

Your Global Automation Partner



TBIL-LL-16DXP-AUX

I/O Hub with IO-Link

Instructions for Use

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1 About these instructions

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

1.1 Target groups

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

1.2 Explanation of symbols used

The following symbols are used in these instructions:



DANGER

DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.



WARNING

WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.



CAUTION

CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.



NOTICE

NOTICE indicates a situation which may lead to property damage if not avoided.



NOTE

NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.



CALL TO ACTION

This symbol denotes actions that the user must carry out.



RESULTS OF ACTION

This symbol denotes relevant results of actions.

1.3 Additional documents

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

- Data sheet
- Commissioning manual IO-Link devices
- IO-Link parameter manuals for IO-Link devices
- EU Declaration of Conformity (current version)
- 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

This instruction is valid for following devices:

- TBIL-LL-16DXP-AUX

2.2 Scope of delivery

The scope of delivery includes:

- I/O hub
- Dummy plugs for M12-connectors
- Label clips
- Quick Start Guide

2.3 Turck service

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

The contact details of Turck subsidiaries worldwide can be found on p. [► 33].

3 For your safety

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

3.1 Intended use

The block module TBIL-LL-16DXP-AUX is an IO-Link device (Class A) and serves as I/O hub between field devices (sensors and actuators) and the IO-Link master. The hub has 16 I/O channels. Each I/O channel can be used as either a digital input or output without additional configuration. The device is designed in IP65/IP67/IP69K and can be mounted directly in the field. The devices can also be used in safety applications up to Performance Level d (according to ISO 13849) and SIL 2 (according to IEC 61508) [► 14].

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

3.2 Notes on the use in safety-related applications

- For the use in safety applications: Observe chapter "Using the device in safety applications".
- The device is part of a safety-related overall system. The overall system must always be evaluated as a whole with regard to the requirements of EN IEC 61508 and EN ISO 13849-1.
- The devices are not specified for a certain application. Make sure that application-specific aspects are considered.
- Replace the devices before the expiration of the permissible duration of use (see "Safety characteristic data for the galvanic isolation").
- If there is a fault, e.g. a defective housing, do not use the device.
- During operation, surface temperatures may occur that could cause burns if touched.
- Perform a function test every 12 months.
- The devices must not be repaired. If problems occur with regard to functional safety, notify Turck immediately and return the devices immediately to:

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

3.3 General safety notes

- The device may only be assembled, installed, operated, parameterized and maintained by professionally-trained personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.
- The device meets the EMC requirements for industrial areas. When used in residential areas, take measures to avoid radio interference.

4 Product description

The I/O hub TBIL-LL-16DXP-AUX connects up to 16 digital sensors or actuators with one IO-Link master port.

Eight M12 connectors are available for connecting the field devices. Each I/O channel of the TBIL-LL-16DXP-AUX can be used either as a digital input or output without additional configuration. The I/O hub is connected to the IO-Link master via an M12 socket. An additional M12 connector is available for connecting the auxiliary voltages V1 and V2 to supply connected field devices. The devices are designed in a fully encapsulated housing with degree of protection IP65/IP67/IP69K.

4.1 Device overview

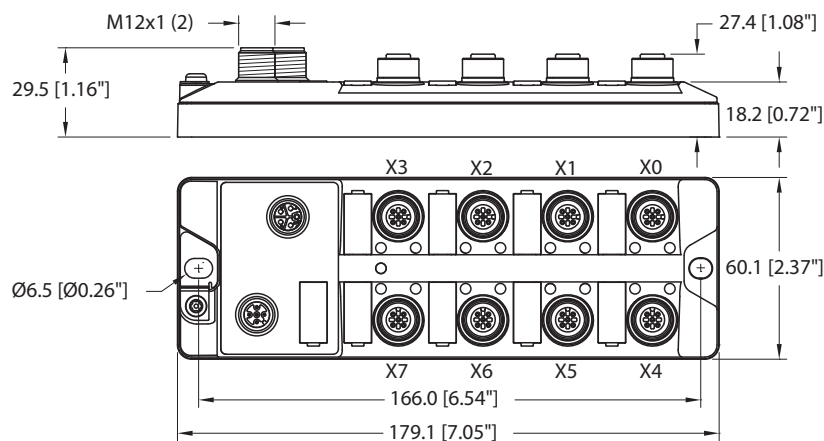


Fig. 1: Dimensions TBIL-LL-16DXP-AUX

4.1.1 Display elements

The device has the following LED indicators:

- IO-Link communication
- I/O status
- Supply voltage (V1, V2, V_{IO-L})

4.2 Properties and features

- Fibre-glass reinforced housing
- Shock and vibration tested
- Fully potted module electronics
- Protection class IP65/IP67/IP69K
- IO-Link Class A device with 3 galvanically isolated supply voltages (V1/V2/V_{IO-L})
- IO-Link diagnostics for short-circuit and supply over- and undervoltage
- 2 universal digital channels per connector
- Metal connectors

4.3 Functions and operating modes

The I/O hub TBIL-LL-16DXP-AUX is an IO-Link Class A device with three galvanically isolated supply voltages V1, V2, V_{IO-L}. The connectors X0...X3 are supplied from V1, the connectors X4...X7 from V2. In addition, V_{IO-L} supplies the internal module electronics via the standard IO-Link connector. The galvanic isolation of V1, V2 and V_{IO-L} allows that V1 and V2 for the outputs at connectors X0...X3 or respectively X4...X7 can be safely switched off or not safely for the purpose of energy management.

The device provides diagnostics for power supply and overload or short circuit of the sensors and actuators via IO-Link.

5 Installing

The device is mounted via two M4 screws on a flat and pre-drilled mounting surface.

- Fasten the module to the mounting surface with two M4 screws. The maximum tightening torque for the screws is 0.5 Nm

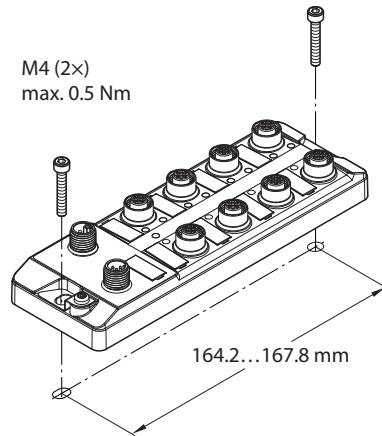


Fig. 2: Mounting the device on a mounting plate

6 Connecting



NOTICE

Intrusion of liquids or foreign bodies through leaking connections

Loss of protection class IP65/IP67/IP69K, device damage possible

- ▶ Tighten M12 connectors with a tightening torque of 0.6 Nm.
- ▶ Only use accessories that guarantee the protection class.
- ▶ Always seal unused connectors with suitable screw caps or blind caps. The tightening torque for the screw caps is 0.5 Nm.

6.1 Connecting the supply voltage

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

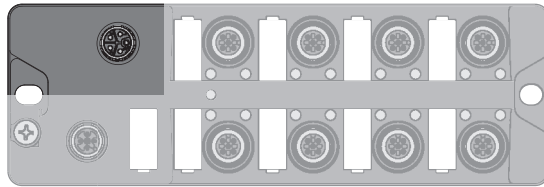


Fig. 3: M12 connector for connecting the supply voltage

- ▶ Connect the device to the power supply according to the pin assignment.

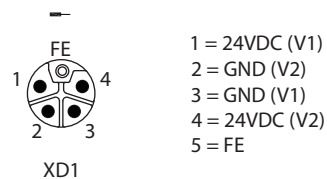


Fig. 4: Pin assignment supply voltage

6.1.1 Supply concept

The I/O hub TBIL-LL-16DXP-AUX is supplied with two galvanically isolated auxiliary voltages V1 and V2 via the M12 connector. This divides the IO-Link channels into two electrically isolated potential groups X0...X3 (supplied from V1) and X4...X7 (supplied from V2).

The galvanic isolation of the potential group allows a safety shutdown of parts of an installation via emergency-off circuits.

