

IO-LINK PARAMETER

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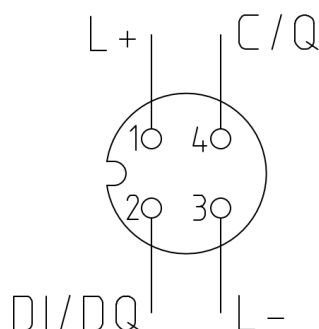
1 General Information

1.1 Target group

This instruction is addressed to skilled personnel and has to be read carefully by each person who fits, puts into operation, runs, maintains, removes or scraps the system.

1.2 Electrical connection

The plug M12 is used as electrical connector. The sensor is designed for **port class A**.



L+: 18-33VDC

L-: GND

C/Q: IO-link / switching output

DI/DQ: switching output

2 IO-link

The sensor can be used in IO-Link mode (IOL) as well as in standard-IO-mode (SIO). The IO-link mode communicates via Pin 4 – in the SIO mode Pin 4 is a normal switching output. There is an additional switching output on Pin 2 which is independent.

2.1 IO Device Description (IODD)

Please find the IODD for the sensor www.ioddfinder.io-link.com/#/.

2.2 IO-link version / profile

The sensor conforms to the standardised IO-link specification V1.1, IO-Link Common Profile V1.0 and the Smart Sensor Profile ED2. Find further information here www.io-link.com.

3 IO-link parameter

3.1 GeneralParameter / direct parameter

The «Direct Parameter» contains the most important parameters for a successful communication with the master. Huba Control AG has Vendor ID 0x051A.

Parameter name	Index	Subindex	Bit offset	Unit	Default	
Direct parameters 1	0	0		RecordT		rw
Min Cycle Time		3	104	UIntegerT_8	3300us	rw
Process Data Input Length		6	80	UIntegerT_8	4	rw
Process Data Output Length		7	72	UIntegerT_8	0	rw
Vendor ID 1		8	64	UIntegerT_8	0x05	rw
Vendor ID 2		9	56	UIntegerT_8	0x1A	rw
Device ID 1		10	48	UIntegerT_8	System specific	rw
Device ID 2		11	40	UIntegerT_8	System specific	rw
Device ID 3		12	32	UIntegerT_8	System specific	rw

3.2 Identification

The Identification of the sensor is carried out with the IO-link Common Profile V1.0. In addition each sensor is explicitly identifiable by «Globally Unique Identifier».

Parameter name	Index	Subindex	Unit	Default	
Vendor name	16	0	StringT [64]	Huba Control AG	ro
Vendor text	17	0	StringT [64]	www.hubacontrol.com	ro
Product name	18	0	StringT [64]		ro
Product ID	19	0	StringT [64]		ro
Product text	20	0	StringT [64]		ro
Serial number	21	0	StringT [16]		ro
Hardware version	22	0	StringT [64]		ro
Firmware version	23	0	StringT [64]		ro
Application Specific Tag	24	0	StringT [16]	***	rw
Function Specific Tag	25	0	StringT [16]	***	rw
Location Specific Tag	26	0	StringT [16]	***	rw
Globally Unique Identifier	70	0	StringT [36]		ro

3.3 Smart Sensor Profile – Digital measuring Sensor SSP 3.1

The process data are transferred as 32 bit Frame. 16 bit are reserved for measuring data (-32768 to 32767). Further 8 bit represent the scale of the measuring data as 10 potencies (-128 to 127). The other 8 bit are used as status bits. The Smart Sensor Profile recommends for pressure sensors the unit pascal. The pressure value can be calculated with the following formula.

PDI32.INT16_INT8

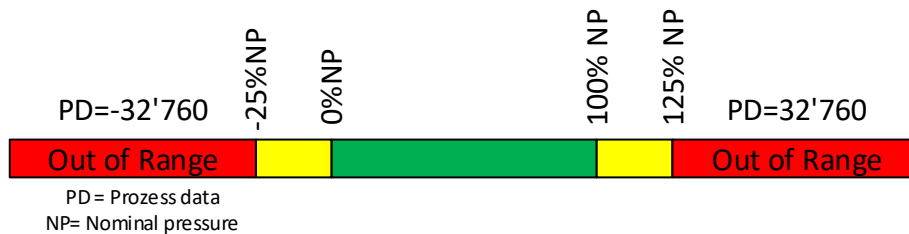
IntegerT(16)	IntegerT(8)	8 bit
Measurement value	Scale	Vendor specific.

$$\text{Pressure [Pa]} = \text{Measurement value} * 10^{\text{Scale}}$$

$$\text{Pressure [bar]} = \text{Measurement value} * 10^{(\text{Scale}-5)}$$

Parameter name	Index	Subindex	Bit offset	Unit	
Process value	40			RecordT	ro
Measurement value		1	16	UIntegerT_16	ro
Scale		2	8	IntegerT_8	ro
Switch Output 1		3	0	BooleanT	ro
Switch Output 2		4	1	BooleanT	ro
Overpressure		5	2	BooleanT	ro
Underpressure		6	3	BooleanT	ro
Short circuit		7	4	BooleanT	ro
Voltage out of specification		8	5	BooleanT	ro
Temperature critical		9	6	BooleanT	ro
Device fault		10	7	BooleanT	ro

The process data are valid between -25% nominal pressure and 125% nominal pressure. Are these limits passed, an out of range event is released and the process value is set to +/- 32'760.



