

Documentation | EN

EPP2xxx

EtherCAT P Box modules with digital outputs



Table of contents

1 Foreword	7
1.1 Notes on the documentation	7
1.2 Safety instructions	8
1.3 Documentation issue status	9
2 Product group: EtherCAT P Box modules	10
3 Product overview	11
3.1 EPP2008-000x	13
3.1.1 Introduction	13
3.1.2 Technical data	14
3.1.3 Scope of supply	15
3.1.4 Process image	16
3.2 EPP2008-0022	17
3.2.1 Introduction	17
3.2.2 Technical data	18
3.2.3 Scope of supply	19
3.2.4 Process image	20
3.3 EPP2028-000x	21
3.3.1 Introduction	21
3.3.2 Technical data	22
3.3.3 Scope of supply	23
3.3.4 Process image	24
3.4 EPP2038-000x	25
3.4.1 Introduction	25
3.4.2 Technical data	27
3.4.3 Scope of supply	28
3.4.4 Process image	29
3.5 EPP2308-000x, EPP2318-000x	30
3.5.1 Introduction	30
3.5.2 Technical data	32
3.5.3 Scope of supply	33
3.5.4 Process image	34
3.6 EPP2328-000x	35
3.6.1 Introduction	35
3.6.2 Technical data	37
3.6.3 Scope of supply	38
3.6.4 Process image	39
3.7 EPP2316-000x	40
3.7.1 Introduction	40
3.7.2 Technical data	42
3.7.3 Scope of supply	43
3.7.4 Process image	44
3.7.5 Status LEDs	47
3.8 EPP2334-0061	48
3.8.1 Introduction	48

3.8.2	Technical data.....	49
3.8.3	Scope of supply.....	50
3.8.4	Process image	51
3.9	EPP2338-000x	52
3.9.1	Introduction	52
3.9.2	Technical data.....	54
3.9.3	Scope of supply.....	55
3.9.4	Process image	56
3.10	EPP2338-x100	57
3.10.1	Introduction	57
3.10.2	Technical data.....	59
3.10.3	Scope of supply.....	60
3.10.4	Process image	61
3.11	EPP2338-2002	62
3.11.1	Introduction	62
3.11.2	Block diagram	63
3.11.3	Technical data.....	64
3.11.4	Scope of supply.....	65
3.11.5	Process image	66
3.12	EPP2339-0003	67
3.12.1	Introduction	67
3.12.2	Technical data.....	68
3.12.3	Scope of supply.....	69
3.12.4	Process image	70
3.13	EPP2339-002x, EPP2349-002x	71
3.13.1	Introduction	71
3.13.2	Technical data.....	73
3.13.3	Scope of supply.....	74
3.13.4	Process image	75
3.14	EPP2624-0002	77
3.14.1	Introduction	77
3.14.2	Technical data.....	78
3.14.3	Scope of supply.....	79
3.14.4	Process image	80
3.15	EPP2809-002x	81
3.15.1	Introduction	81
3.15.2	Technical data.....	83
3.15.3	Scope of supply.....	84
3.15.4	Process image	85
3.16	EPP2816-0003	87
3.16.1	Introduction	87
3.16.2	Technical data.....	88
3.16.3	Scope of supply.....	89
3.16.4	Process image	90
3.17	EPP2816-0004	91
3.17.1	Introduction	91

3.17.2	Technical data.....	92
3.17.3	Scope of supply.....	93
3.17.4	Process image	94
3.18	EPP2816-0008	95
3.18.1	Introduction	95
3.18.2	Technical data.....	96
3.18.3	Scope of supply.....	97
3.18.4	Process image	98
3.18.5	Status LEDs	100
3.19	EPP2816-0010	101
3.19.1	Introduction	101
3.19.2	Technical data.....	102
3.19.3	Scope of supply.....	103
3.19.4	Process image	104
3.20	EPP2817-0008	105
3.20.1	Introduction	105
3.20.2	Technical data.....	106
3.20.3	Scope of supply.....	107
3.20.4	Process image	108
4	Mounting and cabling	110
4.1	Mounting	110
4.1.1	Dimensions	110
4.1.2	Fixing.....	113
4.1.3	Functional earth (FE)	114
4.1.4	Tightening torques for plug connectors.....	114
4.2	EtherCAT P	115
4.2.1	Connectors.....	116
4.2.2	Status LEDs	117
4.2.3	Conductor losses	118
4.3	Supply and connection of sensor/actuator to EPP boxes	119
4.4	Digital inputs.....	120
4.4.1	Digital inputs M8.....	120
4.4.2	Digital inputs M12.....	121
4.4.3	ZS2001 digital inputs.....	122
4.4.4	Digital inputs D-sub 25	124
4.5	Digital outputs	126
4.5.1	Digital outputs M8	126
4.5.2	Digital outputs M12	127
4.5.3	M16 sockets	128
4.5.4	Digital outputs D-sub 9.....	129
4.5.5	Digital outputs D-sub 25.....	130
4.5.6	Digital outputs ZS2001 (EPP2316-0003).....	132
4.5.7	Digital outputs ZS2001 (EPP2816-0003).....	134
4.6	Digital inputs/outputs	136
4.6.1	Digital inputs/outputs M8.....	136
4.6.2	Digital inputs/outputs M12.....	137

4.6.3	Digital inputs/outputs ZS2001	140
4.7	Relay	142
4.8	UL Requirements	143
4.9	Disposal	144
5	Commissioning/Configuration.....	145
5.1	Integrating into a TwinCAT project.....	145
5.2	Behavior of the outputs in case of a fault (EPP2316 and EPP281x only).....	146
5.2.1	Behavior in case of network failure	146
5.2.2	Behavior in case of short circuit	148
5.2.3	Behavior in case of lack of supply voltage	149
5.3	Restore the delivery state	150
5.4	Decommissioning	151
6	Appendix.....	152
6.1	General operating conditions	152
6.2	Accessories	153
6.3	Version identification of EtherCAT devices	154
6.3.1	General notes on marking.....	154
6.3.2	Version identification of IP67 modules	155
6.3.3	Beckhoff Identification Code (BIC).....	156
6.3.4	Electronic access to the BIC (eBIC).....	158
6.4	Support and Service.....	160

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®, ATRO®, EtherCAT®, EtherCAT G®, EtherCAT G10®, EtherCAT P®, MX-System®, Safety over EtherCAT®, TC/BSD®, TwinCAT®, TwinCAT/BSD®, TwinSAFE®, XFC®, XPlanar® and XTS® 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.



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

Copyright

© Beckhoff Automation GmbH & Co. KG, Germany.

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without express authorization are prohibited.

Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility model or design.

Third-party brands

Trademarks of third parties may be used in this documentation. You can find the trademark notices here:

<https://www.beckhoff.com/trademarks>

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
1.10	EPP2338-2002 updated.
1.9	Signal interfaces updated
1.8	Pin assignment updated
1.7	- EPP2816-0003 added - Technical data updated
1.6	- EtherCAT P status LEDs updated - Technical data updated - Structure update
1.5	- EPP2338-2002 added - Technical data updated
1.4	- Dimensions updated - UL requirements updated
1.3	- Front page updated - Structure update
1.2	- EPP2817-0008: Pin assignment corrected - EPP2339-0003 added - UL
1.1	Modules added: EPP2008-0022, EPP2028, EPP2038, EPP2328, EPP2334-0061, EPP2339, EPP2349, EPP2624, EPP2809, EPP2816-0004, EP2816-0010, EPP2817
1.0.5	Preliminary version
1.0.4	- EtherCAT P – calculating cable length, voltage, and current added - Cabling updated - Additional checks added
1.0.3	Signal interface updated
1.0.2	EPP2xxx module overview updated
1.0.1	EtherCAT P connection updated
1.0.0	First release
0.5	First preliminary version

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

WW - week of production (calendar week)

YY - year of production

FF - firmware version

HH - hardware version

Example with D no. 29 10 02 01:

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](#) [► 154].

2 Product group: EtherCAT P Box modules

EtherCAT P

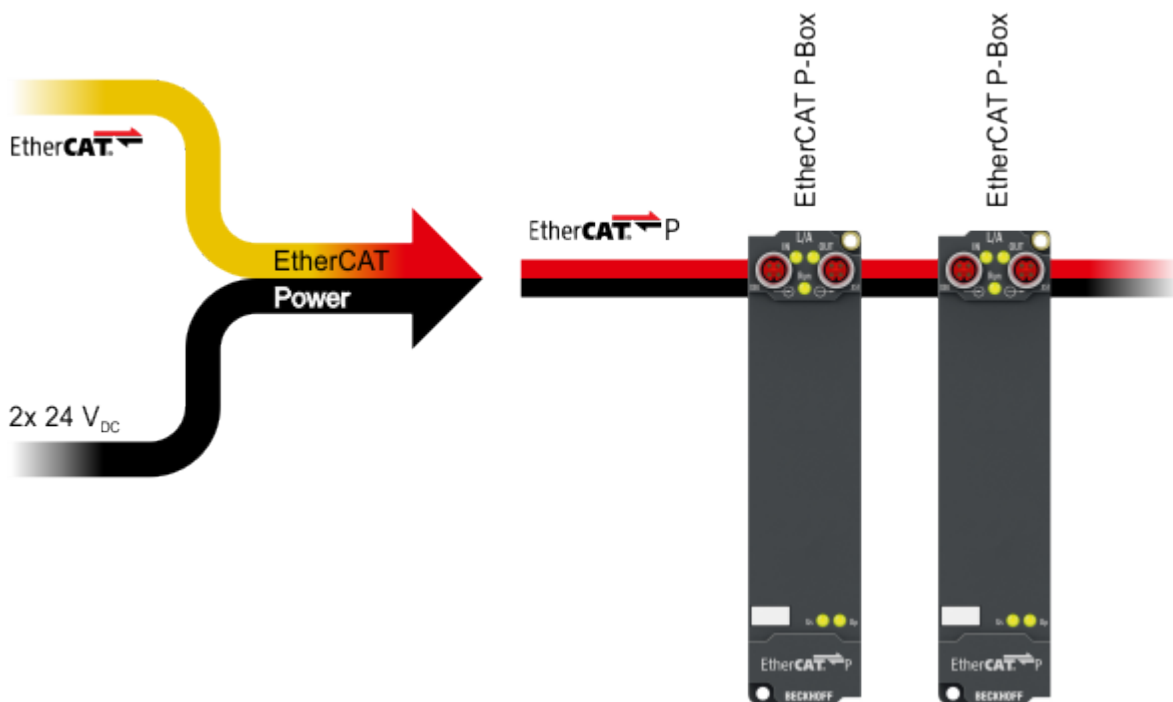
EtherCAT P supplements the EtherCAT technology with a process in which communication and supply voltages are transmitted on a common line. All EtherCAT properties are retained with this process.

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 tables show the products described in this documentation and the main distinguishing features.

Digital outputs

Module	Signal connection	Number of outputs	Output current per channel	Diagnosis	Distributed Clocks
EPP2008-0001 [► 13]	8 x M8	8	0.5 A	-	-
EPP2008-0002 [► 13]	4 x M12	8	0.5 A	-	-
EPP2008-0022 [► 17]	8 x M12	8	0.5 A	-	-
EPP2028-0001 [► 21]	8 x M8	8	2 A	-	-
EPP2028-0002 [► 21]	4 x M12	8	2 A	-	-
EPP2038-0001 [► 25]	8 x M8	8	2 A	Yes	-
EPP2038-0002 [► 25]	4 x M12	8	2 A	Yes	-
EPP2809-0021 [► 81]	16 x M8	16	0.5 A	-	-
EPP2809-0022 [► 81]	8 x M12	16	0.5 A	-	-
EPP2816-0003 [► 87]	2 x ZS2001	16	0.5 A	Yes	Yes
EPP2816-0004 [► 91]	1 x M16	16	0.5 A	Yes	Yes
EPP2816-0008 [► 95]	1 x D-sub 25	16	0.5 A	Yes	Yes
EPP2816-0010 [► 101]	2 x D-sub 9	16	0.5 A	Yes	Yes
EPP2817-0008 [► 105]	1 x D-sub 25	24	0.5 A	Yes	Yes

Digital inputs and outputs

Module	Signal connection	Number of outputs	Output current per channel	Diagnosis	Number inputs	Input filter
EPP2308-0001 [► 30]	8 x M8	4	0.5 A	-	4	3.0 ms
EPP2308-0002 [► 30]	4 x M12	4	0.5 A	-	4	3.0 ms
EPP2316-0003 [► 40]	2 x ZS2001	8	0.5 A	Yes	8	10 µs
EPP2316-0008 [► 40]	1 x D-sub 25	8	0.5 A	Yes	8	10 µs
EPP2318-0001 [► 30]	8 x M8	4	0.5 A	-	4	10 µs
EPP2318-0002 [► 30]	4 x M12	4	0.5 A	-	4	10 µs
EPP2328-0001 [► 35]	8 x M8	4	2 A	-	4	3.0 ms
EPP2328-0002 [► 35]	4 x M12	4	2 A	-	4	3.0 ms

Digital inputs/outputs

Module	Signal connection	Number of inputs/outputs	Output current per channel	Diagnosis	Input filter
EPP2334-0061 ▶ 48	4 x M8	4	0.5 A	-	10 µs
EPP2338-0001 ▶ 52	8 x M8	8	0.5 A	-	10 µs
EPP2338-0002 ▶ 52	4 x M12	8	0.5 A	-	10 µs
EPP2338-1001 ▶ 57	8 x M8	8	0.5 A	-	3.0 ms
EPP2338-1002 ▶ 57	4 x M12	8	0.5 A	-	3.0 ms
EPP2338-2002 ▶ 62	4 x M12	8	0.5 A	-	10 µs
EPP2339-0003 ▶ 67	2 x ZS2001	16	0.5 A	-	3.0 ms
EPP2339-0021 ▶ 71	16 x M8	16	0.5 A	-	3.0 ms
EPP2339-0022 ▶ 71	8 x M12	16	0.5 A	-	3.0 ms
EPP2349-0021 ▶ 71	16 x M8	16	0.5 A	-	10 µs
EPP2349-0022 ▶ 71	8 x M12	16	0.5 A	-	10 µs

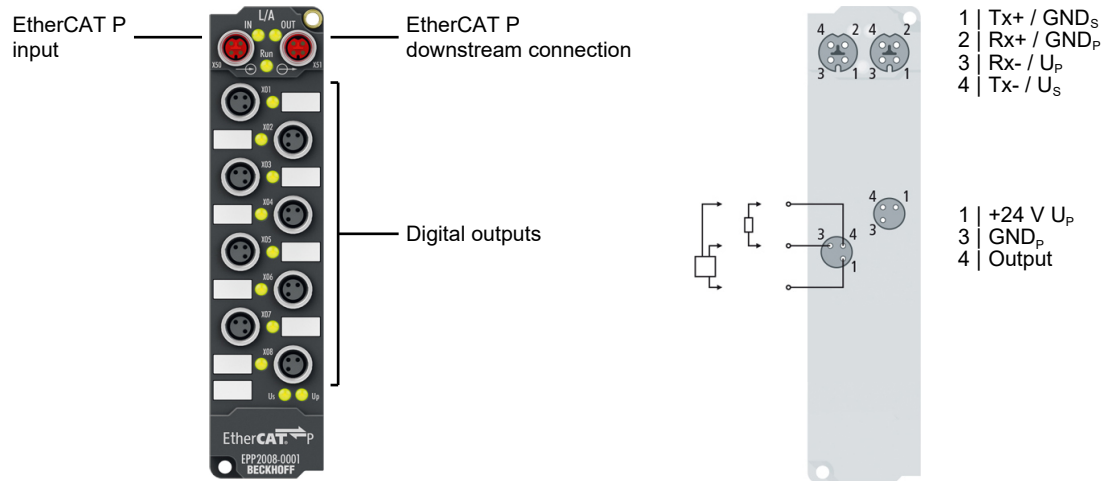
Relay outputs

Module	Signal connection	Number of outputs	Output current per channel	Diagnosis
EPP2624-0002 ▶ 77	4 x M12	4	0.5 A _{AC} / 2 A _{DC}	-

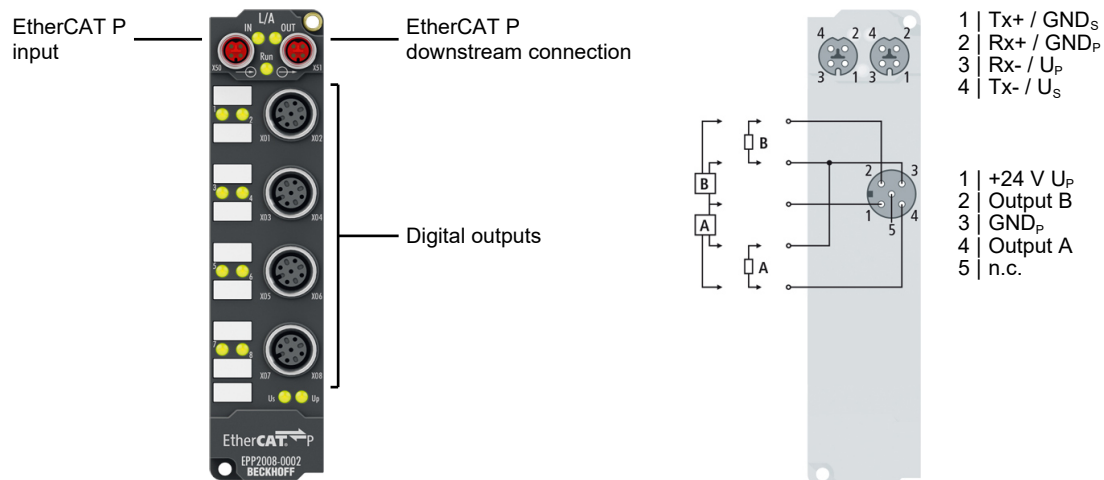
3.1 EPP2008-000x

3.1.1 Introduction

EPP2008-0001



EPP2008-0002



8 digital outputs, 0.5 A

The EPP2008 EtherCAT P Box with digital outputs connects binary control signals from the controller to the actuators at the process level.

The signal state is indicated by means of LEDs. The signal connection is established via M8 connectors (EPP2008-0001) or M12 connectors (EPP2008-0002). The outputs are short-circuit proof and protected against polarity reversal.

Quick links

[Technical data \[P 14\]](#)

[Process image \[P 16\]](#)

[Signal connection M8 \[P 126\]](#)

[Signal connection M12 \[P 127\]](#)

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, shielded

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
U _P nominal voltage	24 V _{DC} (-15 % / +20 %)
U _P sum current: I _{P,sum}	max. 3 A
Current consumption from U _P	20 mA + Output currents of the digital outputs + Output currents of the auxiliary voltage outputs

Digital outputs	EPP2008-0001	EPP2008-0002
Number	8	
Connection	8 x M8 socket	4 x M12 socket
Cable length	max. 30 m	
Load type	ohmic inductive, lamp load	
Nominal voltage	24 V _{DC} from U _P	
Output current I _{OUT}	max. 0.5 A per channel max. 3.0 A in total	
Short circuit current	max. 1.5 A per channel	
Switching times	T _{ON} : 50 µs typ., T _{OFF} : 100 µs typ.	
Auxiliary voltage	24 V _{DC} from U _P . 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 [► 15]
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 [► 143]

*) 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 EPP2008-000x
- 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.

3.1.4 Process image

EPP2008-0001

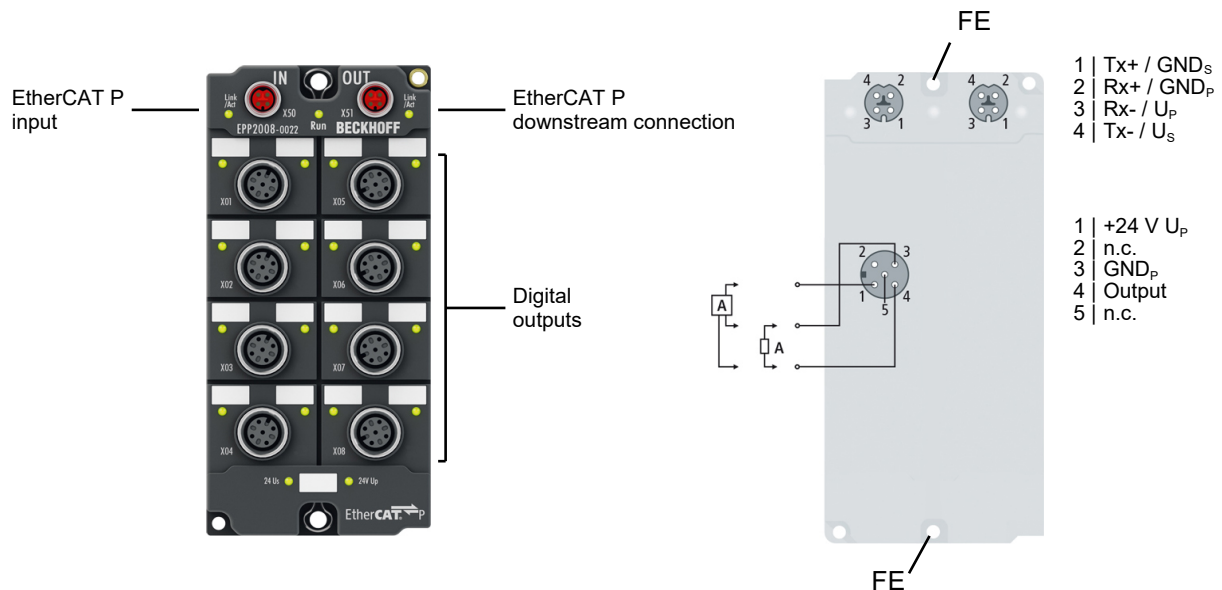
Process image in TwinCAT	Connector	Contact	Output variable
└─ Box 1 (EPP2008-0001) └─ Channel 1 └─ Output └─ Channel 2 └─ Output └─ Channel 3 └─ Output └─ Channel 4 └─ Output └─ Channel 5 └─ Output └─ Channel 6 └─ Output └─ Channel 7 └─ Output └─ Channel 8 └─ Output └─ WcState └─ InfoData	X01	4	Channel 1 Output
	X02	4	Channel 2 Output
	X03	4	Channel 3 Output
	X04	4	Channel 4 Output
	X05	4	Channel 5 Output
	X06	4	Channel 6 Output
	X07	4	Channel 7 Output
	X08	4	Channel 8 Output

EPP2008-0002

Process image in TwinCAT	Connector	Contact	Output variable
└─ Box 1 (EPP2008-0002) └─ Channel 1 └─ Output └─ Channel 2 └─ Output └─ Channel 3 └─ Output └─ Channel 4 └─ Output └─ Channel 5 └─ Output └─ Channel 6 └─ Output └─ Channel 7 └─ Output └─ Channel 8 └─ Output └─ WcState └─ InfoData	X01 / X02	2	Channel 2 Output
		4	Channel 1 Output
	X03 / X04	2	Channel 4 Output
		4	Channel 3 Output
	X05 / X06	2	Channel 6 Output
		4	Channel 5 Output
	X07 / X08	2	Channel 8 Output
		4	Channel 7 Output

3.2 EPP2008-0022

3.2.1 Introduction



8 digital outputs

The EPP2008-0022 EtherCAT P Box with digital outputs connects binary control signals from the controller to the actuators at the process level.

The signal state is indicated by means of LEDs. The signal connection is established via M12 connectors. The outputs are short-circuit proof and protected against polarity reversal.

Quick links

[Technical data \[► 18\]](#)

[Process image \[► 20\]](#)

[Signal connection \[► 127\]](#)

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, shielded

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
U_P nominal voltage	24 V _{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	20 mA + Output currents of the digital outputs + Output currents of the auxiliary voltage outputs

Digital outputs	
Number	8
Connection	8x M12 socket
Cable length	max. 30 m
Load type	ohmic inductive, lamp load
Nominal voltage	24 V _{DC} from U_P
Output current I_{OUT}	max. 0.5 A per channel max. 3.0 A in total
Short circuit current	max. 1.5 A per channel
Switching times	T_{ON} : 60 µs typ., T_{OFF} : 300 µs typ.
Auxiliary voltage	24 V _{DC} 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 -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 [► 19]
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 [► 143]

*) 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 EPP2008-0022
- 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.

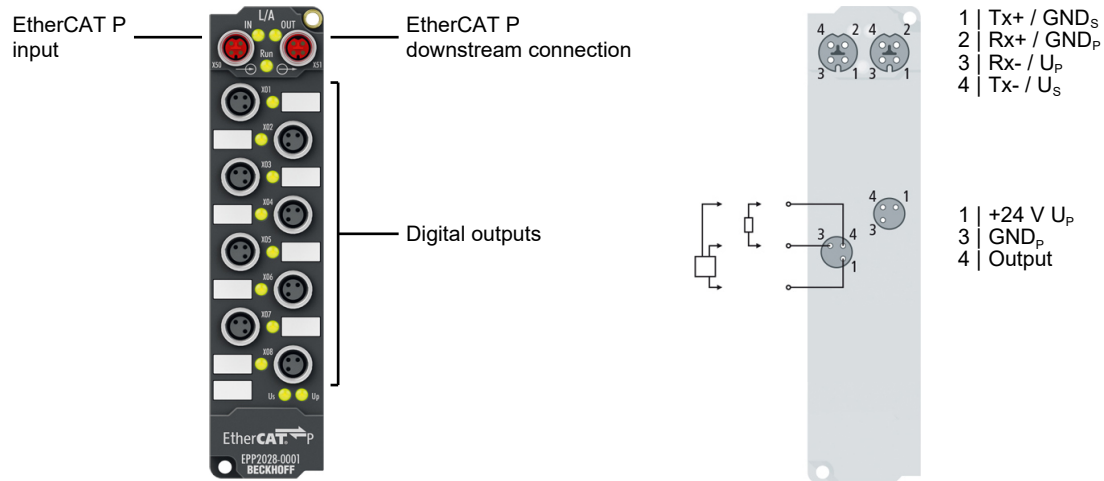
3.2.4 Process image

Process image in TwinCAT	Connector	Contact	Output variable
▲  Box 2 (EPP2008-0022) ▲  Channel 1  Output ▲  Channel 2  Output ▲  Channel 3  Output ▲  Channel 4  Output ▲  Channel 5  Output ▲  Channel 6  Output ▲  Channel 7  Output ▲  Channel 8  Output ▷  WcState ▷  InfoData	X01	4	 Channel 1  Output
	X02	4	 Channel 2  Output
	X03	4	 Channel 3  Output
	X04	4	 Channel 4  Output
	X05	4	 Channel 5  Output
	X06	4	 Channel 6  Output
	X07	4	 Channel 7  Output
	X08	4	 Channel 8  Output

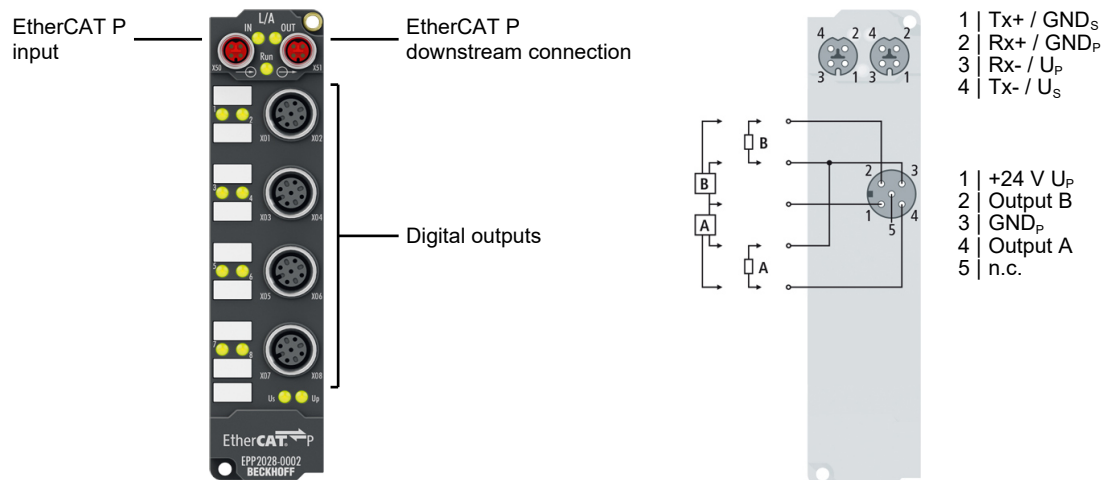
3.3 EPP2028-000x

3.3.1 Introduction

EPP2028-0001



EPP2028-0002



8 digital outputs, 2 A

The EPP2028 EtherCAT P Box with digital outputs connects binary control signals from the controller to the actuators at the process level.

The signal state is indicated by means of LEDs. The signal connection is established via M8 connectors (EPP2028-0001) or M12 connectors (EPP2028-0002). The outputs are short-circuit proof and protected against polarity reversal.

