched-mode power supply module must not consume any power during this time either.

9.9 Connecting the discharge unit

9.9.1 Connection variant 1

With connection variant 1, the discharge unit is connected to the MDP92A power supply module using the TCB thermal circuit breaker.

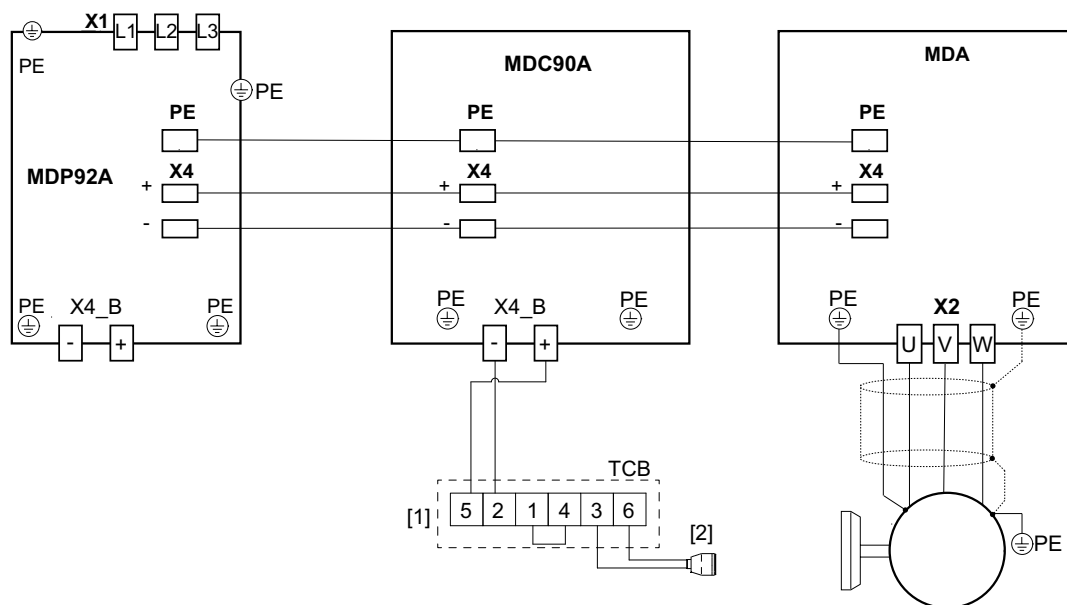


[1] TCB thermal circuit breaker

[2] Connector plug of discharge unit

9.9.2 Connection variant 2

With connection variant 2, the discharge unit is connected to the MDC90A capacitor module using the TCB thermal circuit breaker.

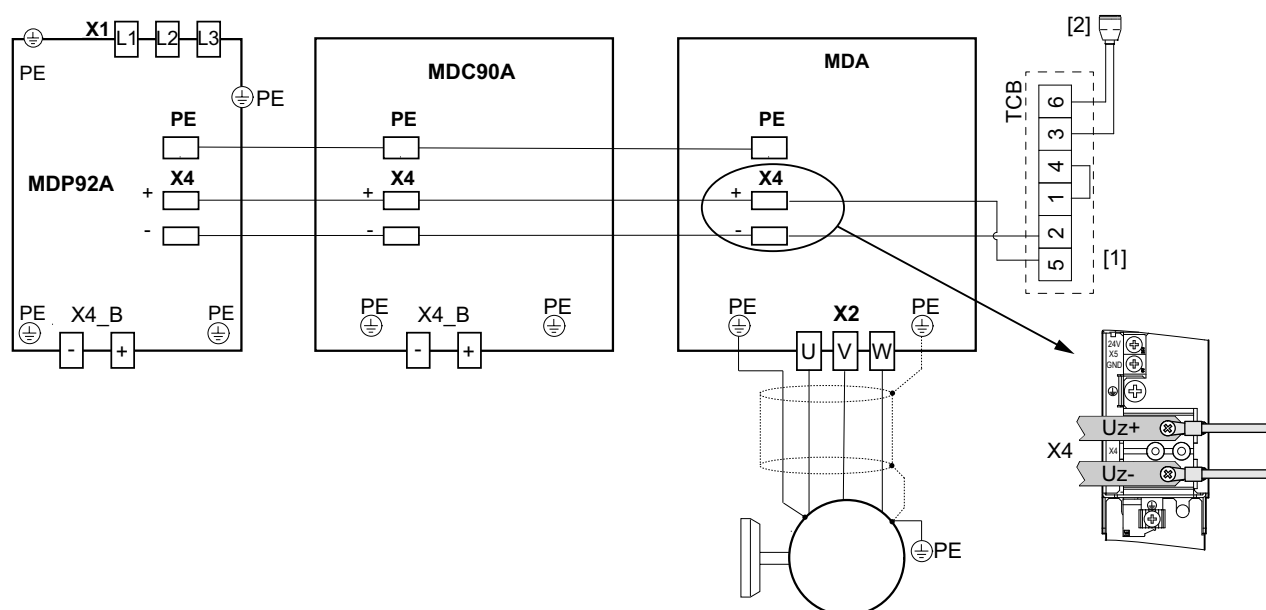


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- [1] TCB thermal circuit breaker
- [2] Connector plug of discharge unit

9.9.3 Connection variant 3

With connection variant 3, the discharge unit is connected to the DC link busbar of the last axis module MDA/MDD using the TCB thermal circuit breaker.



28892011147

[1] TCB thermal circuit breaker

[2] Connector plug of discharge unit

9.9.4 Accessories

The required accessories depend on the selected connection variant.

Connection variant	Required accessories
1	<ul style="list-style-type: none"> Ring cable lugs M6 (X4_B) DCP21A cable set 2 × 5 m, 6 mm²: 18131778 TCB0160, I = 10 A (setting) Discharge connector Harting Han 3A.-agg-QB-K: 18147380 Socket insert: 09120022752 (Harting) Built-on housing: 09200030306 (Harting)
2	
3	<ul style="list-style-type: none"> Ring cable lugs M6 (X4) DCP21A cable set 2 × 5 m, 6 mm²: 18131778 TCB0160, I = 10 A (setting) Discharge connector Harting Han 3A.-agg-QB-K: 18147380 Socket insert: 09120022752 (Harting) Built-on housing: 09200030306 (Harting)

9.10 Line filter

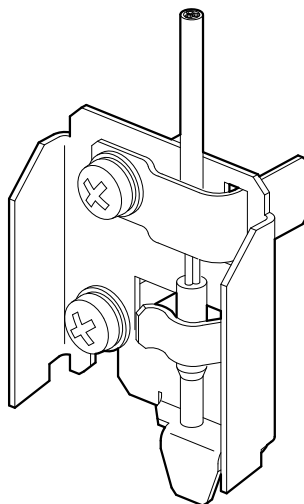
- Install the line filter close to the power supply module/inverter but outside the minimum clearance for cooling. The line filter must not be heated by the exhaust air of the power supply module/inverter.
- Do not wire any other consumers between the line filter and the power supply module/inverter.
- The connection cable between line filter and power supply module/inverter does not have to be shielded.
- Limit the length of the cable between the line filter and the power supply module/inverter to the absolute minimum needed.
- Do not switch between the line filter and power supply module/inverter.

9.11 Temperature monitoring MDC90A capacitor module

The mounting panel with the installed sensor is screwed to the intended position at the top of the device, see chapter "Device structure of MDC90A-0120-50X-X-000 capacitor module" (→ 82).

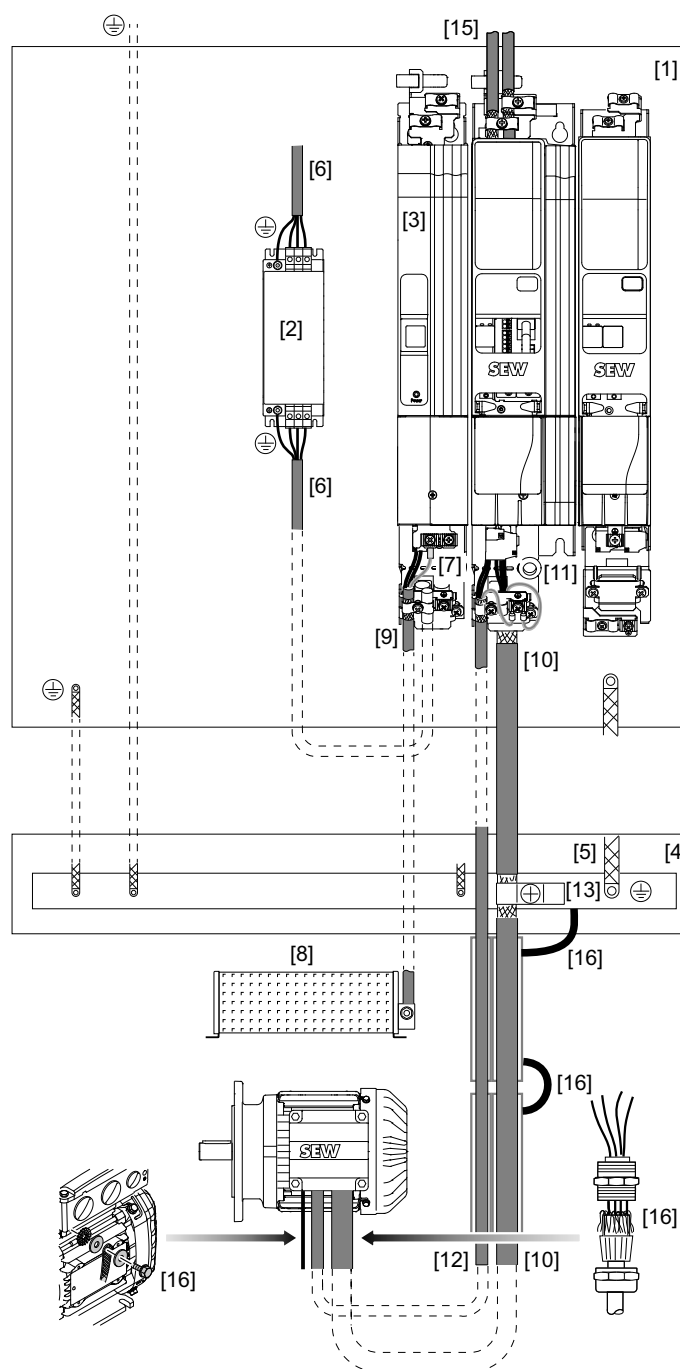
Due to the position of the temperature sensor at the housing, a difference of approx. 10 Kelvin must be added to the measured temperature value.

$$T_{\text{inside}} = T_{\text{sensor}} + 10 \text{ K}$$



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9.12 EMC-compliant installation



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- | | |
|---|--|
| [1] Zinc-coated mounting plate | [9] Braking resistor performance |
| [2] Line filter | [10] Motor cable |
| [3] MDP power supply module | [11] Power shield plate at the axis module |
| [4] PE busbar | [12] Brake cable |
| [5] HF connection of PE busbar/mounting plate | [13] Grounding clamp |
| [6] Supply system cable | [15] Electronics shield plate |
| [7] Power shield plate at the power supply module | [16] HF connection |
| [8] Braking resistor | |

The information in this chapter will help you to optimize the system in regard of electromagnetic compatibility, or to eliminate already existing EMC interferences.

The notes in this chapter are not legal regulations; they are merely recommendations for improving the electromagnetic compatibility of your plant.

For further notes on EMC-compliant installation, refer to the publication Drive Engineering – Practical Implementation, edition "EMC in Drive Engineering – Basic Theoretical Principles – EMC-Compliant Installation in Practice".

9.12.1 Control cabinet

Use control cabinets with electrically conductive (galvanized) mounting plates. If several mounting plates are used, connect them in such a way that they are conductive over a large area.

Mount the line filter and inverter on a shared mounting plate if possible. Make sure they are connected over a large area and with good conductivity.

9.12.2 HF equipotential bonding in the system

Make sure that there is a suitable equipotential bonding between the system, the control cabinet, the machine structure, the cable ducts, and the drives.

Connect the individual sections together in an HF-capable manner.

From an electrical safety perspective, the PE busbar is the star point. The PE connection does not replace either the HF grounding or the shielding.

In terms of EMC, it is advantageous if the mounting plate is used as a star point with respect to HF equipotential bonding.

Perform the following measures for a suitable HF equipotential bonding:

- Connect the PE busbar to the mounting plate in an HF-compatible manner.
- Connect the sheet metal cable ducts to the control cabinet in an HF-compatible manner.
- Connect the cable ducts to the mounting plate in the control cabinet using an HF braid.
- Connect the parts of the sheet metal cable ducts together in an HF-compatible manner.
- Connect the sheet metal cable ducts to the gearmotor in an HF-compatible manner.

9.12.3 Cable installation

Route the power cables, such as the motor cable and the brake cable, separately from the supply system cable and the control cables.

Route all cables as closely to the reference potential as possible, e.g. the mounting plate.

Keep all cables as short as possible. Avoid spare loops.

9.12.4 Supply system cable connection

The supply system cable can be connected to the line choke and/or line filter using twisted unshielded single conductors or using unshielded cables.

If necessary, shielded cables may improve EMC.

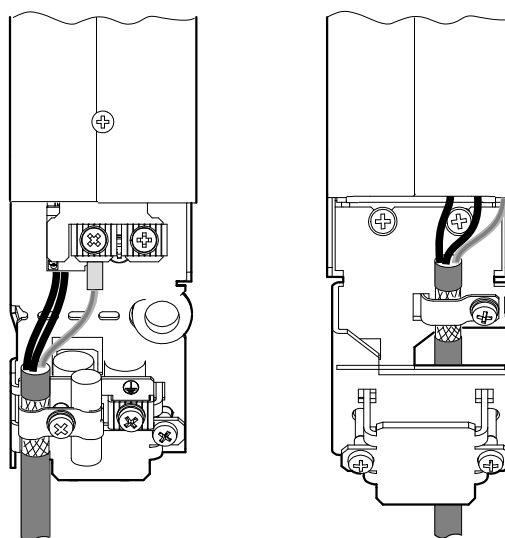
9.12.5 Line filter connection

Limit the length of the connection lead between the line filter and the inverter to the absolute minimum needed.

You must never route filtered and unfiltered cables together. For this reason, route incoming and outgoing line filter cables separately.

9.12.6 Braking resistor connection

For connecting braking resistors, use 2 closely twisted conductors or a shielded power cable. Connect the braided shields of shielded cables over the entire circumference. Use the designated shield plates at the basic device to connect the shield.

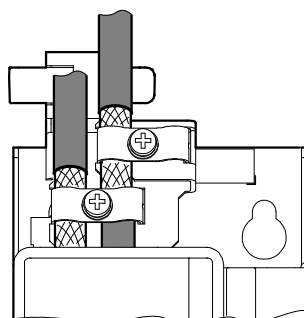


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9.12.7 Control cable connection

The digital inputs can be connected using an unshielded single conductor. Shielded cables increase the EMC. Use the designated shield plates to connect the shield.

For routing outside of the control cabinet shielded cables must be used.



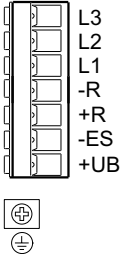

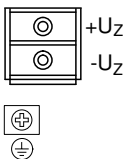

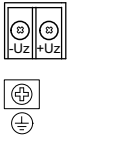

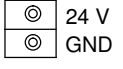
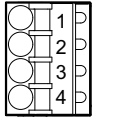
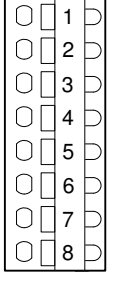
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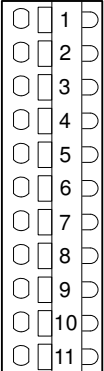




9.12.8 Shielding connection

Ensure that there is an HF-compatible shield connection, e.g. by using grounding clamps or EMC cable glands, so that the braided shield has a large connection surface.

