BECKHOFF New Automation Technology

Documentation | EN

EPP1xxx

EtherCAT P Box modules with digital inputs

2023-12-08 | Version: 1.7

Table of contents

1 Foreword

1.1 Notes on the documentation

Intended audience

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning these components.
The qualified personnel is obliged to always use the currently valid documentation.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared 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 prior announcement.

No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

Trademarks

Beckhoff®, TwinCAT®, TwinCAT/BSD®, TC/BSD®, EtherCAT®, EtherCAT G®, EtherCAT G10®, EtherCAT P®, Safety over EtherCAT®, TwinSAFE®, XFC®, XTS® and XPlanar® are registered trademarks of and licensed by Beckhoff Automation GmbH. Other designations used in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owners.

Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents: EP1590927, EP1789857, EP1456722, EP2137893, DE102015105702 with corresponding applications or registrations in various other countries.

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

Copyright

1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations 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 engineering 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 Documentation issue status

Version	Comment
1.7	• EPP1819-0005 added • EPP1859-0022 added
1.6	• EtherCAT P status LEDs updated
1.5	• Chapter "EtherCAT P" > "Conductor losses" updated • Product images updated
1.4	• Structure update
1.3	• Dimensions updated • UL requirements updated
1.2	• EPP1816-0003 added • Assignment of the Working Counter for EPP1258 added • Structure update
1.1	• Modules added: EPP1004, EPP1008-0022, EPP1258, EPP1809, EPP1819
1.0.3	• EtherCAT P - Calculating cable length, voltage and current added • Cabling updated • Additional checks added
1.0.2	• Signal connection updated
1.0.1	• EtherCAT P connection updated
1.0.0	• First release
0.5	• First preliminary versions

Firmware and hardware versions

This documentation refers to the firmware and hardware version that was applicable at the time the documentation was written.

The module features are continuously improved and developed further. Modules having earlier production statuses cannot have the same properties as modules with the latest status. However, existing properties are retained and are not changed, so that older modules can always be replaced with new ones.

The firmware and hardware version (delivery state) can be found in the batch number (D-number) printed on the side of the EtherCAT Box.

Syntax of the batch number (D-number)

D: WW YY FF HH	Example with D no. 29 10 02 01:
WW - week of production (calendar week) YY - year of production FF - firmware version HH - hardware version	29 - week of production 29 10 - year of production 2010 02 - firmware version 02 01 - hardware version 01

Further information on this topic: Version identification of EtherCAT devices [▶ 109].

2 Product group: EtherCAT P Box modules

EtherCAT P

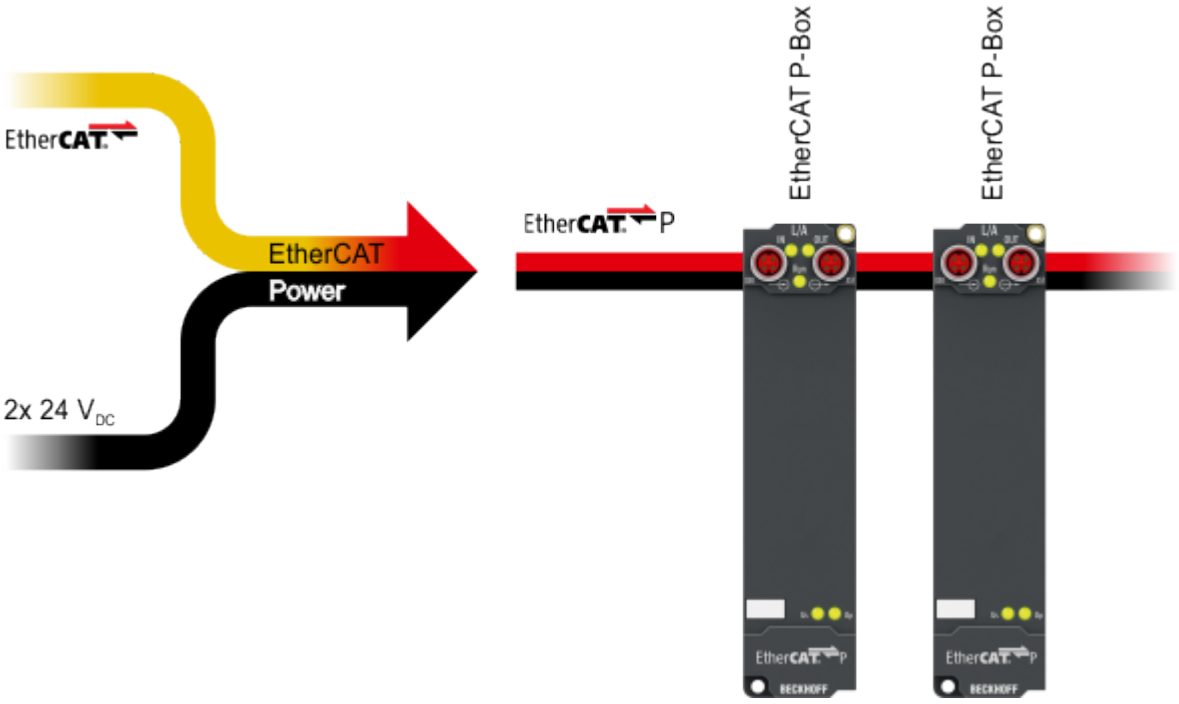
EtherCAT P supplements the EtherCAT technology with a process in which communication and supply voltages are transmitted on a common line. All EtherCAT properties are retained with this process.

Two supply voltages are transmitted per EtherCAT P line. The supply voltages are electrically isolated from each other and can therefore be switched individually. The nominal supply voltage for both is 24 V_{DC}.

EtherCAT P uses the same cable structure as EtherCAT: a 4-core Ethernet cable with M8 connectors. The connectors are mechanically coded so that EtherCAT connectors and EtherCAT P connectors cannot be interchanged.

EtherCAT P Box modules

EtherCAT P Box modules are EtherCAT P slaves with degree of protection IP67. They are designed for operation in wet, dirty or dusty industrial environments.



EtherCAT basics

A detailed description of the EtherCAT system can be found in the EtherCAT system documentation.

3 Product overview

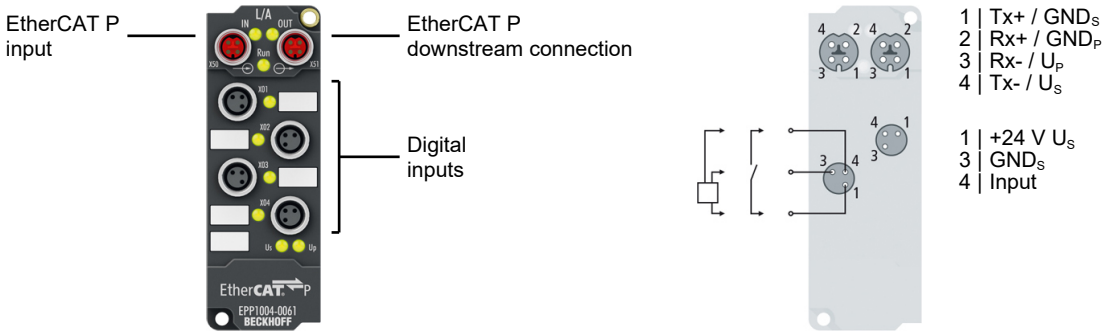
The following table shows the products described in this documentation and the main distinguishing features.

Module	Number inputs	Signal interface	Input filter	Special features
EPP1004-0061 [▶ 12]	4	4 x M8 socket	3.0 ms	-
EPP1008-0001 [▶ 15]	8	8x M8 socket	3.0 ms	-
EPP1008-0002 [▶ 18]	8	4 x M12 socket	3.0 ms	-
EPP1008-0022 [▶ 21]	8	8x M12 socket	3.0 ms	-
EPP1018-0001 [▶ 15]	8	8x M8 socket	10 µs	-
EPP1018-0002 [▶ 18]	8	4 x M12 socket	10 µs	-
EPP1258-0001 [▶ 24]	8	8x M8 socket	10 µs [1)]	Two timestamp inputs
EPP1258-0002 [▶ 28]	8	4 x M12 socket	10 µs [1)]	Two timestamp inputs
EPP1809-0021 [▶ 49]	16	16x M8 socket	3.0 ms	-
EPP1809-0022 [▶ 53]	16	8x M12 socket	3.0 ms	-
EPP1816-0003 [▶ 32]	16	2 x ZS2001	10 µs	Female header with spring connection
EPP1816-0008 [▶ 36]	16	1 x D-sub socket, 25-pin	10 µs	Diagnostic function for antivalent sensors.
EPP1816-3008 [▶ 40]	16	1 x D-sub socket, 25-pin	10 µs	Accelerometers, undervoltage detection
EPP1819-0005 [▶ 45]	16	8x M8 socket	10 µs	Evaluation of up to eight antivalent sensors.
EPP1819-0021 [▶ 49]	16	16x M8 socket	10 µs	-
EPP1819-0022 [▶ 53]	16	8x M12 socket	10 µs	-
EPP1859-0022 [▶ 57]	8	8x M12 socket	3.0 ms	Eight digital outputs

[1)] The timestamp inputs have no input filter.

3.1 EPP1004-0061

3.1.1 Introduction



4-channel digital input 24 V_{DC}, 3.0 ms

The EPP1004-0061 EtherCAT P Box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are connected via M8 screw type connectors.

The EtherCAT P Box modules are characterised by their small and space-saving form factor.

Quick links

Technical data [▶ 13]
Process image [▶ 14]
Scope of supply [▶ 14]
Dimensions [▶ 63]
Signal connection [▶ 71]

3.1.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	
Number	4
Connection	4 x M8 socket
Characteristics	Type 3 according to EN 61131-2, compatible with type 1
Input filter	3.0 ms
Signal voltage "0"	-3 … +5 V
Signal voltage "1"	+11 … +30 V
Input current	6 mA at 24 V_{DC}
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof

Housing data	
Dimensions W x H x D	30 mm x 86 mm x 22 mm (without plug connectors)
Weight	approx. 95 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 14]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.1.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

- 1x EPP1004-0061
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 4x protective cap for M8 socket, black (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

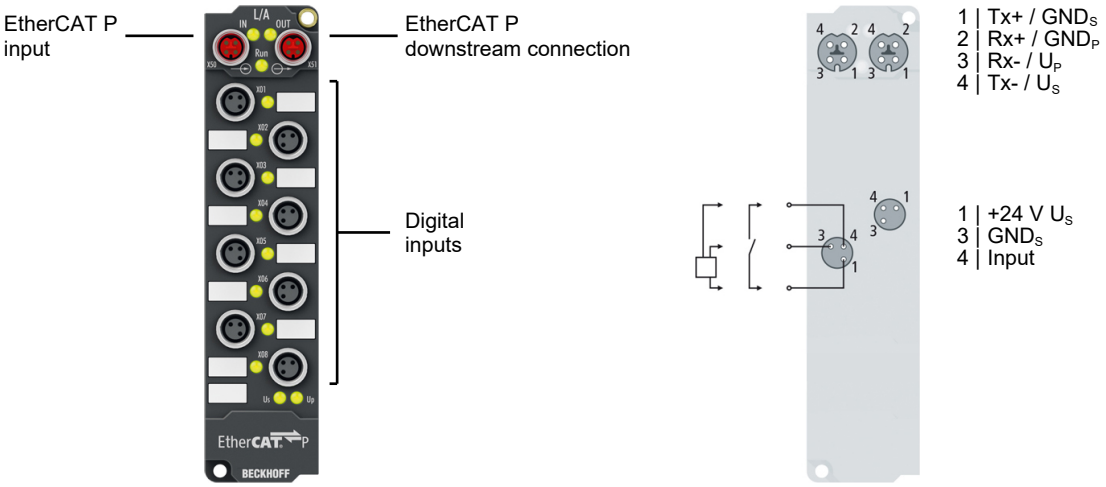
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.1.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable
Box 1 (EPP1004-0061) Channel 1 Input Channel 2 Input Channel 3 Input Channel 4 Input WcState InfoData	X01	4	Channel 1 Input
	X02	4	Channel 2 Input
	X03	4	Channel 3 Input
	X04	4	Channel 4 Input

3.2 EPP10x8-0001

3.2.1 Introduction



8-channel digital input 24 V_{DC}

The EPP10x8-0001 EtherCAT P Box with digital inputs acquires binary control signals from the process level and transfers them electrically isolated to the controller.

The signal state is displayed by LEDs; the signal connection is established via screw-type M8 connectors.

These versions have input filters of different speeds.

The sensors are supplied from the control voltage U_S.

Quick links

Technical data [▶ 16]
Process image [▶ 17]
Scope of supply [▶ 17]
Dimensions [▶ 61]
Signal connection [▶ 71]

3.2.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	EPP1008-0001	EPP1018-0001
Number	8	
Connection	8 x M8 socket	
Characteristics	Type 3 according to EN 61131-2, compatible with type 1	
Input filter	3.0 ms	10 µs
Signal voltage "0"	-3 … +5 V	
Signal voltage "1"	+11 … +30 V	
Input current	6 mA at 24 V_{DC}	
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof	

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors)
Weight	approx. 165 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 17]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.2.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

- 1x EPP10x8-0001
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

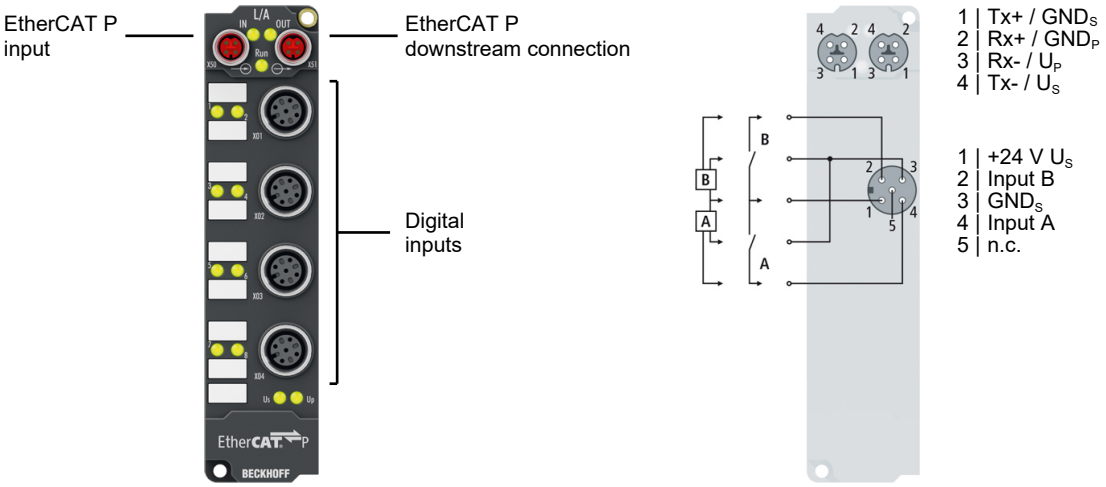
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.2.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable
Box 1 (EPP1008-0001) Channel 1 Input Channel 2 Input Channel 3 Input Channel 4 Input Channel 5 Input Channel 6 Input Channel 7 Input Channel 8 Input WcState InfoData	X01	4	Channel 1 Input
	X02	4	Channel 2 Input
	X03	4	Channel 3 Input
	X04	4	Channel 4 Input
	X05	4	Channel 5 Input
	X06	4	Channel 6 Input
	X07	4	Channel 7 Input
	X08	4	Channel 8 Input

3.3 EPP10x8-0002

3.3.1 Introduction



8-channel digital input 24 V_{DC}

The EPP10x8-0002 EtherCAT P Box with digital inputs acquires binary control signals from the process level and transfers them electrically isolated to the controller.

The signal state is displayed by LEDs; the signal connection is established via screw-type M12 connectors.

These versions have input filters of different speeds.

The sensors are supplied from the control voltage U_S.

Quick links

Technical data [▶ 19]
Process image [▶ 20]
Scope of supply [▶ 20]
Dimensions [▶ 61]
Signal connection [▶ 74]

3.3.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	EPP1008-0002	EPP1018-0002
Number	8	
Connection	4 x M12 socket	
Characteristics	Type 3 according to EN 61131-2, compatible with type 1	
Input filter	3.0 ms	10 µs
Signal voltage "0"	-3 … +5 V	
Signal voltage "1"	+11 … +30 V	
Input current	6 mA at 24 V_{DC}	
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof	

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors)
Weight	approx. 165 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 20]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.3.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

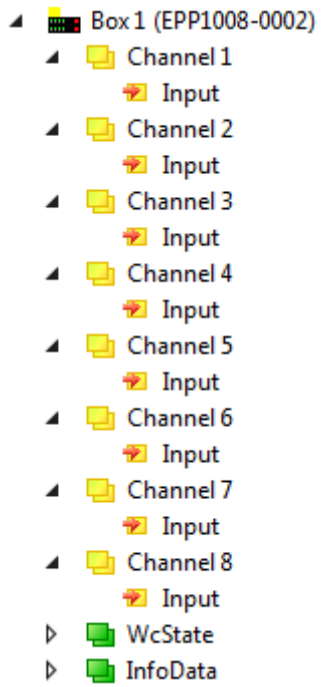
- 1x EPP10x8-0002
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

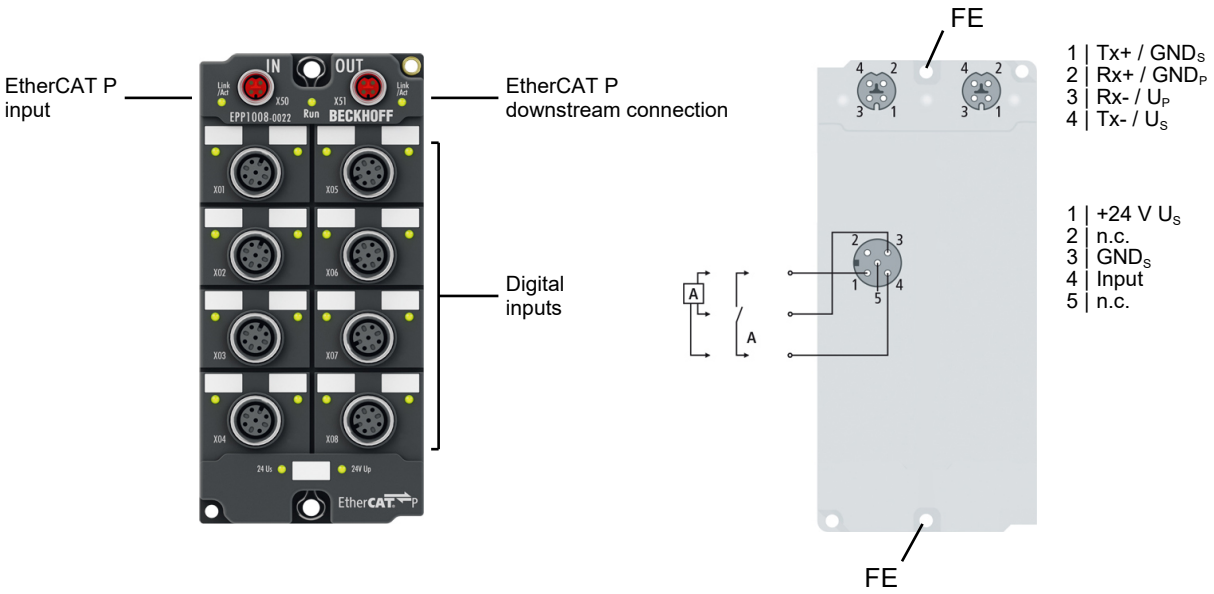
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.3.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable
	X01 / X02	2	Channel 2 Input
		4	Channel 1 Input
	X03 / X04	2	Channel 4 Input
		4	Channel 3 Input
	X05 / X06	2	Channel 6 Input
		4	Channel 5 Input
	X07 / X08	2	Channel 8 Input
		4	Channel 7 Input

3.4 EPP1008-0022

3.4.1 Introduction



8-channel digital input 24 V_{DC}, 3.0 ms

The EPP1008-0022 EtherCAT P Box with digital inputs acquires binary control signals from the process level and transfers them electrically isolated to the controller.

The signal state is displayed by LEDs; the signal connection is established via screw-type M12 connectors.