Quick links

[Technical data \[► 22\]](#)

[Process image \[► 24\]](#)

[Signal connection M8 \[► 126\]](#)

[Signal connection M12 \[► 127\]](#)

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, shielded

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
U _P nominal voltage	24 V _{DC} (-15 % / +20 %)
U _P sum current: I _{P,sum}	max. 3 A
Current consumption from U _P	20 mA + Output currents of the digital outputs + Output currents of the auxiliary voltage outputs

Digital outputs	EPP2028-0001	EPP2028-0002
Number	8	
Connection	8 x M8 socket	4 x M12 socket
Cable length	max. 30 m	
Load type	ohmic inductive, lamp load	
Nominal voltage	24 V _{DC} from U _P	
Output current I _{OUT}	max. 2.0 A per channel max. 3.0 A in total	
Short circuit current	15 A typ.	
Switching times	T _{ON} : 200 µs typ., T _{OFF} : 200 µs typ.	
Auxiliary voltage	24 V _{DC} from U _P . 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 [► 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 [► 143]

*) 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 EPP2028-000x
- 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

EPP2028-0001

Process image in TwinCAT	Connector	Contact	Output variable
└─ Box 1 (EPP2028-0001) └─ Channel 1 └─ Output └─ Channel 2 └─ Output └─ Channel 3 └─ Output └─ Channel 4 └─ Output └─ Channel 5 └─ Output └─ Channel 6 └─ Output └─ Channel 7 └─ Output └─ Channel 8 └─ Output └─ WcState └─ InfoData	X01	4	Channel 1 Output
	X02	4	Channel 2 Output
	X03	4	Channel 3 Output
	X04	4	Channel 4 Output
	X05	4	Channel 5 Output
	X06	4	Channel 6 Output
	X07	4	Channel 7 Output
	X08	4	Channel 8 Output

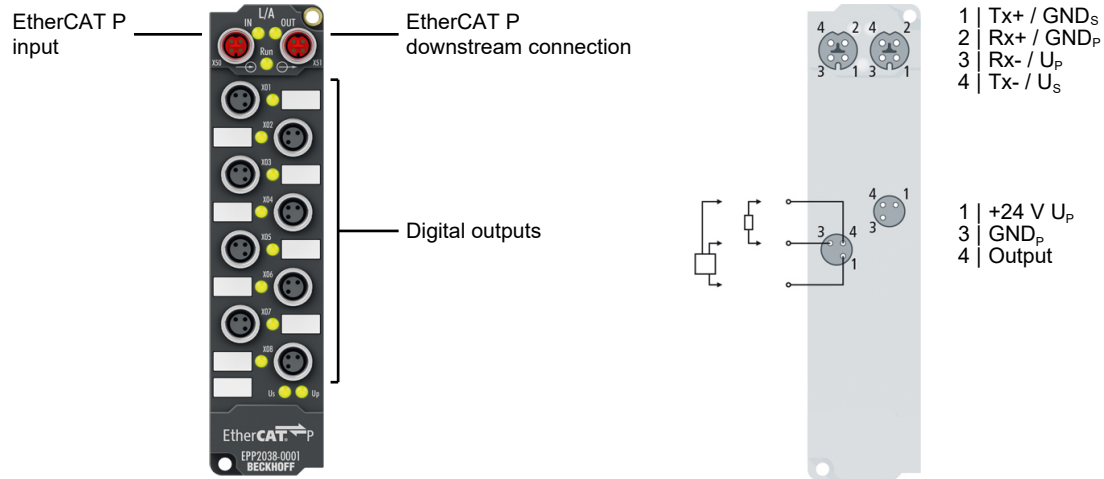
EPP2028-0002

Process image in TwinCAT	Connector	Contact	Output variable
└─ Box 1 (EPP2028-0002) └─ Channel 1 └─ Output └─ Channel 2 └─ Output └─ Channel 3 └─ Output └─ Channel 4 └─ Output └─ Channel 5 └─ Output └─ Channel 6 └─ Output └─ Channel 7 └─ Output └─ Channel 8 └─ Output └─ WcState └─ InfoData	X01 / X02	2	Channel 2 Output
		4	Channel 1 Output
	X03 / X04	2	Channel 4 Output
		4	Channel 3 Output
	X05 / X06	2	Channel 6 Output
		4	Channel 5 Output
	X07 / X08	2	Channel 8 Output
		4	Channel 7 Output

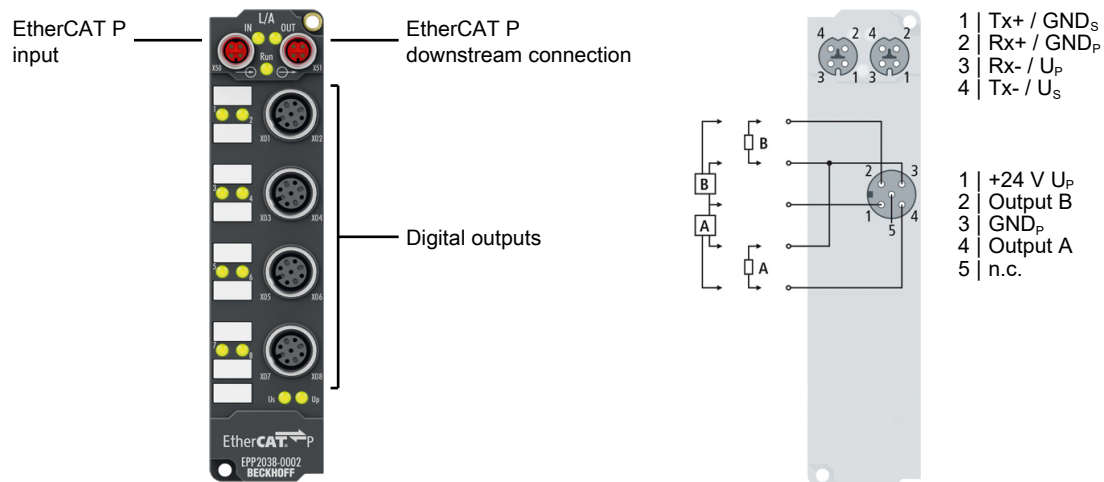
3.4 EPP2038-000x

3.4.1 Introduction

EPP2038-0001



EPP2038-0002



8-channel digital output

The EPP2038 EtherCAT P Box is designed for processing digital/binary signals. It connects the binary control signals from the automation device on to the actuators at the process level. The outputs handle an output current of up to max. 2.0 A. A short-term overload is possible. The outputs are short-circuit proof. The sum current of all outputs is limited to 3 A.

The signal state of the channels is indicated by LEDs. With channel-based short-circuit and open-load/wire break detection, the EPP2038 provides effective diagnostics to ensure reliable system availability. The signal connection is established via screw-type M8 connectors.

Quick links

[Technical data \[► 27\]](#)

[Process image \[► 29\]](#)

[Signal connection M8 \[► 126\]](#)

[Signal connection M12 \[► 127\]](#)

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, shielded

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
U _P nominal voltage	24 V _{DC} (-15 % / +20 %)
U _P sum current: I _{P,sum}	max. 3 A
Current consumption from U _P	20 mA + Output currents of the digital outputs + Output currents of the auxiliary voltage outputs

Digital outputs	EPP2038-0001	EPP2038-0002
Number	8	
Connection	8 x M8 socket	4 x M12 socket
Cable length	max. 30 m	
Load type	ohmic inductive, lamp load	
Nominal voltage	24 V _{DC} from U _P	
Output current I _{OUT}	max. 2.0 A per channel max. 3.0 A in total	
Short circuit current	15 A typ.	
Switching times	T _{ON} : 200 µs typ., T _{OFF} : 200 µs typ.	
Diagnosis	• Short circuit • Open Load	
Auxiliary voltage	24 V _{DC} from U _P 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 [► 28]
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 [► 143]

*) 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 EPP2038-000x
- 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

EPP2038-0001

Process image in TwinCAT	Connector	Contact	Output variable	Diagnostic bit
▲ Box 1 (EPP2038-0001) ▲ Diag Channel 1 - Input ▶ Diag Channel 2 ▶ Diag Channel 3 ▶ Diag Channel 4 ▶ Diag Channel 5 ▶ Diag Channel 6 ▶ Diag Channel 7 ▶ Diag Channel 8 ▲ Channel 1 - Output ▶ Channel 2 ▶ Channel 3 ▶ Channel 4 ▶ Channel 5 ▶ Channel 6 ▶ Channel 7 ▶ Channel 8 ▶ WcState ▶ InfoData	X01	4	Channel 1 Output	Diag Channel 1 Input
	X02	4	Channel 2 Output	Diag Channel 2 Input
	X03	4	Channel 3 Output	Diag Channel 3 Input
	X04	4	Channel 4 Output	Diag Channel 4 Input
	X05	4	Channel 5 Output	Diag Channel 5 Input
	X06	4	Channel 6 Output	Diag Channel 6 Input
	X07	4	Channel 7 Output	Diag Channel 7 Input
	X08	4	Channel 8 Output	Diag Channel 8 Input

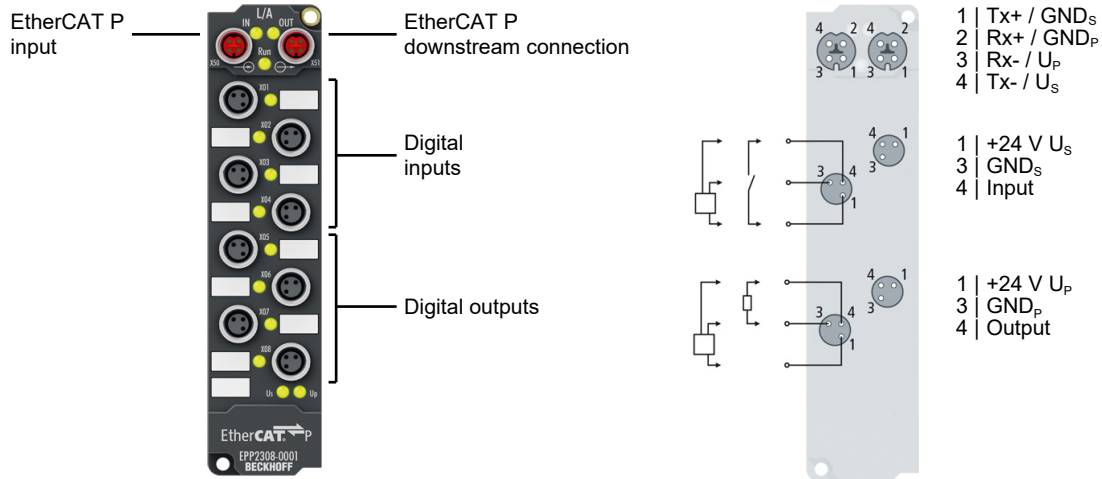
EPP2038-0002

Process image in TwinCAT	Connector	Contact	Output variable	Diagnostic bit
▲ Box 1 (EPP2038-0002) ▲ Diag Channel 1 - Input ▶ Diag Channel 2 ▶ Diag Channel 3 ▶ Diag Channel 4 ▶ Diag Channel 5 ▶ Diag Channel 6 ▶ Diag Channel 7 ▶ Diag Channel 8 ▲ Channel 1 - Output ▶ Channel 2 ▶ Channel 3 ▶ Channel 4 ▶ Channel 5 ▶ Channel 6 ▶ Channel 7 ▶ Channel 8 ▶ WcState ▶ InfoData	X01 / X02	2	Channel 2 Output	Diag Channel 2 Input
		4	Channel 1 Output	Diag Channel 1 Input
	X03 / X04	2	Channel 4 Output	Diag Channel 4 Input
		4	Channel 3 Output	Diag Channel 3 Input
	X05 / X06	2	Channel 6 Output	Diag Channel 6 Input
		4	Channel 5 Output	Diag Channel 5 Input
	X07 / X08	2	Channel 8 Output	Diag Channel 8 Input
		4	Channel 7 Output	Diag Channel 7 Input

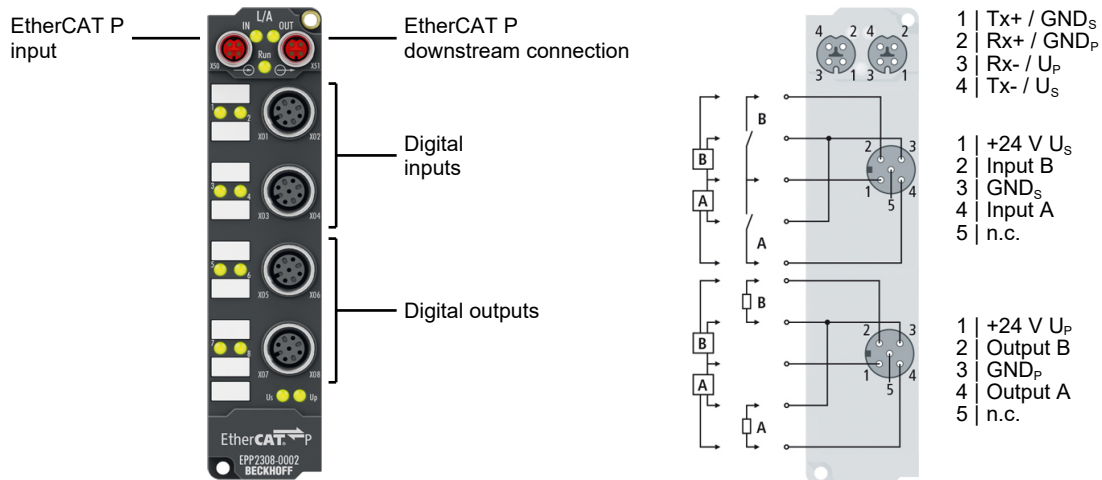
3.5 EPP2308-000x, EPP2318-000x

3.5.1 Introduction

EPP2308-0001, EPP2318-0001



EPP2308-0002, EPP2318-0002



4 digital outputs and 4 digital inputs

The EPP2308 and EPP2318 EtherCAT P Box modules combine four digital inputs and four digital outputs in one device.

The state of each signal is indicated by means of LEDs. The signals are optionally connected via M8 connectors (EPP2308-0001, EPP2318-0001) or M12 connectors (EPP2308-0002, EPP2318-0002). The outputs process load currents up to 0.5 A, are short-circuit proof and protected against polarity reversal.

Quick links

[Technical data](#) [► 32]

[Process image](#) [► 34]

[Digital inputs M8](#) [► 120]

[Digital inputs M12 \[► 121\]](#)

[Digital outputs M8 \[► 126\]](#)

[Digital outputs M12 \[► 127\]](#)

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, shielded

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 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	20 mA + Output currents of the digital outputs + Output currents of the auxiliary voltage outputs

Digital inputs	EPP2308-0001	EPP2308-0002	EPP2318-0001	EPP2318-0002
Number	4			
Connection	4 x M8 socket	2 x M12 socket	4 x M8 socket	2 x M12 socket
Cable length	max. 30 m			
Characteristics	Type 3 according to EN 61131-2, compatible with type 1			
Input filter	3.0 ms	3.0 ms	10 µs	10 µs
Signal voltage "0"	-3 ... +5 V _{DC}			
Signal voltage "1"	+11 ... +30 V _{DC}			
Input current	typically 6 mA at 24 V _{DC}			
Sensor power supply	24 V _{DC} from U_S max. 0.5 A in total, short-circuit proof			

Digital outputs	EPP2308-0001	EPP2308-0002	EPP2318-0001	EPP2318-0002
Number	4			
Connection	4 x M8 socket	2 x M12 socket	4 x M8 socket	2 x M12 socket
Cable length	max. 30 m			
Load type	ohmic, inductive, lamp load			
Nominal voltage	24 V _{DC} from U_P			
Output current	max. 0.5 A per channel max. 3.0 A in total			
Short circuit current	max. 1.5 A per channel			
Switching times	T_{ON} : 50 µs typ., T_{OFF} : 100 µs typ.			
Auxiliary voltage	24 V _{DC} from U_P 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 [► 33]
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 [► 143]

*) 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 EPP2308 / EPP2318
- 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

EPP2308-0001, EPP2318-0001

Process image in TwinCAT	Connector	Contact	Variable
└─ Box 1 (EPP2308-0001) └─ Channel 1 └─ Input └─ Channel 2 └─ Input └─ Channel 3 └─ Input └─ Channel 4 └─ Input └─ Channel 5 └─ Output └─ Channel 6 └─ Output └─ Channel 7 └─ Output └─ Channel 8 └─ Output └─ 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 Output
	X06	4	Channel 6 Output
	X07	4	Channel 7 Output
	X08	4	Channel 8 Output

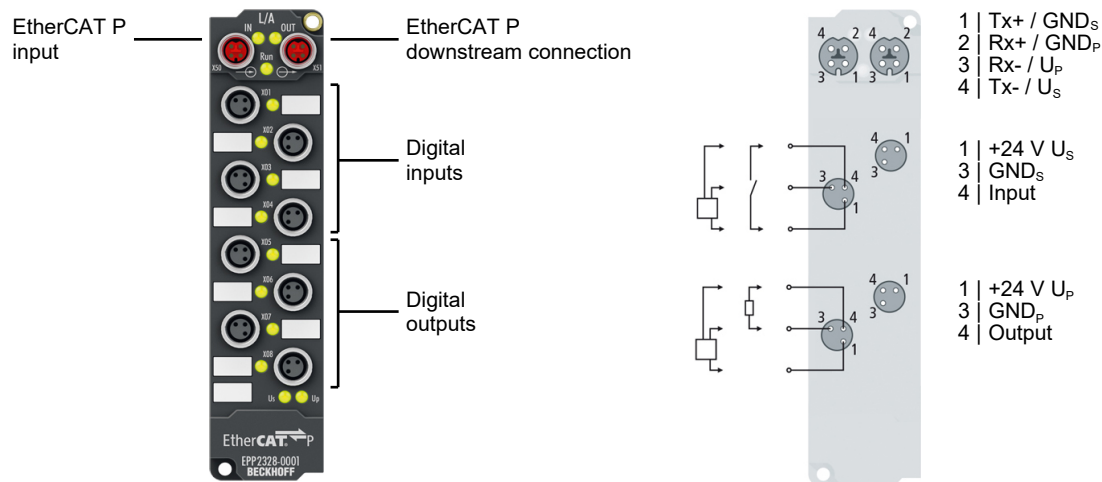
EPP2308-0002, EPP2318-0002

Process image in TwinCAT	Connector	Contact	Variable
└─ Box 1 (EPP2308-0002) └─ Channel 1 └─ Input └─ Channel 2 └─ Input └─ Channel 3 └─ Input └─ Channel 4 └─ Input └─ Channel 5 └─ Output └─ Channel 6 └─ Output └─ Channel 7 └─ Output └─ Channel 8 └─ Output └─ WcState └─ InfoData	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 Output
		4	Channel 5 Output
	X07 / X08	2	Channel 8 Output
		4	Channel 7 Output

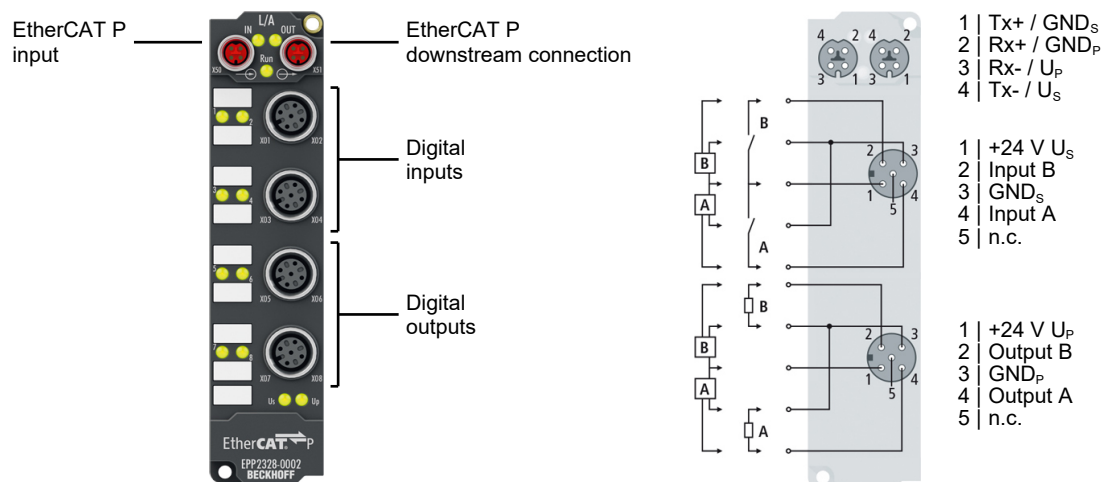
3.6 EPP2328-000x

3.6.1 Introduction

EPP2328-0001



EPP2328-0002



4 digital outputs and 4 digital inputs

The EPP2328 EtherCAT P Box modules combine four digital inputs and four digital outputs in one device.

The state of each signal is indicated by means of LEDs. The signals are optionally connected via M8 connectors (EPP2328-0001) or M12 connectors (EPP2328-0002). The outputs process load currents up to 0.5 A, are short-circuit proof and protected against polarity reversal.

Quick links

[Technical data](#) [► 37]

[Process image](#) [► 39]

[Digital inputs M8](#) [► 120]

[Digital inputs M12 \[► 121\]](#)

[Digital outputs M8 \[► 126\]](#)

[Digital outputs M12 \[► 127\]](#)

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, shielded

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 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	20 mA + Output currents of the digital outputs + Output currents of the auxiliary voltage outputs

Digital inputs	EPP2328-0001	EPP2328-0002
Number	4	
Connection	4 x M8 socket	2 x M12 socket
Cable length	max. 30 m	
Characteristics	Type 3 according to EN 61131-2, compatible with type 1	
Input filter	3.0 ms	3.0 ms
Signal voltage "0"	-3 ... +5 V _{DC}	
Signal voltage "1"	+11 ... +30 V _{DC}	
Input current	typically 6 mA at 24 V _{DC}	
Sensor power supply	24 V _{DC} from U_S max. 0.5 A in total, short-circuit proof	

Digital outputs	EPP2328-0001	EPP2328-0002
Number	4	
Connection	4 x M8 socket	2 x M12 socket
Cable length	max. 30 m	
Load type	ohmic, inductive, lamp load	
Nominal voltage	24 V _{DC} from U_P	
Output current	max. 2.0 A per channel max. 3.0 A in total	
Short circuit current	15 A typ.	
Switching times	T_{ON} : 200 µs typ., T_{OFF} : 200 µs typ.	
Auxiliary voltage	24 V _{DC} from U_P 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 [► 143]

*) 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 EPP2328-0001 / EPP2328-0002
- 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

EPP2328-0001

Process image in TwinCAT	Connector	Contact	Variable
└─ Box 1 (EPP2328-0001) └─ Channel 1 └─ Input └─ Channel 2 └─ Input └─ Channel 3 └─ Input └─ Channel 4 └─ Input └─ Channel 5 └─ Output └─ Channel 6 └─ Output └─ Channel 7 └─ Output └─ Channel 8 └─ Output └─ 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 Output
	X06	4	Channel 6 Output
	X07	4	Channel 7 Output
	X08	4	Channel 8 Output

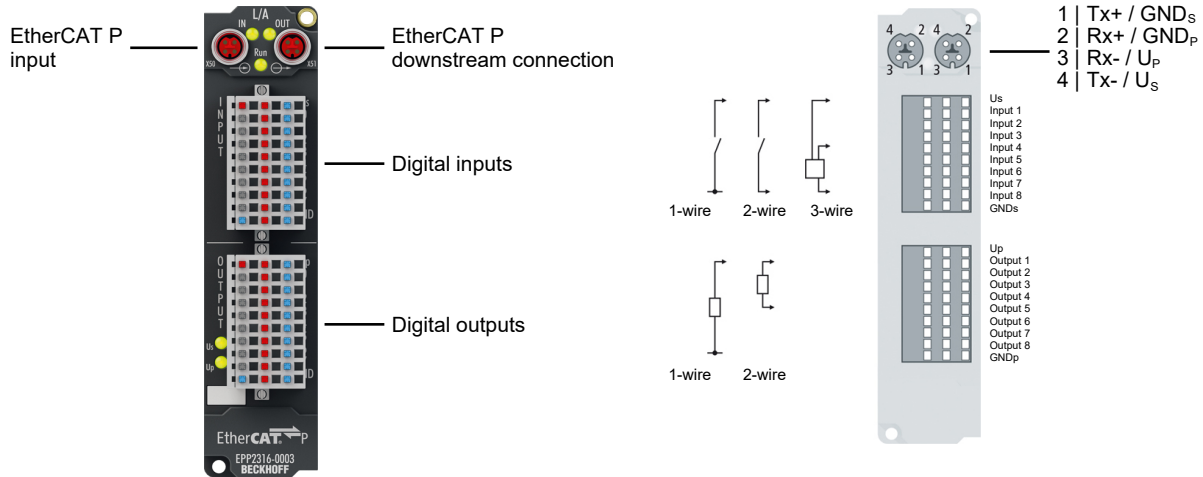
EPP2328-0002

Process image in TwinCAT	Connector	Contact	Variable
└─ Box 1 (EPP2328-0002) └─ Channel 1 └─ Input └─ Channel 2 └─ Input └─ Channel 3 └─ Input └─ Channel 4 └─ Input └─ Channel 5 └─ Output └─ Channel 6 └─ Output └─ Channel 7 └─ Output └─ Channel 8 └─ Output └─ WcState └─ InfoData	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 Output
		4	Channel 5 Output
	X07 / X08	2	Channel 8 Output
		4	Channel 7 Output

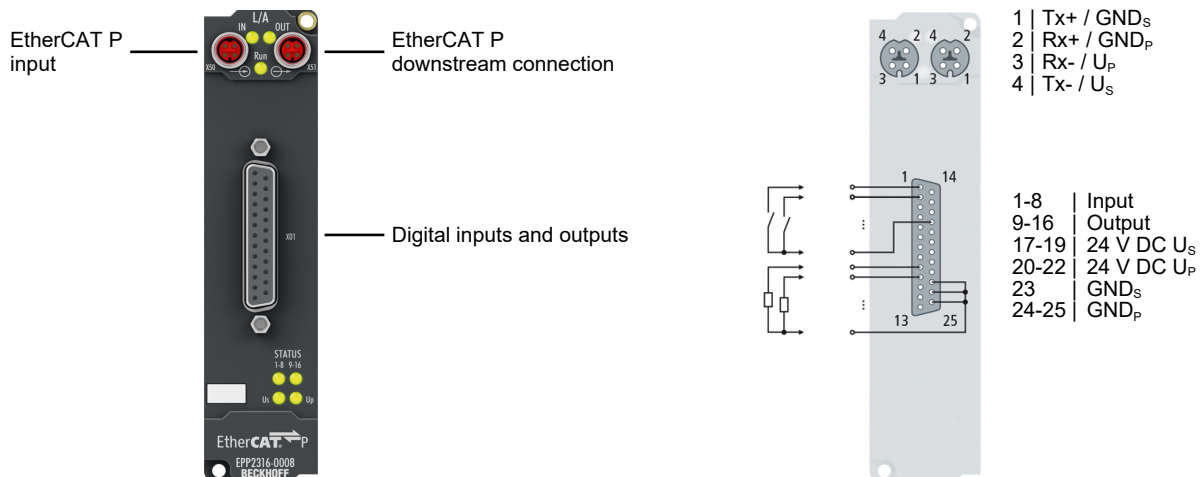
3.7 EPP2316-000x

3.7.1 Introduction

EPP2316-0003



EPP2316-0008



8 digital outputs and 8 digital inputs

The EPP2316 EtherCAT P Box combines eight digital inputs and eight digital outputs in one device. The inputs are available with a 10 µs filter constant.

The outputs process load currents up to 0.5 A, are short-circuit proof and protected against inverse polarity.

The signal is connected to the EPP2316-0008 via a 25-pin D-sub socket. The signal is connected to the EPP2316-0003 via two ZS2001 spring-loaded connectors, optionally available as single-pole or three-pole version. The module is delivered without connector.

The signal state and the status are displayed in groups by light emitting diodes.

Quick links

[Technical data \[► 42\]](#)

[Process image \[► 44\]](#)

[ZS2001 digital inputs \[► 122\]](#)

[Digital inputs D-sub 25 \[► 124\]](#)

[Digital outputs ZS2001 \(EPP2316-0003\) \[► 132\]](#)

[Digital outputs D-sub 25 \[► 130\]](#)

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, shielded

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
U_P nominal voltage	24 V _{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	20 mA + Output currents of the digital outputs + Output currents of the auxiliary voltage outputs

Digital inputs	EPP2316-0003	EPP2316-0008
Number	8	
Connection	ZS2001 (not included)	D-sub socket, 25-pin, thread UNC4-40 Pins 1 ... 8
Cable length	max. 30 m	
Characteristics	Type 3 according to EN 61131-2, compatible with type 1	
Input filter	10 µs	
Signal voltage "0"	-3 ... +5 V _{DC}	
Signal voltage "1"	+11 ... +30 V _{DC}	
Input current	6 mA at 24 V _{DC}	
Sensor power supply	24 V _{DC} from U_S max. 0.5 A in total, short-circuit proof	

Digital outputs	EPP2316-0003	EPP2316-0008
Number	8	
Connection	ZS2001 (not included)	D-sub socket, 25-pin, thread UNC4-40 Pins 9 ... 16
Cable length	max. 30 m	
Load type	ohmic, inductive, lamp load	
Nominal voltage	24 V _{DC} from U_P	
Output current	max. 0.5 A per channel max. 3.0 A in total	
Short circuit current	max. 1.5 A per channel	
Switching times	T_{ON} : 25 µs typ., T_{OFF} : 50 µs typ.	T_{ON} : 60 µs typ., T_{OFF} : 300 µs typ.
Diagnosis	yes	
Auxiliary voltage	24 V _{DC} from U_P 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)

Technical data	EPP2316-0003	EPP2316-0008
Ambient temperature during operation	-25 ... +60 °C	-25 ... +60 °C -25 ... +55 °C according to cULus
Ambient temperature during storage	-40 ... +85 °C	
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27; see also Additional checks [► 43]	
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4	
Protection rating	IP20	IP65, IP66, IP67 conforms to EN 60529

Approvals / markings	
Approvals / markings *)	CE, cULus [► 143]

*) 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 EPP2316 EtherCAT P Box
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

i EPP2316-0003: required accessories

The ZS2001 connectors are not included in the scope of delivery. See Chapter [Accessories](#) [► 153].

i 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

EPP2316-0003

Process image in TwinCAT	Connector	Contact ¹⁾	Variable	Diagnostic bit
▲ Box 1 (EPP2316-0003) ▲ DIG Inputs - Input 1 - Input 2 - Input 3 - Input 4 - Input 5 - Input 6 - Input 7 - Input 8 - Sync error ▲ DIG Diag Inputs - Diag Input 1 - Diag Input 2 - Diag Input 3 - Diag Input 4 - Diag Input 5 - Diag Input 6 - Diag Input 7 - Diag Input 8 ▲ DIG Inputs Device - Safe state active - Error channel 1 - Error channel 2 - Sync error - TxPDO Toggle ▲ DIG Outputs - Output 1 - Output 2 - Output 3 - Output 4 - Output 5 - Output 6 - Output 7 - Output 8 ▲ DIG Outputs Device - Set safe state - Reset outputs ▶ WcState ▶ InfoData	I N P U T	0	DIG Inputs Input 1	-
		1	DIG Inputs Input 2	-
		2	DIG Inputs Input 3	-
		3	DIG Inputs Input 4	-
		4	DIG Inputs Input 5	-
		5	DIG Inputs Input 6	-
		6	DIG Inputs Input 7	-
		7	DIG Inputs Input 8	-
	O U T P U T	0	DIG Outputs Output 1	DIG Diag Inputs Diag Input 1
		1	DIG Outputs Output 2	DIG Diag Inputs Diag Input 2
		2	DIG Outputs Output 3	DIG Diag Inputs Diag Input 3
		3	DIG Outputs Output 4	DIG Diag Inputs Diag Input 4
		4	DIG Outputs Output 5	DIG Diag Inputs Diag Input 5
		5	DIG Outputs Output 6	DIG Diag Inputs Diag Input 6
		6	DIG Outputs Output 7	DIG Diag Inputs Diag Input 7
		7	DIG Outputs Output 8	DIG Diag Inputs Diag Input 8

¹⁾ Contact numbers on ZS2001 connectors.

