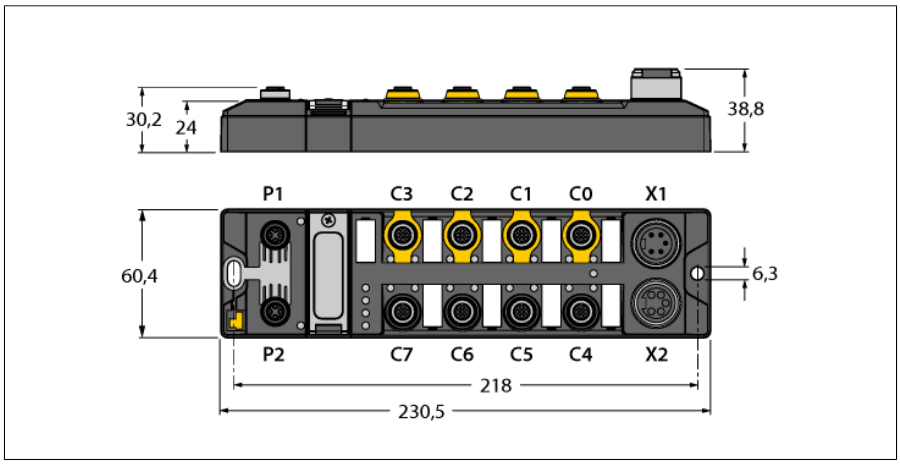
Compact PROFIsafe / PROFINET Block I/O Module
Safe Digital Inputs and Outputs, Standard Universal Digital Channels, IO-Link Master Ports
TBPN-L1-FDIO1-2IOL



- **PROFINET slave**
- **Integrated Ethernet switch**
- **100 Mbps supported**
- **2 × 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**
- **7/8", 5-pin connectors for power supply**
- **Two safe 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**

Type designation	TBPN-L1-FDIO1-2IOL
Ident no.	6814053

Supply	
Supply voltage	24 VDC
Admissible range	20.4…28.8 VDC
Voltage supply connection	5-pin male 7/8" connector X1
Electrical isolation	galvanic isolation of the voltage groups V1 and V2, voltages up to 500 VAC

System data	
Fieldbus transmission rate	100 Mbps
Fieldbus connection technology	2 × M12, 4-pin, reverse-keyed
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 DIN EN 13849-1:2008	e
Category acc. to DIN EN 13849-1:2008	4
SIL according IEC 61508	3
Useful Lifetime	20 years (EN ISO 13849-1)

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 consider 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

Figure 1

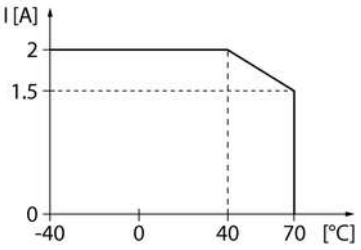
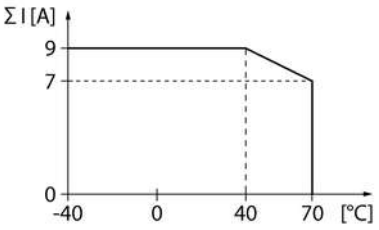


Figure 2



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Safety Inputs floating/antivalent	
Max. loop resistance	< 150 Ω
Max. cable length	max. 1 uF at 150 Ω , limited by cable capacitance
Test pulse, typical	0.6 ms
Test pulse, maximum	0.8 ms
Sensor supply	Versorgung V AUX1/T1 max. 2 A , please consider 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	Versorgung V AUX1/T1 max. 2 A , please consider 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 PPM switching output the negative pole of the load should be wired to the M-terminal of the corresponding output (Pin 2).

Digital inputs	
Connectivity inputs	M12, 5-pin
Input type	PNP
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
Sensor supply	C4, C5: FSO0 max. 2 A; 500 mA per input C6: V AUX1 max. 2 A C7: FSO1 max. 2 A , please consider derating as shown in Figure 1
Electrical isolation	Galvanically isolated to the fieldbus Voltage proof up 500 VDC

Digital outputs	
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	0.5 A, short-circuit-proof, max. 2 A (resistive)/1 A (inductive) all outputs
Short-circuit protection	yes
Actuator power supply	C4, C5: FSO0 max. 2 A; 500 mA per input C6: V AUX1 max. 2 A C7: FSO1 max. 2 A , please consider derating as shown in Figure 1
Electrical isolation	Galvanically isolated to the fieldbus Voltage proof up 500 VDC

