BECKHOFF New Automation Technology

Documentation | EN

EP9224-2037

EtherCAT Box, 4-port junction, with power supply, ENP, B17

2024-05-08 | Version: 1.0

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1 Foreword

1.1 Notes on the documentation

Intended audience

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

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

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement.

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

Trademarks

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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.

Signal words

The signal words used in the documentation are classified below. In order to prevent injury and damage to persons and property, read and follow the safety and warning notices.

Personal injury warnings

⚠ DANGER
Hazard with high risk of death or serious injury.

⚠ WARNING
Hazard with medium risk of death or serious injury.

⚠ CAUTION
There is a low-risk hazard that could result in medium or minor injury.

Warning of damage to property or environment

NOTICE
The environment, equipment, or data may be damaged.

Information on handling the product

This information includes, for example:
recommendations for action, assistance or further information on the product.

1.3 Documentation issue status

Version	Comment
1.0	• 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 [▶ 75].

2 EtherCAT Box - Introduction

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

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

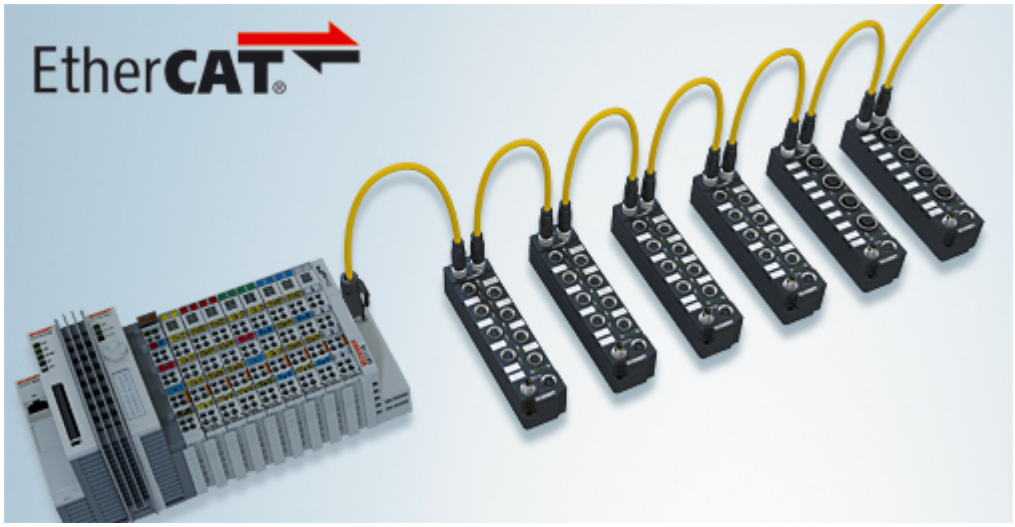


Fig. 1: EtherCAT Box Modules within an EtherCAT network

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

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

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

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

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

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

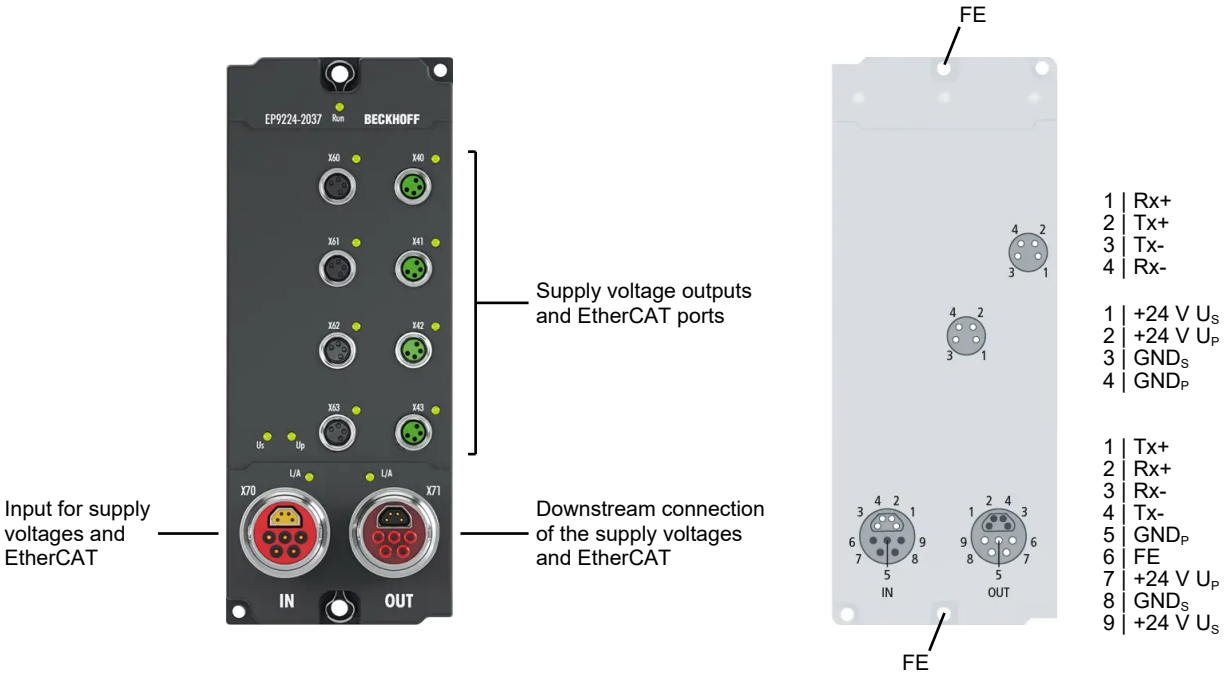
Fig. 3: EtherCAT Box with M12 connections for sensors/actuators

Basic EtherCAT documentation

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

3 Product overview

3.1 Introduction



The EP9224-2037 allows the distribution of one B17 ENP input to four EtherCAT ports and M8 power supply ports with B17-ENP forwarding. In each voltage branch, the current consumption for control voltage U_S and peripheral voltage U_P is monitored, limited and, if necessary, switched off.

The input voltage and current values of all outputs can be evaluated via the process data. The power supply and communication of the box runs via a 5-pin B17-ENP connector with up to 15.5 A (for each U_S / U_P). Several modules can be cascaded via a downstream connection. This voltage is switched off in the case of a short circuit on one of the four outputs or eight voltages (4 x U_S / U_P each). The supply for the other junctions remains active. The switch-off or control takes place in such a way that the input voltage does not fall below a critical value. In the event of an error, continuous data logging of the relevant data can be retrieved.

Via the EtherCAT interface, diagnostic messages of the individual channels can be read by the master and the individual channels switched on/off and reset.

Advantages

- 4 independent EtherCAT segments with communication and power supply
- switch-off characteristic can be selected per channel
- channels can be switched on and off individually
- current and voltage values as process data
- diagnostic data logging

Quick links

Technical data [▶ 11]
Process image [▶ 15]
Dimensions [▶ 20]
Commissioning and configuration [▶ 33]

3.2 Technical data

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

EtherCAT	
Input	B17 ENP, connection X70
Downstream connection	B17 ENP, connection X71
Outputs	4x M8 socket, 4-pin, green, connections X40 ... X43
Electrical isolation	500 V

Supply voltage input and downstream connection	
Input	Plug B17 5G 1.5mm² ENP, connection X70
Downstream connection	Socket B17 5G 1.5mm² ENP, connection X71
U_S nominal voltage	24 V_{DC} (-15 % / +20 %)
U_S sum current	max. 15.5 A at 45 °C
Current consumption from U_S	110 mA + load
U_P nominal voltage	24 V_{DC} (-15 % / +20 %)
U_P sum current	max. 15.5 A at 45 °C
Current consumption from U_P	40 mA + load

Supply voltage outputs	
Number	4
Connection	4x M8 socket, 4-pin, black
Cable length	max. 30 m
Output current per channel	max. 4 A per U_S and U_P.
Output current limitation per channel	4.4 A per U_S and U_P.
Output power limitation per channel	100 W per U_S and U_P.
Overload switch-off	Configurable, see chapter Overload protection [▶ 36].
Fuse (faile-safe element)	Fuse 7 A according to UL 248-1
Capacitive load per channel	2200 µF per U_S and U_P (This value is provisional. The actual possible capacitive load is likely to be higher)
Switch-on time delay of the channels	Adjustable, see chapter Switch output voltages [▶ 47]. • "Fast" = 10 ms • "Moderate" = 100 ms (default) • "Slow" = 200 ms
Total power loss	max. 12 W at full load. (4 A output current per U_S and U_P at all outputs at 24 V_{DC} supply voltage)

Protective functions and diagnostics	
Overtemperature protection	Threshold values: T_{warn} = 75 °C → Warning if exceeded T_{err} = 85 °C → Error message if exceeded
Undervoltage protection	Threshold values: U_{warn} = 21.6 V → Warning when falling below U_{err} = 19.1 V → Error message when 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	Measured current values: 10 mA Measured sum current values U_S + U_P: 10 mA Measured voltage values: 100 mV Measured temperature values: 1 K
Representation	Measured current values: 1 mA / LSB Measured sum current values U_S + U_P: 10 mA / LSB Measured voltage values: 100 mV / LSB Measured temperature values: 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 -25 … +55 °C according to cURus
Ambient temperature during storage	-40 … +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 12]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

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

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

Additional tests

The devices have undergone the following additional tests:

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

3.3 Scope of supply

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

- 1x EP9224-2037
- 4x protective cap for M8 socket, black (pre-assembled)
- 4x protective cap for EtherCAT socket, M8, green (pre-assembled)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

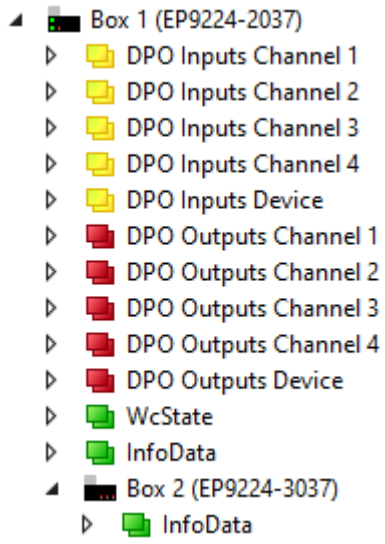
Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

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

3.4 Process image

In the process image, the supply voltage outputs and EtherCAT ports are labeled "Channel 1" to "Channel 4". The following table shows the assignment between the designations in the process image and the connection designations:

Designation in the process image	Supply voltage output	EtherCAT port
Channel 1	X60	X40
Channel 2	X61	X41
Channel 3	X62	X42
Channel 4	X63	X43



DPO Inputs Channel n
Status bits of the channels.

DPO Inputs Device
Status bits of the entire device.

DPO Outputs Channel n
Output bits of the channels.

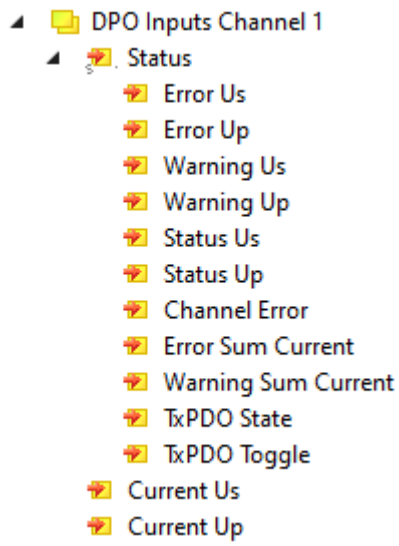
DPO Outputs Device
Output bits of the entire device.

WcState and **InfoData**
EtherCAT system variables.

EP9224-3037
I/O module that represents the second EtherCAT Slave Controller in the device. See chapter Basic Function Principles [▶ 19].

DPO Inputs Channel 1 to 4

Status bits of the individual channels.



Error Us: U_S was switched off due to overload.

Error Up: U_P was switched off due to overload.

Warning Us: The output current US currently exceeds the nominal current (CoE parameter 80n0:12).
If the overcurrent persists, U_S is switched off on this channel.

Warning Up: The output current U_S currently exceeds the nominal current (CoE parameter 80n0:13).
If the overcurrent persists, U_P is switched off on this channel.

Status Us: Switching status (on/off) of the output voltage U_S.

Status Up: Switching status (on/off) of the output voltage U_P.

Channel Error: "Error U_S" or "Error U_P" is TRUE.

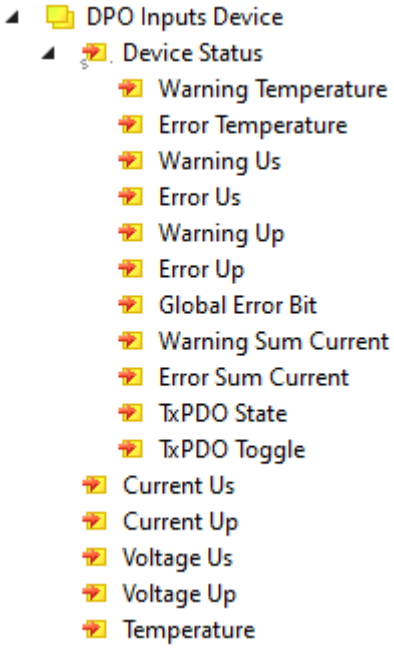
Error Sum Current: The channel was switched off due to sum overcurrent.

Warning Sum Current: The sum current $I_S + I_P$ of the channel currently exceeds the nominal sum current (CoE parameter 80n0:14).
If the overcurrent persists, the channel is switched off.

Current Us, Current Up: 16-bit measured values of the current output currents.

DPO Inputs Device

Status bits for the entire device.



Temperature Warning: The internal temperature exceeds the warning threshold.

Temperature Error: The internal temperature has exceeded the error threshold. The output channels have been switched off.

U_S Warning, U_P Warning: Undervoltage warning. The respective input voltage is currently below the warning threshold value U_{warn}.

Us Error, Up Error: Undervoltage switch-off. The respective input voltage has fallen below the error threshold value U_{err}.
The output voltages have been switched off.

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

Sum Current Warning: The input sum current $I_S + I_P$ currently exceeds the nominal sum current (CoE parameter F80E:12).
If the overcurrent persists, all channels are switched off.

Error Sum Current: All output voltages were switched off due to sum overcurrent.

Current Us: Current U_S input current at supply voltage input X70.

Current Up: Current U_P input current at supply voltage input X70.

Voltage Us: Current value of the supply voltage U_S in 1/10V

Voltage Up: Current value of the supply voltage U_P in 1/10V

Temperature: Current internal temperature of the device.