9.13 Terminal assignment





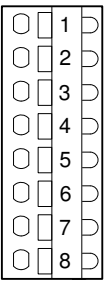
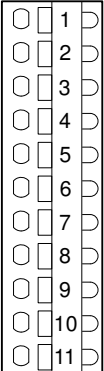
9.13.1 Power supply module with controlled DC link voltage MDP92A-0250-503-4-000

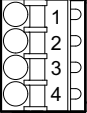




Representation	Terminal	Connection	Brief description
	X1_1	+U _B	Voltage side B for connection of the switched-mode power supply module MDS90A-.. ¹⁾
	X1_2	-ES	Measurement connection negative pole external energy storage unit
	X1_3	+R	Braking resistor connection MDP92A-0250-503-4-000
	X1_4	-R	
	X1_5	L1	Line connection MDP92A-0250-503-4-000
	X1_6	L2	
	X1_7	L3	
		PE	PE connection
	X4: +U _Z	+U _Z	DC link connection
	X4: -U _Z	-U _Z	
		PE	PE connection
	X4_B: +	+U _Z	DC link connection for external energy storage unit
	X4_B: -	-U _Z	
		PE	PE connection
	X5: 24 V	24V_out	+24 V supply voltage
	X5: GND	GND	
	X7_1	+TEMP_R	DC 24 V auxiliary voltage output
	X7_2	-TEMP_R	Sensor input for temperature monitoring of the braking resistor
	X7_3	Reserved	
	X7_4	Reserved	
	X33_1	24V_out	DC 24 V voltage output
	X33_2	5V_out	DC 5 V voltage output
	X33_3	TEMP SENSOR	Reserved
	X33_4	ERROR	Reserved
	X33_5	OVER VOLTAGE	Reserved
	X33_6	CAN LOW	Reserved
	X33_7	CAN HIGH	Reserved
	X33_8	GND	Reference potential

Representa- tion	Terminal	Connection	Brief description
	X20_1	24V_out	DC 24 V voltage supply for digital inputs
	X20_2	DOR-C	Digital output 5, isolated contact, freely programmable
	X20_3	DOR-NO	
	X20_4	DO03	Digital output 4, freely programmable
	X20_5	DO02	Digital output 3, freely programmable
	X20_6	DO01	Digital output 2, freely programmable
	X20_7	DO00	Digital output 1, freely programmable
	X20_8	DI02	Digital input 3, freely programmable
	X20_9	DI01	Digital input 2, freely programmable
	X20_10	DI00	Digital input 1 pre-assigned with "Output stage enable"
	X20_11	GND	Reference potential
 X30 OUT  X30 IN	X30 OUT		System bus
	X30 IN		
 X31_A  X31_B	X31_A		CAN bus (SEW-EURODRIVE Service interface) The functionality of connections X31_A and X31_B is identical.
	X31_B		

1) In preparation








9.13.2 DC/DC converter module MDE90A-0750-500-X-S00

Representa- tion	Terminal	Conne- ction	Brief description
	X4:+U _z	+U _z	DC link connection
	X4:-U _z	-U _z	
		PE	PE connection
	X5:24 V	24V_out	+24 V supply voltage
	X5:GND	GND	
	X12_1	+U _B	+U _B tap for switched-mode power supply module MDS90A-.. ¹⁾
	X12_2	-ESA	Measurement negative pole, storage unit A-side
	X12_3	-ESB	Measurement negative pole, storage unit B-side
	X12_4	ICL	Reserved
	X13	+U _B	Connection of external energy storage unit B-side +
	X13	-U _B	Connection of external energy storage unit B-side -
	X33_1	24V_out	DC 24 V voltage output
	X33_2	5V_out	DC 5 V voltage output
	X33_3	TEMP SENSOR	Reserved
	X33_4	ERROR	Reserved
	X33_5	OVER VOLTAGE	Reserved
	X33_6	CAN LOW	Reserved
	X33_7	CAN HIGH	Reserved
	X33_8	GND	Reference potential for signals and interfaces energy storage units
	X20_1	24V_out	DC 24 V voltage output
	X20_2	DOR-C	Shared relay contact
	X20_3	DOR_NO	NO contact
	X20_4	DO3	Reserved
	X20_5	DO2	Freely programmable
	X20_6	DO1	Freely programmable
	X20_7	DO0	Freely programmable
	X20_8	DI02	Freely programmable
	X20_9	DI01	Freely programmable
	X20_10	DI00	Pre-assigned with "Output stage enable"
	X20_11	GND	Reference potential for digital inputs and digital outputs

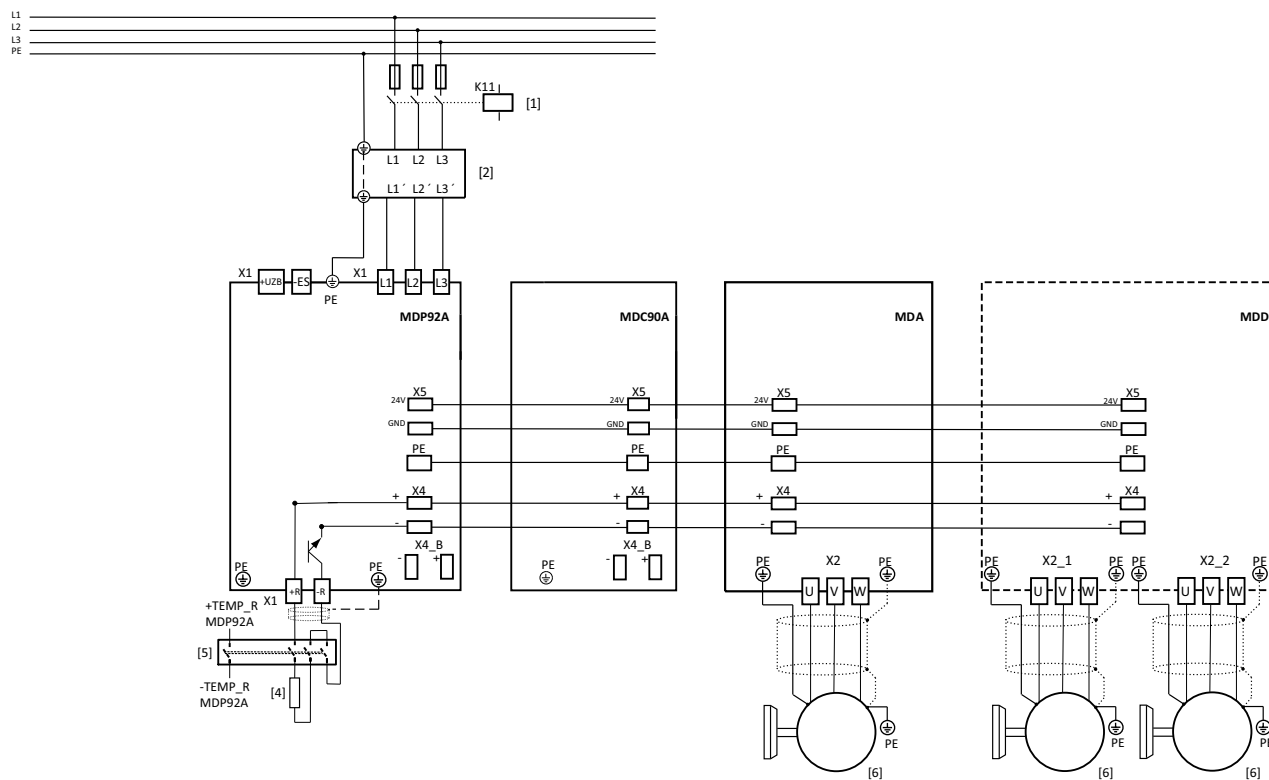
Representa- tion	Terminal	Connec- tion	Brief description
	X21_1	24V_out	Supply voltage for digital input
	X21_2	DI03	Freely programmable
 X30 OUT	X30 OUT		System bus
 X30 IN	X30 IN		
 X31_A	X31_A		CAN bus (SEW-EURODRIVE Service interface) The functionality of connections X31_A and X31_B is identical.
 X31_B	X31_B		

1) In preparation

9.13.3 MDC90A-0120-50X-X-000 capacitor modules

Representa- tion	Terminal	Connec- tion	Brief description
 	X4:+U _z	+U _z	DC link connection
	X4:-U _z	-U _z	
		PE	PE connection
 	X4_B:+	+U _z	Connection DC link (output)
	X4_B:-	-U _z	
		PE	PE connection
	X5:24 V	24V_out	+24 V supply voltage
	X5:GND	GND	

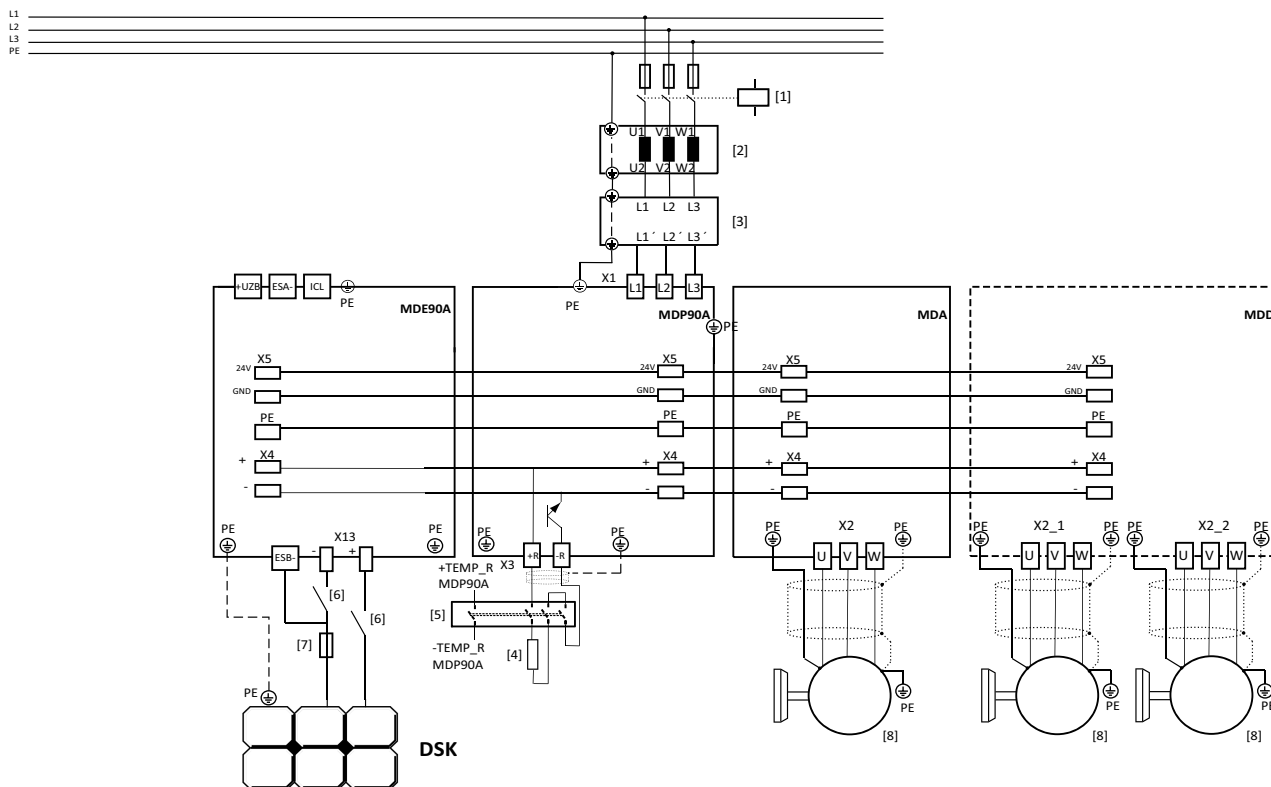
9.14.2 Wiring diagram power mode



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- 1 Line contactor (optional)
- 2 Line filter
- 3 NC contact contactor
- 4 Connection of the braking resistor
- 5 TCB thermal circuit breaker
- 6 Motor

9.14.3 Wiring diagram energy mode

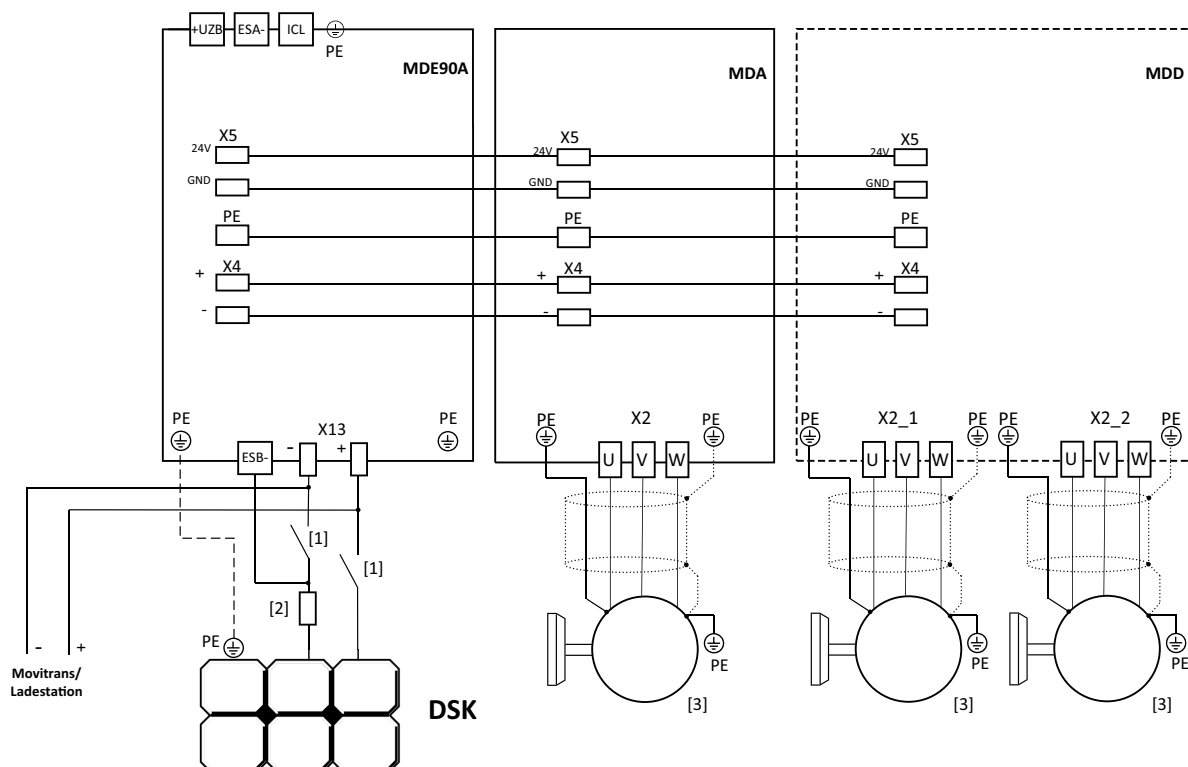


31399655691

- 1 Line contactor (optional)
- 2 Line choke (optional)
- 3 Line filter
- 4 Connection of the braking resistor
- 5 TCB thermal circuit breaker
- 6 DC contactors (optional)¹⁾.
- 7 DC fuse
- 8 Motor

1) For detailed information on storage unit connection and storage unit protection, refer to the "External Energy Storage Units" manual

