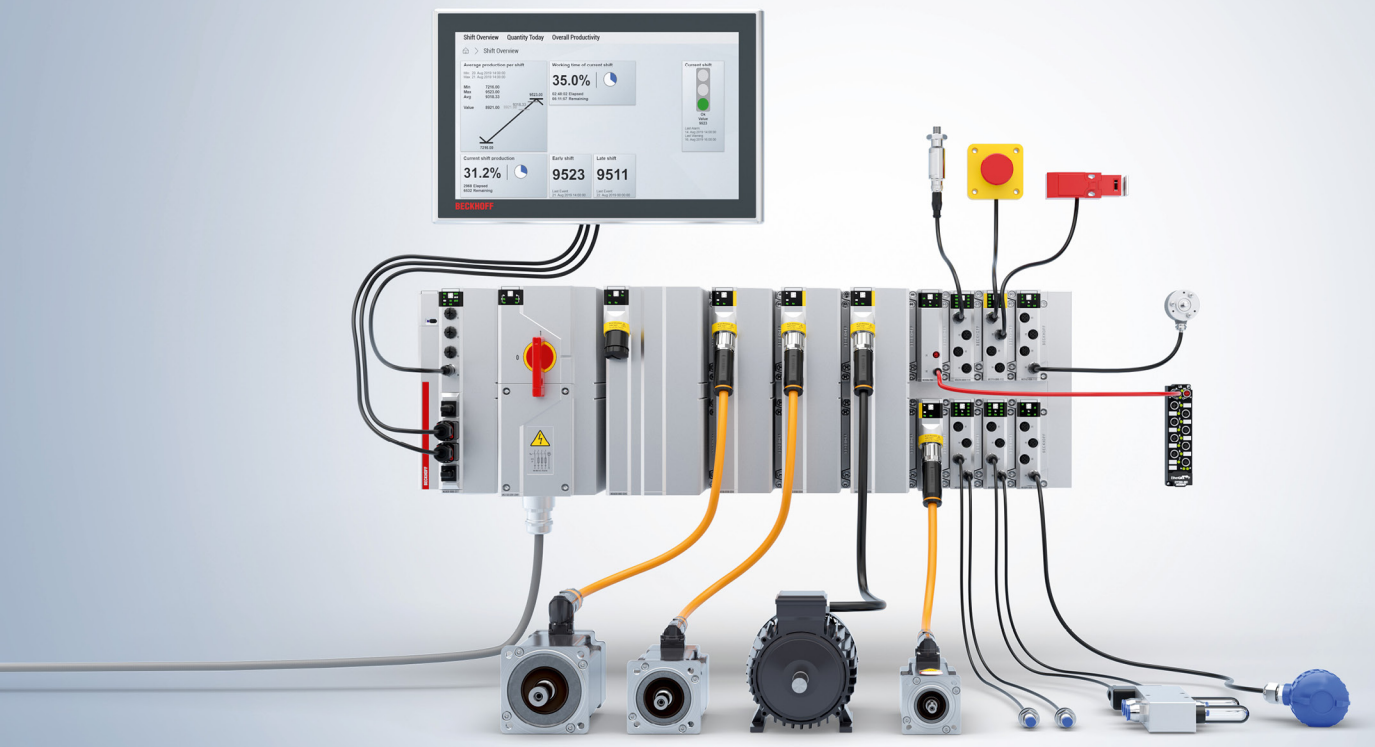
BECKHOFF New Automation Technology

Manual | EN

MD9000-2115-2250

Capacitor module, 600 V DC, 2115 µF



2026-06-03 | Version: 1.0.0

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1 Foreword

1.1 Notes on the documentation

This description is intended exclusively for trained specialists in control and automation technology who are familiar with the applicable national standards.
The documentation and the following notes and explanations must be complied with when installing and commissioning the components.
The trained specialists must always use the current valid documentation.

The trained specialists must ensure that the application and use of the products described is in line with all safety requirements, including all relevant laws, regulations, guidelines, and standards.

Disclaimer

The documentation has been compiled with care. The products described are, however, constantly under development.
We reserve the right to revise and change the documentation at any time and without notice.
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1.2 For your safety

Safety regulations

Read the following explanations for your safety.
Always observe and follow product-specific safety instructions, which you may find at the appropriate places in this document.

Exclusion of liability

All the components are supplied in particular hardware and software configurations which are appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation, and drive technology who are familiar with the applicable national standards.

Signal words

The signal words used in the documentation are classified below. In order to prevent injury and damage to persons and property, read and follow the safety and warning notices.

Personal injury warnings

⚠ DANGER
Hazard with high risk of death or serious injury.

⚠ WARNING
Hazard with medium risk of death or serious injury.

⚠ CAUTION
There is a low-risk hazard that could result in medium or minor injury.

Warning of damage to property or environment

NOTICE
The environment, equipment, or data may be damaged.

Information on handling the product

This information includes, for example:
recommendations for action, assistance or further information on the product.

1.3 Intended use

The module may only be installed on the mounted baseplate in electrical systems or machines and may only be put into operation as an integrated component of the system or machine. Single use of the module is not permitted.

The module is part of a multi-axis system whose DC link is fed by an MD6xxx DC link module. Only use the module in combination with an MD6xxx DC link power supply module or other suitable components of the MX-System. No other way of creating the DC link is permitted.

Read the entire drive system documentation:

- These operating instructions
- The operating instructions for the accessories used
- All relevant system documentation for the MX-System
- The machine manufacturer's complete documentation for the machine

Intended use of an MX-System

Application in machines and systems in industrial environments and exclusively inside buildings.

The electrical wiring must be permanent wiring.

Improper use

Improper use is not permitted and will result in the exclusion of liability on the part of Beckhoff Automation GmbH & Co.

1.3.1 Improper use

Any type of use that exceeds the permissible values from the technical data is regarded as inappropriate and is thus prohibited.

The modules are not suitable for use in the following areas:

- Operation as a single device without integration into an overall MX system
- Operation on a DC link that was not generated via a product from the MX-System
- ATEX zones without suitable housing
- Areas with aggressive environments, for example aggressive gases or chemicals

The relevant standards and directives for EMC interference emissions must be complied with in residential areas.