DPO Outputs Channel 1 to 4

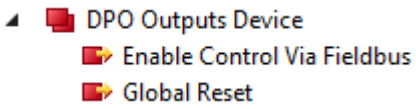
Output data for the individual channels.

Output U_S, Output U_P: Switches the respective output voltage on or off.

Reset U_S, Reset U_P: Reset the error state of the respective output voltage.

DPO Outputs Device

Output data for the entire device.



Enable Control Via Fieldbus:

- TRUE: Enables the switching of the output voltages via the output variables "Output Us" and "Output Up".
- FALSE: Enables the automatic switching on of the output voltages according to the CoE parameters 80n0:02 and 80n0:03.

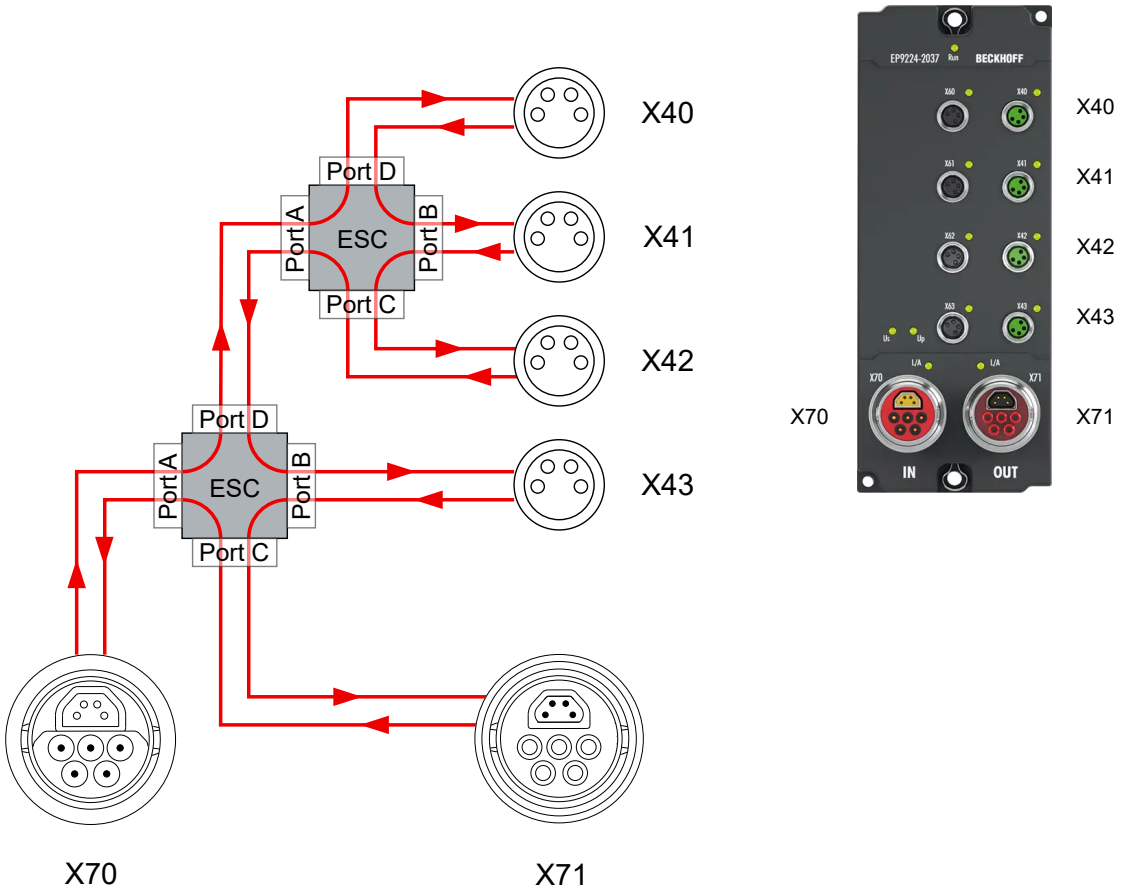
Global Reset: Reset the error state of the device and all channels.

3.5 Basic Function Principles

3.5.1 Internal EtherCAT data flow

The box contains two EtherCAT Slave Controller (ESC).

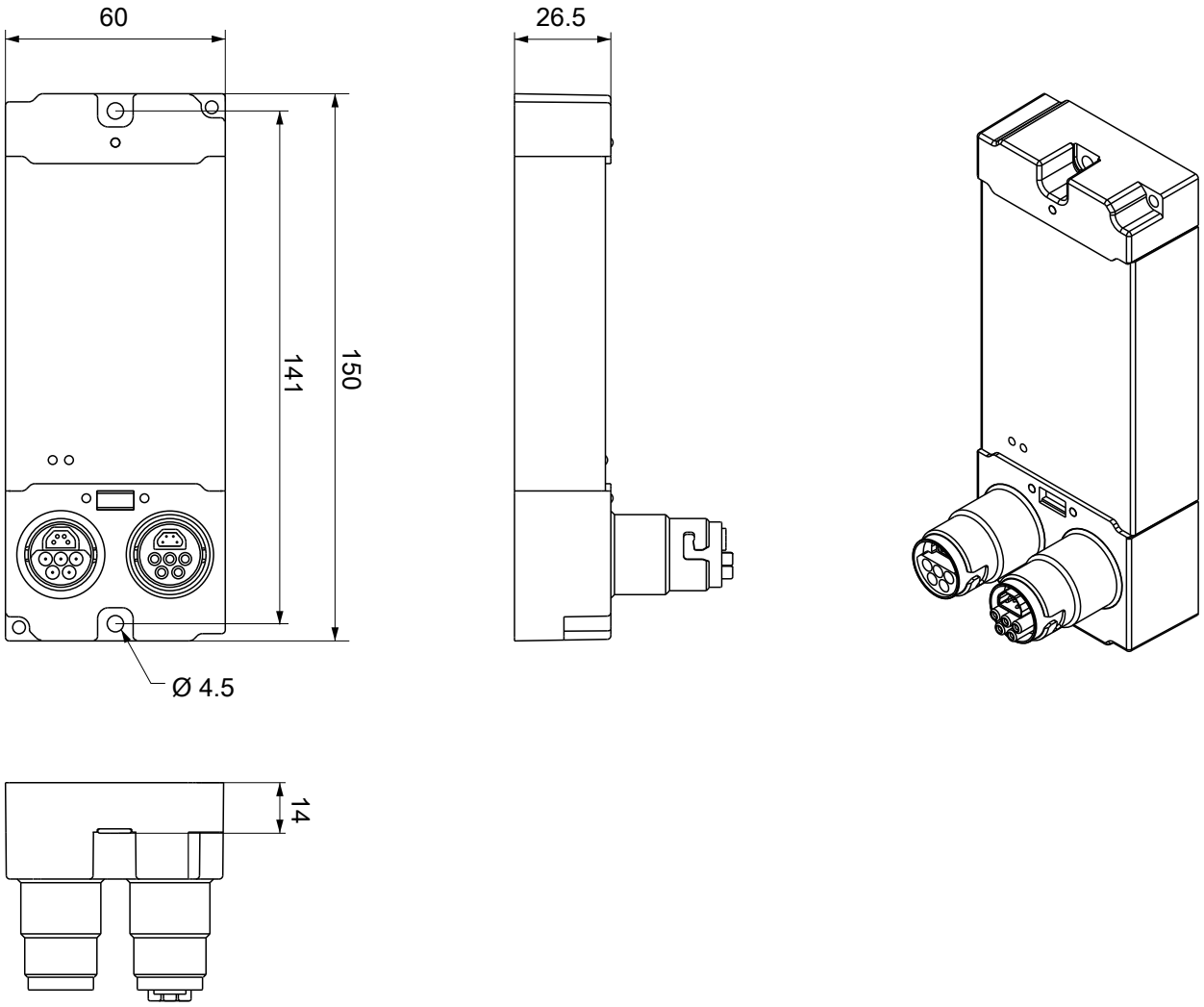
The following figure shows the logical path of an EtherCAT frame through the two ESCs. The ports on an ESC that do not have a device connected are automatically bypassed.



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 mounting 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 Fixing

NOTICE

Dirt during assembly

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

- Protect the plug connectors against dirt during the assembly.

Mount the module with two M4 screws in the centrally located mounting holes.

Cooling plate

The box 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.

4.1.3 Tightening torques for plug connectors

M8 connector

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

B17 connector

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 mounting holes

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

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

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 mounting 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. See chapter Accessories [▶ 74].
- Otherwise: ground 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 Supply voltage input and downstream connection

⚠ WARNING

Power supply from SELV / PELV power supply unit!

SELV / PELV circuits (safety extra-low voltage / protective extra-low voltage) according to IEC 61010-2-201 must be used to supply this device.

Notes:

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

The EtherCAT Box has one input for two supply voltages:

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

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

Redirection of the supply voltages

The power IN and OUT connections are bridged in the module. Hence, the supply voltages U_s and U_p can be passed from EtherCAT Box to EtherCAT Box in a simple manner.

NOTICE

Note the maximum current!

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

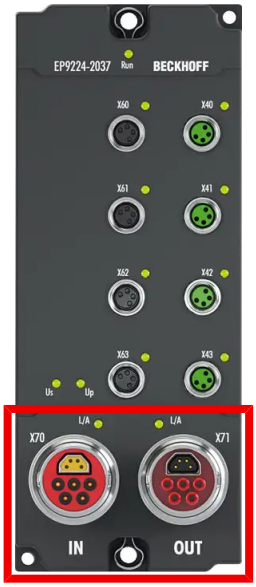
M8 connector: max. 4 A
7/8" connector: max 16 A

NOTICE

Unintentional cancellation of the electrical isolation possible

In some types of EtherCAT Box modules the ground potentials GND_S and GND_P are connected.

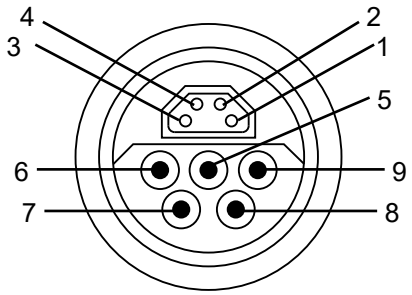
- If several EtherCAT Box modules are supplied with the same electrically isolated voltages, check whether there is an EtherCAT Box among them in which the ground potentials are connected.



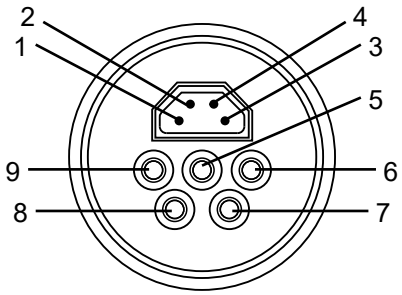
4.3.1 Connection

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



IN



OUT

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.

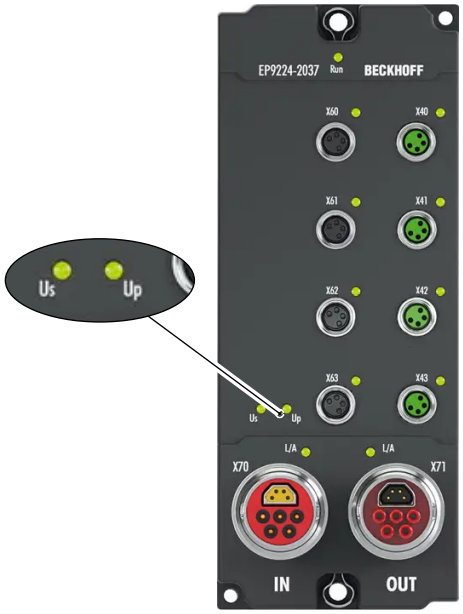
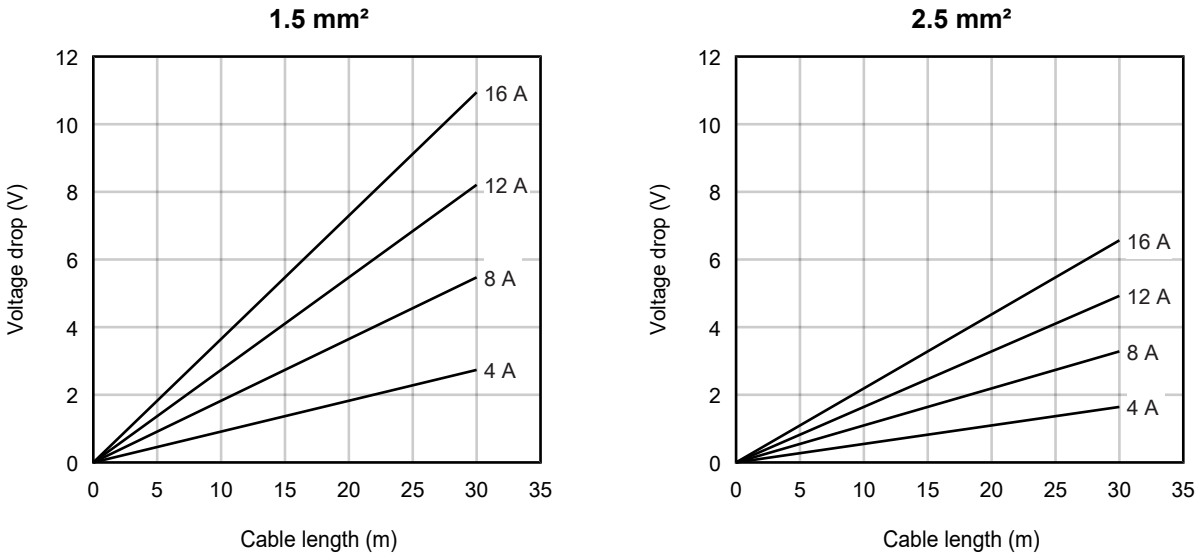


Fig. 4: Status LEDs for the supply voltages

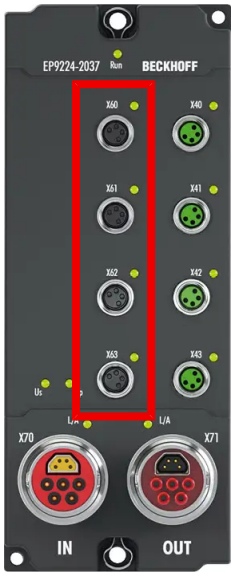
4.3.3 Conductor losses

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

Voltage drop on the supply line



4.4 Supply voltage outputs



4.4.1 Connection

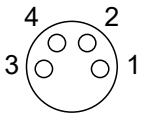
NOTICE

Risk of confusion: supply voltages and EtherCAT

Defect possible through incorrect insertion.