EPP2316-0008

Process image in TwinCAT	Connector	Contact	Variable	Diagnostic bit
- Box 1 (EPP2316-0008) - DIG Inputs - Input 1 - Input 2 - Input 3 - Input 4 - Input 5 - Input 6 - Input 7 - Input 8 - Sync error - DIG Diag Inputs - Diag Input 1 - Diag Input 2 - Diag Input 3 - Diag Input 4 - Diag Input 5 - Diag Input 6 - Diag Input 7 - Diag Input 8 - DIG Inputs Device - Safe state active - Error channel 1 - Error channel 2 - Sync error - TxPDO Toggle - DIG Outputs - Output 1 - Output 2 - Output 3 - Output 4 - Output 5 - Output 6 - Output 7 - Output 8 - DIG Outputs Device - Set safe state - Reset outputs - WcState - InfoData	X01	1	- DIG Inputs - Input 1	-
		2	- DIG Inputs - Input 2	-
		3	- DIG Inputs - Input 3	-
		4	- DIG Inputs - Input 4	-
		5	- DIG Inputs - Input 5	-
		6	- DIG Inputs - Input 6	-
		7	- DIG Inputs - Input 7	-
		8	- DIG Inputs - Input 8	-
		9	- DIG Outputs - Output 1	- DIG Diag Inputs - Diag Input 1
		10	- DIG Outputs - Output 2	- DIG Diag Inputs - Diag Input 2
		11	- DIG Outputs - Output 3	- DIG Diag Inputs - Diag Input 3
		12	- DIG Outputs - Output 4	- DIG Diag Inputs - Diag Input 4
		13	- DIG Outputs - Output 5	- DIG Diag Inputs - Diag Input 5
		14	- DIG Outputs - Output 6	- DIG Diag Inputs - Diag Input 6
		15	- DIG Outputs - Output 7	- DIG Diag Inputs - Diag Input 7
		16	- DIG Outputs - Output 8	- DIG Diag Inputs - Diag Input 8

3.7.4.1 Status bits

DIG Inputs Device

You will find the module's status inputs under **DIG Inputs Device**.

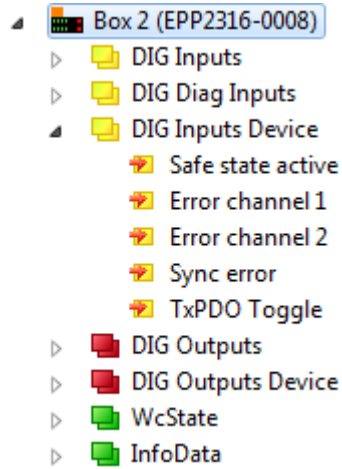


Fig. 1: EPP2316-0008, DIG Inputs Device

Safe state active

Indicates whether the safe state has been assumed. The display only works if the network transmits process input data, i.e. in the network states Pre-Operational (PRE-OP) and Operational (OP), but not in the network state INIT.

Error channel X

Indicates an error on channel X.

Sync Error

See EtherCAT system documentation. The EtherCAT system documentation is available on the Beckhoff homepage under Downloads.

TxPDO Toggle

See EtherCAT system documentation.

DIG Outputs Device

You will find the module's control outputs under **DIG Outputs Device**.

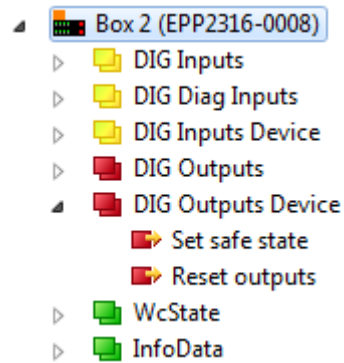


Fig. 2: EPP2316-0008, DIG Outputs Device

Set safe state

Sets the module to the safe state.

Reset outputs

Resets the error bits "Error channel X" of the module. The outputs are reactivated.

3.7.5 Status LEDs

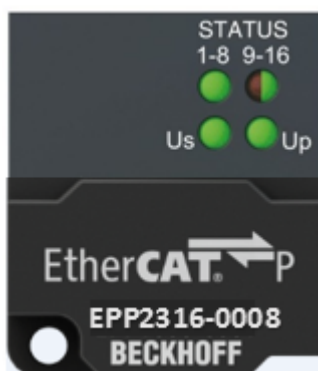


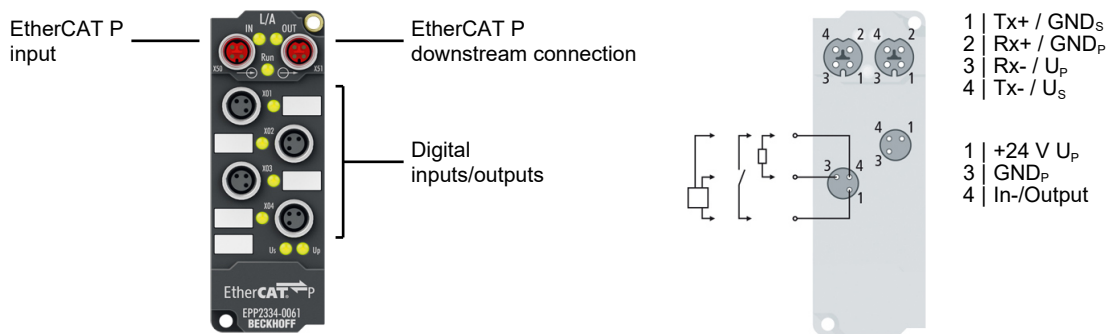
Fig. 3: EPP2316-0008 - Status LEDs

LED Displays

LED	Display	Meaning
STATUS 1-8	green illuminated	a signal (24 V) is present at a least one input of channels 1-8
STATUS 9-16	green illuminated	at least one of the outputs for channel 9-16 is set
	red illuminated	at least one output of channels 9-16 has an error
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 EPP2334-0061

3.8.1 Introduction



Combined digital inputs and outputs

The EPP2334-0061 EtherCAT P Box has four digital channels, which can each be operated as an input or output. It is not necessary to configure whether a channel (pin 4 of the M8 socket) is to be used as input or output. The input circuit is permanently connected to the output driver internally so that a set output is also automatically displayed in the input process image.

The inputs have a 10 µs filter. The outputs process load currents 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 connected sensors are supplied via an internal, short-circuit proof driver block with a total of 0.5 A for all sensors. The inputs and outputs are supplied from U_P. The signal state is displayed by LEDs; the signal connection is established via screw-type M8 connectors.

Thanks to its compact design and the number of signals, the EPP2334-0061 is particularly suitable for connecting distributed, decentralized sensors and actuators to EtherCAT P.

i Supply of the connected sensors from U_P, not from U_S

In contrast to many other modules, the EPP2334-0061 EtherCAT P Box modules supply digital sensors from the peripheral voltage U_P, rather than from the control voltage U_S. This is because the connections can be used either as input or output. Nevertheless, an overload of the sensor supply (current > 0.5 A) is also indicated here by red lighting of the LED U_S.

Quick links

[Technical data \[► 49\]](#)

[Process image \[► 51\]](#)

[Signal connection \[► 136\]](#)

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, shielded

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
U_P nominal voltage	24 V _{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	20 mA + Output currents of the digital outputs + Sensor power supply

Digital inputs	
Number	max. 4 Each digital input can alternatively be used as a digital output.
Connection	4 x M8 socket
Cable length	max. 30 m
Characteristics	Type 3 according to EN 61131-2, compatible with type 1
Input filter	10 µs
Signal voltage "0"	-3 ... +5 V _{DC}
Signal voltage "1"	+11 ... +30 V _{DC}
Input current	6 mA at 24 V _{DC}
Sensor power supply	24 V _{DC} from U_P max. 0.5 A in total, short-circuit proof

Digital outputs	
Number	max. 4 Each digital output can alternatively be used as a digital input.
Connection	4 x M8 socket
Cable length	max. 30 m
Load type	ohmic, inductive, lamp load
Nominal voltage	24 V _{DC} from U_P
Output current	max. 0.5 A per channel, short-circuit proof max. 3.0 A in total
Short circuit current	max. 1.5 A per channel
Switching times	T_{ON} : 50 µs typ., T_{OFF} : 100 µs typ.

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 [► 50]
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 [► 143]

*) 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 Scope of supply

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

- 1x EPP2334-0061 EtherCAT P Box
- 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.

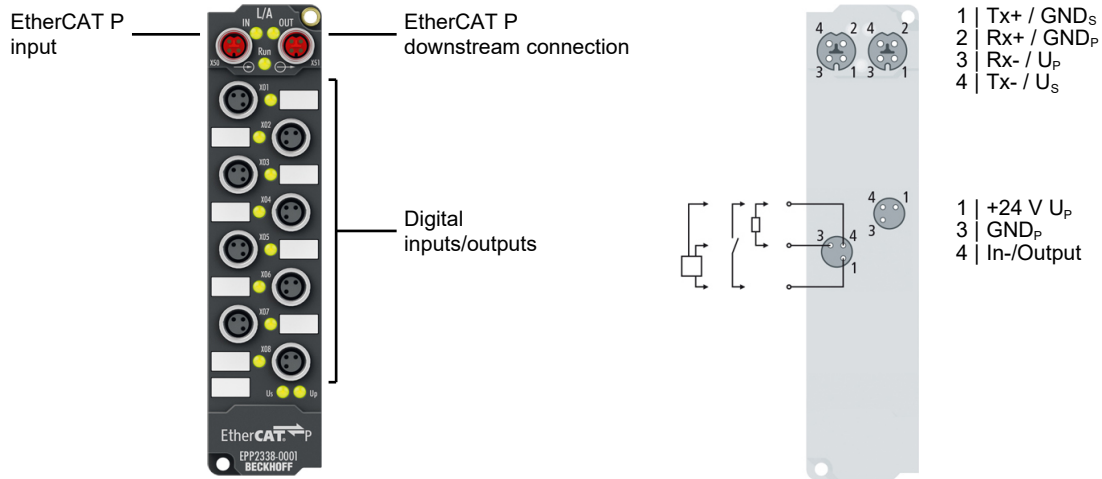
3.8.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable	Output variable
▲  Box 1 (EPP2334-0061) ▲  Channel 1  Input ▶  Channel 2 ▶  Channel 3 ▶  Channel 4 ▲  Channel 5  Output ▶  Channel 6 ▶  Channel 7 ▶  Channel 8 ▶  WcState ▶  InfoData	X01	4	 Channel 1  Input	 Channel 5  Output
	X02	4	 Channel 2  Input	 Channel 6  Output
	X03	4	 Channel 3  Input	 Channel 7  Output
	X04	4	 Channel 4  Input	 Channel 8  Output

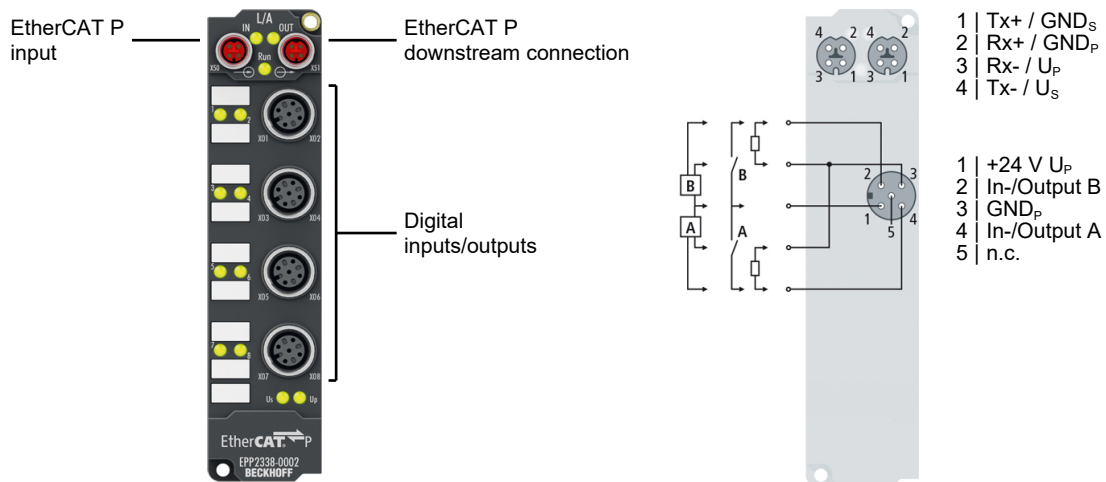
3.9 EPP2338-000x

3.9.1 Introduction

EPP2338-0001



EPP2338-0002



Combined digital inputs and outputs

The EPP2338-000x EtherCAT P Box has eight digital channels, which can each be operated as an input or output. It is not necessary to configure whether a channel is to be used as input or output. The input circuit is permanently connected to the output driver internally so that a set output is also automatically displayed in the input process image.

The outputs process load currents up to 0.5 A, are short-circuit proof and protected against polarity reversal.

The filter constant of the inputs is 10 µs.

The signal state is indicated by means of LEDs. The signals are optionally connected via M8 connectors (EPP2338-0001) or M12 connectors (EPP2338-0002).

**Supply of the connected sensors from U_p , not from U_s**

In contrast to many other modules, the EPP2338-000x EtherCAT P Box modules supply digital sensors from the peripheral voltage U_p , rather than from the control voltage U_s . This is because the connections can be used either as input or output. Nevertheless, an overload of the sensor supply (current > 0.5 A) is also indicated here by red lighting of the LED U_s .

Quick links

[Technical data \[► 54\]](#)

[Process image \[► 56\]](#)

[Signal connection M8 \[► 136\]](#)

[Signal connection M12 \[► 137\]](#)

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, shielded

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
U_P nominal voltage	24 V _{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	20 mA + Output currents of the digital outputs + Sensor power supply

Digital inputs	EPP2338-0001	EPP2338-0002
Number	max. 8 Each digital input can alternatively be used as a digital output.	
Connection	8 x M8 socket	4 x M12 socket
Cable length	max. 30 m	
Characteristics	Type 3 according to EN 61131-2, compatible with type 1	
Input filter	10 µs	
Signal voltage "0"	-3 ... +5 V _{DC}	
Signal voltage "1"	+11 ... +30 V _{DC}	
Input current	6 mA at 24 V _{DC}	
Sensor power supply	24 V _{DC} from U_P max. 0.5 A in total, short-circuit proof	

Digital outputs	EPP2338-0001	EPP2338-0002
Number	max. 8 Each digital output can alternatively be used as a digital input.	
Connection	8 x M8 socket	4 x M12 socket
Cable length	max. 30 m	
Load type	ohmic, inductive, lamp load	
Nominal voltage	24 V _{DC} from U_P	
Output current	max. 0.5 A per channel, short-circuit proof max. 3.0 A in total	
Short circuit current	max. 1.5 A per channel	
Switching times	T_{ON} : 50 µs typ., T_{OFF} : 100 µs typ.	

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 [► 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 [► 143]

*) 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

3.9.3 Scope of supply

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

- 1x EPP2338-000x
- 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.

3.9.4 Process image

EPP2338-0001

Process image in TwinCAT	Connector	Contact	Input variable	Output variable
▲ Box 1 (EPP2338-0001) ▲ Channel 1 - Input ▶ Channel 2 ▶ Channel 3 ▶ Channel 4 ▶ Channel 5 ▶ Channel 6 ▶ Channel 7 ▶ Channel 8 ▲ Channel 9 - Output ▶ Channel 10 ▶ Channel 11 ▶ Channel 12 ▶ Channel 13 ▶ Channel 14 ▶ Channel 15 ▶ Channel 16 ▶ WcState ▶ InfoData	X01	4	Channel 1 Input	Channel 9 Output
	X02	4	Channel 2 Input	Channel 10 Output
	X03	4	Channel 3 Input	Channel 11 Output
	X04	4	Channel 4 Input	Channel 12 Output
	X05	4	Channel 5 Input	Channel 13 Output
	X06	4	Channel 6 Input	Channel 14 Output
	X07	4	Channel 7 Input	Channel 15 Output
	X08	4	Channel 8 Input	Channel 16 Output

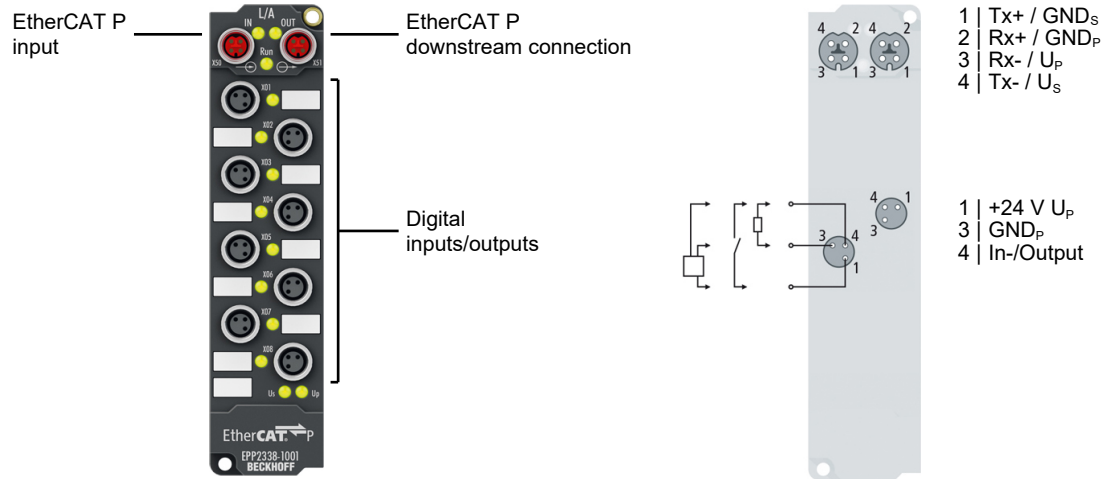
EPP2338-0002

Process image in TwinCAT	Connector	Contact	Input variable	Output variable
▲ Box 1 (EPP2338-0002) ▲ Channel 1 - Input ▶ Channel 2 ▶ Channel 3 ▶ Channel 4 ▶ Channel 5 ▶ Channel 6 ▶ Channel 7 ▶ Channel 8 ▲ Channel 9 - Output ▶ Channel 10 ▶ Channel 11 ▶ Channel 12 ▶ Channel 13 ▶ Channel 14 ▶ Channel 15 ▶ Channel 16 ▶ WcState ▶ InfoData	X01 / X02	2	Channel 2 Input	Channel 10 Output
		4	Channel 1 Input	Channel 9 Output
	X03 / X04	2	Channel 4 Input	Channel 12 Output
		4	Channel 3 Input	Channel 11 Output
	X05 / X06	2	Channel 6 Input	Channel 14 Output
		4	Channel 5 Input	Channel 13 Output
	X07 / X08	2	Channel 8 Input	Channel 16 Output
		4	Channel 7 Input	Channel 15 Output

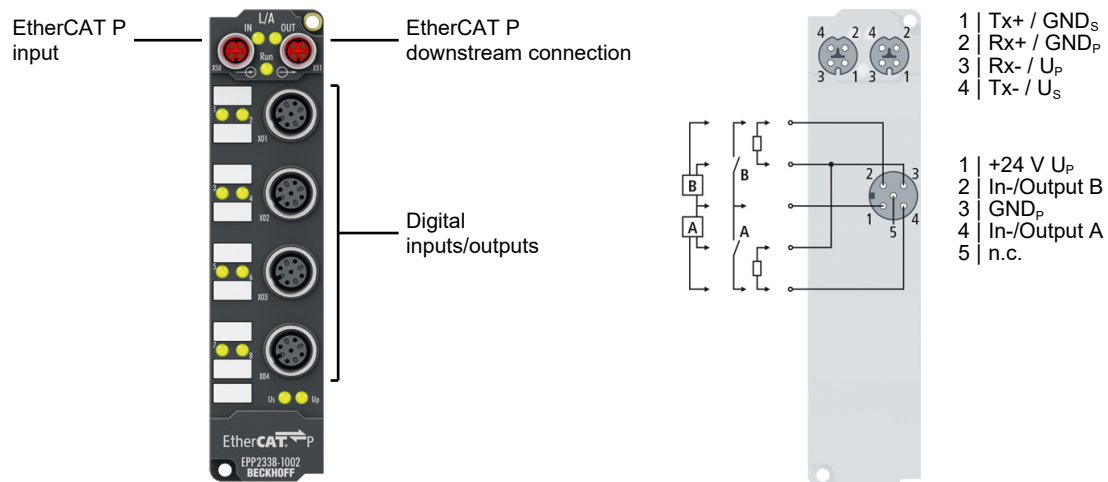
3.10 EPP2338-x100

3.10.1 Introduction

EPP2338-1001



EPP2338-1002



Combined digital inputs and outputs

The EPP2338-100x EtherCAT P Box has eight digital channels, which can each be operated as an input or output. It is not necessary to configure whether a channel is to be used as input or output. The input circuit is permanently connected to the output driver internally so that a set output is also automatically displayed in the input process image.

The outputs process load currents up to 0.5 A, are short-circuit proof and protected against polarity reversal.

The filter constant of the inputs is 3 ms.

The signal state is indicated by means of LEDs. The signals are optionally connected via M8 connectors (EPP2338-1001) or M12 connectors (EPP2338-1002).

**Supply of the connected sensors from U_p , not from U_s**

In contrast to many other modules, the EPP2338-100x EtherCAT P Box modules supply digital sensors from the peripheral voltage U_p , rather than from the control voltage U_s . This is because the connections can be used either as input or output. Nevertheless, an overload of the sensor supply (current > 0.5 A) is also indicated here by red lighting of the LED U_s .

Quick links

[Technical data \[► 59\]](#)

[Process image \[► 61\]](#)

[Signal connection M8 \[► 136\]](#)

[Signal connection M12 \[► 137\]](#)

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, shielded

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
U_P nominal voltage	24 V _{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	20 mA + Output currents of the digital outputs + Sensor power supply

Digital inputs	EPP2338-1001	EPP2338-1002
Number	max. 8 Each digital input can alternatively be used as a digital output.	
Connection	8 x M8 socket	4 x M12 socket
Cable length	max. 30 m	
Characteristics	Type 3 according to EN 61131-2, compatible with type 1	
Input filter	3.0 ms	
Signal voltage "0"	-3 ... +5 V _{DC}	
Signal voltage "1"	+11 ... +30 V _{DC}	
Input current	6 mA at 24 V _{DC}	
Sensor power supply	24 V _{DC} from U_P max. 0.5 A in total, short-circuit proof	

Digital outputs	EPP2338-1001	EPP2338-1002
Number	max. 8 Each digital output can alternatively be used as a digital input.	
Connection	8 x M8 socket	4 x M12 socket
Cable length	max. 30 m	
Load type	ohmic, inductive, lamp load	
Nominal voltage	24 V _{DC} from U_P	
Output current	max. 0.5 A per channel, short-circuit proof max. 3.0 A in total	
Short circuit current	max. 1.5 A per channel	
Switching times	T_{ON} : 50 µs typ., T_{OFF} : 100 µs typ.	

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 [► 60]
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 [► 143]

*) 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 EPP2338-100x
- 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

EPP2338-1001

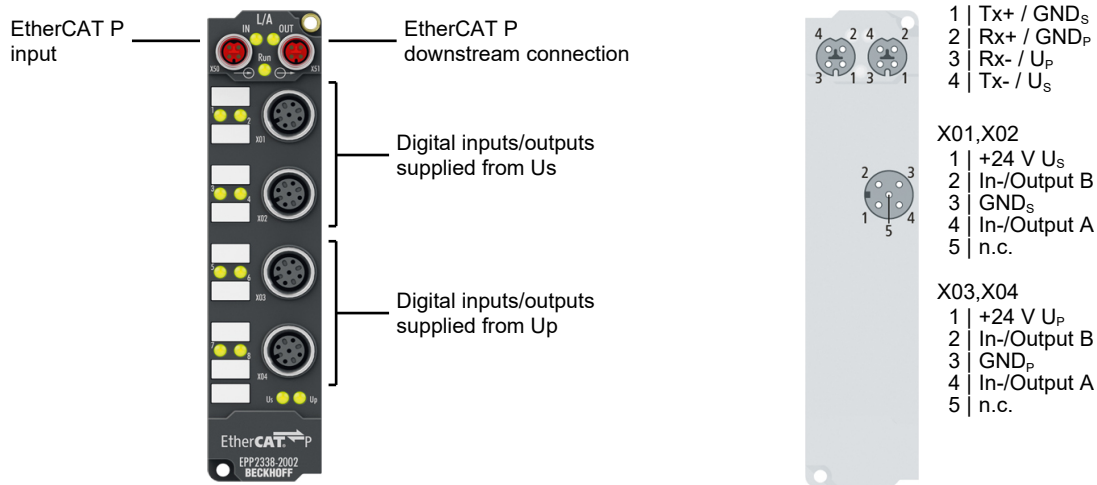
Process image in TwinCAT	Connector	Contact	Input variable	Output variable
▲ Box 1 (EPP2338-1001) ▲ Channel 1 - Input ▶ Channel 2 ▶ Channel 3 ▶ Channel 4 ▶ Channel 5 ▶ Channel 6 ▶ Channel 7 ▶ Channel 8 ▲ Channel 9 - Output ▶ Channel 10 ▶ Channel 11 ▶ Channel 12 ▶ Channel 13 ▶ Channel 14 ▶ Channel 15 ▶ Channel 16 ▶ WcState ▶ InfoData	X01	4	Channel 1 Input	Channel 9 Output
	X02	4	Channel 2 Input	Channel 10 Output
	X03	4	Channel 3 Input	Channel 11 Output
	X04	4	Channel 4 Input	Channel 12 Output
	X05	4	Channel 5 Input	Channel 13 Output
	X06	4	Channel 6 Input	Channel 14 Output
	X07	4	Channel 7 Input	Channel 15 Output
	X08	4	Channel 8 Input	Channel 16 Output

EPP2338-1002

Process image in TwinCAT	Connector	Contact	Input variable	Output variable
▲ Box 1 (EPP2338-1002) ▲ Channel 1 - Input ▶ Channel 2 ▶ Channel 3 ▶ Channel 4 ▶ Channel 5 ▶ Channel 6 ▶ Channel 7 ▶ Channel 8 ▲ Channel 9 - Output ▶ Channel 10 ▶ Channel 11 ▶ Channel 12 ▶ Channel 13 ▶ Channel 14 ▶ Channel 15 ▶ Channel 16 ▶ WcState ▶ InfoData	X01 / X02	2	Channel 2 Input	Channel 10 Output
		4	Channel 1 Input	Channel 9 Output
	X03 / X04	2	Channel 4 Input	Channel 12 Output
		4	Channel 3 Input	Channel 11 Output
	X05 / X06	2	Channel 6 Input	Channel 14 Output
		4	Channel 5 Input	Channel 13 Output
	X07 / X08	2	Channel 8 Input	Channel 16 Output
		4	Channel 7 Input	Channel 15 Output

3.11 EPP2338-2002

3.11.1 Introduction



Combined digital inputs and outputs

The EP2338-2002 EtherCAT Box has eight digital channels, which can each be operated as an input or output. It is not necessary to configure whether a channel (pin 2 and pin 4 of the M12 sockets) is to be used as input or output. The input circuit is permanently connected to the output driver internally so that a set output is also automatically displayed in the input process image.

The inputs have a 10 µs filter. The outputs process load currents up to 0.5 A, are short-circuit proof and protected against polarity reversal. The sum current of all outputs is limited to 4 A.

The connected sensors and actuators (pin 1 of the M12 connector) as well as the input and output circuits are supplied via U_S for connections X01 and X02, while connections X03 and X04 are supplied via U_P. The signal status is indicated by LEDs; the signal interface is via screwable M12 connectors.

Quick links

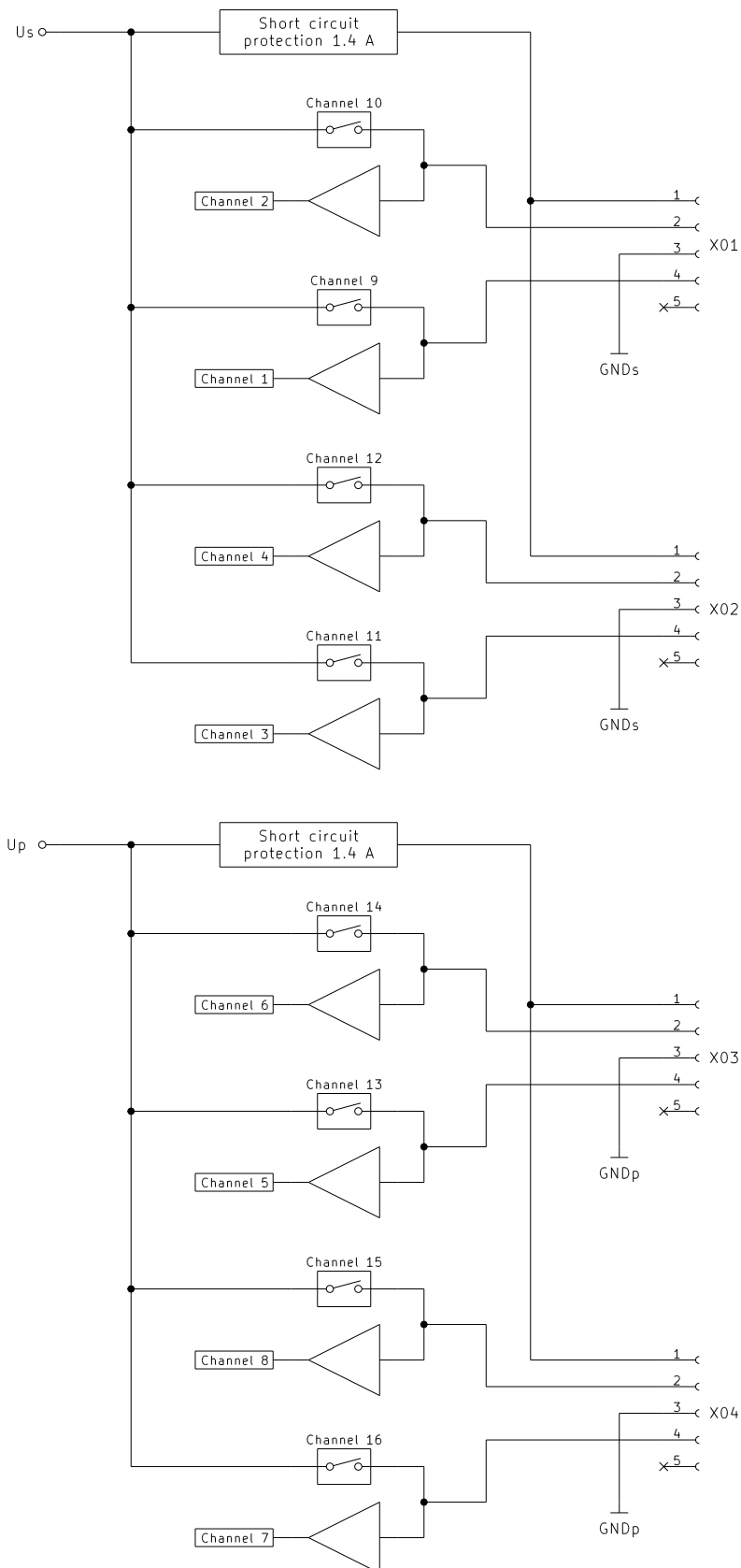
[Technical data \[► 64\]](#)

[Process image \[► 66\]](#)

[Signal connection \[► 138\]](#)

3.11.2 Block diagram

This block diagram shows the distribution of the supply voltages U_S and U_P within the box.



