BECKHOFF New Automation Technology

Documentation | EN

EP9224-0037

Power distribution box ENP to EtherCAT P

2020-08-18 | Version: 1.2

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

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Patent Pending

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

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

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
1.2	• Block diagram added • Chapter added: "Internal EtherCAT data flow" • Dimensions updated
1.1	• Front page updated
1.0	• First release

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 [▶ 65].

2 EtherCAT Box - Introduction

The EtherCAT system has been extended with EtherCAT Box modules with protection class IP 67. 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.

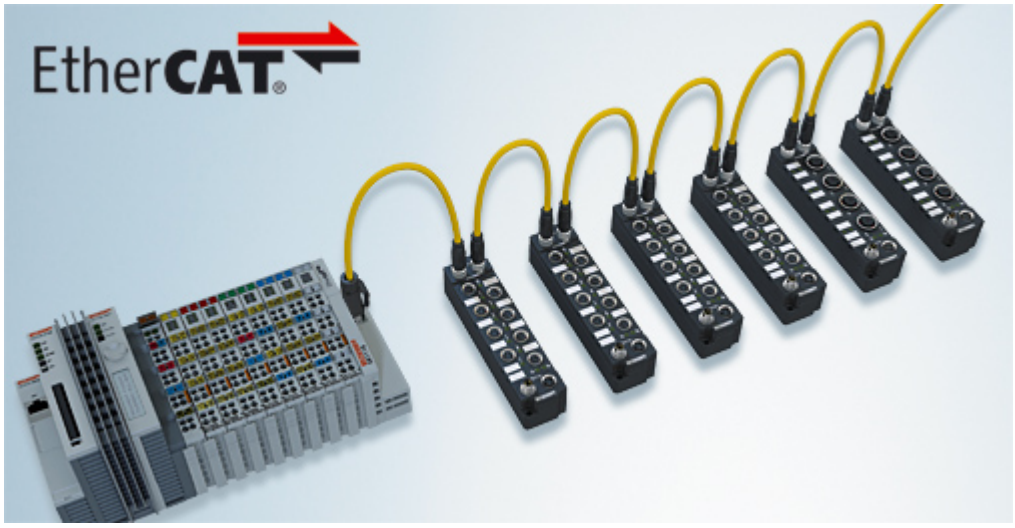


Fig. 1: EtherCAT Box Modules within an EtherCAT network

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

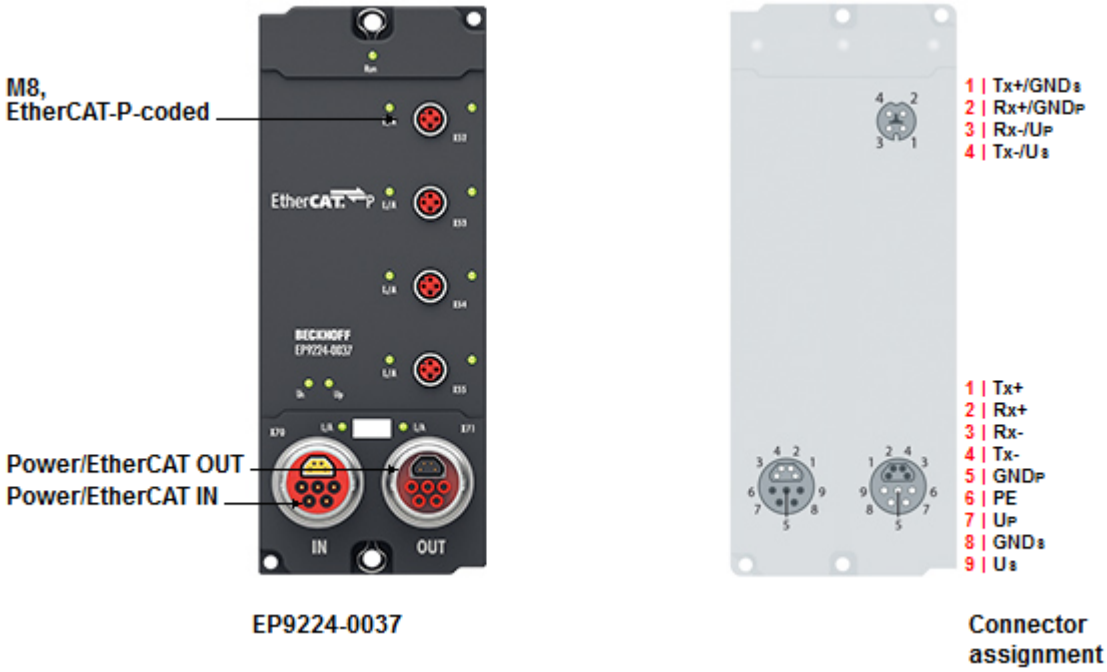


Fig. 4: EP9224-0037

EP9224-0037

The EP9224-0037 EtherCAT Box distributes an EtherCAT signal to four EtherCAT P ports.

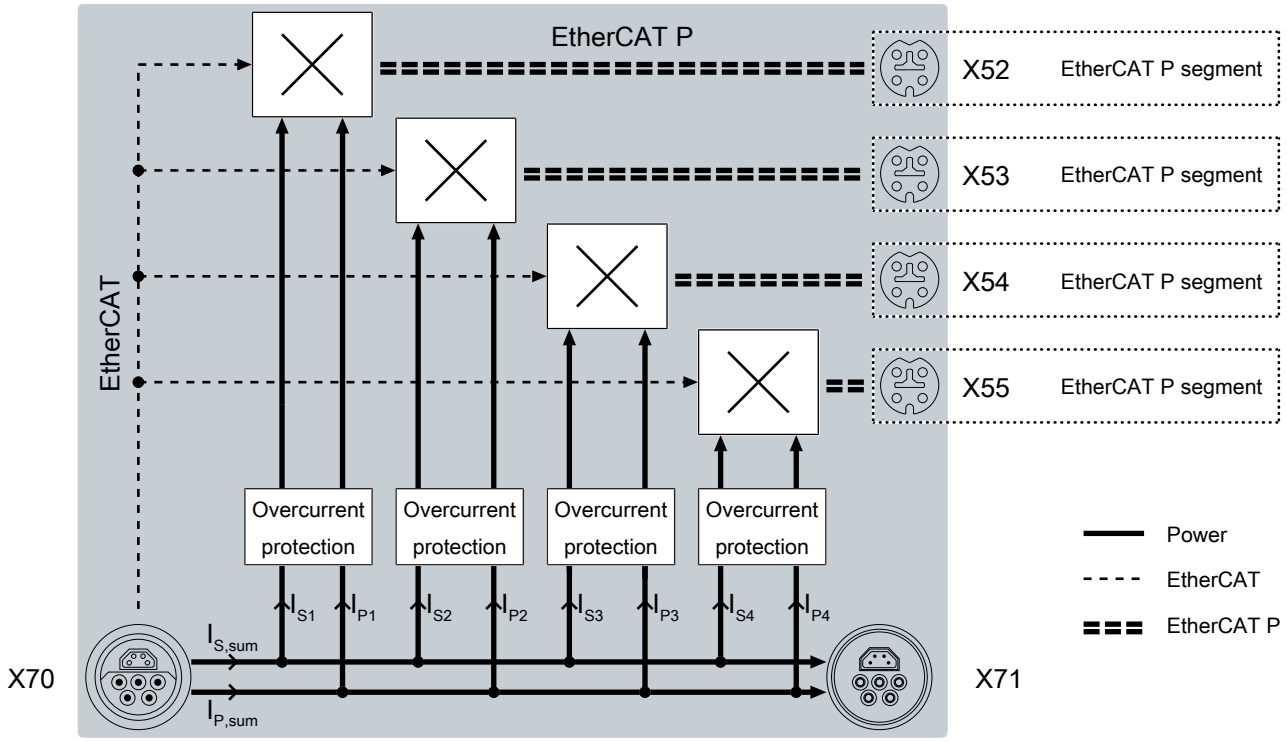
It measures supply voltages, output currents and its own temperature. The measured values are available as process data.

Internal protective functions use the measured values to switch off the output voltages of the EtherCAT P ports in case of error. This prevents damage and malfunctions:

- Overloading of the supply line
- Overloading of the power supply unit
- Overloading of the EtherCAT P cables
- Undervoltage of the supply voltages

EP9224-0037 has a peak value detector and a data logger for the diagnosis of errors.

3.2 Block diagram



3.3 Technical data

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

EtherCAT	
Connection	ENP B17 – connector
Electrical isolation	500 V

Supply voltages	
Connection	Supply (X70): Connector B17 5G 1.5 mm² ENP Downstream connection (X71): Socket B17 5G 1.5 mm² ENP
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current $I_{S,sum}$	max. 15.5 A at 45 °C
Current consumption from U_S	110 mA + load: I_{S1}, I_{S2}, I_{S3}, I_{S4}
Rated voltage U_P	24 V_{DC} (-15 % / +20 %)
U_P Sum current $I_{P,sum}$	max. 15.5 A at 45 °C
Current consumption from U_S	40 mA + load: I_{P1}, I_{P2}, I_{P3}, I_{P4}

EtherCAT P ports	
Number of ports	4
Connections	M8 sockets, p-coded, shielded
Nominal current	3 A per U_S and U_P on each EtherCAT P port
Nominal current (sum)	12 A per U_S and U_P
Capacitive load C_{Load}	max. 2200 µF per U_S and U_P on each EtherCAT P port
Switch-on time delay [1]	Switch output voltages [▶ 43]: • "Fast" = 10 ms • "Moderate" = 100 ms (default) • "Slow" = 200 ms

[1] The output voltages of the EtherCAT P ports are switched on one after the other at the start so that the input inrush currents do not add up. See chapter Switch output voltages [▶ 43].

Overcurrent protection	
Nominal current I_n	Adjustable [▶ 35]: 1…3 A per U_S and U_P on each EtherCAT P port.
Tripping characteristic	Adjustable [▶ 35]. Default 100 ms at 3 x I_n.
Current limitation I_{Lim}	5 A per U_S and U_P on each EtherCAT P port.
Current limitation: Switch-off time t_{Lim}	typically 75 ms
Fuse (faile-safe element)	Rated current: 5 A Melting integral I^2t: 5.566 A^2 s. (with a pulse width of 8 ms)

Further protective functions and diagnosis	
Overtemperature protection	Threshold values: T_{warn} = 75 °C → warning on exceeding T_{err} = 85 °C → error message on exceeding
Undervoltage protection	Threshold values: U_{warn} = 21.6 V → warning on falling below U_{err} = 19.1 V → error message on falling below
Data logger: Sampling interval	Adjustable [▶ 41]: • 1 ms • 10 ms (default) • 25 ms • 100 ms • 1000 ms
Data logger: Buffer size	25 entries.

Measured values	
Resolution	Currents per port: 10 mA Sum currents U_S + U_P: 10 mA Voltages: 100 mV Temperature: 1 K
Representation	Currents per port: 1 mA / LSB Sum currents U_S + U_P: 10 mA / LSB Voltages: 100 mV / LSB Temperature: 1 K / LSB (Celsius scale)

Housing data	
Dimensions W x H x D	60 mm x 150 mm x 26,5 mm (without connectors)
Weight	approx. 540 g
Installation position	variable
Material	PA6 (polyamide)

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

Approvals	
Approvals	CE, EAC, UKCA, UL under preparation

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

3.4 Scope of supply

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

- 1x EtherCAT Box EP9224-0037
- 4x protective caps for EtherCAT P socket (mounted)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

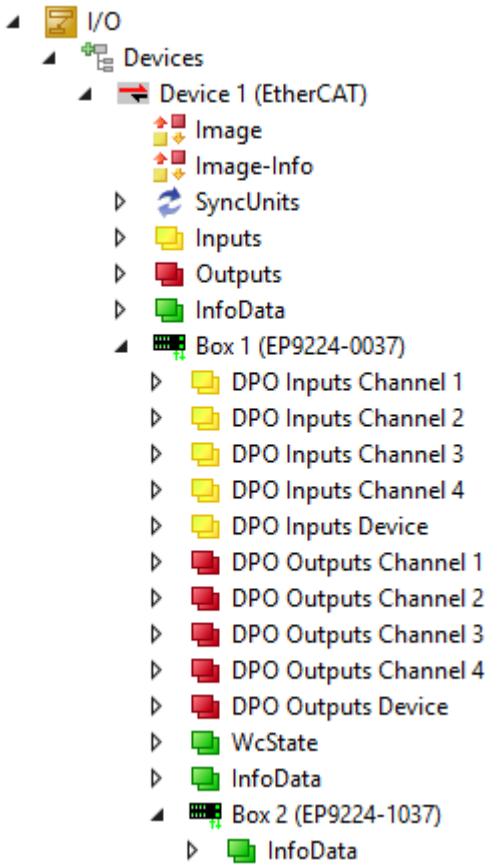
Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

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

3.5 Process image

In the process image the EtherCAT P ports are designated "Channel 1" to "Channel 4". The following table shows the correlation between the designations in the process image and the designations of the EtherCAT P ports:

Designation in the process image	EtherCAT P port
„Channel 1“	X52
„Channel 2“	X53
„Channel 3“	X54
„Channel 4“	X55



The EP9224-0037 has four output channels, **DPO Inputs Channel n.**

Subsequently, a status channel follows for the complete device **DPO Inputs Device.**

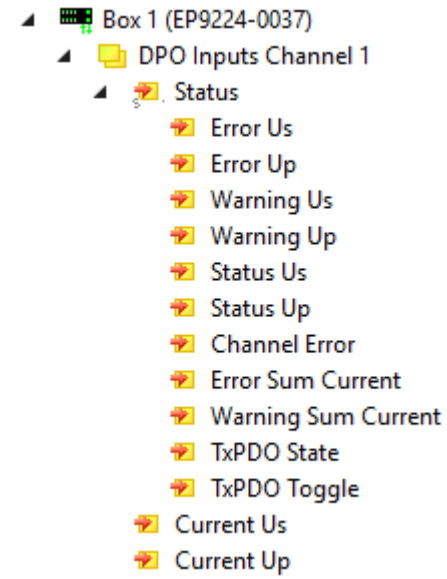
In the output section there are four output channels, **DPO Outputs Channel n.**

An output word follows for the complete device **DPO Outputs Device**.

WcState and **InfoData** are standard EtherCAT system variables.

Since EtherCAT is distributed in addition to power, an **EP9224-1037** device is included.

