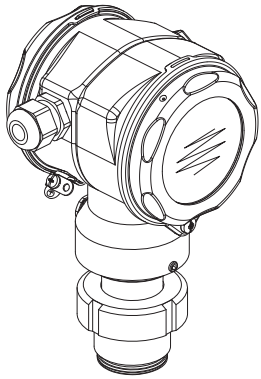
KA01023P/00/EN/17.16
71336354

Brief Operating Instructions
Deltapilot S
FMB70

Hydrostatic level measurement



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

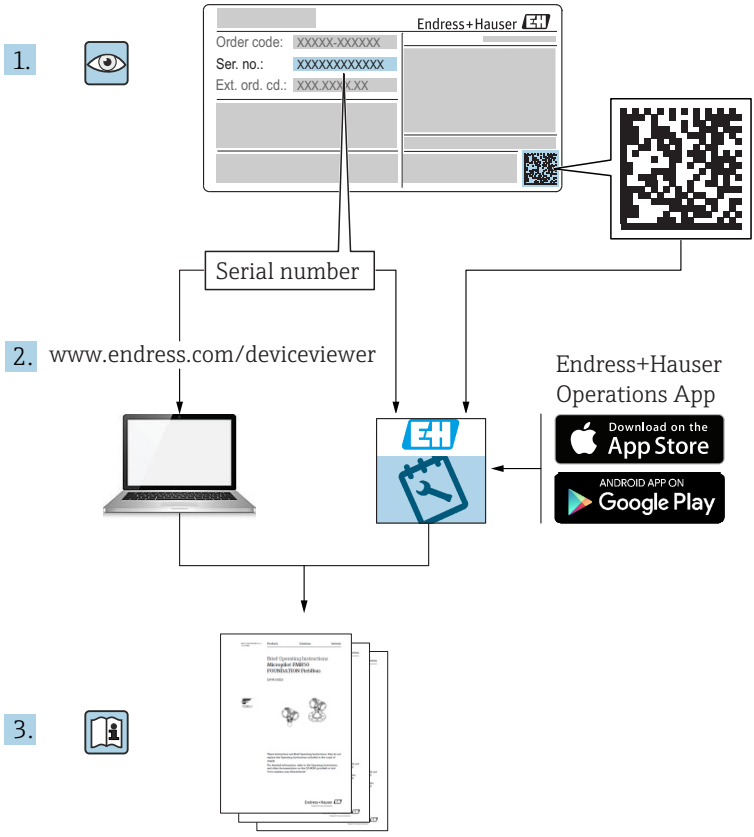

1.
Endress+Hauser
Order code: XXXXX-XXXXXX
Ser. no.: XXXXXXXXXXXX
Ext. ord. cd.: XXX XXX XXX
Serial number
2. www.endress.com/deviceviewer
Endress+Hauser
Operations App
Download on the App Store
ANDROID APP ON Google Play
3.

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Table of contents

1 Document information

1.1 Document function

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.

1.2 Symbols used

1.2.1 Safety symbols

Symbol	Meaning
 A0011189-DE	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in seriousor fatal injury.
 A0011190-DE	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in seriousor fatal injury.
 A0011191-DE	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minoror medium injury.
 A0011192-DE	**NOTICE!** This symbol contains information on procedures and other facts which do not result in personalinjury.

1.2.2 Electrical symbols

Symbol	Meaning	Symbol	Meaning
	Direct current		Alternating current
	Direct current and alternating current		**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.		**Equipotential connection** A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

1.2.3 Tool symbols

Symbol	Meaning
 A0011221	Allen key
 A0011222	Hexagon wrench

1.2.4 Symbols for certain types of information

Symbol	Meaning
 A0011182	**Permitted** Indicates procedures, processes or actions that are permitted.
 A0011184	**Forbidden** Indicates procedures, processes or actions that are forbidden.
 A0011193	**Tip** Indicates additional information.
 A0028658	Reference to documentation
 A0028659	Reference to page
 A0028660	Reference to graphic
1. , 2. , 3. … A0031595	Series of steps
 A0018343	Result of a sequence of actions
 A0028673	Visual inspection

1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3, 4, ...	Item numbers
1. , 2. , 3. ... A0031595	Series of steps
A, **B**, **C**, **D**, ...	Views

1.2.6 Symbols at the device

Symbol	Meaning
 A0019159	**Safety instructions** Observe the safety instructions contained in the associated Operating Instructions.

1.3 Registered trademarks

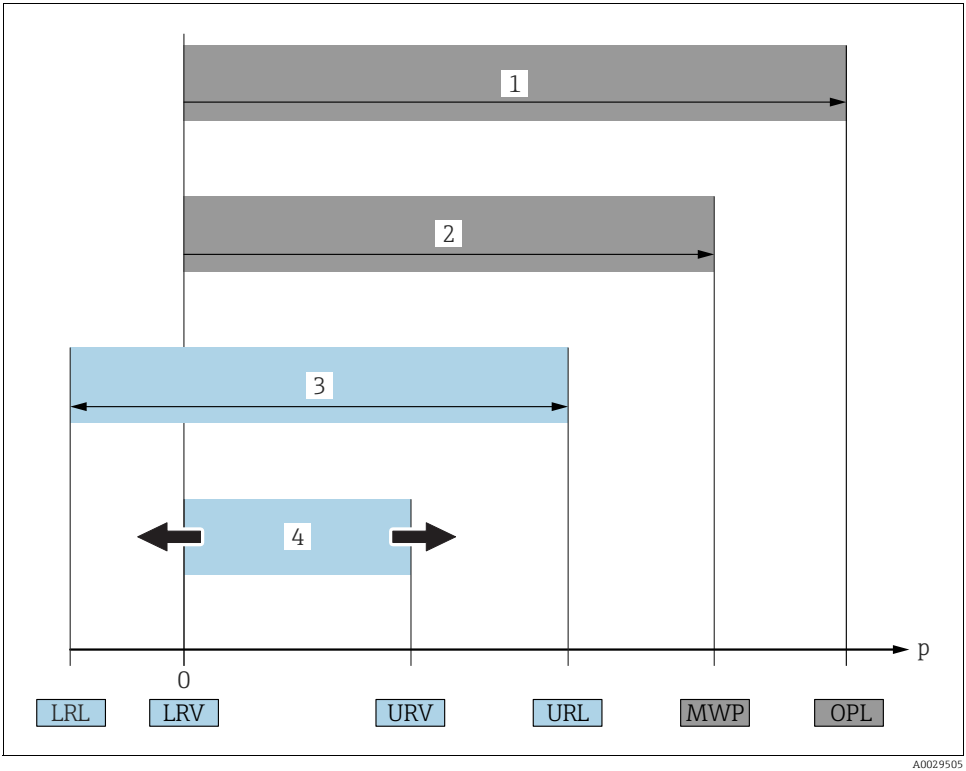
KALREZ, VITON, TEFLON
Registered trademarks of E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP
Registered trademark of Ladish & Co., Inc., Kenosha, USA

PROFIBUS PA®
Trademark of the PROFIBUS User Organization, Karlsruhe, Germany

GORE-TEX®
Registered trademarks of W.L. Gore & Associates, Inc., USA

1.4 Terms and abbreviations



Position	Term/Abbreviation	Explanation
1	OPL	The OPL (over pressure limit = sensor overload limit) for the sensors depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection must be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. For the relevant standards and additional notes, see technical information. The OPL may be applied for a limited time period.
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 technical information. The MWP may be applied for an unlimited time.
3	Maximum sensor measuring range	Range between LRL and URL This span is the maximum calibratable/adjustable measuring span.

