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TBEC-LL-8IOL IO-Link Master Module for EtherCAT

Instructions for Use

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Table of Contents

1	About These Instructions						
	1.1	Target groups	. 7				
	1.2	Explanation of symbols used	. 7				
	1.3	Additional documents	. 7				
	1.4	Feedback about these instructions	. 7				
2	Notes on	the Product	. 8				
	2.1	Product identification	. 8				
	2.2	Scope of delivery	. 8				
	2.3	Legal requirements	. 8				
	2.4	Turck service	. 8				
3	For Your S	Safety	. 9				
	3.1	Intended use	. 9				
	3.2	General safety notes	. 9				
4	Product d	escription	10				
	4.1	Device overview	10				
	4.1.1	Operating elements	11				
	4.1.2	Display elements	11				
	4.1.3	Block diagram	11				
	4.2	Properties and features	12				
	4.3	Operating principle	12				
	4.4	Functions and operating modes	12				
	4.4.1	Module object directory	12				
	4.4.2	EtherCAI functions	12				
	4.4.3 4 4 4	ID-LINK Channels	13				
F	Installing		1 /				
Э		Maunting auto a maunting plate	14				
	5.1 5.2	Mounting onto a mounting plate	14				
	5.2		14				
	5.3	Grounding the device	15				
	532	Shielding of the fieldbus and I/O level	15				
	5.3.3	Grounding the device – I/O level and fieldbus level	16				
6	Connectir		18				
	6.1	Connecting the power supply	18				
	6.1.1	Supply concept	19				
	6.2	Connecting the device to the EtherCAT network	19				
	6.3	Connecting IO-Link devices and digital sensors	20				
7	Commissi	oning	21				
	7.1	Addressing a device on EtherCAT	21				
	7.2	ESI files	21				

	7.3	Connecting the device to a Beckhoff PLC with TwinCAT	22
	7.5.1 720	Installing ESI files	ZZ
	7.3.Z 7.2.2	Configuring slots	24 20
	7.3.5	Setting startup parameters	29 31
	735	Beading process data	32
	7.3.6	Setting EtherCAT device parameters via the object dictionary	
	7.3.7	Addressing a device via Explicit Device ID	35
	7.3.8	Addressing a device via Configured Station Alias	36
	7.3.9	Activating Hot Connect	38
	7.4	Connecting a device to controllers with CODESYS	42
	7.4.1	Installing ESI files	42
	7.4.2	Connecting the device with the controller	44
	7.4.3	Configuring slots	49
	7.4.4	Setting startup parameters	52
	7.4.5	Setting EtherCAT device parameters via the object dictionary	55
	7.4.6	Addressing a device via Explicit Device ID	57
	7.4.7	Addressing a device via Configured Station Alias	58
	7.5	Assigning an IP address for EoE	60
	7.6	Commissioning IO-Link devices	67
	7.6.1	Web server – manage IO-Link devices	67
	7.6.2	FDT/DTM – manage IO-Link devices	69
	7.6.3	Commissioning an IO-Link device with IO-Link V1.0	70
	7.6.4	Commissioning an IO-Link device with IO-Link V1.1	/1
8	Paramete	rizing and Configuring	72
	8.1	Modular device model/slot definition	72
	8.2	Device area – Device Control (0xF200)	73
	8.3	Device area – general device parameters (0xF800)	74
	8.4	I/O channel parameters (Configuration Area, 0x80000x8FFF)	75
	8.4.1	Adapting process data mapping	85
9	Operating]	86
	9.1	Input area, TxPDOs, 0x60000x6FFF	86
	9.2	Output area, RxPDOs, 0x70000x7FFF	91
	9.3	LED displays	94
	9.4	Device area – Device Status (0xF100, 0xF108)	96
	9.5	Diagnosis data, 0xA0000xAFFF	99
	9.5.1	Diagnostic telegram	100
	9.6	Diag History Object (0x10F3)	. 105
	9.7	CANopen Emergencies	. 109
	9.8	IO-Link port – Information Area, 0x90000x9FF	. 110
	9.9	Acyclic access to connected IO-Link devices via CoE	. 111
	9.10	Acyclic access via AoE	. 116
	9.10.1	Function block ADSREAD	117
	9.10.2	Function block ADSWRITE	118
	9.11	IO-Link – using the Data storage mode	. 119
	9.11 9.11.1	IO-Link – using the Data storage mode Parameter "Data storage mode" = activated	. 119 119
	9.11 9.11.1 9.11.2	IO-Link – using the Data storage mode Parameter "Data storage mode" = activated Parameter "Data storage mode" = read in	. 119 119 121
	9.11 9.11.1 9.11.2 9.11.3	IO-Link – using the Data storage mode Parameter "Data storage mode" = activated Parameter "Data storage mode" = read in Parameter "Data storage mode" = overwrite	. 119 119 121 121



	9.12	Reset device (Reset)	122
	9.12.1	Resetting the device with Turck Service Tool	122
	9.12.2	Resetting the device via FDT/DTM	123
	9.12.3	Resetting the device via Object Dictionary	124
10	Troublesh	ooting	125
	10.1	Eliminate parameterization errors	125
11	Maintena	nce	126
	11.1	Carrying out a firmware update via TwinCAT	126
	11.2	Carrying out a firmware update via CODESYS	127
12	Disposal		128
13	Technical	data	129
14	Turck Sub	sidiaries - Contact Information	132



1 About These Instructions

These operating instructions describe the structure, functions and the use of the product and will help you to operate the product as intended. Read these instructions carefully before using the product. This is to avoid possible damage to persons, property or the device. Retain the instructions for future use during the service life of the product. If the product is passed on, pass on these instructions as well.

1.1 Target groups

These instructions are aimed at qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols used

The following symbols are used in these instructions:

	DANGER DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.
	WARNING WARNING indicates a dangerous situation with medium risk of death or severe in- jury if not avoided.
	CAUTION CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.
!	NOTICE NOTICE indicates a situation which may lead to property damage if not avoided.
i	NOTE NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.
	CALL TO ACTION This symbol denotes actions that the user must carry out.
₽	RESULTS OF ACTION This symbol denotes relevant results of actions.

1.3 Additional documents

The following additional documents are available online at www.turck.com

- Data sheet
- EU Declaration of Conformity
- Commissioning manual IO-Link devices
- Approvals

1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to **techdoc@turck.com**.

2 Notes on the Product

- 2.1 Product identification
 - These instructions apply for the following IO-Link master module:
 - TBEC-LL-8IOL (Ident-No. 100004614)

2.2 Scope of delivery

The scope of delivery includes:

- TBEC-LL-8IOL
- Closure caps for M12 female connectors
- Label clips

2.3 Legal requirements

The device falls under the following EU directives:

- 2014/30/EU (electromagnetic compatibility)
- 2011/65/EU (RoHS Directive)

2.4 Turck service

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database under **www.turck.com** contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats.

The contact details of Turck subsidiaries worldwide can be found on p. [132].



3 For Your Safety

The product is designed according to state-of-the-art technology. However, residual risks still exist. Observe the following warnings and safety notices to prevent damage to persons and property. Turck accepts no liability for damage caused by failure to observe these warning and safety notices.

3.1 Intended use

These devices are designed solely for use in industrial areas.

The block I/O module TBEC-LL-8IOL is an IO-Link master according to IO-Link specification V1.1 for EtherCAT.

The IO-Link master module TBEC-LL-8IOL has eight IO-Link channels. Up to eight IO-Link sensors or IO hubs with IO-Link can be connected to the M12 sockets. In addition, up to 12 digital sensors can be connected directly it. When using I/O hubs, it is possible to connect up to 128 digital sensors per device.

The devices may only be used as described in these instructions. Any other use is not in accordance with the intended use. Turck accepts no liability for any resulting damage.

3.2 General safety notes

- The device may only be assembled, installed, operated, parameterized and maintained by professionally-trained personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.
- The device only meets the EMC requirements for industrial areas and is not suitable for use in residential areas.

4 Product description

The devices are designed in a fully encapsulated housing with degree of protection IP65/IP67/IP69K.

The IO-Link master module TBEC-LL-8IOL has eight IO-Link ports for connecting IO-Link devices. The IO-Link ports at the connectors X0...X3 are designed as Class A ports. The IO-Link ports at the connectors X4...X7 are designed as Class B ports. In addition to the eight IO-Link-channels, four universal digital DXP channels (PNP) are available. The eight IO-Link channels can be parameterized independently of each other and operated either in IO-Link mode or in SIO mode (DI).

The four universal digital channels are designed as DXP-channels and can therefore be parameterized as in- or output.

For connecting the supply voltage, the device has 5-pin, L-coded M12 connectors.

4.1 Device overview



Fig. 1: Dimensions TBEC-LL-8IOL

Connector	LED		Function					
XD1 PWR			Supply voltage V1					
XD2	_		Supply voltage V2					
Connector	LED	Channel	Function	Auxiliary voltage				
X0	0	Ch0	IO-Link port 1 (Class A)	VAUX1				
	1	Ch1	DXP1					
X1	2	Ch2	IO-Link port 2 (Class A)	VAUX1				
	3	Ch3	DXP3					
X2	4	Ch4	IO-Link port 3 (Class A)	VAUX1				
	5	Ch5	DXP5					
Х3	6	Ch6	IO-Link port 4 (Class A)	VAUX1				
	7	Ch7	DXP7					
X4	8	Ch8	IO-Link port 5 (Class B)	VAUX1				
	9	Ch9	-	VAUX2				
X5	10	Ch10	IO-Link port 6 (Class B)	VAUX1				
	11	Ch11	-	VAUX2				



Connector	LED	Channel	Function	Auxiliary voltage
X6	12	Ch12	IO-Link port 7 (Class B)	VAUX1
	13	Ch13	-	VAUX2
X7	14 Ch14 IO-Link port 8 (Class B)		IO-Link port 8 (Class B)	VAUX1
	15	Ch15	-	VAUX2
Connector	LED		Function	
XF1	L/A		EtherCAT, EC IN	
XF2	L/A		EtherCAT, EC OUT	

4.1.1 Operating elements

The device has the following operating elements:

- Hexadecimal rotary coding switches to set the device address (identification value) when addressing via explicit device identification
- Reset button for resetting to the factory settings

4.1.2 Display elements

The device has the following LED indicators:

- Power supply
- Group and bus errors
- Status
- Diagnostics

4.1.3 Block diagram



Fig. 2: Block diagram

4.2 Properties and features

- Fibre-glass reinforced housing
- Shock and vibration tested
- Fully potted module electronics
- Degree of protection IP65/IP67/IP69K
- UV-resistant according to DIN EN ISO 4892-2
- Metal connectors
- 4 IO-Link ports Class A and 4 IO-Link ports Class B
- 4 universal DXP channels (PNP)
- EtherCAT slave according to Modular Device Profile
- Supported EtherCAT protocols CoE, EoE, FoE, AoE

4.3 Operating principle

The IO-Link master module TBEC-LL-8IOL connects IO-Link sensors and actuators with the higher-level control system. The device has an EtherCAT interface and fieldbus-independent I/ O electronics with IO-Link master functionality (Class A and Class B ports). Via the EtherCAT interface the IO-Link master is coupled to an EtherCAT network as EtherCAT slave. During operation, the process data is exchanged between EtherCAT and IO-Link. In addition the devices can process signals from sensors and actuators via four universal digital channels.

4.4 Functions and operating modes

4.4.1 Module object directory

The object dictionary of the device contains the following object areas according to ETG 5001:

Index	Object dictionary area
0x00000x0FFF	Data Type area, according to ETG.5001.1
0x10000x1FFF	Communication area, according to ETG.5001.1
0x50000x5FFF	Configured Module ID (for internal use only, vendor specific)
0x60000x6FFF	Input area (TxPDOs of IO-Link devices) [> 86]
0x70000x7FFF	Output area (TxPDOs of IO-Link devices) [> 91]
0x80000x8FFF	Configuration area (configuration of IO-Link devices) [> 75]
0x90000x9FFF	Information area (read in configuration of IO-Link devices) [> 110]
0xA0000xAFFF	Diagnosis Data [🕨 100]
0xF0000xFFFF	Device area [▶ 73]
	Device status [96]
	Device control [73]
	Device parameter [> 74]

4.4.2 EtherCAT functions

The device supports the following EtherCAT communication profiles:

- CoE (CAN Application Protocol over EtherCAT): The object dictionary is provided via the CoE interface. The object dictionary contains all device-specific parameters.
- EoE (Ethernet over EtherCAT): The standard Ethernet protocol is tunneled via the EoE communication protocol. An IP address for EoE can be assigned to the device so that the device can be configured via the web server or via DTM.
- FoE (File Access over EtherCAT): The firmware update is carried out via the FoE communication protocol.
- AoE (ADS over EtherCAT): The AoE communication protocol is used to read or write device data acyclically, e.g. from connected IO-Link devices.



4.4.3 IO-Link channels

The IO-Link master module TBEC-LL-8IOL has four Class A IO-Link ports (slots X0...X3) and four Class B IO-Link ports (slots X4...X7).

The eight IO-Link channels can be parameterized independently of each other and operated either in IO-Link mode or in SIO mode (DI).

4.4.4 Universal digital channels – functions

The device has four universal digital channels that can be used as inputs or outputs without configuration. Up to four 3-wire PNP sensors or four PNP DC actuators can be connected. The maximum output current per output is 2 A.

5 Installing

5.1 Mounting onto a mounting plate

NOTICE

Mounting on uneven surfaces

- Device damage due to stresses in the housing
- Fix the device on a flat mounting surface.
- Use two M6 screws for mounting.

The device can be screwed onto a flat mounting plate.

- Attach the module to the mounting surface with two M6 screws. The maximum tightening torque for the screws is 1.5 Nm.
- Avoid mechanical stresses.
- Optional: Ground the device.



Fig. 3: Mounting the device onto a mounting plate

5.2 Mounting the device outdoors

The device is UV-resistant according to DIN EN ISO 4892-2. Direct sunlight can cause material abrasion and color changes. The mechanical and electrical properties of the device are not affected.

• To avoid material abrasion and color changes: Protect the device from direct sunlight, e.g. by using protective shields.



- 5.3 Grounding the device
- 5.3.1 Equivalent wiring diagram and shielding concept



Fig. 4: TBEC-LL-8IOL- equivalent wiring diagram and shielding concept

5.3.2 Shielding of the fieldbus and I/O level

The fieldbus and the I/O level of the modules can be grounded separately.



Fig. 5: Grounding clip (1), grounding ring (2) and metal screw (3)

The grounding ring (2) is the module grounding. The shielding of the I/O level is permanently connected to the module grounding. The module grounding is only connected to the reference potential of the installation when the module is mounted.

Shielding concept of the I/O modules (I/O level)

In the case of direct mounting on a mounting plate, the module grounding is connected to the reference potential of the system via the metal screw in the lower mounting hole (3). If module grounding is not desired, the electrical connection to the reference potential must be interrupted, e.g. by using a plastic screw.

Shielding concept of the fieldbus level

On delivery, a grounding clip is provided on the connectors for the fieldbus connection.

When mounted directly on a mounting plate, the shielding of the fieldbus cables is routed directly to the module ground via the grounding clip and the metal screw in the lower mounting hole.

If direct grounding of the fieldbus shield is not desired, the grounding clip must be removed. In this case, the fieldbus shield is connected to the module ground via an RC element.

5.3.3 Grounding the device – I/O level and fieldbus level

The grounding of the fieldbus level can either be connected directly via the grounding clip (1) or connected and routed indirectly via an RC element to the grounding of the I/O level. If the grounding is to be routed via an RC element, the grounding clip must be removed.



Fig. 6: Grounding clamp (1)

Removing the grounding clip: disconnect the direct grounding of the fieldbus level

Use a flat screwdriver to slide the grounding clamp forward and remove it.



Fig. 7: Removing the grounding clamp



Mounting the grounding clip: grounding the fieldbus level directly

- Place the grounding clamp between the fieldbus connectors by using a screwdriver in such way that the clamp contacts the metal housing of the connectors.
- The shielding of the fieldbus cables is connected to the grounding clip.



Fig. 8: Mounting the grounding clip

Grounding the device – mounting on a mounting plate

- For mounting onto a mounting plate: Fix the device with an M6 metal screw through the lower mounting hole.
- ⇒ The shielding of the M12 flanges for the I/O level is connected to the reference potential of the installation via the M6 metal screw.
- ➡ With mounted grounding clip: The shielding of the fieldbus is connected to the reference potential of the installation via the module grounding of the I/O level.

6 Connecting



NOTE

Intrusion of liquids or foreign bodies through leaking connections Loss of protection class IP65/IP67/IP69K, device damage possible

- ► Tighten M12 connectors with a tightening torque of 0.8 Nm.
- Only use accessories that guarantee the protection class.
- Always seal unused connectors with suitable screw caps or blind caps.



NOTE

The connection wires or conductors must have a rated operating temperature of min. 75 $^\circ C$ (UL requirement).

6.1 Connecting the power supply

For the connection to the power supply, the device has two 5-pin, L coded M12 connectors. V1 and V2 are galvanically isolated. The maximum tightening torque is 0.8 Nm.

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Fig. 9: M12 connector for connecting the supply voltage

- Connect the device to the power supply according to the pin assignment shown below.
- Seal unused slots with blind plugs.



Fig. 10: Pin assignment power supply connectors

Connector	Function
XD1	Power feed
XD2	Continuation of the power to the next node
V1	System voltage: Supply voltage 1 (incl. supply of electronics)
V2	Load voltage: power supply 2

NOTE The sys

The system voltage (V1) and the load voltage (V2) are supplied and monitored separately. If the voltage goes below the permissible lower limit, the sockets are disconnected according to the supply concept of the module type. If V2 goes below the permissible minimum voltage, the PWR LED changes from green to green flashing or red (depending on the configuration). If V1 goes below the permissible minimum, the PWR LED goes out.



6.1.1 Supply concept

The Device is supplied via two separate voltages V1 and V2.

- V1 = supply of the module electronics and the respective slots
- V2 = supply of module electronics and the respective connectors (separately detachable)



Fig. 11: Power supply TBEC-LL-8IOL

The supply concept enables the safety-related shutdown of parts of the plant via emergency stop circuits by externally switching off the V2 supply.

6.2 Connecting the device to the EtherCAT network

For connection to the Ethernet-based EtherCAT fieldbus system, the device features two integrated Ethernet connections with 4-pin, D-coded M12 connectors. The maximum tightening torque is 0.6 Nm.

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	<u>j j</u>	0	

Fig. 12: M12 connector

- Connect the device to the EtherCAT netzwork according to the pin assignment shown below.
- Seal unused slots with blind plugs.



Fig. 13: Pin assignment EtherCAT IN



Fig. 14: Pin assignment EtherCAT OUT

6.3 Connecting IO-Link devices and digital sensors

The device has eight M12 female connectors for connecting IO-Link devices and digital sensors and actuators. The maximum tightening torque is 0.8 Nm.



NOTICE Wrong supply of IO-Link devices Damage to the device electronics

• Only supply IO-Link devices with the voltage provided at the M12 connectors.



Fig. 15: M12 connectors, IO-Link master ports

- Connect the sensors and actuators to the device according to the pin assignment.
- Seal unused slots with blind plugs.



Fig. 16: Pin assignment of IO-Link master ports, Class A, X0...X3



Fig. 17: Pin assignment of IO-Link master ports, Class B, X4...X7



NOTICE

Connection of Class A devices to Class B ports Loss of the galvanic isolation with Class A devices at pin 2 and 5

• Only use Class A devices with interfaces on pin 1, pin 3 and pin 4 at Class B ports.



7 Commissioning

For commissioning, the connection to an EtherCAT master is necessary. The device can only be configured and addressed via the EtherCAT master. The EtherCAT specific device functions, e.g. FoE or communication via EoE, must be supported by the EtherCAT master.

The device automatically starts after the electrical wiring and connecting the supply voltage.

7.1 Addressing a device on EtherCAT

EtherCAT uses an implicit addressing of the network nodes. The EtherCAT master automatically addresses all connected slaves. A manual addressing or identification is only required for applications such as for toolchange applications (Hot Connect).

The device supports the following EtherCAT identification options for hot connect applications:

- Explicit Device Identification (ADO 0x0134): The device address (Identification Value) is set via the rotary coding switches (0...0x0FFF).
- Configured Station Alias (ADO 0x0012): The device address (Identification Value) is written via the EtherCAT master to the device.



NOTE

The device addressing via data word is not supported by the devices.

Explicit Device Identification

The Identification Value can be set via three hexadecimal rotary coding switches on the device. The switches are located together with the reset button under a cover. In the delivery state, the rotary coding switches are set to switch position "000".

- Open the cover above the switches.
- Set the rotary coding switches to the required position.
- Carry out a voltage reset.
- NOTICE! IP67 or IP69K protection is not guaranteed when the cover over the rotary coding switches is opened. Device damage through penetrating foreign objects or liquids is possible. Close the cover over the switches securely.

Configured Station Alias

The value for the Identification Value is written to the device via register 0x0012 of the Ether-CAT master.

7.2 ESI files

Depending on the used controller, different ESI files must be used:

Controller/ engineering tool	ESI file
TwinCAT	Turck_TBEC-LL-8IOL_R1_ESIxml
CODESYS	Example: Turck_TBEC-LL-8lOL_R1_ESI_1.3_20210325_8110.xml
Sysmac Studio	Turck_TBEC-LL-8IOL_R1_ESIxml Example: Turck_TBEC-LL-8IOL_R1_ESI_1.3_omron_20210325_8110.xml

Turck provides the current ESI files for download free of charge at www.turck.com.

7.3 Connecting the device to a Beckhoff PLC with TwinCAT

Used hardware

The following hardware components are used in this example:

- EtherCAT PLC CX5120 from Beckhoff Automation
- IO-Link master TBEC-LL-8IOL with the following configuration:
 - Port 1: Turck ultra sonic sensor, RU130U-M18E-..., IO-Link V1.1
 - Port 2: Turck IO-Link hub: TBIL-M1-16DXP, IO-Link V1.1
 - Port 3: channel is DI
 - Port 4: channel is DI
 - Port 5: RGB LED indicator K50L2RGBKQ
 - Port 6: channel is DI
 - Port 7: unused
 - Port 8: unused

Used software

The following software tools are used in this example:

- Launch TwinCAT V3.1.0
- ESI file for TBEC-LL-8IOL (available as a free download at www.turck.com)

7.3.1 Installing ESI files

The device is connected to the Beckhoff controller with an xml file, the EtherCAT Slave Information (ESI). The device description file must be saved in TwinCAT Studio V3 for the connection. The ESI file for the device is available free of charge for download from www.turck.com.

Storing an xml file in the installation directory: TwinCAT \rightarrow 3.1 \rightarrow Config \rightarrow Io \rightarrow EtherCAT.



Fig. 18: TwinCAT - storing an xml file in the installation directory



- Launch TwinCAT Studio.
- Create a new project.
- ► Updating the device catalog: TwinCAT → EtherCAT Devices → Reload Device Descriptions.
- ⇒ The device description is loaded.



Fig. 19: TwinCAT – updating the device catalog

7.3.2 Connecting the device with the controller

- Select used EtherCAT master as target system.
- Scan the network for EtherCAT stations: Right-click I/O \rightarrow Devices.
- Click Scan.



Fig. 20: Scanning for devices



➡ The EtherCAT stations are read in and automatically added to the I/O configuration. The module appears in the Solution Explorer as Box 1 (TBEC-LL-8IOL).



Fig. 21: EtherCAT device as Box 1 in the Solution Explorer



At least one variable must be linked to connect online.

Fig. 22: Example of the linking of a variable

Click the Activate configuration button.

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Fig. 23: Activating the configuration

- ⇒ The device configuration is activated.
- Click the **Run mode** button.

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Fig. 24: Run mode



- ⇒ The device is connected online with the EtherCAT master.
- ► Double-click Box 1 (TBEC-LL-8IOL).
- ➡ The current status (here: OP) as well as the data points and the link are shown on the Online tab.

