

Documentation | EN

# EP9576-1032

Brake chopper box





# Table of contents

<b>1 Foreword .....</b>	<b>5</b>
1.1 Notes on the documentation.....	5
1.2 Safety instructions .....	6
1.3 Documentation issue status .....	7
<b>2 EtherCAT Box - Introduction .....</b>	<b>8</b>
<b>3 Product overview.....</b>	<b>10</b>
3.1 Introduction.....	10
3.2 Block diagram.....	11
3.3 Technical data .....	11
3.4 Scope of supply .....	12
3.5 Process image.....	13
3.6 Technology .....	15
<b>4 Mounting and connections .....</b>	<b>16</b>
4.1 Mounting.....	16
4.1.1 Dimensions.....	16
4.1.2 Fixing .....	17
4.1.3 Functional earth (FE).....	17
4.2 Connections.....	18
4.2.1 Supply voltages .....	18
4.2.2 EtherCAT .....	20
<b>5 Commissioning and configuration .....</b>	<b>22</b>
5.1 Integration in TwinCAT .....	22
5.2 Open the parameter directory (CoE) .....	22
5.3 Chopper.....	23
5.4 Measured values .....	24
5.4.1 Temperatures .....	24
5.4.2 Current and voltage .....	26
5.5 Protective functions .....	27
5.5.1 Overtemperature protection.....	27
5.5.2 Overcurrent protection.....	27
5.6 Restoring the delivery state .....	28
5.7 Decommissioning .....	29
<b>6 CoE parameters .....</b>	<b>30</b>
6.1 Object directory .....	30
6.2 Object description.....	31
6.2.1 Objects for parameterization.....	31
6.2.2 Objects for information and diagnostics.....	32
6.2.3 Standard objects.....	33
6.2.4 PDO Mapping and PDO Assignment.....	35
6.2.5 Sync manager objects .....	37
<b>7 Appendix .....</b>	<b>39</b>
7.1 General operating conditions.....	39
7.2 Accessories .....	40

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7.3	Version identification of EtherCAT devices .....	41
7.3.1	Beckhoff Identification Code (BIC).....	45
7.4	Support and Service .....	47

# 1 Foreword

## 1.1 Notes on the documentation

### Intended audience

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

It is essential that the documentation and the following notes and explanations are followed when installing and commissioning these components.

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

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

### Disclaimer

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

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

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

### Trademarks

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### Patent Pending

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



**EtherCAT®**

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

## 1.2 Safety instructions

### Safety regulations

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

### Exclusion of liability

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

### Personnel qualification

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

### Description of instructions

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

#### DANGER

##### **Serious risk of injury!**

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

#### WARNING

##### **Risk of injury!**

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

#### CAUTION

##### **Personal injuries!**

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

#### NOTE

##### **Damage to environment/equipment or data loss**

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



##### **Tip or pointer**

This symbol indicates information that contributes to better understanding.

## 1.3 Documentation issue status

Version	Comment
1.0	• 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

WW - week of production (calendar week)

YY - year of production

FF - firmware version

HH - hardware version

Example with D no. 29 10 02 01:

29 - week of production 29

10 - year of production 2010

02 - firmware version 02

01 - hardware version 01

Further information on this topic: [Version identification of EtherCAT devices \[► 41\]](#).

## 2 EtherCAT Box - Introduction

The EtherCAT system has been extended with EtherCAT Box modules with protection class IP 67. Through the integrated EtherCAT interface the modules can be connected directly to an EtherCAT network without an additional Coupler Box. The high-performance of EtherCAT is thus maintained into each module.

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

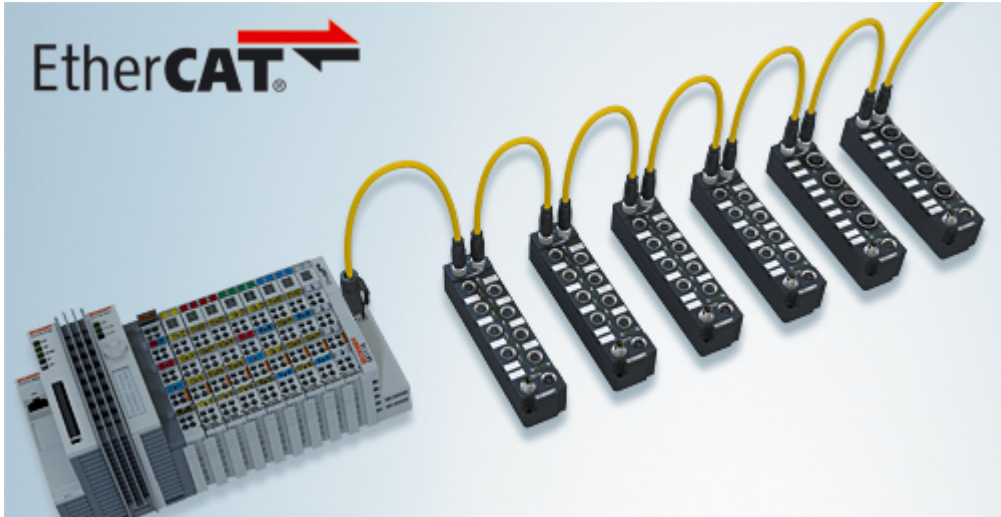


Fig. 1: EtherCAT Box Modules within an EtherCAT network

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

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

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

- digital inputs with different filters (3.0 ms or 10  $\mu$ s)
- 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

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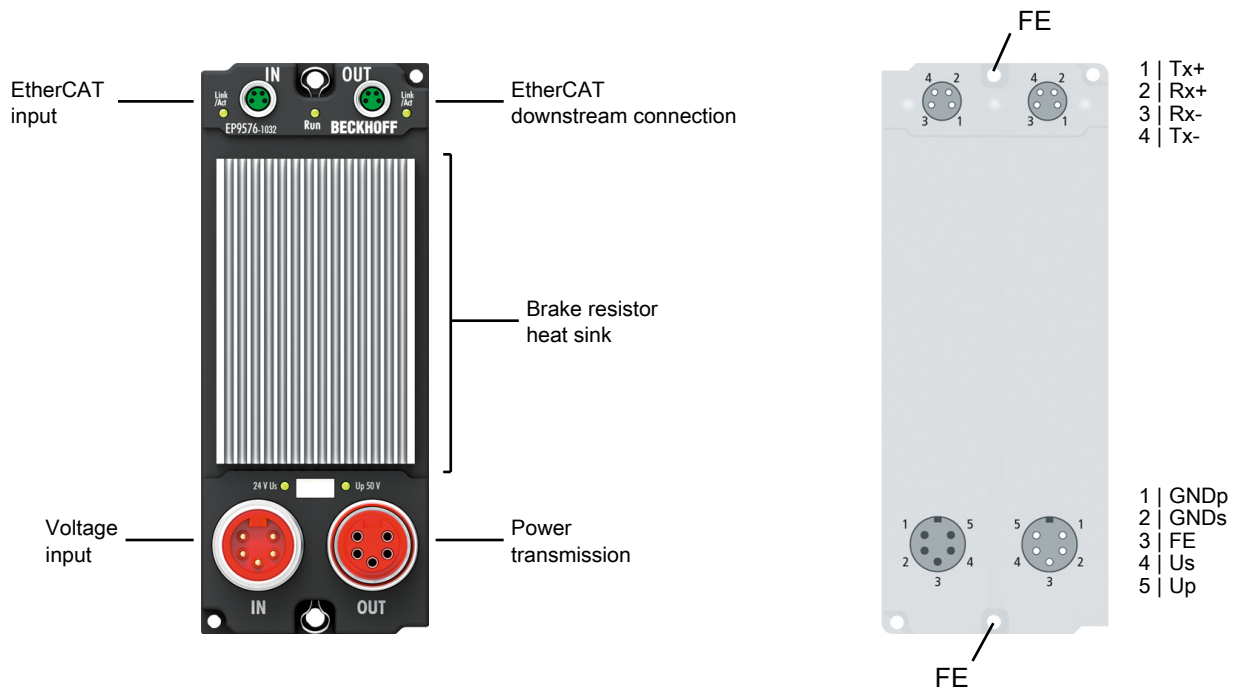
**● Basic EtherCAT documentation**

**i** 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](http://www.beckhoff.com)) under Downloads.

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## 3 Product overview

### 3.1 Introduction



The EP9576-1032 EtherCAT Box contains high-performance capacitors for stabilizing supply voltages. In connection with drive applications, reverse currents are stored and thus overvoltages are prevented. If the energy fed back exceeds the buffer capacity, it is dissipated.

