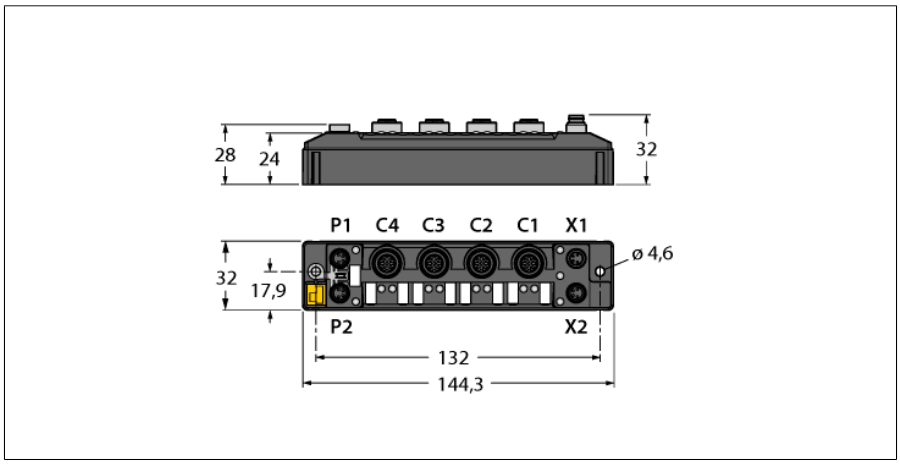
PRELIMINARY

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



- **M12 slots for IO-Link Master, 5-pin**
- **IO-Link Protocol 1.1**
- **Male M8, 4-pin, for power supply**
- **Separated power groups for safety shutdown**
- **Glass-fiber reinforced housing**
- **Shock and vibration tested**
- **Fully potted module electronics**
- **Protection classes IP65 / IP67 / IP69K**

Type code	TBEN-S2-4IOL
Ident no.	6814024
Supply	
Supply voltage	24 VDC
Admissible range	18…30 VDC
	Total current max. 4A per voltage group
Operating current	< 150 mA
Sensor/Actuatorsupply V_{AUX2}	Slots C1-C4 powered by V2;
	Not short-circuit proof, max. 4 A per group C1-C4
Electrical isolation	V1 and V2 voltage groups galvanically isolated, voltages up to 500 VDC
System data	
Fieldbus transmission rate	10 Mbps / 100 Mbps
Fieldbus connection technology	2 x M8, 4-pin
Protocol detection	automatic
Web server	integrated
Service interface	Ethernet via P1 or P2
Modbus TCP	
Addressing	Static IP, BOOTP, DHCP
Supported function codes	FC1, FC2, FC3, FC4, FC5, FC6, FC15, FC16, FC23
Simultaneous CIP connections	8
EtherNet/IP™	
Addressing	acc. to EtherNet/IP™ specification
Quick Connect (QC)	< 500 ms
Device Level Ring (DLR)	supported
Simultaneous CIP connections	3
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

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Digital inputs	
Number of channels	4 DXP + 4 SIO
Connection technology 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	galvanically isolated to the bus, voltages up to 500 VAC

Digital outputs	
Number of channels	4 DXP
Connection technology 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 per port, short-circuit proof
Simultaneity factor	1
Load type	resistive, inductive, lamp load
Electrical isolation	galvanically isolated to the bus, voltages up to 500 VAC

IO-Link	
IO-Link	Pin 4 in IOL mode
IO-Link specification	version 1.1
IO-Link port type	class A
Frame type	Supports all specified framet 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)

Conformance of Standard and Directives	
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 IEC 60068-2-31/IEC 60068-2-32 1
Electro-magnetic compatibility	acc. to EN 61131-2
Approvals and certificates	CE
UL conditions	cULus LISTED 21 W2, Encl.Type 1 IND.CONT.EQ.

General Information	
Dimensions (W x L x H)	32x144x31mm
Operating temperature	-40 … +70 °C
Storage temperature	-40 … +70 °C
Altitude	max.5000 m
IP Rating	IP65 IP67 IP69K
Housing material	PA6-GF30
Housing color	black
halogen-free	yes
Mounting	2 mounting holes □ 4.6 mm

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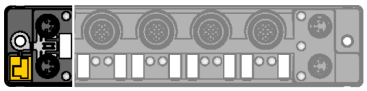
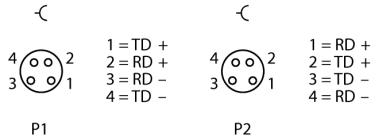
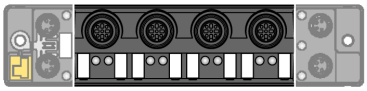
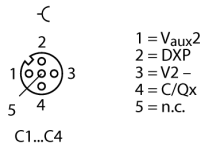
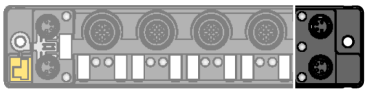
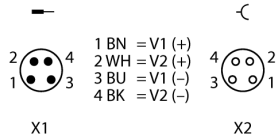
	**Note** It is strongly recommended to use only ready-made Ethernet cables! Ethernet cable (example): M8-M8: PSGS4M-PSGS4M-4414-1M Ident. no. 6932993 M8-RJ45: PSGS4M-RJ45S-4414-1M Ident. no.: 6933004 M8-M12: RSSD-PSGS4M-4414-2M Ident. no.: 6933008	Ethernet M8 x 1 
	**Note** Pin1: V_{AUX2} is not short-circuit proof Pin 2: Digital input or output Pin 4: IO-Link or digital input	I/O port M12 x 1 
	**Note** Power supply cable (example): M8-M8 4 m PKG4M-4-PSG4M/TXL Ident. no. 6626679	Voltage supply M8 x 1 