DPO Inputs Channel 1 to 4



The four channels each have status bits and status LEDs for displaying the current channel state:
Error U_S: U_S was switched off due to overcurrent

Error U_P: U_P was switched off due to overcurrent

Warning U_S: If the current value set in CoE object 80n0:12 persists, the channel will be switched off

Warning U_P: If the current value set in CoE object 80n0:13 persists, the channel will be switched off

Status U_S: Channel switched on or off

Status U_P: Channel switched on or off

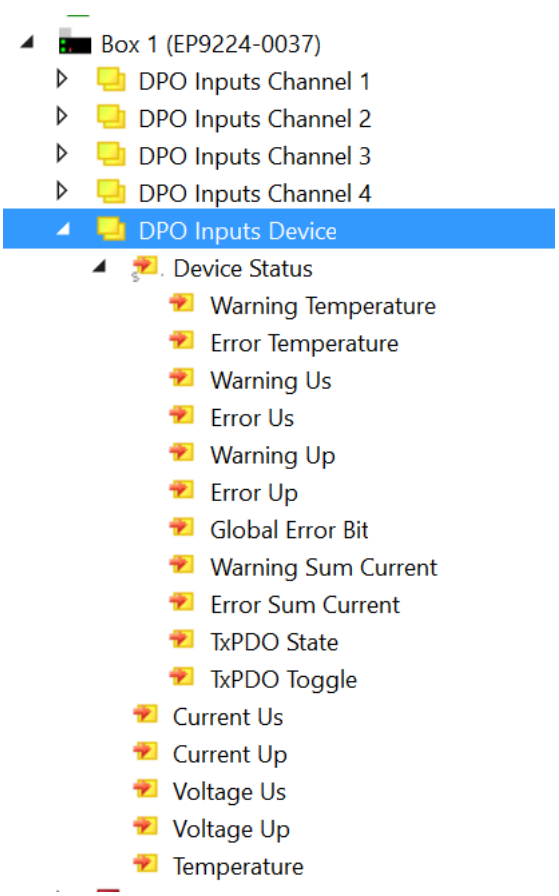
Channel Error: Error U_S or Error U_P is TRUE

Error Sum Current: The sum value for Is and Ip of the channel set in CoE object 8000:14 has been exceeded for too long.

Warning Sum Current: If the sum current for I_S + I_P of the channel persists, the channel will be switched off.

Current U_S, Current U_p: Two 16-bit process words each represent the present output current value of U_S or U_P respectively.

DPO Inputs Device



Subsequently, a status word follows for the complete device **DPO Inputs Device.**

Temperature Warning: The internal temperature of the EP9224 will soon reach the shut-off point.

Temperature Error: The internal temperature was too high. The output channels were switched off.

U_S/U_P Warning: The value of the input voltage U_S/U_P is less than the upper threshold value U_{warn}.

U_S/U_P Error: The value of the input voltage U_S/U_P has fallen below the lower threshold value U_{err}. The output voltages have been switched off.

Global Error Bit: There is at least one error message pending.

Sum Current Warning: The sum value for I_S and I_P of the box set in CoE object F80E:12 has been exceeded for too long.

Error Sum Current: If the sum value for I_S and I_P of the channel set in CoE object 8000:14 persists, the channel will be switched off.

Current U_S: Present sum current of the supply input socket Us

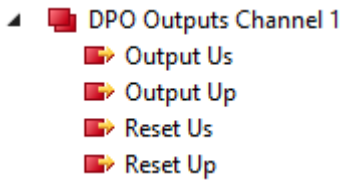
Current U_P: Present sum current of the supply input socket Up

Voltage U_S: Present input voltage of the supply input socket U_S in 1/10V

Voltage U_P: Present input voltage of the supply input socket U_P in 1/10V

Temperature: Current internal temperature of the box

DPO Outputs Channel 1 to 4

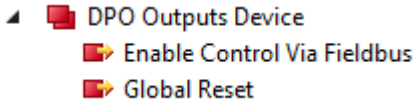


The EP9224 has 4 x 16-bit output data of the four output channels **DPO Outputs Channel n**.

Output U_S/U_P:
TRUE - switches on the output,
FALSE - switches off the output

Reset U_S/U_P: TRUE - reset in case of an error.

DPO Outputs Device



Subsequently, a status word follows for the complete device **DPO outputs Device.**

Enable Control Via Fieldbus:
TRUE - control of all outputs via output variables,
FALSE - automatic switch-on depending on the CoE entries

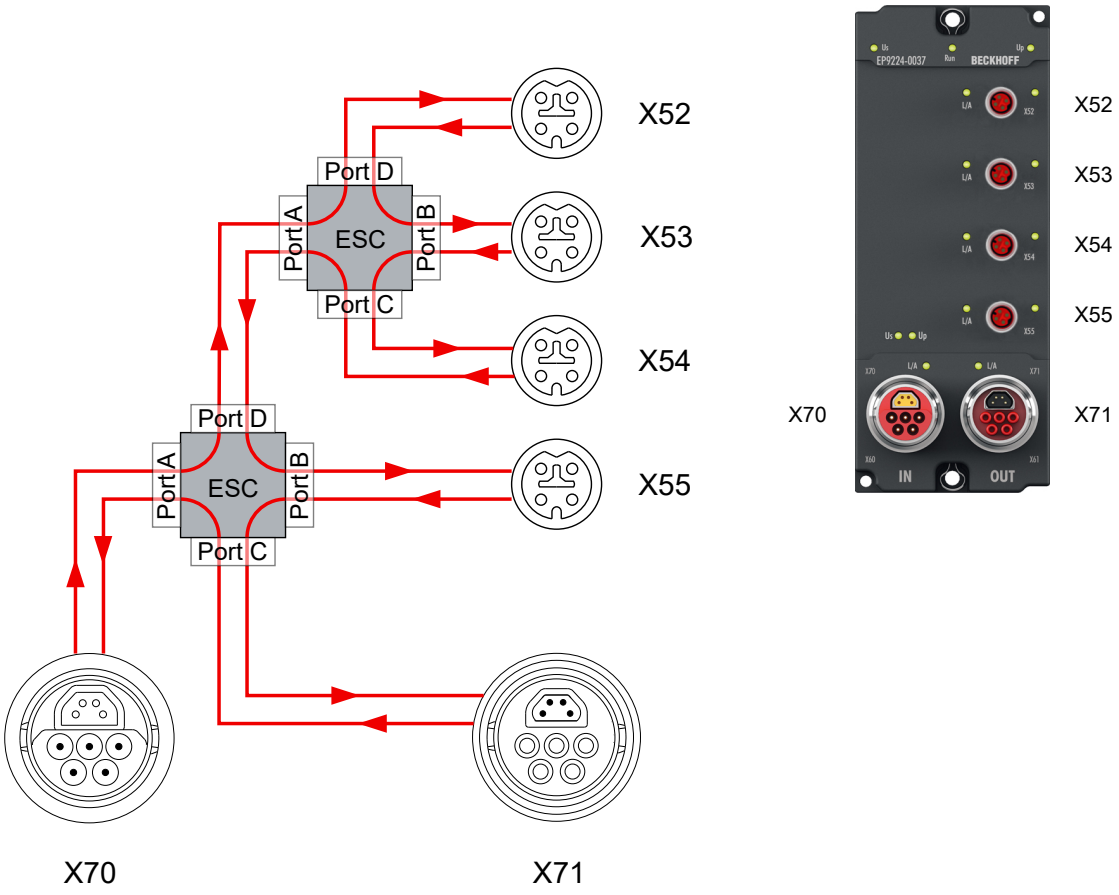
Global Reset: Resets all errors in the box

3.6 Basic Function Principles

3.6.1 Internal EtherCAT data flow

EP9224-0037 contains two EtherCAT Slave Controller (ESC).

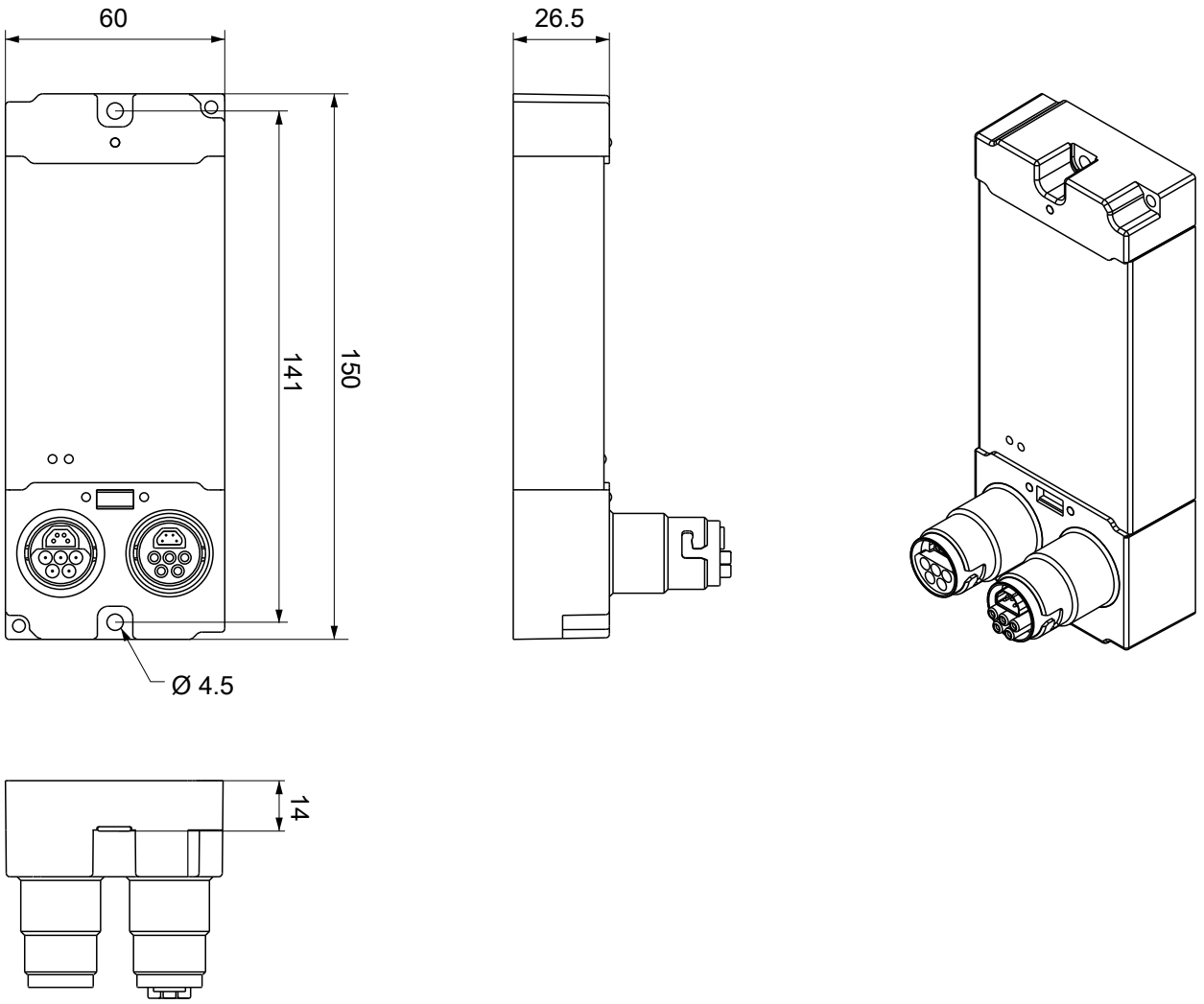
The following figure shows the logical path of an EtherCAT frame through the two ESCs. The ports on an ESC that do not have a device connected are automatically bypassed.



4 Mounting and cabling

4.1 Mounting

4.1.1 Dimensions



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

Housing features

Housing material	PA6 (polyamide)
Sealing compound	polyurethane
Mounting	two fastening holes Ø 4.5 mm for M4
Metal parts	brass, nickel-plated
Contacts	CuZn, gold-plated
Power feed through	max. 15.5 A at 45 °C (B17 5G 1.5 mm^2)
Installation position	variable
Protection class	IP65, IP66, IP67 (conforms to EN 60529) when screwed together
Dimensions (H x W x D)	approx. 150 x 60 x 26.5 mm (without connectors)

4.1.2 Mounting

Mount EtherCAT Box modules with two M4 screws in the centrally located fixing holes.

The screws must be longer than 15 mm. The fastening holes in the modules have no thread.

Protect connectors against soiling

Protect all module connections from soiling during installation! The protection classes IP65, IP66, IP67 (in accordance with EN 60529) are ensured only if all connectors are wired or sealed! Unused connectors must be sealed with suitable protective caps (see Beckhoff catalog for connector sets and protective caps)!

Cooling plate

The EP9224-0037 module has a cooling plate on the underside. For the effective dissipation of the resultant power loss, the box must be bolted to a metal base, e.g. the machine bed, if possible making contact over the entire surface. A temperature-related automatic switch-off of the box can occur if care is not taken to ensure that the power loss from the module is dissipated via the cooling plate. A corresponding temperature error bit is then set!

Note when mounting that the overall height is increased further by the fieldbus connections. See chapter Accessories.

4.1.3 Tightening torques for plug connectors

M8 connector: X52, X53, X54, X55

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

B17 connector: X70, X71

Screw B17 connectors tight by hand:
Plug the cable connector into the connector on the box to the stop. Turn the cap nuts of the cable connector clockwise by about 1/8 of a turn to the stop.

4.2 Functional earth (FE)

Functional earth via the fastening holes

The fastening holes [▶ 20] also serve as connections for the functional earth (FE).

Make sure that the box is earthed with low impedance via both fastening screws.

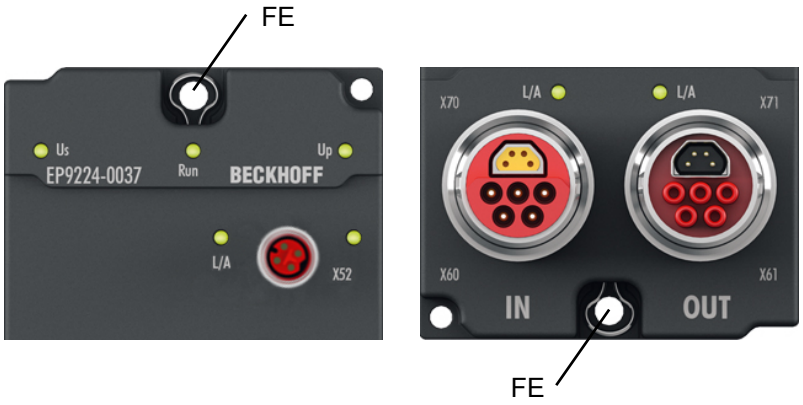


Fig. 5: Functional earth via the fastening holes

Functional earth via the supply lines

Pins 6 of the B17 connectors marked with "FE" are not directly connected with the functional earth potential of the fastening holes.

Connect the functional earth of the "FE" cores in accordance with the following instructions:

- If the remote station is a device with B17 connector: connect the devices with a pre-configured cable. Order number: Beckhoff ZK7208-3031-Axxx.
- Otherwise: Earth the "PE" core with low impedance as near as possible to the remote station.
- Leave the cap nuts and housing of the B17 connectors without contact.

4.3 Power supply

EtherCAT Box modules are supplied with two electrically isolated supply voltages:

Control voltage U_S

Power is supplied to the fieldbus, the processor logic, the inputs and the sensors from the control voltage U_S. The control voltage is electrically isolated from the fieldbus circuitry.

Peripheral voltage U_P

The peripheral voltage U_P supplies the digital outputs; it can be brought in separately. Hence, if the peripheral voltage is switched off, the fieldbus function as well as the supply and function of the inputs are retained.