9.14.4 Wiring diagram isolated operation

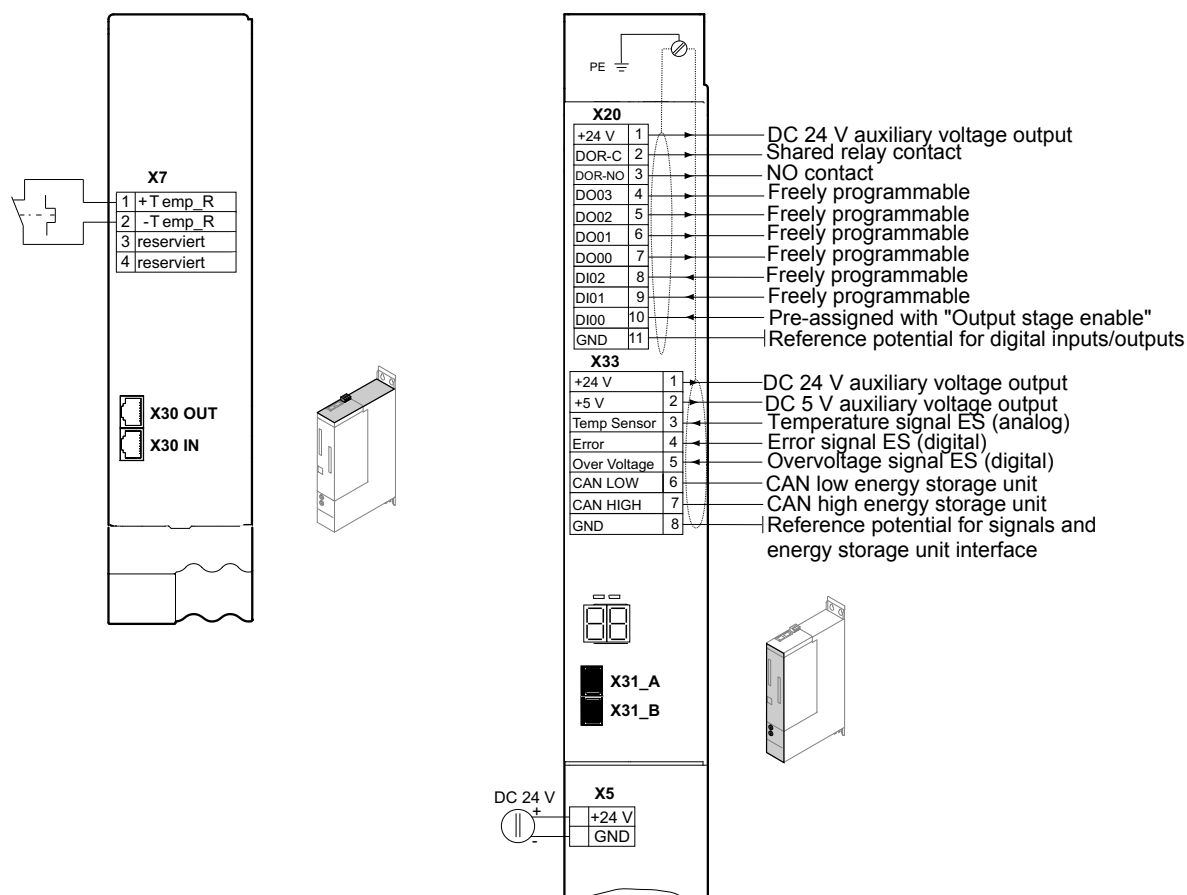


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- 1 DC contactors (optional)¹⁾.
- 2 DC fuse
- 3 Motor

1) For detailed information on storage unit connection and storage unit protection, refer to the "External Energy Storage Units" manual

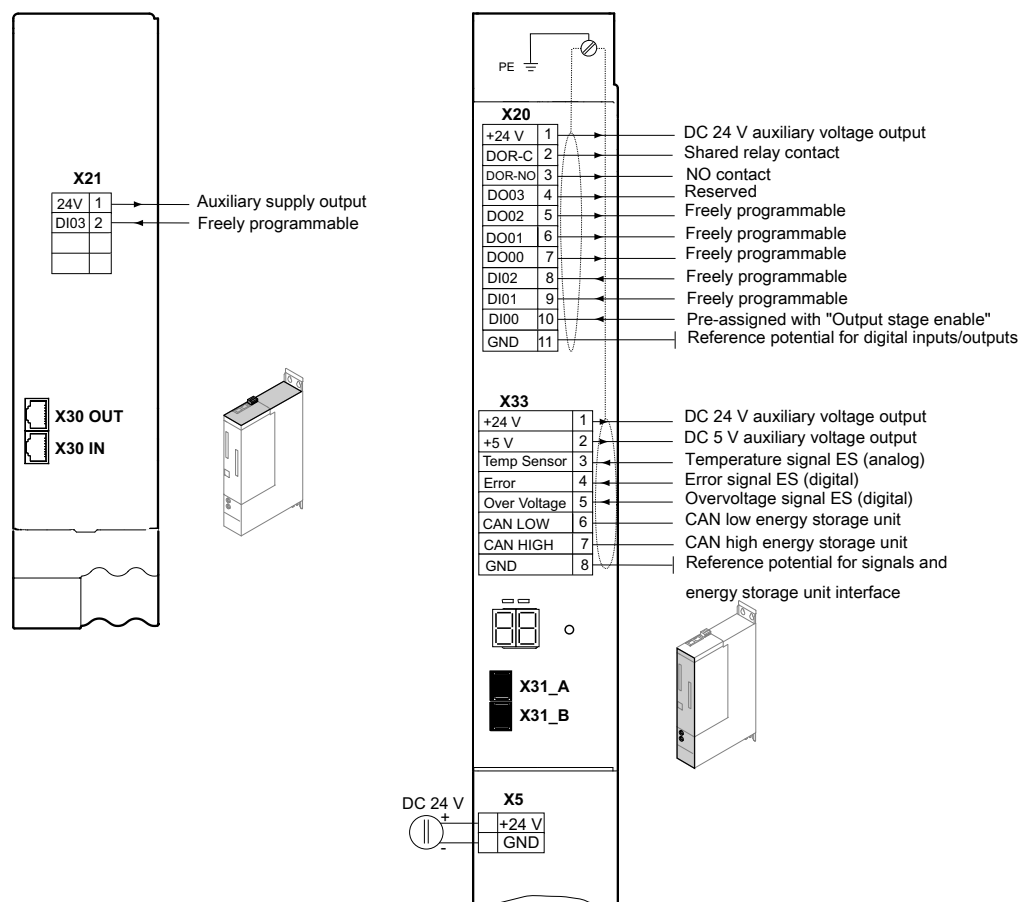
9.14.5 Electronics connection MDP92A power supply module



9007227846225163

- X5 DC input (busbar)
- X7 Temperature monitoring of braking and discharge resistor
- X20 Digital inputs and outputs
- X30 System bus
- X31 CAN bus (SEW-EURODRIVE Service interface)
- X33 Interface for energy storage unit

9.14.6 Wiring diagram DC/DC converter module MDE90A



30734639371

X5	DC 24 V supply
X20	Digital inputs and outputs
X21	Digital input
X30 IN/OUT	System bus
X31_A/B	CAN bus
X33	DC 24/5 V auxiliary voltage output

10 Startup

The startup of the devices is performed using the engineering software "MOVISUITE® for Power and Energy Solutions".

Contact your SEW-EURODRIVE contact person to obtain the engineering software.

10.1 General



⚠ DANGER

Uncovered power connections.

Severe or fatal injuries from electric shock.

- Install the touch guards at the modules, see chapter "Touch guards and closing covers".
- Install the closing covers according to the regulations, see chapter "Touch guards and closing covers".
- Never start up the application inverter unless touch guards are installed and closing covers are inserted.

10



⚠ DANGER

Unplugged connectors.

Severe or fatal injuries from electric shock.

- For the MDP92A-... power supply module, the connector X1 must always be plugged in and screwed tight. This connector is part of the protection against accidental contact that is necessary to achieve IP20 degree of protection.
- For the DC/DC converter MDE90A-..., connector X12 must always be plugged in and screwed tight. This connector is part of the protection against accidental contact that is necessary to achieve IP20 degree of protection.

10.1.1 Lifting applications



⚠ WARNING

Danger of fatal injury if the hoist falls.

Severe or fatal injuries.

- The application inverter is not designed for use as a safety device in lifting applications. Use monitoring systems or mechanical protection devices to ensure safety.

10.1.2 Connecting power

NOTICE

Undercutting the minimum switch-off time of the line contactor.

Irreparable damage to the application inverter or unforeseeable malfunctions.

Adhere to the specified times and intervals.

- Do **not** turn the power of the supply system on or off **more than once per minute**.

10.1.3 Connecting cables

NOTICE

Disconnecting lines under voltage.

Irreparable damage to the application inverter or unforeseeable malfunctions.

- The following plug-in connections must always be disconnected in a de-energized state: Motor, grid, braking resistor, brake, encoder, connection, energy storage unit, connection discharge unit.

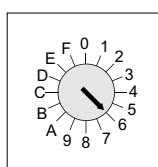
10.2 Assigning the EtherCAT®/SBusPLUS address at the power supply module

To set the EtherCAT®/SBusPLUS address, two hexadecimal address switches S1 and S2 are installed on the power supply module and the DC/DC converter module. For information on the installation position of the switches, refer to chapter "Device structure" (→ 76). A hexadecimal address between 1 and FF is set here. This address can be converted into a decimal address using the table below.

The following table lists example settings for the address switches.

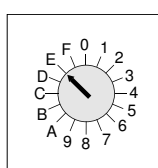
Required address, decimal	Address, hexa-decimal	Setting S1 (× 16)	Setting S2 (× 1)
3	03	0	3
18	12	1	2
25	19	1	9
100	64	6	4
110	6E	6	E
255	FF	F	F

S1 address switch



6

S2 address switch



E

The EtherCAT®/SBusPLUS address "110" is set as an example in the illustration above.

10.3 Startup requirements

The following requirements apply to startup:

- You have performed a correct project planning for the devices used.
- You have installed the device correctly both mechanically and electrically.
- Safety measures prevent accidental startup of the drive.
- Safety measures prevent danger to persons or machines.

Required hardware components:

- PC or laptop with Ethernet interface.
- Commercially available Ethernet cable for connection between PC and MOVI-C® CONTROLLER.
- MOVI-C® CONTROLLER with completed startup

Required software:

- MOVISUITE® standard engineering software from SEW-EURODRIVE.

10.4 Startup procedure

The devices are taken into operation using the MOVISUITE® engineering software from SEW-EURODRIVE.



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Startup with MOVISUITE® can be performed intuitively.

10.5 Line voltage dependency of the nominal output voltage

The output voltage must be limited at low line voltages to meet the requirements of the safety distances:

Line voltage U_{line} (phase-to-phase voltage):	Output voltage U_{out}
200 V	683 V
230 V	704 V
240 V	710 V
> 376 V	800 V

10.6 Dependency of the DC link voltage on the storage voltage

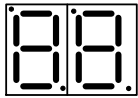
In an isolated DC grid, the voltage of the B-side is kept symmetrical to ground by leakage currents. This limits the DC link voltage depending on the voltage U_A . This limitation does not apply to regenerative energy.

Voltage U_B	Voltage U_A
> 500 V	800 V
300 V	700 V
100 V	600 V
0 V	550 V

11 Operation

11.1 7-segment display

11.1.1 Operating displays



- The two 7-segment displays indicate the operating state of the power supply module.

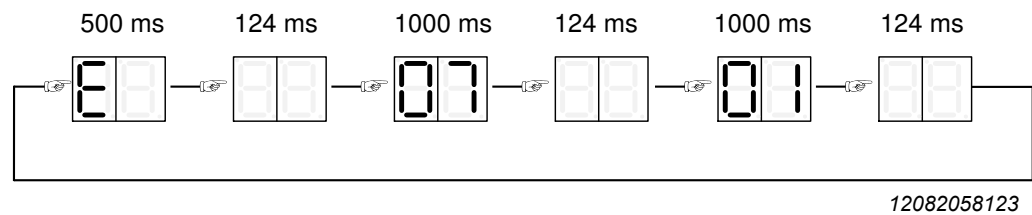
11.1.2 Fault display

The power supply module detects any faults that occur and displays them as fault code. Each fault is clearly defined by its fault code and corresponding attributes, as shown below:

- Fault response
- Final state after executing the fault response
- Type of reset response.

The fault codes are indicated in the power supply module as flashing numeric values.

The fault code is displayed in the following display sequence:



In the example, a 2-digit fault code with subfault is displayed at the power supply module, fault 07.01 in this example.

11.2 Operating displays

11.2.1 Operating displays at the power supply module and at the DC/DC converter – 7-segment display

Display	Description	State	Comment / action
Displays during boot process			
b0 nF nc nH rF -b rb b3 br	Device passes through several states when loading the firmware (boot) in order to become ready for operation.	<ul style="list-style-type: none">• Status: Not ready.• Output stage is inhibited.• No communication possible.	<ul style="list-style-type: none">• Waiting for boot process to finish.• Device stays in this condition: Device is defective.
Displays of different device statuses			
00	DC voltage on the A- or B-side is too low	<ul style="list-style-type: none">• 24 V standby mode• Status: not ready• Output stage is blocked• Communication is possible	<ul style="list-style-type: none">• Check the supply system• Check voltage on A-side• Check voltage on B-side• Settings of the power supply monitoring and DC link monitoring
.	Energy-saving mode		Energy-saving mode active.
C0 Flashing	Module bus is not ready		Check the module bus connection.
C1 Flashing	Startup state		Startup state is active.
C3 Flashing	Synchronization with bus is incorrect. Process data processing not available.		<ul style="list-style-type: none">• Check the bus connection.• Check synchronization setting at device and controller.• Check process data settings at device and controller.
C6 Flashing	Internal device supply incomplete.		<ul style="list-style-type: none">• Supply voltage fault of SMPS• 24 V supply not ready.
C8 Flashing	External device not ready		The message "Not ready" was detected at the digital input.
Cd Flashing	Parameter download running.		One parameter set is being downloaded.
Displays during initialization processes (parameters will be reset to default values)			
d0 Flashing	Basic initialization	<ul style="list-style-type: none">• Status: Not ready.• Output stage is inhibited.• Communication is possible.	Waiting for initialization to finish.
d1 Flashing	Initialization at delivery state.		
d2 Flashing	Initializing parameters		
Displays in normal operation			
51	Output stage inhibit	<ul style="list-style-type: none">• Output stage is inhibited.	The output stage is inhibited. Brake chopper is still working
52	Inhibit brake chopper	<ul style="list-style-type: none">• The brake chopper is inhibited• Output stage is blocked	Output stage and brake chopper are inhibited
55	Voltage control	For further information, refer to the FCB description.	Voltage control

11.2.2 Operating display – power LED

The voltage state of the DC link is indicated by a green flashing LED on the MDP92A, MDE90A and MDC90A devices. The flashing frequency increases with the DC link voltage of the system.

**INFORMATION**

The display of the LED is not a reliable source for information on the voltage level. The exact voltage level can only be measured at the DC link.

11.3 Fault description

11.3.1 Fault 1 Output stage monitoring

Subfault: 1.2 Description: Overcurrent in output stage		
Response: Emergency stop + output stage inhibit		
Cause		Measure
Motor current too high.		Connect a smaller motor.
Current supply		Check the current supply.
Current transformer		Check the current transformer.
Ramp limit deactivated and set ramp time too short.		Increase the ramp time.
Phase module defective.		Check the phase module.
DC 24 V supply voltage unstable.		Check the DC 24 V supply voltage.
Interruption or short circuit on signal lines of phase modules.		Check the signal lines.

11.3.2 Fault 3 Ground fault

Subfault: 3.1 Description: Ground fault		
Response: Warning		
Cause		Measure
Ground fault in the motor lead.		Eliminate ground fault in motor lead.
Ground fault in the inverter.		Eliminate ground fault in inverter.
Ground fault in the motor.		Eliminate ground fault in motor.
Ground fault in line components.		Eliminate ground fault in line components.

11.3.3 Fault 4 Brake chopper

Subfault: 4.1 Description: Brake chopper overcurrent		
Response: Inhibit brake chopper		
Cause		Measure
Excessive regenerative power.		Extend the deceleration ramps.
Short circuit detected in braking resistor circuit.		Check the supply cable to the braking resistor.
Braking resistance too high.		Check the technical data of the braking resistor.

11.3.4 Fault 6 Line fault

Subfault: 6.1 Description: Line phase failure		
Response: Line phase failure		
Cause		Measure
Missing line phase detected.		Check the supply system cable.
DC link voltage periodically too low.		Check the configuration of the supply system.
Inadequate line voltage quality.		Check the supply (fuses, contactor).
Subfault: 6.2 Description: Power failure		
Response: Power failure		
Cause		Measure
Power failure detected.		Check the supply system cable.
Subfault: 6.3 Description: Line overvoltage		
Response: Emergency stop + output stage inhibit		
Cause		Measure
Line voltage exceeds permitted upper threshold value.		Check the nominal line voltage in the project planning.
Inadequate line voltage quality.		Check the quality of the power system.

Subfault: 6.4		
Description: Line undervoltage		
	Response: Line undervoltage	
	Cause	Measure
	Line voltage dropped below permitted lower threshold value.	Check the nominal line voltage in the project planning.
	Inadequate line voltage quality.	Check the quality of the power system.
	Supply system cable missing.	Check the wiring.