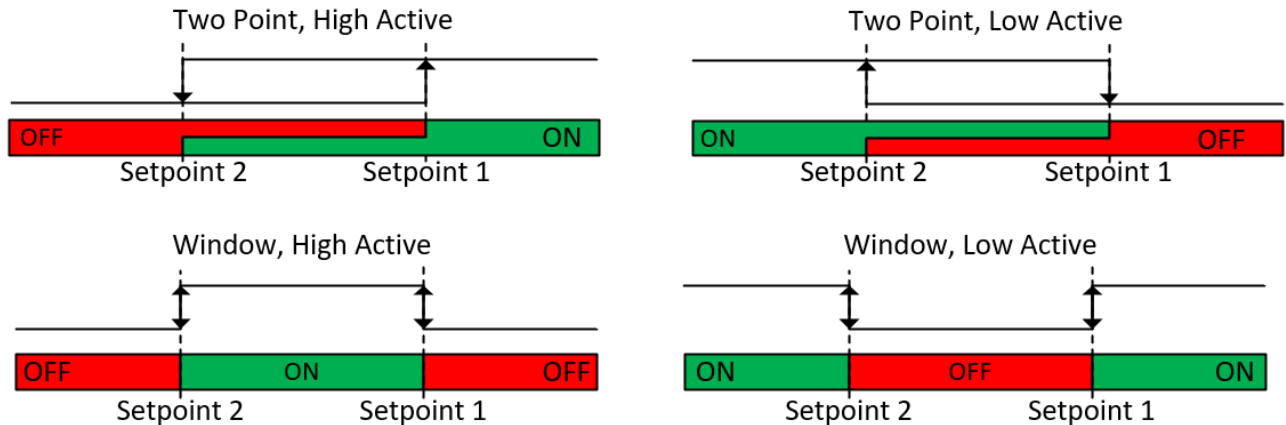
The «Measurement Data Channel Descriptor» belongs also to Smart Sensor Profile and describes the structure of the process data.

Parameter name	Index	Subindex	Bit offset	Unit	Remarks	
MDC Descriptor	16512	0		RecordT		ro
Lower value measurement range		1	56	IntegerT_32	100 % nominal pressure	ro
Upper value measurement range		2	24	IntegerT_32	0 % nominal pressure	ro
Unit code		3	8	UIntegerT_16	1130 for «Pa»	ro
Scale		4	0	IntegerT_8	System specific	ro

3.4 Configuration of the switching outputs

Both switching outputs are set by IO-link.

3.4.1 Setting switching points and function (SSC Config and SSC parameter index 111 - 113)



Parameter name	Index	Subindex	Bit offset	Unit	Remarks
SSC Config	111 / 113			RecordT	
Logic		1	24	UIntegerT_8	High Active (0), Low Active (1)
Mode		2	16	UIntegerT_8	Deactivated (0), Window (2), Two Point (3)
Hysteresis		3	0	UIntegerT_16	Not supported (0)

Parameter name	Index	Subindex	Bit offset	Unit	Remarks	
SSC Parameter	110 / 112			RecordT		rw
Setpoint 1 (SP1)		1	24	IntegerT_16	Switching point	rw
Setpoint 2 (SP2)		2	16	IntegerT_16	Reset	rw

The switching points have to fulfill the following conditions:

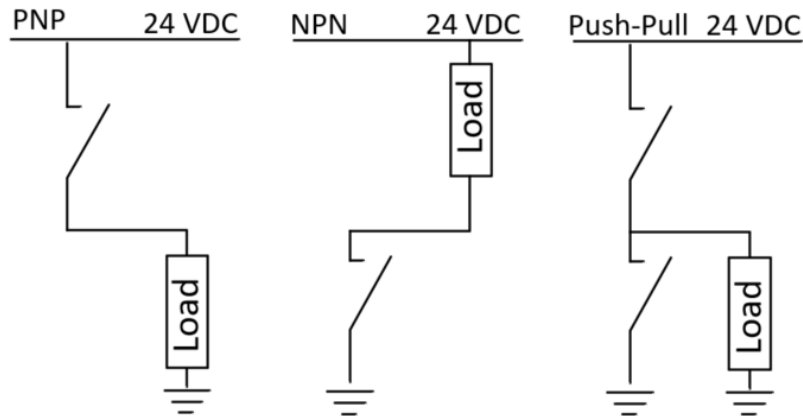
- Setpoint 1 – Setpoint 2 \geq 0.5% nominal pressure
- 100% nominal pressure \geq setpoint 1 \geq 0.5% nominal pressure
- 99.5% nominal pressure \geq setpoint 2 \geq 0% nominal pressure

