

Documentation | EN

EP6080-0000

EtherCAT Box, NOVRAM memory 128 kByte



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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
1.0	• 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 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.

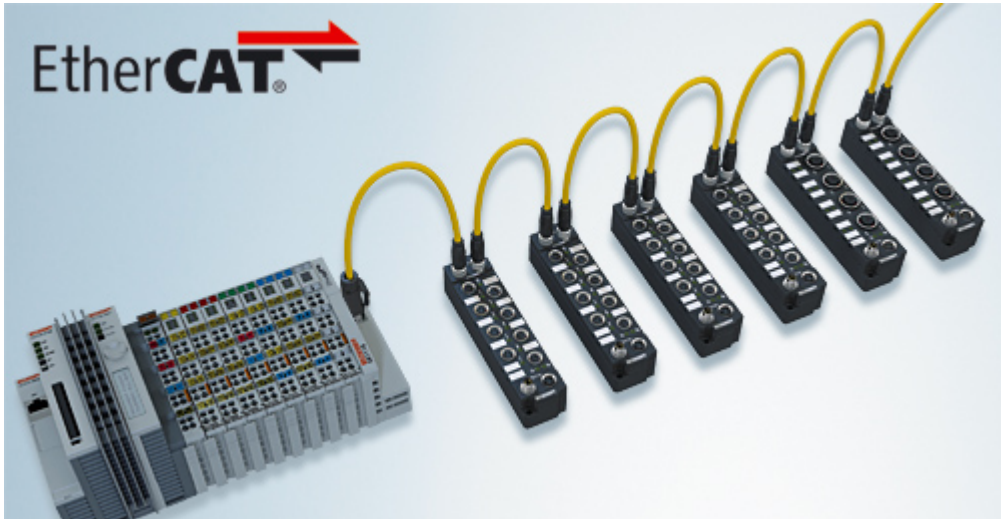


Fig. 1: EtherCAT Box Modules within an EtherCAT network

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 μ 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



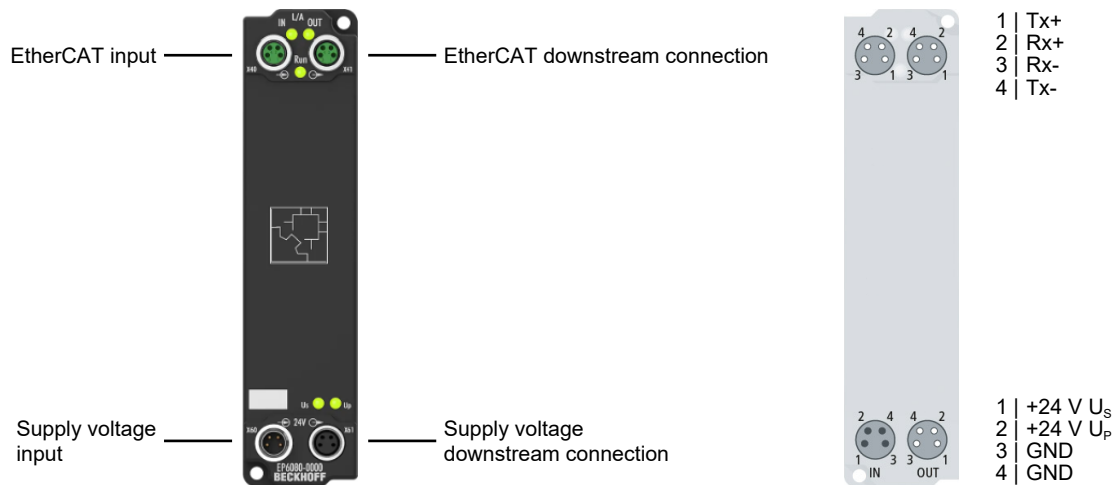
Fig. 3: EtherCAT Box with M12 connections for sensors/actuators

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) under Downloads.

3 Product overview

3.1 Introduction



The EP6080-0000 EtherCAT memory box module offers 128 kbytes of non-volatile memory (NOVRAM). This box module can be used to store and read parameters and recipes. Part of the memory can also be used for cyclic storage of machine data, such as operating hours counters or production counter values.

This EtherCAT Box module is notably used in modular machine concepts featuring a central controller, to store module-related data on the machine module.

Quick links

[Technical data \[▶ 11\]](#)

[Process image \[▶ 13\]](#)

[Dimensions \[▶ 14\]](#)

3.2 Technical data

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

EtherCAT	
Connection	2 x M8 socket, 4-pin, A-coded, shielded
Electrical isolation	500 V

Supply voltages	
Connection	Input: M8 connector, 4-pin, A-coded Downstream connection: M8 socket, 4-pin, A-coded
U _S nominal voltage	24 V _{DC} (-15 % / +20 %)
U _S sum current: I _{S,sum}	max. 4 A
Current consumption from U _S	120 mA
Rated voltage U _P	24 V _{DC} (-15 % / +20 %)
U _P sum current: I _{P,sum}	max. 4 A
Current consumption from U _P	None. U _P is only forwarded.

NOVRAM memory	
Memory	128 kbyte NOVRAM
Max. usable memory, cyclic access	1280 bytes
Max. usable memory, acyclic access	up to 128 kbyte in max. 8190 byte sized objects, depending on variable structure
Number of write/read	variable

Housing data	
Dimensions W x H x D	30 mm x 126 mm x 26.5 mm (without connectors)
Weight	approx. 165 g
Installation position	variable
Material	PA6 (polyamide)

Environmental conditions	
Ambient temperature during operation	-25 ... +60 °C -25 ... +55 °C according to cURus
Ambient temperature during storage	-40 ... +85 °C
Vibration resistance, shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27 Additional tests [▶ 11]
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection class	IP65, IP66, IP67 (conforms to EN 60529)

Approvals/markings	
Approvals/markings *)	CE, cURus [▶ 21]

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

Additional tests

The devices have undergone the following additional tests:

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

3.3 Scope of supply

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

- 1x EP6080-0000 EtherCAT Box
- 1x protective cap for supply voltage input, M8, transparent (pre-assembled)
- 1x protective cap for supply voltage output, M8, black (pre-assembled)
- 2x protective cap for EtherCAT socket, M8, green (pre-assembled)
- 10x labels, blank (1 strip of 10)

