IO-Link Data Map

This document refers to the following IODD file: Banner_Engineering-K50Z-20231222-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	2.6 ms		Data Storage	Yes
Device ID	0x0d0001			

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 K50Z IO-Link Process Data is 32-bits and can be configured using parameter data to include the measurement distance, the state of the stability indicator, and/or the state of both output channels. This information is sent to the IO-Link master every 2.6 ms.

Index 64, Subindex 5 = 0

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 (Zone 1)	1	0 = no target/marginal, 1 = stable
4	Stability (Zone 2)	1	0 = no target/marginal, 1 = stable
5	Measurement 1 Value	12	
6	Measurement 2 Value	16	

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	0	1	0

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

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

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Example based upon the Value above

- Channel 1 Output = Active
- Channel 2 Output = Inactive
- Stability (Zone 1) = Stable
- Stability (Zone 2) = Stable
- Measurement 1 Value = 4095
- Measurement 2 Value = 694

Index 64, Subindex 5 = 1

Subindex	Process Data Input Name	Number of Bits	Data Values
1	Measurement 1 Value	16	
2	Measurement 2 Value	16	

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	0	0

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 upon the Value above

- Measurement 1 Value = 26511
- Measurement 2 Value = 75

Index 64, Subindex 5 = 2

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, 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
Value	0	0	0	0	0	0	0	1

Octet 1								
Subindex	1	1	1	1	1	1	1	1

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Octet 1								
Bit offset	23	22	21	20	19	18	17	16
Value	1	1	1	1	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 upon the Value above

- Measurement Value = 509
- Measurement Scale = -2
- Stability State = no target/marginal
- Channel 2 Output State = Active
- Channel 1 Output State = Inactive

IO-Link Process Data Out (Master to Device)

Subindex	Name	Number of Bits	Data Values
1	Emitter Disable	1	0 = Active, 1 = Inactive

Octet 3								
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 upon the Value above

- Emitter Disable = 1 (Inactive)

Parameters Set Using IO-Link

These parameters can be read from and/or written to an IO-Link model of the K50Z 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	Subindex	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		
2		Standard Command		65 = SP1 Single Value Teach 67 = SP1 Two Value Teach TP1 68 = SP1 Two Value Teach TP2 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	

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Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile
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		K50Z		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, 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		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	20 mm..2000 mm	300 mm	rw	y	y
60	2	BDC1 Setpoint SP2 (FGS mode only)	32-bit Integer	20 mm..2000 mm	300 mm	rw	y	y
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 Object SET, 128 = One-Point static BGS, 129 = Two-Point Window (FGS)	1	rw	y	y
61	3	BDC1 Hysteresis	16-bit Integer	-2000 mm..+2000 mm	0	rw	y	y
62		**BDC2 Setpoints**						
62	1	BDC2 Setpoint SP1	32-bit Integer	20 mm..2000 mm	2000 mm	rw	y	y
62	2	BDC2 Setpoint SP2 (FGS mode only)	32-bit Integer	20 mm..2000 mm	2000 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 Object SET, 128 = One-Point static BGS, 129 = Two-Point Window (FGS)	1	rw	y	y
63	3	BDC2 Hysteresis	16-bit Integer	-2000 mm..+2000mm	0	rw	y	y