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IO-Link	
Number of channels	2
IO-Link specification	Version 1.1
IO-Link port type	Class A and Class B
Frame type	supports all specified frame types
Supported devices	max. 32 byte input/32 byte output
Transmission rate	4.8 kbps (COM 1) / 38.4 kbps (COM 2) / 230 kbps (COM 3)
Power supply	Versorgung V AUX1/T1 max. 2 A , please consider derating as shown in Figure 1
Standard/Directive conformity	
Directive	2006/42/EC Machine Directive 2014/30/EC EMC Directive 2014/35/EC Low Voltage Directive
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)
UL Certificate	cULus LISTED 21 W2, Encl.Type 1 IND.CONT.EQ.
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
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
	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.

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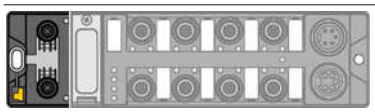
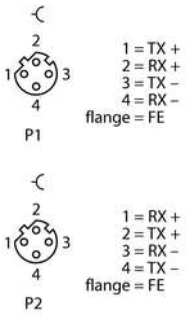
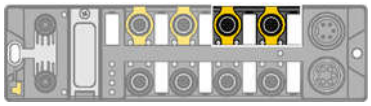
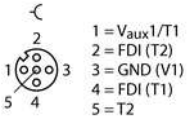
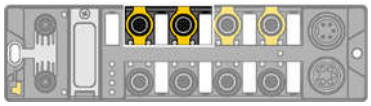
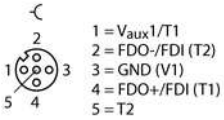
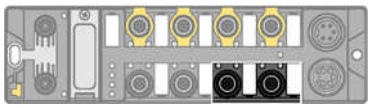
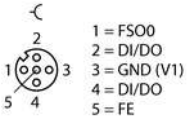
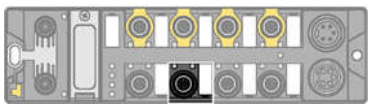
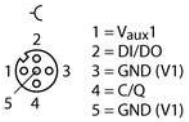
	**Note** Ethernet cable (example): RSSD-RSSD-441-2M/S2174 Ident. no. 6914218	M12 x 1 Ethernet 
	**Note** Actuator and sensor cable/PUR connection cable (example): RKC4.5T-2-RSC4.5T/TXY Ident. no. 6629805	M12 x 1 Safety Inputs 
	**Note** Actuator and sensor cable/PUR connection cable (example): RKC4.5T-2-RSC4.5T/TXY Ident. no. 6629805	M12 x 1 Safety I/O Port 
	**Note** Actuator and sensor cable/PUR connection cable (example): RKC4.5T-2-RSC4.5T/TXL Ident. no. 6625612	M12 x 1 I/O Port 
	**Note** Actuator and sensor cable/PUR connection cable (example): Connection of a class A device: RKC4T-2-RSC4T/TXL Ident. no. 6625604 Connection of a class B device: RKC4.5T-2-RSC4.5T/TXL Ident. no. 6625612	M12 x 1 IO-Link 

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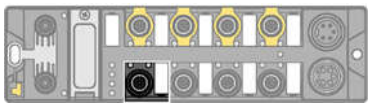
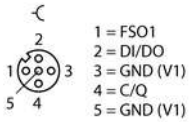
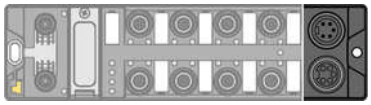
	**Note** Actuator and sensor cable/PUR connection cable (example): Connection of a class A device: RKC4T-2-RSC4T/TXL Ident. no. 6625604 Connection of a class B device: RKC4.5T-2-RSC4.5T/TXL Ident. no. 6625612	M12 x 1 IO-Link 
	**Note** Power supply cable (example): RKM52-1-RSM52 Ident. no. 6914149	7/8" Power Supply 

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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	Diagnostics disabled
	Red	ON	Diagnostics enabled
PWR	Green	ON	Voltage OK
	Red	ON	Voltage faulty
WINK	white	Flashing	Supports blink/wink commands

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	Overload of supply
	Green/Red	Alternating	Channel active and overload of supply (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 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	Overload of supply
		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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