Position	Term/Abbreviation	Explanation
4	Calibrated/Adjusted measuring span	Range between LRV and URV Factory setting: 0...URL Other calibrated spans can be ordered with customised settings.
p	-	Pressure
-	LRL	Lower range limit
-	URL	Upper range limit
-	LRV	Lower range value
-	URV	Upper range value
-	TD	Turn down

1.5 Turn down calculation

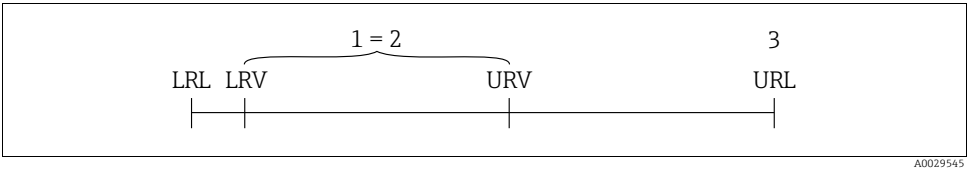


Fig. 1:

1 Calibrated/Adjusted measuring span
2 Zero-based span
3 Upper range limit

Example

- Sensor: 10 bar (150 psi)
- Upper range limit (URL) = 10 bar (150 psi)
- Calibrated/Adjusted measuring span: 0...5 bar (0...75 psi)
- Lower range value (LRV) = 0 bar
- Upper range value (URV) = 5 bar (75 psi)

Turn down (TD):

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

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

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

2 Basic safety instructions

2.1 Requirements concerning the staff

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 beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- Following instructions and basic conditions

The operating personnel must fulfill the following requirements:
- Being instructed and authorized according to the requirements of the task by the facility's owner-operator
- Following the instructions in these Operating Instructions

2.2 Designated use

The Deltapilot S is a hydrostatic pressure transmitter for measuring level and pressure.

2.2.1 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 fluid-wetted materials, but does not accept any warranty or liability.

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.

Repair
To ensure continued operational safety and reliability,
- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to repair of an electrical device.
- ▶ Use original spare parts and accessories from Endress+Hauser only.

2.5 Hazardous area

To eliminate a danger for persons or for the facility when the device is used in the hazardous area (e.g. explosion protection, pressure vessel safety):

- Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
- Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

2.6 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 they are safe to operate. It fulfills general safety requirements and legal requirements. It also conforms to the EC directives listed in the device-specific EC declaration of conformity. Endress+Hauser confirms this fact by applying the CE mark.

3 Identification

3.1 Product identification

The following options are available for identification of the measuring device:
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in W@M Device Viewer (www.endress.com/deviceviewer): All information about the measuring device is displayed.

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

3.2 Device designation

3.2.1 Nameplate

- The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of +20 °C (68°F) and may be applied to the device for an unlimited time. Observe temperature dependency of the MWP. The pressure values permitted at higher temperatures can be found in the standards EN 1092-1: 2001 Tab. 18 (With regard to their

stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.), ASME B 16.5a – 1998 Tab. 2-2.2 F316, ASME B 16.5a – 1998 Tab. 2.3.8 N10276, JIS B 2220.
- The test pressure corresponds to the over pressure limit (OPL) of the device = MWP x 1.5.
- The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.

3.2.2 Identifying the sensor type

See parameter "Sensor Meas.Type" in Operating Instruction BA00296P.

3.3 Scope of delivery

The scope of delivery comprises:
- Deltapilot S hydrostatic pressure transmitter
- For devices with the "HistoROM/M-DAT" option: CD-ROM with FieldCare operating program
- Optional accessories

Documentation supplied:
- The Operating Instructions BA00356P and BA00296P are available via the Internet. → See: www.endress.com → Download.
- Brief Operating Instructions KA01023P
- Leporello KA00244P
- Final inspection report
- Also Safety Instructions with devices for use in hazardous areas
- Optional: factory calibration certificate, test certificates

3.4 CE mark, declaration of conformity

The device is designed 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. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives. Endress+Hauser confirms the successful testing of the device by affixing to it the CE mark.

4 Installation

4.1 Incoming acceptance and storage

4.1.1 Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

4.1.2 Transport

⚠ WARNING

Incorrect transportation

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 (with secure transport protection for the diaphragm).
- ▶ Follow the safety instructions and transport conditions for devices weighing more than 18 kg (39.6 lbs).

4.1.3 Storage

The device must be stored in a dry, clean area and protected against impact (EN 837-2).

Storage temperature range:

- −40 to +90°C (−40 to +194°F)
- Onsite display: −40 to +85°C (−40 to +185°F)
- Separate housing: −40 to +60°C (−40 to +140°F)

4.2 Installation conditions

4.2.1 Dimensions

→ For dimensions, please refer to the Technical Information for Deltapilot S TI00416P, "Mechanical construction" section.

4.3 General installation instructions

- Devices with a G 1 1/2 thread:
  When screwing the device into the tank, the flat seal has to be positioned on the sealing surface of the process connection. To avoid additional strain on the process isolating diaphragm, the thread should never be sealed with hemp or similar materials.
- Devices with NPT threads:
  - Wrap Teflon tape around the thread to seal it.
  - Tighten the device at the hexagonal bolt only. Do not turn at the housing.
  - Do not overtighten the thread when screwing. Max. torque: 20 to 30 Nm (14.75 to 22.13 lbf ft)

4.4 Installation instructions

- Due to the orientation of the Deltapilot S, there may be a shift in the measured value, i.e. when the container is empty, the measured value does not display zero. You can correct this zero point shift either via the "zero" key on the electronic insert, or on the outside of the device or via the onsite display. → 23, Kap. 6.2.1 "Position of operating elements", → 25, Kap. 6.2.2 "Function of operating elements – onsite display not connected" and → 34, Kap. 7.5 "Position adjustment".
- To ensure optimal readability of the onsite display, it is possible to rotate the housing up to 380°. → 16, Section 4.4.5 "Rotating the housing".
- Endress+Hauser offers a mounting bracket for installing on pipes or walls. → 15, Section 4.4.3 "Wall and pipe mounting (optional)".

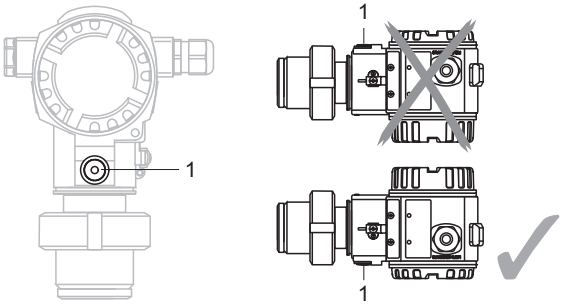
4.4.1 Installation instructions

NOTICE

Damage to the device!

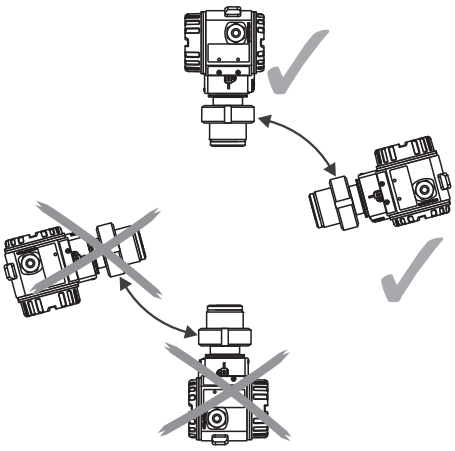
If a heated Deltapilot S is cooled during the cleaning process (e.g. by cold water), a vacuum develops for a short time, whereby moisture can penetrate the sensor through the pressure compensation (1).

▶ If this is the case, mount the sensor with the pressure compensation (1) pointing downwards.



- Keep the pressure compensation and GORE-TEX® filter (1) free from contamination.
- Do not clean or touch process isolating diaphragm with hard or pointed objects.

- The device must be installed as follows in order to comply with the cleanability requirements of the ASME-BPE (Part SD Cleanability):



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 outflow
  - in the suction area of a pump
  - or at a point in the tank that can be affected by pressure pulses from the agitator
- The calibration and functional test can be carried out more easily if you mount the device downstream of a shutoff device.
- Deltapilot S must be included in the insulation for media that can harden when cold.

Pressure measurement in gases

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

Pressure measurement in steams

- Mount Deltapilot S with siphon above the tapping point.
- Fill the siphon with liquid before commissioning.
  The siphon reduces the temperature to almost the ambient temperature.

Pressure measurement in liquids

- Mount Deltapilot S with the shutoff device below or at the same level as the tapping point.

4.4.2 Seal for flange mounting

NOTICE

Corrupted measurement results.

The seal is not allowed to press against the process isolating diaphragm as this could affect the measurement result.

- ▶ Ensure that the seal is not touching the process isolating diaphragm.