11.3.5 Fault 7 DC link

Subfault: 7.6		
Description: Overvoltage A-side or B-side		
	Response: Output stage inhibit	
	Cause	Measure
	Excessive regenerative power of an actuator.	Check the application.
	Energy storage unit dimensioned too small.	Check the project planning.
	Excessive recharging power from power grid.	Check the application.
Subfault: 7.7		
Description: Undervoltage A-side or B-side		
	Response: Warning	
	Cause	Measure
	Excessive motor power of an actuator.	Check the application.
	Energy storage unit dimensioned too small.	Check the project planning.
	Excessive motor power.	Check the application.
	Insufficient recharging power from power grid.	Check the application.
Subfault: 7.8		
Description: Short circuit A-side or B-side		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit in output stage end.	Eliminate the short circuit.

11.3.6 Fault 9 Control mode

Subfault: 9.2		
Description: Requested operating mode not possible with active control mode		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The current FCB activated an operating mode. The active control mode does not support this operating mode, for example "position control" or "torque control" with U/f control mode.	<ul style="list-style-type: none"> – Use a control mode that supports the required operating mode. Connect an encoder if necessary. – Select an operating mode that is supported by the current control mode.

11.3.7 Fault 10 Data Flexibility

Subfault: 10.1		
Description: Initialization		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Init task error.	The init task has issued a return code != 0. Check the program.
Subfault: 10.2		
Description: Illegal operation code		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Illegal opcode in Data Flexibility program.	Contact SEW-EURODRIVE Service.

Subfault: 10.3		
Description: Memory access		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Memory area violated while accessing array.	For example, an array access results in writing beyond the permitted memory range. Check the program.
Subfault: 10.4		
Description: Stack		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Overflow of Data Flexibility stack detected.	Check the program.
Subfault: 10.5		
Description: Division by 0		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Division by 0.	Check the program.
Subfault: 10.6		
Description: Runtime		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error/watchdog	Check the program. The program execution time exceeds the permitted time.
	PDI or PDO tasks.	Check the program. The execution time of the PDI or PDO task exceeds the permitted time.
Subfault: 10.7		
Description: Calculation result of multiplication/division command too large		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Calculation result of multiplication/division command exceeds 32 bits.	Check the program.
	Failed to write calculation result of multiplication/division command into result variable.	Check the program.
Subfault: 10.8		
Description: Illegal connection		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Index used in connect not allowed.	Check the program. The index used either does not exist or is not permitted for access via process data – see parameter list.
Subfault: 10.9		
Description: CRC code		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Wrong CRC checksum of code.	Load the program again. The program memory is corrupt. Unauthorized write access to the program memory.
Subfault: 10.11		
Description: No application program loaded		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	No Data Flexibility application program loaded.	Load the program or disable Data Flexibility.

11.3.8 Fault 11 Temperature monitoring

Subfault: 11.1		
Description: Heat sink overtemperature		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Maximum permitted heat sink temperature exceeded. The capacity utilization is possibly too high.	<ul style="list-style-type: none"> – Reduce the load. – Reduce the rms value of the current. – Reduce the PWM frequency. – Ensure sufficient cooling. – Reduce the ambient temperature.

Subfault: 11.2		
Description: Heat sink utilization – prewarning		
	Response: Warning	
	Cause	Measure
	High thermal load on heat sink of device, and prewarning threshold reached.	<ul style="list-style-type: none"> – Reduce the load. – Reduce the rms value of the output current. – Reduce the PWM frequency. – Ensure sufficient cooling. – Reduce the ambient temperature.
Subfault: 11.9		
Description: Signal electronics overtemperature		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Maximum permitted signal electronics temperature exceeded.	<ul style="list-style-type: none"> – Reduce the load. – Reduce the ambient temperature.

11.3.9 Fault 16 Startup

Subfault: 16.30		
Description: Faulty EtherCAT® EEPROM configuration state		
	Response: Warning	
	Cause	Measure
	Faulty EtherCAT®/SBus ^{PLUS} EEPROM configuration status. EEPROM not loaded; binary file not loaded.	Contact SEW-EURODRIVE Service.
	Faulty EEPROM loading procedure.	Contact SEW-EURODRIVE Service.
	Faulty EEPROM checksum.	Contact SEW-EURODRIVE Service.

11.3.10 Fault 17 Internal processor fault

Subfault: 17.7		
Description: Exception error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Exception trap in CPU.	Contact SEW-EURODRIVE Service.

11.3.11 Fault 18 Software error

Subfault: 18.4		
Description: Task system		
	Response: Emergency stop + output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Error detected while processing internal task system. This may be a timeout for cyclical tasks, for example.	<ul style="list-style-type: none"> – Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.
Subfault: 18.7		
Description: Fatal error		
	Response: Emergency stop + output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Fatal software error.	<ul style="list-style-type: none"> – Switch the device off and on again. – If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service.
Subfault: 18.8		
Description: Invalid fault code		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Invalid fault code requested.	<ul style="list-style-type: none"> – Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.

Subfault: 18.9		
Description: Internal software error		
	Response: Emergency stop + output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The software reports an unexpected event.	– Switch the device off and on again. – If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service.
Subfault: 18.10		
Description: Watchdog		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Software no longer operates within intended cycle time.	– Switch the device off and on again. – Contact SEW-EURODRIVE Service if the fault persists.
Subfault: 18.12		
Description: Configuration data		
	Response: Emergency stop + output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Configuration data not plausible or cannot be interpreted by active firmware version.	Update the firmware or load valid configuration data.

11.3.12 Fault 19 Process data

Subfault: 19.10		
Description: Drive function does not exist		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Non-existent drive function (FCB) selected via process data.	Enter the correct FCB number.

11.3.13 Fault 20 Device monitoring

Subfault: 20.1		
Description: Supply voltage fault		
	Response: Emergency stop + output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Internal electronics supply voltage or externally connected DC 24 V standby supply voltage outside permitted voltage range.	Check the voltage level of the external DC 24 V standby supply voltage and check for correct connection. If required, correct. – Acknowledge the fault. – If the fault occurs repeatedly, replace the device. For further support, contact SEW-EURODRIVE Service.
Subfault: 20.8		
Description: Fan warning		
	Response: Warning with self-reset	
	Cause	Measure
	Fan function impaired.	Check the fan for proper functioning.
Subfault: 20.9		
Description: Fan fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Fan defective.	Contact SEW-EURODRIVE Service.

11.3.14 Fault 23 Power section

Subfault: 23.1		
Description: Warning		
	Response: Warning	
	Cause	Measure
	Power section fault with fault response of the type "Warning".	See also "Power section subcomponent" fault status.

Subfault: 23.4		
Description: Hardware fault		
Response: Emergency stop + output stage inhibit		
	Cause	Measure
	A fault occurred in a hardware component of the power section, e.g.: Overcurrent hardware comparator.	<ul style="list-style-type: none"> – Check the current supply. – Increase the ramp time. – Check for correct motor size (the motor current is too high). – Contact SEW-EURODRIVE Service.
	Switched-mode power supply fault, hardware fault.	<ul style="list-style-type: none"> – Check the current supply. – Check the DC 24 V supply voltage.
	Fault at the gate driver of an IGBT.	Defect in the power output stage. Contact SEW-EURODRIVE Service.
	Invalid process data configuration. Status of control section and power section are not compatible.	Contact SEW-EURODRIVE Service.

11.3.15 Fault 25 Parameter memory monitoring

Subfault: 25.1		
Description: Timeout warning		
Response: Warning with self-reset		
	Cause	Measure
	Access to memory (R/W) takes longer than expected.	The error will be reset automatically after completed memory access.
Subfault: 25.2		
Description: NV memory – runtime error		
Response: Emergency stop + output stage inhibit		
	Cause	Measure
	Runtime error of non-volatile memory system.	<ul style="list-style-type: none"> – Reset the device. – If this error occurs repeatedly, replace the device. Contact SEW-EURODRIVE Service.
Subfault: 25.6		
Description: Incompatible device configuration		
Response: Emergency stop + output stage inhibit		
	Cause	Measure
	The data set in the device was copied from another device, which differs from the current device in the device family, power, or voltage.	<ul style="list-style-type: none"> – Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
	Replaceable memory module used by another device. Power rating, device family, or voltage differs from the current device.	<ul style="list-style-type: none"> – Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
	The power section was replaced and differs in its power rating or voltage from the original power section.	<ul style="list-style-type: none"> – Check whether the configuration is correct and repeat the startup, if necessary. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".
Subfault: 25.7		
Description: NV memory initialization – error		
Response: Emergency stop + output stage inhibit		
	Cause	Measure
	Error initializing non-volatile memory system.	<ul style="list-style-type: none"> – Reset the device. – If this error occurs repeatedly, replace the device. Contact SEW-EURODRIVE Service.
Subfault: 25.10		
Description: Power section configuration data – version conflict		
Response: Emergency stop + output stage inhibit		
	Cause	Measure
	Wrong version of configuration data of power section.	Contact SEW-EURODRIVE Service.

Subfault: 25.11		
Description: Control electronics configuration data – version conflict		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Wrong version of configuration data of control electronics.	Contact SEW-EURODRIVE Service.
Subfault: 25.12		
Description: Power section configuration data – CRC error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Faulty configuration data of power section.	Contact SEW-EURODRIVE Service.
Subfault: 25.13		
Description: Control electronics configuration data – CRC error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Faulty configuration data of control electronics.	Contact SEW-EURODRIVE Service.
Subfault: 25.18		
Description: Power section QA data – CRC error		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of power section.	Contact SEW-EURODRIVE Service.
Subfault: 25.19		
Description: Control electronics QA data – CRC error		
	Response: Warning	
	Cause	Measure
	Faulty quality assurance data of control electronics.	Contact SEW-EURODRIVE Service.
Subfault: 25.20		
Description: Initialization error – basic device memory		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Initialization error of the basic device memory.	Contact SEW-EURODRIVE Service.
Subfault: 25.21		
Description: Runtime error – basic device memory		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Runtime error in memory of basic device.	Contact SEW-EURODRIVE Service.
Subfault: 25.61		
Description: Failure – restore point		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Failed to create restore point.	Delete restore point.
Subfault: 25.70		
Description: Incompatible card configuration		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The current configuration of the cards does not match the state of the stored startup. For example, a card was removed that was still present during startup.	– Restore the original configuration of the cards. – Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset".

11.3.16 Fault 26 External fault

Subfault: 26.1		
Description: Terminal		
	Response: External fault	
	Cause	Measure
	Fault message about external fault source.	Programmable via 8622.5 (default: application stop (with output stage inhibit)).

Subfault: 26.2		
Description: Emergency shutdown		
Response: Output stage inhibit		
	Cause	Measure
	Another module bus station requested external emergency shutdown.	Check other module bus stations for faults.
Subfault: 26.4		
Description: External braking resistor fault		
Response: Inhibit brake chopper		
	Cause	Measure
	External braking resistor's temperature switch connected to terminal tripped.	<ul style="list-style-type: none"> – Check the resistor mounting position. – Clean the resistor. – Check the configuration of the resistor. – Install a larger resistor. – Check the trip switch settings. – Optimize the travel cycle so that less regenerative operation energy is produced.

11.3.17 Fault 32 Communication

Subfault: 32.2		
Description: EtherCAT®/SBus^{PLUS} process data timeout		
Response: Fieldbus – timeout response		
	Cause	Measure
	Process data timeout during EtherCAT®/SBus ^{PLUS} communication.	<ul style="list-style-type: none"> – Check the wiring of the system bus and module bus. – Check that the EtherCAT®/SBus^{PLUS} configuration is set correctly in the MOVI-C® CONTROLLER. – Check the EtherCAT®/SBus^{PLUS} timeout configuration in the device.
Subfault: 32.3		
Description: Faulty synchronization signal		
Response: Warning		
	Cause	Measure
	Faulty synchronization signal period.	Check for correct setting of the EtherCAT®/SBus ^{PLUS} configuration in the MOVI-C® CONTROLLER.
Subfault: 32.4		
Description: No synchronization signal		
Response: Warning		
	Cause	Measure
	No synchronization signal present.	Check for correct setting of the EtherCAT®/SBus ^{PLUS} configuration in the MOVI-C® CONTROLLER.
Subfault: 32.5		
Description: Synchronization timeout		
Response: Warning		
	Cause	Measure
	Timeout while synchronizing to synchronization signal.	Check for correct setting of the EtherCAT®/SBus ^{PLUS} configuration in the MOVI-C® CONTROLLER.
Subfault: 32.6		
Description: Copy parameter set		
Response: Emergency stop + output stage inhibit		
	Cause	Measure
	Error while downloading parameter set to device.	<ul style="list-style-type: none"> – Check the wiring of the system bus and module bus. – Restart download.
Subfault: 32.7		
Description: Application heartbeat timeout		
Response: Warning		
	Cause	Measure
	Communication interrupted between IEC program in MOVI-C® CONTROLLER and device.	<ul style="list-style-type: none"> – Check the status of the IEC program. – Restart the IEC program.

11.3.18 Fault 33 System initialization

Subfault: 33.2		
Description: Firmware CRC check		
	Response: Emergency stop + output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Error checking firmware.	Contact SEW-EURODRIVE Service.
Subfault: 33.6		
Description: FPGA configuration		
	Response: Emergency stop + output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Error checking FPGA configuration.	Contact SEW-EURODRIVE Service.
Subfault: 33.10		
Description: Run-up timeout		
	Response: Emergency stop + output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Timeout during system run-up.	Contact SEW-EURODRIVE Service.
Subfault: 33.12		
Description: Memory module plugged in		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	A plugged-in memory module was detected during device start. The setting for the device parameter source is set to "Internal memory".	– Switch off the device. Remove the memory module and re-start the device. – Change the parameter "Non-volatile memory source" to "Arbitrary" or "Replaceable memory module". Switch the device off and on again.
Subfault: 33.13		
Description: Memory module removed		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The device was started without a memory module. The setting for the device parameter source is set to "Replaceable memory module".	Switch off the device. Insert the memory module and restart the device.
	Replaceable memory module removed during ongoing operation.	Change the parameter "Non-volatile memory source" to "Internal memory". Switch the device off and on again.
Subfault: 33.14		
Description: EtherCAT® slave controller cannot be accessed		
	Response: Emergency stop + output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	EtherCAT® slave controller cannot be accessed.	Contact SEW-EURODRIVE Service.

11.3.19 Fault 34 Process data configuration

Subfault: 34.1		
Description: Changed process data configuration		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Process data configuration changed during active process data operation.	– Stop the process data and make your changes. Then start the process data again. – Perform a reset. Doing so will stop the process data, apply the changes, and restart the process data.

11.3.20 Fault 35 Function activation

Subfault: 35.1
Description: Activation level – invalid activation key

Response: Emergency stop + output stage inhibit		
	Cause	Measure
	The activation key was entered incorrectly.	Enter the activation key again.
	The activation key was not created for this device.	Check the activation key.
	When using a double axis, the activation key for the wrong instance was entered in the device.	Enter the activation key for the allocated instance.
	Activation key entered for technology level in parameter "Application level – activation key".	Enter the activation key in the correct parameter.

Subfault: 35.2
Description: Application level too low

Response: Emergency stop + output stage inhibit		
	Cause	Measure
	The activated software module requires a higher application level.	Activation key was entered for required application level. You can read the required level from the parameter "Application level – Required level".

Subfault: 35.3
Description: Technology level too low

Response: Emergency stop + output stage inhibit		
	Cause	Measure
	An activated technology function requires a higher technology level.	Enter an activation key for the required technology level. You can find the required level in the parameter 8438.13 "Technology level – Required level".

Subfault: 35.4
Description: Technology level – invalid activation key

Response: Emergency stop + output stage inhibit		
	Cause	Measure
	The activation key was entered incorrectly.	Enter the activation key again.
	The activation key was not created for this device.	Check the activation key.
	When using a double axis, the activation key for the wrong instance was entered in the device.	Enter the activation key for the allocated instance.
	Activation key entered for application level in parameter "Technology level – activation key".	Enter the activation key in the correct parameter.

11.3.21 Fault 47 Supply unit

Subfault: 47.1
Description: Supply unit – warning

Response: Warning with self-reset		
	Cause	Measure
	The supply unit signals a fault with response type "warning". The fault is only displayed.	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent.