4.3.1 Connection

The supply and forwarding of the supply voltages takes place via two 5-pin ENP B17 hybrid connectors at the lower end of the modules:

- X70 "IN": left B17 connector for feeding the supply voltages
- X71 "OUT": right B17 connector for routing the supply voltages

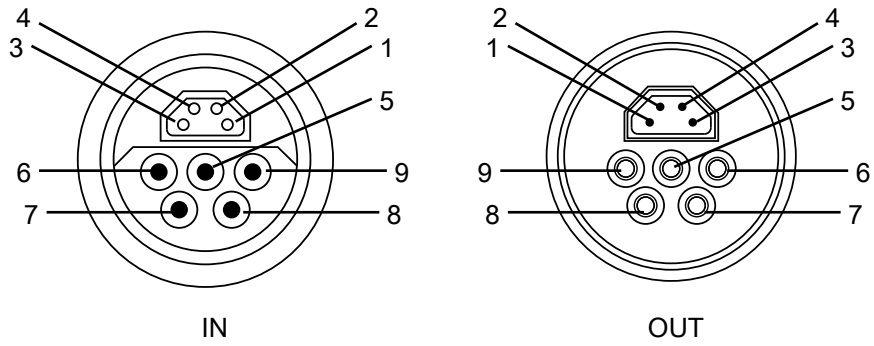


Fig. 6: B17 pin assignment

Pin	Voltage/signal	Core colors [1)]
1	Tx+	yellow
2	Rx+	white
3	Rx-	blue
4	Tx-	orange
5	GND_P: ground for U_P	grey
6	FE: functional earth	green-yellow
7	U_P: peripheral voltage, +24 V_{DC}	black
8	GND_S: ground for U_S	blue
9	U_S: control voltage +24 V_{DC}	brown

[1)] The core colors apply to cables, connectors and flanges of the type

- Beckhoff ZB7203-xxxx
- Beckhoff ZK7208-xxxx

4.3.2 Status LEDs

The status of the supply voltages is signaled by two LEDs. A Status LED lights up green when the respective supply voltage is present on the supply voltage input.

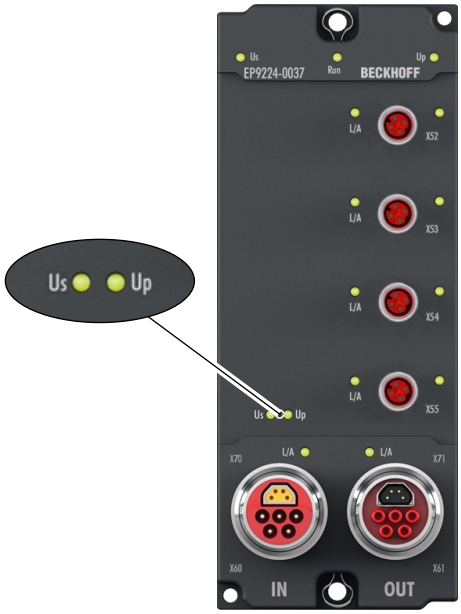


Fig. 7: Status LEDs for the supply voltages

4.3.3 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 permissible value. See Technical data [▶ 11].

Variations in the voltage of the power supply unit must also be taken into account.

The following graph illustrates the dependence of the voltage drop on the core cross-section, current and cable length:

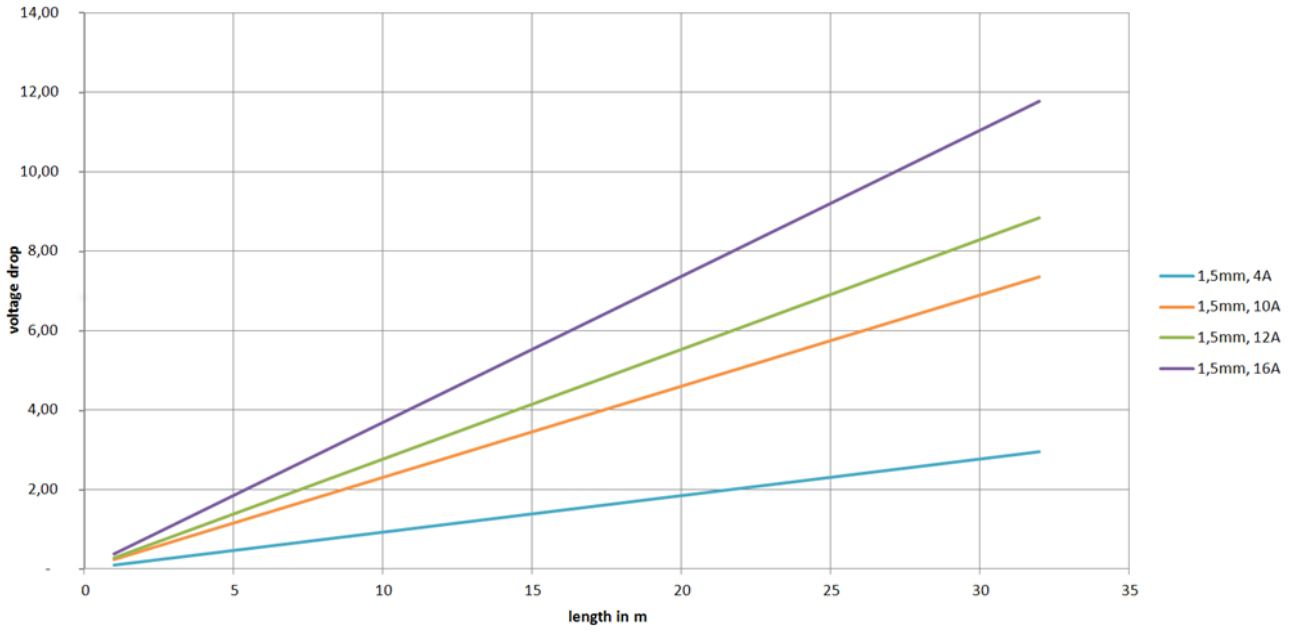


Fig. 8: Losses on the supply line

4.4 EtherCAT

4.4.1 Connection

For the incoming and continuing EtherCAT connection the EP9224-0037 has two 9-pin B17 connectors, each with

- 4-pin trapezoidal EtherCAT core
- 5-pin power supply unit

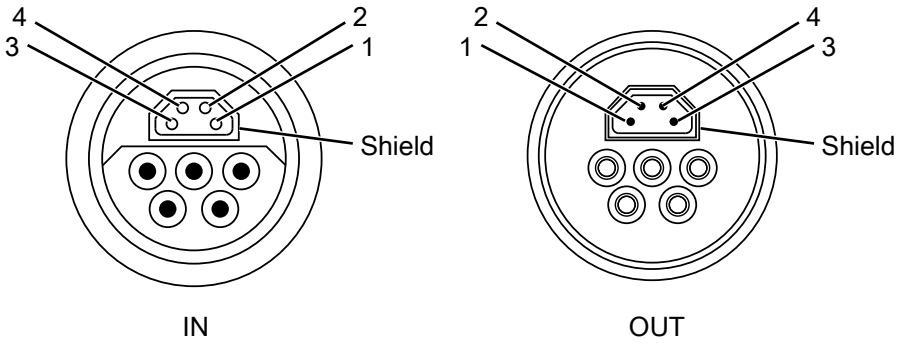


Fig. 9: EtherCAT pin configuration

Pin	Voltage/signal	Core colors [1)]
1	Tx+	yellow
2	Rx+	white
3	Rx-	blue
4	Tx-	orange
Shroud	Shield	Cable shield

[1)] The core colors apply to cables, connectors and flanges of the type

- Beckhoff ZB7203-xxxx
- Beckhoff ZK7208-xxxx

4.4.2 Status LEDs

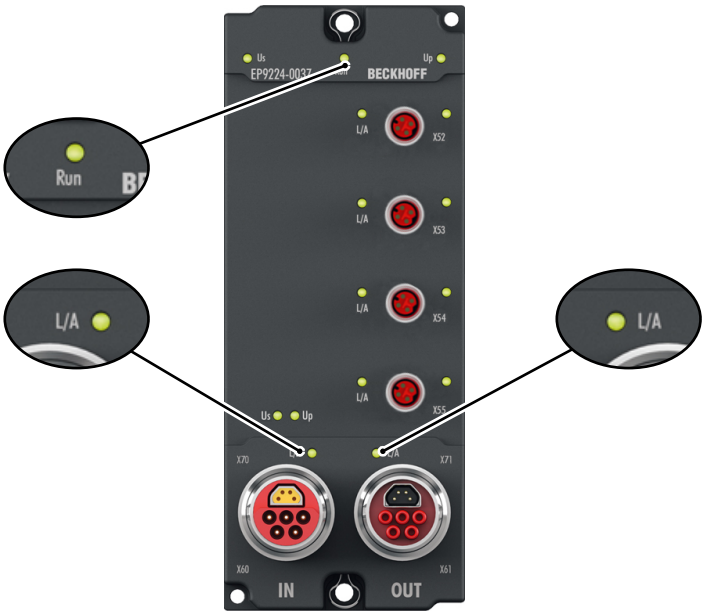


Fig. 10: EtherCAT LEDs

L/A (Link/Act)

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

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

Run

Each EtherCAT slave and each EtherCAT P 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

A description of the EtherCAT slave states can be found under https://infosys.beckhoff.com/content/1033/ethercatsystem/1036980875.html?id=8582353789396071752.

4.5 EtherCAT P

NOTE

Defect possible through parallel connection.

Do not connect EtherCAT P outputs in parallel.

EP9224-0037 converts the incoming EtherCAT signal into an EtherCAT P signal by combining the EtherCAT signal with the applied supply voltages. The EtherCAT P signal is available at four output ports: X52, X53, X54, X55.

Electrical isolation

The grounds of the control voltage (GND_S) and peripheral voltage (GND_P) are electrically isolated from each other in order to ensure the electrical isolation of the peripheral devices on U_P from the control voltage.

4.5.1 Connection

Fig. 11: M8 socket, p-coded

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

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

4.5.2 Status LEDs

The status of an EtherCAT P port is signaled by two LEDs:

Fig. 12: LEDs of EtherCAT P ports (example: X54)

(1) EtherCAT Link/Activity (L/A)

The L/A LEDs of EtherCAT P ports behave like the L/A LEDs of EtherCAT ports. See chapter Status LEDs [▶ 25] of EtherCAT ports.

(2) Output voltage status

Each EtherCAT P port is assigned an LED that signals the states of the output voltages of this port.

LED signal	Meaning
Off	The output voltages U_S and U_P are switched off.
Green illuminated	At least one of the output voltages (U_S, U_P) is switched on. The output currents are within the nominal operating range. ($I < I_n$)
Flashing green	Warning message [▶ 33]. Overcurrent on at least one of the output voltages.
Flashes red	Error message [▶ 33]. This signal is output in two cases: • At least one of the output voltages has been switched off within the last 20 seconds due to a protective function. • The box has been switched on within the last 20 seconds. Prior to switching on there was an error message that had not yet been reset.
Red illuminated	Error message [▶ 33]. At least one of the output voltages has been switched off due to a protective function.
Red running light (all four Status LEDs)	Error message [▶ 33]. Undervoltage or overtemperature.

4.6 Cabling

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

4.7 Disposal

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

5 Commissioning and configuration

5.1 Integration in TwinCAT

The procedure for integration in TwinCAT is described in this Quick start guide.

5.1.1 Assignment of the connectors

This chapter describes the assignment of the EP9224-0037 connectors to their representation in TwinCAT. You require this assignment in order to correctly map an EtherCAT network in the "offline" configuration in TwinCAT.

An EP9224-0037 is represented by two IO modules in the TwinCAT IO tree:

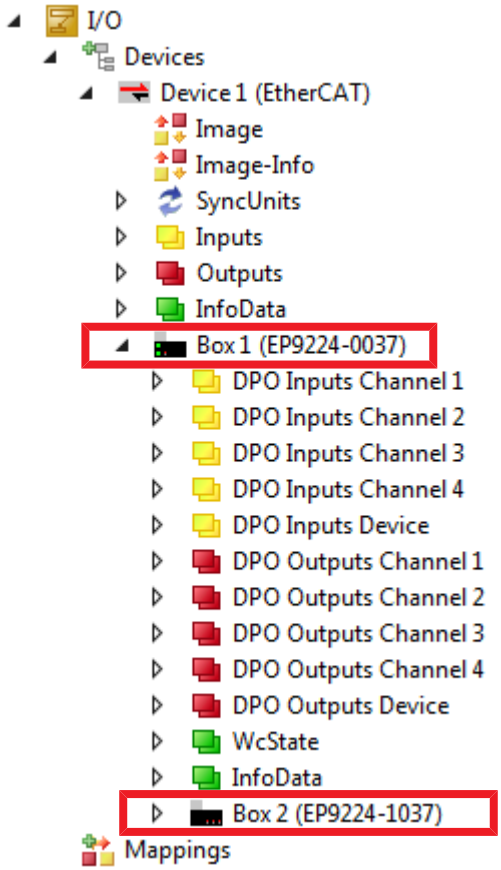


Fig. 13: EP9224-0037 in the TwinCAT IO tree

Each IO module has four ports. Some ports represent connectors, while others represent internal interfaces. The following illustration shows the assignment of the ports to the IO modules in TwinCAT:

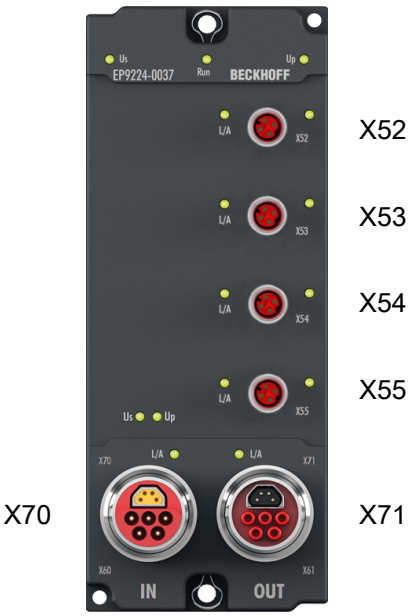


Fig. 14: Designations of the connectors

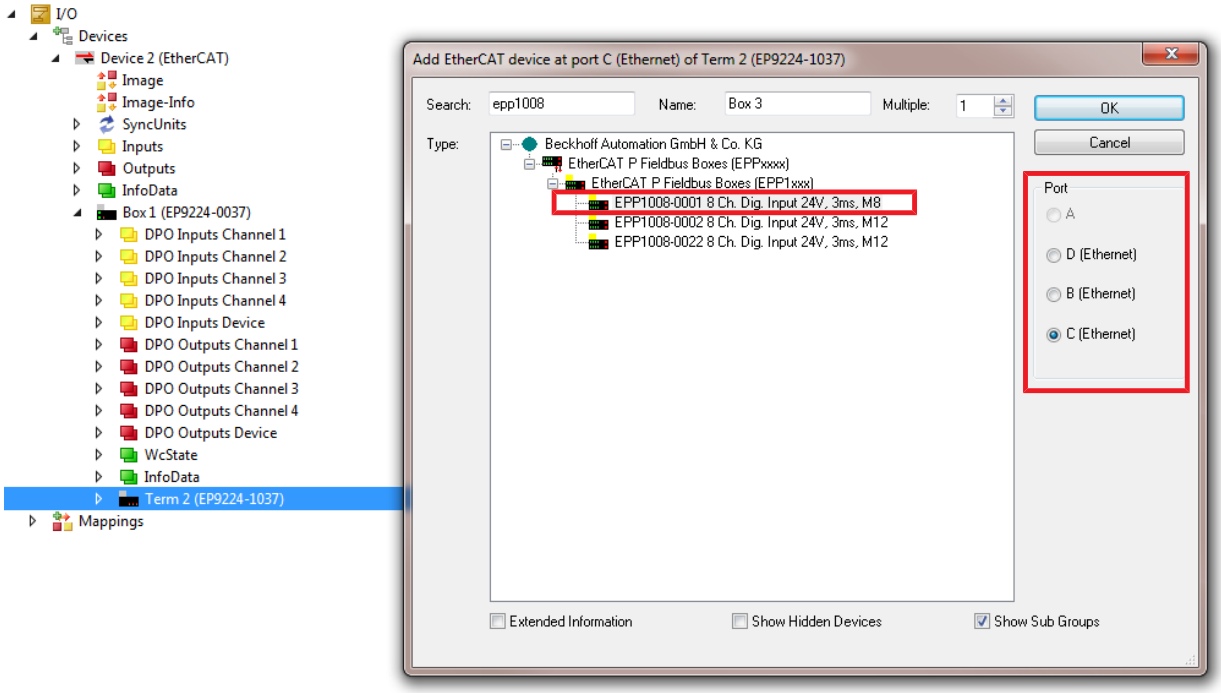
Type	EP9224-0037	TwinCAT	
	Connector	IO module	Port
EtherCAT P output	X52	EP9224-1037	D
EtherCAT P output	X53		B
EtherCAT P output	X54		C
EtherCAT P output	X55	EP9224-0037	B
EtherCAT input	X70		A
EtherCAT output	X71		C

On the following page you will find examples of the use of the table.

