

TBEN-L...-8IOL IO-Link Master Module

Instructions for Use



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1 About these instructions

These instructions describe the setup, functions and use of the product and help you to operate the product according to its intended purpose. Read these instructions carefully before using the product. This will prevent the risk of personal injury and damage to property. Keep these instructions safe 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 written for specifically trained personnel and must be read carefully by anyone entrusted with the installation, commissioning, operation, maintenance, disassembly or disposal of the device.

When using the device in Ex areas, the user must also have knowledge of explosion protection (IEC/EN 60079-14 etc.).

1.2 Explanation of symbols

The following symbols are used in these instructions:

	DANGER DANGER indicates a hazardous situation with a high level of risk, which, if not avoided, will result in death or serious injury.
	WARNING WARNING indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in death or serious injury.
	CAUTION CAUTION indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in moderate or minor injury.
!	NOTICE CAUTION indicates a situation which, if not avoided, may cause damage to property.
i	NOTE NOTE indicates tips, recommendations and important information about special ac- tion steps and issues. The notes simplify your work and help you to avoid additional work.
	MANDATORY ACTION This symbol denotes actions that the user must carry out.
₽	RESULT OF ACTION This symbol denotes the relevant results of an action.

1.3 Additional documents

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

- Data sheet
- EU Declaration of Conformity (current version)
- Commissioning manual IO-Link devices
- Notes on Use in Ex zone 2 and 22 (100022986)
- 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 modules:

- TBEN-L4-8IOL
- TBEN-L5-8IOL

2.2 Scope of delivery

The delivery consists of the following:

- TBEN-L...-8IOL
- Closure caps for M12 female connectors
- Label clips

2.3 Turck service

Turck supports you in your projects — from the initial analysis right through to the commissioning of your application. The Turck product database at www.turck.com offers you several software tools for programming, configuring or commissioning, as well as data sheets and CAD files in many export formats.

For the contact details of our branches worldwide, please see page [212].



3 For your safety

The product is designed according to state of the art technology. Residual hazards, however, still exist. Observe the following safety instructions and warnings in order to prevent danger to persons and property. Turck accepts no liability for damage caused by failure to observe these safety instructions.

3.1 Intended use

The multiprotocol I/O module TBEN-L...-8IOL is an IO-Link master according to IO-Link specification V1.1 and can be can be operated in the four Ethernet protocols PROFINET, Ethernet/IP, Modbus TCP and CC-Link IE Field Basic. The device detects the bus protocol automatically during the start-up.

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

The devices meet the requirements for passive safety Passive Sicherheit and can be used in the following applications:

- Applications up to SIL CL2 (according to EN 62061:2016, section 6.7.7)
- Applications up to Category 3 and Performance Level d (according to EN ISO 13849-1: 2016)

Installation directly in the field is possible thanks to degree of protection IP65, IP67 IP67K. Devices with the Ex marking are suitable for use in the Ex area in zone 2 and zone 22.

The device must 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 Foreseeable Misuse

The device is not suitable for:

The permanent use in liquids

Modifications to the device

It is not permitted to modify the technical function or the construction of the device.

3.3 General safety instructions

- The device must only be fitted, installed, operated, parameterized and maintained by trained and qualified personnel.
- Only use the device in compliance with the applicable national and international regulations, standards and laws.
- The device meets the EMC requirements for the industrial areas. When used in residential areas, take measures to prevent radio frequency interference.
- Change the default password of the integrated web server after the first login. Turck recommends the use of a secure password.

3.4 Notes on Ex protection

- When using the device in Ex areas, the user must have knowledge of explosion protection (IEC/EN 60079-14 etc.).
- Observe national and international regulations for explosion protection.
- Only use the device within the permissible operating and ambient conditions (see certification data and Ex approval specifications).
- The document "Notes on Use in Ex Zone 2 and 22" (ID 100022986) contains the approval data for using the device in hazardous areas. Observe the requirements in the document.



3.5 Requirements for Ex approval

- Only use the device in an area with no more than pollution degree 2.
- Only disconnect and connect circuits when there is no potentially explosive atmosphere or when the power supply is switched off
- Only operate the switches when there is no potentially explosive atmosphere or when the power supply is switched off.
- Connect the metal protective cover to the equipotential bonding in the Ex area (cable cross-section: 4 mm²).
- Ensure impact resistance in accordance with EN IEC 60079-0 alternative measures:
 - Install the device in the TB-SG-L protective housing (available in the set with Ultem window: ID 100014865) and replace the Lexan service window with the Ultem window.
 - Install the device in an area offering impact protection (e.g. in the robot arm) and attach a warning sign: "DANGER: Do not connect or disconnect circuits under live conditions. Do not actuate the switch under live conditions".
- Keep the service window of the devices closed during operation in order to comply with the IP protection.
- Do not install the device in areas critically exposed to UV light.
- Prevent risks caused by electrostatic charge.
- Provide unused male connectors with suitable sealing or blanking caps in order to ensure degree of protection IP65, IP67 or IP69K The tightening torque for the M4 screws is 0.5 Nm.



4 Product description

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

The IO-Link master module TBEN-L...-8IOL has eight IO-Link ports for connecting IO-Link devices. The IO-Link ports at the connectors C0...C3 are designed as Class A ports. The IO-Link ports at the connectors C4...C7 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).

With Turck's "Simple IO-Link Device Integration (SIDI)", IO-Link devices can be directly inte-grated into PROFINET via the GSDML file of the TBEN-L...-8IOL.

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

4-pin (TBEN-L4) or 5-pin (TBEN-L5) 7/8" connectors are available for connecting the supply voltage.

Two device types are available:

- TBEN-L4-8IOL
- TBEN-L5-8IOL



4.1 Device overview



Fig. 1: Dimensions TBEN-L4-8IOL



Fig. 2: Dimensions TBEN-L5-8IOL

Connector	LED	Channel	Function	Auxiliary voltage
C0	0	Ch0	IO-Link port 1 (Class A)	VAUX1
	1	Ch1	DXP1	
C1	2	Ch2	IO-Link port 2 (Class A)	VAUX1
	3	Ch3	DXP3	
C2	4	Ch4	IO-Link port 3 (Class A)	VAUX1
	5	Ch5	DXP5	_
C3	6	Ch6	IO-Link port 4 (Class A)	VAUX1
	7	Ch7	DXP7	
C4	8	Ch8	IO-Link port 5 (Class B)	VAUX1
	9	Ch9	-	VAUX2
C5	10	Ch10	IO-Link port 6 (Class B)	VAUX1
	11	Ch11	-	VAUX2
C6	12	Ch12	IO-Link port 7 (Class B)	VAUX1
	13	Ch13	-	VAUX2
C7	14	Ch14	IO-Link port 8 (Class B)	VAUX1
	15	Ch15	-	VAUX2



4.1.1 Block diagram



Fig. 3: Block diagram

4.1.2 Operating elements

The device has the following operating elements:

- Rotary coding switches for adjusting the network settings
- Reset button for executing a device restart

4.1.3 Indication elements

The device is provided with the following LEDs:

- Power supply voltage
- Group and bus error
- Status
- Diagnostics



4.2 Properties and features

- Fiber-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
- Separated power groups for safety shutdown
- Integrated Ethernet-switch for building up a line-topology
- Transmission speed 10 Mbps/100 Mbps
- Integrated web server
- 4 IO-Link ports Class A and 4 IO-Link ports Class B
- 4 universal DXP channels (PNP)
- Multiprotocol: PROFINET device, EtherNet/IP device, Modbus TCP server, CC-Link IE Field Basic server
- PROFINET:
 - Conformance Class B PA
 - Simple IO-Link Device Integration (SIDI)
 - Conformity according to PROFINET specification V2.35
 - System redundancy S2
 - Network load class 3
- EtherNet/IP:
 - Support of IO-Link parameter object for asynchronous services (IO-Link-CALL)
 - Predefined in- and output assemblies

4.3 Operating principle

The IO-Link master module TBEN-L...-8IOL connects IO-Link sensors and actuators with the higher-level control system. The device has an Ethernet interface and fieldbus-independent I/O electronics with IO-Link master functionality (Class A and Class B ports). Via the Ethernet interface, the IO-Link master is connected to an (existing) Ethernet network as an EtherNet/IP device, Modbus TCP server, PROFINET device or CC-Link IE Field Basic server. During operation, the process data is exchanged between Ethernet and IO-Link. In addition the devices can process signals from sensors and actuators via four configurable digital channels.



4.4 Functions and operating modes

4.4.1 Multiprotocol technology

The device can be used in the following Ethernet protocols:

- PROFINET
- EtherNet/IP
- Modbus TCP
- CC-Link IE Field Basic

The required Ethernet protocol can be detected automatically or determined manually.

Automatic protocol detection

A multiprotocol device can be operated without intervention of the user (which means, without changes in the parameterization) in all of the three Ethernet protocols mentioned.

During the system start-up phase (snooping phase), the module detects which Ethernet protocol requests a connection to be established and adjusts itself to the corresponding protocol. After this an access to the device from other protocols is read-only.

Manual protocol selection

The user can also define the protocol manually. In this case, the snooping phase is skipped and the device is fixed to the selected protocol. With the other protocols, the device can only be accessed read-only.

Protocol-dependent functions

The device supports the following Ethernet protocol-specific features:

PROFINET

- Fast Start Up (FSU), prioritized start-up, only digital I/O channels
- Topology detection
- Address allocation with LLDP
- Media redundancy protocol (MRP)
- S2 redundancy

EtherNet/IP

- QuickConnect (QC), only digital I/O channels
- Device Level Ring (DLR)

Ethernet ports used

Port	Protocol
00022	SFTP
00053	DNS TCP
00067	DHCP
00080	HTTP
00093	PROFINET DCP
00502	Modbus TCP
58554	Turck Services



4.4.2 IO-Link channels

The IO-Link master module TBEN-L...-8IOL has four Class A IO-Link ports (slots C0...C3) and four Class B IO-Link ports (slots C4...C7).

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

Simple IO-Link Device Integration (SIDI)

Turck's Simple IO-Link Device Integration (SIDI) simplifies the handling of IO-Link devices in PROFINET engineering systems. The IO-Link devices are integrated in the GSDML file of the master, which allows the user to select the devices from the device library (for example in TIA Portal) like sub modules on a modular I/O system and integrate them into the project. Plain-text access to all device properties and parameters is possible. IO-Link device-specific data such as measuring ranges, switching points, pulse rates, etc. can be set directly in the engineering system without programming or additional software [**>** 160].



NOTE

Data storage [> 197] is not possible when configuring IO-Link devices with SIDI.

IO-Link-Device-Application

The IO-Link Device Application is a browser-based configuration tool and called from the web server of the IO-Link master module.



NOTE

To be able to call up the IO-Link Device Application, a login to the web server of the IO-Link master is required [> 36].

The IO-Link Device Application allows access to the plain text of all relevant IO-Link device parameters and supports and simplifies the parameterization, commissioning and maintenance of IO-Link devices.

IO-Link device-specific information is made available directly in the IO-Link master. The IODD suitable for the connected IO-Link devices is loaded into the IO-Link master and interpreted by the master. IO-Link events, diagnostics and process data of the IO-Link devices can thus be interpreted directly in the web server of the IOL master according to the specific device. In addition, the IO-Link Device Application provides information on the process data structure and pin assignment of the connected IO-Link devices.



The IO-Link Device Application supports the "Operator", "Maintenance" and "Specialist" user roles specified by the IO-Link specification. The specific access rights for these user roles are defined by the IODD of the IO-Link devices.

START IO-LINK	DOCUMENTATION	N	TURCK Your Global Automation Partner
TBEN-LL-8IOL	IO-LINK -> LOCAL I	/O → PORT 5 - TBIL-M1-16DXP-B	Logout
LOCAL I/O Port 1 - No device Port 2 - No device Port 3 - PS010V-301-2UPN8X-0 Port 4 - Vo device	Read Write Unlind	Specialist Operator Maintenance Specialist Vendor: Turck Device: TBIL-M1	-16DXP-B
Port 4 - No device Port 5 - TBIL-M1-16DXP-B Port 6 - No device	Diagnostics	//O-Hub V01.0031 / 2018-12-12 Vendor Name	© 2018, Werner Turck GmbH Co. & KG TURCK ?
 Port 7 - No device Port 8 - No device 	Observation	Vendor Text Product Name	www.turck.com ? TBIL-M1-16DXP-B ?
	Process data	Product ID Product Text	100000881 ?
	Active events	Serial Number Hardware Revision	V1.0 ?
	Event history	Application-specific Tag	AST from 251457 ?
	Connections	Function Tag	*** ¥##
	Features	Device Status Detailed Device Status	Device is OK (?) There are no Events (?)
English ¥			

Fig. 4: IO-Link Device Application (using the TBEN-LL-8IOL as an example)

4.4.3 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.

4.4.4 Passive safety

Due to the galvanic isolation of load and operating voltage, the design of the devices allows the fault exclusion of voltage carry-over to safely disconnected equipment with a single fault safety of category 3 for safety functions up to Performance Level d. The maximum achievable Safety Integrity Level (SIL CL) is SIL2.

Further technical requirements on other system components for compliance with the respective required performance level or safety integrity level remain unaffected.

4.4.5 Backplane Ethernet Extension Protocol (BEEP)

BEEP (Backplane Ethernet Extension Protocol) is a technology that is available in many digital Turck multi protocol block I/O modules. BEEP allows a network, of up to 33 participants (one controller and 32 devices) or 480 bytes of data, to appear to the PLC as a single device on a single connection using a single IP address.

Detailed information about BEEP can be found in the document "BEEP – Backplane Ethernet Extension Protocol" (ID 100002454).



4.4.6 Turck Field Logic Controller function (FLC ARGEE)

The device supports logic processing via the "Turck Field Logic Controller (FLC ARGEE)" function. This enables the device to implement small to medium-sized control tasks in order to reduce the load of the central controller. The FLCs can be programmed in the ARGEE engineering environment.

The ARGEE programming software can be downloaded free of charge from www.turck.com.

The "SW_ARGEE_Environment_Vx.x.zip" file also contains the documentation for the programming environment as well as the software.

4.5 Possible Ethernet network structures



Fig. 5: Network structure, example 1





Fig. 7: Network structure, example 3



4.5.1 Ethernet daisy chain - max. number of connected modules

Prerequisites:

- Optimized network: only TBEN modules in the daisy chain, no additional switches, no thirdparty devices
- Exchange of pure cyclical process data, no acyclical data

Cycle time	Maximum number of TBEN modules
1 ms	21
2 ms	42



NOTE

Deviations from the specification above may lead to a reduction of possible TBEN modules connected to one daisy chain.



Fig. 8: Daisy chain



5 Installing

5.1 Installing a device in zone 2 and zone 22

The devices can be used in combination with the TB-SG-L (ID 100014865) protective housing set in zone 2 and zone 22.



DANGER

Potentially explosive atmosphere Risk of explosion due to spark ignition Operation in zone 2 or zone 22:

- Only install the device if there is no potentially explosive atmosphere present.
- Observe the requirements for Ex approval.
- Screw on the housing. Use a Torx T8 screwdriver.
- Replace the service window with the supplied Ultem window.
- Place the device on the base plate of the protective housing fasten both together on the mounting plate [> 21].
- Connect the device, [> 25].
- Fit the housing cover and screw on as shown in the following figure. The tightening torque for the Torx T8 screw is 0.5 Nm.



Fig. 9: Installing the device in the TB-SG-L protective housing



5.2 Mounting onto a mounting plate



NOTICE

Mounting on uneven surfaces

- Device damage due to stresses in the housing
- Attach the device to the mounting plate with two M6 screws.
- Attach the module to the mounting surface with two M6 screws. The maximum tightening torque for the screws is 1.5 Nm.
- Optional: Ground the device.





5.3 Outdoor device installation

The device is UV resistant in accordance with DIN EN ISO 4892-2. Direct sunlight may cause material wear and changes in color. The mechanical and electrical properties of the device are not impaired.

• To prevent material wear and color changes: Protect the device from direct sunlight with protective panels.



5.4 Grounding the device

5.4.1 Equivalent wiring diagram and shielding concept



Fig. 11: TBEN-L4-8IOL – equivalent wiring diagram and shielding concept



Fig. 12: TBEN-L5-8IOL – equivalent wiring diagram and shielding concept



5.4.2 Shielding of the fieldbus and I/O level

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



Fig. 13: 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.

I/O level shielding

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.

Fieldbus level shielding

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 module grounding. If the grounding is to be routed via an RC element, the grounding clip must be removed.

In the delivery state, the grounding clip is mounted.



- 5.4.3 Disconnecting the direct grounding of the fieldbus level: removing the grounding clip
 - Use a flat screwdriver to slide the grounding clip forward and remove it.



Fig. 14: Removing the grounding clamp

- 5.4.4 Grounding the fieldbus level directly: inserting the grounding clip
 - Place the grounding clip between the fieldbus connectors by using a screwdriver in such way that the clip contacts the metal housing of the connectors.
 - The shielding of the fieldbus cables is connected to the grounding clip.



Fig. 15: Mounting the grounding clip

- 5.4.5 Grounding the device mounting on a mounting plate
 - For mounting onto a mounting plate: Fix the device with a metal screw through the lower mounting hole.
 - ⇒ The module grounding is connected to the reference potential of the installation via the metal screw.
 - ➡ With mounted grounding clip: The shielding of the fieldbus and the module grounding are connected to the reference potential of the installation.



6 Connecting



NOTICE

Penetration of liquids or foreign objects due to leaking connections Loss of degree of protection IP65/IP67/IP69K possible

- ▶ Tighten M12 male connectors with a tightening torque of 0.6 Nm.
- ▶ Tighten 7/8" male connectors with a tightening torque of 0.8 Nm.
- Only use accessories that guarantee the protection class.
- Provide unused male connectors with suitable sealing or blanking caps. The tightening torque for the M4 screws is 0.5 Nm.

6.1 Connecting a device in zone 2 and zone 22



DANGER

Explosive atmosphere Explosion due to ignitable sparks For use in Zone 2 and Zone 22:

- Only disconnect and connect circuits when there is no potentially explosive atmosphere or when the power supply is switched off.
- Only use connecting cables that are approved for use in potentially explosive atmospheres.
- Use all connectors or seal them with screw caps or blind caps. The tightening torque for the screw caps is 0.5 Nm.
- Observe requirements for Ex approval.



6.2 Connecting the device to Ethernet

For the connection to Ethernet the device has an integrated auto-crossing switch with two 4-pin M12 x 1-Ethernet-connectors. The maximum tightening torque is 0.6 Nm.

Fig. 16: M12 Ethernet connector

- Connect the device to Ethernet according to the pin assignment below.
- Provide unused male connectors with suitable sealing or blanking caps. The tightening torque for the M4 screws is 0.5 Nm.



Fig. 17: Pin assignment Ethernet connectors

6.2.1 Applications with QuickConnect (QC) and Fast Start Up (FSU)

- Do not use crossover cables in applications with QuickConnect (QC) and and Fast Start Up (FSU) applications.
- Connect incoming Ethernet cables to P1.
- Connect outgoing Ethernet cables to P2.



6.3 Connecting the power supply

The device is provided with two 7/8" connectors for connecting the power supply. The plug connectors are 4-pin (TBEN-L4) or 5-pin (TBEN-L5) connectors. V1 and V2 are electrically isolated from each other. The maximum tightening torque is 0.8 Nm.



Fig. 18: TBEN-L4... – 7/8" connector for connecting the power supply

Fig. 19: TBEN-L5... – 7/8" connector for connecting the power supply

- Connect the device to the power supply according to the pin assignment below.
- Provide unused male connectors with suitable sealing or blanking caps. The tightening torque for the M4 screws is 0.5 Nm.



Fig. 20: TBEN-L4... – pin assignment of the power supply connections



Fig. 21: TBEN-L5... – pin assignment of the power supply connections

Connector	Function
X1	Power feed
X2	Continuation of the power to the next node



NOTE

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



6.3.1 Supply concept

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

The I/O-channels are therefore consequently separated into the different potential groups "detachable I/O" (supplied through V2) and "non-detachable" I/O (supplied through V1). This allows a safety shutdown of parts of an installation via emergency-off circuits.

V1 = supply of the module electronics and the respective slots

V2 = supply of the respective connectors (can be switched-off separately)



Fig. 22: Supply TBEN-L...- 8IOL



6.4 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 IO-Link master module.

Class A ports (C0...C3)

Fig. 23: M12 connectors, IO-Link master ports, Class A

• Connect the sensors and actuators to the device according to the pin assignment.



Fig. 24: Pin assignment of IO-Link master ports, Class A, C0...C3

Turck recommends the use of 3-wire cables when connecting:

- pure Class A devices without additional output on pin 2.
- IO-Link devices with additional analog output on pin 2, since an analog signal on pin 2 of the Class A ports can cause interference with IO-Link communication.



Class B ports (C4...C7)

	<u> </u>	Ò	<u>O</u>			
₽₿.		Ö	Ó	Ó		

Fig. 25: M12 connectors, IO-Link master ports, Class B

• Connect the sensors and actuators to the device according to the pin assignment.

-(
$1 \underbrace{\bigcirc 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 4 \end{bmatrix} 3$	$1 = V_{aux}1 (V1) 2 = V_{aux}2 (V2) 3 = GND (V1) 4 = C/Q (V1) 5 = GND (V2)$
C4C7	

Fig. 26: Pin assignment of IO-Link master ports, Class B, C4...C7



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 signals on pin 1, pin 3 and pin 4 at Class B ports.



7 Commissioning

7.1 Adjusting network settings and operation mode



NOTE Changes to network settings and operating mode are only applied after restarting the device.

Adjusting network settings

The network settings can be adapted via three rotary coding switches on the device, via TAS (Turck Automation Suite), the web server, the DTM a DHCP server or PROFINET DCP.

The setting is made during commissioning of the device and is necessary to establish a connection between the PLC and the device.

Configuring the operating mode

The operating mode of the device (Rotary, BootP, PGM-DHCP etc.) can only be adjusted using the decimal rotary coding switches on the device.

7.1.1 Adjusting network settings and operation mode via rotary coding switches

The switches are located under a service window cover together with the SET button.



Fig. 27: Service window

- Open the service window.
- Set the rotary coding switch to the desired mode according to the table below.
- Carry out voltage reset.
- NOTICE! IP65, IP67 or IP69K protection is not guaranteed when the service window above the rotary coding switches is opened. Device damage through penetrating foreign objects or liquids is possible. Tightly close the service window.



Switch positions

The network settings of the device depend on the selected mode. Changes to the settings become active after a voltage reset.

Switch settings 000 and 900 are no operation modes. After each reset of the device to the default values, the setting of an operating mode is necessary.

Switch position	Mode	Description
000	Network reset	The Network reset resets the following the network settings to the default values: IP address: 192.168.1.254 Subnet mask: 255.255.255.0 Gateway: 192.168.1.1
1254	Rotary	In rotary mode (static rotary), the last byte of the IP address can be set manually at the gateway. The other network settings are stored in the non-volatile memory of the gateway and cannot be changed in rotary mode. Addresses from 1254 can be set.
300	BootP	In BootP mode, the network settings are automatically assigned by a BootP server in the network. The subnet mask assigned by the BootP server and the default gateway address are stored non- volatile in the memory of the gateway.
400	DHCP	 In DHCP mode, the network settings are automatically assigned by a DHCP server in the network. The subnet mask assigned by the DHCP server and the default gateway address are stored nonvolatile in the memory of the gateway, DHCP supports three mechanisms for IP address allocation: Automatic address assignment: The DHCP server assigns a permanent IP address to the client. Dynamic address assignment: The IP address assigned by the server is only reserved for a certain period of time. After this time has elapsed or after the explicit release by a client, the IP address is reassigned. Manual address assignment: A network administrator assigns an IP address to the client. In this case, DHCP is only used to transmit the assigned IP address to the client.
500	PGM	In PGM mode, the complete network settings can be assigned manually via TAS (Turck Automation Suite), the DTM or a web server. The data are stored non-volatile in the device.
600	PGM-DHCP	In PGM-DHCP mode, the device is initially a DHCP client and sends DHCP requests until it is assigned a fixed IP address. The DHCP client is automatically deactivated as soon as the device has received an IP address via TAS (Turck Automation Suite), the DTM or the web server. The data are stored non-volatile in the device. In PROFINET: If a DHCP server is used in the network, problems may occur when assigning the IP address, as in this case both the DHCP server and the PROFINET controller (via DCP) attempt to assign the IP address.



Switch position	Mode	Description
701899	Name	The "Name" mode is used to set the DNS name of the device in Ethernet/IP networks. This mode is mainly used for DNS-based addressing in Schneider Electric controllers. The IP address is assigned automatically. The devices are addressed via the prefix "TBEN" and the address set on the rotary coding switches as follows: Switch position 701: TBEN_701
900	Factory reset	 The factory reset resets all settings to the default values: Network setting (IP address, subnet mask, gateway) PROFINET device name Device parameters



7.1.2 Adjusting network settings via TAS (Turck Automation Suite)

In the delivery state the device has the IP address 192.168.1.254. The IP address can be set via TAS (Turck Automation Suite). TAS is available free of charge at www.turck.com.

- Connect the device to a PC via the Ethernet interface.
- Open TAS.
- Click Scan network.

TAS DESKTOP DOC	CUMENTATION	Your Global Automat	DIKK ion Partner
TURCK AUTOMATION SUITE	TAS DESKTOP → VIEW/FEATURE → NETWORK		
VIEW/FEATURE			
Network	Scan network Add device Edit device Change PW FW Update Set clock Global PW Export CSV Import CSV Print Help		
ARGEE	Actions ? Device type/feature ? PN device IP address Adapter address Address mode ? MAC address	Subnet mask/Gateway	Version
BEEP	name · · ·		
Profinet			
Diagnostics			
CODESYS			
O-Link			
₽ M12Plus			

Fig. 28: Home screen in TAS

 \Rightarrow TAS shows the connected devices.

TAS DESKTOP DOC	UMENTATION	TURC Your Global Automati	on Partner
TURCK AUTOMATION SUITE	TAS DESKTOP → VIEW/FEATURE → NETWORK		
VIEW/FEATURE	🔍 🌆 🥒 🔎 🤴 🕓 🐡 🖝 🎝 🚍 ? Scan network Add device Edit device Change PW FW Update Set clock Global PW Export CSV Import CSV Print Help		
ම ARGEE ම BEED	Actions ? Device type/feature ? PN device IP address Adapter address Address mode ? MAC address	Subnet mask/Gateway	Version
ලා BEEP මා Profinet මා Diagnostics මා CODESYS මා IO-Link හි M12Plus	□	255 255 255 0 / 192 168 1.1	1548

Fig. 29: Found devices in TAS

- Select the relevant device (check box).
- Click Edit device.

TAS DESKTOP DOCI	UMENTATION				YOURCEK Your Global Automation Partner
TURCK AUTOMATION SUITE	TAS DESKTOP -> VIEW/FEAT	JRE -> NETWORK			
VIEW/FEATURE	Scan network Add device Edit	Aevice Change PW FW Update Set clock	Global PW Export CSV Import CSV P	🖶 🤗 Irint Help	
්ල් ARGEE බ _{REED}	Actions ?	Device type/feature ? PN device name	IP address Adapter address	Address mode ? MAC address	Subnet mask/Gateway Version
ලා Profinet (මා Diagnostics	☑☺∥∩▫ଓё⊗	BL25-PG-EN-V3 C anargy	<u>192.168.1.254</u> 192.168.1.201	00:07:46:A9:2	7:85 255.255.255.0 / 192.168.1.1
CODESYS					
່ເອງ່ IO-Link 💫 M12Plus					

Fig. 30: Selecting the device in TAS



NOTE By clicking on the IP address of the device, the configuration view of the device can be opened either in TAS or on the device website.



- Change the device name, the IP address and the network mask if necessary.
- Save changes by clicking on **APPLY**.

Edit network settings					
PN device name	ana p				
IP address	192.168.1.254				
Default gateway	192.168.1.1				
Subnet mask	255.255.255.0				
Take care, that the IP address isn't used by any other devices or switches!					

Fig. 31: Changing network settings in TAS



7.1.3 Adjusting network settings via the web server

A login is required to edit settings via the web server. The default password is "password".



NOTE Turck recommends changing the password after the first login for security reasons.

- Open the device's web server.
- Enter **Username** and **Password**.
- Click Login



NOTE

To be able to adjust the network settings via the web server, the device must be in PGM mode.

- Click TBEN-L... \rightarrow Parameter \rightarrow Network.
- Adjust the network settings.
- ▶ Write the changes into the device via SET NETWORK CONFIGURATION.

START IO-LINK	DOCUMENTATION		Your Global Automation Partner
TREN-LL-BOLA	START -> DEVICE -> PARAMETERS		Logout
DEVICE ji Info @ Parameters	Read Write Tab view Print Data format Network Network		~
Co Diagnostics A	MAC address Addressing mode	00:07:46:ff:a9:97 PGM-DHCP ?	
 ↓¹ Ex-/Import Change password <u> </u>	Addressing method IP address Netmask	DHCP 192.168.145.124 255.255.255.0	
لOCAL I/O ر	Default gateway SNMP Public Community	0.0.0. public	
℃ Diagnostics <u>∧</u>	Set network configuration SNMP Private Community LLDP status	SET NETWORK CONFIGURATION ?	
🕐 Output ji) Info	LLDP MAC address 1 LLDP MAC address 2	00:07:46	
	Fieldbus configuration Deactivate Modbus TCP	no 🗸	*
English 🗸			

Fig. 32: Web server - adjusting network settings


7.2 Commissioning the device in PROFINET

7.2.1 Device Model

The TBEN-L...-8IOL has eight parameterizable IO-Link channels, which can also be used as digital channels in SIO mode, and 8 universal I/O channels (DXP).

In addition to that, five virtual slots are provided via GSDML in PROFINET. Those channels are used to map the different diagnostic and status (IO-Link and VAUX diagnostics, IO-Link-Events, module status) data into the master's process image .



NOTE

The GSDML file also contains a one-slot device for the use of devices in engineering environments that are optimized for the use of devices with few slots (e.g. DeltaV).

BEN-L8IC	EN-L8IOL_V16 → Ungrouped devices → turck-tben-II-8iol [TBEN-LL-8IOL] _ L = 🗕 🗡						
			🚆 Topolo	gy view	🔒 Netv	vork view 🛛 🕅 De	evice view
Dev	ice overview						
- Y	Module	Rack	Slot	I address	Q address	Туре	Article no.
	 turck-tben-ll-8iol 	0	0			TBEN-LL-8IOL	100003910
	PN-IO	0	0 X1			turck-tben-ll-8iol	
	LL-Basic_1	0	Basic			LL-Basic	
	IN 32 BYTE (Octet)_1	0	IO-Link Port 1			IN 32 BYTE (Octet)	
	FS+ (FS100-300L-30-2UPN8	0	IO-Link Port 2			FS+ (FS100-300L-3	
	CMVT-QR20-IOLX3-xxxx (IS	0	IO-Link Port 3			CMVT-QR20-IOLX3	
_	B2N360-Q42 (DI)_1	0	IO-Link Port 4			B2N360-Q42 (DI)	
4	VMPAL-EPL-IPO32_1	0	IO-Link Port 5 (Class B)			VMPAL-EPL-IPO32	
	IN 2 WORD/OUT 2 WORD_1	0	IO-Link Port 6 (Class B)			IN 2 WORD/OUT 2	
-	DF-G2-KD-xx_1	0	IO-Link Port 7 (Class B)			DF-G2-KD-xx	
	IN 16 BIT/OUT 16 BIT_1	0	IO-Link Port 8 (Class B)			IN 16 BIT/OUT 16 BIT	
	LL-Diagnostics_1	0	Diagnostics			LL-Diagnostics	
	IO-Link Events_1	0	IO-Link Events			IO-Link Events	
	LL-VAUX control 16CH_1	0	VAUX control			LL-VAUX control 1	
	Device status_1	0	Device status			Device status	
<			111				

Fig. 33: TBEN-L...-8IOL – slot overview in TIA-Portal (example)

Slot	Data
Basic	Data of the DXP channels and data valid signal
IO-Link-port	IO-Link ports for the configuration with specific IO-Link devices or for generic configuration
Diagnostics	One slot each for diagnostics and status
IO-Link Events	
VAUX Control	_
Device status	Module status, status-word of the device



7.2.2 Address setting in PROFINET

In IP-based communication, the field devices are addressed by means of an IP address. PROFINET uses the Discovery and Configuration Protocol (DCP) for IP assignment.



NOTE

DCP is a standard protocol and can also be used outside PROFINET, e.g. in IPC operating systems (Windows, Linux). DCP is available in tool packages such as WinPcap, Npcap, Wireshark etc.

When delivered, each field device has, among other things, a MAC address. The MAC address is sufficient to give the respective field device a unique name.

The address is assigned in two steps:

- Assignment of a unique plant specific name to the respective field device
- Assignment of the IP address from the IO-Controller before the system start-up based on the plant-specific (unique) name

PROFINET naming convention

The names are assigned via DCP. The device name is checked for correct spelling during input. The following rules apply to the use of the device name in accordance with PROFINET specification V2.3.

- All device names must be unique.
- Maximum name size: 240 characters Allowed:
 - Lower case letters a...z
 - Numbers 0...9
 - Hyphen and dot
- The name may consist of several components separated by a period. A name component, i.e. a string between two dots, may be a maximum of 63 characters long.
- The device name must not start or end with a hyphen.
- The name must not begin with or "port-xyz" (y...z = 0...9).
- The name must not have the form of an IP address (n.n.n.n, n = 0...999).
- Do not use special characters.
- Do not use capital letters.



7.2.3 FSU – Fast Start-Up (prioritized startup)

FSU enables a PLC to build up connections to PROFINET nodes in less than 500 ms after switching-on the network power supply (V1). The fast start-up is necessary for fast tool changing applications at robot arms for example in the automobile industry.



NOTE

For the correct cabling in FSU applications please observe the note in the chapter "Connecting the Device to Ethernet" [> 26].

Fast Start Up (FSU) TBEN

The TBEN-L...-8IOL supports the prioritized start-up (FSU). After FSU has been completed, only the process data for the digital I/O channels (pin 2) of C0...C7 are available. IO-Link communication is set up according to the IO-Link standard mechanisms.

Activating FSU

In order to enable FSU, the fieldbus nodes have to be configured respectively, for example in TIA-Portal (Siemens).

Auto negotiation:

deactivated

Transmission medium/duplex: Set to a fixed value

- During configuration, please observe that the neighboring devices do also support FSU and that the settings for the ports of neighboring devices are identical.
- Set "Transmission rate/duplex" to a fix value.
- Deactivate auto-negotiation

						a lop	ology view	Network view	Device view	
De	vice overview									
- Y	Module		Rack	Slot	l address	Q address	Туре	Article no.	Firmware	
	 turck-tben-l4-8iola 	3	0	0			TBEN-L4-8IOLA	100028459	SWV 1.7	
	PN-IO		0	0 X1			turck-tben-l4-8iola			
4	Basic_1		0	Basic	3942	56	Basic			
1	Li1000P0-Q25L (0	DI)_1	0	IO-Link Port 1			Li1000P0-Q25L (DI)			
-	B2N360-Q42_1		0	IO-Link Port 2	209212		B2N360-Q42			
	RU40U-M18E-LIU2	PN8X2T	0	IO-Link Port 3	213214		RU40U-M18E-LIU2			
	TBIL-M1-16DXP_1		0	IO-Link Port 4	215216	2930	TBIL-M1-16DXP			
	4WRPEH10-3X_1		0	IO-Link Port 5	217219	3133	4WRPEH10-3X			
									>	
General PROFINET interface [X1] General Activate										
Ethe Adva	rnet addresses nced options terface options	I A	ctivate th	is port for use						
M	edia redundancy	Conn	ection							
► Re	eal time settings									
▼ Po	ort 1 [X1 P1 R]		Transmission rate / duplex:			TP 100 Mbps full duplex				
General						Monitor				
Port interconnection			Enable autoregotiation							
Port options										
Port 2 [X1 P2 R]										
	Identification & Maintenance									

Fig. 34: TIA-Portal – port-settings for FSU

• Activate the prioritized start-up at the I/O device.



