IO-Link Data Map

This document refers to the following IODD file: Banner_Engineering-Q5X-20210511-IODD1.1.xml. The IODD file and support files can be found on www.bannerengineering.com, under the download section of the product family page.

Communication Parameters

The following communication parameters are used.

Parameter	Value	Parameter	Value
IO-Link revision	V1.1	Port class	A
Process Data In length	32 bits	SIO Mode	Yes
Process Data Out length	8 bits	Smart sensor profile	Yes
Bit Rate	38400 bps	Block parameterization	Yes
Minimum cycle time	3.6 ms	Data Storage	Yes

IO-Link Process Data In (Device to Master)

Process Data In is transmitted cyclically to the IO-Link master from the IO-Link device.

Process Data (If Binary Data Is Included)

Process Data Input			
Subindex	**Name**	**Number of Bits**	**Data Values**
1	Channel 1 Output State	1	0 = inactive 1 = active
2	Channel 2 Output State	1	0 = inactive 1=active
3	Stability State	1	0 = no target/marginal (low excess gain) 1 = stable
4	Measurement 1 Value	13	Value depends on "Configuration.Measurement 1 Selection"
5	Measurement 2 Value	16	Value depends on "Configuration.Measurement 2 Selection"

Octet 0								
Subindex	5	5	5	5	5	5	5	5
Bit offset	31	30	29	28	27	26	25	24
Value	0	0	0	0	0	0	1	0

Octet 1								
Subindex	5	5	5	5	5	5	5	5
Bit offset	23	22	21	20	19	18	17	16
Value	1	0	1	1	0	1	1	0

Octet 2								
Subindex	4	4	4	4	4	4	4	4
Bit offset	15	14	13	12	11	10	9	8
Value	0	0	0	1	1	1	1	1

Octet 3								
Subindex	4	4	4	4	4	3	2	1
Bit offset	7	6	5	4	3	2	1	0
Value	1	1	1	1	1	1	0	1

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206834
p/n: 206834 Rev. F

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

Example Based on the Value Above

Channel 1 Output = Active

Channel 2 Output = Inactive

Stability State = Stable

Measurement 1 Value = 1023

Measurement 2 Value = 694

Process Data (If Binary Data Is Not Included)

Process Data Input			
Subindex	**Name**	**Number of Bits**	**Data Values**
1	Measurement 1 Value	16	Value depends on "Configuration.Measurement 1 Selection"
2	Measurement 2 Value	16	Value depends on "Configuration.Measurement 2 Selection"

Octet 0								
Subindex	2	2	2	2	2	2	2	2
Bit offset	31	30	29	28	27	26	25	24
Value	0	0	0	0	0	0	1	1

Octet 1								
Subindex	2	2	2	2	2	2	2	2
Bit offset	23	22	21	20	19	18	17	16
Value	0	1	0	0	1	0	1	1

Octet 2								
Subindex	1	1	1	1	1	1	1	1
Bit offset	15	14	13	12	11	10	9	8
Value	0	1	1	0	0	1	1	1

Octet 3								
Subindex	1	1	1	1	1	1	1	1
Bit offset	7	6	5	4	3	2	1	0
Value	1	0	0	0	1	1	1	1

Example Based on the Value Above

Measurement 1 Value = 26511

Measurement 2 Value = 843

IO-Link Process Data Out (Master to Device)

Process Data Out transmits cyclically from the IO-Link master to the IO-Link device, which can be used to control the enabling/disabling of the transducer.

Process Data Output			
Subindex	**Name**	**Number of Bits**	**Data Values**
1	Transducer Disable	1	0 = Active 1 = Inactive

Octet 0								
Subindex	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	1
Bit offset	7	6	5	4	3	2	1	0
Value	0	0	0	0	0	0	0	1

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Example Based on the Value Above

Transducer Disable = 1 (Inactive)

Parameters Set Using IO-Link

These parameters can be read from and/or written to an IO-Link model of the Q5X Laser sensor. Also included is information about whether the variable in question is saved during Data Storage and whether the variable came from the IO-Link Smart Sensor Profile.

Unlike Process Data In, which is transmitted from the IO-Link device to the IO-Link master cyclically, these parameters are read or written acyclically as needed.

