Your Global Automation Partner

TURCK

PS325… | PS326…
Differential Pressure Sensors

IO-Link Parameters – IO-Link Version 1.1

Table of Contents

1 About This Manual

This manual describes the parameterization of devices using IO-Link. The manual contains general information on IO-Link and a list of the available parameters.

1.1 Target groups

These instructions are aimed at qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols used

The following symbols are used in these instructions:

⚠	**DANGER** DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.
⚠	**WARNING** WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.
⚠	**CAUTION** CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.
❗	**NOTICE** NOTICE indicates a situation which may lead to property damage if not avoided.
ℹ	**NOTE** NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.
▶	**CALL TO ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULTS OF ACTION** This symbol denotes relevant results of actions.

1.3 Other documents

Besides this document the following material can be found on the Internet at **www.turck.com**:
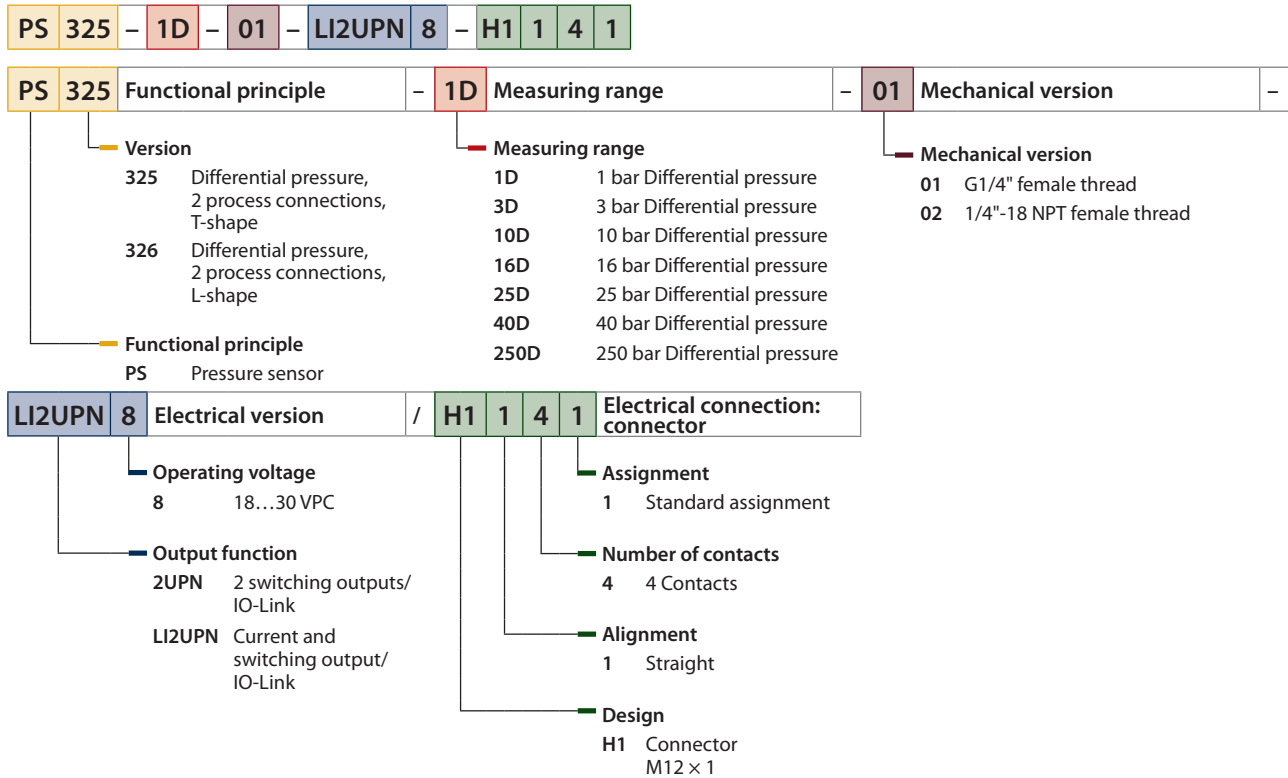
- Data sheet
- Quick Start Guide
- Operating instructions

1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to **techdoc@turck.com**.

