BECKHOFF New Automation Technology

Documentation | EN

EPP4374-0002

EtherCAT P Box with analog inputs and outputs

2023-02-01 | Version: 1.3

Table of contents

1 Foreword

1.1 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.

Description of instructions

In this documentation the following instructions are used.
These instructions must be read carefully and followed without fail!

⚠ DANGER

Serious risk of injury!

Failure to follow this safety instruction directly endangers the life and health of persons.

⚠ WARNING

Risk of injury!

Failure to follow this safety instruction endangers the life and health of persons.

⚠ CAUTION

Personal injuries!

Failure to follow this safety instruction can lead to injuries to persons.

NOTE

Damage to environment/equipment or data loss

Failure to follow this instruction can lead to environmental damage, equipment damage or data loss.

Tip or pointer

This symbol indicates information that contributes to better understanding.

1.2 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.
It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

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

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Patent Pending

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

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

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1.3 Documentation issue status

Version	Comment
1.3	• EtherCAT P status LEDs updated
1.2	• Dimensions updated • UL requirements updated
1.1	• Front page updated • Structure update
1.0	• First release
0.1	• 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.

Documentation	Firmware	Hardware
1.1	04	03
1.0	04	03

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

Syntax of the batch number (D-number)

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

Further information on this topic: Version identification of EtherCAT devices [▶ 52].

2 Product group: EtherCAT P Box modules

EtherCAT P

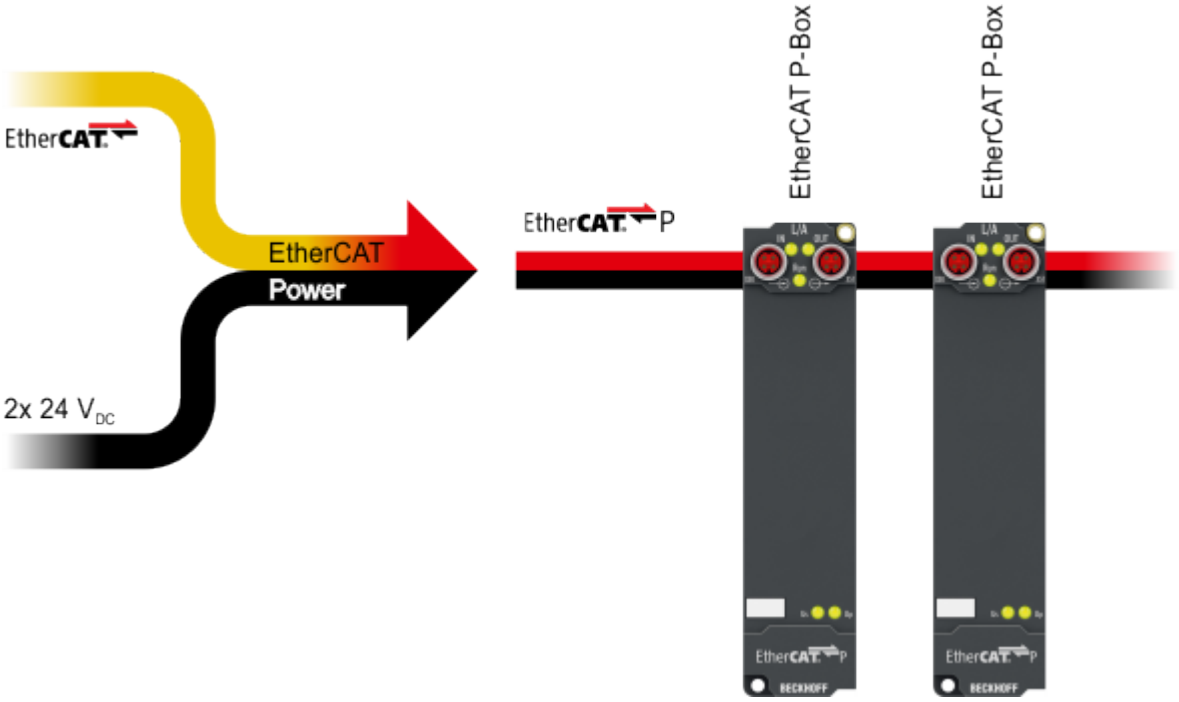
EtherCAT P supplements the EtherCAT technology with a process in which communication and supply voltages are transmitted on a common line. All EtherCAT properties are retained with this process.

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.

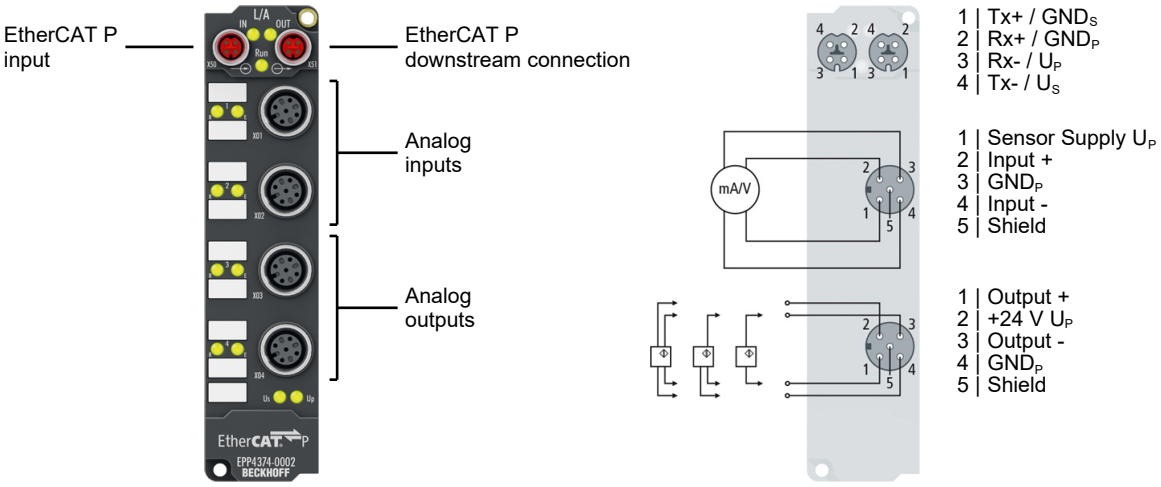


EtherCAT basics

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

3 Product overview

3.1 Introduction



EtherCAT Box with analog inputs and outputs

EPP4374-0002 has two analog inputs and two analog outputs. The signal range can be individually parameterized for each analog input and output:

- -10 … +10 V
- 0 … 10 V
- 0 … 20 mA
- 4 … 20 mA

Quick links

Technical data [▶ 10]
Process image [▶ 13]
Signal connection [▶ 22]

3.2 Technical data

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

Technical data	EPP4374-0002
Fieldbus	
Fieldbus	EtherCAT
Connection	EtherCAT P: Combined connection for EtherCAT and supply voltages Input: 1 x M8 socket, 4-pin, P-coded Downstream connection: 1 x M8 socket, 4-pin, P-coded
Supply voltages	
Connection	See Fieldbus connection
Control voltage U_S	
Nominal voltage	24 V_{DC} (-15 % / +20 %)
Sum current	max. 3 A [1]
Consumers	Module electronics: 120 mA at 24 V_{DC}
Peripheral voltage U_P	
Nominal voltage	24 V_{DC} (-15 % / +20 %)
Sum current	max. 3 A [1]
Consumers	• Sensors [2] • Actuators [2]
Analog inputs	
Number	2
Connection	M12 socket, 5-pin connection
Signal range	Parameterizable: • -10 .. +10 V (default) • 0 .. 10 V • 0 .. 20 mA • 4 .. 20 mA
Electrical specifications [▶ 11]	
Sensor/actuator supply voltage [3]	from the peripheral voltage U_P max. 3 A in total, not short-circuit proof
Analog outputs	
Number	2
Connection	M12 socket, 5-pin connection
Output signal range	Parameterizable: • -10 .. +10 V (default) • 0 .. 10 V • 0 .. 20 mA • 4 .. 20 mA
Electrical specifications [▶ 11]	
Sensor/actuator supply voltage [3]	from the peripheral voltage U_P max. 3 A in total, not short-circuit proof

[1] Sum current of consumers and power transmission.

[2] "Actuators": Field devices that are intended to be connected to outputs.
"Sensors": Field devices that are intended to be connected to inputs.

[3] Supply voltage that is available on the plug connectors of the analog interfaces.

Technical data	EPP4374-0002
Environmental conditions	
Ambient temperature during operation	-25…+60 °C -25…+55 °C according to cURus [▶ 26] 0…+55 °C according to ATEX
Ambient temperature during storage	-40…+85 °C
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27; see also Additional checks [▶ 12].
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 conforms to EN 60529
Mechanics	
Weight	approx. 165 g
Installation position	variable
Approvals and conformity	
Approvals	CE, cURus [▶ 26]

Analog inputs

The measuring range can be switched during operation. The following table shows the electrical specifications depending on the selected measuring range.

Technical data	Measuring range			
	-10…10 V	**0…10 V**	**0…20 mA**	**4…20 mA**
Input type	Differential			
Input resistance	> 200 kΩ	> 200 kΩ	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage
Digital resolution	16-bit	15-bit	15-bit	15-bit
Measuring error	< 0.3 % relative to full scale value			
Conversion time	approx. 100 µs			
Input filter limit frequency	5 kHz			
Value of the least significant bit	approx. 305 µV	approx. 305 µV	approx. 610 µA	approx. 488 µA

The analog inputs and outputs have a common analog ground potential. The analog ground potential is electrically isolated from all other ground potentials in the box.

Analog outputs

The output signal range can be switched during operation. The following table shows the electrical specifications depending on the selected output signal range.

Technical data	Output signal range			
	-10…10 V	**0…10 V**	**0…20 mA**	**4…20 mA**
Load resistor / load	> 5 kΩ	> 5 kΩ	< 500 Ω	< 500 Ω
Digital resolution	16-bit	15-bit	15-bit	15-bit
Output error	< 0.1 % (ambient temperature 0…+55 °C) < 0.2 % (ambient temperature < 0 °C or > 55 °C) related to the final value.			
Conversion time	approx. 40 µs			
Value of the least significant bit	approx. 305 µV	approx. 305 µV	approx. 610 µA	approx. 488 µA

The analog inputs and outputs have a common analog ground potential. The analog ground potential is electrically isolated from all other ground potentials in the box.

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 Scope of supply

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

- 1x EtherCAT P Box EPP4374-0002
- 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.

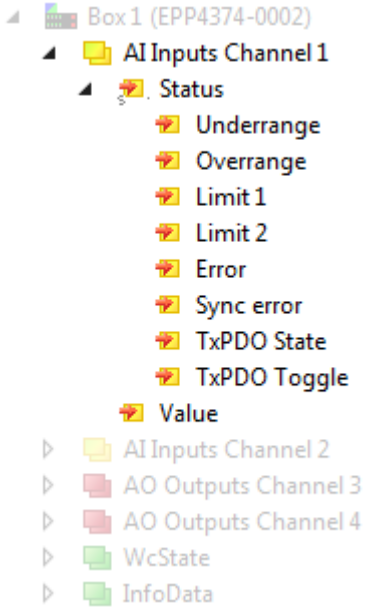
3.4 Process image

3.4.1 Assignment of connectors to process data objects

Process image in TwinCAT	Connector	Process data object
Box 1 (EPP4374-0002) AI Inputs Channel 1 AI Inputs Channel 2 AO Outputs Channel 3 AO Outputs Channel 4 WcState InfoData	X01	AI Inputs Channel 1
	X02	AI Inputs Channel 2
	X03	AO Outputs Channel 3
	X04	AO Outputs Channel 4

3.4.2 Content of the process data objects

AI Inputs Channel 1



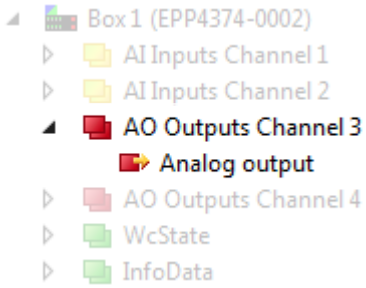
The data for the first analog channel can be found under AI Inputs Channel 1.