The EP9576-1032 EtherCAT Box contains an integrated brake resistor for the dissipation of drive-related overvoltages. The brake resistor converts excess energy, generated when braking, motors into heat. The EP9576-1032 can be used in conjunction with the EP70xx stepper motor modules, the EP7211 servo motor modules or the EP7342 DC motor output stage.

The EP9576 features internal diagnostic functions. Warnings or error messages, e.g. on reaching/exceeding the permissible limit temperature values are signalled via EtherCAT.

#### Quick links

[Technical data](#) [▶ 11]

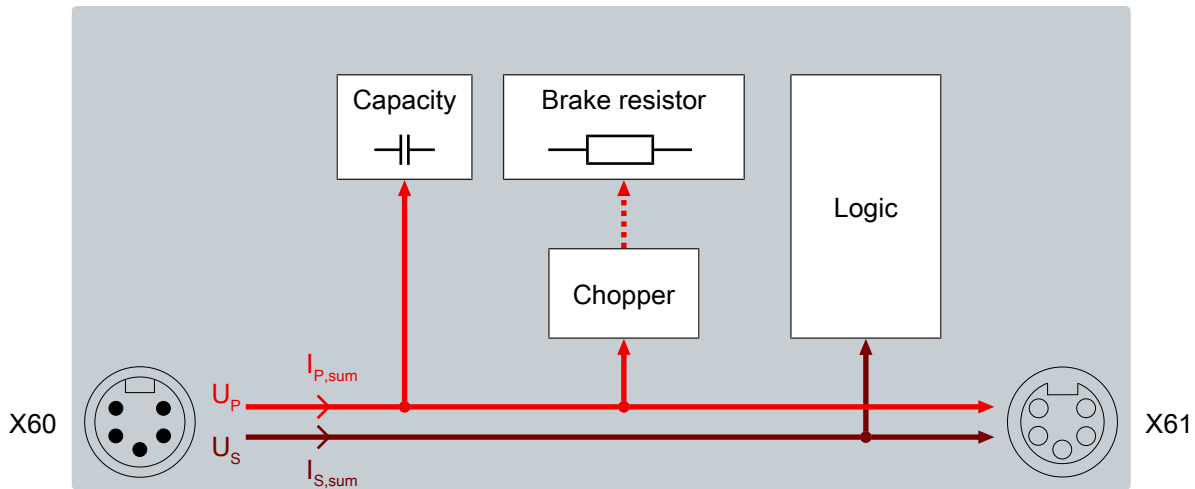
[Process image](#) [▶ 13]

[Connections](#) [▶ 18]

[Commissioning](#) [▶ 22]

### 3.2 Block diagram

The block diagram shows the distribution of the voltages  $U_S$  and  $U_P$  inside the EP9576-1032.



### 3.3 Technical data

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

EtherCAT	
Connection	2 x M8 socket, 4-pin, green
Electrical isolation	500 V

Supply voltages	
Connection	Input: 7/8" plug, 5-pin Downstream connection: 7/8" socket, 5-pin
$U_S$ nominal voltage	24 V <sub>DC</sub> (-15 % / +20 %)
$U_S$ sum current $I_{S,sum}$	max. 16 A at 40 °C
Current consumption from $U_S$	120 mA
Rated voltage $U_P$	any up to 72 V
$U_P$ Sum current $I_{P,sum}$	max. 16 A at 40 °C
Current consumption from $U_P$	Chopper current in case of overvoltage.

$U_P$ voltage stabilization	
Capacitance (internal)	155 $\mu$ F
Brake resistor (internal)	11 $\Omega$ , 60 W
Chopper switch-on threshold	Can be set as desired
Brake resistor overcurrent switch-off	15.5 A
Ripple current	max. 10 A

Housing data	
Dimensions W x H x D	60 mm x 150 mm x 26.5 mm (without connector, without heat sink)
Material	PA6 (polyamide)
Installation position	variable

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

<b>Approvals</b>	
Approvals	CE, UL in preparation

### 3.4 Scope of supply

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

- 1x EP9576-1032
- 2x protective cap for EtherCAT socket, M8, green (pre-assembled)
- 1x Protective cap for supply voltage output, 7/8", black (pre-fitted)
- 10x labels, blank (1 strip of 10)

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#### **● Pre-assembled protective caps do not ensure IP67 protection**

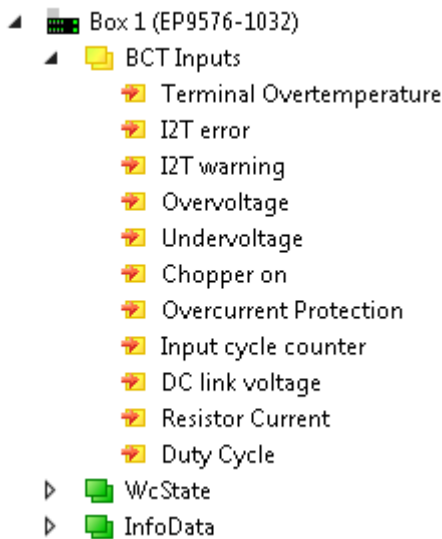
**i** Protective caps are pre-assembled at the factory to protect connectors during transport. They may not be tight enough to ensure IP67 protection.

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

---

## 3.5 Process image

TwinCAT displays the process image in a tree structure.



### Terminal overtemperature

If TRUE: The [internal temperature \[▶ 25\]](#) is higher than the limit value:

- Factory setting: 80 °C
- Parameter 8000:14

### I2T error

If TRUE: The [temperature of the brake resistor \[▶ 24\]](#) is higher than the limit value:

- Factory setting: 120 °C
- Parameter 8000:19

The chopper is disabled if the [overtemperature protection \[▶ 27\]](#) has not been disabled.

### I2T warning

If TRUE: The [temperature of the brake resistor \[▶ 24\]](#) is higher than the limit value:

- Factory setting: 100 °C
- Parameter 8000:18

### Overvoltage

If TRUE: The voltage  $U_p$  is higher than the overvoltage limit value:

- Factory setting: 50 V
- Parameter 8000:11

The chopper is active if it is not being inhibited by a [protective function \[▶ 27\]](#).

### Undervoltage

If TRUE: The voltage  $U_p$  is lower than the undervoltage limit value:

- Factory setting: 22 V
- Parameter 8000:12

### Chopper on

If TRUE: The [chopper \[▶ 23\]](#) is active. The brake resistor is currently converting electrical energy into thermal energy.

### Overcurrent Protection

If TRUE: The chopper was disabled by the [overcurrent protection \[▶ 27\]](#).

### Input cycle counter

### DC link voltage

The [measured value \[▶ 26\]](#) of the voltage  $U_p$ . Unit: mV

### Resistor Current



The [measured value \[▶ 26\]](#) of the current through the brake resistor. Unit: mA.

### Duty Cycle

The current mark-to-space ratio of the [chopper \[▶ 23\]](#). Unit: %.

