IO-Link Devices
Commissioning
User Manual
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1 About these instructions

These operating instructions describe the setup, the functions and use of the system, and help
you to commission the Turck IO-Link devices. Read this manual carefully before using the sys-
tem. This will prevent the risk of personal injury and damage to property. Keep this manual safe
during the service life of the system.

1.1 Target groups

These instructions are written for suitably qualified and trained personnel and must be read
and followed by anyone configuring and commissioning the system.

1.2 Explanation of symbols

The following symbols are used in these instructions:

- **NOTE**
  Note indicates tips, recommendations and important information. The notes contain
  information, particular operating steps that facilitate work and possibly help to avoid
  additional work resulting from incorrect procedures.

- **MANDATORY ACTION**
  This symbol denotes actions that the user must carry out.

- **RESULT OF ACTION**
  This symbol denotes the relevant results of actions and procedures.

1.3 Other documents

Besides this document the following material can be found on the Internet at www.turck.com:
- Product-specific data sheets
- Product-specific operating instructions
- TBEN-S2-4IOL user manual (D301369)
- TBEN-L…-8IOL user manual (D301407)
- IO-Link master user manual for BLxx (D301339)
- User manual for TBPN-L1-FDIO1-2IOL hybrid safety I/O module (D301379)
- IO-Link parameter manuals
- Safety manuals
- Device approvals

1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as pos-
sible. 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 system

2.1 Device identification

This manual applies to all IO-Link capable Turck devices.

2.2 Manufacturer and service

Turck supports you in your projects – from the initial analysis right through to the commissioning of your application. The Turck product database offers you several software tools for programming, configuring or commissioning, as well as data sheets and CAD files in many export formats. You can access the Product Database directly via the following address:

www.turck.de/products

For further inquiries in Germany contact the Sales and Service Team on:
Sales: +49 208 4952-380
Technical: +49 208 4952-390
Internet: www.turck.com/support

For overseas inquiries contact your national Turck representative.

Hans Turck GmbH & Co. KG
Witzlebenstraße 7
45472 Mülheim an der Ruhr
Germany

3 For your safety

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

3.1 Intended use

IO-Link is a digital point-to-point connection for use in industrial automation applications. The IO-Link interface enables IO-Link sensors and actuators to be set and operated. Cyclical process data and acyclical data as well as energy can be transferred between an IO-Link master and an IO-Link device.

IO-Link enables different devices (e.g. a temperature sensor and a linear position sensor) to be operated on one input module.

For further information refer to
4 System description

IO-Link is a fieldbus independent communication interface for sensors and actuators. Signals and energy can be exchanged between any networks, fieldbuses and backplane buses via a digital, serial point-to-point connection.

Each IO-Link system consists of an IO-Link master and an IO-Link device (e.g. sensor, I/O hub, valve block). An IO-Link master is provided with at least one IO-Link port (channel). One IO-Link device can be connected to each port. The system components are interconnected according to the port specification via unshielded 3-wire or 5-wire standard cables.

The IO-Link technology is described in the “IO-Link Interface and System Specification” and IEC 61131-9. IO-Link-capable devices comply either with specification V1.0 or specification V1.1.

The properties, functions and parameters of the IO-Link device are represented in an electronic device description (IODD). The IODDs for Turck devices can be downloaded via the Turck Software Manager and can also be obtained free of charge from www.turck.com. The IODDs of all devices have the same structure and contain the following information for system integration:

- Communication properties
- Device parameters with value range and default value
- Identification, process and diagnostic data
- Device data
- Text description
- Picture of the device
- Logo of the manufacturer

The structure of the IODD is defined by the IO-Link specification and is the same for all IO-Link devices. The IODD is based on indexes. The communication properties, device parameters, identification, process, diagnostic and device data are assigned to fixed indexes in the IODD, via which the parameters can be controlled. Some indexes are further divided by subindexes.

4.1 System features

- Point-to-point connection (max. cable length: 20 m)
- Unshielded 3-wire or 5-wire standard cables
- Cyclical process data transmission
- Acyclical data transmission, e.g. device data and events
- Communication between IO-Link master and IO-Link device possible in 3 baud rates
- Parallel exchange of device data without influencing the process data
- Communication via 24 V pulse modulation, standard UART protocol
4.2 System design

At least one IO-Link master and one IO-Link device (e.g. sensors or actuators) are required for IO-Link communication. IO-Link master and IO-Link device are interconnected via an unshielded 3-wire or 5-wire standard cable. The setting can be carried out with a configuration tool or via the fieldbus level.

The IO-Link master establishes the connection between IO-Link device and the higher-level control system. An IO-Link master can have several IO-Link ports. Only one IO-Link device can be connected to each port.

IO-Link hubs also make it possible to integrate devices without an IO-Link output in automation systems via IO-Link.

Standard tools and functions are provided for the integration, commissioning and configuration of the IO-Link communication.

Fig. 1: IO-Link system overview
4.3 Operating principle

IO-Link is a digital point-to-point connection between an IO-Link master and an IO-Link device. Process data and other information such as parameters and diagnostic messages are transferred with a 24 V pulse modulation via a combined switching status and data channel (C/Q).

IO-Link communication is independent of the fieldbus used.

4.4 Functions and operating modes

The operating mode can be set separately at any port of the IO-Link master.

Two operating modes are available for the IO-Link master
■ IO-Link mode: IO-Link communication possible
■ Standard I/O mode (SIO): digital I/O communication

IO-Link communication is implemented via the switching and communication cable (C/Q).

During initialization the ports of the IO-Link master behave like a normal digital input. The IO-Link devices are operated in IO-Link mode. A command of the higher-level IO-Link master establishes IO-Link communication in IO-Link mode. This command is called the “Wake-up request”.

4.4.1 IO-Link mode

In IO-Link mode communication takes place between an IO-Link master and an IO-Link device. Communication always starts from the IO-Link master.

Transmission speed between IO-Link master and IO-Link device

Three transmission rates are defined in the IO-Link specification:
■ 4.8 kBaud
■ 38.4 kBaud
■ 230.4 kBaud

Each device supports only one baud rate, an IO-Link master supports all transmission rates. The transfer time of the cyclical process data is determined by the telegram length as well as the delay times in the device and the master. With a transmission rate of 38.4 kBaud and a telegram length of 2 byte the transmission time is typically 2.3 ms.
System description

Response times

The response time of the IO-Link system provides information on the frequency and speed of the data transmission between IO-Link master and IO-Link device. This response time depends on the following factors:

- Minimum cycle time: Intervals defined in the IODD in which the IO-Link master addresses the IO-Link device. Different minimum cycle times can be defined for different devices.
- Internal processing time of the IO-Link master and the IO-Link device

Cyclical and acyclical communication

The data exchanged between IO-Link master and the IO-Link device can be divided into cyclical process data and acyclical data. Process data and value states are transferred cyclically. Acyclical data is transferred separately to cyclic process data. Acyclical data includes device data, parameter functions and events such as diagnostic information, which is only transferred on request. The two communication types are independent of each other and do not interact.