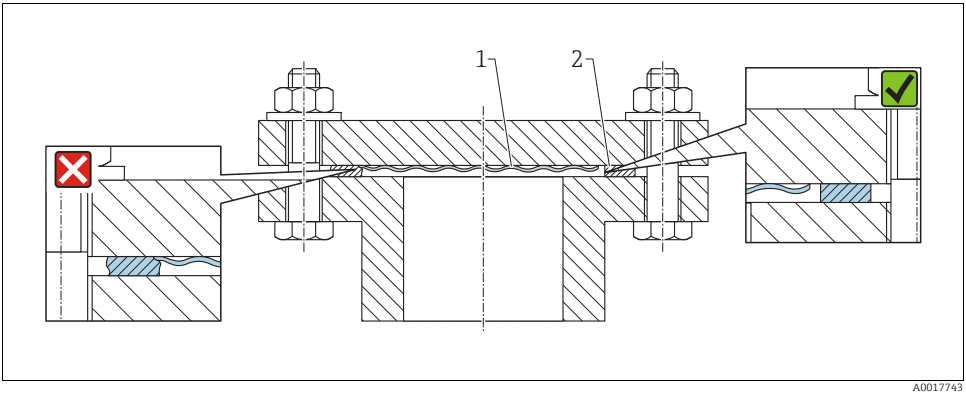


Fig. 2:
1 Process isolating diaphragm
2 Seal

4.4.3 Wall and pipe mounting (optional)

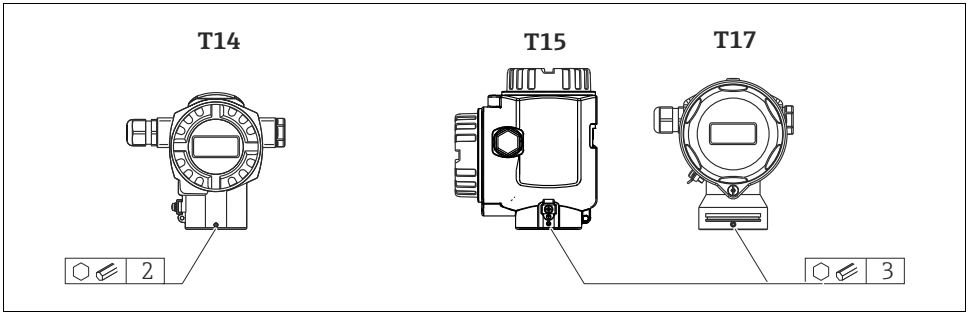
See operating instructions.

4.4.4 Assembling and mounting the "separate housing" version

See operating instructions.

4.4.5 Rotating the housing

The housing can be rotated up to 380° by loosening the Allen screw.



A0019996

1. T14 housing: Loosen setscrew with a 2 mm (0.08 in) Allen key.
   T15 andT17 housing: Loosen setscrew with a 3 mm (0.12 in) Allen key.
2. Rotate housing (max. up to 380 °).
3. Retighten setscrew with 1 Nm (0,74 lbf ft.

4.4.6 Closing the housing cover

NOTICE

Devices with EPDM cover seal - transmitter leakiness!

Mineral-based, animal-based or vegetable-based lubricants cause the EPDM cover seal to swell and the transmitter to become leaky.

- The thread is coated at the factory and therefore does not require any lubrication.

NOTICE

The housing cover can no longer be closed.

Damaged thread!

- When closing the housing cover, please ensure that the thread of the cover and housing are free from dirt, e.g. sand.If you feel any resistance when closing the cover, check the thread on both again to ensure that they are free from dirt.

Close cover on a hygenic stainless steel housing (T17)

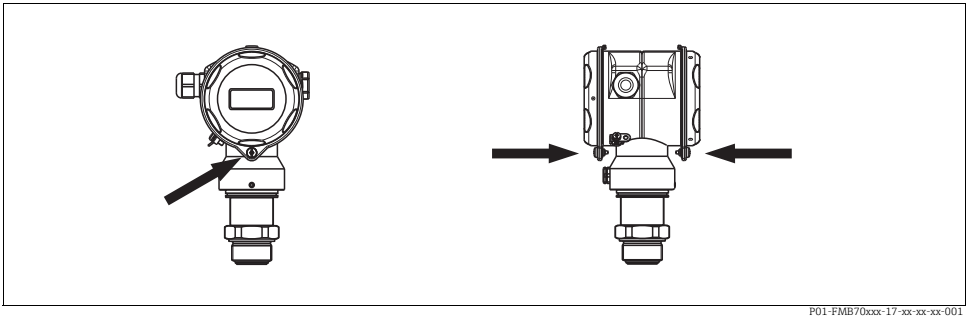


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Fig. 3: Close cover

The covers for the terminal and electronics compartment are hooked into the casing and closed with a screw. These screws should be finger-tightened (2 Nm (1.48 lbf ft)) to the stop to ensure that the covers sit tightly.

4.4.7 Mounting of the profile seal for universal process mounting adapter

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

4.5 Post-installation check

After installing the device, carry out the following checks:
- Are all screws firmly tightened?
- Are the housing covers screwed down tight?

5 Wiring

5.1 Connecting the device

⚠ WARNING

Risk of electric shock!

If the operating voltage is > 35 VDC: Dangerous contact voltage at terminals.

▶ In a wet environment, do not open the cover if voltage is present.

⚠ WARNING

Limitation of electrical safety due to incorrect connection!

- Risk of electric shock and/or explosion in hazardous areas! In a wet environment, do not open the cover if voltage is present.

- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- Devices with integrated overvoltage protection must be earthed.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.
- The supply voltage must match the supply voltage on the nameplate. (→ 10, Kap. 3.2.1 "Nameplate")
- Switch off the supply voltage before connecting the device.
- Remove housing cover of the terminal compartment.
- Guide cable through the gland. → For cable specification → 20, Kap. 6.2.3.
- Connect device in accordance with the following diagram.
- Screw down housing cover.
- Switch on supply voltage.

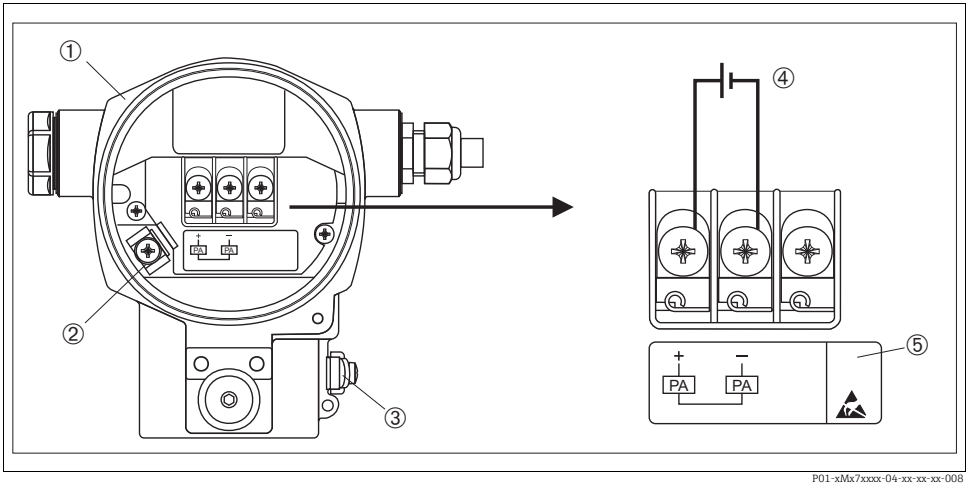
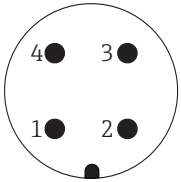


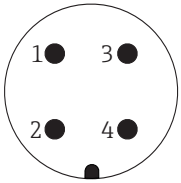
Fig. 4: Electrical connection of PROFIBUS PA
→ Please refer also to → 20, Kap. 5.2.1 "Supply voltage".

1 Housing
3 Internal earth terminal
3 External earth terminal
4 Supply voltage, for version in non-hazardous area = 9...32 V DC
5 Devices with integrated overvoltage protection are labeled OVP (overvoltage protection) here.

