Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Deltabar S PMD70/75, FMD76/77/78

Differential pressure transmitter with ceramic and monosilicon sensors for flow, level and differential measurement
High accuracy with excellent long-term stability
HART®, Profibus® PA or FOUNDATION Fieldbus™ protocols

Application

The Deltabar S differential pressure transmitters are suitable for:
- Flow measurement (volume or mass flow) in conjunction with primary elements in gas, steam and liquid applications
- Level, volume or mass measurement in liquids
- Differential pressure monitoring, e.g. across filters or pumps
- Corrosive or abrasive applications using unique ceramic sensor technology (PMD70). For example, DP measurement across a filter with abrasive product
- High temperatures up to 662°F (350°C) with remote diaphragm seals (FMD78)

Your benefits

- Excellent reproducibility and long-term stability
- High accuracy: up to ±0.075% (<15 : 1 turndown), with optional PLATINUM version: ±0.05% span
- Turn down 100:1 standard, higher on request

Designed with safety in mind to keep your plant, equipment and personnel safe:
- Used for flow and differential pressure monitoring up to SIL 2, certified to IEC 61508 by TÜV SÜD
- Meets PED (Pressure Equipment Directive)
- Secondary seals standard in every transmitter
- Built-in diagnostic software functionality (e.g., user-defined max/min operating window)
- Optional FM and CSA certificates, plus combination certificates
- Function-monitored from the measuring cell to the electronics
- Modularity for easy, cost-effective repair
  - replaceable display
  - universal electronics for pressure and differential pressure
- Easy to setup with menu-driven interface, quick setup menu for standard application modes including pressure, level and flow

HistoROM®/M-DAT memory module enables:
- Quick duplication of measuring points
- Process monitoring via periodic recording of pressure and temperature values
- Monitoring of events and configuration changes
- Analysis and graphical evaluation of data by ToF tool software

Flexible commissioning via multiple modes:
- On-board push buttons (external or inside housing)
- Easy and safe menu-guided operation on-site, via 4 to 20 mA with HART, via PROFIBUS PA or via FOUNDATION Fieldbus
- ToF tool (PC software, provided free with each transmitter) plus HART modem
- Extensive diagnostic functions

TI382P/24/ae

Endress+Hauser

People for Process Automation

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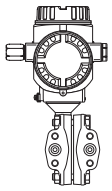
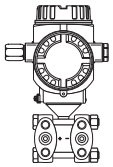
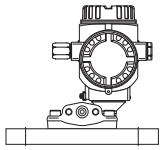
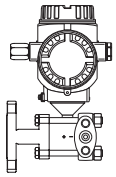
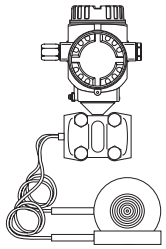
Function and system design

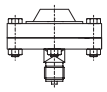
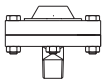
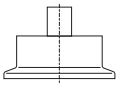
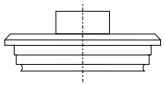
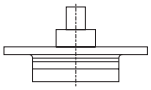
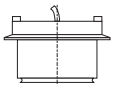
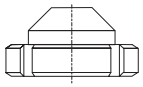
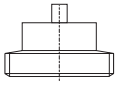
Device selection

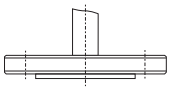
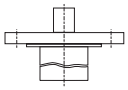
Deltabar S – product family	**PMD70**  P01-PMD70xxx-16-xx-xx-xx-000 **With ceramic measuring diaphragms**	**PMD75**  P01-PMD75xxx-16-xx-xx-xx-000 **With metallic measuring diaphragms**	**FMD76**  P01-FMD76xxx-16-xx-xx-xx-000 **With ceramic measuring diaphragms**	**FMD77**  P01-FMD77xxx-16-xx-xx-xx-000 **With metallic measuring diaphragms and diaphragm seal mounted on one side**	**FMD78**  P01-FMD78xxx-16-xx-xx-xx-003 **With metallic measuring diaphragms and capillary diaphragm seals**
Field of application	– Flow – Level – Differential pressure	– Flow – Level – Differential pressure	– Level	– Level	– Level – Differential pressure
Process connections	– 1/4 – 18 NPT – RC 1/4	– 1/4 – 18 NPT – RC 1/4	Low-pressure side (–): – 1/4 – 18 NPT – RC 1/4 High-pressure side (+): – DN 80 – DN 100 – ANSI 3" – 4" – JIS 80A – 100A	Low-pressure side (–): – 1/4 – 18 NPT – RC 1/4 High-pressure side (+): – DN 50 – DN 100 – ANSI 2" – 4" – JIS 80A – 100A	– Wide range of diaphragm seals, → see page 5, section "Overview of diaphragm seal FMD78"
Measuring ranges	from -10 to +10 inH_2O (–25 to +25 mbar) to -45 to +45 psi (–3 to +3 bar)	from -4 to +4 inH_2O (–10 to +10 mbar) to -600 to +600 psi (–40 to +40 bar)	from -40 to +40 inH_2O (–100 to +100 mbar) to -45 to +45 psi (–3 to +3 bar)	from -40 to +40 inH_2O (–100 to +100 mbar) to -230 to +230 psi (–16 bar to +16 bar)	from -40 to +40 inH_2O (–100 to +100 mbar) to -600 to +600 psi (–40 to +40 bar)
Overload [1]	on one side: max. 1450 psi (100 bar) on both sides: max. 2175 psi (150 bar)	on one side: max. 6100 psi (420 bar) on both sides: max. 8700 psi (630 bar)	on one side: max. 1450 psi (100 bar)	on one side: max. 2320 psi (160 bar)	on one side: max. 2320 psi (160 bar) on both sides: max. 3480 psi (240 bar)
Process temperature	–4 to +185°F (–20 to +85°C))	–40 to +248°F (–40 to +120°C)	–4 to +185°F (–20 to +85°C)	up to +662°F (350°C)	up to +662°F (350°C)
Ambient temperature	–4 to +185°F (–20 to +85°C)	–40 to +185°F (–40 to +85°C) [2]	–4 to +185°F (–20 to +85°C)	–40 to +185°F (–40 to +85°C) [2]	–40 to +185°F (–40 to +85°C) [2]
Reference Accuracy	– Up to ±0.075% of the set span – PLATINUM version: up to ±0.05% of the set span			– Up to ±0.075 % of the set span	
Supply voltage	– For non-hazardous areas: 10.5 to 45 V DC – Intrinsically safe: 10.5 to 30 V DC				
Output	4 to 20 mA with superimposed HART protocol, PROFIBUS PA or FOUNDATION Fieldbus				
Options	– High-pressure version up to p_{stat} 10,500 psi (700 bar) – PMD75, FMD77, FMD78: Gold-Rhodium-coated diaphragm, NACE-compliant materials				
Specialities (options)	– Metal-free measurement with PVDF flange – Available with Deltatop/Deltaset as flow compact device	– p_{stat} up to 6100 psi (420 bar) – Diaphragm: tantalum – Available with Deltatop/Deltaset as flow compact device	– Abrasion-resistant and corrosion-resistant – No diaphragm-seal temperature effects – Metal-free measurement possible with ECTFE-coated process connection	– For high media temperatures	– Wide range of diaphragm seals

1) dependent on the lowest-rated element, with regard to pressure, of the selected components

2) lower temperature on request

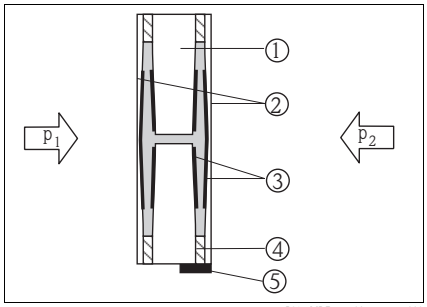
Overview of diaphragm seal
FMD78

Design	Diaphr. seal	Connection	Version	Standard	Nominal diameter	Nom. press./Class
Cell	Membrane diaphragm seal (MDM)	DIN cell	 P01-FMD78xxx-04-xx-xx-xx-000	DIN 2501	– DN 50 – DN 80 – DN 100	PN 16 – 400
		ANSI cell		ANSI B 16.5	– 2" – 3" – 4"	150 – 2500 lbs
Threaded connection with separator	Membrane diaphragm seal (MDM)	G	 P01-FMD78xxx-03-xx-xx-xx-010	ISO 228	G 1/2 B	PN 40
		NPT	 P01-FMD78xxx-03-xx-xx-xx-011	ANSI	1/2 NPT	PN 40
Tri-Clamp	Membrane diaphragm seal (MDM)	Clamp	 P01-FMD78xxx-03-xx-xx-xx-005	ISO 2852	– DN 25 (1") – DN 38 (1-1/2") – DN 51 (2") – DN 76.1 (3")	Dependent on the clamp used
	Pipe diaphragm seal (RDM)	Clamp	 P01-FMD78xxx-03-xx-xx-xx-009	ISO 2852	– DN 25 (1") – DN 38 (1-1/2") – DN 51 (2")	Dependent on the clamp used
Hygienic connections	Membrane diaphragm seal (MDM)	Varivent	 P01-FMD78xxx-03-xx-xx-xx-007		Type N for pipes DN 40 – DN 162	PN 40
		DRD	 P01-FMD78xxx-03-xx-xx-xx-006		d = 65 mm	25 bar
		Sanitary tank spud with 2" extended diaphragm seal	 P01-FMD78xxx-03-xx-xx-xx-008		d = 100 mm	Dependent on the clamp used
		Taper adapter with coupling nut	 P01-FMD78xxx-03-xx-xx-xx-003	DIN 11851	– DN 50 – DN 65 – DN 80	PN 25
		Threaded adapter	 P01-FMD78xxx-03-xx-xx-xx-004	DIN 11851	– DN 50 – DN 65 – DN 80	PN 25

Design	Diaphr. seal	Connection	Version	Standard	Nominal diameter	Nom. press./Class
Flange	Membrane diaphragm seal (MDM)	EN/DIN flange	 P01-FMD78xxx-03-xx-xx-xx-001	EN 1092-1/ DIN 2527	– DN 50 – DN 80 – DN 100	Up to 40 bar
		ANSI flange		ANSI B 16.5	– 2" – 3" – 4"	150 lbs and 300 lbs
		JIS flange		B 2220	– 50 A – 80 A – 100 A	10 K
Flange with extended diaphragm seal	Membrane diaphragm seal (MDM)	ANSI flange	 P01-FMD78xxx-03-xx-xx-xx-002	ANSI B 16.5	– 3" with 2"/4"/6"/ 8" extended diaphragm seal – 4" with 2"/4"/6"/ 8" ext. diaphr. seal	150 lbs

Measuring principle

Ceramic measuring diaphragms used for PMD70 and FMD76

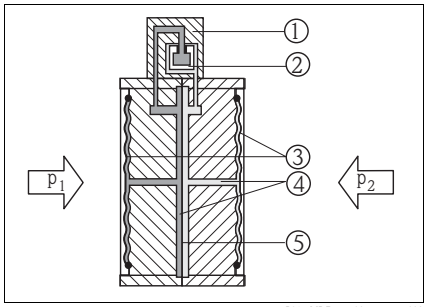


P01-xMD7xxxx-03-xx-xx-xx-000

Ceramic measuring cell PMD70 and FMD76

1 Meter body
2 Diaphragm
3 Electrodes
4 Glass frit fixes the diaphragm onto the meter body
5 Temperature sensor

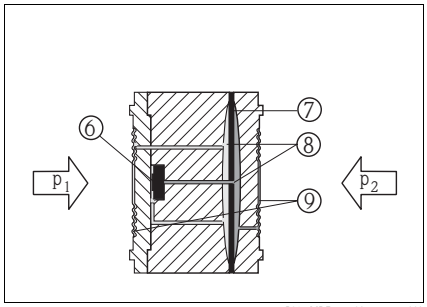
Metallic measuring diaphragms used for PMD75, FMD77 and FMD78



P01-xMD7xxxx-03-xx-xx-xx-002

Metal measuring cell 4 inH_2O (10 mbar) and 12 inH_2O (30 mbar)

1 Sensing element
2 Silicon diaphragm
3 Separating diaphragm
4 Filling oil
5 Integrated overload protection



P01-xMD7xxxx-03-xx-xx-xx-003

Metal measuring cell above 40 inH_2O (100 mbar)

6 Sensing element
7 Overload diaphragm/Middle diaphragm
8 Filling oil
9 Separating diaphragm

Ceramic measuring diaphragms used for PMD70 and FMD76

The ceramic measuring cell is based on the principle of a plate capacitor with an electrode on (1) and a movable electrode on the interior of the diaphragm (3). Standard silicone oil or mineral oil filling oils for this measuring cell.
A differential pressure ($p_1 \neq p_2$) causes a corresponding deflection of both diaphragms. Both capacitance values are converted and are fed to the microprocessor of the transmitter as a digital signal.

Advantages:
- Self-monitoring for diaphragm break or oil loss (constant comparison of the measured temperature with a temperature calculated from the capacitance values)
- Extremely high resistance to aggressive media
- Suitable for vacuums up to 0.02psi_{abs} (1 $mbar_{abs}$)
- Metal-free versions available
- Second process barrier (Secondary Containment) for enhanced integrity

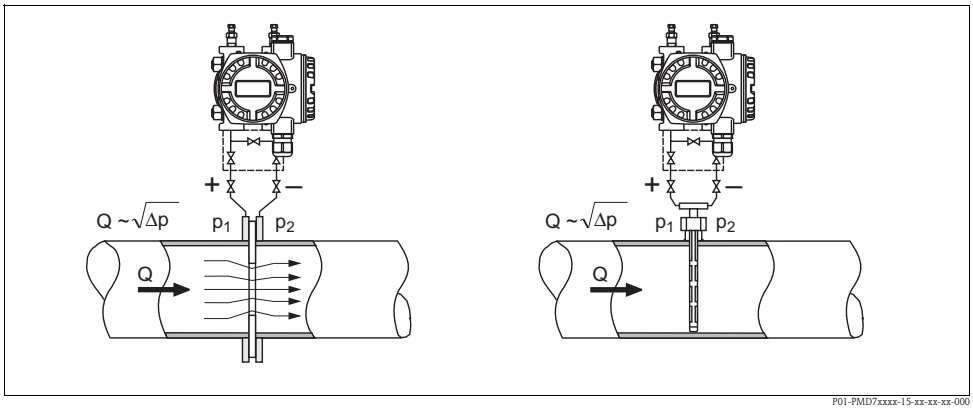
Metallic measuring diaphragms used for PMD75, FMD77 and FMD78

The separating diaphragms (3/9) are deflected on both sides by the acting pressures. A filling oil (4/8) transfers the pressure to a resistance circuit bridge (semi-conductor technology). The differential-pressure-dependent change of the bridge output voltage is measured and further processed.

Advantages:
- Standard operating pressures: 2320 psi and 6100 psi (160 bar and 420 bar)
- High long-term stability
- Very high single-sided overload resistance
- Second process barrier (Secondary Containment) for enhanced integrity

Flow measurement

Design and operation mode



Flow measurement with Deltabar S and primary element, left: Orifice plate and right: Pitot tube

Q Flow
Δp Differential pressure, $\Delta p = p_1 - p_2$

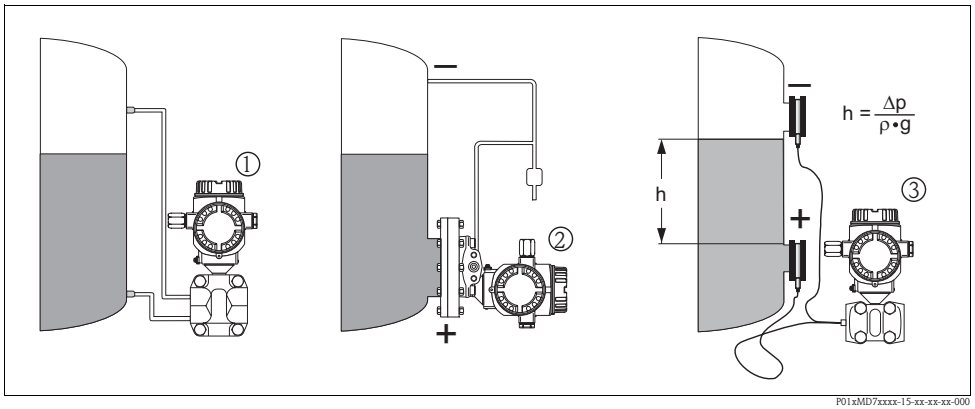
Your benefits

- Choice of four flow modes of operation: volume flow, norm volume flow (European norm conditions), standard volume flow (American standard conditions) and mass flow.
- Choice of diverse flow units with automatic unit conversion.
- A customized unit can be specified
- Low flow cut off: when activated, this function suppresses small flows which can lead to large fluctuations in the measured value.
- Contains two totalizers as standard. One totalizer can be reset to zero.
- The totalizing mode and unit can be individually set for each totalizer. This allows independent daily and annual quantity totalizing.
- With the product families Deltatop and Deltaset, Endress+Hauser is offering two universal and reliable solutions for flow measurement:
  – Deltatop, the compact, ready-to-use flow measuring unit including differential pressure transmitter Deltabar S
  – Deltaset with differential pressure transmitter Deltabar S, the modular flow measuring unit suitable for medium temperatures up to 1832°F (1000°C) and pressures up to 6000 psi (400 bar)

  Note: For more information about flow measurement with the Deltabar S differential pressure transmitter and orifice plate or pitot tube, see Technical Information TI297P Deltatop/Deltaset.

Level measurement (level, volume and mass)

Design and operation mode



Level measurement with Deltabar S

1 Level measurement via impulse piping and PMD70
2 Level measurement with FMD76
3 Level measurement with FMD78
h Height (level)
Δp Differential pressure
ρ Density of the medium
g Gravitation constant

Your benefits

- Choice of three level operating modes
- Volume and mass measurements in any tank shapes by means of a freely programmable characteristic curve
- Choice of diverse level units with automatic unit conversion
- A customised unit can be specified
- Has a wide range of uses, e.g.
  - for level measurement in tanks with superimposed pressure
  - in the event of foam formation
  - in tanks with agitators of screen fittings
  - in the event of liquid gases
  - for standard level measurement

Communication protocol

- 4 to 20 mA with HART communication protocol
- PROFIBUS PA
  - The Endress+Hauser devices meet the requirements as per the FISCO model.
  - Due to the low current consumption of 11 mA ± 1 mA
    - up to 9 Deltabar S for EEx ia, CSA IS and FM IS applications
    - up to 32 Deltabar S for all other applications, e.g. in non-hazardous areas, EEx nA, etc.

    can be operated at one bus segment with installation as per FISCO.

