

IO-Link Data Map

This document refers to the following IODD file: Banner_Engineering-Q4X-20150313-IODD1.1.xml for 100/110 mm and 300/310 mm models, and Banner_Engineering-Q4X-600mm-20161205-IODD1.1.xml for 600/610 mm models. 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	16 bits	SIO mode	Yes
Process Data Out length	N/A	Smart sensor profile	Yes
Bit Rate	38400 bps	Block parameterization	Yes
Minimum cycle time	2.7 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.

The Q4X IO-Link Process Data is 16 bits in size and includes the measurement distance as shown on the Q4X display (listed in the Process Data in tenths of a millimeter), the state of the stability indicator, and the state of both Q4X output channels. This information is sent to the IO-Link master every 2.7 ms. In Dual TEACH mode, the distance value changes to a percentage value displayed as a whole number.

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, 1=stable
4	Measurement Value	13	Value in tenths of millimeter

Octet 0								
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	0	1	1

Octet 1								
Subindex	4	4	4	4	4	3	2	1
Bit offset	7	6	5	4	3	2	1	0
Value	1	0	0	1	1	1	0	1
Example	Measured Value (uses bit offset 3 to 15)					Stability State	Channel 2 Output	Channel 1 Output
	88.3 mm					Stable	Inactive	Active



IO-Link Process Data Out (Master to Device)

Not applicable.

Parameters Set Using IO-Link

These parameters can be read from and/or written to an IO-Link model of the Q4X 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 aperiodically 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 = S1 Exit Teach 130 = Restore Factory Settings 160 = Laser Off 161 = Laser On 162 = Start Discovery 163 = Stop Discovery		wo		y	y
3		Data Storage Index (device-specific list of parameters to be stored)				rw			
4-11		<i>reserved by IO-Link Specification</i>							
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		y	
14		PDInput Descriptor				ro		y	
15		<i>unused</i>							
16		Vendor Name string			Banner Engineering Corp	ro			
17		Vendor Text string				ro			
18		Product Name string				ro			
19		Product ID string				ro			
20		Product Text string				ro		y	
21		Serial Number				ro			
22		Hardware Revision				ro			
23		Firmware Version				ro		y	

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?	AOI
24		App Specific Tag (user defined)				rw	y	y	
25–31		<i>reserved</i>							
32		Error Count				ro			
33–39		<i>reserved</i>							
40		Process Data Input				ro			
41–57		<i>unused/reserved</i>							
58		Teach-in Channel		0 = BDC1 1 = BDC2	0	rw		y	y
59		Teach-In Status							
59	1	Teach State	4-bit Integer	0 = Idle 1 = SP1 Success 4 = Wait for Command 5 = Busy 7 = Error		ro		y	
59	2	SP1 TP1	1-bit	0 = Teachpoint 1 not taught or the last attempt to teach was not successful 1 = Teachpoint 1 was successfully taught		ro		y	y
59	3	SP1 TP2	1-bit	0 = Teachpoint 2 not taught or the last attempt to teach was not successful 1 = Teachpoint 2 was successfully taught		ro		y	y
60		BDC1 Setpoints							
60	1	BDC1 Setpoint SP1 (SP1 switch point in Switch or Window mode) (0.1 mm)	16-bit integer	Q4X100: 250–1000 (25–100 mm) Q4X110: 350–1100 (35–110 mm) Q4X300: 250–3000 (25–300 mm) Q4X310: 350–3100 (35–310 mm) Q4X600: 250–6000 (25–600 mm) Q4X610: 350–6100 (35–610 mm)	Q4X100: 500 (50 mm) Q4X110: 600 (60 mm) Q4X300: 1500 (150 mm) Q4X310: 1600 (160 mm) Q4X600: 3000 (300 mm) Q4X610: 3100 (310 mm)	rw	y	y	y
60	2	BDC1 Setpoint SP2 (SP2 switch point in FGS only) (0.1 mm)	16-bit integer		0	rw	y	y	y
61		BDC1 Configuration							
61	1	BDC1 Switchpoint Logic	8-bit integer	0 = LO 1 = DO	0	rw	y	y	y
61	2	BDC1 Mode	8-bit integer	1 = 1-pt BGS 128 = 2-pt BGS 129 = Dynamic BGS 130 = 1-pt Window 131 = Dual Teach	128	rw	y	y	y
61	3	Hysteresis (mm)	16-bit integer	0	0	rw	y	y	y
62		BDC2 Setpoints							
62	1	BDC2 Setpoint SP1 (SP1 switch point in Switch or Window mode) (0.1 mm)	16-bit integer	Q4X100: 250–1000 (25–100 mm) Q4X110: 350–1100 (35–110 mm) Q4X300: 250–3000 (25–300 mm) Q4X310: 350–3100 (35–310 mm) Q4X600: 250–6000 (25–600 mm) Q4X610: 350–6100 (35–610 mm)	Q4X100: 500 (50 mm) Q4X110: 600 (60 mm) Q4X300: 1500 (150 mm) Q4X310: 1600 (160 mm) Q4X600: 3000 (300 mm) Q4X610: 3100 (310 mm)	rw	y	y	y
62	2	BDC2 Setpoint SP2 (SP2 switch point in FGS only) (0.1 mm)	16-bit integer		0	rw	y	y	y