2 Notes on the Product

2.1 Product identification

| PS | 325 | – | 1D | – | 01 | – | LI2UPN | 8 | – | H1 | 1 | 4 | 1 |

| PS | 325 | Functional principle | – | 1D | Measuring range | – | 01 | Mechanical version | – |

Version

| 325 | Differential pressure, 2 process connections, T-shape |
| 326 | Differential pressure, 2 process connections, L-shape |

Functional principle

| PS | Pressure sensor |

Measuring range

1D	1 bar Differential pressure
3D	3 bar Differential pressure
10D	10 bar Differential pressure
16D	16 bar Differential pressure
25D	25 bar Differential pressure
40D	40 bar Differential pressure
250D	250 bar Differential pressure

Mechanical version

| 01 | G1/4" female thread |
| 02 | 1/4"-18 NPT female thread |

| LI2UPN | 8 | Electrical version | / | H1 | 1 | 4 | 1 | Electrical connection: connector |

Operating voltage

| 8 | 18…30 VPC |

Output function

| 2UPN | 2 switching outputs/ IO-Link |
| LI2UPN | Current and switching output/ IO-Link |

Assignment

| 1 | Standard assignment |

Number of contacts

| 4 | 4 Contacts |

Alignment

| 1 | Straight |

Design

| H1 | Connector M12 × 1 |

2.2 Manufacturer and service

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats. You can access the product database at the following address: www.turck.de/products

For further inquiries in Germany contact the Sales and Service Team on:

- Sales: +49 208 4952-380
- Technology: +49 208 4952-390

Outside Germany, please contact your local Turck representative.

3　Software-Supported IO-Link Parameterization

The ports of the IO-Link master can be configured in IO-Link mode (IOL) or in Standard IO mode (SIO).

If a port is set to SIO mode, the IO-Link master at this port behaves like a normal digital input. The connected IO-Link device transfers its conventional switching output to the IO-Link master – no communication takes place between the device and the IO-Link master.

If the port is configured in IOL mode, the IO-Link master tries to wake the connected IO-Link device via the "Wake-up Request". If the master receives a response from the IO-Link device, both devices start to communicate with each other. The communication parameters are exchanged first of all; the cyclic data exchange of the process data (process data objects) then starts.

When IO-Link communication (IOL mode) is active, both a cyclic and acyclic communication service is available.

There are two ways of setting the parameters via IO-Link:

- via on-request data objects (e.g. close to the PLC via IO-Link function block)
- via tool-based engineering via FDT/DTM (e.g. PACTware with the use of DTM or the IODD)

Device parameters (on-request data objects)

Device parameters are exchanged acyclically and on request of the IO-Link master. The IO-Link master always sends a request to the device first, then the device responds. This applies when the data is written into the device and also when read from the device. On-request data objects (ORDO) enable parameter values to be written into the device (write) or device states to be read from the device (read).

IO-Link configuration in PROFINET

Using SIDI (Simple IO-Link Device Integration), IO-Link devices can be configured in PROFINET applications directly in the programming environment (e.g. TIA Portal). The Turck IO-Link devices are integrated in the GSDML file of the IO-Link masters in the TBEN, TBPN and FEN20 product series and can be configured in the programming environment as submodules of a modular I/O system. During this process, the user has access to all device properties and parameters.