TBEN-LL-8IOL - TcXaeShell 🗸 🖓 Quick Launch (Ctrl+Q) 🔎 - 🗆 X FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT TWINSAFE PLC TEAM SCOPE TOOLS WINDOW HELP						
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Calution Fundament						-
	General EtherCAT Process Data Slots Startup CoE - Online AoE - On	nline Diag History	Online			_
Search Solution Explorer (Ctrl+ü)	State Machine					
PICTask (PICTask)	Init Bootstrap					
Sync_Var.Instance	Pre-Op Safe-Op Current State: OP					
SAFETY	Requested State: OP					
₩ C++						
ANALYTICS	DLL Status					
	Port A: Carrier / Open					
▲ E Devices ▲ ■ Device 1 (EtherCAT)	Port B: No Carrier / Closed					
ten linage	Port C: No Carrier / Closed					
🚔 Image-Info						
SyncUnits	Port D: No Camer / Closed					
Inputs	File Access over EtherCAT					
b InfoData	Download Upload					
Term 1 (EK1200)						
Box 4 (TBEC-LL-8IOL)						
IO-Link Device Status	Name	Online	Type	Size >Ar	ldr In/Out	U A
Module 1 (LL-Basic)	2 Input values valid IQI -Ch8	0	BIT	0.1 50.0	Input	0
P 🛄 Inputs LL-Basic	Input values valid IOL-Ch10	0	BIT	0.1 50.2	Input	0
Module 2 (IN 1 WORD)	😕 Input values valid IOL-Ch12	0	BIT	0.1 50.4	Input	0
Inputs IN 1 WORD	😢 Input values valid IOL-Ch14	0	BIT	0.1 50.6	Input	0
Module 3 (IN 1 WORD/OUT 1 WO	😕 Input data word 0	55056	UINT	2.0 51.0	Input	0
Inputs IN 1 WORD/OUT 1 WOI	nput data word 0	0	UINT	2.0 53.0	Input	0
Outputs IN 1 WORD/OUT 1 W Marked 10 (IL Discovertice)	Overcurrent VAUX1 Pin1 X0 (Ch0/1)	0	BIT	0.1 55.0	Input	0
Module To (LL-Diagnostics)	Overcurrent VAUX1 Pin1 X1 (Ch2/3)	0	BII	0.1 55.1	Input	0
Module 11 (IO-Link Events)	Overcurrent VAUX1 Pin1 X2 (Ch6/7)	0	BIT	0.1 55.2	Input	0
Inputs IO-Link Events	Overcurrent VAUX1 Pin1 X4 (Ch8)	0	BIT	0.1 55.4	Input	ŏ
Module 12 (LL-VAUX control 16Cl	Overcurrent VAUX1 Pin1 X5 (Ch10)	0	BIT	0.1 55.5	Input	0
Outputs LL-VAUX control 16C	😕 Overcurrent VAUX1 Pin1 X6 (Ch12)	0	BIT	0.1 55.6	Input	0
Module 13 (Device Status/Contro	🕫 Overcurrent VAUX1 Pin1 X7 (Ch14)	0	BIT	0.1 55.7	Input	0
InfoData	2 Overcurrent VAUX2 Pin2 X4 (Ch9)	0	BIT	0.1 56.4	Input	0
Mappings	Overcurrent VAUX2 Pin2 X5 (Ch11)	0	BIT	0.1 56.5	Input	0
Sync_Var Instance - Device 1 (EtherCAT)	Chargement VAUX2 Pin2 X6 (Ch13)	U	BII	0.1 56.6	Input	0
· · · · · · · · · · · · · · · · · · ·	Overcurrent output DXP channel-Ch1	0	BIT	0.1 57.1	Input	0
Solution Explorer Team Explorer	<			511 5111	mpar	>
- Party				A		

Fig. 25: EtherCAT Device - Online tab: status display (here: Operational), data points, link

Double-clicking the EtherCAT master causes the states of all connected devices to be displayed on the **Online** tab.



Fig. 26: EtherCAT Master - Online tab: status display of all connected devices

The following states are possible:

- Init: device starts, no SDO and no PDO transfer
- Pre-operational (Pre-Op): SDO transfer, no PDO transfer
- Safe-operational (Safe-Op): SDO and PDO transfer (input data) The input data is updated cyclically, all outputs of the slaves are switched to the safe state.
- Operational (Op): SDO and PDO transfer, input and output data valid
- Bootstrap: Firmware update can be executed



7.3.3 Configuring slots

On the slots tab, the functions can be assigned to the device slots.

Slot	Plugged module in TwinCAT	IO-Link device at port
Basic	LL-Basic	Always plugged Parameters/diagnostics for the DXP-channels of the device (DXP 1, 3, 5 and 7) and Input Valid Signal from the IO-Link ports.
IO-Link port 1	IN 1 WORD	Turck temperature sensor, TS-530-LI2UPN8X
IO-Link port 2	IN 1 WORD/OUT 1 WORD	Turck I/O hub, TBIL-M1-16DXP
IO-Link port 3	DI	The channel is configured as DI
IO-Link port 4	DI	The channel is configured as DI
IO-Link port 5	IN 2 WORD/OUT 2 WORD	RGB LED indicator K50L2RGBKQ
IO-Link port 6	DI	The channel is configured as DI
IO-Link port 7	unused	-
IO-Link port 8	unused	-
Diagnostics	LL-Diagnostics	The diagnostic data are mapped into the pro- cess image
IO-Link Events	IO-Link Events	IO-Link-Events are mapped into the process image
VAUX control	LL-VAUX control 16CH	Parameters for the VAUX voltage supply
Module Status	Device Status/Control	Status- and control for the complete module

- Select the device in the project tree and open the properties by double-clicking.
- Select the **Slots** tab.
- Select on the left the channel to be set.
- Select on the right the required data width or content.
- Click the Add button.

t	Module	ModuleIdent		Module	ModuleIdent	Description	1
 Basic 	LL-Basic	0x0000001	<	T DI	0x00000015	DI	
IO-Link Port 1	IN 1 WORD	0x0000007		DI with parameter access	0x00000016	DI with parameter access	
👅 IO-Link Port 2	_		×	TIN 1 BYTE	0x0000006	IN 1 BYTE	
IO-Link Port 3			~	IN 1 BYTE/OUT 1 BYTE	0x0000000E	IN 1 BYTE/OUT 1 BYTE	
IO-Link Port 4				TIN 1 WORD	0x0000007	IN 1 WORD	
📕 IO-Link Port 5 (Class B)	IN 2 WORD/OUT 2 WORD	0x0000018		IN 1 WORD/OUT 1 WORD	0x0000000F	IN 1 WORD/OUT 1 WORD	
📕 IO-Link Port 6 (Class B)	DI	0x0000015		IN 1 WORD/OUT 4 WORD	0x00000010	IN 1 WORD/OUT 4 WORD	
IO-Link Port 7 (Class B)				T IN 16 BIT	0x00000019	IN 16 BIT	
IO-Link Port 8 (Class B)				TIN 16 BIT/OUT 16 BIT	0x0000001B	IN 16 BIT/OUT 16 BIT	
 Diagnostics 	LL-Diagnostics	0x0000002		TIN 16 BYTE/OUT 16 BYTE	0x000001E	IN 16 BYTE/OUT 16 BYTE	
IO-Link Events	IO-Link Events	0x0000003		TIN 16 WORD	0x0000009	IN 16 WORD	
VAUX control	LL-VAUX control 16CH	0x00000004		TIN 16 WORD/OUT 16 WORD	0x00000014	IN 16 WORD/OUT 16 WOR	0
 Module status 	Device Status/Control	0x0000005		TIN 16 WORD/OUT 2 WORD	0x00000013	IN 16 WORD/OUT 2 WORD)
				IN 2 WORD	0x00000017	IN 2 WORD	
				IN 2 WORD/OUT 16 WORD	0x00000012	IN 2 WORD/OUT 16 WORD)
				IN 2 WORD/OUT 2 WORD	0x00000018	IN 2 WORD/OUT 2 WORD	
				IN 32 BYTE/OUT 32 BYTE	0x0000001D	IN 32 BYTE/OUT 32 BYTE	
				4			
-				Create project apositio XMI, File			

Fig. 27: TwinCAT – Configuring slots



⇒ The device entry in the project tree is extended by the process data of the plugged slots.

Fig. 28: TwinCAT - Device with plugged slots in the project tree



7.3.4 Setting startup parameters

Device parameters which should be permanently written at startup are set in the **Startup** tab.



The parameters depend on the set operating mode.

Example: Set the operation mode "IO-Link with identical device" for IO-Link port 2

- ▶ In the project tree double-click **Box 1 (TBEC-LL-8IOL)**.
- Select the **Startup** tab.

NOTE

- Double-click CoE index 0x8028:01 "Mode".
- ► In the Edit CANopen startup entry submenu double-click Mode.
- ► In the submenu Set Value Dialog enter the value 3 for "IO-Link with identical device" (see parameter "Mode" [▶ 81]).
- Confirm with **OK**.



Fig. 29: TwinCAT – Setting startup parameters

⇒ The operation mode at IO-Link port 2 is set to "IO-Link with identical device".

7.3.5 Reading process data

The process data of connected devices can be read and written at the respective slot in the **Online** tab.



Fig. 30: TwinCAT – Reading process data



7.3.6 Setting EtherCAT device parameters via the object dictionary

NOTE Turck recommends only making changes in the startup parameters.

► In the project tree double-click **Box 1 (TBEC-LL-8IOL)**.



Fig. 31: Project tree

- Select the **CoE Online** tab.
- ⇒ The object dictionary of the device is displayed with all device-specific parameters.

TBEN-LL-8IOL - TcXaeShell				💎 🛛 😨 Quick Launch (Ctr	I+Q)	- 🗆 ×
FILE FOIT VIEW PROJECT BUILD DEBUG TWINCAT TWINSAFE	PLC TEAM	SCOPE TOOLS WINDOW	HELP			
	THECATOL					
	+ TWINCAT KT ((X04) • • Attach •		PROGRAM		M] 🖌 M] =
Build 4024.11 (Loaded) 🔹 🚽 🏦 🗾 🧧 🖉 🔨 🔘 🔯 🐔 🛛 TBEN-	-LL-8IOL		- 1 -	ר פייד <mark>א</mark> וייד או אייד אייד אייד אייד אייד אייד א		122
Solution Explorer 👻 🕂 🖈	MAIN 7 TB	EN-LL-8IOL ⇔ ×				-
◎ ◎ ☆ ☆ - ७ - ₽ 🖋 🗕	General EtherC/	AT Process Data Slots Startup (CoE - Online /	AoE - Online Diag History Onli	ne	
Search Solution Explorer (Ctrl+ü)						
A Di PleTask Innuits	Update I	List 🗌 Auto Update ✔ Sir	ngle Update 🗌	Show Offline Data		
MAIN bSyncVarin	Advance	ed				1
PlcTask Outputs	Add to Da	Online Data	Module OD (AnE Port): 0		
SAFETY	MOD TO GLAR	dup Unine Data	Modulo 0.0 y	Aber ony.		
G. C++	Index	Name	Flags	Value	Unit	^
ANALYTICS	1000	Device Type	RO	0x00001389 (5001)	01	
▲ 🔽 I/O	1000	Emr Register	BO	0x00 (0)		
▲ 📲 Devices	1008	Manufacturer Device Name	RO	TREC-LL-8IOL		· · · · · ·
Device 1 (EtherCAT)	1009	Manufacturer Hardware Version	RO	1		
2 Image	100A	Manufacturer Software Version	RO	V0.0.12.9		
Image-Info	100B	Manufacturer Bootloader Version	RO	V1.0.0.0		
SyncUnits		Identity Object		> 4 <		
Inputs		Diagnosis History		> 23 <		
Outputs	10F8	Timestamp Object	RO	0x470ef8f6380		
InfoData		Mapping RxPDO LL-Basic		> 16 <		
Term 1 (EK1200)	1602:0	Mapping RxPDO IN 1 WORD/OUT 1	1	>1<		
Box 4 (TBEC-LL-8IOL)		Mapping RxPDO IN 2 WORD/OUT 2	2	>2<		
IO-Link Device Status		Mapping RxPDO LL-VAUX control 16	ŝ	> 16 <		_
Module 1 (LI - Basic)		Mapping RxPDO Device Status/Cont	trol	> 16 <		1 1
Module 2 (IN 1 WORD)		Mapping TxPDO LL-Basic		> 32 <		
Inputs IN 1 WORD	⊕ 1A01:0	Mapping TxPDO IN 1 WORD		>1<		1
Input data word 0	IA02:0	Mapping TxPDO IN 1 WORD/OUT 1	l	>1<		
Module 3 (IN 1 WORD/OUT 1 WORD)	± 1A05:0	Mapping TxPDO IN 2 WORD/OUT 2	2	>2<		1
Innuts IN 1 WORD/OUT 1 WORD	H 1AUS:U	Mapping TXPDO LL-Diagnostics		> 160 <		
Outputs IN 1 WORD/OUT 1 WORD	+ 140A:0	Mapping TXPDO IO-LINK Evenis		> 48 <		() ()
Module 6 (IN 2 WORD/OUT 2 WORD)	1490-0	Mapping IXFDU Device Status/Contr TupDO Mapping of IQ-Link Device S	2001	> 32 <		
Instance of the Process of Processory	÷ 100.0	IXPD0 mapping or rought bevice or	I	>42		· · · · · · · · · · · · · · · · · · ·
Outputs IN 2 WORD/OUT 2 WORD	1C12.0	Sync Manager 2 PDO Assignment		>4<		
Module 10 (LL-Diagnostics)	H 1C13:0	Sync Manager 3 PDO Assignment		182		1
Inputs LL-Diagnostics	+ 1C32.0	SM output parameter		> 12 <		
Module 11 (O-Link Events)	+ 1C33:0	SM input parameter		> 12 <		·
 Information (Information Contraction) 	± 4010:0	Vendor Specifics IO-Link Port		>8<		
Medule 12 (LL VALIX control 16 CH)	÷ 4020:0	Vendor Specifics IO-Link Port		>8<		·
Module 12 (LL-VAOA control toch)	± 4030:0	Vendor Specifics IO-Link Port		>8<		
Madula 12 (Davies Status (Canton))	· 4040:0	Vendor Specifics IO-Link Port		>8<		
Woodule IS (Device Status/Control)	€ 4050:0	Vendor Specifics IO-Link Port		> 8 <		
P w wcstate		Vendor Specifics IO-Link Port		> 8 <		
	5000	Configured Module ID	M RW	0x0000001 (1)		
Mappings	5010	Configured Module ID	M RW	0~000007/7		~
Sync_var instance - Device I (EtherCAT) T						
Solution Explorer Learn Explorer						

Fig. 32: CoE-Online – Object Dictionary

The display of the parameters depends on the device configuration. By double-clicking in the **Value** column, the parameters can be changed.



NOTE

The changing of parameters during the runtime can cause a faulty configuration of the device.

- Single Update (recommended): The directory is updated once if a parameter was changed.
- Auto Update: The directory is updated continuously.



7.3.7 Addressing a device via Explicit Device ID

- ► In the project tree double-click **Box 1 (TBEC-LL-8IOL)**.
- Activate Explicit Device Identification (ADO 0x0134): EtherCAT \rightarrow Advanced Settings \rightarrow General \rightarrow Identification.
- ▶ In the Value field enter the Identification Value (hex.) which must match the rotary coding switches on the device (see [▶ 21]).
- Confirm entries with OK.
- Carry out a voltage reset.

Solution Explorer 🔹	I × TwinCAT Projekt1 → ×
○ ○ 🏠 🕂 - 🐻 - 🗗 🏓 🗕	General EtherCAT Process Data Hot Connect Slots Startup CoE - Online AoE - Online Diag History Online
Search Solution Explorer (Ctrl+ 0)	P • Type: TBEC-LL-BIOL Product/Revision: 100004614 / 1 Auto Inc Addr: 0 BherCAT Addr: 1001 Identification Value: 4
	Advanced Settings
 Wo Wo Waster (EtherCAT) Prozessabbild Image-Info SyncUnits Inputs Outputs InfoData Module 1 (LL-Basic) Module 2 (IN 16 WORD) Module 2 (IN 16 WORD) Module 11 (IL-Diagnostics) Module 12 (IL-VAUX contro Module 13 (Device Status/C Module 13 (Device Status/C Module 3 Mappings 	General Behavior Timeout Settings Identification FMMU / SM Init Conmands Hot Connect Maibox Distributed Clock ESC Access ESC Access FPROM Hex Editor FPGA Memory Kallow Ka

Fig. 33: TwinCAT - Select Explicit Device Identification

7.3.8 Addressing a device via Configured Station Alias

- ► In the project tree double-click **Box 1 (TBEC-LL-8IOL)**.
- Activate EtherCAT tab \rightarrow Advanced settings \rightarrow General \rightarrow Identification \rightarrow Configured Station Alias (ADO 0x0012).
- Confirm the entry with **OK**.

Solution Explorer	• ¶ ×	TwinCAT Projekt1 🌸 🗙
○ ○ 🏠 🛱 - To - @ 🔑 💻		General EtherCAT Process Data Hot Connect Slots Startup CoE - Online AoE - Online Diag History Online
Search Solution Explorer (Ctrl+0) Solution 'TBEC-LL-8IOL' (1 project) SVSTEM SVSTEM PIC SAFETY SC++ CT	- م	Type: TBEC-LL-8IOL Product/Revision: 100004614 / 1 Auto Inc Addr: 0 BherCAT Addr: 1001 Identification Value: 4 Advanced Settings ×
 Wo Wo Wo Prozesabbild Image-Info SyncUnits InfoData To-Link Device Status Module 1 (IL-Basic) Module 2 (IN 1 WORD/OUT Module 3 (IN 16 BIT) Module 10 (IL-Diagnostics) Module 11 (IC-Link Events) Module 11 (IC-Link Events) Module 13 (Device Status/C Mappings 	Gen	eral lehavior imeout Settings dentification MMU / SM nit Commands tot Connect box ibuted Clock Access Value: 4

Fig. 34: TwinCAT – Selecting Configured Station Alias


- ► Activate EtherCAT tab → Advanced Settings → ESC Access → E²PROM → choose Configured Station Alias.
- Enter the Identification Value under New value (here: 4).
- ► Click Write to E²PROM.
 - \Rightarrow The master writes the identification value into the device.
- Confirm with **OK**.

General EtherCAT Process Data Hot Connect Slots Startup CoE - Online Ade - Online Diag History Online Search Solution Explorer (Ctrl+0) Product/Revision: 100004614 / 1 Product/Revision: 100004614 / 1 Motion N PLC EtherCAT O Product/Revision: 100004614 / 1 Advanced Settings Identification Value: 4 Product/Revision: Advanced Settings SAFETY General General Behavior Advanced Settings Vo Motion Processabbil Identification Figured Station Alias X Motion Processabbil Identification Actual Value (FegRoM): 56036 Processabbild Init Commands New Value: 4 Write to EPROM	# × TwinCAT Projekt1 + ×
Image - Info > Second and a second	General EtherCAT Process Data Hot Connect Slots Startup CoE - Online AoE - Online Diag History Online P - Twne: TREC:11-300 Transmission Transmiss
Image-Info Configured Station Alias → Prozessabbild → Image-Info → SyncUnits → Inputs	Product/Revision: 100004614 / 1 Auto Inc Addr: 0 EtherCAT Addr: 1001 Advanced Settings Identification Value: 4
	Advanced Settings
 Outputs InfoData Module 1 (LI-Baid) Module 2 (IN 1WORD/OUT) Module 2 (IN 1WORD/OUT) Module 3 (IN 16 BRT) Module 6 (IN 16 WORD) Module 6 (IN 16 WORD) Module 11 (IO-Link Events) Module 11 (IO-Link Events) Module 12 (LL-VAUX contre) Module 13 (Device Status/C Module 14 (Device Status/C Module 15 (Device Status/C Memory Module 15 (Device Status/C Memory Module 15 (Device Status/C Memory OK Memory O	General G

Fig. 35: TwinCAT – Configured Station Alias: Entering the Identification Value

- Carry out a voltage reset.
- ⇒ After switching on, the newly connected device is automatically recognized by the master. The status in the **Online** tab automatically changes to OP.

7.3.9 Activating Hot Connect

The HotConnect function enables devices to be replaced during ongoing plant operation (e.g. with toolchange applications). To use the HotConnect function, a HotConnect group must be set up.

▶ Right-click Box 1 (TBEC-LL-8IOL) \rightarrow Add to HotConnect group.



Fig. 36: TwinCAT – Add to HotConnect group



- Select the relevant slave in the Add HotConnect group window (here: TBEC-LL-8IOL).
- Define the Identification Value (hex.) for the HotConnect group (here: 4).
- Confirm with **OK**.



Fig. 37: TwinCAT – Add to HotConnect group

⇒ The device has been added to a HotConnect group, indicated by the small HC symbol at Box 1.



Fig. 38: TwinCAT – Add to HotConnect group

In order for a new device to be detected by the master, the device address (Identification Value) must either be set with Explicit Device ID or Configured Station Alias.



Devices that are part of a Hot Connect group can also be removed from it:

► Right-click Box 1 (TBEC-LL-8IOL) → Delete from Hot Connect Group.



Fig. 39: Delete device from Hot Connect Group

7.4 Connecting a device to controllers with CODESYS

Used Hardware

The following hardware components are used in this example:

- IO-Link master TBEC-LL-8IOL with the following configuration:
 - Port 1: Turck ultra sonic sensor, RU130U-M18E-..., IO-Link V1.1
 - Port 2: Turck IO-Link hub: TBIL-M1-16DXP, IO-Link V1.1
 - Port 3: channel is DI
 - Port 4: channel is DI
 - Port 5: RGB LED indicator K50L2RGBKQ
 - Port 6: channel is DI
 - Port 7: unused
 - Port 8: unused

Used Software

The following software tools are used in this example:

- CODESYS 3.5. SP16 (available as a free download at www.turck.com)
- WinPLC as EtherCAT master
- ESI file for TBEC-LL-8IOL (available as a free download at www.turck.com)

7.4.1 Installing ESI files

The device is connected to controllers with an xml file containing EtherCAT slave information (ESI). The device description file must be stored in CODESYS for the connection. The ESI file for the device is available free of charge for download from www.turck.com.

- Launch CODESYS.
- Click Tools \rightarrow Device Repository.



Fig. 40: Device Repository



Store the ESI file via the **Install** button.

😤 Device Re	epository					×
<u>L</u> ocation:	System Repository (C:\ProgramData\CODESYS\Devi	Edit Locations				
Installed de String for a	vice descriptions: a fulltext search	Vendor:	<all vendors=""></all>		~	Install
Name	scellaneous eldbuses N CANbus CANopen DeviceNet t EtherCAT - Budt Master - Budt Module - Budt Slave			Vendor		Uninstall

Fig. 41: Installing a device description file

⇒ The module is displayed as an installed device description in the device repository.

🌋 Device Re	epository					×
<u>L</u> ocation	System Repository (C:\ProgramData\CODESYS\Devi	ces)			~	Edit Locations
Installed De	evice Descriptions					
String for a	full text search	Vendor	<all vendors=""></all>		\sim	<u>I</u> nstall
Name					^	<u>U</u> ninstall
🗄 🖷 🚹 Mis	scellaneous					Export
😑 🕤 Fie	ldbuses					
E CAN	CANbus					
	CANopen					
BetÅ	EtherCAT					Renew Device Repository
	Module					,
	- Burth Slave					
	🗄 📴 Beckhoff Automation Gml	H & Co. KG	- Drive and Axis Terminals (EL7xxx)			
	🗉 🚞 Delta Electronics, Inc.					
	표 🚞 Festo AG & Co. KG					Details
	🖲 📴 Hitachi Industrial Equipme	ent Systems	Co.,Ltd.			
	Ifm electronic - ifm electronic	nic EtherCA	T Devices			
	KEB Automation KG - C6 I	PRO/ADVAN	CED drive controllers			
	Panasonic Corporation, A	ppliances Co	ompany - AC Servo Driver			
	Parker Hannifin - Parker S	Servo Drive	15			
		INIK GmbH 8	k Co. KG - Antriebe			
	🖮 🚞 TBEC-Family					
	TBEC-LL-8IOL					
	🖲 🔁 Yaskawa Electric Corpora	tion - Servo	Drives		×	
<				>		
						Close

Fig. 42: Installed device description

7.4.2 Connecting the device with the controller

Prerequisites

- The used master must be EtherCAT-capable.
- The programming software has been opened.
- A new project has been created.

Example: Creating a project with WinPLC

Standard P	roject		×
	You are about objects withir - One program - A program P - A cyclic task - A reference t	t to create a new standard project. This wizard will create the following a this project: nmable device as specified below LC_PRG in the language specified below .which calls PLC_PRG to the newest version of the Standard library currently installed.	
	Device:	CODESYS Control RTE V3 (3S - Smart Software Solutions GmbH)	\sim
	PLC_PRG in:	Structured Text (ST)	\sim
		OK Cancel	

Fig. 43: Example: Creating a project



Adding an EtherCAT master

- Right-click **Device** \rightarrow **Add Device**.
- Select the EtherCAT master in the following window.
- Click Add Device.

	TBEC-LL-8IOL.project* - CODESYS	- 🗆 🗙
Eile Edit View Project Build Online I [™] ☞ ■ ● ∽ ~ & ■ ■ × M %	Debug Iools Window Help 楢 🏰 📕 🤋 🦄 🆄 🎼 🛅 - 🗂 🔠 Application [Device: PLC Logic] - 🥵 🥨 🕟	■ * (= e= += = = = = = = = = = = = = = = = =
Devices	Add Device Name EtherCAT_Master Action Action Action Action Action Dupdate device Dupdate device	×
PLC_PRG (PRG)	String for a full text search Vendor <all vendors=""></all>	~
画- 變 Mainītask (IEC-Tasks) □ ④ PLC_PRG	Name Vendor Version Image: Construction of the construc	Description
Devices POUs	Description: EtherCAT Master Append selected device as last child of Device ① (You can select another target node in the navigator while this window is open.) Add I art hild: O 0 0 0 0 Recomple 4	Device Close

Fig. 44: Adding an EtherCAT master

⇒ The EtherCAT master appears as **EtherCAT_Master (EtherCAT Master)** in the project tree.



Fig. 45: Project tree

Selecting a network adapter

- Double-click EtherCAT_Master (EtherCAT Master) in the project tree.
- ▶ In the General tab open the Select Network Adapter dialog via the Browse... button.
- Select the network adapter and confirm with **OK**.

