

## Documentation IO-Link

### Product: Electronic pressure switch with display, model PSD-4

#### 1. Description of the IO-Link functionality

IO-Link is a point-to-point connection for the communication of the PSD-4 with an IO-Link master.

#### 2. Physical layer

The PSD-4 supports the following features:

- IO-Link specification: Version 1.1
- SIO mode: Yes
- Minimum cycle time: 2,3 ms
- Rate: COM2 (38.4 kBaud)
- Process data length: 16 bit (Frametype 2.2)
- Support of data storage: Yes
- Smart Sensor Profile: Yes

#### 3. Process Data

The PSD-4 has 1 or 2 digital outputs and is optionally available with an 4 ... 20 mA or 0 ... 10 V analogue output signal. Both physical switching outputs are also transmitted as process data via IO-Link.

In the 'SIO Mode' (Standard I/O Mode, without IO-Link operation) the switching output 1 will switch on pin 4 of the M12 connector. In the IO-Link communication mode, this pin 4 is reserved exclusively for communication.

With a Frametype 2.2, the 16-bit process data from the pressure switch is transmitted cyclically. Bit 0 is the state of switching output 1 and Bit 1 is the state of switching output 2, where 1 respectively DC 24 V correspond to the "closed" logic state of the respective output.

The remaining 14 Bit contain the analogue value measured by the pressure switch. According to the measuring range of the sensor and the unit configured, the 14 Bit process data of the measured value, is dynamically adjusted. Multiplying the process data with the gradient (Index # 67) allows for a pressure reading in the selected unit.

Bit	Process value	Value range
0	OU1	0 = inactive; 1 = active
1	OU2	0 = inactive; 1 = active
2 ... 15	ProcessData	-8192 ... 8191

Example:

Measuring range of the sensor = 0 ... 10 psi

ProcessData range = 0...1,000 with Gradient = 0.01

⇒ In this example: ProcessData = 500 = 5.0 psi

Changing the unit, will result in new ProcessData range and Gradient.

#### 4. Service data (ISDU – Indexed Service Data Unit)

Service data is always acyclic and exchanged on the request of the IO-Link Master.

With the help of the service data, the following parameter values or instrument status can be read:

##### IO-Link specific parameters

Index dez (hex)	Name	Format	Length	Access	Default value	Value / Range	Remarks
16 (0x10)	Vendor Name	StringT	max. 64 octets	R	WIKAI Alexander Wiegand SE & Co. KG		
17 (0x11)	Vendor Text	StringT	max. 64 octets	R	<a href="http://www.wika.com">www.wika.com</a>		
18 (0x12)	Product Name	StringT	max. 64 octets	R	PSD-4		
19 (0x13)	Product ID	StringT	max. 64 octets	R	-		Similar to DeviceID
20 (0x14)	Product Text	StringT	max. 64 octets	R	-		Additional product information.
21 (0x15)	Serial Number	StringT	max. 16 octets	R	S#		Corresponds to serial number on the product label (S#...).
22 (0x16)	Hardware Revision	StringT	max. 64 octets	R	-		
23 (0x17)	Firmware Revision	StringT	max. 64 octets	R	-		
24 (0x18)	Application Specific Tag	StringT	max. 32 octets	R/W	-		Customer-specific measuring point name, Allowed Characters: "A...Z"; "0...9"; "-"; <space>
32 (0x20)	Error Count	UIntegerT	2 octets	R	-		Counts errors since power-on or reset.
36 (0x24)	Device status	UIntegerT	1 octet	R	-	0 = Device is OK 1 = Maintenance required 2 = Out of specification 3 = Functional check 4 = Failure	
37 (0x25)	Detailed Device Status	ArrayT of OctetStringT3	24 octets	R	00 00 00 h		Error storage