  Further information on PROFIBUS PA, such as requirements for bus system components, can be found in the Operating Instructions BA034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and in the PNO guideline.
- FOUNDATION Fieldbus
  - The Endress+Hauser devices meet the requirements as per the FISCO model.
  - Due to the low current consumption of 14 mA ± 1 mA
    - up to 7 Deltabar S for EEx ia, CSA IS and FM IS applications
    - up to 30 Deltabar S for all other applications, e.g. in non-hazardous areas, EEx nA, etc.

    can be operated at one bus segment with installation as per FISCO.

  Further information on FOUNDATION Fieldbus, such as requirements for bus system components can be found in the Operating Instructions BA013S "FOUNDATION Fieldbus Overview".

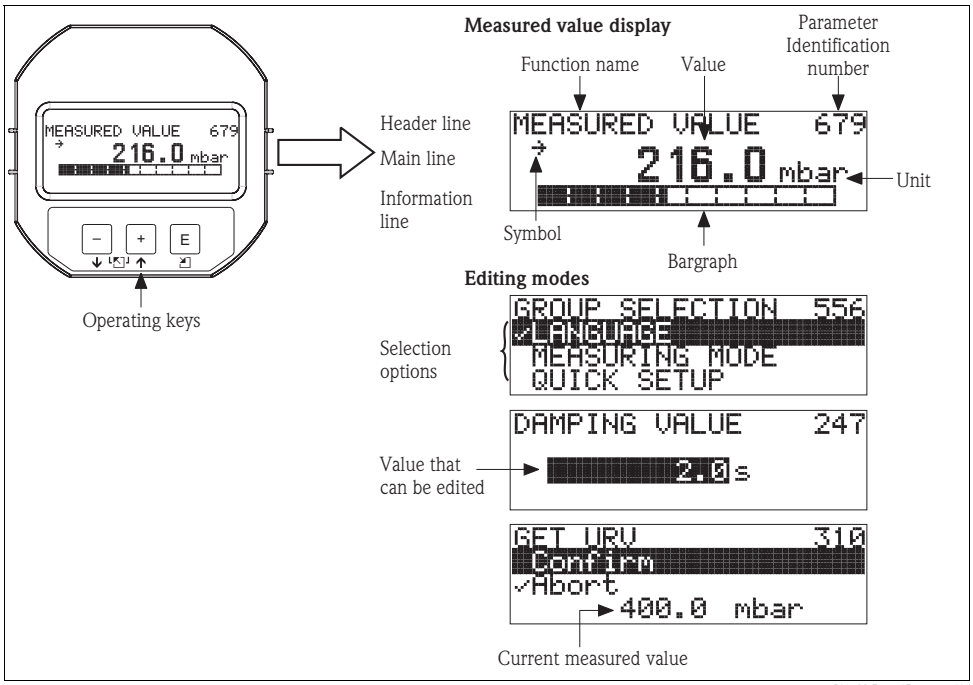
Human interface

Local display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation. The local display shows measured values, dialog text as well as fault and notice messages in plain text, thereby supporting the user in every stage of operation.

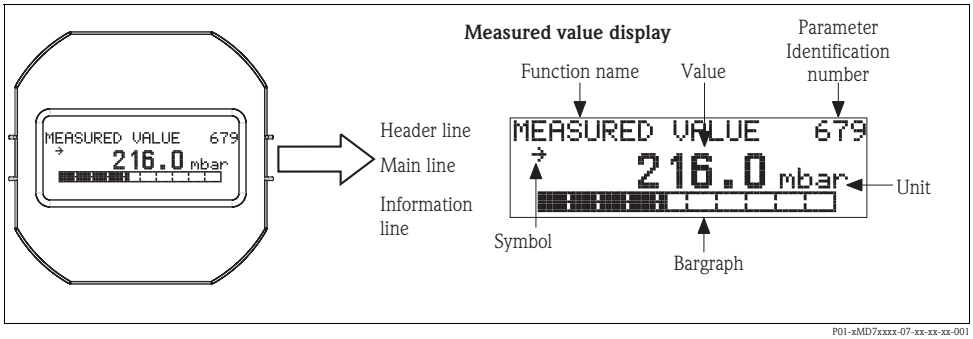
4 to 20 mA HART

Functions:
- 8-digit measured value display including sign and decimal point, bargraph for current display
- Simple and complete menu guidance thanks to separation of the parameters into three levels
- 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, display of other measured values such as sensor temperature, contrast setting
- Comprehensive diagnostic functions (fault and warning message, peak-hold indicators, etc.)
- rapid and safe commissioning with the Quick Setup menus



PROFIBUS PA and FOUNDATION Fieldbus

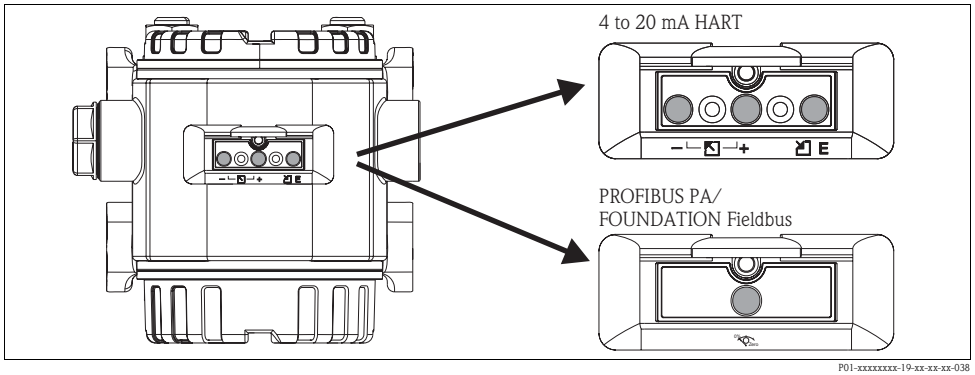
Functions:
- 8-digit measured value display including sign and decimal point, bargraph for current display
- Option for configuring the display according to individual requirements and desires, such as language, alternating display, display of other measured values such as sensor temperature, contrast setting
- Comprehensive diagnostic functions (fault and warning message)



Operating elements

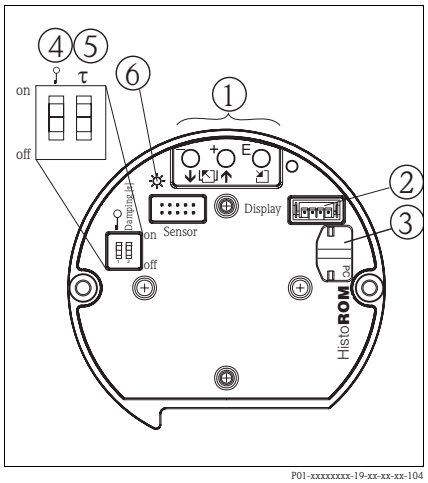
With regard to T14 and T15 housings, the operating keys are located either outside the device under the protection cap or inside on the electronic insert. In T17 housings, the operating keys are always located inside on the electronic insert.
In addition, devices with an local display and a 4 to 20 mA HART electronic insert have operating keys on the local display.

Operating keys on the exterior of the device



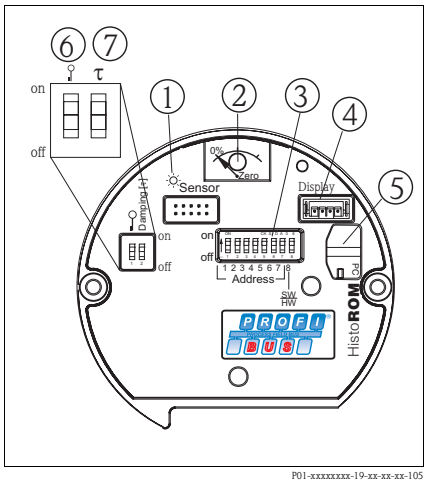
The operating keys located externally on the device work on the Hall sensor principle. As a result, no additional openings are required in the device. This guarantees:
- Complete protection against environmental influences such as moisture and contamination
- Simple operation without any tools
- No wear.

Operating keys and elements located internally on the electronic insert



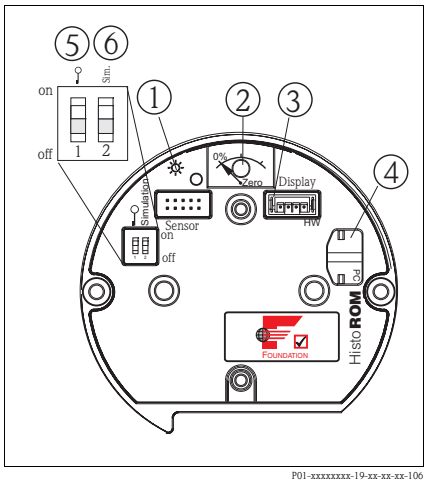
Electronic insert HART

1 Operating keys
2 Slot for optional display
3 Slot for optional HistoROM®/M-DAT
4 DIP-switch for locking/unlocking measured-value-relevant parameters
5 DIP-switch for damping on/off
6 Green LED to indicate value being accepted



Electronic insert PROFIBUS PA

1 Green LED to indicate value being accepted
2 Key for position calibration
3 DIP-switch for bus 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



Electronic insert FOUNDATION Fieldbus

1 Green LED to indicate value being accepted
2 Key for position calibration
3 Slot for optional display
4 Slot for optional HistoROM®/M-DAT
5 DIP-switch for locking/unlocking measured-value-relevant parameters
6 DIP-switch for simulation mode on/off

HistoROM®/M-DAT (optional)

HistoROM®/M-DAT is a memory module, which is attached to the electronic insert. The HistoROM®/M-DAT can be retrofitted at any stage (Order number: 52027785).

Your benefits

- Quick and safe commissioning of the same measuring points by copying the configuration data of one transmitter to another transmitter
- Reliable process monitoring thanks to cyclical recording of pressure and sensor temperature measured values
- Simple diagnosis by recording diverse events such as alarms, configuration changes, counters for measuring range undershoot and overshoot for pressure and temperature as well as user limit overshoot and undershoot for pressure and temperature etc.
- Analysis and graphic evaluation of the events and process parameters via ToF Tool (contained in scope of supply)

HistoROM®/M-DAT can be ordered via feature 100 "Additional options 1" or feature 110 "Additional options 2" or as spare parts. → See also page 63 ff. A CD with the Endress+Hauser ToF Tool operating program is also included in the scope of delivery.

You can copy data from one transmitter to another transmitter when operating a FOUNDATION Fieldbus device via an FF configuration program. You need the Endress+Hauser ToF Tool operating program and the FXA193 service interface to be able to access the data and events saved in the HistoROM®/M-DAT.

Functional Safety SIL2/ IEC 61508 Declaration of conformity (optional)

The Deltabar S differential pressure transmitters with 4 to 20 mA output signal have been developed to IEC 61508 standard and have been certified by TÜV SÜD. These devices can be used for flow and differential pressure monitoring up to SIL 2.
→ For a detailed description of the safety functions with Deltabar S, settings and characteristic quantities for functional safety, please refer to the "Manual for Safety Manual - Deltabar S" SD189P.
→ For devices with SIL2/IEC 61508 declaration of conformity, see page 64 ff, Feature 100 "Additional option 1" and Feature 110 "Additional option 2", version E "SIL2/IEC 61508, Declaration of Conformity".

Local operation

Functions 4 to 20 mA HART

- With local display: navigate through the operating menu using three operating keys
- Without local display:
  - Position calibration (zero point correction)
  - Setting lower-range value and upper-range value – reference pressure present at device
  - Value acceptance indicated by green LED
- Device reset
- Locking and unlocking measured-value-relevant parameters
- Switching damping on and off

Functions PROFIBUS PA

- Position calibration (zero point correction)
- Value acceptance indicated by green LED
- Locking and unlocking measured-value-relevant parameters
- Setting bus address
- Switching damping on and off

Functions FOUNDATION Fieldbus

- Position calibration (zero point correction)
- Value acceptance indicated by green LED
- Locking and unlocking measured-value-relevant parameters
- Switching simulation mode on and off

Handheld terminals – HART

With a handheld terminal, all the parameters can be configured anywhere along the 4 to 20 mA line via menu operation.

Handheld terminal DXR375 – FOUNDATION Fieldbus

With a handheld terminal DXR375, all the parameters can be configured via menu operation.

**ToF Tool –
HART, PROFIBUS PA,
FOUNDATION Fieldbus**

The ToF Tool is a graphic and menu-guided operating program for measuring devices from Endress+Hauser. It is used for the commissioning, data storage, signal analysis and documentation of the devices. The following operating systems are supported: WinNT4.0, Win2000 and Windows XP. You can set all parameters via the ToF Tool.

The ToF Tool supports the following functions:
- Configuration of transmitters in online operation
- Loading and saving device data (upload/download)
- HistoROM®/M-DAT analysis
- Calculation of tank characteristics for the level measuring mode
- Documentation of the measuring point

Connection options:
- HART via Commubox FXA191 and the serial interface RS 232 C of a computer
- HART via Commubox FXA195 and the USB interface of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card
- FOUNDATION Fieldbus, PROFIBUS PA and HART: Service interface with adapter FXA193

Note!
You can use the ToF Tool to configure the Endress+Hauser parameters for devices with "FOUNDATION Fieldbus signal". You need an FF configuration program to be able to configure all the FF-specific parameters and to integrate the device into an FF network.

**FieldCare –
HART, PROFIBUS PA**

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. The following operating systems are supported: WinNT4.0, Win2000 and Windows XP.

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:
- HART via Commubox FXA195 and the USB interface of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card

**Remote operation –
FOUNDATION Fieldbus**

An FF configuration program is required to integrate a device with "FOUNDATION Fieldbus signal" into an FF network or to set the FF-specific parameters. Please contact your local Endress+Hauser Sales Center for more information.

Service interface FXA193

The FXA193 service interface connects Cerabar S, Deltabar S, ToF and PROline measuring devices (level and flow measuring devices) with the RS 232 C serial interface of a PC and thus makes it possible to operate the measuring devices with the Endress+Hauser ToF Tool operating program. The FXA193 service interface is connected to the interface for the local display on the electronic insert. → See also graphics on page 11.

Input

Measured variable

Differential pressure, from which flow (volume or mass current) and level (level, volume or mass) are derived

Measuring range

PMD75, FMD77, FMD78 (with metallic measuring diaphragms)

Nominal value	Measurement limit		Span		MWP [1]	Overload [2]		min. operating pressure [3]	Versions in the order code	
	lower (LRL)	upper (URL)	recom-mended min./max.	minimum [5]		on one side	on both sides		2320 psi (PN 160) [6]	6100 psi (PN 420) [6]
(mbar)	(mbar)	(mbar)	(mbar)	(mbar)	psi (bar)	psi (bar)	psi (bar)	psia ($mbar_{abs}$)		
4 inH_2O (10) [7]	-4 inH_2O (–10)	+4 inH_2O (+10)	4/4 inH_2O (10/10)	0.1 inH_2O (0.25)	2320 (160)	2320 (160)	3480 (240)	0.001 (0.1)	7B	–
12 inH_2O (30) [7]	-12 inH_2O (–30)	+12 inH_2O (+30)	12/12 inH_2O (30/30)	0.12 inH_2O (0.3)	2320 (160)	2320 (160)	3480 (240)	0.001 (0.1)	7C	–
40 inH_2O (100)	-40 inH_2O (–100)	+40 inH_2O (+100)	10/40 inH_2O (25/100)	0.4/2 inH_2O (1/5) [8]	2320 (160)	2320 (160)	3480 (240)	0.001 (0.1)	7D	–
200 inH_2O (500)	-200 inH_2O (–500)	+200 inH_2O (+500)	13/200 inH_2O (33/500)	2 inH_2O (5)	2320/6100 (160/420) [9]	2320/6100 (160/420)	3480/9140 (240/630)	0.001 (0.1)	7F	8F
43 psi (3000)	-43 psi (–3000)	+43 psi (+3000)	3/43 psi (200/3000)	0.4 psi (30)	2320/6100 (160/420)[9]	2320/6100 (160/420)	3480/9140 (240/630)	0.001 (0.1)	7H	8H
232 psi (16000)	-232 psi (–16000)	+232 psi (+16000)	15/232 psi (1066/16000)	2 psi (160)	2320/6100 (160/420) [9]	2320/6100 (160/420)	3480/9140 (240/630)	0.001 (0.1)	7L	8L
600 psi (40000)	-600 psi (–40000)	+600 psi (+40000)	40/600 psi (2666/40000)	6 psi (400)	2320/6100 (160/420) [9]	"+"side: 2320/6100 (160/420) [10]	3480/9140 (240/630)	0.001 (0.1)	7M	8M

PMD70, FMD76 (with ceramic measuring diaphragms)

Nominal value	Measurement limit		Span		MWP [1]	Overload [2]		Min. operating pressure [3]	Versions in order code [4]
	lower (LRL)	upper (URL)	recom-mended min./max.	minimum [5]		on one side	on both sides		
inH_2O (mbar)	inH_2O (mbar)	inH_2O (mbar)	inH_2O (mbar)	inH_2O (mbar)	psi (bar)	psi (bar)	psi (bar)	psia ($mbar_{abs}$)	
10 (25)	-10 (–25)	+10 (+25)	10 (25)	0.1 (0.25)	145 (10)	145 (10)	217 (15)	0.015 (1)	7B
40 (100)	-40 (–100)	+40 (+100)	10/40 (25/100)	0.4 (1)	232 (16)	232 (16)	348 (24)	0.015 (1)	7D
200 (500)	-200 (–500)	+200 (+500)	13/200 (33/500)	2 (5)	1450 (100)	1450 (100)	2175 (150)	0.015 (1)	7F
1200 (3000)	-1200 (-3000)	+1200 (+3000)	80/1200 (200/3000)	12 (30)	1450 (100)	1450 (100)	2175 (150)	0.015 (1)	7H

1) The MWP (maximum working pressure; MWP = PN) for the measuring device depends on the weakest element of the components selected with regard to pressure, i.e. the process connection (→ see page 32 ff) has to be taken into consideration in addition to the measuring cell (→ see table above). Also observe pressure-temperature dependency. For the appropriate standards and further information, see page 31, "Pressure specifications" section.
2) The maximum pressure for the measuring device is dependent on the lowest-rated element, with regard to pressure, of the selected components. → See also page 31, section "Pressure specifications".
3) The minimum operating pressure indicated in the table applies to silicone oil under reference operating conditions.
Min. operating pressure at 185°F (85°C) for silicone oil: 0.14 psia (10 $mbar_{abs}$).
FMD77 and FMD78: Min. operating pressure: 0.73 psia (50 $mbar_{abs}$); observe also the pressure and temperature application limits of the selected filling oil on page 54. For vacuum applications, please observe the installation instructions on Page 61 ff.
4) Versions in the order code → See also page 66 ff, feature 40 "Nominal range; PN"
5) Minimum span that can be calibrated, Turn down > 100:1 on request
6) PN 160 versions with stainless steel A2 screws, PN 420 versions with stainless steel A4 M12 screws
PN 420 versions for PMD75 only.

