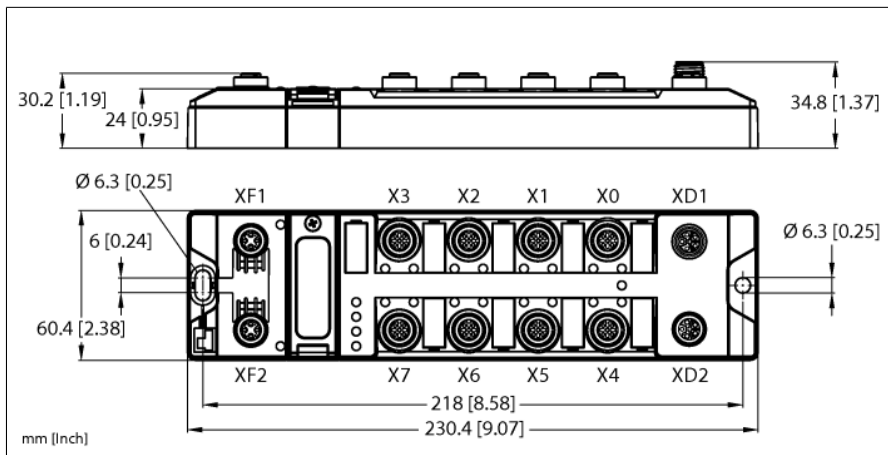


Compact and Secure Ethernet I/O Module

Safe Digital Inputs and Outputs, Standard Universal Digital Channels, IO-Link Master Ports

M12 L-Coded Voltage Connector

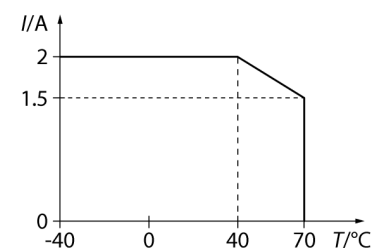
TBPN-LL-FDIO1-2IOL



ID	100029879
Supply	
Supply voltage	24 VDC
Admissible range	20.4...28.8 V DC
Voltage supply connection	M12, L-coded
Electrical isolation	galvanic isolation of the voltage groups V1 and V2, voltages up to 500 VAC
Power dissipation, typical	≤ 5 W
System data	
Fieldbus transmission rate	100 Mbps
Fieldbus connection technology	2 x M12, 4-pin, D-coded
Web server	integrated
Service interface	Ethernet via P1 or P2
PROFINET	
Addressing	DCP
Conformance class	B (RT)
MinCycleTime	1 ms
Diagnostics	acc. to PROFINET alarm handling
Topology detection	supported
Automatic addressing	supported
Media Redundancy Protocol (MRP)	supported
Safety Data	
PL acc. to EN ISO 13849-1	Level e
Category acc. to DIN EN 13849-1:2008	4
MTTF _a gemäß ISO 13849-1:2008	>200 Jahre
DC acc. to ISO 13849-1:2008	99%
SIL acc. to IEC 61508	3
PFH according IEC 61508	< 1* 10E-09 /h
PFD according IEC 61508	< 1* 10E-05
Useful Lifetime	20 years (EN ISO 13849-1)

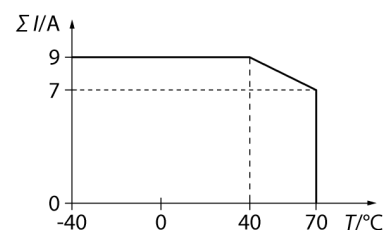
- PROFINET device
- Integrated Ethernet switch
- 100 Mbps supported
- 2 x M12, 4-pin, D-coded, Ethernet fieldbus connection
- Glass fiber reinforced housing
- Shock and vibration tested
- Fully potted module electronics
- Protection classes IP65, IP67, IP69K
- M12, 5-pin, L-coded male connector for power supply
- ATEX zone 2/22
- CCC-Ex
- Two secure digital SIL3-inputs
- Two secure digital SIL3 channels as FDI or FDO (PP, PM)
- Four secure digital SIL3 FDI channels
- 2 IO-Link Master V1.1 slots

