BECKHOFF New Automation Technology

Documentation | EN

EP9576-1032

Brake chopper box



2024-11-28 | Version: 1.2

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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.



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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
1.2	• Overtemperature protection updated (firmware 03 and higher)
1.1	• Added warning notices
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)	29 - week of production 29
YY - year of production	10 - year of production 2010
FF - firmware version	02 - firmware version 02
HH - hardware version	01 - hardware version 01

Further information on this topic: Version identification of EtherCAT devices [▶ 42].

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.

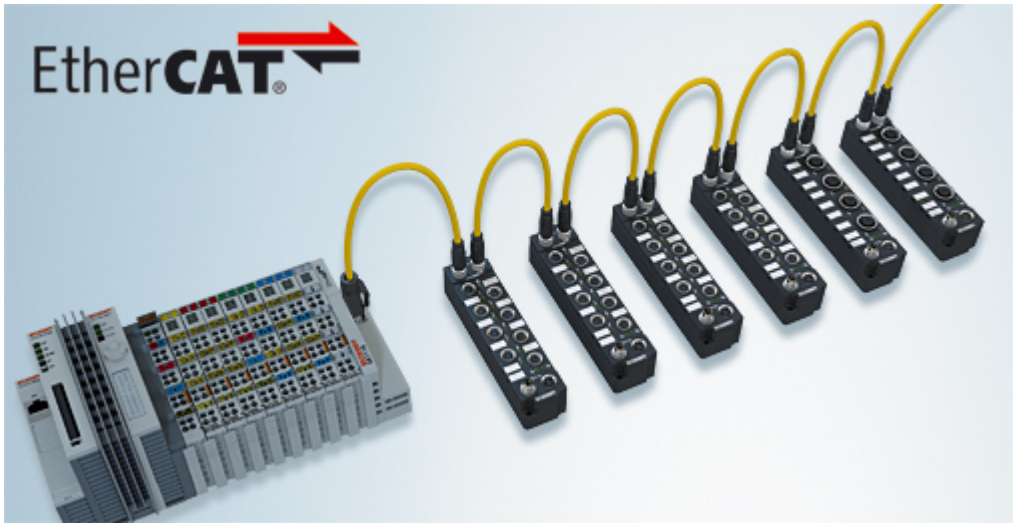


Fig. 1: EtherCAT Box Modules within an EtherCAT network

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

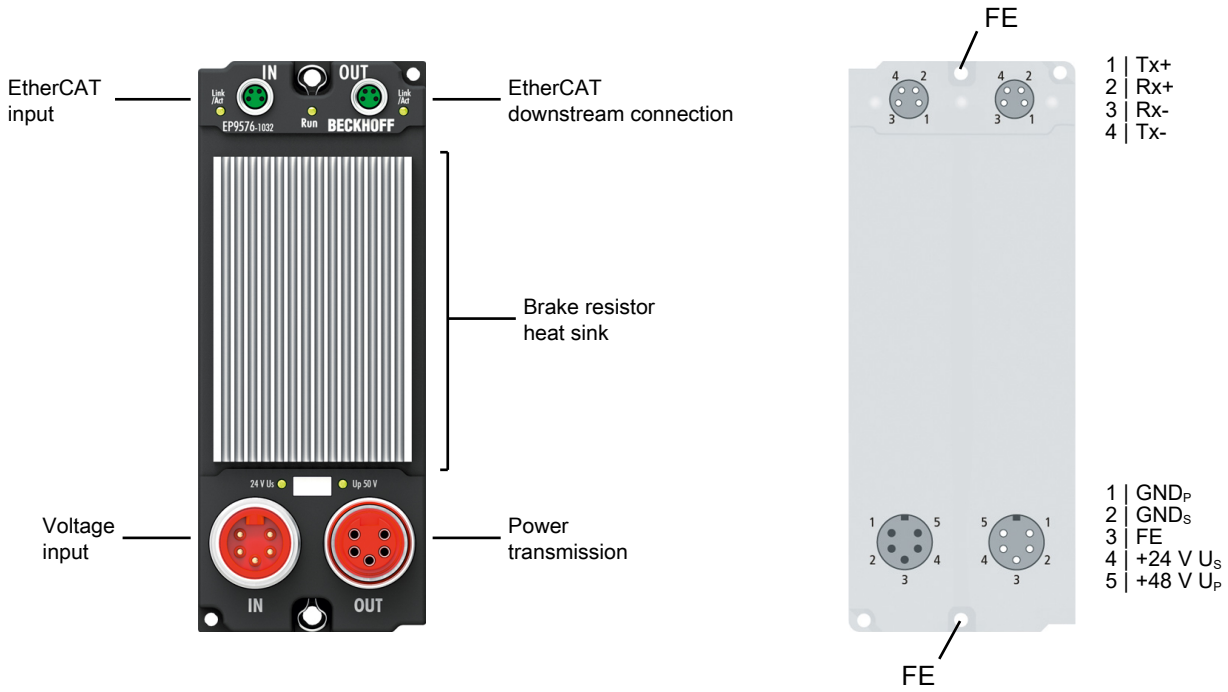
3.1 Introduction

NOTICE

Damage if operated without parameterization

If the chopper threshold is set too low, the braking resistor may be permanently active. This causes the box to overheat. Material damage is possible.

- Only apply U_P to the box after parameterization.
- Set the chopper parameters according to the specifications in the chapter Chopper [▶ 25].



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.