5.1.1 Connecting devices with an M12 connector

PIN assignment for M12 connector	PIN	Meaning
 A0011175	1	Signal +
	2	Not assigned
	3	Signal –
	4	Earth

5.1.2 Connecting devices with 7/8" plug

PIN assignment for 7/8" connector	PIN	Meaning
 A0011176	PIN	Meaning
	1	Signal –
	2	Signal +
	3	Shield
	4	Not assigned

5.1.3 Connecting the cable version

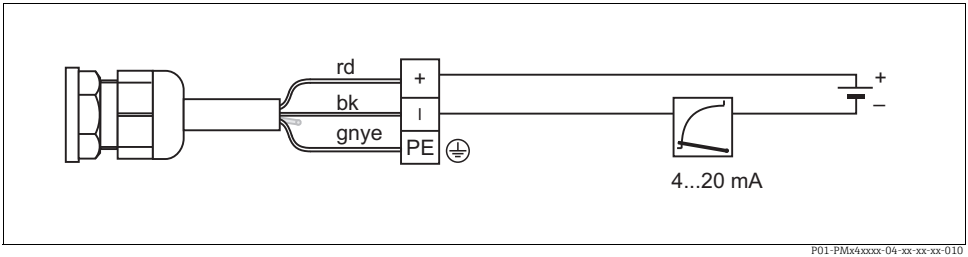


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Fig. 5: rd = red, bk = black, gnye = green-yellow

5.2 Connecting the measuring unit

For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions

BA00034S "Guidelines for planning and commissioning PROFIBUS DP/PA" and the PNO Guideline.

5.2.1 Supply voltage

⚠ WARNING

Supply voltage might be connected!
Risk of electric shock and/or explosion!

- ▶ When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- ▶ All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.

Version for non-hazardous area: 9...32 V DC

5.2.2 Current consumption

Up to HW Version 1.10: 11 mA ±1 mA, switch-on current corresponds to IEC 61158-2, Clause 21.
As of HW Version 02.00: 13 mA ±1 mA, switch-on current corresponds to IEC 61158-2, Clause 21.
As of Hardware Version 1.10, you will find a label in the device on the electronic insert.

5.2.3 Terminals

- Supply voltage and internal ground terminal: 0.5 to 2.5 mm^2 (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm^2 (20 to 12 AWG)

5.2.4 Cable specification

- Use a twisted, shielded two-wire cable, preferably cable type A.
- Outer cable diameter: 5 to 9 mm (0.2 to 0.35 in)

For further information on the cable specifications, see Operating Instructions BA00034S "Guidelines for planning and commissioning PROFIBUS DP/PA", PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

5.2.5 Grounding and shielding

Deltapilot S must be earthed, for example by means of the external earth terminal.

Different grounding and shielding installation methods are available for PROFIBUS PA networks such as:

- Isolated installation (see also IEC 61158-2)
- Installation with multiple grounding
- Capacitive installation

5.3 Overvoltage protection (optional)

See operating instructions.

5.4 Post-connection check

Perform the following checks after completing electrical installation of the device:
- Does the supply voltage match the specifications on the nameplate?
- Is the device connected as per Section 4.1?
- Are all screws firmly tightened?
- Are the housing covers screwed down tight?

As soon as voltage is applied to the device, the green LED on the electronic insert lights up for a few seconds or the connected onsite display lights up.

6 Operation

Feature 20 "Output; operation" in the order code provides you with information on the operating options available to you.

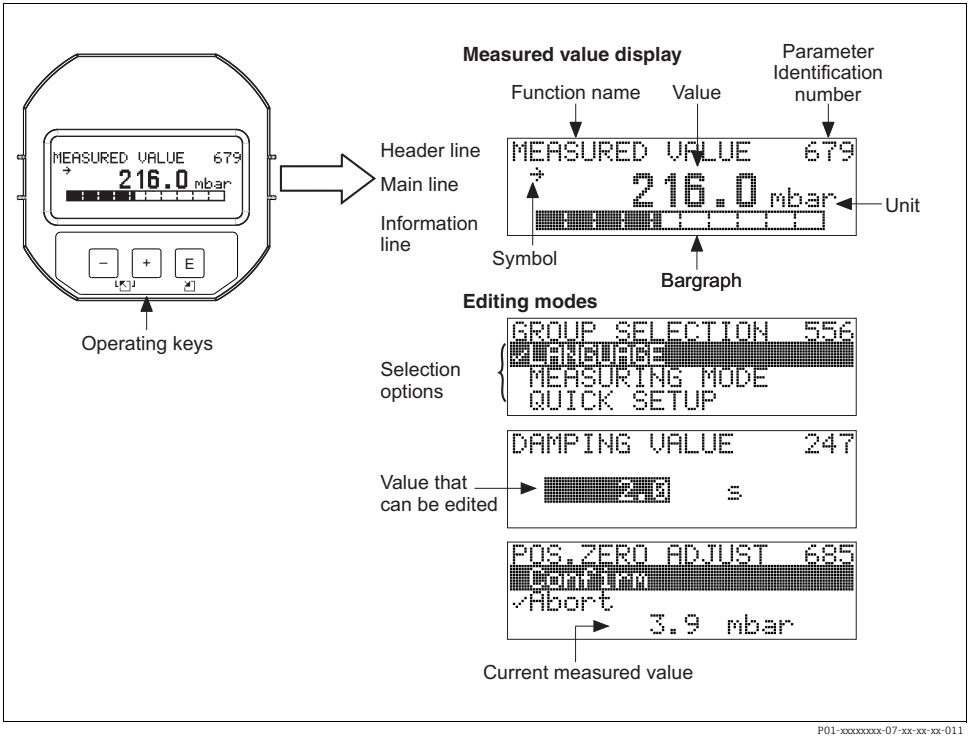
Versions in the order code		Operation
M	PROFIBUS PA; external and LCD	Via onsite display and 1 key on the exterior of the device
N	PROFIBUS PA; internal and LCD	Via onsite display and 1 key on the inside of the device
O	PROFIBUS PA; internal	Without onsite display, 1 key on the inside of the device

6.1 Onsite display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation. The onsite display shows measured values, fault messages and notice messages.
The display of the device can be turned in 90° steps.
Depending on the installation position of the device, this makes it easy to operate the device and read the measured values.

Functions:
- 8-digit measured value display including sign and decimal point, unit display
- Bar Graph as graphic display of standardized value of the Analog Input Block (→ see also graphic, → 📄 41, Kap. 7.8 "Scaling the OUT value")
- Simple and complete menu guidance thanks to separation of the parameters into several levels and groups
- Menu guidance in 8 languages (de, en, fr, es it, nl, jp, ch)
- Each parameter is given a 3-digit ID number for easy navigation

- Option for configuring the display according to individual requirements and desires, such as language, alternating display, contrast setting, display of other measured values such as sensor temperature
- Comprehensive diagnostic functions (fault and warning message, drag needle, etc.)
- rapid and safe commissioning with the Quick Setup menus



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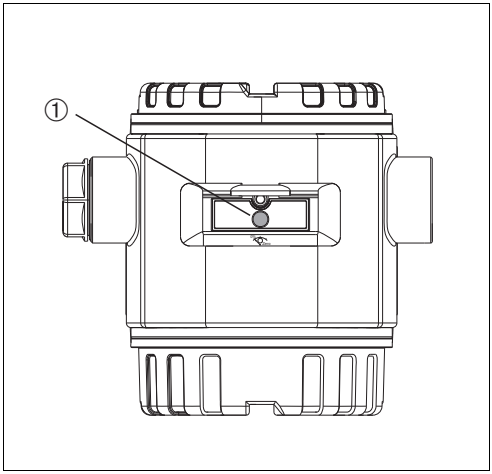
The following table illustrates the symbols that can appear on the onsite display. Four symbols can occur at one time.

Symbol	Meaning
	**Alarm symbol** – Symbol flashing: warning, device continues measuring. – Symbol permanently lit: error, device does not continue measuring. *Note:* The alarm symbol may overlie the tendency symbol.
	**Lock symbol** The operation of the device is locked. To unlock the device, → 32, Kap. 6.7 "Locking/unlocking operation".
	**Communication symbol** Data transfer via communication
	**Tendency symbol (increasing)** The primary value of the Transducer Block is increasing.
	**Tendency symbol (decreasing)** The primary value of the Transducer Block is decreasing.
	**Tendency symbol (constant)** The primary value of the Transducer Block has remained constant over the past few minutes.