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?	AOI
0	1–16	Direct Parameter Page 1 (incl. Vendor ID & Device ID)				ro			
1	1–16	Direct Parameters Page 2				rw			
2		Standard Command		65 = SP1 Single Value Teach 67 = SP1 Two Value Teach TP1 68 = SP1 Two Value Teach TP2 71 = SP1 Dynamic Teach Start 72 = SP1 Dynamic Teach Stop 79 = SP1 Teach Exit 160 = Laser Disable 161 = Laser Enable 130 = Restore Factory Settings 162 = Start discovery 163 = Stop discovery		wo		y	
3		Data Storage Index (device-specific list of parameters to be stored)				rw			
4–11		*reserved by IO-Link Specification*							
12		**Device Access Locks**							
12	1	Parameter Write Access Lock		0 = off 1 = on	0	rw	y		
12	2	Data Storage Lock		0 = off 1 = on	0	rw	y		
12	3	Local Parameterization Lock		0 = off 1 = on	0	rw	y		
12	4	Local User Interface Lock		0 = off 1 = on	0	rw	y		
13		Profile Characteristic				ro			
14		PDInput Descriptor				ro			
15		PDOutput Descriptor				ro			
16		Vendor Name string		Banner Engineering Corporation		ro			
17		Vendor Text string		More Sensors. More Solutions.		ro			
18		Product Name string		Q5X		ro			
19		Product ID string		Q5XKLAF2000-Q8		ro			
20		Product Text string		Laser Measurement Sensor		ro		y	
21		Serial Number				ro			
22		*unused/reserved*				*ro*			
23		Firmware Version				ro		y	
24		App Specific Tag (user defined)				rw	y	y	
25–35		*reserved*							

Continued on page 4

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Continued from page 3

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?	AOI
36		Device Status	8-bit UInteger	0 = Device is OK 1 = Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure 5..255 Reserved		ro			
37		Detailed Device Status	Array[6] of 3-octet			ro			
38–39		*reserved*							
40		Process Data Input				ro			
41		Process Data Output							
42–57		*unused/reserved*							
58		Teach-in Channel		0 = Default 1 = BDC1 2 = BDC2	0	rw		y	
59		**Teach-In Status**							
59	1	Teach State: 4-bit Integer	4-bit UInteger	0 = Idle 1 = SP1 Success 4 = Wait for Command 5 = Busy 7 = Error		ro		y	
59	2	SP1 TP1	1-bit integer	0 = not taught or unsuccessful 1 = successfully taught		ro		y	
59	3	SP1 TP2	1-bit integer	0 = not taught or unsuccessful 1 = successfully taught		ro		y	
60		**BDC1 Setpoints**							
60	1	BDC1 Setpoint SP1	32-bit integer	95 mm – 2000 mm	250 mm	rw	y	y	
60	2	BDC1 Setpoint SP2	32-bit integer	0 mm for all teach modes except One-Point Window (FGS) 95 mm to 2000 mm for One-Point Window (FGS)	0 mm	rw	y	y	
61		**BDC1 Configuration**							
61	1	BDC1 Switchpoint Logic	8-bit UInteger	0 = LO 1 = DO	0	rw	y	y	
61	2	BDC1 Mode	8-bit UInteger	1 = One-Point BGS 128 = Two-Point Static BGS 129 = Dynamic BGS 130 = One-Point Window (FGS) 131 = Dual Teach	128	rw	y	y	
61	3	BDC1 Hysteresis	16-bit integer	0 mm – 2000 mm	0	rw	y	y	
62		**BDC2 Setpoints**							
62	1	BDC2 Setpoint SP1	32-bit integer	95 mm – 2000 mm	500 mm	rw	y	y	
62	2	BDC2 Setpoint SP2	32-bit integer	0 mm for all teach modes except One-Point Window (FGS) 95 mm to 2000 mm for One-Point Window (FGS)	0 mm	rw	y	y	
63		**BDC2 Configuration**							
63	1	BDC2 Switchpoint Logic	8-bit UInteger	0 = LO 1 = DO	0	rw	y	y	
63	2	BDC2 Mode	8-bit UInteger	1 = One-Point BGS 128 = Two-Point Static BGS 129 = Dynamic BGS 130 = One-Point Window (FGS) 131 = Dual Teach	128	rw	y	y	
63	3	BDC2 Hysteresis	16-bit integer	0 mm – 2000 mm	0	rw	y	y	
64		**Configuration**							
64	1	Response Speed	8-bit UInteger	0 = 3 ms 1 = 5 ms 2 = 15 ms 3 = 25 ms 4 = 50 ms	3	rw	y		
64	2	Gain	8-bit UInteger	0 = High excess gain mode 1 = Standard excess gain mode	0	rw	y		

