Operating Instructions
Cerabar PMC21
IO-Link

Process pressure measurement
Pressure transducer for safe measurement and
monitoring of absolute and gauge pressure

IO-Link

Endress+Hauser [EH]

People for Process Automation

A0023555

- Make sure the document is stored in a safe place such that it is always available when working on or with the device.
- To avoid danger to individuals or the facility, read the "Basic safety instructions" section carefully, as well as all other safety instructions in the document that are specific to working procedures.
- The manufacturer reserves the right to modify technical data without prior notice. Your Endress+Hauser distributor will supply you with current information and updates to this manual.

Table of contents

1   About this document

1.1   Purpose of this document

These Operating Instructions contain all the information that is required in the various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.2   Symbols

1.2.1   Safety symbols

⚠ DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

⚠ WARNING

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

⚠ CAUTION

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE

This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2   Electrical symbols

⏚ Protective earth (PE)
Ground terminals, which must be grounded prior to establishing any other connections. The ground terminals are located on the inside and outside of the device.

⏚ Ground connection
Grounded clamp, which is grounded via a grounding system.

1.2.3   Tool symbols

🔧 Open-ended wrench

1.2.4   Symbols for certain types of Information

✅ Permitted
Procedures, processes or actions that are permitted.

❌ Forbidden
Procedures, processes or actions that are forbidden.

ℹ Tip
Indicates additional information

📖 Reference to documentation

1. , 2. , 3. Series of steps

Reference to page: 📖

Result of an individual step: ↳➤

1.2.5   Symbols in graphics

A, B, C ...   View

1, 2, 3 ...   Item numbers

1., **2.**, **3.**   Series of steps

1.3   Documentation

The following types of documentation are available in the Download Area of the Endress +Hauser website (www.endress.com/downloads):

🛈 For an overview of the scope of the associated Technical Documentation, refer to the following:
  - *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
  - *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

1.3.1   Technical Information (TI)

Planning aid
The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

1.3.2   Brief Operating Instructions (KA)

Guide that takes you quickly to the 1st measured value
The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

1.3.3   Safety Instructions (XA)

Depending on the approval, the following Safety Instructions (XA) are supplied with the device. They are an integral part of the Operating Instructions.

🛈 The nameplate indicates the Safety Instructions (XA) that are relevant to the device.

1.3.4   Functional Safety Manual (FY)

Depending on the SIL approval, the Functional Safety Manual (FY) is an integral part of the Operating Instructions and applies in addition to the Operating Instructions, Technical Information and ATEX Safety Instructions.

🛈 The different requirements that apply for the protective function are described in the Functional Safety Manual (FY).

1.4 Terms and abbreviations

A0029505
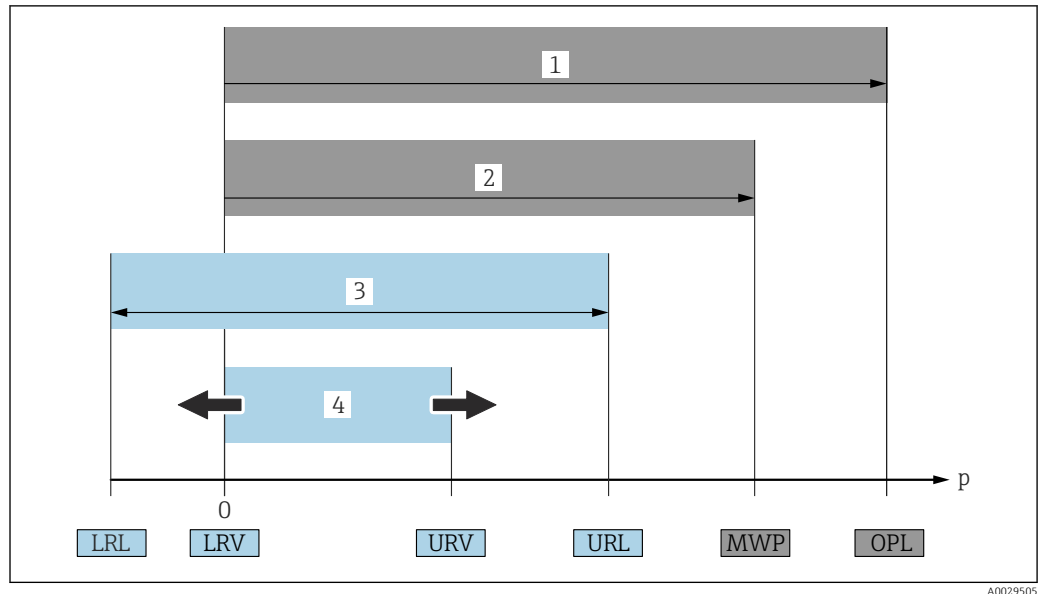
1   OPL: The OPL (over pressure limit = sensor overload limit) for the measuring device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Observe pressure-temperature dependency. The OPL may only be applied for a short period of time.

2   MWP: The MWP (maximum working pressure) for the sensors depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Observe pressure-temperature dependency. The maximum working pressure may be applied at the device for an unlimited period. The MWP can be found on the nameplate.

3   The maximum sensor measuring range corresponds to the span between the LRL and URL. This sensor measuring range is equivalent to the maximum calibratable/adjustable span.

4   The calibrated/adjusted span corresponds to the span between the LRV and URV. Factory setting: 0 to URL. Other calibrated spans can be ordered as customized spans.

p   Pressure

LRL   Lower range limit

URL   Upper range limit

LRV   Lower range value

URV   Upper range value

TD   Turn down Example - see the following section.

The turn down is preset in the factory and can be changed.

1.5 Turn down calculation

A0029545
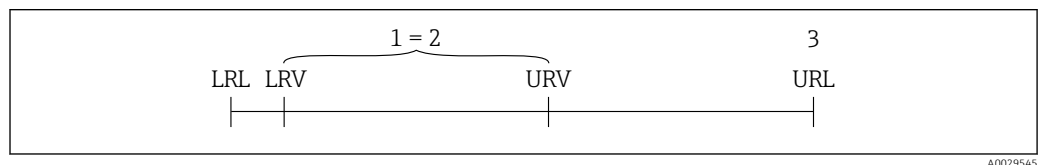
1   Calibrated/adjusted span

2   Zero point-based span

3   Upper range limit

Example	
• Sensor: 10 bar (150 psi) • Upper range limit (URL) = 10 bar (150 psi)	• Calibrated/adjusted span: 0 to 5 bar (0 to 75 psi) • Lower range value (LRV) = 0 bar (0 psi) • Upper range value (URV) = 5 bar (75 psi)

Turn down (TD):

$$TD = \frac{URL}{|URV - LRV|}$$

$$TD = \frac{10 \text{ bar (150 psi)}}{|5 \text{ bar (75 psi)} - 0 \text{ bar (0 psi)}|} = 2$$

In this example, the TD is 2:1.
This span is based on the zero point.

1.6   Registered trademarks

IO-Link

is a registered trademark of the IO-Link Consortium.

2 Basic safety instructions

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:
▶ Trained, qualified specialists must have a relevant qualification for this specific function and task.
▶ Are authorized by the plant owner/operator.
▶ Are familiar with federal/national regulations.
▶ Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
▶ Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:
▶ Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
▶ Follow the instructions in this manual.

2.2 Designated use

2.2.1 Application and media

The device is used to measure absolute and gauge pressure in gases, vapors and liquids. The process-wetted materials of the measuring device must have an adequate level of resistance to the media.

The measuring device may be used for the following measurements (process variables)
• in compliance with the limit values specified under "Technical data"
• in compliance with the conditions listed in this manual.

Measured process variable

Gauge pressure or absolute pressure

Calculated process variable

Pressure

2.2.2 Incorrect use

The manufacturer is not liable for damage caused by using the device incorrectly or for purposes for which it was not intended.

Verification for borderline cases:
▶ For special fluids and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of process-wetted materials, but does not accept any warranty or liability.

2.2.3 Residual risks

When in operation, the housing may reach a temperature close to the process temperature.

Danger of burns from contact with surfaces!
▶ For elevated process temperatures, ensure protection against contact to prevent burns.

2.3 Workplace safety

When working on and with the device:
▶ Wear the required personal protective equipment as per national regulations.
▶ Switch off the supply voltage before connecting the device.

2.4 Operational safety

Risk of injury!
▶ Operate the device only if it is in proper technical condition, free from errors and faults.
▶ The operator is responsible for ensuring trouble-free operation of the device.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:
▶ If modifications are nevertheless required, consult with Endress+Hauser.

Hazardous area

To eliminate danger to persons or the facility when the device is used in the hazardous area (e.g., pressure equipment safety):
▶ Check the nameplate to verify if the device ordered can be put to its intended use in the hazardous area.
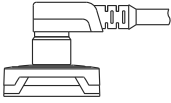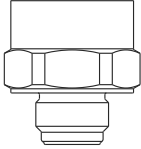
2.5 Product safety

This device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EC directives listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

3 Product description

3.1 Product design

Overview	Item	Description
C - 1 A0021987	C - 1	M12 plug Housing cap made of plastic
D **E** A0027226	D E	Housing Process connection (sample illustration)

3.2 Operating principle

3.2.1 Calculating the pressure

Devices with ceramic process membrane (Ceraphire®)

The ceramic sensor is an oil-free sensor, i.e. the process pressure acts directly on the robust ceramic process membrane and causes it to deflect. A pressure-dependent change in capacitance is measured at the electrodes of the ceramic substrate and the process membrane. The measuring range is determined by the thickness of the ceramic process membrane.

4 Incoming acceptance and product identification

4.1 Incoming acceptance
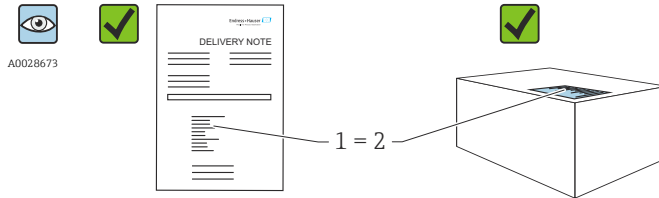
Is the order code on the delivery note (1) identical to the order code on the product sticker (2)?
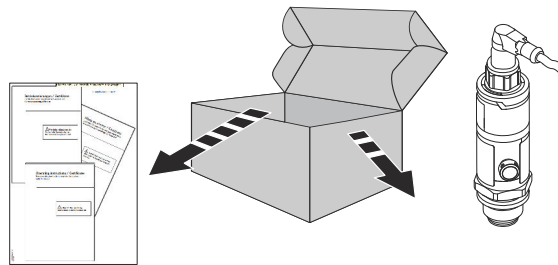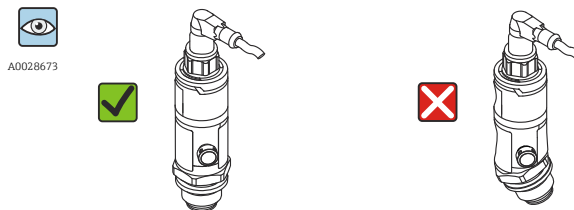
Are the goods undamaged?
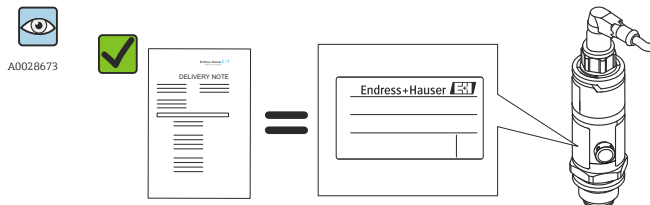
Do the data on the nameplate correspond to the order specifications and the delivery note?

