BECKHOFF New Automation Technology

Documentation | EN

EP3744-x041

EtherCAT Box modules with pressure inputs

2022-02-03 | Version: 2.6

Table of contents

1 Foreword

1.1 Notes on the documentation

Intended audience

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

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

Patent Pending

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

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

Copyright

1.2 Safety instructions

Safety regulations

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

Exclusion of liability

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

Personnel qualification

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

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.

1.3 Documentation Issue Status

Version	Comment
2.6	• Fittings mating cycles amended • Chapter "Connecting hoses" amended
2.5	• Dimensions updated • UL requirements updated
2.4	• Front page updated
2.3	• Pressure measuring ranges made clearer • Structure update
2.2	• Update technical data
2.1	• Update Safety instructions • Correction in chapter *Process image* • Update chapter *Mounting*
2.0.0	• Migration
1.3.0	• Chapter Settings added
1.2.0	• Power Connection updated
1.1.0	• Front page updated • EP3744-1041 added to EP3744-x041 introduction • EP3744-1041 added to Technical Data • Process image heading adapted • Support and Service updated • Safety instructions updated • Notes on the documentation updated • EtherCAT connection updated • Nut torques for connectors updated • EtherCAT cables updated
1.0.0	• First release
0.1.0	• 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	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 [▶ 59].

2 EtherCAT Box - Introduction

The EtherCAT system has been extended with EtherCAT Box modules with protection class IP67. Through the integrated EtherCAT interface the modules can be connected directly to an EtherCAT network without an additional Coupler Box. The high-performance of EtherCAT is thus maintained into each module.

The extremely low dimensions of only 126 x 30 x 26.5 mm (h x w x d) are identical to those of the Fieldbus Box extension modules. They are thus particularly suitable for use where space is at a premium. The small mass of the EtherCAT modules facilitates applications with mobile I/O interface (e.g. on a robot arm). The EtherCAT connection is established via screened M8 connectors.

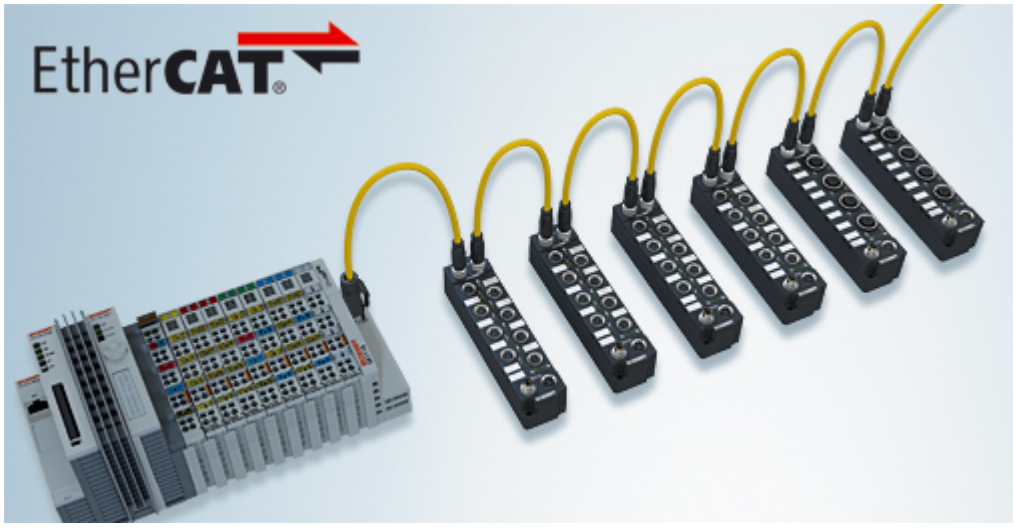


Fig. 1: EtherCAT Box Modules within an EtherCAT network

The robust design of the EtherCAT Box modules enables them to be used directly at the machine. Control cabinets and terminal boxes are now no longer required. The modules are fully sealed and therefore ideally prepared for wet, dirty or dusty conditions.

Pre-assembled cables significantly simplify EtherCAT and signal wiring. Very few wiring errors are made, so that commissioning is optimized. In addition to pre-assembled EtherCAT, power and sensor cables, field-configurable connectors and cables are available for maximum flexibility. Depending on the application, the sensors and actuators are connected through M8 or M12 connectors.

The EtherCAT modules cover the typical range of requirements for I/O signals with protection class IP67:

- digital inputs with different filters (3.0 ms or 10 µs)
- digital outputs with 0.5 or 2 A output current
- analog inputs and outputs with 16 bit resolution
- Thermocouple and RTD inputs
- Stepper motor modules

XFC (eXtreme Fast Control Technology) modules, including inputs with time stamp, are also available.

Fig. 2: EtherCAT Box with M8 connections for sensors/actuators

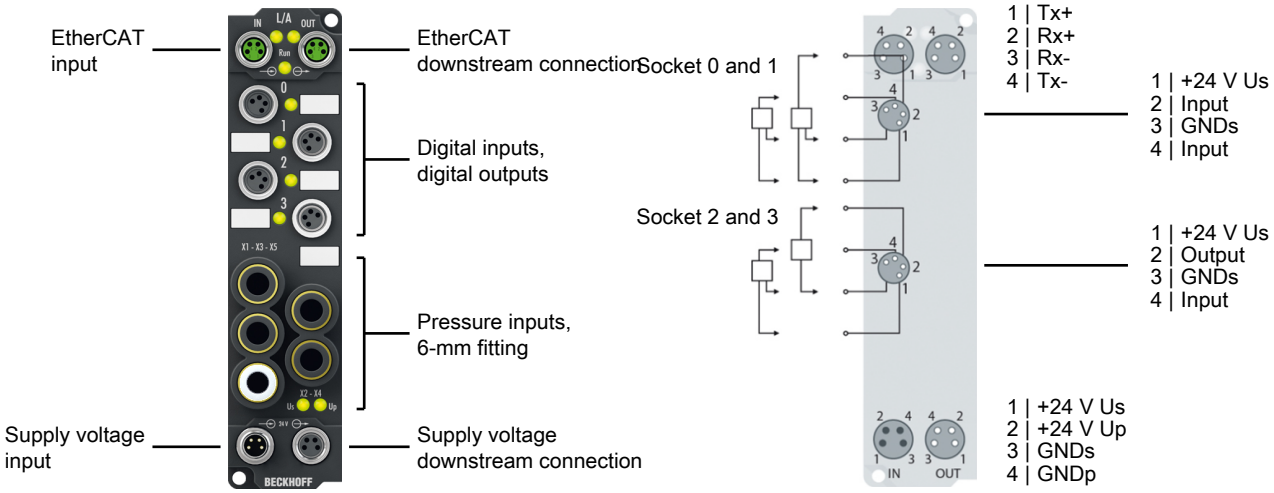
Fig. 3: EtherCAT Box with M12 connections for sensors/actuators

Basic EtherCAT documentation

You will find a detailed description of the EtherCAT system in the Basic System Documentation for EtherCAT, which is available for download from our website (www.beckhoff.com) under Downloads.

3 Product overview

3.1 Introduction



EtherCAT Box with 6 digital inputs (24 V_{DC}, 10 µs), 2 digital outputs (24 V_{DC}, 0.5 A) and reference pressure inputs

The EP3744-x041 EtherCAT Box with six digital inputs and two digital outputs records binary control signals from the process level and transfers them, electrically isolated, to the controller. The signal status is indicated by LEDs, the signals are connected via 3-pole M8 plug connectors (sockets).

Four pneumatic connections (6 mm) offer the possibility to directly measure differential pressure. This value is measured or calculated in relation to the fifth reference pressure connection (6 mm).

The sensors and outputs are supplied from the control voltage Us. Since only one GND is available on the M8 plug for the inputs and outputs, this alternative supply was selected.

The load voltage Up is not used in the input module, but may optionally be connected in order to be relayed downstream.

Pressure measurement with EP3744-0041

The pressure is measured as an absolute value or as a differential value relative to the fifth connection via an integrated 6 mm fitting. The pressure values are available as 16-bit values. Measurement can take place between -1 bar and +1 bar, wherein the value is output relative to the fifth connection, e.g. for vacuum measurement in relation to the ambient pressure at the suction grippers. In absolute pressure mode, pressures between 0 and 1 bar can be measured.

Pressure measurement with EP3744-1041

The pressure is measured as an absolute value or as a differential value relative to the fifth connection via an integrated 6 mm fitting. The pressure values are available as 16-bit values. Measurement can take place between -7 bar and +7 bar, wherein the value is output relative to the fifth connection, e.g. for vacuum measurement in relation to the ambient pressure at the suction grippers. In absolute pressure mode, pressures between 0 and 7 bar can be measured.

Quick links

Technical data [▶ 11]
Process image [▶ 15]
Dimensions [▶ 17]
Commissioning [▶ 29]

3.2 Technical data

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

EtherCAT	
Connection	2 x M8 socket, 4-pin, green
Electrical isolation	500 V
Distributed Clocks	yes
Minimum cycle time	700 µs

Supply voltages	
Connection	Input: M8 connector, 4-pin Downstream connection: M8 socket, 4-pin, black
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current: $I_{S,sum}$	max. 4 A
Current consumption from U_S	120 mA + Current consumption of connected sensors + Loads at digital outputs
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P sum current: $I_{P,sum}$	max. 4 A
Current consumption from U_P	None. U_P is only forwarded.
Diagnostics	Undervoltage detection • U_S < 18 V_{DC} • U_P < 18 V_{DC}

Pressure inputs	EP3744-0041	EP3744-1041
Number	4 + 1 reference input for the differential pressure measurement	
Connections	Fittings, d = 6 mm	
Number of mating cycles	5	
Type of pressure measurement	Adjustable [▶ 29]: • Absolute pressure measurement • Differential pressure measurement (factory setting)	
Absolute pressure measuring range [▶ 13]	0 … 1 bar [1] (0 … 15 psi)	0 … 7 bar [1] (0 … 100 psi)
Differential pressure measuring range [3]	-1 … +1 bar (-15 … +15 psi)	-7 … +7 bar (-100 … +100 psi)
Resolution	1 mbar per LSB	
Measuring error	3% of the full scale value	
Conversion time	5 EtherCAT cycles (Note the minimum EtherCAT cycle time, see above)	
Permissible media	non-aggressive gases	
Maximum overload of an input	3 bar absolute pressure [2]	21 bar absolute pressure [2]

[1] 0 bar = vacuum
1 bar = ambient pressure

[2] Even in the case of differential pressure measurement, the absolute pressure measuring range [▶ 13] must not be exceeded at any pressure input.

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

Digital outputs	
Number	2
Connection	2 M8 sockets (sockets 2 and 3)
Nominal voltage	24 V from the control voltage U_S
Output current	max. 0.5 A per output, individually short-circuit proof

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors and fittings)
Weight	approx. 175 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 [▶ 12]
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, cURus [▶ 27], EAC, UKCA

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

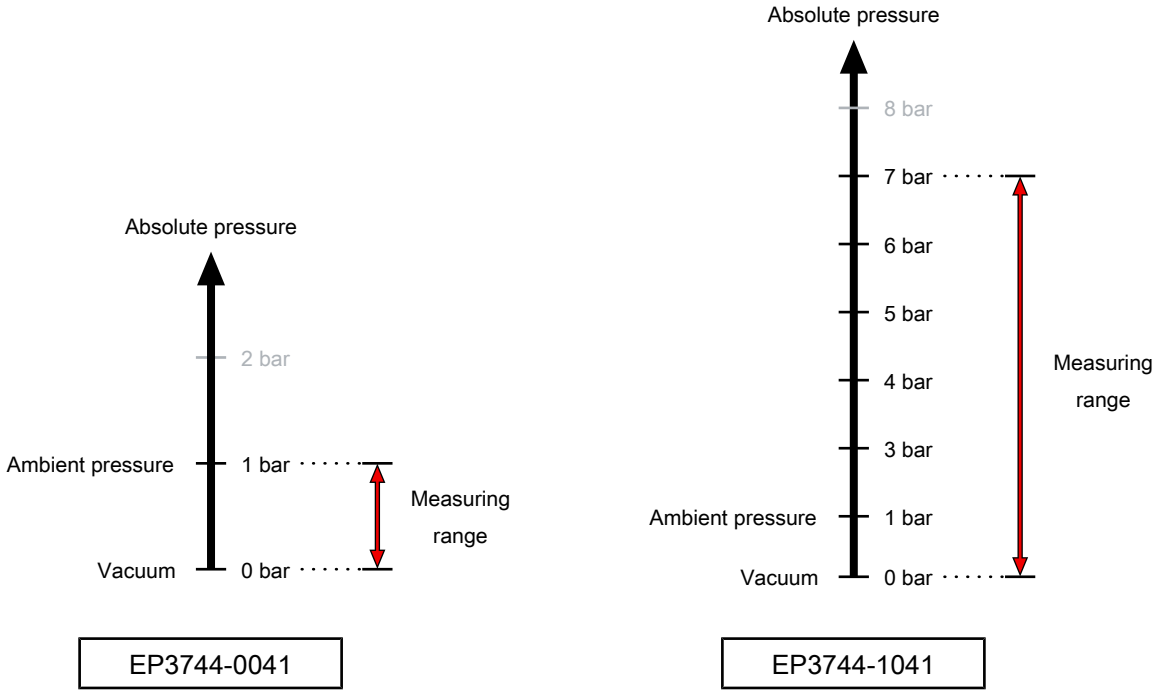
Additional checks

The boxes have been subjected to the following checks:

Verification	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

3.2.1 Absolute pressure measuring range

The absolute pressure measuring range must be adhered to for each pressure connection, regardless of the chosen measurement method (absolute pressure / differential pressure):



3.3 Scope of supply

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

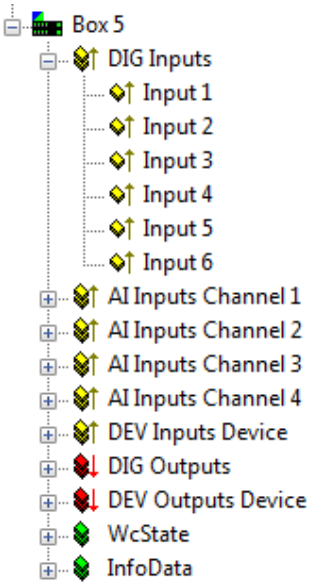
- 1x EtherCAT Box EP3744-x041
- 2x protective cap for EtherCAT socket, M8, green (pre-assembled)
- 1x protective cap for supply voltage input, M8, transparent (pre-assembled)
- 1x protective cap for supply voltage output, M8, black (pre-assembled)
- 10x labels, blank (1 strip of 10)

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.

