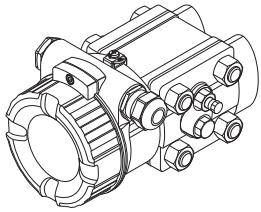
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

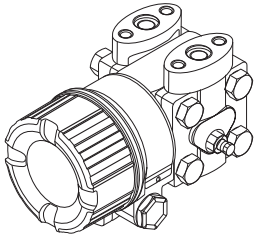
Brief Operating Instructions

Deltabar M

PMD55

Differential pressure measurement





These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.
Detailed information about the device can be found in the Operating Instructions and the other documentation:

Available for all device versions via:
– Internet: www.endress.com/deviceviewer
– Smart phone/tablet: *Endress+Hauser Operations App*

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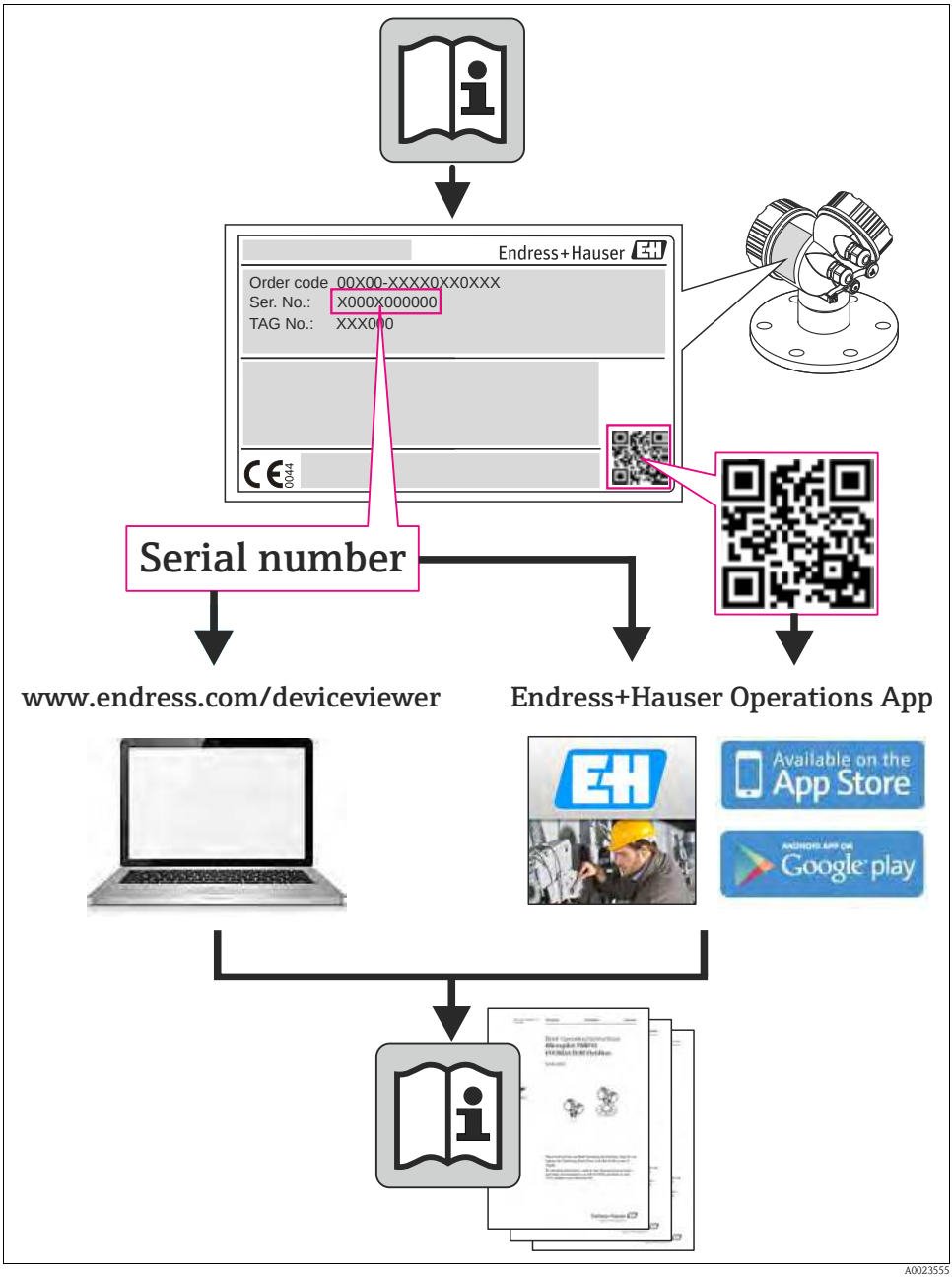
Endress+Hauser
Order code 00X00-XXXX0XX0XXX
Ser. No.: X000X000000
TAG No.: XXX000
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Serial number
www.endress.com/deviceviewer
Endress+Hauser Operations App
Available on the App Store
Google play

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1 Safety instructions

1.1 Designated use

The Deltabar M is a differential pressure transmitter for measuring differential pressure, level and flow.

The manufacturer accepts no liability for damages resulting from incorrect use or use other than that designated.