Quick links

Technical data [▶ 22]
Process image [▶ 23]
Scope of supply [▶ 23]
Dimensions [▶ 62]
Signal interface [▶ 75]

3.4.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	
Number	8
Connection	8 x M12 socket
Characteristics	Type 3 according to EN 61131-2, compatible with type 1
Input filter	3.0 ms
Signal voltage "0"	-3 … +5 V
Signal voltage "1"	+11 … +30 V
Input current	6 mA at 24 V_{DC}
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof

Housing data	
Dimensions W x H x D	60 mm x 126 mm x 26.5 mm (without plug connectors)
Weight	approx. 250 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 23]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.4.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

- 1x EPP1008-0022
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

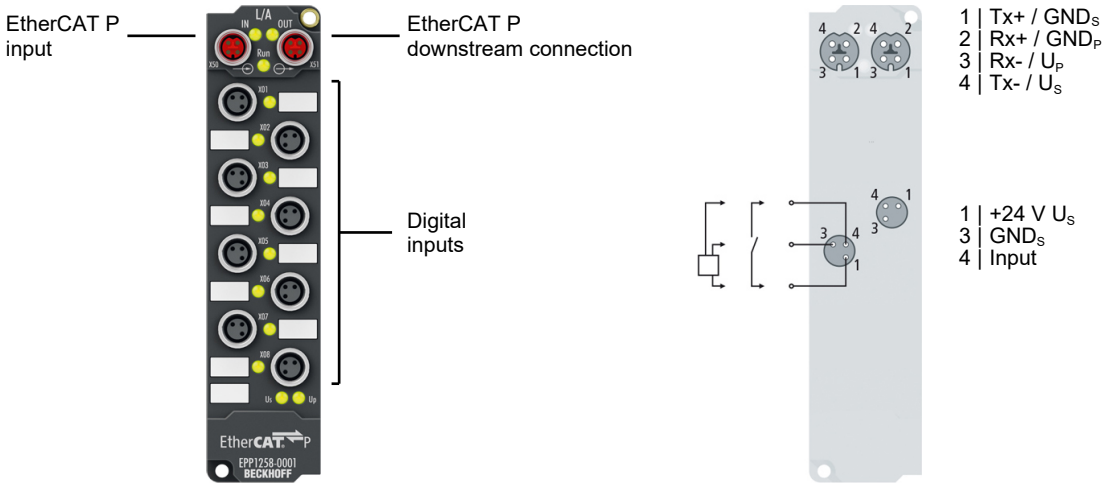
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.4.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable
Box 1 (EPP1008-0022) Channel 1 Input Channel 2 Input Channel 3 Input Channel 4 Input Channel 5 Input Channel 6 Input Channel 7 Input Channel 8 Input WcState InfoData	X01	4	Channel 1 Input
	X02	4	Channel 2 Input
	X03	4	Channel 3 Input
	X04	4	Channel 4 Input
	X05	4	Channel 5 Input
	X06	4	Channel 6 Input
	X07	4	Channel 7 Input
	X08	4	Channel 8 Input

3.5 EPP1258-0001

3.5.1 Introduction



8-channel digital input with 2-channel timestamp

The EPP1258-0001 EtherCAT P Box with digital inputs acquires fast binary control signals from the process level and transmits them, electrically isolated, to the controller.

The signals 0 and 1 are furnished with a timestamp that shows the time of the last edge change with a resolution of 1 ns. With this technology, signal curves can be traced exactly in time and correlated with the distributed clocks system-wide. With this technology, machine-wide parallel hardware wiring of digital inputs or encoder signals for synchronization purposes is often no longer required. As a result, responses with equidistant time intervals, independent of the bus cycle time, are to a large extent possible.

Quick links

Technical data [▶ 25]
Process image [▶ 27]
Scope of supply [▶ 26]
Dimensions [▶ 61]
Signal connection [▶ 71]
Timestamp inputs [▶ 85]

3.5.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red
Distributed Clocks	yes

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	
Number	8, of which 2 are timestamp inputs
Connection	8 x M8 socket
Characteristics	Type 3 according to EN 61131-2, compatible with type 1 Timestamp inputs: similar to type 3 according to EN 61131-2, compatible with type 1
Input filter	10 µs Timestamp inputs: no filter
Signal voltage "0"	-3 … +5 V
Signal voltage "1"	+11 … +30 V
Input current	6 mA at 24 V_{DC} Timestamp inputs: 3 mA at 24 V_{DC}
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof
Timestamp resolution	1 ns
Timestamp accuracy	10 ns + input delay (Accuracy Distributed Clocks: < 100 ns)

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors)
Weight	approx. 165 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 26]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.5.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

- 1x EPP1258-0001
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.5.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable
Box 1 (EPP1258-0001) Channel 1 Input Channel 2 Input Channel 3 Input Channel 4 Input Channel 5 Input Channel 6 Input Channel 7 Input Channel 8 Input Latch Status0 Status1 LatchPos0 LatchNeg0 LatchPos1 LatchNeg1 WcState WcState0 WcState1 InputToggle0 InputToggle1 InfoData	X01	4	Channel 1 Input Latch Status0 LatchPos0 LatchNeg0
	X02	4	Channel 2 Input Latch Status1 LatchPos1 LatchNeg1
	X03	4	Channel 3 Input
	X04	4	Channel 4 Input
	X05	4	Channel 5 Input
	X06	4	Channel 6 Input
	X07	4	Channel 7 Input
	X08	4	Channel 8 Input

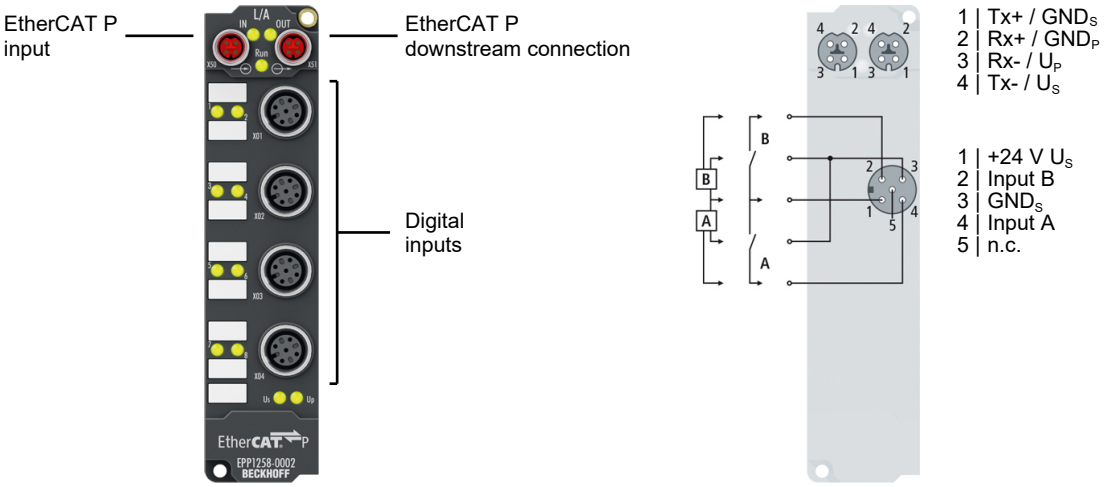
Working Counter

The Working Counter is a diagnostic function for EtherCAT networks. A description of the Working Counter can be found in the EtherCAT system documentation.

- WcState0: Working Counter for the inputs Channel 3 to Channel 8
- WcState1: Working Counter for the Timestamp inputs Channel 1 and Channel 2

3.6 EPP1258-0002

3.6.1 Introduction



8-channel digital input with 2-channel timestamp

The EPP1258-0002 EtherCAT P Box with digital inputs acquires fast binary control signals from the process level and transmits them, electrically isolated, to the controller.

The signals 0 and 1 are furnished with a timestamp that shows the time of the last edge change with a resolution of 1 ns. With this technology, signal curves can be traced exactly in time and correlated with the distributed clocks system-wide. With this technology, machine-wide parallel hardware wiring of digital inputs or encoder signals for synchronization purposes is often no longer required. As a result, responses with equidistant time intervals, independent of the bus cycle time, are to a large extent possible.

Quick links

Technical data [▶ 29]
Process image [▶ 31]
Scope of supply [▶ 30]
Dimensions [▶ 61]
Signal connection [▶ 74]
Timestamp inputs [▶ 85]

3.6.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red
Distributed Clocks	yes

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	
Number	8, of which 2 are timestamp inputs
Connection	8 x M8 socket
Characteristics	Type 3 according to EN 61131-2, compatible with type 1 Timestamp inputs: similar to type 3 according to EN 61131-2, compatible with type 1
Input filter	10 µs Timestamp inputs: no filter
Signal voltage "0"	-3 … +5 V
Signal voltage "1"	+11 … +30 V
Input current	6 mA at 24 V_{DC} Timestamp inputs: 3 mA at 24 V_{DC}
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof
Timestamp resolution	1 ns
Timestamp accuracy	10 ns + input delay (Accuracy Distributed Clocks: < 100 ns)

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors)
Weight	approx. 165 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 30]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.6.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

- 1x EPP1258-0002
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.6.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable
Box 1 (EPP1258-0002) Channel 1 Input Channel 2 Input Channel 3 Input Channel 4 Input Channel 5 Input Channel 6 Input Channel 7 Input Channel 8 Input Latch Status0 Status1 LatchPos0 LatchNeg0 LatchPos1 LatchNeg1 WcState InfoData	X01 / X02	2	Channel 2 Input Latch Status1 LatchPos1 LatchNeg1
		4	Channel 1 Input Latch Status0 LatchPos0 LatchNeg0
	X03 / X04	2	Channel 4 Input
		4	Channel 3 Input
	X05 / X06	2	Channel 6 Input
		4	Channel 5 Input
	X07 / X08	2	Channel 8 Input
		4	Channel 7 Input

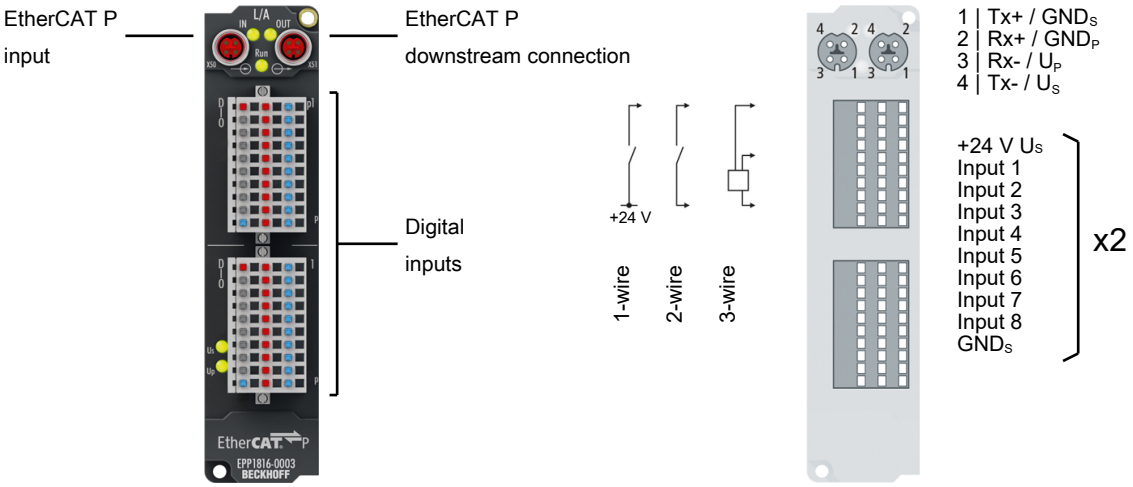
Working Counter

The Working Counter is a diagnostic function for EtherCAT networks. A description of the Working Counter can be found in the EtherCAT system documentation.

- WcState0: Working Counter for the inputs Channel 3 to Channel 8
- WcState1: Working Counter for the Timestamp inputs Channel 1 and Channel 2

3.7 EPP1816-0003

3.7.1 Introduction



EtherCAT P Box modules with 16 digital inputs

The EPP1816-0003 EtherCAT P Box with digital inputs acquires binary control signals from the process level and transfers them electrically isolated to the controller.

The signal state is indicated by means of LEDs. The signal connection is made via female headers with spring connection, optionally available in 1- and 3-pin versions. The module is supplied without connectors.

The sensors are supplied from the control voltage U_S. The peripheral voltage U_P is not used in the input module, but it can be optionally connected for forwarding.

Quick links

Technical data [▶ 33]
Process image [▶ 35]
Scope of supply [▶ 34]
Dimensions [▶ 61]
Signal connection [▶ 76]

3.7.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red
Distributed Clocks	yes

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	
Number	16
Connection	2 x female header with spring connection: ZS2001
Characteristics	Type 3 according to EN 61131-2, compatible with type 1
Input filter	10 µs
Signal voltage "0"	-3 … +5 V
Signal voltage "1"	+11 … +30 V
Input current	6 mA at 24 V_{DC}
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors)
Weight	approx. 165 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 34]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.7.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

- 1x EPP1816-0003
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Female headers with spring connection not included in the scope of supply

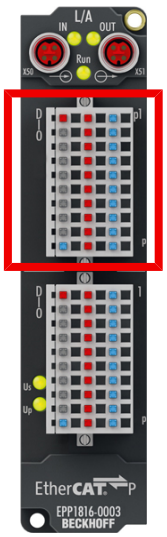
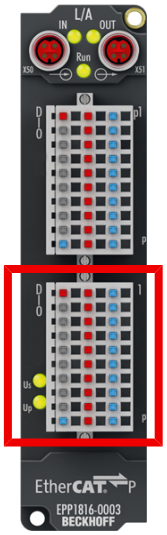
You can find suitable types in the chapter Accessories [▶ 108].

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

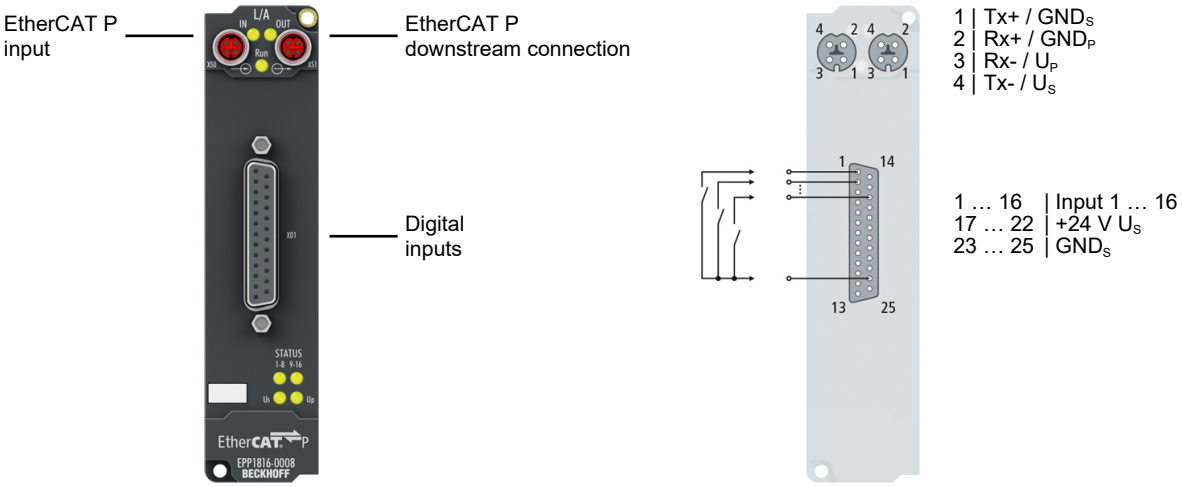
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.7.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable
Box 1 (EPP1816-0003) DIG Inputs Channel 1 Input 1 Input 2 Input 3 Input 4 Input 5 Input 6 Input 7 Input 8 Sync error TxPDO Toggle DIG Inputs Channel 2 Input 1 Input 2 Input 3 Input 4 Input 5 Input 6 Input 7 Input 8 Sync error TxPDO Toggle WcState InfoData		0	DIG Inputs Channel 1 Input 1
		1	DIG Inputs Channel 1 Input 2
		2	DIG Inputs Channel 1 Input 3
		3	DIG Inputs Channel 1 Input 4
		4	DIG Inputs Channel 1 Input 5
		5	DIG Inputs Channel 1 Input 6
		6	DIG Inputs Channel 1 Input 7
		7	DIG Inputs Channel 1 Input 8
		0	DIG Inputs Channel 2 Input 1
		1	DIG Inputs Channel 2 Input 2
		2	DIG Inputs Channel 2 Input 3
		3	DIG Inputs Channel 2 Input 4
		4	DIG Inputs Channel 2 Input 5
		5	DIG Inputs Channel 2 Input 6
		6	DIG Inputs Channel 2 Input 7
		7	DIG Inputs Channel 2 Input 8

3.8 EPP1816-0008

3.8.1 Introduction



EtherCAT P Box modules with 16 digital inputs

The EPP1816-0008 EtherCAT P Box acquires binary control signals from the process level and transfers them electrically isolated to the controller.

The signal state is indicated by means of LEDs. The signal connection is made through a 25-pin D-sub socket.

Quick links

Technical data [▶ 37]
Process image [▶ 39]
Scope of supply [▶ 38]
Dimensions [▶ 61]
Signal connection [▶ 78]

3.8.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red
Distributed Clocks	yes

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	
Number	16
Connection	D-sub socket, 25-pin, UNC4-40 thread
Characteristics	Type 3 according to EN 61131-2, compatible with type 1
Input filter	10 µs
Signal voltage "0"	-3 … +5 V
Signal voltage "1"	+11 … +30 V
Input current	6 mA at 24 V_{DC}
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors)
Weight	approx. 165 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 38]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.8.3 Status LEDs

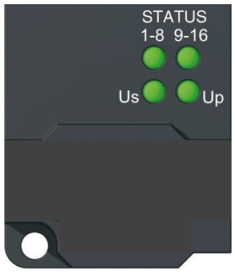


Fig. 1: Status LEDs of EPP1816

LED Displays

LED	Display	Meaning
STATUS 1-8	green illuminated	a signal (24 V) is present at one or more inputs of channels 1 to 8
STATUS 9-16	green illuminated	a signal (24 V) is present at one or more inputs of channels 9 to 16
U_S	off	Supply voltage U_S is not present
	green illuminated	Supply voltage U_S is present
U_P	off	Supply voltage U_P is not present
	green illuminated	Supply voltage U_P is present

3.8.4 Scope of supply

Make sure that the following components are included in the scope of delivery:

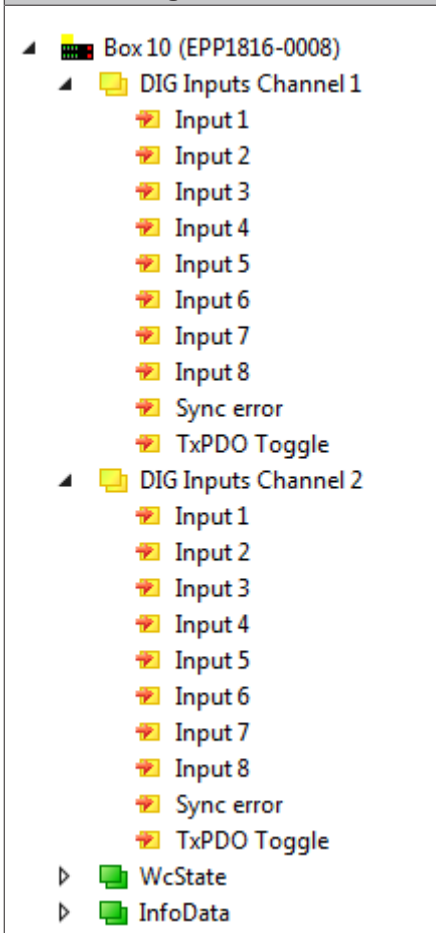
- 1x EPP1816-0008
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

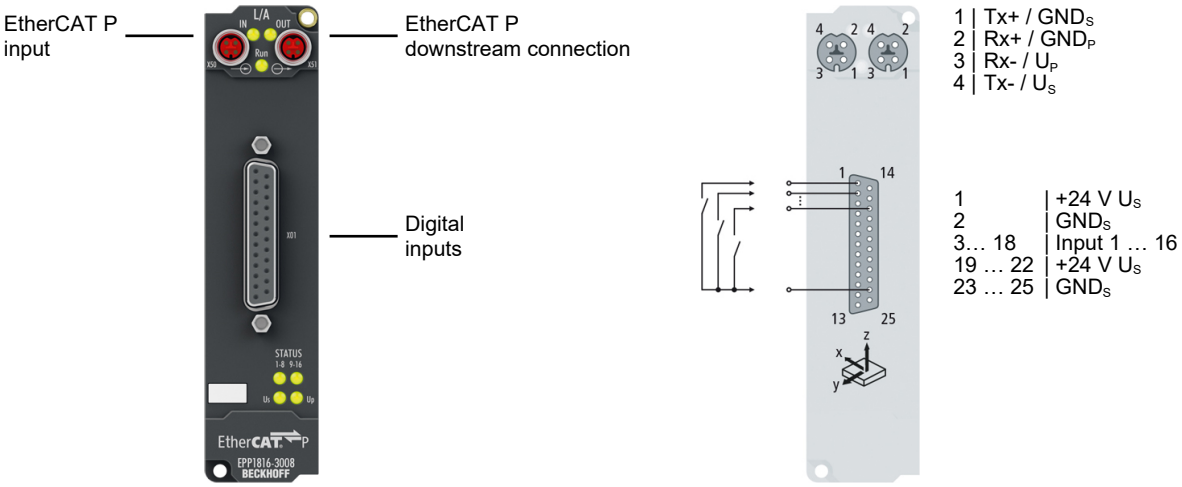
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.8.5 Process image

Process image in TwinCAT	Connector	Contact	Input variable
	X01	1	DIG Inputs Channel 1 Input 1
		2	DIG Inputs Channel 1 Input 2
		3	DIG Inputs Channel 1 Input 3
		4	DIG Inputs Channel 1 Input 4
		5	DIG Inputs Channel 1 Input 5
		6	DIG Inputs Channel 1 Input 6
		7	DIG Inputs Channel 1 Input 7
		8	DIG Inputs Channel 1 Input 8
		9	DIG Inputs Channel 2 Input 1
		10	DIG Inputs Channel 2 Input 2
		11	DIG Inputs Channel 2 Input 3
		12	DIG Inputs Channel 2 Input 4
		13	DIG Inputs Channel 2 Input 5
		14	DIG Inputs Channel 2 Input 6
		15	DIG Inputs Channel 2 Input 7
		16	DIG Inputs Channel 2 Input 8

3.9 EPP1816-3008

3.9.1 Introduction



EtherCAT P Box modules with 16 digital inputs

The EPP1816-3008 EtherCAT P Box with 16 digital inputs acquires binary control signals from the process level and transfers them electrically isolated to the controller.