- Underrange: Value of the analog input is less than 0/4 mA or -10/0 V
- Overrange: Value of the analog input is greater than 20 mA or +10 V
- Limit 1: with activated limit 1 (object 0x80x0:07 [▶ 38] = 1) means
  1: value less than limit 1 (set in object 0x80x0:13 [▶ 38])
  2: value greater than limit 1 (set in object 0x80x0:13 [▶ 38])
  3: value equal to limit 1 (set in object 0x80x0:13 [▶ 38])
- Limit 2: with activated limit 2 (object 0x80x0:08 [▶ 38] = 1) means
  1: value less than limit 2 (set in object 0x80x0:14 [▶ 38])
  2: value greater than limit 2 (set in object 0x80x0:14 [▶ 38])
  3: value equal to limit 2 (set in object 0x80x0:14 [▶ 38])
- Error: This bit is set if overrange or underrange was detected.

AI Inputs Channel 2

The data of the second analog channel have the same structure as those of the first channel.

AO Outputs Channel 3



The data for the third analog channel can be found under AO Outputs Channel 3.

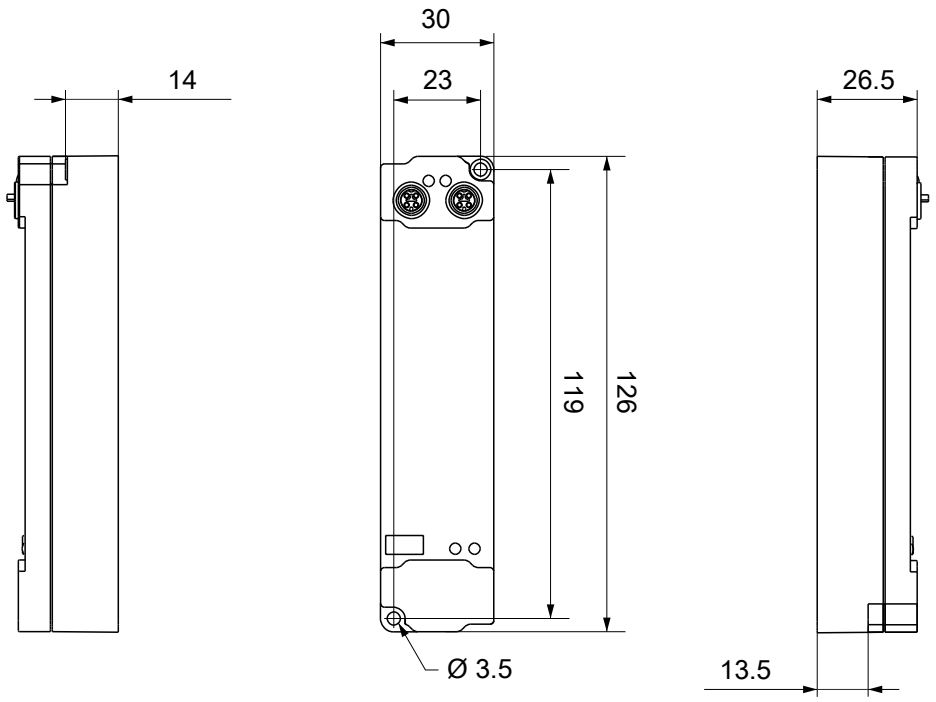
AO Outputs Channel 4

The data of the forth analog channel have the same structure as those of the third channel.

4 Mounting and cabling

4.1 Mounting

4.1.1 Dimensions



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)

4.1.2 Fixing

NOTE

Dirt during assembly

Dirty connectors can lead to malfunctions. Protection class IP67 can only be guaranteed if all cables and connectors are connected.

- Protect the plug connectors against dirt during the assembly.

Mount the module with two M3 screws on the mounting holes in the corners of the module. The mounting holes have no thread.

4.1.3 Functional earth (FE)

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

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

Fig. 1: 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 Cabling

Guidelines

Follow these guidelines to ensure IP67 protection:

- Mount plugs with the torque values specified below. Use a torque wrench, e.g. Beckhoff ZB8801.
- Seal unused connectors with protective caps.
- Ensure the correct seating of pre-assembled protective caps.
  Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

Connector overview

NOTE

Risk of confusion: Inputs and outputs

Defects possible due to mixing up of inputs and outputs. The connectors of the inputs and outputs are of the same type.

- Observe the names of the connectors in order to avoid mistakes.

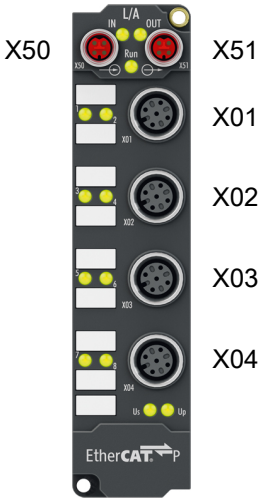


Fig. 2: Connector overview

Name	Connector type	Tightening torque	Function
X01	M12	0.6 Nm	Analog inputs [▶ 22]
X02			
X03	M12	0.6 Nm	Analog outputs [▶ 22]
X04			
X50	M8 socket, p-coded	0.4 Nm	EtherCAT P [▶ 18] input
X51	M8 socket, p-coded	0.4 Nm	EtherCAT P [▶ 18] downstream connection

4.2.1 EtherCAT P

⚠ WARNING

Power supply from SELV/PELV power supply unit!

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

Notes:

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

⚠ CAUTION

Observe the UL requirements

- When operating under UL conditions, observe the warnings in the chapter UL Requirements [▶ 26].

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.

NOTE

Note the maximum current.

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

4.2.1.1 Connectors

NOTE

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 Functional earth (FE) [▶ 16].

Fig. 3: Connectors for EtherCAT P

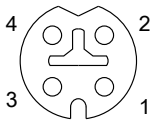


Fig. 4: M8 socket, p-coded

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.

4.2.1.2 Status LEDs

4.2.1.2.1 Supply voltages

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

LED	Display	Meaning
U_S (control voltage)	off	The supply voltage U_S is not available.
	green illuminated	The supply voltage U_S is available.
U_P (peripheral voltage)	off	The supply voltage U_P is not available.
	green illuminated	The supply voltage U_P is available.

4.2.1.2.2 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

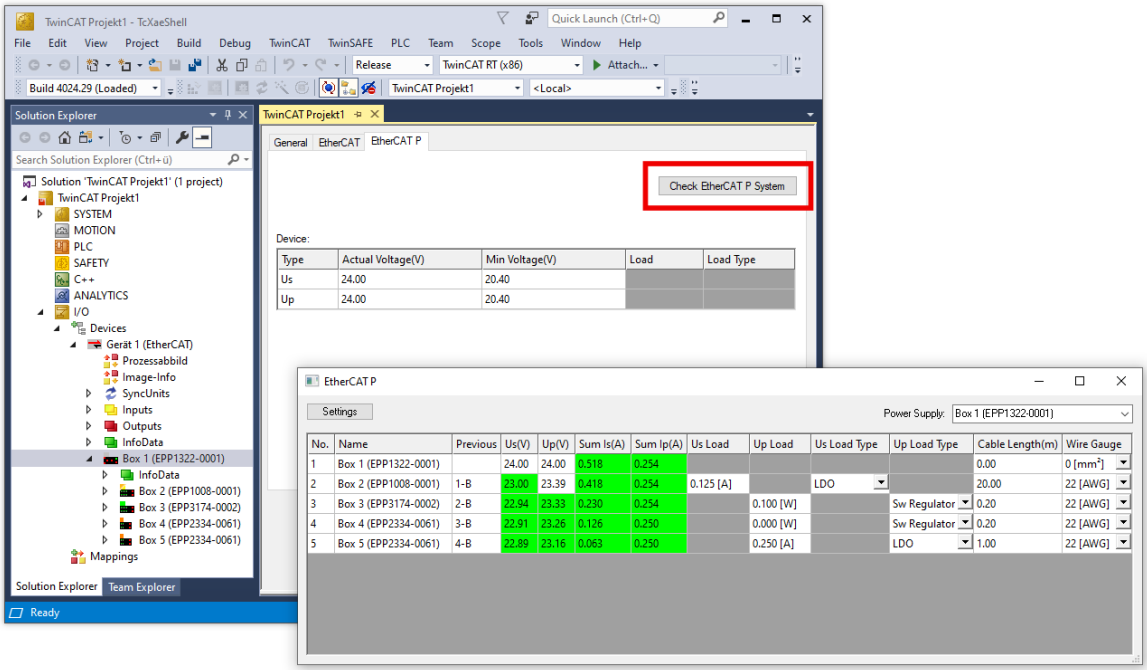
Description of the EtherCAT slave states

4.2.1.3 Conductor losses

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

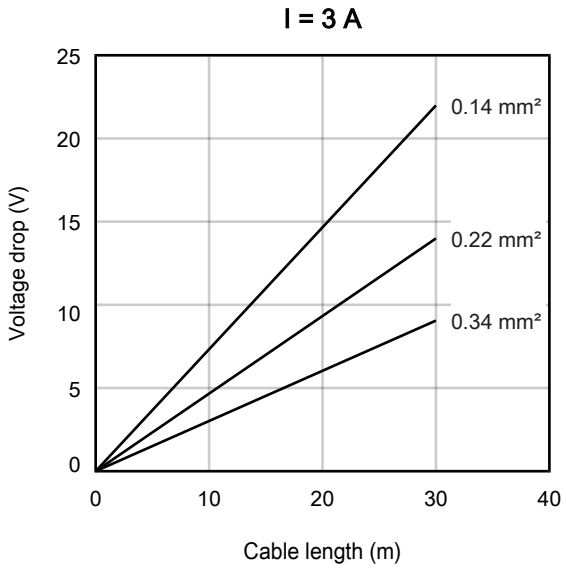
Planning tool for EtherCAT P

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



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

Voltage drop on the supply line



4.2.2 Analog interfaces

NOTE

Signal ranges must be set before carrying out the cabling

Defects possible due to incorrectly set signal ranges.

- Set the signal ranges [▶ 29] before connecting the sensors and actuators.
- Set the signal ranges in accordance with the specifications for the intended sensors and actuators.

NOTE

Risk of confusion: Inputs and outputs

Defects possible due to mixing up of inputs and outputs. The connectors of the inputs and outputs are of the same type.

- Observe the names of the connectors in order to avoid mistakes.

4.2.2.1 Connectors

M12 sockets

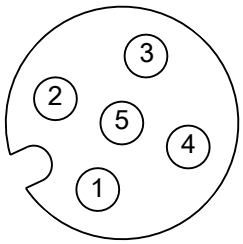


Fig. 5: M12 socket

Pin	Inputs X01 and X02		Outputs X03 and X04	
	Symbol	Description	Symbol	Description
1	U_P	Sensor supply +	Out	Analog output
2	In +	Analog input +	U_P	Actuator supply +
3	GND_P	Sensor supply Ground	Out GND	Analog ground
4	In -	Analog input -	GND_P	Actuator supply Ground
5	Shield		Shield	

EMC shield clamp

Depending on the application it may be necessary to additionally attach the shield of the sensor cables at the signal inputs of the box with shield clamps ZB8513-0002.

See Chapter: "Accessories", section "Cables" [▶ 51].