1.2 Installation, commissioning and operation

- The device must only be installed, connected, commissioned and maintained by qualified and authorized specialists (e.g. electrical technicians) in full compliance with the instructions in this manual, the applicable norms, legal regulations and certificates (depending on the application).
- The specialist must have read and understood this manual and must follow the instructions it contains. If you are unclear on anything in these Brief Operating Instructions, you must read the Operating Instructions. The Operating Instructions provide detailed information on the device/measuring system.
- The device may only be modified or repaired if such work is expressly permitted in the Operating Instructions.
- If faults cannot be rectified, the device must be taken out of service and secured against unintentional commissioning.
- Do not operate damaged devices. Mark them as defective.

1.3 Operational safety and process safety

- Alternative monitoring measures must be taken to ensure operational safety and process safety during confiugration, testing and maintenance work on the device.
- The device is safely built and tested according to state-of-the-art technology and has left the factory in perfect condition as regards technical safety. The applicable regulations and European standards have been taken into account.
- Pay particular attention to the technical data on the nameplate.
- Devices for use in hazardous areas are fitted with an additional nameplate. If the device is to be installed in an explosion hazardous area, then the specifications in the certificate as well as all national and local regulations must be observed. The device is accompanied by separate "Ex documentation", which is an integral part of this Operating Instructions. The installation regulations, connection values and Safety Instructions listed in this Ex document must be observed. The documentation number of the related Safety Instructions is also indicated on the additional nameplate.

1.4 Return

Follow the instructions on returning the device as outlined in the Operating Instructions.

1.5 Safety icons

Symbol	Meaning
⚠	**Warning!** A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument.
☝	**Caution!** Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument.
✎	**Note!** A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

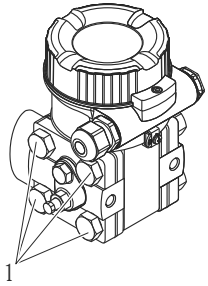
2 Product identification

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

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

3 Installation

✎ Note!
Disassembly of the screws with item number (1) is not permissible under any circumstances and will result in loss of warranty.



3.1 Installation position

✎ Note!

- Due to the orientation of the Deltabar M, there may be a shift in the measured value, i.e. when the container is empty, 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 (→ 🗎 13, "Function of the operating elements")
  - via the operating menu (→ 🗎 28, "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 (see Operating Instructions BA00383P).

3.1.1 Installation position for flow measurement

✎ Note!

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

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

Flow measurement in gases

- 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 steam

- 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

- 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.

3.1.2 Installation position for level measurement

Level measurement in an open container

- Mount the Deltabar M below the lower measuring connection so that the impulse piping is always filled with liquid.
- The low-pressure 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

- Mount the Deltabar M below the lower measuring connection so that the impulse piping is always filled with liquid.
- Always connect the low-pressure 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

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

3.1.3 Installation position for differential pressure measurement

Differential pressure measurement in gases and steam

- 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

- 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.

3.2 Closing the housing cover

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

3.3 Post-installation check

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

4 Wiring

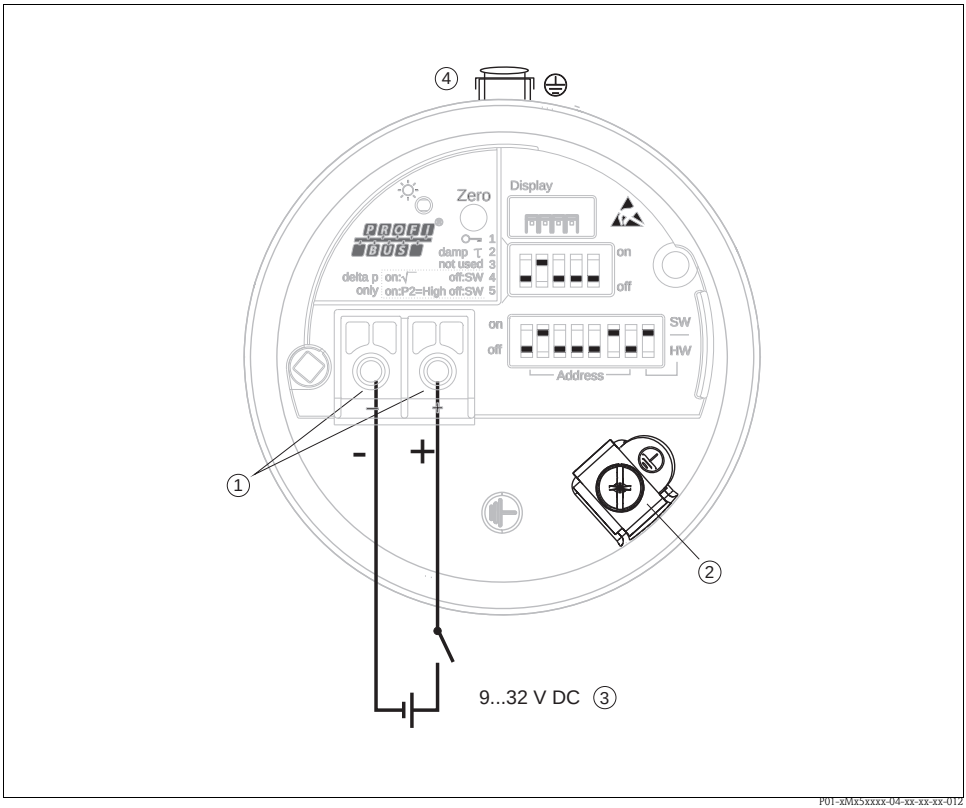
4.1 Connecting the device

✎ Note!

- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- A suitable circuit breaker has to be provided for the device in accordance with IEC/EN 61010.
- Devices with integrated overvoltage protection must be earthed.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are integrated.