## Output signal settings

Index dez (hex)	Name	Format	Length	Access	Default value	Value / Range	Remarks
64 (0x40)	Order Number	StringT	max. 16 octets	R	-		Corresponds to article number on the product label (P#...).
66 (0x42)	Unit Process Data	UIntegerT	1 octet	R/W	Order-related	0 = bar 1 = mbar 2 = MPa 3 = kPa 4 = PSI 5 = kg/cm² 6 = %	Selection of unit for ProcessData and all related parameters (switch point settings, analogue output scaling, etc.)
67 (0x43)	Gradient	Float32T	4 octets	R	Order-related	-	Factor for the calculation of the pressure reading. The factor could be any decimal power. ProcessData multiplied by the gradient = actual pressure in set unit For example: 0...10 psi => ProcessData = 0...1000 with gradient: 0,01
68 (0x44)	Start of Measuring Range	IntegerT	2 octets	R	Order-related	-	Start of measuring range in set ProcessData unit
69 (0x45)	End of Measuring Range	IntegerT	2 octets	R	Order-related	-	End of measuring range in set ProcessData unit
70 (0x46)	OU1	UIntegerT	1 octet	R/W	HNO	0 = HNO = hysteresis function normally open 1 = HNC = hysteresis function normally closed 2 = FNO = window function normally open 3 = FNC = window function normally closed	Switching function – switching output 1
71 (0x47)	DS1	UIntegerT	2 octets	R/W	0	0...65000	Switch delay time switching output 1 [ms]
72 (0x48)	DR1	UIntegerT	2 octets	R/W	0	0...65000	Reset delay time switching output 1 [ms]
73 (0x49)	Damping OU1	UIntegerT	2 octets	R/W	0	0...65000	Damping for the switching signal 1 (τ = 99%) [ms]. 0 = no damping active
74 (0x4A)	Polarity OU1	UIntegerT	2 octets	R/W	PNP	0 = PNP 1 = NPN	Output Logic for switching output 1
80 (0x50)	OU2	UIntegerT	1 octet	R/W	HNO	0 = HNO = hysteresis function normally open 1 = HNC = hysteresis function normally closed 2 = FNO = window function normally open 3 = FNC = window function normally closed	Switching function – switching output 2 Only available for devices with 2 switching outputs PNP/NPN.
81 (0x51)	DS2	UIntegerT	2 octets	R/W	0	0...65000	Switch delay time switching output 2 [ms]
82 (0x52)	DR2	UIntegerT	2 octets	R/W	0	0...65000	Reset delay time switching output 2 [ms]
83 (0x53)	Damping OU2	UIntegerT	2 octets	R/W	0	0...65000	Damping for the switching signal 2 (τ = 99%) [ms]. 0 = no damping active
84 (0x54)	Polarity OU2	UIntegerT	2 octets	R/W	PNP	0 = PNP 1 = NPN	Output Logic for switching output 2
90 (0x5A)	OU3 Analogue Output Mode	UIntegerT	1 octet	R/W	4 ... 20 mA	0 = I / 4...20mA 1 = U / 0...10V	Signal setting of the analogue output. Only available for devices with analogue output 4 ... 20 mA / 0 ... 10 V.
91 (0x5B)	Analogue Output Damping	UIntegerT	2 octets	R/W	0	0...65000	Damping for the analogue output signal 2 (τ = 99%) [ms]. 0 = no damping active

## Output signal settings based on selected unit

Index 66 (0x42) "Unit ProcessData" defines which configurable parameters are shown in the IO-Link tool and which parameter is prioritized.

(e.g. Index 66 is set to "bar" -> Index 140-145 is shown and can be configured, any configuration in e.g. Index 155-160 in "psi" will be ignored.)