**Optional process data objects**

You can add a further process data object [[▶ 24](#)] to the process image:

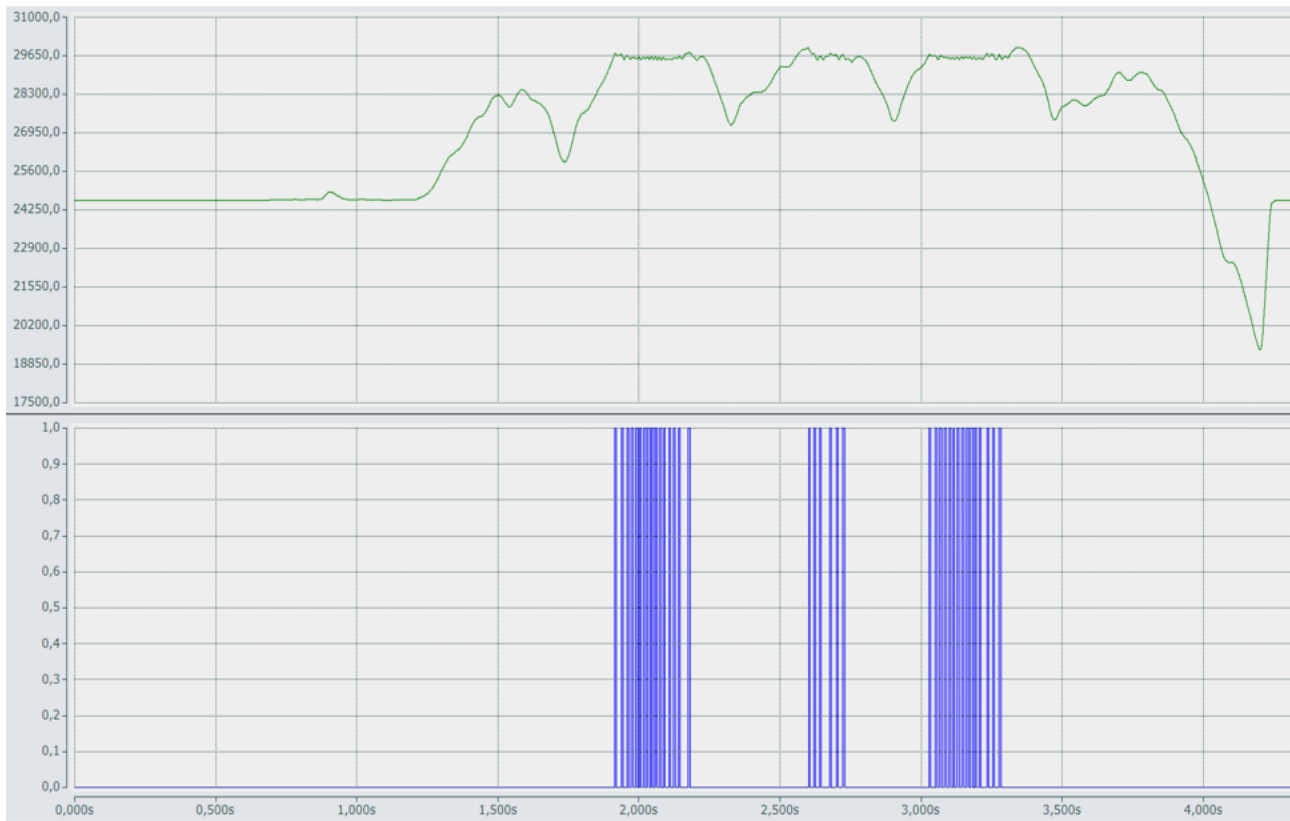
- ▲  BCT Load
  -  I2T load factor

**I2T load factor**

The current temperature of the brake resistor. Unit: °C.

### 3.6 Technology

The following diagram shows an example of a voltage curve that illustrates the operation of EP9576-1032. The top part of the diagram shows the voltage  $U_p$  in mV.



In this example a motor output stage is supplied with  $U_p = 24$  V. The overvoltage limit is set to 28 V.

Electrical energy is generated when the motor brakes or when the motor shaft is moved by an external torque. The voltage  $U_p$  increases.

If  $U_p$  exceeds the overvoltage limit, the brake chopper is switched on. The brake chopper controls the current through the brake resistor. In the brake resistor the excess energy is dissipated and converted to heat. The voltage  $U_p$  drops again.

## 4 Mounting and connections

### 4.1 Mounting

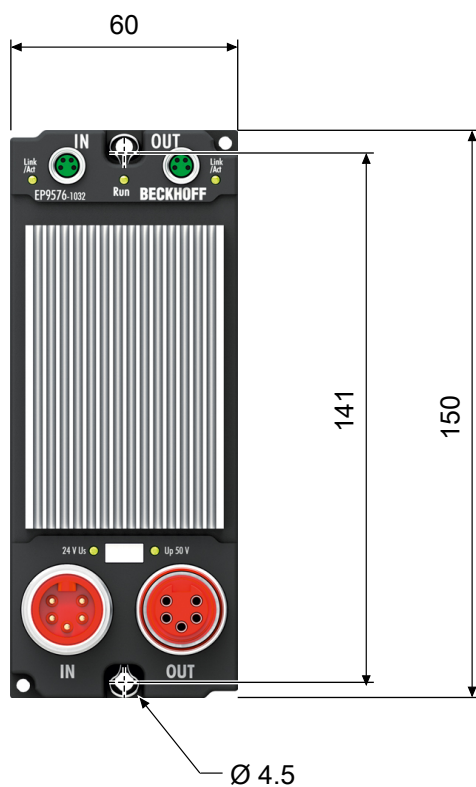
#### ⚠ CAUTION

##### Hot surfaces.

Risk of burns.

- Do not touch the device during operation.
- Allow the device to cool down after operation before touching it.

#### 4.1.1 Dimensions



All dimensions are given in millimeters.

##### Housing features

Housing material	PA6 (polyamide)
Sealing compound	polyurethane
Mounting	two fastening holes Ø 4.5 mm for M4
Metal parts	brass, nickel-plated
Contacts	CuZn, gold-plated
Power feed through	max. 16 A at 40°C (according to IEC 60512-3)
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

### NOTE

#### Dirt during assembly

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

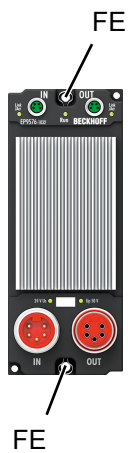
- Protect the plug connectors against dirt during the assembly.

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

## 4.1.3 Functional earth (FE)

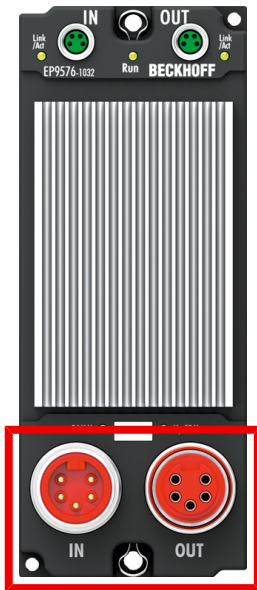
The [fastening holes](#) [► 17] also serve as connections for the functional earth (FE).

Make sure that the box is earthed with low impedance via both fastening screws. You can achieve this, for example, by mounting the box on a grounded machine bed.



## 4.2 Connections

### 4.2.1 Supply voltages



#### 4.2.1.1 Connectors

**NOTE**

**No functionality without  $U_S$ .**

Overvoltages on  $U_P$  are not discharged if  $U_S$  is missing. Defect possible.

- Connect not only  $U_P$  but also  $U_S$ .

**NOTE**

**The permitted sum current must not be exceeded.**

Risk of defect.

- Make sure that maximally 16 A flow per pin at 40 °C. See "Sum current" in the [Technical Data](#) [► 11].
- Incorporate the transmitted supply current into the calculation.