Subfault: 47.2
Description: Supply unit – standard fault

Response: Warning with self-reset		
	Cause	Measure
	The supply unit signals a fault with response type "standard". The driver implemented on the axis or the module bus slave determines a fault response. The axis or module bus slave performs the fault response.	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent.

Subfault: 47.3
Description: Supply unit – critical fault

Response: Output stage inhibit		
	Cause	Measure
	The supply unit signals a fault with response type "critical error". The driver implemented on the axis or the module bus slave determines a fault response. The axis or module bus slave performs the fault response.	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent.

11.3.22 Fault 48 Module bus

Subfault: 48.2		
Description: Timeout		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Timeout detected via module bus.	Check cable connections and voltage supply of module bus stations.
Subfault: 48.3		
Description: Number of module bus slaves exceeded		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Too many module bus slaves.	Reduce the number of module bus slaves to a maximum of one module bus slave.
Subfault: 48.4		
Description: CRC error		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	CRC error during module bus communication.	<ul style="list-style-type: none"> – Restart the device. – Reset the error. – Contact SEW-EURODRIVE service if the error reoccurs.
Subfault: 48.5		
Description: Change of module bus configuration		
	Response: Emergency stop + output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The module bus configuration has been changed. The device must be restarted.	Acknowledge the fault.

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11.3.23 Fault 81 Storage unit

Subfault: 81.1		
Description: Overvoltage		
	Response: Output stage inhibit	
	Cause	Measure
	Maximum storage voltage exceeded.	Discharge the storage unit.
Subfault: 81.2		
Description: Overvoltage – prewarning		
	Response: Warning	
	Cause	Measure
	Prewarning threshold for maximum storage voltage exceeded.	Discharge the storage unit.
Subfault: 81.14		
Description: Overtemperature (storage cells)		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Storage unit overloaded.	Reduce the load.

11.3.24 Fault 82 Subcomponent storage unit

Subfault: 82.3		
Description: Critical fault		
	Response: Output stage inhibit	
	Cause	Measure
	Storage unit signals subcomponent fault with fault response "critical fault".	For the exact cause of the fault and for information on how to correct the cause of the problem, refer to the fault reported by the subcomponent.

Subfault: 82.8**Description: Storage unit communication error**

	Response: Output stage inhibit	
	Cause	Measure
	Error detected on communication interface with storage unit.	If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

11.4 Responses to fault acknowledgment

11.4.1 Fault acknowledgement at the power supply module and the DC/DC converter

During fault acknowledgment, the final fault status determines which reset type will be executed, see following table.

If the power supply module is configured as module bus master, the faults are transferred to the module bus slaves, see chapter "Module bus – fault transmission" (→ 145).

Software reset

Response	Effect
System restart with start of the CPU	Behavior equal to device start
	Reference is lost
	Fieldbus interface is restarted
	EtherCAT®/SBus ^{PLUS} is restarted
	The active "fault message" is reset (digital output = 1, system status = 0).

The ready signal is set again depending on the system state after the reset by the system state control.

11.5 Fault responses

11.5.1 Default – fault response

Fault response	Description
No response	The power supply module ignores the event.
Warning with self-reset	The power supply module sends a warning message with self-reset. The fault is automatically reset after the cause of fault is eliminated.
Warning	The power supply module issues a warning message.
Emergency stop (+ output stage inhibit)	The output stage is deactivated.
Output stage inhibit	The output stage is deactivated.
Inhibit brake chopper	The output stage and the brake chopper are deactivated.

Self-reset means: Eliminating the cause of the fault acknowledges the fault. The power supply module automatically resumes the operation performed before the fault. The voltage and current can increase automatically.

11.5.2 Parameterizable faults

Parameterizable faults	Description	Index no.	Possible fault response
Line phase failure	Here you can set the device response to a line phase failure.	8622.4	<ul style="list-style-type: none"> No response Warning Emergency stop (+ output stage inhibit) Output stage inhibit
Power failure	Here you can set the device response to a power failure.	8622.9	<ul style="list-style-type: none"> No response Warning Emergency stop (+ output stage inhibit) Output stage inhibit
Fieldbus – timeout	Here you can set the device response to a timeout on the EtherCAT®/SBus ^{PLUS} (timeout period, Index 8455.3).	8622.6	<ul style="list-style-type: none"> Warning Warning with self-reset Emergency stop (+ output stage inhibit) Output stage inhibit Emergency stop (+ output stage inhibit) with self-reset Output stage inhibit with self-reset
Line undervoltage	Here you can set the device response to a line undervoltage.	8622.23	<ul style="list-style-type: none"> No response Warning
External fault	Here you can set the device response to a fault message via external fault source		<ul style="list-style-type: none"> No response Warning Emergency stop (+ output stage inhibit) Output stage inhibit

11.5.3 Module bus – fault transmission

The module bus master sends all fault codes, subfault codes, fault messages and the type of the fault that occur to all connected module bus slaves using the module bus. The fault processing in the slave only evaluates the type of the fault. Fault code and subfault code serve only as information. Depending on the type of the fault, the slave triggers the respective fault response.

If the power supply module is configured as module bus master, the faults of the master are transferred to the module bus slaves under the fault group E47.x. The fault group "47 Supply unit" includes 3 stages as to how the faults are classified. The exact fault is signaled as fault of the subcomponent (index 8365.3 in module bus slave).

These 3 stages include:

- E47.1 Supply unit – warning
- E47.2 Supply unit – standard fault
- E47.3 Supply unit – critical fault

Using parameter "8627.4 Fault transmission mode", you can configure the severity of faults. The following configuration can be selected.

- Normal: Slave reacts to the faults of the module bus master with the configured fault response.

The faults are classified according to their fault response:

- E47.1 Supply unit – warning:
 - Warning
 - Warning with self-reset
- E47.2 Supply unit – standard fault:
 - Emergency stop + output stage inhibit
 - Emergency stop (+ output stage inhibit) with self-reset
- E47.3 Supply unit – critical fault:
 - Output stage inhibit with self-reset
 - Output stage inhibit
 - Inhibit brake chopper
- Warning: The faults of the module bus master are always transferred and treated as a warning independent of their fault level. This setting is required, for example, if the slaves should continue to work in case of a power failure that was detected by the master.

Example power failure:

There are two options for configuration if the module bus slaves are to ignore the power failure that was detected in the master:

1. Parameter 8627.4
Set fault transmission mode to "Warning": All faults of the master are processed as warning.
2. Only the configurable line faults (line phase failure, power failure and line under-voltage) are set to "Warning" or "No response". Other faults can be treated as standard or critical faults.

11.5.4 Module bus – emergency shutdown

With system conditions that may damage or destroy the devices, it is important that the output stages of the devices can be inhibited quickly. The module bus master has an emergency shutdown function that is triggered with critical faults. Each station may activate the emergency shutdown.

Emergency shutdown of the power supply module is only performed in case of an overvoltage on the A- or B-side. If the emergency shutdown is triggered by another station, fault "26.2 Emergency shutdown" is executed. This fault can be reset only if no further station triggers the emergency shutdown.

11.6 Module bus faults

The module bus master sends all occurring fault messages to the connected module bus stations (slaves) using the module bus. The faults are divided into 3 categories (warning, standard fault, critical fault). There are two fault transmission modes (normal, warning) available, see chapter "Module bus – fault transmission".

With system conditions that may damage or destroy the axis system, it is important that the output stages of the drives can be inhibited quickly. For this purpose, the module bus offers emergency shutdown, see chapter "Module bus – fault transmission".

If necessary, the module bus communication in the device can be partially deactivated. This means the module bus data in the device is not evaluated, the module bus communication however proceeds if module bus stations are connected to each other. For safety reasons, the device responds to the emergency shutdown.

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11.6.1 Grid condition

Regardless of the set fault responses of the different line faults, the module bus master sends information on the grid condition to other module bus stations (slaves) using the module bus.

The grid condition is only relevant when connecting the module bus slaves. There must be a transition from <Grid OFF> to <Grid OK>. Only then, the slaves are ready to be connected. If there is a line fault or a transition away from <Grid OK> during operation, the slaves do not respond to this information. They respond according to the settings of their own monitoring function.

The power supply module must be able to supply the application using the storage units or another DC source (also external source) if the AC grid has partly or completely failed or if it is not even connected. In this case, the module bus master must not prevent the module bus stations (slaves) from connecting. For this purpose, the parameter "8627.3 sending grid condition" is available. Here, it is possible to set that the grid condition is not transferred, which means the slaves will connect independently of the grid condition.

11.6.2 DC link condition

The DC link condition is determined in the same manner as the grid condition.

11.6.3 Line phase failure

Regardless of the set fault response, the module bus master transmits a line phase failure to other module bus stations (slaves) using the module bus.

This status leads to a fault response in the module bus slave. However, this response can be set in the module bus slave. The response to a line phase failure can also be set at the module bus master, see chapter "Fault responses".

11.7 Monitoring functions

With MDE90A-..., the supply system monitoring function is reduced to phase failure. The other functions, such as power supply monitoring are available with MDE90A-.. and MDP92A-..

11.7.1 Power supply monitoring

The line frequency of the connected AC grid must be set correctly so that the line voltages can be measured correctly. This is done by using the parameter "8809.20 line frequency".

Monitoring is started at an interval of 1 ms. The phase-to-phase voltage of the grid is monitored. If the device is configured as module bus slave, the grid condition itself is not monitored, but it is read out of the module bus data of the master.

The following events are monitored and reported:

- Line phase failure
In the device status, the flag of the failed phase is set to 0 in grid condition.
- Power failure
All flags of the grid condition are set to 0 in the device status.
- Line overvoltage
- Line undervoltage

Phase failure cannot be parameterized. If a phase failure is detected, it is signaled, and the grid condition is adjusted accordingly.

However a module bus slave, regardless of whether it has an AC connection or not, receives a phase failure transmitted by the module bus master and evaluates it accordingly.

The following limit values are available for monitoring:

- Parameter "8809.21 Power off threshold"
If all phase-to-phase voltages exceed this threshold, the grid is detected as "ON" and the supply system monitoring starts. If one of the phase-to-phase voltages falls below the set value, averaging over 100 ms of each phase-to-phase voltage starts. If all phase-to-phase voltages fall below the set value during the averaging process, a power failure is detected and the corresponding fault "E06.02" is signaled and the grid condition is adjusted accordingly using the parameter "8809.24". Monitoring starts from the beginning.

After 100 ms, the mean value is checked by means of the parameter "8809.23 Minimum line voltage". If a fault is detected, monitoring starts from the beginning, from the point when the grid was detected as "ON".
- Parameter "8809.22 Maximum line voltage"
If one of the phase-to phase voltages exceeds the set value, the device signals fault "E06.3 Line overvoltage".
- Parameter "8809.23 Minimum line voltage"
If the grid is detected as "ON", averaging over 100 ms starts even if one of the phase-to-phase voltages has fallen below the set value. If the averaging process has been completed, it is checked whether one of the mean values has fallen below the set voltage. If this is the case, fault "E06.04 Line undervoltage" is signaled and the grid condition is adjusted accordingly using the parameter "8809.24".

However a module bus slave, regardless of whether it has an AC connection or not, receives a phase failure transmitted by the module bus master and evaluates it accordingly.

11.7.2 Rapid undervoltage detection

The voltage on the output stage of the A- or B-side is monitored. Monitoring is started at an interval of 0.5 ms. If this monitoring detects a grid as "ON", the respective bit is set in the parameter "8809.24 grid condition". Rapid undervoltage detection can be set using the following parameters.

- Response of the device to undervoltage using parameter "8351.10"
 - No response
 - Warning

The device signals fault "E-07.07 undervoltage A- or B-side". The parameter "8809.24 Grid condition" is not adjusted.

- Output stage inhibit

With this setting, the device does not signal any faults but it changes to the state "Not ready". This means the output stage is inhibited and the display shows "00". The device status is adjusted accordingly. The bit "DC 24 V standby mode" is set into the status bit "Not ready – power supply" as the reason for "Not ready". The flag "Line voltage on" is set to 0 in parameter "8809.24 Grid condition".

- Selection of the output stage end to be monitored using parameter "8351.11"
 - None
 - A-side
 - B-side
 - Both (the voltages on the A-side and B-side must be below the set limit)

- Voltage level for detection of undervoltage using parameter "8351.12"

If the DC voltage of the A- or B-side is underrun, it is interpreted as undervoltage depending on the setting of parameter 8351.11.

If this value is underrun, the response to undervoltage is performed according to parameter "8351.10".

11.7.3 DC link monitoring

Monitoring is started at an interval of 1 ms. The grid is monitored by means of the DC voltages of the A-side and/or B-side depending on the setting.

With DC link monitoring, no fault is triggered. The device changes its status from "Ready" to "Not ready" in case of undervoltage, inhibiting the monitored output stage end.

The device display shows "00". The bit "DC 24 V standby mode" is set into the status bit "Not ready – power supply" as the reason for "Not ready".

Rapid DC link monitoring can be set using the following parameters.

- Monitoring the selection of the output stage end

The parameter "8809.25" is used to select which output stage end is to be monitored.

 - None
 - A-side
 - B-side
- Voltage level "On" adjustable using parameter "8809.26"
 - Level

11.7.4 Short circuit monitoring

The following parameters are available in group 8809 "Output stage monitoring – Power supply for configuring short circuit monitoring".

These can normally be left at the default values.

- 8809.100 "Short circuit monitoring: voltage limit (A-side)"
- 8809.101 "Short circuit monitoring: voltage limit (B-side)"
- 8809.102 "Short circuit monitoring: activate (A-side)"
- 8809.103 "Short circuit monitoring: activate (B-side)"

Furthermore, short circuit monitoring requires information about the connected capacitances to detect a short circuit correctly. Short circuit monitoring retrieves this information from the parameters of other groups. Their values have to be set according to the application:

- 8811 "Configuration – power supply"
 - 8811.11 "Output stage capacitance (A-side)". This value is obtained from the configuration data of the device.
 - 8811.12 "Output stage capacitance (B-side)". This value is obtained from the configuration data of the device.
 - 8811.13 "Capacitance application fixed (A-side)".
 - 8811.14 "Capacitance application fixed (B-side)".
- 8817 "Configuration data – storage unit".
 - 8817.6 "Capacitance (electrostatic)".
- 8818 "Charge management".
 - 8818.52 "Output stage end".

If a short circuit is detected, the device signals fault E07.08 Short circuit A-side or B-side.

Short circuit monitoring during charging

Monitoring can only detect the short circuit if the device is currently feeding current into this short circuit.

This is a plausibility check between the energy applied to the monitored side, the capacitance of this side, and the resulting voltage rise.

Monitoring is performed up to the voltage limit set by parameter 8809.100 or 8809.101. This means that the measurement lasts until the voltage must theoretically have risen above this limit. In order to be able to work reliably, the voltage must therefore be selected in such a way that up to this voltage no consumers start up.

The lower the voltage limit, the shorter the time until a short circuit is signaled. And consequently also the time during which the current flows into the short circuit. The higher the capacitance or the lower the applied current, the slower will the voltage rise and consequently also the time until a fault is detected.

Short circuit monitoring during operation

Fast transient voltage dips are monitored in this case. A short circuit is detected if an implausible voltage drop is detected for the specified capacitance.

12 Service

12.1 Electronics Service by SEW-EURODRIVE

If you are unable to rectify a fault, contact SEW-EURODRIVE Service. For the addresses, refer to www.sew-eurodrive.com.

When contacting SEW-EURODRIVE Service, always specify the following information so that our service personnel can assist you more effectively:

- Information on the device type on the nameplate (e.g. type designation, serial number, part number, product key, purchase order number)
- Brief description of the application
- Fault message on the status display
- Nature of the fault
- Accompanying circumstances
- Any unusual events preceding the problem

12.2 Extended storage

12.2.1 MDC90A capacitor module

Storage conditions

For the MDC90A device, the defined storage temperature is between -25 °C and +70 °C.

If one of the following conditions applies, measures must be taken prior to startup:

- The storage period exceeds 2 years
- The storage temperature is constantly higher than 35 °C

In this case, an initial current that is increased by a factor of up to 100 may flow for a short time during startup. That is why SEW-EURODRIVE recommends to take specific measures for startup.