The procedure

1. Check if the supply voltage matches the specified supply voltage on the nameplate.
2. Switch off the supply voltage before connecting the device.
3. Remove housing cover.
4. Guide cable through the gland. Preferably use twisted, screened two-wire cable.
5. Connect device in accordance with the following diagram.
6. Screw down housing cover.
7. Switch on supply voltage.



PROFIBUS PA electrical connection

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

4.2 Connecting the measuring unit

Note!
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.

4.2.1 Supply voltage

✎ Note!

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

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

4.2.2 Current consumption

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

4.2.3 Cable specification

- Use a twisted, shielded two-wire cable, preferably cable type A.
- Terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)
- Cable outer diameter: 5 to 9 mm (0.2 to 0.35 in) depends on the used cable gland (see technical information)

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

4.2.4 Shielding/potential equalization

- You achieve optimum shielding against disturbances if the shielding is connected on both sides (in the cabinet and on the device). If potential equalization currents are expected in the plant, only ground 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.

4.3 Potential equalization

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

4.4 Post-connection check

Perform the following checks after completing electrical installation of the device:
- Does the supply voltage match the specifications on the nameplate?
- Is the device connected as per Section 3.1?
- Are all screws firmly tightened?
- Are the housing covers screwed down tight?

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

5 Operation

5.1 Operation without an operating menu

5.1.1 Position of operating elements

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

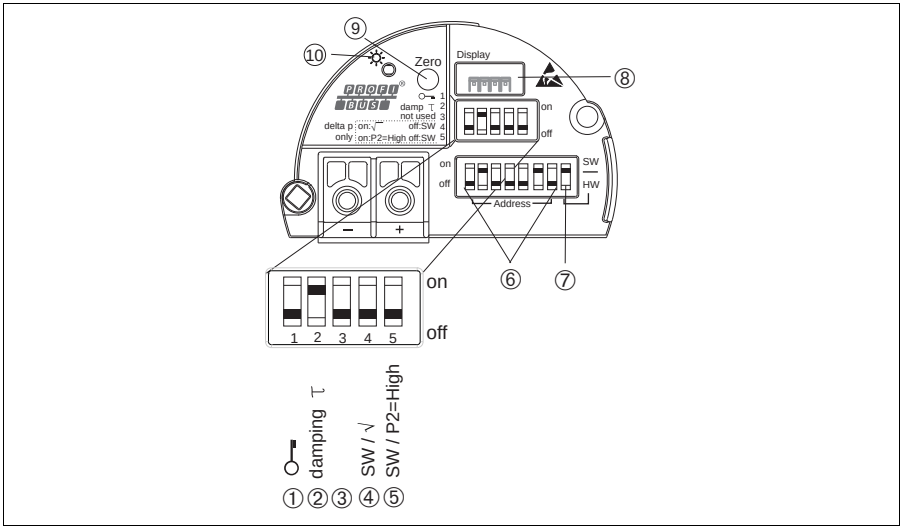


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Fig. 1: PROFIBUS PA electronic insert

1 DIP switch for locking/unlocking parameters relevant to the measured value
2 DIP switch for switching damping on/off
3 Not assigned
4 "SW/Square root"; used to control the output characteristics
5 "SW/P2-High"; used to determine the high-pressure side
6 DIP switch for hardware address
7 DIP switch for bus address SW / HW

8 Slot for optional onsite display
9 Operating key for position adjustment or reset (zero)
10 Green LED to indicate successful operation (Position adjustment, Reset, Warm start)

Function of the DIP switches

Switches	Symbol/ labeling	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.	Damping is switched on. The output signal follows measured value changes with the delay time τ.[1)]
4	SW/√	The measuring mode is "Pressure" and the output characteristics is "Linear", as per the SW default setting.	The measuring mode is "flow" and the output characteristics is "Square root" regardless of the settings in the operating menu.
5	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 regardless 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 the operating elements

Operating key(s)	Meaning
"Zero" pressed for at least 3 seconds	**Position adjustment (zero point correction)** Press key for at least 3 seconds. The LED on the electronic insert lights up briefly if 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 parameters are reset to the order configuration.

Performing position adjustment on site

Note!
- Operation must be unlocked. → 22, Section 5.2.4 "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.

Perform position adjustment:

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

5.1.2 Locking/unlocking operation

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

Note!
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.
→ 13, "Function of the DIP switches".

5.2 Operation with an operating menu

5.2.1 Operation concept

The operation 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 extends beyond value read-off tasks, the tasks involve simple, application-specific functions that are used in operation. Should an error occur, these users simple 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 at 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.

User role	Meaning
Expert	Experts work with the devices over the entire product life cycle, but their device requirements are often extremely high. 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.

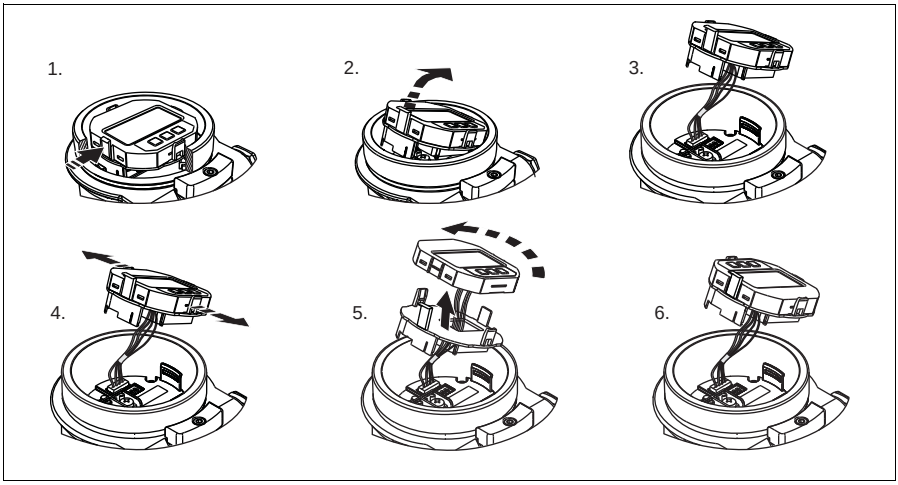
5.2.2 Structure of the operating menu

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.
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 "Extended 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 that are needed 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. ▪ **Factory reset**