3.11.3 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, shielded

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 + load
U_P nominal voltage	24 V _{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	20 mA + load

Digital inputs	
Number	max. 8 Each digital input can alternatively be used as a digital output.
Connection	4 x M12 socket
Cable length	max. 30 m
Input filter	10 µs
Characteristics	Type 3 according to EN61131-2, compatible with type 1
Signal voltage "0"	-3...+5 V
Signal voltage "1"	+11...+30 V
Input current	6 mA
Sensor power supply	- Connections X01 and X02: 24 V_{DC} from U_S. max. 1.4 A in total, short-circuit proof. - Connections X03 and X04: 24 V_{DC} from U_P. max. 1.4 A in total, short-circuit proof.

Digital outputs	
Number	max. 8 Each digital output can alternatively be used as a digital input.
Connection	4 x M12 socket
Cable length	max. 30 m
Load type	Ohmic, inductive, lamp load
Nominal output voltage	- Connections X01 and X02: 24 V_{DC} from U_S - Connections X03 and X04: 24 V_{DC} from U_P
Output current	max. 0.5 A per output, short-circuit proof. max. 3 A in total.
Short-circuit current	max. 1.5 A
Switching times	T_{ON} : 50 µs typ., T_{OFF} : 100 µs typ.

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 [► 65]
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 [► 143]

*) 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

3.11.4 Scope of supply

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

- 1x EPP2338-2002 EtherCAT P Box
- 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.

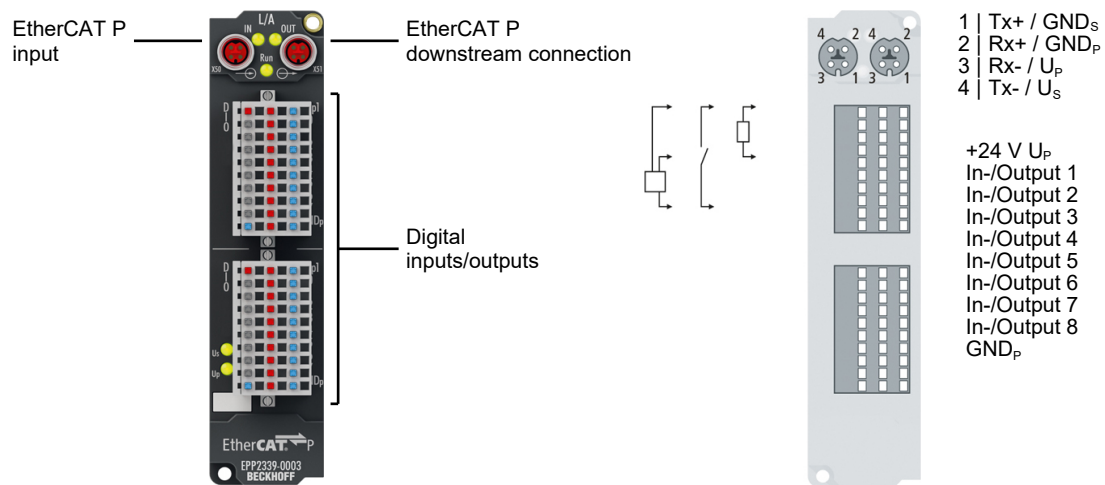
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.11.5 Process image

Process image in TwinCAT	Connector	Contact	Input variable	Output variable
▲ Box 1 (EPP2338-2002) ▲ Channel 1 - Input ▷ Channel 2 ▷ Channel 3 ▷ Channel 4 ▷ Channel 5 ▷ Channel 6 ▷ Channel 7 ▷ Channel 8 ▲ Channel 9 - Output ▷ Channel 10 ▷ Channel 11 ▷ Channel 12 ▷ Channel 13 ▷ Channel 14 ▷ Channel 15 ▷ Channel 16 ▷ WcState ▷ InfoData	X01	2	Channel 2 Input	Channel 10 Output
		4	Channel 1 Input	Channel 9 Output
	X02	2	Channel 4 Input	Channel 12 Output
		4	Channel 3 Input	Channel 11 Output
	X03	2	Channel 6 Input	Channel 14 Output
		4	Channel 5 Input	Channel 13 Output
	X04	2	Channel 8 Input	Channel 16 Output
		4	Channel 7 Input	Channel 15 Output

3.12 EPP2339-0003

3.12.1 Introduction



16-channel digital input or output 24 V_{DC}

The EPP2339-0003 EtherCAT P Box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image.

The outputs are short-circuit proof and protected against inverse polarity. They handle load currents of up to 0.5 A each, although the total current is limited to 3 A. The signals are connected via connectors with a spring-loaded system. The connectors with a spring-loaded system are available with 1 or 3 pins. The EPP2339-0003 is supplied without connectors.

The sensors are powered by the peripheral voltage U_P.

Quick links

[Technical data \[► 68\]](#)

[Process image \[► 70\]](#)

[Signal connection \[► 140\]](#)

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, shielded

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
Rated voltage U_P	24 V _{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	20 mA + Output currents of the digital outputs + sensor supply

Digital inputs	
Number	max. 16 Each digital input can alternatively be used as a digital output.
Connection	2 x ZS2001
Cable length	max. 30 m
Characteristics	Type 3 according to EN 61131-2, compatible with type 1
Input filter	3 ms
Signal voltage "0"	-3 ... +5 V _{DC}
Signal voltage "1"	+11 ... +30 V _{DC}
Input current	6 mA at 24 V _{DC}
Sensor power supply	24 V _{DC} from U_P max. 0.5 A in total, short-circuit proof

Digital outputs	
Number	max. 16 Each digital output can alternatively be used as a digital input.
Connection	2x ZS2001
Cable length	max. 30 m
Sensor power supply	24 V _{DC} from U_P , max. 0.5 A in total, short-circuit proof
Nominal voltage	24 V _{DC} from U_P
Load type	ohmic, inductive, lamp load
Output current	max. 0.5 A per channel max. 3.0 A in total
Short circuit current	max. 1.5 A per channel
Switching times	typ. T_{ON} : 25 µs, typ. T_{OFF} : 75 µs

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 rating	IP20

Approvals/markings	
Approvals/markings *)	CE

*) 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 EPP2339-0003 EtherCAT P Box
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)



Required accessories

The ZS2001 connectors are not included in the scope of delivery. See Chapter [Accessories](#) [► 153].



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.

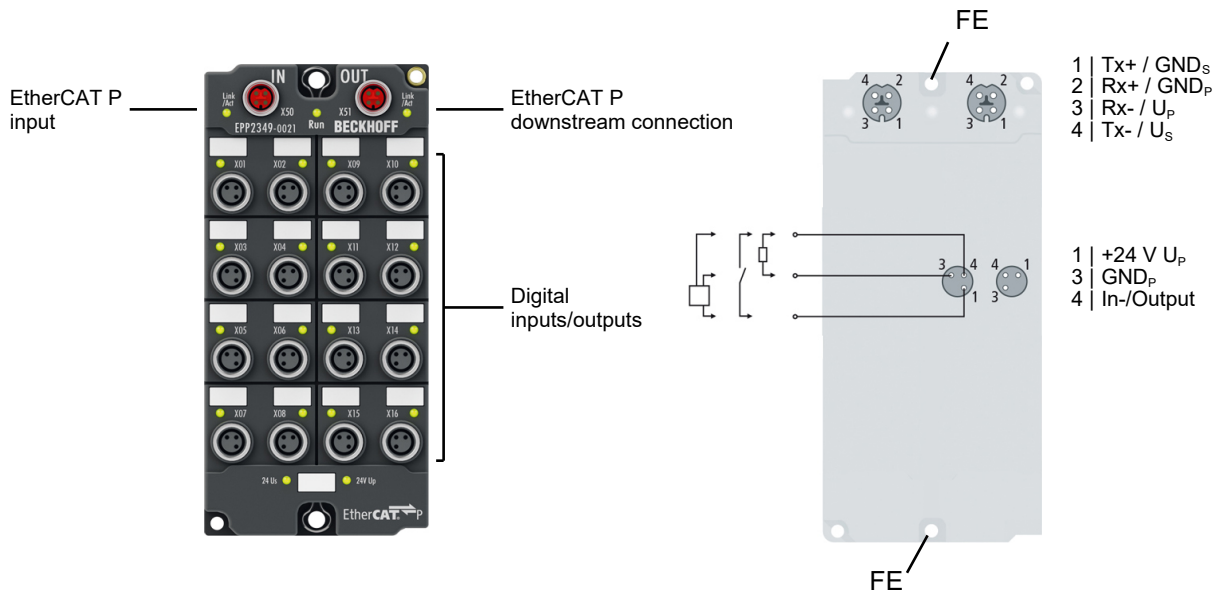
3.12.4 Process image

Process image in TwinCAT	Connector	Contact	Input variable	Output variable
▲ Box 1 (EPP2339-0003) ▲ DI Inputs Channel 1 - Input 1 - Input 2 - Input 3 - Input 4 - Input 5 - Input 6 - Input 7 - Input 8 - Sync error - TxPDO State - TxPDO Toggle ▶ DI Inputs Channel 2 ▲ DO Outputs Channel 1 - Output 1 - Output 2 - Output 3 - Output 4 - Output 5 - Output 6 - Output 7 - Output 8 ▶ DO Outputs Channel 2 ▶ WcState ▶ InfoData	X01	0	DI Inputs Channel 1 Input 1	DO Outputs Channel 1 Output 1
		1	DI Inputs Channel 1 Input 2	DO Outputs Channel 1 Output 2
		2	DI Inputs Channel 1 Input 3	DO Outputs Channel 1 Output 3
		3	DI Inputs Channel 1 Input 4	DO Outputs Channel 1 Output 4
		4	DI Inputs Channel 1 Input 5	DO Outputs Channel 1 Output 5
		5	DI Inputs Channel 1 Input 6	DO Outputs Channel 1 Output 6
		6	DI Inputs Channel 1 Input 7	DO Outputs Channel 1 Output 7
		7	DI Inputs Channel 1 Input 8	DO Outputs Channel 1 Output 8
	X02	0	DI Inputs Channel 2 Input 1	DO Outputs Channel 2 Output 1
		1	DI Inputs Channel 2 Input 2	DO Outputs Channel 2 Output 2
		2	DI Inputs Channel 2 Input 3	DO Outputs Channel 2 Output 3
		3	DI Inputs Channel 2 Input 4	DO Outputs Channel 2 Output 4
		4	DI Inputs Channel 2 Input 5	DO Outputs Channel 2 Output 5
		5	DI Inputs Channel 2 Input 6	DO Outputs Channel 2 Output 6
		6	DI Inputs Channel 2 Input 7	DO Outputs Channel 2 Output 7
		7	DI Inputs Channel 2 Input 8	DO Outputs Channel 2 Output 8

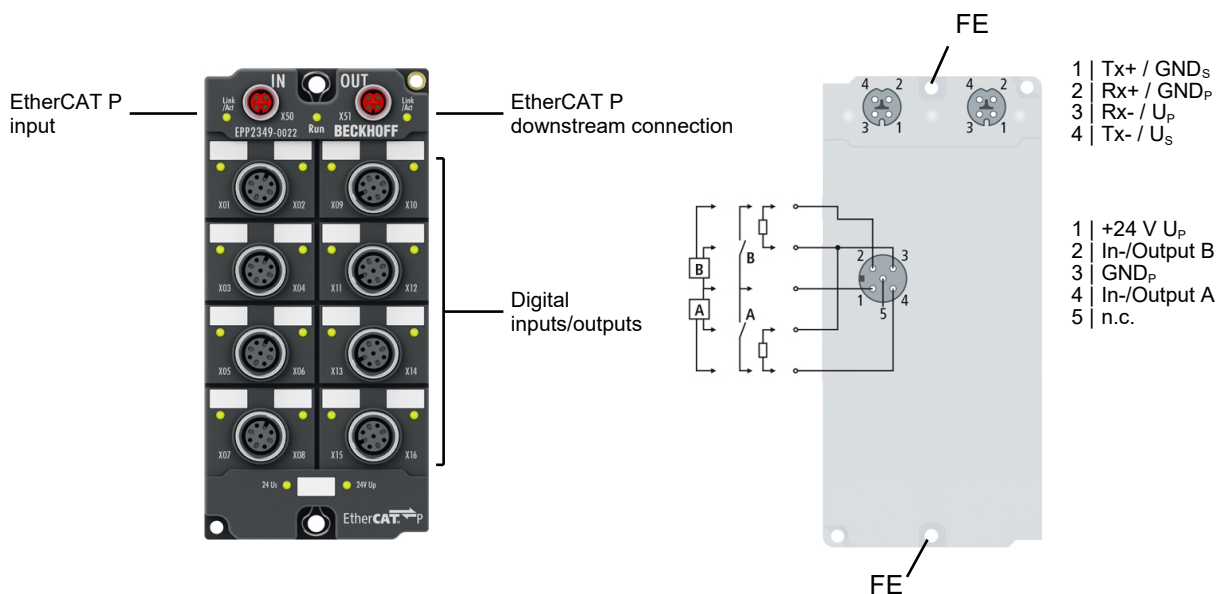
3.13 EPP2339-002x, EPP2349-002x

3.13.1 Introduction

EPP2339-0021, EPP2349-0021



EPP2339-0022, EPP2349-0022



16-channel digital input or output, 24 V_{DC}

The EPP23x9 EtherCAT P Box has 16 digital channels, each of which can be operated as input or output. A configuration whether a channel is to be used as input or output is not required; the input circuit is internally connected to the output driver so that a set output is automatically displayed in the input process image.

The outputs are short-circuit proof and protected against polarity reversal and process load currents up to 0.5 A, whereby the overall current is limited to 3 A. The signals are optionally connected via M8 connectors (EPP23x9-0021) or M12 connectors (EPP23x9-0022). The connectors with spring-loaded technology are available in 1 and 3-pin versions.

The signal state is indicated by means of LEDs.

Sensors are supplied from the peripheral voltage U_P .

Quick links

[Technical data \[► 73\]](#)

[Process image \[► 75\]](#)

[Signal connection M8 \[► 136\]](#)

[Signal connection M12 \[► 137\]](#)

3.13.2 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, shielded

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
Rated voltage U_P	24 V _{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	20 mA + Output currents of the digital outputs + sensor supply

Digital inputs	EPP2339 -0021	EPP2339 -0022	EPP2349 -0021	EPP2349 -0022
Number	max. 16 Each digital input can alternatively be used as a digital output.			
Connection	16 x M8 socket	8x M12 socket	16 x M8 socket	8x M12 socket
Cable length	max. 30 m			
Characteristics	Type 3 according to EN 61131-2, compatible with type 1			
Input filter	3 ms	3 ms	10 µs	10 µs
Signal voltage "0"	-3 ... +5 V _{DC}			
Signal voltage "1"	+11 ... +30 V _{DC}			
Input current	6 mA at 24 V _{DC}			
Sensor power supply	24 V _{DC} from U_P , max. 0.5 A in total, short-circuit proof			

Digital outputs	EPP2339 -0021	EPP2339 -0022	EPP2349 -0021	EPP2349 -0022
Number	max. 16 Each digital output can alternatively be used as a digital input.			
Connection	16 x M8 socket	8x M12 socket	16 x M8 socket	8x M12 socket
Cable length	max. 30 m			
Sensor power supply	24 V _{DC} from U_P , max. 0.5 A in total, short-circuit proof			
Nominal voltage	24 V _{DC} from U_P			
Load type	ohmic, inductive, lamp load			
Output current	max. 0.5 A per channel max. 3.0 A in total			
Short circuit current	max. 1.5 A per channel			
Switching times	T_{ON} : 60 µs typ., T_{OFF} : 300 µs typ.			

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 [► 74]
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 [► 143]

*) 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

3.13.3 Scope of supply

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

- 1x EPP23x9 EtherCAT P Box
- 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

EPP23x9-0021

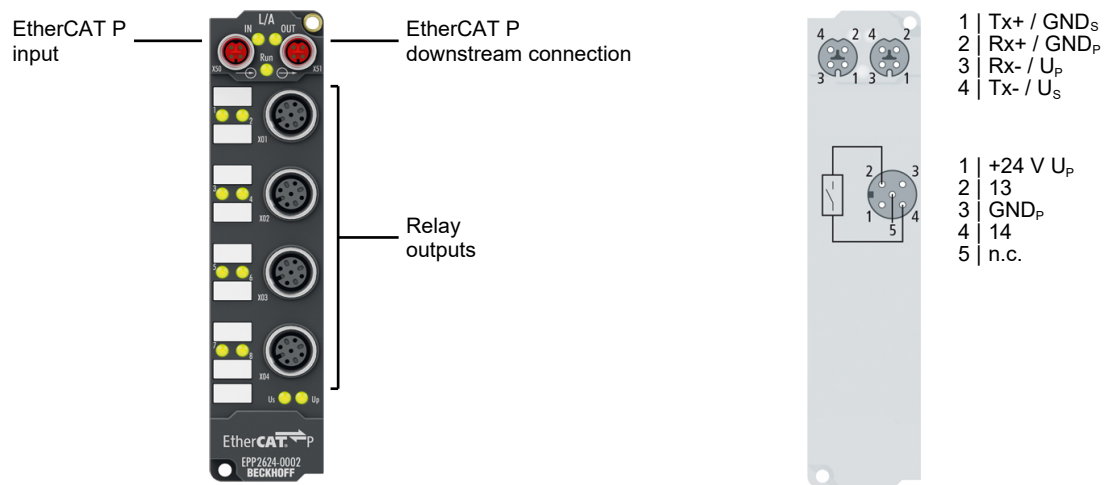
Process image in TwinCAT	Connector	Contact	Input variable	Output variable
▲  Box 1 (EPP2339-0021) ▲  Channel 1  Input ▶  Channel 2 ▶  Channel 3 ▶  Channel 4 ▶  Channel 5 ▶  Channel 6 ▶  Channel 7 ▶  Channel 8 ▶  Channel 9 ▶  Channel 10 ▶  Channel 11 ▶  Channel 12 ▶  Channel 13 ▶  Channel 14 ▶  Channel 15 ▶  Channel 16 ▲  Channel 17  Output ▶  Channel 18 ▶  Channel 19 ▶  Channel 20 ▶  Channel 21 ▶  Channel 22 ▶  Channel 23 ▶  Channel 24 ▶  Channel 25 ▶  Channel 26 ▶  Channel 27 ▶  Channel 28 ▶  Channel 29 ▶  Channel 30 ▶  Channel 31 ▶  Channel 32 ▶  WcState ▶  InfoData	X01	4	 Channel 1  Input	 Channel 17  Output
	X02	4	 Channel 2  Input	 Channel 18  Output
	X03	4	 Channel 3  Input	 Channel 19  Output
	X04	4	 Channel 4  Input	 Channel 20  Output
	X05	4	 Channel 5  Input	 Channel 21  Output
	X06	4	 Channel 6  Input	 Channel 22  Output
	X07	4	 Channel 7  Input	 Channel 23  Output
	X08	4	 Channel 8  Input	 Channel 24  Output
	X09	4	 Channel 9  Input	 Channel 25  Output
	X10	4	 Channel 10  Input	 Channel 26  Output
	X11	4	 Channel 11  Input	 Channel 27  Output
	X12	4	 Channel 12  Input	 Channel 28  Output
	X13	4	 Channel 13  Input	 Channel 29  Output
	X14	4	 Channel 14  Input	 Channel 30  Output
	X15	4	 Channel 15  Input	 Channel 31  Output
	X16	4	 Channel 16  Input	 Channel 32  Output

EPP23x9-0022

Process image in TwinCAT	Connector	Contact	Input variable	Output variable
Box 1 (EPP2339-0022) - Channel 1 - Input - Channel 2 - Channel 3 - Channel 4 - Channel 5 - Channel 6 - Channel 7 - Channel 8 - Channel 9 - Channel 10 - Channel 11 - Channel 12 - Channel 13 - Channel 14 - Channel 15 - Channel 16 - Channel 17 - Output - Channel 18 - Channel 19 - Channel 20 - Channel 21 - Channel 22 - Channel 23 - Channel 24 - Channel 25 - Channel 26 - Channel 27 - Channel 28 - Channel 29 - Channel 30 - Channel 31 - Channel 32 - WcState - InfoData	X01 / X02	2	Channel 2 Input	Channel 18 Output
		4	Channel 1 Input	Channel 17 Output
	X03 / X04	2	Channel 4 Input	Channel 20 Output
		4	Channel 3 Input	Channel 19 Output
	X05 / X06	2	Channel 6 Input	Channel 22 Output
		4	Channel 5 Input	Channel 21 Output
	X07 / X08	2	Channel 8 Input	Channel 24 Output
		4	Channel 7 Input	Channel 23 Output
	X09 / X10	2	Channel 10 Input	Channel 26 Output
		4	Channel 9 Input	Channel 25 Output
	X11 / X12	2	Channel 12 Input	Channel 28 Output
		4	Channel 11 Input	Channel 27 Output
	X13 / X14	2	Channel 14 Input	Channel 30 Output
		4	Channel 13 Input	Channel 29 Output
	X15 / X16	2	Channel 16 Input	Channel 32 Output
		4	Channel 15 Input	Channel 31 Output

3.14 EPP2624-0002

3.14.1 Introduction



4 potential-free relay outputs

The EPP2624-0002 EtherCAT P Box has four relays, each with a single contact. The relay contact can be used up to 25 V_{AC} or 30 V_{DC}. The LEDs indicate signal state of the EtherCAT P Box. The EPP2624-0002 is equipped with potential-free contacts; the power supply is passed through.

Quick links

[Technical data \[► 78\]](#)

[Process image \[► 80\]](#)

[Signal connection \[► 142\]](#)

3.14.2 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, shielded

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
Rated voltage U_P	24 V _{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	= sum of the output currents of the auxiliary voltage outputs

Relay outputs	
Number	4 x make contact
Connection	4x M12 socket
Cable length	max. 30 m
Switching voltage	25 V _{AC} / 30 V _{DC}
Switching current	0.5 A _{AC} / 2 A _{DC} (resistive load)
Minimum permitted load	10 µA, 10 mV _{DC}
Mechanical service life	1 x 10 ⁸ switching cycles as a minimum
Electrical service life	1 x 10 ⁵ switching cycles as a minimum (1 A, 30 V _{DC} , resistive load)
Auxiliary voltage	24 V _{DC} from U_P max. 3 A in total, not 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 [► 78]
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 [► 143]

*) 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

3.14.3 Scope of supply

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

- 1x EPP2624-0002 EtherCAT P Box
- 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.

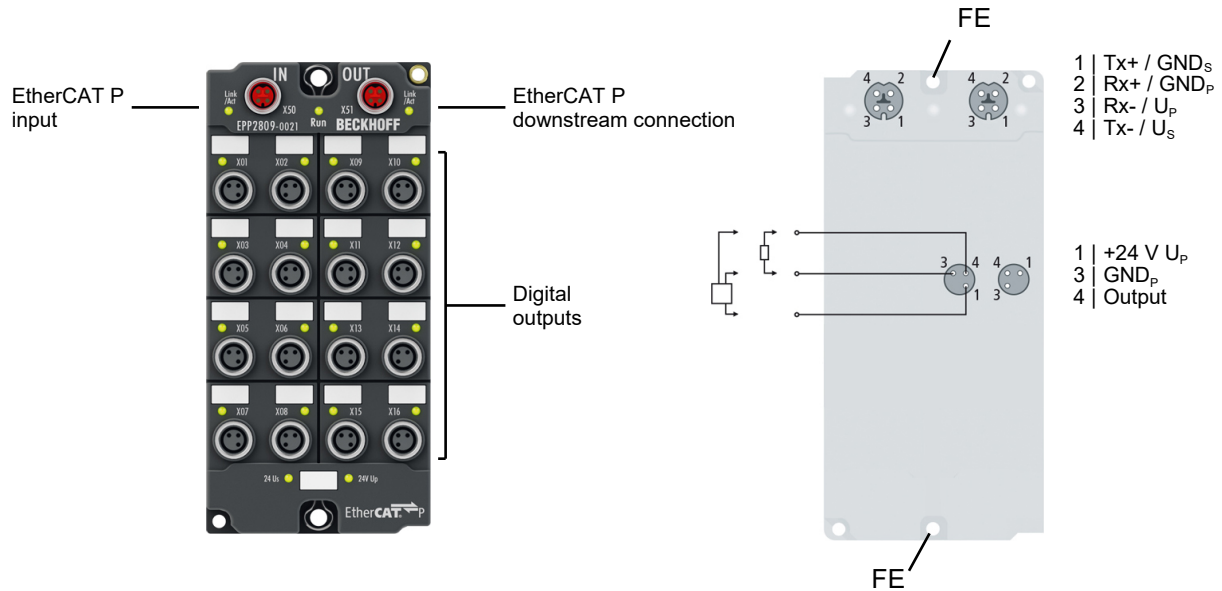
3.14.4 Process image

Process image in TwinCAT	Connector	Contact	Output variable
▲  Box 1 (EPP2624-0002) ▲  Channel 1  Output ▲  Channel 2  Output ▲  Channel 3  Output ▲  Channel 4  Output ▷  WcState ▷  InfoData	X01	2 , 4	 Channel 1  Output
	X02	2 , 4	 Channel 2  Output
	X03	2 , 4	 Channel 3  Output
	X04	2 , 4	 Channel 4  Output

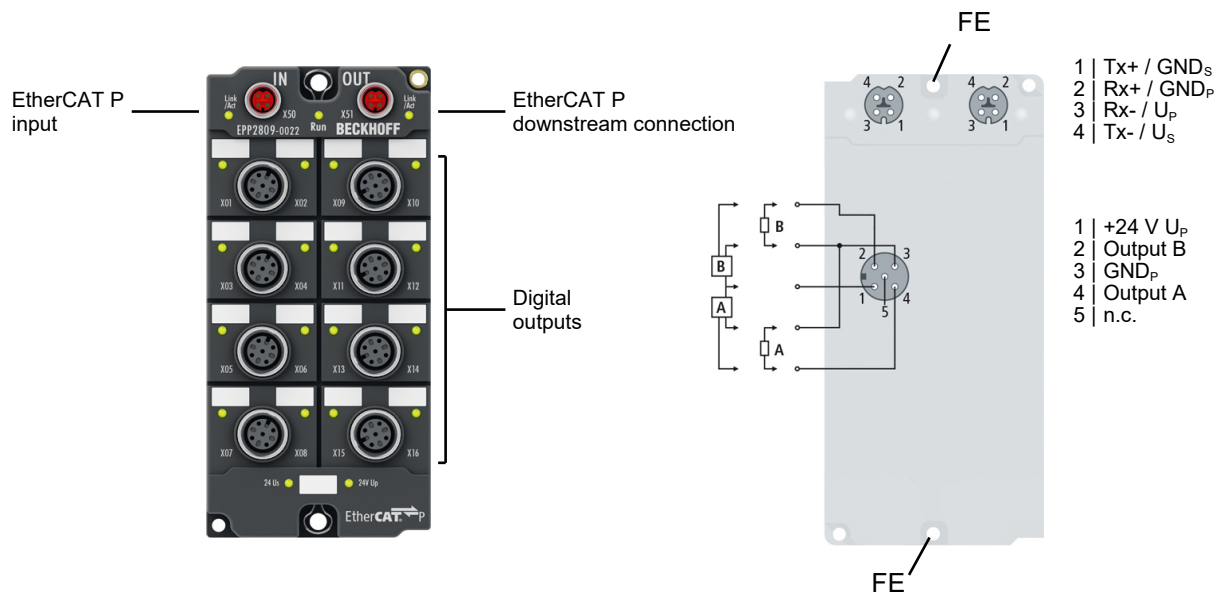
3.15 EPP2809-002x

3.15.1 Introduction

EPP2809-0021



EPP2809-0022



16 digital outputs

The EPP2809 EtherCAT P Box with digital outputs connects binary control signals from the controller to the actuators at the process level. The 16 outputs process load currents up to 0.5 A each, although the overall current is limited to 3 A. This makes these modules particularly suitable for applications in which not all outputs are active simultaneously or in which not all actuators require signal currents of 0.5 A.

The signal state is indicated by means of LEDs. The signal connection can optionally be established via screw-type M8 (EPP2809-0021) or M12 connectors (EPP2809-0022). All outputs are short-circuit proof and protected against polarity reversal.

Quick links

[Technical data \[► 83\]](#)

[Process image \[► 85\]](#)

[Signal connection M8 \[► 126\]](#)

[Signal connection M12 \[► 127\]](#)

3.15.2 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, shielded

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
Rated voltage U _P	24 V _{DC} (-15 % / +20 %)
U _P sum current: I _{P,sum}	max. 3 A
Current consumption from U _P	20 mA + Output currents of the digital outputs + Output currents of the auxiliary voltage outputs

Digital outputs	EPP2809-0021	EPP2809-0022
Number	16	
Connection	16 x M8 socket	8x M12 socket
Cable length	max. 30 m	
Load type	ohmic, inductive, lamp load	
Nominal voltage	24 V _{DC} from U _P	
Output current	max. 0.5 A per channel max. 3.0 A in total	
Short circuit current	max. 1.5 A per channel	
Switching times	T _{ON} : 60 µs typ., T _{OFF} : 300 µs typ.	
Diagnosis	-	
Auxiliary voltage	24 V _{DC} 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 -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 [► 84]
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 [► 143]

*) 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

3.15.3 Scope of supply

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

- 1x EPP2809 EtherCAT P Box
- 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.

