TURCK

PS310/PS510
Pressure Sensors

IO-Link Parameters

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Contents

1 About This Manual

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

1.1 Target groups

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

1.2 Other documents

Besides this document, the following documents and software tools can be found on the Internet at **www.turck.com**:
- Data sheet
- Quick Start Guide
- IO-Link Commissioning Manual

1.3 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 any information is missing from the instructions, please send your suggestions to **techdoc@turck.com**.

2 Information About the Product

2.1 Product identification

These instructions apply to the following devices:

Device types	Output
PS310…-2UPN8…	Device with display, rotatable sensor body, 2 switching outputs (pnp/npn)
PS510…-2UPN8…	Device with display, rotatable sensor body, 1 switching output (pnp/npn) and 1 switching output (pnp/npn) or 1 switching output (pnp/npn) and 1 analog output (configurable as current output or voltage output)
PS310…-LI2UPN8…	Device with display, rotatable sensor body, 1 switching output (pnp/npn) and 1 switching output (pnp/npn) or 1 switching output (pnp/npn) and 1 analog output (configurable as current output or voltage output)
PS510…-LI2UPN8…	Device with display, rotatable sensor body, 1 switching output (pnp/npn) and 1 switching output (pnp/npn) or 1 switching output (pnp/npn) and 1 analog output (configurable as current output or voltage output)

2.2 Software

All of the necessary Turck software components and the IODD can be downloaded via the Turck software manager.

2.3 Manufacturer and service

Hans Turck GmbH & Co. KG
Witzlebenstraße 7
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Germany

Turck provides you with support and assistance for your projects — from the initial analysis to commissioning your application. The Turck product database contains software tools for programming, configuration and commissioning, as well as data sheets and CAD files in numerous export formats. You can access the product database at the following address:
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Should you have any further questions, please contact the sales and service team in Germany on the following telephone numbers:
Sales: +49 208 4952-380
Technology: +49 208 4952-390

Outside Germany, please contact your Turck representative.

3   Software-Supported IO-Link Parametrization

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

If a port is configured in SIO mode, the IO-Link master on this port behaves like a normal digital input, and the connected IO-Link device sends the standard switching output to the IO-Link master – there is no communication between the device and the master.

If the port is configured in IOL mode, the IO-Link master tries to "wake" the connected IO-Link device using the "wake-up request". If the master receives a response from the signal processor, both devices start to communicate with each other. First the communication parameters are exchanged, and then the cyclic data exchange of process data (objects) starts.

In the case of active IO-Link communication (IOL mode), both cyclic and acyclic communication services are available.

Parameterization via IO-Link can occur in two different ways:
- via on-request data objects (e.g. IO-Link function block close to the control),
- via tool-based engineering with FDT/DTM (e.g. PACT*ware*™ with the use of DTM or the IODD).

Device parameters (on-request data objects)

Device parameters are exchanged in an acyclical manner and upon the request of the IO-Link master. The IO-Link master always sends a request to the device first, and then the device responds. This is the case both when the data is written into the device and read from the device. With the help of on-request data objects (ORDO), the parameters can be written into the device (Write) or the device status can be read from the device (Read).

4 IO-Link Parameters

4.1 General parameters

The general parameter data are used to identify the sensors. This data can only be read.

Address (hexa-decimal)	Parameter name	Description	Value (hexa-decimal)	Meaning
04	IO-Link Revision ID	Imported IO-Link version		
07	Vendor ID 1	Vendor ID	01	317 for Hans Turck GmbH & Co. KG IM/Vendor_ID_Table.xml
08	Vendor ID 2		3D	
09	Device ID 1	Device ID (assigned by the manufacturer)	01	
0A	Device ID 2		see table below	
0B	Device ID 3		see table below	

Device ID 2

Electrical output	Device ID 2 (hexadecimal)
2UPN:	00
LI2UPN:	01

Device ID 3

Measuring range	Device ID 3 (hexadecimal)
01VR:	0x00
001A:	0x01
003A:	0x02
010A:	0x03
016A:	0x04
025A:	0x05
001V:	0x06
003V:	0x07
010V:	0x08
016V:	0x09
025V:	0x0A
040V:	0x0B
001R:	0x0C
100R:	0x0D
250R:	0x0E
400R:	0x0F
600R:	0x10
0.25V:	0x12

4.2 Process data

The representation of the process data depends on the process data profile that has been configured. Four different profiles can be selected (the default profile is Profile 3).