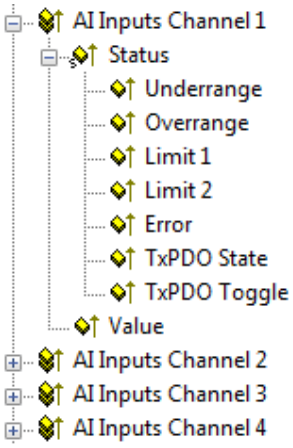
Ensure that the protective caps are correctly seated to ensure IP67 protection.

3.4 Process image



The six digital inputs of the module can be found under **DIG Inputs 1** to **6**.

- Input 1 - socket 0, pin 4
- Input 2 - socket 0, pin 2
- Input 3 - socket 1, pin 4
- Input 4 - socket 1, pin 2
- Input 5 - socket 2, pin 4
- Input 6 - socket 3, pin 4



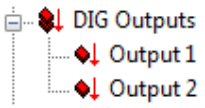
The four pressure measuring inputs of the module can be found under **AI inputs Channel 1** to **4**.

- Underrange: the value fell below the underrange value
- Overrange: the overrange value was exceeded
- Limit1: the Limit1 value specified in the CoE objects was reached
- Limit2: the Limit2 value specified in the CoE objects was reached
- Error: one of the above events has occurred
- Value: the pressure measured in the unit that was pre-scaled in the CoE objects (e.g. mbar).

Assignment of the channels to the connections at the housing [▶ 24]

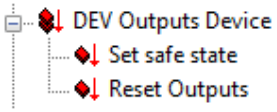
The diagnostic data for the module can be found under **DEV Inputs Device**.

- Safe State Active: there was an interruption in communication, causing the outputs to change to the safe state
- Sync error: a synchronization error has occurred
- Undervoltage Us: the voltage U_S is less than approx. 18 V_{DC}
- Undervoltage Up: the voltage U_P is less than approx. 18 V_{DC}
- TxPDO Toggle: EtherCAT variable for displaying a transmitted date of receipt (see general EtherCAT documentation)



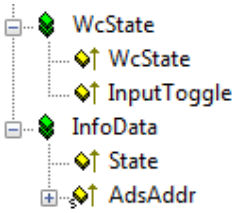
The two digital outputs of the module can be found under **DIG Outputs 1** and **2**.

- Output 1 - socket 2, pin 2
- Output 2 - socket 3, pin 2



The output variables for setting or resetting the outputs of the module can be found under **DEV Output Device**.

- Set safe state: the outputs change to the safe state (see CoE objects)
- Reset Outputs: reserved

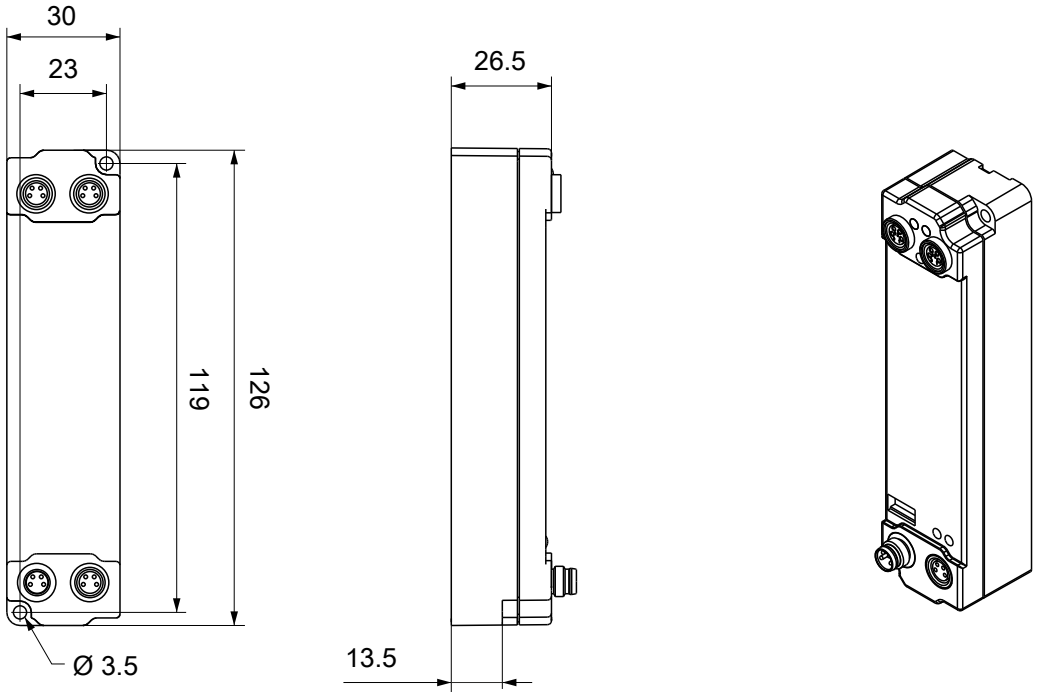


These are standard EtherCAT variables; more information in the general EtherCAT manual.

4 Mounting and connection

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 fastening holes Ø 3.5 mm for M3
Metal parts	brass, nickel-plated
Contacts	CuZn, gold-plated
Power feed through	max. 4 A
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 fastening holes in the corners of the module. The fastening holes have no thread.

4.1.3 Tightening torques for connectors

Screw M8 connectors tight with a torque wrench. (e.g. ZB8801 from Beckhoff)
Torque: 0.4 Nm.

4.2 Connection

4.2.1 EtherCAT

4.2.1.1 Connectors

NOTE

Risk of confusion: supply voltages and EtherCAT

Defect possible through incorrect insertion.

- Observe the color coding of the connectors:
  black: Supply voltages
  green: EtherCAT

EtherCAT Box Modules have two green M8 sockets for the incoming and downstream EtherCAT connections.

Connection

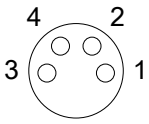


Fig. 4: M8 socket

EtherCAT	M8 connector	Core colors		
Signal	**Contact**	**ZB9010, ZB9020, ZB9030, ZB9032, ZK1090-6292, ZK1090-3xxx-xxxx**	**ZB9031 and old versions of ZB9030, ZB9032, ZK1090-3xxx-xxxx**	**TIA-568B**
Tx +	1	yellow[1)]	orange/white	white/orange
Tx -	4	orange[1)]	orange	orange
Rx +	2	white[1)]	blue/white	white/green
Rx -	3	blue[1)]	blue	green
Shield	Housing	Shield	Shield	Shield

[1)] Core colors according to EN 61918

Adaptation of core colors for cables ZB9030, ZB9032 and ZK1090-3xxxx-xxxx

For standardization, the core colors of the ZB9030, ZB9032 and ZK1090-3xxx-xxxx cables have been changed to the EN61918 core colors: yellow, orange, white, blue. So there are different color codes in circulation. The electrical properties of the cables have been retained when the core colors were changed.

4.2.1.2 Status LEDs

L/A (Link/Act)

A green LED labelled "L/A" is located next to each EtherCAT 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 Cables

For connecting EtherCAT devices only shielded Ethernet cables that meet the requirements of at least category 5 (CAT5) according to EN 50173 or ISO/IEC 11801 should be used.

EtherCAT uses four wires for signal transmission.
Thanks to automatic line detection ("Auto MDI-X"), both symmetrical (1:1) or cross-over cables can be used between Beckhoff EtherCAT.

Detailed recommendations for the cabling of EtherCAT devices

4.2.2 Supply voltages

⚠ 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 this device.

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 [▶ 27].

The EtherCAT Box has one input for 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 Box has inputs.
- **Peripheral voltage U_P**
  For EtherCAT Box modules with digital outputs the digital outputs are typically supplied from the peripheral voltage U_P. 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 power IN and OUT connections are bridged in the module. Hence, the supply voltages U_s and U_p can be passed from EtherCAT Box to EtherCAT Box in a simple manner.

NOTE

Note the maximum current!

Ensure that the permitted current for the connectors is not exceeded when routing the supply voltages U_S and U_P:

M8 connector: max. 4 A
7/8" connector: max 16 A

NOTE

The electrical isolation between GND_S and GND_P can be removed

In some EtherCAT Box modules the ground potentials GND_S and GND_P are linked.

If several EtherCAT Box modules are supplied with the same electrically isolated voltages, check whether there is an EtherCAT Box among them in which the ground potentials are linked.

4.2.2.1 Connectors

NOTE

Risk of confusion: supply voltages and EtherCAT

Defect possible through incorrect insertion.

- Observe the color coding of the connectors:
  black: Supply voltages
  green: EtherCAT

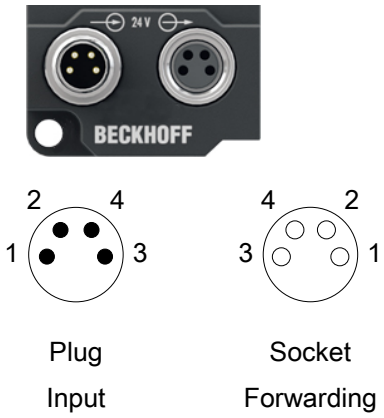


Fig. 5: M8 connector

Contact	Function	Description	Core color [1)]
1	U_S	Control voltage	Brown
2	U_P	Peripheral voltage	White
3	GND_S	GND to U_S	Blue
4	GND_P	GND to U_P	Black

[1)] The core colors apply to cables of the type: Beckhoff ZK2020-3xxx-xxxx

4.2.2.2 Status LEDs

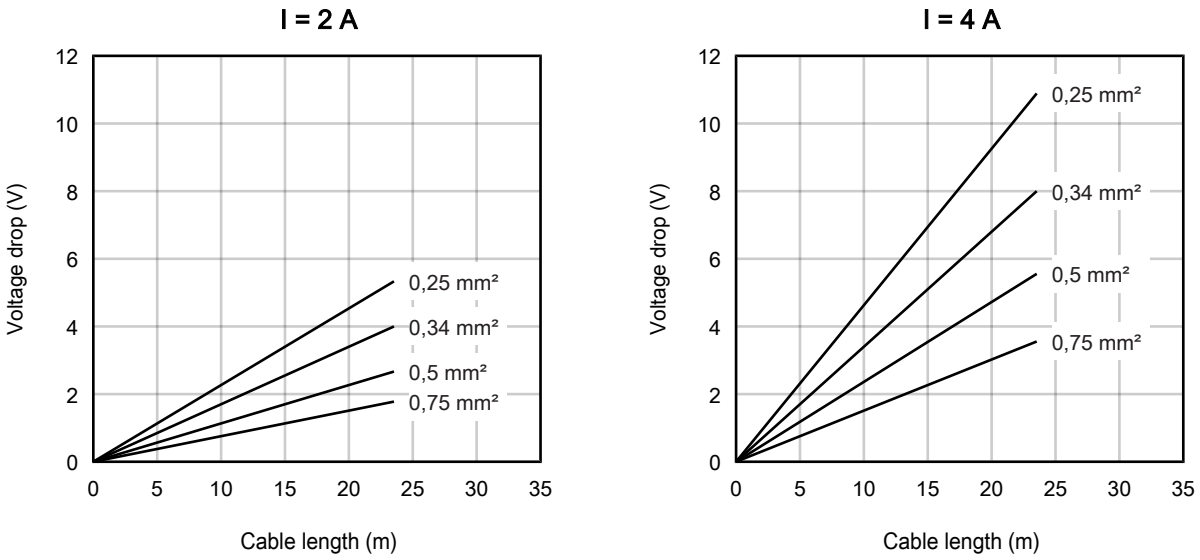
LED	Display	Meaning
U_S (control voltage)	off	Supply voltage U_S is not present
	green illuminated	Supply voltage U_S is present
U_P (peripheral voltage)	off	Supply voltage U_P is not present
	green illuminated	Supply voltage U_P is present

4.2.2.3 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.

Voltage drop on the supply line



4.2.3 Pressure inputs

⚠ CAUTION

Compressed air

- Before connecting or disconnecting the module, check if the system is under pressure.

  ⇨ The compressed air connections must not be opened while the system is under pressure.
- The general safety and installation instructions for handling compressed air must be observed.

X1 / Channel 1

X2 / Channel 2

X3 / Channel 3

X4 / Channel 4

Reference

Pressure measuring inputs, 6 mm pneumatic hose

The connection for pressure measurement is made via fittings for standard pneumatic hoses (6 mm). The values are output as a reference to the lower left measuring channel.

The values of the reference channel are not available in the process data, but in the CoE objects.

4.2.3.1 Connect hoses

NOTE

Limited number of mating cycles

One fitting is designed for five mating cycles.

Procedure

1. Cut the hose burr-free at an angle of 90° ± 5°, if possible with a suitable hose cutter.
   This step must be performed immediately before each connection.

2. Ensure that the hose is free of oil and grease.
3. Ensure that the end of the hose is free of scratches.
4. Optional: place a mark 14 mm from the end of the hose.
   This allows you to check whether the hose has been fully inserted after connection.
5. Grasp the hose approx. 20 mm from the end with your fingers.
   The hose should be as straight as possible and not bent.
6. Push the hose into the fitting up to the first stop.
   ⇨ You will feel a slight resistance.
7. Carefully push on until the second stop is reached.
   The stop is at 14 mm insertion depth.

4.2.4 Digital inputs and outputs

Digital inputs/outputs M8, 4-pin

The EP3744 has four 4-pin M8 sockets.

Sockets 0 and 1 each have two digital inputs; sockets 2 and 3 each have one input and one output.