4   IO-Link Parameters

4.1   General parameters

Parameter	Content
Vendor ID	317 (0x13D)
Device ID	66317 (0x1030D) For PS325-…/F010 and PS326-…/F10: 66318 (0x1030E)
IO-Link version	1.1
Bitrate	COM2 (38.4 kbit/s)
Minimum cycle time	3 ms
SIO supported	True
M-Sequence Capability	PREOPERATE = TYPE_0 with 1 octet on-request data OPERATE = TYPE_0 with 1 octet on-request data ISDU supported
Block Parameter	True
Data Storage	True
ProfileCharacteristic	

4.2   Process Input Data

Four mapping profiles are available for displaying the process input data. The mapping profiles can be set via the **process data structure parameter** (Index 80 or 0x50). Profile 3 is the default setting. The following profiles can be selected:

- Mapping profile 1: 16-bit process data (value range 0…65535)
- Mapping profile 2: 14-bit process data (value range 0…16383), status of the outputs
- Mapping profile 3: 13-bit process data (value range 0…8191), status of the outputs, error message
- Mapping profile 4: 14-bit process data (value range -1110…1101), status of the outputs

Mapping profile 1

Name	Byte.Bit-offset	Bit length	Subindex access supported	Data Type	Value	Description
Process value	0.0	16	False	UInteger	0…65535	
					0	Underload
					65533	EEPROM Error
					65534	Error
					65535	Overload

Calculation of the pressure value – mapping profile 1

Pressure value in bar = measured value × IODD gradient + IODD offset

Pressure range	IODD gradient	IODD offset
1D	0,0000361696355909214	-1,1851885342255200
3D	0,0000632968622841125	-1,3240799348946600
10D	0,0001989329957500680	-2,0185369382403500
16D	0,0003074419025228320	-2,5741025409169000
25D	0,0004702052626819780	-3,4074509449317300
40D	0,0007414775296138890	-4,7963649516231100
250D	0,0045212044488651800	-23,1485667781897000

Mapping profile 2

Name	Byte.Bit-offset	Bit length	Subindex access supported	Data Type	Value	Description
Process value	0.2	14	False	UInteger	0…16383	
					0	Underload
					16381	EEPROM Error
					16382	Error
					16383	Overload
Switching output 2	1.1	1	False	Boolean	false/true	
					false	Open
					true	Closed
Switching output 1	1.0	1	False	Boolean	false/true	
					false	Open
					true	Closed

Calculation of the pressure value – mapping profile 2

Pressure value in bar = measured value × IODD gradient + IODD offset

Pressure range	IODD gradient	IODD offset
1D	0,0001446785423636860	-1,1851885342255200
3D	0,0002531874491364500	-1,3240799348946600
10D	0,0007957319830002710	-2,0185369382403500
16D	0,0012297676100913300	-2,5741025409169000
25D	0,0018808210507279100	-3,4074509449317300
40D	0,0029659101184555600	-4,7963649516231100
250D	0,0180848177954607000	-23,1485667781897000

Mapping profile 3

Name	Byte.Bit-offset	Bit length	Subindex access supported	Data Type	Value	Description
Process value	0.3	13	False	UInteger	0…8191	
					0	Underload
					8189	EEPROM Error
					8190	Error
					8191	Overload
Fault indicator	1.2	1	False	Boolean	false/true	
					false	No fault
					true	Fault detected
Switching output 2	1.1	1	False	Boolean	false/true	
					false	Open
					true	Closed
Switching output 1	1.0	1	False	Boolean	false/true	
					false	Open
					true	Closed

Calculation of the pressure value – mapping profile 3

Pressure value in bar = measured value × IODD gradient + IODD offset

Pressure range	IODD gradient	IODD offset
1D	0,0002893570847273710	-1,1851885342255200000
3D	0,0005063748982729000	-1,3240799348946600000
10D	0,0015914639660005400	-2,0185369382403500000
16D	0,0024595352201826600	-2,5741025409169000000
25D	0,0037616421014558300	-3,4074509449317300000
40D	0,0059318202369111100	-4,7963649516231100000
250D	0,0361696355909214000	-23,1485667781897000000

Mapping profile 4

Name	Byte.Bit-offset	Bit length	Subindex access supported	Data Type	Value	Description
Process value	0.2	14	False	Integer	-1110…1101	
					-1110	Underload
					1101	Overload
Switching output 2	1.1	1	False	Boolean	false/true	
					false	Open
					true	Closed
Switching output 1	1.0	1	False	Boolean	false/true	
					false	Open
					true	Closed

