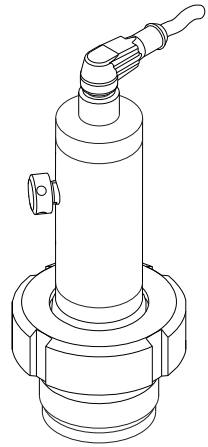
KA01402P/00/EN/02.19
71440623
2019-05-31

Brief Operating Instructions
Cerabar PMP23
IO-Link

Process pressure measurement

IO-Link



These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the other documentation:
Available for all device versions via:
- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: *Endress+Hauser Operations App*

Endress+Hauser
People for Process Automation

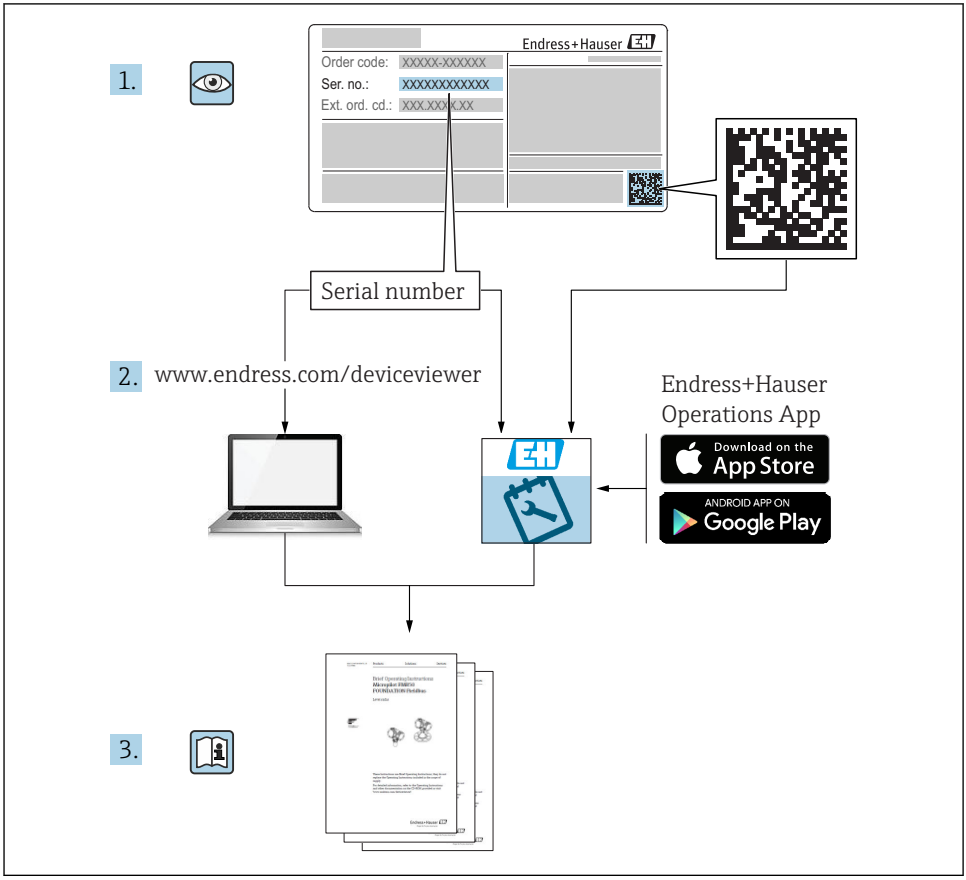

1.
Endress+Hauser
Order code: XXXXX-XXXXXX
Ser. no.: XXXXXXXXXXXX
Ext. ord. cd.: XXX.XXX-XXX
Serial number
2.
www.endress.com/deviceviewer
Endress+Hauser
Operations App
Download on the App Store
ANDROID APP ON Google Play
3.