If one of these conditions does not apply, please contact your Endress+Hauser sales office.

4.2   Product identification

The measuring device can be identified in the following ways:
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter the serial numbers from the nameplates in *W@M Device Viewer*
  (www.endress.com/deviceviewer): all the information about the device is displayed.

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

4.2.1   Manufacturer address

Endress+Hauser SE+Co. KG
Hauptstraße 1
79689 Maulburg, Germany

Place of manufacture: See nameplate.

4.2.2   Nameplate
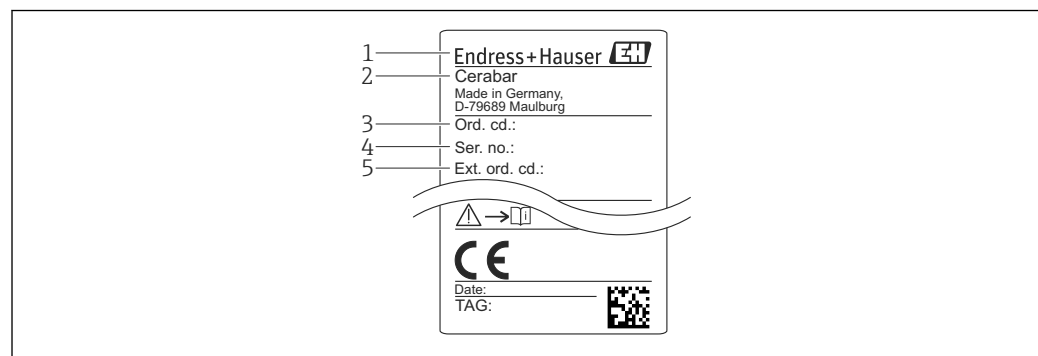
1   Manufacturer's address
2   Device name
3   Order number
4   Serial number
5   Extended order number

4.3   Storage and transport

4.3.1   Storage conditions

Use original packaging.

Store the measuring device in clean and dry conditions and protect from damage caused by shocks (EN 837-2).

Storage temperature range

−40 to +85 ℃ (−40 to +185 ℉)

4.3.2 Transporting the product to the measuring point

⚠ WARNING

Incorrect transport!
Housing and membrane may become damaged, and there is a risk of injury.
▶ Transport the measuring device to the measuring point in its original packaging or by the process connection.

5 Mounting

5.1 Mounting requirements

- Moisture must not penetrate the housing when the device is being mounted, the electrical connection is being set up or during operation.
- Do not clean or touch process isolating diaphragms with hard and/or pointed objects.
- Do not remove the protection on the process membrane until just before installation.
- Always tighten the cable entry firmly.
- Point the cable and plug downwards where possible to prevent moisture from entering (e.g. rain or condensation water).
- Protect the housing against impact.
- For devices with gauge pressure sensor, the following applies:

NOTICE

If a heated device is cooled during a cleaning process (e.g. by cold water), a vacuum develops for a short time and, as a result, moisture can enter the sensor through the pressure compensation element (1).
Device could be destroyed!

▶ In the event of this happening, mount the device in such a way that the pressure compensation element (1) is pointing downwards at an angle or to the side, if possible.
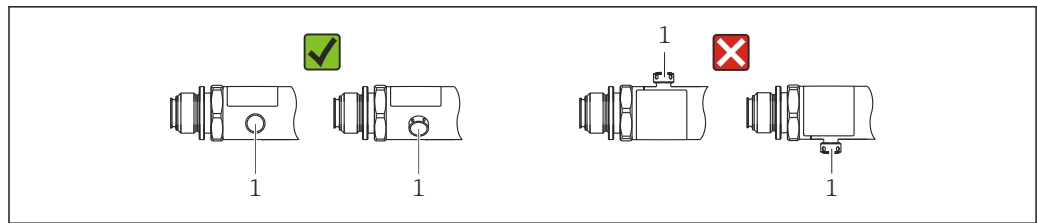
5.2 Influence of orientation

Any orientation is possible. However, the orientation may cause a zero point shift, i.e. the measured value does not show zero when the vessel is empty or partially full.
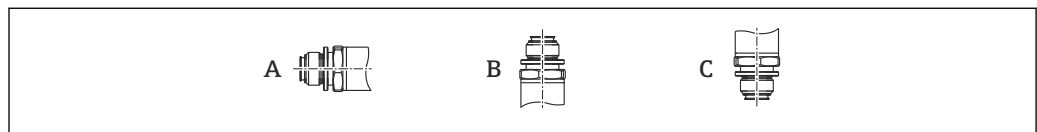
Type	Process membrane axis is horizontal (A)	Process membrane pointing upwards (B)	Process membrane pointing downwards (C)
< 1 bar (15 psi)	Calibration position, no effect	Up to +0.3 mbar (+0.0044 psi)	Up to −0.3 mbar (−0.0044 psi)
> 1 bar (15 psi)	Calibration position, no effect	Up to +3 mbar (+0.0435 psi)	Up to −3 mbar (−0.0435 psi)

5.3   Mounting location

5.3.1   Pressure measurement

Pressure measurement in gases

Mount the device with the shutoff device above the tapping point to allow any condensate to flow into the process.
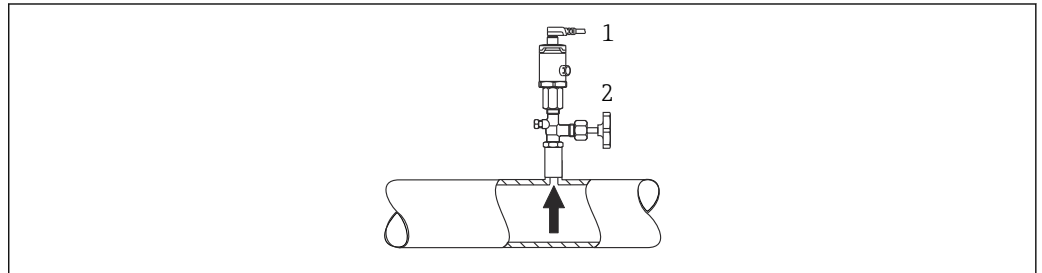
A0021904

1   Device
2   Shutoff device

Pressure measurement in vapors

For pressure measurement in vapors, use a siphon. The siphon reduces the temperature to almost ambient temperature. Mount the device with the shutoff device at the same level as the tapping point.

Advantage:
only minor/negligible heat effects on the device.

Note the max. permitted ambient temperature of the transmitter!
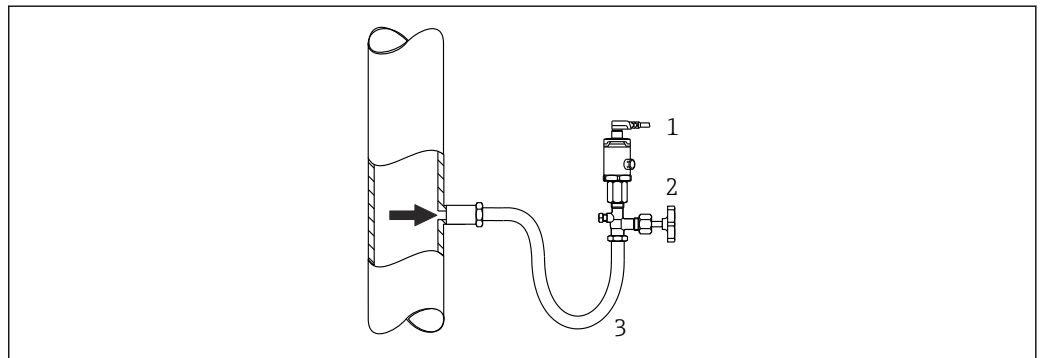
A0024395

1   Device
2   Shutoff device
3   Siphon

Pressure measurement in liquids

Mount the device with the shutoff device at the same level as or below the tapping point.
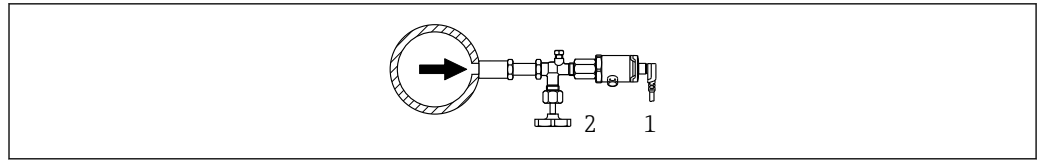
A0024399

1   Device
2   Shutoff device

5.3.2   Level measurement

- Always install the device below the lowest measuring point.
- Do not install the device at the following positions:
  - In the filling curtain
  - In the tank outlet
  - In the suction area of a pump
  - At a point in the tank which could be affected by pressure pulses from the agitator
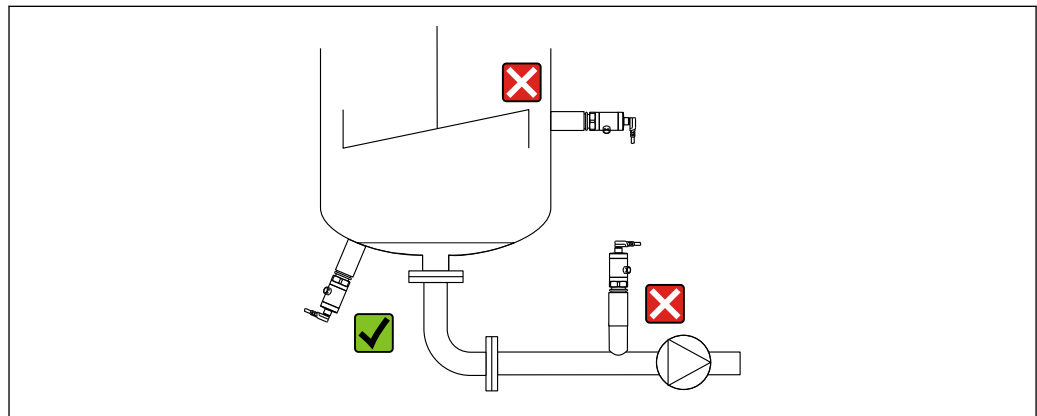
A0024405

5.4   Mounting instructions for oxygen applications

Oxygen and other gases can react explosively to oils, grease and plastics, such that, among other things, the following precautions must be taken:
- All components of the system, such as measuring devices, must be cleaned in accordance with the BAM requirements.
- Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded for oxygen applications.
- The following table lists devices (devices only, not accessories or enclosed accessories), which are suitable for gaseous oxygen applications.

p_{max} for oxygen applications	T_{max} for oxygen applications	Option [1]
40 bar (600 psi)	−10 to +60 °C (+14 to +140 °F)	HB

1)   Product Configurator, order code for "Service"

5.5   Post-mounting check

- Is the device undamaged (visual inspection)?
- Does the device comply with the measuring point specifications? For example:
  - Process temperature
  - Process pressure
  - Ambient temperature
  - Measurement range
- Are the measuring point identification and labeling correct (visual inspection)?