4.2.2.2 Status LEDs

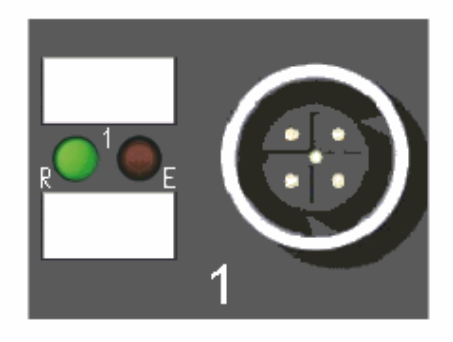


Fig. 6: Status LEDs at the M12 connections

Status LEDs at M12 connections 1 and 2 (inputs)

Connection	LED	Display	Meaning
M12 socket no. 1 and 2	R left	off	No data transfer to the D/A converter
		green	Data transfer to the D/A converter
	E right	off	Function OK
		red	Error: Open circuit or measured value outside of the measuring range (smaller than 3.5 mA/-11 V or larger than 21 mA/11 V)

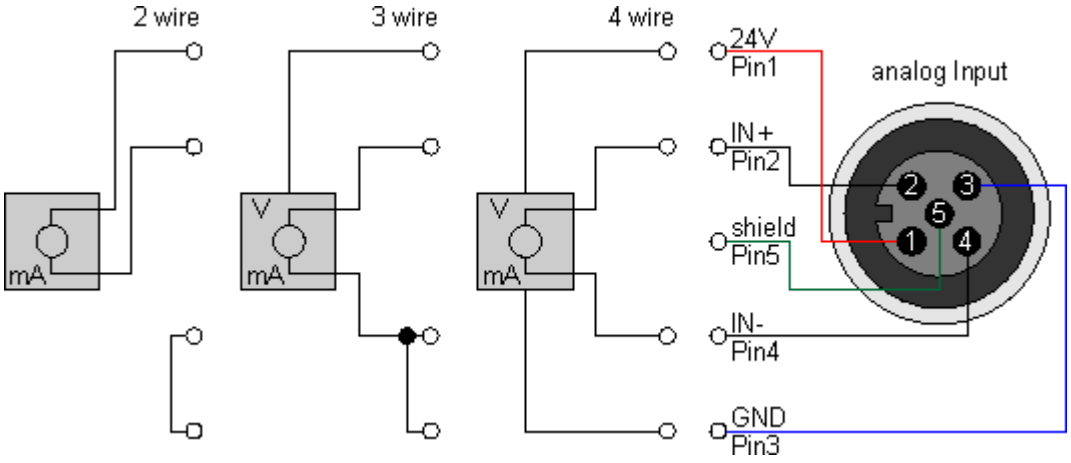
Correct function is indicated if the green *Run* LED is on and the red *Error* LED is off.

Status LEDs at M12 connections 3 and 4 (outputs)

Connection	LED	Display	Meaning
M12 socket no. 3 and 4	R left	off	No data transfer to the D/A converter
		green	Data transfer to the D/A converter

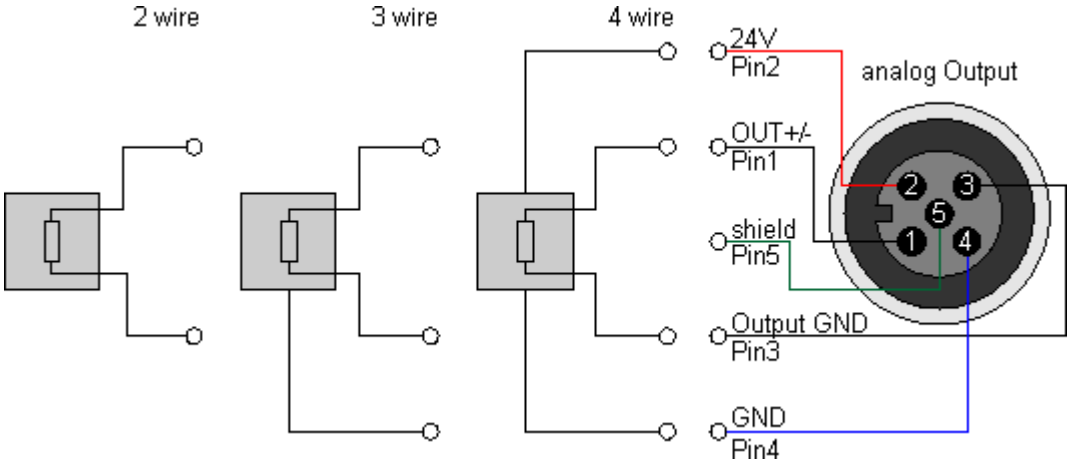
4.2.2.3 Connection examples

Analog inputs



The sensor is connected via In+ and In-. The sensor can optionally be operated/supplied with 24 V_{DC}.

Analog outputs

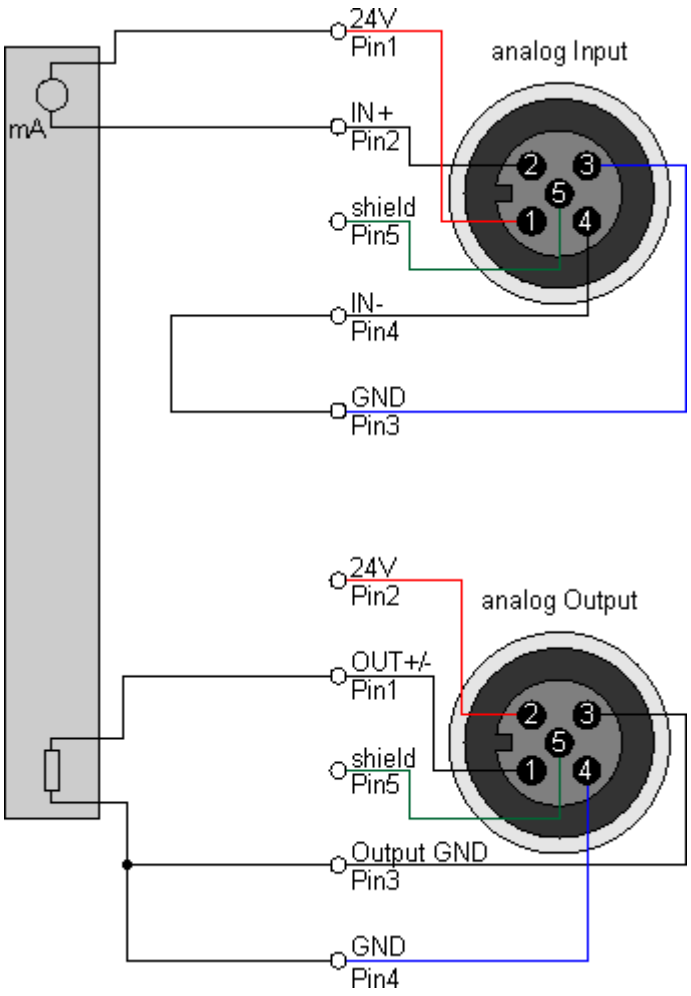


The actuator is connected via output +/- and output GND. The actuator can optionally be operated/supplied with 24 V_{DC}.

Combined analog inputs and outputs

There are sensors that have an analog input in addition to their analog output. If the analog output of the sensor is not potential-free, the following recommendation applies:

Connect pin 3 and pin 4 of the analog output of EP4374-0002 with a jumper. Otherwise, measuring errors may occur.



4.3 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. 7: UL label

4.4 Disposal

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

5 Commissioning and configuration

5.1 Integrating into a TwinCAT project

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

5.2 Setting signal ranges

NOTE

Signal ranges must be set before carrying out the cabling

Defects possible due to incorrectly set signal ranges.

- Set the signal ranges [▶ 29] before connecting the sensors and actuators.
- Set the signal ranges in accordance with the specifications for the intended sensors and actuators.

The signal range can be individually set for each analog input and output. The parameters that define the signal range are located in the CoE directory:

Interface	CoE Index
Analog input X01	F800:01
Analog input X02	F800:02
Analog output X03	F800:03
Analog output X04	F800:04

TwinCAT

Proceed as follows to change the signal range of an analog channel in TwinCAT:

1. Double-click the IO module EPP4374-0002 in the IO tree.
2. Click on the "CoE - Online" tab.
   ⇨ The CoE directory is displayed.
3. Double-click on the CoE index of the interface that you wish to set (see table above).
4. Select the signal range in the dialog box which then opens.

5.3 Object overview

EtherCAT XML Device Description

The display matches that of the CoE objects from the EtherCAT XML Device Description. We recommend downloading the latest XML file from the download area of the Beckhoff website and installing it according to installation instructions.

Index (hex)		Name	Flags	Default value
1000 [▶ 41]		Device type	RO	0x00001389 (5001_{dec})
1008		Device name	RO	EP4374-0002
1009 [▶ 41]		Hardware version	RO	00
100A [▶ 41]		Software version	RO	02
1011:0 [▶ 36]	**Subindex**	Restore default parameters	RO	0x01 (1_{dec})
	1011:01	SubIndex 001	RW	0x00000000 (0_{dec})
1018:0	**Subindex**	Identity	RO	0x04 (4_{dec})
	1018:01	Vendor ID	RO	0x00000002 (2_{dec})
	1018:02	Product code	RO	0x11164052 (286670930_{dec})
	1018:03	Revision	RO	0x00110002 (1114114_{dec})
	1018:04	Serial number	RO	0x00000000 (0_{dec})
10F0:0 [▶ 41]	**Subindex**	Backup parameter handling	RO	0x01 (1_{dec})
	10F0:01	Checksum	RO	0x00000000 (0_{dec})
1600:0 [▶ 41]	**Subindex**	AO Outputs Ch.3	RO	0x01 (1_{dec})
	1600:01	SubIndex 001	RO	0x7020:11, 16
1601:0 [▶ 42]	**Subindex**	AO Outputs Ch.4	RO	0x01 (1_{dec})
	1601:01	SubIndex 001	RO	0x7030:11, 16
1800:0 [▶ 42]	**Subindex**	AI Inputs Ch.1	RO	0x06 (6_{dec})
	1800:06	Exclude TxPDOs	RO	01 1A
1801:0 [▶ 42]	**Subindex**	AI Inputs Compact Ch.1	RO	0x06 (6_{dec})
	1801:06	Exclude TxPDOs	RO	00 1A
1802:0 [▶ 42]	**Subindex**	AI Inputs Ch.2	RO	0x06 (6_{dec})
	1802:06	Exclude TxPDOs	RO	03 1A
1803:0 [▶ 42]	**Subindex**	AI Inputs Compact Ch.2	RO	0x06 (6_{dec})
	1803:06	Exclude TxPDOs	RO	02 1A
1A00:0 [▶ 42]	**Subindex**	AI Inputs Ch.1	RO	0x0B (11_{dec})
	1A00:01	SubIndex 001	RO	0x6000:01, 1
	1A00:02	SubIndex 002	RO	0x6000:02, 1
	1A00:03	SubIndex 003	RO	0x6000:03, 2
	1A00:04	SubIndex 004	RO	0x6000:05, 2
	1A00:05	SubIndex 005	RO	0x6000:07, 1
	1A00:06	SubIndex 006	RO	0x0000:00, 1
	1A00:07	SubIndex 007	RO	0x0000:00, 5
	1A00:08	SubIndex 008	RO	0x6000:0E, 1
	1A00:09	SubIndex 009	RO	0x6000:0F, 1
	1A00:0A	SubIndex 010	RO	0x6000:10, 1
	1A00:0B	SubIndex 011	RO	0x6000:11, 16