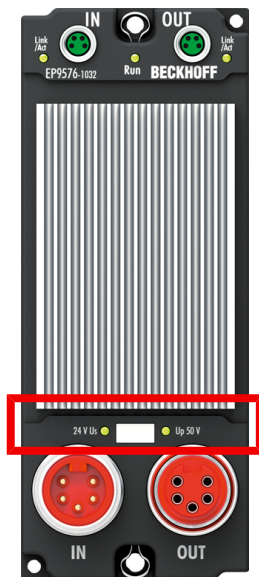
Input X60 7/8" connector	Downstream con- nection X61 7/8" socket	Pin	Symbol	Description
		1	$GND_P$	GND for $U_P$
		2	$GND_S$	GND for $U_S$
		3	FE	Functional earth
		4	$U_S$	Supply voltage 24 V <sub>DC</sub>
		5	$U_P$	Supply voltage 0...72 V <sub>DC</sub>

Ground the core "FE" at the other end of the cable.

The pin "FE" is directly connected to the [connections for the functional earth](#) [► 17].

### 4.2.1.2 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.

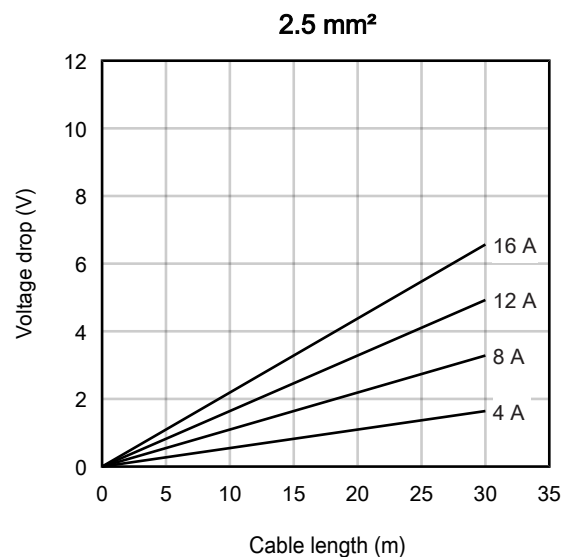
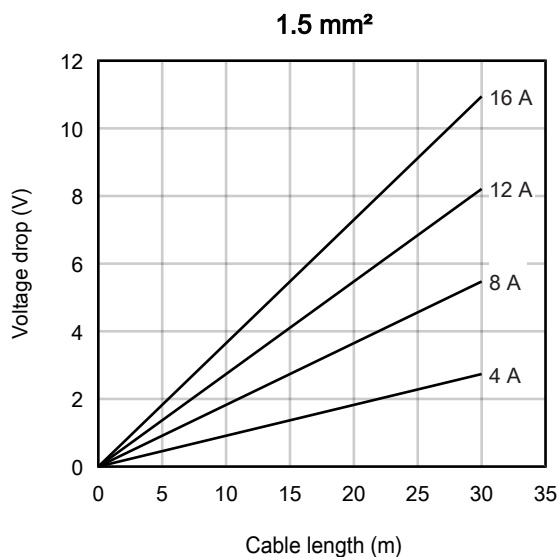


### 4.2.1.3 Conductor losses

Take into account the voltage drop on the supply line when planning a system. Avoid the voltage drop being so high that the supply voltage at the box lies below the minimum nominal voltage.

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

#### Voltage drop on the supply line



## 4.2.2 EtherCAT

### 4.2.2.1 Connectors

**NOTE**

**Risk of confusion: supply voltages and EtherCAT**

Defect possible through incorrect insertion.

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

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



Fig. 4: EtherCAT connectors

**Connection**

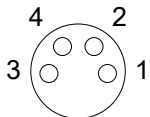


Fig. 5: M8 socket

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

<sup>1)</sup> Core colors according to EN 61918

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

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

**4.2.2.2 Status LEDs**



Fig. 6: EtherCAT Status LEDs

**L/A (Link/Act)**

A green LED labelled "L/A" is located next to each EtherCAT socket. The LED indicates the communication state of the respective socket:

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

**Run**

Each EtherCAT slave has a green LED labelled "Run". The LED signals the status of the slave in the EtherCAT network:

LED	Meaning
off	Slave is in "Init" state
flashes uniformly	Slave is in "Pre-Operational" state
flashes sporadically	Slave is in "Safe-Operational" state
lit	Slave is in "Operational" state

Description of the EtherCAT slave states

**4.2.2.3 Cables**

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

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

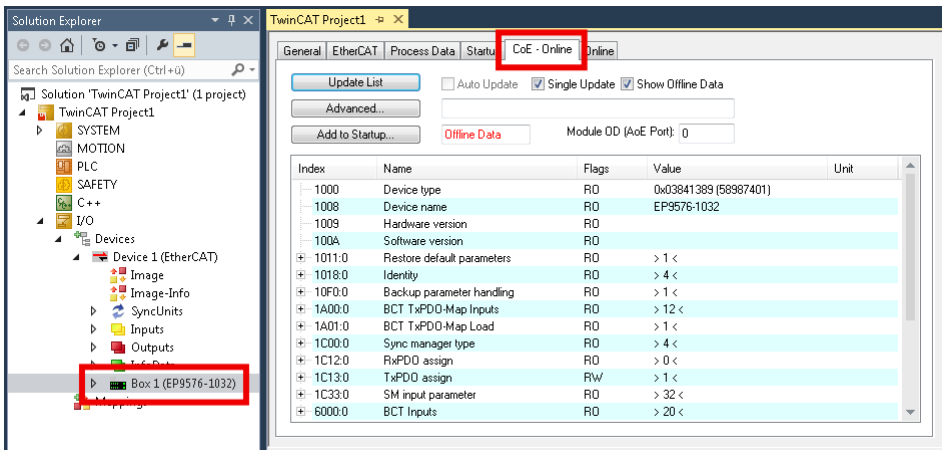
Detailed recommendations for the cabling of EtherCAT devices

## 5 Commissioning and configuration

### 5.1 Integration in TwinCAT

The procedure for integration in TwinCAT is described in this [Quick start guide](#).

### 5.2 Open the parameter directory (CoE)



1. In the Solution Explorer: Double-click EP9576-1032.
  2. Click on the "CoE - Online" tab.
- ⇒ You will see the CoE directory of the EP9576-1032. Here you can check and change parameter values.

#### **i** Resetting parameters to factory settings

If you do not know whether parameters have already been changed by the present EP9576-1032, you can [reset all parameters to the factory settings](#) ► [28](#).

### 5.3 Chopper

**NOTE**

**The chopper is disabled in case of overtemperature [▶ 27]**

Overtages are no longer dissipated in case of overtemperature. Defect possible due to overvoltage.

- Monitor the bit I2T warning [▶ 13] in order to recognize a temperature increase in good time.
- If necessary, disable the drive if the bit I2T error [▶ 13] is TRUE.

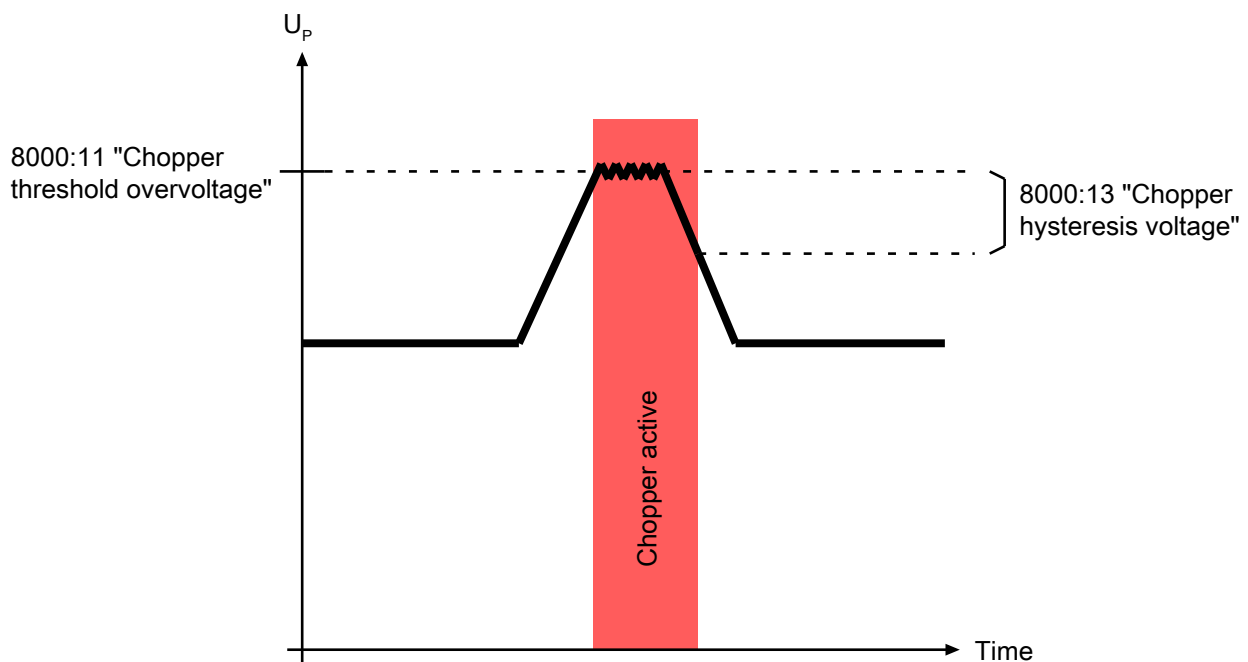
The chopper is automatically activated when the voltage  $U_p$  exceeds the limit value "Chopper threshold overvoltage". The chopper controls the current through the braking resistor such that the voltage  $U_p$  does not increase further.