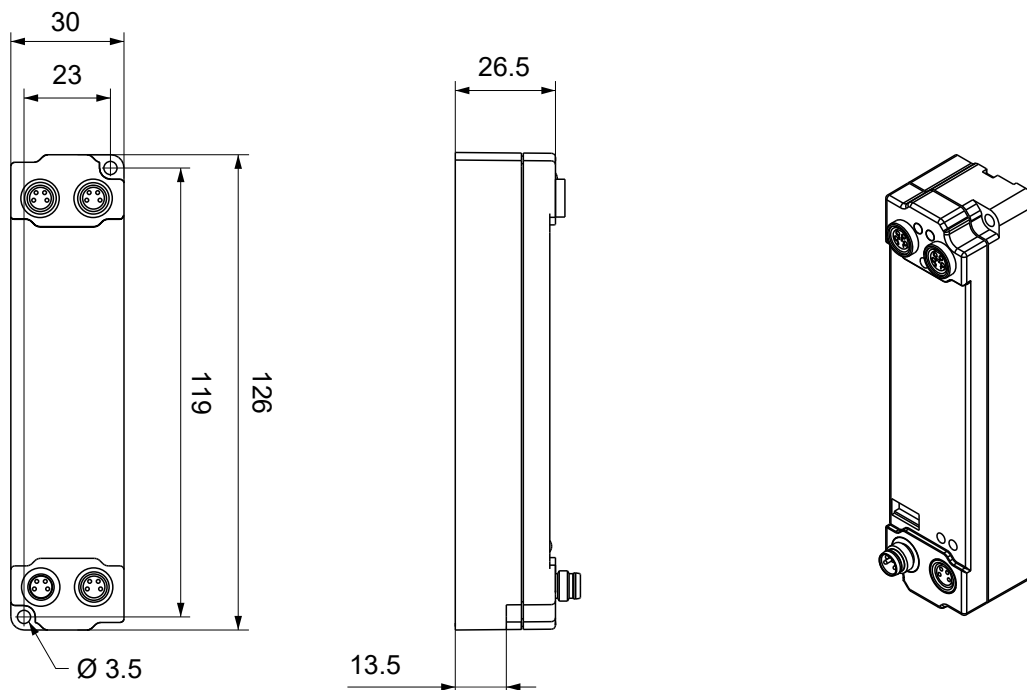
● Pre-assembled protective caps do not ensure IP67 protection

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.

4 Mounting and connection

4.1 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 $\varnothing 3.5$ mm for M3
Metal parts	brass, nickel-plated
Contacts	CuZn, gold-plated
Power feed through	max. 4 A
Installation position	variable
Protection class	IP65, IP66, IP67 (conforms to EN 60529) when screwed together
Dimensions (H x W x D)	approx. 126 x 30 x 26.5 mm (without connectors)

4.2 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 M3 screws on the mounting holes in the corners of the module. The mounting holes have no thread.

4.3 Functional earth (FE)

The upper mounting holes also serves as a connection for functional earth (FE).

Make sure that the box is grounded to low impedance via the functional earth (FE) connection. You can achieve this, for example, by mounting the box on a grounded machine bed.



4.4 EtherCAT

4.4.1 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.



Connection

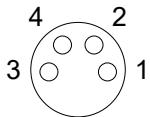


Fig. 4: M8 socket

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

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.

4.4.2 Status LEDs



L/A (Link/Act)

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

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

Run

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

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

Description of the EtherCAT slave states

4.4.3 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

4.5 Supply voltages

⚠ WARNING

Power supply from SELV/PELV power supply unit!

SELV/PELV circuits (Safety Extra Low Voltage, Protective Extra Low Voltage) according to IEC 61010-2-201 must be used to supply this device.

Notes:

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

⚠ CAUTION

Observe the UL requirements

- When operating under UL conditions, observe the warnings in the chapter [UL Requirements](#) [► 21].

The EtherCAT Box has one input for two supply voltages:

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

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

Redirection of the supply voltages

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

NOTICE

Note the maximum current!

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

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

NOTICE

Unintentional cancellation of the electrical isolation possible

In some types of EtherCAT Box modules the ground potentials GND_s and GND_p are connected.

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

4.5.1 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

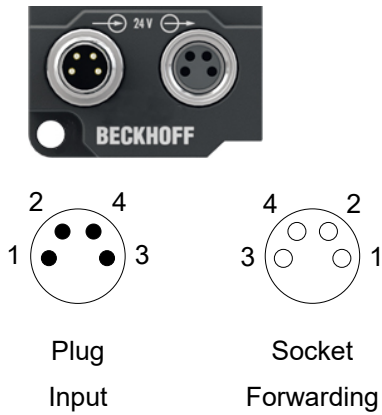


Fig. 5: M8 connector

Contact	Function	Description	Core color ¹⁾
1	U _S	Control voltage	Brown
2	U _P	Peripheral voltage	White
3	GND _S	GND to U _S	Blue
4	GND _P	GND to U _P	Black

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

4.5.2 Status LEDs

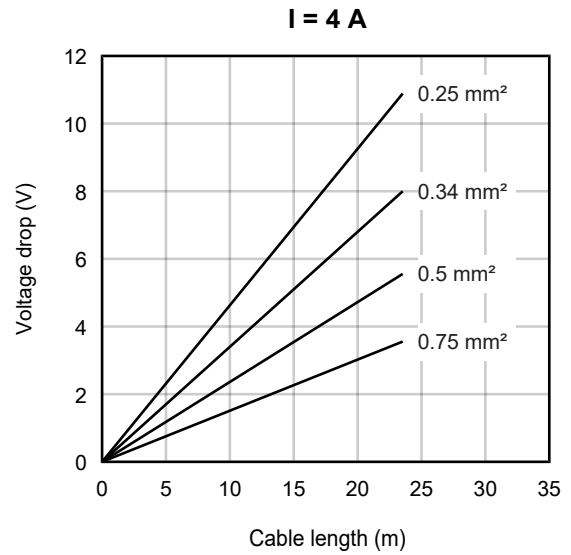
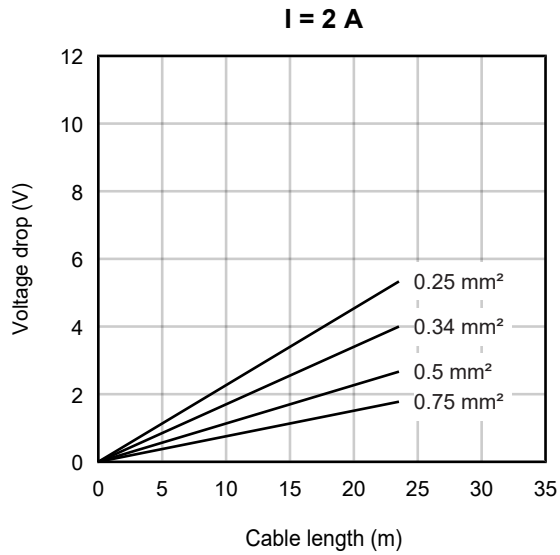


LED	Display	Meaning
U _S (control voltage)	off	The supply voltage U _S is not available.
	green illuminated	The supply voltage U _S is available.
U _P (peripheral voltage)	off	The supply voltage U _P is not available.
	green illuminated	The supply voltage U _P is available.

4.5.3 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



4.6 UL Requirements

The installation of the EtherCAT Box Modules certified by UL has to meet the following requirements.

Supply voltage

⚠ CAUTION

CAUTION!

This UL requirements are valid for all supply voltages of all marked EtherCAT Box Modules!
For the compliance of the UL requirements the EtherCAT Box Modules should only be supplied

- by a 24 V_{DC} supply voltage, supplied by an isolating source and protected by means of a fuse (in accordance with UL248), rated maximum 4 Amp, or
- by a 24 V_{DC} power source, that has to satisfy *NEC class 2*.
A *NEC class 2* power supply shall not be connected in series or parallel with another (class 2) power source!

⚠ CAUTION

CAUTION!

To meet the UL requirements, the EtherCAT Box Modules must not be connected to unlimited power sources!

Networks

⚠ CAUTION

CAUTION!

To meet the UL requirements, EtherCAT Box Modules must not be connected to telecommunication networks!

Ambient temperature range

⚠ CAUTION

CAUTION!

To meet the UL requirements, EtherCAT Box Modules has to be operated only at an ambient temperature range of -25 °C to +55 °C!

Marking for UL

All EtherCAT Box Modules certified by UL (Underwriters Laboratories) are marked with the following label.