7.2.4 MRP (Media Redundancy Protocol)

The device supports MRP. MRP is a standardized protocol according to IEC 62439. It describes a mechanism for media redundancy in ring topologies. With MRP, a defective ring topology with up to 50 nodes is detected and reconfigured in the event of an error. With MRP a trouble-free switch-over is not possible.

A Media Redundancy Manager (MRM) checks the ring topology of a PROFINET network defined by the network configuration for functionality. All other network nodes are Media Redundancy Clients (MRC). In the error-free state, the MRM blocks normal network traffic on one of its ring ports, with the exception of the test telegrams. The physical ring structure thus becomes a line structure again at the logical level for normal network traffic. If a test telegram fails to appear, a network error has occurred. In this case, the MRM opens its blocked port and establishes a new functioning connection between all remaining devices in the form of a linear network topology.

The time between ring interruption and recovery of a redundant path is called reconfiguration time. For MRP, this is a maximum of 200 ms. Therefore, an application must be able to compensate for the 200 ms interruption. The reconfiguration time always depends on the Media Redundancy Manager (e.g. the PROFINET PLC) and the I/O cycle and watchdog times set here. For PROFINET, the response monitoring time must be selected accordingly > 200 ms.

It is not possible to use Fast Start-Up in an MRP network.

7.2.5 User data for acyclic services (IO-Link)

The acyclic data exchange is by using via Record Data CRs (Communication Relation). Via these Record Data CRs the reading and writing of the following services is realized:

- Writing of AR data (AR = Application Relation)
- Writing of configuration data
- Reading and writing of device data
- Reading of diagnostic data
- Reading of I/O data
- Reading of Identification Data Objects (I&M functions)

Acyclic device user data

Index		Name	Data type	Access	Comment
Dec.	Hex.				
1	0x01	Module parameters	WORD	read/ write	Parameter data of the module (slot 0)
2	0x02	Module designation	STRING	read	Designation assigned to the module (slot 0)
3	0x03	Module revision	STRING	read	Firmware revision of the module
4	0x04	Vendor ID	WORD	read	Vendor ID for Turck
5	0x05	Module name	STRING	read	The device name assigned to the module
6	0x06	Module type	STRING	read	Device type of the module
7	0x07	Device ID	WORD	read	Device ID of the module
823	0x08 0x17	reserved	-	-	-
24	0x18	Module diagnostics	WORD	read	Diagnostic data of the module (slot 0).
2531	0x19 0x1F	reserved	-	-	-
32	0x20	Input list	ARRAY of BYTE	read	List of all module input channels
33	0x21	Output list	ARRAY of BYTE	read	List of all module output chan- nels
34	0x22	Diag. list	ARRAY of BYTE	read	List of all I/O-channel dia- gnostics
35	0x23	Parameter list	ARRAY of BYTE	read	List of all I/O-channel paramet- ers
36 28671	0x24 0x6FFF	reserved	-	-	-
28672	0x7000	Module parameters	WORD	read/ write	Activate fieldbus protocol
28673 45039	0x7001 0xAFEF	reserved	-	-	-
45040	0xAFF0	I&M0-functions		read	Identification & Maintaining
45041	0xAFF1	I&M1-functions	STRING[54]	read/ write	I&M Tag function and location



Index		Name	Data type	Access	Comment
45042	0xAFF2	I&M2-functions	STRING[16]	read/ write	I&M Installation Date
45043	0xAFF3	I&M3-functions	STRING[54]	read/ write	I&M Description Text
45044	0xAFF4	I&M4-functions	STRING[54]	read/ write	I&M Signature
45045 45055	0xAFF5 0xAFFF	I&M5 to I&M15- functions		-	Not supported

Acyclic I/O channel user data

Index		Name	Data type	Access	Comment
Dec.	Hex.				
1	0x01	Module parameters	specific	read/ write	Parameters of the module
2	0x02	Module type	ENUM UINT8	read	Contains the module type
3	0x03	Module version	UINT8	read	Firmware version of I/O channels
4	0x04	Module ID	DWORD	read	Module ID of the I/O
59	0x05 0x09	reserved	-	-	-
10	0x0A	Controller version	UINT8 array [8]	read	
1118	0x0B 0x12	reserved	-	-	-
19	0x13	Input data	specific	read	Input data of the respective I/O-channel
2022	0x14 0x16	reserved	-	-	-
23	0x17	Output data	specific	read/ write	Output data of the respective I/O-channel
		reserved	-	-	-



Index Dec.	Hex.	Name	Data type	Access	Comment
247	0xF7	CAP 1	Record	read/ write	Client access point for class 1 masters
248	0xF8	CAP 2	Record	read/ write	_
249	0xF9	CAP 3	Record	read/ write	_
250	0xFA	CAP 4	Record	read/ write	
251	0xFB	CAP 5	Record	read/ write	-
252	0xFC	CAP 6	Record	read/ write	-
253	0xFD	CAP 7	Record	read/ write	-
254	0xFE	CAP 8	Record	read/ write	-
255	0xFF	CAP 9	Record	read/ write	Client access point for class 2 masters



7.2.6 The IO-Link function block IOL_CALL

The IO-Link function block IOL_CALL is specified in the IO-Link specification "IO-Link Integration Part 1- Technical Specification for PROFIBUS and PROFINET".



Fig. 35: IOL_CALL in accordance with IO-Link specification



NOTE

Depending on the controller manufacturer, the function blocks may deviate from the specification, e.g. in the representation and use of the variables used (example: Siemens function block IO_Link_Device for TIA Portal). For more information, refer to the documentation of the respective controller manufacturer.

Function block IOL_CALL – input variables

The following description of the function block variables is partially taken from the IO-Link specification.

Name in accordance with IO-Link specification	Data type	Meaning
REQ	BOOL	$0 \rightarrow 1 \rightarrow 0$: Send command
ID	DWORD	 Address of the IO-Link master module Siemens CPU 300, 400 (PROFIBUS/PROFINET): Start address of the input data of the IO-Link master module 3S CODESYS: Slot number of the IO-Link master Siemens CPU 1200, 1500 (PROFIBUS/ PROFINET): Hardware identifier of the IO-Link master module Siemens CPU 300, 400 (PROFIBUS/PROFINET): Start address of the input data of the IO-Link master module
ITFMODULE	DWORD	Device name of the IO-Link master
INDEX_CAP	INT	Function block instance: 247254, 255
RD_WR	BOOL	0: Write access 1: Write access
ENTITY_PORT	INT	Address of the IO-Link port to be accessed.
FI_INDEX	INT	Constant value (65098): Defines the access as IO- Link function block IOL_CALL
IOL_INDEX	INT	Number of the IO-Link index which has to be read or written
IOL_SUBINDEX	INT	Number of the IO-Link sub index which has to be read or written



Name in accordance with IO-Link specification	Data type	Meaning
LEN	INT	Length of the data to be read or written
RECORD_IOL_DATA		Source or destination for the data to be read/written

Function block IOL_CALL: output variables

The following description of the function block variables is partially taken from the IO-Link specification.

Name in accordance with IO-Link specification	Data type	Meaning
DONE_VALID	BOOL	0: Command was not executed. 1: Command was executed.
BUSY	BOOL	0: Command is currently not executed. 1: Command is currently executed.
ERROR	BOOL	0: No error present 1: Error while reading or writing.
STATUS	DWORD	Communication error status: status of the acyclic communication [> 45]
IOL_STATUS	DWORD	IO-Link error message: Error in the communication between IO-Link master ad IO-Link device [> 46]
LEN	INT	Length of the read data

IOL_CALL – communication error status

The status of the acyclic communication contains 4 byte and is structured as follows:

Byte 3		Byte 2	Byte 1	Byte 0		
Manufacturer specific identifier (not always applicable)		0×80 Specifies the error as an error of acyclic communication.	Error code/ status code	Vendor specific identifier (not always applicable)		
Status Code	Name	2	Meaning			
0xFF000000	TIME	OUT	Internal error in the co	ommunication with the		
0x00FFF00	INVA	LID_HANDLE	module			
0x00FFFE00	HANDLE_OUT_OF_ BUFFERS		_			
0x00FFFD00	HANDLE_DESTINATION_ UNAVAILABLE		_			
0x00FFFC00	HAN	DLE_UNKNOWN	_			
0x00FFFB00	HANDLE_METHOD_ INVALID					
0xXX80A0XX	MAS	TER_READ_ERROR	Error while reading			
0xXX80A1XX	MASTER_WRITE_ERROR		Error while writing			
0xXX80A2XX	MASTER_MODULE_ FAILURE		Failure of the IO-Link master, bus failure possible			
0xXX80A6XX	MAS	TER_NO_DATA	No data received			
0xXX80A7XX	MAS	TER_BUSY	IO-Link master busy			



Status Code	Name	Meaning
0xXX80A9XX	MASTER_FEATURE_NOT_ SUPPORTED	Function not supported by IO-Link master.
0xXX80AAXX	MASTER_RESOURCE_ UNAVAILABLE	IO-Link master not available.
0xXX80B0XX	ACCESS_INVALID_INDEX	Index invalid, wrong INDEX_CAP used
0xXX80B1XX	ACCESS_WRITE_ LENGTH_ERROR	Length of data to be written can not be handled from the module, wrong module accessed.
0xXX80B2XX	ACCESS_INVALID_ DESTINATION	Wrong slot accessed
0xXX80B03XX	ACCESS_TYPE_CONFLICT	IOL_CALL invalid
0xXX80B5XX	ACCESS_INVALID_INDEX	Error in IOL_CALL sequence
0xXX80B6XX	ACCESS_DENIED	IOL-Link master module refuses the access.
0xXX80C2XX	RESOURCE_BUSY	The IO-Link master module is busy or is
0xXX80C3XX	RESOURCE_UNAVAILABLE	waiting for an answer of the connected IO-Link device.
0xXX8901XX	INPUT_LEN_TOO_SHORT	The index to be read contains more data than defined in the input variable "LEN".

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-Erro	or-Code		IOL-Error Type							
IOL_M Error Code	Designations specifications and the second s	on acc. to on	Meaning							
0x0000	No error		No erro	or						
0x7000	IOL_CALL	Conflict	Unexp	ected write-request, r	ead request expected					
0x7001	Wrong IOI	CALL	Decod	ing error						
0x7002	Port block	ed	The ac	cessed port is occupie	ed by another task					
	reserved									
0x8000	Timeout		Timeout, IOL master or IOL device port busy							
0x8001	Wrong inc	lex	Error: IOL index < 32767 or > 65535 selected							
0x8002	Wrong po	rt address	Port address not available							
0x8003	Wrong po	rt function	Port function not available							
•••	reserved									
IOL Error Type	Designation specification	acc. to	Meanin	Ig						
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_T	IMEOUT	Timeou in time	imeout in communication, device does not respond						



IOL Error Type	Designation acc. to specification	Meaning
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 or 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 above upper limit
0x8032	PAR_VALLTLIM	Parameter value value below the lower limit
0x8033	VAL_LENOVRRUN	Length of data to be written does not match the
0x8034	VAL_LENUNDRUN	length defined for this parameter
0x8035	FUNC_NOTAVAIL	Function not available in the device
0x8036	FUNC_UNAVAILTEMP	Function 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	



7.3 Connecting the devices to a PROFINET controller with TIA Portal

The following example describes the connection of the devices to a Siemens PLC in PROFINET by means of the programming software SIMATIC STEP7 Professional V15 (TIA-Portal).

Used hardware

The following hardware components are used in this example:

- Siemens PLC S7-1500
- IO-Link master TBEN-L...-8IOL with the following configuration:
 - Port 1: Turck temperature sensor, TS700-..., IO-Link V1.1
 - Port 2: Channel used as DI
 - Port 3: Turck linear position sensor, Li100P0-Q25LM0-..., IO-Link V1.0
 - Port 4: Channel used as DI
 - Port 5: Channel used as DI
 - Port 6: Turck IO-Link hub: TBIL-M1-16DXP, IO-Link V1.1
 - Port 7: Turck ultra sonic sensor, RU130U-M18E-..., IO-Link V1.1
 - Port 8: Turck ultra sonic sensor, B2N360-Q42-..., IO-Link V1.1

Used Software

The following software tools are used in this example:

- SIMATIC STEP7 Professional V15 (TIA-Portal)
- GSDML file for TBEN-L...-8IOL (can be downloaded for free as ZIP archive "TBEN-L_PROFINET.zip" under www.turck.com)

Prerequisites

- The software is started.
- A new project has been created.
- The controller has been added to the project.



7.3.1 Installing the GSDML-file

The GSDML file is available for free at www.turck.com.

- ► Adding the GSDML file: Click **Options** → **Manage general station description files (GSD)**.
- ▶ Installing the GSDML file: Define the source path for the GSDML-file and click Install.
- ⇒ The device is added to the hardware catalog.

Manage general station description files				×
Installed GSDs GSDs in the project				
Source path: C:\Users\\Downloads\TBEN-L_PROFINET				
Content of imported path				
File	Version	Language	Status	
GSDML-V2.35-Turck-TBEN_L45N-20190301-010500.xml	V2.35	English, Ger	Not yet instal	~
GSDML-V2.35-Turck-TBEN_L45P-20190301-010500.xml	V2.35	English, Ger	Not yet instal	
GSDML-V2.35-Turck-TBEN_L45_8IOL-20190228-010709.xml	V2.35	English, Ger	Not yet instal	
				≡
				~
			>	
	Delet	e Insta	I Cance	

Fig. 36: TIA Portal: Installing the GSDML-file



7.3.2 Connecting the devices to the PLC

- Select the device from the Hardware catalog and drag it into the Device & networks editor.
- Connect the devices to the PLC in the **Devices & networks** editor.

<u>P</u> roject <u>E</u> dit <u>V</u> iew <u>Insert</u> <u>O</u> nline O	otio <u>n</u> s <u>T</u> ools <u>W</u> indow <u>H</u> elp	Totally Integrated Automation
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Devices	😴 Topology view 🛛 🛔 Network view 🔢 Device view	Options
	🕞 Network 🔡 Connections HM connection 🔽 📅 🗮 🖽 🔲 💽 🛨	5
ž l		H Catalog
The TBEN-BIOL TIA V15	+ to system. PLC_T.Phon NET To System (100)	
Add new device		
😤 🚠 Devices & networks	PLC_1 turck-tben-I5-8	Filter Profile: <all></all>
PLC_1 [CPU 1511-1 PN]	CPU 1511-1 PN TEEN-L5-8IOL	Controllers
👌 🕨 🔚 Ungrouped devices	PLC_1	▶ 🛅 HMI
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Display/hide interfaces		Field devices
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Display more information		PROFINET IO
PANGP Virtual Ethernet Ada		Drives
Realtek USB GbE Family Con.		Encoders
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	In Dentes and	

Fig. 37: Connecting the device to the PLC



7.3.3 Assigning the PROFINET device name

- ► Select Online access → Online & diagnostics.
- Functions \rightarrow Assign PROFINET device name.
- Assign the desired PROFINET device name with **Assign name**.

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Devices										8
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Fig. 38: TIA-Portal: Assigning the PROFINET device name



7.3.4 Setting the IP address in TIA Portal

- Select **Device view** \rightarrow register **Properties** \rightarrow **Ethernet addresses**.
- Assign the desired IP address.

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Fig. 39: TIA-Portal: Assigning the IP address



7.3.5 Configuring device functions

The TBEN-L...-8IOL appears as a modular device with twelve empty virtual slots. Slots 0 and **Basic** are pre-configured.

The function of the twelve empty slots is already defined in the GSDML file. The slots can only be used for a specific purpose.

Slot		Meaning						
0		Main module tben-l8iol (Defaultname) Parameterization of functions (protocol deactivation, etc.), which are valid for the whole module.						
	XI	Parameterization of PROFINET functions (MRP, etc.)						
	X1 P1	Parameterization of the Ethernet port properties (topology, connection						
	X1 P2	ptions etc.).						
Basic		Parameters/diagnostics for the DXP-channels of the device (DXP 1, 3, 5 and 7) and Data Valid Signal from the IO-Link ports.						
IO-Link port	:18	Configuration of the eight IO-Link ports						
Diagnostics		Optional mapping of the diagnostics (IO-Link and DXP-diagnostics) into the master's process image.						
IO-Link Ever	nts	Optional mapping of the IO-Link events into the master's process image.						
VAUX Control		Optional mapping of the VAUX diagnostics into the master's process image.						
Module stat	us	Optional mapping of the module status into the masters process image.						

Configuring the IO-Link ports (example)

IO-Link port (hardware)	Process data length	IO-Link device	GSDML entry
Port 1	2 Byte IN	Turck temperature sensor, TS700	Port configuration generic: IN 1 WORD
Port 2	1 Bit IN	-	DI
Port 3	2 Byte IN	Turck linearity sensor, LI100P0-Q25LM0	Port configuration specific: LI100P0-QU25L
Port 4	2 Byte IN 2 byte OUT	Turck I/O hub, TBIL-M1-16DXP	Port configuration specific: TBIL-M1-16DXP
Port 5	1 Bit IN	-	DI
Port 6	1 Bit IN	-	DI
Port 7	1 Bit IN	Turck ultrasonic sensor, RU40U-M18E	Port configuration specific: RU40U-M18E-LIU2PN(DI) The IO-Link port is configured as digital input.
Port 8	4 Byte IN	Turck inclinometer, B2N360-Q42	Port configuration specific: B2N360-Q42-E2LIUPN8X2



- Select Device view \rightarrow Device overview.
- Select functions as operation mode, diagnostics Diagnostics etc. from the hardware catalog and add them to the device slots via drag&drop.

Project Edit View Ins	Project Edit View Insert Online Options Tools Window Help Totally Integrated Automation PORTAL										
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ຼ 🖼 📃 🖻	Device	overview			Harc						
Vork		Module	Rack	Slot	✔ Catalog						
TBEN-SIOL_T		 turck-tben-I5-8iol 	0	0	<search></search>						
Add new		PN-IO	0	0 X1	Filter Profile: Alls T a						
Devices		Basic_1	0	Basic	Port configuration specific						
O Image: PLC_1 [C Image: Second se		IN 1 WORD_1	0	IO-Link Port 1							
		DI_1	0	IO-Link Port 2	B2N360-042 (DI)						
Security s		Li1000P0-Q25L_1	0	IO-Link Port 3							
Unassig	3	EZ-Array Family IO-Link_1	0	IO-Link Port 4							
Common	i i i i i i i i i i i i i i i i i i i	DI_3	0	IO-Link Port 5 (Class B)	EZ-Array Family (O-Link						
Docume	, ice	TBIL-M1-16DXP_1	0	IO-Link Port 6 (Class B)	EZ-Array Family IO-Link						
Languag	8	RU130U-M18E-LIU2PN8X2T	0	IO-Link Port 7 (Class B)							
Online access		B2N360-Q42_1	0	IO-Link Port 8 (Class B)							
Card Reader/		Diagnostics_1	0	Diagnostics							
		IO-Link Events_1	0	IO-Link Events							
		VAUX control_1	0	VAUX control							
		Module status_1	0	Module status							
✓ Details view											
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		🖳 Properties 🛛 🗓 Inf	o 追	🔋 Diagnostics 🔤 🗖 🗏 🔺	> Information -						
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Fig. 40: TIA-Portal: Configuring device slots



Setting IO-Link port parameters

In generic port configuration, the ports of the IO-Link master can be operated in IO-Link mode with different configuration as well as in SIO mode (DI).

In specific port configuration, the IO-Link ports receive the parameters from the GSDML-file. Parameters like for example Operation mode, Data storage mode, Vendor- and Device ID cannot be changed.

- ► Select **Device view** → **Device overview**.
- Select the device to be parameterized.
- Click Properties \rightarrow General \rightarrow Module parameters.
- Set the device parameters.

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Online & diagnostics	ă	DI_1	0	IO-Lin			DI			
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Technology objects		IBIL-MT-T6DXP_	0	IO-Lin	9293	6/	IBIL-MT-T6DXP			
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Online backups	General	uu							<u>^</u>	
Traces	Hardware	interrupts	Module parameters							
Device proxy data	Module pa	rameters								
Program info	I/O addres	ses								
PLC supervisions & alarms				Operatio	n mode:	IO-Link without validation				
PLC alarm text lists				Data storag	e mode:	deactivated	l, clear			
PLC 1 [CPU 1511-1 PN]			•	Cy	le time:	automatic				
 Distributed I/O 			-	, i	evision:	automatic				
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✓ Details view			activate diac	nostics:	notification	s and warnings				
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Fig. 41: TIA-Portal: parameterizing generic IO-Link devices



7.3.6 Connecting the device online with the controller

- Start the online mode (Go online).
- ⇒ The device has been successfully connected to the PLC.



Fig. 42: TIA-Portal: Online mode

7.3.7 PROFINET – mapping

The PROFINET mapping corresponds to the data mapping described in the sections "Process Input Data" [> 186] and "Process Output Data" [> 188].



7.3.8 Using the IO_LINK_DEVICE function block in TIA Portal

The IO_LINK_DEVICE function block is based on the IOL_CALL function block according to the IO-Link specification.

BEN-	Save project 📑 🐰 8IOL_TIA_V15 → PLC1	॥ 🛅 🗙 🎝 ± (२) I [CPU 1511-1 PN] →	• 🔂 🚺 🖬 🖢	🛛 🙀 🂋 Go s 🕨 IO-Link	online 💋 Go [FB1]	offline	2 12 12	* - 1	<search< th=""><th>in project> 🛛 🖬</th><th>i</th><th>PORT</th><th>TAI</th></search<>	in project> 🛛 🖬	i	PORT	TAI
∲ ≝ IO-) 🕞 ± 🔩 📰 🖓	i ± 😥 🍋 📞 🦛 🤅	a 📬 😵 🗲 E	三部「	1 IP 91	či 🖗						E	1
	Name	Data type	Default value	Retain	Accessible .	. Writa	Visible in	Setpoint	Supervi	Comment			
	 Input 												1
	 <hinzufügen></hinzufügen> 				-								
-	▼ Output												
	436 437 // IO-Link Devi	ice											1
	437 // IO-Link Devi	ice											
	438	Instance Bl/DEO	"TO-Link Data	" "DEO Song	or 1"				"TO-Lin	k Doto"	1DPF		
	440	TD :=	"TO-Link Data"	"TD Sensor	1".				"TO-Lin	nk Data"	*DB5		
	440	CAP ::	= "IO-Link Data	"."CAP Sens	or 1".				"TO-Lin	nk Data"	*DB5		
	442	RD WR	:= "IO-Link Da	ta"."RD WR	Sensor 1".				"IO-Lin	nk Data"	*DB5		
-	443	"PORT	" := "IO-Link D	ata". "PORT	Sensor 1".			÷.	"IO-Lin	nk Data"	%DB5		
1	444	IOL II	WDEX := "IO-Lin	k Data"."IO	L INDEX Sens	or 1",		1	"IO-Lin	nk Data"	%DB5		1
5	445	IOL ST	JBINDEX := "IO-	Link Data".	"IOL SUBINDE	X Sensor	1",	•	"IO-Lin	uk Data"	%DB5		
۲	446	LEN :	= "IO-Link Data	"."LEN Sens	or 1",			•	"IO-Lin	uk Data"	*DB5		
	447	DONE '	WALID => "IO-Li	nk Data"."D	ONE Sensor 1	",		•	"IO-Lin	nk Data"	*DB5		
	448	BUSY	> "IO-Link Dat	a"."BUSY Se	nsor 1",			•	"IO-Lin	nk Data"	*DB5		1
	449	ERROR	=> "IO-Link Da	ta"."ERROR	Sensor 1",			•	"IO-Lin	uk Data"	%DB5		
	450 STATUS => "IO-Link Data"."STATUS Sensor 1", IO-Link Data"								%DB5				
	451 IOL_STATUS => "IO-Link Data"."IOL_STATUS Sensor 1",								%DB5				
	452 RD_LEN => "IO-Link Data". "RD_LEN Sensor 1", IO-Link Data" %D								%DB5				
	453 RECORD_IOL_DATA := "IO-Link Record"."RECORD_IOL_DATA_SENSOR 1");												
	454												
	ASS DATO LINK DEVICE	Thetence D2/DEO	"TO-link Dete	" "DEO Sene	or 2"	100			"TO_Tin	19 INS 1000	2DR5		
1			Ш					2	n. 437 G.	19 1145 1100%	•		-
									🔍 Pro	operties 🔼	Info 🛛 😨 Diagnostic	s i i i i	

Fig. 43: Example call of Siemens FB "IO_LINK_DEVICE"



NOTE

The access to the port 0 functions of the IO-Link master with an IOL_INDEX of 65535 is not possible with version V3.0.2 of the Siemens IO_LINK_DEVICE block. In TIA Portal \geq V15, the original IOL_CALL function block can also be used to access the Port 0 functions.



Example accesses with IO_LINK_DEVICE

In this example, the watch table **Sensor1** serves to visualize the procedure of the read and write access via IO_LINK_DEVICE. The assignment of the SPDU-indices of IO-Link devices can be found in the respective device documentation.

The function block access to the device an the connected sensors is done via the input variable **ID**. The value which has to be set as ID depends on the used CPU:

Example:

HW identifier of the Basic slot (slot 1), for example with CPU 1511-PN (used in this example)
 Start address of the input data of the IO-Link master e.g. with CPU 315



Fig. 44: Hardware identifier: Basic slot of the TBEN-L...-8IOL in the example

Example read access - read product name

Reading out the product name (product name, index 0x12) of the TURCK IO-Link I/O-hub TBIL-M1-16DXP at IO-Link port 4.

• Write the input variables of the function block via **control variable** as follows:

Variable	Value	Meaning
REQ	TRUE	Send a read request
ID	264	Hardware identifier of the Basic slot according to the configuration in the Device view
CAP	251	Function block instance
Port	4	The I/O hub TBIL-M1-16DXP is connected to port 4.
IOL_INDEX	0x12	Index for product name

TB	EN TIA_V15 → PLC1 [CPU 1511-1 PN] →	Watch a	nd force table	s → Sensor 1			_ I	
	🔮 🕪 🌜 🝠 🖧 🐯 😋							
	i Name	Address	Display format	Monitor value	Modify value	4	Comment	
1	"IO-Link Daten"."REQ Sensor 1"		Bool	FALSE	FALSE			~
2	"IO-Link Daten"."DONE Sensor 1"		Bool	FALSE				
3	"IO-Link Daten"."BUSY Sensor 1"		Bool	FALSE				
4	"IO-Link Daten"."ERROR Sensor 1"		Bool	FALSE	FALSE			
5								
6	"IO-Link Daten"."ID Sensor 1 "		DEC 💌	264	264			
7	"IO-Link Daten"."CAP Sensor 1"		DEC	251	251			
8	"IO-Link Daten"."LEN Sensor 1"		DEC	232	232			=
9	"IO-Link Daten"."PORT Sensor 1"		DEC	4	4			
10	"IO-Link Daten"."IOL_INDEX Sensor 1"		Hex	16#0012	16#0012			
11	"IO-Link Daten"."IOL_SUBINDEX Sensor 1"		DEC	0				
12	"IO-Link Daten"."RD_WR Sensor 1"		Bool	FALSE	FALSE			
13	"IO-Link Daten"."RD_LEN Sensor 1"		DEC	13	13			
14								
15	"IO-Link Daten"."STATUS Sensor 1"		Hex	16#0000_0000				
16	"IO-Link Daten"."IOL_STATUS Sensor 1"		Hex	16#0000_0000				
17	"IO-Link Daten"."RD_LEN Sensor 1"		DEC	13				
18								
19	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
20	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
21	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
22	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
23	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
24	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
25	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
26	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
27	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
28	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
29	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
30	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
31	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					
32	"IO-Link Record"."RECORD_IOL_DATA_SE		Character					*
	<							>

Fig. 45: IO_LINK_DEVICE – input variables for read access



• Activate the read access via a rising edge at **REQ**.

TBE	BEN· TIA_V15 → PLC1 [CPU 1511-1 PN] → Watch and force tables → Sensor 1 🖷 🗮 🗙										
1	🥐 🌆 🥠 🐔 🌮 🚏 🖤										
	i Name	Address	Display format	Monitor value	Modify value	4	Comment				
1	"IO-Link Daten"."REQ Sensor 1 "		Bool 💌	🔳 TRUE	TRUE	🗹 🔼	$0 \Rightarrow 1$ start CALL	^			
2	"IO-Link Daten"."DONE Sensor 1"		Bool	TRUE							
3	"IO-Link Daten"."BUSY Sensor 1"		Bool	FALSE							
4	"IO-Link Daten"."ERROR Sensor 1"		Bool	FALSE	FALSE						
5											
6	"IO-Link Daten"."ID Sensor 1"		DEC	264	264						
7	"IO-Link Daten"."CAP Sensor 1"		DEC	251	251			_			

Fig. 46: IO_LINK_DEVICE – activate read access

➡ In this example, the result of this request can be seen in the watch table (row 19 and following) in the IO-Link Record.

Name	Address	Display format	Monitor value	Modify value	4		Comment	
"IO-Link Daten"."REQ Sensor 1"		Bool		TRUE	Í 🖂	٨	0 ⇒ 1 start CALL	
"IO-Link Daten"."DONE Sensor 1"		Bool			Ā	_		
"IO-Link Daten"."BUSY Sensor 1"		Bool	FALSE					
"IO-Link Daten"."ERROR Sensor 1"		Bool	FALSE	FALSE				
"IO-Link Daten"."ID Sensor 1"		DEC	264	264				
"IO-Link Daten"."CAP Sensor 1"		DEC	251	251				
"IO-Link Daten"."LEN Sensor 1"		DEC	232	232				
"IO-Link Daten"."PORT Sensor 1"		DEC	4	4 .				
"IO-Link Daten"."IOL_INDEX Sensor 1"		Hex	16#0012	16#0012				
"IO-Link Daten"."IOL_SUBINDEX Sensor 1"		DEC	0					
"IO-Link Daten"."RD_WR Sensor 1"		Bool	FALSE	FALSE				
"IO-Link Daten"."RD_LEN Sensor 1"		DEC	13	13		▲		
"In Link Detern" "CTATUS Servers 1"		Linu	1/#0000.0000					
"IO-Link Daten I. SIAIUS Sensor I		Hex	16#0000_0000					
"IO-Link Daten : IOL_SIAIUS Sensor I		Hex	16#0000_0000					
IO-LINK Daten : KD_LEN Sensor I		DEC	15	_				
"IO-Link Record"."RECORD_IOL_DATA 🔳		Character 💌	'T'	\$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	'B'	\$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	4	' \$00'	Ē			
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	10 I	' \$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	9	' \$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	'M'	' \$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	'1'	\$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	Q	' \$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	'1'	' \$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	'6'	\$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	'D'	' \$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	'X'	\$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	'P'	' \$00'				
"IO-Link Record"."RECORD_IOL_DATA_SE		Character	16#00	'\$00'				

Fig. 47: IO_LINK_DEVICE – product name TBIL-M1-16DXP



Example access write - rotate display

The display of the Turck - temperature sensor TS700 at IO-Link Port 1 is rotated. The parameter **Rotation of display** in index 91 is set to 0x01 = Rotated by **180**°.

	Information	
Variable id	V_DISPLAY_ROT	
Variable name	Rotation of Display	
Index	91	
Description	The display can be rotated b	y 180°.
Default value	Not Rotated	
Data tuno	UntogokT	ರ್ಧ್ಯ-
	Bit length	8 bit
	Access rights	ReadWrite
	Raw values	Not Rotated: 0 Rotated by 180°: 1

Fig. 48: Extract from the IODD of TS700-... in IODD viewer



- Write the input variables of the function block via **control variable** as follows.
- Activate the write access in the function block via **RD_WR Sensor 1**= TRUE.

Variable	Value	Meaning
REQ	TRUE	Send a write request
ID	264	Hardware identifier of the Basic slot according to the configuration in the Device view
CAP	251	Function block instance
LEN	1	Length of the data to be written in byte
Port	1	The temperature sensor TS700 is connected to port 1.
IOL_INDEX	0x5B	Index (91) for Rotation of display

TE	BENTIA_V15 → PLC1 [CPU 1511-1 PN] →	Watch a	ind force tabl	es 🕨 Sensor 1				∎∎×
2	🔮 🕪 🐌 🝠 🗞 🕫 嘴							
	i Name	Address	Display format	Monitor value	Modify value	4	Comment	
1	"IO-Link Daten"."REQ Sensor 1"		Bool	FALSE	FALSE			^
2	"IO-Link Daten"."DONE Sensor 1"		Bool	FALSE				
з	"IO-Link Daten"."BUSY Sensor 1"		Bool	FALSE				
4	"IO-Link Daten"."ERROR Sensor 1"		Bool	FALSE	FALSE			
5								
6	"IO-Link Daten"."ID Sensor 1" 🔋		DEC 💽	264	264	Image: A state of the state	1	
7	"IO-Link Daten"."CAP Sensor 1"		DEC	251	251	- I 🗹 🧕	Δ.	_
8	"IO-Link Daten"."LEN Sensor 1"		DEC	1	1	- I 🗹 🤳	Δ.	=
9	"IO-Link Daten"."PORT Sensor 1"		DEC	1	1	- I 🗹 🤳	1	
10	"IO-Link Daten"."IOL_INDEX Sensor 1"		Hex	16#005B	16#005B	Image: A state of the state		
11	"IO-Link Daten"."IOL_SUBINDEX Sensor 1"		DEC	0			_	
12	"IO-Link Daten"."RD_WR Sensor 1"		Bool	TRUE	TRUE			
13	"IO-Link Daten"."RD_LEN Sensor 1"		DEC	0	1			
14								
15	"IO-Link Daten"."STATUS Sensor 1"		Hex	16#0000_0000				
16	"IO-Link Daten"."IOL_STATUS Sensor 1"		Hex	16#0001_0000				
17	"IO-Link Daten"."RD_LEN Sensor 1"		DEC	0				
18								
19	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
20	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
21	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
22	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
23	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
24	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
25	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
26	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
27	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
28	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
29	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
30	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
31	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			
32	"IO-Link Record"."RECORD_IOL_DATA_SE		Hex	16#00	16#00			*
	<							>

Fig. 49: IO_LINK_DEVICE – input variables for read access



Set the value to be written **0x01** via the first word of IO-Link Record in the watch table.

TBEN	TIA_V15 → PLC1 [CPU 1511-1 PN] → Wa	itch and force table	es 🕨 Sensor 1			_ 12 1	١X
-							
22							
i	Name Ad	dress Display format	Monitor value	Modify value	- 4	Comment	
1	"IO-Link Daten"."REQ Sensor 1"	Bool 💌	FALSE	FALSE		0 → 1 start CALL	^
2	"IO-Link Daten"."DONE Sensor 1"	Bool	FALSE				
3	"IO-Link Daten"."BUSY Sensor 1"	Bool	FALSE				
4	"IO-Link Daten"."ERROR Sensor 1"	Bool	FALSE	FALSE			
5							
6	"IO-Link Daten"."ID Sensor 1"	DEC	264	264			
7	"IO-Link Daten"."CAP Sensor 1"	DEC	251	251			=
8	"IO-Link Daten"."LEN Sensor 1"	DEC	1	1			-
9	"IO-Link Daten"."PORT Sensor 1"	DEC	1	1			
10	"IO-Link Daten"."IOL_INDEX Sensor 1"	Hex	16#005B	16#005B			
11	"IO-Link Daten"."IOL_SUBINDEX Sensor 1"	DEC	0				
12	"IO-Link Daten"."RD_WR Sensor 1"	Bool	TRUE	TRUE			
13	"IO-Link Daten"."RD_LEN Sensor 1"	DEC	0	1			
14							
15	"IO-Link Daten"."STATUS Sensor 1"	Hex	16#0000_0000				
16	"IO-Link Daten"."IOL_STATUS Sensor 1"	Hex	16#0001_0000				
17	"IO-Link Daten"."RD_LEN Sensor 1"	DEC	0				
18						-	
19	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#01	16#01	🗹 🔁 📥		
20	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
21	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
22	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
23	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
24	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
25	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
26	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
27	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
28	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
29	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
30	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
31	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			
32	"IO-Link Record"."RECORD_IOL_DATA_SE	Hex	16#00	16#00			~
<							>

Fig. 50: IO_LINK_DEVICE - control value 0x01 for index 0x5B

• Activate the Write access via a rising edge at REQ.