V1	Supply of connectors X0...X3 and the connected sensors and actuators
V2	Supply of connectors X4...X7 and the connected sensors and actuators
V _{IOL}	Power supply of the IO-Link electronic

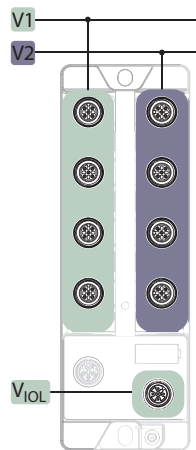


Fig. 5: Supply concept TBIL-LL-16DXP-AUX

6.2 Connecting IO-Link

The device provides a 5-pin M12 connector for the connection to IO-Link and the supply voltage.

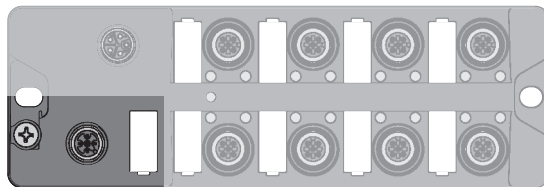


Fig. 6: M12 connector (XF1) for the connection to IO-Link

- Connect the device to IO-Link and the supply voltage according to the pin assignment below.

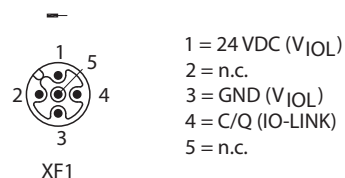


Fig. 7: Pin assignment IO-Link

6.3 Connecting digital sensors and actuators

For connecting digital sensors and actuators, 5-pin M12 connectors are available.

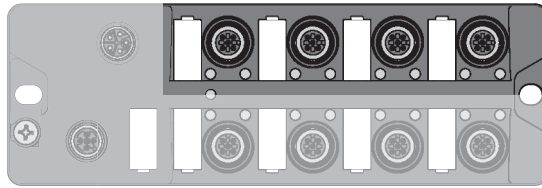


Fig. 8: M12 connector for connecting digital sensors and actuators (X0...X3)

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

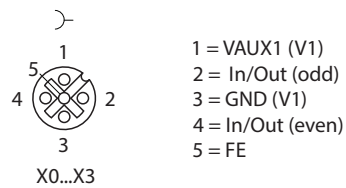


Fig. 9: Pin assignment TBIL-LL-16DXP-AUX (X0...X3)

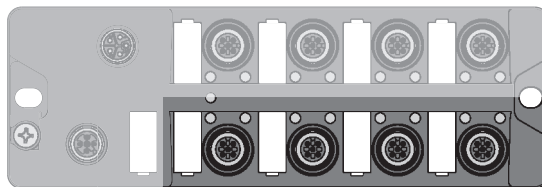


Fig. 10: M12 connector for connecting digital sensors and actuators (X4...X7)

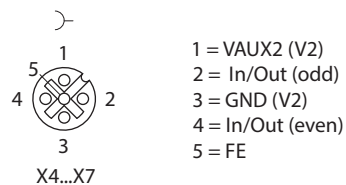


Fig. 11: Pin assignment TBIL-LL-16DXP-AUX (X4...X7)

External supply of sensors and actuators

Sensors and actuators, which are supplied via an external power supply, can also be connected to the TBIL I/O hub. If sensors or actuators are supplied via an external power supply, the following safety regulations have to be observed:

- Supply sensors and actuators from SELV or PELV power supplies.
- Decouple external circuits that are not designed as SELV or PELV systems by opto-couplers, relays or other measures.

7 Using the device in safety applications

The device is designed in accordance with EN ISO 13849-1 "Safety of machinery - Safety-related parts of control systems".

7.1 Safety function

The safety function is executed by the higher-level system.

The supply voltage V1 of the outputs at X0...X3 and the supply voltage V2 of the outputs at X4...X7 can be safely switched off by an external safety relay or a safe control.

Safe state

In the safe state, the outputs are switched off (0 V). The disconnection is done externally in the higher-level system.

Performance Level (PL)/SIL Level

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 (according to EN ISO 13849). The maximum achievable Safety Integrity Level is SIL CL2 (according to EN 62061:2016, section 6.7.7).

The device is part of a safety-related overall system. The overall system must always be evaluated as a whole with regard to the requirements of EN ISO 13849-1 and EN 62061.