The signal status is indicated by LEDs; the signal connection is made through a 25-pin D-sub socket.

The EtherCAT P Box has two internal 3-axis acceleration sensors with adjustable measuring range. Possible applications include the recording of vibrations and shocks/oscillations, but inclination measurements in all three axes are also possible. Undervoltage detection (U_S and U_P) is integrated and is signaled to the controller.

Quick links

Technical data [▶ 41]
Process image [▶ 44]
Scope of supply [▶ 43]
Dimensions [▶ 61]
Signal connection [▶ 78]
Acceleration sensors [▶ 86]
Undervoltage detection [▶ 88]

3.9.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red
Distributed Clocks	yes

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.
Diagnostics	Undervoltage detection • U_S < 18 V_{DC} • U_P < 18 V_{DC}

Digital inputs	
Number	16
Connection	D-sub socket, 25-pin, UNC4-40 thread
Characteristics	Type 3 according to EN 61131-2, compatible with type 1
Input filter	10 µs
Signal voltage "0"	-3 … +5 V
Signal voltage "1"	+11 … +30 V
Input current	6 mA at 24 V_{DC}
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors)
Weight	approx. 165 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 42]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.9.2.1 Acceleration measurement

Technical data	Acceleration measurement		Inclination measurement
	Raw values	Measured values	
Measuring range [1]	Adjustable: • ±2 g • ±4 g • ±8 g • ±16 g		±180°
Resolution [1]	10-bit	• Measuring range ±2 g: 4 mg • Measuring range ±4 g: 8 mg • Measuring range ±8 g: 16 mg • Measuring range ±16 g: 48 mg	1°
Representation [1]	10-bit in 16-bit (left aligned)	1 mg / LSB	1° / LSB
Sampling rate	1 … 5000 Hz		

[1] Unit of measurement: 1 g = 9.81 m/s^2 (acceleration of gravity). 1 mg = 1/1000 g

3.9.3 Status LEDs

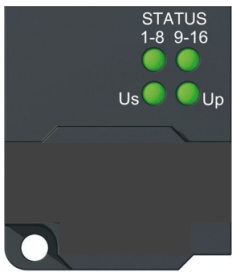


Fig. 2: Status LEDs of EPP1816

LED Displays

LED	Display	Meaning
STATUS 1-8	green illuminated	a signal (24 V) is present at one or more inputs of channels 1 to 8
STATUS 9-16	green illuminated	a signal (24 V) is present at one or more inputs of channels 9 to 16
U_S	off	Supply voltage U_S is not present
	green illuminated	Supply voltage U_S is present
U_P	off	Supply voltage U_P is not present
	green illuminated	Supply voltage U_P is present

3.9.4 Scope of supply

Make sure that the following components are included in the scope of delivery:

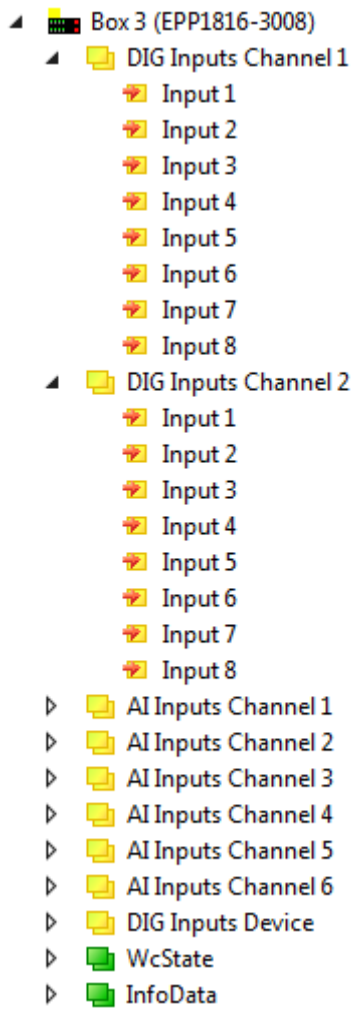
- 1x EPP1816-3008
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

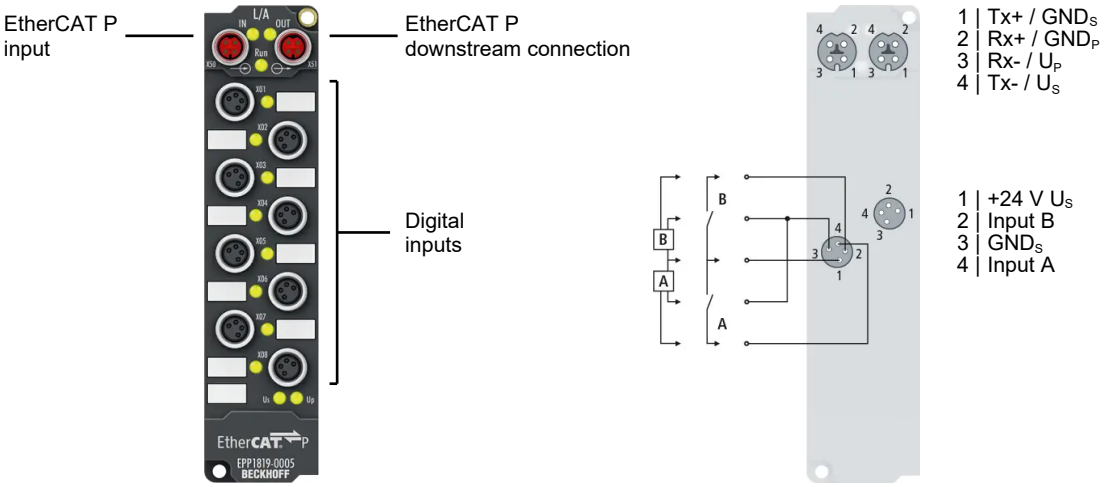
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.9.5 Process image

Process image in TwinCAT	Connector	Contact	Input variable
	X01	3	DIG Inputs Channel 1 Input 1
		4	DIG Inputs Channel 1 Input 2
		5	DIG Inputs Channel 1 Input 3
		6	DIG Inputs Channel 1 Input 4
		7	DIG Inputs Channel 1 Input 5
		8	DIG Inputs Channel 1 Input 6
		9	DIG Inputs Channel 1 Input 7
		10	DIG Inputs Channel 1 Input 8
		11	DIG Inputs Channel 2 Input 1
		12	DIG Inputs Channel 2 Input 2
		13	DIG Inputs Channel 2 Input 3
		14	DIG Inputs Channel 2 Input 4
		15	DIG Inputs Channel 2 Input 5
		16	DIG Inputs Channel 2 Input 6
		17	DIG Inputs Channel 2 Input 7
		18	DIG Inputs Channel 2 Input 8

3.10 EPP1819-0005

3.10.1 Introduction



The EPP1819-0005 EtherCAT P Box with digital inputs acquires binary control signals from the process level and transfers them electrically isolated to the controller. The signal state is indicated by means of LEDs. The signal connection is made via screwable 4-pin M8 connectors. This means that sensors with antivalent channels (NC/NO, change-over) can be connected directly using a 4-pin cable.

The sensors are supplied from the control voltage U_S. The load voltage U_P is not used in the input module, but it can optionally be connected for forwarding and is fed through to the next device.

The connected sensors are supplied via an internal, short-circuit proof driver block with a total of 0.5 A for all sensors.

Thanks to the input filter of 10 µs, the EPP1819-0005 is preferably suitable for electronic inputs that transmit to the controller with the shortest possible delay due to the short filter time. The use of antivalent sensors also enables the sensor to be diagnosed.

Quick links

Technical data [▶ 46]
Process image [▶ 48]
Signal interface [▶ 72]
Diagnostics for antivalent sensors [▶ 91]

3.10.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	130 mA + sensor supply
U_P nominal voltage	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	
Number of inputs	16
Connection	8x socket M8 x 1, 4-pin, A-coded
Cable length	max. 30 m
Characteristics	Type 3 according to EN 61131-2, compatible with type 1
Nominal voltage	24 V_{DC} (-15 % / +20 %)
Input filter	10 µs
Signal voltage "0"	-3 … +5 V
Signal voltage "1"	+11 … +30 V
Input current	3 mA
Sensor power supply	24 V_{DC} from U_S max. 0.5 A, short-circuit proof in total

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors)
Weight	approx. 165 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C
Ambient temperature during storage	-40 … +85 °C
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 conforms to EN 60529

Approvals / markings	
Approvals / markings *)	CE, UL under preparation

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.10.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

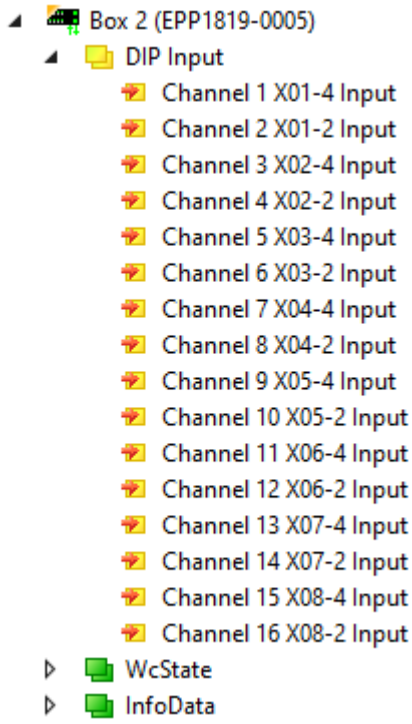
- 1x EPP1819-0005
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

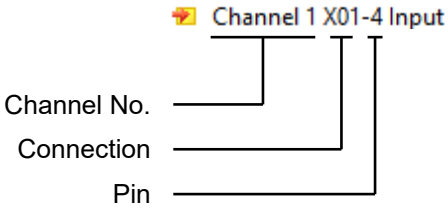
Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.10.4 Process image

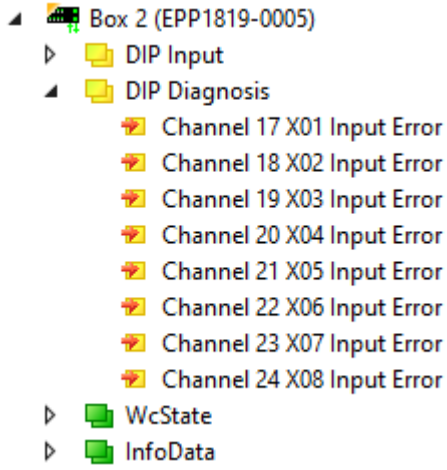


"DIP Input" contains the input variables of the digital inputs. The variable names are structured as follows:



3.10.4.1 Optional: "DIP Diagnosis" for diagnosing antivalent sensors

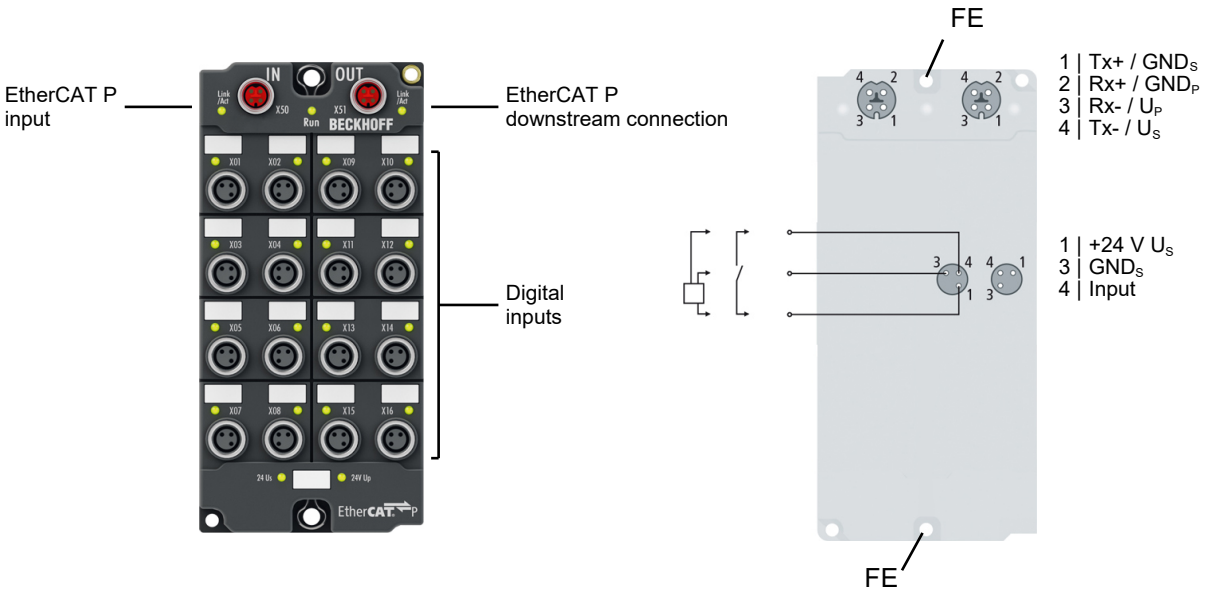
The process data object "DIP Diagnosis" contains status bits for diagnosing antivalent sensors.



Further information can be found in chapter Antivalent sensors (EPP1819-0005) [▶ 91].

3.11 EPP18x9-0021

3.11.1 Introduction



EtherCAT P Box modules with 16 digital inputs

The EPP18x9-0021 EtherCAT P Box with digital inputs acquires binary control signals from the process level and transfers them electrically isolated to the controller.

The signal state is displayed by LEDs; the signal connection is established via screw-type M8 connectors.

Quick links

Technical data [▶ 50]
Process image [▶ 52]
Scope of supply [▶ 51]
Dimensions [▶ 62]
Signal connection [▶ 71]

3.11.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	EPP1809-0021	EPP1819-0021
Number	16	
Connection	16 x M8 socket	
Characteristics	Type 3 according to EN 61131-2, compatible with type 1	
Input filter	3.0 ms	10 µs
Signal voltage "0"	-3 … +5 V	
Signal voltage "1"	+11 … +30 V	
Input current	6 mA at 24 V_{DC}	
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof	

Housing data	
Dimensions W x H x D	60 mm x 126 mm x 26.5 mm (without plug connectors)
Weight	approx. 250 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 51]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.11.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

- 1x EPP18x9-0021
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

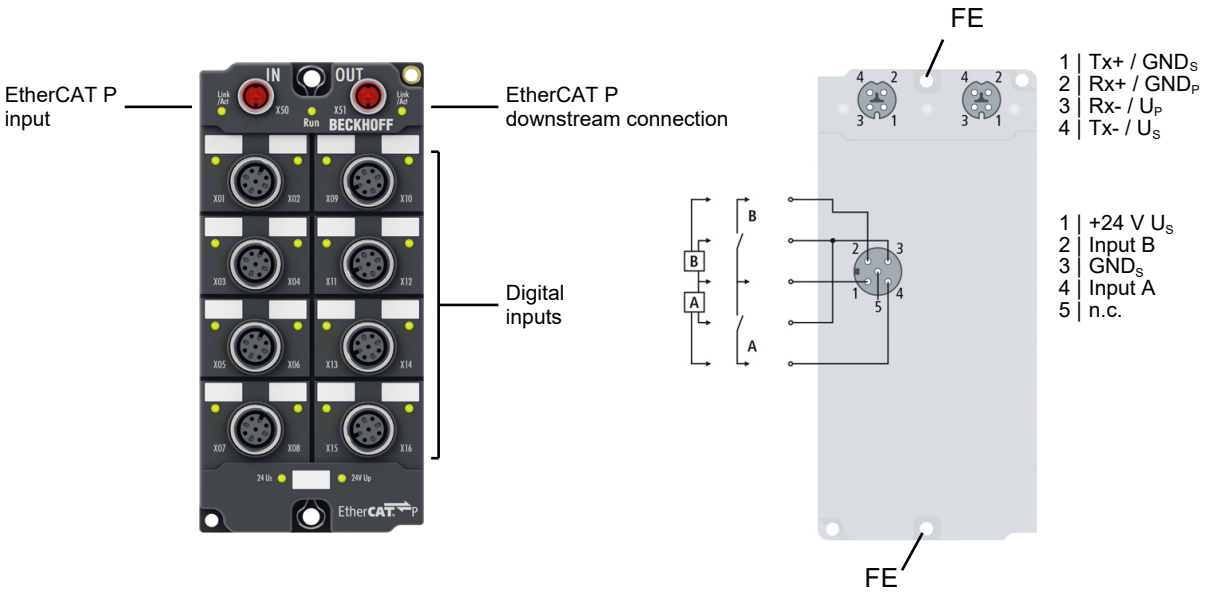
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.11.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable
Box 3 (EPP1819-0021) Channel 1 Input Channel 2 Input Channel 3 Input Channel 4 Input Channel 5 Input Channel 6 Input Channel 7 Input Channel 8 Input Channel 9 Input Channel 10 Input Channel 11 Input Channel 12 Input Channel 13 Input Channel 14 Input Channel 15 Input Channel 16 Input WcState InfoData	X01	4	Channel 1 Input
	X02	4	Channel 2 Input
	X03	4	Channel 3 Input
	X04	4	Channel 4 Input
	X05	4	Channel 5 Input
	X06	4	Channel 6 Input
	X07	4	Channel 7 Input
	X08	4	Channel 8 Input
	X09	4	Channel 9 Input
	X10	4	Channel 10 Input
	X11	4	Channel 11 Input
	X12	4	Channel 12 Input
	X13	4	Channel 13 Input
	X14	4	Channel 14 Input
	X15	4	Channel 15 Input
	X16	4	Channel 16 Input

3.12 EPP1809-0022, EPP1819-0022

3.12.1 Introduction



EtherCAT P Box modules with 16 digital inputs

The EPP18x9-0022 EtherCAT P Box with digital inputs acquires binary control signals from the process level and transfers them electrically isolated to the controller.

The signal state is displayed by LEDs; the signal connection is established via screw-type M12 connectors.

Quick links

Technical data [▶ 54]
Process image [▶ 56]
Scope of supply [▶ 55]
Dimensions [▶ 62]
Signal connection [▶ 74]

3.12.2 Technical data

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

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	100 mA + sensor power supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	EPP1809-0022	EPP1819-0022
Number	16	
Connection	8 x M12 socket	
Characteristics	Type 3 according to EN 61131-2, compatible with type 1	
Input filter	3.0 ms	10 µs
Signal voltage "0"	-3 … +5 V	
Signal voltage "1"	+11 … +30 V	
Input current	6 mA at 24 V_{DC}	
Sensor power supply	24 V_{DC} from the supply voltage U_S. max. 0.5 A in total, short-circuit proof	

Housing data	
Dimensions W x H x D	60 mm x 126 mm x 26.5 mm (without plug connectors)
Weight	approx. 250 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C -25 … +55 °C according to cULus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 55]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals / markings	
Approvals / markings *)	CE, cULus [▶ 80]

*) Real applicable approvals/markings see type plate on the side (product marking).

Additional tests

The devices have undergone the following additional tests:

Test	Explanation
Vibration	10 frequency sweeps in 3 axes
	5 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 g, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	35 g, 11 ms

3.12.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

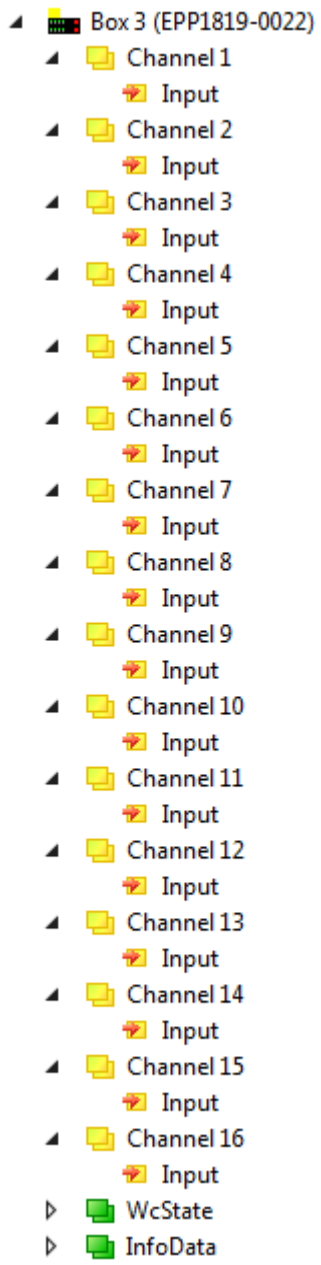
- 1x EPP18x9-0022
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

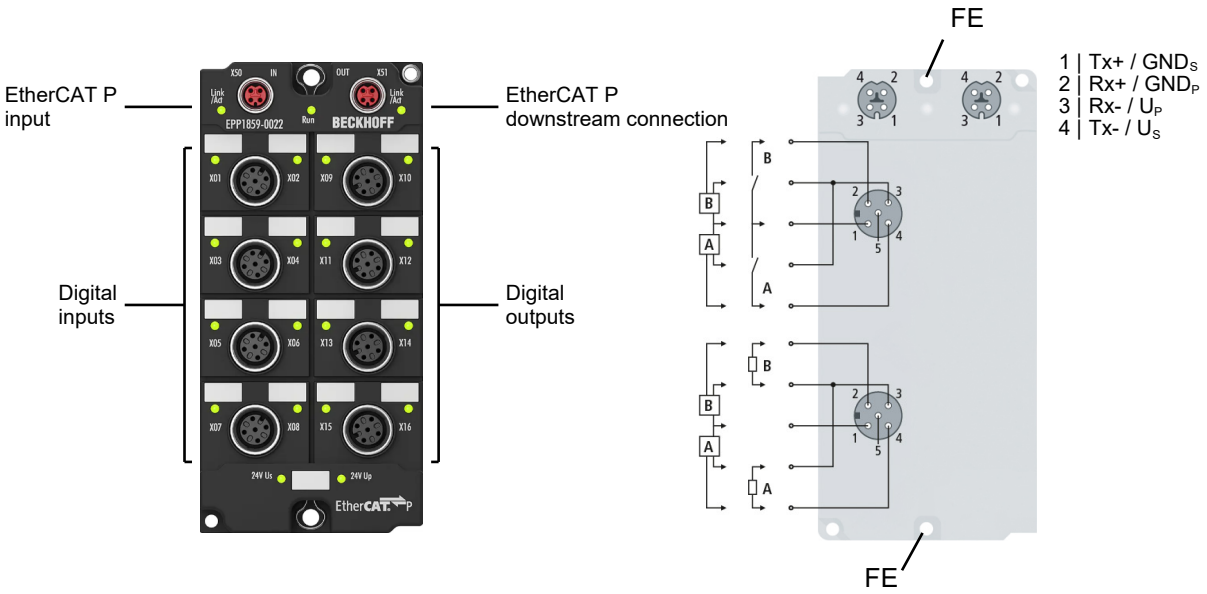
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.12.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable
	X01 / X02	2	Channel 2 Input
		4	Channel 1 Input
	X03 / X04	2	Channel 4 Input
		4	Channel 3 Input
	X05 / X06	2	Channel 6 Input
		4	Channel 5 Input
	X07 / X08	2	Channel 8 Input
		4	Channel 7 Input
	X09 / X10	2	Channel 10 Input
		4	Channel 9 Input
	X11 / X12	2	Channel 12 Input
		4	Channel 11 Input
	X13 / X14	2	Channel 14 Input
		4	Channel 13 Input
	X15 / X16	2	Channel 16 Input
		4	Channel 15 Input

3.13 EPP1859-0022

3.13.1 Introduction



8-channel digital input + 8-channel digital output

The EPP1859-0022 EtherCAT P Box combines eight digital inputs (four M12 sockets on the left) and eight digital outputs (four M12 sockets on the right) on one device. The inputs have a filter of 3.0 ms, the outputs process load currents of up to 0.5 A, are short-circuit proof and protected against polarity reversal. The sum current of all outputs is limited to 3 A. The signal state is indicated by means of LEDs. The signal connection is established via screw-type M12 connectors.