- Is the device adequately protected from precipitation and direct sunlight?
- Are the securing screws firmly tightened?
- Does the pressure compensation element point downwards at an angle or to the side?
- To prevent moisture from penetrating, ensure that the connecting cables/plugs are pointing downwards.

6   Electrical connection

6.1   Connecting the measuring unit

6.1.1   Terminal assignment

⚠ **WARNING**

Risk of injury from the uncontrolled activation of processes!
▸ Switch off the supply voltage before connecting the device.
▸ Make sure that downstream processes are not started unintentionally.

⚠ **WARNING**

An incorrect connection compromises electrical safety!
▸ In accordance with IEC/EN 61010, a suitable circuit breaker must be provided for the device.
▸ **Non-hazardous area:** To meet device safety specifications according to the IEC/EN 61010 standard, the installation must ensure that the maximum current is limited to 500 mA.
▸ Protective circuits against reverse polarity are integrated.

NOTICE

Damage to analog input of PLC resulting from incorrect connection
▸ Do not connect the active PNP switch output of the device to the 4 to 20 mA input of a PLC.

Connect the device in the following order:

1.   Check whether the supply voltage matches the supply voltage indicated on the nameplate.

2.   Connect the device as indicated in the following diagram.

Switch on the supply voltage.
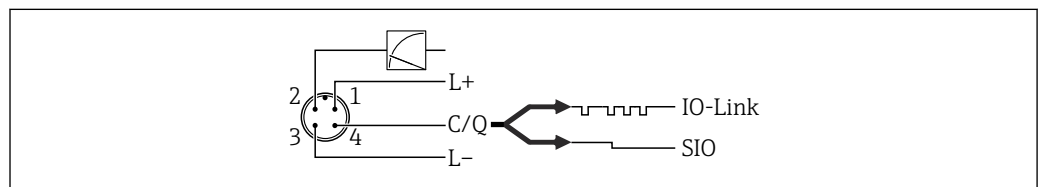
🔲 *1   M12 plug*

1   Supply voltage +
2   4-20 mA
3   Supply voltage -
4   C/Q (IO-Link communication or SIO mode)

6.1.2   Supply voltage

Electronic version	Supply voltage
IO-Link	10 to 30 V_{DC} IO-Link communication is guaranteed only if the supply voltage is at least 18 V.

6.1.3   Current consumption and alarm signal

Electronic version	Current consumption	Alarm signal [1]
IO-Link	Maximum current consumption: ≤ 300 mA	

1)   For MAX alarm (factory setting)

6.2   Connection data

6.2.1   Switching capacity

- Switch status ON: I_a ≤ 200 mA [1] [2]; Switch status OFF: I_a ≤1 mA
- Switch cycles: >10,000,000
- Voltage drop PNP: ≤2 V
- Overload protection: Automatic load testing of switching current;
  - Max. capacitance load: 1 µF at max. supply voltage (without resistive load)
  - Max. cycle duration: 0.5 s; min. t_{on}: 40 µs
  - Periodic disconnection from protective circuit in the event of overcurrent (f = 2 Hz) and "F804" displayed

6.2.2   Load (for 4 to 20 mA devices)

In order to guarantee sufficient terminal voltage, a maximum load resistance R_L (including line resistance) must not be exceeded depending on the supply voltage U_B of the supply unit.

$$2 \rightarrow R_{Lmax} \leq \frac{U_B - 6.5V}{23mA}$$
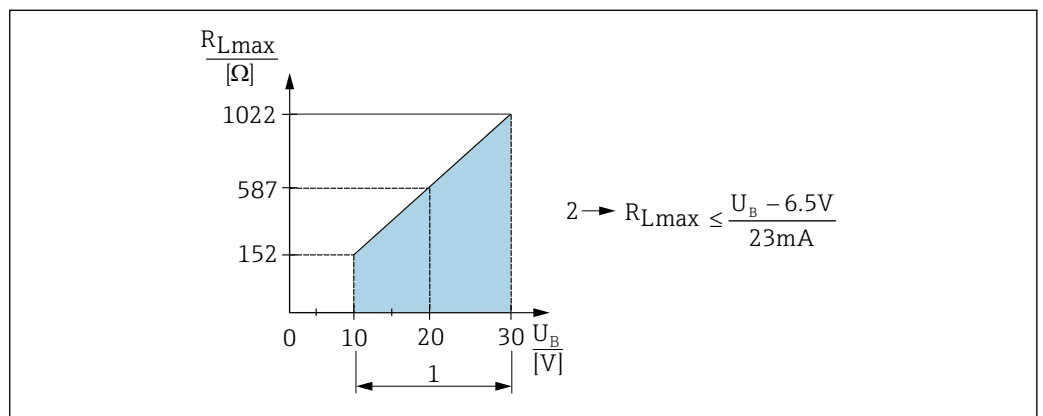
1   Power supply 10 to 30 V_{DC}
2 R_{Lmax} Maximum load resistance
U_B Supply voltage

If load is too great:
- Failure current is indicated and "S803" displayed (indication: MIN alarm current)
- Periodic checking to establish if it is possible to quit fault state
- In order to guarantee sufficient terminal voltage, a maximum load resistance RL (including line resistance) must not be exceeded depending on the supply voltage UB of the supply unit.

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1)   For the switch output 1 x PNP + 4 to 20 mA output 100 mA can be guaranteed over the entire temperature range. For lower ambient temperatures, higher currents are possible but cannot be guaranteed. Typical value at 20 ℃ (68 ℉) approx. 200 mA. For the switch output "1 x PNP", 200 mA can be guaranteed over the entire temperature range.
2)   Larger currents are supported, thus deviating from the IO-Link standard.

6.3   Post-connection check

- Is the device or cable undamaged (visual check)?
- Do the cables used comply with the requirements?
- Are the mounted cables relieved of tension?
- Are all cable glands installed, securely tightened and leak-tight?
- Does the supply voltage match the specifications on the nameplate?
- Is the terminal assignment correct ?
- If required: has protective ground connection been established?

7 Operation options

7.1 IO-Link

7.1.1 IO-Link information

IO-Link is a point-to-point connection for communication between the measuring device and an IO-Link master. The measuring device features an IO-Link communication interface type 2 with a second IO function on pin 4. This requires an IO-Link-compatible assembly (IO-Link master) for operation. The IO-Link communication interface enables direct access to the process and diagnostic data. It also provides the option of configuring the measuring device while in operation.

Physical layer, the measuring device supports the following features:
- IO-Link specification: Version 1.1
- IO-Link Smart Sensor Profile 2nd Edition
- SIO mode: Yes
- Speed: COM2; 38.4 kBaud
- Minimum cycle time: 2.5 msec.
- Process data width: 48 bits (Float32+14-bit vendor-spec. + 2 bits SSC)
- IO-Link data storage: Yes
- Block configuration: Yes

7.1.2 IO-Link download

http://www.endress.com/download
- Select "Software" as the media type.
- Select "Device Driver" as the software type.
  Select IO-Link (IODD).
- In the "Text Search" field enter the device name.

https://ioddfinder.io-link.com/
Search by
- Manufacturer
- Article number
- Product type

8   System integration

8.1   Process data

The measuring device's process data are transmitted cyclically as per SSP 4.3.1

Bit-offset	Name	Data type	Permitted values	Offset/gradient	Description
0	Process Data Input.Switching Signal Channel 1.1 Pressure	1-bit Uinteger	0 = False 1 = True	-	Switching signal status SSC 1.1
1	Process Data Input.Switching Signal Channel 1.2 Pressure	1-bit Uinteger	0 = False 1 = True	-	Switching signal status SSC 1.2
8	Summary status (Condensed)	8-bit UInteger	• 36 = Error • 60 = Function check • 120 = Outside specifications • 128 = Good • 129 = Simulation • 164 = Maintenance required	-	Summary status as per PI specification
16	Pressure	Float32	-	psi: 0 / 0.0001450326 bar: 0 / 0.00001 kPa: 0 / 0.001 MPa: 0 / 0.000001	Current pressure

Process Value Pressure [Float32]		
[47...16 bit]		
Condensed status	N/A	SSC 1.1-1.2
[15...8 bit]	[7...2 bit]	[1.0 bit]

8.2   Reading out and writing device data (ISDU – Indexed Service Data Unit)

Device data are always exchanged acyclically and at the request of the IO-Link master. Using the device data, the following parameter values or device statuses can be read out:

8.2.1   Endress+Hauser-specific device data

ISDU (dec)	Description	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Offset/ gradient	Data storage	Range limits
66	Sim. current	0x0042	1	UintegerT	r/w		0 ~ off 3 ~ 3.5 mA 4 ~ 4 mA 5 ~ 8 mA 6 ~ 12 mA 7 ~16 mA 8 ~ 20 mA 9 ~ 21.95 mA		No	
67	Unit changeover	0x0043	1	UintegerT	r/w	0 = bar	0 ~ bar 1 ~ kPa 2 ~ psi 3 ~ MPa		Yes	
68	Zero point configuration (ZRO)	0x0044	4	IntegerT	r/w	0	as 00.00% Default 0.00%		Yes	
69	Zero point adoption (GTZ)	0x0045	1	UintegerT	w				No	
70	Damping (TAU)	0x0046	2	UintegerT	r/w	20	in 000.0 sec Default 2.0 sec	-	Yes	0 - 9999
71	Lower Range Value for 4 mA (STL)	0x0047	4	IntegerT	r/w	0	as 00.00% Default 0.00%	bar: 0/0.001 kPa: 0/0.1 MPa: 0/0.0001 psi: 0/0.01	Yes	-
72	Upper Range Value for 20 mA (STU)	0x0048	4	IntegerT	r/w	10000	as 00.00% Default 100.00%	bar: 0/0.001 kPa: 0/0.1 MPa: 0/0.0001 psi: 0/0.01	Yes	-
73	Pressure applied for 4 mA(GTL)	0x0049	1	UintegerT	w	-	-	-	No	-
74	Pressure applied for 20 mA (GTU)	0x004A	1	UintegerT	w	-	-	-	No	-
75	Alarm current (FCU)	0x004B	1	Uinteger	r/w	1 ~ MAX	0 ~ MIN 1 ~ MAX 2 ~ HOLD	-	Yes	-
82	Hi Max value (maximum indicator)	0x0052	4	IntegerT	r	0	-	-	No	-
83	Lo Min value (minimum indicator)	0x0053	4	IntegerT	r	0	-	-	No	-

ISDU (dec)	Description	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Offset/ gradient	Data storage	Range limits
84	Revisioncounter (RVC)	0x0054	2	UintegerT	r	0	-	-	No	-
85	Simulation Switch Output (OU1)	0x0055	1	UintegerT	r/w	0 = OFF	0 ~ OFF 1 ~ OU1 = low (OPN) 2 ~ OU1 = high (CLS)	-	No	-
88	FUNC	0x0058	1	UintegerT	r/w	1 = 4 to 20 mA(I)	0 ~ OFF 1 ~ 4 to 20 mA	-	Yes	-
256	Device type	0x0100	2	UintegerT	r	0x92FD	-	-	No	-
257	ENP_VERSION	0x0101	16	StringT	r	02.03.00	-	-	No	-
259	extended Ordercode	0x0103	60	StringT	r	-	-	-	No	-