Example: Appending an EtherCAT P Box to EP9224-0037

✓ Requirement: an EP9224-0037 is appended in the IO tree in TwinCAT.

1. Decide which connector of the EP9224-0037 to connect the EtherCAT P Box to.
   (e.g. to X54)
2. Determine the corresponding IO module and port with the help of the table.
   (e.g. EP9224-1037, Port C)
3. Right-click on the IO module determined in the IO tree.
   (e.g. EP9224-1037)
4. Click on the menu item **Add new Item…**
5. In the window that appears, select the EtherCAT P Box to be appended and the port determined.
   (e.g. EPP1008-0001, Port C)



6. Click **OK**

⇨ Result: The box was appended in the correct place in the IO tree.

Example: Connect an already appended EtherCAT P Box to a different connector

1. Double-click on the EtherCAT P Box in the IO tree.
   (e.g. an EPP1008-0001 that was previously connected to X54)
2. Click on the **EtherCAT** tab.
3. Determine the corresponding IO module and port of the new connector with the help of the table.
   (e.g. X55 → EP9224-0037, Port B)
4. Select the determined IO module and port in the drop-down list **Previous Port**.
   (e.g. "Box 1 (EP9224-0037) – B")

⇨ Result: The EtherCAT P Box is connected to the new connector.

Checking the IO configuration graphically

1. Double-click the EtherCAT master device in the IO tree.
2. Click the **EtherCAT** tab.
3. Click the **Topology** button.

⇨ Result: A graphical illustration of the network structure created in TwinCAT appears.
Move the mouse pointer over the icons of the IO modules to display their description.

5.2 Warning and error messages

Protective functions output warning and error messages.

Warning messages are temporary. They indicate that a measured variable lies outside of the nominal operating range. The warning message is canceled if the measured variable returns to within the nominal operating range.

Error messages are persistent. They persist until they are actively reset: Resetting an error status [▶ 34].
They also persist after a voltage reset (U_S).
A protective function signals through an error message that it has switched off at least one output voltage.

Warning messages and error messages are signaled in two ways:

- Status LEDs [▶ 27]
- Status bits in the process data

Use the Status bits to narrow down the cause of warnings or errors.

Status bits for group errors

- „Global Error Bit“
  (Input variable "DPO Inputs Device" > "Device Status").
  This Status bit is set with every error message. If it is not set, there is no error message from any protective function.
- „Channel Error“
  (Input variables "DPO Inputs Channel n" > "Status").
  These Status bits are set with every error message that concerns the respective EtherCAT P port.

Global Status bits

Input variable: „DPO Inputs Device“ > „Device Status“:

Status bit	Responsible protective function
Warning Temperature	Overtemperature protection [▶ 37]
Error Temperature	
Warning Us	Undervoltage protection [▶ 37]
Error Us	
Warning Up	
Error Up	
Warning Sum Current	Overcurrent protection for sum currents [▶ 36]
Error Sum Current	

Status bits per EtherCAT P port

Input variable: „DPO Inputs Channel n“ > „Status“
(n = 0 for X52, n = 1 for X53, n = 2 for X54, n = 3 for X55)

Status bit	Responsible protective function
Error Us	Overcurrent protection [▶ 35]
Error Up	
Warning Us	
Warning Up	
Error Sum Current	Overcurrent protection for sum currents [▶ 36]
Warning Sum Current	

5.3 Protective functions

Protective functions protect against overload and malfunctions by switching off output voltages of EtherCAT P ports in case of error.

They signal warnings and errors: Warning and error messages [▶ 33]

Resetting an error state

If a protective function has signaled an error, you must reset the error state so that the switched-off supply voltages can be switched on again.

1. Eliminate the cause of the error.
2. Apply a positive edge to the output variable:
   „DPO Outputs Device“ > „Global Reset“.

Comment: The designation "Reset" refers only to the error state. Parameters and settings remain unchanged.

Further information can be found in the sections "Resetting an error state" in the chapter for the individual protective functions.

5.3.1 Overcurrent protection

Both output voltages (U_S and U_P) on each EtherCAT P port are protected against overcurrent.

The overcurrent protection can be divided into several operating ranges:

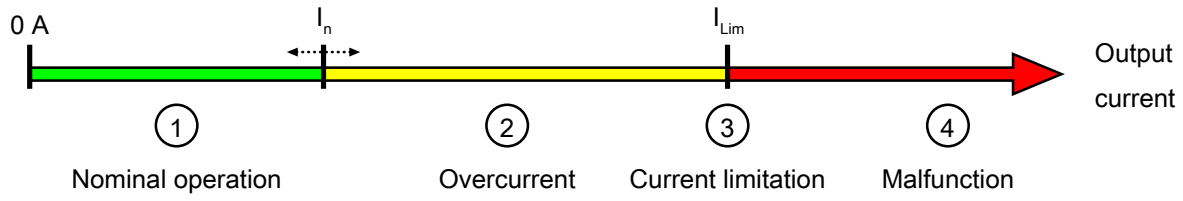


Fig. 15: Overcurrent protection operating ranges

(1) Nominal operation

The overcurrent protection is inactive in nominal operation.

(2) Overcurrent

If the nominal current I_n is exceeded, this is detected as overcurrent. A warning message [▶ 33] is output. If the overcurrent persists, the respective output voltage is switched off in accordance with the tripping characteristic and an error message [▶ 33] is output.

The nominal current and the tripping characteristic can be parameterized individually for each output current:

- Nominal current I_n:
  CoE Index 80x0:12 "Nominal Current Us"
  CoE Index 80x0:13 "Nominal Current Up"
  Value range: see chapter Technical data [▶ 11].
- Tripping characteristic:
  CoE Index 80x0:11 "Characteristic"

The tripping characteristic is comparable with that of fuses. The fuse blows with a delay, depending on the magnitude of the overcurrent:

Current	Very fast acting	Fast acting	Slow acting	Time delay
100 % I_n	1 h	-	-	-
110 % I_n	1 h	4 h	-	-
120 % I_n	7 min	4 h	-	-
150 % I_n	30 s	30 min	1 h	4 h
210 % I_n	500 ms	20 s	20 s	100 s
275 % I_n	500 ms	1 s	20 s	10 s
300 % I_n	20 ms	100 ms	1 s	3 s

(3) Current limitation

The current limitation limits each output current to I_{Lim}. I_{Lim} is higher than the nominal current I_n.

The current limitation switches the supply voltage of the respective output off if it has to limit the current for longer than t_{Lim}. An error message [▶ 33] is output.
I_{Lim} and t_{Lim} cannot be parameterized. See chapter Technical data [▶ 11].

The delay of the switch-off procedure by t_{Lim} allows short-term overcurrents in order among other things to switch capacitive loads.

Current limitation and overcurrent protection are active at the same time. Depending on the parameterization it may be the case that the overcurrent protection switches an output off before t_{Lim} has expired.

(4) Malfunction

In case of a malfunction of overcurrent protection and current limitation, each output voltage is protected by a short-circuit protection. The short-circuit protection is dimensioned such that it only becomes active if the overcurrent protection and current limitation fail.

As a last resort, each output voltage is protected by a fuse. If the fuse has blown the box is defective. The fuse specifications can be found in the chapter Technical data [▶ 11].

Resetting an error state

If an output voltage has been switched off by the overcurrent protection, it can be activated again through one of the following actions:

- a positive edge on the output variables
  "DPO Inputs Channel n" > "Reset Ux" of the respective EtherCAT P port
  (n = 0 for X52, n = 1 for X53, n = 2 for X54, n = 3 for X55)
- a positive edge on the output variables
  „DPO Outputs Device“ > „Global Reset“

The error message is also reset as a result.

5.3.2 Overcurrent protection for sum currents

EP9224-0037 determines two types of sum currents:

- Sum current for each individual EtherCAT P port (calculated)
  $U_S + U_P$
- Sum current for all EtherCAT P ports (measured)
  $\sum (U_S + U_{P)}$

The overcurrent protection for sum currents is deactivated in the factory settings. It can be individually activated and parameterized for each sum current.

Sum current	CoE indices		
	Activation „Enable Sum Current Limitation“	Nominal current „Nominal Sum Current“	Tripping characteristic „Sum Current Characteristic“
X52: $U_S + U_P$	8000:04	8000:14	8000:11
X53: $U_S + U_P$	8010:04	8010:14	8010:11
X54: $U_S + U_P$	8020:04	8020:14	8020:11
X55: $U_S + U_P$	8030:04	8030:14	8030:11
$\sum (U_S + U_P)$ (Sum of all output currents)	F80E:02	F80E:12	F80E:13

5.3.3 Undervoltage protection

The undervoltage protection prevents connected EtherCAT P devices from being operated with a supply voltage that is too low. A malfunction of the EtherCAT P devices due to undervoltage is thus impossible.

The undervoltage protection has two threshold values, see Technical data [▶ 11]:

- U_{warn}: A warning message is output if a supply voltage U_S or U_P falls below the upper threshold value U_{warn}.
- U_{err}: If a supply voltage falls below the lower threshold value U_{err}, all outputs are switched off and an error message is output.

The threshold values of the undervoltage protection cannot be parameterized.

Deactivation for U_p

The undervoltage protection for the peripheral voltage U_P can be deactivated in the CoE index F80E:05 "Disable Up Undervoltage Error". That is useful in applications in which U_P is not needed. In such applications U_P would otherwise only have to be connected so as not to trigger the undervoltage protection.

Resetting an error state

If the output voltages have been switched off by the undervoltage protection, they can be re-activated in two ways:

- a positive edge on the output variables „DPO Inputs Device“ > „Global Reset“.
- A voltage reset (U_S)

Requirement: Both supply voltages are higher at this point in time than the upper threshold value U_{warn}.

5.3.4 Overtemperature protection

The overtemperature protection monitors the internal temperature of EP9224-0037.

It has two threshold values (see Technical data [▶ 11]):

- T_{warn}: If the internal temperature exceeds T_{warn} the box outputs a warning message.
- T_{err}: If the internal temperature exceeds T_{err} the box outputs an error message and switches all output voltages off.

Resetting an error state

1. Allow the box to cool down until the internal temperature has fallen below T_{warn}.
2. Apply a positive edge to the output variable „DPO Outputs Device“ > „Global Reset“.

⇨ The error message is reset.

⇨ All output voltages are switched on again if no other protective function signals an error.

5.4 Diagnostic functions

5.4.1 Peak value detector

The peak value detector detects two types of event:

- Occurrence of an extreme value of a measured variable (output current, supply voltage, temperature).
- Output of a warning message or error message.

The value of the maximum extreme value and the time of occurrence in input variables are available at all times.

The following diagrams illustrate the mode of operation of the peak value detector taking the example of the maximum of a measured variable:

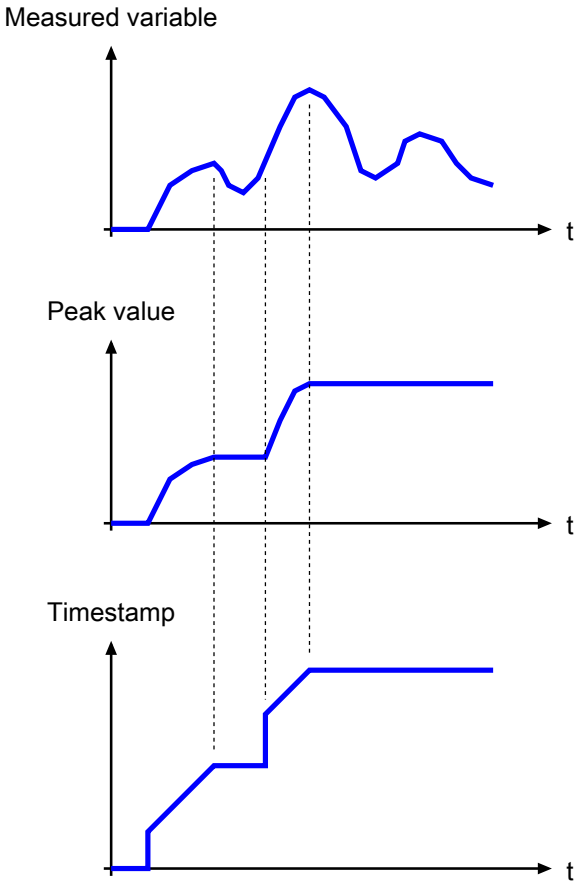


Fig. 16: Peak value detector example: Maximum of a measured variable

Activate peak value detector

You have to activate additional process data objects in the process image in order to be able to use the peak value detector:

Scope	Process data objects for control		Process data objects for evaluation	
	Index (Sync Manager SM2)	Name	Index (Sync Manager SM3)	Name
EtherCAT P port X52	0x1601	DPO Extended Diag Outputs Channel 1	0x1A01	DPO Extended Diag Inputs Channel 1
EtherCAT P port X53	0x1603	DPO Extended Diag Outputs Channel 2	0x1A03	DPO Extended Diag Inputs Channel 2
EtherCAT P port X54	0x1605	DPO Extended Diag Outputs Channel 3	0x1A05	DPO Extended Diag Inputs Channel 3
EtherCAT P port X55	0x1607	DPO Extended Diag Outputs Channel 4	0x1A07	DPO Extended Diag Inputs Channel 4
Global	0x1609	DPO Extended Diag Outputs Device	0x1A09	DPO Extended Diag Inputs Device

Proceed as follows:

1. Double-click on the EP9224-0037 IO module in the IO tree.
2. Click on the **Process Data** tab.
3. Click on the "Outputs" entry in the **Sync Manager** field.
4. Activate the **PDO Assignment (0x1C12)** checkbox next to the desired PDOs.
   ⇨ The corresponding process data object "DPO Extended Diag Outputs […]" appears in the IO tree.
5. Click on the "Inputs" entry in the **Sync Manager** field.
6. Activate the **PDO Assignment (0x1C13)** checkbox next to the desired PDOs.
   ⇨ The corresponding process data object "DPO Extended Diag Inputs […]" appears in the IO tree.

⇨ Result: The process data objects for controlling and evaluating the peak value detector are activated.

Select measured variables/messages

You can select ten measured variables or messages for which events are to be detected.

- Two measured variables or messages per EtherCAT P port.
- Two global measured variables or messages that concern the complete box (temperatures, supply voltages, sum currents).

