



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services

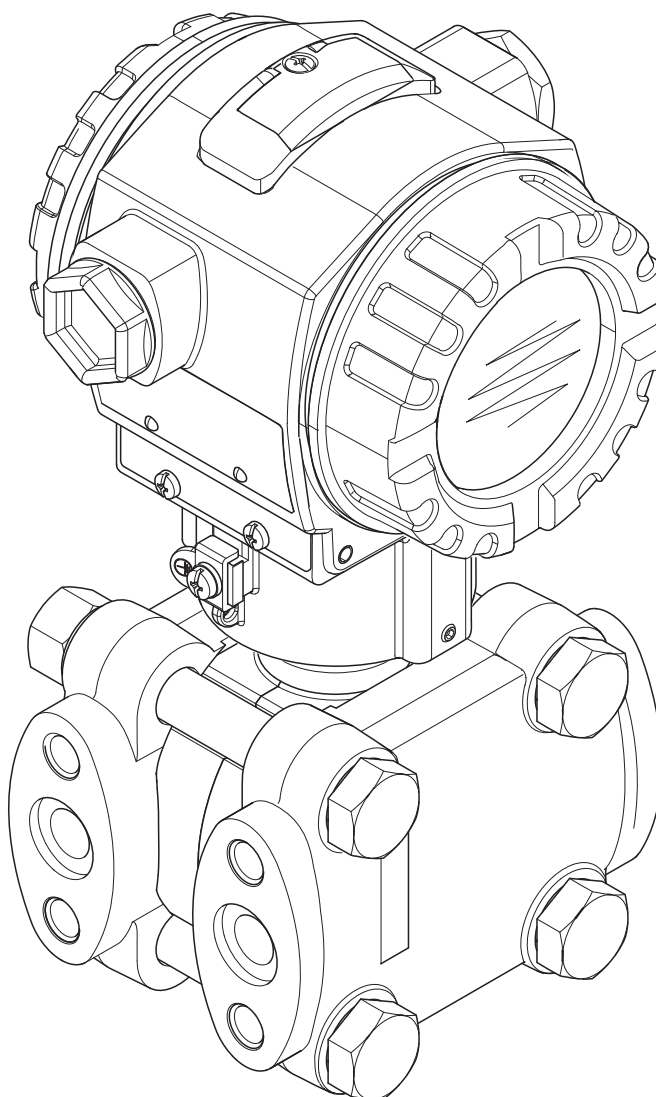


Solutions

Operating Instructions

Deltabar S FMD76/77/78, PMD70/75

Differential pressure measurement



BA00294P/00/EN/14.12
71161883

valid from Software version:
04.00.zz

Overview documentation

Device	Documentation	Content	Remarks
Deltabar S PROFIBUS PA	Technical Information TI00382P	Technical data	<ul style="list-style-type: none"> – The documentation can be found on the supplied documentation CD. – The documentation is also available via the Internet. → See: www.endress.com
	Operating Instructions BA00294P	<ul style="list-style-type: none"> – Identification – Installation – Wiring – Operation – Commissioning, Description of Quick Setup menus – Maintenance – Trouble-shooting and spare parts – Appendix: Illustration of menu 	
	Operating Instructions BA00296P	<ul style="list-style-type: none"> – Examples of configuration for pressure, level and flow measurement – Description of parameters – Trouble-shooting – Appendix: Illustration of menu 	
	Brief Operating Instructions KA01021P	<ul style="list-style-type: none"> – Installation – Wiring – Operation on-site – Commissioning – Description of Quick Setup menus 	<ul style="list-style-type: none"> – The documentation is supplied with the device. – The documentation can be found on the supplied documentation CD. – The documentation is also available via the Internet. → See: www.endress.com
	Leporello KA00244P	<ul style="list-style-type: none"> – Wiring – Description of operating elements – Operation HistoROM®/M-DAT 	

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1 Safety instructions

1.1 Designated use

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

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 has been designed to operate safely in accordance with current technical, safety and EU standards. If installed incorrectly or used for applications for which it is not intended, however, it is possible that application-related dangers may arise, e.g. product overflow due to incorrect installation or calibration. For this reason, the instrument must be installed, connected, operated and maintained according to the instructions in this manual: personnel must be authorised and suitably qualified. The manual must have been read and understood, and the instructions followed. Modifications and repairs to the device are permissible only when they are expressly approved in the manual. Pay particular attention to the technical data on the nameplate.

1.3 Operational safety and process safety

Alternative monitoring measures must be taken to ensure operational safety and process safety during configuration, testing and maintenance work on the device.














1.3.1 Hazardous areas (optional)

Devices for use in hazardous areas are fitted with an additional nameplate (→ see Page 6). 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 documentation must be observed. The documentation number of the related Safety Instructions is also indicated on the additional nameplate.

- Ensure that all personnel are suitably qualified.

1.4 Notes on safety conventions and icons

In order to highlight safety-relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding icon in the margin.

Safety conventions	
	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.
	Device certified for use in explosion hazardous area If the device has this symbol embossed on its nameplate, it can be installed in an explosion hazardous area or a non-explosion hazardous area, according to the approval.
	Explosion hazardous area Symbol used in drawings to indicate explosion hazardous areas. – Devices used in hazardous areas must possess an appropriate type of protection.
	Safe area (non-explosion hazardous area) Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. – Devices used in hazardous areas must possess an appropriate type of protection. Lines used in hazardous areas must meet the necessary safety-related characteristic quantities.
	Direct voltage A terminal to which or from which a direct current or voltage may be applied or supplied.
	Alternating voltage A terminal to which or from which an alternating (sine-wave) current or voltage may be applied or supplied.
	Grounded terminal A grounded terminal, which as far as the operator is concerned, is already grounded by means of an earth grounding system.
	Protective grounding (earth) terminal A terminal which must be connected to earth ground prior to making any other connection to the equipment.
	Equipotential connection (earth bonding) A connection made to the plant grounding system which may be of type e.g. neutral star or equipotential line according to national or company practice.
	Temperature resistance of the connection cables States, that the connection cables must be resistant to a temperature of at least 85 °C (185 °F).
	Safety instruction For safety instructions refer to the manual for the appropriate instrument version.

2 Identification

2.1 Device designation

2.1.1 Nameplate

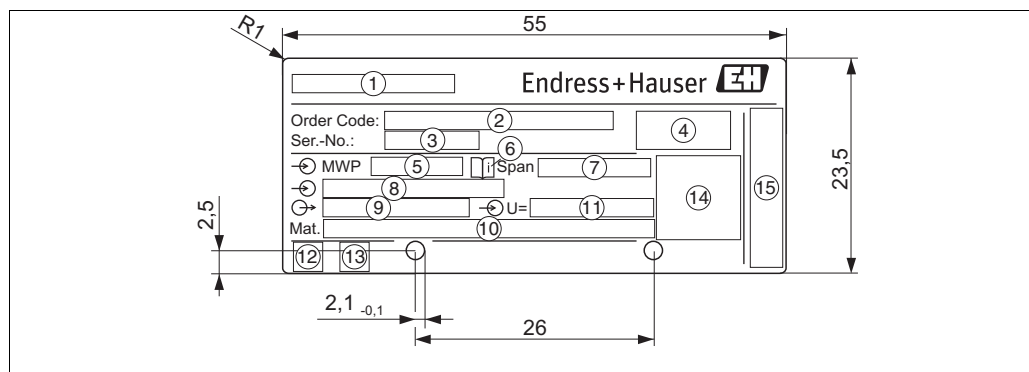


Note!

- The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of 20°C (68°F) or 100°F (38°C) for ANSI flanges.
- The pressure values permitted at higher temperatures can be found in the following standards:
 - EN 1092-1: 2001 Tab. 18 ¹⁾
 - ASME B 16.5a – 1998 Tab. 2-2.2 F316
 - ASME B 16.5a – 1998 Tab. 2.3.8 N10276
 - JIS B 2220
- For PMD70 and PMD75, the MWP applies for the temperature ranges specified in the Technical Information TI00382P in the "Ambient temperature range" and "Process temperature limits" sections.
- The test pressure corresponds to the over pressure limit (OPL) of the device = MWP x 1.5.
- The Pressure Equipment Directive (EC Directive 97/23/EC) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.

1) With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

Aluminium housing (T14/T15) and stainless steel housing (T14)



P01-30MX7xxxx-16-xx-xx-xx-000

Fig. 1: Nameplate

- 1 Device name
- 2 Order code
See the specifications on the order confirmation for the meanings of the individual letters and digits.
- 3 Serial number
- 4 Degree of protection
- 5 MWP (Maximum working pressure)
- 6 Symbol: Note: pay particular attention to the data in the "Technical Information"!
- 7 Minimum/maximum span
- 8 Nominal measuring range
- 9 Electronic version (output signal)
- 10 Wetted materials
- 11 Supply voltage
- 12 GL-symbol for GL marine certificate (optional)
- 13 SIL-symbol for devices with SIL3/IEC 61508 Declaration of conformity (optional)
- 14 Approval ID and ID numbers
- 15 Address of manufacturer

Devices for use in hazardous areas are fitted with an additional nameplate.

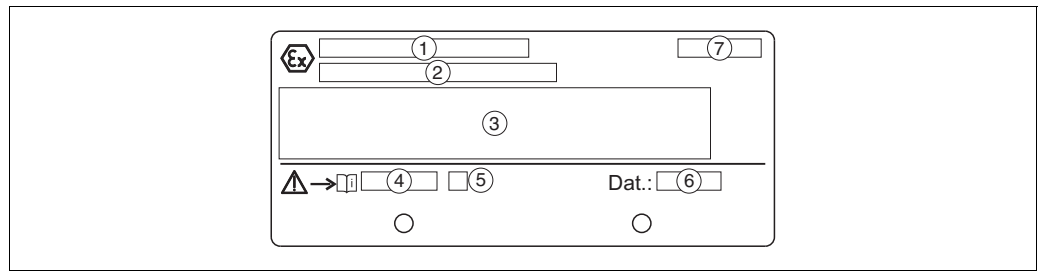


Fig. 2: Additional nameplate for devices for hazardous areas

- 1 EC type examination certificate number
2 Type of protection e.g. II 1/2 G Ex ia IIC T4/T6
3 Electrical data
4 Safety Instructions number e.g. XA00235P
5 Safety Instructions index e.g. A
6 Device manufacture data
7 Installation in accordance with the FISCO model is possible for devices with Ex ia, CSA IS or FM IS

Devices suitable for oxygen applications are fitted with an additional nameplate.

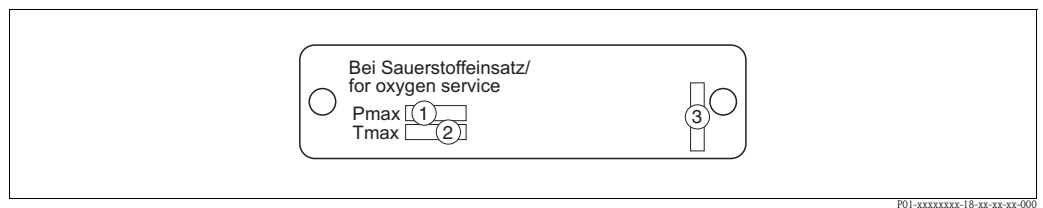


Fig. 3: Additional nameplate for devices suitable for oxygen applications

- 1 Maximum pressure for oxygen applications
- 2 Maximum temperature for oxygen applications
- 3 Layout identification of the nameplate

Hygienic stainless steel housing (T17)

The nameplate is divided into two main sections. The left section contains fields for identification and technical specifications, while the right section contains fields for safety and environmental data.

Left Section:

- 1: Device name (Endress+Hauser)
- 2: Address of manufacturer
- 3: Order Code
- 4: Ser.-No.
- 5: MWP (Maximum working pressure)
- 6: Symbol (Note: pay particular attention to the data in the "Technical Information")
- 7: Minimum/Maximum span
- 8: Nominal measuring range
- 9: Electronic version (output signal)
- 10: Supply voltage
- 11: Wetted materials
- 12: Degree of protection
- 13: Approval ID and ID numbers
- 14: 3A-symbol
- 15: CSA-symbol
- 16: FM-symbol
- 17: SIL-symbol for devices with SIL3/IEC 61508 Declaration of conformity
- 18: GL-symbol for GL marine certificate

Right Section:

- 19: EC type examination certificate
- 20: Type of protection
- 21: Approval number for WHG overspill protection
- 22: Temperature operating range for devices for use in hazardous areas
- 23: Electrical data for devices for use in hazardous areas
- 24: Safety Instructions number
- 25: Safety Instructions index
- 26: Device manufacture data
- 27: Maximum temperature for devices suitable for oxygen applications
- 28: Maximum pressure for devices suitable for oxygen applications

Fig. 4: Nameplate

- 1 Device name
- 2 Address of manufacturer
- 3 Order code
- 4 Serial number
- 5 MWP (Maximum working pressure)
- 6 Symbol: Note: pay particular attention to the data in the "Technical Information"!
- 7 Minimum/Maximum span
- 8 Nominal measuring range
- 9 Electronic version (output signal)
- 10 Supply voltage
- 11 Wetted materials
- 12 Degree of protection
- Optional:
- 13 Approval ID and ID numbers
- 14 3A-symbol
- 15 CSA-symbol
- 16 FM-symbol
- 17 SIL-symbol for devices with SIL3/IEC 61508 Declaration of conformity
- 18 GL-symbol for GL marine certificate
- 19 EC type examination certificate
- 20 Type of protection
- 21 Approval number for WHG overspill protection
- 22 Temperature operating range for devices for use in hazardous areas
- 23 Electrical data for devices for use in hazardous areas
- 24 Safety Instructions number
- 25 Safety Instructions index
- 26 Device manufacture data
- 27 Maximum temperature for devices suitable for oxygen applications
- 28 Maximum pressure for devices suitable for oxygen applications

2.1.2 Identifying the sensor type

See parameter "Sensor Meas.Type" in Operating Instruction BA00296P. The Operating Instruction BA00296P can be found on the supplied documentation CD.

2.2 Scope of delivery

The scope of delivery comprises:

- Deltabar S differential pressure transmitter
- For PMD70 and PMD75 with side flanges made of AISI 316L or C22.8: additional 2 vent valves, AISI 316L
- PMD75 with side flanges made of AISI 316L or C22.8 and side vent: additional 4 locking screws, AISI 316L
- Operating program FieldCare with DTM
- Optional accessories

Documentation supplied:

- The Operating Instructions BA00294P and BA00296P, the Technical Information TI00382P and the Safety Instructions and brochures can be found on the supplied documentation CD.
→ See also Page 2, "Overview documentation" chapter.
- Brief Operating Instructions KA01021P
- Leporello KA00244P
- Final inspection report
- Also Safety Instructions with ATEX, IECEx and NEPSI devices
- Optional: factory calibration form, test certificates

2.3 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.

2.4 Registered trademarks

KALREZ, VITON, TEFLON

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

TRI-CLAMP

Registered trademark of Ladish & Co., Inc., Kenosha, USA

PROFIBUS

Registered trademark of the PROFIBUS Trade Organisation, Karlsruhe, D

3 Installation

3.1 Incoming acceptance and storage

3.1.1 Incoming acceptance

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

3.1.2 Transport



Caution!

Follow the safety instructions and transport conditions for devices of more than 18 kg (39.69 lbs). Transport the measuring device to the measuring point in its original packaging or at the process connection.

3.1.3 Storage

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

Storage temperature range:

- $-40...+90^{\circ}\text{C}$ (-40 to $+194^{\circ}\text{F}$)
- On-site display: -40 to $+85^{\circ}\text{C}$ (-40 to $+185^{\circ}\text{F}$)
- Separate housing: -40 to $+60^{\circ}\text{C}$ (-40 to $+140^{\circ}\text{F}$)

3.2 Installation conditions

3.2.1 Dimensions

→ For dimensions, please refer to the Technical Information for Deltabar S TI00382P, "Mechanical construction" section. See Page 2, "Overview documentation".

3.3 Installation instructions



Note!

- Due to the orientation of the Deltabar S, there may be a shift in the measured value, i.e. when the container is empty, the measured value does not display zero. You can correct this zero point shift either via the "zero" key on the electronic insert, or on the outside of the device or via the on-site display. → See Page 28, Section 5.2.1 "Position of operating elements", Page 29, Section 5.2.2 "Function of operating elements – on-site display not connected" and Page 57, Section 6.4 "Position adjustment".
- For FMD77 and FMD78, please refer to Section 3.3.4. "Installation instructions for devices with diaphragm seals", Page 17.
- 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%.

- To ensure optimal readability of the on-site display, it is possible to rotate the housing up to 380°. → See Page 22, Section 3.3.9 "Rotating the housing".
- Endress+Hauser offers a mounting bracket for installing on pipes or walls. → See Page 20, Section 3.3.7 "Wall and pipe mounting".

3.3.1 Installation for flow measurement

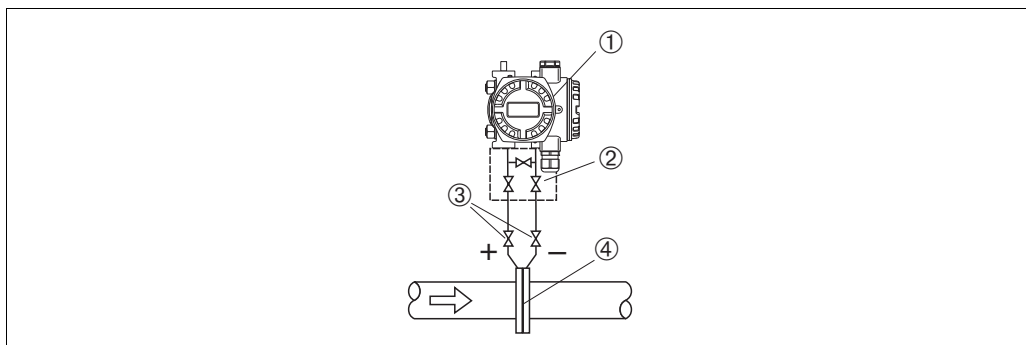


Note!

For more information about flow measurement with the Deltabar S differential pressure transmitter

- Deltabar S with orifice plate (TI00422P, Deltatop DO6x)
- Deltabar S with Pitot tube (TI00425P, Deltatop DP6x)

Flow measurement in gases with PMD70/PMD75



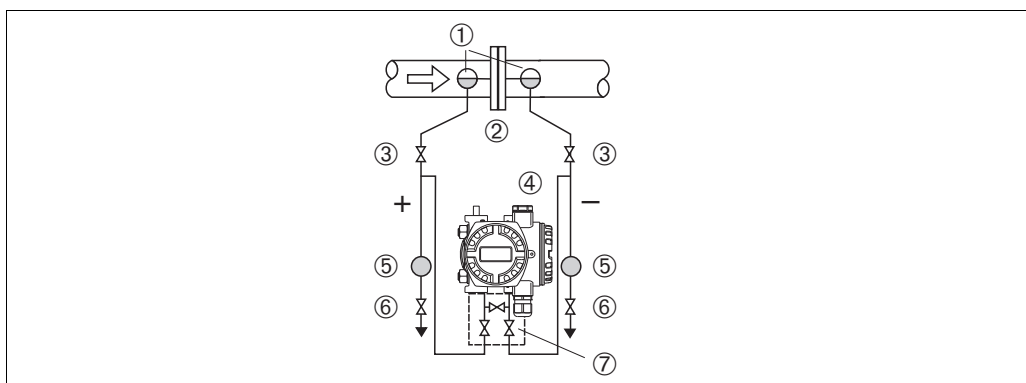
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Fig. 5: Measuring layout for flow measurement in gases with PMD75

- 1 Deltabar S, here PMD75
- 2 Three-valve manifold
- 3 Shut-off valves
- 4 Orifice plate or pitot tube

- Mount the Deltabar S above the measuring point so that the condensate can run off into the process piping.

Flow measurement in steam with PMD70/PMD75



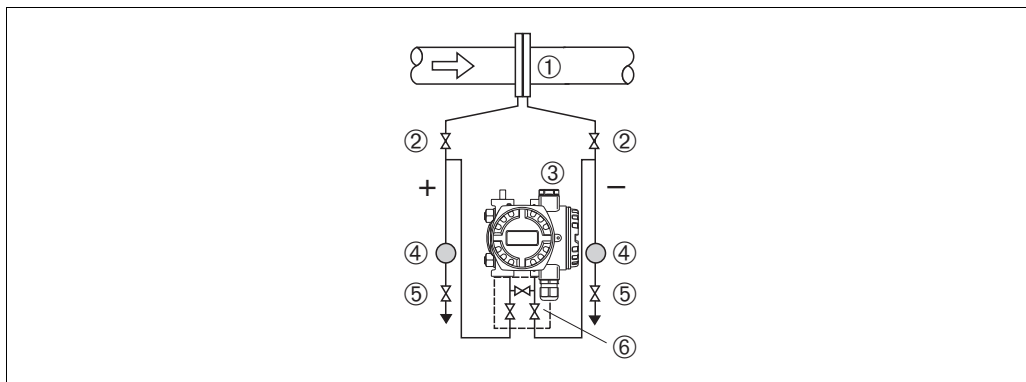
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Fig. 6: Measuring layout for flow measurement in steam with PMD75

- 1 Condensate traps
- 2 Orifice plate or pitot tube
- 3 Shut-off valves
- 4 Deltabar S, here PMD75
- 5 Separator
- 6 Drain valves
- 7 Three-valve manifold

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

Flow measurement in liquids with PMD70/PMD75



P01-PMD75xxx-11-xx-xx-xx-002

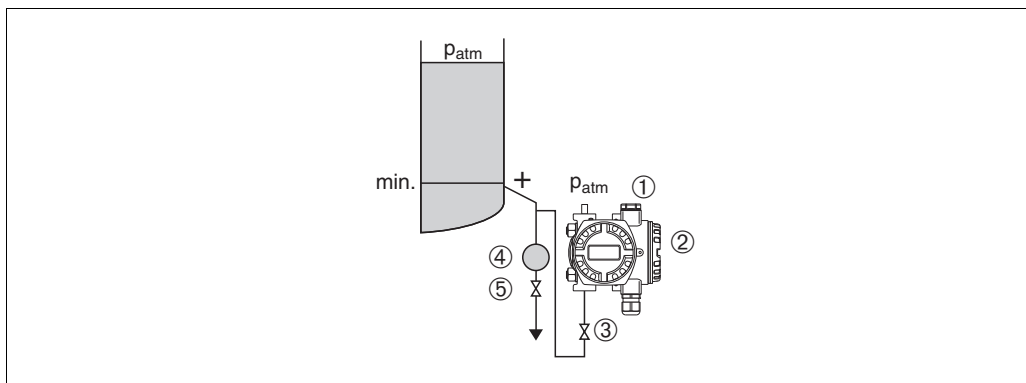
Fig. 7: Measuring layout for flow measurement in liquids with PMD75

- 1 Orifice plate or pitot tube
- 2 Shut-off valves
- 3 Deltabar S, here PMD75
- 4 Separator
- 5 Drain valves
- 6 Three-valve manifold

- Mount the Deltabar S 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.

3.3.2 Installation for level measurement

Level measurement in an open container with PMD70/PMD75



P01-PMD75xxx-11-xx-xx-xx-003

Fig. 8: Measuring layout for level measurement in open containers with PMD75

- 1 The negative side is open to atmospheric pressure
- 2 Deltabar S, here PMD75
- 3 Shut-off valve
- 4 Separator
- 5 Drain valve

- Mount the Deltabar S below the lower measuring connection so that the impulse piping is always filled with liquid.
- The negative side is open to atmosphere 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 an open container with FMD76/FMD77

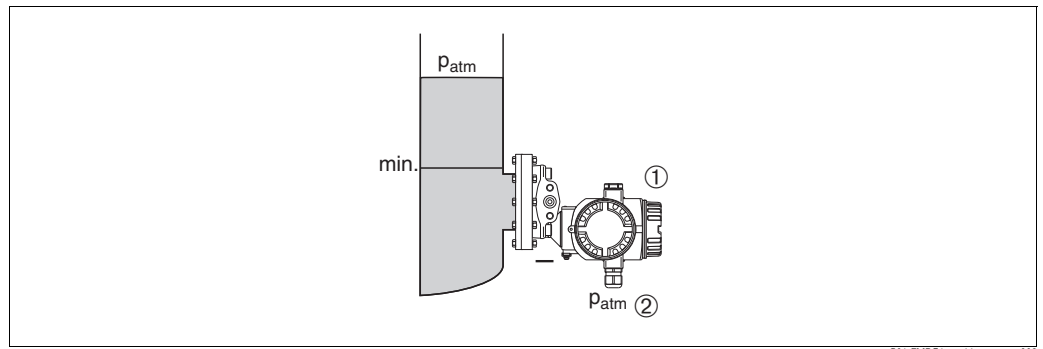


Fig. 9: Measuring layout for level measurement in open containers with FMD76

- 1 Deltabar S, here FMD76
- 2 The negative side is open to atmospheric pressure

- Mount the Deltabar S direct on the container. → See also Page 19, Section 3.3.5 "Seal for flange mounting".
- The negative side is open to atmosphere pressure.

Level measurement in a closed container with PMD70/PMD75

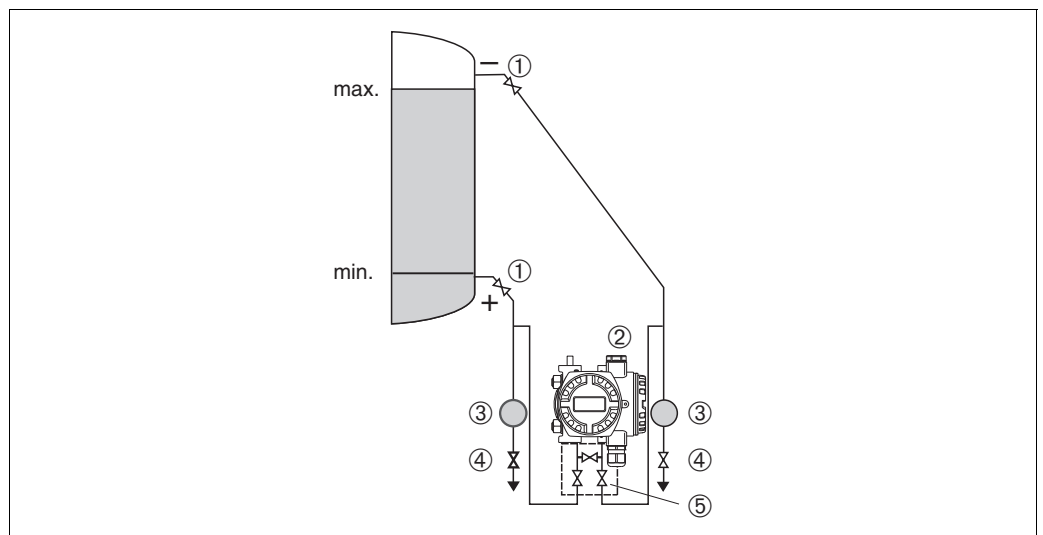


Fig. 10: Measuring layout for level measurement in a closed container with PMD75

- 1 Shut-off valves
- 2 Deltabar S, PMD75
- 3 Separator
- 4 Drain valves
- 5 Three-valve manifold

- Mount the Deltabar S below the lower measuring connection so that the impulse piping is always filled with liquid.
- Always connect the impulse piping of negative 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 FMD76/FMD77

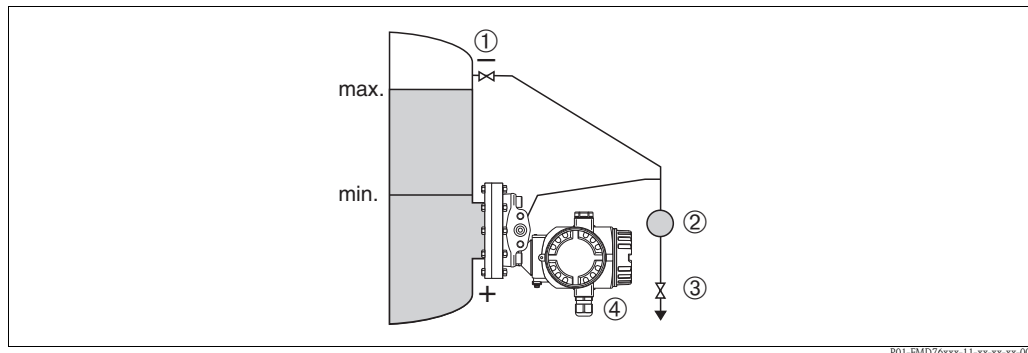


Fig. 11: Measuring layout for level measurement in a closed container with FMD76

- 1 Shut-off valve
- 2 Separator
- 3 Drain valve
- 4 Deltabar S, here FMD76

- Mount the Deltabar S direct on the container. → See also Page 19, Section 3.3.5 "Seal for flange mounting".
- Always connect the impulse piping of negative 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 FMD78

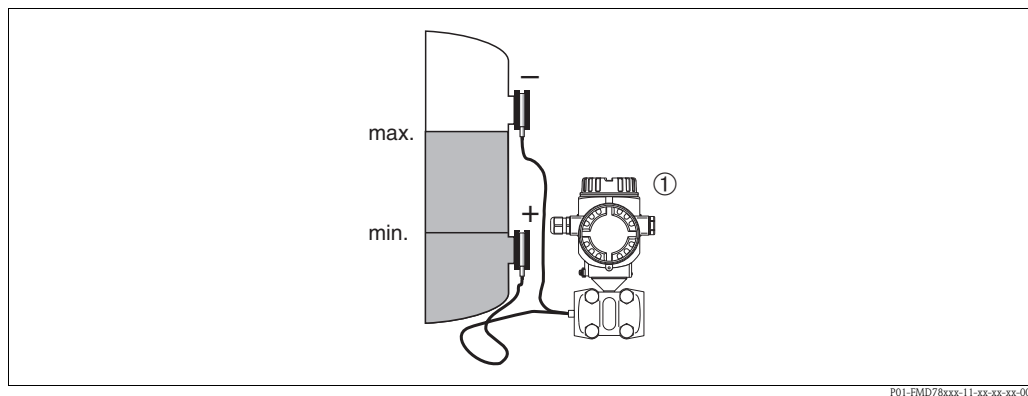


Fig. 12: Measuring layout for level measurement in a closed container with FMD78

- 1 Deltabar S, here FMD78

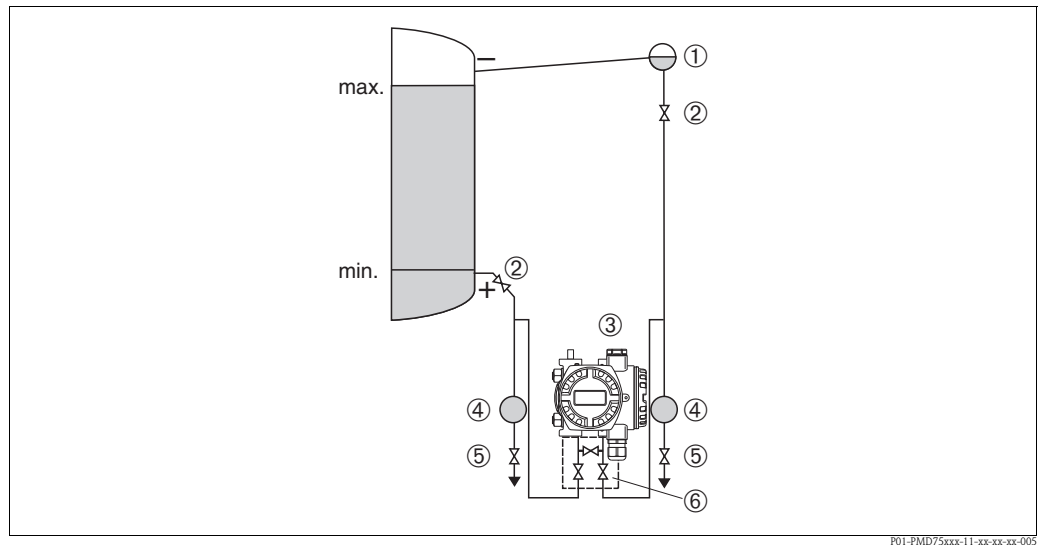
- Mount the Deltabar S below the lower diaphragm seal. → See also Page 17, Section 3.3.4 "Installation instructions for devices with diaphragm seals".
- The ambient temperature should be the same for both capillaries.



