IO-Link Data Reference Guide: QS18 Expert

IO-Link Data Map

This document refers to the following IODD file: Banner_Engineering-QS18E-20181015-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
IO-Link revision	V1.1
Process Data In length	32 bits
Process Data Out length	8 bits
Bit Rate	38400 bps
Minimum cycle time	3.6 ms

Parameter	Value
Port class	A
SIO mode	Yes
Smart sensor profile	Yes
Block parameterization	Yes
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 QS18 Expert IO-Link Process Data is 32 bits in size and includes the state of the output channel and the health state of the sensor. This information is sent to the IO-Link master every 2.3 ms.

Process Data Input			
Subindex	**Name**	**Number of Bits**	**Data Values**
1	Output State	1	0=Inactive, 1=Active
2	Health State	1	0=Inactive, 1=Active
3	Marginal Light State	1	0=Inactive, 1=Marginal Light
4	Marginal Dark State	1	0=Inactive, 1=Marginal Dark
5	Normalized Signal Strength	10	NSS Value 0-990, 999
6	Process Data Input Configuration	16	Value depends on "Vendor Specific Configuration.Process Data Input Configuration" Selection Choice 1 - Signal Choice 2 - Count Choice 3 - Duration Choice 4 - Events per Minute

Octet 0								
Subindex	6	6	6	6	6	6	6	6
Bit offset	31	30	29	28	27	26	25	24
Value	0	0	0	0	0	1	1	0

Octet 1								
Subindex	6	6	6	6	6	6	6	6
Bit offset	23	22	21	20	19	18	17	16
Value	0	1	0	0	1	0	1	1

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

Octet 2								
Subindex	////	////	5	5	5	5	5	5
Bit offset	15	14	13	12	11	10	9	8
Value	N/A	N/A	1	1	1	1	0	1

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

Based on the values in the example tables:

- Output State: Active
- Health State: Active
- Marginal Light State: Inactive
- Marginal Dark State: Inactive
- Normalized Signal Strength: 990
- Process Data Input Configuration (Signal): 1611

IO-Link Process Data Out (Master to Device)

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

Process Data Out allows for easily turning the emitter on and off. This information is sent from the IO-Link Master every 3.6 ms.

Process Data Out			
Subindex	**Name**	**Number of bits**	**Data Values**
1	Emitter LED	1	0 = Emitter On 1 = Emitter Off

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

Based on the values in the example table above: Emitter LED: Off.

Parameters Set Using IO-Link

These parameters can be read from and/or written to an IO-Link model of the QS18EK6 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	1-15	Direct Parameter Page 1 (incl. Vendor ID & Device ID)				ro			y

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile	AOI
0	16	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 = Dynamic Teach Stop 79 = S1 Exit Teach 130 = Restore Factory Settings 162 = Discovery Start 163 = Discovery Stop 164 = Reset Output Event		wo			y
1	1-16	Direct Parameters Page 2				rw			
2		Standard Command	8-bit uinteger	65 = SP1 Single Value Teach 67 = SP1 Two Value Teach TP1 68 = SP1 Two Value Teach TP2 71 = SP1 Dynamic Teach Start 72 = Dynamic Teach Stop 79 = S1 Exit Teach 130 = Restore Factory Settings 162 = Discovery Start 163 = Discovery Stop 164 = Reset Output Event		wo		y	y
3		Data Storage Index (device-specific list of parameters to be stored)							
4-11		*reserved by IO-Link Specification*							
12		**Device Access Locks**							
12	1	Parameter Write Access Lock		0 = off 1 = on	0	rw	y		y
12	2	Data Storage Lock		0 = off 1 = on	0	rw	y		y
12	3	Local Parameterization Lock		0 = off 1 = on	0	rw	y		y
12	4	Local User Interface Lock		0 = off 1 = on	0	rw	y		y
13-15		*unused*				ro			
16		Vendor Name string		Banner Engineering Corporation		ro			
17		Vendor Text string		More Sensors. More Solutions		ro			
18		Product Name string		QS18 Expert IO-Link series		ro			
19		Product ID string				ro			
20		Product Text string		More Sensors. More Solutions		ro		y	
21		Serial Number				ro			y
22		*unused*				ro			
23		Firmware Version				ro		y	
24		App Specific Tag (user defined)				rw	y	y	
25-35		*reserved*							
36		Device Status	8-bit integer	0=Device is OK 1=Maintenance required 2=Out of specification 3=Functional check 4=Failure 5..255 Reserved		ro			