### Cyclical communication

<table>
<thead>
<tr>
<th>Process data</th>
<th>Value status (port qualifier)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0…32 bytes of process data per device (each input and output)</td>
<td>The Port Qualifier indicates whether the process data is valid or not</td>
</tr>
<tr>
<td>Process data size determined by the device</td>
<td></td>
</tr>
</tbody>
</table>

### Acyclical communication

<table>
<thead>
<tr>
<th>Device data</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameters, identification data or diagnostic information</td>
<td>Device indicates event to master: Error messages and warnings</td>
</tr>
<tr>
<td>Replacement on request of the IO-Link master</td>
<td>Master indicates event to device: e.g. cable break or communication abort</td>
</tr>
<tr>
<td>Device data can be written to the device or read from the device</td>
<td></td>
</tr>
</tbody>
</table>

Combining IO-Link devices with different specifications

Only devices of specification V1.0 can be operated on IO-Link masters of specification V1.0. Devices of specification V1.0 and V1.1 can be operated on IO-Link masters of specification V1.1.

<table>
<thead>
<tr>
<th>IO-Link device V1.0</th>
<th>IO-Link device V1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO-Link master V1.0</td>
<td>✓</td>
</tr>
<tr>
<td>IO-Link master V1.1</td>
<td>✓</td>
</tr>
</tbody>
</table>
Data retention mode

**NOTE**

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

Data retention mode makes it possible to replace IO-Link devices without the need for a reconfiguration. The IO-Link master or the IO-Link device save the device parameters set in the previous configuration. In data retention mode the parameter data memories of IO-Link master and IO-Link device are synchronized.

If data retention mode is activated in the IO-Link master, the master writes the stored device parameters to the new device after a device is replaced. The application can be restarted without having to perform a new configuration.

![Diagram](image)

Fig. 3: Data retention mode (example)

4.4.2 Standard I/O mode (SIO mode)

In standard I/O mode IO-Link devices behave like digital sensors or actuators. In this mode the devices only send input or output data to the higher-level instance. IO-Link access to the device is not possible.
## 5 Connection

A Turck IO-Link master is provided with one or several ports for connecting IO-Link devices. The IO-Link devices are connected via unshielded 3-wire or 5-wire standard cables to the ports of the IO-Link master. The maximum cable length is 20 m.

The IO-Link specification for IO-Link masters defines two different types of ports with different power supplies.
- **Port class A:** The functions of pins 2 and 5 are manufacturer specific. For example, pin 2 can be assigned with an additional digital channel.
- **Port class B:** An additional electrically isolated power supply is provided via pins 2 and 5. Class B IO-Link ports are suitable for connecting IO-Link devices with a greater power requirement. A 5-wire standard cable is required to use the additional power supply.

Adapters (ident no. 6629515 and 6629516) are available for connecting Port class B devices to Port class A masters.

### 5.1 Wiring diagrams

#### 5.1.1 IO-Link master

<table>
<thead>
<tr>
<th>Pin</th>
<th>Pin assignment</th>
<th>Wiring diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V₁⁺</td>
<td><img src="image1.png" alt="Diagram" /></td>
</tr>
<tr>
<td>2</td>
<td>manufacturer specific (e.g. additional digital channel)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>V₁⁻</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C/Q</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>n. c.</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 4: Wiring diagram of IO-Link master Port class A

<table>
<thead>
<tr>
<th>Pin</th>
<th>Pin assignment</th>
<th>Wiring diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V₁⁺</td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
<tr>
<td>2</td>
<td>V₂⁺</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>V₁⁻</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C/Q</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>V₂⁻</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 5: Wiring diagram of IO-Link master Port class B

#### 5.1.2 IO-Link device

<table>
<thead>
<tr>
<th>Pin</th>
<th>Pin assignment</th>
<th>Wiring diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V₁⁺</td>
<td><img src="image3.png" alt="Diagram" /></td>
</tr>
<tr>
<td>2</td>
<td>not specified</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>V₁⁻</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C/Q</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>n. c.</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 6: Wiring diagram of IO-Link device Port class A
6 Configuring and commissioning

➤ Set the IO-Link master to IO-Link mode (see device operating instructions).

If the port is set to IO-Link mode, the IO-Link master will try to set up communication with the IO-Link device. IO-Link communication is established in IO-Link mode through a wake-up request from the higher-level IO-Link master. The IO-Link master first tries to establish transmission at the highest data transmission rate defined. If communication cannot be established, the master automatically tries to use the next highest data transmission rate to establish communication.

Transmission starts if the master receives a feedback signal from the device. The communication parameters are exchanged first of all. If necessary, the IO-Link master transfers parameters saved in the system to the device. The cyclical exchange of process data and value status is then started.

IO-Link devices can be started up via a Turck IO-Link master on different controller types. In PROFINET systems this requires the GSDML file of the IO-Link master. The GSDML files of the Turck devices are available for download at www.turck.com.

The following examples describe the configuration of IO-Link devices. The following scenarios are possible here:

- Configuring devices via a PC using a configuration tool
  - Configuring with IO-Link-USB adapter
  - Configuring with an IO-Link master
- Configuring devices via the fieldbus level
  - Configuring with a programmable gateway and CODESYS 2
  - Configuring with a programmable gateway and CODESYS 3
  - Commissioning with a Siemens PLC in Simatic Manager
  - Commissioning with a Siemens PLC in the TIA Portal
- Configuring devices via the fieldbus level with an extended GSDML file

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<table>
<thead>
<tr>
<th>Pin</th>
<th>Pin assignment</th>
<th>Wiring diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>$V_1^+$</td>
<td></td>
</tr>
<tr>
<td>Pin 2</td>
<td>$V_2^+$</td>
<td></td>
</tr>
<tr>
<td>Pin 3</td>
<td>$V_1^-$</td>
<td></td>
</tr>
<tr>
<td>Pin 4</td>
<td>C/Q</td>
<td></td>
</tr>
<tr>
<td>Pin 5</td>
<td>$V_2^-$</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 7: Wiring diagram of IO-Link device Port class B
6.1 Setting devices via a PC with a configuration tool

IO-Link devices can be set via a PC with a configuration tool (e.g. PACTware™).

All the required Turck software components can be downloaded via the Turck Software Manager. The Turck Software Manager is available free of charge from www.turck.com.