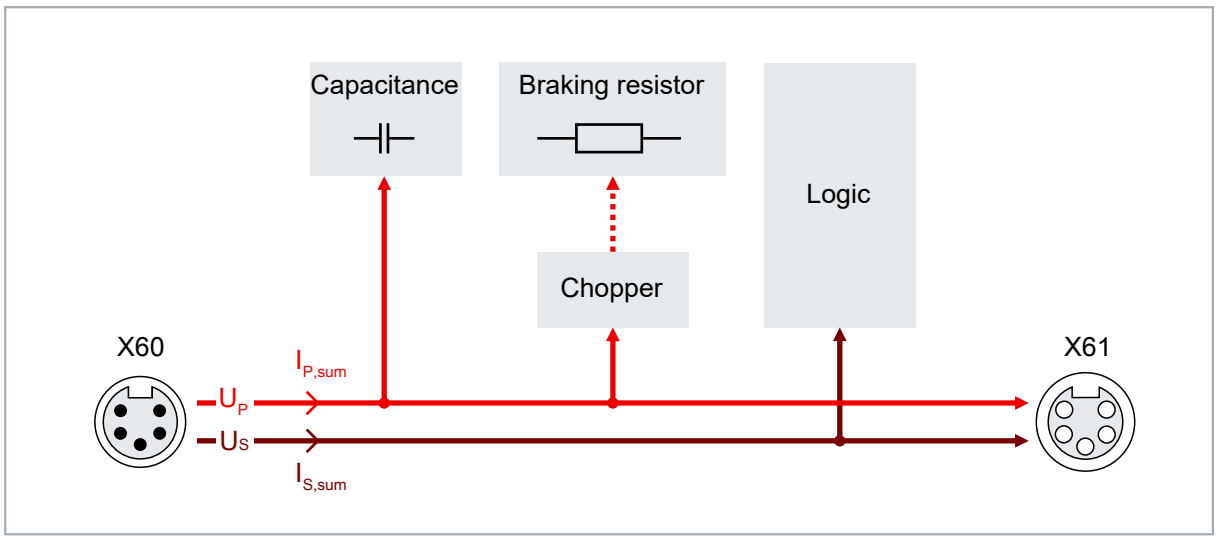
The EP9576 features internal diagnostic functions. Warnings or error messages, e.g. on reaching/exceeding the permissible limit temperature values are signalled via EtherCAT.

Quick links

Technical data [▶ 11]
Process image [▶ 13]
Connections [▶ 19]
Commissioning [▶ 24]

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, A-coded, shielded
Electrical isolation	500 V

Supply voltages	
Connection	Input: 7/8" plug, 5-pin, 16-UN thread Downstream connection: 7/8" socket, 5-pin, 16-UN thread
U_S nominal voltage	24 V_{DC} (-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 µF
Brake resistor (internal)	11 Ω, 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)
Weight	approx. 560 g
Material	PA6 (polyamide)
Installation position	variable

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

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

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

3.4 Scope of supply

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

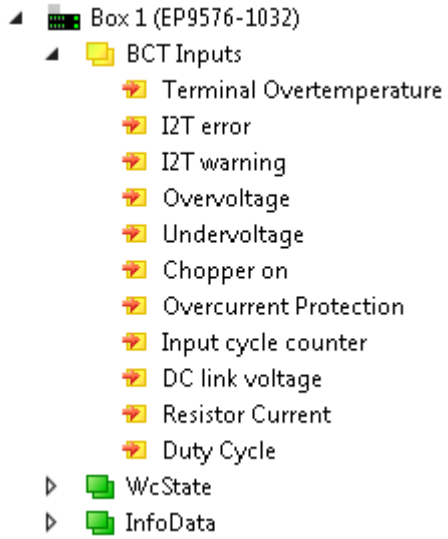
- 1x EP9576-1032
- 2x protective cap for EtherCAT socket, M8, green (pre-assembled)
- 1x Protective cap for supply voltage output, 7/8”, black (pre-fitted)
- 10x labels, blank (1 strip of 10)

Pre-assembled protective caps do not ensure IP67 protection

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

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

3.5 Process image



Terminal Overtemperature
Indicates that the internal temperature of the box is above the limit value. (default 80 °C, CoE parameter 8000:14)

Note: From firmware 03, the chopper is disabled above an internal temperature of 80 °C, regardless of the above limit value. See “I2T error”.

I2T error
Indicates that one of the following errors has occurred:

- The temperature of the braking resistor is above the error limit value. (default 120 °C, CoE parameter 8000:19)
- The internal temperature of the box is higher than 80 °C. (from firmware 03)

In both cases, the chopper is disabled unless the overtemperature shutdown is disabled. See chapter Overtemperature protection [▶ 26].

I2T warning
Indicates that one of the following cases exists:

- The temperature of the braking resistor is above the warning limit value. (default 100 °C, CoE parameter 8000:18)
- The internal temperature of the box is higher than 70 °C. (from firmware 03)

Overvoltage
Indicates that the voltage U_P is above the overvoltage limit value. (default 50 V, CoE parameter 8000:11)

Undervoltage
Indicates that the voltage U_P is below the undervoltage limit value. (default 22 V, CoE parameter 8000:12)

Chopper on
Indicates that the chopper is active. The braking resistor is currently converting electrical energy into thermal energy.

Overcurrent protection
Indicates that the chopper has been disabled due to overcurrent.
See chapter Overcurrent protection [▶ 26].

Input cycle counter
A 2-bit counter. It is incremented each time the input data is updated in the process image. After it reaches its maximum value of 3, it jumps back to 0.

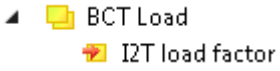
DC link voltage
The measured value of the voltage U_P. Unit: mV

Resistor Current
The measured value of the current through the braking resistor. Unit: mA.

Duty Cycle
The current mark-to-space ratio of the chopper. Unit: %.