7) PMD75 only
8) Minimum span that can be calibrated for PMD75: 0.4 inH_2O (1 mbar); minimum span that can be calibrated for FMD77 and FMD78: 2 inH_2O (5 mbar)
9) For PMD75 with CRN-approved process connections, the MWP is 4570 psi (315 bar).
10) "–" side: 1450 psi (100 bar)

Explanation of terms

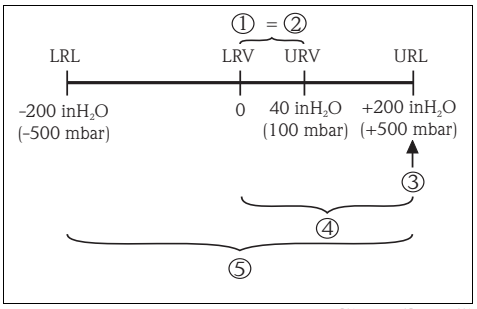
Explanation of the terms: Turn down (TD), set span and zero based span

Case 1:
- $|$Lower range value$|$ ≤ $|$Upper range value$|$

Example:
- Lower range value (LRV) = 0 psi (mbar)
- Upper range value (URV) = 40 inH_2O (100 mbar)
- Nominal value (URL) = 200 inH_2O (500 mbar)

Turn down:
- Nominal value / $|$Upper range value$|$ = 200 inH_2O/40 inH_2O (500 mbar/100 mbar) TD = 5:1

set span:
- Upper range value – Lower range value = 100 mbar – 0 psi (0 mbar) set span = 40 inH_2O (100 mbar) This span is based on the zero point.



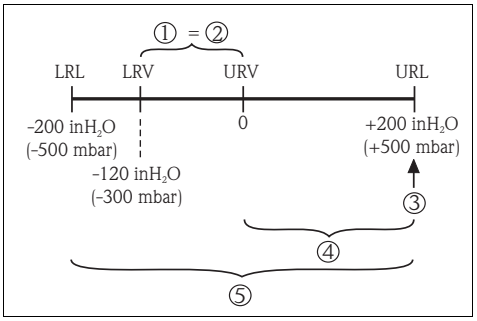
Example: 200 inH_2O (500 mbar) sensor

Case 2:
- $|$Lower range value$|$ ≥ $|$Upper range value$|$

Example:
- Lower range value (LRV) = -120 inH_2O (–300 mbar)
- Upper range value (URV) = 0 (0 bar)
- Nominal value (URL) = 200 inH_2O (500 mbar)

Turn down:
- Nominal value / $|$Lower range value$|$ = 200 inH_2O/120 inH_2O (500 mbar/300 mbar) TD 1.67:1

set span:
- Upper range value – Lower range value = 0 psi - (-120 inH_2O) 0 mbar – (–300 mbar) set span = 120 inH_2O (300 mbar) This span is based on the zero point.



Example: 200 inH_2O (500 mbar) sensor

1 Set span
2 Zero based span
3 Nominal value ≙ Upper range limit (URL)
4 Nominal measuring range
5 Sensor measuring range
LRL Lower range limit
URL Upper range limit
LRV Lower range value
URV Upper range value

Output

Output signal

- 4 to 20 mA with superimposed digital communication protocol HART 5.0, 2-wire
- Digital communication signal PROFIBUS PA (Profile 3.0)
- Digital communication signal FOUNDATION Fieldbus

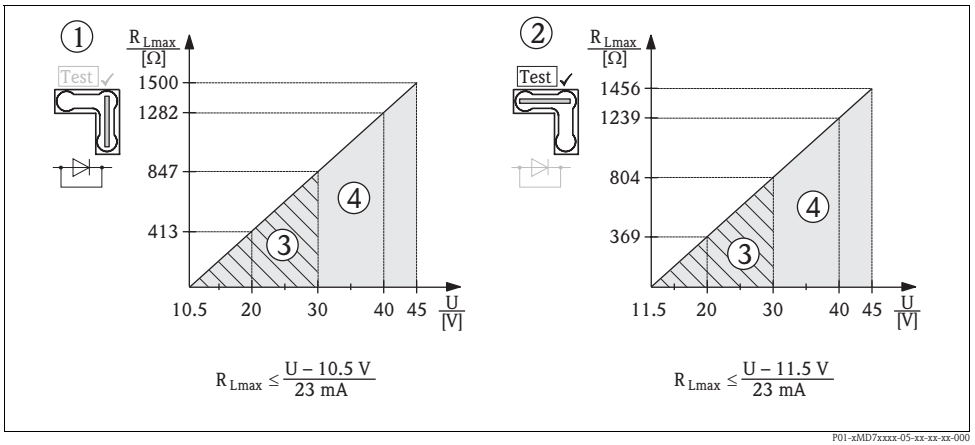
Signal range – 4 to 20 mA HART

3.8 mA to 20.5 mA

Signal on alarm

- 4 to 20 mA HART
  Options:
  – Max. alarm*: can be set from 21 to 23 mA
  – Keep measured value: last measured value is kept
  – Min. alarm: 3.6 mA
  * Factory setting: 22 mA
- PROFIBUS PA: can be set in the Analog Input block,
  options: Last Valid Out Value, Fsafe Value (factory setting), Status bad
- FOUNDATION Fieldbus: can be set in the Analog Input Block,
  options: Last Good Value, Fail Safe Value (factory setting), Wrong Value

Load – 4 to 20 mA HART



Load diagram, observe the position of the jumper and the explosion protection (→ See also page 20, section "Measuring 4 to 20 mA test signal".)

1 Jumper for 4 to 20 mA test signal inserted in "Non-test" position
2 Jumper for 4 to 20 mA test signal inserted in "Test" position
3 Supply voltage 10.5 (11.5) to 30 V DC for 1/2 D, 1 GD, 1/2 GD, FM IS, CSA IS, IECEx ia, NEPSI Ex ia and TIIS Ex ia
4 Supply voltage 10.5 (11.5) to 45 V DC for device for non-hazardous areas, 1/2 D, 1/3 D, 2 G EEx d, 3 G EEx nA, FM XP, FM DIP, FM NI, CSA XP, CSA Dust-Ex, NEPSI Ex d and TIIS Ex d
R_{Lmax} Maximum load resistance
U Supply voltage

Note!
When operating via a handheld terminal or via PC with an operating program, a minimum communication resistance of 250 Ω must exist within the loop.

Resolution

- Current output: 1 μA
- Display: can be set (setting at the factory: presentation of the maximum accuracy of the transmitter)

Reading cycle

- HART commands: on average 3 to 4 per second
- PROFIBUS PA:
  - cyclic:
    - max.: 100/s
    - typical value: 20/s
  - acyclic:
    - max.: 20/s
    - typical value: 10/s
- FOUNDATION Fieldbus:
  - cyclic: up to 5/s, dependent on the number and type of function blocks used in a closed-control loop
  - acyclic: 10/s

Cycle time (Update time)

PROFIBUS PA

- The cycle time in a bus segment in cyclic data communication depends on the number of devices, on the segment coupler used and on the internal PLC cycle time.
- The minimum cycle time is approx. 20 ms per device.

Response time

- PROFIBUS PA:
  - cyclic: approx. 10 ms per request
  - acyclic: < 50 ms
- FOUNDATION Fieldbus:
  - cyclic: < 80 ms
  - acyclic: < 40 ms

All values are typical values.

Damping

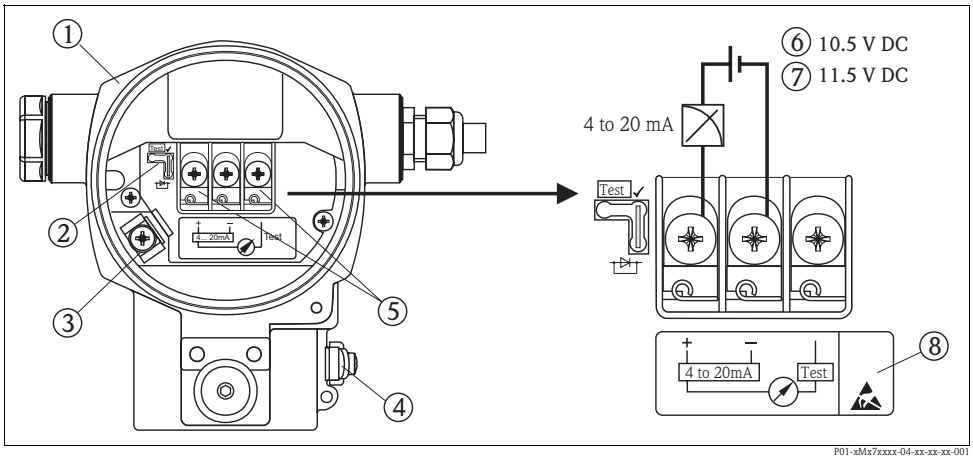
- Via on-site display, handheld terminal or PC with operating program, continuous from 0 to 999 s
- Additionally for HART and PROFIBUS PA: via DIP-switch on the electronic insert, switch position "on" = set value and "off"
- Factory setting: 2 s

Power supply

Electrical connection

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. → See also page 77, section "Safety Instructions" and "Installation/Control Drawings".
- Devices with integrated overvoltage protection must be earthed. → See also page 30.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.

4 to 20 mA HART



Electrical connection 4 to 20 mA HART

1 Housing
2 Jumper for 4 to 20 mA test signal. → See also page 20, section "Measuring 4 to 20 mA test signal" .
3 Internal earth terminal
4 External earth terminal
5 4 to 20 mA test signal between positive and test terminal
6 minimum supply voltage = 10.5 V DC, jumper is inserted in accordance with the illustration.
7 minimum supply voltage = 11.5 V DC, jumper is inserted in "Test" position.
8 Devices with integrated overvoltage protection are labelled OVP (overvoltage protection) here (→ see also page 30).

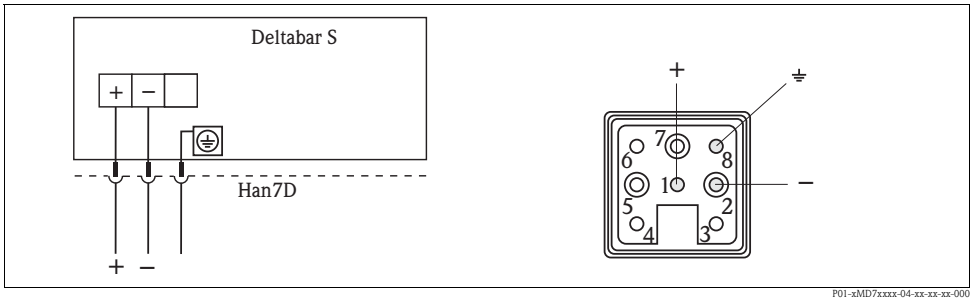
PROFIBUS PA

The two-wire cable must be connected to the "PA+" and "PA–" terminals.

FOUNDATION Fieldbus

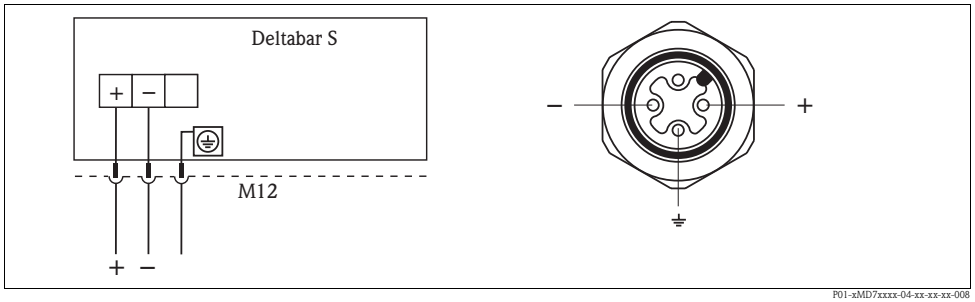
The two-wire cable must be connected to the "FF+" and "FF–" terminals.

Devices with Harting plug Han7D



Left: electrical connection for devices with Harting plug Han7D
Right: view of the plug at the device

Devices with M12 plug



Left: electrical connection for devices with M12 plug
Right: view of the plug at the device

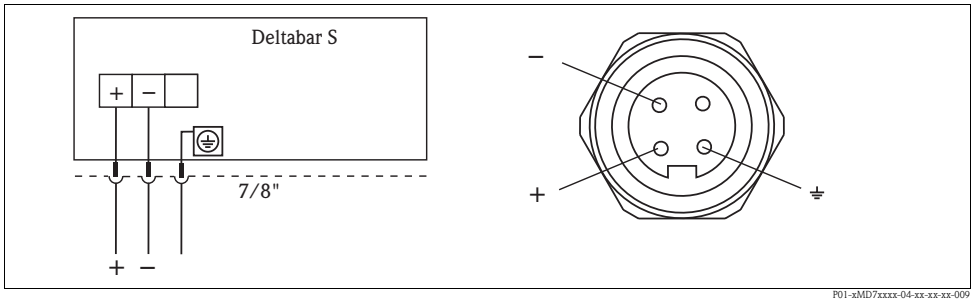
Endress+Hauser offers for devices with M12 plug the following accessories:

Plug-in jack M 12x1, straight
- Material: Body PA; coupling nut CuZn, nickel-plated
- Degree of protection (fully locked): NEMA 4X (IP67)
- Order number: 52006263

Plug-in jack M 12x1, elbowed
- Material: Body PBT/PA; coupling nut GD-Zn, nickel-plated
- Degree of protection (fully locked): NEMA 4X (IP67)
- Order number: 51006327

Cable 4 x 20 AWG (4x0.34 mm^2) with M12 socket, elbowed, threaded plug, 16 ft (5 m length)
- Material: Body PUR; coupling nut CuSn/Ni; cable PVC
- Degree of protection (fully locked): NEMA 4X (IP67)
- Order number: 52010285

Devices with 7/8" plug



Left: electrical connection for devices with 7/8" plug
Right: view of the plug at the device

Measuring 4 to 20 mA test signal

A 4 to 20 mA signal may be measured via the positive and test terminal without interrupting the measurement. The minimum supply voltage of the device can be reduced by simply changing the position of the jumper. As a result, operation is also possible with lower voltage sources. Observe the position of the jumper in accordance with the following table.

Jumper position for test signal	Description
	– Measuring 4 to 20 mA test signal via plus and test terminal: possible. (Thus, the output current can be measured without interruption via the diode.) – Delivery status – Minimum supply voltage: 11.5 V DC
	– Measuring 4 to 20 mA test signal via plus and test terminal: not possible. – Minimum supply voltage: 10.5 V DC

Supply voltage

Note!
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas. → See also page 77, sections "Safety Instructions" and "Installation/Control drawing".

4 to 20 mA HART

- Version for non-hazardous areas, jumper for 4 to 20 mA test signal in "Test" position (delivery status): 11.5 to 45 V DC
- Version for non-hazardous areas, jumper for 4 to 20 mA test signal in "Non-test" position: 10.5 to 45 V DC

PROFIBUS PA

- Version for non-hazardous areas: 9 to 32 V DC

FOUNDATION Fieldbus

- Version for non-hazardous areas: 9 to 32 V DC

Current consumption

- PROFIBUS PA: 11 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21
- FOUNDATION Fieldbus: 14 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21

Cable entry

→ See also page 63 ff, feature 30 "Housing, Cable entry, Protection".

Cable specification

- Endress+Hauser recommends using shielded, twisted-pair two-wire cables.
- Terminals for wire cross-sections 20 to 14 AWG (0.5 to 2.5 mm^2)
- Cable external diameter: 0.2" to 0.4" (5 to 9 mm)

Residual ripple

Without influence on 4 to 20 mA signal up to ± 5 % residual ripple within the permitted voltage range [according to HART hardware specification HCF_SPEC-54 (DIN IEC 60381-1)]

Influence of power supply

≤ 0.0006% of URL/1 V

Performance characteristics – general

Reference operating conditions

- As per IEC 60770
- Ambient temperature T_U = constant, in the range of: +69.8 to +91.4°F (+21 to +33°C)
- Humidity φ = constant, in the range of: 5 to 80 % r.H
- Ambient pressure p_U = constant, in the range of: 12 to 15 psi (860 to 1060 mbar)
- Position of the measuring cell: constant, in the range of: ±1°
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- Zero based span
- Membrane material
  - PMD75: AISI 316L SS/1.4435, Alloy C276, Gold-Rhodium coated, Monel
  - FMD77, FMD78: AISI 316L SS/1.4435
  - PMD70, FMD76: Al_2O_3 (Aluminum-oxide-ceramic)
- Filling oil: silicone oil
- Supply voltage: 24 V DC ± 3 V DC
- Load with HART: 250 Ω

Long-term stability

Measuring cells ≥ 200 inH_2O (500 mbar):
- ±0.05% of URL/year
- ±0.125% of URL/5 years

Measuring cells ≤ 40 inH_2O (100 mbar):
- ±0.18% of URL/year

Influence of the installation position

- PMD70, FMD76: ≤ 1.2 inH_2O (3 mbar) [1, 3]
- PMD75: ≤ 1.6 inH_2O (4 mbar) [1, 3]
- FMD77: ≤ 12.8 inH_2O (32 mbar) [2, 3]

1) Device is rotated vertically to the membrane axis.
2) Device rotated vertically to the flange membrane.
3) The value is doubled for devices with inert oil.