6.1.1 Setting with USB adapter and configuration tool

Software used

This example uses the following software:
- PACTware™ 4.1 configuration tool
- IODD Interpreter configuration software
- DTM for USB-2-IOL-0002 USB-IO-Link adapter
- IODD for TS-400-2UPN8X-H1141 temperature sensor

Hardware used

- TS-400-2UPN8X-H1141 temperature sensor
- RKC4.4T-2-RSC4.4T/TXL sensor cable
- USB-2-IOL-0002 USB-IO-Link adapter

![Fig. 8: Hardware components in the application example (temperature sensor, sensor cable, USB-IO-Link adapter)](image-url)
Fig. 9: Application example – setup

Example: Device configuration

➤ Start the IODD Interpreter.
➤ Click “Add IODD”.
➤ Select the IODD for TS400-2UPN8X-H1141 in the following window.
➤ Click “Open” to add the IODD for temperature sensor TS-400-2UPN8X-H1141.

Fig. 10: Adding IODD for TS400-2UPN8X-H1141 in the IODD Interpreter
Configuring and commissioning

➤ Launch PACTware™.
➤ Add the USB adapter: Right-click Host PC → Add device.

Fig. 11: Adding a device in PACTware™

➤ Select IO-Link interface “IO-Link USB Master 2.0”.

Fig. 12: Adding an USB-IO-Link adapter
➤ Start the topology scan in order to find devices connected to the IO-Link adapter: Right-click the IO-Link adapter → Click the topology scan.

Fig. 13: Starting the topology scan
Configuring and commissioning

➤ Search for devices via the topology scan: Click the “Search” button.

![Topology scan – Searching for devices](image1)

Fig. 14: Topology scan – Searching for devices

➤ Select the IODD for the connected device if the device is not automatically detected (see red marking).

![Topology scan – selecting the IODD](image2)

Fig. 15: Topology scan – selecting the IODD

➤ Transfer settings to the configuration: Click Accept ➔ Close topology scan.
➤ Establish the connection between the IO-Link device and PC by right-clicking the device.

Fig. 16: Establishing a connection
Configuring and commissioning

➤ Start Expert mode by right-clicking the adapter.

Fig. 17: Starting Expert mode
➤ Select "IO-Link Parameters".

Fig. 18: PACTware™ Expert mode – IO-Link parameters

Refer to the adjustable parameters provided in the IO-Link parameter manuals for the specific devices. The parameter manuals contain a description of the IODD and are available for download at www.turck.com. Example: The "Rotate display and set measured value refresh time" command is controlled via index 85.

Variable "Display of measured value" index=85 id=V_dis

description: The refresh time can be adjusted. The display can be rotated by 180° or disabled. In disabled state, the measured value is displayed temporarily when pressing the set button.
data type: 8-bit Uinteger
allowed values: 0 = 50 ms refresh time, 1 = 200 ms refresh time, 2 = 600 ms refresh time, 3 = 50 ms refresh time/display rotated by 180°, 4 = 200 ms refresh time/display rotated by 180°, 5 = 600 ms refresh time/display rotated by 180°, 6 = disabled
default value: 0
access rights: rw

Fig. 19: Extract from the parameter manual for the TS-400-2UPN8X-H1141 sensor (example: Set display)
➤ Set the number format for the index (here 85).
➤ Read the value of the "Display of measured value" parameter.
➤ The display field (highlighted in red) shows the default value 0 (50 ms measured value refresh time).

Fig. 20: Reading out parameters
» Rotate display by 180° and measured value refresh time of 50 ms (set index value to 3): Write the value of the parameter as follows.

![IO-Link USB Master 2.0](image)

**Fig. 21:** Setting the parameters for display and measured value refresh time
6.1.2 Setting with IO-Link master and configuration tool

Software used

This example uses the following software:
- PACTware™ 4.1 configuration tool
- IODD Interpreter configuration software
- IODD for TS-400-2UPN8X-H1141 temperature sensor

Hardware used

**NOTE**
As an alternative to the BL67-GW-EN gateway with a BL67-4IOL IO-Link master module, the TBEN-S2-4IOL and TBEN-L….-8IOL IO-Link block modules can be used.

- BL67-GW-EN multiprotocol gateway (IP address: 192.168.1.254)
- BL67-4IOL IO-Link master module with BL67-B-4M12 base module
- TS-400-2UPN8X-H1141 temperature sensor, connected to IO-Link channel 1
- RKC4.4T-2-RSC4.4T/TXL sensor cable

Fig. 22: Hardware components in the application example (programmable gateway, IO-Link master module, temperature sensor, sensor cable)
Setup

Fig. 23: Application example – setup

Example: Device configuration

➤ Start the IODD Interpreter.
➤ Click “Add IODD”.
➤ Select the IODD for TS400-2UPN8X-H1141 in the following window.
➤ Click “Open” to add the IODD for temperature sensor TS-400-2UPN8X-H1141.

Fig. 24: Adding IODD for TS400-2UPN8X-H1141 in the IODD Interpreter
Configuring and commissioning

➤ Launch PACTware™.
➤ Add IODD in PACTware™ (View → Device Catalog → Refresh Device Catalog).
➤ Add Ethernet interface (right-click Host PC → Add device).

![PACTware](image)

Fig. 25: Adding a device in PACTware™

➤ Select “BL Service Ethernet” interface.

![Device Catalog](image)

Fig. 26: Adding BL Service Ethernet
➤ Add BL67-GW-EN via the bus address management of the Ethernet interface (right-click the Ethernet interface, here TCP:192.168.1.50 ➔ Other functions ➔ Bus address management).

Fig. 27: Starting Bus address management
Search for BL67 gateway ( ) and add it to the project ( ).

Fig. 28: Adding a gateway to the project

Confirm the “Add DTMs for all connected devices” with “OK”.

**NOTE**
The particular firmware version of the gateway and the IO-Link master can be queried via the Info icon ( ).
Start the topology scan in order to find devices connected to the IO-Link master.

Fig. 29: Starting the topology scan
If a DTM is found during a topology scan instead of an IODD, load the IODD manually.

Fig. 30: Replacing DTM with IODD
Select the IODD for the TS-400-2UPN8X-H1141 temperature sensor and confirm with OK.

Close the topology scan.

Establish the connection between host PC and IO-Link device by right-clicking IO-Link device.
Configuring and commissioning

➢ In the tree structure double-click the IO-Link device in order to display the parameters.

Fig. 33: IO-Link parameters
➤ Set the Measured value display parameter to "50 ms refresh time, 180° rotated".

Fig. 34: Setting the measured value display

➤ Write parameters to the device.

Fig. 35: Writing parameters to the device
6.2 Configuring devices via the PLC program

IO-Link devices can be started up via a Turck IO-Link master on different controllers. In PROFINET the GSDML file of the IO-Link master is required for the configuration with a Siemens controller in PROFINET. The GSDML file is available for download from www.turck.com.

