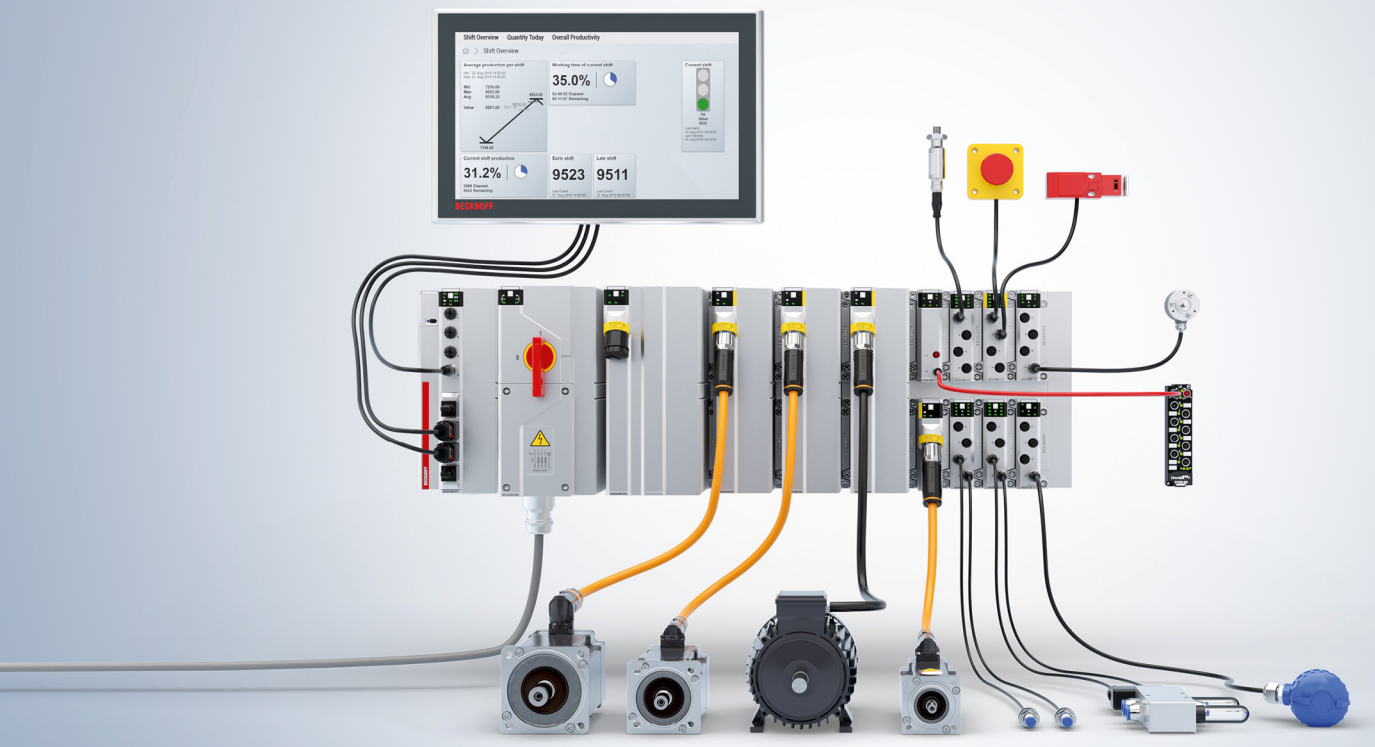
BECKHOFF New Automation Technology

Manual | EN

MO2316-0000-1112

16-channel digital combi, 24 V DC/0.5 A, M12



2026-10-28 | Version: 1.0

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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.
Claims to modify products that have already been supplied may not be made on the basis of the data, diagrams, and descriptions in this documentation.

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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