Fig. 6: UL label

5 Commissioning and configuration

5.1 Integrating into a TwinCAT project

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

5.2 Basic function principles

The EP6080-0000 supports two memory access methods:

- [Cyclic process data](#) [▶ 23]
- [Acyclic SDO/CoE access](#) [▶ 26]

Delivery state

The EP6080-0000 is delivered ready for operation with no predefined acyclic data structures.

● General information on data consistency

i The EP6080-0000 can be used to store machine data cyclically in a fail-safe manner. A corresponding feedback in the status (cyclic operation) confirms that the data has been correctly transferred from the EP6080-0000. The data must appear correctly in the CoE in acyclic operation mode.

An operational case may occur where the box is switched off or the task is stopped during cyclic or acyclic write access. In this case, shadow buffers or the NOVRAM in the EP6080-0000 ensure data consistency at the lowest level, so that the last correctly written data set can always be accessed. At application level, however, the user must take care himself through appropriate use that the application adopts consistent data, for example, at the start (e.g. continuous counters or ID recognition in the data to be saved).

Example:

Several acyclic data objects are defined from 1 to 3 that are continuously written to by the application in sequence, e.g. 3 axis positions that are determined simultaneously in the application. The power fails during write access to object 2. Object 1 now contains the current axis position 1, but objects 2 & 3 contain outdated positions. At restart, the application must not assume that it is receiving 3 axis positions originating from the same point in time.

The same side effects must be taken into account in the case of simultaneous operation of the EP6080-0000 and Persistent/Retain/Other NOVRAM data (e.g. from FC cards or CX).

● Operational readiness

i It is **imperative** that you ensure in your application that the box has a valid WorkingCounter WcState before beginning with writing and, in particular, reading communication! Process data delivered by an EtherCAT slave when the WcState is $\neq 0$ (even if the data is $\neq 0$) must be discarded as invalid!

● CoE directory

i The functionality of the EP6080-0000 results in CoE objects being deleted or created during parameterization. Please refer to the [notes](#) [▶ 27] in order to ensure correct online CoE display.

5.3 Cyclic memory access

Data traffic with cyclic process data

The user can create one set of process data with an arbitrary structure, max. 1280 bytes. This data set can be written cyclically in its entirety to the box or read by it. Individual access to the constituent parts of this data set is not possible (keyword: addressing). Control is performed by the task by means of a handshake via Control/Status Word, so that several task cycles may be necessary for saving or reading back, depending on the extent of the data and the cycle time.

When the EP6080-0000 is switched on, the regularly stored data from the last operating session are immediately available for reading via the inputs.

Commissioning: the cyclic process image must be created identically at inputs and outputs, max. 1280 bytes. Creation by right-clicking on "IO Inputs" or "IO Outputs".

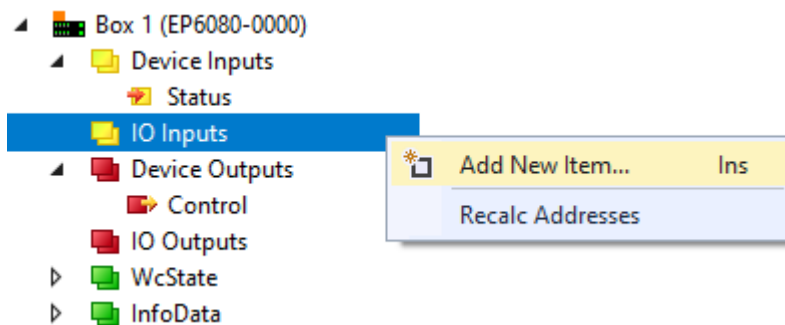


Fig. 7: Manual creation of the cyclic process data

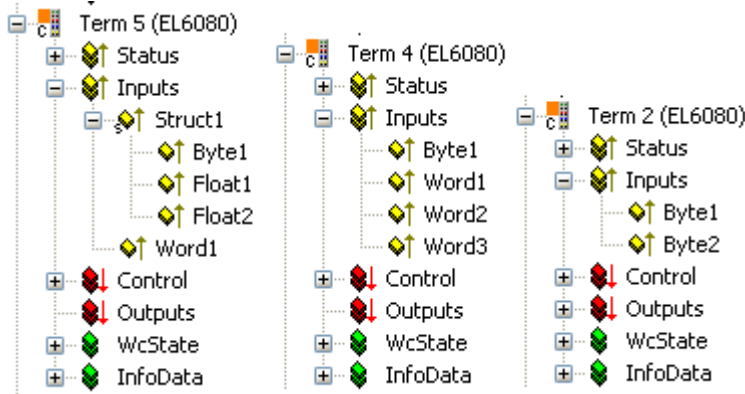
If the input and output are created in different sizes, the box start fails: "PREOP to SAFEOP failed".
If more than 1280 bytes are created, the box start fails with "Invalid SM In/Out Cfg".

- The data to be written from the task to the EP6080-0000 is output via the PDO "IO Outputs".
- The last valid data received from the EP6080-0000 arrives at the task as read data via the PDO "IO Inputs" without further action.

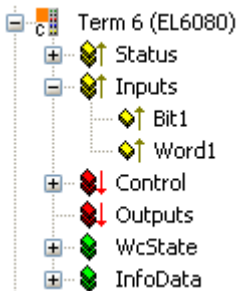
i Restriction up to and including TwinCAT 2.10

The structure of the Input/Output data is subject to the following restriction up to TwinCAT 2.10 build 1330: all defined variables must be composed of n*bytes; individual bits or such types of composed structures are not permissible. If such data is defined, the EP6080-0000 attains the OP state, but reports an error due to Working Counter = 1.

Examples of permissible configurations:



Example of an invalid configuration:



Cyclic operation with handshake, recommended operating sequence:

1. Output of the input data to the box, set "Control" to the value 1.
 - ⇒ If the box has successfully transferred the data, "Status" = 1 is returned.
2. Set "Control" to the value 0.
3. Wait until "Status" = 0 is returned.
 - ⇒ The box is ready for a new write access.

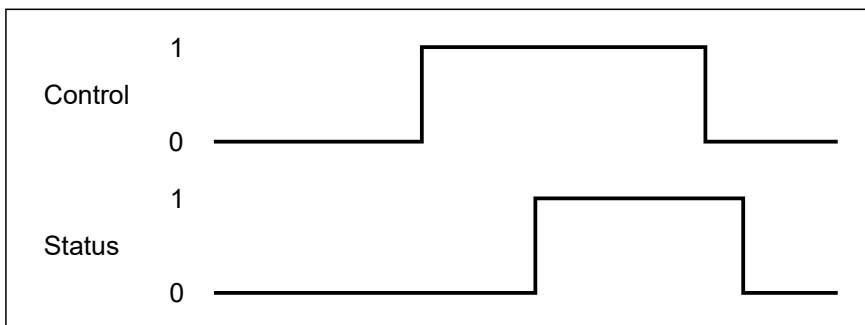


Fig. 8: Cyclic operation with handshake

Typical example of a measurement on the EL6080 for a cyclic write process according to the sequence specified above: (Beckhoff reserves the right to make unannounced changes)

- 20 bytes: 200 µs
- 1250 bytes: 2.5 ms

i **Process data image and frame length**

In the case of short cycle times, an extensive process image for the EP6080-0000 can result in an Ethernet frame that is longer than the cycle time. Therefore, in order to use the entire 1280 bytes of the cyclic process image, the cycle time must be at least 200 μ s.