1.4 Safety instructions

1.4.1 Before operation

Protective equipment

Do not remove or bypass any protective devices. Check all protective devices before operation. Make sure that all emergency switches are present at all times and can be reached by you and other people. People could be seriously or fatally injured by unprotected machine parts.

Observe tightening torques

Mount and repeatedly check connections and components, complying with the prescribed tightening torques.

Correctly ground electrical components or modules

Prevent electric shocks due to incorrect grounding of electrical components or modules. Ground all conductive components according to the specifications in the chapter Electrical installation.

Keep the immediate environment clean

Keep your workplace and the surrounding area clean. Ensure safe working.

Shut down and secure the machine or plant

Shut down the machine or plant. Secure the machine or plant against being inadvertently started up.

1.4.2 During operation

Do not touch hot surfaces

Check the temperature of the surfaces with a thermometer. Do not touch the components during and immediately after operation. Allow the components to cool sufficiently after switching off.

Avoid overheating

Operate the components according to the technical specifications. Refer here to the chapter Technical data. Provide for sufficient cooling. Switch the components off immediately if the temperature is too high.

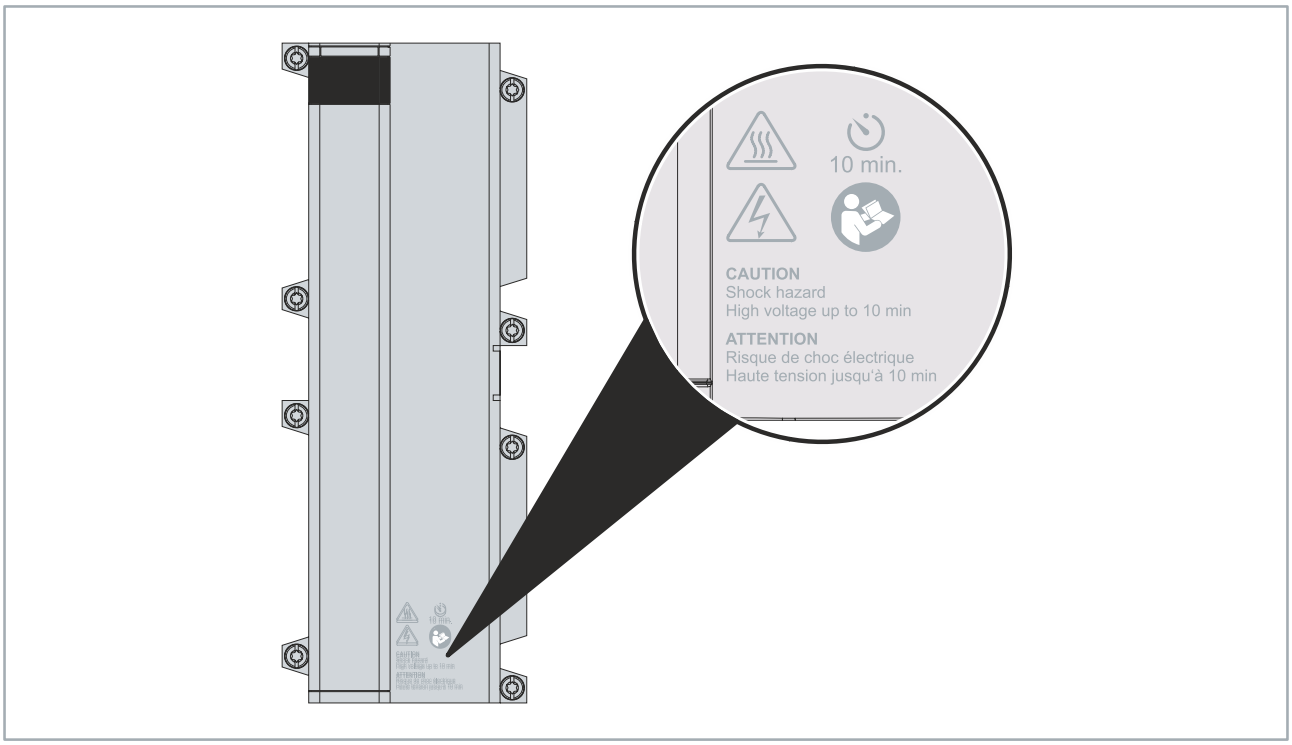
1.4.3 After operation

De-energize and switch off components before working on them

Check the functionality of all safety-relevant devices. Secure the working environment. Secure the machine or plant against being inadvertently started up. Observe the chapter Decommissioning.

1.5 Safety sign

You will find safety symbols on Beckhoff products and packaging. The symbols may be glued, printed, or lasered on and may vary depending on the product. They serve to protect people and to prevent damage to the products. Safety pictograms may not be removed and must be legible for the user.



Do not touch hot surfaces!
Check the temperature of the surface with a thermometer. Do not touch the components during and immediately after operation. Allow the components to cool sufficiently after switching off.

Warning of high voltage!
The DC link capacitors and power contacts on all modules may carry hazardous voltages up to 848 V_{DC}.