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

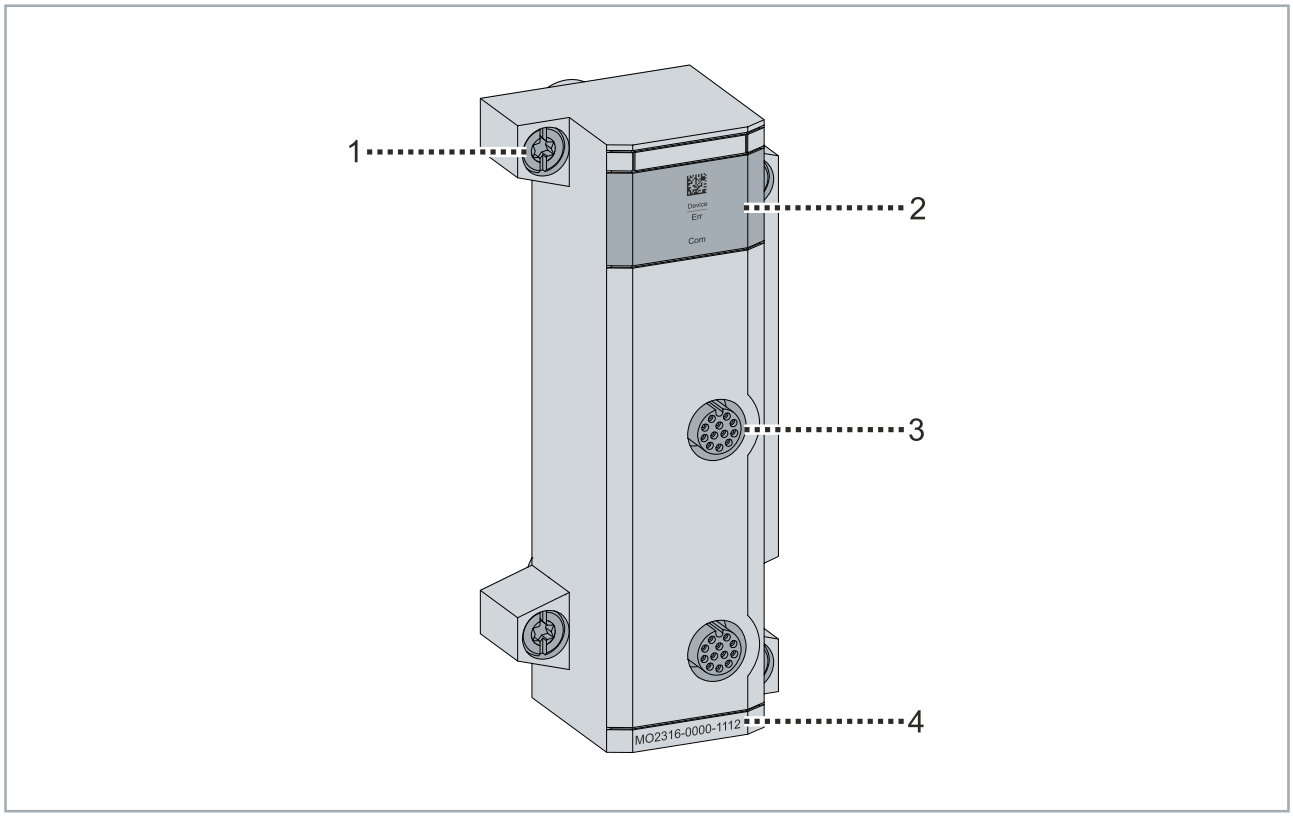
Improper use is not permitted and will result in the exclusion of liability on the part of Beckhoff Automation GmbH & Co. KG.

2 Product overview

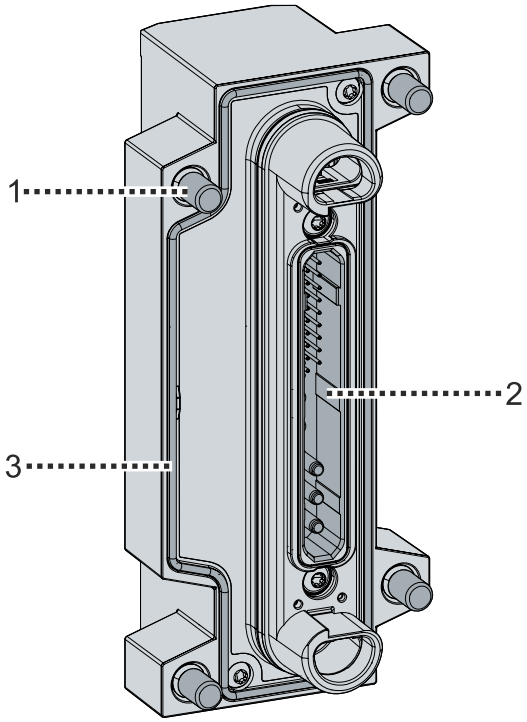
With 16 digital channels, each of which can be operated as inputs or outputs, the MO2316-0000-1112 can be used universally to operate a wide variety of inputs and outputs in any combination. Configuration is not required; the input circuit is internally permanently connected to the output driver so that a set output is automatically displayed in the input process image.

Each output can handle an output current up to a maximum of 0.5 A and is limited to a total of 4 A. The inputs record binary control signals from the process level and transfer them, with electrical isolation, to the controller. The signal state is shown on the display; the signal interface is established via screw-type M12 connectors.

Various diagnostic options are available for each channel. The short-circuit proof 24 V DC sensor/actuator supply for the M12 connectors is protected by an electronic fuse.



Position	Name
1	Fastening screw, captive, 4 x
2	Status display
3	Digital combi channel, can be used as input or output, 2 x
4	Module name



Position	Name
1	Fastening screw, captive, 4 x
2	Data connector
3	Seal

2.1 Product functions

2.1.1 Digital combi channels

You can use a digital combi channel either as a digital input or as a digital output. Each digital combi channel consists of a digital input and a digital output that are directly connected to each other.

If the digital output is set, the digital input detects a high level.

Properties of the digital inputs

The digital inputs are current-sinking inputs type 3 in accordance with EN 61131-2. The rated input voltage is 24 V DC.

Each digital input is equipped with an input filter and wire break detection. The filter time of the input filters is adjustable. The wire break detection can be enabled or disabled. It only works for sensors with PNP output.

On delivery, the digital inputs are configured as follows:

- The filter time of the input filter is 3 ms.
- Wire break detection is disabled.