ТВ	BEN TIA_V15 → PLC1 [CPU 1511-1 PN] → Watch and force tables → Sensor 1 🔲 🗮 🗙										
Í	' 🕐 🛽	🗲 🇓 🝠 1 76 🌮 🖺 🖤 🖤									
	i	Name	Address	Display format	Monitor value	Modify value	9	Comment			
1		"IO-Link Daten"."REQ Sensor 1"		Bool 💌	TRUE	TRUE	A A	$0 \Rightarrow 1 \text{ start CALL}$	^		
2	["IO-Link Daten"."DONE Sensor 1"		Bool	TRUE						
З		"IO-Link Daten"."BUSY Sensor 1"		Bool	FALSE						
4		"IO-Link Daten"."ERROR Sensor 1"		Bool	FALSE	FALSE					
5											
6		"IO-Link Daten"."ID Sensor 1"		DEC	264	264					
7		"IO-Link Daten"."CAP Sensor 1"		DEC	251	251			_		

Fig. 51: IO_LINK_DEVICE – activate read access

⇒ The sensor display is now 180° rotated.



7.4 Commissioning the devices in Modbus TCP

7.4.1 Implemented Modbus functions

The devices support the following functions for accessing process data, parameters, diagnostics and other services.

Function Cod	e
3	Read Holding Registers – reading multiple output registers
4	Read Input Registers – reading multiple input registers
б	Write Single Register – writing single output register
16	Write Multiple Registers – writing multiple output
23	Read/Write Multiple Registers – reading and writing multiple registers

7.4.2 Modbus registers

Address	Access	Meaning
0x00000x01FF	read only	Process data of the inputs (identical to registers 0x8000 0x8400)
0x08000x09FF	read/write	Process data of the outputs (identical to registers 0x90000x9400)
0x10000x100B	read only	Module identifier, contains the first 24 characters of the device type
0x100C	read only	Module status
0x1017	read only	Register mapping revision (always 2, if not, mapping is incompatible with this description)
0x1020	read only	Watchdog, actual time in ms
0x1120	read/write	Watchdog, predefined time in ms (default: 500 ms
0x1130	read/write	Modbus Connection Mode Register
0x1131	read/write	Modbus Connection Timeout in s. (default: 0 = never)
0x113C0x113D	read/write	Modbus Parameter Restore (reset of parameters to default values)
0x113E0x113F	read/write	Modbus Parameter Save (permanent storing of parameters)
0x1140	read/write	Deactivate protocol Deactivates explicitly the selected Ethernet protocol: Bit 0 = deactivate EtherNet/IP Bit 1 = deactivate Modbus TCP Bit 2 = deactivate PROFINET Bit 15 = deactivate web server
0x1141	read/write	Active protocol Bit 0 = EtherNet/IP active Bit 1 = Modbus TCP active Bit 2 = PROFINET active Bit 15 = web server active
0x1150	read only	LED behavior (PWR) at V2 undervoltage Bit 0: 0 = red 1 = green flashing
0x2400	read only	V1 in mV: 0 at undervoltage



Address	Access	Meaning
0x2401	read only	V2 in mV: 0 at undervoltage
0x80000x8400	read only	Process data of the inputs (identical to registers 0x0000 0x01FF)
0x90000x9400	read/write	Process data of the outputs (identical to registers 0x08000x09FF)
0xA0000xA400	read only	Diagnostics
0xB0000xB400	read/write	Parameters

The following table shows the register mapping for the different Modbus addressing methods:

Description	Hex	Decimal	5 digit	Modicon
Process data of the inputs	0x00000x01FF	0511	4000140512	400001400512
Process data of the outputs	0x08000x09FF	20482559	4204942560	402049402560
Module identifier	0x10000x1006	40964102	4409744103	404097404103
Module status	0x100C	4108	44109	404109
Watchdog, actual time	0x1020	4128	44129	404129
Watchdog, predefined time	0x1120	4384	44385	404385
Modbus connection mode register	0x1130	4400	44401	404401
Modbus connection timeout in s	0x1131	4401	44402	404402
Modbus Parameter Restore	0x113C0x113D	44124413	4441344414	404413404414
Modbus Parameter Save	0x113E0x113F	44144415	4441544416	404415404416
Deactivate protocol	0x1140	4416	44417	404417
Active protocol	0x1141	4417	44418	404418
LED behavior (PWR) at V2 undervoltage	0x1150	4432	44433	404433
V1 in mV	0x2400	9216	49217	409217
V2 in mV	0x2401	9217	49218	409218
Process data inputs	0x8000, 0x8001	32768, 32769	-	432769, 432770
Process data outputs	0x9000, 0x9001	36864, 36865	-	436865, 436866
Diagnostics	0xA000, 0xA001	40960, 40961	-	440961, 440962
Parameters	0xB000, 0xB001	45056, 45057	-	445057, 445058



Register 0x1130: Modbus connection mode

This register defines the behavior of the Modbus connections.

Bit	Designation	Value	Meaning
0	MB_OnlyOneWrite	0	All Modbus connections receive the write authorization.
	Permission	1	Only one Modbus connection can receive the write per- mission. A write permission is opened until a disconnect. After the disconnect the next connection which requests a write access receives the write authorization.
1	1 MB_ImmediateWrite Permission		With the first write access, a write authorization for the respective Modbus connection is requested. If this request fails, an exception response with exception-code 0x01 is generated. If the request is accepted, the write access is executed and the write authorization remains active until the connection is closed.
		1	The write authorization for the respective Modbus connection is already opened during the connection establishment. The first Modbus connection thus receives the write authorization, all following connections do not (only if bit 0 = 1).
215	Reserved	-	-

Register 0x1131: Modbus connection timeout

This register defines after which time of inactivity a Modbus connection is closed through a disconnect.

Value range: 0...65535 s

default: 0 s = never (Modbus connection will never be closed)

Behavior of the BUS LED

If Modbus is the active protocol in case of a connection timeout and no further Modbus connections exist, the BUS LED behaves as follows:

Connection timeout	BUS LED
Timeout	Green flashing

Register 0x113C and 0x113D: Restore Modbus connection parameters

Registers 0x113C and 0x113D serve for resetting the parameter-register 0x1120 and 0x1130 to 0x113B to the default settings. The service resets the parameters without saving them.

Procedure:

- ▶ Write 0x6C6F to register 0×113C.
- To activate the reset of the registers, write 0x6164 ("load") within 30 seconds in register 0x113D. Both registers can also be written with one single request using the function codes FC16 and FC23.
- ⇒ The parameters are reset to default values.
- Save changes via a subsequent Save service.



Register 0x113E and 0x113F: Save Modbus connection parameters

Registers 0x113E and 0x113F are used for the non-volatile saving of parameters in registers 0x1120 and 0x1130 to 0x113B.

Procedure:

- ▶ Write 0x7361 to register 0×113E.
- Write 0x7665 ("save") within 30 seconds in register 0x113F to activate the reset of the registers. Both registers can also be written with one single request using the function codes FC16 and FC23.
- \Rightarrow The parameters are saved.

7.4.3 Data width

Module	Process input data	Process output data	Alignment
TBEN-L8IOL	344 byte	260	word by word



7.4.4 Register mapping

Register	gister Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
		-1		N	/ISB			_				L	SB			
									1	Input dat	a					
0x0000		Process input data														
0x00xx		[▶ 186]														
		Module status														
0x00xx	see status- and control word															
+ 1 re-	[▶ 192]															
gister																
										Output da	ata					
0x0800		Process output data														
0x08xx										[▶ 188]						
										Diagnosti	cs					
										[▶ 192]						
0xA000									DXP cl	nannel dia	gnostic	5				
0xA001									IO-Link	channel o	diagnosi	S				
0xA09																
										Paramete	rs					
										IO-Link Ba	sic					
0xB000	-	-	-	-	-	-	-	-	DXP7_ SRO	-	DXP5_ SRO	-	DXP3_ SRO	-	DXP1_ SRO	-
0xB001	-	-	-	-	-	-	-	-	DXP7_	-	DXP5_	-	DXP3_	-	DXP1_	-
									EN DO		EN DO		EN DO		EN DO	
									l.	O-Link poi	rt 1					
0xB002	Сус	le tir	ne						GSD	Activate Quick Start-Up	Data st mode	orage	Mode			
0xB003	-	-	-	-	-	-	-	-	Mappir	ng	Mappir	ng	Deactiv	vate	PDIN	Rev.
				_					PCDO	1	PDIN		diag.	1	Invalid	
0xB004 0xB005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0xB006										Vendor II	D					
0xB007 0xB008										Device II)					
0xB009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	IO-Link port 2								1							
0xB00A 0xB011	8 registers parameter data, assignment similar to port 1															
										O-Link poi	rt 3					
0xB012 0xB019	8 registers parameter data, assignment similar to port 1															



Register	Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
						-			IC	D-Link po	rt 4					1
0xB01A 0xB021	8 registers parameter data, assignment similar to port 1															
		IO-Link port 5														
0xB022 0xB029	8 registers parameter data, assignment similar to port 1															
									IC	D-Link po	rt 6					
0xB02A 0xB031	8 registers parameter data, assignment similar to port 1															
	IO-Link port 7															
0xB032 0xB039						8 re	giste	rs pa	rameter	data, assig	gnment	similar	r to port	1		
									IC	D-Link po	rt 8					
0xB30A 0xB041	8 registers parameter data, assignment similar to port 1															
									VAL	JX1 monit	toring					
0xB042	-	-	-	-	-	-	VAUX1 pin1 C1 (ch2/3)		-	-	-	-	-	-	VAUX C0 (ch	1 pin1 0/1)
0xB043	-	-	-	-	-	-	VAL pin ²	JX1 1 C3 5/7)	-	-	-	-	-	-	VAUX1 pin1 C2 (ch4/5)	
0xB044	-	-	-	-	-	-	VAU pin (ch1	JX1 1 C5 1 0)	-	-	-	-	-	-	VAUX1 pin1 C4 (ch8)	
0xB045	-	-	-	-	-	-	VAUX1 pin1 C7 (ch14)		-	-	-	-	-	-	VAUX1 pin1 C6 (ch12)	
0xB046 0xB047	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
									VAL	JX1 monit	toring					
0xB048	-	-	-	-	-	-	VAUX2 pin2 C5 (ch11)		-	-	-	-	-	-	VAUX2 C4 (ch	2 pin2 9)
0xB049	-	-	-	-	-	-	(ch11) VAUX2 pin2 C7 (ch15)		-	-	-	-	-	-	VAUX2 pin2 C6 (ch13)	



7.4.5 Error behavior (watchdog)

Behavior of outputs

In case of a failure of the Modbus communication, the outputs' behavior is as follows, depending on the defined time for the Watchdog (register 0x1120):

Watchdog	Behavior of outputs
0 ms	All outputs maintain the actual value in case of an error
> 0 ms (default = 500 ms)	Outputs switch to 0 after the watchdog time has expired (setting in register $0x1120$).



NOTE

Setting the outputs to predefined substitute values is not possible in Modbus TCP. Eventually parameterized substitute values will not be used.

Behavior of the BUS LED

When the watchdog triggers, the BUS LED lights up red.

Behavior of the device in case of loss of Modbus communication

If Modbus is the active protocol and all Modbus connections are closed, the watchdog switches all outputs to "0" after the watchdog time has expired, unless another protocol (PROFINET, EtherNet/IP) has been activated in the meantime.



7.5 Connecting devices to a Modbus Client with CODESYS

Naming convention

Turck uses the terms "Modbus client" and "Modbus server" according to Modbus Organization. The following description uses the terms "Modbus TCP Master" (client) and "Modbus TCP Slave" (server) only because of the naming in CODESYS.

Used hardware

The following hardware components are used in this example:

- TX715-P3CV01 (IP address: 192.168.145.72)
- Block module TBEN-L...- (IP address: 192.168.145.200)

Used software

The following software tools are used in this example:

CODESYS 3.5.18.2 (can be downloaded for free under www.turck.com).



7.5.1 Connecting the device to the PLC

The following components have to be added to CODESYS first, in order to connect the device to the PLC.

- Ethernet adapter
- Modbus TCP client (in CODESYS: Modbus TCP Master)
- Modbus TCP server (in CODESYS: Modbus TCP Slave)

Adding the Ethernet Adapter

- Right-click **Device** in the project tree **TX715-P3CV01**.
- Select Add Device.
- Select Ethernet Adapter.
- Click Insert device.
- ⇒ The Ethernet Adapter is added to the project tree as Ethernet (Ethernet).

TBEN.project* - CODESYS	- 0	×
File Edit View Project Build Onlin	M Add Device	×
Perices ■ 700 Perices	Name: Ethernet Action: Action: Action: Plug device Update device	
🖻 🗊 Device (TX715-P3CV01)	String for a fulltext search Vendor: <all vendors=""></all>	~
PLC Logic Application ImagePool PLC PRG (PRG) PLC _PRG (PRG) Watabase Automation PLC _PRG (PRG) PLC _PRG (PRG	Name Vendor Version Description Image: Second Secon	^
ー・一・ PLC_PRG ロー・参 VISU_TASK 一・一・ VISUElems.Visu_Prg 一・ TextList 単 観 Visualization Manager		~
Uisualization	Image: State	
	Append selected device as last child of Device (You can select another target node in the navigator while this window is open.)	
2 Devices POUs	Add Device Clos	e
	Last build: 😳 0 🕐 0 Precompile: 🗸 🚰 Project user: (nobody)	0

Fig. 52: Adding the Ethernet Adapter


Adding the Modbus TCP Master

- Right-click the **Ethernet (Ethernet)** in the project tree.
- Select Add Device.
- Double-click Modbus TCP Master.
- ⇒ The **Modbus_TCP_Master** is added to the project tree.

TBEN.project* - CODESYS		– 🗆 X
File Edit View Project Build Online Debug	ff Add Device	×
1 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Name Modbus_TCP_Master Action Action Contract device Contrac	
Devices TERV Device (TX715+93CV01) Device	Append device Insert device Plug device Update device String for a full text search Vendor Name Vendor Image: String for a full text search Vendor Image: Modbus TCP Master Jose Sector Image: Modbus TCP Master Image: Modbus TCP Master	Version Description 4.1.0.0 A device the ated versions en.) evice Close
	Lasi build: 🤤 U 🦁 U Precomplie: 🗸 Project user: (,nobody) 🔰 🤃

Fig. 53: Adding the Modbus TCP Master



Adding the Modbus TCP Server (Slave)

- Right-click the **Modbus TCP Master** in the project tree.
- Select Add Device.
- Double-click Modbus TCP Slave.
- ⇒ The **Modbus_TCP_Slave** is added to the project tree.

Add Device Modbus_TCP_Slave_1 Action: Action: Append device O Insert device O Plug		×
Name: Modbus_TCP_Slave_1 Action: Append device O Insert device O Plug		
	device 🔘 Update device	
String for a fulltext search	Vendor: <all vendors=""></all>	~ C
Fieldbuses Fieldbuses Modbus Group by category Display all versions (3S - Smart Software Solutions GmbH 4.1.0.0	A
(You can select another target node in the	e navigator while this window is open.) Add Device Cl	ose
	Append device Insert device Plug String for a fulltext search Name Image: Fieldbuses Image: Fieldbuses <th>Actual:</th>	Actual:

Fig. 54: Adding the Modbus TCP Slave



7.5.2 Configuring the Network Interface

- Click Device \rightarrow Scan network.
- Select Modbus TCP Master (here: TX715-P3CV01) and confirm with OK.

🎓 тв	EN.project* - COI	DESYS				_	
File	Edit View	Project Build Online	Debug Tools	Window Help			₹
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Devices			→ ‡	X Device X			-
	TBEN			Communication Sal	tinga Scan networ	k Gateway - Device	*
8.	Device (TX715	P3CV01)		Communication Se	ungs	outenay bende	
	PLC Logic	Select Device					×
	Im	Select the network path	to the controller:				
	- 🎁 Lib	Gateway-1			Device Name:	▲ Scan networ	/k 📃 🔛
	PL	- 🚹 TX715-P3C	V01 [0301.B048]		TX715-P3CV01	Wink	
	🖃 🎇 Ta			•	Device Address: 0301,8048	With	G
					Block driver		
	-				UDP		
					Number of channels:		
	E 👪 Vis				4		
	Uis				AA00012MH000079339AA		
	🖻 👚 Ethernet (F				Target ID:		
	🗏 🚹 Modbu	6			10CD 0209		
					Target Name:		
					4096		
						~	
San :	D DOLL	Hide non-matching de	evices, filter by Targe	t ID		OK Canc	el 🗸
2 Devi	ces IL POUS				Descending 4	D. (.) (.)	
				Last Dulid: 🤮 U 😗 Ü	Precomplie: V	Project user: (nobody)	V:

Fig. 55: Configuring the network interface



- Double-click Ethernet.
- Open the dialog box Network Adapter by clicking the Browse... button in the register tab General.
- Select the interface TX715-P3CV01 (here: 192.168.145.72)

TBEN-L.project* - CODESYS					— [) ×				
File Edit View Project Build Online	Debug 1	ools Window	Help			₹				
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Devices •		Device	j Ethernet X			•				
Even Device Connected (TV715 D3CV01)	Ge	eneral								
				Network Interface	ethu	Browse				
	St	atus		IP address	192 . 168 . 147 . 199					
ImagePool	-	harrat Davias I/O	Magning	Subnet mask	255 . 255 . 255 . 0					
👘 Library Manager		nemet Device 1/0	марріпд							
PLC_PRG (PRG)	Network A	dapters				^				
Task Configuration	Interfaces:	:								
⊟∵©≊ MainTask	Name	Description	IP Address							
	lo		127.0.0.1							
UsuElems, Visu Pro	eth0		192.168.145.72							
TextList	eth1		0.0.0.0							
🗉 📲 Visualization Manager	eth2		0.0.0.0							
Visualization										
Ethernet (Ethernet)				_						
Modbus_TCP_Master (Modbus TCP Ma	IP Addres	s 192 .	168 . 145 . 72	2						
Modbus_TCP_Slave (Modbus TCP	Subnet Ma	ask 255 .	255 . 255 . 0							
	Default G	ateway 0	0.0.0							
	MAGAIN	00.07	40.05.00.00							
	MAC Add	ess 00:07:	46:25:09:30							
					OK	ancel				
<					UN V					
Sevices POUs	<					>				
	Last build:	000 P	recompile: 🗸	ഫ	Project user: (nobody)	Ø				

Fig. 56: Selecting the interface



7.5.3 Modbus TCP Server (Slave): setting the IP address

- Double click Modbus TCP Server (Slave).
- Enter the slave IP address in the General register tab (here: 192.168.145.200).

TBEN.project" - CODESYS			~
File Edit View Project Build Online Debug	Tools Window Help		₹
🎦 🚅 🔚 🎒 い 🖂 🌾 🛍 🖄 🕍 🌿		🎬 端 ଔ 🕞 📲 🔏 Ç= 🤊	현 백 왕 수 麗 류 🏷
Devices - 🖵 🗙	Modbus_TCP_Slave X		•
TBEN V			
🖮 🗊 Device (TX715-P3CV01)	General	Modbus-TCP	
PLC Logic	Modbus Slave Channel	Slave IP Address:	192 . 168 . 145 . 200
🖻 🧔 Application		Descent Transit (ma)	1000
ImagePool	Modbus Slave Init	Response Timeout (ms):	1000
		Port:	502
	ModbusTCPSIave Parameters		
A MainTask	ModbusTCPSlave IEC Objects		
PLC_PRG	· · · · · · · · · · · · · · · · · · ·		
SU_TASK	Status		
VisuElems.Visu_Prg	Information		
TextList			
Visualization Manager			
		-	
Modbus_TCP_Master (Modbus TCP Master)			
Modbus_TCP_Slave (Modbus TCP Slave)			
			×
			2
	Last build: 😳 0 😗 0 🛛 F	Precompile: 🗸 Pro	oject user: (nobody) 🛛 💔 🔡

Fig. 57: Modbus TCP Slave: Setting the IP address



7.5.4 Defining modbus channels

Defining channel 0 (input data)

- Double click Modbus TCP Slave.
- ▶ In the register tab select Modbus Slave Channel → Add Channel.
- Enter the following values: Channel name Access type: Read Input Registers Offset: 0x0000 Length: 1 register
- Confirm with OK.

TBEN.project* - CODESYS								- 🗆	×
File Edit View Project Build Online	Debug Tools V	Vindow Help							₹
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	/ Modbus_TCP_SI	ave X							•
□ - □ 7EEV □ - □ Device (TX715-P3CV01) □ - 테 PLC Logic	General		Name Access Type	Trigger	READ Offset	Length	Error Handling	WRITE Offset	Len
G Application	Modbus Slave Channel								
ImagePool	Modbus Slave Init	ModbusChannel	4			×			
PLC_PRG (PRG)	ModbusTCPSIave Par	Channel Name	Inputs]					
⊂ 🍪 MainTask	ModbusTCPSlave IEC	Access Type	Read Input Registers (Function	on Code 4)		\sim			
Service Transk	Status	Trigger	Cyclic ~	Cycle Time ((ms) 100				
TextList	Information	Comment							
🕀 🖶 Visualization Manager		READ Register							
Uisualization		Offset	0x0000			~			
Ethernet (Ethernet)		Length	1						
Modbus_TCP_Slave		Error Handling	Keep last Value V						
		WRITE Register	r						
		Offset				\sim			
		Length	1						
< >>					ок	ancel	Add Channe	el Dele	:te
😰 Devices 🗋 POUs	<								>
			Last build: 📀	0 🕐 0 🛛 Pre	ecompile: 🗸		Project user: (no	body)	()

Fig. 58: Defining the input register



Defining channel 1 (output data)

- Double click Modbus TCP Slave.
- ▶ In the register tab select Modbus Slave Channel → Add Channel.
- Enter the following values: Channel name Access type Write Single Register Offset: 0x0800 Length: 1 register
- Confirm with OK.

TBEN.project* - CODESYS								- 0	×
File Edit View Project Build Onlir	ne Debug	Tools Wir	ndow	Help					T
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Devices – 4 ×	Modb	ous_TCP_Slav	/e X						•
E- TBEN									
Device (TX715-P3CV01)			Name	Access Type	Trigger	READ Offset	Length	Error Handling	WRITE C
PLC Logic	inel	0 1	Inputs	Read Input Registers (Function Code 04)	Cyclic, t#100ms	16#0000	1	Keep last Value	
Application ImagePool	Modb	usChannel			×				
Library Manager	Char	nnel							
PLC_PRG (PRG)	aram Nam	ie	Outputs						
🖻 🌃 Task Configuration	Acce	ass Tupe	Meite Cie	ala Daciatar (Eurotian Cada 6)					
🖻 💖 MainTask	'O Ma	as type	write air	gie Register (i direttori code o)					
PLC_PRG	Trig	ger	Cyclic	Cycle Time (ms)	100				
VISU_TASK	Com	nment							
TextList	REAL	D Register							
😟 📑 Visualization Manager	Offs	et			~				
Visualization	Lend	ath	1						
Ethernet (Ethernet)	E Cong	- 1.1	*						
Modbus_TCP_Slave (Modbus	Erro	r Handling	Keep last	: value 🗸					
	WRI	TE Register —							
	Offs	et	0x0800		~				
	Leng	oth	1						
			-						>
				OK	Cancel	Add Channel	Del	ete Eo	dit
POUs	<	_	_				_		>
				Last build: 😮 0 🕐	0 Precompile:	/	Project use	er: (nobody)	()

Fig. 59: Defining the output data register



7.5.5 Going online with the PLC

- Select the device.
- Click Online \rightarrow Login.

TBEN.project* - CODESYS										- 0	×
File Edit View Project Build	On	ine Debu	ig Tools	Window	Help						₹
🎦 🖆 🔚 🕌 🗠 여 🐰 🖻 💼	2 ⁰ 8	Login			Alt+F8	11	🗄 🞯 🥬 ,	🔲 👋 ÇE 🦻	1 da +1 \$		≓ ∿
	0ğ	Logout			Ctrl+F8						
Devices		Create Bo	ot Applicati	on							•
- TBEN	1	Download									
🗐 🗊 Device (TX715-P3CV01)		Online Ch	ange				-Modbus-TCF				
PLC Logic		Source Do	wnload to (Connected I	Device		Slave IP A	ddress:	192 . 168	. 145 . 200	0
Application		Multiple [ownload				Pasponsa	Timeout (ms):	1000		
Library Mapager		Reset War	m			-	Response	mileout (ms).	1000		
PLC_PRG (PRG)		Reset Cold	1				Port:		502		
🖻 🔣 Task Configuration		Reset Orig	in								
🗏 🗳 MainTask		Simulatio	1								
		Security			•						
VISU_TASK	s	Operating	Mode		•	-					
	~	Assian Se	ver Applica	tions on Do	wnload	-					
🖲 📑 Visualization Manage	er 🛄	//asign be	Info	mation							
			1110	inderen .							
Ethernet (Ethernet)	odbus T	(CP Master)									
Modbus_TCP_Slave	(Modbu	s TCP Slave)					1				
<			>								
Revices POUs			<				[L				>
				Last bui	ld: 🗿 0 🕐 0	Pr	ecompile: 🗸	Pro	oject user: (nobo	dy)	0
	_					_					

Fig. 60: Login

- Download the application to the PLC and start it via **Debug** \rightarrow **Start**.
- ⇒ The Modbus TCP communication is setup.



Fig. 61: Modbus TCP communication



7.5.6 Reading process data

The process data can be interpreted by means of the mapping (Register Mapping) if the device is connected to the PLC.

- Double click Modbus TCP Slave.
- Click onto register tab Modbus TCP Slave I/O Mapping.
- Set the function Always update variables to Enabled 1 (...).
- ⇒ The process data are displayed.



Fig. 62: Process data



7.6 Commissioning the devices in EtherNet/IP

7.6.1 Common EtherNet/IP features

Features	Description
QuickConnect	Yes (only digital channels, no IO-Link)
Device Level Ring (DLR)	Yes
Number of TCP connections	3
Number of CIP connections	10
Input assembly instance	103, 120, 121, 122, 123,124, 125
Output assembly instance	104, 150, 151, 152
Configuration assembly instance	106

7.6.2 EDS files and catalog files

The EDS and catalog files can be downloaded free of charge from www.turck.com.

TBEN-L_ETHERNETIP.zip

7.6.3 QuickConnect (QC)

The devices support QuickConnect. The maximum start-up times defined for QuickConnect are, however, only guaranteed for the digital channels.

QuickConnect enables a PLC to build up connections to EtherNet/IP nodes in less than 500 ms after switching-on the power supply for the EtherNet/IP network. The fast start-up is necessary for fast tool changing applications at robot arms for example in the automobile industry.

QuickConnect can be activated via the web server of the device, via Configuration Assembly (e.g. in RS Logix or via Class Instance Attribute.



NOTE

Activating QuickConnect activated the automatic setting of all necessary port properties.

Port property	Status	
Auto negotiation	Deactivated	
Transmission speed	100BaseT	
Duplex	Full duplex	
Тороlоду	Linear	
AutoMDIX	Deactivated	

For information on the correct connection of Ethernet cables in QuickConnect applications, please refer to the chapter Connecting [> 26].

Activating QuickConnect via Configuration Assembly

The Configuration Assembly is part of the device's Assembly Class.

- Configure the Configuration Assembly in RS Logix.
- Activate QuickConnect via byte9, bit 0 = 1 in the Controller Tags.



Activating Quick Connect via Class Instance Attribute

Activate Quick Connect via Class Instance Attribute as follows:

Class	Instance	Attribute	Value
0xF5	0x01	0x0C	0: deactivated (default) 1: activated

Activating QuickConnect via the Webserver.

Activate the checkbox Activate QuickConnect in the web server.

START DOCUMENTA	TION		YOURCH Your Global Automation Partner
TBEN-		START ->	DEVICE -> PARAMETERS
DEVICE ① Info ③ Parameters	Read Write Tab view Print Data format Deactivate PROFINET	no	7
C Diagnosis	Deactivate CC-Link Fieldbus Deactivate WEB server Ethernet Port 1 Ethernet Port 2	no v no v 100 Mbps, full-duplex v 100 Mbps, full-duplex v	0 0 0
Firmware	EtherNet/IP configuration Activate GW Control Word	yes 🗸	0
LOCAL I/O <u>අ</u> ලි Parameters (V _P Diagnosis <u>r</u>	Activate QuickConnect	NO YES	ן •
ی Input	QuickConnect-Status Modbus TCP configuration Activation write permission Write permission Modbus connection timeout Watchdog time PROFINET configuration	enable with first write access all connections o s 500 ms	
	Device name		?

Fig. 63: Activating QuickConnect in the web server

7.6.4 Device Level Ring (DLR)

The devices support DLR (Device Level Ring). The DLR redundancy protocol is used to increase the stability of EtherNet/IP networks.

DLR-enabled devices have an integrated switch and can thus be integrated into a ring topology. The DLR protocol is used to detect an interruption in the ring. If the data line is interrupted, data are sent through an alternative network section, so that the network can be reconfigured as soon as possible.

DLR-capable network nodes (DLR supervisor) are provided with extended diagnostic functions which enable the devices to localize errors and thus decrease the time for error search and maintenance. Normally, the controller (i.e. the controller/PLC) assumes the supervisor function, all other network nodes are DLR participants. The supervisor blocks one of its two ports for normal Ethernet traffic, so that a line topology is created for normal Ethernet telegrams. DLR messages can continue to use the ring in both directions and thus continuously check the function of the ring.



7.6.5 Diagnostic messages via process data

The diagnostic messages of the IO-Link channels are directly mapped into the process data [> 186].

Additionally, the device's status word contains the module diagnostics:

Byte 1 (MSB)							Byte 0 (LSB)								
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	FCE	-	-	-	-	V1	-	V2	-	-	-	-	-	AR	DIAG
														GEE	

7.6.6 EtherNet/IP standard classes

The modules support the following EtherNet/IP Standard Classes in accordance with the CIP specification.

Class Code		Object name
Dec.	Hex.	
01	0x01	Identity Object [> 84]
04	0x04	Assembly Object [86]
06	0x06	Connection Manager Object [> 99]
245	0xF5	TCP/IP Interface Object [▶ 100]
246	0xF6	Ethernet Link Object [> 103]

Identity Object (0x01)

The following description is taken from the CIP specification, Vol. 2, Rev. 2.1 by ODVA & Control-Net International Ltd. and adapted to the Turck products.

Instance attributes

Attr. no.		Attribute name	Get/Set	Туре	Value
Dec.	Hex.				
1	0x01	Vendor	G	UINT	Contains the manufacturer ID. Turck = $0x30$
2	0x02	Product type	G	UINT	Shows the general product type. Communications Adapter $12_{dec} = 0x0C$
3	0x03	Product code	G	UINT	ldentifies a special product in a device type. default: 27247 _{dec} = 0x6A6F
4	0x04	Revision Major Minor	G	STRUCT OF: USINT USINT	Revision of the device which is represented by the Indentity Object. 0x01 0x06
5	0x05	Device status	G	WORD	WORD
6	0x06	Serial number	G	UDINT	Contains the last 3 bytes of the MAC ID
7	0x07	Product name	G	STRUCT OF: USINT STRING [13]	i.e.: TBEN-L5-8IOL



Device status

Bit	Name	Definition
01	Reserved	default = 0
2	Configured	TRUE = 1: The application in the device has been configured (default setting).
3	Reserved	default = 0
47	Extended Device Status	0011 = no I/O connection established 0110 = at least one I/O connection in RUN mode 0111 = at least one I/O connection established, all in IDLE mode All other settings = reserved
8	Minor recoverable fault	Recoverable fault, e.g.: Undervoltage Force mode of DTM active Diagnostics at I/O channel active
910	Reserved	
11	DIAG	Common error bit
1215	Reserved	default = 0

Common services

Service code		Class Instance		Service name
Dec.	Hex.			
1	0x01	Yes	Yes	Get_Attribute_All Returns a predefined list of object attributes
5	0x05	No	Yes	Reset Starts the reset service for the device
14	0x0E	Yes	Yes	Get_Attribute_Single Returns the content of a specified attribute
16	0x10	No	No	Set_Attribute_Single Changes a single attribute



Assembly object (0x04)

The Assembly Object combines attributes of several objects and allows data to be sent from one object to another or to receive data in a targeted manner

The following description of the Ethernet Link Object is taken from the CIP specification, Vol. 2, Rev. 2.1 by ODVA & ControlNet International Ltd. and adapted to the Turck products.

Instance attributes

Attr. no.		Attribute name	Get/Set	Туре	Value		
Dec.	Hex.						
3	0x03	Data	S	ARRAY OF BYTE	ldentifies a special product in a device type. default: 27247 _{dec} = 6A6F		
4	0x04	Size	G	UINT	Number of bytes in attribute 3: 256 or variable		

Common services

Service code		Class	Instance Service name						
Dec.	Hex.								
14	0x0E	Yes	Yes	Get_Attribute_Single Returns the content of a specified attribute.					

Assembly instances

EtherNet/IP Connection	Input Assembly	,	Output Assembly		Configura sembly	tion As-	Supported by	
	Instance	Size (in 8 bit)	Instance	Size (in 8 bit)	Instance	Size (in 8 bit)	Rockwell	Omron
Exclusive Owner	103	346	104	262	106	160	х	-
Input Only	103	346	254	0	1	0	х	-
Exclusive Owner (Omron)	103	346	104	262	1	0	-	х
Exclusive owner, IOL 4 IN/4 OUT, diagnostics	120	58	150	38	106	160	x	Х
Exclusive owner, IOL 6 IN/6 OUT, diagnostics	122	74	151	54	106	160	х	х
Exclusive owner, IOL 8 IN/8 OUT, diagnostics	124	90	152	70	106	160	х	х
Exclusive owner, IOL 4 IN/4 OUT	121	38	150	38	106	160	х	х
Exclusive owner, IOL 6 IN/6 OUT	123	54	151	54	106	160	x	х
Exclusive owner, IOL 8 IN/8 OUT	125	70	152	70	106	160	х	х



Configuration Assembly (instance 106)

The modules support Configuration Assembly.

The Configuration Assembly contains:

10 byte device configuration data (EtherNet/IP specific)

+ 136 Byte (parameter data, depending on device type)

The meaning of the input data can be found in chapter "Parameterizing and configuring".