Note!
Position-dependent zero shift can be corrected. → See also page 26, section "General installation instructions" and page 59 ff, section "Installation instructions, Diaphragm seal systems".

Vibration effects

Device	Housing	Test standard	Vibration effects
PMD70/ FMD76	optional local display on the side (T14)	GL	≤ reference accuracy to 10 to 18 Hz: ±0.16" (4 mm); 18 to 500 Hz: 5 g
PMD75	optional local display on the side (T14)	IEC 61298-3	≤ reference accuracy to 10 to 60 Hz: ±0.01" (0.35 mm); 60 to 2000 Hz: 5 g
PMD75	optional local display on the top (T15)		

Performance characteristics – metallic diaphragms

Reference accuracy – PMD75, FMD77, FMD78

The reference accuracy comprises the non-linearity including hysteresis and non-reproducibility in accordance with the limit point method as per IEC 60770.

The following applies for the root-extracting characteristic curve:
The accuracy data of the Deltabar S is taken into the accuracy calculation of the flow rate with a factor of 0.5.

PMD75, FMD77 and FMD78

4 inH_2O, 12 inH_2O (10 mbar, 30 mbar) measuring cells:
- TD 1:1: ±0.15% of the set span
- TD > 1:1: ±0.15% of the set span x TD

40 inH_2O (100 mbar) measuring cell:
- TD 1:1 to TD 4:1: ±0.075% of the set span
- TD > 4:1: ±(0.012 x TD + 0.027)% of the set span

Measuring cells ≥ 200 inH_2O (500 mbar):
- TD 1:1 to TD 15:1: ±0.075% of the set span
- TD > 15:1: ±(0.0015 x TD + 0.053)% of the set span

Platinum version,
Measuring cells ≥ 40 inH_2O (100 mbar):
- TD 1:1: ±0.05 % of the set span

Total performance – PMD75

The "Total performance" specification comprises the non-linearity including hysteresis, non-reproducibility, the thermal change of the zero point as well as the influence of the line pressure (p_{st} = 1015 psi / 70 bar).

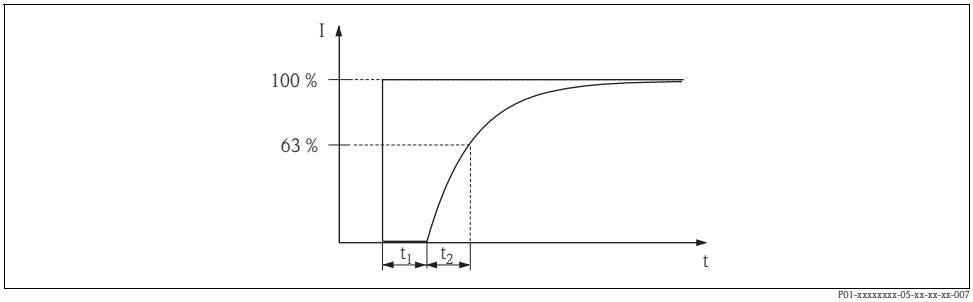
- AISI 316L /1.4435, Alloy, Gold-Rhodium coated or Monel membrane:
  ±0.15 % of the set span [1, 2]
- Tantalum membrane:
  ±0.30 % of the set span [1, 2]

1. for measuring ranges ≥ 200 inH_2O (500 mbar) to TD 2:1
2. All specifications apply to the temperature range +14 to +140°F (–10 to +60°C).

Warm-up period – PMD75, FMD77, FMD78

- 4 to 20 mA HART : < 10 s
- PROFIBUS PA: 6 s
- FOUNDATION Fieldbus: 50 s

Dynamic response time, Time constant (T63) – PMD75, FMD77, FMD78



Presentation of the dynamic response time and the time constant

Type	Dynamic response time t_1	Time constant (T63), t_2
PMD75	45 ms	■ 4 inH_2O and 12 inH_2O (10 mbar and 30 mbar) measuring cell: 200 ms ■ 40 inH_2O (100 mbar) measuring cell: 60 ms ■ 200 inH_2O (500 mbar) measuring cell: 45 ms ■ 43 psi (3 bar) measuring cell: 40 ms ■ 232 psi and 580 psi (16 bar and 40 bar) measuring cell: 60 ms
FMD77, FMD78	dependent on the diaphragm seal	

Influence of the operating pressure on zero point and span – PMD75, FMD77, FMD78

Measuring cell	AISI 316L SS/1.4435, Alloy, Gold-Rhodium coated or Monel membrane		Tantalum membrane	
	Influence of the operating pressure on the zero point **psi (bar)**	Influence of the operating pressure on the span **psi (bar)**	Influence of the operating pressure on the zero point **psi (bar)**	Influence of the operating pressure on the span **psi (bar)**
4 inH_2O (10 mbar)	±0.15 % of URL/100 psi (7 bar)	±0.035 % of URL/100 psi (7 bar)	±0.28 % of URL/100 psi (7 bar)	±0.28 % of URL/100 psi (7 bar)
12 inH_2O (30 mbar)	±0.35 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)	±0.70 % of URL/1015 psi (70 bar)	±0.70 % of URL/1015 psi (70 bar)
40 inH_2O (100 mbar)	±0.15 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)	±0.42 % of URL/1015 psi (70 bar)	±0.42 % of URL/1015 psi (70 bar)
200 inH_2O (500 mbar)	±0.075 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)
43 psi (3 bar)	±0.075 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)
232 psi (16 bar)	±0.075 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)
600 psi (40 bar)	±0.075 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)

Note!
The influence of the operating pressure on the zero point can be calibrated out.

Thermal change of the zero output and the output span – PMD75

+14 to +140°F (–10 to +60°C)
AISI 316L SS/1.4435, Alloy, Gold-Rhodium coated or Monel membrane:
- 4 inH_2O, 12 inH_2O (10 mbar, 30 mbar) measuring cell: ±(0.31 x TD + 0.06)% of the set span
- 40 inH_2O (100 mbar) measuring cell: ±(0.18 x TD + 0.02)% of the set span
- 200 inH_2O (500 mbar), 43 psi (3 bar) measuring cell: ±(0.08 x TD + 0.05)% of the set span
- 232 psi (16 bar) measuring cell: ±(0.1 x TD + 0.1)% of the set span
- 600 psi (40 bar) measuring cell: ±(0.08 x TD + 0.05)% of the set span

+14 to +140°F (–10 to +60°C)
Tantalum membrane:
- 4 inH_2O, 12 inH_2O (10 mbar, 30 mbar) measuring cell: ±(0.31 x TD + 0.06)% of the set span
- 40 inH_2O (100 mbar) measuring cell: ±(0.24 x TD + 0.06)% of the set span
- 200 inH_2O (500 mbar), 43 psi (3 bar) measuring cell: ±(0.08 x TD + 0.05)% of the set span
- 232 psi (16 bar) measuring cell: ±(0.1 x TD + 0.1)% of the set span
- 600 psi (40 bar) measuring cell: ±(0.08 x TD + 0.05)% of the set span

–40 to +14°F, +140 to +185°F (–40 to –10°C, +60 to +85°C)
All membrane materials:
- 4 inH_2O, 12 inH_2O (10 mbar, 30 mbar) measuring cell: ±(0.45 x TD + 0.1)% of the set span
- 40 inH_2O (100 mbar) measuring cell: ±(0.3 x TD + 0.15)% of the set span
- 200 inH_2O (500 mbar), 43 psi (3 bar) measuring cell: ±(0.12 x TD + 0.1)% of the set span
- 232 psi (16 bar) measuring cell: ±(0.15 x TD + 0.2)% of the set span
- 600 psi (40 bar) measuring cell: ±(0.37 x TD + 0.1)% of the set span

Performance characteristics – ceramic diaphragms

Reference accuracy – PMD70, FMD76

The reference accuracy comprises the non-linearity including hysteresis and non-reproducibility in accordance with the limit point method as per IEC 60770.

The following applies for the root-extracting characteristic curve:
The accuracy data of the Deltabar S is taken into the accuracy calculation of the flow rate with a factor of 0.5.

10 inH_2O (25 mbar) measuring cell:
- TD 1:1: ±0.15% of the set span
- TD > 1:1: ±0.15% of the set span x TD

40 inH_2O (100 mbar) measuring cell:
- TD 1:1 to TD 4:1: ±0.075% of the set span
- TD > 4:1: ±(0.012 x TD + 0.027)% of the set span

200 inH_2O (500 mbar), 43 psi (3 bar) measuring cell:
- TD 1:1 to TD 15:1: ±0.075% of the set span
- TD > 15:1: ±(0.0015 x TD + 0.05252)% of the set span

Platinum version,
40 inH_2O (100 mbar), 200 inH_2O (500 mbar), 43 psi (3 bar) measuring cells:
- TD 1:1: ±0.05 % of the set span

Total performance – PMD70, FMD76

The "Total performance" specification comprises the non-linearity including hysteresis, non-reproducibility, the thermal change of the zero point as well as the influence of the line pressure (p_{st} = 1015 psi / 70 bar).

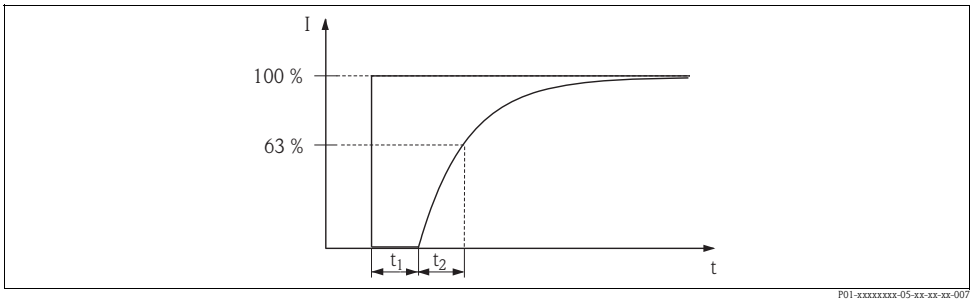
- ±0.15% of the set span [1, 2]

1. for measuring ranges ≥ 200 inH_2O (500 mbar), TD 1:1
2. All specifications apply to the temperature range +14 to +140°F (–10 to +60°C).

Warm-up period – PMD70, FMD76

- 4 to 20 mA HART : < 10 s
- PROFIBUS PA: 6 s
- FOUNDATION Fieldbus: 50 s

Dynamic response time, Time constant (T63) – PMD75, FMD77, FMD78



Presentation of the dynamic response time and the time constant

Type	Dynamic response time t_1	Time constant (T63), t_2
PMD70, FMD76	90 ms	■ 10 inH_2O (25 mbar) measuring cell: 4700 ms ■ 40 inH_2O (100 mbar) measuring cell: 280 ms ■ 200 inH_2O (500 mbar) measuring cell: 210 ms ■ 43 psi (3 bar) measuring cell: 110 ms

Influence of the operating pressure on zero point and span – PMD70, FMD76

Measuring cell	Influence of the operating pressure on the zero point	Influence of the operating pressure on the span
10 inH_2O (25 mbar)	±0.7 % of URL/100 psi (7 bar)	±0.14 % of URL/100 psi (7 bar)
40 inH_2O (100 mbar)	±0.175 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)
200 inH_2O (500 mbar)	±0.075 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)
43 psi (3 bar)	±0.075 % of URL/1015 psi (70 bar)	±0.14 % of URL/1015 psi (70 bar)

Note!
The influence of the operating pressure on the zero point can be calibrated out.

Thermal change of the zero output and the output span – PMD70, FMD76

+14 to +140°F (–10 to +60°C):
- 10 inH_2O (25 mbar) measuring cell: ±(0.35 x TD + 0.05)% of the set span
- ≥ 40 inH_2O (100 mbar) measuring cells: ±(0.05 x TD + 0.05)% of the set span

–4 to +14°F, +140 to +185°F (–20 to –10°C, +60 to +85°C):
- 10 inH_2O (25 mbar) measuring cell: ±(0.3 x TD + 0.15)% of the set span
- ≥ 40 inH_2O (100 mbar) measuring cells: ±(0.08 x TD + 0.07)% of the set span

Operating conditions (installation)

General installation instructions

- The position-dependent zero shift can be corrected directly at the device via operating key, for devices with external operation even in hazardous areas. Diaphragm seals also shift the zero point, depending on the installation position (→ See also page 60 ff, "Installation instructions, Diaphragm seal systems").
- The housing of the Deltabar S can be rotated up to 380°. → See also page 28, section "Rotate the housing".
- Endress+Hauser offers a mounting bracket for installing the device on pipes or walls. → See also page 27, section "Wall- and pipe-mounting".
- When measuring in media with solid proportions, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.
- Using a three-valve or five-valve manifold allows for easy commissioning, installation and maintenance without interrupting the process (refer to "Accessories").
- General recommendations for 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.
- Install the impulse piping with a continuous gradient of at least 10%.
- When routing the impulse piping outdoors, ensure that sufficient anti-freeze protection is used, e.g. by using pipe heat tracing.
- For FMD77 and FMD78: See page 60 ff, "Installation instructions, Diaphragm seal systems" section.

Measuring arrangement

Flow measurement

- The PMD70 and PMD75 are best suited to flow measurement.
- Measuring arrangement for gases: Mount device above the measuring point.
- Measuring arrangement for liquids and steam: Mount device below tapping point.
- For flow measurement in steam, mount the condensate traps at the same level as the tapping point and at the same distance from Deltabar S.

Level measurement

- PMD70, PMD75, FMD76 and FMD77 are best suited to level measurement in open tanks. All Deltabar S devices are suitable for level measurement in closed tanks.

Measuring arrangement level measurement in open tanks

- PMD70, PMD75: Mount device below the lower measuring connection. The negative side is open to atmosphere pressure.
- FMD76, FMD77: Mount device direct on the tank. The negative side is open to atmosphere pressure.

Measuring arrangement level measurement in closed tanks and closed tanks with static pressure

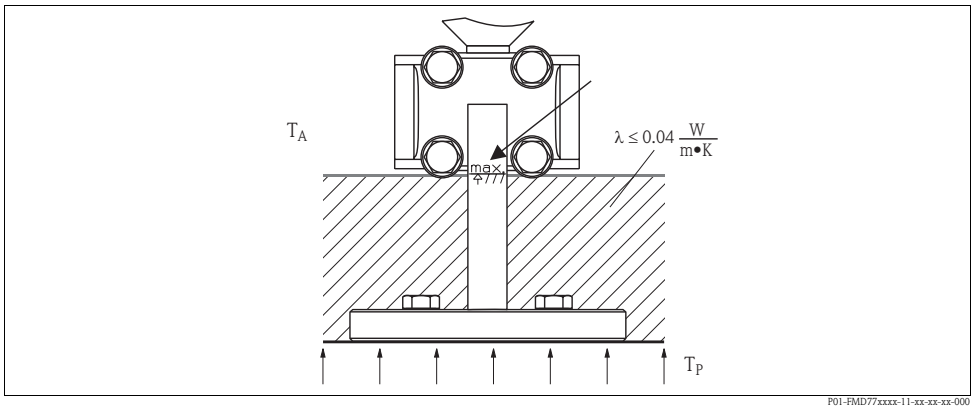
- PMD70, PMD75: Mount device below the lower measuring connection. Always connect the negative side above the maximum level.
- FMD76, FMD77: Mount device direct on the tank. Always connect the negative side above the maximum level.
- In the case of level measurement in closed tanks with static pressure, a condensate trap ensures pressure which remains constant on the minus side.

Pressure measurement

- The PMD70 and PMD75 are best suited to differential pressure measurement.
- Measuring arrangement for gases: Mount device above the measuring point.
- Measuring arrangement for liquids and steams: Mount device below tapping point.
- For differential pressure measurement in steam, mount the condensate traps at the same level as the tapping point and at the same distance from Deltabar S.

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 ≤ 0.04 W/(m x K) and to the maximum permitted ambient and process temperature (→ see table below). The data were determined under the most critical application "quiescent air".



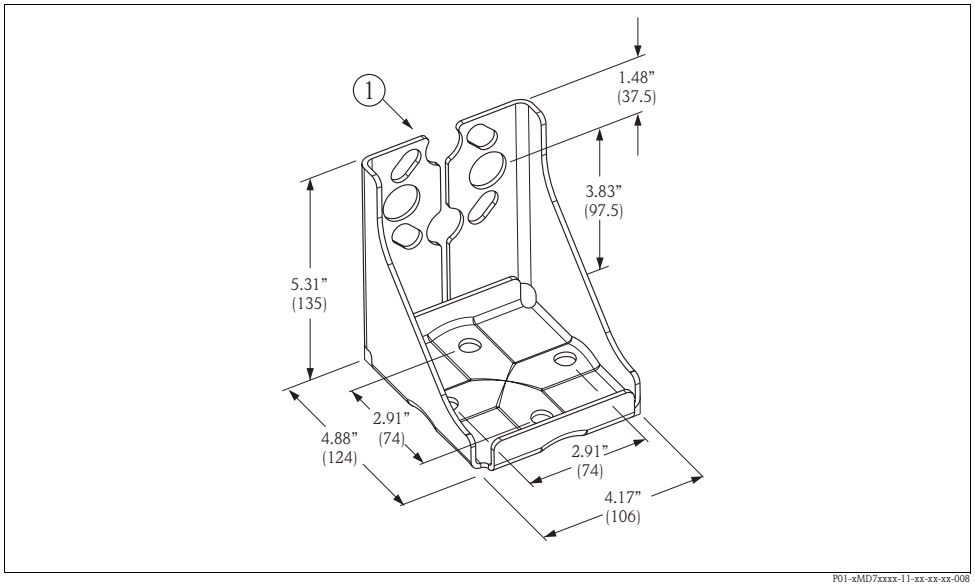
Maximum permitted insulation height

	FMD77
Ambient temperature (T_A)	≤ 158°F (70°C)
Process temperature (T_P)	max. 662°F (350°C), depending on the diaphragm seal filling oil used (→ see page 54)

Wall- and pipe-mounting

Endress+Hauser offers a mounting bracket for installing the device on pipes or walls. → See also page 63 ff, feature 110, "Additional options 2".