User role	Submenu	Meaning/use
Expert	Expert	Contains all the parameters of the device (including those in one of the 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.

5.2.3 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 through a 90 mm (3.54 in) cable.
The display of the device 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.



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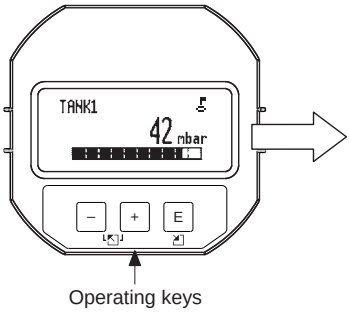
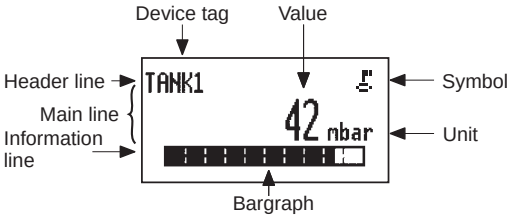
Functions:

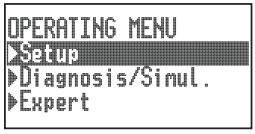
- 8-digit measured value display including sign and decimal point.
- Bar graph as graphic display of the standardized value of the Analog Input Block (→ see Operating Instructions)
- Three keys for operation
- Simple and complete menu guidance as parameters are split into several levels and groups
- 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.)



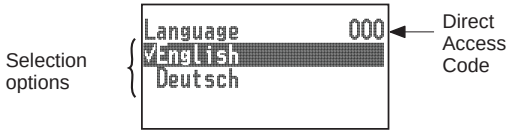
Measured value display



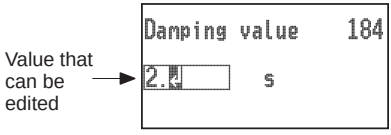
Operating menu



Parameter with selection list



Freely editable parameter



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

Symbol	Meaning
	Lock symbol The operation of the device is locked. To unlock the device, → 22, Locking/unlocking operation.
	Communication symbol Data transfer via communication
	Square root symbol Active measuring mode "Flow measurement"
S	**Error message "Out of specification"** The device is being operated outside its technical specifications (e.g. during warmup or cleaning processes).
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 remains valid.
F	**Error message "Failure detected"** An operating error has occurred. The measured value is no longer valid.

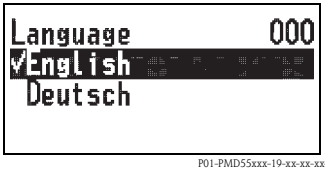
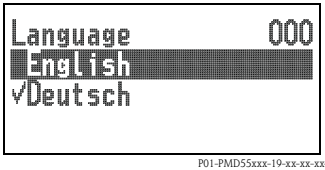
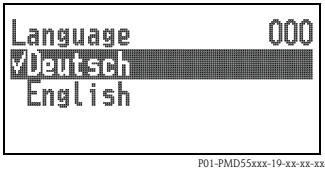
Operating keys on the display and operating module

Operating key(s)	Meaning
+	– Navigate downwards in the picklist – Edit the numerical values and characters within a function
–	– Navigate upwards in the picklist – Edit the numerical values and characters within a function
E	– Confirm entry – Jump to the next item – Selection of a menu item and activation of the editing mode
+ and E	Contrast setting of onsite display: darker
– and E	Contrast setting of onsite display: brighter

Operating key(s)	Meaning
+ and −	ESC functions: – Exit the edit mode for a parameter without saving the changed value. – You are in a menu at a selection level. Each time you press the keys simultaneously, you go up a level in the menu.

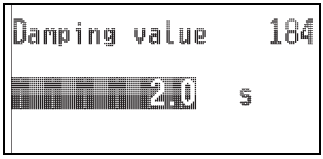
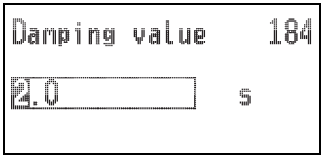
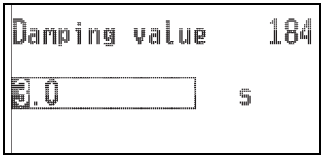
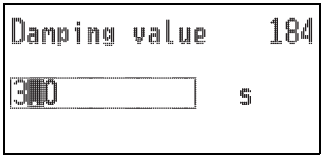
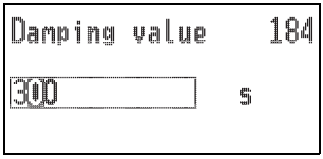
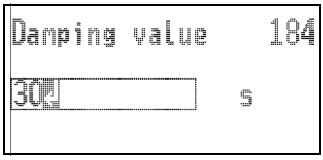
Parameters with a picklist

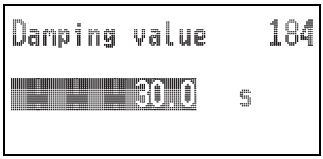
Example: selecting "Deutsch" as the language.