Properties of the digital outputs

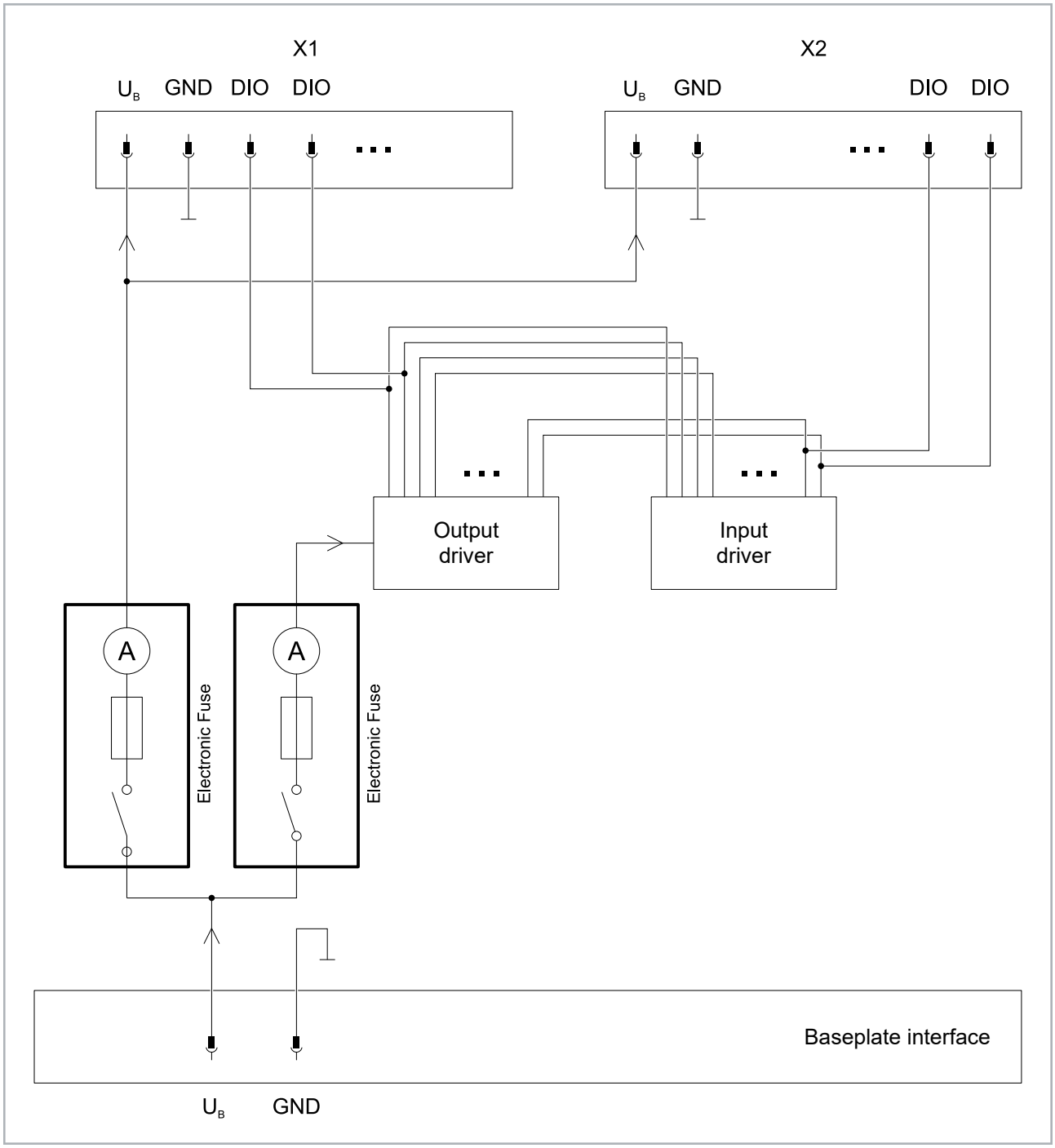
The digital outputs are current-supplying outputs in accordance with EN 61131-2. The rated output voltage is U_B = 24 V DC.