5.4 Acyclic memory access

Data traffic with acyclic CoE access

In acyclic access, the user can create up to 255 memory objects that may also be differently sized. These objects can be specifically accessed from the PLC task via acyclic SDO access (Service Data Objects) for writing or reading; see sample program. This read/write access proceeds considerably slower than the above-described cyclic memory access.

The created structure can only be changed in the status PREOP. It can also be generally locked to prevent further changes.

Background information: The entire memory capacity is administered in the form of CoE objects (CAN over EtherCAT). The administration data (number and byte size) is located in the object index 0x2F00 with its subindexes; the stored data itself in the CoE objects from 0x2000: 0x2000, 0x2008, 0x2010, 0x2018 etc.

A memory object in acyclic access can comprise 1 to 8190 bytes.

The following procedure is recommended in order to use acyclic access:

- [Calculation of the storage space \[► 26\]](#)
- [Definition of the memory objects via the StartUp list \[► 27\]](#)
- [Access to the memory objects during operation \[► 31\]](#)

Calculation of the memory space

The available 128 KB (131,072 bytes) of memory are subdivided as follows:

- 1280 bytes for the cyclic data
- 2000 bytes for internal administration
- x bytes as defined by the user for the acyclic data in the following
- y bytes: a shadow buffer as large as the largest memory object is kept on standby in the background.

Sample: The acyclic memory objects Obj1, Obj2 and Obj3 are defined with 1,000, 3,000 and 7,000 bytes respectively --> x = 11,000 bytes and y = 7,000 bytes. Thus 113,072 bytes of memory space remain.

Definition of the memory objects via the StartUp list

The desired structure of the memory objects must be created once only in the status PREOP in the CoE directory in CoE object 0x2F00. This is also possible offline, i.e. without a connected box. At start-up, the EP6080-0000 checks whether the memory structure has changed and if necessary creates the objects in the memory accordingly.

Change in the data structure

I If the data structure or the object 0x2F00 is changed, all existing data in the EP6080-0000 is deleted. The data structure can be locked against modification by setting the lock object 0xF200:02.

Procedure short form:

1. Set "Lock" in CoE object 0xF200:02 to 0 (manually in TwinCAT or via PLC).
2. Enter the StartUp command for the CoE object 0x2F00
Content: number of objects + respective length in bytes.
Note: complete access, byte alignment, no empty object possible, only possible in P -> S transition, 16 bit entries, max. 127 memory objects.
3. Reload the configuration.
4. For control: reload the CoE directory.
5. Set Locked in CoE object 0xF200:02 = 1 (manually in the System Manager or via PLC), thus locking the structure to prevent further changes.

Procedure in detail:

The procedure to specify the structure of the memory objects as required by the user is as follows:

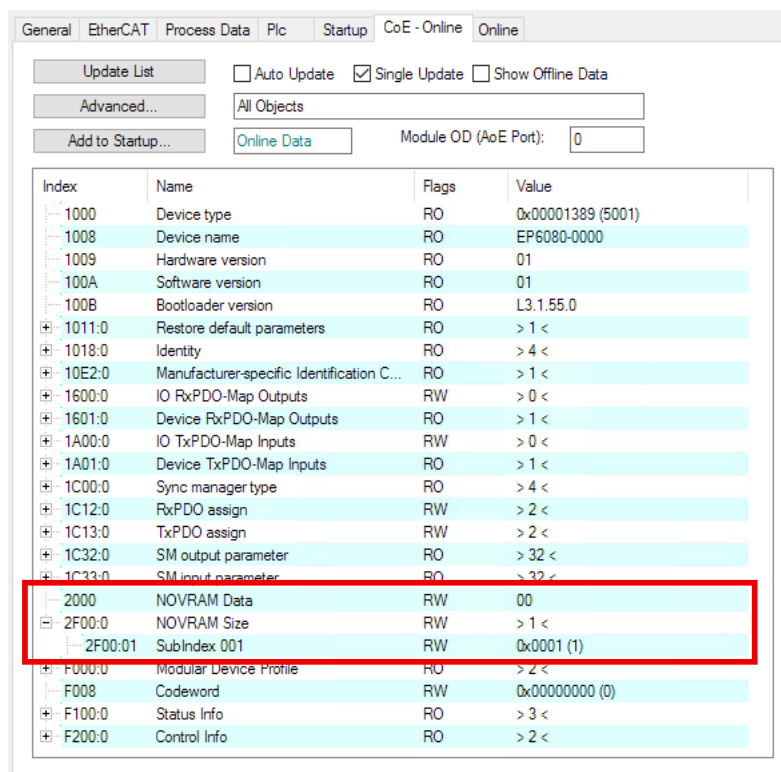


Fig. 9: Arbitrary start state of the EP6080-0000

Following startup, the EP6080-0000 contains either an already changed memory structure or the default memory structure. The CoE objects from 0x2000 and 0x2F00 are important in the following. In Figure *Any start state of the EP6080-0000*, an object of size 1 byte is already created in the EP6080-0000:

- 0x2F00:0 ("NOVRAM Size Info"): "1" = 1 memory object exists.
- 0x2F00:01 ("Subindex 001"): "0x0001" = this one memory object has been defined with a size of 1 byte.

- 0x2000 ("NOVRAM Data"): 00 - this one memory object thus bears "00" as the date of use.

Now the EP6080-0000 is to be reconfigured to the following memory structure:

- 1 byte
- 10 byte
- 256 byte
- 3 byte

i.e. a total of 270 bytes in 4 memory objects, which can each be accessed acyclically via the CoE. A corresponding entry for this must be made in the EP6080-0000's StartUp list. This list is empty by default on the EP6080-0000.

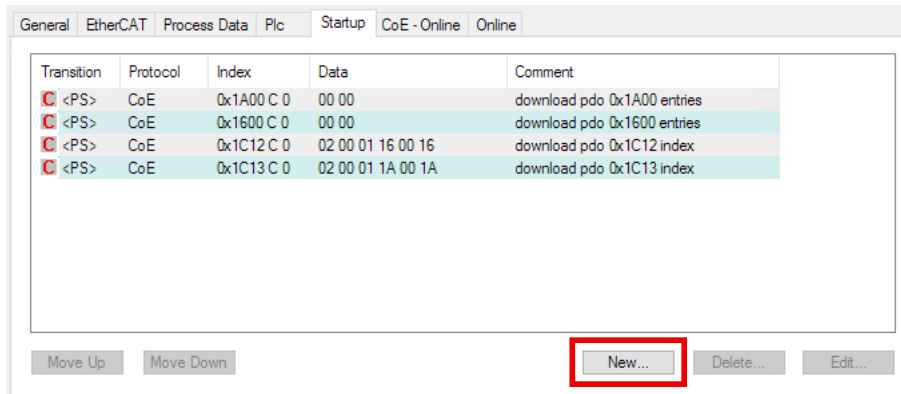


Fig. 10: Addition of a new StartUp entry

This is achieved by *New..* in the *StartUp* tab of EP6080-0000.