٠	TBEC-LL-8IOL.project* - CODESYS	_ 🗆 🛛
<u>File Edit View Project Build Online Debug Tool</u>	Window Help	₹
🎦 🚔 🛃 🗠 🖙 🌡 🛍 🗶 🖪 🌿 🔳	🎙 🆄 🦄 🔚 🛗 👘 - 🗗 🛗 Application [Device: PLC Logic] 🔹 🥵 🥨 🕟 🔳 💐 🗐 🖅 🖕 🗉 🤌	:
		1
Devices 👻 🕈 🗙	EtherCAT_Master X	•
TBEC-LL-SIOL Device (CODESYS Control Win V3) Device (CODESYS Control Win V3)	General Image: Autoconfig master/slaves Sync Unit Assignment EtherCAT NIC Settings	Ether CAT.
Library Manager	Log Destination address (MAC) FF-FF-FF-FF Broadcast Source address (MAC) 00-00-00-00 Browse	Redundancy
EtherCAT_Task (IEC-Tasks)	EtherCAT I/O Mapping Network name	
문 😻 MainTask (IEC-Tasks)	EtherCAT IEC Objects	
EtherCAT Master (EtherCAT Mas	Select Network Adapter	
MAC address	Name Description PNET Intel PCI Ethemet Adapter (Signabil)	
	OK Abort	
C > C POUs	< Last build: ♥ 0 ♥ 0 Precompile ✔ Project user: (nobody	>

Fig. 46: Selecting a network adapter

- ▶ In the **General** tab open the **Options** menu item.
- Select the option **Restart slaves automatically**.

EtherCAT_Master X	
General	✓ Autoconfig master/slaves EtherCAT
Sync Unit Assignment	EtherCAT NIC Settings
Log	Destination address (MAC) FF-FF-FF-FF-FF
EtherCAT I/O Mapping	Source address (MAC) 68-05-CA-37-91-FC Browse
EtherCAT IEC Objects	Select network by MAC Select network by name
Status	Distributed Clock Options
Information	Cycle time 4000
٢	

Fig. 47: Restart slaves automatically

- Click Online \rightarrow Login.
- \Rightarrow The project is written to the controller.



Adding an EtherCAT slave

- Click Online \rightarrow Logout.
- ⇒ The configuration is possible in the logged-out state.
- ► Right-click EtherCAT_Master (EtherCAT Master) → select Scan For Devices.

•		TBEC-LL-8IOL.project* - CODESYS
File Edit View Project Build Online D	ebug	Tools Window Help
19 ☞ ■ ● ∞ ∝ ↓ № 億 × 桷 ‰ (14	📕 🐧 🦄 🆄 🛍 🛗 🚈 🕤 🛗 Applicat
Devices	•	Ф Х
THEC-LL-SIOL		•
Device (CODESYS Control Win V3)		
Library Manager		
PLC_PRG (PRG)		
E Task Configuration		
EtherCAT_Task (IEC-Tasks)		
Main Lask (LEC-Lasks)		
EtherCAT Master (EtherCAT Master)		-
	ð	Cut
	42	Сору
		Paste
		Refactoring •
	G.	Properties
	1.00	Add Object
		Add Folder
		Add Device
		Insert Device
		Scan for Devices
		Disable Device
		Update Device
	10	Edit Object
		East Object with
		Edit IO mapping
		Import mappings from CSV
<	1	Export mappings to CSV

Fig. 48: Scan For Devices

Select the EtherCAT slave (here: TBEC-LL-8IOL) in the following window and click Copy to project.

			Scan Devices – 🗖
canned Devices			
Device name	Device type	Alias Address	
TBEC_LL_8IOL	TBEC-LL-8IOL	0	
Assign Address			Show differences to project

Fig. 49: Copying found devices to the project

⇒ The module appears with the standard settings from the ESI file in the project tree.

Connecting the device online with the controller

- Click **Online** \rightarrow **Login** and start the program.
- \Rightarrow The device is connected online with the PLC.
- ⇒ The green symbols in the project tree indicate the active connection.
- ► Double-click TBEC_LL_8IOL (TBEC-LL-8IOL).
- ⇒ On the General tab → Diagnostics the Operational status indicates the active connection.

EtherCAT_Master	TBEC_LL_8IOL X			
General	Address		Additional	[though a
Process Data	AutoInc address EtherCAT address	0	Expert settings Optional	EtherCAT.
Startup Parameters	Distributed Clock			
EoE Settings	Diagnostics			
Diagnosis History	Current State O	perational		
Log				
EtherCAT I/O Mapping				
EtherCAT IEC Objects				
Status				
Information				
·				

Fig. 50: Status: Operational



7.4.3 Configuring slots

The slots are configured via the "Plug device" function.

Example configuration

Slot	Module	IO-Link device at port
Basic	LL-Basic	Always plugged Parameters/diagnostics for the DXP-channels of the device (DXP 1, 3, 5 and 7) and Input Valid Signal from the IO-Link ports.
IO-Link port 1	IN 1 WORD	Turck temperature sensor, TS-530-LI2UP- N8X
IO-Link port 2	IN 1 WORD/OUT 1 WORD	Turck I/O hub, TBIL-M1-16DXP
IO-Link port 3	DI	The channel is configured as DI
IO-Link port 4	DI	The channel is configured as DI
IO-Link port 5	IN 2 WORD/OUT 2 WORD	RGB LED indicator K50L2RGBKQ
IO-Link port 6	DI	The channel is configured as DI
IO-Link port 7	Unused	-
IO-Link port 8	Unused	-
Diagnostics	LL-Diagnostics	The diagnostic data are mapped into the process image
IO-Link Events	IO-Link Events	IO-Link-Events are mapped into the process image
VAUX control	LL-VAUX control 16CH	Parameters for the VAUX voltage supply
Module Status	Device Status/Control	Status- and control for the complete module

• Click Online \rightarrow Logout.

⇒ The configuration is possible in the logged-out state.

- Devices **-** 4 × TBEC-LL-SIOL • Device (CODESYS Control Win V3) PLC Logic Application 🎁 Library Manager PLC_PRG (PRG) Task Configuration 🕸 EtherCAT_Task (IEC-Tasks) 🖮 🍪 MainTask (IEC-Tasks) PLC_PRG EtherCAT_Master (EtherCAT Master) E TBEC_LL_8IOL (TBEC-LL-8IOL) IL_Basic (LL-Basic) IO_Link_Port_1 X Cut IO_Link_Port_2 🖹 Сору IO_Link_Port_3 IO_Link_Port_4 (DI) Paste K IO_Link_Port_5_Class ➤ Delete IO_Link_Port_6_Class IO_Link_Port_7_Class K IO_Link_Port_8_Clase Add Object 🛱 Diagnostics_1 (LL-Dia 📄 Add Folder... IO_Link_Events_1 (IC Plug Device... VAUX_control_1 (LL-**Disable Device** ŧ. Module_status_1 (De Download the missing device description Edit Object Cĩ -< Edit Object With... 👻 Devices 📄 POUs Edit IO mapping 🔲 Messages - Total 0 error(s), 0 warning Import mappings from CSV...
- Right-click an empty slot in the project tree \rightarrow select **Plug Device**.

Fig. 51: CODESYS – Configuring slots

- Example: Select data width for IO-Link port 1(here: IN 1 WORD)
- Click Plug Device.



Fig. 52: CODESYS - Configured IO-Link port 1





• Configure all slots according to the example configuration above.

7.4.4 Setting startup parameters

- ► Double-click TBEC_LL_8IOL (TBEC-LL-8IOL).
- Select the Startup Parameters tab
- All set parameters of the module are displayed, but cannot be changed. Setting the startup parameters is done per slot.

rices 🔫 🛪 🗶	EtherCAT_Master	TBEC_LL_8IC	LX				
TBEC-LL-8IOL TBEC-LL-8IOL CODESYS Control Win V3)	General	🕂 Add 🛛	🖁 Edit 🗙 Delete 🕼	Move Up 🕀 Move Down			
E D PLC Logic	Process Data	Line	Index:Subindex 16#5000:16#00	Name Configured Module ID	Value 1	Bit Length	Abort on Error
Library Manager Ilbrary PLC_PRG (PRG)	Startup Parameters	2	16#8000:16#02 16#8000:16#04	Manual output reset after overcurr. DXP-Ch1 Manual output reset after overcurr. DXP-Ch3	no no	8	
Task Configuration SetterCAT_Task (IEC-Tasks)	EoE Settings	4	16#8000:16#06 16#8000:16#08	Manual output reset after overcurr. DXP-Ch5 Manual output reset after overcurr. DXP-Ch7	no no	8	
□ S MainTask (IEC-Tasks) □ □ PLC_PRG		- 6	16#8000:16#12 16#8000:16#14	Activate output DXP-Ch1 Activate output DXP-Ch3	no no	8	
EtherCAT_Master (EtherCAT Master)	EtherCAT IEC Objects	- 8	16#8000:16#16 16#8000:16#18	Activate output DXP-Ch5 Activate output DXP-Ch7	no no	8	
IO_Link_Port_1 (IN 1 WORD)	Status	10	16#5010:16#00 16#8010:16#04	Configured Module ID Device ID	7	32	
- Ki IO_Link_Port_3_1 (DI)	Information	12	16#8010:16#05 16#8010:16#20	Vendor ID Revision	0	8	
IO_Link_Port_5_Class_B_1 (IN 2 WORD/OUT		14	16#8010:16#22	Cycle time Input data length	0	8	
IO_Link_Port_7_Class_B_		- 16	16#8010:16#25	Master Control	3	8	
IO_Link_Gete_class_c		- 18	16#8018:16#01	Mode Data storage mode	0	8	
VAUX_control_1 (LL-VAUX control 16CH)			16#8018:16#03 16#8018:16#07	Activate Quick Start-Up Process input data invalid	False	8	
		- 22	16#8018:16#08 16#8018:16#09	Deactivate diagnostics Input data mapping Output data mapping	0	8	
		- 24	16#8018:16#0A 16#5020:16#00	Configured Module ID	15	32	
		26	16#8020:16#04 16#8020:16#05	Device ID Vendor ID	0	8	

Fig. 54: Startup parameters of the module



Example: Set the operation mode "IO-Link with identical device" for IO-Link port 2

File Edit View Project Build Online Debug	Tools Window Help							₹
🖹 🖆 📕 🎒 🗠 🗠 🕉 🛍 🛍 🗙 I 🖊 🌿 🐴	11 11 11 11 12 12 12 12 12 12 12 12 12	Applica	tion [Device: PLC Lo	gic] 🔹 💖 🥬 🖒 🔳 🔏 🗍 🗐 🕾	+∃ \$ ¢	🌃 🗮 🎶		
Devices _ II ¥	Ma TO Link Port 1 1 Y							
Device (CODESYS Control Win V3)	Startup Parameters	🕂 Add (🔏 Edit 🔀 Delete 👎	🗈 Move Up 🛛 🖶 Move Down				
= Device (CODESTS Control WILLYS)		Line	IndowSubindov	Name	Value	Rit Longth	Abort on Error	lum
	Module I/O Mapping	Line	index.3dbindex		value	bit Length	Abort on Enor	Jum
Library Manager		1	16#5000:16#00	Configured Module ID	1/302/22	32		
	Module IEC Objects	- 2	16#8000:16#04	Device ID IO-Link channel	0	8		
Task Configuration		3	16#8000:16#05	Vendor ID IO-Link channel	0	8		
EtherCAT_Task (IEC-Tasks)	Information	4	16#8000:16#20	Revision IO-Link channel	0	8		
MainTask (IEC-Tasks)		5	16#8000:16#22	Cycle time IO-Link channel	0	8		
		6	16#8000:16#24	Input data length IO-Link channel	0	8		
EtherCAT Master (EtherCAT Master)		-/	16#8000:16#25	Output data length 10-Link channel	0	8		
		8	16#8000:16#28	Master Control	3	8		
UL Basic (L-Basic)		9	16#8008:16#01	Mode	3	8		
IO Link Port 1 1 (IN 1 WORD)		10	16#8008:16#02	Data storage mode	0	8		
IO Link Port 2 1 (IN 1 WORD/OUT 1 WORD		- 11	16#8008:16#03	Activate Quick Start-Up IO-Link channel	False	8		
IO Link Port 3 1 (DI)		12	16#8008:16#07	Process input data invalid IO-Link channel	False	8		
IO Link Port 4 1 (DI)		- 13	16#8008:16#08	Deactivate diagnostics IO-Link channel	2	8		
IO Link Port 5 Class B (IN 2 WORD/OUT)		- 14	16#8008:16#09	Input data mapping IO-Link channel	0	8		
IO Link Port 6 Class B (DT)		- 15	16#8008:16#0A	Output data mapping IO-Link channel	0	8		
 K 10_Link_Port_7_Class_B_ K 10_Link_Port_8_Class_B_ Diagnostics 1 (Ll-Diagnostics) I 10_Link_Events_1 (10-Link Events) VAUX_control_1 (Ll-VAUX control 16CH) Module_status_1 (Device Status/Control) 		٢						
Cevices OUs	<							

Double-click IO-Link Port 2 in the project tree.

Fig. 55: CODESYS – Startup parameters for IO-Link port 2

- Select the **Startup Parameters** tab.
- In the submenu double-click **Mode**.
- ► Under Value, enter the value 3 for "IO-Link with identical device" (see parameter "Mode" [▶ 81]).
- For parameters that do not occupy a full byte (here: Mode is data type BIT4), the **Byte array** option must be enabled.
- Confirm with **OK**.

Module I/O Mapping		12							Dist. 2	AL 1 5		
	g	Line	Index:Subindex	Name				Value	Bit Length	Abort on Error	Jump to Line on Error	r
		r 1	16#5000:16#00	Configur	ed Module	e ID		17302722	32			0
10dule IEC Objects		2	16#8000:16#04	Device II	D IO-Link	channel		0	8			0
		- 3	16#8000:16#05	Vendor I	D IO-Link	channel		0	8			0
nformation	_	- 4	16#8000:16#20	Revision	IO-Link d	nannel		0	8			0
		5	16#8000:16#22	Cycle tim	ie IO-Link	channei 10. Liele des		0	8			
			16#8000:16#24	Input da	ta lengtn lata longt	10-Link chai	nnei	0	8			
			16#8000:16#25	Magter C	iata lengti 'ontrol	n 10-Link a	lannel	2	0			-
		0	16#8000:16#28	Made	onuoi			0	0			
		- 10	16#8008:16#01	Data sto	race mod			0	8			
		11	16#8008:16#02	Activate	Ouick Sta	e et.l.lo IO.l.ie	k channel	Falco	9			
	Select Item from	Object	Directory									
		,	,									
	Index:Subindex	c	Name		Flags	Туре	Default					
		i#00	Vendor Specifics IO-Li	ink Port								
	16#5000:16	#00	Configured Module ID	1	RW	UDINT						
	16#8000:16	#00	Parameter IO-Link Por	rt								
	6 16#8008:16	#00	Parameter IO-Link Por	rt								
	:16#01		Mode		RW	BIT4	16#00					
	:16#02		Data storage mode		RW	BIT2	16#00					
	:16#03		Activate Quick Start-L	Jp IO-Li	RW	BOOL	16#00					
	:16#07		Process input data inv	alid IO	RW	BOOL	16#00					
	:16#08		Deactivate diagnostic	s IO-Lin	RW	BIT2	16#02					
	:16#09		Input data mapping IO	D-Link c	RW	BIT2	16#00					
	116#04		Output data mapping	IO-Link	RW	BIT2	16#00					

Fig. 56: CODESYS – Setting startup parameters



7.4.5 Setting EtherCAT device parameters via the object dictionary



Turck recommends only making changes in the startup parameters.

- ► In the project tree double-click **TBEC_LL_8IOL** (**TBEC-LL-8IOL**).
- In the **General** tab activate the **Expert Settings** option.

TBEC_LL_8IOL >	<			•
Address		- Additional		
Auto Inc address	0	 Expert settings 	Ether CAT	
EtherCAT address	1001	Optional		
Distributed Clock				
> Startup Checking		Dimeouts		
DC Cyclic Unit Cont	rol: Assign to Local µ0	2		
Vatchdog ————————————————————————————————————				
Identification				
Disabled				
Configured station a	lias (ADO 0x0012)	Value	1001	
○ Explicit device identi	fication (ADO 0x0134)			
0				
 Data Word (2 Bytes) 	1	ADO (hex)	16#0	
<				>

Fig. 57: Activate expert settings

- Click Online \rightarrow Login.
- Select the **CoE Online** tab.
- ⇒ The object dictionary of the device is displayed with all device-specific parameters.

→ ∓ X	EtherCAT_Master	Device	8IOL ×			
BIOL		(
evice [connected] (CODESYS Control Win V3)	General	Read Objects	Auto update 💿 Offline fro	m ESI file	Online from	device
LC Logic	5	IndexSubindex	Name	Flags	Turne	Value
Application [run]	Expert Process Data	Index.Subindex		Tiags	iype	value
📶 Library Manager	Process Data	16#1000:16#00	Device Type	RO	UDINI	5001
PLC_PRG (PRG)	Troccas bata	16#1001:16#00	Error Register	RO	USINI	
Task Configuration	Startup Parameters	16#1008:16#00	Manufacturer Device Name	RO	STRING(15)	TBEC-LL-8IOL
- 😏 🗇 EtherCAT_Task (IEC-Tasks)		16#1009:16#00	Manufacturer Hardware version	RO	STRING(4)	T the second
😑 😏 👹 MainTask (IEC-Tasks)	Online	16#100A:16#00	Manufacturer Software Version	RO	STRING(12)	V0.0.12.9
PLC_PRG		16#100B:16#00	Manufacturer Bootloader Version	RO	STRING(12)	'V1.0.0.0'
EtherCAT_Master (EtherCAT Master)	CoE Online	# 16#1018:16#00	Identity Object			
TBEC_LL_SIOL (TBEC-LL-SIOL)		± 16#10F3:16#00	Diagnosis History			
C 11 LL_Basic (LL-Basic)	EoE Settings	16#10F8:16#00	Timestamp Object	RO	ULINT	80019370000000
IO Link Port 1 1 (IN 1 WORD)		16#1600:16#00	Mapping RxPDO LL-Basic			
IO Link Port 2 1 (IN 1 WORD/OUT 1 WORD)	Diagnosis History	16#1602:16#00	Mapping RxPDO IN 1 WORD/OUT 1 WORD			
ON IO Link Port 3 1 (DI)		± 16#1605:16#00	Mapping RxPDO IN 2 WORD/OUT 2 WORD			
IO Link Port 4 1 (DT)	Log	16#160B:16#00	Mapping RxPDO LL-VAUX control 16CH			
IO Link Port 5 Class B 1 (IN 2 WORD/OLT 2 WOR		± 16#160C:16#00	Mapping RxPDO Device Status/Control			
IO Link Port 7 Class B 1 (DI)	EtherCAT I/O Mapping	± 16#1A00:16#00	Mapping TxPDO LL-Basic			
I IO Link Port 7 Class B	FiberCAT IFC Objects	16#1A01:16#00	Mapping TxPDO IN 1 WORD			
I D Link Port 9 Class P	EtherCAT IEC Objects	I6#1A02:16#00	Mapping TxPDO IN 1 WORD/OUT 1 WORD			
	Status	16#1A05:16#00	Mapping TxPDO IN 2 WORD/OUT 2 WORD			
In the function of the fu	Status	16#1A09:16#00	Mapping TxPDO LL-Diagnostics			
IO_LINK_EVENTS_1 (IO-LINK EVENTS)	Information	16#1A0A:16#00	Mapping TxPDO IO-Link Events			
VAUX_control_1 (LL-VAUX control 16CH)			Mapping TxPDO Device Status/Control			
Module_status_1 (Device Status/Control)		■ 16#1A80:16#00	TxPDO Mapping of IO-Link Device Status			
			Sync manager Type			
		I6#1C12;16#00	Sync Manager 2 PDO Assignment			
		■ 16#1C13:16#00	Sync Manager 3 PDO Assignment			
		± 16#1C32:16#00	SM output parameter			
		± 16#1033:16#00	SM input parameter			
		16#4010:16#00	Vendor Specifics IO-Link Port			
		H- 16#4020:16#00	Vendor Specifics IO-Link Port			
		#- 16#4030:16#00	Vendor Specifics IO-Link Port			
		16#4040+16#00	Vendor Specifics IO-Link Port			
		t- 16#4050+16#00	Vendor Specifics IO-Link Port			
		10#4050:10#00	Vendor Specifics IO-Link Port			
		16#5000.16#00	Confer and Medule TD	DW	LIDINT	
		16#5000:16#00	Configured Module ID	RW	UDINT	1
		16#5010:16#00	Configured Module ID	RW	UDINI	/
		16#5020:16#00	Conngured Module ID	RW	UDINI	15
		16#5030:16#00	Configured Module ID	RW	UDINT	21
		16#5040:16#00	Configured Module ID	RW	UDINT	21
		16#5050:16#00	Configured Module ID	RW	UDINT	24
		16#5060:16#00	Configured Module ID	RW	UDINT	21
		16#5090:16#00	Configured Module ID	RW	UDINT	2
		16#50A0:16#00	Configured Module ID	RW	UDINT	3
		16#50B0:16#00	Configured Module ID	RW	UDINT	4
		16#50C0:16#00	Configured Module ID	RW	UDINT	5

Fig. 58: CODESYS – Object Dictionary

The display of the parameters depends on the device configuration. The parameters can be changed in the object dictionary.



The changing of parameters during the runtime can cause a faulty configuration of the device.



7.4.6 Addressing a device via Explicit Device ID

- ► In the project tree double-click **TBEC_LL_8IOL** (**TBEC-LL-8IOL**).
- ▶ In the General tab activate the Optional checkbox.
- ► General → Identification → Explicit Device Identification (ADO 0x0134): In the Value field enter the Identification Value (hex.) corresponding to the position of the rotary coding switches on the device.

TBEC_LL_8IOL X				-
General	Address		Additional	EtherCAT
Expert Process Data	AutoIncaddress EtherCAT address	1001	✓ Expert settings ✓ Optional	
Process Data	Distributed Clock			
Startup Parameters	> Startup Checking		> Timeouts	
EoE Settings	DC Cyclic Unit Con	ntrol: Assign to Local µ	C	
Log	Identification			
EtherCAT I/O Mapping	 Disabled 			
EtherCAT IEC Objects	Configured station	alias (ADO 0x0012)	Value	4
Status	Explicit device ident	tification (ADO 0x0134)		
Information	🔿 Data Word (2 Bytes	;)	ADO (hex)	16#134

Fig. 59: CODESYS - Explicit Device ID: entering the Identification Value

• Click Online \rightarrow Login.

7.4.7 Addressing a device via Configured Station Alias

- ► In the project tree double-click **TBEC_LL_8IOL** (**TBEC-LL-8IOL**).
- Click Online \rightarrow Login.
- On the General tab activate the Configured Station Alias (ADO 0x0012) option under Identification.
- ▶ In the Value field enter the Identification Value.
- Click Write to EEPROM.

tto Inc address (herCAT address) stributed Clock — nostics — urrent State artup Checking — C Cyclic Unit Control atchdog — ttification —	0 +	 ✓ Expert settings ✓ Optional → Timeouts → al μC → Timeouts → Timeouts	Ether CAT
herCAT address	1001 🗘	✓ Optional → Timeouts — al μC —	
stributed Clock — nostics — urrent State — artup Checking — C Cyclic Unit Control atchdog — ntification —	l: Assign to Loca	— D Timeouts —— al μC ———	
nostics urrent State artup Checking C Cyclic Unit Control atchdog utification	l: Assign to Loca	— ▷ Timeouts —— al µC ——	
urrent State artup Checking — C Cyclic Unit Control atchdog — ntification —	l: Assign to Loca	— ▷ Timeouts —— al µC ———————————————————————————————————	
artup Checking — C Cyclic Unit Control atchdog ——— ntification ———	l: Assign to Loca	— ▷ Timeouts —— al µC ——	
C Cyclic Unit Control atchdog tification	l: Assign to Loc	al µC	
atchdog			
tification ———			
isabled	- (40.0.0.0012)	Malua	
Write to EEprom	s (ADU 0x0012)	Value Actual address	
xplicit device identifica	ation (ADO 0x0134	4)	
ata Word (2 Pyton)		ADO (bay)	15#10
ata woru (2 bytes)		ADO (IIEX)	10#12
; ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;	Write to EEprom xplicit device identific ata Word (2 Bytes)	Write to EEprom kplicit device identification (ADO 0x0134 ata Word (2 Bytes)	Write to EEprom Actual address xplicit device identification (ADO 0x0134) ata Word (2 Bytes) ADO (hex)

Fig. 60: CODESYS – Configured Station Alias: entering the Identification Value

• Confirm the following dialog with **OK**.



Identification — ODisabled				
Configured Statio	n Alias (ADO 0x0012)	Value	8	
Write to EEpror	n	Actual address	6	
O Explicit Device Ide	entification (ADO 0x0134)			
🔿 Data Word (2 Byt	es)	ADO (hex)	16#12	
	CODESYS After writing is necessary. I	the EEprom alias address a Please switch off and on a	a reboot of the device gain!	
			ОК	

Fig. 61: CODESYS – restart required

- ⇒ The Identification Value is written to the device.
- Carry out a voltage reset.
- After switching on, the newly connected device is automatically recognized by the master. The status in the **Online** tab automatically changes to OP.

7.5 Assigning an IP address for EoE

The normal Ethernet protocol is tunneled via the EoE communication protocol. An IP address for EoE can be assigned to the device so that the device can be configured via the web server or the DTM. Requirement: The set EtherCAT master supports the EoE function.