Optional process data objects

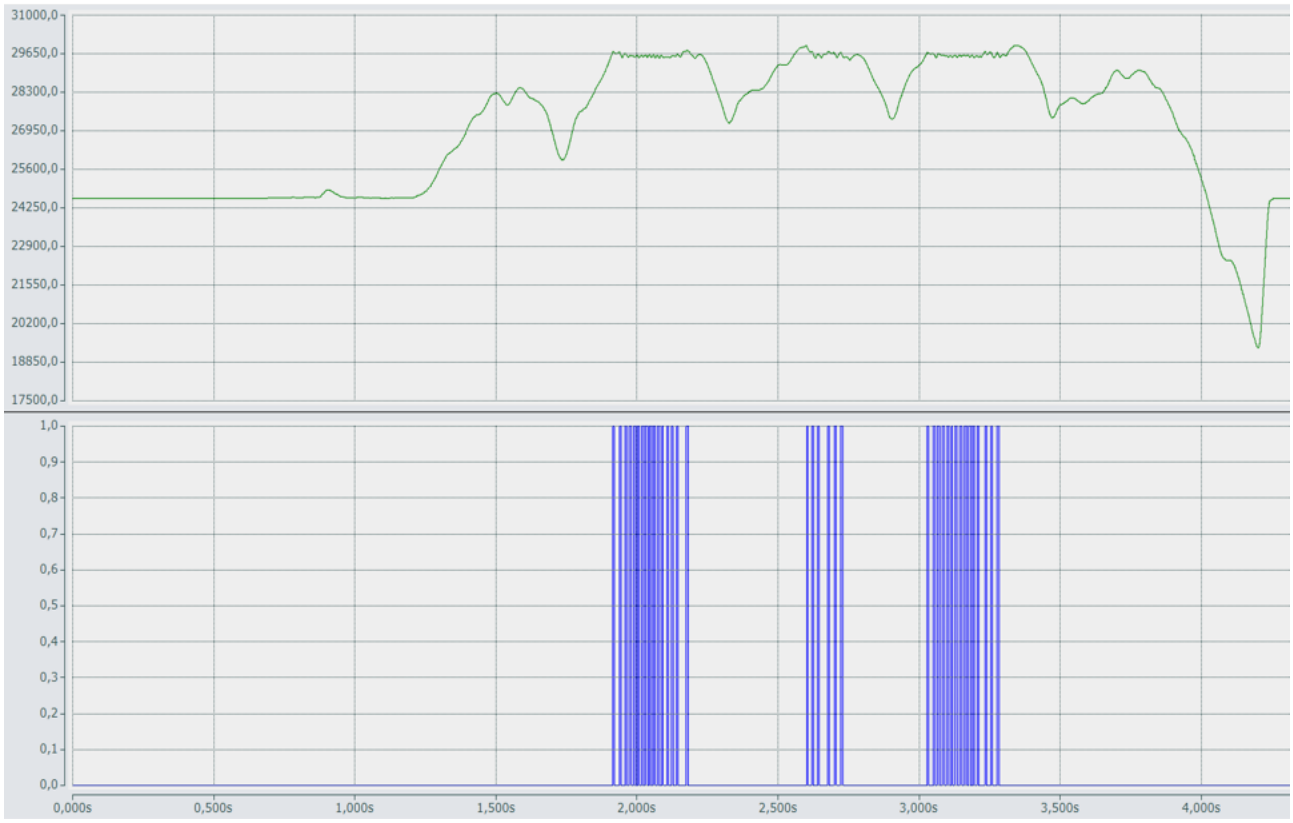
You can optionally enable the process data object “BCT Load” in the process image. The procedure for enabling can be found in chapter Temperature of the brake resistor [▶ 27].



I2T load factor
The current temperature of the braking resistor. Unit: °C.

3.6 Technology

The following figure shows an example of a voltage curve that illustrates the operation of EP9576-1032. The upper diagram shows the voltage U_P in mV, the lower diagram shows the activity of the chopper.



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 braking resistor. In the braking resistor the excess energy is dissipated and converted to heat. The voltage U_P drops again.

4 Mounting and connections

4.1 Mounting

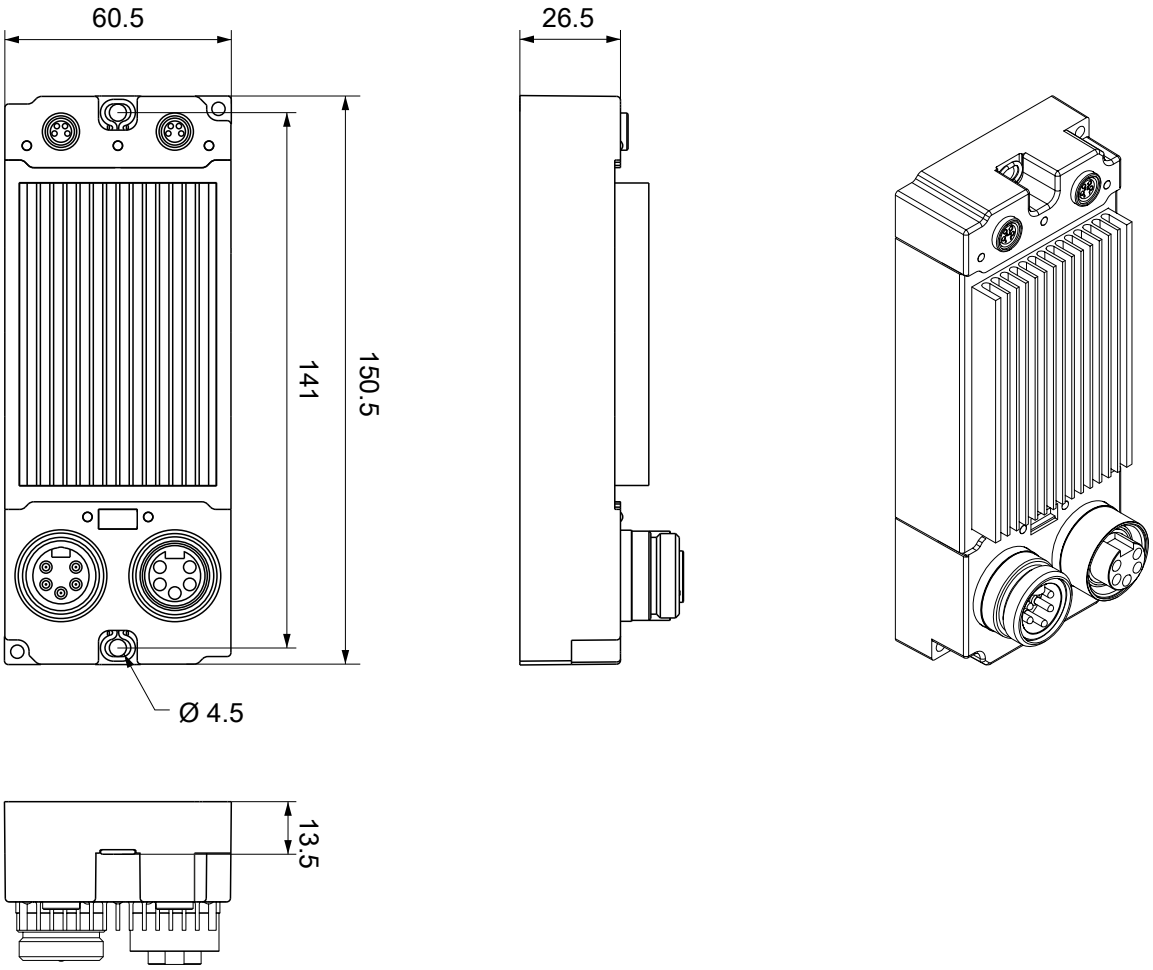
⚠ CAUTION

Hot surfaces.