Note!

Level measurement is only ensured between the upper edge of the lower diaphragm seal and the lower edge of the upper diaphragm seal.

Level measurement in a closed container with superimposed steam with PMD 70/ PMD75



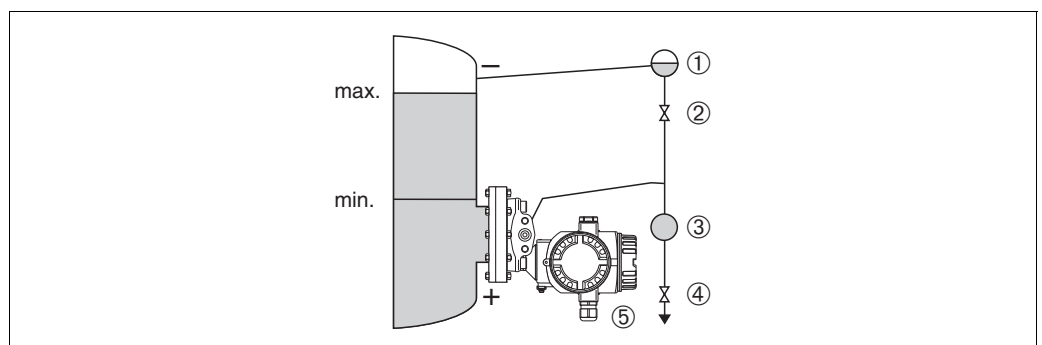
P01-PMD75xxx-11-xx-xx-xx-005

Fig. 13: Measuring layout for level measurement in a container with superimposed steam with PMD75

- 1 Condensate trap
- 2 Shut-off valves
- 3 Deltabar S, here PMD75
- 4 Separator
- 5 Drain valves
- 6 Three-valve manifold

- Mount the Deltabar S below the lower measuring connection so that the impulse piping is always filled with liquid.
- Always connect the impulse piping of negative side above the maximum level.
- A condensate trap ensures constant pressure on the negative side.
- 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 with FMD 76/ FMD77



P01-FMD76xxx-11-xx-xx-xx-005

Fig. 14: Measuring layout for level measurement in a container with superimposed steam with FMD76

- 1 Condensate trap
- 2 Shut-off valve
- 3 Separator
- 4 Drain valve
- 5 Deltabar S, here FMD76

- Mount the Deltabar S direct on the container. → See also Page 19, Section 3.3.5 "Seal for flange mounting".
- Always connect the impulse piping of negative side above the maximum level.
- A condensate trap ensures constant pressure on the negative side.
- When measuring in media with solid parts, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.

3.3.3 Installation for differential pressure measurement

Differential pressure measurement in gases and steam with PMD70/PMD75

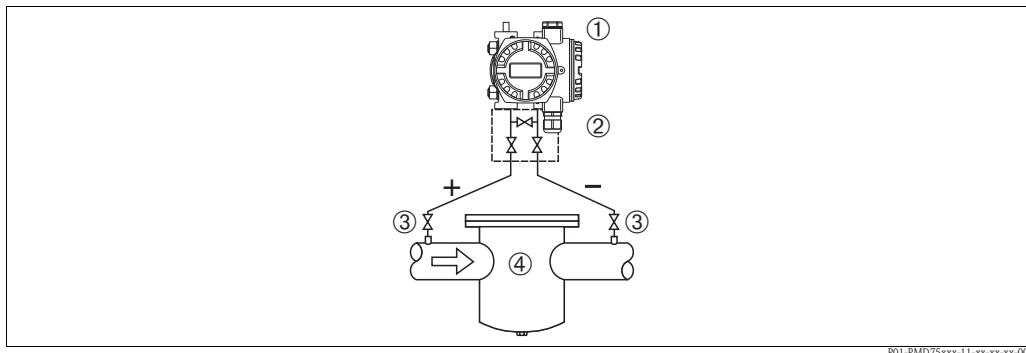


Fig. 15: Measuring layout for differential pressure measurement in gases and steam with PMD75

- 1 Deltabar S, here PMD75
- 2 Three-valve manifold
- 3 Shut-off valves
- 4 e.g. filter

- Mount the Deltabar S above the measuring point so that the condensate can run off into the process piping.

Differential pressure measurement in liquids with PMD70/PMD75

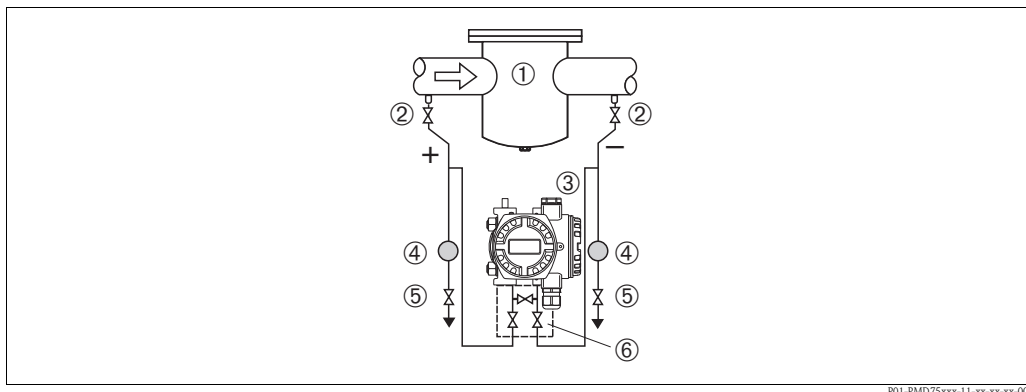


Fig. 16: Measuring layout for differential pressure measurement in liquids with PMD75

- 1 e.g. filter
- 2 Shut-off valves
- 3 Deltabar S, here PMD75
- 4 Separator
- 5 Drain valves
- 6 Three-valve manifold

- Mount the Deltabar S 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.

Differential pressure measurement in gases, steam and liquids with FMD78

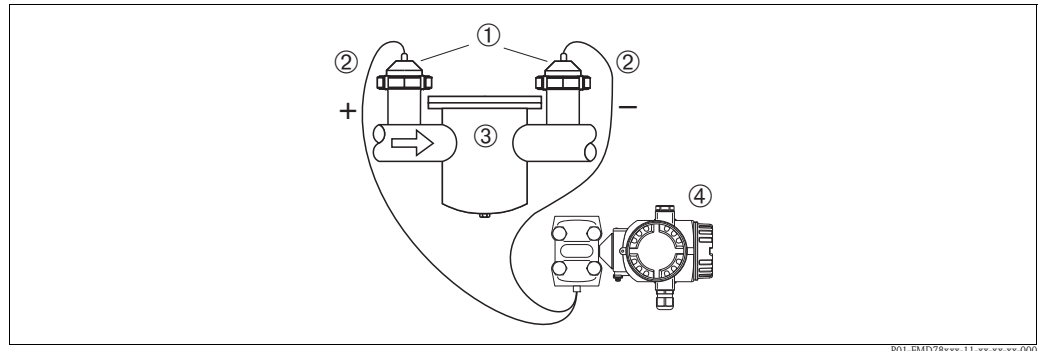


Fig. 17: Measuring layout for differential pressure measurement in gases, steam and liquids with FMD78

- 1 Diaphragm seal
- 2 Capillary
- 3 e.g. filter
- 4 Deltabar S, here FMD78

- Mount the diaphragm seal with capillaries at the top or on the side on the piping.
- For vacuum applications: mount the Deltabar S below the measuring point. → See Page 17, Section 3.3.4 "Installation instructions for devices with diaphragm seals", "Vacuum application" part.
- The ambient temperature should be the same for both capillaries.

3.3.4 Installation instructions for devices with diaphragm seals (FMD78)

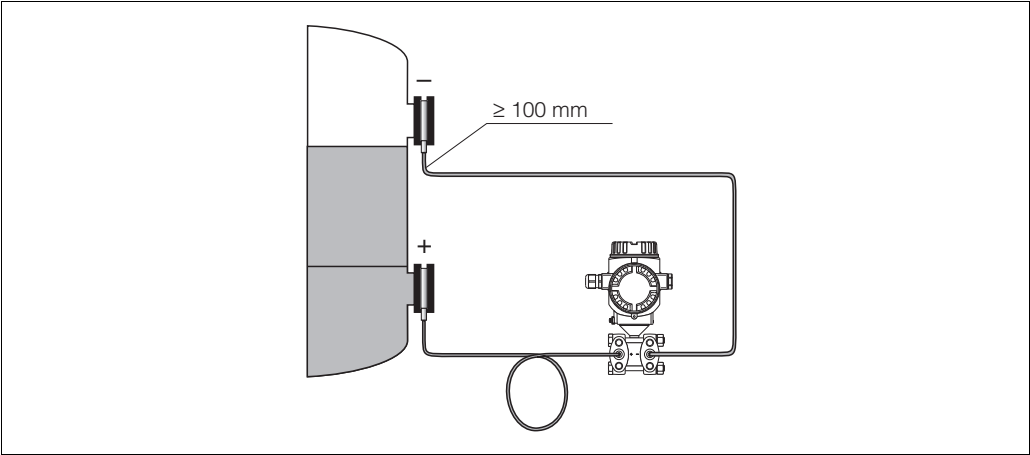


Note!

- The diaphragm seal, together with the pressure transmitter, forms a closed, calibrated system, which is filled through openings in the diaphragm seal and in the measurement system of the pressure transmitter. These openings are sealed and must not be opened.
- Do not clean or touch diaphragm seals with hard or pointed objects.
- Do not remove the protection of the isolating process diaphragm until shortly before installation.
- 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 note that the hydrostatic pressure of the liquid columns in the capillaries can cause zero point shift. The zero point shift can be corrected. → See also Page 57, Section 6.4 "Position adjustment".
- Please note the application limits of the diaphragm seal filling oil as detailed in the Technical Information for Deltabar S TI00382P, section "Planning instructions for diaphragm seal systems". → See also Page 2, "Overview documentation".

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 if the ambient temperature is below or above the reference temperature
- with a bending radius of ≥ 100 mm (3.94 in).
- The ambient temperature and length of both capillaries should be the same when using two-sided diaphragm seal systems.
- Two diaphragm seals which are the same (e.g. with regard to diameter, material, etc.) should always be used for the negative and positive side (standard delivery).



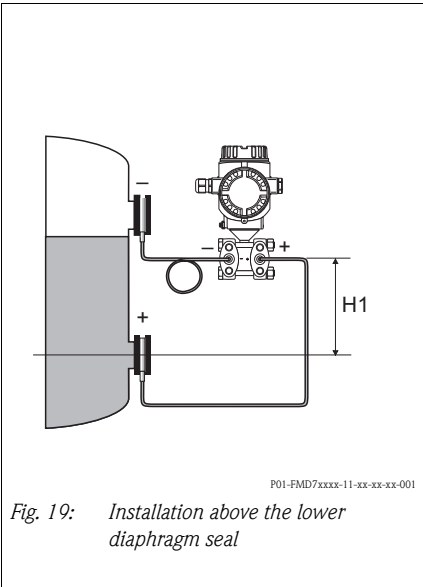
P01-FMD78xxx-11-xx-xx-xx-005

Fig. 18: Mounting Deltabar S, FMD78 with diaphragm seals and capillary, recommended mounting for vacuum applications: mount pressure transmitter below the lowest diaphragm seal!

Vacuum application (FMD78)

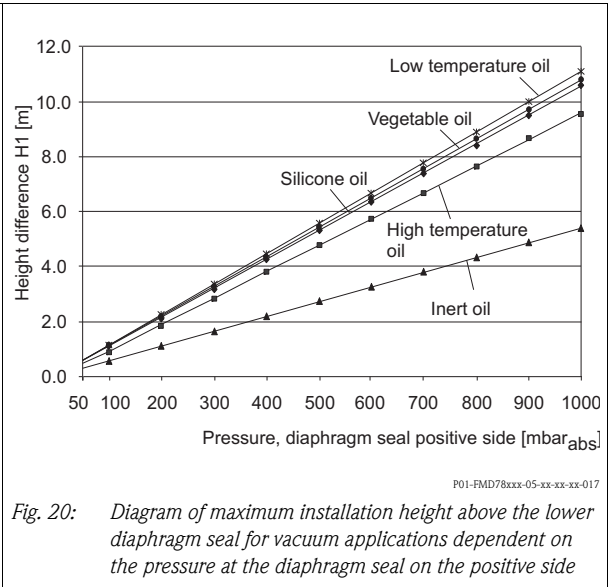
For applications under vacuum, Endress+Hauser recommends mounting the pressure transmitter underneath the lower diaphragm seal. A vacuum load of the diaphragm seal caused by the presence of filling oil in the capillaries is hereby prevented.

When the pressure transmitter is mounted above the lower diaphragm seal, the maximum height difference H1 in accordance with the illustration below on the left must not be exceeded. The maximum height difference is dependent on the density of the filling oil and the smallest ever pressure that is permitted to occur at the diaphragm seal on the positive side (empty container), see illustration below, on the right.



P01-FMD78xxx-11-xx-xx-xx-001

Fig. 19: Installation above the lower diaphragm seal



P01-FMD78xxx-05-xx-xx-xx-017

Fig. 20: Diagram of maximum installation height above the lower diaphragm seal for vacuum applications dependent on the pressure at the diaphragm seal on the positive side

3.3.5 Seal for flange mounting

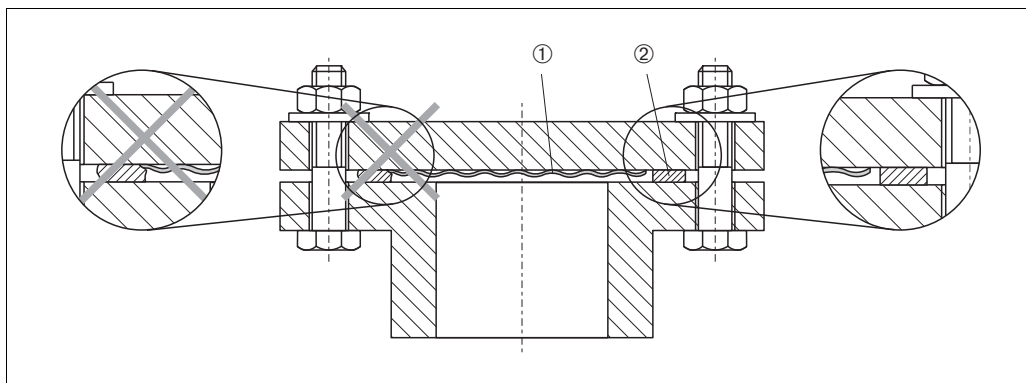


Fig. 21: Mounting the versions with flange or diaphragm seal

- 1 Process isolating diaphragm
2 Seal



Warning!

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

3.3.6 Heat insulation – FMD77

The FMD77 must only be insulated up to a certain height. The maximum permitted insulation height is labelled on the devices and applies to an insulation material with a heat conductivity $\leq 0.04 \text{ W/(m} \times \text{K)}$ and to the maximum permitted ambient and process temperature (\rightarrow see table below). The data were determined under the most critical application "quiescent air".

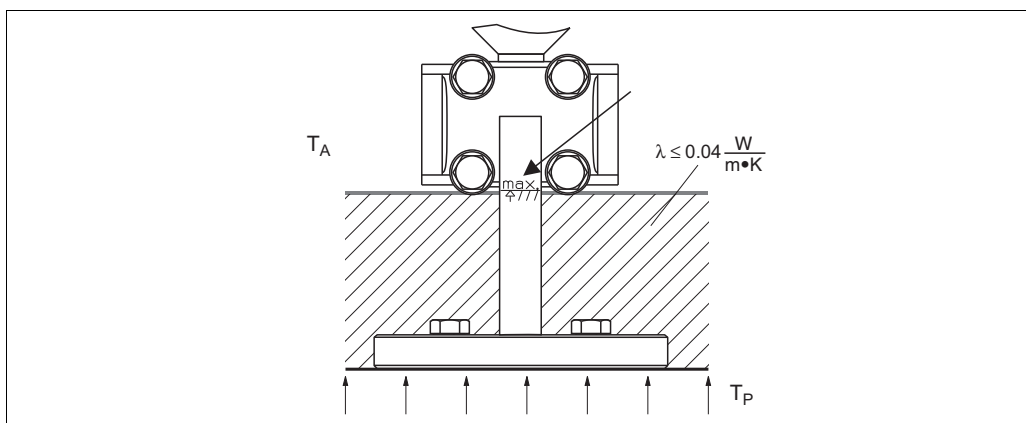


Fig. 22: Maximum permitted insulation height

	FMD77
Ambient temperature (T_A)	$\leq 70^\circ\text{C}$ (158°F)
Process temperature (T_P)	max. 400°C (752°F), depending on the diaphragm seal filling oil used (\rightarrow see Technical Information TI00382P Deltabar S)

3.3.7 Wall and pipe-mounting (optional)

Endress+Hauser offers a mounting bracket for installing the device on pipes or walls. A bracket with mounting accessories for pipe mounting is included with the device.



Note!

When using a valve block, the block's dimensions must be taken into account.

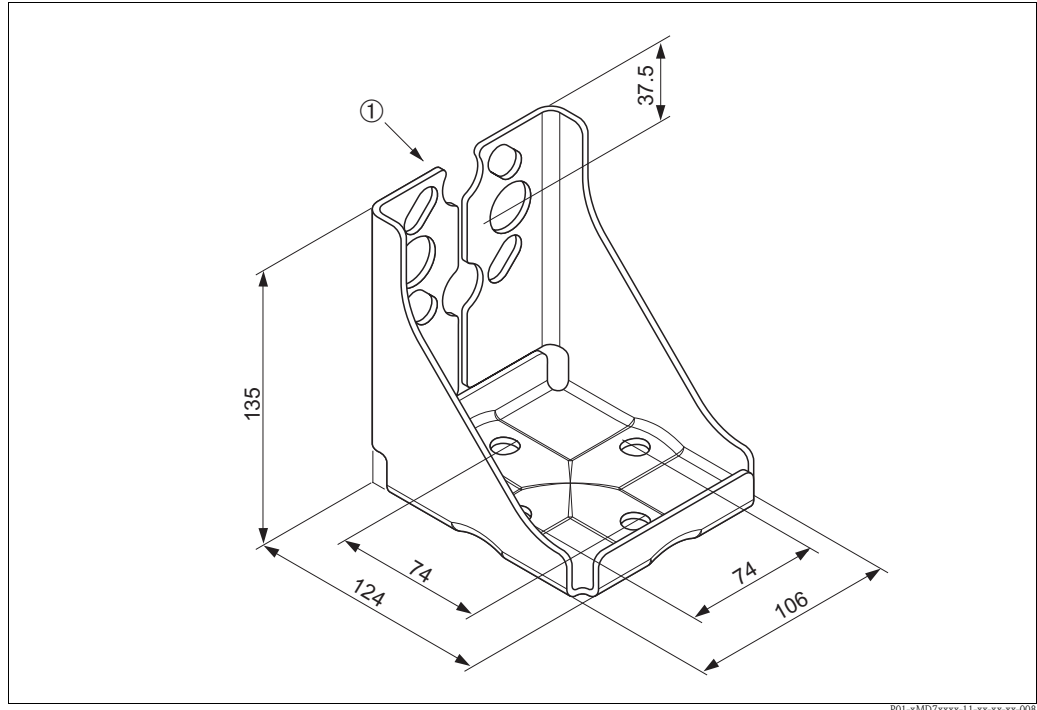


Fig. 23: Mounting bracket for wall and pipe mounting

1 Device mounting

Please note the following when mounting:

- Devices with capillary lines: mount capillaries with a bending radius of ≥ 100 mm (3.94 in).
- To prevent the mounting screws from scoring, lubricate them with a multi-purpose grease prior to mounting.
- In the case of pipe mounting, the nuts on the bracket must be tightened uniformly with a torque of at least 30 Nm (22.13 lbf ft).

3.3.8 Assembling and mounting the "separate housing" version

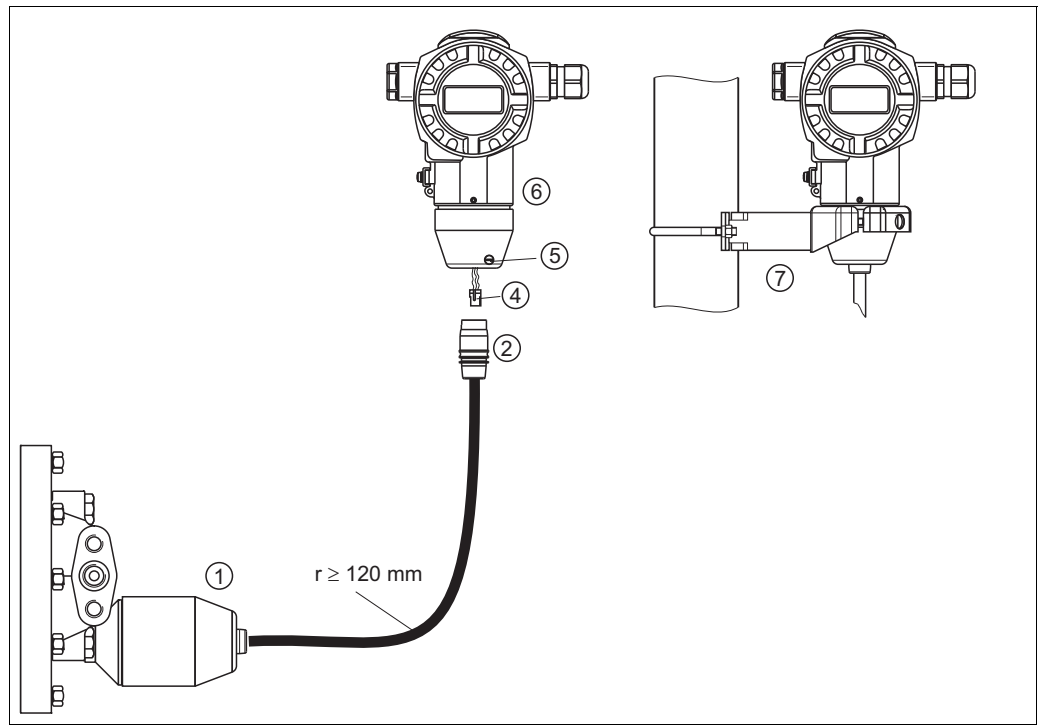


Fig. 24: "Separate housing" version

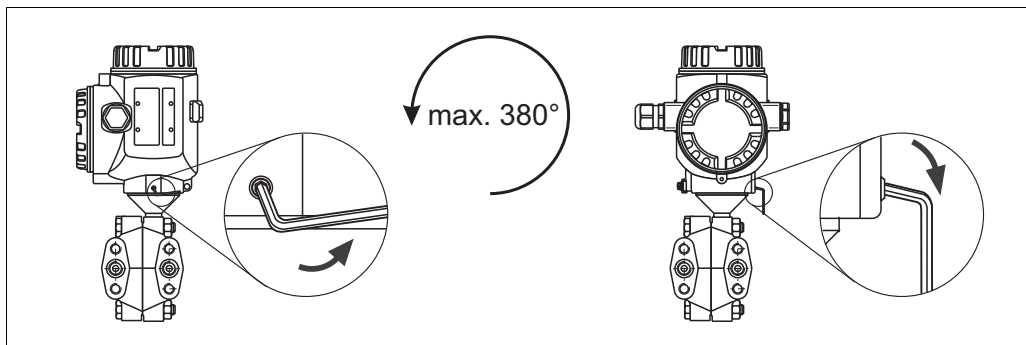
- 1 In the "separate housing" version, the sensor is supplied with process connection and cable fitted.
- 2 Cable with connection jack
- 4 Plug
- 5 Locking screw
- 6 Housing fitted with housing adapter, included
- 7 Mounting bracket suitable for wall and pipe mounting, included

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) $\geq 120 \text{ mm}$ (4.72 in).

3.3.9 Rotating the housing

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

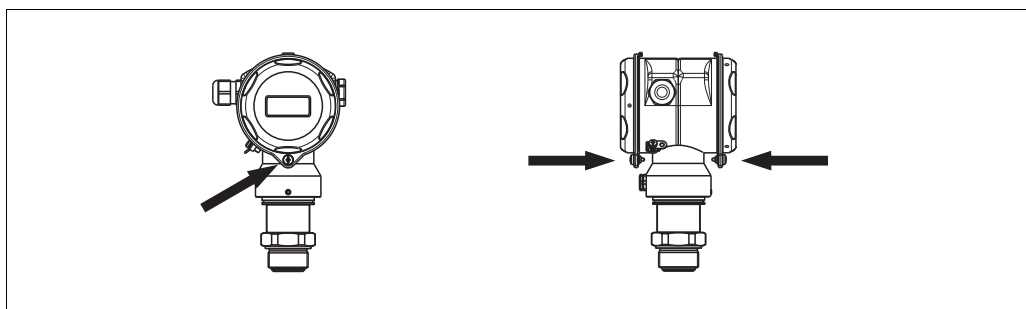


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Fig. 25: Aligning the housing

- For aluminium (T14/T15) and stainless steel housing (T14): Loosen setscrew with a 2 mm (0.08 in) Allen key.
- For hygienic stainless steel housing (T17): Loosen setscrew with a 3 mm (0.12 in) Allen key.
- Rotate housing (max. up to 380°).
- Retighten setscrew with 1 Nm (0,74 lbf ft).

3.3.10 Close cover on a hygienic stainless steel housing (T17)



P01-FMB70xxxx-17-xx-xx-xx-001

Fig. 26: Close cover

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

3.4 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.
 - Devices with integrated overvoltage protection must be earthed.
 - Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.
-
- The supply voltage must match the supply voltage on the nameplate. (→ See also Page 6, Section 2.1.1 Nameplate.)
 - Switch off the supply voltage before connecting the device.
 - Remove housing cover of the terminal compartment.
 - Guide cable through the gland. → For cable specification see Page 24, Section 4.2.3.
 - Connect device in accordance with the following diagram.
 - Screw down housing cover.
 - Switch on supply voltage.

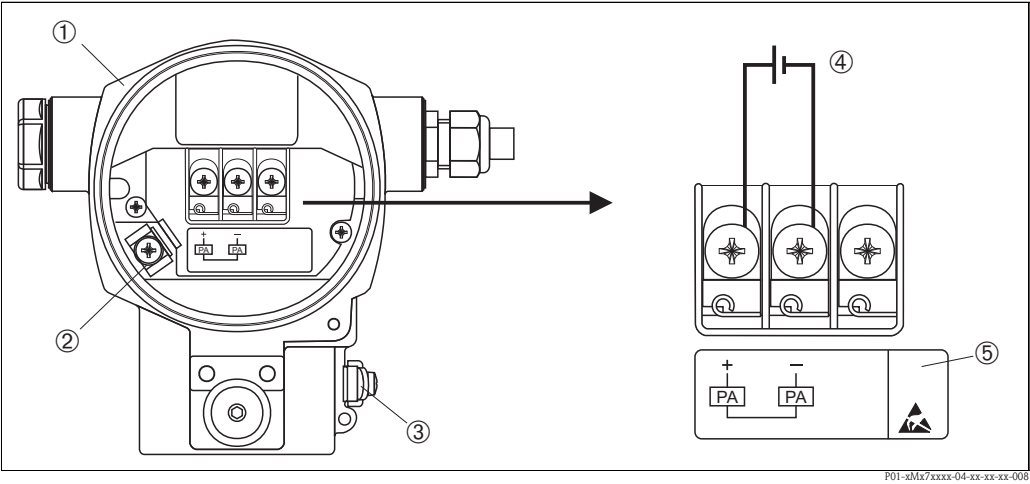


Fig. 27: Electrical connection of PROFIBUS PA
 → Please refer also to Section 4.2.1 "Supply voltage", Page 24.