The signals are connected via M8 connectors

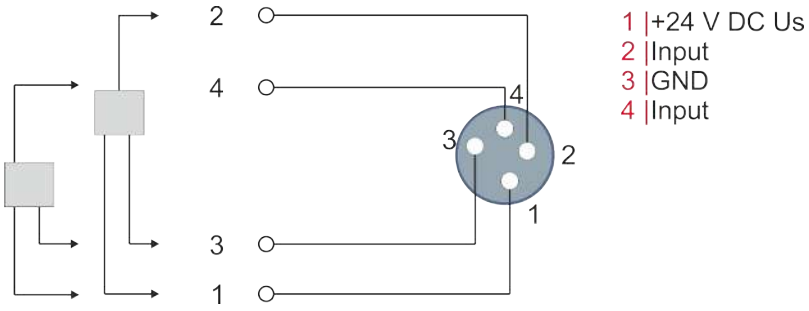


Fig. 6: Socket 0 and 1

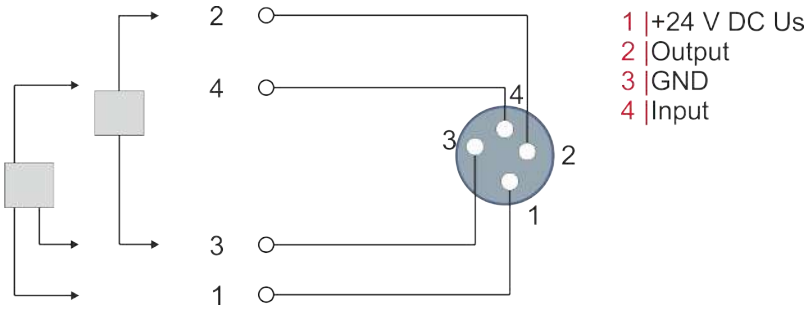


Fig. 7: Socket 2 and 3

The sensors are supplied with a common maximum current of 0.5 A from the control voltage Us.

Light emitting diodes indicate the signal state of the inputs.

4.2.4.1 Status LEDs at the signal connections

LED displays

LED	Display	Meaning
STATUS 1-4	green illuminated	a signal (24 V) is present on at least one input of channels 1-6 or one of the outputs 1 or 2 is switched on
Us	off	The supply voltage, Us, is not present
	green illuminated	The supply voltage, Us, is present
	red illuminated	short circuit on the power supply for sensor outputs of Us
Up	off	The supply voltage, Up, is not present
	green illuminated	The supply voltage, Up, is present

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. 8: 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/Configuration

5.1 Absolute pressure / differential pressure

NOTE

Differential pressure measurement: Also observe the absolute pressure measuring range

- Even in the case of differential pressure measurement, the absolute pressure measuring range must not be exceeded at any pressure input. See Technical data.

You can set the pressure measurement method individually for each pressure connection:

- Absolute pressure
- Differential pressure (factory setting) in relation to the reference connection X5

Set the pressure measurement method in the following CoE parameters:

Pressure connection	CoE object		Parameter	
X1	8020_{hex}	AI Settings Ch.1	19_{hex}	Range
X2	8030_{hex}	AI Settings Ch.2	19_{hex}	Range
X3	8040_{hex}	AI Settings Ch.3	19_{hex}	Range
X4	8050_{hex}	AI Settings Ch.4	19_{hex}	Range

Possible values

Value	Enum
7_{dec}	“Absolute Pressure Measurement”
8_{dec} (factory setting)	“Differential Pressure Measurement to Reference Sensor”

5.2 Filter

FIR and IIR filter

The box is equipped with a digital filter which, depending on its settings, can adopt the characteristics of a *F*inite *I*mpulse *R*esponse filter (*FIR filter*), or an *I*nfinite *I*mpulse *R*esponse filter (*IIR filter*). The filter can also be deactivated.

The filter characteristics are set via index 0x8020:15

The filter frequencies are set centrally for all channels of the box via index 0x8020:15 (channel 1). The corresponding indices 0x80n0:15 [▶ 42] of the other channels have no parameterization function.

FIR filter

The filter works as a notch filter and determines the conversion time of the box. It is parameterized via the index 0x8020:15 [▶ 42]. The higher the filter frequency, the faster the conversion time. A 50 Hz and a 60 Hz filter are available.
Notch filter means that the filter has zeros (notches) in the frequency response at the filter frequency and multiples thereof, i.e. it attenuates the amplitude at these frequencies.

The FIR filter functions as a non-recursive filter, which can be adjusted by the parameterization of the object 0x8020:15 [▶ 42].

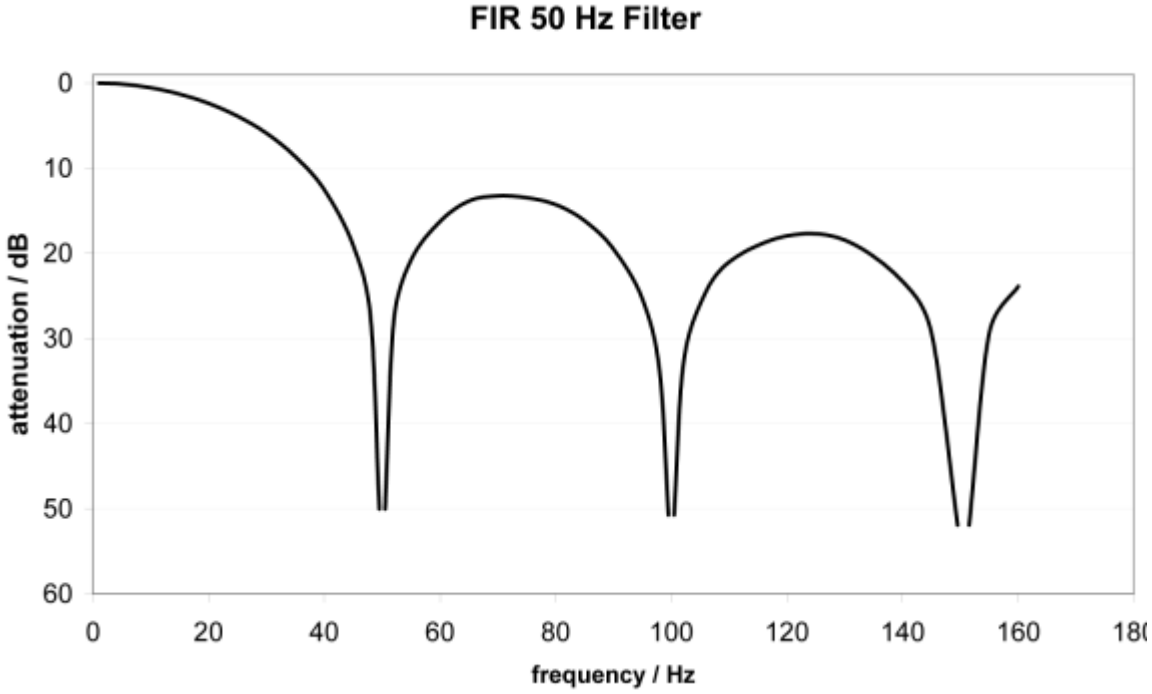


Fig. 9: Typical attenuation curve of notch filter at 50 Hz

Filter data FIR filter (1-4-channel boxes)

Filter	Attenuation	Limit frequency (-3 dB)
50 Hz FIR	> 50 dB	22 Hz
60 Hz FIR	> 40 dB	26 Hz

Filter data FIR filter (8-channel boxes)

Filter	Attenuation	Limit frequency (-3 dB)
50 Hz FIR	> 50 dB	23 Hz
60 Hz FIR	> 50 dB	27 Hz

IIR filter

The filter with IIR characteristics is a discrete time, linear, time invariant filter that can be set to eight levels (level 1 = weak recursive filter, up to level 8 = strong recursive filter).

The IIR can be understood to be a moving average value calculation after a low-pass filter.

By means of the synchronization mode *FreeRun*, the IIR filter works with an internal cycle time of 500 µs (1, 2 or 4 channels) or 1 ms (8 channels).

Filter data for IIR filter

IIR filter	Limit frequency with internal box cycle time 1 ms (-3 dB)
IIR 1	168 Hz
IIR 2	88 Hz
IIR 3	43 Hz
IIR 4	21 Hz
IIR 5	10.5 Hz
IIR 6	5.2 Hz
IIR 7	2.5 Hz
IIR 8	1.2 Hz

Conversion time & FIR and IIR filters, index 0x80n0:06 [▶ 42]

The typical conversion time and trigger mode depend on

- the selected filter setting (default: 50 Hz)
- the setting in the CoE register 0x1C33:01 [▶ 51]
  - by manual parameterization in the System Manager. **CAUTION**: Enter any changes made in the StartUp list!
  - by the StartUp list as an automatic parameter download during the EtherCAT start phase. **CAUTION**: Entries are implemented only after activation of the configuration!

The conversion time is the time interval in which the box makes a new measured value available. A new measured value is displayed by toggling “TxPDO Toggle” (index 0x60n0:10 [▶ 52]).

5.3 Limit value monitoring

Limit 1 and Limit 2, Index 0x80n0:13 [▶ 42], Index 0x80n0:14 [▶ 42]

If the limits of the values that can be entered in indices 0x80n0:13 [▶ 42] and 0x80n0:14 [▶ 42] are violated, the bits in indices 0x60n0:03 [▶ 53] and 0x60n0:05 [▶ 53] are set accordingly (see sample below). The indices 0x80n0:07 [▶ 42] or 0x80n0:08 [▶ 42] serve to activate the limit value monitoring.

Output limit n (2-bit):

- 0: not active
- 1: Value is smaller than the limit value
- 2: Value is larger than the limit value
- 3: Value is equal to the limit value

Linking in the PLC with 2-bit values

The limit information consists of 2 bits. *Limitn* can be linked to the PLC or a task in the System Manager.

- PLC:
  IEC61131-PLC contains no 2-bit data type that can be linked with this process data directly. To transfer the limit information, you should therefore define an input byte, for example, and link the limit to the *VariableSizeMismatch* dialog, as described in the diagram *Linking 2-bit variable with additional task*.

```
VAR
    byLimit1 AT %I*:BYTE;
END_VAR
```

Fig. 10: Input byte definition

- Additional task
  2-bit variables can be created in the System Manager.

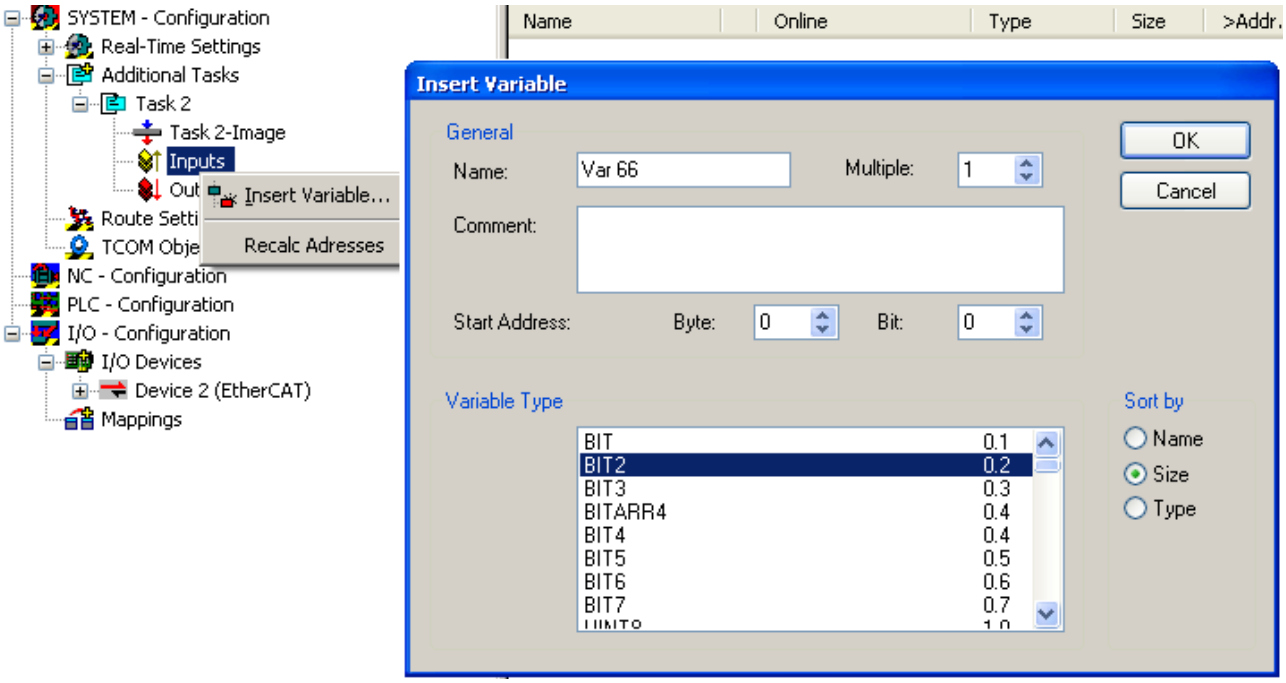


Fig. 11: Linking of 2-bit variable to additional task

Sample for EL3062:

Channel 1; Limit1 and Limit2 enabled, Limit 1 = 2.8 V, Limit 2 = 7.4 V, representation: signed integer

Entry in Index 0x80n0:13 [▶ 42] *(Limit 1):*
(2.8 V / 10 V) x 2^{16} / 2 - 1 = **9,174**$_{dec}$

Entry in Index 0x80n0:14 [▶ 42] *(Limit 2):*
(7.4 V / 10 V) x 2^{16} / 2 - 1 = **24,247**$_{dec}$

Output:

Input channel 1	Index 0x6000:03 [▶ 53]	Index 0x6000:05 [▶ 53]
1.8 V	$0x01_{hex}$, (Limit 1, limit value undershot)	$0x01_{hex}$, (Limit 2, limit value undershot)
2.8 V	$0x03_{hex}$, (Limit 1, limit value reached)	$0x01_{hex}$, (Limit 2, limit value undershot)
4.2 V	$0x02_{hex}$, (Limit 1, limit value exceeded)	$0x01_{hex}$, (Limit 2, limit value undershot)
8.5 V	$0x02_{hex}$, (Limit 1, limit value exceeded)	$0x02_{hex}$, (Limit 2, limit value exceeded)