Note!
If a valve block is used, its dimensions should also be taken into consideration.



Mounting bracket for wall and pipe-mounting

A bracket including mounting accessories for pipe mounting is included with the device.

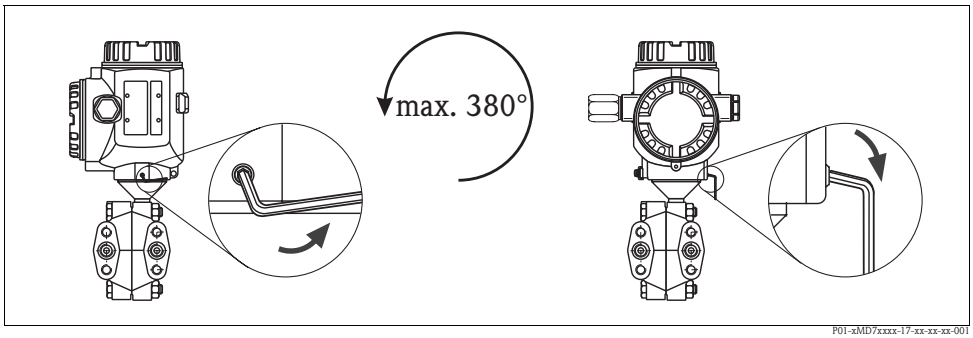
1 Device mounting

Rotate the housing

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

Your benefits

- Simple mounting by optimally aligning the housing
- Good, accessible device operation
- Optimum readability of the local display (optional).



Align the housing by loosening the Allen screw.
T14 and T15 housing: 2 mm Allen key; T17 housing: 3 mm Allen key

Oxygen applications

Oxygen and other gases can react explosively to oils, grease and plastics, such that, among other things, the following precautions must be taken:

– All components of the system, such as measuring devices, must be cleaned in accordance with the BAM (DIN 19247) requirements.
– Dependent on the materials used, a certain maximum temperature and a maximum pressure for oxygen applications must not be exceeded.

The devices suitable for gaseous oxygen applications are listed in the following table with the specification p_{max}.

Order code for devices cleaned for oxygen applications	p_{max} for oxygen applications	T_{max} for oxygen applications
PMD70 – * * * ** * * * 2 * *, Devices with 7 psi (500 mbar) or 43 psi (3000 mbar) measuring cell	435 psi (30 bar)	140°F (60°C)
PMD70 – * * * ** * * * 2 * *, Devices with 10 inH_2O (25 mbar) or 40 inH_2O (100 mbar) measuring cell	Pressure rating (PN) of the flange	140°F (60°C)
PMD75 – * * * ** * * * K * *	2320 psi (160 bar)	185°F (85°C)
PMD75 – * * * ** * * * 2 * *	2320 psi (160 bar)	140°F (60°C)
PMD75 – * * * ** * * * 3 * *	2320 psi (160 bar)	140°F (60°C)
FMD76 – * * * ** * T * * *, Devices with 7 psi (500 mbar) or 43 psi (3000 mbar) measuring cell	435 psi (30 bar)	140°F (60°C)
FMD76 – * * * ** * T * * *, Devices with 10 inH_2O (25 mbar) or 40 inH_2O (100 mbar) measuring cell	Pressure rating (PN) of the measuring cell	140°F (60°C)
FMD77 – * * * ** T * F * *	Pressure rating (PN) of the flange	140°F (60°C)
FMD78 – * * * ** * ** 4 * * FMD78 – * * * ** * ** D * *	1300 psi (90 bar)	185°F (85°C)

Ultra pure gas applications

Endress+Hauser also offers degreased devices for special applications, such as ultra pure gas.
No special restrictions regarding the process conditions apply to these devices.

→ See also page 63 ff, PMD70 and PMD75: feature 80 "Seal", FMD76 and FMD77: feature 70 "Process connection low-pressure side, material, seal".

Diaphragms for materials with hydrogen build-up (Gold-Rhodium coating)

With regard to materials in which hydrogen build-up takes place, hydrogen atoms can diffuse through the metal diaphragms. This can result in incorrect measurement results.
Endress+Hauser offers diaphragms with Gold-Rhodium coating for this application.

→ See also page 66 "Ordering information PMD75", page 72 "Ordering information FMD77" or page 75 "Ordering information FMD78", feature 60 "Membrane material".

Operating conditions (Environment)

Ambient temperature range

- PMD75, FMD77, FMD78: –40 to +185°F (–40 to +85°C), devices for lower temperatures on request
- PMD70, FMD76: –4 to +185°F (–20 to +85°C)
- On-site display: –4 to +158°F (–20 to +70°C)
  Extended temperature application range with restrictions in optical properties such as display speed and contrast: –40 to +185°F (–40 to +85°C)

For devices used in hazardous areas, see Safety instructions, Installation or Control Drawing. (→ See also page 77, sections "Safety Instruction" and "Installation/Control drawings".)

The device can be used in this temperature range. The values of the specification, such as thermal change, may be exceeded. → See also DIN 16086.

Storage temperature range

- –40 to +212°F (–40 to +100°C)
- On-site display: –40 to +185°F (–40 to +85°C)

Degree of protection

- → See page 63 ff, feature 30 "Housing, Cable entry, Protection".
- Degree of protection NEMA 6P (IP 68) for T17 housing: 6 ftH_2O (1.83 mH_2O) for 24 h

Climate class

Class 4K4H (air temperature: –4 to +131F / –20 to 55°C, relative humidity: 4 to 100%) fulfilled as per DIN EN 60721-3-4 (condensation possible)

Vibration resistance

Device/Additional option	Housing	Test standard	Vibration resistance
PMD70/ FMD76	optional local display on the side (T14)	GL	guaranteed for: 2 to 18 Hz: ± 0.16" (4 mm); 18 to 500 Hz: 5 g in all 3 planes
PMD75	optional local display on the side (T14)	IEC 61298-3	guaranteed for: 10 to 60 Hz: ±0.01" (0.35 mm); 60 to 2000 Hz: 5 g in all 3 planes
PMD75	optional local display on the top (T15)		
with mounting bracket		IEC 61298-3	guaranteed for: 10 to 0 Hz: ±0.006" (0.15 mm); 60 to 500 Hz: 2 g in all 3 plans

Electromagnetic compatibility

- Interference emission as per EN 61326 electrical device B, Interference immunity as per EN 61326 appendix A (industrial use) and NAMUR EMC recommendation (NE 21)[1].
- With increased interference immunity against electromagnetic fields as per EN 61000-4-3: 30 V/m with closed cover[2]
- Maximum deviation: < 0.5% of span
- All EMC measurements were performed with a turn down (TD) = 2:1.

1) Larger deviations possible with PMD70 with 10 inH_2O (25 mbar) or 40 inH_2O (100 mbar) sensor
2) For devices with T14 or T15 housing

Overvoltage protection (optional)

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

→ See also page 64 ff, feature 100 "Additional options 1" and feature 110 "Additional options 2", version "M Overvoltage protection".

Note!
Devices with integrated overvoltage protection must be earthed.

Operating conditions (Process)

Process temperature limits

- PMD70: –20 to +85°C (–4 to +185°F)
- FMD76: –20 to +85°C (–4 to +185°F)
- PMD75 with impulse piping longer than 4" (100 mm): –40 to +248°F (–40 to +120°C), with side flanges C22.8 and impulse piping longer than 4" (100 mm): 14 to +248°F (–10 to +120°C)
- FMD77 and FMD78, depending on the diaphragm seal and filling oil: up to +662°F (+350°C)

Note!
- For oxygen applications, observe page 28 "Oxygen applications" section.
- PMD70, FMD76, PMD75 and FMD78: Observe the temperature operating range of the seal. → See also the following section "Temperature operating range, seals".
- FMD77 and FMD78: Observe the temperature application limits of the diaphragm seal oil. → See also page 54, sections "Diaphragm seal filling oils".
- FMD77 and FMD78: Do not use diaphragm seals with 0.004" (0.09 mm) PTFE foil on AISI 316L SS (1.4435/1.4405) for vacuum applications, upper temperature limit +401°F (+205°C).

Temperature operating range, seals

PMD70 (with ceramic measuring diaphragms)

Versions for feature 80 in the order code	Seal	Temperature operating range
A	FKM Viton	–4 to +185°F (–20 to +85°C)
B	EPDM	–4 to +185°F (–20 to +85°C)
D	Kalrez, Compound 4079	+41 to +185°F (+5 to +85°C)
E	Chemraz, Compound 505	–4 to +185°F (–20 to +85°C)
1	FKM Viton, degreased	+14 to +185°F (–10 to +85°C)
2	FKM Viton, cleaned for oxygen service	+14 to +140°F (–10 to +60°C)

FMD76 (with ceramic measuring diaphragms)

Versions for feature 70 in the order code	Seal	Temperature operating range
B, D, F, G, U	FKM Viton	–4 to +185°F (–20 to +85°C)
K, L	EPDM FDA 21 CFR 177.2600	–4 to +185°F (–20 to +85°C)
M, N	Kalrez, Compound 4079	+41 to +185°F (+5 to +85°C)
P, Q	Chemraz, Compound 505	–4 to +185°F (–20 to +85°C)
S	FKM Viton, degreased	+14 to +185°F (–10 to +85°C)
T	FKM Viton, cleaned for oxygen service	+14 to +140°F (–10 to +60°C)

PMD75 (with metallic measuring diaphragms)

Versions for feature 80 in the order code	Seal	Temperature operating range [1]
A	FKM Viton	–4 to +185°F (–20 to +85°C)
C	PTFE, glass-filled	–40 to +185°F (–40 to +85°C)
F	NBR	–4 to +185°F (–20 to +85°C)
H	Copper	–40 to +185°F (–40 to +85°C)
K	Copper, cleaned for oxygen service	–4 to +140°F (–20 to +60°C)
1	FKM Viton, degreased	+14 to +185°F (–10 to +85°C)
2	FKM Viton, cleaned for oxygen service	+14 to +140°F (–10 to +60°C)
3	PTFE, glass-filled, cleaned for oxygen service	–4 to +140°F (–20 to +60°C)

1) lower temperature on request

FMD77 (with metallic measuring diaphragms)

Versions for feature 70 in the order code	Seal on the LP side (–)	Temperature operating range [1]
B, D, F, G	FKM Viton	–4 to +185°F (–20 to +85°C)
H, J	PTFE, glass-filled	–40 to +185°F (–40 to +85°C)
K, L	EPDM	–40 to +185°F (–40 to +85°C)
M, N	Kalrez, Compound 4079	+41 to +185°F (+5 to +85°C)
P, Q	Chemraz, Compound 505	–4 to +185°F (–20 to +85°C)
S	FKM Viton, degreased	+14 to +185°F (–10 to +85°C)
T	FKM Viton, cleaned for oxygen service	+14 to +140°F (–10 to +60°C)

1) lower temperature on request

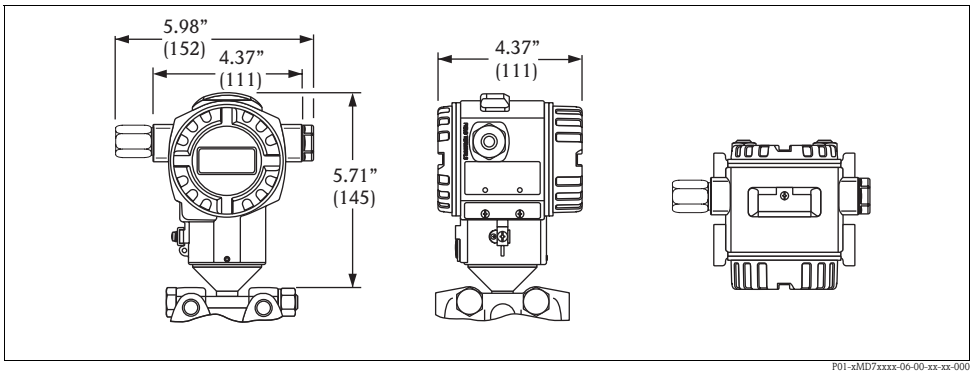
Pressure specifications

- The MWP (maximum working pressure) is specified on the nameplate. The maximum pressure for the measuring device is dependent on the lowest-rated element with regard to pressure, see the following sections for this:
  – → page 14 ff, section "Measuring range"
  – → chapter "Mechanical construction".
  The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of 68°F (20°C) or 100°F for ANSI flanges. Observe pressure-temperature dependency.
- 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 "Ambient temperature range" (see page 29) and "Process temperature limits" (see page 30) 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.
- In the case of sensor range and process connections where the OPL (Over pressure limit) of the pressure connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If you want to use the entire sensor range, select a process connection with a higher OPL value (1.5 x PN; PN = MWP).
- In oxygen applications, the values for "p_{max} and T_{max} for oxygen applications" as per page 28, "Oxygen applications" may not be exceeded.

1) With regard to its stability property, the material 317L SS (1.4435) is identical to 316L SS (1.4404) which is grouped under 13EO in EN 1092-1 Tab. 18. the chemical composition of the two materials can be identical.

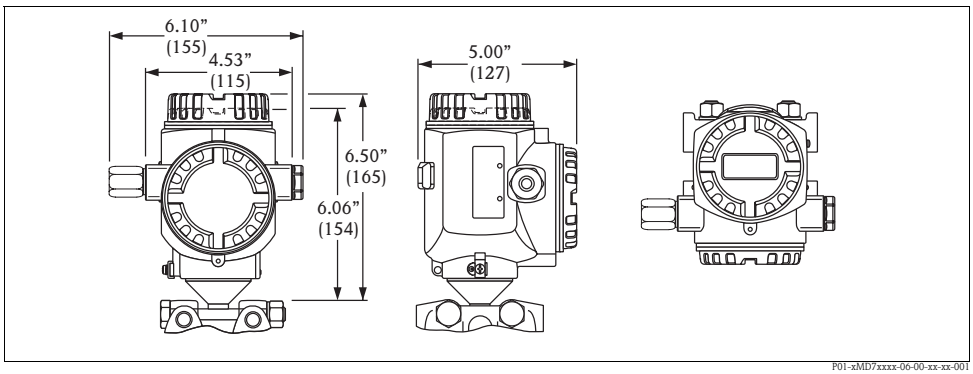
Mechanical construction

Housing dimensions T14, optional side-mounted display



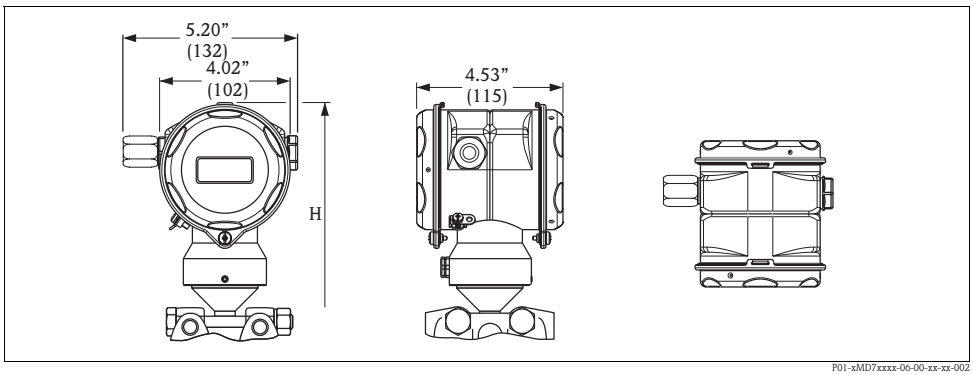
Front view, left-hand side view, top view
→ See the process connection in question for installation height. Housing weight see page 52.

Housing dimensions T15, optional top-mounted display



Front view, left-hand side view, top view
→ See the process connection in question for installation height. Housing weight see page 52.

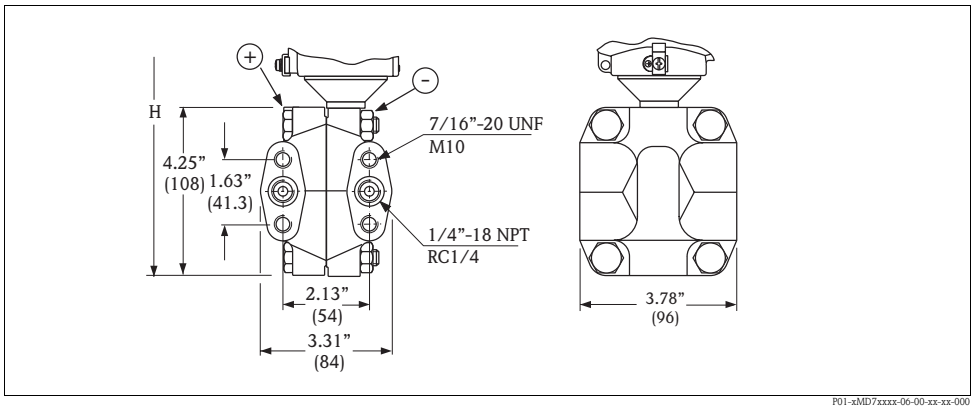
Housing dimensions T17, optional side-mounted display



Front view, left-hand side view, top view
→ See the process connection in question for installation height. Housing weight see page 52.

Process connections PMD70 (with ceramic measuring diaphragms)

Note!
Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→ see page 64, feature 70 "Process connection") has to be ordered with a CSA approval (→ see page 63, feature 10 "Approval"). These devices are fitted with a separate plate bearing the registration number 0F10524.5C.