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

The supply voltage outputs X60 ... X63 are implemented as M8 sockets.

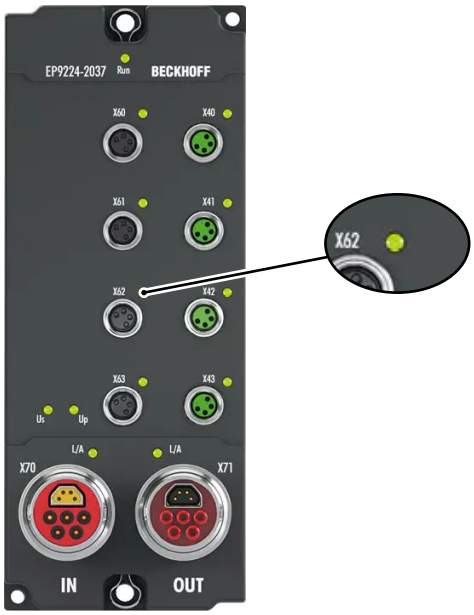


Contact	Function	Description	Core color [1)]
1	U_S	Control voltage	Brown
2	U_P	Peripheral voltage	White
3	GND_S	GND to U_S	Blue
4	GND_P	GND to U_P	Black

[1)] The core colors apply to M8 cables from Beckhoff. See chapter Accessories [▶ 74].

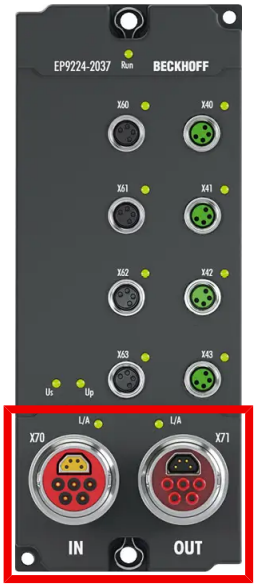
4.4.2 Status LEDs

There is a status LED next to each supply voltage output. It shows the status of the two output voltages at this output.



LED signal	Meaning
Off	The output voltages U_S and U_P are switched off.
Lights up green	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 [▶ 40]. Overcurrent on at least one of the output voltages.
Flashes red	Error message [▶ 40]. 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.
Lights up red	Error message [▶ 40]. At least one of the output voltages has been switched off due to a protective function.
Chaser light red (all four status LEDs)	Error message [▶ 40]. Undervoltage or overtemperature.

4.5 EtherCAT input and downstream connection



4.5.1 Connection

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

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

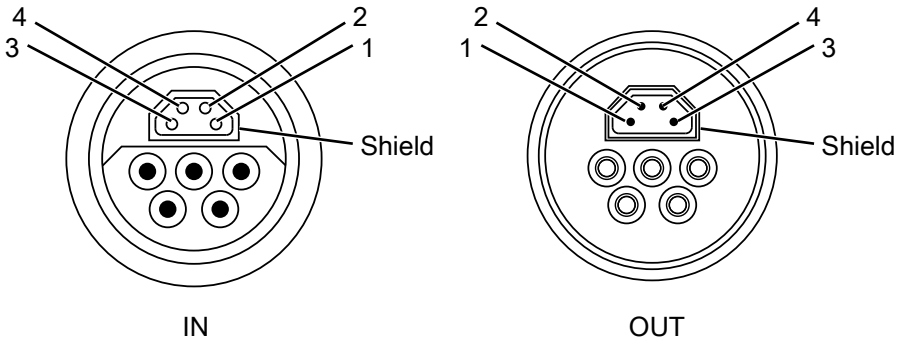


Fig. 5: EtherCAT pin assignment

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

4.5.2 Status LEDs

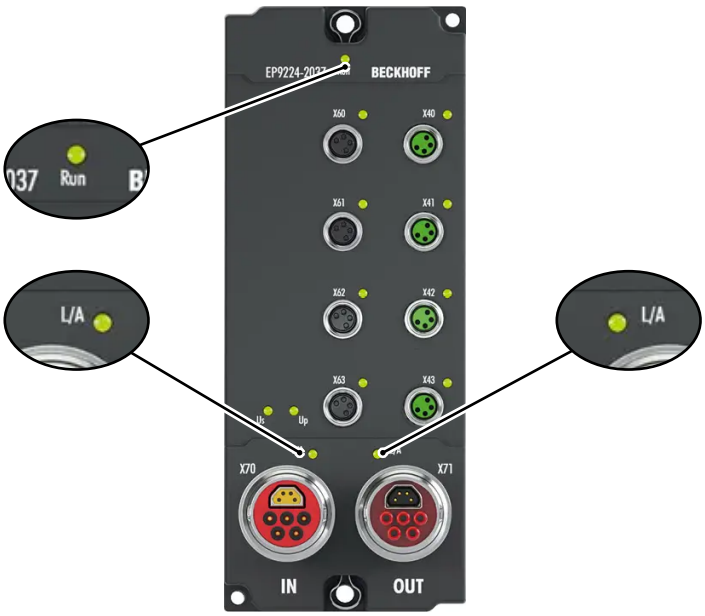


Fig. 6: EtherCAT LEDs

L/A (Link/Act)

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

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

Run

Each EtherCAT slave and each EtherCAT P slave has a green LED labeled "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

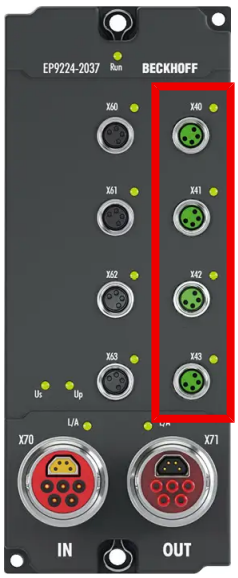
4.6 EtherCAT ports X40 … X43

NOTICE

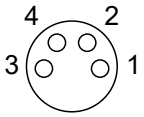
Risk of confusion: supply voltages and EtherCAT

Defect possible through incorrect insertion.

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



The EtherCAT ports X40 to X43 are implemented as M8 sockets.



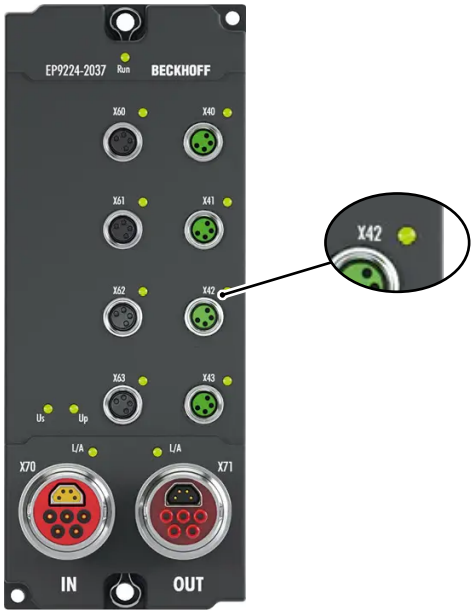
EtherCAT	M8 socket	Core colors		
Signal	**Contact**	**ZB9010, ZB9020, ZB9030, ZB9032, ZK1090-6292, ZK1090-3xxx-xxxx**	**ZB9031 and old versions of ZB9030, ZB9032, ZK1090-3xxx-xxxx**	**TIA-568B**
Tx +	1	yellow[1)]	orange/white	white/orange
Tx -	4	orange[1)]	orange	orange
Rx +	2	white[1)]	blue/white	white/green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

[1)] Core colors according to EN 61918

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

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

4.6.1 Status LEDs



There is a green LED next to each EtherCAT socket. The LED signals 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

4.6.2 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

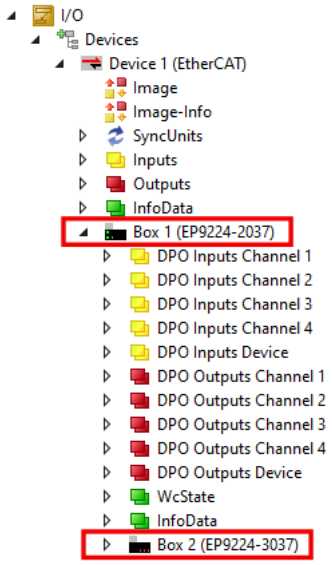
5.1 Integration in TwinCAT

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

5.1.1 Assignment of the connections

This chapter describes the assignment of the EtherCAT connections of an EP9224-2037 to their representation in TwinCAT. This assignment is required to correctly map an EtherCAT network in TwinCAT "offline" configuration.

An EP9224-2037 is represented by two I/O modules in the TwinCAT I/O tree:



Each I/O module has four ports. Some ports represent the EtherCAT connections, while others represent internal interfaces. The following table shows the assignment of the EtherCAT connections to the ports of the I/O modules in TwinCAT:

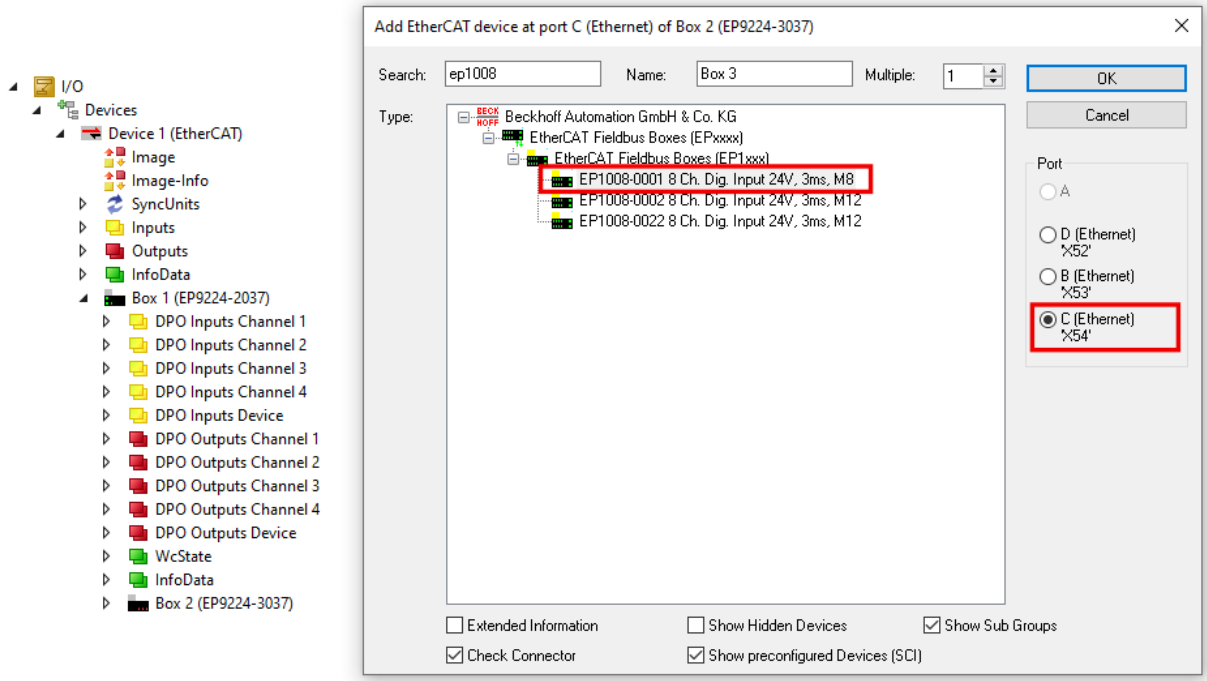
EtherCAT connection	I/O module in TwinCAT	Port
X40	EP9224-3037	D
X41		B
X42		C
X43	EP9224-2037	B
X70		A
X71		C

Below you will find examples of how to use the table.

Example: Appending an EtherCAT Box to EP9224-2037

✓ Requirement: an EP9224-2037 is appended in the I/O tree in TwinCAT.

1. Decide to which connector of the EP9224-2037 the EtherCAT Box is to be connected.
   (e.g. to X42)
2. Determine the corresponding I/O module and port with the help of the table.
   (e.g. EP9224-3037, Port C)
3. In the I/O tree, right-click on the determined I/O module.
   (e.g. EP9224-3037)
4. Click the menu item **Add new Item…**
5. In the window that appears select the EtherCAT Box to be added and the previously determined port.
   (e.g. EP1008-0001, Port C)



6. Click the **OK** button

⇨ Result: The Box was added at the correct position in the I/O tree.

Example: Moving an EtherCAT Box that has already been added to another connection

1. Double-click on the EtherCAT Box in the I/O tree.
   (e.g. an EP1008-0001 connected to X42)
2. Click the **EtherCAT** tab.
3. Determine the corresponding I/O module and port of the new connector with the help of the table.
   (e.g. X43 → EP9224-2037, Port B)
4. In the **Previous Port** drop-down list box, select the determined I/O module and the port.
   (e.g. "Box 1 (EP9224-2037) - B")

⇨ Result: The EtherCAT 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 Protective functions

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

They signal warnings and errors: Warning and error messages [▶ 40].

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".

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

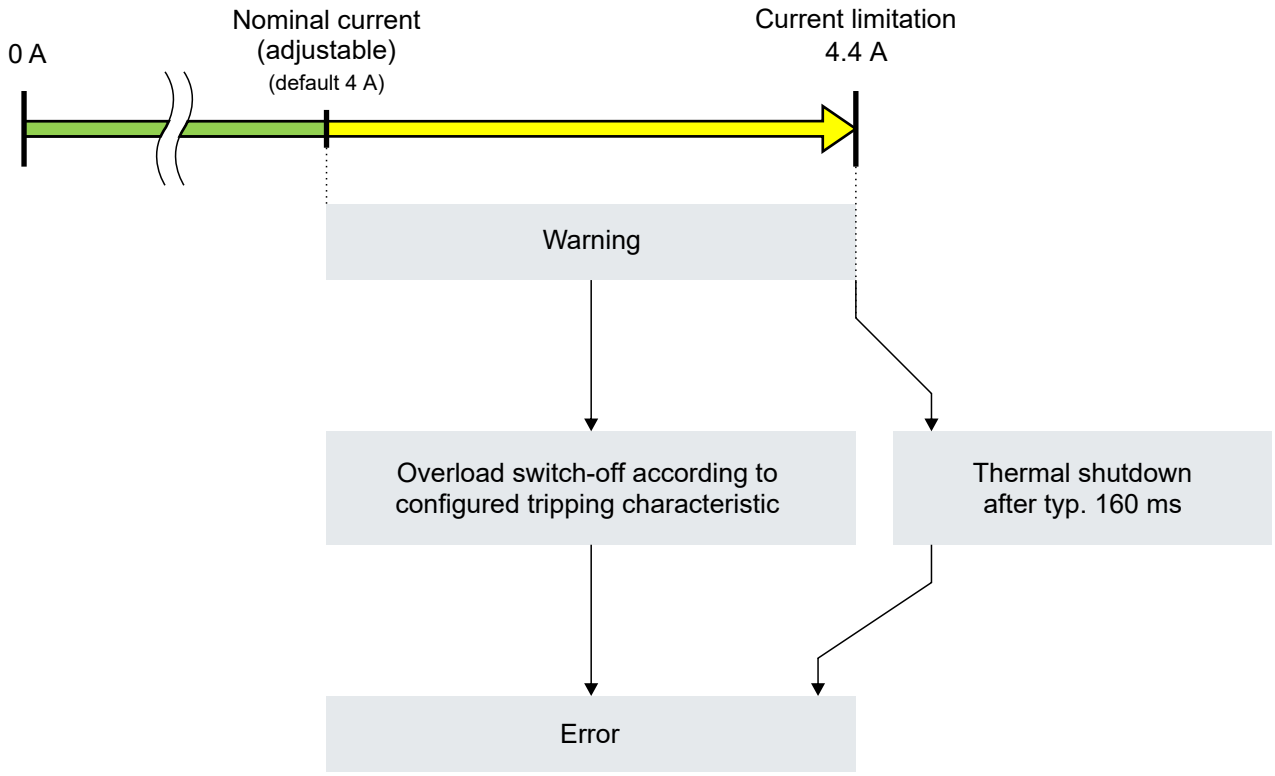
Further information can be found in the sections "Resetting an error state" in the chapter for the individual protective functions.