5.4 Restoring the delivery state

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

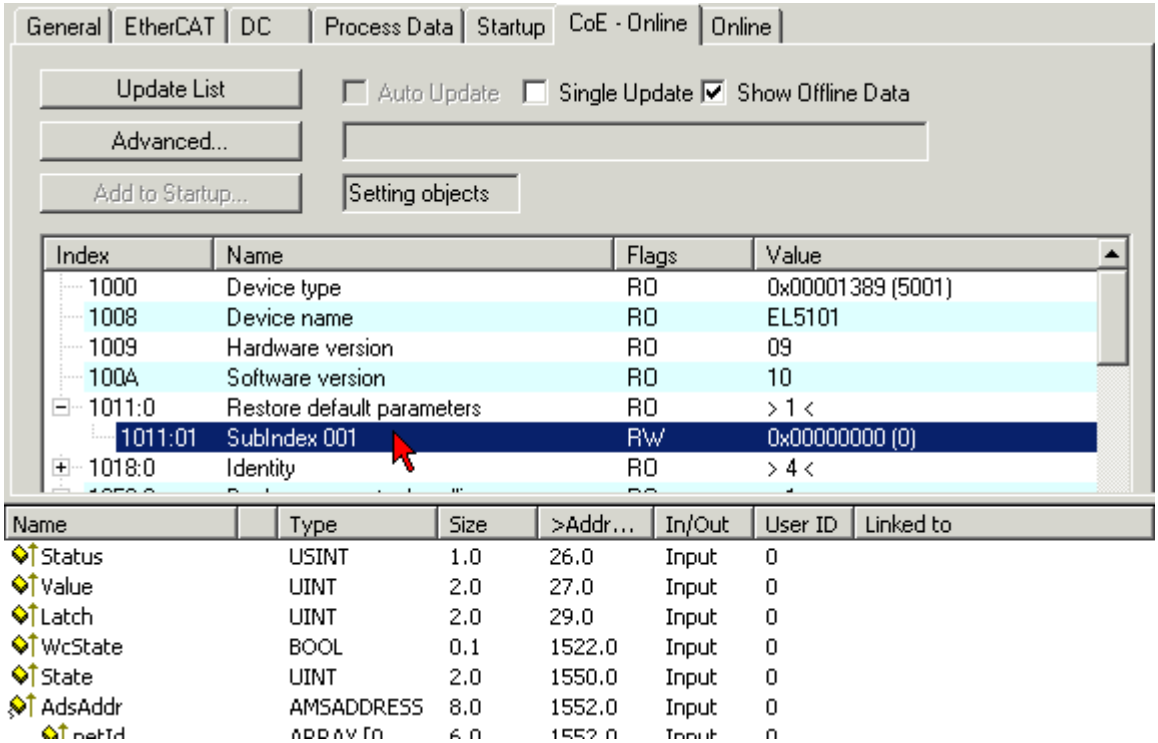


Fig. 12: Selecting the Restore default parameters PDO

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.

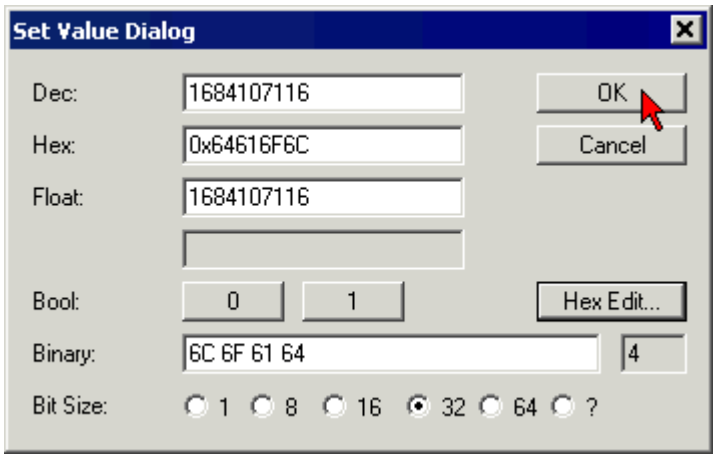


Fig. 13: Entering a restore value in the Set Value dialog

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 CoE parameters

6.1 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 [▶ 45]		Device type	RO	0x00001389 (5001$_{dec}$)
1008 [▶ 45]		Device name	RO	EP3744-0041
1009 [▶ 46]		Hardware version	RO	00
100A [▶ 46]		Software version	RO	03
1011 [▶ 41]	**Subindex**	Restore default parameters	RO	0x01 (1$_{dec}$)
	0x1011:01	SubIndex 001	RW	0x00000000 (0$_{dec}$)
1018 [▶ 46]:0	**Subindex**	Identity	RO	0x04 (4$_{dec}$)
	0x1018:01	Vendor ID	RO	0x00000002 (2$_{dec}$)
	0x1018:02	Product code	RO	0x0EA04052 (245383250$_{dec}$)
	0x1018:03	Revision	RO	0x00000000 (0$_{dec}$)
	0x1018:04	Serial number	RO	0x00000000 (0$_{dec}$)
10F0 [▶ 46]:0	**Subindex**	Backup parameter handling	RO	0x01 (1$_{dec}$)
	0x10F0:01	Checksum	RO	0x00000000 (0$_{dec}$)
1600 [▶ 46]:0	**Subindex**	DIG RxPDO-Map Outputs	RO	0x03 (3$_{dec}$)
	0x1600:01	SubIndex 001	RO	0x7010:01, 1
	0x1600:02	SubIndex 002	RO	0x7010:02, 1
	0x1600:03	SubIndex 003	RO	0x0000:00, 14
1601 [▶ 46]:0	**Subindex**	DEV RxPDO-Map Outputs Device	RO	0x02 (2$_{dec}$)
	0x1601:01	SubIndex 001	RO	0xF700:01, 1
	0x1601:02	SubIndex 002	RO	0x0000:00, 15
1A00 [▶ 47]:0	**Subindex**	DIG TxPDO-Map Inputs	RO	0x07 (7$_{dec}$)
	0x1A00:01	SubIndex 001	RO	0x6000:01, 1
	0x1A00:02	SubIndex 002	RO	0x6000:02, 1
	0x1A00:03	SubIndex 003	RO	0x6000:03, 1
	0x1A00:04	SubIndex 004	RO	0x6000:04, 1
	0x1A00:05	SubIndex 005	RO	0x6000:05, 1
	0x1A00:06	SubIndex 006	RO	0x6000:06, 1
	0x1A00:07	SubIndex 007	RO	0x0000:00, 10
1A01 [▶ 47]:0	**Subindex**	AI TxPDO-Map Inputs Ch.1	RO	0x09 (9$_{dec}$)
	0x1A01:01	SubIndex 001	RO	0x6020:01, 1
	0x1A01:02	SubIndex 002	RO	0x6020:02, 1
	0x1A01:03	SubIndex 003	RO	0x6020:03, 2
	0x1A01:04	SubIndex 004	RO	0x6020:05, 2
	0x1A01:05	SubIndex 005	RO	0x6020:07, 1
	0x1A01:06	SubIndex 006	RO	0x0000:00, 7
	0x1A01:07	SubIndex 007	RO	0x6020:0F, 1
	0x1A01:08	SubIndex 008	RO	0x6020:10, 1
	0x1A01:09	SubIndex 009	RO	0x6020:11, 32

Index (hex)		Name	Flags	Default value
1A02 [▶ 47]:0	**Subindex**	AI TxPDO-Map Inputs Ch.2	RO	0x09 (9_{dec})
	0x1A02:01	SubIndex 001	RO	0x6030:01, 1
	0x1A02:02	SubIndex 002	RO	0x6030:02, 1
	0x1A02:03	SubIndex 003	RO	0x6030:03, 2
	0x1A02:04	SubIndex 004	RO	0x6030:05, 2
	0x1A02:05	SubIndex 005	RO	0x6030:07, 1
	0x1A02:06	SubIndex 006	RO	0x0000:00, 7
	0x1A02:07	SubIndex 007	RO	0x6030:0F, 1
	0x1A02:08	SubIndex 008	RO	0x6030:10, 1
	0x1A02:09	SubIndex 009	RO	0x6030:11, 32
1A03 [▶ 48]:0	**Subindex**	AI TxPDO-Map Inputs Ch.3	RO	0x09 (9_{dec})
	0x1A03:01	SubIndex 001	RO	0x6040:01, 1
	0x1A03:02	SubIndex 002	RO	0x6040:02, 1
	0x1A03:03	SubIndex 003	RO	0x6040:03, 2
	0x1A03:04	SubIndex 004	RO	0x6040:05, 2
	0x1A03:05	SubIndex 005	RO	0x6040:07, 1
	0x1A03:06	SubIndex 006	RO	0x0000:00, 7
	0x1A03:07	SubIndex 007	RO	0x6040:0F, 1
	0x1A03:08	SubIndex 008	RO	0x6040:10, 1
	0x1A03:09	SubIndex 009	RO	0x6040:11, 32
1A04 [▶ 48]:0	**Subindex**	AI TxPDO-Map Inputs Ch.4	RO	0x09 (9_{dec})
	0x1A04:01	SubIndex 001	RO	0x6050:01, 1
	0x1A04:02	SubIndex 002	RO	0x6050:02, 1
	0x1A04:03	SubIndex 003	RO	0x6050:03, 2
	0x1A04:04	SubIndex 004	RO	0x6050:05, 2
	0x1A04:05	SubIndex 005	RO	0x6050:07, 1
	0x1A04:06	SubIndex 006	RO	0x0000:00, 7
	0x1A04:07	SubIndex 007	RO	0x6050:0F, 1
	0x1A04:08	SubIndex 008	RO	0x6050:10, 1
	0x1A04:09	SubIndex 009	RO	0x6050:11, 32
1A05 [▶ 48]:0	**Subindex**	DEV TxPDO-Map Inputs Device	RO	0x07 (7_{dec})
	0x1A05:01	SubIndex 001	RO	0xF600:01, 1
	0x1A05:02	SubIndex 002	RO	0x0000:00, 15
	0x1A05:03	SubIndex 003	RO	0xF611:01, 1
	0x1A05:04	SubIndex 004	RO	0xF611:02, 1
	0x1A05:05	SubIndex 005	RO	0x0000:00, 13
	0x1A05:06	SubIndex 006	RO	0xF611:10, 1
	0x1A05:07	SubIndex 007	RO	0x0000:00, 96
1C00 [▶ 49]:0	**Subindex**	Sync manager type	RO	0x04 (4_{dec})
	0x1C00:01	SubIndex 001	RO	0x01 (1_{dec})
	0x1C00:02	SubIndex 002	RO	0x02 (2_{dec})
	0x1C00:03	SubIndex 003	RO	0x03 (3_{dec})
	0x1C00:04	SubIndex 004	RO	0x04 (4_{dec})
1C12 [▶ 49]:0	**Subindex**	RxPDO assign	RW	0x02 (2_{dec})
	0x1C12:01	SubIndex 001	RW	0x1600 (5632_{dec})
	0x1C12:02	SubIndex 002	RW	0x1601 (5633_{dec})
1C13 [▶ 49]:0	**Subindex**	TxPDO assign	RW	0x06 (6_{dec})
	0x1C13:01	SubIndex 001	RW	0x1A00 (6656_{dec})
	0x1C13:02	SubIndex 002	RW	0x1A01 (6657_{dec})
	0x1C13:03	SubIndex 003	RW	0x1A02 (6658_{dec})
	0x1C13:04	SubIndex 004	RW	0x1A03 (6659_{dec})
	0x1C13:05	SubIndex 005	RW	0x1A04 (6660_{dec})
	0x1C13:06	SubIndex 006	RW	0x1A05 (6661_{dec})

Index (hex)		Name	Flags	Default value
1C32 [▶ 50]:0	**Subindex**	SM output parameter	RO	0x20 (32_{dec})
	0x1C32:01	Sync mode	RW	0x0001 (1_{dec})
	0x1C32:02	Cycle time	RW	0x003D0900 (4000000_{dec})
	0x1C32:03	Shift time	RO	0x00000384 (900_{dec})
	0x1C32:04	Sync modes supported	RO	0xC007 (49159_{dec})
	0x1C32:05	Minimum cycle time	RO	0x000F4240 (1000000_{dec})
	0x1C32:06	Calc and copy time	RO	0x00000000 (0_{dec})
	0x1C32:07	Minimum delay time	RO	0x00000384 (900_{dec})
	0x1C32:08	Command	RW	0x0000 (0_{dec})
	0x1C32:09	Maximum delay time	RO	0x00000384 (900_{dec})
	0x1C32:0B	SM event missed counter	RO	0x0000 (0_{dec})
	0x1C32:0C	Cycle exceeded counter	RO	0x0000 (0_{dec})
	0x1C32:0D	Shift too short counter	RO	0x0000 (0_{dec})
	0x1C32:20	Sync error	RO	0x00 (0_{dec})
1C33 [▶ 51]:0	**Subindex**	SM input parameter	RO	0x20 (32_{dec})
	0x1C33:01	Sync mode	RW	0x0022 (34_{dec})
	0x1C33:02	Cycle time	RW	0x003D0900 (4000000_{dec})
	0x1C33:03	Shift time	RO	0x00000384 (900_{dec})
	0x1C33:04	Sync modes supported	RO	0xC007 (49159_{dec})
	0x1C33:05	Minimum cycle time	RO	0x000F4240 (1000000_{dec})
	0x1C33:06	Calc and copy time	RO	0x00000000 (0_{dec})
	0x1C33:07	Minimum delay time	RO	0x00000384 (900_{dec})
	0x1C33:08	Command	RW	0x0000 (0_{dec})
	0x1C33:09	Maximum delay time	RO	0x00000384 (900_{dec})
	0x1C33:0B	SM event missed counter	RO	0x0000 (0_{dec})
	0x1C33:0C	Cycle exceeded counter	RO	0x0000 (0_{dec})
	0x1C33:0D	Shift too short counter	RO	0x0000 (0_{dec})
	0x1C33:20	Sync error	RO	0x00 (0_{dec})
6000 [▶ 53]:0	**Subindex**	Dig Inputs	RO	0x06 (6_{dec})
	0x6000:01	Input 1	RO	0x00 (0_{dec})
	0x6000:02	Input 2	RO	0x00 (0_{dec})
	0x6000:03	Input 3	RO	0x00 (0_{dec})
	0x6000:04	Input 4	RO	0x00 (0_{dec})
	0x6000:05	Input 5	RO	0x00 (0_{dec})
	0x6000:06	Input 6	RO	0x00 (0_{dec})
6020 [▶ 52]:0	**Subindex**	AI Inputs Ch.1	RO	0x11 (17_{dec})
	0x6020:01	Underrange	RO	0x00 (0_{dec})
	0x6020:02	Overrange	RO	0x00 (0_{dec})
	0x6020:03	Limit 1	RO	0x00 (0_{dec})
	0x6020:05	Limit 2	RO	0x00 (0_{dec})
	0x6020:07	Error	RO	0x00 (0_{dec})
	0x6020:0F	TxPDO State	RO	0x00 (0_{dec})
	0x6020:10	TxPDO Toggle	RO	0x00 (0_{dec})
	0x6020:11	Value	RO	0x00000000 (0_{dec})
6030 [▶ 52]:0	**Subindex**	AI Inputs Ch.2	RO	0x11 (17_{dec})
	0x6030:01	Underrange	RO	0x00 (0_{dec})
	0x6030:02	Overrange	RO	0x00 (0_{dec})
	0x6030:03	Limit 1	RO	0x00 (0_{dec})
	0x6030:05	Limit 2	RO	0x00 (0_{dec})
	0x6030:07	Error	RO	0x00 (0_{dec})
	0x6030:0F	TxPDO State	RO	0x00 (0_{dec})
	0x6030:10	TxPDO Toggle	RO	0x00 (0_{dec})
	0x6030:11	Value	RO	0x00000000 (0_{dec})