The sensors are supplied from the control voltage U_S. The outputs are supplied from U_P. All outputs are short-circuit proof and protected against polarity reversal.

Quick links

Technical data [▶ 58]
Process image [▶ 60]
Signal interface Digital inputs [▶ 74]
Signal connection Digital outputs [▶ 79]

3.13.2 Technical data

EtherCAT P	
Connection	2 x M8 socket, 4-pin, P-coded, red

Supply voltages	
Connection	See EtherCAT P connection
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 3 A
Current consumption from U_S	120 mA + sensor supply
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	None. U_P is only forwarded.

Digital inputs	
Number	8
Connection	4x socket M12 x 1, 5-pin, A-coded: X01, X02, X03, X04
Cable length	max. 30 m
Nominal input voltage	24 V_{DC} (-15 %/+20 %)
Input filter	3 ms
Signal voltage "0"	-3 … +5 V (similar to EN 61131-2, type 3)
Signal voltage "1"	+11 … +30 V (similar to EN 61131-2, type 3)
Input current	6 mA (similar to EN 61131-2, type 3)
Sensor power supply	from U_S, max. 0.5 A in total, short-circuit proof.

Digital outputs	
Number	8
Connection	4x M12 socket: X05, X06, X07, X08
Cable length	max. 30 m
Load type	Ohmic, inductive, lamp load
Output current	max. 0.5 A per channel, individually short-circuit proof
Short circuit current	1.5 A typ.
Changeover times	T_{ON}: 50 µs typ., T_{OFF}: 100 µs typ.
Auxiliary voltage output	from U_P, max. 0.5 A in total, short-circuit proof.

Housing data	
Dimensions W x H x D	60 mm x 126 mm x 26.5 mm (without plug connectors)
Weight	approx. 250 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 … +60 °C
Ambient temperature during storage	-40 … +85 °C
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 conforms to EN 60529

Approvals / markings	
Approvals / markings *)	CE, UL under preparation

*) Real applicable approvals/markings see type plate on the side (product marking).

3.13.3 Scope of supply

Make sure that the following components are included in the scope of delivery:

- 1x EPP1859-0022
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

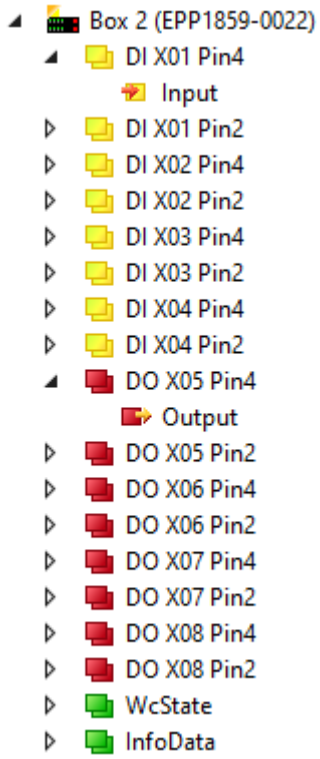
Pre-assembled protective caps do not ensure IP67 protection

Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.13.4 Process image

The process image contains a process data object for each digital input and each digital output. The names of the process data objects contain the connection and the pin number of the respective input or output.

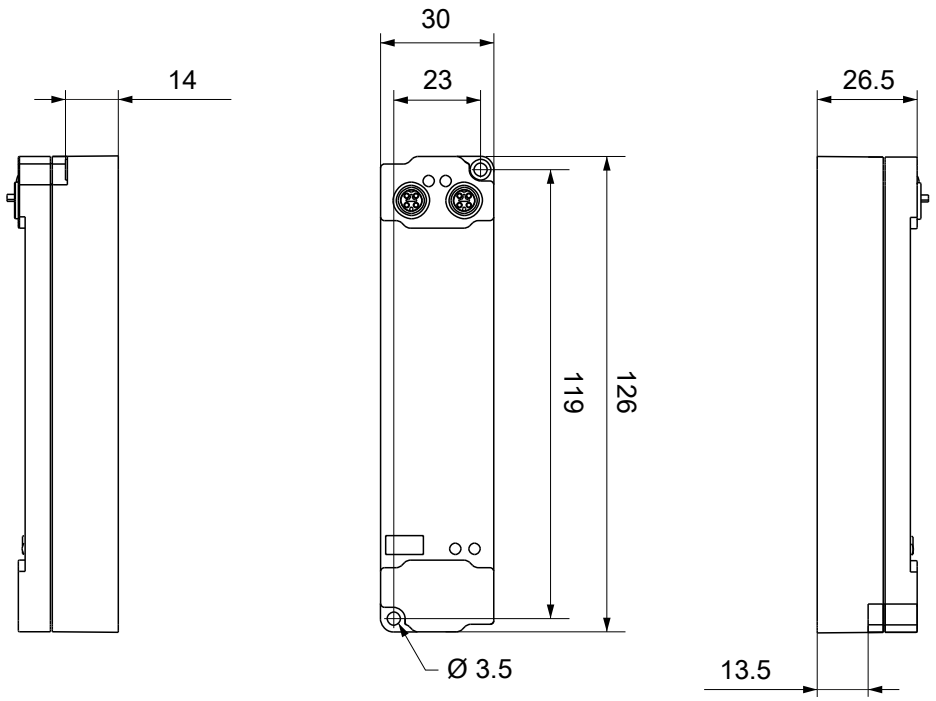


4 Mounting and cabling

4.1 Mounting

4.1.1 Dimensions

Housing -000x and -0010

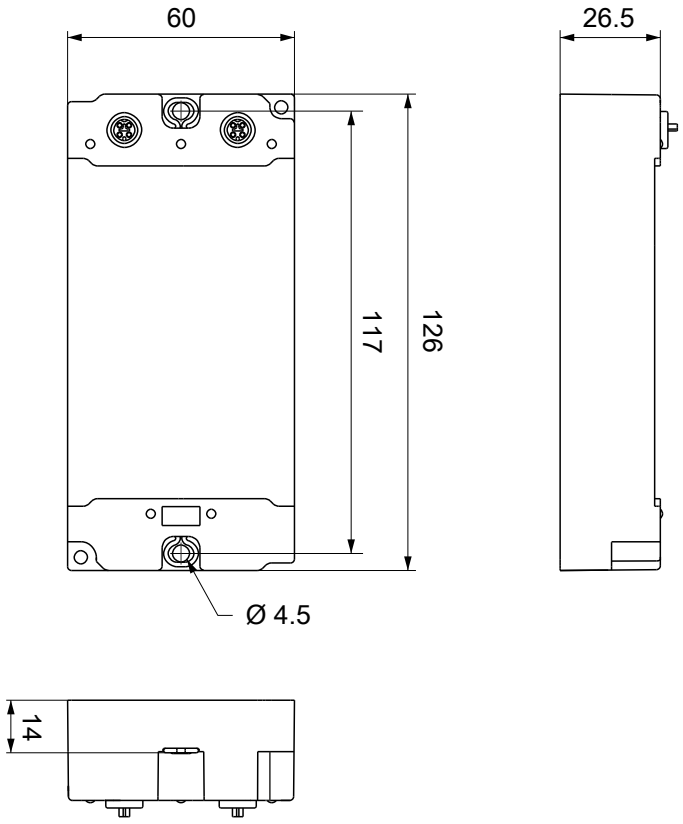


All dimensions are given in millimeters.
The drawing is not true to scale.

Housing features

Housing material	PA6 (polyamide)
Sealing compound	polyurethane
Mounting	two mounting holes Ø 3.5 mm for M3
Metal parts	brass, nickel-plated
Contacts	CuZn, gold-plated
Installation position	variable
Protection class	IP65, IP66, IP67 (conforms to EN 60529) when screwed together
Dimensions (H x W x D)	approx. 126 x 30 x 26.5 mm (without connectors)

Housing -002x

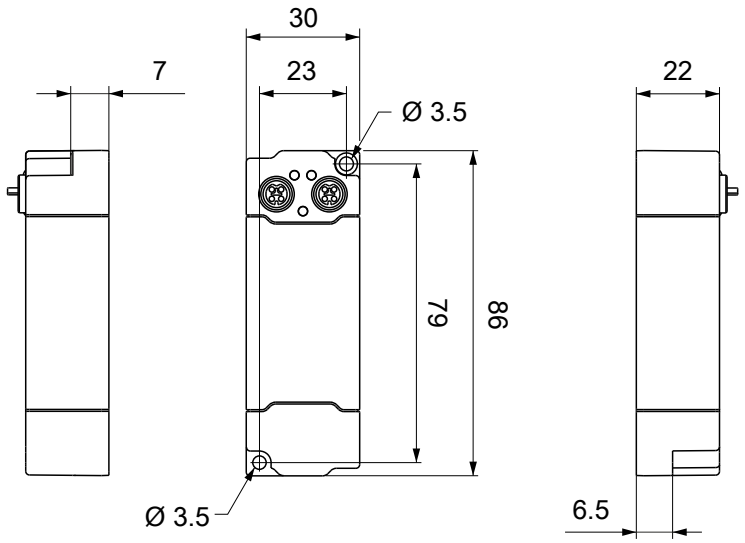


All dimensions are given in millimeters.
The drawing is not true to scale.

Housing features

Housing material	PA6 (polyamide)
Sealing compound	polyurethane
Mounting	two mounting holes Ø 4.5 mm for M4
Metal parts	brass, nickel-plated
Contacts	CuZn, gold-plated
Installation position	variable
Protection class	IP65, IP66, IP67 (conforms to EN 60529) when screwed together
Dimensions (H x W x D)	approx. 126 x 60 x 26.5 mm (without connectors)

Housing -0061



All dimensions are given in millimeters.
The drawing is not true to scale.

Housing features

Housing material	PA6 (polyamide)
Sealing compound	polyurethane
Mounting	two mounting holes Ø 3.5 mm for M3
Metal parts	brass, nickel-plated
Contacts	CuZn, gold-plated
Installation position	variable
Protection class	IP65, IP66, IP67 (conforms to EN 60529) when screwed together
Dimensions (H x W x D)	approx. 86 x 30 x 22 mm
Weight	approx. 90 g

4.1.2 Fixing

Protection of connectors against contamination!

While mounting the modules, protect all connectors, against contamination! Only with connected cables or plugs the protection class IP67 is guaranteed! Unused connectors have to be protected with the right plugs! See for plug sets in the catalogue.

Modules with narrow housing are mounted with two M3 bolts.
Modules with wide housing are mounted with two M3 bolts to the mounting holes located at the corners or mounted with two M4 bolts to the mounting holes located centrally.

The bolts must be longer than 15 mm. The mounting holes of the modules are not threaded.

When assembling, remember that the fieldbus connectors increases the overall height. See chapter accessories.

Mounting Rail ZS5300-0001

The mounting rail ZS5300-0001 (500 mm x 129 mm) allows the time saving assembly of modules.

The rail is made of stainless steel, 1.5 mm thick, with already pre-made M3 threads for the modules. The rail has got 5.3 mm slots to mount it via M5 screws to the machine.

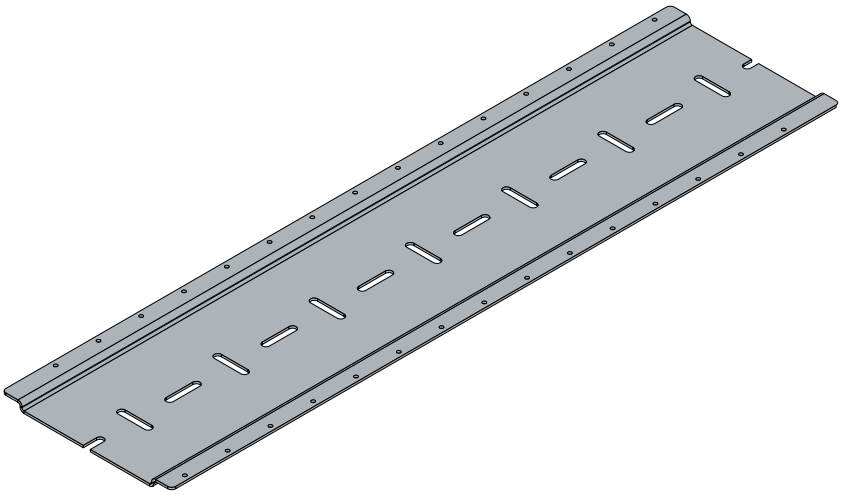


Fig. 3: Mounting Rail ZS5300-000

The mounting rail is 500 mm long, that way 15 narrow modules can be mounted with a distance of 2 mm between two modules. The rail can be cut to length for the application.

Mounting Rail ZS5300-0011

The mounting rail ZS5300-0011 (500 mm x 129 mm) has in addition to the M3 treads also pre-made M4 treads to fix 60 mm wide modules via their middle holes.

Up to 14 narrow or 7 wide modules may be mixed mounted.

4.1.3 Functional earth (FE)

Housing -000x, -0010, -0061

The upper mounting holes also serves as a connection for functional earth (FE).

Make sure that the box is grounded to low impedance via the functional earth (FE) connection. You can achieve this, for example, by mounting the box on a grounded machine bed.

Fig. 4: Connection for functional earth (FE)

Housing -002x

The mounting holes also serve as connections for the functional earth (FE).

Make sure that the box is grounded to low impedance via the functional earth (FE) connections. You can achieve this, for example, by mounting the box on a grounded machine bed.

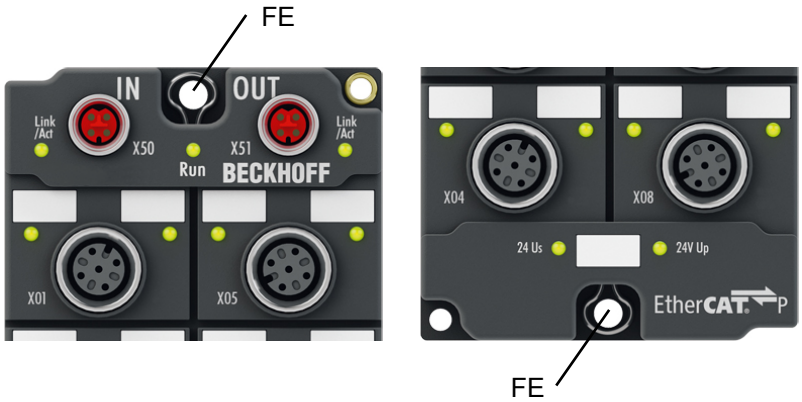


Fig. 5: Connection for functional earth (FE)

4.1.4 Tightening torques for plug connectors

Screw connectors tight with a torque wrench. (e.g. ZB8801 from Beckhoff)

Connector diameter	Tightening torque
M8	0.4 Nm
M12	0.6 Nm

4.2 EtherCAT P

⚠ WARNING

Power supply from SELV/PELV power supply unit!

SELV/PELV circuits (Safety Extra Low Voltage, Protective Extra Low Voltage) according to IEC 61010-2-201 must be used to supply the EtherCAT P Power Sourcing Device (PSD).

Notes:

- SELV/PELV circuits may give rise to further requirements from standards such as IEC 60204-1 et al, for example with regard to cable spacing and insulation.
- A SELV (Safety Extra Low Voltage) supply provides safe electrical isolation and limitation of the voltage without a connection to the protective conductor,
  a PELV (Protective Extra Low Voltage) supply also requires a safe connection to the protective conductor.

⚠ CAUTION

Observe the UL requirements

- When operating under UL conditions, observe the warnings in the chapter UL Requirements [▶ 80].

EtherCAT P transmits two supply voltages:

- **Control voltage U_S**
  The following sub-functions are supplied from the control voltage U_S:
  - the fieldbus
  - the processor logic
  - typically the inputs and the sensors if the EtherCAT P Box has inputs.
- **Peripheral voltage U_P**
  The digital outputs are typically supplied from the peripheral voltage U_P for EtherCAT P Box modules with digital outputs. U_P can be supplied separately. If U_P is switched off, the fieldbus function, the function of the inputs and the supply of the sensors are maintained.

The exact assignment of U_S and U_P can be found in the pin assignment of the I/O connections.

Redirection of the supply voltages

The supply voltages are passed on internally from the "IN" connection to the "OUT" connection. Hence, the supply voltages U_S and U_P can be passed from one EtherCAT P Box to the next EtherCAT P Box in a simple manner.

NOTICE

Note the maximum current.

Ensure that the maximum permitted current of 3 A for the M8 connectors is not exceeded when redirecting EtherCAT P.

4.2.1 Connectors

NOTICE

Risk of damage to the device!

Bring the EtherCAT/EtherCAT P system into a safe, powered down state before starting installation, disassembly or wiring of the modules!

Two M8 sockets at the upper end of the modules are provided for supply and downstream connection of EtherCAT P:

- IN: left M8 socket for EtherCAT P supply
- OUT: right M8 socket for downstream connection of EtherCAT P

The metal threads of the M8 EtherCAT P sockets are internally linked to the FE connection via high impedance RC combination. See chapter Ankerfragment: Funktionserdung.

Fig. 6: Connectors for EtherCAT P

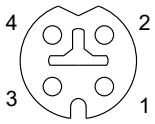


Fig. 7: M8 socket, p-coded

Contact	Signal	Voltage	Core color [1)]
1	Tx +	GND_S	yellow
2	Rx +	GND_P	white
3	Rx -	U_P: peripheral voltage, +24 V_{DC}	blue
4	Tx -	U_S: control voltage, +24 V_{DC}	orange
Housing	Shield	Shield	Shield

[1)] The core colors apply to EtherCAT P cables and ECP cables from Beckhoff.

4.2.2 Status LEDs

4.2.2.1 Supply voltage

EtherCAT P Box modules indicate the status of the supply voltages via two status LEDs. The status LEDs are labeled with the designations of the supply voltages: Us and Up.

LED	Display	Meaning
U_S (control voltage)	off	U_S not present.
	green illuminated	U_S present.
	red illuminated	Error. [1]
U_P (peripheral voltage)	off	U_P not present.
	green illuminated	U_P present.
	red illuminated	Error. [1]

[1] Overload of the sensor supply/auxiliary voltage output at the signal interfaces.
You can find out whether the sensor supply/auxiliary voltage is derived from U_S or from U_P from the assignment of the signal interfaces.