12.3 Shutdown

Voltage from charged capacitors can still be present at the live components or power connections after disconnection from the supply voltage. Observe the following information to avoid electric shock and risk of injury:



▲ WARNING

The energy storage units are still charged after the device has been switched off.

Severe or fatal injuries from electric shock.

The energy storage units must be discharged before you perform any work on the device. Only electrically skilled persons may discharge the energy storage units and install the fused connectors for discharging. For further information, refer to the documentation "MOVI-DPS® Discharge Unit".



▲ WARNING

With the MDP92A on the AC grid, voltage is present between PE and DC link even in deactivated state.

Severe or fatal injuries from electric shock.

All work on the DC link may only be carried out after complete disconnection from the grid.

- Prior to any electric work, the energy storage units must be discharged using the discharge units from SEW-EURODRIVE or discharge resistors.
- Observe the hazard symbols on the product.
- Disconnect the device from the power supply.
- Connect the energy storage unit to the discharge unit according to the listed connection variants.

After discharging the energy storage units, the system must be protected against re-charging with a short circuit.

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12.4 Discharging the energy storage units using the discharge unit

A requirement for discharging the energy storage units using the discharge unit is installation with the DCP21A cable set and further accessories depending on the connection variant.

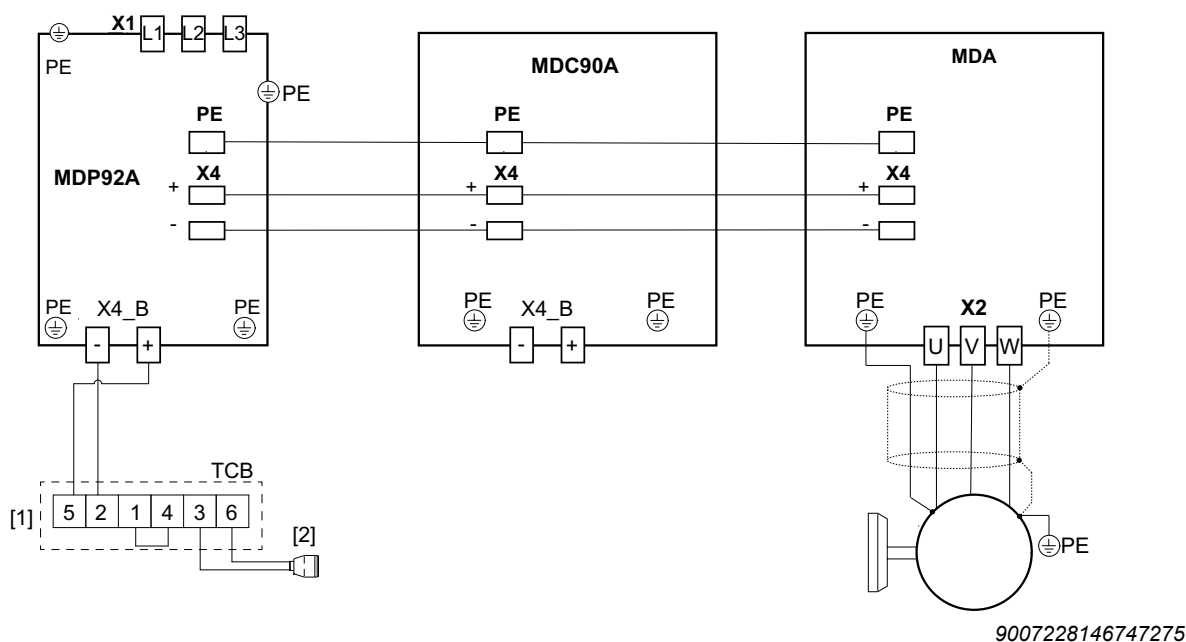
Always use a TCB thermal circuit breaker as line protection. The cable length to the discharge plug must not exceed 3 m.

Another requirement is that the discharge connector is installed at the control cabinet.

You can choose between 3 connection variants for discharging.

12.4.1 Connection variant 1

With connection variant 1, the discharge unit is connected to the MDP92A power supply module using the TCB thermal circuit breaker.

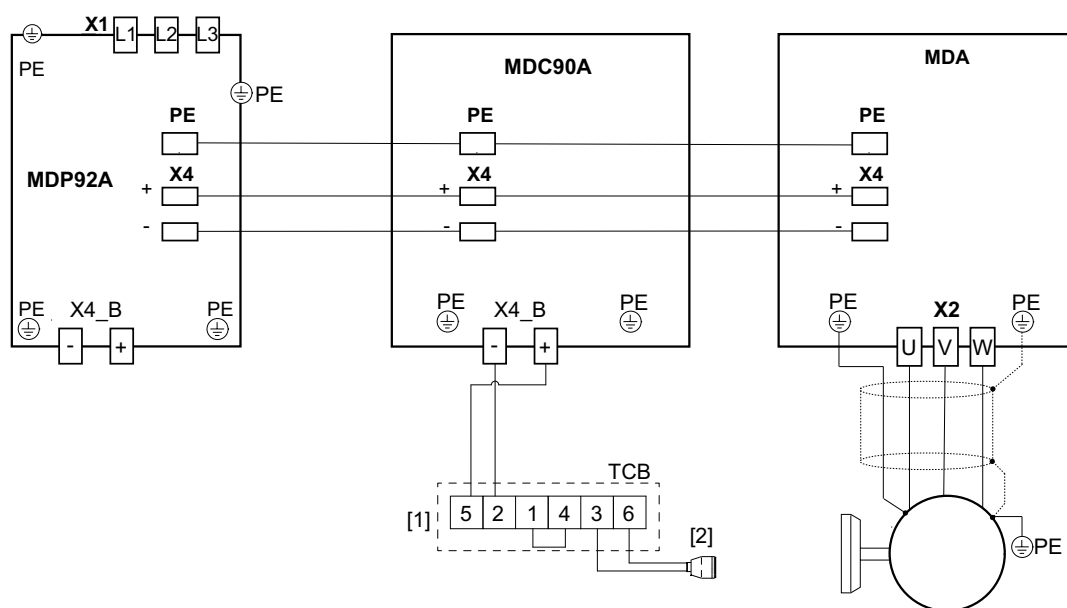


[1] TCB thermal circuit breaker

[2] Connector plug of discharge unit

12.4.2 Connection variant 2

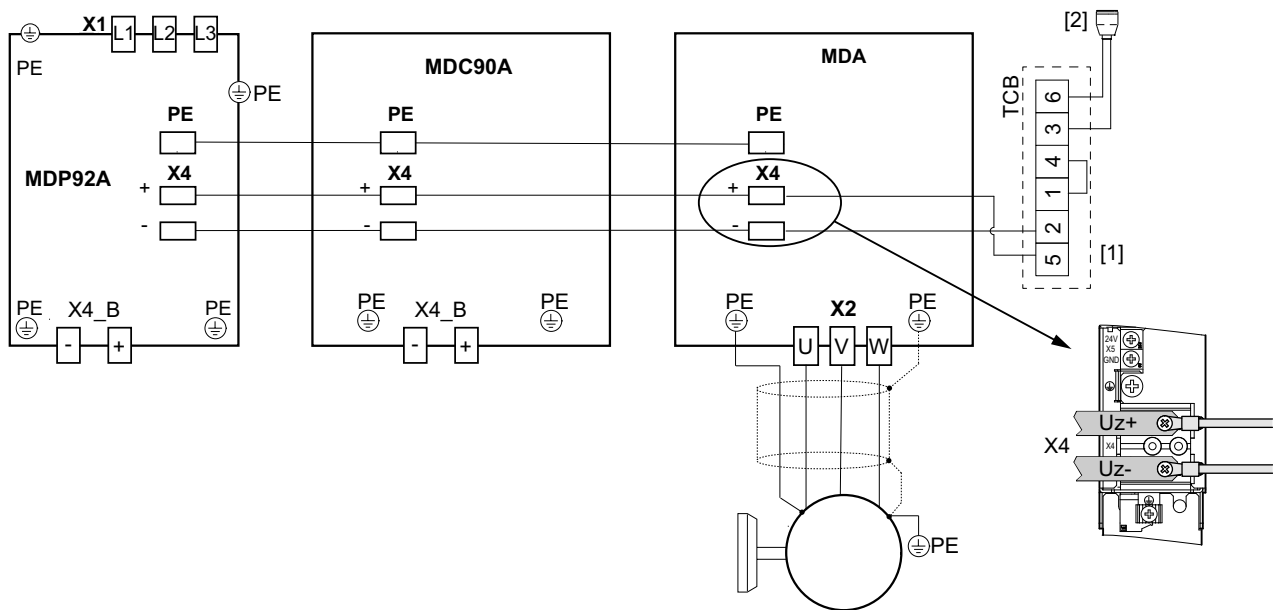
With connection variant 2, the discharge unit is connected to the MDC90A capacitor module using the TCB thermal circuit breaker.



- [1] TCB thermal circuit breaker
- [2] Connector plug of discharge unit

12.4.3 Connection variant 3

With connection variant 3, the discharge unit is connected to the DC link busbar of the last axis module MDA/MDD using the TCB thermal circuit breaker.



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- [1] TCB thermal circuit breaker
- [2] Connector plug of discharge unit

12.5 Discharging the energy storage units using the braking resistor

The power supply module with controlled DC link MDP92A has a connection for an external discharge resistor. The external discharge resistor is controlled by the internal brake chopper and can be used to discharge the DC circuit connected to side A.

If an overcurrent is present in the brake chopper, the brake chopper must be inhibited. Fault "F4.1 Brake chopper overcurrent" is executed.

If one of the terminals signals a fault of an external braking resistor, the brake chopper and the output stage are inhibited. Fault "E26.4 External braking resistor fault" is executed.

The system can only be discharged completely if the 24 V switched-mode power supply module MDS90A¹⁾ is connected in addition to the DC busbar via pin "+UZB" of MDP92A-... or directly to the AC supply system.

Discharge can be activated via the braking resistor in two ways.

1) In preparation

12

12.5.1 Activation via control technology

Discharge can be carried out via control technology. In this case, the parameters of the discharge resistor are entered, among others. The controller then takes over clocked control of the brake chopper for complete discharge of the DC link. An excess temperature in the discharge resistor is avoided in this way.

This application is recommended when discharging large storage units.

For more information, refer to the "MOVIKIT®" manuals.

12.5.2 Activation via control word

The resistor on the A-side can be activated manually using control word "8809.9 External resistor – control word". The discharge resistor is loaded with full current. Large amounts of energy can quickly cause the resistor to overheat, causing the TCB to trip.

This application is recommended only for discharging small storage units (MDC90A).

12.6 Waste disposal

Observe the applicable national regulations.

Dispose of the following materials separately in accordance with the country-specific regulations in force, such as:

- Electronics scrap (printed circuit boards)
- Plastic
- Sheet metal
- Copper
- Aluminum



This product falls within the scope of the European WEEE Directive 2012/19/EU on waste electrical and electronic equipment.

Under no circumstances may electrical and electronic equipment be placed in regular household waste. The product must be disposed of properly in accordance with the currently applicable statutory regulations of the respective EU Member State, Norway, Liechtenstein, and Iceland.

The aim of this is to ease the burden on natural resources and to protect the environment and human health from hazardous substances by bringing them to recycling.

13 Appendix

13.1 Abbreviation key

The following table lists the abbreviations that are used in this document together with their unit and meaning.

Abbreviation	Information on the nameplate	Unit	Meaning
ASM			Asynchronous motor
C	C	μF	Capacitance
f_{max}	f	Hz	Maximum output frequency
f_{line}	f	Hz	Line frequency
f_{PWM}		kHz	Frequency of the pulse width modulation
h		m	Installation altitude
I_{trip}		A	Tripping current (braking resistor)
I_{max}	I_{max}	A	Max. DC link current (specification on the nameplate)
I_{max}		A	Maximum output current (encoder cards)
I_{peak}		A	Output peak current (encoder cards)
$I_{\text{A max}}$		A	Max. output current
I_{Appl}		A	Total current of the application
I_{N}		A	Nominal output current/nominal current (filter, choke)
I_{line}	I	A	Nominal line current
I_{NDCL}	I	A	Nominal DC link current
L_{N}		mH	Inductance
LSPM			Line Start Permanent Magnet
P_{eff}		kW	Effective power (braking resistor)
P_{max}		kW	Maximum power (braking resistor)
P_{Mot}	P(ASM)	kW	Motor power of the asynchronous motor
P_{N}		kW	Nominal motor power (rated power)
P_{V}		W	Power loss
PWM			Pulse width modulation
R_{BW}		Ω	Value of the braking resistance
R_{BWmin}		Ω	Minimum value of the braking resistance
S_{N}	S	kVA	Apparent output power
SM			Synchronous motor
U_{A}	U	V	Motor output voltage
U_{BR}		V	Brake supply voltage
U_{N}		V	Nominal line voltage (filter, choke)
U_{line}	U	V	Connection voltage
U_{NDCL}	U	V	Nominal DC link voltage

Abbreviation	Information on the nameplate	Unit	Meaning
U_{out}		V	DC 24 V to supply STO_P1 and STO_P2
U_S		V	Supply voltage of encoders
U_{S12VG}		V	DC 12 V supply voltage of encoders
U_{S24VG}		V	DC 24 V supply voltage of encoders
U_{I24}		V	Voltage supply for electronics and brake
ϑ_{amb}	T	°C	Ambient temperature
(+ES)			... with output stage inhibit

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14 Address list

Argentina

Assembly Sales	Buenos Aires	SEW EURODRIVE ARGENTINA S.A. Ruta Panamericana Km 37.5, Lote 35 (B1619IEA) Centro Industrial Garín Prov. de Buenos Aires	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 http://www.sew-eurodrive.com.ar sewar@sew-eurodrive.com.ar
-------------------	--------------	---	--

Australia

Assembly Sales Service	Melbourne	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. +61 3 9933-1000 Fax +61 3 9933-1003 http://www.sew-eurodrive.com.au enquires@sew-eurodrive.com.au
	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au

Austria

Assembly Sales Service	Vienna	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Straße 24 1230 Wien	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://www.sew-eurodrive.at sew@sew-eurodrive.at
------------------------------	--------	--	---

Bangladesh

Sales	Bangladesh	SEW-EURODRIVE INDIA PRIVATE LIMITED 345 DIT Road East Rampura Dhaka-1219, Bangladesh	Tel. +88 01729 097309 salesdhaka@seweurodrivebangladesh.com
-------	------------	---	---

Belarus

Sales	Minsk	Foreign unitary production enterprise SEW- EURODRIVE Rybalko Str. 26 220033 Minsk	Tel. +375 17 298 47 56 / 298 47 58 Fax +375 17 298 47 54 http://www.sew.by sales@sew.by
-------	-------	--	--

Belgium

Assembly Sales Service	Brussels	SEW-EURODRIVE n.v./s.a. Researchpark Haasrode 1060 Evenementenlaan 7 3001 Leuven	Tel. +32 16 386-311 Fax +32 16 386-336 http://www.sew-eurodrive.be info@sew-eurodrive.be
Service Competence Center	Industrial Gears	SEW-EURODRIVE n.v./s.a. Rue du Parc Industriel, 31 6900 Marche-en-Famenne	Tel. +32 84 219-878 Fax +32 84 219-879 http://www.sew-eurodrive.be service-IG@sew-eurodrive.be

Brazil

Production Sales Service	São Paulo	SEW-EURODRIVE Brasil Ltda. Estrada Municipal José Rubim, 205 – Rodovia Santos Dumont Km 49 Indaiatuba – 13347-510 – SP	Tel. +55 19 3835-8000 sew@sew.com.br
Assembly Sales Service	Rio Claro	SEW-EURODRIVE Brasil Ltda. Rodovia Washington Luiz, Km 172 Condomínio Industrial Conpark Caixa Postal: 327 13501-600 – Rio Claro / SP	Tel. +55 19 3522-3100 Fax +55 19 3524-6653 montadora.rc@sew.com.br
	Joinville	SEW-EURODRIVE Brasil Ltda. Jvl / Ind Rua Dona Francisca, 12.346 – Pirabeiraba 89239-270 – Joinville / SC	Tel. +55 47 3027-6886 Fax +55 47 3027-6888 filial.sc@sew.com.br

