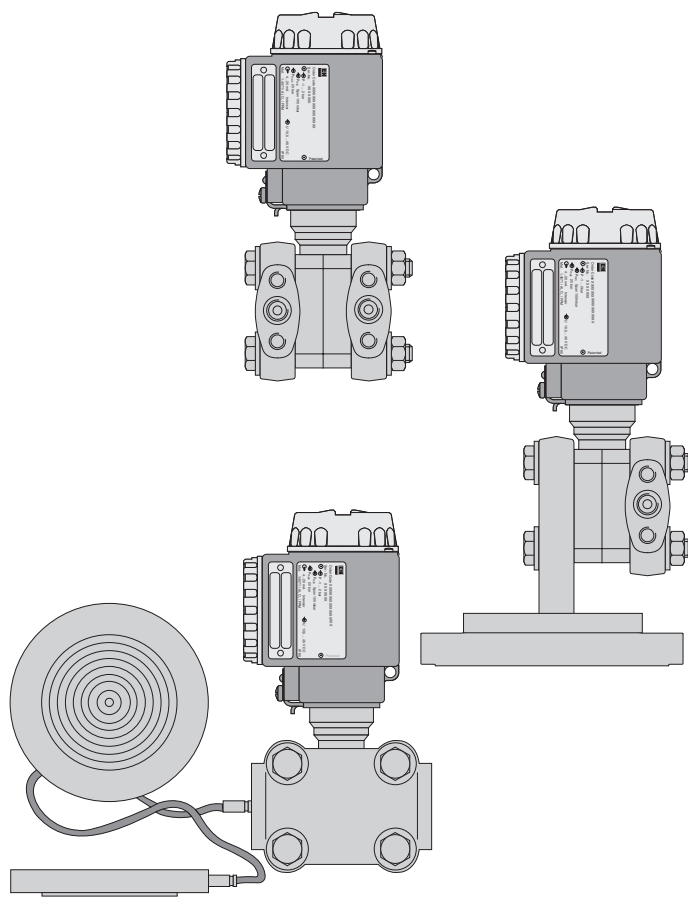
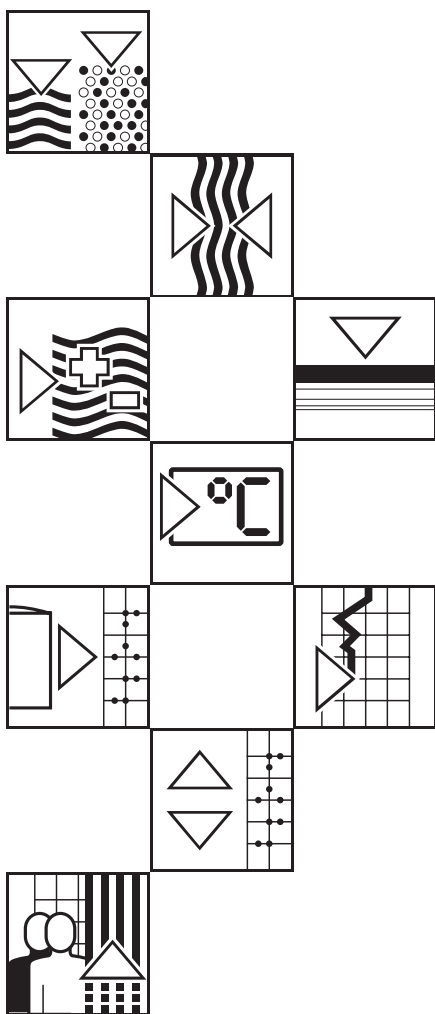