Byte no.		Bit no	Bit no.									
Dec.	Hex.	7	6	5	4	3	2	1	0			
Device Co	nfiguration	Data										
08	0x00 0x08	-	-	-	-	-	-	-	-			
9	0x09	-	-	-	-	LED behavior (PWR) at V2 undervoltage	Eth2 port setup	Eth1 port setup	QuickConnect (not supported)			
DXP chanr	DXP channels											
10	0x0A	-	-	-	-	-	-	-	DXP1_SRO			
11	0x0B	-	-	-	-	-	-	-	DXP3_SRO			
12	0x0C	-	-	-	-	-	-	-	DXP5_SRO			
13	0x0D	-	-	-	-	-	-	-	DXP7_SRO			
14	0x0E	-	-	-	-	-	-	-	DXP1_EN DO			
15	0x0F	-	-	-	-	-	-	-	DXP3_EN DO			
16	0x10	-	-	-	-	-	-	-	DXP5_EN DO			
17	0x11	-	-	-	-	-	-	-	DXP7_EN DO			
IO-Link po	rt paramete	ers										
		IO-Li	nk pc	ort 1								
18	0x12	-	Operation mode									
19	0x13	-	-	-	-	-	-	Data Storage I	Node			
20	0x14	Cycle	e time									
21	0x15	-	-	-	-	-	-	-	Revision			
22	0x16	-	-	-	-	-	-	-	Quick Start-Up			
23	0x17	-	-	-	-	-	-	-	GSD			
24	0x18	-	-	-	-	-	-	-	PCDI invalid			
25	0x19	-	-	-	-	-	-	-	Deactivate diagnostics			
26	0x1A	-	-	-	-	-	-	Mapping PDIN	1			
27	0x1B	-	-	-	-	-	-	Mapping PDO	UT			
2829	0x1C 0x1D	Vend	lor ID									
3033	0x1E 0x21	Devi	ce ID									
3449	0x22 0x31	IO-Li	nk pc	ort 2								
5065	0x32 0x41	IO-Li	nk po	ort 3								



Byte no.		Bit no.										
Dec.	Hex.	7	6	5	4	3	2	1	0			
6681	0x42 0x51	IO-Li	IO-Link port 4									
8297	0x52 0x61	IO-Li	IO-Link port 5									
98113	0x62 0x71	IO-Li	O-Link port 6									
114129	0x72 0x81	IO-Li	O-Link port 7									
130145	0x82 0x91	IO-Li	IO-Link port 8									
146	0x92	-	-	-	-	-	-	VAUX1 pin1 C0 (ch0/1)			
147	0x93	-	-	-	-	-	-	VAUX1 pin1 C1 (ch2/3)			
148	0x94	-	-	-	-	-	-	VAUX1 pin1 C2 (ch4/5)			
149	0x95	-	-	-	-	-	-	VAUX1 pin1 C3 (ch6/7)			
150	0x96	-	-	-	-	-	-	VAUX1 pin1 C4 (ch8)			
151	0x97	-	-	-	-	-	-	VAUX2 pin2 C4 (ch9)			
152	0x98	-	-	-	-	-	-	VAUX1 pin1 C5 (ch10)			
153	0x99	-	-	-	-	-	-	VAUX2 pin2 C5 (ch11)			
154	0x9A	-	-	-	-	-	-	VAUX1 pin1 C6 (ch12)			
155	0x9B	-	-	-	-	-	-	VAUX2 pin2 C6 (ch13)			
156	0x9C	VAUX1 pin1 C7 (ch14)				ch14)						
157	0x9D	-	-	-	-	-	-	VAUX2 pin2 C7 (ch15)			

Device configuration data

Parameter name	Value		Meaning	
LED behavior (PWR) at V2 undervoltage	0 Red		PWR-LED constant red at V2 undervoltage.	
	1	green	PWR-LED is blinking green at V2 un- dervoltage.	
ETH x Port Setup	0	Auto negotiation	The port is set to autonegotiation.	
	1 100BT/FD		Fix setting of the communication parameters for the Ethernet port to: 100BaseT full duplex	



Input Assembly Instances

EtherNet/IP Connection	Input Ass	sembly	Device status	Basic I/O (in byte)	IO-Link inputs	Diagnostics (in byte)	Event data (in byte)
	Instance	Size (in 8 bit)	(in byte)		(in byte)		
Exclusive Owner	103	346	2	4	256	20	64
Input Only	103	346	2	4	256	20	64
Exclusive Owner (Omron)	103	346	2	4	256	20	64
Exclusive owner, IOL 4 IN/4 OUT, diagnostics	120	58	2	4	32	20	0
Exclusive owner, IOL 6 IN/6 OUT, diagnostics	122	74	2	4	48	20	0
Exclusive owner, IOL 8 IN/8 OUT, diagnostics	124	90	2	4	64	20	0
Exclusive owner, IOL 4 IN/4 OUT	121	38	2	4	32	0	0
Exclusive owner, IOL 6 IN/6 OUT	123	54	2	4	48	0	0
Exclusive owner, IOL 8 IN/8 OUT	125	70	2	4	64	0	0



Input instance 103 – standard input

The description of the input data can be found in chapter "Operating".

Word	Bit no.	,														
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Status	word															
0x00	FCE	-	-	-	-	-	V1	-	V2	-	-	-	-	-	AR GEE	DIAG
Inputs																
0x01	-	DI14 (SIO)	-	DI12 (SIO)	-	DI10 (SIO)	-	DI8 (SIO)	DXP7	DI6 (SIO)	DXP5	DI4 (SIO)	DXP3	DI2 (SIO)	DXP1	DI0 (SIO)
Process	s data v	valid				•										
0x02	-	DVS 14	-	DVS 12	-	DVS 10	-	DVS8	-	DVS6	-	DVS4	-	DVS2	-	DVS0
IO-Link	proce	ss inpu	it data													
0x03 0x12 0x72 0x82	16 wo	rds pei	r port													
Diagno	stics															
	VAUX	1/VAUX	K2													
0x83	VERR V2 C7 Ch15	VERR V2 C6 Ch13	VERR V2 C5 Ch11	VERR V2 C4 Ch9	-	-	-	-	VERR V1 C7 Ch14	VERR V1 C6 Ch12	VERR V1 C5 Ch10	VERR V1 C4 Ch8	VERR V1 C3 Ch6/7	VERR V1 C2 Ch4/5	VERR V1 C1 Ch2/3	VERR V1 C0 Ch0/1
	DXP c	hannel	S													
0x84	-	-	-	-	-	-	-	-	ERR DXP 7	-	ERR DXP 5	-	ERR DXP 3	-	ERR DXP 1	-
	IO-Lin	k port	diagno	ostics												
	Port 1			,	1			1		1	1	T				
0x85	GEN ERR	OVL	V HIGH	V LOW	UL VE	LL VU	O TMP	PRM ERR	EVT2	EVT1	PD INV	HW ERR	DS ERR	CFG ERR	PPR	-
	Port 8			1	1	1				1	1	1				
0x8C	GEN ERR	OVL	V HIGH	V LOW	UL VE	LL VU	O TMP	PRM ERR	EVT2	EVT1	PD INV	HW ERR	DS ERR	CFG ERR	PPR	-
	IO-Lin	k Even	ts													
0x8D	Port (1	l st Eve	nt)						Qualif	ier (1st	Event)					
0x8E	Event	Code l	ow byt	e (1st Ev	vent)				Event	Code h	igh byt	e (1st e	event)			
0xAB	Port 1	6th eve	ent)						Qualif	ier (16tl	h event	:)				
0xAC	Event	Code l	ow byt	e (16th e	event)			Event	Code h	igh byt	e (16th	event)			



Instance 120 – 4 byte IN, diagnostics

The description of the input data can be found in chapter "Operating".

Word	Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Status	word		1		1		1				1		1			
0x00	FCE	-	-	-	-	-	V1	-	V2	-	-	-	-	-	AR GEE	DIAG
Inputs						1	1				1					
0x01	-	DI14 (SIO)	-	DI12 (SIO)	-	DI10 (SIO)	-	DI8 (SIO)	DXP7	DI6 (SIO)	DXP5	DI4 (SIO)	DXP3	DI2 (SIO)	DXP1	DI0 (SIO)
Process	s data v	valid														
0x02	-	DVS 14	-	DVS 12	-	DVS 10	-	DVS8	-	DVS6	-	DVS4	-	DVS2	-	DVS0
IO-Link	proce	ss inpu	it data		1	1				1	1		1			
0x03 0x04	2 word	ds per	port													
	1															
0x11 0x12																
Diagno	stics															
	VAUX	1/VAU	K2													
0x13	VERR V2 C7 Ch15	VERR V2 C6 Ch13	VERR V2 C5 Ch11	VERR V2 C4 Ch9	-	-	-	-	VERR V1 C7 Ch14	VERR V1 C6 Ch12	VERR V1 C5 Ch10	VERR V1 C4 Ch8	VERR V1 C3 Ch6/7	VERR V1 C2 Ch4/5	VERR V1 C1 Ch2/3	VERR V1 C0 Ch0/1
	DXP c	hannel	S			1	1				1		1			
0x14	-	-	-	-	-	-	-	-	ERR DXP 7	-	ERR DXP 5	-	ERR DXP 3	-	ERR DXP 1	-
	IO-Lin	k port	diagno	stics												
	Port 1															
0x15	GEN ERR	OVL	V HIGH	V LOW	UL VE	LL VU	O TMP	PRM ERR	EVT2	EVT1	PD INV	HW ERR	DS ERR	CFG ERR	PPR	-
	Port 8															
0x1C	GEN ERR	OVL	V HIGH	V LOW	UL VE	LL VU	O TMP	PRM ERR	EVT2	EVT1	PD INV	HW ERR	DS ERR	CFG ERR	PPR	-



Instance 121 – 4 byte IN

The description of the input data can be found in chapter "Operating".

Word	Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Status	word															
0x00	FCE	-	-	-	-	-	V1	-	V2	-	-	-	-	-	AR GEE	DIAG
Inputs		-				-										
0x01	-	DI14 (SIO)	-	DI12 (SIO)	-	DI10 (SIO)	-	DI8 (SIO)	DXP7	DI6 (SIO)	DXP5	DI4 (SIO)	DXP3	DI2 (SIO)	DXP1	DI0 (SIO)
Proces	s data v	valid														
0x02	-	DVS 14	-	DVS 12	-	DVS 10	-	DVS8	-	DVS6	-	DVS4	-	DVS2	-	DVS0
IO-Link	proce	ss inpu	ut data			•										
0x03 0x04 0x11 0x12	2 wor	ds per	port													



Instance 122 – 6 byte IN, diagnostics

The description of the input data can be found in chapter "Operating".

Word	Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Status	word															
0x00	FCE	-	-	-	-	-	V1	-	V2	-	-	-	-	-	ARGEE	DIAG
Inputs																
0x01	-	DI14	-	DI12	-	DI10	-	DI8	DXP7	DI6	DXP5	DI4	DXP3	DI2	DXP1	DI0
		(SIO)		(SIO)		(SIO)		(SIO)		(SIO)		(SIO)		(SIO)		(SIO)
Proces	s data v	valid														
0x02	-	DVS	-	DVS	-	DVS	-	DVS8	-	DVS6	-	DVS4	-	DVS2	-	DVS0
		14		12		10										
IO-Link	proce	ss inpu	ıt data													
0x03	3 word	ds per	oort													
0x05	_															
0x06																
0x08	-															
0x09																
	-															
0x0C																
0x0F	-															
0x11																
0x12																
0x14																
0x15																
0x17	_															
0x18																
0x1A																
Diagno	ostics															
	VAUX	I/VAU	(2	1	1	1	1	1	1	1	1	1	1	1	1	
0x1B	VERR	VERR	VERR	VERR	-	-	-	-	VERR	VERR	VERR	VERR	VERR	VERR	VERR	VERR
	Ch15	V2 C0 Ch13	V2 C5	V2 C4 Ch9					Ch14	Ch12	Ch10	Ch8	Ch6/7	VI C2 Ch4/5	Ch2/3	Ch0/1
		hannel	c	CIIJ					CIIII	CITZ	Cirro	Cho			CH2/5	
0v10			_						EDD		EDD		FRP		FRR	
UXIC	-	-	-	-	-	-	-	-	DXP 7	-	DXP 5	-	DXP 3	-	DXP 1	-
	IO-I in	k nort i	diagno	ostics												
	Port 1	n port	alagno	stics												
0x1D	GEN	OVI	V	V		11	0	PRM	FV/T2	FVT1	PD	HW/	DS	CEG	PPR	_
	ERR	UVL	HIGH	LOW	VE	VU	TMP	ERR			INV	ERR	ERR	ERR		
					1	1										
	Port 8				1	1	1	I	1	I	1					I
0x24	GEN	OVI	V	V	UI	11	0	PRM	FVT2	FVT1	PD	HW/	DS	CEG	PPR	_
	ERR	U	HIGH	LOW	VE	VU	TMP	ERR			INV	ERR	ERR	ERR		



Instance 123 – 6 byte IN

The description of the input data can be found in chapter "Operating".

Word	Bit no	•														
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Status	word															
0x00	FCE	-	-	-	-	-	V1	-	V2	-	-	-	-	-	ARGEE	DIAG
Inputs																
0x01	-	DI14 (SIO)	-	DI12 (SIO)	-	DI10 (SIO)	-	DI8 (SIO)	DXP7	DI6 (SIO)	DXP5	DI4 (SIO)	DXP3	DI2 (SIO)	DXP1	DI0 (SIO)
Proces	s data	valid														
0x02	-	DVS 14	-	DVS 12	-	DVS 10	-	DVS8	-	DVS6	-	DVS4	-	DVS2	-	DVS0
IO-Linl	<pre>c proce</pre>	ss inpu	ut data													
0x03 0x05 0x18 0x1A	. 3 wor	ds per	port													



Instance 124 – 8 byte IN, diagnostics

The description of the input data can be found in chapter "Operating".

Word	Bit no.	,														
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Status	word															
0x00	FCE	-	-	-	-	-	V1	-	V2	-	-	-	-	-	ARGEE	DIAG
Inputs																
0x01	-	DI14 (SIO)	-	DI12 (SIO)	-	DI10 (SIO)	-	DI8 (SIO)	DXP7	DI6 (SIO)	DXP5	DI4 (SIO)	DXP3	DI2 (SIO)	DXP1	DI0 (SIO)
Process	s data v	valid														
0x02	-	DVS 14	-	DVS 12	-	DVS 10	-	DVS8	-	DVS6	-	DVS4	-	DVS2	-	DVS0
IO-Link	proce	ss inpu	it data													
0x03 0x06	4 word	ds per	port													
	-															
0x1F 0x22																
Diagno	stics															
	VAUX	1/VAU	K2													
0x23	VERR V2 C7 Ch15	VERR V2 C6 Ch13	VERR V2 C5 Ch11	VERR V2 C4 Ch9	-	-	-	-	VERR V1 C7 Ch14	VERR V1 C6 Ch12	VERR V1 C5 Ch10	VERR V1 C4 Ch8	VERR V1 C3 Ch6/7	VERR V1 C2 Ch4/5	VERR V1 C1 Ch2/3	VERR V1 C0 Ch0/1
	DXP c	hannel	S	1	1		1		1		1		1	1	1	·
0x24	-	-	-	-	-	-	-	-	ERR DXP 7	-	ERR DXP 5	-	ERR DXP 3	-	ERR DXP 1	-
	IO-Lin	k port	diagno	stics												
	Port 1															
0x25	GEN ERR	OVL	V HIGH	V LOW	UL VE	LL VU	O TMP	PRM ERR	EVT2	EVT1	PD INV	HW ERR	DS ERR	CFG ERR	PPR	-
	Port 8		•			•				•						·
0x2C	GEN ERR	OVL	V HIGH	V LOW	UL VE	LL VU	O TMP	PRM ERR	EVT2	EVT1	PD INV	HW ERR	DS ERR	CFG ERR	PPR	-



Instance 125 – 8 byte IN

The description of the input data can be found in chapter "Operating".

Word	Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Status	word															
0x00	FCE	-	-	-	-	-	V1	-	V2	-	-	-	-	-	ARGEE	DIAG
Inputs		-			-								-			
0x01	-	DI14 (SIO)	-	DI12 (SIO)	-	DI10 (SIO)	-	DI8 (SIO)	DXP7	DI6 (SIO)	DXP5	DI4 (SIO)	DXP3	DI2 (SIO)	DXP1	DI0 (SIO)
Proces	s input	data v	valid													
0x02	-	DVS 14	-	DVS 12	-	DVS 10	-	DVS8	-	DVS6	-	DVS4	-	DVS2	-	DVS0
IO-Link	proce	ss inpu	ut data										•			
0x03 0x06 0x1F 0x22	4 wor	ds per	port													



Output assembly instances

EtherNet/IP Connection	Output As	sembly	Control word	DXP outputs	IO-Link outputs	VAUX (in byte)
	Instance	Size (in 8 bit)	(in byte)	(in byte)	(in byte)	
Exclusive Owner	104	262	2	2	256	2
Exclusive owner, IOL 4 IN/4 OUT	150	38	2	2	32	2
Exclusive owner, IOL 6 IN/6 OUT	151	54	2	2	48	2
Exclusive owner, IOL 8 IN/8 OUT	152	70	2	2	64	2

Instance 104 – standard output

The description of the input data can be found in chapter "Operating".

Word	Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Control	word															
0x00	reserve	rd														
DXP ou	tputs															
0x01	-	-	-	-	-	-	-	-	DXP7	-	DXP5	-	DXP3	-	DXP1	-
IO-Link	process	s outpu	t data													
0x02	16 wor	ds per p	ort													
0x11																
0x72																
0x81																
VAUX1	/VAUX2															
0x82	VAUX	VAUX	VAUX	VAUX	-	-	-	-	VAUX	VAUX	VAUX	VAUX	VAUX1	VAUX1	VAUX1	VAUX1
	2 Pin2	2 Pin2	2 Pin2	2 Pin2					1 Pin1	1 Pin1	1 Pin1	1 Pin1	Pin1 C3	Pin1 C2	Pin1 C1	Pin1 C0
	C7	C6	C5	C4					C7	C6	C5	C4	(ch6/7)	(ch2/5)	(ch2/3)	(ch0/1)
	(ch15)	(ch13)	(ch11)	(ch9)					(ch14)	(ch12)	(ch10)	(ch8)				



Instance 150 – 4 byte OUT

The description of the input data can be found in chapter "Operating".

Word	Bit no.															
no.	15	14	13	12	11	10 9	9 8	8	7	6	5	4	3	2	1	0
Contro	word															
0x00	reserve	erd														
DXP ou	tputs															
0x01	-	-	-	-	-		- -	-	DXP7	-	DXP5	-	DXP3	-	DXP1	-
IO-Link	proces	s outpu	t data													
0x02	2 word	s per po	ort													
0x03																
0x10																
0x11																
VAUX1	/VAUX2															
0x12	VAUX	VAUX	VAUX	VAUX	-	- -	- -	-	VAUX	VAUX	VAUX	VAUX	VAUX1	VAUX1	VAUX1	VAUX1
	2 pin2	2 pin2	2 pin2	2 pin2					1 pin1	1 pin1	1 pin1	1 pin1	pin1	pin1	pin1	pin1
	C7	C6	C5	C4					C7	C6	C5	C4	C3	C2	C1	C0
	(ch15)	(ch13)	(ch11)	(ch9)					(ch14)	(ch12)	(ch10)	(ch8)	(ch6/7)	(ch4/5)	(ch2/3)	(ch0/1)

Instance 151 – 6 byte OUT

The description of the input data can be found in chapter "Operating".

Word	Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Control	word															
0x00	reserve	rd														
DXP ou	tputs															
0x01	-	-	-	-	-	-	-	-	DXP7	-	DXP5	-	DXP3	-	DXP1	-
IO-Link	process	soutput	t data													
0x02	3 word	s per po	ort													
0x04																
0x17																
0x19																
VAUX1	/VAUX2															
0x1A	VAUX	VAUX	VAUX	VAUX	-	-	-	-	VAUX	VAUX	VAUX	VAUX	VAUX1	VAUX1	VAUX1	VAUX1
	2 pin2	2 pin2	2 pin2	2 pin2					1 pin1	1 pin1	1 pin1	1 pin1	pin1	pin1	pin1	pin1
	C7	C6	C5	C4					C7	C6	C5	C4	C3	C2	C1	C0
	(ch15)	(ch13)	(ch11)	(ch9)					(ch14)	(ch12)	(ch10)	(ch8)	(ch6/7)	(ch4/5)	(ch2/3)	(ch0/1)



Instance 152 – 8 byte OUT

The description of the input data can be found in chapter "Operating".

Word	Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Control	word															
0x00	reserve	erd														
DXP ou	tputs															
0x01	-	-	-	-	-	-	-	-	DXP7	-	DXP5	-	DXP3	-	DXP1	-
IO-Link	proces	s outpu	t data													
0x02	4 word	s per po	ort													
0x05	_															
0x1E																
0x21																
VAUX1	/VAUX2															
0x22	VAUX	VAUX	VAUX	VAUX	-	-	-	-	VAUX	VAUX	VAUX	VAUX	VAUX1	VAUX1	VAUX1	VAUX1
	2 pin2	2 pin2	2 pin2	2 pin2					1 pin1	1 pin1	1 pin1	1 pin1	pin1	pin1	pin1	pin1
	C7	C6	C5	C4					C7	C6	C5	C4	C3	C2	C1	C0
	(ch15)	(ch13)	(ch11)	(ch9)					(ch14)	(ch12)	(ch10)	(ch8)	(ch6/7)	(ch4/5)	(ch2/3)	(ch0/1)

Connection Manager Object (0x06)

This object is used for connection and connectionless communications, including establishing connections across multiple subnets.

The following description of the Ethernet Link Object is taken from the CIP specification, Vol. 2, Rev. 2.1 by ODVA & ControlNet International Ltd. and adapted to the Turck products.

Common services

Service c	ode	Class	Instance	Meaning
Dec.	Hex.			
84	0x54	No	Yes	FWD_OPEN_CMD (opens a connection)
78	0x4E	No	Yes	FWD_CLOSE_CMD (closes a connection)
82	0x52	No	Yes	UNCONNECTED_SEND_CMD

TCP/IP Interface Object (0xF5)

The following description of the Ethernet Link Object is taken from the CIP specification, Vol. 2, Rev. 1.1 by ODVA & ControlNet International Ltd. and adapted to the Turck products.

Class attributes

Attr. no.		Designation	Get/Set	Туре	Value
Dec.	Hex.				
1	0x01	Revision	G	UINT	1
2	0x02	Max. object instance	G	UINT	1
3	0x03	Number of instances	G	UINT	1
6	0x06	Max. class identifier	G	UINT	7
7	0x07	Max. instance attribute	G	UINT	6

Instance Attributes

Attr. no.		Designation	Get/Set	Туре	Value
Dec.	Hex.				
1	0x01	Status	G	DWORD	Interface status
2	0x02	Configuration capability	G	DWORD	Interface capability flag
3	0x03	Configuration control	G/S	DWORD	Interface control flag
4	0x04	Physical link object	G	STRUCT	
		Path size		UINT	Number of 16 bit words: 0x02
		Path		Padded EPATH	0x20, 0xF6, 0x24, 0x01
5	0x05	Interface configuration	G	Structure of:	TCP/IP network interface config-ration
		IP address	G	UDINT	Actual IP address
		Network mask	G	UDINT	Actual network mask
		Gateway addr.	G	UDINT	Actual default gateway
		Name server	G	UDINT	0 = no server address configured
		Name server 2	G	UDINT	0 = no secondary server address configured
		Domain name	G	UDINT	0 = no Domain Name configured
6	0x06	Host name	G	STRING	0 = no host name configured
12	0x0C	QuickConnect	G/S	BOOL	0 = deactivate 1 = activate

Common services

Service c	ode	Class	Instance	Meaning
Dec.	Hex.			
1	0x01	Yes	Yes	Get_Attribute_All
2	0x02	No	No	Set_Attribute_All
14	0x0E	Yes	Yes	Get_Attribute_Single
16	0x10	No	Yes	Set_Attribute_Single

Interface Status

The Status attribute indicates the status of the TCP/IP network interface.

Bit	Designation	Meaning
03	Interface configuration status	 Indicates the status of the Interface Configuration attribute: 0 = The Interface Configuration attribute has not been configured 1 = The Interface Configuration attribute contains valid configuration. 215 = reserved
431	Reserved	

Configuration Capability

The Configuration Capability indicates the device's support for optional network configuration capability.

Bit	Designation	Meaning	Value
0	BOOTP client	The device is capable of obtaining its network configuration via BOOTP.	1
1	DNS client	The device is capable of resolving host names by querying a DNS server.	0
2	DHCP client	The device is capable of obtaining its network configuration via DHCP.	1

Configuration control

The Configuration Control attribute is used to control network configuration options.

Bit	Designation	Meaning
03	Startup configuration	Determines how the device shall obtain its initial configuration. 0 = The device shall use the interface configuration values previously stored (for example, in non-volatile memory or via hardware switches, etc). 13 = reserved
4	DNS Enable	Always 0
531	Reserved	Set to 0



Interface Configuration

This attribute contains the configuration parameters required to operate a TCP/IP device.

To change this attribute, proceed as follows:

- Read out the attribute.
- Change the parameters.
- Set the attribute.
- ➡ The TCP/IP Interface Object applies the new configuration upon completion of the Set service. If the value of the Startup Configuration bits (Configuration Control attribute) is 0, the new configuration is stored in non-volatile memory.

The device does not reply to the set service until the values are safely stored to non-volatile memory.

An attempt to set any of the components of the Interface Configuration attribute to invalid values results in an error (status code 0x09) returned from the Set service. If initial configuration is obtained via BOOTP or DHCP, the Interface Configuration attribute components are all 0 until the BOOTP or DHCP reply is received. Upon receipt of the BOOTP or DHCP reply, the Interface Configuration attribute shows the configuration obtained via BOOTP/DHCP.

Host name

This attribute contains the device's host name. The host name attribute is used when the device supports the DHCP-DNS Update capability and has been configured to use DHCP upon start up. The mechanism allows the DHCP client to transmit its host name to the DHCP server. The DHCP server then updates the DNS records on behalf of the client.

Ethernet Link Object (0xF6)

The following description of the Ethernet Link Object is taken from the CIP specification, Vol. 2, Rev. 1.1 by ODVA & ControlNet International Ltd. and adapted to the Turck products.

Class attributes

Attrno.		Designation	Get/Set	Туре	Value
Dec.	Hex.				
1	0x01	Revision	G	UINT	1
2	0x02	Max. object instance	G	UINT	1
3	0x03	Number of instances	G	UINT	1
6	0x06	Max. class identifier	G	UINT	7
7	0x07	Max. instance attribute	G	UINT	6

Instance attributes

Attrno.		Designation	Get/Set	Туре	Value
Dec.	Hex.				
1	0x01	Interface speed	G	UDINT	Speed in megabit per second (e.g. 10, 100, 1000 etc.)
2	0x02	Interface flags	G	DWORD	Interface capability flag
3	0x03	Physical address	G	ARRAY OF USINT	Contains the interface's MAC address (Turck: 00:07:46:xx:xx:xx)
6	0x06	Interface control	G	2 WORD	Allows port-wise changes of the Ethernet-settings
7	0x07	Interface type	G		
10	0x0A	Interface label	G		

Interface flags

Bit	Designation	Meaning	Default value
0	Link status	Indicates whether or not the Ethernet communica- tions interface is connected to an active network. 0 = inactive link 1 = active link	Depends on application
1	Half/full duplex	0 = Half duplex 1 = Full duplex If the Link Status flag is 0, the value of the Half/Full Duplex flag is indeterminate.	Depends on application
24	Negotiation status	Indicates the status of the automatic auto- negotiation 0 = autonegotiation in progress 1 = autonegotiation and speed detection failed, using default values for speed and duplex (10 Mbps/half duplex). 2 = auto-negotiation failed but detected speed (default: half duplex). 3 = successfully negotiated speed and duplex 4 = autonegotiation not started, yet. Forced speed and duplex.	Depends on application



Bit	Designation	Meaning	Default value
5	Manual setting requires reset	 0 = interface can activate changes to link parameters (auto-negotiate, duplex mode, interface speed) automatically 1 = device requires a Reset service to be issued to its Identity Object in order to adapt the changes. 	0
6	Local Hardware Fault	0 = interface detects no local hardware fault 1 = local hardware error detected	0

Common services

Service co	ode	Class	Instance	Meaning
Dec.	Hex.			
1	0x01	Yes	Yes	Get_Attribute_All
14	0x0E	Yes	Yes	Get_Attribute_Single
76	0x4C	No	Yes	Enetlink_Get_and_Clear



7.6.7 VSC-Vendor Specific Classes

In addition to supporting the above named CIP Standard Classes, the device support the vendor specific classes (VSCs) described in the following.

Class Code		Name	Description	
dec.	Hex.			
100	0x64	Gateway Class [▶ 105]	Data and parameters for the fieldbus specific part of the device.	
103	0x67	IO-Link Parameter Object [▶ 107]	ISDU object for acyclic transmission of parameter data between IO-Link master and IO-Link device	
137	0x89	IO-Link Port Class [▶ 112]	Parameters and diagnostics of the IO-Link channels	
138	0x8A	IO-Link Events Class [▶ 114]	IO-Link Events	
153	0x99	Basic Class [▶ 114]	Parameters and diagnostics of the digital channels channels	
161	0xA1	VAUX Control Class [116]	Parameters and diagnostics for VAUX	

Gateway Class (VSC 100)

Object instance

Attr. n	0.	Designation	Get/Set	Туре	Meaning
Dec.	Hex.				
100	0x64	Max. object attribute	G	USINT	Number of the last object attribute to be implemented
101	0x65	Hardware revision	G	STRUCT	Hardware revision number of of the device (USINT Maj./USINT Min.)
102	0x66	Firmware revision	G	STRUCT	Firmware revision of the boot firmware (maj./min.).
103	0x67	Service tool ident number	G	UDINT	BOOT-ID (identification number)
104	0x68	Hardware Info	G	STRUCT	Module hardware information (UINT)

Object instance 2, gateway instance

Attr. no.		Designation	Get/Set	Туре	Meaning
Dec.	Hex.				
109	0x6D	Device status	G	STRUCT	Contains the device status.
115	0x73	On IO connection timeout	G/S	ENUM USINT	Reaction when the time limit for an I/O connection is exceeded:
					0: SWITCH IO FAULTED (0): The channels are switched to substitute value.
					1: SWITCH IO OFF (1): The outputs are switched to 0.
					2: SWITCH IO HOLD (2): No further changes to I/O data. The outputs are held.



Attr. no.		Designation	Get/Set	Туре	Meaning
Dec.	Hex.				
138	0x8A	GW status register	G/S	DWORD	Activates or deactivates the mapping of the status word into the device's input data. Activating or deactivating of the status word is only possible in Assembly Instance 103.
139	0x8B	GW control register	G/S	DWORD	Activates or deactivates the mapping of the control word into the device's output data. Activating or deactivating of the control word is only possible in Assembly Instance 104.
140	0x8C	Disable protocols	G/S	UINT	Deactivation of the used Ethernet protocol.
					Bit 0: Deactivates EtherNet/IP (cannot be deactivated via the EtherNet/IP interface).
					Bit 1: Deactivates Modbus TCP
					Bit 2: Deactivates PROFINET
					Bit 15: Deactivates the web server
141	0x8D	LED behavior (PWR)	G/S	USINT	0: Red
		at V2 undervoltage			1: Green flashing



IO-Link Parameter Object (VSC 103)

The IO-Link Parameter Object enables the acyclic transfer of parameter data between the IO-Link master and the IO-Link device.

Instance 1 of the object addresses the IO-Link master

The instance attribute numbers address the IO-Link port at the IO-Link master or the port 0 functions of the IO-Link master.

■ 1...n: IO-Link port at IO-Link master, n = number of IO-Link ports at IO-Link master

128: Port-0 functions of the IO-Link master

Instance attributes

Common services

Service code		Class	Instance Service name	
Dec.	Hex.			
14	0x0E	Yes	No	Get_Attribute_Single Returns the content of a specified attribute.
75	0x4B	No	Yes	Read_ISDU The service reads parameters from the connected IO-Link device.
76	0x4C	No	Yes	Write_ISDU The service writes parameters from the connected IO-Link device.

Read_ISDU - Request

Data	Value/content	Description	
Class	0x67	IO-Link Param	neter Object
Instance	0x01	Addressing th	ne IO-Link master
Instance attribute	0x01n, 128	IO-Link port n	umber, or 128 for Port-0 functions
Service code	0x4B	Read_ISDU	
Data	Request parameters for the ISDU Read Service		
	Name	Data type	Description
Data byte 0	Index (LSB)	UINT	LSB from index of the IO-Link ISDU object acc. to IODD
Data byte 1	Index (MSB)	UINT	MSB from index of the IO-Link ISDU object acc. to IODD
Data byte 2	Sub index	USINT	Sub index from the IO-Link ISDU object acc. to IODD



Read_ISDU – Response

■ CIP Service Response, General-Status \neq 0 \rightarrow error-free access structure of the response:

Name	Data type	Description
ISDU data	Array of Byte	Read data, max. 232 byte

■ CIP Service Response, General-Status \neq 0 \rightarrow access error structure of the response:

Name	Data type	Description
IOL_Master Error	UINT	IO-Link master specific, see IO-Link master Error Codes
IOL_Device Error	UINT	IO-Link device specific, see IO-Link device Error Codes and device documentation

Example:

Read access - name of device at port 4 is read out

Data	Value/content	Description		
Class	0x67	IO-Link Param	neter Object	
Instance	0x01	Addressing th	ne IO-Link master	
Instance attribute	0x04	IO-Link port r	number	
Service code	0x4B	Read_ISDU: read access		
Data	Request paramete	ers for the ISDU Read Service		
	Name	Data type	Description	
Data byte 0	0x12	UINT	Index for the product name in the device (e.g. Turck I/O hub TBIL-M1-16DXP) according to IODD	
Data byte 1	0x00	UINT	-	
Data byte 2	0x00	USINT	The index has no sub index.	

CIP Service Response:

Name	Data type	Description
ISDU data	Array of Byte	Error-free access: Content: 54 42 49 4C 2D 4D 31 2D 31 36 44 58 50 (TBIL- M1-16DXP) Access error: Content: Error code


Data	Value/content	Description			
Class	0x67	IO-Link Param	neter Object		
Instance	0x01	Addressing th	ne IO-Link master		
Instance attribute	0x01n, 128	IO-Link port r	number, or 128 for Port-0 functions		
Service code	0x4C	Write_ISDU			
Data	Request paramete	ers for the ISDU write service			
	Name	Data type	Description		
Data byte 0	Index (LSB)	UINT	LSB from index of the IO-Link ISDU object acc. to IODD		
Data byte 1	Index (MSB)	UINT	MSB from index of the IO-Link ISDU object acc. to IODD		
Data byte 2	Sub index	USINT	Sub index from the IO-Link ISDU object acc. to IODD		
Data byte 3 data byte n	Data	Array of Byte	Parameter data (n= length of ISDU object + 3)		

Write_ISDU – Request



Write_ISDU – Response

- CIP Service Response, general status = 0 → error-free access Service response without further data
- CIP Service Response, general status \neq 0 \rightarrow access error structure of the response:

Name	Data type	Description
IOL_Master Error	UINT	IO-Link master specific, see IO-Link master Error Codes
IOL_Device Error	UINT	IO-Link device specific, see IO-Link device Error Codes and device documentation

Example:

Write access - Application Specific Tag is written into the device at port 4

Data	Value/content	Description					
Class	0x67	IO-Link Parameter Object					
Instance	0x01	Addressing t	he IO-Link master				
Instance attribute	0x04	IO-Link port r	number				
Service code	0x4C	Write_ISDU: Write access					
Data	Request paramete	ters for the ISDU write service					
	Name	Data type	Description				
	0x18	UINT	Index for the application specific tag in the device (e.g. In Turck I/O-Hub TBIL-M1- 16DXP)				
	0x00	USINT	The index has no sub index.				
	Byte 0: 0x54 Byte 1: 0x65 Byte 2: 0x6D Byte 3: 0x70 Byte 4: 0x65 Byte 17: 0x31 Byte 1831: 00		The Application Specific Tag of the device can consist of 32 byte, example: ASCII: Temperature_sensor1 Hex: 54 65 6d 70 65 72 61 74 75 72 65 5f 73 65 6e 73 6f 72 31 00 00 The remainder of the 32 bytes not re- quired is filled with 00.				