Safety characteristic data for the galvanic isolation

Characteristic data	Value	
MTTF	See "Technical data"	
Lifetime	20 years	
Diagnostic coverage	0...99 %	Determination via FMEA according to ISO 13849-2: 2013



NOTE

The calculation of $MTTF_D$ data of electronic components is done according to ISO 13849-1:201, Annex C.5: "MTTF_D data of electrical components" and D.1: "Parts count method".

7.2 Safety planning

The operator is responsible for the safety planning.

Prerequisites

- ▶ Perform a hazard and risk analysis.
- ▶ Develop a safety concept for the machine or plant.
- ▶ Calculate the safety integrity for the complete machine or plant.
- ▶ Validate the complete system.

7.3 Safe commissioning

7.3.1 Installing connecting cables safely



NOTICE

Incorrect connection of connecting cables

Danger of cross connections

- ▶ Install and connect the cables safely and separately in accordance with EN 60204-1.
- ▶ Install cables with cross-circuit protection if the safe installation of the cables is not possible.

7.3.2 Switch off supply voltage safely



WARNING

1-pole switch-off the supply voltage

Safe separation not guaranteed

- ▶ Always switch-off the supply voltage on both poles.

7.3.3 Connecting sensors and actuators



WARNING

External feed

Deactivation of the galvanic isolation

- ▶ If the galvanic isolation is used, ensure on the application side that no external feed can occur.
- ▶ DXP channels that operate with safe disconnectable potential must be supplied by the corresponding connector.

7.4 Function tests

- ▶ Have the function test carried out by qualified personnel only.
- ▶ Before commissioning the system, check and document the switch-off of the V1 and V2 voltage group by an upstream safety relay.
- ▶ Control the switching behavior of the output circuits.

7.5 Cited standards

Standard	Title
DIN EN ISO 13849-1:2016-06	Safety-related parts of control systems
EN 62061:2005 + Cor.:2010 + A1:2013 + A2:2015 IEC 62061:2005 + A1:2012 + A2:2015	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
DIN EN 61508:2011 IEC 61508:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems
DIN EN 61131-2:2008 IEC 61131-2:2007	Programmable controllers
EN ISO 12100:2010 DIN EN ISO 12100:211-03	Safety of machinery - General principles for design - Risk assessment and risk reduction

8 Parameterizing and configuring

8.1 Parameters

IO-Link object directory — ISDU device parameters: Direct Parameter Page

ISDU Index Hex. (dec.)	Sub index	Object name	Access	Length in bytes	Meaning/default value
0x00 (0)		Direct Parameter Page 1	read only	16	
	0x03	Min. cycle time	read only	1	
	0x05	IO-Link version ID	read only	1	17
	0x08 0x09	Vendor ID	read only	2	ID for Turck: 0x013D
	0x0A 0x0B 0x0C	Device ID	read only	3	E. g.: TBIL-LL-16DXP-AUX: 0x1E3307

IO-Link object directory — ISDU device parameters: Identification

ISDU Index Hex. (dec.)	Object name	Access	Length in bytes	Meaning/ default value	Comment
0x10 (16)	Vendor name	read only	16	Turck	
0x11 (17)	Vendor text	read only	32	www.turck.com	
0x12 (18)	Product name	read only	32	TBIL-LL-16DXP-AUX	
0x13 (19)	Product ID	read only	16	ID of the device	
0x14 (20)	Product text	read only	32	I/O hub	
0x15 (21)	Serial number	read only	16	Sequential serial number	
0x16 (22)	Hardware ID	read only	8	Hardware revision of the device, e. g. V1.0	
0x17 (23)	Firmware revision	read only	16	Firmware revision of the device, e. g. V1.0.7.0	
0x18 (24)	Application Specific Tag	read/ write	32	Default "****"	Field for customer or application specific data

ISDU Index Hex. (dec.)	Object name	Access	Length in bytes	Meaning/ default value	Comment
0x19 (25)	Function Tag	read/ write	32	Default "****"	Field for the application specific device function
0x1A (26)	Location Tag	read/ write	32	Default "****"	Field for the application-specific installation location of the device