Risk of burns.

- Do not touch the device during operation.
- Allow the device to cool down after operation before touching it.
- When selecting the installation location, ensure that neighboring components are not damaged by heat.

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. 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

NOTICE

Dirt during assembly

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

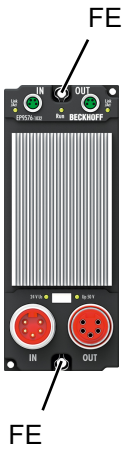
- Protect the plug connectors against dirt during the assembly.

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

4.1.3 Functional earth (FE)

The Fixing [▶ 18] 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

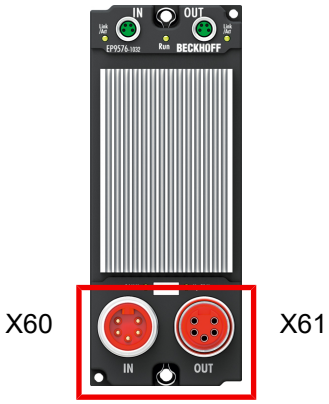
4.2.1 Supply voltages

NOTICE

Damage if operated without parameterization

If the chopper threshold is set too low, the braking resistor may be permanently active. This causes the box to overheat. Material damage is possible.

- Only apply U_P to the box after parameterization.
- Set the chopper parameters according to the specifications in the chapter Chopper [▶ 25].



4.2.1.1 Connectors

NOTICE

No functionality without U_S.

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

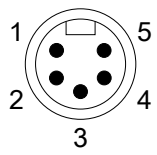
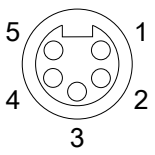
- Connect not only U_P but also U_S.

NOTICE

The permitted sum current must not be exceeded.

Risk of defect.

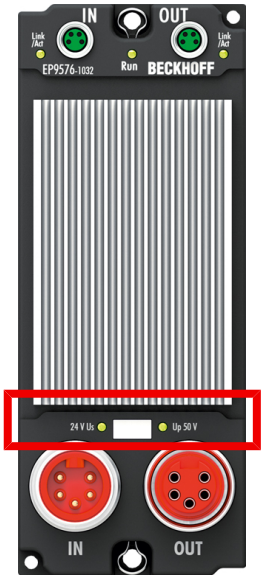
- Ensure that the maximum permitted sum current of 16 A at 40 °C flows through each pin.
- Incorporate the transmitted supply current into the calculation.

Input X60 7/8“ connector	Downstream connection 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_{DC}
		5	U_P	Supply voltage 0...72 V_{DC}

Ground the core "FE" at the other end of the cable.
The pin "FE" is directly connected to the connections for the functional earth [▶ 18].

4.2.1.2 Status LEDs

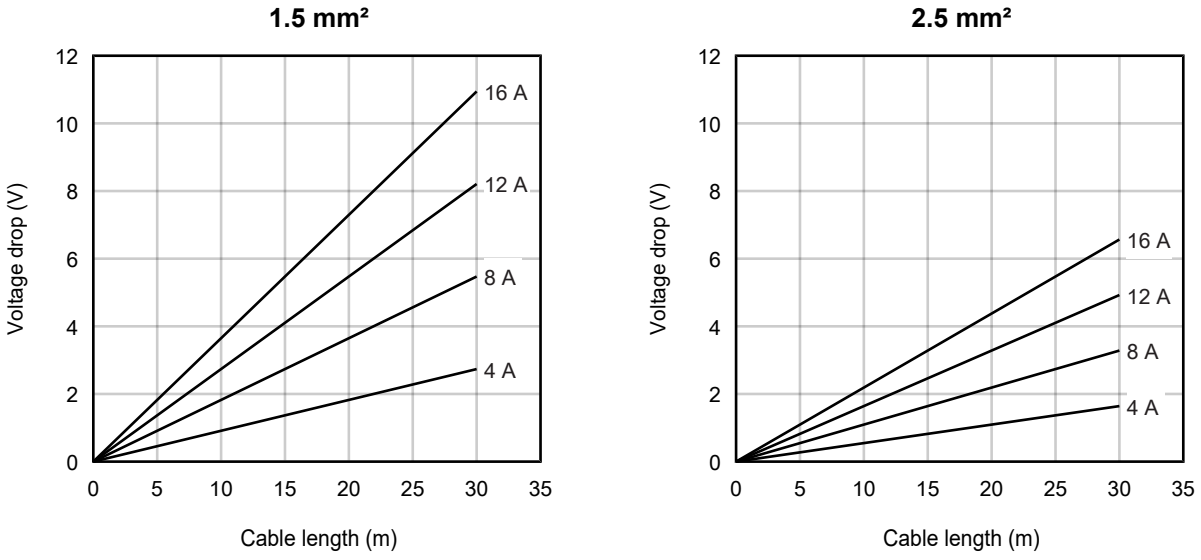
The status of the supply voltages is signaled by two LEDs. A Status LED lights up green when the respective supply voltage is present on the supply voltage input.



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

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

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

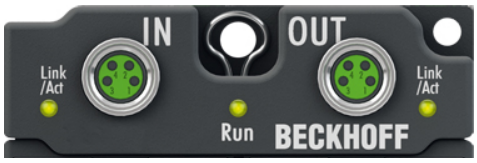


Fig. 4: EtherCAT connectors

Connection

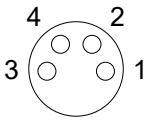


Fig. 5: M8 socket

EtherCAT	M8 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.