6.2 Operating elements

6.2.1 Position of operating elements

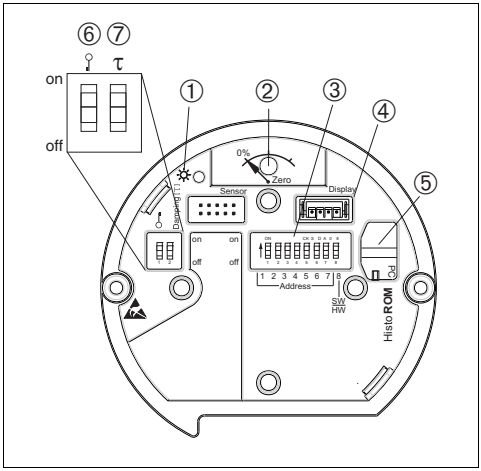
With regard to aluminum housings (T14/T15), the operating key is located either outside the device under the protection cap or inside on the electronic insert. In hygienic stainless steel housings (T17), the operating key is always located inside on the electronic insert. Additionally, three operating keys are located on the optional onsite display.



P01-PMx7xxxx-19-xx-xx-xx-075

Fig. 6: Operating key external, under the protective flap

1 Operating key for position adjustment (zero point correction) and total reset

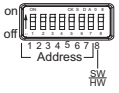
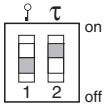


P01-xxxxxxxx-19-xx-xx-xx-105

Fig. 7: Operating key and operating elements, internal

1 Green LED to indicate value is accepted
2 Operating key for position adjustment (zero point correction) and total reset
3 DIP switch for hardware address
4 Slot for optional display
5 Slot for optional HistoROM®/M-DAT
6 DIP-switch for locking/unlocking measured-value-relevant parameters
7 DIP-switch for damping on/off

6.2.2 Function of operating elements – onsite display not connected

Operating elements	Meaning
 P01-xxxxxxxx-19-xx-xx-xx-107	– Position adjustment (zero point correction): Press key for at least 3 seconds. If the LED on the electronic insert lights up briefly, the pressure applied has been accepted for position adjustment. → See also the following section "Performing position adjustment onsite". – Total reset: Press key for at least 12 seconds. If the LED on the electronic insert lights up briefly, the reset is being carried out.
 P01-xxxxxxxx-19-xx-xx-xx-109	Set address in the bus. → 📄 26, Kap. 6.3.1, "Device identification and addressing".
 P01-xxxxxxxx-19-xx-xx-xx-108	– DIP-switch 1: for locking/unlocking measured-value-relevant parameters Factory setting: off (unlocked) → 📄 32, Kap. 6.7 "Locking/unlocking operation". – DIP switch 2: damping on/off Factory setting: on (damping on)

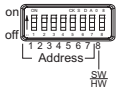
Performing position adjustment onsite

- The operation must be unlocked. → 📄 32, Kap. 6.7 "Locking/unlocking operation".
- The device is configured for the Pressure measuring mode as standard. You can switch measuring modes by means of the MEASURING MODE parameter. → 📄 34, Kap. 7.4 "Selecting language and measuring mode".
- The pressure applied must be within the nominal pressure limits of the sensor. See information on the nameplate.

Carry out position adjustment:

1. Pressure is present at device.
2. Press key for at least 3 seconds.
3. If the LED on the electronic insert lights up briefly, the pressure applied has been accepted for position adjustment.
   If the LED does not light up, the pressure applied was not accepted. Observe the input limits. → For error messages see operating instructions.

6.2.3 Function of the operating elements – onsite display connected

Operating key(s)	Meaning
+	– Navigate upwards in the picklist – Edit the numerical values and characters within a function
−	– Navigate downwards in the picklist – Edit the numerical values and characters within a function
E	– Confirm entry – Jump to the next item
+ and E	Contrast setting of onsite display: darker
− and E	Contrast setting of onsite display: brighter
+ and −	ESC functions: – Exit edit mode without saving the changed value. – You are in a menu within a function group. The first time you press the keys simultaneously, you go back a parameter within the function group. Each time you press the keys simultaneously after that, you go up a level in the menu. – You are in a menu at a selection level. Each time you press the keys simultaneously, you go up a level in the menu. *Note:* The terms function group, level and selection level are explained → 28, Kap. 6.4.1 "".
 P01-xxxxxxxx-19-xx-xx-xx-109	Set address in the bus. → 26, Kap. 6.3.1 "Device identification and addressing".

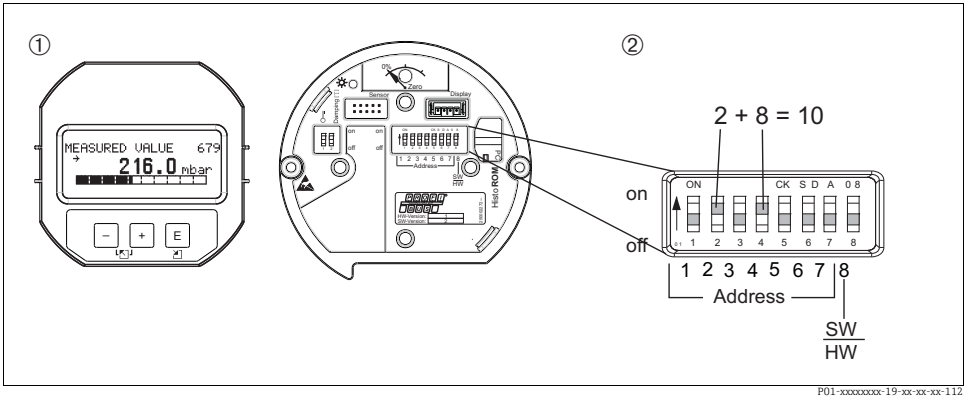
6.3 PROFIBUS PA communication protocol

See operating instructions.

6.3.1 Device identification and addressing

Note the following points:
- An address must be assigned to every PROFIBUS PA device. Only when the address is configured correctly will the device be recognized by the control system/master.
- Each address may only be assigned once in each PROFIBUS PA network.
- Valid device addresses are in the range from 0 to 125.
- The address 126 set at the factory can be used to check the function of the device and to connect to a PROFIBUS PA network already in operation. This address then has to be changed in order to integrate additional devices.
- All devices have the address 126 and software addressing on leaving the factory.
- The FieldCare operating program is delivered with the address 0 (default setting).

There are two ways of assigning the device address to Deltapilot S:
- Using a DP Class 2 master operating program, such as FieldCare or
- On site using the DIP switches



P01-xxxxxxxx-19-xx-xx-xx-112

Fig. 8: Configuring the device address using the DIP switches

1 If necessary, remove onsite display (optional)
2 Set the hardware address via the DIP switches

Hardware addressing

Hardware addressing is configured as follows:
1. Set DIP switch 8 (SW/HW) to "Off".
2. Configure the address with DIP switches 1 to 7 (see graphic above).
3. You have to wait 10 seconds for a change in address to take effect. The device is restarted.

DIP-switch	1	2	3	4	5	6	7
Weighting in "On" position	1	2	4	8	16	32	64
Weighting in "Off" position	0	0	0	0	0	0	0

Software addressing

Software addressing is configured as follows:
1. Set DIP switch 8 (SW/HW) to "On" (factory setting).
2. The device is restarted.
3. The device reports its current address. Factory setting: 126
4. Configure the address via the configuration program.
   See the following section for entering a new address using the ToF Tool.
   For other operating programs, please refer to the relevant Operating Instructions.

Configuring the new address using the FieldCare. DIP switch 8 (SW/HW) is set to "On" (SW):

1. Using the "Device Operation" menu, select the "Connect" option. The "Open Connection Wizard" screen is displayed.
2. The device reports its current address. Factory setting: 126 [1)]
3. The device has to be disconnected from the bus before you can assign the device a new address. For this purpose, select the "Disconnect" option in the "Device Operation" menu.
4. Using the "Device Operation" "Device Functions" "Additional Functions" menu, select the "Set Device Station Address" option. The "PROFIdtm DPV1 (Set Device Station address)" screen is displayed.
5. Enter the new address and confirm with "Set".
6. The new address is assigned to the device.