3.15.4 Process image

EPP2809-0021

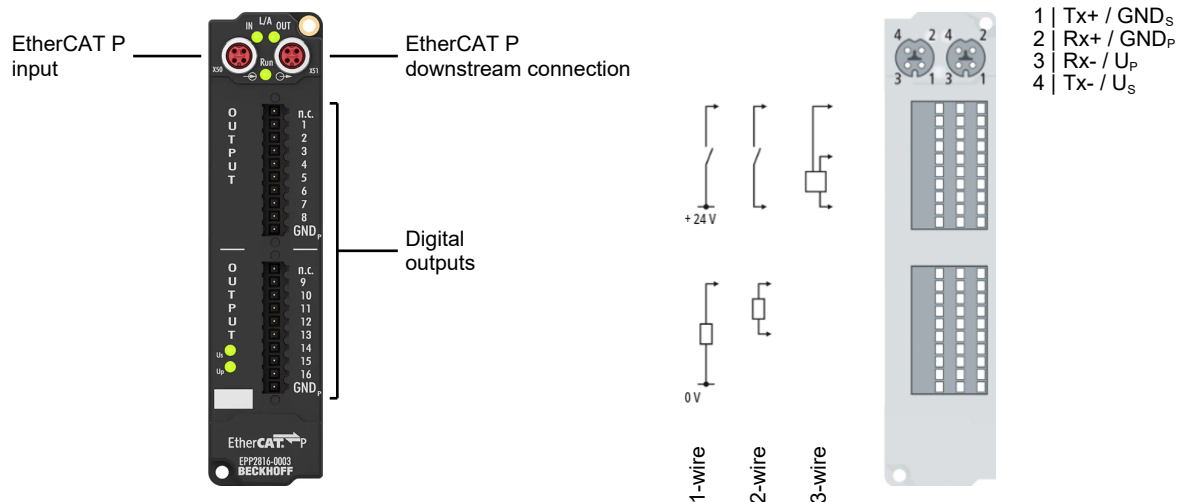
Process image in TwinCAT	Connector	Contact	Output variable
▲  Box 1 (EPP2809-0021) ▲  Channel 1  Output ▲  Channel 2  Output ▲  Channel 3  Output ▲  Channel 4  Output ▲  Channel 5  Output ▲  Channel 6  Output ▲  Channel 7  Output ▲  Channel 8  Output ▲  Channel 9  Output ▲  Channel 10  Output ▲  Channel 11  Output ▲  Channel 12  Output ▲  Channel 13  Output ▲  Channel 14  Output ▲  Channel 15  Output ▲  Channel 16  Output ▶  WcState ▶  InfoData	X01	4	 Channel 1  Output
	X02	4	 Channel 2  Output
	X03	4	 Channel 3  Output
	X04	4	 Channel 4  Output
	X05	4	 Channel 5  Output
	X06	4	 Channel 6  Output
	X07	4	 Channel 7  Output
	X08	4	 Channel 8  Output
	X09	4	 Channel 9  Output
	X10	4	 Channel 10  Output
	X11	4	 Channel 11  Output
	X12	4	 Channel 12  Output
	X13	4	 Channel 13  Output
	X14	4	 Channel 14  Output
	X15	4	 Channel 15  Output
	X16	4	 Channel 16  Output

EPP2809-0022

Process image in TwinCAT	Connector	Contact	Output variable
▲  Box 1 (EPP2809-0022) ▲  Channel 1  Output ▲  Channel 2  Output ▲  Channel 3  Output ▲  Channel 4  Output ▲  Channel 5  Output ▲  Channel 6  Output ▲  Channel 7  Output ▲  Channel 8  Output ▲  Channel 9  Output ▲  Channel 10  Output ▲  Channel 11  Output ▲  Channel 12  Output ▲  Channel 13  Output ▲  Channel 14  Output ▲  Channel 15  Output ▶  WcState ▶  InfoData	X01 / X02	2	 Channel 2  Output
		4	 Channel 1  Output
	X03 / X04	2	 Channel 4  Output
		4	 Channel 3  Output
	X05 / X06	2	 Channel 6  Output
		4	 Channel 5  Output
	X07 / X08	2	 Channel 8  Output
		4	 Channel 7  Output
	X09 / X10	2	 Channel 10  Output
		4	 Channel 9  Output
	X11 / X12	2	 Channel 12  Output
		4	 Channel 11  Output
	X13 / X14	2	 Channel 14  Output
		4	 Channel 13  Output
	X15 / X16	2	 Channel 16  Output
		4	 Channel 15  Output

3.16 EPP2816-0003

3.16.1 Introduction



16-channel digital output

The EPP2816-0003 EtherCAT P Box is designed for processing digital/binary signals. It connects the binary control signals from the automation device on to the actuators at the process level. The outputs handle an output current of up to max. 0.5 A. A short-term overload is possible. The outputs are short-circuit proof. An output short-circuit is recognized and passed on to the control level. The sum current of all outputs is limited to 3 A.

The signal state is indicated for signal groups by means of LEDs. Alternatively, the state is displayed in the optional spring-loaded connector. The signal connection is established via spring-loaded connectors, optionally available in 1- and 3-pole versions. The module is supplied without connectors. The 16-channel design offers high channel density in a small space. The protection rating is limited due to the spring-loaded connector.

The module is supplied without connectors.

Quick links

[Technical data \[► 88\]](#)

[Process image \[► 90\]](#)

[Signal connection \[► 134\]](#)

3.16.2 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, shielded
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
U_P nominal voltage	24 V _{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 3 A
Current consumption from U_P	20 mA + load

Digital outputs	
Number	16
Connection	2x ZS2001
Cable length	max. 30 m
Load type	ohmic, inductive, lamp load
Nominal output voltage	24 V _{DC} from U_P
Output current	max. 0.5 A on each channel, individually short-circuit proof.
Short circuit current	maximum 1.5 A
Switching times	T_{ON} : 25 µs typ., T_{OFF} : 50 µs typ.
Auxiliary voltage output	-

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 cURus
Ambient temperature during storage	-40 ... +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional checks [► 88]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection rating	IP20

Approvals / markings	
Approvals / markings *)	CE, cULus [► 143]

*) 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

3.16.3 Scope of supply

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

- 1x EPP2816-0003 EtherCAT P Box
- 2x protective cap for EtherCAT P socket, M8, red (pre-assembled)
- 10x labels, blank (1 strip of 10)

● i EPP2816-0003: Accessories needed

The ZS2001 connectors are not included in the scope of delivery. See chapter [Accessories](#) [► 153].

● i 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.

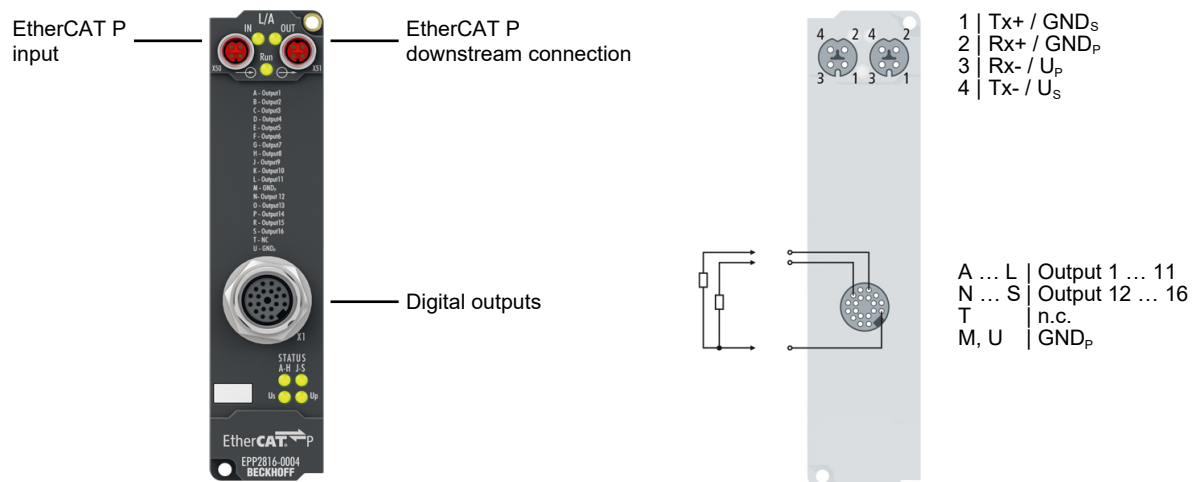
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.16.4 Process image

Process image in TwinCAT	Printed pin no.		Variable	Diagnostic bit
	Box	ZS2001		
Box 2 (EPP2816-0003) DIG Diag Inputs Channel 1 Diag Input 1 Diag Input 2 Diag Input 3 Diag Input 4 Diag Input 5 Diag Input 6 Diag Input 7 Diag Input 8 DIG Diag Inputs Channel 2 Diag Input 1 Diag Input 2 Diag Input 3 Diag Input 4 Diag Input 5 Diag Input 6 Diag Input 7 Diag Input 8 DIG Inputs Device DIG Outputs Channel 1 Output 1 Output 2 Output 3 Output 4 Output 5 Output 6 Output 7 Output 8 DIG Outputs Channel 2 Output 1 Output 2 Output 3 Output 4 Output 5 Output 6 Output 7 Output 8 DIG Outputs Device WcState InfoData	Upper connector			
	1	0	DIG Outputs Channel 1 Output 1	DIG Diag Inputs Channel 1 Diag Input 1
	2	1	DIG Outputs Channel 1 Output 2	DIG Diag Inputs Channel 1 Diag Input 2
	3	2	DIG Outputs Channel 1 Output 3	DIG Diag Inputs Channel 1 Diag Input 3
	4	3	DIG Outputs Channel 1 Output 4	DIG Diag Inputs Channel 1 Diag Input 4
	5	4	DIG Outputs Channel 1 Output 5	DIG Diag Inputs Channel 1 Diag Input 5
	6	5	DIG Outputs Channel 1 Output 6	DIG Diag Inputs Channel 1 Diag Input 6
	7	6	DIG Outputs Channel 1 Output 7	DIG Diag Inputs Channel 1 Diag Input 7
	8	7	DIG Outputs Channel 1 Output 8	DIG Diag Inputs Channel 1 Diag Input 8
	Lower connector			
	9	0	DIG Outputs Channel 2 Output 1	DIG Diag Inputs Channel 2 Diag Input 1
	10	1	DIG Outputs Channel 2 Output 2	DIG Diag Inputs Channel 2 Diag Input 2
	11	2	DIG Outputs Channel 2 Output 3	DIG Diag Inputs Channel 2 Diag Input 3
	12	3	DIG Outputs Channel 2 Output 4	DIG Diag Inputs Channel 2 Diag Input 4
	13	4	DIG Outputs Channel 2 Output 5	DIG Diag Inputs Channel 2 Diag Input 5
	14	5	DIG Outputs Channel 2 Output 6	DIG Diag Inputs Channel 2 Diag Input 6
	15	6	DIG Outputs Channel 2 Output 7	DIG Diag Inputs Channel 2 Diag Input 7
	16	7	DIG Outputs Channel 2 Output 8	DIG Diag Inputs Channel 2 Diag Input 8

3.17 EPP2816-0004

3.17.1 Introduction



Digital output

The EPP2816-0004 EtherCAT P Box is designed for processing digital/binary signals. It connects the binary control signals from the automation device on to the actuators at the process level. The outputs handle an output current of up to max. 0.5 A. A short-term overload is possible. The outputs are short-circuit proof. An output short-circuit is recognized and passed on to the control level. The sum current of all outputs is limited to 3 A.

The signal state is indicated for signal groups by means of LEDs. The signal connection is established via a 19-pin M16 socket. The 16-channel design offers high channel density in a small space. IP67 M16 connectors enable cost-efficient, decentralized connection, e.g. of 16-channel valve terminals in the field.

Quick links

[Technical data \[► 92\]](#)
[Process image \[► 94\]](#)
[Signal connection \[► 128\]](#)

3.17.2 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, shielded
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
U _P nominal voltage	24 V _{DC} (-15 % / +20 %)
U _P sum current: I _{P,sum}	max. 3 A
Current consumption from U _P	20 mA + Output currents of the digital outputs

Digital outputs	
Number	16
Connection	1 x M16 socket, 19-pin
Cable length	max. 30 m
Load type	ohmic, inductive, lamp load
Nominal voltage	24 V _{DC} from U _P
Output current	max. 0.5 A per channel max. 3.0 A in total
Short circuit current	max. 1.5 A per channel
Switching times	T _{ON} : 25 µs typ., T _{OFF} : 50 µs typ.
Diagnosis	yes

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 [► 93]
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 [► 143]

*) 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

3.17.3 Scope of supply

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

- 1x EPP2816-0004 EtherCAT P Box
- 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.

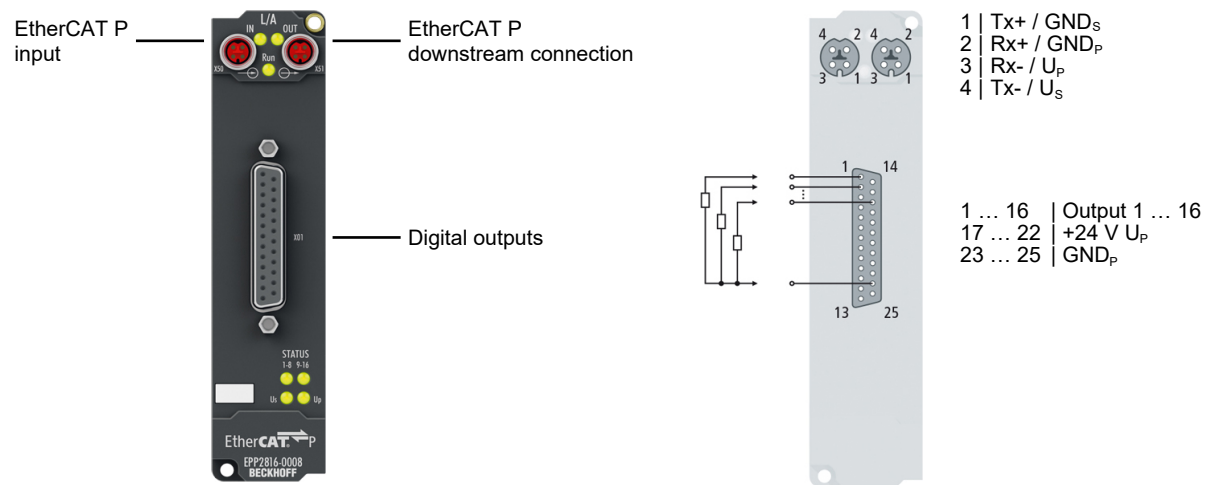
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.17.4 Process image

Process image in TwinCAT	Connector	Contact	Output variable	Diagnostic bit
▲ Box 1 (EPP2816-0004) ▲ DIG Diag Inputs Channel 1 - Diag Input 1 - Diag Input 2 - Diag Input 3 - Diag Input 4 - Diag Input 5 - Diag Input 6 - Diag Input 7 - Diag Input 8 ▲ DIG Diag Inputs Channel 2 - Diag Input 1 - Diag Input 2 - Diag Input 3 - Diag Input 4 - Diag Input 5 - Diag Input 6 - Diag Input 7 - Diag Input 8 ▶ DIG Inputs Device ▲ DIG Output Channel 1 - Output 1 - Output 2 - Output 3 - Output 4 - Output 5 - Output 6 - Output 7 - Output 8 ▲ DIG Output Channel 2 - Output 1 - Output 2 - Output 3 - Output 4 - Output 5 - Output 6 - Output 7 - Output 8 ▶ DIG Outputs Device ▶ WcState ▶ InfoData	X01	A	DIG Outputs Channel 1 Output 1	DIG Diag Inputs Channel 1 Diag Input 1
		B	DIG Outputs Channel 1 Output 2	DIG Diag Inputs Channel 1 Diag Input 2
		C	DIG Outputs Channel 1 Output 3	DIG Diag Inputs Channel 1 Diag Input 3
		D	DIG Outputs Channel 1 Output 4	DIG Diag Inputs Channel 1 Diag Input 4
		E	DIG Outputs Channel 1 Output 5	DIG Diag Inputs Channel 1 Diag Input 5
		F	DIG Outputs Channel 1 Output 6	DIG Diag Inputs Channel 1 Diag Input 6
		G	DIG Outputs Channel 1 Output 7	DIG Diag Inputs Channel 1 Diag Input 7
		H	DIG Outputs Channel 1 Output 8	DIG Diag Inputs Channel 1 Diag Input 8
		I	DIG Outputs Channel 2 Output 1	DIG Diag Inputs Channel 2 Diag Input 1
		K	DIG Outputs Channel 2 Output 2	DIG Diag Inputs Channel 2 Diag Input 2
		L	DIG Outputs Channel 2 Output 3	DIG Diag Inputs Channel 2 Diag Input 3
		N	DIG Outputs Channel 2 Output 4	DIG Diag Inputs Channel 2 Diag Input 4
		O	DIG Outputs Channel 2 Output 5	DIG Diag Inputs Channel 2 Diag Input 5
		P	DIG Outputs Channel 2 Output 6	DIG Diag Inputs Channel 2 Diag Input 6
		R	DIG Outputs Channel 2 Output 7	DIG Diag Inputs Channel 2 Diag Input 7
		S	DIG Outputs Channel 2 Output 8	DIG Diag Inputs Channel 2 Diag Input 8

3.18 EPP2816-0008

3.18.1 Introduction



Digital output

The EPP2816-0008 EtherCAT P Box is designed for processing digital/binary signals. It connects the binary control signals from the automation device on to the actuators at the process level. The outputs handle an output current of up to max. 0.5 A. A short-term overload is possible. The outputs are short-circuit proof. An output short-circuit is recognized and passed on to the control level. The sum current of all outputs is limited to 3 A.

The signal state is indicated for signal groups by means of LEDs. The signal connection is made through a 25-pin D-sub socket. The 16-channel design offers high channel density in a small space. The IP67 D-sub connectors enable cost-effective, decentralized connection, e.g. of 16-channel valve terminals in the field.

Quick links

[Technical data \[► 96\]](#)

[Process image \[► 98\]](#)

[Signal connection \[► 130\]](#)

3.18.2 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, shielded
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
U _P nominal voltage	24 V _{DC} (-15 % / +20 %)
U _P sum current: I _{P,sum}	max. 3 A
Current consumption from U _P	20 mA + Output currents of the digital outputs + Output currents of the auxiliary voltage outputs

Digital outputs	
Number	16
Connection	1 x D-sub socket, 25-pin, UNC4-40 thread
Cable length	max. 30 m
Load type	ohmic, inductive, lamp load
Nominal voltage	24 V _{DC} from U _P
Output current	max. 0.5 A per channel max. 3.0 A in total
Short circuit current	max. 1.5 A per channel
Switching times	T _{ON} : 60 µs typ., T _{OFF} : 300 µs typ.
Diagnosis	yes
Auxiliary voltage	24 V _{DC} from U _P 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 [► 97]
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 [► 143]

*) 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

3.18.3 Scope of supply

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

- 1x EPP2816-0008 EtherCAT P Box
- 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.

3.18.4 Process image

Process image in TwinCAT	Connector	Contact	Output variable	Diagnostic bit
▲ Box 2 (EPP2816-0008) ▲ DIG Diag Inputs Channel 1 - Diag Input 1 - Diag Input 2 - Diag Input 3 - Diag Input 4 - Diag Input 5 - Diag Input 6 - Diag Input 7 - Diag Input 8 ▲ DIG Diag Inputs Channel 2 - Diag Input 1 - Diag Input 2 - Diag Input 3 - Diag Input 4 - Diag Input 5 - Diag Input 6 - Diag Input 7 - Diag Input 8 ▶ DIG Inputs Device ▲ DIG Outputs Channel 1 - Output 1 - Output 2 - Output 3 - Output 4 - Output 5 - Output 6 - Output 7 - Output 8 ▲ DIG Outputs Channel 2 - Output 1 - Output 2 - Output 3 - Output 4 - Output 5 - Output 6 - Output 7 - Output 8 ▶ DIG Outputs Device ▶ WcState ▶ InfoData	X01	1	DIG Outputs Channel 1 Output 1	DIG Diag Inputs Channel 1 Diag Input 1
		2	DIG Outputs Channel 1 Output 2	DIG Diag Inputs Channel 1 Diag Input 2
		3	DIG Outputs Channel 1 Output 3	DIG Diag Inputs Channel 1 Diag Input 3
		4	DIG Outputs Channel 1 Output 4	DIG Diag Inputs Channel 1 Diag Input 4
		5	DIG Outputs Channel 1 Output 5	DIG Diag Inputs Channel 1 Diag Input 5
		6	DIG Outputs Channel 1 Output 6	DIG Diag Inputs Channel 1 Diag Input 6
		7	DIG Outputs Channel 1 Output 7	DIG Diag Inputs Channel 1 Diag Input 7
		8	DIG Outputs Channel 1 Output 8	DIG Diag Inputs Channel 1 Diag Input 8
		9	DIG Outputs Channel 2 Output 1	DIG Diag Inputs Channel 2 Diag Input 1
		10	DIG Outputs Channel 2 Output 2	DIG Diag Inputs Channel 2 Diag Input 2
		11	DIG Outputs Channel 2 Output 3	DIG Diag Inputs Channel 2 Diag Input 3
		12	DIG Outputs Channel 2 Output 4	DIG Diag Inputs Channel 2 Diag Input 4
		13	DIG Outputs Channel 2 Output 5	DIG Diag Inputs Channel 2 Diag Input 5
		14	DIG Outputs Channel 2 Output 6	DIG Diag Inputs Channel 2 Diag Input 6
		15	DIG Outputs Channel 2 Output 7	DIG Diag Inputs Channel 2 Diag Input 7
		16	DIG Outputs Channel 2 Output 8	DIG Diag Inputs Channel 2 Diag Input 8

3.18.4.1 Status bits

DIG Inputs Device

You will find the module's status inputs under **DIGInputs Device**.

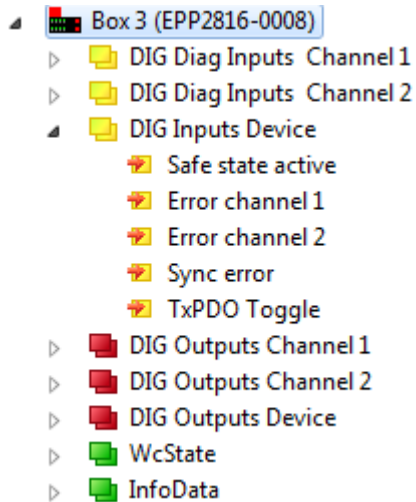


Fig. 4: EPP2816-0008, DIG Inputs Device

Safe state active

Indicates whether the safe state has been assumed. The display only works if the network transmits process input data, i.e. in the network states Pre-Operational (PRE-OP) and Operational (OP), but not in the network state INIT.

Error channel X

Indicates an error on channel X.

Sync Error

See EtherCAT system documentation. The EtherCAT system documentation is available on the Beckhoff homepage under Downloads.

TxPDO Toggle

See EtherCAT system documentation.

DIG Outputs Device

You will find the module's control outputs under **DIG Outputs Device**.

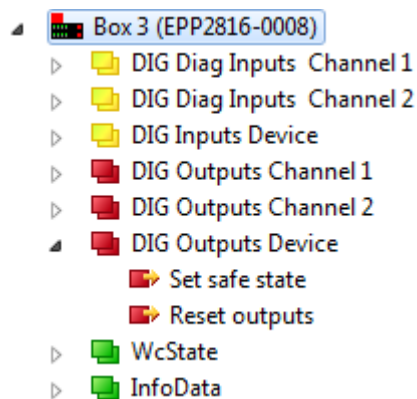


Fig. 5: EPP2816-0008, DIG Outputs Device

Set safe state

Sets the module to the safe state.

Reset outputs

Resets the error bits "Error channel X" of the module. The outputs are reactivated.

3.18.5 Status LEDs

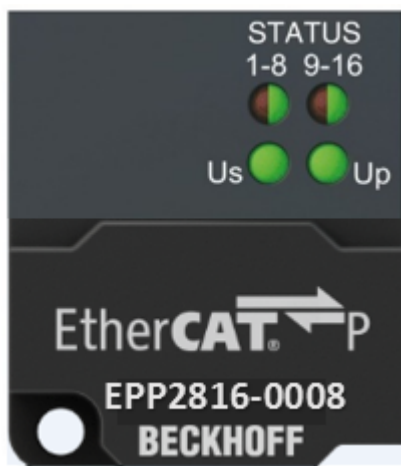


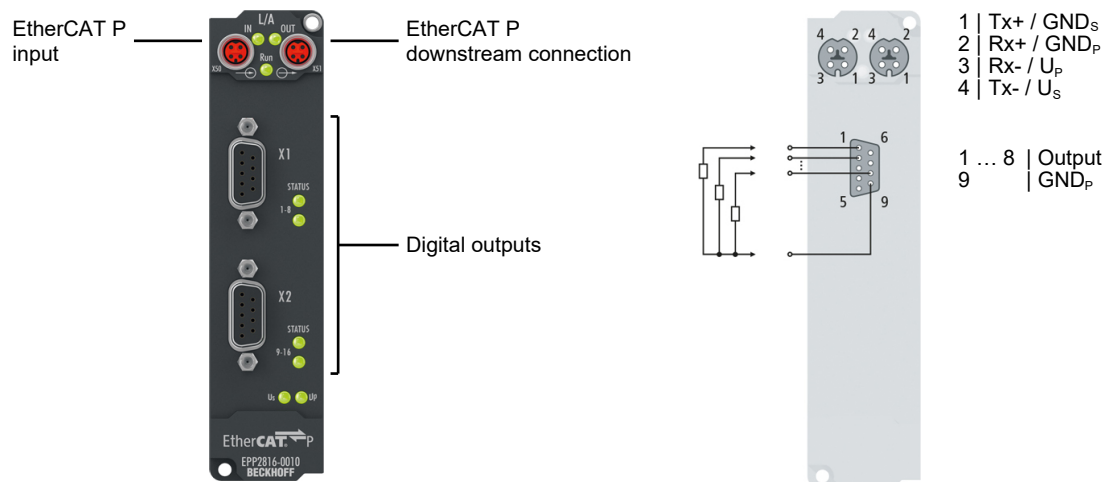
Fig. 6: EPP2816-0008 - Status LEDs

LED Displays

LED	Display	Meaning
STATUS 1-8	green illuminated	at least one of the outputs for channel 1-8 is set
	red illuminated	at least one of the outputs for channel 1-8 has a short-circuit
STATUS 9-16	green illuminated	at least one of the outputs for channel 9-16 is set
	red illuminated	at least one of the outputs for channel 9-16 has a short-circuit
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

3.19 EPP2816-0010

3.19.1 Introduction



Digital output

The EPP2816-0010 EtherCAT P Box is designed for processing digital/binary signals. It connects the binary control signals from the automation device on to the actuators at the process level. The outputs handle an output current of up to max. 0.5 A. A short-term overload is possible. The outputs are short-circuit proof. An output short-circuit is recognized and passed on to the control level. The sum current of all outputs is limited to 3 A.

The signal state is indicated for signal groups by means of LEDs. The signal connection is established through two 9-pin D-sub sockets. The 2x8-channel design offers high channel density in a small space. Two D-sub connectors enable cost-efficient, decentralized connection, e.g. of 8-channel valve terminals in the field.

Quick links

[Technical data \[► 102\]](#)

[Process image \[► 104\]](#)

[Signal connection \[► 129\]](#)

3.19.2 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, shielded
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
U _P nominal voltage	24 V _{DC} (-15 % / +20 %)
U _P sum current: I _{P,sum}	max. 3 A
Current consumption from U _P	20 mA + Output currents of the digital outputs

Digital outputs	
Number	16
Connection	2 x D-sub socket, 9-pin
Cable length	max. 30 m
Load type	ohmic, inductive, lamp load
Nominal voltage	24 V _{DC} from U _P
Output current	max. 0.5 A per channel max. 3.0 A in total
Short circuit current	max. 1.5 A per channel
Switching times	T _{ON} : 60 µs typ., T _{OFF} : 300 µs typ.
Diagnosis	yes

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 [► 103]
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 [► 143]

*) 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

3.19.3 Scope of supply

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

- 1x EPP2816-0010 EtherCAT P Box
- 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.

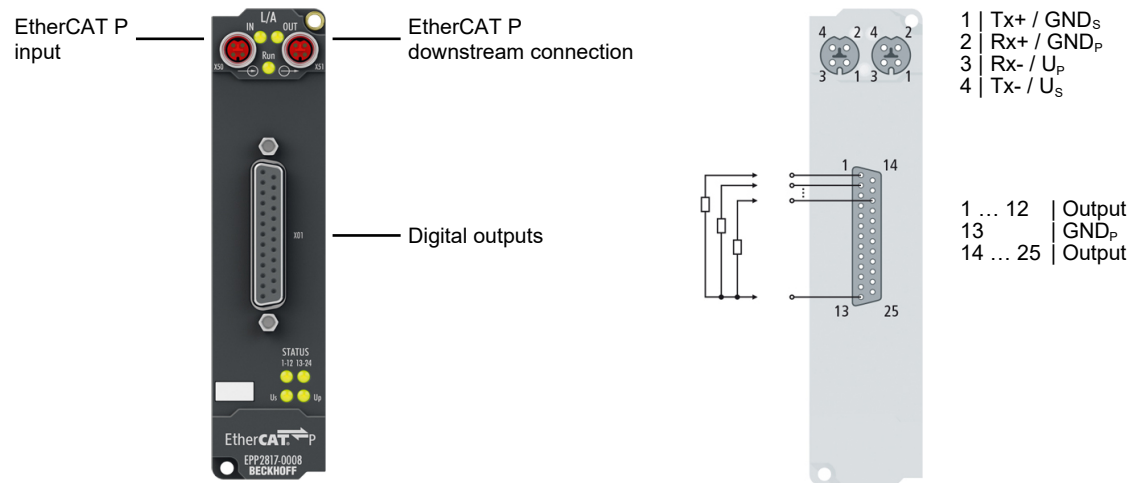
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.19.4 Process image

Process image in TwinCAT	Connector	Contact	Output variable	Diagnostic bit
▲ Box 1 (EPP2816-0010) ▲ DIG Diag Inputs Channel 1 - Diag Input 1 - Diag Input 2 - Diag Input 3 - Diag Input 4 - Diag Input 5 - Diag Input 6 - Diag Input 7 - Diag Input 8 ▲ DIG Diag Inputs Channel 2 - Diag Input 1 - Diag Input 2 - Diag Input 3 - Diag Input 4 - Diag Input 5 - Diag Input 6 - Diag Input 7 - Diag Input 8 ▶ DIG Inputs Device ▲ DIG Outputs Channel 1 - Output 1 - Output 2 - Output 3 - Output 4 - Output 5 - Output 6 - Output 7 - Output 8 ▲ DIG Outputs Channel 2 - Output 1 - Output 2 - Output 3 - Output 4 - Output 5 - Output 6 - Output 7 - Output 8 ▶ DIG Outputs Device ▶ WcState ▶ InfoData	X01	1	DIG Outputs Channel 1 Output 1	DIG Diag Inputs Channel 1 Diag Input 1
		2	DIG Outputs Channel 1 Output 2	DIG Diag Inputs Channel 1 Diag Input 2
		3	DIG Outputs Channel 1 Output 3	DIG Diag Inputs Channel 1 Diag Input 3
		4	DIG Outputs Channel 1 Output 4	DIG Diag Inputs Channel 1 Diag Input 4
		5	DIG Outputs Channel 1 Output 5	DIG Diag Inputs Channel 1 Diag Input 5
		6	DIG Outputs Channel 1 Output 6	DIG Diag Inputs Channel 1 Diag Input 6
		7	DIG Outputs Channel 1 Output 7	DIG Diag Inputs Channel 1 Diag Input 7
		8	DIG Outputs Channel 1 Output 8	DIG Diag Inputs Channel 1 Diag Input 8
	X02	1	DIG Outputs Channel 2 Output 1	DIG Diag Inputs Channel 2 Diag Input 1
		2	DIG Outputs Channel 2 Output 2	DIG Diag Inputs Channel 2 Diag Input 2
		3	DIG Outputs Channel 2 Output 3	DIG Diag Inputs Channel 2 Diag Input 3
		4	DIG Outputs Channel 2 Output 4	DIG Diag Inputs Channel 2 Diag Input 4
		5	DIG Outputs Channel 2 Output 5	DIG Diag Inputs Channel 2 Diag Input 5
		6	DIG Outputs Channel 2 Output 6	DIG Diag Inputs Channel 2 Diag Input 6
		7	DIG Outputs Channel 2 Output 7	DIG Diag Inputs Channel 2 Diag Input 7
		8	DIG Outputs Channel 2 Output 8	DIG Diag Inputs Channel 2 Diag Input 8

3.20 EPP2817-0008

3.20.1 Introduction



Digital output

The EPP2817-0008 EtherCAT P Box is designed for processing digital/binary signals. It connects the binary control signals from the automation device on to the actuators at the process level. The outputs handle an output current of up to max. 0.5 A. A short-term overload is possible.