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Table of contents

1 About this document

1.1 Document function

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

1.2 Symbols used

1.2.1 Safety symbols

Symbol	Meaning
DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
CAUTION	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	**NOTICE!** This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Electrical symbols

Symbol	Meaning	Symbol	Meaning
	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.		**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

1.2.3 Tool symbols

Symbol	Meaning
 A0011222	Open-ended wrench

1.2.4 Symbols for certain types of information

Symbol	Meaning	Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.		**Tip** Indicates additional information.
	**Forbidden** Procedures, processes or actions that are forbidden.	1. , 2. , 3. ...	Series of steps
	Reference to documentation		Result of a step
	Reference to graphic		Visual inspection
	Reference to page		

1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
1. , 2. , 3. ...	Series of steps
A, B, C, ...	Views

1.3 Documentation

The document types listed are available:
In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

1.3.1 Technical Information (TI): planning aid for your device

TI01203P

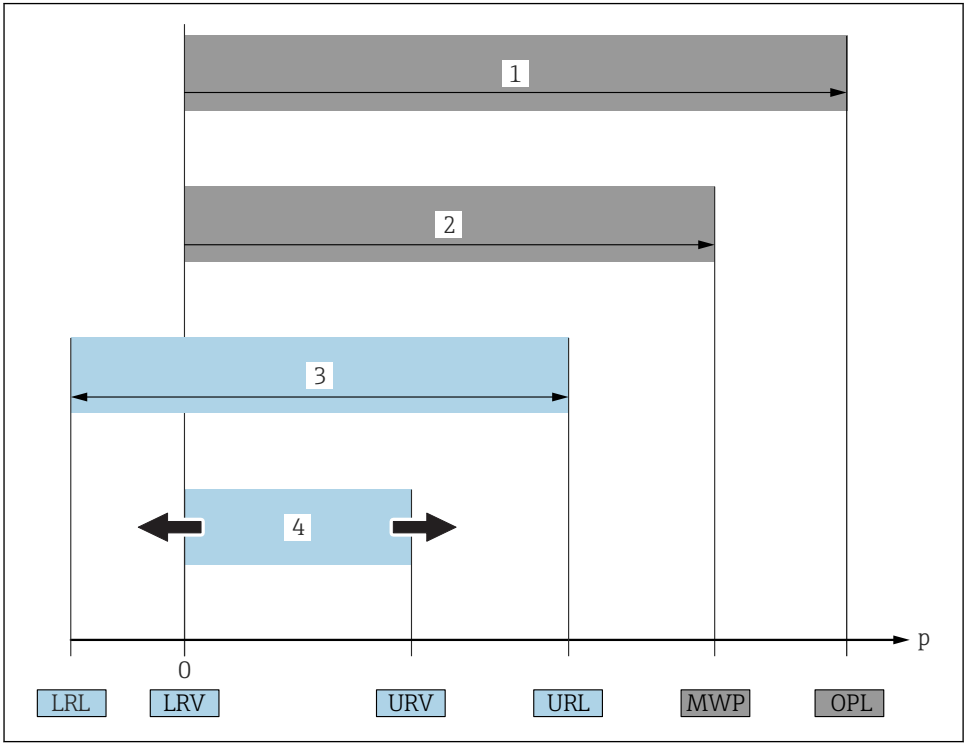
The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

1.3.2 Operating Instructions (BA): your comprehensive reference

BA01784P (devices with IO-Link)

These Operating Instructions contain all the information that is required in 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.

