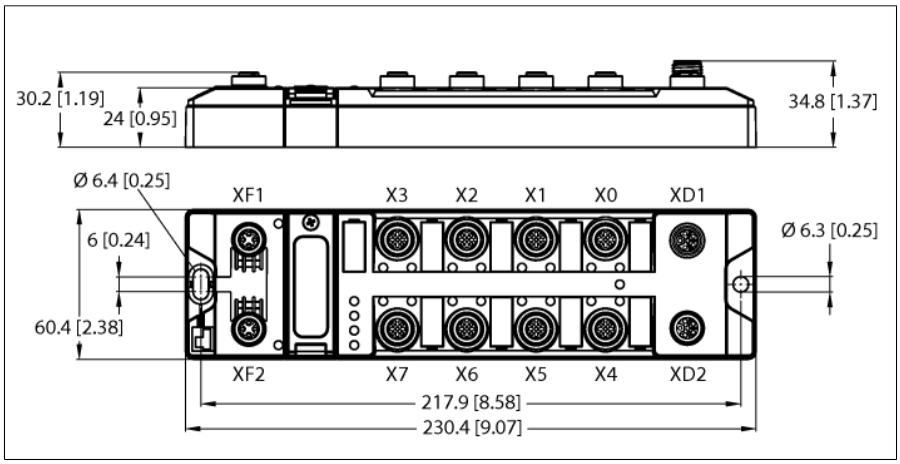
Compact multiprotocol I/O module for Ethernet
16 Universal Digital Channels, Configurable as PNP Inputs or 2 A Outputs
TBEN-LL-16DXP



- **PROFINET device, EtherNet/IP device or Modbus TCP slave**
- **Integrated Ethernet switch**
- **Supports 10 Mbps / 100 Mbps**
- **2x M12, 4-pin, D-coded, Ethernet field-bus connection**
- **Glass fiber reinforced housing**
- **Shock and vibration tested**
- **Fully potted module electronics**
- **Protection classes IP65, IP67, IP69K**
- **M12, L-coded connector for power supply**
- **Separated power groups for safety shutdown**
- **Input diagnostics per port**
- **Max. 2 A per output**
- **Output diagnostics per channel**
- **Two freely selectable digital channels per port**

Type designation	TBEN-LL-16DXP
Ident no.	100004252

Supply	
Supply voltage	24 VDC
Admissible range	18…30 VDC Total current max. 9 A per voltage group Total current V1 + V2 max. 11 A
Voltage supply connection	M12 L-coded connector
Sensor/Actuator supply V_{AUX1}	Ports X0-X3 powered by V1 short-circuit proof, 120 mA per port
Sensor/Actuator supply V_{AUX2}	Ports X4-X7 powered by V2 short-circuit proof, 120 mA per port
Electrical isolation	galvanic isolation of the voltage groups V1 and V2, voltages up to 500 VAC

System data	
Fieldbus transmission rate	10 Mbps/100 Mbps
Fieldbus connection technology	2 × M12, 4-pin, reverse-keyed
Protocol detection	automatic
Service interface	Ethernet via XF1 or XF2

Modbus TCP	
Addressing	Static IP, DHCP
Supported function codes	FC1, FC2, FC3, FC4, FC5, FC6, FC15, FC16, FC23
Number of TCP connections	8
Input register start address	0 (0x0000 hex)
Output register start address	2048 (0x0800 hex)

Ethernet/IP	
Addressing	acc. to EtherNet/IP specification
Quick Connect (QC)	< 150 ms
Device Level Ring (DLR)	supported
Class 3 connections (TCP)	3
Class 1 connections (CIP)	10
Input Assembly Instance	101
Output Assembly Instance	102
Configuration Assembly Instance	106

PROFINET	
Addressing	DCP
Conformance class	B (RT)
MinCycleTime	1 ms
Fast Start-Up (FSU)	< 150 ms
Diagnostics	acc. to PROFINET alarm handling
Topology detection	supported
Automatic addressing	supported
Media Redundancy Protocol (MRP)	supported

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Digital inputs	
Number of channels	16
Connectivity inputs	M12, 5-pin
Input type	PNP
Type of input diagnostics	Group diagnostics
Switching threshold	EN 61131-2 Typ 3, PNP
Low level signal voltage	< 5 V
High level signal voltage	> 11 V
Low level signal current	< 1.5 mA
High level signal current	> 2 mA
Input delay	2.5 ms
Electrical isolation	Galvanically isolated to the fieldbus Voltage proof up 500 VDC

Digital outputs	
Number of channels	16
Connectivity outputs	M12, 5-pol
Output type	PNP
Type of output diagnostics	Channel diagnostics
Output voltage	24 VDC from potential group
Output current per channel	2.0 A, short-circuit proof, max. 2.0 A per port
Output delay	1.3 ms
Load type	EN 60947-5-1: DC-13
Short-circuit protection	yes
Electrical isolation	Galvanically isolated to the fieldbus Voltage proof up 500 VDC