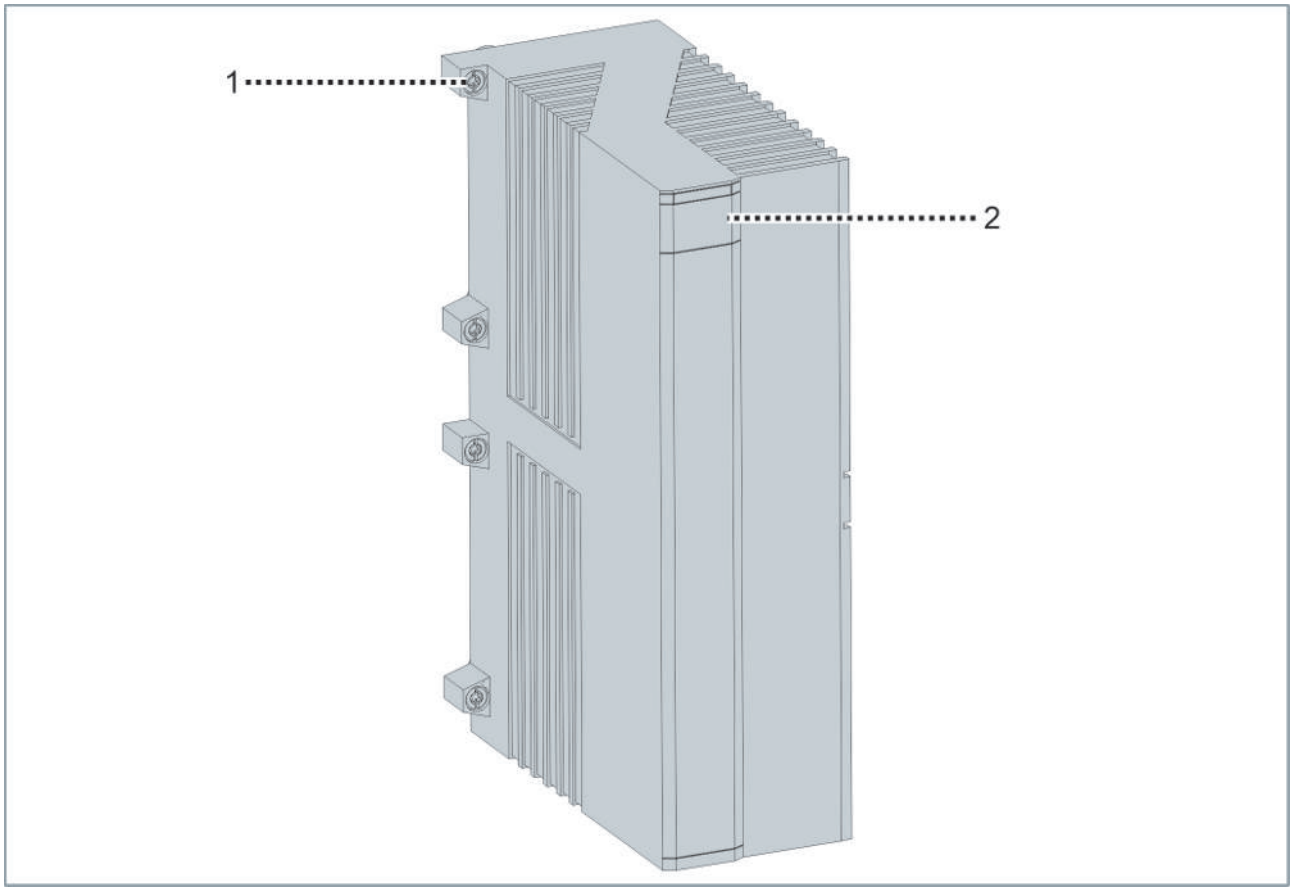
Observe the waiting time!
Dangerous voltages for 10 minutes after switching off all power connections.

Read the operating instructions!
Familiarize yourself with the entire contents of the operating instructions before commissioning. Always read the general safety instructions and the warnings in the individual chapters.

2 Product overview

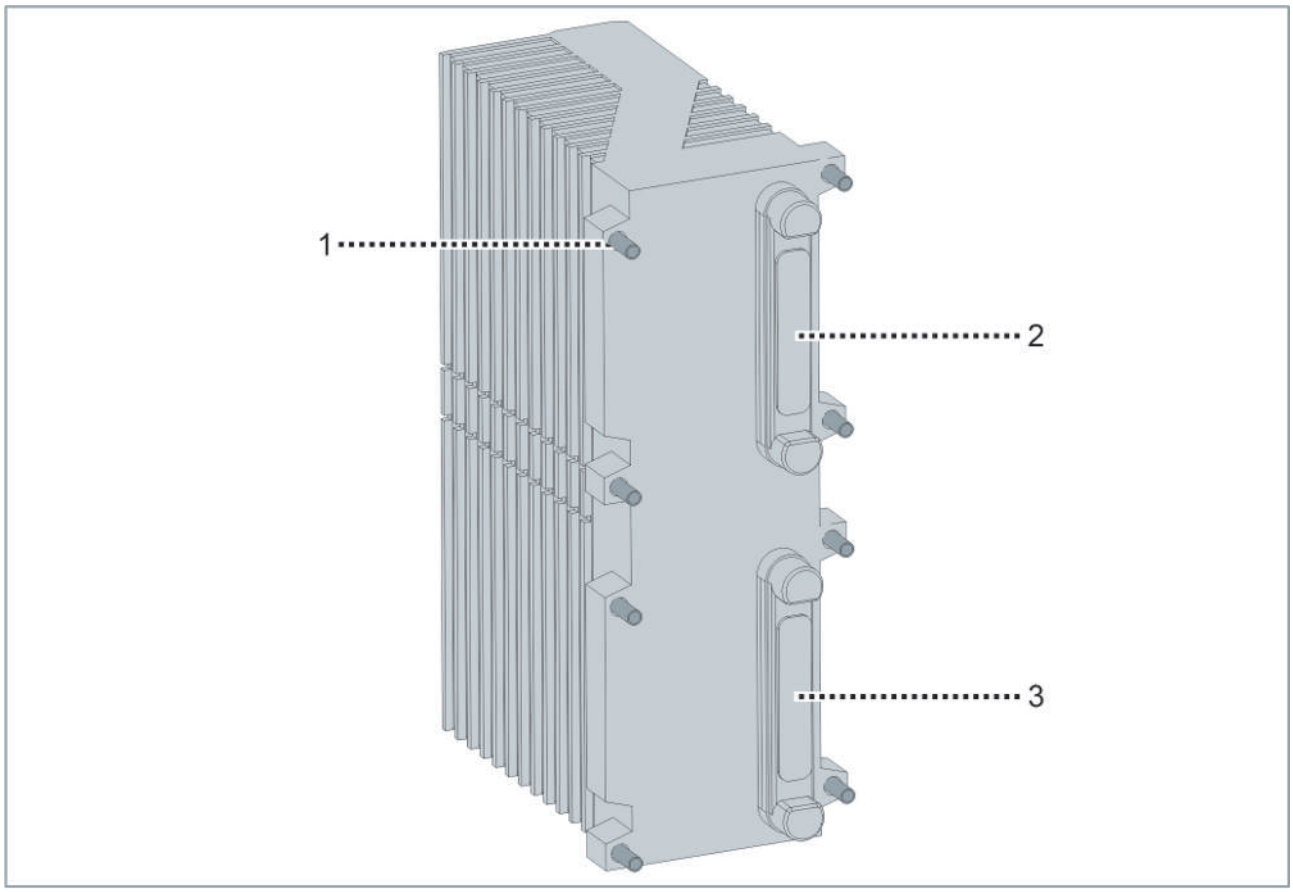
The MD9000 capacitor module expands the DC link capacity and is suitable for supporting the DC link. It serves to save energy: regenerative energy, which is generated when motors are braked, is absorbed and stored. As a result, the MD9000 minimizes the use of the braking resistor as much as possible and reduces power loss. The capacitor module reduces the total connected load of the drive, and the fuse can be made smaller in many cases.