IO-Link object directory — ISDU device parameters: Preferred Index (parameters and diagnostics of the digital in- and outputs)

ISDU Index Hex. (dec.)	Object name	Access	Length in bytes	Meaning
0x40 (64)	Parameter ID	read/ write	4	Customer-specific ID, for free use
0x41 (65)	Inverting input	read/ write	2	Invert digital input
0x42 (66)	Activate output	read/ write	2	Activate output
0x43 (67)	Impulse stretching input	read/ write	16	Pulse stretching input
0x44 (68)	Short circuit recovery	read/ write	2	Manual output reset after overcurrent
0x45 (69)	Failsafe	read/ write	4	Output after error
0x46 (70)	Under voltage diagnostics	read/ write	2	Enable V1 and V2 undervoltage diagnostics/ threshold values for undervoltage diagnostics V1, V2 and V _{IOL}
Diagnostics				
0x50 (80)	Supply error	read only	2	Undervoltage supply V1, V2 and V_{IOL} Overcurrent VAUX connector X0...X7
Diagnostics				
0x51 (81)	Output short circuit	read only	2	Overcurrent output 0...15

Invert digital input — 0x41 (65), sub index 0

This parameter inverts the state of the digital input in the process image.

Format	Length
Byte	2 byte

1 bit per channel

Default values are shown in **bold**.

Value	Meaning
0	No
1	Yes

Input signal inverted

Byte 0								Byte 1							
Bit offset								Bit offset							
7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Sub index								Sub index							
9	10	11	12	13	14	15	16	1	2	3	4	5	6	7	8
X7P2 (B)	X7P4 (A)	X6P2 (B)	X6P4 (A)	X5P2 (B)	X5P4 (A)	X4P2 (B)	X4P4 (A)	X3P2 (B)	X3P4 (A)	X2P2 (B)	X2P4 (A)	X1P2 (B)	X1P4 (A)	X0P2 (B)	X0P4 (A)

Activate output — 0x42 (66), sub index 0

This parameter activates or deactivates the output function of the digital channel.

Format	Length
Byte	2 byte

1 bit per channel

Default values are shown in **bold**.

Value	Meaning
0	No
1	Yes

Output function deactivated, channel can only be used as input

Output function activated, channel can be used as in- or output

Byte 0								Byte 1							
Bit offset								Bit offset							
7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Sub index								Sub index							
9	10	11	12	13	14	15	16	1	2	3	4	5	6	7	8
X7P2 (B)	X7P4 (A)	X6P2 (B)	X6P4 (A)	X5P2 (B)	X5P4 (A)	X4P2 (B)	X4P4 (A)	X3P2 (B)	X3P4 (A)	X2P2 (B)	X2P4 (A)	X1P2 (B)	X1P4 (A)	X0P2 (B)	X0P4 (A)

**NOTE**

This parameter can also be set for all connectors of the module via the IODD.

Pulse stretching input — 0x43 (67)

This parameter defines the duration of the pulse stretching for digital input edges in multiples of 10 ms. This allows that even short signals with longer PLC cycle times can be detected.

Format	Length
Array of byte	16 byte 1 byte per channel

Default values are shown in **bold**.

Value	Meaning
0	Disabled Pulse stretching deactivated
1	1...255 Pulse stretching (in steps of 10 ms)

Bit offset								Bit offset							
0	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
Sub index								Sub index							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
X7P2 (B)	X7P4 (A)	X6P2 (B)	X6P4 (A)	X5P2 (B)	X5P4 (A)	X4P2 (B)	X4P4 (A)	X3P2 (B)	X3P4 (A)	X2P2 (B)	X2P4 (A)	X1P2 (B)	X1P4 (A)	X0P2 (B)	X0P4 (A)

**NOTE**

This parameter can also be set for all connectors of the module via the IODD.

Manual output reset after overcurrent — 0x44 (68), sub index 0

This parameter defines if a manual reset is necessary after an overcurrent occurred at the digital channel.

Format	Length
Byte	2 byte 1 bit per channel

Default values are shown in **bold**.