3.4.2 Switching delay (Index 116-119)

Parameter name	Index	Subindex	Bit offset	Unit	Remarks	
Delay setpoint 1 (SP1)	116 / 118	0	0	UIntegerT_16	Delay switching point 1	rw
Delay setpoint 2 (SP2)	117 / 119	0	0	UIntegerT_16	Delay switching point 2	rw

3.4.3 Setting of switching function (Index 114 / 115)

Parameter name	Index	Subindex	Bit offset	Unit	Remarks	
Switch function	114 / 115	0	0	UIntegerT_8	PNP (0), NPN (1), Push Pull (2)	rw



3.4.4 Teach-In

The switching points can be set with the «Teach-In» function. With the parameter «Teach-In Select» the «Switching Channel» can be chosen. The «System Command Teach Setpoint 1 or 2» sets the switching points. Select the status of the Teach-In procedure in the register «Teach-In Result».

Parameter name	Index	Subindex	Bit offset	Unit	Remarks	
Teach-In Select	108	0	0	UIntegerT_8	Default Channel (SSC 1) (0), SSC 1 (1), SSC 2 (2)	rw

Parameter name	Index	Subindex	Bit offset	Unit	Remarks
Teach-In result	109			RecordT	
Flag SP2 TP2		5	7	BooleanT	Not supported (0)
Flag SP2 TP1		4	6	BooleanT	Not supported (0)
Flag SP1 TP2		3	5	BooleanT	Not supported (0)
Flag SP1 TP1		2	4	BooleanT	Not supported (0)
State		1	0	UIntegerT_4	IDLE (0), SP1 SUCCESS (1), SP2 SUCCESS (2), ERROR (7)

3.5 Diagnosis events

The exchange of diagnosis data between IO-Link master and IO-Link sensor is made by events composed of «Event Qualifier» and «Event Code». These data are exchanged non-cyclical between master and device.

- The «Event Qualifier» defines the kind of the event (signal, warning and error).
- The «Event Code» defines the event.

«Standard Events» are defined in the IO-link specifications which are used as far as possible.

Standard events			
Code	Type	Name	Default
0x4210	Warning	Device temperature over-run – clear source of heat	On
0x5000	Error	Device hardware fault – device exchange	On
0x5111	Warning	Primary supply voltage under-run – Check tolerance	On
0x7710	Error	Short circuit – Check installation	On
0x8C20	Error	Measurement range over-run – check application (pressure > 125% nominal pressure or pressure < -25% nominal pressure)	On

Non standard events			
Code	Type	Name	De- fault
0x8CA2	Warning	Over-pressure (set @105% nominal pressure – reset 103% nominal pressure)	Off
0x8CA3	Warning	Under-pressure (set @-5% nominal pressure – reset -3% nominal pressure)	Off
0x8CA6	Notification	New max value recorded	Off
0x8CA7	Notification	New min value recorded	Off

Switch on/off all diagnosis events in the register «Event enabled».

Parameter name	Index	Subindex	Bit offset	Unit	Default	
Event enabled	76	0		RecordT		rw
Temperature overrun		1	0	BooleanT	on (true)	rw
Device hardware fault		2	1	BooleanT	on (true)	rw
Supply voltage underrun		3	2	BooleanT	on (true)	rw
Short circuit		4	3	BooleanT	on (true)	rw
Measurement range overrun		5	4	BooleanT	on (true)	rw
Over-pressure		6	5	BooleanT	off (false)	rw
Under-pressure		7	6	BooleanT	off (false)	rw
Min Value recorded		8	7	BooleanT	off (false)	rw
Max Value recorded		9	8	BooleanT	off (false)	rw

3.6 Behaviour in case of error

Find the behaviour of the switching outputs in case of error in the following list.

Event Name	Switching status
Temperature overrun	No influence on the switching status
Device hardware fault	Behaviour acc. parameter «Switch n Error State».
Supply voltage underrun	No influence on the switching status
Short circuit	The concerned switching output is turned off until the short circuit is resolved.
Measurement range overrun	No influence on the switching status
Over-pressure	No influence on the switching status
Under-pressure	No influence on the switching status

Define the behaviour in case of an error with the following parameter «Device hardware fault».