Front view



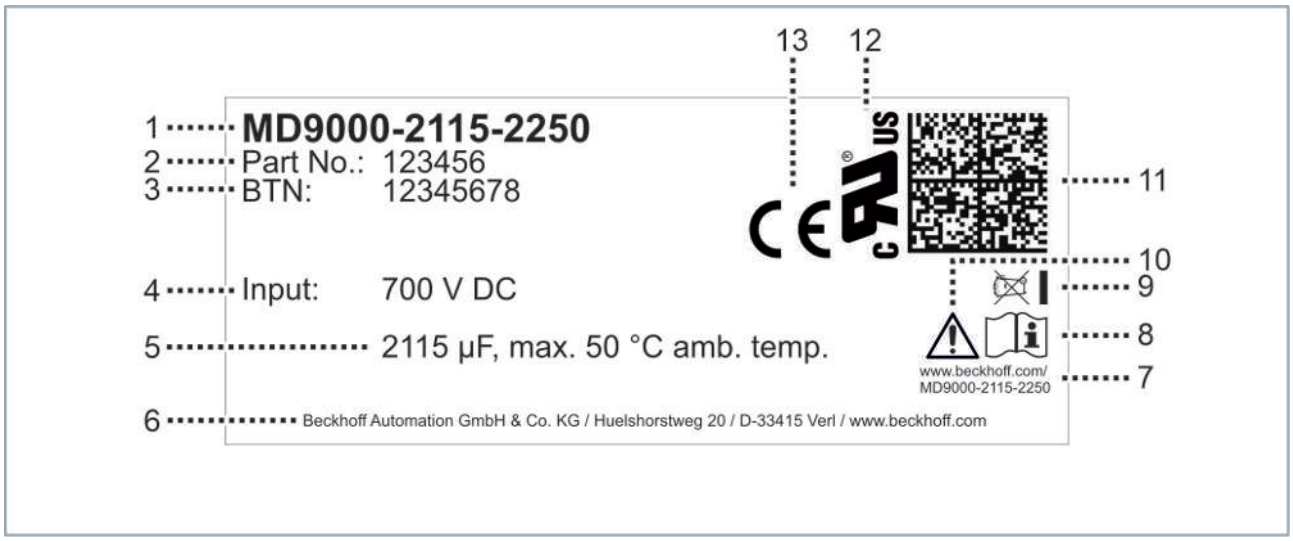
Item number	Description	Further information
1	Fastening screw	
2	Status display	Status display [▶ 16]

Rear view



Item number	Description	Further information
1	Fastening screw	
2	Data connector	
3	Power connector	

2.1 Name plate

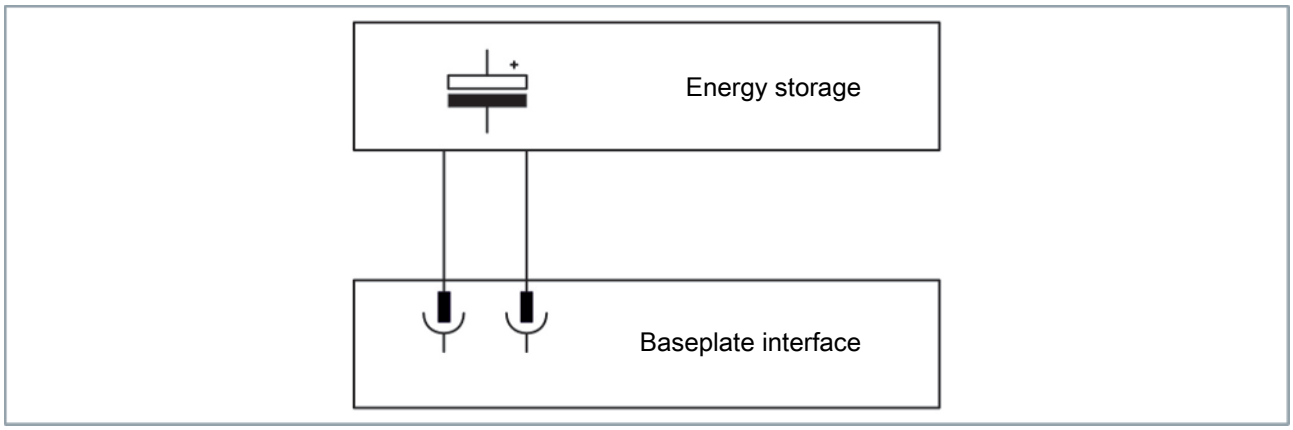


Position	Explanation
1	Product name
2	Order number
3	Beckhoff Traceability Number
4	Input values: Voltage
5	Capacitance at max. ambient temperature
6	Contact details
7	Product address
8	Safety pictogram: Read operating instructions
9	Disposal according to WEEE directives
10	Safety pictogram: Caution
11	Data Matrix Code
12	UL approval
13	CE approval