deltabar S Differential pressure transmitter

Operating Instructions



Short Instructions

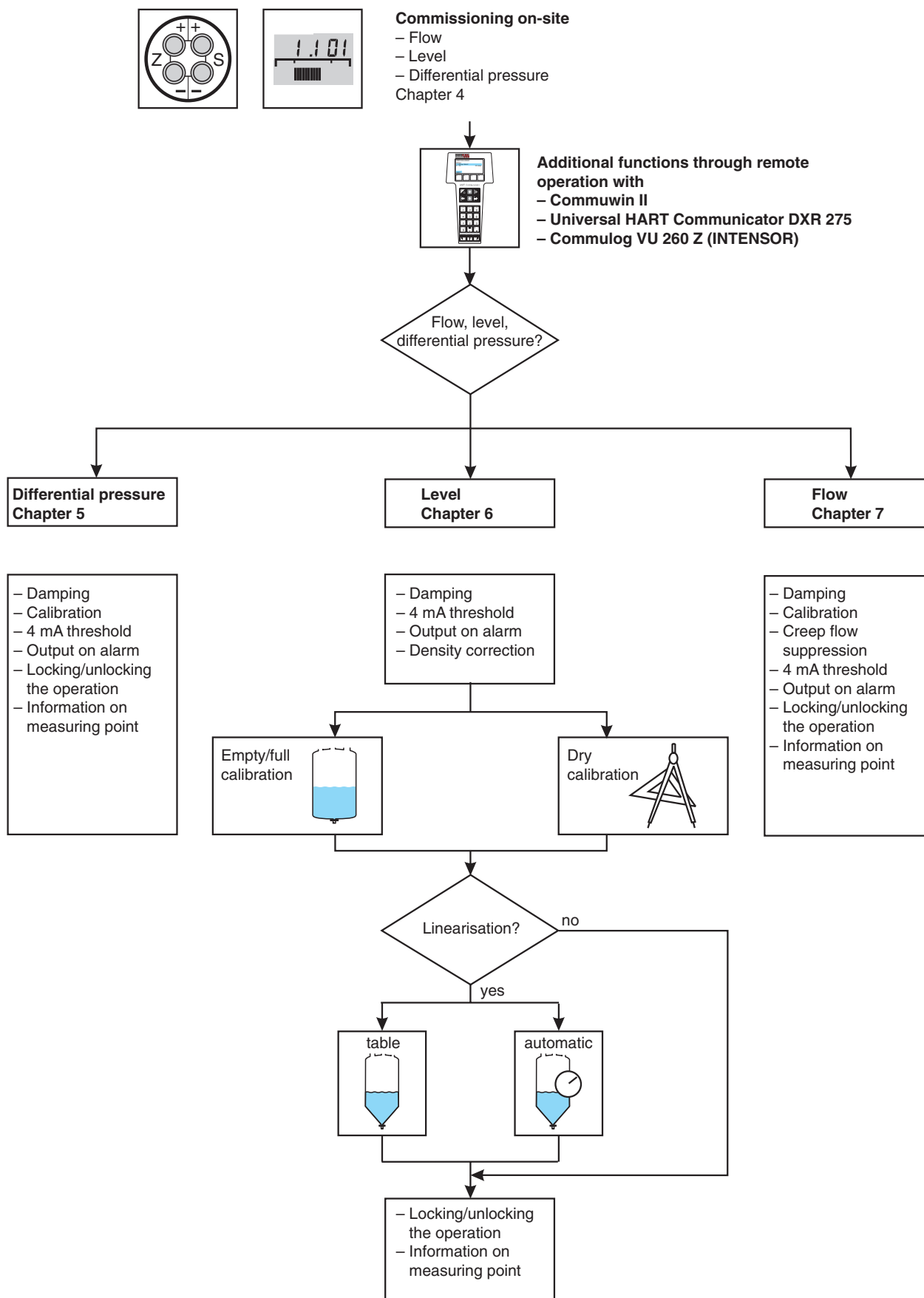


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Software History

HART electronics (operation using Universal HART Communicator DXR 275)

SW/BA	Device and Software No.	Device revision	DD revision	Changes																																							
1.x	731x	1	2	_____																																							
2.0 from 10.97	7320	2	1	– Operation Mode (V3H0) "Level Manual" extended. New parameters for the "Level Manual" mode: Manual Level, Table Editing (V3H6), Row No. Table (V3H7), Input Level (V3H8), Set Volume (V3H9). – "Pressure Before Bias", "Pressure After Bias" and "Security Locking" parameters moved from the Linearisation menu to the Service menu. – "Set Simulation Current" (V7H1) Simulation limits extended from 3.8 to 22 mA. – "MIN Alarm" option for "Set Output Safety" (V0H8) parameter no longer possible. – Error and warning list extended.																																							
5.0	7350	5	1	– "MIN Alarm" option for "Set Output Safety" (V0H8) parameter available again. – "Set Simulation Current" (V7H1) parameter: Simulations limits again 3.6 to 22 mA.																																							
6.0 from 11.99	7360	6	1	– New totalizer function. New parameters for totalizer functions: Internal Counter (V5H0), Display Mode (V5H1), Counter Display (V5H2), Conversion Factor (V5H3), Counting Units (V5H4). – Units list for "Level Cylindrical" and "Square Root" extended.																																							
7.0 from 10.00	7370	7	1	– Operation Mode (V3H0) "Pressure in %" extended. – New "Alarm Current Max" (V9H4) parameter. – Zero correction function: New parameters for zero correction function, refer to page 38 Zero Correction (V9H5), Zero Correction Value (V9H6). – Editing limits: Refer to chapter 8.4. – Download error E116, resettable using Reset 5140.																																							
7.1 from 03.03	7371	7	2	– Parameter names changed <table><tr><td>old</td><td>→</td><td>new (matrix position in brackets)</td></tr><tr><td>Set output safety</td><td>→</td><td>Alarm mode (V0H8)</td></tr><tr><td>• Min. (–10 %)</td><td>→</td><td>Min. alarm</td></tr><tr><td>• Max. (+110 %)</td><td>→</td><td>Max. alarm</td></tr><tr><td>• Continue</td><td>→</td><td>Value hold</td></tr><tr><td>Min. pressure</td><td>→</td><td>Peak hold P Min (V2H3)</td></tr><tr><td>Max. pressure</td><td>→</td><td>Peak hold P Max (V2H4)</td></tr><tr><td>Min. temperature</td><td>→</td><td>Peak hold T Min (V2H7)</td></tr><tr><td>Max. temperature</td><td>→</td><td>Peak hold T Max (V2H8)</td></tr><tr><td>Low Sensor Cal</td><td>→</td><td>Low Sensor Trim (V7H4)</td></tr><tr><td>High Sensor Cal</td><td>→</td><td>High Sensor Trim (V7H5)</td></tr><tr><td>Set max. current</td><td>→</td><td>Max. alarm current (V9H4)</td></tr><tr><td>Serial number</td><td>→</td><td>HART Serial number (VAH2)</td></tr></table>	old	→	new (matrix position in brackets)	Set output safety	→	Alarm mode (V0H8)	• Min. (–10 %)	→	Min. alarm	• Max. (+110 %)	→	Max. alarm	• Continue	→	Value hold	Min. pressure	→	Peak hold P Min (V2H3)	Max. pressure	→	Peak hold P Max (V2H4)	Min. temperature	→	Peak hold T Min (V2H7)	Max. temperature	→	Peak hold T Max (V2H8)	Low Sensor Cal	→	Low Sensor Trim (V7H4)	High Sensor Cal	→	High Sensor Trim (V7H5)	Set max. current	→	Max. alarm current (V9H4)	Serial number	→	HART Serial number (VAH2)
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Set max. current	→	Max. alarm current (V9H4)																																									
Serial number	→	HART Serial number (VAH2)																																									