IO-Link master error codes

Error code	Designation acc. to specification	Meaning
0x0000	No error	No error
0x7000	IOL_CALL Conflict	Unexpected write-request, read request expected
0x7001	Wrong IOL_CALL	Decoding error
0x7002	Port blocked	The accessed port is occupied by another task
	reserved	
0x8000	Timeout	Timeout, IOL master or IOL device port busy
0x8001	Wrong index	Error: IOL index < 32767 or > 65535 selected
0x8002	Wrong port address	Port address not available
0x8002	Wrong port function	Port function not available
	reserved	



IO-Link device error codes

Error code	Designation acc. to specifica- tion	Meaning
0x1000	COM_ERR	Communication error Possible source: the addressed port is parameter- ized 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 at the device act- ive)
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
0x8033	VAL_LENOVRRUN	Length of data to be written does not match the
0x8034	VAL_LENUNDRUN	length 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 documen-
0x8101 0x8FF	VENDOR_SPECIFIC	tation



IO-Link Port Class (VSC 137)

This class provides one instance per IO-Link port at the IO-Link master module.

Attr. no.		Designation	Get/set	Туре	Meaning		
Dec.	Hex.						
Paran	neters						
1	0x01	Operation mode	G/S	USINT	0 = IO-Link without validation 1 = IO-Link with family compatible device 2 = IO-Link with compatible device 3 = IO-Link with identical device 4 = DI (with parameter access) 57 = reserved 8 = DI		
2	0x02	Data Storage Mode	G/S	USINT	0 = activated 1 = overwrite 2 = read in 3 = deactivated, clear		
3	0x03	Cycle time	G/S	USINT	See [▶ 175]		
4	0x04	Revision	G/S	USINT	0 = automatic 1 = V 1.0		
5	0x05	Activate Quick Start-Up	G/S	USINT	0 = no 1 = yes		
6	0x06	Device parameterization via GSD	G/S	USINT	0 = no 1 = yes		
7	0x07	Process input data invalid	G/S	USINT	0 = diagnostics generated 1 = no diagnostic generated		
8	0x08	Deactivate diagnostics	G/S	USINT	0 = no 1 = notifications 2 = notifications and warnings 3 = yes		
9	0x09	Process input data mapping	G/S	USINT	0 = direct 1 = swap16 bit 2 = swap 32 bit 3 = swap all		
10	0x0A	Process output data mapping	G/S	USINT	0 = direct 1 = swap16 bit 2 = swap 32 bit 3 = swap all		
11	0x0B	Vendor ID	G/S	INT			
12	0x0C	Device ID	G/S	DINT			
Diagn	ostics			-			
13	0x0D	Wrong or missing device	G	USINT	0 = inactive 1 = active		
14	0x0E	Data storage error	G	USINT	0 = inactive 1 = active		
15	0x0F	Process input data invalid	G	USINT	0 = inactive 1 = active		
16	0x10	Hardware error	G	USINT	0 = inactive 1 = active		



Attr. n	0.	Designation	Get/set	Туре	Meaning
Dec.	Hex.				
17	0x11	Maintenance events	G	USINT	0 = inactive 1 = active
18	0x12	Out-of-specification events	G	USINT	0 = inactive 1 = active
19	0x13	Parameterization error	G	USINT	0 = inactive 1 = active
20	0x14	Over temperature	G	USINT	0 = inactive 1 = active
21	0x15	Lower limit value underrun	G	USINT	0 = inactive 1 = active
22	0x16	Upper limit value exceeded	G	USINT	0 = inactive 1 = active
23	0x17	Undervoltage	G	USINT	0 = inactive 1 = active
24	0x18	Overvoltage	G	USINT	0 = inactive 1 = active
25	0x19	Overload	G	USINT	0 = inactive 1 = active
26	0x1A	Common error	G	USINT	0 = inactive 1 = active
27	0x1B	Port parameterization error	G	USINT	0 = inactive 1 = active
Proce	ss data	l i i i i i i i i i i i i i i i i i i i			
28	0x1C	Input data word 0	G	USINT	
	•••	•••	G	USINT	
43	0x2B	Input data word 15	G	USINT	
44	0x2C	Output data word 0	G	USINT	
	•••	•••	G	USINT	
59	0x3B	Output data word 15	G	USINT	



IO-Link Event Class (VSC 138)

Attr. no.		Designation		Туре	Meaning	
Dec.	Hex.					
1	0x01	IO-Link Events – port 1	G	USINT	Port number of the port which sends the 1st IO-Link Event.	
16	0x10	IO-Link Events – port 16	G	USINT	Port number of the port which sends the 16th IO-Link Event.	
17	0x11	IO-Link Events – Qualifier 1	G	USINT	Qualifier of the 1st IO-Link Event	
	••••					
32	0x20	IO-Link Events – Qualifier 16	G	USINT	Qualifier of the 16th IO-Link Event	
33	0x21	IO-Link Events – Event Code 1	G	USINT	Event Code of the 1st IO-Link Event	
48	0x30	IO-Link Events – Event Code 16	G	USINT	Event Code of the 16th IO-Link Event	

Basic Class (VSC 153)

Attr. no.		Designation		Туре	Meaning
Dec.	Hex.				
1	0x01	DXP 1 - Manual output reset after overcurrent	G/S	USINT	0 = no 1 = yes
2	0x02	DXP 3 - Manual output reset after overcurrent	G/S	USINT	0 = no 1 = yes
3	0x03	DXP 5 - Manual output reset after overcurrent	G/S	USINT	0 = no 1 = yes
4	0x04	DXP 7 - Manual output reset after overcurrent	G/S	USINT	0 = no 1 = yes
5	0x05	DXP 1 - Activate output	G/S	USINT	0 = no 1 = yes
6	0x06	DXP 3 - Activate output	G/S	USINT	0 = no 1 = yes
7	0x07	DXP 5 - Activate output	G/S	USINT	0 = no 1 = yes
8	0x08	DXP 7 - Activate output	G/S	USINT	0 = no 1 = yes
9	0x09	DXP 1 - Overcurrent output	G	USINT	0 = inactive 1 = active
10	0x0A	DXP 3 - Overcurrent output	G	USINT	0 = inactive 1 = active
11	0x0B	DXP 5 - Overcurrent output	G	USINT	0 = inactive 1 = active
12	0x0C	DXP 7 - Overcurrent output	G	USINT	0 = inactive 1 = active



Attr. no.		Designation		Туре	Meaning
Dec.	Hex.				
13	0x0D	IOL 0 – DI input	G	USINT	0 1
14	0x0E	IOL 2 –DI input	G	USINT	0 1
15	0x0F	IOL 4 – DI input	G	USINT	0 1
16	0x10	IOL 6 – DI input	G	USINT	0 1
17	0x11	IOL 8 – DI input	G	USINT	0 1
18	0x12	IOL 10 – DI input	G	USINT	0 1
19	0x13	IOL 12 – DI input	G	USINT	0 1
20	0x14	IOL 14 – DI input	G	USINT	0 1
21	0x15	IOL0 - Input value valid (Data Valid Signal)	G	USINT	0 = no 1 = yes
22	0x16	IOL0 - Input value valid (Data Valid Signal)	G	USINT	0 = no 1 = yes
23	0x17	IOL4 - Input value valid (Data Valid Signal)	G	USINT	0 = no 1 = yes
24	0x18	IOL6 - Input value valid (Data Valid Signal)	G	USINT	0 = no 1 = yes
25	0x19	IOL8 - Input value valid (Data Valid Signal)	G	USINT	0 = no 1 = yes
26	0x1A	IOL10 - Input value valid (Data Valid Signal)	G	USINT	0 = no 1 = yes
27	0x1B	IOL12 - Input value valid (Data Valid Signal)	G	USINT	0 = no 1 = yes
28	0x1C	IOL14 - Input value valid (Data Valid Signal)	G	USINT	0 = no 1 = yes
29	0x1D	DXP 1 – Input value	G	0 1	
30	0x1E	DXP 3 – Input value	G	0 1	
31	0x1F	DXP 5 – Input value	G	0	
32	0x20	DXP 7 – Input value	G	0 1	
33	0x21	DXP 1 – Output value	G	USINT	
34	0x22	DXP 3 – Output value	G	USINT	
35	0x23	DXP 5 – Output value	G	USINT	
36	0x24	DXP 7 – Output value	G	USINT	



VAUX Control Class (VSC 161)

This class contains parameters and diagnostics for the monitoring of 24 VDC sensor and actuator supply.

Attrno.		Designation	Get/ Set	Туре	Meaning
Dec.	Hex.				
Activate	VAUX1 n	nonitoring			
1	0x01	VAUX Control - VAUX1 pin1 C0 (ch0/1)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
2	0x02	VAUX Control - VAUX1 pin1 C1 (ch2/3)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
3	0x03	VAUX Control - VAUX1 pin1 C2 (ch4/5)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
4	0x04	VAUX Control - VAUX1 pin1 C3 (ch6/7)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
5	0x05	VAUX Control - VAUX1 pin1 C4 (ch8)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
7	0x07	VAUX Control - VAUX1 pin1 C5 (ch10)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
9	0x09	VAUX Control - VAUX1 pin1 C6 (ch12)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
11	0x0B	VAUX Control - VAUX1 pin1 C7 (ch14)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
Activate	VAUX1 n	nonitoring			
6	0x06	VAUX Control - VAUX2 pin2 C4 (ch9)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
8	0x08	VAUX Control - VAUX2 pin2 C5 (ch11)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
10	0x0A	VAUX Control - VAUX2 pin2 C6 (ch13)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
12	0x0C	VAUX Control - VAUX2 pin2 C7 (ch15)	G/S	USINT	0 = 24 VDC 1 = switchable 2 = off
VAUX1 s	tatus				
13	0x0D	VAUX Control - VAUX1 pin1 C0 (ch0/1)	G	USINT	0 = off 1 = on
14	0x0E	VAUX Control - VAUX1 pin1 C1 (ch2/3)	G	USINT	0 = off 1 = on



Attrno.		Designation		Туре	Meaning
Dec.	Hex.				
15	0x0F	VAUX Control - VAUX1 pin1 C2 (ch4/5)	G	USINT	0 = off 1 = on
16	0x10	VAUX Control - VAUX1 pin1 C3 (ch6/7)	G	USINT	0 = off 1 = on
17	0x11	VAUX Control - VAUX1 pin1 C4 (ch8)	G	USINT	0 = off 1 = on
19	0x13	VAUX Control - VAUX1 pin1 C5 (ch10)	G	USINT	0 = off 1 = on
21	0x15	VAUX Control - VAUX1 pin1 C6 (ch12)	G	USINT	0 = off 1 = on
23	0x17	VAUX Control - VAUX1 pin1 C7 (ch14)	G	USINT	0 = off 1 = on
VAUX2 s	status				
18	0x12	VAUX Control - VAUX2 pin2 C4 (ch9)	G	USINT	0 = off 1 = on
20	0x14	VAUX Control - VAUX2 pin2 C5 (ch11)	G	USINT	0 = off 1 = on
22	0x16	VAUX Control - VAUX2 pin2 C6 (ch13)	G	USINT	0 = off 1 = on
24	0x18	VAUX Control - VAUX2 pin2 C7 (ch15)	G	USINT	0 = off 1 = on



7.7 Connecting the devices to an EtherNet/IP scanner with Studio 5000

Used hardware

The following hardware components are used in this example:

- Rockwell Contoller ControlLogix 1756-L72, Logix 5572
- Rockwell Scanner 1756-EN2TR
- Block module TBEN-L...-8IOL

Used software

The following software tools are used in this example:

- Studio 5000
- Catalog file for Turck compact stations "IOLINK_Vxx_....L5K" as part of the file "TBEN-L_ETH-ERNETIP.zip" (downloadable free of charge under www.turck.com)

Catalog files

Turck provides catalog files (L5K files) for use in Studio5000 from Rockwell Automation. The catalog files contain predefined, application-dependent device configurations with different input and output data widths and descriptions of the configuration, input and output tag data. The predefined device configurations correspond to the input and output assembly instances described in the section "Assembly Object" in the chapter "Commissioning Devices with Ether-Net/IP" \rightarrow under "EtherNet/IP Standard Classes".



NOTE

The catalog file is available in the L5K file format and must be converted to the "ACD" file format before it can be used. The file is opened in Studio5000 and saved as a project (*.ACD).

Prerequisites

- Instance of the programming software Studio5000 with the Catalog files is opened.
- A new project has been created in a second instance of Studio5000.
- The PLC and the Scanner mentioned above have been added to the project in the second instance of Studio5000.



7.7.1 Adding the devices from the catalog files to the new project

RSLogix 5000 - BL	.OCKIO_Catalog_File_Lite_v19 in TURCK_BLOCK_STATIONS_V19_LITE.ACD [1768-L45 20.11]	
ile <u>E</u> dit <u>V</u> iew	<u>S</u> earch Logic <u>C</u> ommunications <u>T</u> ools <u>W</u> indow <u>H</u> elp	
1 🖻 🖬 🎒	👗 🛍 💼 🗠 🐃 🚺 Select a Language	e 🔻
ffline 🛛	J↓ □ RUN 🕂 🙀 Path: <none> 🗸 🔛</none>	
p Forces		
n Edits		Þ
	A Favorites Add-On Safety Alarms Bit Timer/Counter Inn	ut/Output & Comr
ontroller Organizer		-
	ration	
	therest	
	FTHERNET-MODULE FEN20 4DIP 4DXP	
	FTHERNET-MODULE FEN20 4DIN 4DXN	
1	ETHERNET-MODULE FEN20 16DXP	
	ETHERNET-MODULE FEN20 4IOL	
1	FTHERNET-MODULE FEN20 4101 4in4out	
	ETHERNET-MODULE FEN20 4IOL 6infout	
1	FTHERNET-MODULE FEN20 410L SinBout	
1	FTHERNET-MODULE FEN20 4101 4in4out Diag	
	ETHERNET-MODULE FEN20 4IOL 6in6out Diag	
1	FTHERNET-MODULE FEN20 4101 Sin8out Diag	
	ETHERNET-MODULE FGEN XSG16 5001	
	ETHERNET-MODULE FGEN IM16 5001	
	ETHERNET-MODULE FGEN OM16 5001	
	ETHERNET-MODULE FGEN IOM88 5001	
	ETHERNET-MODULE FXEN XSG16 0001 IP CS30007	
	ETHERNET-MODULE FXEN IM16 0001 IP CS30007	
	ETHERNET-MODULE FXEN_OM16_0001_IP_CS30007	
	ETHERNET-MODULE FXEN JOM88 0001 IP CS30007	
	ETHERNET-MODULE TBEN L4 16DIP	
	ETHERNET-MODULE TBEN L4 16DIN	
	ETHERNET-MODULE TBEN L4 16DOP	
1	ETHERNET-MODULE TBEN L4 16DON	
	ETHERNET-MODULE TBEN 14 16DXP	
	ETHERNET-MODULE TBEN L4 16DXN	
	ETHERNET-MODULE TBEN L4 8DIP 8DOP	
	ETHERNET-MODULE TBEN L4 8DIN 8DON	
1	ETHERNET-MODULE TBEN 14 8IOL	
	ETHERNET-MODULE TBEN L4 8IOL 4in4out	
	ETHERNET-MODULE TBEN L4 8IOL 6infout	
1	ETHERNET-MODULE TBEN L4 8IOL 8in8out	
	ETHERNET-MODULE TBEN L4 8IOL 4in4out diag	
	ETHERNET-MODULE TBEN L4 8IOL 6infout diag	
1	ETHERNET-MODULE TBEN L4 8IOL 8in8out diag	
	ETHERNET-MODULE TBEN L4 4RFID 8DXP Extended	
	FTHERNET_MODULE TREN 14 AREID 8DXP Mid Size	

• Right-click the device entry and use **Copy**.

Fig. 64: Copying the device entry from catalog file



Right-click the EtherNet/IP-Scanner in the second instance of the software RS Logix and add the device to the project via Paste. Here in the example the configuration with 4 byte each input and output data plus diagnostics TBEN_L..._8IOL_4in4out_diag is used.



Fig. 65: Predefined configurations of TBEN-L...-8IOL in new project



7.7.2 Configuring the device

- Open the device entry by double-clicking.
- ▶ If necessary, define a module name.
- Enter the IP address of the device or a Host Name.

Module Properties Report: Scanner1 (ETHERNET-MODULE 1.1)					
General Conr	nection Module Info				
Type: Vendor:	ETHERNET-MODULE Generic Ether Allen-Bradley	net Module			
Parent: Na <u>m</u> e:	Scanner1 TBEN_L5_8IOL_4in4out_diag Connection Parameters Accomptin				
Descri <u>p</u> tion:	*		Instance:	Size:	
	-	<u>I</u> nput:	120	29 🎅 (16-bit))
Cororo Format:	Data INT	O <u>u</u> tput:	150	19 🎅 (16-bit))
Address / H	ost Name	<u>C</u> onfiguration:	106	160 🚔 (8-bit)	
│ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │	SS: · · ·	<u>S</u> tatus Input:			
● <u>H</u> ost Nar	me: a261	S <u>t</u> atus Output:			
L Status: Offline	ОК	Cancel	Apply	Help	

Fig. 66: Setting the module name and the IP address or respectively the host name

• Optional: Set the connection parameters.

Module Properties Report: Scanner1 (ETHERNET-MODULE 1.1)
General Connection Module Info
Requested Packet Interval (RPI): 100 ms (1.0 - 3200.0 ms) Inhibit Module Major Fault On Controller If Connection Fails While in Run Mode Vuse Unicast Connection over EtherNet/IP
Module Fault Status: Offline OK Cancel Apply

Fig. 67: Setting the connection parameters



7.7.3 Parameterizing the device

- Open the Controller Tags of the device.
- Parameterize the device by using the Controller Tags (in the example: TBEN_L..._8IOL_4in4out_diag:C).

😰 RSLogix 5000 - TBEN_Lx_8IOL [1756-L72 20.11]* - [Controller Tags - TBEN_Lx_8IOL(controller)]						
	🗸 🧸 🍇 🍡 🏗 🖓 🛒 🕀 😔 🛛 Select a Language 🗸 🎉					
	Path: AB_ETHIP-1\192.168.1.100\Backplane\0*					
No Forces						
No Edits 🛃 🗖 1/0						
Redundancy 🖏						
	✓ ► Favorites X Add-On X Safety X Alarms X Bit X Timer/C					
Controller Organizer - 🗣 🗙	Scope: 🛅 TBEN_Lx_8IOL ▾ Show: All Tags ▾ . Enter Name Filter	•				
pntroller TBEN_Lx_8IOL	Name <u>=</u> ∎1△ Valut Fot Style Data Description	▲ 				
Controller Tags	TBEN_L5_8IOL_4in4out_diag:C.Data 1 Hex SINT Reserved					
Controller Fault Handler	+ TBEN_L5_8IDL_4in4out_diag:C.Data 1 Hex SINT Reserved	Fop				
Power-Up Handler	TBEN_L5_8IDL_4in4out_diag:C.Data 1 Hex SINT Quick Connect, Eth Custom Setup, LED-beha	avior (PWR) a				
ISKS MainTack	TBEN_L5_8I0L_4in4out_diag:C.D 0 De BOOL Quick Connect: 0=disable, 1=enable	es S				
MainTask	TBEN_L5_8IOL_4in4out_diag:C.D 0 De BOOL Eth 1 Custom Setup: 0=Auto-negotiate, 1=100	JBT/FD				
L Unscheduled Programs / Phases	TBEN_L5_8IOL_4in4out_diag:C.D 0 De BOOL Eth 2 Custom Setup: 0=Auto-negotiate, 1=100	JBT/FD				
otion Groups	TBEN_L5_8IOL_4in4out_diag:C.D 1 De BOOL LED-behavior (PWR) at V2 undervoltage: 0=F	Red, 1=Greer				
Ungrouped Axes	TBEN_L5_8I0L_4in4out_diag:C.D 0 De BOOL Reserved					
dd-On Instructions	TBEN_L5_8IOL_4in4out_diag:C.D 0 De BOOL Reserved LED-behavior (PWR)					
ata Types	TBEN_L5_8IOL_4in4out_diag:C.D O De BOOL Reserved at V2 undervoltage: 0-Red 1-Green					
User-Defined	TBEN_L5_8I0L_4in4out_diag:C.D 0 De BOOL Reserved					
strings	TBEN_L5_8IOL_4in4out_diag:C.Data 1 Hex SINT DXP1 - Manual reset after overcurr.					
Add-On-Defined	TBEN_L5_8IOL_4in4out_diag:C.Data 1 Hex SINT DXP 3 · Manual reset after overcurr.					
Predefined	TBEN_L5_8IOL_4in4out_diag:C.Data 1 Hex SINT DXP 5 - Manual reset after overcurr.					
Module-Defined	TBEN_L5_8I0L_4in4out_diag:C.Data 1 Hex SINT DXP 7 - Manual reset after overcurr.					
ends	TBEN_L5_8IOL_4in4out_diag:C.D 0 De BOOL DXP 7 - Manual reset after overcurr. (ENUM b	bit0): 0=no, 1				
D Configuration	TBEN_L5_8I0L_4in4out_diag:C.D 0 De BOOL Reserved					
1756 Backplane, 1756-A10	TBEN_L5_8I0L_4in4out_diag:C.D 0 De BOOL Reserved					
[] [0] 1756-L72 TBEN_Lx_8IOL	TBEN_L5_8IOL_4in4out_diag:C.D 0 De BOOL Reserved					
[1] 1/56-EN2TR Scanner1	TBEN_L5_8I0L_4in4out_diag:C.D 0 De BOOL Reserved					
Ethernet	TBEN_L5_8IOL_4in4out_diag:C.D 0 De BOOL Reserved					
I/30-EN2TR Scanner1	TBEN_L5_8IOL_4in4out_diag:C.D 0 De BOOL Reserved					
ETHERNET-MODULE TBEN_L5_8IOL_4	TBEN_L5_8IOL_4in4out_diag:C.D 0 De BOOL Reserved					
	+ TBEN_L5_8IDL_4in4out_diag:C.Data 1 Hex SINT DXP1 - Activate output	-				
	Monitor Tags (Edit Tags / IIII)	▶				
Enter a tag description						

Fig. 68: Parameterizing the device



7.7.4 Going online with the PLC

- Search the network via Who Active function.
- Select the PLC.
- Set the communication path via **Set Project Path**.
- ⇒ The communication path is set



Fig. 69: Setting the communication path



- Select the PLC.
- Click Go online.



Fig. 70: Going online with the device

- Click Download in the following dialog (Connect To Go Online)
- Confirm all following messages.
- ⇒ The program is downloaded to the PLC. The online connection is established.



7.7.5 Reading process data

- Open the Controller Tags in the project tree by double-clicking.
- Access tot he parameter data (TBEN_L..._8IOL_4in4out_diag:C), input data (TBEN_L..._8IOL_4in4out_diag:I) and output data (TBEN_L..._8IOL_4in4out_diag:O) is possible.

😰 RSLogix 5000 - TBEN_Lx_8IOL [1756-L72 20.11]* - [Controller Tags - TBEN_Lx_8IOL(controller)]					
📝 File Edit View Search Logic Communications Iools Window Help	_ 8 ×				
🗎 🖆 🖬 🎒 🕫 🕫 🍽					
Offline 🛛 🗸 🗖 RUN 👘 🎆 Path: AB_ETHIP-1\192.168.1.100\Backplane\0* 🗸 😭					
No Edits ■ Energy Storage ▲ H H= H= +1 + +1 + () + (∪) + (∪)					
Redundancy 0.0 D					
✓ I Favorites X Add-On X Safety X Alarms X Bit X Timer/C					
Controller Organizer	•				
ontroller TBEN_Lx_8IOL	A				
Controller Tags					
Controller Fault Handler	rop				
Power-Up Handler	Derti				
sks	e s				
Main Lask E TBEN_L5_8I0L_4in4out_diagit.Data[0] 0 De INT Station Status Word					
Harchevelued Program Horses H TBEN_L5_8I0L_4in4out_diagit.Data[1] 0 De INT DI input, Input value					
tion Grouns					
Horonord Aves Horonord Aves Horonord Aves Horonord Aves	=				
H-TBEN_L5_8I0L_4in4out_diagil.Data[4] 133 De INT 10-Link Port 1 - Input data word 1					
sta Types + TBEN_L5_8I0L_4in4out_diag:I.Data[5] 0 De INT I0-Link Port 2 - Input data word 0					
User-Defined					
Strings					
Add-On-Defined					
Predefined					
Module-Defined + TBEN_L5_8I0L_4in4out_diag:I.Data[0 De INT IO-Link Port 4 - Input data word 1					
ends					
D Configuration					
1756 Backplane, 1756-A10 E TBEN_L5_8I0L_4in4out_diagil.Data[0 De INT I0-Link Port 6 - Input data word 0					
- To [0] 1756-172 TBEN_Lx_8IOL					
[1] 1/36-HX21R Scanner1 [E] TBEN_L5_8I0L_4in4out_diagil.Data[0 De INT I0-Link Port 7 · Input data word 0					
TBEN_L5_BIOL_4in4out_diagl.Data[0 De INT IO-Link Port 7 - Input data word 1					
9 THERNET MODILE TORN IS BIOL 4: TBEN_L5_8IOL_4in4out_diagl.Data[0 De INT IO-Link Port 8 - Input data word 0					
TBEN_L5_8I0L_4in4out_diagl.Data[0 De INT IO-Link Port 8 - Input data word 1					
TISEN_L5_8I0L_4in4out_diagl.Data[0 De INT Overcurrent VAUX1 Pin1 C0 (Ch0/1), Overcurrent VAU> 👻				
L L L L L L L L L L L L L L L L L L L	•				
Ready					

Fig. 71: Controller Tags in the project tree



7.8 Commissioning the devices in CC-Link IE Field Basic

7.8.1 General features CC-Link IE Field Basic

CC-Link IE Field Basic works with a client/server communication model. A maximum data width of 64×64 bits is available for communication between a client station and several server stations, whereby a unit of 64 bits is referred to as an occupied station. A CC-Link Field Basic network can consist of a maximum of 64 occupied stations. I/O modules can occupy one or more of the 64 occupied stations, depending on their complexity and data width.

Turck IO-Link master modules of the TBEN-L... series occupy 1...4 occupied stations.

CC-Link IE Field Basic				
Maximum number of stations in a network	max. 64 occupied stations	An I/O module can occupy several occupied stations.		
Group	max. 16 occupied stations	To optimize process data traffic, devices can be combined into groups according to their func- tion. A group can consist of a max- imum of 16 occupied stations.		
Cyclic data		Cyclical data is mapped bit by bit or word by word in registers.		
	RX	Register for bit-by-bit access to digital inputs (DI)		
	RY	Register for bit-by-bit access to digital outputs (DO)		
	RWr	Register for word-by-word, read access to process data (e.g. IO-Link)		
	RWw	Register for word-by-word, write access to process data (e.g. IO-Link)		
Port numbers	61450 (cyclic data)			
	ver station for NodeSearch and			

7.8.2 CSP+ files

The CSP+ files can be downloaded free of charge at www.turck.com.



7.8.3 Cyclic data transmission

The cyclic process image of the devices is divided into a bit area and a word area. The bit area is the same for all device configurations. The word area can vary in size depending on the profile used and, in addition to the IO-Link process data in the input area, can also contain the module status, IO-Link port diagnostics or I/O-Link events. Due to the different process data sizes, the TBEN-L...-8IOL can occupy a different number of stations (occupied stations [\triangleright 128]).

Input data		
Bit area RX	Word area RWr	Access type
 Basic input: Input data of the digital channels (DI and DXP channels) Data valid bit of the IO-Link channels Module status 	 IO-Link data Module diagnostics IO-Link port diagnostics IO-Link events 	RO
Output data		
Bit area RY	Word area RWw	Access type
Basic output: Output data of the digital DXP channels	IO-Link data	RW



7.8.4 Occupied Stations

Profile	Occupied	d Size of the process input data		Size of the process output data		
	stations	Bit area (RX)	Register area (RWr)	Bit area (RY)	Register area (RWw)	
1	1	 6 byte Basic input (DI, DXP + data valid bit): 32 bit Module status: 16 bit 	 52 byte IO-Link data: 4 byte per port Module diagnostics: 4 byte IO-Link port diagnostics: 2 byte per port 	 4 byte: Basic output (DXP + deactivate diagnostics): 16 bit VAUX control: 	64 byteIO-Link data: 8 byte per port	
2	2		 116 byte IO-Link data: byte per port Module diagnostics: byte IO-Link port diagnostics: byte per port 	16 bit	 128 byte IO-Link data: 16 byte per port 	
3	3		 180 byte IO-Link data: 12 byte per port Module diagnostics: 4 byte IO-Link port diagnostics: 2 byte per port IO-Link events: max. 16 events, 4 byte per event 		 192 byte IO-Link data: 24 byte per port 	
4	4		256 byteIO-Link data: 32 byte per port		256 byteIO-Link data: 32 byte per port	



7.8.5 Bit area

The bit area contains the module status (status word) in the process input data, see [186] "Basic" and "Module status" [186] or Status- und Control-Wort. In addition to the output data of the DXP channels, the process output data contains the bits for deactivating the channel diagnostics (DD...) and for setting the VAUX1/VAUX2 monitoring, see "Basic" and "VAUX1/ VAUX2" [188].

RX	Signal	RY	Signal	
Digital channels		Deactivate diagnostics and Digit channels (DXP)		
RX0	DI0 (SIO)	RY0	DD0	
RX1	DXP1	RY1	DXP1	
RX2	DI2 (SIO)	RY2	DD2	
RX3	DXP3	RY3	DXP3	
RX4	DI4 (SIO)	RY4	DD4	
RX5	DXP5	RY5	DXP5	
RX6	DI6 (SIO)	RY6	DD6	
RX7	DXP7	RY7	DXP7	
RX8	DI8 (SIO)	RY8	DD8	
RX9	-	RY9	-	
RXA	DI10 (SIO)	RYA	DD10	
RXB	-	RYB	-	
RXC	DI12 (SIO)	RYC	DD12	
RXD	-	RYD	-	
RXE	DI14 (SIO)	RYE	DD14	
RXF	-	RYF	-	
RX10	DVS0	RY10	VAUX1 pin1 C0 (Ch0/1)	
RX11	-	RY11	VAUX1 pin 1 C1 (Ch2/3)	
RX12	DVS2	RY12	VAUX1 pin 1 C2 (Ch4/5)	
RX13	-	RY13	VAUX1 pin 1 C3 (Ch6/7)	
RX14	DVS4	RY14	VAUX1 pin 1 C4 (Ch8)	
RX15	-	RY15	VAUX1 pin 1 C5 (Ch10)	
RX16	DVS6	RY16	VAUX1 pin 1 C6 (Ch12)	
RX17	-	RY17	VAUX1 pin 1 C7 (Ch14)	
RX18	DVS8	RY18	-	
RX19	-	RY19	-	
RX1A	DVS10	RY1A	-	
RX1B	-	RY1B	-	
RX1C	DVS12	RY1C	VAUX2 pin2 C4 (Ch9)	
RX1D	-	RY1D	VAUX2 pin2 C5 (Ch11)	
RX1E	DVS14	RY1E	VAUX2 pin2 C6 (Ch13)	
RX1F	-	RY1F	VAUX2 pin2 C7 (Ch15)	



RX	Signal	RY	Signal
Module status (status word)			
RX20	DIAG		
RX21	ARGEE program active		
	-		
RX27	V2		
RX28	-		
RX29	V1		
RX2A	Internal error		
	-		
RX2E	FCE		
RX2F	-		



7.8.6 Word area

The data in the word area has different data sizes and content depending on the profile.

For a description of the process data, see "process input data" [▶ 186] and "process output data" [▶ 188].