2.1.2 Supply voltage outputs

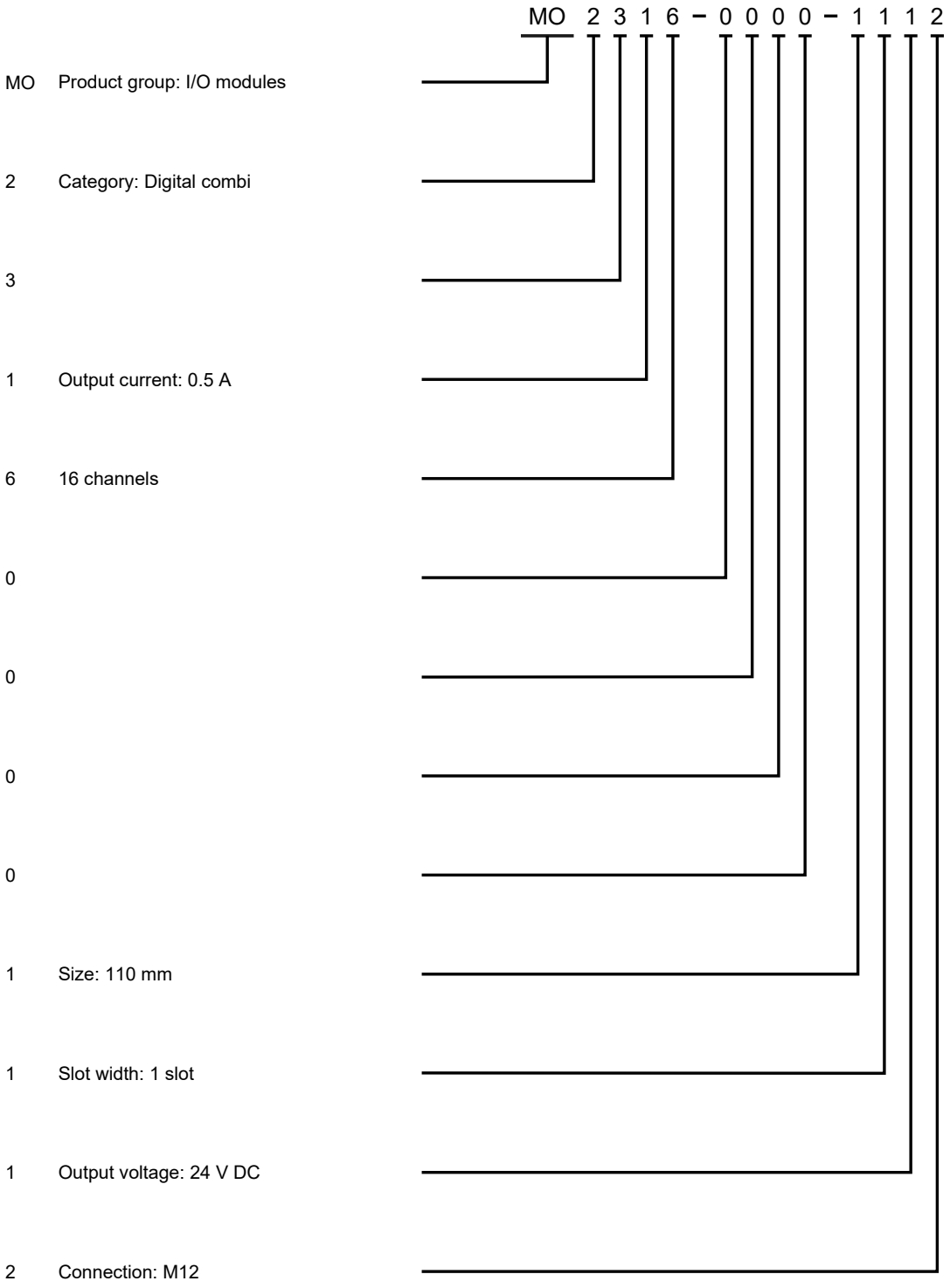
There is also a sensor power supply output on each connection. If required, this supplies the connected device with 24 V DC from the supply voltage U_B.

The module has a common electronic fuse for all supply voltage outputs. If a short circuit occurs at a supply voltage output, the fuse trips and all supply voltage outputs of the module are shut down.

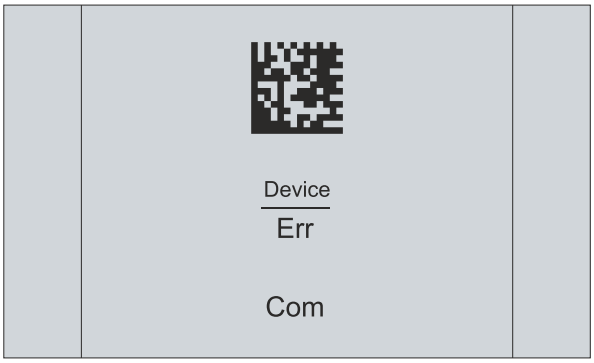
2.2 Block diagram



2.3 Type key


MO 2 3 1 6 – 0 0 0 0 – 1 1 1 2
MO Product group: I/O modules
2 Category: Digital combi
3
1 Output current: 0.5 A
6 16 channels
0
0
0
0
1 Size: 110 mm
1 Slot width: 1 slot
1 Output voltage: 24 V DC
2 Connection: M12