The outputs are short-circuit proof. An output short-circuit is recognized and passed on to the control level. The sum current of all outputs is limited to 3 A. The signal state is indicated for signal groups by means of LEDs. The signal connection is made through a 25-pin D-sub socket. The 24-channel design offers high channel density in a small space. The IP67 D-sub connectors enable cost-effective, decentralized connection, e.g. of 24-channel valve terminals in the field.

EPP2817-0008 features undervoltage detection for the supply voltages.

Quick links

[Technical data \[► 106\]](#)

[Process image \[► 108\]](#)

[Signal connection \[► 130\]](#)

3.20.2 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, shielded
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
U _P nominal voltage	24 V _{DC} (-15 % / +20 %)
U _P sum current: I _{P,sum}	max. 3 A
Current consumption from U _P	20 mA + Output currents of the digital outputs
Undervoltage detection	U _S < 18 V U _P < 18 V

Digital outputs	
Number	24
Connection	1 x D-sub socket, 25-pin, UNC4-40 thread
Cable length	max. 30 m
Load type	ohmic, inductive, lamp load
Nominal voltage	24 V _{DC} from U _P
Output current	max. 0.5 A per channel max. 3.0 A in total
Short circuit current	max. 1.5 A per channel
Switching times	T _{ON} : 10 µs typ., T _{OFF} : 50 µs typ.
Diagnosis	yes

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 [► 107]
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 [► 143]

*) 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

3.20.3 Scope of supply

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

- 1x EPP2817-0008 EtherCAT P Box
- 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.

3.20.4 Process image

Process image in TwinCAT	Connector	Contact	Output variable	Diagnostic bit
▲ Box 1 (EPP2817-0008) ▲ DIG Diag Inputs Channel 1 - Diag Input 1 - Diag Input 2 - Diag Input 3 - Diag Input 4 - Diag Input 5 - Diag Input 6 - Diag Input 7 - Diag Input 8 ▶ DIG Diag Inputs Channel 2 ▶ DIG Diag Inputs Channel 3 ▶ DIG Inputs Device ▲ DIG Output Channel 1 - Output 1 - Output 2 - Output 3 - Output 4 - Output 5 - Output 6 - Output 7 - Output 8 ▶ DIG Output Channel 2 ▶ DIG Output Channel 3 ▶ DIG Outputs Device ▶ WcState ▶ InfoData	X01	1	DIG Output Channel 1 Output 1	DIG Diag Inputs Channel 1 Diag Input 1
		2	DIG Output Channel 1 Output 3	DIG Diag Inputs Channel 1 Diag Input 3
		3	DIG Output Channel 1 Output 5	DIG Diag Inputs Channel 1 Diag Input 5
		4	DIG Output Channel 1 Output 7	DIG Diag Inputs Channel 1 Diag Input 7
		5	DIG Output Channel 2 Output 1	DIG Diag Inputs Channel 2 Diag Input 1
		6	DIG Output Channel 2 Output 3	DIG Diag Inputs Channel 2 Diag Input 3
		7	DIG Output Channel 2 Output 5	DIG Diag Inputs Channel 2 Diag Input 5
		8	DIG Output Channel 2 Output 7	DIG Diag Inputs Channel 2 Diag Input 7
		9	DIG Output Channel 3 Output 1	DIG Diag Inputs Channel 3 Diag Input 1
		10	DIG Output Channel 3 Output 3	DIG Diag Inputs Channel 3 Diag Input 3
		11	DIG Output Channel 3 Output 5	DIG Diag Inputs Channel 3 Diag Input 5
		12	DIG Output Channel 3 Output 7	DIG Diag Inputs Channel 3 Diag Input 7
		14	DIG Output Channel 1 Output 2	DIG Diag Inputs Channel 1 Diag Input 2
		15	DIG Output Channel 1 Output 4	DIG Diag Inputs Channel 1 Diag Input 4
		16	DIG Output Channel 1 Output 6	DIG Diag Inputs Channel 1 Diag Input 6
		17	DIG Output Channel 1 Output 8	DIG Diag Inputs Channel 1 Diag Input 8
		18	DIG Output Channel 2 Output 2	DIG Diag Inputs Channel 2 Diag Input 2

(Continued on next page)

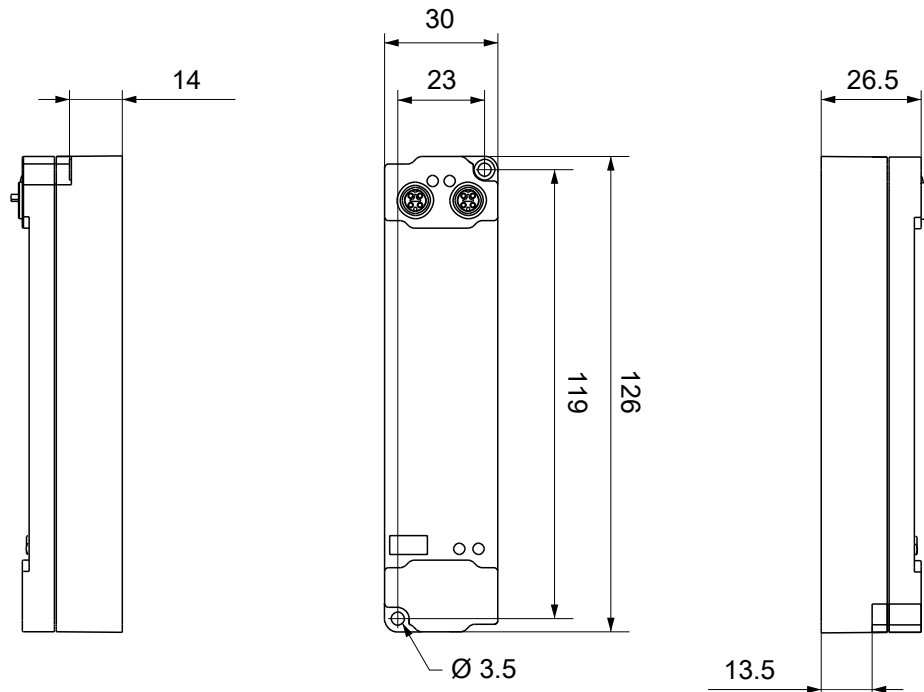
		19	 DIG Output Channel 2  Output 4	 DIG Diag Inputs Channel 2  Diag Input 4
		20	 DIG Output Channel 2  Output 6	 DIG Diag Inputs Channel 2  Diag Input 6
		21	 DIG Output Channel 2  Output 8	 DIG Diag Inputs Channel 2  Diag Input 8
		22	 DIG Output Channel 3  Output 2	 DIG Diag Inputs Channel 3  Diag Input 2
		23	 DIG Output Channel 3  Output 4	 DIG Diag Inputs Channel 3  Diag Input 4
		24	 DIG Output Channel 3  Output 6	 DIG Diag Inputs Channel 3  Diag Input 6
		25	 DIG Output Channel 3  Output 8	 DIG Diag Inputs Channel 3  Diag Input 8

4 Mounting and cabling

4.1 Mounting

4.1.1 Dimensions

Housing -000x and -0010

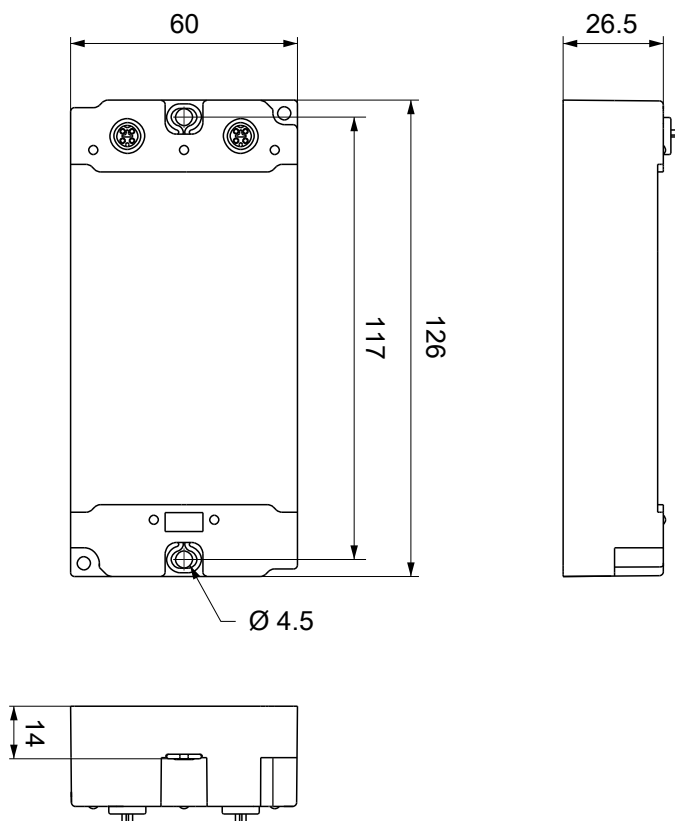


All dimensions are given in millimeters.
The drawing is not true to scale.

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)

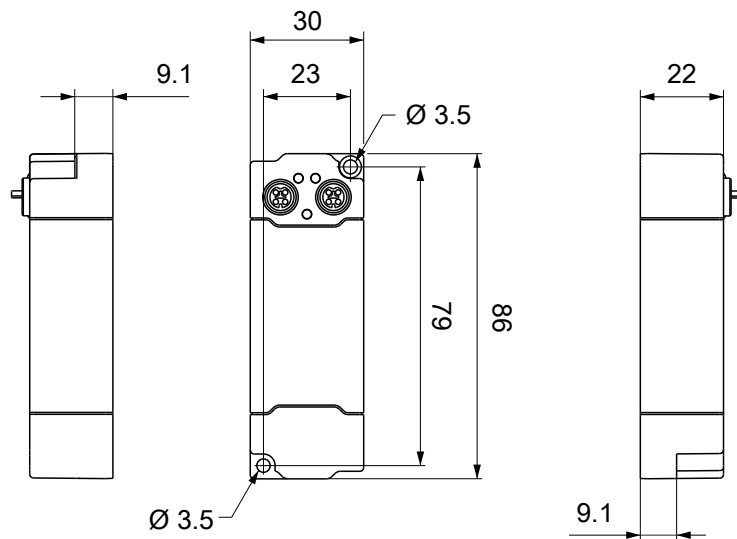
Housing -002x



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 $\varnothing 4.5$ 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.

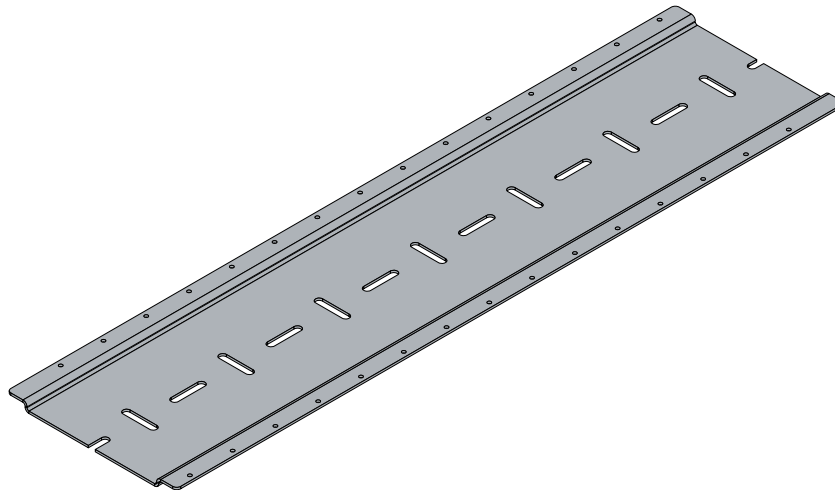


Fig. 7: Mounting Rail ZS5300-000

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 threads also pre-made M4 threads 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 serve 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. 8: 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.

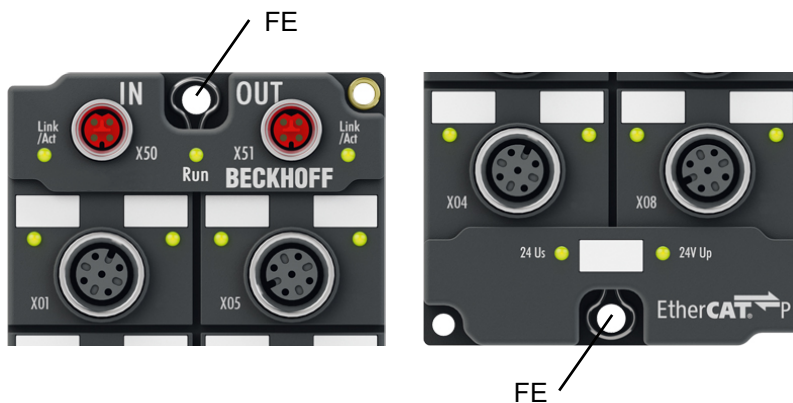


Fig. 9: Connection for functional earth (FE)

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 supply provides safe electrical isolation and limitation of the voltage without a connection to the protective conductor.
- A PELV 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 \[► 143\]](#).

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. 10: Connectors for EtherCAT P

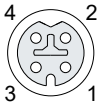


Fig. 11: M8 socket, p-coded

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: U_s and U_p .

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

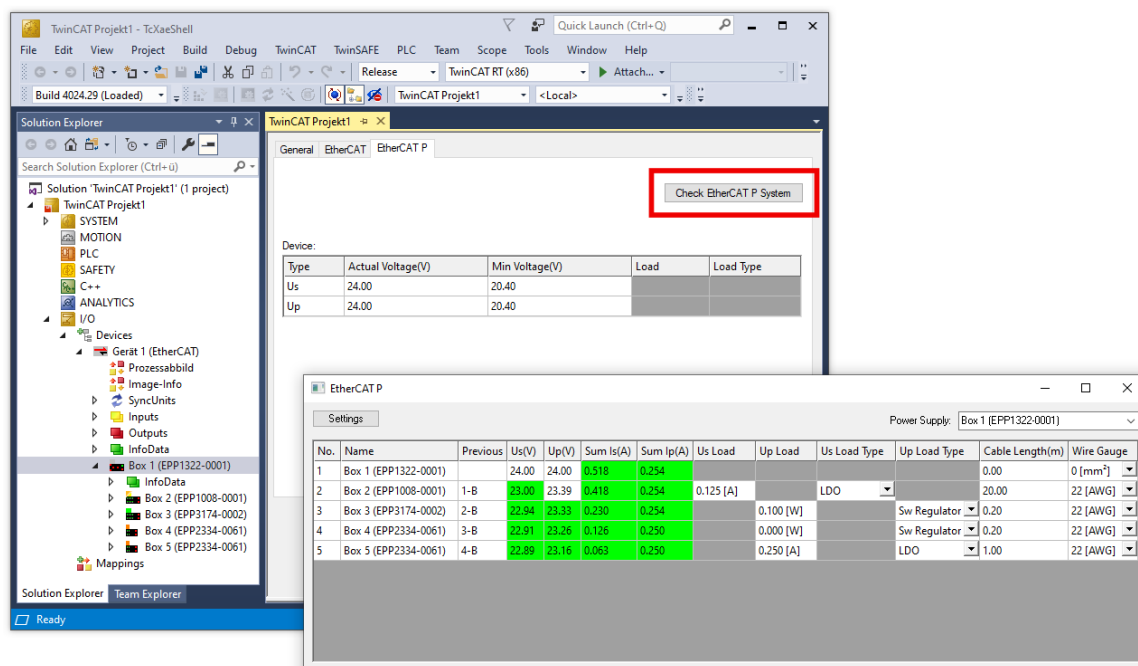
Description of the EtherCAT slave states

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.

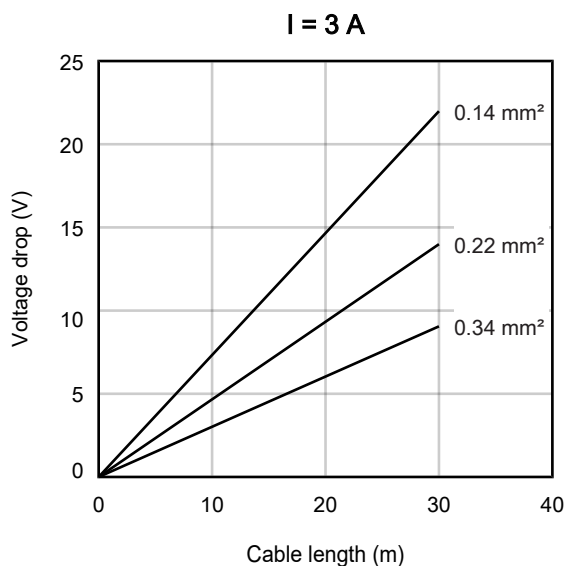
i Planning tool for EtherCAT P

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 Supply and connection of sensor/actuator to EPP boxes

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.

4.4 Digital inputs

4.4.1 Digital inputs M8

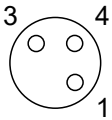


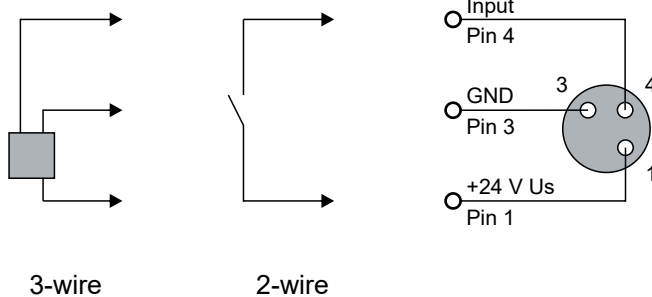
Fig. 12: M8 socket, 3-pin

Pin	Symbol	Description
1	+24 V U _s	Sensor supply: 24 V _{DC} from U _s
3	GND	GND _s
4	Input	Digital input

Use the output voltage at pin 1 as supply voltage for sensors. Make sure that the sum of the supply currents of all connected sensors does not exceed the sum current of 0.5 A.

Light emitting diodes indicate the signal state of the inputs.

Connection examples



4.4.2 Digital inputs M12

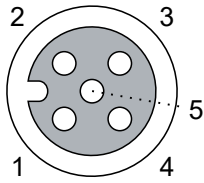


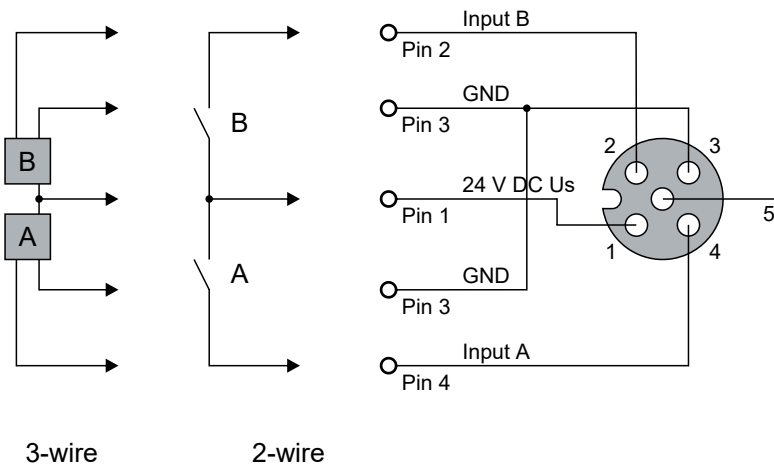
Fig. 13: M12 socket, 5-pin

Pin	Symbol	Description
1	+24 V U _s	Sensor supply: 24 V _{DC} from U _s
2	Input B	Digital input
3	GND	GND _s
4	Input A	Digital input
5	n.c.	-

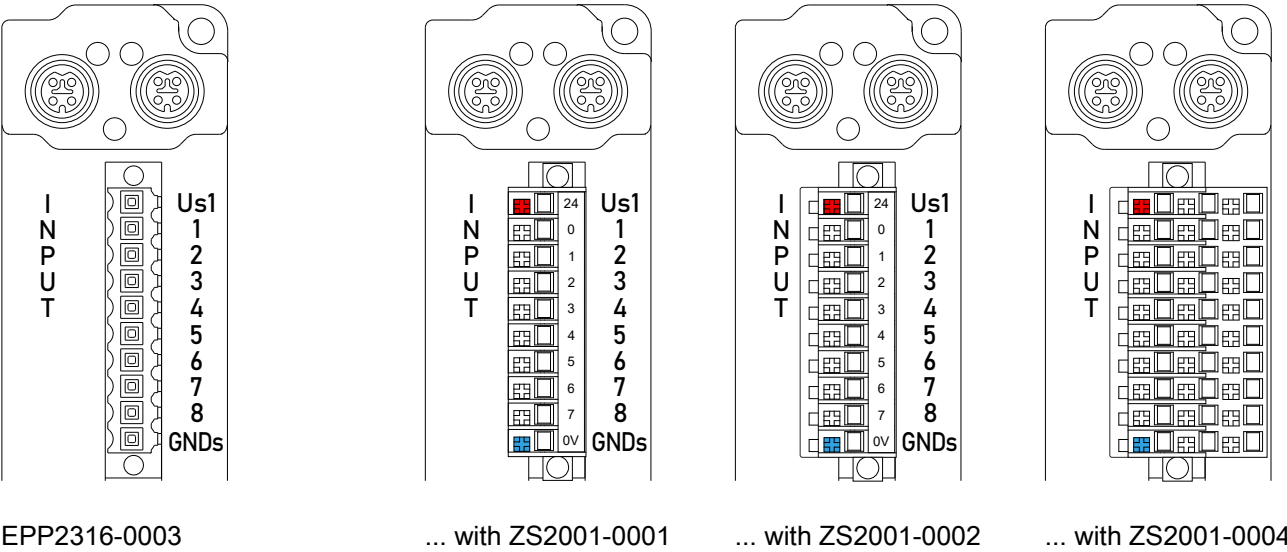
Use the output voltage at pin 1 as supply voltage for sensors. Make sure that the sum of the supply currents of all connected sensors does not exceed the sum current of 0.5 A.

Light emitting diodes indicate the signal state of the inputs.

Connection examples



4.4.3 ZS2001 digital inputs



The ZS2001 connectors are not included in the scope of delivery. See chapter [Accessories \[► 153\]](#).

NOTICE

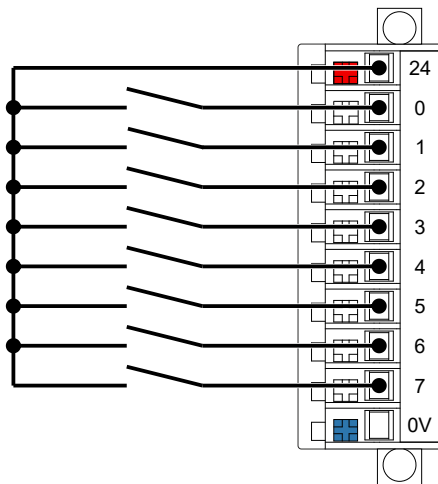
Different pin numbering
Danger of confusion: The pins are numbered differently on the box than on the ZS2001.

Pin	Imprint on the ZS2001	Description
Us1	24	Sensor power supply: 24 V _{DC} from U _s
1	0	Input 1
2	1	Input 2
3	2	Input 3
4	3	Input 4
5	4	Input 5
6	5	Input 6
7	6	Input 7
8	7	Input 8
GNDs	0 V	GND _s

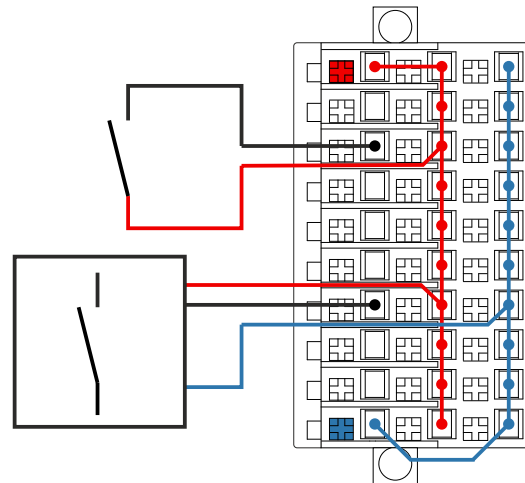
Use the output voltage Us1 as supply voltage for the sensors. Make sure that the total of the supply currents of all connected sensors does not exceed the total current of 0.5 A.

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 \[► 123\]](#).

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.

4.4.4 Digital inputs D-sub 25

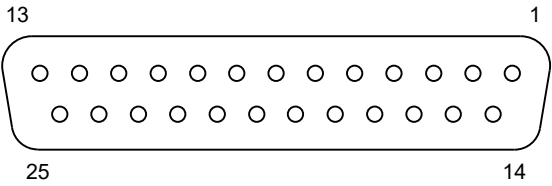
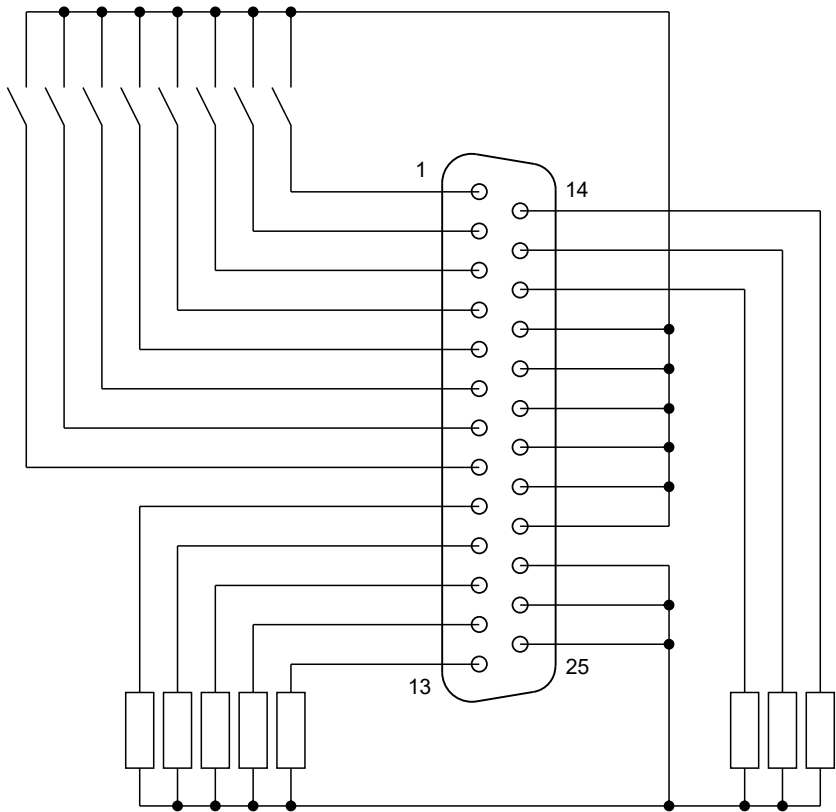


Fig. 14: D-sub socket, 25-pin

Pin	EPP2316-0008
1	Input 1
2	Input 2
3	Input 3
4	Input 4
5	Input 5
6	Input 6
7	Input 7
8	Input 8
9	Output 1
10	Output 2
11	Output 3
12	Output 4
13	Output 5
14	Output 6
15	Output 7
16	Output 8
17	U _{S1}
18	U _{S1}
19	U _{S1}
20	U _{P1}
21	U _{P1}
22	U _{P1}
23	GND _S
24	GND _P
25	GND _P

Connection example for EPP2316-0008



4.5 Digital outputs

4.5.1 Digital outputs M8

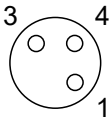


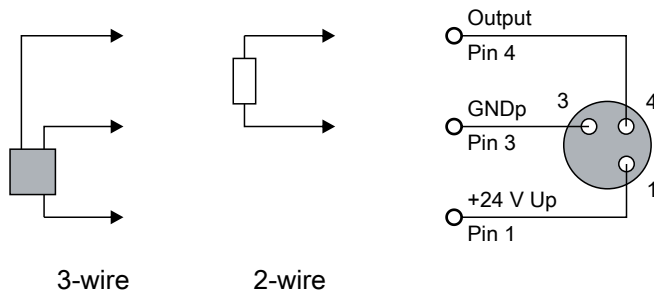
Fig. 15: M8 socket, 3-pin

Pin	Symbol	Description
1	+24 V Up	Auxiliary voltage output: 24 V _{DC} from U _P
3	GND _p	GND _P
4	Output	Digital output

The outputs are short-circuit proof and protected against inverse connection.

LEDs indicate the signal state of the outputs.