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile	AOI
37		Detailed Device Status	Array[6] of 3-octet			ro			
38-39		*reserved*							
40		Process Data Input				ro			
41		Process Data Output				ro			
42-60		*unused/reserved*							
61		**BDC1 Configuration**							
61	1	BDC1 Switchpoint Logic	8-bit uninteger	0 = LO 1 = DO	0 for all models except LP; LP default is 1	rw	y	y	y
61	2	BDC1 Mode	8-bit uninteger	128 = Light Set 129 = Dark Set 130 = Window Set 131 = Two Point Teach 132 = Dynamic Teach	131 for all models except LP; LP default is 128	rw	y	y	y
61	3	Hysteresis	16-bit uninteger	0 = Minimum 1 = Standard 2 = Double	1	rw	y	y	y
62-64		*unused*							
65		**BDC1 Vendor Specific Configuration**							
65	1	BDC1 Delay Mode	8-bit uinteger	0 = Disabled 1 = On-Off Delay 2 = Oneshot	0	rw	y		y
65	2	BDC1 Delay Time 1 (Off Delay/One-Shot Delay) (ms)	32-bit integer	0-90000	0	rw	y		y
65	3	BDC1 Delay Time 2 (On Delay Time) (ms)	32-bit integer	0-90000	0	rw	y		y
65	4	BDC1 Auto Compensation	8-bit uinteger	0 = Disabled 1 = Enabled	0	rw	y		y
65	5	BDC1 Offset Percentage	8-bit uinteger	0 = Minimum 1 = 10% 2 = 15% 3 = 20% 4 = 25% 5 = 30% 6 = 40% 7 = 50% 8 = 100% 9 = 200%	5	rw	y		y
65	6	BDC1 Response Speed	8-bit uinteger	0 = High Speed (350 µs On/Off) 1 = Standard (1 ms On/Off) 2 = Robust (2 ms On/1 ms Off)	1	rw	y		y
65	7	BDC1 Health State Threshold (%)	8-bit uinteger	0..90	50	rw	y		y
65	8	BDC1 Marginal Signal Delay (ms)	16-bit uinteger	0..60000	3000	rw	y		y
66-68		*unused*							
69		All Time Run Time (hrs)	32-bit integer			ro			y
70		Resettable Run Time (hrs)	32-bit integer			ro			y

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile	AOI
71		Quality of Health (The current adapted switching threshold normalized to original taught signal)	8-bit uinteger	0-200		ro			y
72		Normalized Signal Strength (The current signal strength normalized to the current switching threshold)	16-bit uinteger	0-990 = non-saturated 999 = saturated signal		ro			y
73		Quality of Teach The original taught signal normalized to 1.5 times the minimally acceptable teach value. A value of 100 or higher is a reliable teach condition. Less than 100 means that the sensor has less than a 50% signal strength reserve. The quality of teach is a snapshot of the teach process and does not change until the sensor is taught again. Optimizing sensor to target alignment can result in higher values.	8-bit uinteger	0-200		ro			y
74		**Health Thresholds**							
74	1	Upper Limit	8-bit uinteger			ro			y
74	2	Lower Limit	8-bit uinteger			ro			y
75		**Sensing Thresholds**							
75	1	SP1 Upper Threshold	16-bit uinteger			ro			y
75	2	SP1 Lower Threshold	16-bit uinteger			ro			y
75	3	SP2 Upper Threshold	16-bit uinteger			ro			y
75	4	SP2 Upper Threshold	16-bit uinteger			ro			y
76		**Vendor Specific Configuration**							
76	1	Polarity of Pins 2 and 4	8-bit uinteger	0 = Push Pull 1 = PNP 2 = NPN	0	rw	y		y
76	2	Pin 2 Configuration	8-bit uinteger	0 = Deactivated 1 = Pin 2 Emitter Enable 2 = Pin 2 Emitter Disable 3 = Remote Input 4 = Detection Output 5 = Complimentary Output 6 = Normally Closed Health 7 = Normally Open Health 8 = Normally Closed Marginal 9 = Normally Open Marginal	4	rw	y		y
76	3	Process Data Input Configuration	8-bit uinteger	0 = Standard Five and Signal 1 = Standard Five and Count 2 = Standard Five and Duration 3 = Standard Five and Events Per Minute	3	rw	y		y

Index	Sub-index	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile	AOI
76	4	Marginal state threshold mode selection	8-bit uinteger	0 = Disable (marginal outputs remain inactive for all sensing conditions) 1 = Auto (default). Thresholds calculated by the sensor based on offset percentages and hysteresis values. 2 = User (Marginal Light and Dark thresholds can be set by the user)	1	rw	y		y
76	5	User Marginal Light Threshold (% of current switching threshold)	16-bit uinteger	0..1000	108	rw	y		y
76	6	User Marginal Dark Threshold (% of current switching threshold)	16-bit uinteger	0..1000	92	rw	y		y
76	7	LED Power Level	8-bit uinteger	0 = Auto 1 = Min Power 2 = Power 2 3 = Power 3 4 = Power 4 5 = Power 5 6 = Max Power					y
77		Operation Mode	8-bit uinteger	128 = Light Set 129 = Dark Set 130 = Window Set 131 = Two Point Teach 132 = Dynamic Teach		ro			y
78		All Time Run Time Event (.25 hrs)	32-bit uinteger	0 = disable raising event 1..2147483647	0	rw	y		y
79		Resetable Run Time Event Time	32-bit uinteger	0 = disable raising event 1..2147483647	0	rw	y		y
80		Output Event Count	16-bit uinteger	0..65535		ro			y
81		Output Event Duration (ms)	16-bit uinteger	0..65535		ro			y
82		Output Events Per Minute	16-bit uinteger	0..65535		ro			y
83		**Active Marginal Thresholds**							
83	1	Active Marginal Light Thresholds (% of current switching threshold)	16-bit uinteger	0..990		ro			y
83	2	Active Marginal Dark Thresholds (% of current switching threshold)	16-bit uinteger	0..990		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	Name	Description
25376 (0x6320)	Error	Parameter Error	Check data sheet 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 Point Coerced Event	One or more taught positions were outside the sensing range of the device

Code	Type	Name	Description
36006 (0x8ca6)	Notification	Teach Offset Causes Coercion Event	Applying the configured teach offset would place the setpoint outside the range of the device
36006 (0x8ca7)	Notification	Teach Cancel Event	Event indicating a teach has been canceled

© Banner Engineering Corp. All rights reserved