6.2.1 Commissioning with BLxx and programmable gateway in CODESYS 2

Software used

- CODESYS 2.3.9.35 with BLxx_PG_PB.lib library

Hardware used

- BL67-PG-EN programmable gateway
- BL67-4IOL IO-Link master module with BL67-B-4M12
- TS-400-2UPN8X-H1141 temperature sensor, connected to IO-Link channel 1
- RKC4.4T-2-RSC4.4T/TXL sensor cable

Setup

![Diagram of setup](image)

Fig. 36: Application example – setup
Example: Generic device configuration

**NOTE**
The BLxx-4IOL IO-Link master can only be configured generically. The connected devices must be configured separately.

Configure hardware in CODESYS.

Fig. 37: Configuring hardware in CODESYS
Configuring and commissioning

➤ Set the module properties of the BL67-4IOL IO-Link master.

Fig. 38: Setting parameters

➤ In online mode, the process data can be read if an IO-Link device is connected.

Fig. 39: Reading out process data in online mode
6.2.2 Commissioning with BLxx and TX500 in CODESYS 3

Software used

- CODESYS 3.5 SP8 Patch 1
- GSDML file for BL67-GW-EN

Hardware used

- BL67-GW-EN multiprotocol gateway
- BL67-4IOL IO-Link master module with BL67-B-4M12 base module
- TS-400-2UPN8X-H1141 temperature sensor, connected to IO-Link channel 1
- RKC4.4T-2-RSC4.4T/TXL sensor cable
- TX507 visual HMI/PLC device

Setup

Fig. 40: Application example – setup
Example: Configuring the device

**NOTE**
The BLxx-4IOL IO-Link master can only be configured generically. The connected devices must be configured separately.

➤ Configure hardware in CODESYS.

![Configuring hardware in CODESYS](image)

**Fig. 41:** Configuring hardware in CODESYS
➤ Double-click IO-Link master.
➤ Select parameters.

Fig. 42: Setting parameters

➤ In online mode, the process data can be read if an IO-Link device is connected.

Fig. 43: Reading out process data in online mode
6.3 Commissioning with TBEN and TX507 in CODESYS 3

Software used

- CODESYS 3.5 SP8 Patch 1
- GSDM file for TBEN-S2-4IOL

Hardware used

**NOTE**
As an alternative to the TBEN-S2-4IOL IO-Link block module, the TBEN-L...8IOL IO-Link block modules can be used.

- TBEN-S2-4IOL IO-Link master
- TS-400-2UPN8X-H1141 temperature sensor, connected to IO-Link channel 1
- RKC4.4T-2-RSC4.4T/TXL sensor cable
- TX507 visual HMI/PLC device

Example: Generic device configuration

➤ Configure hardware in CODESYS.

Fig. 44: Hardware configuration
➤ Assign slots of IO-Link master: Right-click the slot → Select Insert device.
The last three slots are for diagnostics, bytes and module status.

Fig. 45: IO-Link master – Assigning slots

Fig. 46: Example: Selecting diagnostics
Configuring and commissioning

➤ Assign IO-Link ports: Right-click the slot ➔
Insert device.
➤ Select generic configuration.

Fig. 47: Selecting generic configuration
Configure port.

Fig. 48: Configuring port
Online mode enables the process values to be observed.

Fig. 49: Online mode – Observing process values
Example: Specific device configuration

**NOTE**
The TBEN-S2-4IOL IO-Link master can be configured specifically. The connected devices can be configured via the configuration program of the PLC.

➤ Configure hardware in CODESYS.
Configuring and commissioning

➤ Assign slots of IO-Link master: Right-click the slot → Select Insert device.
The last three slots are for diagnostics, bytes and module status.

Fig. 51: IO-Link master – Assigning slots
Fig. 52: Example: Selecting diagnostics
Configuring and commissioning

➤ Assign IO-Link ports: Right-click the slot ➔ Insert device.
➤ Select specific configuration.

Fig. 53: Selecting a specific configuration
Select IO-Link device.

Fig. 54: Selecting the IO-Link device
Select device parameters.

The specific configuration also makes it possible to set the parameters of the IO-Link master as well as those of the IO-Link device. When the application is started in the PLC, the settings are transferred to the device via PROFINET.
Online mode enables the process values to be observed.

Fig. 56: Online mode – Observing process values
6.3.1 Commissioning with BLxx and Siemens PLC in Simatic Manager (V5.5)

Software used

- Siemens STEP7 V5.5 (Simatic Manager)
- GSDML file for BL67-GW-EN

Hardware used

- BL67-GW-EN multiprotocol gateway
- BL67-4IOL IO-Link master module with BL67-B-4M12 base module
- TS-400-2UPN8X-H1141 temperature sensor, connected to IO-Link channel 1
- RKC4.4T-2-RSC4.4T/TXL sensor cable
- Siemens S7 controller, e.g. CPU 315-2PN/DP

Setup

Fig. 57: Application example – setup
Example: Generic device configuration

**NOTE**
The BLxx-4IOL IO-Link master can only be configured generically. The connected devices must be configured separately.

- Configure the hardware in Simatic Manager.
- Write the I/O addresses.

Fig. 58: Writing the I/O addresses in Simatic Manager
Configuring and commissioning

➤ Double-click IO-Link master.
➤ Select parameters.

Fig. 59: Setting parameters

➤ In online mode, the process data can be read if an IO-Link device is connected.

Fig. 60: Reading out process data in online mode
6.3.2 Commissioning with TBEN and Siemens PLC in Simatic Manager (V5.5)

Software used

- Siemens STEP7 V5.5 (Simatic Manager)
- GSDM file for TBEN-S2-4IOL

Hardware used

**NOTE**
As an alternative to the TBEN-S2-4IOL IO-Link block module, the TBEN-L…-8IOL IO-Link block modules can be used.

- TBEN-S2-4IOL IO-Link master
- TS-400-2UPN8X-H1141 temperature sensor, connected to IO-Link channel 1
- RKC4.4T-2-RSC4.4T/TXL sensor cable
- Siemens S7 controller, e.g. CPU 315-2PN/DP

Setup

![Application example – setup](image)

Fig. 61: Application example – setup
Example: Specific device configuration

**NOTE**
The TBEN-S2-4IOL IO-Link master can be configured specifically or generically. The connected Turck devices can be configured via the PLC program.

- Configure the hardware in Simatic Manager.
- Assign the device ports of the TBEN IO-Link master.

![Assigning device ports](image)

Fig. 62: Assigning device ports
➤ Double-click 2IN.
➤ Select parameters.

Fig. 63: Selecting parameters for 2IN

➤ Double-click DI.
➤ Select parameters.

Fig. 64: Selecting parameters for DI
In online mode, the process data can be read if an IO-Link device is connected.

Fig. 65: Reading out process data

Setting device parameters

The GSDML file for TBEN devices enables the parameters to be set for IO-Link devices.

Fig. 66: Setting device parameters

The specific configuration also makes it possible to set the parameters of the IO-Link master as well as those of the IO-Link device. When the application is started in the PLC, the settings are transferred to the device via PROFINET.
Online mode enables the process data of the connected device to be read.