Connection examples



4.5.2 Digital outputs M12

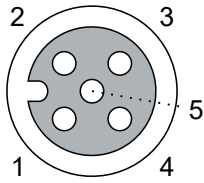


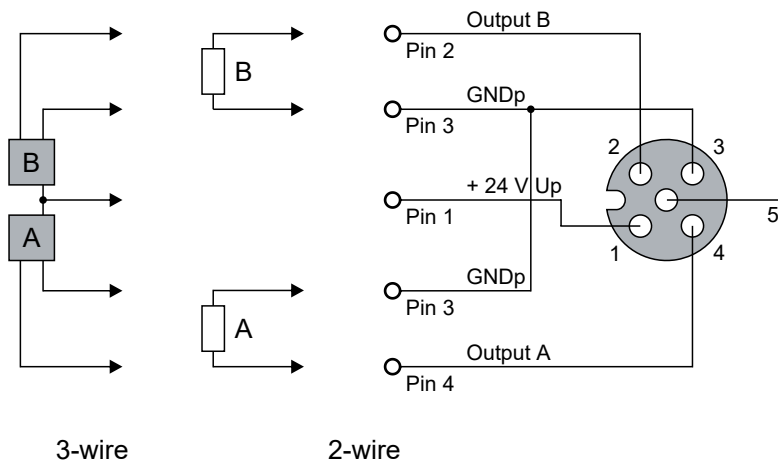
Fig. 16: M12 socket

Pin	Symbol	Description
1	+24 V Up	Auxiliary voltage output: 24 V _{DC} from U _P
2	Output B	Digital output
3	GNDp	GND _P
4	Output A	Digital output
5	n.c.	-

The outputs are short-circuit proof and protected against inverse connection.

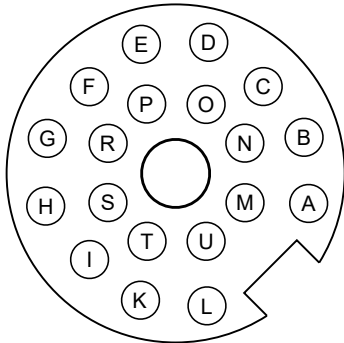
LEDs indicate the signal state of the outputs.

Connection examples



4.5.3 M16 sockets

Pin assignment



Pin	Description
A	Channel 1, Output 1
B	Channel 1, Output 2
C	Channel 1, Output 3
D	Channel 1, Output 4
E	Channel 1, Output 5
F	Channel 1, Output 6
G	Channel 1, Output 7
H	Channel 1, Output 8
I	Channel 2, Output 1
K	Channel 2, Output 2
L	Channel 2, Output 3
M	GND
N	Channel 2, Output 4
O	Channel 2, Output 5
P	Channel 2, Output 6
R	Channel 2, Output 7
S	Channel 2, Output 8
T	-
U	GND

4.5.4 Digital outputs D-sub 9

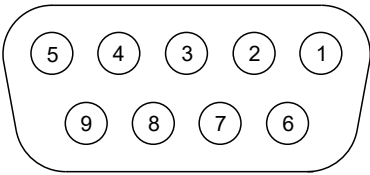


Fig. 17: D-sub socket, 9-pin

Pin	Description
1	Output 1
2	Output 2
3	Output 3
4	Output 4
5	Output 5
6	Output 6
7	Output 7
8	Output 8
9	GND _p

4.5.5 Digital outputs D-sub 25

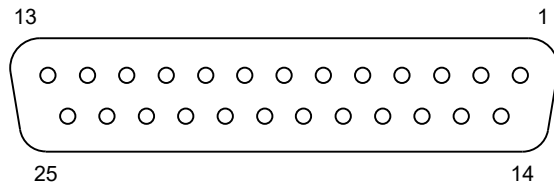
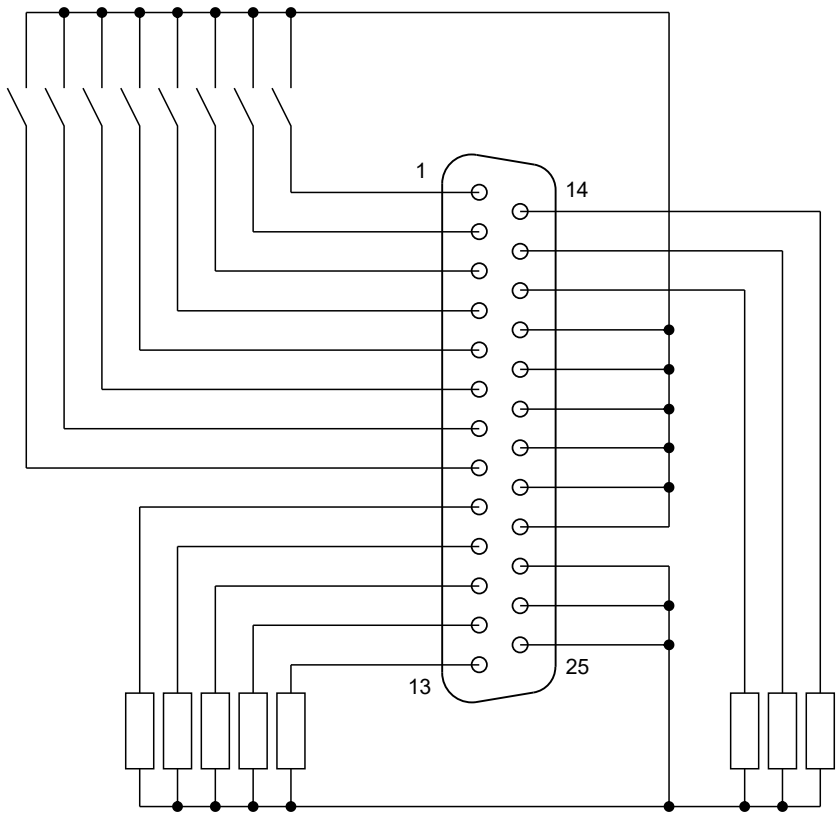


Fig. 18: D-sub socket, 25-pin

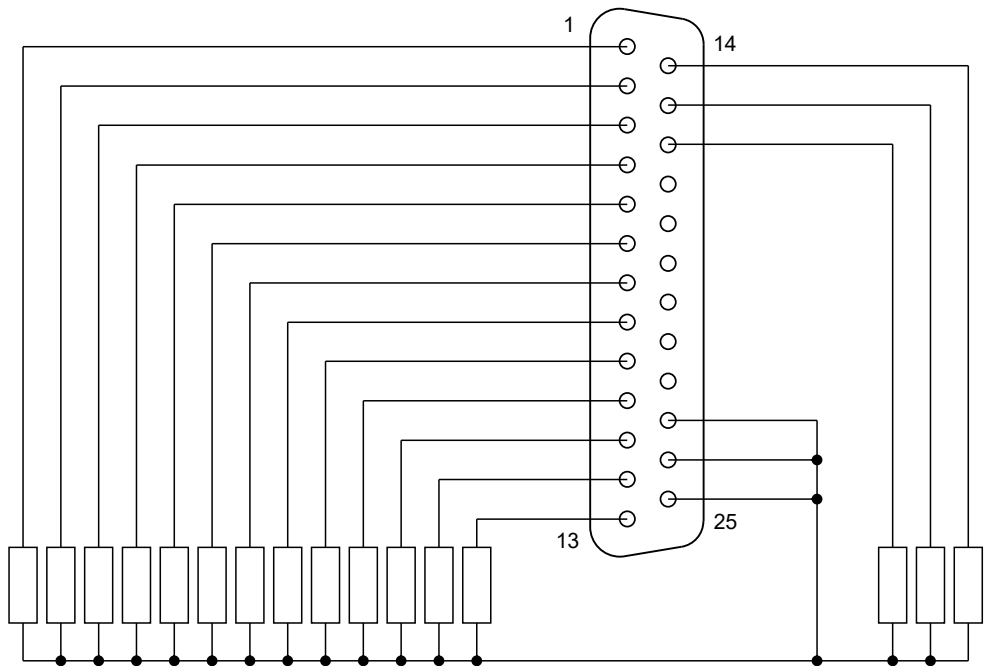
Pin	EPP2316-0008	EPP2816-0008	EPP2817-0008
1	Input 1	Channel 1, Output 1	Channel 1, Output 1
2	Input 2	Channel 1, Output 2	Channel 1, Output 3
3	Input 3	Channel 1, Output 3	Channel 1, Output 5
4	Input 4	Channel 1, Output 4	Channel 1, Output 7
5	Input 5	Channel 1, Output 5	Channel 2, Output 1
6	Input 6	Channel 1, Output 6	Channel 2, Output 3
7	Input 7	Channel 1, Output 7	Channel 2, Output 5
8	Input 8	Channel 1, Output 8	Channel 2, Output 7
9	Output 1	Channel 2, Output 1	Channel 3, Output 1
10	Output 2	Channel 2, Output 2	Channel 3, Output 3
11	Output 3	Channel 2, Output 3	Channel 3, Output 5
12	Output 4	Channel 2, Output 4	Channel 3, Output 7
13	Output 5	Channel 2, Output 5	GND _P
14	Output 6	Channel 2, Output 6	Channel 1, Output 2
15	Output 7	Channel 2, Output 7	Channel 1, Output 4
16	Output 8	Channel 2, Output 8	Channel 1, Output 6
17	U _{S1}	U _{P1}	Channel 1, Output 8
18	U _{S1}	U _{P1}	Channel 2, Output 2
19	U _{S1}	U _{P1}	Channel 2, Output 4
20	U _{P1}	U _{P1}	Channel 2, Output 6
21	U _{P1}	U _{P1}	Channel 2, Output 8
22	U _{P1}	U _{P1}	Channel 3, Output 2
23	GND _S	GND _P	Channel 3, Output 4
24	GND _P	GND _P	Channel 3, Output 6
25	GND _P	GND _P	Channel 3, Output 8

4.5.5.1 Connection examples

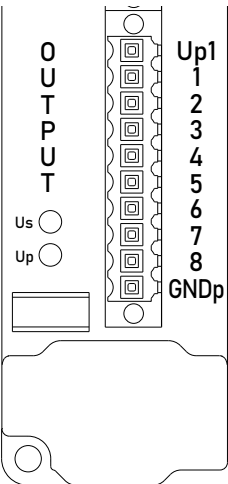
EPP2316-0008



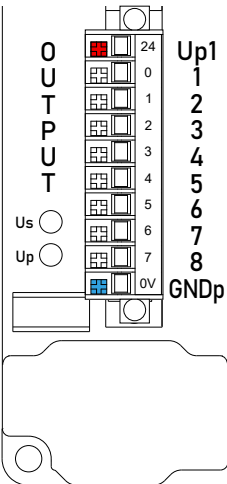
EPP2816-0008



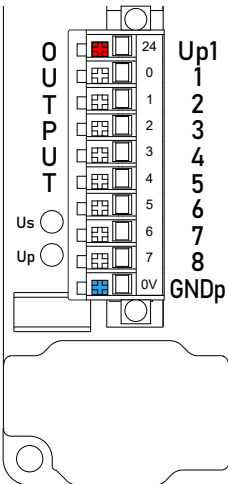
4.5.6 Digital outputs ZS2001 (EPP2316-0003)



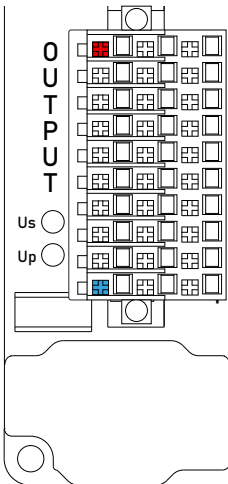
EPP2316-0003



... with ZS2001-0001



... with ZS2001-0002



... with ZS2001-0004

The ZS2001 connectors are not included in the scope of delivery. See chapter [Accessories](#) [► 153].

NOTICE

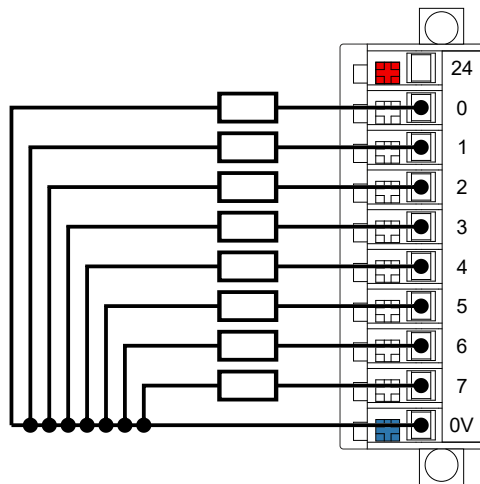
Different pin numbering

Danger of confusion: The pins are numbered differently on the box than on the ZS2001.

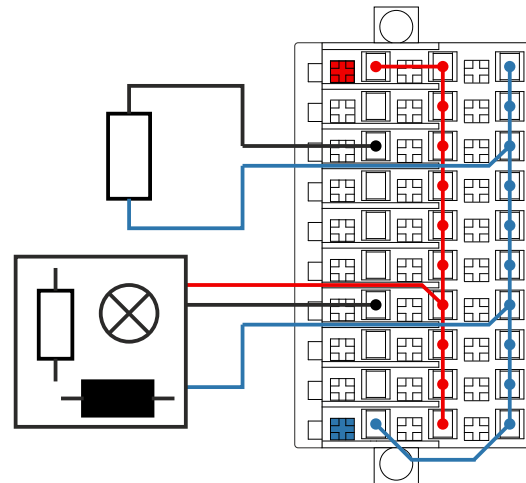
Pin	Imprint on the ZS2001	Description
Up1	24	Auxiliary voltage output: 24 V _{DC} from U _P
1	0	Output 1
2	1	Output 2
3	2	Output 3
4	3	Output 4
5	4	Output 5
6	5	Output 6
7	6	Output 7
8	7	Output 8
GNDp	0 V	GND _P

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](#) [► 133].

Connection examples



ZS2001-0001
ZS2002-0002

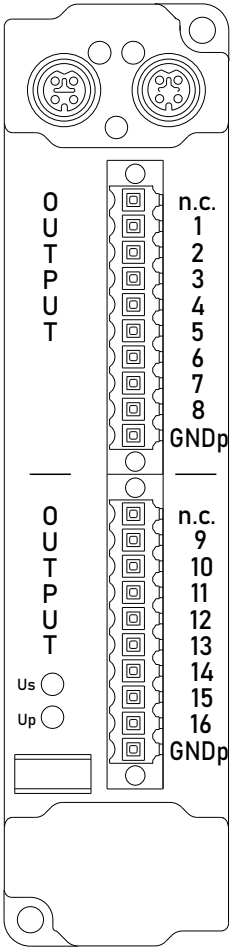


ZS2001-0004

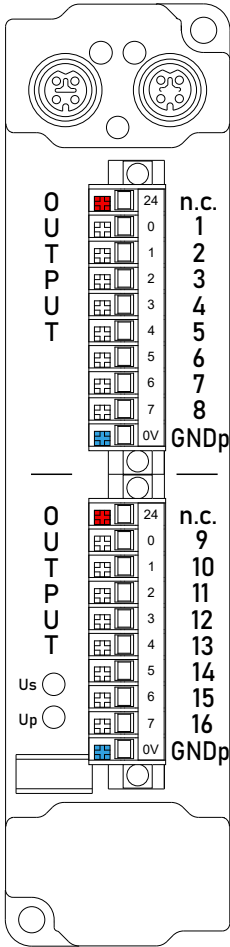
The diagram shows the connection of 8 actuators in 1-wire technique and one actuator each in 2-wire and 3-wire technique.

Please note for connector ZS2001-0004: two bridges (24 V and 0 V) are required to supply the terminal points for 2-wire and 3-wire connection technology.

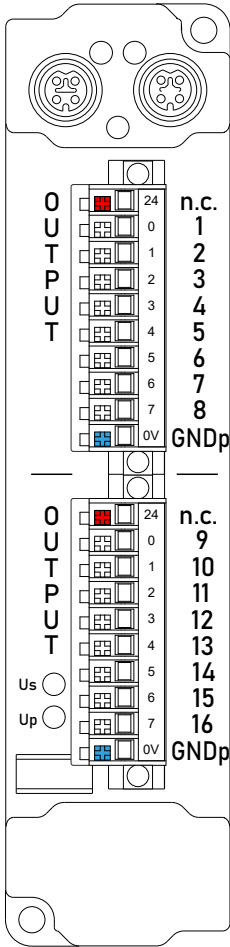
4.5.7 Digital outputs ZS2001 (EPP2816-0003)



EPP2816-0003



... with 2x ZS2001-0001



... with 2x ZS2001-0002

The ZS2001 connectors are not included in the scope of delivery. See chapter [Accessories](#) [► 153].

NOTICE

Different pin numbering

Danger of confusion: The pins are numbered differently on the box than on the ZS2001.

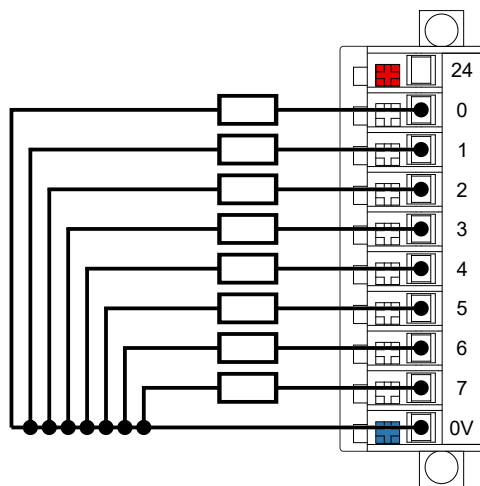
Upper connector: Channel 1

Pin	Imprint on the ZS2001	Description
n.c.	24	-
1	0	Output 1
2	1	Output 2
3	2	Output 3
4	3	Output 4
5	4	Output 5
6	5	Output 6
7	6	Output 7
8	7	Output 8
GNDp	0 V	GND _p

Lower connector: Channel 2

Pin	Imprint on the ZS2001	Description
n.c.	24	-
9	0	Output 1
10	1	Output 2
11	2	Output 3
12	3	Output 4
13	4	Output 5
14	5	Output 6
15	6	Output 7
16	7	Output 8
GNDp	0 V	GND _P

Connection example



ZS2001-0001

ZS2002-0002

The graphic shows the connection of 8 actuators in 1-wire technique.

4.6 Digital inputs/outputs

The EPP2334, EPP2338, EPP2339 and EPP2349 have digital channels which can be operated as inputs or outputs.

If the channels are operated as digital inputs, the modules record the binary control signals from the process level and transport them to the higher-level automation device. The sensors are supplied from the load voltage U_P .

If the channels are operated as a digital output, the modules forward the binary control signals of the automation device to the actuators at the process level. The outputs are short-circuit proof and protected against polarity reversal.

4.6.1 Digital inputs/outputs M8

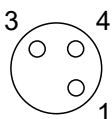
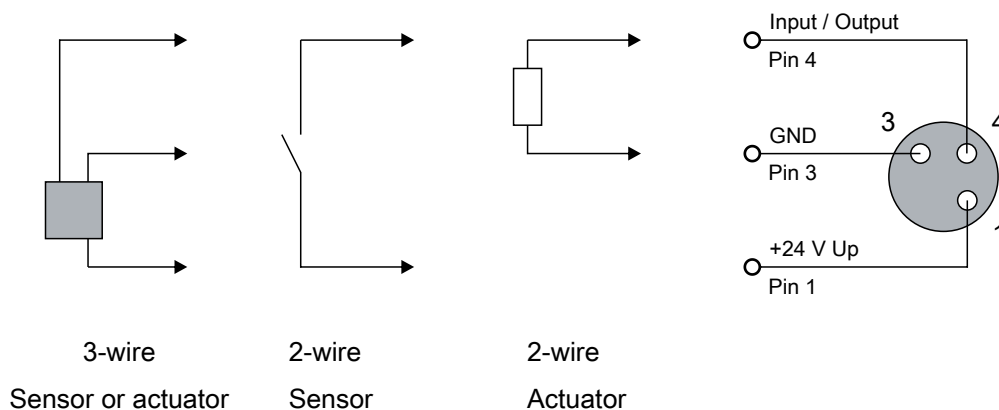


Fig. 19: M8 socket, 3-pin

Pin	Symbol	Description
1	+24 V U_P	Sensor power supply: 24 V _{DC} from U_P
3	GND	GND
4	Input / Output	Digital input or output

Use the output voltage at pin 1 as supply voltage for sensors. Make sure that the sum of the supply currents of all connected sensors does not exceed the sum current of 0.5 A.

Connection examples



4.6.2 Digital inputs/outputs M12

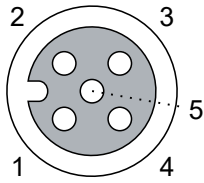
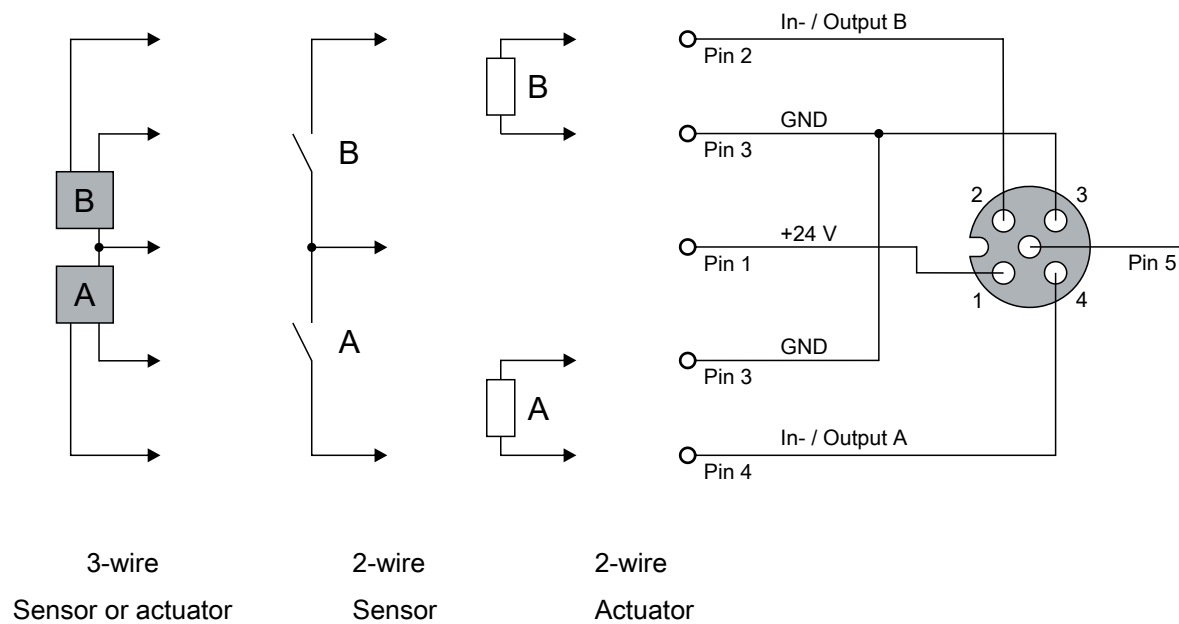


Fig. 20: M12 socket, 5-pin

Pin	Name	Description
1	+24 V Up	Sensor power supply: 24 V _{DC}
2	Input/output B	Digital input or output
3	GNDp	GND
4	Input/output A	Digital input or output
5	n.c.	-

Use the output voltage at pin 1 as supply voltage for sensors. Make sure that the sum of the supply currents of all connected sensors does not exceed the sum current of 0.5 A.

Connection examples



4.6.2.1 EPP2338-2002

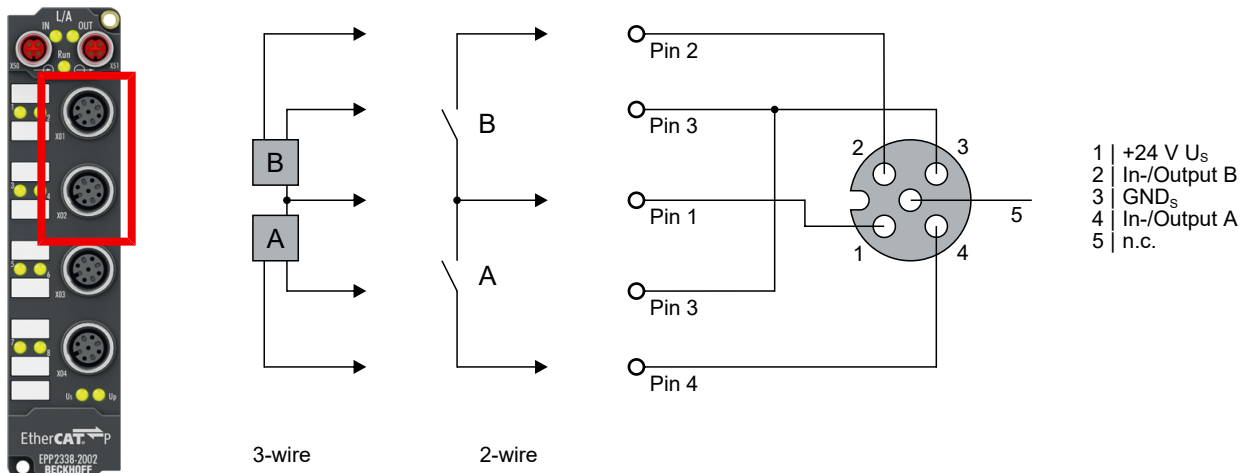
There are two channels on each M12 socket. Each channel can be operated individually as a digital input or as a digital output.

All channels are functionally identical, but are connected in groups to different potentials that are electrically isolated from each other:

- The channels at X01 and X02 are at U_S/GND_S potential.
Sensors, input drivers and output drivers are supplied from U_S .
- The channels at X03 and X04 are at U_P/GND_P potential.
Sensors, input drivers and output drivers are supplied from U_P .

The following figures show connection examples and pin assignments for the two groups.

X01/X02 as digital input



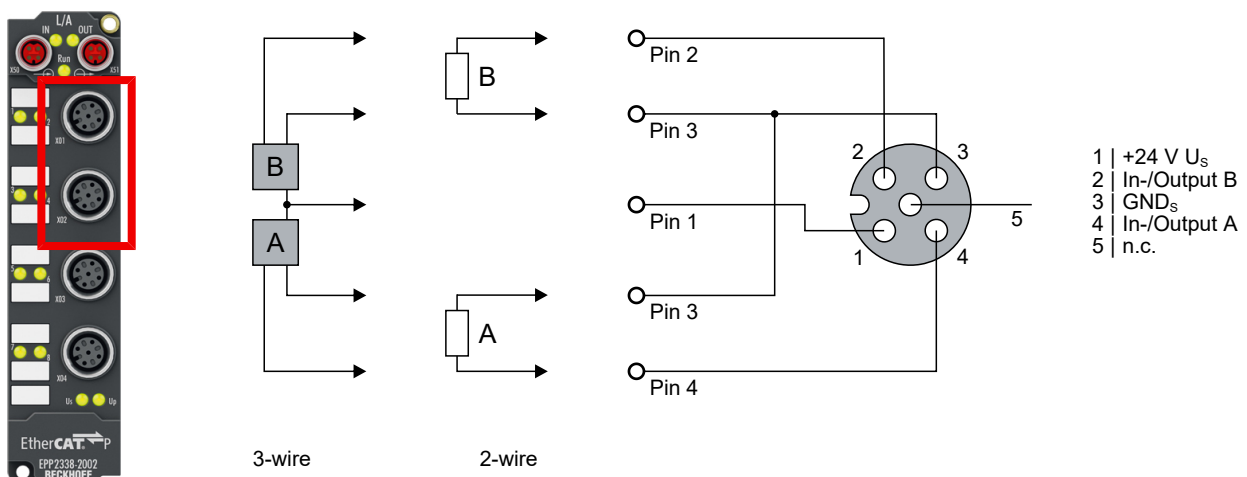
X01/X02 as digital output

NOTICE

Digital outputs active despite shutdown of U_P (X01, X02)

The digital inputs/outputs of EtherCAT Box modules are usually supplied from U_P . This enables the collective shutdown of all outputs by switching U_P off.

The digital outputs at X01 and X02 of the EP2338-2002 are supplied from U_S . They therefore remain active even if U_P is switched off externally.



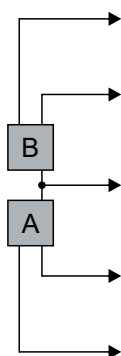
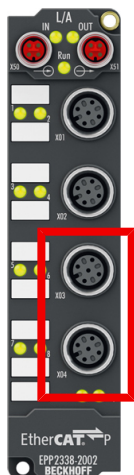
X03/X04 as digital input

NOTICE

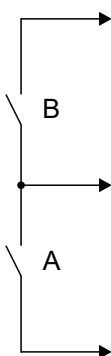
Digital inputs without function if U_p is missing (X03, X04)

The digital inputs of EtherCAT Box modules are usually supplied from U_s .
The digital inputs at X03 and X04 of the EP2338-2002 are supplied from U_p .

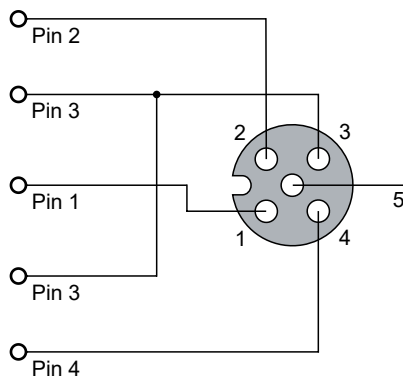
If the supply voltage U_p is missing, a constant low-level of the digital inputs at X03 and X04 is displayed in the process data, even if a high level is present.