Note!



Note!

- The entries in brackets indicate the matrix position in Commuwin II. If you use the DXR 275 handheld terminal, you can access the parameters via Menu, see chapter 11.2 HART Matrix.
- An upload/download is only possible within a software revision, e.g. 1.x.

SW/BA	Device and Software No.	VU 260Z	Changes
1.x	721x	1.7	—
2.0 from 10.97	7220	1.8	– Operation Mode (V3H0) "Level Manual" extended. New parameters for the "Level Manual" mode: Manual Level, Table Editing (V3H6), Row No. Table (V3H7), Input Level (V3H8), Set Volume (V3H9). – "Pressure Before Bias", "Pressure After Bias" and "Security Locking" parameters moved from the Linearisation menu to the Service menu. – Error and warning list extended. – "Set Simulation Current" (V7H1) parameter, Simulations limits from 3.8 to 22 mA. – "MIN Alarm" option for "Set Output Safety" (V0H8) parameter no longer possible.
5.0	7250	1.8	– "MIN Alarm" option for "Set Output Safety" (V0H8) parameter available again. – "Set Simulation Current" (V7H1) parameter: Simulation limits again from 3.6 to 22 mA

INTENSOR electronics
(operation using
Commulog VU 260 Z)

Note!

- The "Totalizer", "Zero Correction", "Editing Limits" and "Alarm Current MAX " functions are not included in the INTENSOR electronics (software version 5.0).
- An upload/download is only possible within the software revision, e.g. 1.x.



Note!

Notes on Safety

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

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 attention to the technical data on the nameplate.

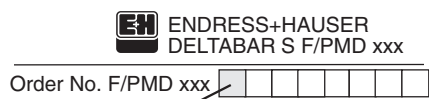
If the device is to be installed in an explosion hazardous area, then the specifications in the certificate as well as all national and local regulations must be observed. The instrument can be delivered with the certificates listed in the table below. A separate Ex-documentation is enclosed with the device and is an integral part of this documentation. The installation regulations, connection values and Safety Instructions listed in this document must be observed. The certificate can be identified from the first letter of the order code stamped on the nameplate (see table below).

- Ensure that all personnel are suitably qualified.
- Observe the specifications in the certificate as well as national and local regulations.

Approved usage

Mounting, commissioning operation

Explosion hazardous areas



Code	Certificate	Explosion protection
A, F, K, S, 5	Standard	none
C, L, 6	ATEX	ATEX II 1/2 G EEx ia IIC T4/T6
M, T	ATEX	ATEX II 2 G EEx d IIC T5/T6
B, N	ATEX	ATEX II 3 G EEx nA II T6
U	FM	Explosion proof Class I, II, III, Div. 1, Group A-G
W	FM	IS Class I, II, III, Div. 1, Group A-G
1	CSA	Explosion proof Class I, II, III, Div. 1, Group B-G
2	CSA	IS Class I-III, Div. 1, Group A-G
P	TIIS	EEx d IIC T6 or EEx ia IIC T6

Certificates for applications in explosion hazardous areas

Safety Conventions and Symbols

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

Symbol	Meaning
 Note!	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.
 Caution!	Caution! Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument.
 Warning!	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.