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Module LED status

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	ready
	red	on	IP-address conflict or Restore Mode or Modbus timeout
		flashing	Blink/Wink command active
		off	Power off
ERR	green	on	Diagnostics disabled
	red	on	Diagnostics enabled
PWR	green	on	V_1 and V_2 power on
	red	on	V_2 power off or below defined tolerance
		off	V_1 power off or below defined tolerance

LED status IOs

LED	Color	Status	Description
LED IOL1, 3, 5, 7 (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
LED IOL 1, 3, 5, 7 (IO-Link Port 1-4) SIO Mode	Green	ON	Digital Input signal is present
		OFF	No input signal
LED DXP 2, 4, 6, 8	Green	ON	Digital input or output active
	Red	ON	Output active with overload / short circuit
		OFF	Input or output inactive

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Process data mapping of 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	-	-	-	-	-	-	-	-	DXP8 C4P2	SIO7 C4P4	DXP6 C3P2	SIO5 C3P4	DXP4 C2P2	SIO3 C2P4	DXP2 C1P2	SIO1 C1P4
	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	-	-	-	-	-	-	-	-	ERR8	-	ERR6	-	ERR4	-	ERR2	-
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	-	-	-	-	-	-	-	-	DXP8 C4P2	-	DXP6 C3P2	-	DXP4 C2P2	-	DXP2 C1P2	-
	0x0801	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0x0802 … 0x0811	IO-Link Port 1 Byte 0…31															
	0x0812 … 0x0821	IO-Link Port 2 Byte 0…31															
	0x0822 … 0x0831	IO-Link Port 3 Byte 0…31															
	0x0832 … 0x0841	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	Bit 3	Bit 2	Bit 1	Bit 0
Input data (Station -> Scanner)																	
Status Word	0x0001	-	FCE	-	-	-	-	V1	-	-	-	-	-	-	-	-	Diag
Inputs (RO)	0x0002	-	-	-	-	-	-	-	-	DXP8 C4P2	SIO7 C4P4	DXP6 C3P2	SIO5 C3P4	DXP4 C2P2	SIO3 C2P4	DXP2 C1P2	SIO1 C1P4
	0x0003	-	-	-	-	-	-	-	-	-	DVS7	-	DVS5	-	DVS3	-	DVS1
	0x0004 … 0x0013	IO-Link Port 1 Byte 0…31															
	0x0014 …	IO-Link Port 2 Byte 0…31															

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	0x0023																
	0x0024 … 0x0033	IO-Link Port 3 Byte 0…31															
	0x0034 … 0x0043	IO-Link Port 4 Byte 0…31															
Diag Port1	0x0044	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port2	0x0045	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port3	0x0046	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag Port4	0x0047	GEN-ER	OVL	VHIGH	VLOW	ULVE	LLVU	OTMP	PRMER	EVT2	EVT1	PDINV	HWER	DSER	CFGER	PPE	-
Diag DXP	0x0048	-	-	-	-	-	-	-	-	ERR8	-	ERR6	-	ERR4	-	ERR2	-
IOL Events	0x0049	Port								Qualifier							
	0x004A	eventCode MSB								eventCode LSB							
	…																
	0x0067	Port								Qualifier							
	0x0068	eventCode MSB								eventCode LSB							

Output (Scanner -> Station)																	
Command Word	0x0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Outputs (RO)	0x0002	-	-	-	-	-	-	-	-	DXP8 C4P2	-	DXP6 C3P2	-	DXP4 C2P2	-	DXP2 C1P2	-
	0x0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0x0004 … 0x0013	IO-Link Port 1 Byte 0…31															
	0x0014 … 0x0023	IO-Link Port 2 Byte 0…31															
	0x0024 … 0x0033	IO-Link Port 3 Byte 0…31															
	0x0034 … 0x0043	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	-	-	-	-	-	-	-	-	DXP8 C4P2	SIO7 C4P4	DXP6 C3P2	SIO5 C3P4	DXP4 C2P2	SIO3 C2P4	DXP2 C1P2	SIO1 C1P4
	0x02 LSB 0x03 MSB	-	-	-	-	-	-	-	-	-	DVS7	-	DVS5	-	DVS3	-	DVS1
	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	-

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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	-	-	-	-	-	-	-	-	ERR8	-	ERR6	-	ERR4	-	ERR2	-
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	-	-	-	-	-	-	-	-	DXP8 C4P2	-	DXP6 C3P2	-	DXP4 C2P2	-	DXP2 C1P2	-
	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		
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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