Activating EoE in TwinCAT

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Ш	

NOTE

In the following example, the communication between EtherCAT and standard Ethernet network is realized via a special Ethernet switch port terminal (e.g. EL6601) from Beckhoff Automation.

The following steps are required to activate the EoE function:

- activating EoE in EtherCAT master
- activating EoE in the switch port terminal
- activating EoE in EtherCAT slave

Activating EoE in the EtherCAT master:

- Double-click Master (EtherCAT) in the project tree in TwinCAT.
- Click **EtherCAT** tab → **Advanced Settings**.
- In the Advanced Settings window select EoE Support on the left.
- At Virtual Ethernet Switch activate the Enable option and the Connect to TCP/IP Stack option at Windows Network.
- ⇔ The EoE function is activated in the master.

General Adapter EtherCAT Online CoE - On	line
Netld: 10.17.110.140.9.1	Advanced Settings
	Export Configuration File
	Sync Unit Assignment
	Topology
Advanced Settings	
State Machine Master Settings Slave Settings Slave Settings Order Cyclic Frames Distributed Clocks EoE Support Redundancy Diagnosis	rmet Switch Image: Windows Network 2 Image: Connect to TCP/IP Stack s: 120 ids: 100 Image: Mailbox Gateway Virtual MAC: 0 Image: Virtual MAC:





Activating EoE in the switch port terminal (EL6601):

- Double-click the Ethernet switch port terminal (EL6601) in the project tree in TwinCAT.
- ► Click EtherCAT tab → Advanced Settings.
- In the Advanced Settings window select Mailbox \rightarrow EoE on the left.
- Enter the IP Address, Subnet Mask and Default Gateway.
- ⇒ The EoE function is activated in the Ethernet switch port terminal.

Туре:	EL6601 1 Port	t Switch (Ethemet, CoE)
Product/Revision: Auto Inc Addr:	EL6601-0000-0	-0021
Identification Value: Previous Port: Advanced Setting	0 ÷	• Advanced Settings • • • • • • • • • • • • • • • • • •
 General Behavior Timeout 1 Identifica FMMU / 3 Init Comr Mailbox CoE FoE EoE Distributed C ESC Access 	Settings tion SM mands	EoE ✓ Virtual Ethernet Port Virtual MAC Id: 02 01 05 10 03 eb ○ Switch Port ○ DHCP ④ IP Address 192.168.122. 1 Subnet Mask: 255.255.0 Default Gateway: 192.168.122. 1 DNS Server: DNS Name: □ Time Stamp Requested

Fig. 63: TwinCAT – Activating EoE in switch port terminal

Activating EoE in EtherCAT slave:

- ► In the project tree double-click **Box 1 (TBEC-LL-8IOL)**.
- ► Click **EtherCAT** tab → **Advanced Settings**.
- In the Advanced Settings window select Mailbox \rightarrow EoE on the left.
- Enter the IP Address, Subnet Mask and Default Gateway.
- ⇒ The EoE function is activated in the EtherCAT slave.

TBEC-LL-8IOL ↔ ×	
General EtherCAT Process Data Slo	ts Startup CoE - Online Diag History Online
Type: TBEC-LL-8IOL Product/Revision: 100004614 / 1 Auto Inc Addr: 0 EtherCAT Addr: 1001 Identification Value: 0 Pre Advanced Settings	Advanced Settings
	FaE
	Vitual Ethemet Port Vitual MAC Id: 02 01 05 10 03 e9 Switch Port IP Port DHCP IP Address 192.168.122.4 Subnet Mask: 255.255.255.0 Default Gateway: IPS Server: DNS Name:

Fig. 64: TwinCAT – activating EoE in EtherCAT slave





Activating EoE in CODESYS

In CODESYS, EoE is activated in the EtherCAT master by default.

Activating EoE in EtherCAT slave:

- ► In the project tree double-click **TBEC_LL_8IOL** (**TBEC-LL-8IOL**).
- Select the **EoE Settings** tab.
- Enter the IP Address, Subnet Mask and Default Gateway.
- ⇒ The EoE function is activated in the EtherCAT slave.

General	Settings	Settings					
	Virtual Ethernet port						
Expert Process Data	Virtual MAC ID	02-01-05-10-03-E9					
Process Data	⊖ Switch port	IP port					
Startup Parameters	IP Settings						
	IP address	192 . 168 . 122 . 4					
EoE Settings	Subnet mask	255 . 255 . 255 . 0					
Log	Default gateway	192 . 168 . 122 . 1					
EtherCAT I/O Mapping	DNS server	0.0.0.0					
	DNS name	TBEC_LL_8IOL					
EtherCAT IEC Objects							
Status							
Information							

Fig. 65: CODESYS – activating EoE in EtherCAT slave

Configuring the Device

After EoE was activated in the EtherCAT master and in the EtherCAT slave, the device can be configured in the in the DTM or in the web server.

Configuring the device in the web server

Requirement: The TBEC-LL-8IOL already has an IP address.

- Access the web server by entering the IP address in the web browser.
- Log in to the device's web server.
- Configure the device and send the changes to the device via Write.

i Info 값 Parameter Di Diaonosis	Write Tab view Print	etei	
∮ Event log ↓ Ex. / Import ♥ Change Password LOCAL I/O) ① Info ③ Parameter ② Diagnosis ★ Input ★ Output	Fieldbus configuration Deactivate WEB server EtherCAT configuration Deactivate all diagnostics Deactivate load voltage diagnostics Output on fieldbus error Deactivate I/O-ASSISTANT Force Mode LED behavior (PWR) at V2 undervoltage Special device properties Production data Version code Serial number Hardware version Rev. counter	no ~ no ~ no ~ set substitute value ~ no ~ green ~ 00	

Fig. 66: Web server - configuring the device



Configuring the device in the DTM

Requirement: The TBEC-LL-8IOL already has an IP address.

- Add the Ethernet interface **BL Service Ethernet** to the project.
- ▶ Use the Add device function to add the TBEC-LL-8IOL to the interface.



Fig. 67: DTM – Adding a device

Select the TBEC-LL-8IOL from the device catalog.

Device for						×
All Devices (2/228 DTMs)						
tbec		Find Clear				
Device 🔺	Protocol Vendor	Group	Device Version	FDT version	DTM version	
TBEC-LL-4RFID-8DXP	BL Service Turck	DTM speci	1.0.0 / 2019-11-05	1.2.0.0	1.00.2901 /	
TBEC-LL-8IOL	BL Service Turck	DTM speci	1.0.0 / 2021-01-21	1.2.0.0	1.00.2901 /	
FixModData FWDownloadFile="" FWDov FwDwlBaudrate="9600" DWLOptions="1 Model.mdb" ModuleType="TBEC-LL-8IOL	vnloadBinaryStart="2 12+" DataBase="C\P " WizFavorite="1130"	62144" FWWait4DW rogram Files (x86)\Tu " StationSubSystem='	L="101" Progid="g ırck Software\DTMs 'Modbus ip ProfiNe	wBIDtm.Main. \gwBIDtm\da t" IPClass="6"	2" DefBaudrate= tabase\gwBLDTM 7"/> OK	"9600" I Turck Cancel



▶ Enter the IP address for TBEC-LL-8IOL .





• Configure the device in the DTM.



Fig. 70: DTM - Configuring the device



7.6 Commissioning IO-Link devices

7.6.1 Web server – manage IO-Link devices

The web server of the device can only be reached if the device has been assigned an IP address via EoE [> 60]. Requirement: The set EtherCAT master supports the EoE function.

Web server: integrated IODD Configurator

The integrated IODD configurator in the web server enables all IO-Link devices connected to the IO-Link master to be read in and thus enables the devices to be parameterized and monitored. Requirement: The ports of the device are configured as IO-Link ports in the EtherCAT configuration software.

- Access the web server by entering the device IP address in the web browser.
- Click IODD Configurator in the web server of the IO-Link master.
- ➡ The IO-Link master automatically performs a topology scan. All connected IO-Link devices are read in. Devices whose IODD is not known are displayed as generic devices.

MAIN IODD CONFIGURATOR	DOCUMENTATION			LOGO
INTERN LL-8IOL	IODD Config	jurator		
Port 1 - device connected				
📎 Port 2 - no device	Read Write	Load IODD Websearch Print		
Port 3 - device connected	Identification	Vendor: Generic		
Nort 4 - no device		Device: Generic device		
Port 5 - device connected	Process data	Minimal IODD for generic device		
Nort 6 - no device		Generic IODD loaded		
Nort 7 - no device	Active events	Info		
Port 8 - no device		Vendor Name	TURCK	
	Event history	Vendor Text	www.turck.com	
		Product Name	TBIL-M1-16DXP	
		Product ID	6814102	
		Product Text	I/O-Hub	
		Serial Number	000327933-00003D	
		Hardware Version	0000	
		Firmware Version	1.4.8.0	
		Application Specific Tag		
		Direct parameters 1: Process Data Input Length	16	
		Direct parameters 1: Process Data Output	16	
		Length Direct parameters 1: Vendor ID	317	
		Direct parameters 1: Device ID	1979139	
		Direct parameters 1: IO-Link Version ID	17	

Fig. 71: Web server: IODD Configurator - generic IODD

Missing IODDs can be searched for locally using the **Load IODD** function or on the Internet using the **Websearch** function.

		TURCK
MAIN IODD CONFIGURATOR	DOCUMENTATION	LOGOUT
INTERN LL-BIOL	IODD Configurator	_
Port 3 - device connected Port 4 - no device Port 5 - device connected Port 6 - no device	Identification Vendor: Generic Device: Generic device Process data Minimal IODD for generic device V01.0000 / 2020.05-28 Generic IODD loaded	
 Port 7 - no device Port 8 - no device 	Active events Info Vendor Name TURCK	
	Event history Vendor Text www.turck Product Name TBIL-M1-1	com I6DXP

Fig. 72: Web server: IODD Configurator - load IODD

When the IODD for the device is loaded, access to all parameters, diagnostics and process data of the connected IO-Link device is possible.

MAIN IODD CONFIGURATOR	DOCUMENTATION	LOGOU
INTERN LL-8IOL	IODD Configurator	
 Port 1 - device connected Port 2 - no device 	■▶ ▶토 다 권 않? 믙 Read Write Export Import Unlink IODD Print	
 Port 3 - device connected Port 4 - no device 	Identification Vendor: Turck Device: TBIL-M1-16DXP	•
 Port 5 - device connected Port 6 - no device 	I/O-Hub V01.0031 / 2018-12-12 © 2018, Werner Turck GmbH	1 Co. & KG
Part 7 - no device	Diagnostics General Settings Device Access Locks: Parameter (write)	
	Observe Access Lock Device Access Locks: Data Storage Lock	
	Process data Lock Local Verice Access Local Verice Access Local Verice Access Local Verice Access Local User Interface	
	Processdata Structure Standard Command	2
	Active events Standard Command RESTORE FACTOR	
	Event history Summarized parameterization of all connectors	
	Connections Standard Command NO FOR ALL	CHANNELS
	Standard Command YES FOR ALL	CHANNELS
	Pulse stretching input Standard Command DEACTIVATE FOR	

Fig. 73: Web server: IODD Configurator - access to IO-Link device via IODD



7.6.2 FDT/DTM – manage IO-Link devices

FDT/DTM enables parameterization and monitoring of the IO-Link devices connected to the IO-Link master. The DTM communicates via EoE with the connected devices. For commissioning, the IO-Link master must be connected to an EtherCAT master that supports the EoE function.

Read in connected IO-Link devices: topology scan in the DTM

The Topology Scan in PACTware allows to read-in of an IO-Link configuration down to the IO-Link device. IO-Link device, known in PACTware, are added to the IO-Link ports of the master. Either the respective sensor DTMs in PACTware or the sensor IODDs via IODD DTM Configurator have to be installed.

	PACTware _ 🗆 🗙				
File Edit View	Project Device Extras Win	dow Help			
🗆 🗇 🗗 🗃 👔	1 🗱 🗱 🔟 🛄 🙀 🗄 🗋 🖉				
Project		• x • TCP:192.168.122.5 Busaddress management • x • x • x			
Device tag	Addres 🛈 🕸 I	evice type (DTM)			
B HOST PC		Your Global Automation Partner TORCK			
🕀 🖛 TCP:192.168.12	2.5	BL Service Ethern Device type BL Service Ethernet			
	Connect	IBEC-LL-8IOL			
	Disconnect				
- E 🕡 Po	Get device state	Port 1			
<u>-</u> <u>D</u>	Load from device	TBIL-M1-8DOP			
🐺 Pc 👧	Store to device	Port 2 Topology Scan	_ 🗆 X		
-⊟ 🐳 Po	Parameter •	Port 3			
	Measured value	TBIL-N Scall Paul			
er Po	Simulation	Port 5 Sean Tree			
	Diagnosis	Port 6			
- 🕡 Pc	Do not display channels	Port 7 Device tag Address Device type (DTM) Scanning Port 4			
🚽 🐺 Pc	Channel	Port 8 P 01/5C 1 2/4/ IBEC-LE-8IOL V IBEC-LE-8IOL			
	T 1 0	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □			
	Disensatis See	TBIL-M1-8DOP TBIL-M1-8DOP Connect device			
	Un /Download Managor	Port 2 🗸 Port 2 Scan started			
	Drint	- 🖂 🙀 Port 3 🖍 Port 3			
		TBIL-M1-16DXP 🗹 TBIL-M1-16DXP			
	Additional functions	- 🛱 Port 4 🧭 Port 4			
9	Add device	Port 5 Port 5			
	Exchange device	The port of the po			
<u>8</u>	Delete device	W Port 8 * Port 8			
	Properties TBEC-LL-8IOL				
		()			
<					
<>> ★ ● <	NONAME> Administra	or Close Settings			

Fig. 74: PACTware - topology scan

7.6.3 Commissioning an IO-Link device with IO-Link V1.0

IO-Link devices in accordance with IO-Link specification V1.0 do not support data storage. If an IO-Link V1.0 device is used, data storage on the IO-Link port must be deactivated. The data storage is deactivated in the configuration software of the EtherCAT master via the parameter "Master Control", bit 4...15 = 0 (CoE index 0x80n0:28).

In the web server, data storage is disabled via the "Data storage mode" parameter.

- Set the parameter **Data storage mode** at the port to **deactivated**, **clear**.
- Use the **Write** button to write the parameter into the device.
- Connect the IO-Link V1.0 device.
- ⇒ The LED IOL at the IO-Link port is green, IO-Link communication active.

MAIN IODD CONFIGURATOR	DOCUMENTATION			LO	GOUT
TBEC-LL-8IOL	TBEC-LL-8IOL - Local I/O - Par	ameter			
j) Info					
နို္င္ငံ} Parameter	Write Tab view Print				
😳 Diagnosis 🚹	Port 1 - IO- Link (Channel	10 List without wilded as			
Event log	0) Detection mode	IO-Link Without Validation			
[√] Ex-/Import	Port 1 - DXP Our la time	deactivated, clear			
Change Password	(Channel 1)	automatic			
	Port 2 - IO-	automatic	?		
	Link (Channel Activate Quick Start-U	p no	× ?		
	 Diagnostic settings Process input data inv 	alid no diagnostic generated	× ?		
₹os Parameter	Port 2 - DXP (Channel 3) Deactivate diagnostic	ves			
💱 Diagnosis 🚹	Data mapping	0			
ર્⊸્ Input	Port 3 - IO- Link (Channel Process input data ma	swap 16 bit	× ?		
ട Output	4) Process output data r	swap 16 bit	✓ ?		
	Port 3 - DXP				
	(Channel 5)				
	Port 4 - IO-				
	Link (Channel 6)				
	(Channel 7)				
	Port 5 IO				
	Link (Channel				
	8)				
	Port 6 - IO- Link (Channel				
	`10)				
	Port 7 - IO-				
	LINK (Channel 12)				
	Port 8 - IO-				
	Link (Channel				

Fig. 75: Example: Deactivate data storage via **Data storage mode** in the web server.



7.6.4 Commissioning an IO-Link device with IO-Link V1.1

The data storage of the master should be cleared before a device with a different device type is connected to an IO-Link port which has already been used before.

There are two ways to clear the data memory:

- Set back the master to factory settings [▶ 122].
- Delete the data storage memory or deactivate the data storage via parameter "Master Control".

Delete the data storage memory via parameters

Deleting the data storage memory or respectively deactivating the data storage is done via the parameter "Master Control", bit 4...15 = 0 (CoE index 0x80n0:28) in the configuration software of the EtherCAT master.

In the web server, data storage memory is deleted via the "Data storage mode" parameter.

- Set the parameter Data storage mode at the port to deactivated, clear.
- Use the **Write** button to write the parameter into the device.
- ⇒ The LED IOL at the IO-Link port is green, IO-Link communication active.



Fig. 76: Example: Deactivate data storage via Data storage mode in the web server.

- Re-activate the data storage, if necessary.
- Use the **Write** button to write the parameter into the device.
- Connect the IO-Link V1.1 device.
- ⇒ The LED IOL at the IO-Link port is green, IO-Link communication active.

8 Parameterizing and Configuring

8.1 Modular device model/slot definition

The TBEC-LL-8IOL appears in the configuration software as a modular EtherCAT slave with 13 configurable slots. The slots are configured by adding/plugging predefined EtherCAT modules.

The following table	e shows the possible	slot/module assignments.
---------------------	----------------------	--------------------------

Slot	Module	Description				
Basic	LL-Basic	Parameters and diagnostics of the DXP and SIO channels of the device, as well as in- put valid signal of the IO-Link ports				
IO-Link port [18]	IO-Link Input/ Output Module	 IN1 BYTE IN 1 WORD IN 1WORD/ OUT 1 WORD 	Plugging in a module activates the "IO-Link" function for the port, i.e. the IO-Link port is operated in IO-Link mode. The length of the process data can be adapted to the connected IO-Link device by selecting a respective module. Sets the bits 04 in parameter "Master Control" (0x80n0:28) to the value 3. The mode of the IO-Link port (e.g. "IO-Link without validation") is defined via the "Mode" parameter (0x80n8:01) [▶ 79].			
		DI	Plugging the module activates the "DI" function for the port, pin4 of the IO-Link port is operated as simple digital input mode. Data storage is not supported. Sets the bits 04 in parameter "Master Control" (0x80n0:28) to the value 1 [> 79].			
		DI with parameter access	Plugging the module activates the "DI with parameter access" function for the port, pin 4 of the IO-Link port is operated as simple digital input mode. However, an acyclic parameter access from the PLC or the DTM is possible. The IO-Link master starts the port in IO-link mode, para- meterizes the device and sets the port back into SIO mode (SI). The port remains in SIO mode (DI) until a new IO-Link request is sent from the higher-level control. Data storage is not supported. Con- nected devices have to support the SIO mode (DI). In case of a parameter access, the IO-Link communication at the port is star- ted. Switching signals are interrupted. Sets the bits 04 in parameter "Master Control" (0x80n0:28) to the value 4 [▶ 79].			
Diagnostics	LL-Diagnostics	Diagnostic data o	f DXP channels, IO-Link channels and VAUX diagnostics [> 99]			
IO-Link Events	IO-Link Events	Activates the mapping of IO-Link-Events to the process data [> 86].				
VAUX control	LL-VAUX control 16CH	Activates the VAL	IX voltage supply [▶ 79]			
Module Status	Device Status/ Control	Status- and control for the complete module see "Device Level Entries" [> 73]				


8.2 Device area – Device Control (0xF200)

Device Control

Device Control can be accessed via the process data if the module "Device Status/Control" is plugged.

СоЕ	CoE sub index	Byte no.	Bit	3it						
index			7	6	5	4	3	2	1	0
0xF200	0x080x01	0	-	-	-	-	-	-	-	Wink
	0x100x09	1	-	-	-	-	-	-	-	-

Meaning of the Device control bits

CoE index	CoE sub index	Designation	Meaning
0xF200	0x01	Wink	0: no 1: yes, activates the Wink command (only settable in Status "Pre-OP")

СоЕ	Sub	Byte no.	Bit									
index	index		7	6	5	4	3	2	1	0		
0xF800	0x07 0x01	0	DEV2	V2LED	-	-	DEWEB	FFB		DDI		
	0x0F 0x08	1	-	DEFC	-	-	-	-	-	-		

8.3 Device area – general device parameters (0xF800)

Meaning of parameter bits

The default values are written in **bold**.

CoE index	Sub index	Designation		Meaning					
0xF800	0x01	DDI	Deactivate all diagnostics						
			0: no	All diagnostic and alarm messages are sent.					
			1: yes	All diagnostic and alarm messages are suppressed.					
	0x02	FFB	Output behavior at communication loss						
			00: Set to 0	If EtherCAT communication fails, the DXP channels are set to 0. IO-Link devices receive 0 as a valid value ("output data valid").					
			01: Substitute value	If EtherCAT communication fails, the DXP channels are set to 0. Values at IO-Link devices are marked as invalid ("out- put data invalid"). The substitute value is defined by the connected IO-Link device.					
			10: Hold current value	If EtherCAT communication fails, the DXP channels hold the current value. IO Link devices receive the current value as a valid value ("output data valid").					
	0x03	DEWEB	Deactivate Webserver NOTE:	the web conver requires a device restart					
				The web server in the device is activated					
				The web server in the device is activated.					
	0x06		I: yes 						
	0,00	VZLLD	0. red	PWR-I ED is red at V2 undervoltage					
			1: green	PWR-LED is flashing green at V2 undervoltage					
	0x07	DEV2	Deactivate load voltage di	agnostics					
			0: no	Load voltage diagnostics are activated.					
			1: yes	All load voltage diagnostics are deactivated.					
	0x0E	DEFC	Deactivate I/O-ASSISTANT	Force Mode					
			0: no	The force mode is activated, the DTM accesses the device.					
			1: yes	The force mode is deactivated.					



8.4 I/O channel parameters (Configuration Area, 0x8000...0x8FFF)

The general device parameters are set via Device Level Entries [> 73].

The I/O channel parameters of the TBEC-LL-8IOL occupy the following CoE indices:

Slot no.	CoE index	Channel
0	-	Status word
Configuration Dat	ta Basic	
1	0x8000	Parameters for DXP channels Ch1, Ch3, Ch5, Ch7
Configuration Dat	ta IO-Link Port	
2	0x8010	Parameters for IO-Link port 1 (acc. to ETG 5001)
	0x8018	Parameters for IO-Link port 1 (vendor specific)
3	0x8020	Parameters for IO-Link port 2 (acc. to ETG 5001)
	0x8028	Parameters for IO-Link port 2 (vendor specific)
4	0x8030	Parameters for IO-Link port 3 (acc. to ETG 5001)
	0x8038	Parameters for IO-Link port 3 (vendor specific)
5	0x8040	Parameters for IO-Link port 4 (acc. to ETG 5001)
	0x8048	Parameters for IO-Link port 4 (vendor specific)
6	0x8050	Parameters for IO-Link port 5 (acc. to ETG 5001)
	0x8058	Parameters for IO-Link port 5 (vendor specific)
7	0x8060	Parameters for IO-Link port 6 (acc. to ETG 5001)
	0x8068	Parameters for IO-Link port 6 (vendor specific)
8	0x8070	Parameters for IO-Link port 7 (acc. to ETG 5001)
	0x8078	Parameters for IO-Link port 7 (vendor specific)
9	0x8080	Parameters for IO-Link port 8 (acc. to ETG 5001)
	0x8088	Parameters for IO-Link port 8 (vendor specific)
Configuration Dat	ta VAUX control	
12	0x80B0	Parameters for the switchable voltage supply VAUX

The device has 4 byte module parameters (Configuration Data Basic), 36 byte IO-Link port parameters (Configuration Data IO-Link-Port) and 16 byte parameters for the VAUX1/VAUX2 control (Configuration Data VAUX Control).