Figure 1



Safety Inputs OSSD	
Low-level signal voltage	EN 61131-2 type 1 (< 5 V; < 0.5 mA)
High-level signal voltage	EN 61131-2 type 1 (> 15 V; > 2 mA)
Max. OSSD supply per channel	2 A per C0, C1, C2, C3 1.5 A at 70 °C Please note derating as shown in figure 1
Max. tolerance test pulse width	1 ms
Interval between 2 test pulses, minimum	20 ms at 1 ms test pulse width 15 ms at 0.5 ms test pulse width
Safety Inputs floating/antivalent	
Max. loop resistance	< 150 Ω
Max. cable length	Max. 1 µF at 150 Ω Limited by line capacity
Test pulse, typical	0.6 ms
Test pulse, maximum	0.8 ms
Sensor supply	Power supply V AUX1/T1 max. 2 A Please note derating as shown in figure 1
Interval between 2 test pulses, minimum	900 ms
Additional information	No connection to external potential allowed
Safety Outputs	
Output current in off state	< 5 V
Output current in off state	< 1 mA Suitable for inputs according to EN 61131-2 type 1
Test pulse, typical	0.5 ms
Test pulse, maximum	1.25 ms
Interval between 2 test pulses, typical	500 ms
Interval between 2 test pulses, minimum	250 ms
Actuator power supply	Power supply V AUX1/T1 max. 2 A Please note derating as shown in figure 1
Max. output current	2 A (resistive) 1 A (inductive)
Additional information	The load must be mechanically or electrically inert to tolerate the test pulses. When configured as a PM switching output the negative pole of the load must be wired to the M-terminal of the corresponding output (Pin 2).
Connectivity inputs	
Input delay	M12, 5-pin 2.5 ms
Sensor supply	C4, C5: FSO 0 max. 2 A; 500 mA per input C6: V AUX1 max. 2 A C7: FSO1 max. 2 A Please note derating as shown in figure 1
Connectivity outputs	
Output current per channel	M12, 5-pin 0.5 A, short-circuit proof, Max. 2 A (resistive)/ 1 A (inductive) all standard outputs
Actuator power supply	C4, C5: FSO 0 max. 2 A; 500 mA per output C6: V AUX1 max. 2 A C7: FSO1 max. 2 A Please note derating as shown in figure 1

Figure 2

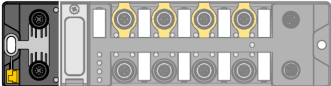
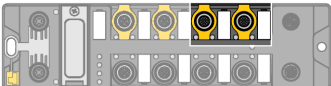
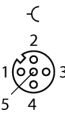
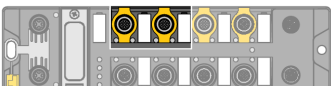
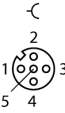
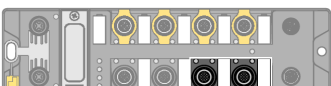
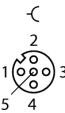
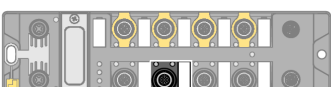
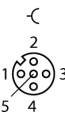


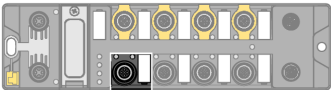
IO-Link	
Number of channels	2
IO-Link specification	V 1.1
IO-Link port type	Class A and Class B
Frame type	supports all specified frame types
Supported devices	Max. 32 bytes in/32 bytes out per port
Transmission rate	4.8 kbps (COM 1) / 38.4 kbps (COM 2) / 230 kbps (COM 3)
Power supply	Power supply V AUX1 max. 2 A Please note derating as shown in figure 1

Standard/Directive conformity	
	With request for perusal
Directive	2006/42/EC Machine Directive 2014/30/EC EMC Directive 2014/35/EC Low Voltage Directive
Safety standard	EN/IEC 61508
Application Standard	EN ISO 13849-1 EN/IEC 62061
Product Standard	IEC 61131-6
Vibration test	Acc. to EN 60068-2-6 Acceleration up to 20 g
Shock test	acc. to EN 60068-2-27
Drop and topple	acc. to EN 60068-2-31/IEC 60068-2-32
Electromagnetic compatibility	Acc. to EN 61131-2
Approvals and certificates	CE UKCA ATEX zone 2/22 CCC-Ex FCC statement, UV resistant acc. to DIN EN ISO 4892-2A (2013)
UL Certificate	cULus LISTED 21 W2, Encl.Type 1 IND.CONT.EQ.
Note on ATEX/IECEx	The Quick Start Guide with information on use in Ex areas must be observed.

General Information	
Dimensions (W x L x H)	60.4 x 230.4 x 34.8 mm
Ambient temperature	-40...+70 °C
Storage temperature	-40...+85 °C
Altitude	Max. 5000 m
Protection class	IP65 IP67 IP69K
Housing material	PA6-GF30
Housing color	Black
Connector material	Nickel-plated brass
Window material	Lexan
Material screw	303 stainless steel
Material label	Polycarbonate
Halogen-free	yes
Mounting	2 mounting holes □ 6.3 mm

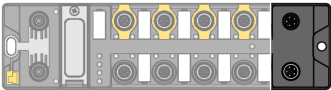
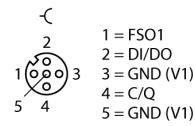
The data sheet serves as advance information. For definitive values see the corresponding product manual. In this respect, no liability for completeness and accuracy can be applied to the content of this data sheet.