The following table shows the CoE indices in which the measured variables or messages can be selected:

Scope	Input variables	CoE Index
EtherCAT P port X52	„DPO Extended Diag Inputs Channel 1“ > „Peak Value 1“ > „Timestamp 1“	8000:15
	„DPO Extended Diag Inputs Channel 1“ > „Peak Value 2“ > „Timestamp 2“	8000:16
EtherCAT P port X53	„DPO Extended Diag Inputs Channel 2“ > „Peak Value 1“ > „Timestamp 1“	8010:15
	„DPO Extended Diag Inputs Channel 2“ > „Peak Value 2“ > „Timestamp 2“	8010:16
EtherCAT P port X54	„DPO Extended Diag Inputs Channel 3“ > „Peak Value 1“ > „Timestamp 1“	8020:15
	„DPO Extended Diag Inputs Channel 3“ > „Peak Value 2“ > „Timestamp 2“	8020:16
EtherCAT P port X55	„DPO Extended Diag Inputs Channel 4“ > „Peak Value 1“ > „Timestamp 1“	8030:15
	„DPO Extended Diag Inputs Channel 4“ > „Peak Value 2“ > „Timestamp 2“	8030:16
Global	„DPO Extended Diag Inputs Device“ > „Peak Value 1“ > „Timestamp 1“	F80E:15
	„DPO Extended Diag Inputs Device“ > „Peak Value 2“ > „Timestamp 2“	F80E:16

Reset

Resetting the peak value detector leads to the current measured value and the current timestamp being adopted as the new peak value and new timestamp.

You can reset the peak value detector for each port and for the global peak values individually.

To do this, apply a positive edge to the respective output variable "Reset Extended Diag Data".

Evaluation

The peak values and timestamp can be found in the process data objects "DPO Extended Diag Inputs" as input variables:

- Peak value "Peak Value 1" and the associate timestamp "Timestamp 1"
- Peak value "Peak Value 2" and the associate timestamp "Timestamp 2"

5.4.2 Data logger

The data logger enables the recording of measured values. The recording can be used for the analysis of errors.

Once the recording has been started, it saves all measured values continuously in a ring buffer. The recording stops automatically if a protective function signals an error. With the recorded measured values you can trace the events that led to the error.

Activate control

You have to activate additional process data objects in the process image in order to be able to use the data logger:

- PDO 0x1610 (Sync Manager SM2 "Outputs")
- PDO 0x1A10 (Sync Manager SM3 "Inputs")

Proceed as follows:

✓ Requirement: an EP9224-0037 is appended in the IO tree in TwinCAT.

1. Double-click on the EP9224-0037 IO module in the IO tree.
2. Click on the **Process Data** tab.
3. Click on the "Outputs" entry in the **Sync Manager** field.
4. Activate the **PDO Assignment (0x1C12)** checkbox next to the entry "0x1610".
   ⇨ The process data object "LOG Control" appears in the IO tree.
5. Click on the "Inputs" entry in the **Sync Manager** field.
6. Activate the **PDO Assignment (0x1C13)** checkbox next to the entry „0x1A10".
   ⇨ The process data object "LOG Status" appears in the IO tree.

⇨ Result: The process data objects for controlling the data logger are activated.

Parameterization

The sampling rate for the recording can be selected in the index 8040:11 "Sampling Rate".

Start recording

The output variable "Start Logger" is located in the process data object "LOG Control". The recording is started by a positive edge on this output variable.

If the recording is running, the Status bit
"LOG Status" > "Status" > "Logger Running"
is set.

Stop recording

The recording stops in two cases:

- if a protective function signals an error.
- upon a positive edge on the output variable
  "LOG Control" > "Control" > "Stop Logger".

If the recording has stopped, the input variable
"LOG Status" > "Status" > "Logger Running"
has the value "0".

Evaluate recorded measured values

The recorded measured values are available as a .csv file. The file must be uploaded from the box to the control computer in order to be able to evaluate it.

Proceed as follows to upload the recorded measured values to the control computer:

1. Double-click on the EP9224-0037 IO module in the IO tree.
2. Click on the **Online** tab.
3. Click on the **Upload** button.
   ⇨ A dialog box with the title "Save As" appears.
4. Select a directory and write in the field **File Name:**
   „logdata.csv“
5. Click on the **Save** button.
   ⇨ A dialog box appears with the title "Edit FoE Name".
6. Click **OK**.

⇨ The file with the measured values was uploaded to the control computer.

File format

The file with the measured values begins with a header "**** Logfile from Ethercat Slave ****".

Below that follow

- a file header
- a measured value table

Format of the file header:

Field	Description
Device Name	Name of the module
File Version	Version number (Note: when importing from EXCEL the version, e.g. 1.5, is interpreted/displayed as a date (1st May))
Reason for which the snapshot was taken	Reason for stopping the data logger
Age of snapshot	time elapsed from stopping the data logger until the upload
System timestamp (0 if DC not supported)	current timestamp when uploading

Format of the measured value table:

Type	Description
Time offset additional to snapshot age	The age of the measured values in the row in relation to the stopping of the data logger (0 = stop, > 0 older values) in ms
I(U...)	present current values of the channels Us / Up 1 - 4 in 100 mA
Internal Temperature	internal module temperature in °C
Us / Up	Input voltage Us and Up at the 7/8" input in V
Sum Current Us / Up	Sum current of Us and Up in A
I^2t(U...)	virtual overload, incremented or decremented depending on the nominal current • from 10% warning • at 100% shut-off

5.5 Switch output voltages

For each EtherCAT P port the output voltages U_S and U_P can be switched individually.

Protective functions [▶ 34] can prevent the switching-on of the output voltages.

A switched-on output voltage is signaled in two ways:

- Status LEDs [▶ 27]
- Status bits in the process data:
  „DPO Inputs Channel n“ > „Status“ > „Status Us“
  „DPO Inputs Channel n“ > „Status“ > „Status Up“
  (where: n = 0 for X52, n = 1 for X53, n = 2 for X54, n = 3 for X55)

The output variable "DPO Outputs Device" > "Enable Control Via Fieldbus" defines whether the output voltages are switched manually or automatically.

- „0“: automatic (factory setting)
- „1“: manual

Inadvertent switching of output voltages.

If you change the value of "Enable Control Via Fieldbus", it is possible that the output voltages may be switched on or off.
To prevent that, match the values of the CoE indices (automatic switching) and output variables (manual switching) mentioned below to each other before changing the value of "Enable Control Via Fieldbus".

Automatic switching

You can specify whether the output voltages are automatically switched on after application of the supply voltage U_S.

The following table shows the correlation of the output voltages and the CoE indices that control the automatic switch-on.

EtherCAT P port	Output voltage	CoE Index	Name
X52	U_S	8000:02	„DPO Settings Ch. 1“ > „Default State Us“
	U_P	8000:03	„DPO Settings Ch. 1“ > „Default State Up“
X53	U_S	8010:02	„DPO Settings Ch. 2“ > „Default State Us“
	U_P	8010:03	„DPO Settings Ch. 2“ > „Default State Up“
X54	U_S	8020:02	„DPO Settings Ch. 3“ > „Default State Us“
	U_P	8020:03	„DPO Settings Ch. 3“ > „Default State Up“
X55	U_S	8030:02	„DPO Settings Ch. 4“ > „Default State Us“
	U_P	8030:03	„DPO Settings Ch. 4“ > „Default State Up“

Value range:

- „1“: U_S/U_P is switched on automatically when U_S is applied (factory setting).
- „0“: U_S/U_P remains switched off when U_S is applied.

The output voltages are switched on with a time offset. The time offset prevents the starting currents of the connected EtherCAT P devices adding together.
You can set the time offset in the CoE index F80E:11 "Startup Delay":

- „0“: „Fast“
- „1“: „Moderate“
- „2“: „Slow“

Manual switching

Set "Enable Control Via Fieldbus" to "1" to switch output voltages manually via output variables.

EtherCAT P port	Output voltage	Output variable
X52	U_S	„DPO Outputs Channel 1“ > „Output Us“
	U_P	„DPO Outputs Channel 1“ > „Output Up“
X53	U_S	„DPO Outputs Channel 2“ > „Output Us“
	U_P	„DPO Outputs Channel 2“ > „Output Up“
X54	U_S	„DPO Outputs Channel 3“ > „Output Us“
	U_P	„DPO Outputs Channel 3“ > „Output Up“
X55	U_S	„DPO Outputs Channel 4“ > „Output Us“
	U_P	„DPO Outputs Channel 4“ > „Output Up“

5.6 Object description

5.6.1 EP9224-0037 – Object description

Parameterization

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

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 on the Beckhoff website (http://www.beckhoff.de/german/default.htm?download/elconfg.htm) and installing it according to the installation instructions.

The CoE overview contains objects for different intended applications:

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

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

5.6.1.1 Objects for parameterization

5.6.1.1.1 Index 1011 Restore default parameters

Index	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})

5.6.1.1.2 Index 8000 DPO Settings Ch.1

Parameters for the EtherCAT P port X52.

Index	Name	Meaning	Data type	Flags	Default
8000:0	DPO Settings Ch.1		UINT8	RO	0x16 (22_{dec})
8000:02	Default State Us	The output adopts this value if F707:01 is not set	boolean	RW	1
8000:03	Default State Up	The output adopts this value if F707:01 is not set	boolean	RW	1
8000:04	Enable Sum Current Limitation	Activates the overcurrent protection for the sum current Us+Up on this output.	boolean	RW	0
8000:11	Characteristic	Specifies the characteristic with which the current monitoring reacts: 0_{dec}: very fast acting 1_{dec}: fast acting 2_{dec}: slow acting 3_{dec}: time delay	UINT16	RW	0x0001 (1_{dec})
8000:12	Nominal Current Us	Nominal maximum current at the output (value range 1000 ... 3000_{dec})	UINT16	RW	0x0FA0 (3000_{dec})
8000:13	Nominal Current Up	Nominal maximum current at the output (value range 1000 ... 3000_{dec})	UINT16	RW	0x0FA0 (3000_{dec})
8000:14	Nominal Sum Current	Nominal maximum sum current (Us+Up) at the output.	UINT16	RW	0x1770 (6000_{dec})
8000:15	Timestamp 1 Trigger	Defines which events are detected by the peak value detector at this port.	UINT16	RW	0x0000 (0_{dec})
8000:16	Timestamp 2 Trigger	Defines which events are detected by the peak value detector at this port.	UINT16	RW	0x0000 (0_{dec})

5.6.1.1.3 Index 8010 DPO Settings Ch.2

Parameters for the EtherCAT P port X53.

Index	Name	Meaning	Data type	Flags	Default
8010:0	DPO Settings Ch.2		UINT8	RO	0x16 (22_{dec})
8010:02	Default State Us	The output adopts this value if F707:01 is not set	boolean	RW	1
8010:03	Default State Up	The output adopts this value if F707:01 is not set	boolean	RW	1
8010:04	Enable Sum Current Limitation	Activates the overcurrent protection for the sum current Us+Up on this output.	boolean	RW	0
8010:11	Characteristic	Specifies the characteristic with which the current monitoring reacts: 0_{dec}: very fast acting 1_{dec}: fast acting 2_{dec}: slow acting 3_{dec}: time delay	UINT16	RW	0x0001 (1_{dec})
8010:12	Nominal Current Us	Nominal maximum current at the output (value range 1000 ... 3000_{dec})	UINT16	RW	0x0FA0 (3000_{dec})
8010:13	Nominal Current Up	Nominal maximum current at the output (value range 1000 ... 3000_{dec})	UINT16	RW	0x0FA0 (3000_{dec})
8010:14	Nominal Sum Current	Nominal maximum sum current (Us+Up) at the output.	UINT16	RW	0x1770 (6000_{dec})
8010:15	Timestamp 1 Trigger	Defines which events are detected by the peak value detector at this port.	UINT16	RW	0x0000 (0_{dec})
8010:16	Timestamp 2 Trigger	Defines which events are detected by the peak value detector at this port.	UINT16	RW	0x0000 (0_{dec})

5.6.1.1.4 Index 8020 DPO Settings Ch.3

Parameters for the EtherCAT P port X54.

Index	Name	Meaning	Data type	Flags	Default
8020:0	DPO Settings Ch.3		UINT8	RO	0x16 (22_{dec})
8020:02	Default State Us	The output adopts this value if F707:01 is not set	boolean	RW	1
8020:03	Default State Up	The output adopts this value if F707:01 is not set	boolean	RW	1
8020:04	Enable Sum Current Limitation	Activates the overcurrent protection for the sum current Us+Up on this output.	boolean	RW	0
8020:11	Characteristic	Specifies the characteristic with which the current monitoring reacts: 0_{dec}: very fast acting 1_{dec}: fast acting 2_{dec}: slow acting 3_{dec}: time delay	UINT16	RW	0x0001 (1_{dec})
8020:12	Nominal Current Us	Nominal maximum current at the output (value range 1000 ... 3000_{dec})	UINT16	RW	0x0FA0 (3000_{dec})
8020:13	Nominal Current Up	Nominal maximum current at the output (value range 1000 ... 3000_{dec})	UINT16	RW	0x0FA0 (3000_{dec})
8020:14	Nominal Sum Current	Nominal maximum sum current (Us+Up) at the output.	UINT16	RW	0x1770 (6000_{dec})
8020:15	Timestamp 1 Trigger	Defines which events are detected by the peak value detector at this port.	UINT16	RW	0x0000 (0_{dec})
8020:16	Timestamp 2 Trigger	Defines which events are detected by the peak value detector at this port.	UINT16	RW	0x0000 (0_{dec})

5.6.1.1.5 Index 8030 DPO Settings Ch.4

Parameters for the EtherCAT P port X55.