CoE	СоЕ	Byte no.	Bit no.									
index	sub index		7	6 5 4 3 2 1								
Configurati	ion Data Basi	c	1	•								
0x8000	0x080x01	0	SRO_ DXP7	-	SRO_ DXP5	-	SRO_ DXP3	-	SRO_ DXP1	-		
	0x100x09	1	Reserved	1			1					
	0x180x11	2	ENDO_ DXP7	-	ENDO_ DXP5	-	ENDO_ DXP3	-	ENDO_ DXP5	-		
	0x20	3	Reserved									
Configurati	ion Data IO-Li	ink port 1										
0x8010	0x04	0	Device ID (LSB)									
			····									
		3	Device ID (MSB)									
	0x05	4	Vendor II	D (LSB)								
		7	Vendor II	D (MSB)								
	0x20	8	IO-Link R	-Link Revision								
	0x21	9	Reserved									
	0x22	10	Cycle tim	e								
	0x23	11	Reserved									
	0x24	12	Process D	Data In Length								
	0x25	13	Process D	Data Out Length	1							
	0x26	1415	Reserved									
	0x27	1617										
	0x28	18	Master Co	ontrol								
		19										
0x8018	0x040x01	0	-	Activate Quick Start-Up	Data sto mode	orage	Mode					
	0x05	1	Reserved	1								
	0x0A 0x06	2	Output d mapping	ata	Input da mappin	ita g	Deactiva diagnost	te ics	Process input data invalid	-		
	0x0B	3	Reserved				1		1			
	0x35	15	1									
Configurati	ion Data IO-Li	ink port 2	1									
0x8020	0x04	0	Assignme	ent similar to IO	-Link por	t 1						
	0x28	19	1									
0x8028	0x01	0	Assignme	ent similar to IO	-Link por	t 1 (0x80	018)					
			1									
	0x35	15	1									



CoE	СоЕ	Byte no.	o. Bit no.										
index	sub index		7 6	7 6 5 4 3 2 1 0									
Configuratio	on Data IO-Li	nk port 3	II		-	1	-						
0x8030	0x04	0	Assignmer	nt similar to IO	-Link por	t 1							
			1										
	0x28	19											
0x8038	0x01	0	Assignmer	nt similar to IO	-Link por	t 1 (0x8	018)						
	0x35	15	-										
Configuratio	on Data IO-Li	nk port 4											
0x8040	0x04	0	Assignmer	nt similar to IO	-Link por	t 1							
	0x28	19	-										
0x8048	0x01	0	Assianmer	nt similar to IO	-Link por	t 1 (0x8	018)						
							,						
	0x35	15	-										
Configuratio	on Data IO-I i	nk port 5											
0x8050	0x04	0	Assignmer	t similar to IO	link nor	t 1							
0,0050		0	, issigniner		Linkpor								
	 0v28	10	-										
0,0050	0x01	0	Accianmor	t cimilar to IO	Linkpor	+ 1 /0.20	010)						
0X0030	0.001	0	Assignmen		-спк рог	ι Ι (υχο	010)						
		1	-										
	0X35	15											
Configuratio	on Data IO-Li	nk port 6											
0x8060	0x04	0	Assignmer	it similar to IO	-Link por	t 1							
	0x28	19	-										
0x8068	0x01	0	Assignmer	nt similar to IO	-l ink por	t 1 (0x8	018)						
		0	, issigniner		Lintpol	e i (ono	010)						
	0x35	15	-										
Configuratio	on Data IO-l i	nk nort 7											
0_8070			Assignmen	t similar to IO	link por	+ 1							
0,0070	0704	0	Assignmen		-спк рог	L I							
		10	-										
0.0070	0x28	19	A		. I :	+ 1 /00	010)						
0x8078	0x01	0	Assignmer	it similar to IO	-Link por	t I (UX8	018)						
			-										
	0x35	15											
Configuration	on Data IO-Li	nk port 8											
0x8080	0x04	0	Assignmer	it similar to IO	-Link por	t 1							
			-										
	0x28	19											
0x8088	0x01	0	Assignmer	nt similar to IO	-Link por	t 1 (0x8	018)						
			-										
	0x35	15											

Configuring and Parameterizing I/O channel parameters (Configuration Area, 0x8000...0x8FFF)

CoE	CoE	Byte no.	Bit no.										
index	sub index		7	6	5	4	3	2	1	0			
Configurati	on Data VAl	JX control					÷						
0x80B0	0x01	0	-	-	-	-	-	-	VAUX1 pin1 X (Ch0/1)	0			
	0x08	1	-	-	-	-	-	-	VAUX1 pin1 X (Ch2/3)	1			
	0x0F	2	-	-	-	-	-	-	VAUX1 pin1 X (Ch4/5)	2			
	0x16	3	-	-	-	-	-	-	VAUX1 pin1 X (Ch6/7)	3			
	0x1D	4	-	-	-	-	-	-	VAUX1 pin1 X	4 (Ch8)			
	0x24	5	-	-	-	-	-	-	VAUX1 pin1 X (Ch10)	5			
	0x2B	6	-	-	-	-	-	-	VAUX1 pin1 X (Ch12)	б			
	0x32	7	-	-	-	-	-	-	VAUX1 pin1 X (Ch14)	7			
	0x39	8	Reserved	l	•								
		9											
	0x54	11											
	0x55	12	-	-	-	-	-	-	VAUX2 pin2 X	4 (Ch9)			
	0x5C	13	-	-	-	-	-	-	VAUX2 pin2 X (Ch11)	5			
	0x63	14	-	-	-	-	-	-	VAUX2 pin2 X (Ch13)	б			
	0x6A	15	-	-	-	-	-	-	VAUX2 pin2 X (Ch15)	7			



Select the IO-Link port via (n = 0: port IOL1n = 8: port IOL8) The default values are written in bold. CoE index sub index Parametr sub index Parametr poc. Meaning poc. Description 0x8000 SRO_DXP Manual output reset after overcurrent DXP 0 0x00 No The output sixthches on automatically after an overload. 0x004 SRO_DXP3 0 0x00 No The output is manually switched-off after an overload until a new set-command is given (rise and fall). 0x04 SRO_DXP3 Acct. to sub index 0x02 The output is manually switched-off after an overload until a new set-command is given (rise and fall). 0x04 SRO_DXP5 0x00 No The output at pin 2 is deactivated. 0x04 SRO_DXP7 0x00 No The output at pin 2 is deactivated. 0x14 ENDO_DXP3 Acct. to sub index 0x12 The output at pin 2 is activated. 0x14 ENDO_DXP7 Device ID for the port configuration check 0 0x00FFFFFF 0x8001 0x20 Vendor ID 0 0x00FFFFFF 0x8002 Vendor ID 0 0x00FFFFFF Device ID for the port configuration check 0 0x0FFFF 0x800 0x22 Vendo		Meaning	of paramete	r bits			
The default values are written in bold. CoE index sub index Parameter sub index Parameter per default values are written in bold. CoE index SRO_DXP Manual output reset after overcurrent DXP Ox02 SRO_DXP1 Manual output reset after overcurrent DXP Ox02 SRO_DXP1 0x02 SRO_DXP1 0x03 SRO_DXP3 SRO_DXP3 Ox04 SRO_DXP3 0x06 SRO_DXP3 0x06 SRO_DXP3 0x06 SRO_DXP3 0x06 SRO_DXP3 0x06 SRO_DXP3 0x012 ENDO_DXP 0x12 SRO_DXP3 0x12 SRO_DXP3 0x12 SRO_DXP3 0x12 SRO_DXP3 0x12 The output at pin 2 is deactivated. Ox12 ENDO_DXP3 0x12 SRO_DXP3 0x12 SRO_DXP3 0x12 The output at pin 2 is deactivated. Ox14 ENDO_DXP3 0x12 SRO_OX0 No Ox15 ENDO_DXP3 0x16 SRO_OX0FFFFF Ox18 Device ID for the port configuration check 0 Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan="2"Colspan			Select the IO-L	ink po	ort via (n	n = 0: port IOL1n =	8: port IOL8)
CoE index CoE sub index Parameter sub index Value name Meaning Dec. Description 0x8000 SRO_DXP Manual output reset after overcurrent DXP 0x02 SRO_DXP1 0 0x00 No The output switches on automatically after an overload. 0x02 SRO_DXP3 0x06 Acct. to sub index 0x02 The output is manually switched-off after an overload until a new set-command is given (rise and fall). 0x04 SRO_DXP3 0x06 Acct. to sub index 0x02 The output is manually switched-off after an overload until a new set-command is given (rise and fall). 0x04 SRO_DXP7 Ox08 SRO_DXP7 0x12 ENDO_DXP1 Ox00 No The output at pin 2 is deactivated. 0x12 ENDO_DXP7 Ox00 No The output at pin 2 is deactivated. 0x14 ENDO_DXP7 Device ID for the port configuration check 16777215 24 bit value 0 Ox00 0x18 ENDO_DXP7 Device ID for the port configuration check 16.777215 24 bit value 0 Ox00FFFFF 0x00 Ox05 Vendor ID 0 Ox00 FFFF Ox00FFFFF Ox00FFFFF 0x80n0 0x22 Cycle time <			The default va	lues ar	re writte	en in bold .	
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1 0x01 Yes The output is manually switched-off after an overload until a new set-command is given (rise and fall). 0x04 SR0_DXP3 Acct. to sub index 0x02 0x06 SR0_DXP7 0x08 SR0_DXP7 0x08 SR0_DXP7 0x12 ENDO_DXP1 0x12 ENDO_DXP3 0x14 ENDO_DXP3 0x16 ENDO_DXP3 0x16 ENDO_DXP7 0x18 ENDO_DXP7 0x80n0 0x04 0x01 Device ID 0x005 Vendor ID 0x006 Quice ID 0x007 Vendor ID 0x008 0x20 Vendor ID 0 0x80n0 0x20 Vendor ID 0 0x80n0 0x20 Vendor ID 0 0x80n0 0x20 V2 Vendor ID 0x80n0 0x20 0x80n0 0x20 0x80n0 0x20 0x80n0 0x20 0x80n0 0x22 Cycle time 0 0x00 0 0x00 0x80n0 0x22 Cycle time 0 0x80n0		0x02	SRO_DXP1	0	0x00	No	The output switches on automatically after an overload.
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0x08 SR0_DXP7 0x8000 END0_DXP Activate output DXP Activate output DXP The output at pin 2 is deactivated. 0x12 END0_DXP3 Activate output DXP 0 0x00 No The output at pin 2 is deactivated. 0x14 END0_DXP3 Act. to sub index 0x12 0x16 END0_DXP7 The output at pin 2 is activated. 0x18 END0_DXP7 0 0x01 Yes 0x80n0 0x04 Device ID Device ID for the port configuration check 1677215 24 bit value 0 0x00FFFFF 0x05 Vendor ID 0 0x00FFFFF Device ID for the port configuration check 0x0000 0x00FFFFF 0x80n0 0x20 IO-Link Revision Vendor ID for the port configuration check 0x0000 0xFFFF The Master defines the IO-Link-revision automatically. 0x80n0 0x20 IO-Link Revision The Iowest cycle time supported by the device is taken from the table. 0x80n0 0x22 Cycle time I.6 0x00 Automatic 0x80 The lowest cycle time supported by the device is taken from the table. 0x80n0 0x22 Cycle time 0x10 I.6 = 132,8 ms Settable in steps of 0.8 or 1.6 ms. 191 Settable in steps of 0.8 or 1.6 ms. 191 </td <td></td> <td>0x06</td> <td>SRO_DXP5</td> <td>_</td> <td></td> <td></td> <td></td>		0x06	SRO_DXP5	_			
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0x12 ENDO_DXP1 0 0x0 No The output at pin 2 is deactivated. 0x14 ENDO_DXP3 Acct. to sub index 0x12 The output at pin 2 is activated. 0x16 ENDO_DXP5 Acct. to sub index 0x12 The output at pin 2 is activated. 0x16 ENDO_DXP5 Service ID The output at pin 2 is activated. 0x18 ENDO_DXP5 Service ID Service ID 0x80n0 0x04 Device ID Device ID for the port configuration check 0x05 Vendor ID Service ID for the port configuration check Service ID for the port configuration check 0x000 Ox05 Vendor ID Service ID for the port configuration check 0x080n0 Ox20 IO-Link Revision Vendor ID for the port configuration check 0x80n0 Ox20 IO-Link Revision Intervision automatically. 1 0x01 V1.0 IO-Link-Revision V 1.0 is used. 0x80n0 Ox22 Cycle time Intervision 0x80n0 Ox22 Cycle time Intervision 0x80n1 Servision Intervision <td< td=""><td>0x8000</td><td></td><td>ENDO_DXP Activate outp</td><td>out DXI</td><td>P</td><td></td><td></td></td<>	0x8000		ENDO_DXP Activate outp	out DXI	P		
$\begin{array}{ c c c c c } \hline 1 & 0x01 & Yes & The output at pin 2 is activated. \\ \hline 0x14 & ENDO_DXP3 & Acct. to sub index 0x12 \\ \hline 0x16 & ENDO_DXP7 & & & \\ \hline 0x18 & ENDO_DXP7 & & & \\ \hline 0x18 & ENDO_DXP7 & & & \\ \hline 0x00 & 0x04 & \hline 0cvice ID & & & \\ \hline 0 & 0cvice ID for the port configuration check & 16777215 & 24 bit value & & \\ \hline 0 & 0x00FFFFF & & & \\ \hline 0x05 & Vendor ID & & & \\ \hline 065535 & Vendor ID for the port configuration check & \\ \hline 0x06 & 0x00 & & & \\ \hline 0x80n0 & 0x20 & \hline 0 & 0x0FFFFF & & \\ \hline 0x80n0 & 0x20 & \hline 0 & 0x00 & Automatic & The Master defines the IO-Link-revision & \\ \hline 0x80n0 & 0x22 & \hline 0 & 0x00 & Automatic & The Master defines the IO-Link-revision & \\ \hline 0x80n0 & 0x22 & \hline 0 & 0x00 & Automatic & The Iovest cycle time supported by the device is taken from the table. \\ \hline 1 & 0x01 & V1.0 & IO-Link-Revision V1.0 is used. \\ \hline 0x80n0 & 0x22 & \hline 0 & 0x00 & Automatic & The lowest cycle time supported by the device is taken from the table. \\ \hline 16 & 0x10 & 1.6 = 132,8 ms & \\ \hline 0x80F & \hline 0x8FF & & \\ \hline 0x8F & \hline$		0x12	ENDO_DXP1	0	0x00	No	The output at pin 2 is deactivated.
$ \begin{array}{ c c c c c } \hline 0x14 & ENDO_DXP3 & Acct. to sub index 0x12 \\ \hline 0x16 & ENDO_DXP7 \\ \hline 0x18 & ENDO_DXP7 \\ \hline 0x80n0 & 0x04 & \hline Device ID \\ \hline & & & & & & & & & & & & & & & & & &$				1	0x01	Yes	The output at pin 2 is activated.
$ \frac{0x16}{0x18} ENDO_DXP5 \\ \hline 0x18 ENDO_DXP7 \\ \hline 0x80n0 \\ 0x04 \\ \hline 0x04 \\ \hline 0x05 \\ \hline 0x0$		0x14	ENDO_DXP3	Acct.	to sub i	ndex 0x12	
0x18 ENDO_DXP7 0x80n0 0x04 Device ID 0 0 Device ID for the port configuration check 16777215 24 bit value 0 0x00FFFFFF 0x05 Vendor ID 0x0000 0x0000 0x80n0 0x20 IO-Link Revision Vendor ID for the port configuration check 0x80n0 0x20 IO-Link Revision The Master defines the IO-Link-revision automatically. 0x80n0 0x22 Cycle time I 0x00 Automatic The lowest cycle time supported by the device is taken from the table. 16 0x10 191 0xBF Image: Settable in steps of 0.8 or 1.6 ms. 191		0x16	ENDO_DXP5	_			
0x80n0 0x04 Device ID 0 0 Device ID for the port configuration check 16777215 24 bit value 0 0x00FFFFF 0x00 Vendor ID 0x80n0 0x20 10-Link Revision 0x80n0 0x20 10-Link Revision 0x80n0 0x22 10-Link Revision 1 0x01 1 0x01 1 0x01 1 0x01 1 0x10 16 10-Link-Revision V 1.0 is used. 0x80n0 0x22 Cycle time 0x00 Automatic The Master defines the IO-Link-revision automatically. 1 0x01 V1.0 10-Link-Revision V 1.0 is used. 0 0x80n0 0x22 Cycle time 16 0x10 1.6 = 132,8 ms 16 0x10 1.6 = 132,8 ms 191 0x8F 255 0xFF Automatic, compatible Compatibility mode The mode solves possible communication problems with sensors of the SGB fam		0x18	ENDO_DXP7				
0 Device ID for the port configuration check 16777215 24 bit value 0 0x00FFFFFF 0x00 Vendor ID 0 065535 0x0000 0x06 0x80n0 0x20 10-Link Revision 0 0x01 1 0x01 1 0x01 1 0x01 0 Automatic 1 0x01 1 0x01 0 0x00 0 0x00 0 0x00 0 0x01 1 0x01 1 0x01 1 0x01 1 0x01 1 0x01 1 0x01 1.6 = 132,8 ms 16 0x10 1.6 = 132,8 ms 191 0xBF 255 0xFF 255 0xFF 255 0xFF 255 0xFF 255 0xFF	0x80n0	0x04	Device ID				
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065535 0x0000 0xFFFF Vendor ID for the port configuration check 0x80n0 0x20 IO-Link Revision 0 0x00 Automatic The Master defines the IO-Link-revision automatically. 1 0x01 V1.0 IO-Link-Revision V 1.0 is used. 0x80n0 0x22 Cycle time IO-Link-Revision V 1.0 is used. 0x80n0 0x22 Cycle time IO-Link-Revision V 1.0 is used. 0x80n0 0x22 Cycle time IO-Link-Revision V 1.0 is used. 0x80n0 0x22 Cycle time IO-Link-Revision V 1.0 is used. 0x80n0 0x22 Cycle time IO-Link-Revision V 1.0 is used. 0x80n0 0x22 Cycle time Intervention of the lowest cycle time supported by the device is taken from the table. 16 0x10 1.6 = 132,8 ms Settable in steps of 0.8 or 1.6 ms. 191 0xBF Compatibility mode The mode solves possible communication problems with sensors of the SGB family from IFM.		0x05	Vendor ID				
0x80n0 0x20 IO-Link Revision 0 0x00 Automatic The Master defines the IO-Link-revision automatically. 1 0x01 V1.0 IO-Link-Revision V 1.0 is used. 0x80n0 0x22 Cycle time Image: Cycle time supported by the device is taken from the table. 0 0x00 Automatic The lowest cycle time supported by the device is taken from the table. 16 0x10 1.6 = 132,8 ms Settable in steps of 0.8 or 1.6 ms. 191 0xBF Z55 0xFF Automatic, compatible Compatibility mode The mode solves possible communication problems with sensors of the SGB family from IFM.				065 0x000 0xFFF	5535 00 F	Vendor ID for the po	ort configuration check
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1 0x01 V1.0 IO-Link-Revision V 1.0 is used. 0x80n0 0x22 Cycle time 0 0x00 Automatic The lowest cycle time supported by the device is taken from the table. 16 0x10 1.6 = 132,8 ms Settable in steps of 0.8 or 1.6 ms. 191 0xBF 255 0xFF Automatic, compatible Compatibility mode The mode solves possible communication problems with sensors of the SGB family from IFM.				0	0x00	Automatic	The Master defines the IO-Link-revision automatically.
0x80n0 0x22 Cycle time 0 0x00 Automatic The lowest cycle time supported by the device is taken from the table. 16 0x10 1.6 = 132,8 ms Settable in steps of 0.8 or 1.6 ms. 191 0xBF Z55 0xFF Automatic, compatible Compatibility mode The mode solves possible communication problems with sensors of the SGB family from IFM.				1	0x01	V1.0	IO-Link-Revision V 1.0 is used.
00x00AutomaticThe lowest cycle time supported by the device is taken from the table.160x101.6 = 132,8 msSettable in steps of 0.8 or 1.6 ms.191 0xBF0xFFAutomatic, compatibleCompatibility mode The mode solves possible communication problems with sensors of the SGB family from IFM.	0x80n0	0x22	Cycle time				
160x101.6 = 132,8 msSettable in steps of 0.8 or 1.6 ms.1910xBF2550xFFAutomatic, compatibleCompatibility mode The mode solves possible communication problems with sensors of the SGB family from IFM.				0	0x00	Automatic	The lowest cycle time supported by the device is taken from the table.
2550xFFAutomatic, compatibleCompatibility mode The mode solves possible communication problems with sensors of the SGB family from IFM.				16 191	0x10 0xBF	1.6 = 132,8 ms	Settable in steps of 0.8 or 1.6 ms.
				255	0xFF	Automatic, compatible	Compatibility mode The mode solves possible communication problems with sensors of the SGB family from IFM.

CoE index	CoE sub index	Parameter name	Value Dec.	Hex.	Meaning	Description				
0x80n0	0x24	Process Data Content is on well as the SIC	In Leng ly for ii O indic	gth nformat ator are	ion. Setting the bits h defined by the mode	has no effect. The process data length as ule selection $[\triangleright$ 72].				
		Bit 04			Process input data le	ength in bit or byte				
		Bit 5			Reserved					
		Bit 6	1	0x01	SIO indicator: channel is set to "DI'	" or "DI with parameter access"				
		Bit 7	0	0x00	Process input data le	ength in bit 04 is specified in bit				
			1	0x01	Process input data le	ength in bit 04 is specified in byte				
0x80n0	0x25	Process Data The content is as well as the	Out Le s only 1 SIO inc	ngth for infor dicator a	mation. Setting the b are defined by the mo	bits has no effect. The process data length odule selection [▶ 72].				
		Bit 04			Process output data	length in bit or byte				
		Bit 5			Reserved					
		Bit 6 SIO indicator: not relevant, device does not support DO function								
		Bit 7	0	0x00	Process output data length in bit 04 is specified in bit					
			1	0x01	Process output data	length in bit 04 is specified in byte				
0x80n0 0x28	Requirement: Parameter "Data storage mode" (index 0x80n8, sub index 0x02) has to be "0" to set para- meter "Master Control".									
		Bit 03	0	0x00	Channel inactive					
			1	0x01	DI	The functions of the IO-Link port are spe-				
			2	0x02	DO (not supported)	cified via predefined EtherCAT modules				
			3	0x03	IO-Link	-[▶ 72]				
			4	0x04	DI with parameter access	-				
		Bit 415	0	0x00	No data storage	Synchronization of parameter data deac- tivated. The data set in the master is de- leted. Data storage mode = deactivated, clear [▶ 122]				
			2	0x02	Data storage active	Synchronization of parameter data activ- ated. The actual data (master or device) serve as the reference data. Data storage mode = activated [> 119]				
			6	0x06	Data storage active, upload deactivated	Synchronization of parameter data activ- ated, the data in the master serve as ref- erence data. Data storage mode = overwrite [> 121]				



CoE index	CoE sub index	Parameter name	Value Dec.	Hex.	Meaning	Description
0x80n8	0x01	Mode Defines the IC	D-Link	port fur	nction	
			0	0x00	IO-Link without validation	Pin 4 is operated in IO-Link mode. The master does not check if the connec- ted device matches the configured one.
			1	0x01	IO-Link with family compatible device	Pin 4 is operated in IO-Link mode. The master checks if the Vendor ID and the MSB of the Device ID (this byte defines the product family) of the con- nected device match those of the con- figured one. If the master detects a mis- match, the IO-Link communication is es- tablished, but there is no process data ex- change. The device remains in the safe state (Pre-Operate). Parameters and diagnostic information can be read and respectively written.
			2	0x02	IO-Link with compatible device	Pin 4 is operated in IO-Link mode. The master checks if the Vendor ID and the Device ID of the connected device match those of the configured one. If the Vendor ID matches, but the Device ID not, then the master tries to write the Device ID to the device. If the writing is successful, then the device is a compat- ible one, process data exchange is pos- sible. If writing the Device ID is not suc- cessful, then process data exchange is not possible. The device remains in the safe state (Pre-Operate). Parameters and diagnostic information can be read and respectively written.
			3	0x03	IO-Link with identical device	Pin 4 is operated in IO-Link mode. The master checks if the device type (Vendor ID and Device ID) and the serial number of the connected device match the data of the configured one. If the master detects a mismatch, the IO-Link communication is established, but there is no process data exchange. The device remains in the safe state (Pre-Operate). Parameters and diagnostic information can be read and respectively written.

CoE index	CoE sub index	Parameter name	Value Dec.	Hex.	Meaning	Description	
0x80n8	0x02	Data storage Completes th sub index 0x2	mode e optio 28, bit •	ons for a 415).	data management in	the parameter "Master Control", (0x80n0,	
			0	0x00	Use Master Control setting	Data storage behavior of the "Master Control" parameter is applied	
020=0			1	0x01	Read in	Synchronization of parameter data activ- ated. The data in the connected IO-Link device serve as reference data. Data storage mode = read in [\triangleright 121] NOTE: By setting this bit, bits 415 in para- meter "Master Control" (index 0x80n0, sub index 0x28) are automatically forced and set to 2 = "data storage active".	
0x80n8	0x03	Activate Quic	k Start	-Up			
		For fast applic can be shorte tection Time)	cation: ned. T is redu	s (e.g. to he start uced.	ool changing applicat -up time defined in tl	ions) the start-up time of IO-Link devices he IO-Link specification (TSD = Device De-	
				0	0x00	Νο	The start-up time is within the specified range (0.5 s). All IO-Link devices in accordance with the specification can be operated.
			1	0x01	Yes	The start-up time is reduced to approx. 100 ms. It is not supported by every IO- Link device. It can thus be necessary to check if the used IO-Link device starts in this mode.	
0x80n8		PD invalid Process input	data i	nvalid			
	0x07		0	0x00	Diagnostics generated	If the process data are invalid, a respect- ive diagnostic message is generated.	
			1	0x01	No diagnostics generated	Invalid process data do not cause a dia- gnostic message.	
0x80n8	0x08	Deactivate dia	agnos	tics			
		Influences the the paramete not.	e send rizatio	ing of IC n, the m	D-Link-Events from th naster transmits Even	e master to the fieldbus. Depending on ts based on their priority to the fieldbus or	
			0	0x00	No	The master transmits all IO-Link Events to the fieldbus.	
			1	0x01	Notifications	The master transmits all IO-Link Events to the fieldbus except for IO-Link notifica-tions.	
			2	0x02	Notifications and warnings	The master transmits all IO-Link Events to the fieldbus except for IO-Link notifica- tions and warnings.	
			3	0x03	Yes	The master doesn't transmit any IO-Link Event to the fieldbus.	