3-wire

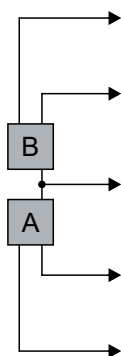
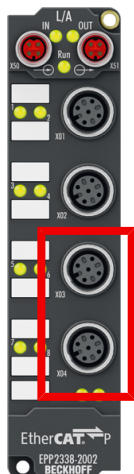


2-wire



- | | | |
|---|--|------------------|
| 1 | | +24 V U_p |
| 2 | | In-/Output B |
| 3 | | GND _p |
| 4 | | In-/Output A |
| 5 | | n.c. |

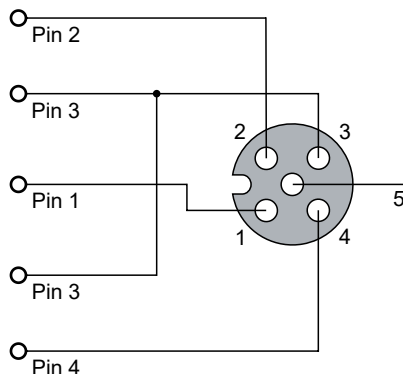
X03/X04 as digital output



3-wire

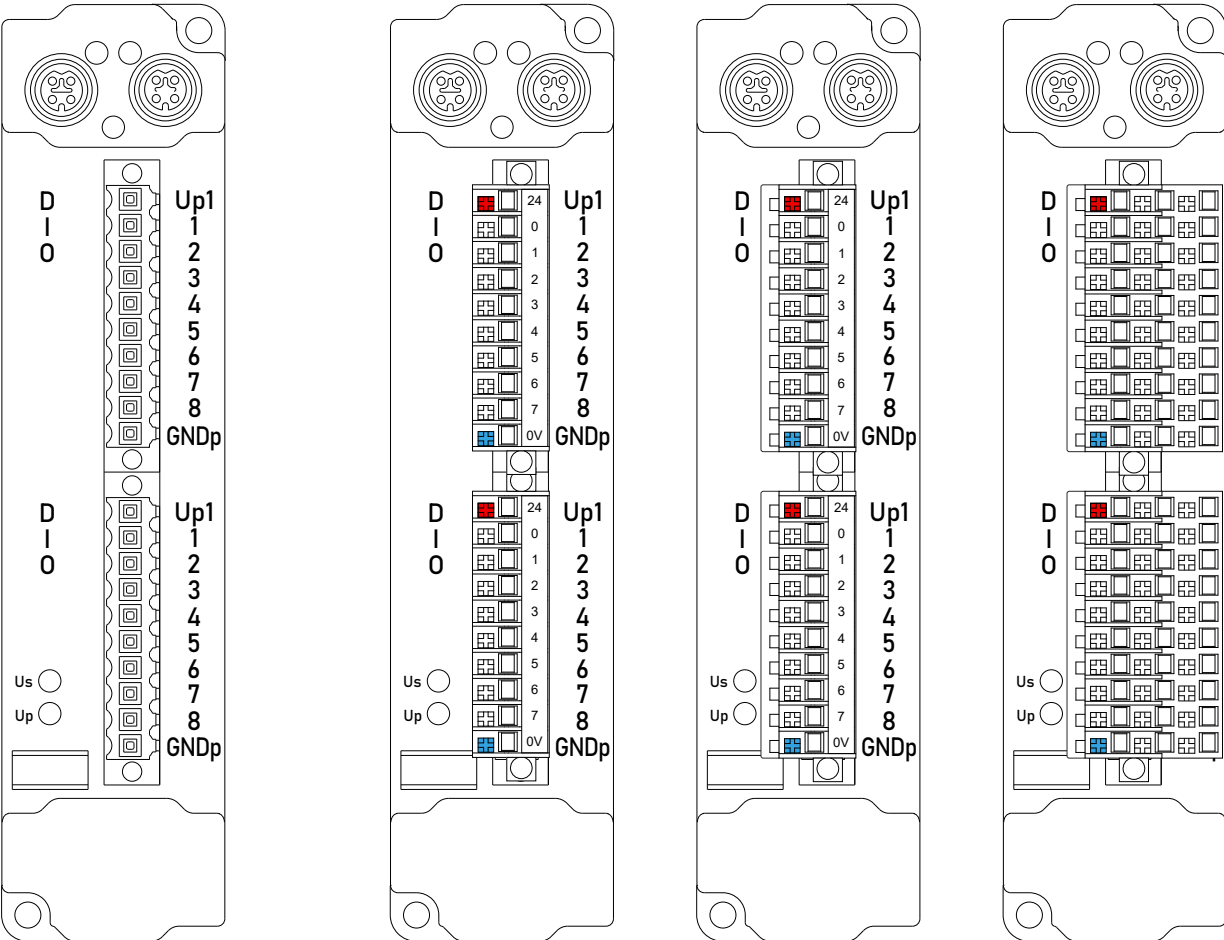


2-wire



- | | | |
|---|--|------------------|
| 1 | | +24 V U_p |
| 2 | | In-/Output B |
| 3 | | GND _p |
| 4 | | In-/Output A |
| 5 | | n.c. |

4.6.3 Digital inputs/outputs ZS2001



EPP2339-0003 ... with 2x ZS2001-0001 ... with 2x ZS2001-0002 ... with 2x ZS2001-0004

The ZS2001 connectors are not included in the scope of delivery. See chapter [Accessories](#) [► 153].

NOTICE

Different pin numbering

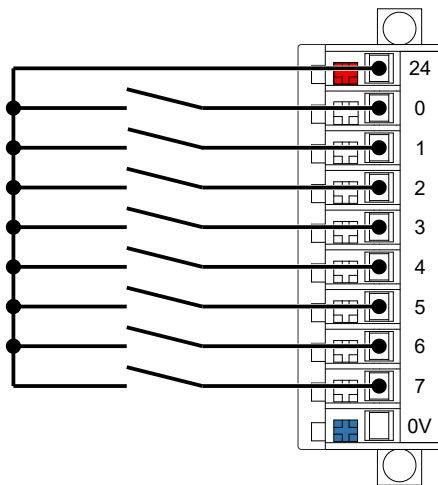
Danger of confusion: The pins are numbered differently on the box than on the ZS2001.

Pin	Imprint on the ZS2001	Description
Up1	24	Sensor power supply: 24 V _{DC} from U _P
1	0	Input/output 1
2	1	Input/output 2
3	2	Input/output 3
4	3	Input/output 4
5	4	Input/output 5
6	5	Input/output 6
7	6	Input/output 7
8	7	Input/output 8
GNDp	0 V	GND _P

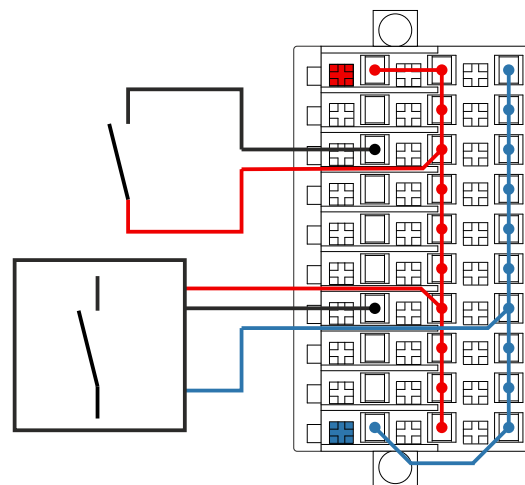
Use the output voltage Up1 as supply voltage for the sensors. Make sure that the total of the supply currents of all connected sensors does not exceed the total current of 0.5 A.

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](#) [► 141].

Connection examples: Inputs



ZS2001-0001
ZS2001-0002

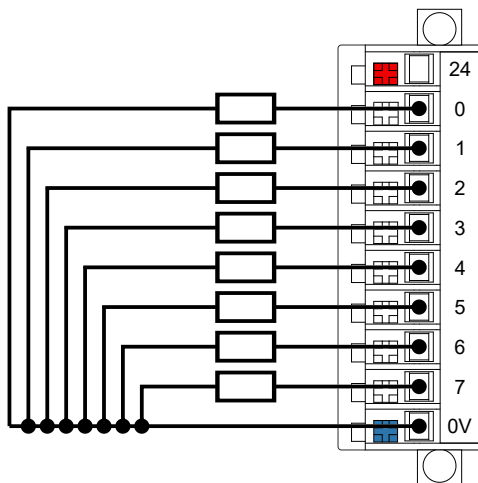


ZS2001-0004

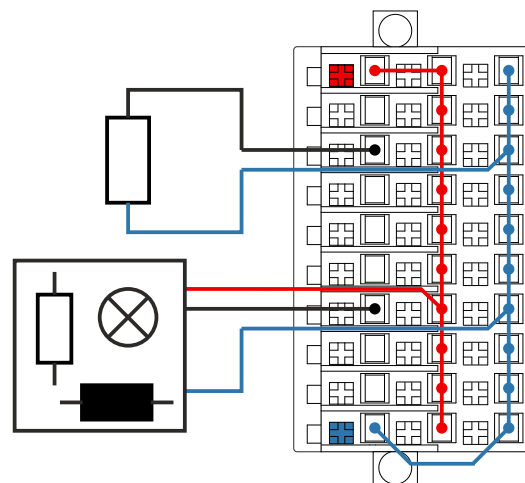
The diagram shows the connection of 8 sensors in single-wire technology and one sensor each in two-wire and three-wire technology.

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.

Connection examples: Outputs



ZS2001-0001
ZS2002-0002



ZS2001-0004

The diagram shows the connection of 8 actuators in 1-wire technique and one actuator each in 2-wire and 3-wire technique.

Please note for connector ZS2001-0004: two bridges (24 V and 0 V) are required to supply the terminal points for 2-wire and 3-wire connection technology.

4.7 Relay

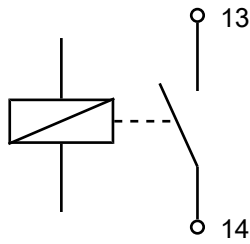


Fig. 21: Relay connections

Pin assignment

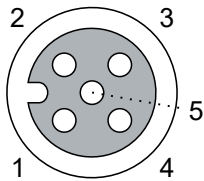


Fig. 22: M12 socket

Pin	Function	Core color ¹⁾
1	24 V _{DC} U _P	brown
2	Relay connection 13	white
3	GND _P	blue
4	Relay connection 14	black
5	n.c.	grey

¹⁾ The core colors apply to M12 cables from Beckhoff:

- ZK2000-5xxx
- ZK2000-6xxx
- ZK2000-7xxx

Status LEDs

There are two LEDs next to each M12 socket. The LED on the left turns green when the relay contact is closed. The LED on the right has no function.



Fig. 23: Status LEDs of M12 sockets

4.8 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. 24: UL label

4.9 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/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 Behavior of the outputs in case of a fault (EPP2316 and EPP281x only)

EPP2316 and EPP281x have diagnostic functions. They can detect faults and automatically react to them. The following chapters describe the configuration of the behavior in case of various types of fault.

5.2.1 Behavior in case of network failure

You can use bit 8000:0n (Safe State Active) to specify whether channel n should assume a certain value (Safe State Value) when data transmission is interrupted.

With bit 8001:0n (Safe State Value) you define this value for channel n.

● Safe State Value during network start-up

i The network transmits output process data only in the network states Save-Operational (SAFE-OP) and Operational (OP). Also at the network states INIT, Pre-Operational (PRE-OP) and BOOT passed through during network start-up no output process data is transmitted. If Safe State is activated for an output, this output also adopts the specified value during network start-up.

8000:0 - DIG Safe state active Ch.1

● Observe the maximum short-circuit current!

i When dimensioning the power supply unit and choosing the fuses, observe that the short-circuit current is approximately 1.7 A.

The screenshot shows the TwinCAT Project4 software interface. On the left is the 'Solution Explorer' showing the project structure for 'TwinCAT Project1'. The 'I/O' section is expanded, showing 'Devices' and 'Box 1'. The 'Box 1' section is expanded, showing 'DIG Outputs'. The main window displays the 'General' tab for the 'DIG Safe state active Ch.1' parameter. The 'Update List' section shows 'Auto Update' unchecked, 'Single Update' checked, and 'Show Offline Data' unchecked. The 'Advanced...' button is visible. The 'Add to Startup...' button is also visible. The 'Online Data' button is visible. The 'Module OD (AoE Port):' field is set to 0. The table below shows the configuration for the DIG Safe state active Ch.1 parameter.

Index	Name	Flags	Value	Unit
7000:0	DIG Outputs Ch.1	RO	> 8 <	
8000:0	DIG Safe state active Ch.1	RW	> 8 <	
8000:01	Output 1	RW	TRUE	
8000:02	Output 2	RW	TRUE	
8000:03	Output 3	RW	TRUE	
8000:04	Output 4	RW	TRUE	
8000:05	Output 5	RW	TRUE	
8000:06	Output 6	RW	TRUE	
8000:07	Output 7	RW	TRUE	
8000:08	Output 8	RW	TRUE	
8001:0	DIG Safe state value Ch.1	RW	> 8 <	
8001:01	Output 1	RW	FALSE	
8001:02	Output 2	RW	FALSE	
8001:03	Output 3	RW	FALSE	
8001:04	Output 4	RW	FALSE	
8001:05	Output 5	RW	FALSE	
8001:06	Output 6	RW	FALSE	
8001:07	Output 7	RW	FALSE	
8001:08	Output 8	RW	FALSE	
F000:0	Modular device profile	RO	> 2 <	
F008	Code word	RW	0x00000000 (0)	

8000:01 to 8000:08 - DIG Safe state active Ch.1, Output 1 to Output 8 (default: TRUE)

Specifies whether or not the outputs should adopt a safe state in the case of a network failure.

Value	Meaning
FALSE	Safe state disabled
TRUE	Safe state enabled

8001:01 to 8001:08 - DIG Safe state value Ch.1, Output 1 to Output 8 (default: FALSE)

Specifies what the safe state is.

Value	Meaning
FALSE	Output switched off
TRUE	Output switched on

5.2.2 Behavior in case of short circuit

You can set the behavior of the outputs in case of short circuit in the CoE object F800 "DO Settings".

F800:0 - DO Settings (Safe State Value)

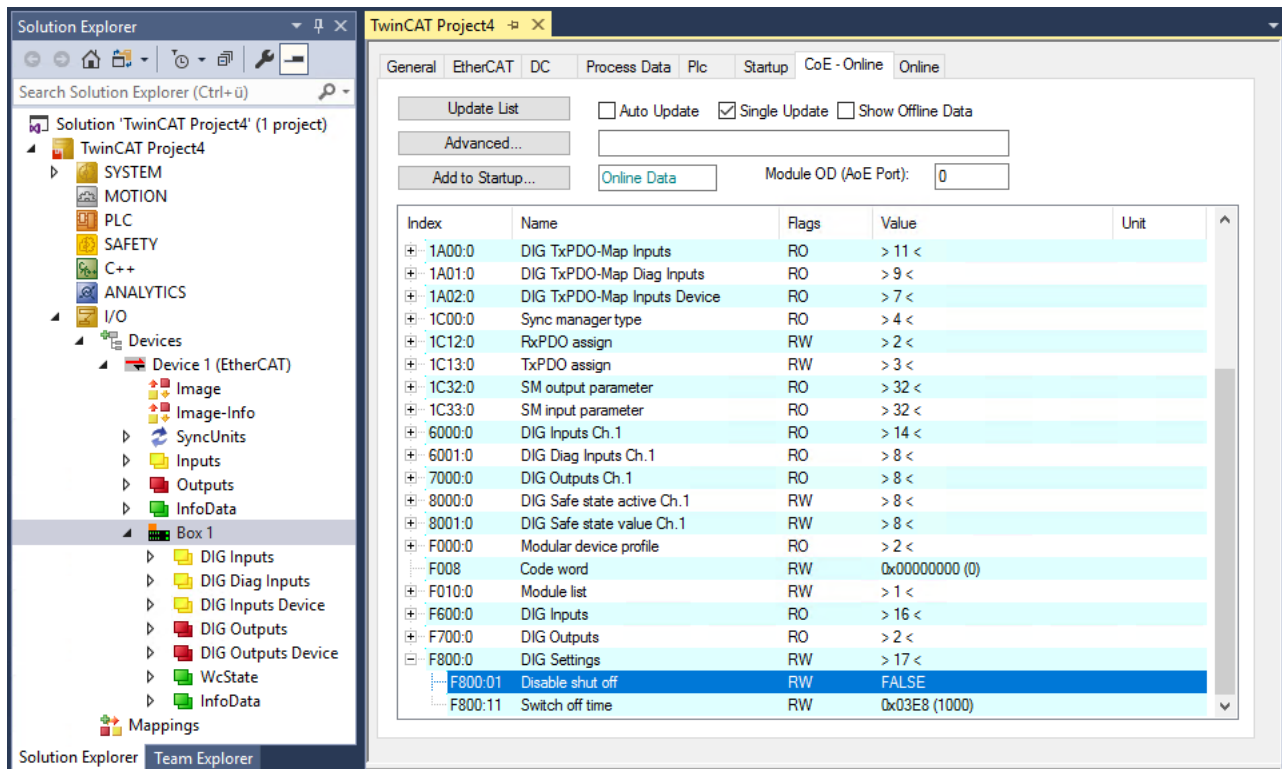


Table 1: F800:01 - Disable shut off (default: FALSE)

Value	Meaning
FALSE	In the event of a short circuit at one output, all outputs of the module are switched off. This disabling can be removed through the process data value <i>Reset Outputs</i> .
TRUE	In the event of a short circuit at an output, only this output of the module is switched off. After rectifying the short circuit, this output is automatically enabled again.

F800:11 - Switch off time (default: 0x03E8, 1000_{dec})

Here you can enter a time in milliseconds. During this time, the module checks whether the short circuit has been eliminated by switching itself on again.

Default = 1000 ms (depending on module type and internal cycle time). Errors are only displayed after this time.

5.2.3 Behavior in case of lack of supply voltage

The digital outputs are supplied from the supply voltage U_p . If the supply voltage U_p is not present, the digital outputs cannot output a high level.

If an output is set and does not output a high level, this is detected as a fault. On expiry of the fault reaction time, the fault is reported in the process data:

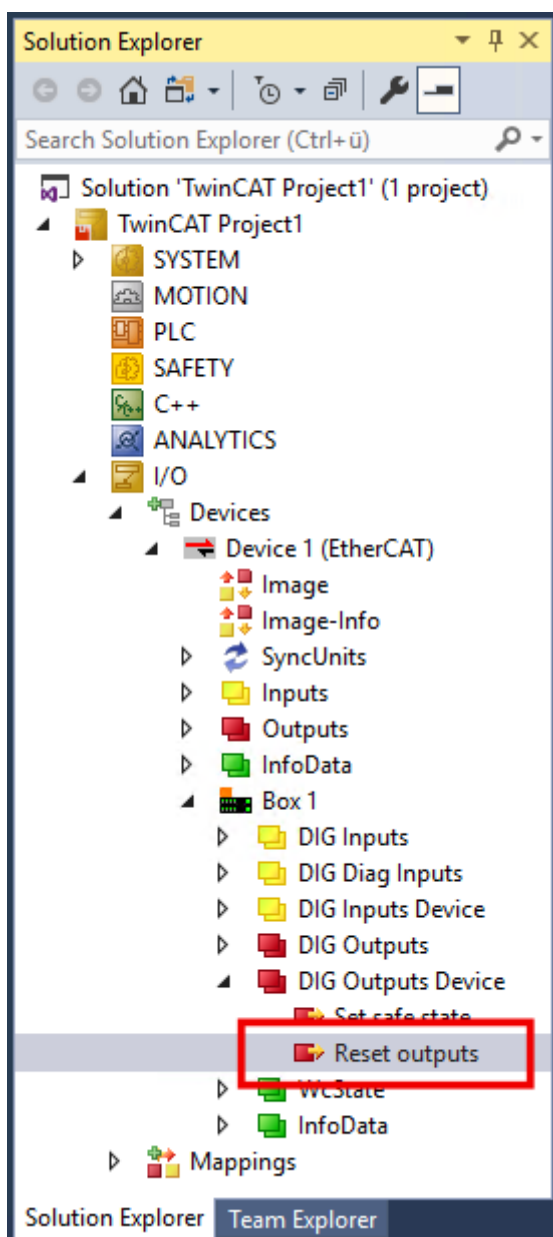
- The "Diag Input x" bit of the output is set to "1".
- The "Error Channel y" bit of the channel to which the output belongs is set to "1".

In the factory setting, all outputs of a channel in which a fault has occurred are disabled. The outputs also remain disabled when U_p is switched on again.

Re-enabling outputs

There are two ways to re-enable disabled outputs:

- Manual: Apply a positive edge to the variable "Reset outputs".



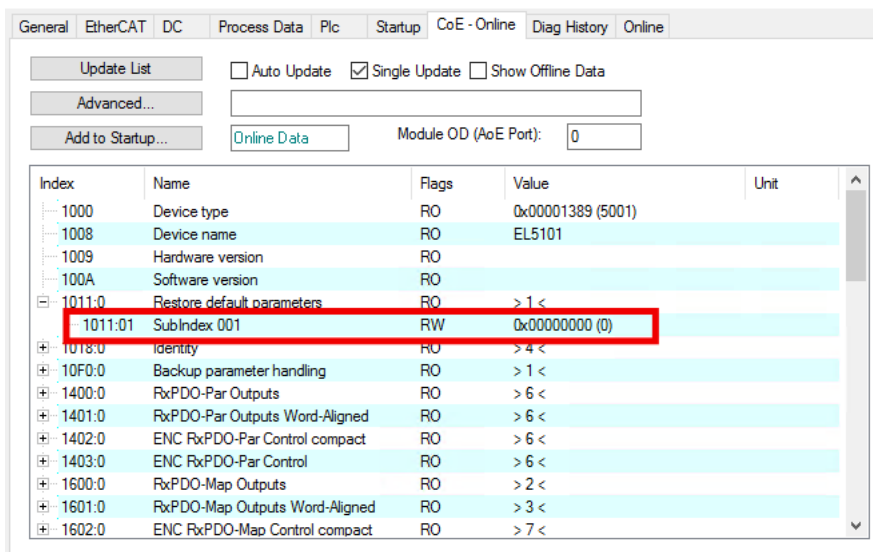
- Automatic: Set the parameter F800:01 to TRUE. All outputs will then be re-enabled as soon as U_p is switched on.

Note: F800:01 also influences the [behavior in case of short circuit](#) (► 148).

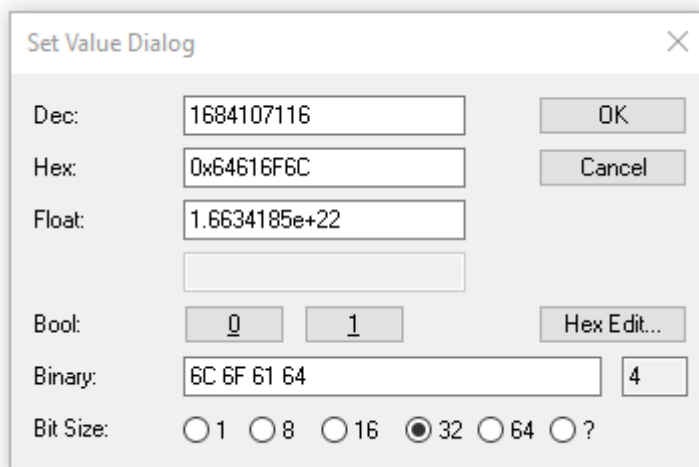
5.3 Restore the delivery state

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.

5.4 Decommissioning

WARNING

Risk of electric shock!

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

6 Appendix

6.1 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

6.2 Accessories

Mounting

Ordering information	Description	Link
ZS5300-0011	Mounting rail	Website

Cables

A complete overview of pre-assembled cables can be found on the Beckhoff website: [Link](#).

Ordering information	Description	Link
ZK2000-2xxx-xxxx	Sensor cable M8, 3-pin	Website
ZK2000-6xxx-xxxx	Sensor cable M12, 4-pin	Website
ZK2000-7xxx-0xxx	Sensor cable M12, 4-pin + shield	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>.

6.3 Version identification of EtherCAT devices

6.3.1 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. "EL2872 with revision 0022 and serial number 01200815".
- The type, version and revision are read as decimal numbers, even if they are technically saved in hexadecimal.

6.3.2 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**

KK - week of production (CW, calendar week)

YY - year of production

FF - firmware version

HH - hardware version

Example with serial number 12 06 3A 02:

12 - production week 12

06 - production year 2006

3A - firmware version 3A

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

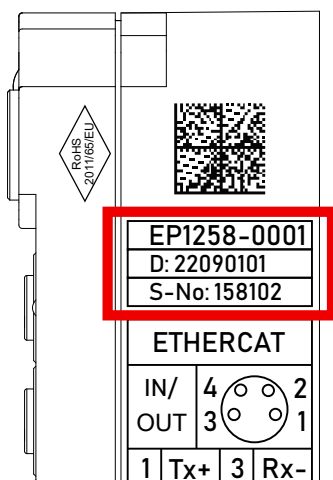


Fig. 25: EP1258-00001 IP67 EtherCAT Box with batch number/DateCode 22090101 and unique serial number 158102

6.3.3 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.

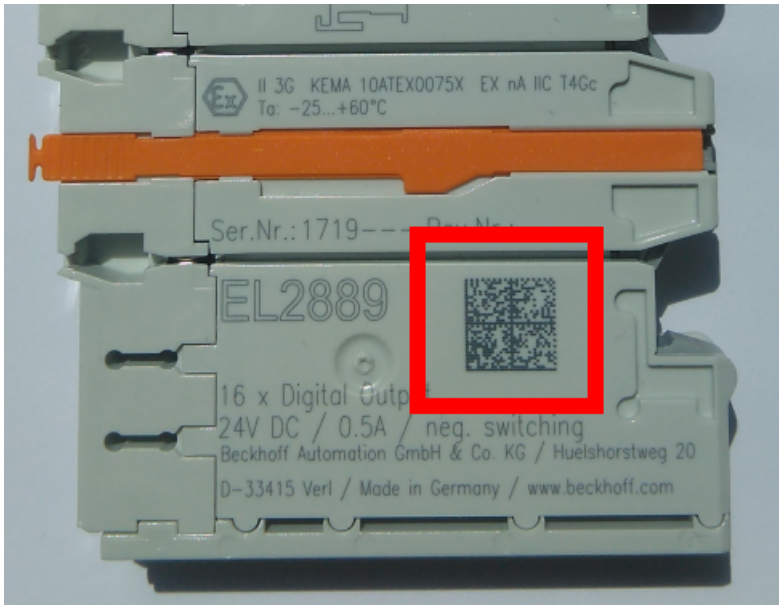


Fig. 26: BIC as data matrix code (DMC, code scheme ECC200)

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	1P 072222
2	Beckhoff Traceability Number (BTN)	Unique serial number, see note below	SBTN	12	SBTN k4p562d7
3	Article description	Beckhoff article description, e.g. EL1008	1K	32	1KEL 1809
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	2P 401503180016
6	ID/serial number	Optional: Present-day serial number system, e.g. with safety products	51S	12	51S 678294
7	Variant number	Optional: Product variant number on the basis of standard products	30P	12	30P F971, 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**SBTN**k4p562d7**1KEL**1809 **Q1** **51S**678294

Accordingly as DMC:



Fig. 27: Example DMC **1P**072222**SBTN**k4p562d7**1KEL**1809 **Q1** **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 documentation.

6.3.4 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.

The interface that the product can be electronically addressed by is crucial for the electronic readout.

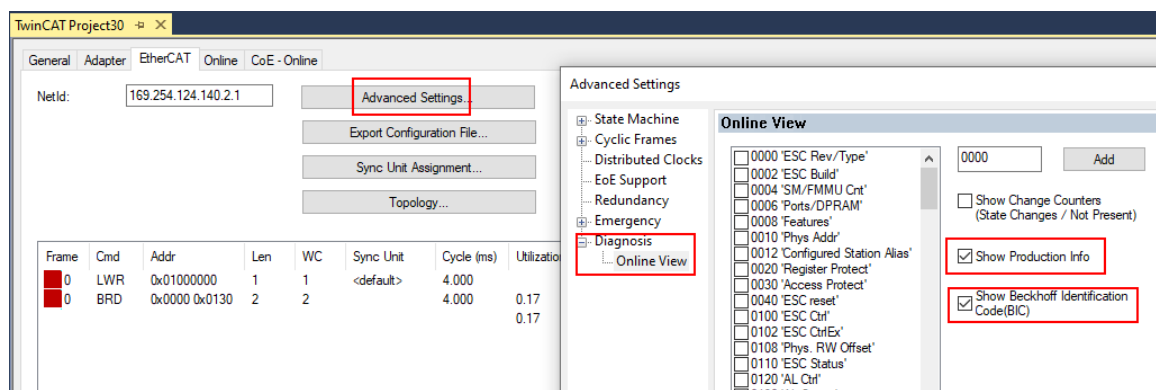
EtherCAT devices (IP20, IP67)

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

Beckhoff also stores the eBIC in the ESI-EEPROM. The eBIC was introduced into Beckhoff IO production (terminals, box modules) in 2020; as of 2023, implementation is largely complete.

The user can electronically access the eBIC (if present) 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 "Show Beckhoff Identification Code (BIC)" checkbox under EtherCAT → Advanced Settings → Diagnostics:



- The BTN and its contents are then displayed:

No	Addr	Name	State	CRC	Fw	Hw	Production Data	ItemNo	BTN	Description	Quantity	BatchNo	SerialNo
1	1001	Term 1 (EK1100)	OP	0, 0	0	0	—	—	—	—	—	—	—
2	1002	Term 2 (EL1018)	OP	0, 0	0	0	2020 KW36 Fr	072222	k4p562d7	EL1809	1	—	678294
3	1003	Term 3 (EL3204)	OP	0, 0	7	6	2012 KW24 Sa	—	—	—	—	—	—
4	1004	Term 4 (EL2004)	OP	0, 0	0	0	—	072223	k4p562d7	EL2004	1	—	678295
5	1005	Term 5 (EL1008)	OP	0, 0	0	0	—	—	—	—	—	—	—
6	1006	Term 6 (EL2008)	OP	0, 0	0	12	2014 KW14 Mo	—	—	—	—	—	—
7	1007	Term 7 (EK1110)	OP	0	1	8	2012 KW25 Mo	—	—	—	—	—	—

- Note: As shown in the figure, 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* for reading into the PLC are available in the Tc2_EtherCAT library from v3.3.19.0.
- EtherCAT devices with a CoE directory may also have the object 0x10E2:01 to display their own eBIC, which can also be easily accessed by the PLC:

- 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	1P158442SBTN0008jelp1KELM3704 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 preferentially introduced into stock products in the course of necessary firmware revision.
- From TwinCAT 3.1. build 4024.24, the functions *FB_EcCoEReadBIC* and *FB_EcCoEReadBTN* for reading into the PLC are available in the Tc2_EtherCAT library from v3.3.19.0
- The following auxiliary functions are available for processing the BIC/BTN data in the PLC in *Tc2_Uutilities* as of TwinCAT 3.1 build 4024.24
 - *F_SplitBIC*: The function splits the Beckhoff Identification Code (BIC) sBICValue into its components using known identifiers and returns the recognized substrings in the ST_SplittedBIC structure as a return value
 - *BIC_TO_BTN*: The function extracts the BTN from the BIC and returns it as a return value
- Note: If there is further electronic 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 written as an additional category in the ESI-EEPROM during device production. The structure of the ESI content is largely dictated by the ETG specifications, therefore the additional vendor-specific content is stored using a category in accordance with the ETG.2010. ID 03 tells all EtherCAT masters that they may not overwrite these data in the event of an update or restore the data after an ESI update.
The structure follows the content of the BIC, see here. The EEPROM therefore requires approx. 50..200 bytes of memory.
- 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 which each have 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.

6.4 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

Hotline: +49 5246 963 157
e-mail: support@beckhoff.com
web: www.beckhoff.com/support

Service

The Beckhoff Service Center supports you in all matters of after-sales service:

- on-site service
- repair service
- spare parts service
- hotline service

Hotline: +49 5246 963 460
e-mail: service@beckhoff.com
web: www.beckhoff.com/service

Headquarters Germany

Beckhoff Automation GmbH & Co. KG

Hülshorstweg 20
33415 Verl
Germany

Phone: +49 5246 963 0
e-mail: info@beckhoff.com
web: www.beckhoff.com

Trademark statements

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.

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20
33415 Verl
Germany
Phone: +49 5246 9630
info@beckhoff.com
www.beckhoff.com