Process connection PMD70, oval flange

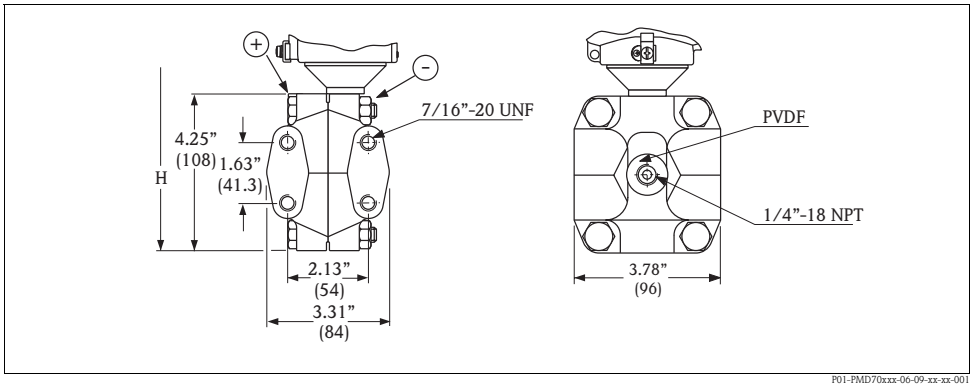
H Device height → see page 34, section "Device height H"

Version	Connection	Mounting	Material	Accessories	Weight [1]
B	1/4-18 NPT IEC 61518	7/16-20 UNF	Steel C 22.8	2 vent valves (AISI 316L/1.4404) included	8.8 lbs (4.0 kg)
D	1/4-18 NPT IEC 61518	7/16-20 UNF	AISI 316L [2]		8.8 lbs (4.0 kg)
F	1/4-18 NPT IEC 61518	7/16-20 UNF	Alloy C276 [3]	Vent valves (Alloy C276/2.4819), see page 64 feature 110 "Additional options 2".	9.3 lbs (4.2 kg)
U	RC 1/4	7/16-20 UNF	AISI 316L [2]	2 vent valves (AISI 316L/1.4404) included	8.8 lbs (4.0 kg)
1	1/4-18 NPT IEC 61518	PN 160: M10	Steel C 22.8		8.8 lbs (4.0 kg)
2	1/4-18 NPT IEC 61518	PN 160: M10	AISI 316L [2]		8.8 lbs (4.0 kg)
3	1/4-18 NPT IEC 61518	PN 160: M10	Alloy C276 [3]	Vent valves (Alloy C276/2.4819), see page 64, feature 110 "Additional options 2".	9.3 lbs (4.2 kg)

1) Process connection weight, for housing weight see page 52

2) AISI 316L SS/1.4435

3) Alloy C276/2.4819



Process connection PMD70, version G, PVDF inlay, 145 psi (PN = 10 bar), process temperature T = 14 to +140°F (–10 to +60°C)

H Device height → see page 34, section "Device height H"

Version	Connection	Mounting	Material	Weight [1]
G	1/4-18 NPT IEC 61518	7/16-20 UNF	PVDF	8.4 lbs (3.8 kg)

1) Process connection weight, for housing weight see page 52

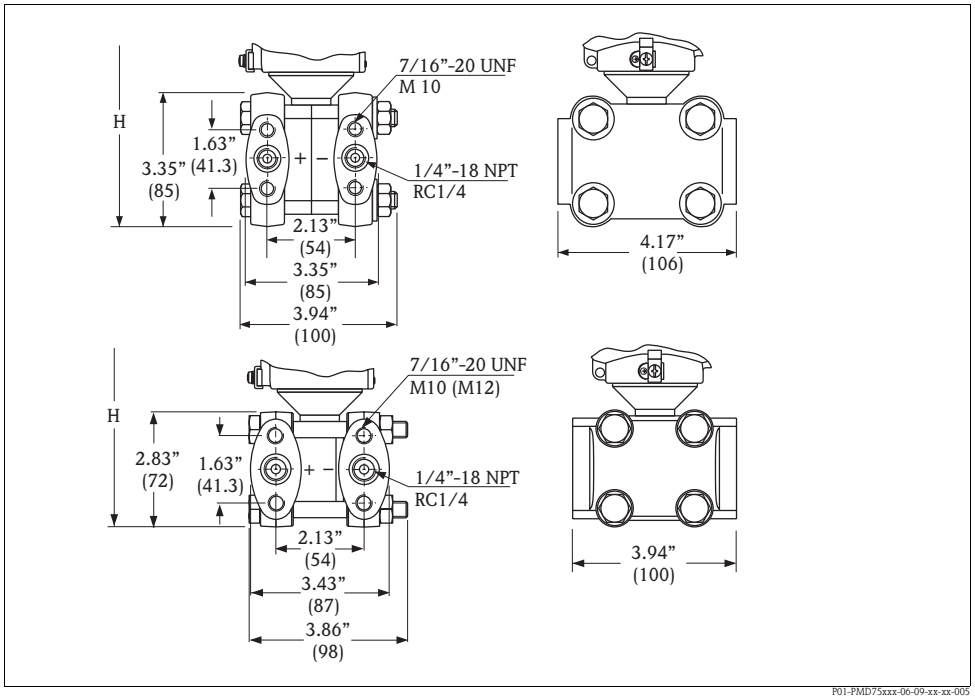
Device height H

Description	Device height H
T14 housing, optional side-mount display	9.96" (253 mm)
T15 housing, optional top-mount display, flat cover	10.2" (259 mm)
T15 housing, optional top-mount display, high cover	10.6" (270 mm)
T17 housing, optional side-mount display	10.6" (269 mm)

Process connections PMD75 (with metallic measuring diaphragms)

Note!
Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→ see page 66, feature 70 "Process connection") has to be ordered with a CSA approval (→ see page 64, feature 10 "Approval"). These devices are fitted with a separate plate bearing the registration number 0F10524.5C.

Oval flange, connection 1/4-18 NPT or RC 1/4



Process connection PMD75,
above 4 inH_2O (10 mbar) and 12 inH_2O (30 mbar) measuring cell; below: Measuring cell ≥ 40 inH_2O (100 mbar)

H Device height → see page 37, section "Device height H"

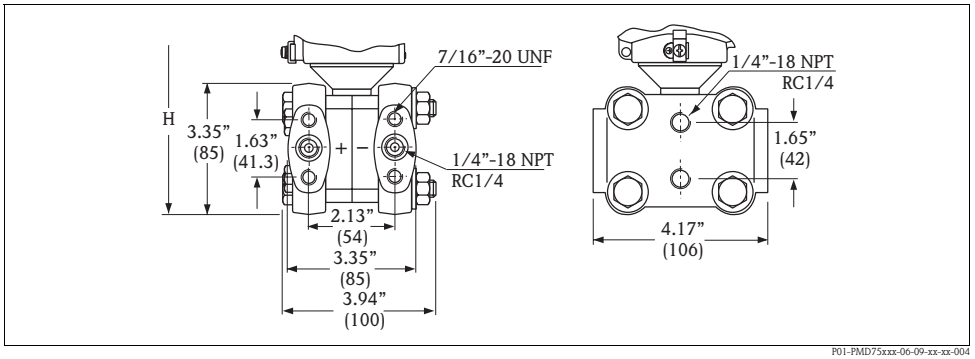
Version	Connection	Mounting	Material	Accessories	Weight [1] lbs (kg)
B	1/4-18 NPT IEC 61518	7/16-20 UNF	Steel C 22.8	2 vent valves (AISI 316L/1.4404) included	9.3 (4.2)
D	1/4-18 NPT IEC 61518	7/16-20 UNF	AISI 316L [2]		9.3 (4.2)
F	1/4-18 NPT IEC 61518	7/16-20 UNF	Alloy C276 [3]	Vent valves (Alloy C276/2.4819), see page 67, feature 110 "Additional options 2".	9.9 (4.5)
U	RC 1/4	7/16-20 UNF	AISI 316L [2]	2 vent valves (AISI 316L/1.4404) included	9.3 (4.2)
1	1/4-18 NPT IEC 61518	– PN 160: M10 – PN 420: M12	Steel C 22.8		9.3 (4.2)
2	1/4-18 NPT IEC 61518	– PN 160: M10 – PN 420: M12	AISI 316L [2]		9.3 (4.2)
3	1/4-18 NPT IEC 61518	– PN 160: M10 – PN 420: M12	Alloy C276 [3]	Vent valves (Alloy C276/2.4819), see page 67, feature 110 "Additional options 2".	9.9 (4.5)

1) Weight of process connections without vent valves with 4 inH_2O (10 mbar) and 12 inH_2O (30 mbar) sensors, process connections without vent valves with sensors ≥ 40 inH_2O (100 mbar) weght approx. 1.7 lb (800 g) less. Housing weight see page 52.

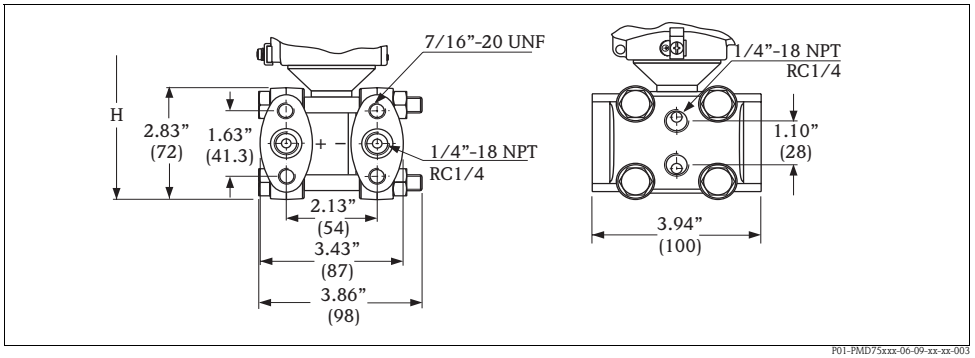
2) AISI 316L/1.4435

3) Alloy C276/2.4819

Oval flange, connection 1/4-18 NPT or RC 1/4, with side vent



Process connection PMD75, 4 inH_2O (10 mbar) and 12 inH_2O (30 mbar) measuring cell



Process connection PMD75, nominal value ≥ 40 inH_2O (100 mbar)

H Device height → see page 37, section "Device height H"

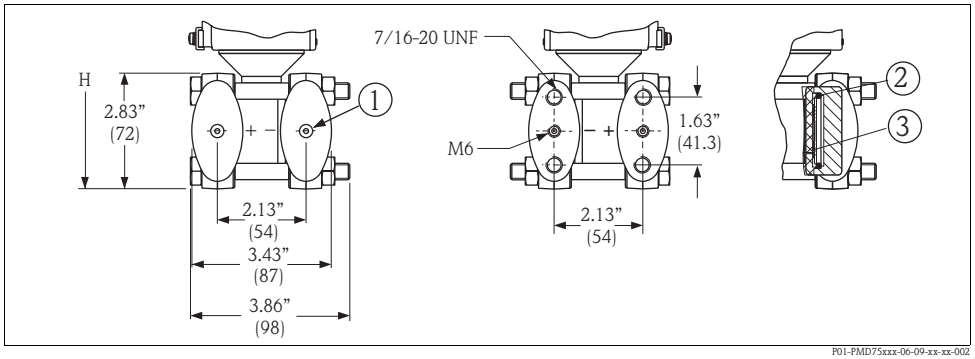
Version	Connection	Mounting	Material	Accessories	Weight [1] lbs (kg)
C	1/4-18 NPT IEC 61518	7/16-20 UNF	Steel C 22.8	4 locking screws (AISI 316L/ 1.4404) included	9.3 (4.2)
E	1/4-18 NPT IEC 61518	7/16-20 UNF	AISI 316L [2]		9.3 (4.2)
H	1/4-18 NPT IEC 61518	7/16-20 UNF	Alloy C276 [3]	Vent valves (Alloy C276/2.4819), see page 67, feature 110 "Additional options 2".	9.9 (4.5)
V	RC 1/4	7/16-20 UNF	AISI 316L [2]	4 looking screws (AISI 316L/ 1.4404) included	9.3 (4.2)

1) Weight of process connections without vent valves with **4 inH_2O (10 mbar) and 12 inH_2O (30 mbar)** sensors, process connections without vent valves with sensors ≥ 40 inH_2O (100 mbar) weght approx. 1.7 lbs (800 g) less. Housing weight see page 52

2) AISI 316L/1.4435

3) Alloy C276/2.4819

Oval flange, prepared for diaphragm seal mount



Left: Process connection PMD75, version W, prepared for diaphragm seal mount
Right: Position of the copper ring seal

H Device height → see the following section "Device height H"
1 Diaphragm seal attachment
2 Copper ring seal
3 Cup diaphragm

Device height H

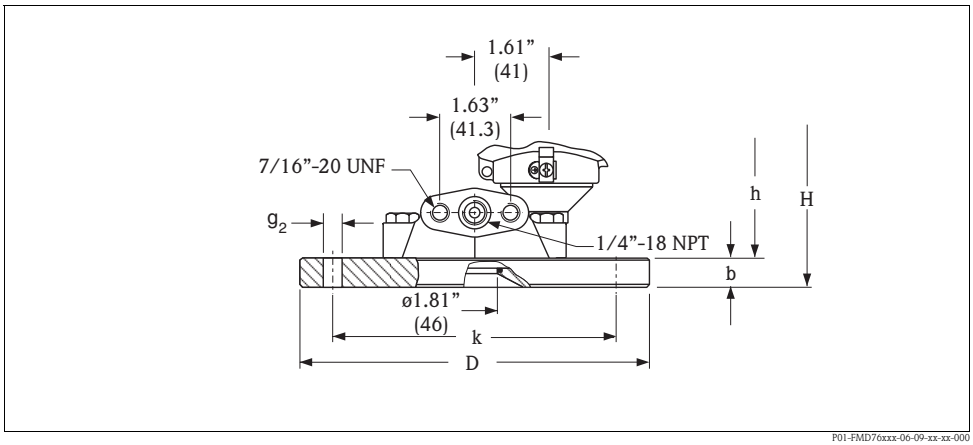
Description	Device height H [1]
T14 housing, optional side-mounted display	8.54" / 217 mm (9.05" / 230 mm)
T15 housing, optional top-mounted display, flat cover	8.78" / 223 mm (9.29" / 236 mm)
T15 housing, optional top-mounted display, high cover	9.21" / 234 mm (9.72" / 247 mm)
T17 housing, optional top-mounted display	9.17" / 233 mm (9.69" / 246 mm)

1) Values for devices with 4 inH_2O (10 mbar) and 12 inH_2O (30 mbar) measuring cell in brackets

Process connection FMD76 (with ceramic measuring diaphragms)

Note!
- Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→ see page 69, feature 70 "Process connection") has to be ordered with a CSA approval (→ see page 68, feature 10 "Approval"). These devices are fitted with a separate plate bearing the registration number 0F10524.5C.
- FMD76 devices with an EN/DIN flange DN 80 PN 40, an ANSI flange 3" 150 lbs or a JIS flange 80 A 10 K can only be mounted with an open-ended wrench.

EN/DIN flanges, connection dimensions as per EN 1092-1/DIN 2527



Process connection FMD76, high-pressure side: EN/DIN flange,
low-pressure side: connection 1/4-18 NPT
Application limits for version "G" in feature 70 "Process connection low-pressure side" with PVDF inlay:
PN = 10 bar, process temperature T = –10 to +60°C (14 to +140°F)

H Device height → see page 40, section "Device height H, devices with flange"
h Height of the device without flange thickness b

	Flange							Bolt holes			
Version	**Material**	**Nominal diameter**	**Shape** [1]	**Nominal pressure**	**Diameter** **D** [mm]	**Thickness** **b** [mm]	**Raised face** **g** [mm]	**Quantity**	**Diameter** g_2 [mm]	**Hole circle** **k** [mm]	**Flange weight** [2] [kg]
B	AISI 316L [3]	DN 80	B1 (D)	PN 10-40	200	24	138	8	18	160	5.3
D	ECTFE [4]	DN 80	–	PN 10-40	200	24	–	8	18	160	5.3
E	Alloy C276 [5]	DN 80	B1 (D)	PN 10-40	200	24	138	8	18	160	6
F	AISI 316L [3]	DN 100	B1 (C)	PN 10-16	220	22	–	8	18	180	6
G	AISI 316L [3]	DN 100	B1 (D)	PN 25-40	235	26	162	8	22	190	8
H	ECTFE [4]	DN 100	–	PN 25-40	235	26	–	8	22	190	8
J	Alloy C276 [5]	DN 100	B1 (D)	PN 25-40	235	26	162	8	22	190	9
L	ECTFE [4]	DN 100	–	PN 10-16	220	22	–	8	18	180	6
M	Alloy C276 [5]	DN 100	B1 (C)	PN 10-16	220	22	–	8	18	180	6.8

1) Designation as per DIN 2527 in brackets

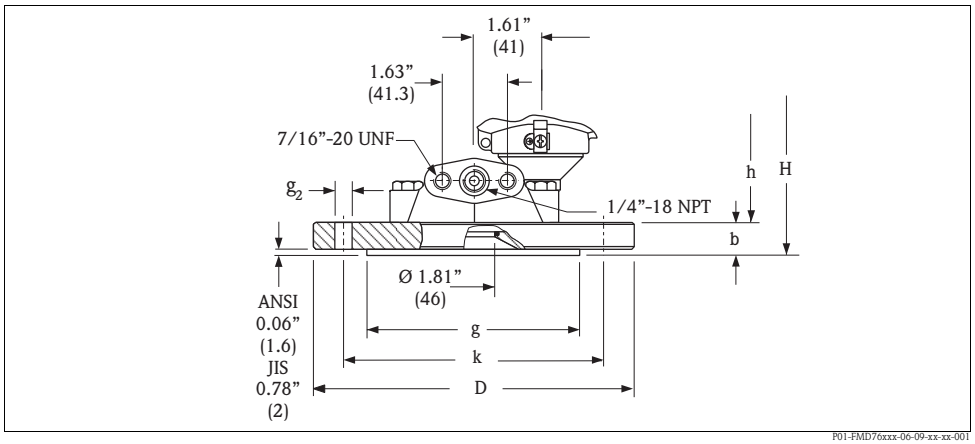
2) Housing weight see page 52

3) AISI 316L/1.4435

4) ECTFE coating on AISI 316L SS/1.4435,
When operating in hazardous area, avoid electrostatic charge of the plastic surfaces.