Index (hex)		Name	Flags	Default value
6040 [▶ 52]:0	**Subindex**	AI Inputs Ch.3	RO	0x11 (17_{dec})
	0x6040:01	Underrange	RO	0x00 (0_{dec})
	0x6040:02	Overrange	RO	0x00 (0_{dec})
	0x6040:03	Limit 1	RO	0x00 (0_{dec})
	0x6040:05	Limit 2	RO	0x00 (0_{dec})
	0x6040:07	Error	RO	0x00 (0_{dec})
	0x6040:0F	TxPDO State	RO	0x00 (0_{dec})
	0x6040:10	TxPDO Toggle	RO	0x00 (0_{dec})
	0x6040:11	Value	RO	0x00000000 (0_{dec})
6050 [▶ 53]:0	**Subindex**	AI Inputs Ch.4	RO	0x11 (17_{dec})
	0x6050:01	Underrange	RO	0x00 (0_{dec})
	0x6050:02	Overrange	RO	0x00 (0_{dec})
	0x6050:03	Limit 1	RO	0x00 (0_{dec})
	0x6050:05	Limit 2	RO	0x00 (0_{dec})
	0x6050:07	Error	RO	0x00 (0_{dec})
	0x6050:0F	TxPDO State	RO	0x00 (0_{dec})
	0x6050:10	TxPDO Toggle	RO	0x00 (0_{dec})
	0x6050:11	Value	RO	0x00000000 (0_{dec})
7010 [▶ 53]:0	**Subindex**	Dig Outputs	RO	0x02 (2_{dec})
	0x7010:01	Output 1	RO	0x00 (0_{dec})
	0x7010:02	Output 2	RO	0x00 (0_{dec})
8010 [▶ 41]:0	**Subindex**	Safe state active	RW	0x02 (2_{dec})
	0x8010:01	Output 1	RW	0x00 (0_{dec})
	0x8010:02	Output 2	RW	0x00 (0_{dec})
8011 [▶ 41]:0	**Subindex**	Safe state value	RW	0x02 (2_{dec})
	0x8011:01	Output 1	RW	0x00 (0_{dec})
	0x8011:02	Output 2	RW	0x00 (0_{dec})
8020 [▶ 42]:0	**Subindex**	AI Settings Ch.1	RW	0x19 (25_{dec})
	0x8020:01	Enable user scale	RW	0x00 (0_{dec})
	0x8020:06	Enable filter	RW	0x01 (1_{dec})
	0x8020:07	Enable limit 1	RW	0x00 (0_{dec})
	0x8020:08	Enable limit 2	RW	0x00 (0_{dec})
	0x8020:0A	Enable user calibration	RW	0x00 (0_{dec})
	0x8020:0B	Enable vendor calibration	RW	0x01 (1_{dec})
	0x8020:11	User scale offset	RW	0x00000000 (0_{dec})
	0x8020:12	User scale gain	RW	0x00010000 (65536_{dec})
	0x8020:13	Limit 1	RW	0x0000 (0_{dec})
	0x8020:14	Limit 2	RW	0x0000 (0_{dec})
	0x8020:15	Filter settings	RW	0x0000 (0_{dec})
	0x8020:17	User calibration offset	RW	0x00000000 (0_{dec})
	0x8020:18	User calibration gain	RW	0x4000 (16384_{dec})
	0x8020:19	Range	RW	0x0008 (8_{dec})
802E [▶ 53]:0	**Subindex**	AI Internal data Ch.1	RO	0x01 (1_{dec})
	0x802E:01	ADC raw value	RO	0x00000000 (0_{dec})
802F [▶ 53]:0	**Subindex**	AI Vendor data Ch.1	RW	0x04 (4_{dec})
	0x802F:01	Calibration offset pressure	RW	0x00000000 (0_{dec})
	0x802F:02	Calibration gain pressure	RW	0x4000 (16384_{dec})
	0x802F:03	Calibration offset temp	RW	0x00000000 (0_{dec})
	0x802F:04	Calibration gain temp	RW	0x0000 (0_{dec})

Index (hex)		Name	Flags	Default value
8030 [▶ 43]:0	**Subindex**	AI Settings Ch.2	RW	0x19 (25_{dec})
	0x8030:01	Enable user scale	RW	0x00 (0_{dec})
	0x8030:06	Enable filter	RW	0x01 (1_{dec})
	0x8030:07	Enable limit 1	RW	0x00 (0_{dec})
	0x8030:08	Enable limit 2	RW	0x00 (0_{dec})
	0x8030:0A	Enable user calibration	RW	0x00 (0_{dec})
	0x8030:0B	Enable vendor calibration	RW	0x01 (1_{dec})
	0x8030:11	User scale offset	RW	0x00000000 (0_{dec})
	0x8030:12	User scale gain	RW	0x00010000 (65536_{dec})
	0x8030:13	Limit 1	RW	0x0000 (0_{dec})
	0x8030:14	Limit 2	RW	0x0000 (0_{dec})
	0x8030:15	Filter settings	RW	0x0000 (0_{dec})
	0x8030:17	User calibration offset	RW	0x00000000 (0_{dec})
	0x8030:18	User calibration gain	RW	0x4000 (16384_{dec})
	0x8030:19	Range	RW	0x0008 (8_{dec})
803E [▶ 53]:0	**Subindex**	AI Internal data Ch.2	RO	0x01 (1_{dec})
	0x803E:01	ADC raw value	RO	0x00000000 (0_{dec})
803F [▶ 54]:0	**Subindex**	AI Vendor data Ch.2	RW	0x04 (4_{dec})
	0x803F:01	Calibration offset pressure	RW	0x00000000 (0_{dec})
	0x803F:02	Calibration gain pressure	RW	0x4000 (16384_{dec})
	0x803F:03	Calibration offset temp	RW	0x00000000 (0_{dec})
	0x803F:04	Calibration gain temp	RW	0x0000 (0_{dec})
8040 [▶ 44]:0	**Subindex**	AI Settings Ch.3	RW	0x19 (25_{dec})
	0x8040:01	Enable user scale	RW	0x00 (0_{dec})
	0x8040:06	Enable filter	RW	0x01 (1_{dec})
	0x8040:07	Enable limit 1	RW	0x00 (0_{dec})
	0x8040:08	Enable limit 2	RW	0x00 (0_{dec})
	0x8040:0A	Enable user calibration	RW	0x00 (0_{dec})
	0x8040:0B	Enable vendor calibration	RW	0x01 (1_{dec})
	0x8040:11	User scale offset	RW	0x00000000 (0_{dec})
	0x8040:12	User scale gain	RW	0x00010000 (65536_{dec})
	0x8040:13	Limit 1	RW	0x0000 (0_{dec})
	0x8040:14	Limit 2	RW	0x0000 (0_{dec})
	0x8040:15	Filter settings	RW	0x0000 (0_{dec})
	0x8040:17	User calibration offset	RW	0x00000000 (0_{dec})
	0x8040:18	User calibration gain	RW	0x4000 (16384_{dec})
	0x8040:19	Range	RW	0x0008 (8_{dec})
804E [▶ 54]:0	**Subindex**	AI Internal data Ch.3	RO	0x01 (1_{dec})
	0x804E:01	ADC raw value	RO	0x00000000 (0_{dec})
804F [▶ 54]:0	**Subindex**	AI Vendor data Ch.3	RW	0x04 (4_{dec})
	0x804F:01	Calibration offset pressure	RW	0x00000000 (0_{dec})
	0x804F:02	Calibration gain pressure	RW	0x4000 (16384_{dec})
	0x804F:03	Calibration offset temp	RW	0x00000000 (0_{dec})
	0x804F:04	Calibration gain temp	RW	0x0000 (0_{dec})

Index (hex)		Name	Flags	Default value
8050 [▶ 45]:0	**Subindex**	AI Settings Ch.4	RW	0x19 (25_{dec})
	0x8050:01	Enable user scale	RW	0x00 (0_{dec})
	0x8050:06	Enable filter	RW	0x01 (1_{dec})
	0x8050:07	Enable limit 1	RW	0x00 (0_{dec})
	0x8050:08	Enable limit 2	RW	0x00 (0_{dec})
	0x8050:0A	Enable user calibration	RW	0x00 (0_{dec})
	0x8050:0B	Enable vendor calibration	RW	0x01 (1_{dec})
	0x8050:11	User scale offset	RW	0x00000000 (0_{dec})
	0x8050:12	User scale gain	RW	0x00010000 (65536_{dec})
	0x8050:13	Limit 1	RW	0x0000 (0_{dec})
	0x8050:14	Limit 2	RW	0x0000 (0_{dec})
	0x8050:15	Filter settings	RW	0x0000 (0_{dec})
	0x8050:17	User calibration offset	RW	0x00000000 (0_{dec})
	0x8050:18	User calibration gain	RW	0x4000 (16384_{dec})
	0x8050:19	Range	RW	0x0008 (8_{dec})
805E [▶ 54]:0	**Subindex**	AI Internal data Ch.4	RO	0x01 (1_{dec})
	0x805E:01	ADC raw value	RO	0x00000000 (0_{dec})
805F [▶ 54]:0	**Subindex**	AI Vendor data Ch.4	RW	0x04 (4_{dec})
	0x805F:01	Calibration offset pressure	RW	0x00000000 (0_{dec})
	0x805F:02	Calibration gain pressure	RW	0x4000 (16384_{dec})
	0x805F:03	Calibration offset temp	RW	0x00000000 (0_{dec})
	0x805F:04	Calibration gain temp	RW	0x0000 (0_{dec})
F000 [▶ 54]:0	**Subindex**	Modular device profile	RO	0x02 (2_{dec})
	0xF000:01	Module index distance	RO	0x0010 (16_{dec})
	0xF000:02	Maximum number of modules	RO	0x0006 (6_{dec})
F008 [▶ 54]		Code word	RW	0x00000000 (0_{dec})
F010 [▶ 55]:0	**Subindex**	Module list	RW	0x06 (6_{dec})
	0xF010:01	SubIndex 001	RW	0x00000118 (280_{dec})
	0xF010:02	SubIndex 002	RW	0x00000118 (280_{dec})
	0xF010:03	SubIndex 003	RW	0x0000012C (300_{dec})
	0xF010:04	SubIndex 004	RW	0x0000012C (300_{dec})
	0xF010:05	SubIndex 005	RW	0x0000012C (300_{dec})
	0xF010:06	SubIndex 006	RW	0x0000012C (300_{dec})
F600 [▶ 55]:0	**Subindex**	DEV Inputs Safe State Active	RO	0x01 (1_{dec})
	0xF600:01	Safe State Active	RO	0x00 (0_{dec})
F611 [▶ 55]:0	**Subindex**	DEV Inputs Undervoltage	RO	0x10 (16_{dec})
	0xF611:01	Undervoltage Us	RO	0x00 (0_{dec})
	0xF611:02	Undervoltage Up	RO	0x00 (0_{dec})
	0xF611:10	TxPDO Toggle	RO	0x00 (0_{dec})
F700 [▶ 55]:0	**Subindex**	DEV Outputs Set Safe State	RO	0x01 (1_{dec})
	0xF700:01	Set safe state	RO	0x00 (0_{dec})
F800 [▶ 55]:0	**Subindex**	AI Settings Reference	RW	0x18 (24_{dec})
	0xF800:0A	Enable user calibration	RW	0x00 (0_{dec})
	0xF800:0B	Enable vendor calibration	RW	0x01 (1_{dec})
	0xF800:17	User calibration offset	RW	0x00000000 (0_{dec})
	0xF800:18	User calibration gain	RW	0x4000 (16384_{dec})
F80E [▶ 55]:0	**Subindex**	AI Internal data Reference	RO	0x02 (2_{dec})
	0xF80E:01	ADC raw value 1	RO	0x00000000 (0_{dec})
	0xF80E:02	ADC raw value 2	RO	0x00000000 (0_{dec})
F80F [▶ 56]:0	**Subindex**	AI Vendor data Reference	RW	0x04 (4_{dec})
	0xF80F:01	Calibration offset pressure	RW	0x00000000 (0_{dec})
	0xF80F:02	Calibration gain pressure	RW	0x4000 (16384_{dec})
	0xF80F:03	Calibration offset temp	RW	0x00000000 (0_{dec})
	0xF80F:04	Calibration gain temp	RW	0x0000 (0_{dec})

Legend

Flags:
RO = Read Only
RW = Read/Write

6.2 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 [▶ 41] during commissioning
- Objects for indicating internal settings [▶ 45] (may be fixed)
- Further profile-specific objects [▶ 52] 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.