4.2.2.2 EtherCAT

L/A (Link/Act)

A green LED labeled "L/A" or "Link/Act" is located next to each EtherCAT/EtherCAT P socket. The LED indicates the communication state of the respective socket:

LED	Meaning
off	no connection to the connected EtherCAT device
lit	LINK: connection to the connected EtherCAT device
flashes	ACT: communication with the connected EtherCAT device

Run

Each EtherCAT slave has a green LED labelled "Run". The LED signals the status of the slave in the EtherCAT network:

LED	Meaning
off	Slave is in "Init" state
flashes uniformly	Slave is in "Pre-Operational“ state
flashes sporadically	Slave is in "Safe-Operational" state
lit	Slave is in "Operational" state

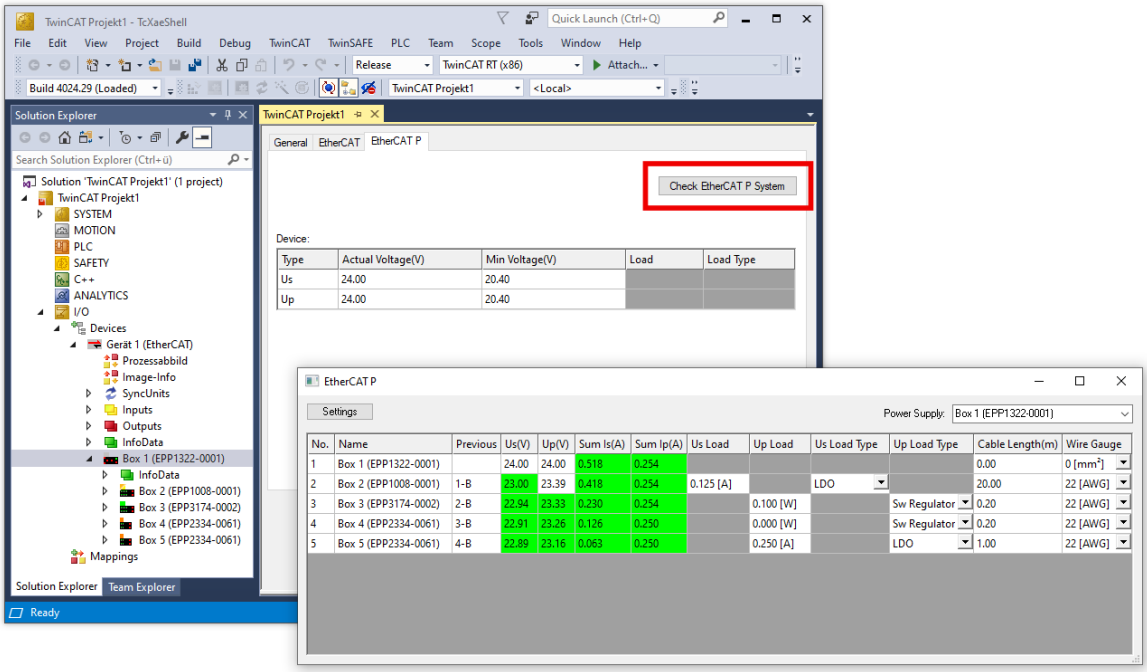
Description of the EtherCAT slave states

4.2.3 Conductor losses

Take into account the voltage drop on the supply line when planning a system. Avoid the voltage drop being so high that the supply voltage at the box lies below the minimum nominal voltage.
Variations in the voltage of the power supply unit must also be taken into account.

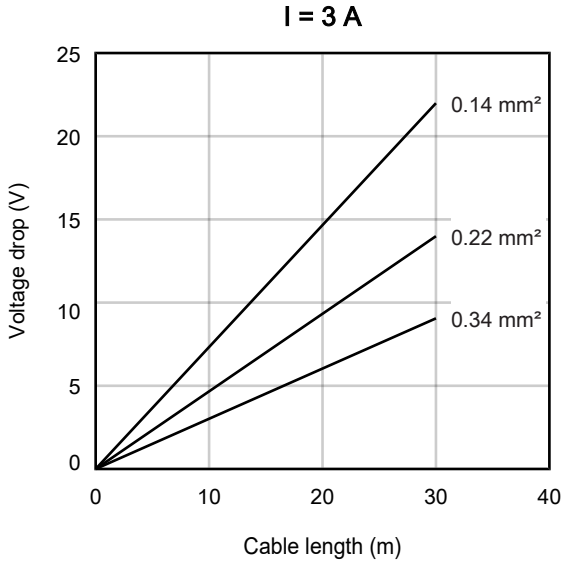
Planning tool for EtherCAT P

You can plan cable lengths, voltages and currents of your EtherCAT P system using TwinCAT 3. The requirement for this is TwinCAT 3 Build 4020 or higher.



Further information can be found in the quick start guide IO configuration in TwinCAT in chapter "Configuration of EtherCAT P via TwinCAT".

Voltage drop on the supply line



4.3 Digital inputs

NOTICE

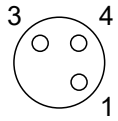
Supply and connection of sensors and actuators to EtherCAT P Box modules

The connected sensors and actuators must be supplied by an EtherCAT P Box. GND_S and GND_P from one of the M8 / M12 signal connections of an EtherCAT P Box must not be connected to the machine bed.

Supply of externally powered sensors or actuators

If the sensors and actuators cannot be supplied from the EtherCAT P Box, the supply of externally powered sensors and actuators must be electrically isolated.

4.3.1 M8 sockets, 3-pin

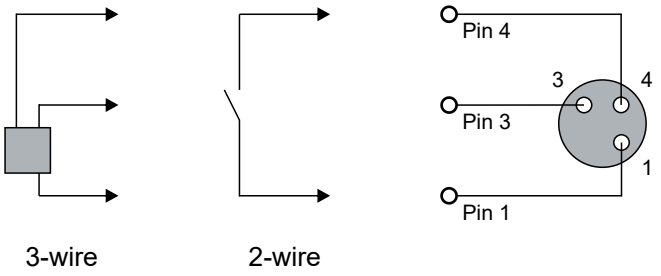


Pin assignment

Pin	Function	Wire color [1]
1	U_S	brown
3	GND_S	blue
4	Input	black

[1] The core colors apply to sensor cables from Beckhoff. See chapter Accessories [▶ 108].

Connection examples



Status LEDs

There is a green LED next to each M8 socket. The LED lights up when a high level is detected at the digital input.

4.3.2 M8 sockets, 4-pin

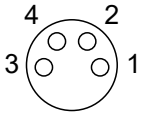
NOTICE

Incorrect signal levels due to electromagnetic interference

The digital inputs are optimized for fast signal transmission and are therefore susceptible to electromagnetic interference.

Under the influence of electromagnetic interference, a false signal level can be detected.

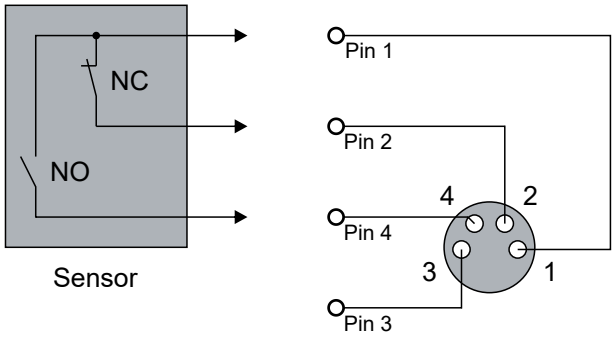
- If necessary, use shielded signal lines.



Pin assignment

Pin	Function
1	+24 V U_S
2	Input B
3	GND_S
4	Input A

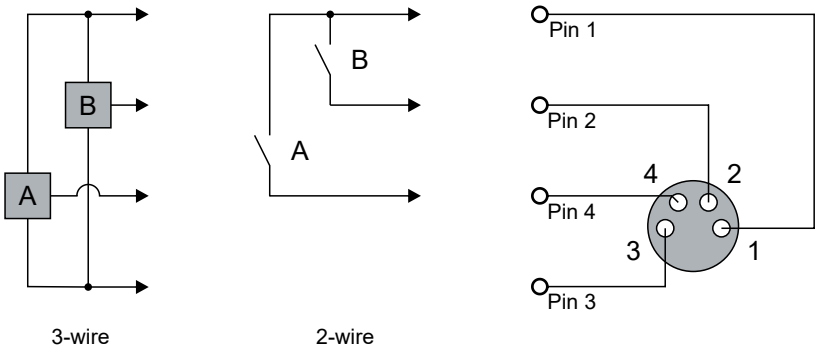
Connection example: An antivalent sensor



Diagnosis

The EPP1819-0005 has a diagnostic function for antivalent sensors. See chapter Antivalent sensors (EPP1819-0005) [▶ 91].

Connection example: Two non-antivalent sensors



Status LEDs

There is a green LED next to each M8 socket.

The behavior of the status LED depends on whether the diagnosis for antivalent sensors is enabled.

LED signal	Meaning with disabled diagnosis	Meaning with enabled diagnosis
off	Low level on pin 2 and pin 4.	No error. Low level on pin 4 and high level on pin 2.
green	High level on pin 2 and/or pin 4.	No error. High level on pin 4 and low level on pin 2.
red	n/a	Error

The procedure for enabling diagnosis can be found in the chapter Antivalent sensors (EPP1819-0005) [▶ 91].

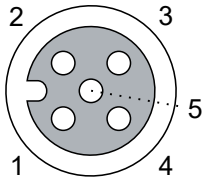
4.3.3 M12 sockets

NOTICE

Different pin assignment

The pin assignment shown in this chapter does not apply to EPP1008-0022.

- For the pin assignment of EPP1008-0022, see chapter EPP1008-0022 [▶ 75].

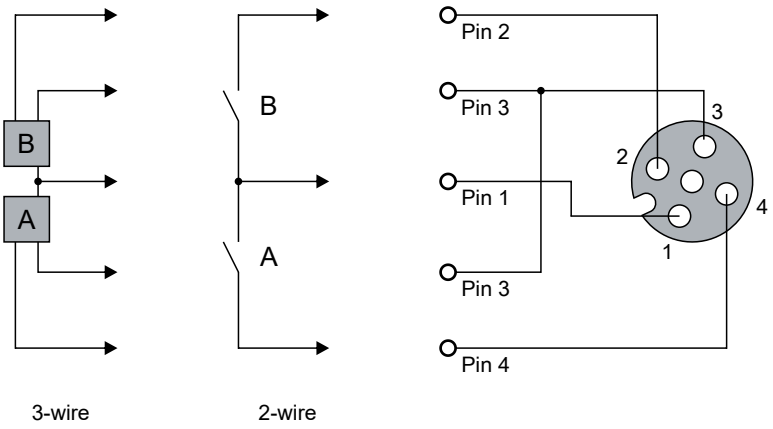


Pin assignment

Pin	Function	Wire color [1]
1	U_S	brown
2	Input B	white
3	GND_S	blue
4	Input A	black
5	-	gray

[1] The core colors apply to sensor cables from Beckhoff. See chapter Accessories [▶ 108].

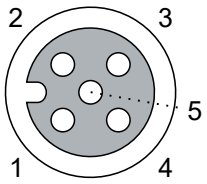
Connection examples



Status LEDs

Each M12 socket has two green LEDs. An LED lights up when a high level is detected at the respective input.

4.3.3.1 EPP1008-0022

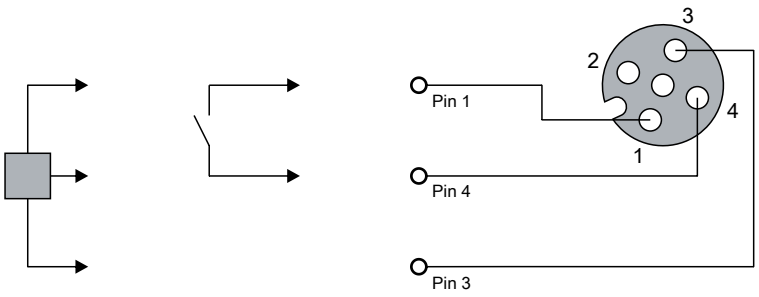


Pin assignment

Pin	Function	Wire color [1]
1	U_S	brown
2	-	white
3	GND_S	blue
4	Input	black
5	-	gray

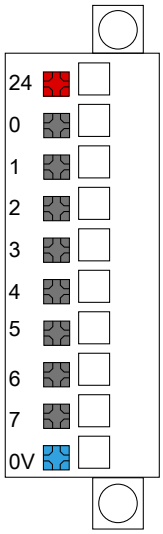
[1] The core colors apply to sensor cables from Beckhoff. See chapter Accessories [▶ 108].

Connection examples

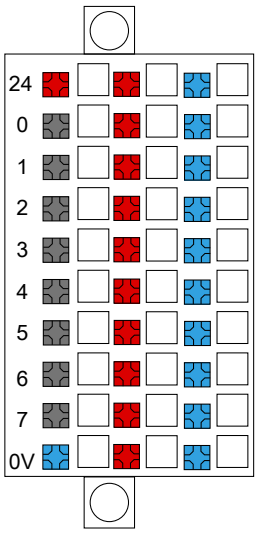


3-wire 2-wire

4.3.4 ZS2001: pluggable spring-loaded terminals



ZS2001-0001
ZS2001-0002



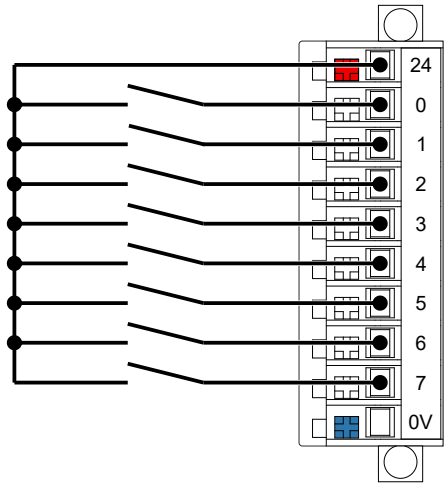
ZS2001-0004

Pin assignment

Contact	Function
0	Input 1
1	Input 2
2	Input 3
3	Input 4
4	Input 5
5	Input 6
6	Input 7
7	Input 8
"24"	U_S
"0V"	GND_S

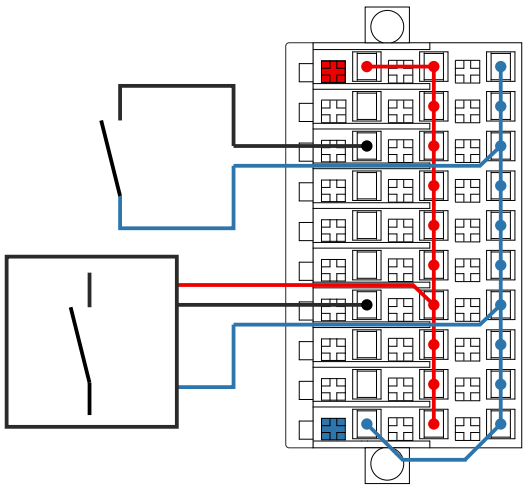
ZS2001-0004 has three rows with ten terminal contacts each. The first row is occupied as shown in the table. The second and third rows are designed to distribute the supply voltage and ground. See connection examples:

Connection examples



ZS2001-0001

ZS2001-0002



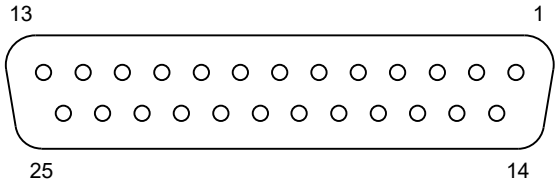
ZS2001-0004

The diagram shows the connection of 8 sensors in single-wire technology and one sensor each in two-wire and three-wire technology.
Please note for connector ZS2001-0004: two bridges (24 V and 0 V) are required to supply the terminal points for two-wire and three-wire connection technology.

Status LEDs

ZS2001-0002 and ZS2001-0004 have a green status LED for each digital input. An LED lights up when a high level is detected at the corresponding input.

4.3.5 D-sub sockets



Contact	EPP1816-0008	EPP1816-3008
1	Channel 1, Input 1	U_S
2	Channel 1, Input 2	GND_S
3	Channel 1, Input 3	Channel 1, Input 1
4	Channel 1, Input 4	Channel 1, Input 2
5	Channel 1, Input 5	Channel 1, Input 3
6	Channel 1, Input 6	Channel 1, Input 4
7	Channel 1, Input 7	Channel 1, Input 5
8	Channel 1, Input 8	Channel 1, Input 6
9	Channel 2, Input 1	Channel 1, Input 7
10	Channel 2, Input 2	Channel 1, Input 8
11	Channel 2, Input 3	Channel 2, Input 1
12	Channel 2, Input 4	Channel 2, Input 2
13	Channel 2, Input 5	Channel 2, Input 3
14	Channel 2, Input 6	Channel 2, Input 4
15	Channel 2, Input 7	Channel 2, Input 5
16	Channel 2, Input 8	Channel 2, Input 6
17	U_S	Channel 2, Input 7
18	U_S	Channel 2, Input 8
19	U_S	U_S
20	U_S	U_S
21	U_S	U_S
22	U_S	U_S
23	GND_S	GND_S
24	GND_S	GND_S
25	GND_S	GND_S

[1] U_{S1} serves as sensor supply voltage. It is branched off from the U_S supply voltage.

4.4 Digital outputs

4.4.1 M12 sockets

Pin assignment

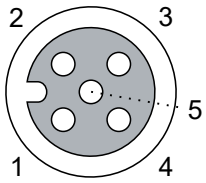
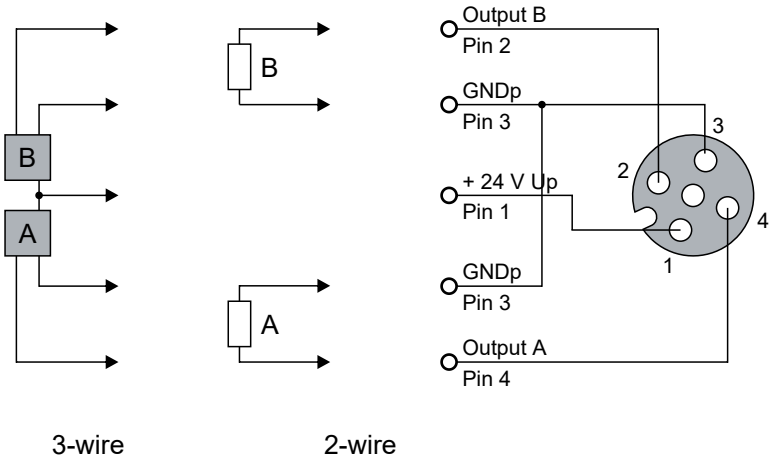


Fig. 8: M12 socket

Pin	Function	Wire color [1)]
1	+24 V U_P	brown
2	Output B	white
3	GND_P	blue
4	Output A	black
5	-	-

[1)] The core colors apply to M12 cables from Beckhoff: ZK2000-5xxx, ZK2000-6xxx, ZK2000-7xxx

Connection examples



Status LEDs

LEDs indicate the signal state of the outputs.

4.5 UL Requirements

The installation of the EtherCAT Box Modules certified by UL has to meet the following requirements.

Supply voltage

⚠ CAUTION

CAUTION!

This UL requirements are valid for all supply voltages of all marked EtherCAT Box Modules!
For the compliance of the UL requirements the EtherCAT Box Modules should only be supplied

- by a 24 V_{DC} supply voltage, supplied by an isolating source and protected by means of a fuse (in accordance with UL248), rated maximum 4 Amp, or
- by a 24 V_{DC} power source, that has to satisfy *NEC class 2*.
  A *NEC class 2* power supply shall not be connected in series or parallel with another (class 2) power source!

⚠ CAUTION

CAUTION!

To meet the UL requirements, the EtherCAT Box Modules must not be connected to unlimited power sources!

Networks

⚠ CAUTION

CAUTION!

To meet the UL requirements, EtherCAT Box Modules must not be connected to telecommunication networks!

Ambient temperature range

⚠ CAUTION

CAUTION!

To meet the UL requirements, EtherCAT Box Modules has to be operated only at an ambient temperature range of -25 °C to +55 °C!

Marking for UL

All EtherCAT Box Modules certified by UL (Underwriters Laboratories) are marked with the following label.

Fig. 9: UL label

4.6 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.

5 Commissioning and configuration

5.1 Integrating into a TwinCAT project

The procedure for integration in a TwinCAT project is described in these Quick start guide.

5.2 Adapt process image (EPP1819-0005)

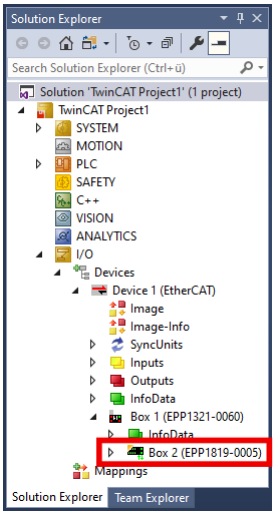
You can set which process data objects are transferred in the process image of an EtherCAT device. Possible reasons to do this:

- Activate additional process data objects to control sub-functions that are not activated in the factory setting.
- Remove unused process data objects from the process image.

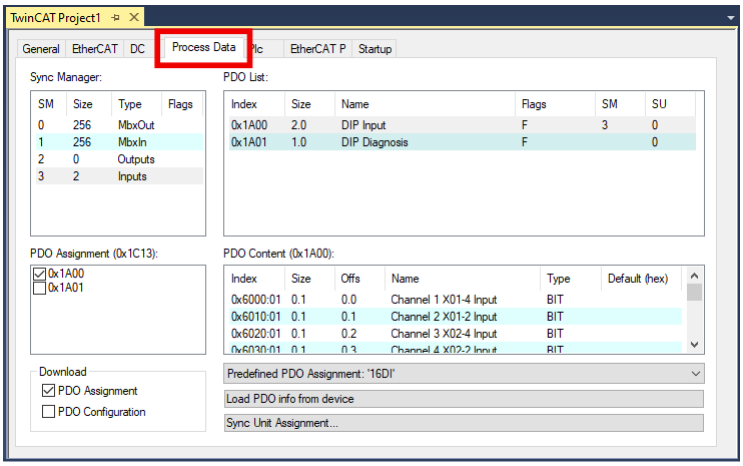
Recommendation: use the "Predefined PDO Assignments" for this purpose. "Predefined PDO Assignments" are useful predefined assemblies of process data objects.