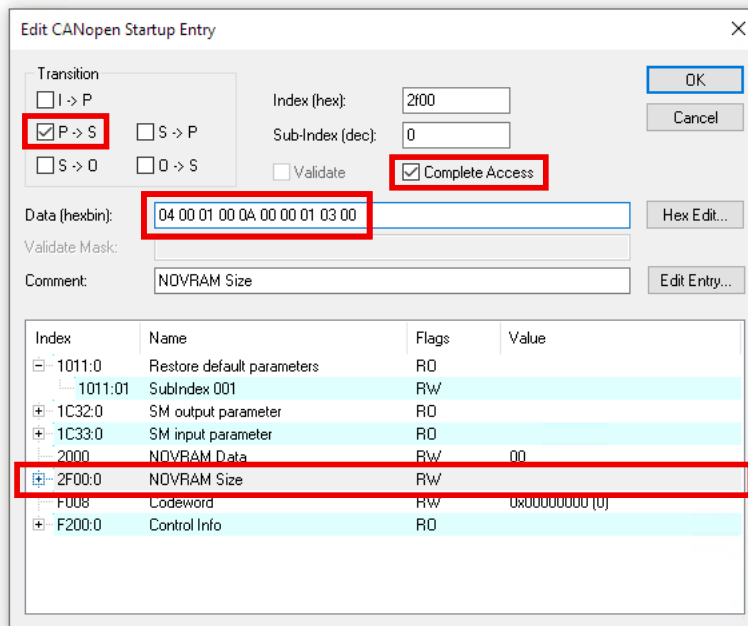


Fig. 11: Definition of the StartUp entry

A window opens in which the new StartUp entry can be defined.

- Select object 0x2F00 from the list, so that the correct values already appear in *Index/SubIndex* and *Comment*.
- "P-->S" must be selected in *Transition* (the value will be loaded to the EP6080-0000 during the state transition PREOP-->SAFEOP).
- *CompleteAccess* must be activated.

- Enter the structure you require in Data, in the form “aa aa bb bb cc cc”
 aa aa: Number of desired memory objects, in hex and reverse byte order (byte alignment).
 bb bb, cc cc, ...: respective size definition of the objects, in hex and reverse byte order (byte alignment).

StartUp list selection dialog

I If no CoE entries (see Fig. *Definition of the StartUp entry*) are offered for selection, this is because you are working offline (i.e. without a connected box) and the ESI (EtherCAT Slave Information, XML description) of the EP6080-0000 that you are using does not contain a dictionary. In this case you can also define StartUp entries entirely manually, i.e. enter Index and Subindex manually.

Example:

- aa aa = 04 00: 4 memory objects are desired.
- bb bb = 01 00: 1st memory object has a size of 1 byte ($00\ 01_{hex} = 1_{dec}$).
- cc cc = 0A 00: 2nd memory object has a size of 10 bytes ($00\ 0A_{hex} = 10_{dec}$).
- dd dd = 00 01: 3rd memory object has a size of 256 bytes ($01\ 00_{hex} = 256_{dec}$).
- ee ee = 03 00: 4th memory object has a size of 3 bytes ($00\ 03_{hex} = 3_{dec}$).

Confirm with OK. The new StartUp entry looks like this:

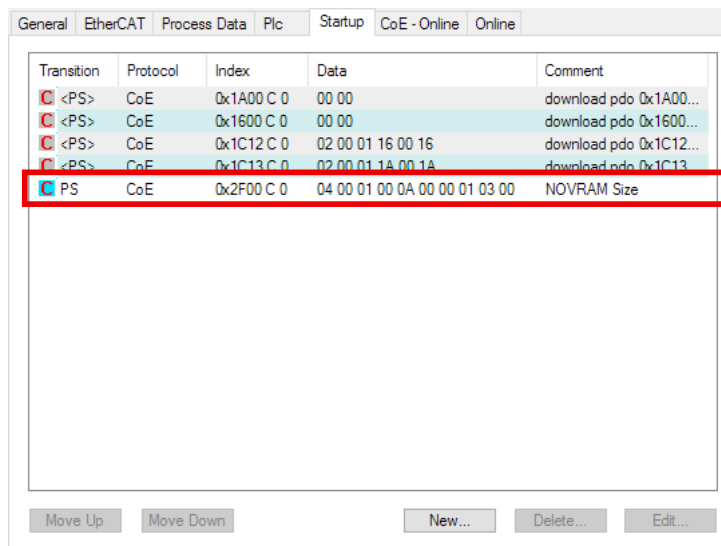


Fig. 12: New EP6080-0000 StartUp entry

This configuration must now be loaded to the EP6080-0000 and, in particular, the PREOP-->SAFEOP state transition must be run through as defined in the StartUp entry. Click the "Reload Devices" button (Fig. *Reload the configuration*):

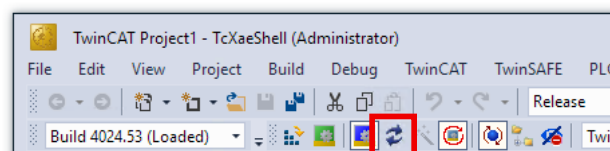


Fig. 13: Reload the configuration

The old entry is still visible in the *CoE-Online* tab.

The reason is that TwinCAT primarily only loads the values of CoE objects that are known to the System Manager. If the CoE structure changes on the device, the System Manager has to be instructed to load the new structure, which may differ from the default structure according to XML/Dictionary.

Load the reconfigured CoE directory (Fig. *Full reload of the CoE directory*):

- CoE-Online, *Advanced...*
- Double-click *AllObjects*
- then *OK*

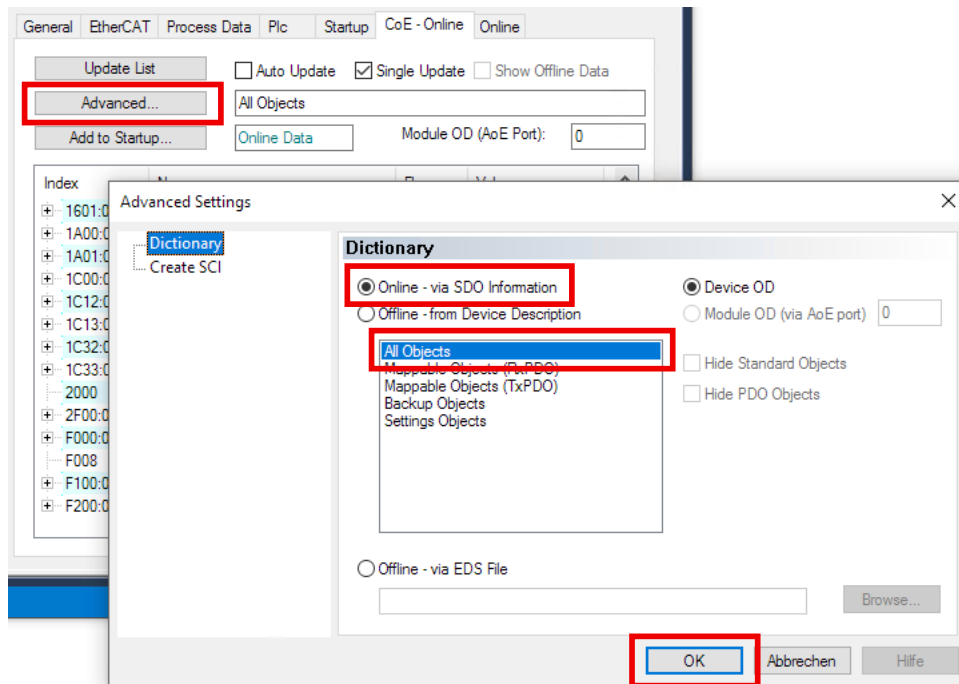


Fig. 14: Complete reload of the CoE directory

The newly defined memory objects are now visible and enabled, see Fig. *Modified CoE directory*.