5.2.1 Overload protection

Each supply voltage output X60 ... X63 has overload protection for the output voltages U_S and U_P. If an output voltage is switched off due to overload, all other output voltages remain switched on.

The overload protection comprises two protection mechanisms:

- Overload switch-off, configurable
- Starting current limitation, not configurable



If an output current exceeds the nominal current (factory setting 4 A), the status bit "Warning" is set. In this range, the protection mechanisms are active as follows:

- Below 4.4 A, only the overload switch-off is active. It switches off the respective output voltage according to the configured tripping characteristic.
  See chapter Configure overload switch-off.
- At 4.4 A, the starting current limitation limits the current.
  Now the overload switch-off and starting current limitation are active at the same time. The output voltage is either switched off by the overload switch-off according to the switch-off characteristic or by the starting current limitation in the event of thermal overload.

You can use the data logger to determine which of the two protection mechanisms has switched off an output voltage. See chapter Troubleshooting with the data logger [▶ 43].

Overload message

If the overload protection has switched off an output voltage, this is reported as follows:

- The status bit "Error Us" or "Error Up" of the output is set.
- The output voltage status LED of the output lights up red.

Resetting an error state

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

- a positive edge at the output variable "DPO Inputs Channel n" > "Reset Ux" of the respective supply voltage output.
- a positive edge at the output variable "DPO Outputs Device" > "Global Reset"

The status bit "Error" is also reset as a result.

5.2.1.1 Configure overload switch-off

You can configure the overload switch-off for each output voltage individually.

The configuration of the overload switch-off is similar to the selection of a fuse: you select the nominal current and the tripping characteristic.

The nominal current can be set between 1000 mA and 4000 mA.

Port	Nominal current in mA	Tripping characteristic
X52	8000:12 "Nominal Current Us" 8000:13 "Nominal Current Up"	8000:11 "Characteristic"
X53	8010:12 "Nominal Current Us" 8010:13 "Nominal Current Up"	8010:11 "Characteristic"
X54	8020:12 "Nominal Current Us" 8020:13 "Nominal Current Up"	8020:11 "Characteristic"
X55	8030:12 "Nominal Current Us" 8030:13 "Nominal Current Up"	8030:11 "Characteristic"

If the nominal current is exceeded, the status bit "Warning" is set.

Examples of the switch-off time

The following table shows the switch-off time of the overload switch-off for different currents and tripping characteristics.

Shorter switch-off time with 4.4 A current limitation

The switch-off times shown only apply to output currents below 4.4 A.

At 4.4 A, the starting current limitation limits the output current and switches it off thermally, even if the switch-off time of the overload switch-off would be longer.

% of the nominal current	Very fast acting	Fast acting	Slow acting	Time delay
105 %	3600 s	3600 s	3600 s	3600 s
135 %	420 s	3600 s	3600 s	3600 s
200 %	0.5 s	20 s	20 s	100 s
300 %	0.02 s	0.1 s	1 s	3 s

5.2.2 Overcurrent protection for sum currents

EP9224-2037 determines two types of sum currents:

- Sum current for each individual output (calculated)
  $U_S + U_P$
- Sum current for all outputs (measured)
  $\sum (U_S + U_P)$

The overcurrent protection for sum currents is disabled 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"
X60: $U_S + U_P$	8000:04	8000:14	8000:11
X61: $U_S + U_P$	8010:04	8010:14	8010:11
X62: $U_S + U_P$	8020:04	8020:14	8020:11
X63: $U_S + U_P$	8030:04	8030:14	8030:11
$\sum (U_S + U_P)$ (Sum of all output currents)	F80E:02	F80E:12	F80E:13

5.2.3 Undervoltage protection

The undervoltage protection prevents connected devices from being operated with a supply voltage that is too low. A malfunction of the 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.

Disabling for U_p

The undervoltage protection for the peripheral voltage U_P can be disabled 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.

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

- a positive edge at the output variable
  "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}.

5.2.4 Overtemperature protection

The overtemperature protection monitors the internal temperature.

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.

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.

5.2.5 Warning and error messages

The 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 state [▶ 35].
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
- 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 affects the respective output.

Global Status bits

Input variable: "DPO Inputs Device" > "Device Status":

Status bit	Responsible protective function
Warning Temperature	Overtemperature protection [▶ 39]
Error Temperature	
Warning Us	Undervoltage protection [▶ 39]
Error Us	
Warning Up	
Error Up	
Warning Sum Current	Overcurrent protection for sum currents [▶ 38]
Error Sum Current	

Status bits per supply voltage output

Input variable: "DPO Inputs Channel n" > "Status"
(n = 0 for X60, n = 1 for X61, n = 2 for X62, n = 3 for X63)

Status bit	Responsible protective function
Error Us	Overload protection [▶ 36]
Error Up	
Warning Us	
Warning Up	
Error Sum Current	Overcurrent protection for sum currents [▶ 38]
Warning Sum Current	

5.3 Diagnostic functions

5.3.1 Data logger

The data logger enables the recording of measured values. The recording can be used for the analysis of errors. See also Chapter Troubleshooting with the data logger [▶ 43].

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 EP9224-2037 is appended in the I/O tree in TwinCAT.

1. Double-click on the EP9224-2037 I/O module in the I/O tree.
2. Click the **Process Data** tab.
3. Click "Outputs" in the "**Sync Manager**" box.
4. Activate the **PDO Assignment (0x1C12)** checkbox next to the entry "0x1610".
   ⇨ The process data object "LOG Control" appears in the I/O tree.
5. Click "Inputs" in the **Sync Manager** box.
6. Activate the **PDO Assignment (0x1C13)** checkbox next to the entry "0x1A10".
   ⇨ The process data object "LOG Status" appears in the I/O 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 EP9224-2037 I/O module in the I/O tree.
2. Click the "**Online**" tab.
3. Click 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 the **Save** button.
   ⇨ A dialog box appears with the title "Edit FoE Name".
6. Click the **OK** button.

⇨ 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 this follows:

- 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

5.3.1.1 Troubleshooting with the data logger

You can use the data logger to determine the cause of an error, among other things. The prerequisite for this is that the recording of the measured values is already enabled when the error occurs.

Determine the cause of the error

The data logger stops recording the measured values if an error occurs, among other things. The reason for the last stop of the recording is output in the process data and via a CoE parameter:

- PDO "Log Status" > "Trigger Reason"
- CoE parameter 6040:12 "Trigger Reason"

Possible values:

Value	Enum text	Reason for stopping the recording
0	Undefined	Unknown.
1	Undervoltage Us	Undervoltage of U_S.
2	Undervoltage Up	Undervoltage of U_P.
3	Overtemperature	Internal temperature too high.
4	Overcurrent	The overload switch-off has switched off an output voltage.
5	FoE Transfer	The data upload was started before the recording was stopped.
6	Hardware Protection	The starting current limitation has switched off an output voltage.
7	User Stop Bit	Set the bit "Stop Logger" in the process data.
255	Logger still running	N/A. The recording has not yet been stopped.

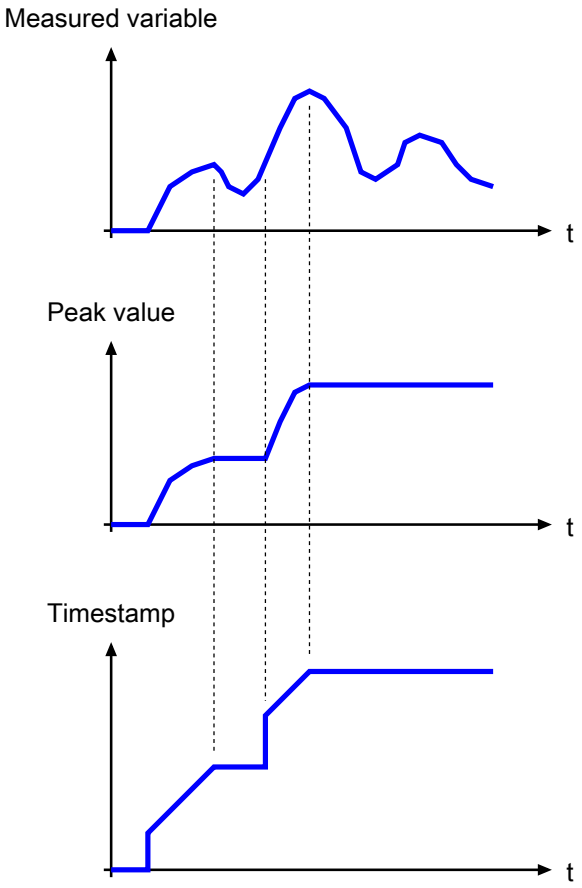
5.3.2 Peak value detector

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:



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
Output X60	0x1601	DPO Extended Diag Outputs Channel 1	0x1A01	DPO Extended Diag Inputs Channel 1
Output X61	0x1603	DPO Extended Diag Outputs Channel 2	0x1A03	DPO Extended Diag Inputs Channel 2
Output X62	0x1605	DPO Extended Diag Outputs Channel 3	0x1A05	DPO Extended Diag Inputs Channel 3
Output X63	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 EP9224-2037 I/O module in the I/O tree.
2. Click the **Process Data** tab.
3. Click "Outputs" in the "**Sync Manager**" box.
4. Activate the **PDO Assignment (0x1C12)** checkbox next to the desired PDOs.
   ⇨ The corresponding process data object "DPO Extended Diag Outputs […]" appears in the I/O tree.
5. Click "Inputs" in the **Sync Manager** box.
6. Activate the **PDO Assignment (0x1C13)** checkbox next to the desired PDOs.
   ⇨ The corresponding process data object "DPO Extended Diag Inputs […]" appears in the I/O 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 output.
- 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
Output X60	"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
Output X61	"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
Output X62	"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
Output X63	"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 1" and the associate "Timestamp 1"
- "Peak Value 2" and the associate "Timestamp 2"

5.4 Switch output voltages

You can switch the output voltages U_S and U_P of each output individually.

Protective functions [▶ 35] can prevent an output voltage from being switched on.

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

- Status LEDs.
- Status bits in the process data:
  "DPO Inputs Channel n" > "Status" > "Status Us"
  "DPO Inputs Channel n" > "Status" > "Status Up"
  (where: n = 0 for X60, n = 1 for X61, n = 2 for X62, n = 3 for X63)

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

In the factory setting, all output voltages are switched on automatically when the supply voltage U_S is applied. You can activate or deactivate automatic switch-on for each output voltage individually.

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

Connection	Output voltage	Parameter	
X60	U_S	8000:02	"DPO Settings Ch. 1" > "Default State Us"
	U_P	8000:03	"DPO Settings Ch. 1" > "Default State Up"
X61	U_S	8010:02	"DPO Settings Ch. 2" > "Default State Us"
	U_P	8010:03	"DPO Settings Ch. 2" > "Default State Up"
X62	U_S	8020:02	"DPO Settings Ch. 3" > "Default State Us"
	U_P	8020:03	"DPO Settings Ch. 3" > "Default State Up"
X63	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 input inrush currents of the connected devices from adding up.
You can set the time offset in CoE index F80E:11 "Startup Delay":

- "0": "Fast"
- "1": "Moderate"
- "2": "Slow"

Manual switching

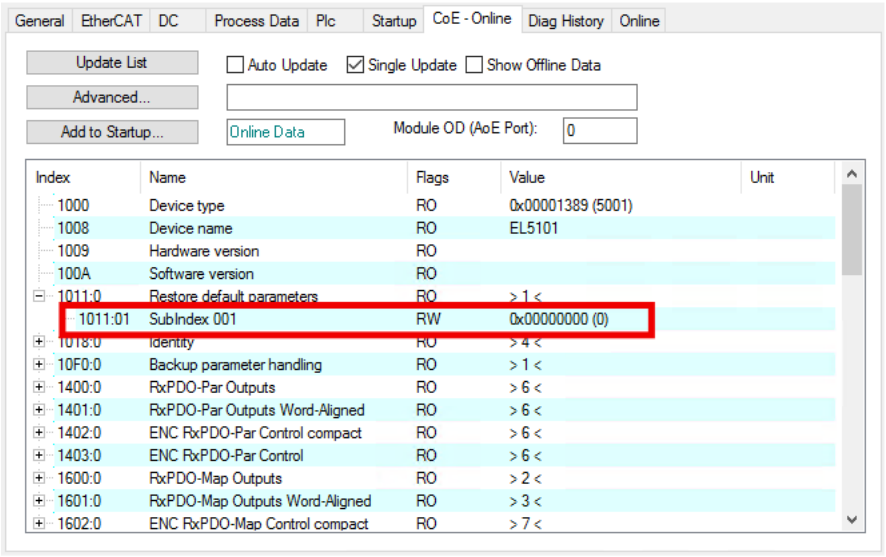
Set the variable "Enable Control Via Fieldbus" to "1" to switch output voltages manually via output variables.