1.4 Terms and abbreviations



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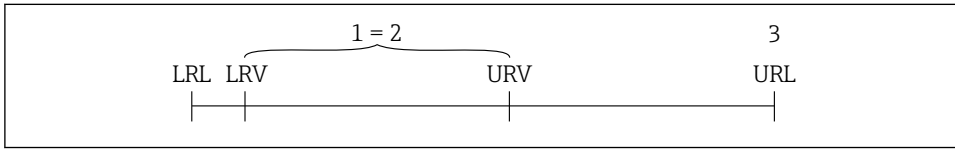
Item	Term/ abbreviation	Explanation
1	OPL	The OPL (over pressure limit = sensor overload limit) for the measuring device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. For the relevant standards and additional notes, see the "Pressure specifications" section of the Operating Instructions . The OPL may only be applied for a limited 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. Also observe pressure-temperature dependency. For the relevant standards and additional notes, see the "Pressure specifications" section of the Operating Instructions . The MWP may be applied at the device for an unlimited period. The MWP can also be found on the nameplate.
3	Maximum sensor measuring range	Span between LRL and URL This sensor measuring range is equivalent to the maximum calibratable/adjustable span.

Item	Term/ abbreviation	Explanation
4	Calibrated/ adjusted span	Span between 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)	Turn down The turn down is preset at the factory and cannot be changed. Example - see the following section.

1.5 Turn down calculation



1 Calibrated/adjusted span
2 Zero point-based span
3 URL sensor

Example

- Sensor:10 bar (150 psi)
- Upper range value (URL) = 10 bar (150 psi)

Turn down (TD):

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

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

- 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)

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

2 Basic safety instructions

2.1 Requirements concerning the staff

The staff must fulfill the following requirements for their tasks:
- ▶ Trained staff: Must have a qualification which corresponds to their function and tasks.
- ▶ Authorized by the plant operator.
- ▶ Familiar with the national regulations.
- ▶ Before starting their work: Must have read and understood all instructions in the operating manual and supplementary documentation as well as the certificate (depending on the application).
- ▶ Must comply with all instructions and the regulatory framework.

2.2 Designated use

2.2.1 Application and media

The Cerabar 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 that are 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 improper or non-designated use.

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

For work on and with the device:
- ▶ Wear the required personal protective equipment according to federal/national regulations.

- ▶ Switch off the supply voltage before connecting the device.

2.4 Operational safety

Risk of injury!
- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for interference-free operation of the device.

Conversions to the device

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

Hazardous area

To eliminate the risk of danger to persons or the facility when the device is used in the approval-related area (e.g. pressure equipment safety):
- ▶ Check the nameplate to verify if the device ordered can be put to its intended use in the approval-related area.

2.5 Product safety

This measuring 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 EU directives listed in the device-specific EU Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

3 Product description

See Operating Instructions.

4 Incoming acceptance and product identification

4.1 Incoming acceptance

- Is the order code on the delivery note identical to the order code on the product sticker?
- Are the goods undamaged?
- Do the data on the nameplate correspond to the order specifications and the delivery note?
- If required (see nameplate): Are the safety instructions (XA) provided?
- Is the documentation available?

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

4.2 Product identification

The following options are available for the identification of the measuring device:
- Nameplate specifications
- Order code with a 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 measuring device is displayed.

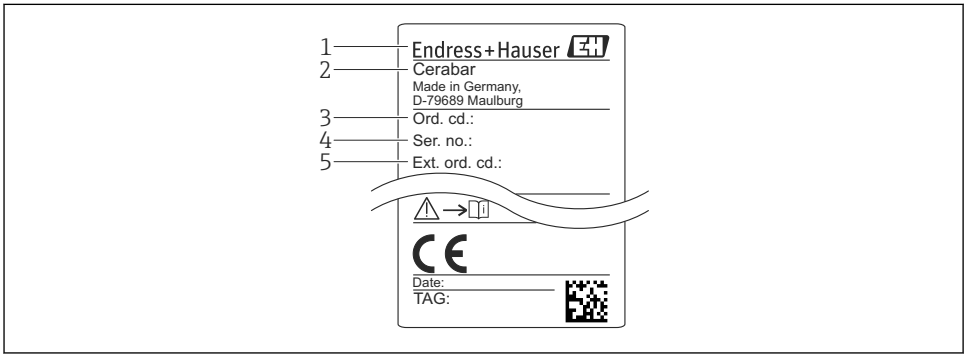
For an overview of the technical documentation provided, enter the serial number from the nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer)

4.2.1 Manufacturer address

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

Address of the manufacturing plant: See nameplate.