	Accessories Ethernet cordset (example): RSSD RSSD 441-2M Ident. no. U-02482	M12 × 1 Ethernet  P1 1 = TX + 2 = RX + 3 = TX - 4 = RX - - flange = FE  P2 1 = RX + 2 = TX + 3 = RX - 4 = TX - - flange = FE
	Accessories Actuator and sensor cordset, PVC, red plug bodies (example): RK 4.5T-2-WS 4.5T/S1055 Ident. no. 100031634	M12 × 1 safety inputs  5 4 1 = V_{aux}1/T1 2 = FDI (T2) 3 = GND (V1) 4 = FDI (T1) 5 = T2
	Accessories Actuator and sensor cordset, PVC, red plug bodies (example): RK 4.5T-2-WS 4.5T/S1055 Ident. no. 100031634	M12 × 1 safety I/O slot  5 4 1 = V_{aux}1/T1 2 = FDO-/FDI (T2) 3 = GND (V1) 4 = FDO+/FDI (T1) 5 = T2
	Accessories Actuator and sensor cordset, PVC (example): RK 4.5T-2-RS 4.5T Ident. no. U2187-1	I/O slot, M12 × 1  5 4 1 = FSO0 2 = DI/DO 3 = GND (V1) 4 = DI/DO 5 = FE
	Accessories Actuator and sensor cordset, PVC (example): Connection of a class A device: RK 4T-2-RS 4T Ident. no. U2151-3 Connection of a class B device: RK 4.5T-2-RS 4.5T Ident. no. U2187-1	M12 × 1 IO-Link  5 4 1 = V_{aux}1 2 = DI/DO 3 = GND (V1) 4 = C/Q 5 = GND (V1)



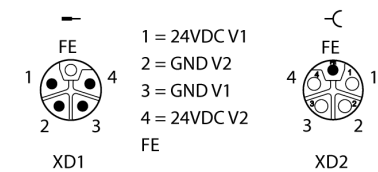
Accessories
Actuator and sensor cordset, PVC (example):
Connection of a class A device:
RK 4T-2-RS 4T
Ident. no. U2151-3
Connection of a class B device:
RK 4.5T-2-RS 4.5T
Ident. no. U2187-1

M12 x 1 IO-Link



Accessories

M12 x 1 power cable



Module Status LED

LED	Color	Status	Description
ETH1/ETH2	Green	On	Ethernet link (100 Mbps)
		Flashing	Ethernet communication (100 Mbps)
		Off	No Ethernet link
BUS	Green	On	Active connection to a master
		Flashing	Ready
	Red	On	IP address conflict or Restore mode or Modbus timeout
		Flashing	Blink/Wink command active
	Red/green	Alternating	Autonegotiation or waiting for DHCP/Boot-P addressing
ERR	Green	On	No diagnosis is present
	Red	On	Diagnosis is pending
PWR	LED response parameter (PWR) at V_2 undervoltage = "red"		
	Green	On	V_1 and V_2 power supply OK
	Red	On	V_2 power supply off or V_2 undervoltage
		Off	V_1 power supply off or V_1 undervoltage
	LED response parameter (PWR) at V_2 undervoltage = "green"		
	Green	On	V_1 and V_2 power supply OK
		Flashing	V_2 power supply off or V_2 undervoltage
		Off	V_1 power supply off or V_1 undervoltage

LED Status I/O

LED	Color	Status	Description
0...3	Green	On	Channel active
		Flashing	Self test
	Red	On	Discrepancy
		Flashing	Cross circuit
4...7	Green	On	Channel active
		Flashing	Self test (input only)
	Red	On	Discrepancy, overload (output only)
		Flashing	Cross circuit
8...11	Green	On	Channel active
	Red	On	Overload (output only)
		Flashing	Power supply overload
	Green/red	Alternating	Channel active and power supply overload (input only)
12, 14 (IO-Link port 1 and 2) IO-Link mode	Green	Flashing	IO-Link communication, process data valid
	Red	Flashing	IO-Link communication, process data invalid
		On	IO-Link power supply OK, no IO-Link communication
		Off	Port inactive
12, 14 (IO-Link port 1 and 2) SIO mode	Green	On	Digital input signal is present
		Off	No input signal
13, 15	Green	On	Digital input or output active
	Red	On	Output active with overload/short circuit
		Flashing	Power supply overload
		Off	Input or output inactive

Process Data Mapping of the Single Protocols

For more details on the corresponding protocols see manual.

Accessories

Type code	Ident-No.		Dimension drawing
TB-SG-L	100014865	Protective housing for TBEN-L and TBIL-M block I/O modules for use in ATEX Zone 2/22	