6.4 Onsite operation – onsite display connected

If the onsite display is connected, the three operating keys are used to navigate through the operating menu, → 📄 26, Kap. 6.2.3 "Function of the operating elements – onsite display connected".

6.4.1 General structure of the operating menu

The menu is split into four levels. The three upper levels are used to navigate while you use the bottom level to enter numerical values, select options and save settings. The entire menu is illustrated in Section 10.1 "Menu".
The structure of the OPERATING MENU depends on the measuring mode selected, e.g. if the "Pressure" measuring mode is selected, only the functions necessary for this mode are displayed.

1) The address 126 is not adjustable via the menu. After a reset (code 2712) the address is stored as a default address in the device.

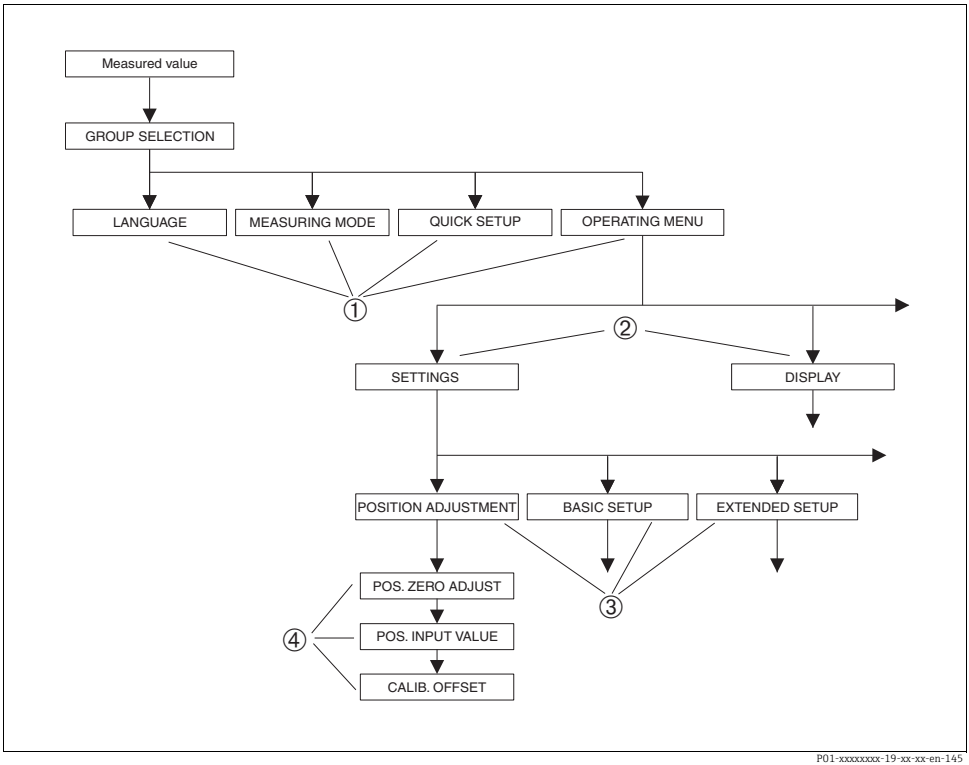


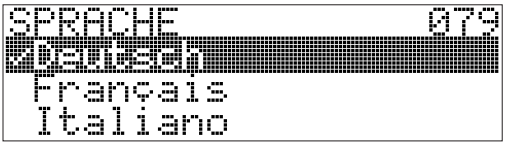
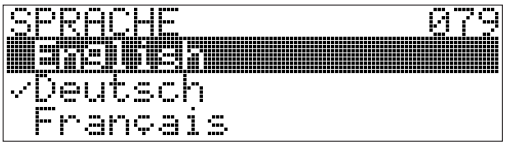
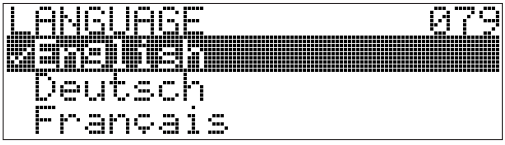
Fig. 9: General structure of the operating menu

1 1. Selection level
2 2. Selection level
3 Function groups
4 Parameter

The LANGUAGE and MEASURING MODE parameters are only displayed via the onsite display on the 1st selection level. In FieldCare, the LANGUAGE parameter is displayed in the DISPLAY group and the MEASURING MODE parameter is displayed in the QUICK SETUP menus or in the BASIC SETUP function group.

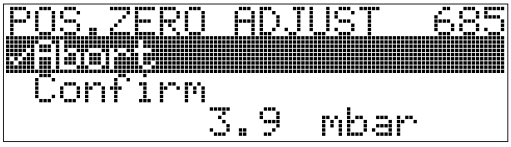
6.4.2 Selecting an option

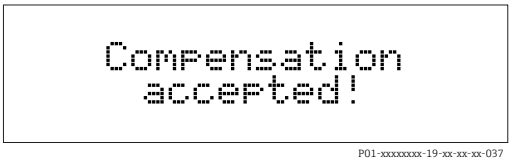
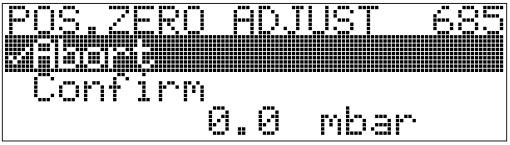
Example: select "English" as the language of the menu.

Onsite display	Operation
 P01-xxxxxxxx-19-xx-xx-xx-017	German is selected as the language. A 3 in front of the menu text indicates the active option.
 P01-xxxxxxxx-19-xx-xx-xx-033	Select English with "+" or "–".
 P01-xxxxxxxx-19-xx-xx-xx-034	1. Confirm your choice with "E". A 3 in front of the menu text indicates the active option. (English is now selected as the menu language.) 2. Jump to the next item with "E".

6.4.3 Taking pressure applied at device as value

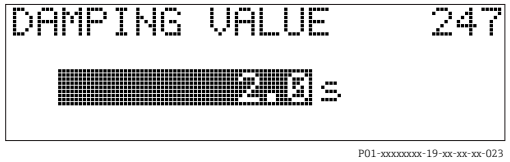
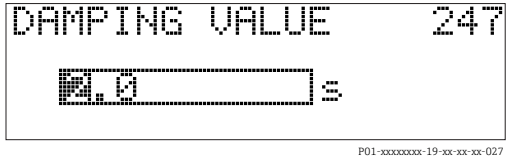
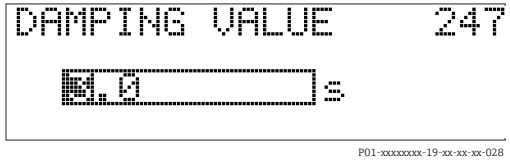
Example: performing position adjustment.

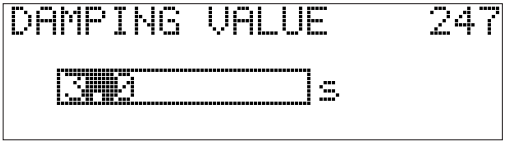
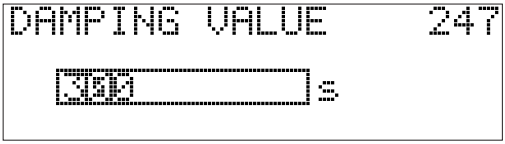
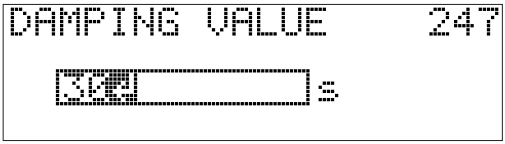
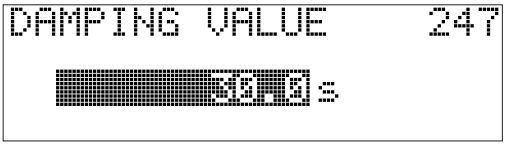
Onsite display	Operation
 P01-xxxxxxxx-19-xx-xx-xx-158	The bottom line on the onsite display displays the pressure present, here 3.9 mbar.
 P01-xxxxxxxx-19-xx-xx-xx-159	Use "+" or "–" to switch to the "Confirm" option. The active selection is highlighted in black.