Explosion protection

	Device certified for use in explosion hazardous area If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area.
	Explosion hazardous area Symbol used in drawings to indicate explosion hazardous areas. – Devices located in and wiring entering areas with the designation "explosion hazardous areas" must conform with the stated type of protection.
	Safe area (non-explosion hazardous area) Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. – Devices located in safe areas still require a certificate if their outputs run into explosion hazardous areas.

Electrical symbols

	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.

1 Introduction

The Deltabar S family of devices is used for the measurement of differential pressure, level and flow in gases, vapours and liquids. They are used in all sectors of industry.

Application

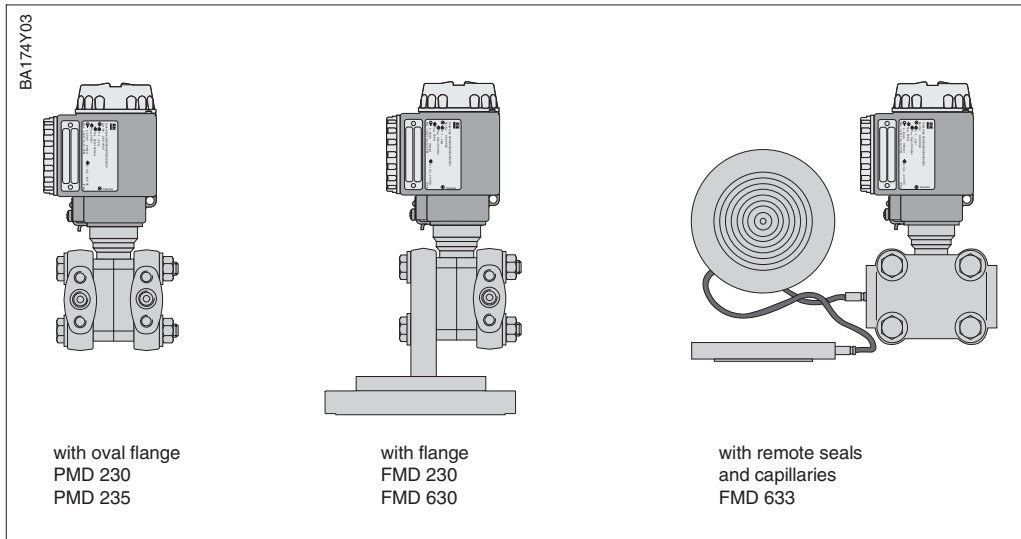


Figure 1.1
Deltabar S versions

Metal sensor

The system pressure deflects the separating diaphragm and a fill fluid transmits the pressure to a resistance bridge. The pressure dependent change in bridge output voltage is measured and processed further.

