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01.00.zz

Operating Instructions
Cerabar M
Deltabar M
Deltapilot M

Process pressure / Differential pressure, Flow / Hydrostatic
PROFIBUS PA

Cerabar M

Deltabar M

Deltapilot M

Endress+Hauser
People for Process Automation

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 Document function

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

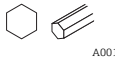
1.2.1 Safety symbols

Symbol	Meaning
 A0011189-EN	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 A0011190-EN	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 A0011191-EN	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 A0011192-EN	**NOTE!** This symbol contains information on procedures and other circumstances that do not result in personal injury.

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 that must be connected to the 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	Open-ended wrench

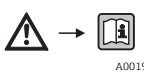
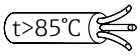
1.2.4 Symbols for certain types of information

Symbol	Meaning
 A0011182	**Permitted** Indicates procedures, processes or actions that are allowed.
 A0011184	**Not permitted** Indicates procedures, processes or actions that are forbidden.
 A0011193	**Tip** Indicates additional information.
 A0015482	Reference to documentation
 A0015484	Reference to page.
 A0015487	Reference to graphic
1. , 2. , etc.	Series of steps
A0018343	Result of a series of actions
 A0015502	Visual inspection
 A0015502	Indicates how to navigate to the parameter using the display and operating module
 A0015502	Indicates how to navigate to the parameter using operating tools (e.g. FieldCare)

1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3, 4 etc.	Numbering of main items
1. , 2. , etc.	Series of steps
A, **B**, **C**, **D** etc.	Views

1.2.6 Symbols on the device

Symbol	Meaning
 A0019159	**Safety notice** Observe the safety instructions contained in the associated operating instructions.
	**Temperature resistance of the connection cables** Indicates that the connecting cables must be able to withstand temperatures of at least 85 °C.

1.2.7 Registered trademarks

KALREZ®
Registered label of E.I. Du Pont de Nemours & Co., Wilmington, USA

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

PROFIBUS PA®
Registered trademark of the PROFIBUS Trade Organization, Karlsruhe, Germany

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

2 Basic safety instructions

2.1 Requirements for the personnel

The personnel responsible for installation, commissioning, diagnostics and maintenance must fulfil the following requirements:
- Trained, qualified specialists must have a relevant qualification for this specific function and task
- They must be authorized by the plant operator
- They must be familiar with 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)
- They must follow instructions and comply with basic conditions

The operating personnel must fulfil the following requirements:
- They must be instructed and authorized according to the requirements of the task by the plant operator
- They must follow the instructions in these Operating Instructions

2.2 Intended use

The **Cerabar M** is a pressure transmitter for measuring level and pressure.
The **Deltabar M** is a differential pressure transmitter for measuring differential pressure, flow and level.
The **Deltapilot M** is a hydrostatic pressure sensor for measuring level and pressure.

2.2.1 Incorrect use

The manufacturer is not liable for damage caused by improper or unintended use.
Clarification for borderline cases:
In the case of special media and fluids used for cleaning, Endress+Hauser is glad to provide assistance in clarifying the corrosion resistance of wetted materials, but does not accept any warranty or liability.

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 that the device is in good working order.
- ▶ Only disassemble the device in unpressurized condition!

Modifications 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 the repair of an electrical device.
- ▶ Use original spare parts and accessories from Endress+Hauser only.

2.5 Hazardous area

To eliminate danger to persons or the installation when the device is used in the hazardous area (e.g. explosion protection, pressure container safety):

- Check the nameplate to verify if the device ordered can be put to its intended use in the hazardous area.
- Comply with the instructions in the separate supplementary documentation, which is an integral part of this manual.

2.6 Product safety

This measuring instrument 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 conforms to 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 Identification

3.1 Product identification

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

3.1.1 Manufacturer's address

Endress+Hauser SE+Co. KG
Hauptstraße 1
79689 Maulburg, Germany
Address of the manufacturing plant: See nameplate

3.2 Device designation

3.2.1 Nameplate

Different nameplates are used depending on the device version.

The nameplates contain the following information:
- Manufacturer name and device name
- Address of the certificate holder and country of manufacture
- Order code and serial number
- Technical data
- Approval-specific information

Compare the data on the nameplate with your order.

3.2.2 Identification of sensor type

In the case of gauge pressure measuring cells, the "Pos. zero adjust" parameter appears in the operating menu ("Setup" -> "Pos. zero adjust").
In the case of absolute pressure sensors, the "Calib. offset" parameter appears in the operating menu ("Setup" -> "Calib. offset").

3.3 Scope of delivery

The scope of delivery comprises:
- Measuring instrument
- Optional accessories

Documentation supplied:
- Operating Instructions BA00383P is available on the Internet.
  → See: www.endress.com → Downloads.
- Brief Operating Instructions: KA01031P Cerabar M / KA01028P Deltabar M / KA01034P Deltapilot M
- Final inspection report
- Additional Safety Instructions with ATEX, IECEx and NEPSI devices
- 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 Mounting

4.1 Incoming acceptance

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

4.2 Storage and transport

4.2.1 Storage

The measuring instrument must be stored in a dry, clean area and protected against damage from impact (EN 837-2).
Storage temperature range:
See Technical Information for Cerabar M TI00436P / Deltabar M TI00434P / Deltapilot M TI00437P.

4.2.2 Transportation

⚠ WARNING
Incorrect transportation
Housing, membrane and capillary may become damaged, and there is a risk of injury!
- ▶ Transport the measuring instrument to the measuring point in its original packaging or by the process connection.
- ▶ Follow the safety instructions and transport conditions for devices weighing more than 18 kg (39.6 lbs).
- ▶ Do not use capillaries as a carrying aid for the diaphragm seals.

4.3 Installation conditions

4.3.1 Dimensions

→ For dimensions, please refer to the Technical Information for Cerabar M TI00436P / Deltabar M TI00434P / Deltapilot M TI00437P, "Mechanical construction" section.

4.4 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 membrane, 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 in the screw. Max. torque: 20 to 30 Nm (14.75 to 22.13 lbf ft)
- For the following process connections, a tightening torque of max. 40 Nm (29.50 lbf ft) is required:
  - Thread ISO228 G1/2 (Order option "GRC" or "GRJ" or "G0J")
  - Thread DIN13 M20 x 1.5 (Order option "G7J" or "G8J")

4.4.1 Mounting sensor modules with PVDF thread

⚠ WARNING

Risk of damage to process connection!

Risk of injury!

▶ Sensor modules with PVDF process connections with threaded connection must be installed with the mounting bracket provided!

⚠ WARNING

Material fatigue from pressure and temperature!

Risk of injury due to bursting of parts! The thread can become loose if exposed to high pressure and temperature loads.

▶ The integrity of the thread must be checked regularly and the thread may need to be re-tightened with the maximum tightening torque of 7 Nm (5.16 lbf ft). Teflon tape is recommended for sealing the ½" NPT thread.

4.5 Installing the Cerabar M

- Due to the orientation of the Cerabar M, a zero point shift may occur, i.e. when the container is empty or partially filled, the measured value does not display zero. You can correct this zero point shift → 42, section "Function of operating elements".
- For PMP55, please refer to section 4.5.2 "Installation instructions for devices with diaphragm seals – PMP55", → 16.
- Endress+Hauser offers a mounting bracket for installations on pipes or walls. → 17, section 4.5.5 "Wall and pipe mounting (optional)".

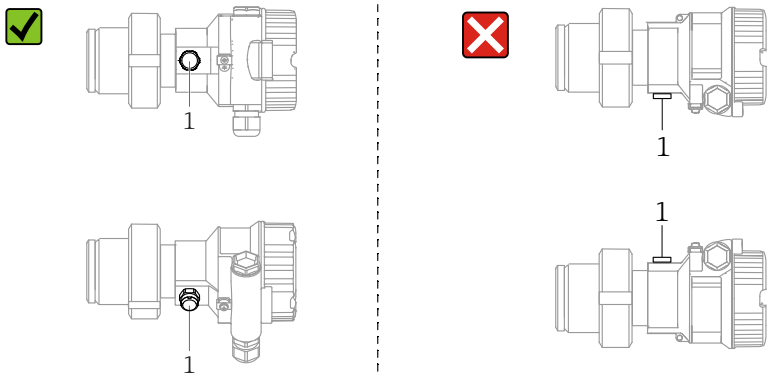
4.5.1 Installation instructions for devices without diaphragm seals – PMP51, PMC51

NOTICE

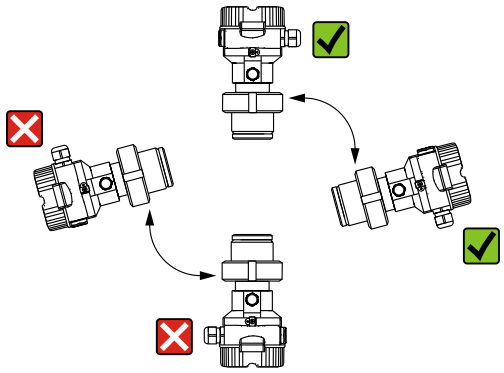
Damage to the device!

If a heated Cerabar M is cooled during the 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 (1).

▶ Mount the device as follows.



- Keep the pressure compensation and GORE-TEX® filter (1) free from dirt.
- Cerabar M transmitters without diaphragm seals are mounted in accordance with the same guidelines as a manometer (DIN EN 837-2). We recommend the use of shutoff devices and siphons. The orientation depends on the measuring application.
- Do not clean or touch process membranes 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):



Pressure measurement in gases

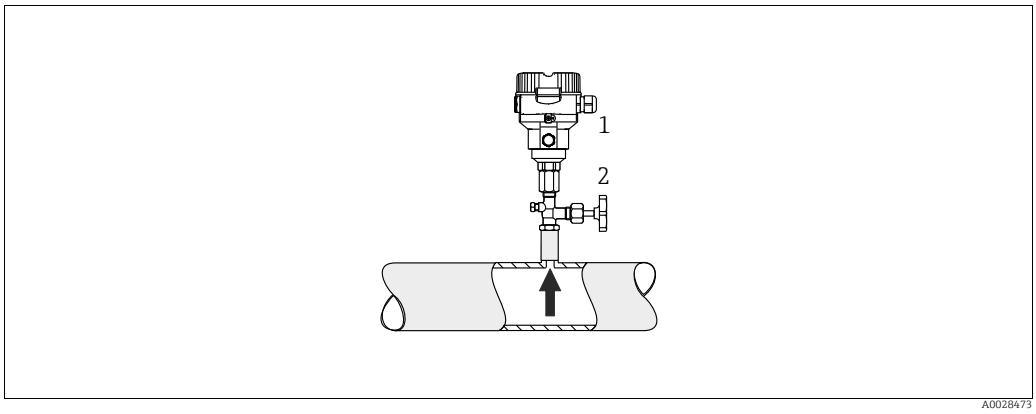


Fig. 1: Measuring arrangement for pressure measurement in gases

1 Cerabar M
2 Shutoff device

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

Pressure measurement in steams

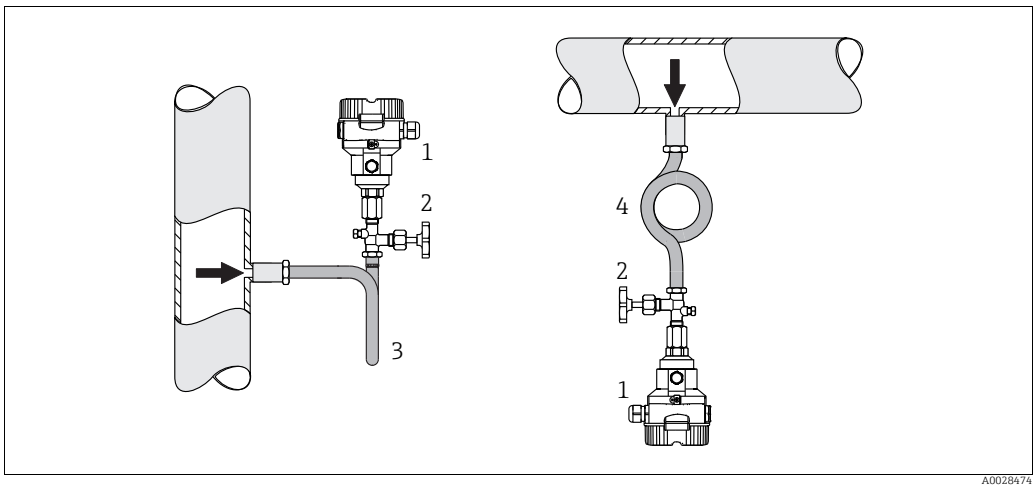


Fig. 2: Measuring arrangement for pressure measurement in steams

1 Cerabar M
2 Shutoff device
3 U-shaped siphon
4 Circular siphon

Observe the maximum permitted ambient temperature of the transmitter!

Mounting:
- Preferably mount the device with an O-shaped siphon below the tapping point
  The device may also be mounted above the tapping point
- Fill the siphon with liquid before commissioning

Advantages of using siphons:
- Protection of the measuring instrument from hot, pressurized media by forming and accumulating condensate
- Damping of pressure shocks
- The defined water column only causes minimal (negligible) measurement errors and minimal (negligible) thermal effects on the device

For the technical data (such as the materials, dimensions or order numbers), see the accessory document SD01553P.

Pressure measurement in liquids

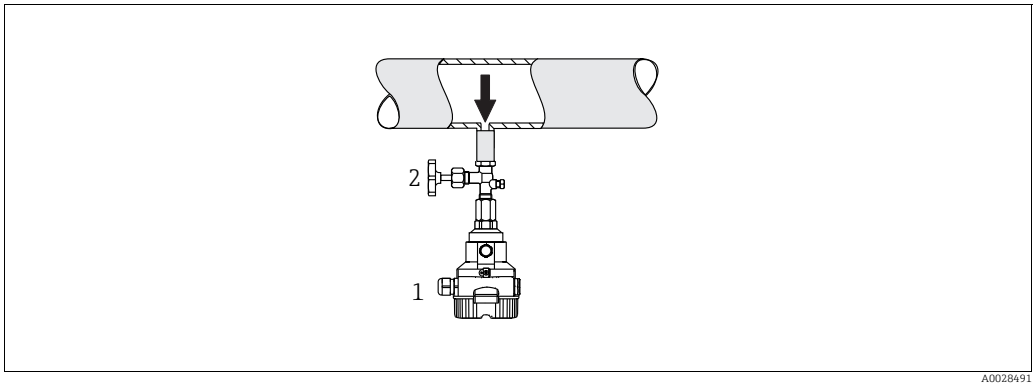


Fig. 3: Measuring arrangement for pressure measurement in liquids

1 Cerabar M
2 Shutoff device

- Mount the Cerabar M with the shutoff device below or at the same level as the tapping point.

Level measurement

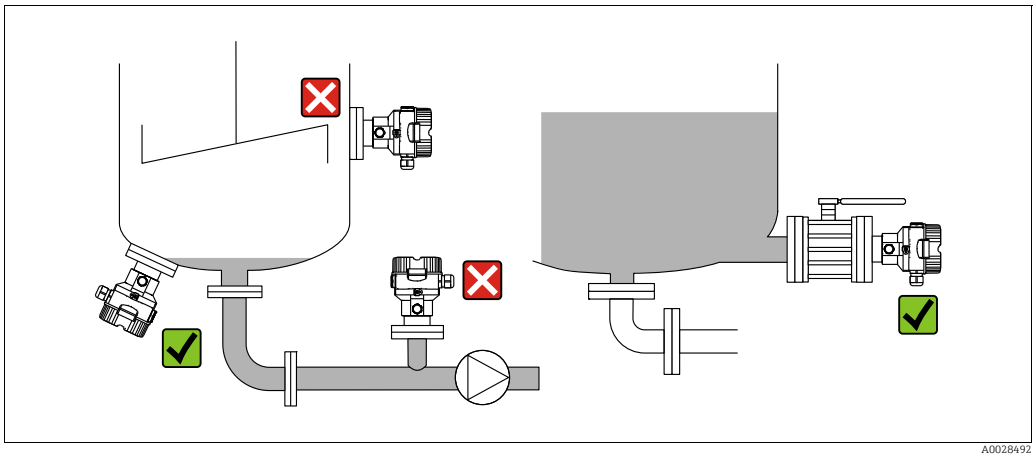


Fig. 4: Measuring arrangement for level

- Always install the Cerabar M below the lowest measuring point.
- Do not mount the device in the filling curtain or at a point in the tank which could be affected by pressure pulses from an agitator.
- Do not mount the device in the suction area of a pump.
- The adjustment and functional test can be carried out more easily if you mount the device downstream from a shutoff device.

4.5.2 Installation instructions for devices with diaphragm seals – PMP55

- Cerabar M devices with diaphragm seals are screwed in, flanged or clamped, depending on the type of diaphragm seal.
- Please note that the hydrostatic pressure of the liquid columns in the capillaries can cause zero point shift. The zero point shift can be corrected.
- Do not clean or touch the process membrane of the diaphragm seal with hard or pointed objects.
- Do not remove the protection on the process membrane until just before installation.

NOTICE

Incorrect handling!

Damage to the device!

- ▶ The diaphragm seal and the pressure sensor together form a closed, calibrated system which is filled with fill fluid through a hole in the upper part. This hole is sealed and not to be opened.
- ▶ When using a mounting bracket, sufficient strain relief must be ensured for the capillaries in order to prevent the capillary bending down (bending radius ≥ 100 mm (3.94 in)).
- ▶ Please observe the application limits of the diaphragm seal fill fluid as detailed in the Technical Information for Cerabar M TI00436P, "Planning instructions for diaphragm seal systems" section.

NOTICE

In order to obtain more precise measurement results and to avoid a defect in the device, mount the capillaries as follows:

- ▶ Vibration-free (in order to avoid additional pressure fluctuations)
- ▶ Not in the vicinity of heating or cooling lines
- ▶ Insulate the capillaries if the ambient temperature is below or above the reference temperature
- ▶ With a bending radius of ≥ 100 mm (3.94 in)
- ▶ Do not use the capillaries as a carrying aid for the diaphragm seals!

Vacuum application

See Technical Information.

Mounting with temperature isolator

See Technical Information.

4.5.3 Seal for flange mounting

NOTICE

Incorrect measurement results.

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

▶ Ensure that the seal is not touching the process membrane.

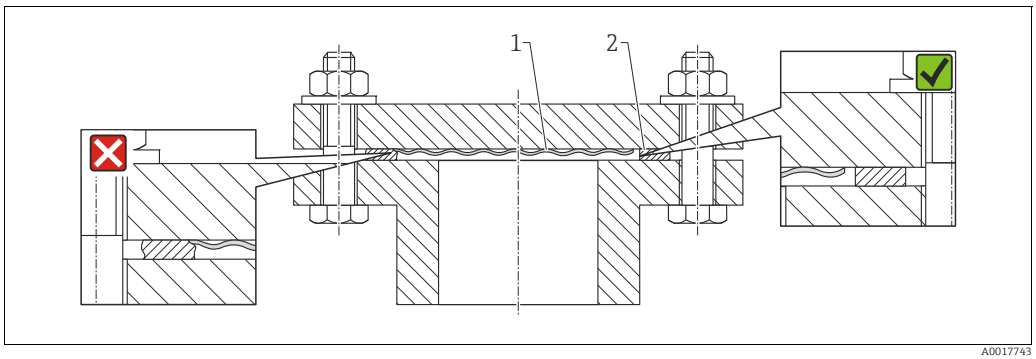


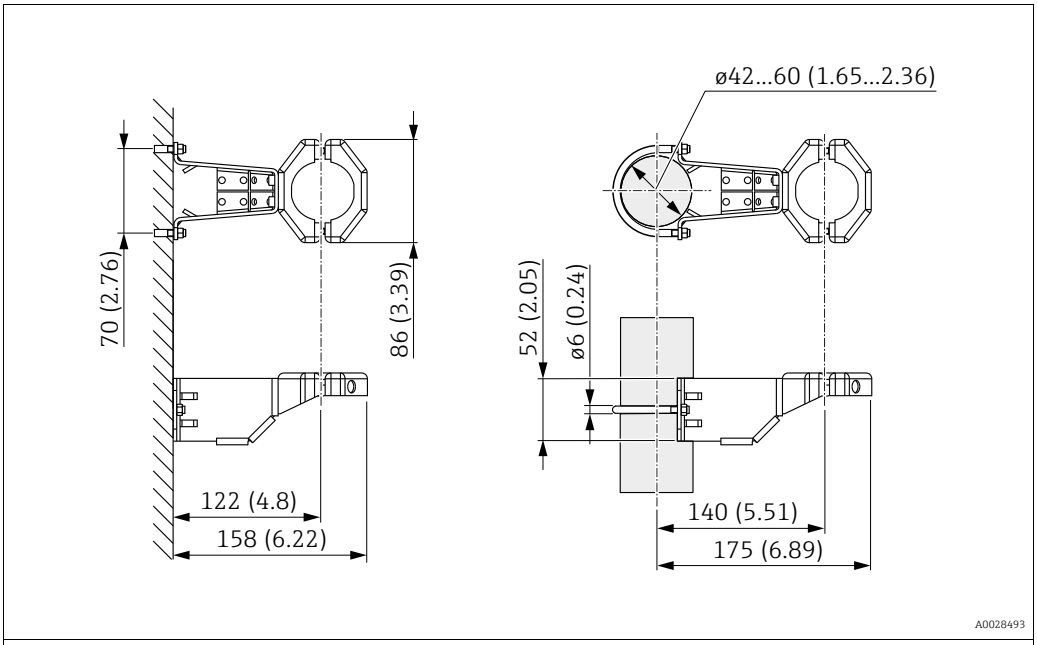
Fig. 5:
1 Process membrane
2 Seal

4.5.4 Thermal insulation – PMP55

See Technical Information.

4.5.5 Wall and pipe mounting (optional)

Endress+Hauser offers a mounting bracket for installation on pipes or walls (for pipe diameters from 1 ¼" to 2").



Unit mm (in)

Please note the following when mounting:

- Devices with capillaries: mount capillaries with a bending radius ≥ 100 mm (3.94 in).
- When mounting on a pipe, tighten the nuts on the bracket uniformly with a torque of at least 5 Nm (3.69 lbs ft).

4.5.6 Assembling and mounting the "separate housing" version

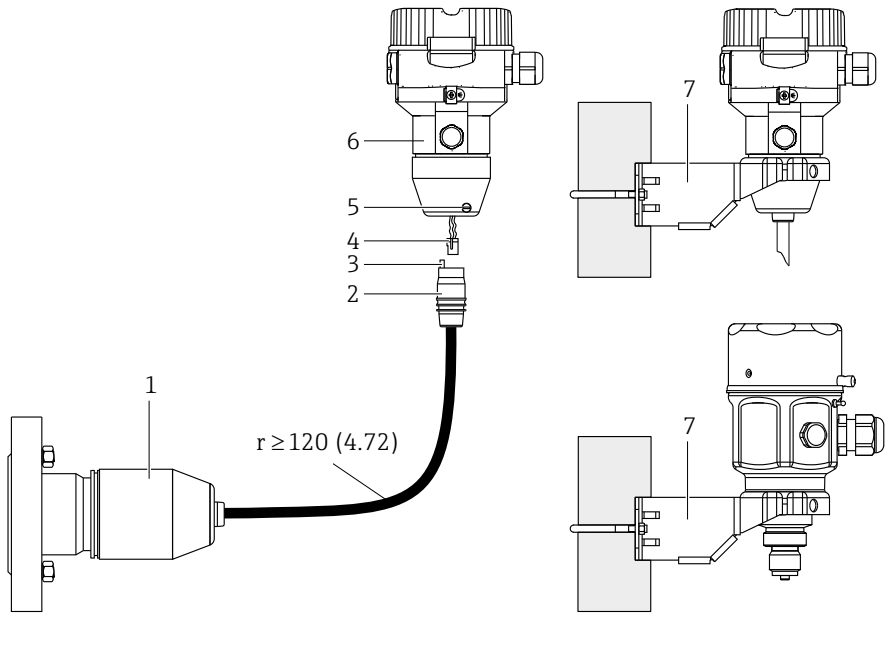


Fig. 6: "Separate housing" version

1 In the "separate housing" version, the sensor is supplied with process connection and cable fitted.
2 Cable with connection jack
3 Pressure compensation
4 Plug
5 Locking screw
6 Housing mounted with housing adapter, included
7 Mounting bracket provided, suitable for pipe and wall mounting (for pipe diameters from 1 ¼" up to 2")

Unit mm (in)

Assembly and mounting

1. Connect plug (item 4) into the corresponding connection jack of the cable (item 2).
2. Plug the cable into the housing adapter (item 6).
3. Tighten the locking screw (item 5).
4. Mount the housing on a wall or pipe using the mounting bracket (item 7).
   When mounting on a pipe, tighten the nuts on the bracket uniformly with a torque of at least 5 Nm (3.69 lbs ft).
   Mount the cable with a bending radius (r) ≥ 120 mm (4.72 in).

Routing the cable (e.g. through a pipe)

You require the cable shortening kit.
Order number: 71093286
For details on mounting, see SD00553P/00/A6.

4.5.7 PMP51, version prepared for diaphragm seal mount – welding recommendation

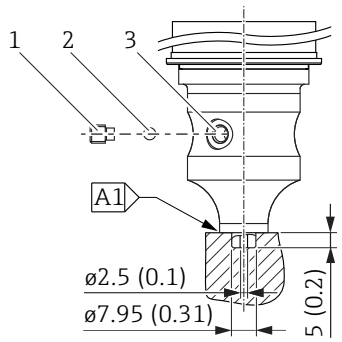
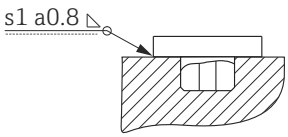


Fig. 7: Version XSJ: prepared for diaphragm seal mount

1 Hole for fill fluid
2 Bearing
3 Setscrew
A1 See the following "Welding recommendation" table

Unit mm (in)

Endress+Hauser recommends welding on the diaphragm seal as follows for the "XSJ - Vorbereitet für Druckmittleranbau" version in feature 110 "Prozessanschluss" in the order code up to, and including, 40 bar (600 psi) sensors: the total welding depth of the fillet weld is 1 mm (0.04 in) with an outer diameter of 16 mm (0.63 in). Welding is performed according to the WIG method.

Consecutive seam no.	Sketch/welding groove shape, dimension as per DIN 8551	Base material matching	Welding method DIN EN ISO 24063	Welding position	Inert gas, additives
A1 for sensors ≤ 40 bar (600 psi)	 A0024811	Adapter made of AISI 316L (1.4435) to be welded to diaphragm seal made of AISI 316L (1.4435 or 1.4404)	141	PB	Inert gas Ar/H 95/5 Additive: ER 316L Si (1.4430)

Information on filling

The diaphragm seal must be filled as soon as it has been welded on.

- Once welded into the process connection, the sensor assembly must be properly filled with a fill fluid and sealed gas-tight with a sealing ball and lock screw.
  Once the diaphragm seal has been filled, at the zero point the device display should not exceed 10% of the full scale value of the cell measuring range. The internal pressure of the diaphragm seal must be corrected accordingly.
- Adjustment / calibration:
  - The device is operational once it has been fully assembled.
  - Perform a reset. The device must then be calibrated to the process measuring range as described in the Operating Instructions.

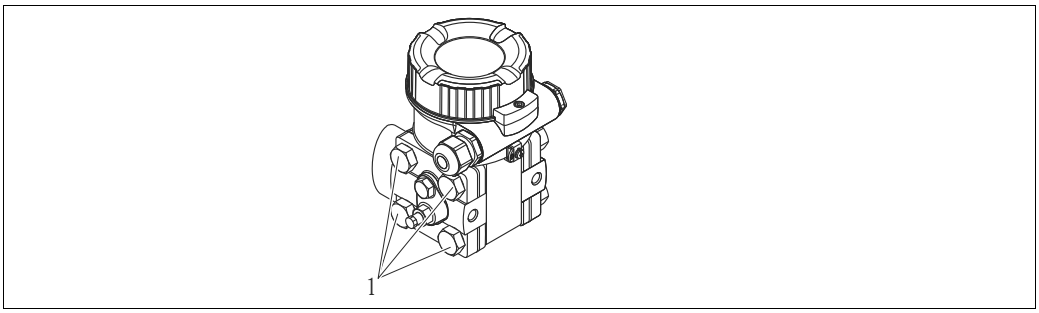
4.6 Installing the Deltabar M

NOTICE

Incorrect handling!

Damage to the device!

▶ The removal of the screws with item number (1) is not permissible under any circumstances and will void the warranty.



4.6.1 Orientation

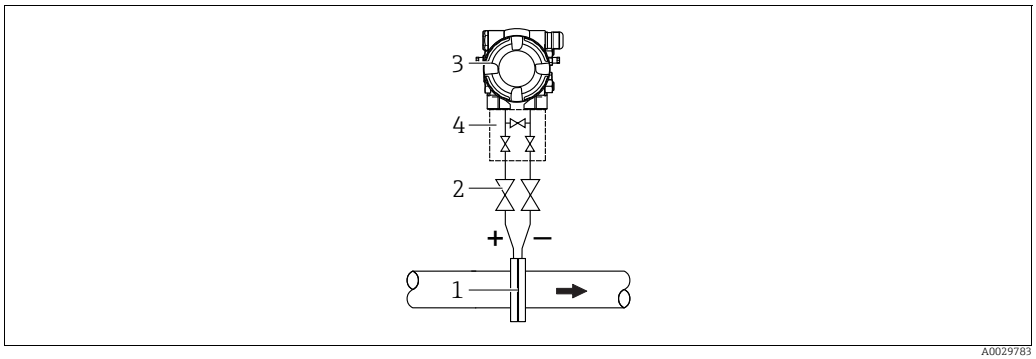
- Due to the orientation of the Deltabar M, a zero point shift may occur, i.e. when the container is empty or partially filled, the measured value does not display zero. You may correct this zero point shift by a position adjustment in one of the following ways:
  - via the operation keys on the electronics module (→ 42, "Function of operating elements")
  - via the operating menu (→ 81, "Position zero adjustment")
- General recommendations for routing the impulse piping can be found in DIN 19210 "Methods for measurement of fluid flow; differential piping for flow measurement devices" or the corresponding national or international standards.
- Using a three-valve or five-valve manifold allows for easy commissioning, installation and maintenance without interrupting the process.
- When routing the impulse piping outdoors, ensure that sufficient anti-freeze protection is used, e.g. by using pipe heat tracing.
- Install the impulse piping with a monotonic gradient of at least 10 %.
- Endress+Hauser offers a mounting bracket for installing on pipes or walls (→ 25, "Wall and pipe mounting (optional)").

Installation position for flow measurement

For more information about differential pressure flow measurement refer to following documents:

- Differential pressure flow measurement with orifices: Technical Information TI00422P
- Differential pressure flow measurement with Pitot tubes: Technical Information TI00425P

Flow measurement in gases

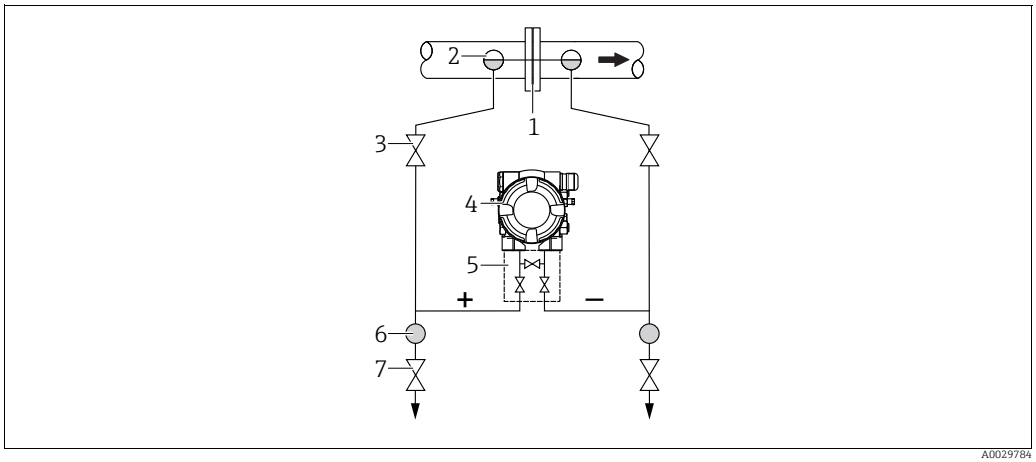


Measuring arrangement for flow measurement in gases

1 Orifice plate or pitot tube
2 Shutoff valves
3 Deltabar M
4 Three-valve manifold

- Mount the Deltabar M above the measuring point so that the condensate which may be present, can run off into the process piping.

Flow measurement in steams

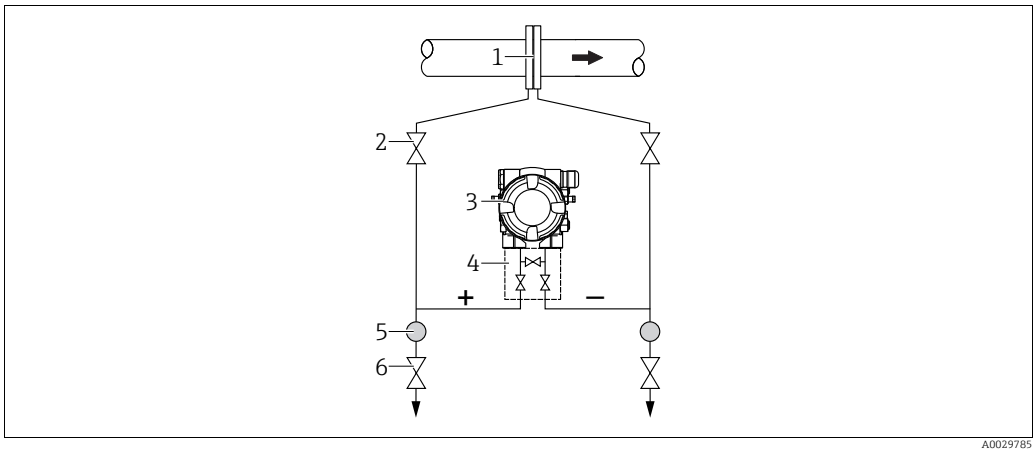


Measuring arrangement for flow measurement in steam

1 Orifice plate or pitot tube
2 Condensate traps
3 Shutoff valves
4 Deltabar M
5 Three-valve manifold
6 Separator
7 Drain valves

- Mount the Deltabar M below the measuring point.
- Mount the condensate traps at the same level as the tapping points and at the same distance to the Deltabar M.
- Prior to commissioning, fill the impulse piping to the height of the condensate traps.

Flow measurement in liquids



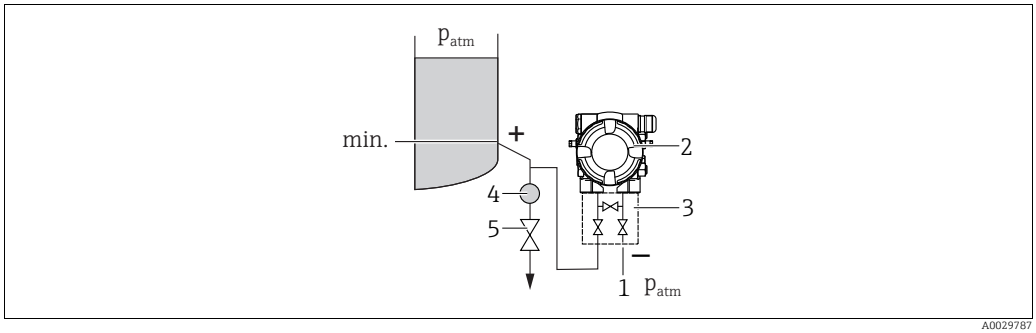
Measuring arrangement for flow measurement in liquids

1 Orifice plate or pitot tube
2 Shutoff valves
3 Deltabar M
4 Three-valve manifold
5 Separator
6 Drain valves

- Mount the Deltabar M below the measuring point so that the impulse piping is always filled with liquid and gas bubbles can run back into the process piping.
- When measuring in media with solid parts, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.

Orientation for level measurement

Level measurement in an open container

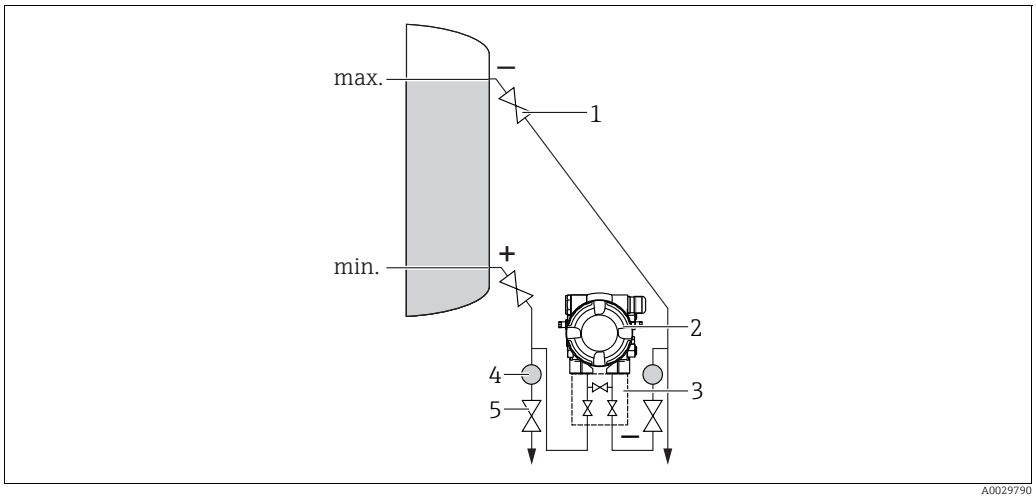


Measuring arrangement for level measurement in an open container

1 The low-pressure side is open to atmospheric pressure
2 Deltabar M
3 Three-valve manifold
4 Separator
5 Drain valve

- Mount the Deltabar M below the lower measuring connection so that the impulse piping is always filled with liquid.
- The low-pressure side is open to atmospheric pressure.
- When measuring in media with solid parts, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.

Level measurement in a closed container

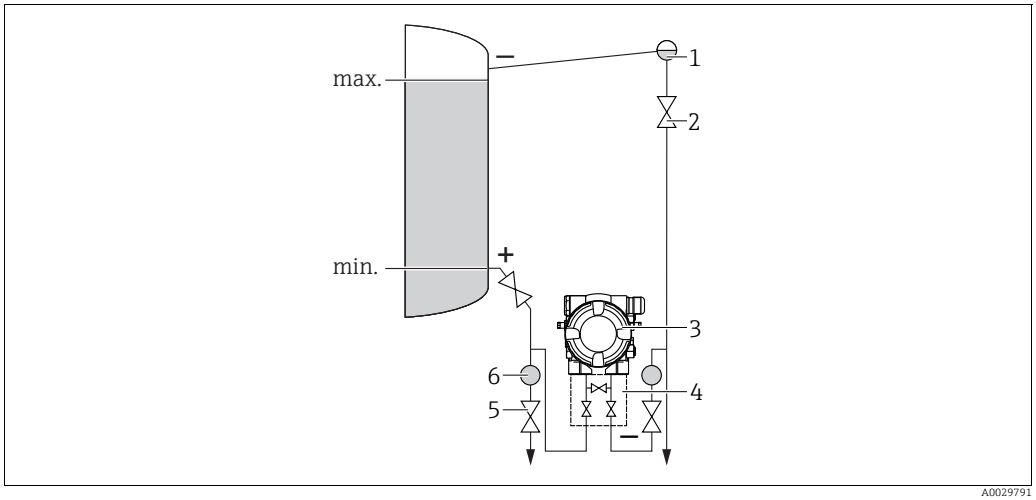


Measuring arrangement for level measurement in a closed container

1 Shutoff valves
2 Deltabar M
3 Three-valve manifold
4 Separator
5 Drain valves

- Mount the Deltabar M below the lower measuring connection so that the impulse piping is always filled with liquid.
- Always connect the low-pressure side above the maximum level.
- When measuring in media with solid parts, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.

Level measurement in a closed container with superimposed steam



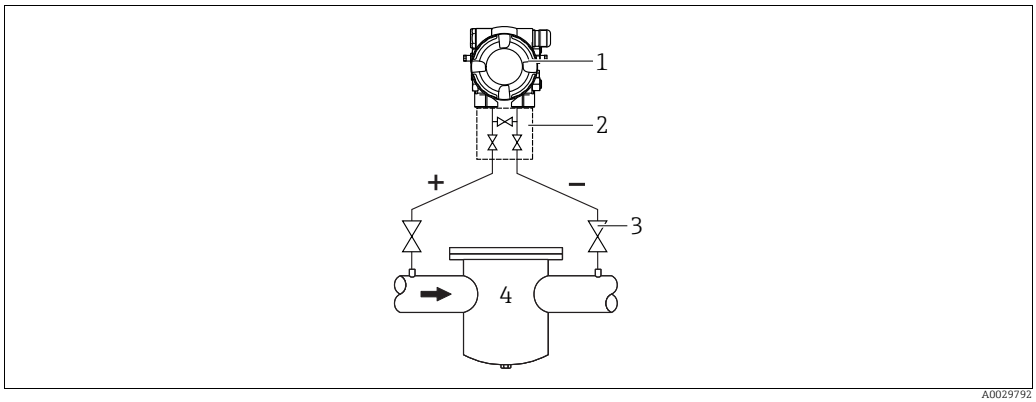
Measuring arrangement for level measurement in a container with superimposed steam

1 Condensate trap
2 Shutoff valves
3 Deltabar M
4 Three-valve manifold
5 Drain valves
6 Separator

- Mount the Deltabar M below the lower measuring connection so that the impulse piping is always filled with liquid.
- Always connect the low-pressure side above the maximum level.
- A condensate trap ensures constant pressure on the low-pressure side.
- When measuring in media with solid parts, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.

Installation position for differential pressure measurement

Differential pressure measurement in gases and steam

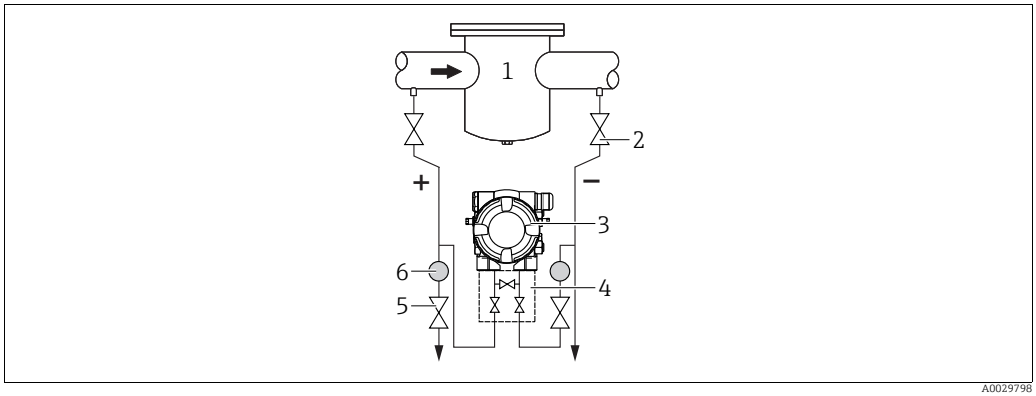


Measuring arrangement for differential pressure measurement in gases and steam

1 Deltabar M
2 Three-valve manifold
3 Shutoff valves
4 E.g. filter

- Mount the Deltabar M above the measuring point so that the condensate which may be present, can run off into the process piping.

Differential pressure measurement in liquids



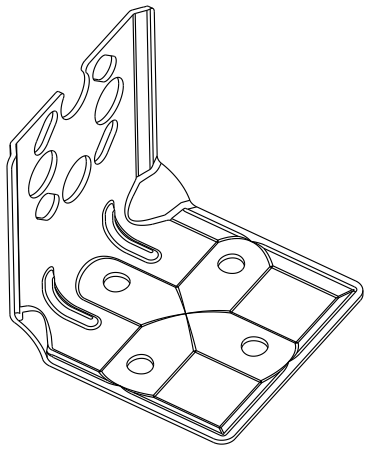
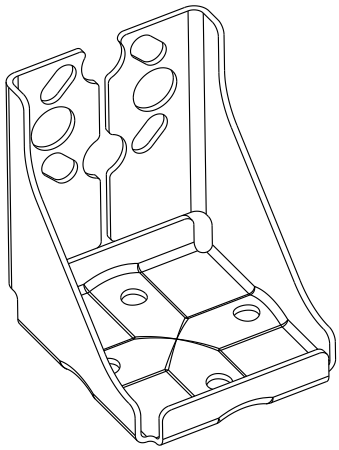
Measuring arrangement for differential pressure measurement in liquids

1 E.g. filter
2 Shutoff valves
3 Deltabar M
4 Three-valve manifold
5 Separator
6 Drain valves

- Mount the Deltabar M below the measuring point so that the impulse piping is always filled with liquid and gas bubbles can run back into the process piping.
- When measuring in media with solid parts, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.

4.6.2 Wall and pipe mounting (optional)

Endress+Hauser offers the following mounting brackets to install the device on pipes or walls:

Standard version	Reinforced version
 A0031326	 A0031327

If a valve manifold is used, its dimensions should also be taken into consideration.
Bracket for wall and pipe mounting including retaining bracket for pipe mounting and two nuts.
The material of the screws used to secure the device depend on the order code.
For the technical data (such as the dimensions or order numbers for screws), see the accessories document SD01553P/00/EN.

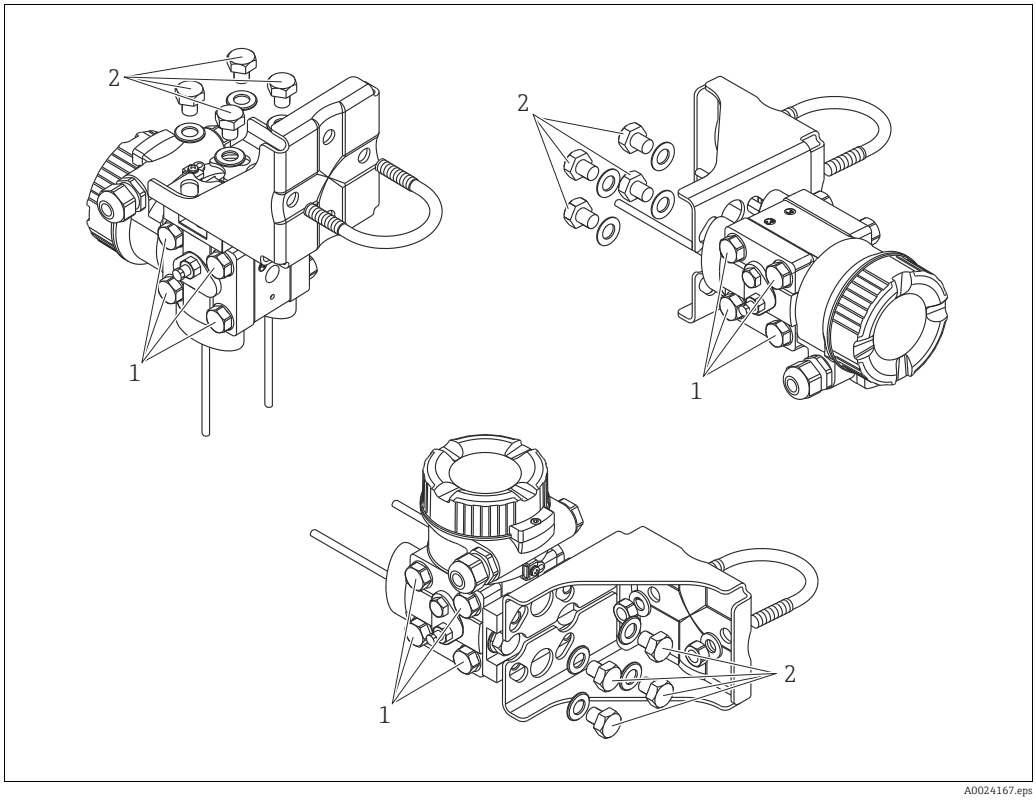
Please note the following when mounting:
- To prevent the mounting screws from scoring, they must be lubricated with a multi-purpose grease before mounting.
- For pipe mounting, the nuts on the retainer must be tightened uniformly with a torque of at least 30 Nm (22.13 lbf ft).
- For installation purposes, only use the screws with item number (2) (see the following diagram).

NOTICE

Incorrect handling!

Damage to the device!

- The removal of the screws with item number (1) is not permissible under any circumstances and will void the warranty.



A0024167.eps

Typical installation arrangements

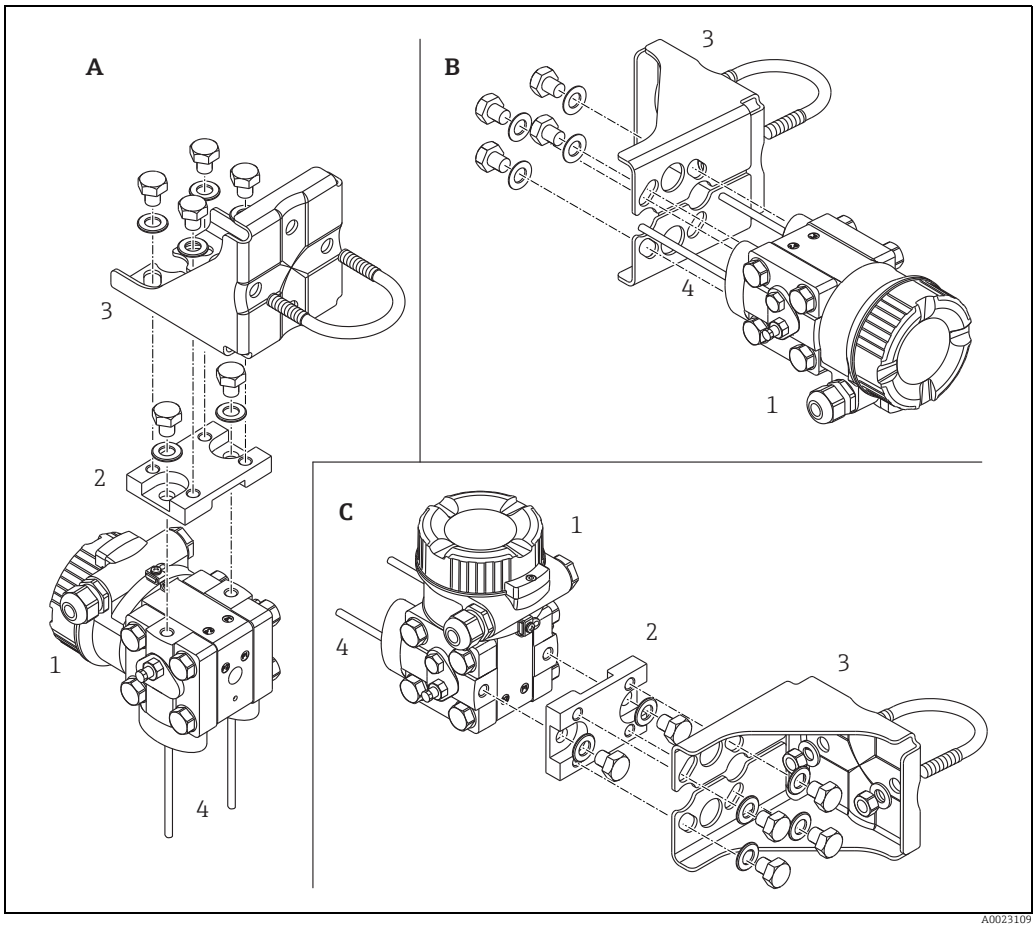


Fig. 8:

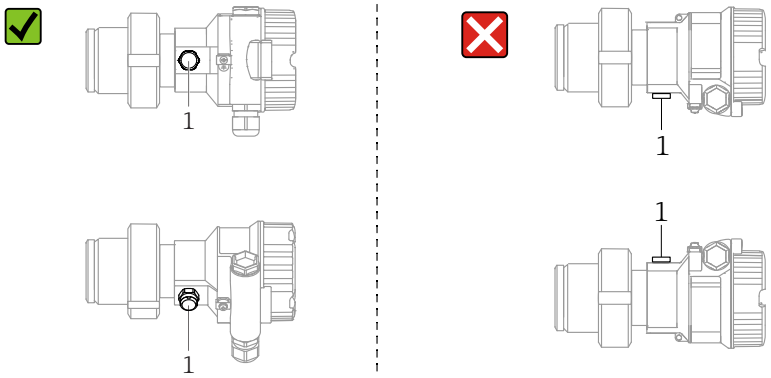
A Impulse line vertical, version V1, alignment 90°
B Impulse line horizontal, version H1, alignment 180°
C Impulse line horizontal, version H2, alignment 90°
1 Deltabar M
2 Adapter plate
3 Mounting bracket
4 Impulse line

4.7 Installing the Deltapilot M

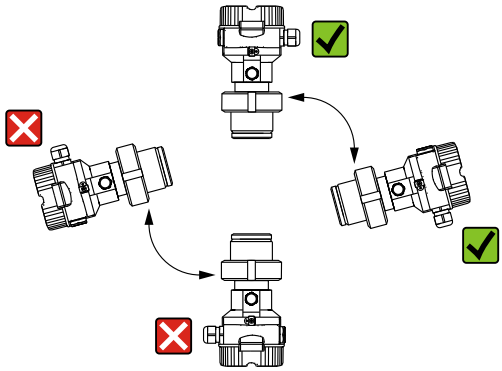
- Due to the orientation of the Deltapilot M, a zero point shift may occur, i.e. when the container is empty or partially filled, the measured value does not display zero. You can correct this zero point shift → 42, section "Function of operating elements" or → 81, section 8.3 "Position zero adjustment".
- The onsite display can be rotated in 90° stages.
- Endress+Hauser offers a mounting bracket for installing on pipes or walls. → 17, section 4.5.5 "Wall and pipe mounting (optional)".

