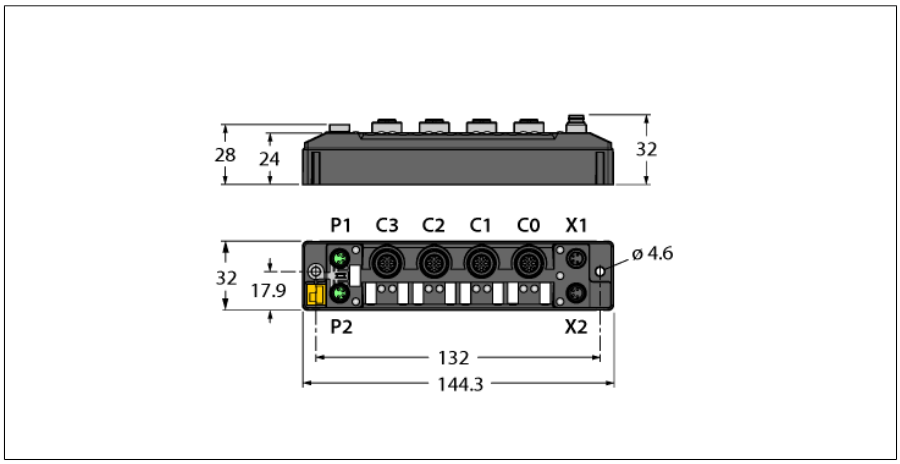
Compact Multiprotocol I/O Module for Ethernet
4 IO-Link Master Channels
4 Universal Digital PNP Channels, 0.5 A, Channel Diagnostics
TBEN-S2-4IOL



- **PROFINET device, EtherNet/IP device or Modbus TCP slave**
- **Integrated Ethernet switch**
- **Supports 10 Mbps / 100 Mbps**
- **2x M8, 4-pin, Ethernet fieldbus connection**
- **Glass fiber reinforced housing**
- **Shock and vibration tested**
- **Fully potted module electronics**
- **Protection classes IP65, IP67, IP69K**
- **M8, 4-pin connector for power supply**
- **Galvanically isolated voltage groups**
- **M12 ports for IO-Link master, 5-pin**
- **IO-Link Protocol 1.1**
- **FLC/ARGEE programmable**

Type designation	TBEN-S2-4IOL
Ident no.	6814024

Supply	
Supply voltage	24 VDC
Admissible range	18…30 VDC
	Total current max. 4A per voltage group
Voltage supply connection	2 × M8, 4-pin
Operating current	V1: min. 50 mA, max. 110 mA
	V2: min.10 mA, max. 115 mA
Sensor/Actuator supply V_{AUX2}	supply of ports C0-C3 from V2
	not short-circuit proof, max. 4 A per group C0-C3
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 × M8, 4-pin
Protocol detection	automatic
Web server	default: 192.168.1.254
Service interface	Ethernet via P1 or P2

Field Logic Controller (FLC)	
ARGEE Firmware Version	3.1.10.0
ARGEE Engineering Version	2.0.26.0

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)	< 500 ms
Device Level Ring (DLR)	supported
Class 3 connections (TCP)	3
Class 1 connections (CIP)	10
Input Assembly Instance	103
Output Assembly Instance	104
Configuration Assembly Instance	106

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PROFINET	
Addressing	DCP
Conformance class	B (RT)
MinCycleTime	1 ms
Fast Start-Up (FSU)	< 500 ms
Diagnostics	acc. to PROFINET alarm handling
Topology detection	supported
Automatic addressing	supported
Media Redundancy Protocol (MRP)	supported

Digital inputs	
Number of channels	4 DXP + 4 SIO
Connectivity inputs	M12, 5-pin
Input type	PNP
Type of input diagnostics	Channel 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	0.05 ms
Electrical isolation	galvanic isolation to the bus voltages up to 500 VAC

Digital outputs	
Number of channels	4 DXP
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
Load type	resistive, inductive, lamp load
Electrical isolation	galvanic isolation to P1/P2 voltages up to 500 VDC

IO-Link	
Number of channels	4
IO-Link	pin 4 in IOL mode
IO-Link specification	Version 1.1
IO-Link port type	Class A
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)

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)
UL Certificate	cULus LISTED 21 W2, Encl.Type 1 IND.CONT.EQ.

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General Information	
Dimensions (W x L x H)	32 x 144 x 32mm
Operating temperature	-40…+70 °C
Storage temperature	-40 °C … +85 °C
Altitude	max. 5000 m
Protection class	IP65 IP67 IP69K
MTTF	260 years acc. to SN 29500 (Ed. 99) 20 °C
Housing material	PA6-GF30
Housing color	Black
Material label	Polycarbonate
Halogen-free	yes
Mounting	2 mounting holes □ 4.6 mm

	Note the numbering of the IO range: From firmware version 3.1.10.0 and higher ports C0 to C3 and channels CH0 to CH3 are counted. For more details on the corresponding change see manual.