Index	Name	Meaning	Data type	Flags	Default
8030:0	DPO Settings Ch.4		UINT8	RO	0x16 (22_{dec})
8030:02	Default State Us	The output adopts this value if F707:01 is not set	boolean	RW	1
8030:03	Default State Up	The output adopts this value if F707:01 is not set	boolean	RW	1
8030:04	Enable Sum Current Limitation	Activates the overcurrent protection for the sum current Us+Up on this output.	boolean	RW	0
8030:11	Characteristic	Specifies the characteristic with which the current monitoring reacts: 0_{dec}: very fast acting 1_{dec}: fast acting 2_{dec}: slow acting 3_{dec}: time delay	UINT16	RW	0x0001 (1_{dec})
8030:12	Nominal Current Us	Nominal maximum current at the output (value range 1000 ... 3000_{dec})	UINT16	RW	0x0FA0 (3000_{dec})
8030:13	Nominal Current Up	Nominal maximum current at the output (value range 1000 ... 3000_{dec})	UINT16	RW	0x0FA0 (3000_{dec})
8030:14	Nominal Sum Current	Nominal maximum sum current (Us+Up) at the output.	UINT16	RW	0x1770 (6000_{dec})
8030:15	Timestamp 1 Trigger	Defines which events are detected by the peak value detector at this port.	UINT16	RW	0x0000 (0_{dec})
8030:16	Timestamp 2 Trigger	Defines which events are detected by the peak value detector at this port.	UINT16	RW	0x0000 (0_{dec})

5.6.1.1.6 Index F707 DPO Outputs Device

Index	Name	Meaning	Data type	Flags	Default
F707:0	DPO Outputs Device		UINT8	RO	0x11 (17_{dec})
F707:01	Enable Control Via Fieldbus	0_{bin}: All outputs are set according to their default values (80X0:02, 80X0:03) 1_{bin}: All outputs are set according to their PDOs (70X0:01, 70X0:02)	boolean	RO	0x00 (0_{dec})
F707:04	Global Reset	All error bits are reset	boolean	RO	0x00 (0_{dec})

5.6.1.1.7 Index F80E DPO Settings Device

Index	Name	Meaning	Data type	Flags	Default
F80E:0	DPO Settings Device		UINT8	RW	0x16 (22_{dec})
F80E:02	Enable Sum Current Limitation	Activates the overcurrent protection for the sum current ∑ Us + ∑ Up.	boolean	RW	0
F80E:05	Disable Up Undervoltage Error	Deactivates the undervoltage protection for the peripheral voltage Up.	boolean	RW	0
F80E:11	Startup Delay	Sets the time that is kept between two switch-on procedures: 1_{dec}: fast (10 ms) 2_{dec}: moderate (100 ms) 3_{dec}: slow (200 ms)	UINT16	RW	0x0001 (1_{dec})
F80E:12	Nominal Sum Current	Nominal maximum current for the sum current.	UINT16	RW	0x5DC0 (24000_{dec})
F80E:13	Sum Current Characteristic	Specifies the characteristic with which the current monitoring reacts: 0_{dec}: very fast acting 1_{dec}: fast acting 2_{dec}: slow acting 3_{dec}: time delay	UINT16	RW	0x0001 (1_{dec})
F80E:15	Timestamp 1 Trigger	Defines which events are detected by the peak value detector.	UINT16	RW	0
F80E:16	Timestamp 2 Trigger	Defines which events are detected by the peak value detector.	UINT16	RW	0

5.6.1.2 Standard objects

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

5.6.1.2.1 Index 1000 Device type

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

5.6.1.2.2 Index 1008 Device name

Index	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EP9224-0037

5.6.1.2.3 Index 1009 Hardware version

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

5.6.1.2.4 Index 100A Software Version

Index	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	06

5.6.1.2.5 Index 1018 Identity

Index	Name	Meaning	Data type	Flags	Default
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4_{dec})
1018:01	Vendor ID	Vendor ID of the EtherCAT slave	UINT32	RO	0x00000002 (2_{dec})
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	0x24084052 (6045205300_{dec})
1018:03	Revision	Revision number of the EtherCAT slave; the low word (bit 0-15) indicates the special terminal number, the high word (bit 16-31) refers to the device description	UINT32	RO	0x00000000 (0_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave; the Low Byte (bit 0-7) of the Low Word contains the year of production, the High Byte (bit 8-15) of the Low Word contains the week of production, the High Word (bit 16-31) is 0	UINT32	RO	0x00000000 (0_{dec})

5.6.1.2.6 Index 10F0 Backup parameter handling

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

5.6.1.2.7 Index 1600 DPO RxPDO-Map Outputs Ch.1

Index	Name	Meaning	Data type	Flags	Default
1600:0	DPO RxPDO-Map Outputs Ch.1	PDO Mapping RxPDO 1	UINT8	RO	0x06 (6_{dec})
1600:01	SubIndex 001	1. PDO Mapping entry (object 0x7000 (DPO Outputs Ch.1), entry 0x01 (Output Us))	UINT32	RO	0x7000:01, 1
1600:02	SubIndex 002	2. PDO Mapping entry (object 0x7000 (DPO Outputs Ch.1), entry 0x02 (Output Up))	UINT32	RO	0x7000:02, 1
1600:03	SubIndex 003	3. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1600:04	SubIndex 004	4. PDO Mapping entry (object 0x7000 (DPO Outputs Ch.1), entry 0x05 (Reset Us))	UINT32	RO	0x7000:05, 1
1600:05	SubIndex 005	5. PDO Mapping entry (object 0x7000 (DPO Outputs Ch.1), entry 0x06 (Reset Up))	UINT32	RO	0x7000:06, 1
1600:06	SubIndex 006	6. PDO Mapping entry (10 bits align)	UINT32	RO	0x0000:00, 10

5.6.1.2.8 Index 1601 DPO RxPDO-Map Outputs Ch.2

Index	Name	Meaning	Data type	Flags	Default
1601:0	DPO RxPDO-Map Outputs Ch.2	PDO Mapping RxPDO 2	UINT8	RO	0x06 (6_{dec})
1601:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (DPO Outputs Ch.2), entry 0x01 (Output Us))	UINT32	RO	0x7010:01, 1
1601:02	SubIndex 002	2. PDO Mapping entry (object 0x7010 (DPO Outputs Ch.2), entry 0x02 (Output Up))	UINT32	RO	0x7010:02, 1
1601:03	SubIndex 003	3. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1601:04	SubIndex 004	4. PDO Mapping entry (object 0x7010 (DPO Outputs Ch.2), entry 0x05 (Reset Us))	UINT32	RO	0x7010:05, 1
1601:05	SubIndex 005	5. PDO Mapping entry (object 0x7010 (DPO Outputs Ch.2), entry 0x06 (Reset Up))	UINT32	RO	0x7010:06, 1
1601:06	SubIndex 006	6. PDO Mapping entry (10 bits align)	UINT32	RO	0x0000:00, 10

5.6.1.2.9 Index 1602 DPO RxPDO-Map Outputs Ch.3

Index	Name	Meaning	Data type	Flags	Default
1602:0	DPO RxPDO-Map Outputs Ch.3	PDO Mapping RxPDO 3	UINT8	RO	0x06 (6_{dec})
1602:01	SubIndex 001	1. PDO Mapping entry (object 0x7020 (DPO Outputs Ch.3), entry 0x01 (Output Us))	UINT32	RO	0x7020:01, 1
1602:02	SubIndex 002	2. PDO Mapping entry (object 0x7020 (DPO Outputs Ch.3), entry 0x02 (Output Up))	UINT32	RO	0x7020:02, 1
1602:03	SubIndex 003	3. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1602:04	SubIndex 004	4. PDO Mapping entry (object 0x7020 (DPO Outputs Ch.3), entry 0x05 (Reset Us))	UINT32	RO	0x7020:05, 1
1602:05	SubIndex 005	5. PDO Mapping entry (object 0x7020 (DPO Outputs Ch.3), entry 0x06 (Reset Up))	UINT32	RO	0x7020:06, 1
1602:06	SubIndex 006	6. PDO Mapping entry (10 bits align)	UINT32	RO	0x0000:00, 10

5.6.1.2.10 Index 1603 DPO RxPDO-Map Outputs Ch.4

Index	Name	Meaning	Data type	Flags	Default
1603:0	DPO RxPDO-Map Outputs Ch.4	PDO Mapping RxPDO 4	UINT8	RO	0x06 (6_{dec})
1603:01	SubIndex 001	1. PDO Mapping entry (object 0x7030 (DPO Outputs Ch.4), entry 0x01 (Output Us))	UINT32	RO	0x7030:01, 1
1603:02	SubIndex 002	2. PDO Mapping entry (object 0x7030 (DPO Outputs Ch.4), entry 0x02 (Output Up))	UINT32	RO	0x7030:02, 1
1603:03	SubIndex 003	3. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1603:04	SubIndex 004	4. PDO Mapping entry (object 0x7030 (DPO Outputs Ch.4), entry 0x05 (Reset Us))	UINT32	RO	0x7030:05, 1
1603:05	SubIndex 005	5. PDO Mapping entry (object 0x7030 (DPO Outputs Ch.4), entry 0x06 (Reset Up))	UINT32	RO	0x7030:06, 1
1603:06	SubIndex 006	6. PDO Mapping entry (10 bits align)	UINT32	RO	0x0000:00, 10

5.6.1.2.11 Index 1604 DPO RxPDO-Map Outputs Device

Index	Name	Meaning	Data type	Flags	Default
1604:0	DPO RxPDO-Map Outputs Device	PDO Mapping RxPDO 5	UINT8	RO	0x04 (4_{dec})
1604:01	SubIndex 001	1. PDO Mapping entry (object 0xF707 (DPO Outputs Device), entry 0x01 (Enable Control Via Fieldbus))	UINT32	RO	0xF707:01, 1
1604:02	SubIndex 002	2. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1604:03	SubIndex 003	3. PDO Mapping entry (object 0xF707 (DPO Outputs Device), entry 0x04 (Global Reset))	UINT32	RO	0xF707:04, 1
1604:04	SubIndex 004	4. PDO Mapping entry (12 bits align)	UINT32	RO	0x0000:00, 12

5.6.1.2.12 Index 1A00 DPO TxPDO-Map Inputs Ch.1

Index	Name	Meaning	Data type	Flags	Default
1A00:0	DPO TxPDO-Map Inputs Ch.1	PDO Mapping TxPDO 1	UINT8	RO	0x0B (11_{dec})
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x01 (Error Us))	UINT32	RO	0x6000:01, 1
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x02 (Error Up))	UINT32	RO	0x6000:02, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x03 (Warning Us))	UINT32	RO	0x6000:03, 1
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x04 (Warning Up))	UINT32	RO	0x6000:04, 1
1A00:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x05 (Status Us))	UINT32	RO	0x6000:05, 1
1A00:06	SubIndex 006	6. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x06 (Status Up))	UINT32	RO	0x6000:06, 1
1A00:07	SubIndex 007	7. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x07 (Channel Error))	UINT32	RO	0x6000:07, 1
1A00:08	SubIndex 008	8. PDO Mapping entry (6 bits align)	UINT32	RO	0x0000:00, 6
1A00:09	SubIndex 009	9. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x0E (Sync error))	UINT32	RO	0x6000:0E, 1
1A00:0A	SubIndex 010	10. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x0F (TxPDO State))	UINT32	RO	0x6000:0F, 1
1A00:0B	SubIndex 011	11. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6000:10, 1

5.6.1.2.13 Index 1A01 DPO TxPDO-Map Inputs Ch.2

Index	Name	Meaning	Data type	Flags	Default
1A01:0	DPO TxPDO-Map Inputs Ch.2	PDO Mapping TxPDO 2	UINT8	RO	0x0B (11_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x01 (Error Us))	UINT32	RO	0x6010:01, 1
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x02 (Error Up))	UINT32	RO	0x6010:02, 1
1A01:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x03 (Warning Us))	UINT32	RO	0x6010:03, 1
1A01:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x04 (Warning Up))	UINT32	RO	0x6010:04, 1
1A01:05	SubIndex 005	5. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x05 (Status Us))	UINT32	RO	0x6010:05, 1
1A01:06	SubIndex 006	6. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x06 (Status Up))	UINT32	RO	0x6010:06, 1
1A01:07	SubIndex 007	7. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x07 (Channel Error))	UINT32	RO	0x6010:07, 1
1A01:08	SubIndex 008	8. PDO Mapping entry (6 bits align)	UINT32	RO	0x0000:00, 6
1A01:09	SubIndex 009	9. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x0E (Sync error))	UINT32	RO	0x6010:0E, 1
1A01:0A	SubIndex 010	10. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x0F (TxPDO State))	UINT32	RO	0x6010:0F, 1
1A01:0B	SubIndex 011	11. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6010:10, 1

5.6.1.2.14 Index 1A02 DPO TxPDO-Map Inputs Ch.3

Index	Name	Meaning	Data type	Flags	Default
1A02:0	DPO TxPDO-Map Inputs Ch.3	PDO Mapping TxPDO 3	UINT8	RO	0x0B (11_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x01 (Error Us))	UINT32	RO	0x6020:01, 1
1A02:02	SubIndex 002	2. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x02 (Error Up))	UINT32	RO	0x6020:02, 1
1A02:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x03 (Warning Us))	UINT32	RO	0x6020:03, 1
1A02:04	SubIndex 004	4. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x04 (Warning Up))	UINT32	RO	0x6020:04, 1
1A02:05	SubIndex 005	5. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x05 (Status Us))	UINT32	RO	0x6020:05, 1
1A02:06	SubIndex 006	6. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x06 (Status Up))	UINT32	RO	0x6020:06, 1
1A02:07	SubIndex 007	7. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x07 (Channel Error))	UINT32	RO	0x6020:07, 1
1A02:08	SubIndex 008	8. PDO Mapping entry (6 bits align)	UINT32	RO	0x0000:00, 6
1A02:09	SubIndex 009	9. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x0E (Sync error))	UINT32	RO	0x6020:0E, 1
1A02:0A	SubIndex 010	10. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x0F (TxPDO State))	UINT32	RO	0x6020:0F, 1
1A02:0B	SubIndex 011	11. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6020:10, 1

5.6.1.2.15 Index 1A03 DPO TxPDO-Map Inputs Ch.4

Index	Name	Meaning	Data type	Flags	Default
1A03:0	DPO TxPDO-Map Inputs Ch.4	PDO Mapping TxPDO 4	UINT8	RO	0x0B (11_{dec})
1A03:01	SubIndex 001	1. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x01 (Error Us))	UINT32	RO	0x6030:01, 1
1A03:02	SubIndex 002	2. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x02 (Error Up))	UINT32	RO	0x6030:02, 1
1A03:03	SubIndex 003	3. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x03 (Warning Us))	UINT32	RO	0x6030:03, 1
1A03:04	SubIndex 004	4. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x04 (Warning Up))	UINT32	RO	0x6030:04, 1
1A03:05	SubIndex 005	5. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x05 (Status Us))	UINT32	RO	0x6030:05, 1
1A03:06	SubIndex 006	6. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x06 (Status Up))	UINT32	RO	0x6030:06, 1
1A03:07	SubIndex 007	7. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x07 (Channel Error))	UINT32	RO	0x6030:07, 1
1A03:08	SubIndex 008	8. PDO Mapping entry (6 bits align)	UINT32	RO	0x0000:00, 6
1A03:09	SubIndex 009	9. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x0E (Sync error))	UINT32	RO	0x6030:0E, 1
1A03:0A	SubIndex 010	10. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x0F (TxPDO State))	UINT32	RO	0x6030:0F, 1
1A03:0B	SubIndex 011	11. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6030:10, 1

5.6.1.2.16 Index 1A04 DPO TxPDO-Map Inputs Device

Index	Name	Meaning	Data type	Flags	Default
1A04:0	DPO TxPDO-Map Inputs Device	PDO Mapping TxPDO 5	UINT8	RW	0x0C (12_{dec})
1A04:01	SubIndex 001	1. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x01 (Temperature Warning))	UINT32	RW	0xF607:01, 1
1A04:02	SubIndex 002	2. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x02 (Temperature Error))	UINT32	RW	0xF607:02, 1
1A04:03	SubIndex 003	3. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x03 (Us Warning))	UINT32	RW	0xF607:03, 1
1A04:04	SubIndex 004	4. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x04 (Us Error))	UINT32	RW	0xF607:04, 1
1A04:05	SubIndex 005	5. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x05 (Up Warning))	UINT32	RW	0xF607:05, 1
1A04:06	SubIndex 006	6. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x06 (Up Error))	UINT32	RW	0xF607:06, 1
1A04:07	SubIndex 007	7. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x07 (Global Error Bit))	UINT32	RW	0xF607:07, 1
1A04:08	SubIndex 008	8. PDO Mapping entry (4 bits align)	UINT32	RW	0x0000:00, 4
1A04:09	SubIndex 009	9. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x0C (Reset Input))	UINT32	RW	0xF607:0C, 1
1A04:0A	SubIndex 010	10. PDO Mapping entry (2 bits align)	UINT32	RW	0x0000:00, 2
1A04:0B	SubIndex 011	11. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x0F (TxPDO State))	UINT32	RW	0xF607:0F, 1
1A04:0C	SubIndex 012	12. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x10 (TxPDO Toggle))	UINT32	RW	0xF607:10, 1