Onsite display	Operation
 P01-PMD55xxx-19-xx-xx-xx-002	"English" is set as the language (default value). A ✓ in front of the menu text indicates the active option.
 P01-PMD55xxx-19-xx-xx-xx-001	Select "Deutsch" with "+" or "–" .
 P01-PMD55xxx-19-xx-xx-xx-000	1. Confirm your choice with "E". A ✓ in front of the menu text indicates the active option. ("Deutsch" is now selected as the menu language.) 2. Exit the edit mode for the parameter with "E" .

User-definable parameters

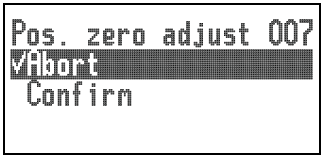
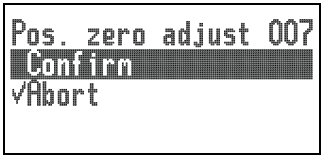
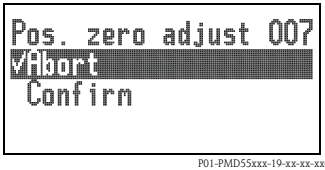
Example: changing the damping function from 2.0 s to 30.0 s.

Onsite display	Operation
 P01-xxxxxxxx-19-xx-xx-en-001	The onsite display shows the parameter to be changed. The value highlighted in black can be changed. The unit "s" is prespecified and cannot be changed.
 P01-xxxxxxxx-19-xx-xx-en-002	1. Press "+" or "–" to get to the editing mode. 2. The first digit is highlighted in black.
 P01-xxxxxxxx-19-xx-xx-en-003	1. Use "+" to change "2" to "3". 2. Confirm "3" with "E". The cursor jumps to the next position (highlighted in black).
 P01-xxxxxxxx-19-xx-xx-en-004	The decimal point is highlighted in black. This means you can now edit this digit.
 P01-xxxxxxxx-19-xx-xx-en-005	1. Press "+" or "–" until "0" is displayed. 2. Confirm "0" with "E". The cursor goes to the next position. ↵ is displayed and highlighted in black. → See next graphic.
 P01-xxxxxxxx-19-xx-xx-en-006	Use "E" to save the new value and exit the editing mode. → See next graphic.

Onsite display	Operation
 P01-xxxxxxxx-19-xx-xx-en-007	The new value for the damping is 30.0 s. – Go to the next parameter with "E" . – You can get back to the editing mode with "+" or "–".

Accepting the pressure present

Example: setting position adjustment

Onsite display	Operation
 P01-PMD55xxx-19-xx-xx-xx-009	The pressure for position adjustment is present at the device.
 P01-PMD55xxx-19-xx-xx-xx-010	Use "+" or "–" to switch to the "Confirm" option. The active option is highlighted in black.
 P01-PMD55xxx-19-xx-xx-xx-011	Accept the pressure present as position adjustment with the "E" key. The device confirms the adjustment and goes back to the "Pos. zero adjust" parameter.
 P01-PMD55xxx-19-xx-xx-xx-009	Exit the edit mode for the parameter with "E" .

5.2.4 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 "Lockstate" parameter.

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

Note!
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.

The "Operator code (021)" parameter 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 release code. Note! 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 a release code with which the device can be unlocked. **User input:** ■ A number between 0 and 9999 **Factory setting:** 0

5.3 Device identification and addressing

Please note the following:
- An address must be assigned to each PROFIBUS PA device. The control system/master can only recognize the device if the address is set correctly.
- Each address can only be assigned once in any PROFIBUS PA network.
- Device addresses in the range from 0 to 125 are valid.
- The address "126" configured at the factory can be used for functional device testing and to connect to a PROFIBUS PA network already in operation. This address must be changed subsequently to add additional devices.
- On leaving the factory, all devices are delivered with the default address 126 and software addressing.
- The FieldCare operating program is delivered with the default address 1.

There are two ways to assign the device address to a Deltabar:
- Via an operating program of the DP Class 2 master, such as FieldCare or
- Onsite via DIP switches.

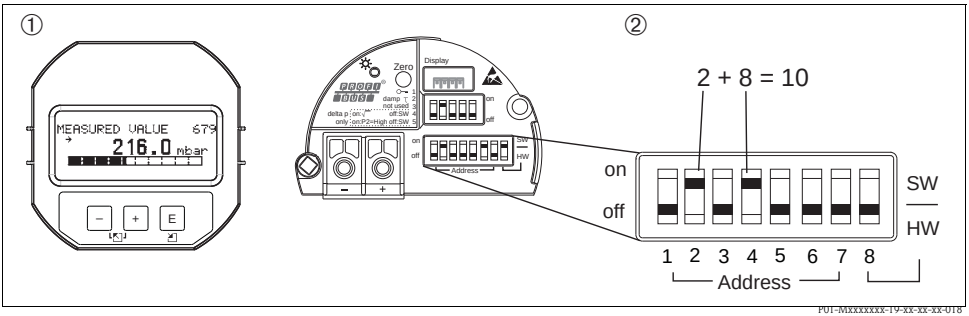


Fig. 2: Setting the device address via DIP switches

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

5.3.1 Hardware addressing

A hardware address is set as follows:

1. Set the DIP switch 8 (SW/HW) to "Off".
2. Set the address with DIP switches 1 to 7.
3. The change of address takes effect after 10 seconds. 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

5.3.2 Software addressing

A software address is set as follows:

1. Set the 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. Set 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, see the corresponding operating manual.