The chopper is automatically deactivated when the voltage  $U_p$  has dropped again by the "Chopper hysteresis voltage".

**Parameter**

Index (hex)	Name	Description	Data type	Flags	Default
8000:11	Chopper threshold overvoltage	The Chopper is switched on if the voltage $U_p$ exceeds this value. Unit: mV.	UINT32	RW	50000 <sub>dec</sub>
8000:13	Chopper hysteresis voltage	Hysteresis voltage for switching off the Chopper. Unit: mV.	UINT32	RW	1000 <sub>dec</sub>

The following diagram shows the influence of the parameters on an exemplary curve of the voltage  $U_p$ :



## 5.4 Measured values

### 5.4.1 Temperatures

#### 5.4.1.1 Temperature of the brake resistor

The temperature of the brake resistor is not measured directly. It is calculated internally from the time curve of the measured current value [► 26].

#### Configuring the temperature calculation

The ambient temperature must be known in order to calculate the temperature of the brake resistor. Enter the ambient temperature in the following CoE parameter:

8000:15 "Ambient temperature offset"

Factory setting: 50 °C

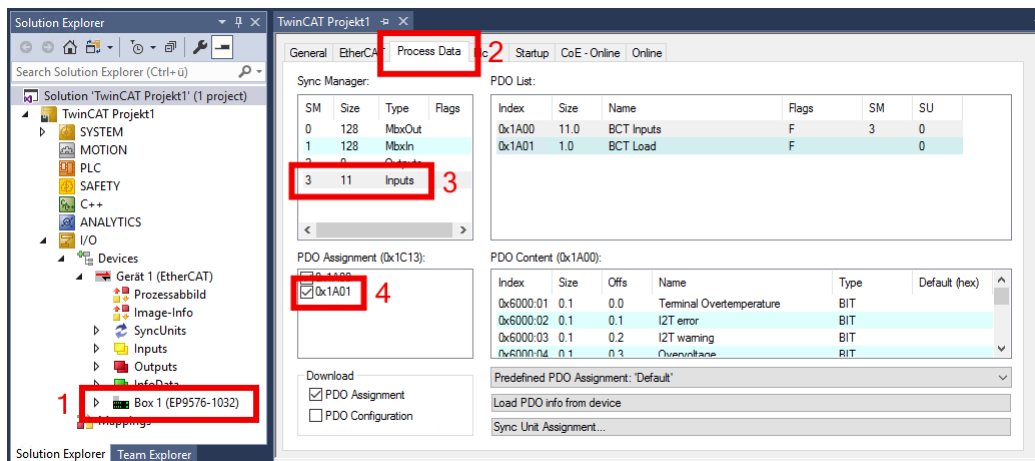
#### Overtemperature protection

If the temperature of the brake resistor is too high, the overtemperature protection [► 27] disables the chopper [► 23].

#### Activating process data

You can display the temperature of the brake resistor in the process data. To do this, activate the process data object 0x1A01.

Procedure in TwinCAT 3:



1. In the Solution Explorer: Double-click EP9576-1032.
  2. Click on the "Process data" tab.
  3. In the box "Sync Manager": click "Inputs"
  4. In the box "PDO Assignment (0x1C13)": check the checkbox next to "0x1A01"
- ⇒ The process data object BCT Load [► 14] is added to the process data.



### 5.4.1.2 Internal temperature

The current internal temperature is located in the CoE parameter A000:11 "Temperature".

The internal temperature is purely informative. It is not monitored by any protective function [▶ 27].

## 5.4.2 Current and voltage

The [process data \[▶ 13\]](#) contains the measured values of two electrical variables:

- The voltage  $U_p$ : "DC link voltage"
- The current through the brake resistor: "Resistor current"

### 5.4.2.1 Measured value filter

The measured values "DC Link voltage" and "Resistor current" can be filtered with a digital filter.

The measured value filter is already enabled in the factory setting.

#### Parameter

Index (hex)	Name	Description	Data type	Flags	Default
8000:02	Enable filter	Enables the <a href="#">measured value filter [▶ 26]</a> .	BOOL	RW	TRUE
8000:1A	Filter Settings	Measured value filter type: 0: FIR 50 Hz 1: FIR 60 Hz 2: IIR1 3: IIR2 4: IIR3 5: IIR4 6: IIR5 7: IIR6 8: IIR7 9: IIR8	UINT16	RW	0

## 5.5 Protective functions

### 5.5.1 Overtemperature protection

The [chopper \[▶ 23\]](#) is disabled if the [temperature of the brake resistor \[▶ 24\]](#) exceeds the limit value "I2T error level". The bit "I2T error" in the [process data \[▶ 13\]](#) is set to TRUE.

The chopper is re-enabled when the temperature of the brake resistor falls below the limit value "I2T warn level". (Hysteresis)

#### Parameter

Index (hex)	Name	Description	Data type	Flags	Default
8000:18	I2T warn level	If the internal temperature exceeds this value, the bit "I2T warning " is set to TRUE. Unit: °C.	UINT16	RW	100 <sub>dec</sub>
8000:19	I2T error level	The chopper is disabled if the internal temperature exceeds this value. The bit "I2T error" is set to TRUE. Unit: °C.	UINT16	RW	120 <sub>dec</sub>

#### Overtemperature warning

The bit "I2T warning" in the [process data \[▶ 13\]](#) serves as an early warning system.

The bit is set to TRUE if the temperature of the brake resistor exceeds the limit value "I2T warn level". However, the chopper is not yet disabled. Therefore, you can still react to the warning.

#### Deactivate

You can disable the overtemperature protection by setting the parameter 8000:01 "Disable chopper on overtemperature" to FALSE.

### 5.5.2 Overcurrent protection

The overcurrent protection disables the [chopper \[▶ 23\]](#) if the current through the brake resistor exceeds 15.5 A. The bit "Overcurrent Protection" in the [process data \[▶ 13\]](#) is set to TRUE.

The chopper remains disabled until you apply a positive edge to the parameter 8000:03 "Overcurrent Protection Reset": set the parameter from FALSE to TRUE.