Parameter Name	Index	Subindex	Unit	Remarks	
Switch 1 Error State	86	0	UIntegerT_8	Tri-State (0) (default), NPN/PNP: open / PushPull: High (1), NPN/PNP: closed / PushPull: Low (2), last state (3)	rw
Switch 2 Error State	87	0	UIntegerT_8	Tri-State (0) (default), NPN/PNP: open / PushPull: High (1), NPN/PNP: closed / PushPull: Low (2), last state (3)	rw

3.7 Diagnosis parameter

The minimal and maximal pressure values as well as the number of over-pressure cycles are recorded in the sensor. Further operating hours and errors are counted. The actual status of the device can be detected with the parameters «Device Status» and «Detailed Device Status» at any time.

Parameter name	Index	Unit	
Minimum value memory	106	IntegerT_16	ro
Maximum value memory	105	IntegerT_16	ro
Overload counter	77	UIntegerT_32	ro
Operation hours counter	75	UIntegerT_32	ro
Error counter	32	UIntegerT_16	ro
Device status	36	UIntegerT_8	ro
Detailed device status	37	ArrayT	ro

3.8 System adjustment

Parameter name	Index	Unit	Remarks	
System command	2	UIntegerT_8	Device reset (128), Restore factory setting (130), Erase minimum value (160), Erase maximum value (161), Correct zero point (162), Erase overload counter (163), Teach setpoint 1 (165), Teach setpoint 2 (166)	wo
Offset correction	104	IntegerT_16	+/- 5% des nominal pressure	rw
Filter time constant	90	UIntegerT_16	0 = off, in ms	rw

3.8.1 System command (Index 2 / UIntegerT_8)

System commands:

- Device Reset (128): restarts the system.
- Restore Factory Setting (130): resets all register to the initial state.
- Erase minimum value (160): resets the register «minimum value memory» (index 106).
- Erase maximum value (161): resets the register «maximum value memory» (index 105).
- Correct Zero Point (162): corrects the offset.
- Erase overload counter (163): resets the register «Overload Counter» (index 77).
- Teach Setpoint 1 / 2 (165 / 166): adopts the actual value as set point 1 / 2 of the chosen switch channel by teach-in select.

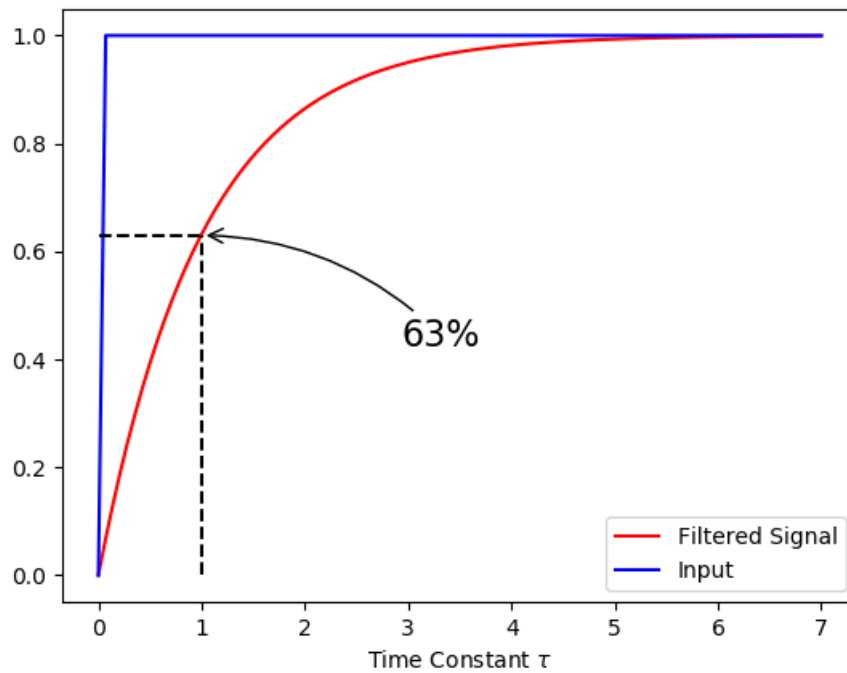
3.8.2 Offset correction (Index 104 / IntegerT_16)

Set an offset with this register. The offset has to be max. +/- 5% of the nominal pressure. The process value is calculated as follows.

$$process\ value = bridge\ value + offset$$

3.8.3 Tau of filter (index 90 / UIntegerT_16)

Adjust the low-pass filter 1st range (exponential moving average filter) with parameter «Filter Time Constant». With this parameter the length of a response time (Tau) in milliseconds is adjusted. After a response time (Tau) 63.2% of the input signal at the output is pending.



Scheme 1 step response of a TP 1. range