Setting a Predefined PDO Assignment

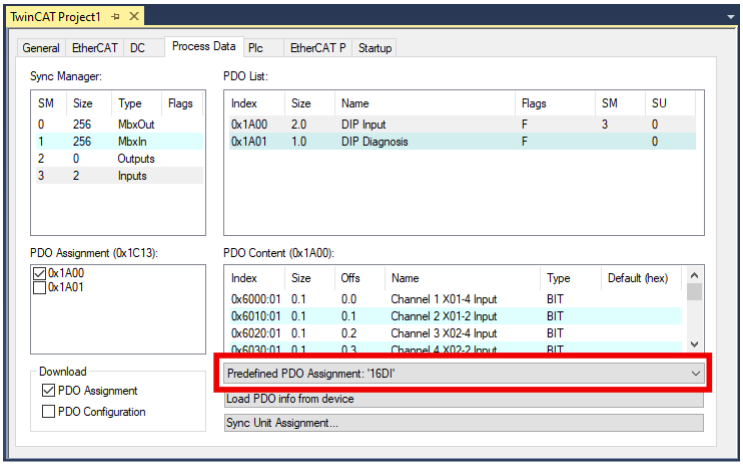
1. Double-click in the Solution Explorer on the EtherCAT device whose process image you want to change.



2. Click the "Process Data" tab.



3. Select the desired entry in the drop-down menu "Predefined PDO Assignment".



5.3 Timestamp inputs (EPP1258)

Timestamp inputs are digital inputs that log the times of signal edges with high temporal resolution.

A timestamp input provides two timestamps in variables:

- Timestamp of the last recorded rising signal edge
- Timestamp of the last recorded falling signal edge

At each signal edge the corresponding variable is overwritten with the current timestamp.

Variables are always read in by the PLC at the beginning of a PLC cycle. If several signal edges occur within a PLC cycle, the PLC receives only the timestamps of the last rising and the last falling signal edge at the beginning of the following PLC cycle.

Application Note DK9222-0211-0021 contains further information on timestamp inputs.

Variables in the process image

Variable		Contents
Input X01	**Input X02**	
Channel 1 Input	Channel 2 Input	Signal level that is currently present at the digital input
Latch Status0	Latch Status1	Information as to whether the last recorded signal edge was a rising or a falling signal edge: Bit 3: • Bit 3 is set on rising signal edge • Bit 3 is cleared on falling signal edge
Latch LatchPos0	Latch LatchPos1	Timestamp of the last recorded rising signal edge. Representation: 1 ns / LSB
Latch LatchNeg0	Latch LatchNeg1	Timestamp of the last recorded falling signal edge. Representation: 1 ns / LSB

5.4 Accelerometers (EPP1816-3008)

EPP1816-3008 has two accelerometers. Each accelerometer measures the acceleration in three axes.

The accelerometers are offset by 90°. This enables a plausibility check of the measured values.

EPP1816-3008 can also convert the measured values into inclination angles: Presentation of the measured values [▶ 87].

Assignment of the acceleration axes to variables in the process image

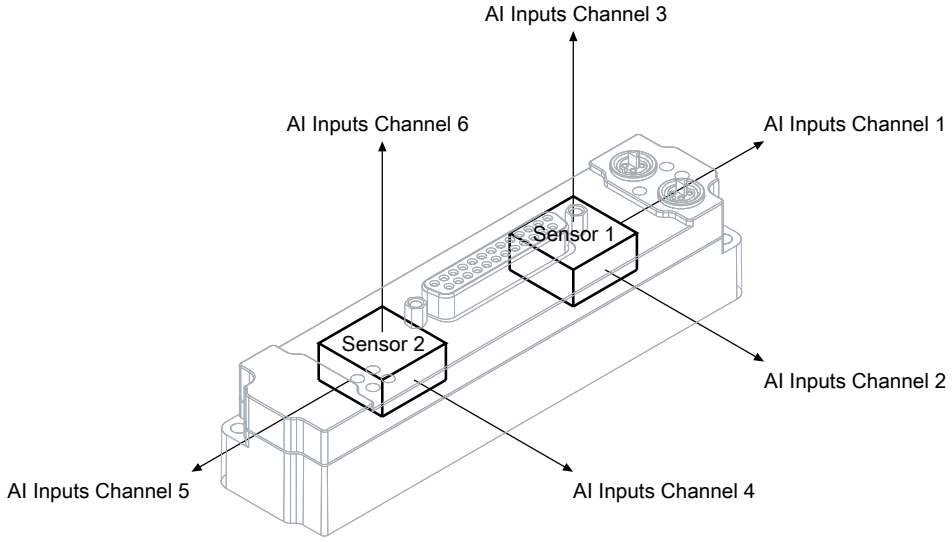


Fig. 10: Acceleration axes of EPP1816-3008

Assignment of the inclination axes to variables in the process image

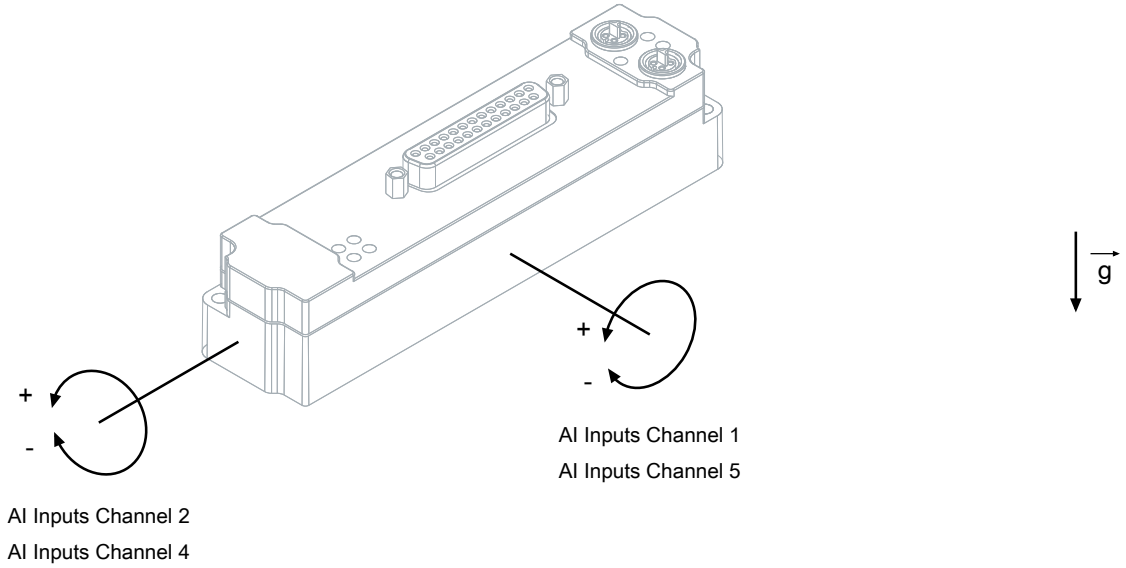


Fig. 11: Inclination axes of EPP1816-3008

5.4.1 Parameters

Measuring range

CoE index 8080:11 „Range“

Value	Measuring range
03_{dec} (default)	+/- 2 g
04_{dec}	+/- 4 g
05_{dec}	+/- 8 g
06_{dec}	+/- 16 g

Sampling rate

CoE index 8080:0D „Mode“

Value	Sampling rate
04_{dec}	1 Hz
05_{dec}	10 Hz
06_{dec}	25 Hz
07_{dec}	50 Hz
08_{dec}	100 Hz
09_{dec}	250 Hz
10_{dec}	400 Hz
11_{dec}	1600 Hz
12_{dec} (default)	5000 Hz

Presentation of the measured values

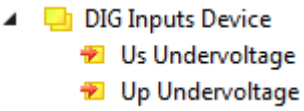
CoE index 8080:1D „Presentation“

Value	Format designation	Description
03_{dec} (default)	Raw Values	The measured acceleration values are output as raw values.
04_{dec}	Horizontal Off-Axis Angle	The measured acceleration values are converted into inclination angles.
05_{dec}	milli G (mG)	The measured acceleration values are output in mg.

5.5 Undervoltage detection (EPP1816-3008)

Variables in the process image

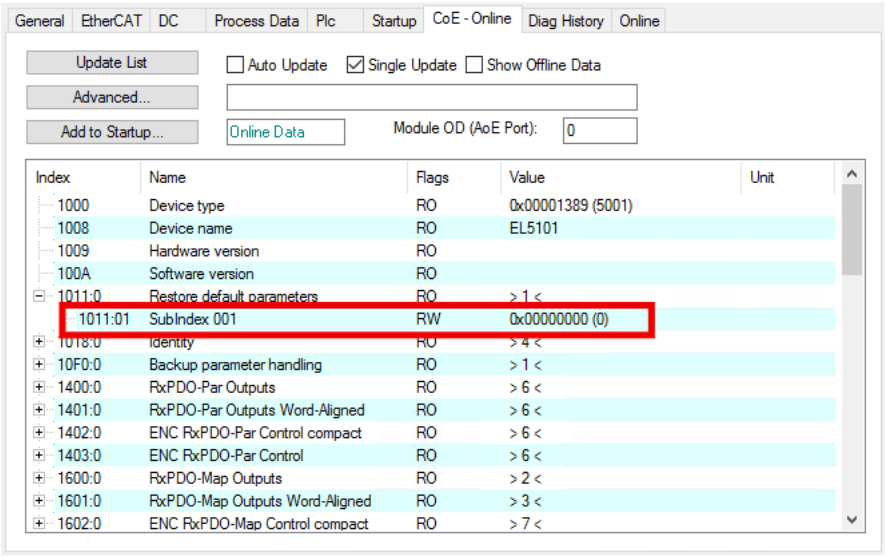
In case of undervoltage of U_S or U_P, the corresponding bit in the process image is set:



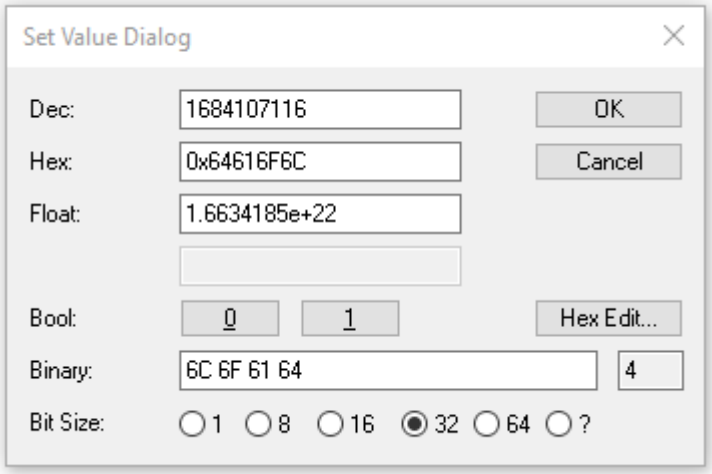
5.6 Restore the delivery state

You can restore the delivery state of the backup objects as follows:

1. Ensure that TwinCAT is running in Config mode.
2. In CoE object 1011:0 "Restore default parameters" select parameter 1011:01 "Subindex 001".



3. Double-click on "Subindex 001".
   ⇨ The "Set Value Dialog" dialog box opens.
4. Enter the value 1684107116 in the "Dec" field.
   Alternatively: enter the value 0x64616F6C in the "Hex" field.



5. Confirm with "OK".

⇨ All backup objects are reset to the delivery state.

Alternative restore value

With some older modules the backup objects can be changed with an alternative restore value:
Decimal value: 1819238756
Hexadecimal value: 0x6C6F6164

An incorrect entry for the restore value has no effect.

5.7 Decommissioning

⚠ WARNING

Risk of electric shock!

Bring the bus system into a safe, de-energized state before starting disassembly of the devices!

6 Diagnosis

6.1 Antivalent sensors (EPP1819-0005)

The EPP1819-0005 has a diagnostic function for antivalent sensors.

The diagnostic function is disabled in the factory setting.

Enable

1. Connect antivalent sensors as shown in the connection example in chapter M8 sockets, 4-pin [▶ 72].
2. Set the Predefined PDO Assignment "16DI with diagnostic".
   See chapter Adapt process image (EPP1819-0005) [▶ 83].
   ⇨ The process data object "DIP Diagnosis" is enabled.
3. Set the CoE parameters 81n0:03 "Enable antivalent input diagnostic" of the corresponding connections to TRUE. See the following table.

Connection	CoE parameter "Enable antivalent input diagnostic"
X01	8100:03
X02	8110:03
X03	8120:03
X04	8130:03
X05	8140:03
X06	8150:03
X07	8160:03
X08	8170:03

Evaluation

In error-free operation, the outputs of an antivalent sensor provide inverted signals. If both outputs of the sensor deliver the same value, this is interpreted as an error. An error is signaled in two ways:

- Status LEDs. See chapter M8 sockets, 4-pin [▶ 72], section "Status LEDs".
- Status bits in the process data. See chapter Process image [▶ 48].

7 CoE parameters

7.1 EPP1816-0008 - Object description and parameterization

Parameterization

You can parameterize the box via the "CoE - Online" tab in TwinCAT.

EtherCAT XML Device Description

The presentation matches that of the EtherCAT XML Device Description. Recommendation: download the latest XML file from https://www.beckhoff.com/ and install it according to the installation instructions.

7.1.1 Standard objects

Index 1011 Restore default parameters

Index	Name	Meaning	Data type	Flags	Default
1011:0	Restore default parameters	Restore default settings	UINT8	RO	0x01 (1_{dec})
1011:01	SubIndex 001	If this object is set to **0x64616F6C** in the set value dialog, all backup objects are reset to their delivery state.	UINT32	RW	0x00000000 (0_{dec})

Index 1000 Device type

Index	Name	Meaning	Data type	Flags	Default
1000:0	Device type	Device type of the EtherCAT P slave: The Lo-Word contains the CoE profile used (5001). The Hi-Word contains the module profile according to the modular device profile.	UINT32	RO	0x01181389 (18355081_{dec})

Index 1008 Device name

Index	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT P slave	string	RO	EPP1816-0008

Index 1009 Hardware version

Index	Name	Meaning	Data type	Flags	Default
1009:0	Hardware version	Hardware version of the EtherCAT P slave	string	RO	00

Index 100A Software version

Index	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT P slave	string	RO	01

Index 1018 Identity

Index	Name	Meaning	Data type	Flags	Default
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4_{dec})
1018:01	Vendor ID	Manufacturer ID of the EtherCAT P slave	UINT32	RO	0x00000002 (2_{dec})
1018:02	Product code	Product code of the EtherCAT P slave	UINT32	RO	0x07184052 (119029842_{dec})
1018:03	Revision	Revision number of the EtherCAT P slave; the Low Word (bit 0-15) indicates the special terminal number, the High Word (bit 16-31) refers to the device description	UINT32	RO	0x00100008 (1048584_{dec})
1018:04	Serial number	Serial number of the EtherCAT P slave; the Low Byte (bit 0-7) of the Low Word contains the year of production, the High Byte (bit 8-15) of the Low Word contains the week of production, the High Word (bit 16-31) is 0	UINT32	RO	0x00000000 (0_{dec})

Index 10F0 Backup parameter handling

Index	Name	Meaning	Data type	Flags	Default
10F0:0	Backup parameter handling	Information for standardized loading and saving of backup entries	UINT8	RO	0x01 (1_{dec})
10F0:01	Checksum	Checksum across all backup entries of the EtherCAT P slave	UINT32	RO	0x00000000 (0_{dec})

Index 1A00 DO TxPDO-Map Inputs Ch.1

Index	Name	Meaning	Data type	Flags	Default
1A00:0	DO TxPDO-Map Inputs Ch.1	PDO Mapping TxPDO 1	UINT8	RO	0x0B (11_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (DO Inputs Ch.1), entry 0x01 (Input 1))	UINT32	RO	0x6000:01, 1
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (DO Inputs Ch.1), entry 0x02 (Input 2))	UINT32	RO	0x6000:02, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (DO Inputs Ch.1), entry 0x03 (Input 3))	UINT32	RO	0x6000:03, 1
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (DO Inputs Ch.1), entry 0x04 (Input 4))	UINT32	RO	0x6000:04, 1
1A00:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (DO Inputs Ch.1), entry 0x05 (Input 5))	UINT32	RO	0x6000:05, 1
1A00:06	SubIndex 006	6. PDO Mapping entry (object 0x6000 (DO Inputs Ch.1), entry 0x06 (Input 6))	UINT32	RO	0x6000:06, 1
1A00:07	SubIndex 007	7. PDO Mapping entry (object 0x6000 (DO Inputs Ch.1), entry 0x07 (Input 7))	UINT32	RO	0x6000:07, 1
1A00:08	SubIndex 008	8. PDO Mapping entry (object 0x6000 (DO Inputs Ch.1), entry 0x08 (Input 8))	UINT32	RO	0x6000:08, 1
1A00:09	SubIndex 009	9. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A00:0A	SubIndex 010	10. PDO Mapping entry (object 0x1C32, entry 0x20)	UINT32	RO	0x1C32:20, 1
1A00:0B	SubIndex 011	11. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2

Index 1A01 DO TxPDO-Map Inputs Ch.2

Index	Name	Meaning	Data type	Flags	Default
1A01:0	DO TxPDO-Map Inputs Ch.2	PDO Mapping TxPDO 2	UINT8	RO	0x0B (11_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (DO Inputs Ch.2), entry 0x01 (Input 1))	UINT32	RO	0x6010:01, 1
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (DO Inputs Ch.2), entry 0x02 (Input 2))	UINT32	RO	0x6010:02, 1
1A01:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (DO Inputs Ch.2), entry 0x03 (Input 3))	UINT32	RO	0x6010:03, 1
1A01:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (DO Inputs Ch.2), entry 0x04 (Input 4))	UINT32	RO	0x6010:04, 1
1A01:05	SubIndex 005	5. PDO Mapping entry (object 0x6010 (DO Inputs Ch.2), entry 0x05 (Input 5))	UINT32	RO	0x6010:05, 1
1A01:06	SubIndex 006	6. PDO Mapping entry (object 0x6010 (DO Inputs Ch.2), entry 0x06 (Input 6))	UINT32	RO	0x6010:06, 1
1A01:07	SubIndex 007	7. PDO Mapping entry (object 0x6010 (DO Inputs Ch.2), entry 0x07 (Input 7))	UINT32	RO	0x6010:07, 1
1A01:08	SubIndex 008	8. PDO Mapping entry (object 0x6010 (DO Inputs Ch.2), entry 0x08 (Input 8))	UINT32	RO	0x6010:08, 1
1A01:09	SubIndex 009	9. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A01:0A	SubIndex 010	10. PDO Mapping entry (object 0x1C32, entry 0x20)	UINT32	RO	0x1C32:20, 1
1A01:0B	SubIndex 011	11. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2

Index 1C00 Sync manager type

Index	Name	Meaning	Data type	Flags	Default
1C00:0	Sync manager type	Using the Sync Managers	UINT8	RO	0x04 (4_{dec})
1C00:01	SubIndex 001	Sync-Manager Type Channel 1: Mailbox Write	UINT8	RO	0x01 (1_{dec})
1C00:02	SubIndex 002	Sync-Manager Type Channel 2: Mailbox Read	UINT8	RO	0x02 (2_{dec})
1C00:03	SubIndex 003	Sync-Manager Type Channel 3: Process Data Write (Outputs)	UINT8	RO	0x03 (3_{dec})
1C00:04	SubIndex 004	Sync-Manager Type Channel 4: Process Data Read (Inputs)	UINT8	RO	0x04 (4_{dec})

Index 1C12 RxPDO assign

Index	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RO	0x00 (0_{dec})

Index 1C13 TxPDO assign

Index	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RO	0x02 (2_{dec})
1C13:01	Subindex 001	1. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RO	0x1A00 (6656_{dec})
1C13:02	Subindex 002	2. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RO	0x1A01 (6657_{dec})

Index 1C33 SM input parameter

Index	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32_{dec})
1C33:01	Sync mode	Current synchronization mode: • 0: Free Run • 1: Synchron with SM 3 Event (no outputs available) • 2: DC - Synchron with SYNC0 Event • 3: DC - Synchron with SYNC1 Event • 34: Synchron with SM 2 Event (outputs available)	UINT16	RW	0x0022 (34_{dec})
1C33:02	Cycle time	Cycle time (in ns): • Synchron with SM 2 Event: Master cycle time • DC mode: SYNC0/SYNC1 Cycle Time	UINT32	RW	0x000186A0 (100000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:04	Sync modes supported	Supported synchronization modes: • Bit 0: free run is supported • Bit 1: Synchron with SM 2 Event is supported (outputs available) • Bit 1: Synchron with SM 3 Event is supported (no outputs available) • Bit 2-3 = 01: DC mode is supported • Bit 4-5 = 01: Input Shift through local event (outputs available) • Bit 4-5 = 10: Input Shift with SYNC1 Event (no outputs available) • Bit 14 = 1: dynamic times (measurement through writing of 1C33:08 [▶ 95])	UINT16	RO	0xC007 (49159_{dec})
1C33:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x000124F8 (75000_{dec})
1C33:06	Calc and copy time	Time between reading of the inputs and availability of the inputs for the master (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:08	Command	• 0: Measurement of the local cycle time is stopped • 1: Measurement of the local cycle time is started The entries 1C33:03 [▶ 95], 1C33:06 [▶ 95], 1C33:07, 1C33:09 [▶ 95] are updated with the maximum measured values. For a subsequent measurement the measured values are reset	UINT16	RW	0x0000 (0_{dec})
1C33:09	Delay time	Time between SYNC1 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:0B	SM event missed counter	Number of missed SM events in OPERATIONAL (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	Number of occasions the cycle time was exceeded in OPERATIONAL (cycle was not completed in time or the next cycle began too early)	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	Number of occasions that the interval between SYNC0 and SYNC1 event was too short (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	The synchronization was not correct in the last cycle (outputs were output too late; DC mode only)	boolean	RO	0x00 (0_{dec})

7.1.2 Profile-specific objects (0x6000 ... 0xFFFF)

Index 6000 DO Inputs Ch.1

Index	Name	Meaning	Data type	Flags	Default
6000:0	DO Inputs Ch.1		UINT8	RO	0x0E (14_{dec})
6000:01	Input 1		boolean	RO	0x00 (0_{dec})
6000:02	Input 2		boolean	RO	0x00 (0_{dec})
6000:03	Input 3		boolean	RO	0x00 (0_{dec})
6000:04	Input 4		boolean	RO	0x00 (0_{dec})
6000:05	Input 5		boolean	RO	0x00 (0_{dec})
6000:06	Input 6		boolean	RO	0x00 (0_{dec})
6000:07	Input 7		boolean	RO	0x00 (0_{dec})
6000:08	Input 8		boolean	RO	0x00 (0_{dec})
6000:0E	Sync Error		boolean	RO	0x00 (0_{dec})

Index 6010 DO Inputs Ch.2

Index	Name	Meaning	Data type	Flags	Default
6010:0	DO Inputs Ch.2		UINT8	RO	0x0E (14_{dec})
6010:01	Input 1		boolean	RO	0x00 (0_{dec})
6010:02	Input 2		boolean	RO	0x00 (0_{dec})
6010:03	Input 3		boolean	RO	0x00 (0_{dec})
6010:04	Input 4		boolean	RO	0x00 (0_{dec})
6010:05	Input 5		boolean	RO	0x00 (0_{dec})
6010:06	Input 6		boolean	RO	0x00 (0_{dec})
6010:07	Input 7		boolean	RO	0x00 (0_{dec})
6010:08	Input 8		boolean	RO	0x00 (0_{dec})
6010:0E	Sync Error		boolean	RO	0x00 (0_{dec})

Index F000 Modular device profile

Index	Name	Meaning	Data type	Flags	Default
F000:0	Modular device profile	General information for the modular device profile	UINT8	RO	0x02 (2_{dec})
F000:01	Module index distance	Index distance of the objects of the individual channels	UINT16	RO	0x0010 (16_{dec})
F000:02	Maximum number of modules	Number of channels	UINT16	RO	0x0002 (2_{dec})

Index F008 Code word

Index	Name	Meaning	Data type	Flags	Default
F008:0	Code word		UINT32	RW	0x00000000 (0_{dec})

Index F010 Module list

Index	Name	Meaning	Data type	Flags	Default
F010:0	Module list		UINT8	RW	0x02 (2_{dec})
F010:01	SubIndex 001		UINT32	RW	0x00000118 (280_{dec})
F010:02	SubIndex 002		UINT32	RW	0x00000118 (280_{dec})

7.2 EPP1819-0005 - Object description and parameterization

Parameterization

You can parameterize the box via the "CoE - Online" tab in TwinCAT.