8.2.2 IO-Link-specific device data

ISDU (dec)	Description	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Data storage
7...8	VendorID	0x0007... 0x0008	-	-	r	17		No
9...11	DeviceID	0x0009... 0x000B	-	-	r	0x000Fxx	-	No
16	VendorName	0x0010	max. 64	StringT	r	Endress+Hauser	-	No
17	VendorText	0x0011	max. 64	StringT	r	People for Process Automation	-	No
18	ProductName	0x0012	max. 64	StringT	r	Cerabar	-	No
19	ProductID	0x0013	max. 64	StringT	r	PMx2x	-	No
20	ProductText	0x0014	max. 64	StringT	r	Absolute and gauge pressure	-	No
21	Serial number	0x0015	max. 64	StringT	r	-	-	No
22	Hardware Revision	0x0016	max. 64	StringT	r	-	-	No
23	Firmware Version	0x0017	max. 64	StringT	r	-	-	No
24	Application Specific Tag	0x0018	32	StringT	r/w	-	-	Yes
25	Function Tag	0x0019	32	StringT	r/w	***	-	No
26	Location Tag	0x001A	32	StringT	r/w	***	-	No
36	Device status	0x0024	1	Integer T	r	0	0 ~ Device is OK 1 ~ Maintenance required 2 ~ Out of specification 3 ~ Functional check 4 ~ Failure	No
37	Detailed Device Status	0x0025	3	OctetStringT		-	-	No
260	Actual Diagnostic (STA)	0x0104	4	StringT	r	0	-	No
261	Last Diagnostic (LST)	0x0105	4	StringT	r	0	-	No

Teach - Single value

ISDU (dec)	Description	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Data storage
58	Teach Select	0x003A	1	UintegerT	r/w	1	0 ~ Default Channel = SSC1.1 Pressure 1 ~ SSC1.1 Pressure 2 ~ SSC1.2 success 255 ~ All SSC	No
59	Teach Result State	0x003B	1	UintegerT	r	0	0 ~ Idle 1 ~ SP1 success 2 ~ SP2 success 5 ~ Busy 7 ~ Error	No

Switching Signal Channel 1.1 Pressure

ISDU (dec)	Subindex	Description	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Data storage
60	24	SSC1.1 Param.SP1	0x003C	4	Float32T	r/w	9000.0	-	Yes
60	23	SSC1.1 Param.SP2	0x003C	4	Float32T	r/w	1000.0	-	Yes
61	01	SSC1.1 Config.Logic	0x003D	1	UintegerT	r/w	0	0 ~ High active 1 ~ Low active	Yes
61	02	SSC1.1 Config.Mode	0x003D	1	UintegerT	r/w	0	0 ~ Deactivation 1 ~ Single point 2 ~ Window 3 ~ Two-point	Yes
61	03	SSC1.1 Config.Hyst	0x003D	4	Float32T	r/w	10.0	-	Yes

Switching Signal Channel 1.2 Pressure

ISDU (dec)	Subindex	Description	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Data storage
60	24	SSC1.2 Param.SP1	0x003C	4	Float32T	r/w	9500.0	-	Yes
60	23	SSC1.2 Param.SP2	0x003C	4	Float32T	r/w	1500.0	-	Yes
61	01	SSC1.2 Config.Logic	0x003D	1	UintegerT	r/w	0	0 ~ High active 1 ~ Low active	Yes
61	02	SSC1.2 Config.Mode	0x003D	1	UintegerT	r/w	0	0 ~ Deactivation 1 ~ Single point 2 ~ Window 3 ~ Two-point	Yes
61	03	SSC1.2 Config.Hyst	0x003D	4	Float32T	r/w	10.0	-	Yes

Measurement Data Information

ISDU (dec)	Subindex	Description	ISDU (hex)	Size (byte)	Data type	Access	Default value	Value range	Data storage
16512	1	MDC Descriptor - Pressure.Lower Value	0x4080	4	Float32T	r	0	-	No
16512	2	MDC Descriptor - Pressure.Upper Value	0x4080	4	Float32T	r	0	-	No
16512	3	MDC Descriptor - Pressure.Unit Code	0x4080	2	UintegerT	r	1130 (Pa)	-	No
16512	4	MDC Descriptor - Pressure.Scale	0x4080	1	IntegerT	r	0	-	No

8.2.3   System commands

| ISDU (dec)	Subindex	Description	ISDU (hex)	Access
2	65	Teach SP1	0x0002	w
2	66	Teach SP2	0x0002	w
2	130	Reset to factory settings (RES)	0x0002	w
2	131	Back-To-Box	0x0002	w

8.2.4   Switching signals

The switching signals offer a simple way of monitoring the measured values for limit violations.

Each switching signal is clearly assigned to a process value and provides a status. This status is transmitted with the process data (process data link). Its switching behavior must be configured using the configuration parameters of a "Switching Signal Channel" (SSC). In addition to manual configuration for switch points SP1 and SP2, a teach mechanism is available in the "Teach" menu. This mechanism writes the current process value to the selected SSC via a system command. The following section illustrates the different behaviors of the modes available for selection. The "Logic" parameter is always "High active" in these cases. If the logic is supposed to be inverted, the "Logic" parameter can be set to "Low active"(→ 🖹 34).

Single Point Mode
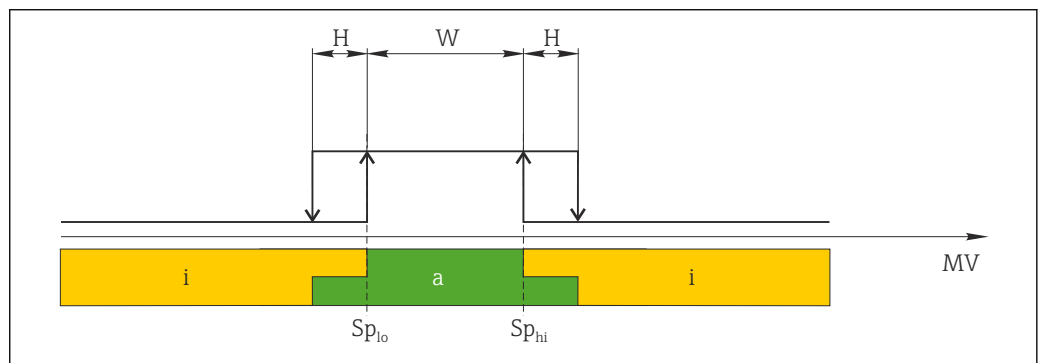
SP2 is not used in this mode.
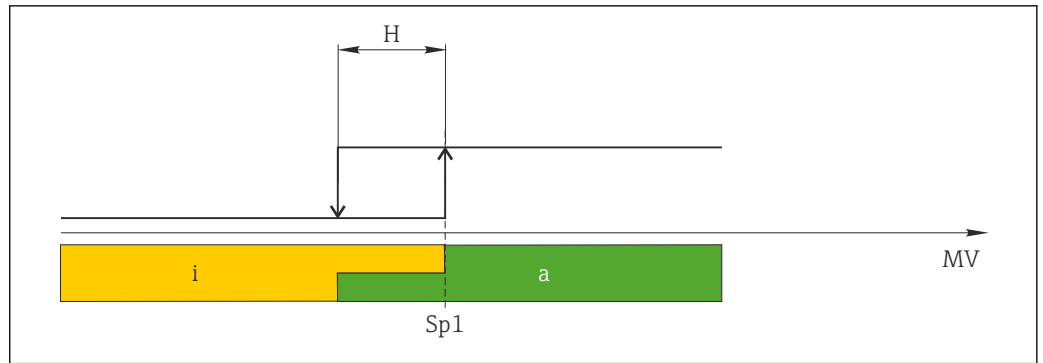
2 SSC, Single Point

H Hysteresis
Sp1 Switch point 1
MV Measured value
i inactive (orange)
a active (green)

Window Mode

SP_{hi} always corresponds to whichever value is higher, SP1 or SP2, and SP_{lo} always corresponds to whichever value is lower, SP1 or SP2.

3 SSC, Window

H Hysteresis
W Window
Sp_{lo} Switch point with lower measured value
Sp_{hi} Switch point with higher measured value
MV Measured value
i inactive (orange)
a active (green)

Two-point mode

SP_{hi} always corresponds to whichever value is higher, SP1 or SP2 and SP_{lo} always corresponds to whichever value is lower value, SP1 or SP2.
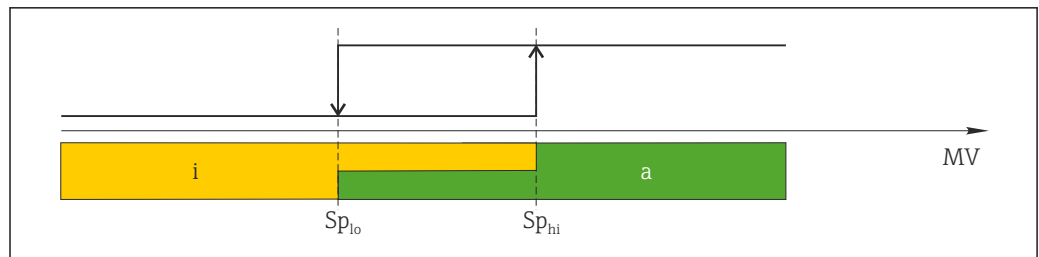
Hysteresis is not used.

4 SSC, Two-point

Sp$_{lo}$ Switch point with lower measured value
Sp$_{hi}$ Switch point with higher measured value
MV Measurement value
i Inactive (orange)
a Active (green)

9 Commissioning

If an existing configuration is changed, measuring operation continues! The new or modified entries are only accepted once the setting has been made.

If block parameter configuration is used, a parameter change is only adopted after the parameter download.

> ⚠️ **WARNING**
>
> **Risk of injury from the uncontrolled activation of processes!**
> ▸ Make sure that downstream processes are not started unintentionally.

> ⚠️ **WARNING**
>
> **If a pressure smaller than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession:**
> ▸ S140
> ▸ F270

> **NOTICE**
>
> **An IODD with corresponding default values is used for all pressure measuring ranges. This IODD applies to all measuring ranges! The default values of this IODD may not be valid for this device. IO-Link messages (e.g. "Parameter value above limit") may be displayed when the device is updated with these default values. Existing values are not accepted in this case. The default values apply exclusively to the 10 bar (150 psi) sensor.**
> ▸ Before default values are written from the IODD to the device, the data must first be read from the device.

9.1 Function check

Before commissioning your measuring point, ensure that the post-installation and post-connection checks have been performed:

- "Post-installation check" checklist
- "Post-connection check" checklist

9.2 Commissioning with an operating menu

Commissioning comprises the following steps:
- Configuring pressure measurement
- Where applicable, performing position adjustment
- Where applicable, configuring process monitoring

9.3   Configuring pressure measurement

9.3.1   Adjustment without reference pressure (dry adjustment = adjustment without medium)

Example:

In this example, a device with a 400 mbar (6 psi) sensor is configured for the measuring range 0 to 300 mbar (0 to 4.4 psi).