Bulgaria

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

Cameroon

Sales	Douala	SEW-EURODRIVE S.A.R.L. Ancienne Route Bonabéri P.O. Box B.P 8674 Douala-Cameroun	Tel. +237 233 39 02 10 Fax +237 233 39 02 10 sew@sew-eurodrive-cm
-------	--------	--	---

Canada

Assembly Sales Service	Toronto	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, ON L6T 3W1	Tel. +1 905 791-1553 Fax +1 905 791-2999 http://www.sew-eurodrive.ca l.watson@sew-eurodrive.ca
	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. Tilbury Industrial Park 7188 Honeyman Street Delta, BC V4G 1G1	Tel. +1 604 946-5535 Fax +1 604 946-2513 b.wake@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2001 Ch. de l'Aviation Dorval Quebec H9P 2X6	Tel. +1 514 367-1124 Fax +1 514 367-3677 n.paradis@sew-eurodrive.ca

Chile

Assembly Sales Service	Santiago de Chile	SEW-EURODRIVE CHILE LTDA Las Encinas 1295 Parque Industrial Valle Grande LAMP Santiago de Chile P.O. Box Casilla 23 Correo Quilicura - Santiago - Chile	Tel. +56 2 2757 7000 Fax +56 2 2757 7001 http://www.sew-eurodrive.cl ventas@sew-eurodrive.cl
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China

Production Assembly Sales Service	Tianjin	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 78, 13th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25323273 http://www.sew-eurodrive.cn info@sew-eurodrive.cn
Assembly Sales Service	Suzhou	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021	Tel. +86 512 62581781 Fax +86 512 62581783 suzhou@sew-eurodrive.cn
	Guangzhou	SEW-EURODRIVE (Guangzhou) Co., Ltd. No. 9, JunDa Road East Section of GETDD Guangzhou 510530	Tel. +86 20 82267890 Fax +86 20 82267922 guangzhou@sew-eurodrive.cn
	Shenyang	SEW-EURODRIVE (Shenyang) Co., Ltd. 10A-2, 6th Road Shenyang Economic Technological Development Area Shenyang, 110141	Tel. +86 24 25382538 Fax +86 24 25382580 shenyang@sew-eurodrive.cn
	Taiyuan	SEW-EURODRIVE (Taiyuan) Co., Ltd. No.3, HuaZhang Street, TaiYuan Economic & Technical Development Zone ShanXi, 030032	Tel. +86-351-7117520 Fax +86-351-7117522 taiyuan@sew-eurodrive.cn
	Wuhan	SEW-EURODRIVE (Wuhan) Co., Ltd. 10A-2, 6th Road No. 59, the 4th Quanli Road, WEDA 430056 Wuhan	Tel. +86 27 84478388 Fax +86 27 84478389 wuhan@sew-eurodrive.cn
	Xi'An	SEW-EURODRIVE (Xi'An) Co., Ltd. No. 12 Jinye 2nd Road Xi'An High-Technology Industrial Development Zone Xi'An 710065	Tel. +86 29 68686262 Fax +86 29 68686311 xian@sew-eurodrive.cn
Sales Service	Hong Kong	SEW-EURODRIVE LTD. Unit No. 801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. +852 36902200 Fax +852 36902211 contact@sew-eurodrive.hk

Colombia			
Assembly Sales Service	Bogota	SEW-EURODRIVE COLOMBIA LTDA. Calle 17 No. 132-18 Interior 2 Bodega 6, Manzana B Santafé de Bogotá	Tel. +57 1 54750-50 Fax +57 1 54750-44 http://www.sew-eurodrive.com.co sew@sew-eurodrive.com.co
Croatia			
Sales Service	Zagreb	KOMPEKS d. o. o. Zeleni dol 10 10 000 Zagreb	Tel. +385 1 4613-158 Fax +385 1 4613-158 kompeks@inet.hr
Czech Republic			
Assembly Sales Service	Hostivice	SEW-EURODRIVE CZ s.r.o. Floriánova 2459 253 01 Hostivice	Tel. +420 255 709 601 Fax +420 235 350 613 http://www.sew-eurodrive.cz sew@sew-eurodrive.cz
	Drive Service Hotline / 24 Hour Service	+420 800 739 739 (800 SEW SEW)	Service Tel. +420 255 709 632 Fax +420 235 358 218 servis@sew-eurodrive.cz
Denmark			
Assembly Sales Service	Copenhagen	SEW-EURODRIVEA/S Geminivej 28-30 2670 Greve	Tel. +45 43 95 8500 Fax +45 43 9585-09 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk
Service	Vejle	SEW-EURODRIVE A/S Bødkervej 2 7100 Vejle	Tel. +45 43 9585 00 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk
Egypt			
Sales Service	Cairo	Copam Egypt for Engineering & Agencies Building 10, Block 13005, First Industrial Zone, Obour City Cairo	Tel. +202 44812673 / 79 (7 lines) Fax +202 44812685 http://www.copam-egypt.com copam@copam-egypt.com
Estonia			
Sales	Tallin	ALAS-KUUL AS Loomäe tee 1, Lehmja küla 75306 Rae vald Harjumaa	Tel. +372 6593230 Fax +372 6593231 http://www.alas-kuul.ee veiko.soots@alas-kuul.ee
Finland			
Assembly Sales Service	Hollola	SEW-EURODRIVE OY Vesimäentie 4 15860 Hollola	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi
Service	Hollola	SEW-EURODRIVE OY Keskikankaantie 21 15860 Hollola	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi
	Tornio	SEW-EURODRIVE Oy Lossirannankatu 5 95420 Tornio	Tel. +358 201 589 300 Fax +358 3 780 6211 http://www.sew-eurodrive.fi sew@sew.fi
Production Assembly	Karkkila	SEW Industrial Gears Oy Santasalonkatu 6, PL 8 03620 Karkkila, 03601 Karkkila	Tel. +358 201 589-300 Fax +358 201 589-310 http://www.sew-eurodrive.fi sew@sew.fi
France			
Production Sales Service	Hagenau	SEW USOCOME 48-54 route de Soufflenheim B. P. 20185 67506 Hagenau Cedex	Tel. +33 3 88 73 67 00 Fax +33 3 88 73 66 00 http://www.usocom.com sew@usocom.com
Production	Forbach	SEW USOCOME Zone industrielle Technopôle Forbach Sud B. P. 30269 57604 Forbach Cedex	Tel. +33 3 87 29 38 00

France

	Brumath	SEW USOCOME 1 Rue de Bruxelles 67670 Mommenheim Cedex	Tel. +33 3 88 37 48 00
Assembly Sales Service	Bordeaux	SEW USOCOME Parc d'activités de Magellan 62 avenue de Magellan – B. P. 182 33607 Pessac Cedex	Tel. +33 5 57 26 39 00 Fax +33 5 57 26 39 09
	Lyon	SEW USOCOME 75 rue Antoine Condorcet 38090 Vaulx-Milieu	Tel. +33 4 74 99 60 00 Fax +33 4 74 99 60 15
	Nantes	SEW USOCOME Parc d'activités de la forêt 4 rue des Fontenelles 44140 Le Bignon	Tel. +33 2 40 78 42 00 Fax +33 2 40 78 42 20
	Paris	SEW USOCOME Zone industrielle 2 rue Denis Papin 77390 Verneuil l'Étang	Tel. +33 1 64 42 40 80 Fax +33 1 64 42 40 88

Gabon

Representation: Cameroon

Germany

Headquarters Production Sales	Bruchsal	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 http://www.sew-eurodrive.de sew@sew-eurodrive.de
Production / Industrial Gears	Bruchsal	SEW-EURODRIVE GmbH & Co KG Christian-Pähr-Str. 10 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-2970
Production	Graben	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 76676 Graben-Neudorf	Tel. +49 7251 75-0 Fax +49 7251-2970
	Östringen	SEW-EURODRIVE GmbH & Co KG, Werk Östringen Franz-Gurk-Straße 2 76684 Östringen	Tel. +49 7253 9254-0 Fax +49 7253 9254-90 oestringen@sew-eurodrive.de
Service Competence Center	Mechanics / Mechatronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 76676 Graben-Neudorf	Tel. +49 7251 75-1710 Fax +49 7251 75-1711 scc-mechanik@sew-eurodrive.de
	Electronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 scc-elektronik@sew-eurodrive.de
Drive Technology Center	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 43 30823 Garbsen (Hannover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 dtc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Dankritzer Weg 1 08393 Meerane (Zwickau)	Tel. +49 3764 7606-0 Fax +49 3764 7606-20 dtc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 85551 Kirchheim (München)	Tel. +49 89 909551-21 Fax +49 89 909551-50 dtc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 40764 Langenfeld (Düsseldorf)	Tel. +49 2173 8507-10 Fax +49 2173 8507-50 dtc-west@sew-eurodrive.de
Drive Center	Berlin	SEW-EURODRIVE GmbH & Co KG Alexander-Meißner-Straße 44 12526 Berlin	Tel. +49 306331131-30 Fax +49 306331131-36 dc-berlin@sew-eurodrive.de
	Hamburg	SEW-EURODRIVE GmbH & Co KG Hasselbinnen 44 22869 Schenefeld	Tel. +49 40298109-60 Fax +49 40298109-70 dc-hamburg@sew-eurodrive.de
	Ludwigshafen	SEW-EURODRIVE GmbH & Co KG c/o BASF SE c/o BASF SE Gebäude W130 67056 Ludwigshafen	Tel. +49 7251 75 3759 Fax +49 7251 75 503759 dc-ludwigshafen@sew-eurodrive.de

Germany			
	Saarland	SEW-EURODRIVE GmbH & Co KG Gottlieb-Daimler-Straße 4 66773 Schwalbach Saar – Hülzweiler	Tel. +49 6831 48946 10 Fax +49 6831 48946 13 dc-saarland@sew-eurodrive.de
	Ulm	SEW-EURODRIVE GmbH & Co KG Dieselstraße 18 89160 Dornstadt	Tel. +49 7348 9885-0 Fax +49 7348 9885-90 dc-ulm@sew-eurodrive.de
	Würzburg	SEW-EURODRIVE GmbH & Co KG Nürnbergerstraße 118 97076 Würzburg-Lengfeld	Tel. +49 931 27886-60 Fax +49 931 27886-66 dc-wuerzburg@sew-eurodrive.de
Drive Service Hotline / 24 Hour Service			0 800 SEWHELP 0 800 7394357
Great Britain			
Assembly Sales Service	Normanton	SEW-EURODRIVE Ltd. DeVilliers Way Trident Park Normanton West Yorkshire WF6 1GX	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk
Drive Service Hotline / 24 Hour Service			Tel. 01924 896911
Greece			
Sales	Athens	Christ. Boznos & Son S.A. 12, K. Mavromichali Street P.O. Box 80136 18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr
Hungary			
Sales Service	Budapest	SEW-EURODRIVE Kft. Csillaghegyi út 13. 1037 Budapest	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 http://www.sew-eurodrive.hu office@sew-eurodrive.hu
Iceland			
Sales	Reykjavik	Varma & Vélaverk ehf. Knarrarvogi 4 104 Reykjavik	Tel. +354 585 1070 Fax +354 585 1071 http://www.varmaverk.is vov@vov.is
India			
Registered Office Assembly Sales Service	Vadodara	SEW-EURODRIVE India Private Limited Plot No. 4, GIDC POR Ramangamdi • Vadodara - 391 243 Gujarat	Tel. +91 265 3045200 Fax +91 265 3045300 http://www.seweurodriveindia.com salesvadodara@seweurodriveindia.com
Assembly Sales Service	Chennai	SEW-EURODRIVE India Private Limited Plot No. K3/1, Sipcot Industrial Park Phase II Mambakkam Village Sriperumbudur - 602105 Kancheepuram Dist, Tamil Nadu	Tel. +91 44 37188888 Fax +91 44 37188811 saleschennai@seweurodriveindia.com
	Pune	SEW-EURODRIVE India Private Limited Plant: Plot No. D236/1, Chakan Industrial Area Phase- II, Warale, Tal- Khed, Pune-410501, Maharashtra	Tel. +91 21 35 628700 Fax +91 21 35 628715 salespune@seweurodriveindia.com
Sales Service	Gurgaon	SEW-EURODRIVE India Private Limited Drive Center Gurugram Plot no 395, Phase-IV, UdyogVihar Gurugram , 122016 Haryana	Tel. +91 99588 78855 salesgurgaon@seweurodriveindia.com
Indonesia			
Sales	Medan	PT. Serumpun Indah Lestari Jl.Pulau Solor no. 8, Kawasan Industri Medan II Medan 20252	Tel. +62 61 687 1221 Fax +62 61 6871429 / +62 61 6871458 / +62 61 30008041 sil@serumpunindah.com serumpunindah@yahoo.com http://www.serumpunindah.com

Indonesia			
	Jakarta	PT. Cahaya Sukses Abadi Komplek Rukan Puri Mutiara Blok A no 99, Sunter Jakarta 14350	Tel. +62 21 65310599 Fax +62 21 65310600 csajkt@cbn.net.id
	Jakarta	PT. Agrindo Putra Lestari JL.Pantai Indah Selatan, Komplek Sentra In- dustri Terpadu, Pantai indah Kapuk Tahap III, Blok E No. 27 Jakarta 14470	Tel. +62 21 2921-8899 Fax +62 21 2921-8988 aplindo@indosat.net.id http://www.aplindo.com
	Surabaya	PT. TRIAGRI JAYA ABADI Jl. Sukosemolo No. 63, Galaxi Bumi Permai G6 No. 11 Surabaya 60111	Tel. +62 31 5990128 Fax +62 31 5962666 sales@triagri.co.id http://www.triagri.co.id
	Surabaya	CV. Multi Mas Jl. Raden Saleh 43A Kav. 18 Surabaya 60174	Tel. +62 31 5458589 Fax +62 31 5317220 sianhwa@sby.centrin.net.id http://www.cvmultimas.com
Ireland			
Sales Service	Dublin	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458 http://www.alperton.ie info@alperton.ie
Israel			
Sales	Tel Aviv	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 http://www.liraz-handasa.co.il office@liraz-handasa.co.il
Italy			
Assembly Sales Service	Milan	SEW-EURODRIVE S.a.s. di SEW S.r.l. & Co. Via Bernini,12 20020 Solaro (Milano)	Tel. +39 02 96 980229 Fax +39 02 96 980 999 http://www.sew-eurodrive.it milano@sew-eurodrive.it
Ivory Coast			
Sales	Abidjan	SEW-EURODRIVE SARL Ivory Coast Rue des Pêcheurs, Zone 3 26 BP 916 Abidjan 26	Tel. +225 21 21 81 05 Fax +225 21 25 30 47 info@sew-eurodrive.ci http://www.sew-eurodrive.ci
Japan			
Assembly Sales Service	Iwata	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 http://www.sew-eurodrive.co.jp sewjapan@sew-eurodrive.co.jp
Kazakhstan			
Sales Service	Almaty	SEW-EURODRIVE LLP 291-291A, Tole bi street 050031, Almaty	Tel. +7 (727) 350 5156 Fax +7 (727) 350 5156 http://www.sew-eurodrive.kz sew@sew-eurodrive.kz
	Tashkent	SEW-EURODRIVE LLP Representative office in Uzbekistan 96A, Sharaf Rashidov street, Tashkent, 100084	Tel. +998 71 2359411 Fax +998 71 2359412 http://www.sew-eurodrive.uz sew@sew-eurodrive.uz
	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230, MN	Tel. +976-77109997 Fax +976-77109997 imt@imt.mn
Latvia			
Sales	Riga	SIA Alas-Kuul Katlakalna 11C 1073 Riga	Tel. +371 6 7139253 Fax +371 6 7139386 http://www.alas-kuul.lv info@alas-kuul.com