5) Alloy C276/2.4819

ANSI flanges, connection dimensions as per ANSI B 16.5, raised face RF and JIS flanges, connection dimensions as per JIS B 2220, raised face RF



Process connection FMD76, high-pressure side: ANSI or JIS flange (see table below), low-pressure side: connection 1/4-18 NPT

H Device height → see page 40, section "Device height H, devices with flange"
h Height of the device without flange thickness b

	Flange						Bolt holes			
Version	**Material**	**Nominal diameter**	**Class/ Nominal pressure**	**Diameter** **D** in (mm)	**Thickness** **b** in (mm)	**Raised face** **g** in (mm)	**Quantity**	**Diameter** **g_2** in (mm)	**Hole circle** **k** in (mm)	**Flange weight** [1] lbs (kg)
ANSI flanges										
P	AISI 316/ 316L [2]	3 in	150 lb./sq.in	7.5 (190.5)	0.94 (23.9)	5 (127)	4	0.75 (19.1)	6 (152.4)	10.8 (4.9)
R	ECTFE [3]									10.8 (4.9)
S	Alloy C276									12/1 (5.5)
T	AISI 316/ 316L [2]	4 in	150 lb./sq.in	9 (228.5)	0.94 (23.9)	6.19 (157.2)	8	0.75 (19.1)	7.5 (190.5)	15.7 (7.1)
U	ECTFE [3]									15.7 (7.1)
V	Alloy C276									17.6 (8)
W	AISI 316/ 316L [2]	4 in	300 lb./sq.in	10 (254)	1.25 (31.8)	6.19 (157.2)	8	0.88 (22.4)	7.88 (200.2)	26 (11.7)
JIS flanges										
1	AISI 316L/ 1.4435	80 A	10 K	7.32 (185)	0.71 (18)	5 (127)	8	0.75 (19.1)	5.9 (150)	7.3 (3.3)
3	Alloy C276									8.2 (3.7)
4	AISI 316L/ 1.4435	100 A	10 K	8.27 (210)	0.71 (18)	5.95 (151)	8	0.75 (19.1)	6.89 (175)	9.7 (4.4)

1) Housing weight see page 52

2) Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)

3) ECTFE coating on AISI 316L/1.4435.
When operating in hazardous area, avoid electrostatic charge of the plastic surfaces.

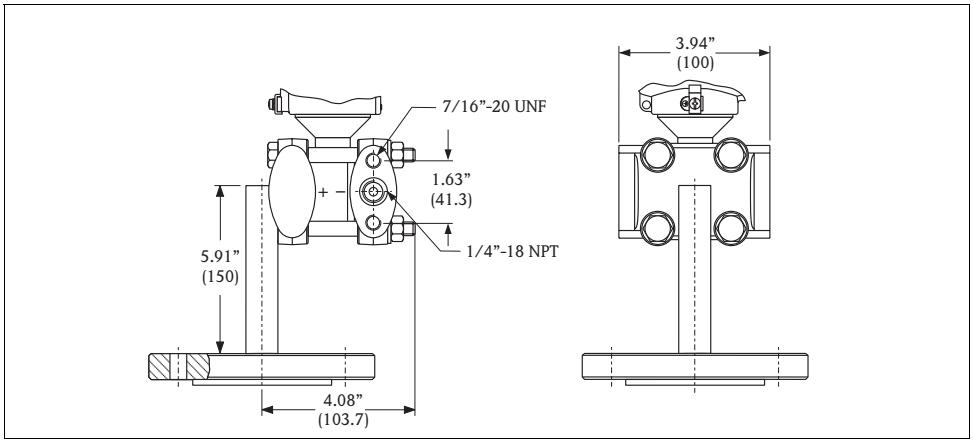
Device height H, devices with flange

Description	Device height H (h + b)
T14 housing, optional side-mount display	6.89" (175 mm) + flange thickness b (see tables)
T15 housing, optional top-mount display, flat cover	7.12" (181 mm) + flange thickness b (see tables)
T15 housing, optional top-mount display, high cover	7.56" (192 mm) + flange thickness b (see tables)
T17 housing, optional side-mount display	7/52" (191 mm) + flange thickness b (see tables)

Process connections FMD77 (with metallic measuring diaphragms), low-pressure side

Bracket flange design

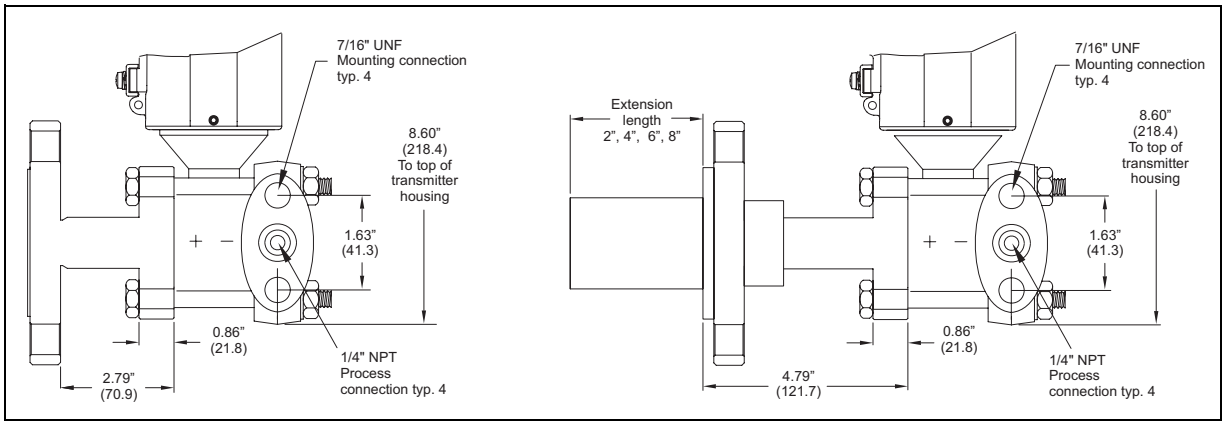
EN/DIN flanges, JIS flanges, ANSI flanges (versions N, P, Q, T and W only – see page 72 process connection ordering)



Low-pressure side: connection 1/4-18 NPT, mounting optionally 7/16-20 UNF, high-pressure side, see the following section "Process connections, high-pressure side FMD77"

Compact flange design

ANSI flanges (versions 5, 6, 7 and 8 only – see page 72 process connection ordering information)

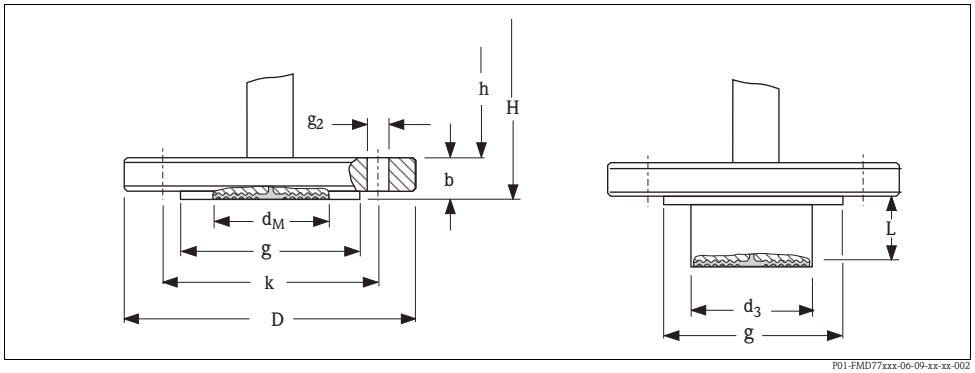


Process connections FMD77 (with metallic measuring diaphragms), high-pressure side

Note!

- Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→ see page 72, feature 70 "Process connection") has to be ordered with a CSA approval (→ see page 71, feature 10 "Approval"). These devices are fitted with a separate plate bearing the registration number 0F10524.5C.
- Specifications for the "T_K Ambient" and "T_K Process" are listed in the following tables. These are typical values. These temperature coefficients apply to silicone oil and the membrane material AISI 316L/1.4435. For other filling oils, this temperature coefficient must be multiplied by the T_K correction factor of the corresponding filling oil. For the T_K correction factors, see also page 54, section "Diaphragm seal filling oils".

EN/DIN flanges, connections as per EN 1092-1/DIN 2527



Process connection FMD77, high-pressure side EN/DIN flange with and without extended diaphragm seal, material AISI 316L/1.4435

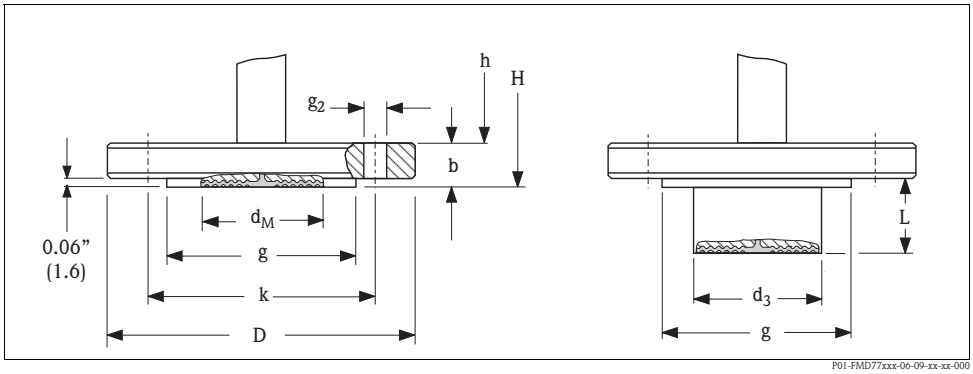
H Device height see page 43, → section "Device height H"
h Height of the device without flange thickness b

	Flange								Bolt holes			Diaphragm seal			
Version	**Nominal diameter**	**Nominal pressure**	**Shape** [1]	**Diameter** **D** [mm]	**Thickness** **b** [mm]	**Raised face** **g** [mm]	**Extension length** **L** [mm]	**Extension diameter** **d_3**	**Quantity**	**Diameter** **g_2** [mm]	**Bolt circle** **k** [mm]	**max. Diaphragm diameter** **d_M** [mm]	**T_K Ambient** [mbar/10 K]	**T_K Process** [mbar/10 K]	**Flange weight** [2] [kg]
A	DN 50	PN 10-40	B1 (D)	165	20	102	–	–	4	18	125	59	+3.02	+1.15	3.0
B	DN 80	PN 10-40	B1 (D)	200	24	138	–	–	8	18	160	89	+0.23	+0.11	5.2
C	DN 80	PN 10-40	B1 (D)	200	24	–	50	76	8	18	160	72	+0.23	+0.11	6.2
							100								6.7
							200								7.8
F	DN 100	PN 10-16	B1 (C)	220	20	–	–	–	8	18	180	89	+0.23	+0.11	4.8
G	DN 100	PN 25-40	B1 (D)	235	24	162	–	–	8	22	190	89	+0.23	+0.11	6.7

1) Designation as per DIN 2527 in brackets

2) Housing weight see page 52

ANSI flanges, connection dimensions as per B 16.5, raised face RF



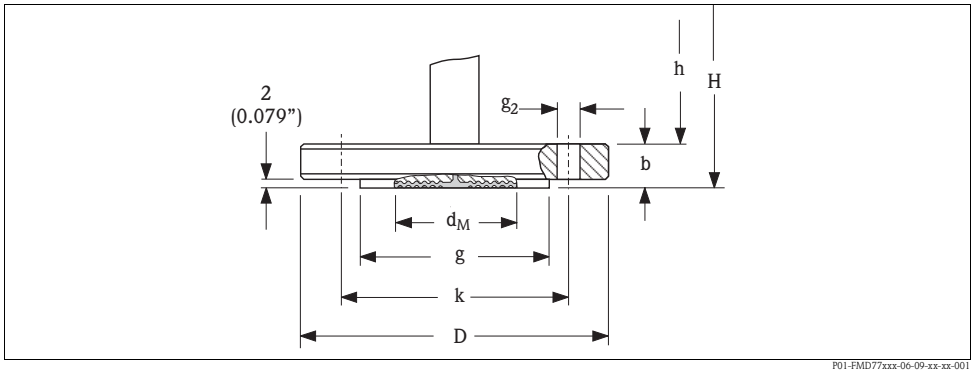
Process connection FMD77, high-pressure side ANSI flange with and without extended diaphragm seal, material AISI 316/316L

H Device height → see page 43, section "Device height H"
h Height of the device without flange thickness b

	ANSI Flange							Bolt holes			Diaphragm seal			
Version	**Nominal diameter**	**Class**	**Diameter** **D**	**Thickness** **b**	**Raised face** **g**	**Extension length** **L**	**Extension diameter** **d_3**	**Quantity**	**Diameter** **g_2**	**Bolt circle** **k**	**max. Diaphragm diameter** **d_M**	**T_K Ambient**	**T_K Process**	**Flange weight** [1]
		lb_f/in^2	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)		in (mm)	in (mm)	in (mm)	[mbar/10 K]		lbs (kg)
N	2"	150	6 (152.4)	0.75 (19.1)	3.62 (91.9)	–	–	4	0.75 (19.1)	4.75 (120.7)	2.32 (59)	+3.02	+1.15	5.7 (2.6)
P, 5	3"	150	7.5 (190.5)	0.94 (23.9)	5 (127)	–	–	4	0.75 (19.1)	6 (152.4)	3.50 (89)	+0.23	+0.11	11.2 (5.1)
6	3"	300	8.25 (209.6)	1.12 (28.5)	5 (127)	–	–	8	0.875 (22.23)	6.62 (168.1)	3.50 (89)	+0.23	+0.11	15 (6.8)
Q, 7	3"	150	7.5 (190.5)	0.94 (23.9)	5 (127)	2 (50.8)	2.85 (76.2)	4	0.75 (19.1)	6 (152.4)	2.83 (72)	+0.23	+0.11	13.2 (6)
						4 (101.6)								14.6 (6.6)
						6 (152.4)								15.7 (7.1)
						8 (203.8)								17.0 (7.7)
T, 8	4"	150	9 (228.6)	0.94 (23.9)	6.19 (157.2)	–	–	8	0.75 (19.1)	7.5 (190.5)	3.50 (89)	+0.23	+0.11	16 (7.2)
W	4"	300	10 (254)	1.25 (31.8)	6.19 (157.2)	–	–	8	0.88 (22.4)	7.88 (200.2)	3.50 (89)	+0.23	+0.11	26 (11.7)

1) Housing weight see page 52

JIS flanges, connection dimensions as per JIS B 2220, raised face RF



Process connection FMD77, high-pressure side, JIS flange, material AISI 316L/1.4435

H Device height → see the following section "Device height H"
h Height of the device without flange thickness b

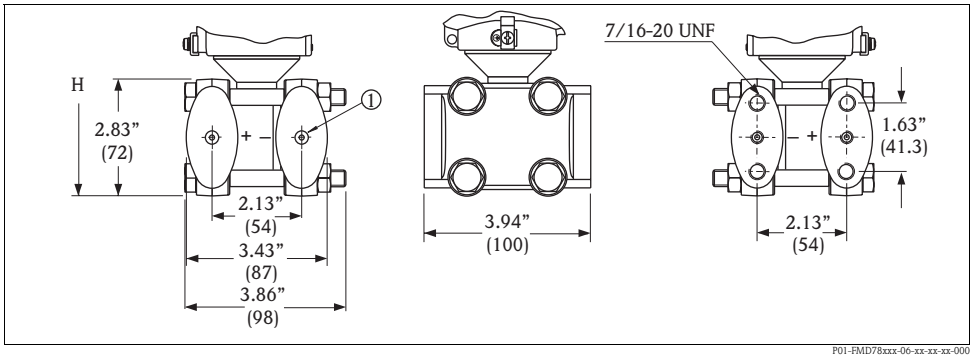
	Flange					Bolt holes			Diaphragm seal			
Version	**Nominal diameter**	**Nominal pressure**	**Diameter**	**Thickness**	**Raised face**	**Quantity**	**Diameter**	**Hole circle**	**max. Diaphragm diameter**	**T_K Ambient**	**T_K Process**	**Flange weight [1]**
			D	**b**	**g**		**g_2**	**k**	**d_M**			
			mm (in)	mm (in)	mm (in)		mm (in)	mm (in)	mm (in)	[mbar/10 K]		kg (lbs)
X	50 A	10 K	155 (6.1)	16 (0.63)	96 (3.78)	4	19 (0.75)	120 (4.72)	59 (2.32)	+3.02	+1.15	2.3 (5.1)
1	80 A	10 K	185 (7.28)	18 (0.71)	126 (4.96)	8	19 (0.75)	150 (5.91)	89 (3.50)	+0.23	+0.11	3.5 (7.7)
4	100 A	10 K	210 (8.27)	18 (0.71)	151 (5.94)	8	19 (0.75)	175 (6.89)	89 (3.50)	+0.23	+0.11	4.7 (10.4)

1) Housing weight see page 52

Device height H

Description	Device height H (h + b)
T14 housing, optional side-mount display	325 mm (12.8")+ flange thickness b (see tables)
T15 housing, optional top-mount display, flat cover	331 mm (13.0")+ flange thickness b (see tables)
T15 housing, optional top-mount display, high cover	342 mm (13.5") + flange thickness b (see tables)
T17 housing, optional side-mount display	341 mm (13.4") + flange thickness b (see tables)

FMD78 Basic unit



FMD78 Basic unit

H Device height → the following section "Device height H"
1 Diaphragm seal attachment

Device height H

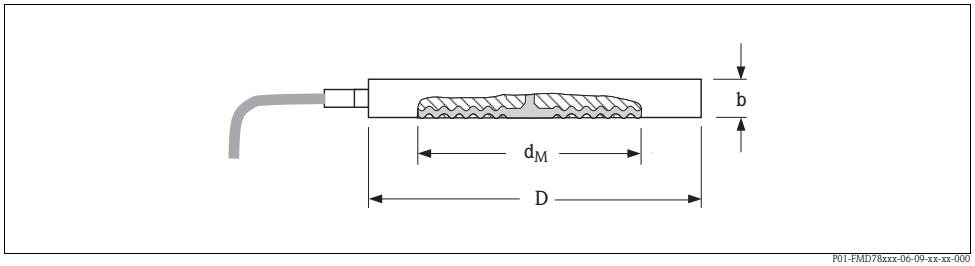
Description	Device height
T14 housing, optional side-mount display	8.54" (217 mm)
T15 housing, optional top-mount display, flat cover	8.78" (223 mm)
T15 housing, optional top-mount display, high cover	9.21" (234 mm)
T17 housing, optional side-mount display	9.17" (233 mm)

Process connection FMD78 (with metallic measuring diaphragms)

Note!