Index dez (hex)	Name	Format	Length	Access	Default value	Value / Range	Remarks
140 (0x8C)	Analog Output Start Value_bar	IntegerT	2 octets	R/W	Start of measuring range	Start ... end of measuring range	Defines the pressure value for start of analogue output signal (e.g. 10 bar = 4 mA). Only available for devices with analogue output.
141 (0x8D)	Analog Output End Value_bar	IntegerT	2 octets	R/W	End of measuring range	Start ... end of measuring range	Defines the pressure value for end of analogue output signal (e.g. 78 bar = 20 mA). Only available for devices with analogue output.
142 (0x8E)	SP1 / FH1_bar	IntegerT	2 octets	R/W	End of measuring range	(Start of meas. range + 0.25 %) ... end of meas. range	Switching point (or window high) value The value must always be higher than the reset point (or window low). The minimum gap between these two points has a value of 0,25% of pressure range. If the Gap is lower than the minimum hysteresis, the associate reset point will automatically be changed to observe the limits.
143 (0x8F)	RP1 / FL1_bar	IntegerT	2 octets	R/W	End of measuring range - 10% of range	Start of meas. range ... (end of meas. range - 0.25 %)	Reset point (or window low) value The value must always be lower than the switch point (or window high). The minimum gap between these two points has a value of 0,25% of pressure range. If the Gap is lower than the minimum hysteresis, the associate switching point will automatically be changed to observe the limits.
144 (0x90)	SP2 / FH2_bar	IntegerT	2 octets	R/W	End of measuring range	(Start of meas. range + 0.25 %) ... end of meas. range	See SP1 / FH1, only available for devices with 2 switching outputs.
145 (0x91)	RP2 / FL2_bar	IntegerT	2 octets	R/W	End of measuring range - 10% of range	Start of meas. range ... (end of meas. range - 0.25 %)	See RP1 / FL1, only available for devices with 2 switching outputs.
155 to 160 (0x9B to 0xA0)	Index 140 ... 145 in Unit "mbar"	IntegerT	2 octets	R/W	See 140 ... 145	See 140 ... 145	Index 140 ... 145 in Unit "mbar"
170 to 175 (0xAA to 0xAF)	Index 140 ... 145 in Unit "MPa"	IntegerT	2 octets	R/W	See 140 ... 145	See 140 ... 145	Index 140 ... 145 in Unit "MPa"
185 to 190 (0xB9 to 0xBE)	Index 140 ... 145 in Unit "kPa"	IntegerT	2 octets	R/W	See 140 ... 145	See 140 ... 145	Index 140 ... 145 in Unit "kPa"

Index dez (hex)	Name	Format	Length	Access	Default value	Value / Range	Remarks
200 to 205 (0xC8 to 0xCD)	Index 140 ... 145 in Unit "PSI"	IntegerT	2 octets	R/W	See 140 ... 145	See 140 ... 145	Index 140 ... 145 in Unit "PSI"
215 to 220 (0xD7 to 0xDC)	Index 140 ... 145 in Unit "kg_cm²"	IntegerT	2 octets	R/W	See 140 ... 145	See 140 ... 145	Index 140 ... 145 in Unit "kg_cm²"
230 to 235 (0xE6 to 0xEB)	Index 140 ... 145 in Unit "%"	IntegerT	2 octets	R/W	See 140 ... 145	See 140 ... 145	Index 140 ... 145 in Unit "%"

## Local display settings

Index dez (hex)	Name	Format	Length	Access	Default value	Value / Range	Remarks
100 (0x64)	Display Unit	UIntegerT	1 octet	R/W	Order-related	0 = bar 1 = mbar 2 = MPa 3 = kPa 4 = PSI 5 = kg/cm² 6 = %	Unit of the pressure reading on the display. Depending on the Measuring Range, it may be that some units are not available.
101 (0x65)	Display Rotation	BooleanT	1 octet	R/W	Standard	0 = Standard 1 = 180° rotated	Turns display indicator by 180°
102 (0x66)	Display Mode	UIntegerT	1 octet	R/W	Actual Pressure	0 = Actual Pressure 1 = Highest Pressure 2 = Lowest Pressure 3 = Off 4 = SP1 / FH1 5 = RP1 / FL1 6 = SP2 / FH2 7 = RP2 / FL2	Value shown in local display mode. "5" and "6" only available for devices with 2 switching outputs.
103 (0x67)	Display Password	StringT	4 octets	R/W	0000	0000...9999	Sets the password for local parametrization via display and buttons. "0000" = No Password
104 (0x68)	Display Damping	UIntegerT	2 octets	R/W	200	0...65000	Damping for the Display (τ = 99%) [ms]. 0 = no damping active
105 (0x69)	Display Update	UIntegerT	1 octet	R/W	5 Hz	0 = 1Hz 1 = 2Hz 2 = 5Hz 3 = 10Hz	Display update rate
106 (0x6A)	Locate me	BooleanT	1 octet	R/W	Off	0 = Off 1 = On	Helps to locate the device on a machine, flashes the switching output LEDs and displays "*****" on the display. - "Locate Me" has the highest priority, e.g. an error OL would have less priority - The flashing can only be disabled by setting the parameter to "off" - The buttons on the device will be disabled

107 (0x6B)	Display Resolution	UIntegerT	1 octet	R/W	OPT	0 = OPT (Optimized) 1 = FULL (Full Resolution)	OPT = optimised (stable measurement value on display with rounding factors for the last digit, optimised to the measuring range) FULL = maximum (finest resolution, if required for a stable measurement value on display, a damping must be set for the digital indicator)
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## Diagnosis