Lebanon			
Sales (Lebanon)	Beirut	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 510 532 Fax +961 1 494 971 ssacar@inco.com.lb
Sales (Jordan, Kuwait , Beirut Saudi Arabia, Syria)		Middle East Drives S.A.L. (offshore) Sin El Fil. B. P. 55-378 Beirut	Tel. +961 1 494 786 Fax +961 1 494 971 http://www.medrives.com info@medrives.com
Lithuania			
Sales	Alytus	UAB Irseva Statybininku 106C 63431 Alytus	Tel. +370 315 79204 Fax +370 315 56175 http://www.irseva.lt irmantas@irseva.lt
Luxembourg			
Representation: Belgium			
Macedonia			
Sales	Skopje	Boznos DOOEL Dime Anicin 2A/7A 1000 Skopje	Tel. +389 23256553 Fax +389 23256554 http://www.boznos.mk
Malaysia			
Assembly Sales Service	Johor	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my
Mexico			
Assembly Sales Service	Quéretaro	SEW-EURODRIVE MEXICO S.A. de C.V. SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Quéretaro C.P. 76220 Querétaro, México	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Sales Service	Puebla	SEW-EURODRIVE MEXICO S.A. de C.V. Calzada Zavaleta No. 3922 Piso 2 Local 6 Col. Santa Cruz Buenavista C.P. 72154 Puebla, México	Tel. +52 (222) 221 248 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Mongolia			
Technical Office	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230, MN	Tel. +976-77109997 Tel. +976-99070395 Fax +976-77109997 http://imt.mn/ imt@imt.mn
Morocco			
Sales Service Assembly	Bouskoura	SEW-EURODRIVE Morocco SARL Parc Industriel CFCIM, Lot. 55/59 27182 Bouskoura Grand Casablanca	Tel. +212 522 88 85 00 Fax +212 522 88 84 50 http://www.sew-eurodrive.ma sew@sew-eurodrive.ma
Namibia			
Sales	Swakopmund	DB MINING & INDUSTRIAL SUPPLIES CC Einstein Street Strauss Industrial Park Unit1 Swakopmund	Tel. +264 64 462 738 Fax +264 64 462 734 anton@dbminingnam.com
Netherlands			
Assembly Sales Service	Rotterdam	SEW-EURODRIVE B.V. Industrieweg 175 3044 AS Rotterdam Postbus 10085 3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 Service: 0800-SEWHELP http://www.sew-eurodrive.nl info@sew-eurodrive.nl

New Zealand			
Assembly Sales Service	Auckland	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 30 Lodestar Avenue, Wigram Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz
Nigeria			
Sales	Lagos	Greenpeg Nig. Ltd Plot 296A, Adeyemo Akapo Str. Omole GRA Ikeja Lagos-Nigeria	Tel. +234-701-821-9200-1 http://www.greenpegltd.com bolaji.adekunle@greenpegltd.com
Norway			
Assembly Sales Service	Moss	SEW-EURODRIVE A/S Solgaard skog 71 1599 Moss	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no
Pakistan			
Sales	Karachi	Industrial Power Drives Al-Fatah Chamber A/3, 1st Floor Central Com- mercial Area, Sultan Ahmed Shah Road, Block 7/8, Karachi	Tel. +92 21 452 9369 Fax +92-21-454 7365 seweurodrive@cyber.net.pk
Paraguay			
Sales	Fernando de la Mora	SEW-EURODRIVE PARAGUAY S.R.L De la Victoria 112, Esquina nueva Asunción Departamento Central Fernando de la Mora, Barrio Bernardino	Tel. +595 991 519695 Fax +595 21 3285539 sewpy@sew-eurodrive.com.py
Peru			
Assembly Sales Service	Lima	SEW EURODRIVE DEL PERU S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe
Philippines			
Sales	Makati	P.T. Cerna Corporation 4137 Ponte St., Brgy. Sta. Cruz Makati City 1205	Tel. +63 2 519 6214 Fax +63 2 890 2802 mech_drive_sys@ptcerna.com http://www.ptcerna.com
Poland			
Assembly Sales Service	Łódź	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 92-518 Łódź	Tel. +48 42 293 00 00 Fax +48 42 293 00 49 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl
	Service	Tel. +48 42 293 0030 Fax +48 42 293 0043	24 Hour Service Tel. +48 602 739 739 (+48 602 SEW SEW) serwis@sew-eurodrive.pl
Portugal			
Assembly Sales Service	Coimbra	SEW-EURODRIVE, LDA. Av. da Fonte Nova, n.º 86 3050-379 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Romania			
Sales Service	Bucharest	Sialco Trading SRL str. Brazilia nr. 36 011783 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 sialco@sialco.ro

Russia			
Assembly Sales Service	St. Petersburg	ЗАО «СЕВ-ЕВРОДРАЙФ» 188660, Russia, Leningrad Region, Vse- volozhsky District, Korabselki, Aleksandra Nevskogo str. building 4, block 1 P.O. Box 36 195220 St. Petersburg	Tel. +7 812 3332522 / +7 812 5357142 Fax +7 812 3332523 http://www.sew-eurodrive.ru sew@sew-eurodrive.ru
Senegal			
Sales	Dakar	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 338 494 770 Fax +221 338 494 771 http://www.senemeca.com senemeca@senemeca.sn
Serbia			
Sales	Belgrade	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor 11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 office@dipar.rs
Singapore			
Assembly Sales Service	Singapore	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com
Slovakia			
Sales	Bernolákovo	SEW-Eurodrive SK s.r.o. Priemyselná ulica 6267/7 900 27 Bernolákovo	Tel. +421 2 33595 202, 217, 201 Fax +421 2 33595 200 http://www.sew-eurodrive.sk sew@sew-eurodrive.sk
Slovenia			
Sales Service	Celje	Pakman - Pogonska Tehnika d.o.o. Ul. XIV. divizije 14 3000 Celje	Tel. +386 3 490 83-20 Fax +386 3 490 83-21 pakman@siol.net
South Africa			
Assembly Sales Service	Johannesburg	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 248-7289 http://www.sew.co.za info@sew.co.za
	Cape Town	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 bgriffiths@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 48 Prospecton Road Isipingo Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 902 3815 Fax +27 31 902 3826 cdejager@sew.co.za
	Nelspruit	SEW-EURODRIVE (PROPRIETARY) LIMITED 7 Christie Crescent Vintonia P.O.Box 1942 Nelspruit 1200	Tel. +27 13 752-8007 Fax +27 13 752-8008 robermeyer@sew.co.za
South Korea			
Assembly Sales Service	Ansan	SEW-EURODRIVE KOREA CO., LTD. 7, Dangjaengi-ro, Danwon-gu, Ansan-si, Gyeonggi-do, Zip 425-839	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-eurodrive.kr master.korea@sew-eurodrive.com

South Korea

Busan	SEW-EURODRIVE KOREA CO., LTD. 28, Noksansandan 262-ro 50beon-gil, Gangseo-gu, Busan, Zip 618-820	Tel. +82 51 832-0204 Fax +82 51 832-0230
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Spain

Assembly Sales Service	Bilbao	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 48170 Zamudio (Vizcaya)	Tel. +34 94 43184-70 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
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Sri Lanka

Sales	Colombo	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981
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Swaziland

Sales	Manzini	C G Trading Co. (Pty) Ltd Simunye street Matsapha, Manzini	Tel. +268 7602 0790 Fax +268 2 518 5033 charles@cgtrading.co.sz www.cgtrading.co.sz
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Sweden

Assembly Sales Service	Jönköping	SEW-EURODRIVE AB Gnejsvägen 6-8 553 03 Jönköping Box 3100 S-550 03 Jönköping	Tel. +46 36 34 42 00 Fax +46 36 34 42 80 http://www.sew-eurodrive.se jonkoping@sew.se
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Switzerland

Assembly Sales Service	Basel	Alfred Imhof A.G. Jurastrasse 10 4142 Münchenstein bei Basel	Tel. +41 61 417 1717 Fax +41 61 417 1700 http://www.imhof-sew.ch info@imhof-sew.ch
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Taiwan

Sales	Taipei	Ting Shou Trading Co., Ltd. 6F-3, No. 267, Sec. 2 Tung Huw S. Road Taipei	Tel. +886 2 27383535 Fax +886 2 27368268 Telex 27 245 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
	Nan Tou	Ting Shou Trading Co., Ltd. No. 55 Kung Yeh N. Road Industrial District Nan Tou 540	Tel. +886 49 255353 Fax +886 49 257878 sewtwn@ms63.hinet.net http://www.tingshou.com.tw

Tanzania

Sales	Daressalam	SEW-EURODRIVE PTY LIMITED TANZANIA Plot 52, Regent Estate PO Box 106274 Dar Es Salaam	Tel. +255 0 22 277 5780 Fax +255 0 22 277 5788 http://www.sew-eurodrive.co.tz info@sew.co.tz
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Thailand

Assembly Sales Service	Chonburi	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com
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Tunisia

Sales	Tunis	T. M.S. Technic Marketing Service Zone Industrielle Mghira 2 Lot No. 39 2082 Fouchana	Tel. +216 79 40 88 77 Fax +216 79 40 88 66 http://www.tms.com.tn tms@tms.com.tn
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Turkey

Assembly Sales Service	Kocaeli-Gebze	SEW-EURODRIVE Ana Merkez Gebze Organize Sanayi Böl. 400 Sok No. 401 41480 Gebze Kocaeli	Tel. +90 262 9991000 04 Fax +90 262 9991009 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr
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Ukraine

Assembly Sales Service	Dnipropetrovsk	SEW-EURODRIVE, LLC Robochya str., bld. 23-B, office 409 49008 Dnipro	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua
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United Arab Emirates

Drive Technology Center	Dubai	SEW-EURODRIVE FZE PO Box 263835 Jebel Ali Free Zone – South, P.O. Box Dubai, United Arab Emirates	Tel. +971 (0)4 8806461 Fax +971 (0)4 8806464 info@sew-eurodrive.ae
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Uruguay

Assembly Sales	Montevideo	SEW-EURODRIVE Uruguay, S. A. Jose Serrato 3569 Esquina Corumbe CP 12000 Montevideo	Tel. +598 2 21181-89 Fax +598 2 21181-90 sewuy@sew-eurodrive.com.uy
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USA

Production Assembly Sales Service	Southeast Region	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Production +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly Sales Service	Northeast Region	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 332-0038 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Wellford	SEW-EURODRIVE INC. 148/150 Finch Rd. Wellford, S.C. 29385	Tel. +1 864 439-7537 Fax +1 864 661 1167 IGOrders@seweurodrive.com

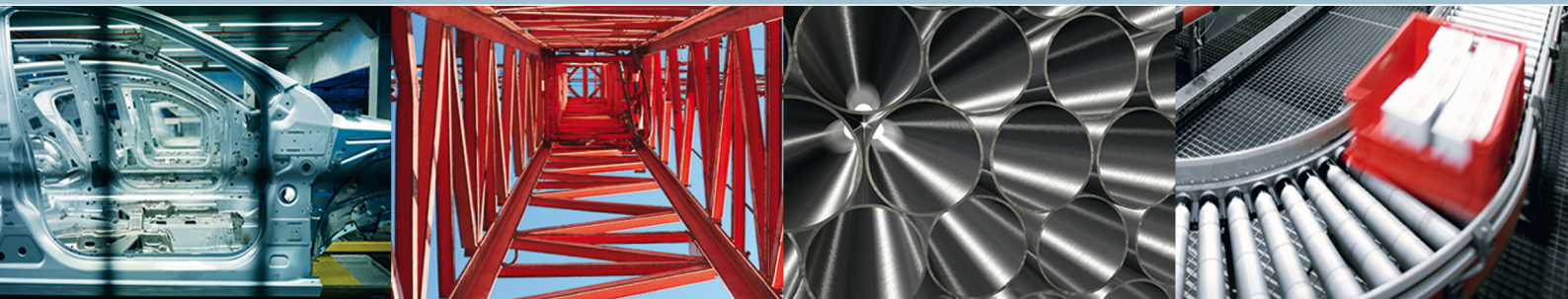
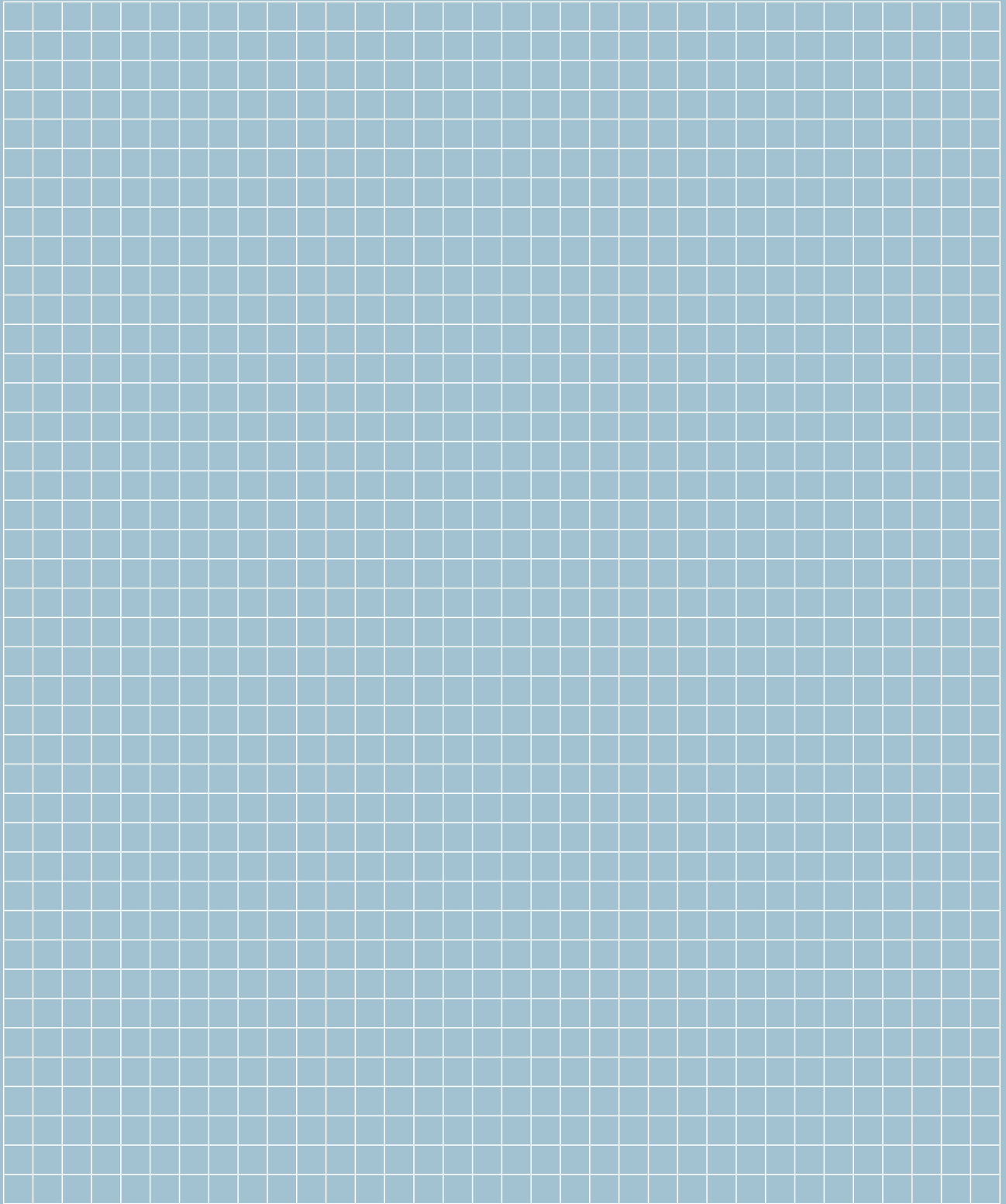
Additional addresses for service provided on request!

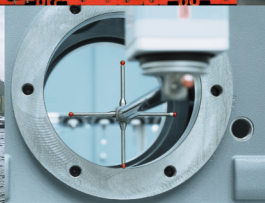
Vietnam

Sales	Ho Chi Minh City	SEW-EURODRIVE PTE. LTD. RO at Hochim- inh City Floor 8, KV I, Loyal building, 151-151 Bis Vo Thi Sau street, ward 6, District 3, Ho Chi Minh City, Vietnam	Tel. +84 937 299 700 huytam.phan@sew-eurodrive.com
	Hanoi	MICO LTD Quảng Trị - North Vietnam / All sectors except Construction Materials 8th Floor, Ocean Park Building, 01 Dao Duy Anh St, Ha Noi, Viet Nam	Tel. +84 4 39386666 Fax +84 4 3938 6888 nam_ph@micogroup.com.vn http://www.micogroup.com.vn

Zambia

Representation: South Africa





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