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

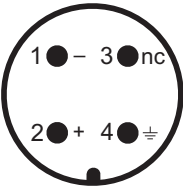
4.1.1 Connecting devices with an M12 connector

PIN assignment for M12 connector

	PIN	Meaning
	1	Signal +
	2	Not assigned
	3	Signal -
	4	Earth

4.1.2 **Devices with 7/8" plug**

PIN assignment for 7/8" connector

 <small>A0011176</small>	PIN	Meaning
	1	Signal –
	2	Signal +
	3	Not assigned
	4	Earth

4.2 **Connecting the measuring unit**



Note!
For further information on the network structure and earthing and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00034S "Guidelines for planning and commissioning PROFIBUS DP/PA" and the PNO Guideline.

4.2.1 **Supply voltage**

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



Note!
■ When using the measuring device in hazardous areas, the corresponding national standards and regulations and the safety instructions or installation or control drawings must also be complied with.
■ All explosion protection data are given in a separate documentation which is available upon request. The Ex documentation is available as standard with all devices approved for use in explosion hazardous areas.

4.2.2 **Current consumption**

Up to HW Version 1.10:
11 mA ±1 mA, switch-on current corresponds to IEC 61158-2, Clause 21.

As of HW Version 02.00:
13 mA ±1 mA, switch-on current corresponds to IEC 61158-2, Clause 21.

As of Hardware Version 1.10, you will find a label in the device on the electronic insert.

4.2.3 **Cable specification**

- Use a twisted, screened two-wire cable, preferably cable type A.
- Terminals for wire cross-sections: 0.5 to 2.5 mm² (20 to 14 AWG)
- Outer cable diameter: 5 to 9 mm (0.2 to 0.35 in)



Note!
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).

4.2.4 Earthing and screening

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

Different earthing and screening installation methods are available for PROFIBUS PA networks such as:

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

4.2.5 Overvoltage protection (optional)

Devices showing version "M" in feature 100 "Additional options 1" or feature 110 "Additional options 2" in the order code are equipped with overvoltage protection (see also Technical Information TI00382P "Ordering information").

- Overvoltage protection:
 - Nominal functioning DC voltage: 600 V
 - Nominal discharge current: 10 kA
- Surge current check $i = 20$ kA as per DIN EN 60079-14: 8/20 μ s satisfied
- Arrester AC current check $I = 10$ A satisfied



Warning!

Devices with integrated overvoltage protection must be earthed.

4.3 Post-connection check

Perform the following checks after completing electrical installation of the device:

- Does the supply voltage match the specifications on the nameplate?
- Is the device connected as per Section 4.1?
- Are all screws firmly tightened?
- Are the housing covers screwed down tight?

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

5 Operation

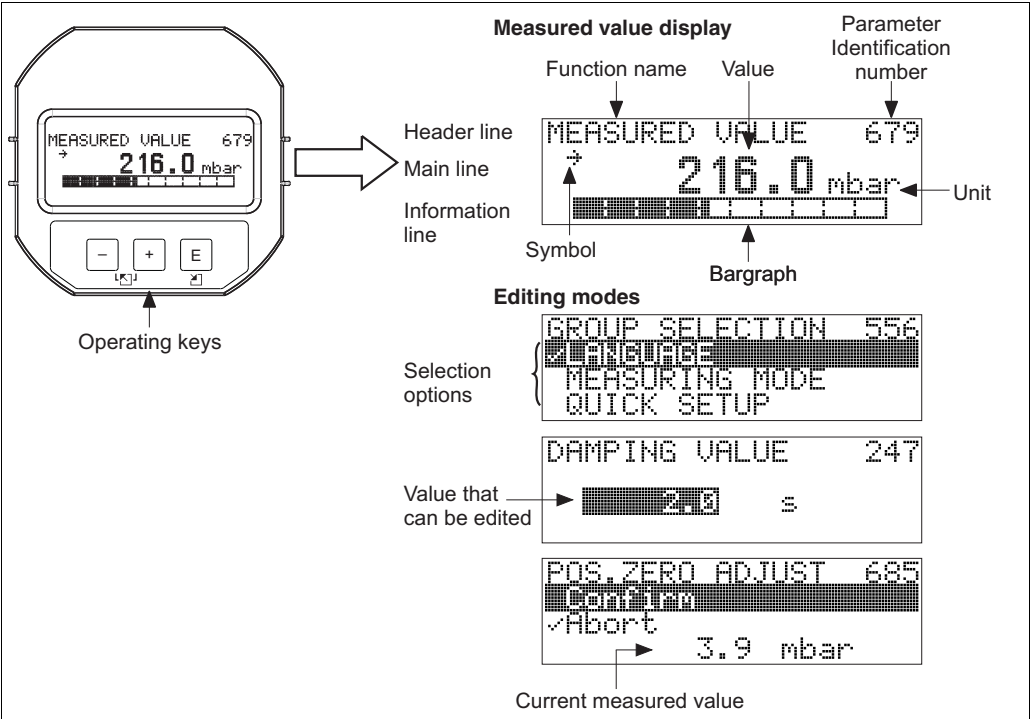
Feature 20 "Output; operation" in the order code provides you with information on the operating options available to you.

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

5.1 On-site display (optional)








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

- Functions:
- 8-digit measured value display including sign and decimal point, unit display
 - Bargraph as graphic display of standardised value of the Analog Input Block (→ see also graphic, Page 70, Section 6.8 "Scaling OUT value")
 - Simple and complete menu guidance thanks to separation of the parameters into several levels and groups
 - Menu guidance in 8 languages
 - Each parameter is given a 3-digit ID number for easy navigation
 - Option for configuring the display according to individual requirements and desires, such as language, alternating display, contrast setting, display of other measured values such as sensor temperature
 - Comprehensive diagnostic functions (fault and warning message)
 - rapid and safe commissioning with the Quick Setup menus



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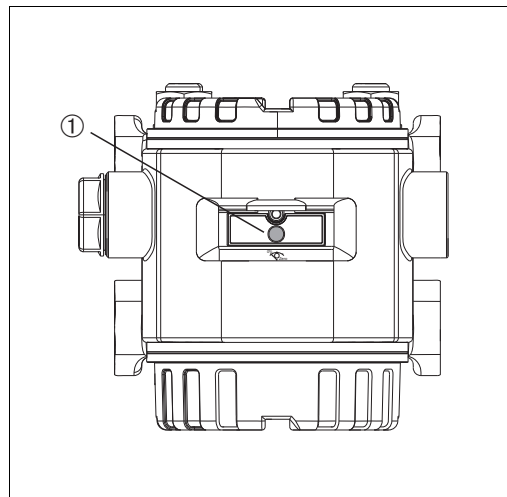
The following table illustrates the symbols that can appear on the on-site display. Four symbols can occur at one time.

Symbol	Meaning
	Alarm symbol – Symbol flashing: warning, device continues measuring. – Symbol permanently lit: error, device does not continue measuring. <i>Note:</i> The alarm symbol may overlies the tendency symbol.
	Lock symbol The operation of the device is locked. Unlock device, → see Page 50, Section 5.7. "Locking/Unlocking operation".
	Communication symbol Data transfer via communication
	Square root symbol Active measuring mode "Flow measurement" The square root flow signal is used for the digital output value of the Analog Input Block OUT.
	Tendency symbol (increasing) The primary value of the Transducer Block is increasing.
	Tendency symbol (decreasing) The primary value of the Transducer Block is decreasing.
	Tendency symbol (constant) The primary value of the Transducer Block has remained constant over the past few minutes.

5.2 Operating elements

5.2.1 Position of operating elements

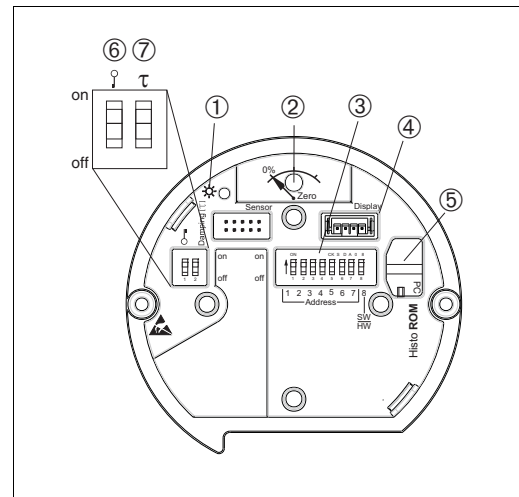
With regard to aluminium housings (T14/T15) and stainless steel housing (T14), the operating key is located either outside the device under the protection cap or inside on the electronic insert. In hygienic stainless housings (T17), the operating key is always located inside on the electronic insert.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



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Fig. 28: Operating key external, under the protective flap

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

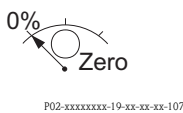
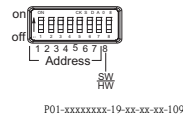
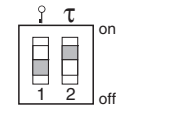


P01-xxxxxxx-19-xx-xx-xx-105

Fig. 29: Operating key and operating elements, internal

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

5.2.2 Function of operating elements – on-site display not connected

Operating key(s)	Meaning
	<ul style="list-style-type: none"> 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". Total reset: Press key for at least 12 seconds. If the LED on the electronic insert lights up briefly, the reset is being carried out.
	Set address in the bus. → See also Page 51, Section 5.8 "Configuring the device address".
	<ul style="list-style-type: none"> DIP-switch 1: for locking/unlocking measured-value-relevant parameters Factory setting: off (unlocked) → See also Page 50, Section 5.7 "Locking/unlocking operation". DIP switch 2: damping on/off Factory setting: on (damping on)

Performing position adjustment on-site












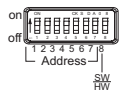
Note!

- The operation must be unlocked. → See Page 50, Section 5.7 "Locking/unlocking operation".
- The device is configured for the Pressure measuring mode as standard. You can switch measuring modes by means of the MEASURING MODE parameter. → See Page 55, Section 6.3 "Selecting language and operating mode".
- The pressure applied must be within the nominal pressure limits of the sensor. See information on the nameplate.

Carry out position adjustment:

1. Pressure is present at device.
2. Press key for at least 3 seconds.
3. If the LED on the electronic insert lights up briefly, the pressure applied has been accepted for position adjustment.
If the LED does not light up, the pressure applied was not accepted. Observe the input limits.
→ For error messages, see Page 75, Section 8.1 "Messages".

5.2.3 Function of the operating elements – on-site display connected

Operating key(s)	Meaning
	<ul style="list-style-type: none"> – Navigate upwards in the picklist – Edit the numerical values and characters within a function
	<ul style="list-style-type: none"> – Navigate downwards in the picklist – Edit the numerical values and characters within a function
	<ul style="list-style-type: none"> – Confirm entry – Jump to the next item
 and 	Contrast setting of on-site display: darker
 and 	Contrast setting of on-site display: brighter
 and 	<p>ESC functions:</p> <ul style="list-style-type: none"> – Exit edit mode without saving the changed value. – You are in a menu within a function group. The first time you press the keys simultaneously, you go back a parameter within the function group. Each time you press the keys simultaneously after that, you go up a level in the menu. – You are in a menu at a selection level. Each time you press the keys simultaneously, you go up a level in the menu. <p><i>Note:</i> The terms function group, level and selection level are explained in Section 5.4.1, Page 44.</p>
 <p>SW HW P01-xxxxxxxx-19-xx-xx-xx-109</p>	Set address in the bus. → See also Page 51, Section 5.8 "Configuring the device address".

5.3 PROFIBUS PA communication protocol

5.3.1 System architecture

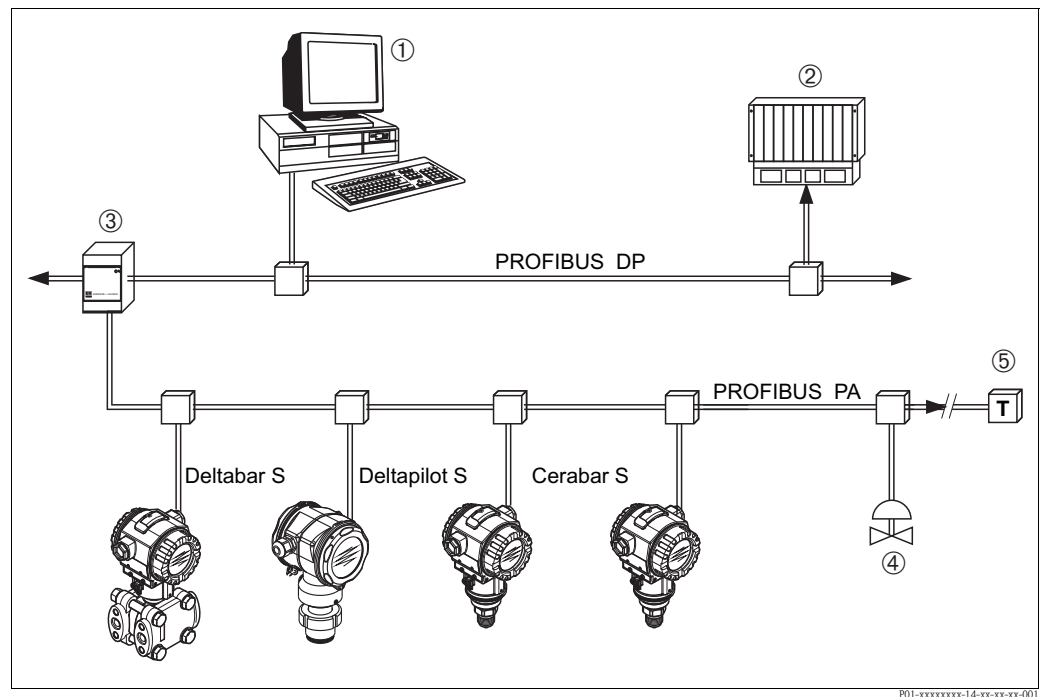


Fig. 30: PROFIBUS system architecture

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



Note!

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).

5.3.2 Number of devices

- Endress+Hauser Deltabar S 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 HW Version 1.10:

- Up to 9 Deltabar S for Ex ia, CSA and FM IS applications
- Up to 32 Deltabar S in all other applications, e.g. in non-Ex areas, Ex nA etc.

As of HW Version 1.10:

- Up to 7 Deltabar S for Ex ia, CSA and FM IS applications
- Up to 27 Deltabar S in all other applications, e.g. in non-Ex areas, Ex nA etc.

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

As of Hardware Version 1.10, you will find a label in the device on the electronic insert.

5.3.3 Operation

Special configuration and operating programs from various manufacturers are available for configuring the device, such as the Endress+Hauser operating program FieldCare (→ see Page 44, Section 5.4). This operating program makes it possible to configure PROFIBUS PA and the device-specific parameters. The predefined function blocks allow uniform access to all the network and device data.

5.3.4 Cyclic data exchange

Deltabar S block model

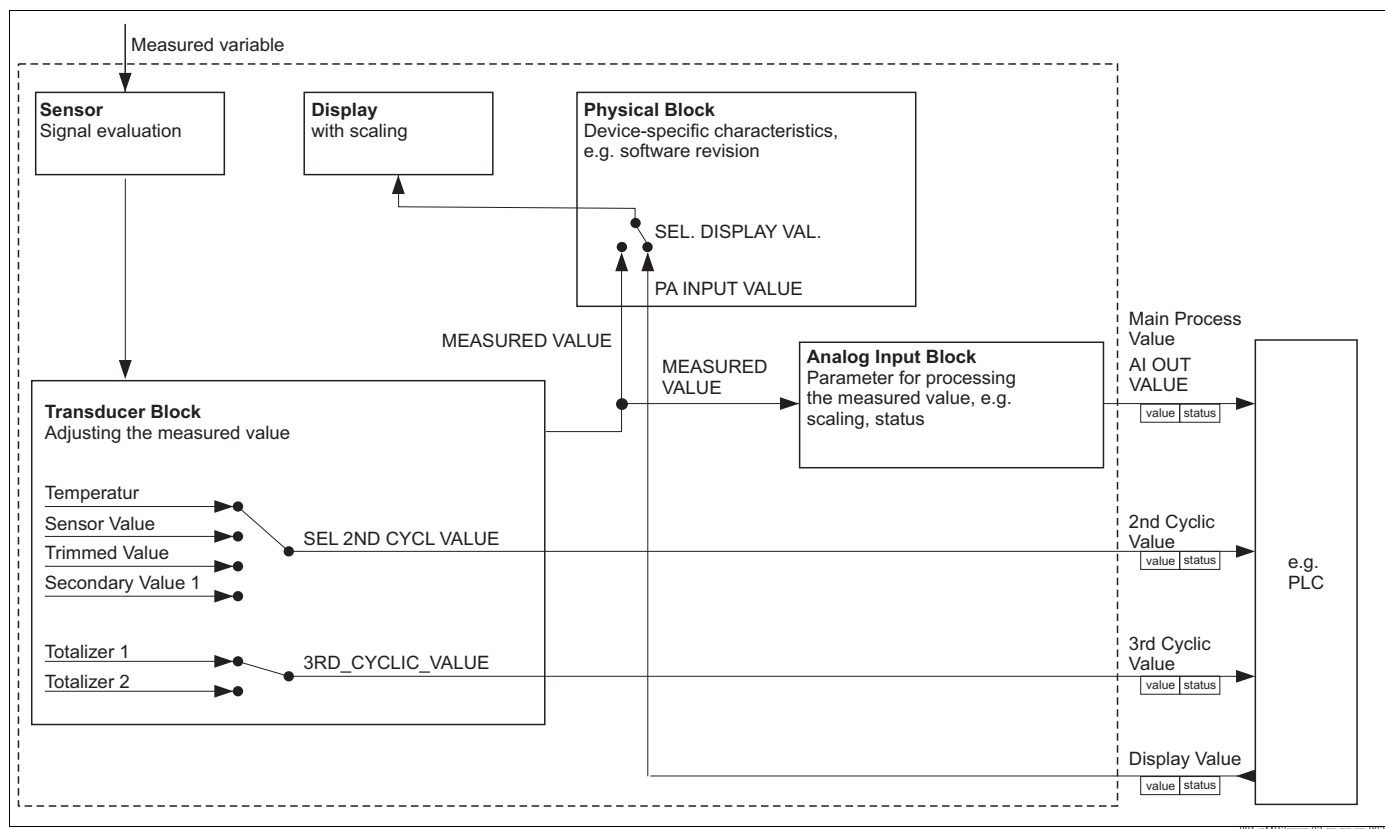


Fig. 31: The block model indicates what type of data can be transmitted between Deltabar S and the Class 1 master (e.g. PLC) during cyclic data communication. Using the configuration software of your PLC, compile the cyclic data telegram with the aid of modules (→ see also "Modules for the cyclic data telegram" in this Section). The parameters, written in CAPS, are parameters in the operating program (e.g. FieldCare) which you can use to make settings for the cyclic data telegram or to display values (→ see also "Parameter description" in this Section).

Deltabar S 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 in Deltabar S:

- **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 ID number switching
- **Transducer Block:**
The Transducer Block contains all the measuring and device-specific parameters of the device. In the Deltabar S Transducer Block, the differential pressure measuring principle is illustrated for use as a pressure, flow or 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.

Description of parameters

Parameter name	Description
AI OUT VALUE	This parameter shows the digital output value of the Analog Input Block. Menu path FieldCare: PROFILE VIEW → ANALOG INPUT BLOCK → AI PARAMETER Menu on-site display: GROUP SELECTION → OPERATING MENU → TRANSMITTER INFO → PA DATA
PA INPUT VALUE	This value is transmitted from the PLC to Deltabar S. The PA INPUT VALUE can be displayed on the on-site display (→ see also this table, SEL. DISPLAY VAL.). Menu path FieldCare: PROFILE VIEW → PHYSICAL BLOCK → PB E+H PARAMETER Menu path on-site display: GROUP SELECTION → OPERATING MENU → TRANSMITTER INFO → PA DATA
SEL. DISPLAY VAL.	Use this parameter to specify whether the primary value or a value of the PLC is displayed on the on-site display. Menu path FieldCare: MANUFACTOR VIEW → OPERATING MENU → DISPLAY or PROFILE VIEW → PHYSICAL BLOCK → PB E+H PARAMETER Menu path on-site display: GROUP SELECTION → OPERATING MENU → TRANSMITTER INFO → PA DATA Options: <ul style="list-style-type: none"> ■ Primary value (PV): the primary value is displayed on the on-site display. ■ Input value: a value from the PLC is displayed on the on-site display (→ see this table, PA INPUT VALUE). Example for the "Input value" option: <ul style="list-style-type: none"> ■ Deltabar S is measuring a volume flow. At the same time, the temperature and the pressure are measured at the measuring point. All these measured values are forwarded to a PLC. The PLC calculates the steam mass from the volume flow, temperature and pressure measured values. Use the "Input value" option to assign this calculated value to the on-site display. Factory setting: <ul style="list-style-type: none"> ■ Primary value (PV)
2ND CYCLIC VALUE	You can use this parameter to specify which value should be transmitted via the bus as the 2nd cyclic value. Menu path FieldCare: PROFILE VIEW → PHYSICAL BLOCK → TB PARAMETER Menu path on-site display: GROUP SELECTION → OPERATING MENU → TRANSMITTER INFO → PA DATA Options: <ul style="list-style-type: none"> ■ Temperature ■ Sensor value: corresponds to the SENSOR PRESSURE parameter ■ Trimmed value: corresponds to the CORRECTED PRESS. parameter ■ Secondary value 1: corresponds to the PRESSURE parameter The SENSOR PRESSURE, CORRECTED PRESSURE and PRESSURE parameters are displayed in the PROCESS VALUES menu (menu path: MANUFACTOR VIEW → OPERATING MENU → PROCESSINFO → PROCESS VALUES). The TEMPERATURE parameter is displayed in the TB PARAMETER menu (menu path: PROFILE VIEW → TRANSDUCER BLOCK → TB PARAMETER) Factory setting: <ul style="list-style-type: none"> ■ Temperature

Parameter name	Description
SEL_3RD_CYCL_VAL ("Flow" operating mode)	<p>You can use this parameter to specify which value should be transmitted via the bus as the 3rd cyclic value.</p> <p>Menu path FieldCare: PROFILE VIEW → PHYSICAL BLOCK → TB PARAMETER</p> <p>Options:</p> <ul style="list-style-type: none"> ■ Totalizer 1 ■ Totalizer 2 <p>Both parameters are displayed in the PROCESS VALUES menu (menu path: MANUFACTOR VIEW → OPERATING MENU → PROCESSINFO → PROCESS VALUES).</p> <p>Factory setting:</p> <ul style="list-style-type: none"> ■ Totalizer

Modules for the cyclic data diagram

Deltabar S makes the following modules available for the cyclic data diagram:

- Main process value
Depending on the operating mode selected, a pressure, level or flow value is transmitted here.
- 2nd cyclic value
Depending on the option selected, a temperature, the sensor value, trimmed value or secondary value 1 is transmitted here.
- 3rd cyclic value
Depending on the option selected, the value of totalizer 1 or totalizer 2 is transmitted here.
- Display value
This is any value that is transmitted from the PLC to Deltabar S. This value can also be displayed on the on-site display.
- FREE PLACE
Select this empty module if a value should not be used in the data telegram.

Structure of the output data PLC → Deltabar S

With the Data_Exchange service, a PLC can read output data from Deltabar S in the call telegram. The cyclic data telegram has the following structure:

Index output data	Data	Access	Data format/comments
0, 1, 2, 3	Display value	Write	32 bit floating point number (IEEE 754)
4	Status code	Write	→ See "Status codes"

Structure of the input data Deltabar S → PLC

With the Data_Exchange service, a PLC can read input data from Deltabar S in the response telegram. The cyclic data telegram has the following structure:

Index input data	Data	Access	Data format/comments
0, 1, 2, 3	Main process value: pressure, level or flow	Read	32 bit floating point number (IEEE 754)
4	Status code for main process value	Read	→ See "Status codes"
5, 6, 7, 8	2nd cyclic value: temperature, sensor value, trimmed value or secondary value 1	Read	32 bit floating point number (IEEE 754)
9	Status code for 2nd cyclic value	Read	→ See "Status codes"
10, 11, 12, 13	3rd cyclic value: totalizer 1 or totalizer 2	Read	32 bit floating point number (IEEE 754)

Index input data	Data	Access	Data format/comments
14	Status code for 3rd cyclic value	Read	→ See "Status codes"

Status codes

Deltabar S supports the following status codes for the main process value, 2nd cyclic value and 3rd cyclic value:

Status code ¹⁾	Device status	Meaning	Main process value	2nd cyclic value	3rd cyclic value
0000 0000	BAD	Not specific (FSAFE_TYPE = 2)	X	X ²⁾	X ²⁾
0000 01xx	BAD	Configuration error (e.g. calibration not performed correctly) (FSAFE_TYPE = 2)	X	X ²⁾	X ²⁾
0000 11xx	BAD	Device error (FSAFE_TYPE = 2)	X	X ²⁾	X ²⁾
0001 00xx	BAD	Sensor error (FSAFE_TYPE = 2)	X	X ²⁾	X ²⁾
0001 1111	BAD	Out of service (target mode)	X		
0100 00xx	UNCERTAIN	Not-specific	X	X ²⁾	X ²⁾
0100 0100	UNCERTAIN	Last valid value (FSAFE_TYPE = 1)	X		
0100 1000	UNCERTAIN	Substitute value (FSAFE_TYPE = 0)	X		
0100 1100	UNCERTAIN	Initial value (FSAFE_TYPE = 1)	X		
0101 11xx	UNCERTAIN	Configuration error (e.g. linearisation table not monotonic increasing)	X	X ²⁾	X ²⁾
0110 00xx	UNCERTAIN	Simulation in progress	X	X ²⁾	X ²⁾
1000 0000	GOOD	OK	X	X	X
1000 0100	GOOD	Active block alarm (static revision was increased)	X		
1000 1001	GOOD	LOW_LIM (alarm active)	X		
1000 1010	GOOD	HI_LIM (alarm active)	X		
1000 1101	GOOD	LOW_LOW_LIM (alarm active)	X		
1000 1110	GOOD	HI_HI_LIM (alarm active)	X		

1) Variable x: 0 or 1

2) If the variables xx in the status code assume the value "00"

5.3.5 Acyclic data exchange

Acyclic data exchange is used:

- To transmit commissioning or maintenance parameters
- 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 is an examples of a Class 2 master.

All the device parameters have to be made known to the master before data can be exchanged via PROFIBUS.

For this, you have the following options:

- A configuration program in the master that accesses the parameters via the slot and index addresses (e.g. FieldCare)
- A software component (DTM: Device Type Manager)



Note!

- The DTM is available on the FieldCare CD.
- The number of Class 2 masters that can simultaneously communicate with a device is restricted to the number of SAPs available for this communication. Deltabar S supports MS2 communication with two SAPs. Here, you must make certain that they do not both attempt to write-access the same data, since otherwise the data consistency cannot be guaranteed.
- 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.

Deltabar S supports MS1 communication with one SAP.



Warning!

In the application program, avoid constantly writing parameters, e.g. for every cycle of the program. Parameters written acyclically are written to memory modules (EEPROM, Flash, etc.). These are resistant to voltage. 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.

5.3.6 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 the FieldCare as an operating program, input screens are available as a user interface.