Continued on page 5

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Continued from page 4

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?	AOI
64	3	Secondary Output Function	8-bit UInteger	0 = Remote Teach Input 1 = Laser On 2 = Master 3 = Slave 4 = Complementary Ouput 5 = Laser Off 6 = Pulse Frequency Modulation 7 = Independent Output	7	rw	y		
64	4	Zero Reference Location	8-bit UInteger	0 = Near 1 = Far	0	rw	y		
64	5	Shift Zero Reference After Teach	8-bit UInteger	0 = Off 1 = On	0	rw	y		
64	6	Display Read	8-bit UInteger	0 = On 1 = On + Inverted 2 = Off 3 = Off + Inverted	0	rw	y		
64	7	Pushbutton Lockout	8-bit UInteger	0 = No Lockout 1 = Pushbuttons Locked 2 = Operator Lockout	0	rw	y		
64	8	Output Polarity	8-bit UInteger	0 = Default 1 = PNP 2 = NPN	0	rw	y		
64	9	IOL Filter Time	16-bit UInteger	0 ms – 65535 ms	0	rw	y		
64	10	Includes Binary Data in Process Data	8-bit UInteger	0 = Include 1 = Don't Include	0	rw	y		
64	11	Process Data Measurement 1 Selection	8-bit UInteger	0 = Disabled 1 = Excess Gain 2 = Excess Gain / 10 3 = Channel 1 Dual Mode Percent	1	rw	y		
64	12	Process Data Measurement 2 Selection	8-bit UInteger	0 = Disabled 1 = Distance Measurement Value (mm) 2 = Displayed Distance Measurement Value (mm)(1) 3 = Channel 2 Dual Mode Percent	1	rw	y		
65		**BDC1 Vendor-Specific Configuration**							
65	1	BDC1 Delay Mode	8-bit UInteger	0 = Disabled 1 = On/Off Delay 2 = Oneshot 3 = Totalizer	0	rw	y		
65	2	BDC1 Delay Time 1	32-bit UInteger	0–90000 ms	0 ms	rw	y		
65	3	BDC1 Delay Time 2	32-bit UInteger	0–90000 ms	0 ms	rw	y		
65	4	BDC1 BGS Teach Offset Mode	8-bit UInteger	0 = Auto 1 = User Selected	0	rw	y		
65	5	BDC1 FGS Window Size Mode	8-bit UInteger	0 = Auto 1 = User Selected	0	rw	y		
65	6	BDC1 User Teach Offset	16-bit integer	-1905 mm – 1905 mm	0 mm	rw	y		
65	7	BDC1 FGS User Window Size	16-bit integer	0 mm – 1905 mm	0 mm	rw	y		
65	8	BDC1 Auto Thresholding	8-bit UInteger	0 = On 1 = Off 2 = High Speed	1	rw	y		
66		**BDC2 Vendor-Specific Configuration**				rw			
66	1	BDC2 Delay Mode	8-bit UInteger	0 = Disabled 1 = On/Off Delay 2 = Oneshot 3 = Totalizer	0	rw	y		
66	2	BDC2 Delay Time 1	32-bit UInteger	0–90000 ms	0 ms	rw	y		
66	3	BDC2 Delay Time 2	32-bit UInteger	0–90000 ms	0 ms	rw	y		
66	4	BDC2 BGS Teach Offset Mode	8-bit UInteger	0 = Auto 1 = User Selected	0	rw	y		
66	5	BDC2 FGS Window Size Mode	8-bit UInteger	0 = Auto 1 = User Selected	0	rw	y		
66	6	BDC2 User Teach Offset	16-bit integer	-1905 mm – 1905 mm	0 mm	rw	y		

Continued on page 6

(1) Displays **Distance Measurement Value** with adjustments made by **Zero Reference Location** and **Shift Zero Reference After Teach**.