4.7.1 General installation instructions

- Do not clean or touch process membranes with hard or pointed objects.
- The process membrane in the rod and cable version is protected against mechanical damage by a plastic cap.
- If a heated Deltapilot M is cooled during the 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 (1).
  Mount the device as follows.



- Keep the pressure compensation and GORE-TEX® filter (1) free from contamination.
- The device must be installed as follows in order to comply with the cleanability requirements of the ASME-BPE (Part SD Cleanability):



4.7.2 FMB50

Level measurement

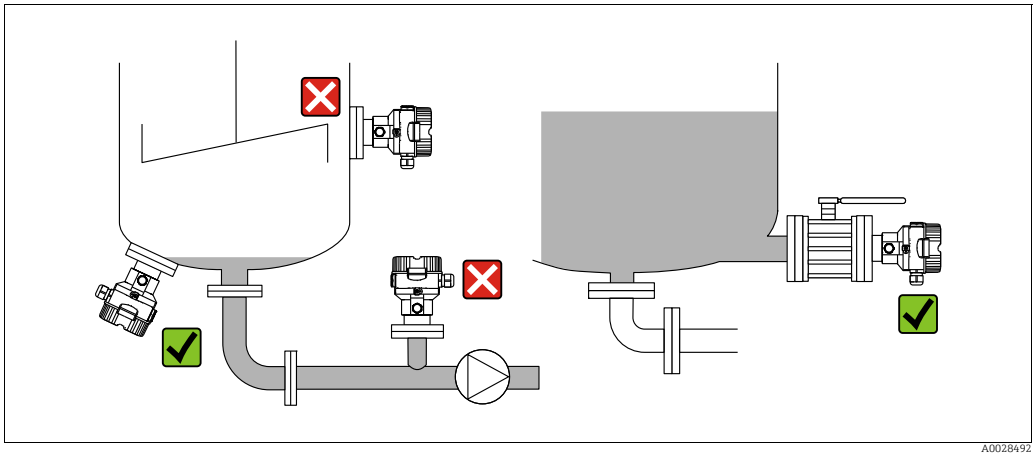


Fig. 9: Measuring arrangement for level

- 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.
- The adjustment and functional test can be carried out more easily if you mount the device downstream from a shutoff device.
- The Deltapilot M must also be insulated in the case of media that can harden when cold.

Pressure measurement in gases

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

Pressure measurement in steams

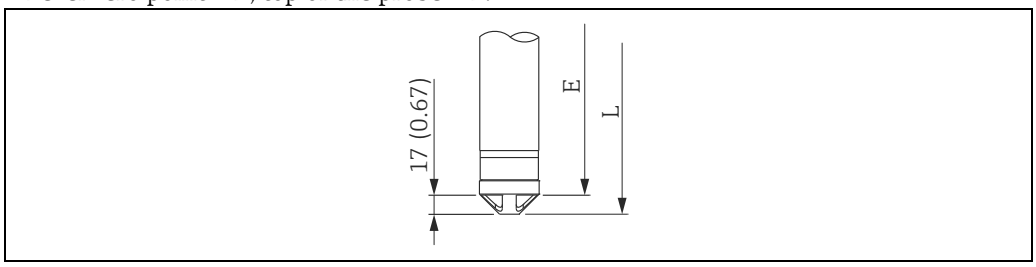
- Mount the Deltapilot M with the siphon above the tapping point.
- Fill the siphon with liquid before commissioning.
  The siphon reduces the temperature to almost ambient temperature.

Pressure measurement in liquids

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

4.7.3 FMB51/FMB52/FMB53

- When mounting rod and cable versions, make sure that the probe head is located at a point as free as possible from flow. To protect the probe from impact from lateral movement, mount the probe in a guide tube (preferably made of plastic) or secure it with a clamping fixture.
- In the case of devices for hazardous areas, comply strictly with the safety instructions when the housing cover is open.
- The length of the extension cable or the probe rod is based on the planned level zero point. The height of the protective cap must be taken into consideration when designing the layout of the measuring point. The level zero point (E) corresponds to the position of the process membrane.
  Level zero point = E; top of the probe = L.



4.7.4 Mounting the FMB53 with a suspension clamp

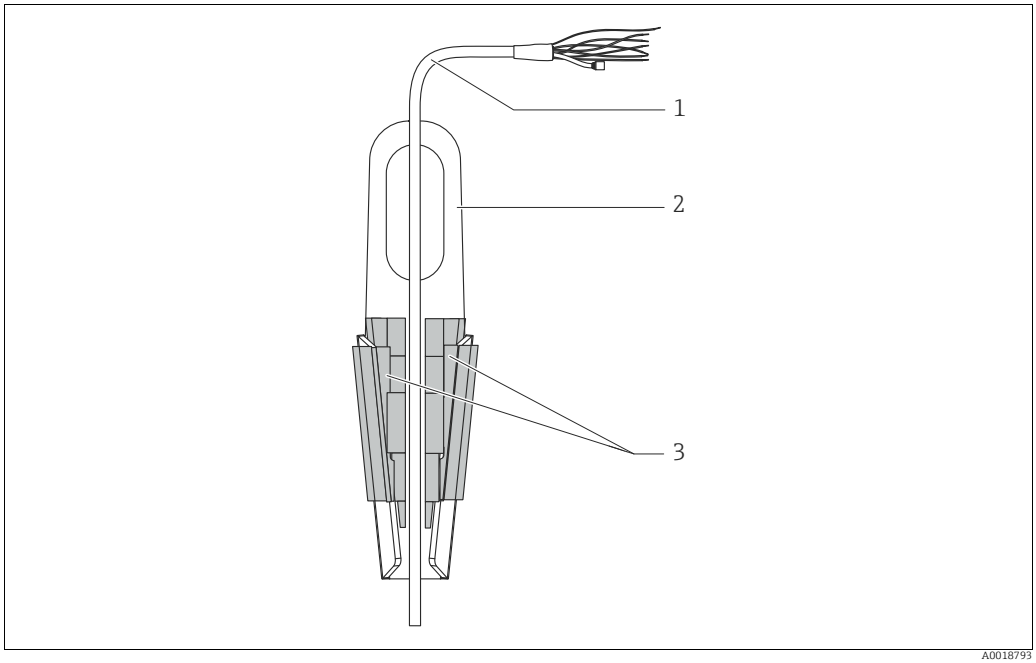


Fig. 10: Mounting with a suspension clamp

1 Extension cable
2 Suspension clamp
3 Clamping jaws

Mounting the suspension clamp:

1. Mount the suspension clamp (item 2). Take the weight of the extension cable (item 1) and the device into account when selecting the fastening point.
2. Push up the clamping jaws (item 3). Place the extension cable (item 1) between the clamping jaws as shown in the graphic.
3. Hold the extension cable (item 1) in position and push the clamping jaws (item 3) back down.
   Tap the clamping jaws gently from above to fix them in place.

4.7.5 Seal for flange mounting

NOTICE

Incorrect measurement results.

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

▶ Ensure that the seal is not touching the process membrane.

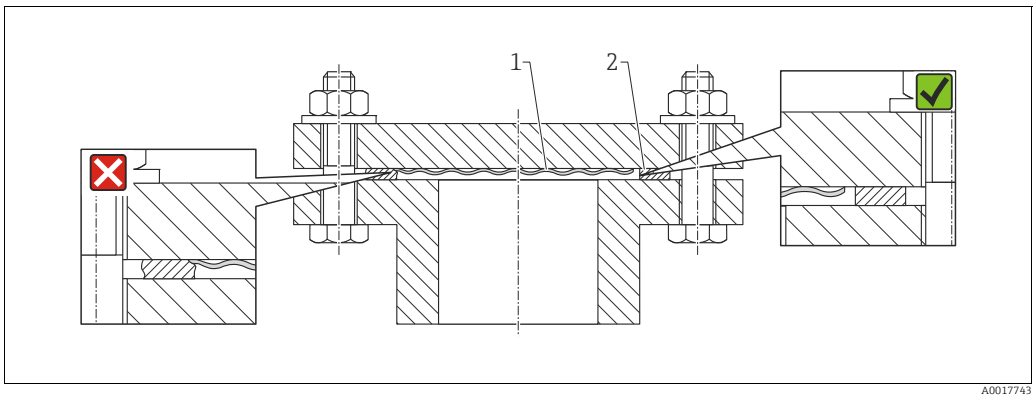
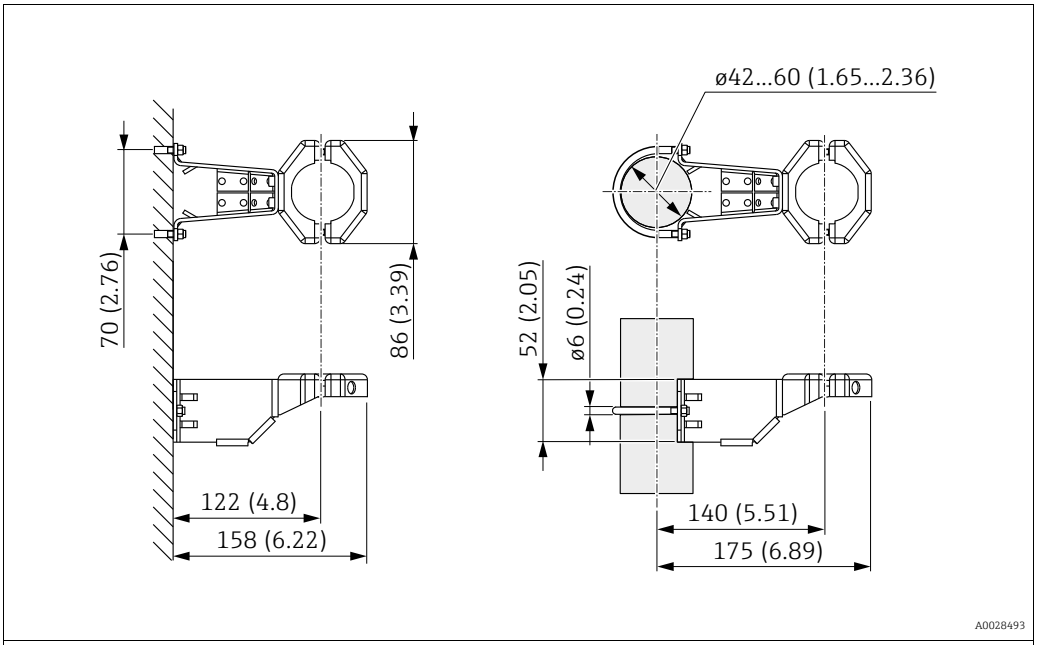


Fig. 11:
1 Process membrane
2 Seal

4.7.6 Wall and pipe mounting (optional)

Mounting bracket

Endress+Hauser offers a mounting bracket for installation on pipes or walls (for pipe diameters from 1 ¼" to 2").



Unit mm (in)

When mounting on a pipe, tighten the nuts on the bracket uniformly with a torque of at least 5 Nm (3.69 lbf ft).

4.7.7 Assembling and mounting the "separate housing" version

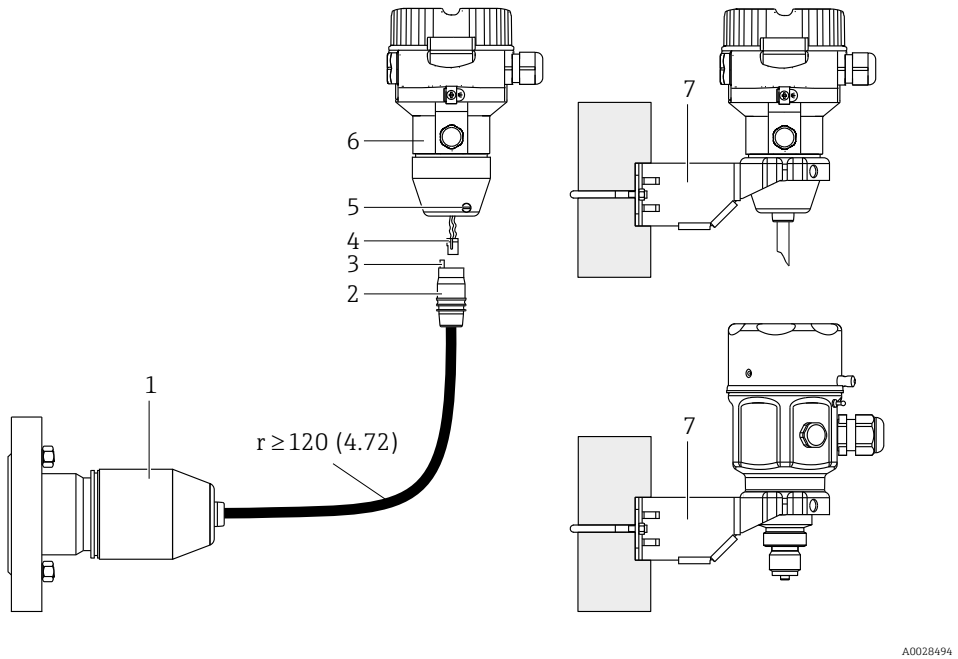


Fig. 12: "Separate housing" version

1 *In the "separate housing" version, the sensor is supplied with process connection and cable fitted.*
2 *Cable with connection jack*
3 *Pressure compensation*
4 *Plug*
5 *Locking screw*
6 *Housing mounted with housing adapter, included*
7 *Mounting bracket provided, suitable for pipe and wall mounting (for pipe diameters from 1 ¼" up to 2")*

Unit mm (in)

Assembly and mounting

1. Connect plug (item 4) into the corresponding connection jack of the cable (item 2).
2. Plug the cable into the housing adapter (item 6).
3. Tighten the locking screw (item 5).
4. Mount the housing on a wall or pipe using the mounting bracket (item 7).
   When mounting on a pipe, tighten the nuts on the bracket uniformly with a torque of at least 5 Nm (3.69 lbf ft).
   Mount the cable with a bending radius (r) ≥ 120 mm (4.72 in).

Routing the cable (e.g. through a pipe)

You require the cable shortening kit.
Order number: 71093286
For details on mounting, see SD00553P/00/A6.

4.7.8 Additional installation instructions

Seal the probe housing

- No moisture may enter the housing when installing or operating the device, or when establishing the electrical connection.
- Always firmly tighten the housing cover and the cable entries.

4.8 Mounting the profile seal for universal process adapter

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

4.9 Closing the housing covers

NOTICE

Devices with EPDM cover seal - leaking transmitter!

Mineral-, animal- or plant-based lubricants cause the EPDM cover seal to swell and the transmitter to leak as a result.

- ▶ It is not necessary to grease the thread due to the coating applied to the thread at the factory.

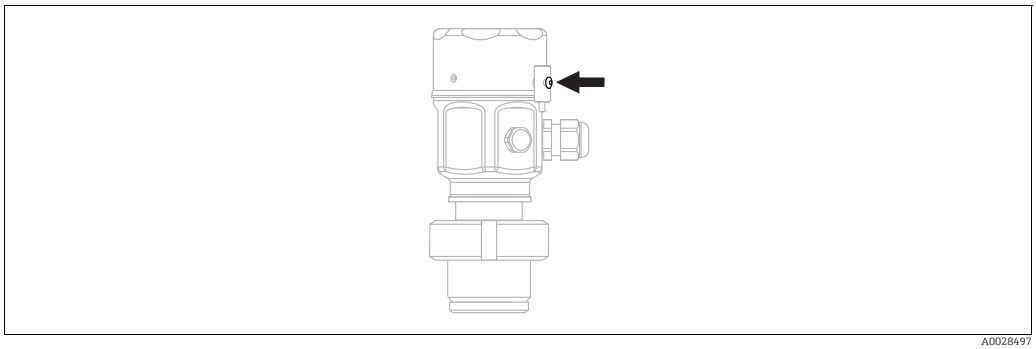
NOTICE

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 encounter resistance when closing the covers, then check the threads again for dirt or fouling.

4.9.1 Closing the cover on the stainless steel housing



A0028497

Fig. 13: Closing the cover

The cover for the electronics compartment is tightened by hand at the housing until the stop. The screw serves as DustEx protection (only on devices with DustEx approval).

4.10 Post-mounting checks

O	Is the device undamaged (visual inspection)?
O	Does the device comply with the measuring point specifications? For example: ▪ Process temperature ▪ Process pressure ▪ Ambient temperature ▪ Measuring range
O	Are the measuring point identification and labeling correct (visual inspection)?
O	Is the device adequately protected from precipitation and direct sunlight?
O	Are the securing screw and securing clamp tightened securely?

5 Electrical connection

5.1 Connecting the device

⚠ WARNING

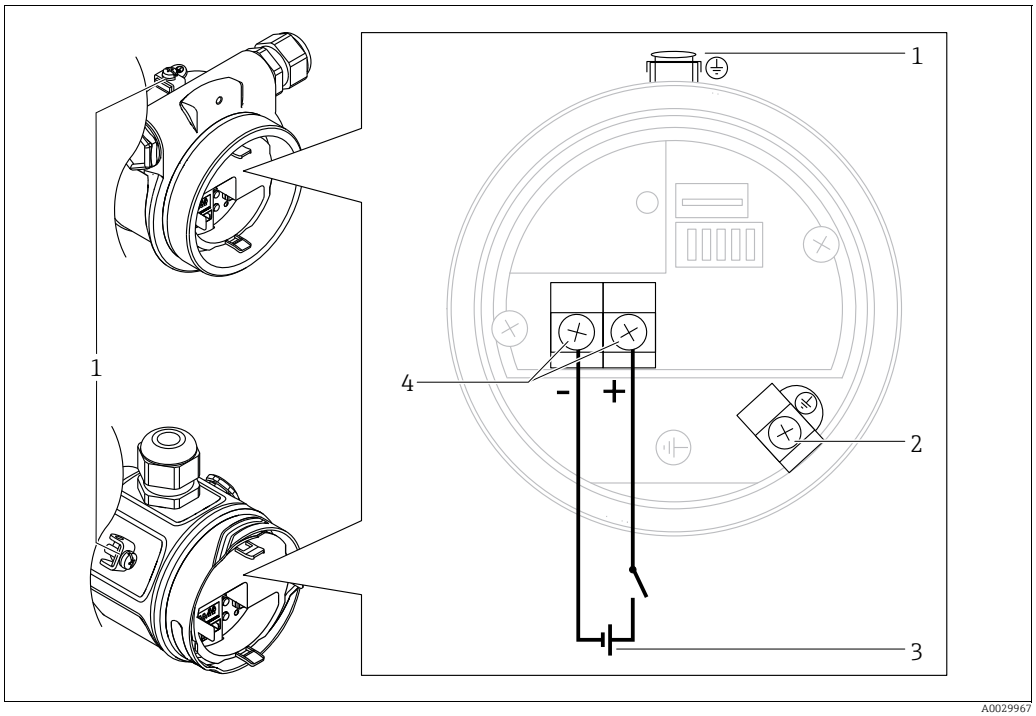
Supply voltage might be connected!

Risk of electric shock and/or explosion!

- Ensure that no uncontrolled processes are activated at the facility.
- Switch off the supply voltage before connecting the device.
- When using the measuring instrument in hazardous areas, installation must also comply with the applicable national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- A suitable circuit breaker must be provided for the device in accordance with IEC/EN 61010.
- Devices with integrated overvoltage protection must be grounded.
- Protective circuits against reverse polarity, HF influences, and overvoltage peaks are integrated.

Connect the device in the following order:

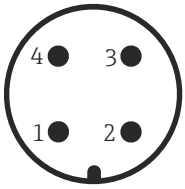
1. Check whether the supply voltage matches the supply voltage indicated on the nameplate.
2. Switch off the supply voltage before connecting the device.
3. Remove the housing cover.
4. Guide cable through the gland. Preferably use twisted, shielded two-wire cable. Tighten the cable glands or cable entries so that they are leak-tight. Counter-tighten the housing entry. Use a suitable tool with width across flats AF24/25 (8 Nm (5.9 lbf ft) for the M20 cable gland.
5. Connect the device as indicated in the following diagram.
6. Screw down the housing cover.
7. Switch on the supply voltage.



PROFIBUS PA electrical connection

1 External ground terminal
2 Ground terminal
3 Supply voltage: 9 to 32 VDC (segment coupler)
4 Terminals for supply and signal

5.1.1 Devices with M12 plug

PIN assignment for M12 plug	PIN	Meaning
	1	Signal +
	2	Not assigned
	3	Signal –
	4	Ground

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

5.2.1 Supply voltage

Electronic version	
PROFIBUS PA, version for non-hazardous areas	9 to 32 V DC

5.2.2 Current consumption

11 mA ±1 mA, switch-on current corresponds to IEC 61158-2, Clause 21.

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 twin-core 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 Shielding/potential equalization

- You achieve optimum shielding against interference influences if the shielding is connected on both sides (in the cabinet and at the device). If potential equalization currents are expected in the plant, only ground the shielding on one side, preferably at the transmitter.
- When using in hazardous areas, you must observe the applicable regulations. Separate Ex documentation with additional technical data and instructions is included with all Ex systems as standard.

5.3 Potential equalization

Hazardous area applications: Connect all devices to the local potential equalization. Observe the applicable regulations.

5.4 Overvoltage protection (optional)

Devices showing option "NA" in feature 610 "Zubehör montiert" in the order code are equipped with overvoltage protection (see also Technical Information TI00436P "Ordering information"). The overvoltage protection is mounted at the factory on the housing thread for the cable gland and is approx. 70 mm (2.76 in) long (take additional length into account when installing).
The device is connected as illustrated in the following graphic. For details refer to TI001013KEN, XA01003KA3 and BA00304KA2.

5.4.1 Wiring

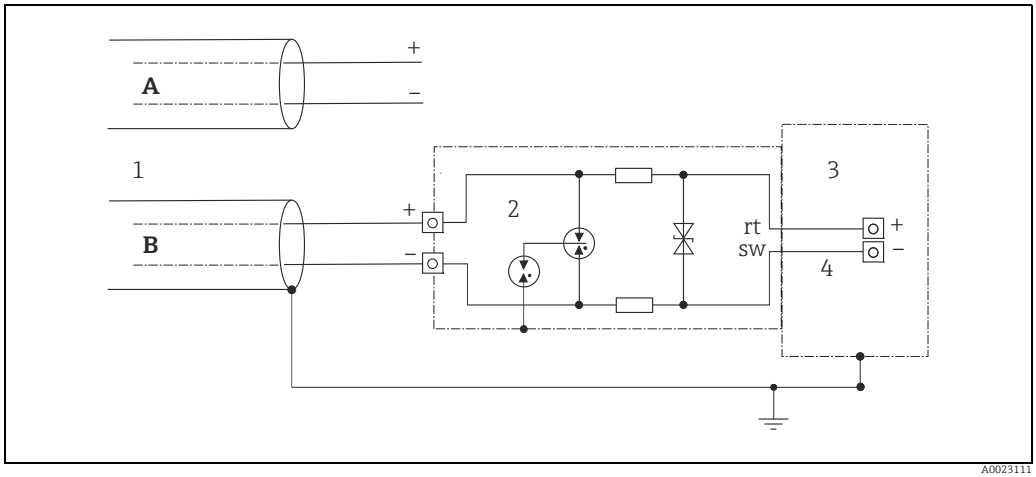


Fig. 14:

A Without direct shield grounding
B With direct shield grounding
1 Incoming connection cable
2 HAW569-DA2B
3 Terminal to be protected
4 Connection cable

5.4.2 Mounting

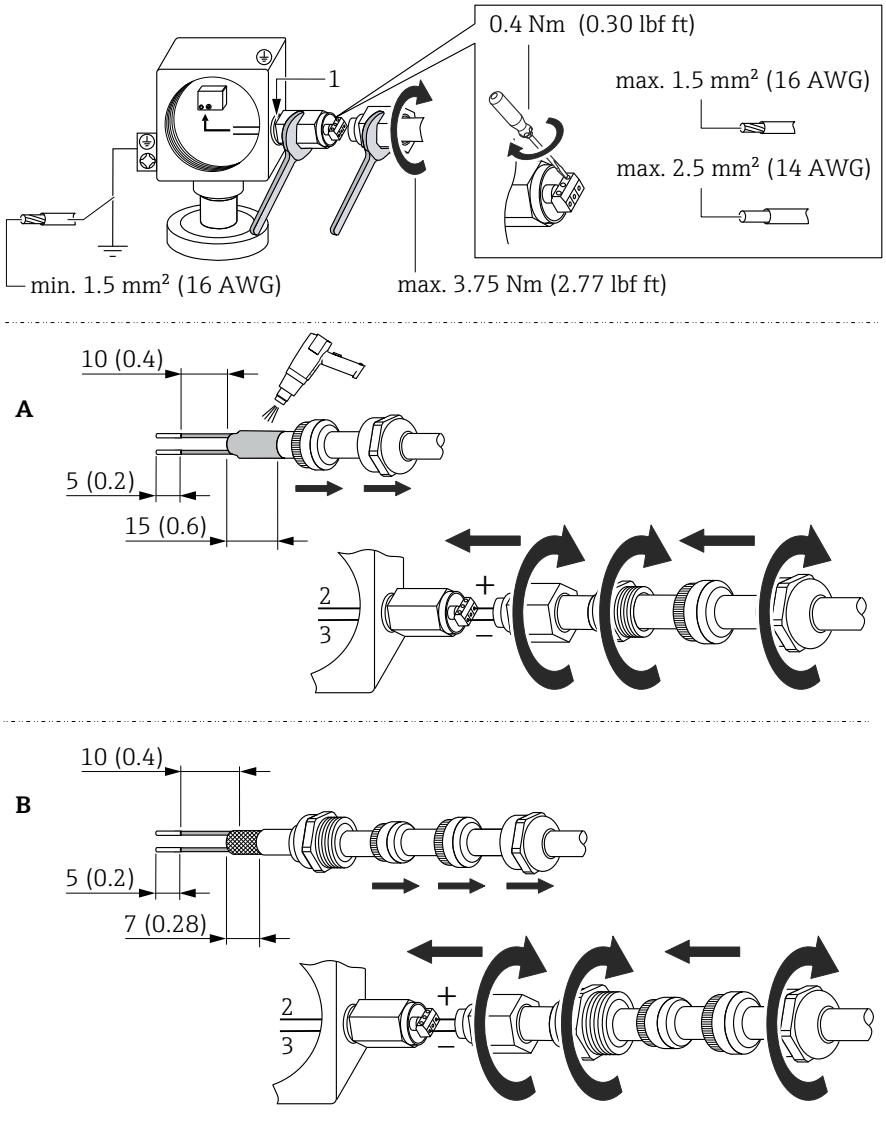


Fig. 15:

A Without shield grounding
B With shield grounding
1 See NOTICE below
2 Red
3 Black

Unit mm (in)

NOTICE

Screw connection glued at factory!

Damage to the device and/or surge arrester!

▶ When releasing/tightening the union nut, use a wrench to hold the screw steady so it does not turn.

5.5 Post-connection check

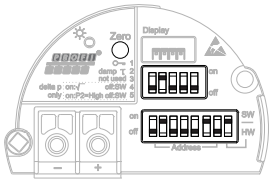
Perform the following checks after completing the electrical installation of the device:
- Does the supply voltage match the specification on the nameplate?
- Is the device properly connected?
- Are all screws firmly tightened?
- Are the housing covers screwed down tight?

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

6 Operation

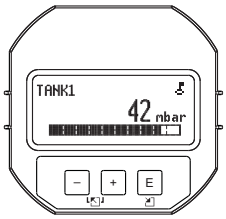
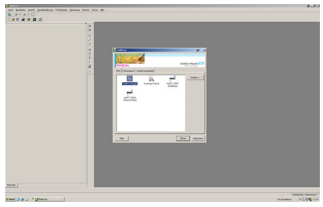
6.1 Operation options

6.1.1 Operation without an operating menu

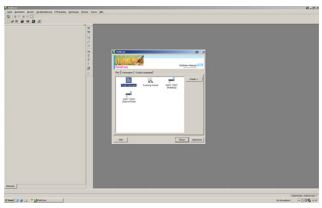
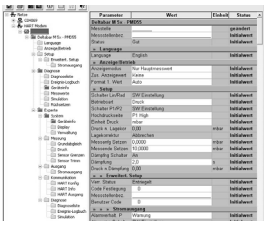
Operation options	Explanation	Graphic	Description
Local operation without device display	The device is operated using the operating key and DIP switches on the electronic insert.		→ 41

6.1.2 Operation with an operating menu

Operation with an operating menu is based on an operation concept with "user roles" → 43.

Operation options	Explanation	Graphic	Description
Local operation with device display	The device is operated using the operating keys on the device display.		→ 45
Remote operation via FieldCare	The device is operated using the FieldCare operating tool.		→ 49

6.1.3 Operation via PA communication protocol

Operation options	Explanation	Graphic	Description
Remote operation via FieldCare	The device is operated using the FieldCare operating tool.		→ 52
Remote operation via PDM	The device is operated using the PDM tool.		→ 52

6.2 Operation without an operating menu

6.2.1 Position of operating elements

The operating key and DIP switches are located on the electronic insert in the measuring instrument.

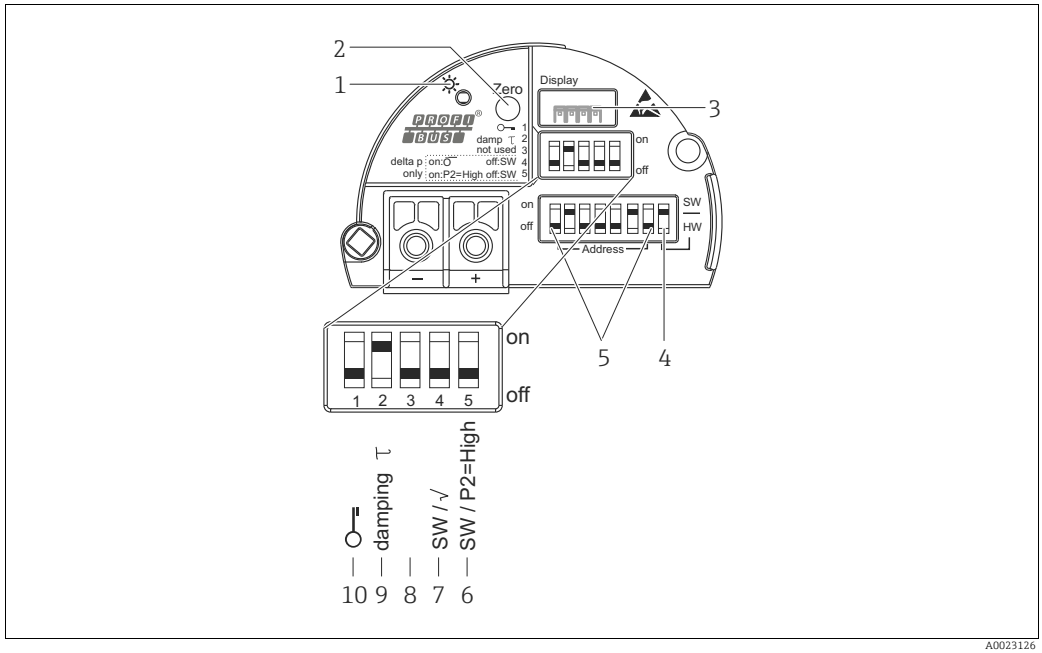


Fig. 16: PROFIBUS PA electronic insert

1 Green LED to indicate successful operation
2 Operating key for position zero adjustment (zero) or reset
3 Slot for optional onsite display
4 DIP switch for SW/HW bus address
5 DIP switch for hardware address
6+7 DIP switch for Deltabar M only:
Switch 7: "SW/Square root"; used to control the output characteristics
Switch 6: "SW/P2 High"; used to determine the high-pressure side
8 Not assigned
9 DIP switch for damping on/off
10 DIP switch for locking/unlocking parameters relevant to the measured values

Function of the DIP switches

Switch	Symbol/ label	Switch position	
		"off"	"on"
1		The device is unlocked. Parameters relevant to the measured value can be modified.	The device is locked. Parameters relevant to the measured value cannot be modified.
2	damping τ	Damping is switched off. The output signal follows measured value changes without any delay.	The damping is switched on. The output signal reacts to changes of the measured value with the delay time τ.[1)]
4 (Deltabar)	SW/√	The measuring mode is "Pressure" and the output characteristics "Linear", as per the SW default setting.	The measuring mode is "Flow" and the output characteristics "Square root" regardless of the settings in the operating menu.
5 (Deltabar)	SW/P2= High	The high-pressure side (+/HP) is defined by the setting in the operating menu. ("Setup" -> "High press. side")	The high-pressure side (+/HP) is allocated to the P2 pressure connection, irrespective of the setting in the operating menu.
6	Address	Set the device address using switches 1-7	
7	SW / HW	Hardware addressing	Software addressing

1) The value for the delay time can be configured via the operating menu ("Setup" -> "Damping").
Factory setting: τ = 2 s or as per order specifications.

Function of operating elements

Key	Meaning
"Zero" pressed for at least 3 seconds	**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 on site".
"Zero" pressed for at least 12 seconds	**Reset** All the parameters are reset to the order configuration.

Performing position adjustment on site

- Operation must be unlocked. → 📄 49, section 6.3.5 "Locking/unlocking operation".
- The device is configured for the "Pressure" measuring mode (Cerabar, Deltabar) or "Level" measuring mode (Deltapilot) as standard.
- The pressure applied must be within the nominal pressure limits of the sensor. See information on the nameplate.

Perform position adjustment:

1. Pressure is present at the 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 → 📄 199, section 11.1 "Messages".

6.2.2 Locking/unlocking operation

Once you have entered all the parameters, you can lock your entries against unauthorized and undesired access.

If operation is locked by means of the DIP switch, you can only unlock operation again by means of the DIP switch. If operation is locked by means of the operating menu, you can only unlock operation again using the operating menu.

Locking/unlocking via DIP switches

DIP switch 1 on the electronic insert is used to lock/unlock operation.
→ 42, "Function of the DIP switches".

6.3 Operation with an operating menu

6.3.1 Operating concept

The operating concept makes a distinction between the following user roles:

User role	Meaning
Operator	Operators are responsible for the devices during normal "operation". This is usually limited to reading process values either directly at the device or in a control room. If the work with the devices goes beyond reading, it involves simple, application-specific functions that are used in operation. If an error occurs, these users simply forward the information on the errors but do not intervene themselves.
Service engineer/ technician	Service engineers usually work with the devices in the phases following device commissioning. They are primarily involved in maintenance and troubleshooting activities for which simple settings have to be made on the device. Technicians work with the devices over the entire life cycle of the product. Thus, commissioning and advanced settings and configurations are some of the tasks they have to carry out.
Expert	Experts work with the devices over the entire life cycle of the device, but, at times, have high device requirements. Individual parameters/functions from the overall functionality of the devices are required for this purpose time and again. In addition to technical, process-oriented tasks, experts can also perform administrative tasks (e.g. user administration). "Experts" can avail of the entire parameter set.

6.3.2 Structure of the operating menu

User role	Submenu	Meaning/use
Operator	Language	Only consists of the "Language" parameter (000) where the operating language for the device is specified. The language can always be changed even if the device is locked.
Operator	Display/Operat.	Contains parameters that are needed to configure the measured value display (selecting the values displayed, display format, etc.). With this submenu, users can change the measured value display without affecting the actual measurement.

User role	Submenu	Meaning/use
Service engineer/ technician	Setup	Contains all the parameters that are needed to commission measuring operations. This submenu has the following structure: ▪ **Standard setup parameters** A wide range of parameters, which can be used to configure a typical application, is available at the start. The measuring mode selected determines which parameters are available. After making settings for all these parameters, the measuring operation should be completely configured in the majority of cases. ▪ **"Extended setup" submenu** The "Setup" submenu contains additional parameters for more in-depth configuration of the measurement operation to convert the measured value and to scale the output signal. This menu is split into additional submenus depending on the measuring mode selected.
Service engineer/ technician	Diagnosis	Contains all the parameters required to detect and analyze operating errors. This submenu has the following structure: ▪ **Diagnostic list** Contains up to 10 error messages currently pending. ▪ **Event logbook** Contains the last 10 error messages (no longer pending). ▪ **Instrument info** Contains information on the device identification. ▪ **Measured values** Contains all the current measured values ▪ **Simulation** Is used to simulate pressure, level, flow and alarm/warning. ▪ **Reset**
Expert	Expert	Contains all the parameters of the device (including those already in one of the other submenus). The "Expert" submenu is structured by the function blocks of the device. It thus contains the following submenus: ▪ **System** Contains general device parameters that neither affect measurement nor integration into a distributed control system. ▪ **Measurement** Contains all the parameters for configuring the measurement. ▪ **Communication** Contains the parameters of the PROFIBUS PA interface. ▪ **Application** Contains all the parameters for configuring the functions that go beyond the actual measurement (e.g. totalizer). ▪ **Diagnosis** Contains all the parameters that are needed to detect and analyze operating errors.

For an overview of the entire operating menu: → 114 ff.

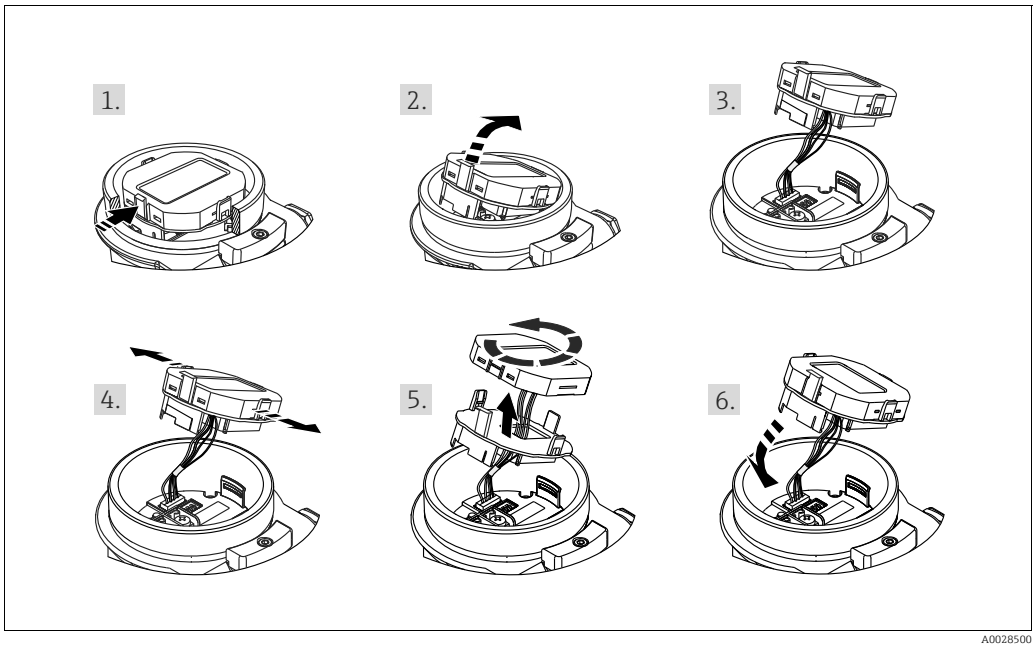
Direct access to parameters

The parameters can only be accessed directly via the "Expert" user role.

Parameter name	Description
Direct access (119) Entry Menu path: Expert → Direct access	Use this function to enter a parameter code for direct access. **User input:** ▪ Use this function to enter the desired parameter code. **Factory setting:** 0

6.3.3 Operation with a device display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation. The onsite display shows measured values, dialog texts, fault messages and notice messages.
For easy operation the display can be taken out of the housing (see figure steps 1 to 3). It is connected to the device via a 90 mm (3.54 in) long cable.
The device display can be turned in 90° stages (see figure steps 4 to 6).
Depending on the orientation of the device, this makes it easy to operate the device and read the measured values.



A0028500

Functions:
- 8-digit measured value display including sign and decimal point.
- Bar graph as graphic display of the standardized value of the Analog Input Block (→ see also → 146, section 9.3.1 "Scaling the output value (Out Value)", graphic)
- Three keys for operation
- Simple and complete menu guidance due to breakdown of parameters into several levels and groups
- Each parameter is given a 3-digit parameter code for easy navigation
- Possibility of configuring the display to suit individual requirements and preferences, such as language, alternating display, display of other measured values such as sensor temperature, contrast setting
- Comprehensive diagnostic functions (fault and warning message etc.)

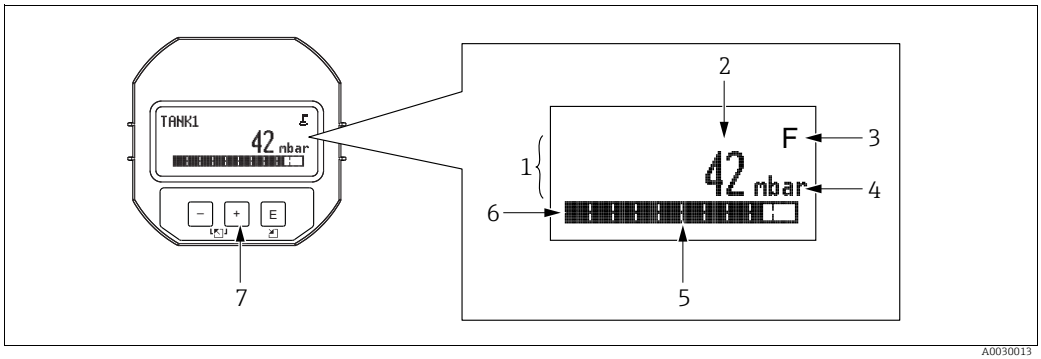


Fig. 17: Display

1 Main line
2 Value
3 Symbol
4 Unit
5 Bar graph
6 Information line
7 Operating keys

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

Symbol	Meaning
	Lock symbol The operation of the device is locked. To unlock the device, → 49, Locking/ unlocking operation.
	Communication symbol Data transfer via communication
	Root symbol (Deltabar M only) Active measuring mode "Flow measurement"
S	**Error message "Out of specification"** The device is being operated outside its technical specifications (e.g. during warm-up or cleaning).
C	**Error message "Service mode"** The device is in the service mode (during a simulation, for example).
M	**Error message "Maintenance required"** Maintenance is required. The measured value is still valid.
F	**Error message "Failure detected"** An operating error has occurred. The measured value is no longer valid.

Operating keys on the display and operating module

Operating key(s)	Meaning
+	– Navigate downwards in the picklist – Edit the numerical values or characters within a function
−	– Navigate upwards in the picklist – Edit the numerical values or characters within a function
E	– Confirm entry – Jump to the next item – Selection of a menu item and activation of edit mode
+ and E	Contrast setting of onsite display: darker
− and E	Contrast setting of onsite display: brighter
+ and −	ESC functions: – Exit the edit mode for a parameter without saving the changed value – You are in the menu at a selection level: each time you press the keys simultaneously, you go up a level in the menu.

Operating example: Parameters with a picklist

Example: selecting "Deutsch" as the language of the menu.

	Language 000	Operation
1	✔ English Deutsch	"English" is set as the menu language (default value). A ✔ in front of the menu text indicates the option that is currently active.
2	Deutsch ✔ English	Select "Deutsch" with ⊞ or ⊟.
3	✔ Deutsch English	1. Select Ⓔ to confirm. A ✔ in front of the menu text indicates the option that is currently active ("Deutsch" is the language selected). 2. Use Ⓔ to exit the edit mode for the parameter.

Operating example: User-definable parameters

Example: setting "Set URV" parameter from 100 mbar (1.5 psi) to 50 mbar (0.75 psi).

	Set URV 014	Operation
1	1 0 0 . 0 0 0 mbar	The onsite display shows the parameter to be changed. The value highlighted in black can be changed. The "mbar" unit is defined in another parameter and cannot be changed here.
2	**1** 0 0 . 0 0 0 mbar	1. Press ⊞ or ⊟ to enter editing mode. 2. The first digit is highlighted in black.
3	**5** 0 0 . 0 0 0 mbar	1. Use the ⊞ key to change "1" to "5". 2. Press the Ⓔ key to confirm "5". The cursor jumps to the next position (highlighted in black). 3. Confirm "0" with Ⓔ (second position).
4	5 0 **0** . 0 0 0 mbar	The third digit is highlighted in black and can now be edited.
5	5 0 ↵ . 0 0 0 mbar	1. Use the ⊟ key to change to the "↵" symbol. 2. Use Ⓔ to save the new value and exit the edit mode. → See next graphic.
6	5 0 . 0 0 0 mbar	The new value for the upper range value is 50.0 mbar (0.75 psi). – Use Ⓔ to exit the edit mode for the parameter. – Use ⊞ or ⊟ to return to the edit mode.

Operating example: Accepting the pressure present

Example: setting position adjustment

	Pos. zero adjust 007	Operation
1	✔ Abort Confirm	The pressure for pos. zero adjustment is present at the device.
2	Confirm ✔ Abort	Use ⊞ or ⊟ to switch to the "Confirm" option. The active selection is highlighted in black.
3	Calibration was applied!	Accept the pressure present as position adjustment with the Ⓔ key. The device confirms the adjustment and goes back to the "Pos. zero adjust" parameter.
4	✔ Abort Confirm	Use Ⓔ to exit the edit mode for the parameter.

6.3.4 Operation via FieldCare

FieldCare is an Endress+Hauser asset management tool based on FDT technology. With FieldCare, you can configure all Endress+Hauser devices as well as devices from other manufacturers that support the FDT standard. You can find hardware and software requirements on the Internet: www.endress.com → Search: FieldCare → FieldCare → Technical data.

FieldCare supports the following functions:
- Configuration of transmitters in online/offline mode
- Loading and saving device data (upload/download): see "Download select." parameter → 124 in the operating menu or via Physical Block → 161.
- Documenting the measuring point
- Offline configuration of transmitters

- In "Level expert" measuring mode, the configuration data which were generated by FDT upload cannot be saved back again (FDT download); they are used solely to document the configuration.
- As not all internal device dependencies can be mapped in offline operation, the consistency of the parameters must be checked before the parameters are transmitted to the device. The DIP switches must be set to the order configuration for this purpose (see Figure → 41). When commissioning for the first time, "**Download select**." must be set to "Device replacement".
- Further information on FieldCare can be found on the Internet (http://www.endress.com, Downloads, → Search for: FieldCare).

6.3.5 Locking/unlocking operation

Once you have entered all the parameters, you can lock your entries against unauthorized and undesired access.
Locked operation is indicated as follows:
- By the symbol on the onsite display
- The parameters are grayed out in FieldCare and the handheld terminal, which means they cannot be edited. Indicated in the corresponding "Status locking" parameter.

Parameters which refer to how the display appears, e.g. "**Language (000)**" can still be altered.

If operation is locked by means of the DIP switch, you can only unlock operation again by means of the DIP switch. If operation is locked by means of the operating menu, you can only unlock operation again using the operating menu.

Parameter "**Operator code (021)**" is used to lock and unlock the device.

Parameter name	Description
Operator code (021) Entry Menu path: Setup → Extended setup → Operator code	Use this function to enter a code to lock or unlock operation. **User input:** ▪ To lock: Enter a number the release code (value range: 1 to 9999). ▪ To unlock: Enter the access code. The release code is "0" in the order configuration. Another release code can be defined in the "**Code definition (023)**" parameter. If the user has forgotten the release code, the release code can be visible by entering the number "5864". **Factory setting:** 0

The release code is defined in the "**Code definition (023)**" parameter.

Parameter name	Description
Code definition (023) Entry Menu path: Setup → Extended setup → Code definition	Use this function to enter an access code with which the device can be unlocked. **User input:** ▪ A number from 0 to 9999 **Factory setting:** 0

6.3.6 Resetting to factory settings (reset)

By entering a certain code, you can completely, or partially, reset the entries for the parameters to the factory settings ("**Enter reset code (124)**"[1)]). Enter the code via the "**Enter reset code (124)**" parameter (menu path: "Diagnosis" → "Reset" → "**Enter reset code (124)**"). There are various reset codes for the device. The following table illustrates which parameters are reset by the particular reset codes. Operation must be unlocked to reset parameters (→ 49).

Any customer-specific configuration carried out at the factory is not affected by a reset (customer-specific configuration remains). If you want to change the customer-specific configuration carried out at the factory, please contact Endress+Hauser Service.

Reset code[1)]	Description and effect
62	**PowerUp reset (warm start)** ▶ The device is restarted. ▶ Data are read back anew from the EEPROM (processor is initialized again). ▶ Any simulation running is terminated.
333	**User reset** ▶ This code resets all the parameters apart from: – **Device tag (022)** – **Operating hours (162)** – **Lo trim sensor (131)** – **Hi trim sensor (132)** – Event logbook – Linearization table ▶ Any simulation running is terminated. ▶ The device is restarted.

1) The default value for the individual parameters is indicated in the parameter description (→ 122 ff)

Reset code[1)]	Description and effect
7864	**Total reset** ▶ This code resets all the parameters apart from: – **Operating hours (162)** – **Lo trim sensor (131)** – **Hi trim sensor (132)** – Event logbook ▶ Any simulation running is terminated. ▶ The device is restarted.

1) To be entered in "Diagnosis" → "Reset" → "**Enter reset code (124)**"

6.4 PROFIBUS PA communication protocol

6.4.1 System architecture

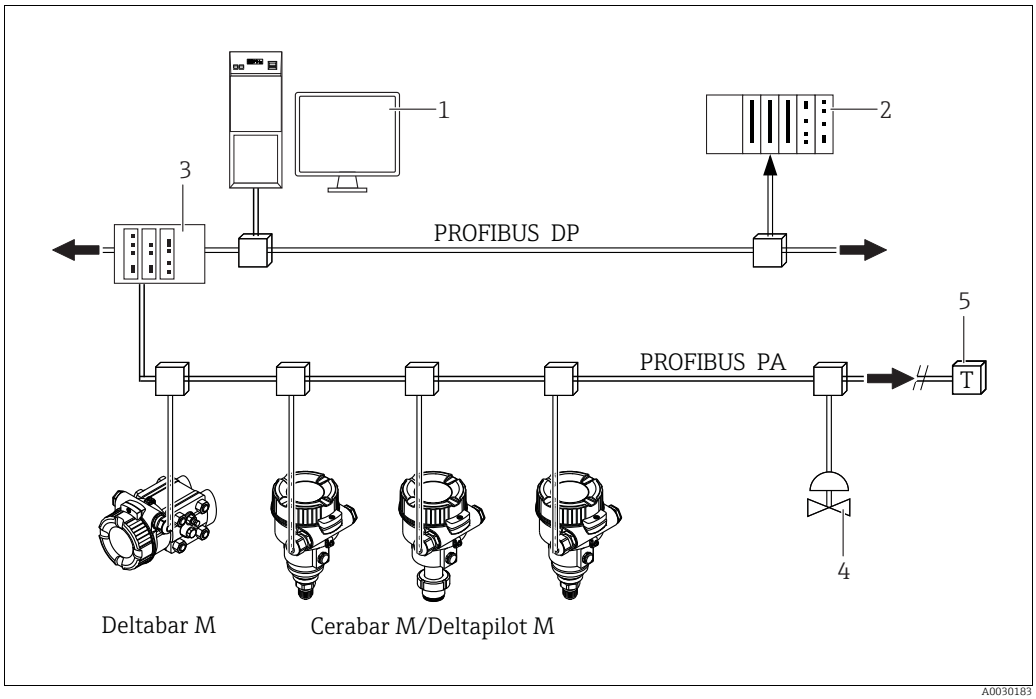


Fig. 18: PROFIBUS system architecture

1 PC with PROFIBUS interface card (Profiboard/Proficard) and FieldCare operating program (Class 2 master)
2 PLC (Class 1 master)
3 Segment coupler (DP/PA signal converter and bus feed unit)
4 Other measuring instruments and adjusters such as valves
5 PROFIBUS PA terminating resistor

Further information on PROFIBUS PA can be found in Operating Instructions BA00034S "Guidelines for planning and commissioning PROFIBUS DP/PA", the PNO Guideline and standards IEC 61158, IEC 61784, EN 50170/DIN 19245 and EN 50020 (FISCO model).

6.4.2 Number of devices

- The Endress+Hauser devices meet the requirements of the FISCO model.
- Due to the low current consumption, the following can be operated at one bus segment when installation is performed according to FISCO:
  – Up to 8 measuring instruments for EEx ia, CSA and FM IS applications
  – Up to 31 measuring instruments in all other applications, e.g. in non hazardous areas, EEx nA etc.

The maximum number of measuring instruments at one bus segment is defined by their current consumption, the performance of the bus coupler, and the required bus length.

6.4.3 Operation

Special configuration and operating programs from various manufacturers are available for configuring the device, such as Endress+Hauser's FieldCare operating program (→ 49, "Operation via FieldCare"). This operating program makes it possible to configure the PROFIBUS PA and device-specific parameters. The predefined function blocks allow uniform access to network and device data.