6.2.1 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 8010 Safe state active

Index (hex)	Name	Meaning		Data type	Flags	Default
8010:0	Safe state active			UINT8	RO	0x02 (2_{dec})
8010:01	Output 1	0	Output State will remain unchanged during OP-> SafeOP	BOOLEAN	RW	0x00 (0_{dec})
		1	Output will go to Safe State during OP-> SafeOP			
8010:02	Output 2	0	Output State will remain unchanged during OP-> SafeOP	BOOLEAN	RW	0x00 (0_{dec})
		1	Output will go to Safe State during OP-> SafeOP			

Index 8011 Safe state value

Index (hex)	Name	Meaning		Data type	Flags	Default
8011:0	Safe state value			UINT8	RO	0x02 (2_{dec})
8011:01	Output 1	0	Output -> 0 in case of Safe State condition	BOOLEAN	RW	0x00 (0_{dec})
		1	Output -> 1 in case of Safe State condition			
8011:02	Output 2	0	Output -> 0 in case of Safe State condition	BOOLEAN	RW	0x00 (0_{dec})
		1	Output -> 1 in case of Safe State condition			

Index 8020 AI settings Ch.1 (parameterization of channel 1)

Index (hex)	Name	Meaning		Data type	Flags	Default
8020:0	AI Settings Ch.1	Maximum subindex		UINT8	RO	0x19 (25_{dec})
8020:01	Enable user scale	1	User scale is active.	BOOLEAN	RW	0x00 (0_{dec})
8020:06	Enable filter	1	Enable filter, which makes PLC-cycle-synchronous data exchange unnecessary	BOOLEAN	RW	0x01 (1_{dec})
8020:07	Enable limit 1	1	Limit 1 enabled	BOOLEAN	RW	0x00 (0_{dec})
8020:08	Enable limit 2	1	Limit 2 enabled	BOOLEAN	RW	0x00 (0_{dec})
8020:0A	Enable user calibration	1	Enabling of the user calibration	BOOLEAN	RW	0x00 (0_{dec})
8020:0B	Enable vendor calibration	1	Enabling of the vendor calibration	BOOLEAN	RW	0x01 (1_{dec})
8020:11	User scale offset	User scale offset		INT32	RW	0x00000000 (0_{dec})
8020:12	User scale gain	User scale gain. The gain is represented in fixed-point format, with the factor 2^{-16}. The value 1 corresponds to 65535_{dez} ($0x00010000_{hex}$) and is limited to +/- 0x7FFFF		INT32	RW	0x00010000 (65536_{dec})
8020:13	Limit 1	First limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8020:14	Limit 2	Second limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8020:15	Filter settings	This object determines the digital filter settings **for all channels of the module**, if it is activated via Enable filter (index 0x80n0:06). The possible settings are sequentially numbered.		UINT16	RW	0x0000 (0_{dec})
		0	50 Hz FIR			
		1	60 Hz FIR			
		2	IIR 1			
		3	IIR 2			
		4	IIR 3			
		5	IIR 4			
		6	IIR 5			
		7	IIR 6			
		8	IIR 7			
		9	IIR 8			
8020:17	User calibration offset			INT32	RW	0x00000000 (0_{dec})
8020:18	User calibration gain			INT16	RW	0x4000 (16384_{dec})
8020:19	Range	Permissible values:		UINT16	RW	0x0008 (8_{dec})
		8	Differential pressure measurement relative to the reference sensor			
		7	Absolute pressure measurement			

Index 8030 AI settings Ch.2 (parameterization of channel 2)

Index (hex)	Name	Meaning		Data type	Flags	Default
8030:0	AI Settings Ch.2	Maximum subindex		UINT8	RO	0x19 (25_{dec})
8030:01	Enable user scale	1	User scale is active.	BOOLEAN	RW	0x00 (0_{dec})
8030:06	Enable filter	1	Enable filter, which makes PLC-cycle-synchronous data exchange unnecessary	BOOLEAN	RW	0x01 (1_{dec})
8030:07	Enable limit 1	1	Limit 1 enabled	BOOLEAN	RW	0x00 (0_{dec})
8030:08	Enable limit 2	1	Limit 2 enabled	BOOLEAN	RW	0x00 (0_{dec})
8030:0A	Enable user calibration	1	Enabling of the user calibration	BOOLEAN	RW	0x00 (0_{dec})
8030:0B	Enable vendor calibration	1	Enabling of the vendor calibration	BOOLEAN	RW	0x01 (1_{dec})
8030:11	User scale offset	User scale offset		INT32	RW	0x00000000 (0_{dec})
8030:12	User scale gain	User scale gain. The gain is represented in fixed-point format, with the factor 2^{-16}. The value 1 corresponds to 65535_{dez} ($0x00010000_{hex}$) and is limited to +/- 0x7FFFF		INT32	RW	0x00010000 (65536_{dec})
8030:13	Limit 1	First limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8030:14	Limit 2	Second limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8030:15	Filter settings	This object shows the digital filter settings. The filter settings can only be read here. They are set via channel 1 for all channels of the module.		UINT16	RW	0x0000 (0_{dec})
		0	50 Hz FIR			
		1	60 Hz FIR			
		2	IIR 1			
		3	IIR 2			
		4	IIR 3			
		5	IIR 4			
		6	IIR 5			
		7	IIR 6			
		8	IIR 7			
		9	IIR 8			
8030:17	User calibration offset			INT32	RW	0x00000000 (0_{dec})
8030:18	User calibration gain			INT16	RW	0x4000 (16384_{dec})
8030:19	Range	Permissible values:		UINT16	RW	0x0008 (8_{dec})
		8	Differential pressure measurement relative to the reference sensor			
		7	Absolute pressure measurement			

Index 8040 AI settings Ch.3 (parameterization of channel 3)

Index (hex)	Name	Meaning		Data type	Flags	Default
8040:0	AI Settings Ch.3	Maximum subindex		UINT8	RO	0x19 (25_{dec})
8040:01	Enable user scale	1	User scale is active.	BOOLEAN	RW	0x00 (0_{dec})
8040:06	Enable filter	1	Enable filter, which makes PLC-cycle-synchronous data exchange unnecessary	BOOLEAN	RW	0x01 (1_{dec})
8040:07	Enable limit 1	1	Limit 1 enabled	BOOLEAN	RW	0x00 (0_{dec})
8040:08	Enable limit 2	1	Limit 2 enabled	BOOLEAN	RW	0x00 (0_{dec})
8040:0A	Enable user calibration	1	Enabling of the user calibration	BOOLEAN	RW	0x00 (0_{dec})
8040:0B	Enable vendor calibration	1	Enabling of the vendor calibration	BOOLEAN	RW	0x01 (1_{dec})
8040:11	User scale offset	User scale offset		INT32	RW	0x00000000 (0_{dec})
8040:12	User scale gain	User scale gain. The gain is represented in fixed-point format, with the factor 2^{-16}. The value 1 corresponds to 65535_{dez} ($0x00010000_{hex}$) and is limited to +/- 0x7FFFF		INT32	RW	0x00010000 (65536_{dec})
8040:13	Limit 1	First limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8040:14	Limit 2	Second limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8040:15	Filter settings	This object shows the digital filter settings. The filter settings can only be read here. They are set via channel 1 for all channels of the module.		UINT16	RW	0x0000 (0_{dec})
		0	50 Hz FIR			
		1	60 Hz FIR			
		2	IIR 1			
		3	IIR 2			
		4	IIR 3			
		5	IIR 4			
		6	IIR 5			
		7	IIR 6			
		8	IIR 7			
		9	IIR 8			
8040:17	User calibration offset			INT32	RW	0x00000000 (0_{dec})
8040:18	User calibration gain			INT16	RW	0x4000 (16384_{dec})
8040:19	Range	Permissible values:		UINT16	RW	0x0008 (8_{dec})
		8	Differential pressure measurement relative to the reference sensor			
		7	Absolute pressure measurement			

Index 8050 AI Settings Ch.3 (parameterization of channel 4)

Index (hex)	Name	Meaning		Data type	Flags	Default
8050:0	AI Settings Ch.4	Maximum subindex		UINT8	RO	0x19 (25_{dec})
8050:01	Enable user scale	1	User scale is active.	BOOLEAN	RW	0x00 (0_{dec})
8050:06	Enable filter	1	Enable filter, which makes PLC-cycle-synchronous data exchange unnecessary	BOOLEAN	RW	0x01 (1_{dec})
8050:07	Enable limit 1	1	Limit 1 enabled	BOOLEAN	RW	0x00 (0_{dec})
8050:08	Enable limit 2	1	Limit 2 enabled	BOOLEAN	RW	0x00 (0_{dec})
8050:0A	Enable user calibration	1	Enabling of the user calibration	BOOLEAN	RW	0x00 (0_{dec})
8050:0B	Enable vendor calibration	1	Enabling of the vendor calibration	BOOLEAN	RW	0x01 (1_{dec})
8050:11	User scale offset	User scale offset		INT32	RW	0x00000000 (0_{dec})
8050:12	User scale gain	User scale gain. The gain is represented in fixed-point format, with the factor 2^{-16}. The value 1 corresponds to 65535_{dez} ($0x00010000_{hex}$) and is limited to +/- 0x7FFFF		INT32	RW	0x00010000 (65536_{dec})
8050:13	Limit 1	First limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8050:14	Limit 2	Second limit value for setting the status bits		INT16	RW	0x0000 (0_{dec})
8050:15	Filter settings	This object shows the digital filter settings. The filter settings can only be read here. They are set via channel 1 for all channels of the module.		UINT16	RW	0x0000 (0_{dec})
		0	50 Hz FIR			
		1	60 Hz FIR			
		2	IIR 1			
		3	IIR 2			
		4	IIR 3			
		5	IIR 4			
		6	IIR 5			
		7	IIR 6			
		8	IIR 7			
		9	IIR 8			
8050:17	User calibration offset			INT32	RW	0x00000000 (0_{dec})
8050:18	User calibration gain			INT16	RW	0x4000 (16384_{dec})
8050:19	Range	Permissible values:		UINT16	RW	0x0008 (8_{dec})
		8	Differential pressure measurement relative to the reference sensor			
		7	Absolute pressure measurement			

6.2.2 Standard objects (0x1000-0x1FFF)

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

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 supported CoE Profile (5001). The Hi-Word contains the Module Profile corresponding 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	EP3744-0041

Index 1009: Hardware version

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

Index 100A Software version

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

Index 1018 Identity

Index (hex)	Name	Meaning	Data type	Flags	Default
1018:0	Identity	contains information to identify the EtherCAT 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	0x0EA04052 (245383250_{dec})
1018:03	Revision	Revision number of the EtherCAT-Slave, the Lo-Word (Bit 0-15) indicates the special functions terminal number; the Hi-Word (Bit 16-31) refers to the device description.	UINT32	RO	0x00000000 (0_{dec})
1018:04	Serial number	Serial number of the EtherCAT-Slave, the Lo-Byte (Bit 0-7) of the Lo-Word contains the year of manufacturing, the Hi-Byte (Bit 8-15) of the Lo-Word contains the week of manufacturing, the Hi-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	contains information for the standardized Upload and Download of the Backup Entries	UINT8	RO	0x01 (1_{dec})
10F0:01	Checksum	Checksum over all backup entries	UINT32	RO	0x00000000 (0_{dec})

Index 1600 DIG RxPDO-Map Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
1600:0	DIG RxPDO-Map Outputs	PDO Mapping RxPDO 1	UINT8	RO	0x03 (3_{dec})
1600:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (Dig Outputs), entry 0x01 (Output 1))	UINT32	RO	0x7010:01, 1
1600:02	SubIndex 002	2. PDO Mapping entry (object 0x7010 (Dig Outputs), entry 0x02 (Output 2))	UINT32	RO	0x7010:02, 1
1600:03	SubIndex 003	3. PDO Mapping entry (14 bits align)	UINT32	RO	0x0000:00, 14

Index 1601 DEV RxPDO-Map Outputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	DEV RxPDO-Map Outputs Device	PDO Mapping RxPDO 2	UINT8	RO	0x02 (2_{dec})
1601:01	SubIndex 001	1. PDO Mapping entry (object 0xF700 (DEV Outputs Set Safe State), entry 0x01 (Set safe state))	UINT32	RO	0xF700:01, 1
1601:02	SubIndex 002	2. PDO Mapping entry (object 0xF700 (DEV Outputs Set Safe State), entry 0x02 (Reset Outputs))	UINT32	RO	0x0000:00, 15

Index 1A00 DIG TxPDO-Map Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	DIG TxPDO-Map Inputs	PDO Mapping TxPDO 1	UINT8	RO	0x07 (7_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (Dig Inputs), entry 0x01 (Input 1))	UINT32	RO	0x6000:01, 1
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (Dig Inputs), entry 0x02 (Input 2))	UINT32	RO	0x6000:02, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (Dig Inputs), entry 0x03 (Input 3))	UINT32	RO	0x6000:03, 1
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (Dig Inputs), entry 0x04 (Input 4))	UINT32	RO	0x6000:04, 1
1A00:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (Dig Inputs), entry 0x05 (Input 5))	UINT32	RO	0x6000:05, 1
1A00:06	SubIndex 006	6. PDO Mapping entry (object 0x6000 (Dig Inputs), entry 0x06 (Input 6))	UINT32	RO	0x6000:06, 1
1A00:07	SubIndex 007	7. PDO Mapping entry (10 bits align)	UINT32	RO	0x0000:00, 10

Index 1A01 AI TxPDO-Map Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	AI TxPDO-Map Inputs Ch.1	PDO Mapping TxPDO 2	UINT8	RO	0x09 (9_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6020 (AI Inputs Ch.1), entry 0x01 (Underrange))	UINT32	RO	0x6020:01, 1
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6020 (AI Inputs Ch.1), entry 0x02 (Overrange))	UINT32	RO	0x6020:02, 1
1A01:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (AI Inputs Ch.1), entry 0x03 (Limit 1))	UINT32	RO	0x6020:03, 2
1A01:04	SubIndex 004	4. PDO Mapping entry (object 0x6020 (AI Inputs Ch.1), entry 0x05 (Limit 2))	UINT32	RO	0x6020:05, 2
1A01:05	SubIndex 005	5. PDO Mapping entry (object 0x6020 (AI Inputs Ch.1), entry 0x07 (Error))	UINT32	RO	0x6020:07, 1
1A01:06	SubIndex 006	6. PDO Mapping entry (7 bits align)	UINT32	RO	0x0000:00, 7
1A01:07	SubIndex 007	7. PDO Mapping entry (object 0x6020 (AI Inputs Ch.1), entry 0x0F (TxPDO State))	UINT32	RO	0x6020:0F, 1
1A01:08	SubIndex 008	8. PDO Mapping entry (object 0x6020 (AI Inputs Ch.1), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6020:10, 1
1A01:09	SubIndex 009	9. PDO Mapping entry (object 0x6020 (AI Inputs Ch.1), entry 0x11 (Value))	UINT32	RO	0x6020:11, 32