The following values should be assigned:
- 0 mbar = 4 mA value
- 300 mbar (4.4 psi) = 20 mA value

Prerequisite:

This is a theoretical adjustment, i.e. the pressure values for the lower and upper range are known. It is not necessary to apply pressure.

ℹ️ Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. the measured value is not zero in an unpressurized state. For information on how to perform position adjustment, see the "Performing position adjustment" section.

ℹ️ For a description of the parameters mentioned and possible error messages, see the "Description of device parameters" section.

Carrying out the adjustment

1. Select a pressure unit, here "bar" for example, via the **Unit changeover (UNI)** parameter.

2. Select **Value for 4 mA (STL)** parameter. Enter the value (0 bar (0 psi)) and confirm.
   ↳ This pressure value is assigned to the lower current value (4 mA).

3. Select **Value for 20 mA (STU)** parameter. Enter the value (300 mbar (4.4 psi)) and confirm.
   ↳ This pressure value is assigned to the upper current value (20 mA).

The measuring range is set for 0 to 300 mbar (0 to 4.4 psi).

9.3.2 Adjustment with reference pressure (wet adjustment = adjustment with medium)

Example:

In this example, a device with a 400 mbar (6 psi) sensor is configured for the measuring range 0 to 300 mbar (0 to 4.4 psi).

The following values should be assigned:
- 0 mbar = 4 mA value
- 300 mbar (4.4 psi) = 20 mA value

Prerequisite:

The pressure values 0 mbar and 300 mbar (4.4 psi)can be specified. For example, the device is already installed.

ℹ️ Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. the measured value is not zero in an unpressurized state. For information on how to perform position adjustment, see the "Performing position adjustment" section.

ℹ️ For a description of the parameters mentioned and possible error messages, see the "Description of device parameters" section.

Carrying out the adjustment

1. Select a pressure unit, here "bar" for example, via the **Unit changeover (UNI)** parameter.

2. The pressure for the LRV (4 mA value) is present at the device, here 0 bar (0 psi) for example. Select **Pressure applied for 4mA (GTL)** parameter. The selection is confirmed by pressing "Get Lower Limit".
   ↳ The pressure value present at the device is assigned to the lower current value (4 mA).

3. The pressure for the full scale value (20 mA value) is present at the device, here for example 300 mbar (4.4 psi). Select **Pressure applied for 20mA (GTU)** parameter. The selection is confirmed by pressing "Get Lower Limit".
   ↳ The pressure value present at the device is assigned to the upper current value (20 mA).

The measuring range is set for 0 to 300 mbar (0 to 4.4 psi).

9.4   Performing position adjustment

Zero point configuration (ZRO)

Navigation	Parameter → Application → Sensor → Zero point configuration (ZRO)
Description	(Typically absolute pressure sensor) A pressure shift resulting from the orientation of the device can be corrected by the position adjustment. The pressure difference between zero (set point) and the measured pressure must be known.
Prerequisite	An offset is possible (parallel shifting of the sensor characteristic) to correct the orientation and any zero point drift. The set value of the parameter is subtracted from the "raw measured value". The requirement to be able to perform a zero point shift without changing the span is met with the offset function. Maximum offset value = ± 20 % of the sensor nominal range. If an offset value is entered that shifts the span beyond the physical limits of the sensor, the value is admitted but a warning message is generated and displayed via IO-Link. The warning message only disappears when the span is within the sensor limits, taking the offset value currently configured into consideration.
	The sensor can • be operated in a physically unfavorable range, i.e. outside its specifications, or • be operated by making appropriate corrections to the offset or span.
	Raw measured value – (manual offset) = display value (measured value)
Example	• Measured value = 0.002 bar (0.029 psi) • Set the manual offset to 0.002. • Display value (measured value) after position adjustment = 0 bar (0 psi) • The current value is also corrected.
Note	Setting in increments of 0.001. As the value is entered numerically, the increment depends on the measuring range
Options	No selection. The user is free to edit the values.
Factory setting	0

Zero point adoption (GTZ)

Navigation	Parameter → Application → Sensor → Zero point adoption (GTZ)
Description	(Typically gauge pressure sensor) A pressure shift resulting from the orientation of the device can be corrected by the position adjustment. The pressure difference between zero (set point) and the measured pressure need not be known.

Prerequisite

The pressure value present is automatically adopted as the zero point.
An offset is possible (parallel shifting of the sensor characteristic) to correct the orientation and any zero point drift. The accepted value of the parameter is subtracted from the "raw measured value". The requirement to be able to perform a zero point shift without changing the span is met with the offset function.
Maximum offset value = ± 20 % of the sensor nominal range.
If an offset value is entered that shifts the span beyond the physical limits of the sensor, the value is admitted but a warning message is generated and displayed via IO-Link. The warning message only disappears when the span is within the sensor limits, taking the offset value currently configured into consideration.

The sensor can
• be operated in a physically unfavorable range, i.e. outside its specifications, or
• be operated by making appropriate corrections to the offset or span.

Raw measured value – (manual offset) = display value (measured value)

Example 1

• Measured value = 0.002 bar (0.029 psi)
• Use the **Zero point adoption (GTZ)** parameter to correct the measured value with the value, e.g. 0.002 bar (0.029 psi). This means that you are assigning the value 0 bar (0 psi) to the pressure present.
• Display value (measured value) after position adjustment = 0 bar (0 psi)
• The current value is also corrected.
• Where applicable, check and correct switch points and span settings.

Example 2

Sensor measuring range: −0.4 to +0.4 bar (−6 to +6 psi) (SP1 = 0.4 bar (6 psi); STU = 0.4 bar (6 psi))
• Measured value = 0.08 bar (1.2 psi)
• Use the **Zero point adoption (GTZ)** parameter to correct the measured value with the value, e.g. 0.08 bar (1.2 psi). This means that you are assigning the value 0 mbar (0 psi) to the pressure present.
• Display value (measured value) after position adjustment = 0 bar (0 psi)
• The current value is also corrected.
• Warnings C431 or C432 appear because the value 0 bar (0 psi) was assigned to the real value of 0.08 bar (1.2 psi) present and the sensor measuring range was thus exceeded by ± 20%.
  SP1 and STU values must be readjusted downwards by 0.08 bar (1.2 psi).

9.5 Configuring process monitoring

For process monitoring, it is possible to specify a pressure range which is monitored by the point level switch. Both monitoring versions are described below. The monitoring function allows the user to define optimum ranges for the process (with high yields etc.) and deploy a point level switch to monitor the ranges.

9.5.1 Digital process monitoring (switch output)

It is possible to select defined switch points and switchback points which act as NO or NC contacts depending on whether a window function or hysteresis function is configured.

The "Mode" and "Logic" parameters from the IODD are grouped in the product structure under the "Application Type" parameter. The following table compares the configurations.

Function (IODD: Mode)	Output (IODD: Logic)	Application type	Product structure
Two Point	Two Point normally open	NO contact	TPNO
Two Point	Two point normally closed	NC contact	TPNC
Window	Window normally open	NO contact	WNO
Window	Window normally closed	NC contact	WNC
Single Point	Single Point normally open	NO contact	SPNO
Single Point	Single point normally closed	NC contact	SPNC

If the device is restarted within the given hysteresis, the switch output is open (0 V present at the output).

9.5.2 Analog process monitoring (4 to 20 mA output)

- The 3.8 to 20.5 mA signal range is controlled according to NAMUR NE 43.
- The alarm current and current simulation are exceptions:
  - If the defined limit is exceeded, the device continues measuring linearly. The output current increases linearly to 20.5 mA and holds the value until the measured value drops below 20.5 mA again or the device detects a fault.
  - If the defined limit is undershot, the device continues measuring linearly. The output current decreases linearly to 3.8 mA and holds the value until the measured value rises above 3.8 mA again or the device detects a fault.

9.6 Current output

Operating Mode (FUNC)

Navigation   Parameter → Application → Sensor → Operating Mode (FUNC)

Description   Enables the desired behavior of output 2 (not IO-Link output)

Options   Options:
                        - OFF
                        - 4-20 mA (I)

Value for 4 mA (STL)

Navigation	Parameter → Application → Current output → Value for 4 mA (STL)
Description	Assignment of the pressure value which should correspond to the 4 mA value. It is possible to invert the current output. To do so, assign the pressure upper range value to the lower measuring current.
Note	Enter the value for 4 mA in the selected pressure unit anywhere within the measuring range. The value can be entered in increments of 0.1 (increment depends on the measuring range).
Options	No selection. The user is free to edit the values.
Factory setting	0.0 or as per order specifications

Value for 20 mA (STU)

Navigation	Parameter → Application → Current output → Value for 20 mA (STU)
Description	Assignment of the pressure value which should correspond to the 20 mA value. It is possible to invert the current output. To do so, assign the pressure lower range value to the upper measuring current.
Note	Enter the value for 20 mA in the selected pressure unit anywhere within the measuring range. The value can be entered in increments of 0.1 (increment depends on the measuring range).
Options	No selection. The user is free to edit the values.
Factory setting	Upper measuring limit or as per order specifications.

Pressure applied for 4mA (GTL)

Navigation	Parameter → Application → Current output → Pressure applied for 4mA (GTL)

Description   The pressure value present is automatically adopted for the 4 mA current signal.
Parameter for which the current range can be assigned to any section of the nominal
range. This occurs by assigning the pressure lower range value to the lower measuring
current and the pressure upper range value to the upper measuring current.
The pressure lower range value and upper range value can be configured independently of
one another so the pressure measuring span does not remain constant.
The LRV and URV pressure measuring span can be edited over the entire sensor range.
An invalid TD value is indicated by diagnostic message S510. An invalid position offset is
indicated by diagnostic message C431.
The editing operation cannot result in the device being operated outside the minimum and
maximum sensor limits.

Incorrect entries are declined as indicated by the following messages, and the last valid
value prior to the change is used again:
- Parameter value above limit (0x8031)
- Parameter value below limit (0x8032)

The measured value currently present is accepted as the value for 4mA anywhere within
the measuring range.
The sensor characteristic curve is shifted such that the pressure present becomes the zero
value.

Pressure applied for 20mA (GTU)

Navigation   Parameter → Application → Current output → Pressure applied for 20mA (GTU)

Description   The pressure value present is automatically adopted for the 20 mA current signal.
Parameter for which the current range can be assigned to any section of the nominal
range. This occurs by assigning the pressure lower range value to the lower measuring
current and the pressure upper range value to the upper measuring current.
The pressure lower range value and upper range value can be configured independently of
one another so the pressure measuring span does not remain constant.
The LRV and URV pressure measuring span can be edited over the entire sensor range.
An invalid TD value is indicated by diagnostic message S510. An invalid position offset is
indicated by diagnostic message C431.
The editing operation cannot result in the device being operated outside the minimum and
maximum sensor limits.
Incorrect entries are declined, and the last valid value prior to the change is used again.
The measured value currently present is accepted as the value for 20 mA anywhere within
the measuring range.
There is a parallel shift of the sensor characteristic so that the pressure present becomes
the max value.