6.4.4 Identification number of the device

Parameter "**Ident number sel (229)**" allows users to modify the identification number. The identification number (Ident number (Ident_Number)) must support the following settings:

Values for "Ident number sel"	Description
0 "0x9700"	Profile-specific identification number V3.02 with the "Classic" or "Condensed" status.
1 "0x1553", "0x1554", "0x1555"	Manufacturer-specific identification number (V3.02). Cerabar M, Deltabar M, Deltapilot M
127 "Auto. identification number (Auto.Id.Num.)"	Device adaptation mode (the device can communicate using a variety of identification numbers), see "Smart device management" (automatic smart device management).
128 "0x1503", "0x151C"	Manufacturer-specific identification number (V3.00). Deltapilot M, Cerabar M

The "Automatic Identification Number Selection" (value = 127) for Profile 3.02 is described in the section on smart device management (automatic smart device management).
The choice of identification number affects the status and diagnostic messages ("Classic" or "Condensed"). "Old" identification numbers work with the "Classic" status and old diagnostic messages.
New identification numbers only work with the "Condensed" status and new diagnostic messages.
Depending on the configuration data of the user or the behavior selected in the physical "Cond.status diag" block parameter, the profile identification number works with either the "Condensed" or "Classic" status.
The identification number can only be changed if no cyclic communication is taking place with the device.
Cyclic data transmission and the corresponding identification number of the device remain the same until cyclic transmission is aborted and reestablished or the device is shut down. When reestablishing cyclic data transmission, the device uses the last value of the "Ident number sel" parameter.
The choice of identification number also determines how many modules are assigned during cyclic communication. All blocks are internally instantiated in advance for all the devices but only the configured modules can be accessed depending on the entries in the device master data.

Table of the function blocks:

Parameter: "Ident number sel"	0 (Profile-specific)	128 (Old identification number)	127 (Auto. identification number)	1 (New identification number)
Cerabar M / Deltapilot M	3 blocks (PB,TB,AI)	3 blocks (PB,TB,AI)	Depends on the identification number automatically selected.	6 blocks (PB,TB,AI1, AI2,DAO_EH1, DAO_EH2)
	1 module (1xAI)	3 modules (2xAI, 1xAO)		4 modules (2xAI, 2xDAO_EH)
Deltabar M	3 blocks (PB,TB,AI)	...	Depends on the identification number automatically selected.	7 blocks (PB,TB,AI1, AI2,DAO_EH1,DAO_EH2,TOT)
	1 module (1xAI)	...		5 modules (2xAI, 2xDAO_EH, 1xTOT)

If the device is configured with an old identification number (0x151C), then it automatically switches to the pressure measuring mode (Pressure). The level measuring mode (Level) is not supported in an old pressure measuring instrument of the Cerabar M series (0x151C).

Table of the identification numbers:

	Identification number			Selection text			Status	Diagnosis
Value for "Ident number sel"	**Cerabar M**	**Deltabar M**	**Deltapilot M**	**Cerabar M**	**Deltabar M**	**Deltapilot M**		
0 (Profile-specific 3.x)	0x9700	0x9700	0x9700	0x9700	0x9700	0x9700	Classic status / Condensed status	Old diagnostic messages / New diagnostic messages
128 (Old identification number)	0x151C	...	0x1503	0x151C	...	0x1503	Classic status	Old diagnostic messages
127 (Adaptation mode)	0x1553 / 0x151C/ 0x9700	0x1554 / 0x9700	0x1555 / 0x1503/ 0x9700	Auto. identification number	Auto. identification number	Auto. identification number	Depends on ident numbers	Depends on ident numbers
1 (New identification number)	0x1553	0x1554	0x1555	0x1553	0x1554	0x1555	Condensed status	New diagnostic messages

Smart device management (automatic smart device management)

Smart PA device management is performed by automatically adapting the device identification number. This makes it possible to replace old devices with new models without having to modify the PLC, allowing the transition from an installed device technology to a more sophisticated technology without interrupting the process.
With the "Automatic Identification Number Selection" option, the device behavior and rules (diagnostics, cyclic communication etc.) remain the same as those for a static identification number. The identification number is selected automatically depending on the recognized request frame -"Set Slave Parameter" or "Set Slave Address".
It is permitted to change the identification number in two specific device transition states, namely after Set Slave Address (SAP 55) and after Set Slave Parameter (SAP 61), and only if the identification number is listed in the table above.
If the identification number is undefined and the selector is set to "automatic", following a "Get Slave Diagnose" frame the device returns an identification number diagnostic value which is compatible with the device. After every new "Get Slave Diagnose" frame, the device returns another identification number that is compatible with the device until the PLC sends a "Set Slave Address" or "Set Slave Parameter" frame with a known identification number.

6.4.5 Device identification and addressing

Note the following:
- An address must be assigned to every PROFIBUS PA device. Only when the address is configured correctly will the measuring instrument 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 which is set at the factory can be used to check the function of the device and to connect to a PROFIBUS PA network that is in operation. This address must be changed subsequently to add additional devices.
- All devices have the address 126 and software addressing on leaving the factory.
- The FieldCare operating program is delivered with the default address 1.

There are two ways to assign the device address to a Cerabar/Deltabar/Deltapilot:
- Via an operating program of the DP Class 2 master, such as FieldCare or
- On site using the DIP switches.

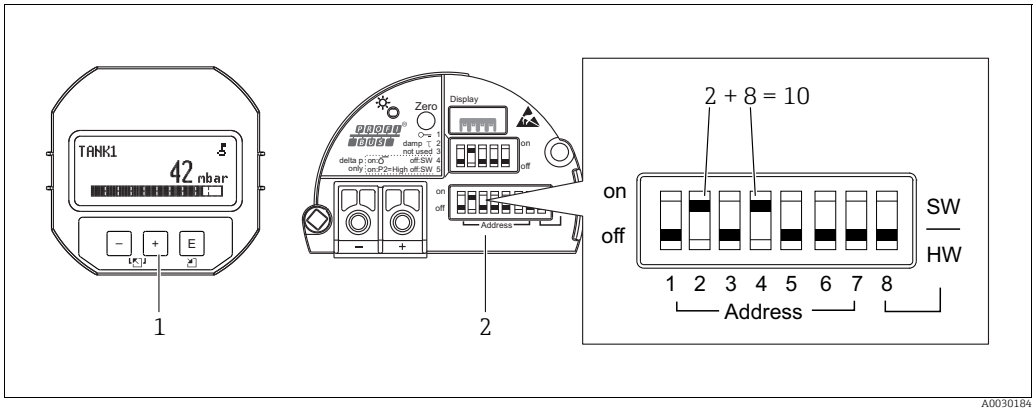


Fig. 19: Configuring the device address using the DIP switches

1 If necessary, remove the (optional) onsite display
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.
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
Value when set to "On"	1	2	4	8	16	32	64
Value when set to "Off"	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 next section for information on how to enter a new address via FieldCare.
   For other operating programs, please refer to the relevant Operating Instructions.

Setting a new address via FieldCare. DIP switch 8 (SW/HW) is set to "On" (SW):

1. Select the Profibus DP communication DTM "PROFIdtm DPV1" via the menu "Device operation" → "Add device".
2. Click the mouse once to select the Profibus DP communication DTM and via the "Tools" menu, select → "Scanning tools" → "Create network". The network is scanned and a device previously connected reports with an active address (e.g. 126: default address).
3. The device has to be disconnected from the bus before you can assign the device a new address. For this purpose, go to the "Device operation" menu and select "Disconnect".
4. Click the mouse once to select the Profibus DP communication DTM and via the "Device operation" menu, select → "Device functions" → "Additional functions" → "Set device station address". The "ProfiDTM DPV1 (Set device station address)" screen is displayed. Enter the old and new address and select "Set" to confirm. The new address is assigned to the device.
5. Click the mouse once to select the Profibus DP communication DTM and via the "Device operation" menu, select → "Device functions" → "Additional functions" → "Edit DTM station addresses...". The "PROFIdtm DPV1 (Edit DTM station addresses...)" screen is displayed. Enter the device address previously configured and select "Apply" to confirm. The new address is assigned to the device.
6. Click the mouse once to select the device DTM. The device is operated online via "Device operation" → "Connect".

6.4.6 System integration

Device master data (GSD files)

The device is ready for system integration following commissioning via the Class 2 master (FieldCare). To integrate the field devices into the bus system, the PROFIBUS PA system requires a description of the device, such as the device ID, identification number (Ident_Number), supported communication features, module structure (combination of cyclic input/output telegrams) and the meaning of the diagnostic bits.
These data are found in a device master file (GSD file) which is made available to the PROFIBUS DP master (e.g. PLC) when the communication system is being commissioned. Device bitmaps, which appear as icons in the network tree, can also be integrated.

The following versions of GSD are possible when using devices that support the "PA devices" profile:

- Deltapilot M:
  - Manufacturer-specific GSD, identification number (Ident_Number): 0x1555:
    This GSD ensures unrestricted functionality of the field device. All device-specific process parameters and functions are available.
  - Manufacturer-specific GSD, identification number: 0x1503:
    The device behaves like a Deltapilot S DB50, DB50L, DB51, DB52, DB53.
    → See Operating Instructions BA00164F.
- Deltabar M:
  - Manufacturer-specific GSD, identification number (Ident_Number): 0x1554:
    This GSD ensures unrestricted functionality of the field device. All device-specific process parameters and functions are available.
- Cerabar M:
  - Manufacturer-specific GSD, identification number (Ident_Number): 0x1553:
    This GSD ensures unrestricted functionality of the field device. All device-specific process parameters and functions are available.
  - Manufacturer-specific GSD, identification number: 0x15C1:
    The device behaves like a Cerabar M PMC41, PMC45, PMP41, PMP45, PMP46, PMP48.
    → See Operating Instructions BA00222P.
- Profile GSD:
  As an alternative to the manufacturer-specific GSD, the PNO makes a general database file available with the name PA139700.gsd for devices with an Analog Input Block. This file supports the transmission of the primary value. The transmission of a 2nd cyclic value or a display value is not supported. If a system is commissioned with the profile GSDs, devices of different manufacturers can be exchanged.

The following device master files (GSD) can be used:

Name of device	Comments	Identification number (Ident_Number) [1]	GSD	Type file	Bit map
All	Profile GSD	0x9700	PA139700.gsd		
Deltapilot M PROFIBUS PA	Device-specific GSD	0x1555 [2]	EH3x1555.gsd		EH_1555_d.bmp/.dib EH_1555_n.bmp/.dib EH_1555_s.bmp/.dip
	Device-specific GSD, the device behaves like a Deltapilot S DB50, DB50L, DB51, DB52, DB53. → See Operating Instructions BA00164F.	0x1503 [2]	EH3_1503.gsd EH3x1503.gsd	EH31503x.200	EH_1503_d.bmp/.dib EH_1503_n.bmp/.dib EH_1503_s.bmp/.dip
Deltabar M PROFIBUS PA	Device-specific GSD	0x1554 [2]	EH3x1554.gsd		EH_1554_d.bmp/.dib EH_1554_n.bmp/.dib EH_1554_s.bmp/.dip
Cerabar M PROFIBUS PA	Device-specific GSD	0x1553 [2]	EH3x1553.gsd		EH_1553_d.bmp/.dib EH_1553_n.bmp/.dib EH_1553_s.bmp/.dip
	Device-specific GSD, the device behaves like a Cerabar M PMC41, PMC45, PMP41, PMP45, PMP46, PMP48. → See Operating Instructions BA00222P.	0x151C [2]	EH3_151C.gsd EH3x151C.gsd	EH3151Cx.200	EH_151C_d.bmp/.dib EH_151C_n.bmp/.dib EH_151C_s.bmp/.dip

1) Use the "Ident number sel" parameter to select the appropriate identification number
Menu path FieldCare/onsite display: Setup → Extended setup or Expert → Communication → PB-PA config

2) Each device is given an identification number by the PROFIBUS user organization (PNO). The name of the Device Master File (GSD) is derived from this. For Endress+Hauser, this identification number begins with the manufacturer ID "15xx".

The factory setting for the "Ident number sel" parameter is "Auto.ID.Num" (adaptation mode). The adaptation mode allows automatic identification/integration into the control system. The "Ident number sel" parameter can only be changed if the device is not included in cyclic communication (not commissioned in the PLC) or if cyclic communication of the PLC is set to "Stop". If an attempt is nevertheless made to change the parameter via a configuration software program, such as FieldCare, the entry is ignored.

The Device Master Files (GSD) for Endress+Hauser devices can be acquired in the following manner:
- Endress+Hauser website: http://www.endress.com → Downloads → Search for "GSD"
- Internet PNO: http://www.profibus.com (Products – Product Guide)
- On CD-ROM from Endress+Hauser, order number: 56003894

The Profile Device Master Files (GSD) of the PNO can be acquired in the following manner:
- Internet PNO: http://www.profibus.com (Products – Profile GSD Library)

Directory structure of GSD files from Endress+Hauser
For Endress+Hauser field devices with PROFIBUS PA interface, all the data which are needed for configuration are contained in a compressed file. After unpacking the file, the following structure is generated:

Cerabar_M/PA/Profile3/Revision1.0/	→	BMP/	→	Eh1553_d.bmp
				Eh1553_n.bmp
				Eh1553_s.bmp
	→	DIB/	→	Eh1553_d.dib
				Eh1553_n.dib
				Eh1553_s.dib
	→	GSD/	→	Eh3x1553.gsd
	→	Info/	→	Liesmich.pdf
				Readme.pdf
Deltabar_M/PA/Profile3/Revision1.0/	→	BMP/	→	Eh1554_d.bmp
				Eh1554_n.bmp
				Eh1554_s.bmp
	→	DIB/	→	Eh1554_d.dib
				Eh1554_n.dib
				Eh1554_s.dib
	→	GSD/	→	Eh3x1554.gsd
	→	Info/	→	Liesmich.pdf
				Readme.pdf
Deltapilot_M/PA/Profile3/Revision1.0/	→	BMP/	→	Eh1555_d.bmp
				Eh1555_n.bmp
				Eh1555_s.bmp
	→	DIB/	→	Eh1555_d.dib
				Eh1555_n.dib
				Eh1555_s.dib
	→	GSD/	→	Eh3x1555.gsd
	→	Info/	→	Liesmich.pdf
				Readme.pdf

- Revision x.x stands for the corresponding device version.
- Information relating to the implementation of the field transmitter and any dependencies in the device software can be found in the "Info" folder. Read this information carefully before configuring.
- Device-specific bitmaps can be found in the "BMP" and "DIB" directories. The utilization of these will depend on the configuration software that is being used.

Working with Device Master Files (GSD)
The Device Master Files (GSD) must be integrated into a specific subdirectory of the PROFIBUS DP configuration software of the PLC used. Depending on the software used, these data can be either copied to the program-specific directory or imported into the database using an import function in the configuration software.
Detailed information on the directories to which the Device Master Files (GSD) are to be saved is provided in the description of the configuration software used.

6.4.7 Cyclic data exchange

Block model

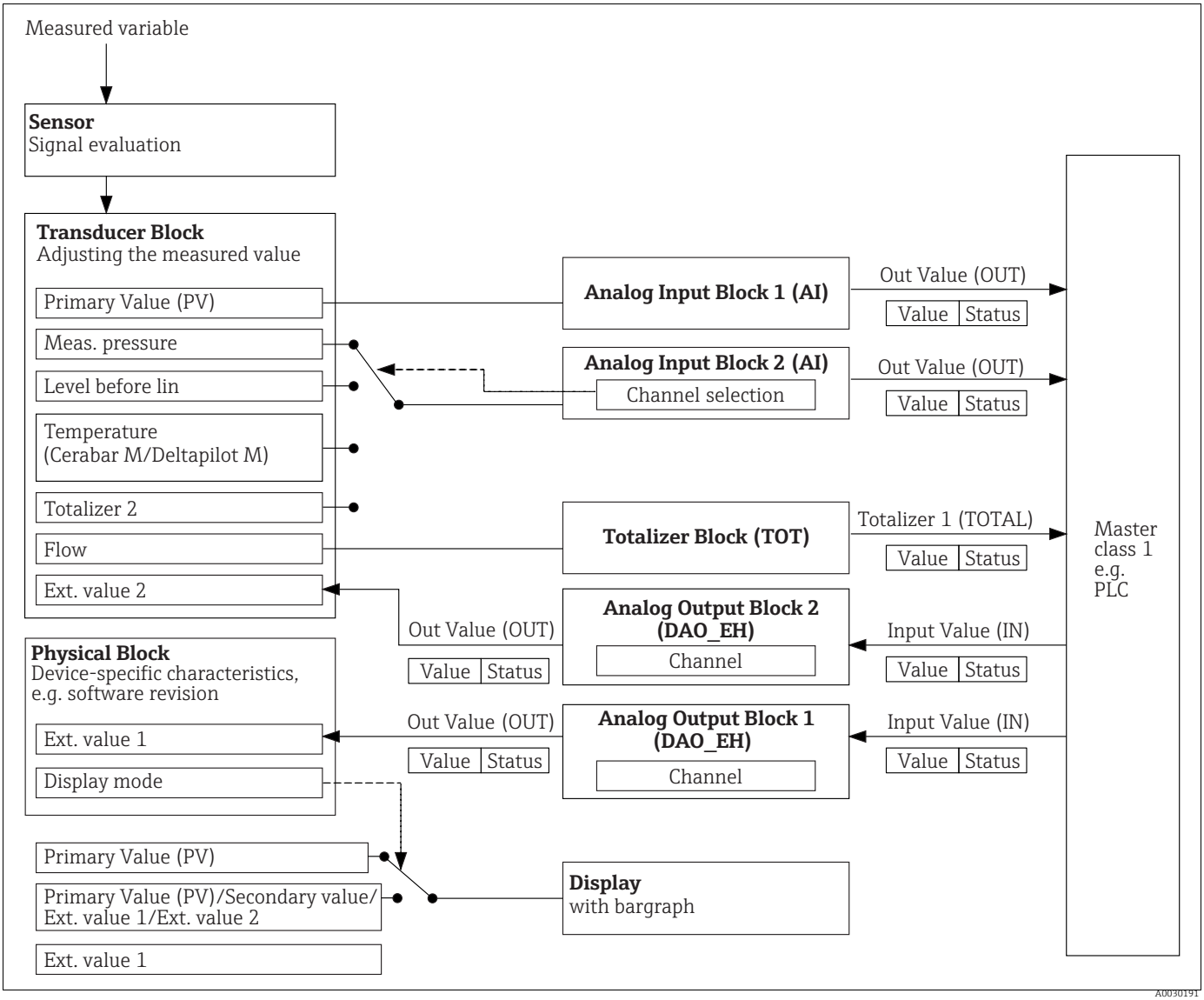


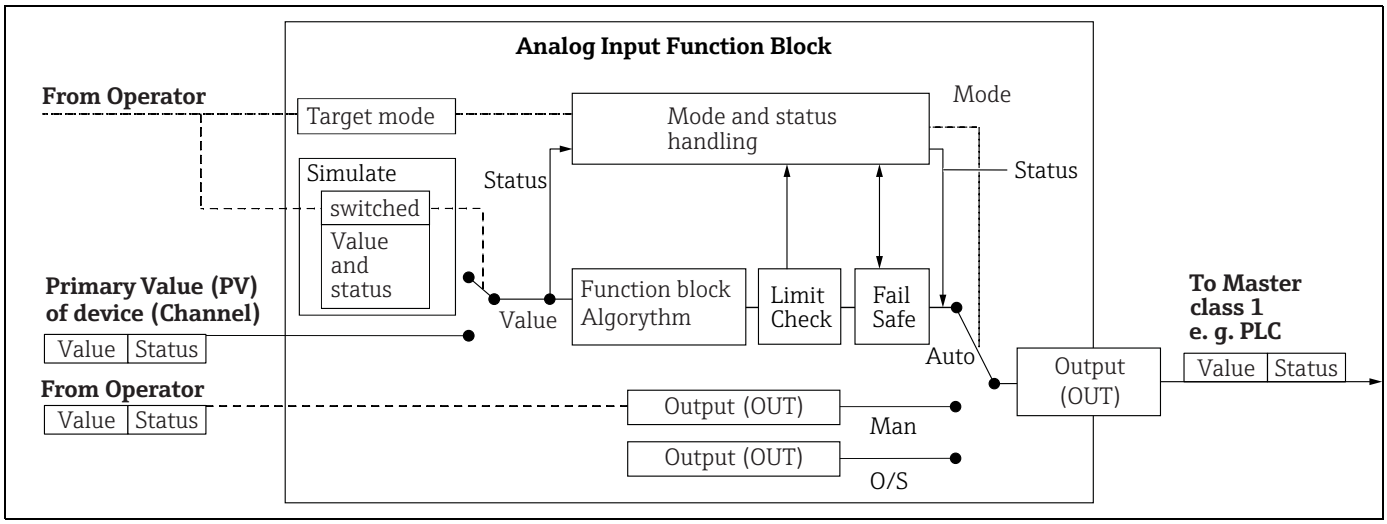
Fig. 20: The block model shows what data can be transmitted between the measuring instrument and the Class 1 master (e.g. PLC) during cyclic data exchange. Using the configuration software of your PLC, compile the cyclic data telegram with the aid of modules (→ see also "Modules for the cyclic data diagram" in this section). The parameters, written in CAPS, are parameters in the operating program (e.g. PLC) which you can use to make settings for the cyclic data telegram or to display values (→ see also "Parameter description" in this section).

Function blocks

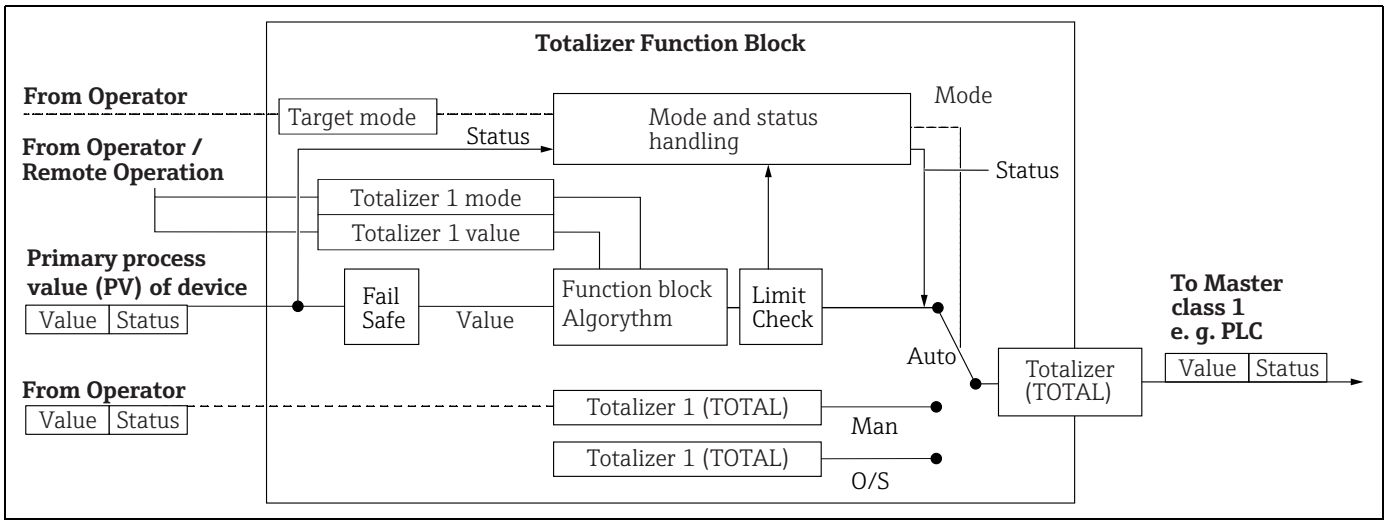
PROFIBUS uses predefined function blocks to describe the function blocks of a device and to specify uniform data access.

The following blocks are implemented:

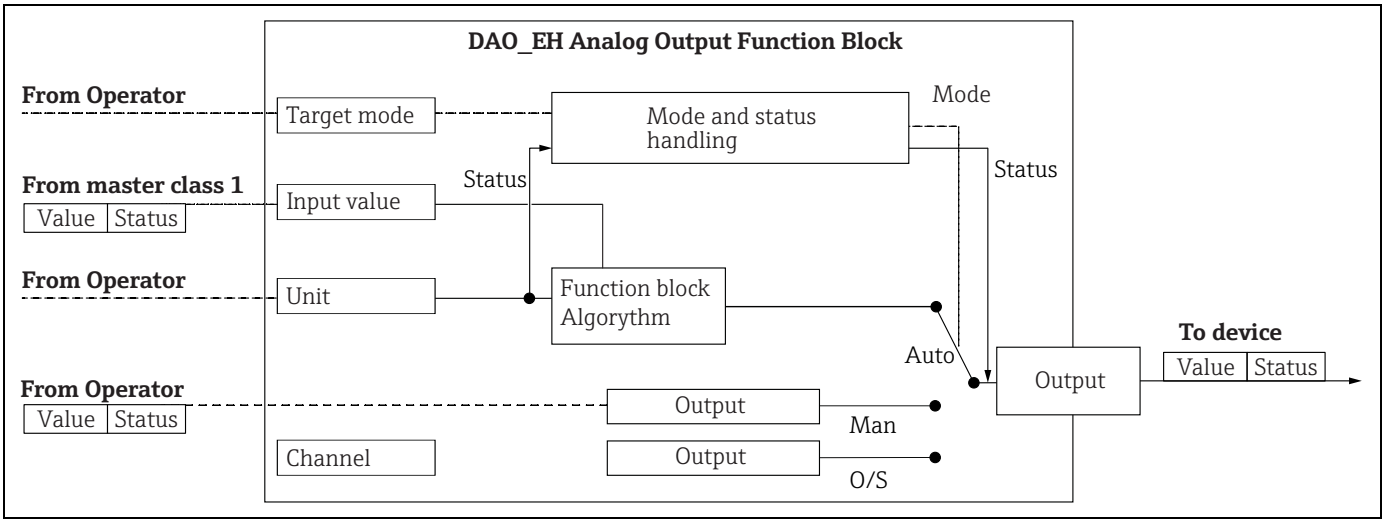
- Physical Block:
  The Physical Block contains device-specific features such as the device type, manufacturer, version etc. as well as functions such as write protection management and identification number changeover (Ident_Number)
- Transducer Block:
  The Transducer Block contains all the measuring and device-specific parameters of the device.
  - Cerabar M and Deltapilot M:
    The Transducer Block contains the pressure measuring principle for use as a pressure and level transmitter.
  - Deltabar M:
    The Transducer Block contains the differential pressure measuring principle for use as a pressure, flow and level transmitter.
- Analog Input Block (function block):
  The Analog Input Block contains the signal processing functions of the measured value such as scaling, special function calculations, simulation etc.
  The following graphic illustrates the structure of the standard Analog Input Block:



- Totalizer Block (function block) (Deltabar M):
  The Totalizer Block contains the signal processing functions of the measured value to be totalized, such as flow, scaling, special function calculations, simulation etc. The following graphic illustrates the structure of the standard Totalizer Block:



- Analog Output Block (function block)
  The DAO_EH Block is an Analog Output Block specific to Endress+Hauser which is used to transmit external values from the PLC to the device and show them on the display. The block contains the signal processing functions that process the external value (IN) into the output value (Out Value).
  The following graphic illustrates the structure of the Endress+Hauser-specific Analog Output Block:



Parameter description

Parameter name	Description
Output value (OUT Value) (Analog Input Block 1)	This parameter displays the digital Output value (OUT Value) of the Analog Input Block 1. The channel selection (channel entry) is permanently linked to the primary value. Menu path FieldCare: Expert → Communication → Analog input 1 AI parameter Menu path on onsite display: Expert Communication Analog input 1
Output value (OUT Value) (Analog Input Block 2)	This parameter displays the digital Output value (OUT Value) of the Analog Input Block. The following device measured values are linked via the channel entry. For Cerabar M and Deltapilot M: "Meas. pressure", "Level before lin." and temperature For Deltabar M: "Meas. pressure", "Level before lin.", and totalizer 1 Menu path FieldCare: Expert → Communication → Analog input 2 AI parameter Menu path on onsite display: Expert → Communication → Analog input 2
Totalizer 1 (Totalizer Block) (Deltabar M)	This parameter displays the digital Output value (OUT Value) of the Totalizer Block. The channel selection (channel entry) is permanently linked to the flow measured value. Menu path FieldCare: Expert → Communication → Totalizer 1 TOT parameter Menu path on onsite display: Expert → Communication → Totalizer 1
Input value (IN Value) (Analog Output Block 1)	The PLC sends this value to the device. The channel selection (channel) is permanently linked to the Ext. value 1. The "Ext. value 1" can be displayed on the onsite display (see this table, Display mode). Menu path FieldCare: Expert → Communication → Analog output 1 AO parameter Expert → Communication → Physical Block → PB parameter → Display value Menu path on onsite display: Expert Communication Analog output 1

Parameter name	Description
Input value (IN Value) (Analog Output Block 2)	The PLC sends this value to the device. The channel selection (channel) is permanently linked to the Ext. value 2. The "Ext. value 2" can be shown on the onsite display (see this table, Display mode). This channel is used by Cerabar M and Deltapilot M to display and/or transmit the calculated electrical differential pressure. In the case of Deltabar M, it is used for display purposes only (external temperature, head pressure). Menu path FieldCare: Expert → Communication → Analog output 2 AO parameter Menu path for onsite display: Expert → Communication → Analog output 2 Menu path for onsite display: and FieldCare Expert Application
Display mode	Use this parameter to specify whether the main value (primary value) or the Ext. value 1 should be displayed or whether the display should alternate between these values and 'Ext. value 2'. The appropriate modules (DAO_EH) must be cyclically configured to display the external values from the PLC in alternating mode. Menu path FieldCare: Display/Operat. Menu path on onsite display: Display/Operat. **Options**: ▪ Main value only: the main (primary) value is shown on the onsite display. ▪ Ext. value 1 only: a value from the PLC is shown on the onsite display (see → 20). ▪ All alternating: the display alternates between the main value, Ext. value 1 and Ext. value 2. A value previously configured via "Add. disp. value" also alternates with the other values on the display. **Deltapilot M/Cerabar M example for the "Ext. value 1" option:** ▪ Two Deltapilot M or two Cerabar M devices measure the drop in pressure across a filter. The differential pressure is formed in the PLC. Using the "Ext. value 1" option, assign this calculated value to the onsite display. **Deltabar M example for the "Ext. value 1" option:** ▪ One Deltabar M device measures a volume flow. The temperature and the pressure are also measured at the measuring point at the same time. All these measured values are sent to a PLC. The PLC calculates the steam mass from the volume flow, temperature and pressure measured values. Using the "Ext. value 1" option, assign this calculated value to the onsite display. **Factory setting**: ▪ Main value only

Modules for the cyclic data diagram

The following modules are available in the measuring instrument for the cyclic data diagram:

- Output value (OUT Value) (Analog Input Block 1)
  Depending on the measuring mode selected, a pressure, flow or level value is transmitted here.
- Output value (OUT Value) (Analog Input Block 2)
  Depending on the option selected, the measured pressure, level before linearization, sensor temperature or a totalizer 2 value is transmitted here.
- Totalizer 1 (Totalizer Block) (Deltabar M)
  Depending on the flow measuring mode selected, the totalizer 1 value is transmitted here.
- Input value (IN Value) (Analog Output Block 1)
  This can be any value which is transmitted by the PLC to the device. This value can also be shown on the onsite display (Ext. value 1).
- Input value (IN Value) (Analog Output Block 2)
  This can be any value which is transmitted by the PLC to the device. This value can also alternate with another value on the onsite display (Ext. value 2) or be used to calculate the differential pressure.
- FREE PLACE
  Select this empty module if a value should not be used in the data telegram.

Structure of the output data PLC

Using the Data_Exchange service, a PLC can write output data to the measuring instrument in the call telegram. The cyclic data telegram has the following structure:

Index	Output data	Data access	Data format/comments
0, 1, 2, 3	Input value (IN Value) (Analog Output Block 1)	Write	32 bit floating point number (IEEE 754)
4	Input status (IN Status) (Analog Output Block 1)	Write	→ See "Status codes" section
5, 6, 7, 8	Input value (IN Value) (Analog Output Block 2)	Write	32 bit floating point number (IEEE 754)
9	Input status (IN Status) (Analog Output Block 2)	Write	→ See "Status codes" section

Structure of the input data measuring instrument - PLC

Using the Data_Exchange service, a PLC can read input data from the measuring instrument in the response telegram. The cyclic data telegram has the following structure:

Index	Input data	Data access	Data format/comments
0, 1, 2, 3	Output value (OUT value) (Analog Input 1)	Read	32 bit floating point number (IEEE 754)
4	Output status (OUT Status) (Analog Input 1)	Read	→ See "Status codes" section
5, 6, 7, 8	Output value (OUT Value) (Analog Input 2)	Read	32 bit floating point number (IEEE 754)
9	Output status (OUT Status) (Analog Input 2)	Read	→ See "Status codes" section
10, 11, 12, 13	Totalizer 1 value (Totalizer) (Deltabar M)	Read	32 bit floating point number (IEEE 754)
14	Totalizer 1 status (Totalizer) (Deltabar M)	Read	→ See "Status codes" section

Status codes

The Cerabar M, Deltapilot M and Deltabar M devices support the "Condensed status" function as defined in the PNO specification. However, the "Classic" status is also supported to ensure compatibility with older devices in the M series and due to the profile-specific identification number (Profile Specific Ident. Number).

The status type is selected depending on the device identification number:
- The "Classic" status is enabled if the identification number (Ident number) is set to 0x151C (Cerabar M PMC4x, PMP4x)/0x1503 (Deltapilot S DB5x)/0x9700 (specific identification number for Profile 3.x).
- The "Condensed" status is enabled if the identification number (Ident number) is set to 0x1553 (Cerabar M s1)/0x1554 (Deltabar M s1)/0x1555 (Deltapilot M s1)/0x9700 (specific identification number for Profile 3.02).

If the profile identification number is selected, the status type can be set via the "Cond.status diag" parameter.
The "Condensed" and/or "Classic" status and their current active states are displayed by the "Physical Block" in the "Feature" parameter.
The measuring instrument supports the following status codes for the Output value parameters of the Analog Input Blocks and the Totalizer Block:

Classic status

Status code	Device status	Meaning	Output value (OUT Value) (Analog Input 1)	Output value (OUT Value) (Analog Input 2)	Totalizer 1 (Totalizer (Deltabar M)
0000 0000	BAD	Not specific	X [1)]	X[1)]	-
0000 0100	BAD	Configuration error (e.g. adjustment not performed correctly)	X[1)]	X[1)]	X
0000 1100	BAD	Device error	X[1)]	X[1)]	X
0001 0000	BAD	Sensor error	X[1)]	X[1)]	-
0001 1100	BAD	Out of service (Target mode)	X	X	X
0100 0000	UNCERTAIN	Not specific	X	X	X
0100 0100	UNCERTAIN	Last valid value (Failsafe mode =1)	X	X	X
0100 1000	UNCERTAIN	Substitute value (Failsafe mode = 0)	X	X	X
0100 1100	UNCERTAIN	Initial value (Failsafe mode = 1)	X	X	X
0101 1000	UNCERTAIN	Abnormal	X	X	X
0101 1100	UNCERTAIN	Configuration error (e.g. linearization table not increasing monotonically)	X	X	X
0101 0011	UNCERTAIN	Sensor calibration - constant	X	X	X
0101 0010	UNCERTAIN	Sensor calibration - limit value exceeded	X	X	X
0101 0010	UNCERTAIN	Sensor calibration - limit value undershot	X	X	X
0101 0000	UNCERTAIN	Sensor calibration	X	X	X
0110 0000	UNCERTAIN	Simulation value	X	X	X
1000 0000	GOOD	Good	X	X	X
1000 1000	GOOD	Warning limit	X	X	X
1000 1001	GOOD	Warning limit - limit value exceeded	X	X	X
1000 1010	GOOD	Warning limit - limit value undershot	X	X	X
1000 1100	GOOD	Alarm limit	X	X	X
1000 1101	GOOD	Alarm limit - limit value exceeded	X	X	X
1000 1110	GOOD	Alarm limit - limit value undershot	X	X	X

1) Only if the analog input failure behavior = 2 ("Status BAD")

Condensed status

The main reason for implementing the "Condensed" status mode in the Profibus PA Profile 3.02 is to clarify the diagnostic events resulting from use in the PCS/DCS and in the operating station.
Furthermore, this functionality also implements the requirements of NE 107.

The following "Condensed" status codes are configured via the device.

Status code[1)]	Device status	Meaning	Output value (OUT Value) (Analog Input 1)	Output value (OUT Value) (Analog Input 2)	Totalizer 1 (Totalizer (Deltabar M))
0010 01xx	BAD [2)]	Maintenance alarm, advanced diagnostics present	X	X	X
0010 10xx	BAD [2)]	Process error, no maintenance required	X[3)]	X[3)]	X[4)]
0011 11xx	BAD [2]	Function check / local override	X[3)]	X[3)]	X
0010 0011	BAD [2)]	Switch off	X	X	X
0111 1011	UNCERTAIN	Process error, no maintenance required - limit value constant	X	X	X
0111 1010	UNCERTAIN	Process error, no maintenance required - limit value exceeded	X	X	X
0111 1001	UNCERTAIN	Process error, no maintenance required - limit value undershot	X	X	X
0111 1000	UNCERTAIN	Process error, no maintenance required	X	X	X
0110 10xx	UNCERTAIN	Maintenance required	X	X	X
0100 1011	UNCERTAIN	Substitute value	X	X	X
0100 1111	UNCERTAIN	Initial value			X
0111 0011	UNCERTAIN	Simulated value, start	X	X	X
0111 0100	UNCERTAIN	Simulated value, end	X	X	X
1000 0000	GOOD	Good	X	X	X
1011 1100	GOOD	Function check	X	X	X

1) Variable x: 0 or 1

2) See → section 11.2.1

3) Only if the analog input failure behavior = 2 ("Status BAD")

4) Only if the "Total. 1 failsafe" parameter is set to 1 ("Hold") or 0 ("Run")

6.4.8 Acyclic data exchange

Acyclic data exchange is used:
- To transmit parameters during commissioning and maintenance
- To display measured variables not contained in the cyclic data diagram.

Using acyclic data exchange, device parameters can be modified even when the device is involved in cyclic data exchange with a PLC.

There are two types of acyclic data exchange:
- Acyclic communication via the C2 channel (MS2)
- Acyclic communication via the C1 channel (MS1)

Acyclic communication via the C2 channel (MS2)

When communicating via the C2 channel, a master opens a communication channel by means of a service access point (SAP) to access the device. A master that supports acyclic communication via the C2 channel is called a Class 2 master. FieldCare, for example, is a Class 2 master.
All the device parameters have to be made known to the master before data can be exchanged via PROFIBUS.

The following options are available here:
- A configuration program in the master which accesses the parameters via slot and index addresses (e.g. FieldCare)
- A software component (DTM: Device Type Manager)

The DTM can be found on the FieldCare CD.

Restrictions:
- The number of Class 2 masters that can simultaneously communicate with a device is restricted to the number of SAPs available for this communication. The device supports MS2 communication with two SAPs. Ensure that multiple masters do not write-access the same data as the consistency of the data cannot be guaranteed if this occurs.
- Using the C2 channel for acyclic data exchange increases the cycle times of the bus system. This should be taken into account when programming the control system.

Acyclic communication via the C1 channel (MS1)

With acyclic communication via the C1 channel, a master that is already communicating cyclically with the device also opens an acyclic communication channel via SAP 0x33 (special SAP for MS1). The master can then acyclically read or write the parameters like a Class 2 master via slot and index addresses.
The device supports MS1 communication with one SAP.

NOTICE

The memory modules are only designed for a limited number of writes!
Parameters written acyclically are saved as persistent data to the memory modules (e.g. EEPROM, flash). The memory modules are only designed for a limited number of writes which is not even remotely reached in normal operation without MS1 (during configuration). This figure can be quickly exceeded as a result of incorrect programming and thus the operating time of a device can be drastically reduced.
- ▶ In the application program, avoid permanently writing parameters, such as for every program cycle.

6.4.9 Slot/index tables

The device parameters are listed in the following tables. You can access the parameters by means of the slot and index number. The individual blocks each contain standard parameters, block parameters and manufacturer-specific parameters.
If you use FieldCare as the operating program, input screens are available as the user interface.

General explanatory remarks

Object type
- Record: contains data structures (DS)
- Array: group of a certain data type
- Simple: contains individual data types, e.g. float

Data type
- DS: data structure, contains data types such as Unsigned8, OctetString etc.
- Float: IEEE 754 format
- Integer:
  - Integer8: value range = −128 to 127
  - Integer16: value range = 32768 to 32767
  - Integer32: value range = -2^{31} to $(2^{31}-1)$
- OctetString: binary encoded
- VisibleString: ASCII encoded
- Unsigned:
  - Unsigned8: value range = 0 to 255
  - Unsigned16: value range = 0 to 65535
  - Unsigned32: value range = 0 to 4294967295

Storage Class
- Cst: constant parameter
- D: dynamic parameter
- N: non-volatile parameter
- S: static parameter

Physical Block

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write	Page
Physical Block standard parameters									
Block object	0	16	Record	DS-32	20	Cst	x		→ 150
Static rev. no.	0	17	Simple	Unsigned16	2	N	x		→ 150
Device tag	0	18	Simple	VisibleString	32	S	x	x	→ 150
Strategy	0	19	Simple	Unsigned16	2	S	x	x	→ 151
Alert key	0	20	Simple	Unsigned8	1	S	x	x	→ 151
Target mode	0	21	Simple	Unsigned8	1	S	x	x	→ 151
Block mode	0	22	Record	DS-37	3	D	x		→ 151
Alarm summary	0	23	Record	DS-42	8	D	x		→ 151
Firmware version	0	24	Simple	VisibleString	16	Cst	x		→ 151
Hardware rev.	0	25	Simple	VisibleString	16	Cst	x		→ 151
Manufacturer ID	0	26	Simple	Unsigned16	2	Cst	x		→ 151
Device name str.	0	27	Simple	VisibleString	16	Cst	x		→ 152
Serial number	0	28	Simple	VisibleString	16	Cst	x		→ 152
Diagnosis	0	29	Simple	Unsigned32	4	D	x		→ 152
Diag extension	0	30	Simple	OctetString	6	D	x		→ 152
Diag mask	0	31	Simple	OctetString	4	Cst	x		→ 152
Diag mask Ex	0	32	Simple	OctetString	6	Cst	x		→ 152
Dev. certificat.	0	33	Simple	VisibleString	32	Cst	x		→ 152
Write locking	0	34	Simple	Unsigned16	2	N	x	x	→ 153
Enter reset code	0	35	Simple	Unsigned16	2	S	x	x	→ 153
Description	0	36	Simple	OctetString	32	S	x	x	→ 153
Message	0	37	Simple	OctetString	32	S	x	x	→ 153
Install. date	0	38	Simple	OctetString	16	S	x	x	→ 153
Ident number sel	0	40	Simple	Unsigned8	1	S	x	x	→ 153
Lock switch	0	41	Simple	Unsigned8	1	D	x		→ 154

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write	Page
Feature	0	42	Record	DS-68	8	N	x		→ 154
Cond.status diag	0	43	Simple	Unsigned8	1	S	x	x	→ 154
Physical Block, Endress+Hauser parameters									
Diagnostic code	0	54	Record	Endress+Hauser-specific	5	D	x		→ 154
Last diag. code	0	55	Record	Endress+Hauser-specific	5	D	x		→ 154
Bus address	0	59	Simple	Unsigned8	1	D	x		→ 154
Set unit to bus	0	61	Simple	Unsigned8	1	S	x	x	→ 155
Ext. value 1	0	62	Record	Endress+Hauser-specific	6	D	x	x	→ 155
Profile revision	0	64	Simple	VisibleString	32	Cst	x		→ 155
Reset logbook	0	65	Simple	Unsigned8	1	S	x	x	→ 155
Ident number (Ident_Number)	0	66	Simple	Unsigned16	2	D	x		→ 156
Check conf.	0	67	Simple	Unsigned8	1	D	x		→ 156
Order code	0	69	Simple	VisibleString	32	Cst	x		→ 156
Tag location	0	70	Simple	VisibleString	22	Cst	x	x	→ 156
Signature	0	71	Simple	OctetString	54	Cst	x	x	→ 156
ENP version	0	72	Simple	VisibleString	16	Cst	x		→ 156
Device diag.	0	73	Simple	OctetString	48	D	x		→ 156
Ext. order code	0	74	Simple	VisibleString	60	Cst	x		→ 156
Service locking	0	75	Simple	Unsigned16	2	D	x	x	→ 156
Up/Dl feature	0	76	Simple	Unsigned16	2	Cst	x		→ 157
Updl control	0	77	Simple	Unsigned8	1	D	x	x	→ 157
Updl status	0	78	Simple	Unsigned8	1	N	x		→ 157
Updl veri delay	0	79	Simple	Unsigned16	2	N	x		→ 157
Up/Dl rev	0	80	Simple	Unsigned16	2	Cst	x		→ 157
Config. counter	0	89	Simple	Unsigned16	2	D	x		→ 157
Operating hours	0	90	Simple	Unsigned32	4	D	x		→ 157
Sim. error no.	0	91	Simple	Unsigned16	2	D	x	x	→ 157
Sim. messages	0	92	Simple	Unsigned8	1	D	x	x	→ 157
Language	0	93	Simple	Unsigned8	1	N	x	x	→ 157
Device name str.	0	94	Simple	Unsigned8	1	Cst	x		→ 157
Display mode	0	95	Simple	Unsigned8	1	N	x	x	→ 158
Add. disp. value	0	96	Simple	Unsigned8	1	N	x	x	→ 158
Format 1st value	0	97	Simple	Unsigned8	1	N	x	x	→ 158
Format 1st value	0	98	Simple	Unsigned8	1	N	x		→ 158
Status (Device Status)	0	99	Simple	Unsigned8	1	D	x		→ 158
Format ext. val. 2	0	100	Simple	Unsigned8	1	N	x	x	→ 159
Advanced diagnostics 7 (Diag add ext.)	0	101	Record	OctetString	6	D	x		→ 159
Diag mask add ext.	0	102	Record	OctetString	6	Cst	x		→ 159
Electr. serial no.	0	103	Simple	VisibleString	16	Cst	x		→ 159
Diagnostic code	0	104	Simple	Array	20	D	x		→ 159
Sw build nr.	0	105	Simple	Unsigned16	2	Cst	x		→ 159
Status locking	0	106	Simple	Unsigned8	1	D	x		→ 159
Com.err.counters	0	107	Record	Endress+Hauser-specific	10	D	x		→ 159
Addressing	0	108	Simple	Unsigned8	1	D	x		→ 159
Alarm behav. P	0	109	Simple	Unsigned8	1	S	x	x	→ 160
Maintenance instructions	0	110	Simple	Array	20	D	x		→ 160
Operator code	0	111	Simple	Unsigned16	2	N	x	x	→ 160
Format ext. val. 1	0	112	Simple	Unsigned8	1	N	x	x	→ 160
Reset	0	113	Simple	Unsigned16	2	D	x	x	→ 160
Code definition	0	114	Simple	Unsigned16	2	N	x	x	→ 160
DIP switch	0	115	Record	Endress+Hauser-specific	4	D	x		→ 160
Last diag. code	0	116	Simple	Array	20	D	x		→ 160
Instructions	0	117	Simple	Unsigned16	2	D	x		→ 161
Download select.	0	118	Simple	Unsigned8	1	D	x	x	→ 161
PB view 1	0	126	Simple	PB_View	17	N	x		→ 161

Analog Input Block 1 and Analog Input Block 2

Parameter	Slot [1]	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write	Page
Analog Input Block standard parameters									
Block object	1 / 2	16	Record	DS-32	20	Cst	x		→ 162
Static rev. no.	1 / 2	17	Simple	Unsigned16	2	N	x		→ 162
TAG	1 / 2	18	Simple	VisibleString	32	S	x	x	→ 162
Strategy	1 / 2	19	Simple	Unsigned16	2	S	x	x	→ 162
Alert key	1 / 2	20	Simple	Unsigned8	1	S	x	x	→ 162
Target mode	1 / 2	21	Simple	Unsigned8	1	S	x	x	→ 163
Block mode	1 / 2	22	Record	DS-37	3	D	x		→ 163
Alarm summary	1 / 2	23	Record	DS-42	8	D	x		→ 163
Analog Input Block parameters									
Batch information	1 / 2	24	Record	DS-67	10	S	x	x	→ 163
Output value (OUT Value)	1 / 2	26	Record	DS-33	5	D	x	x [2]	→ 163
Proc value scale	1 / 2	27	Array	Float	8	S	x	x	→ 164
Output scale	1 / 2	28	Record	DS-36	11	S	x	x	→ 164
Characterization	1 / 2	29	Simple	Unsigned8	1	S	x	x	→ 164
Channel	1 / 2	30	Simple	Unsigned16	2	S	x	x	→ 164
Filt. time const.	1 / 2	32	Simple	Float	4	S	x	x	→ 164
Failsafe mode	1 / 2	33	Simple	Unsigned8	1	S	x	x	→ 165
Failsafe default	1 / 2	34	Simple	Float	4	S	x	x	→ 165
Limit hysteresis	1 / 2	35	Simple	Float	4	S	x	x	→ 166
Upper limit alarm	1 / 2	37	Simple	Float	4	S	x	x	→ 166
Upper limit warning	1 / 2	39	Simple	Float	4	S	x	x	→ 166
Lower limit warning	1 / 2	41	Simple	Float	4	S	x	x	→ 167
Lower limit alarm	1 / 2	43	Simple	Float	4	S	x	x	→ 167
Upper limit alarm	1 / 2	46	Record	DS-39	16	D	x		→ 167
Upper limit warning	1 / 2	47	Record	DS-39	16	D	x		→ 167
Lower limit warning	1 / 2	48	Record	DS-39	16	D	x		→ 167
Lower limit alarm	1 / 2	49	Record	DS-39	16	D	x		→ 167
Simulate	1 / 2	50	Record	DS-50	6	S	x	x	→ 168
Unit text	1 / 2	51	Simple	OctetString	16	S	x	x	→ 168
PV scale unit	1 / 2	61	Simple	Unsigned16	2	N	x		→ 168
AI view 1	1 / 2	62	Simple	FB_view	18	D	x		→ 168

1) Analog Input Block 1 = Slot 1; Analog Input Block 2 = Slot 2

2) If "Block mode" current mode = manual (Man)

Analog Output Block 1 and Analog Output Block 2

Parameter	Slot [1)]	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write	Page
Analog Output Block Standard Parameters									
Block object	3 / 4	16	Record	DS-32	20	Cst	x		→ 169
Static rev. no.	3 / 4	17	Simple	Unsigned16	2	N	x		→ 169
TAG	3 / 4	18	Simple	VisibleString	32	S	x	x	→ 169
Strategy	3 / 4	19	Simple	Unsigned16	2	S	x	x	→ 169
Alert key	3 / 4	20	Simple	Unsigned8	1	S	x	x	→ 170
Target mode	3 / 4	21	Simple	Unsigned8	1	S	x	x	→ 170
Block mode	3 / 4	22	Record	DS-37	3	D	x		→ 170
Alarm summary	3 / 4	23	Record	DS-42	8	D	x		→ 170
Analog Output Block Parameters									
Batch information	3 / 4	24	Record	DS-67	10	S	x	x	→ 170
Input value	3 / 4	26	Record	DS-101	5	D	x		→ 171
Channel	3 / 4	27	Simple	Unsigned16	2	S	x	x	→ 171
Data size	3 / 4	28	Simple	Unsigned8	1	Cst	x		→ 171
Data max. size	3 / 4	29	Simple	Unsigned8	1	Cst	x		→ 171
Failsafe time	3 / 4	32	Simple	Float	4	S	x	x	→ 171
Failsafe mode	3 / 4	33	Simple	Unsigned8	1	S	x	x	→ 171
Failsafe default	3 / 4	34	Simple	Float	4	S	x	x	→ 171
Unit	3 / 4	35	Simple	Unsigned16	2	S	x	x	→ 172
Output value (OUT Value)	3 / 4	36	Simple	DS-101	5	D	x	x	→ 172
AO view 1	3 / 4	39	Simple	OctetString	20	D	x		→ 172

1) Analog Output Block 1 = Slot 3; Analog Output Block 2 = Slot 4

Totalizer Block (Deltabar M)