- the structure information (byte size) of memory objects 1 to 4 is defined in CoE object 0x2F00, Subindex 001 to 004
- the current memory contents are displayed in the order according to associated CoE objects 0x2000, 0x2008, 0x2010 etc.

i Updating the CoE directory

In order to update the display of the CoE directory, use AutoUpdate, UpdateList or the appropriate dialog under Advanced.

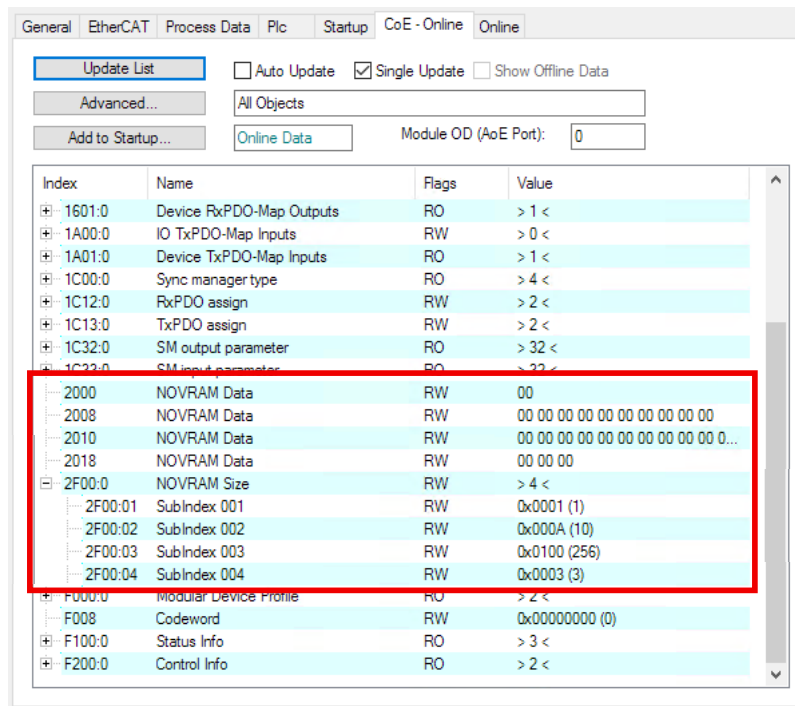


Fig. 15: Changed CoE directory

i **Displaying larger CoE objects**

In the sample selected here, the content of the third memory object in the CoE object 0x2010 is not shown in the TwinCAT display, see Fig. *Changed CoE directory*, because the content is too large to be displayed. Regardless of that, the contents naturally exist.

Online access to the memory objects during operation

Function blocks from the PLC library "Tc2_EtherCAT" such as *FB_EcCoESdoWriteEx* can be used for access from the PLC.

Sample

```
fbWriteCoE (
sNetId:=sAmsNetId,
nSlaveAddr:= tAmsAddr.port ,
nSubIndex:= 0,
nIndex:= 16#2000 + ((byObjectNo - 1) * 8),
pSrcBuf:= pDataForWrite,
cbBufLen:= wSizeOfData,
bExecute:= TRUE,
tTimeout:= tAdsTimeOut,
bCompleteAccess:= FALSE,
bBusy=> ,
bError=> ,
nErrId=> );
```

i **Sample program**

The EL6080 documentation contains a sample program that demonstrates CoE access from a PLC program.

[Documentation on EL6080](#)

5.5 Delete data

Deleting existing data

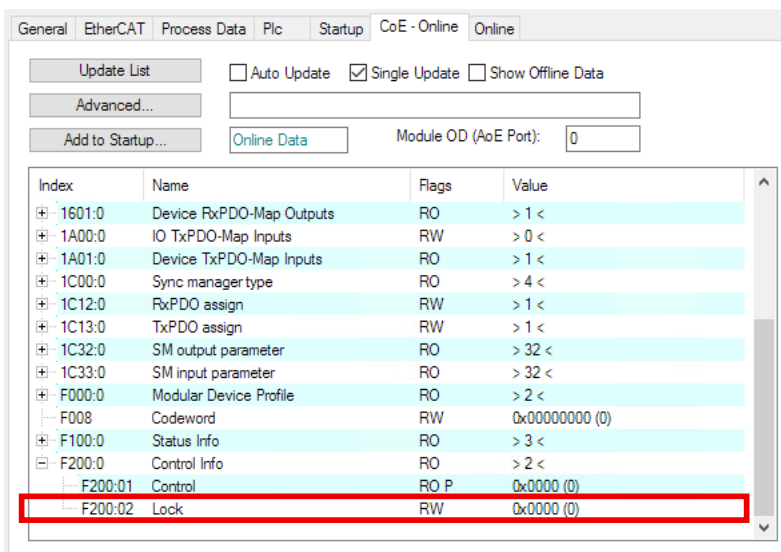
If the value <BECF6080> is entered in the CoE object 'Code Word' (0xF008 [▶ 37]), the EL6080 deletes all existing data at the next restart (status transition INIT --> PREOP). The structure of the acyclic data is retained.

This reset also deletes the LOCK in 0xF200:02 [▶ 35].

5.6 Protecting an acyclic structure against changes

Protecting an acyclic structure against changes

If the CoE object 0xF200:02 [▶ 35] is set to <1>, the structure from CoE object 0x2F00 [▶ 34] can no longer be changed.

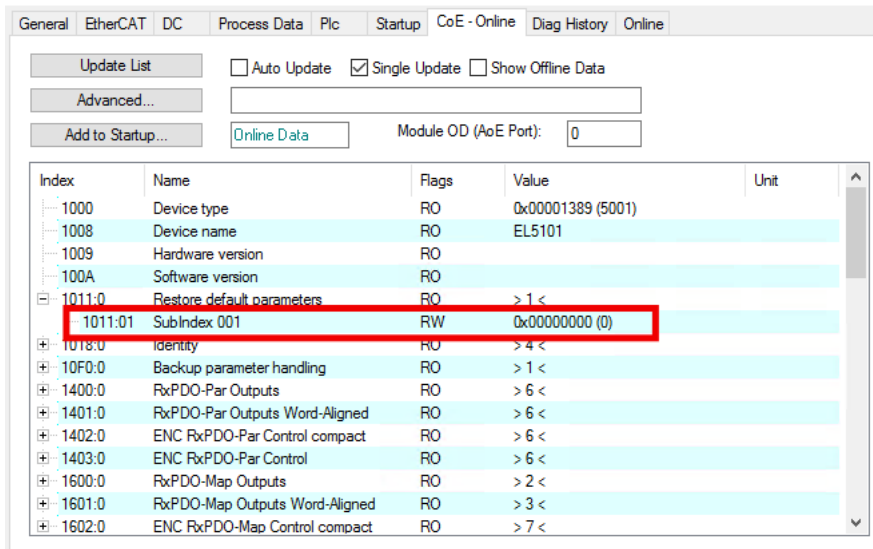


Index	Name	Flags	Value
1601:0	Device RxPDO-Map Outputs	RO	> 1 <
1A00:0	IO TxPDO-Map Inputs	RW	> 0 <
1A01:0	Device TxPDO-Map Inputs	RO	> 1 <
1C00:0	Sync manager type	RO	> 4 <
1C12:0	RxPDO assign	RW	> 1 <
1C13:0	TxPDO assign	RW	> 1 <
1C32:0	SM output parameter	RO	> 32 <
1C33:0	SM input parameter	RO	> 32 <
F000:0	Modular Device Profile	RO	> 2 <
F008	Codeword	RW	0x00000000 (0)
F100:0	Status Info	RO	> 3 <
F200:0	Control Info	RO	> 2 <
F200:01	Control	RO P	0x0000 (0)
F200:02	Lock	RW	0x0000 (0)