6 Commissioning without an operating menu

Warning!

- If a pressure smaller than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession:
  1. "S140 Working range P" or "F140 Working range P" [1)]
  2. "S841 Sensor range" or "F841 Sensor range" [1)]

Note!

The device is configured for the Pressure measuring mode as standard. The measuring range and the unit in which the measured value is transmitted correspond to the specifications on the nameplate.

6.1 Function check

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

- "Post-installation check" checklist → 📄 8
- "Post-connection check" checklist → 📄 12

1) Depending on the setting in the "Alarm behav. P (050) parameter.

6.2 Position adjustment

The following functions are possible by means of the key on the electronic insert:
- Position adjustment (zero point correction)
- Device reset (see Operating Instructions)

Note!
- Operation must be unlocked. → 22, "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.

Carrying out position adjustment	
Pressure is present at device.	
↓	
Press the "Zero" key for at least 3 s.	
↓	
Does the LED on the electronic insert light up briefly?	
Yes	No
↓	↓
Applied pressure for position adjustment has been accepted.	1) Applied pressure for position adjustment has not been accepted. Observe the input limits.

1) Observe warning on commissioning (→ 24)

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

⚠ Warning!

- If a pressure smaller than the minimum permitted pressure or greater than the maximum permitted pressure is present at the device, the following messages are output in succession:
  1. "S140 Working range P" or "F140 Working range P" [2)]
  2. "S841 Sensor range" or "F841 Sensor range" [2)]

✎ Note!
The device is configured for the Pressure measuring mode as standard. The measuring range and the unit in which the measured value is transmitted correspond to the specifications on the nameplate.

7.1 Function check

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

- "Post-installation check" checklist → 📄 8
- "Post-connection check" checklist → 📄 12

7.2 Commissioning

Commissioning comprises the following steps:

1. Function check → 📄 26
2. Selecting the language, measuring mode and pressure unit → 📄 26
3. Position adjustment → 📄 28
4. Configuring measurement:
   – Pressure measurement → 📄 29 ff
   – Flow measurement → 📄 31 ff
   – Level measurement → 📄 33 ff

2) depending on the setting in the "Alarm behav. P" (050) parameter

7.2.1 Selecting the language, measuring mode and pressure unit

Language selection

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

Measuring mode selection

Parameter name	Description
Measuring mode (005) Options Menu path: Setup → Measuring mode (005)	Select the measuring mode. The operating menu is structured differently depending on the measuring mode selected. ✎ Note! If the measuring mode is changed, no conversion takes place. If necessary, the device has to be recalibrated after the measuring mode has been changed. **Options:** ■ Pressure ■ Level ■ Flow **Factory setting:** Pressure

Pressure unit selection

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, ■ inH2O, ftH2O ■ Pa, kPa, MPa ■ psi ■ mmHg, inHg ■ kgf/cm^2 **Factory setting:** mbar or bar depending on the sensor nominal measuring range, or as per order specifications

7.3 Position zero adjustment

The pressure resulting from the orientation of the device can be corrected here.

Parameter name	Description
Corrected press. (172) Display Menu path: Setup → Corrected press. (172)	Displays the measured pressure after sensor trim and position adjustment. ✎ Note! 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 relative pressure sensor) Options Menu path: Setup → Pos. zero adjust (007) (Deltabar and relative pressure sensor)	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 relative pressure sensor)" 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 sensor) 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

7.4 Pressure measurement

7.4.1 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:
This is a theoretical calibration, i.e. the pressure values for the lower and upper range are known.

✎ Note!
Due to the orientation of the device, there may be pressure shifts in the measured value, i.e. the measured value is not zero in a pressureless condition. For information on how to perform position adjustment, see → 28. Calibration is possible only using FieldCare.

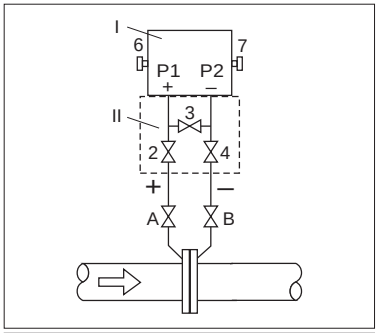
	Description
1	Select the "Pressure" measuring mode via the "Measuring mode (005)" parameter. Menu path: Setup → Measuring mode (005)
2	Select a pressure unit via the "Press. eng. unit (125)" parameter, here "mbar" for example. Menu path: Setup → Press. eng. unit (125)
3	Where necessary scale the "Output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

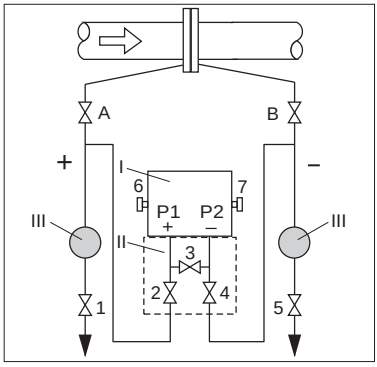
7.5 Differential pressure measurement

7.5.1 Preparatory steps

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

	Valves	Meaning
1	Close 3.	
2	Fill 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 device completely with medium and remove air.
5	Set measuring point in 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	Carry out calibration if necessary. → See also page 28.	