Standard/Directive conformity	
Vibration test	acceleration to 20 g acc. to EN 60068-2-6
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, FCC, UV-resistant in accordance with DIN EN ISO 4892-2A (2013)

General Information	
Dimensions (W x L x H)	60.4 x 230.4 x 39mm
Operating temperature	-40…+70 °C
Storage temperature	-40 °C … +85 °C
Altitude	max. 5000 m
Protection class	IP65 IP67 IP69K
MTTF	134 years acc. to SN 29500 (Ed. 99) 20 °C
Housing material	PA6-GF30
Housing color	Black
Window material	Lexan
Material screw	303 stainless steel
Material label	Polycarbonate
Halogen-free	yes
Mounting	2 mounting holes □ 6.3 mm

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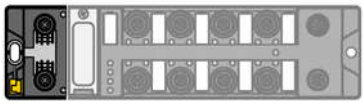
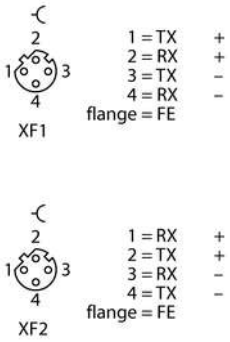
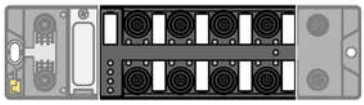
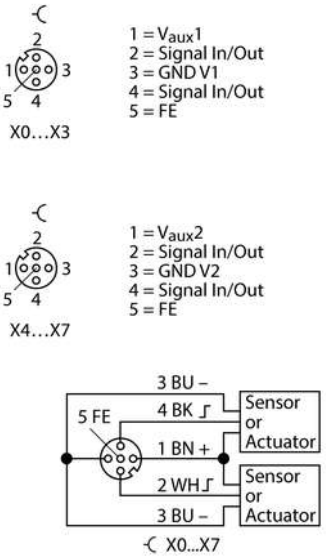
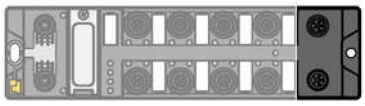
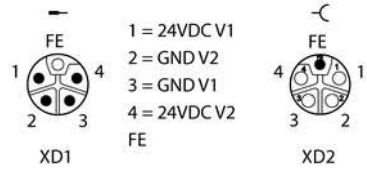
	**Note** Ethernet cable (example): RSSD-RSSD-4416-2M Ident. no. 6441652	M12 × 1 Ethernet 
	**Note** Actuator and sensor cable/PUR connection cable (example): RKC4.4T-2-RSC4.4T/TXL Ident-no. 6625608 Connection cable with Y piece for single assignment VBRS4.4-2RKC4T-1/1/TEL Ident. no. 6628199	M12 × 1 I/O port 
	**Note** Power supply cable (example): Female with 2-m open end: RKP56-PL-2/TXL Connector with 2m open end: RSP56-PL-2/TXL Connection cable 2 m: RKP-56-PL-2-RSP56-PL/TXL	M12 power supply, L-coded 

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Module Status LED

LED	Color	Status	Description
L/A	Green	On	Ethernet Link (100 Mbps)
		Flashing	Ethernet communication (100 Mbps)
	yellow	On	Ethernet link (10 Mbps)
		Flashing	Ethernet communication (10 Mbps)
		Off	No Ethernet link
BUS	Green	On	Active connection to a master
		Flashing	Steady flashing: Ready Sequence of 3 flashes in 2 seconds: FLC/ARGEE active
	Red	On	IP address conflict or restore mode or Modbus timeout
		Flashing	Blink/Wink command active
	Green/red	Alternating	Autonegotiation and/or waiting for DHCP/Boot-P addressing
		Off	Power off
ERR	Green	On	No diagnosis is present
	Red	On	Diagnosis is pending V_2 undervoltage diagnosis is parameter-dependent
PWR	LED response parameter (PWR) at V_2 Undervoltage = "red"		
	Green	On	V_1 and V_2 power on
	Red	On	V_2 power off or below defined tolerance of 18 V
		Off	V_1 power off or below defined tolerance of 18 V
	LED response parameter (PWR) at V_2 Undervoltage = "green"		
	Green	On	V_1 and V_2 power on
		Flashing	V_2 power off or below defined tolerance of 18 V
		Off	V_1 power off or below defined tolerance of 18 V

LED Status I/O

LED	Color	Status	Description
LED 0…15	Green	On	Input or output active
	Red	On	Output active with overload/short circuit
		Flashing	Power overload at the corresponding port. Both port LEDs are flashing.
		Off	Input or output inactive

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Process Data Mapping of the Single Protocols

For more details on the corresponding protocols see manual.

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