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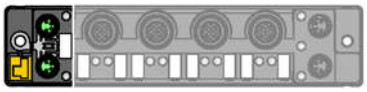
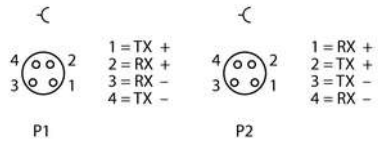
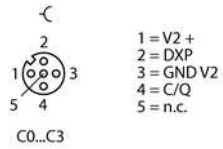
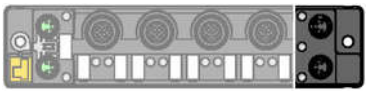
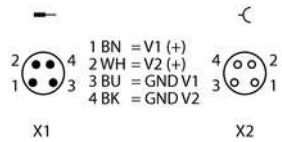
	**Note** It is strongly recommended to use only ready-made Ethernet cables! Ethernet cable (example): M8-M8: ID number 6630376 PSG4M-0,2-PSG4M/TXN ID number 6934033 PSGS4M-PSGS4M-4416-1M M8-RJ45: ID number 6935342 PSGS4M-RJ45S-4416-1M M8-M12: ID number 6935351 RSSD-PSGS4M-4416-2M	M8 x 1 Ethernet 
	**Note** Pin1: V_{AUX2} is not short-circuit proof Pin 2: Digital input or output Pin 4: IO-Link or digital input Accessories: Appropriate IO-Link cable for example: Ident. no. 6625604 2 m: RKC4T-2-RSC4T/TXL Ident. no. 6625730 5m: RKC4T-5-RSC4T/TXL Further lengths and variants on request or see product catalog External supply for class B device: Ident. no. 6629516 VB-IO-LINK-CLASS-B-POWER-0,3/0,3/TXL For the external supply also observe the instructions in the manual!	M12 x 1 I/O Port 
	**Note** Power supply cable (example): M8-M8 ID number 6627044 PKG4M-0,2-PSG4M/TXL ID number 6626679 PKG4M-4-PSG4M/TXL	M8 x 1 Voltage 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)
	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
	Red/ Green	Alternating	Waiting for assignment of an IP address, DHCP or BootP
		OFF	Power off
ERR	Green	On	No diagnosis is present
	Red	On	Diagnosis is pending V_2 undervoltage diagnosis is parameter-dependent
PWR	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 Status I/O

LED	Color	Status	Description
IOL 0, 2, 4, 6 (IO-Link Port 1-4) 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
IOL 0, 2, 4, 6 (IO-Link Port 1-4) SIO Mode	Green	ON	Digital Input signal is present
		OFF	No input signal
DXP 1, 3, 5, 7	Green	ON	Digital input or output active
	Red	ON	Output active with overload/short circuit
		OFF	Input or output inactive
DXP 7	White	Flashing	Supports blink/wink commands

Edition • 2021-04-09T09:30:42+02:00

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Process Data Mapping of the Single Protocols

For more details on the corresponding protocols see manual.

Modbus TCP Register Mapping

	Reg	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Inputs (RO)	0x0000	-	-	-	-	-	-	-	-	DXP7 C3P2	SIO6 C3P4	DXP5 C2P2	SIO4 C2P4	DXP3 C1P2	SIO2 C1P4	DXP1 C0P2	SIO0 C0P4
	0x0001	-	-	-	-	-	-	-	-	-	DVS7	-	DVS5	-	DVS3	-	DVS1
	0x0002 … 0x0011	IO-Link Port 1 Byte 0…31															
	0x0012 … 0x0021	IO-Link Port 2 Byte 0…31															
	0x0022 … 0x0031	IO-Link Port 3 Byte 0…31															
	0x0032 … 0x0041	IO-Link Port 4 Byte 0…31															
Diag Port1	0x0042	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port2	0x0043	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port3	0x0044	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port4	0x0045	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag DXP	0x0046	-	-	-	-	-	-	-	-	ERR7	-	ERR6	-	ERR4	-	ERR1	-
IOL Events	0x0047	Port								Qualifier							
	0x0048	eventCode MSB								eventCode LSB							
	…																
	0x0065	Port								Qualifier							
	0x0066	eventCode MSB								eventCode LSB							
Status (RO)	0x0067		FCE					V1		V2							DIAG

Outputs (RO)	0x0800	-	-	-	-	-	-	-	-	DXP7 C3P2	-	DXP5 C2P2	-	DXP3 C1P2	-	DXP1 C0P2	-
	0x0801 … 0x0810	IO-Link Port 1 Byte 0…31															
	0x0811 … 0x0820	IO-Link Port 2 Byte 0…31															
	0x0821 … 0x0830	IO-Link Port 3 Byte 0…31															
	0x0831 … 0x0840	IO-Link Port 4 Byte 0…31															