General explanatory remarks

Object type

- Record: contains data structure (DS)
- Array: group of a certain data type
- Simple: contains individual data types such as Float

Data type

- DS: data structure, contains data types such as Unsigned8, Octet String etc.
- Float: IEEE 754 format
- Integer:
 - Integer8: value range = -128...127
 - Integer16: value range = 327678...-327678
 - Integer32: value range = $-2^{31} \dots 2^{31}$
- Octet String: binary coded
- Visible String: ASCII coded
- Unsigned:
 - Unsigned8: value range = 0...255
 - Unsigned16: value range = 0...65535
 - Unsigned32: value range = 0...4294967295

Storage Class

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

Device management

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write
Directory object header	1	0	Array	Unsigned16	12	Cst	x	
Composite list directory entries	1	1	Array	Unsigned16	24	Cst	x	
GAP directory continuous	1	2 – 8						
GAP reserved	1	9 – 15						

Physical Block

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write
Physical Block standard parameters								
BLOCK_OBJECT	0	16	Record	DS-32	20	Cst	x	
ST_REV	0	17	Simple	Unsigned16	2	N	x	
TAG_DESC	0	18	Simple	Visible String	32	S	x	x
STRATEGY	0	19	Simple	Unsigned16	2	S	x	x
ALERT_KEY	0	20	Simple	Unsigned8	1	S	x	x
TARGET_MODE	0	21	Simple	Unsigned8	1	S	x	x
MODE_BLK	0	22	Record	DS-37	3	D	x	
ALARM SUM	0	23	Record	DS-42	8	D	x	
Physical Block parameters								
SOFTWARE VERSION	0	24	Simple	Visible String	16	Cst	x	
HARDWARE REV.	0	25	Simple	Visible String	16	Cst	x	
MANUFACTOR ID	0	26	Simple	Unsigned16	2	Cst	x	
DEVICE NAME STR.	0	27	Simple	Visible String	16	Cst	x	
DEVICE SERIAL No.	0	28	Simple	Visible String	16	Cst	x	

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write
DIAGNOSIS	0	29	Simple	Octet String	4	D	x	
DIAG_EXT.	0	30	Simple	Octet String	6	D	x	
DIAG_MASK	0	31	Simple	Octet String	4	Cst	x	
DIAG_MASK_EXT.	0	32	Simple	Octet String	6	Cst	x	
DEV_CERTIFIC.	0	33	Simple	Visible String	32	Cst	x	
INSERT PIN NO.	0	34	Simple	Unsigned 16	2	N	x	x
ENTER RESET CODE	0	35	Simple	Unsigned 16	2	S	x	x
ADDITIONAL INFO	0	36	Simple	Visible String	32	S	x	x
MESSAGE	0	37	Simple	Visible String	32	S	x	x
DEV_INSTALL_DATE	0	38	Simple	Visible String	16	S	x	x
IDENT_NUMBER_SEL	0	40	Simple	Unsigned 8	1	S	x	x
DIP STATUS	0	41	Simple	Unsigned 8	1	D	x	
Physical Block, Endress+Hauser parameters								
ALARM STATUS	0	54	Record	E+H specific	5	D	x	
LAST DIAG. CODE	0	55	Record	E+H specific	5	D	x	
UP_DOWN_FEAT	0	56	Simple	Unsigned 8	1	Cst	x	
UP/DOWNLOAD CTRL	0	57	Simple	Unsigned 8	1	D		x
UP/DOWN PARAM	0	58	Simple	Octet String	20	D	x	x
BUS_ADDRESS	0	59	Simple	Unsigned 8	1	D	x	
SET_UNIT_TO_BUS	0	61	Simple	Unsigned 8	1	S	x	x
PA INPUT VALUE	0	62	Record	E+H specific	6	D	x	x
SEL. DISPLAY VAL.	0	63	Simple	Unsigned 8	1	S	x	x
PROFILE_REV	0	64	Simple	Visible String	32	C	x	
RESET ALL ALARMS	0	65	Simple	Unsigned 8	1	S	x	x
IDENT_NUMBER	0	66	Simple	Unsigned 16	2	D	x	
2ND_CYCLIC_VALUE	0	68	Simple	Unsigned 8	1	S	x	
DEVICE DESIGN.	0	69	Simple	Visible String	32	S	x	
CONFIG RECORDER	0	74	Simple	Unsigned 16	2	D	x	
OPERATING HOURS	0	75	Simple	Unsigned 32	4	D	x	
SIM. ERROR NO.	0	76	Simple	Unsigned 16	2	D	x	x
SIM MESSAGES	0	77	Simple	Unsigned 8	1	D	x	x
LANGUAGE	0	78	Simple	Unsigned 8	1	N	x	x
DISPLAY CONTRAST	0	79	Simple	Unsigned 8	1	S	x	x
MENU DESCRIPTOR	0	80	Simple	Unsigned 8	1	N	x	x
MAIN DATA FORMAT	0	81	Simple	Unsigned 8	1	D	x	x
ALTERNATE DATA	0	82	Simple	Unsigned 8	1	N	x	x
UNIT TEXT	0	83	Simple	Visible String	8	S	x	x
USER DESCRIPTION	0	84	Simple	Visible String	32	S	x	x
ACK. ALARM MODE	0	85	Simple	Unsigned 8	1	S	x	x
ACK. ALARM	0	86	Simple	Unsigned 8	1	D	x	x
SELECT ALARM TYPE	0	87	Simple	Unsigned 8	1	S	x	x
ERROR NO.	0	88	Simple	Unsigned 16	2	D	x	x
ALARM DELAY	0	89	Simple	Float	4	S	x	x
ALARM DISPL. TIME	0	90	Simple	Float	4	S	x	x
DIAG ADD EXTENSION	0	91	Simple	Octet String	6	D	x	
MASK ADD EXTENSION	0	92	simple	Octet String	6	D	x	
SEL_3RD_CYCL_VAL	0	93	Simple	Unsigned 8	1	S	x	x
HistoROM AVAIL.	0	94	Simple	Unsigned 8	1	D	x	
HIST. SAVING CYCL	0	95	Simple	Unsigned 8	1	S	x	x
HistoROM CONTROL	0	96	Simple	Unsigned 8	1	S	x	x
ELECTR. SERIAL NO.	0	97	Simple	Visible String	32	Cst	x	
PCB TEMPERATURE	0	98	Simple	Float	4	D	x	
Allowed Min. TEMP	0	99	Simple	Float	4	Cst	x	
Allowed Max. TEMP	0	100	Simple	Float	4	Cst	x	
PCB COUNT: T>Tmax	0	101	Simple	Unsigned 16	2	D	x	
PCB MAX. TEMP.	0	102	Simple	Float	4	D	x	
PCB COUNT: T < Tmin	0	103	Simple	Unsigned 16	4	D	x	
PCB MIN. TEMP.	0	104	Simple	Float	4	D	x	
MAIN LINE FORMAT	0	106	Simple	Unsigned 8	1	D	x	
DOWNLOAD FUNCT.	0	107	Simple	Unsigned 8	1	N	x	x
STATUS LOCKING	0	108	Simple	Unsigned 8	1	D	x	x

Analog Input Block

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write
Analog Input Block standard parameters								
BLOCK_OBJECT	1	16	Record	DS-32	20	Cst	x	
ST_REV	1	17	Simple	Unsigned16	2	N	x	
TAG_DESC	1	18	Simple	Visible String	32	S	x	x
STRATEGY	1	19	Simple	Unsigned16	2	S	x	x
ALERT_KEY	1	20	Simple	Unsigned8	1	S	x	x
TARGET_MODE	1	21	Simple	Unsigned8	1	S	x	x
MODE_BLK	1	22	Record	DS-37	3	D	x	
ALARM_SUM	1	23	Record	DS-42	8	D	x	
Analog Input Block parameters								
AI_BATCH	1	24	Record	DS-67	10	S	x	x
OUT	1	26	Record	DS-33	5	D	x	x ¹⁾
PV_SCALE	1	27	Array	Float	8	S	x	x
OUT_SCALE	1	28	Record	DS-36	11	S	x	x
LIN_TYPE	1	29	Simple	Unsigned8	1	S	x	x
CHANNEL	1	30	Simple	Unsigned16	2	S	x	x
PV_FTIME	1	32	Simple	Float	4	S	x	x
FSAFE_TYPE	1	33	Simple	Unsigned8	1	S	x	x
FSAFE_VALUE	1	34	Simple	Float	4	S	x	x
ALARM_HYS	1	35	Simple	Float	4	S	x	x
HI_HI_LIM	1	37	Simple	Float	4	S	x	x
HI_LIM	1	39	Simple	Float	4	S	x	x
LO_LIM	1	41	Simple	Float	4	S	x	x
LO_LO_LIM	1	43	Simple	Float	4	S	x	x
HI_HI_ALM	1	46	Record	DS-39	16	D	x	
HI_ALM	1	47	Record	DS-39	16	D	x	
LO_ALM	1	48	Record	DS-39	16	D	x	
LO_LO_ALARM	1	49	Record	DS-39	16	D	x	
SIMULATE	1	50	Record	DS-50	6	S	x	x
UNIT_TEXT	1	51	Simple	Visible String	16	S	x	x
VIEW_1_FB	1	61	Simple	Octet String	18	D	x	

1) If MODE_BLK Actual = Manual (MAN)

Transducer Block

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write
Transducer Block standard parameters								
BLOCK_OBJECT	2	16	Record	DS-32	20	Cst	x	
ST_REV	2	17	Simple	Unsigned16	2	N	x	
TAG_DESC	2	18	Simple	Visible String	32	S	x	x
STRATEGY	2	19	Simple	Unsigned16	2	S	x	x
ALERT_KEY	2	20	Simple	Unsigned8	1	S	x	x
TARGET_MODE	2	21	Simple	Unsigned8	1	S	x	x
MODE_BLK	2	22	Record	DS-37	3	D	x	
ALARM_SUM	2	23	Record	DS-42	8	D	x	
SENSOR PRESSURE	2	24	Simple	Float	4	D	x	
PRESS.SENS HILIM	2	25	Simple	Float	4	N	x	
PRESS.SENS LOLIM	2	26	Simple	Float	4	N	x	
HIGH SENSOR TRIM	2	27	Simple	Float	4	S	x	x
LOW SENSOR TRIM	2	28	Simple	Float	4	S	x	x
MINIMUM SPAN	2	29	Simple	Float	4	N	x	
PRESS. ENG. UNIT	2	30	Simple	Unsigned16	2	S	x	
TRIMMED_VALUE (Corrected Press.)	2	31	Record	DS-33	5	D	x	
SENSOR MEAS.TYPE	2	32	Simple	Unsigned16	2	N	x	
SENSOR SER. No.	2	33	Simple	Unsigned32	4	N	x	
PRIM_VALUE (Measured Value)	2	34	Record	DS-33	5	D	x	

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write
PRIM_VALUE_UNIT	2	35	Simple	Unsigned16	2	S	x	x
PRIM_VALUE_TYPE	2	36	Simple	Unsigned16	2	S	x	x
MAT. MEMBRANE	2	37	Simple	Unsigned16	2	S	x	
FILLING FLUID	2	38	Simple	Unsigned16	2	S	x	
SEAL TYPE	2	40	Simple	Unsigned16	2	S	x	x
PROC.CONN.TYPE	2	41	Simple	Unsigned16	2	S	x	x
MAT.PROC.CONN. +	2	42	Simple	Unsigned16	2	S	x	x
TB TEMPERATURE (Sensor Temp.)	2	43	Record	DS-33	5	D	x	
TEMP. ENG UNIT	2	44	Simple	Unsigned16	2	S	x	x
SEC_VALUE_1 (Pressure)	2	45	Record	DS-33	5	D	x	
SEC_VALUE1_UNIT	2	46	Simple	Unsigned16	2	S	x	x
SEC_VALUE_2	2	47	Record	DS-33	5	D	x	
SEC_VALUE2_UNIT	2	48	Simple	Unsigned16	2	S	x	x
LIN_TYP	2	49	Simple	Unsigned8	1	S	x	x
SCALE_IN	2	50	Array	Float	8	S	x	x
SCALE_OUT	2	51	Array	Float	8	S	x	x
LOW_FLOW_CUT_OFF	2	52	Simple	Float	4	S	x	x
FLOW_LIN_SQUARE	2	53	Simple	Float	4	S	x	x
TAB_ACTUAL_NUMB	2	54	Simple	Unsigned8	1	N	x	
LINE-NUMB:	2	55	Simple	Unsigned8	1	D	x	x
TAB_MAX_NR	2	56	Simple	Unsigned8	1	N	x	
TAB_MIN_NR	2	57	Simple	Unsigned8	1	N	x	
TAB_OP_CODE	2	58	Simple	Unsigned8	1	D	x	x
TAB_STATE	2	59	Simple	Unsigned8	1	D	x	
TAB_XY_VALUE	2	60	Array	Float	8	D	x	x
MAX. MEAS. PRESS.	2	61	Simple	Float	4	N	x	x ¹⁾
MIN. MEAS. PRESS.	2	62	Simple	Float	4	N	x	x ¹⁾
MAX. MEAS.TEMP.	2	63	Simple	Float	4	N	x	x ¹⁾
MIN. MEAS. TEMP.	2	64	Simple	Float	4	N	x	x ¹⁾
EMPTY CALIB.	2	75	Simple	Float	4	S	x	x
FULL CALIB.	2	76	Simple	Float	4	S	x	x
GET LRV	2	77	Simple	Unsigned8	1	D	x	x
GET URV	2	78	Simple	Unsigned8	1	D	x	x
DAMPING VALUE	2	79	Simple	Float	4	S	x	x
MAX FLOW	2	80	Simple	Float	4	S	x	x
MAX PRESS. FLOW	2	81	Simple	Float	4	S	x	x
PminALARM WINDOW	2	82	Simple	Float	4	S	x	x
PmaxALARM WINDOW	2	83	Simple	Float	4	S	x	x
TminALARM WINDOW	2	84	Simple	Float	4	S	x	x
TmaxALARM WINDOW	2	85	Simple	Float	4	S	x	x
SIMULATED VALUE	2	86	Simple	Float	4	D	x	x
SIMULATION MODE	2	87	Simple	Unsigned8	1	D	x	x
COUNTER P>Pmin	2	88	Simple	Unsigned16	2	D	x	
COUNTER P<Pmax	2	89	Simple	Unsigned16	2	D	x	
COUNTER T>Tmax	2	90	Simple	Unsigned16	2	D	x	
COUNTER T<Tmin	2	91	Simple	Unsigned16	2	D	x	
MEAS. VAL. TREND	2	92	Simple	Unsigned8	1	D	x	
TOTALISER 1	2	93	Simple	Visible String	8	D	x	
TOTAL. 1 OVERFLOW	2	94	Simple	Visible String	8	D	x	
TOTALISER 2	2	95	Simple	Visible String	8	D	x	
TOTAL. 2 OVERFLOW	2	96	Simple	Visible String	8	D	x	
TEMP Abs RANGE	2	97	Simple	Float	4	Cst	x	
Tmin SENSOR	2	98	Simple	Float	4	Cst	x	
Tmax SENSOR	2	99	Simple	Float	4	Cst	x	
SENSOR H/WARE REV.	2	100	Simple	Unsigned8	1	Cst	x	
Pmax PROC. CONN.	2	101	Simple	Float	4	S	x	x
TOTAL. 1 ENG. UNIT	2	102	Simple	Unsigned16	2	S	x	x
TOTAL. 2 ENG. UNIT	2	103	Simple	Unsigned16	2	S	x	x
FACT.U.U.TOTAL.1	2	104	Simple	Float	4	S	x	x
FACT.U.U.TOTAL.2	2	105	Simple	Float	4	S	x	x
TOT. 1 USER UNIT	2	106	Simple	Visible String	8	S	x	x
TOT. 2 UNIT TEXT	2	107	Simple	Visible String	8	S	x	x
NEG. FLOW TOT. 1	2	108	Simple	Unsigned8	1	S	x	x
NEG. FLOW TOT. 2	2	109	Simple	Unsigned8	1	S	x	x
RESET TOTALISER1	2	110	Simple	Unsigned8	1	S	x	x
FLOW-MEAS. TYPE	2	111	Simple	Unsigned8	1	S	x	x

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write
CUSTOMER UNIT F	2	112	Simple	Visible String	8	S	x	x
CUST.UNIT FACT.F	2	113	Simple	Float	4	S	x	x
CUSTOMER UNIT P	2	114	Simple	Visible String	8	S	x	x
CUST.UNIT FACT.P	2	115	Simple	Float	4	S	x	x
POS.ZERO ADJUST	2	116	Simple	Unsigned8	1	D	x	x
POS. INPUT VALUE	2	117	Simple	Float	4	S	x	x
CALIB. OFFSET	2	118	Simple	Float	4	S	x	x
TANK DESCRIPTION	2	119	Simple	Visible String	32	S	x	x
LIN. EDIT MODE	2	120	Simple	Unsigned8	1	N	x	x
CALIBRATION MODE	2	121	Simple	Unsigned8	1	S	x	x
ADJUSTED DENSITY	2	122	Simple	Float	4	N	x	
LEVEL UNIT TXT	2	123	Simple	Visible String	8	S	x	x
CUST.UNIT FACT.L	2	124	Simple	Float	4	S	x	x
CUST. UNIT CONT.	2	125	Simple	Visible String	8	S	x	x
FACTOR TANK CONT.	2	126	Simple	Float	4	S	x	x
DENSITY UNIT	2	127	Simple	Unsigned16	2	S	x	x
ADJUST DENSITY	2	128	Simple	Float	4	S	x	x
TANK VOLUME	2	129	Simple	Float	4	S	x	x
TANK HEIGHT	2	130	Simple	Float	4	S	x	x
100% POINT	2	131	Simple	Float	4	S	x	x
ZERO POSITION	2	132	Simple	Float	4	S	x	x
LEVEL MIN.	2	133	Simple	Float	4	S	x	x
LEVEL MAX.	2	134	Simple	Float	4	S	x	x
PROCESS DENSITY	2	135	Simple	Float	4	S	x	x
MAX TURNDOWN	2	136	Simple	Float	4	S	x	
SENSOR CHANGES	2	137	Simple	Unsigned16	2	S	x	
P PEAKHOLD.STEP	2	138	Simple	Float	4	S	x	
T PEAKHOLD.STEP	2	139	Simple	Float	4	S	x	
ACC. OF GRAVITY	2	140	Simple	Float	4	S	x	
CREEP FLOW HYST.	2	141	Simple	Float	4	S	x	
LEVEL BEFORE LIN	2	142	Simple	Float	4	D	x	
Pmin SENS. DAMAGE	2	143	Simple	Float	4	Cst	x	
Pmax SENS. DAMAGE	2	144	Simple	Float	4	Cst	x	
ENG. UNIT LEVEL	2	145	Simple	Unsigned16	2	S	x	x
UNIT VOLUME	2	146	Simple	Unsigned16	2	S	x	x
CUSTOMER UNIT V	2	147	Simple	Visible String	8	S	x	x
CUST.UNIT FACT.V	2	148	Simple	Float	4	S	x	x
SET.L.FL.CUT-OFF	2	149	Simple	Float	4	S	x	x
MAT.PROC.CONN. -	2	150	Simple	Unsigned16	2	S	x	x
TANK CONTENT	2	151	Simple	Float	4	D	x	
SUPPRESSED FLOW	2	152	Simple	Float	4	D	x	
RESET PEAKHOLD	2	153	Simple	Unsigned8	1	D	x	x
MEASURING MODE	2	154	Simple	Unsigned8	1	S	x	x
UNIT FLOW	2	155	Simple	Unsigned16	2	S	x	x
TOTALIZER 1 UNIT (Volume p. cond.)	2	156	Simple	Unsigned16	2	S	x	x
TOTALIZER 2 UNIT (Volume p. cond.)	2	157	Simple	Unsigned16	2	S	x	x
LOW FLOW CUT-OFF	2	158	Simple	Unsigned8	1	S	x	x
LO TRIM MEASURED	2	159	Simple	Float	4	N	x	
HI TRIM MEASURED	2	160	Simple	Float	4	N	x	
PERCENT UNIT	2	161	Simple	Unsigned16	2	Cst	x	x
X-VAL:	2	162	Simple	Float	4	N	x	x
Y-VAL:	2	163	Simple	Float	4	N	x	x
MASS FLOW UNIT	2	164	Simple	Unsigned16	2	S	x	x
SIM.FLOW VALUE	2	165	Simple	Float	4	D	x	x
STD. FLOW UNIT	2	166	Simple	Unsigned16	2	S	x	x
NORM FLOW UNIT	2	167	Simple	Unsigned16	2	S	x	x
TOTALIZER 1 UNIT (Mass p. cond.)	2	168	Simple	Unsigned16	2	S	x	x
TOTALIZER 2 UNIT (Mass p. cond.)	2	169	Simple	Unsigned16	2	S	x	x
TOTALIZER 1 UNIT (Gas. std. cond.)	2	170	Simple	Unsigned16	2	S	x	x
TOTALIZER 2 UNIT (Gas. std. cond.)	2	171	Simple	Unsigned16	2	S	x	x
TOTALIZER 1 UNIT (Gas. norm cond.)	2	172	Simple	Unsigned16	2	S	x	x
TOTALIZER 2 UNIT (Gas. norm cond.)	2	173	Simple	Unsigned16	2	S	x	x

Parameter	Slot	Index	Object type	Data type	Size (byte)	Storage Class	Read	Write
MASS UNIT	2	174	Simple	Unsigned 16	2	S	x	x
CUST.UNIT FACT.M	2	175	Simple	Float	4	S	x	x
CUSTOMER UNIT M	2	176	Simple	Visible String	8	S	x	x
HEIGHT UNIT	2	177	Simple	Unsigned 16	2	S	x	x
CUST.UNIT FACT.H	2	178	Simple	Float	4	S	x	x
CUSTOMER UNIT H	2	179	Simple	Visible String	8	S	x	x
EMPTY PRESSURE	2	180	Simple	Float	4	N	x	
FULL PRESSURE	2	181	Simple	Float	4	N	x	
SIM. LEVEL	2	182	Simple	Float	4	D	x	x
SIM. TANK CONT.	2	183	Simple	Float	4	D	x	x
LEVEL MODE	2	184	Simple	Float	4	S	x	x
ACTIV LIN.TAB.X	2	185	Simple	Float	4	N	x	
X-VAL (semi-autom.):	2	186	Simple	Float	4	D	x	
TANK CONTENT MAX.	2	188	Simple	Float	4	S	x	x
TANK CONTENT MIN.	2	189	Simple	Float	4	S	x	x
HYDR. PRESS MAX.	2	190	Simple	Float	4	S	x	x
TAB. ACTIVATE	2	191	Simple	Unsigned 8	1	D	x	
TABLE EDITOR	2	192	Simple	Unsigned 8	1	N	x	x
ACTIVE LIN. TAB. Y	2	193	Simple	Float	4	N	x	x
HYDR. PRESS MIN.	2	194	Simple	Float	4	S	x	x
VALUE LIN. MIN.	2	195	Simple	Float	4	S	x	x
VALUE LIN. MAX	2	196	Simple	Float	4	S	x	x
TOTALIZER 1	2	197	Simple	Float	4	D	x	
TOTALIZER 2	2	198	Simple	Float	4	D	x	
LIN. MEASURAND	2	199	Simple	Unsigned 8	1	S	x	x
LIND. MEASURAND	2	200	Simple	Unsigned 8	1	S	x	x
COMB.MEASURAND	2	201	Simple	Unsigned 8	1	S	x	x
TABLE SELECTION	2	202	Simple	Unsigned 8	1	S	x	x
EDITOR TABLE	2	203	Simple	Unsigned 8	1	S	x	x
AREA UNIT	2	204	Simple	Unsigned 16	2	S	X	x
SIM. PRESSURE	2	205	Simple	Float	4	D	x	x
PRESSURE ABS RNG	2	206	Simple	Float	4	Cst	x	
PRESSURE INVERT	2	207	Simple	Unsigned 8	1	N	x	x
HEIGHT UNIT	2	240	Simple	Unsigned 16	2	S	x	x
CALIBRATION MODE	2	241	Simple	Unsigned 8	1	S	x	x
EMPTY HEIGHT	2	242	Simple	Float	4	S	x	x
FULL HEIGHT	2	243	Simple	Float	4	S	x	x
EINHEIT DICHT	2	244	Simple	Unsigned 16	2	S	x	x
DENSITY UNIT	2	245	Simple	Float	4	S	x	x
PROCESS DENSITY	2	246	Simple	Float	4	S	x	x
MEAS.LEVEL EASY	2	247	Simple	Float	4	N	x	x
LEVEL SELECTION	2	248	Simple	Unsigned 8	1	S	x	x
OUTPUT UNIT	2	249	Simple	Unsigned 16	2	S	x	x

1) can only be reset

5.3.7 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 standardised 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:

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

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	2 ⁵	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 0000 binary

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



Note!

- 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 strings

Some data types, e.g. DS-36, are listed in the slot/index table. These data types are data strings, structured according to 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)
OUT	DS-33	1	26	OUT VALUE	1	Float	4
				OUT STATUS	5	Unsigned8	1

Parameter name	Type	Slot	Index	Element	Sub-index	Type	Size (byte)
OUT_SCALE	DS-36	1	28	EU_100_PERCENT	1	Float	4
				EU_0_PERCENT	5	Float	4
				UNITS_INDEX	9	Unsigned16	2
				DECIMAL_POINT	11	Integer8	1

5.4 On-site operation – on-site display connected

If the on-site display is connected, the three operating keys are used to navigate through the operating menu, → see Page 30, Section 5.2.3 "Function of the operating elements".

5.4.1 General structure of the operating menu

The menu is split into four levels. The three upper levels are used to navigate while you use the bottom level to enter numerical values, select options and save settings. The entire menu is illustrated in Section 10.1 "Menu".

The structure of the OPERATING MENU depends on the measuring mode selected, e.g. if the "Pressure" measuring mode is selected, only the functions necessary for this mode are displayed.

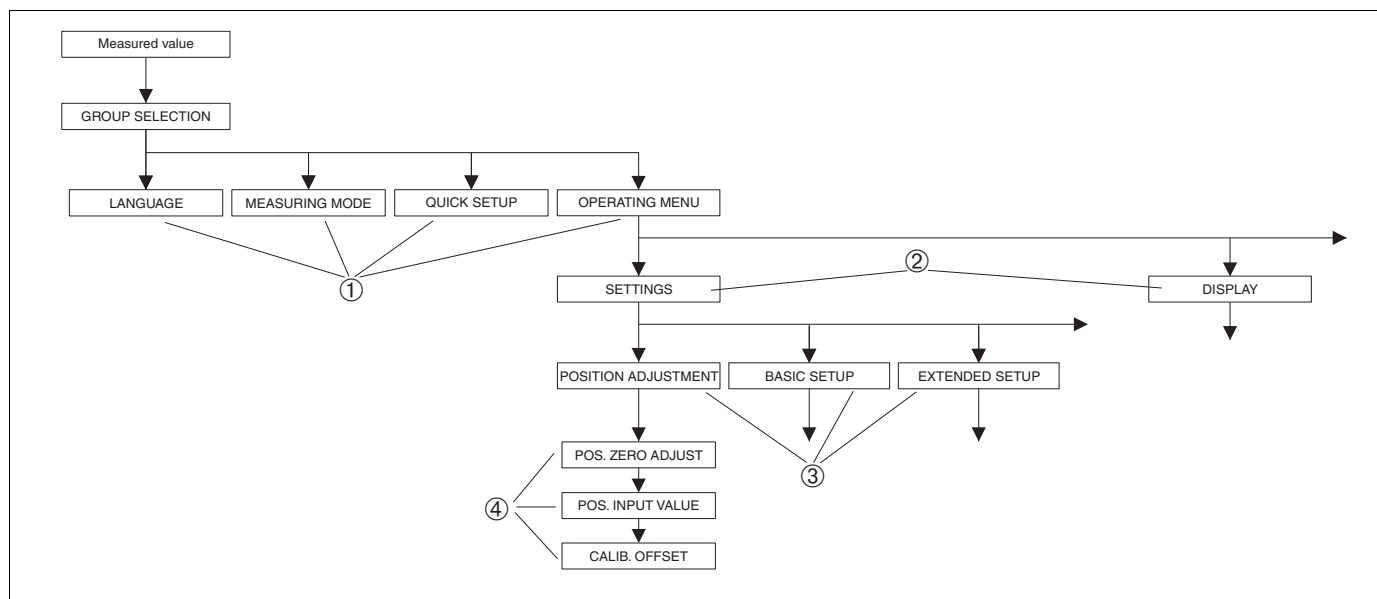


Fig. 32: Structure of the operating menu

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

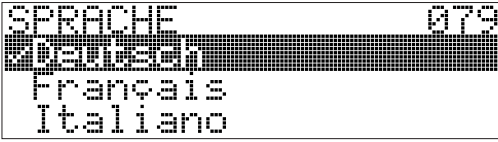
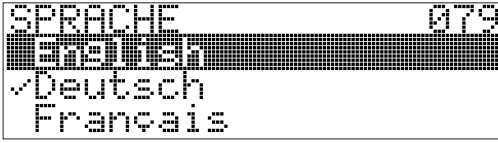
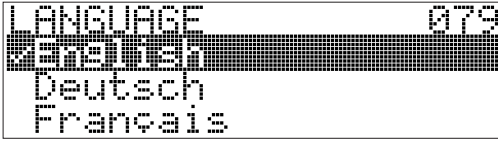


Note!

The LANGUAGE and MEASURING MODE parameters are only displayed via the on-site display on the 1st selection level. In the digital communication, the LANGUAGE parameter is displayed in the DISPLAY group and the MEASURING MODE parameter is displayed in the QUICK SETUP menus or in the BASIC SETUP function group. → See also Section 10.1 "Menu".

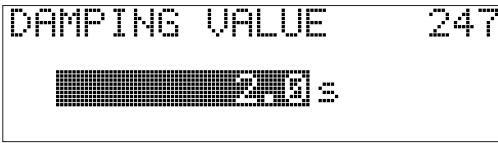
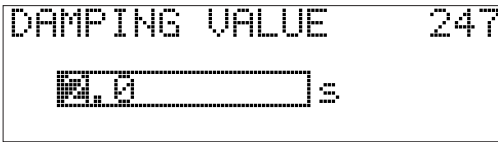
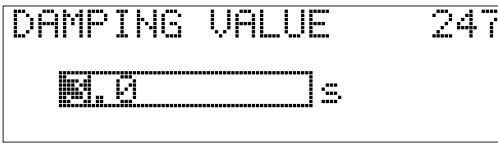
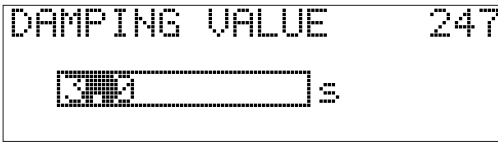
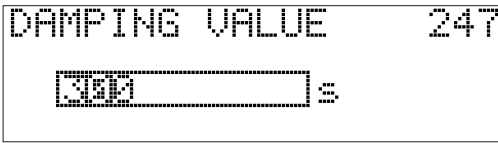
5.4.2 Selecting an option

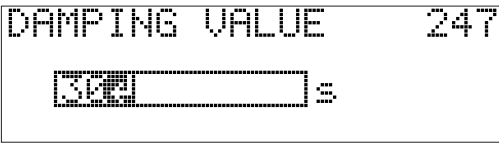
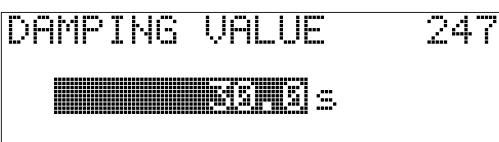
Example: select "English" as the language of the menu.