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Continued from page 5

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?	AOI
66	7	BDC2 FGS User Window Size	16-bit integer	0 mm – 1905 mm	0 mm	rw	y		
66	8	BDC2 Auto Thresholding	8-bit UInteger	0 = On 1 = Off 2 = High Speed	1	rw	y		
67		**Status**							
67	1	Measurement Value (distance in mm)	32-bit integer			ro			
67	2	Excess Gain Percent	32-bit integer			ro			
67	3	Stability	8-bit UInteger	0 = No target 1 = Marginal (low excess gain)/Multiple Peaks 2 = Stable		ro			
67	4	Multiple Peak State	8-bit UInteger	0 = Multiple Peaks Not Present 1 = Multiple Peaks Present		ro			
67	5	Emitter Status	8-bit UInteger	0 = Active 1 = Inactive		ro			
67	6	Laser Fault Status	8-bit UInteger	0 = Not Present 1 = Laser Fault Present		ro			
67	7	BDC1 Totalizer Counts	16-bit UInteger			ro			
67	8	BDC2 Totalizer Counts	16-bit UInteger			ro			
68		*unused/reserved*							
69		**All-Time Run Time**							
69	1	Run Counter	32-bit UInteger			ro			
70		**Resettable Run Time**							
70	1	Run Counter	32-bit UInteger		0	rw			
71		**Pulse Frequency Configuration**							
71	1	Near Frequency	32-bit integer	The frequency corresponding to a target at the near limit of the sensing range 100 Hz – 45000 Hz	100 Hz	rw	y		
71	2	Far Frequency	32-bit integer	The frequency corresponding to a target at the far limit of the sensing range 100 Hz – 45000 Hz	600 Hz	rw	y		
72		**Display String**							
72	1	Line 1	5-octet String US_ASCII			ro			
73-75		*unused/reserved*							
76		**All-Time Run Time Event Time**							
76	1	Event Time	32-bit UInteger	0–2147483647	0	rw	y		
77		**Resettable Run Time Event Time**							
77	1	Event Time	32-bit UInteger	0-2147483647	0	rw	y		
78		**Pulse Frequency Setpoints**							
78	1	Setpoint SP1	32-bit UInteger	Switch point 95 mm – 2000 mm	95 mm	rw	y		
78	2	Setpoint SP2	32-bit UInteger	In One-Point Window (FGS) teach, SP2 defines the second switching point. In other teach modes, SP2 is unused and must be written to 0 95 mm – 2000 mm	2000 mm	rw	y		
79		**Pulse Frequency LOS Frequency**							
79	1	Pulse Frequency LOS Frequency	32-bit UInteger	Frequency used to indicate Loss-of-Signal 50 Hz – 45000 Hz	50 Hz	rw	y		

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IO-Link Events

Events are acyclic transmissions from the IO-Link device to the IO-Link master. Events can be error messages and/or warning or maintenance data.

Code	Type	Description
25376 (0×6320)	Error	Parameter error (check datasheet and values)
36000 (0×8CA0)	Warning	All-time Run Time Event (Event indicating the corresponding configured running time has elapsed.)
36001 (0×8CA1)	Warning	Resettable Run Time Event (Event indicating the corresponding configured running time has elapsed.)
36003 (0×8CA3)	Notification	Teach Completed Event (Event indicating a teach has been completed.)
36004 (0×8CA4)	Notification	Factory Settings Restored Event (Event indicating that the factory settings have been restored.)
36005 (0×8CA5)	Notification	Teach Coerced Event (Event indicating a taught condition resulting in a setpoint being coerced. Taught was updated.)
36007 (0×8CA7)	Notification	Teach Failed Event (Event indicating an invalid target condition was attempted to be taught. Taught setpoint was not updated.)
36096 (0×8d00)	Error	Laser fault event (laser shut down for safety)
36097 (0×8D01)	Error	System Fault Event (Contact Banner Engineering to resolve.)

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