Operating principle

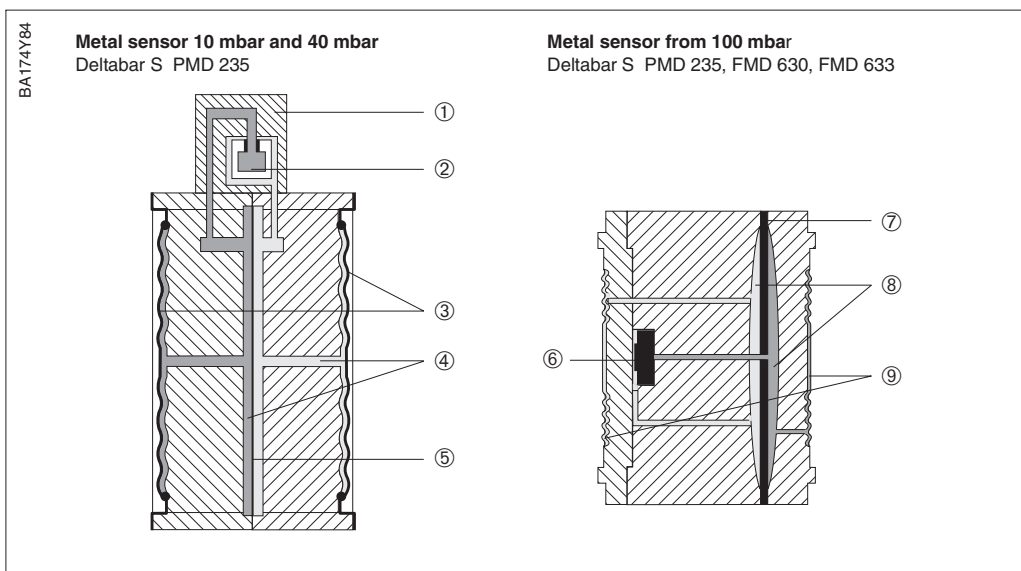


Figure 1.2

Metal sensor 10 mbar, 40 mbar

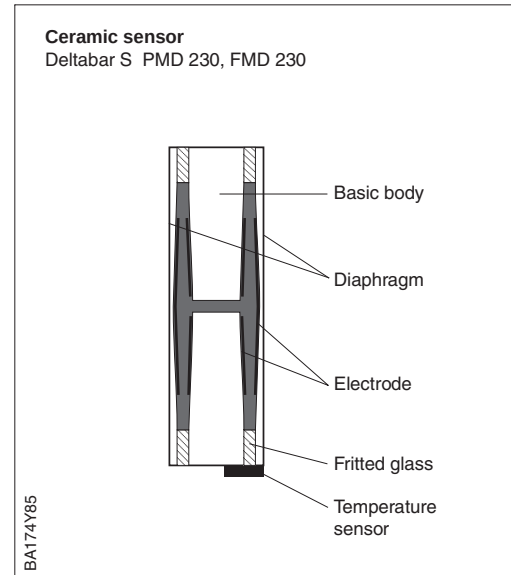
- ① Measuring element
- ② Silicon diaphragm
- ③ Separating diaphragm as nap diaphragm extended
- ④ Filling fluid
- ⑤ Integrated overload protection

Metal sensor from 100 mbar

- ⑥ Measuring element
- ⑦ Overload diaphragm
- ⑧ Filling fluid
- ⑨ Separating diaphragm as nap diaphragm extended

Ceramic sensor

The system pressure acts directly on the robust ceramic diaphragm of the pressure sensor and deflects it by maximum 0.025 mm. A change in capacitance proportional to the pressure acting is measured by electrodes on the ceramic substrate and diaphragm. The measuring range is determined by the thickness of the ceramic diaphragm.

**1.1 Measuring system**

In the simplest case, the complete measuring system comprises

- a Deltabar S with 4...20 mA current output
- an optional four-character display for pressure
- supply voltage for non-hazardous area: 11.5...45 V DC, EEx ia: 11.5...30 V DC, EEx d: 13...30 V DC, EEx nA: 11.5...30 V DC

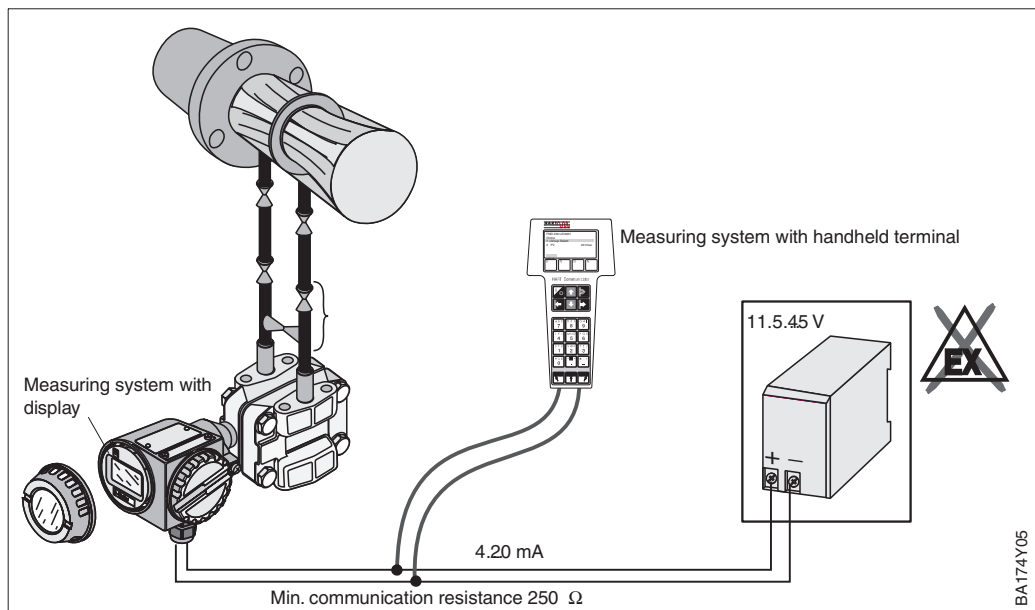


Fig. 1.3
Deltabar S measuring system
with display and/or handheld
terminal

The HART or INTENSOR versions have a digital communication signal superposed on the current signal which is used for remote calibration.

These transmitters have extended functions so that level or flow can also be measured.

The device is operated:

- via the Commuwin II operating program
- via the Universal HART Communicator DXR 275 universal handheld terminal (HART protocol)
- via the Commulog VU 260 Z handheld terminal (INTENSOR protocol)

2 Installation

This chapter describes the measuring set-up of the Deltabar S and the electrical connection.