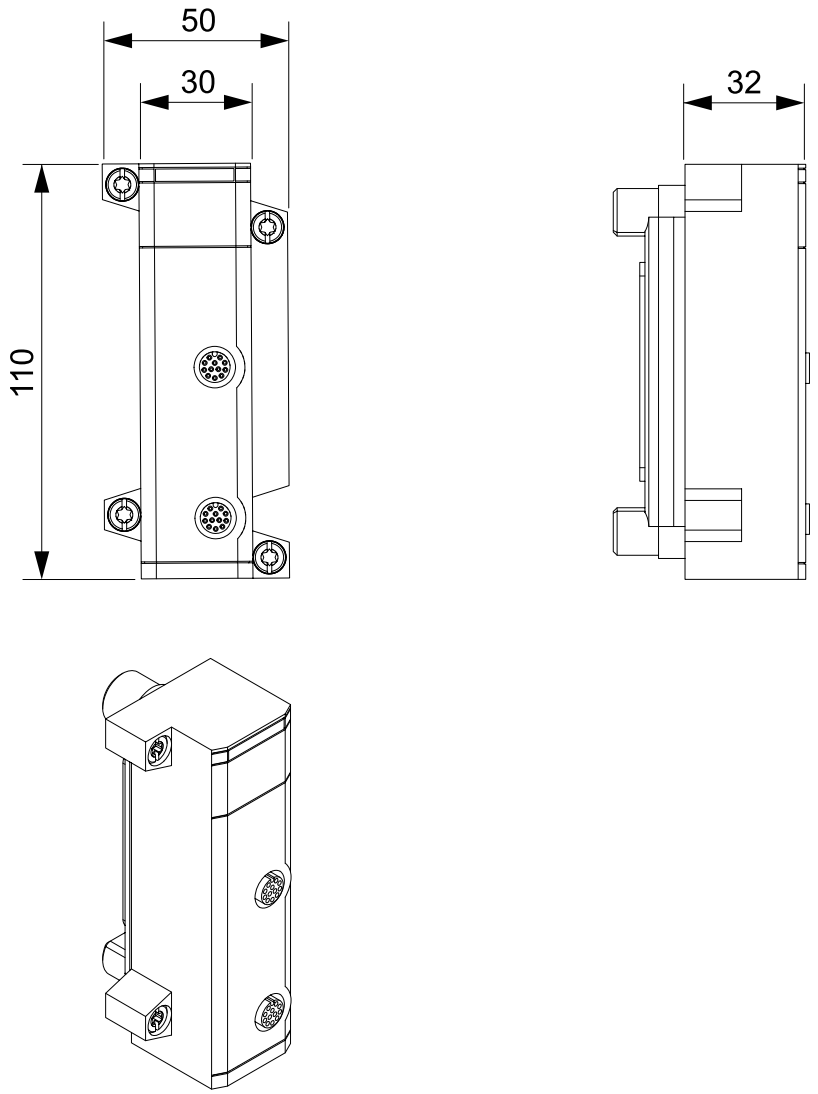
2.4 Status display



LED	State	Meaning
	-	Beckhoff Identification Code as Data Matrix code
Device | Err	off	There are no active error messages.
	lights up red	There are active error messages. You can find more detailed information in TwinCAT.
Com	off	EtherCAT communication status: Initialization Initial state after switching on. The device is detected and initialized; no process data exchange is taking place yet.
	flashes green	EtherCAT communication status: Pre-Operational The device is configurable. Mailbox communication (e.g., CoE/ SDO accesses) is possible, but process data is not yet being transmitted.
	green single flash	EtherCAT communication status: Safe-Operational Configuration is now complete. The device receives and processes process data; however, the outputs remain in a safe state and are not yet activated.
	lights up green	EtherCAT communication status: Operational Normal operating state. Full cyclic process data exchange; inputs and outputs are active.
	flickers green	EtherCAT communication status: Bootstrap Special maintenance mode for firmware updates. Normal process data communication is not possible.

2.5 Dimensions

All dimensions in mm



3 Technical data

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

Baseplate interface	
Connector	1 data connector
Fieldbus	EtherCAT

Digital inputs/outputs	
Number of channels	16
Connection	2 x M12 socket, 12-pin, A-coded
Characteristics of the inputs	EN61131-2, type 3
Rated voltage	24 V DC (-15%…+20%)
Max. output current for the entire module	4 A
Max. output current for the digital output per channel	0.5 A
Max. output current of the sensor power supply per connector	0.5 A

Housing data	
Width (slots)	1
Height (rows)	1
Dimensions W × H × D	50 mm × 110 mm × 33 mm 50 mm × 110 mm × 32 mm (housing only)
Material	Zinc die-cast and aluminum die-cast
Cooling	Convection
Installation position	Vertical. See system manual, chapter "Installation conditions".
Weight	Approx. 320 g

Device safety	
Separation between main and control circuits	Double or reinforced electrical isolation
Protection class	I

Standards, approvals	
Device safety	conforms to EN 61010-2-201
EMC immunity/emission	conforms to EN IEC 61000-6-2/EN IEC 61000-6-4
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
Approvals	• CE • UL in preparation

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

4 Software functions

Software functions are the functions of a module's firmware that a controller can access via EtherCAT.

Functionality

The following descriptions document the full range of software functions at the time of publication of this manual. The range of functions that can actually be used depends on the firmware version of a module.

Process data objects

Process data objects (PDOs) are used for the cyclic transmission of process data between the EtherCAT MainDevice and EtherCAT SubDevice. The data is exchanged at fixed intervals as part of the real-time cycle and serves as the basis for control and monitoring of field devices. PDOs typically contain input and output data required for the direct operation of a device. Cyclic transfer ensures a continuous and deterministic data exchange.

Inputs Profile DIP Input

Variable	Type	Description
Input Channel x	BIT	0 = There is no input value on the corresponding channel. 1 = An input value is present on the corresponding channel.