4.2.1 Profile 1 – value range

The process data width is 16 bits (Bit 0…15).

Measured value					
Bit 15	…	Bit 3	Bit 2	Bit 1	Bit 0

The measured value as well as process errors and EEPROM errors are mapped in the process data.

Pressure											
Pressure below permissible value	Lower tolerance value (dec./hex.)		Start of measuring range (dec./hex.)		End of measuring range (dec./hex.)		Upper tolerance value (dec./hex.)		Pressure above permissible value (dec./hex.)	
0	2765	0xACD	5120	0x1400	60415	0xEBFF	63180	0xF6CC	65535	0xFFFF

Error			
Process		EEPROM	
65534	0xFFFE	65535	0xFFFD

Profile 1 – calculation of pressure value

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

Series	Pressure range	IODD gradient	IODD offset
PS3xx	1	0.0000180848177954607	-0.0925942671127588
	0 V	0.0000180848177954607	-1.0925942671127600
	100	0.0018084817795460700	-9.2594267112758800
	10 V	0.0001989329957500680	-2.0185369382403500
	16 V	0.0003074419025228320	-2.5741025409169000
	1 A	0.0000180848177954607	-0.0925942671127588
	1 V	0.0000361696355909214	-1.1851885342255200
	2.5 A	0.0000452120444886518	-0.2314856677818970
	2.5 V	0.0000632968622841125	-1.3240799348946600
	25 V	0.0004702052626819780	-3.4074509449317300
	40 V	0.0007414775296138890	-4.7963649516231100
PS5xx	100	0.0018084817795460700	-9.2594267112758800
	10 A	0.0001808481779546070	-0.9259426711275880
	10 V	0.0001989329957500680	-2.0185369382403500
	16 A	0.0002893570847273710	-1.4815082738041400
	16 V	0.0003074419025228320	-2.5741025409169000
	250	0.0045212044488651800	-23.1485667781897000
	25 A	0.0004521204448865180	-2.3148566778189700
	25 V	0.0004702052626819780	-3.4074509449317300
	400	0.0072339271181842800	-37.0377068451035000
	40 V	0.0007414775296138890	-4.7963649516231100
	600	0.0108508906772764000	-55.5565602676553000

4.2.2 Profile 2 – value range

The process data width is 16 bits (Bit 0…15).

Measured value				Switching state A2	Switching state A1
Bit 15	…	Bit 3	Bit 2	Bit 1	Bit 0

The process data map the measured value and the switching state of the two outputs, as well as process errors and EEPROM errors.

Pressure					
Pressure below permissible value	Lower tolerance value (dec./hex.)	Start of measuring range (dec./hex.)	End of measuring range (dec./hex.)	Upper tolerance value (dec./hex.)	Pressure above permissible value (dec./hex.)
0	691 0x2B3	1280 0x500	15103 0x3AFF	15794 0x3DB2	16383 0x3FFF

Error	
Process	EEPROM
16382 0x3FFE	16381 0x3FFD

Profile 2 – calculation of pressure value

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

Series	Pressure range	IODD gradient	IODD offset
PS3xx	1	0.0000723392711818428	-0.0925942671127588
	0 V	0.0000723392711818428	-1.0925942671127600
	100	0.0072339271181842800	-9.2594267112758800
	10 V	0.0007957319830002710	-2.0185369382403500
	16 V	0.0012297676100913300	-2.5741025409169000
	1 A	0.0000723392711818428	-0.0925942671127588
	1 V	0.0001446785423636860	-1.1851885342255200
	2.5 A	0.0001808481779546070	-0.2314856677818970
	2.5 V	0.0002531874491364500	-1.3240799348946600
	25 V	0.0018808210507279100	-3.4074509449317300
	40 V	0.0029659101184555600	-4.7963649516231100
PS5xx	100	0.0072339271181842800	-9.2594267112758800
	10 A	0.0007233927118184280	-0.9259426711275880
	10 V	0.0007957319830002710	-2.0185369382403500
	16 A	0.0011574283389094900	-1.4815082738041400
	16 V	0.0012297676100913300	-2.5741025409169000
	250	0.0180848177954607000	-23.1485667781897000
	25 A	0.0018084817795460700	-2.3148566778189700
	25 V	0.0018808210507279100	-3.4074509449317300
	400	0.0289357084727371000	-37.0377068451035000
	40 V	0.0029659101184555600	-4.7963649516231100
	600	0.0434035627091057000	-55.5565602676553000

4.2.3 Profile 3 – value range (default)

The process data width is 16 bits (Bit 0…15).