Value	Meaning
0	No Automatic recovery mode
1	Yes Controlled recovery mode (output has to be reset manually)

**NOTE**

This parameter can also be set for all connectors of the module via the IODD.

Byte 0								Byte 1							
Bit offset								Bit offset							
7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
Sub index								Sub index							
9	10	11	12	13	14	15	16	1	2	3	4	5	6	7	8
X7P2 (B)	X7P4 (A)	X6P2 (B)	X6P4 (A)	X5P2 (B)	X5P4 (A)	X4P2 (B)	X4P4 (A)	X3P2 (B)	X3P4 (A)	X2P2 (B)	X2P4 (A)	X1P2 (B)	X1P4 (A)	X0P2 (B)	X0P4 (A)

Output after error — 0x45 (69), Sub Index 0

This parameter defines the behavior of the output in case of an interruption of the IO-Link communication.

Format	Length
Array of byte	4 byte

2 bit per channel

Default values are shown in **bold**.

Value	Meaning
00	0 Set output to 0
01	1 Set output to 1
10	Current value Hold current value
11	reserved

Byte 0				Byte 1				Byte 2				Byte 3			
Bit offset															
6	4	2	0	14	12	10	8	22	20	18	16	30	28	26	24
Sub index															
13	14	15	16	9	10	11	12	5	6	7	8	1	2	3	4
X7P2 (B)	X7P4 (A)	X6P2 (B)	X6P4 (A)	X5P2 (B)	X5P4 (A)	X4P2 (B)	X4P4 (A)	X3P2 (B)	X3P4 (A)	X2P2 (B)	X2P4 (A)	X1P2 (B)	X1P4 (A)	X0P2 (B)	X0P4 (A)

**NOTE**

This parameter can also be set for all connectors of the module via the IODD.

Enable undervoltage diagnostics V1, V2 and V_{IOL} /threshold values for undervoltage diagnostics — 0x46 (70), sub index 0

This parameter defines whether undervoltage diagnostic messages are sent in case of an V1, V2 or V_{IOL} undervoltage. Additionally it defines the threshold values for undervoltage diagnostics for V1, V2 and V_{IOL} .

Format	Length
Array of byte	2 byte

3 bit per module

Default values are shown in **bold**.

Value	Meaning
Activate undervoltage diagnostics	
0	No
1	Yes
Threshold value for undervoltage diagnostics V1, V2 and V_{IOL}	
0	Standard (IEC 61131-2)
	Lower threshold: 19.2 V Upper threshold: 20.4 V
1	Extended
	Lower threshold: 17.5 V

Byte 0							
Bit offset							
7	6	5	4	3	2	1	0
-	-	-	-	-	-	-	-

Byte 1							
Bit offset							
15	14	13	12	11	10	9	8
-	-	-	-	-	Activate V2 under-voltage diagnostics	Activate V1 under-voltage diagnostics	Threshold

9 Operating



CAUTION

Operating the device outside the specification
Slight injuries and equipment damage possible.

- ▶ Operate the unit only within the operating temperature specified in the technical data.
- ▶ Use only thermally suitable connection cables.

9.1 Process input data

Byte no.	Bit offset							
	7	6	5	4	3	2	1	0
Inputs								
0	X3P2 (B)	X3P4 (A)	X2P2 (B)	X2P4 (A)	X1P2 (B)	X1P4 (A)	X0P2 (B)	X0P4 (A)
1	X7P2 (B)	X7P4 (A)	X6P2 (B)	X6P4 (A)	X5P2 (B)	X5P4 (A)	X4P2 (B)	X4P4 (A)
Module diagnostics								
2	Group diagnostics	-	-	Under-voltage V2	Under-voltage V1	Under-voltage V _{IOL}	-	-
Connector diagnostics – overcurrent sensor supply								
3	Overcurrent X7	Overcurrent X6	Overcurrent X5	Overcurrent X4	Overcurrent X3	Overcurrent X2	Overcurrent X1	Overcurrent X0
Channel diagnostics – overcurrent output								
4	Overcurrent X3P2	Overcurrent X3P4	Overcurrent X2P2	Overcurrent X2P4	Overcurrent X1P2	Overcurrent X1P4	Overcurrent X0P2	Overcurrent X0P4
5	Overcurrent X7P2	Overcurrent X7P4	Overcurrent X6P2	Overcurrent X6P4	Overcurrent X5P2	Overcurrent X5P4	Overcurrent X4P2	Overcurrent X4P4



NOTE

The diagnostics can also be accessed via IO-Link indices.