On-site display	Operation
 <p>SPRACHE 079 Deutsch Français Italiano</p> <p>P01-xxxxxxxx-19-xx-xx-xx-017</p>	German is selected as the language. A ✓ in front of the menu text indicates the active option.
 <p>SPRACHE 079 English ✓Deutsch Français</p> <p>P01-xxxxxxxx-19-xx-xx-xx-033</p>	Select English with "+" or "-".
 <p>LANGUAGE 079 English Deutsch Français</p> <p>P01-xxxxxxxx-19-xx-xx-xx-034</p>	<ol style="list-style-type: none"> 1. Confirm your choice with "E". A ✓ in front of the menu text indicates the active option. (English is now selected as the menu language.) 2. Jump to the next item with "E".

5.4.3 Editing a value

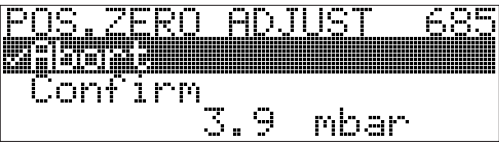

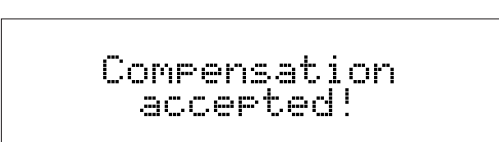
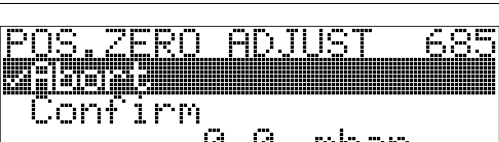
Example: adjusting DAMPING VALUE function from 2.0 s to 30.0 s. → See also Page 30, Section 5.2.3 "Function of the operating elements".

On-site display	Operation
 <p>DAMPING VALUE 247 2.0 s</p> <p>P01-xxxxxxxx-19-xx-xx-xx-023</p>	The on-site display shows the parameter to be changed. The value highlighted in black can be changed. The "s" unit is fixed and cannot be changed.
 <p>DAMPING VALUE 247 2.0 s</p> <p>P01-xxxxxxxx-19-xx-xx-xx-027</p>	<ol style="list-style-type: none"> 1. Press "+" or "-" to get to the editing mode. 2. The first digit is highlighted in black.
 <p>DAMPING VALUE 247 3.0 s</p> <p>P01-xxxxxxxx-19-xx-xx-xx-028</p>	<ol style="list-style-type: none"> 1. Use "+" to change "2" to "3". 2. Confirm "3" with "E". The cursor jumps to the next position (highlighted in black).
 <p>DAMPING VALUE 247 30.0 s</p> <p>P01-xxxxxxxx-19-xx-xx-xx-029</p>	The decimal point is highlighted in black, i.e. you can now edit it.
 <p>DAMPING VALUE 247 300 s</p> <p>P01-xxxxxxxx-19-xx-xx-xx-030</p>	<ol style="list-style-type: none"> 1. Keep pressing "+" or "-" until "0" is displayed. 2. Confirm "0" with "E". The cursor jumps to the next position. ↵ is displayed and is highlighted in black. → See next graphic.

On-site display	Operation
 <p>P01-xxxxxxx-19-xx-xx-xx-031</p>	Use "E" to save the new value and exit the editing mode. → See next graphic.
 <p>P01-xxxxxxx-19-xx-xx-xx-032</p>	The new value for the damping is now 30.0 s. – Jump to the next parameter with "E". – You can get back to the editing mode with "+" or "-".

5.4.4 Taking pressure applied at device as value

Example: performing position adjustment.

On-site display	Operation
 <p>P01-xxxxxxx-19-xx-xx-xx-158</p>	The bottom line on the on-site display displays the pressure present, here 3.9 mbar.
 <p>P01-xxxxxxx-19-xx-xx-xx-159</p>	Use "+" or "-" to switch to the "Confirm" option. The active selection is highlighted in black.
 <p>P01-xxxxxxx-19-xx-xx-xx-028</p>	Use "E" to assign the value (3.9 mbar) to the POS. ZERO ADJUST parameter. The device confirms the calibration and jumps back to the parameter, here POS. ZERO ADJUST (see next graphic).
 <p>P01-xxxxxxx-19-xx-xx-xx-160</p>	Switch to the next parameter with "E".

5.5 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. Hardware and software requirements you can find on the internet: www.endress.com → select your country → Search: FieldCare → FieldCare → Technical Data.

FieldCare supports the following functions:

- Configuration of transmitters in online operation
- Loading and saving device data (upload/download)
- HistoROM®/M-DAT analysis
- Documentation of the measuring point

Connection options:

- PROFIBUS PA via segment coupler and PROFIBUS interface card
- PROFIBUS PA via Fieldgate FXA720, segment coupler and PROFIBUS interface card



Note!

- Further information on the FieldCare can be found on the Internet (<http://www.endress.com>, Download → Search for: FieldCare).

5.6 HistoROM®/M-DAT (optional)

HistoROM®/M-DAT is a memory module, which is attached to the electronic insert and fulfils the following functions:

- Back-up copy of configuration data
- Copying configuration data of a transmitter into another transmitter
- Cyclic recording of pressure and sensor-temperature measured values
- Recording diverse events, such as alarms, configuration changes, counters for measuring range undershooting and exceeding for pressure and temperature, exceeding and undershooting the user limits for pressure and temperature, etc.



Warning!

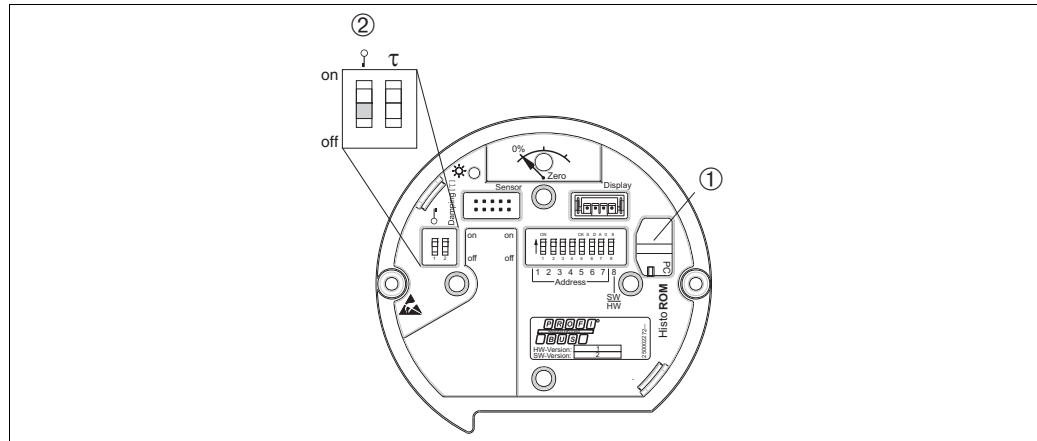
Detach HistoROM®/M-DAT from the electronic insert or attach it to the insert in a deenergised state only.



Note!

- The HistoROM®/M-DAT module may be retrofitted at any time (Order No.: 52027785).
- The HistoROM data and the data in the device are analysed once a HistoROM®/M-DAT is attached to the electronic insert and power is reestablished to the device. During the analysis, the messages "W702, HistoROM data not consistent" and "W706, Configuration in HistoROM and device not identical" can occur. For measures, see Page 75, Section 8.1 "Messages."

5.6.1 Copying configuration data



P01-xxxxxxxx-19-xx-xx-xx-110

Electronic insert with optional HistoROM®/M-DAT memory module

- 1 Optional HistoROM®/M-DAT
- 2 To copy configuration data from the HistoROM®/M-DAT to a device or from a device to a HistoROM®/M-DAT, the operation must be unlocked (DIP switch 1, position "Off", parameter INSERT PIN No = 2457). See also Page 50, Section 5.7 "Locking/unlocking operation".

On-site operation via on-site display (optional) or remote operation

Copying configuration data from a device to a HistoROM®/M-DAT:



Note!

The operation must be unlocked.

1. Disconnect device from supply voltage.
2. Attach the HistoROM®/M-DAT module to the electronic insert.
3. Reestablish supply voltage to the device.
4. The DOWNLOAD SELECT. parameter (OPERATION menu) setting has no influence on an upload from the device into HistoROM.
5. Using the HistoROM CONTROL parameter select the option "Device → HistoROM" as the data transfer direction.
6. Wait approx. 20 seconds. Configuration data are loaded from the device to the HistoROM®/M-DAT. The device is not restarted.
7. Disconnect device from the supply voltage again.
8. Detach memory module.
9. Reestablish supply voltage to the device.

Copying configuration data from a HistoROM®/M-DAT to a device:

Note!

The operation must be unlocked.

1. Disconnect device from supply voltage.
2. Attach the HistoROM®/M-DAT module to the electronic insert. Configuration data from another device are stored in the HistoROM®/M-DAT.
3. Reestablish supply voltage to the device.
4. Use the DOWNLOAD SELECT parameter (OPERATION menu) to select which parameters are to be overwritten.

The following parameters are overwritten according to the selection:

– **Configuration copy (factory setting):**

all parameters except DEVICE SERIAL No., DEVICE DESIGN, TAG DESCRIPTOR, DESCRIPTION, IDENT_NUMBER_SEL, BUS ADDRESS and the parameters in the POSITION ADJUSTMENT, PROCESS CONNECTION, SENSOR TRIM and SENSOR DATA group.

– **Device replacement:**

all parameters except DEVICE SERIAL No., IDENT_NUMER_SEL, DEVICE DESIGN and the parameters in the POSITION ADJUSTMENT, PROCESS CONNECTION, SENSOR TRIM and SENSOR DATA group.

– **Electronics replace:**

all parameters except the parameters in the SENSOR DATA group.

Factory setting: Configuration copy


5. Using the HistoROM CONTROL parameter select the option "HistoROM → Device" as the data transfer direction.
(Menu path: GROUP SELECTION → OPERATING MENU → OPERATION)
6. Wait approx. 20 seconds. Configuration data are loaded from the device to the HistoROM®/M-DAT. The device is restarted.
7. Before removing the HistoROM®/M-DAT again from the electronic insert, disconnect the device from supply voltage.

5.7 Locking/unlocking operation

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

You have the following possibilities for locking/unlocking the operation:

- Via a DIP-switch on the electronic insert, locally on the display.
- Via the on-site display (optional)
- Via communication e.g. FieldCare.

The -symbol on the on-site display indicates that operation is locked. Parameters which refer to how the display appears, e.g. LANGUAGE and DISPLAY CONTRAST 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 remote operation e.g. FieldCare, you can only unlock operation again by means of remote operation.

The table provides an overview of the locking functions:

Locking via	View/read parameter	Modify/write via ¹⁾		Unlocking via		
		On-site display	Remote operation	DIP-switch	On-site display	Remote operation
DIP-switch	Yes	No	No	Yes	No	No
On-site display	Yes	No	No	No	Yes	Yes
Remote operation	Yes	No	No	No	Yes	Yes

1) Parameters which refer to how the display appears, e.g. LANGUAGE and DISPLAY CONTRAST can still be altered.

5.7.1 Locking/unlocking operation locally via DIP-switch

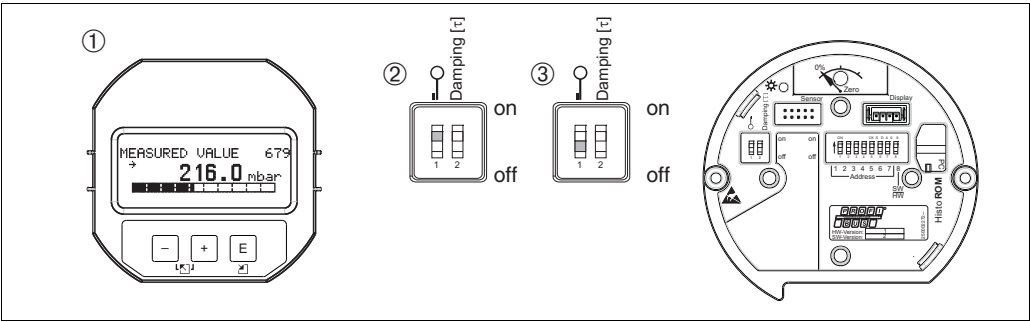


Fig. 33: DIP-switch position "Hardware locking" on the electronic insert

- 1 If necessary, remove on-site display (optional)
- 2 DIP-switch is at "On": operation is locked.
- 3 DIP-switch is at "Off": operation is unlocked (operation possible)

5.7.2 Locking/unlocking operation via remote operation

	Description
Locking operation	<ol style="list-style-type: none">1. Select INSERT PIN No parameter, menu path on-site display: GROUP SELECTION → OPERATING MENU → OPERATING → INSERT PIN No. menu path FieldCare: MANUFACTURER VIEW → OPERATING MENU → OPERATION → INSERT PIN No.2. To lock operation, enter "0" for the parameter.

	Description
Unlocking operation	<ol style="list-style-type: none"> 1. Select INSERT PIN No. parameter. 2. To unlock operation, enter "2457" for the parameter.

5.8 Configuring the device address

Note the following points:

- An address must be assigned to every PROFIBUS PA device. Only when the address is configured correctly will the device be recognised by the control system/master.
- Each address may only be assigned once in each PROFIBUS PA network.
- Valid device addresses are in the range from 0 to 125.
- The address 126 set at the factory can be used to check the function of the device and to connect to a PROFIBUS PA network already in operation. This address then has to be changed in order to integrate additional devices.
- All devices have the address 126 and software addressing on leaving the factory.
- The FieldCare operating program is delivered from the factory with the address 1.

There are two ways of assigning the device address to Deltabar S:

- Using a DP Class 2 master operating program, such as FieldCare or
- On-site using the DIP switches

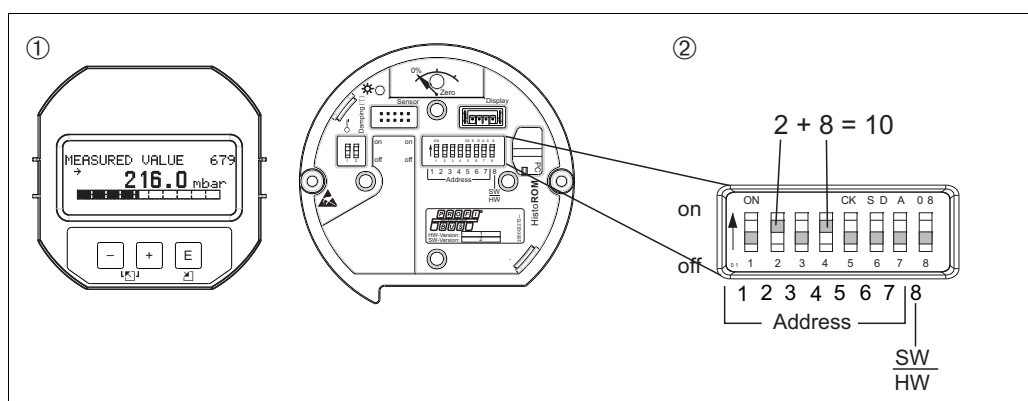


Fig. 34: Configuring the device address using the DIP switches

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

5.8.1 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
Weighting in "On" position	1	2	4	8	16	32	64
Weighting in "Off" position	0	0	0	0	0	0	0

5.8.2 Software addressing

Software addressing is configured as follows:

1. Set DIP switch 8 (SW/HW) to "On" (factory setting).
2. The device is restarted.

3. The device reports its current address. Factory setting: 126
4. Configure the address via the configuration program.
See the following section for entering a new address using the FieldCare.
For other operating programs, please refer to the relevant Operating Instructions.

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

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

5.9 Factory setting (reset)

- Total reset: Press zero-key for at least 12 seconds. If the LED on the electronic insert lights up briefly, the reset is being carried out.
- By entering a certain code, you can completely, or partially, reset the entries for the parameters to the factory settings. (→ For the factory settings see Operating Instructions BA00296P "Cerabar S/Deltabar S/Deltapilot S Description of Device Functions". See also Page 2, "Overview of documentation".)
Enter the code by means of the ENTER RESET CODE parameter (menu path: MANUFACTOR VIEW → OPERATING MENU → OPERATING).
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 (→ see Page 50, Section 5.7).



Note!

- Any customer-specific configuration carried out by the factory is not affected by a reset (customer-specific configuration remains). If, after a reset, you wish the parameters to be reset to the factory settings, please contact Endress+Hauser Service.
- The OUT value may have to be rescaled after resetting with code 1, 40864 or 33333.
→ See also Page 70, Section 6.8 "Scaling OUT Value" and Page 71, Section 6.9 "System units".

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

Reset code	Description and effect
1 or 40864	Total reset <ul style="list-style-type: none"> – This reset resets the following parameters: <ul style="list-style-type: none"> – POSITION ADJUSTMENT function group – BASIC SETUP function group – EXTENDED SETUP function group – LINEARISATION function group (an existing linearisation table is deleted) – TOTALIZER SETUP function group – OUTPUT group – PA DATA function group, SET UNIT TO BUS, 2ND CYCLIC VALUE, SEL.DISPLAY VALUE parameters – TRANSMITTER DATA function group, TAG DESCRIPTION, ADDITIONAL INFO. parameters – MESSAGES function group – All configurable messages ("Error" type) are set to "Warning". → See also Page 75, Section 8.1 "Messages" and Page 82, 8.2 "Response of outputs to errors". – USER LIMITS function group – Any simulation which may be running is ended. – The device is restarted.
33333	User reset <ul style="list-style-type: none"> – This reset resets the following parameters: <ul style="list-style-type: none"> – POSITION ADJUSTMENT function group – BASIC SETUP function group, apart from customer-specific units – EXTENDED SETUP function group – TOTALIZER SETUP function group – OUTPUT group – PA DATA function group, SET UNIT TO BUS, 2ND CYCLIC VALUE, SEL.DISPLAY VALUE parameters – TRANSMITTER DATA function group, TAG DESCRIPTION, ADDITIONAL INFO. parameters – Any simulation which may be running is ended. – The device is restarted.
35710	Reset Level measuring mode <ul style="list-style-type: none"> – Depending on the settings for the LEVEL MODE, LIN MEASURAND, LINd MEASURAND or COMB. MEASURAND parameters, the parameters needed for this measuring task will be reset. – Any simulation which may be running is ended. – The device is restarted. <p>Example LEVEL MODE = linear and LIN. MEASURAND = level</p> <ul style="list-style-type: none"> ■ HEIGHT UNIT = m ■ CALIBRATION MODE = wet ■ EMPTY CALIB. = 0 ■ FULL CALIB. = Sensor end value converted to mH₂O, e.g. 5.099 mH₂O for a 500 mbar (7.5 psi)
34846	Display reset <ul style="list-style-type: none"> – This reset resets all parameters which have to do with how the display appears (DISPLAY group). – Any simulation which may be running is ended. – The device is restarted.
41888	HistoROM reset <p>The measured value and event buffers are deleted. During the reset, the HistoROM has to be attached to the electronic insert.</p>
2506 or 33062	PowerUp reset (warm start) <ul style="list-style-type: none"> – This reset resets all the parameters in the RAM. Data are read back anew from the EEPROM (processor is initialised again). – Any simulation which may be running is ended. – The device is restarted.
2712	Bus address reset <ul style="list-style-type: none"> – The device address configured via the bus is reset to the 126 factory setting. – Any simulation which may be running is ended. – The device is restarted.

6 Commissioning



Warning!

- If a pressure smaller than the minimum permitted pressure is present at the device, the messages "E120 Sensor low pressure" and "E727 Sensor pressure error – overrange" are output in succession.
- If a pressure greater than the maximum permitted pressure is present at the device, the messages "E115 Sensor overpressure" and "E727 Sensor pressure error – overrange" are output in succession.
- Messages E727, E115 and E120 are "Error"-type messages and can be configured as a "Warning" or an "Alarm". These messages are configured as "Warning" messages at the factory. In applications where the user is consciously aware of the fact that the sensor range can be exceeded (e.g. cascade measurement), this setting prevents the transference of status BAD.
- We recommend setting messages E727, E115 and E120 to "Alarm" in the following instances:
 - The sensor range does not have to be exceeded for the measuring application.
 - Position adjustment has to be carried out that has to correct a large measured error as a result of the orientation of the device (e.g. devices with a diaphragm seal).



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, as well as the digital output value of the Analog Input Block OUT, correspond to the data on the nameplate. The OUT value may have to be rescaled after resetting with code 1, 40864 or 33333 (→ see also Page 70, Section 6.8 "Scaling OUT value" and Page 71, Section 6.9 "System units").

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 → see Section 3.4
- "Post-connection check" checklist → see Section 4.4

6.2 Commissioning via Class 2 master (FieldCare)

Commissioning and operating of FieldCare are described in the integrated FieldCare online help.

Proceed as follows to commission the device:

1. Check the hardware write protection on the electronic insert (→ see Page 50, Section 5.7 "Locking/unlocking configuration").
The DIP STATUS parameter indicates the hardware write protection (menu path: MANUFACTOR VIEW → TRANSMITTER INFO → TRANSMITTER DATA or PROFILE VIEW → PHYSICAL BLOCK → PB PARAMETER)
2. Enter the tag name by means of the ADDITIONAL INFO parameter. (Menu path: MANUFACTOR VIEW → TRANSMITTER INFO → TRANSMITTER DATA or PROFILE VIEW → PB PARAMETER)
3. Assign the device an address in the bus (→ see also Page 51, Section 5.8 "Configuring the device address")
4. Configure manufacturer-specific device parameters via the MANUFACTOR VIEW menu.
5. Configure the PHYSICAL BLOCK (menu path: PROFILE VIEW → PHYSICAL BLOCK)
6. Configure the ANALOG INPUT 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 (→ see Page 70, Section 6.8 "Scaling OUT value").
 - If necessary, configure the limit values.
7. Configure the cyclic data communication (→ see Page 70, Section 6.8).

6.3 Selecting language and measuring mode

6.3.1 On-site operation

The LANGUAGE and MEASURING MODE parameters are located on the top menu level. → See also Page 44, Section 5.4.1 "General structure of the operating menu".

The following languages are available:

- Deutsch
- English
- Français
- Italiano
- Español
- Nederlands
- Chinese (CHS)
- Japanese (JPN)

The following measuring modes are available:

- Pressure
- Level
- Flow

6.3.2 Digital communication

The MEASURING MODE parameter is displayed in the digital communication in the QUICK SETUP menus and in the BASIC SETUP function group (OPERATING MENU → SETTINGS → BASIC SETUP).

The following measuring modes are available:

- Pressure
- Level
- Flow

The LANGUAGE parameter is arranged in the DISPLAY group (OPERATING MENU → DISPLAY).

- Use the LANGUAGE parameter to select the menu language for the on-site display.
- Select the menu language for FieldCare by means of the "Language Button" in the configuration window. Select the menu language for the FieldCare frame via the "Extra" menu → "Options" → "Display" → "Language".

The following languages are available:

- Deutsch
- English
- Français
- Italiano
- Español
- Nederlands
- Chinese (CHS)
- Japanese (JPN)

6.4 Position adjustment

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

- Menu path on-site display: GROUP SELECTION → OPERATING MENU → SETTINGS → POSITION ADJUSTMENT
- Menu path FieldCare: MANUFACTURER VIEW → OPERATING MENU → SETTINGS → POSITION ADJUSTMENT

Parameter name	Description
POS. ZERO ADJUST Entry	<p>Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known.</p> <p>Example:</p> <ul style="list-style-type: none"> – MEASURED VALUE = 2.2 mbar (0.032 psi) – Correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option. This means that you are assigning the value 0.0 to the pressure present. – MEASURED VALUE (after pos. zero adjust) = 0.0 mbar <p>The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected.</p> <p>Factory setting: 0.0</p>
POS. INPUT VALUE Entry	<p>Position adjustment – the pressure difference between zero (set point) and the measured pressure need not be known. To correct the pressure difference, you need a reference measurement value (e. g. from a reference device).</p> <p>Example:</p> <ul style="list-style-type: none"> – MEASURED VALUE = 0.5 mbar (0.0073 psi) – For the POS. INPUT VALUE parameter, specify the desired set point for the MEASURED VALUE, e.g. 2.0 mbar (0.029 psi). ($\text{MEASURED VALUE}_{\text{new}} = \text{POS. INPUT VALUE}$) – MEASURED VALUE (after entry for POS. INPUT VALUE) = 2.0 mbar (0.029 psi) – The CALIB. OFFSET parameter displays the resulting pressure difference (offset) by which the MEASURED VALUE was corrected. $\text{CALIB. OFFSET} = \text{MEASURED VALUE}_{\text{old}} - \text{POS. INPUT VALUE}$, here: $\text{CALIB. OFFSET} = 0.5 \text{ mbar (0.0073 psi)} - 2.0 \text{ mbar (0.029 psi)} = -1.5 \text{ mbar (0.022 psi)}$ <p>Factory setting: 0.0</p>
CALIB. OFFSET Entry	<p>Position adjustment – the pressure difference between zero (set point) and the measured pressure is known. (A reference pressure is not present at the device.)</p> <p>Example:</p> <ul style="list-style-type: none"> – MEASURED VALUE = 2.2 mbar (0.032 psi) – Via the CALIB. OFFSET parameter, enter the value by which the MEASURED VALUE should be corrected. To correct the MEASURED VALUE to 0.0 mbar, you must enter the value 2.2 here. ($\text{MEASURED VALUE}_{\text{new}} = \text{MEASURED VALUE}_{\text{old}} - \text{CALIB. OFFSET}$) – MEASURED VALUE (after entry for calib. offset) = 0.0 mbar <p>Factory setting: 0.0</p>

6.5 Flow measurement

6.5.1 Preparatory steps



Note!

- The Deltabar S PMD70 or PMD75 is usually used for flow measurement.
- Before calibrating the Deltabar S, the impulse piping must be cleaned and filled with fluid. → See the following table.

	Valves	Meaning	Preferred installation
1	Close 3.		
2	Fill measuring system with fluid.		
	Open A, B, 2, 4.	Fluid 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 fluid.	
	Close 4.	Close negative side.	
	Open 3.	Balance positive and negative side.	
	Open 6 and 7 briefly, then close them again.	Fill device completely with fluid and remove air.	
5	Carry out pos. zero adjustment 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. → See Page 60, Section 6.5.3 and Page 57, Section 6.4. 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 positive side from negative side.	
	Open 4.	Connect negative 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 pos. zero adjustment if the flow can be blocked off. In this case, step 5 is not applicable. → See Page 60, Section 6.5.3. and 57, Section 6.4		
8	Carry out calibration. → See Page 59, Section 6.5.2.		

Fig. 35: Above: preferred installation for gases
Below: preferred installation for liquids

- I Deltabar S, PMD70 or PMD75
 II Three-valve manifold
 Separator
 1, 5 Drain valves
 2, 4 Inlet valves
 3 Equalising valve
 6, 7 Vent valves on Deltabar S
 A, B Shut-off valves

1) for arrangement with 5 valves

6.5.2 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 devices such as pitot tubes or orifice plates and depends on the volume or mass flow. Four flow measuring modes are available: volume flow, norm volume flow (European norm conditions), standard volume flow (American standard conditions) and mass flow.

In addition, the Deltabar S software is equipped with two totalizers as standard. The totalizers add up 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) totalises the flow from commissioning onwards and cannot be reset.



Note!

- There is a Quick Setup menu for each of the measuring modes Pressure, Level and Flow which guides you through the most important basic functions. With the setting in the MEASURING MODE parameter, you specify which Quick Setup menu should be displayed. → See also Page 55, Section 6.3 "Selecting language and measuring mode".
- For a detailed description of the parameters see the Operating Instructions BA00296P "Cerabar S/Deltabar S/Deltapilot S, Description of device functions"
 - Table 6, POSITION ADJUSTMENT
 - Table 14, BASIC SETUP
 - Table 17, EXTENDED SETUP
 - Table 20, TOTALIZER SETUP.→ See also Page 2, Section "Overview documentation".
- For flow measurement, select the "Flow" option by means of the MEASURING MODE parameter. The operating menu is structured appropriately. → See also Section 10.1.