Fig. 67: Reading out process data
6.3.3 Commissioning with BLxx and Siemens PLC in the TIA Portal V13 SP1

Software used

- Siemens STEP 7 V13 Professional (TIA Portal) SP1 Update 5
- GSDML file for BL67-GW-EN

Hardware used

- BL67-GW-EN multiprotocol gateway
- BL67-4IOL IO-Link master module with BL67-B-4M12 base module
- TS-400-2UPN8X-H1141 temperature sensor, connected to IO-Link channel 1
- RKC4.4T-2-RSC4.4T/TXL sensor cable
- Siemens S7-300 controller, e.g. CPU 315-2PN/DP

Setup

Fig. 68: Application example – setup
Example: Generic device configuration

**NOTE**
The BLxx-4IOL IO-Link master can only be configured generically. The connected devices must be configured separately.

➤ Configure the hardware in the TIA Portal.

Fig. 69: Hardware configuration
Configuring and commissioning

Select the operating mode for the IO-Link ports.

Fig. 70: IO-Link ports – Setting the operating mode
Online mode enables the process values to be observed if an IO-Link device is connected.

<table>
<thead>
<tr>
<th>Name</th>
<th>Adresse</th>
<th>Anzeigeformat</th>
<th>Beobachtungswert</th>
<th>Steuerwert</th>
<th>Kommentar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>%IW10</td>
<td>Hex</td>
<td>16#5214</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>%IW2</td>
<td>Hex</td>
<td>16#0100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>%IW4</td>
<td>Hex</td>
<td>16#0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>%IW6</td>
<td>Hex</td>
<td>16#0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>&lt;hinzufügen&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 71: Online mode – Observing process values
6.3.4 Commissioning with TBEN and Siemens PLC in the TIA Portal

Software used

- Siemens STEP 7 V13 Professional (TIA Portal) SP1 Update 5
- GSDM file for TBEN-S2-4IOL

Hardware used

**NOTE**
As an alternative to the TBEN-S2-4IOL IO-Link block module, the TBEN-L...-8IOL IO-Link block modules can be used.

- TBEN-S2-4IOL IO-Link master
- TS-400-2UPN8X-H1141 temperature sensor, connected to IO-Link channel 1
- RKC4.4T-2-RSC4.4T/TXL sensor cable
- Siemens S7-300 controller, e.g. CPU 315-2PN/DP

Setup

**Fig. 72: Application example – setup**
Example: Specific device configuration

NOTE
The TBEN-S2-4IOL IO-Link master can be configured specifically. The connected devices can be configured via the PLC program.

➤ Configure the hardware in the TIA Portal.

Fig. 73: Hardware configuration
Configuring and commissioning

➤ Select the operating mode for the IO-Link ports

![Image of IO-Link ports configuration]

Fig. 74: IO-Link ports – Setting the operating mode

**NOTE**
The I/O addresses are automatically displayed when a specific module is selected.
➤ Select an IO-Link device for the required port.

Fig. 75: Selecting the IO-Link device

➤ Online mode enables the process values to be observed.

Fig. 76: Online mode – Observing process values
7 Setting

The following examples describe the setting of IO-Link devices during operation. The following scenarios are possible here:

- Setting with a programmable gateway from VN03-00 and CODESYS 3
- Setting with a programmable gateway and CODESYS 2
- Setting with a Siemens PLC in Simatic Manager
- Setting with a Siemens PLC in the TIA Portal

7.1 Setting devices via the PLC program with a function block

IO-Link devices can be set and configured via the higher-level PLC. This requires the use of an IO-Link function block. The function block is provided by the PLC manufacturer.

The IO-Link function block IOL_CALL is defined in the IO-Link specification “IO-Link Integration Part 1 – Technical Specification for PROFIBUS and PROFINET”.

Fig. 77: IOL_CALL according to IO-Link specification

### NOTE

The function blocks can differ from the specification in representation and in the utilization of the variables used, depending on the controller manufacturer (example: Siemens IO_Link_Device function block for TIA Portal). Further information is provided in the manual of the relevant controller manufacturer.

Fig. 78: IO_Link_Device function block for S7-TIA Portal
IOL_CALL function block – input variables

The following description of the input variables has been taken from the IO-Link specification.

<table>
<thead>
<tr>
<th>Name as per IO-Link specification</th>
<th>Data type</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQ</td>
<td>BOOL</td>
<td>0 → 1 → 0: Send command</td>
</tr>
</tbody>
</table>
| ID                               | DWORD     | Address of the IO-Link master  
 |                                  |           | – 3 S CODESYS: Slot number of the IO-Link master module  
 |                                  |           | – Siemens CPU 1200er, 1500er (PROFIBUS/PROFINET): Hardware identifier of the IO-Link master module  
 |                                  |           | – Siemens CPU 300er, 400er (PROFIBUS/PROFINET): Start address of the input data of the IO-Link master module |
| ITFMODULE                        | Device name of the IO-Link master |
| INDEX_CAP                        | INT       | Function block instance: 251…254 |
| RD_WR                            | BOOL      | 0: Read access  
 |                                  |           | 1: Write access |
| ENTITY_PORT                      | INT       | Address of the IO-Link port to be accessed. |
| FI_INDEX                         | INT       | Fixed value (65098): Defines the access as IO-Link function block IOL_CALL |
| IOL_INDEX                        | INT       | Number of the IO-Link index to be read or written |
| IOL_SUBINDEX                     | INT       | Number of the IO-Link subindex to be read or written |
| LEN                              | INT       | Length of the data to be read or written |
| RECORD_IOL_DATA                  | ANY       | Source or target area of the data to be read or written |
IOL_CALL function block – output variables

The following description of the output variables has been taken from the IO-Link specification.

<table>
<thead>
<tr>
<th>Name as per IO-Link specification</th>
<th>Data type</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| DONE_VALID                        | BOOL      | 0: Command not executed  
  1: Command executed            |
| BUSY                              | BOOL      | 0: Command currently not executed  
  1: Command currently executed |
| ERROR                             | BOOL      | 0: No error present  
  1: Error during read or write access |
| STATUS                            | DWORD     | Communication error status: Status of the acyclical communication |
| IOL_STATUS                        | DWORD     | IO-Link error message: Error during communication between IO-Link master and IO-Link device |
| LEN                               | INT       | Length of the read data |
7.1.1 Setting with a programmable gateway and CODESYS 3

IO-Link devices can be set with a programmable gateway from VN03-00 and CODESYS. This requires the use of the IO-Link function block IOL_CALL. The function block is contained in the BLxx_PG_PB.lib library for programmable gateways. The library is part of the target support package for BLxx-PG-EN and is available free of charge from www.turck.com.

Information for the configuration of the IO-Link master with CODESYS is provided in the operating instructions of the particular device.