EtherCAT XML Device Description

The presentation matches that of the EtherCAT XML Device Description.
Recommendation: download the latest XML file from https://www.beckhoff.com/ and install it according to the installation instructions.

7.2.1 Objects to be parameterized during commissioning

Index 8100 DIP Settings Ch.17

Index (hex)	Name	Meaning	Data type	Flags	Default
8100:0	DIP Settings Ch.17		UINT8	RO	0x03 (3_{dec})
8100:03	Enable Antivalent Input Diagnostic	Enable antivalent diagnostic on the inputs	BOOLEAN	RW	0x00 (0_{dec})

Index 8110 DIP Settings Ch.18

Index (hex)	Name	Meaning	Data type	Flags	Default
8110:0	DIP Settings Ch.18		UINT8	RO	0x03 (3_{dec})
8110:03	Enable Antivalent Input Diagnostic	Enable antivalent diagnostic on the inputs	BOOLEAN	RW	0x00 (0_{dec})

Index 8120 DIP Settings Ch.19

Index (hex)	Name	Meaning	Data type	Flags	Default
8120:0	DIP Settings Ch.19		UINT8	RO	0x03 (3_{dec})
8120:03	Enable Antivalent Input Diagnostic	Enable antivalent diagnostic on the inputs	BOOLEAN	RW	0x00 (0_{dec})

Index 8130 DIP Settings Ch.20

Index (hex)	Name	Meaning	Data type	Flags	Default
8130:0	DIP Settings Ch.20		UINT8	RO	0x03 (3_{dec})
8130:03	Enable Antivalent Input Diagnostic	Enable antivalent diagnostic on the inputs	BOOLEAN	RW	0x00 (0_{dec})

Index 8140 DIP Settings Ch.21

Index (hex)	Name	Meaning	Data type	Flags	Default
8140:0	DIP Settings Ch.21		UINT8	RO	0x03 (3_{dec})
8140:03	Enable Antivalent Input Diagnostic	Enable antivalent diagnostic on the inputs	BOOLEAN	RW	0x00 (0_{dec})

Index 8150 DIP Settings Ch.22

Index (hex)	Name	Meaning	Data type	Flags	Default
8150:0	DIP Settings Ch.22		UINT8	RO	0x03 (3_{dec})
8150:03	Enable Antivalent Input Diagnostic	Enable antivalent diagnostic on the inputs	BOOLEAN	RW	0x00 (0_{dec})

Index 8160 DIP Settings Ch.23

Index (hex)	Name	Meaning	Data type	Flags	Default
8160:0	DIP Settings Ch.23		UINT8	RO	0x03 (3_{dec})
8160:03	Enable Antivalent Input Diagnostic	Enable antivalent diagnostic on the inputs	BOOLEAN	RW	0x00 (0_{dec})

Index 8170 DIP Settings Ch.24

Index (hex)	Name	Meaning	Data type	Flags	Default
8170:0	DIP Settings Ch.24		UINT8	RO	0x03 (3_{dec})
8170:03	Enable Antivalent Input Diagnostic	Enable antivalent diagnostic on the inputs	BOOLEAN	RW	0x00 (0_{dec})

7.2.2 Standard objects (0x1000 to 0x1FFF)

Index 1000 Device type

Index (hex)	Name	Meaning	Data type	Flags	Default
1000:0	Device type	Device type of the EtherCAT slave: the Lo-Word contains the used CoE profile (5001). The Hi-Word contains the module profile according to the modular device profile.	UINT32	RO	0x00651389 (6624137_{dec})

Index 1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EPP1819-0005

Index 1009 Hardware version

Index (hex)	Name	Meaning	Data type	Flags	Default
1009:0	Hardware version	Hardware version of the EtherCAT slave	STRING	RO	

Index 100A Software version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	00

Index 100B Bootloader version

Index (hex)	Name	Meaning	Data type	Flags	Default
100B:0	Bootloader version		STRING	RO	N/A

Index 1011 Restore default parameters

Index (hex)	Name	Meaning	Data type	Flags	Default
1011:0	Restore default parameters	Restore default parameters	UINT8	RO	0x01 (1_{dec})
1011:01	SubIndex 001	If this object is set to "0x64616F6C" in the set value dialog, all backup objects are reset to their delivery state.	UINT32	RW	0x00000000 (0_{dec})

Index 1018 Identity

Index (hex)	Name	Meaning	Data type	Flags	Default
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4_{dec})
1018:01	Vendor ID	Vendor ID of the EtherCAT slave	UINT32	RO	0x00000002 (2_{dec})
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	0x647637b9 (1685469113_{dec})
1018:03	Revision	Revision number of the EtherCAT slave; the Low Word (bit 0-15) indicates the special terminal number, the High Word (bit 16-31) refers to the device description	UINT32	RO	0x00000000 (0_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave; the Low Byte (bit 0-7) of the Low Word contains the year of production, the High Byte (bit 8-15) of the Low Word contains the week of production, the High Word (bit 16-31) is 0	UINT32	RO	0x00000000 (0_{dec})

Index 10E2 Manufacturer-specific Identification Code

Index (hex)	Name	Meaning	Data type	Flags	Default
10E2:0	Manufacturer-specific Identification Code		UINT8	RO	0x01 (1_{dec})
10E2:01	SubIndex 001		STRING	RO	

Index 10F0 Backup parameter handling

Index (hex)	Name	Meaning	Data type	Flags	Default
10F0:01	Checksum	Checksum across all backup entries of the EtherCAT slave	UINT32	RO	0x00000000 (0_{dec})

Index 1A00 DIP TxPDO-Map Input

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	DIP TxPDO-Map Input	PDO Mapping TxPDO 1	UINT8	RO	0x10 (16_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (DIS Input Ch.1), entry 0x01 (Input))	UINT32	RO	0x6000:01, 1
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (DIS Input Ch.2), entry 0x01 (Input))	UINT32	RO	0x6010:01, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (DIS Input Ch.3), entry 0x01 (Input))	UINT32	RO	0x6020:01, 1
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6030 (DIS Input Ch.4), entry 0x01 (Input))	UINT32	RO	0x6030:01, 1
1A00:05	SubIndex 005	5. PDO Mapping entry (object 0x6040 (DIS Input Ch.5), entry 0x01 (Input))	UINT32	RO	0x6040:01, 1
1A00:06	SubIndex 006	6. PDO Mapping entry (object 0x6050 (DIS Input Ch.6), entry 0x01 (Input))	UINT32	RO	0x6050:01, 1
1A00:07	SubIndex 007	7. PDO Mapping entry (object 0x6060 (DIS Input Ch.7), entry 0x01 (Input))	UINT32	RO	0x6060:01, 1
1A00:08	SubIndex 008	8. PDO Mapping entry (object 0x6070 (DIS Input Ch.8), entry 0x01 (Input))	UINT32	RO	0x6070:01, 1
1A00:09	SubIndex 009	9. PDO Mapping entry (object 0x6080 (DIP Input Ch.09), entry 0x01 (Input))	UINT32	RO	0x6080:01, 1
1A00:0A	SubIndex 010	10. PDO Mapping entry (object 0x6090 (DIP Input Ch.10), entry 0x01 (Input))	UINT32	RO	0x6090:01, 1
1A00:0B	SubIndex 011	11. PDO Mapping entry (object 0x60A0 (DIP Input Ch.11), entry 0x01 (Input))	UINT32	RO	0x60A0:01, 1
1A00:0C	SubIndex 012	12. PDO Mapping entry (object 0x60B0 (DIP Input Ch.12), entry 0x01 (Input))	UINT32	RO	0x60B0:01, 1
1A00:0D	SubIndex 013	13. PDO Mapping entry (object 0x60C0 (DIP Input Ch.13), entry 0x01 (Input))	UINT32	RO	0x60C0:01, 1
1A00:0E	SubIndex 014	14. PDO Mapping entry (object 0x60D0 (DIP Input Ch.14), entry 0x01 (Input))	UINT32	RO	0x60D0:01, 1
1A00:0F	SubIndex 015	15. PDO Mapping entry (object 0x60E0 (DIP Input Ch.15), entry 0x01 (Input))	UINT32	RO	0x60E0:01, 1
1A00:10	SubIndex 016	16. PDO Mapping entry (object 0x60F0 (DIP Input Ch.16), entry 0x01 (Input))	UINT32	RO	0x60F0:01, 1

Index 1A01 DIP TxPDO-Map Diagnosis

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	DIP TxPDO-Map Diagnosis	PDO Mapping TxPDO 2	UINT8	RO	0x08 (8_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (DIP Input Ch.1), entry 0x01 (Input))	UINT32	RO	0x6101:02, 1
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (DIP Input Ch.1), entry 0x02 (Input 2))	UINT32	RO	0x6111:02, 1
1A01:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (DIP Input Ch.2), entry 0x01 (Input))	UINT32	RO	0x6121:02, 1
1A01:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (DIP Input Ch.2), entry 0x02 (Input 2))	UINT32	RO	0x6131:02, 1
1A01:05	SubIndex 005	5. PDO Mapping entry (object 0x6020 (DIP Input Ch.3), entry 0x01 (Input))	UINT32	RO	0x6141:02, 1
1A01:06	SubIndex 006	6. PDO Mapping entry (object 0x6020 (DIP Input Ch.3), entry 0x02 (Input 2))	UINT32	RO	0x6151:02, 1
1A01:07	SubIndex 007	7. PDO Mapping entry (object 0x6030 (DIP Input Ch.4), entry 0x01 (Input))	UINT32	RO	0x6161:02, 1
1A01:08	SubIndex 008	8. PDO Mapping entry (object 0x6030 (DIP Input Ch.4), entry 0x02 (Input 2))	UINT32	RO	0x6171:02, 1

Index 1C00 Sync manager type

Index (hex)	Name	Meaning	Data type	Flags	Default
1C00:0	Sync manager type	Using the Sync Managers	UINT8	RO	0x04 (4_{dec})
1C00:01	SubIndex 001	Sync-Manager Type Channel 1: Mailbox Write	UINT8	RO	0x01 (1_{dec})
1C00:02	SubIndex 002	Sync-Manager Type Channel 2: Mailbox Read	UINT8	RO	0x02 (2_{dec})
1C00:03	SubIndex 003	Sync-Manager Type Channel 3: Process Data Write (Outputs)	UINT8	RO	0x03 (3_{dec})
1C00:04	SubIndex 004	Sync-Manager Type Channel 4: Process Data Read (Inputs)	UINT8	RO	0x04 (4_{dec})

Index 1C12 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RO	0x00 (0_{dec})

Index 1C13 TxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x01 (1_{dec})
1C13:01	Subindex 001	1. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656_{dec})
1C13:02	Subindex 002	2. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})

Index 1C33 SM input parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32_{dec})
1C33:01	Sync mode	Current synchronization mode: • 0: Free Run • 1: Synchron with SM 3 Event (no outputs available) • 2: DC - Synchron with SYNC0 Event • 3: DC - Synchron with SYNC1 Event • 34: Synchron with SM 2 Event (outputs available)	UINT16	RW	0x0001 (1_{dec})
1C33:02	Cycle time	as 1C32:02	UINT32	RW	0x000F4240 (1000000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, DC mode only)	UINT32	RO	0x000249F0 (150000_{dec})
1C33:04	Sync modes supported	Supported synchronization modes: • Bit 0: Free Run is supported • Bit 1: Synchron with SM 2 Event is supported (outputs available) • Bit 1: Synchron with SM 3 Event is supported (no outputs available) • Bit 2-3 = 01: DC-Mode is supported • Bit 4-5 = 01: Input Shift through local event (outputs available) • Bit 4-5 = 10: Input Shift with SYNC1 Event (no outputs available) • Bit 14 = 1: dynamic times (measurement through writing of 1C32:08 or 1C33:08)	UINT16	RO	0x440B (17419_{dec})
1C33:05	Minimum cycle time	as 1C32:05	UINT32	RO	0x000249F0 (150000_{dec})
1C33:06	Calc and copy time	Time between reading of the inputs and availability of the inputs for the master (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:07	Minimum delay time		UINT32	RO	0x00000000 (0_{dec})
1C33:08	Get Cycle Time	as 1C32:08	UINT16	RW	0x0000 (0_{dec})
1C33:09	Maximum delay time	Time between SYNC1 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:0B	SM event missed counter	as 1C32:11	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	as 1C32:12	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	as 1C32:13	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	as 1C32:32	BOOLEAN	RO	0x00 (0_{dec})

7.2.3 Profile-specific objects (0x6000 to 0xFFFF)

Index 6000 DIP Input Ch.01

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	DIP Input Ch.01		UINT8	RO	0x01 (1_{dec})
6000:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 6010 DIP Input Ch.02

Index (hex)	Name	Meaning	Data type	Flags	Default
6010:0	DIP Input Ch.02		UINT8	RO	0x01 (1_{dec})
6010:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 6020 DIP Input Ch.03

Index (hex)	Name	Meaning	Data type	Flags	Default
6020:0	DIP Input Ch.03		UINT8	RO	0x01 (1_{dec})
6020:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 6030 DIP Input Ch.04

Index (hex)	Name	Meaning	Data type	Flags	Default
6030:0	DIP Input Ch.04		UINT8	RO	0x01 (1_{dec})
6030:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 6040 DIP Input Ch.05

Index (hex)	Name	Meaning	Data type	Flags	Default
6040:0	DIP Input Ch.05		UINT8	RO	0x01 (1_{dec})
6040:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 6050 DIP Input Ch.06

Index (hex)	Name	Meaning	Data type	Flags	Default
6050:0	DIP Input Ch.06		UINT8	RO	0x01 (1_{dec})
6050:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 6060 DIP Input Ch.07

Index (hex)	Name	Meaning	Data type	Flags	Default
6060:0	DIP Input Ch.07		UINT8	RO	0x01 (1_{dec})
6060:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 6070 DIP Input Ch.08

Index (hex)	Name	Meaning	Data type	Flags	Default
6070:0	DIP Input Ch.08		UINT8	RO	0x01 (1_{dec})
6070:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 6080 DIP Input Ch.09

Index (hex)	Name	Meaning	Data type	Flags	Default
6080:0	DIP Input Ch.09		UINT8	RO	0x01 (1_{dec})
6080:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 6090 DIP Input Ch.10

Index (hex)	Name	Meaning	Data type	Flags	Default
6090:0	DIP Input Ch.10		UINT8	RO	0x01 (1_{dec})
6090:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 60A0 DIP Input Ch.11

Index (hex)	Name	Meaning	Data type	Flags	Default
60A0:0	DIP Input Ch.11		UINT8	RO	0x01 (1_{dec})
60A0:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 60B0 DIP Input Ch.12

Index (hex)	Name	Meaning	Data type	Flags	Default
60B0:0	DIP Input Ch.12		UINT8	RO	0x01 (1_{dec})
60B0:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 60C0 DIP Input Ch.13

Index (hex)	Name	Meaning	Data type	Flags	Default
60C0:0	DIP Input Ch.13		UINT8	RO	0x01 (1_{dec})
60C0:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 60D0 DIP Input Ch.14

Index (hex)	Name	Meaning	Data type	Flags	Default
60D0:0	DIP Input Ch.14		UINT8	RO	0x01 (1_{dec})
60D0:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 60E0 DIP Input Ch.15

Index (hex)	Name	Meaning	Data type	Flags	Default
60E0:0	DIP Input Ch.15		UINT8	RO	0x01 (1_{dec})
60E0:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 60F0 DIP Input Ch.16

Index (hex)	Name	Meaning	Data type	Flags	Default
60F0:0	DIP Input Ch.16		UINT8	RO	0x01 (1_{dec})
60F0:01	Input	Input value	BOOLEAN	RO	0x00 (0_{dec})

Index 6101 DIP Diagnosis Ch.17

Index (hex)	Name	Meaning	Data type	Flags	Default
6101:0	DIP Diagnosis Ch.17		UINT8	RO	0x02 (2_{dec})
6101:02	Input Error	Input validation fails. E.g. antivalent inputs are reading implausible values. Check sensor and wiring.	BOOLEAN	RO	0x00 (0_{dec})

Index 6111 DIP Diagnosis Ch.18

Index (hex)	Name	Meaning	Data type	Flags	Default
6111:0	DIP Diagnosis Ch.18		UINT8	RO	0x02 (2_{dec})
6111:02	Input Error	Input validation fails. E.g. antivalent inputs are reading implausible values. Check sensor and wiring.	BOOLEAN	RO	0x00 (0_{dec})

Index 6121 DIP Diagnosis Ch.19

Index (hex)	Name	Meaning	Data type	Flags	Default
6121:0	DIP Diagnosis Ch.19		UINT8	RO	0x02 (2_{dec})
6121:02	Input Error	Input validation fails. E.g. antivalent inputs are reading implausible values. Check sensor and wiring.	BOOLEAN	RO	0x00 (0_{dec})

Index 6131 DIP Diagnosis Ch.20

Index (hex)	Name	Meaning	Data type	Flags	Default
6131:0	DIP Diagnosis Ch.20		UINT8	RO	0x02 (2_{dec})
6131:02	Input Error	Input validation fails. E.g. antivalent inputs are reading implausible values. Check sensor and wiring.	BOOLEAN	RO	0x00 (0_{dec})

Index 6141 DIP Diagnosis Ch.21

Index (hex)	Name	Meaning	Data type	Flags	Default
6141:0	DIP Diagnosis Ch.21		UINT8	RO	0x02 (2_{dec})
6141:02	Input Error	Input validation fails. E.g. antivalent inputs are reading implausible values. Check sensor and wiring.	BOOLEAN	RO	0x00 (0_{dec})

Index 6151 DIP Diagnosis Ch.22

Index (hex)	Name	Meaning	Data type	Flags	Default
6151:0	DIP Diagnosis Ch.22		UINT8	RO	0x02 (2_{dec})
6151:02	Input Error	Input validation fails. E.g. antivalent inputs are reading implausible values. Check sensor and wiring.	BOOLEAN	RO	0x00 (0_{dec})

Index 6161 DIP Diagnosis Ch.23

Index (hex)	Name	Meaning	Data type	Flags	Default
6161:0	DIP Diagnosis Ch.23		UINT8	RO	0x02 (2_{dec})
6161:02	Input Error	Input validation fails. E.g. antivalent inputs are reading implausible values. Check sensor and wiring.	BOOLEAN	RO	0x00 (0_{dec})

Index 6171 DIP Diagnosis Ch.24

Index (hex)	Name	Meaning	Data type	Flags	Default
6171:0	DIP Diagnosis Ch.24		UINT8	RO	0x02 (2_{dec})
6171:02	Input Error	Input validation fails. E.g. antivalent inputs are reading implausible values. Check sensor and wiring.	BOOLEAN	RO	0x00 (0_{dec})

Index F000 Modular Device Profile

Index (hex)	Name	Meaning	Data type	Flags	Default
F000:0	Modular Device Profile		UINT8	RO	0x02 (2_{dec})
F000:01	Index distance		UINT16	RO	0x0010 (16_{dec})
F000:02	Maximum number of modules		UINT16	RO	0x0018 (24_{dec})

Index F008 Code word

Index (hex)	Name	Meaning	Data type	Flags	Default
F008:0	Code word		UINT32	RW	0x00000000 (0_{dec})

Index FB00 DEV Command

Index (hex)	Name	Meaning	Data type	Flags	Default
FB00:0	DEV Command		UINT8	RO	0x03 (3_{dec})
FB00:01	Request		OCTET-STRING[2]	RW	{0}
FB00:02	Status		UINT8	RO	0x00 (0_{dec})
FB00:03	Response		OCTET-STRING[8]	RO	{0}

8 Appendix

8.1 General operating conditions

Protection rating according to IP code

The degrees of protection are defined and divided into different classes in the IEC 60529 standard (EN 60529). Degrees of protection are designated by the letters "IP" and two numerals: **IPxy**

- Numeral x: Dust protection and contact protection
- Numeral y: Protection against water

x	Meaning
0	Not protected
1	Protected against access to dangerous parts with the back of the hand. Protected against solid foreign objects of 50 mm Ø
2	Protected against access to dangerous parts with a finger. Protected against solid foreign objects of 12.5 mm Ø
3	Protected against access to dangerous parts with a tool. Protected against solid foreign objects of 2.5 mm Ø
4	Protected against access to dangerous parts with a wire. Protected against solid foreign objects of 1 mm Ø
5	Protection against access to dangerous parts with a wire. Dust-protected. Ingress of dust is not prevented completely, although the quantity of dust able to penetrate is limited to such an extent that the proper function of the device and safety are not impaired
6	Protection against access to dangerous parts with a wire. Dust-tight. No ingress of dust

y	Meaning
0	Not protected
1	Protection against vertically falling water drops
2	Protection against vertically falling water drops when enclosure tilted up to 15°
3	Protection against spraying water. Water sprayed at an angle of up to 60° on either side of the vertical shall have no harmful effects
4	Protection against splashing water. Water splashed against the enclosure from any direction shall have no harmful effects
5	Protection against water jets.
6	Protection against powerful water jets.
7	Protected against the effects of temporary immersion in water. Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is immersed in water at a depth of 1 m for 30 minutes

Chemical resistance

The resistance refers to the housing of the IP67 modules and the metal parts used. In the table below you will find some typical resistances.