Designation	Meaning	
Inputs		
XxPy	0	Input inactive
	1	Input active
Module diagnostics		
Group diagnostics	0	No diagnostics
	1	Module diagnostics active
		▶ Evaluate the bit to monitor the diagnostics cyclically. ⇒ Bit = 0: no diagnostics active ⇒ Bit = 1: Module diagnostics ▶ Bit = 1: Evaluate further diagnostic bits to determine the origin of the diagnostic message.

Designation	Meaning	
Undervoltage Vx	0	No diagnostics
	1	Undervoltage of supply voltage V1, V2 or V _{IO} L
Connector diagnostics – overcurrent sensor supply		
Overcurrent Xx	0	No diagnostics
	1	Overload at the sensor/actuator supply at the connector. At modules with group diagnostics all connector-LEDs of the supply group flash simultaneously in case of an error.
Channel diagnostics – overcurrent output		
Overcurrent Xx	0	No diagnostics
	1	Overcurrent at output or short-circuit

9.2 Process output data

Byte no.	Bit offset							
	7	6	5	4	3	2	1	0
Outputs								
0	X3P2 (B)	X3P4 (A)	X2P2 (B)	X2P4 (A)	X1P2 (B)	X1P4 (A)	X0P2 (B)	X0P4 (A)
1	X7P2 (B)	X7P4 (A)	X6P2 (B)	X6P4 (A)	X5P2 (B)	X5P4 (A)	X4P2 (B)	X4P4 (A)
Designation	Meaning							
XxPy	0							
	Output inactive							
XxPy	1							
	Output active							

9.3 LED displays

The device has the following LED indicators:

- IO-Link communication
- I/O status

9.3.1 IO-Link

IO-Link LED	Meaning
Green flashing (1 Hz)	IO-Link communication OK, valid process data are sent
Red	IO-Link communication error or module error
Red flashing (1 Hz)	IO-Link communication OK, invalid process data or diagnostic message
Off	No voltage supply

9.3.2 Channel LEDs

LED 0...15	Meaning (input)	Meaning (output)
Green	Input signal is present	Output active
Red flashing (0.5 Hz)	Overload of the sensor supply In devices with group diagnostics, all connector-LEDs of the supply group flash simultaneously in case of an error.	
Red	–	Output active, overload/overcurrent at output
Off	No input signal	Output inactive

9.4 Diagnostic data

Group diagnostics: undervoltage V1/V2 and overcurrent sensor supply – 0x50 (80), sub index 0

The group diagnosis indicates errors in the module and sensor supply:

- Group diagnostics: Diagnostics pending at the module
- Undervoltage V1 (per module)
- Undervoltage V2 (per module)
- Undervoltage V_{IOL} (per module)
- Overcurrent sensor supply (per connector)

Format	Length
Array of bytes	2 byte

0 = no diagnostics

1 = diagnostic message available

Byte 0							
Bit offset							
15	14	13	12	11	10	9	8
Group diagnostics	-	-	Undervoltage supply V2	Undervoltage supply V1	Undervoltage supply V_{IOL}	-	-

Byte 1							
Bit offset							
7	6	5	4	3	2	1	0
Overcurrent VAUX X7	Overcurrent VAUX X6	Overcurrent VAUX X5	Overcurrent VAUX X4	Overcurrent VAUX X3	Overcurrent VAUX X2	Overcurrent VAUX X1	Overcurrent VAUX X0

Overcurrent output – 0x51 (81), sub index 0

The diagnostics indicates an overcurrent at the corresponding digital output.