4.2.2.2 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

4.3 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

NOTICE

Damage if operated without parameterization

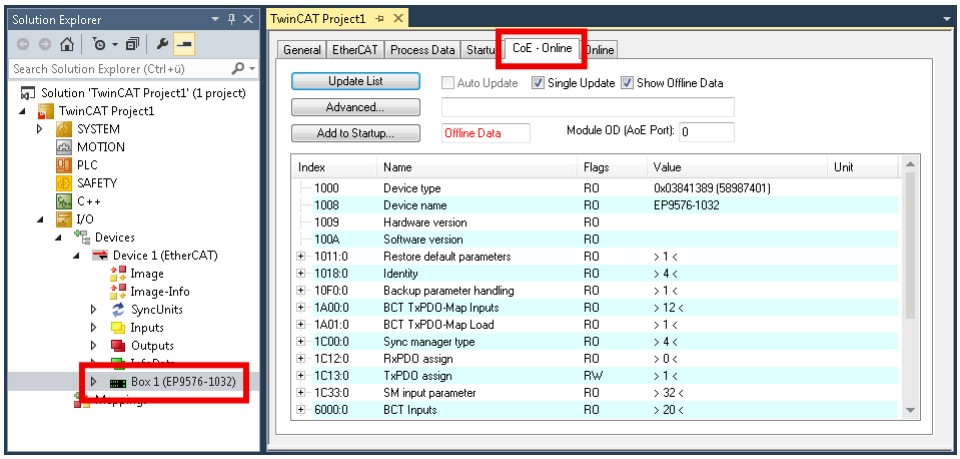
If the chopper threshold is set too low, the braking resistor may be permanently active. This causes the box to overheat. Material damage is possible.

- Only apply U_P to the box after parameterization.
- Set the chopper parameters according to the specifications in the chapter Chopper [▶ 25].

5.1 Integrating into a TwinCAT project

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

5.2 Open the parameter directory (CoE)



1. Double-click on EP9576-1032 in the Solution Explorer.
2. Select the “CoE - Online” tab.

⇨ You will see the CoE directory of the EP9576-1032. Here you can check and change parameter values.

Resetting parameters to factory settings

If you do not know whether parameters have already been changed on this EP9576-1032, you can reset all parameters to the factory settings before parameterization, see chapter Restore the delivery state [▶ 30].

5.3 Chopper

NOTICE

Damage if operated without parameterization

If the chopper threshold is set too low, the braking resistor may be permanently active. This causes the box to overheat. Material damage is possible.

- Only apply U_P to the box after parameterization.
- Set the parameters so that the following condition is always met:

$$V_{th} - V_{hyst} > U_{p,max}$$

V_{th}: 8000:11 "Chopper threshold overvoltage".

V_{hyst}: 8000:13 "Chopper hysteresis voltage".

$U_{p,max}$: Nominal voltage U_P plus the maximum tolerance upwards.

NOTICE

The chopper is disabled in case of overtemperature

Overvoltages 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.

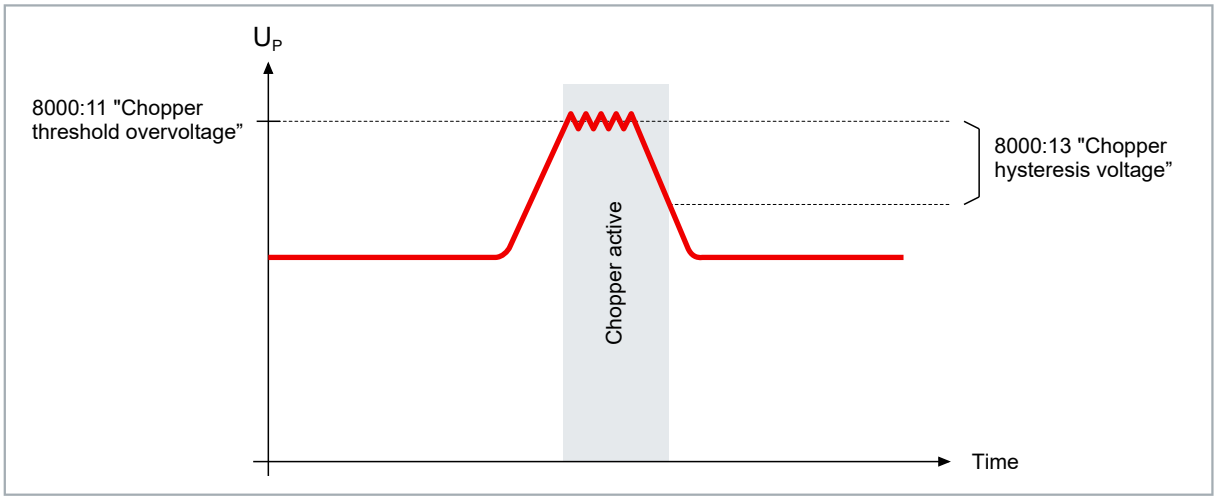
The chopper is automatically activated when the voltage U_P exceeds the limit value "Chopper threshold overvoltage". The chopper controls the current through the braking resistor such that the voltage U_P does not increase further.

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_{dec}
8000:13	Chopper hysteresis voltage	Hysteresis voltage for switching off the Choppers. Unit: mV.	UINT32	RW	1000_{dec}

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



5.4 Protective functions

5.4.1 Overtemperature protection

The overtemperature protection disables the chopper if one of the following cases occurs:

- The temperature of the braking resistor exceeds the limit value “I2T error level”.
- The internal temperature of the box exceeds 80 °C. (from firmware 03)

In both cases, the bit “I2T error” in the process data is also set to 1.

The chopper is re-enabled when the temperature of the braking resistor falls below the limit value “I2T warn level” or the internal temperature of the box falls below 70 °C. (Hysteresis)

Parameter

Index (hex)	Name	Description	Data type	Flags	Default
8000:18	I2T warn level	If the temperature of the braking resistor exceeds this value, the bit “I2T warning” is set to TRUE. Unit: °C.	UINT16	RW	100_{dec}
8000:19	I2T error level	If the temperature of the braking resistor exceeds this value, the chopper is disabled. The bit “I2T error” is set to TRUE. Unit: °C.	UINT16	RW	120_{dec}

Overtemperature warning

The bit “I2T warning” in the process data is set to 1 if one of the following cases occurs:

- The temperature of the braking resistor exceeds the limit value “I2T warn level”.
- The internal temperature of the box exceeds 70 °C. (from firmware 03)

However, the chopper is not yet disabled. Therefore, you can still react to the warning. As soon as the value falls below the corresponding threshold again, the bit is reset to 0.

Disabling the overtemperature shutdown

You can disable the overtemperature shutdown of the chopper by setting parameter 8000:01 “Disable chopper on overtemperature” to FALSE.

5.4.2 Overcurrent protection

The overcurrent protection disables the chopper if the current through the braking resistor exceeds 15.5 A. The “Overcurrent Protection” bit in the process data is set to 0.