9.7 Application examples

9.7.1 Compressor control with two-point mode

Example: The compressor is started when the pressure drops below a certain value. The compressor is switched off when a certain value is exceeded.

1. Set the switch point to 2 bar (29 psi).

2. Set the switch-back point to 1 bar (14.5 psi)

3. Configure the switch output as "NC contact" (Mode = Two Point, Logic = High).

The compressor is controlled by the defined settings.

9.7.2 Pump control with two-point mode

Example: The pump should switch on when 2 bar (29 psi) is reached (increasing pressure) and switch off when 1 bar (14.5 psi) is reached (decreasing pressure).

1. Set the switch point to 2 bar (29 psi).

2. Set the switch-back point to 1 bar (14.5 psi)

3. Configure the switch output as a "NO contact" (Mode = Two Point, Logic = High)

The pump is controlled by the defined settings.

10   Diagnosis and troubleshooting

10.1   Troubleshooting

If an invalid configuration exists in the device, the device switches to the fault state.

Example:
• The diagnostic message "C485" is displayed via IO-Link.
• The device is in the simulation mode.
• If the device configuration is corrected, e.g. by resetting the device, the device quits the fault state and switches to the measuring mode.

General faults

Fault	Possible cause	Remedial action
Device does not respond.	Supply voltage does not match the voltage specified on the nameplate.	Connect the correct voltage.
	The polarity of the supply voltage is wrong.	Correct the polarity.
	The cables do not contact the terminals properly.	Check the electrical contact between the cable and terminals and correct if necessary.
No communication	• Communication cable not connected. • Communication cable incorrectly attached to device. • Communication cable incorrectly attached to the IO-Link master.	Check wiring and cables.
Output current ≤ 3.6 mA	Signal line is not wired correctly.	Check wiring.
No transmission of process data	There is an error in the device.	Correct errors that are displayed as a diagnostic event.

10.2   Diagnostic events

10.2.1   Diagnostic message

Faults detected by the self-monitoring system of the measuring device are displayed as a diagnostic message in alternation with the measured value display via the IODD.

Status signals

The table ("List of diagnostic events" section) lists the messages that may occur. The ALARM STATUS parameter shows the message with the highest priority. The device has four different status information codes according to NE107:

Failure F
A device error has occurred. The measured value is no longer valid.

Maintenance required M
Maintenance is required. The measured value remains valid.

Check function C
The device is in service mode (e.g. during a simulation).

**Out of specification S**
The device is being operated:
• Outside its technical specifications (e.g. during startup or cleaning)
• Outside the configuration performed by the user (e.g. level outside the configured range)

Diagnostic event and event text

The fault can be identified by means of the diagnostic event.

Diagnostic event	
Status signal	Event number
↓	↓

Example

C A0013959	469
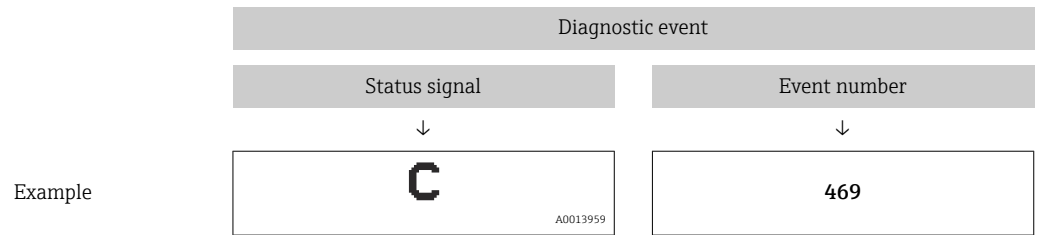
If several diagnostic events are simultaneously pending, only the diagnostic message with the highest priority is displayed in the STA via the IODD.

ℹ The last diagnostic message is displayed - see LST parameter in the **DIAG** submenu.

10.2.2 Overview of diagnostic events

Status signal/ Diagnostic event	Diagnostic behavior	EventCode	Event text	Cause	Remedial measure
S140	Warning	0x180F	Sensor signal outside of permitted ranges	Overpressure or low pressure present	Operate device in the specified measuring range.
S140	Warning	0x180F	Sensor signal outside of permitted ranges	Sensor defective	Replace device.
F270 [1] [2]	Fault	0x1800	Overpressure/low pressure	Overpressure or low pressure present	• Check the process pressure. • Check the sensor range. • Restart device.
F270 [1] [2]	Fault	0x1800	Defect in electronics/ sensor	Defect in electronics/sensor	Replace device.
C431 [3]	Warning	0x1805	Invalid position adjustment (Current output)	The adjustment performed would cause the sensor nominal range to be exceeded or undershot.	Position adjustment + parameter of the current output must be within the sensor nominal range • Check position adjustment (see **Zero point configuration (ZRO)** parameter) • Check measuring range (see **Value for 20 mA (STU)** and **Value for 4 mA (STL)** parameters)
C432	Warning	0x1806	Invalid position adjustment (Switching output)	The adjustment performed leads to switch points being outside the sensor nominal range.	Position adjustment + parameter of the hysteresis and window function must be within the sensor nominal range • Check position adjustment (see **Zero point configuration (ZRO)** parameter) • Check the switch point, switchback point for hysteresis and window function
F437	Fault	0x1810	Incompatible configuration	Invalid device configuration	• Restart device. • Reset device. • Replace device.
C485	Warning	0x8C01 [4]	Simulation active	During simulation of the switch output or current output, the device issues a warning message.	Switch off simulation.
S510	Fault	0x1802	Turn down violated	A change in the span results in a violation of the turn down (max. TD 5:1) Values for adjustment (lower range value and upper range value) are too close together	• Operate device in the specified measuring range. • Check the measuring range.
S803	Fault	0x1804	Current loop	Impedance of load resistance at analog output is too high	• Check the cabling and load at the current output. • If the current output is not required, switch it off via the configuration.
S803	Fault	0x1804	Current output not connected	Current output not connected	• Connect current output with load. • If the current output is not required, switch it off via the configuration.
F804	Fault	-	Overload at switch output	Load current too high	Increase load resistance at switch output
F804	Fault	-	Overload at switch output	Switch output defective	• Check output circuit. • Replace device.

Status signal/ Diagnostic event	Diagnostic behavior	EventCode	Event text	Cause	Remedial measure
S971	Warning	0x1811	Measured value is outside sensor range	The current is outside the permitted range from 3.8 to 20.5 mA. The present pressure value is outside the configured measuring range (but may be within the sensor range).	Operate the device within the set span
F419	Fault	-	Back-2-Box command has been executed.	IO-Link communication no longer available.	Manual restart is necessary.

1) The switch output is open and the current output adopts the configured alarm current. Therefore, errors affecting the switch output are not displayed because the switch output is in the safe state.
2) The device indicates a failure current of 0 mA if an internal communication error occurs. In all other cases the device returns the configured error current.
3) If no remedial measures are taken, the warning messages are displayed following a device restart if configuration (span, switch points and offset) is performed with a gauge pressure device and readings are > URL + 10 % or < LRL + 5 % and with an absolute pressure device and readings are > URL + 10% or < LRL.
4) EventCode as per IO-Link standard 1.1

10.3 Behavior of the device in the event of a fault

The device displays warnings and faults via IO-Link. All the device warnings and faults are for information purposes only and do not have a safety function. The errors diagnosed by the device are displayed via IO-Link in accordance with NE107. Depending on the diagnostic message, the device behaves as per a warning or fault condition. A distinction must be made between the following types of error here:
- Warning:
  - The device continues measuring if this type of error occurs. The output signal is not affected (exception: simulation is active).
  - The switch output remains in the state defined by the switch points.
- Fault:
  - The device does **not** continue measuring if this type of error occurs. The output signal adopts its fault state (value in the event of an error - see the following section).
  - The fault state is displayed via IO-Link.
  - The switch output changes to the "open" state.
  - For the analog output option, an error is signaled with the configured alarm current behavior.

10.4 Behavior of the current output in the event of a fault

The behavior of the current output in the event of a fault is regulated in accordance with NAMUR NE43.

The behavior of the current output in the event of faults is defined in the following parameters:
- **Alarm current FCU** "MIN": Lower alarm current (≤3.6 mA) (optional, see the following table)
- **Alarm current FCU** "MAX" (factory setting): Upper alarm current (≥21 mA)

- The selected alarm current is used for all errors.
- It is not possible to acknowledge errors and warnings. The relevant message disappears if the event is no longer pending.
- The failsafe mode can be changed directly when a device is running (see the following table).

Changing the failsafe mode	After writing to the device
From MAX to MIN	Active immediately
From MIN to MAX	Active immediately

10.4.1   Alarm current

Description	Option
Configured min. alarm current	IA [1]

1)   Product Configurator order code "Service"

10.5   Resetting to factory settings (reset)

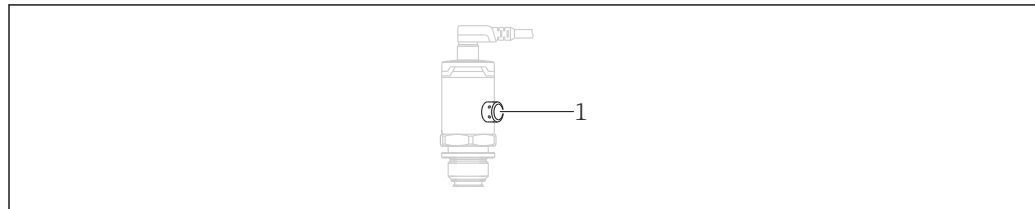See parameter description Reset to factory settings (RES) → 🕮 60.

10.6   Disposal

When disposing, separate and recycle the device components based on the materials.

11   Maintenance

No special maintenance work is required.

Keep the pressure compensation element (1) free from contamination.

A0022141

11.1   Exterior cleaning

Please note the following points when cleaning the device:
- The cleaning agents used should not corrode the surfaces and the seals
- Mechanical damage to the process membrane, e.g. due to pointed objects, must be avoided.
- Observe the degree of protection of the device. See the nameplate if necessary.

12   Repairs

12.1   General notes

12.1.1   Repair concept

Repairs are not possible.

12.2   Return

The measuring device must be returned if the wrong device has been ordered or delivered.

As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium. To ensure swift, safe and professional device returns, please read the return procedures and conditions on the Endress+Hauser website.
www.services.endress.com/return-material

12.3   Disposal

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

13 Overview of the operating menu

ℹ️ Depending on the parameter configuration, not all submenus and parameters are available. Information on this can be found in the parameter description under "Prerequisite".

