Q5XKLAF5000 and 10000 IO-Link Data Reference Guide

IO-Link Data Map

This document refers to the following IODD file: Banner_Engineering-Q5XKLAF5000-20230418-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)

Configuration: Include Binary in Process Data = Include

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	1	1	1	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

Example Based on the Value Above

Channel 1 Output = Active

© Banner Engineering Corp.

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

Channel 2 Output = Inactive

Stability State = Stable

Measurement 1 Value = 8191

Measurement 2 Value = 694

Configuration: Include Binary in Process Data = Don't Include

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	1	1	1
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

Configuration: Include Binary in Process Data = Measurement Device

Process Data Input

Subindex	Name	Number of Bits	Data Values
1	Measurement Value	16	The measurement device value
2	Measurement Scale	8	The measurement device scale
3	Stability State	1	0 = no target/marginal (low excess gain) 1 = stable
4	Channel 2 Output State	1	0 = inactive 1 = active
5	Channel 1 Output State	1	0 = inactive 1 = active

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

Continued on page 3

© Banner Engineering Corp. All rights reserved.

Continued from page 2

Octet 0								
Value	0	0	0	0	0	0	0	0

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

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

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

Example Based on the Value Above

Measurement Value = 109

Measurement Scale = -2
Scaled Measurement Value = 1.09 m

Stability State = no target/marginal (low excess gain)

Channel 2 Output State = Active

Channel 1 Output State = Inactive

IO-Link Process Data Out (Master to Device)

Process Data Output

Subindex	Name	Number of Bits	Data Values
1	Laser Status	1	0 = Enabled 1 = Disabled

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

Example Based on the Value Above

Laser Status = 1 (Disabled)

Parameters Set Using IO-Link

These parameters can be read from and/or written to an IO-Link model of the Q5XLAF5000 and Q5XKLAF10000 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?
0	1-16	Direct Parameter Page 1 (incl. Vendor ID & Device ID)			ro			
1	1-16	Direct Parameters Page 2				rw		

Continued on page 4

© Banner Engineering Corp. All rights reserved.

Continued from page 3

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?
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 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				ro		
20		Product Text string				ro		
21		Serial Number				ro		
22		Hardware Version				ro		
23		Firmware Version				ro		
24		App Specific Tag (user defined)				rw	y	
25		Function Tag				rw	y	
26		Location Tag				rw	y	
27-35		*reserved*						
36		Device Status	8-bit integer	0 = Device is OK 4 = Failure		ro		
37		Detailed Device Status	Array[6] of 3-octet			ro		
38-39		*reserved*						
40		Process Data Input		*see Process Data In*		ro		
41		Process Data Output		*see Process Data Out*		ro		
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	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	50–10000 mm	250 mm	rw	y	y
60	2	BDC1 Setpoint SP2 (FGS mode only)	32-bit integer	50–10000 mm	0 mm	rw	y	y

Continued on page 5

© Banner Engineering Corp. All rights reserved.

Continued from page 4

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?
61		**BDC1 Configuration**						
61	1	BDC1 Switchpoint Logic	8-bit integer	0 = LO 1 = DO	0	rw	y	y
61	2	BDC1 Mode	8-bit integer	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	-10000–10000 mm	0	rw	y	y
62		**BDC2 Setpoints**						
62	1	BDC2 Setpoint SP1	32-bit integer	50–10000 mm	500 mm	rw	y	y
62	2	BDC2 Setpoint SP2 (FGS mode only)	32-bit integer	50–10000 mm	0 mm	rw	y	y
63		**BDC2 Configuration**						
63	1	BDC2 Switchpoint Logic	8-bit integer	0 = LO; 1 = DO	0	rw	y	y
63	2	BDC2 Mode	8-bit integer	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	-10000 mm – 10000 mm	0	rw	y	y
64		**Configuration**						
64	1	Response Speed	8-bit Uinteger	0 = 2 ms 1 = 5 ms 2 = 15 ms 3 = 50 ms 4 = 250 ms	3	rw	y	
64	2	Gain	8-bit Uinteger	0 = Normal excess gain mode; 1 = Best accuracy excess gain mode; 2 = High excess gain mode	1	rw	y	
	3	Secondary Output Function	8-bit Uinteger	0 = Remote Teach Input; 1 = Laser On; 2 = Master; 3 = Slave; 4 = Complementary Output; 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=Off	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	Display Units	8-bit Uinteger	0 = Centimeters 1 = Inches 2 = Millimeters	0	rw	y	
64	8	Pushbutton Lockout	8-bit Uinteger	0 = No Lock-out 1 = Pushbuttons Locked 2 = Operator Lockout	0	rw	y	
64	9	Output Polarity	8-bit Uinteger	0 = Default 1 = PNP 2 = NPN	0	rw	y	
64	10	IOL Filter Time (ms)	16-bit Uinteger	0-65535	0	rw	y	
64	11	Include Binary Data in Process Data	8-bit Uinteger	0 = Include 1 = Don't Include 2 = Measurement Device	0	rw	y	
64	12	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	13	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	

Continued on page 6

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

© Banner Engineering Corp. All rights reserved.