Type	Resistance
Water vapor	unstable at temperatures > 100 °C
Sodium hydroxide solution (ph value > 12)	stable at room temperature unstable > 40 °C
Acetic acid	unstable
Argon (technically pure)	stable

Key

- resistant: Lifetime several months
- non inherently resistant: Lifetime several weeks
- not resistant: Lifetime several hours resp. early decomposition

8.2 Accessories

Mounting

Ordering information	Description	Link
ZS5300-0011	Mounting rail	Website

Cables

A complete overview of pre-assembled cables for fieldbus components can be found here.

Ordering information	Description	Link
ZK2000-2xxx-xxxx	Sensor cable M8, 3-pin	Website
ZK2000-3xxx-xxxx	Sensor cable M8, 4-pin	Website
ZK2000-6xxx-xxxx	Sensor cable M12, 4-pin	Website
ZK700x-xxxx-xxxx	EtherCAT P cable M8	Website

Connector

Ordering information	Description	Link
ZS2001-000x	Female header with spring connection, IP20	Website
ZS2002-0111	D-sub connector, 25-pin	Website

Labeling material, protective caps

Ordering information	Description
ZS5000-0010	Protective cap for M8 sockets, IP67 (50 pieces)
ZS5000-0020	Protective cap for M12 sockets, IP67 (50 pcs.)
ZS5100-0000	Inscription labels, unprinted, 4 strips of 10
ZS5000-xxxx	Printed inscription labels on enquiry

Tools

Ordering information	Description
ZB8801-0000	Torque wrench for plugs, 0.4…1.0 Nm
ZB8801-0001	Torque cable key for M8 / wrench size 9 for ZB8801-0000
ZB8801-0002	Torque cable key for M12 / wrench size 13 for ZB8801-0000
ZB8801-0003	Torque cable key for M12 field assembly / wrench size 18 for ZB8801-0000

Further accessories

Further accessories can be found in the price list for fieldbus components from Beckhoff and online at https://www.beckhoff.com.

8.3 Version identification of EtherCAT devices

8.3.1 General notes on marking

Designation

A Beckhoff EtherCAT device has a 14-digit designation, made up of

- family key
- type
- version
- revision

Example	Family	Type	Version	Revision
EL3314-0000-0016	EL terminal 12 mm, non-pluggable connection level	3314 4-channel thermocouple terminal	0000 basic type	0016
ES3602-0010-0017	ES terminal 12 mm, pluggable connection level	3602 2-channel voltage measurement	0010 high-precision version	0017
CU2008-0000-0000	CU device	2008 8-port fast ethernet switch	0000 basic type	0000

Notes

- The elements mentioned above result in the **technical designation**. EL3314-0000-0016 is used in the example below.
- EL3314-0000 is the order identifier, in the case of “-0000” usually abbreviated to EL3314. “-0016” is the EtherCAT revision.
- The **order identifier** is made up of
  - family key (EL, EP, CU, ES, KL, CX, etc.)
  - type (3314)
  - version (-0000)
- The **revision** -0016 shows the technical progress, such as the extension of features with regard to the EtherCAT communication, and is managed by Beckhoff.
  In principle, a device with a higher revision can replace a device with a lower revision, unless specified otherwise, e.g. in the documentation.
  Associated and synonymous with each revision there is usually a description (ESI, EtherCAT Slave Information) in the form of an XML file, which is available for download from the Beckhoff web site.
  From 2014/01 the revision is shown on the outside of the IP20 terminals, see Fig. *“EL5021 EL terminal, standard IP20 IO device with batch number and revision ID (since 2014/01)”*.
- The type, version and revision are read as decimal numbers, even if they are technically saved in hexadecimal.

8.3.2 Version identification of IP67 modules

The serial number/ data code for Beckhoff IO devices is usually the 8-digit number printed on the device or on a sticker. The serial number indicates the configuration in delivery state and therefore refers to a whole production batch, without distinguishing the individual modules of a batch.

Structure of the serial number: **KK YY FF HH**	Example with serial number 12 06 3A 02:
KK - week of production (CW, calendar week)	12 - production week 12
YY - year of production	06 - production year 2006
FF - firmware version	3A - firmware version 3A
HH - hardware version	02 - hardware version 02

Exceptions can occur in the **IP67 area**, where the following syntax can be used (see respective device documentation):

Syntax: D ww yy x y z u

D - prefix designation
ww - calendar week
yy - year
x - firmware version of the bus PCB
y - hardware version of the bus PCB
z - firmware version of the I/O PCB
u - hardware version of the I/O PCB

Example: D.22081501 calendar week 22 of the year 2008 firmware version of bus PCB: 1 hardware version of bus PCB: 5 firmware version of I/O PCB: 0 (no firmware necessary for this PCB) hardware version of I/O PCB: 1

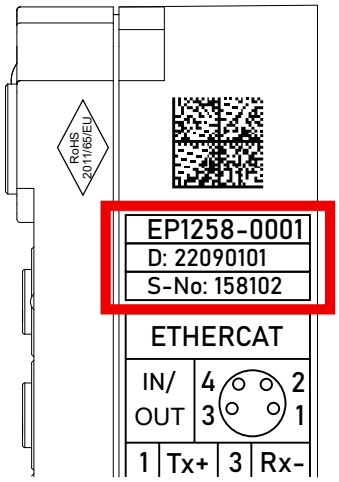


Fig. 12: EP1258-00001 IP67 EtherCAT Box with batch number/DateCode 22090101 and unique serial number 158102

8.3.3 Beckhoff Identification Code (BIC)

The Beckhoff Identification Code (BIC) is increasingly being applied to Beckhoff products to uniquely identify the product. The BIC is represented as a Data Matrix Code (DMC, code scheme ECC200), the content is based on the ANSI standard MH10.8.2-2016.

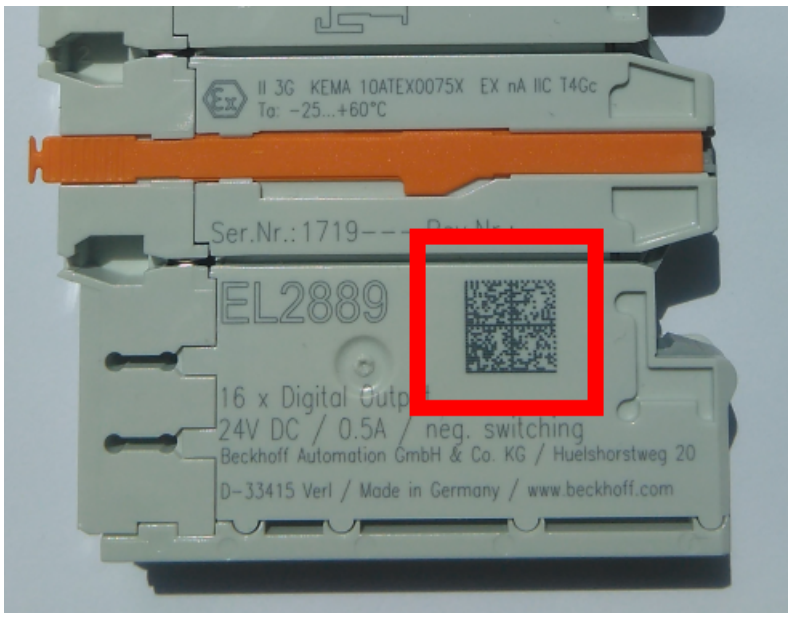


Fig. 13: BIC as data matrix code (DMC, code scheme ECC200)

The BIC will be introduced step by step across all product groups.

Depending on the product, it can be found in the following places:

- on the packaging unit
- directly on the product (if space suffices)
- on the packaging unit and the product

The BIC is machine-readable and contains information that can also be used by the customer for handling and product management.

Each piece of information can be uniquely identified using the so-called data identifier (ANSI MH10.8.2-2016). The data identifier is followed by a character string. Both together have a maximum length according to the table below. If the information is shorter, spaces are added to it.

Following information is possible, positions 1 to 4 are always present, the other according to need of production:

Position	Type of information	Explanation	Data identifier	Number of digits incl. data identifier	Example
1	Beckhoff order number	**Beckhoff order number**	1P	8	1P072222
2	Beckhoff Traceability Number (BTN)	**Unique serial number, see note below**	SBTN	12	SBTNk4p562d7
3	Article description	**Beckhoff article description, e.g. EL1008**	1K	32	1KEL1809
4	Quantity	**Quantity in packaging unit, e.g. 1, 10, etc.**	Q	6	Q1
5	Batch number	Optional: Year and week of production	2P	14	2P401503180016
6	ID/serial number	Optional: Present-day serial number system, e.g. with safety products	51S	12	51S678294
7	Variant number	Optional: Product variant number on the basis of standard products	30P	32	30PF971, 2*K183
...					

Further types of information and data identifiers are used by Beckhoff and serve internal processes.

Structure of the BIC

Example of composite information from positions 1 to 4 and with the above given example value on position 6. The data identifiers are highlighted in bold font:

1P072222**S**BTNk4p562d7**1K**EL1809 **Q**1 **51S**678294

Accordingly as DMC:

Fig. 14: Example DMC **1P**072222**S**BTNk4p562d7**1K**EL1809 **Q**1 **51S**678294

BTN

An important component of the BIC is the Beckhoff Traceability Number (BTN, position 2). The BTN is a unique serial number consisting of eight characters that will replace all other serial number systems at Beckhoff in the long term (e.g. batch designations on IO components, previous serial number range for safety products, etc.). The BTN will also be introduced step by step, so it may happen that the BTN is not yet coded in the BIC.

NOTICE

This information has been carefully prepared. However, the procedure described is constantly being further developed. We reserve the right to revise and change procedures and documentation at any time and without prior notice. No claims for changes can be made from the information, illustrations and descriptions in this information.

8.3.4 Electronic access to the BIC (eBIC)

Electronic BIC (eBIC)

The Beckhoff Identification Code (BIC) is applied to the outside of Beckhoff products in a visible place. If possible, it should also be electronically readable.

Decisive for the electronic readout is the interface via which the product can be electronically addressed.

K-bus devices (IP20, IP67)

Currently, no electronic storage and readout is planned for these devices.

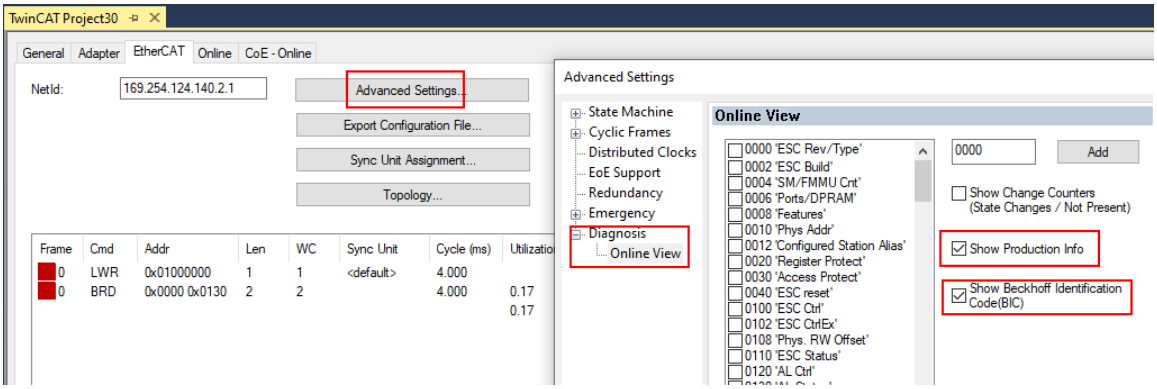
EtherCAT devices (IP20, IP67)

All Beckhoff EtherCAT devices have a so-called ESI-EEPROM, which contains the EtherCAT identity with the revision number. Stored in it is the EtherCAT slave information, also colloquially known as ESI/XML configuration file for the EtherCAT master. See the corresponding chapter in the EtherCAT system manual (Link) for the relationships.

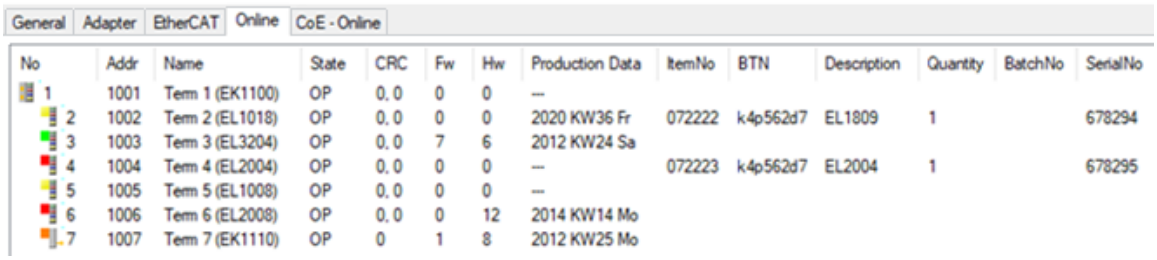
The eBIC is also stored in the ESI-EEPROM. The eBIC was introduced into the Beckhoff I/O production (terminals, box modules) from 2020; widespread implementation is expected in 2021.

The user can electronically access the eBIC (if existent) as follows:

- With all EtherCAT devices, the EtherCAT master (TwinCAT) can read the eBIC from the ESI-EEPROM
  - From TwinCAT 3.1 build 4024.11, the eBIC can be displayed in the online view.
  - To do this,
    check the checkbox "Show Beckhoff Identification Code (BIC)" under
    EtherCAT → Advanced Settings → Diagnostics:

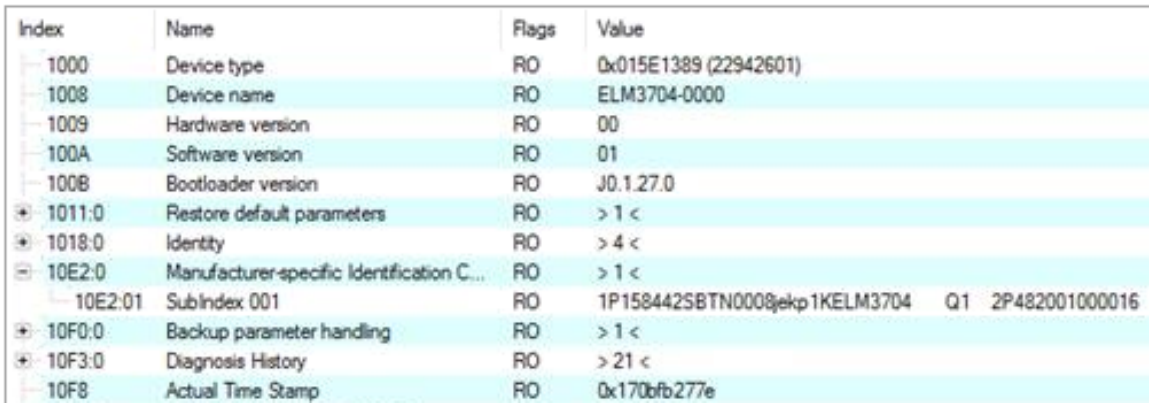


  - The BTN and its contents are then displayed:



  - Note: as can be seen in the illustration, the production data HW version, FW version and production date, which have been programmed since 2012, can also be displayed with "Show Production Info".
  - Access from the PLC: From TwinCAT 3.1. build 4024.24 the functions *FB_EcReadBIC* and *FB_EcReadBTN* are available in the Tc2_EtherCAT Library from v3.3.19.0 for reading into the PLC..
- In the case of EtherCAT devices with CoE directory, the object 0x10E2:01 can additionally by used to display the device's own eBIC; the PLC can also simply access the information here:

- The device must be in PREOP/SAFEOP/OP for access:



Index	Name	Flags	Value
1000	Device type	RO	0x015E1389 (22942601)
1008	Device name	RO	ELM3704-0000
1009	Hardware version	RO	00
100A	Software version	RO	01
100B	Bootloader version	RO	J0.1.27.0
1011:0	Restore default parameters	RO	> 1 <
1018:0	Identity	RO	> 4 <
10E2:0	Manufacturer-specific Identification C...	RO	> 1 <
10E2:01	SubIndex 001	RO	1P158442SBTN0008jekp 1KELM3704 Q1 2P482001000016
10F0:0	Backup parameter handling	RO	> 1 <
10F3:0	Diagnosis History	RO	> 21 <
10F8	Actual Time Stamp	RO	0x170bfb277e

  - The object 0x10E2 will be introduced into stock products in the course of a necessary firmware revision.
  - From TwinCAT 3.1. build 4024.24 the functions *FB_EcCoEReadBIC* and *FB_EcCoEReadBTN* are available in the Tc2_EtherCAT Library from v3.3.19.0 for reading into the PLC.
- For processing the BIC/BTN data in the PLC, the following auxiliary functions are available in *Tc2_Utilities* from TwinCAT 3.1 build 4024.24 onwards
  - F_SplitBIC: The function splits the Beckhoff Identification Code (BIC) sBICValue into its components based on known identifiers and returns the recognized partial strings in a structure ST_SplitBIC as return value.
  - BIC_TO_BTN: The function extracts the BTN from the BIC and returns it as a value.
- Note: in the case of electronic further processing, the BTN is to be handled as a string(8); the identifier "SBTN" is not part of the BTN.
- Technical background
  The new BIC information is additionally written as a category in the ESI-EEPROM during the device production. The structure of the ESI content is largely dictated by the ETG specifications, therefore the additional vendor-specific content is stored with the help of a category according to ETG.2010. ID 03 indicates to all EtherCAT masters that they must not overwrite these data in case of an update or restore the data after an ESI update.
  The structure follows the content of the BIC, see there. This results in a memory requirement of approx. 50..200 bytes in the EEPROM.
- Special cases
  - If multiple, hierarchically arranged ESCs are installed in a device, only the top-level ESC carries the eBIC Information.
  - If multiple, non-hierarchically arranged ESCs are installed in a device, all ESCs carry the eBIC Information.
  - If the device consists of several sub-devices with their own identity, but only the top-level device is accessible via EtherCAT, the eBIC of the top-level device is located in the CoE object directory 0x10E2:01 and the eBICs of the sub-devices follow in 0x10E2:nn.

PROFIBUS, PROFINET, DeviceNet devices etc.

Currently, no electronic storage and readout is planned for these devices.

8.4 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.

Beckhoff's branch offices and representatives

Please contact your Beckhoff branch office or representative for local support and service on Beckhoff products!

The addresses of Beckhoff's branch offices and representatives round the world can be found on her internet pages: www.beckhoff.com

You will also find further documentation for Beckhoff components there.

Support

The Beckhoff Support offers you comprehensive technical assistance, helping you not only with the application of individual Beckhoff products, but also with other, wide-ranging services:

- support
- design, programming and commissioning of complex automation systems
- and extensive training program for Beckhoff system components

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web:	www.beckhoff.com/support

Service

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- spare parts service
- hotline service

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