IO-Link	Level 1	Level 2	Level 3	Details
Identification	Serial Number			-
	Firmware Revision			-
	Extended Ordercode			→ 🕮 46
	Product Name			-
	Product Text			-
	Vendor Name			-
	Hardware Revision			-
	ENP_VERSION			→ 🕮 46
	Application Specific Tag			→ 🕮 46
	Function Tag			→ 🕮 46
	Location Tag			→ 🕮 46
	Device Type			-
Diagnosis	Device Status			→ 🕮 47
	Detailed Device Status			→ 🕮 47
	Actual Diagnostics (STA)			→ 🕮 47
	Last Diagnostic (LST)			→ 🕮 47
	Simulation Switch Output (OU1)			→ 🕮 47
	Simulation Current Output (OU2)			→ 🕮 48
Parameter	Application	Sensor	Operating Mode (FUNC)	→ 🕮 34
			Unit changeover (UNI)	→ 🕮 49
			Zero point configuration (ZRO)	→ 🕮 32
			Zero point adoption (GTZ)	→ 🕮 32
			Damping (TAU)	→ 🕮 51
		Current output	Value for 4 mA (STL)	→ 🕮 34
			Value for 20 mA (STU)	→ 🕮 35
			Pressure applied for 4mA (GTL)	→ 🕮 35
			Pressure applied for 20mA (GTU)	→ 🕮 36
			Alarm current (FCU)	→ 🕮 53
	Teach - Single Value	Teach Select		→ 🕮 55
		System Command		→ 🕮 55
		Teach SP1		→ 🕮 55
		Teach SP2		→ 🕮 55
		Teach Result State		→ 🕮 55
	Switching Signal Channels	Switching Signal Channel 1.1	SSC1.1 Param. SP1	→ 🕮 55
			SSC1.1 Param. SP2	→ 🕮 56
			SSC1.1 Config. Logic	→ 🕮 56
			SSC1.1 Config. Mode	→ 🕮 56
			SSC1.1 Config. Hyst.	→ 🕮 56

IO-Link	Level 1	Level 2	Level 3	Details
			Switching delay time, output 1 (dS1)	→ 📖 56
			Switchback delay time, output 1 (dR1)	→ 📖 57
		Switching Signal Channel 1.2	SSC1.2 Param. SP1	→ 📖 57
			SSC1.2 Param. SP2	→ 📖 57
			SSC1.2 Config. Logic	→ 📖 57
			SSC1.2 Config. Mode	→ 📖 58
			SSC1.2 Config. Hyst.	→ 📖 58
			Switching delay time, output 2 (dS2)	→ 📖 58
			Switchback delay time, output 2 (dR2)	→ 📖 58
	System	Device Management	HI Max value (maximum indicator)	→ 📖 60
			LO Min value (minimum indicator)	→ 📖 60
			Revisioncounter (RVC)	→ 📖 60
			Reset to factory settings (RES)	→ 📖 60
			Back-to-box	→ 📖 61
Observation	Pressure			→ 📖 61
	Condensed Status			
	Switch State Output (OU1)			→ 📖 61
	Switch State Output (OU2)			

14   Description of device parameters

14.1   Identification

Extended order code

Navigation	Identification → Extended order code
Description	Used to replace (reorder) the device. Displays the extended order code (max. 60 alphanumeric characters).
Factory setting	As per order specifications

ENP_VERSION

Navigation	Identification → ENP_VERSION
Description	Displays the ENP version (ENP: electronic name plate)

Application Specific Tag

Navigation	Identification → Application Specific Tag
Description	Used for unique identification of device in the field. Enter device tag (max. 32 alphanumeric characters).
Factory setting	As per order specifications

Function Tag

Navigation	Identification → Function Tag
Description	Function description

Location Tag

Navigation	Identification → Location Tag
Description	Location identification

14.2   Diagnosis

Device Status

Navigation	Diagnosis → Diagnosis → Device Status
Description	Current device status
Selection	• 0 = Device OK • 1 = Maintenance required • 2 = Out of specification • 3 = Functional test • 4 = Error

---

Detailed Device Status

Navigation	Diagnosis → Diagnostic → Detailed Device Status
Description	Events currently pending

Actual Diagnostics (STA)

Navigation	Diagnosis → Actual Diagnostics (STA)
Description	Displays the current device status.

Last Diagnostic (LST)

Navigation	Diagnosis → Last Diagnostic (LST)
Description	Displays the latest device status (error or warning) that was rectified during operation.

Simulation Switch Output (OU1)

Navigation	Diagnosis → Simulation Switch Output (OU1)
Description	The simulation affects the process data only. It does not affect the physical switch output. If a simulation is active, a warning to this effect is displayed so that it is obvious to the user that the device is in the simulation mode. A warning is communicated via IO-Link (C485 - simulation active). The simulation must be ended actively via the menu. If the device is disconnected from the power supply during the simulation and power is then resupplied, the simulation mode is not resumed, and instead the device continues operation in the measuring mode.

Options   • OFF
                                  • OU1 = low (OPN)
                                  • OU1= high (CLS)

Simulation Current Output (OU2)

Navigation   Diagnosis → Simulation Current Output (OU2)

Description   Simulation affects the process data and the physical current output.
                                  If a simulation is active, a warning to this effect is displayed so that it is obvious to the user
                                  that the device is in the simulation mode. A warning is communicated via IO-Link (C485 -
                                  simulation active). The simulation must be ended actively via the menu. If the device is
                                  disconnected from the power supply during the simulation and then power is resupplied
                                  afterwards, the simulation mode is not resumed, and instead the device continues
                                  operation in the measuring mode.

Options   • OFF
                                  • 3.5 mA
                                  • 4 mA
                                  • 8 mA
                                  • 12 mA
                                  • 16 mA
                                  • 20 mA
                                  • 21.95 mA

14.3   Parameter

14.3.1   Application

Sensor

Operating Mode (FUNC)

Navigation	Parameter → Application → Sensor → Operating Mode (FUNC)
Description	Enables the desired behavior of output 2 (not IO-Link output)
Options	Options: • OFF • 4-20 mA (I)

Unit changeover (UNI)

Navigation	Parameter → Application → Sensor → Unit changeover (UNI)
Description	Select the pressure engineering unit. If a new pressure engineering unit is selected, all pressure-specific parameters are converted.
Switch on value	Depends on order specifications.
Options	• bar • kPa • Mpa • psi
Factory setting	Depends on order specifications.

Zero point configuration (ZRO)

Navigation	Parameter → Application → Sensor → Zero point configuration (ZRO)
Description	(Typically absolute pressure sensor) A pressure shift resulting from the orientation of the device can be corrected by the position adjustment. The pressure difference between zero (set point) and the measured pressure must be known.

Prerequisite

An offset is possible (parallel shifting of the sensor characteristic) to correct the orientation and any zero point drift. The set value of the parameter is subtracted from the "raw measured value". The requirement to be able to perform a zero point shift without changing the span is met with the offset function.
Maximum offset value = ± 20 % of the sensor nominal range.
If an offset value is entered that shifts the span beyond the physical limits of the sensor, the value is admitted but a warning message is generated and displayed via IO-Link. The warning message only disappears when the span is within the sensor limits, taking the offset value currently configured into consideration.

The sensor can
• be operated in a physically unfavorable range, i.e. outside its specifications, or
• be operated by making appropriate corrections to the offset or span.

Raw measured value – (manual offset) = display value (measured value)

Example

• Measured value = 0.002 bar (0.029 psi)
• Set the manual offset to 0.002.
• Display value (measured value) after position adjustment = 0 bar (0 psi)
• The current value is also corrected.

Note

Setting in increments of 0.001. As the value is entered numerically, the increment depends on the measuring range

Options

No selection. The user is free to edit the values.

Factory setting

0

Zero point adoption (GTZ)

Navigation

Parameter → Application → Sensor → Zero point adoption (GTZ)

Description

(Typically gauge pressure sensor)
A pressure shift resulting from the orientation of the device can be corrected by the position adjustment.
The pressure difference between zero (set point) and the measured pressure need not be known.

Prerequisite

The pressure value present is automatically adopted as the zero point.
An offset is possible (parallel shifting of the sensor characteristic) to correct the orientation and any zero point drift. The accepted value of the parameter is subtracted from the "raw measured value". The requirement to be able to perform a zero point shift without changing the span is met with the offset function.
Maximum offset value = ± 20 % of the sensor nominal range.
If an offset value is entered that shifts the span beyond the physical limits of the sensor, the value is admitted but a warning message is generated and displayed via IO-Link. The warning message only disappears when the span is within the sensor limits, taking the offset value currently configured into consideration.

The sensor can
• be operated in a physically unfavorable range, i.e. outside its specifications, or
• be operated by making appropriate corrections to the offset or span.

Raw measured value – (manual offset) = display value (measured value)

Example 1
- Measured value = 0.002 bar (0.029 psi)
- Use the **Zero point adoption (GTZ)** parameter to correct the measured value with the value, e.g. 0.002 bar (0.029 psi). This means that you are assigning the value 0 bar (0 psi) to the pressure present.
- Display value (measured value) after position adjustment = 0 bar (0 psi)
- The current value is also corrected.
- Where applicable, check and correct switch points and span settings.

Example 2
Sensor measuring range: −0.4 to +0.4 bar (−6 to +6 psi) (SP1 = 0.4 bar (6 psi); STU = 0.4 bar (6 psi))
- Measured value = 0.08 bar (1.2 psi)
- Use the **Zero point adoption (GTZ)** parameter to correct the measured value with the value, e.g. 0.08 bar (1.2 psi). This means that you are assigning the value 0 mbar (0 psi) to the pressure present.
- Display value (measured value) after position adjustment = 0 bar (0 psi)
- The current value is also corrected.
- Warnings C431 or C432 appear because the value 0 bar (0 psi) was assigned to the real value of 0.08 bar (1.2 psi) present and the sensor measuring range was thus exceeded by ± 20%.
  SP1 and STU values must be readjusted downwards by 0.08 bar (1.2 psi).

Damping (TAU)

Navigation   Parameter → Application → Sensor → Damping (TAU)

Description   The damping affects the speed at which the measured value reacts to changes in pressure.

Input range   0.0 to 999.9 seconds in increments of 0.1 seconds

Factory setting   2 seconds

Current output

Value for 4 mA (STL)

Navigation	Parameter → Application → Current output → Value for 4 mA (STL)
Description	Assignment of the pressure value which should correspond to the 4 mA value. It is possible to invert the current output. To do so, assign the pressure upper range value to the lower measuring current.
Note	Enter the value for 4 mA in the selected pressure unit anywhere within the measuring range. The value can be entered in increments of 0.1 (increment depends on the measuring range).
Options	No selection. The user is free to edit the values.
Factory setting	0.0 or as per order specifications

Value for 20 mA (STU)

Navigation	Parameter → Application → Current output → Value for 20 mA (STU)
Description	Assignment of the pressure value which should correspond to the 20 mA value. It is possible to invert the current output. To do so, assign the pressure lower range value to the upper measuring current.
Note	Enter the value for 20 mA in the selected pressure unit anywhere within the measuring range. The value can be entered in increments of 0.1 (increment depends on the measuring range).
Options	No selection. The user is free to edit the values.
Factory setting	Upper measuring limit or as per order specifications.

Pressure applied for 4mA (GTL)

Navigation	Parameter → Application → Current output → Pressure applied for 4mA (GTL)

Description   The pressure value present is automatically adopted for the 4 mA current signal.
Parameter for which the current range can be assigned to any section of the nominal
range. This occurs by assigning the pressure lower range value to the lower measuring
current and the pressure upper range value to the upper measuring current.
The pressure lower range value and upper range value can be configured independently of
one another so the pressure measuring span does not remain constant.
The LRV and URV pressure measuring span can be edited over the entire sensor range.
An invalid TD value is indicated by diagnostic message S510. An invalid position offset is
indicated by diagnostic message C431.
The editing operation cannot result in the device being operated outside the minimum and
maximum sensor limits.