1 occupied staion (profile 1) [128]

RWr		Process input data	RWw		Process output data
Word (hex)	Bit		Word (hex)	Bit	
IO-Link input data			IO-Link output data		1
RWr0RWr1		IO-Link input data port 1	RWw0RWv	v3	IO-Link output data port 1
RWr2RWr3		IO-Link input data port 2	RWw4RWv	v7	IO-Link output data port 2
RWr4RWr5		IO-Link input data port 3	RWw8RWv	vВ	IO-Link output data port 3
RWr6RWr7		IO-Link input data port 4	RWwCRWv	vF	IO-Link output data port 4
RWr8RWr9		IO-Link input data port 5	RWw10RW	′w13	IO-Link output data port 5
RWrARWrB		IO-Link input data port 6	RWw14RW	/w17	IO-Link output data port 6
RWrCRWrD		IO-Link input data port 7	RWw18RW	/w1B	IO-Link output data port 7
RWrERWrF		IO-Link input data port 8	RWw1CRW	/w1F	IO-Link output data port 8
VAUX diagnostics					
RWr10	0x0	VERR V1 C0 Ch0Ch1			
	0x1	VERR V1 C1 Ch2Ch3			
	0x2	VERR V1 C2 Ch4Ch5			
	0x3	VERR V1 C3 Ch6Ch7			
	0x4	VERR V1 C4 Ch8			
	0x5	VERR V1 C5 Ch10			
	0x6	VERR V1 C6 Ch12			
	0x7	VERR V1 C7 Ch14			
	0x8 0xB	-			
	0xC	VERR V2 C4 Ch9			
	0xD	VERR V2 C5 Ch11			
	0xE	VERR V2 C6 Ch13			
	0xF	VERR V2 C7 Ch15			
DXP diagnostics					
RWr11	0x0	-			
	0x1	ERR DXP1]		
	0x2	-			
	0x3	ERR DXP3			
	0x4	-			
	0x5	ERR DXP5			
	0x6	-			
	0x7	ERR DXP7			
	0x8 0xF	-			



RWr		Process input data	RWw		Process output data
Word (hex)	Bit		Word (hex)	Bit	
Master and device diagnostics (IO-Link port 18)					
IO-Link port 1 (chan	nel 0)				
RWr12	0x0	-			
	0x1	PPE			
	0x2	CFGERR			
	0x3	DSERR			
	0x4	HWERR			
	0x5	PDINV			
	0x6	EVT1			
	0x7	EVT2			
	0x8	PRMERR			
	0x9	OTEMP			
	0xA	LLVU			
	0xB	ULVE			
	0xC	VLOW			
	0xD	VHIGH			
	0xE	OLV			
	0xF	GENERR			
IO-Link port 2 (chan	nel 2)				
RWr13	Assigr	ment similar to IO-Link port 1			
IO-Link port 3 (chan	nel 4)				
RWr14	Assigr	ment similar to IO-Link port 1			
IO-Link port 4 (chan	nel 6)				
RWr15	Assigr	ment similar to IO-Link port 1			
IO-Link port 5 (chan	nel 8)		_		
RWr16	Assigr	ment similar to IO-Link port 1			
IO-Link port (chann	el 10)				
RWr17	Assigr	ment similar to IO-Link port 1			
IO-Link port 7 (chan	nel 12)				
RWr18	Assigr	ment similar to IO-Link port 1			
IO-Link port 8 (chan	nel 14)				
RWr19	Assigr	ment similar to IO-Link port 1			



2 occupied station (pr	ofile 2)		128]
------------------------	----------	--	------

RWr	Process input data RWw			Process output data	
Word (hex)	Bit		Word (hex) Bit		
IO-Link input data	Ì		IO-Link output dat	ta	
RWr0RWr5		IO-Link input data port 1	RWw0RWw7		IO-Link output data port 1
RWr6RWrB		IO-Link input data port 2	RWw8RWwF		IO-Link output data port 2
RWrCRWr11		IO-Link input data port 3	RWw10RWw17		IO-Link output data port 3
RWr12RWr17		IO-Link input data port 4	RWw18RWw1F		IO-Link output data port 4
RWr18RWr1D		IO-Link input data port 5	RWw20RWw27		IO-Link output data port 5
RWr1ERWr23		IO-Link input data port 6	RWw28RWw2F		IO-Link output data port 6
RWr24RWr29		IO-Link input data port 7	RWw30RWw37		IO-Link output data port 7
RWr2ARWr2F		IO-Link input data port 8	RWw38RWw3F		IO-Link output data port 8
VAUX diagnostics					
RWr30	0	VERR V1 C0 Ch0Ch1	_		
	1	VERR V1 C1 Ch2Ch3			
	2	VERR V1 C2 Ch4Ch5			
	3	VERR V1 C3 Ch6Ch7			
	4	VERR V1 C4 Ch8			
	5	VERR V1 C5 Ch10	_		
	6	VERR V1 C6 Ch12	_		
	7	VERR V1 C7 Ch14			
	8 11	-			
	12	VERR V2 C4 Ch9	-		
	13	VERR V2 C5 Ch11	-		
	14	VERR V2 C6 Ch13			
	15	VERR V2 C7 Ch15	-		
DXP diagnostics		1			
RWr31	0	-			
	1	ERR DXP1			
	2	-	-		
	3	ERR DXP3			
	4	-	-		
	5	ERR DXP5	-		
	6	-			
	7	ERR DXP7	1		
	8 15	-			



RWr		Process input data	RWw		Process output data
Word (hex)	Bit		Word (hex)	Bit	
Master and device	diagn	ostics (IO-Link port 18)			
IO-Link port 1 (cha	nnel 0)				
RWr32	0	-			
	1	PPE			
	2	CFGERR			
	3	DSERR			
	4	HWERR			
	5	PDINV			
	6	EVT1			
	7	EVT2			
	8	PRMERR			
	9	OTEMP			
	10	LLVU			
	11	ULVE			
	12	VLOW			
	13	VLOW			
	14	OLV			
	15	GENERR			
IO-Link port 2 (cha	nnel 2)				
RWr33 Assignment similar to IO-Link port 1					
IO-Link port 3 (cha	nnel 4)				
RWr34	Assigr	nment similar to IO-Link port 1			
IO-Link port 4 (channel 6)					
RWr35	/r35 Assignment similar to IO-Link port 1				
IO-Link port 5 (cha	IO-Link port 5 (channel 8)				
RWr36	Assigr	nment similar to IO-Link port 1			
O-Link port 6 (channel 10)					
RWr37	Assignment similar to IO-Link port 1				
IO-Link port 7 (cha	nnel 12	2)			
RWr38	Assign	nment similar to IO-Link port 1			
IO-Link port (chanr	nel 14)				
RWr39	Assign	nment similar to IO-Link port 1			



3 occupied station (p	orofile 3)	[▶ 128]
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RWr		Process input data	RWw		Process output data
Word (hex)	Bit		Word (hex)	Bit	
IO-Link input data	1		IO-Link output data		
RWr0RWr5		IO-Link input data port 1	RWw0RWwB		IO-Link output data port 1
RWr6RWrB		IO-Link input data port 2	RWwCRWw17		IO-Link output data port 2
RWrCRWr11		IO-Link input data port 3	RWw18RWw23		IO-Link output data port 3
RWr12RWr17		IO-Link input data port 4	RWw24RWw2F		IO-Link output data port 4
RWr18RWr1D		IO-Link input data port 5	RWw30RWw3B		IO-Link output data port 5
RWr1ERWr23		IO-Link input data port 6	RWw3CRWw47		IO-Link output data port 6
RWr24RWr29		IO-Link input data port 7	RWw48RWw53		IO-Link output data port 7
RWr2ARWr2F		IO-Link input data port 8	RWw54RWw5F		IO-Link output data port 8
VAUX diagnostics					
RWr30	0	VERR V1 C0 Ch0Ch1			
	1	VERR V1 C1 Ch2Ch3			
	2	VERR V1 C2 Ch4Ch5			
	3	VERR V1 C3 Ch6Ch7			
	4	VERR V1 C4 Ch8	-		
	5	VERR V1 C5 Ch10	-		
	6	VERR V1 C6 Ch12			
	7	VERR V1 C7 Ch14	-		
	8	-	-		
	11		-		
	12	VERR V2 C4 Ch9	_		
	13	VERR V2 C5 Ch11	_		
	14	VERR V2 C6 Ch13	_		
	15	VERR V2 C7 Ch15			
DXP diagnostics			_		
RWr31	0	-	_		
	1	ERR DXP1	_		
	2	-	_		
	3	ERR DXP3	_		
	4	-			
	5	ERR DXP5			
	6	-			
	7	ERR DXP7			
	8 15	-			



RWr		Process input data	RWw		Process output data
Word (hex)	Bit		Word (hex)	Bit	
Master and device	diagn	ostics (IO-Link port 18)			
IO-Link port 1 (cha	nnel 0)				
RWr32	0	-			
	1	PPE			
	2	CFGERR			
	3	DSERR			
	4	HWERR			
	5	PDINV			
	6	EVT1			
	7	EVT2			
	8	PRMERR			
	9	OTEMP			
	10	LLVU			
	11	ULVE			
	12	VLOW			
	13	VLOW			
	14	OLV			
	15	GENERR			
IO-Link port 2 (cha	nnel 2)				
RWr33	Assigr	nment similar to IO-Link port 1			
IO-Link port 3 (cha	nnel 4)				
RWr34	Assigr	nment similar to IO-Link port 1			
IO-Link port 4 (channel 6)					
RWr35	Assigr	nment similar to IO-Link port 1			
IO-Link port 5 (cha	O-Link port 5 (channel 8)				
RWr36	Assigr	nment similar to IO-Link port 1			
IO-Link port 6 (cha	ort 6 (channel 10)				
RWr37	Assignment similar to IO-Link port 1				
IO-Link port 7 (cha	nnel 12	2)			
RWr38	Assigr	nment similar to IO-Link port 1			
IO-Link port 8 (cha	nnel 14	4)			
RWr39	Assign	nment similar to IO-Link port 1			



RWr		Process input data	RWw		Process output data
Word (hex)	Bit		Word (hex)	Bit	
IO-Link events					
RWr3A	07	Qualifier 1st event			
	8 15	Port 1st event			
RWr3B	0 15	Event code 1st event			
RWr3C	07	Qualifier 2nd event			
	8 15	Port 2nd event			
RWr3D	0 15	Event code 2nd event			
•••]		
RWr58	07	Qualifier 16th event]		
	8 15	Port 16th event			
RWr59	0 15	Event code 16th event			

4 occupied station (profile 4) [> 128]

RWr		Process input data	RWw		Process output data
Word (hex)	Bit		Word (hex)	Bit	
IO-Link input data		IO-Link output data			
RWr0RWrF		IO-Link input data port 1	RWw0RWw	′F	IO-Link output data port 1
RWr1RWr1F		IO-Link input data port 2	RWw10RW	w1F	IO-Link output data port 2
RWr20RWr2F		IO-Link input data port 3	RWw20RW	w2F	IO-Link output data port 3
RWr30RWr3F		IO-Link input data port 4	RWw30RWv	w3F	IO-Link output data port 4
RWr40RWr4F		IO-Link input data port 5	RWw40RW	w4F	IO-Link output data port 5
RWr50RWr5F		IO-Link input data port 6	RWw50RW	w5F	IO-Link output data port 6
RWr60RWr6F		IO-Link input data port 7	RWw60RW	wбF	IO-Link output data port 7
RWr70RWr7F		IO-Link input data port 8	RWw70RW	w7F	IO-Link output data port 8



7.8.7 Parameter mapping

The chapter "Parameterizing and configuring" [▶ 170] contains a detailed parameter description.

Parameter ID	Offset	Parameter name	Channel	Value	Meaning
B000	0.0	Manual output reset after	1	0	No
		overcurrent Ch1		1	Yes
	0.3	Manual output reset after	3	0	No
		overcurrent Ch3		1	Yes
	0.5	Manual output reset after	5	0	No
		overcurrent Ch5		1	Yes
	0.7	Manual output reset after	7	0	No
		overcurrent Ch7		1	Yes
	1.0	Activate output Ch1	1	0	No
				1	Yes
	1.3	Activate output Ch3	3	0	No
		-		1	Yes
	1.5	Activate output Ch5	5	0	No
		-		1	Yes
	1.7	Activate output Ch7	7	0	No
				1	Yes
B001	0.0	Operation mode	IOL1	0	IO-Link without validation
		Data storage mode	_	1	IO-Link with family compatible device
				2	IO-Link with compatible device
				3	IO-Link with identical device
				4	DI (with parameter access)
				8	DI
	0.4			0	Activated
				1	Overwrite
				2	Read in
				3	Deactivated, clear
	0.6	Activate Quick Start-Up	-	0	Inactive
				1	Active
	0.7	Device parameterization via GSD	-	0	Inactive
		(GSD)		1	Active
	0.8	Cycle time		0	Automatic
				16	1.6132.8 ms
				191	
			_	255	Automatic, compatible
	1.0	Revision		0	Automatic
			-	1	V1.0
	1.1	Process input data invalid		0	Diagnostics generated
		(PDIN invalid)		1	No diagnostics generated



Parameter ID	Offset	Parameter name	Channel	Value	Meaning		
B001	1.2	Deactivate diagnostics	IOL1	0	No		
				1	Notifications		
				2	Notifications and warnings		
				3	Yes		
	1.4	Process inpput		0	Direct		
		data mapping		1	Swap 16 bit		
		(Mapping PDIN)		2	Swap 32 bit		
				3	Swap all		
	1.6	Process output		0	Direct		
		data mapping		1	Swap 16 bit		
				2	Swap 32 bit		
				3	Swap all		
	4.0	Vendor ID		0655	35		
	5.0	Device ID		0167	016777215		
B002			IOL2	Assignr	ment similar to B001 for IOL1		
B008			IOL8				
B009	0.0	VAUX1 Pin1 C0 (Ch0/1)	0/1	0	24 VDC		
				1	switchable		
				2	Off		
	0.8	VAUX1 Pin1 C1 (Ch2/3)	2/3	Assignr	ment acc. to offset 0.0 for C0		
	1.0	VAUX1 Pin1 C2 (Ch4/5)	4/5				
	1.8	VAUX1 Pin1 C3 (Ch6/7)	6/7				
	2.0	VAUX1 pin 1 C4 (Ch8/9)	8/9				
	2.8	VAUX1 Pin1 C5 (Ch10/11)	10/11				
	3.0	VAUX1 pin 1 C6 (Ch12/13)	12/13				
	3.8	VAUX1 pin 1 C7 (Ch14/15)	14/15				
	6.0	VAUX2 Pin2 1 C4 (Ch8/9)	8/9				
	6.8	VAUX2 Pin2 C5 (Ch10/11)	10/11				
	7.0	VAUX2 Pin2 1 C6 (Ch12/13)	12/13				
	7.8	VAUX2 Pin2 1 C7 (Ch14/15)	14/15				



7.8.8 Acyclic communication via SLMP – supported functions

The devices support acyclical access via SLMP command Device Read (0x0401) and Device Write (0x1401).

Supported Device Codes

Device Code	Description
0x0011	Device information (vendor ID, device code, device name, etc.)
0x00AC	Acyclic communication
0x00D8	Input data
0x00D9	Output data
0x00DD	Diagnostic data

Supported End Codes

End Code	Description
0x0000	Command successfully executed
0xC059	Command/subcommand: not supported command or subcommand
0xC05C	Wrong data: data content does not fit to the command data content does not fit to the command
0xC061	Data length: data length does not fit to the command

Read device information (Device Code 0x0011)

Address (Add)	Content	Access type	Data length in word (Len)	Description
0x0001	Vendor code	ro	1	Vendor ID Turck: 0x3355
0x0002	Model code	ro	2	ID of the device
0x0003	Model name	ro	2	Device name
0x0004	FW version	ro	2	Firmware version of the device
0x0005	Stack version	ro	2	Version of the CC-Link component



Address (Add)	Read access	Write access	Data length in word (Len)	Content	Description
0xACAC	Open Connection		1	0xAD00 0xADFF, 0x0000	A read access to this address opens an acyclic connection or returns an error. A valid connection handle is 0xAD000xADFF, or 0 in case of failure.
0xACAC		Close Connection	1	0xAD00 0xADFF, 0xFFFF	Write access to this address closes an acyclic connection. Writing a previously opened connection ad- dress (0xAD000xADFF) closes this connection. If the value -1 (0xFFFF) is written, all acyclic connections opened for CC-Link are closed.
0xAD00			1240	Acyclic dat	ta
 0xADFF					

Acyclic I/O communication (Device Code 0x00AC)

Example access:

1. Open Connection:

Device Read (0x0401) Device Code = 0xAC Add = 0xACAC Len =1 Result: 0xAD00 = Connection address: must be used for the following connection accesses, like read, write and close.

2. Read Connection:

Device Read (0x0401) Device Code = 0xAC Add = 0xAD00 Len =1 Result: n words of received frame. The requested length is the maximum buffer size. If the available acyclic data does not fit in the buffer, the exceeding data is truncated.

3. Write Connection:

Device Read (0x1401) Device Code = 0xAC Add = 0xAD00 Len =1 Result: n words of data to be sent.

4. Close Connection:

Device Write (0x1401) Device Code = 0xAC Add=0xACAC, Len=1 Data: 0xADxx (address of the previously used Open Connection)



Read input data (Device Code 0x00D8)

Address (Add)	Access type	Data length in word (Len)	Description
0x0000	ro	1n	Access to all input data of the device regardless of profiles and restrictions due to the number of occupied stations, order:
			1. Data from RWr area
			2. Data from RX area
0x0001 0x00	ro	1n	Accesses the input data of one (sub)module. Data is struc- tured in the native order of that (sub)module.

Write output data (Device Code 0x00D9)

Address (Add)	Access type	Data length in word (Len)	Description	
0x0000	rw	1n	Access to all output data of the device regardless of profiles and restrictions due to the number of occupied stations, order:	
			1. Data from RWw area	
			2. Data from RY area	
0x0001 0x00	rw	1n	Accesses the output data of one (sub)module. Data is structured in the native order of that (sub)module.	

Read Diagnostic data data (Device Code 0x00DD)

Address (Add)	Access type	Data length in word (Len)	Description
0x0000	ro	1n	Access to all diagnostic data of the device regardless of profiles and restrictions due to the number of occupied stations
0x0001 0x00	ro	1n	Accesses the diagnostic data data of one (sub)module. Data is structured in the native order of that (sub)module.



7.9 Connecting devices to a CC-Link IE Field Basic client with GX Works3

Naming convention

Turck uses the terms "client" and "server". The following description uses the terms "Master Station" (client) and "Slave Station" (server) only because of the naming in Melsoft GX Works.

Used hardware

The following hardware components are used in this example:

- Mitsubishi MELSEC iQ-R controller
- Mitsubishi CPU 04ENCPU with local CC-Link IOs
- TBEN modules (as example)
 - TBEN-LL-8DIP-8DOP (IP address: 192.168.3.10)
 - TBEN-S2-4IOL (IP address: 192.168.3.12)

Used software

The following software tools are used in this example:

Melsoft GX Works3

Prerequisites

- The GX Works3 software is open and a new project has been created.
- The controller including CPU and local IOs is configured in GX Works3.



7.9.1 Register the CSP+ files in GXWorks3

Select and register CSP+ files via Tools → Profile Management → Register. Note: CSP+ files can only be registered in GX Works3 if no project is open.



Fig. 72: Profile Management, Register Profile


7.9.2 Configuring the network settings

The network settings are configured at the CPU used under **Parameter** \rightarrow **used CPU** (here: R04ENCPU) \rightarrow **Module Parameters**.

Setting the IP address of the CPU

► Set the IP address of the CPU under **Own Node Settings** → **IP Address**.

Activate CC-Link Field Basic

The CC-Link IEF Basic protocol must be activated in the CPU.

Under CC-Link IEF Baisc Settings, set the option To Use or Not to Use CC-Link IEF Basic Setting to Use in order to activate







7.9.3 Configuring the CC-Link IE Field Basic network

Scanning the network

► Under Module Parameters → CC-Link IEF Basic Settings open the function Network Configuration Settings.



Fig. 74: GX Works3: Network Configuration Settings



Scan the CC-Link IEF Basic network under CC-Link IEF Basic Configuration via Detect Now.

8	CC-Lin	k IEF Ba	asic Configuration											×
i co	-Link I	IEF Basi	c Configuration Edit	View Clo	se with Discarding t	the Setting Close with F	Reflecting the Se	tting						
		C	Detect Now	Lin	k Scan Setting							Modu	le List	×
L.,	Conn	ected	Count 0									EF Basic	Selectior	n 4 ≻]
		No	Model Name	STA	# Station Type	RX/RY Set	ting	RWw/RWr S	Setting	Group No	RSVD	<u>₽</u> ₽↓		A
T				31/1	" Station Type	Points	Start End	Points Start	End	droup no.	STA	大崎		
IT.	-	U	Host Station	0	Master Station							E CC-I	ink IEF	Basic
L												E CC-I	ink IEF	Basic
L												∃ In	put Mo	dule
L													Itput M	Iodule
L												<u>⊞ 1/</u>	O Comi	oned N
L												E 50		nnlifier
L												E G)T2000	Series
L												⊡ In	verter	(FR-A
	<		-								>	🕀 In	verter	(FR-F8
													F Basic	Modu
												∃ 10	-Link g	atewa
Host	Station												F Basic	Modu
linose	5424011												-Link M	laster
													F Basic	ios No
All	×#0 Connec	cted Co											in sei	ies ne
Tot	::0 al STA:	#:0												
			<								>			
Out	put													×
	_													
L														
L														
L														
L														

Fig. 75: GX Works3: scanning the CC-Link IEF Basic network



All CC-Link devices found in the Ethernet network are displayed in the order in which they are integrated in the network.

B (C-Link	c IEF B	asic Cor	nfiguration													— 🗆	Х
i cc	-Link IE	EF Bas	ic Confi	guration E	dit View Close	with Dis	scarding the S	etting	Close	with Ref	lecting	the Sett	ing					
		1	Detect	Now	Link	Scan Se	tting											
L	Conne	ected	Count	8														
		No	N	Indal Nama	Station Typ		RX/RY	Settir	ng		RWw	/RWr Se	etting	Group		ID Address	Subpot Mask	MAC
		NO.	P	louername	Station Typ	-	Points		Start	End	Points	Start	End	No.	KSVD STA	IP Address	Subilet Mask	ddre:
	-	0	Host S	tation	Master Statio	r										192.168.3.39	255.255.255.0	
	C.m.	1	TBEN-	LL-8IOL	Slave Station	54 (1	Occupied Sta	ation)	0000	003F	32	0000	001F	1	No Setting	192.168.145.112	255.0.0.0	:12
	-	2	TBEN-	S2-4IOL	Slave Station	54 (1	Occupied Sta	ation)	0040	007F	32	0020	003F	1	No Setting	192.168.3.12	255.255.255.0	:B7
	-	3	TBEN-	S2-4IOL	Slave Station	54 (1	Occupied Sta	ation)	0080	00BF	32	0040	005F	1	No Setting	192.168.145.121	255.255.255.0	:13
	-	4	TBEN-	S2-4AI	Slave Station	54 (1	Occupied Sta	ation)	00C0	00FF	32	0060	007F	1	No Setting	192.168.145.95	255.255.255.0	:68
	0.000 M	5	TBEN-	LL-8DIP-8DO	P Slave Station	54 (1	Occupied Sta	ation)	0100	013F	32	0080	009F	1	No Setting	192.168.3.10	255.255.255.0	:38
	CAILINE .	5	TBEN-	LL-16DIP	Slave Station	54 (1	Occupied Sta	tion)	0140	01/F	32	00A0	OODE	1	No Setting	192.168.1.254	255.255.255.0	
	0.0011a	· 。	TDEN-		Slave Station	54 (1	Occupied Sta	ation)	0160	0166	32	0000	000F	1	No Setting	192.108.145.125	255.255.255.0	
	C.0114	0	I DEIN-	LL-0IULA	Slave Station	54 (1	Occupied Sta	aciony	0100	UIFF	52	UUEU	UUFF	1	NO Second	192.100.145.124	233.233.233.0	97
	<																	>
		\square	#1	STA#2	STA#3	STA#4	STA#5	S	TA#6	ST	A#7	STA	#8					
Host 9	Station					Т			Т									
ST/ All (unt	1#0 Connect	ted Co	1990 -	Similar	Straines .	in the basis	A 1965		- Alth		Ath.	3. B	All's					
	ai 51A#	-10	LL-8I L	TBEN-S2-4I OL	TBEN-S2-4I TB OL	EN-S2-4A I	P-8DOP	I TBE	EN-LL-16 DIP	TBEN	I-LL-8I OL	TBEN-L OL	.L-8I .A					
			<															>

Fig. 76: GX Works3: Devices in the CC-Link IEF Basic network

Devices that do not match the IP address range of the controller cannot be added to the project.

- ▶ Delete the devices with an IP address outside the IP address range of the control unit by right-clicking on the device → Delete from the list of network nodes or change the devices' IP address in the IP address column.
- For devices that can be integrated with different process data variables (profiles) (here: TBEN-S2-4IOL): select the requested profile under Station Type.



Parameterizing CC-Link nodes

► Right-click on the device to be parameterized and select the device parameters via Online → Parameter Processing of Slave Station.

8	CC-Link	c IEF B	asic Co	nfiguration														- 0	×
i co	C-Link II	EF Bas	ic Conf	iguration Edit	View	Close	with Dis	carding	the Setting Clos	e with Re	flecting	the Sett	ing						
		[Detect	Now		Link S	Scan Set	ting											
	Conne	ected	Count	2															
				Mandal Manag		CTA#	Chattin		RX	'RY Setti	ng		RWw/	/RWr Se	etting	Conver No.	DOUD CTA	TD Address	rc
		NO.		Model Name		STA#	Statio	туре	Points		Start	End	Points	Start	End	Group No.	KSVD STA	IP Address	a
	839	0	Host S	Station		0	Master	Station										192.168.3.3	9 5
I	0.000	1	TBEN-	LL-8DIP-8DOP		1	Slave S	tation	54 (1 Occupied	Station)	0000	003F	32	0000	001F	1	No Setting	192.168.3.1	0 5
I		2	TBEN	S2-4IOL		2	Slaver	Com	54 (1 Occupied	Station)	0040	007F	32	0020	003F	1	No Setting	192.168.3.1	2 5
I	<							Сору											>
								Paste	-	-									
li -			#1	STA#2				Selec	t All										
							- 1	Delet	e										_
Host	Station							Mov	es Up]									
I			100	at the second				Mov	es Below										
ST	A#0		hat	Sinne				Char	ige Module 🛛 🕨										
All un	t:2	ted Co						Chec	k 🕨										
То	tal STA#	¢:2	L-8DI	TBEN-S2-4I				Onlir	ne 🕨	De	tect Nov	v							
I			OP	OL		Prop	erties	Co	ommuni	cation S	Setting F	Reflectio	n of Sla	ve Station					
			<							Pa	rameter	Process	sing of S	Slave Sta	tion				>

Fig. 77: GX Works3: Opening parameterization

• Activate the writing of parameters via **Method selection** \rightarrow **Parameter write**.



NOTE

All parameters for one slot (in the example below: Slot 1) must be set. It is not possible to set individual parameters for a slot.



Set the	parameters	and store the	e settings via	Execute.
	1			

rameter Processing of Slave Station									>
arget Module Information: TBEN-S2-4IOL Station No.: 1									^
									*
ethod selection: Parameter write		~	Write parame	ter to t	arget module.				^
٤									
Parameter Information									*
Checked parameters are the targets of	selected process	ses.							
Select All Cancel All S	elections								
Name	Initial Value	Unit	Read Value	Unit	Write Value	Unit	Setting Range	Description	^
Slot1									
🗹 🖻 Basic_PARAM						-			
····· Manual reset after overcurr.					yes	;			
Manual reset after overcurr.					yes	;			
Manual reset after overcurr.					no				-
Manual reset after overcurr.					yes	;			-
Activate output 1					yes	; 			-
Activate output 3					yes	5			
Activate output 5		<u> </u>			no	2			-
Slot2					nd	'			- V
Clear All "Read Value"			Clear All "Writ	e Value					
Cical All Read Value			Cical All With	e value					
Process Option									
		The	ere is no option	in the s	elected process				
- Process is executed to a module of "Ta	raet Module Infa	rmatic	n"						
- The device is accessed by using "the cu	irrent connection	n desti	nation". Please	check i	f there is any pr	oblem	with the connection	n destination.	,
- For information on items not displayed	on the screen, p	lease	refer to the Op	erating	Manual.				
									Execute
Import	Export								Close
anipor erri	Experient								0.000

Fig. 78: GX Works3: Parameterizing the device



- ▶ Optional: Export the parameter settings under Method selection → Parameter read as CSV file and re-import the file under Method selection → Parameter write in order to fill the column Write Values with the actual parameter settings and then to be able to change single parameters.
- Close the window CC-Link IEF Basic Configuration via Close with Reflecting the Setting and store the network structure.

8	CC Li	nk IEF B	asic Configuratio	n											- 0		×
÷	CC-Link	IEF Bas	ic Configuration	Edit View	v Close	with Discarding	the Setting Close with	n Reflecting	the Sett	ing							
Г			Detect Now		Link	Scan Setting											
Ŀ	Con	nected	Count	2													
		No.	Model 1	Name	STA#	Station Type	RX/RY S	etting		RWw/	RWr Se	etting	Group No.	RSVD STA	TP Ad	dress	rc
	-		Houer		0174	Station Type	Points	Start	End	Points	Start	End	oroup no.	1010 0111	1 /10	01000	a
17		0	Host Station		0	Master Station									192.16	8.3.39	5
L .	C.011	1	TBEN-LL-8DIP-8	BDOP	1	Slave Station	54 (1 Occupied Stati	on) 0000	003F	32	0000	001F	1	No Setting	192.16	8.3.10	5
L .	ener	2	TBEN-S2-4IOL		2	Slave Station	64 (1 Occupied Stat	✓ 0040	007F	32	0020	003F	1	No Setting	192.16	8.3.12	5
L .	<						64 (1 Occupied Stat	ion)				_	_		_	_	>
I			STA#1	STA#2			256 (4 Occupied Sta	ition)									
Ho	ost Statio	n	1990	- EST													
	STA#0 All Conne unt:2 Total ST	ected Co	A THUR	San in													
	rotai 517		TBEN-LL-8DI T P-8DOP	TBEN-S2-4I OL													
L			٤														>

Fig. 79: GX Works3: Storing the network structure







Fig. 80: GX Works3: Module Parameters, accept changes



7.9.4 Defining the process data mapping for CC-Link devices in the network

The start addresses of the process data for the devices that follow the **Master Station (Client)** (controller + local IOs) in the network are defined under **Module Parameters** \rightarrow **CC-Link IEF Basic Settings** using the **Refresh Settings** function.

- ▶ Open the Refresh Settings function under Module Parameters → CC-Link IEF Basic Settings.
- Define the start addresses for the process data of the CC-Link devices in CPU side. Check can be used to verify whether the addresses are valid or overlap with the memory area occupied by the control unit.

📳 R04ENCPU Module Parameter 🗙											4 ۵ -
Setting Item List	Setting Item										
<u> </u>											
		Link Side						CPU Side	1		
Basic Settings	Device Name	Points	Start	End		Target		Device Name	Points	Start	End
🔤 🖉 Own Node Settings	RX	192	00000	000BF	+	Specify Device	\sim	X ~	192	00100	001BF
😋 CC-Link IEF Basic Setting	RY	192	00000	000BF	+	Specify Device	\sim	Y ~	192	00100	001BF
External Device Configura	RWr	96	00000	0005F	- 🗰 -	Specify Device	\sim	W ~	96	00300	0035F
	R₩w	96	00000	0005F	+	Specify Device	\sim	W ~	96	00100	0015F
< >	Explanation										
Item List Find Result	Chec <u>k</u>		Re	store the	Defa <u>u</u> lt S	Settings					
										<u>A</u> pply	

• Accept the mapping settings with **Apply**.

Fig. 81: GX Works3: Process data mapping in Refresh Settings



NOTE

Adjusting the mapping may require a voltage reset of the control unit.



7.9.5 Going online with the PLC

• Write the configuration to the PLC via **Online** \rightarrow **Write to PLC**.

MELSOFT GX Works3 C:\Users\testplatz\Desktop	CC-Link IEFB.gx3 - [R04	ENCPU Module Param	neter]	_	
Project Edit Find/Replace Convert View	Online Debug Reg	ording Diagnostics	Tool Window Help		_ & ×
	Current Connect	ion Destination			
	Read from PLC				•
	Write to PLC				
	Verify with PLC				4.5
	Remote Operatio	n(S)			
Setting Item I	Safety PLC Opera	tion	•	Cattion	
Module Configuration	Redundant PLC (Operation(G)	▶ nge	Disable All (SLMP)	^1
🗉 🔚 Program	CPU Memory Op	eration	lige	Binary	
🔂 FB/FUN	Delete PLC Data.			Do Not Open by Program	
🖬 🌆 Label 🔤 🖓 🖼 🖓 Barice	User Data				
E Cevice	Set Clock		nk IEF Basic Setting	<pre>Use <detailed setting=""></detailed></pre>	
🔹 System Parameter	Monitor		•	<detailed setting=""></detailed>	
E 🛃 R04ENCPU	FB Property Man	agement (Online)	n		
CPU Parameter	Watch		> on	<detailed setting=""></detailed>	
Memory Card Parar	User Authenticat	ion	▶ ort UDP/IP	Use	
🗏 🙆 Module Information	J	MELSOFT Transmissio	n Port TCP/IP	Use	~
(£ 0000:_RJ71EN71(CC	Expla	nation			
040:RG60		Check	Restore the Default Se	attinge	
1 tem List F	nd Result	Check	ricatore the Delu <u>u</u> it of	cungo	·
10060:RG60				Ar	pply
Remote Password Output					д×
Watch 1					д х
HILON HLOFF HAON/OFF toggle 🖉 Update					
Progress					
		R04EN	Host-192.168.3.39		.:

Fig. 82: GX Works3: Writing the configuration to the PLC



▶ If necessary, define which data have to be written and click Execute.

line Data Operation									-		>
isplay Setting Related Functions											
			Verify	/ 🖳 🎸	Delete	•					
Parameter + Program(F) Select All Open/Close All(T) Deselect All(N)	Legend	Built-in Me	mory	SD M	lemory Card	🚹 Inte	elligent Function Module				
Module Name/Data Name	*			Detail	Title		Last Change	Size (Byte)			^
CC-Link IEFB											
- 🚯 Parameter											
System Parameter/CPU Parameter							27.01.2022 08:19:54	Not Calculat	ed		
- 🚳 Module Parameter	•						15.05.2024 10:48:03	Not Calculat	ed		
Memory Card Parameter							03.12.2021 08:05:49	Not Calculat	ed		
Remote Password							27.01.2022 08:19:54	Not Calculat	ed		
🖻 🎁 Global Label											
Global Label Setting	~						22.12.2021 08:37:58	Not Calculat	ed		
e-Se Program				Detail							
MAIN	•						14.03.2022 13:02:26	Not Calculat	ed		
E-@ Device Memory				1							
MATN				Detail			27.01.2022.08+20+02	-		_	-
Display Memory Capacity											
Size Calculation									Free		
									157/160KB		
egend Data Memory									Free		
Used									1811/2049KB		
Increased Device/Label Memory (File Sto	rage Area) –								Free		
Decreased									192/256KB		
Free: 5% or Less SD Memory Card									Free		
									0/0KB		
								Execute		Close	



7.9.6 Reading process data

The monitoring of process data is done in the Device/Buffer Memory Batch Monitor.

▶ Open the monitoring via **Online** → **Monitor** → **Device**/**Buffer Memory Batch Monitor**.



Fig. 84: GX Works3: Starting the monitoring of process data



► Enter the address of the process data to be read under **Device Name**. According to the defined process data mapping [▶ 153] **X100** is selected as start address.

🙀 Module Config	urat	ion		1	[De	vic	e/B	uffe	er N	1en	nory	Ba	atch >	<														4	⊳ -
Device Name		×10	0								``	-	Ор	en D	lisplay	/ Form	at	[Detail	ed (Condit	ions		۲	Monit	oring			
O Buffer Memory	/	Unit										1	(HEX)		Addr	ess					~	DEC	С		Stop Mo	nitoring	1		
Device Name	FI	EDC	в	A	9 8	7	6	5	4 3	3 2	1	0			Currer	t Value					Stri	ng							~
X100	0	0 0 0	0	0	0 0	0	0	0	0 0) 0	1	0							2										<u> </u>
X110	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X120	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(_					
X130	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X140	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X150	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X160	0	0 0 0	0	0	0 0	0	0	0	0 0) 0	0	0						(
X170	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X180	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X190	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X1A0	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X180	0	0 0 0	0	0	0 0	0	0	0	0 0) 0	0	0						(
X1C0	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X1D0	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X1E0	0	0 0 0	0	0	0 0	0	0	0	0 0) 0	0	0						(
X1F0	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X200	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X210	0	0 0 0	0	0	0 0	0	0	0	0 0) 0	0	0						(
X220	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						()										
X230	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X240	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X250	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X260	0	0 0 0	0	0	0 0	0	0	0	0 0) 0	0	0						(
X270	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X280	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(
X290	0	0 0 0	0	0	0 0	0	0	0	0 0) 0	0	0						(
X2A0	0	0 0 0	0	0	0 0	0	0	0	0 0	0 0	0	0						(~

Fig. 85: GX Works3: Monitoring of process data

➡ The mapping shows a signal at the 2nd Digital input of the 1st CC-Link device (station address 2, TBEN-LL-8DIP-8DOP) [▶ 146].



7.10 Commissioning IO-Link devices

7.10.1 Commissioning IO-Link device-Link devices via IO-Link Device Application

The IO-Link devices connected to the IO-Link master can be commissioned via generic or device-specific IODDs in the IO-Link Device Application. The IO-Link Device Application is called up via the web server of the IO-Link device-Link master module.



NOTE

To be able to call up the IO-Link Device Application, a login to the web server of the IO-Link master is required [> 36].

Connected IO-Link devices are read in and initially mapped by a generic IODD.

START IO-LINK	DOCUMENTATION	TURCK Your Global Automation Partner
TBEN-LL-8IOLA	IO-LINK → LOCAL I/O → PORT 8 - P\$510-10V-04-2UPN8-H1141	Logout
LOCAL I/O Port 1 - No device Port 2 - No device Port 3 - No device Port 4 - TBIL-M1-16DXP Port 5 - No device Port 6 - No device Port 7 - No device Port 8 - P5510-10V-04-2UPN8	Read Write Load IODD Web search Print User role Identification Vendor: Generic Device: Generic device Process data Active events Vendor Name Turck Event history Vendor Text www.turck.com Product ID Product Text intelligent pressure Serial Number 040633720000007 Hardware Revision 1.1.7.0 Application-specific Tag Direct grameters: Process Data Input Length Direct secondaries: Dresse Data Outerd Length 10	N8-H1141
English 🗸		

Fig. 86: IO-Link device with generic IODD



Device-specific IODDs can be loaded either directly from the local file system via **Load IODD** or from the database of the IO-Link consortium via **Websearch**. A PC with Internet access is required for the **Websearch** function.

When using a device-specific IODD, the IO-Link device is mapped with all IO-Link device-specific parameters, process data, etc. that are defined in the IODD.

START IO-LINK	DOCUMENTATION	ı		TURCK Your Global Automation Partner
TBEN-L4-8IOLA	IO-LINK -> LOCAL I	/O → PORT 2 - TBIL-S4-8DXP		Logout
LOCAL I/O Port 1 - No device Port 2 - TBIL-S4-8DXP Port 3 - No device	₽► ► Ö Read <i>Write</i> Unlink Identification	Specialist IODD Print User role Vendor:		ŕ
Port 4 - No device Port 5 - SBG232	Parameters	Device: TBIL-S4-8DXP	ALCON ALCON	
Port 6 - No device	Diagnostics	V01.0031 / 2018-12-06 © 2018, Vendor Name	Werner Turck GmbH Co. & KG Turck ?	
No device	Observation	Vendor Text	www.turck.com	
Port 8 - No device	Process data	Product Name Product ID	TBIL-S4-8DXP ? 100002596 ?	
	Process data structure	Product Text Serial Number	VO-Hub ?	
	Active events	Hardware Revision Firmware Revision	V0.1 ?	
	Event history	Application-specific Tag	SS ?	
	Connections	Function Tag Location Tag	TAS-FuncTag TAS-LocTag	
Earlish				· · · · · · · · · · · · · · · · · · ·

Fig. 87: IO-Link device with device specific IODD



Unlink IODD disconnects the connection to the device-specific IODD and causes the IO-Link device to be mapped again by a generic IODD. **Print** can be used to print the respective page content or save it as a PDF file, e.g., for system documentation.