6.5.3 Quick Setup menu for the Flow measuring mode

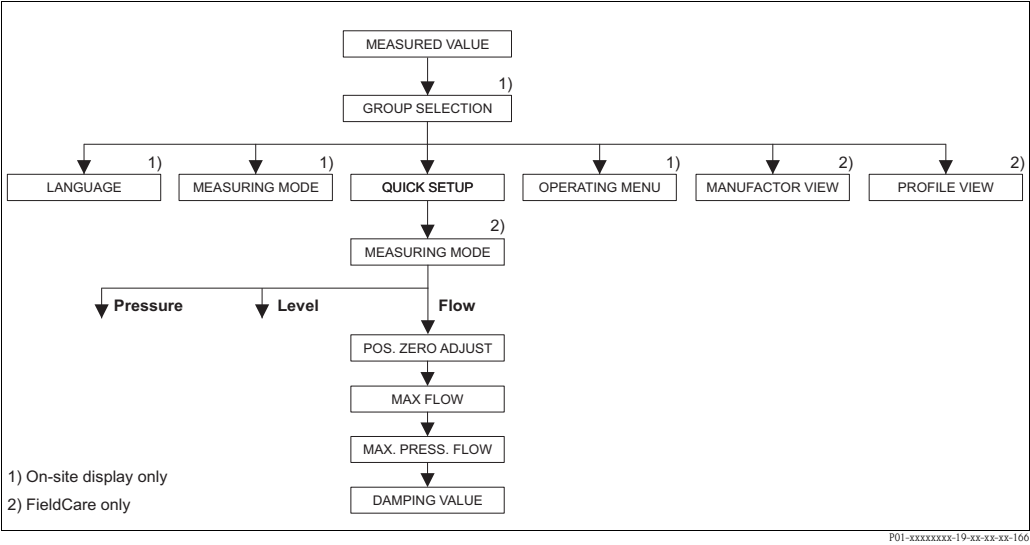



Fig. 36: Quick Setup menu for the Flow measuring mode

On-site operation	FieldCare
Measured value display On-site display: Switch from the measured value display to GROUP SELECTION with  .	Measured value display Select QUICK SETUP menu.
GROUP SELECTION Select MEASURING MODE.	MEASURING MODE Select "Flow" option.
MEASURING MODE Select "Flow" option.	
GROUP SELECTION Select QUICK SETUP menu.	
POS. ZERO ADJUST Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.	POS. ZERO ADJUST Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.
MAX. FLOW Enter maximum flow of primary device. (→ See also layout sheet of primary device).	MAX. FLOW Enter maximum flow of primary device. (→ See also layout sheet of primary device).
MAX. PRESS FLOW Enter maximum pressure of primary device. (→ See also layout sheet of primary device).	MAX. PRESS FLOW Enter maximum pressure of primary device. (→ See also layout sheet of primary device).
DAMPING TIME Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and OUT value of the Analog Input Block react to a change in the pressure.	DAMPING TIME Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and OUT value of the Analog Input Block react to a change in the pressure.



Note!
For on-site operation, see also Page 30, Section 5.2.3 "Function of the operating elements" and Page 44, Section 5.4 "On-site operation".

6.6 Level measurement

6.6.1 Preparatory steps

Open container



Note!

- The Deltabar S PMD70, PMD75, FMD76 and FMD77 are suitable for level measurement in an open container.
- FMD76 and FMD77: the device is ready for calibration immediately after opening a shut-off valve (may or may not be present).
- PMD70 and PMD75: before calibrating the device, the impulse piping must be cleaned and filled with fluid. → See the following table.

	Valves	Meaning	Installation
1	Fill container to a level above the lower tap.		<p style="text-align: right; font-size: small;">P01-xMD7xxxx-11-xx-xx-xx-003</p>
2	Fill measuring system with fluid.		
	Open A.	Open shut-off valve.	
3	Vent device.		
	Open 6 briefly, then close it again.	Fill device completely with fluid and remove air.	
4	Set measuring point in operation.		
	Now – B and 6 are closed. – A is open.		
5	Carry out calibration. → See Page 64, Section 6.6.2.		<p><i>Fig. 37: Open container</i></p> <p><i>I Deltabar S, PMD70 or PMD75</i></p> <p><i>II Separator</i></p> <p><i>6 Vent valves on Deltabar S</i></p> <p><i>A Shut-off valve</i></p> <p><i>B Drain valve</i></p>

Closed container

Note!

- All Deltabar S versions are suitable for level measurement in closed containers.
- FMD76 and FMD77: the device is ready for calibration immediately after opening the shut-off valves (may or may not be present).
- FMD78: the device is ready for calibration immediately.
- PMD70 and PMD75: before calibrating the device, the impulse piping must be cleaned and filled with fluid. → See the following table.

	Valves	Meaning	Installation
1	Fill container to a level above the lower tap.		
2	Fill measuring system with fluid.		
	Close 3.	Shut off positive side from negative side.	
	Open A and B.	Open shut-off valves.	
3	Vent positive side (empty negative side if necessary).		
	Open 2 and 4.	Introduce fluid on positive side.	
	Open 6 and 7 briefly, then close them again.	Fill positive side completely with fluid 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. → See Page 64, Section 6.5.2.		<p>Fig. 38: Closed container</p> <p><i>I</i> Deltabar S, PMD70 and PMD75 <i>II</i> Three-valve manifold <i>III</i> Separator <i>1, 2</i> Drain valves <i>2, 4</i> Inlet valves <i>3</i> Equalising valve <i>6, 7</i> Vent valve on Deltabar S <i>A, B</i> Shut-off valve</p>

Closed containers with superimposed steam

Note!

- All Deltabar S versions are suitable for level measurement in containers with superimposed steam.
- FMD76 and FMD77: the device is ready for calibration immediately after opening the shut-off valves (may or may not be present).
- FMD78: the device is ready for calibration immediately.
- PMD70 and PMD75: before calibrating the device, the impulse piping must be cleaned and filled with fluid. → See the following table.

	Valves	Meaning	Installation
1	Fill container to a level above the lower tap.		<p style="text-align: right; font-size: small;">P01-xMD7xxxx-11-xx-xx-xx-005</p>
2	Fill measuring system with fluid.		
	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 fluid.	
	Close 4.	Close negative side.	
	Open 3.	Balance positive and negative side.	
	Open 6 and 7 briefly, then close them again.	Fill device completely with fluid and remove air.	
4	Set measuring point in operation.		
	Close 3.	Shut off positive side from negative side.	<p><i>Fig. 39: Closed container with superimposed steam</i></p> <p><i>I Deltabar S, PMD70 and PMD75</i> <i>II Three-valve manifold</i> <i>III Separator</i> <i>1, 5 Drain valves</i> <i>2, 4 Inlet valves</i> <i>3 Equalising valve</i> <i>6, 7 Vent valves on Deltabar S</i> <i>A, B Shut-off valves</i></p>
	Open 4.	Connect negative side.	
	Now – 3, 6 and 7 are closed. – 2, 4, A and B are open.		
5	Carry out calibration. → See Page 64, Section 6.6.2.		

6.6.2 Information on level measurement



Note!

- The Flow, Level and Pressure operating modes each have a quick setup menu which guides you through the most important basic functions. → See Page 66 for the "Level" quick setup menu.
- Furthermore, the three level modes "Level Easy Pressure", "Level Easy Height" and "Level Standard" are available to you for level measurement. You can select from the "Linear", "Pressure linearized" and "Height linearized" level types for the "Level Standard" level mode. The table in the "Overview of level measurement" section below provides an overview of the various measuring tasks.
 - In the "Level Easy Pressure" and "Level Easy Height" level modes, the values entered are not tested as extensively as in the "Level Standard" level mode. The values entered for EMPTY CALIB./FULL CALIB., EMPTY PRESSURE/FULL PRESSURE and EMPTY HEIGHT/FULL must have a minimum interval of 1% for the "Level Easy Pressure" and "Level Easy Height" level modes. The value will be rejected with a warning message if the values are too close together. Further limit values are not checked; i.e. the values entered must be appropriate for the sensor and the measuring task so that the measuring device can measure correctly.
 - The "Level Easy Pressure" and "Level Easy Height" level modes encompass fewer parameters than the "Level Standard" mode and are used for quick and easy configuration of a level application.
 - Customer-specific units of fill level, volume and mass or a linearization table may only be entered in the "Level Standard" level mode.
- See the Operating Instructions BA00296P "Cerabar S/Deltabar S/Deltapilot S, Description of device functions". → See also Page 2, "Overview Documentation" section.

6.6.3 Overview of level measurement

Measuring task	LEVEL SELECTION/ LEVEL MODE	Measured variable options	Description	Comment	Measured value display
The measured variable is in direct proportion to the measured pressure. Calibration is performed by entering two pressure-level value pairs.	LEVEL SELECTION: Level Easy Pressure	Via OUTPUT UNIT parameter: %, level, volume or mass units.	<ul style="list-style-type: none"> – Calibration with reference pressure – wet calibration, see Operating Instructions BA00296P, Section 5.2.1 – Calibration without reference pressure – dry calibration, see Operating Instructions BA00296P, Section 5.2.2 	<ul style="list-style-type: none"> – Incorrect entries are possible – Customised units are not possible 	The measured value display and the LEVEL BEFORE LIN parameter show the measured value.
The measured variable is in direct proportion to the measured pressure. Calibration is performed by entering the density and two height-level value pairs.	LEVEL SELECTION: Level Easy Height	Via OUTPUT UNIT parameter: %, level, volume or mass units.	<ul style="list-style-type: none"> – Calibration with reference pressure – wet calibration, see Operating Instructions BA00296P, Section 5.3.1 – Calibration without reference pressure – dry calibration, see Operating Instructions BA00296P, Section 5.3.2 	<ul style="list-style-type: none"> – Incorrect entries are possible – Customised units are not possible 	The measured value display and the LEVEL BEFORE LIN parameter show the measured value.
The measured variable is in direct proportion to the measured pressure.	LEVEL SELECTION: Level standard/ LEVEL MODE: Linear	Via LIN. MEASURAND parameter: <ul style="list-style-type: none"> – % (level) – Level – Volume – Mass 	<ul style="list-style-type: none"> – Calibration with reference pressure – wet calibration, see Operating Instructions BA00296P, Section 5.4.1 – Calibration without reference pressure – dry calibration, see Operating Instructions BA00296P, Section 5.4.2 	<ul style="list-style-type: none"> – Incorrect entries are rejected by the device – Customised level, volume and mass units are possible 	The measured value display and the LEVEL BEFORE LIN parameter show the measured value.
The measured variable is not in direct proportion to the measured pressure as, for example, with containers with a conical outlet. A linearisation table must be entered for the calibration.	LEVEL SELECTION: Level standard/ LEVEL MODE: Pressure linearized	Via LIND. MEASURAND parameter: <ul style="list-style-type: none"> – Pressure + % – Pressure + volume – Pressure + mass 	<ul style="list-style-type: none"> – Calibration with reference pressure: semiautomatic entry of linearisation table, see Operating Instructions BA00296P, Section 5.5.1 – Calibration without reference pressure: manual entry of linearisation table, see Operating Instructions BA00296P, Section 5.5.2 	<ul style="list-style-type: none"> – Incorrect entries are rejected by the device – Customised level, volume and mass units are possible 	The measured value display and the TANK CONTENT parameter show the measured value.
<ul style="list-style-type: none"> – Two measured variables are required or – The container shape is given by value pairs, such as height and volume. <p>The 1st measured variable %-height or height must be in direct proportion to the measured pressure. The 2nd measured variable volume, mass or % must not be in direct proportion to the measured pressure. A linearisation table must be entered for the 2nd measured variable. The 2nd measured variable is assigned to the 1st measured variable by means of this table.</p>	LEVEL SELECTION: Level standard/ LEVEL MODE: Height linearized	Via COMB. MEASURAND parameter: <ul style="list-style-type: none"> – Height + volume – Height + mass – Height + % – %-Height + volume – %-Height + mass – %-Height + % 	<ul style="list-style-type: none"> – Calibration with reference pressure: wet calibration and semiautomatic entry of linearisation table, see Operating Instructions BA00296P, Section 5.6.1 – Calibration without reference pressure: dry calibration and manual entry of linearisation table, see Operating Instructions BA00296P, Section 5.6.2 	<ul style="list-style-type: none"> – Incorrect entries are rejected by the device – Customised level, volume and mass units are possible 	<p>The measured value display and the TANK CONTENT parameter show the 2nd measured value (volume, mass or %).</p> <p>The LEVEL BEFORE LIN parameter displays the 1st measured value (%-height or height).</p>

6.6.4 Quick Setup menu for the Level measuring mode



Note!

- Some parameters are only displayed if other parameters are appropriately configured. For example, the EMPTY CALIB. parameter is only displayed in the following cases:
 - LEVEL SELECTION "Level Easy Pressure" and CALIBRATION MODE "Wet"
 - LEVEL SELECTION "Level Standard", LEVEL MODE "Linear" and CALIBRATION MODE "WET"You can find the LEVEL MODE parameter in the BASIC SETTINGS function group.
- The following parameters are set to the following values in the factory:
 - LEVEL SELECTION: Level Easy Pressure
 - CALIBRATION MODE: Wet
 - OUTPUT UNIT or LIN. MEASURAND: %
 - EMPTY CALIB.: 0.0
 - FULL CALIB.: 100.0
- The quick setup is suitable for simple and quick commissioning. If you wish to make more complex settings, e.g. change the unit from "%" to "m", you will have to calibrate using the BASIC SETTINGS group. → See Operating Instructions BA00296P or Page 2, "Overview Documentation" section.

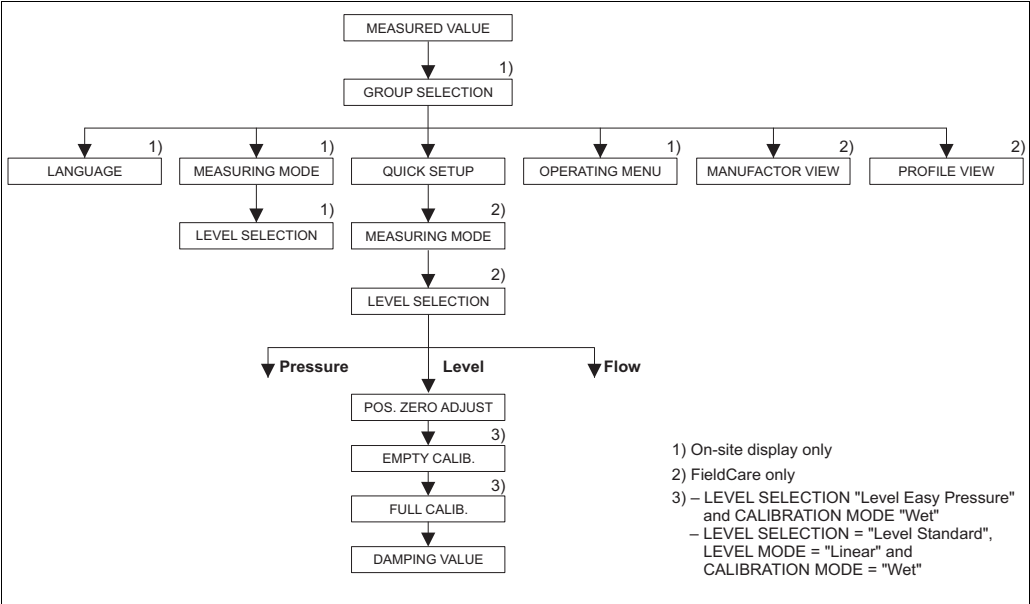


Fig. 40: Quick Setup menu for the "Level" measuring mode"

On-site operation
Measured value display On-site display: Switch from the measured value display to GROUP SELECTION with .
GROUP SELECTION Select MEASURING MODE.
MEASURING MODE Select "Level" option.
LEVEL SELECTION Select level mode. For an overview see Page 65.
GROUP SELECTION Select QUICK SETUP menu.

FieldCare
Measured value display Select QUICK SETUP menu.
MEASURING MODE Select "Level" option.
LEVEL SELECTION Select level mode. For an overview see Page 65.

On-site operation	FieldCare
POS. ZERO ADJUST Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.	POS. ZERO ADJUST Due to orientation of the device, there may be a shift in the measured value. You correct the MEASURED VALUE via the POS. ZERO ADJUST parameter with the "Confirm" option, i. e. you assign the value 0.0 to the pressure present.
EMPTY CALIB. ¹⁾ Enter level for the lower calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.	EMPTY CALIB. ¹⁾ Enter level for the lower calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.
FULL CALIB. ¹⁾ Enter level for the upper calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.	FULL CALIB. ¹⁾ Enter level for the upper calibration point. For this parameter, enter a level value which is assigned to the pressure present at the device.
DAMPING TIME Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and OUT value of the Analog Input Block react to a change in the pressure.	DAMPING TIME Enter damping time (time constant τ). The damping affects the speed at which all subsequent elements, such as the on-site display, measured value and OUT value of the Analog Input Block react to a change in the pressure.

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



Note!

For on-site operation, see also Page 30, Section 5.2.3 "Function of the operating elements" and Page 44, Section 5.4 "On-site operation".

6.7 Differential pressure measurement

6.7.1 Preparatory steps



Note!

- The Deltabar S PMD70, PMD75 and FMD78 are usually used for differential pressure measurement.
- FMD78: the device is ready for calibration immediately.
- PMD70 and PMD75: before calibrating the device, the impulse piping must be cleaned and filled with fluid. → See the following table.

	Valves	Meaning	Preferred installation
1	Close 3.		
2	Fill measuring system with fluid.		
	Open A, B, 2, 4.	Fluid 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 fluid.	
	Close 4.	Close negative side.	
	Open 3.	Balance positive and negative side.	
	Open 6 and 7 briefly, then close them again.	Fill device completely with fluid and remove air.	
5	Set measuring point in operation.		
	Close 3.	Shut off positive side from negative side.	
	Open 4.	Connect negative 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 69, Section 6.7.2.		

Fig. 41: Above: preferred installation for gases
Below: preferred installation for liquids

- I Deltabar S, PMD70 or PMD75
- II Three-valve manifold
- III Separator
- 1, 5 Drain valves
- 2, 4 Inlet valves
- 3 Equalising valve
- 6, 7 Vent valves on Deltabar S
- A, B Shut-off valve

1) for arrangement with 5 valves

6.7.2 Information on differential pressure measurement



Note!

- There is a Quick Setup menu for each of the measuring modes Pressure, Level and Flow which guides you through the most important basic functions. With the setting in the MEASURING MODE parameter, you specify which Quick Setup menu should be displayed. → See also Page 55, Section 6.3 "Selecting language and measuring mode".
- For a detailed description of the parameters see the Operating Instructions BA00296P "Cerabar S/Deltabar S/Deltapilot S, Description of device functions"
 - Table 6, POSITION ADJUSTMENT
 - Table 7, BASIC SETUP
 - Table 16, EXTENDED SETUP→ See also Page 2, Section "Overview documentation".
- For differential pressure measurement, select the "Pressure" option by means of the MEASURING MODE parameter. The operating menu is structured appropriately. → See also Section 10.1.

6.7.3 Quick Setup menu for the Pressure measuring mode

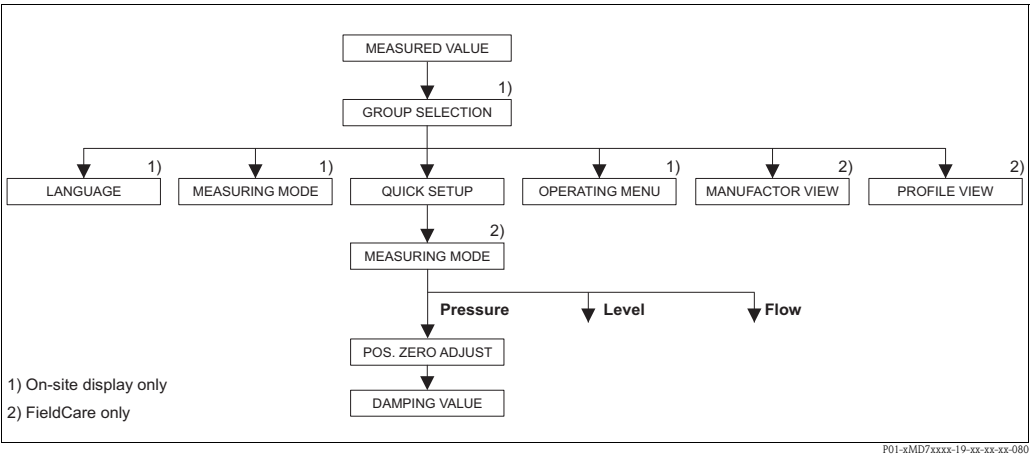



Fig. 42: Quick Setup menu for the "Pressure" measuring mode

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

**Note!**

For on-site operation, see also Page 30, Section 5.2.3 "Function of the operating elements" and Page 44, Section 5.4 "On-site operation".

6.8 Scaling 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...500 mbar should be rescaled to 0...10000.

- Select PV SCALE group.

Menu path: PROFILE VIEW → ANALOG INPUT BLOCK → AI parameter

- For SCALE_0, enter "0".

- For SCALE_100, enter "500".

- Select OUT SCALE group.

Menu path: PROFILE VIEW → ANALOG INPUT BLOCK → AI parameter

- For EU_0_PERCENT, enter "0".

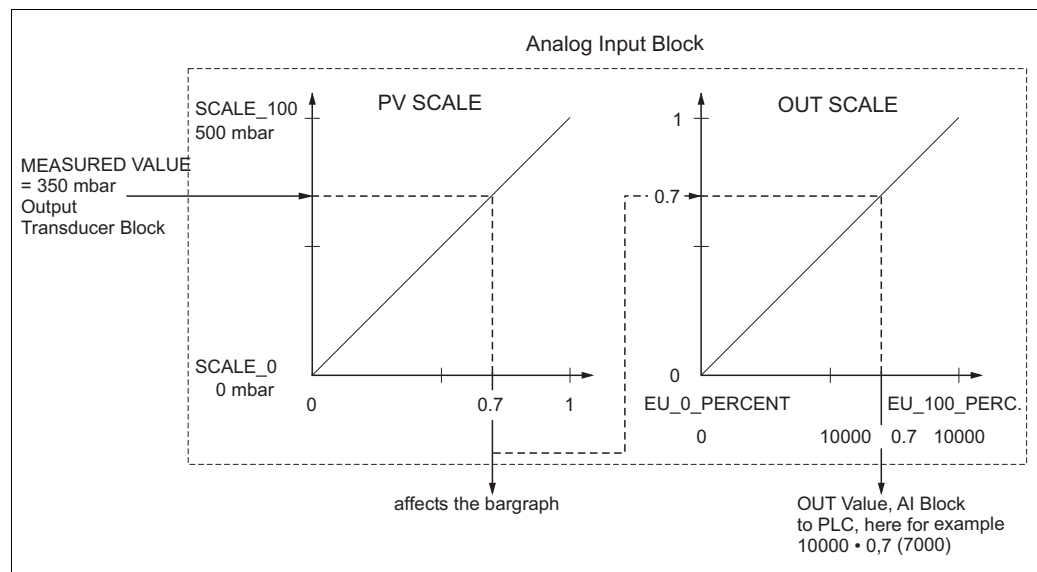
- For EU_100_PERCENT, enter "10000".

- For UNITS_INDEX, select "User unit" for example.

The unit selected here does not have any effect on the scaling. This unit is not displayed on the on-site display or in the operating program such as FieldCare.

- Result:

At a pressure of 350 mbar, the value 7000 is output to the PLC as the OUT value.



P01-xMx7xxxx-05-xx-xx-xx-002

**Note!**

- The OUT Value can only be scaled via remote operation (e.g. FieldCare).
- If the unit is changed within an operating mode, the limits for PV SCALE and OUT SCALE are converted.
- If the operating mode is changed, no conversion takes place. The device must be recalibrated following a change in the operating mode.

6.9 System units (SET UNIT TO BUS)

The on-site display of Deltabar S and the MEASURED VALUE (FieldCare) display the same value as standard. The bargraph on the on-site display corresponds to the standardised value of the Analog Input Block. The digital output value of the Analog Input Block OUT works independently of the MEASURED VALUE or of the on-site display.

The following options are available so that the on-site display or the MEASURED VALUE and the digital output value display the same value:

- Set the values for the lower and upper limit of PV SCALE and OUT SCALE in the Analog Input Block as equal (→ see also Section 6.8 "Scaling OUT value"):
 - SCALE_0 (PV SCALE) = EU_SCALE_0 (OUT SCALE)
 - SCALE_100 (PV SCALE) = EU_SCALE_100 (OUT_SCALE)
- By means of the SET UNIT TO BUS parameter, confirm the option "On". By confirming the option, the limits of PV SCALE and OUT SCALE are automatically set as equal.

Example:

The on-site display or the MEASURED VALUE and the OUT value display 100 mbar. Select the new unit "psi" by means of the PRESS. ENG. UNIT parameter.

- Display
 - On-site display and MEASURED VALUE: 1.45 psi
 - OUT value: 100 mbar
- By means of the SET UNIT TO BUS parameter, confirm the option "On".
Menu path FieldCare: PROFILE VIEW → PHYSICAL BLOCK → PB E+H PARAMETER
Menu path on-site display: GROUP SELECTION → OPERATING MENU → TRANSMITTER INFO → PA DATA
- Result:
The OUT value displays 1.45 psi.

In the following instances, the on-site display or the MEASURED VALUE and the digital output value of the Analog Input Block OUT no longer display the same value:

- If you change the operating mode
- If you change the values for PV SCALE
- If you change the values for OUT SCALE
- If you change the unit



Note!

If you confirm the SET UNIT TO BUS parameter, please note that a change in the digital output value could affect the control system.

6.10 System integration

6.10.1 Device Master Files (GSD)

The device is ready for system integration once commissioning has been effected 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 device identification, ID number, supported communication features, module structure (combination of cyclic input and output telegrams) and meaning of diagnosis bits.

These data are contained in a Device Master File (GSD file) which is placed at the disposal of the PROFIBUS DP master (e.g. PLC) while 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:

- Manufacturer-specific GSD, ID number: 0x1542 (factory setting):
This GSD guarantees the unlimited functionality of the field device. All device-specific process parameters and functions are available.
- Manufacturer-specific GSD, ID number: 0x1504:
The device behaves like a Deltabar S FMD230, FMD630, FMD633, PMD230, PMD235.
→ See Operating Instructions BA00167P.
- 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, a 3rd cyclic value or of a display value is not supported. If a system has been configured with profile GSDs, it is possible to exchange devices that are supplied by various manufacturers.

The following Device Master Files (GSD) can be used with Deltabar S:

Name of device	Comments	ID number (IDENT_NUMBER_SELECT) ¹⁾	GSD	Type file	Bit map
Deltabar S PROFIBUS PA	Profile GSD	0x9700	PA139700.gsd		
	Device-specific GSD	0x1542 ²⁾	EH3x1542.gsd		EH_1542_d.bmp/.dib EH_1542_n.bmp/.dib EH_1542_s.bmp/.dip
	Device-specific GSD, the device behaves like a Deltabar S FMD230, FMD630, FMD633, PMD230, PMD235. → See Operating Instructions BA00167P.	0x1504 ²⁾	EH3_1504.gsd EH3x1504.gsd	EH31504x.200	EH_1504_d.bmp/.dib EH_1504_n.bmp/.dib EH_1504_s.bmp/.dip

- 1) Select the corresponding ID number by means of the IDENT_NUMBER_SEL parameter
menu path FieldCare: PROFILE VIEW → PHYSICAL BLOCK → PB PARAMETER
menu path on-site display: GROUP SELECTION → OPERATING MENU → TRANSMITTER INFO → PA DATA
- 2) Each device receives an ID number from the Profibus User Organisation (PNO). The name of the Device Master File (GSD) is derived from this. For Endress+Hauser, this ID No. starts with the manufacturer ID "15xx".

It is only possible to change the "IDENT_NUMBER_SEL" parameter if either the device is not integrated into the cyclic communication (not planned in the PLC) or the cyclic communication of the PLC is at Stop. If an attempt is nevertheless made to change the parameter via configuration software, e.g. FieldCare, the input is ignored.

The Device Master Files (GSD) for Endress+Hauser devices can be acquired in the following manner:

- Internet Endress+Hauser: <http://www.endress.com> → Download → 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:

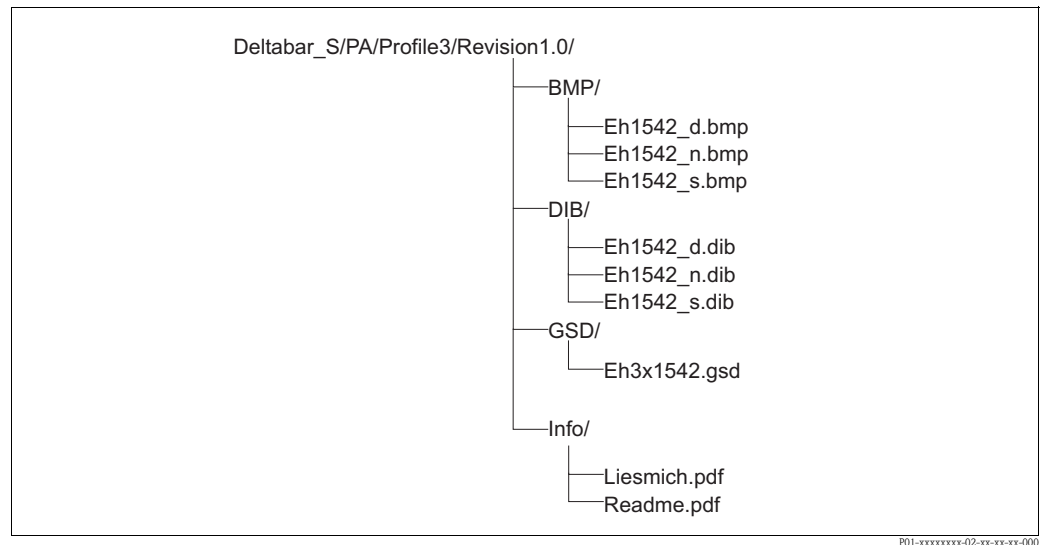


Fig. 43: Directory structure of GSD 1542

- 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 directories "BMP" and "DIB". The utilisation 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 that is being used, these files can be copied to the program-specific directory or can be read into the database using the import function within 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.

7 Maintenance

Deltabar S requires no maintenance.

7.1 Exterior cleaning

Please note the following points when cleaning the device:

- The cleaning agents used should not attack the surface and the seals.
- Mechanical damage to the process isolating diaphragm, e.g. due to pointed objects, must be avoided.