Index (hex)		Name	Flags	Default value
1A01:0 [▶ 43]	**Subindex**	AI Inputs Compact Ch.1	RO	0x01 (1_{dec})
	1A01:01	SubIndex 001	RO	0x6000:11, 16
1A02:0 [▶ 43]	**Subindex**	AI Inputs Ch.2	RO	0x0B (11_{dec})
	1A02:01	SubIndex 001	RO	0x6010:01, 1
	1A02:02	SubIndex 002	RO	0x6010:02, 1
	1A02:03	SubIndex 003	RO	0x6010:03, 2
	1A02:04	SubIndex 004	RO	0x6010:05, 2
	1A02:05	SubIndex 005	RO	0x6010:07, 1
	1A02:06	SubIndex 006	RO	0x0000:00, 1
	1A02:07	SubIndex 007	RO	0x0000:00, 5
	1A02:08	SubIndex 008	RO	0x6010:0E, 1
	1A02:09	SubIndex 009	RO	0x6010:0F, 1
	1A02:0A	SubIndex 010	RO	0x6010:10, 1
	1A02:0B	SubIndex 011	RO	0x6010:11, 16
1A03:0 [▶ 43]	**Subindex**	AI Inputs Compact Ch.2	RO	0x01 (1_{dec})
	1A03:01	SubIndex 001	RO	0x6010:11, 16
1C00:0 [▶ 43]	**Subindex**	Sync manager type	RO	0x04 (4_{dec})
	1C00:01	SubIndex 001	RO	0x01 (1_{dec})
	1C00:02	SubIndex 002	RO	0x02 (2_{dec})
	1C00:03	SubIndex 003	RO	0x03 (3_{dec})
	1C00:04	SubIndex 004	RO	0x04 (4_{dec})
1C12:0 [▶ 43]	**Subindex**	RxPDO assign	RW	0x02 (2_{dec})
	1C12:01	SubIndex 001	RW	0x1600 (5632_{dec})
	1C12:02	SubIndex 002	RW	0x1601 (5633_{dec})
1C13:0 [▶ 44]	**Subindex**	TxPDO assign	RW	0x02 (2_{dec})
	1C13:01	SubIndex 001	RW	0x1A00 (6656_{dec})
	1C13:02	SubIndex 002	RW	0x1A02 (6658_{dec})
1C32:0	**Subindex**	SM output parameter	RO	0x20 (32_{dec})
	1C32:01	Sync mode	RW	0x0001 (1_{dec})
	1C32:02	Cycle time	RW	0x000F4240 (1000000_{dec})
	1C32:03	Shift time	RO	0x00002710 (10000_{dec})
	1C32:04	Sync modes supported	RO	0xC007 (49159_{dec})
	1C32:05	Minimum cycle time	RO	0x0007A120 (500000_{dec})
	1C32:06	Calc and copy time	RO	0x00001388 (5000_{dec})
	1C32:07	Minimum delay time	RO	0x00001388 (5000_{dec})
	1C32:08	Command	RW	0x0000 (0_{dec})
	1C32:09	Maximum delay time	RO	0x00001388 (5000_{dec})
	1C32:0B	SM event missed counter	RO	0x0000 (0_{dec})
	1C32:0C	Cycle exceeded counter	RO	0x0000 (0_{dec})
	1C32:0D	Shift too short counter	RO	0x0000 (0_{dec})
	1C32:20	Sync error	RO	0x00 (0_{dec})

Index (hex)		Name	Flags	Default value
1C33:0 [▶ 45]	**Subindex**	SM input parameter	RO	0x20 (32_{dec})
	1C33:01	Sync mode	RW	0x0022 (34_{dec})
	1C33:02	Cycle time	RW	0x000F4240 (1000000_{dec})
	1C33:03	Shift time	RO	0x00001388 (5000_{dec})
	1C33:04	Sync modes supported	RO	0xC007 (49159_{dec})
	1C33:05	Minimum cycle time	RO	0x0007A120 (500000_{dec})
	1C33:06	Calc and copy time	RO	0x00002710 (10000_{dec})
	1C33:07	Minimum delay time	RO	0x00001388 (5000_{dec})
	1C33:08	Command	RW	0x0000 (0_{dec})
	1C33:09	Maximum delay time	RO	0x00001388 (5000_{dec})
	1C33:0B	SM event missed counter	RO	0x0000 (0_{dec})
	1C33:0C	Cycle exceeded counter	RO	0x0000 (0_{dec})
	1C33:0D	Shift too short counter	RO	0x0000 (0_{dec})
	1C33:20	Sync error	RO	0x00 (0_{dec})
6000:0 [▶ 46]	**Subindex**	AI Inputs Ch.1	RO	0x11 (17_{dec})
	6000:01	Underrange	RO	0x00 (0_{dec})
	6000:02	Overrange	RO	0x00 (0_{dec})
	6000:03	Limit 1	RO	0x00 (0_{dec})
	6000:05	Limit 2	RO	0x00 (0_{dec})
	6000:07	Error	RO	0x00 (0_{dec})
	6000:0E	Sync error	RO	0x00 (0_{dec})
	6000:0F	TxPDO State	RO	0x00 (0_{dec})
	6000:10	TxPDO Toggle	RO	0x00 (0_{dec})
	6000:11	Value	RO	0x0000 (0_{dec})
6010:0 [▶ 46]	**Subindex**	AI Inputs Ch.2	RO	0x11 (17_{dec})
	6010:01	Underrange	RO	0x00 (0_{dec})
	6010:02	Overrange	RO	0x00 (0_{dec})
	6010:03	Limit 1	RO	0x00 (0_{dec})
	6010:05	Limit 2	RO	0x00 (0_{dec})
	6010:07	Error	RO	0x00 (0_{dec})
	6010:0E	Sync error	RO	0x00 (0_{dec})
	6010:0F	TxPDO State	RO	0x00 (0_{dec})
	6010:10	TxPDO Toggle	RO	0x00 (0_{dec})
	6010:11	Value	RO	0x0000 (0_{dec})

Index (hex)		Name	Flags	Default value
7020:0 [▶ 46]	**Subindex**	AO Outputs Ch.3	RO	0x11 (17_{dec})
	7020:11	Analog output	RO	0x0000 (0_{dec})
7030:0 [▶ 46]	**Subindex**	AO Outputs Ch.4	RO	0x11 (17_{dec})
	7030:11	Analog output	RO	0x0000 (0_{dec})
8000:0 [▶ 37]	**Subindex**	AI Settings Ch.1	RW	0x18 (24_{dec})
	8000:01	Enable user scale	RW	0x00 (0_{dec})
	8000:02	Presentation	RW	0x00 (0_{dec})
	8000:05	Siemens bits	RW	0x00 (0_{dec})
	8000:06	Enable filter	RW	0x00 (0_{dec})
	8000:07	Enable limit 1	RW	0x00 (0_{dec})
	8000:08	Enable limit 2	RW	0x00 (0_{dec})
	8000:0A	Enable user calibration	RW	0x00 (0_{dec})
	8000:0B	Enable vendor calibration	RW	0x01 (1_{dec})
	8000:0E	Swap limit bits	RW	0x00 (0_{dec})
	8000:11	User scale offset	RW	0x0000 (0_{dec})
	8000:12	User scale gain	RW	0x00010000 (65536_{dec})
	8000:13	Limit 1	RW	0x0000 (0_{dec})
	8000:14	Limit 2	RW	0x0000 (0_{dec})
	8000:15	Filter settings	RW	0x0000 (0_{dec})
	8000:17	User calibration offset	RW	0x0000 (0_{dec})
	8000:18	User calibration gain	RW	0x4000 (16384_{dec})
800E:0 [▶ 46]	**Subindex**	AI Internal data Ch.1	RO	0x01 (1_{dec})
	800E:01	ADC raw value	RO	0x0000 (0_{dec})
800F:0 [▶ 47]	**Subindex**	AI Vendor data Ch.1	RW	0x06 (6_{dec})
	800F:01	R0 offset	RW	0x0000 (0_{dec})
	800F:02	R0 gain	RW	0x4000 (16384_{dec})
	800F:03	R1 offset	RW	0x0000 (0_{dec})
	800F:04	R1 gain	RW	0x4000 (16384_{dec})
	800F:05	R2 offset	RW	0x0000 (0_{dec})
	800F:06	R2 gain	RW	0x4000 (16384_{dec})
8010:0 [▶ 38]	**Subindex**	AI Settings Ch.2	RW	0x18 (24_{dec})
	8010:01	Enable user scale	RW	0x00 (0_{dec})
	8010:02	Presentation	RW	0x00 (0_{dec})
	8010:05	Siemens bits	RW	0x00 (0_{dec})
	8010:06	Enable filter	RW	0x00 (0_{dec})
	8010:07	Enable limit 1	RW	0x00 (0_{dec})
	8010:08	Enable limit 2	RW	0x00 (0_{dec})
	8010:0A	Enable user calibration	RW	0x00 (0_{dec})
	8010:0B	Enable vendor calibration	RW	0x01 (1_{dec})
	8010:0E	Swap limit bits	RW	0x00 (0_{dec})
	8010:11	User scale offset	RW	0x0000 (0_{dec})
	8010:12	User scale gain	RW	0x00010000 (65536_{dec})
	8010:13	Limit 1	RW	0x0000 (0_{dec})
	8010:14	Limit 2	RW	0x0000 (0_{dec})
	8010:15	Filter settings	RW	0x0000 (0_{dec})
	8010:17	User calibration offset	RW	0x0000 (0_{dec})
	8010:18	User calibration gain	RW	0x4000 (16384_{dec})

Index (hex)		Name	Flags	Default value
801E:0 [▶ 47]	**Subindex**	AI Internal data Ch.2	RO	0x01 (1_{dec})
	801E:01	ADC raw value	RO	0x0000 (0_{dec})
801F:0 [▶ 47]	**Subindex**	AI Vendor data Ch.2	RW	0x06 (6_{dec})
	801F:01	R0 offset	RW	0x0000 (0_{dec})
	801F:02	R0 gain	RW	0x4000 (16384_{dec})
	801F:03	R1 offset	RW	0x0000 (0_{dec})
	801F:04	R1 gain	RW	0x4000 (16384_{dec})
	801F:05	R2 offset	RW	0x0000 (0_{dec})
	801F:06	R2 gain	RW	0x4000 (16384_{dec})
8020:0 [▶ 39]	**Subindex**	AO Settings Ch.3	RW	0x16 (22_{dec})
	8020:01	Enable user scale	RW	0x00 (0_{dec})
	8020:02	Presentation	RW	0x00 (0_{dec})
	8020:05	Watchdog	RW	0x00 (0_{dec})
	8020:07	Enable user calibration	RW	0x00 (0_{dec})
	8020:08	Enable vendor calibration	RW	0x01 (1_{dec})
	8020:11	User scale offset	RW	0x0000 (0_{dec})
	8020:12	User scale gain	RW	0x00010000 (65536_{dec})
	8020:13	Default output	RW	0x0000 (0_{dec})
	8020:14	Default output ramp	RW	0xFFFF (65535_{dec})
	8020:15	User calibration offset	RW	0x0000 (0_{dec})
	8020:16	User calibration gain	RW	0x4000 (16384_{dec})
802E:0 [▶ 47]	**Subindex**	AO Internal data Ch.3	RO	0x01 (1_{dec})
	802E:01	DAC raw value	RO	0x0000 (0_{dec})
802F:0 [▶ 47]	**Subindex**	AO Vendor data Ch.3	RW	0x06 (6_{dec})
	802F:01	R0 Calibration Offset	RW	0x0000 (0_{dec})
	802F:02	R0 Calibration Gain	RW	0x4000 (16384_{dec})
	802F:03	R1 Calibration Offset	RW	0x0000 (0_{dec})
	802F:04	R1 Calibration Gain	RW	0x4000 (16384_{dec})
	802F:05	R2 Calibration Offset	RW	0x0000 (0_{dec})
	802F:06	R2 Calibration Gain	RW	0x4000 (16384_{dec})