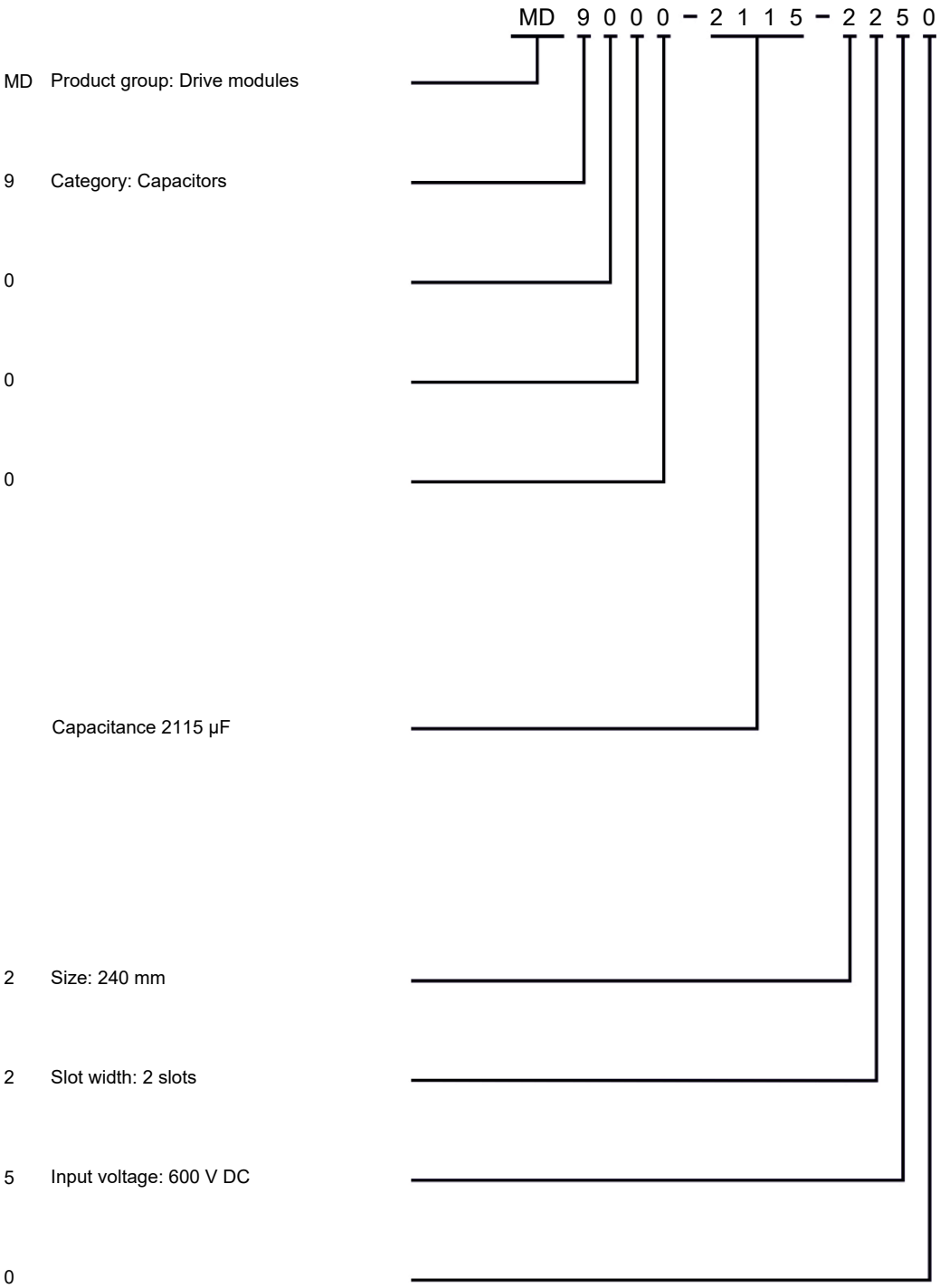
2.2 Product functions

- extends the DC link capacity and supports the DC link
- Energy savings: voltage peaks generated by motor braking are absorbed and stored.
- Reduces the total connected load of the drive; in many cases, a smaller fuse can be used.

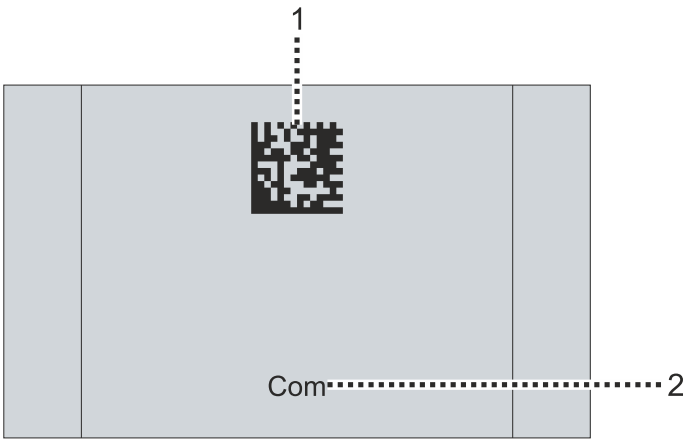
2.3 Block diagram



2.4 Type key


MD 9 0 0 0 – 2 1 1 5 – 2 2 5 0
MD Product group: Drive modules
9 Category: Capacitors
0
0
0
Capacitance 2115 µF
2 Size: 240 mm
2 Slot width: 2 slots
5 Input voltage: 600 V DC
0