## 5.6 Restoring the delivery state

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

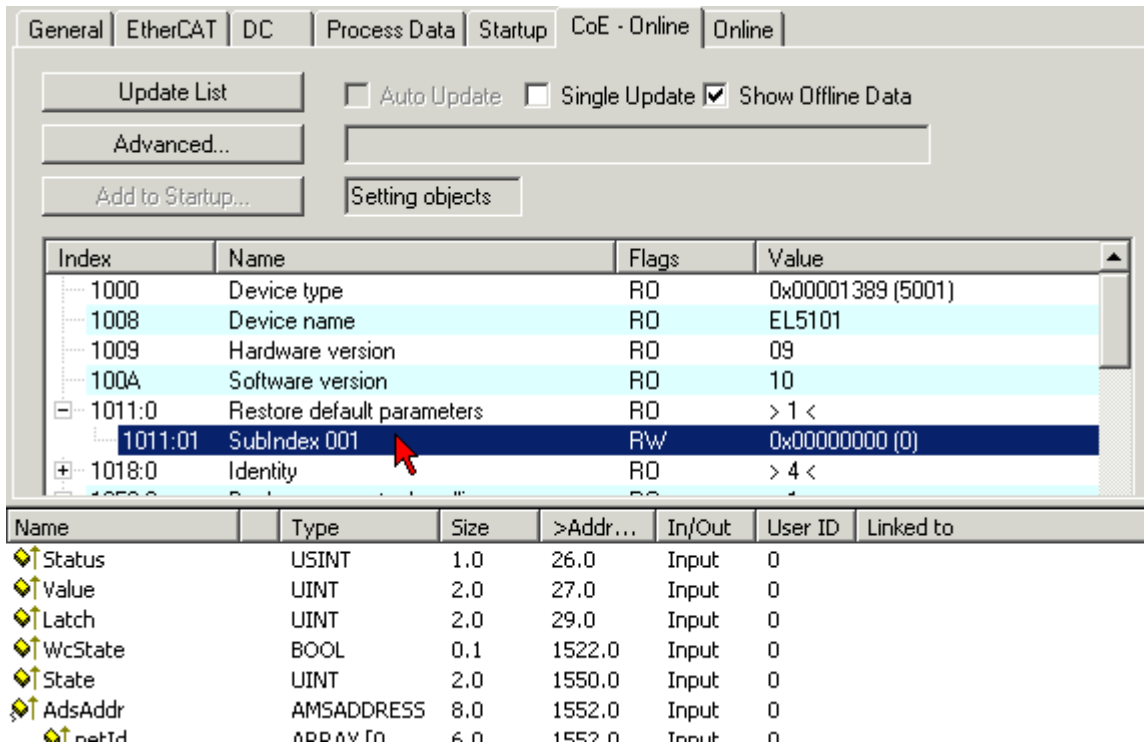


Fig. 7: Selecting the Restore default parameters PDO

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

All backup objects are reset to the delivery state.

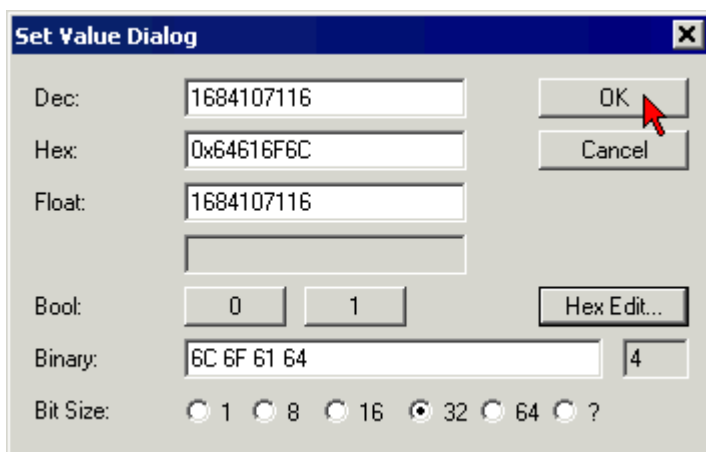


Fig. 8: Entering a restore value in the Set Value dialog

### Alternative restore value

In some older terminals / boxes the backup objects can be switched with an alternative restore value:

Decimal value: 1819238756

Hexadecimal value: 0x6C6F6164

An incorrect entry for the restore value has no effect.

## 5.7 Decommissioning

**⚠ WARNING****Risk of electric shock!**

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

**Disposal**

In order to dispose of the device, it must be removed.

In accordance with the WEEE Directive 2012/19/EU, Beckhoff takes back old devices and accessories in Germany for proper disposal. Transport costs will be borne by the sender.

Return the old devices with the note "for disposal" to:

Beckhoff Automation GmbH & Co. KG  
Service Department  
Stahlstraße 31  
D-33415 Verl

## 6 CoE parameters

### 6.1 Object directory

Index (hex)	Name
1000	<a href="#">Device Type [► 33]</a>
1008	<a href="#">Device name [► 33]</a>
1009	<a href="#">Hardware version [► 33]</a>
100A	<a href="#">Software version [► 33]</a>
1011	<a href="#">Restore default parameters [► 33]</a>
1018	<a href="#">Identity [► 33]</a>
10F0	<a href="#">Backup parameter handling [► 34]</a>
1A00	<a href="#">BCT TxPDO-Map Inputs [► 35]</a>
1A01	<a href="#">BCT TxPDO-Map Load [► 35]</a>
1C00	<a href="#">Sync manager type [► 37]</a>
1C12	<a href="#">RxPDO assign [► 35]</a>
1C13	<a href="#">TxPDO assign [► 36]</a>
1C33	<a href="#">SM input parameter [► 38]</a>
6000	<a href="#">BCT Inputs [► 36]</a>
6001	<a href="#">BCT Load Factor [► 36]</a>
8000	<a href="#">BCT Settings [► 31]</a>
800F	<a href="#">BCT Vendor data [► 32]</a>
A000	<a href="#">BCT Diag data [► 32]</a>
B000	<a href="#">BCT Command [► 34]</a>
F000	<a href="#">Modular Device Profile [► 34]</a>
F008	<a href="#">Code word [► 34]</a>
F081	<a href="#">Download revision [► 34]</a>

## 6.2 Object description

### 6.2.1 Objects for parameterization

#### Index 8000: BCT Settings

Index (hex)	Name	Description	Data type	Flags	Default
8000:0	BCT Settings		UINT8	RO	0x1A (26 <sub>dec</sub> )
8000:01	Disable chopper on overtemperature	Disable <u>overtemperature protection</u> [▶ 27].	BOOL	RW	TRUE
8000:02	Enable filter	Enables the <u>measured value filter</u> [▶ 26].	BOOL	RW	TRUE
8000:03	Overcurrent Protection Reset	Reset <u>overcurrent protection</u> [▶ 27].	BOOL	RW	FALSE
8000:11	Chopper threshold overvoltage	The Chopper is switched on if the voltage $U_p$ exceeds this value. Unit: mV.	UINT32	RW	50000 <sub>dec</sub>
8000:12	Chopper threshold undervoltage	If the voltage $U_p$ falls below this value, the bit "Undervoltage" is set in the process data. Unit: mV.	UINT32	RW	22000 <sub>dec</sub>
8000:13	Chopper hysteresis voltage	Hysteresis voltage for switching off the Chopper. Unit: mV.	UINT32	RW	1000 <sub>dec</sub>
8000:14	Terminal overtemperature threshold	If the internal temperature exceeds this value, the bit Terminal Overtemperature is set to TRUE. Unit: °C.	UINT8	RW	80 <sub>dec</sub>
8000:15	Ambient temperature offset	Enter the ambient temperature here. This value is incorporated into the calculation of the <u>temperature of the brake resistor</u> [▶ 24]. Unit: °C.	UINT8	RW	50 <sub>dec</sub>
8000:18	I2T warn level	If the internal temperature exceeds this value, the bit "I2T warning " is set to TRUE. Unit: °C.	UINT16	RW	100 <sub>dec</sub>
8000:19	I2T error level	The chopper is disabled if the internal temperature exceeds this value. The bit "I2T error" is set to TRUE. Unit: °C.	UINT16	RW	120 <sub>dec</sub>
8000:1A	Filter Settings	Measured value filter type: 0: FIR 50 Hz 1: FIR 60 Hz 2: IIR1 3: IIR2 4: IIR3 5: IIR4 6: IIR5 7: IIR6 8: IIR7 9: IIR8	UINT16	RW	0