4.2.2 Nameplate



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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 °C (–40 to +185 °F)

4.3.2 Transporting the product to the measuring point

WARNING

Incorrect transport!

Housing and diaphragm 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 Installation

5.1 Installation conditions

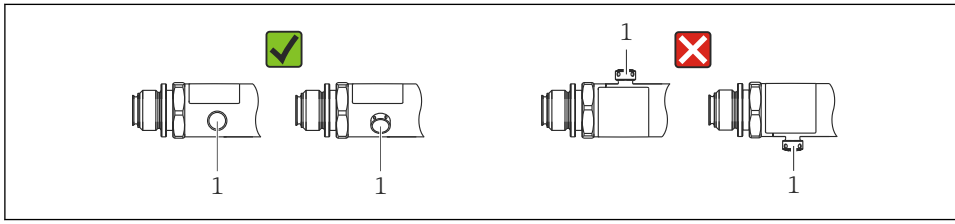
- Moisture must not penetrate the housing when mounting the device, establishing the electrical connection and during operation.
- For M12 plug made of metal: Do not remove the protection cap (only in IP69) of M12 plug connection until shortly before electrical connection.
- Do not clean or touch process isolating diaphragms with hard and/or pointed objects.
- Do not remove process isolating diaphragm protection until shortly before installation.
- Always tighten the cable entry firmly.
- Point the cable and connector downwards where possible to prevent moisture from entering (e.g. rain or condensation water).
- Protect housing against impact.
- For devices with gauge pressure sensor, the following applies:

NOTICE

If a heated device is cooled in the course of a cleaning process (by cold water, for example), a vacuum develops for a short time causing moisture to penetrate the sensor via 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.



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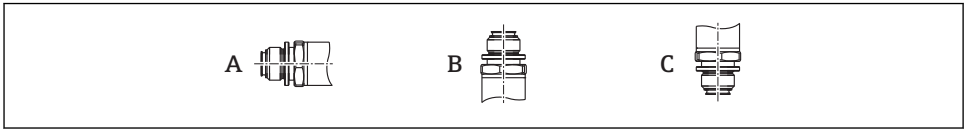
5.2 Influence of the installation position

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.



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Type	Process isolating diaphragm axis is horizontal (A)	Process isolating diaphragm pointing upwards (B)	Process isolating diaphragm pointing downwards (C)
PMP23	Calibration position, no effect	Up to +4 mbar (+0.058 psi)	Up to −4 mbar (−0.058 psi)

5.3 Mounting location

5.3.1 Pressure measurement

Pressure measurement in gases

Mount the device with shutoff device above the tapping point so that any condensate can flow into the process.

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 a shutoff device at the same height as the tapping point.

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

Note the max. permitted ambient temperature of the transmitter!

Pressure measurement in liquids

Mount the device with a shutoff device at the same height as the tapping point.

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
  - Or at a point in the tank which could be affected by pressure pulses from the agitator.

5.4 Mounting of the profile seal for universal process mounting adapter

For details on mounting, see KA00096F/00/A3.

5.5 Post-installation check

❑	Is the device undamaged (visual inspection)?
❑	Does the device comply with the measuring point specifications? For example: ▪ Process temperature ▪ Process pressure ▪ Ambient temperature range ▪ Measuring range
❑	Are the measuring point identification and labeling correct (visual inspection)?
❑	Is the device adequately protected against precipitation and direct sunlight?
❑	Are the securing screws tightened securely?
❑	Is the pressure compensation element pointing 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

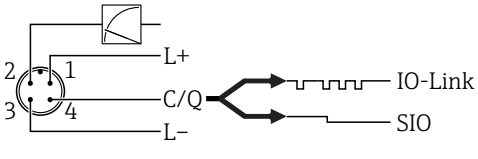
Electrical safety is compromised by an incorrect connection!