Incorrect entries are declined as indicated by the following messages, and the last valid
value prior to the change is used again:
• Parameter value above limit (0x8031)
• Parameter value below limit (0x8032)

The measured value currently present is accepted as the value for 4mA anywhere within
the measuring range.
The sensor characteristic curve is shifted such that the pressure present becomes the zero
value.

Pressure applied for 20mA (GTU)

Navigation   Parameter → Application → Current output → Pressure applied for 20mA (GTU)

Description   The pressure value present is automatically adopted for the 20 mA current signal.
Parameter for which the current range can be assigned to any section of the nominal
range. This occurs by assigning the pressure lower range value to the lower measuring
current and the pressure upper range value to the upper measuring current.
The pressure lower range value and upper range value can be configured independently of
one another so the pressure measuring span does not remain constant.
The LRV and URV pressure measuring span can be edited over the entire sensor range.
An invalid TD value is indicated by diagnostic message S510. An invalid position offset is
indicated by diagnostic message C431.
The editing operation cannot result in the device being operated outside the minimum and
maximum sensor limits.
Incorrect entries are declined, and the last valid value prior to the change is used again.
The measured value currently present is accepted as the value for 20 mA anywhere within
the measuring range.
There is a parallel shift of the sensor characteristic so that the pressure present becomes
the max value.

Alarm current (FCU)

Navigation   Parameter → Application → Current output → Alarm current (FCU)

Description	The device displays warnings and faults. This is done via IO-Link using the diagnostic message stored in the device. The purpose of all device diagnostics is solely to provide information to the user; they do not have a safety function. The errors diagnosed by the device are displayed via IO-Link in accordance with NE107. In accordance with the diagnostic message, the device behaves as per a warning or fault condition:

Warning (S971, S140, C485, C431, C432):

With this type of error, the device continues to measure. The output signal does not adopt its fault state (value in the event of an error). The main measured value and the state in the form of the letter plus a defined number are displayed alternately (0.5 Hz) via IO-Link. The switch outputs remain in the state defined by the switch points.

Fault (F437, S803, F270, S510, F804):

With this type of error, the device does not continue to measure. The output signal adopts its fault state (value in the event of an error). The fault state is displayed via IO-Link in the form of the letter plus a defined number. The switch output changes to the defined state (open). For the analog output option, an error is also signaled and transmitted via the 4 to 20mA signal. In NE43, NAMUR defines a current ≤3.6 mA and ≥21 mA as a device failure. A corresponding diagnostic message is displayed. Current levels available for selection: The selected alarm current is used for all errors. Diagnostic messages are displayed with numbers and letter via IO-Link. It is not possible to acknowledge all the diagnostic messages. The relevant message disappears if the event is no longer pending.

The messages are displayed in order of priority:
- Highest priority = first message displayed
- Lowest priority = last message displayed

Selection	• Min: Lower alarm current (≤3.6 mA) • Max: Upper alarm current (≥21 mA)
Factory setting	Max or as per order specifications

Teach Single Value

Teach Select

Navigation	Parameter → Teach → Single Value → Teach Select
Description	Selection of switching signal to be taught
Selection	• 0 = Default Channel = SSC1.1 Pressure • 1 = SSC1.1 Pressure • 2 = SSC1.2 success • 255 = All SSC
Factory setting	1

Teach SP1

Navigation	Parameter → Teach → Single Value → Teach SP1
Description	System command (value 65) "Teach switch point 1"

Teach SP2

Navigation	Parameter → Teach → Single Value → Teach SP2
Description	System command (value 66) "Teach switch point 2"

Teach Result State

Navigation	Parameter → Teach → Single Value → Teach Result State
Description	Result of the activated system command

Switching Signal Channels

Switching Signal Channel 1.1

SSC1.1 Param. SP1

Navigation	Parameter → Signal Switching Channels 1.1 → SSC1.1 Param. SP1
Description	Switch point 1 of switching signal SSC1.1 for pressure
Selection	No selection. The user is free to edit the values.

SSC1.1 Param. SP2

Navigation	Parameter → Signal Switching Channels 1.1 → SSC1.1 Param. SP2
Description	Switch point 2 of switching signal SSC1.1 for pressure
Selection	No selection. The user is free to edit the values.

SSC1.1 Config. Logic

Navigation	Parameter → Signal Switching Channels 1.1 → SSC1.1 Config. Logic
Description	Logic for inverting the switching signal SSC1.1 for pressure
Selection	• 0 = High active • 1 = Low active
Factory setting	0

SSC1.1 Config. Mode

Navigation	Parameter → Signal Switching Channels 1.1 → SSC1.1 Config. Mode
Description	Module of switching signal SSC1.1 for pressure
Selection	• 0 = Deactivated • 1 = Single point • 2 = Window • 3 = Two-point
Factory setting	0

SSC1.1 Config. Hyst.

Navigation	Parameter → Signal Switching Channels 1.1 → SSC1.1 Config. Hyst.
Description	Hysteresis of switching signal SSC1.1 for pressure
Selection	No selection. The user is free to edit the values.

Switching delay time, output 1 (dS1)

Navigation	Parameter → Signal Switching Channels 1.1 → Switching delay time, output 1 (dS1)

Description	To prevent switching on and switching off at values around the switch point, you can configure a delay for the specific points within a range of 0 to 50 s with a resolution of 2 decimal places.
	If the measured value leaves the switching range during the configured delay time, the delay time starts again.

Selection	0.00 to 50.00 s

Factory setting	0 s

Switchback delay time, output 1 (dR1)

Navigation	Parameter → Signal Switching Channels 1.1 → Switchback delay time, output 1 (dR1)

Description	To prevent switching on and switching off at values around the switch-back point, you can configure a delay for the specific points within a range of 0 to 50 s with a resolution of 2 decimal places.
	If the measured value leaves the switching range during the configured delay time, the delay time starts again.

Selection	0.00 to 50.00 s

Factory setting	0 s

Switching Signal Channel 1.2

SSC1.2 Param. SP1

Navigation	Parameter → Signal Switching Channels 1.2 → SSC1.2 Param. SP1

Description	Switch point 1 of switching signal SSC1.2 for pressure

Selection	No selection. The user is free to edit the values.

SSC1.2 Param. SP2

Navigation	Parameter → Signal Switching Channels 1.2 → SSC1.2 Param. SP2

Description	Switch point 2 of switching signal SSC1.2 for pressure

Selection	No selection. The user is free to edit the values.

SSC1.2 Config. Logic

Navigation	Parameter → Signal Switching Channels 1.2 → SSC1.2 Config. Logic

Description	Logic for inverting the switching signal SSC1.2 for pressure

Selection	• 0 = High active
	• 1 = Low active

Factory setting	0

SSC1.2 Config. Mode

Navigation	Parameter → Signal Switching Channels 1.2 → SSC1.2 Config. Mode

Description	Module of switching signal SSC1.2 for pressure

Selection	• 0 = Deactivated
	• 1 = Single point
	• 2 = Window
	• 3 = Two-point

Factory setting	0

SSC1.2 Config. Hyst.

Navigation	Parameter → Signal Switching Channels 1.2 → SSC1.2 Config. Hyst.

Description	Hysteresis of switching signal SSC1.2 for pressure

Selection	No selection. The user is free to edit the values.

Switching delay time, output 2 (dS2)

Navigation	Parameter → Signal Switching Channels 1.2 → Switching delay time, output 2 (dS2)

Description	To prevent switching on and switching off at values around the switch point, you can configure a delay for the specific points within a range of 0 to 50 s with a resolution of 2 decimal places.
	If the measured value leaves the switching range during the configured delay time, the delay time starts again.

Selection	0.00 to 50.00 s

Factory setting	0 s

Switchback delay time, output 2 (dR2)

Navigation	Parameter → Signal Switching Channels 1.2 → Switchback delay time, output 2 (dR2)

Description	To prevent switching on and switching off at values around the switch-back point, you can configure a delay for the specific points within a range of 0 to 50 s with a resolution of 2 decimal places.
	If the measured value leaves the switching range during the configured delay time, the delay time starts again.
Selection	0.00 to 50.00 s
Factory setting	0 s

14.3.2   System

Device Management

HI Max value (maximum indicator)

Navigation	Parameter → System → Device Management → HI Max value (maximum indicator)
Description	This parameter is used as the maximum indicator and makes it possible to call up retroactively the highest value ever measured for pressure. A pressure that is present for at least 2.5 ms is logged to the maximum indicator. The maximum indicators cannot be reset.

LO Min value (minimum indicator)

Navigation	Parameter → System → Device Management → LO Min value (minimum indicator)
Description	This parameter is used as the maximum indicator and makes it possible to call up retroactively the lowest value ever measured for pressure. A pressure that is present for at least 2.5 ms is logged to the maximum indicator. The maximum indicators cannot be reset.

Revisioncounter (RVC)

Navigation	Parameter → System → Device Management → Revisioncounter (RVC)
Description	Counter that indicates the number of parameter changes.

Reset to factory settings (RES)

Navigation	Parameter → System → Device Management → Reset to factory settings (RES)

Description   **⚠ WARNING**

"Reset to factory settings" causes an immediate reset to the factory settings of the order configuration (as-delivered state).
If the factory settings have been changed, downstream processes might be affected following a reset (the behavior of the switch output or current output might be changed).
▶   Make sure that downstream processes are not started unintentionally.

The reset is not subject to additional locking, such as in the form of device locking. The reset also depends on the device status.
Any customer-specific configuration carried out at the factory is not affected by a reset (customer-specific configuration remains).

The following parameters are **not** reset when a reset is performed:
• LO Min value (minimum indicator)
• HI Max value (maximum indicator)
• Last Diagnostic (LST)
• Revisioncounter (RVC)

Note   The last error is not reset in a reset.

Back-to-box

Navigation   Parameter → System → Device Management → Back-to-box

Description   Total reset (IO-link); this code resets all the parameters apart from:
• Revision-counter
• Peakhold indicator

Any simulation that may be running is terminated, the "F419" is displayed and a manual restart is required.

14.4   Observation

The process data are transmitted acyclically.

15   Accessories

15.1   M12 plug-in jacks

M12 plug (self-configurable connection to M12 plug)
- Degree of protection: IP67
- Material:
  - Union nut: Cu Sn/Ni
  - Body: PBT
  - Seal: NBR
- Option [3]: R1
- Order number: 52006263

M12 plug, angled with 5 m (16 ft) cable
- Degree of protection: IP67
- Material:
  - Union nut: GD Zn/Ni
  - Body: PUR
  - Cable: PVC
- Cable colors:
  - 1 = BN = brown
  - 2 = WT = white
  - 3 = BU = blue
  - 4 = BK = black
- Option [4]: RZ
- Order number: 52010285

M12 plug, angled (self-configurable connection to M12 plug)
- Degree of protection: IP67
- Material:
  - Union nut: GD Zn/Ni
  - Body: PBT
  - Seal: NBR
- Option [5]: RM
- Order number: 71114212

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3)   Product Configurator: order code "620"
4)   Product Configurator: order code "620"
5)   Product Configurator: order code "620"

Index

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