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write	Page
Totalizer Block Standard Parameters									
Block object	5	16	Record	DS-32	20	Cst	x		→ 173
Static rev. no.	5	17	Simple	Unsigned16	2	N	x		→ 173
TAG	5	18	Simple	VisibleString	32	S	x	x	→ 173
Strategy	5	19	Simple	Unsigned16	2	S	x	x	→ 173
Alert key	5	20	Simple	Unsigned8	1	S	x	x	→ 173
Target mode	5	21	Simple	Unsigned8	1	S	x	x	→ 174
Block mode	5	22	Record	DS-37	3	D	x		→ 174
Alarm summary	5	23	Record	DS-42	8	D	x		→ 174
Totalizer Block Parameters									
Batch information	5	24	Record	DS-67	10	S	x	x	→ 174
Totalizer 1	5	26	Record	DS-36	11	S	x	x	→ 174
Eng. unit totalizer 1	5	27	Simple	Unsigned8	1	S	x	x	→ 174
Channel	5	28	Simple	Unsigned16	2	S	x	x	→ 175
Total.1 value	5	29	Simple	Unsigned8	1	N	x	x	→ 175
Totalizer 1 mode	5	30	Simple	Float	4	S	x	x	→ 175
Total. 1 failsafe	5	31	Simple	Unsigned8	1	S	x	x	→ 175
Preset value	5	32	Simple	Float	4	S	x	x	→ 175
Limit hysteresis	5	33	Simple	Float	4	S	x	x	→ 176
Upper limit alarm	5	34	Simple	Float	4	S	x	x	→ 176
Upper limit warning	5	35	Simple	Float	4	S	x	x	→ 176
Lower limit warning	5	36	Simple	Float	4	S	x	x	→ 177
Lower limit alarm	5	37	Simple	Float	4	S	x	x	→ 177
Upper limit alarm	5	38	Record	DS-39	16	D	x		→ 177
Upper limit warning	5	39	Record	DS-39	16	D	x		→ 177
Lower limit warning	5	40	Record	DS-39	16	D	x		→ 177
Lower limit alarm	5	41	Record	DS-39	16	D	x		→ 177
Tot view 1	5	52	Simple	OctetString	18	D	x		→ 178

Transducer Block

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write	Page
Transducer Block standard parameters									
Block object	6	16	Record	DS-32	20	Cst	x		→ 178
Static rev. no.	6	17	Simple	Unsigned16	2	N	x		→ 178
TAG	6	18	Simple	VisibleString	32	S	x	x	→ 178
Strategy	6	19	Simple	Unsigned16	2	S	x	x	→ 179
Alert key	6	20	Simple	Unsigned8	1	S	x	x	→ 179
Target mode	6	21	Simple	Unsigned8	1	S	x	x	→ 179
Block mode	6	22	Record	DS-37	3	D	x		→ 179
Alarm summary	6	23	Record	DS-42	8	D	x		→ 179
Sensor pressure	6	24	Simple	Float	4	D	x		→ 179
URL sensor	6	25	Simple	Float	4	N	x		→ 179
LRL sensor	6	26	Simple	Float	4	N	x		→ 179
Hi trim sensor	6	27	Simple	Float	4	S	x	x	→ 180
Lo trim sensor	6	28	Simple	Float	4	S	x	x	→ 180
Minimum span	6	29	Simple	Float	4	N	x		→ 180
Pressure unit	6	30	Simple	Unsigned16	2	S	x		→ 180
Corrected press.	6	31	Record	DS-33	5	D	x		→ 180
Sensor meas. type	6	32	Simple	Unsigned16	2	N	x		→ 180
Sensor serial no.	6	33	Simple	Unsigned32	4	N	x		→ 180
Primary value	6	34	Record	DS-33	5	D	x		→ 180
Primary value unit	6	35	Simple	Unsigned16	2	S	x	x	→ 181
Transmitter type	6	36	Simple	Unsigned16	2	S	x	x	→ 181
Sensor Temp. (Cerabar/Deltapilot)	6	43	Record	DS-33	5	D	x		→ 181
Temp. eng. unit. (Cerabar/Deltapilot)	6	44	Simple	Unsigned16	2	S	x	x	→ 181
Value (sec val 1)	6	45	Record	DS-33	5	D	x		→ 181
Value (sec val 1)	6	46	Simple	Unsigned16	2	S	x	x	→ 181
Value (sec val 2)	6	47	Record	DS-33	5	D	x		→ 181
Sec val2 unit	6	48	Simple	Unsigned16	2	S	x	x	→ 181
Characterization	6	49	Simple	Unsigned8	1	S	x	x	→ 181
Measuring range	6	50	Array	Float	8	S	x	x	→ 182
Working range	6	51	Array	Float	8	S	x	x	→ 182
Set low-flow cut-off	6	52	Simple	Float	4	S	x	x	→ 182
Squareroot point	6	53	Simple	Float	4	S	x	x	→ 182
Tab actual numb	6	54	Simple	Unsigned8	1	N	x		→ 182
Line numb.:	6	55	Simple	Unsigned8	1	D	x	x	→ 182
Table max. number	6	56	Simple	Unsigned8	1	N	x		→ 182
Table min. number	6	57	Simple	Unsigned8	1	N	x		→ 183
Simulation mode	6	58	Simple	Unsigned8	1	D	x	x	→ 183
Status (characteristic)	6	59	Simple	Unsigned8	1	D	x		→ 183
Tab xy value	6	60	Array	Float	8	D	x	x	→ 183
Max. meas. press.	6	61	Simple	Float	4	N	x	x [1)]	→ 183
Min. meas. press.	6	62	Simple	Float	4	N	x	x [1]	→ 183
Transducer Block, Endress+Hauser parameters									
Empty calib. (Tr)	6	66	Simple	Float	4	S	x	x	→ 183
Full calib.	6	67	Simple	Float	4	S	x	x	→ 183
Pressure Empty/Full	6	68	Array	Float	8	N	x		→ 184
Calibration Empty/Full	6	69	Array	Float	8	N	x		→ 184
Max. turndown	6	70	Simple	Float	4	S	x	x	→ 184
High press. side	6	71	Simple	Unsigned8	1	S	x	x	→ 184
Reset peak hold	6	72	Simple	Unsigned8	1	D	x	x	→ 184
Measuring mode	6	73	Simple	Unsigned8	1	S	x	x	→ 184
Simulation mode	6	74	Simple	Unsigned8	1	D	x	x	→ 184
Sim. level	6	76	Simple	Float	4	D	x	x	→ 185
Sim. tank cont.	6	77	Simple	Float	4	D	x	x	→ 185
Sim. flow (Deltabar)	6	78	Simple	Float	4	D	x	x	→ 186
Sim. pressure	6	79	Simple	Float	4	D	x	x	→ 186
Electr. Delta P (Cerabar / Deltapilot)	6	80	Simple	Unsigned8	1	S	x	x	→ 186
Pressure abs range	6	81	Simple	Float	4	N	x		→ 186
Lo trim measured	6	82	Simple	Float	4	N	x	x	→ 186
Hi trim measured	6	83	Simple	Float	4	N	x	x	→ 186
Pos. zero adjust (Deltabar M and gauge pressure measuring cells)	6	84	Simple	Unsigned8	1	N	x	x	→ 186
Calib. offset (absolute pressure sensors)	6	86	Simple	Float	4	S	x	x	→ 186

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write	Page
Damping	6	87	Simple	Float	4	S	x	x	→ 187
Meas. pressure	6	88	Simple	Float	4	D	x		→ 187
Unit before lin.	6	89	Simple	Unsigned16	2	S	x	x	→ 188
Calibration mode	6	90	Simple	Unsigned8	1	S	x	x	→ 188
Height unit	6	91	Simple	Unsigned16	2	S	x	x	→ 188
Density unit	6	92	Simple	Unsigned16	2	S	x		→ 188
Adjust density	6	93	Simple	Float	4	S	x	x	→ 189
Process density	6	94	Simple	Float	4	S	x	x	→ 189
Meas. Level	6	95	Simple	Float	4	D	x		→ 189
Empty height	6	96	Simple	Float	4	S	x	x	→ 189
Full height	6	97	Simple	Float	4	S	x	x	→ 189
Level before lin.	6	97	Simple	Float	4	S	x	x	→ 189
Tank description	6	101	Simple	VisibleString	32	S	x	x	→ 189
Lin. mode	6	102	Simple	Unsigned8	1	S	x	x	→ 190
Unit after lin.	6	103	Simple	Unsigned16	2	S	x	x	→ 190
Tank content	6	104	Simple	Float	4	D	x		→ 190
Empty calib.	6	105	Simple	Float	4	S	x	x	→ 190
Full calib.	6	106	Simple	Float	4	S	x	x	→ 191
Tab xy value	6	107	Array	Float	8	D	x		→ 191
Edit table	6	108	Simple	Unsigned8	1	D	x	x	→ 191
Lin tab index 01	6	109	Array	Float	8	D	x	x	→ 191
...									...
Lin tab index 32	6	140	Array	Float	8	D	x	x	→ 191
Ext. value 2	6	141	Record	DS-101	5	D	x		→ 191
Ext.val.2 unit	6	142	Simple	Unsigned16	2	D	x		→ 191
Flow-meas. type	6	143	Simple	Unsigned8	1	S	x	x	→ 192
Max. flow	6	144	Simple	Float	4	S	x	x	→ 192
Max. pressure flow	6	145	Simple	Float	4	S	x	x	→ 192
Flow unit	6	146	Simple	Unsigned16	2	S	x	x	→ 192
Mass flow unit	6	147	Simple	Unsigned16	2	S	x	x	→ 192
Std. flow unit	6	148	Simple	Unsigned16	2	S	x	x	→ 192
Norm. flow unit	6	149	Simple	Unsigned16	2	S	x	x	→ 193
Flow unit	6	150	Simple	Unsigned16	2	S	x	x	→ 193
Flow	6	151	Simple	Float	4	D	x		→ 193
Totalizer 2 mode	6	153	Simple	Unsigned8	1	S	x	x	→ 193
Totalizer 2	6	154	Simple	Float	4	D	x	x	→ 193
Eng. unit totalizer 2	6	155	Simple	Unsigned16	2	S	x	x	→ 193
Totalizer 2	6	156	Simple	VisibleString	8	D	x		→ 193
Totalizer 2 overflow	6	157	Simple	VisibleString	8	D	x		→ 194
Eng. unit totalizer 2	6	158	Simple	Unsigned16	2	S	x	x	→ 193
Eng. unit totalizer 2	6	159	Simple	Unsigned16	2	S	x	x	→ 193
Eng. unit totalizer 2	6	160	Simple	Unsigned16	2	S	x	x	→ 193
Eng. unit totalizer 2	6	161	Simple	Unsigned16	2	S	x	x	→ 193
Totalizer 1	6	162	Simple	VisibleString	8	D	x		→ 194
Totalizer 1 overflow	6	163	Simple	VisibleString	8	D	x		→ 194
Total. 2 failsafe	6	164	Simple	Unsigned8	1	S	x	x	→ 194
Damping	6	165	Simple	Float	4	S	x		→ 194
Level selection	6	166	Simple	Float	1	S	x	x	→ 194
High press. side	6	167	Simple	Unsigned8	1	N	x		→ 195
Fixed ext. value (Cerabar / Deltapilot)	6	168	Simple	Float	4	S	x	x	→ 195
Empty pressure	6	169	Simple	Float	4	S	x	x	→ 195
Full pressure	6	170	Simple	Float	4	S	x	x	→ 195
Pressure af. damp	6	171	Simple	Float	4	D	x		→ 195
Calib. offset	6	172	Simple	Float	4	S	x	x	→ 196
Sensor temp.	6	173	Simple	Float	4	D	x		→ 196
X-Value	6	174	Simple	Float	4	D	x		→ 196
Sensor serial no.	6	175	Simple	VisibleString	16	N	x		→ 196
Totalizer 1	6	176	Simple	Float	4	D	x		→ 196
PaTbRangeParameters	6	177	Record	X	32	S	x	x	→ 197
Eng. unit totalizer 1	6	178	Simple	Unsigned16	2	S	x	x	→ 197
Eng. unit totalizer 1	6	179	Simple	Unsigned16	2	S	x	x	→ 197
Eng. unit totalizer 1	6	180	Simple	Unsigned16	2	S	x	x	→ 197
Eng. unit totalizer 1	6	181	Simple	Unsigned16	2	S	x	x	→ 197
TB View 1	6	250	Simple	OctetString	18	D	x		→ 197

1) can only be reset

6.4.10 Data format

In the case of PROFIBUS PA, the cyclic transmission of analog values to the PLC is effected in data blocks 5 bytes long. The measured value is portrayed in the first 4 bytes in the form of floating point numbers in accordance with IEEE standard. The 5th byte contains standardized status information belonging to the device.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measured value as IEEE 754 floating point number				Status

The measured value is transmitted as an IEEE 754 floating point number as follows:

Measured value = $(-1)^{sign} \times 2^{(E-127)} \times (1 + F)$

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Sign	Exponent (E)								Fraction (F)						
	2^7	2^6	25	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}
Fraction (F)															
2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}

Example
40 F0 00 00 hex = 0100 0000 1111 000 000 000 000 0000 binary

Value = $(-1)^0 \times 2^{(129-127)} \times (1 + 2^{-1} + 2^{-2} + 2^{-3})$
= $1 \times 2^2 \times (1 + 0.5 + 0.25 + 0.125)$
= $1 \times 4 \times 1.875$
= 7.5

Restrictions:
- Not all programmable logic controllers support the IEEE 754-format. A conversion module must then be used or written.
- Depending on the type of data management (Most-Significant-Byte or Low-Significant-Byte) used in the PLC (master), it may also be necessary to change the byte sequence (byte-swapping routine).

Data structures

A number of data types, e.g. DS-36, are listed in the slot/index table. These data types are data structures, structured in accordance with the PROFIBUS PA Specification, Part 1, Version 3.0. They consist of several elements that are addressed by means of the slot, index and sub-index:

Parameter name	Type	Slot	Index	Element	Sub-index	Type	Size (byte)
Output value (OUT Value)	DS-33	1	26	Output value (OUT Value)	1	Float	4
				Status (Device Status)	5	Unsigned8	1

Parameter name	Type	Slot	Index	Element	Sub-index	Type	Size (byte)
Output scale	DS-36	1	28	Upper value	1	Float	4
				Lower value	5	Float	4
				Unit	9	Unsigned16	2
				Decimal point	11	Integer8	1

6.4.11 Assignment of the PA profile to internal parameters

As defined in the specification of the Profibus device, the following table describes the influence of the profile parameters on the basic parameters and the assignment of the Transducer Block:

	Basic parameter				PROFIBUS PA profile parameter		
Sensor type	**Measuring mode (005)**	**Flow type (044)**	**Lin. mode (037) 1)**	**Primary value unit**	**Characterization (TB_LIN_TYPE)**	**Transmitter type (PV_TYPE)**	**Unit (PV_UNIT)**
Absolute pressure/ gauge pressure/ diff.	Pressure			**Press. eng. unit (125)**	No linearization (=0)	Pressure (=0)	Pressure unit
Differential (Deltabar)	Flow	Volume operat. cond.		**Flow unit (048)**	Square root (=10)	Flow (=1)	Volume flow unit
	Flow	Vol. norm. cond.		**Norm. flow unit (046)**	Square root (=10)	Flow (=1)	Norm. flow unit
	Flow	Vol. std. cond.		**Std. flow unit (047)**	Square root (=10)	Flow (=1)	Standard flow unit
	Flow	Mass		**Mass flow unit (045)**	Square root (=10)	Flow (=1)	Mass flow unit
	Flow	Flow in %		%	Square root (=10)	Flow (=1)	%
Absolute pressure/ gauge pressure/ diff.	Level (linear)		Linear or table editing mode	**Unit before lin (025)**	No linearization (=0)	Level easy (=130)	Level unit (%, Volume, Mass, Height)
	Level (with lin. table)		Activate table	**Unit after lin. (038)**	Linearization (=1)	Level easy (=130)	Level unit (%, Volume, Mass, Height)

1) The device uses the "**Lin. mode (037)**" parameter internally to enable or disable the linearization table (to set the device to the linear or linearization measuring mode). The same parameter is also used to set the table to the edit mode or to check and validate the edited table.

The editing, enabling/disabling and control of the linearization table in the "Level" measuring mode affects the Transducer Block and the internal "Basic" parameters. They have to be assigned to one another to obtain a simple mechanism between the internal and profile configuration.
The device only contains one table and the linearization cannot be activated while the table is being edited or if the table is incorrect. We have defined that the "Level" mode must be linear in such instances. The Characterization parameter (TB_TYPE) must be set to "Linear" as soon as the linearization table is disabled or is being edited or cannot be enabled.

If the level configuration is modified:

1. Using the "Basic" parameters:
- Successful modification of the ("Lin. mode (037)") basic parameter to "Linear" or "Activate table" must update the PA profile parameters. If the linearization table could not be activated due to a mistake in the table, the Characterization" (TB_TYPE) parameter then remains unchanged.
- The linearization table mode "Lin. mode (037)" basic parameter can be set to the editing mode (manual or semi-automatic entry): in this case, the Characterization (TB_TYPE) Profibus parameter must be changed to "Linear".
- The "Erase table" option of the "Lin. mode (037)" basic parameter resets the parameter to "Linear" so that the Characterization (TB_TYPE) parameter must return to "No linearization".

2 Using the PA profile parameters:
- The modification of the Characterization (TB_LIN_TYPE) PA profile parameter updates the "Lin. mode (037)". If the linearization table cannot be activated due to a mistake in the table, then the table must be corrected and activated again.

To edit the table, the Simulation mode (TAB_OP_CODE) parameter must be set to 1 (Editing) to allow editing. To activate the table, selection 3 (Check and activate table) must be made.

Simulation mode (TAB_OP_CODE)	Function	Effect on "Lin. mode (037)"
0	Reset table	Erase table, then "Linear"
1	Editing	Manual entry
3	Check and activate table	Activate table if the table is correct or leave the table unchanged.
4	Delete point (only available in the manual and semiautomatic mode)	Manual or semi-automatic entry
5	Enter point (only available in the manual and semiautomatic mode)	Manual or semi-automatic entry

The Characterization parameter (TB_LIN_TYPE) is affected by:
- Simulation mode (TAB_OP_CODE): If the table is being edited, the Characterization parameter (TB_LIN_TYPE) is automatically set to "Linear". If the table was activated successfully, the Characterization parameter (Lin_Type) is automatically set to "Linearization".
- "Lin. mode (037)": Just as in the case of the Simulation mode parameter (TAB_OP_CODE), this parameter is also used by the basic application to set the device to linear or linearized conversion or to edit the linearization table. The "Linear", "Manual entry", "Semi-auto. entry" or "Erase table" options must reset Characterization (TB_LIN_TYPE) to "Linear". The "Activate table" option with a successful result must reset the Characterization (TB_LIN_TYPE) to "Linearization".

7 Commissioning without an operating menu

The device is configured for the "Pressure" measuring mode (Cerabar, Deltabar) or "Level" measuring mode (Deltapilot) as standard. The measuring range and the unit in which the measured value is transmitted correspond to the data on the nameplate.

⚠ WARNING

The permitted process pressure is exceeded!

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

▶ If a pressure lower than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession (depending on the setting in the "Alarm behavior P" (050) parameter):
"S140 Working range P" or "F140 Working range P"
"S841 Sensor range" or "F841 Sensor range"
"S971 Adjustment"
Only operate the device within the sensor range limits!

NOTICE

The permitted process pressure is undershot!

Output of messages if pressure is too low.

▶ If a pressure lower than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession (depending on the setting in the "Alarm behavior P" (050) parameter):
"S140 Working range P" or "F140 Working range P"
"S841 Sensor range" or "F841 Sensor range"
"S971 Adjustment"
Only operate the device within the sensor range limits!

7.1 Function check

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

- Checklist for "Post-mounting checks" → 📄 33
- Checklist for "Post-connection check" → 📄 39

7.2 Position adjustment

The following functions are possible by means of the key on the electronic insert:
- Position adjustment (zero point correction)
- Device reset → 📄 42 (total reset)

- Operation must be unlocked. → 📄 49, "Locking/unlocking operation"
- The device is configured for the "Pressure" measuring mode as standard.
- The pressure applied must be within the nominal pressure limits of the sensor. See information on the nameplate.

Performing position adjustment
Pressure is present at the device.
↓
Press the "Zero" key for at least 3 s.
↓

Performing position adjustment	
Does the LED on the electronic insert light up briefly?	
Yes	No
↓	↓
Applied pressure for position adjustment has been accepted.	Applied pressure for position adjustment [1] has not been accepted. Observe the input limits.

1) Observe warning concerning commissioning (→ 77)

8 Commissioning with an operating menu (onsite display/FieldCare)

The device is configured for the "Pressure" measuring mode (Cerabar, Deltabar) or "Level" measuring mode (Deltapilot) as standard. The measuring range and the unit in which the measured value is transmitted correspond to the data on the nameplate.

⚠ WARNING

The permitted process pressure is exceeded!

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

▶ If a pressure lower than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession (depending on the setting in the "Alarm behavior P" (050) parameter):
"S140 Working range P" or "F140 Working range P"
"S841 Sensor range" or "F841 Sensor range"
"S971 Adjustment".
Only operate the device within the sensor range limits!

NOTICE

The permitted process pressure is undershot!

Output of messages if pressure is too low.

▶ If a pressure lower than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession (depending on the setting in the "Alarm behavior P" (050) parameter):
"S140 Working range P" or "F140 Working range P"
"S841 Sensor range" or "F841 Sensor range"
"S971 Adjustment".
Only operate the device within the sensor range limits!

8.1 Function check

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

- Checklist for "Post-mounting checks" → 33
- Checklist for "Post-connection check" → 39

8.2 Commissioning

Commissioning comprises the following steps:

1. Function check → 79
2. Selection of the language, measuring mode and pressure unit → 80
3. Position adjustment → 81
4. Configuring measurement:
   - Pressure measurement → 96 ff
   - Level measurement (Cerabar M and Deltapilot M) → 82 ff
   - Flow measurement (Deltabar M) → 99 ff
   - Level measurement (Deltabar M) → 102 ff

8.2.1 Selecting the language, measuring mode and pressure unit

Selecting the language

Parameter name	Description
Language (000) Options Menu path: Main menu → Language	Select the language for the onsite display. **Options:** ▪ English ▪ Possibly another language (as selected when ordering the device) ▪ One further language (language of the manufacturing plant) **Factory setting**: English

Selecting the measuring mode

Parameter name	Description
Measuring mode (005) Options Menu path: Setup → **Measuring mode (005)**	Select the measuring mode. The operating menu is structured according to the selected measuring mode. **⚠ 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 and, if necessary, reconfigured! **Options:** ▪ Pressure ▪ Level ▪ Flow **Factory setting:** Pressure

Selecting the pressure unit

Parameter name	Description
Press. eng. unit (125) Options Menu path: Setup → **Press. eng. unit (125)**	Select the pressure unit. If a new pressure unit is selected, all pressure-specific parameters are converted and displayed with the new unit. **Options:** ▪ mbar, bar ▪ mmH2O, mH2O ▪ in H2O, ftH2O ▪ Pa, kPa, MPa ▪ psi ▪ mmHg, inHg ▪ kgf/cm^2 **Factory setting:** mbar or bar depending on the nominal measuring range of the sensor, or as per order specifications

8.3 Position zero adjustment

A pressure shift resulting from the orientation of the measuring instrument can be corrected by the position adjustment.

Parameter name	Description
Corrected press. (172) Display Menu path: Setup → **Corrected press. (172)**	Displays the measured pressure after sensor trim and position adjustment. If this value is not equal to "0", it can be corrected to "0" by the position adjustment.
Pos. zero adjust (007) (Deltabar M and gauge pressure measuring cells) Options Menu path: Setup → **Pos. zero adjust (007) (Deltabar and gauge pressure measuring cells)**	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 (007) (Deltabar and gauge pressure measuring cells)**" 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 **Options** ▪ Confirm ▪ Abort **Factory setting:** Abort
Calib. offset (192) (008) (absolute pressure sensors) Entry Menu path: Setup → **Calib. offset (192)**	Position adjustment – the pressure difference between the set point and the measured pressure must be known. **Example:** – Measured value = 982.2 mbar (14.25 psi) – You correct the measured value with the value entered (e.g. 2.2 mbar (0.032 psi)) via the "**Calib. offset (192)**" parameter. This means that you are assigning the value 980.0 (14.21 psi) to the pressure present. – Measured value (after calib. offset) = 980.0 mbar (14.21 psi) **Factory setting:** 0.0

8.4 Level measurement (Cerabar M and Deltapilot M)

8.4.1 Information on level measurement

- The limit values are not checked, i.e. the values entered must be appropriate for the sensor and the measuring task for the measuring instrument to be able to measure correctly.
- Customer-specific units are not possible.
- There is no unit conversion.
- The values entered for "**Empty calib. (028)**/**Full calib. (031)**", "**Empty pressure (029)**/**Full pressure (032)**", "**Empty height (030)**/**Full height (033)**" must be at least 1% apart. The value will be rejected, and a message displayed, if the values are too close together.

You have a choice of two methods for calculating the level: "In pressure" and "In height". The table in the "Overview of level measurement" section that follows provides you with an overview of these two measuring tasks.

8.4.2 Overview of level measurement

Measuring task	Level selection	Measured variable options	Description	Measured value display
Calibration is performed by entering two pressure/level value pairs.	"In pressure"	Via the "**Unit before lin (025)**" parameter: %, level, volume or mass units.	– Calibration with reference pressure (wet calibration), see → 📄 83 – Calibration without reference pressure (dry calibration), see → 📄 85	The measured value display and the "**Level before. lin. (019)**" parameter show the measured value.
Calibration is performed by entering the density and two height/level value pairs.	"In height"		– Calibration with reference pressure (wet calibration), see → 📄 87 – Calibration without reference pressure (dry calibration), see → 📄 89	

8.4.3 "In pressure" level selection Calibration with reference pressure (wet calibration)

Example:
In this example, the level in a tank should be measured in "m". The maximum level is 3 m (9.8 ft). The pressure range is derived from the level and the density of the medium.

Prerequisite(s):
- The measured variable is in direct proportion to the pressure.
- The tank can be filled or emptied.

The values entered for "**Empty calib. (028)**/**Full calib. (031)**" and the pressures present at the device must be at least 1% apart. The value will be rejected, and a message displayed, 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 instrument can measure correctly.

	Description
1	"Performing position adjustment" → 81.
2	Select the "Level" measuring mode via the "**Measuring mode (005)**" parameter. Menu path: Setup → **Measuring mode (005)**
3	Select a pressure unit via the "**Press. eng. unit (125)**" parameter, here "mbar" for example. Menu path: Setup → **Press. eng. unit (125)**
4	Select the "In pressure" level mode via the "**Level selection (024)**" parameter. Menu path: Setup → Extended setup → Level → **Level selection (024)**

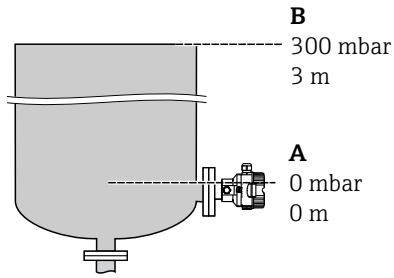


Fig. 21: Calibration with reference pressure – wet calibration

A See table, step 7.
B See table, step 8.

	Description
5	Select a level unit via the "**Unit before lin (025)**" parameter, here "m" for example. Menu path: Setup →Extended setup → Level → **Unit before lin (025)**
6	Select the "Wet" option via the "**Calibration mode (027)**" parameter. Menu path: Setup →Extended setup → Level → **Calibration mode (027)**
7	The pressure for the lower calibration point is present at the device, here "0 mbar" for example.
	Select the "**Empty calib. (028)**" parameter. Menu path: Setup → Extended setup → Level → **Empty calib. (028)**
	Enter the level value, here "0 m" for example. The pressure value present is assigned to the lower level value by confirming the value.
8	The pressure for the upper calibration point is present at the device, here 300 mbar (4.35 psi) for example.
	Select the "**Full calib. (031)**" parameter. Menu path: Setup → Extended setup → Level → **Full calib. (031)**
	Enter the level value, here 3 m (9.8 ft) for example. The pressure value present is assigned to the upper level value by confirming the value.
9	If calibration is performed with a medium other than the process medium, enter the density of the calibration medium in the "**Adjust density (034)**" parameter. Menu path: Setup → Extended setup → Level → **Adjust density (034)**
10	If calibration was performed with a medium other than the process medium, specify the density of the process medium in the "**Process density (035)**" parameter. Menu path: Setup → Extended setup → Level → **Process density (035)**.
11	Result: The measuring range is set for 0 to 3 m (9.8 ft).

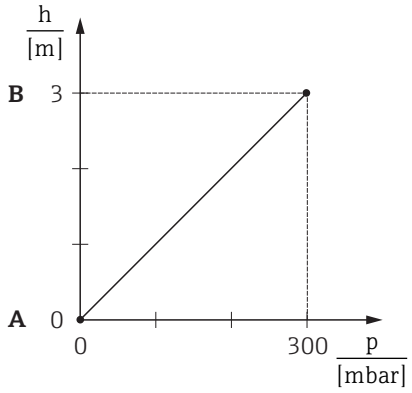


Fig. 22: Calibration with reference pressure – wet calibration

A See table, step 7.
B See table, step 8.

The measured variables %, level, volume and mass are available for this level mode. See → 129 "**Unit before lin (025)**".

8.4.4 "In pressure" level selection Calibration without reference pressure (dry calibration)

Example:
In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 gal) corresponds to a pressure of 450 mbar (6.53 psi). The minimum volume of 0 liters corresponds to a pressure of 50 mbar (0.72 psi) since the device is mounted below the start of the level measuring range.

Prerequisite(s):
- The measured variable is in direct proportion to the pressure.
- This is a theoretical calibration i.e. the pressure and volume values for the lower and upper calibration point must be known.

- The values entered for "**Empty calib. (028)**/**Full calib. (031)**", "**Empty pressure (029)**/**Full pressure (032)**" must be at least 1% apart. The value will be rejected, and a message displayed, 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 instrument can measure correctly.
- Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. when the container is empty or partly filled, the measured value is not zero. For information on how to perform position adjustment, see → 81, "Position zero adjustment".

	Description
1	Select the "Level" measuring mode via the "**Measuring mode (005)**" parameter. Menu path: Setup → **Measuring mode (005)**
2	Select a pressure unit via the "**Press. eng. unit (125)**" parameter, here "mbar" for example. Menu path: Setup → **Press. eng. unit (125)**
3	Select the "In pressure" level mode via the "**Level selection (024)**" parameter. Menu path: Setup → Extended setup → Level → **Level selection (024)**
4	Select a volume unit via the "**Unit before lin (025)**" parameter, here "l" (liters) for example. Menu path: Setup → Extended setup → Level → **Unit before lin (025)**

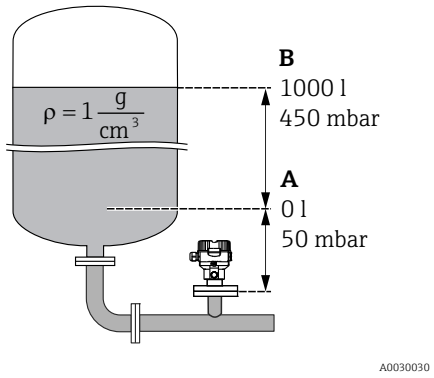


Fig. 23: Calibration without reference pressure – dry calibration

A See table, steps 7 + 8.
B See table, steps 9 + 10.

	Description
5	Select the "Dry" option via the "**Calibration mode (027)**" parameter. Menu path: Setup → Extended setup → Level → **Calibration mode (027)**
6	"**Adjust density (034)**" contains the factory setting 1.0, but this value can be changed if required. The entered value pairs must correspond to this density. Menu path: Setup → Extended setup → Level→ **Adjust density (034)**
7	Enter the volume value for the lower calibration point via the "**Empty calib. (028)**" parameter, here 0 liters for example. Menu path: Setup → Extended setup → Level → **Empty calib. (028)**
8	Enter the pressure value for the lower calibration point via the "**Empty pressure (029)**" parameter, here 50 mbar (0.72 psi) for example. Menu path: Setup → Extended setup → Level → **Empty pressure (029)**
9	Enter the volume value for the upper calibration point via the "**Full calib. (031)**" parameter, here 1000 liters (264 gal) for example. Menu path: Setup → Extended setup → Level → **Full calib. (031)**
10	Enter the pressure value for the upper calibration point via the "**Full pressure (032)**" parameter, here 450 mbar (6.53 psi) for example. Menu path: Setup → Extended setup → Level → **Full pressure (032)**
11	If calibration was performed with a medium other than the process medium, specify the density of the process medium in the "**Process density (035)**" parameter. Menu path: Setup → Extended setup → Level → **Process density (035)**.
12	Result: The measuring range is set for 0 to 1000 l (264 gal).

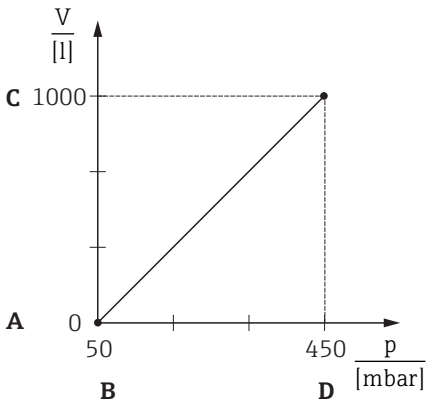


Fig. 24: Calibration with reference pressure – wet calibration

A See table, step 7.
B See table, step 8.
C See table, step 9.
D See table, step 10.

The measured variables %, level, volume and mass are available for this level mode. See → 129 "**Unit before lin (025)**".

8.4.5 "In height" level selection Calibration with reference pressure (wet calibration)

Example:
In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 gal) corresponds to a level of 4.5 m (14.8 ft). The minimum volume of 0 liters corresponds to a level of 0.5 m (1.6 ft) since the device is mounted below the start of the level measuring range.
The density of the fluid is 1 g/cm^3 (1 SGU).

Prerequisite(s):
- The measured variable is in direct proportion to the pressure.
- The tank can be filled or emptied.

The values entered for "**Empty calib. (028)**/**Full calib. (031)**" and the pressure values present at the device must be at least 1% apart. The value will be rejected, and a message displayed, 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 instrument can measure correctly.

	Description
1	Perform position adjustment. Refer to → 81.
2	Select the "Level" measuring mode "**Measuring mode (005)**" parameter. Menu path: Setup → **Measuring mode (005)**
3	Select a pressure unit via the "**Press. eng. unit (125)**" parameter, here "mbar" for example. Menu path: Setup → **Press. eng. unit (125)**
4	Select the "In height" level mode via the "**Level selection (024)**" parameter. Menu path: Setup → Extended setup → Level → **Level selection (024)**
5	Select a volume unit via the "**Unit before lin (025)**" parameter, here "l" (liters) for example. Menu path: Setup → Extended setup → Level → **Unit before lin (025)**

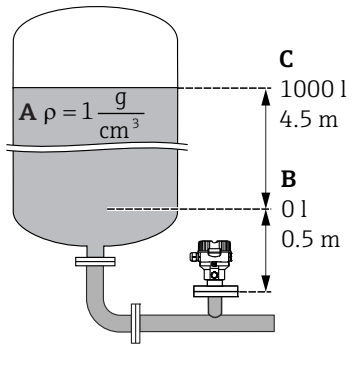


Fig. 25: Calibration with reference pressure – wet calibration

A See table, step 8.
B See table, step 9.
C See table, step 10.

	Description
6	Select a level unit via the "**Height unit (026)**" parameter, here "m" for example. Menu path: Setup → Extended setup → Level → **Height unit (026)**
7	Select the "Wet" option via the "**Calibration mode (027)**" parameter. Menu path: Setup → Extended setup → Level → **Calibration mode (027)**
8	If calibration is performed with a medium other than the process medium, enter the density of the calibration medium in the "**Adjust density (034)**" parameter, here 1 g/cm³ (1 SGU) for example. Menu path: Setup → Extended setup → Level → **Adjust density (034)**
9	The pressure for the lower calibration point is present at the device, here 0.5 m covered / 49 mbar (0.71 psi) for example.
	Enter the volume value for the lower calibration point via the "**Empty calib. (028)**" parameter, here 0 liters for example. Menu path: Setup → Extended setup → Level → **Empty calib. (028)**
10	The pressure for the upper calibration point is present at the device, here 4.5 m covered / 441 mbar (6.4 psi) for example.
	Enter the volume value for the upper calibration point via the "**Full calib. (031)**" parameter, here "1000 liters" (264 gal) for example. Menu path: Setup → Extended setup → Level → **Full calib. (031)**
11	If calibration was performed with a medium other than the process medium, specify the density of the process medium in the "**Process density (035)**" parameter. Menu path: Setup → Extended setup → Level → **Process density (035)**
12	Result: The measuring range is set for 0 to 1000 l (264 gal).

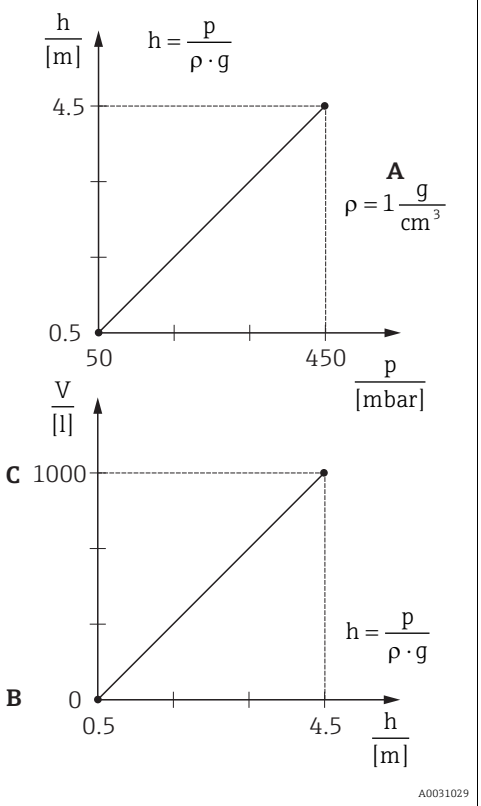


Fig. 26: Calibration with reference pressure – wet calibration

A See table, step 8.
B See table, step 9.
C See table, step 10.

The measured variables %, level, volume and mass are available for this level mode, → 129 "**Unit before lin (025)**".

8.4.6 "In height" level selection Calibration without reference pressure (dry calibration)

Example:
In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 gal) corresponds to a level of 4.5 m (14.8 ft). The minimum volume of 0 liters corresponds to a level of 0.5 m (1.6 ft) since the device is mounted below the start of the level measuring range.

Prerequisite(s):
- The measured variable is in direct proportion to the pressure.
- This is a theoretical calibration i.e. the height and volume values for the lower and upper calibration point must be known.

- The values entered for "**Empty calib. (028)/Full calib. (031)**", "**Empty height (030)/Full height (033)**" must be at least 1% apart. The value will be rejected, and a message displayed, 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 instrument can measure correctly.
- Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. when the container is empty or partly filled, the measured value is not zero. For information on how to perform position adjustment, see → 81, "Position zero adjustment".

	Description
1	Select the "Level" measuring mode via the "**Measuring mode (005)**" parameter. Menu path: Setup → **Measuring mode (005)**
2	Select a pressure unit via the "**Press. eng. unit (125)**" parameter, here "mbar" for example. Menu path: Setup → **Press. eng. unit (125)**
3	Select the "in height" level mode via the "**Level selection (024)**" parameter. Menu path: Setup → Extended setup → Level → **Level selection (024)**
4	Select a volume unit via the "**Unit before lin (025)**" parameter, here "l" (liter) for example. Menu path: Setup → Extended setup → Level → **Unit before lin (025)**
5	Select a level unit via the "**Height unit (026)**" parameter, here "m" for example. Menu path: Setup → Extended setup → Level → **Height unit (026)**
6	Select the "Dry" option via the "**Calibration mode (027)**" parameter. Menu path: Setup → Extended setup → Level → **Calibration mode (027)**
7	Enter the density of the medium via the "**Adjust density (034)**", here "1 g/cm³" (1 SGU) for example. Menu path: Setup → Extended setup → Level → **Adjust density (034)**

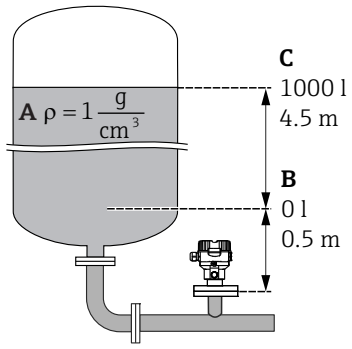


Fig. 27: Calibration without reference pressure – dry calibration

A See table, step 7.
B See table, steps 8 and 10.
C See table, steps 9 and 11.

	Description
8	Enter the volume value for the lower calibration point via the "**Empty calib. (028)**", here 0 liters for example. Menu path: Setup → Extended setup → Level → **Empty calib. (028)**
9	Enter the height value for the lower calibration point via the "**Empty height (030)**" parameter, here 0.5 m (1.6 ft) for example. Menu path: Setup → Extended setup → Level → **Empty height (030)**
10	Enter the volume value for the upper calibration point via the "**Full calib. (031)**" parameter, here 1000 liters (264 gal) for example. Menu path: Setup → Extended setup → Level → **Full calib. (031)**
11	Enter the height value for the upper calibration point via the "**Full height (033)**" parameter, here 4.5 m (14.8 ft) for example. Menu path: Setup → Extended setup → Level → **Full height (033)**
12	If the process uses a medium other than that on which the calibration was based, the new density must be specified in the "**Process density (035)**" parameter. Menu path: Setup → Extended setup → Level → **Process density (035)**.
13	Result: The measuring range is set for 0 to 1000 l (264 gal).

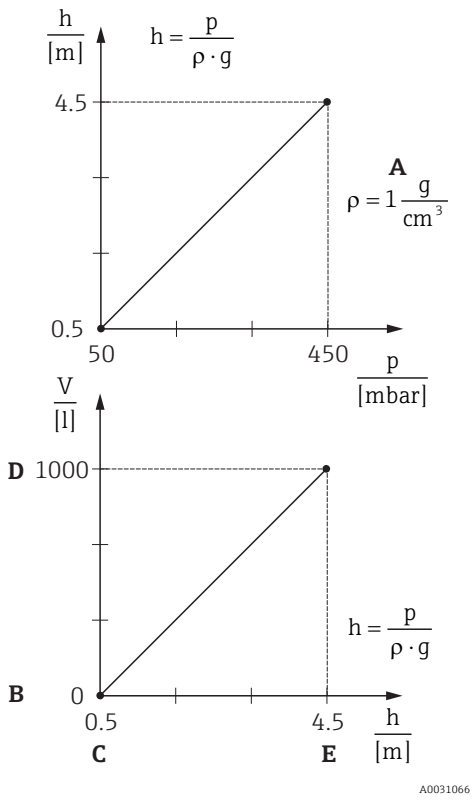


Fig. 28: Calibration with reference pressure – wet calibration

A See table, step 7.
B See table, step 8.
C See table, step 9.
D See table, step 10.
E See table, step 11.

The measured variables %, level, volume and mass are available for this level mode → 129 "**Unit before lin (025)**".

8.4.7 Required parameters for Level measuring mode

Parameter name	Description
Level selection (024)	→ 129
Unit before lin (025)	→ 129
Height unit (026)	→ 129
Calibration mode (027)	→ 129
Empty calib. (028)	→ 130
Empty pressure (029)	→ 130
Empty height (030)	→ 130
Full calib. (031)	→ 130
Full pressure (032)	→ 130
Full height (033)	→ 130
Density unit (127)	→ 131
Adjust density (034)	→ 131
Process density (035)	→ 131
Level before. lin. (019)	→ 131

8.5 Linearization

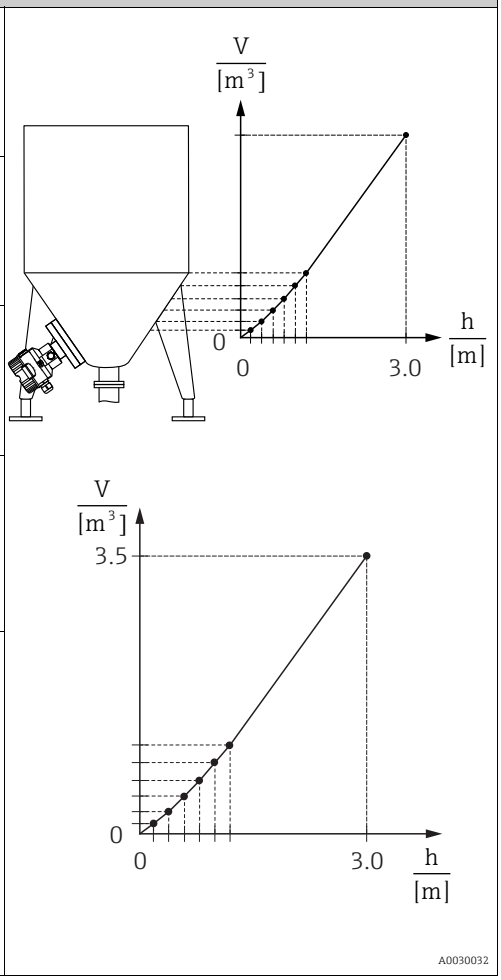
8.5.1 Manual entry of the linearization table via onsite display

Example:
In this example, the volume in a tank with a conical outlet should be measured in m^3.

Prerequisite(s):

- This is a theoretical calibration, i.e. the points for the linearization table are known.
- A level calibration has been performed.

For a description of the parameters mentioned, → section 8.11 "Parameter description".

	Description	
1	Select the "Manual entry" option via the "**Lin. mode (037)**" parameter. Menu path: Setup → Extended setup → Linearization → **Lin. mode (037)**	
2	Select a unit via the "**Unit after lin. (038)**" parameter, e.g. m^3. Menu path: Setup → Extended setup → Linearization → **Unit after lin. (038)**	
3	Enter the number of the point in the table via the "**Line numb (039)**" parameter. Menu path: Setup → Extended setup → Linearization → **Line numb (039)**	
	The level is entered via the "**X-value (040) (manual entry)**" parameter, here 0 m for example. Confirm your entry. Menu path: Setup → Extended setup → Linearization → **X-value (040) (manual entry)**	
	Using the "**Y-value (041) (manual entry/in semi-auto. entry)**" parameter, enter the corresponding volume, here 0 m^3 for example, and confirm the value. Menu path: Setup → Extended setup → Linearization → **Y-value (041) (manual entry/in semi-auto. entry)**	

	Description	
4	To enter another point in the table, select the "Next point" option via the "**Edit table (042)**" parameter. Enter the next point as explained in Step 3. Menu path: Setup → Extended setup → Linearization → **Edit table (042)**	
5	Once all the points have been entered in the table, select the "Activate table" option via the "**Lin. mode (037)**" parameter. Menu path: Setup → Extended setup → Linearization → **Lin. mode (037)**	
6	Result: The measured value after linearization is displayed.	

Error message F510 "Linearization" is displayed as long as entries are being made to the table and it is not activated.

8.5.2 Manual entry of the linearization table via the operating tool

Using an operating tool based on FDT technology (e.g. FieldCare), you can enter the linearization using a module specially designed for this purpose. This provides you with an overview of the selected linearization, even during entry. Additionally, it is possible to call up pre-programmed tank shapes.

The linearization table may also be entered manually point by point in the operating tool menu, see → section 8.5.1 "Manual entry of the linearization table via onsite display".

8.5.3 Semi-automatic entry of the linearization table

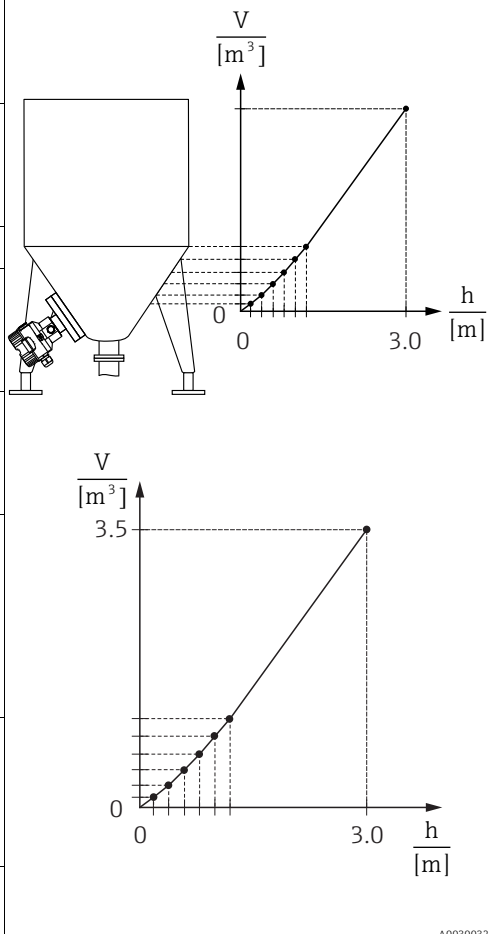
Example:
In this example, the volume in a tank with a conical outlet should be measured in m^3.

Prerequisite(s):

- The tank can be filled or emptied. The linearization characteristic must rise continuously.
- A level calibration has been performed.

For a description of the parameters mentioned → section 8.11 "Parameter description".

	Description
1	Select the "Semi-auto. entry" option via the "**Lin. mode (037)**" parameter. Menu path: Setup → Extended setup → Linearization → **Lin. mode (037)**
2	Select a unit via the "**Unit after lin. (038)**" parameter, e.g. m^3. Menu path: Setup → Extended setup → Linearization → **Unit after lin. (038)**
3	Fill the tank to the height of the 1st point.
4	Enter the number of the point in the table via the "**Line numb (039)**" parameter. Menu path: Setup → Extended setup → Linearization → **Line numb (039)**
	The level at the current time is displayed using the "**X-value (040) (manual entry)**"parameter. Menu path: Setup → Extended setup → Linearization → **X-value (040) (manual entry)**
	Using the "**Y-value (041) (manual entry/in semi-auto. entry)**" parameter, enter the corresponding volume, here 0 m^3 for example, and confirm the value. Menu path: Setup → Extended setup → Linearization → **Y-value (041) (manual entry/in semi-auto. entry)**
5	To enter another point in the table, select the "Next point" option via the "**Edit table (042)**"parameter. Enter the next point as explained in Step 4. Menu path: Setup → Extended setup → Linearization → **Edit table (042)**
6	Once all the points have been entered in the table, select the "Activate table" option via the "**Lin. mode (037)**" parameter. Menu path: Setup → Extended setup → Linearization → **Lin. mode (037)**
7	Result: The measured value after linearization is displayed.



Error message F510 "Linearization" is displayed as long as entries are being made to the table and it is not activated.

8.5.4 Required parameters for linearization

Parameter name	Description
Lin. mode (037)	→ 131
Unit after lin. (038)	→ 132
Line numb (039)	→ 132
X-value (040) (manual entry)	→ 132
Y-value (041) (manual entry/in semi-auto. entry)	→ 132
Edit table (042)	→ 132
Tank description (173)	→ 132
Tank content (043)	→ 132

8.6 Pressure measurement

8.6.1 Calibration without reference pressure (dry calibration)

Example:
In this example, a device with a 400 mbar (6 psi) sensor is configured for the 0 to +300 mbar (4.35 psi) measuring range, i.e. 0 mbar and 300 mbar (4.35 psi) are assigned.

Prerequisite(s):
This is a theoretical calibration, i.e. the pressure values for the lower and upper range are known.

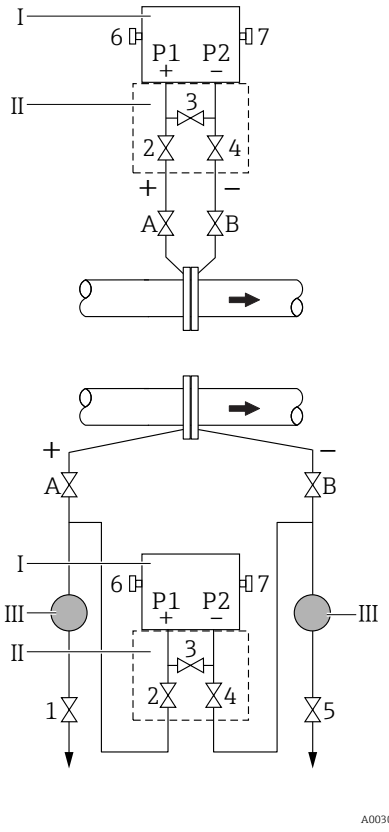
Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. the measured value is not zero in a pressureless condition. For information on how to perform a position adjustment, see → 81. The adjustment is only possible via FieldCare.

	Description
1	Select the "Pressure" measuring mode via the "**Measuring mode (005)**"parameter. Menu path: Setup → **Measuring mode (005)**
2	Select a pressure unit via the "**Press. eng. unit (125)**" parameter, here "mbar" for example. Menu path: Setup → **Press. eng. unit (125)**
3	Where necessary, scale the "Output value (OUT Value)" of the Analog Input Block, → 146, parameter descriptions "Proc value scale" and "Output scale".
4	Result: The measuring range is configured for 0 to +300 mbar (4.35 psi).

8.7 Differential pressure measurement (Deltabar M)

8.7.1 Preliminaries

Before calibrating the device, the impulse piping must be cleaned and filled with medium.
→ See the following table.