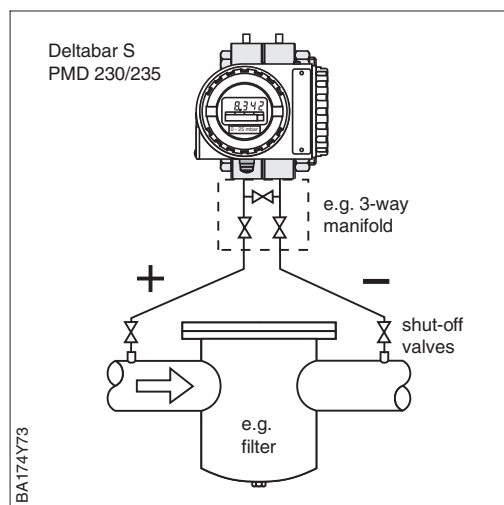
2.1 Measuring system for differential pressure measurement

Note!

- General recommendations for laying pressure piping may be taken from DIN 19210 "Methods for measurement of fluid flow; differential pressure piping for flow measurement devices" or the appropriate national or international standards.
- Check that pressure piping installed outdoors is adequately insulated and/or heated.

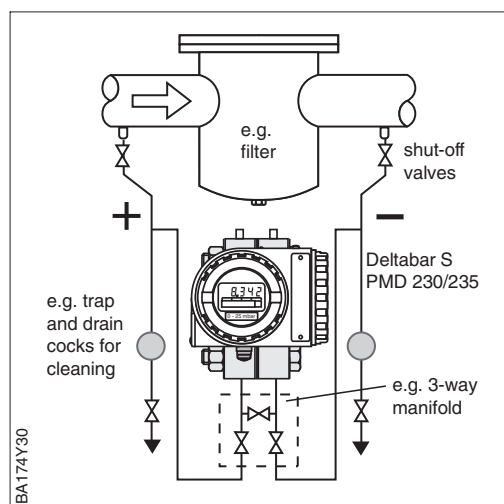


Note!



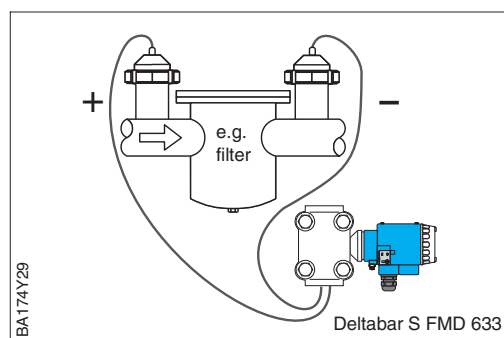
- Mount the Deltabar S above the tapping point, so that condensation can run back into the process piping.
- Use a three-way manifold for simple mounting without interruption of the process.
- Install the pressure piping with a continuous fall of at least 10%.

Gases and vapours



- Mount the Deltabar S below the tapping point, so that the pressure piping is always filled with liquid and gas bubbles can back into the process pipe.
- Use a three-way manifold for simple mounting without interruption of the process.
- In order to avoid build-up in dirty liquids, it is recommended that traps and drain cocks are used.
- Install the pressure piping with a continuous fall of at least 10%.

Liquids



- FMD 633: Mount the remote seals on flanges above the process pipe.
- For vacuum: Mount the transmitter below the tapping point.
- There should be no temperature difference between the capillaries.
- Always use two identical diaphragm seals (e.g. diameter, material etc.) for the plus and minus sides.

Gases, vapours and liquids with diaphragm seals and capillaries

2.2 Measuring system for flow measurement



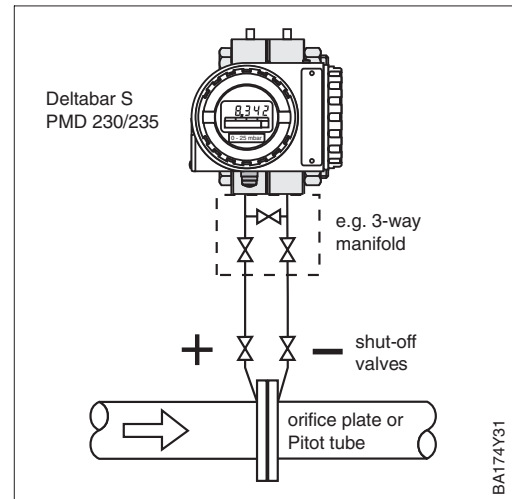
Note!

Note!

General recommendations for laying pressure piping may be taken from DIN 19210 "Methods for measurement of fluid flow; differential pressure piping for flow measurement devices" or the appropriate national or international standards.