Inputs Profile DIP Diagnosis

Variable	Type	Description
Wirebreak Channel x	BIT	0 = The minimum current is reached on the corresponding channel. 1 = The minimum current is not reached on the corresponding channel.
Power Supply Missing Channel x	BIT	0 = The input status on the corresponding channel is known. 1 = The input status on the corresponding channel is unknown because the required power supply is missing.

Inputs Profile DOS Diagnosis

Variable	Type	Description
Overcurrent Channel x	BIT	0 = No overcurrent detected at the corresponding output. 1 = Overcurrent at the corresponding output. The output is drawing too much current.
Overload Channel x	BIT	0 = No overload detected at the relevant output. 1 = The output is in thermal overload protection mode and has been shut down.
Short to 24 V Channel x	BIT	0 = No external +24 V signal detected at the corresponding output. 1 = In the switched-off state, a voltage is detected at the corresponding output.
Power Supply Missing Channel x	BIT	0 = The output is not switched on, or it is switched on and the power supply is detected correctly. 1 = The output is switched on, but the expected power supply is not available.

Inputs Profile EFU (Ux) Inputs (IO)

Variable	Type	Description
Error	BIT	0 = No pending error in the electronic fuse that requires acknowledgment, and no watchdog error. 1 = The electronic fuse could not be reactivated after the configured auto-retry attempts were completed, or a watchdog error occurred. Reset via a rising edge at **Reset**.
Tripped	BIT	0 = The electronic fuse has not triggered. 1 = The electronic fuse has triggered due to the protection limit.
Enabled	BIT	0 = The electronic fuse is turned off; there is no output voltage. 1 = The electronic fuse is turned on and the output voltage is present.
Input Cycle Counter	BIT2	A 2-bit counter that increments when the TxPDO data is updated.
Current	REAL	Current in amperes flowing through the electronic fuse.

Inputs Profile EFU Inputs Supply

Variable	Type	Description
Warning	BIT	0 = The electronic fuse is not turned on and does not trigger. 1 = The electronic fuse has turned on or tripped.
Error	BIT	0 = The electronic fuse was not triggered despite the automatic retry sequence, and no watchdog error occurred. 1 = The electronic fuse was triggered despite the automatic retry sequence, or a watchdog error occurred.
Tripped	BIT	0 = The electronic fuse has not triggered. 1 = The electronic fuse has triggered.
Enabled	BIT	0 = The electronic fuse is turned off or there is no output voltage. 0 = The electronic fuse is turned on and the output voltage is present.
Input Cycle Counter	BIT2	A 2-bit counter that increments when the TxPDO data is updated.
Current	REAL	Current in amperes flowing through the electronic fuse

Outputs Profile DOS Outputs

Variable	Type	Description
Output Channel x	BIT	0 = There is no output value at the corresponding digital output. 1 = An output value is present at the corresponding digital output.

Outputs Profile EFU (Ux) Outputs (IO)

Variable	Type	Description
Enable	BIT	0 = The electronic fuse is disabled. 1 = The electronic fuse is activated. Becomes active only if the process data output is set to **Control via Process Data**.
Control via Process Data	BIT	0 = The output state is determined by the **Default State** parameter of the electronic fuse. The process data bit **Enable** is not evaluated. 1 = The output state is controlled via the process data bit **Enable**. **Enable** = 1 requests the output driver to turn on; **Enable** = 0 turns it off. The electronic fuse's protective function remains active.
Reset	BIT	0 = No error acknowledgment. 1 = An error is acknowledged on a rising edge.

Outputs Profile EFU Outputs Supply

Variable	Type	Description
Enable	BIT	0 = The electronic fuse is disabled. 1 = The electronic fuse is activated. Is only active if the process data output is set to **Control via Process Data**.
Control via Process Data	BIT	0 = Control of the **Enable** process data output is disabled. 1 = Control of the **Enable** process data output is activated.
Reset	BIT	0 = No reset or error acknowledgment. 1 = A rising edge acknowledges an impending error.

WcState

WcState indicates whether an EtherCAT SubDevice correctly participated in the cyclic process data exchange during the last bus cycle.

Variable	Type	Description
WcState	BIT	0 = data is valid 1 = data is invalid
InputToggle	BIT	A 1-bit counter that increments after each cycle

InfoData

InfoData indicates which diagnostic and status information an EtherCAT SubDevice provides.

Variable		Type	Description
State		UINT	0x___1 = EtherCAT SubDevice in INIT state 0x___2 = EtherCAT SubDevice in PREOP state 0x___3 = EtherCAT SubDevice in BOOT state 0x___4 = EtherCAT SubDevice in SAFEOP state 0x___8 = EtherCAT SubDevice in OP state 0x001_ = EtherCAT SubDevice reports an error 0x002_ = Invalid vendor ID, product code x read 0x004_ = Initialization error occurred 0x008_ = EtherCAT SubDevice disabled 0x010_ = EtherCAT SubDevice not present 0x020_ = EtherCAT SubDevice reports a connection error 0x040_ = EtherCAT SubDevice reports no connection 0x080_ = EtherCAT SubDevice reports an unexpected connection 0x100_ = Communication Port A 0x200_ = Communication Port B 0x400_ = Communication Port C 0x800_ = Communication Port D
AdsAddr		AMSADDR	Full ADS address for accessing the EtherCAT SubDevice (mailbox)
	netId	AMSNETID	unique network address
	port	WORD	Internal ADS port number of the EtherCAT device

5 Mechanical installation

Required tools

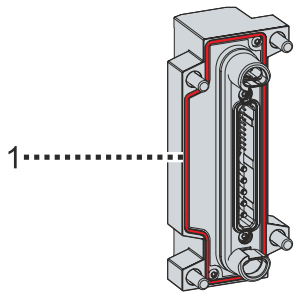
- Torx T25 screwdriver
- Torque wrench 5 Nm

5.1 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.