EtherNet/IP data mapping

	Word	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit3	Bit 2	Bit 1	Bit 0
Input data (station -> scanner)																	
Status word	0x0000	-	FCE	-	-	-	-	V1	-	V2	-	-	-	-	-	-	Diag
Inputs (RO)	0x0001	-	-	-	-	-	-	-	-	DXP7 C3P2	SIO6 C3P4	DXP5 C2P2	SIO4 C2P4	DXP3 C1P2	SIO2 C1P4	DXP1 C0P2	SIO0 C0P4
	0x0002	-	-	-	-	-	-	-	-	-	DVS6	-	DVS4	-	DVS2	-	DVS0
	0x0003 … 0x0012	IO-Link port 1 Byte 0…31															
	0x0013 … 0x0022	IO-Link port 2 Byte 0…31															

Edition • 2021-04-09T09:30:42+02:00

	0x0023 … 0x0032	IO-Link port 3 Byte 0…31															
	0x0033 … 0x0042	IO-Link port 4 Byte 0…31															
Diag DXP	0x0043	-	-	-	-	-	-	-	-	ERR7	-	ERR5	-	ERR3	-	ERR1	-
Diag Port1	0x0044	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT1	EVT2	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port2	0x0045	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT1	EVT2	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port3	0x0046	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT1	EVT2	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port4	0x0047	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT1	EVT2	PDINV	HWER	DSER	CFGER	PPE	-
IOL events	0x0048	Port								Qualifier							
	0x0049	eventCode MSB								eventCode LSB							
	…																
	0x0066	Port								Qualifier							
	0x0067	eventCode MSB								eventCode LSB							

Output data (scanner -> station)																	
Command Word	0x0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Outputs (RO)	0x0001	-	-	-	-	-	-	-	-	DXP7 C3P2	-	DXP5 C2P2	-	DXP3 C1P2	-	DXP1 C0P2	-
	0x0002 … 0x0013	IO-Link port 1 Byte 0…31															
	0x0014 … 0x0022	IO-Link port 2 Byte 0…31															
	0x0023 … 0x0032	IO-Link port 3 Byte 0…31															
	0x0033 … 0x0042	IO-Link port 4 Byte 0…31															

PROFINET Register Mapping

		MSB								LSB							
	Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Inputs (RO)	0x00 LSB 0x01 MSB	-	-	-	-	-	-	-	-	DXP7 C3P2	SIO6 C3P4	DXP5 C2P2	SIO4 C2P4	DXP3 C1P2	SIO2 C1P4	DXP1 C0P2	SIO0 C0P4
	0x02 LSB 0x03 MSB	-	-	-	-	-	-	-	-	-	DVS6	-	DVS4	-	DVS2	-	DVS0
	0x04 LSB … 0x23 MSB	IO-Link Port 1 Byte 0…31															
	0x24 LSB … 0x43 MSB	IO-Link Port 2 Byte 0…31															
	0x44 LSB … 0x63 MSB	IO-Link Port 3 Byte 0…31															
	0x64 LSB … 0x83 MSB	IO-Link Port 4 Byte 0…31															
Diag Port1	0x84 LSB 0x85 MSB	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port2	0x0086 LSB 0x0087 MSB	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-

Diag Port3	0x88 LSB 0x89 MSB	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port4	0x90 LSB 0x91 MSB	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag DXP	0x92 LSB 0x93 MSB	-	-	-	-	-	-	-	-	ERR7	-	ERR5	-	ERR3	-	ERR1	-
IOL Events	0x94 LSB 0x95 MSB	Port								Qualifier							
	0x96 LSB 0x97 MSB	eventCode MSB								eventCode LSB							
	…																
	0xCA LSB 0xCB MSB	Port								Qualifier							
	0xCC LSB 0xCD MSB	eventCode MSB								eventCode LSB							
Status (RO)	0x94 LSB 0x95 MSB	-	FCE	-	-	-	-	V1	-	V2	-	-	-	-	-	-	DIAG

Outputs (RO)	0x00 LSB 0x01 MSB	-	-	-	-	-	-	-	-	DXP7 C3P2	-	DXP5 C2P2	-	DXP3 C1P2	-	DXP1 C0P2	-
	0x02 LSB 0x03 MSB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0x04 LSB … 0x23 MSB	IO-Link Port 1 Byte 0…31															
	0x24 LSB … 0x43 MSB	IO-Link Port 2 Byte 0…31															
	0x44 LSB … 0x63 MSB	IO-Link Port 3 Byte 0…31															
	0x64 LSB … 0x83 MSB	IO-Link Port 4 Byte 0…31															

Key:

V1	Undervoltage V1	CFG	I/O configuration error
V2	Undervoltage V2	FCE	I/O-ASSISTANT Force Mode active
Cx	Port x	Px	Pin x
I/ODiag	I/O diagnostics connected	DVS	Data Valid Signal
Diag	Diagnostic at least on 1 channel	ERR x	Overcurrent output
GENER	Common error	OVL	Overload
VHIGH	Overvoltage	VLOW	Undervoltage
ULVE	Upper limit value exceeded	LLVU	Lower limit value underrun
OTMP	Overtemperature	PRMER	Parameterization error
EVT2	Out of specification error	EVT1	Maintenance events
PDINV	Process input data invalid	HWER	Hardware error
DSER	Data storage error	CFGer	Wrong or missing device
PPE	Port parameterization error		

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