Onsite display	Operation
 P01-xxxxxxxx-19-xx-xx-xx-037	Use "E" to assign the value (3.9 mbar) to the POS. ZERO ADJUST parameter. The device confirms the calibration and jumps back to the parameter, here POS. ZERO ADJUST (see next graphic).
 P01-xxxxxxxx-19-xx-xx-xx-160	Switch to the next parameter with "E".

6.4.4 Editing a value

Example: adjusting DAMPING VALUE function from 2.0 s to 30.0 s. → 📄 26, Kap. 6.2.3 "Function of the operating elements – onsite display connected".

Onsite display	Operation
 P01-xxxxxxxx-19-xx-xx-xx-023	The onsite display shows the parameter to be changed. The value highlighted in black can be changed. The "s" unit is fixed and cannot be changed.
 P01-xxxxxxxx-19-xx-xx-xx-027	1. Press "+" or "–" to get to the editing mode. 2. The first digit is highlighted in black.
 P01-xxxxxxxx-19-xx-xx-xx-028	1. Use "+" to change "2" to "3". 2. Confirm "3" with "E". The cursor jumps to the next position (highlighted in black).

Onsite display	Operation
	The decimal point is highlighted in black, i.e. you can now edit it.
	1. Keep pressing "+" or "–" until "0" is displayed. 2. Confirm "0" with "E". The cursor jumps to the next position. ↵ is displayed and is highlighted in black. → See next graphic.
	Use "E" to save the new value and exit the editing mode. → See next graphic.
	The new value for the damping is now 30.0 s. – Jump to the next parameter with "E". – You can get back to the editing mode with "+" or "–".

6.5 FieldCare

See operating instructions.

6.6 HistoROM®/M-DAT (optional)

See operating instructions.

6.7 Locking/unlocking operation

See operating instructions.

6.8 Factory setting (reset)

See operating instructions.

7 Commissioning

The device is configured for the "level" measuring mode and level selection "Level Easy Pressure" as standard. The measuring range and the unit in which the measured value is transmitted, as well as the digital output value of the Analog Input Block OUT, correspond to the data on the nameplate. Following a reset with code 1, 40864 or 33333 the OUT Value may have to be rescaled (→ 41, Kap. 7.8 "Scaling the OUT value" and → 41, "System units (SET UNIT TO BUS)).

⚠ WARNING

Exceeding the maximum allowable working pressure!

Risk of injury due to bursting of parts! Warning messages are generated if pressure is too high.

- ▶ If a pressure greater than the maximum permitted pressure is present at the device, the messages "E115 Sensor overpressure" and "E727 Sensor pressure error - overrange" are output in succession! Use the device only within the sensor range limits

NOTICE

Shortfall of the allowable working pressure!

Output of messages if pressure is too low.

- ▶ If a pressure smaller than the minimum permitted pressure is present at the device, the messages "E120 Sensor low pressure" and "E727 Sensor pressure error - overrange" are output in succession! Use the device only within the sensor range limits

7.1 Configuring messages

- Messages E727, E115 and E120 are "Error"-type messages and can be configured as a "Warning" or an "Alarm". These messages are configured as "Warning" messages at the factory. This setting prevents the current output from assuming the set alarm current value for applications (e.g. cascade measurement) where the user is consciously aware of the fact that the sensor range can be exceeded
- We recommend setting messages E727, E115 and E120 to "Alarm" in the following instances:
  - The sensor range does not have to be exceeded for the measuring application.
  - Position adjustment has to be carried out that has to correct a large measured error as a result of the orientation of the device (e.g. devices with a diaphragm seal).

7.2 Function check

Carry out a post-installation and a post-connection check as per the checklist before commissioning the device.

- "Post-installation check" checklist → see Kap. 4.5
- "Post-connection check" checklist → see Kap. 5.4

7.3 Commissioning via Class 2 master (FieldCare)

See operating instructions.

7.4 Selecting language and measuring mode

7.4.1 Local operation

The LANGUAGE and MEASURING MODE parameters are located on the top menu level.
→ 28, Kap. 6.4.1 "General structure of the operating menu".

The following languages are available:
- Deutsch
- English
- Français
- Italiano
- Español
- Nederlands
- Chinese (CHS)
- Japanese (JPN)

The following measuring modes are available:
- Pressure
- Level

7.4.2 FieldCare

See operating instructions.

7.5 Position adjustment

Due to the orientation of the device, there may be a shift in the measured value, i.e. when the container is empty or partly filled, the measured value parameter does not display zero. There are three options to choose from when performing position adjustment.

- Menu path onsite display: GROUP SELECTION → OPERATING MENU → SETTINGS → POSITION ADJUSTMENT
- Menu path FieldCare: MANUFACTOR VIEW → OPERATING MENU → SETTINGS → POSITION ADJUSTMENT

Parameter name	Description
POS. ZERO ADJUST Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. **Example:** – MEASURED VALUE = 2.2 mbar (0.032 psi) – Correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option. This means that you are assigning the value 0.0 to the pressure present. – MEASURED VALUE (after pos. zero adjust) = 0.0 mbar The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected. **Factory setting:** 0.0
POS. INPUT VALUE Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. To correct the pressure difference, you need a reference measurement value (e. g. from a reference device). **Example:** – MEASURED VALUE = 0.5 mbar (0.0073 psi) – For the POS. INPUT VALUE parameter, specify the desired set point for the MEASURED VALUE, e.g. 2.0 mbar (0.029 psi). (MEASURED $VALUE_{new}$ = POS. INPUT VALUE) – MEASURED VALUE (after entry for POS. INPUT VALUE) = 2.0 mbar (0.029 psi) – The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected. CALIB. OFFSET = MEASURED $VALUE_{old}$ – POS. INPUT VALUE, here: CALIB. OFFSET = 0.5 mbar (0.0073 psi) – 2.0 mbar (0.029 psi) = – 1.5 mbar (0.022 psi) **Factory setting:** 0.0
CALIB. OFFSET Entry	Position adjustment – the pressure difference between zero (set point) and the measured pressure is known. **Example:** – MEASURED VALUE = 2.2 mbar (0.032 psi) – Via the CALIB. OFFSET parameter, enter the value by which the MEASURED VALUE should be corrected. To correct the MEASURED VALUE to 0.0 mbar, you must enter the value 2.2 here. (MEASURED $VALUE_{new}$ = MEASURED $VALUE_{old}$ – CALIB. OFFSET) – MEASURED VALUE (after entry for calib. offset) = 0.0 mbar **Factory setting:** 0.0

7.6 Level measurement

7.6.1 Information on level measurement

- The Level and Pressure operating modes each have a quick setup menu which guides you through the most important basic functions. → 37 "Quick Setup menu for the Level measuring mode".
- Furthermore, the three level modes "Level Easy Pressure", "Level Easy Height" and "Level Standard" are available to you for level measurement. You can select from the "Linear", "Pressure linearized" and "Height linearized" level types for the "Level Standard" level mode. The table in the "Overview of level measurement" section below provides an overview of the various measuring tasks.
  - In the "Level Easy Pressure" and "Level Easy Height" level modes, the values entered are not tested as extensively as in the "Level Standard" level mode. The values entered for EMPTY CALIB./FULL CALIB., EMPTY PRESSURE/FULL PRESSURE and EMPTY HEIGHT/FULL must have a minimum interval of 1% for the "Level Easy Pressure" and "Level Easy Height" level modes. The value will be rejected with a warning message if the values are too close together. Further limit values are not checked; i.e. the values entered must be appropriate for the sensor and the measuring task so that the measuring device can measure correctly.
  - The "Level Easy Pressure" and "Level Easy Height" level modes encompass fewer parameters than the "Level Standard" mode and are used for quick and easy configuration of a level application.
  - Customer-specific units of fill level, volume and mass or a linearization table may only be entered in the "Level Standard" level mode.
- For a detailed description of the parameters and configuration examples, see Operating Instructions BA00296P "Cerabar S/Deltabar S/Deltapilot S, Description of Device Functions.

⚠ WARNING

Changing the measuring mode affects the span (URV)!

This situation can result in product overflow.

▶ If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured!