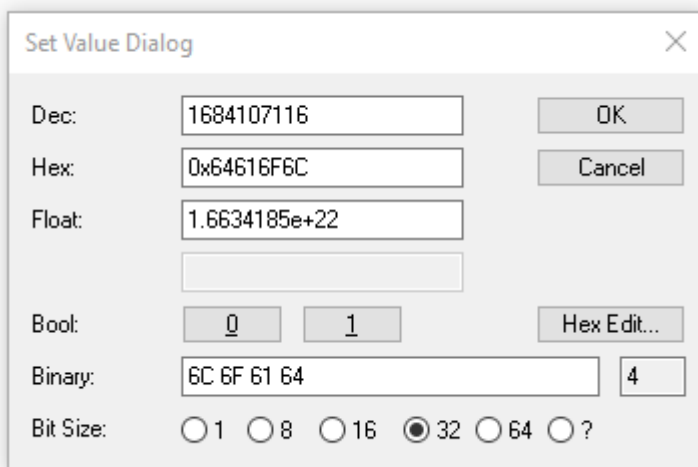
5.7 Restore the delivery state

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.

i Alternative restore value

With some older modules the backup objects can be changed with an alternative restore value:

Decimal value: 1819238756

Hexadecimal value: 0x6C6F6164

An incorrect entry for the restore value has no effect.

6 CoE parameters

● EtherCAT XML Device Description

i The display matches that of the CoE objects from the EtherCAT XML Device Description. We recommend downloading the latest XML file from the download area of the Beckhoff website and installing it according to installation instructions.

● Parameterization via the CoE list (CAN over EtherCAT)

i The EtherCAT device is parameterized via the CoE-Online tab (double-click on the respective object) or via the Process Data tab (allocation of PDOs). Please note the following general CoE notes when using/manipulating the CoE parameters:

- Keep a startup list if components have to be replaced
- Differentiation between online/offline dictionary, existence of current XML description
- use “CoE reload” for resetting changes

6.1 Objects for parameterization

Index 2000 NOVRAM data

Index (hex)	Name	Meaning	Data type	Flags	Default
2000	NOVRAM data	Memory object 1 (enter size in index 0x2F00:01 [▶ 34])	-	RW	-

Index 2008 NOVRAM data

Index (hex)	Name	Meaning	Data type	Flags	Default
2008	NOVRAM data	Memory object 2 (enter size in index 0x2F00:02 [▶ 34])	-	RW	-

*

*

*

Index 23F8 NOVRAM data

Index (hex)	Name	Meaning	Data type	Flags	Default
23F8	NOVRAM data	Memory object 127 (enter size in index 0x2F00:7F [▶ 34])	-	RW	-

Index 2F00 NOVRAM size info

Index (hex)	Name	Meaning	Data type	Flags	Default
2F00:0	NOVRAM size info	Maximum subindex	UINT8	RW	-
2F00:01	Subindex 001	Size of memory object 1 in bytes	-	RW	-
2F00:02	Subindex 002	Size of memory object 2 in bytes	-	RW	-
2F00:7F	Subindex 127	Size of memory object 127 in bytes	-	RW	-

Index F100 Status Info

Index (hex)	Name	Meaning	Data type	Flags	Default
F100:0	Status Info	Maximum subindex	UINT8	RO	0x03 (3_{dec})
F100:01	Status	Status	UINT16	RO	0x0000 (0_{dec})
F100:02	Restored	Restored 0: Standard 1: Last written object is restored (the box was switched off during writing) 2: Manufacturer configuration active (once after 1st boot process)	UINT16	RO	0x0000 (0_{dec})
F100:03	Locked	Locked	UINT16	RO	0x0000 (0_{dec})

Index F200 control info

Index (hex)	Name	Meaning	Data type	Flags	Default
F200:0	Module list	Maximum subindex	UINT8	RO	0x02 (2 _{dec})
F200:01	Control	Control	UINT16	RO	0x0000 (0 _{dec})
F200:02	Lock	Acyclic structure is protected against changes, if bit is set.	UINT16	RO	0x0000 (0 _{dec})

6.2 Standard objects

Index 1000 Device type

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

Index 1008 Device name

Index (hex)	Name	Meaning	Data type	Flags	Default
1008:0	Device name	Device name of the EtherCAT slave	STRING	RO	EP6080-0000

Index 1009 Hardware version

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

Index 100A Software version

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

Index 1018 Identity

Index (hex)	Name	Meaning	Data type	Flags	Default
1018:0	Identity	Information for identifying the slave	UINT8	RO	0x04 (4 _{dec})
1018:01	Vendor ID	Vendor ID of the EtherCAT slave	UINT32	RO	0x00000002 (2 _{dec})
1018:02	Product code	Product code of the EtherCAT slave	UINT32	RO	0x17C03052 (398471250 _{dec})
1018:03	Revision	Revision number of the EtherCAT slave; the low word (bit 0-15) indicates the special terminal number, the high word (bit 16-31) refers to the device description	UINT32	RO	0x00100000 (1048576 _{dec})
1018:04	Serial number	Serial number of the EtherCAT slave; the low byte (bit 0-7) of the low word contains the year of production, the high byte (bit 8-15) of the low word contains the week of production, the high word (bit 16-31) is 0	UINT32	RO	0x00000000 (0 _{dec})

Index 1601 RxPDO-Map Outputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
1601:0	RxPDO-Map Outputs Device	PDO Mapping RxPDO	UINT8	RO	0x02 (2 _{dec})
1601:01	SubIndex 001	1 st PDO Mapping entry (object 0xF200 (outputs), entry 0x01 (control))	UINT32	RO	0xF200:01, 16
1601:02	SubIndex 002	2 nd PDO Mapping entry (object 0xF200 (outputs), entry 0x02 (lock))	UINT32	RO	0xF200:02, 16

Index 1A01 TxPDO-Map Inputs Device

Index (hex)	Name	Meaning	Data type	Flags	Default
1A01:0	TxPDO-Map Inputs Word-Aligned	PDO Mapping TxPDO 2	UINT8	RO	0x03 (3 _{dec})
1A01:01	SubIndex 001	1 st PDO Mapping entry (object 0xF100 (inputs), entry 0x01 (status))	UINT32	RO	0xF100:01, 16
1A01:02	SubIndex 002	2 nd PDO Mapping entry (object 0xF100 (inputs), entry 0x02 (restored))	UINT32	RO	0xF100:02, 16
1A01:03	SubIndex 003	3 rd PDO Mapping entry (object 0xF100 (inputs), entry 0x03 (locked))	UINT32	RO	0xF100:03, 16

Index 1C00 Sync manager type

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

Index 1C12 RxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C12:0	RxPDO assign	PDO Assign Outputs	UINT8	RW	0x01 (1 _{dec})
1C12:01	SubIndex 001	1 st allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1600 (5632 _{dec})
1C12:02	SubIndex 002	2 nd allocated RxPDO (contains the index of the associated RxPDO mapping object)	UINT16	RW	0x1601 (5633 _{dec})