## 6.2.2 Objects for information and diagnostics

### Index 800F: BCT Vendor data

Index (hex)	Name	Meaning	Data type	Flags	Default
800F:0	BCT Vendor data		UINT8	RO	0x16 (22 <sub>dec</sub> )
800F:13	Resistor current offset	Vendor calibration: Offset value for <u>current</u> measurement [▶ 26].	INT16	RW	-
800F:14	Resistor current gain	Vendor calibration: Gain value for <u>current</u> measurement [▶ 26].	UINT16	RW	-
800F:15	DC link voltage offset	Vendor calibration: Offset value for <u>voltage</u> measurement [▶ 26].	INT16	RW	-
800F:16	DC link voltage gain	Vendor calibration: Offset value for <u>voltage</u> measurement [▶ 26].	UINT16	RW	-

### Index A000: BCT Diag data

Index (hex)	Name	Description	Data type	Flags	Default
A000:0	BCT Diag data		UINT8	RO	0x11 (17 <sub>dec</sub> )
A000:11	Temperature	<u>Internal temperature</u> [▶ 25]. Unit: °C.	UINT8	RO	-



## 6.2.3 Standard objects

### Index 1000 Device type

Index (hex)	Name	Description	Data type	Flags	Default
1000:0	Device type	Bit 0...15: Device profile number Bit 16...31: Module profile number  (Device profile number 5001: Modular Device Profile MDP)	UINT32	RO	5001 <sub>dec</sub>

### Index 1009 Hardware version

Index (hex)	Name	Description	Data type	Flags	Default
1009:0	Hardware version	<a href="#">Hardware version [► 7]</a>	STRING	RO	-

### Index 100A Software version

Index (hex)	Name	Description	Data type	Flags	Default
100A:0	Software version	<a href="#">Firmware version [► 7]</a>	STRING	RO	-

### Index 1011 Restore default parameters

Access rights: read/write

Index (hex)	Name	Description	Data type	Flags	Default
1011:0	Restore default parameters	Restore default settings	UINT8	RO	0x01 (1dec)
1011:01	Subindex 001	Resets the CoE parameters to the factory settings.  To do this, write the value 0x64616F6C in this parameter.	UINT32	RW	0

### Index 1018 Identity

Index (hex)	Name	Description	Data type	Flags	Value
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4dec)
1018:01	Vendor ID	Vendor identifier (2: Beckhoff Automation)	UINT32	RO	2
1018:02	Product code	Product code	UINT32	RO	2568405 2 <sub>hex</sub>
1018:03	Revision	Bit 0...15: Index number of the product version Bit 16...31: Revision of the device description (ESI)	UINT32	RO	Bit 0...15: 1032 <sub>dec</sub>
1018:04	Serial number	Reserved	UINT32	RO	0

**Index 10F0: Backup parameter handling**

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

**Index B000: BCT Command**

Index	Name	Meaning	Data type	Flags	Default
B000:0	BCT Command		UINT8	RO	0x03 (3 <sub>dec</sub> )
B000:01	Request		OCTET-STRING [2]	RW	{0}
B000:02	Status		UINT8	RO	0
B000:03	Response		OCTET-STRING [6]	RO	{0}

**Index F000: Modular Device Profile**

Index	Name	Meaning	Data type	Flags	Default
F000:0	Modular Device Profile	General information for the modular device profile	UINT8	RO	0x02 (2 <sub>dec</sub> )
F000:01	Index distance	Index distance of the objects of the individual channels	UINT16	RO	0x0010 (16 <sub>dec</sub> )
F000:02	Maximum number of modules	Number of channels	UINT16	RO	0x0001 (1 <sub>dec</sub> )

**Index F008: Code word**

Index	Name	Meaning	Data type	Flags	Default
F008:0	Code word		UINT32	RW	0

**Index F081: Download revision**

Index	Name	Meaning	Data type	Flags	Default
F081:0	Download revision		UINT8	RO	0x01 (1 <sub>dec</sub> )
F081:01	Revision number		UINT32	RW	0

## 6.2.4 PDO Mapping and PDO Assignment

### Index 1A00: BCT TxPDO-Map Inputs

Index	Name	Meaning	Data type	Flags	Default
1A00:0	BCT TxPDO-Map Inputs	PDO Mapping TxPDO 1	UINT8	RO	0x0C (12 <sub>dec</sub> )
1A00:01	SubIndex 001	1. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x01 (Terminal Overtemperature))	UINT32	RO	0x6000:01, 1
1A00:02	SubIndex 002	2. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x02 (I2T error))	UINT32	RO	0x6000:02, 1
1A00:03	SubIndex 003	3. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x03 (I2T warning))	UINT32	RO	0x6000:03, 1
1A00:04	SubIndex 004	4. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x04 (Overvoltage))	UINT32	RO	0x6000:04, 1
1A00:05	SubIndex 005	5. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x05 (Undervoltage))	UINT32	RO	0x6000:05, 1
1A00:06	SubIndex 006	6. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x06 (Chopper on))	UINT32	RO	0x6000:06, 1
1A00:07	SubIndex 007	7. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x07 (Overcurrent Protection))	UINT32	RO	0x6000:07, 1
1A00:08	SubIndex 008	8. PDO Mapping entry (7 bits align)	UINT32	RO	0x0000:00, 7
1A00:09	SubIndex 009	9. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x0F (Input cycle counter))	UINT32	RO	0x6000:0F, 2
1A00:0A	SubIndex 010	10. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x11 (DC link voltage))	UINT32	RO	0x6000:11, 32
1A00:0B	SubIndex 011	11. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x13 (Resistor Current))	UINT32	RO	0x6000:13, 32
1A00:0C	SubIndex 012	12. PDO Mapping entry (object 0x6000 (BCT Inputs), entry 0x14 (Duty Cycle))	UINT32	RO	0x6000:14, 8

### Index 1A01: BCT TxPDO-Map Load

Index	Name	Meaning	Data type	Flags	Default
1A01:0	BCT TxPDO-Map Load	PDO Mapping TxPDO 2	UINT8	RO	1
1A01:01	SubIndex 001	1. PDO Mapping entry (object 0x6001 (BCT Load Factor), entry 0x01 (I2T load factor))	UINT32	RO	0x6001:01, 8

### Index 1C12: RxPDO assign

Index	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RO	0

**Index 1C13: TxPDO assign**

Index	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	1
1C13:01	SubIndex 001	1. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656 <sub>dec</sub> )
1C13:02	SubIndex 002	2. allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0

**Index 6000: BCT Inputs**

Index	Name	Meaning	Data type	Flags	Default
6000:0	BCT Inputs		UINT8	RO	0x14 (20 <sub>dec</sub> )
6000:01	Terminal overtemperature		BOOL	RO	0
6000:02	I2T error		BOOL	RO	0
6000:03	I2T warning		BOOL	RO	0
6000:04	Overvoltage		BOOL	RO	0
6000:05	Undervoltage		BOOL	RO	0
6000:06	Chopper on		BOOL	RO	0
6000:07	Overcurrent Protection		BOOL	RO	0
6000:0F	Input cycle counter		BIT2	RO	0
6000:11	DC link voltage		UINT32	RO	0
6000:13	Resistor Current		INT32	RO	0
6000:14	Duty Cycle		UINT8	RO	0

**Index 6001: BCT Load Factor**

Index	Name	Meaning	Data type	Flags	Default
6001:0	BCT Load Factor		UINT8	RO	1
6001:01	I2T load factor		UINT8	RO	0

## 6.2.5 Sync manager objects

### Index 1C00: Sync manager type

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

## Index 1C33: SM input parameter

Index	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32 <sub>dec</sub> )
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	0
1C33:02	Cycle time	as 1C32:02	UINT32	RW	0x000F4 240 (100000 0 <sub>dec</sub> )
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0
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	1
1C33:05	Minimum cycle time	as 1C32:05	UINT32	RO	0x00002 710 (10000 <sub>dec</sub> )
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	0
1C33:07	Minimum delay time		UINT32	RO	0
1C33:08	Get Cycle Time	as 1C32:08	UINT16	RW	0
1C33:09	Maximum delay time	Time between SYNC1 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	0
1C33:0B	SM event missed counter	as 1C32:11	UINT16	RO	0
1C33:0C	Cycle exceeded counter	as 1C32:12	UINT16	RO	0
1C33:0D	Shift too short counter	as 1C32:13	UINT16	RO	0
1C33:20	Sync error	as 1C32:32	BOOL	RO	0

# 7 Appendix

## 7.1 General operating conditions

### Protection degrees (IP-Code)

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

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

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

\*) These protection classes define only protection against water!