7.6.2 Overview of level measurement

See operating instructions.

7.6.3 Quick Setup menu for the Level measuring mode

- Some parameters are only displayed if other parameters are appropriately configured. For example, the EMPTY CALIB. parameter is only displayed in the following cases:
  - LEVEL SELECTION "Level Easy Pressure" and CALIBRATION MODE "Wet"
  - LEVEL SELECTION "Level Standard", LEVEL MODE "Linear" and CALIBRATION MODE "WET"

  You can find the LEVEL MODE parameter in the BASIC SETTINGS function group.
- The following parameters are set to the following values in the factory:
  - LEVEL SELECTION: Level Easy Pressure
  - CALIBRATION MODE: Wet
  - OUTPUT UNIT or LIN. MEASURAND: %
  - EMPTY CALIB.: 0.0
  - FULL CALIB.: 100.0
- The quick setup is suitable for simple and quick commissioning. If you wish to make more complex settings, e.g. change the unit from "%" to "m", you will have to calibrate using the BASIC SETTINGS group. → See Operating Instructions BA00296P.

⚠ WARNING

Changing the measuring mode affects the span (URV)!

This situation can result in product overflow.

▶ If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured!

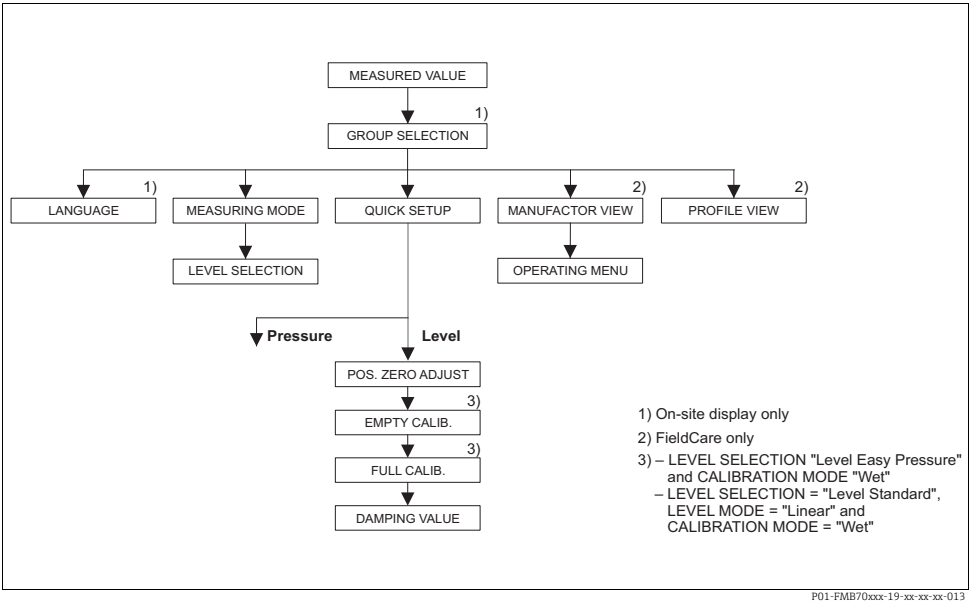


Fig. 10: Quick Setup menu for the "Level" measuring mode

Local operation	FieldCare
Measured value display Onsite display: Switch from the measured value display to GROUP SELECTION with F.	**Measured value display** Select QUICK SETUP menu.
GROUP SELECTION Select MEASURING MODE.	**MEASURING MODE** Select "Level" option.
MEASURING MODE Select "Level" option.	
LEVEL SELECTION Select level mode. For an overview → 📄 37.	**LEVEL SELECTION** Select level mode. For an overview → 📄 37.
GROUP SELECTION Select QUICK SETUP menu.	
POS. ZERO ADJUST Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.	**POS.ZERO ADJUST** Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.
EMPTY CALIB. [1)] Enter level for the lower calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.	**EMPTY CALIB.** [1] Enter level for the lower calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.

Local operation	FieldCare
FULL CALIB. [1] Enter level for the upper calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.	**FULL CALIB.** [1] Enter level for the upper calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.
DAMPING VALUE Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the onsite display, measured value and OUT value of the Analog Input Block react to a change in the pressure.	**DAMPING VALUE** Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the onsite display, measured value and OUT value of the Analog Input Block react to a change in the pressure.

1) – LEVEL SELECTION "Level Easy Pressure" and CALIBRATION MODE "Wet"
– LEVEL SELECTION "Level Standard", LEVEL MODE "Linear" and CALIBRATION MODE "Wet"

For onsite operation, see also → 26, Kap. 6.2.3 "Function of the operating elements – onsite display connected" and → 28, Kap. 6.4 "Onsite operation – onsite display connected".

7.7 Pressure measurement

7.7.1 Information on pressure measurement

- The Level and Pressure operating modes each have a quick setup menu which guides you through the most important basic functions. With the setting in the MEASURING MODE parameter, you specify which Quick Setup menu should be displayed. → 34, Kap. 7.4 "Selecting language and measuring mode".
- For a detailed description of the parameters see the Operating Instructions BA00296P "Cerabar S/Deltabar S/Deltapilot S, Description of device functions"
  - Table 6, POSITION ADJUSTMENT
  - Table 7, BASIC SETUP
  - Table 16, EXTENDED SETUP
- For differential pressure measurement, select the "Pressure" option by means of the MEASURING MODE parameter. The operating menu is structured appropriately.

⚠ WARNING

Changing the measuring mode affects the span (URV)!

This situation can result in product overflow.

▶ If the measuring mode is changed, the span setting (URV) must be verified in the "Calibration" → "Basic Setup" operating menu and, if necessary, reconfigured!

7.7.2 Quick Setup menu for the Pressure measuring mode

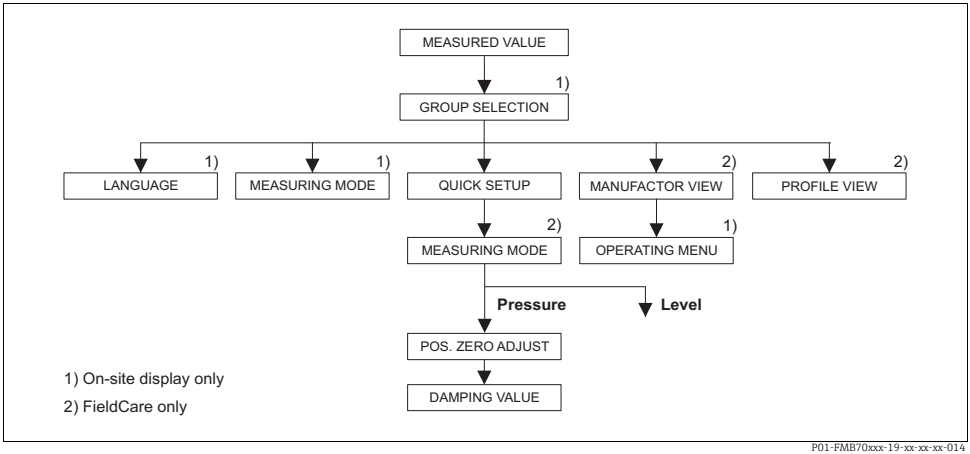


Fig. 11: Quick Setup menu for the "Pressure" measuring mode

Local operation	FieldCare
Measured value display Onsite display: Switch from the measured value display to GROUP SELECTION with F.	**Measured value display** Select QUICK SETUP menu.
GROUP SELECTION Select MEASURING MODE.	**MEASURING MODE** Select "Pressure" option.
MEASURING MODE Select "Pressure" option.	
GROUP SELECTION Select QUICK SETUP menu.	
POS.ZERO ADJUST Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.	**POS.ZERO ADJUST** Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.
DAMPING VALUE Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the onsite display, measured value and OUT value of the Analog Input Block react to a change in the pressure.	**DAMPING VALUE** Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the onsite display, measured value and OUT value of the Analog Input Block react to a change in the pressure.

For onsite operation, see also → 26, Kap. 6.2.3 "Function of the operating elements – onsite display connected" and → 28, Kap. 6.4 "Onsite operation – onsite display connected".

7.8 Scaling the OUT value

See operating instructions.

7.9 System units (SET UNIT TO BUS)

See operating instructions.

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