Parameter settings for IO-Link devices can be exported or imported as *.json files in the **Parameter** section. **Set defaults** resets the values in the IO-Link Device Application interface to default settings. To reset IO-Link devices, the **RESTORE FACTORY SETTINGS** system command must be executed.

		DOCUMENTATION								
TBEN-LL-8IOLA	0-LINK → LOCAL I/(Logout								
 LOCAL I/O Port 1 - No device Port 2 - No device Port 3 - No device Port 4 - TBIL-M1-16DXP Port 5 - No device Port 6 - No device Port 7 - No device Port 8 - PS510-10V-04-2UPN8- 	Read Write Export Identification Parameters Diagnostics Observation Process data Process data Active events Event history	Import Set defaults ic? ic?<	cialist V User role	2 2 2 2						
English V	Connections		TEST ON ALL OTIMINELS	•						

Fig. 88: Parameters of the IO-Link device



7.10.2 Commissioning IO-Link devices via SIDI (PROFINET only)

The IO-Link devices are defined in the GSMDL file of the IO-Link master. They can be selected directly in PROFINET engineering and assigned to the IO-Link ports of the IO-Link master module.



Fig. 89: Example: TIA Portal, IO-Link device in hardware catalog (SIDI)



Parameterizing IO-Link devices via PROFINET engineering

To be able to parameterize IO-Link devices via the GSDML, the "Device parameterization via GSD" parameter must be activated on the IO-Link master port (default setting).

Vîŝ	Sie	mens - (C:\Users\Auto	matisie	rung\TIA\	TBEN-L8IC	DLA_V16\TBEN-L	8IOLA_V16							_ 🗆 ×
Pro Pro	ject	Edit	View Insert eproject 📑	Online	e Option	s Tools	Window Help	🖳 🛃 💋 Go	on	ine 🔊 Go offli	line 🎝 🔝	Total	Ily Integrated Aut	omation PORT	AL
\mathbf{r}	TBE	N-L8101	_A_V16 → U	ngroup	oed devic	es ▶ tur	rck-tben-l4-8iola	(TBEN-L4-81	0L/	<u>]</u>				- •	X (
										🚆 Topolo	ogy view	晶 Network	k view 🛛 🚺 Dev	ice view	
s		Devic	e overview												lard
ork		*	. Module			Rack	Slot	I ad		Туре	Article	no.	Firmware	Com	Wa
etv			 turck-tbe 	n-l4-8iol	a	0	0			TBEN-L4-8IOLA	A 1000	28459	SWV 1.7.25		^ 0
~	8 1		PN-IO			0	0 X1			turck-tben-l4-8	8iola				ata
S .	2 -		Basic_1			0	Basic			Basic					
No.	i e		B2N360-	Q42_1		0	IO-Link Port 1			B2N360-Q42					
l ă l'	1.		Li300P0-	Q25L_1		0	IO-Link Port 2			Li300P0-Q25L	-				Ų.
			4WRPE10)-3X_1		0	IO-Link Port 3			4WRPE10-3X					0
			IBIL-WIT-0	SUOP_1		U	IO-LINK PORt 4			IBIL-MIT-SDOP					~ 륽
-		<		_	_	_			_						- e
	B2N	360-Q4	2_1 [B2N360	-Q42]						🔍 Prop	perties	🕽 Info 🔒	🞖 Diagnostics		ĕ
	G	eneral	IO tags	Sys	tem cons	tants	Texts								
	► Ge	eneral			Modul	e parame	eters								· ^ 🗊
	In	puts			Stat	ion narar	neter								
	M	odule pa	rameters		Stat	ion purui	increation and a second s								l≡ š
	I/C) address	ses				Operation mode:	IO-Link with c	om	atible device					
						Da	ta storage mode:	deactivated,	clea	r				-	
							Cycle time:	automatic						-	F
							Pevision	V1.0							arie
							e i les su	1.0							Š
						Activa	te Quick Start-Up:	no						-	
						Process i	nput data invalid:	diagnostic ge	ener	ated				-	A
						Deacti	ivate diagnostics:	notifications	and	warnings				-	1
						Inp	ut data mapping:	direct						-	sl
						Outp	ut data mapping:	direct						•	
							Vendor ID:	317	_						
							Device ID:	720897							
						Device pa	arametrization via				1			_	
				•		bence pe	GSD:	active						-	
									_						
					Devi	ice paran	neter								_
					<				_					>	Ť
	4	PortaLy	iew	🔛 Over	rview	turo	k-tben-l4				In 🗸 The	project TREN	-I 8IOLA V16 was say	•	

Fig. 90: Example: TIA Portal, "Device parameterization via GSD" parameter



DEN LOIO		ngiou	peu ue m								
								l opology v	ew intwork	view The Dev	ice view
Devi	ce overview										
*	Module			Rack	Slot		I ad	Туре	Article no.	Firmware	Com
	 turck-tbe 	en-l4-8iol	la	0	0			TBEN-L4-8IOLA	100028459	SWV 1.7.25	
۰	PN-IC)		0	0 X1			turck-tben-l4-8iola			
-	Basic_1	042.1		0	Basic IO Link Post	1		Basic Bablaco 042			
•	Li300P0-	-0251 1		0	IO-Link Port	7		Li300P0-0251			
	4WRPE10	0-3X 1		0	IO-Link Port	3		4WRPE10-3X			
	TBIL-M1-	BDOP_1		0	IO-Link Port	4		TBIL-M1-8DOP			
<							1111				
2N360-04	2 1 [B2N360	-0421						O Propertie	s tilnfo 🛈 🛛	Diagnostics	
211300 Q		(T-					Diagnostics	
General	IO tags	Sys	stem con	stants	Texts						
General			Modu	le parame	eters						
Inputs Module na	rameterr		Sta	tion parar	meter						
I/O addres	ses										
					Operation mo	de: IO-Li	nk with cor	npatible device			
				Da	ta storage mo	de: dead	tivated, cl	ear			-
					Cycle ti	me: auto	matic				-
					Revis	ion: V1.0					
				Activa	te Ouick Start	Up: no					-
				Processi	innut data invi	lid: diag	nostic gen	erated			
						ind. Glog	iosae gen	duran la co			
				Deact	ivate diagnos	ics: noui	cations ar	a warnings			
				Inp	ut data mapp	ing: direc	t				-
				Outp	ut data mapp	ing: direc	t				-
					Vendo	r ID: 317					
		•	4		Device	ID: 7208	97				
				Device pa	arametrizatior	via					
			-		G	SD: activ	e				-
			Des	dee narar	notor						
			Dev	nce paran	neter						
					Operation mo	de: Inclin	ation				
					Lowpass filte	r A: Cut-c	off frequence	v 24Hz			-
					Lownass filte	r B: Cut-	fffrequen	y 15Hz			
					Lowpass file	- C. Cutt	# frequence	.y 13112			
					Lowpass filte	r C: Cut-c	in πequenc	yiowest			
					Active fi	ter: Filter	A				•
					Mountig posit	ion: Posit	ion M1 C	r			-
					Functional a	rea: Uppe	r hemisph	ere			•
				Output	t 2 / Referring a	xis: Y					-

The parameters of the IO-Link devices are set directly in PROFINET engineering.

Fig. 91: Example: TIA Portal, IO-Link device parameters via GSDML

The parameterization of the IO-Link devices is controlled by the PLC. After a restart or an IO-Link device exchange, the start-up parameters stored in the PLC are written to the connected IO-Link devices. Parameter settings made during runtime either via the PLC (e.g., via IO-Link call accesses), directly at the IO-Link device (e.g., via operating elements) or at the IO-Link master (e.g., via web server or DTM) only apply temporarily and are overwritten with the parameter settings from the PLC at every restart.

Various IO-Link port parameters (station parameters) such as "operating mode", "data retention mode", "manufacturer ID" and "device ID" are defined via the GSDML file and cannot be changed.



NOTE Data storage [▶ 197] is not possible when configuring IO-Link devices with SIDI.



Parameterizing IO-Link devices via IO-Link mechanisms

The "Device parameterization via GSD" parameter must be deactivated. Parameters and process data structures of the IO-Link devices are structured via the GSDML and displayed in PROFINET engineering (e.g., in CODESYS) in a device-specific manner. However, parameter handling is performed via IO-Link mechanisms (e.g., data management).



Fig. 92: PROFINET engineering (CODESYS); Device parameterization via GSD inactive





Fig. 93: PROFINET engineering (CODESYS): Process data structure IO-Link device with SIDI



7.10.3 IO-Link network scan in TAS desktop

The IO-Link network scan in TAS-Desktop scans a connected network for IO-Link masters and IO-Link devices connected to them.

Scan network for IO-Link devices in the IO-Link view of TAS desktop via Scan network.

TAS DESKTOP DOC	UMENTAT	ION					Your Global Automation Partner
TURCK AUTOMATION SUITE	TAS DES	(Top -> View	//Feature -> IC	-LINK			
VIEW/FEATURE	Scan	network Import	configuration)			Q, Filter
ARGEE		Actions	Port	Product name	Product text	Vendor	Application specific tag
BEEP				Click "S	Scan network" to scan for de	vices.	
မှာ Profinet							
IO-Link							
🗘 M12Plus							

Fig. 94: TAS - scan network for IO-Link devices

All IO-Link masters connected in the network, including the connected I/O-Link devices, are displayed.

TAS DESKTOP	DOCUME	ENTATI	ON							Your Global Automation Partner	
TURCK AUTOMATION SU	UITE TA	S DESK	Top -> View/Fea	TURE -> I	o-link						
VIEW/FEATURE		C Scan n	etwork Import config	uration He	lp					Q Filter	
			Actions	Port	Product nam	e	Product to	ext	Vendor	Application specific tag	
BEEP			⊜ 查	TBEN-LL	-8IOL 192.168	.145.205 4.3.5.0 tbil-	test				
Profinet			+ 🗞 🖘	1	TBIL-M1-160)XP	I/O-Hub		TURCK	***	
Diagnostics			- 🗞 🖘	3	TBIL-M1-160	DXP-B	I/O-Hub		TURCK	***	
CODESYS			Location tag ***	Fun	tion tag ***	Hardware revision	V29.0	Firmware revision V1.0.	7.0 Serial number		
🔊 IO-Link			⊜ 査								
M12Plus			- 🗞 🖘	2	TL50 RGB I	DL	TL50 Mult	ticolor RGB with IO-Link	Banner Engineering Corpo	oration	
		Location tag Function tag Hardware revision V00-010 Firm				Firmware revision 1.1	.16 Serial number 1	18-05-0908:37:06			
			⊜ 査	TBEN-S2	-4IOL 192.168	.145.121 3.5.1.0 aufb	au-tben-s2-	4iol			
			+ 🗞 🖘	2	TS-530-LI2U	PN8X-H1141-L016	intelligent	temperature sensor	Turck		
			+ 🗞 🖘	3	PC025V-201	-2UPN8X-H1141	intelligent	pressure sensor	Turck	AST from 247547	
			+ 🗞 🖘	4	TBIL-M1-16	DIP	I/O-Hub		TURCK	AST from 128351063	
			⊜ 查	TBEN-LL	-8IOL 192.168	.145.123 4.3.5.0 auft	au-tben-II-8	iol			
			+ 🗞 🖘	3	PS010V-301	-2UPN8X-H1141	intelligent	pressure sensor	Turck	uvw	
			+ 🛛 🖘	5	TBIL-M1-16	ХР-В	I/O-Hub		TURCK	AST from 251047	
			⊜ 查	TBEN-L4	-8IOLA 192.16	8.145.89 1.0.5.0 auft	au-tben-l4-8	Biola			
			+ 🗞 🖘	2	TBIL-S4-8D)	(P	I/O-Hub		Turck		
		_		-						*	

Fig. 95: TAS - IO-Link masters and devices found





Click on the Open IO-Link in TAS button to open the IO-Link device application [> 157].

Fig. 96: IO-Link view - Open IO-Link device application

The **Import IO-Link configuration** button can be used to load a previously saved IO-Link device configuration into a new IO-Link device (example: device replacement).

Scan n	etwork Import cor) figuration	? Help		Q Filter	
	Actions	Port	Product name	Product text	Vendor	Application specific tag
	(三) 点	TBEN-	LL-8IOL 192.168.145.20	05 4.3.5.0 tbil		
	+ 🗞 🖘	1	TBIL-M1-16DXP	I/O-Hub	TURCK	***
	+ 🜏 🖘	3	TBIL-M1-16DXP-B	I/O-Hub	TURCK	***
	Import IO-Link col	nfiguration	S2-4IOL 192.168.145.84	l 3.5.5.9 rack-00-s2-4i	ol	
	+ 🗞 🖓	2	TL50 RGB IOL	TL50 Multicolor RGB with IO-Link	Banner Engineering Corporation Corporation	





7.10.4 Commissioning IO-Link devices V1.0 (data storage)

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 of the IO-Link master must be deactivated, e.g. via the web server or via TAS Desktop.

Deactivating data storage (example: TAS)

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

TAS DESKTOP	START	IO-LINK	DOCUMENTATION		Your Global Automation Partner
TBEN-LL-8IOL	ST	ART → Local I/	O → PARAMETERS		Logout
DEVICE ① Info ⑦ Parameters		Reading Writing	Tab view Print		
Diagnostics A		(Channel 0)	IO-Link port parameters		
🗳 Event log		Port 1 DXP (Channel 1)	Operation mode	IO-Link without validation	<u> </u>
Ex-/Import		Port 2 IOLink	Data storage mode Cvcle time	automatic	× ?
Change password		(Channel 2)	Revision	automatic	× ?
Firmware		Port 2 DXP (Channel 3)	Activate Quick Start-Up	no	× ?
OCAL I/O		Port 3 IOLink (Channel 4)	Device parametrization via GSD Diagnostic settings	inactive	▼ ?
 Diagnostics Input 		Port 3 DXP (Channel 5)	Process input data invalid Deactivate diagnostics	diagnostic generated	✓?✓?
🖒 Output		Port 4 IOLink (Channel 6)	Data mapping Process input data mapping	swap 16 bit	~ ?
		Port 4 DXP (Channel 7)	Process output data mapping	swap 16 bit	` ?
		Port 5 IOLink (Channel 8)			
		Port 6 IOLink (Channel 10)			
		Port 7 IOLink (Channel 12)			
		Port 8 IOLink (Channel 14)			-

Fig. 98: TAS – deactivate data storage



7.10.5 Commissioning IO-Link devices V1.1 (data storage)

If another device type is connected to an IO-Link port that has already been used, the data storage memory of the master should first be deleted, e.g. via the web server of the IO-Link master or via TAS.

The data storage memory of the master can be deleted in two ways:

- Reset the IO-Link master to the factory settings.
- Delete the data storage memory of the IO-Link master via the Data storage mode parameter.

Reset the IO-Link master to factory settings (example: TAS)

In TAS Desktop, reset the IO-Link master to factory settings via Start → Device → Parameter by clicking Factory reset and reboot → Execute reset.

TAS DESKTOP	START IO-LINK	DOCUMENTATION		Your Global Automation Partner
TBEN-LL-8IOL	START → DEVIO	E -> PARAMETERS		Logout
TBEN-LL-8IOL DEVICE ① Info ② Parameters ② Diagnostics ③ Event log ① ① ○ Change password ② Parameters ③ Parameters ③ Input △ Output ① Info	START -> DEVIC Reading Write Activation Write perm Modbus co Watchdog PROFINET Device nar Output ber Deactivate Deactivate Global LED-behav Resets Reboot Legacy res Network re Factory res Special devi	CE -> PARAMETERS	t with first write access ✓ all connections ✓ 0 s 500 ms 500 ms tbil-test set to 0 no no no green ✓ EXECUTE REBOOT EXECUTE RESET EXECUTE RESET EXECUTE RESET	Logout
	Production ARGEE ARGEE pr	data pject write protection	u1 3a 4u 00 00 00 4t 49 46 58 53 47 00 0	?

Fig. 99: TAS - resetting the device to factory settings

⇒ The device is reset.



Deleting the data storage memory via parameters (example: TAS)

- Set the parameter **Data storage mode** to **deactivated**, **clear**.
- Use Writing to write the parameter changes into the device.

TAS DESKTOP	START	IO-LINK	DOCUMENTATION		Your Global Automation Partner	
TBEN-LL-8IOL	ST	ART → LOCAL I/	O → PARAMETERS		Logout	t
DEVICE ① Info ③ Parameters		Reading Writing	Tab view Print			
Diagnostics 🔺 🛱 Event log		(Channel 0) Port 1 DXP (Channel 1)	IO-Link port parameters Operation mode Data storage mode	IO-Link without validation deactivated, clear	× ?	
 Ex-/Import Change password Firmware 		Port 2 IOLink (Channel 2) Port 2 DXP	Cycle time Revision Activate Quick Start-Up	automatic automatic no	 ✓ ? ? ? ? ? 	l
LOCAL I/O 🛕 Parameters Diagnostics A		(Channel 3) Port 3 IOLink (Channel 4) Port 3 DXP	Device parametrization via GSD Diagnostic settings Process input data invalid	inactive diagnostic generated	 ✓ ? ✓ ? 	l
・ Input 企 Output ① Info		(Channel 5) Port 4 IOLink (Channel 6)	Deactivate diagnostics Data mapping Process input data mapping Process output data mapping	swap 16 bit	 ✓ ? ✓ ? ✓ ? ✓ ? 	l
		Port 4 DXP (Channel 7) Port 5 IOLink (Channel 8)	sooo ooqoo aata mapping			
		Port 6 IOLink (Channel 10) Port 7 IOLink				
		Port 8 IOLink (Channel 14)				-

Fig. 100: TAS: deleting the data storage memory via parameters

- Re-activate the data storage, if necessary and write the parameter changes into the device via **Writing**.
- 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 Parameters

The device has 4 bytes of module parameters, 16 bytes each of IO-Link port parameters and 16 bytes of parameters for VAUX1/VAUX2 monitoring.

Word no.	ord no. Bit no.															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Basic																
0x00	-	-	-	-	-	-	-	-	DXP7_	-	DXP5_	-	DXP3_	-	DXP1_	-
									SRO		SRO		SRO		SRO	
0x01	-	-	-	-	-	-	-	-	DXP7_	-	DXP5_	-	DXP3_	-	DXP1_	-
IO-Link por	rt 1								LINDO		LINDO		LINDO		LINDO	
0x02	Cycl	e tim	e						GSD	Activate quick start-up	Data storage mode		Operation mode			
0x03	-								Mapping PCDO		Mappir PDIN	ng	Deactiv diag.	vate	PDIN invalid	Rev.
0x04 0x05	-								-	-	-	-	-	-	-	-
0x06	Ven	dor II	D (MS	SB)					Vendor ID	(LSB)						
0x07	Dev	ice ID)						Device ID	(LSB)						
0x08	Dev	ice ID) (MS	B)					Device ID							
0x09	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IO-Link por	t 2															
0x0A 0x11	Assi	gnm	ent si	imila	r to l	0-Lin	k port	1 (word	0x020x0)9)						
IO-Link por	t 3															
0x12 0x19	Assi	gnm	ent si	imila	r to l	O-Lin	k port	1 (word	0x020x0)9)						
IO-Link por	t 4															
0x1A 0x21	Assi	gnm	ent si	imila	r to l	0-Lin	k port	1 (word	0x020x0)9)						
IO-Link por	t 5															
0x22 0x29	Assignment similar to IO-Link port 1 (Word 0x020x09)															
IO-Link por	t 6															
0x2A 0x31	Assignment similar to IO-Link port 1 (Word 0x020x09)															
IO-Link por	t 7															
0x32 0x39	Assignment similar to IO-Link port 1 (Word 0x020x09)															



Word no.	Bit no.															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IO-Link po	rt 8								•		·					
0x3A 0x41	Assi	gnm	ent s	imila	r to l	O-Lir	nk port	1 (Word	d 0x020x	09)						
VAUX mon	itori	ng														
0x42	-	-	-	-	-	-	VAUX1 C1 (ch	l pin1 2/3)	-	-	-	-	-	-	VAUX1 C0 (ch0	pin1 /1)
0x43	-	-	-	-	-	-	VAUX1 pin1 C3 (ch6/7)		-	-	-	-	-	-	VAUX1 C2 (ch4	pin1 /5)
0x44	-	-	-	-	-	-	VAUX1 C5 (ch	l pin1 10)	-	-	-	-	-	-	VAUX1 C4 (ch8	pin1)
0x45	-	-	-	-	-	-	VAUX1 C7 (ch	l pin1 14)	-	-	-	-	-	-	VAUX1 C6 (ch1	pin1 2)
0x46 0x47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0x48	-	-	-	-	-	-	VAUX2 pin2 C5 (ch11)		-	-	-	-	-	-	VAUX2 C4 (ch9	pin2)
0x49	-	-	-	-	-	-	VAUX2 pin2 C7 (ch15)		-	-	-	-	-	-	VAUX2 C6 (ch1	pin2 3)

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

Parameter name	Value		Meaning	Description
	Dec.	Hex.		
Manual output reset after	0	0x00	No	The output switches on automatically after an overload.
overcurrent (DXPSRO)	1	0x01	Yes	The output is manually switched-off after an overload until a new set command is given (rise and fall).
Activate	0	0x00	No	The output at pin 2 is deactivated.
output Ch (DXPENDO)	1	0x01	Yes	The output at pin 2 is activated.
Operation mode	0 0x0		IO-Link without validation	Pin 4 is operated in IO-Link mode. The master does not check if the connected 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 connected device match those of the configured one. If the master de- tects a mismatch, the IO-Link communication is established, 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.



Parameter name	Value Dec.	Hex.	Meaning	Description
	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 compatible one, process data exchange is possible. If writing the Device ID is not successful, 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 con- figured 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.
	4	0x04	DI (with parameter access)	Pin 4 is generally operated as simple digital input. An acyclic parameter access from the PLC or the DTM is possible. The IO-Link master starts the port in IO-link mode, parameterizes the device and sets the port back into SIO mode (DI). 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. Connected devices have to support the SIO mode (DI). In case of a parameter access, the IO-Link communication at the port is started. Switching signals are interrupted.
	8	0x08	DI	Pin 4 is operated as simple digital input. Data storage is not supported.



Parameter name	Value Dec.	Hex.	Meaning	Description				
Data Storage Mode	Synch device If the the da	Synchronization of parameter data of IO-Link devices (storing the parameter of the connected device in the master). If the synchronization is not possible, a diagnostic message is displayed (DS_ERR). In this case the data memory of the master must be deleted:						
	IO-Lin When	k devid using	es in accordance with IO-Link spe IO-Link devices with IO-Link V1.0:	cification V1.0 do not support data storage.				
	0	0x00	Activated	Synchronization of parameter data activated. The actual data (master or device) serve as the reference data.				
	1	0x01	Overwrite	Synchronization of parameter data activated, the data in the master serve as reference data.				
	2	0x02	Read in	Synchronization of parameter data activated. The data in the connected IO-Link device serve as reference data.				
	3	0x03	Deactivated, clear	Synchronization of parameter data deactiv- ated. The data set in the master is deleted.				
Activate Quick Start-Up	For fa be sh Time)	st appl ortened is redu	ications (e.g. tool changing applic d. The start-up time defined in the ced.	ations) the start-up time of IO-Link devices can IO-Link specification (TSD = Device Detection				
	0	0x00	No	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.				
Device	0	0x00	Inactive	The port is generic or is not parameterized.				
parameterization via GSD (GSD)	1	0x01	Active	In PROFINET the port is parameterized with a specific device type from the GSDML-file (SIDI).				
Cycle time	0	0x00	Automatic	The lowest cycle time supported by the device is taken from the table.				
	16 191	0x10 0xBF	1.6 = 132,8 ms	Settable in steps of 0.8 or 1.6 ms.				
	255	255 0xFF Automatic, compatible		Compatibility mode The mode solves possible communication problems with sensors of the SGB family from IFM.				
Revision	0	0x00	Automatic	The Master defines the IO-Link revision auto- matically.				
	1	0x01	V1.0	IO-Link Revision V 1.0 is used.				
Process input data invalid	0	0x00	Diagnostic generated	If the process data are invalid, a respective dia- gnostic message is generated.				
(PDIN invalid)	1	0x01	No diagnostic generated	Invalid process data do not cause a diagnostic message.				



Parameter name	Value Dec.	Hex.	Meaning	Description		
Deactivate diagnostics	Influe param	nces th neteriza	e sending of IO-Link-Events from t ation, the master transmits Events	the master to the fieldbus. Depending on the based on their priority to the fieldbus or not.		
	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 notifications.		
	2	0x02	Notifications and warnings	The master transmits all IO-Link Events to the fieldbus except for IO-Link notifications and warnings.		
	3	0x03	Yes	The master doesn't transmit any IO-Link Event to the fieldbus.		
Process inpput data mapping (Mapping PDIN)	Optim swapp the fie PROFI With F	nization ped dep eldbus : NET: PROFIN	o of the process data mapping for bending on the used fieldbus in or side. ET, the parameter is permanently	the used fieldbus: The I/O-Link-data can be rder to achieve an optimized data mapping on set to 0x00 = direct and cannot be changed.		
	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 Swa		Swap all	All bytes are swapped. i.e.: 0xEFCD AB89 6745 2301		
Process output data mapping (Mapping PDOUT)	see ab	ove Pr	ocess input data mapping			
Vendor ID	065 0x000	535 00xF	FFF	Vendor ID for the port configuration check		
Device ID	016 00x	77721. 00FFFF	5 FF	Device ID for the port configuration check, 24 bit value		
VAUX1 pin 1 Cx (Ch)	0	0x00	24 VDC	The 24 VDC sensor/actuator supply at pin1 of the respective 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 respective connector is switched off.		
VAUX2 pin 2 Cx (Ch)	0	0x00	24 VDC	The Class B supply at pin2 of the respective connector is switched on.		
	1	0x01	switchable	The Class B supply at pin 2 of the respective connector is switchable via the process data.		
	2	0x02	off	The Class B supply at pin2 of the respective connector is switched off.		



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

Values for the parameter "cycle time" in ms:



8.1.1 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	through the IO-Lin	k master \rightarrow fieldbus -	→ PLC				
Byte	Device at IO-Link port	Device process dat IO-Link master	a in	Parameter: Process data mapping	Device process data to fieldbus		
Byte 0		Status/Control			Status/Control		
Byte 1							
IO-Link J	port 1						
Byte 2	Temperature	Temperature	Low byte	Swap 16 bit	Temperature	High byte	
Byte 3	sensor TS		High byte			Low byte	
IO-Link J	port 2						
Byte 4	Linear position	Position	Low byte	Swap 16 bit	position	High byte	
Byte 5	sensor 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	_	Mo Sig Byt			Diagnostics		

Example mapping for fieldbuses with Little Endian-format



8.1.2 PROFINET parameters

For PROFINET, a distinction must be made between the PROFINET device parameters and the parameters of the I/O channels.

PROFINET device parameters

Default values are shown in **bold**.

Parameter name	Value	Meaning	Description
Output behavior at communication loss	0	Set to 0	The device switches the outputs to "0". No error information is sent.
	1	Hold current value	The device keeps the current data at the outputs.
Deactivate all diagnostics	0	No	Diagnostic and alarm messages are generated.
	1	Yes	Diagnostic and alarm messages are suppressed.
Disable output	0	No	Monitoring of voltage V2 is activated.
power diagnosis	1	Yes	The sending of the diagnosis is deac- tivated.
LED behavior (PWR) at V2 undervoltage	0	Red	The PWR LED lights up red in the event of an undervoltage at V2.
	1	Green	The PWR LED is flashes green in the event of an undervoltage at V2.
Deactivate	0	No	
I/O-ASSISTANT Force Mode	1	Yes	The Force Mode of the DTM is deac- tivated.
Deactivate	0	No	Explicit disabling of the Ethernet pro-
EtherNet/IP	1	Yes	tocols or the web server
Deactivate	0	No	
Modbus TCP	1	Yes	_
Deactivate	0	No	_
web server	1	Yes	



8.2 IO-Link functions for acyclic communication

The acyclic access to the data of IO-Link devices is realized via IO-Link CALLs. A distinction must be made between data of the IO-Link master (IOLM) and data of connected IO-Link devices (IOLD).

The addressing of the IO-Link CALL defines which device is addressed via the CALL:

The addressing is defined by the so called Entitiy_Port:

- Entity_Port 0 = IO-Link master module (IOLM)
- Entity_Port 1 = IO-Link device at IO-Link port 1
- ····
- Entity_Port 8 = IO-Link device at IO-Link port 8
- 8.2.1 Port functions for Port 0 (IO-Link Master)

IO-Link index (port function invocation)

The access to the IO-Link master functionalities (port 0) is done via index 65535.

Subindex 64: Master Port Validation Configuration

The object writes a specific configuration of the devices which have to be connected to the IO-Link port to the master. The master stores the data for the The IO-Link device expected at the port and then accepts only one device at the port with exactly matching data (vendor ID, device ID and serial number).

The Master Port Validation Configuration is only useful in combination with an operation mode with validation (IO-Link with family compatible device, IO-Link with compatible device, IO-Link with identical device.

Entity_Port	IO-Link sub index	Read/write	Length
0	64	Write	Max. 192 byte

	Content	Size	Format	Comment
IOL1	VENDOR_ID	2 byte	Unsigned 16	
	DEVICE_ID	4 byte	Unsigned 32	
	FUNCTION_ID	2 byte	Unsigned 16	Value: 0
	SERIAL_NUMBER	16 byte	String	
IOL2	VENDOR_ID	2 byte	Unsigned 16	
	DEVICE_ID	4 byte	Unsigned 32	
	FUNCTION_ID	2 byte	Unsigned 16	Value: 0
	SERIAL_NUMBER	16 byte	String	
IOL3	VENDOR_ID	2 byte	Unsigned 16	
	DEVICE_ID	4 byte	Unsigned 32	
	FUNCTION_ID	2 byte	Unsigned 16	Value: 0
	SERIAL_NUMBER	16 byte	String	
IOL4	VENDOR_ID	2 byte	Unsigned 16	
	DEVICE_ID	4 byte	Unsigned 32	
	FUNCTION_ID	2 byte	Unsigned 16	Value: 0
	SERIAL_NUMBER	16 byte	String	

Structure of the command IOL_Port_Config:



	Content	Size	Format	Comment
IOL5	VENDOR_ID	2 byte	Unsigned 16	
	DEVICE_ID	4 byte	Unsigned 32	
	FUNCTION_ID	2 byte	Unsigned 16	Value: 0
	SERIAL_NUMBER	16 byte	String	
IOL6	VENDOR_ID	2 byte	Unsigned 16	
	DEVICE_ID	4 byte	Unsigned 32	
	FUNCTION_ID	2 byte	Unsigned 16	Value: 0
	SERIAL_NUMBER	16 byte	String	
IOL7	VENDOR_ID	2 byte	Unsigned 16	
	DEVICE_ID	4 byte	Unsigned 32	
	FUNCTION_ID	2 byte	Unsigned 16	Value: 0
	SERIAL_NUMBER	16 byte	String	
IOL8	VENDOR_ID	2 byte	Unsigned 16	
	DEVICE_ID	4 byte	Unsigned 32	
	FUNCTION_ID	2 byte	Unsigned 16	Value: 0
	SERIAL_NUMBER	16 byte	String	



Subindex 65: IO-Link events

The object reads IO-Link Event diagnostics.

Entity_Port	IO-Link sub index	Read/write	Length
0	65	Read	255 byte



NOTE

Only "appears" (coming diagnostics) and "Single Shot Events" are shown, as long as they are pending.

Structure of the read data:

- Byte 0 contains 2 bit per IO-Link port which show, if the process data of the connected device are valid or not.
- 4 byte per diagnostic event, which assign and specify the diagnostics more precisely. A maximum of 14 Events per IO-Link port are shown.

Byte no.	no. Bit no.					Description			
	7	6	5	4	3	2	1	0	
0								х	PD_Valid Input Port 1
							х		PD_Valid Output Port 1
						х			PD_Valid Input Port 2
					x				PD_Valid Output Port 2
				x					PD_Valid Input Port 3
			x						PD_Valid Output Port 3
		x							PD_Valid Input Port 4
	x								PD_Valid Output Port 4
1								х	PD_Valid Input Port 5
							х		PD_Valid Output Port 5
						х			PD_Valid Input Port 6
					х				PD_Valid Output Port 6
				x					PD_Valid Input Port 7
			x						PD_Valid Output Port 7
		x							PD_Valid Input Port 8
	x								PD_Valid Output Port 8
2	Qualifier								Defines the type of the event (Warning, Noti- fication, Single Shot Event, etc.) in accordance with IO-Link specification "IO-Link Interface and System".
3	Por	t							IO-Link port which sends an event
4	Eve	nt Co	ode h	igh l	oyte				High or- low byte of the error code sent
5	Eve	nt Co	ode lo	ow b	yte				
223	Qua	alifier							see byte 2 - 5
224	Por	t							
225	Eve	nt Co	bde h	igh l	oyte				
226	Eve	nt Co	ode lo	ow b	yte				


Subindex 66: Set Default Parameterization

Writing this object sets the IO-Link master back to factory settings. Any parameter setting and configuration is overwritten. The data storage buffer is deleted as well.

Entity_Port	IO-Link sub index	Read/write	Length
0	66	Write	4 byte

Structure of the reset command:

Byte 3	Byte 2	Byte 1	Byte 0
0xEF	0xBE	0xAD	0xDE

Subindex 67: Teach Mode

The master reads all data (device-Id, vendor-ID, serial number, etc.) from the connected device and saves them. All all previously saved device data are overwritten.

Entity_Port	IO-Link sub index	Read/write	Length
0	67	Write	1 byte

Structure of the Teach command:

Byte 0		
0x00	Teach all ports	
0x01	Teach port 1	
0x02	Teach port 2	
0x03	Teach port 3	
0x04	Teach port 4	
0x05	Teach port 5	
0x06	Teach port 6	
0x07	Teach port 7	
0x08	Teach port 8	
0x090xFF	Reserved	

Subindex 68: Master Port Scan Configuration

The object reads the configuration of the IO-Link devices connected to the IO-Link master.

28 byte are returned per IO-Link port.

Entity_Port	IO-Link sub index	Read/write	Length
0	68	Read	Max. 244 byte

Structure of the response telegram:

IO-Link-port	Content	Length	Format	Description
Port 1	Vendor ID	2 byte	UINT16	Vendor ID of the connected device
	Device ID	4 byte	UINT32	Device ID of the connected device
	Function ID	2 byte	UINT16	Reserved
	Serial Number	16 byte	UINT8	Serial number of the connected device
	COM_Revision	1 byte	UINT8	IO-Link version
	Proc_In_Length	1 byte	UINT8	Process input data length of the con- nected device [182]
	Proc_Out_Length	1 byte	UINT8	Process output data length of the con- nected device [▶ 182]
	Cycle time	1 byte	UINT8	Cycle time of the connected device
Port 2 port 8	Structure similar to	o port 1		

Length of the process data from the connected IO-Link device

The structure of the input and output data is identical except for bit 6. The SIO bit is only contained in the process input data.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	SIO	BYTE	LENGTH				

Bit 6: SIO (only valid for process input data)

SIO

0	SIO mode not supported
1	SIO mode supported by device

Bit 7 and bits 0...4 in combination provide information about the length of the process data.