Connection	Output voltage	Output variable
X60	U_S	"DPO Outputs Channel 1" > "Output Us"
	U_P	"DPO Outputs Channel 1" > "Output Up"
X61	U_S	"DPO Outputs Channel 2" > "Output Us"
	U_P	"DPO Outputs Channel 2" > "Output Up"
X62	U_S	"DPO Outputs Channel 3" > "Output Us"
	U_P	"DPO Outputs Channel 3" > "Output Up"
X63	U_S	"DPO Outputs Channel 4" > "Output Us"
	U_P	"DPO Outputs Channel 4" > "Output Up"

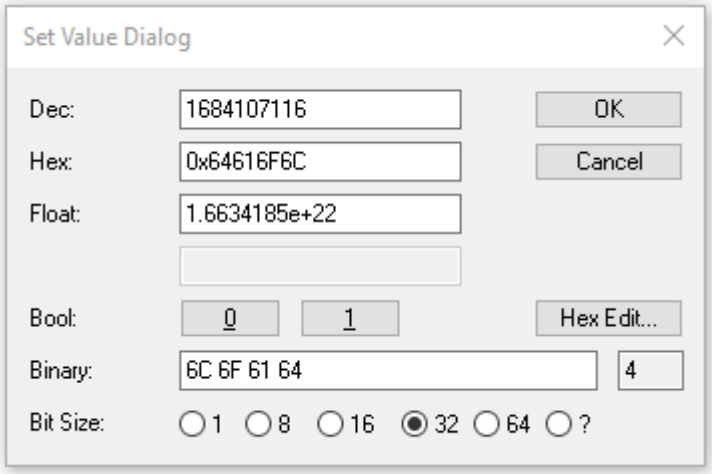
5.5 Restore the delivery state

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

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



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



5. Confirm with "OK".

⇨ All backup objects are reset to the delivery state.

Alternative restore value

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

An incorrect entry for the restore value has no effect.

6 CoE parameters

Parameterization

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

EtherCAT XML Device Description

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

6.1 Objects for parameterization

Index 1011 Restore default parameters

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

Index 8000 DPO Settings Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
8000:0	DPO Settings Ch.1		UINT8	RO	0x16 (22_{dec})
8000:02	Default State Us	The output assumes this value if F707:01 "Enable Control Via Fieldbus" is not set. See chapter Switch output voltages [▶ 47].	BOOLEAN	RW	0x01 (1_{dec})
8000:03	Default State Up	The output assumes this value if F707:01 "Enable Control Via Fieldbus" is not set. See chapter Switch output voltages [▶ 47].	BOOLEAN	RW	0x01 (1_{dec})
8000:04	Enable Sum Current Limitation	Activates the overcurrent protection for the sum current Us+Up on this output. See chapter Overcurrent protection for sum currents [▶ 38].	BOOLEAN	RW	0x00 (0_{dec})
8000:11	Characteristic	Tripping characteristics of the overload switch-off: • 0: Very fast acting • 1: Fast acting • 2: Slow acting • 3: Time delay See chapter Overload protection [▶ 36].	UINT16	RW	0x0001 (1_{dec})
8000:12	Nominal Current Us	Nominal current for U_S. Unit: mA Value range: 1000 ... 3000_{dec} See chapter Overload protection [▶ 36].	UINT16	RW	0x0BB8 (3000_{dec})
8000:13	Nominal Current Up	Nominal current for U_P. Unit: mA Value range: 1000 ... 3000_{dec} See chapter Overload protection [▶ 36].	UINT16	RW	0x0BB8 (3000_{dec})
8000:14	Nominal Sum Current	Nominal maximum sum current (Us+Up) at the output. See chapter Overcurrent protection for sum currents [▶ 38].	UINT16	RW	0x1770 (6000_{dec})
8000:15	Timestamp 1 Trigger	Defines which events are detected by the peak value detector at this port. Possible values: • 0: Error Us • 1: Error Up • 2: Warning Us • 3: Warning Up • 7: Error Sum Current • 8: Warning Sum Current • 16: Minimum Current Us • 17: Maximum Current Us • 18: Minimum Current Up • 19: Maximum Current Up See chapter Peak value detector [▶ 44].	UINT16	RW	0x0000 (0_{dec})
8000:16	Timestamp 2 Trigger	See 8000:15.	UINT16	RW	0x0000 (0_{dec})

Index 8010 DPO Settings Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
8010:0	DPO Settings Ch.2		UINT8	RO	0x16 (22_{dec})
8010:02	Default State Us	The output assumes this value if F707:01 "Enable Control Via Fieldbus" is not set. See chapter Switch output voltages [▶ 47].	BOOLEAN	RW	0x01 (1_{dec})
8010:03	Default State Up	The output assumes this value if F707:01 "Enable Control Via Fieldbus" is not set. See chapter Switch output voltages [▶ 47].	BOOLEAN	RW	0x01 (1_{dec})
8010:04	Enable Sum Current Limitation	Activates the overcurrent protection for the sum current Us+Up on this output. See chapter Overcurrent protection for sum currents [▶ 38].	BOOLEAN	RW	0x00 (0_{dec})
8010:11	Characteristic	Tripping characteristics of the overload switch-off: • 0: Very fast acting • 1: Fast acting • 2: Slow acting • 3: Time delay See chapter Overload protection [▶ 36].	UINT16	RW	0x0001 (1_{dec})
8010:12	Nominal Current Us	Nominal current for U_S. Unit: mA Value range: 1000 ... 3000_{dec} See chapter Overload protection [▶ 36].	UINT16	RW	0x0BB8 (3000_{dec})
8010:13	Nominal Current Up	Nominal current for U_P. Unit: mA Value range: 1000 ... 3000_{dec} See chapter Overload protection [▶ 36].	UINT16	RW	0x0BB8 (3000_{dec})
8010:14	Nominal Sum Current	Nominal maximum sum current (Us+Up) at the output. See chapter Overcurrent protection for sum currents [▶ 38].	UINT16	RW	0x1770 (6000_{dec})
8010:15	Timestamp 1 Trigger	Defines which events are detected by the peak value detector at this port. Possible values: • 0: Error Us • 1: Error Up • 2: Warning Us • 3: Warning Up • 7: Error Sum Current • 8: Warning Sum Current • 16: Minimum Current Us • 17: Maximum Current Us • 18: Minimum Current Up • 19: Maximum Current Up See chapter Peak value detector [▶ 44].	UINT16	RW	0x0000 (0_{dec})
8010:16	Timestamp 2 Trigger	See 8010:15.	UINT16	RW	0x0000 (0_{dec})

Index 8020 DPO Settings Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
8020:0	DPO Settings Ch.3		UINT8	RO	0x16 (22_{dec})
8020:02	Default State Us	The output assumes this value if F707:01 "Enable Control Via Fieldbus" is not set. See chapter Switch output voltages [▶ 47].	BOOLEAN	RW	0x01 (1_{dec})
8020:03	Default State Up	The output assumes this value if F707:01 "Enable Control Via Fieldbus" is not set. See chapter Switch output voltages [▶ 47].	BOOLEAN	RW	0x01 (1_{dec})
8020:04	Enable Sum Current Limitation	Activates the overcurrent protection for the sum current Us+Up on this output. See chapter Overcurrent protection for sum currents [▶ 38].	BOOLEAN	RW	0x00 (0_{dec})
8020:11	Characteristic	Tripping characteristics of the overload switch-off: • 0: Very fast acting • 1: Fast acting • 2: Slow acting • 3: Time delay See chapter Overload protection [▶ 36].	UINT16	RW	0x0001 (1_{dec})
8020:12	Nominal Current Us	Nominal current for U_S. Unit: mA Value range: 1000 ... 3000_{dec} See chapter Overload protection [▶ 36].	UINT16	RW	0x0BB8 (3000_{dec})
8020:13	Nominal Current Up	Nominal current for U_P. Unit: mA Value range: 1000 ... 3000_{dec} See chapter Overload protection [▶ 36].	UINT16	RW	0x0BB8 (3000_{dec})
8020:14	Nominal Sum Current	Nominal maximum sum current (Us+Up) at the output. See chapter Overcurrent protection for sum currents [▶ 38].	UINT16	RW	0x1770 (6000_{dec})
8020:15	Timestamp 1 Trigger	Defines which events are detected by the peak value detector at this port. Possible values: • 0: Error Us • 1: Error Up • 2: Warning Us • 3: Warning Up • 7: Error Sum Current • 8: Warning Sum Current • 16: Minimum Current Us • 17: Maximum Current Us • 18: Minimum Current Up • 19: Maximum Current Up See chapter Peak value detector [▶ 44].	UINT16	RW	0x0000 (0_{dec})
8020:16	Timestamp 2 Trigger	See 8020:15	UINT16	RW	0x0000 (0_{dec})

Index 8030 DPO Settings Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
8030:0	DPO Settings Ch.4		UINT8	RO	0x16 (22_{dec})
8030:02	Default State Us	The output assumes this value if F707:01 "Enable Control Via Fieldbus" is not set. See chapter Switch output voltages [▶ 47].	BOOLEAN	RW	0x01 (1_{dec})
8030:03	Default State Up	The output assumes this value if F707:01 "Enable Control Via Fieldbus" is not set. See chapter Switch output voltages [▶ 47].	BOOLEAN	RW	0x01 (1_{dec})
8030:04	Enable Sum Current Limitation	Activates the overcurrent protection for the sum current Us+Up on this output. See chapter Overcurrent protection for sum currents [▶ 38].	BOOLEAN	RW	0x00 (0_{dec})
8030:11	Characteristic	Tripping characteristics of the overload switch-off: • 0: Very fast acting • 1: Fast acting • 2: Slow acting • 3: Time delay See chapter Overload protection [▶ 36].	UINT16	RW	0x0001 (1_{dec})
8030:12	Nominal Current Us	Nominal current for U_S. Unit: mA Value range: 1000 ... 3000_{dec} See chapter Overload protection [▶ 36].	UINT16	RW	0x0BB8 (3000_{dec})
8030:13	Nominal Current Up	Nominal current for U_P. Unit: mA Value range: 1000 ... 3000_{dec} See chapter Overload protection [▶ 36].	UINT16	RW	0x0BB8 (3000_{dec})
8030:14	Nominal Sum Current	Nominal maximum sum current (Us+Up) at the output. See chapter Overcurrent protection for sum currents [▶ 38].	UINT16	RW	0x1770 (6000_{dec})
8030:15	Timestamp 1 Trigger	Defines which events are detected by the peak value detector at this port. Possible values: • 0: Error Us • 1: Error Up • 2: Warning Us • 3: Warning Up • 7: Error Sum Current • 8: Warning Sum Current • 16: Minimum Current Us • 17: Maximum Current Us • 18: Minimum Current Up • 19: Maximum Current Up See chapter Peak value detector [▶ 44].	UINT16	RW	0x0000 (0_{dec})
8030:16	Timestamp 2 Trigger	See 8030:15	UINT16	RW	0x0000 (0_{dec})

Index 8040 LOG Settings

Index (hex)	Name	Meaning	Data type	Flags	Default
8040:0	LOG Settings		UINT8	RO	0x11 (17_{dec})
8040:11	Sampling Rate	Sampling rate of the data logger • 1: 1 ms • 10: 10 ms • 25: 25 ms • 100: 100 ms • 1000: 1000 ms See chapter Data logger [▶ 41].	UINT16	RW	0x000A (10_{dec})

Index F707 DPO Outputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
707F: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 (80n0:02, 80n0:03) 1_{bin}: All outputs are set according to their PDOs (70n0:01, 70n0:02) See chapter Switch output voltages [▶ 47].	BOOLEAN	RO	0x00 (0_{dec})
707F:04	Global Reset	Reset all errors.	BOOLEAN	RO	0x00 (0_{dec})
707F:11	Reset Extended Diag Data	Reset all values of the peak value detector. See chapter Peak value detector [▶ 44].	BOOLEAN	RO	0x00 (0_{dec})

Index F80E DPO Settings Device

Index (hex)	Name	Meaning	Data type	Flags	Default
F80E:0	DPO Settings Device		UINT8	RO	0x16 (22_{dec})
F80E:02	Enable Sum Current Limitation	Enables the overcurrent protection for the sum current $\sum U_S + \sum U_P$.	BOOLEAN	RW	0x00 (0_{dec})
F80E:05	Disable Up Undervoltage Error	Disables the undervoltage protection for the peripheral voltage U_P.	BOOLEAN	RW	0x00 (0_{dec})
F80E:11	Startup Delay	Sets the time that is kept between two switch-on procedures: • 0: Fast (10 ms) • 1: Moderate (100 ms) • 2: Slow (200 ms)	UINT16	RW	0x0001 (1_{dec})
F80E:12	Nominal Sum Current	Nominal maximum current for the sum current.	INT16	RW	0x5DC0 (24000_{dec})
F80E:13	Sum Current Characteristic	Specifies the characteristic with which the current monitoring reacts: • 0: Very fast acting • 1: Fast acting • 2: Slow acting • 3: Time delay	UINT16	RW	0x0001 (1_{dec})
F80E:15	Timestamp 1 Trigger	Defines which events are detected by the peak value detector. Possible values: • 0: Temperature Warning • 1: Temperature Error • 2: Us Warning • 3: Us Error • 4: Up Warning • 5: Up Error • 7: Sum Current Warning • 8: Sum Current Error • 16: Minimum Current Us • 17: Maximum Current Us • 18: Minimum Current Up • 19: Maximum Current Up • 20: Minimum Voltage Us • 21: Maximum Voltage Us • 22: Minimum Voltage Up • 23: Maximum Voltage Up • 24: Minimum Temperature • 25: Maximum Temperature See chapter Peak value detector [▶ 44].	UINT16	RW	0x0000 (0_{dec})
F80E:16	Timestamp 2 Trigger	See F80E:15.	UINT16	RW	0x0000 (0_{dec})

6.2 Standard objects

Index 1000 Device type

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

Index 1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EP9224-2037

Index 1009 Hardware version

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

Index 100A Software version

Index (hex)	Name	Meaning	Data type	Flags	Default
100A:0	Software version	Firmware version of the EtherCAT slave	STRING	RO	07

Index 100B Bootloader version

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

Index 1018 Identity

Index (hex)	Name	Meaning	Data type	Flags	Default
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4_{dec})
1018:01	Vendor ID	Vendor ID of the EtherCAT slave	UINT32	RO	0x00000002 (2_{dec})
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	0x24084052 (604520530_{dec})
1018:03	Revision	Revision number of the EtherCAT slave; the Low Word (bit 0-15) indicates the special terminal number, the High Word (bit 16-31) refers to the device description	UINT32	RO	0x00000000 (0_{dec})
1018:04	Serial number	Serial number of the EtherCAT slave; the Low Byte (bit 0-7) of the Low Word contains the year of production, the High Byte (bit 8-15) of the Low Word contains the week of production, the High Word (bit 16-31) is 0	UINT32	RO	0x00000000 (0_{dec})