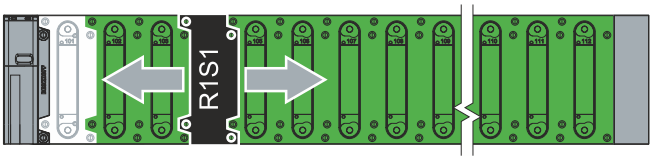


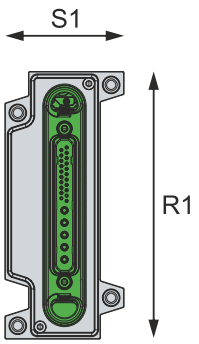
1. Check the seal [1] of the module for wear and damage
2. Replace worn and damaged seals

5.2 Placement of the module on the baseplate

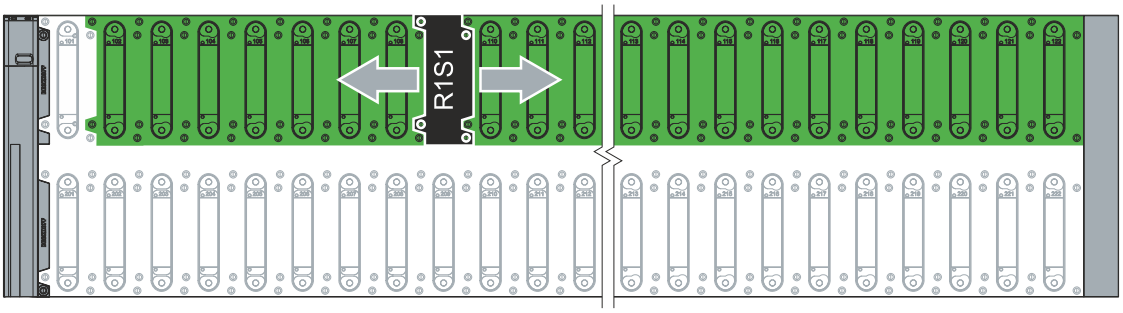
The module can be plugged into the following areas marked in green:

MB11xx-0000-0000

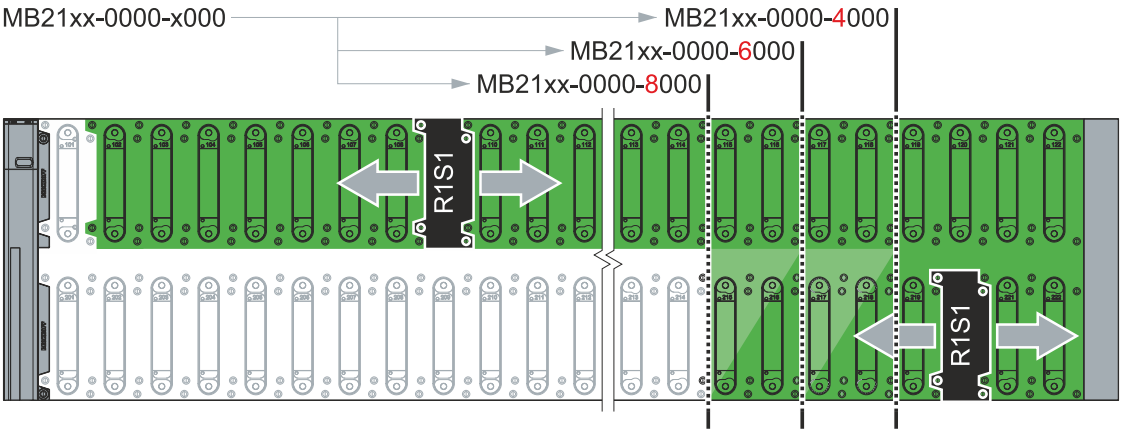




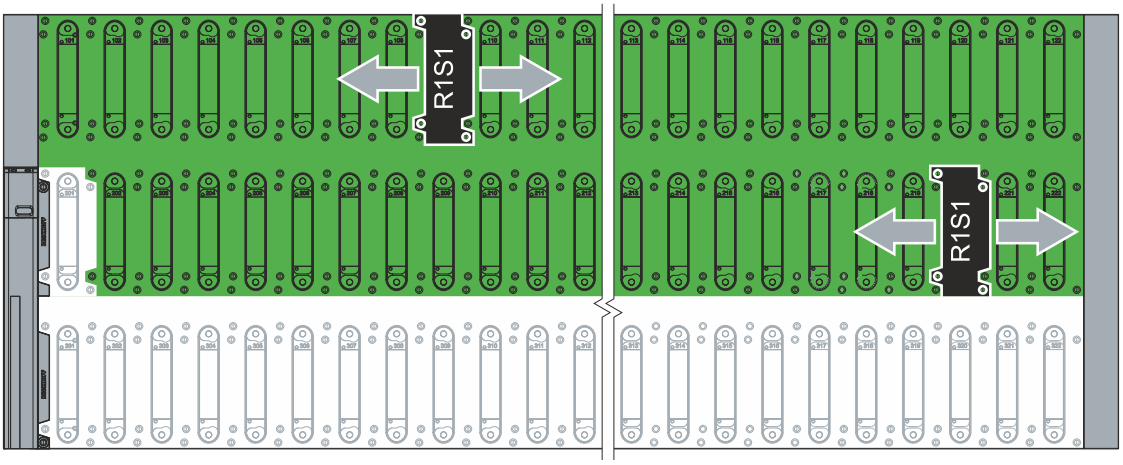
MB21xx-0000-0000



MB21xx-0000-x000



MB31xx-0000-0000



5.3 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 installation 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.

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.

6 Connection

NOTICE

PELV voltage source

The module must be powered by a PELV voltage source.

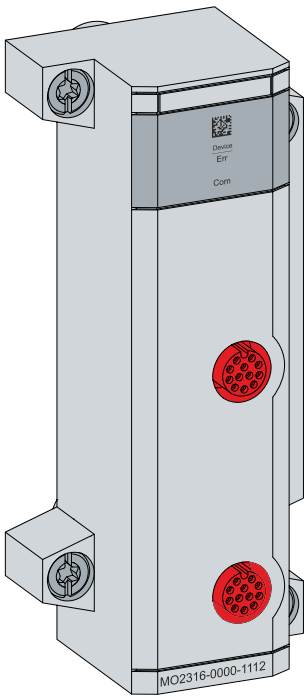
NOTICE

Cover unused sockets with protective caps

IP67 protection rating is only guaranteed if plugs are connected to all sockets and unused sockets are covered with protective caps.

Tested with a UL-listed circuit breaker (without current limiting) rated at 20 A.

6.1 Digital combi connections



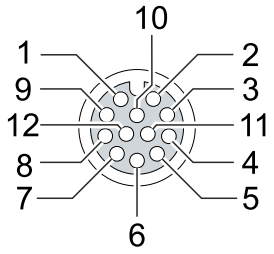
The digital combi connections are 12-pin A-coded M12 connectors.

Tightening torque: 0.6 Nm

NOTICE

Do not feed supply voltage output backwards

Material damage due to overcurrent is possible.

M12 socket, A-coded	Pin	Symbol	Function
	1	U_B	Supply voltage
	2	GND	Ground
	3	DIO 1	Digital combi 1
	4	DIO 2	Digital combi 2
	5	DIO 3	Digital combi 3
	6	DIO 4	Digital combi 4
	7	DIO 5	Digital combi 5
	8	DIO 6	Digital combi 6
	9	DIO 7	Digital combi 7
	10	DIO 8	Digital combi 8
	11	n. c.	not used
	12	n. c.	not used

7 Commissioning and operation

NOTICE

Damage to property due to operation in an unsuitable environment

Before commissioning, ensure that the environmental conditions at the place of commissioning and operation are complied with at all times.

1. Plug the module onto a baseplate.
2. Screw the module onto the baseplate.
3. Wire the module.
4. Switch on the external supply voltage.

8 Decommissioning

8.1 Disassembly

NOTICE

Damage to property due to electrical voltage

Disassembling this module under voltage can lead to material damage.

- Switch off the supply voltage before disassembling.

✓ 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.

8.2 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.

9 Appendix

9.1 CoE parameters

CoE parameters (CANopen over EtherCAT) describe the configuration values and settings of an EtherCAT device. They are organized as entries in the device's object directory and are used for parameterization, commissioning, and diagnostics. CoE parameters are accessed acyclically, that is, independently of the real-time cycle, by reading and writing the corresponding objects. This allows devices to be flexibly configured and adapted to the specific application.

See parameter list in the Beckhoff Information System: Link

9.2 Manual version history

The following table shows the version history of this manual.

Version	Comment
1.0	• First release

9.3 Accessories

Suitable accessories can be found on the product website:

www.beckhoff.com/MO2316-0000-1112

Product	Description
ZMX1000-0010	M5x17.5 combi-TX25 replacement screws for module fastening (PU = 10 pcs.)
ZMX3001-0011	1-row, 1-slot replacement seal for module base
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
ZMX4001-0003	Replacement cover for MA6060 interface
ZS5000-0020	Protective cap for M12 socket, plastic, black, IP65/67

9.4 Support and Service

Beckhoff Support and Service provides assistance with questions regarding Beckhoff products and system solutions, as well as with their planning, commissioning, and operation.

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✉ Email:	support@beckhoff.com, Support form
Web page:	www.beckhoff.com/support

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Beckhoff Information System

The Beckhoff Information System is the central online documentation resource for Beckhoff products and contains documentation on products and automation topics, as well as sample code.

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