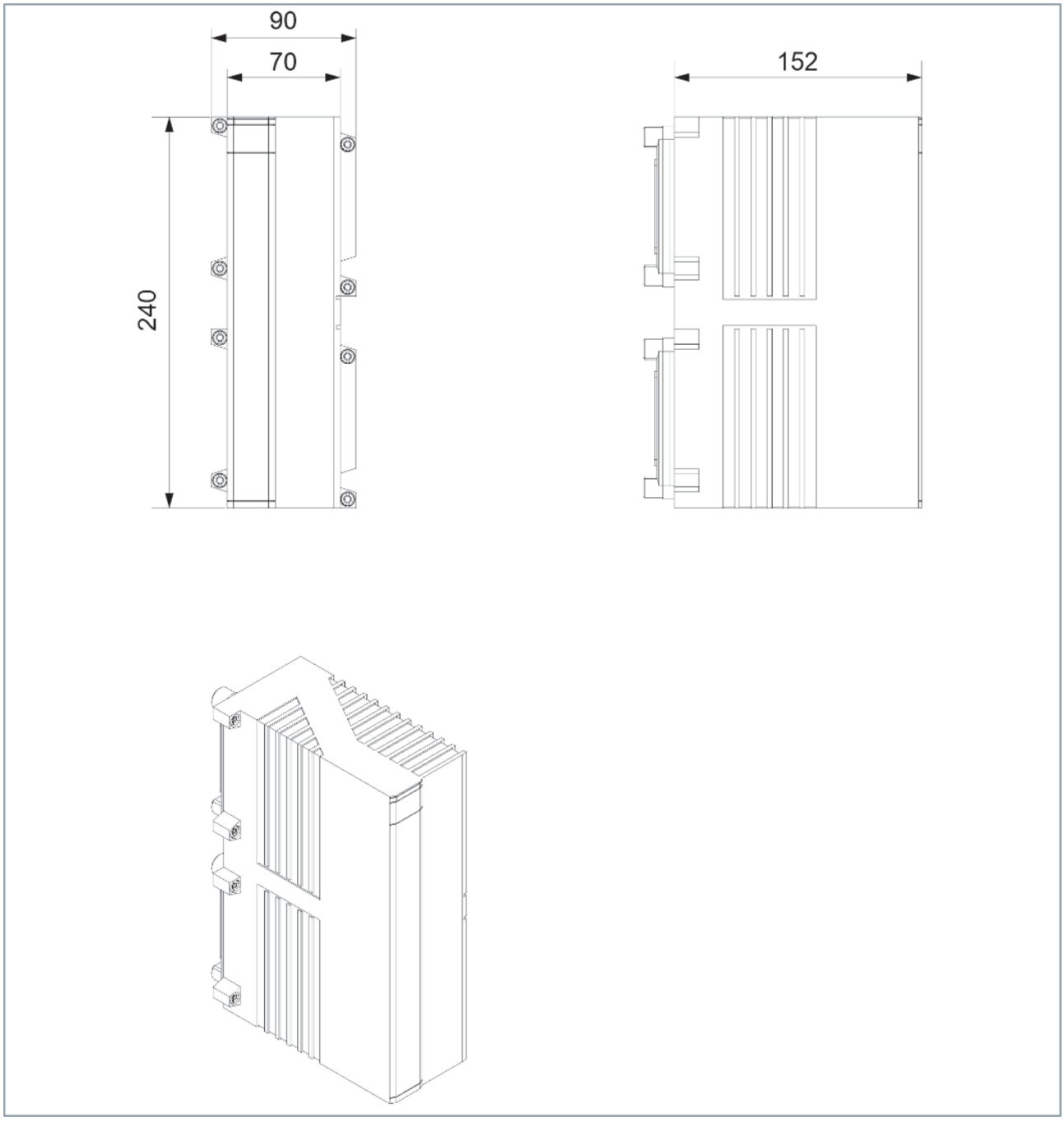
2.5 Status display



Position	Labeling	Meaning	Status	Explanation
1	-		-	Beckhoff Identification Code as DataMatrix code
2	Com	Communication	Lights up green	The capacitor module is mounted on the baseplate

2.6 Dimensions

All dimensions in mm



3 Technical data

All values are typical values over the entire temperature range, unless stated otherwise.

3.1 Data for operation and environment

Beckhoff products are designed for operation under certain environmental conditions, which vary according to the product. The following specifications must be observed for operation and environment in order to achieve the optimum service life of the products.

Environmental conditions	
Operating temperature	0 … 50 °C
Storage temperature	-25 … +60 °C
Air humidity	95 %, no condensation
Protection rating	IP20 as a separate module
	IP65 / IP67 as part of a fully and correctly assembled MX-System
Pollution degree	2
Overvoltage category	III
Maximum installation altitude	2000 m

3.2 System data

Baseplate interface	
Connector	1 data connector 1 power connector
Hot Swap	No

Housing data	
Rows (height)	2
Slots (width)	2
Dimensions W × H × D	70 mm x 240 mm x 152 mm without connectors
Material	Zinc and aluminum die-cast
Cooling	Convection
Weight	4.9 kg
Installation position	Vertical. See system manual, chapter “Installation conditions”.

General technical data	
Product group	Drive modules
Category/Execution	Capacitor module
DC link voltage	0…700 V DC*
Capacitance	2115 µF

*) Modules are capable of operating at maximum dc link working voltage of temporarily 848 Vdc.

3.3 Electrical data

DC link		
Voltage range	V DC	0…700*
Capacitance	µF	2115

*) Modules are capable of operating at maximum dc link working voltage of temporarily 848 Vdc.

4 Mechanical installation

Required tools

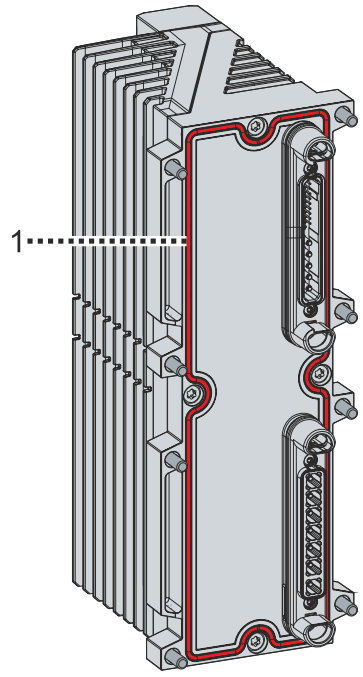
- Torx T25 screwdriver
- Torque wrench 5 Nm

4.1 Preparation

NOTICE

Check the module for damage

If the seal is worn or damaged, liquids and dirt can penetrate and damage the MX-System. The IP65/IP67 protection rating is not met if the seals are worn or damaged.