Measured value			Error	Switching state A2	Switching state A1
Bit 15	…	Bit 3	Bit 2	Bit 1	Bit 0

The process data map the measured value and the switching state of the two outputs, as well as process errors and EEPROM errors.

Pressure										
Pressure below permissible value	Lower tolerance value (dec./hex.)		Start of measuring range (dec./hex.)		End of measuring range (dec./hex.)		Upper tolerance value (dec./hex.)		Pressure above permissible value (dec./hex.)	
0	346	0x15A	640	0x280	7551	0x1D7F	7897	0x1ED9	8191	0x1FFF

Error			
Process		EEPROM	
8190	0x1FFE	8189	0x1FFD

Profile 3 – calculation of pressure value

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

Series	Pressure range	IODD gradient	IODD offset
PS3xx	1	0.0001446785423636860	-0.0925942671127588000
	0 V	0.0001446785423636860	-1.0925942671127600000
	100	0.0144678542363686000	-9.2594267112758800000
	10 V	0.0015914639660005400	-2.0185369382403500000
	16 V	0.0024595352201826600	-2.5741025409169000000
	1 A	0.0001446785423636860	-0.0925942671127588000
	1 V	0.0002893570847273710	-1.1851885342255200000
	2.5 A	0.0003616963559092140	-0.2314856677818970000
	2.5 V	0.0005063748982729000	-1.3240799348946600000
	25 V	0.0037616421014558300	-3.4074509449317300000
	40 V	0.0059318202369111100	-4.7963649516231100000
PS5xx	100	0.0144678542363686000	-9.2594267112758800000
	10 A	0.0014467854236368600	-0.9259426711275880000
	10 V	0.0015914639660005400	-2.0185369382403500000
	16 A	0.0023148566778189700	-1.4815082738041400000
	16 V	0.0024595352201826600	-2.5741025409169000000
	250	0.0361696355909214000	-23.1485667781897000000
	25 A	0.0036169635590921400	-2.3148566778189700000
	25 V	0.0037616421014558300	-3.4074509449317300000
	400	0.0578714169454743000	-37.0377068451035000000
	40 V	0.0059318202369111100	-4.7963649516231100000
	600	0.0868071254182114000	-55.5565602676553000000

4.2.4 Profile 4 – value range

The process data width is 16 bits (Bit 0…15).

Measured value				Switching state A2	Switching state A1
Bit 15	…	Bit 3	Bit 2	Bit 1	Bit 0

The measured value and the switching state of the two outputs are mapped in the process data.

Profile 4 – calculation of pressure value

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

Pressure range of sensor	Lower tolerance value	Start of measuring range	Span of measuring range	End of measuring range	Upper tolerance value	IODD gradient
0 V	-1030	-1000	1000	50	51	0.001
1 V	-1110	-1000	1000	1100	1101	0.001
1	-51	-50	1000	1050	1051	0.001
1 A	-51	-50	1000	1050	1051	0.001
2.5 V	-100	-100	2500	2625	2626	0.001
2.5	-13	-13	250	263	264	0.01
2.5 A	-13	-13	250	263	264	0.01
10 V	-100	-100	1000	1050	1051	0.01
10	-50	-50	1000	1050	1051	0.01
10 A	-50	-50	1000	1050	1051	0.01
16 V	-100	-100	1600	1680	1681	0.01
16	-80	-80	1600	1680	1681	0.01
16 A	-80	-80	1600	1680	1681	0.01
25 V	-100	-100	2500	2525	2526	0.01
25	-10	-10	250	263	264	0.1
25 A	-10	-10	250	263	264	0.1
40 V	-10	-10	400	420	421	0.1
40	-10	-10	400	420	421	0.1
100	0	0	1000	1050	1051	0.1
250	0	0	250	263	264	1
400	0	0	400	420	421	1
600	0	0	600	630	631	1

4.3   General service PDU

The sensors of the PS series support the data traffic via so called SPDUs. The data is only transferred on demand and via special data channels. The data transfer via SPDU enables the parametrization and configuration of the sensors.