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?	AOI
63		BDC2 Configuration							
63	1	BDC2 Switchpoint Logic	8-bit integer	0 = LO 1 = DO	0	rw	y	y	y
63	2	BDC2 Mode	8-bit integer	1 = 1-pt BGS 128 = 2-pt BGS 129 = Dynamic BGS 130 = 1-pt Window 131 = Dual Teach	128	rw	y	y	y
63	3	Hysteresis (0.1 mm)	16-bit integer	0	0	rw	y	y	y
64		Configuration							
64	1	Response Speed (ms)	8-bit integer	0 = 1.5 ms (Q4X100/110/300/310) or 2 ms (Q4X600/610) 1 = 3 ms (Q4X100/110/300/310) or 5 ms (Q4X600/610) 2 = 10 ms (Q4X100/110/300/310) or 15 ms (Q4X600/610) 3 = 25 ms 4 = 50 ms	Q4X100/110/ 300/310: 2 Q4X600/610: 3	rw	y		y
64	2	Gain	8-bit integer	0 = High 1 = Standard	1	rw	y		y
64	3	Secondary Output Function	8-bit integer	0 = Independent 1 = Complementary 2 = Remote Teach Input 3 = Laser Off 4 = Laser On 5 = Master 6 = Slave 7 = Pulse Frequency Modulation	0	rw	y		y
64	4	Zero Reference Location	8-bit integer	0 = Near 1 = Far	0	rw	y		y
64	5	Shift Zero Reference After Teach	8-bit integer	0 = On 1 = Off	0	rw	y		y
64	6	Display Read	8-bit integer	0 = On 1 = On + Inverted 2 = Off 3 = Off + Inverted	0	rw	y		y
64	7	Pushbutton Lockout	8-bit integer	0 = No 1 = Pushbutton Lock 2 = Operator Lockout	0	rw	y		y
64	8	IOL Filter Time (ms)	16-bit integer	0-65535	0	rw	y		y
65		BDC1 Vendor Specific Configuration							
65	1	BDC1 Delay Mode	8-bit unsigned integer	0 = Disabled 1 = On/Off Delay 2 = Oneshot 3 = Totalizer	0	rw	y		y
65	2	BDC1 Delay Timer 1 (ms)	32-bit integer	0-9999	0	rw	y		y
65	3	BDC1 Delay Timer 2 (ms)	32-bit integer	0-9999	0	rw	y		y
65	4	BDC1 Teach Offset Mode	8-bit unsigned integer	0 = Auto 1 = User Selected	0	rw	y		y
65	5	BDC1 User Teach Offset (0.1 mm)	16-bit integer	Q4X100/110: -750--+750 (-75--+75 mm) Q4X300/310: -2750--+2750 (-275--+275 mm) Q4X600/610: -5750--+5750 (-575--+575 mm)	0	rw	y		y