CoE index	CoE sub index	Parameter name	Value Dec.	Hex.	Meaning	Description
0x80n8	0x9	Input data m	apping	J		
		Optimization ized data ma	of pro pping.	cess da	ta mapping: The IO-L	ink data can be rotated to achieve optim-
			0	0x00	Direct	The process data are not swapped. i.e.: 0x0123 4567 89AB CDEF
			1	0x01	Swap 16 bit	The bytes are swapped per word. i.e.: 0x2301 6745 AB89 EFCD
			2	0x02	Swap 32 bit	The bytes are swapped per double word. i.e.: 0x6745 2301 EFCD AB89
			3	0x03	Swap all	All bytes are swapped. i.e.: 0xEFCD AB89 6745 2301
	0x0A	Output data	mappi	ng		
		See "Input da	ita maj	oping"		
0x80B0		Configuration	n Data	VAUX c	ontrol	
	0x01	VAUX1 pin 1 X0 (Ch0/1)	0	0x00	24 VDC	The 24 VDC sensor/actuator supply at pin1 of the connector is switched on.
			1	0x01	Switchable	The 24 VDC sensor/actuator supply at pin1 of the respective connector is switchable via the process data.
			2	0x02	Off	The 24 VDC sensor/actuator supply at pin1 of the connector is switched off.
	0x08	VAUX1 pin 1 X1 (Ch2/3)	See V	AUX1 p	in 1 X0 (Ch0/1)	
	0x0F	VAUX1 pin 1 X2 (Ch4/5)				
	0x16	VAUX1 pin 1 X3 (Ch6/7)				
	0x1D	VAUX1 pin 1 X4 (Ch8)				
	0x24	VAUX1 pin 1 X5 (Ch10)				
	0x2B	VAUX1 pin 1 X6 (Ch12)				
	0x32	VAUX1 pin 1 X7 (Ch15)				
	0x55	VAUX2 pin 2 X4 (Ch9)	0	0x00	24 VDC	The Class B supply at pin 2 of the respect- ive connector is switched on.
			1	0x01	Switchable	The Class B supply at pin 2 of the respect- ive connector is switchable via the pro- cess data.
			2	0x02	Off	The Class B supply at pin 2 of the respect- ive connector is switched off.

Configuring and Parameterizing I/O channel parameters (Configuration Area, 0x8000...0x8FFF)

CoE index	CoE sub index	Parameter name	Value Dec. Hex.	Meaning	Description
	0x5C	VAUX2 pin 2 X5 (Ch11)	See VAUX2 p	oin 2 X4 (Ch9)	
	0x63	VAUX2 pin 2 X6 (Ch13)			
	0x6A	VAUX2 pin 2 X7 (Ch15)			

Values for the parameter "cycle time" in ms:

Time	Value	Time	Value	Time	Value	Time	Value	Time	Value	Time	Value
auto	0x00	16	0x58	31.2	0x7E	60.8	0x92	91.2	0xA5	121.6	0xB8
1.6	0x10	16.8	0x5A	32	0x80	62.4	0x93	92.8	0xA6	123.2	0xB9
2.4	0x18	17.6	0x5C	33.6	0x81	64	0x94	94.4	0xA7	124.8	0xBA
3.2	0x20	18.4	0x5E	35.2	0x82	65.6	0x95	96	0xA8	126.4	0xBB
4	0x28	19.2	0x60	36.8	0x83	67.1	0x96	97.6	0xA9	128	0xBC
4.8	0x30	20	0x62	38.4	0x84	68.8	0x97	99.2	0xAA	129.6	0xBD
5.6	0x38	20.8	0x67	40	0x85	70.4	0x98	100.8	0xAB	131.2	0xBE
6.4	0x40	21.6	0x66	41.6	0x86	72	0x99	102.4	0xAC	132.8	0xBF
7.2	0x42	22.4	0x68	43.2	0x87	73.6	0x9A	104	0xAD	Reserve	ed
8	0x44	23.2	0x6A	44.8	0x88	75.2	0x9B	105.6	0xAE		
8.8	0x46	24.0	0x6C	46.4	0x89	76.8	0x9C	107.2	0xAF		
9.6	0x48	24.8	0x6E	48	0x8A	78.4	0x9D	108.8	0xB0		
10.4	0x4A	25.6	0x70	49.6	0x8B	80	0x9E	110.4	0xB1		
11.2	0x4C	26.4	0x72	51.2	0x8C	81.6	0x9F	112	0xB2		
12.0	0x4E	27.2	0x74	52.8	0x8D	83.2	0xA0	113.6	0xB3		
12.8	0x50	28	0x76	54.4	0x8E	84.8	0xA1	115.2	0xB4		
13.6	0x52	28.8	0x78	56	0x8F	86.4	0xA2	116.8	0xB5		
14.4	0x54	29.6	0x7A	57.6	0x90	88	0xA3	118.4	0xB6		
15.2	1x56	30.4	0x7C	59.2	0x91	89.6	0xA4	120	0xB7	auto., comp.	0xFF



8.4.1 Adapting process data mapping

The mapping of process data can be adapted application-specifically via the IO-Link master's parameterization.

Depending on the used fieldbus, it can be necessary to swap process data word-wise, double word-wise or completely in order to align them to the data structure in the PLC. The process data mapping is determined channel by channel through the parameters **process input data mapping** and **process output data mapping**.

Mapping	g through the IO-Lin	k master $ ightarrow$ field bus	\rightarrow PLC			
Byte	Device at IO-Link-port	Device process dat IO-Link master	a in	Parameter: Process data mapping	Device process dat	a to fieldbus
Byte 0		Status/Control			Status/Control	
Byte 1						
IO-Link	port 1					
Byte 2	Temperature	Temperature	Low byte	Swap 16 bit	Temperature	High byte
Byte 3	sensor TS		High byte			Low byte
IO-Link	port 2					
Byte 4	Linearity sensor	Position	Low byte	Swap 16 bit	position	High byte
Byte 5	Li		High byte			Low byte
IO-Link	port 3					
Byte 6	I/O hub TBIL	Digital signals	07	Direct	Digital signal	07
Byte 7		Digital signals	815		Digital signal	815
IO-Link	port 4					
Byte 8		Diagnostics		swap all	Counter/position value	Most Significant Byte
Byte 9	Rotary encoder	Counter/position	Low byte			High byte
Byte 10	RI	value	High byte			Low byte
Byte 11			Most Significant Byte		Diagnostics	

Example mapping for field buses with Little Endian-format

9 Operating

9.1 Input area, TxPDOs, 0x6000...0x6FFF

CoE in- CoE Byte no. Bit no.										
dex	sub index		7	6	5	4	3	2	1	0
Inputs Ba	sic									
0x6000	0x08 0x01	0	DXP Ch7	DI Ch6 (SIO)	DXP Ch5	DI Ch4 (SIO)	DXP Ch3	DI Ch2 (SIO)	DXP Ch1	DI Ch0 (SIO)
	0x10 0x09	1	-	DI Ch14 (SIO)	-	DI Ch12 (SIO)	-	DI Ch10 (SIO)	-	DI Ch8 (SIO)
	0x18 0x11	2	-	DVS Ch6	-	DVS Ch4	-	DVS Ch2	-	DVS Ch0
	0x20 0x19	3	-	DVS Ch14	-	DVS Ch12	-	DVS Ch10	-	DVS Ch8
IO-Link p	rocess inpu	t data								
0x6010	0x01 0x20	031	IO-Link po structure	O-Link port 1, structure depends on the channel parameterization (032 byte per channel)						
0x6020	0x01 0x20	031	IO-Link po structure	D-Link port 2, tructure depends on the channel parameterization (032 byte per channel)						
0x6030	0x01 0x20	031	IO-Link po structure	O-Link port 3, structure depends on the channel parameterization (032 byte per channel)						
0x6040	0x01 0x20	031	IO-Link port 4, structure depends on the channel parameterization (032 byte per channel)							
0x6050	0x01 0x20	031	IO-Link port 5, structure depends on the channel parameterization (032 byte per channel)							
0x6060	0x01 0x20	031	IO-Link po structure	ort 6, depends o	on the chai	nnel paran	neterizatio	n (032 k	oyte per ch	annel)
0x6070	0x01 0x20	031	IO-Link po structure	ort 7, depends o	on the chai	nnel paran	neterizatio	n (032 b	oyte per ch	annel)
0x6080	0x01 0x20	031	IO-Link po structure	ort 8, depends o	on the chai	nnel paran	neterizatio	n (032 k	oyte per ch	annel)
Inputs Di	agnostics –	VAUX1/V	AUX2							
0x6090	0x08 0x01	0	VERR V1 X7 (Ch14)	VERR V1 X6 (Ch12)	VERR V1 X5 (Ch10)	VERR V1 X4 (Ch8)	VERR V1 X3 (Ch6/7)	VERR V1 X2 (Ch4/5)	VERR V1 X1 (Ch2/3)	VERR V1 X0 (Ch0/1)
	0x10 0x09	1	VERR V2 X7 (Ch15)	VERR V2 X6 (Ch13)	VERR V2 X5 (Ch11)	VERR V2 X4 (Ch9)	-	-	-	-
Inputs Di	agnostics –	DXP chan	nels							
0x6090	0x18 0x11	2	ERR DXP Ch7	-	ERR DXP Ch5	-	ERR DXP Ch3	-	ERR DXP Ch1	-
	0x20 0x19	3	-	-	-	-	-	-	-	-



CoE in-	CoE	Byte no.	Bit no.	no.									
dex	sub index		7	6	5	4	3	2	1	0			
Inputs Di	agnostics –	IO-Link po	orts										
0x6090	IO-Link por	t 1 (Ch 0)	1	Υ.	1	1	1	1	1	1			
	0x28 0x21	4	EVT2	EVT1	PDINV	HWERR	DSERR	CFGERR	PPE	-			
	0x30 0x29	5	GENERR	OVL	VHIGH	VLOW	ULVE	LLVU	ΟΤΜΡ	PRMERR			
	IO-Link por	t 2 (Ch 2)			·								
	0x38 0x31	6	Assignme	ent similar	to port 1 (Ch 0)							
	0x40 0x39	7											
	IO-Link por	t 3 (Ch 4)											
	0x48 0x41	8	Assignme	ssignment similar to port 1 (Ch 0)									
	0x50 0x49	9											
	IO-Link por	O-Link port 4 (Ch 6)											
	0x58 0x51	10	Assignme	Assignment similar to port 1 (Ch 0)									
	0x60 0x59	11											
	IO-Link por	IO-Link port 5 (Ch 8)											
	0x68 0x61	12	Assignme	ent similar	to port 1 (Ch 0)							
	0x70 0x69	13											
	IO-Link por	t 6 (Ch 10)										
	0x78 0x71	14	Assignme	ent similar	to port 1 (Ch 0)							
	0x80 0x79	15											
	IO-Link por	t 7 (Ch 12)										
	0x88 0x81	16	Assignme	ent similar	to port 1 (Ch 0)							
	0x90 0x89	17											
IO-Link port 8 (Ch 14)													
	0x98 0x91	18	Assignme	ent similar	to port 1 (Ch 0)							
	0xA0 0x99	19											

CoE in-	СоЕ	Byte no.	Bit no.	Bit no.								
dex	sub index		7	6	5	4	3	2	1	0		
Inputs IO	-Link Events	5										
0x60A0	0x01	0	Qualifier (Qualifier (1st Event)								
	0x02	1	Port (1st E	ort (1st Event)								
	0x03	2	Event cod	vent code LSB (1st Event)								
		3	Event cod	le MSB (1st	t Event)							
	0x2E	60	Qualifier (16th Event)									
	0x2F	61	Port 16th	Port 16th Event)								
	0x30 62 Event code LSB (16th Event)											
		63	Event cod	le MSB (16	th Event)							
Inputs De	evice Status	/Control										
0x60C0	0x08 0x01	0	-	-	-	-	-	-	ARGEE	-		
	0x10 0x09	1	-	FCE	-	-	-	-	-	-		
	0x18 0x11	2	V2	-	-	-	-	-	-	DIAG		
	0x20 0x19	3	-	-	-	-	-	-	V1	-		



Meaning of the process data bits

CoE index	CoE sub index	Name	Value	Meaning
I/O data				
0x6000	DI input IOL	– DI Ch (SIC))	
	0x01	DI Ch0 (SIO)	Digital input	
			0	No signal at DI (pin 4, SIO)
			1	Signal at DI (pin 4, SIO)
	0x03	DI Ch2 (SIO)	See DI0 (SIO)	
	0x05	DI Ch4 (SIO)	-	
	0x07	DI Ch6 (SIO)	-	
	0x09	DI Ch8 (SIO)	-	
	0x0B	DI Ch10 (SIO)	-	
	0x0D	DI Ch12 (SIO)	-	
	0x0F	DI Ch14 (SIO)	-	
	DXP input va	alue – DXP Ch	•••	
	0x02	DXP Ch1	Configurable	digital channel (DXP channel)
			0	No input signal at DXP channel (pin 2)
			1	Input signal at DXP channel (pin 2)
	0x04	DXP Ch3	See DXP1	
	0x06	DXP Ch5		
	0x08	DXP Ch7		
	Input values	valid (DVS Ch	n)	
	0x11	DVS Ch0	Input value v	alid (Data Valid Signal)
			0	The IO-Link data are invalid.
				Possible causes:
				Sensor supply is below the admissible range. The IO-I ink port is parameterized as simple digital input
				 No device connected to the master.
				No input data received from the connected device (only
				valid for devices with an input data length $>$ 0).
				No reaction from the connected device to the sending of autout data (and unified for device autout data)
				Solution output data (only valid for devices with an output data length > 0)
				 The connected device sends an process input data invalid error.
			1	The IO-Link data are valid.
	0x13	DVS Ch2	See DVS Ch0	
	0x15	DVS Ch4	_	
	0x17	DVS Ch6	_	
	0x19	DVS Ch8	_	
	0x1B	DVS Ch10	_	
	0x1D	DVS Ch12	_	
	0x1F	DVS Ch14		

CoE index	CoE sub index	Name	Value	Meaning
0x6010 0x6080	Inputs IO-Lii	nk port	Process inpu cess input da	t data of the connected device The order of the IO-Link pro- ita can be changed via the parameter Input data mapping .
0x6090	Inputs Diag	nostics	[▶ 99]	
0x60A0	Inputs IO-Li	nk Events		
0x60C0	Inputs Devic Control	ce Status/	[▶ 96]	



CoE CoE Byte no. Bit no.										
index	sub index		7	6	5	4	3	2	1	0
Outputs Ba	sic	1	L	L	1		1	1		1
0x7000	0x08 0x01	0	DXP Ch7	DD Ch6	DXP Ch5	DD Ch4	DXP Ch3	DD Ch2	DXP Ch1	DD Ch0
	0x10 0x09	1	-	DD Ch14	-	DD Ch12	-	DD Ch10	-	DD Ch8
Outputs IO	-Link port		-							•
0x7010	0x01 0x20	031	IO-Link po structure	D-Link port 1, tructure depends on the channel parameterization (032 byte per channel)						
0x7020	0x01 0x20	031	IO-Link po structure							
0x7030	0x01 0x20	031	IO-Link po structure	D-Link port 3, tructure depends on the channel parameterization (032 byte per channel)						
0x7040	0x01 0x20	031	IO-Link po structure	O-Link port 4, structure depends on the channel parameterization (032 byte per channel)						
0x7050	0x01 0x20	031	IO-Link po structure	IO-Link port 5, structure depends on the channel parameterization (0…32 byte per channel)						
0x7060	0x01 0x20	031	IO-Link po structure	ort 6, depends c	on the chai	nnel paran	neterizatio	n (032 b	yte per ch	annel)
0x7070	0x01 0x20	031	IO-Link po structure	ort 7, depends c	on the chai	nnel paran	neterizatio	n (032 b	yte per ch	annel)
0x7080	0x01 0x20	031	IO-Link po structure	ort 8, depends c	on the chai	nnel paran	neterizatio	n (032 b	yte per ch	annel)
Outputs VA	AUX contro	ol – VAUX1	I/VAUX2							
0x70B0	0x08 0x01	0	VAUX1 pin1 X7 (Ch14)	VAUX1 pin1 X6 (Ch12)	VAUX1 pin1 X5 (Ch10)	VAUX1 pin1 X4 (Ch8)	VAUX1 pin1 X3 (Ch6/7)	VAUX1 pin1 X2 (Ch4/5)	VAUX1 pin1 X1 (Ch2/3)	VAUX1 pin1 X0 (Ch0/1)
	0x10 0x09	1	VAUX2 pin2 X7 (Ch15)	VAUX2 pin2 X6 (Ch13)	VAUX2 pin2 X5 (Ch11)	VAUX2 pin2 X4 (Ch9)	-	-	-	-
Outputs De	evice Statu	s/Control								
0x70C0	0x08 0x01	0	-	-	-	-	-	-	-	WINK
	0x10 0x09	1	-	-	-	-	-	-	-	-

9.2 Output area, RxPDOs, 0x7000...0x7FFF

CoE index	CoE sub index	Name	Value	Meaning
Outputs Bas	sic			
	DXP Ch			
0x7000	0x01	DXP Ch1	DXP Output	value
			0	Output inactive
			1	Output active, max. output current 2 A
	0x03	DXP Ch3	See DXP1	
	0x05	DXP Ch5	_	
	0x07	DXP Ch7		
	DD Ch		Deactivate o	liagnostics
	0x02	DD Ch0	0	Diagnostic messages are sent depending on the setting of parameter "Deactivate diagnostics" [> 82].
			1	All diagnostic and alarm messages are suppressed. Possible use case: Selective deactivation and activation of the diagnostic messages via the process data in the PLC pro- gram. In the case of tool change applications, no diagnostics are sent that would otherwise lead to system downtimes.
	0x04	DD Ch2	See DD Ch0	
	0x06	DD Ch4	_	
	0x08	DD Ch6	_	
	0x09	DD Ch8	_	
	0x0B	DD Ch10	_	
	0x0D	DD Ch12	_	
	0x0F	DD Ch14		
Outputs VA	UX Control			
	VAUX1 pin1			
0x70B0	0x01	VAUX1 pin1 X0 (Ch0/1)	0	The 24 VDC sensor/actuator supply at pin1 of the connector is switched off.
			1	The 24 VDC sensor/actuator supply at pin 1 of the connector is switched on.
	0x02	VAUX1 pin1 X1 (Ch2/3)	See VAUX1 p	bin1 X0 (Ch0/1)
	0x03	VAUX1 pin1 X2 (Ch4/5)		
	0x04	VAUX1 pin1 X3 (Ch6/7)	-	
	0x05	VAUX1 pin1 X4 (Ch8)	_	
	0x06	VAUX1 pin1 X5 (Ch10)	_	
	0x07	VAUX1 pin1 X6 (Ch12)	_	
	0x08	VAUX1 pin1 X7 (Ch14)		

Meaning of the process data bits



CoE index	CoE sub index	Name	Value	Meaning
	VAUX2 pin2	2 – Class-B sup	ply	
0x70B0	0x0D	VAUX2 pin2	0	The Class B supply at pin2 of the connector is switched off.
		X4 (Ch9)	0x0F	The Class B supply at pin2 of the connector is switched on.
	0x0E	VAUX2 pin2 X5 (Ch11)	See VAUX2 p	in2 X4 (Ch9)
	0x0F	VAUX2 pin2 X6 (Ch13)	_	
	0x10	VAUX2 pin2 X7 (Ch15)	-	
	Outputs Dev Control	vice Status/		
0x70C0	0x01	WINK	Activate the	WINK command

9.3 LED displays

The device has the following LED displays:

- Supply voltage (PWR)
- Status messages (STAT), according to EtherCAT specification
- Device specific messages (INFO)
- Localization (WINK)

PWR LED	Meaning
Off	No voltage or undervoltage at V1
Green	Voltage at V1 and V2 ok
Green flashing	No voltage or undervoltage at V2 (depending on configuration of the
Red	"LED behavior (PWR) on V2 undervoltage" parameter)

LED STAT	Meaning
Green off	Status Init
Green flashing	Status Pre Operational
Green flashing 1 \times	Status Safe Operational
Green	Status Operational
Green flickering	Status Bootstrap
Red off	No error
Red flashing 1 \times	Local error, Synchronization error, device changes from status Opera- tional to status Pre Operational
Red flashing 2 \times	Time out watchdog process data or time out watchdog EtherCAT
Red flashing	Invalid configuration

LED INFO	Meaning
Off	No voltage connected
Red	Diagnostic message available
Green	No diagnostics
Orange	Firmware update running (see "Maintenance")

LED WINKMeaningWhite flashingWink command active

The Ethernet ports XF1 AND XF2 each have an LED L/A.

LED L/A	Meaning
Off	No EtherCAT connection
Green	EtherCAT connection established
Green flashing	Data transfer



LED IOL 0, 2, 4, 6, 8, 10, 12, 14	Meaning (Channel in IO-Link-mode)								
(IO-Link port 18)									
Off	Port inactive, no IO-Link communication, diagnostics deactivated								
Green flashing	IO-Link communication, process da	ta valid							
Red flashing	IO-Link communication active and	module error, invalid process data							
Red	IO-Link supply error free, no IO-Link communication and/ or module error, process data invalid								
LED IOL	Meaning (channel in SIO mode (DI))								
0, 2, 4, 6, 8, 10, 12, 14									
(IO-Link port 18)									
Off	No input signal								
Green	Digital input signal active								
LED IOL 9, 11, 13, 15	Meaning								
(IO-Link Class B ports 58)									
Off	VAUX2 at Pin 2 inactive								
Green	VAUX2 at Pin 2 active								
Red	VAUX2 at Pin 2 active, overload/sho	ort-circuit at VAUX2							
Red flashing	Overcurrent supply VAUX1								
LED DXP 1, 3, 5, 7	Meaning (input)	Meaning (output)							
Off	Input not active	Output not active							
Green	Input active	Output active (max. 2 A)							
Red	-	Output active with overload/short circuit							
Red flashing	Overcurrent supply VAUX1								

9.4 Device area – Device Status (0xF100, 0xF108)

IO-Link Device Status (0xF100)

0xF100 is mapped into the device process data.

СоЕ	CoE	Byte no.	Bit								
index	sub index		7	6	5	4	3	2	1	0	
0xF100	0x02	0	Error co	Error code IOL1 Error code IOL2				IO-Link status IOL1			
	0x03	1	Error co					IO-Link status IOL2			
	0x09	7	Error code IOL8				IO-Link status IOL8				

Error codes (according to ETG 5001.6220)

Error codes	Meaning	Description
0	No Error	
1	Watchdog Error	Not supported
2	Buffer Overflow	Not supported
3	Invalid Device ID	The device ID of the connected IO-Link device does not match the one expected by the mas- ter. The check is only done for an operating mode with validation [> 75].
4	Invalid Vendor ID	The vendor ID of the connected IO-Link device does not match the one expected by the mas- ter. The check is only done for an operating mode with validation [▶ 75].
5	Invalid IO-Link Revision	The IO-Link revision of the connected device does not match the parameterization of the IO- Link port.
6	Invalid Frame Capability	Not supported
7	Invalid Cycle Time	Invalid cycle time The cycle time set on the master is not suppor- ted by the connected IO-Link device or is too high.
8	Invalid Length process data In	Not supported
9	Invalid Length process data Out	Not supported
10	No device detected	No IO-Link Device connected
11	Error Pre-Op	Not supported



IO-Link status codes (acc. to ETG 5001.6220)

Status	Meaning	Description
0	Port Inactive	Port unused, no module plugged in the config- uration software
1	SIO mode Digital In	Port configured as DI and in SIO mode
2	SIO mode Digital Out	Not supported
3	Communication OP	Port configured as IO-Link port, IO-Link device connected, IO-Link communication running
4	Communication STOP	Port configured as IO-Link port, IO-Link device connected, no IO-Link communication The cause is specified more precisely via the er- ror code.

Device Status (0xF108)

Device Status can be accessed via the process data if the module "Device Status/Control" is plugged.

	CoE in-	СоЕ	Byte no.	Bit								
dex	sub index		7	6	5	4	3	2	1	0		
	0xF108	0x080x01	0	-	-	-	-	-	-	ARGEE	-	
		0x100x09	1	-	FCE	-	-	-	-	-	-	
	0xF110	0x080x01	0	V2	-	-	-	-	-	-	DIAG	
		0x100x09	1	-	-	-	-	-	-	V1	-	

Meaning of the Device Status bits

CoE index	CoE sub index	Designa- tion	Meaning
0xF108	0x02	ARGEE	ARGEE project active (currently not supported)
	0x0F	FCE	Force Mode active
0xF110	0x01	DIAG	Module diagnostics available
	0x08	V2	Undervoltage at supply voltage V2 (undervoltage detec- tion at 20.419.2 VDC)
	0x0A	V1	Undervoltage at supply voltage V1 (undervoltage detec- tion at 20.419.2 VDC), DXP channels turn off



9.5 Diagnosis data, 0xA000...0xAFFF

The device provides the following software diagnostic messages:

- V1/V2 overcurrent diagnostics
 - Overcurrent diagnostics for the sensor-/ actuator supply VAUX1 and the Class B supply VAUX2
- IO-Link master diagnostics
 - The IO-Link-master reports problems within the IO-Link communication.
- IO-Link device diagnostics

The device diagnostics map the IO-Link Event Codes (according to the IO-Link specification) sent from the IO-Link devices to the diagnostic telegram of the master.

Event Codes can be read from the connected devices by using appropriate device tools (e.g. IODD-Interpreter).