Software used

- CODESYS 3.5 SP8 Patch 1
- Example program of an application in CODESYS (available from Turck on request)

Hardware used

- BL67-PG-EN programmable gateway (VN03.00)
- BL67-4IOL IO-Link master module with BL67-B-4M12 base module
- TS-400-2UPN8X-H1141 temperature sensor (connected to port 1 of the IO-Link master)

Setup

![Application example – setup](image)

Fig. 80: Application example – setup
Example: Reading out product names

The required parameter values for configuring the IO-Link device are provided in the IO-Link parameter manual of the particular device.

Fig. 81: Extract from the parameter manual for the TS-400-2UPN8X-H1141 temperature sensor (example: reading product name)
Reading values (example: reading product names of the temperature sensor): Control variables as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD_WR</td>
<td>0</td>
<td>Read access</td>
</tr>
<tr>
<td>SLOT</td>
<td>1</td>
<td>Position of the IO-Link master module in the BL67 station</td>
</tr>
<tr>
<td>INDEX_CAP</td>
<td>251</td>
<td>Function block instance</td>
</tr>
<tr>
<td>ENTITY_PORT</td>
<td>1</td>
<td>The IO-Link device is connected to port 1.</td>
</tr>
<tr>
<td>IOL_INDEX</td>
<td>0x12</td>
<td>Index for display parameter</td>
</tr>
<tr>
<td>LEN</td>
<td>0x20</td>
<td>32 bytes are read</td>
</tr>
</tbody>
</table>

Fig. 82: Entering input variables for read access
Activate read access with a rising edge at IOL_REQ.

Fig. 83: Activating read access
The product name is displayed in the “READ” data array in hexadecimal code.

Fig. 84: “READ” process data array
Example: Writing values

The required parameter values of the IO-Link device are provided in the parameter manual of the particular IO-Link device.

Variable "Display of measured value" index=85 id=V_dis

description: The refresh time can be adjusted. The display can be rotated by 180° or disabled. In disabled state, the measured value is displayed temporarily when pressing the set button.
data type: 8-bit Integer
allowed values: 0 = 50 ms refresh time, 1 = 200 ms refresh time, 2 = 500 ms refresh time, 3 = 500 ms refresh time/display rotated by 180°, 4 = 200 ms refresh time/display rotated by 180°, 5 = 500 ms refresh time/display rotated by 180°, 6 = disabled

default value: 0
access rights: rw

tabular representation:

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>offset</td>
<td>7 - 0</td>
</tr>
<tr>
<td>element bit</td>
<td>7 - 0</td>
</tr>
</tbody>
</table>

Fig. 85: Extract from the parameter manual for the TS-400-2UPN8X-H1141 sensor (example: setting the display)
Writing values (example: Rotate display of the TS-400-2UPN8X-H1141 temperature sensor by 180° and set measured value refresh time to 200 ms): Control variables as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD_WR</td>
<td>1</td>
<td>Write access</td>
</tr>
<tr>
<td>SLOT</td>
<td>1</td>
<td>Position of the IO-Link master module in the BL67 station</td>
</tr>
<tr>
<td>INDEX_CAP</td>
<td>251</td>
<td>Function block instance</td>
</tr>
<tr>
<td>ENTITY_PORT</td>
<td>1</td>
<td>The IO-Link device is connected to port 1.</td>
</tr>
<tr>
<td>IOL_INDEX</td>
<td>0x55</td>
<td>Index for display parameter</td>
</tr>
<tr>
<td>LEN</td>
<td>1</td>
<td>1 byte is written</td>
</tr>
</tbody>
</table>

Fig. 86: Entering input variables for write access
➤ Enter value 5 to be written in array WRITE in order to rotate the display by 180° and set the measured value refresh time to 200 ms.
➤ Activate write access with a rising edge at REQ.

Fig. 87: Activating write access
7.1.2 Setting with a programmable gateway and CODESYS 2

IO-Link devices can be set with a programmable gateway up to version 2 and CODESYS. This requires the use of the IO-Link function block IOL_CALL. The function block is contained in the BLxx_PG_PB.lib library for programmable gateways. The library is part of the target support package for BLxx-PG-EN and is available free of charge from www.turck.com.

Information for the configuration of the IO-Link master with CODESYS is provided in the operating instructions of the particular device.

Software used

- CODESYS 2.3 with BLxx_PG_PB.lib library
- Example program of an application in CODESYS (available from Turck on request)

Hardware used

- BL20-PG-EN programmable gateway
- BL20-E-4IOL IO-Link master module
- TS-400-2UPN8X-H1141 temperature sensor (connected to port 1 of the IO-Link master)
- TBIL-M1-16DIP I/O hub (connected to Port 4 of the IO-Link master)

Fig. 88: Hardware components in the application example (programmable gateway, IO-Link master module, temperature sensor, IO-Link I/O hub)
Fig. 89: Application example – setup
Example: Reading out product names

The required parameter values for configuring the IO-Link device are provided in the IO-Link parameter manual of the particular device.

Fig. 90: Extract from the parameter manual for the TBIL-M1-16DIP IO-Link I/O hub (example: reading product name)
Reading values (example: Read product name of the IO-Link I/O hub): Control variables as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD_WR</td>
<td>0</td>
<td>Read access</td>
</tr>
<tr>
<td>SLOT</td>
<td>1</td>
<td>Position of the IO-Link master module in the BL67 station</td>
</tr>
<tr>
<td>INDEX_CAP</td>
<td>251</td>
<td>Function block instance</td>
</tr>
<tr>
<td>ENTITY_PORT</td>
<td>4</td>
<td>The IO-Link device is connected to port 4.</td>
</tr>
<tr>
<td>IOL_INDEX</td>
<td>0x12</td>
<td>Index for display parameter</td>
</tr>
<tr>
<td>LEN</td>
<td>0x20</td>
<td>32 bytes are read</td>
</tr>
</tbody>
</table>

Fig. 91: Entering input variables for read access
➤ Activate read access with a rising edge at REQ.

Fig. 92: Activating read access
The product name is displayed in the “READ” data array in hexadecimal code.

Fig. 93: “READ” process data array
Example: Writing values

The required parameter values of the IO-Link device are provided in the parameter manual of the particular IO-Link device.