8 Trouble-shooting

8.1 Messages

The following table lists all the possible messages that can occur.



The device differentiates between the error types "Alarm", "Warning" and "Error". You may specify whether the instrument should react as if for an "Alarm" or "Warning" for "Error" messages.

→ See "Error type/NA 64" column and Section 8.2 "Response of outputs to errors".

In addition, the "Message type/NA 64" column classifies the messages in accordance with NAMUR Recommendation NA 64:

- Break down: indicated with "B"
- Maintenance need: indicated with "C" (check request)
- Function check: indicated with "I" (in service)

Error message display on the on-site display:

- The measured value display shows the message with the highest priority. → See "Priority" column.
- The ALARM STATUS parameter shows all the messages present in descending order of priority. You can scroll through all the messages present with the -key or -key.

Message display via FieldCare:

- The measured value display shows the message and a code with the highest priority. → See "Priority" column.



Note!

- If the device detects a defect in the on-site display during initialization, special error messages are generated. → For the error messages, see Page 81, Section 8.1.1 "On-site display error messages".
- For support and further information, please contact Endress+Hauser Service.
- → See also Section 8.4, 8.5 and 8.6.

Code	Error type/ NA 64	Message/description	Cause	Measure	Priority
101 (A101)	Alarm B	B>Sensor electronic EEPROM error	<ul style="list-style-type: none"> – Electromagnetic effects are greater than specifications in the technical data. (→ See Section 9.) This message normally only appears briefly. – Sensor defect. 	<ul style="list-style-type: none"> – Wait a few minutes. – Restart the device. Perform reset (Code 2506 or 33062). – Block off electromagnetic effects or eliminate source of disturbance. – Replace sensor. 	17
102 (W102)	Warning C	C>Checksum error in EEPROM: peakhold segment	<ul style="list-style-type: none"> – Main electronics defect. Correct measurement can continue as long as you do not need the peak hold indicator function. 	<ul style="list-style-type: none"> – Replace main electronics. 	51
106 (W106)	Warning C	C>Downloading - please wait	<ul style="list-style-type: none"> – Downloading. 	<ul style="list-style-type: none"> – Wait for download to complete. 	50
110 (A110)	Alarm B	B>Checksum error in EEPROM: configuration segment	<ul style="list-style-type: none"> – The supply voltage is disconnected when writing. – Electromagnetic effects are greater than specifications in the technical data. (→ See Section 9.) – Main electronics defect. 	<ul style="list-style-type: none"> – Reestablish supply voltage. Perform reset (Code 1 or 40864) if necessary. Carry out calibration again. – Block off electromagnetic effects or eliminate sources of disturbance. – Replace main electronics. 	6
113 (A113)	Alarm B	B>ROM failure in transmitter electronic	<ul style="list-style-type: none"> – Main electronics defect. 	<ul style="list-style-type: none"> – Replace main electronics. 	1

Code	Error type/ NA 64	Message/description	Cause	Measure	Priority
115 (E115)	Error B Factory setting: Warning	B>Sensor overpressure	<ul style="list-style-type: none"> – Overpressure present. – Sensor defect. 	<ul style="list-style-type: none"> – Reduce pressure until message disappears. – Replace sensor. 	29
116 (W116)	Warning C	C>Download error, repeat download	<ul style="list-style-type: none"> – The file is defect. – 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. 	<ul style="list-style-type: none"> – Use another file. – Check cable connection PC – transmitter. – Block off electromagnetic effects or eliminate sources of disturbance. – Perform reset (Code 1 or 40864) and carry out calibration again. – Repeat download. 	36
120 (E120)	Error B Factory setting: Warning	B>Sensor low pressure	<ul style="list-style-type: none"> – Pressure too low. – Sensor defect. 	<ul style="list-style-type: none"> – Increase pressure until message disappears. – Replace sensor. 	30
121 (A121)	Alarm B	B>Checksum error in factory segment of EEPROM	<ul style="list-style-type: none"> – Main electronics defect. 	<ul style="list-style-type: none"> – Replace main electronics. 	5
122 (A122)	Alarm B	B>Sensor not connected	<ul style="list-style-type: none"> – Cable connection sensor –main electronics disconnected. – Electromagnetic effects are greater than specifications in the technical data. (→ See Section 9.) – Main electronics defect. – Sensor defect. 	<ul style="list-style-type: none"> – Check cable connection and repair if necessary. – Block off electromagnetic effects or eliminate source of disturbance. – Replace main electronics. – Replace sensor. 	13
130 (A130)	Alarm B	B>EEPROM is defect.	<ul style="list-style-type: none"> – Main electronics defect. 	<ul style="list-style-type: none"> – Replace main electronics. 	10
131 (A131)	Alarm B	B>Checksum error in EEPROM: min/max segment	<ul style="list-style-type: none"> – Main electronics defect. 	<ul style="list-style-type: none"> – Replace main electronics. 	9
132 (A132)	Alarm B	B>Checksum error in totalizer EEPROM	<ul style="list-style-type: none"> – Main electronics defect. 	<ul style="list-style-type: none"> – Replace main electronics. 	7
133 (A133)	Alarm B	B>Checksum error in History EEPROM	<ul style="list-style-type: none"> – An error occurred when writing. – Main electronics defect. 	<ul style="list-style-type: none"> – Perform reset (Code 1 or 40864) and carry out calibration again. – Replace electronics. 	8
602 (W602)	Warning C	C>Linearisation curve not monoton	<ul style="list-style-type: none"> – The linearisation table is not monotonic increasing or decreasing. 	<ul style="list-style-type: none"> – Add to linearisation table or perform linearisation again. 	55
613 (W613)	Warning I	I>Simulation is active	<ul style="list-style-type: none"> – Simulation is switched on, i.e. the device is not measuring at present. 	<ul style="list-style-type: none"> – Switch off simulation. 	58
700 (W700)	Warning C	C>Last configuration not stored	<ul style="list-style-type: none"> – An error occurred when writing or reading configuration data or the power supply was disconnected. – Main electronics defect. 	<ul style="list-style-type: none"> – Perform reset (Code 1 or 40864) and carry out calibration again. – Replace main electronics. 	52
702 (W702)	Warning C	C>HistoROM data not consistent.	<ul style="list-style-type: none"> – Data were not written correctly to the HistoROM, e.g. if the HistoROM was detached during the writing process. – HistoROM does not have any data. 	<ul style="list-style-type: none"> – Repeat upload. – Perform reset (Code 1 or 40864) and carry out calibration again. – Copy suitable data to the HistoROM. (→ See also Page 48, Section 5.6.1 "Copying configuration data".) 	53

Code	Error type/ NA 64	Message/description	Cause	Measure	Priority
703 (A703)	Alarm B	B>Measurement error	<ul style="list-style-type: none"> – Fault in the main electronics. – Main electronics defect. 	<ul style="list-style-type: none"> – Briefly disconnect device from the power supply. – Replace main electronics. 	22
704 (A704)	Alarm B	B>Measurement error	<ul style="list-style-type: none"> – Fault in the main electronics. – Main electronics defect. 	<ul style="list-style-type: none"> – Briefly disconnect device from the power supply. – Replace main electronics. 	12
705 (A705)	Alarm B	B>Measurement error	<ul style="list-style-type: none"> – Fault in the main electronics. – Main electronics defect. 	<ul style="list-style-type: none"> – Briefly disconnect device from the power supply. – Replace main electronics. 	21
706 (W706)	Warning C	C>Configuration in HistoROM and device not identical	<ul style="list-style-type: none"> – Configuration (parameters) in the HistoROM and in the device is not identical. 	<ul style="list-style-type: none"> – Copy data from the device to the HistoROM. (→ See also Page 48, Section 5.6.1 "Copying configuration data".) – Copy data from the HistoROM to the device. (→ See also Page 48, Section 5.6.1 "Copying configuration data".) The message remains if the HistoROM and the device have different software versions. The message goes out if you copy the data from the device to the HistoROM. – Device reset codes such as 1 or 40864 do not have any effect on the HistoROM. That means that if you do a reset, the configurations in the HistoROM and in the device may not be the same. 	57
707 (A707)	Alarm B	B>X-VAL. of lin. table out of edit limits.	<ul style="list-style-type: none"> – At least one X-VALUE in the linearisation table is either below the value for HYDR. PRESS MIN. or MIN. LEVEL or above the value for HYDR. PRESS. MAX. or LEVEL MAX. 	<ul style="list-style-type: none"> – Carry out calibration again. (→ See also Operating Instructions BA00296P, chapter 5 or these Operating Instructions, Page 2.) 	37
710 (W710)	Warning C	B>Set span too small. Not allowed.	<ul style="list-style-type: none"> – Values for calibration (e.g. lower range value and upper range value) are too close together. – The sensor was replaced and the customer-specific configuration does not suit the sensor. – Unsuitable download carried out. 	<ul style="list-style-type: none"> – Adjust calibration to suit sensor. (→ See also Operating Instructions BA00296P, parameter description MINIMUM SPAN or these Operating Instructions, Page 2.) – Adjust calibration to suit sensor. – Replace sensor with a suitable sensor. – Check configuration and perform download again. 	49
713 (A713)	Alarm B	B>100% POINT level out of edit limits	<ul style="list-style-type: none"> – The sensor was replaced. 	<ul style="list-style-type: none"> – Carry out calibration again. 	38
715 (E715)	Error C Factory setting: Warning	C>Sensor over temperature	<ul style="list-style-type: none"> – The temperature measured in the sensor is greater than the upper nominal temperature of the sensor. (→ See also Operating Instructions BA00296P, parameter description Tmax SENSOR or these Operating Instructions, Page 2.) – Unsuitable download carried out. 	<ul style="list-style-type: none"> – Reduce process temperature/ ambient temperature. – Check configuration and perform download again. 	32

Code	Error type/ NA 64	Message/description	Cause	Measure	Priority
716 (E716)	Error B Factory setting: Alarm	B>Process isolating diaphragm broken	<ul style="list-style-type: none"> – Sensor defect. – PMD70, FMD76: Overpressure is present at minus or plus side of the device (on-sided overpressure) 	<ul style="list-style-type: none"> – Replace sensor. – Reduce pressure. 	24
717 (E717)	Error C Factory setting: Warning	C>Transmitter over temperature	<ul style="list-style-type: none"> – The temperature measured in the electronics is greater than the upper nominal temperature of the electronics (+88 °C (+190 °F)). – Unsuitable download carried out. 	<ul style="list-style-type: none"> – Reduce ambient temperature. – Check configuration and perform download again. 	34
718 (E718)	Error C Factory setting: Warning	C>Transmitter under temperature	<ul style="list-style-type: none"> – The temperature measured in the electronics is smaller than the lower nominal temperature of the electronics (–43 °C (–45 °F)). – Unsuitable download carried out. 	<ul style="list-style-type: none"> – Increase ambient temperature. Insulate device if necessary. – Check configuration and perform download again. 	35
719 (A719)	Alarm B	B>Y-VAL of lin. table out of edit limits	<ul style="list-style-type: none"> – At least on Y-VALUE in the linearisation table is below the MIN. TANK CONTENT or above the MAX. TANK CONTENT. 	<ul style="list-style-type: none"> – Carry out calibration again. (→ See also Operating Instructions BA00296P, chapter 5 or these Operating Instructions, Page 2.) 	39
720 (E720)	Error C Factory setting: Warning	C>Sensor under temperature	<ul style="list-style-type: none"> – The temperature measured in the sensor is smaller than the lower nominal temperature of the sensor. (→ See also Operating Instructions BA00296P, parameter description Tmin SENSOR or Operating Instructions, Page 2.) – Unsuitable download carried out. – Loose connection at sensor cable 	<ul style="list-style-type: none"> – Increase process temperature/ ambient temperature. – Check configuration and perform download again. – Wait a short period of time and tighten the connection, or avoid loose connection. 	33
721 (A721)	Alarm B	B>ZERO POSITION level out of edit limits	<ul style="list-style-type: none"> – LEVEL MIN or LEVEL MAX has been changed. 	<ul style="list-style-type: none"> – Perform reset (Code 35710) and carry out calibration again. 	40
722 (A722)	Alarm B	B>EMPTY CALIB. or FULL CALIB. out of edit limits	<ul style="list-style-type: none"> – LEVEL MIN or LEVEL MAX has been changed. 	<ul style="list-style-type: none"> – Perform reset (Code 35710) and carry out calibration again. 	41
723 (A723)	Alarm B	B>MAX. FLOW out of edit limits	<ul style="list-style-type: none"> – FLOW-MEAS. TYPE has been changed. 	<ul style="list-style-type: none"> – Carry out calibration again. 	42
725 (A725)	Alarm B	B>Sensor connection error, cycle disturbance	<ul style="list-style-type: none"> – Electromagnetic effects are greater than specifications in the technical data. (→ See Section 9.) – Setscrew loose. – Sensor or main electronics defect. 	<ul style="list-style-type: none"> – Block off electromagnetic effects or eliminate source of disturbance. – Retighten setscrew with 1 Nm (0,74 lbf ft) (see Chap. 3.3.9). – Replace sensor or main electronics. 	25
726 (E726)	Error C Factory setting: Warning	C>Sensor temperature error - overrange	<ul style="list-style-type: none"> – Electromagnetic effects are greater than specifications in the technical data. (→ See Section 9.) – Process temperature is outside permitted range. – Sensor defect. 	<ul style="list-style-type: none"> – Block off electromagnetic effects or eliminate source of disturbance. – Check temperature present, reduce or increase if necessary. – If the process temperature is within the permitted range, replace sensor. 	31

Code	Error type/ NA 64	Message/description	Cause	Measure	Priority
727 (E727)	Error C Factory setting; Warning	C>Sensor pressure error - overrange	<ul style="list-style-type: none"> – Electromagnetic effects are greater than specifications in the technical data. (→ See Section 9.) – Pressure is outside permitted range. – Sensor defect. 	<ul style="list-style-type: none"> – Block off electromagnetic effects or eliminate source of disturbance. – Check pressure present, reduce or increase if necessary. – If the pressure is within the permitted range, replace sensor. 	28
728 (A728)	Alarm B	B>RAM error	<ul style="list-style-type: none"> – Fault in the main electronics. – Main electronics defect. 	<ul style="list-style-type: none"> – Briefly disconnect device from the power supply. – Replace main electronics. 	2
729 (A729)	Alarm B	B>RAM error	<ul style="list-style-type: none"> – Fault in the main electronics. – Main electronics defect. 	<ul style="list-style-type: none"> – Briefly disconnect device from the power supply. – Replace main electronics. 	3
730 (E730)	Error C Factory setting; Warning	C>LRV user limits exceeded	<ul style="list-style-type: none"> – Pressure measured value has undershot the value specified for the Pmin ALARM WINDOW parameter. – Loose connection at sensor cable 	<ul style="list-style-type: none"> – Check system/pressure measured value. – Change value for Pmin ALARM WINDOW if necessary. (→ See also Operating Instructions BA00296P, parameter description Pmin ALARM WINDOW or these Operating Instructions, Page 2.) – Wait a short period of time and tighten the connection, or avoid loose connection. 	46
731 (E731)	Error C Factory setting; Warning	C>URV user limits exceeded	<ul style="list-style-type: none"> – Pressure measured value has overshoot the value specified for the Pmax ALARM WINDOW parameter. 	<ul style="list-style-type: none"> – Check system/pressure measured value. – Change value for Pmax ALARM WINDOW if necessary. (→ See also Operating Instructions BA00296P, parameter description Pmax ALARM WINDOW or these Operating Instructions, Page 2.) 	45
732 (E732)	Error C Factory setting; Warning	C>LRV Temp. User limits exceeded	<ul style="list-style-type: none"> – Temperature measured value has undershot the value specified for the Tmin ALARM WINDOW parameter. – Loose connection at sensor cable 	<ul style="list-style-type: none"> – Check system/temperature measured value. – Change value for Tmin ALARM WINDOW if necessary. (→ See also Operating Instructions BA00296P, parameter description Tmin ALARM WINDOW or these Operating Instructions, Page 2.) – Wait a short period of time and tighten the connection, or avoid loose connection. 	48
733 (E733)	Error C Factory setting; Warning	C>URV Temp. User limits exceeded	<ul style="list-style-type: none"> – Temperature measured value has overshoot the value specified for the Tmax ALARM WINDOW parameter. 	<ul style="list-style-type: none"> – Check system/temperature measured value. – Change value for Tmax ALARM WINDOW if necessary. (→ See also Operating Instructions BA00296P, parameter description Tmax ALARM WINDOW or these Operating Instructions, Page 2.) 	47
736 (A736)	Alarm B	B>RAM error	<ul style="list-style-type: none"> – Fault in the main electronics. – Main electronics defect. 	<ul style="list-style-type: none"> – Briefly disconnect device from the power supply. – Replace main electronics. 	4
737 (A737)	Alarm B	B>Measurement error	<ul style="list-style-type: none"> – Fault in the main electronics. – Main electronics defect. 	<ul style="list-style-type: none"> – Briefly disconnect device from the power supply. – Replace main electronics. 	20

Code	Error type/ NA 64	Message/description	Cause	Measure	Priority
738 (A738)	Alarm B	B>Measurement error	<ul style="list-style-type: none"> – Fault in the main electronics. – Main electronics defect. 	<ul style="list-style-type: none"> – Briefly disconnect device from the power supply. – Replace main electronics. 	19
739 (A739)	Alarm B	B>Measurement error	<ul style="list-style-type: none"> – Fault in the main electronics. – Main electronics defect. 	<ul style="list-style-type: none"> – Briefly disconnect device from the power supply. – Replace main electronics. 	23
740 (E740)	Error C Factory setting: Warning	C>Calculation overflow, bad configuration	<ul style="list-style-type: none"> – Level measuring mode: the measured pressure has undershot the value for HYDR. PRESS. MIN. or overshot the value for HYDR. PRESS MAX. – Level measuring mode: The measured level did not reach the LEVEL MIN value or exceeded the LEVEL MAX value. – Flow measuring mode: the measured pressure has undershot the value for MAX. PRESS FLOW. 	<ul style="list-style-type: none"> – Check configuration and carry out calibration again if necessary. – Select a device with a suitable measuring range. – Check configuration and carry out calibration again if necessary. (→ See also Operating Instructions BA00296P, parameter description LEVEL MIN. these Operating Instructions, Page 2.) – Check configuration and carry out calibration again if necessary. – Select a device with a suitable measuring range. 	27
741 (A741)	Alarm B	B>TANK HEIGHT out of edit limits	<ul style="list-style-type: none"> – LEVEL MIN or LEVEL MAX has been changed. 	<ul style="list-style-type: none"> – Perform reset (Code 35710) and carry out calibration again. 	43
742 (A742)	Alarm B	B>Sensor connection error (upload)	<ul style="list-style-type: none"> – Electromagnetic effects are greater than specifications in the technical data. (→ See Section 9.) This message normally only appears briefly. – Cable connection sensor –main electronics disconnected. – Sensor defect. 	<ul style="list-style-type: none"> – Wait a few minutes. – Perform reset (Code 1 or 40864) and carry out calibration again. – Check cable connection and repair if necessary. – Replace sensor. 	18
743 (E743)	Alarm B	B>Electronic PCB error during initialisation	<ul style="list-style-type: none"> – This message normally only appears briefly. – Main electronics defect. 	<ul style="list-style-type: none"> – Wait a few minutes. – Restart the device. Perform reset (Code 2506 or 33062). – Replace main electronics. 	14
744 (A744)	Alarm B	B>Main electronic PCB error	<ul style="list-style-type: none"> – Electromagnetic effects are greater than specifications in the technical data. (→ See Section 9.) – Main electronics defect. 	<ul style="list-style-type: none"> – Restart the device. Perform reset (Code 2506 or 33062). – Block off electromagnetic effects or eliminate source of disturbance. – Replace main electronics. 	11
745 (W745)	Warning C	C>Sensor data unknown	<ul style="list-style-type: none"> – Sensor does not suit the device (electronic sensor nameplate). Device continues measuring. 	<ul style="list-style-type: none"> – Replace sensor with a suitable sensor. 	54
746 (W746)	Warning C	C>Sensor connection error - initialising	<ul style="list-style-type: none"> – Electromagnetic effects are greater than specifications in the technical data. (→ See Section 9.) This message normally only appears briefly. – Overpressure or low pressure present. 	<ul style="list-style-type: none"> – Wait a few minutes. – Restart the device. Perform reset (Code 1 or 40864). – Block off electromagnetic effects or eliminate source of disturbance. – Reduce or increase pressure. 	26
747 (A747)	Alarm B	B>Sensor software not compatible to electronics	<ul style="list-style-type: none"> – Sensor does not suit the device (electronic sensor nameplate). 	<ul style="list-style-type: none"> – Replace sensor with a suitable sensor. 	16

Code	Error type/ NA 64	Message/description	Cause	Measure	Priority
748 (A748)	Alarm B	B>Memory failure in signal processor	<ul style="list-style-type: none"> – Electromagnetic effects are greater than specifications in the technical data. (→See Section 9.) – Main electronics defect. 	<ul style="list-style-type: none"> – Block off electromagnetic effects or eliminate source of disturbance. – Replace main electronics. 	15
750 (A750)	Alarm B	B>Configuration not permitted	<ul style="list-style-type: none"> – By means of the operation profile, options were selected for the configuration of the device but the options do not suit one another. For example, if the option "1" (linearisation table) was selected for LIN_TYPE and the unit "1347 (m³/s)" was selected for PRIMARY_VALUE_UNIT. 	<ul style="list-style-type: none"> – Check configuration. – Perform reset (Code 1 or 40864) and recalibrate the device. 	44



8.1.1 On-site display error messages

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

Message	Measure
Initialization, VU Electr. Defect A110	Exchange on-site 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	

8.2 Response of outputs to errors

The device differentiates between the message types "Alarm", "Warning" and "Error".
→ See the following table and Page 75, Section 8.1 "Messages".

Output	A (Alarm)	W (Warning)	E (Error: Alarm/Warning)
PROFIBUS	The process variable in question is transmitted with the status BAD.	Device continues measuring. The process variable in question is transmitted with the status UNCERTAIN.	For this error, you can enter whether the device should react as in the event of an alarm or as in the event of a warning. See corresponding "Alarm" or "Warning" column. (→ See also Operating Instructions BA00296P, SELECT ALARM TYPE parameter description or these Operating Instructions, Page 2.)
Bargraph (on-site display)	The bargraph assumes the value specified via the FSAFE_TYPE ¹⁾ and FSAFE_VALUE ¹ parameters. → See also Section 8.2.1.	Device continues measuring.	For this error, you can enter whether the device should react as in the event of an alarm or as in the event of a warning. See corresponding "Alarm" or "Warning" column.
On-site display	<ul style="list-style-type: none"> – The measured value and message are displayed alternately – Measured value display:  -symbol is permanently displayed. <p>Message display</p> <ul style="list-style-type: none"> – A + 3-digit number such as A122 and – Description 	<ul style="list-style-type: none"> – The measured value and message are displayed alternately – Measured value display:  -symbol flashes. <p>Message display:</p> <ul style="list-style-type: none"> – W + 3-digit number such as W613 and – Description 	<ul style="list-style-type: none"> – The measured value and message are displayed alternately – Measured value display: see corresponding "Alarm" or "Warning" column <p>Message display:</p> <ul style="list-style-type: none"> – E + 3-digit number such as E713 and – Description
Remote operation (FieldCare)	In the case of an alarm, the ALARM STATUS parameter displays a ²⁾ 3-digit number such as 122 for "Sensor connection error, incorrect data."	In the case of a warning, the ALARM STATUS ² parameter displays a 3-digit number such as 613 for "Simulation is active".	In the case of an error, the ALARM STATUS parameter ² displays a 3-digit number such as 731 for "Pmax ALARM WINDOW undershot".

1) Parameter are displayed via remote operation (e.g. FieldCare) only.
Menu path: PROFILE VIEW → ANALOG INPUT BLOCK → AI PARAMETER

2) Menu path on-site display: GROUP SELECTION → OPERATING MENU → DIAGNOSTICS → MESSAGES
Menu path FieldCare: MANUFACTOR VIEW → OPERATING MENU → DIAGNOSTICS → MESSAGES

8.2.1 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 FSAFE_TYPE¹ parameter.

The following options are available by means of the FSAFE_TYPE¹ parameter:

- LastValidOutValue
The last valid value is used for further processing with the status UNCERTAIN.
- FSsafeValue
The value specified by means of the FSAFE_VALUE¹ 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:

- FSAFE_TYPE¹: FsafeValue
- FSAFE_VALUE¹: 0



Note!

- The failsafe mode is also activated if the "Out of Service O/S" option was selected by means of the TARGET_MODE² parameter.
- The FSAFE_TYPE and FSAFE_VALUE parameter are available via remote operation (e.g. FieldCare) only.

1) Menu path: PROFILE VIEW → ANALOG INPUT BLOCK → AI PARAMETER

2) Menu path: PROFILE VIEW → ANALOG INPUT BLOCK → AI STANDARD PARAMETER

8.3 Confirming messages

Depending on the settings for the ALARM DISPL. TIME and ACK. ALARM MODE parameters, the following measures should be taken to clear a message:

Settings ¹⁾	Measures
<ul style="list-style-type: none"> – ALARM DISPL. TIME = 0 s – ACK. ALARM MODE = off 	<ul style="list-style-type: none"> – Rectify cause of the message (see also Section 8.1).
<ul style="list-style-type: none"> – ALARM DISPL. TIME > 0 s – ACK. ALARM MODE = off 	<ul style="list-style-type: none"> – Rectify cause of the message (see also Section 8.1). – Wait for the alarm display time to elapse.
<ul style="list-style-type: none"> – ALARM DISPL. TIME = 0 s – ACK. ALARM MODE = on 	<ul style="list-style-type: none"> – Rectify cause of the message (see also Section 8.1). – Confirm message using ACK. ALARM parameter.
<ul style="list-style-type: none"> – ALARM DISPL. TIME > 0 s – ACK. ALARM MODE = on 	<ul style="list-style-type: none"> – Rectify cause of the message (see also Section 8.1). – Confirm message using ACK. ALARM parameter. – Wait for the alarm display time to elapse. If a message appears and the alarm display time elapses before the message has been acknowledged, the message will be cleared once it has been acknowledged.

1) ALARM DISPL. TIME and ACK. ALARM MODE parameter are located in the MESSAGES menu.

8.4 Repair

The Endress+Hauser repairs concept provides for measuring devices to have a modular design and also the customer may carry out repairs (see Chap. 8.6 "Spare Parts" on Page 85).



Note!

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

8.5 Repair of Ex-certified devices



Warning!

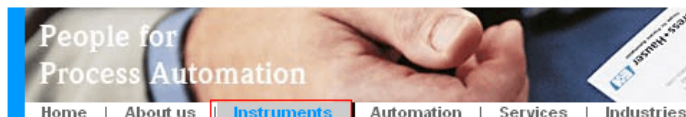
When repairing Ex-certified devices, please note the following:

- Only specialist personnel or Endress+Hauser may undertake repairs of certified devices.
- Relevant standards, national hazardous area regulations and Safety Instructions (XA...) 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. Identical parts may only be used as replacements.
- 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 fulfil the requirements of the specified individual tests.
- A certified device may only be converted into another certified variant by Endress+Hauser.
- All repairs and modifications must be documented.

8.6 Spare Parts

An overview of the spare parts for your device is available in the internet at www.endress.com. To obtain information on the spare parts, proceed as follows:

1. Go to "www.endress.com" and select your country.
2. Click "Instruments".



3. Enter the product name into the "product name" field.

Endress+Hauser product search

Via product name
Enter the product name

4. Select the device.
5. Click the "Accessories/Spare parts" tab.

General information	Technical information	Documents/Software	Service	Accessories/Spare parts
---------------------	-----------------------	--------------------	---------	--------------------------------

▶ Accessories
 ▼ All Spare parts

- ▶ Housing/housing accessories
- ▶ Sealing
- ▶ Cover
- ▶ Terminal module
- ▶ HF module
- ▶ Electronic
- ▶ Power supply
- ▶ Antenna module

Advice
Here you'll find a list of all available accessories and spare parts. To only view accessories and spare parts specific to your product(s), please contact us and ask about our Life Cycle Management Service.

1 / 2

6. Select the required spare parts (You may also use the overview drawing on the right side of the screen.)

When ordering spare parts, always quote the serial number indicated on the nameplate. As far as necessary, the spare parts also include replacement instructions.

8.7 Return

The measuring device must be returned if repairs or a factory calibration are required, or if the wrong measuring device has been ordered or delivered. According to legal regulations, Endress+Hauser, as a ISO-certified company, is required to follow certain procedures when handling returned products that are in contact with process fluids.

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.