Calculation of the pressure value – mapping profile 4

Pressure value in bar = measured value $\times$ IODD gradient

Pressure range	IODD gradient
1D	0,001
3D	0,001
10D	0,01
16D	0,01
25D	0,01
40D	0,1
250D	1

4.3 Standard parameters

Name	Index hex. (dec.)	Sub-index hex. (dec.)	Subindex access supported	Access	Byte. Bit-offset	Bit length	Data Type	Value	Default	Description
Min Cycle Time	0x0 (0)	0x3 (3)	True	read	2.0	8	UInteger			
IO-Link Version ID	0x0 (0)	0x5 (5)	True	read	4.0	8	UInteger	17		
Vendor ID 1	0x0 (0)	0x8 (8)	True	read	7.0	8	UInteger			
Vendor ID 2	0x0 (0)	0x9 (9)	True	read	8.0	8	UInteger			
Device ID 1	0x0 (0)	0xA (10)	True	read	9.0	8	UInteger			
Device ID 2	0x0 (0)	0xB (11)	True	read	10.0	8	UInteger			
Device ID 3	0x0 (0)	0xC (12)	True	read	11.0	8	UInteger			
Standard Command	0x2 (2)	0x0 (0)	True	write	0.0	8	UInteger	0…163		System command
								128		Device Reset
								129		Application Reset
								130		Restore Factory Settings
								160		Reset maximum pressure memory
								161		Reset minimum pressure memory
								162		-
								163		-
Parameter (write) Access Lock	0xC (12)	0x1 (1)	False	read/ write	0.0	1	Boolean	false/ true		Device access locks
Data Storage Lock	0xC (12)	0x2 (2)	False	read/ write	0.1	1	Boolean	false/ true		Device access locks
Local Para-meterization Lock	0xC (12)	0x3 (3)	False	read/ write	0.2	1	Boolean	false/ true		Device access locks
Local User Interface Lock	0xC (12)	0x4 (4)	False	read/ write	0.3	1	Boolean	false/ true		Device access locks
Vendor Name	0x10 (16)	0x0 (0)	True	read	0.0	512	String		Turck	Vendor name
Vendor Text	0x11 (17)	0x0 (0)	True	read	0.0	512	String			Additional manufacturer information
Product Name	0x12 (18)	0x0 (0)	True	read	0.0	512	String		PS	Manufacturer's device designation
Product ID	0x13 (19)	0x0 (0)	True	read	0.0	512	String			Ident-No.

Name	Index hex. (dec.)	Sub-index hex. (dec.)	Subindex access supported	Access	Byte. Bit-offset	Bit length	Data Type	Value	Default	Description
Product Text	0x14 (20)	0x0 (0)	True	read	0.0	512	String			Device category
Serial Number	0x15 (21)	0x0 (0)	True	read	0.0	128	String			Device serial number
Hardware Version	0x16 (22)	0x0 (0)	True	read	0.0	512	String			Hardware revision
Firmware Version	0x17 (23)	0x0 (0)	True	read	0.0	512	String			Firmware revision
Application Specific Tag	0x18 (24)	0x0 (0)	True	read/ write	0.0	32	String			Any user generated content
Error Count	0x20 (32)	0x0 (0)	True	read	0.0	16	UInteger			
Device Status	0x24 (36)	0x0 (0)	True	read	0.0	8	UInteger	0… 255		
								0		Device is OK
								1		Maintenance required
								2		Out of specification
								3		Functional check
								4		Failure
Detailed Device Status	0x25 (37)	0x0 (0)	False	read	0.0	11	Array			
Process Data Input	0x28 (40)	0x0 (0)	True	read	0.0	16	Process-DataIn-Union			

Hans Turck GmbH & Co. KG | T +49 208 4952-0 | F +49 208 4952-264 | more@turck.com | www.turck.com