	Valves	Meaning	Preferred installation
1	Close 3.		
2	Fill the measuring system with medium.		
	Open A, B, 2, 4.	Medium flows in.	
3	Clean impulse piping if necessary:[1)] – by blowing out with compressed air in the case of gases – by rinsing out in the case of liquids.		
	Close 2 and 4.	Block off device.	
	Open 1 and 5.[1]	Blow out/rinse out impulse piping.	
	Close 1 and 5.[1]	Close valves after cleaning.	
4	Vent device.		
	Open 2 and 4.	Introduce medium.	
	Close 4.	Close low-pressure side.	
	Open 3.	Balance positive and low-pressure side.	
	Open 6 and 7 briefly, then close them again.	Fill measuring instrument completely with medium and remove air.	
5	Set measuring point to operation.		
	Close 3.	Shut off high-pressure side from low-pressure side.	
	Open 4.	Connect low-pressure side.	
	Now – 1[1], 3, 5[1], 6 and 7 are closed. – 2 and 4 are open. – A and B open (if present).		
6	If necessary, perform adjustment. → See also page 98		

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Above: preferred installation for gases
Below: preferred installation for liquids

I *Deltabar M*
II *Three-valve manifold*
III *Separator*
1, 5 *Drain valves*
2, 4 *Inlet valves*
3 *Equalizing valve*
6, 7 *Vent valves on Deltabar M*
A, B *Shutoff valve*

1) for arrangement with 5 valves

8.7.2 Required parameters for differential pressure via Pressure measuring mode

Parameter name	Description
Measuring mode (005)	→ 125
Switch P1/P2 (163) (Deltabar)	→ 127
High-pressure side (006) (Deltabar)	→ 127
Press. eng. unit (125)	→ 126
Corrected press. (172)	→ 128
Pos. zero adjust (007) (Deltabar and gauge pressure measuring cells)	→ 125
Calib. offset (192)	→ 125
Damping switch (164)	→ 126
Damping value (017)	→ 126
Pressure af. damp (111)	→ 128

8.8 Flow measurement (Deltabar M)

8.8.1 Information on flow measurement

In the "Flow" measuring mode, the device determines a volume or mass flow value from the differential pressure measured. The differential pressure is generated by means of primary elements such as pitot tubes or orifice plates and depends on the volume or mass flow. Four flow types are available: volume flow, normal volume flow (European normal conditions), standard volume flow (American standard conditions), mass flow and flow in %.

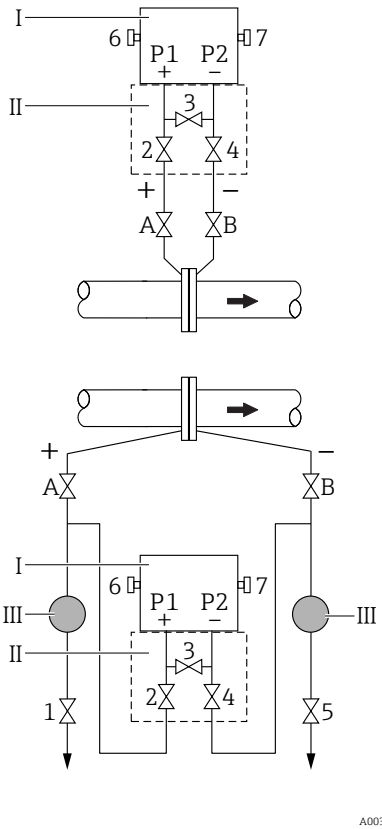
In addition, the Deltabar M software provides two totalizers as standard. The totalizers integrates the volume or the mass flow. The counting function and the unit can be set separately for both totalizers. The first totalizer (totalizer 1) can be reset to zero at any time while the second (totalizer 2) totalizes the flow from commissioning onwards and cannot be reset.

The totalizers are not available for the "Flow in %" flow type.

8.8.2 Preliminaries

Before calibrating the Deltabar M, the impulse piping must be cleaned and filled with fluid.
→ See the following table.

	Valves	Meaning	Preferred installation
1	Close 3.		
2	Fill the measuring system with medium.		
	Open A, B, 2, 4.	Medium flows in.	
3	If necessary, clean the impulse piping if necessary[1)]: – by blowing out with compressed air in the case of gases – by rinsing out in the case of liquids.		
	Close 2 and 4.	Block off device.	
	Open 1 and 5.[1]	Blow out/rinse out impulse piping.	
	Close 1 and 5.[1]	Close valves after cleaning.	
4	Vent device.		
	Open 2 and 4.	Introduce medium.	
	Close 4.	Close low-pressure side.	
	Open 3.	Balance positive and low-pressure side.	
	Open 6 and 7 briefly, then close them again.	Fill measuring instrument completely with medium and remove air.	
5	Carry out position zero adjustment (→ 81) if the following conditions are met. If the conditions are not met, then do not carry out the pos. zero adjustment until after step 6. Conditions: – The process cannot be blocked off. – The tapping points (A and B) are at the same geodetic height.		
6	Set measuring point to operation.		
	Close 3.	Shut off high-pressure side from low-pressure side.	
	Open 4.	Connect low-pressure side.	
	Now – 1[1], 3, 5[1], 6 and 7 are closed. – 2 and 4 are open. – A and B open (if present).		
7	Carry out position zero adjustment (→ 81) if the flow can be blocked off. In this case, step 5 is not applicable.		
8	Carry out calibration. 101, → section 8.8.3.		



Above: preferred installation for gases
Below: preferred installation for liquids

I *Deltabar M*
II *Three-valve manifold*
III *Separator*
1, 5 *Drain valves*
2, 4 *Inlet valves*
3 *Equalizing valve*
6, 7 *Vent valves on Deltabar M*
A, B *Shutoff valves*

1) for arrangement with 5 valves

8.8.3 Required parameters for the "Flow" measuring mode

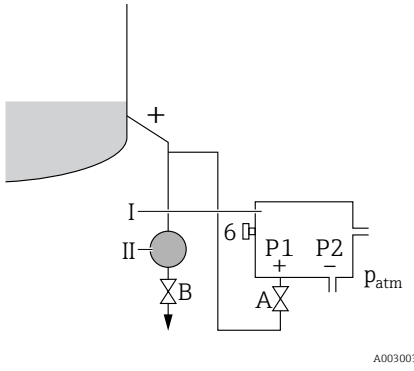
Parameter name	Description
Lin./SQRT switch (133) (Deltabar)	→ 125
Measuring mode (005)	→ 125
Switch P1/P2 (163) (Deltabar)	→ 127
High-pressure side (006) (Deltabar)	→ 127
Press. eng. unit (125)	→ 126
Corrected press. (172)	→ 128
Pos. zero adjust (007) (Deltabar and gauge pressure measuring cells)	→ 125
Max. flow (009)	→ 134
Max. pressure flow (010)	→ 134
Damping switch (164)	→ 126
Damping value (017)	→ 126
Flow (018)	→ 134
Pressure af. damp (111)	→ 128

8.9 Level measurement (Deltabar M)

8.9.1 Preliminaries

Open container

Before calibrating the device, the impulse piping must be cleaned and filled with medium.
→ See the following table.

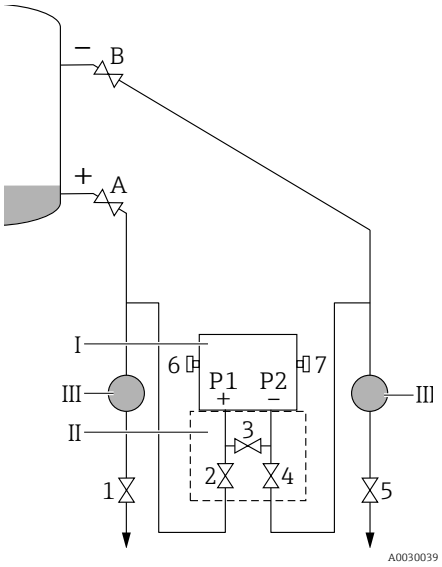
	Valves	Meaning	Installation
1	Fill the container to a level above the lower tap.		
2	Fill the measuring system with medium.		
	Open A.	Open shutoff valve.	
3	Vent device.		
	Open 6 briefly, then close again.	Fill measuring instrument completely with medium and remove air.	
4	Set measuring point to operation.		
	Now: – B and 6 are closed. – A is open.		
5	Carry out calibration according to one of the following methods: ▪ "in pressure" - with reference pressure (→ 105) ▪ "in pressure" - without reference pressure (→ 107) ▪ "in height" - with reference pressure (→ 109) ▪ "in height" - without reference pressure (→ 111)		

Open container

I *Deltabar M*
II *Separator*
6 *Vent valves on Deltabar M*
A *Shutoff valve*
B *Drain valve*

Closed container

Before calibrating the device, the impulse piping must be cleaned and filled with medium.
→ See the following table.

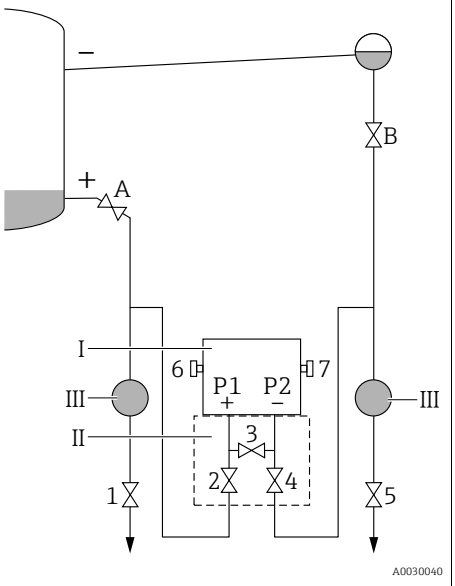
	Valves	Meaning	Installation
1	Fill the container to a level above the lower tap.		
2	Fill the measuring system with medium.		
	Close 3.	Shut off high-pressure side from low-pressure side.	
	Open A and B.	Open shutoff valves.	
3	Vent positive side (drain low-pressure side if necessary).		
	Open 2 and 4.	Introduce medium on high-pressure side.	
	Open 6 and 7 briefly, then close them again.	Fill high-pressure side completely with medium and remove air.	
4	Set measuring point to operation.		
	Now: – 3, 6 and 7 are closed. – 2, 4, A and B are open.		
5	Carry out calibration according to one of the following methods: ▪ "in pressure" - with reference pressure (→ 105) ▪ "in pressure" - without reference pressure (→ 107) ▪ "in height" - with reference pressure (→ 109) ▪ "in height" - without reference pressure (→ 111)		

Closed container

I *Deltabar M*
II *Three-valve manifold*
III *Separator*
1, 5 *Drain valves*
2, 4 *Inlet valves*
3 *Equalizing valve*
6, 7 *Vent valve on Deltabar M*
A, B *Shutoff valve*

Closed container with superimposed steam

Before calibrating the device, the impulse piping must be cleaned and filled with medium.
→ See the following table.

	Valves	Meaning	Installation
1	Fill the container to a level above the lower tap.		
2	Fill the measuring system with medium.		
	Open A and B.	Open shutoff valves.	
	Fill the impulse piping of negative side to the height of the condensate trap.		
3	Vent device.		
	Open 2 and 4.	Introduce medium.	
	Close 4.	Close low-pressure side.	
	Open 3.	Balance positive and low-pressure side.	
	Open 6 and 7 briefly, then close them again.	Fill measuring instrument completely with medium and remove air.	
4	Set measuring point to operation.		
	Close 3.	Shut off high-pressure side from low-pressure side.	
	Open 4.	Connect low-pressure side.	
	Now: – 3, 6 and 7 are closed. – 2, 4, A and B are open.		
5	Carry out calibration according to one of the following methods: ▪ "in pressure" - with reference pressure (→ 105) ▪ "in pressure" - without reference pressure (→ 107) ▪ "in height" - with reference pressure (→ 109) ▪ "in height" - without reference pressure (→ 111)		

Closed container with superimposed steam

I *Deltabar M*
II *Three-valve manifold*
III *Separator*
1, 5 *Drain valves*
2, 4 *Inlet valves*
3 *Equalizing valve*
6, 7 *Vent valves on Deltabar M*
A, B *Shutoff valves*

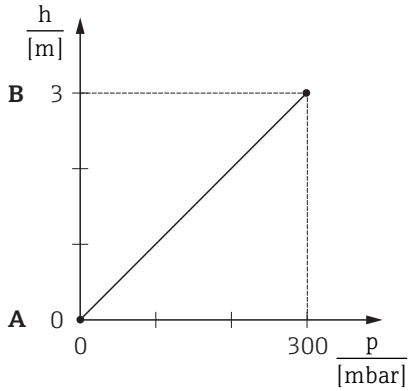
8.9.2 "In pressure" level selection Calibration with reference pressure (wet calibration)

Example:
In this example, the level in a tank should be measured in "m". The maximum level is 3 m (9.8 ft). The pressure range is derived from the level and the density of the medium.

Prerequisite(s):
- The measured variable is in direct proportion to the pressure.
- The tank can be filled or emptied.

The values entered for "**Empty calib. (028)**/**Full calib. (031)**" and the pressures present at the device must be at least 1% apart. The value will be rejected, and a message displayed, 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 instrument can measure correctly.

	Description	
1	Perform "position adjustment".→ 81	
2	Select the "Level" measuring mode via the "**Measuring mode (005)**" parameter. Menu path: Setup → **Measuring mode (005)**	
3	Select a pressure unit via the "**Press. eng. unit (125)**" parameter, here "mbar" for example. Menu path: Setup → **Press. eng. unit (125)**	
4	Select the "In pressure" level mode via the "**Level selection (024)**" parameter. Menu path: Setup → Extended setup → Level → **Level selection (024)**	

	Description	
5	Select a level unit via the "**Unit before lin (025)**" parameter, here "m" for example. Menu path: Setup → Extended setup → Level → **Unit before lin (025)**	 *Calibration with reference pressure – wet calibration* *A See table, step 7.* *B See table, step 8.*
6	Select the "Wet" option via the "**Calibration mode (027)**". Menu path: Setup → Extended setup → Level → **Calibration mode (027)**	
7	The pressure for the lower calibration point is present at the device, here "0 mbar" for example.	
	Select the "**Empty calib. (028)**" parameter. Menu path: Setup → Extended setup → Level → **Empty calib. (028)**	
	Enter the level value, here "0 m" for example. The pressure value present is assigned to the lower level value by confirming the value.	
8	The pressure for the upper calibration point is present at the device, here 300 mbar (4.35 psi) for example.	
	Select the "**Full calib. (031)**" parameter. Menu path: Setup → Extended setup → Level → **Full calib. (031)**	
	Enter the level value, here 3 m (9.8 ft) for example. The pressure value present is assigned to the upper level value by confirming the value.	
9	If calibration is performed with a medium other than the process medium, enter the density of the calibration medium in "**Adjust density (034)**". Menu path: Setup → Extended setup → Level → **Adjust density (034)**	
10	If calibration was performed with a medium other than the process medium, specify the density of the process medium in the "**Process density (035)**" parameter. Menu path: Setup → Extended setup → Level → **Process density (035)**.	
11	Result: The measuring range is set for 0 to 3 m (9.8 ft).	

The measured variables %, level, volume and mass are available for this level mode. See → 129 "**Unit before lin (025)**".

8.9.3 "In pressure" level selection Calibration without reference pressure (dry calibration)

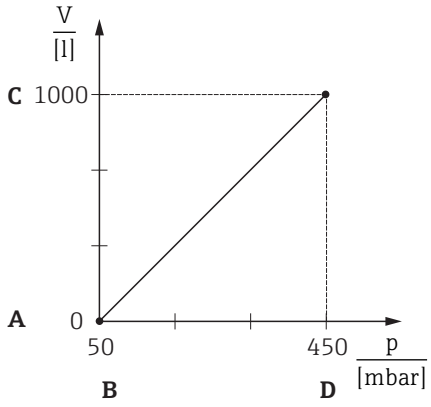
Example:
In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 gal) corresponds to a pressure of 450 mbar (6.53 psi). The minimum volume of 0 liters corresponds to a pressure of 50 mbar (0.72 psi) since the device is mounted below the start of the level measuring range.

Prerequisite(s):
- The measured variable is in direct proportion to the pressure.
- This is a theoretical calibration i.e. the pressure and volume values for the lower and upper calibration point must be known.

- The values entered for "**Empty calib. (028)**/**Full calib. (031)**", "**Empty pressure (029)**/**Full pressure (032)**" must be at least 1% apart. The value will be rejected, and a message displayed, 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 instrument can measure correctly.
- Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. when the container is empty or partly filled, the measured value is not zero. For information on how to perform position adjustment, see → 81, "Position zero adjustment".

	Description	
1	Select the "Level" measuring mode via the "**Measuring mode (005)**" parameter. Menu path: Setup → **Measuring mode (005)**	
2	Select a pressure unit via the "**Press. eng. unit (125)**" parameter, here "mbar" for example. Menu path: Setup → **Press. eng. unit (125)**	
3	Select the "In pressure" level mode via the "**Level selection (024)**" parameter. Menu path: Setup → Extended setup → Level → **Level selection (024)**	
4	Select a volume unit via the "**Unit before lin (025)**" parameter, here "l" (liters) for example. Menu path: Setup → Extended setup → Level → **Unit before lin (025)**	

	Description
5	Select the "Dry" option via the "**Calibration mode (027)**" parameter. Menu path: Setup → Extended setup → Level → **Calibration mode (027)**
6	"**Adjust density (034)**" contains the factory setting 1.0, but this value can be changed if required. The entered value pairs must correspond to this density. Menu path: Setup → Extended setup → Level → **Adjust density (034)**
7	Enter the volume value for the lower calibration point via the "**Empty calib. (028)**" parameter, here 0 liters for example. Menu path: Setup → Extended setup → Level → **Empty calib. (028)**
8	Enter the pressure value for the lower calibration point via the "**Empty pressure (029)**" parameter, here 50 mbar (0.72 psi) for example. Menu path: Setup → Extended setup → Level → **Empty pressure (029)**
9	Enter the volume value for the upper calibration point via the "**Full calib. (031)**" parameter, here 1000 liters (264 gal) for example. Menu path: Setup → Extended setup → Level → **Full calib. (031)**
10	Enter the pressure value for the upper calibration point via the "**Full pressure (032)**" parameter, here 450 mbar (6.53 psi) for example. Menu path: Setup → Extended setup → Level → **Full pressure (032)**
11	If calibration was performed with a medium other than the process medium, specify the density of the process medium in the "**Process density (035)**" parameter. Menu path: Setup → Extended setup → Level → **Process density (035)**.
12	Result: The measuring range is set for 0 to 1000 l (264 gal).



Calibration without reference pressure – dry calibration

A See table, step 7.
B See table, step 8.
C See table, step 9.
D See table, step 10.

The measured variables %, level, volume and mass are available for this level mode. See → 129 "**Unit before lin (025)**".

8.9.4 "In height" level selection Calibration without reference pressure (dry calibration)

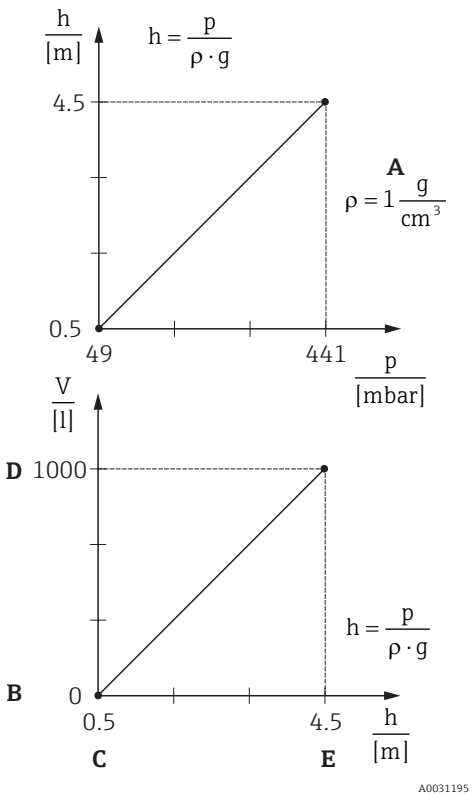
Example:
In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 gal) corresponds to a level of 4.5 m (14.8 ft). The minimum volume of 0 liters corresponds to a level of 0.5 m (1.6 ft) since the device is mounted below the start of the level measuring range.

Prerequisite(s):
- The measured variable is in direct proportion to the pressure.
- This is a theoretical calibration i.e. the height and volume values for the lower and upper calibration point must be known.

- The values entered for "**Empty calib. (028)/Full calib. (031)**", "**Empty height (030)/Full height (033)**" must be at least 1% apart. The value will be rejected, and a message displayed, 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 instrument can measure correctly.
- Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. when the container is empty or partly filled, the measured value is not zero. For information on how to perform position adjustment, see → 81, "Position zero adjustment".

	Description	
1	Select the "Level" measuring mode via the "**Measuring mode (005)**" parameter. Menu path: Setup → **Measuring mode (005)**	
2	Select a pressure unit via the "**Press. eng. unit (125)**" parameter, here "mbar" for example. Menu path: Setup → **Press. eng. unit (125)**	
3	Select the "in height" level mode via the "**Level selection (024)**" parameter. Menu path: Setup → Extended setup → Level → **Level selection (024)**	
4	Select a volume unit via the "**Unit before lin (025)**" parameter, here "l" (liter) for example. Menu path: Setup → Extended setup → Level → **Unit before lin (025)**	
5	Select a level unit by means of the "**Height unit (026)**" parameter, here "m" for example. Menu path: Setup → Extended setup → Level → **Height unit (026)**	
6	Select the "Dry" option via the "**Calibration mode (027)**" parameter. Menu path: Setup → Extended setup → Level → **Calibration mode (027)**	
7	Enter the density of the medium via the "**Adjust density (034)**" parameter, here "1 g/cm³" (1 SGU) for example. Menu path: Setup → Extended setup → Level → **Adjust density (034)**	

	Description
8	Enter the volume value for the lower calibration point via the "**Empty calib. (028)**" parameter, here 0 liters for example. Menu path: Setup → Extended setup → Level → **Empty calib. (028)**
9	Enter the height value for the lower calibration point via the "**Empty height (030)**" parameter, here 0.5 m (1.6 ft) for example. Menu path: Setup → Extended setup → Level → **Empty height (030)**
10	Enter the volume value for the upper calibration point via the "**Full calib. (031)**" parameter, here 1000 liters (264 gal) for example. Menu path: Setup → Extended setup → Level → **Full calib. (031)**
11	Enter the height value for the upper calibration point via the "**Full height (033)**" parameter, here 4.5 m (14.8 ft) for example. Menu path: Setup → Extended setup → Level → **Full height (033)**
12	If the process uses a medium other than that on which the calibration was based, the new density must be specified in the "**Process density (035)**" parameter. Menu path: Setup → Extended setup → Level → **Process density (035)**.
13	Result: The measuring range is set for 0 to 1000 l (264 gal).



Calibration without reference pressure – dry calibration

A See table, step 7.
B See table, step 8.
C See table, step 9.
D See table, step 10.
E See table, step 11.

The measured variables %, level, volume and mass are available for this level mode → 129 "**Unit before lin (025)**".

8.9.5 "In height" level selection Calibration with reference pressure (wet calibration)

Example:
In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 gal) corresponds to a level of 4.5 m (14.8 ft). The minimum volume of 0 liters corresponds to a level of 0.5 m (1.6 ft) since the device is mounted below the start of the level measuring range.
The density of the fluid is 1 g/cm^3 (1 SGU).

Prerequisite(s):
- The measured variable is in direct proportion to the pressure.
- The tank can be filled or emptied.

The values entered for "**Empty calib. (028)**/**Full calib. (031)**" and the pressure values present at the device must be at least 1% apart. The value will be rejected, and a message displayed, 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 instrument can measure correctly.

	Description	
1	Perform position adjustment. Refer to → 81.	
2	Select the "Level" measuring mode via the "**Measuring mode (005)**". Menu path: Setup → **Measuring mode (005)**	
3	Select a pressure unit via the "**Press. eng. unit (125)**" parameter, here "mbar" for example. Menu path: Setup → **Press. eng. unit (125)**	
4	Select the "In height" level mode via the "**Level selection (024)**" parameter. Menu path: Setup → Extended setup → Level → **Level selection (024)**	
5	Select a volume unit via the "**Unit before lin (025)**" parameter, here "l" (liters) for example. Menu path: Setup → Extended setup → Level → **Unit before lin (025)**	

	Description
6	Select a level unit by means of the "**Height unit (026)**" parameter, here "m" for example. Menu path: Setup → Extended setup → Level → **Height unit (026)**
7	Select the "Wet" option via the "**Calibration mode (027)**" parameter. Menu path: Setup → Extended setup → Level → **Calibration mode (027)**
8	If calibration is performed with a medium other than the process medium, enter the density of the calibration medium in the "**Adjust density (034)**" parameter, here 1 g/cm³ (1 SGU) for example. Menu path: Setup → Extended setup → Level → **Adjust density (034)**
9	The pressure for the lower calibration point is present at the device, here 0.5 m covered / 49 mbar (0.71 psi) for example.
	Enter the volume value for the lower calibration point via the "**Empty calib. (028)**" parameter, here 0 liters for example. Menu path: Setup → Extended setup → Level → **Empty calib. (028)**
10	The pressure for the upper calibration point is present at the device, here 4.5 m covered / 441 mbar (6.4 psi) for example.
	Enter the volume value for the upper calibration point via the "**Full calib. (031)**" parameter, here "1000 liters" (264 gal) for example. Menu path: Setup → Extended setup → Level → **Full calib. (031)**
11	If calibration was performed with a medium other than the process medium, specify the density of the process medium in the "**Process density (035)**" parameter. Menu path: Setup → Extended setup → Level → **Process density (035)**
12	Result: The measuring range is set for 0 to 1000 l (264 gal).

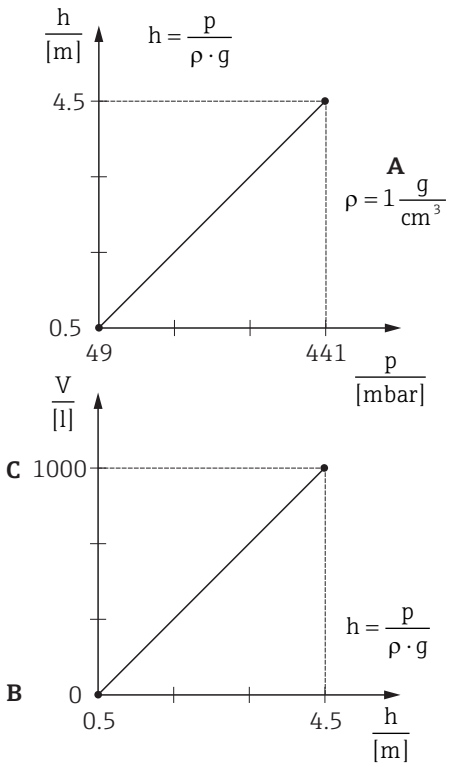


Fig. 29: Calibration with reference pressure – wet calibration

A See table, step 8.
B See table, step 9.
C See table, step 10.

The measured variables %, level, volume and mass are available for this level mode → 129 "**Unit before lin (025)**".

8.9.6 Required parameters for Level measuring mode

Parameter name	Description
Level selection (024)	→ 129
Unit before lin (025)	129
Height unit (026)	129
Calibration mode (027)	129
Empty calib. (028)	130
Empty pressure (029) ***Empty pressure (185)***	130
Empty height (030) ***Empty height (186)***	130
Full calib. (031)	130
Full pressure (187) ***Full pressure (032)***	130
Full height (033) ***Full height (188)***	130
Density unit (127)	131
Adjust density (034)	131
Process density (035)	131
Level before. lin. (019)	131

8.10 Overview of the onsite display operating menu

All parameters and their direct access code (in brackets) are listed in the following table. The page number refers to where a description of the parameter can be found.

Level 1	Level 2	Level 3	Level 4	Page
Parameters in italics cannot be edited (read only). Specific settings, such as the **Measuring mode (005)**, dry or wet calibration, or hardware locking, determine whether these parameters are displayed.				
Language (000)				→ 123
Display/Operat.	**Display mode (001)**			→ 123
	Add. disp. value (002)			→ 123
	Format 1st value (004)			→ 124
	Format ext.val. 1 (235)			→ 124
	Format ext.val. 2 (258)			→ 124
Setup	**Lin./SQRT switch (133) (Deltabar)**			→ 125
	Measuring mode (005) ***Measuring mode (182)***			→ 125
	Switch P1/P2 (163) (Deltabar)			→ 127
	High-pressure side (183) (Deltabar) ***High-pressure side (006) (Deltabar)***			→ 127
	Press. eng. unit (125)			→ 126
	Corrected press. (172)			→ 128
	Pos. zero adjust (007) (Deltabar and gauge pressure measuring cells) **Calib. offset (192)** (absolute pressure sensors)			→ 125 → 125
	Max. flow (009) ("Flow" measuring mode) (Deltabar)			→ 134
	Max. pressure flow (010) ("Flow" measuring mode) (Deltabar)			→ 134
	Empty calib. (011) ("Level" measuring mode and "**Calibration mode (027)**" = wet)			→ 130
	Full calib. (012) ("Level" measuring mode and "**Calibration mode (027)**" = wet)			→ 130
	Damping switch (164) (read only)			→ 126
	Damping value (184) ***Damping value (017)***			→ 126
	Flow (018) ("Flow" measuring mode) (Deltabar)			→ 134
	Level before. lin. (019) ("Level" measuring mode)			→ 131
	Pressure af. damp (111)			→ 128
	Extended setup	**Code definition (023)**		→ 122
		Device tag (022)		→ 123
		Ident number sel (229)		→ 135
		Operator code (021)		→ 122
		Level **(Level measuring mode)**	**Level selection (024)**	→ 129
			Unit before lin (025)	129
			Height unit (026)	129
			Calibration mode (027)	129
			Empty calib. (028)	130
			Empty pressure (029) ***Empty pressure (185)***	130
			Empty height (030) ***Empty height (186)***	130
...	...	...	**Full calib. (031)**	130

Level 1	Level 2	Level 3	Level 4	Page
... Setup	... Extended setup	... Level ("Level" measuring mode)	Full pressure (187) *Full pressure (032)*	130
			Full height (033) *Full height (188)*	130
			Density unit (127)	131
			Adjust density (034)	131
			Process density (035)	131
			Level before. lin. (019)	131
		Linearization	Lin. mode (037)	131
			Unit after lin. (038)	132
			Line numb (039)	132
			X-value (040) (manual entry) *X-value (123) (in linear/activ. table)*	132
			Y-value (041) (manual entry/in semi-auto. entry) *Y-value (194) (in linear/activ. table)*	132
			Edit table (042)	132
			Tank description (173)	132
			Tank content (043)	132
		Flow ("Flow" measuring mode) (Deltabar)	Flow type (044)	133
			Mass flow unit (045)	133
			Norm. flow unit (046)	133
			Std. flow unit (047)	133
			Flow unit (048)	134
			Max. flow (009)	134
			Max. pressure flow (010)	134
			Set low-flow cut-off (049)	134
			Flow (018)	134
		Analog input 1	Channel (171)	136
			Output value (OUT Value) (224)	136
			Status (196)	136
			Filt. time const. (197)	136
			Fail safe mode (198)	136
			Failsafe default (199)	136
		Analog input 2	Channel (230) (Cerabar/Deltapilot)	136
			Channel (231) (Deltabar)	136
			Output value (OUT Value) (201)	136
			Status (202)	136
			Filt. time const. (203)	136
			Failsafe mode (204)	136
			Failsafe default (205)	137
		Analog output 1	Failsafe time (206)	137
			Failsafe mode (207)	137
			Failsafe default (208)	137
...	...	...	Input value (209)	137

Level 1	Level 2	Level 3	Level 4	Page
… Setup	… Extended setup	… Analog output 1	Input status (220)	137
			Unit (211)	137
		Analog output 2	Failsafe time (212)	137
			Failsafe mode (213)	137
			Failsafe default (214)	138
			Input value (215)	138
			Input status (223)	138
			Unit (217)	138
		Totalizer 1 (Deltabar)	Channel (218)	138
			Eng.unit total.1 (058) (059) (060) (061)	138
			Totalizer 1 mode (175)	138
			Total. 1 failsafe (221)	138
			Total.1 value (219)	139
			Preset value (222)	139
			Totalizer 1 (261)	139
			Status (236)	139
		Totalizer 2 (Deltabar)	Eng. unit totalizer 2 (065) (066) (067) (068)	140
			Totalizer 2 mode (177)	140
			Total. 2 failsafe (178)	140
			Totalizer 2 (069)	140
			Totalizer 2 overflow (070)	140
Diagnosis	Diagnostic code (071)			140
	Last diag. code (072)			140
	Min. meas. press. (073)			140
	Max. meas. press. (074)			140
	Diagnostic list	Diagnostic 1 (075)		141
		Diagnostic 2 (076)		141
		Diagnostic 3 (077)		141
		Diagnostic 4 (078)		141
		Diagnostic 5 (079)		141
		Diagnostic 6 (080)		141
		Diagnostic 7 (081)		141
		Diagnostic 8 (082)		141
		Diagnostic 9 (083)		141
		Diagnostic 10 (084)		141
	Event logbook	Last diag. 1 (085)		141
		Last diag. 2 (086)		141
		Last diag. 3 (087)		141
		Last diag. 4 (088)		141
		Last diag. 5 (089)		141
		Last diag. 6 (090)		141
		Last diag. 7 (091)		141

Level 1	Level 2	Level 3	Level 4	Page
...	...	Last diag. 8 (092)		141
... Diagnosis	... Event logbook	Last diag. 9 (093)		141
		Last diag. 10 (094)		141
	Instrument info	**Firmware version (095)**		123
		Serial number (096)		123
		Ext. order code (097)		123
		Order code (098)		123
		Device tag (022)		123
		ENP version (099)		123
		Config. counter (100)		141
		LRL sensor (101)		134
		URL sensor (102)		134
		Ident number (225)		135
	Measured values	**Flow (018)**		134
		Level before. lin. (019)		131
		Tank content (043)		132
		Meas. pressure (020)		127
		Sensor pressure (109)		128
		Corrected press. (172)		128
		Pressure af. damp (111)		128
		Sensor temp. (110) (Cerabar/Deltapilot)		126
		Analog input 1	**Channel (171)**	136
			Output value (OUT Value) (224)	136
			Status (196)	136
		Analog input 2	**Channel (230) (Cerabar/Deltapilot)**	136
			Channel (231) (Deltabar)	136
			Output value (OUT Value) (201)	136
			Status (202)	136
		Analog output 1	**Input value (209)**	137
			Input status (220)	137
		Analog output 2	**Input value (215)**	138
			Input status (223)	138
		Totalizer 1 (Deltabar)	**Channel (218)**	138
			Totalizer 1 (261)	139
			Status (236)	139
		Totalizer 2 (Deltabar)	**Totalizer 2 (069)**	140
			Totalizer 2 overflow (070)	140
	Simulation	**Simulation mode (112)**		142
		Sim. pressure (113)		143
		Sim. flow (114) (Deltabar)		143
		Sim. level (115)		143
		Sim. tank cont. (116)		143
		Sim. error no. (118)		143

Level 1	Level 2	Level 3	Level 4	Page
	Reset	Enter reset code (124)		124
Expert	Direct access (119)			122
	System	Code definition (023)		122
		Lock switch (120)		122
		Operator code (021)		122
		Instrument info	Device tag (022)	123
			Serial number (096)	123
			Firmware version (095)	123
			Ext. order code (097)	123
			Order code (098)	123
			ENP version (099)	123
			Electr. serial no. (121)	123
			Sensor ser. no. (122)	123
		Display	Language (000)	123
			Display mode (001)	123
			Add. disp. value (002)	123
			Format 1st value (004)	124
			Format ext.val. 1 (235)	124
			Format ext.val. 2 (258)	124
		Management	Enter reset code (124)	124
			Download select.	124
	Measurement	Lin./SQRT switch (133) (Deltabar)		125
		Measuring mode (005) *Measuring mode (182)*		125
		Basic setup	Pos. zero adjust (007) (Deltabar and gauge pressure measuring cells)	125
			Calib. offset (192) Calib. offset (008)	125
			Damping switch (164) (read only)	126
			Damping value (184) *Damping value (017)*	126
			Press. eng. unit (125)	126
			Temp. eng. unit. (126) (Cerabar/ Deltapilot)	126
			Sensor temp. (110) (Cerabar/ Deltapilot)	126
		Pressure	Switch P1/P2 (163) (Deltabar)	127
			High-pressure side (183) (Deltabar) *High-pressure side (006) (Deltabar)*	127
			Meas. pressure (020)	127
			Sensor pressure (109)	128
			Corrected press. (172)	128
			Pressure af. damp (111)	128
		Level	Level selection (024)	129
			Unit before lin (025)	129
			Height unit (026)	129

Level 1	Level 2	Level 3	Level 4	Page
			Calibration mode (027)	129
...	...	...	Empty calib. (028)	130
... Expert	... Measurement	... Level	Empty pressure (185) *Empty pressure (029)*	130
			Empty height (030) *Empty height (186)*	130
			Full calib. (031)	130
			Full pressure (187) *Full pressure (032)*	130
			Full height (033) *Full height (188)*	130
			Density unit (127)	131
			Adjust density (034)	131
			Process density (035)	131
			Level before. lin. (019)	131
		Linearization	Lin. mode (037)	131
			Unit after lin. (038)	132
			Line numb (039)	132
			X-value (040) (manual entry) *X-value (123) (in linear/activ. table)*	132
			Y-value (041) (manual entry/in semi-auto. entry) *Y-value (194) (in linear/activ. table)*	132
			Edit table (042)	132
			Tank description (173)	132
			Tank content (043)	132
		Flow (Deltabar)	Flow type (044)	133
			Mass flow unit (045)	133
			Norm. flow unit (046)	133
			Std. flow unit (047)	133
			Flow unit (048)	134
			Max. flow (009)	134
			Max. pressure flow (010)	134
			Set low-flow cut-off (049)	134
			Flow (018)	134
		Sensor limits	LRL sensor (101)	134
			URL sensor (102)	134
		Sensor trim	Lo trim measured (129)	135
			Hi trim measured (130)	135
			Lo trim sensor (131)	135
			Hi trim sensor (132)	135
	Communication	PB-PA Info	Ident number (225)	135
			Profile revision (227)	135
		PB-PA Config	Addressing (228)	135
			Bus address (233)	135
			Ident number sel (229)	135

Level 1	Level 2	Level 3	Level 4	Page
			Cond.status diag (234)	135
...	...	Analog input 1	Channel (171)	→ 136
... Expert	... Communication	... Analog input 1	Output value (OUT Value) (224)	136
			Status (196)	136
			Filt. time const. (197)	136
			Fail safe mode (198)	136
			Failsafe default (199)	136
		Analog input 2	Channel (230) (Cerabar/Deltapilot)	136
			Channel (231) (Deltabar)	136
			Output value (OUT Value) (201)	136
			Status (202)	136
			Filt. time const. (203)	136
			Failsafe mode (204)	136
			Failsafe default (205)	137
		Analog output 1	Failsafe time (206)	137
			Failsafe mode (207)	137
			Failsafe default (208)	137
			Input value (209)	137
			Input status (220)	137
			Unit (211)	137
		Analog output 2	Failsafe time (212)	137
			Failsafe mode (213)	137
			Failsafe default (214)	138
			Input value (215)	138
			Input status (223)	138
			Unit (217)	138
		Totalizer 1 (Deltabar)	Channel (218)	138
			Eng.unit total.1 (058) (059) (060) (061)	138
			Totalizer 1 mode (175)	→ 138
			Total. 1 failsafe (221)	138
			Total.1 value (219)	139
			Preset value (222)	139
			Totalizer 1 (261)	139
			Status (236)	139
	Application	Electr. Delta P (158) (Cerabar / Deltapilot)		→ 139
		Fixed ext. value (174) (Cerabar / Deltapilot)		→ 139
		Ext. val. 2 (259)		→ 139
		Ext. val. 2 status (260)		→ 139
		Totalizer 2 (Deltabar)	Eng. unit totalizer 2 (065) (066) (067) (068)	140
			Totalizer 2 mode (177)	140
			Total. 2 failsafe (178)	140
			Totalizer 2 (069)	140

Level 1	Level 2	Level 3	Level 4	Page
			Totalizer 2 overflow (070)	140
	Diagnosis	**Diagnostic code (071)**		140
...	...	**Last diag. code (072)**		140
... Expert	... Diagnosis	**Reset logbook (159)**		140
		Min. meas. press. (073)		140
		Max. meas. press. (074)		140
		Reset peak hold (161)		141
		"Alarm behav. P (050)"		141
		Operating hours (162)		141
		Config. counter (100)		141
		Diagnostic list	Diagnostic 1 (075)	141
			Diagnostic 2 (076)	141
			Diagnostic 3 (077)	141
			Diagnostic 4 (078)	141
			Diagnostic 5 (079)	141
			Diagnostic 6 (080)	141
			Diagnostic 7 (081)	141
			Diagnostic 8 (082)	141
			Diagnostic 9 (083)	141
			Diagnostic 10 (084)	141
		Event logbook	Last diag. 1 (085)	141
			Last diag. 2 (086)	141
			Last diag. 3 (087)	141
			Last diag. 4 (088)	141
			Last diag. 5 (089)	141
			Last diag. 6 (090)	141
			Last diag. 7 (091)	141
			Last diag. 8 (092)	141
			Last diag. 9 (093)	141
			Last diag. 10 (094)	141
		Simulation	**Simulation mode (112)**	142
			Sim. pressure (113)	143
			Sim. flow (114) (Deltabar)	143
			Sim. level (115)	143
			Sim. tank cont. (116)	143
			Sim. error no. (118)	143

8.11 Parameter description

This section describes the parameters in the order they are arranged in the "Expert" operating menu.

Expert

Parameter name	Description
Direct access (119) Entry	Enter the direct access code to go directly to a parameter. **Options:** ▪ A number between 0 and 999 (only valid entries are recognized) **Factory setting:** 0 **Note:** For direct access, it is not necessary to enter leading zeros.

8.11.1 System

Expert → System

Parameter name	Description
Code definition (023) Entry	Use this function to enter an access code with which the device can be unlocked. **Options:** ▪ A number from 0 to 9999 **Factory setting:** 0
Lock switch (120) Display	Displays the status of DIP switch 1 (on) on the electronic insert. You can lock or unlock parameters relevant to the measured value with DIP switch 1. If operation is locked by means of the "**Operator code (021)**" parameter, you can only unlock operation again by means of this parameter. **Display:** ▪ On (locking switched on) ▪ Off (locking switched off) **Factory setting:** Off (locking switched off)
Operator code (021) Entry	Use this function to enter a code to lock or unlock operation. **Options:** ▪ To lock: Enter a number ≠ the release code. ▪ To unlock: Enter the access code. The release code is "0" in the order configuration. Another release code can be defined in the "**Code definition (023)**" parameter. If the user has forgotten the release code, it can be made visible again by entering the number sequence "5864". **Factory setting:** 0

Expert → System → Instrument info

Parameter name	Description
Device tag (022) Entry	Enter device tag (max. 32 alphanumeric characters). **Factory setting** According to order specifications
Serial number (096) Display	Displays the serial number of the device (11 alphanumeric characters).
Firmware version (095) Display	Displays the firmware version.
Ext. order code (097) Display	Displays the extended order code (max. 60 alphanumeric characters). **Factory setting** According to order specifications
Order code (098) Display	Displays the order code (max. 20 alphanumeric characters). **Factory setting** According to order specifications
ENP version (099) Display	Displays the ENP version (ENP = electronic nameplate)
Electr. serial no. (121) Display	Displays the serial number of the main electronics (11 alphanumeric characters).
Sensor ser. no. (122) Display	Displays the serial number of the sensor (11 alphanumeric characters).

Expert → System → Display

Parameter name	Description
Language (000) Options	Select the language for the onsite display. **Options:** ▪ English ▪ One further language (language of the manufacturing plant) ▪ Possibly another language (as selected when ordering the device) **Factory setting**: English
Display mode (001) Options	Specify the display mode for the onsite display during operation. **Options:** ▪ Main value only (value+bar graph) ▪ Ext. value 1 only (value+status) ▪ All alternating (main value+secondary value+Ext. value 1+Ext. value 2) Ext. value 1 and Ext. value 2 are only displayed if the PLC sends these values to the device via the analog input blocks. **Factory setting:** Main value only
Add. disp. value (002) Options	Specify the contents for the second value in the alternating display mode in measuring mode. **Options:** ▪ No value ▪ Pressure ▪ Measured value(%) ▪ Totalizer 1 (Deltabar M) ▪ Totalizer 2 (Deltabar M) ▪ Temperature (Cerabar/Deltapilot) The options depend on the measuring mode chosen. **Factory setting:** No value

Parameter name	Description
Format 1st value (004) Options	Specify the number of places after the decimal point for the value displayed in the main line for the primary value. **Options:** ▪ Auto ▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx ▪ x.xxxxx **Factory setting:** Auto
Format ext.val. 1 (235) Options	Specify the number of places after the decimal point for the value displayed in the main line for the external value 1. **Options:** ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx ▪ x.xxxxx **Factory setting:** x.x
Format ext.val. 2 (258) Options	Specify the number of places after the decimal point for the value displayed in the main line for the external value 2. **Options:** ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx ▪ x.xxxxx **Factory setting:** x.x

Expert → System → Management

Parameter name	Description
Enter reset code (124) Entry	Reset parameters completely or partially to the factory values or order configuration by entering a reset code, → 50, "Resetting to factory settings (reset)". **Factory setting:** 0
Download select. Display	Select the data records for the upload/download function in Fieldcare and PDM. **Prerequisite(s):** DIP switch to the "SW" setting and "Damping" to "On". A download with the "Configuration copy" factory setting causes the device to download all the parameters required for a measurement. The "Electronics replacement" setting only takes effect if an appropriate release code is entered in the "Operator code" parameter. **Options:** ▪ Configuration copy: With this option, general configuration parameters are overwritten except for the serial number, order number, calibration, position adjustment, application and tag information. ▪ Device replacement: This option overwrites general configuration parameters with the exception of the serial number, order number, calibration and position adjustment. ▪ Electronics replacement: This option overwrites general configuration parameters. **Factory setting:** Configuration copy

8.11.2 Measurement

Expert → Measurement

Parameter name	Description
Lin./SQRT switch (133) (Deltabar) Display	Displays the status of DIP switch 4 on the electronic insert, which is used to define the output characteristics of the current output. **Display:** ▪ SW setting The output characteristic depends on the measuring mode; default = "linear". ▪ Square root The flow measurement is active and the square root signal is used. **Factory setting** SW setting
Measuring mode (005) Measuring mode (182) Options	Select the measuring mode. The operating menu is structured according to the selected measuring mode. **⚠ 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 and, if necessary, reconfigured! **Options:** ▪ Pressure ▪ Level ▪ Flow (Deltabar M only) **Factory setting** Pressure or according to order specifications

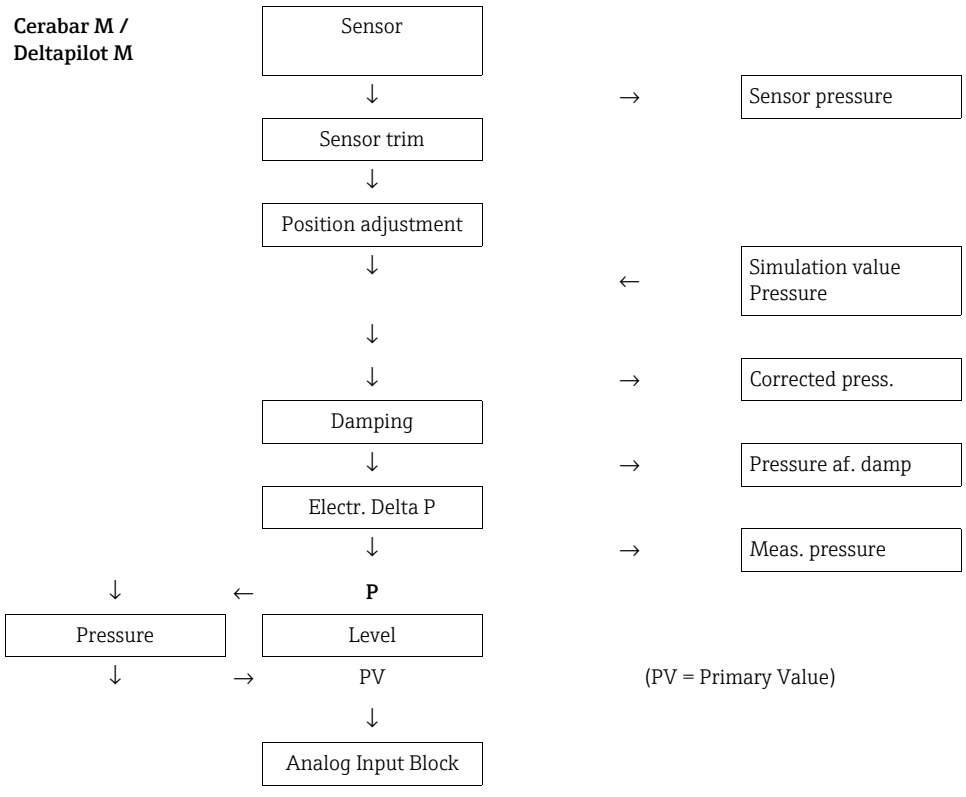
Expert → Measurement → Basic setup

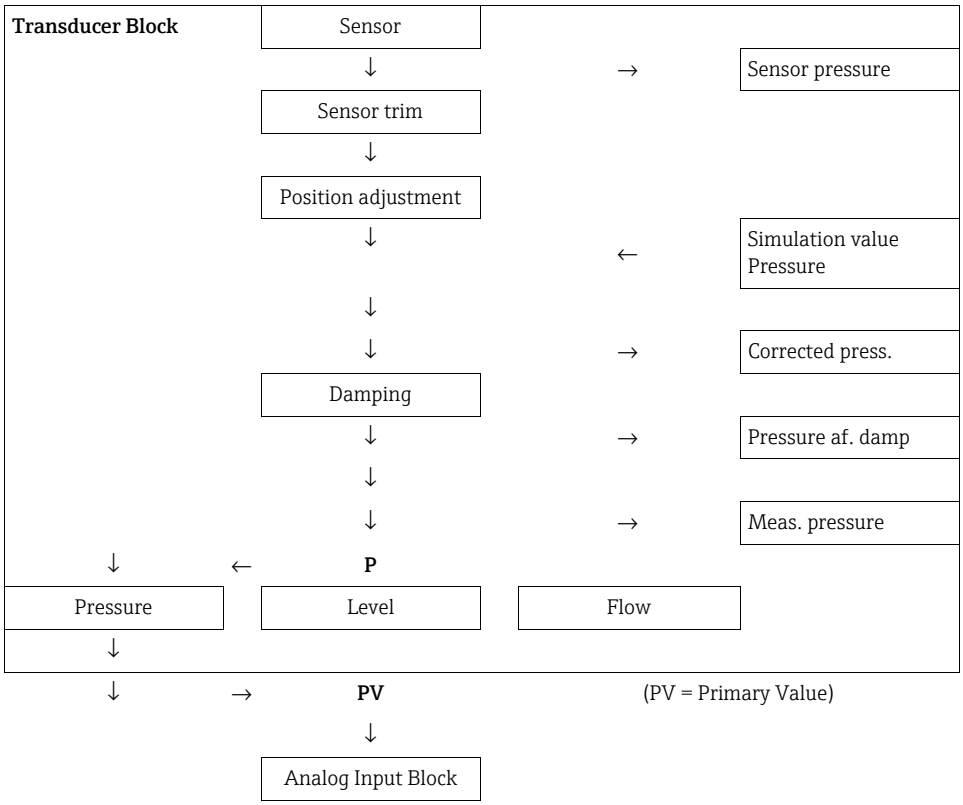
Parameter name	Description
Pos. zero adjust (007) (Deltabar and gauge pressure measuring cells) Options	Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. **Example:** – Measured value = 2.2 mbar (0.032 psi) – Correct the measured value via the "**Pos. zero adjust (007) (Deltabar and gauge pressure measuring cells)**" 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 **Options** ▪ Confirm ▪ Abort **Factory setting:** Abort
Calib. offset (192) Calib. offset (008) Entry	Position adjustment – the pressure difference between the set point and the measured pressure must be known. **Example:** – Measured value = 982.2 mbar (14.25 psi) – You correct the measured value with the value entered (e.g. 2.2 mbar (0.032 psi)) via the "**Calib. offset (192)**" parameter. This means that you are assigning the value 980.0 (14.21 psi) to the pressure present. – Measured value (after pos. zero adjust) = 980.0 mbar (14.21 psi) **Factory setting:** 0.0

Parameter name	Description
Damping switch (164) Display	Displays the switch position of DIP switch 2 which is used to switch the damping of the output signal on and off. **Display:** ▪ Off The output signal is not damped. ▪ On The output signal is damped. The attenuation constant is specified in the "**Damping value (184)**" parameter **Factory setting** On
Damping value (017) **Damping value (184)** Entry	Enter damping time (time constant τ). The damping affects the speed at which the measured value reacts to changes in pressure. **Input range:** 0.0 to 999.0 s **Factory setting:** 2.0 or as per order specifications
Press. eng. unit (125) Options	Select the pressure unit. If a new pressure unit is selected, all pressure-specific parameters are converted and displayed with the new unit. **Options:** ▪ mbar, bar ▪ mmH2O, mH2O ▪ inH2O, ftH2O ▪ Pa, kPa, MPa ▪ psi ▪ mmHg, inHg ▪ kgf/cm^2 **Factory setting:** mbar or bar depending on the nominal measuring range of the sensor, or as per order specifications
Temp. eng. unit. (126) (Cerabar/Deltapilot) Options	Select the unit for the temperature measured values.  The setting affects the unit for the "**Sensor temp. (110)**" parameter. **Options:** ▪ °C ▪ °F ▪ K **Factory setting:** °C
Sensor temp. (110) (Cerabar/Deltapilot) Display	Displays the temperature currently measured in the sensor. This can deviate from the process temperature.