- ► In accordance with IEC/EN61010 a suitable circuit breaker must be provided for the device .
- ► The device must be operated with a 500 mA fine-wire fuse (slow-blow).
- ► Protective circuits against reverse polarity are integrated.

Connect the device in the following order:

1. Check that the supply voltage corresponds to the supply voltage indicated on the nameplate.
2. Connect the device in accordance with the following diagram.

Switch on the supply voltage.

Device	M12 plug
PMP23	 A0034006 *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	Device	Supply voltage
IO-Link	PMP23	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	Device	Current consumption	Alarm signal [1]
IO-Link	PMP23	Maximum current consumption: ≤ 300 mA	

1) For MAX alarm (factory setting)

6.2 Switching capacity

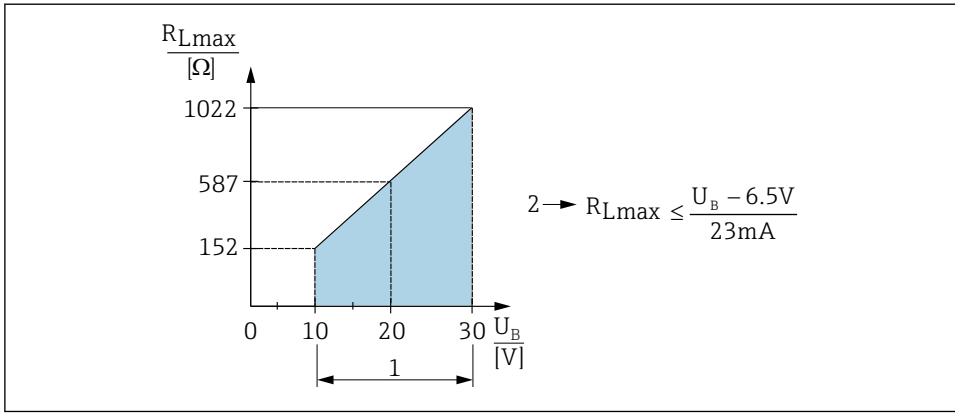
- Switch status ON: $I_a \leq 200$ mA [1) 2)]; switch status OFF: $I_a \leq 1$ mA
- Switch cycles: >10,000,000
- Voltage drop PNP: ≤2 V
- Overload protection: Automatic load testing of switching current;
  - Max. capacitive load: 1 µF at max. supply voltage (without resistive load)
  - Max. cycle duration: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

6.3 Connection data

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

6.3.1 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.



1 Power supply 10 to 30 V DC
2 R_{Lmax} Maximum load resistance
U_B Supply voltage

- Error current is output and "S803" displayed (output: MIN alarm current)
- Periodic checking to establish if it is possible to quit fault state

6.4 Post-connection check

❑	Is the device or cable undamaged (visual check)?
❑	Do the cables comply with the requirements?
❑	Do the mounted cables have adequate strain relief?
❑	Are all the cable glands installed, firmly 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 Operation with an operating menu

7.1.1 IO-Link

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 (supports minimum scope of IdentClass)
- SIO mode: Yes
- Speed: COM2; 38.4 kBaud
- Minimum cycle time: 2.5 msec.
- Process data width: 32 bit
- IO-Link data storage: Yes
- Block configuration: Yes

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

7.1.2 Structure of the operating menu

The menu structure has been implemented according to VDMA 24574-1 and complemented by Endress+Hauser-specific menu items.

For an overview of the operating menu, see the Operating Instructions.

8 System integration

See Operating Instructions.

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 IO-DD with corresponding default values is used for all pressure measuring ranges. This IO-DD applies for all measuring ranges! The default values of this IO-DD can be inadmissible 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.

- ▶ The data must first be read out of the device before default values are written from the IO-DD to the device.