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Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile
64		**Configuration**						
64	1	Response Speed	8-bit Uinteger	0 = Reduced Resolution. Fast, 1 = Reduced Resolution, Medium, 2 = Reduced Resolution, Slow, 3 = Fast, 4 = Medium, 5 = Slow	3	rw	y	
64	2	Remote Input Mode	8-bit Uinteger	0 = Remote Teach Input, 1 = Emitter On, 2 = Emitter Off 3 = Disabled	0	rw	y	
64	3	Secondary Output Function	8-bit Uinteger	0 = Independent Output, 1 = Complementary Output, 2 = Pulse Frequency Modulation	0	rw	y	
64	4	IOL Filter Time	16-bit Uinteger	0–65535	0	rw	y	
64	5	Include Binary Data in Process Data	8-bit Uinteger	0 = Include, 1 = Don't Include, 2 = Measurement Device	0	rw	y	
64	6	Measurement 1 Selection	8-bit Uinteger	0 = Disabled, 1 = Excess Gain (Zone 1), 2 = Excess Gain (Zone 2), 3 = Excess Gain / 10 (Zone 1), 4 = Excess Gain / 10 (Zone 2), 5 = Measurement Value (Zone 1), 6 = Measurement Value (Zone 2)	5	rw	y	
64	7	Measurement 2 Selection	8-bit Uinteger	0 = Disabled, 1 = Excess Gain (Zone 1), 2 = Excess Gain (Zone 2), 3 = Excess Gain / 10 (Zone 1), 4 = Excess Gain / 10 (Zone 2), 5 = Measurement Value (Zone 1), 6 = Measurement Value (Zone 2)	6	rw	y	
64	8	Digital Measuring Sensor Zone Selection	8-but UInteger	0 = Zone 1, 1 = Zone 2	0	rw	y	
65		**BDC1 Vendor Specific Configuration**						
65	1	BDC1 Delay Mode	8-bit Uinteger	0 = Disabled, 1 = On-Off Delay, 2 = Oneshot	0	rw	y	
65	2	BDC1 Delay Time On/Oneshot	32-bit Uinteger	0..90000	0ms	rw	y	
65	3	BDC1 Delay Time Off	32-bit Uinteger	0..90000	0ms	rw	y	
65	4	BDC1 BGS Teach Offset Mode	8-bit Uinteger	0 = Auto, 1 = User Selected	0	rw	y	
65	5	BDC1 User Teach Offset	32-bit Integer	-1980 mm..+1980 mm	0mm	rw	y	
66		**BDC2 Vendor Specific Configuration**						
66	1	BDC2 Delay Mode	8-bit Uinteger	0 = Disabled, 1 = On-Off Delay, 2 = Oneshot	0	rw	y	
66	2	BDC2 Delay Time 1	32-bit Uinteger	0..90000	0ms	rw	y	
66	3	BDC2 Delay Time 2	32-bit Uinteger	0..90000	0ms	rw	y	
66	4	BDC2 BGS Teach Offset Mode	8-bit Uinteger	0 = Auto, 1 = User Selected	0	rw	y	
66	5	BDC2 User Teach Offset	32-bit Integer	-1980 mm..+1980 mm	0mm	rw	y	
67		**Status**						
67	1	Measurement Value (Zone 1)	32-bit Integer			ro		
67	2	Excess Gain (Zone 1)	32-bit Integer			ro		
67	3	Stability (Zone 1)	8-bit Uinteger	0 = No target, 1 = Marginal Signal, 2 = Stable		ro		
67	4	Measurement Value (Zone 2)	32-bit Integer			ro		
67	5	Excess Gain (Zone 2)	32-bit Integer			ro		
67	6	Stability (Zone 2)	8-bit Uinteger	0 = No target, 1 = Marginal Signal, 2 = Stable		ro		
67	7	Emitter Status	8-bit Uinteger	0 = Active, 1 = Inactive		ro		
67	8	Temperature	16-bit Integer			ro		
67	9	Last Taught Temperature	16-bit Integer			ro		
71		**Pulse Frequency Configuration**						
71	1	Near Frequency	32-bit Integer	100..100000	100Hz	rw	y	
71	2	Far Frequency	32-bit Integer	100..100000	600Hz	rw	y	
78		**Pulse Frequency Setpoints**						
78	1	Setpoint SP1	32-bit Integer	20..2000	20	rw	y	

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Index	Subindex	Name	Length	Value Range	Default	Access Rights	Data Storage?	Smart Sensor Profile
	2	Setpoint SP2	32-bit Integer	20..2000	2000	rw	y	
79	1	Pulse Frequency LOS Frequency	32-bit Uinteger	50..100000	50	rw	y	
16512		**MDC Descriptor**		**Measuring Data Channel Descriptor - Smart Sensor Profile 2nd Edition**				
16512	1	Lower Limit	32-bit Integer			ro		y
16512	2	Upper Limit	32-bit Integer			ro		y
16512	3	Unit	16-bit Uinteger	1010 = m		ro		y
16512	4	Scale	8-bit Integer	-2 = range shift of $(10)^{-2}$		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 datasheet and values.
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. Setpoints were updated.
36007 (0x8CA7)	Notification	Teach Failed Event	Event indicating an invalid target condition was attempted to be taught. Setpoints were not updated.
36097 (0x8D01)	Error	System Fault Event	Contact Banner Engineering to resolve.

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