Continued from page 5

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?
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	32-bit integer	-4050 mm – 4050 mm	0 mm	rw	y	
65	7	BDC1 FGS User Window Size	32-bit integer	20 mm – 4050 mm	0 mm	rw	y	
65	8	BDC1 Auto-Thresholding	8-bit Uinteger	0 = On 1 = Off 2 = High Speed	1	rw	y	
66		**BDCD Vendor Specific Configuration**						
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	32-bit integer	-4050 mm – 4050 mm	0 mm	rw	y	
66	7	BDC2 FGS User Window Size	32-bit integer	20 mm – 4050 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 Distance: (distance in mm)	32-bit integer			ro		
67	2	Excess Gain	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	Emitter Status	8-bit Uinteger	0 = Active 1 = Inactive		ro		
67	5	Laser Fault Status	8-bit Uinteger	0 = Not Present 1 = Laser Fault Present		ro		
67	6	BDC1 Totalizer Counts	16-bit Uinteger			ro		
67	7	BDC2 Totalizer Counts	16-bit Uinteger			ro		
67	8	Temperature (in 0.1 °C)	16-bit integer			ro		
67	9	Last Taught Temperature (in 0.1 °C)	16-bit integer			ro		
68		*unused/reserved*						
69		**All-Time Run Time**						
69	1	Run counter (0.25 hr)	32-bit Uinteger			ro		
70		**Resettable Run Time**						
70	1	Run counter (0.25 hr)	32-bit Uinteger		0	rw		
71		**Pulse Frequency Configuration**						
71	1	Near Frequency	32-bit integer	100 Hz – 45000 Hz	100 Hz	rw	y	
71	2	Far Frequency	32-bit integer	100 Hz – 45000 Hz	600 Hz	rw	y	
72		**Display String**						
72	1	Line 1	5-octet String US_ASCII			ro		
76		**All-Time Run Time Event Time**						
76	1	Event Time (0.25 hr)	32-bit Uinteger	0–2147483647	0	rw	y	
77		**Resettable Run Time Event Time**						
77	1	Event Time (0.25 hr)	32-bit Uinteger	0–2147483647	0	rw	y	
78		**Pulse Frequency Setpoints**						
	1	Setpoint SP1	32-bit UInteger	Switch point 30-10000 mm	30 mm	rw	y	
	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; 30-10000 mm	5000 mm	rw	y	
79		**Pulse Frequency LOS Frequency**						
	1	Pulse Frequency LOS Frequency	32-bit UInteger	Frequency used to indicate Loss-of-Signal; 50-45000 Hz	50 Hz	tw	y	

Continued on page 7

© Banner Engineering Corp. All rights reserved.

Continued from page 6

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile?
16512		**MDC Descriptor**		**Measuring Data Channel Descriptor - Smart Sensor Profile 2nd Edition**				
16512	1	Lower Limit	32-bit integer			ro		
16512	2	Upper Limit	32-bit integer			ro		
16512	3	Unit	16-bit uinteger	1010 = m		ro		
16512	4	Scale	8-bit integer	-2 = range shift of $(10)^{-2}$		ro		

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	Name	Description
25376 (0x6320)	Error	Parameter error	Check datasheet and values
36000 (0x8CA0)	Warning	All-time Run Time Event	Event indicating the corresponding configured running time has elapsed.
36001 (0x8CA1)	Warning	Resettable Run Time Event	Event indicating the corresponding configured running time has elapsed.
36003 (0x8CA3)	Notification	Teach Completed Event	Event indicating a teach has been completed.
36004 (0x8CA4)	Notification	Factory Settings Restored Event	Event indicating that the factory settings have been restored.
36005 (0x8CA5)	Notification	Teach Coerced Event	Event indicating a taught condition resulting in a setpoint being coerced. Taught was updated.
36007 (0x8CA7)	Notification	Teach Failed Event	Event indicating an invalid target condition was attempted to be taught. Taught setpoint was not updated.
36096 (0x8d00)	Error	Laser fault event	Indicate that the laser drive has been shut down due to a safety fault.
36097 (0x8D01)	Error	System Fault Event	Contact Banner Engineering to resolve.

Document title: Q5XKLAF5000 and Q5XKLAF10000 IO-Link Data Reference Guide
Part number: 217157
Revision: C
Original Instructions
© Banner Engineering Corp. All rights reserved.



© Banner Engineering Corp. All rights reserved.