Index 10F0 Backup parameter handling

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

Index 1600 DPO RxPDO-Map Outputs Ch.1

Index (hex)	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

Index 1601 DPO RxPDO-Map Extended Diag Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	DPO RxPDO-Map Extended Diag Outputs Ch.1	PDO Mapping RxPDO 2	UINT8	RO	0x02 (2_{dec})
1601:01	SubIndex 001	1. PDO Mapping entry (object 0x7000 (DPO Outputs Ch.1), entry 0x11 (Reset Extended Diag Data))	UINT32	RO	0x7000:11, 1
1601:02	SubIndex 002	2. PDO Mapping entry (15 bits align)	UINT32	RO	0x0000:00, 15

Index 1602 DPO RxPDO-Map Outputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1602:0	DPO RxPDO-Map Outputs Ch.2	PDO Mapping RxPDO 3	UINT8	RO	0x06 (6_{dec})
1602:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (DPO Outputs Ch.2), entry 0x01 (Output Us))	UINT32	RO	0x7010:01, 1
1602:02	SubIndex 002	2. PDO Mapping entry (object 0x7010 (DPO Outputs Ch.2), entry 0x02 (Output Up))	UINT32	RO	0x7010:02, 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 0x7010 (DPO Outputs Ch.2), entry 0x05 (Reset Us))	UINT32	RO	0x7010:05, 1
1602:05	SubIndex 005	5. PDO Mapping entry (object 0x7010 (DPO Outputs Ch.2), entry 0x06 (Reset Up))	UINT32	RO	0x7010:06, 1
1602:06	SubIndex 006	6. PDO Mapping entry (10 bits align)	UINT32	RO	0x0000:00, 10

Index 1603 DPO RxPDO-Map Extended Diag Outputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1603:0	DPO RxPDO-Map Extended Diag Outputs Ch.2	PDO Mapping RxPDO 4	UINT8	RO	0x02 (2_{dec})
1603:01	SubIndex 001	1. PDO Mapping entry (object 0x7010 (DPO Outputs Ch.2), entry 0x11 (Reset Extended Diag Data))	UINT32	RO	0x7010:11, 1
1603:02	SubIndex 002	2. PDO Mapping entry (15 bits align)	UINT32	RO	0x0000:00, 15

Index 1604 DPO RxPDO-Map Outputs Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
1604:0	DPO RxPDO-Map Outputs Ch.3	PDO Mapping RxPDO 5	UINT8	RO	0x06 (6_{dec})
1604:01	SubIndex 001	1. PDO Mapping entry (object 0x7020 (DPO Outputs Ch.3), entry 0x01 (Output Us))	UINT32	RO	0x7020:01, 1
1604:02	SubIndex 002	2. PDO Mapping entry (object 0x7020 (DPO Outputs Ch.3), entry 0x02 (Output Up))	UINT32	RO	0x7020:02, 1
1604:03	SubIndex 003	3. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1604:04	SubIndex 004	4. PDO Mapping entry (object 0x7020 (DPO Outputs Ch.3), entry 0x05 (Reset Us))	UINT32	RO	0x7020:05, 1
1604:05	SubIndex 005	5. PDO Mapping entry (object 0x7020 (DPO Outputs Ch.3), entry 0x06 (Reset Up))	UINT32	RO	0x7020:06, 1
1604:06	SubIndex 006	6. PDO Mapping entry (10 bits align)	UINT32	RO	0x0000:00, 10

Index 1605 DPO RxPDO-Map Extended Diag Outputs Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
1605:0	DPO RxPDO-Map Extended Diag Outputs Ch.3	PDO Mapping RxPDO 6	UINT8	RO	0x02 (2_{dec})
1605:01	SubIndex 001	1. PDO Mapping entry (object 0x7020 (DPO Outputs Ch.3), entry 0x11 (Reset Extended Diag Data))	UINT32	RO	0x7020:11, 1
1605:02	SubIndex 002	2. PDO Mapping entry (15 bits align)	UINT32	RO	0x0000:00, 15

Index 1606 DPO RxPDO-Map Outputs Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
1606:0	DPO RxPDO-Map Outputs Ch.4	PDO Mapping RxPDO 7	UINT8	RO	0x06 (6_{dec})
1606:01	SubIndex 001	1. PDO Mapping entry (object 0x7030 (DPO Outputs Ch.4), entry 0x01 (Output Us))	UINT32	RO	0x7030:01, 1
1606:02	SubIndex 002	2. PDO Mapping entry (object 0x7030 (DPO Outputs Ch.4), entry 0x02 (Output Up))	UINT32	RO	0x7030:02, 1
1606:03	SubIndex 003	3. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1606:04	SubIndex 004	4. PDO Mapping entry (object 0x7030 (DPO Outputs Ch.4), entry 0x05 (Reset Us))	UINT32	RO	0x7030:05, 1
1606:05	SubIndex 005	5. PDO Mapping entry (object 0x7030 (DPO Outputs Ch.4), entry 0x06 (Reset Up))	UINT32	RO	0x7030:06, 1
1606:06	SubIndex 006	6. PDO Mapping entry (10 bits align)	UINT32	RO	0x0000:00, 10

Index 1607 DPO RxPDO-Map Extended Diag Outputs Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
1607:0	DPO RxPDO-Map Extended Diag Outputs Ch.4	PDO Mapping RxPDO 8	UINT8	RO	0x02 (2_{dec})
1607:01	SubIndex 001	1. PDO Mapping entry (object 0x7030 (DPO Outputs Ch.4), entry 0x11 (Reset Extended Diag Data))	UINT32	RO	0x7030:11, 1
1607:02	SubIndex 002	2. PDO Mapping entry (15 bits align)	UINT32	RO	0x0000:00, 15

Index 1608 DPO RxPDO-Map Outputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
1608:0	DPO RxPDO-Map Outputs Device	PDO Mapping RxPDO 9	UINT8	RO	0x04 (4_{dec})
1608:01	SubIndex 001	1. PDO Mapping entry (object 0xF707 (DPO Outputs Device), entry 0x01 (Enable Control Via Fieldbus))	UINT32	RO	0xF707:01, 1
1608:02	SubIndex 002	2. PDO Mapping entry (2 bits align)	UINT32	RO	0x0000:00, 2
1608:03	SubIndex 003	3. PDO Mapping entry (object 0xF707 (DPO Outputs Device), entry 0x04 (Global Reset))	UINT32	RO	0xF707:04, 1
1608:04	SubIndex 004	4. PDO Mapping entry (12 bits align)	UINT32	RO	0x0000:00, 12

Index 1609 DPO RxPDO-Map Extended Diag Outputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
1609:0	DPO RxPDO-Map Extended Diag Outputs Device	PDO Mapping RxPDO 10	UINT8	RO	0x02 (2_{dec})
1609:01	SubIndex 001	1. PDO Mapping entry (object 0xF707 (DPO Outputs Device), entry 0x11 (Reset Extended Diag Data))	UINT32	RO	0xF707:11, 1
1609:02	SubIndex 002	2. PDO Mapping entry (15 bits align)	UINT32	RO	0x0000:00, 15

Index 1610 LOG RxPDO-Map Control

Index (hex)	Name	Meaning	Data type	Flags	Default
1610:0	LOG RxPDO-Map Control	PDO Mapping RxPDO 17	UINT8	RO	0x03 (3_{dec})
1610:01	SubIndex 001	1. PDO Mapping entry (object 0x7040 (LOG Control), entry 0x01 (Start Logger))	UINT32	RO	0x7040:01, 1
1610:02	SubIndex 002	2. PDO Mapping entry (object 0x7040 (LOG Control), entry 0x02 (Stop Logger))	UINT32	RO	0x7040:02, 1
1610:03	SubIndex 003	3. PDO Mapping entry (14 bits align)	UINT32	RO	0x0000:00, 14

Index 1A00 DPO TxPDO-Map Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A00:0	DPO TxPDO-Map Inputs Ch.1	PDO Mapping TxPDO 1	UINT8	RO	0x0E (14_{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 (object 0x6000 (DPO Inputs Ch.1), entry 0x08 (Error Sum Current))	UINT32	RO	0x6000:08, 1
1A00:09	SubIndex 009	9. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x09 (Warning Sum Current))	UINT32	RO	0x6000:09, 1
1A00:0A	SubIndex 010	10. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A00:0B	SubIndex 011	11. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x0F (TxPDO State))	UINT32	RO	0x6000:0F, 1
1A00:0C	SubIndex 012	12. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6000:10, 1
1A00:0D	SubIndex 013	13. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x11 (Current Us))	UINT32	RO	0x6000:11, 16
1A00:0E	SubIndex 014	14. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x12 (Current Up))	UINT32	RO	0x6000:12, 16

Index 1A01 DPO TxPDO-Map Extended Diag Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	DPO TxPDO-Map Extended Diag Inputs Ch.1	PDO Mapping TxPDO 2	UINT8	RO	0x04 (4_{dec})
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x13 (Peak Value 1))	UINT32	RO	0x6000:13, 16
1A01:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x14 (Peak Value 2))	UINT32	RO	0x6000:14, 16
1A01:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x17 (Timestamp 1))	UINT32	RO	0x6000:17, 64
1A01:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (DPO Inputs Ch.1), entry 0x18 (Timestamp 2))	UINT32	RO	0x6000:18, 64

Index 1A02 DPO TxPDO-Map Inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A02:0	DPO TxPDO-Map Inputs Ch.2	PDO Mapping TxPDO 3	UINT8	RO	0x0E (14_{dec})
1A02:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x01 (Error Us))	UINT32	RO	0x6010:01, 1
1A02:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x02 (Error Up))	UINT32	RO	0x6010:02, 1
1A02:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x03 (Warning Us))	UINT32	RO	0x6010:03, 1
1A02:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x04 (Warning Up))	UINT32	RO	0x6010:04, 1
1A02:05	SubIndex 005	5. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x05 (Status Us))	UINT32	RO	0x6010:05, 1
1A02:06	SubIndex 006	6. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x06 (Status Up))	UINT32	RO	0x6010:06, 1
1A02:07	SubIndex 007	7. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x07 (Channel Error))	UINT32	RO	0x6010:07, 1
1A02:08	SubIndex 008	8. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x08 (Error Sum Current))	UINT32	RO	0x6010:08, 1
1A02:09	SubIndex 009	9. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x09 (Warning Sum Current))	UINT32	RO	0x6010:09, 1
1A02:0A	SubIndex 010	10. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A02:0B	SubIndex 011	11. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x0F (TxPDO State))	UINT32	RO	0x6010:0F, 1
1A02:0C	SubIndex 012	12. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6010:10, 1
1A02:0D	SubIndex 013	13. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x11 (Current Us))	UINT32	RO	0x6010:11, 16
1A02:0E	SubIndex 014	14. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x12 (Current Up))	UINT32	RO	0x6010:12, 16

Index 1A03 DPO TxPDO-Map Extended Diag Inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
1A03:0	DPO TxPDO-Map Extended Diag Inputs Ch.2	PDO Mapping TxPDO 4	UINT8	RO	0x04 (4_{dec})
1A03:01	SubIndex 001	1. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x13 (Peak Value 1))	UINT32	RO	0x6010:13, 16
1A03:02	SubIndex 002	2. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x14 (Peak Value 2))	UINT32	RO	0x6010:14, 16
1A03:03	SubIndex 003	3. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x17 (Timestamp 1))	UINT32	RO	0x6010:17, 64
1A03:04	SubIndex 004	4. PDO Mapping entry (object 0x6010 (DPO Inputs Ch.2), entry 0x18 (Timestamp 2))	UINT32	RO	0x6010:18, 64

Index 1A04 DPO TxPDO-Map Inputs Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
1A04:0	DPO TxPDO-Map Inputs Ch.3	PDO Mapping TxPDO 5	UINT8	RO	0x0E (14_{dec})
1A04:01	SubIndex 001	1. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x01 (Error Us))	UINT32	RO	0x6020:01, 1
1A04:02	SubIndex 002	2. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x02 (Error Up))	UINT32	RO	0x6020:02, 1
1A04:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x03 (Warning Us))	UINT32	RO	0x6020:03, 1
1A04:04	SubIndex 004	4. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x04 (Warning Up))	UINT32	RO	0x6020:04, 1
1A04:05	SubIndex 005	5. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x05 (Status Us))	UINT32	RO	0x6020:05, 1
1A04:06	SubIndex 006	6. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x06 (Status Up))	UINT32	RO	0x6020:06, 1
1A04:07	SubIndex 007	7. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x07 (Channel Error))	UINT32	RO	0x6020:07, 1
1A04:08	SubIndex 008	8. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x08 (Error Sum Current))	UINT32	RO	0x6020:08, 1
1A04:09	SubIndex 009	9. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x09 (Warning Sum Current))	UINT32	RO	0x6020:09, 1
1A04:0A	SubIndex 010	10. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A04:0B	SubIndex 011	11. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x0F (TxPDO State))	UINT32	RO	0x6020:0F, 1
1A04:0C	SubIndex 012	12. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6020:10, 1
1A04:0D	SubIndex 013	13. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x11 (Current Us))	UINT32	RO	0x6020:11, 16
1A04:0E	SubIndex 014	14. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x12 (Current Up))	UINT32	RO	0x6020:12, 16

Index 1A05 DPO TxPDO-Map Extended Diag Inputs Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
1A05:0	DPO TxPDO-Map Extended Diag Inputs Ch.3	PDO Mapping TxPDO 6	UINT8	RO	0x04 (4_{dec})
1A05:01	SubIndex 001	1. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x13 (Peak Value 1))	UINT32	RO	0x6020:13, 16
1A05:02	SubIndex 002	2. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x14 (Peak Value 2))	UINT32	RO	0x6020:14, 16
1A05:03	SubIndex 003	3. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x17 (Timestamp 1))	UINT32	RO	0x6020:17, 64
1A05:04	SubIndex 004	4. PDO Mapping entry (object 0x6020 (DPO Inputs Ch.3), entry 0x18 (Timestamp 2))	UINT32	RO	0x6020:18, 64