9.1 Function check

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

- "Post-installation check" checklist → 🖹 13
- "Post-connection check" checklist → 🖹 15

9.2 Commissioning with an operating menu

Commissioning comprises the following steps:

- Configure pressure measurement → 🖹 18
- Where applicable, perform position adjustment → 🖹 20
- Where applicable, configure process monitoring → 🖹 23

9.3 Configuring pressure measurement

9.3.1 Calibration without reference pressure (dry calibration = calibration 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 calibration, i.e. the pressure values for the lower and upper range are known. It is not necessary to apply pressure.

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 a pressureless condition. For information on how to perform position adjustment, see the "Performing position adjustment" section → 20.

For a description of the parameters mentioned and possible error messages, see the Operating Instructions.

Performing the configuration

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 configured for 0 to 300 mbar (0 to 4.4 psi).

9.3.2 Calibration with reference pressure (wet calibration = calibration 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. The device is already mounted, for example.

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 a pressureless condition. For information on how to perform position adjustment, see the "Performing position adjustment" section → 20.

For a description of the parameters mentioned and possible error messages, see the Operating Instructions.

Performing the configuration

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 is assigned to the lower current value (4 mA).
3. The pressure for the URV (20 mA value) is present at the device, here 300 mbar (4.4 psi) for example. Select **Pressure applied for 20mA (GTU)** parameter. The selection is confirmed by pressing "Get Lower Limit".
   ↳ The pressure value present is assigned to the upper current value (20 mA).

The measuring range is configured 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

To monitor the process, it is possible to specify a pressure range which is monitored by the limit 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 limit switches 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.

Function	Selection	Output	Abbreviation for operation
Hysteresis	Hysteresis normally open	NO contact	HNO
Hysteresis	Hysteresis normally closed	NC contact	HNC
Window	Window normally open	NO contact	FNO
Window	Window normally closed	NC contact	FNC

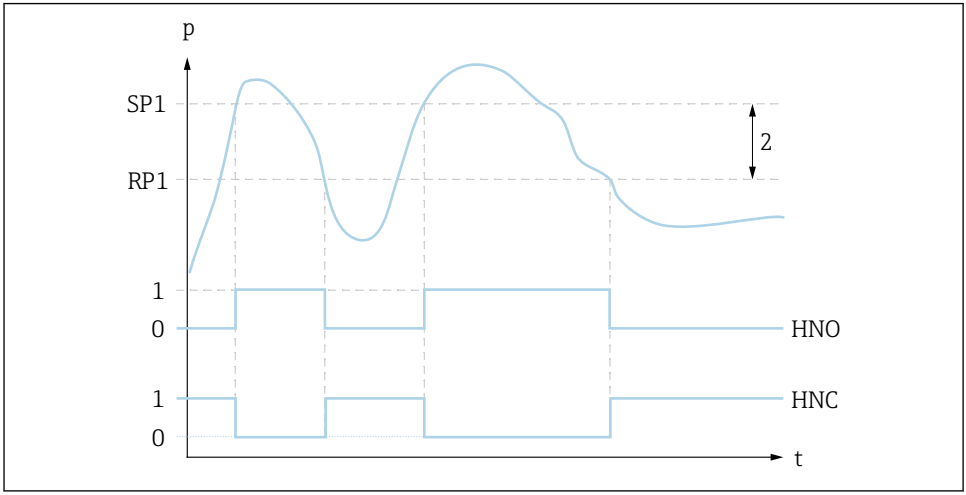
If the device is restarted within the given hysteresis, the switch output is open (0 V present at the output).

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 up to 20.5 mA and holds the value until the measured value drops below 20.5 mA again or the device detects an error (see the Operating Instructions).
  - 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 an error (see the Operating Instructions).

9.5.3 Switch output 1

Behavior of switch output



0 *0-signal. Output open in quiescent state*
1 *1-signal. Output closed in quiescent state*
2 *Hysteresis*
SP1 *Switch point*
RP1 *Switchback point*
HNO *NO contact*
HNC *NC contact*

9.6 Application examples

See Operating Instructions.

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