The chopper remains disabled until you apply a positive edge to parameter 8000:03 “Overcurrent Protection Reset”.

5.5 Measured values

5.5.1 Temperatures

5.5.1.1 Temperature of the brake resistor

The temperature of the braking resistor is not measured directly. It is calculated internally from the time curve of the measured current value.

Configuring the temperature calculation

The ambient temperature must be known in order to calculate the temperature of the braking resistor.

Enter the ambient temperature in parameter 8000:15 “Ambient temperature offset”. The factory setting is 50 °C.

Overtemperature shutdown

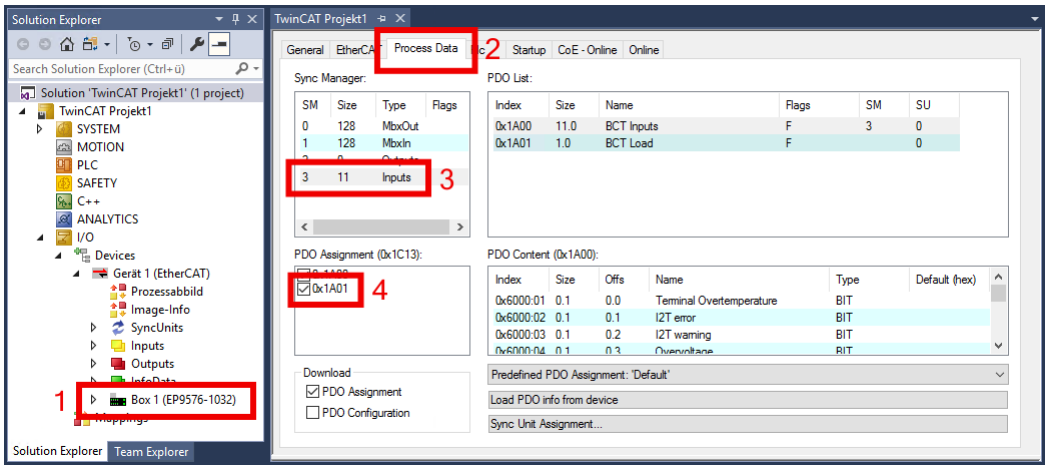
If the temperature of the braking resistor is too high, the overtemperature protection disables the chopper.

See chapter Overtemperature protection [▶ 26].

Activating process data

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

Procedure in TwinCAT 3:



1. Double-click on EP9576-1032 in Solution Explorer.
2. Select the "Process data" tab.
3. In the "Sync Manager" field, click on "Inputs".
4. In the "PDO Assignment (0x1C13)" field, check "0x1A01".

⇨ The process data object BCT Load [▶ 14] is added to the process data.

5.5.1.2 Internal temperature

The current internal temperature of the box is in CoE parameter A000:11 “Temperature”.

Overtemperature shutdown

From firmware 03, the chopper is disabled if the internal temperature exceeds 80 °C. See chapter Overtemperature protection [▶ 26].

Up to and including firmware 02, the chopper remains enabled regardless of the internal temperature.

Limit value monitoring

If the internal temperature exceeds a limit value, the status bit “Terminal Overtemperature” is set. The default limit is 80 °C and can be set via parameter 8000:14 “Terminal overtemperature threshold”.

Changing this limit does not affect the overtemperature limit.

5.5.2 Current and voltage

The process data contains the measured values of two electrical variables:

- The voltage U_P: “DC link voltage”
- The current through the braking resistor: “Resistor current”

See also chapter Process data [▶ 13].

5.5.2.1 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.

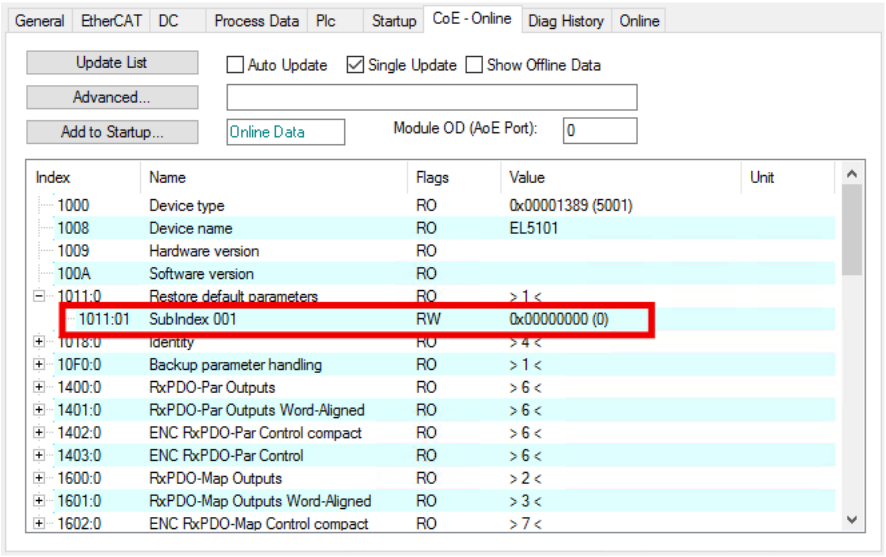
Parameter

Index (hex)	Name	Description	Data type	Flags	Default
8000:02	Enable filter	Enable the measured value filter [▶ 29].	BOOL	RW	TRUE
8000:1A	Filter Settings	Measured value filter type: 0: FIR 50Hz 1: FIR 60Hz 2: IIR1 3: IIR2 4: IIR3 5: IIR4 6: IIR5 7: IIR6 8: IIR7 9: IIR8	UINT16	RW	0

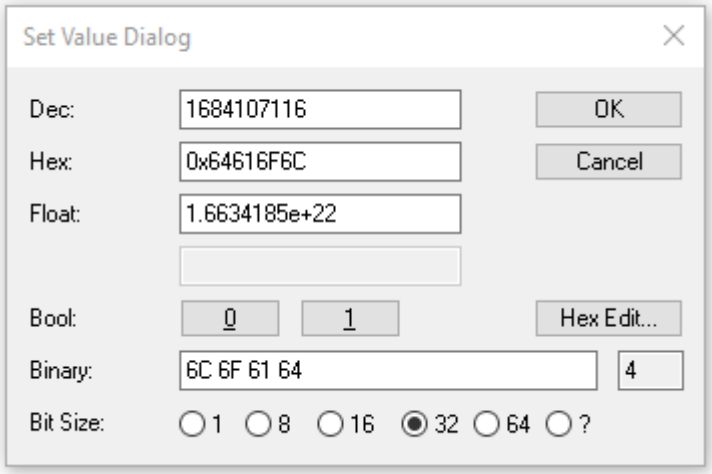
5.6 Restore the delivery state

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.