![Parameter manual extract](image.png)

Fig. 94: Extract from the parameter manual for the TS-400-2UPN8X-H1141 sensor (example: setting the display)
Writing values (example: Rotate display of the TS-400-2UPN8X-H1141 temperature sensor by 180° and set measured value refresh time to 200 ms): Control variables as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD_WR</td>
<td>1</td>
<td>Write access</td>
</tr>
<tr>
<td>SLOT</td>
<td>1</td>
<td>Position of the IO-Link master module in the BL67 station</td>
</tr>
<tr>
<td>INDEX_CAP</td>
<td>251</td>
<td>Function block instance</td>
</tr>
<tr>
<td>ENTITY_PORT</td>
<td>1</td>
<td>The IO-Link device is connected to port 1.</td>
</tr>
<tr>
<td>IOL_INDEX</td>
<td>0x55</td>
<td>Index for display parameter</td>
</tr>
<tr>
<td>LEN</td>
<td>1</td>
<td>1 byte is written</td>
</tr>
</tbody>
</table>

Fig. 95: Entering input variables for write access
➤ Enter value 5 to be written in array WRITE in order to rotate the display by 180° and set the measured value refresh time to 200 ms.
➤ Activate write access with a rising edge at REQ.
7.1.3 Setting with an S7-1200/1500 Siemens PLC and TIA Portal

IO-Link devices can be set and configured via a Turck-IO-Link master on a Siemens S7-1200/1500 PLC and STEP7 V12/13 TIA Portal. This requires the use of the IO-Link function block IOL_DEVICE and the GSDML file of the IO-Link master. The function block is provided in the library IO_Link_Library_v13_SP1. The library is available on the website of the PLC manufacturer. The GSDML file is available for download from www.turck.com.

Information for the configuration of the IO-Link master with STEP7 V13 TIA Portal is provided in the operating instructions of the particular device.

Software used

- Siemens STEP 7 V13 Professional (TIA Portal) SP1 Update 5
- GSDML file of the IO-Link master
- Example program (available from Turck on request)

Hardware used

**NOTE**
As an alternative to the TBEN-S2-4IOL IO-Link block module, the TBEN-L…-8IOL IO-Link block modules can be used.

- Siemens S7 controller, e.g. with CPU 1513-1PN
- TBEN-S2-4IOL IO-Link master
- TS-400-2UPN8X-H1141 temperature sensor (connected to port 1 of the IO-Link master)

Setup

![Application example – setup](image)

Fig. 97: Application example – setup
Example: Device configuration

The required parameter values of the IO-Link device are provided in the parameter manual of the particular IO-Link device.

Variable "Display of measured value" index=85 id=V_dis

description: The refresh time can be adjusted. The display can be rotated by 180° or disabled. In disabled state, the measured value is displayed temporarily when pressing the set button.
data type: 8-bit Integer
allowed values: 0 = 50 ms refresh time, 1 = 200 ms refresh time, 2 = 500 ms refresh time, 3 = 50 ms refresh time/display rotated by 180°, 4 = 200 ms refresh time/display rotated by 180°, 5 = 500 ms refresh time/display rotated by 180°, 6 = disabled

default value: 0
access rights: rw

<table>
<thead>
<tr>
<th>vdat</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>bit offset</td>
<td>7-0</td>
</tr>
<tr>
<td>element bit</td>
<td>7-0</td>
</tr>
</tbody>
</table>

Fig. 98: Extract from the parameter manual for the TS-400-2UPN8X-H1141 sensor (example: setting the display)
The processes are visualized in the example program in the “IOL1P1” visualization table.

➤ Reading values (example: reading product names of the temperature sensor): Control variables as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD_WR</td>
<td>0</td>
<td>Read access</td>
</tr>
<tr>
<td>CAP</td>
<td>251</td>
<td>Function block instance</td>
</tr>
<tr>
<td>PORT</td>
<td>1</td>
<td>The temperature sensor is connected to port 1.</td>
</tr>
<tr>
<td>IOL_INDEX</td>
<td>18</td>
<td>Index for display parameter</td>
</tr>
<tr>
<td>LEN</td>
<td>32</td>
<td>32 bytes are read</td>
</tr>
</tbody>
</table>

Fig. 99: Entering input variables for read access

➤ Activate read access with a rising edge at REQ.
The read data is displayed in the "visualization values" table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Display format</th>
<th>Monitor value</th>
<th>Modify value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;IOL_1PI_PARA_DATA&quot; REQ</td>
<td>%DB1.D6X0.0</td>
<td>BOOL</td>
<td>FALSE</td>
<td>FALSE</td>
<td></td>
</tr>
<tr>
<td>&quot;IOL_1PI_PARA_Data_DD_WR&quot;</td>
<td>%DB1.D6X8.0</td>
<td>BOOL</td>
<td>FALSE</td>
<td>FALSE</td>
<td></td>
</tr>
<tr>
<td>&quot;IOL_1PI_PARA_Data_DD_INDEX&quot;</td>
<td>%DB1.D6W0.0</td>
<td>DEZ</td>
<td>18</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>&quot;IOL_1PI_PARA_Data_DD_SUBINDEX&quot;</td>
<td>%DB1.D6W2</td>
<td>DEZ</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>&quot;IOL_1PI_PARA_Data_DD_LEN&quot;</td>
<td>%DB1.D6W46</td>
<td>DEZ</td>
<td>232</td>
<td>232</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 100: Read data in the "visualization values" table
Setting

➤ Writing values (example: Rotate display of the TS-400-2UPN8X-H1141 temperature sensor by 180° and set the measured value refresh time to 50 ms): Control variables as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD_WR</td>
<td>1</td>
<td>Write access</td>
</tr>
<tr>
<td>CAP</td>
<td>251</td>
<td>Function block instance</td>
</tr>
<tr>
<td>PORT</td>
<td>1</td>
<td>The IO-Link device is connected to port 1.</td>
</tr>
<tr>
<td>IOL_INDEX</td>
<td>85</td>
<td>Index for display parameter</td>
</tr>
<tr>
<td>LEN</td>
<td>1</td>
<td>1 byte is written</td>
</tr>
</tbody>
</table>

Fig. 101: Entering input variables for write access

➤ Activate read access with a rising edge at REQ.
7.1.4 Setting with an S7-300/400 Siemens PLC and STEP7 V5.5

IO-Link devices can be set and configured via a Turck IO-Link master on a Siemens S7-300/400 PLC and STEP7 V5.5. This requires the use of the IO-Link function block IOL_CALL and the GSDM file of the IO-Link master. The function block is available from the PLC manufacturer. The GSDM file is available for download from www.turck.com.

Information for the configuration of the IO-Link master with STEP7 V5.5 is provided in the operating instructions of the particular device.

Software used

- Siemens STEP7 V5.5 (Simatic Manager)
- GSDML file for BL67-GW-EN
- Example program (available from Turck on request)

Hardware used

- BL67-GW-EN multiprotocol gateway (VN03-00)
- BL67-B-4M12 base module with BL67-4IOL IO-Link master module
- TS-400-2UPN8X-H1141 temperature sensor
- Siemens S7 controller, e.g. CPU 315-2PN/DP

Example: Device configuration

The required parameter values of the IO-Link device are provided in the parameter manual of the particular IO-Link device.