Index (hex)		Name	Flags	Default value
8030:0 [▶ 40]	**Subindex**	AO Settings Ch.4	RW	0x16 (22_{dec})
	8030:01	Enable user scale	RW	0x00 (0_{dec})
	8030:02	Presentation	RW	0x00 (0_{dec})
	8030:05	Watchdog	RW	0x00 (0_{dec})
	8030:07	Enable user calibration	RW	0x00 (0_{dec})
	8030:08	Enable vendor calibration	RW	0x01 (1_{dec})
	8030:11	User scale offset	RW	0x0000 (0_{dec})
	8030:12	User scale gain	RW	0x00010000 (65536_{dec})
	8030:13	Default output	RW	0x0000 (0_{dec})
	8030:14	Default output ramp	RW	0xFFFF (65535_{dec})
	8030:15	User calibration offset	RW	0x0000 (0_{dec})
	8030:16	User calibration gain	RW	0x4000 (16384_{dec})
803E:0 [▶ 47]	**Subindex**	AO Internal data Ch.4	RO	0x01 (1_{dec})
	803E:01	DAC raw value	RO	0x0000 (0_{dec})
803F:0 [▶ 48]	**Subindex**	AO Vendor data Ch.4	RW	0x06 (6_{dec})
	803F:01	R0 Calibration Offset	RW	0x0000 (0_{dec})
	803F:02	R0 Calibration Gain	RW	0x4000 (16384_{dec})
	803F:03	R1 Calibration Offset	RW	0x0000 (0_{dec})
	803F:04	R1 Calibration Gain	RW	0x4000 (16384_{dec})
	803F:05	R2 Calibration Offset	RW	0x0000 (0_{dec})
	803F:06	R2 Calibration Gain	RW	0x4000 (16384_{dec})
F000:0 [▶ 48]	**Subindex**	Modular device profile	RO	0x02 (2_{dec})
	F000:01	Module index distance	RO	0x0010 (16_{dec})
	F000:02	Maximum number of modules	RO	0x0004 (4_{dec})
F008 [▶ 48]		Code word	RW	0x00000000 (0_{dec})
F010:0 [▶ 48]	**Subindex**	Module list	RW	0x04 (4_{dec})
	F010:01	SubIndex 001	RW	0x0000012C (300_{dec})
	F010:02	SubIndex 002	RW	0x0000012C (300_{dec})
	F010:03	SubIndex 003	RW	0x00000190 (400_{dec})
	F010:04	SubIndex 004	RW	0x00000190 (400_{dec})
F800:0 [▶ 40]	**Subindex**	AIAO Range settings	RW	0x04 (4_{dec})
	F800:01	Input type Ch1	RW	0x0000 (0_{dec})
	F800:02	Input type Ch2	RW	0x0000 (0_{dec})
	F800:03	Output type Ch3	RW	0x0000 (0_{dec})
	F800:04	Output type Ch4	RW	0x0000 (0_{dec})

Legend

Flags:
RO (Read Only): this object can be read only
RW (Read/Write): this object can be read and written to

5.4 Object description and parameterization

EtherCAT XML Device Description

The display matches that of the CoE objects from the EtherCAT XML Device Description. We recommend downloading the latest XML file from the download area of the Beckhoff website and installing it according to installation instructions.

Parameterization via the CoE list (CAN over EtherCAT)

The EtherCAT device is parameterized via the CoE - Online tab (double-click on the respective object) or via the Process Data tab (allocation of PDOs).

Introduction

The CoE overview contains objects for different intended applications:

- Objects required for parameterization during commissioning
- Objects intended for regular operation, e. g. through ADS access.
- Objects for indicating internal settings (may be fixed)
- Further profile-specific objects [▶ 46] indicating inputs, outputs and status information

The following section first describes the objects required for normal operation, followed by a complete overview of missing objects.

5.4.1 Objects to be parameterized during commissioning

Index 1011 Restore default parameters

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

Index 8000 AI Settings Ch.1

Index (hex)	Name	Meaning		Data type	Flags	Default
8000:0	AI Settings Ch.1	Maximum subindex		UINT8	RO	0x18 (24_{dec})
8000:01	Enable user scale	0_{bin}	User scaling is not active.	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	User scale is active.			
8000:02	Presentation	0_{dec}	Signed presentation	BIT3	RW	0x00 (0_{dec})
		1_{dec}	Unsigned presentation			
		2_{dec}	Absolute value with MSB as sign (signed amount representation)			
8000:05	Siemens bits			BOOLEAN	RW	0x00 (0_{dec})
8000:06	Enable filter	0_{bin}	Filter not enabled	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	Filter enabled, which makes PLC-cycle-synchronous data exchange unnecessary			
8000:07	Enable limit 1	0_{bin}	Limit 1 not enabled	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	Limit 1 enabled			
8000:08	Enable limit 2	0_{bin}	Limit 2 not enabled	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	Limit 2 enabled			
8000:0A	Enable user calibration	0_{bin}	User calibration not enabled	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	User calibration enabled			
8000:0B	Enable vendor calibration	0_{bin}	Vendor calibration not enabled	BOOLEAN	RW	0x01 (1_{dec})
		1_{bin}	Vendor calibration enabled			
8000:0E	Swap limit bits	1_{bin}	Limit bits swapped	BOOLEAN	RW	0x00 (0_{dec})
8000:11	User scale offset	User scaling: Offset		INT16	RW	0x0000 (0_{dec})
8000:12	User scale gain	User scaling: Gain The gain is represented in fixed-point format, with the factor 2^{-16}. The value 1 corresponds to 65535_{dec} ($0x00010000_{hex}$) and is limited to +/- 0x7FFFF		INT32	RW	0x00010000 (65536_{dec})
8000:13	Limit 1	First limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8000:14	Limit 2	Second limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8000:15	Filter settings	This object determines the digital filter settings, if it is active via Enable filter (index 0x80n0:06 [▶ 37]). The possible settings are sequentially numbered.		UINT16	RW	0x0000 (0_{dec})
		0_{dec}	50 Hz FIR			
		1_{dec}	60 Hz FIR			
		2_{dec}	IIR 1			
		3_{dec}	IIR 2			
		4_{dec}	IIR 3			
		5_{dec}	IIR 4			
		6_{dec}	IIR 5			
		7_{dec}	IIR 6			
		8_{dec}	IIR 71			
		9_{dec}	IIR 8			
8000:17	User calibration offset	User calibration: Offset		INT16	RW	0x0000 (0_{dec})
8000:18	User calibration gain	User calibration: Gain		INT16	RW	0x4000 (16384_{dec})

Index 8010 AI Settings Ch.2

Index (hex)	Name	Meaning		Data type	Flags	Default
8010:0	AI Settings Ch.2	Maximum subindex		UINT8	RO	0x18 (24_{dec})
8010:01	Enable user scale	0_{bin}	User scaling is not active.	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	User scale is active.			
8010:02	Presentation	0_{dec}	Signed presentation	BIT3	RW	0x00 (0_{dec})
		1_{dec}	Unsigned presentation			
		2_{dec}	Absolute value with MSB as sign (signed amount representation)			
8010:05	Siemens bits			BOOLEAN	RW	0x00 (0_{dec})
8010:06	Enable filter	0_{bin}	Filter not enabled	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	Filter enabled, which makes PLC-cycle-synchronous data exchange unnecessary			
8010:07	Enable limit 1	0_{bin}	Limit 1 not enabled	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	Limit 1 enabled			
8010:08	Enable limit 2	0_{bin}	Limit 2 not enabled	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	Limit 2 enabled			
8010:0A	Enable user calibration	0_{bin}	User calibration not enabled	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	User calibration enabled			
8010:0B	Enable vendor calibration	0_{bin}	Vendor calibration not enabled	BOOLEAN	RW	0x01 (1_{dec})
		1_{bin}	Vendor calibration enabled			
8010:0E	Swap limit bits	1_{bin}	Limit bits swapped	BOOLEAN	RW	0x00 (0_{dec})
8010:11	User scale offset	User scaling: Offset		INT16	RW	0x0000 (0_{dec})
8010:12	User scale gain	User scaling: Gain The gain is represented in fixed-point format, with the factor 2^{-16}. The value 1 corresponds to 65535_{dec} ($0x00010000_{hex}$) and is limited to +/- 0x7FFFF		INT32	RW	0x00010000 (65536_{dec})
8010:13	Limit 1	First limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8010:14	Limit 2	Second limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8010:15	Filter settings	This object determines the digital filter settings, if it is active via Enable filter (index 0x80n0:06 [▶ 37]). The possible settings are sequentially numbered.		UINT16	RW	0x0000 (0_{dec})
		0_{dec}	50 Hz FIR			
		1_{dec}	60 Hz FIR			
		2_{dec}	IIR 1			
		3_{dec}	IIR 2			
		4_{dec}	IIR 3			
		5_{dec}	IIR 4			
		6_{dec}	IIR 5			
		7_{dec}	IIR 6			
		8_{dec}	IIR 71			
		9_{dec}	IIR 8			
8010:17	User calibration offset	User calibration: Offset		INT16	RW	0x0000 (0_{dec})
8010:18	User calibration gain	User calibration: Gain		INT16	RW	0x4000 (16384_{dec})

Index 8020 AO Settings Ch.3

Index (hex)	Name	Meaning		Data type	Flags	Default
8020:0	AO Settings Ch.3	Maximum subindex		UINT8	RO	0x16 (22_{dec})
8020:01	Enable user scale	0_{bin}	User scaling not active	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	User scaling active			
8020:02	Presentation	0_{dec}	Signed presentation The output value range 0x7pp1:11 is shown as 16 bit signed integer. For unipolar terminals (0-10V or 0-20 mA) the negative range is set to zero.	BIT3	RW	0x00 (0_{dec})
		1_{dec}	Unsigned presentation The output value range 0x7pp1:11 is shown as 16 bit unsigned integer. Negative values are not possible.			
		2_{dec}	Absolute value with MSB as sign Signed amount representation is active.			
		3_{dec}	Absolute value The absolute value of the signed representation is formed.			
8020:05	Watchdog	0_{dec}	Default watchdog value The default value (0x8pp0:13) is active.	BIT2	RW	0x00 (0_{dec})
		1_{dec}	Watchdog ramp The ramp (0x8pp0:14) for moving to the default value ((0x8pp0:13)) is active.			
		2_{dec}	Last output value In the event of an error (triggering of the watchdog) the last process data is output.			
8020:07	Enable user calibration	0_{bin}	User calibration not active	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	User calibration active			
8020:08	Enable vendor calibration	0_{bin}	Manufacturer calibration not active	BOOLEAN	RW	0x01 (1_{dec})
		1_{bin}	Vendor calibration active			
8020:11	User scale offset	User scaling: Offset		INT16	RW	0x0000 (0_{dec})
8020:12	User scale gain	User scaling: Gain This is the user scaling gain. The gain is represented in fixed-point format, with the factor 2^{-16}. The value one corresponds to 65535 (0x00010000).		INT32	RW	0x00010000 (65536_{dec})
8020:13	Default output	Default output value		INT16	RW	0x0000 (0_{dec})
8020:14	Default output ramp	This value defines the ramps for the ramp-down to the default value. The value is specified in digits/ms. If the entry is 100 and the default value 0, for example, it takes 327 ms (32767/100) for the output value to change from the maximum value (32767) to the default value in the event of a fault.		UINT16	RW	0xFFFF (65535_{dec})
8020:15	User calibration offset	User calibration: Offset		INT16	RW	0x0000 (0_{dec})
8020:16	User calibration gain	User calibration: Gain		UINT16	RW	0x4000 (16384_{dec})