Index (hexadeci-mal)	Parameter name	Access R: Read W: Write	Length in bytes	Data type	Description
0x00	Direct page 1	R	16	Record of 16 Unsigned8	
0x10	Vendor name	R	32	String	Vendor name, e.g. "Hans Turck GmbH & Co."
0x11	Vendor text	R	32	String	Vendor description, e.g. "http://www.turck.com"
0x12	Product name	R	32	String	Product name, e.g. "PS400R-LI2UPN1OL8X"
0x13	Product ID	R	16	String	Turck product ident-no., e.g. "6845641"
0x14	Product text	R	32	String	Product description, e.g. "Pressure sensor with 2 switching outputs"
0x15	Serial number	R	16	String	Batch code and serial number, e.g. 123456-18
0x17	Firmware revision	R	16	String	Firmware version, e.g. 3.0.0.0
0x18	Application specific name	RW	16	String	Measuring point, e.g. "Measuring point 39"
0x28	Process data in	R	2	Unsigned16	Process data (see page 8)

4.4 Specific service PDU – overview

Index (hexadecimal)	Parameter name	Access R: Read W: Write	Length in bytes	Data type	Description	Default value	See page
0x50	PDProfile	RW	1	Unsigned8	Process data profile	0x02	14
0x51	Ou1	RW	1	Unsigned8	Function of output 1	0x00	14
0x52	Ou2	RW	1	Unsigned8	Function of output 2 Li2UPN LUUPN 2UPN	0x04 0x08 0x00	15
0x53	P-n	RW	1	Unsigned8	Behavior of switching output	0x00	15
0x54	Uni	RW	1	Unsigned8	Display unit	0x00	16
0x55	Display update rate	RW	1	Unsigned8	Display: Configure/disable update rate	0x00	16
0x56	Error output 1	RW	1	Unsigned8	Output 1: Behavior in the event of an error	0x00	17
0x57	Error output 2	RW	1	Unsigned8	Output 2: Behavior in the event of an error	0x00	17
0x58	Menu locked	RW	1	Unsigned8	Locking the menu	0x00	17
0x59	IO-Link write protection	RW	1	Unsigned8	IO-Link parameter with write protection	0x00	17
0x5A	Color behavior of display	RW	1	Unsigned8	Display: Color depending on output state	0x00	17
0x5B	Display rotation	RW	1	Unsigned8	Display: Orientation	0x00	17
0x60	Sp1/rP1 (FH1/FL1)	RW	4	Record of 2 Unsigned16	Switch/reset point 1	SP: 0x2000 rP: 0x1000	18
0x61	Sp2/rP2 (FH2/FL2)	RW	4	Record of 2 Unsigned16	Switch/reset point 2 (not for LUUPN)	SP: 0x2000 rP: 0x1000	18
0x62	ASP/AEP	RW	4	Record of 2 Unsigned16	Start value/end value of the analog range (not for 2UPN)	ASP see below AEP: 0x3AFF	18
0x68	cof	RW	2	Signed16	Offset adjustment	0x0000	18
0x69	HI	R	2	Unsigned16	Stored max. value	–	19
0x6A	LO	R	2	Unsigned16	Stored min. value	–	19
0x70	dAA	RW	2	Unsigned16	Damping of the analog output	0x0000	19
0x71	dAP	RW	2	Unsigned16	Damping of the switching output/ switching outputs	0x0000	19
0x78	dsp1	RW	2	Unsigned16	Switching delay of switching point of output 1	0x0000	19
0x79	drp1	RW	2	Unsigned16	Switching delay of reset switching point of output 2	0x0000	19
0x7A	dsp2	RW	2	Unsigned16	Switching delay of switching point of output 2 (not for LUUPN)	0x0000	19
0x7B	drp2	RW	2	Unsigned16	Switching delay of reset switching point of output 2 (not for LUUPN)	0x0000	19