Index 1A02 AI TxPDO-Map Inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	AI TxPDO-Map Inputs Ch.2	PDO Mapping TxPDO 3	UINT8	RO	0x09 (9_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry (object 0x6030 (AI Inputs Ch.2), entry 0x01 (Underrange))	UINT32	RO	0x6030:01, 1
1A02:02	SubIndex 002	2. PDO Mapping entry (object 0x6030 (AI Inputs Ch.2), entry 0x02 (Overrange))	UINT32	RO	0x6030:02, 1
1A02:03	SubIndex 003	3. PDO Mapping entry (object 0x6030 (AI Inputs Ch.2), entry 0x03 (Limit 1))	UINT32	RO	0x6030:03, 2
1A02:04	SubIndex 004	4. PDO Mapping entry (object 0x6030 (AI Inputs Ch.2), entry 0x05 (Limit 2))	UINT32	RO	0x6030:05, 2
1A02:05	SubIndex 005	5. PDO Mapping entry (object 0x6030 (AI Inputs Ch.2), entry 0x07 (Error))	UINT32	RO	0x6030:07, 1
1A02:06	SubIndex 006	6. PDO Mapping entry (7 bits align)	UINT32	RO	0x0000:00, 7
1A02:07	SubIndex 007	7. PDO Mapping entry (object 0x6030 (AI Inputs Ch.2), entry 0x0F (TxPDO State))	UINT32	RO	0x6030:0F, 1
1A02:08	SubIndex 008	8. PDO Mapping entry (object 0x6030 (AI Inputs Ch.2), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6030:10, 1
1A02:09	SubIndex 009	9. PDO Mapping entry (object 0x6030 (AI Inputs Ch.2), entry 0x11 (Value))	UINT32	RO	0x6030:11, 32

Index 1A03 AI TxPDO-Map Inputs Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
1A03:0	AI TxPDO-Map Inputs Ch.3	PDO Mapping TxPDO 4	UINT8	RO	0x09 (9_{dec})
1A03:01	SubIndex 001	1. PDO Mapping entry (object 0x6040 (AI Inputs Ch.3), entry 0x01 (Underrange))	UINT32	RO	0x6040:01, 1
1A03:02	SubIndex 002	2. PDO Mapping entry (object 0x6040 (AI Inputs Ch.3), entry 0x02 (Overrange))	UINT32	RO	0x6040:02, 1
1A03:03	SubIndex 003	3. PDO Mapping entry (object 0x6040 (AI Inputs Ch.3), entry 0x03 (Limit 1))	UINT32	RO	0x6040:03, 2
1A03:04	SubIndex 004	4. PDO Mapping entry (object 0x6040 (AI Inputs Ch.3), entry 0x05 (Limit 2))	UINT32	RO	0x6040:05, 2
1A03:05	SubIndex 005	5. PDO Mapping entry (object 0x6040 (AI Inputs Ch.3), entry 0x07 (Error))	UINT32	RO	0x6040:07, 1
1A03:06	SubIndex 006	6. PDO Mapping entry (7 bits align)	UINT32	RO	0x0000:00, 7
1A03:07	SubIndex 007	7. PDO Mapping entry (object 0x6040 (AI Inputs Ch.3), entry 0x0F (TxPDO State))	UINT32	RO	0x6040:0F, 1
1A03:08	SubIndex 008	8. PDO Mapping entry (object 0x6040 (AI Inputs Ch.3), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6040:10, 1
1A03:09	SubIndex 009	9. PDO Mapping entry (object 0x6040 (AI Inputs Ch.3), entry 0x11 (Value))	UINT32	RO	0x6040:11, 32

Index 1A04 AI TxPDO-Map Inputs Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
1A04:0	AI TxPDO-Map Inputs Ch.4	PDO Mapping TxPDO 5	UINT8	RO	0x09 (9_{dec})
1A04:01	SubIndex 001	1. PDO Mapping entry (object 0x6050 (AI Inputs Ch.4), entry 0x01 (Underrange))	UINT32	RO	0x6050:01, 1
1A04:02	SubIndex 002	2. PDO Mapping entry (object 0x6050 (AI Inputs Ch.4), entry 0x02 (Overrange))	UINT32	RO	0x6050:02, 1
1A04:03	SubIndex 003	3. PDO Mapping entry (object 0x6050 (AI Inputs Ch.4), entry 0x03 (Limit 1))	UINT32	RO	0x6050:03, 2
1A04:04	SubIndex 004	4. PDO Mapping entry (object 0x6050 (AI Inputs Ch.4), entry 0x05 (Limit 2))	UINT32	RO	0x6050:05, 2
1A04:05	SubIndex 005	5. PDO Mapping entry (object 0x6050 (AI Inputs Ch.4), entry 0x07 (Error))	UINT32	RO	0x6050:07, 1
1A04:06	SubIndex 006	6. PDO Mapping entry (7 bits align)	UINT32	RO	0x0000:00, 7
1A04:07	SubIndex 007	7. PDO Mapping entry (object 0x6050 (AI Inputs Ch.4), entry 0x0F (TxPDO State))	UINT32	RO	0x6050:0F, 1
1A04:08	SubIndex 008	8. PDO Mapping entry (object 0x6050 (AI Inputs Ch.4), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6050:10, 1
1A04:09	SubIndex 009	9. PDO Mapping entry (object 0x6050 (AI Inputs Ch.4), entry 0x11 (Value))	UINT32	RO	0x6050:11, 32

Index 1A05 DEV TxPDO-Map Inputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
1A05:0	DEV TxPDO-Map Inputs Device	PDO Mapping TxPDO 6	UINT8	RO	0x07 (7_{dec})
1A05:01	SubIndex 001	1. PDO Mapping entry (object 0xF600 (DEV Inputs Safe State Active), entry 0x01 (Safe State Active))	UINT32	RO	0xF600:01, 1
1A05:02	SubIndex 002	2. PDO Mapping entry (15 bits align)	UINT32	RO	0x0000:00, 15
1A05:03	SubIndex 003	3. PDO Mapping entry (object 0xF611 (DEV Inputs Undervoltage), entry 0x01 (Undervoltage Us))	UINT32	RO	0xF611:01, 1
1A05:04	SubIndex 004	4. PDO Mapping entry (object 0xF611 (DEV Inputs Undervoltage), entry 0x02 (Undervoltage Up))	UINT32	RO	0xF611:02, 1
1A05:05	SubIndex 005	5. PDO Mapping entry (13 bits align)	UINT32	RO	0x0000:00, 13
1A05:06	SubIndex 006	6. PDO Mapping entry (object 0xF611 (DEV Inputs Undervoltage), entry 0x10 (TxPDO Toggle))	UINT32	RO	0xF611:10, 1
1A05:07	SubIndex 007	7. PDO Mapping entry (96 bits align)	UINT32	RO	0x0000:00, 96

Index 1C00 Sync manager type

Index (hex)	Name	Meaning	Data type	Flags	Default
1C00:0	Sync manager type	Usage of the Sync Manager channels	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	1. assigned RxPDO (contains the index of the corresponding RxPDO Mapping object)	UINT16	RW	0x1600 (5632_{dec})
1C12:02	Subindex 002	2. assigned RxPDO (contains the index of the corresponding 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	0x06 (6_{dec})
1C13:01	Subindex 001	1. assigned TxPDO (contains the index of the corresponding TxPDO Mapping object)	UINT16	RW	0x1A00 (6656_{dec})
1C13:02	Subindex 002	2. assigned TxPDO (contains the index of the corresponding TxPDO Mapping object)	UINT16	RW	0x1A01 (6657_{dec})
1C13:03	Subindex 003	3. assigned TxPDO (contains the index of the corresponding TxPDO Mapping object)	UINT16	RW	0x1A02 (6658_{dec})
1C13:04	Subindex 004	4. assigned TxPDO (contains the index of the corresponding TxPDO Mapping object)	UINT16	RW	0x1A03 (6659_{dec})
1C13:05	Subindex 005	5. assigned TxPDO (contains the index of the corresponding TxPDO Mapping object)	UINT16	RW	0x1A04 (6660_{dec})
1C13:06	Subindex 006	6. assigned TxPDO (contains the index of the corresponding TxPDO Mapping object)	UINT16	RW	0x1A05 (6661_{dec})

Index 1C32 SM output parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C32:0	SM output parameter	Synchronization parameter of the outputs	UINT8	RO	0x20 (32_{dec})
1C32:01	Sync mode	actual synchronization mode: • 0: Free Run • 1: Synchronous with SM 2 Event • 2: DC-Mode - Synchronous with SYNC0 Event • 3: DC-Mode - Synchronous with SYNC1 Event	UINT16	RW	0x0001 (1_{dec})
1C32:02	Cycle time	Cycle time (in ns): • Free Run: cycle time of the local timer • Synchronous with SM 2 Event: Cycle time of the master • DC-Mode: SYNC0/SYNC1 Cycle time	UINT32	RW	0x003D0900 (4000000_{dec})
1C32:03	Shift time	Time between SYNC0 Event and Outputs Valid (in ns, only in DC-Mode)	UINT32	RO	0x00000384 (900_{dec})
1C32:04	Sync modes supported	Supported synchronization modes: • Bit 0 = 1: Free Run is supported • Bit 1 = 1: Synchronous with SM 2 Event is supported • Bit 2-3 = 01: DC-Mode is supported • Bit 4-5 = 10: Output Shift with SYNC1 Event (only DC-Mode) • Bit 14 = 1: dynamic times (could be measured by writing 0x1C32:08 [▶ 50])	UINT16	RO	0xC007 (49159_{dec})
1C32:05	Minimum cycle time	Minimum cycle time supported (in ns)	UINT32	RO	0x000F4240 (1000000_{dec})
1C32:06	Calc and copy time	Minimal time between SYNC0 and SYNC1 Event (in ns, only in DC-Mode)	UINT32	RO	0x00000000 (0_{dec})
1C32:07	Minimum delay time		UINT32	RO	0x00000384 (900_{dec})
1C32:08	Command	• 0: Measurement of the times will be stopped • 1: Measurement of the times will be started The Entries 0x1C32:03 [▶ 50], 0x1C32:05 [▶ 50], 0x1C32:06 [▶ 50], 0x1C32:09 [▶ 50], 0x1C33:03 [▶ 51], 0x1C33:06 [▶ 50], 0x1C33:09 [▶ 51] will be updated with the maximum measured values.	UINT16	RW	0x0000 (0_{dec})
1C32:09	Maximum delay time	Time between SYNC1 Event and Outputs Valid (in ns, only in DC-Mode)	UINT32	RO	0x00000384 (900_{dec})
1C32:0B	SM event missed counter	Number of the missed SM-Events in state OPERATIONAL (only in DC Mode)	UINT16	RO	0x0000 (0_{dec})
1C32:0C	Cycle exceeded counter	Number of exceeded cycles in state OPERATIONAL	UINT16	RO	0x0000 (0_{dec})
1C32:0D	Shift too short counter	Number of inadequate distances between SYNC0 and SYNC1 events (only in DC Mode)	UINT16	RO	0x0000 (0_{dec})
1C32:20	Sync error	TRUE: In the last cycle the synchronization was not correct (only in DC Mode)	BOOLEAN	RO	0x00 (0_{dec})

Index 1C33 SM input parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameter of the inputs	UINT8	RO	0x20 (32_{dec})
1C33:01	Sync mode	actual synchronization mode: • 0: Free Run • 1: Synchronous with SM 3 Event (no Outputs available) • 2: DC - Synchronous with SYNC0 Event • 3: DC - Synchronous with SYNC1 Event • 34: Synchronous with SM 2 Event (Outputs available)	UINT16	RW	0x0022 (34_{dec})
1C33:02	Cycle time	same as 0x1C32:02 [▶ 50]	UINT32	RW	0x003D0900 (4000000_{dec})
1C33:03	Shift time	time between SYNC0-Event and Input Latch (in ns, only in DC-Mode)	UINT32	RO	0x00000384 (900_{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 with local event (Outputs available) • Bit 4-5 = 10: Input Shift with SYNC1 Event (no Outputs available) • Bit 14 = 1: dynamic times (could be measured by writing 0x1C32:08 [▶ 50] or 0x1C33:08 [▶ 51])	UINT16	RO	0xC007 (49159_{dec})
1C33:05	Minimum cycle time	same as 0x1C32:05 [▶ 50]	UINT32	RO	0x000F4240 (1000000_{dec})
1C33:06	Calc and copy time	time between Input Latch and the availability of the inputs for the master (in ns, only in DC-Mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:07	Minimum delay time		UINT32	RO	0x00000384 (900_{dec})
1C33:08	Command	same as 0x1C32:08 [▶ 50]	UINT16	RW	0x0000 (0_{dec})
1C33:09	Maximum delay time	time between SYNC1-Event and Input Latch (in ns, only in DC-Mode)	UINT32	RO	0x00000384 (900_{dec})
1C33:0B	SM event missed counter	same as 0x1C32:11 [▶ 50]	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	same as 0x1C32:12 [▶ 50]	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	same as 0x1C32:13 [▶ 50]	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	same as 0x1C32:32 [▶ 50]	BOOLEAN	RO	0x00 (0_{dec})

6.2.3 Profile specific objects (0x6000-0xFFFF)

Profile specific objects (0x6000-0xFFFF)

The profile specific objects have the same meaning for all EtherCAT Slaves which support the profile 5001.