Expert → Measurement → Pressure

Parameter name	Description
Switch P1/P2 (163) (Deltabar) Display	Indicates whether the "SW/P2 High" DIP switch (DIP switch 5) is switched on. The "SW/P2 High" DIP switch determines which pressure input corresponds to the high-pressure side. **Display:** ▪ SW setting "SW/P2 High" is switched off: The "**High-pressure side (183)** (Deltabar)" parameter determines which pressure input corresponds to the high-pressure side. ▪ P2 High "SW/P2 High" is switched on: Pressure input P2 corresponds to the high-pressure side, independent of the setting in the "**High-pressure side (183)** (Deltabar)" parameter. **Factory setting:** SW setting
High-pressure side (006) (Deltabar) **High-pressure side (183)** (Deltabar) Options	Determines, which pressure input corresponds to the high-pressure side. This setting is only valid if the "SW/P2 High" DIP switch is switched off (see "Switch P1/P2 (163) (Deltabar)" parameter). Otherwise P2 corresponds to the high-pressure side in any case. **Options:** ▪ P1 High: Pressure input P1 is the high-pressure side ▪ P2 High: Pressure input P2 is the high-pressure side **Factory setting** P1 High
Meas. pressure (020) Display	Displays the measured pressure after sensor trim, position adjustment and damping.



Parameter name	Description
	Deltabar M 
Sensor pressure (109) Display	Displays the measured pressure before sensor trim and position adjustment.
Corrected press. (172) Display	Displays the measured pressure after the sensor trim and position adjustment.
Pressure af. damp (111) Display	Displays the measured pressure after sensor trim, position adjustment and damping.

Expert → Measurement → Level

Parameter name	Description
Level selection (024) Options	Select the method for calculating the level **Options:** ▪ In pressure If this option is selected, specify two pressure/level value pairs. The level value is displayed directly in the unit that you select via the "**Unit before lin (025)**" parameter. ▪ In height If this option is selected, specify two height/level value pairs. From the measured pressure, the device first calculates the height using the density. This information is then used to calculate the level in the "**Unit before lin (025)**" selected using the two value pairs specified. **Factory setting:** In pressure
Unit before lin (025) Options	Select the unit for the measured value display for the level before linearization.  The selected unit is used only to describe the measured value. This means that the measured value is not converted when a new output unit is selected. **Example:** ▪ Current measured value: 0.3 ft ▪ New output unit: m ▪ New measured value: 0.3 m **Options** ▪ % ▪ mm, cm, dm, m ▪ ft, in ▪ m^3, in^3 ▪ l, hl ▪ ft^3 ▪ gal, Igal ▪ kg, t ▪ lb **Factory setting:** %
Height unit (026) Options	Select height unit. The measured pressure is converted to the selected height unit using the "**Adjust density (034)**" parameter. **Prerequisite(s)** "**Level selection (024)**" = In height **Options** ▪ mm ▪ m ▪ in ▪ ft **Factory setting:** m
Calibration mode (027) Options	Select the calibration mode. **Options:** ▪ Wet Wet calibration takes place by filling and emptying the container. In the case of two different levels, the level, volume, mass or percentage value entered is assigned to the pressure measured at this point in time "(**Empty calib. (028)**" and "**Full calib. (031)**" parameters). ▪ Dry Dry calibration is a theoretical calibration. For this calibration, you specify two pressure/level value pairs or height/level value pairs via the following parameters: "**Empty calib. (028)**", "**Empty pressure (029)**", "**Full calib. (031)**", "**Full pressure (032)**", "**Empty height (030)**", "**Full height (033)**". **Factory setting:** Wet

Parameter name	Description
Empty calib. (028) **Empty calib. (011)** Entry	Enter the output value for the lower calibration point (tank empty). The unit defined in "**Unit before lin (025)**" must be used.  ▪ In the case of wet calibration, the level (tank empty) must actually be available. The associated pressure is then automatically recorded by the device. ▪ In the case of dry calibration, the level (tank empty) does not have to be available. The associated pressure has to be entered in the "**Empty pressure (029)**" parameter for the "In pressure" level selection. The associated height has to be entered in the "**Empty height (030)**" parameter for the "In height" level selection. **Factory setting:** 0.0
Empty pressure (029) **Empty pressure (185)** Entry/Display	Enter the pressure value for the lower calibration point (tank empty). → See also "**Empty calib. (028)**". **Prerequisite(s)** ▪ "**Level selection (024)**" = In pressure ▪ "**Calibration mode (027)**" = Dry -> Entry ▪ "**Calibration mode (027)**" = Wet -> Display **Factory setting:** 0.0
Empty height (030) **Empty height (186)** Entry/Display	Enter the height value for the lower calibration point (tank empty). Select the unit via the "**Height unit (026)**" parameter. **Prerequisite(s):** ▪ "**Level selection (024)**" In height ▪ "**Calibration mode (027)**" = Dry -> Entry ▪ "**Calibration mode (027)**" = Wet -> Display **Factory setting:** 0.0
Full calib. (031) **Full calib. (012)** Entry	Enter the output value for the upper calibration point (tank full). The unit defined in "**Unit before lin (025)**" must be used.  ▪ In the case of wet calibration, the level (tank full) must actually be available. The associated pressure is then automatically recorded by the device. ▪ In the case of dry calibration, the level (tank full) does not have to be available. The associated pressure has to be entered in the "**Full pressure (032)**" parameter for the "In pressure" level selection. The associated height has to be entered in the "**Full height (033)**" parameter for the "In height" level selection. **Factory setting:** 100.0
Full pressure (032) **Full pressure (187)** Entry/Display	Enter the pressure value for the upper calibration point (tank full). → See also "**Full calib. (031)**". **Prerequisite(s)** ▪ "**Level selection (024)**" = In pressure ▪ "**Calibration mode (027)**" = Dry -> Entry ▪ "**Calibration mode (027)**" = Wet -> Display **Factory setting:** Upper-range limit (URL) of the sensor
Full height (033) **Full height (188)** Entry/Display	Enter the height value for the upper calibration point (tank full). Select the unit via the "**Height unit (026)**" parameter. **Prerequisite(s):** ▪ "**Level selection (024)**" = In height ▪ "**Calibration mode (027)**" = Dry -> Entry ▪ "**Calibration mode (027)**" = Wet -> Display **Factory setting:** Upper-range limit (URL) is converted to a level unit

Parameter name	Description
Density unit (127) Display	Displays the density unit. The measured pressure is converted to a height using the "**Height unit (026)**" and "**Adjust density (034)**" parameters. **Factory setting:** g/cm³
Adjust density (034) Entry	Enter the density of the medium with which the adjustment is to be carried out. The measured pressure is converted to a height using the "**Height unit (026)**" and "**Adjust density (034)**" parameters. **Factory setting:** 1.0
Process density (035) Entry	Enter a new density value for density correction. The calibration was carried out with the medium water, for example. Now the container is to be used for another medium with another density. The calibration is corrected appropriately by entering the new density value in the "**Process density (035)**" parameter.  If you change to dry calibration after completing a wet calibration using the "**Calibration mode (027)**" parameter, the density for the "**Adjust density (034)**" and "**Process density (035)**" parameters must be entered correctly before changing the calibration mode. **Factory setting:** 1.0
Level before. lin. (019) Display	Displays the level value before the linearization table.

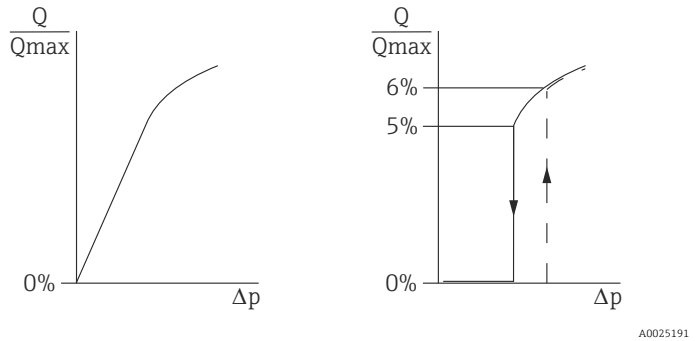
Expert → Measurement → Linearization

Parameter name	Description
Lin. mode (037) Options	Select the linearization mode. **Options:** ▪ Linear: The level is output without being converted beforehand. "**Level before. lin. (019)**" is output. ▪ Erase table: The existing linearization table is cleared. ▪ Manual entry (sets the table to edit mode, an alarm is output): The value pairs of the table ("**X-value (040) (manual entry)**" and "**Y-value (041) (manual entry/in semi-auto. entry)**") are entered manually. ▪ Semiautomatic entry (sets the table to the edit mode, an alarm is output): The container is emptied or filled in stages in this entry mode. The device records the level value automatically ("**X-value (040) (manual entry)**"). The associated volume, mass or % value is entered manually ("**Y-value (041) (manual entry/in semi-auto. entry)**"). ▪ Activate table The table entered is activated and checked with this option. The device shows the level after linearization. **Factory setting:** Linear

Parameter name	Description
Unit after lin. (038) Options	Select the unit of the level value after linearization (unit of the Y-value). **Options:** ▪ % ▪ cm, dm, m, mm ▪ hl ▪ in^3, ft^3, m^3 ▪ l ▪ in, ft ▪ kg, t ▪ lb ▪ gal ▪ Igal **Factory setting:** %
Line numb (039) Entry	Enter the number of the current point in the table. The subsequent entries in "**X-value (040) (manual entry)**" and "**Y-value (041) (manual entry/in semi-auto. entry)**" refer to this point. **Input range:** 1 to 32
X-value (040) (manual entry) **X-value (123) (in linear/ activ. table)** **X-value (193) (in semi-auto. entry)** Entry/Display	Enter "**X-value (040) (manual entry)**" (level before linearization) for the specific point in the table and confirm.  ▪ If "**Lin. mode (037)**" = "Manual entry", the level value must be entered. ▪ If "**Lin. mode (037)**" = "Semi-auto. entry", the level value is displayed and must be confirmed by entering the associated Y-value.
Y-value (041) (manual entry/in semi-auto. entry) **Y-value (194) (in linear/ activ. table)** Entry/Display	Enter the "**Y-value (041) (manual entry/in semi-auto. entry)**" (value after linearization) for the specific point in the table. The unit is determined by "**Unit after lin. (038)**".  The linearization table must be monotonic (increasing or decreasing).
Edit table (042) Options	Select the function for entering the table. **Options:** ▪ Next point: The "Line numb." parameter is incremented by 1. The next point can be entered. ▪ Current point: stay on the current point to correct a mistake for example. ▪ Previous point: The "Line numb." parameter is decremented by 1. The previous point can be corrected/entered again. ▪ Insert point: Insert an additional point (see example below). ▪ Delete point: Delete the current point (see example below). **Example:** Add a point - in this case between the 4th and 5th point for example – Select point 5 via the "**Line numb (039)**" parameter. – Select the "Insert point" option via the "**Edit table (042)**" parameter. – Point 5 is displayed for the "**Line numb (039)**" parameter. Enter new values for the "**X-value (040) (manual entry)**" and "**Y-value (041) (manual entry/in semi-auto. entry)**" parameters. **Example:** Delete a point - in this case the 5th point for example – Select point 5 via the "**Line numb (039)**" parameter. – Select the "Delete point" option via the "**Edit table (042)**" parameter. – The 5th point is deleted. All of the subsequent points are moved up one number i.e. following deletion, the 6th point becomes Point 5. **Factory setting:** Current point
Tank description (173) Entry	Enter the tank description (max. 32 alphanumeric characters)
Tank content (043) Display	Displays the level value after linearization

Expert → Measurement → Flow (Deltabar M)

Parameter name	Description
Flow type (044) Options	Select the flow type. **Options:** ▪ Volume operat. cond. (volume under operating conditions) ▪ Volume norm. cond. (normal volume under normal conditions in Europe: 1013.25 mbar and 273.15 K (0 °C)) ▪ Volume std. cond. (standard volume under standard conditions in the USA: 1013.25 mbar (14.7 psi) and 288.15 K (15 °C/59 °F)) ▪ Mass ▪ Flow in % **Factory setting:** Volume operat. conditions
Mass flow unit (045) Options	Select the mass flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow mode (flow-meas. type). When the flow mode is changed, conversion is not possible. **Prerequisite(s):** ▪ "Flow type" (044) = Mass **Options:** ▪ g/s, kg/s, kg/min, kg/h ▪ t/s, t/min, t/h, t/d ▪ oz/s, oz/min ▪ lb/s, lb/min, lb/h ▪ ton/s, ton/min, ton/h, ton/d **Factory setting:** kg/s
Norm. flow unit (046) Options	Select norm. volume flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow mode (flow-meas. type). When the flow mode is changed, conversion is not possible. **Prerequisite(s):** ▪ "Flow type" (044) = Volume norm. cond. **Options:** ▪ Nm^3/s, Nm^3/min, Nm^3/h, Nm^3/d **Factory setting:** Nm^3/s
Std. flow unit (047) Options	Select standard volume flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow mode (flow-meas. type). When the flow mode is changed, conversion is not possible. **Prerequisite(s):** ▪ "Flow type" (044) = Volume std. cond. **Options:** ▪ Sm^3/s, Sm^3/min, Sm^3/h, Sm^3/d ▪ SCFS, SCFM, SCFH, SCFD **Factory setting:** Sm^3/s

Parameter name	Description
Flow unit (048) Options	Select volume flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow mode (flow-meas. type). When the flow mode is changed, conversion is not possible. **Prerequisite(s):** ▪ "Flow type" (044) = Volume operat. cond. **Options:** ▪ dm^3/s, dm^3/min, dm^3/h ▪ m^3/s, m^3/min, m^3/h, m^3/d ▪ l/s, l/min, l/h ▪ hl/s, hl/min, hl/d ▪ ft^3/s, ft^3/min, ft^3/h, ft^3/d ▪ ACFS, ACFM, ACFH, ACFD ▪ ozf/s, ozf/min ▪ gal/s, gal/min, gal/h, gal/d, Mgal/d ▪ Igal/s, Igal/min, Igal/h ▪ bbl/s, bbl/min, bbl/h, bbl/d **Factory setting:** m^3/h
Max. flow (009) Entry	Enter maximum flow of primary device. See also layout sheet of primary device. The maximum flow is assigned to the maximum pressure which you enter via the "Max. pressure flow" (010) parameter. **Factory setting:** 100.0
Max. pressure flow (010) Entry	Enter maximum pressure of primary device. → See layout sheet of primary device. This value is assigned to the maximum flow value (→ See "**Max. flow (009)**"). **Factory setting:** Upper-range limit (URL) of the sensor
Set low-flow cut-off (049) Entry	Enter switch-on point of the flow-flow cut-off. The hysteresis between the switch-on point and the switch-off point is always 1% of the maximum flow value. **Input range:** Switch-off point: 0 to 50% of end flow value ("**Max. flow (009)**").  **Factory setting:** 5 % (of the maximum flow value)
Flow (018) Display	Displays the present flow value.

Expert → Measurement → Sensor limits

Parameter name	Description
LRL sensor (101) Display	Displays the lower-range limit of the sensor.
URL sensor (102) Display	Displays the upper range limit of the sensor.

Expert → Measurement → Sensor trim

Parameter name	Description
Lo trim measured (129) Display	Displays the reference pressure present to be accepted for the lower calibration point.
Hi trim measured (130) Display	Displays the reference pressure present to be accepted for the upper calibration point.
Lo trim sensor (131) Display	Internal service parameter.
Hi trim sensor (132) Display	Internal service parameter.

8.11.3 Communication

Expert → Communication → PROFIBUS PA Info

Parameter name	Description
Ident number (225) Display	Displays the set identification number.
Profile revision (227) Display	Displays the profile version of the device.

Expert → Communication → PROFIBUS PA conf

Parameter name	Description
Addressing (228) Display	Displays the addressing mode: via hardware (DIP switch) or software. **Factory setting:** Software
Bus address (233) Display	Displays the set bus address. **Factory setting:** 126
Ident number sel (229) Options	Use this function to enter the identification number of the device. For additional information, see section 6.4.4. **Options:** ▪ Auto ident number: Adaptation mode of the device ▪ Profile: 0x9700 ▪ Manufacturer-specific: 0x1553 (Cerabar), 0x1554 (Deltabar), 0x1555 (Deltapilot) ▪ Compatibility mode: 0x151C (Cerabar), 0x1503 (Deltapilot) **Factory setting:** Auto ident number
Cond.status diag (234) Display/options	Displays whether "Condensed status" or "Classic status" is set. For additional information, see → section 6.4.4. **Factory setting:** Condensed status

Expert → Communication → Analog input 1

Parameter name	Description
Channel (171) Display	Displays the Transducer Block measured variable that is used. **Factory setting:** Primary value
Output value (OUT Value) (224) Display	Displays the output value (Out Value) of the Analog Input 1 Block.
Status (196) Display	Displays the output status (Out Status) of the Analog Input 1 Block.
Filt. time const. (197) Entry	Use this function to enter the damping time of the Analog Input 1 Block. **Factory setting:** 0.0 sec.
Fail safe mode (198) Options	Specifies the output value of the Analog Input 1 in case of an error. Refer to → section 6.4.4. **Options:** ▪ Failsafe value ▪ Last valid out val. ▪ Status BAD **Factory setting:** Last valid out val.
Failsafe default (199) Entry	Substitute value in case of an error. **Prerequisite(s):** ▪ "**Fail safe mode (198)**" = Failsafe value **Factory setting:** 0.0

Expert → Communication → Analog input 2

Parameter name	Description
Channel (230) (Cerabar/ Deltapilot) **Channel (231) (Deltabar)** Options	Select the Transducer Block measured variable to be used. **Options:** ▪ Totalizer 2 (Deltabar) ▪ **Level before. lin. (019)** ▪ Pressure ▪ Temperature (Cerabar/Deltapilot) **Factory setting:** Pressure
Output value (OUT Value) (201) Display	Output value (Out Value) of the Analog Input 2 Block.
Status (202) Display	Output status (Out Status) of the Analog Input 2 Block.
Filt. time const. (203) Entry	Use this function to enter the damping time of the Analog Input 2 Block. **Factory setting:** 0.0 sec.
Failsafe mode (204) Options	Specifies the output value of the Analog Input 2 in case of an error. **Options:** ▪ Failsafe value ▪ Last valid out val. ▪ Status BAD **Factory setting:** Last valid out val.

Parameter name	Description
Failsafe default (205) Entry	Substitute value in case of an error. **Prerequisite(s):** ▪ "**Failsafe mode (204)**" = Failsafe value **Factory setting:** 0.0

Expert → Communication → Analog output 1

Parameter name	Description
Failsafe time (206) Options	Use this function to enter the damping time of the Analog output 1 Block. **Factory setting:** 0.0 sec.
Failsafe mode (207) Options	Specifies the output value of the Analog output 1 in case of an error. **Options:** ▪ Failsafe value ▪ Last valid out val. ▪ Status BAD **Factory setting:** Last valid out val.
Failsafe default (208) Entry	Substitute value in case of an error. **Prerequisite(s):** ▪ "**Failsafe mode (207)**" = Failsafe value **Factory setting:** 0.0
Input value (209) Display	Displays the value that is sent to the device.
Input status (220) Display	Displays the status that is sent to the device.
Unit (211) Options	Use this function to enter the unit for the value that is sent to the device. **Options:** ▪ % ▪ Pressure units ▪ Flow units ▪ Level units ▪ Temperature units ▪ Unknown **Factory setting:** Unknown

Expert → Communication → Analog output 2

Parameter name	Description
Failsafe time (212) Options	Enter the damping time of the Analog output 2 Block. **Factory setting:** 0.0 sec.
Failsafe mode (213) Options	Specifies the output value of the Analog output 2 in the event of an error. **Options:** ▪ Failsafe value ▪ Last valid out val. ▪ Status BAD **Factory setting:** Last valid out val.

Parameter name	Description
Failsafe default (214) Entry	Substitute value in case of an error. **Prerequisite(s):** ▪ "**Failsafe mode (213)**" = Failsafe value **Factory setting:** 0.0
Input value (215) Display	Displays the value that is sent to the device.
Input status (223) Display	Displays the status that is sent to the device.
Unit (217) Options	Use this function to enter the unit for the value that is sent to the device. **Options:** ▪ Pressure units, temperature units

Expert → Communication → Totalizer 1 (Deltabar)

With the "Flow in %" flow type setting, the totalizer is not available and is not displayed at this position.

Parameter name	Description
Channel (218) Display	Displays the measured variable that is used as input value for the channel. **Factory setting:** Flow
Eng.unit total.1 (058) (059) (060) (061) Options	Select the unit for totalizer 1. **Options** Depending on the setting in the "**Flow type (044)**" (→ 133) parameter, this parameter offers a list of volume, normal volume, standard volume and mass units. When a new volume or mass unit is selected, totalizer-specific parameters are converted and displayed with the new unit within a unit group. When the flow mode is changed, the totalizer value is not converted. The direct access code depends on the selected "**Flow type (044)**": – (058): Flow-meas. type "Mass" – (059): Flow-meas. type "Volume norm. cond." – (060): Flow-meas. type "Volume std. cond." – (061): Flow-meas. type "Volume operat. cond." **Factory setting:** m^3 (Flow-meas. type "Volume operat. cond.")
Totalizer 1 mode (175) Options	Define the behavior of the totalizer. **Options:** ▪ Balanced: Integration of all measured flows (positive and negative). ▪ Pos. flow only: only positive flows are integrated. ▪ Neg. flow only: only negative flows are integrated. ▪ Hold: The totalizer is stopped and keeps its current value. **Factory setting:** Pos. flow only
Total. 1 failsafe (221) Options	Set the failsafe mode of the totalizer. **Options:** ▪ Actual value (It is integrated continuously with the current flow value) ▪ Hold (stop the totalizer) ▪ Memory (the totalizer continues running with the last valid value) **Factory setting:** Actual value

Parameter name	Description
Total.1 value (219) Options	Set the totalizer to zero or a predefined value. **Options:** ▪ Totalize (normal function of the totalizer) ▪ Reset (totalizer is reset to zero) ▪ Preset (totalizer is set to a predefined value) (see "**Preset value (222)**").) **Factory setting:** Totalize
Preset value (222) Entry	Value for setting the totalizer to a predefined value, see "Preset" option of "**Total.1 value (219)**". **Factory setting:** 0.0
Totalizer 1 (261) Display	Displays the totalizer value.
Status (236) Display	Displays the totalizer status.

8.11.4 Application

Expert → Application (Cerabar M and Deltapilot M)

Parameter name	Description
Electr. Delta P (158) (Cerabar / Deltapilot) Options	This function activates the electr. delta P application with an external or constant value. **Options:** ▪ Off ▪ Ext. value 2 ▪ Constant **Factory setting:** Off
Fixed ext. value (174) (Cerabar / Deltapilot) Entry	Use this function to enter the constant value for the electr. delta P application. The value refers to "**Press. eng. unit (125)**" **Factory setting:** 0.0
Ext. val. 2 (259) Display	Displays the PROFIBUS input value 2 (Analog Output 2).
Ext. val. 2 status (260) Display	Displays the status of the PROFIBUS input value 2 (Analog Output 2).

Expert → Application → Totalizer 2 (Deltabar M)

With the "Flow in %" flow type setting, the totalizer is not available and is not displayed at this position.

Parameter name	Description
Eng. unit totalizer 2 (065) (066) (067) (068) Options	Select the unit for totalizer 2. The direct access code depends on the selected "**Flow type (044)**": – (065): Flow-meas. type "Mass" – (066): Flow-meas. type "Gas norm. cond." – (067): Flow-meas. type "Gas. std. cond." – (068): Flow-meas. type "Volume operat. cond." **Factory setting:** m^3
Totalizer 2 mode (177) Options	Define the behavior of the totalizer 2. **Options:** ▪ Balanced: Integration of all measured flows (positive and negative). ▪ Pos. flow only: only positive flows are integrated. ▪ Neg. flow only: only negative flows are integrated. ▪ Hold: The totalizer is stopped and keeps its current value. **Factory setting:** Pos. flow only
Total. 2 failsafe (178) Options	Define the behavior of the totalizer in the case of an error. **Options:** ▪ Actual value: It is integrated continuously with the current flow value. ▪ Hold: The totalizer is stopped and keeps its current value. **Factory setting:** Actual value
Totalizer 2 (069) Display	Displays the totalizer value. Parameter "**Totalizer 2 overflow (070)**" displays the overflow. **Example:** The value 123456789 m^3 is displayed as follows: – Totalizer 1: 3456789 m^3 – Totalizer 1 overflow: 12 E7 m^3
Totalizer 2 overflow (070) Display	Displays the overflow value of totalizer 2. → See also "**Totalizer 2 (069)**".

8.11.5 Diagnosis

Expert → Diagnosis

Parameter name	Description
Diagnostic code (071) Display	Displays the diagnostic message with the highest priority currently present.
Last diag. code (072) Display	Displays the last diagnostic message that occurred and was rectified.  The messages listed in the "**Reset logbook (159)**" parameter can be deleted via the "**Last diag. code (072)**" parameter.
Reset logbook (159) Options	With this parameter, you reset all the messages of the "**Last diag. code (072)**" parameter and the "Last diag. 1 (085)" to "Last diag. 10 (094)" event log. **Options:** ▪ Abort ▪ Confirm **Factory setting:** Abort
Min. meas. press. (073) Display	Displays the lowest pressure value measured (peak hold indicator). You can reset this indicator by means of the "**Reset peak hold (161)**" parameter.
Max. meas. press. (074) Display	Displays the highest pressure value measured (peak hold indicator). You can reset this indicator by means of the "**Reset peak hold (161)**" parameter.

Parameter name	Description
Reset peak hold (161) Options	You can reset the "Min. meas. press." and "Max. meas. press." indicators with this parameter. **Options:** ▪ Abort ▪ Confirm **Factory setting:** Abort
"Alarm behav. P (050)" Options	Set the measured value status if sensor limits are overshot or undershot. **Options:** ▪ Warning The device continues to measure. An error message is displayed. "UNCERTAIN" is displayed for the measured value status. ▪ Alarm "BAD" is displayed for the measured value status. An error message is displayed. **Factory setting:** Warning
Operating hours (162) Display	Displays the operating hours of the device. This parameter cannot be reset.
Config. counter (100) Display	Displays the configuration counter. This counter is increased by one with each change to a parameter or group. The counter counts to 65535 and then starts again at zero.

Expert → Diagnosis → Diagnostic list

Parameter name	Description
Diagnostic 1 (075) Diagnostic 2 (076) Diagnostic 3 (077) Diagnostic 4 (078) Diagnostic 5 (079) Diagnostic 6 (080) Diagnostic 7 (081) Diagnostic 8 (082) Diagnostic 9 (083) Diagnostic 10 (084)	These parameters contain up to ten diagnostic messages that are currently pending, arranged in order of priority.

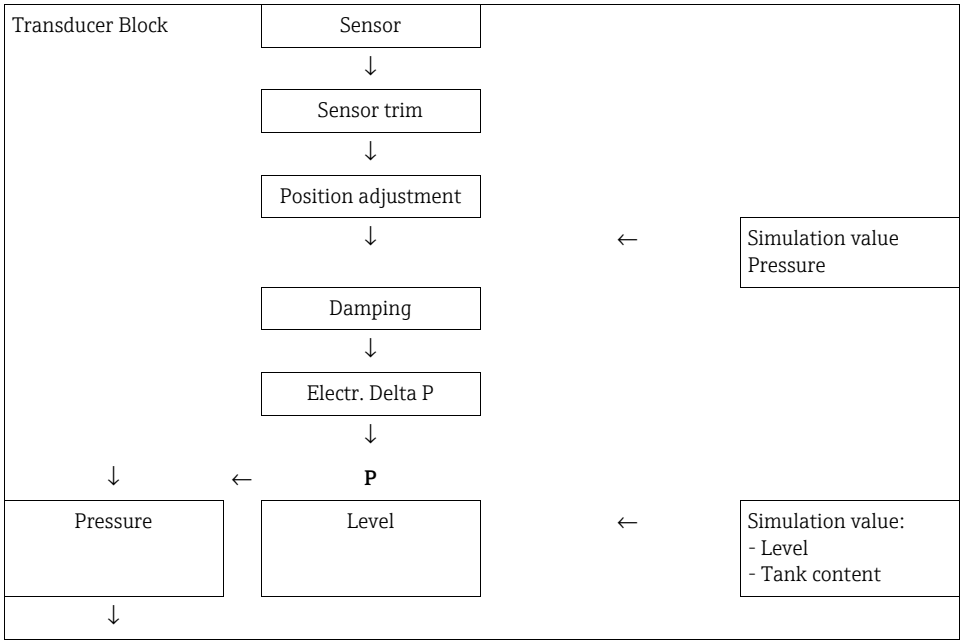
Expert → Diagnosis → Event logbook

Parameter name	Description
Last diag. 1 (085) Last diag. 2 (086) Last diag. 3 (087) Last diag. 4 (088) Last diag. 5 (089) Last diag. 6 (090) Last diag. 7 (091) Last diag. 8 (092) Last diag. 9 (093) Last diag. 10 (094)	These parameters contain the last 10 diagnostic messages to occur and be rectified. They can be reset using the "**Reset logbook (159)**" parameter. Errors which have occurred multiple times are displayed once only.

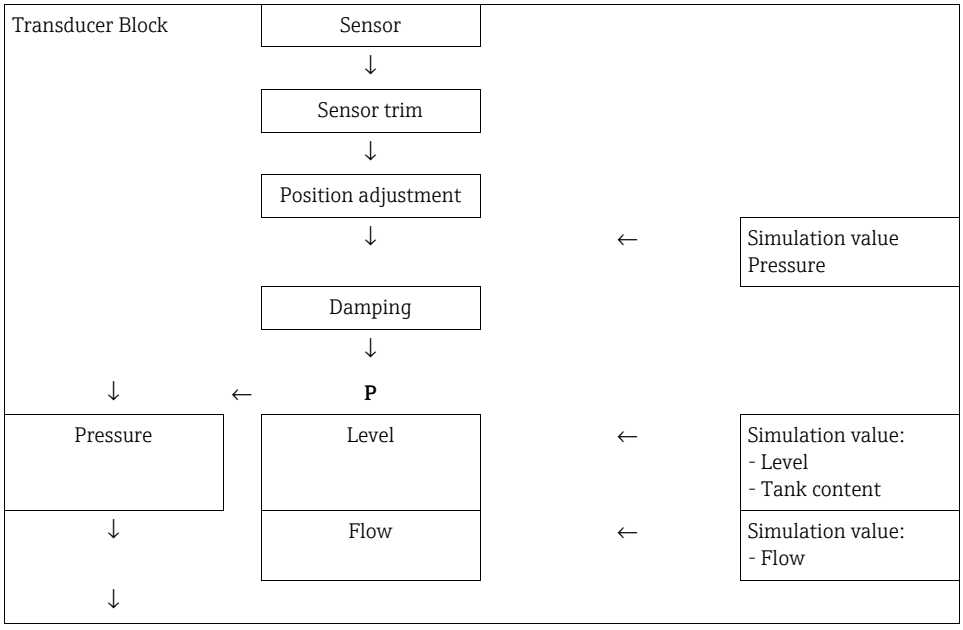
Expert → Diagnosis → Simulation

Parameter name	Description
Simulation mode (112) Options	Switch on the simulation mode and select the simulation type. Any simulation running is switched off if the **Lin. mode (037)** measuring mode or level type is changed. **Options**: ▪ None ▪ Pressure, → see this table, parameter "**Sim. pressure (113)**" ▪ Level, → see this table, parameter "**Sim. level (115)**" ▪ Flow, → see this table, parameter "**Sim. flow (114) (Deltabar)**" ▪ Tank content, → see this table, parameter "**Sim. tank cont. (116)**" ▪ Alarm/warning, → see this table, parameter "**Sim. error no. (118)**"

Cerabar M / Deltapilot M



Deltabar M



Parameter name	Description
→	**PV** PV = Primary Value ↓ Analog Input Block
Sim. pressure (113) Entry	Use this function to enter the simulation value. → See also "**Simulation mode (112)**". **Prerequisite(s):** ▪ "**Simulation mode (112)**" = Pressure **Value when switched on:** Current pressure measured value
Sim. flow (114) (Deltabar) Entry	Use this function to enter the simulation value. → See also "**Simulation mode (112)**". **Prerequisite(s):** ▪ "**Measuring mode (005)**" = Flow and "**Simulation mode (112)**" = Flow
Sim. level (115) Entry	Use this function to enter the simulation value. → See also "**Simulation mode (112)**". **Prerequisite(s):** ▪ "**Measuring mode (005)**" = Level and "**Simulation mode (112)**" = Level
Sim. tank cont. (116) Entry	Use this function to enter the simulation value. → See also "**Simulation mode (112)**". **Prerequisite(s):** ▪ "**Measuring mode (005)**" = Level, **Lin. mode (037)** = "Activate table" and "**Simulation mode (112)**" = Tank content.
Sim. error no. (118) Entry	Enter the diagnostic message number. → See also "**Simulation mode (112)**". **Prerequisite(s):** ▪ "**Simulation mode (112)**"= Alarm/warning **Value when switched on:** 484 (**Simulation mode (112)** active)

8.12 Backing up or duplicating the device data

The device does not have a memory module. With an operating tool based on FDT technology (e.g. FieldCare), the following options are, however, available (see "Download select." parameter → 124 in the operating menu or via the Physical Block → 161.):
- Storage/recovery of configuration data
- Duplication of instrument configurations
- Transfer of all relevant parameters when replacing electronic inserts.

For more information, read the operating manual for the FieldCare operating program.

9 Commissioning via Class 2 master (FieldCare)

The device is configured for the "Pressure" measuring mode (Cerabar, Deltabar) or "Level" measuring mode (Deltapilot) as standard. The measuring range and the unit in which the measured value is transmitted correspond to the data on the nameplate.

⚠ WARNING

The permitted process pressure is exceeded!

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

- ▶ If a pressure lower than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession (depending on the setting in the "Alarm behavior P" (050) parameter):
  "S140 Working range P" or "F140 Working range P"
  "S841 Sensor range" or "F841 Sensor range"
  "S971 Adjustment".
  Only operate the device within the sensor range limits!

NOTICE

The permitted process pressure is undershot!

Output of messages if pressure is too low.

- ▶ If a pressure lower than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession (depending on the setting in the "Alarm behavior P" (050) parameter):
  "S140 Working range P" or "F140 Working range P"
  "S841 Sensor range" or "F841 Sensor range"
  "S971 Adjustment".
  Only operate the device within the sensor range limits!

9.1 Function check

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

- Checklist for "Post-mounting checks" → 📄 33
- Checklist for "Post-connection check" → 📄 39

9.2 Commissioning

The procedure for commissioning and operating the FieldCare program is described in the integrated FieldCare online help.

Proceed as follows to commission the device:

1. Check the hardware write protection on the electronic insert (→ 49, section 6.3.5 "Locking/unlocking operation").
   Parameter "**Lock switch (120)**" indicates the status of the hardware write protection (Menu path: Expert → System or Expert → Communication → Physical Block → PB Parameter → Device)
2. Enter the tag name via the "Device tag" parameter. (Menu path: Expert → System → Instrument info or Setup → Extended setup → Instrument info)
3. Assign the device an address in the bus:
   Operating program of the DP Class 2 master such as FieldCare: FieldCare: (→ 55, section 6.4.5 "Device identification and addressing" or via the address switch.
4. Configure the manufacturer-specific device parameters via the Setup menu or configure the Transducer Block
   Configure the Analog Output Block
   Configure the Totalizer Block (Deltabar).
5. Configure the Physical Block (Menu path: Expert → Communication → Physical Block)
6. Configure the Analog Input Block or AI-Block.
   - In the Analog Input Block, the input value or the input range can be scaled in accordance with the requirements of the automation system (→ 146, section 9.3.1 "Scaling the output value (Out Value)").
   - If necessary, configure the limit values.
7. Configure cyclic data transmission (→ 57, section 6.4.6 "System integration" and → 60, section 6.4.7 "Cyclic data exchange").

9.3 Output value (OUT Value)

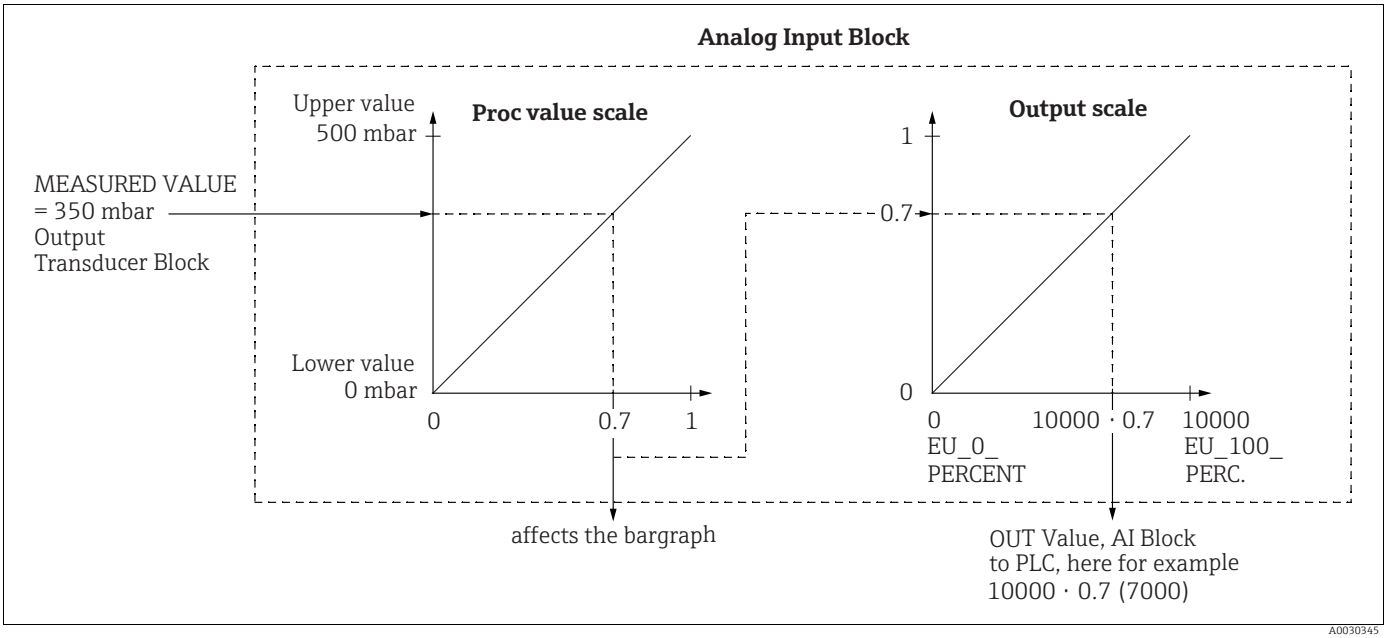
9.3.1 Scaling the output value (Out Value)

In the Analog Input Block, the input value or input range can be scaled in accordance with the automation requirements.

Example:

The measuring range 0 to 500 mbar should be rescaled to 0 to 10000.

- Select the "Output scale" group.
  Menu path: Expert → Communication → Analog input 1 → AI parameter → Proc value scale
  - Enter "0" as the lower value.
  - Enter "500" as the upper value.
- Select the "Output scale" group.
  Menu path: Expert → Communication → Analog input 1 → AI parameter → Output scale
  - Enter "0" as the lower value.
  - Enter "10000" as the upper value.
  - For UNIT, select "User unit" for example.
    The unit selected here does not have any effect on the scaling.
- Result:
  At a pressure of 350 mbar, the value 7000 is output to the PLC as the output value (OUT Value).



⚠ CAUTION

Note Dependencies when setting parameters!

- ▶ The output value (Out Value) can only be scaled via remote operation (e.g. FieldCare).
- ▶ When a unit changes within a measuring mode (pressure, flow - flow meas. type), the values for "Proc value scale" and "Output scale" are converted.
  When a unit changes within a measuring mode, the "Proc value scale" is converted and "Output scale" is updated.
- ▶ When the measuring mode is changed, no conversion takes place. The device has to be recalibrated if the measuring mode is changed.

- 2 AIs are available. The first is assigned to the primary value and the second can be assigned to a second measured variable. Both must be scaled accordingly.
- When the configuration (measuring mode, unit, scaling) is changed in the Transducer Block, the "Proc value scale" and "Output scale" values are automatically set as equal in accordance with the Transducer Block scaling.
- The unit of "Proc value scale" is the main measured value unit of the Transducer Block.
- The configuration of the AI Block 1 is automatically updated with the Transducer Block configuration (if the configuration of the Transducer Block is changed in the Setup menu, this change is copied to the AI Block). This means that the configuration of the AI Blocks must be performed at the end, as the configuration would be overwritten by the setup otherwise.

9.4 Electrical differential pressure measurement with gauge pressure measuring cells (Cerabar M or Deltapilot M)

Example:
In the example given, two Cerabar M or Deltapilot M devices (each with a gauge pressure measuring cell) are interconnected. The pressure difference can thus be measured using two independent Cerabar M or Deltapilot M devices.

For a description of the parameters mentioned → section 8.11 "Parameter description".

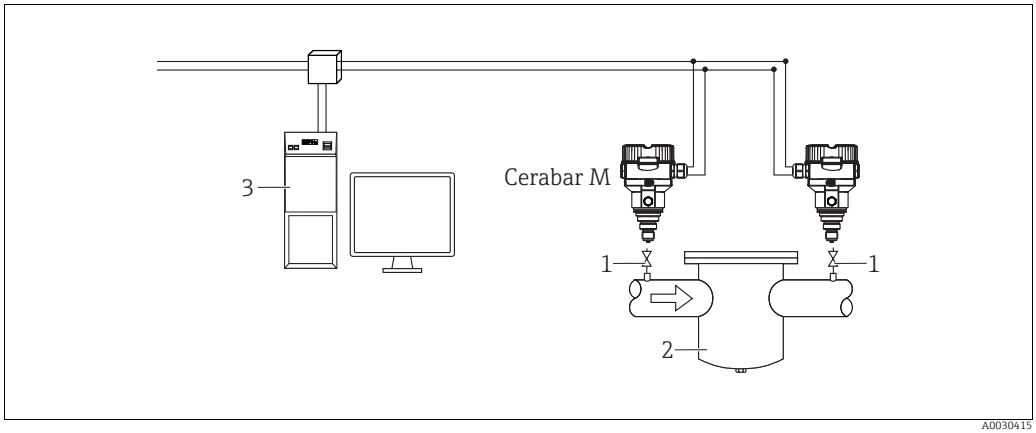


Fig. 30:
1 Shutoff valves
2 E.g. filter
3 PA HOST system

1.)

	Description **Adjustment of the Cerabar M/Deltapilot M on the high-pressure side in the Transducer Block**
1	Open the Transducer Block.
2	Select the "Pressure" measuring mode via the "**Measuring mode (005)**" or "Transmitter type" parameter.
3	Select a pressure unit via the "Press. eng. unit" parameter (125), here "mbar" for example.
4	The Cerabar M/Deltapilot M is unpressurized, perform position adjustment, see → 81.
5	Where necessary, configure via the Analog Input Block "Channel" parameter and output scaling (→ 164).

2.)

The output of the Analog Input Block of the device on the high-pressure is read by the PLC and sent as an output variable via the input of the Analog Output 2 block of the device on the low-pressure side. Here, the "Unit" of Analog Output 2 must be set to a pressure unit (the same unit as the unit of the device on the high-pressure side).

3.)

	Description **Adjustment of the Cerabar M/Deltapilot M on the low-pressure side (the differential is generated in this device) in the Transducer Block**
1	Select the "Pressure" measuring mode via the "**Measuring mode (005)**" or "Transmitter type" parameter.
2	Select a pressure engineering unit via the "**Press. eng. unit (125)**" parameter.
3	The Cerabar M/Deltapilot M is unpressurized, perform position adjustment, see → 81.
4	Select "Ext. value 2" via the "**Electr. Delta P (158) (Cerabar / Deltapilot)**" parameter.
5	Select the desired pressure unit via the "Unit" parameter in the Analog Output 2 Block (here "mbar" for example).
6	The current measured values and status information returned by the device on the high-pressure side can be read via the "Ext. value 2" and "Ext. val. 2 status" parameters.

⚠ CAUTION

Note Dependencies when setting parameters!

- It is not permissible to reverse the assignment of the measuring points to the direction of communication.
- The measured value of the transmitting device must always be greater than the measured value of the receiving device (via the "Electr. Delta P" function).
- Adjustments that result in an offset of the pressure values (e.g. position adjustment, trim) must always be performed in accordance with the individual sensor and its orientation, irrespective of the "Electr. Delta P" application. Other settings result in non-permitted use of the "Electr. Delta P" function and can lead to incorrect measured values.
- In order to be able to transmit the "BAD" status of the transmitting device (high-pressure side) to the receiver device (low-pressure side), the "**Fail safe mode (198)** parameter of the analog input of the device on the high-pressure side and the **Failsafe mode (213)** of analog output 2 of the device on the low-pressure side must be set to "Status BAD".

9.5 Parameter description

9.5.1 Block model

The Cerabar M/Deltabar M/Deltapilot M has the following blocks:
- Physical Block
- Analog Input Block 1 / Analog Input Block 2
- Analog Output Block 1 / Analog Output Block 2
- Totalizer Block (Deltabar M)
- Transducer Block

9.5.2 Physical Block

Expert → Communication → Physical Block → PB Standard Parameter	
Parameter name	**Description**
Block object Display Slot: 0 Index: 16	The "Block object" parameter is a structured parameter consisting of 13 elements. This parameter describes the characteristics of the Physical Block. **Reserved profile parameter** ▪ 250 = not used **Block object** ▪ 1 = Physical Block **Parent class** ▪ 1 = Transmitter **Class** ▪ 250 = not used **Device rev.** ▪ 1 **Device rev. comp** ▪ 1 **DD_revision** ▪ 0 (for future use) **Profile** ▪ Number of the PROFIBUS PA profile in the PNO ▪ 0x40, 0x02 (compact class B) **Profile revision** ▪ Displays the profile version, here: 0x302 (Profiles 3.02) **Execution time** ▪ 0 (for future use) **No. of parameters** ▪ Number of parameters of the Physical Block, here: 110 **Index of View 1** ▪ Address of the "PB view 1" parameter, here: 0x00, 0x7E **Number of view lists** ▪ 1 = The Block contains one "View object".
Static rev. no. Display Index: 0 Slot: 17	Displays the static revision counter for the parameters of the Physical Block. The counter is incremented by one with each change of a static parameter of the Analog Output Block. The counter counts to 65535 and then starts again at zero. **Factory setting:** 0
Device tag Entry Slot: 0 Index: 18	Enter device tag e.g. TAG number (max. 32 alphanumeric characters). **Factory setting:** _ or as per order specifications

Expert → Communication → Physical Block → PB Standard Parameter	
Parameter name	**Description**
Strategy Entry Slot: 0 Index: 19	Enter user-specific value for grouping and thus faster evaluation of the blocks. Grouping takes place by entering the same numerical value for the "Strategy" parameter of the block in question. **Input range:** 0 to 65535 **Factory setting:** 0
Alert key Entry Slot: 0 Index: 20	Enter the user-specific value (e.g. identification number of the plant unit). The process control system can use this information to sort alarms and events that were generated by this block. **Input range:** 0 to 255 **Factory setting:** 0
Target mode Options Slot: 0 Index: 21	Select the desired block mode. Only the "Automatic (Auto)" mode can be selected for the Physical Block. **Options:** ▪ Automatic (Auto) **Factory setting:** Automatic (Auto)
Block mode Display Slot: 0 Index: 22	The "Block mode" parameter is a structured parameter consisting of three elements. PROFIBUS makes a distinction between the following block modes: automatic mode (Auto), manual user intervention (Man) and out of service (O/S). The Physical Block only works in the automatic mode (Auto) and out of service (O/S). **Actual mode** ▪ Displays the current block mode. ▪ Factory setting: automatic (Auto) **Permitted mode** ▪ Displays the modes supported by the block. ▪ Factory setting: 8 = automatic (Auto) **Normal mode** ▪ Displays the normal working mode of the block. ▪ Factory setting: Automatic (Auto)
Alarm summary Display Slot: 0 Index: 23	The "Alarm summary" parameter is a structured parameter consisting of four elements. **Current alarm summary** ▪ Displays the current alarms ▪ Factory setting: 0x0, 0x0
Firmware version Display Slot: 0 Index: 24	Displays the software version. E.g.: 01.00.10
Hardware rev. Display Slot: 0 Index: 25	Displays the revision number of the main electronics. E.g. 01.00.00
Manufacturer ID Display Slot: 0 Index: 26	Displays the manufacturer number in decimal numerical format. Here: 17 Endress+Hauser

Expert → Communication → Physical Block → PB Standard Parameter	
Parameter name	**Description**
Device name str. Display Slot: 0 Index: 27	Displays the name of the device. Possible names: Cerabar M, Deltabar M or Deltapilot M
Serial number Display Slot: 0 Index: 28	Displays the serial number of the device (11 alphanumeric characters).
Diagnosis Display Slot: 0 Index: 29	The "Diagnosis" parameter is a structured parameter consisting of two elements. This parameter displays pending profile alarms, bit-encoded. More than one alarm is possible at one time. If the highest bit of the fourth byte is set to 1, the "Diag extension" (→ see this table) and "Advanced diagnostics 7 (Diag add ext.)" (→ 159) parameters display additional messages. **Diagnosis** ▪ Factory setting: 0x0, 0x0, 0x0, 0x0
Diag extension Display Slot: 0 Index: 30	The "Diag extension" parameter is a structured parameter consisting of three elements. This parameter displays pending manufacturer-specific alarms and warnings, bit-encoded. More than one alarm is possible at one time. In addition, the "Advanced diagnostics 7 (Diag add ext.)" parameter (→ 159) can display additional alarm messages and warnings. **Extended diagnostics 1, 2** ▪ Factory setting: 0x0, 0x0 **Extended diagnostics 3, 4** ▪ Factory setting: 0x0, 0x0 **Extended diagnostics 5, 6** ▪ Factory setting: 0x0, 0x0
Diag mask Display Slot: 0 Index: 31	The "Diag mask" parameter is a structured parameter consisting of two elements. This parameter describes what profile alarms are supported by the device. Bit = 0: alarm is not supported; Bit = 1: alarm is supported. **Diag mask A** ▪ 0xB1, 0x24 **Diag mask B** ▪ 0x0, 0x80
Diag mask Ex Display Slot: 0 Index: 32	This parameter describes what manufacturer-specific alarms and warnings are supported by the device. Bit = 0: alarm is not supported; Bit = 1: alarm is supported
Dev. certificat. Display Slot: 0 Index: 33	Displays the certificate

Expert → Communication → Physical Block → PB Standard Parameter	
Parameter name	**Description**
Write locking Entry Slot: 0 Index: 34	Use this function to enter a code to lock or unlock operation. ▪ The symbol on the onsite display indicates that operation is locked. Parameters which refer to how the display appears, e.g. "**Language (000)**" can still be altered. ▪ If operation is locked by means of the DIP switch, you can only unlock operation again by means of the DIP switch. If operation is locked by means of remote operation e.g. FieldCare, you can only unlock operation again by means of remote operation. **Options:** ▪ Lock: enter the number 0. ▪ Unlock: enter the number 2457. **Factory setting:** 2457
Enter reset code Entry Slot: 0 Index: 35	Reset parameters completely or partially to the factory values or order configuration using the "Enter reset code". **Factory setting:** 0
Description Entry Slot: 0 Index: 36	Enter tag description (max. 32 alphanumeric characters). **Factory setting:** Empty field or as per order specifications
Message Entry Slot: 0 Index: 37	Enter the user-specific "Message", e.g. a description of the device in the application or plant (max. 32 alphanumeric characters). **Factory setting:** _ or as per order specifications
Install. date Entry Slot: 0 Index: 38	Enter the installation date of the device (max. 16 alphanumeric characters). **Factory setting:** Empty field
Ident number sel Options Slot: 0 Index: 40	Select device master file (GSD). **Cerabar M:** ▪ 0x9700: Profile GSD ▪ 0x1553: Device-specific GSD (factory setting) ▪ 0x151C: Device-specific GSD. The device behaves like a Cerabar M PMC41, PMC45, PMP41, PMP45, PMP46, PMP48. → See Operating Instructions BA00222P. **Deltabar M:** ▪ 0x9700: Profile GSD ▪ 0x1554: Device-specific GSD (factory setting) **Deltapilot M:** ▪ 0x9700: Profile GSD ▪ 0x1555: Device-specific GSD (factory setting) ▪ 0x1503: Device-specific GSD. The device behaves like a Deltapilot S DB50, DB50L, DB51, DB52 or DB53. → See Operating Instructions BA00164F.