Index 0x62: Default values for ASP (start value of the analog range)

Type	Measuring range	Default value
PS01VR	-1 to 0 bar	0x0500
PS0.25V	-0.25 to +0.25 bar	0x2000
PS001R	0 to +1 bar	0x0500
PS001V	-1 to +1 bar	0x2000
PS003V	-1 to +2.5 bar	0x146D
PS010V	-1 to +10 bar	0x09E9
PS016V	-1 to +16 bar	0x082D
PS025V	-1 to +25 bar	0x0714
PS040V	-1 to +40 bar	0x0651
PS100R	0 to +100 bar	0x0500
PS250R	0 to +250 bar	0x0500
PS400R	0 to +400 bar	0x0500
PS600R	0 to +600 bar	0x0500
PS001A	0 to +1 bar	0x0500
PS003A	0 to +2.5 bar	0x0500
PS010A	0 to +10 bar	0x0500
PS016A	0 to +16 bar	0x0500
PS025A	0 to +25 bar	0x0500

4.5 Specific service PDU

Index 0x50: Process data profiles

Value (hexadecimal)	Menu item	Description
0x00	Profile 1	high-resolution (see "Process data")
0x01	Profile 2	compatible (see "Process data")
0x02	Profile 3	complete (default) (see "Process data")
0x03	Profile 4	alternative scaling (see "Process data")

Index 0x51: Function of output 1

Value (hexadecimal)	Menu item	Function
0x00	Hno	Hysteresis function NO = normally open
0x01	Hnc	Hysteresis function NC = normally closed
0x02	Fno	Window function NO = normally open
0x03	Fnc	Window function NC = normally closed

Index 0x52: Function of output 2

Value (hexadecimal)	Menu item	Function
0x00	Hno	Hysteresis function NO = normally open
0x01	Hnc	Hysteresis function NC = normally closed
0x02	Fno	Window function NO = normally open
0x03	Fnc	Window function NC = normally closed

For LI2UPN:

Value (hexadecimal)	Menu item	Function
0x00	Hno	Hysteresis function NO = normally open
0x01	Hnc	Hysteresis function NC = normally closed
0x02	Fno	Window function NO = normally open
0x03	Fnc	Window function NC = normally closed
0x04	4 - 20	4…20 mA linear increase
0x05	0 - 20	0…20 mA linear increase
0x06	20 - 4	20…4 mA linear decrease
0x07	20 - 0	20…0 mA linear decrease
0x08	0 - 10	0…10 V linear increase
0x09	0 - 5	0…5 V linear increase
0x0A	1 - 6	1…6 V linear increase
0x0B	10 - 0	10…0 V linear decrease
0x0C	5 - 0	5…0 V linear decrease
0x0D	6 - 1	6…1 V linear decrease

For LUUPN:

Value (hexadecimal)	Menu item	Function
0x08	0-10	0…10 V linear increase
0x09	0-5	0…5 V linear increase
0x0A	1-6	1…6 V linear increase
0x0B	10-0	10…0 V linear decrease
0x0C	5-0	5…0 V linear decrease
0x0D	6-1	6…1 V linear decrease

Index 0x53: Behavior of switching outputs

Value (hexadecimal)	Menu item	Function
0x00	PnP	p switching
0x01	nPn	n switching

Index 0x54: Displayed unit

Value (hexadecimal)	Menu item	Function
0x00	bAr	bar
0x01	PSi	psi
0x02	kPA	kPa
0x03	MPA	MPa
0x04	Ud 1	Millibar = Hectopascal
0x05	Ud 2	mm Hg (0 °C) = Torr
0x06	Ud 3	Inch of water (60 °F)
0x07	Ud 4	Inch of water (39 °F)
0x08	Ud 5	Feet of water (39 °F)
0x09	Ud 6	Inch of Hg (60 °F)
0x0A	Ud 7	Inch of Hg (32 °F)
0x0B	Ud 8	mH_2O (16 °C)
0x0C	Ud 9	mH_2O (4 °C)
0x0D	Ud10	kg/cm^2