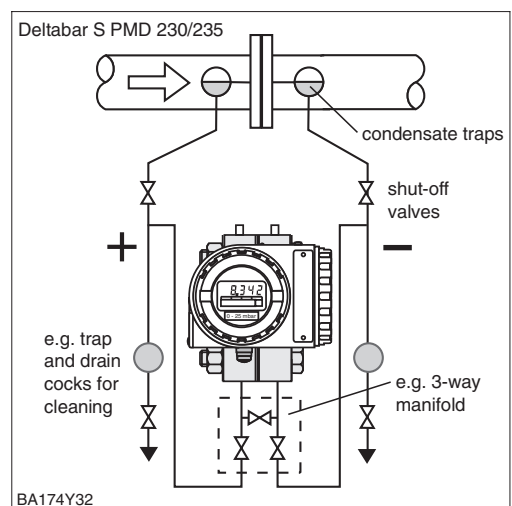
Gases

- Mount the Deltabar S above the tapping point, so that condensation can run back into the process piping.
- Use a three-way manifold for simple mounting without interruption of the process.
- Install the pressure piping with a continuous fall of at least 10%.



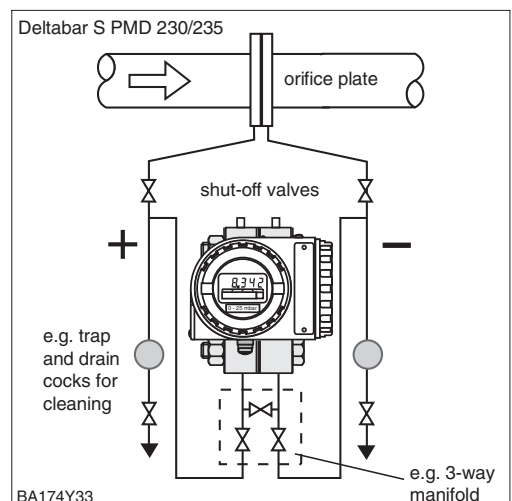
Vapours

- Mount the Deltabar S below the tapping point.
- Mount condensate traps at the same level as the tapping points.
- Fill the traps with liquid before calibration.
- Use a three-way manifold for simple mounting without interruption of the process.
- Install the pressure piping with a continuous fall of at least 10%.



Liquids

- Mount the Deltabar S below the tapping point, so that the pressure piping is always filled with liquid and gas bubbles can back into the process pipe.
- Use a three-way manifold for simple mounting without interruption of the process.
- In order to avoid build-up in dirty liquids, it is recommended that traps and drain cocks are used.
- Install the pressure piping with a continuous fall of at least 10%.



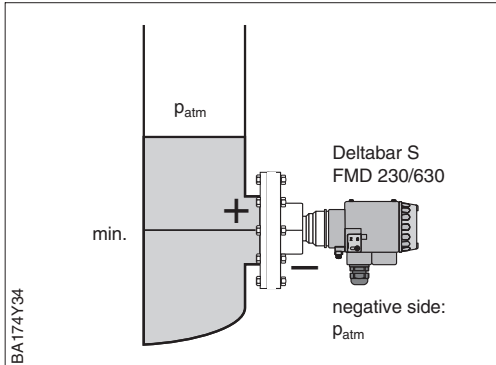
2.3 Measuring system for level measurement

Note!

General recommendations for laying pressure piping may be taken from DIN 19210 "Methods for measurement of fluid flow; differential pressure piping for flow measurement devices" or the appropriate national or international standards.



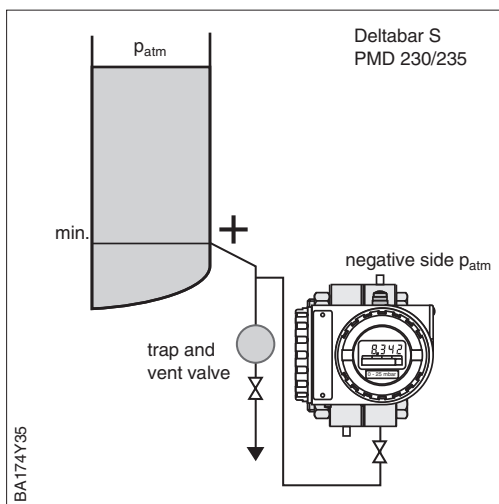
Note!



FMD 230, FMD 630

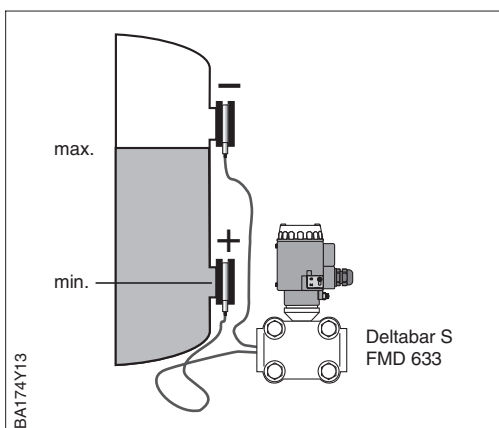
- Mount the Deltabar S direct on the tank.
- The negative side is open to atmosphere pressure.

Open tank



PMD 230, PMD 235

- Mount the Deltabar S below the lower tapping, so that the pressure piping is always filled with liquid.
- The negative side is open to atmosphere pressure.
- A trap prevents the build up of dirt in the pressure piping.
- Install the pressure piping with a continuous fall of at least 10%.