BYTE	LENGTH	Meaning
0	0	No process data
0	1	1 bit process data
0	n (215)	n bit of process data, structured in bits
0	16	16 bit of process data, structured in bits
0	1731	Reserved
1	0, 1	Reserved
1	2	3 byte, structured in bytes
1	n (330)	n + 1 byte, structured in bytes
1	31	32 byte, structured in bytes



Subindex 69: Extended Port Diagnostics

The object reads the Extended Port Diagnostics.

Entity_Port	IO-Link sub index	Read/write	Length
0	69	Read	Max. 120 byte

Structure of the Extended Port Diagnostics:

Byte no.	Bit no.							
	7	6	5	4	3	2	1	0
0	NO_SIO	TCYC	-	-	DS_F	NO_DS	-	-
1	-	WD	MD	PDI_H	-	-	NO_PD	
2	-	-	-	-	-	-	-	-
3	Device s	tatus accord	ding to IO-	Link speci	fication	1		
Diagnosti	c bit	Meaning						
NO_DS		The parame Remedy: Change t	eterized po	ort mode c eterizatior	loes not su n of the po	ıpport data rt.	storage.	
DS_F		Error in the Possible ca Connect Overflow	data stora uses: ed device () of the dat	ge, synchi does not s ta storage	ronization upport da buffer	not possibl ta storage	e	
	 Remedy: Connect a device that supports data storage. Clear the data storage buffer. Deactivate the data storage. 							
ТСҮС		The device does not support the cycle time parameterized in the master. Remedy:						
NO_SIO		The device does not support the SIO mode. Remedy:						
NO_PD		No process data available The connected device is not ready for operation Remedy:						
PDI_E		The connec Link specifi	ted device	e reports ir).	nvalid proc	ess data in	accordance	e with IO
PDI_H		The connected device reports invalid process data in accordance with IO- Link specification V1.1.						
MD		Missing dev Remedy: Check th Change	vice, no IO- e IO-Link c the device	Link devid Cable.	ce detected	d.		
WD		Wrong devi (Vendor ID, which are s Remedy: Change 1	ice detecte Device ID, tored in th the device	ed: one or serial nur e master f	more para nber) does or this dev	meters of t s not/do no ⁄ice.	he connect t match the	ed device data

Adapt the master parameterization.



Device Status

Value	Meaning
0	Device works correctly
1	Maintenance Event
2	Out-of-Specification Event
3	Functional check
4	Error
5255	Reserved



8.3 Parameterizing IO-Link devices (IO-Link Device Application)

The parameter settings made in the IO-Link device using the on the IO-Link Device Application are saved in the device and, depending on the setting of the master parameter "Data storage mode" [> 173], can be saved in the IO-Link master and written to a new IO-Link device in the event of a device replacement.



NOTE

If IO-Link devices are configured and parameterized in PROFINET via SIDI (Simple IO-Link Device Integration) in the PLC, all parameter changes via the IO Configurator are temporary and are overwritten by the IO-Link device parameter set from the PLC on restart.

Parameterizing an IO-Link device



NOTE

To be able to call up the IO-Link Device Application, a login to the web server of the IO-Link master is required [> 36].

- Change **parameters** as required. Changed parameter settings are marked accordingly.
- Write changed parameters to the IO-Link device via Write.

START IO-LINK	DOCUMENTATION	TURCK Your Global Automation Partner
TBEN-L4-8IOLA	IO-LINK → LOCAL I/O → PORT 2 - TBIL-S4-8DXP	Logout
LOCAL I/O	Read Write Export Import Set defaults Unlink IODD Print User role	
Port 2 - TBIL-54-8DXP Dort 3 - No device	System Command YES FOR ALL CHANNELS	Î
Port 4 - No device	Manual output reset after overcurrent System Command NO FOR ALL CHANNELS	
 Port 5 - SBG232 Port 6 - No device 	System Command YES FOR ALL CHANNELS	
Port 7 - No device	Output after error System Command	
No device	System Command O FOR ALL CHANNELS System Command 1 FOR ALL CHANNELS	
	System Command CURRENT VALUE FOR ALL CHANNELS	
	Connector 0, Pin 4 Invert digital input no ?	
	Pulse stretching input -enter value-	
	Activate output 2 yes ?	
	Manual output reset after overcurrent 📃 yes 🖍 ?	
	Output after error 0 🗸 🗸 🦿	
	Connector 0, Pin 2 Invert digital input Invert digital input ?)
	Pulse stretching input deactivated 🗸	
	Activate output yes ?	
	Manual output reset after overcurrent no no	· · · · · · · · · · · · · · · · · · ·
English 🗸		

Fig. 101: Parameterizing an IO-Link device

Set defaults resets all device parameters to the default values defined in the IODD.

The parameter set of the IO-Link device can be exported or imported using the **Export** and **Import** functions.



9 Operating



CAUTION Hot surface at full load and high ambient temperatures Burn risk

• Avoid touching the device without additional protection.

9.1 Process input data

Word	Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Basic																
0x00	-	DI14 (SIO)	-	DI12 (SIO)	-	DI10 (SIO)	-	DI8 (SIO)	DXP7	DI6 (SIO)	DXP5	DI4 (SIO)	DXP3	DI2 (SIO)	DXP1	DI0 (SIO)
0x01	-	DVS 14	-	DVS 12	-	DVS 10	-	DVS8	-	DVS6	-	DVS4	-	DVS2	-	DVS0
IO-Link	nk process input data															
0x02 0x11	IO-Link port 1, structure depends on the channel parameterization (032 byte per channel)															
0x12 0x21	IO-Link port 2, structure depends on the channel parameterization (032 byte per channel)															
0x22 0x31	IO-Link port 3, structure depends on the channel parameterization (032 byte per channel)															
0x32 0x41	IO-Link port 4, structure depends on the channel parameterization (032 byte per channel)															
0x42 0x51	IO-Link port 5, structure depends on the channel parameterization (032 byte per channel)															
0x52 0x61	IO-Link port 6, structure depends on the channel parameterization (032 byte per channel)															
0x62 0x71	IO-Link structu	re dep	, ends or	n the cl	nanr	nel pai	ramete	erizatio	n (03	32 byte	per cha	nnel)				
0x72 0x81	IO-Link structu	re dep	, ends or	n the cl	nanr	nel pai	ramete	erizatio	n (03	32 byte	per cha	nnel)				
Diagno	stics															
	VAUX1	/VAUX	2													
0x82	VERR V2 C7 ch15	VERR V2 C6 ch13	VERR V2 C5 ch11	VERR V2 C4 ch9	-	-	-	-	VERR V1 C7 ch14	VERR V1 C6 ch12	VERR V1 C5 ch10	VERR V1 C4 ch8	VERR V1 C3 ch6/7	VERR V1 C2 ch4/5	VERR V1 C1 ch2/3	VERR V1 C0 ch0/1
	DXP ch	annels	5													
0x83	-	-	-	-	-	-	-	-	ERR DXP 7	-	ERR DXP 5	-	ERR DXP 3	-	ERR DXP 1	-
	IO-Link	port 1														
0x84	GEN- ERR	OVL	V HIGH	V LOW	UL VE	LL VU	O TMP	PRM ERR	EVT2	EVT1	PD INV	HW ERR	DS ERR	CFG ERR	PPE	-
0x85	IO-Link	port 2	, assign	ment s	imil	ar to p	ort 1									
0x86	IO-Link	port 3	, assign	ment s	imil	ar to p	oort 1									
0x87	IO-Link	port 4	, assign	ment s	imil	ar to p	oort 1									

Word	Bit no.															
no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x88	IO-Link	port 5	i, assign	ment s	imil	ar to p	ort 1									
0x89	IO-Link	port 6	i, assign	ment s	imil	ar to p	ort 1									
0x8A	IO-Link	port 7	', assign	ment s	imil	ar to p	ort 1									
0x8B	IO-Link port 8, assignment similar to port 1															
IO-Link	Events															
0x8C	Port (1	st Ever	nt)						Qualifier (1st Event)							
0x8D	Event C	Code lo	ow byte	(1st Ev	ent)				Event Code high byte (1st Event)							
0xAA	Port 16	ith Eve	nt)						Qualifier (16th Event)							
0xAB	Event C	Code lo	ow byte	(16th I	Even	it)			Event Code high byte (16th Event)							
Module	e status	(statu	s word)													
0xAC	-	FCE	-	-	-	COM	V1	-	V2	-	-	-	-	-	AR GEE	DIAG

Meaning of the process data bits

Name	Value	Meaning						
I/O data								
DI	Digital	input						
	0	No signal at DI (pin 4, SIO)						
	1	Signal at DI (pin 4, SIO)						
DXP	Config	Configurable digital channel (DXP channel)						
	0	No input signal at DXP channel (pin 2)						
	1	Input signal at DXP channel (pin 2)						
DVS	Input value valid (Data Valid Signal)							
	0	 The IO-Link data are invalid. Possible causes: Sensor supply below the admissible range. IO-Link port parameterized as simple digital input. No IO-Link 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 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.						
IO-Link process input data	Process input data of the connected IO-Link device The order of the IO-Link process input data can be changed via the parameter "Process input data mapping" .							
Diagnostics	[▶ 192]							
IO-Link Events	[▶ 180]							
Module status	[▶ 192]							



9.2 Process output data

Wor	Bit no.															
d no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Basic																
0x00	-	DD 14	-	DD 12	-	DD 10	-	DD 8	DXP7	DD6	DXP5	DD4	DXP3	DD2	DXP1	DD0
IO-Liı	nk proce	ess outp	ut data	1		1										
0x01 0x10	 IO-Link port 1, structure depends on the channel parameterization (032 byte per channel) 															
0x11 0x20	1 IO-Link port 2, structure depends on the channel parameterization (032 byte per channel) 0															
0x21 0x30	IO-Link port 3, structure depends on the channel parameterization (032 byte per channel)															
0x31 0x40	I IO-Link port 4, structure depends on the channel parameterization (032 byte per channel)															
0x41 0x50	IO-Link structur	port 5, e deper	nds on t	he chan	nel	paran	net	teriza	ation (0.	32 by	te per c	hannel)	I			
0x51 0x60	IO-Link structur	port 6, e deper	nds on t	he chan	nel	paran	net	teriza	ation (0.	32 by	te per c	hannel)				
0x61 0x70	IO-Link structur	port 7, e deper	nds on t	he chan	nel	paran	net	teriza	ation (0.	32 by	te per c	hannel)	I			
0x71 0x80	 IO-Link port 8, structure depends on the channel parameterization (032 byte per channel) 80 															
VAUX	VAUX1/VAUX2															
0x81	VAUX2 pin2 C7 (ch15)	VAUX 2 pin2 C6 (ch13)	VAUX 2 pin2 C5 (ch11)	VAUX 2 pin2 C4 (ch9)	-	-	-	-	VAUX 1 pin1 C7 (ch14)	VAUX 1 pin1 C6 (ch12)	VAUX 1 pin1 C5 (ch10)	VAUX 1 pin1 C4 (ch8)	VAUX1 pin1 C3 (ch6/7)	VAUX1 pin1 C2 (ch4/5)	VAUX1 pin1 C1 (ch2/3)	VAUX1 pin1 C0 (ch0/1)



Meaning of the process data bits

Name	Value	Meaning
I/O data		
DXPx	DXP out	put
	0	Output inactive
	1	Output active, max. output current 2 A
DDx	Deactiv	ate diagnostics
	0	Diagnostic messages are sent depending on the setting of the "Deac- tivate diagnostics" parameter [> 174] .
	1	All diagnostic messages are suppressed. Possible application: Controlled deactivation and activation of the dia- gnostic messages via the process data in the PLC program. In the case of tool change applications, no diagnostics are sent that would other- wise lead to system downtimes.
VAUX1 pin1 Cx (ch/	0	The 24 VDC sensor/actuator supply at pin 1 of the connector is switched off.
ch)	1	The 24 VDC sensor/actuator supply at pin 1 of the connector is switched on.
VAUX2 pin2	0	The Class B supply at pin2 of the connector is switched off.
Cx (ch/ ch)	1	The Class B supply at pin 2 of the connector is switched on.



9.3 LED displays

The device is provided with the following LEDs:

- Power supply voltage
- Group and bus error
- Status
- Diagnostics

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

BUS LED	Meaning				
Off	No voltage present				
Green	Connection to a master active				
Flashing $3 \times$ green in 2 s	ARGEE active				
Green flashing (1 Hz)	Device is operational				
Red	IP address conflict, Restore mode active, F_Reset active or Modbus connection timeout				
Red flashing	Wink command active				
Red/green (1 Hz)	utonegotiation and/or wait for IP address allocation in DHCP or BootIP mode				
ERR LED	Meaning				
Off	No voltage present				
Green	No diagnostics				
Red	Diagnostics present				
ETH1 and ETH2 LEDs	Meaning				
Off	No Ethernet connection				
Green	Ethernet connection established, 100 Mbit/s				
Green flashing	Data transfer, 100 Mbit/s				
Yellow	Ethernet connection established, 10 Mbit/s				
Yellow flashing	Data transfer, 10 Mbit/s				



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 communio	cation, diagnostics deactivated
Green flashing	IO-Link communication, process da	ata valid
Red flashing	IO-Link communication active and	module error, invalid process data
Red	IO-Link supply error free, no IO-Lin error, process data invalid	k communication and/ or module
LED IOL 0, 2, 4, 6, 8, 10, 12, 14	Meaning (channel in SIO mode (DI))	
(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/sh	ort-circuit at VAUX2
Red flashing	Overcurrent supply VAUX1	
	Mooning (input)	Maaning (autout)
Off	No input signal	Output inactive or V2 under- voltage
Green	Input signal present	Output active (max. 2 A)
Red	-	Output active with overload/short circuit
Red flashing	Overload supply VAUX1 both connector LEDs are flashing	
LED WINK (without designation on the device)	Meaning	
White flashing	Wink command active	



9.4 Software diagnostic messages

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
- DSP diagnostics
- Diagnostic messages of the universal digital channels of the module (DXP 1, 3, 5, 7).
- 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.

9.4.1 Status- and control word

Status word

EtherNet/IP/ Modbus	PROFINET	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Byte 1	V2	-	-	-	-	-	ARGEE	DIAG
Byte 1	Byte 0	-	FCE	-	-	-	СОМ	V1	-

Bit	Description
ARGEE	ARGEE program running
СОМ	Internal error The device-internal communication is disturbed.
DIAG	Diagnostic messages at the device
FCE	The DTM Force Mode is activated. The actual output values may no match the ones defined and sent by the fieldbus.
V1	Undervoltage at supply voltage V1 (threshold, s. technical data), DXP channels switch off
V2	Undervoltage at supply voltage V2 (threshold, s. technical data),

The status word is mapped into the module's process data.

In EtherNet/IP the mapping can be deactivated via the Gateway Class (VSC 100).



Activating or deactivating the status and control word modifies the process data mapping in den standard Assembly Instances 103 and 104 [86].

Control word

The control word has no function.

NOTE



9.4.2 Diagnostic telegram

Channel	Byte no.	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0				
V1/V2			V1/V2 overcurrent diagnostics										
	0	VERR V1	VERR V1	VERR V1	VERR V1	VERR V1	VERR V1	VERR V1	VERR V1				
		C7 ch14	C6 ch12	C5 ch10	C4 ch8	C3 ch6/7	C2 ch4/5	C1 ch2/3	C0 ch0/1				
	1	VERR V 2	VERR V2	VERR V2	VERR V2	-	-	-	-				
		C7 ch15	C6 ch13	C5 ch11	C4 ch9								
DXP			DXP diagnostics										
	0	ERR DXP7	-	ERR DXP5	-	ERR DXP3	-	ERR DXP1	-				
	1	-	-	-	-	-	-	-	-				
IO-Link		Device di	agnostic m	essages		Master dia	gnostics						
IO-Link port 1	0	EVT2	EVT1	PD INV	HW_ ERR	DS ERR	CFG ERR	PPE	-				
	1	GEN ERR	OLV	VHIGH	VLOW	ULVE	LLVU	OTEMP	PRM ERR				
IO-Link port 2	23	Assignme	ent similar to	IO-Link por	t 1								
IO-Link port 8	1415												



NOTE

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

Meaning of diagnostic Bits

Bit	Meaning
V1/V2 overcu	urrent diagnostics
VERRV1 Cx	Overcurrent VAUX1 (pin 1) at connector/channel group
<u></u>	
VERRV1	Overcurrent VAUX1 (pin 1) at connector/channel
Cxch	
VERRV2	Overcurrent VAUX2 (pin 2) at connector/channel
Cxch	
DXP diagnos	tics
ERR_DXPx	Overcurrent at the output (if the DXP channel is used as output)
IO-Link mast	er diagnostics
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.



Bit	Meaning	
DSER	 Data storage error Possible causes: Data storage mismatch: IO-Link device in accordance with IO-Link V1.0 connected. The data storage buffer contains data of another device. Overflow of the data storage buffer The connected device may be locked for parameter changes or for data storage. 	
PPE	 Port parameterization The port parameters are inconsistent. The device parameterization via GSD is active, but not working. Possible causes: The IO-Link-master did not receive GSDML-parameters for a connected device. The connected device was not parameterized by a PROFINET PLC via GSDML. The port is in operation mode "IO-Link without validation" or "DI". These modes do not allow parameterization via GSDL file. Data storage mode is active. The parameter is not set to "deactivated, clear". A device parameterization via GSDML is not possible with activated data storage. Vendor or Device ID are "0". The connected device can not be identified and is thus not parameterizable. 	
PDINV	 Evaluating Process Input Data 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 sources: 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) 	
IO-I ink de	vice diagnostics	
	The IO-Link device diagnostics depend on the IO-Link device used. For more detailed information on the diagnoses, please refer to the documentation for the IO-Link device.	
EVT1	Maintenance events A Maintenance Event in accordance with the IO-Link specification occurred, maintenance necessary.	
EVT2	Out-of-specification events An Out-of-Specification Event in accordance with the IO-Link specification occurred.	
GENERR	Common error The device sends an error (device status 4, in accordance with IO-Link specifica- tion), which is not clearly specified. Read out the device Event Codes in order to be able to specify the error more precisely.	
HWER	Hardware error General hardware error or device malfunction of the connected device	
LLVU	Lower limit value underrun The process value lies under the parameterized measurement range or the chosen measurement range has been chosen too high.	



Bit	Meaning
OLV	Overload The connected device detected an overload.
OTMP	Overtemperature A temperature diagnosis is available on the connected device.
PRMERR	Parameterization error The connected device reports a parameterization error (loss of parameters, no parameter initialization, etc.).
ULVE	Upper limit value exceeded The process value exceeds the parameterized measurement range or the chosen measurement range has been chosen too low.
VLOW	Undervoltage One of the voltages at the connected device is below the defined range.
VHIGH	Overvoltage One of the voltages at the connected device exceeds the defined range.

9.4.3 PROFINET diagnostics

Module diagnostics (slot 0 according to conf	iguration tool)	PROFINET Diagnostics		
	Connector	Error code	Channel	
Undervoltage V1	-	0x0002	0	
Undervoltage V2	-	0x0002	1	

DXP diagnostics PROFINET Diagnostics (slot 1 according to configuration tool)				
	Channel	Connector	Error code	Channel
Overcurrent output	DXP1	C0	0x0001	1
	DXP3	C1	0x0001	3
	DXP5	C2	0x0001	5
	DXP7	C3	0x0001	7

VAUX1/VAUX2 diagnostics (slot 1, according ot configuration tool)	PROFINET Diag	nostics
	Error code	Channel
Overcurrent VAUX1 (pin 1) at C0, channel 0/1	0x01D0	0
Overcurrent VAUX1 (pin 1) at C1, channel 2/3	0x01D1	
Overcurrent VAUX1 (pin 1) at C2, channel 4/5	0x01D2	
Overcurrent VAUX1 (pin 1) at C3, channel 6/7	0x01D3	
Overcurrent VAUX1 (pin 1) at C4, channel 8	0x01E8	
Overcurrent VAUX1 (pin 1) at C5, channel 10	0x01EA	
Overcurrent VAUX1 (pin 1) at C6, channel 12	0x01EC	
Overcurrent VAUX1 (pin 1) at C7, channel 14	0x01EE	
Overcurrent VAUX2 (pin2) at C4, channel 9	0x01F9	
Overcurrent VAUX2 (pin2) at C5, channel 12	0x01FB	
Overcurrent VAUX2 (pin2) at C6, channel 14	0x01FD	
Overcurrent VAUX2 (pin2) at C7, channel 9	0x01FF	



IO-Link port diagnostics		PROFINET Di	agnostics
IO-Link port 1	Connector	Error code	Channel
(Slot 2, according to configuration tool)			
Undervoltage (VLOW)	C0	0x0002	0
Overcurrent (VHIGH)		0x0003	
Overload (OVL)		0x0004	
Over temperature (OTMP)		0x0005	
Wrong or missing device (CFGER)		0x0006	
Upper limit value exceeded (ULVE)		0x0007	_
Lower limit value underrun (LLVU)		0x0008	
Data storage error (DSER)		0x0009	
Process input data invalid (PDINV)			
Maintenance events (EVT1)			
Out of specification error (EVT2)			
Port parameterization error (PPE)			
Parameterization error (PRMER)		0x0010	
Hardware error (HWER)		0x0010	
IO-Link port 2 (Slot 3, according to configuration tool)			
Similar to port 1	C1		2
IO-Link port 3			
(Slot 4, according to configuration tool)			
Similar to port 1	C2		4
IO-Link port 4 (Slot 5, according to configuration tool)			
Similar to port 1	C3		6
IO-Link port 5 (Slot 6, according to configuration tool)			
Similar to port 1	C4		8
IO-Link port 6 (Slot 7, according to configuration tool)			
Similar to port 1	C5		10
IO-Link port 7 (Slot 8, according to configuration tool)			
Similar to port 1	C6		12
IO-Link port 8 (Slot 9, according to configuration tool)			
Similar to port 1	C7		14



9.5 Using IO-Link data storage

IO-Link data storage is only possible if IO-Link devices connected to the IO-Link master are not parameterized by a controller (e.g., via a GSDML). This means that parameterization of IO-Link devices in PROFINET via SIDI (Simple IO-Link-Device-Integration [> 15]) excludes the use of data storage.

Data storage mode



NOTE Data storage mode is only available for devices complying with the IO-Link specification V1.1. IO-Link devices in accordance with IO-Link specification V1.0 do not support data storage.

In the IO-Link master, the data storage mode can be set using the parameter "data storage mode".

- 0 = activated
- 1 = overwrite
- 2 = read in
- 3 = deactivated, clear



Fig. 102: 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.)

9.5.1 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. ⇔





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. 104: 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. 105: 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.



9.5.2 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.





9.5.3 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. 107: Data storage mode = overwrite - parameter set in the master changed

IOLD

Para. IOLD Para. IOLD Para. IOLD

9.5.4 Parameter "Data storage mode" = deactivated, clear

- The data set in the master is deleted.
- The synchronization of parameter sets is deactivated.



Fig. 108: Data storage mode deactivated – no synchronization



9.6 Operating IO-Link devices (IO-Link Device Application)

The IO-Link Device Application offers many functions for monitoring IO-Link devices during operation and for reading out and checking process data. The functions vary depending on the IO-Link device used and the associated IODD.

The **process data** currently present on the IO-Link is prepared and displayed according to the data structure of the IO-Link device. The chronological progression can be displayed using the chart function.





TURCK START IO-LINK DOCUMENTATION TBEN-LL-8IOL IO-LINK -> LOCAL I/O -> PORT 1 - DR15S-M30E-IOL8X2-H1141 Logout LOCAL I/O 🗈 😼 🤣 🖶 Specialist 🗸 Read Write Unlink IODD Print User role No device Identification Vendor: Turck TURCK Device: DR15S-M30E-IOL8X2-H1141 Parameters Port 4 - No device
 Port 5 - No device Omilia Radar Distance Sensor, 15m sensing range, 1 switching ouput and 1 configurable switching or analog output Diagnostics No device V01.0000 / 2021-10-25 © 2021, Werner Turck GmbH Co. & KG Device Status Failure Port 7 - No device
 Port 8 - No device Observation Detailed Device Status Fault from Application (0x8ca3) ? The sensor was unable to perform autodetection at output 2. Process data Error Count ? 0 Process data structure 2064 h Operating hours ? Operating hours limit 1000000 h ? Radar monitor Switching counter: Output 1 10089023 ? 25609 ? Switching counter: Output 2 Active events Switching counter limit: Output 1 1000000000 ? 1000000000 Event history Switching counter limit: Output 2 ? System Command START BLINKING Connections System Command STOP BLINKING Features Extreme values Smallest distance 0.0 mm System Command RESET SMALLEST DISTANCE VALUE Largest distance 5110.2 mm ? System Command RESET LARGEST DISTANCE VALUE

Diagnostics present at the IO-Link device are displayed under **Diagnostics**.

Fig. 110: Diagnostics at IO-Link device



Current IO-Link events are processed under **Active events** and displayed in plain text. The **Event history** provides past events.

START I O-LINK		URCK our Global Automation Partner
TBEN-LL-8IOL	IO-LINK → LOCAL I/O → PORT 1 - DR15S-M30E-IOL8X2-H1141	Logout
IDENCL JOC IDENCL 1/O Image: Strate of the	Image: Second	Code 0x8ca3
English V		

Fig. 111: Active events

In addition, the IO-Link Device Application offers the special functions of some sensors such as the **Radar monitor** for Turck radar sensors or the **Subsonic monitor** for Turck ultrasonic sensors.



Fig. 112: Radar monitor



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 in the IO-Link master

DXP channels

Error	Possible causes	Measure	
DXP output not switching	The output is deactivated in the default setting of the device.	•	Activate the output function via the Activate output parameter (DXP_EN_DO = 1).

IO-Link channels

LED behavior	Diagnostics	Possible causes:	Reme	dy
LED ERR constant red, LED IOL red flashing	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.). The parameterization can be done manually via the web server, TAS or similar or by teaching the master using the IO-Link-Call (port 0 func- tion, sub index 67: Teach mode).
	Process input data invalid	Certain IO-Link devices send a process input data invalid diagnosis if the process value cannot be measured.	•	Deactivate the sending of the diagnosis for the IO-Link port with the parameter Process input data invalid \rightarrow No diagnostic generated .



11 Maintenance

Ensure regularly that the plug connections and cables are in good condition.

The devices are maintenance-free, clean dry if required.

11.1 Updating the firmware via TAS

NOTICE

Interruption of the power supply during the firmware update Risk of device damage due to faulty firmware update

- Do not interrupt the power supply during the firmware update.
- During the firmware update do not reset the power supply.
- Do not interrupt the Ethernet connection during the firmware update.



NOTE

The firmware update function in TAS is locked when the controller connection is active. The device must first be disconnected from the controller before performing the update.

Starting a firmware update for a device

- Open TAS.
- Open the network view.
- Select the device.
- Click Firmware update.

TAS DESKTOP DOCUMENTATION TURCK AUTOMATION SUITE TAS DESKTOP -> VIEW/FEATURE -> NETWORK VIEW/FEATURE 0 **•** ۲ Scan network Add device Edit device Change PW FW Update Set clock ARGEE Actions ? Device type/feature ? BEEP TBEN-Profinet

Fig. 113: Firmware update network view

As an alternative to selecting a single device, it is also possible to select multiple devices. To do so, all devices to be updated must correspond to the same device type and be in the same TCP network.

This enables a firmware update to be performed for multiple devices at once.



Starting a firmware update for multiple devices

- ▶ In the network view, check the box for all desired devices.
- Click **FW update** in the header.

TAS DESKTOP DOCUMENTATION				
TURCK AUTOMATION SUITE	TAS DESKTOP -> VIEW/FEATURE -> NETWORK			
VIEW/FEATURE	Image: Scan network Image: Scan classical scan scale s			
ළා ARGEE මා BEEP	Actions ? Device type/feature ?			
ProfinetDiagnostics	 ✓ ● 2 ∩ ○ ○ 沓 ⊗ ✓ ● 2 ∩ ○ ○ 沓 ⊗ 			

Fig. 114: Firmware update network view multiple devices

For multiple devices of the same type, a global password can be set, which can be used to unlock all selected devices directly. This requires that all selected devices have the same device password and are in the same TCP network.

- Enter a global or device password. The default password is "password".
- Click LOG IN.
- Click SELECT FILE.
- Open the directory of the firmware file.
- Select a new firmware file and load it by clicking **Open**.
- Click **START** to start the firmware update.

Please enter dev	ice passw	ord for each	device or s	et as global device	e password.
Global passwo	ord		۲	LOGIN	
192.168.1.254				Switching To Bo	otlandor e e e
Do not close the	current br	owser winder	w until the f	irmware undate is	
Do not close the Interrupting the I	current bro oading pro	owser windo cess can res	w until the f sult in dama	irmware update is ge to the equipme	complete.
Do not close the Interrupting the I Firmware file:	current bro oading pro	owser windo cess can res	w until the f sult in dama	irmware update is ge to the equipme dat	complete.

Fig. 115: Firmware update progress

⇒ The progress of the firmware update is displayed.



11.2 Updating the firmware via web server



NOTICE

Interruption of the power supply during the firmware update **Risk of device damage due to faulty firmware update**

- Do not interrupt the power supply during the firmware update.
- During the firmware update do not reset the power supply.
- ▶ Do not interrupt the Ethernet connection during the firmware update.
- Open the web server.
- Log on to the device as administrator. The default password for the web server is "password".
- Click Firmware \rightarrow SELECT FIRMWARE FILE.
- Select the new firmware file and load it via **Open**.

Image: Search "FW_Update"	TBEN-L5-8IOL (i) Info රිදි Parameter	Gateway - Firmware	
Image: Second	Vector Diagnosis C Open Ø Event log ← → ^ Ø Ex- / Impor Organize • Change Pa ✓ Quick access Desktop Firmware Desktop Downloads Info Documents Info Pictures Diagnosis Videos Videos OneDrive	esktop > FW_Update	✓ ひ Search "FW_Update" 座 ▼ 1

Fig. 116: Webserver - Selecting the firmware file



• Click **Update Firmware** and start the update.

			URCK
MAIN	DOCUMENTATION IODD CONFIGURATOR	LOGO	тис
TBEN (i) Info (ii) Info (iii) Diag (iiii) Chai (iiiii) Film LOCAL I/ (iiiiii) (iiiiii) Info (iiiii) Info (iiiii) Info (iiiii) Info (iiiii) Info (iiiiii) Info (iiiii) Info (iiii) Info (iiiiiii) Info (iiiii	TBEN Gate SELECT FIRMWA File TBENVb. UPDATE FIRM UPDATE FIRM UPDATE FIRM	eway - Info RE FILE dat selected WARE	

Fig. 117: Webserver – Starting the firmware update

⇒ The progress of the firmware update is displayed.

		TURC
MAIN DOCUMENTATION	IODD CONFIGURATOR	LOGOUT
TBEN	TBEN	
	SELECT FIRMWARE FILE	
	Write block 568 of 1793	
	UPDATE FIRMWARE	
	•.•	
	Flashing	
<u>숙</u> 관 Output		

Fig. 118: Webserver – Firmware update running

• Restart the device after the update process has been completed.



12 Repair

The device is not intended for repair by the user. The device must be decommissioned if it is faulty. Observe our return acceptance conditions when returning the device to Turck.

12.1 Returning devices

If a device has to be returned, bear in mind that only devices with a decontamination declaration will be accepted. This is available for download at https://www.turck.de/en/return-service-6079.php and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Disposal



The devices must be disposed of properly and do not belong in the domestic waste.



14 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
Supply	
Threshold for undervoltage diagnostics V1 and V2 (if used in device)	18 V DC
Ex derating	S. document "Notes on Use in Ex zone 2 and 22" (ID 100022986)
Supply	
Threshold for undervoltage diagnostics V1 and V2 (if used in device)	18 V DC
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 no loadEthernet connection active
Sensor/actuator supply V _{AUX1}	Supply from V1, short-circuit proof, max. 4 A per connector C0 and C4, max. 2 A per connector C1C3, C5C7
Sensor/actuator supply V _{AUX2}	Class B supply from V2 short-circuit proof, max. 4 A per connector C4C5 2 A per connector C6C7
Potential isolation	Galvanic isolation from V1 and V2 voltage group, voltages up to 500 VDC
Connectors	
Ethernet	2 x M12, 4-pin, D coded
Power supply	
■ TBEN-L4	 X1: 7/8" male connector, 4-pin X2: 7/8" female connector, 4-pin
■ TBEN-L5	 X1: 7/8" male connector, 5-pin X2: 7/8" female connector, 5-pin
Digital in-/outputs	8× M12, 5-pin, A-coded
Permissible torques Ethernet I/O channels/supply Mounting (M6 screws)	0.6 Nm 0.8 Nm 1.5 Nm
Max. cable length	



Technical data	
Ethernet	100 m (per segment)
Isolation voltages	
V1 to V2	≥ 500 V AC
V1/V2 to fieldbus	≥ 500 V AC
System data	
Transmission rate	10 Mbps/100 Mbps
Protocol detection	Automatic
Web server	Integrated, 192.168.1.254
Service interface	Ethernet via P1 or P2
Field Logic Controller (FLC)	
Supported from firmware version	3.0.6.0
Released as of ARGEE version	2.0.25.0
Modbus TCP	
Address assignment	Static IP, DHCP
Supported Function Codes	FC3, FC4, FC6, FC16, FC23
Number of TCP connections	8
Input register start address	0 (0x0000)
Output register start address	2048 (0x0800)
Local port	Port 502, fix setting
EtherNet/IP	
Address assignment	According to EtherNet/IP standard
Device Level Ring (DLR)	Supported
Quick Connect (QC)	< 150 ms
Min. RPI (Requested Packet Interval)	2 ms
Number of Class 3 (TCP) connections	3
Number of Class 1 (CIP) connections	10
Input Assembly Instances	103, 120, 121, 122, 123, 124, 125
Output Assembly Instances	104, 150, 151, 152
Configuration Assembly Instances	106
PROFINET	
PROFINET specification	V 2.35
Conformance Class	B (RT)
Address assignment	DCP
MinCycle Time	1 ms
Fast Start Up (FSU)	< 150 ms
Diagnostics	According to PROFINET alarm handling
Topology detection	Supported
Automatic address setting	Supported
Media Redundancy Protocol (MRP)	Supported
System redundancy	52
Network load class	3
Digital inputs	



Technical data	
No. of channels	4 DXP and 8 SIO
Input type	PNP
Type of input diagnostics	Channel diagnostics
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
Max. input frequency	100 Hz (for fieldbus communication)
Input delay	0.05 ms
Potential isolation	Galvanic isolation to Ethernet, voltage proof up to 500 V AC
Digital outputs	
No. 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
Load type (UL)	Resistive, coil
Potential isolation	Galvanic isolation to Ethernet, voltage proof up to 500 V AC
IO-Link	
No. of channels	8
IO-Link	Pin 4 in IO-Link mode
IO-Link specification	Version 1.1
IO-Link port type	Class A at C0C3 Class B at C4C7
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), unshielded
Mounting	



Technical data	
Type of mounting	Via 2 mounting holes, Ø 6.3 mm
Mounting distance (device to device)	 ≥ 50 mm Valid for operation in the ambient temperatures mentioned below, with sufficient ventilation as well as maximum load (horizontal mounting). 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
Electromagnetic compatibility	According to EN 61131-2
Approvals and certificates	CE, FCC
UL cond.	cULus LISTED 21 W2, Encl.Type 1 IND.CONT.EQ.
General information	
Dimensions (w \times l \times h)	$60.4 \times 230.4 \times 39 \text{ mm}$
Operating temperature	-40+70 °C
Storage temperature	-40+85 °C
Operating height	Max. 5000 m
Degree of protection	IP65/IP67/IP69K (not evaluated by UL)
MTTF	160 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

Note on FCC



NOTE

This device complies with the limit values for a Class A digital device in accordance with Part 15 of the FCC regulations. Operation of this device in a residential area may cause harmful interference. In this case users must rectify the interference at their own cost.



15 Turck branches — contact data

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