### Chemical Resistance

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

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

### Key

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

## 7.2 Accessories

### Protective caps for connectors

Ordering information	Description
ZS5000-0010	Protective cap for M8 sockets, IP67 (50 pieces)

### Labelling material

Ordering information	Description
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	<a href="#">Website</a>
ZK1093-3xxx-xxxx	EtherCAT cable M8, yellow	<a href="#">Website</a>
ZK203x-xxxx-xxxx	Power cable 7/8 ", 5-pin	<a href="#">Website</a>

### 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

### **i** 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

### Designation

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

- family key
- type
- version
- revision

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

### Notes

- The elements mentioned above result in the **technical designation**. EL3314-0000-0016 is used in the example below.
- EL3314-0000 is the order identifier, in the case of "-0000" usually abbreviated to EL3314. "-0016" is the EtherCAT revision.
- The **order identifier** is made up of
  - family key (EL, EP, CU, ES, KL, CX, etc.)
  - type (3314)
  - version (-0000)
- The **revision** -0016 shows the technical progress, such as the extension of features with regard to the EtherCAT communication, and is managed by Beckhoff.  
In principle, a device with a higher revision can replace a device with a lower revision, unless specified otherwise, e.g. in the documentation.  
Associated and synonymous with each revision there is usually a description (ESI, EtherCAT Slave Information) in the form of an XML file, which is available for download from the Beckhoff web site.  
From 2014/01 the revision is shown on the outside of the IP20 terminals, see Fig. "EL5021 EL terminal, standard IP20 IO device with batch number and revision ID (since 2014/01)".
- The type, version and revision are read as decimal numbers, even if they are technically saved in hexadecimal.

### Identification number

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

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

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

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

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

Example with

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

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

Syntax: D ww yy x y z u

D - prefix designation

ww - calendar week

yy - year

x - firmware version of the bus PCB

y - hardware version of the bus PCB

z - firmware version of the I/O PCB

u - hardware version of the I/O PCB

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

### Unique serial number/ID, ID number

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

See also the further documentation in the area

- IP67: [EtherCAT Box](#)
- Safety: [TwinSafe](#)
- Terminals with factory calibration certificate and other measuring terminals

### Examples of markings



Fig. 9: EL5021 EL terminal, standard IP20 IO device with serial/ batch number and revision ID (since 2014/01)



Fig. 10: EK1100 EtherCAT coupler, standard IP20 IO device with serial/ batch number



Fig. 11: CU2016 switch with serial/ batch number

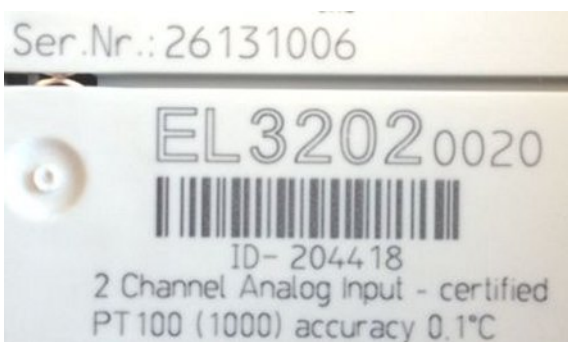


Fig. 12: EL3202-0020 with serial/ batch number 26131006 and unique ID-number 204418



Fig. 13: EP1258-00001 IP67 EtherCAT Box with batch number/ date code 22090101 and unique serial number 158102



Fig. 14: EP1908-0002 IP67 EtherCAT Safety Box with batch number/ date code 071201FF and unique serial number 00346070



Fig. 15: EL2904 IP20 safety terminal with batch number/ date code 50110302 and unique serial number 00331701



Fig. 16: ELM3604-0002 terminal with unique ID number (QR code) 100001051 and serial/ batch number 44160201

### 7.3.1 Beckhoff Identification Code (BIC)

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

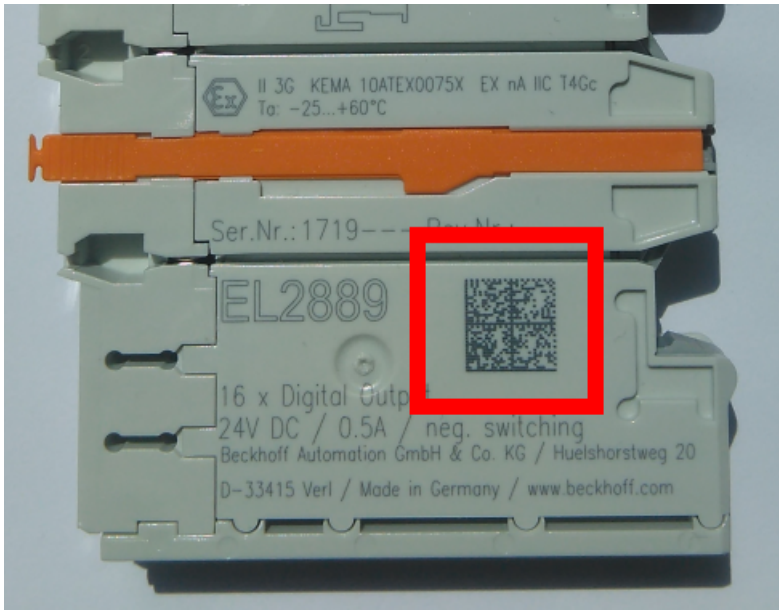


Fig. 17: BIC as data matrix code (DMC, code scheme ECC200)

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

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

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

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

Each piece of information can be uniquely identified using the so-called data identifier (ANSI MH10.8.2-2016). The data identifier is followed by a character string. Both together have a maximum length according to the table below. If the information is shorter, spaces are added to it. The data under positions 1 to 4 are always available.

The following information is contained:

Item no.	Type of information	Explanation	Data identifier	Number of digits incl. data identifier	Example
1	Beckhoff order number	<b>Beckhoff order number</b>	1P	8	<b>1P</b> 072222
2	Beckhoff Traceability Number (BTN)	<b>Unique serial number, see note below</b>	S	12	<b>S</b> BTNk4p562d7
3	Article description	<b>Beckhoff article description, e.g. EL1008</b>	1K	32	<b>1K</b> EL1809
4	Quantity	<b>Quantity in packaging unit, e.g. 1, 10, etc.</b>	Q	6	<b>Q</b> 1
5	Batch number	Optional: Year and week of production	2P	14	<b>2P</b> 401503180016
6	ID/serial number	Optional: Present-day serial number system, e.g. with safety products or calibrated terminals	51S	12	<b>51S</b> 678294104
7	Variant number	Optional: Product variant number on the basis of standard products	30P	32	<b>30P</b> F971, 2*K183
...					

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

### Structure of the BIC

Example of composite information from item 1 to 4 and 6. The data identifiers are marked in red for better display:

### BTN

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

### NOTE

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

## 7.4 Support and Service

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

### Beckhoff's branch offices and representatives

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

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

You will also find further documentation for Beckhoff components there.

### Beckhoff Support

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

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

Hotline: +49 5246 963 157  
Fax: +49 5246 963 9157  
e-mail: [support@beckhoff.com](mailto:support@beckhoff.com)

### Beckhoff Service

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

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

Hotline: +49 5246 963 460  
Fax: +49 5246 963 479  
e-mail: [service@beckhoff.com](mailto:service@beckhoff.com)

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