1. Check the seal [1] of the module for wear and damage
2. Replace worn and damaged seals

4.2 Placement of the module on the baseplate

The module can be plugged into the following areas marked in green:

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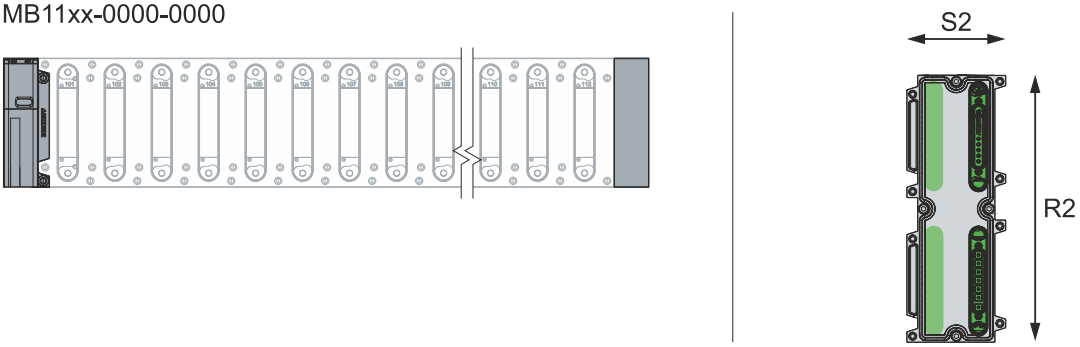

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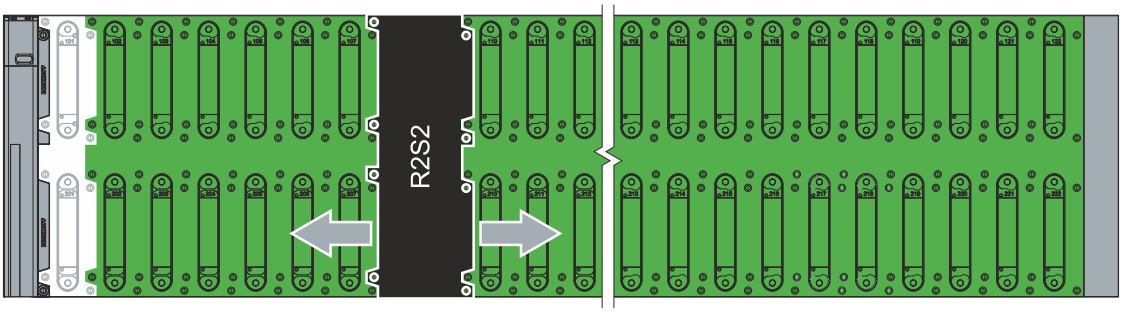

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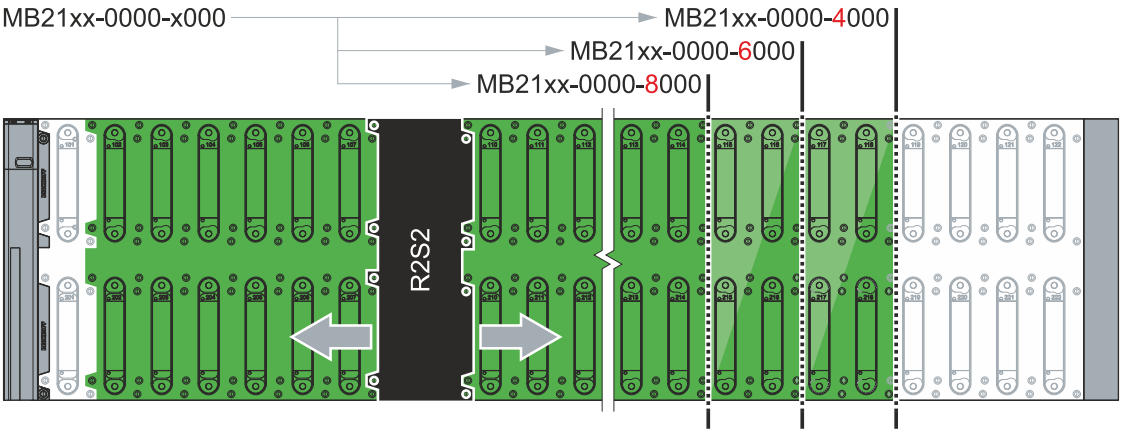

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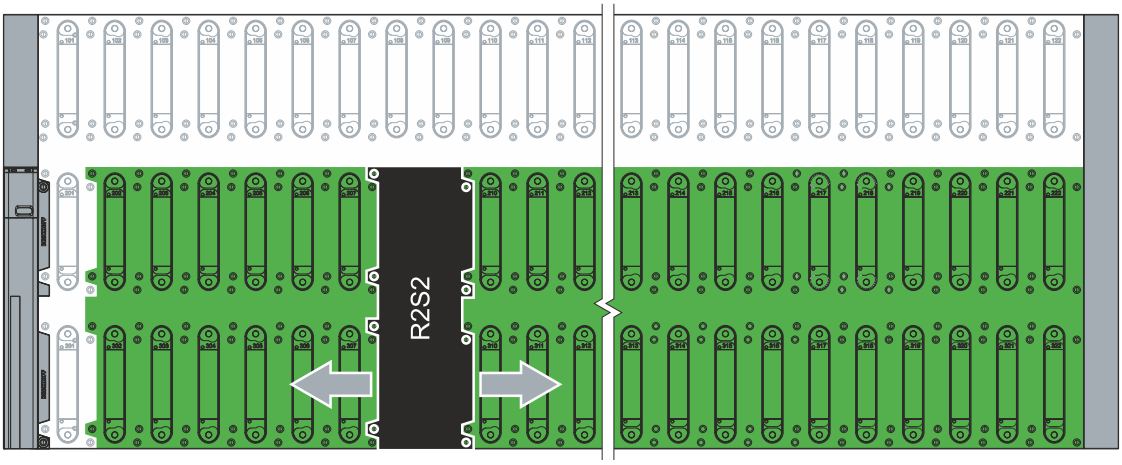

4.3 Mounting the module

⚠ CAUTION

Danger due to the high weight of an equipped baseplate

First mount the baseplate and then the modules to the baseplate. If you mount the modules on the baseplate first, the total weight of the MX-System will increase. Another person is required to transport and assemble an equipped baseplate.

- Wear personal protective equipment.
- The equipped baseplate must be transported and mounted by two people.

NOTICE

Ensure correct installation

If the module is not installed correctly, liquids and dirt may enter and damage the MX-System. The IP65/IP67 protection rating is not met if the installation is incorrect.

NOTICE

Limited number of mating cycles

The module may be plugged in a maximum of 25 times to attach it to the baseplate. If the module is plugged into the baseplate more than 25 times, a secure connection between the module and the baseplate cannot be guaranteed.