5.6.1.2.17 Index 1C00 Sync manager type

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

5.6.1.2.18 Index 1C12 RxPDO assign

Index	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	0x05 (5_{dec})
1C12:01	Subindex 001	1. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1600 (5632_{dec})
1C12:02	Subindex 002	2. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1601 (5633_{dec})
1C12:03	Subindex 003	3. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1602 (5634_{dec})
1C12:04	Subindex 004	4. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1603 (5635_{dec})
1C12:05	Subindex 005	5. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1604 (5636_{dec})

5.6.1.2.19 Index 1C13 TxPDO assign

Index	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x05 (5_{dec})
1C13:01	Subindex 001	1. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656_{dec})
1C13:02	Subindex 002	2. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A01 (6657_{dec})
1C13:03	Subindex 003	3. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A02 (6658_{dec})
1C13:04	Subindex 004	4. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A03 (6659_{dec})
1C13:05	Subindex 005	5. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A04 (6660_{dec})

5.6.1.2.20 Index 1C32 SM output parameter

Index	Name	Meaning	Data type	Flags	Default
1C32:0	SM output parameter	Synchronization parameters for the outputs	UINT8	RO	0x20 (32_{dec})
1C32:01	Sync mode	Current synchronization mode: • 0: Free Run • 1: Synchron with SM 2 Event • 2: DC-Mode - Synchron with SYNC0 Event • 3: DC-Mode - Synchron with SYNC1 Event	UINT16	RW	0x0000 (0_{dec})
1C32:02	Cycle time	Cycle time (in ns): • Free Run: Cycle time of the local timer • Synchron with SM 2 Event: Master cycle time • DC mode: SYNC0/SYNC1 Cycle Time	UINT32	RW	0x000F4240 (1000000_{dec})
1C32:03	Shift time	Time between SYNC0 event and output of the outputs (in ns, DC mode only)	UINT32	RO	0x00000384 (900_{dec})
1C32:04	Sync modes supported	Supported synchronization modes: • Bit 0 = 1: free run is supported • Bit 1 = 1: Synchron 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 (measurement through writing of 1C32:08)	UINT16	RO	0xC007 (49159_{dec})
1C32:05	Minimum cycle time	Minimum cycle time (in ns)	UINT32	RO	0x000F4240 (1000000_{dec})
1C32:06	Calc and copy time	Minimum time between SYNC0 and SYNC1 event (in ns, DC mode only)	UINT32	RO	0x00000000 (0_{dec})
1C32:07	Minimum delay time		UINT32	RO	0x00000384 (900_{dec})
1C32:08	Command	• 0: Measurement of the local cycle time is stopped • 1: Measurement of the local cycle time is started The entries 1C32:03, 1C32:05, 1C32:06, 1C32:09, 1C33:03, 1C33:06, 1C33:09 are updated with the maximum measured values. For a subsequent measurement the measured values are reset	UINT16	RW	0x0000 (0_{dec})
1C32:09	Maximum delay time	Time between SYNC1 event and output of the outputs (in ns, DC mode only)	UINT32	RO	0x00000384 (900_{dec})
1C32:0B	SM event missed counter	Number of missed SM events in OPERATIONAL (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C32:0C	Cycle exceeded counter	Number of occasions the cycle time was exceeded in OPERATIONAL (cycle was not completed in time or the next cycle began too early)	UINT16	RO	0x0000 (0_{dec})
1C32:0D	Shift too short counter	Number of occasions that the interval between SYNC0 and SYNC1 event was too short (DC mode only)	UINT16	RO	0x0000 (0_{dec})
1C32:20	Sync error	The synchronization was not correct in the last cycle (outputs were output too late; DC mode only)	boolean	RO	0x00 (0_{dec})

5.6.1.2.21 Index 1C33 SM input parameter

Index	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32_{dec})
1C33:01	Sync mode	Current synchronization mode: • 0: Free Run • 1: Synchron with SM 3 Event (no outputs available) • 2: DC - Synchron with SYNC0 Event • 3: DC - Synchron with SYNC1 Event • 34: Synchron with SM 2 Event (outputs available)	UINT16	RW	0x0000 (0_{dec})
1C33:02	Cycle time	as 1C32:02	UINT32	RW	0x000F4240 (1000000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000384 (900_{dec})
1C33:04	Sync modes supported	Supported synchronization modes: • Bit 0: free run is supported • Bit 1: Synchron with SM 2 Event is supported (outputs available) • Bit 1: Synchron with SM 3 Event is supported (no outputs available) • Bit 2-3 = 01: DC mode is supported • Bit 4-5 = 01: Input Shift through local event (outputs available) • Bit 4-5 = 10: Input Shift with SYNC1 event (no outputs available) • Bit 14 = 1: dynamic times (measurement through writing of 1C32:08 or 1C33:08)	UINT16	RO	0xC007 (49159_{dec})
1C33:05	Minimum cycle time	as 1C32:05	UINT32	RO	0x000F4240 (1000000_{dec})
1C33:06	Calc and copy time	Time between reading of the inputs and availability of the inputs for the master (in ns, only DC mode)	UINT32	RO	0x00000000 (0_{dec})
1C33:07	Minimum delay time		UINT32	RO	0x00000384 (900_{dec})
1C33:08	Command	as 1C32:08	UINT16	RW	0x0000 (0_{dec})
1C33:09	Maximum delay time	Time between SYNC1 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0x00000384 (900_{dec})
1C33:0B	SM event missed counter	as 1C32:11	UINT16	RO	0x0000 (0_{dec})
1C33:0C	Cycle exceeded counter	as 1C32:12	UINT16	RO	0x0000 (0_{dec})
1C33:0D	Shift too short counter	as 1C32:13	UINT16	RO	0x0000 (0_{dec})
1C33:20	Sync error	as 1C32:32	boolean	RO	0x00 (0_{dec})

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

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

5.6.1.3.1 Index 6000 DPO Inputs Ch.1

Index	Name	Meaning	Data type	Flags	Default
6000:0	DPO Inputs Ch.1	Input of the first channel	UINT8	RO	0x10 (16_{dec})
6000:01	Error Us	The current monitoring of Us has tripped. The bit must be reset by a 'Global Reset' (F707:04) or by the corresponding Reset Us (7000:05). The output cannot be activated as long as the warning bit is 1.	boolean	RO	0x00 (0_{dec})
6000:02	Error Up	The current monitoring of Up has tripped.	boolean	RO	0x00 (0_{dec})
6000:03	Warning Us	The monitoring has detected overcurrent; the switching off of output Us on this channel is imminent if the current consumption of the branch does not decrease.	boolean	RO	0x00 (0_{dec})
6000:04	Warning Up	The monitoring has detected overcurrent; the switching off of output Us on this channel is imminent if the current consumption of the branch does not decrease.	boolean	RO	0x00 (0_{dec})
6000:05	Status Us	0: The output is switched off 1: The output supplies 24 V	boolean	RO	0x00 (0_{dec})
6000:06	Status Up	0: The output is switched off 1: The output supplies 24 V	boolean	RO	0x00 (0_{dec})
6000:07	Channel Error	6000:01 or 6000:02 are set	boolean	RO	0x00 (0_{dec})
6000:0E	Sync error		boolean	RO	0x00 (0_{dec})
6000:0F	TxPDO State		boolean	RO	0x00 (0_{dec})
6000:10	TxPDO Toggle		boolean	RO	0x00 (0_{dec})

5.6.1.3.2 Index 6010 DPO Inputs Ch.2

Index	Name	Meaning	Data type	Flags	Default
6010:0	DPO Inputs Ch.2	Inputs of the second channel	UINT8	RO	0x10 (16_{dec})
6010:01	Error Us	The current monitoring of Us has tripped. The bit must be reset by a 'Global Reset' (F707:04) or by the corresponding Reset Us (7000:05). The output cannot be activated as long as the warning bit is 1.	boolean	RO	0x00 (0_{dec})
6010:02	Error Up	The current monitoring of Up has tripped.	boolean	RO	0x00 (0_{dec})
6010:03	Warning Us	The monitoring has detected overcurrent; the switching off of output Us on this channel is imminent if the current consumption of the branch does not decrease.	boolean	RO	0x00 (0_{dec})
6010:04	Warning Up	The monitoring has detected overcurrent; the switching off of output Us on this channel is imminent if the current consumption of the branch does not decrease.	boolean	RO	0x00 (0_{dec})
6010:05	Status Us	0: The output is switched off 1: The output supplies 24 V	boolean	RO	0x00 (0_{dec})
6010:06	Status Up	0: The output is switched off 1: The output supplies 24 V	boolean	RO	0x00 (0_{dec})
6010:07	Channel Error	6010:01 or 6010:02 are set	boolean	RO	0x00 (0_{dec})
6010:0E	Sync error		boolean	RO	0x00 (0_{dec})
6010:0F	TxPDO State		boolean	RO	0x00 (0_{dec})
6010:10	TxPDO Toggle		boolean	RO	0x00 (0_{dec})

5.6.1.3.3 Index 6020 DPO Inputs Ch.3

Index	Name	Meaning	Data type	Flags	Default
6020:0	DPO Inputs Ch.3	Inputs of the third channel	UINT8	RO	0x10 (16_{dec})
6020:01	Error Us	The current monitoring of Us has tripped. The bit must be reset by a 'Global Reset' (F707:04) or by the corresponding Reset Us (7000:05). The output cannot be activated as long as the warning bit is 1.	boolean	RO	0x00 (0_{dec})
6020:02	Error Up	The current monitoring of Up has tripped.	boolean	RO	0x00 (0_{dec})
6020:03	Warning Us	The monitoring has detected overcurrent; the switching off of output Us on this channel is imminent if the current consumption of the branch does not decrease.	boolean	RO	0x00 (0_{dec})
6020:04	Warning Up	The monitoring has detected overcurrent; the switching off of output Us on this channel is imminent if the current consumption of the branch does not decrease.	boolean	RO	0x00 (0_{dec})
6020:05	Status Us	0: The output is switched off 1: The output supplies 24 V	boolean	RO	0x00 (0_{dec})
6020:06	Status Up	0: The output is switched off 1: The output supplies 24 V	boolean	RO	0x00 (0_{dec})
6020:07	Channel Error	6020:01 or 6020:02 are set	boolean	RO	0x00 (0_{dec})
6020:0E	Sync error		boolean	RO	0x00 (0_{dec})
6020:0F	TxPDO State		boolean	RO	0x00 (0_{dec})
6020:10	TxPDO Toggle		boolean	RO	0x00 (0_{dec})

5.6.1.3.4 Index 6030 DPO Inputs Ch.4

Index	Name	Meaning	Data type	Flags	Default
6030:0	DPO Inputs Ch.4	Inputs of the fourth channel	UINT8	RO	0x10 (16_{dec})
6030:01	Error Us	The current monitoring of Us has tripped. The bit must be reset by a 'Global Reset' (F707:04) or by the corresponding Reset Us (7000:05). The output cannot be activated as long as the warning bit is 1.	boolean	RO	0x00 (0_{dec})
6030:02	Error Up	The current monitoring of Up has tripped.	boolean	RO	0x00 (0_{dec})
6030:03	Warning Us	The monitoring has detected overcurrent; the switching off of output Us on this channel is imminent if the current consumption of the branch does not decrease.	boolean	RO	0x00 (0_{dec})
6030:04	Warning Up	The monitoring has detected overcurrent; the switching off of output Us on this channel is imminent if the current consumption of the branch does not decrease.	boolean	RO	0x00 (0_{dec})
6030:05	Status Us	0: The output is switched off 1: The output supplies 24 V	boolean	RO	0x00 (0_{dec})
6030:06	Status Up	0: The output is switched off 1: The output supplies 24 V	boolean	RO	0x00 (0_{dec})
6030:07	Channel Error	6020:01 or 6020:02 are set	boolean	RO	0x00 (0_{dec})
6030:0E	Sync error		boolean	RO	0x00 (0_{dec})
6030:0F	TxPDO State		boolean	RO	0x00 (0_{dec})
6030:10	TxPDO Toggle		boolean	RO	0x00 (0_{dec})

5.6.1.3.5 Index 7000 DPO Outputs Ch.1

Index	Name	Meaning	Data type	Flags	Default
7000:0	DPO Outputs Ch.1		UINT8	RO	0x06 (6_{dec})
7000:01	Output Us	0: Us will be switched off 1: Us will be switched on	boolean	RO	0x00 (0_{dec})
7000:02	Output Up	0: Us will be switched off 1: Us will be switched on	boolean	RO	0x00 (0_{dec})
7000:05	Reset Us	An error on Us will be reset	boolean	RO	0x00 (0_{dec})
7000:06	Reset Up	An error on Up will be reset	boolean	RO	0x00 (0_{dec})

5.6.1.3.6 Index 7010 DPO Outputs Ch.2

Index	Name	Meaning	Data type	Flags	Default
7010:0	DPO Outputs Ch.2		UINT8	RO	0x06 (6_{dec})
7010:01	Output Us	0: Us will be switched off 1: Us will be switched on	boolean	RO	0x00 (0_{dec})
7010:02	Output Up	0: Us will be switched off 1: Us will be switched on	boolean	RO	0x00 (0_{dec})
7010:05	Reset Us	An error on Us will be reset	boolean	RO	0x00 (0_{dec})
7010:06	Reset Up	An error on Up will be reset	boolean	RO	0x00 (0_{dec})

5.6.1.3.7 Index 7020 DPO Outputs Ch.3

Index	Name	Meaning	Data type	Flags	Default
7020:0	DPO Outputs Ch.3		UINT8	RO	0x06 (6_{dec})
7020:01	Output Us	0: Us will be switched off 1: Us will be switched on	boolean	RO	0x00 (0_{dec})
7020:02	Output Up	0: Us will be switched off 1: Us will be switched on	boolean	RO	0x00 (0_{dec})
7020:05	Reset Us	An error on Us will be reset	boolean	RO	0x00 (0_{dec})
7020:06	Reset Up	An error on Up will be reset	boolean	RO	0x00 (0_{dec})

5.6.1.3.8 Index 7030 DPO Outputs Ch.4

Index	Name	Meaning	Data type	Flags	Default
7030:0	DPO Outputs Ch.4		UINT8	RO	0x06 (6_{dec})
7030:01	Output Us	0: Us will be switched off 1: Us will be switched on	boolean	RO	0x00 (0_{dec})
7030:02	Output Up	0: Us will be switched off 1: Us will be switched on	boolean	RO	0x00 (0_{dec})
7030:05	Reset Us	An error on Us will be reset	boolean	RO	0x00 (0_{dec})
7030:06	Reset Up	An error on Up will be reset	boolean	RO	0x00 (0_{dec})

5.6.1.3.9 Index 800F DPO Vendor data Ch.1

Index	Name	Meaning	Data type	Flags	Default
800F:0	DPO Vendor data Ch.1		UINT8	RO	0x14 (20_{dec})
800F:11	GainS		UINT16	RW	0x4000 (16384_{dec})
800F:12	OffsetS		INT16	RW	0x0000 (0_{dec})
800F:13	GainP		UINT16	RW	0x4000 (16384_{dec})
800F:14	OffsetP		INT16	RW	0x0000 (0_{dec})