Format	Length	
Array of bytes	2 byte	1 bit per output

0 = no diagnostics

1 = diagnostic message available

Byte 0							
Bit offset							
7	6	5	4	3	2	1	0
Overcurrent X3P2	Overcurrent X3P4	Overcurrent X2P2	Overcurrent X2P4	Overcurrent X1P2	Overcurrent X1P4	Overcurrent X0P2	Overcurrent X0P4

Byte 1							
Bit offset							
7	6	5	4	3	2	1	0
Overcurrent X7P2	Overcurrent X7P4	Overcurrent X6P2	Overcurrent X6P4	Overcurrent X5P2	Overcurrent X5P4	Overcurrent X4P2	Overcurrent X4P4

9.5 IO-Link error codes

Error code	Description	
0x8011	Index not available	
0x8012	Sub index not available	
0x8023	Access denied	Index cannot be written
0x8030	Parameter value out of range	
0x8033	Parameter length overrun	Length of data to be written does not match the length defined for this parameter.
0x8034	Parameter length overrun	
0x8035	Function not available	Function not available in the device
0x8041	Inconsistent parameter set	

10 Troubleshooting

If the device does not function as expected, first check whether ambient interference is present. If there is no ambient interference present, check the connections of the device for faults.

If there are no faults, there is a device malfunction. In this case, decommission the device and replace it with a new device of the same type.

11 Maintenance

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

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

12 Repair

The device must not be repaired 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

Returns to Turck can only be accepted if the device has been equipped with a Decontamination declaration enclosed. The decontamination declaration can be downloaded from <https://www.turck.de/en/retoure-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 correctly and must not be included in general household garbage.

14 Technical data

Technical data	
Supply	
Operating/load voltage	24 VDC
Permissible range	18...30 VDC
Total current	V1: max. 9 A, V2: max. 9 A, V _{IOL} + V1 + V2: max. 11 A
Operating current	V1: max: 80 mA V2: max: 80 mA V _{IOL} : max: 20 mA
Sensor/actuator supply VAUX1	Supply from V1, X0...X3, short-circuit-proof, max. 120 mA per connector
Sensor/actuator supply VAUX2	Supply from V2, X4...X7, short-circuit-proof, max. 120 mA per connector
Power loss, typical	≤ 3.5 W
Potential isolation	Possible isolation of voltage groups V1, V2 and V _{IOL} , voltage proof up to 500 VDC
Digital inputs	
Number of channels	16 digital pnp inputs (EN 61131-2)
Type of input diagnostics	Channel diagnostics
Signal voltage low level	-3...5 VDC (EN 61131-2, type 1 and 3)
Signal voltage, high level	11...30 VDC (EN 61131-2, type 1 and 3)
Input current	7 mA
Digital outputs	
Number of channels	16 digital pnp outputs
Type of output diagnostics	Channel diagnostics
Output voltage	24 VDC from supply voltage
Output current	2 A per channel, 4 A per connector
■ According to UL approval	2.5 A per connector
Load type	Ohmic, inductive lamp load
Short-circuit protection	Yes
Potential isolation	500 VDC
IO-Link	
IO-Link specification	Specified according to version 1.1
IO-Link port type	Class A
Parameterization	FDT/DTM, IODD
Frame type	2.6
Transmission rate	COM 2: 38.4 kbit/s
Transmission physics	3-wire physics (PHY2)
Minimum cycle time	4.2 ms
Connectors	
Power supply	M12 male connector, L coded
IO-Link	M12 × 1, 5 pin

Technical data	
Input/output	M12 × 1, 5-pole
Permissible torques	
■ IO-Link	0.8 Nm
■ I/O channels	0.8 Nm
■ Mounting (M6 screws)	1.5 Nm
Standard/directive conformity	
Vibration test	According to EN 60068-2-6
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/-6-4
Approvals	CE, cULus
General Information	
Dimensions (B × L × H)	60.1 × 179.1 × 29.5 mm
Operating temperature	-40...+70 °C
Storage temperature	-40...+85 °C
Protection class	IP65 IP67 IP69K
MTTF	164 years acc. to SN 29500 (Ed. 99) 20 °C
Housing material	PA6-GF30
Housing color	Black
Halogen-free	Yes
Mounting	2 mounting holes, Ø 6.5 mm

15 Turck subsidiaries — contact information

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