5.7 Decommissioning

⚠ WARNING

Risk of electric shock!

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

6 CoE parameters

6.1 Object directory

Index (hex)	Name
1000	Device Type [▶ 35]
1008	Device name [▶ 35]
1009	Hardware version [▶ 35]
100A	Software version [▶ 35]
1011	Restore default parameters [▶ 35]
1018	Identity [▶ 35]
10F0	Backup parameter handling [▶ 35]
1A00	BCT TxPDO-Map Inputs [▶ 37]
1A01	BCT TxPDO-Map Load [▶ 37]
1C00	Sync manager type [▶ 39]
1C12	RxPDO assign [▶ 37]
1C13	TxPDO assign [▶ 37]
1C33	SM input parameter [▶ 39]
6000	BCT Inputs [▶ 38]
6001	BCT Load Factor [▶ 38]
8000	BCT Settings [▶ 33]
800F	BCT Vendor data [▶ 34]
A000	BCT Diag data [▶ 34]
B000	BCT Command [▶ 35]
F000	Modular Device Profile [▶ 36]
F008	Code word [▶ 36]
F081	Download revision [▶ 36]

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_{dec})
8000:01	Disable chopper on overtemperature	Disable overtemperature protection [▶ 26].	BOOL	RW	TRUE
8000:02	Enable filter	Enable the measured value filter [▶ 29].	BOOL	RW	TRUE
8000:03	Overcurrent Protection Reset	Reset overcurrent protection [▶ 26].	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_{dec}
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_{dec}
8000:13	Chopper hysteresis voltage	Hysteresis voltage for switching off the Choppers. Unit: mV.	UINT32	RW	1000_{dec}
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_{dec}
8000:15	Ambient temperature offset	Enter the ambient temperature here. This value is included in the calculation of the temperature of the braking resistor [▶ 27]. Unit: °C.	UINT8	RW	50_{dec}
8000:18	I2T warn level	If the temperature of the braking resistor exceeds this value, the bit “I2T warning” is set to TRUE. Unit: °C.	UINT16	RW	100_{dec}
8000:19	I2T error level	If the temperature of the braking resistor exceeds this value, the chopper is disabled. The bit “I2T error” is set to TRUE. Unit: °C.	UINT16	RW	120_{dec}
8000:1A	Filter Settings	Measured value filter type: 0: FIR 50Hz 1: FIR 60Hz 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_{dec})
800F:13	Resistor current offset	Vendor calibration: Offset value for current measurement [▶ 29].	INT16	RW	-
800F:14	Resistor current gain	Vendor calibration: Gain value for current measurement [▶ 29].	UINT16	RW	-
800F:15	DC link voltage offset	Vendor calibration: Offset value for voltage measurement [▶ 29].	INT16	RW	-
800F:16	DC link voltage gain	Vendor calibration: Offset value for voltage measurement [▶ 29].	UINT16	RW	-

Index A000: BCT Diag data

Index (hex)	Name	Description	Data type	Flags	Default
A000:0	BCT Diag data		UINT8	RO	0x11 (17_{dec})
A000:11	Temperature	Internal temperature [▶ 28]. 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_{dec}

Index 1009 Hardware version

Index (hex)	Name	Description	Data type	Flags	Default
1009:0	Hardware version	Hardware version [▶ 7]	STRING	RO	-

Index 100A Software version

Index (hex)	Name	Description	Data type	Flags	Default
100A:0	Software version	Firmware version [▶ 7]	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	25684052_{hex}
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_{dec}
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_{dec})
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_{dec})
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_{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	0x0001 (1_{dec})

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_{dec})
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_{dec})
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_{dec})
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_{dec})
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_{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 1C33: SM input parameter

Index	Name	Meaning	Data type	Flags	Default
1C33:0	SM input parameter	Synchronization parameters for the inputs	UINT8	RO	0x20 (32_{dec})
1C33:01	Sync mode	Current synchronization mode: 0: Free Run 1: Synchron with SM 3 Event (no outputs available) 2: DC - Synchron with SYNC0 Event 3: DC - Synchron with SYNC1 Event 34: Synchron with SM 2 Event (outputs available)	UINT16	RW	0
1C33:02	Cycle time	as 1C32:02	UINT32	RW	0x000F4240 (1000000_{dec})
1C33:03	Shift time	Time between SYNC0 event and reading of the inputs (in ns, only DC mode)	UINT32	RO	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	0x00002710 (10000_{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	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 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

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 can be found on the Beckhoff website: Link.

Ordering information	Description	Link
ZK1090-3xxx-xxxx	EtherCAT cable M8, green	Website
ZK1093-3xxx-xxxx	EtherCAT cable M8, yellow	Website
ZK203x-xxxx-xxxx	Power cable 7/8", 5-pin	Website

Tools

Ordering information	Description
ZB8801-0000	Torque wrench for plugs, 0.4…1.0 Nm
ZB8801-0001	Torque cable key for M8 / wrench size 9 for ZB8801-0000

Further accessories

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

7.3 Version identification of EtherCAT devices

7.3.1 General notes on marking

Designation

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

- family key
- type
- version
- revision

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

Notes

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

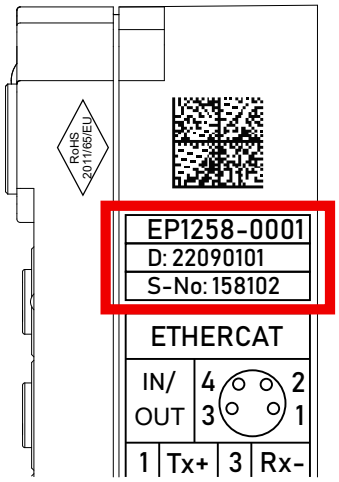


Fig. 7: EP1258-00001 IP67 EtherCAT Box with batch number/DateCode 22090101 and unique serial number 158102

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.