4.4 Parameters

Name	Index hex. (dec.)	Sub-index hex. (dec.)	Subindex Access supported	Access	Byte. Bit offset	Bit length	Data type	Value	Default	Description
Function-specific marking	0x19 (25)	0x0 (0)	True	read/write	0.0	256	String	NaN … NaN		
Location-specific marking	0x1A (26)	0x0 (0)	True	read/write	0.0	256	String	NaN … NaN		
Operating hours	0x48 (72)	0x0 (0)	True	read	0.0	32	UInteger	NaN … NaN		Total operating hours
Operating hours limit	0x4A (74)	0x0 (0)	True	read/write	0.0	32	UInteger	NaN … NaN	1000000	Operating hours warning
Process data profile	0x50 (80)	0x0 (0)	True	read/write	0.0	8	UInteger	0…3	2	With this parameter you can choose between a high-resolution 16-bit process value, a compatible 14-bit process value + two switching bits or a 13-bit process value + two switching bits + an error indicator bit
								0		Profile 1 — 16-bit process data
								1		Profile 2 — 14-bit process data with two switching bits
								2		Profile 3 — 13-bit process data with one error and two switching bits
								3		Profile 4 — 14-bit alternatively scaled process data with two switching bits
Function	0x51 (81)	0x0 (0)	True	read/write	0.0	8	UInteger	0…3	0	Output 1 can be used in SIO mode, as a switching output, in hysteresis or window mode.
								0		Hysteresis mode, NO
								1		Hysteresis mode, NC
								2		Window mode, NO
								3		Window mode, NC

Name	Index hex. (dec.)	Sub-index hex. (dec.)	Subindex Access supported	Access	Byte. Bit Bit offset	Bit length	Data type	Value	Default	Description
Function	0x52 (82)	0x0 (0)	True	read/ write	0.0	8	UInteger	0…15	4	Output 2 can be configured as either a switching or analog output.
								0		Hysteresis mode, NO
								1		Hysteresis mode, NC
								2		Window mode, NO
								3		Window mode, NC
								4		Analog, automatic detection
								5		4…20 mA (rising edge)
								6		0…20 mA (rising edge)
								7		20…4 mA (falling edge)
								8		20…0 mA (falling edge)
								9		0…10 V (rising edge)
								10		0…5 V (rising edge)
								11		1…6 V (rising edge)
								12		10…0 V (falling edge)
								13		5…0 V (falling edge)
								14		6…1 V (falling edge)
								15		ratiometric 0.5…4.5 V
Polarity of the switching outputs	0x53 (83)	0x0 (0)	True	read/ write	0.0	8	UInteger	0…2	2	Switching outputs can be configured as "PNP" or "NPN." In the switched state, the output is switched to the operating voltage with the "PNP" setting, and to the ground with the "NPN" setting.
								0		PNP
								1		NPN
								2		Automatic

Name	Index hex. (dec.)	Sub-index hex. (dec.)	Subindex Access supported	Access	Byte. Bit offset	Bit length	Data type	Value	Default	Description
Unit (not available for PS325-…/F010 and PS326-…/F010)	0x54 (84)	0x0 (0)	True	read/write	0.0	8	UInteger	0…13	0	The values can be displayed in different units. This setting applies to the display on the sensor. Only units that can also be displayed can be selected. [▶ 21]
								0		bar
								1		psi
								2		kPa
								3		MPa
								4		mbar
								5		mm Hg (0 °C) = Torr
								6		Inch of water (60 °F)
								7		Inch of water (39 °F)
								8		Foot of water (39 °F)
								9		Inch of Hg (60 °F)
								10		Inch of Hg (32 °F)
								11		mH2O (16 °C)
								12		mH2O (4 °C)
								13		kg/cm²
Display refresh rate	0x55 (85)	0x0 (0)	True	read/write	0.0	8	UInteger	0…3	0	The refresh rate of the display can be set here, or the display can be switched off. Then only the unit, error and switching indicators light up.
								0		50 ms
								1		200 ms
								2		600 ms
								3		Off
Error output behavior (Output 1)	0x56 (86)	0x0 (0)	True	read/write	0.0	8	UInteger	0…1	0	In order to detect measuring errors at the switching output, the switching state in the event of an error can be defined here.
								0		Open
								1		Closed
Error output behavior (Output 2)	0x57 (87)	0x0 (0)	True	read/write	0.0	8	UInteger	0…1	0	In order to detect measuring errors at the switching output, the switching state in the event of an error can be defined here.
								0		Open
								1		Closed