FMD 633

- Mount the Deltabar S below the tapping point.
- Mount the remote seals with capillaries onto the tank.
- There should be no temperature difference between the capillaries.
- Always use two identical diaphragm seals (e.g. diameter, material etc.) for the plus and minus sides.

Note!

Level measurement can only be carried out between the upper edge of the lower remote seal and the lower edge of the upper remote seal.

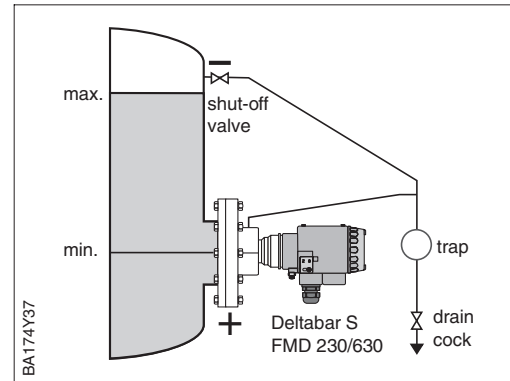


Note!

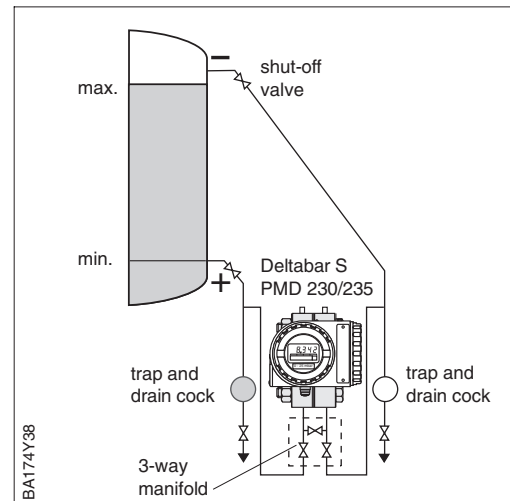
Closed tank

Closed tank*FMD 230, FMD 630*

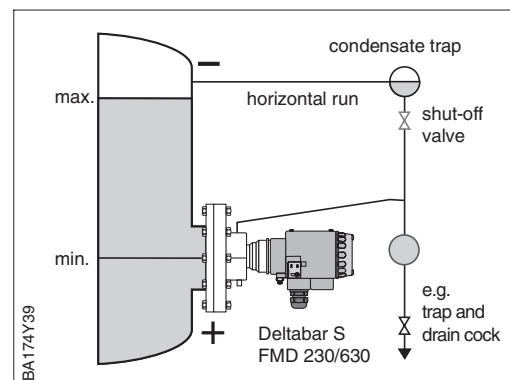
- Mount the Deltabar S direct on the tank.
- The tapping for the negative side must be above the maximum level to be measured.
- Install the pressure piping with a continuous fall of at least 10%.

*PMD 230, PMD 235*

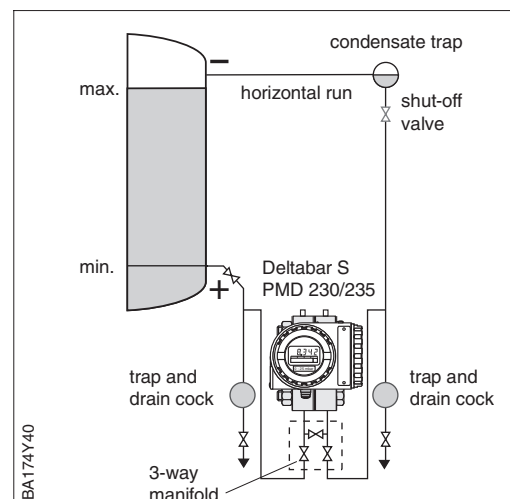
- Mount the Deltabar S below the lower tapping so that the pressure piping is always filled with liquid.
- The negative side must be above the maximum level to be measured.
- Traps prevent the build up of dirt in the pressure piping.
- Use a three-way manifold for simple mounting without interrupting the process.
- Install the pressure piping with a continuous fall of at least 10%.

**Closed tank with steaming liquid***FMD 230, FMD 630*

- Mount the Deltabar S direct on the tank.
- The tapping for the negative side must be above the maximum level to be measured.
- A condensate trap ensures constant pressure on the negative side.
- Install the pressure piping with a continuous fall of at least 10%.

*PMD 230, PMD 235*

- Mount the Deltabar S below the lower tapping, so that the pressure piping is always filled with liquid.
- The tapping for the negative side must be above the maximum level to be measured. The condensate trap ensures a constant pressure.
- Traps prevent the build up of dirt in the pressure piping.
- Use a three-way manifold for simple mounting without interruption of the process.
- Install the pressure piping with a continuous fall of at least 10%.



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