Index 6020 AI Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
6020:0	AI Inputs Ch.1		UINT8	RO	0x11 (17_{dec})
6020:01	Underrange	Underrange event active	BOOLEAN	RO	0x00 (0_{dec})
6020:02	Overrange	Overrange event active	BOOLEAN	RO	0x00 (0_{dec})
6020:03	Limit 1		BIT2	RO	0x00 (0_{dec})
6020:05	Limit 2	Bit0: Value greater than Limit2 Bit1: Value smaller than Limit2	BIT2	RO	0x00 (0_{dec})
6020:07	Error	Bit set when Over- or Underrange	BOOLEAN	RO	0x00 (0_{dec})
6020:0F	TxPDO State		BOOLEAN	RO	0x00 (0_{dec})
6020:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
6020:11	Value		INT32	RO	0x00000000 (0_{dec})

Index 6030 AI Inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
6030:0	AI Inputs Ch.2		UINT8	RO	0x11 (17_{dec})
6030:01	Underrange	Underrange event active	BOOLEAN	RO	0x00 (0_{dec})
6030:02	Overrange	Overrange event active	BOOLEAN	RO	0x00 (0_{dec})
6030:03	Limit 1		BIT2	RO	0x00 (0_{dec})
6030:05	Limit 2	Bit0: Value greater than Limit2 Bit1: Value smaller than Limit2	BIT2	RO	0x00 (0_{dec})
6030:07	Error	Bit set when Over- or Underrange	BOOLEAN	RO	0x00 (0_{dec})
6030:0F	TxPDO State		BOOLEAN	RO	0x00 (0_{dec})
6030:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
6030:11	Value		INT32	RO	0x00000000 (0_{dec})

Index 6040 AI Inputs Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
6040:0	AI Inputs Ch.3		UINT8	RO	0x11 (17_{dec})
6040:01	Underrange	Underrange event active	BOOLEAN	RO	0x00 (0_{dec})
6040:02	Overrange	Overrange event active	BOOLEAN	RO	0x00 (0_{dec})
6040:03	Limit 1		BIT2	RO	0x00 (0_{dec})
6040:05	Limit 2	Bit0: Value greater than Limit2 Bit1: Value smaller than Limit2	BIT2	RO	0x00 (0_{dec})
6040:07	Error	Bit set when Over- or Underrange	BOOLEAN	RO	0x00 (0_{dec})
6040:0F	TxPDO State		BOOLEAN	RO	0x00 (0_{dec})
6040:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
6040:11	Value		INT32	RO	0x00000000 (0_{dec})

Index 6050 AI Inputs Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
6050:0	AI Inputs Ch.4		UINT8	RO	0x11 (17_{dec})
6050:01	Underrange	Underrange event active	BOOLEAN	RO	0x00 (0_{dec})
6050:02	Overrange	Overrange event active	BOOLEAN	RO	0x00 (0_{dec})
6050:03	Limit 1		BIT2	RO	0x00 (0_{dec})
6050:05	Limit 2	Bit0: Value greater than Limit2 Bit1: Value smaller than Limit2	BIT2	RO	0x00 (0_{dec})
6050:07	Error	Bit set when Over- or Underrange	BOOLEAN	RO	0x00 (0_{dec})
6050:0F	TxPDO State		BOOLEAN	RO	0x00 (0_{dec})
6050:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
6050:11	Value		INT32	RO	0x00000000 (0_{dec})

Index 6000 Dig Inputs

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	Dig Inputs		UINT8	RO	0x06 (6_{dec})
6000:01	Input 1		BOOLEAN	RO	0x00 (0_{dec})
6000:02	Input 2		BOOLEAN	RO	0x00 (0_{dec})
6000:03	Input 3		BOOLEAN	RO	0x00 (0_{dec})
6000:04	Input 4		BOOLEAN	RO	0x00 (0_{dec})
6000:05	Input 5		BOOLEAN	RO	0x00 (0_{dec})
6000:06	Input 6		BOOLEAN	RO	0x00 (0_{dec})

Index 7010 Dig Outputs

Index (hex)	Name	Meaning	Data type	Flags	Default
7010:0	Dig Outputs		UINT8	RO	0x02 (2_{dec})
7010:01	Output 1		BOOLEAN	RO	0x00 (0_{dec})
7010:02	Output 2		BOOLEAN	RO	0x00 (0_{dec})

Index 802E AI Internal data Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
802E:0	AI Internal data Ch.1		UINT8	RO	0x01 (1_{dec})
802E:01	ADC raw value		INT32	RO	0x00000000 (0_{dec})

Index 802F AI Vendor data Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
802F:0	AI Vendor data Ch.1		UINT8	RO	0x04 (4_{dec})
802F:01	Calibration offset pressure		INT32	RW	0x00000000 (0_{dec})
802F:02	Calibration gain pressure		INT16	RW	0x4000 (16384_{dec})
802F:03	Calibration offset temp		INT32	RW	0x00000000 (0_{dec})
802F:04	Calibration gain temp		INT16	RW	0x0000 (0_{dec})

Index 803E AI Internal data Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
803E:0	AI Internal data Ch.2		UINT8	RO	0x01 (1_{dec})
803E:01	ADC raw value		INT32	RO	0x00000000 (0_{dec})

Index 803F AI Vendor data Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
803F:0	AI Vendor data Ch.2		UINT8	RO	0x04 (4_{dec})
803F:01	Calibration offset pressure		INT32	RW	0x00000000 (0_{dec})
803F:02	Calibration gain pressure		INT16	RW	0x4000 (16384_{dec})
803F:03	Calibration offset temp		INT32	RW	0x00000000 (0_{dec})
803F:04	Calibration gain temp		INT16	RW	0x0000 (0_{dec})

Index 804E AI Internal data Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
804E:0	AI Internal data Ch.3		UINT8	RO	0x01 (1_{dec})
804E:01	ADC raw value		INT32	RO	0x00000000 (0_{dec})

Index 804F AI Vendor data Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
804F:0	AI Vendor data Ch.3		UINT8	RO	0x04 (4_{dec})
804F:01	Calibration offset pressure		INT32	RW	0x00000000 (0_{dec})
804F:02	Calibration gain pressure		INT16	RW	0x4000 (16384_{dec})
804F:03	Calibration offset temp		INT32	RW	0x00000000 (0_{dec})
804F:04	Calibration gain temp		INT16	RW	0x0000 (0_{dec})

Index 805E AI Internal data Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
805E:0	AI Internal data Ch.4		UINT8	RO	0x01 (1_{dec})
805E:01	ADC raw value		INT32	RO	0x00000000 (0_{dec})

Index 805F AI Vendor data Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
805F:0	AI Vendor data Ch.4		UINT8	RO	0x04 (4_{dec})
805F:01	Calibration offset pressure		INT32	RW	0x00000000 (0_{dec})
805F:02	Calibration gain pressure		INT16	RW	0x4000 (16384_{dec})
805F:03	Calibration offset temp		INT32	RW	0x00000000 (0_{dec})
805F:04	Calibration gain temp		INT16	RW	0x0000 (0_{dec})

Index F000 Modular device profile

Index (hex)	Name	Meaning	Data type	Flags	Default
F000:0	Modular device profile	general information about the Modular Device Profile	UINT8	RO	0x02 (2_{dec})
F000:01	Module index distance	Index distance between the objects of two channels	UINT16	RO	0x0010 (16_{dec})
F000:02	Maximum number of modules	number of channels	UINT16	RO	0x0006 (6_{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	0x06 (6_{dec})
F010:01	SubIndex 001		UINT32	RW	0x00000118 (280_{dec})
F010:02	SubIndex 002		UINT32	RW	0x00000118 (280_{dec})
F010:03	SubIndex 003		UINT32	RW	0x0000012C (300_{dec})
F010:04	SubIndex 004		UINT32	RW	0x0000012C (300_{dec})
F010:05	SubIndex 005		UINT32	RW	0x0000012C (300_{dec})
F010:06	SubIndex 006		UINT32	RW	0x0000012C (300_{dec})

Index F600 DEV Inputs Safe State Active

Index (hex)	Name	Meaning	Data type	Flags	Default
F600:0	DEV Inputs Safe State Active		UINT8	RO	0x01 (1_{dec})
F600:01	Safe State Active	1: Outputs are in Safe State 0: Outputs are in Normal State	BOOLEAN	RO	0x00 (0_{dec})

Index F611 DEV Inputs Undervoltage

Index (hex)	Name	Meaning	Data type	Flags	Default
F611:0	DEV Inputs Undervoltage		UINT8	RO	0x10 (16_{dec})
F611:01	Undervoltage Us	Us ≤ 18 V	BOOLEAN	RO	0x00 (0_{dec})
F611:02	Undervoltage Up	Up ≤ 18 V	BOOLEAN	RO	0x00 (0_{dec})
F611:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})

Index F700 DEV Outputs Set Safe State

Index (hex)	Name	Meaning	Data type	Flags	Default
F700:0	DEV Outputs Set Safe State		UINT8	RO	0x01 (1_{dec})
F700:01	Set safe state	Set Device to Safe State	BOOLEAN	RO	0x00 (0_{dec})

Index F800 AI Settings Reference

Index (hex)	Name	Meaning	Data type	Flags	Default
F800:0	AI Settings Reference		UINT8	RO	0x18 (24_{dec})
F800:0A	Enable user calibration		BOOLEAN	RW	0x00 (0_{dec})
F800:0B	Enable vendor calibration		BOOLEAN	RW	0x01 (1_{dec})
F800:17	User calibration offset		INT32	RW	0x00000000 (0_{dec})
F800:18	User calibration gain		INT16	RW	0x4000 (16384_{dec})

Index F80E AI Internal data Reference

Index (hex)	Name	Meaning	Data type	Flags	Default
F80E:0	AI Internal data Reference		UINT8	RO	0x02 (2_{dec})
F80E:01	ADC raw value 1	Pressure Value	INT32	RO	0x00000000 (0_{dec})
F80E:02	ADC raw value 2	Pressure Value	INT32	RO	0x00000000 (0_{dec})

Index F80F AI Vendor data Reference

Index (hex)	Name	Meaning	Data type	Flags	Default
F80F:0	AI Vendor data Reference		UINT8	RO	0x04 (4_{dec})
F80F:01	Calibration offset pressure		INT32	RW	0x00000000 (0_{dec})
F80F:02	Calibration gain pressure		INT16	RW	0x4000 (16384_{dec})
F80F:03	Calibration offset temp		INT32	RW	0x00000000 (0_{dec})
F80F:04	Calibration gain temp		INT16	RW	0x0000 (0_{dec})

7 Appendix

7.1 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

7.2 Accessories

Mounting

Ordering information	Description	Link
ZS5300-0011	Mounting rail	Website

Labeling material, protective caps

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

Cables

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

Ordering information	Description	Link
ZK1090-3xxx-xxxx	EtherCAT cable M8, green	Website
ZK1093-3xxx-xxxx	EtherCAT cable M8, yellow	Website
ZK2000-3xxx-xxxx	Sensor cable M8, 4-pin	Website
ZK2020-3xxx-xxxx	Power cable M8, 4-pin	Website

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

Further accessories

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

7.3 Version identification of EtherCAT devices

7.3.1 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.

7.3.2 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

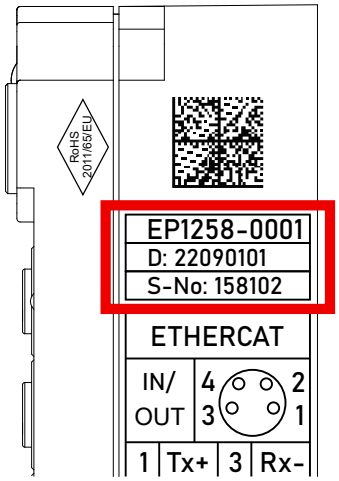


Fig. 14: EP1258-00001 IP67 EtherCAT Box with batch number/DateCode 22090101 and unique serial number 158102

7.3.3 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.

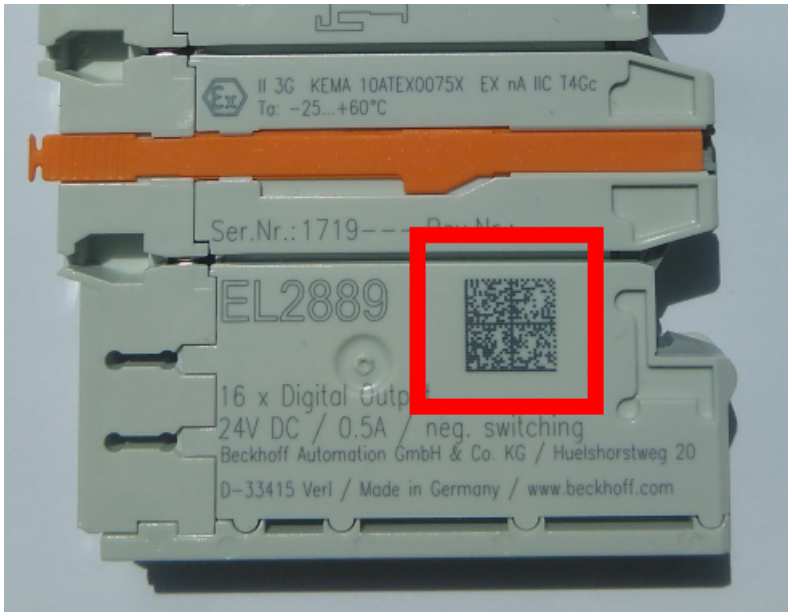


Fig. 15: BIC as data matrix code (DMC, code scheme ECC200)

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. 16: 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.

7.3.4 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.

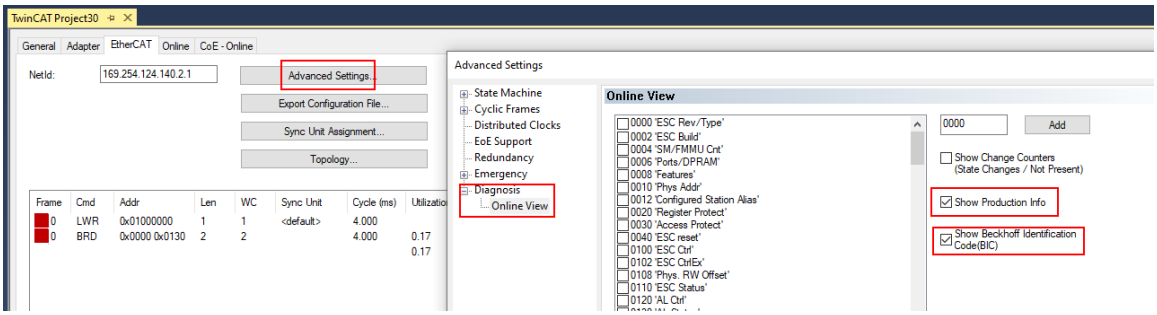
EtherCAT devices (IP20, IP67)

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.

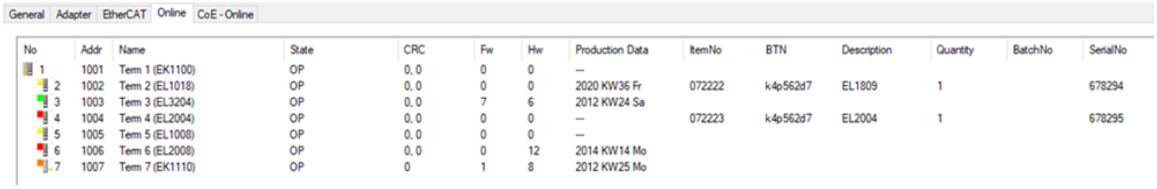
The eBIC is also stored in the ESI-EEPROM. The eBIC was introduced into the Beckhoff I/O production (terminals, boxes) from 2020; widespread implementation is expected in 2021.

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 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.

7.4 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.

Beckhoff Support

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
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Beckhoff Service

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

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

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