Name	Index hex. (dec.)	Sub-index hex. (dec.)	Subindex Access supported	Access	Byte. Bit Bit offset	Bit length	Data type	Value	Default	Description
Switching point/upper window limit	0x59 (89)	0x1 (1)	False	read/ write	0.0	16	UInteger	5396 … 60415	60415	Shows the window boundaries of the color change.
Release point/ lower window limit	0x59 (89)	0x2 (2)	False	read/ write	2.0	16	UInteger	5120 … 60139	32768	Shows the window boundaries of the color change.
Color change	0x5A (90)	0x0 (0)	True	read/ write	0.0	8	UInteger	0…7	0	The display color can be changed depending on the outputs or a virtual window.
								0		Always green
								1		Always red
								2		Green when output 1 is active
								3		Red when output 1 is active
								4		Green when output 2 is active
								5		Red when output 2 is active
								6		Green inside the color window
								7		Red inside the color window
Display rotation	0x5B (91)	0x0 (0)	True	read/ write	0.0	8	UInteger	0…1	0	The orientation of the display can be defined here.
								0		0°
								1		180°
P1	0x5E (94)	0x0 (0)	True	read	0.0	16	UInteger			Read out the value of pressure cell P1, depending on the mapping profile.
P2	0x5F (95)	0x0 (0)	True	read	0.0	16	UInteger			Read out the value of pressure cell P2, depending on the mapping profile.
Switching point/upper window limit (output 1)	0x60 (96)	0x1 (1)	False	read/ write	0.0	16	UInteger	5396 … 60415	46591	Shows the switching and release point or the window limits.
Release point/ lower window limit (output 1)	0x60 (96)	0x2 (2)	False	read/ write	2.0	16	UInteger	5120 … 60139	39679	Shows the switching and release point or the window limits.
Switching point/upper window limit (output 2)	0x61 (97)	0x1 (1)	False	read/ write	0.0	16	UInteger	5396 … 60415	46591	Shows the switching and release point or the window limits.

Name	Index hex. (dec.)	Sub-index hex. (dec.)	Subindex Access supported	Access	Byte. Bit offset	Bit length	Data type	Value	Default	Description
Release point/ lower window limit (output 2)	0x61 (97)	0x2 (2)	False	read/ write	2.0	16	UInteger	5120 … 60139	39679	Shows the switching and release point or the window limits.
Start point of the analog signal	0x62 (98)	0x1 (1)	False	read/ write	0.0	16	UInteger	5120 … 54885	32768	The start and end points can be set up to 10 % of the measuring range as a minimum distance and up to the measuring range limits.
End point of the analog signal	0x62 (98)	0x2 (2)	False	read/ write	2.0	16	UInteger	10650 … 60415	60415	The start and end points can be set up to 10 % of the measuring range as a minimum distance and up to the measuring range limits.
Offset adjustment	0x68 (104)	0x0 (0)	True	read/ write	0.0	16	Integer	-2765 … 2765	0	A strong thermal change in the environment of the sensor can result in a zero point offset in a depressurized state. Adjustment range: -5…+5 % of the measuring range.
Maximum value memory (Measuring input 1)	0x69 (105)	0x0 (0)	True	read	0.0	16	UInteger	NaN … NaN		This value describes the highest measured value.
Minimum value memory (Measuring input 1)	0x6A (106)	0x0 (0)	True	read	0.0	16	UInteger	NaN … NaN		This value describes the lowest measured value.
Damping the analog output	0x70 (112)	0x0 (0)	True	read/ write	0.0	16	UInteger	0… 800	0	Pressure peaks of short duration or high frequency can be filtered for the analog output. Adjustment range: 0…8 s in increments of 0.01 s (0 = delay time not active)
Damping the measured value for the switching output	0x71 (113)	0x0 (0)	True	read/ write	0.0	16	UInteger	0… 800	0	Pressure peaks of short duration or high frequency can be filtered for the switching outputs. Adjustment range: 0…8 s in increments of 0.01 s (0 = delay time not active)