Variable "Display of measured value" index=85 id=V_dis

description: The refresh time can be adjusted. The display can be rotated by 180° or disabled. In disabled state, the measured value is displayed temporarily when pressing the set button.
data type: 8-bit Integer
allowed values: 0 = 50 ms refresh time, 1 = 200 ms refresh time, 2 = 600 ms refresh time, 3 = 50 ms refresh time/display rotated by 180°, 4 = 200 ms refresh time/display rotated by 180°, 5 = 600 ms refresh time/display rotated by 180°, 6 = disabled
default value: 0
access rights: rw

col
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>odet</td>
<td>0</td>
</tr>
<tr>
<td>bit offset</td>
<td>7-0</td>
</tr>
<tr>
<td>element bit</td>
<td>7-0</td>
</tr>
</tbody>
</table>

Fig. 102: Extract from the parameter manual for the TS-400-2UPN8X-H1141 sensor (example: setting the display)
**Standard Variable "Product Name" Index=18 id=V_ProductName**

data type: 64-bit string UTF-8
default value: "TBIL-M1-16DIP"
access rights: ro

<table>
<thead>
<tr>
<th>octet</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>octet</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>octet</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
</tr>
</thead>
<tbody>
<tr>
<td>bit offset</td>
<td>383-376</td>
<td>375-368</td>
<td>367-360</td>
<td>359-352</td>
<td>351-344</td>
<td>343-336</td>
<td>335-328</td>
<td>327-320</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>octet</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
<th>28</th>
<th>29</th>
<th>30</th>
<th>31</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>octet</th>
<th>32</th>
<th>33</th>
<th>34</th>
<th>35</th>
<th>36</th>
<th>37</th>
<th>38</th>
<th>39</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>octet</th>
<th>40</th>
<th>41</th>
<th>42</th>
<th>43</th>
<th>44</th>
<th>45</th>
<th>46</th>
<th>47</th>
</tr>
</thead>
<tbody>
<tr>
<td>bit offset</td>
<td>191-184</td>
<td>183-176</td>
<td>175-168</td>
<td>167-160</td>
<td>159-152</td>
<td>151-144</td>
<td>143-136</td>
<td>135-128</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>octet</th>
<th>48</th>
<th>49</th>
<th>50</th>
<th>51</th>
<th>52</th>
<th>53</th>
<th>54</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>bit offset</td>
<td>127-120</td>
<td>119-112</td>
<td>111-104</td>
<td>103-96</td>
<td>95-88</td>
<td>87-80</td>
<td>79-72</td>
<td>71-64</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>octet</th>
<th>56</th>
<th>57</th>
<th>58</th>
<th>59</th>
<th>60</th>
<th>61</th>
<th>62</th>
<th>63</th>
</tr>
</thead>
<tbody>
<tr>
<td>bit offset</td>
<td>63-56</td>
<td>55-48</td>
<td>47-40</td>
<td>39-32</td>
<td>31-24</td>
<td>23-16</td>
<td>15-8</td>
<td>7-0</td>
</tr>
</tbody>
</table>

Fig. 103: Extract from the parameter manual for the TBIL-M1-16DIP IO-Link I/O hub (example: setting the display)
The processes are visualized in the example program in the “HMI” variable table. The process data is shown in the “Sensor1” and “Sensor2” variable table.

➤ Reading values (example: Read product name of the IO-Link I/O hub): Control variables as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD_WR</td>
<td>0</td>
<td>Read access</td>
</tr>
<tr>
<td>ID</td>
<td>30</td>
<td>Start address of the output data of the module as per hardware configuration</td>
</tr>
<tr>
<td>INDEX_CAP</td>
<td>251</td>
<td>Function block instance</td>
</tr>
<tr>
<td>ENTITY_PORT</td>
<td>4</td>
<td>The IO-Link hub is connected to port 4.</td>
</tr>
<tr>
<td>IOL_INDEX</td>
<td>0x12</td>
<td>Index for display parameter</td>
</tr>
<tr>
<td>LEN</td>
<td>32</td>
<td>32 bytes are read</td>
</tr>
</tbody>
</table>

Fig. 104: Entering input variables for read access
➤ Activate read access with a rising edge at REQ.

Fig. 105: Activating read access
The read data is displayed in the “Sensor1” process data table.

Fig. 106: Read data in the “Sensor1” variable table
- Writing values (example: Rotate display of the TS-400-2UPN8X-H1141 temperature sensor by 180° and set measured value refresh time to 200 ms): Control variables as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RD_WR</td>
<td>1</td>
<td>Write access</td>
</tr>
<tr>
<td>ID</td>
<td>1</td>
<td>Position of the IO-Link master module in the BL67 station</td>
</tr>
<tr>
<td>INDEX_CAP</td>
<td>251</td>
<td>Function block instance</td>
</tr>
<tr>
<td>ENTITY_PORT</td>
<td>1</td>
<td>The IO-Link device is connected to port 1.</td>
</tr>
<tr>
<td>IOL_INDEX</td>
<td>0x55</td>
<td>Index for display parameter</td>
</tr>
<tr>
<td>LEN</td>
<td>1</td>
<td>1 byte is written</td>
</tr>
</tbody>
</table>

![Fig. 107: Entering input variables for write access](image-url)
➤ Enter value 5 to be written in the variable table under "Control value" in order to rotate the display by 180° and set the measured value refresh time to 200 ms.

Fig. 108: Entering a control value for index 85 (0x55)
_activate write access with a rising edge at REQ.

Fig. 109: Activating write access
8 Operation

The communication system operates with a 24 V signal. If a transmission is not successful, the telegram is automatically repeated twice. If the second repeat attempt is not successful, the IO-Link master detects a communication abort. The error is automatically reported to the higher-level controller.

IO-Link devices can be set for the specific application or operated without any special settings. If no settings are required in the IO-Link device, the signals are forwarded directly to the higher control level.

Fig. 110: Overview – operating IO-Link devices

Further information on operating the IO-Link masters and the IO-Link devices is provided in the operating instructions of the particular device.
8.1 Combining Turck IO-Link devices

The following Turck devices can be combined together:

<table>
<thead>
<tr>
<th>Device</th>
<th>Version</th>
<th>TBEN-L…-8IOL</th>
<th>TBEN-S-4IOL</th>
<th>TBPN…-2</th>
<th>BL67-4IOL</th>
<th>BL20-E-4IOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Li…-Q25</td>
<td>1.0</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Ri360P</td>
<td>1.0</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>B2N360-Q42</td>
<td>1.0</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>PC…</td>
<td>1.0</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>PS…</td>
<td>1.0</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>TS…</td>
<td>1.0</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>EZ-ARRAY</td>
<td>1.0</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>FM(X)-IM</td>
<td>1.0</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>RU…U</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>DF-G1</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>TBIL-M1</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>TTM</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Uprox 3</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>BCT…</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Q4X</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LE…</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LTF…</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>TL50</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>NIC…</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>IM12-CCM</td>
<td>1.1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>