Index dez (hex)	Name	Format	Length	Access	Default value	Value / Range	Remarks
110 (0x6E)	Temperature Unit	UIntegerT	1 octet	R/W	°C	0 = °C 1 = °F	Unit of the internal temperature measurement.
111 (0x6F)	Actual Temperature	Float32T	4 octets	R	-		Internal temperature measurement of the electronic components.
112 (0x70)	Temperature Low	Float32T	4 octets	R	-		Displays the minimum temperature value in unit of temperature since first installation / since "reset low temperature".
113 (0x71)	Temperature High	Float32T	4 octets	R	-		Displays the maximum temperature value in unit of temperature since first installation / since "reset high temperature".
114 (0x72)	Temperature Low since Power Up	Float32T	4 octets	R	-		Displays the minimum temperature value in unit of temperature since last power-up.
115 (0x73)	Temperature High since Power Up	Float32T	4 octets	R	-		Displays the maximum temperature value in unit of temperature since last power-up.
120 (0x78)	Pressure Overload Counter	UIntegerT	4 octets	R	-		Duration in Pressure Overload Range (Display = "OL") [s]
121 (0x79)	Operating Hours Total	UIntegerT	4 octets	R	-		Displays the total amount of operating hours since first installation. [h]
122 (0x7A)	Operating Hours since Power Up	UIntegerT	4 octets	R	-		Displays the total amount of operating hours since power-up. [h]
123 (0x7B)	Sensor Status	UIntegerT	1 octet	R	-	Bit0 = Sensor is defect Bit1 = Overpressure Bit2 = Underpressure Bit3 = Overtemperature Bit4 = Undertemperature  „0" = no error / warning „1" = error / warning	Status of sensor self-diagnosis
124 (0x7C)	Low Pressure	IntegerT	2 octets	R			Displays the minimum pressure value in set unit of ProcessData since first installation / since reset with "Reset Low Pressure"
125 (0x7D)	High Pressure	IntegerT	2 octets	R			Displays the maximum pressure value in set unit of ProcessData since first installation / since reset with "Reset High Pressure"
126 (0x7E)	Low Pressure since Power Up	IntegerT	2 octets	R			Displays the minimum pressure value in set unit of ProcessData since last power-up.
127 (0x7F)	High Pressure Since Power Up	IntegerT	2 octets	R			Displays the maximum pressure value in set unit of ProcessData since last power-up.

## System commands

Index dez (hex)	Name	Format	Length	Access	Default value	Value / Range	Remarks
2 (0x02)	Device Reset	UIntegerT	1 octet	W	-	128 (0x80)	This feature restarts the device without change of parameters.
2 (0x02)	Restore Factory Settings	UIntegerT	1 octet	W	-	130 (0x82)	Restores the device to factory settings.
2 (0x02)	Reset High Pressure	UIntegerT	1 octet	W	-	160 (0xA0)	Resets the high pressure counter.
2 (0x02)	Reset Low Pressure	UIntegerT	1 octet	W	-	161 (0xA1)	Resets the low pressure counter.
2 (0x02)	Reset Pressure Overload Counter	UIntegerT	1 octet	W	-	162 (0xA2)	Clears the overload counter to zero.
2 (0x02)	Reset High Temperature	UIntegerT	1 octet	W	-	163 (0xA3)	Resets the high temperature counter.
2 (0x02)	Reset Low Temperature	UIntegerT	1 octet	W	-	164 (0xA4)	Resets the low temperature counter.
2 (0x02)	Adjust Zero Point	UIntegerT	1 octet	W	-	165 (0xA5)	Performs an "Autozero"

## Device Access Locks

Index dez (hex)	Name	Format	Length	Access	Default value	Value / Range	Remarks
12 (0x0C)	Device Access Locks	RecordT	2 octets	R/W	00 00 h (unlocked)	Bit 0: Parameter (write) access Bit 1: Data Storage Bit 2: Local Parametrization Bit 3: Local User Interface  0 = Unlocked, 1 = Locked	Bit 0: Disables change of parameters via IO-Link Bit 1: Disables data storage mechanism Bit 2: Disable change of parameters via buttons on the device Bit 3: Disable access on the menu via buttons on the device