- Observe the permissible number of mating cycles.
- Replace the module if the number of mating cycles is exceeded.
- Replace the baseplate if the number of mating cycles is exceeded.

Observe the mounting sequence on the baseplate!

1. MD60xx DC link power supply
2. Optional capacitor module MD9000
3. All other axis modules such as MD8xxx servo drives and MD3xxx variable frequency drives

1. Plug the module on the baseplate
2. Tighten all screws
3. Observe tightening torques:

Components	Tightening torque [Nm]
Screws	5

Further information on installation can be found in the system manual in the "Mounting" chapter.

5 Commissioning and operation

⚠ WARNING

Serious injuries due to residual voltage

Although a motor is no longer rotating, voltage on the control and power connections or a residual voltage in the capacitors of the Capacitor module can lead to serious injuries.

- Switch off the main switch on the power infeed
- Secure the main switch of the power infeed against being switched on again
- Wait at least 10 minutes after switching off the main switch until the DC link voltage has been discharged before starting work.

5.1 During operation

- Observe information for environment and operation
- Observe maintenance intervals
- Switch off the system if
  - unusual noise occurs
  - smoke develops
  - an atypical temperature development occurs

Pay attention to the following points during operation:

1. Atypical noise development
2. Smoke development
3. Always check drive surfaces and cables for dirt or dust
4. Check temperature development
5. Check function of safety devices

6 Decommissioning

6.1 Disassembly

⚠ WARNING

Danger to life due to electric shock

After disconnecting from the supply voltage, a life-threatening voltage is still present at the contacts of the DC link voltage. Touching the contacts can lead to death or injury from electric shock.

- After disconnecting from the supply network, wait 10 minutes before starting disassembly.

⚠ CAUTION

Danger to life due to exposed contacts with dangerous voltages

After disassembling the module, the contacts of the power connectors in the baseplate are exposed. Touching the contacts can lead to death or injury from electric shock.

- Shutdown the input voltage before disassembly.
- Switch off the main switch on the power infeed
- Secure the main switch of the power infeed against being switched on again
- Wait at least 10 minutes after switching off the main switch until the DC link voltage has been discharged before starting work.

Further information on this can be found in the chapter in the system manual at Disassembly.

Disassembly may only be carried out by qualified and trained technical personnel.

✓ The supply voltage is shut down.

1. Remove cables.
2. Loosen all mounting screws of the module.
3. Take the module off the baseplate.

⇨ The module has been removed correctly.

6.2 Disposal

Products marked with a crossed-out wheeled bin shall not be discarded with the normal waste stream. The device is considered as waste electrical and electronic equipment. The national regulations for the disposal of waste electrical and electronic equipment must be observed.

7 Standards and guidelines

Standards

Generic standards EN IEC 61000-6-2

"Immunity standard for industrial environments"

Generic standards EN IEC 61000-6-4

"Emission standard for industrial environments"

IEC 61800-5-3

"Adjustable speed electrical power drive systems"

Part 5-3: Safety requirements - Functional, electrical and environmental requirements for encoders

Product standard EN IEC 61800-3

"Adjustable speed electrical power drive systems. EMC requirements and specific test methods"

EN IEC 63000

"Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances"

Guidelines

2014/30/EU

EMC Directive

2014/35/EU

Low Voltage Directive

2011/65/EU

RoHS Directive

8 Appendix

8.1 Manual version history

The following table shows the version history of this manual.

Version	Comment
1.0.0	• First release

8.2 Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

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The downloads are available in various formats.

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You will also find further documentation for Beckhoff components there.

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8.3 Accessories

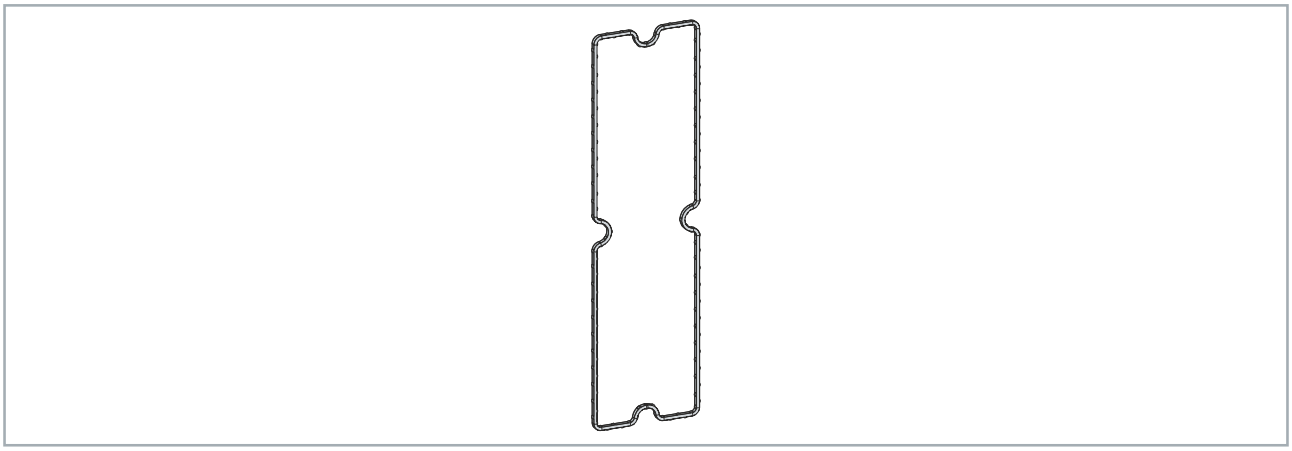
Suitable accessories can be found on the product website:

- https://www.beckhoff.com/md9000-2115-2250

Product	Description
ZMX1000-0010	M5x17.5 combi-TX25 replacement screws for module fastening (PU = 10 pcs.)
ZMX4001-0001	Replacement cover for potential equalization for 1-row baseplate with Beckhoff logo
ZMX4001-0002	Replacement cover for potential equalization for 2- and 3-row baseplate with Beckhoff logo

The following items are also available for replacing worn parts:

MX seal S2R2



The S2R2 seal is available to replace worn and damaged seals on a 2-row MX module with two slots.

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