P01-PMD55xxx-11-xx-xx-xx-013

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	*Shut-off valve*

1) for arrangement with 5 valves

7.6 Flow measurement

7.6.1 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, norm volume flow (European norm 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.

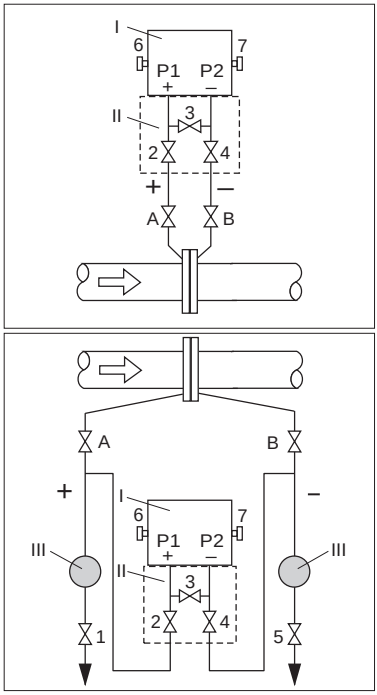
✎ Note!
The totalizers are not available for the flow type "Flow in %".

7.6.2 Preparatory steps

✎ Note!
- Before calibrating the Deltabar M, the impulse piping must be cleaned and filled with medium. → See the following table.

	Valves	Meaning
1	Close 3.	
2	Fill 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 device completely with medium and remove air.
5	Carry out position zero adjustment (→ 📄 28) 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 in 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 (→ 📄 28) if the flow can be blocked off. In this case, step 5 is not applicable.	
8	Carry out calibration → 📄 28.	

Preferred installation



P01-PMD55xxx-11-xx-xx-xx-013

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 Shut-off valves

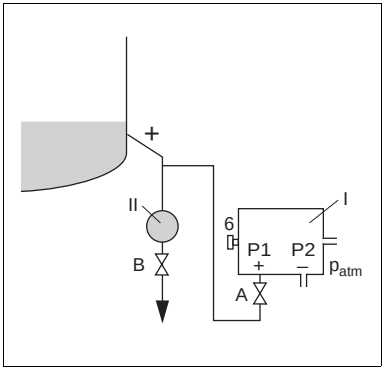
1) for arrangement with 5 valves

7.7 Level measurement

7.7.1 Preparatory steps

Open container

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

	Valves	Meaning	Installation
1	Fill container to a level above the lower tap.		
2	Fill measuring system with medium.		
	Open A.	Open shut-off valve.	
3	Vent device.		
	Open 6 briefly, then close it again.	Fill device completely with medium and remove air.	
4	Set measuring point in 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 (→ 36) ■ "in pressure" - without reference pressure (→ 38) ■ "in height" - with reference pressure (→ 40) ■ "in height" - without reference pressure (→ 43)		

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Open container

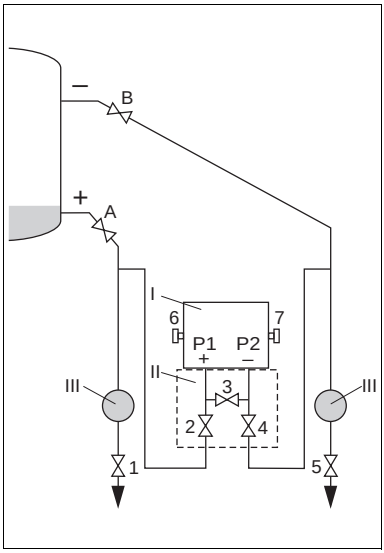
I Deltabar M
II Separator
6 Vent valves on Deltabar M
A Shut-off valve
B Drain valve

Closed container

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

	Valves	Meaning
1	Fill container to a level above the lower tap.	
2	Fill measuring system with medium.	
	Close 3.	Shut off high-pressure side from low-pressure side.
	Open A and B.	Open shut-off valves.
3	Vent high-pressure side (empty 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 in 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 (→ 36) ■ "in pressure" - without reference pressure (→ 38) ■ "in height" - with reference pressure (→ 40) ■ "in height" - without reference pressure (→ 43)	

Installation



P01-PMD55xxx-11-xx-xx-xx-009

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	*Shut-off valve*

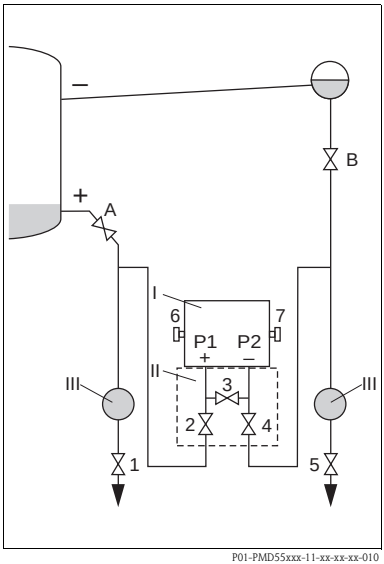
Closed container with superimposed steam

Note!