Further information concerning the IO-Link Event Codes and their meaning can be found in the IO-Link specification or in the documentation of the connected devices.

9.5.1 Diagnostic telegram

CoE index	CoE sub index	Byte no.	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Configur	ation Data	Basic		1	1	1	1	1	1	1
					V1/	V2 overcu	rrent diag	nostics		
0xA000	0x08	0	VERR V1	VERR V1	VERR V1	VERR V1	VERR V1	VERR V1	VERR V1	VERR V1
	0x01		X7 Ch14	X6 Ch12	X5 Ch10	X4 Ch8	X3 Ch6/7	X2 Ch4/5	X1 Ch2/3	X0 Ch0/1
	0x10	1	VERR V2	VERR V2	VERR V2	VERR V2	-	-	-	-
	0x09		X7 Ch15	X6 Ch13	X5 Ch11	X4 Ch9				
					1	DXP di	agnostics		,	
	0x18 0x11	2	ERR DXP Ch7	-	ERR DXP Ch5	-	ERR DXP Ch3	-	ERR DXP Ch1	-
	0x20 0x19	3	-	-	-	-	-	-	-	-
Diagnosi	s Data IO-I	_ink port 1		1	1	1	1			1
						Lost	Frames			
0xA010	0x01	0	reserved							
	0x02	1	Lost fram	es IO-Link	port 1					
					IO-Lir	k device/	master dia	gnostics		
0xA018			Device di	agnostics			Master di	agnostics		
	0x08 0x01	0	EVT2	EVT1	PD INV	HW ERR	DSERR	CFG ERR	PPE	-
	0x10 0x09	1	GEN ERR	OVL	V HIGH	V LOW	ULVE	LLVU	OTEMP	PRM ERR
Diagnosi	s Data IO-I	_ ink port 2	2	1	1	1	1	1	1	1
0xA020	0x08 0x01	0	Assignme	ent similar	to IO-Link	port 1 (0x/	A010)			
0xA028	0x10 0x09	1	Assignme	ent similar	to IO-Link	port 1 (0x/	A018)			
Diagnosi	s Data IO-I	_ ink port 3	3							
0xA030	0x08 0x01	0	Assignme	ent similar	to IO-Link	port 1 (0x/	A010)			
0xA038	0x10 0x09	1	Assignme	ent similar	to IO-Link	port 1 (0x/	A018)			
Diagnosi	s Data IO-I	_ink port 4	ŀ							
0xA040	0x08 0x01	0	Assignme	ent similar	to IO-Link	port 1 (0x/	A010)			
0xA048	0x10 0x09	1	Assignme	ent similar	to IO-Link	port 1 (0x/	A018)			
Diagnosi	s Data IO-I	_ ink port 5	5							
0xA050	0x08 0x01	0	Assignme	ent similar	to IO-Link	port 1 (0x/	A010)			
A058	0x10 0x09	1	Assignme	ent similar	to IO-Link	port 1 (0x/	A018)			



CoE index	CoE sub index	Byte no.	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0			
Diagnosis Data IO-Link port 6													
0xA060	0x08 0x01	0	Assignme	signment similar to IO-Link port 1 (0xA010)									
0xA068	0x10 0x09	1	Assignme	ssignment similar to IO-Link port 1 (0xA018)									
Diagnosis	s Data IO-l	ink port 7-	,										
0xA070	0x08 0x01	0	Assignme	nt similar	to IO-Link	port 1 (0xA	A010)						
0xA078	0x10 0x09	1	Assignme	Assignment similar to IO-Link port 1 (0xA018)									
Diagnosis	s Data IO-I	ink port 8	8										
0xA080	0x08 0x01	0	Assignme	ssignment similar to IO-Link port 1 (0xA010)									
0xA088	0x10 0x09	1	Assignme	ssignment similar to IO-Link port 1 (0xA018)									



NOTE A "process data invalid" diagnostic (PD_INV) can be sent from both devices, IO-Link master or IO-Link device.

Meaning of Diagnostic Bits

CoE index	CoE sub index	Bit	Meaning			
Diagnosis D)ata Basic – V1	/V2 overcur	rent and DXP diagnostics			
0xA000	0x01	VERR V1 X0 (Ch0/1)	Overcurrent VAUX1 (pin1) at connector/channel group			
	0x02	VERR V1 X1 (Ch2/3)	-			
	0x03	VERR V1 X2 (Ch4/5)	-			
	0x04	VERR V1 X3 (Ch6/7)	-			
	0x05	VERR V1 X4 (Ch8)	Overcurrent VAUX1 (pin 1) at connector/channel			
	0x06	VERR V1 X5 (Ch10)				
	0x07	VERR V1 X6 (Ch12)	-			
	0x08	VERR V1 X7 (Ch14)	-			
	0x0D	VERR V2 X4 (Ch9)	Overcurrent VAUX2 (pin 2) at connector/channel			
	0x0E	VERR V2 X5 (Ch11)	-			
	0c0F	VERR V2 X6 (Ch13)	-			
	0x10	VERR V2 X7 (Ch15)	-			
	0x12	ERR_ DXP Ch1	Overcurrent at output (DXP channel used as output)			
	0x14	ERR_ DXP Ch3				
	0x16	ERR_ DXP Ch5				
	0x18	ERR_ DXP Ch7				
Diagnosis D	ata IO-Link po	ort – Lost Fra	ames			
0xA010 0xA080	0x02	Lost frames IO-Link port x	Counter for lost or faulty IO-Link frames			
Diagnosis D	ata IO-Link Po	ort – IO-Link	port diagnostics			
0xA028 0xA088	0x02	PPE	 Port parameterization The port parameters are inconsistent. Possible causes: The IO-Link-master did not receive parameters for a connected device. Vendor or Device ID are "0". The connected device can not be identified and is thus not parameterizable. 			



CoE index	CoE sub index	Bit	Meaning				
	0x03	CFGER	Wrong or missing device The connected device does not match the channel configuration or there is no device connected to the channel. This diagnostic message depends on the parameterization of the channel.				
	0x04	DSER	 Data storage error Possible causes: Data storage mismatch: IO-Link device in accordance with IO-Link V1.0 connected. Mathematical The data storage buffer contains data of another device. Overflow of the data storage buffer Parameter access for data storage not possible The connected device may be locked for parameter changes or for data storage. 				
	0x05	HWER	Hardware error General hardware error or device malfunction.				
	0x06	PDINV	 Process input data invalid The IO-Link master or the IO-Link device report invalid process input data. The connected device is not in status "operate", which means, it is not ready for operation. Possible cause: The connected device does not match the configured one, additional diagnostic message Wrong or missing device. Diagnostic message Process input data invalid because the process value can not be measured (depends on the IO-Link device) 				
	0x07	EVT1	 Maintenance events A Maintenance Event in accordance with the IO-Link specification occurred, maintenance necessary. Causes: The master has received an event of type "Notification" from the device. or The master has read the value 1 from the device status (index 36) of the connected IO-Link device. 	Note: The IO-Link master reads index 36 every 20 s. Pre- requisite: the connected device supports index 36. An event of type "Notifica- tion" (single shot) is present for 60 s in the dia- gnostic data (EVT1) of the master. The reception of the diagnostic messages can be filtered via the "Disable diagnostics" parameter. The slot "IO-Link Events" in the process data (CoE index 0x60A0 [▶ 86]) shows the Event Code. The meaning of the event code depends on the IO- Link device.			
	0x08	EVT2	 Out-of-specification events An Out-of-Specification Event in accordance with the IO-Link specification occurred. Causes: The master has received an event of type "Warning" from the device. or The master has read the value 2 from the device status (index 36) of the connected IO-Link device. 				
	0x09	PRMERR	Parameterization error The connected device reports a parameterizatio no parameter initialization, etc.).	n error (loss of parameters,			
	0x0A	OTMP	Over temperature A temperature diagnosis is available on the com	nected device.			

CoE index	CoE sub index	Bit	Meaning
	0x0B	LLVU	Lower limit value underrun The process value has fallen below the parameterized measurement range or the measurement range has been chosen too high.
	0x0C ULVE Upper limit value exceeded The process value exceeds the parameterize measurement range has been chosen too lo		Upper limit value exceeded The process value exceeds the parameterized measurement range or the measurement range has been chosen too low.
	0x0D	VLOW	Undervoltage One of the voltages at the connected device is below the defined range.
	0x0E	VHIGH	Overvoltage One of the voltages at the connected device exceeds the defined range.
	0x0F	OVL	Overload The connected device detected an overload.
	0x10	GENERR	Common error The device sends an error (device status 4, in accordance with IO-Link spe- cification), which is not clearly specified. Read out the device event codes in order to be able to specify the error more precisely.



9.6 Diag History Object (0x10F3)

The Diag History Object (0x10F3) is implemented according to ETG.1020. The maximum number of diagnostic messages is 50.

Sub index	Name	Data type	Access	PDO mapping	Description
0x01	Maximum messages	UNSIGNED8	R	No	Read Number of diagnostic messages that can be stored in the diagnostic history (see from sub index 6).
0x02	Newest message	UNSIGNED8	RO	No	Sub index of the latest diagnostic message (6255), standard value = 0
0x03	Newest acknowledged message	UNSIGNED8	RW	No	 Overwrite Mode (sub index 5, bit 4 = 0) Read = 0: The slave sets sub index 3 to 0 when messages in the message queue are overwritten. Writing = 0: (support optional) Slave deletes all messages, i.e. resets sub index 2, 3, 4 and bit 5 in sub index 5. Writing = 15: Slave returns an SDO abort with codes 0x06090030 (value range of parameter exceeded) or 0x06090032 (value of written parameter too low). Writing = 655] sub index 3 = written value without check Writing > 55255: SDO abort with codes 0x06090030 or 0x06090031 (value of written parameter too high) Acknowledge Mode (sub index 5, bit 4 = 1) Read = 0: No messages acknowledged Read <> 0: Sub index of the latest acknowledged diagnostic message (6255) Writing = 15: Slave returns an SDO abort with codes 0x06090030 (value range of parameter exceeded) or 0x06090032 (value of written parameter too low) Writing = 0: (support optional) All acknowledged messages are deleted Writing = 15: Slave returns an SDO abort with codes 0x06090032 (value of written parameter too low) Writing = 5: Slave returns an SDO abort with codes 0x06090032 (value of written parameter too low) Writing = 655: Messages are acknowledged Writing = 5:255: SDO abort with codes 0x06090032 (value of written parameter too low)

The default values are written in **bold**.

Sub	Name	Data	Access	PDO mapping	Description
0x04	New messages available	BOOLEAN	RO	TxPDO	Overwrite Mode 0: latest message was read 1: latest message was not read Acknowledge Mode
					 0: no unacknowledged message 1: diagnostic messages are present and can be ac- knowledged
0x05	Flags	UNSIGNED16	RW	No	Flag for controlling the sending and saving of diagnostic messages.
					 Bit 0: Enable sending of emergencies, see "Sending emergencies". - 0: disabled - 1: New diagnostic messages are sent as emergencies
					 Bit 1: Disable info messages - 0: Info messages are stored in the diagnostic buffer. - 1: Info messages are not stored in the dia-
					 gnostic buffer. Bit 2: Deactivate warning messages 0: Warning messages are stored in the diagnostic buffer. 1: Warning messages are not stored in the diagnostic buffer.
					 Bit 3: Deactivate error messages 0: Error messages are stored in the diagnostic buffer (default setting) 1: Error messages are not stored in the diagnostic buffer.
					 Bit 4: Mode for handling the diagnostic history 0: Overwrite mode: old messages are overwritten by new ones when the buffer is full. 1: Acknowledge mode: new messages overwrite only messages that were previously acknowledged.
					 Bit 5: Overwrite/discard information in Overwrite mode: unacknowledged messages have been overwritten (=buffer overflow) (sub index 3 is also set to 0) 1: in Acknowledge mode: Message buffer full of unacknowledged messages, a new message is discarded.
0x06	Diagnosis message	OCTET- STRING	RO	No	Diagnosis message buffer Depending on sub index 1 the EtherCAT slave can store up to 50 diagnosis messages; the first message is stored in sub index 6, the second in sub index 7 and so on. When the buffer is full, the EtherCAT slave overwrites sub index 6 and so on. Thus always the latest maximum messages (in subindex 1) are made accessible for the EtherCAT master.



Parameters	Data type	Description				
Diag Code	UNSIGNED32	Diagnosis code to identify the diagnosis message				
		Bit 015	0x00000xDFFF	Reserved		
			0xE0000xE7FF	Bit 1631: can be used manufacturer specific		
			0xE800	Bit 1631: Emergency Error Code as defined in DS301 or DS4xxx		
			0xE8010xEDFF	Reserved		
			0xEE000xEFFF	Bit 1631: profile specific		
			0xF0000xFFFF	Reserved		
Flags	UNSIGNED16	Bit 03		Diag type:		
				00 = no message		
				01 = warning message		
				10 = error message		
Text ID	UNSIGNED16	Text ID as reference to Diagnosis text as defined in the ESI file				
		0		No text ID		
		165535		Text ID, vendor specific text ID [> 108]		
Time Stamp	UNSIGNED64	Time stamp in r	ns			
		0		No time stamp		
		≠ 0		Time stamp		

Diagnostic message (beginning with sub index 6)

Text IDs

Text ID	Meaning				
0x100x21	State change request from x to y				
0x11	Sync Manager x invalid address (y)				
0x12	Sync Manager x invalid Size (y)				
0x13	Sync Manager x invalid settings (y)				
0x0F	Calculate bus cycle time failed (Local timer too slow)				
0x20	DC activation register is invalid				
0x21	Configured SyncType (0x1C32.1 or 0x1C33.1) not supported. Check DC registers and supported SyncTypes (0x1C32.4 and 0x1C33.4)				
Vendor specific text ID	s				
Meaning of the text lds,	see Diagnosis Data, 0xA000…0xAFFF [▶ 99].				
Bit $15 = 0$: Appear, exan Bit $15 = 8$: Diappear, exa	nple: 0x 0 101				
0x = 101	Overcurrent output Chx				
0x 102					
0x 103					
0x 104	Overload				
0x 105	Overtemperature Chx				
0x106	Wrong or missing device Chx				
0x107	Upper limit value exceeded Chx				
0x108	Lower limit value underrun Chx				
0x109	Common error Chx				
0x110	Parameterization error Chx				
0x115	Hardware error Chx				
0x2D0	Overcurrent VAUX1 pin1 X0 (Ch0/1)				
0x2D1	Overcurrent VAUX1 pin1 X1 (Ch2/3)				
0x2D2	Overcurrent VAUX1 pin1 X2 (Ch4/5)				
0x2D3	Overcurrent VAUX1 pin1 X3 (Ch6/7)				
0x2E8	Overcurrent VAUX1 pin1 X4 (Ch8)				
0x2EA	Overcurrent VAUX1 pin1 X5 (Ch10)				
0x2EC	Overcurrent VAUX1 pin1 X6 (Ch12)				
0x2EE	Overcurrent VAUX1 pin1 X7 (Ch14)				
0x2F9	Overcurrent VAUX2 pin2 X4 (Ch9)				
0x2FB	Overcurrent VAUX2 pin2 X5 (Ch11)				
0x2FD	Overcurrent VAUX2 pin2 X6 (Ch13)				
0x2FF	Overcurrent VAUX2 pin2 X7 (Ch15)				
0x760	Port parameterization error				
0x761	Data storage error				
0x762	Process input data invalid				
0x763	Maintenance events				
0x764	Out of spec. error				


9.7 CANopen Emergencies

CAN Header	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x080+	Error code	•	Error Vendor specific d					
Node ID			register	Channel n	umber	Text ID, see [▶ 108]		
Error code		Error register						
0x3100 0x04 (Mains voltage) (volt		0x04 (voltage)	0x04 (voltage)			V1 undervoltage		
0x3300 (Output voltage)			_			V2 undervoltage		
0xFF00			0x81			Force Mode active		
(Vendor specific)			(generic, vendor specific)			Module diagnostics available		
					ARGEE project active (currently not supported)			
					I/O Diagnostic message avail- able			

9.8 IO-Link port – Information Area, 0x9000...0x9FF

The object area contains all data of the connected IO-Link devices. The contents of the sub indices correspond to those of the parameter objects of the IO-Link channels (0x8010...0x8090), see Parameters [▶ 75]

CoE in- dex	CoE sub index	Byte n	0.	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Information Data IO-Link port – Port 1											
0x9010	0x04	4	0 Device ID LSB								
		7	3	Device ID	MSB						
	0x05	8	4	Vendor ID) LSB						
		11	7	Vendor ID	MSB						
	0x20	12	8	IO-Link Re	evision						
	0x21	13	9	Reserved							
	0x22	14	10	Cycle time	e						
	0x23	15	11	Reserved							
	0x24	16	12	Process D	ata In Leng	gth					
	0x25	17	13	Process D	ata Out Le	ngth					
	0x28	18	14	Reserved							
	0x27	23	19								
Informati	ion Data IC	D-Link	port –	Port 2							
0x9020	0x04 0x28	40 58	0 19	Assignme	ent similar	to IO-Link	port 1 (0x9	9010)			
Informati	on Data IC	D-Link	port –	Port 3							
0x9030	0x04 0x28	75 93	0 19	Assignme	ent similar i	to IO-Link	port 1 (0x9	9010)			
Informati	ion Data IC	D-Link	port –	Port 4							
0x9040	0x04 0x28	110 128	0 19	Assignme	ent similar	to IO-Link	port 1 (0x9	9010)			
Informati	ion Data IC	D-Link	port –	Port 5							
0x9050	0x04 0x28	145 163	0 19	Assignme	ent similar i	to IO-Link	port 1 (0x9	9010)			
Informati	on Data IC	D-Link	port –	Port 6							
0x9060	0x04 0x28	180 198	0 19	Assignme	ent similar	to IO-Link	port 1 (0x9	9010)			
Informati	ion Data IC	D-Link	port –	Port 7							
0x9070	0x04 0x28	215 233	0 19	Assignme	ent similar	to IO-Link	port 1 (0x9	9010)			
Informati	ion Data IC) D-Link	port –	Port 8							
0x9090	0x04 0x28	250 268	0 19	Assignme	ent similar	to IO-Link	port 1 (0x9	9010)			



9.9 Acyclic access to connected IO-Link devices via CoE

Access via CoE is done via object dictionary indices in the manufacturer specific area (0x40n0). A complete access to index 0x40n0 enables an IO-Link CALL via a single SDO transfer.

Index	Name	Data type	Access	Alignment (byte offset)	Comment
0x40n0:00	Number of Entries	USINT8	RO	0	Full access for the complete index
0x40n0:01	Control	USINT	RW	2	Initiates the IOL call after the element is written.2: Write operation3: Read operation
0x40n0:02	Status	USINT	RW	3	Contains the status of the IO-Link call: 0: OK/ operation completed 1: Busy 2: Error
0x40n0:03	Index	UINT	RW	4	Index of the device entry from the IO-Link device at the IO-Link port
0x40n0:04	Sub index	USINT	RW	6	Sub index of the device entry from the IO-Link device at the IO- Link port
0x40n0:05	Data length	USINT	RW	7	Data length to be read or written in bytes Read operation: The actual length of the data ac- cording to the ISDU index of the connected IO-Link device is re- turned. The exact length of the data can be taken from the device documentation.
0x40n0:06	Data	ARRAY [0231] OF BYTE	RW	8	Data buffer for data to be read or written
0x40n0:07	Error code	UDINT	RW	240	Error code according to IO-Link specification, see "IOL_Status" [> 114]

The index contains the following elements:

Example access, read operation – read product name (IO-Link device at IO-Link port 2)

Reading out the product name (product name, index 0x12) of the TURCK IO-Link I/O-hub TBIL-M1-16DXP at IO-Link port 2.

Index	Name	Value	Meaning
0x4020:01	Control	0x03	Read operation
0x4020:03	Index	0x12	Index for product name acc. to the documenta- tion of the connected IO-Link device
0x4020:05	Data length	0x0D	Data length of the data to be read here: 13 bytes (length of the index "product name" of the connected TBIL-M1-16DXP.

Enter the index for product name (0x4020:2 = 0x12) and length of the data to be read (0x4020:3 = 0x0D).

	Start the	write o	peration	with	0x4020:1	= 0x03.
--	-----------	---------	----------	------	----------	---------

E 4020:0	Vendor Specifics IO-Link Port		> 8 <
4020:01	Control	RW	0x03 (3)
4020:02	Status	RW	0x00 (0)
4020:03	Index	RW	0x0012 (18)
4020:04	Subindex	RW	0x00 (0)
4020:05	Datalength	RW	0x0D (13)
4020:06	Data	RW	00 00 00 00 00 00 00 00 00 00 00 00 00
4020:07	Error Code	RW	0x0000000 (0)
4020:08	res.	RW	0x00 (0)

Fig. 77: TwinCAT – Reading out the product name

 ⇒ CoE index 0x4020:06 contains the product name of the IO-Link device at IO-Link port 2: 54 42 49 4c 2d 4d 31 2d 31 36 44 58 50 (TBIL-M1-16DXP)

± 1C32:0	SM output parameter		> 12 <	Set Value Dialog	
∃ 1C33:0	SM input parameter		> 12 <	Set Value Dialog	
± 4010:0	Vendor Specifics IO-Link Port		> 8 <		
E 4020:0	Vendor Specifics IO-Link Port		> 8 <	Dez:	
4020:01	Control	RW	0x03 (3)	Hex: Abbruch	
4020:02	Status	RW	0x00 (0)		
4020:03	Index	RW	0x0012 (18)	Float:	
4020:04	Subindex	RW	0x00 (0)		
4020:05	Datalength	RW	0x0D (13)		
4020:06	Data	RW	54 42 49 4C 2D 4D	0 31 2D 31 36 44 58 50 50 00 Bool: 0 1 Hex Edit	
4020:07	Error Code	RW	0x00000000 (0)		×
4020:08	res.	RW	0x00 (0)	Hex Editor	
± 4030:0	Vendor Specifics IO-Link Port				
÷ 4040:0	Vendor Specifics IO-Link Port			p000 54 42 49 4C 2D 4D 31 2D 31 36 44 58 50 00 00 00 TBIL-M1-16DXP	OK
÷ 4050:0	Vendor Specifics IO-Link Port				bhuch
÷ 4060:0	Vendor Specifics IO-Link Port				bruch
5000	Configured Module ID	MRW	0x0000001 (1)		
5010	Configured Module ID	MRW	0x000000F (15)	0050 00 00 00 00 00 00 00 00 00 00 00 00	
5020	Configured Module ID	MRW	0x000000F (15)		
5030	Configured Module ID	MRW	0x00000000 (0)	0070 00 00 00 00 00 00 00 00 00 00 00 00	
5040	Configured Module ID	MRW	0x00000000 (0)		
5050	Configured Module ID	MRW	0x00000000 (0)		
5060	Configured Module ID	MRW	0x00000000 (0)		
5090	Configured Module ID	MRW	0x0000002 (2)		
50A0	Configured Module ID	MRW	0x0000003 (3)		
50B0	Configured Module ID	MRW	0x00000004 (4)	0020 00 00 00 00 00 00 00 00 00	
50C0	Configured Module ID	MRW	0x0000005 (5)		
÷ 6000:0	Inputs Basic		> 32 <		
÷ 6010:0	Inputs IO-Link Port		>1<		
÷ 6020:0	Inputs IO-Link Port		>1<		
÷ 6050:0	Inputs IO-Link Port				
÷ 6090:0	Inputs Diagnostics		> 160 <		
+ 60A0:0	Inputs IO-Link Events		> 48 <		
÷ 60C0:0	Inputs Device Status/Control		> 32 <		
	Outputs Basic		> 16 <	()	
÷ 7020:0	Outputs IO-Link Port		>1<		
7050.0	0				

Fig. 78: TwinCAT – Product name in index 0x12



Example access write operation – writing the Application Specific Tag (IO-Link device at IO-Link port 1)

The Application Specific Tag (Index 0x18) of the IO Link-Device an IO-Link port 1 is written.

Index	Name	Value	Meaning
0x4050:01	Control	2	Write operation
0x4050:03	Index	18	Index for Application Specific Tag acc. to the documentation of the connected IO-Link device
0x4050:05	Data length	USINT	0x10
0x4050:06	Data	Status 1 = 53 74 61 74 75 73 20 31	Application Specific Tag

- Enter the index for the Application Specific Tag (0x4050:03 = 0x18), the data length (0x4050:05 = 0x10) and the data to be written (0x4050:06 = 53 74 61 74 75 73 20 31).
- ► Start the write operation with **0x4020:1** = **0x02**.