8.8 Disposal

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

8.9 Software history

Date	Software version	Changes software	Documentation		
			CD-ROM	Operating Instructions	Description of Instrument Functions
12.2004	03.00.zz	Original software. Compatible with: – Update ToF Tool – Field Tool® Package, version 2.03 or higher	—	BA294P/00/EN/11.04 52025888	BA296P/00/EN/01.05 52026474
			—	BA294P/00/EN/11.05 71009592	BA296P/00/EN/01.05 52026474
05.2007	04.00.zz	<ul style="list-style-type: none"> – Operation via on-site display with three keys implemented. – New level modes "Level Easy Pressure" and "Level Easy Height" implemented. – DOWNLOAD FUNCTION parameter added to OPERATION group. – Factory settings for the "Error"-type messages redefined. – Chinese" and "Japanese" menu language included as standard. Compatible with: – FieldCare from Version 2.15.00	CD506P/00/A2/10.07 71033929	BA294P/00/EN/10.07 71043298	BA296P/00/EN/07.07 71043301
			CD506P/00/A2/12.07 71033929	BA294P/00/EN/12.07 71043298	BA296P/00/EN/07.07 71043301
			CD506P/00/A2/05.08 71071762	BA294P/00/EN/05.08 71071734	BA296P/00/EN/05.08 71071861
			CD506P/00/A2/08.08 71077542	BA294P/00/EN/08.08 71077516	BA296P/00/EN/05.08 71071861
			CD506P/00/A2/06.09 71095432	BA294P/00/EN/06.09 71095417	BA296P/00/EN/06.09 71095454
			CD506P/00/A2/05.10 71111787	BA294P/00/EN/05.10 71111776	BA296P/00/EN/05.10 71111811
			CD00506P/00/A2/13.11 71139775	BA00294P/00/EN/13.11 71139764	BA00296P/00/EN/13.11 71139803
			CD00506P/00/A2/14.12 71158707	BA00294P/00/EN/14.12 71161883	BA00296P/00/EN/13.11 71139803

8.10 Hardware history

Date	Hardware version	Changes hardware
05.2005	1.0	Original hardware
06.2007	1.10	Resistance inserted due to new requirements.
04.2008	02.00	Replacement of IC Media Access Unit

9 Technical data

For technical data, please refer to the Technical Information TI00382P for Deltabar S.
→ See also Page 2, Section "Overview documentation".

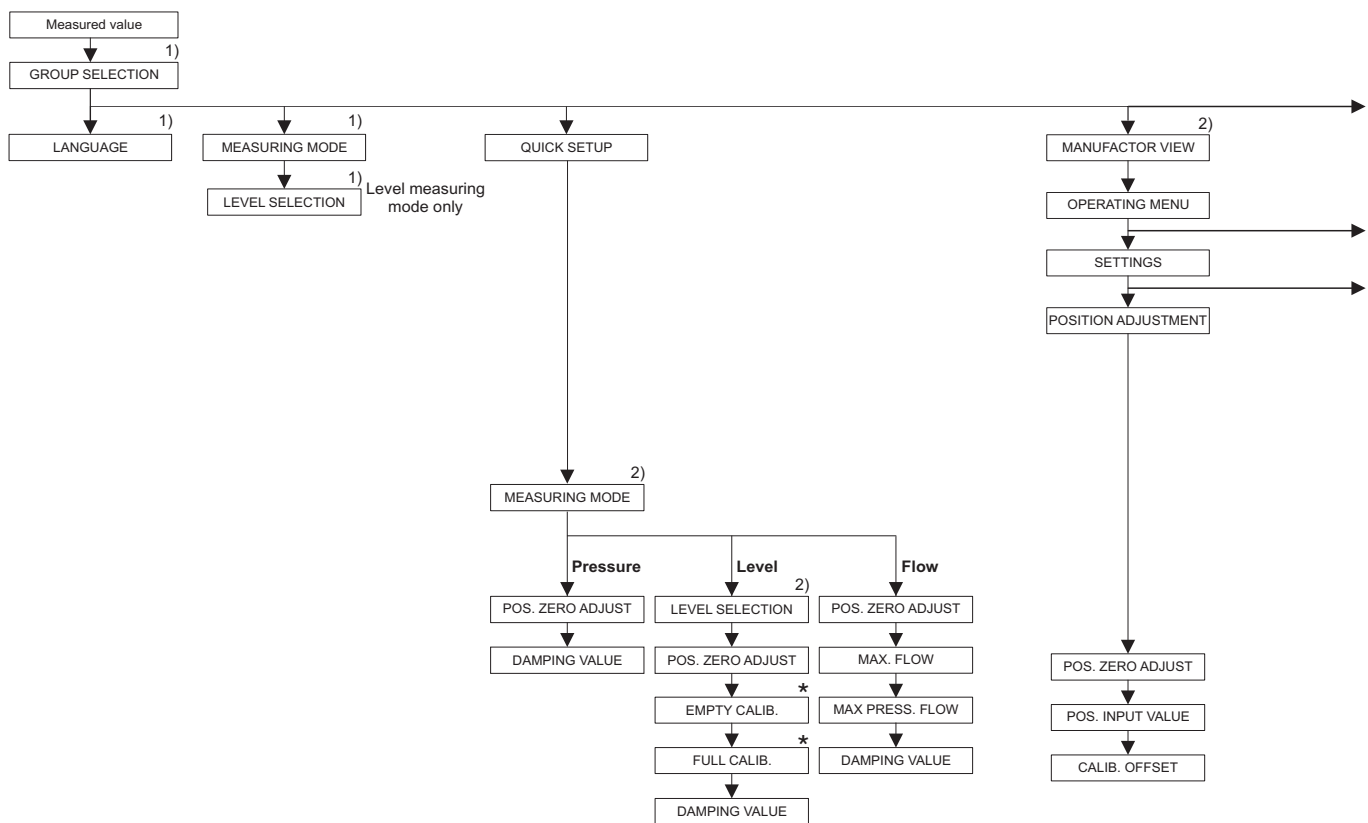
10 Appendix

10.1 Menu



Note!

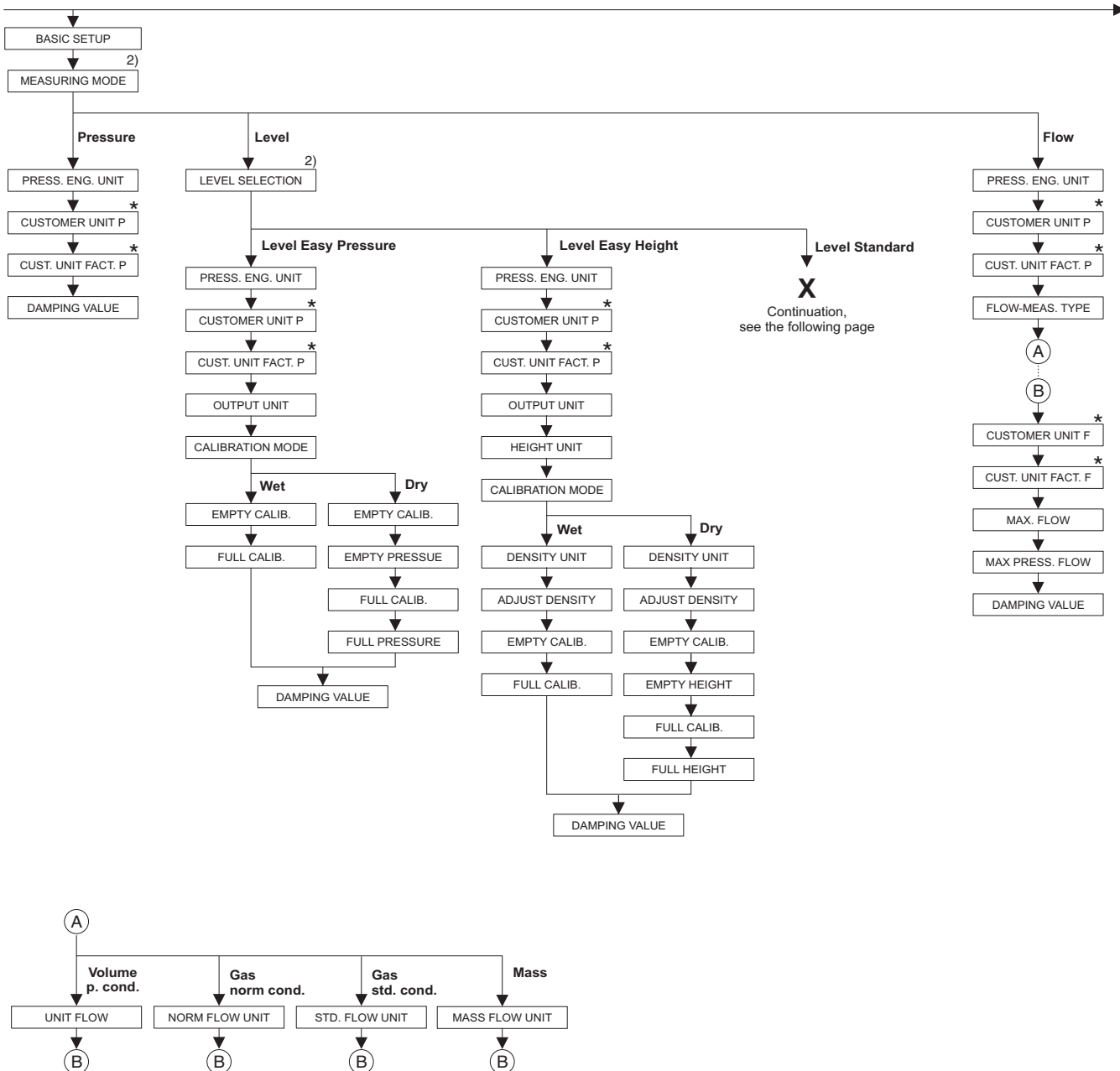
- The entire menu is depicted on the following pages.
- The menu has a different structure depending on the measuring mode selected. This means that some function groups are only displayed for one measuring mode, e.g. "LINEARISATION" function group for the Level measuring mode.
- In addition, there are also parameters that are only displayed if other parameters are appropriately configured. For example the Customer Unit P parameter is only displayed if the "User unit" option was selected for the PRESS. ENG. UNIT parameter. These parameters are indicated with a "*".
- For a description of the parameters, please refer to Operating Instructions BA00296P "Description of device functions". The exact dependency of individual parameters on one another is explained here. See also Page 2, Section "Overview documentation".



1) Display via on-site display only

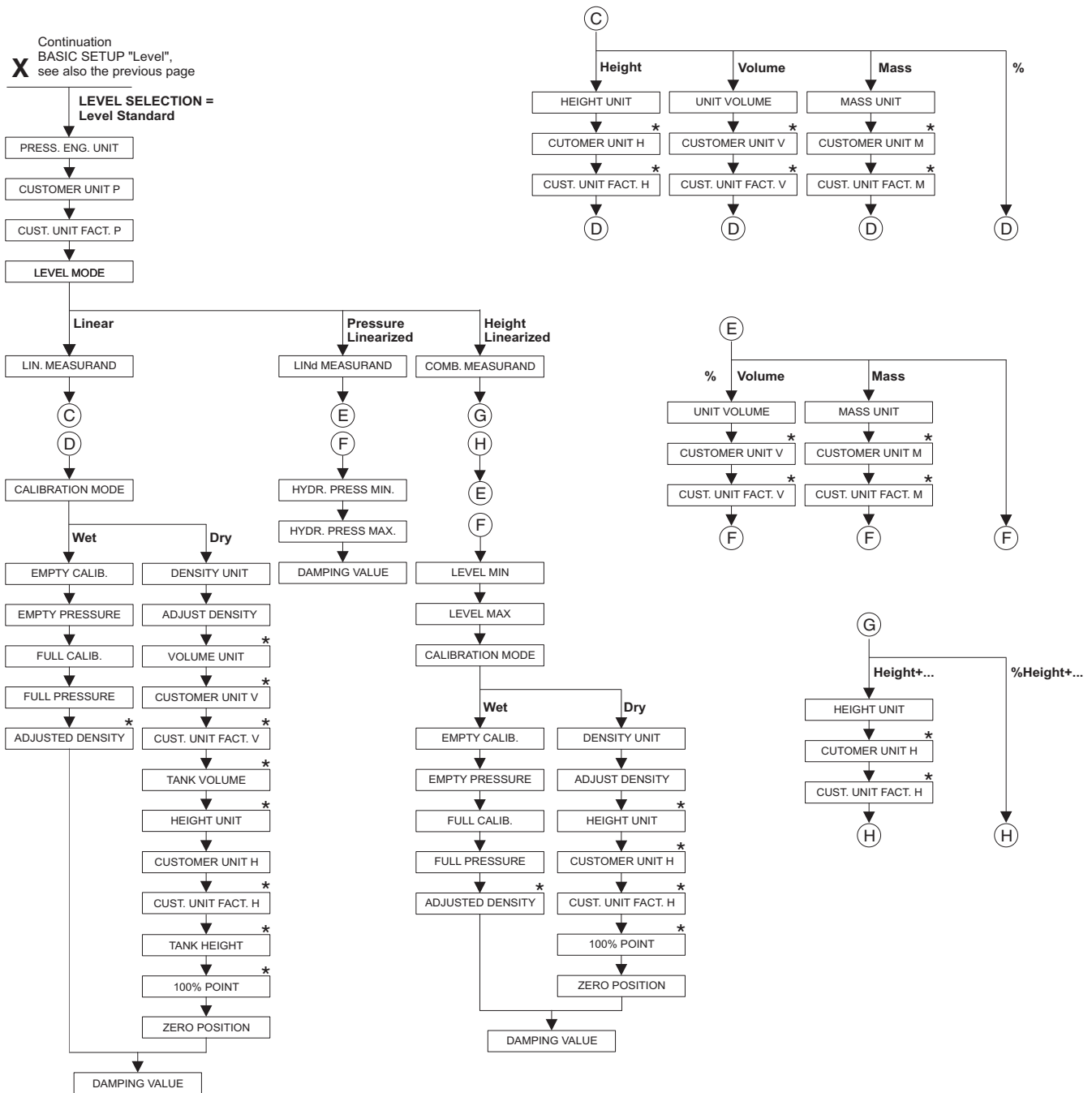
2) Display via FieldCare

* There are parameters that are only displayed if other parameters are appropriately configured.
For example the CUSTOMER UNIT P parameter is only displayed if the "User unit" option was selected for the PRESS. ENG. UNIT parameter.
These parameters are indicated with a "**".



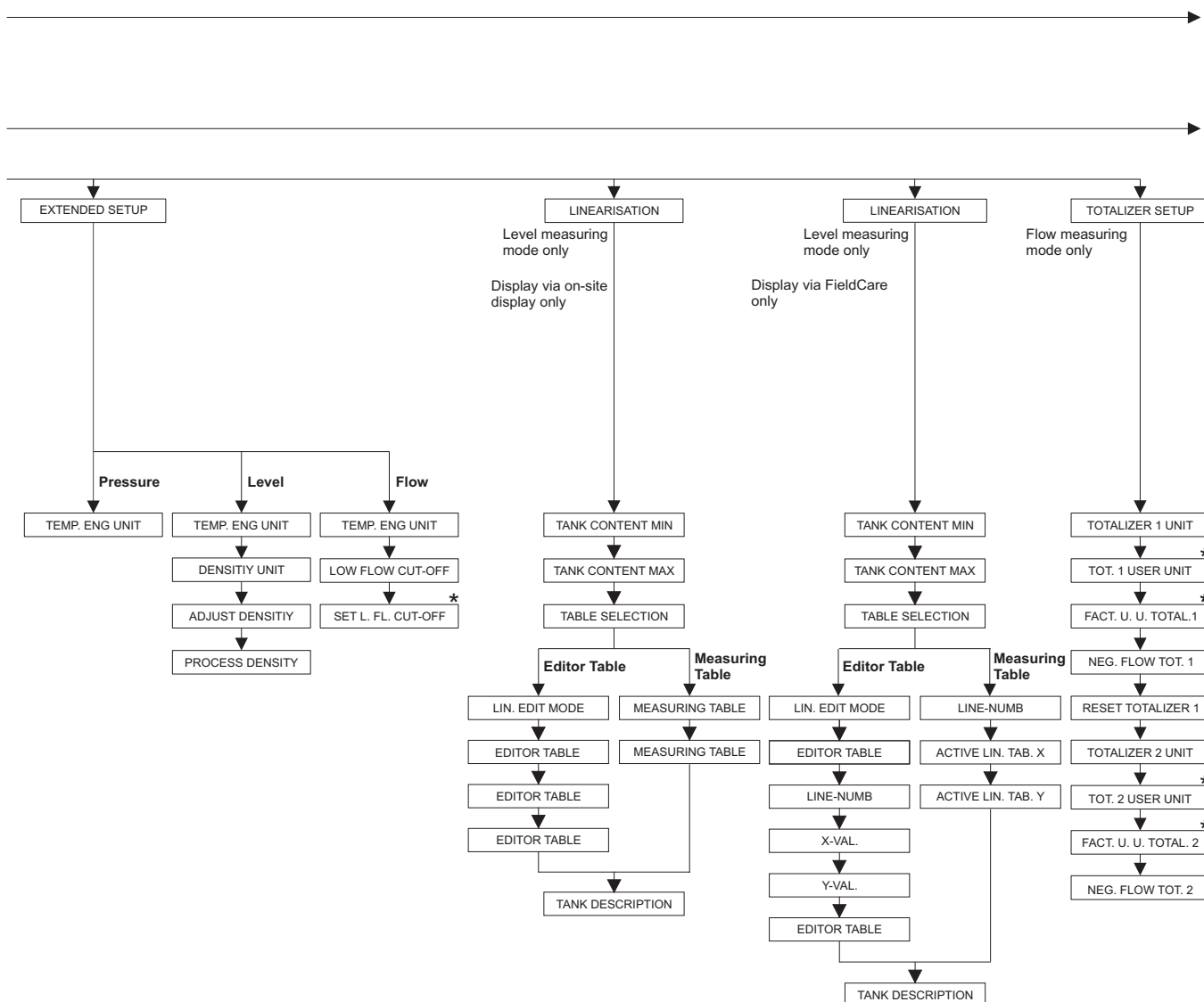
2) Display via FieldCare

★ There are parameters that are only displayed if other parameters are appropriately configured.
For example the CUSTOMER UNIT P parameter is only displayed if the "User unit" option was selected for the PRESS. ENG. UNIT parameter.
These parameters are indicated with a "★".

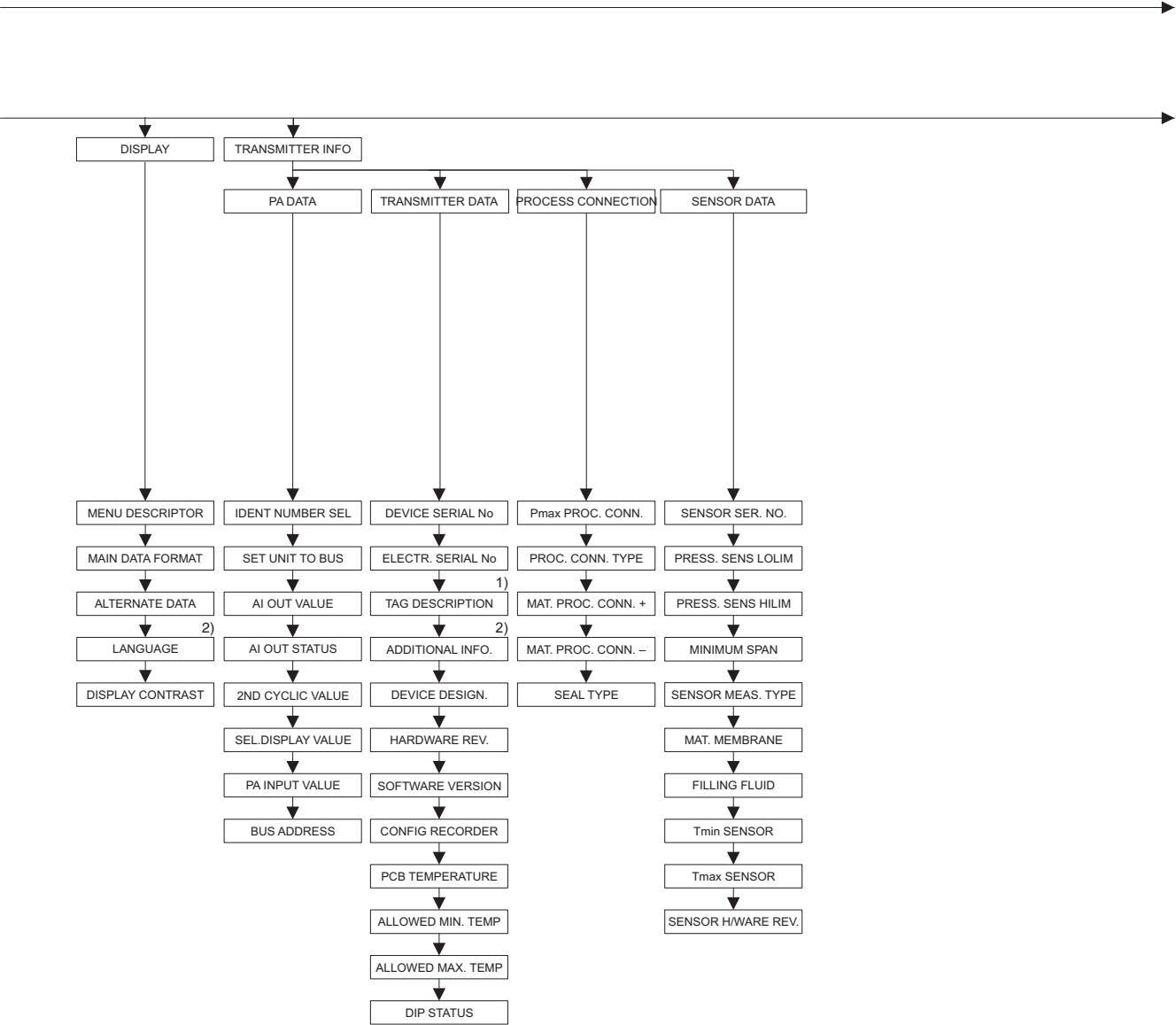


* There are parameters that are only displayed if other parameters are appropriately configured.
For example the CUST. UNIT FACT. H parameter is only displayed if the "User unit" option was selected for the HEIGHT UNIT parameter.
These parameters are indicated with a "*".

P01-xxxxxxx-19-xx-xx-xx-150

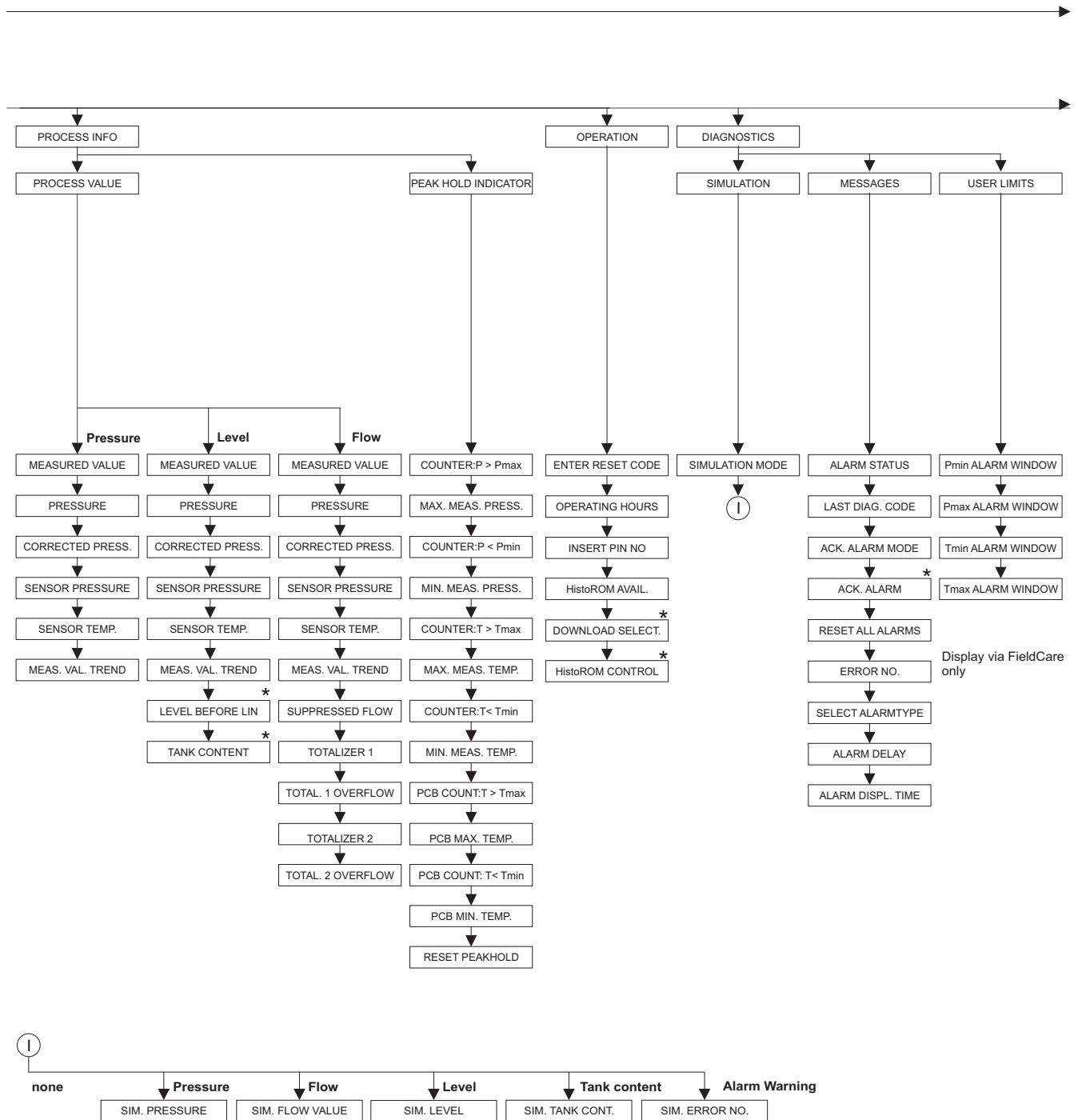


* There are parameters that are only displayed if other parameters are appropriately configured.
 For example the TOT. 1 USER UNIT parameter is only displayed if the "User unit" option was selected for the TOTALIZER 1 UNIT parameter.
 These parameters are indicated with a "*".

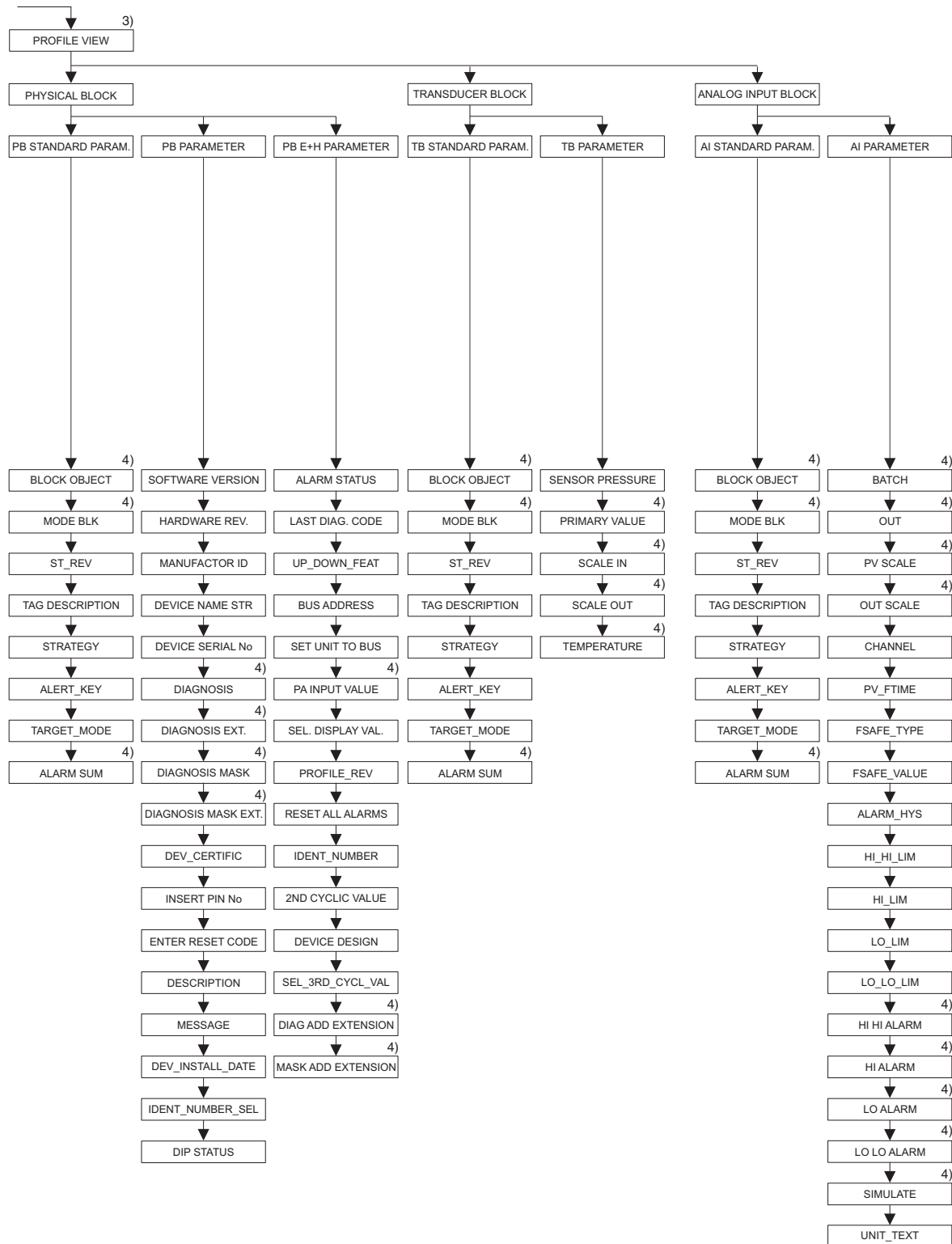


1) Display via on-site display only

2) Display via FieldCare



* There are parameters that are only displayed if other parameters are appropriately configured. These parameters are indicated with a "*".



3) The "Profile view" menu is available via remote operation e.g. FieldCare only.

4) Parameter group (Data type: Record)

P01-xxxxxxxx-19-xx-xx-xx-154

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