Index 8030 AO Settings Ch.4

Index (hex)	Name	Meaning		Data type	Flags	Default
8030:0	AO Settings Ch.4	Maximum subindex		UINT8	RO	0x16 (22_{dec})
8030:01	Enable user scale	0_{bin}	User scaling not active	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	User scaling active			
8030:02	Presentation	0_{dec}	Signed presentation The output value range 0x7pp1:11 is shown as 16 bit signed integer. For unipolar terminals (0-10V or 0-20 mA) the negative range is set to zero.	BIT3	RW	0x00 (0_{dec})
		1_{dec}	Unsigned presentation The output value range 0x7pp1:11 is shown as 16 bit unsigned integer. Negative values are not possible.			
		2_{dec}	Absolute value with MSB as sign Signed amount representation is active.			
		3_{dec}	Absolute value The absolute value of the signed representation is formed.			
8030:05	Watchdog	0_{dec}	Default watchdog value The default value (0x8pp0:13) is active.	BIT2	RW	0x00 (0_{dec})
		1_{dec}	Watchdog ramp The ramp (0x8pp0:14) for moving to the default value ((0x8pp0:13)) is active.			
		2_{dec}	Last output value In the event of an error (triggering of the watchdog) the last process data is output.			
8030:07	Enable user calibration	0_{bin}	User calibration not active	BOOLEAN	RW	0x00 (0_{dec})
		1_{bin}	User calibration active			
8030:08	Enable vendor calibration	0_{bin}	Manufacturer calibration not active	BOOLEAN	RW	0x01 (1_{dec})
		1_{bin}	Vendor calibration active			
8030:11	User scale offset	User scaling: Offset		INT16	RW	0x0000 (0_{dec})
8030:12	User scale gain	User scaling: Gain This is the user scaling gain. The gain is represented in fixed-point format, with the factor 2^{-16}. The value one corresponds to 65535 (0x00010000).		INT32	RW	0x00010000 (65536_{dec})
8030:13	Default output	Default output value		INT16	RW	0x0000 (0_{dec})
8030:14	Default output ramp	This value defines the ramps for the ramp-down to the default value. The value is specified in digits/ms. If the entry is 100 and the default value 0, for example, it takes 327 ms (32767/100) for the output value to change from the maximum value (32767) to the default value in the event of a fault.		UINT16	RW	0xFFFF (65535_{dec})
8030:15	User calibration offset	User calibration: Offset		INT16	RW	0x0000 (0_{dec})
8030:16	User calibration gain	User calibration: Gain		UINT16	RW	0x4000 (16384_{dec})

Index F800 AIAO Range settings

Index (hex)	Name	Meaning		Data type	Flags	Default
F800:0	AIAO Range settings	Maximum subindex		UINT8	RO	0x04 (4_{dec})
F800:01	Input type Ch1	Input signal range for channel 1		UINT16	RW	0x0000 (0_{dec})
		0_{dec}	-10…+10 V			
		1_{dec}	0...20 mA			
		2_{dec}	4...20 mA			
		3_{dec}	0...10 V			
F800:02	Input type Ch2	Input signal range for channel 2 (values see channel 1)		UINT16	RW	0x0000 (0_{dec})
F800:03	Output type Ch3	Output signal range for channel 3		UINT16	RW	0x0000 (0_{dec})
		0_{dec}	-10…+10 V			
		1_{dec}	0...20 mA			
		2_{dec}	4...20 mA			
		3_{dec}	0...10 V			
F800:04	Output type Ch4	Output signal range for channel 4 (values see channel 3)		UINT16	RW	0x0000 (0_{dec})

5.4.2 Standard objects (0x1000-0x1FFF)

The standard objects have the same meaning for all EtherCAT slaves.

Index 1000 Device type

Index (hex)	Name	Meaning	Data type	Flags	Default
1000:0	Device type	Device type of the EtherCAT slave: The Lo-Word contains the CoE profile used (5001). The Hi-Word contains the module profile according to the modular device profile.	UINT32	RO	0x00001389 (5001_{dec})

Index 1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EPP4374-0002

Index 1009 Hardware version

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

Index 100A Software version

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

Index 1018 Identity

Index (hex)	Name	Meaning	Data type	Flags	Default
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4_{dec})
1018:01	Vendor ID	Vendor ID of the EtherCAT slave	UINT32	RO	0x00000002 (2_{dec})
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	0x6476D769 (1685509993_{dec})
1018:03	Revision	Revision number of the EtherCAT slave; the Low Word (bit 0-15) indicates the special terminal number, the High Word (bit 16-31) refers to the device description	UINT32	RO	0x00110002 (1114114_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave; the Low Byte (bit 0-7) of the Low Word contains the year of production, the High Byte (bit 8-15) of the Low Word contains the week of production, the High Word (bit 16-31) is 0	UINT32	RO	0x00000000 (0_{dec})

Index 10F0 Backup parameter handling

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

Index 1600 AO Outputs Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	AO Outputs Ch.3	PDO Mapping RxPDO 1	UINT8	RO	0x01 (1_{dec})
1600:01	SubIndex 001	1. PDO Mapping entry (object 0x7020 (AO outputs Ch.3), entry 0x11 (Analog output))	UINT32	RO	0x7020:11, 16

Index 1601 AO Outputs Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	AO Outputs Ch.4	PDO Mapping RxPDO 2	UINT8	RO	0x01 (1_{dec})
1601:01	SubIndex 001	1. PDO Mapping entry (object 0x7030 (AO outputs Ch.4), entry 0x11 (Analog output))	UINT32	RO	0x7030:11, 16

Index 1800 AI Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1800:0	AI Inputs Ch.1	PDO Parameter TxPDO 1	UINT8	RO	0x06 (6_{dec})
1800:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 1	OCTET-STRING[2]	RO	01 1A

Index 1801 AI Inputs Compact Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1801:0	AI Inputs Compact Ch.1	PDO Parameter TxPDO 2	UINT8	RO	0x06 (6_{dec})
1801:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 2	OCTET-STRING[2]	RO	00 1A

Index 1802 AI Inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1802:0	AI Inputs Ch.2	PDO Parameter TxPDO 3	UINT8	RO	0x06 (6_{dec})
1802:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 3	OCTET-STRING[2]	RO	03 1A

Index 1803 AI Inputs Compact Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1803:0	AI Inputs Compact Ch.2	PDO Parameter TxPDO 4	UINT8	RO	0x06 (6_{dec})
1803:06	Exclude TxPDOs	Specifies the TxPDOs (index of TxPDO mapping objects) that must not be transferred together with TxPDO 4	OCTET-STRING[2]	RO	02 1A

Index 1A00 AI Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	AI Inputs Ch.1	PDO Mapping TxPDO 1	UINT8	RO	0x0B (11_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (AI Inputs), entry 0x01 (Underrange))	UINT32	RO	0x6000:01, 1
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (AI Inputs), entry 0x02 (Overrange))	UINT32	RO	0x6000:02, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (AI Inputs), entry 0x03 (Limit 1))	UINT32	RO	0x6000:03, 2
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (AI Inputs), entry 0x05 (Limit 2))	UINT32	RO	0x6000:05, 2
1A00:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (AI Inputs), entry 0x07 (Error))	UINT32	RO	0x6000:07, 1
1A00:06	SubIndex 006	6. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A00:07	SubIndex 007	7. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A00:08	SubIndex 008	8. PDO Mapping entry (object 0x6000 (AI Inputs), entry 0x0E (Sync error))	UINT32	RO	0x6000:0E, 1
1A00:09	SubIndex 009	9. PDO Mapping entry (object 0x6000 (AI Inputs), entry 0x0F (TxPDO State))	UINT32	RO	0x6000:0F, 1
1A00:0A	SubIndex 010	10. PDO Mapping entry (object 0x6000 (AI Inputs), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6000:10, 1
1A00:0B	SubIndex 011	11. PDO Mapping entry (object 0x6000 (AI Inputs), entry 0x11 (Value))	UINT32	RO	0x6000:11, 16

Index 1A01 AI Inputs Compact Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	AI Inputs Compact Ch.1	PDO Mapping TxPDO 2	UINT8	RO	0x01 (1_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (AI Inputs), entry 0x11 (Value))	UINT32	RO	0x6000:11, 16

Index 1A02 AI Inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	AI Inputs Ch.2	PDO Mapping TxPDO 3	UINT8	RO	0x0B (11_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (AI Inputs), entry 0x01 (Underrange))	UINT32	RO	0x6010:01, 1
1A02:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (AI Inputs), entry 0x02 (Overrange))	UINT32	RO	0x6010:02, 1
1A02:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (AI Inputs), entry 0x03 (Limit 1))	UINT32	RO	0x6010:03, 2
1A02:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (AI Inputs), entry 0x05 (Limit 2))	UINT32	RO	0x6010:05, 2
1A02:05	SubIndex 005	5. PDO Mapping entry (object 0x6010 (AI Inputs), entry 0x07 (Error))	UINT32	RO	0x6010:07, 1
1A02:06	SubIndex 006	6. PDO Mapping entry (1 bits align)	UINT32	RO	0x0000:00, 1
1A02:07	SubIndex 007	7. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A02:08	SubIndex 008	8. PDO Mapping entry (object 0x6010 (AI Inputs), entry 0x0E (Sync error))	UINT32	RO	0x6010:0E, 1
1A02:09	SubIndex 009	9. PDO Mapping entry (object 0x6010 (AI Inputs), entry 0x0F (TxPDO State))	UINT32	RO	0x6010:0F, 1
1A02:0A	SubIndex 010	10. PDO Mapping entry (object 0x6010 (AI Inputs), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6010:10, 1
1A02:0B	SubIndex 011	11. PDO Mapping entry (object 0x6010 (AI Inputs), entry 0x11 (Value))	UINT32	RO	0x6010:11, 16

Index 1A03 AI Inputs Compact Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A03:0	AI Inputs Compact Ch.2	PDO Mapping TxPDO 4	UINT8	RO	0x01 (1_{dec})
1A03:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (AI Inputs), entry 0x11 (Value))	UINT32	RO	0x6010:11, 16

Index 1C00 Sync manager type

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

Index 1C12 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	0x02 (2_{dec})
1C12:01	Subindex 001	1st allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1600 (5632_{dec})
1C12:02	Subindex 002	2nd allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1601 (5633_{dec})

Index 1C13 TxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x02 (2_{dec})
1C13:01	Subindex 001	1st allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656_{dec})
1C13:02	Subindex 002	2nd allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A02 (6658_{dec})

Index 1C32 SM output parameter

Index (hex)	Name	Meaning			Data type	Flags	Default
1C32:0	SM output parameter	Synchronization parameters for the outputs			UINT8	RO	0x20 (32_{dec})
1C32:01	Sync mode	**Value**	Current synchronization mode		UINT16	RW	0x0001 (1_{dec})
		0	Free Run				
		1	Synchron with SM 2 Event				
		2	DC-Mode - Synchron with SYNC0 Event				
		3	DC-Mode - Synchron with SYNC1 Event				
1C32:02	Cycle time	Cycle time (in ns):			UINT32	RW	0x000F4240 (1000000_{dec})
		Free Run	Cycle time of the local timer				
		Synchron with SM 2 Event	Master cycle time				
		DC-Mode	SYNC0/SYNC1 Cycle Time				
1C32:03	Shift time	Time between SYNC0 event and output of the outputs (in ns, DC mode only)			UINT32	RO	0x00002710 (10000_{dez})
1C32:04	Sync modes supported	**Bit**	**Value**	Supported synchronization modes:	UINT16	RO	0xC007 (49159_{dec})
		0	1	free run is supported			
		1	1	Synchronous with SM 2 event is supported			
		3.2	01	DC mode is supported			
		5.4	10	Output shift with SYNC1 event (only DC mode)			
		14	1	dynamic times (measurement through writing of 0x1C32:08 [▶ 44])			
1C32:05	Minimum cycle time	Minimum cycle time (in ns)			UINT32	RO	0x0007A120 (500000_{dez})
1C32:06	Calc and copy time	Minimum time between SYNC0 and SYNC1 event (in ns, DC mode only)			UINT32	RO	0x00001388 (5000_{dez})
1C32:07	Minimum delay time				UINT32	RO	0x00001388 (5000_{dez})
1C32:08	Command	0	Measurement of the local cycle time is stopped		UINT16	RW	0x0000 (0_{dec})
		1	Measurement of the local cycle time is started				
		The entries 0x1C32:03 [▶ 44], 0x1C32:05 [▶ 44], 0x1C32:06 [▶ 44], 0x1C32:09 [▶ 44], 0x1C33:03, 0x1C33:06 [▶ 44], 0x1C33:09					
1C32:09	Maximum Delay time	Time between SYNC1 event and output of the outputs (in ns, DC mode only)			UINT32	RO	0x00001388 (5000_{dez})
1C32:0B	SM event missed counter	Number of missed SM events in OPERATIONAL (DC mode only)			UINT16	RO	0x0000 (0_{dec})
1C32:0C	Cycle exceeded counter	Number of occasions the cycle time was exceeded in OPERATIONAL (cycle was not completed in time or the next cycle began too early)			UINT16	RO	0x0000 (0_{dec})
1C32:0D	Shift too short counter	Number of occasions that the interval between SYNC0 and SYNC1 event was too short (DC mode only)			UINT16	RO	0x0000 (0_{dec})
1C32:20	Sync error	The synchronization was not correct in the last cycle (outputs were output too late; DC mode only)			BOOLEAN	RO	0x00 (0_{dec})