<u>⊟</u> 4010:0	Vendor Specifics IO-Link Port		> 8 <
4010:01	Control	RW	0x02 (2)
4010:02	Status	RW	0x00 (0)
4010:03	Index	RW	0x0018 (24)
4010:04	Subindex	RW	0x00 (0)
4010:05	Datalength	RW	0x1E (30)
4010:06	Data	RW	53 74 61 74 75 73 20 31 00 00 00 00 00 00 00 00 00 00
4010:07	Error Code	RW	0x0000000 (0)
4010.00		-	0.00(0)

Fig. 79: TwinCAT – Writing the Application Specific Tag

• The written value can then be read out from register 0x18 for verification:

IA09:0	Mapping TxPDO LL-Diagnostics		> 160 <	
1A0A:0	Mapping TxPDO IO-Link Events		> 48 <	
IA0C:0	Mapping TxPDO Device Status/Control		> 32 <	Hex Editor
.000 € 1	TxPDO Mapping of IO-Link Device St		> 8 <	
± 1C00:0	Sync manager Type		> 4 <	0K 000 53 74 61 74 75 73 20 31 00 00 00 00 00 00 00 00 Status 1
IC12:0	Sync Manager 2 PDO Assignment		> 5 <	
∃ 1C13:0	Sync Manager 3 PDO Assignment		>7<	Abbruch
± 1C32:0	SM output parameter		> 12 <	
	SM input parameter		> 12 <	
⊟ 4010:0	Vendor Specifics IO-Link Port		> 8 <	
4010:01	Control	RW	0x03 (3)	0070 00 00 00 00 00 00 00 00 00 00 00 00
4010:02	Status	RW	0x00 (0)	🖌 0080 00 00 00 00 00 00 00 00 00 00 00 0
4010:03	Index	RW	0x0018 (24)	
4010:04	Subindex	RW	0x00 (0)	00A0 00 00 00 00 00 00 00 00 00 00 00 00
4010:05	Datalength	RW	0x08 (8)	
4010:06	Data	RW	53 74 61 74 75 73 20 31 00 00	
4010:07	Error Code	RW	0x0000000 (0)	
4010:08	res.	RW	0x00 (0)	
+ 4020:0	Vendor Specifics IO-Link Port		> 8 <	
+ 4030:0	Vendor Specifics IO-Link Port			
± 4040:0	Vendor Specifics IO-Link Port			
± 4050:0	Vendor Specifics IO-Link Port			
± 4060:0	Vendor Specifics IO-Link Port			
5000	Configured Module ID	MRW	0x0000001 (1)	
5010	Configured Module ID	MRW	0x000000F (15)	
5020	Configured Module ID	MRW	0x000000F (15)	< >>
5030	Configured Module ID	MRW	0x0000000 (0)	
6040	Configured Markula ID	MRW	0-0000000 (0)	

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IOL_CALL - IOL_STATUS

The IOL_STATUS consists of 2 byte Error Code (IOL_M Error_Codes, according to "IO-Link Integration Part 1- Technical Specification for PROFIBUS and PROFINET") and 2 byte Error Type (according to "IO-Link Interface and System").

Byte 3	Byte 2	Byte 1	Byte 0			
IOL_M-Error-Code		IOL-Error Type				
IOL_M-Error-Code	Designation acc. to IO-Link	Spec. Meaning				
0x0000	No error					
0x7000	IOL_CALL Conflict	Unexpected write expected	e-request, read request			
0x7001	Wrong IOL_CALL	Decoding error				
0x7002	Port blocked	The accessed por other task	t is occupied by an-			
	Reserved					
0x8000	Timeout	Timeout, IOL mas busy	ter or IOL device port			
0x8001	Wrong index	Error: IOL index < lected	32767 or > 65535 se-			
0x8002	Wrong port address	Port address not a	available			
0x8003	Wrong port function	Port function not	available			
	Reserved					

IOL-Error-Type	Designation acc. to IO- Link Spec.	Meaning
0x1000	COM_ERR	Communication error Possible source: the addressed port is parameterized as digital input DI and is not in IO-Link mode
0x1100	I_SERVICE_TIMEOUT	Timeout in communication, device does not respond in time
0x5600	M_ISDU_CHECKSUM	Master reports checksum error, access to device not possible
0x5700	M_ISDU_ILLEGAL	Device can not respond to master request
0x8000	APP_DEV	Application error in the device
0x8011	IDX_NOTAVAIL	Index not available
0x8012	SUBIDX_NOTAVAIL	Sub-Index not available
0x8020	SERV_NOTAVAIL	The service is temporarily not available.
0x8021	SERV_NOTAVAIL_ LOCCTRL	Service temporarily not available, device is busy (e.g. teaching or parameterization of the device via the master active)
0x8022	SERV_NOTAVAIL_ DEVCTRL	Service temporarily not available, device is busy (e.g. teaching or parameterization of the device via DTM/ PLC etc. active)
0x8023	IDX_NOT_WRITEABLE	Access denied, index cannot be written
0x8030	PAR_VALOUTOFRNG	Parameter value out of the valid range
0x8031	PAR_VALGTLIM	Parameter value value above the upper limit
0x8032	PAR_VALLTLIM	Parameter value value below the lower limit



IOL-Error-Type	Designation acc. to IO- Link Spec.	Meaning
0x8033	VAL_LENOVRRUN	Length of data to be written does not match the length
0x8034	VAL_LENUNDRUN	defined for this parameter
0x8035	FUNC_NOTAVAIL	Function not available in the device
0x8036	FUNC_UNAVAILTEMP	Function temporarily not available in the device
0x8040	PARA_SETINVALID	Invalid parameter: Parameters not consistent with other parameters in the device.
0x8041	PARA_SETINCONSIST	Inconsistent parameters
0x8082	APP_DEVNOTRDY	Application not ready, device busy
0x8100	UNSPECIFIC	Vendor specific, according to device documentation
0x8101 0x8FFF	VENDOR_SPECIFIC	

9.10 Acyclic access via AoE

The device supports ADS via EtherCAT (AoE) according to ETG.5001.6220.

In TwinCAT the function blocks ADSREAD and ADSWRITE from Beckhoff Automation are supported.



Fig. 81: Example call – Function blocks ADSREAD and ADSWRITE



9.10.1 Function block ADSREAD



Fig. 82: TwinCAT – ADSREAD

Block variables – inputs

Variable	Meaning
NETID	Network identifier of the device, automatically assigned The network identifier can be read out at the device in TwinCAT e.g. in the EtherCAT tab under Advanced Settings \rightarrow Mailbox \rightarrow AoE .
PORT	 Port number of the IO-Link port at which the IO-link device is connected: IO-Link port 1 = 16#1001 IO-Link port 2 = 16#1002
IDXGRP	Fix value: 0xF302
IDXOFFS	32 bit value, structure acc. to ETG.5001.6220: 16 bit for the index, 8 'bit = re- served, 8 bit for the sub index: Example: Index 18 "product name", sub index 0 = 16#0012 0000
LEN	Number of the data to be read in bytes
DESTADDR	Address of the buffer which is to receive the read data
READ	A rising edge triggers the send command.
TMOUT	Time before the function is canceled

Block variables - outputs

Variable	Meaning
BUSY	TRUE until the read command is executed
ERR	TRUE, if an error occurs during the execution of a command
ERRID	 Error code, structure acc. to ETG.5001.6220: Low word: ADS error code (0x0700) High word: contains the IOL_STATUS of the IO-Link call acc. to IO-Link specification [▶ 114]

9.10.2 Function block ADSWRITE



Fig. 83: TwinCAT – ADSWRITE

Block variables – inputs

Variable	Meaning
NETID	Network identifier of the device, automatically assigned The network identifier can be read out at the device in TwinCAT e.g. in the
	EtherCAT tab under Advanced Settings $ ightarrow$ Mailbox $ ightarrow$ AoE.
PORT	 Port number of the IO-Link port at which the IO-link device is connected: IO-Link port 1 = 16#1001 IO-Link port 2 = 16#1002
	
IDXGRP	Fix value: 0xF302
IDXOFFS	32 bit value, structure acc. to ETG.5001.6220: 16 bit for the index, 8 ´bit = reserved, 8 bit for the sub index: Example: Index 24 " Application Specific Tag", sub index 0 = 16#0018 0000
LEN	Number of the data to be written in bytes
SRCADDR	Address of teh buffer which contains the data to be written
WRITE	A rising edge triggers the write command.
TMOUT	Time before the function is canceled

Block variables – outputs

Variable	Meaning
BUSY	TRUE until the write command is executed
ERR	TRUE, if an error occurs during the execution of a command
ERRID	 Error code, structure acc. to ETG.5001.6220: Low word: ADS error code (0x0700) High word: contains the IOL_STATUS of the IO-Link call acc. to IO-Link specification [> 114]



9.11 IO-Link – using the Data storage mode

Data storage mode

NOTE Data st

Data storage mode is only available for devices complying with the IO-Link specification V1.1.

The Data storage mode is set and configured in the IO-Link master via parameter "Master Control" and "Data storage mode" [▶ 75].

Master Control: Object 0x80n0 (n = 1...8 = IOL1...IOL8), sub index 0x28

Requirement: Data storage mode (DSM) = 0

- Bit 4...15 = 0 = deactivated, delete (no data storage)
- Bit 4...15 = 2 = activated (data storage active)
- Bit 4...15 = 6 = overwrite (data storage active, upload deactivated)

Data storage mode (DSM): Object 0x80n8 (n = 1...8 = IOL1...IOL8), sub index 0x02

- 0= Use Master Control setting (see above)
- 1 = read in



Fig. 84: Data storage mode – general principle, Para. IOLD = parameters of the IO-Link device

A change of parameters in the device is indicated by the status of the DS_UPLOAD_FLAG bit:

- 0 = no changes in the device's parameter set
- 1 = changes in the device's parameter set (e. g. via DTM, at the device, etc.)

9.11.1 Parameter "Data storage mode" = activated

The synchronization of the parameter sets is bidirectional. The actual data set (master or device) is valid: The following applies:

■ The data set in the device is actual, if DS_UPLOAD_FLAG = 1.

The data set in the master is actual, if DS_UPLOAD_FLAG = 0.

Use case 1: parameterizing the device using e.g. a DTM

✓ The IO-Link device is already installed in the system and connected to the master.

- Parameterizing the device via DTM.
- DS_UPLOAD_FLAG = 1, parameter set in the device changed. ⇔
- The parameter data are transferred from the new IO-Link device to the IO-Link master. ⇔



Fig. 85: Data storage mode activated - parameter set in the device changed

Use case 2: replace a defective device with a device in the delivery state.

- ✓ The **new** IO-Link device has **not** been connected to the master before.
- The parameters of the new device remain unchanged, DS UPLOAD FLAG = 0.
- The parameter data of the defective device are transferred from the IO-Link master to the ⇒ new IO-Link device.



Fig. 86: Data storage mode activated - parameter set in the device unchanged

Use case 3: replace a defective device with a device with unknown (changed) parameters

✓ The **new** IO-Link device has **not** been connected to the master before.

- The parameters of the new device remain unchanged, DS_UPLOAD_FLAG = 1.
- ⇔ The parameter data are transferred from the new IO-Link device to the IO-Link master.

IOLM	IOLD
Para. IOLD Para. IOLD Para. IOLD	 Para. IOLD Para. IOLD Para. IOLD

Fig. 87: Data storage mode activated - parameter set in the device changed



If device replacement is necessary when data storage is activated, an IO-Link replacement device with unknown parameter data should be reset to its factory settings before connection to the IO-Link master.

Turck IO-Link devices can be reset to factory settings via a system command using a generic IO-Link-DTM and the device-specific IODD. For the reset of third party devices, please read the corresponding manufacturer documentation.



9.11.2 Parameter "Data storage mode" = read in

- The data set in the device is **always** the reference data set.
- The synchronization of the parameter sets is unidirectional towards to the master.
- The status of the DS_UPLOAD_FLAG is ignored.



Fig. 88: Data storage mode = read in - parameter set in the device changed

- 9.11.3 Parameter "Data storage mode" = overwrite
 - The data set in the master is **always** the reference data set.
 - The synchronization of the parameter sets is unidirectional towards to the device.
 - The status of the DS_UPLOAD_FLAG is ignored.



Fig. 89: Data storage mode = overwrite - parameter set in the master changed

- 9.11.4 Parameter "Data storage mode" = deactivated, clear
 - The data set in the master is deleted.
 - The synchronization of parameter sets is deactivated.



Fig. 90: Data storage mode deactivated - no synchronization

9.12 Reset device (Reset)

The device is provided with the following options to reset to the default settings:

- Reset button
- via the Turck Service Tool, if the EoE function is activated
- via FDT/DTM
- Via CoE index 0xFBF0 "Device Reset Command"

9.12.1 Resetting the device with Turck Service Tool

Requirement: The EoE function must be activated so that the device can be found in the Turck Service Tool.



NOTE

The device search is based on multicasts or broadcasts. Routers in the network must be configured in such a way that multicasts or broadcasts are passed through.

- Click search and browse network for devices.
- Mark the device that is to be reset.
- ► Execute a factory reset via Actions (F4) → Factory settings.

Yo	our Global Aut	omat	tion P	artner				-	UR	CK
P earch (F5) Change (F2)	Wink (Fi	3) Acti	ons (F4)	EN .	Expe	O ert view O	FF Close		
No.	MAC address	N	IP V	Reboot		Mode	Device	Version	Adapter	Protocol
- 1	00:07:46:04:EB:2B	tu	0. 🛋	Network reset		PG	BL20	3.3.18.0	192.168.144.244	DCP, Turck
- 2	00:07:46:1F:C0:AB		1 #	Factory reset		PG	TBE	1.4.14.7	172.28.7.69	Turck
- 3	00:07:46:17:44:A4		10	Set clock		PG	TBE	1.4.1.0	172.28.7.69	Turck
- 4	54:4A:16:A0:F0:F9		1	Set Clock		ÞG.	RI 20	1/18	172 28 7 69	Turck
5	4C:CC:6A:37:E5:26	dt	1 (*)	Set HF RFID re Set device	parameters	and ne	twork co	nfiguration	to factory default v	alues.
6	20:87:56:24:CE:6A	s	192.168	<u>.144.162</u> 255.255.255.0	192.1		SCA		192.168.144.244	DCP
ound 6 D	evices.									

Fig. 91: Turck Service Tool - resetting the device to factory settings

⇒ The device is reset to factory settings.



9.12.2 Resetting the device via FDT/DTM

Requirement: The EoE function must be activated so that the device can be operated with the DTM.

► Select EC-LL-8IOL in the DTM project and reset the device under Global → Factory settings.

		PACTware		_ 🗆 ×
File Edit View Project Devic	e Extras Window	Help		
	¥¥ 40 ; L1 ≥ ⊌ €			
Project 4×	01/EC-LL-8IOL On	line parameterization		
Device tag HOST PC	Your Global Auto	mation Partner		TURCK
🗆 💳 TCP:192.168.122.5	Device type Intern-E	C-LL-8IOL		
□		ectronic modules 8 10-1	Link ports preliminar	y version
🤤 🛱 Modulbus			€_ ▼ 🕌	Online parameterization
= = 01/EC-LL-8IOL	Global	Name	Value	
	Port 1 - DXP (Channel 1) Port 2 - DXP (Channel 3)	E Common		
TBIL-M1-8DOP	Port 3 - DXP (Channel 5)	Factory settings	selection	v
Port 2	Port 4 - DXP (Channel 7)		selection	
Port 3	VAUX control		set to factory settings	
TBIL-M1-16DXP				
Port 4				
Port 5				
Port 6				
Port 7				
······ φ' Port 8				
			OK	Cancel Apply
< >	Disconnected	<u> D</u> evice		
-€•• * • • • • • • • • • • • • • • • • • • •	Administrator			

Fig. 92: FDT/DTM –Resetting the device to factory settings

9.12.3 Resetting the device via Object Dictionary

The device is reset via the CoE index 0xFBF0 "Device Reset Command", subindex 0x01 "Command".

Write the reset command 74 65 73 65 72 66 as hexadecimal value in CoE index 0xFBF0:01.

E-FBF0:0	Device Reset Command	> 3 <
FBF0:01	Command	RW 74 65 73 65 72 66
FBF0:02	Status	RO 0x00 (0)
FBF0:03	Response	RO 00 00

Fig. 93: TwinCAT (example) - Resetting the device to factory settings via CoE index

⇒ The device is reset to factory settings.



10 Troubleshooting

If the device does not work as expected, proceed as follows:

- Exclude environmental disturbances.
- Check the connections of the device for errors.
- Check device for parameterization errors.

If the malfunction persists, the device is faulty. In this case, decommission the device and replace it with a new device of the same type.

10.1 Eliminate parameterization errors

DXP channels

Error	Possible causes:		edy
DXP output does not switch	The output is deactivated per default.		Switch on the output via parameter Ac- tivate output (DXP_EN_DO =1).

$ \bigcirc - $	ink	channe	ام
10-L	_11 I.N	CHAINE	15

LED behavior	Diagnostics	Possible causes:	Reme	dy
LED ERR con- stant red, LED IOL red blinking	Data storage error	IO-Link device according to IO- Link V1.0 connected IO-Link devices in accordance with IO- Link specification V1.0 do not support data storage.	► 1	Set parameter Data storage mode to deactivated, clear . Data storage remain deactivated.
		The data storage buffer contains data of another device.	•	Set parameter Data storage mode to deactivated, clear . Re-activate the data storage if neces-
				sary.
	Wrong or missing device	The connected device does not match the configured one (wrong vendor-ID, device-ID etc.)	•	Adapt the parameterization of the IO-Link port (Vendor ID, Device ID, etc.) at the master. The parameterization can be done manually via DTM, the web server or similar or by teaching the master us- ing the IO-Link-Call (port 0 function, sub index 67: Teach mode).
	Process input data invalid	Certain IO-Link devices send a process input data invalid dia- gnosis if the process value can- not be measured.	•	Deactivate the sending of the dia- gnosis for the IO-Link port with the parameter Process input data in- valid \rightarrow No diagnostic generated.

11 Maintenance

The firmware update is performed according to ETG specification ETG.5003.0002. The FoE protocol (File access over EtherCAT) is used for the firmware update of the device. The device must be in "Bootstrap" status for the update process.

The current firmware version of the device can be read from CoE index 0x100A "Manufacturer Software Version", the current hardware version from CoE index 0x1009 "Manufacturer Hardware Version".



Interruption of data connection and power supply during firmware update **Risk of device damage due to faulty firmware update**

Do not interrupt the data connection and the power supply during the firmware update.

11.1 Carrying out a firmware update via TwinCAT

Downloading the firmware file

The firmware file for the device is available free of charge for download from www.turck.com.

- ► In the project tree double-click **Box 1 (TBEC-LL-8IOL)**.
- Click Online tab \rightarrow State Machine \rightarrow Bootstrap.
- ► Click File Access over EtherCAT → Download....

State Ma Init Pre-Op Op	achine p	Bootstrap Safe-Op Clear Error	Curren Reque	t State: ested State	BOOT BOOT	
DLL Sta Port A: Port B:	itus Car No	rier / Open Carrier / Closed				
Port C: Port D:	No No	Carrier / Closed Carrier / Closed				
File Acc	ess over E nload	therCAT Upload.				

Fig. 94: Starting the firmware update

- Select the firmware file in the new window.
- Confirm with OK.
- ⇒ The firmware file is loaded in the flash memory of the device.
- ⇒ The STAT LED flickers green.
- ➡ TwinCAT displays a progress bar at the bottom of the screen to indicate the download of the firmware file.



Carrying out an update

- Click Online tab \rightarrow State Machine \rightarrow Init.
- ⇒ The update is carried out.
- ⇒ The INFO LED is orange during this.
- ⇒ If the update is completed the device switches to normal operating mode.

11.2 Carrying out a firmware update via CODESYS

Prerequisites

- The device is logged in online.
- The **Expert settings** are activated on the **General** tab.
- The option **Restart slaves automatically** on the **General** tab is deactivated.

Downloading the firmware file

The firmware file for the device is available free of charge for download from www.turck.com.

- ► In the project tree double-click **TBEC_LL_8IOL** (**TBEC-LL-8IOL**).
- Click **Online** tab \rightarrow **State Machine** \rightarrow **Bootstrap**.
- Click File access over EtherCAT \rightarrow Download....
- In the new window select the firmware file and click \rightarrow **Open**.
- ⇒ The firmware file is loaded in the flash memory of the device.
- ⇒ The STAT LED flickers green.
- ➡ CODESYS displays a progress bar at the bottom of the screen to indicate the download of the firmware file.

TBEC_LL_8IOL X	
General Expert Process Data Process Data	State Machine Init Bootstrap Init Bootstrap Current state Boot Strap Modus Pre-Op Safe-Op Requested State Boot Strap Modus
Startup Parameters Online	File access over EtherCAT
CoE Online	E ² PROM access
EoE Settings	WILE EFFKUM KEBU EFFKUM WILE EFFKUM AML
Diagnosis History	
Log	
EtherCAT I/O Mapping	

Fig. 95: Download of the firmware file

Carrying out an update

- Click Online tab \rightarrow State Machine \rightarrow Init.
- ⇒ The update is carried out.
- ⇒ The INFO LED is orange during this.
- ⇒ If the update is completed the device switches to normal operating mode.
- Activate the option **Restart slaves Slave automatically** on the **General** tab.

12 Disposal



The devices must be disposed of correctly and must not be included in general household garbage.



13 Technical data

Technical data	
Supply	
Supply voltage	24 VDC
Permissible range	1830 VDC
Total current	Max. 9 A per voltage group V1 + V2: max. 11 A
Power consumption	
Operating current (at 24 VDC nominal voltage)	< 120 mA (outputs inactive)
Operating current (at 28.818.0 VDC)	V1: 120180 mAV2: 9040 mA
	Operating conditions: All outputs active without load Ethernet communication active
Sensor/actuator supply V _{AUX1}	 Supply from V1, short circuit proof Max. 4 A per connector X0 and X4 (marked on the device with "+") Max. 2 A per connector X1X3, X5X7
Sensor/actuator supply V _{AUX2}	 Class - B-supply from V2, short circuit proof Max. 4 A per connector X4 X5 (marked on the device with "+") Max. 2 A per connector X6 X7
Potential isolation	Galvanic isolation from V1 and V2 voltage group, voltages up to 500 VDC
Connectors	
Power supply	$2 \times M12$ male, L coded
EtherCAT	2 × M12, 4-pin, D coded
IO-Link ports	M12, 5-pole, A-coded
 Permissible torques Ethernet I/O channels/supply Mounting (M6 screws) 	0.6 Nm 0.8 Nm 1.5 Nm
Isolation voltages	
V1 to V2	≥ 500 V AC
V1/V2 to field bus	≥ 500 V AC
System data	
Transmission rate	10 Mbps/100 Mbps
Web server	Integrated, via EoE
Service interface	EoE
EtherCAT	
CAN over EtherCAT	According to Modular Device Profile (ETG.5001.1)
Supported EtherCAT protocols	CoE, EoE, FoE, AoE
Diagnostics	CoE Emergencies, Diag History Object
Address assignment	Automatic, Explicit Device Identification, Configured Station Alias

Technical data	
Communikation cycle	Min. 125 μs
Digital inputs	
Number of channels	4 DXP and 8 SIO
Max. input current	7 mA at pin 2
	12 mA at pin 4
Input type	PNP
Type of input diagnostics	Channel diagnosis
Switching threshold	EN 61131-2 type 3, PNP
Signal voltage low level	< 5 V
Signal voltage high level	> 11 V
Signal current low level	< 1.5 mA
Signal current high level	> 2 mA
Input delay	0.05 ms
Potential isolation	Galvanic isolation to XF1/XF2, voltage proof up to 500 V AC
Digital outputs	
Number of channels	4 DXP
Output type	PNP
Type of output diagnostics	Channel diagnostics
Output voltage	24 VDC from potential group
Output current per channel	2 A, short-circuit-proof
Leakage current	≤ 2.5 µA
Residual voltage (ON)	≤ 0.8 V
Potential isolation	Galvanic isolation to XF1/XF2, voltage proof up to 500 V AC
IO-Link	
Number of channels	8
IO-Link	Pin 4 operated in IO-Link mode
IO-Link specification	Version 1.1
IO-Link port type	Class A at X0X3 Class B at X4X7
Frame type	Supports all specified frame types
Supported devices	Max. 32 byte input/32 byte output
Input data	Max. 32 Byte per channel
Output data	Max. 32 Byte per channel
Transmission rate	4.8 kbps (COM 1), 38.4 kbps (COM 2), 230.4 kbps (COM 3)
Transmission cable	Length: max. 20 m standard lines, 3- or 4-wire (depending on the application), un- shielded



Technical data	
Mounting	
Type of mounting	Via 2 mounting holes, Ø 6.3 mm
Mounting distance (device to device)	 ≥ 50 mm Valid for operation in ambient temperatures defined below with sufficient ventilation and maximum load (horizontal nominal position). At ambient temperatures of < 30 °C, the devices can also be mounted directly next to each other.
Standard/Directive conformity	
Vibration test	According to EN 60068-2-6
Acceleration	Up to 20 g
Shock test	According to EN 60068-2-27
Drop and topple	According to IEC 60068-2-31/IEC 60068-2-32
Electro magnetic compatibility	According to EN 61131-2
Approvals and certificates	CE UV-resistant according to DIN EN ISO 4892-2013
UL cond.	cULus LISTED 21 W2, Encl.Type 1 IND.CONT.EQ.
General information	
Dimensions ($B \times L \times H$)	60.4 × 230.4 × 39 mm
Operating temperature	-40+70 °C
Storage temperature	-40+85 °C
Operating height	Max. 5000 m
Protection class	IP65/IP67/IP69K
MTTF	146 years acc. to SN 29500 (Ed. 99) 20 °C
Housing material	PA6-GF30
Housing color	Black
Material window	Lexan
Material label	Polycarbonate
Halogen-free	Yes

FCC declaration



NOTE

This device complies with the limits for a Class A digital device, according to Part 15 of the FCC Rules. Operation of this equipment in a residential area may cause harm-ful interference. In this case, the user must correct the interference at his own expense.

14 Turck Subsidiaries - Contact Information

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205



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