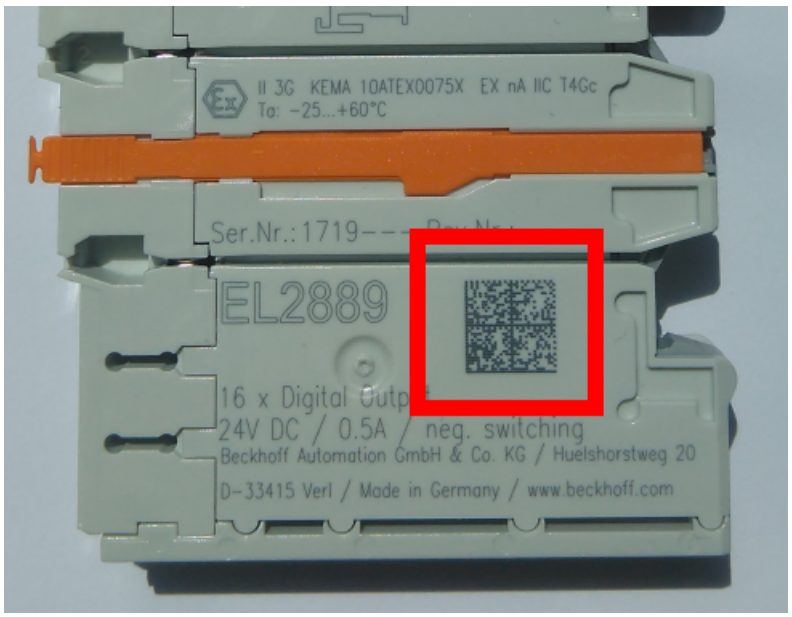


Fig. 8: BIC as data matrix code (DMC, code scheme ECC200)

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.

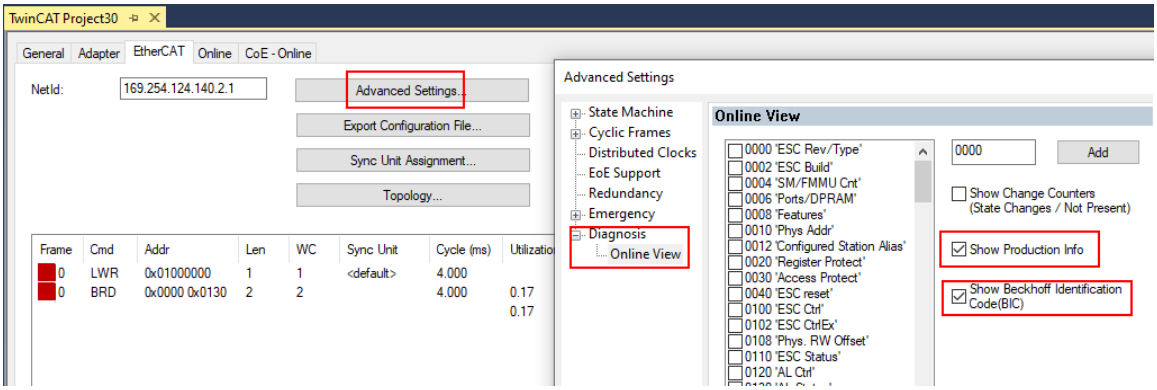
EtherCAT devices (IP20, IP67)

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.

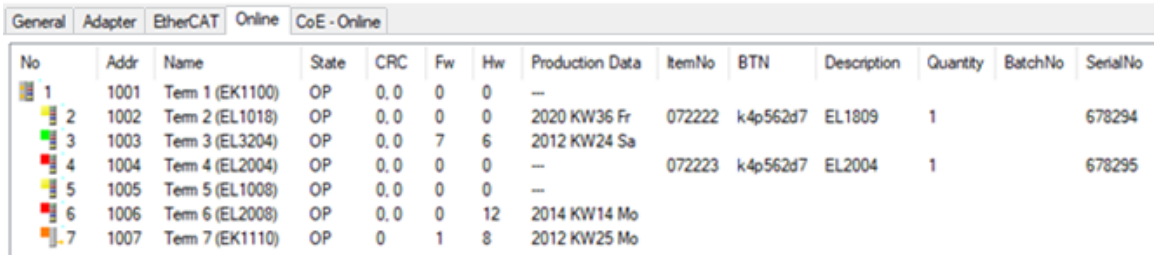
Beckhoff also stores the eBIC in the ESI-EEPROM. The eBIC was introduced into Beckhoff IO production (terminals, box modules) in 2020; as of 2023, implementation is largely complete.

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:

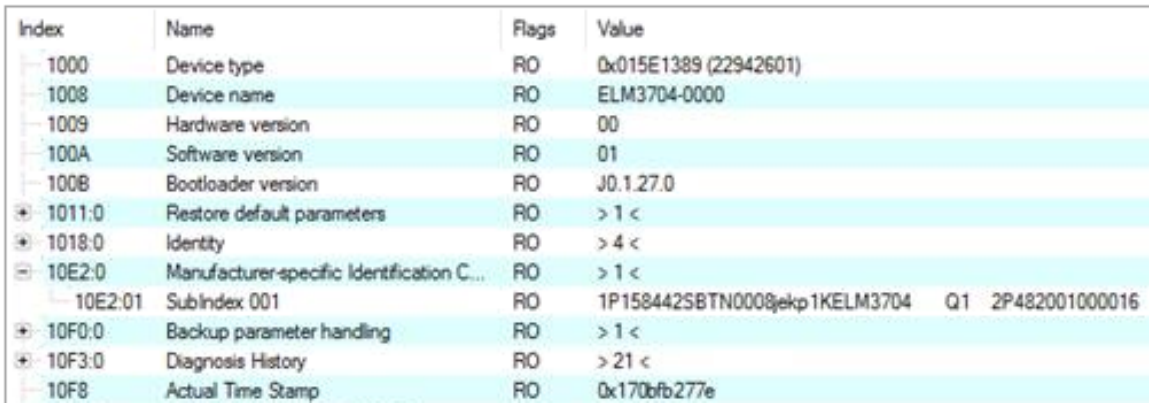


  - The BTN and its contents are then displayed:



  - 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

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web:	www.beckhoff.com/support

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- repair service
- spare parts service
- hotline service

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