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?	AOI
65	6	FGS Window Size (0.1 mm)	16-bit integer	Q4X100/110: 0–750 (0–75 mm) Q4X300/310: 0–2750 (0–275 mm) Q4X600/610: 0–5750 (0–575 mm)	0	rw	y		y
65	7	BDC1 Auto Thresholding (Dual mode only)	8-bit unsigned integer	0 = On 1 = Off 2 = High Speed	0	rw	y		y
66		BDC2 Vendor Specific Configuration				rw			
66	1	BDC2 Delay Mode	8-bit unsigned integer	0 = Disabled 1 = On/Off Delay 2 = Oneshot 3 = Totalizer	0	rw	y		y
66	2	BDC2 Delay Timer 1 (ms)	32-bit integer	0–9999	0	rw	y		y
66	3	BDC2 Delay Timer 2 (ms)	32-bit integer	0–9999	0	rw	y		y
66	4	BDC2 Teach Offset Mode	8-bit unsigned integer	0 = Auto 1 = User Selected	0	rw	y		y
66	5	BDC2 User Teach Offset (0.1 mm)	16-bit integer	Q4X100/110: –750–+750 (–75–+75 mm) Q4X300/310: –2750–+2750 (–275–+275 mm) Q4X600/610: –5750–+5750 (–575–+575 mm)	0	rw	y		y
66	6	FGS Window Size (0.1 mm)	16-bit integer	Q4X100/110: 0–750 (0–75 mm) Q4X300/310: 0–2750 (0–275 mm)	0	rw	y		y
66	7	BDC2 Auto Thresholding (Dual mode only)	8-bit unsigned integer	0 = On 1 = Off 2 = High Speed	0	rw	y		y
67		Status							
67	1	Measurement Value (distance in 0.1 mm)	16-bit integer			ro			y
67	2	Excess Gain Percent (%)	64-bit integer	0–18446744073709551615	0	ro			
67	3	Stability	8-bit unsigned integer	0 = No target 1 = Marginal/Multiple Peaks 2 = Stable		ro			y
67	4	Multiple Peak State	8-bit unsigned integer	0 = Present 1 = Not Present		ro			y
67	5	Laser Fault Status	8-bit unsigned integer	0 = No Fault 1 = Fault Present		ro			y
67	6	BDC1 Totalizer Counts	16-bit unsigned integer	0–65535	0	ro			y
67	7	BDC2 Totalizer Counts	16-bit unsigned integer	0–65535	0	ro			y
68		Statistics							
68	1	Number of Samples	16-bit unsigned integer	0–65535	0	ro			
68	2	Sum	32-bit unsigned integer	0–4294967295	0	ro			
68	3	Sum Squared	64-bit unsigned integer	0–65535	0	ro			
68	4	Minimum	16-bit unsigned integer	0–65535	0	ro			
68	5	Maximum	16-bit unsigned integer	0–65535	0	ro			

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?	AOI
69	1	All-time Run Time (0.25 hr)	32-bit unsigned integer	0-4294967295	0	ro			
70	1	Resetable Run Time (0.25 hr)	32-bit unsigned integer	0-4294967295	0	rw			
71		Pulse Frequency Configuration							
71	1	Near Frequency (Hz)	16-bit unsigned integer	10-45000	100	rw	y		y
71	2	Far Frequency (Hz)	16-bit unsigned integer	10-45000	600	rw	y		y
72		Display String	8-octet String US_ASCII			ro			y

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 (0x6320)	Error	Parameter error (verify inputs are valid)
36096 (0x8d00)	Error	Laser fault event (laser shut down for safety)