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	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3 bar	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10 bar	+	+	+	+	–	+	+	+	+	+	+	+	+	+
16 bar	+	+	+	+	–	–	+	+	+	+	+	+	+	+
25 bar	+	+	+	+	–	–	–	–	+	+	+	+	+	+
40 bar	+	+	+	+	–	–	–	–	+	+	+	+	+	+
100 bar	+	+	–	+	–	–	–	–	+	+	+	+	+	+
250 bar	+	+	–	+	–	–	–	–	+	+	+	+	+	+
400 bar	+	+	–	+	–	–	–	–	–	–	–	+	+	+
600 bar	+	+	–	+	–	–	–	–	–	–	–	+	+	+

Index 0x55: Display: Configure/disable update time

Value (hexadecimal)	Menu item	Function
0x00	50	50 ms measured value update time
0x01	200	200 ms measured value update time
0x02	600	600 ms measured value update time
0x03	Off	Display disabled

Index 0x56: Output 1: Behavior in the event of an error

Value (hexadecimal)	Menu item	Function
0x00	0	open
0x01	1	closed

Index 0x57: Output 2: Behavior in the event of an error

Value (hexadecimal)	Menu item	Function
0x00	0	open
0x01	1	closed

Index 0x58: Menu locked

Value (hexadecimal)	Function
0x00	Menu unlocked
0x01	Parameters can be displayed but not changed (not even in SIO mode)
0x02	Menu generally locked

Index 0x59: IO-Link write protection

Value (hexadecimal)	Function
0x00	No write protection
0x01	Writing of parameters via IO-Link not possible (except 0x59)

### Index 0x5A: Display: Color depending on output state

Value (hexadecimal)	Menu item	Function
0x00	0	0=Green, 1=Red, 2=GreenOut1, 3=RedOut1, 4=GreenOut2, 5=RedOut2, 6=GreenVirtual, 7=RedVirtual
0x01	1	

Index 0x5B: Display: Rotation/orientation

Value (hexadecimal)	Menu item	Function
0x00	0	0 °
0x01	1	180 °

Index 0x60: Switching and reset point 1

The switching point (SP) and related reset point (rP) are transferred together as one record in process value format. Transfer is executed according to the "big endian" specification.

Switching point		Release position	
MSB	LSB	MSB	LSB

0 ───▶ 1
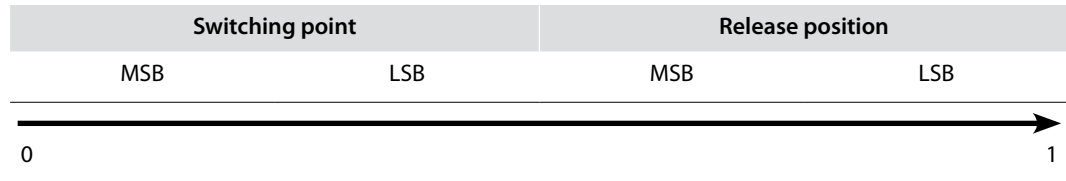
The following values are allowed:
The switching point must be at least 0.5 % f.s. above the reset point:
SP - rP > 0x45
The reset point must be at least 0.5 % of the entire span above the start value of the measuring range:
rP > 0x545
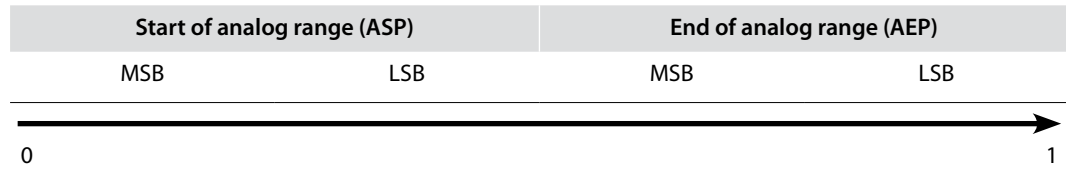The switching point should not exceed the end value of the measuring phase:
SP ≤ 0x3AFF

Index 0x61: Switching and reset point 2
See Index 60: Switching and reset point 1

Index 0x62: Start and end value of the analog range
Transfer is executed according to the "big endian" specification.