Name	Index hex. (dec.)	Sub-index hex. (dec.)	Subindex Access supported	Access	Byte. Bit offset	Bit length	Data type	Value	Default	Description
Switching delay (switching point/window entry) (Output 1)	0x78 (120)	0x0 (0)	True	read/ write	0.0	16	UInteger	0… 600	0	Switching can be delayed when the switching point (hysteresis mode) or the entry into the window (window mode) is exceeded. Adjustment range: 0…60 s in increments of 0.1 s (0 = delay time not active)
Switching delay (Release point/window exit) (Output 1)	0x79 (121)	0x0 (0)	True	read/ write	0.0	16	UInteger	0… 600	0	Switching can be delayed when the release point (hysteresis mode) or the exit from the window (window mode) is undershot. Adjustment range: 0…60 s in increments of 0.1 s (0 = delay time not active)
Switching delay (switching point/window entry) (Output 2)	0x7A (122)	0x0 (0)	True	read/ write	0.0	16	UInteger	0… 600	0	Switching can be delayed when the switching point (hysteresis mode) or the entry into the window (window mode) is exceeded. Adjustment range: 0…60 s in increments of 0.1 s (0 = delay time not active)
Switching delay (Release point/window exit) (Output 2)	0x7B (123)	0x0 (0)	True	read/ write	0.0	16	UInteger	0… 600	0	Switching can be delayed when the release point (hysteresis mode) or the exit from the window (window mode) is undershot. Adjustment range: 0…60 s in increments of 0.1 s (0 = delay time not active)
Maximum value memory (Measuring input 2)	0x7E (126)	0x0 (0)	True	read	0.0	16	UInteger	NaN … NaN		This value describes the highest measured value for measuring input 2.
Minimum value memory (Measuring input 2)	0x7F (127)	0x0 (0)	True	read	0.0	16	UInteger	NaN … NaN		This value describes the lowest measured value for measuring input 2.
Measurement direction	0x80 (128)	0x0 (0)	True	read/ write	0.0	8	UInteger	0…1	0	Defines the direction of the pressure difference.
								0		1–2
								1		2–1

4.4.1 Displayed units

Only displayable units are supported. These depend on the end value of the measuring range. The following table shows the supported units:

Measuring range end	bar	psi	kPa	Mpa	Ud1	Ud2	Ud3	Ud4	Ud5	Ud6	Ud7	Ud8	Ud9	Ud10
1 bar	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3 bar	x	x	x	x	x	x	x	x	x	x	x	x	x	x
10 bar	x	x	x	x	-	x	x	x	x	x	x	x	x	x
16 bar	x	x	x	x	-	-	x	x	x	x	x	x	x	x
25 bar	x	x	x	x	-	-	-	-	x	x	x	x	x	x
40 bar	x	x	x	x	-	-	-	-	x	x	x	x	x	x
100 bar	x	x	-	x	-	-	-	-	x	x	x	x	x	x
250 bar	x	x	-	x	-	-	-	-	x	x	x	x	x	x
400 bar	x	x	-	x	-	-	-	-	-	-	-	x	x	x
600 bar	x	x	-	x	-	-	-	-	-	-	-	x	x	x

4.5 Events

Code	Type	Name	Description
30480	Error	Short circuit	Check installation
36001	Error	Overload	
36002	Error	Underload	
36003	Warning	Overrun	
36004	Warning	Underrun	
36006	Notification	New maximum value recorded	
36007	Notification	New minimum value recorded	
36009	Error	Test event	
36010	Error	Critical error	The sensor encountered an critical error and needs to be replaced.
36016	Warning	Operating hours limit reached	

TURCK

Over 30 subsidiaries and over
60 representations worldwide!

www.turck.com