Index 1C13 TxPDO assign

Index (hex)	Name	Meaning	Data type	Flags	Default
1C13:0	TxPDO assign	PDO Assign Inputs	UINT8	RW	0x01 (1 _{dec})
1C13:01	SubIndex 001	1 st allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A00 (6656 _{dec})
1C13:02	SubIndex 002	2 nd allocated TxPDO (contains the index of the associated TxPDO mapping object)	UINT16	RW	0x1A01 (6657 _{dec})

Index F000 Modular device profile

Index (hex)	Name	Meaning	Data type	Flags	Default
F000:0	Modular device profile	General information for the modular device profile	UINT8	RO	0x02 (2 _{dec})
F000:01	Module index distance	Index distance of the objects of the individual channels	UINT16	RO	0x0001 (1 _{dec})
F000:02	Maximum number of modules	Number of channels	UINT16	RO	0x0001 (1 _{dec})

Index F008 Code word

Index (hex)	Name	Meaning	Data type	Flags	Default
F008	Code word	Codeword [► 32]	-	RW	-

7 Troubleshooting

Problem	Cause	Solution
Error message in TwinCAT: "PREOP to SAFEOP failed".	Variables of different sizes in the process data objects "IO Inputs" and "IO Outputs".	Ensure that the size of the variables in "IO Inputs" and "IO Outputs" is the same.
Error message in TwinCAT: "Invalid SM In/Out Cfg".	The variables in the process data objects "IO Inputs" and "IO Outputs" exceed 1280 bytes.	Ensure that the sum of the variables in each of the process data objects does not exceed 1280 bytes.

8 Appendix

8.1 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

8.2 Accessories

Mounting

Ordering information	Description	Link
ZS5300-0011	Mounting rail	Website

Labeling material, protective caps

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

Cables

A complete overview of pre-assembled cables for fieldbus components can be found [here](#).

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

Tools

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



Further accessories

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

8.3 Version identification of EtherCAT devices

8.3.1 General notes on marking

Designation

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

- family key
- type
- version
- revision

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

Notes

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

8.3.2 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**

KK - week of production (CW, calendar week)

YY - year of production

FF - firmware version

HH - hardware version

Example with serial number 12 06 3A 02:

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

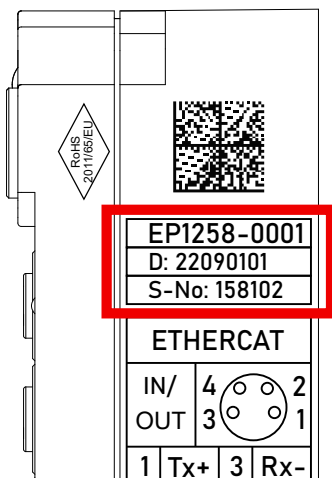


Fig. 16: EP1258-00001 IP67 EtherCAT Box with batch number/DateCode 22090101 and unique serial number 158102

8.3.3 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.

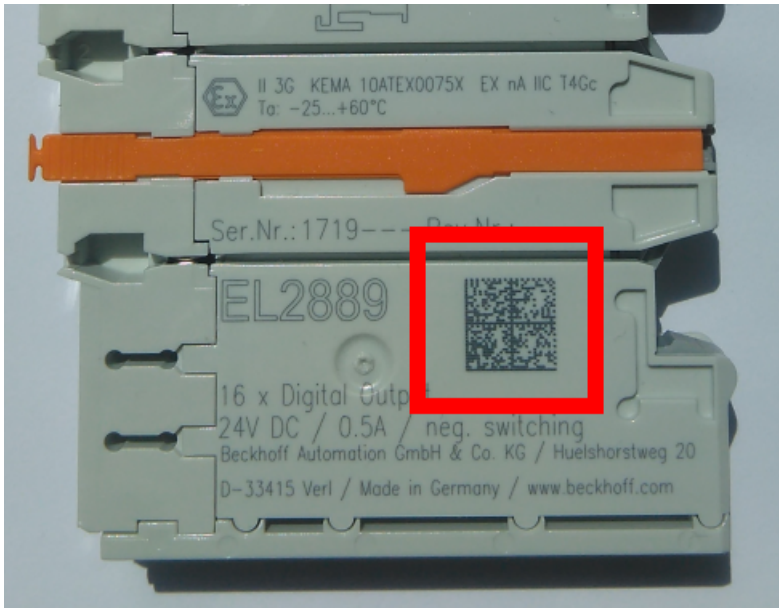


Fig. 17: BIC as data matrix code (DMC, code scheme ECC200)

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.

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	1P 072222
2	Beckhoff Traceability Number (BTN)	Unique serial number, see note below	SBTN	12	S BTNk4p562d7
3	Article description	Beckhoff article description, e.g. EL1008	1K	32	1K EL1809
4	Quantity	Quantity in packaging unit, e.g. 1, 10, etc.	Q	6	Q 1
5	Batch number	Optional: Year and week of production	2P	14	2P 401503180016
6	ID/serial number	Optional: Present-day serial number system, e.g. with safety products	51S	12	51S 678294
7	Variant number	Optional: Product variant number on the basis of standard products	30P	32	30P 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 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. 18: 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 information.

8.3.4 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.

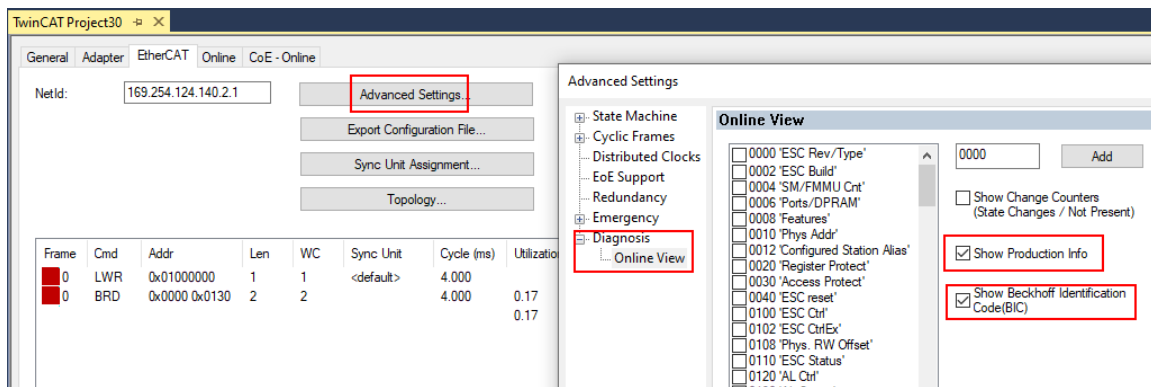
EtherCAT devices (IP20, IP67)

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:

No	Addr	Name	State	CRC	Fw	Hw	Production Data	ItemNo	BTN	Description	Quantity	BatchNo	SerialNo
1	1001	Term 1 (EK1100)	OP	0,0	0	0	---						
2	1002	Term 2 (EL1018)	OP	0,0	0	0	2020 KW36 Fr	072222	k4p562d7	EL1809	1		678294
3	1003	Term 3 (EL3204)	OP	0,0	7	6	2012 KW24 Sa						
4	1004	Term 4 (EL2004)	OP	0,0	0	0	---	072223	k4p562d7	EL2004	1		678295
5	1005	Term 5 (EL1008)	OP	0,0	0	0	---						
6	1006	Term 6 (EL2008)	OP	0,0	0	12	2014 KW14 Mo						
7	1007	Term 7 (EK1110)	OP	0	1	8	2012 KW25 Mo						

- 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	1P158442SBTN0008jckp1KELM3704 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_Uilities* 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.

8.4 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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