Index 1C33 SM input parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32_{dec})
1C33:01	Sync mode	Current synchronization mode: • 0: Free Run • 1: Synchronous with SM 3 Event (no outputs available) • 2: DC - Synchron with SYNC0 Event • 3: DC - Synchron with SYNC1 Event • 34: Synchronous with SM 2 Event (outputs available)	UINT16	RW	0x0022 (34_{dec})
1C33:02	Cycle time	as 0x1C32:02	UINT32	RW	0x000F4240 (1000000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00001388 (5000_{dec})
1C33:04	Sync modes supported	Supported synchronization modes: • Bit 0: free run is supported • Bit 1: Synchronous with SM 2 Event is supported (outputs available) • Bit 1: Synchronous with SM 3 Event is supported (no outputs available) • Bit 2-3 = 01: DC mode is supported • Bit 4-5 = 01: input shift through local event (outputs available) • Bit 4-5 = 10: input shift with SYNC1 event (no outputs available) • Bit 14 = 1: dynamic times (measurement through writing of 0x1C32:08 or 0x1C33:08 [▶ 45])	UINT16	RO	0xC007 (49159_{dec})
1C33:05	Minimum cycle time	as 0x1C32:05	UINT32	RO	0x0007A120 (500000_{dec})
1C33:06	Calc and copy time	Time between reading of the inputs and availability of the inputs for the master (in ns, only DC mode)	UINT32	RO	0x00002710 (10000_{dec})
1C33:07	Minimum delay time		UINT32	RO	0x00001388 (5000_{dec})
1C33:08	Command	as 0x1C32:08	UINT16	RW	0x0000 (0_{dec})
1C33:09	Maximum delay time	Time between SYNC1 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00001388 (5000_{dec})
1C33:0B	SM event missed counter	as 0x1C32:11	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	as 0x1C32:12	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	as 0x1C32:13	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	as 0x1C32:32	BOOLEAN	RO	0x00 (0_{dec})

5.4.3 Profile-specific objects (0x6000-0xFFFF)

The profile-specific objects have the same meaning for all EtherCAT slaves that support the profile 5001.

Index 6000 AI Inputs Ch.1

Index (hex)	Name	Meaning		Data type	Flags	Default
6000:0	AI Inputs Ch.1			UINT8	RO	0x11 (17_{dec})
6000:01	Underrange	Underrange event active		BOOLEAN	RO	0x00 (0_{dec})
6000:02	Overrange	Overrange event active		BOOLEAN	RO	0x00 (0_{dec})
6000:03	Limit 1	Bit 0 = 1_{bin}	Value greater than limit 1	BIT2	RO	0x00 (0_{dec})
		Bit 1 = 1_{bin}	Value less than limit 1			
6000:05	Limit 2	Bit 0 = 1_{bin}	Value greater than limit 2	BIT2	RO	0x00 (0_{dec})
		Bit 1 = 1_{bin}	Value less than limit 2			
6000:07	Error	Bit set when Over- or Underrange		BOOLEAN	RO	0x00 (0_{dec})
6000:0E	Sync error			BOOLEAN	RO	0x00 (0_{dec})
6000:0F	TxPDO State			BOOLEAN	RO	0x00 (0_{dec})
6000:10	TxPDO Toggle			BOOLEAN	RO	0x00 (0_{dec})
6000:11	Value			INT16	RO	0x0000 (0_{dec})

Index 6010 AI Inputs Ch.2

Index (hex)	Name	Meaning		Data type	Flags	Default
6010:0	AI Inputs Ch.2			UINT8	RO	0x11 (17_{dec})
6010:01	Underrange	Underrange event active		BOOLEAN	RO	0x00 (0_{dec})
6010:02	Overrange	Overrange event active		BOOLEAN	RO	0x00 (0_{dec})
6010:03	Limit 1	Bit 0 = 1_{bin}	Value greater than limit 1	BIT2	RO	0x00 (0_{dec})
		Bit 1 = 1_{bin}	Value less than limit 1			
6010:05	Limit 2	Bit 0 = 1_{bin}	Value greater than limit 2	BIT2	RO	0x00 (0_{dec})
		Bit 1 = 1_{bin}	Value less than limit 2			
6010:07	Error	Bit set when Over- or Underrange		BOOLEAN	RO	0x00 (0_{dec})
6010:0E	Sync error			BOOLEAN	RO	0x00 (0_{dec})
6010:0F	TxPDO State			BOOLEAN	RO	0x00 (0_{dec})
6010:10	TxPDO Toggle			BOOLEAN	RO	0x00 (0_{dec})
6010:11	Value			INT16	RO	0x0000 (0_{dec})

Index 7020 AO Outputs Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
7020:0	AO Outputs Ch.3		UINT8	RO	0x11 (17_{dec})
7020:11	Analog output	Analog output data	INT16	RO	0x0000 (0_{dec})

Index 7030 AO Outputs Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
7030:0	AO Outputs Ch.4		UINT8	RO	0x11 (17_{dec})
7030:11	Analog output	Analog output data	INT16	RO	0x0000 (0_{dec})

Index 800E AI Internal data Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
800E:0	AI Internal data Ch.1		UINT8	RO	0x01 (1_{dec})
800E:01	ADC raw value		INT16	RO	0x0000 (0_{dec})

Index 800F AI Vendor data Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
800F:0	AI Vendor data Ch.1		UINT8	RO	0x06 (6_{dec})
800F:01	R0 offset		INT16	RW	0x0000 (0_{dec})
800F:02	R0 gain		INT16	RW	0x4000 (16384_{dec})
800F:03	R1 offset		INT16	RW	0x0000 (0_{dec})
800F:04	R1 gain		INT16	RW	0x4000 (16384_{dec})
800F:05	R2 offset		INT16	RW	0x0000 (0_{dec})
800F:06	R2 gain		INT16	RW	0x4000 (16384_{dec})

Index 801E AI Internal data Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
801E:0	AI Internal data Ch.2		UINT8	RO	0x01 (1_{dec})
801E:01	ADC raw value		INT16	RO	0x0000 (0_{dec})

Index 801F AI Vendor data Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
801F:0	AI Vendor data Ch.2		UINT8	RO	0x06 (6_{dec})
801F:01	R0 offset		INT16	RW	0x0000 (0_{dec})
801F:02	R0 gain		INT16	RW	0x4000 (16384_{dec})
801F:03	R1 offset		INT16	RW	0x0000 (0_{dec})
801F:04	R1 gain		INT16	RW	0x4000 (16384_{dec})
801F:05	R2 offset		INT16	RW	0x0000 (0_{dec})
801F:06	R2 gain		INT16	RW	0x4000 (16384_{dec})

Index 802E AO Internal data Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
802E:0	AO Internal data Ch.3		UINT8	RO	0x01 (1_{dec})
802E:01	DAC raw value	This is the raw DAC value.	UINT16	RO	0x0000 (0_{dec})

Index 802F AO Vendor data Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
802F:0	AO Vendor data Ch.3		UINT8	RO	0x06 (6_{dec})
802F:01	R0 Calibration Offset	Vendor calibration: Offset for +/-10 V	INT16	RW	0x0000 (0_{dec})
802F:02	R0 Calibration Gain	Vendor calibration: Gain for +/-10 V	UINT16	RW	0x4000 (16384_{dec})
802F:03	R1 Calibration Offset	Vendor calibration: Offset for 0-20 mA	INT16	RW	0x0000 (0_{dec})
802F:04	R1 Calibration Gain	Vendor calibration: Gain for 0-20 mA	UINT16	RW	0x4000 (16384_{dec})
802F:05	R2 Calibration Offset	Vendor calibration: Offset for 4-20 mA	INT16	RW	0x0000 (0_{dec})
802F:06	R2 Calibration Gain	Vendor calibration: Gain for 4-20 mA	UINT16	RW	0x4000 (16384_{dec})

Index 803E AO Internal data Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
803E:0	AO Internal data Ch.4		UINT8	RO	0x01 (1_{dec})
803E:01	DAC raw value	This is the raw DAC value.	UINT16	RO	0x0000 (0_{dec})

Index 803F AO Vendor data Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
803F:0	AO Vendor data Ch.4		UINT8	RO	0x06 (6_{dec})
803F:01	R0 Calibration Offset	Vendor calibration: Offset for +/-10 V	INT16	RW	0x0000 (0_{dec})
803F:02	R0 Calibration Gain	Vendor calibration: Gain for +/-10 V	UINT16	RW	0x4000 (16384_{dec})
803F:03	R1 Calibration Offset	Vendor calibration: Offset for 0-20 mA	INT16	RW	0x0000 (0_{dec})
803F:04	R1 Calibration Gain	Vendor calibration: Gain for 0-20 mA	UINT16	RW	0x4000 (16384_{dec})
803F:05	R2 Calibration Offset	Vendor calibration: Offset for 4-20 mA	INT16	RW	0x0000 (0_{dec})
803F:06	R2 Calibration Gain	Vendor calibration: Gain for 4-20 mA	UINT16	RW	0x4000 (16384_{dec})

Index F000 Modular device profile

Index (hex)	Name	Meaning	Data type	Flags	Default
F000:0	Modular device profile	General information for the modular device profile	UINT8	RO	0x02 (2_{dec})
F000:01	Module index distance	Index distance of the objects of the individual channels	UINT16	RO	0x0010 (16_{dec})
F000:02	Maximum number of modules	Number of channels	UINT16	RO	0x0004 (4_{dec})

Index F008 Code word

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

Index F010 Module list

Index (hex)	Name	Meaning	Data type	Flags	Default
F010:0	Module list		UINT8	RW	0x04 (4_{dec})
F010:01	SubIndex 001		UINT32	RW	0x0000012C (300_{dec})
F010:02	SubIndex 002		UINT32	RW	0x0000012C (300_{dec})
F010:03	SubIndex 003		UINT32	RW	0x00000190 (400_{dec})
F010:04	SubIndex 004		UINT32	RW	0x00000190 (400_{dec})

5.5 Restoring the delivery state

To restore the delivery state for backup objects in ELxxxx terminals / EPxxxx- and EPPxxxx box modules, the CoE object *Restore default parameters, SubIndex 001* can be selected in the TwinCAT System Manager (Config mode).