Index 1A06 DPO TxPDO-Map Inputs Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
1A06:0	DPO TxPDO-Map Inputs Ch.4	PDO Mapping TxPDO 7	UINT8	RO	0x0E (14_{dec})
1A06:01	SubIndex 001	1. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x01 (Error Us))	UINT32	RO	0x6030:01, 1
1A06:02	SubIndex 002	2. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x02 (Error Up))	UINT32	RO	0x6030:02, 1
1A06:03	SubIndex 003	3. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x03 (Warning Us))	UINT32	RO	0x6030:03, 1
1A06:04	SubIndex 004	4. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x04 (Warning Up))	UINT32	RO	0x6030:04, 1
1A06:05	SubIndex 005	5. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x05 (Status Us))	UINT32	RO	0x6030:05, 1
1A06:06	SubIndex 006	6. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x06 (Status Up))	UINT32	RO	0x6030:06, 1
1A06:07	SubIndex 007	7. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x07 (Channel Error))	UINT32	RO	0x6030:07, 1
1A06:08	SubIndex 008	8. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x08 (Error Sum Current))	UINT32	RO	0x6030:08, 1
1A06:09	SubIndex 009	9. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x09 (Warning Sum Current))	UINT32	RO	0x6030:09, 1
1A06:0A	SubIndex 010	10. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A06:0B	SubIndex 011	11. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x0F (TxPDO State))	UINT32	RO	0x6030:0F, 1
1A06:0C	SubIndex 012	12. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x10 (TxPDO Toggle))	UINT32	RO	0x6030:10, 1
1A06:0D	SubIndex 013	13. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x11 (Current Us))	UINT32	RO	0x6030:11, 16
1A06:0E	SubIndex 014	14. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x12 (Current Up))	UINT32	RO	0x6030:12, 16

Index 1A07 DPO TxPDO-Map Extended Diag Inputs Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
1A07:0	DPO TxPDO-Map Extended Diag Inputs Ch.4	PDO Mapping TxPDO 8	UINT8	RO	0x04 (4_{dec})
1A07:01	SubIndex 001	1. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x13 (Peak Value 1))	UINT32	RO	0x6030:13, 16
1A07:02	SubIndex 002	2. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x14 (Peak Value 2))	UINT32	RO	0x6030:14, 16
1A07:03	SubIndex 003	3. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x17 (Timestamp 1))	UINT32	RO	0x6030:17, 64
1A07:04	SubIndex 004	4. PDO Mapping entry (object 0x6030 (DPO Inputs Ch.4), entry 0x18 (Timestamp 2))	UINT32	RO	0x6030:18, 64

Index 1A08 DPO TxPDO-Map Inputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
1A08:0	DPO TxPDO-Map Inputs Device	PDO Mapping TxPDO 9	UINT8	RO	0x11 (17_{dec})
1A08:01	SubIndex 001	1. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x01 (Temperature Warning))	UINT32	RO	0xF607:01, 1
1A08:02	SubIndex 002	2. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x02 (Temperature Error))	UINT32	RO	0xF607:02, 1
1A08:03	SubIndex 003	3. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x03 (Us Warning))	UINT32	RO	0xF607:03, 1
1A08:04	SubIndex 004	4. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x04 (Us Error))	UINT32	RO	0xF607:04, 1
1A08:05	SubIndex 005	5. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x05 (Up Warning))	UINT32	RO	0xF607:05, 1
1A08:06	SubIndex 006	6. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x06 (Up Error))	UINT32	RO	0xF607:06, 1
1A08:07	SubIndex 007	7. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x07 (Global Error Bit))	UINT32	RO	0xF607:07, 1
1A08:08	SubIndex 008	8. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x08 (Sum Current Warning))	UINT32	RO	0xF607:08, 1
1A08:09	SubIndex 009	9. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x09 (Sum Current Error))	UINT32	RO	0xF607:09, 1
1A08:0A	SubIndex 010	10. PDO Mapping entry (5 bits align)	UINT32	RO	0x0000:00, 5
1A08:0B	SubIndex 011	11. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x0F (TxPDO State))	UINT32	RO	0xF607:0F, 1
1A08:0C	SubIndex 012	12. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x10 (TxPDO Toggle))	UINT32	RO	0xF607:10, 1
1A08:0D	SubIndex 013	13. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x11 (Current Us))	UINT32	RO	0xF607:11, 16
1A08:0E	SubIndex 014	14. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x12 (Current Up))	UINT32	RO	0xF607:12, 16
1A08:0F	SubIndex 015	15. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x13 (Voltage Us))	UINT32	RO	0xF607:13, 16
1A08:10	SubIndex 016	16. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x14 (Voltage Up))	UINT32	RO	0xF607:14, 16
1A08:11	SubIndex 017	17. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x15 (Temperature))	UINT32	RO	0xF607:15, 16

Index 1A09 DPO TxPDO-Map Extended Diag Inputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
1A09:0	DPO TxPDO-Map Extended Diag Inputs Device	PDO Mapping TxPDO 10	UINT8	RO	0x04 (4_{dec})
1A09:01	SubIndex 001	1. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x16 (Peak Value 1))	UINT32	RO	0xF607:16, 16
1A09:02	SubIndex 002	2. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x17 (Peak Value 2))	UINT32	RO	0xF607:17, 16
1A09:03	SubIndex 003	3. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x18 (Timestamp 1))	UINT32	RO	0xF607:18, 64
1A09:04	SubIndex 004	4. PDO Mapping entry (object 0xF607 (DPO Inputs Device), entry 0x19 (Timestamp 2))	UINT32	RO	0xF607:19, 64

Index 1A10 LOG TxPDO-Map Status

Index (hex)	Name	Meaning	Data type	Flags	Default
1A10:0	LOG TxPDO-Map Status	PDO Mapping TxPDO 17	UINT8	RO	0x04 (4_{dec})
1A10:01	SubIndex 001	1. PDO Mapping entry (object 0x6040 (LOG Status), entry 0x01 (Logger Running))	UINT32	RO	0x6040:01, 1
1A10:02	SubIndex 002	2. PDO Mapping entry (15 bits align)	UINT32	RO	0x0000:00, 15
1A10:03	SubIndex 003	3. PDO Mapping entry (object 0x6040 (LOG Status), entry 0x11 (Elapsed Time))	UINT32	RO	0x6040:11, 32
1A10:04	SubIndex 004	4. PDO Mapping entry (object 0x6040 (LOG Status), entry 0x12 (Trigger Reason))	UINT32	RO	0x6040:12, 16

Index 1C00 Sync manager type

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

Index 1C12 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	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	0x1602 (5634_{dec})
1C12:03	Subindex 003	3. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1604 (5636_{dec})
1C12:04	Subindex 004	4. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1606 (5638_{dec})
1C12:05	Subindex 005	5. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1608 (5640_{dec})
1C12:06	Subindex 006	6. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:07	Subindex 007	7. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:08	Subindex 008	8. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:09	Subindex 009	9. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:0A	Subindex 010	10. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C12:0B	Subindex 011	11. allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})

Index 1C13 TxPDO assign

Index (hex)	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	0x1A02 (6658_{dec})
1C13:03	Subindex 003	3. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A04 (6660_{dec})
1C13:04	Subindex 004	4. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A06 (6662_{dec})
1C13:05	Subindex 005	5. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A08 (6664_{dec})
1C13:06	Subindex 006	6. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:07	Subindex 007	7. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:08	Subindex 008	8. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:09	Subindex 009	9. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:0A	Subindex 010	10. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})
1C13:0B	Subindex 011	11. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x0000 (0_{dec})

Index 1C32 SM output parameter

Index (hex)	Name	Meaning	Data type	Flags	Default
1C32:0	SM output parameter	Synchronization parameters for the outputs	UINT8	RO	0x20 (32_{dec})
1C32:01	Sync mode	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: cycle time of the master • 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	0x00000000 (0_{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	0x0001 (1_{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	0x00000000 (0_{dec})
1C32:08	Get Cycle Time	Possible values: • 0: Stop measurement of the local cycle time • 1: Start measurement of the local cycle time The parameters 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	0x00000000 (0_{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})

Index 1C33 SM input parameter

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

6.3 Profile-specific objects

Index 6000 DPO Inputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
6000:0	DPO Inputs Ch.1		UINT8	RO	0x18 (24_{dec})
6000:01	Error Us		BOOLEAN	RO	0x00 (0_{dec})
6000:02	Error Up		BOOLEAN	RO	0x00 (0_{dec})
6000:03	Warning Us		BOOLEAN	RO	0x00 (0_{dec})
6000:04	Warning Up		BOOLEAN	RO	0x00 (0_{dec})
6000:05	Status Us		BOOLEAN	RO	0x00 (0_{dec})
6000:06	Status Up		BOOLEAN	RO	0x00 (0_{dec})
6000:07	Channel Error		BOOLEAN	RO	0x00 (0_{dec})
6000:08	Error Sum Current		BOOLEAN	RO	0x00 (0_{dec})
6000:09	Warning Sum Current		BOOLEAN	RO	0x00 (0_{dec})
6000:0F	TxPDO State		BOOLEAN	RO	0x00 (0_{dec})
6000:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
6000:11	Current Us		INT16	RO	0x0000 (0_{dec})
6000:12	Current Up		INT16	RO	0x0000 (0_{dec})
6000:13	Peak Value 1		INT16	RO	0x0000 (0_{dec})
6000:14	Peak Value 2		INT16	RO	0x0000 (0_{dec})
6000:17	Timestamp 1		UINT64	RO	
6000:18	Timestamp 2		UINT64	RO	

Index 6010 DPO Inputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
6010:0	DPO Inputs Ch.2		UINT8	RO	0x18 (24_{dec})
6010:01	Error Us		BOOLEAN	RO	0x00 (0_{dec})
6010:02	Error Up		BOOLEAN	RO	0x00 (0_{dec})
6010:03	Warning Us		BOOLEAN	RO	0x00 (0_{dec})
6010:04	Warning Up		BOOLEAN	RO	0x00 (0_{dec})
6010:05	Status Us		BOOLEAN	RO	0x00 (0_{dec})
6010:06	Status Up		BOOLEAN	RO	0x00 (0_{dec})
6010:07	Channel Error		BOOLEAN	RO	0x00 (0_{dec})
6010:08	Error Sum Current		BOOLEAN	RO	0x00 (0_{dec})
6010:09	Warning Sum Current		BOOLEAN	RO	0x00 (0_{dec})
6010:0F	TxPDO State		BOOLEAN	RO	0x00 (0_{dec})
6010:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
6010:11	Current Us		INT16	RO	0x0000 (0_{dec})
6010:12	Current Up		INT16	RO	0x0000 (0_{dec})
6010:13	Peak Value 1		INT16	RO	0x0000 (0_{dec})
6010:14	Peak Value 2		INT16	RO	0x0000 (0_{dec})
6010:17	Timestamp 1		UINT64	RO	
6010:18	Timestamp 2		UINT64	RO	

Index 6020 DPO Inputs Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
6020:0	DPO Inputs Ch.3		UINT8	RO	0x18 (24_{dec})
6020:01	Error Us		BOOLEAN	RO	0x00 (0_{dec})
6020:02	Error Up		BOOLEAN	RO	0x00 (0_{dec})
6020:03	Warning Us		BOOLEAN	RO	0x00 (0_{dec})
6020:04	Warning Up		BOOLEAN	RO	0x00 (0_{dec})
6020:05	Status Us		BOOLEAN	RO	0x00 (0_{dec})
6020:06	Status Up		BOOLEAN	RO	0x00 (0_{dec})
6020:07	Channel Error		BOOLEAN	RO	0x00 (0_{dec})
6020:08	Error Sum Current		BOOLEAN	RO	0x00 (0_{dec})
6020:09	Warning Sum Current		BOOLEAN	RO	0x00 (0_{dec})
6020:0F	TxPDO State		BOOLEAN	RO	0x00 (0_{dec})
6020:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
6020:11	Current Us		INT16	RO	0x0000 (0_{dec})
6020:12	Current Up		INT16	RO	0x0000 (0_{dec})
6020:13	Peak Value 1		INT16	RO	0x0000 (0_{dec})
6020:14	Peak Value 2		INT16	RO	0x0000 (0_{dec})
6020:17	Timestamp 1		UINT64	RO	
6020:18	Timestamp 2		UINT64	RO	

Index 6030 DPO Inputs Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
6030:0	DPO Inputs Ch.4		UINT8	RO	0x18 (24_{dec})
6030:01	Error Us		BOOLEAN	RO	0x00 (0_{dec})
6030:02	Error Up		BOOLEAN	RO	0x00 (0_{dec})
6030:03	Warning Us		BOOLEAN	RO	0x00 (0_{dec})
6030:04	Warning Up		BOOLEAN	RO	0x00 (0_{dec})
6030:05	Status Us		BOOLEAN	RO	0x00 (0_{dec})
6030:06	Status Up		BOOLEAN	RO	0x00 (0_{dec})
6030:07	Channel Error		BOOLEAN	RO	0x00 (0_{dec})
6030:08	Error Sum Current		BOOLEAN	RO	0x00 (0_{dec})
6030:09	Warning Sum Current		BOOLEAN	RO	0x00 (0_{dec})
6030:0F	TxPDO State		BOOLEAN	RO	0x00 (0_{dec})
6030:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
6030:11	Current Us		INT16	RO	0x0000 (0_{dec})
6030:12	Current Up		INT16	RO	0x0000 (0_{dec})
6030:13	Peak Value 1		INT16	RO	0x0000 (0_{dec})
6030:14	Peak Value 2		INT16	RO	0x0000 (0_{dec})
6030:17	Timestamp 1		UINT64	RO	
6030:18	Timestamp 2		UINT64	RO	

Index 6040 LOG Status

Index (hex)	Name	Meaning	Data type	Flags	Default
6040:0	LOG Status		UINT8	RO	0x12 (18_{dec})
6040:01	Logger Running		BOOLEAN	RO	0x00 (0_{dec})
6040:11	Elapsed Time		UINT32	RO	0x00000000 (0_{dec})
6040:12	Trigger Reason		UINT16	RO	0x0000 (0_{dec})

Index 7000 DPO Outputs Ch.1

Index (hex)	Name	Meaning	Data type	Flags	Default
7000:0	DPO Outputs Ch.1		UINT8	RO	0x11 (17_{dec})
7000:01	Output Us		BOOLEAN	RO	0x00 (0_{dec})
7000:02	Output Up		BOOLEAN	RO	0x00 (0_{dec})
7000:05	Reset Us		BOOLEAN	RO	0x00 (0_{dec})
7000:06	Reset Up		BOOLEAN	RO	0x00 (0_{dec})
7000:11	Reset Extended Diag Data		BOOLEAN	RO	0x00 (0_{dec})