Start of analog range (ASP)		End of analog range (AEP)	
MSB	LSB	MSB	LSB

0 ───▶ 1

The following values are allowed:
The end value must be at least 10 % f.s. above the start value:
AEP - ASP > 0x566
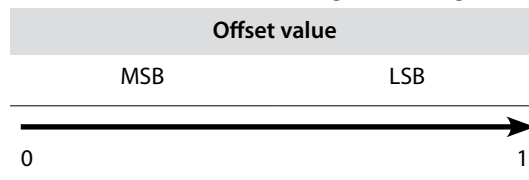The start value of the analog range should not drop below the start value of the measuring range:
ASP >= 0x0500
The end value of the analog range should not exceed the end value of the measuring range:
AEP <= 0x3AFF

Index 0x68: Offset
Transfer is executed according to the "big endian" specification.

Offset value	
MSB	LSB

0 ─────────────────────▶ 1

The following values are allowed:
The offset (COF) can be ± 10 % of the measuring range. It is transferred with a sign bit.
-0x526 < COF < 0x526

Index 0x69: Maximum value memory
Formatting is implemented in compliance with the general representation of process values (see above).

Index 0x6A: Minimum value memory
Formatting is implemented in compliance with the general representation of process values (see above).

Index 0x70: Damping of the analog output
Transfer is executed according to the "big endian" specification.

Damping value	
MSB	LSB

0   →   1

Value (hexadecimal)	Function
0x0000	0.00 s
0x0001	0.01 s
0x0002	0.02 s
…	…
0x018F	3.99 s
0x0190	4.00 s

Index 0x71: Damping of the switching output
See Index 0x70: Damping of the analog output

Index 0x78: Switching point for output 1 – switching delay
Transfer is executed according to the "big endian" specification.

Damping value	
MSB	LSB

0   →   1

Value (hexadecimal)	Function
0x0000	0.0 s
0x0001	0.1 s
0x0002	0.2 s
…	…
0x01F3	49.9 s
0x01F4	50.0 s

Index 0x79: Reset switching point for output 1 – switching delay
See Index 0x78: Switching point 1 for output 1 – switching delay 1

Index 0x7A: Switching point for output 2 – switching delay
See Index 0x78: Switching point 1 for output 1 – switching delay 1

Index 0x7A: Reset switching point for output 2 – switching delay
See Index 0x78: Switching point 1 for output 1 – switching delay 1

4.6   Error messages

Code	Additional code	Name	Description
128 (0x80)	0 (0x00)	Device application error - no details	The service has been refused by the device application. Additional information available.
128 (0x80)	17 (0x11)	Index not available	Attempt to access an index that does not exist
128 (0x80)	18 (0x12)	Subindex not available	Attempt to access a subindex that does not exist
128 (0x80)	35 (0x23)	Access denied	Attempt to write to a read-only parameter
128 (0x80)	48 (0x30)	Parameter value out of range	Parameter values entered outside the permitted measuring range
128 (0x80)	51 (0x33)	Parameter length overrun	Parameter length entered above the predefined length
128 (0x80)	52 (0x34)	Parameter length underrun	Parameter length entered below the predefined length
128 (0x80)	53 (0x35)	Function not available	Command entered not supported by the device application.
128 (0x80)	54 (0x36)	Function temporarily unavailable	Command entered not available in the device's current operating status.
128 (0x80)	64 (0x40)	Invalid parameter set	Parameter value entered conflicts with the current parameter settings
128 (0x80)	65 (0x41)	Inconsistent parameter set	Plausibility check of device has failed: Parameter inconsistencies found at the end of block parameter transfer.
129 (0x81)	255 (0xff)	EEPROM FAILURE	EEPROM failed, stable operation no longer possible. Replace the device!

4.7 Events

Code	Type	Name	Description
30480 (0x7710)	Error	Short circuit	Check installation
36001 (0x8ca1)	Error	Overload	Pressure is above permissible value
36002 (0x8ca2)	Error	Underload	Pressure is below permissible value
36003 (0x8ca3)	Warning	Overrun	Pressure is above measuring range
36004 (0x8ca4)	Warning	Underrun	Pressure is below measuring range
36006 (0x8ca6)	Notification	New maximum value recorded	New maximum pressure value measured
36007 (0x8ca7)	Notification	New minimum value recorded	New maximum pressure value measured
36010 (0x8caa)	Error	Critical Error	Critical error detected. The device must be replaced.

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