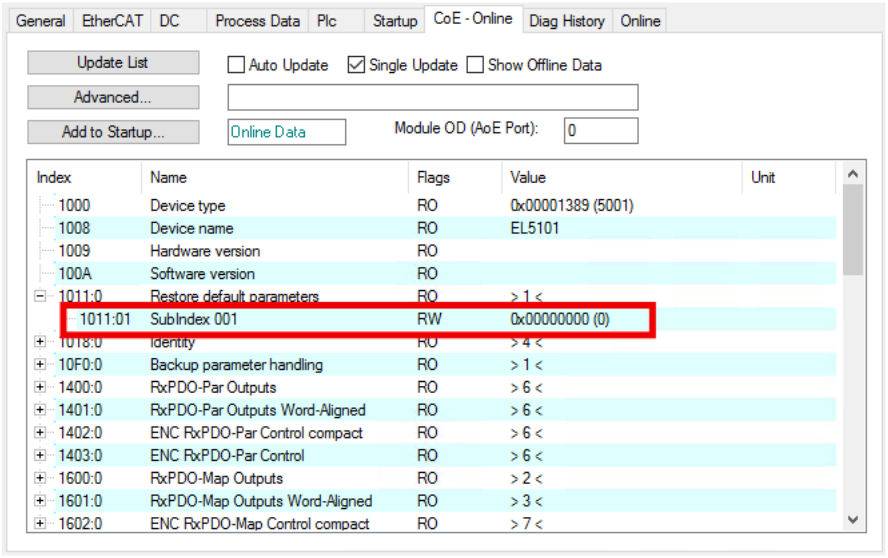


Fig. 8: Selecting the Restore default parameters PDO

Double-click on *SubIndex 001* to enter the Set Value dialog. Enter the value **1684107116** in field *Dec* or the value **0x64616F6C** in field *Hex* and confirm with OK.

All backup objects are reset to the delivery state.

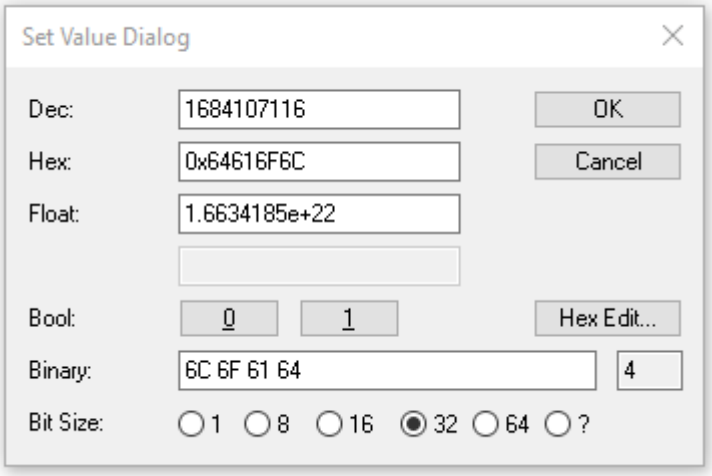


Fig. 9: Entering a restore value in the Set Value dialog

Alternative restore value

In some older terminals / boxes the backup objects can be switched with an alternative restore value:
Decimal value: 1819238756
Hexadecimal value: 0x6C6F6164

An incorrect entry for the restore value has no effect.

6 Appendix

6.1 General operating conditions

Protection degrees (IP-Code)

The standard IEC 60529 (DIN EN 60529) defines the degrees of protection in different classes.

1. Number: dust protection and touch guard	Definition
0	Non-protected
1	Protected against access to hazardous parts with the back of a hand. Protected against solid foreign objects of Ø 50 mm
2	Protected against access to hazardous parts with a finger. Protected against solid foreign objects of Ø 12.5 mm.
3	Protected against access to hazardous parts with a tool. Protected against solid foreign objects Ø 2.5 mm.
4	Protected against access to hazardous parts with a wire. Protected against solid foreign objects Ø 1 mm.
5	Protected against access to hazardous parts with a wire. Dust-protected. Intrusion of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the device or to impair safety.
6	Protected against access to hazardous parts with a wire. Dust-tight. No intrusion of dust.
2. Number: water* protection	Definition
0	Non-protected
1	Protected against water drops
2	Protected against water drops when enclosure tilted up to 15°.
3	Protected against spraying water. Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects.
4	Protected against splashing water. Water splashed against the disclosure from any direction shall have no harmful effects
5	Protected against water jets
6	Protected against powerful water jets
7	Protected against the effects of temporary immersion in water. Intrusion of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water for 30 min. in 1 m depth.

*) These protection classes define only protection against water.

Chemical Resistance

The Resistance relates to the Housing of the IP67 modules and the used metal parts. In the table below you will find some typical resistance.

Character	Resistance
Steam	at temperatures >100°C: not resistant
Sodium base liquor (ph-Value > 12)	at room temperature: resistant > 40°C: not resistant
Acetic acid	not resistant
Argon (technical clean)	resistant

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 for fieldbus components can be found here.

Ordering information	Description	Link
ZB8513-0002	EMC shield clamp for M12 connectors	Data sheet
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

Labeling material, protective caps

Ordering information	Description
ZS5000-0012	Protective cap for M8 sockets, P-coded, 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. *“EL5021 EL terminal, standard IP20 IO device with batch number and revision ID (since 2014/01)”*.
- The type, version and revision are read as decimal numbers, even if they are technically saved in hexadecimal.

6.3.2 Version identification of EP/EPI/EPP/ER/ERI boxes

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

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

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

Syntax: D ww yy x y z u

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

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

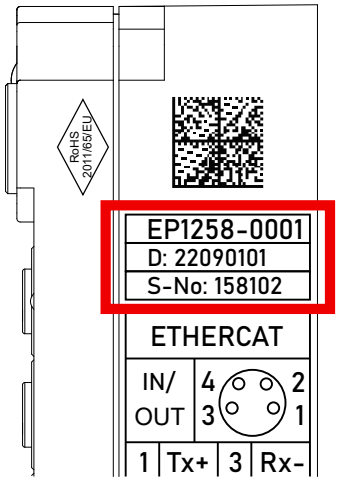


Fig. 10: EP1258-00001 IP67 EtherCAT Box with batch number/DateCode 22090101 and unique serial number 158102

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.

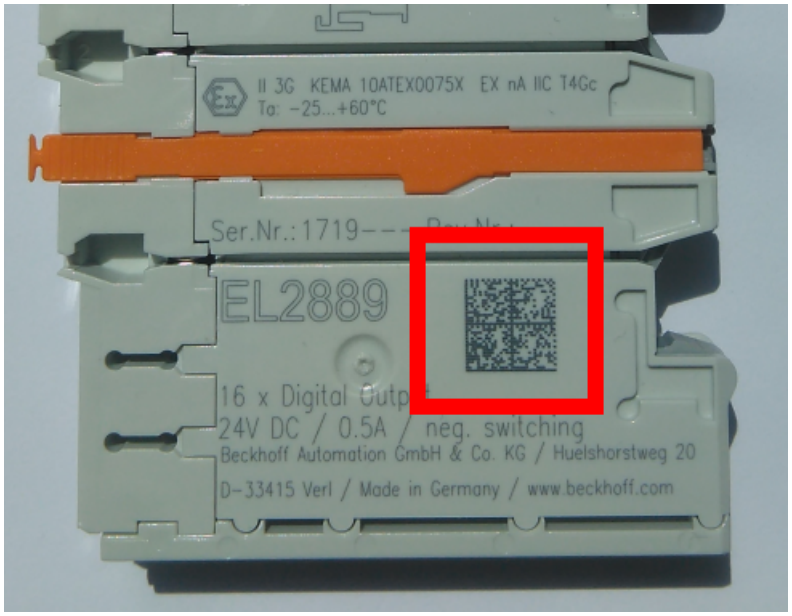


Fig. 11: BIC as data matrix code (DMC, code scheme ECC200)

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

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

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

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

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

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

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

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

Structure of the BIC

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

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

Accordingly as DMC:

Fig. 12: Example DMC **1P**072222**S**BTNk4p562d7**1K**EL1809 **Q**1 **51S**678294

BTN

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

NOTE

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

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.

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

K-bus devices (IP20, IP67)

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

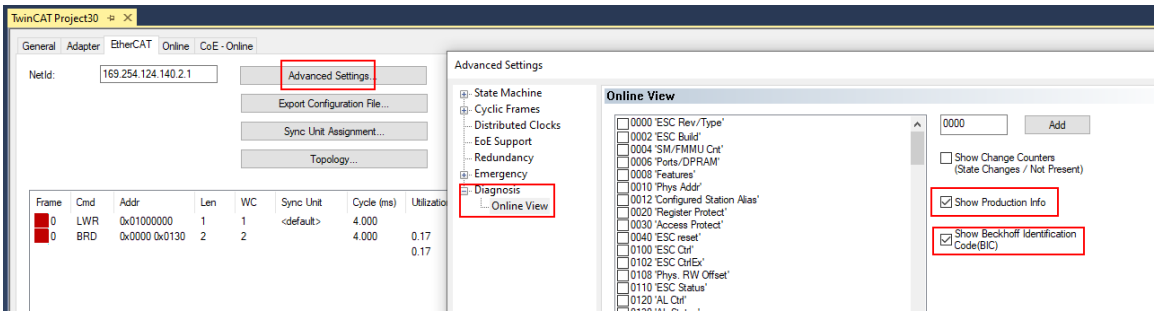
EtherCAT devices (IP20, IP67)

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

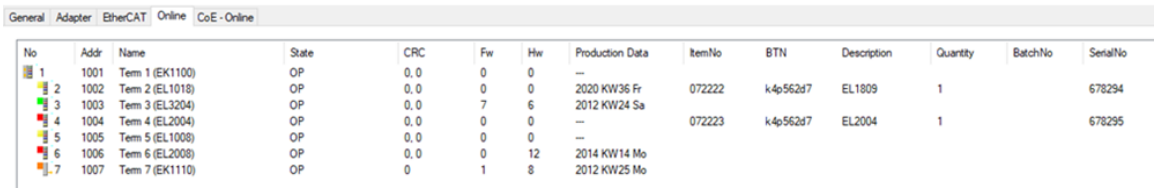
The eBIC is also stored in the ESI-EEPROM. The eBIC was introduced into the Beckhoff I/O production (terminals, box modules) from 2020; widespread implementation is expected in 2021.

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

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



  - The BTN and its contents are then displayed:



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

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

Index	Name	Flags	Value
1000	Device type	RO	0x015E1389 (22942601)
1008	Device name	RO	ELM3704-0000
1009	Hardware version	RO	00
100A	Software version	RO	01
100B	Bootloader version	RO	J0.1.27.0
1011:0	Restore default parameters	RO	> 1 <
1018:0	Identity	RO	> 4 <
10E2:0	Manufacturer-specific Identification C...	RO	> 1 <
10E2:01	SubIndex 001	RO	1P158442SBTN0008jekp1KELM3704 Q1 2P482001000016
10F0:0	Backup parameter handling	RO	> 1 <
10F3:0	Diagnosis History	RO	> 21 <
10F8	Actual Time Stamp	RO	0x170bfb277e

- the object 0x10E2 will be introduced into stock products in the course of a necessary firmware revision.
- From TwinCAT 3.1. build 4024.24 the functions *FB_EcCoEReadBIC* and *FB_EcCoEReadBTN* for reading into the PLC and further eBIC auxiliary functions are available in the Tc2_EtherCAT Library from v3.3.19.0.

- Note: in the case of electronic further processing, the BTN is to be handled as a string(8); the identifier "SBTN" is not part of the BTN.
- Technical background
  The new BIC information is additionally written as a category in the ESI-EEPROM during the device production. The structure of the ESI content is largely dictated by the ETG specifications, therefore the additional vendor-specific content is stored with the help of a category according to ETG.2010. ID 03 indicates to all EtherCAT masters that they must not overwrite these data in case of an update or restore the data after an ESI update.
  The structure follows the content of the BIC, see there. This results in a memory requirement of approx. 50..200 bytes in the EEPROM.
- Special cases
  - If multiple, hierarchically arranged ESCs are installed in a device, only the top-level ESC carries the eBIC Information.
  - If multiple, non-hierarchically arranged ESCs are installed in a device, all ESCs carry the eBIC Information.
  - If the device consists of several sub-devices with their own identity, but only the top-level device is accessible via EtherCAT, the eBIC of the top-level device is located in the CoE object directory 0x10E2:01 and the eBICs of the sub-devices follow in 0x10E2:nn.

Profibus/Profinet/DeviceNet... Devices

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

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: https://www.beckhoff.com

You will also find further documentation for Beckhoff components there.

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

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e-mail:	support@beckhoff.com

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