Expert → Communication → Physical Block → PB Standard Parameter	
Parameter name	**Description**
Lock switch Display Slot: 0 Index: 41	Displays the status of DIP switch 1 (on) on the electronic insert. You can lock or unlock parameters relevant to the measured value with DIP switch 1. If operation is locked by means of the "Write locking" parameter, you can only unlock operation again by means of this parameter ("Write locking" → 153). **Displays:** ▪ On (locking switched on) ▪ Off (locking switched off) **Factory setting:** Off (locking switched off)
Feature Display Slot: 0 Index: 42	Displays optional features implemented in the device, and the status of these features. It indicates whether the feature is supported or not. The settings are based on the actual identification number of the device. In the "Ident_Number" profile, the features for the "Classic" and "Condensed" statuses are supported and set. Only the "Classic" status is supported in the compatibility mode (old identification number). Only the "Condensed" status is supported with the new identification number.
Cond.status diag Display Slot: 0 Index: 43	Indicates the mode of a device that can be configured for status and diagnostic behavior. **Options:** ▪ Condensed status ▪ Classic status **Factory setting:** Condensed status

Expert → Communication → Physical Block → PB Parameter	
Parameter name	**Description**
Diagnostic code Display Slot: 0 Index: 54	Displays the current messages present. → See also these Operating Instructions, → section 11.1 "Messages". The "Status (Device Status)" field and the "Diagnostic code" display the message with the highest priority.
Last diag. code Slot: 0 Index: 55	Displays the last message that occurred and has been already fixed. ▪ The messages listed in the Last diag. code parameter can be deleted via the "Reset logbook" parameter.
Bus address Display Slot: 0 Index: 59	Displays the device address in the PROFIBUS PA bus. You can configure the address either locally on the electronic insert (hardware addressing) or via the software (software addressing). Using a DIP switch on the electronic insert, you specify whether the hardware address or the software address takes effect. **Factory setting:** 126

Expert → Communication → Physical Block → PB Parameter	
Parameter name	**Description**
Set unit to bus Options Slot: 0 Index: 61	The onsite display and the "Primary value" parameter display the same value as standard. The digital output value (Out Value) of the Analog Input Block "Output value (OUT Value)" is independent of the onsite display and the "Primary value". The following options are available to make the onsite display, the "Primary value" and the digital output value (Out Value) display the same value: ▪ Set the values for the lower and upper limit of the "Proc value scale" (→ 164) and "Output scale" (→ 164) as equal in the Analog Input Block ▪ Via the "Set unit to bus" parameter, confirm the "On" option. Confirming the option automatically sets the limits for "Proc value scale" and "Output scale" to equal values. If you confirm the "Set unit to bus" parameter, please note that a change in the digital output value (Out Value) can affect the control system.
Ext. value 1 Display Slot: 0 Index: 62	The "Ext. value 1" parameter is a structured parameter consisting of three elements. The value and status displayed here is transmitted to the device via Analog Output Block 1 by the PLC. The "Ext. value 1" can be displayed on the onsite display (see → Abb. 23 and the "Display mode" parameter). **Ext. val. 1** ▪ Factory setting: 0.0 **Ext. val. 1 status** ▪ Factory setting: BAD **Ext. val. 1 avail.** ▪ This element indicates whether the PLC is sending a value to the device. 0: The PLC is not sending a value, along with the status, to the device. 1: The PLC sends a value with a status to the device. ▪ Factory setting: 0
Profile revision Display Slot: 0 Index: 64	Displays the profile version, here: 3.02.
Reset logbook Options Slot: 0 Index: 65	Use this parameter to reset all the messages of the "Last diag. code" parameter. **Options:** ▪ Abort ▪ Confirm **Factory setting:** Abort

Expert → Communication → Physical Block → PB Parameter	
Parameter name	**Description**
Ident number (Ident_Number) Display Slot: 0 Index: 66	Displays the device ID number and the selected device master file (GSD). Select the device master data (GSD file) via the "Ident number sel" parameter (→ 153). **Cerabar M:** ▪ 0x9700: Profile GSD ▪ 0x1553: Device-specific GSD (factory setting) ▪ 0x151C: Device-specific GSD. The device behaves like a Cerabar M PMC41, PMC45, PMP41, PMP45, PMP46, PMP48. → See Operating Instructions BA00222P. **Deltabar M:** ▪ 0x9700: Profile GSD ▪ 0x1554: Device-specific GSD (factory setting) **Deltapilot M:** ▪ 0x9700: Profile GSD ▪ 0x1555: Device-specific GSD (factory setting) ▪ 0x1503: Device-specific GSD. The device behaves like a Deltapilot S DB50, DB50L, DB51, DB52 or DB53. → See Operating Instructions BA00164F.
Check conf. Display Slot: 0 Index: 67	Function to check whether the configuration of a Class 1 master was accepted in the device for cyclic data exchange. **Display:** ▪ 0 (configuration not OK) ▪ 1 (configuration OK) **Factory setting:** 0
Order code Display Slot: 0 Index: 69	Device order code. **Factory setting:** According to order specifications
Tag location Entry Slot: 0 Index: 70	User ID description of the slot module location.
Signature Entry Slot: 0 Index: 71	Enter the signature. **Factory setting:** According to order specifications
ENP version Display Slot: 0 Index: 72	This parameter indicates the version of the standard for electronic nameplates supported by the device. **Factory setting:** 2.02.00
Device diag. Display Slot: 0 Index: 73	Contains the device diagnostic in bit-encoded format (bit string). Allows access to all the diagnostic data of the device via one single acyclic read command.
Ext. order code Display Slot: 0 Index: 74	Displays extended order number. **Factory setting** According to order specifications
Service locking Entry Slot: 0 Index: 75	Internal service parameter.

Expert → Communication → Physical Block → PB Parameter	
Parameter name	**Description**
Up/Dl feature Display Slot: 0 Index: 76	Describes the function supported by the device. **Factory setting** 3
Updl control Display Slot: 0 Index: 77	Control parameter for parameter transaction. **Factory setting** passive
Updl status Display Slot: 0 Index: 78	Status information on the current status of the parameter transaction. **Factory setting** Data transfer status OK
Updl veri delay Entry Slot: 0 Index: 79	Delay between the end of the download and the activation of the new configuration. After this delay, the "Updl status" parameter must be updated correctly. A device restart may be required. **Factory setting** 120
Up/Dl rev Display Slot: 0 Index: 80	Version of the upload/download specification. **Factory setting** 1
Config. counter Display Slot: 0 Index: 89	Displays the configuration counter. This counter is increased by 1 every time a configuration parameter or group is changed. The counter counts to 65535 and then starts again at zero.
Operating hours Display Slot: 0 Index: 90	Displays the operating hours of the device. This parameter cannot be reset.
Sim. error no. Entry Slot: 0 Index: 91	Enter the diagnostic message number. → See also "Simulation mode". **Prerequisite(s):** ▪ "Simulation mode" = Alarm/warning **Value when switched on:** 484 (Simulation mode active)
Sim. messages Entry Slot: 0 Index: 92	Enter the diagnostic number for simulation. **Prerequisite(s):** ▪ Simulation = alarm/warning **Factory setting:** 484 "Simul error" (simulation active)
Language Options Slot: 0 Index: 93	Select the language. **Options:** ▪ English ▪ Possibly another language (as selected when ordering the device) ▪ One further language (language of the manufacturing plant) **Factory setting**: English
Device name str. Display Slot: 0 Index: 94	Displays the name of the device. Possible names: Cerabar M, Deltabar M or Deltapilot M

Expert → Communication → Physical Block → PB Parameter	
Parameter name	**Description**
Display mode Options Slot: 0 Index: 95	Specify the display mode for the onsite display during operation. **Options:** ▪ Main value only (value+bar graph) ▪ External value 1 only (value+status) ▪ All alternating (main value+secondary value+Ext. value 1+**Ext. val. 2 (259)**) Ext. value 1 and **Ext. val. 2 (259)** are only displayed if the PLC sends these values to the device. **Factory setting:** Main value only
Add. disp. value Options Slot: 0 Index: 96	Specify the contents for the second value in the alternating display mode in measuring mode. **Options:** ▪ No value ▪ Pressure ▪ Measured value(%) ▪ Totalizer 1 (Deltabar M) ▪ Totalizer 2 (Deltabar M) ▪ Temperature (Cerabar/Deltapilot) The options depend on the measuring mode chosen. **Factory setting:** No value
Format 1st value Options Slot: 0 Index: 97	Specifies the number of places after the decimal point for the value displayed in the main line. **Options:** ▪ Auto ▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx ▪ x.xxxxx **Factory setting:** Auto
Format 1st value Display Slot: 0 Index: 98	Specifies the number of places after the decimal point for the value displayed in the main line. **Options:** ▪ Auto ▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx ▪ x.xxxxx **Factory setting:** Auto
Status (Device Status) Display Slot: 0 Index: 99	Provides information on the current status of the device. **Display:** ▪ Good ▪ Failure ▪ Function check ▪ Maintenance required ▪ Out of spec.

Expert → Communication → Physical Block → PB Parameter	
Parameter name	**Description**
Format ext. val. 2 Options Slot: 0 Index: 100	Specifies the number of places after the decimal point for the value displayed in the main line. **Options:** ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx ▪ x.xxxxx **Factory setting:** x.x
Advanced diagnostics 7 (Diag add ext.) Display Slot: 0 Index: 101	This parameter displays pending manufacturer-specific alarms and warnings, bit-encoded. More than one alarm is possible at one time. In addition, the "Diag extension" parameter (→ 152) can display additional alarm messages and warnings. **Factory setting:** 0x0, 0x0
Diag mask add ext. Display Slot: 0 Index: 102	This parameter describes what manufacturer-specific alarms and warnings are supported by the device. Bit = 0: alarm is not supported; Bit = 1: alarm is supported.
Electr. serial no. Display Slot: 0 Index: 103	Displays the serial number of the main electronics (11 alphanumeric characters).
Diagnostic code Display Slot: 0 Index: 104	Displays the current messages present. → See also these Operating Instructions, → section 11.1 "Messages". The "Status" (Slot 0 Index 99) field and the Diagnostic code parameter display the message with the highest priority.
Sw build nr. Display Slot: 0 Index: 105	This parameter displays the software build number.
Status locking Display Slot: 0 Index: 106	Displays the current locking status of the device or conditions that can lock the device (hardware locking, software locking).
Com.err.counters Display Slot: 0 Index: 107	This parameter is a structured parameter and monitors PROFIBUS communication specific errors on the lowest communication layers. "Frame CRC error": number of received frames with a PA CRC error. "Frame delim. err.": number of received frames with an incorrect ASIC start delimitation character. "Frame length err.": number of received frames with incorrect number of the received byte. "Frame retry err.": number of time the master has tried to run a retry request. "Frame type error.": number of received frames with a damaged first frame delimitation character.
Addressing Display Slot: 0 Index: 108	Displays the addressing mode: via hardware (DIP switch) or software. **Factory setting:** Software

Expert → Communication → Physical Block → PB Parameter	
Parameter name	**Description**
Alarm behav. P Options Slot: 0 Index: 109	Set the measured value status if sensor limits are overshot or undershot. **Options:** ▪ Warning The device continues to measure. An error message is displayed. "UNCERTAIN" is displayed for the measured value status. ▪ Alarm "BAD" is displayed for the measured value status. An error message is displayed. **Factory setting:** Warning
Maintenance instructions Display Slot: 0 Index: 110	Displays the diagnostic message with the highest priority currently present (Record with the 10 highest active warnings/error messages).
Operator code Entry Slot: 0 Index: 111	Use this function to enter a code to lock or unlock operation. **Entry:** ▪ To lock: Enter a number the release code (value range: 0 to 9999). ▪ To unlock: Enter the access code. The release code is "0" in the order configuration. Another release code can be defined in the "Code definition" parameter. If the user has forgotten the release code, the release code can be visible by entering the number "5864". **Factory setting:** 0
Format ext. val. 1 Options Slot: 0 Index: 112	Specifies the number of places after the decimal point for the value displayed in the main line. **Options:** ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx ▪ x.xxxxx **Factory setting:** x.x
Reset Entry Slot: 0 Index: 113	Reset parameters completely or partially to the factory values or order configuration. **Factory setting:** 0
Code definition Entry Slot: 0 Index: 114	Use this function to enter an access code with which the device can be unlocked. **Entry:** ▪ A number from 0 to 9999 **Factory setting:** 0
DIP switch Display Slot: 0 Index: 115	Displays the status of the active DIP switches.
Last diag. code Display Slot: 0 Index: 116	Record with the last 10 diagnostic messages that occurred and were rectified. ▪ Digital communication: the last message is displayed. ▪ The messages listed in the Last diag. code parameter can be deleted via the "Reset logbook" parameter.

Expert → Communication → Physical Block → PB Parameter	
Parameter name	**Description**
Instructions Display Slot: 0 Index: 117	Instructions for resolving the highest active warning/error message.
Download select. Display Slot: 0 Index: 118	Select the data records for the upload/download function in Fieldcare and PDM. **Prerequisite(s):** DIP switch 1, 3, 4 and 5 set to "OFF", DIP switch 2 set to "ON" (see picture in section 6.2.1). A download with the "Configuration copy" factory setting causes the device to download all the parameters required for a measurement. The "Electronics replacement" setting only takes effect if an appropriate release code is entered in the Operator code parameter. **Options:** ▪ Configuration copy: With this option, general configuration parameters are overwritten except for serial number, order number, calibration, position adjustment, application, and tag information. ▪ Device replacement: This option overwrites general configuration parameters with the exception of the serial number, order number, calibration and position adjustment. ▪ Electronics replacement: This option contains all parameters from "Configuration copy" and "Device replacement" and "position adjustment", "sensor trim", "serial number", "order number". **Factory setting:** Configuration copy
PB view 1 Display Slot: 0 Index: 126	Group of Physical Block parameters that are read as one via a communication request. The "PB view 1" comprises: ▪ Static rev. no. ▪ Block mode ▪ Alarm summary ▪ Diagnosis

9.5.3 Analog Input Block 1 / Analog Input Block 2

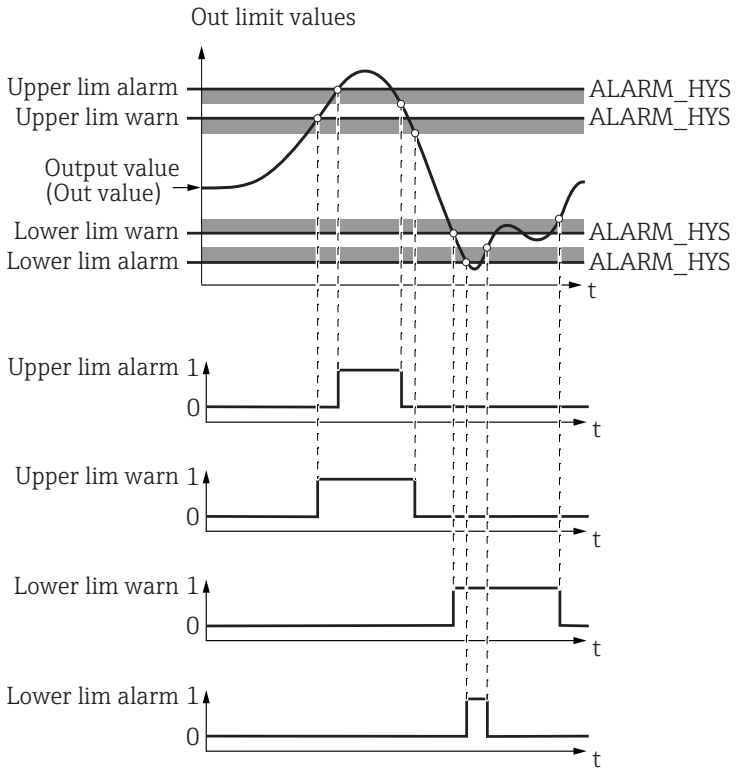
Expert → Communication → Analog Input 1/Analog Input 2→ AI Standard Parameter	
Parameter name	**Description**
Block object Display AI1 Slot: 1 AI2 Slot: 2 Index: 16	The "Block object" parameter is a structured parameter consisting of 13 elements. This parameter describes the characteristics of the Analog Input Block. **Reserved profile parameter** ▪ 250 = not used **Block object** ▪ 2 = Function Block **Parent class** ▪ 1 = Input **Class** ▪ 1 = Analog Input **Device rev.** ▪ 1 **Device rev. comp** ▪ 1 **DD_revision** ▪ 0 (for future use) **Profile** ▪ Number of the PROFIBUS PA profile in the PNO ▪ 0x40, 0x02 (compact class B) **Profile revision** ▪ Displays the profile version, here: 0x302 (Profiles 3.02) **Execution time** ▪ 0 (for future use) **No. of parameters** ▪ Number of parameters of the Analog Input Block, here: 46 **Index of View 1** ▪ Address of the "AI view 1" parameter, here: AI1 = 0x01, 0x3E; AI2 = 0x02, 0x3E **Number of view lists** ▪ 1 = The Block contains one "View object".
Static rev. no. Display AI1 Slot: 1 AI2 Slot: 2 Index: 17	Displays the static revision for the parameters of the Analog Input Block. The counter is incremented by one with each change of a static parameter of the Analog Input Block. The counter counts to 65535 and then starts again at zero. **Factory setting:** 0
TAG Entry AI1 Slot: 1 AI2 Slot: 2 Index: 18	Enter device tag e.g. TAG number (max. 32 alphanumeric characters). **Factory setting:** _ or as per order specifications
Strategy Entry AI1 Slot: 1 AI2 Slot: 2 Index: 19	Enter user-specific value for grouping and thus faster evaluation of the blocks. Grouping takes place by entering the same numerical value for the "Strategy" parameter of the block in question. **Input range:** 0 to 65535 **Factory setting:** 0
Alert key Entry AI1 Slot: 1 AI2 Slot: 2 Index: 20	Enter the user-specific value (e.g. identification number of the plant unit). The process control system can use this information to sort alarms and events that were generated by this block. **Input range:** 0 to 255 **Factory setting:** 0

Expert → Communication → Analog Input 1/Analog Input 2→ AI Standard Parameter	
Parameter name	**Description**
Target mode Options AI1 Slot: 1 AI2 Slot: 2 Index: 21	Select the desired block mode. **Options:** ▪ Automatic (Auto) ▪ Manual (Man) ▪ Out of service (O/S) **Factory setting:** Automatic (Auto)
Block mode Display AI1 Slot: 1 AI2 Slot: 2 Index: 22	The "Block mode" parameter is a structured parameter consisting of three elements. PROFIBUS makes a distinction between the following block modes: automatic mode (Auto), manual user intervention (Man) and out of service (O/S). **Actual mode** ▪ Displays the current block mode. ▪ Factory setting: Automatic (Auto) **Permitted mode** ▪ Displays the modes supported by the block. ▪ Factory setting: 152 = Automatic (Auto), manual user intervention or out of service **Normal mode** ▪ Displays the normal working mode of the block. ▪ Factory setting: Automatic (Auto)
Alarm summary Display AI1 Slot: 1 AI2 Slot: 2 Index: 23	The "Alarm summary" parameter is a structured parameter consisting of four elements. **Current alarm summary** ▪ Displays the current alarms ▪ Factory setting: 0x0, 0x0

Expert → Communication → Analog Input 1/Analog Input 2 → AI Parameter	
Parameter name	**Description**
Batch information Entry AI1 Slot: 1 AI2 Slot: 2 Index: 24	The "Batch information" parameter is a structured parameter consisting of four elements. This parameter is used in batch processes in accordance with IEC 61512 Part 1 (ISA S88). The "Batch information" parameter is required in a decentralized automation system to identify the input channels used. In addition, the errors occurring for the current batch process can also be displayed. **Batch ID** ▪ Enter the ID of a batch application so you can assign device messages, such as alarms etc. **Batch unit (no. of recipe unit procedure or of the unit)** ▪ Enter the recipe code required for the batch application or the related unit, such as the reactor for example. **Batch operation** ▪ Enter the recipe currently available. **Batch phase** ▪ Enter the current recipe phase.
Output value (OUT Value) Display/Entry AI1 Slot: 1 AI2 Slot: 2 Index: 26	The "Output value (OUT Value)" parameter is a structured parameter consisting of two elements. **Output value (OUT Value)** ▪ Displays the output value (Out Value) of the Analog Input Block **Out status** ▪ Displays the status of the Output value (OUT Value)  If the "MAN" (manual) block mode was selected by means of the "Block mode" parameter, the output value (Out Value) "Output value (OUT Value)" and its status can be specified manually here.

Expert → Communication → Analog Input 1/Analog Input 2 → AI Parameter	
Parameter name	**Description**
Proc value scale Entry AI1 Slot: 1 AI2 Slot: 2 Index: 27	Scales the input value of the Analog Input Block. **Lower value**: ▪ Enter the lower value for the input value of the Analog Input Block. ▪ Factory setting: 0 **Upper value**: ▪ Enter the upper value for the input value of the Analog Input Block. ▪ Factory setting: 100 **Example:** → 146
Output scale Entry AI1 Slot: 1 AI2 Slot: 2 Index: 28	Scale the output value (Out Value) of the Analog Input Block. → See also this table, "Proc value scale" parameter description. **Lower value**: ▪ Enter the lower limit for the output value (Out Value) of the Analog Input Block. ▪ Factory setting: 0 **Upper value**: ▪ Enter the upper limit for the output value (Out Value) of the Analog Input Block. ▪ Factory setting: 100 **Unit**: ▪ Select the unit. The unit selected here does not have any effect on the scaling. This unit is only editable in the operating program. ▪ Factory setting: % **Decimal point**: ▪ Specify the number of decimal places for the output value (Out Value). ▪ Factory setting: 0
Characterization Options AI1 Slot: 1 AI2 Slot: 2 Index: 29	This parameter is used to set the characteristic type for the Analog Input Block ever linear.
Channel Entry AI1 Slot: 1 AI2 Slot: 2 Index: 30	This parameter is used to assign a process variable of the Transducer Block to the input of the Analog Input Block. **AI2 options**: ▪ Pressure (0x011D) ▪ Level before lin. (0x0152) ▪ Totalizer 2 (0x18A) (Deltabar) ▪ Sensor temperature (0x011B) (Deltapilot/Cerabar) **Factory setting:** AI1: Measured value (digital value 0x0112) (fixed setting) AI2: Pressure (digital value 0x011D)
Filt. time const. Entry AI1 Slot: 1 AI2 Slot: 2 Index: 32	Enter the filter time constant for the 1st order digital filter. This time is required in order for 63% of a change in the Analog Input Block (input value) to have an effect on the "Output value (OUT Value)". → See also the "Damping" parameter description (→ 187). If the "MAN" (manual) block mode was selected by means of the "Target mode" parameter, the time entered here does not affect the output value (Out Value). **Factory setting:** 0.0 s

Expert → Communication → Analog Input 1/Analog Input 2 → AI Parameter	
Parameter name	**Description**
Failsafe mode Options AI1 Slot: 1 AI2 Slot: 2 Index: 33	If the Analog Input Block receives an input value or simulation value with the status BAD, the Analog Input Block continues working with the failsafe mode defined by means of this parameter. The following options are available by means of the "Failsafe mode" parameter: ▪ Last valid out val. The last valid value is used for further processing with the status UNCERTAIN. ▪ Failsafe value The value specified by means of the "Failsafe default" parameter is used for further processing with the status UNCERTAIN. → See this table, "Failsafe default" parameter description. ▪ Status BAD The current value is used for further processing with the status BAD.  The status BAD is activated if the "Out of service" (O/S) option was selected in the "Target mode" parameter. **Factory setting:** Last valid out val.
Failsafe default Entry AI1 Slot: 1 AI2 Slot: 2 Index: 34	Enter the value for the "Failsafe value" option selected via the "Failsafe mode" parameter. → See also this table, "Failsafe mode" parameter description. **Factory setting:** 0.0000 %

Expert → Communication → Analog Input 1/Analog Input 2 → AI Parameter	
Parameter name	**Description**
Limit hysteresis Entry AI1 Slot: 1 AI2 Slot: 2 Index: 35	Enter hysteresis value for the upper and lower alarm value or critical alarm value. The alarm conditions remain active as long as the measured value is in the hysteresis. The hysteresis affects the following alarm or critical alarm limit values: ▪ "Upper limit alarm": upper critical alarm limit value ▪ "Upper limit warning": upper alarm limit value ▪ "Lower limit warning": lower alarm limit value ▪ "Lower limit alarm": lower critical alarm limit value  *Fig. 31: Illustration of the output value (Out Value) with limit values and hysteresis as well as the alarms "Upper limit alarm", "Upper limit warning", "Lower limit warning" and "Lower limit alarm"* **Input range:** 0.0 to 50.0 % with regard to the range of the "Output scale" group (→ 164) **Factory setting:** 0.5000 %
Upper limit alarm Entry AI1 Slot: 1 AI2 Slot: 2 Index: 37	Enter upper critical limit value. If the "Output value (OUT Value)" exceeds this limit value, the "Upper limit alarm" parameter displays an alarm message. → See also this table, "Limit hysteresis" parameter description. **Factory setting:** 3.4028e+038 %
Upper limit warning Entry AI1 Slot: 1 AI2 Slot: 2 Index: 39	Enter upper limit value. If the "Output value (OUT Value)" exceeds this limit value, the "Upper limit warning" parameter displays an alarm message. → See also this table, "Limit hysteresis" parameter description. **Factory setting:** 3.4028e+038 %

Expert → Communication → Analog Input 1/Analog Input 2 → AI Parameter	
Parameter name	**Description**
Lower limit warning Entry AI1 Slot: 1 AI2 Slot: 2 Index: 41	Enter lower limit value. If the "Output value (OUT Value)" drops below this limit value, the "Lower limit warning" parameter displays an alarm message. → See also this table, "Limit hysteresis" parameter description. **Factory setting:** −3.4028e+038 %
Lower limit alarm Entry AI1 Slot: 1 AI2 Slot: 2 Index: 43	Enter lower critical limit value. If the "Output value (OUT Value)" drops below this limit value, the "Lower limit alarm" parameter displays an alarm message. → See also this table, "Limit hysteresis" parameter description. **Factory setting:** −3.4028e+038 %
Upper limit alarm Display AI1 Slot: 1 AI2 Slot: 2 Index: 46	The "Upper limit alarm" parameter is a structured parameter consisting of four elements. The parameter displays the status of the upper critical limit value alarm. → 166, "Limit hysteresis", graphic. **Status** ▪ Displays the current status of the "Upper limit alarm" e.g. alarm still active, alarm reported to control level etc. ▪ Factory setting: 0 **Alarm output value (Out Value)** ▪ Displays the value that violated the upper critical limit ("Upper limit alarm"). ▪ Factory setting: 0.0000 %
Upper limit warning Display AI1 Slot: 1 AI2 Slot: 2 Index: 47	The "Upper limit warning" parameter is a structured parameter consisting of four elements. The parameter displays the status of the upper limit value alarm. → 166, "Limit hysteresis", graphic. **Status** ▪ Displays the current status of the "Upper limit warning" e.g. alarm still active, alarm reported to control level etc. ▪ Factory setting: 0 **Warning output value (Out Value)** ▪ Displays the value that violated the upper limit ("Upper limit warning"). ▪ Factory setting: 0.0000 %
Lower limit warning Display AI1 Slot: 1 AI2 Slot: 2 Index: 48	The "Lower limit warning" parameter is a structured parameter consisting of four elements. The parameter displays the status of the lower limit value alarm. → 166, "Limit hysteresis", graphic. **Status** ▪ Displays the current status of the "Lower limit warning" e.g. alarm still active, alarm reported to control level etc. ▪ Factory setting: 0 **Warning output value (Out Value)** ▪ Displays the value that violated the lower limit ("Lower limit warning"). ▪ Factory setting: 0.0000 %
Lower limit alarm Display AI1 Slot: 1 AI2 Slot: 2 Index: 49	The "Lower limit alarm" parameter is a structured parameter consisting of four elements. The parameter displays the status of the lower critical limit value alarm. → 166, "Limit hysteresis", graphic. **Status** ▪ Displays the current status of the "Lower limit alarm" e.g. alarm still active, alarm reported to control level etc. ▪ Factory setting: 0 **Alarm output value (Out Value)** ▪ Displays the value that violated the lower critical limit ("Lower limit alarm"). ▪ Factory setting: 0.0000 %

Expert → Communication → Analog Input 1/Analog Input 2 → AI Parameter	
Parameter name	**Description**
Simulate Entry AI1 Slot: 1 AI2 Slot: 2 Index: 50	The "Simulate" parameter is a structured parameter consisting of three elements. The input value and status of the Analog Input Block can be simulated by means of this parameter. As this value runs through the complete algorithm, the behavior of the Analog Input Block can be checked. **Simulation** ▪ 0: Simulation mode switched off ▪ 1: Simulation mode switched on **Simulation value** ▪ This element is displayed if the simulation mode was enabled via the simulation element. Depending on the settings for the "**Measuring mode (005)**" level selection and unit parameters, you can enter a pressure, level, volume, mass or flow value here. ▪ Factory setting: 0.0 **Status** ▪ This element is displayed if the simulation mode was enabled via the simulation element. Enter the status for the simulation value. ▪ Factory setting: 128 (Gut (GOOD))
Unit text Entry AI1 Slot: 1 AI2 Slot: 2 Index: 51	Enter text (max. 16 alphanumeric characters). **Factory setting:** Empty field
PV scale unit Display AI1 Slot: 1 AI2 Slot: 2 Index: 61	This parameter describes the unit of the process variable of the Transducer Block which is assigned to this Analog Input Block via the channel (see "Channel" parameter → 164.
AI view 1 Display AI1 Slot: 1 AI2 Slot: 2 Index: 62	Group of Analog Input Block parameters that are read as one via a communication request. The "AI view 1" comprises: ▪ Static rev. no. ▪ Block mode ▪ Alarm summary ▪ Output value (OUT Value)

9.5.4 Analog Output Block 1 / Analog Output Block 2

Expert → Communication → Analog Output 1/Analog Output 2 → AO Standard Parameter	
Parameter name	**Description**
Block object Display AO1 Slot: 3 AO2 Slot: 4 Index: 16	The "Block object" parameter is a structured parameter consisting of 13 elements. This parameter describes the characteristics of the Analog Output Block. **Reserved profile parameter** ▪ 250 = not used **Block object** ▪ 2 = Function Block **Parent class** ▪ 2 = Output **Class** ▪ 128 = Endress+Hauser Analog Output Block (DAO_EH) **Device rev.** ▪ 1 **Device rev. comp** ▪ 1 **DD revision** ▪ 0 (for future use) **Profile** ▪ Number of the PROFIBUS PA profile in the PNO ▪ 0x40, 0x02 (compact class B) **Profile revision** ▪ Displays the profile version, here: 0x302 (Profiles 3.02) **Execution time** ▪ 0 (for future use) **No. of parameters** ▪ Number of parameters of the Endress+Hauser Analog Output, here: 23 **Index of View 1** ▪ Address of the "AO view 1" parameter, here: AO1 = 0x03, 0x27; AO2 = 0x04, 0x27 **Number of view lists** ▪ 1 = The Block contains one "View object".
Static rev. no. Display AO1 Slot: 3 AO2 Slot: 4 Index: 17	Displays the static revision counter for the parameters of the Analog Output Block. The counter is incremented by one with each change of a static parameter of the Analog Output Block. The counter counts to 65535 and then starts again at zero. **Factory setting:** 0
TAG Entry AO1 Slot: 3 AO2 Slot: 4 Index: 18	Enter tag name e.g. TAG number (max. 32 alphanumeric characters). **Factory setting:** _ or as per order specifications
Strategy Entry AO1 Slot: 3 AO2 Slot: 4 Index: 19	Enter user-specific value for grouping and thus faster evaluation of the blocks. Grouping takes place by entering the same numerical value for the "Strategy" parameter of the block in question. **Input range:** 0 to 65535 **Factory setting:** 0

Expert → Communication → Analog Output 1/Analog Output 2 → AO Standard Parameter	
Parameter name	**Description**
Alert key Entry AO1 Slot: 3 AO2 Slot: 4 Index: 20	Enter the user-specific value (e.g. identification number of the plant unit). The process control system can use this information to sort alarms and events that were generated by this block. **Input range:** 0 to 255 **Factory setting:** 0
Target mode Options AO1 Slot: 3 AO2 Slot: 4 Index: 21	Select the desired block mode. **Options:** ▪ Automatic (Auto) ▪ Manual (Man) ▪ Out of service (O/S) **Factory setting:** Automatic (Auto)
Block mode Display AO1 Slot: 3 AO2 Slot: 4 Index: 22	The "Block mode" parameter is a structured parameter consisting of three elements. PROFIBUS makes a distinction between the following block modes: automatic mode (Auto), manual user intervention (Man) and out of service (O/S). **Actual mode** ▪ Displays the current block mode. ▪ Factory setting: Automatic (Auto) **Permitted mode** ▪ Displays the modes supported by the block. ▪ Factory setting: 152 = Automatic (Auto), manual user intervention or out of service **Normal mode** ▪ Displays the normal working mode of the block. ▪ Factory setting: Automatic (Auto)
Alarm summary Display AO1 Slot: 3 AO2 Slot: 4 Index: 23	The "Alarm summary" parameter is a structured parameter consisting of four elements. **Current alarm summary** ▪ Displays the current alarms ▪ Factory setting: 0x0, 0x0

Expert → Communication → Analog Output 1/Analog Output 2→ AO Parameter	
Parameter name	**Description**
Batch information Entry AO1 Slot: 3 AO2 Slot: 4 Index: 24	The "Batch information" parameter is a structured parameter consisting of four elements. This parameter is used in batch processes in accordance with IEC 61512 Part 1 (ISA S88). The "Batch information" parameter is required in a decentralized automation system to identify the input channels used. In addition, the errors occurring for the current batch process can also be displayed. **Batch ID** ▪ Enter the ID of a batch application so you can assign device messages, such as alarms etc. **Batch unit (no. of recipe unit procedure or of the unit)** ▪ Enter the recipe code required for the batch application or the related unit, such as the reactor for example. **Batch operation** ▪ Enter the recipe currently available. **Batch phase** ▪ Enter the current recipe phase.

Expert → Communication → Analog Output 1/Analog Output 2→ AO Parameter	
Parameter name	**Description**
Input value Display AO1 Slot: 3 AO2 Slot: 4 Index: 26	The "Input value" parameter is a structured parameter consisting of two elements. **Input value** ▪ Displays the input value of the Analog Output Block **Input status** ▪ Displays the status of the input value If the "MAN" (manual) block mode was selected by means of the "Block mode" parameter, the "Input value" and its status can be specified manually here.
Channel Display AO1 Slot: 3 AO2 Slot: 4 Index: 27	This parameter is used to assign the output of the Analog Output Block to the received parameter of the Transducer Block. **Factory setting:** ▪ "Ext. val. 1" fixed assignment to the external value 1 of the Analog Output 1 ▪ "Ext. value 2" fixed assignment to the external value 2 for the Analog Output 2
Data size Display AO1 Slot: 3 AO2 Slot: 4 Index: 28	Size of the "Output value (OUT Value)" parameter in number of bytes, with status byte. **Factory setting:** 4
Data max. size Display AO1 Slot: 3 AO2 Slot: 4 Index: 29	Maximum size of the "Output value (OUT Value)" parameter in number of bytes, with status byte.
Failsafe time Entry AO1 Slot: 3 AO2 Slot: 4 Index: 32	Time in seconds since the failure was detected until action on the part of the block if the condition persists. **Factory setting:** 0
Failsafe mode Options AO1 Slot: 3 AO2 Slot: 4 Index: 33	If the Analog Output Block receives an input value with the status BAD, the Analog Output Block continues working with the failsafe mode defined by means of this parameter. The following options are available by means of the "Failsafe mode" parameter: ▪ Last valid out val. The last valid value is used for further processing with the status UNCERTAIN. ▪ Failsafe value The value specified by means of the "Failsafe default" parameter is used for further processing with the status UNCERTAIN. → See this table, "Failsafe default" parameter description. ▪ Status BAD The current value is used for further processing with the status BAD. The failsafe mode is also activated if the "Out of service" (O/S) option was selected by means of the "Target mode" parameter. **Factory setting:** Last valid out val.
Failsafe default Entry AO1 Slot: 3 AO2 Slot: 4 Index: 34	Enter the value for the "Failsafe value" option selected via the "Failsafe mode" parameter. → See also this table, "Failsafe mode" parameter description. **Factory setting:** 0.0000

Expert → Communication → Analog Output 1/Analog Output 2→ AO Parameter	
Parameter name	**Description**
Unit Entry AO1 Slot: 3 AO2 Slot: 4 Index: 35	This parameter describes the unit for the input value. **Factory setting:** Unknown
Output value (OUT Value) Display AO1 Slot: 3 AO2 Slot: 4 Index: 36	The "Output value (OUT Value)" parameter is a structured parameter consisting of two elements. **Output value (OUT Value)** ▪ Displays the output value (Out Value) of the Analog Output Block. It is transmitted to the "Ext. val. 1" or "Ext. value 2" parameter via the channel. **Out status** ▪ Displays the status of the output value (Out Value) If the "MAN" (manual) block mode was selected by means of the "Block mode" parameter, the "Output value (OUT Value)" and its status can be specified manually here.
AO view 1 Display AO1 Slot: 3 AO2 Slot: 4 Index: 39	Group of Analog Output Block parameters that are read as one via a communication request. The "AO view 1" comprises: ▪ Static rev. no. ▪ Block mode ▪ Alarm summary ▪ Input value ▪ Data size ▪ Data max. size

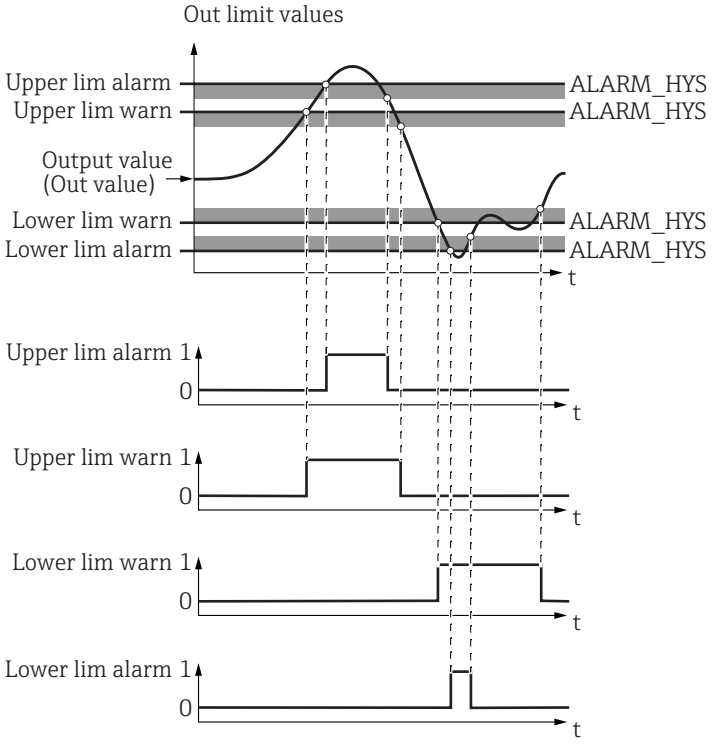
9.5.5 Totalizer Block (Deltabar M)

Expert → Communication → Totalizer 1→ TOT Standard Parameter	
Parameter name	**Description**
Block object Display Slot: 5 Index: 16	The "Block object" parameter is a structured parameter consisting of 13 elements. This parameter describes the characteristics of the Totalizer Block. **Reserved profile parameter** ▪ 250 = not used **Block object** ▪ 2 = Function Block **Parent class** ▪ 5 = Calculation **Class** ▪ 8 = Totalizer **Device rev.** ▪ 1 **Device rev. comp** ▪ 1 **DD revision** ▪ 0 (for future use) **Profile** ▪ Number of the PROFIBUS PA profile in the PNO ▪ 0x40, 0x02 (compact class B) **Profile revision** ▪ Displays the profile version, here: 0x302 (Profiles 3.02) **Execution time** ▪ 0 (for future use) **No. of parameters** ▪ Number of parameters for the totalizer, here: 36 **Index of View 1** ▪ Address of the "Tot view 1" parameter, here: 0x05, 0x34 **Number of view lists** ▪ 1 = The Block contains one "View object".
Static rev. no. Display Index: 5 Slot: 17	Displays the static revision counter for the parameters of the Totalizer Block. The counter is incremented by one with each change of a static parameter of the Totalizer Block. The counter counts to 65535 and then starts again at zero. **Factory setting:** 0
TAG Entry Slot: 5 Index: 18	Enter device tag e.g. TAG number (max. 32 alphanumeric characters). **Factory setting:** _ or as per order specifications
Strategy Entry Slot: 5 Index: 19	Enter user-specific value for grouping and thus faster evaluation of the blocks. Grouping takes place by entering the same numerical value for the "Strategy" parameter of the block in question. **Input range:** 0 to 65535 **Factory setting:** 0
Alert key Entry Slot: 5 Index: 20	Enter the user-specific value (e.g. identification number of the plant unit). The process control system can use this information to sort alarms and events that were generated by this block. **Input range:** 0 to 255 **Factory setting:** 0

Expert → Communication → Totalizer 1→ TOT Standard Parameter	
Parameter name	**Description**
Target mode Options Slot: 5 Index: 21	Select the desired block mode. **Options:** ▪ Automatic (Auto) ▪ Manual (Man) ▪ Out of service (O/S) **Factory setting:** Automatic (Auto)
Block mode Display Slot: 5 Index: 22	The "Block mode" parameter is a structured parameter consisting of three elements. PROFIBUS makes a distinction between the following block modes: automatic mode (Auto), manual user intervention (Man) and out of service (O/S). **Actual mode** ▪ Displays the current block mode. ▪ Factory setting: Automatic (Auto) **Permitted mode** ▪ Displays the modes supported by the block. ▪ Factory setting: 152 = Automatic (Auto), manual user intervention or out of service **Normal mode** ▪ Displays the normal working mode of the block. ▪ Factory setting: Automatic (Auto)
Alarm summary Display Slot: 5 Index: 23	The "Alarm summary" parameter is a structured parameter consisting of four elements. **Current alarm summary** ▪ Displays the current alarms ▪ Factory setting: 0x0, 0x0

Expert → Communication → Totalizer 1 → TOT Parameter	
Parameter name	**Description**
Batch information Entry Slot: 5 Index: 24	The "Batch information" parameter is a structured parameter consisting of four elements. This parameter is used in batch processes in accordance with IEC 61512 Part 1 (ISA S88). The "Batch information" parameter is required in a decentralized automation system to identify the input channels used. In addition, the errors occurring for the current batch process can also be displayed. **Batch ID** ▪ Enter the ID of a batch application so you can assign device messages, such as alarms etc. **Batch unit (no. of recipe unit procedure or of the unit)** ▪ Enter the recipe code required for the batch application or the related unit, such as the reactor for example. **Batch operation** ▪ Enter the recipe currently available. **Batch phase** ▪ Enter the current recipe phase.
Totalizer 1 Display Slot: 5 Index: 26	The "Totalizer 1" function block parameter contains the value and the associated status of the Totalizer 1.
Eng. unit totalizer 1 Entry Slot: 5 Index: 27	Unit of the Totalizer 1. **Factory setting:** m^3

Expert → Communication → Totalizer 1 → TOT Parameter	
Parameter name	**Description**
Channel Entry Slot: 5 Index: 28	Describes the flow measured value channel which is calculated by the Transducer Block.
Total.1 value Entry Slot: 5 Index: 29	Set the totalizer to zero or a predefined value. **Options:** ▪ Totalize (normal function of the totalizer) ▪ Reset (totalizer is reset to zero) ▪ Preset (totalizer is set to a predefined value) **Factory setting:** Totalize
Totalizer 1 mode Options Slot: 5 Index: 30	This function block parameter controls the totalization behavior. The following options are available: ▪ Balanced: true arithmetic integration of the flow values. ▪ Positive flow only: only positive flow values are totalized. ▪ Negative flow only: only negative flow values are totalized. ▪ Hold: the totalizer stops totalizing. **Factory setting:** Pos. flow only
Total. 1 failsafe Options Slot: 5 Index: 31	Define the behavior of the totalizer in the case of an error. **Options:** ▪ Actual value: It is integrated continuously with the current flow value. ▪ Hold: The totalizer is stopped and keeps its current value. ▪ Memory (the totalizer continues running with the last valid value). **Factory setting:** Actual value
Preset value Entry Slot: 5 Index: 32	Value for setting the totalizer to a predefined value, see "Preset" option of "Total.1 value" **Factory setting:** 0.0

Expert → Communication → Totalizer 1 → TOT Parameter	
Parameter name	**Description**
Limit hysteresis Entry Slot: 5 Index: 33	Enter hysteresis value for the upper and lower alarm value or critical alarm value. The alarm conditions remain active as long as the measured value is in the hysteresis. The hysteresis affects the following alarm or critical alarm limit values: The hysteresis affects the following alarm or critical alarm limit values: ▪ "Upper limit alarm": upper critical alarm limit value ▪ "Upper limit warning": upper alarm limit value ▪ "Lower limit warning": lower alarm limit value ▪ "Lower limit alarm": lower critical alarm limit value  *Fig. 32: Illustration of the output value (Totalizer 1) with limit values and hysteresis as well as the alarms "Upper limit alarm", "Upper limit warning", "Lower limit warning" and "Lower limit alarm"* **Factory setting:** 0 m^3
Upper limit alarm Entry Slot: 5 Index: 34	Enter upper critical limit value. If the "Output value (OUT Value)" exceeds this limit value, the "Upper limit alarm" parameter displays an alarm message. → See also this table, "Limit hysteresis" parameter description. **Factory setting:** 3.4028e+038 m^3
Upper limit warning Entry Slot: 5 Index: 35	Enter upper limit value. If the "Totalizer 1" exceeds this limit value, the "Upper limit warning" parameter displays an alarm message. → See also this table, "Limit hysteresis" parameter description. **Factory setting:** 3.4028e+038 m^3

Expert → Communication → Totalizer 1 → TOT Parameter	
Parameter name	**Description**
Lower limit warning Entry Slot: 5 Index: 36	Enter lower limit value. If the "Totalizer 1" drops below this limit value, the "Lower limit warning" parameter displays an alarm message. → See also this table, "Limit hysteresis" parameter description. **Factory setting:** -3.4028e+038 m^3
Lower limit alarm Entry Slot: 5 Index: 37	Enter lower critical limit value. If the "Totalizer 1" drops below this limit value, the "Lower limit alarm" parameter displays an alarm message. → See also this table, "Limit hysteresis" parameter description. **Factory setting:** -3.4028e+038 m^3
Upper limit alarm Display Slot: 5 Index: 38	The "Upper limit alarm" parameter is a structured parameter consisting of four elements. The parameter displays the status of the upper critical limit value alarm. → 176, "Limit hysteresis", graphic. **Status** ▪ Displays the current status of the "Upper limit alarm" e.g. alarm still active, alarm reported to control level etc. ▪ Factory setting: 0 **Alarm output value (Out Value)** ▪ Displays the value that violated the upper critical limit ("Upper limit alarm"). ▪ Factory setting: 0.0000 m^3
Upper limit warning Display Slot: 5 Index: 39	The "Upper limit warning" parameter is a structured parameter consisting of four elements. The parameter displays the status of the upper limit value alarm. → 176, "Limit hysteresis", graphic. **Status** ▪ Displays the current status of the "Upper limit warning" e.g. alarm still active, alarm reported to control level etc. ▪ Factory setting: 0 **Warning output value** ▪ Displays the value that violated the upper limit ("Upper limit warning"). ▪ Factory setting: 0.0000 m^3
Lower limit warning Display Slot: 5 Index: 48	The "Lower limit warning" parameter is a structured parameter consisting of four elements. The parameter displays the status of the lower limit value alarm. → 176, "Limit hysteresis", graphic. **Status** ▪ Displays the current status of the "Lower limit warning" e.g. alarm still active, alarm reported to control level etc. ▪ Factory setting: 0 **Warning output value** ▪ Displays the value that violated the lower limit ("Lower limit warning"). ▪ Factory setting: 0.0000 m^3
Lower limit alarm Display Slot: 5 Index: 41	The "Lower limit alarm" parameter is a structured parameter consisting of four elements. The parameter displays the status of the lower critical limit value alarm. → 176, "Limit hysteresis", graphic. **Status** ▪ Displays the current status of the "Lower limit alarm" e.g. alarm still active, alarm reported to control level etc. ▪ Factory setting: 0 **Alarm output value** ▪ Displays the value that violated the lower critical limit ("Lower limit alarm"). ▪ Factory setting: 0.0000 m^3

Expert → Communication → Totalizer 1 → TOT Parameter	
Parameter name	**Description**
Tot view 1 Display Slot: 5 Index: 52	Group of Totalizer Block parameters that are read as one via a communication request. The "Tot view 1" comprises: ▪ Static rev. no. ▪ Block mode ▪ Alarm summary ▪ Totalizer 1

9.5.6 Transducer Block

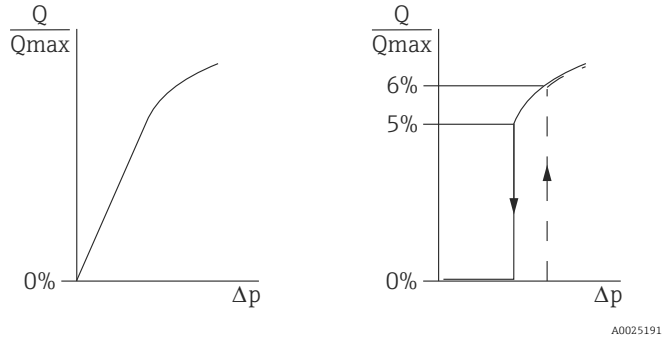
Expert → Communication → Transducer Block → TB Standard Parameter	
Parameter name	**Description**
Block object Display Slot: 6 Index: 16	The "Block object" parameter is a structured parameter consisting of 13 elements. This parameter describes the characteristics of the Transducer Block. **Reserved profile parameter** ▪ 250 = not used **Block object** ▪ 3 = Transducer Block **Parent class** ▪ 1 = Pressure **Class** ▪ 7 = Differential pressure, gauge pressure, absolute pressure **Device rev.** ▪ 1 **Device rev. comp** ▪ 1 **DD revision** ▪ 0 (for future use) **Profile** ▪ Number of the PROFIBUS PA profile in the PNO ▪ 0x40, 0x02 (compact class B) **Profile revision** ▪ Displays the profile version, here: 0x302 (Profiles 3.02) **Execution time** ▪ 0 (for future use) **No. of parameters** ▪ Number of parameters for the transducer, here: 234 **Index of View 1** ▪ Address of the "TB View 1" parameter, here: 0x06, 0xFA **Number of view lists** ▪ 1 = The Block contains one "View object".
Static rev. no. Display Index: 6 Slot: 17	Displays the static revision counter for the parameters of the Transducer Block The counter is incremented by one with each change of a static parameter of the Transducer Block. The counter counts to 65535 and then starts again at zero. **Factory setting:** 0
TAG Entry Slot: 6 Index: 18	Enter tag name e.g. TAG number (max. 32 alphanumeric characters). **Factory setting:** _ or as per order specifications

Expert → Communication → Transducer Block → TB Standard Parameter	
Parameter name	**Description**
Strategy Entry Slot: 6 Index: 19	Enter user-specific value for grouping and thus faster evaluation of the blocks. Grouping takes place by entering the same numerical value for the "Strategy" parameter of the block in question. **Input range:** 0 to 65535 **Factory setting:** 0
Alert key Entry Slot: 6 Index: 20	Enter the user-specific value (e.g. identification number of the plant unit). The process control system can use this information to sort alarms and events that were generated by this block. **Input range:** 0 to 255 **Factory setting:** 0
Target mode Options Slot: 6 Index: 21	Select the desired block mode. Only the "Automatic (Auto)" mode can be selected for the Transducer Block. **Options:** ▪ Automatic (Auto) **Factory setting:** Automatic (Auto)
Block mode Display Slot: 6 Index: 22	The "Block mode" parameter is a structured parameter consisting of three elements. PROFIBUS makes a distinction between the following block modes: automatic mode (Auto), manual user intervention (Man) and out of service (O/S). The Transducer Block only works in the "Automatic (Auto)" mode. **Actual mode** ▪ Displays the current block mode. ▪ Factory setting: Automatic (Auto) **Permitted mode** ▪ Displays the modes supported by the block. ▪ Factory setting: 8 = Automatic (Auto) **Normal mode** ▪ Displays the normal working mode of the block. ▪ Factory setting: Automatic (Auto)
Alarm summary Display Slot: 6 Index: 23	The "Alarm summary" parameter is a structured parameter consisting of four elements. **Current alarm summary** ▪ Displays the current alarms ▪ Factory setting: 0x0, 0x0

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Sensor pressure Display Slot: 6 Index: 24	Displays the measured pressure before sensor trim, position adjustment and damping. → 127, **Meas. pressure (020)**, graphic
URL sensor Display Slot: 6 Index: 25	Displays the upper range limit of the sensor.
LRL sensor Display Slot: 6 Index: 26	Displays the lower-range limit of the sensor.