5.6.1.3.10 Index 801F DPO Vendor data Ch.2

Index	Name	Meaning	Data type	Flags	Default
801F:0	DPO Vendor data Ch.2		UINT8	RO	0x14 (20_{dec})
801F:11	GainS		UINT16	RW	0x4000 (16384_{dec})
801F:12	OffsetS		INT16	RW	0x0000 (0_{dec})
801F:13	GainP		UINT16	RW	0x4000 (16384_{dec})
801F:14	OffsetP		INT16	RW	0x0000 (0_{dec})

5.6.1.3.11 Index 802F DPO Vendor data Ch.3

Index	Name	Meaning	Data type	Flags	Default
802F:0	DPO Vendor data Ch.3		UINT8	RO	0x14 (20_{dec})
802F:11	GainS		UINT16	RW	0x4000 (16384_{dec})
802F:12	OffsetS		INT16	RW	0x0000 (0_{dec})
802F:13	GainP		UINT16	RW	0x4000 (16384_{dec})
802F:14	OffsetP		INT16	RW	0x0000 (0_{dec})

5.6.1.3.12 Index 803F DPO Vendor data Ch.4

Index	Name	Meaning	Data type	Flags	Default
803F:0	DPO Vendor data Ch.4		UINT8	RO	0x14 (20_{dec})
803F:11	GainS		UINT16	RW	0x4000 (16384_{dec})
803F:12	OffsetS		INT16	RW	0x0000 (0_{dec})
803F:13	GainP		UINT16	RW	0x4000 (16384_{dec})
803F:14	OffsetP		INT16	RW	0x0000 (0_{dec})

5.6.1.3.13 Index F000 Modular device profile

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

5.6.1.3.14 Index F008 Code word

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

5.6.1.3.15 Index F010 Module list

Index	Name	Meaning	Data type	Flags	Default
F010:0	Module list		UINT8	RW	0x04 (4_{dec})
F010:01	SubIndex 001		UINT32	RW	0x0000010E (270_{dec})
F010:02	SubIndex 002		UINT32	RW	0x0000010E (270_{dec})
F010:03	SubIndex 003		UINT32	RW	0x0000010E (270_{dec})
F010:04	SubIndex 004		UINT32	RW	0x0000010E (270_{dec})

5.6.1.3.16 Index F607 DPO Inputs Device

Index	Name	Meaning	Data type	Flags	Default
F607:0	DPO Inputs Device		UINT8	RO	0x10 (16_{dec})
F607:01	Temperature Warning	A temperature of about 80 °C has been reached	boolean	RO	0x00 (0_{dec})
F607:02	Temperature Error	A critical temperature of about 85 °C has been reached, the outputs will be switched off. The bit must be reset by a Global Reset (F707:04) or by a voltage reset. No output can be switched on if the error bit is set.	boolean	RO	0x00 (0_{dec})
F607:03	Us Warning	Us is less than 21.5 V, no further outputs can be switched on.	boolean	RO	0x00 (0_{dec})
F607:04	Us Error	Us is less than 19 V, all Us outputs will be switched off. This bit must be reset by a Global Reset (F707:04) or by a voltage reset. No Us output can be switched on if the error bit is set.	boolean	RO	0x00 (0_{dec})
F607:05	Up Warning	See F607:03	boolean	RO	0x00 (0_{dec})
F607:06	Up Error	See F607:04	boolean	RO	0x00 (0_{dec})
F607:07	Global Error Bit	One of the error bits of the four channels or F607:02 or F607:04 or F60706 is set	boolean	RO	0x00 (0_{dec})
F607:0C	Reset Input	0: There is no voltage on the external reset input 1: 24 V is present on the external reset input (only if there is a reset input)	boolean	RO	0x00 (0_{dec})
F607:0F	TxPDO State		boolean	RO	0x00 (0_{dec})
F607:10	TxPDO Toggle		boolean	RO	0x00 (0_{dec})

5.6.1.3.17 Index F81F DPO Vendor Data Device

Index	Name	Meaning	Data type	Flags	Default
F81F:0	DPO Vendor Data Device		UINT8	RO	0x1A (26_{dec})
F81F:01	Enable Auto Offset Calibration	reserved	boolean	RW	0x00 (0_{dec})
F81F:02	Enable Crosstalk Compensation	reserved	boolean	RW	0x01 (1_{dec})
F81F:10	Enable Calibration Mode	reserved	boolean	RW	0x00 (0_{dec})
F81F:11	GainS	reserved	UINT16	RW	0x4000 (16384_{dec})
F81F:12	OffsetS	reserved	INT16	RW	0x0000 (0_{dec})
F81F:13	GainP	reserved	UINT16	RW	0x4000 (16384_{dec})
F81F:14	OffsetP	reserved	INT16	RW	0x0000 (0_{dec})
F81F:15	Gain US	reserved	UINT16	RW	0x4000 (16384_{dec})
F81F:16	Offset US	reserved	INT16	RW	0x0000 (0_{dec})
F81F:17	Gain UP	reserved	UINT16	RW	0x4000 (16384_{dec})
F81F:18	Offset UP	reserved	INT16	RW	0x0000 (0_{dec})
F81F:19	Gain Temperature	reserved	UINT16	RW	0x4000 (16384_{dec})
F81F:1A	Offset Temperature	reserved	INT16	RW	0x0000 (0_{dec})

5.7 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).

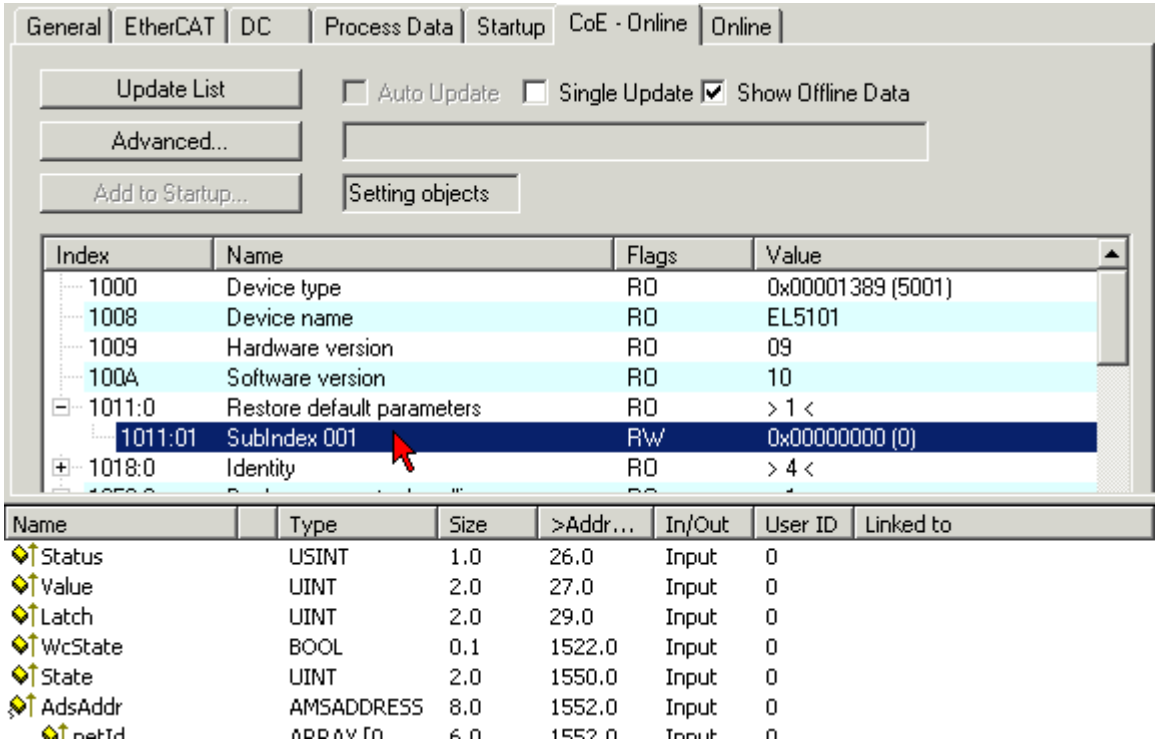


Fig. 17: Selecting the Restore default parameters PDO

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.

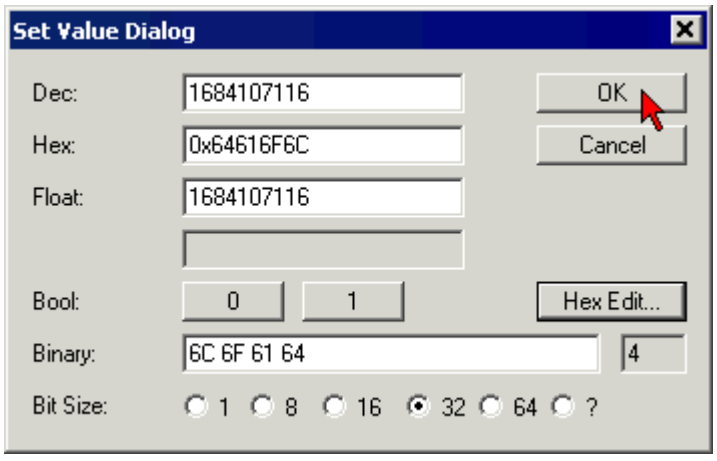


Fig. 18: Entering a restore value in the Set Value dialog

Alternative restore value

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

An incorrect entry for the restore value has no effect.

6 Appendix

6.1 General operating conditions

Protection degrees (IP-Code)

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

1. Number: dust protection and touch guard	Definition
0	Non-protected
1	Protected against access to hazardous parts with the back of a hand. Protected against solid foreign objects of Ø 50 mm
2	Protected against access to hazardous parts with a finger. Protected against solid foreign objects of Ø 12.5 mm.
3	Protected against access to hazardous parts with a tool. Protected against solid foreign objects Ø 2.5 mm.
4	Protected against access to hazardous parts with a wire. Protected against solid foreign objects Ø 1 mm.
5	Protected against access to hazardous parts with a wire. Dust-protected. Intrusion of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the device or to impair safety.
6	Protected against access to hazardous parts with a wire. Dust-tight. No intrusion of dust.

2. Number: water* protection	Definition
0	Non-protected
1	Protected against water drops
2	Protected against water drops when enclosure tilted up to 15°.
3	Protected against spraying water. Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects.
4	Protected against splashing water. Water splashed against the disclosure from any direction shall have no harmful effects
5	Protected against water jets
6	Protected against powerful water jets
7	Protected against the effects of temporary immersion in water. Intrusion of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water for 30 min. in 1 m depth.

*) These protection classes define only protection against water!

Chemical Resistance

The Resistance relates to the Housing of the IP 67 modules and the used metal parts. In the table below you will find some typical resistance.

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

Key

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

6.2 Accessories

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
ZK700x-xxxx-xxxx	EtherCAT P cable M8	Website
ZK7208-3xxx-Axxx	ENP cable B17 5G 1.5 mm^2	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.

6.3 Version identification of EtherCAT devices

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.

Identification number

Beckhoff EtherCAT devices from the different lines have different kinds of identification numbers:

Production lot/batch number/serial number/date code/D number

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

Structure of the serial number: **KK YY FF HH**

KK - week of production (CW, calendar week)
YY - year of production
FF - firmware version
HH - hardware version

Example with
Ser. no.: 12063A02: 12 - production week 12 06 - production year 2006 3A - firmware version 3A 02 - hardware version 02

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

Syntax: D ww yy x y z u

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

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

Unique serial number/ID, ID number

In addition, in some series each individual module has its own unique serial number.

See also the further documentation in the area

- IP67: EtherCAT Box
- Safety: TwinSafe
- Terminals with factory calibration certificate and other measuring terminals

Examples of markings

Fig. 19: EL5021 EL terminal, standard IP20 IO device with serial/ batch number and revision ID (since 2014/01)

Fig. 20: EK1100 EtherCAT coupler, standard IP20 IO device with serial/ batch number

Fig. 21: CU2016 switch with serial/ batch number

Fig. 22: EL3202-0020 with serial/ batch number 26131006 and unique ID-number 204418

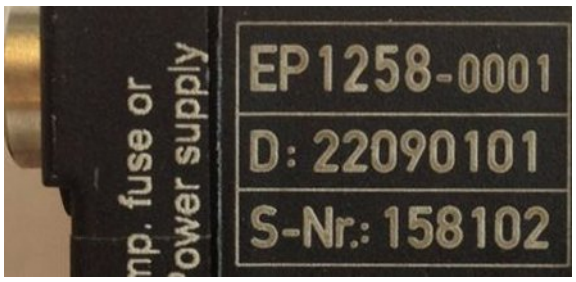


Fig. 23: EP1258-00001 IP67 EtherCAT Box with batch number/ date code 22090101 and unique serial number 158102

Fig. 24: EP1908-0002 IP67 EtherCAT Safety Box with batch number/ date code 071201FF and unique serial number 00346070

Fig. 25: EL2904 IP20 safety terminal with batch number/ date code 50110302 and unique serial number 00331701

Fig. 26: ELM3604-0002 terminal with unique ID number (QR code) 100001051 and serial/ batch number 44160201

6.3.1 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.

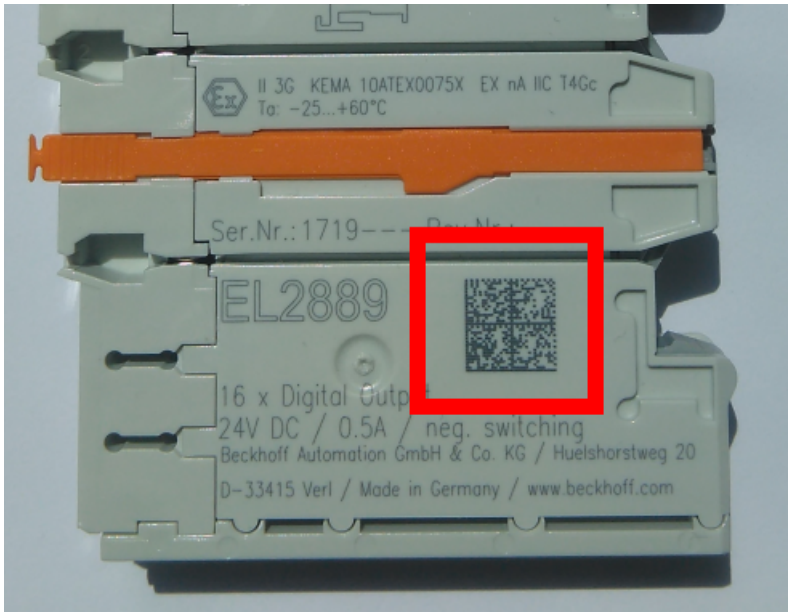


Fig. 27: BIC as data matrix code (DMC, code scheme ECC200)

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. The data under positions 1 to 4 are always available.

The following information is contained:

Item no.	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**	S	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 or calibrated terminals	51S	12	51S678294104
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 item 1 to 4 and 6. The data identifiers are marked in red for better display:

BTN

An important component of the BIC is the Beckhoff Traceability Number (BTN, item no. 2). The BTN is a unique serial number consisting of eight characters that will replace all other serial number systems at Beckhoff in the long term (e.g. batch designations on IO components, previous serial number range for safety products, etc.). The BTN will also be introduced step by step, so it may happen that the BTN is not yet coded in the BIC.

NOTE

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

6.4 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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e-mail:	support@beckhoff.com

Beckhoff Service

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

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

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