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

	Valves	Meaning
1	Fill container to a level above the lower tap.	
2	Fill measuring system with medium.	
	Open A and B.	Open shut-off valves.
	Fill the negative impulse piping to the level 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 device completely with medium and remove air.
4	Set measuring point in 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 (→ 36) ■ "in pressure" - without reference pressure (→ 38) ■ "in height" - with reference pressure (→ 40) ■ "in height" - without reference pressure (→ 43)	

Installation



P01-PMD55xxx-11-xx-xx-xx-010

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 Shut-off valves

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

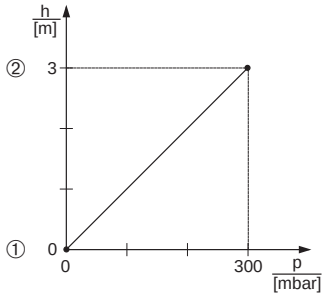
Example:
In this example, the level in a tank should be measured in "m". The maximum level is 3 m (9.8 ft). The pressure range is due to the filling height and the density.

Prerequisite:
- The measured variable is in direct proportion to the pressure.
- The tank can be filled and emptied.

✎ Note!
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 warning 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 device can measure correctly.

	Description	
1	Perform "position adjustment" → 🗎 28.	
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 by means of the "Level selection (024)" parameter. Menu path: Setup → Extended Setup → Level → Level selection (024)	

	Description
5	Select a level unit by means of 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 by means of 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 "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).



P01-xxxxxxxx-05-xx-xx-xx-011

Fig. 3: Calibration with reference pressure – wet calibration

1 See Table, Step 7.
2 See Table, Step 8.

Note!
The measured variables %, level, volume and mass are available for this level mode see parameter "Unit before lin (025)" in the Operating Instructions.

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

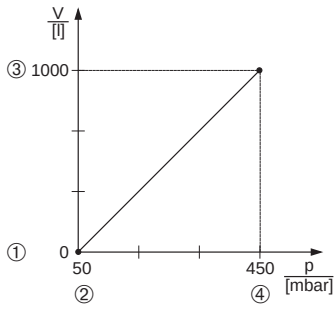
Example:
In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 gal) corresponds to a pressure of 450 mbar (6.53 psi). The minimum volume of 0 liters corresponds to a pressure of 50 mbar (0.72 psi) since the device is mounted below the start of the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

Prerequisite:
- 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.

✎ Note!
- 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 warning 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 device 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 → 🗎 28, "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 by means of 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)	

	Description
5	Select the "Dry" option by means of 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).



P01-xxxxxxxx-05-xx-xx-xx-026

Fig. 4: Calibration with reference pressure – wet calibration

1 See Table, Step 7.
2 See Table, Step 8.
3 See Table, Step 9.
4 See Table, Step 10.

Note!
The measured variables %, level, volume and mass are available for this level mode see parameter "Unit before lin (025)" in the Operating Instructions.

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

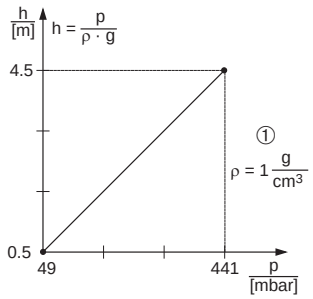
Example:
In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 gal) corresponds to a level of 4.5 m (14.8 ft). The minimum volume of 0 liters corresponds to a level of 0.5 m (1.6 ft) since the device is mounted below the start of the level measuring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

Prerequisite:
- 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.

✎ Note!
- 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 warning 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 device 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 → 🗎 28, "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 by means of 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/cm^3" (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).



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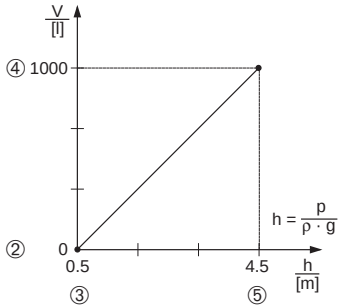

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Fig. 5: Calibration with reference pressure – wet calibration

1 See Table, Step 7.
2 See Table, Step 8.
3 See Table, Step 9.
4 See Table, Step 10.
5 See Table, Step 11.

✎ Note!
The measured variables %, level, volume and mass are available for this level mode see parameter "Unit before lin (025)" in the Operating Instructions.

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

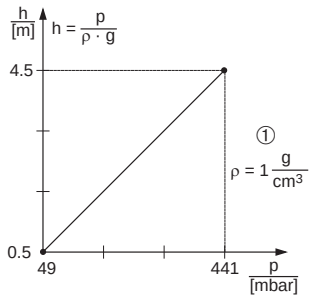
Example:
In this example, the volume in a tank should be measured in liters. The maximum volume of 1000 liters (264 gal) corresponds to a level of 4.5 m (14.8 ft). The minimum volume of 0 liters corresponds to a level of 0.5 m (1.6 ft) since the device is mounted below the start of the level measuring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

Prerequisite:
- The measured variable is in direct proportion to the pressure.
- The tank can be filled and emptied.

✎ Note!
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 warning 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 device can measure correctly.

	Description	
1	Perform position adjustment. See → 🗎 28.	
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 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" (liter) 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 by means of 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).



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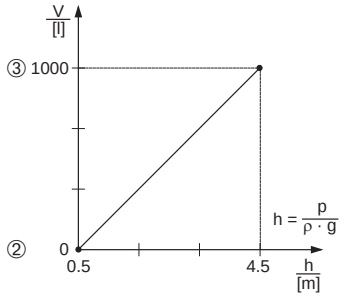

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Fig. 6: Calibration with reference pressure – wet calibration

1 See Table, Step 8.
2 See Table, Step 9.
3 See Table, Step 10.

✎ Note!
The measured variables %, level, volume and mass are available for this level mode see parameter "Unit before lin (025)" in the Operating Instructions.

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