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Hi trim sensor Display Slot: 6 Index: 27	Sensor recalibration by entering a target pressure while simultaneously and automatically accepting a reference pressure present for the upper calibration point.
Lo trim sensor Entry Slot: 6 Index: 28	Sensor recalibration by entering a target pressure while simultaneously and automatically accepting a reference pressure present for the lower calibration point.
Minimum span Display Slot: 6 Index: 29	Displays the smallest possible span.
Pressure unit Options Slot: 6 Index: 30	Select the pressure unit. If a new pressure unit is selected, all pressure-specific parameters are converted and displayed with the new unit. **Options:** ▪ mbar, bar ▪ mmH2O, mH2O ▪ inH2O, ftH2O ▪ Pa, kPa, MPa ▪ psi ▪ mmHg, inHg ▪ kgf/cm^2 **Factory setting:** mbar or bar depending on the nominal measuring range of the sensor, or as per order specifications
Corrected press. Display Slot: 6 Index: 31	Displays the measured pressure after sensor trim and position adjustment. If this value is not equal to "0", it can be corrected to "0" by the position adjustment.
Sensor meas. type Display Slot: 6 Index: 32	Displays the sensor type. ▪ Deltabar M = differential ▪ Cerabar M with gauge pressure measuring cells = gauge ▪ Cerabar M with absolute pressure sensors = absolute ▪ Deltapilot M with gauge pressure measuring cells = gauge
Sensor serial no. Display Slot: 6 Index: 33	Displays the serial number of the sensor (11 alphanumeric characters).
Primary value Display Slot: 6 Index: 34	The "Primary value" parameter is a structured parameter consisting of two elements. **Measured value** ▪ Depending on the settings for the "**Measuring mode (005)**", Lin. mode (037) and unit parameters, a pressure, level, volume, mass or flow value is displayed here. **Status** ▪ Displays the status of the measured value

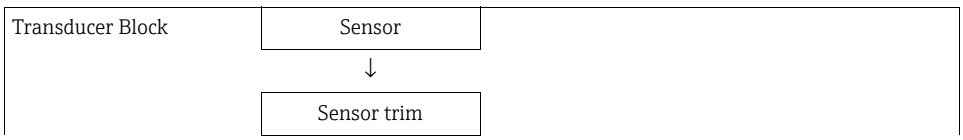
Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Primary value unit Display Slot: 6 Index: 35	This parameter describes the unit of the primary value depending on the "transmitter type".
Transmitter type Display Slot: 6 Index: 36	This parameter describes the measuring mode of the pressure transmitter. **Options:** ▪ Pressure ▪ Flow ▪ Level
Sensor Temp. (Cerabar/ Deltapilot) Display Slot: 6 Index: 43	The "Sensor Temp. (Cerabar/Deltapilot)" parameter is a structured parameter consisting of two elements. **Sensor temp.** ▪ Displays the temperature currently measured in the sensor. This can deviate from the process temperature. **Status** ▪ Displays the status of the temperature measured
Temp. eng. unit. (Cerabar/Deltapilot) Options Slot: 6 Index: 44	Select the unit for the temperature measured values.  The setting affects the unit for the "Sensor temp." parameter. **Options:** ▪ °C ▪ °F ▪ K **Factory setting:** °C
Value (sec val 1) Display Slot: 6 Index: 45	This parameter contains the pressure value and the status that is available for the function block.
Value (sec val 1) Display Slot: 6 Index: 46	This parameter contains the pressure unit of the "Value (sec val 1)" (= "Pressure unit") parameter.
Value (sec val 2) Display Slot: 6 Index: 47	This parameter contains the measured value after input scaling and the status that is available for the function block. The parameter contains the standardized pressure value without an engineering unit.
Sec val2 unit Display Slot: 6 Index: 48	This parameter contains the unit of the "Value (sec val 2)" parameter. The digital value, that corresponds "None" and is transmitted, is 1997 (PROFIBUS PA Profile).
Characterization Display Slot: 6 Index: 49	Type of characteristic. **Options:** ▪ Linear ▪ Linearization ▪ Square root

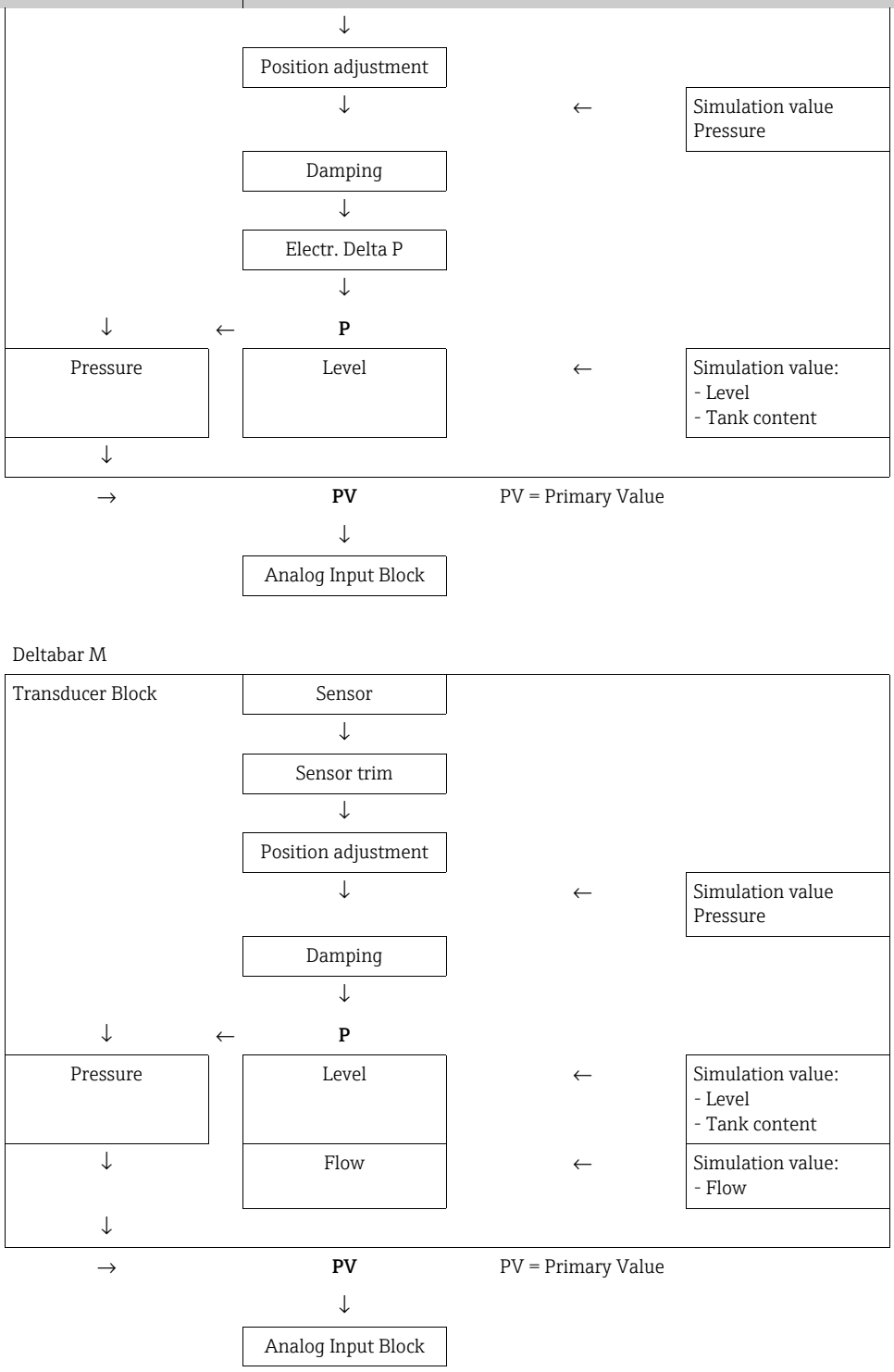
Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Measuring range Entry Slot: 6 Index: 50	The "Measuring range" parameter is a structured parameter consisting of two elements. **Full pressure** ▪ Enter the upper limit for the input value of the Transducer Block. ▪ Factory setting: URL sensor (→ For the sensor upper range value, see "URL sensor".) **Empty pressure** ▪ Enter the lower limit for the input value of the Transducer Block. ▪ Factory setting: 0
Working range Entry Slot: 6 Index: 51	The "Working range" parameter is a structured parameter consisting of two elements. **Full calib.** ▪ Enter the upper limit for the output value (Out Value) of the Transducer Block. ▪ Factory setting: URL sensor (→ For the sensor upper range value, see "URL sensor".) **Empty calib.** ▪ Enter the lower limit for the output value (Out Value) of the Transducer Block. ▪ Factory setting: 0
Set low-flow cut-off Display Slot: 6 Index: 52	Enter switch-on point of the flow-flow cut-off. The hysteresis between the switch-on point and the switch-off point is always 1% of the maximum flow value. **Input range:** Switch-off point: 0 to 50% of end flow value ("**Max. flow (009)**").  **Factory setting:** 5 % (of the maximum flow value)
Squareroot point Display Slot: 6 Index: 53	This is the point in the flow function when the curve changes from a linear to a square root function. The value must be entered as a percentage of the standardized flow.
Tab actual numb Display Slot: 6 Index: 54	Contains the actual numbers of entries in the table. It is calculated when table transmission has ended.
Line numb.: Display Slot: 6 Index: 55	The "Line numb.:" parameter identifies which element in the table is currently in the "Tab xy value" parameter.
Table max. number Display Slot: 6 Index: 56	"Table max. number" is the maximum size (number of value pairs "X-Value" and "Y value") of the table in the device.

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Table min. number Display Slot: 6 Index: 57	For device-internal reasons (e.g. calculation), it is sometimes necessary to use a minimum number of table values. This number is provided in the "Table min. number" parameter.
Simulation mode Options Slot: 6 Index: 58	Select the function for entering the table. **Options:** ▪ Clear table: deletes an active linearization table ▪ New operation: creates a new linearization table ▪ Accept input table: enables the linearization table entered ▪ Delete point: deletes a linearization point. ▪ Insert point: adds a new linearization point. **Factory setting:** Clear table
Status (characteristic) Display Slot: 6 Index: 59	Displays the result of check of the linearization table.
Tab xy value Display Slot: 6 Index: 60	"X-value" and "Y value" value pairs for Linearization curve.
Max. meas. press. Display Slot: 6 Index: 61	Displays the highest measured pressure value (peak hold indicator). You can reset this indicator by means of the "Reset peak hold" parameter.
Min. meas. press. Display Slot: 6 Index: 62	Displays the smallest measured pressure value (peak hold indicator). You can reset this indicator by means of the "Reset peak hold" parameter.
Empty calib. Entry Slot: 6 Index: 66	Enter the output value for the lower calibration point (tank empty). The unit defined in "Unit before lin." must be used.  ▪ In the case of wet calibration, the level (tank empty) must actually be available. The associated pressure is then automatically recorded by the device. ▪ In the case of dry calibration, the level (tank empty) does not have to be available. The associated pressure has to be entered in the "Empty pressure" parameter for the "In pressure" level selection. The associated height has to be entered in the "Empty height" parameter for the "In height" level selection. **Factory setting:** 0.0
Full calib. Entry Slot: 6 Index: 67	Enter the output value for the upper calibration point (tank full). The unit defined in "Unit before lin." must be used.  ▪ In the case of wet calibration, the level (tank full) must actually be available. The associated pressure is then automatically recorded by the device. ▪ In the case of dry calibration, the level (tank full) does not have to be available. The associated pressure has to be entered in the "Full pressure" parameter for the "In pressure" level selection. The associated height has to be entered in the "Full height" parameter for the "In height" level selection. **Factory setting:** 100.0

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Pressure Empty/Full Display Slot: 6 Index: 68	Internal service parameter.
Calibration Empty/Full Display Slot: 6 Index: 69	Internal service parameter.
Max. turndown Display Slot: 6 Index: 70	Internal service parameter
High press. side Display Slot: 6 Index: 71	Determines which pressure input corresponds to the high-pressure side. This setting is only valid if the "SW/P2 High" DIP switch is switched off (see "**Switch P1/P2 (163) (Deltabar)**") parameter. Otherwise P2 corresponds to the high-pressure side in any case.
Reset peak hold Display Slot: 6 Index: 72	You can reset the "Min. meas. press." and "Max. meas. press." indicators with this parameter. **Options:** ▪ Abort ▪ Confirm **Factory setting:** Abort
Measuring mode Options Slot: 6 Index: 73	Select the measuring mode. The operating menu is structured according to the selected measuring mode. **⚠ 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 and, if necessary, reconfigured! **Options:** ▪ Pressure ▪ Level ▪ Flow (Deltabar) **Factory setting:** Pressure
Simulation mode Options Slot: 6 Index: 74	Switch on the simulation mode and select the simulation type. A simulation that is running is switched off if the measuring mode or (**Lin. mode (037)**) level mode is changed. **Options**: ▪ None ▪ Pressure, → see this table, "Sim. pressure" parameter ▪ Level, → see this table, "Sim. level" parameter ▪ Flow, → see this table, "Sim. flow (Deltabar)" parameter ▪ Tank content, → see this table, "Sim. tank cont." parameter ▪ Alarm/warning, → see this table, "Sim. error no." parameter

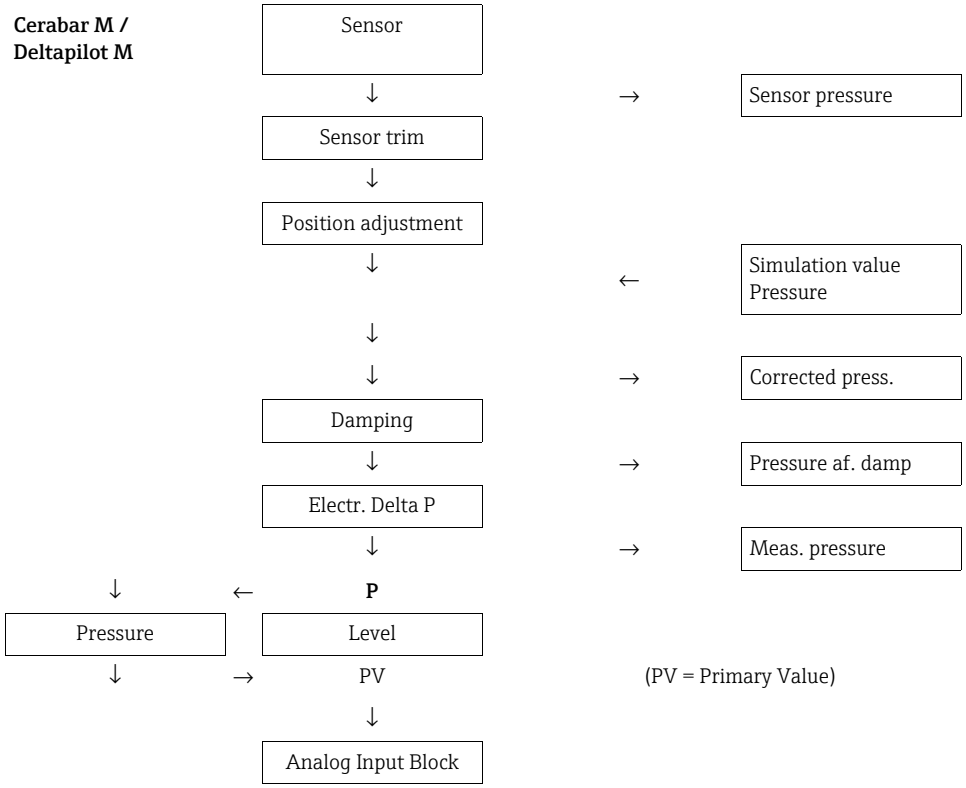
Cerabar M /
Deltapilot M



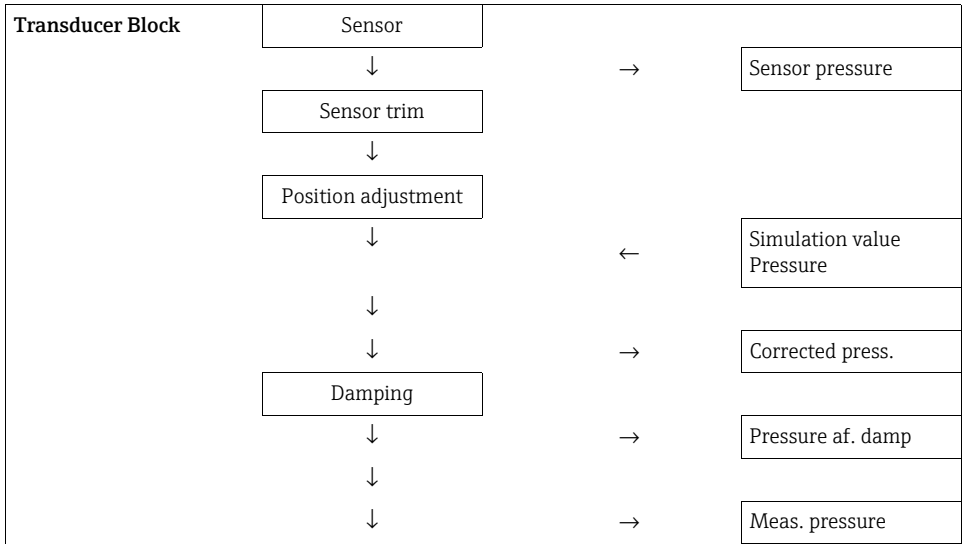
Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
	
Sim. level Entry Slot: 6 Index: 76	Use this function to enter the simulation value. → See also "Simulation mode". **Prerequisite(s):** ▪ "Measuring mode" = Level and "Simulation mode" = Level
Sim. tank cont. Entry Slot: 6 Index: 77	Use this function to enter the simulation value. → See also "Simulation mode". **Prerequisite(s):** ▪ "Measuring mode" = Level, Lin. mode = "Activate table" and "Simulation mode" = Tank content.

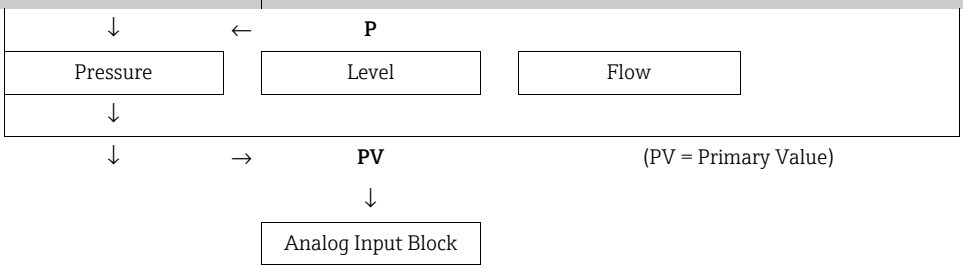
Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Sim. flow (Deltabar) Entry Slot: 6 Index: 78	Use this function to enter the simulation value. → See also "Simulation mode". **Prerequisite(s):** ▪ "Measuring mode" = Flow and "Simulation mode" = Flow
Sim. pressure Entry Slot: 6 Index: 79	Use this function to enter the simulation value. → See also "Simulation mode". **Prerequisite(s):** ▪ "Simulation mode" = Pressure **Value when switched on:** Current pressure measured value
Electr. Delta P (Cerabar / Deltapilot) Options Slot: 6 Index: 80	This function activates the electr. delta P application with an external or constant value. **Options:** ▪ Off ▪ Ext. value 2 ▪ Constant **Factory setting:** Off
Pressure abs range Entry Slot: 6 Index: 81	Absolute measuring range of the sensor.
Lo trim measured Display Slot: 6 Index: 82	Displays the reference pressure present to be accepted for the lower calibration point.
Hi trim measured Display Slot: 6 Index: 83	Displays the reference pressure present to be accepted for the upper calibration point.
Pos. zero adjust (Deltabar M and gauge pressure measuring cells) Options Slot: 6 Index: 84	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 (Deltabar M and gauge pressure measuring cells)" 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 **Options** ▪ Confirm ▪ Abort **Factory setting:** Abort
Calib. offset (absolute pressure sensors) Entry Slot: 6 Index: 86	Position adjustment – the pressure difference between the set point and the measured pressure must be known. **Example:** – Measured value = 982.2 mbar (14.25 psi) – You correct the measured value with the value entered (e.g. 2.2 mbar (0.032 psi)) via the "Calib. offset" parameter. This means that you are assigning the value 980.0 (14.21 psi) to the pressure present. – Measured value (after calib. offset) = 980.0 mbar (14.21 psi) **Factory setting:** 0.0

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Damping Entry/Display Slot: 6 Index: 87	Enter damping time (time constant τ). The damping affects the speed at which the measured value reacts to changes in pressure. The damping is only active if DIP switch 2 ("damping τ") is in the ON position.
Meas. pressure Display Slot: 6 Index: 88	Displays the measured pressure after sensor trim, position adjustment and damping.



Deltabar M



Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
	
Unit before lin. Entry Slot: 6 Index: 89	Select the unit for the measured value display for the level before linearization. The selected unit is used only to describe the measured value. This means that the measured value is not converted when a new output unit is selected. **Example:** ▪ Current measured value: 0.3 ft ▪ New output unit: m ▪ New measured value: 0.3 m **Options** ▪ % ▪ mm, cm, dm, m ▪ ft, in ▪ m^3, in^3 ▪ l, hl ▪ ft^3 ▪ gal, Igal ▪ kg, t ▪ lb **Factory setting:** %
Calibration mode Options Slot: 6 Index: 90	Select the calibration mode. **Options:** ▪ Wet Wet calibration is performed by filling and emptying the container. In the case of two different levels, the level, volume, mass or percentage value entered is assigned to the pressure measured at this point in time ("Empty calib." and "Full calib." parameters). ▪ Dry Dry calibration is a theoretical calibration. For this calibration, you specify two pressure/level value pairs via the following parameters: "Empty calib.", "Empty pressure", "Full calib.", "Full pressure", "Empty height", "Full height". **Factory setting:** Wet
Height unit Options Slot: 6 Index: 91	Select the height unit. The measured pressure is converted to the selected height unit using the "Adjust density" parameter. **Prerequisite(s)** "Level selection" = In height **Options** ▪ mm ▪ m ▪ in ▪ ft **Factory setting:** m
Density unit Display Slot: 6 Index: 92	Select the density unit. The measured pressure is converted to a height using the "Height unit" and "Adjust density" parameters. **Factory setting:** ▪ g/cm^3

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Adjust density Entry Slot: 6 Index: 93	Enter the density of the medium. The measured pressure is converted to a height using the "Height unit" and "Adjust density" parameters. **Factory setting:** 1.0
Process density Entry Slot: 6 Index: 94	Enter a new density value for density correction. The calibration was carried out with water as the medium, for example. Now the container is to be used for another medium with another density. The calibration is corrected appropriately by entering the new density value in the "Process density" parameter. If you change to dry calibration after completing a wet calibration using the "Calibration mode" parameter, the density for the "Adjust density" and "Process density" parameters must be entered correctly before changing the calibration mode. **Factory setting:** 1.0
Meas. Level Display Slot: 6 Index: 95	Displays the height currently measured. The measured pressure is converted to a height using the **Process density (035)** parameter.
Empty height Entry/Display Slot: 6 Index: 96	Enter the height value for the lower calibration point (tank empty). Select the unit via the "Height unit" parameter. **Prerequisite(s):** ▪ "Level selection" = In height ▪ "Calibration mode" = Dry -> entry ▪ "Calibration mode" = Wet -> display **Factory setting:** 0.0
Full height Entry/Display Slot: 6 Index: 97	Enter the height value for the upper calibration point (tank full). Select the unit via the "Height unit" parameter. **Prerequisite(s):** ▪ "Level selection" = In height ▪ "Calibration mode" = Dry -> entry ▪ "Calibration mode" = Wet -> display **Factory setting:** Upper-range limit (URL) is converted to a level unit
Level before lin. Display Slot: 6 Index: 98	Displays the level value before the linearization table.
Tank description Entry Slot: 6 Index: 101	Enter the tank description (max. 32 alphanumeric characters)

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Lin. mode Options Slot: 6 Index: 102	Select the linearization mode. **Options:** ▪ Linear: The level is output without being converted beforehand. "Level before lin." is output. ▪ Erase table: The existing linearization table is cleared. ▪ Manual entry (sets the table to the edit mode, an alarm is output): The value pairs of the table ("X-Value" and "**Y-value (041) (manual entry/in semi-auto. entry)**") are entered manually. ▪ Semiautomatic entry (sets the table to the edit mode, an alarm is output): The container is emptied or filled in stages in this entry mode. The device records the level value automatically ("X-Value"). The associated volume, mass or % value is entered manually ("**Y-value (041) (manual entry/in semi-auto. entry)**"). ▪ Activate table The table entered is activated and checked with this option. The device shows the level after linearization. **Factory setting:** Linear
Unit after lin. Options Slot: 6 Index: 103	Select the unit of the level value after linearization (unit of the Y-value). **Options:** ▪ % ▪ cm, dm, m, mm ▪ hl ▪ in^3, ft^3, m^3 ▪ l ▪ in, ft ▪ kg, t ▪ lb ▪ gal ▪ Igal **Factory setting:** %
Tank content Display Slot: 6 Index: 104	Displays the level value after linearization
Empty calib. Entry Slot: 6 Index: 105	Enter the output value for the lower calibration point (tank empty). The unit defined in "Unit before lin." must be used.  ▪ In the case of wet calibration, the level (tank empty) must actually be available. The associated pressure is then automatically recorded by the device. ▪ In the case of dry calibration, the level (tank empty) does not have to be available. The associated pressure has to be entered in the "Empty pressure" parameter for the "In pressure" level selection. The associated height has to be entered in the "Empty height" parameter for the "In height" level selection. **Factory setting:** 0.0

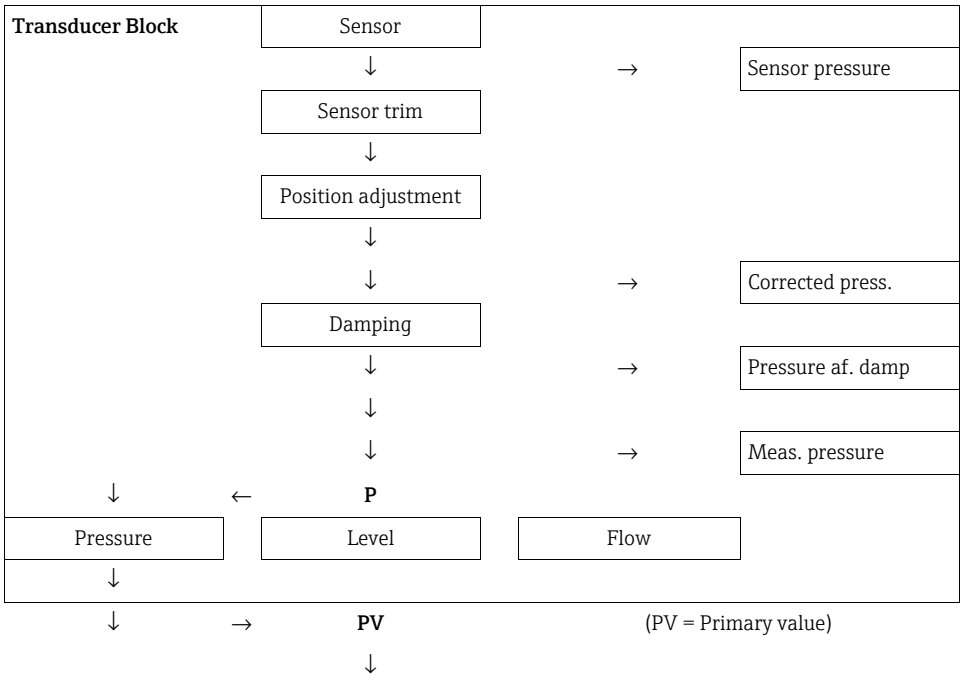
Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Full calib. Entry Slot: 6 Index: 106	Enter the output value for the upper calibration point (tank full). The unit defined in "Unit before lin." must be used. ▪ In the case of wet calibration, the level (tank full) must actually be available. The associated pressure is then automatically recorded by the device. ▪ In the case of dry calibration, the level (tank full) does not have to be available. The associated pressure has to be entered in the "Full pressure" parameter for the "In pressure" level selection. The associated height has to be entered in the "Full height" parameter for the "In height" level selection. **Factory setting:** 100.0
Tab xy value Display/Entry Slot: 6 Index: 107	Displays a pair of points of the linearization table.
Edit table Options Slot: 6 Index: 108	Select the function for entering the table. **Options:** ▪ Next point: Enter the next point. ▪ Current point: stay on the current point to correct a mistake for example. ▪ Previous point: skip back to the previous point to correct a mistake for example. ▪ Insert point: Insert an additional point (see example below). ▪ Delete point: Delete the current point (see example below). **Example:** Add a point - in this case between the 4th and 5th point for example – Select point 5 via the "Line numb.:" parameter. – Select the "Insert point" option via the "Edit table" parameter. – Point 5 is displayed for the "Line numb.:" parameter. Enter new values for the "X-Value" and "**Y-value (041) (manual entry/in semi-auto. entry)**" parameters. **Example:** Delete a point - in this case the 5th point for example – Select point 5 via the "Line numb.:" parameter. – Select the "Delete point" option via the "Edit table" parameter. – The 5th point is deleted. All of the subsequent points are moved up one number i.e. following deletion, the 6th point becomes Point 5. **Factory setting:** Current point
Lin tab index 01 Entry Slot: 6 Index: 109	First table point parameter for linearization via the Fieldcare module.
...	
Lin tab index 32 Entry Slot: 6 Index: 140	Last table point parameter for linearization via the Fieldcare module.
Ext. value 2 Display Slot: 6 Index: 141	Output value and status parameters of Analog Output 2.
Ext.val.2 unit Entry Slot: 6 Index: 142	Unit of the output value parameter of Analog Output 2.

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Flow-meas. type Options Slot: 6 Index: 143	Select the flow type. **Options:** ▪ Volume operat. cond. (volume under operating conditions) ▪ Volume norm. cond. (normal volume under normal conditions in Europe: 1013.25 mbar and 273.15 K (0 °C)) ▪ Volume std. cond. (standard volume under standard conditions in the USA: 1013.25 mbar (14.7 psi) and 288.15 K (15 °C/59 °F)) ▪ Mass ▪ Flow in % **Factory setting:** Volume operat. conditions
Max. flow Entry Slot: 6 Index: 144	Enter maximum flow of primary device. See also layout sheet of primary device. The maximum flow is assigned to the maximum pressure which you enter via "**Max. pressure flow (010)**".
Max. pressure flow Entry Slot: 6 Index: 145	Enter maximum pressure of primary device. → See layout sheet of primary device. This value is assigned to the maximum flow value (→ See "**Max. flow (009)**").
Flow unit Entry Slot: 6 Index: 146	Unit of the set "flow type".
Mass flow unit Options Slot: 6 Index: 147	Select the mass flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow mode (flow-meas. type). When the flow mode is changed, conversion is not possible. **Prerequisite(s):** ▪ "Flow-meas. type" = Mass **Options:** ▪ g/s, kg/s, kg/min, kg/h ▪ t/s, t/min, t/h, t/d ▪ oz/s, oz/min ▪ lb/s, lb/min, lb/h ▪ ton/s, ton/min, ton/h, ton/d **Factory setting:** kg/s
Std. flow unit Options Slot: 6 Index: 148	Select standard volume flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow mode (flow-meas. type). When the flow mode is changed, conversion is not possible. **Prerequisite(s):** ▪ "Flow-meas. type" = Volume std. conditions **Options:** ▪ Sm^3/s, Sm^3/min, Sm^3/h, Sm^3/d ▪ SCFS, SCFM, SCFH, SCFD **Factory setting:** Sm^3/s

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Norm. flow unit Options Slot: 6 Index: 149	Select norm. volume flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow type Flow-meas. type. When the flow mode is changed, conversion is not possible. **Prerequisite(s):** ▪ "Flow-meas. type" = Volume norm. cond. **Options:** ▪ Nm^3/s, Nm^3/min, Nm^3/h, Nm^3/d **Factory setting:** Nm^3/s
Flow unit Options Slot: 6 Index: 150	Select volume flow unit. When a new flow unit is selected, all flow-specific parameters are converted and displayed with the new unit within a flow type Flow-meas. type. When the flow mode is changed, conversion is not possible. **Prerequisite(s):** ▪ "Flow-meas. type" = Volume operat. cond. **Options:** ▪ dm^3/s, dm^3/min, dm^3/h ▪ m^3/s, m^3/min, m^3/h, m^3/d ▪ l/s, l/min, l/h ▪ hl/s, hl/min, hl/d ▪ ft^3/s, ft^3/min, ft^3/h, ft^3/d ▪ ACFS, ACFM, ACFH, ACFD ▪ ozf/s, ozf/min ▪ gal/s, gal/min, gal/h, gal/d, Mgal/d ▪ Igal/s, Igal/min, Igal/h ▪ bbl/s, bbl/min, bbl/h, bbl/d **Factory setting:** m^3/h
Flow Display Slot: 6 Index: 151	Displays the present flow value.
Totalizer 2 mode Options Slot: 6 Index: 153	Define the behavior of the totalizer. **Options:** ▪ Balanced: Integration of all measured flows (positive and negative). ▪ Pos. flow only: only positive flows are integrated. ▪ Neg. flow only: only negative flows are integrated. ▪ Hold: The totalizer is stopped and keeps its current value. **Factory setting:** Pos. flow only
Totalizer 2 Display Slot: 6 Index: 154	Displays the counter reading of totalizer 2. The Totalizer 2 overflow parameter displays the overflow. **Example:** The value 123456789 m^3 is displayed as follows: – Totalizer 1: 3456789 m^3 – Totalizer 1 overflow: 12 E7 m^3
Eng. unit totalizer 2 Options Slot: 6 Index: 155	Select the unit for totalizer 2. The direct access code and the option list depends on the selected "Flow-meas. type": – (065): Flow-meas. type "Mass" – (066): Flow-meas. type "Gas norm. cond." – (067): Flow-meas. type "Gas. std. cond." – (068): Flow-meas. type "Volume operat. cond." **Factory setting:** m^3

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Totalizer 2 Display Slot: 6 Index: 156	Displays the total flow value of totalizer 2. The Totalizer 2 overflow parameter displays the overflow. **Example:** The value 123456789 m^3 is displayed as follows: – Totalizer 1: 3456789 m^3 – Totalizer 1 overflow: 12 E7 m^3
Totalizer 2 overflow Display Slot: 6 Index: 157	Displays the overflow value of totalizer 2. → See also "Totalizer 2".
Eng. unit totalizer 2 Options Slot: 6 Index: 158, 159, 160, 161	Select the unit for totalizer 2. The direct access code and the option list depends on the selected "Flow-meas. type": – (065): Flow-meas. type "Mass" – (066): Flow-meas. type "Gas norm. cond." – (067): Flow-meas. type "Gas. std. cond." – (068): Flow-meas. type "Volume operat. cond." **Factory setting:** m^3
Totalizer 1 Display Slot: 6 Index: 162	Displays the totalizer value.
Totalizer 1 overflow Display Slot: 6 Index: 163	Displays the overflow value of totalizer 1. → See also "Totalizer 1"
Total. 2 failsafe Options Slot: 6 Index: 164	Define the behavior of the totalizer 2 in the case of an error. **Options:** ▪ Actual value: It is integrated continuously with the current flow value. ▪ Hold: The totalizer is stopped and keeps its current value. **Factory setting:** Actual value
Damping Entry/Display Slot: 6 Index: 165	Enter damping time (time constant τ). The damping affects the speed at which the measured value reacts to changes in pressure.  The damping is only active if DIP switch 2 ("damping τ") is in the ON position.
Level selection Options Slot: 6 Index: 166	Select the method for calculating the level **Options:** ▪ In pressure If this option is selected, specify two pressure/level value pairs. The level value is displayed directly in the unit that you select via the "Unit before lin." parameter. ▪ In height If this option is selected, specify two height/level value pairs. From the measured pressure, the device first calculates the height using the density. This information is then used to calculate the level in the "Unit before lin." selected using the two value pairs specified. **Factory setting:** In pressure

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
High press. side Options/Display Slot: 6 Index: 167	Determines which pressure input corresponds to the high-pressure side. This setting is only valid if the "SW/P2 High" DIP switch is switched off (see "**Switch P1/P2 (163) (Deltabar)**") parameter. Otherwise P2 corresponds to the high-pressure side in any case.
Fixed ext. value (Cerabar / Deltapilot) Entry Slot: 6 Index: 168	Use this function to enter the constant value. The value refers to Electr. Delta P (Cerabar / Deltapilot)→ 186. **Factory setting:** 0.0
Empty pressure Entry/Display Slot: 6 Index: 169	Enter the pressure value for the lower calibration point (tank empty). → See also "Empty calib.". **Prerequisite(s)** ▪ "Level selection" = In pressure ▪ "Calibration mode" = Dry -> entry ▪ "Calibration mode" = Wet -> display **Factory setting:** 0.0
Full pressure Entry/Display Slot: 6 Index: 170	Enter the pressure value for the upper calibration point (tank full). → See also "**Full calib. (031)**". **Prerequisite(s)** ▪ "Level selection" = In pressure ▪ "Calibration mode" = Dry -> entry ▪ "Calibration mode" = Wet -> display **Factory setting:** Upper-range limit (URL) of the sensor
Pressure af. damp Display Slot: 6 Index: 171	Displays the measured pressure after sensor trim, position adjustment and damping. **Cerabar M / Deltapilot M** Sensor → Sensor pressure ↓ Sensor trim ↓ Position adjustment ↓ ← Simulation value Pressure ↓ ↓ → Corrected press. Damping ↓ → Pressure af. damp Electr. Delta P ↓ → Meas. pressure ↓ ← **P** Pressure — Level ↓ → PV (PV = Primary value) ↓ Analog Input Block

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
Deltabar M  	
Calib. offset Entry Slot: 6 Index: 172	Position adjustment – the pressure difference between the set point and the measured pressure must be known. **Example:** – Measured value = 982.2 mbar (14.25 psi) – You correct the measured value with the value entered (e.g. 2.2 mbar (0.032 psi)) via the "Calib. offset" parameter. This means that you are assigning the value 980.0 (14.21 psi) to the pressure present. – Measured value (after calib. offset) = 980.0 mbar (14.21 psi) **Factory setting:** 0.0
Sensor temp. (Cerabar/Deltapilot) Display Slot: 6 Index: 173	Displays the temperature currently measured in the sensor. This can deviate from the process temperature.
X-Value Display (Semi-automatic entry) Slot: 6 Index: 174	If "Lin. mode" = "Semiautomatic", the level value is displayed and must be confirmed by entering the associated Y-value.
Sensor serial no. Display Slot: 6 Index: 175	Displays the serial number of the sensor (11 alphanumeric characters).
Totalizer 1 Display Slot: 6 Index: 176	Displays the totalizer value.

Expert → Communication → Transducer Block → TB Endress+Hauser Parameter	
Parameter name	**Description**
PaTbRangeParameters Entry Slot: 6 Index: 177	This parameter is a structured parameter with transducer scaling information for the internal function of the upload/download module.
Eng. unit totalizer 1 Options Slot: 6 Index: 178, 179, 180, 181	Select the unit for totalizer 1. **Options** Depending on the setting in the "Flow-meas. type" parameter (→ 192), this parameter offers a list of volume, normal volume, standard volume and mass units. When a new volume or mass unit is selected, totalizer-specific parameters are converted and displayed with the new unit within a unit group. When the flow mode is changed, the totalizer value is not converted. The direct access code depends on the selected "Flow-meas. type": – (058): Flow-meas. type "Mass" – (059): Flow-meas. type "Volume norm. cond." – (060): Flow-meas. type "Volume std. cond." – (061): Flow-meas. type "Volume operat. cond." **Factory setting:** m^3
TB View 1 Entry Slot: 6 Index: 182	Group of Transducer Block parameters that are read as one via a communication request. The TB View 1 comprises: ▪ Static rev. no. ▪ Block mode ▪ Alarm summary ▪ Primary value

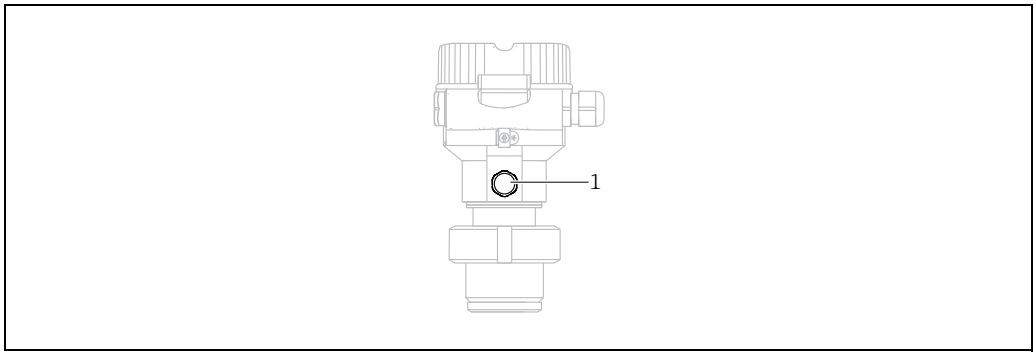
9.6 Backing up or duplicating the device data

The device does not have a memory module. The following options are available to you with an operating tool that is based on FDT technology (e.g. FieldCare):
- Storage/recovery of configuration data
- Duplication of instrument configurations
- Transfer of all relevant parameters when replacing electronic inserts.

For more information, read the operating manual for the FieldCare operating program.

10 Maintenance

Deltabar M requires no maintenance.
In the case of the Cerabar M and Deltapilot M, keep the pressure compensation and GORE-TEX® filter (1) free from dirt.



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10.1 Cleaning instructions

Endress+Hauser provides flushing rings as an accessory to enable cleaning of the process membrane without removing the transmitter from the process.
For further information, please contact your local Endress+Hauser Sales Center.

10.1.1 Cerabar M PMP55

We recommend you perform CIP (cleaning in place (hot water)) before SIP (sterilization in place (steam)) for inline seals. Frequent use of SIP cleaning increases the stress and strain on the process membrane. Under unfavorable conditions, frequent changes of temperature can lead to process membrane material fatigue and potentially leaks over the long term.

10.2 Exterior cleaning

Please note the following points when cleaning the measuring instrument:
- The cleaning agents used should not corrode the surface and the seals.
- Mechanical damage to the membrane, e.g. due to pointed objects, must be avoided.
- Observe the degree of protection of the device. See the nameplate if necessary (→ 9 ff).

11 Troubleshooting

11.1 Messages

The following table lists the messages that can occur. The measured value display shows the message and a code with the highest priority. The device has four different status information codes according to NE107:

- F = failure
- M (warning) = maintenance required
- C (warning) = function check
- S (warning) = out of specification (deviations from the permitted ambient or process conditions determined by the device with the self-monitoring function, or errors in the device itself indicate that the measurement uncertainty is greater than what would be expected under normal operating conditions).

Diagnostic code	Error message	Cause	Measure
0	No error	–	–
C411	Upload/download	– Upload active.	Upload/download active, please wait
C484	Error simul.	– Fault state simulation is switched on, i.e. the device is not measuring at present.	End the simulation
C485	Measure simul.	– Simulation is switched on, i.e. the device is not measuring at present.	End the simulation
C824	Process pressure	– Gauge pressure or low pressure present. – Electromagnetic effects are greater than specifications in the technical data. This message normally only appears briefly.	1. Check the pressure value 2. Restart the device 3. Perform a reset
F002	Sens. unknown	– Sensor does not suit the device (electronic sensor nameplate).	Contact Endress+Hauser Service
F062	Sensor conn.	– Cable connection between sensor and main electronics disconnected. – Sensor defect. – Electromagnetic effects are greater than specifications in the technical data.	1. Check sensor cable 2. Replace electronics 3. Contact Endress+Hauser Service 4. Replace sensor (snap-on version)
F081	Initialization	– Cable connection between sensor and main electronics disconnected. – Sensor defect. – Electromagnetic effects are greater than the specifications in the technical data. This message normally only appears briefly.	1. Perform a reset 2. Check sensor cable 3. Contact Endress+Hauser Service
F083	Memory content	– Sensor defect. – Electromagnetic effects are greater than specifications in the technical data. This message normally only appears briefly.	1. Restart the device 2. Contact Endress+Hauser Service
F140	Working range P	– Overpressure or low pressure present. – Electromagnetic effects are greater than specifications in the technical data. – Sensor defect.	1. Check the process pressure 2. Check the sensor range
F261	Electronics module	– Main electronics defect. – Fault in the main electronics.	1. Restart the device 2. Replace electronics
F282	Data memory	– Fault in the main electronics. – Main electronics defect.	1. Restart the device 2. Replace electronics
F283	Memory content	– Main electronics defect. – Electromagnetic effects are greater than the specifications in the technical data. – The supply voltage is disconnected when writing. – An error occurred when writing.	1. Perform a reset 2. Replace electronics

Diagnostic code	Error message	Cause	Measure
F410	Upload/download	– The file is corrupt. – During the download, the data are not correctly transmitted to the processor, e.g. because of open cable connections, spikes (ripple) on the supply voltage or electromagnetic effects.	1. Repeat download 2. Use another file 3. Perform a reset
F411	Upload/download	– Download active.	1. Upload/download in progress, please wait 2. Restart, if download aborted
F437	Configuration	– The Profibus configuration is inconsistent.	Adapt the characteristic type with the transmitter type in the Transducer Block Check the transmitter type Check the characterization Check the unit
F510	Linearization	– The linearization table is being edited.	1. Conclude entries 2. Select "linear"
F511	Linearization	– The linearization table consists of less than 2 points.	1. Table too small 2. Corr. table 3. Accept the table
F512	Linearization	– The linearization table is not increasing or decreasing monotonically.	1. Tab. not monotonic 2. Corr. table 3. Accept the table
F841	Sensor range	– Overpressure or low pressure present. – Sensor defect.	1. Check the pressure value 2. Contact Endress+Hauser Service
F882	Input signal	– External measured value is not received or displays a failure status.	1. Check the bus 2. Check source device 3. Check the setting
M002	Sens. unknown	– Sensor does not suit the device (electronic sensor nameplate). Device continues measuring.	Contact Endress+Hauser Service
M283	Memory content	– Cause as indicated for F283. – Correct measurement can continue as long as you do not need the peak hold indicator function.	1. Perform a reset 2. Replace electronics
M410	Upload/download	– A value is exceeded or a parameter change was not accepted. – During the download, the data are not correctly transmitted to the processor, e.g. because of open cable connections, spikes (ripple) on the supply voltage or electromagnetic effects. – Electromagnetic effects are greater than the specifications in the technical data. – The supply voltage is disconnected when writing. – An error occurred when writing.	1. Press the "Confirm" button to confirm. 2. Repeat download 3. Use another file 4. Perform a reset
M431	Calibration	– The calibration carried out would cause the sensor nominal range to be exceeded or undershot.	1. Check the measuring range 2. Check position adjustment 3. Check the setting
M434	Scaling	– Values for calibration (e.g. lower range value and upper range value) are too close together. – Lower range value and/or upper range value exceed or fall below the range limits of the sensor. – The sensor was replaced and the customer-specific configuration does not suit the sensor. – Unsuitable download carried out.	1. Check the measuring range 2. Check the setting 3. Contact Endress+Hauser Service
M438	Data record	– The supply voltage is disconnected when writing. – An error occurred when writing.	1. Check setting 2. Restart the device 3. Replace electronics
M515	Configuration Flow	– Max. flow out of nominal range of sensor	1. Recalibrate the device 2. Perform a reset.

Diagnostic code	Error message	Cause	Measure
M520	Ident. Number	– The configured identification number is not supported by the device. – The user configuration data are not compatible with the set identification number. – The configuration data are not supported by the device or a requested feature is not enabled in the device (e.g. watchdog function, failsafe). – Unsuitable download carried out.	Use the correct identification number
M882	Input signal	– External measured value displays a warning status.	1. Check the bus 2. Check source device 3. Check the setting
S110	Working range T	– Overtemperature and low temperature present. – Electromagnetic effects are greater than specifications in the technical data. – Sensor defect.	1. Check proc. temp. 2. Check temperature range
S140	Working range P	– Overpressure or low pressure present. – Electromagnetic effects are greater than specifications in the technical data. – Sensor defect.	1. Check the process pressure 2. Check the sensor range
S822	Process temp.	– The temperature measured in the sensor is higher than the upper nominal temperature of the sensor. – The temperature measured in the sensor is less than the lower nominal temperature of the sensor.	1. Check the temperature 2. Check the setting
S841	Sensor range	– Gauge pressure or low pressure present. – Sensor defect.	1. Check the pressure value 2. Contact Endress+Hauser Service

11.1.1 Onsite display error messages

If the device detects a defect in the onsite display during initialization, the following error messages can be displayed:

Message	Measure
Initialization, VU Electr. Defect A110	Replace onsite display.
Initialization, VU Electr. Defect A114	
Initialization, VU Electr. Defect A281	
Initialization, VU Checksum Err. A110	
Initialization, VU Checksum Err. A112	
Initialization, VU Checksum Err. A171	

11.2 Response of outputs to errors

The device makes a distinction between the message types F (failure) and M, S, C (warning).
→ See the following table and Page 199, section 11.1 "Messages".

Output	F (failure)	M, S, C (warning)
PROFIBUS	The process variable in question is transmitted with the status[1)] BAD.	Device continues measuring. The process variable in question is transmitted with the status UNCERTAIN.
Onsite display	– The measured value and message are displayed alternately – Measured value display: F-symbol is permanently displayed.	– The measured value and message are displayed alternately – Measured value display: M, S, or C symbol flashes.

1) Process value: depends on the AI configuration
Totalizer 1: depends on the "Total. 1 failsafe" parameter

11.2.1 Analog Input Block

If the Analog Input Block receives an input or simulation value with the status BAD, the Analog Input Block uses the failsafe mode defined in the "Failsafe mode" parameter.

The following options are available by means of the "Failsafe mode" parameter:
- Last valid out val.
  The last valid value is used for further processing with the status UNCERTAIN.
- Failsafe value
  The value specified by means of the "Failsafe default" parameter is used for further processing with the
  status UNCERTAIN.
- Status BAD
  The current value is used for further processing with the status BAD.

Factory setting:
- Failsafe mode: Last valid out val.
- Failsafe default: 0

The status BAD is output if the "Out of service" (O/S) option was selected by means of the "Target mode" parameter.

11.2.2 Totalizer 1 Block

If totalizer 1 receives an input value from the transducer with the status BAD, the Totalizer 1 Block continues working with the failsafe mode defined by means of the "Total. 1 failsafe" parameter.

The following options are available by means of the "Total. 1 failsafe" parameter:
- Run
  Totalizer 1 continues calculating with the input value, i.e. the input status is ignored. Depending on the "Cond. status diag", the value is output with the status "UNCERTAIN" in the "Classic status" mode or with the status "BAD" in the "Condensed status" mode.
- Memory
  Totalizer 1 continues calculating with the last valid input value with the status "UNCERTAIN".
- Hold
  Totalizer 1 is stopped if a status BAD occurs for the input value.

Factory setting:
Run

- The status BAD is output if the "Out of service" option was selected via the "Block mode/ Target mode" parameter.
- If the error refers to a hardware failure, the "Totalizer 1" output retains the status "BAD" whatever is the failsafe mode.

11.3 Repair

The Endress+Hauser repair concept provides for measuring instruments to have a modular design and that the customer can also carry out repairs (see → 204, section 11.5 "Spare parts").

- For certified devices, please consult the "Repair of Ex-certified devices" section.
- For more information on service and spare parts contact the Endress+Hauser Service. → See www.endress.com/worldwide.

11.4 Repair of Ex-certified devices

⚠ WARNING

Incorrect repair can compromise electrical safety!

Explosion hazard!

When repairing Ex-certified devices, please note the following:

- Repairs to Ex-certified devices must be carried out by Endress+Hauser Service or by specialist personnel according to national regulations.
- Relevant standards, national hazardous area regulations and Safety Instructions and Certificates must be observed.
- Only genuine Endress+Hauser spare parts may be used.
- When ordering spare parts, please check the device designation on the nameplate. Only replace parts with identical parts.
- Electronic inserts or sensors already in use in a standard instrument may not be used as spare parts for a certified device.
- Carry out repairs according to the instructions. After repairs, the device must fulfill the requirements of the specified individual tests.
- A certified device may only be converted into another certified variant by Endress+Hauser.

11.5 Spare parts

- Some replaceable measuring instrument components are identified by means of a spare part nameplate. This contains information about the spare part.
- All the spare parts for the measuring instrument, along with the order code, are listed in the W@M Device Viewer (www.endress.com/deviceviewer) and can be ordered here. If available, users can also download the associated Installation Instructions.

Measuring instrument serial number:
- Located on the device and spare part nameplate.
- Can be read out via the "Serial number" parameter in the "Instrument info" submenu.

11.6 Returns

The measuring instrument must be returned if it is in need of repair or a factory calibration, or if the wrong measuring instrument has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.
To ensure swift, safe and professional device returns, please read the return procedures and conditions on the Endress+Hauser website at www.services.endress.com/return-material.

11.7 Disposal

When disposing, ensure that the materials of the device components are separated and processed accordingly.

11.8 Software history

Device	Date	Software version	Changes to the software
Cerabar M	01.2011	01.00.zz	Original software. Compatible with: – FieldCare from version 2.08.00

Device	Date	Software version	Changes to the software
Deltabar M	01.2011	01.00.zz	Original software. Compatible with: – FieldCare from version 2.08.00

Device	Date	Software version	Changes to the software
Deltapilot M	01.2011	01.00.zz	Original software. Compatible with: – FieldCare from version 2.08.00

12 Technical data

For the technical data, please refer to the Technical Information for Cerabar M TI00436P/ Deltabar M TI00434P/Deltapilot M TI00437P.

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www.addresses.endress.com

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