Index 7010 DPO Outputs Ch.2

Index (hex)	Name	Meaning	Data type	Flags	Default
7010:0	DPO Outputs Ch.2		UINT8	RO	0x11 (17_{dec})
7010:01	Output Us		BOOLEAN	RO	0x00 (0_{dec})
7010:02	Output Up		BOOLEAN	RO	0x00 (0_{dec})
7010:05	Reset Us		BOOLEAN	RO	0x00 (0_{dec})
7010:06	Reset Up		BOOLEAN	RO	0x00 (0_{dec})
7010:11	Reset Extended Diag Data		BOOLEAN	RO	0x00 (0_{dec})

Index 7020 DPO Outputs Ch.3

Index (hex)	Name	Meaning	Data type	Flags	Default
7020:0	DPO Outputs Ch.3		UINT8	RO	0x11 (17_{dec})
7020:01	Output Us		BOOLEAN	RO	0x00 (0_{dec})
7020:02	Output Up		BOOLEAN	RO	0x00 (0_{dec})
7020:05	Reset Us		BOOLEAN	RO	0x00 (0_{dec})
7020:06	Reset Up		BOOLEAN	RO	0x00 (0_{dec})
7020:11	Reset Extended Diag Data		BOOLEAN	RO	0x00 (0_{dec})

Index 7030 DPO Outputs Ch.4

Index (hex)	Name	Meaning	Data type	Flags	Default
7030:0	DPO Outputs Ch.4		UINT8	RO	0x11 (17_{dec})
7030:01	Output Us		BOOLEAN	RO	0x00 (0_{dec})
7030:02	Output Up		BOOLEAN	RO	0x00 (0_{dec})
7030:05	Reset Us		BOOLEAN	RO	0x00 (0_{dec})
7030:06	Reset Up		BOOLEAN	RO	0x00 (0_{dec})
7030:11	Reset Extended Diag Data		BOOLEAN	RO	0x00 (0_{dec})

Index 7040 LOG Control

Index (hex)	Name	Meaning	Data type	Flags	Default
7040:0	LOG Control		UINT8	RO	0x02 (2_{dec})
7040:01	Start Logger		BOOLEAN	RO	0x00 (0_{dec})
7040:02	Stop Logger		BOOLEAN	RO	0x00 (0_{dec})

Index 800F DPO Vendor data Ch.1

Index (hex)	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})

Index 801F DPO Vendor data Ch.2

Index (hex)	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})

Index 802F DPO Vendor data Ch.3

Index (hex)	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})

Index 803F DPO Vendor data Ch.4

Index (hex)	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})

Index F000 Modular Device Profile

Index (hex)	Name	Meaning	Data type	Flags	Default
F000:0	Modular Device Profile	General information for the Modular Device Profile	UINT8	RO	0x02 (2_{dec})
F000:01	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	0x0005 (5_{dec})

Index F008 Code word

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

Index F010 Module Profile List

Index (hex)	Name	Meaning	Data type	Flags	Default
F010:0	Module Profile List		UINT8	RO	0x05 (5_{dec})
F010:01	SubIndex 001		UINT32	RO	0x0000010E (270_{dec})
F010:02	SubIndex 002		UINT32	RO	0x0000010E (270_{dec})
F010:03	SubIndex 003		UINT32	RO	0x0000010E (270_{dec})
F010:04	SubIndex 004		UINT32	RO	0x0000010E (270_{dec})
F010:05	SubIndex 005		UINT32	RO	0x00000384 (900_{dec})

Index F607 DPO Inputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
607F:0	DPO Inputs Device		UINT8	RO	0x19 (25_{dec})
F607:01	Warning Temperature		BOOLEAN	RO	0x00 (0_{dec})
607F:02	Error Temperature		BOOLEAN	RO	0x00 (0_{dec})
607F:03	Warning Us		BOOLEAN	RO	0x00 (0_{dec})
607F:04	Error Us		BOOLEAN	RO	0x00 (0_{dec})
607F:05	Warning Up		BOOLEAN	RO	0x00 (0_{dec})
607F:06	Error Up		BOOLEAN	RO	0x00 (0_{dec})
607F:07	Global Error Bit		BOOLEAN	RO	0x00 (0_{dec})
607F:08	Warning Sum Current		BOOLEAN	RO	0x00 (0_{dec})
607F:09	Error Sum Current		BOOLEAN	RO	0x00 (0_{dec})
F607:0F	TxPDO State		BOOLEAN	RO	0x00 (0_{dec})
607F:10	TxPDO Toggle		BOOLEAN	RO	0x00 (0_{dec})
607F:11	Current Us		INT16	RO	0x0000 (0_{dec})
607F:12	Current Up		INT16	RO	0x0000 (0_{dec})
607F:13	Voltage Us		INT16	RO	0x0000 (0_{dec})
607F:14	Voltage Up		INT16	RO	0x0000 (0_{dec})
607F:15	Temperature		INT16	RO	0x0000 (0_{dec})
607F:16	Peak Value 1		INT16	RO	0x0000 (0_{dec})
607F:17	Peak Value 2		INT16	RO	0x0000 (0_{dec})
607F:18	Timestamp 1		UINT64	RO	
607F:19	Timestamp 2		UINT64	RO	

Index F81F DPO Vendor Data Device

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

7 Appendix

7.1 General operating conditions

Protection rating according to IP code

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

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

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

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

Chemical resistance

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

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

Key

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

7.2 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
ZK1090-3xxx-xxxx	EtherCAT cable M8, green	Website
ZK1093-3xxx-xxxx	EtherCAT cable M8, yellow	Website
ZK2020-3xxx-xxxx	Power cable M8, 4-pin	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.

7.3 Version identification of EtherCAT devices

7.3.1 General notes on marking

Designation

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

- family key
- type
- version
- revision

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

Notes

- The elements mentioned above result in the **technical designation**. EL3314-0000-0016 is used in the example below.
- EL3314-0000 is the order identifier, in the case of “-0000” usually abbreviated to EL3314. “-0016” is the EtherCAT revision.
- The **order identifier** is made up of
  - family key (EL, EP, CU, ES, KL, CX, etc.)
  - type (3314)
  - version (-0000)
- The **revision** -0016 shows the technical progress, such as the extension of features with regard to the EtherCAT communication, and is managed by Beckhoff.
  In principle, a device with a higher revision can replace a device with a lower revision, unless specified otherwise, e.g. in the documentation.
  Associated and synonymous with each revision there is usually a description (ESI, EtherCAT Slave Information) in the form of an XML file, which is available for download from the Beckhoff web site.
  From 2014/01 the revision is shown on the outside of the IP20 terminals, see Fig. *“EL2872 with revision 0022 and serial number 01200815”*.
- The type, version and revision are read as decimal numbers, even if they are technically saved in hexadecimal.

7.3.2 Version identification of IP67 modules

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

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

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

Syntax: D ww yy x y z u

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

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

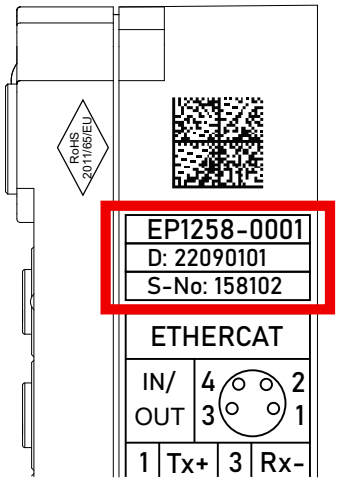


Fig. 7: EP1258-00001 IP67 EtherCAT Box with batch number/DateCode 22090101 and unique serial number 158102

7.3.3 Beckhoff Identification Code (BIC)

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

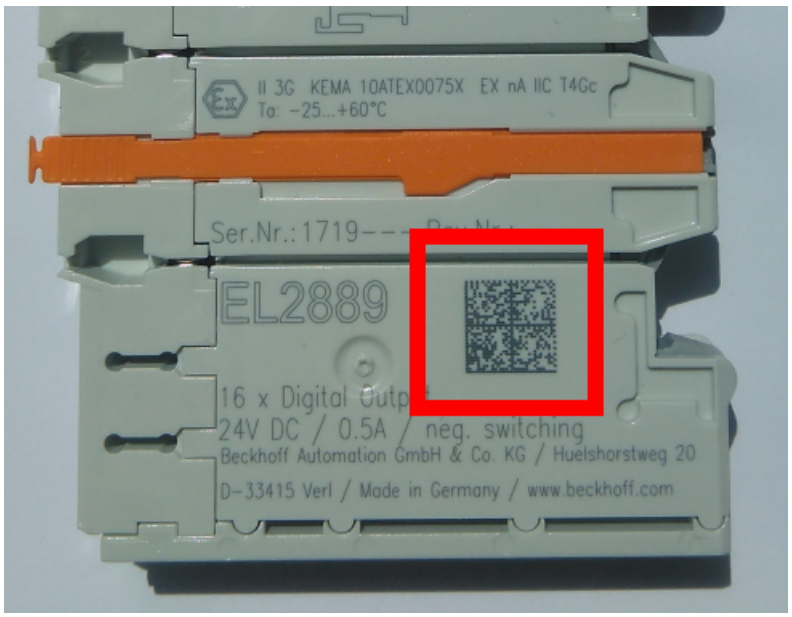


Fig. 8: BIC as data matrix code (DMC, code scheme ECC200)

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

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

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

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

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

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

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

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

Structure of the BIC

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

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

Accordingly as DMC:

Fig. 9: Example DMC **1P**072222**S**BTNk4p562d7**1K**EL1809 **Q**1 **51S**678294

BTN

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

NOTICE

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

7.3.4 Electronic access to the BIC (eBIC)

Electronic BIC (eBIC)

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

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

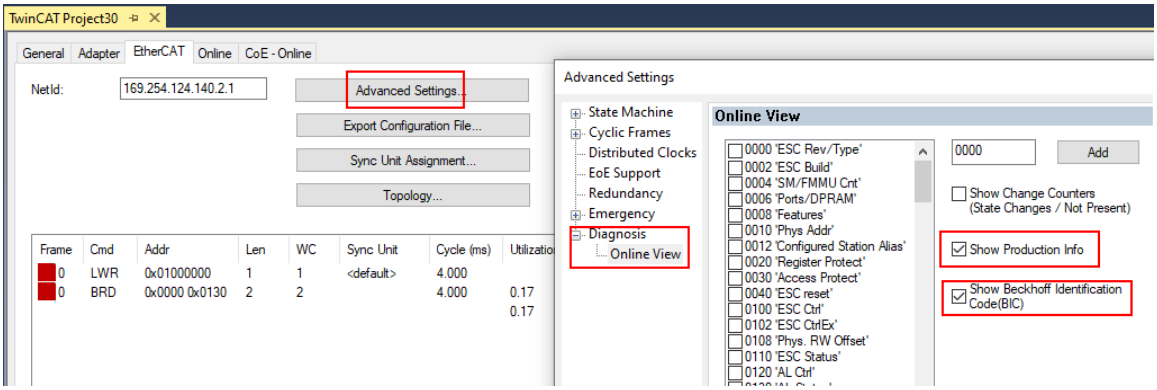
EtherCAT devices (IP20, IP67)

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

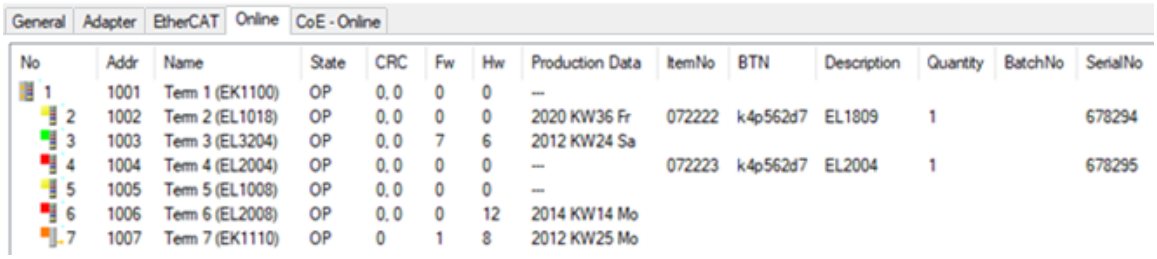
Beckhoff also stores the eBIC in the ESI-EEPROM. The eBIC was introduced into Beckhoff IO production (terminals, box modules) in 2020; as of 2023, implementation is largely complete.

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

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

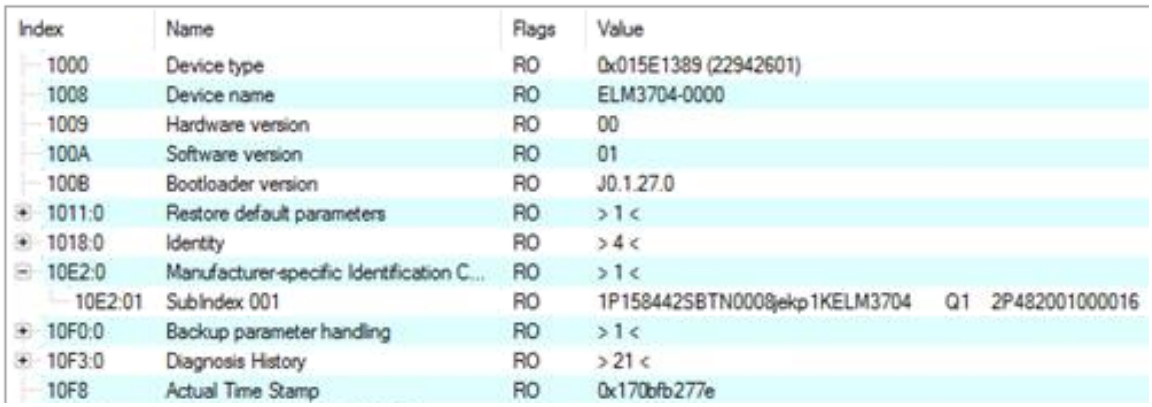


  - The BTN and its contents are then displayed:



  - Note: As shown in the figure, the production data HW version, FW version, and production date, which have been programmed since 2012, can also be displayed with "Show production info".
  - Access from the PLC: From TwinCAT 3.1. build 4024.24, the functions *FB_EcReadBIC* and *FB_EcReadBTN* for reading into the PLC are available in the Tc2_EtherCAT library from v3.3.19.0.
- EtherCAT devices with a CoE directory may also have the object 0x10E2:01 to display their own eBIC, which can also be easily accessed by the PLC:

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



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

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

7.4 Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

Beckhoff's branch offices and representatives

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

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

You will also find further documentation for Beckhoff components there.

Support

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

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

Hotline:	+49 5246 963 157
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web:	www.beckhoff.com/support

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

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- spare parts service
- hotline service

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