- Specifications for the "T_K Process" are listed in the following tables. These are typically values. These temperature coefficients apply to silicone oil and the membrane material AISI 316L/1.4435. For other filling oils, this temperature coefficient must be multiplied by the T_K correction factor of the corresponding filling oil. For the T_K correction factors, see also page 54, section "Diaphragm seal filling oils".
- The temperature coefficient "T_K Ambient" is listed in relation to the capillary length on page 55 in the "Influence of the temperature on the zero point" section.
- The weights of the diaphragm seals are given in the tables. See page 35 for the weight of the transmitter and page 52 for the weight of the housing.
- The following drawings are drawings that illustrate how the system works in principle. In other words, the dimensions of a diaphragm seal supplied can deviate from the dimensions given in this document.

Pancake seal



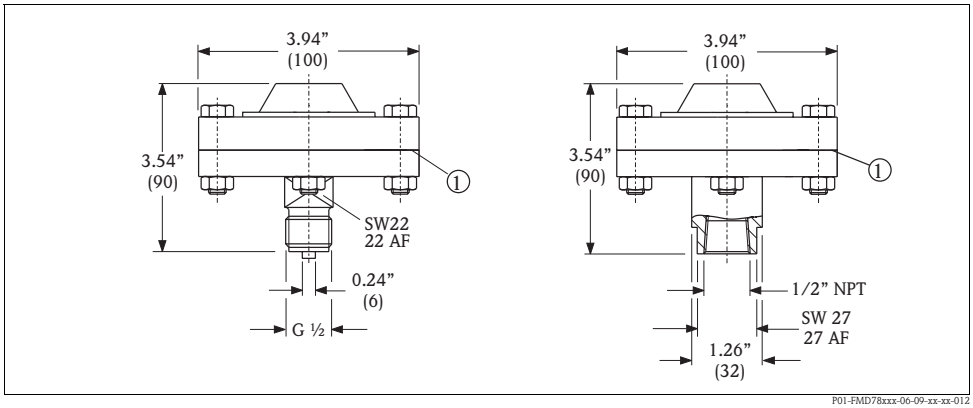
Process connection FMD78, material AISI 316L

	Flange				Diaphragm seal			
Version	**Nominal diameter**	**Nominal pressure** [1]	**Diameter** **D** [mm]	**Thickness** **b** [mm]	**max. Diaphragm diameter** d_M [mm]	**T_K Process** [mbar/10K]	**Minimum installation distance** **A** [mm]	**Weight of two diaphragm seals** [kg]
UF	DN 50	PN 16-400	102	20	59	+1.21	130	2.6
UH	DN 80	PN 16-400	136	20	89	+0.19	130	4.6
UJ	DN 100	PN 16-400	158	20	89	+0.19	130	6.2

	Flange				Diaphragm seal			
Version	**Nominal diameter**	**Nominal pressure** [1]	**Diameter** **D**	**Thickness** **b**	**max. Diaphragm diameter** d_M	**T_K Process**	**Minimum installation distance**	**Weight of two diaphragm seals**
	inches	[lb/sq.in]	in (mm)	in (mm)	in (mm)	[mbar/10K]	in (mm)	lbs (kg)
VF	2	150-2500	3.99 (99)	0.79 (20)	2.32 (59)	+1.21	5 (130)	5.7 (2.6)
VH	3	150-2500	5.00 (127)	0.79 (20)	3.50 (89)	+0.08	5 (130)	10.1 (4.6)
VJ	4	150-2500	6.22 (158)	0.79 (20)	3.50 (89)	+0.19	5 (130)	13.7 (6.2)

1) The specified nominal pressure applies to the diaphragm seal. The maximum pressure for the measuring device is dependent on the lowest-rated element, with regard to pressure, of the selected components. → See also page 31, section "Pressure specifications".

Threaded connection ISO 228 G 1/2 B and ANSI 1/2 MNPT, separator with PTFE seal

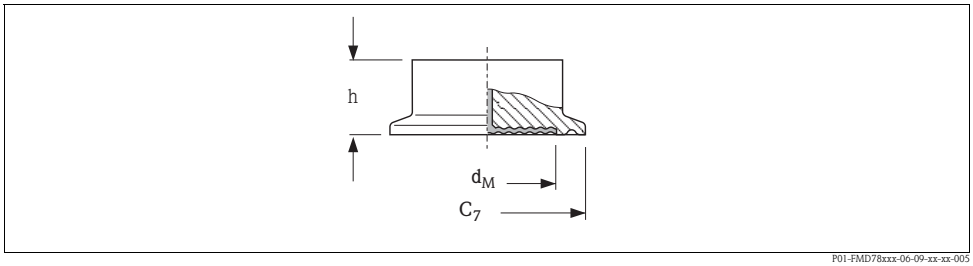


Process connection FMD78, left: with threaded connection ISO 228 G 1/2 B, right: with threaded connection ANSI 1/2 MNPT

1 PTFE seal as standard

Version	Material	Nominal pressure	T_K Process	Weight of two diaphragm seals
			[mbar/10 K]	lbs (kg)
GA	AISI 316L	600 psi (PN 40)	+0.1	6.4 (2.9)
RL	AISI 316L	600 psi (PN 40)	+0.1	6.4 (2.9)

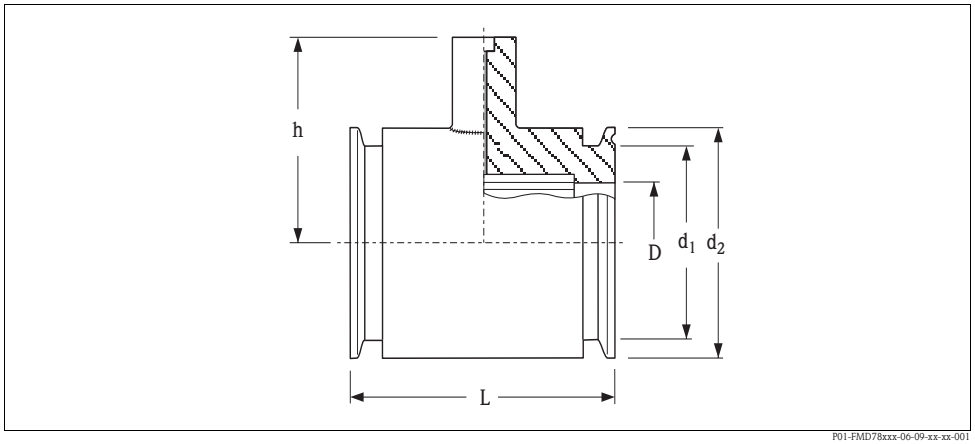
Tri-Clamp ISO 2852



Process connection FMD78, Material: AISI 316L/1.4435, surface roughness of the wetted surfaces ≤ 30 µinch (0.8 µm) as standard. Lower surface roughness on request.

Version	Nominal diameter ISO 2852	Nominal diameter DIN 32676	Nominal diameter	Diameter C_7	max. Diaphragm diameter d_M	Height h	T_K Process	Weight of two diaphragm seals
			inch	in (mm)	in (mm)	in (mm)	[mbar/10 K]	lbs (kg)
TB	DN 25	DN 25	1	2.0 (50.5)	0.94 (24)	1.46 (37)	+10.45	1.4 (0.64)
TC	DN 38	DN 40	1-1/2	2.0 (50.5)	1.42 (36)	1.18 (30)	+5.44	4.4 (2.0)
TD	DN 51	DN 50	2	2.5 (64)	1.89 (48)	1.18 (30)	+1.91	4.8 (2.2)
TF	DN 76.1	–	3	3.6 (91)	2.87 (73)	1.18 (30)	+0.08	5.3 (2.4)

Annular flow-through tri-clamp seal

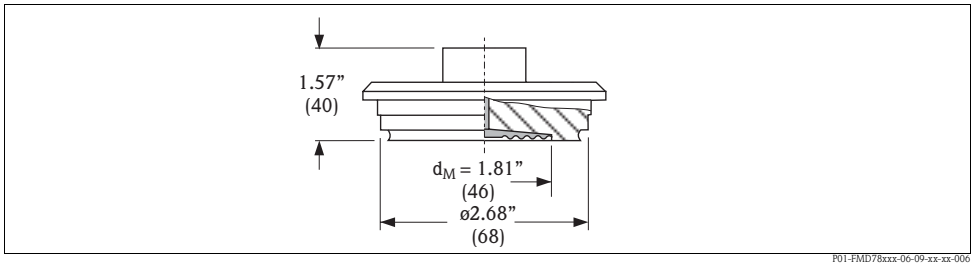


Process connection FMD78, Material: AISI 316L, surface roughness of the wetted surfaces ≤ 30 µinch (0.8 µm) as standard. Lower surface roughness on request.

Version	Nominal diameter ISO 2852	Nominal diameter	Diameter D	Diameter d_1	Diameter d_2	Height h	Face-to-face length L	T_K Process	Weight of two diaphragm seals
		inch	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	[mbar/10 K]	lbs (kg)
SB	DN 25	1	0.89 (22.5)	1.71 (43.5)	1.99 (50.5)	2.64 (67)	4.96 (126)	+5.10	7.5 (3.4)
SC [1]	DN 38	1-1/2	1.40 (35.5)	1.71 (43.5)	1.99 (50.5)	2.64 (67)	4.96 (126)	+2.51	4.4 (2)
SD [1]	DN 51	2	1.91 (48.6)	2.22 (56.5)	2.52 (64)	3.11 (79)	3.94 (100)	+2.51	7.5 (3.4)

1) Including 3.1 and pressure test as per Pressure Equipment Directive, category II

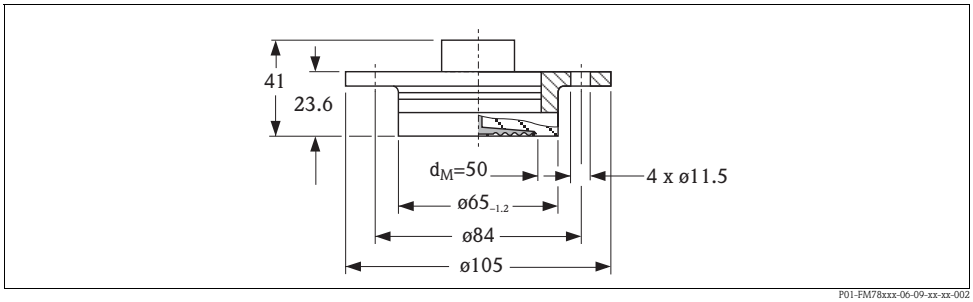
Varivent N for pipes DN 40 – DN 162



Process connection FMD78, surface roughness of the wetted surfaces ≤ 30 µinch (0.8 µm) as standard. Lower surface roughness on request.

Version	Material	Nominal pressure	T_K Process	Weight of two diaphragm seals
			[mbar/10 K]	kg
TR	AISI 316L/1.4435	PN 40 (600 psi)	+2.01	2.6 (5.7 lbs)

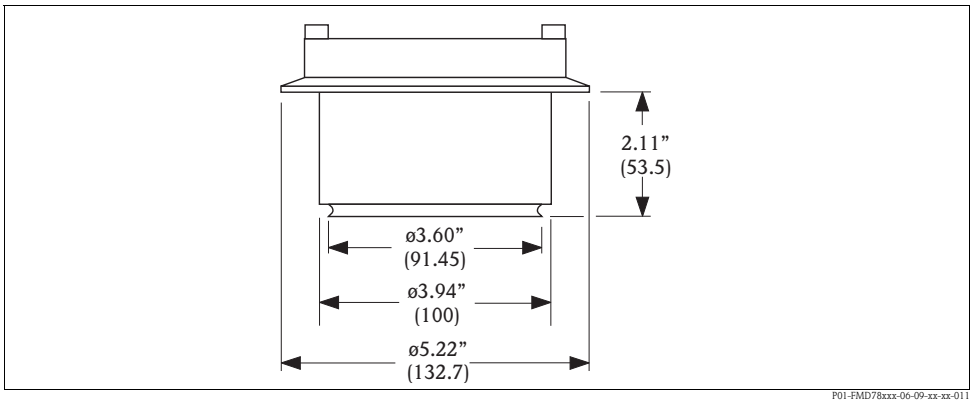
DRD 65 mm



Process connection FMD78, surface roughness of the wetted surfaces ≤ 30 µinch (0.8 µm) as standard. Lower surface roughness on request.

Version	Material	Nominal pressure	T_K Process [mbar/10 K]	Weight of two diaphragm seals kg
TK	AISI 316L/1.4435	PN 25 (360 psi)	+2.01	1.5 (3.3 lbs)

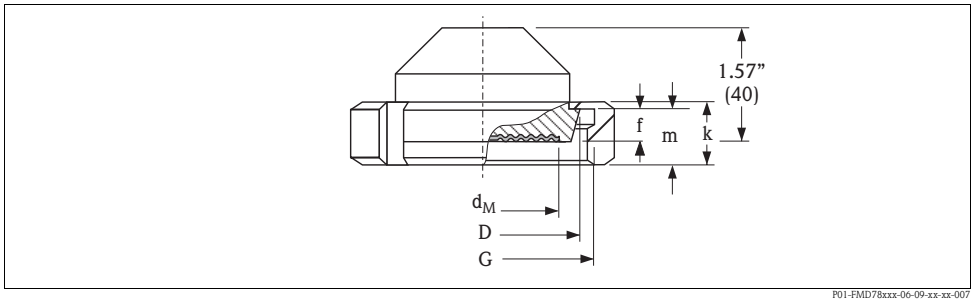
Hygienic connection, sanitary tank spud, extended diaphragm seal 2"



Process connection FMD78, surface roughness of the wetted surfaces ≤ 30 µinch (0.8 µm) as standard. Lower surface roughness on request.

Version	Material	T_K Process [mbar/10 K]	Weight of two diaphragm seals lbs (kg)
WH	AISI 316L	+1.64	11 (5)

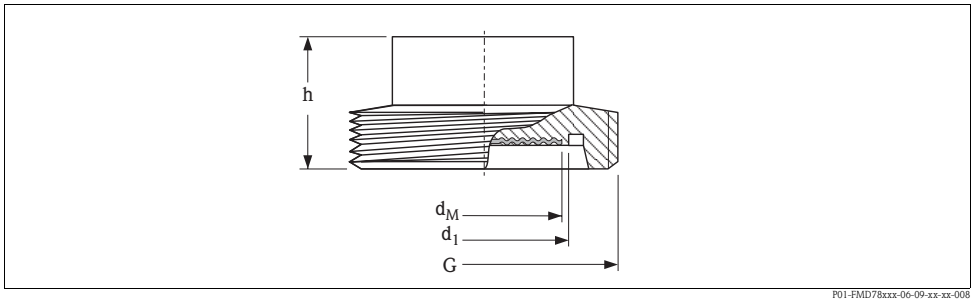
Taper adapter with coupling nut, DIN 11851 (dairy fitting)



Process connection FMD78, material AISI 316L/1.4435, surface roughness of the wetted surfaces ≤ 30 µinch (0.8 µm) as standard. Lower surface roughness on request.

	Taper adapter				Slotted nut			Diaphragm seal		
Version	**Nominal diameter**	**Nominal pressure**	**Diameter** **D** [mm]	**Adapter height** **f** [mm]	**Thread** **G**	**Height** **k** [mm]	**Height** **m** [mm]	**max. Diaphragm diameter** **d_M** [mm]	**T_K Process** [mbar/10 K]	**Weight of two diaphragm seals** [kg]
MR	DN 50	PN 25	68.5	11	Rd 78 x 1/6"	22	19	52	+1.21	2.2
MS	DN 65	PN 25	86	12	Rd 95 x 1/6"	25	21	66	+0.29	4.0
MT	DN 80	PN 25	100	12	Rd 110 x 1/4"	30	26	81	+0.19	5.1

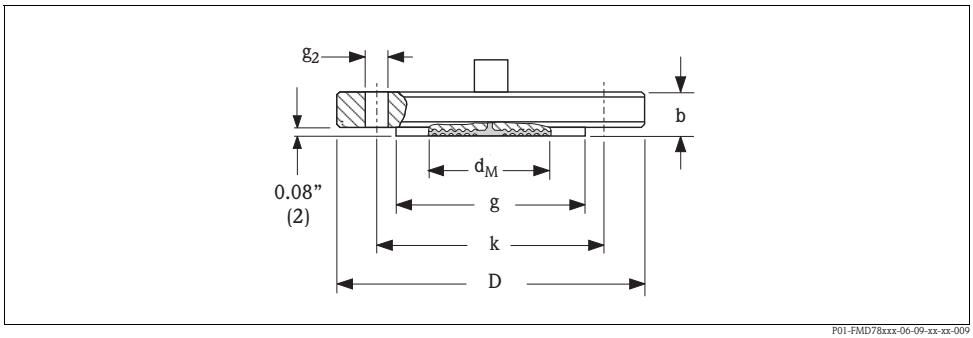
Threaded adapter, DIN 11851 (dairy fitting)



Process connection FMD78, material AISI 316L/1.4435, surface roughness of the wetted surfaces ≤ 30 µinch (0.8 µm) as standard. Lower surface roughness on request.

	Threaded adapter					Diaphragm seal		
Version	**Nominal diameter**	**Nominal pressure**	**Diameter** **d_1** [mm]	**Height** **h** [mm]	**Thread** **G**	**max. Diaphragm diameter** **d_M** [mm]	**T_K Process** [mbar/10 K]	**Weight of two diaphragm seals** [kg]
M3	DN 50	PN 25	54	35	Rd 78 x 1/6"	52	+1.21	1.8
M4	DN 65	PN 25	71	40	Rd 95 x 1/6"	66	+0.29	3.4
M5	DN 80	PN 25	85	40	Rd 110 x 1/4"	81	+0.19	4.0

EN/DIN flanges, connection dimensions as per EN 1092-1/DIN 2527
JIS flanges, connection dimensions as per JIS B 2220



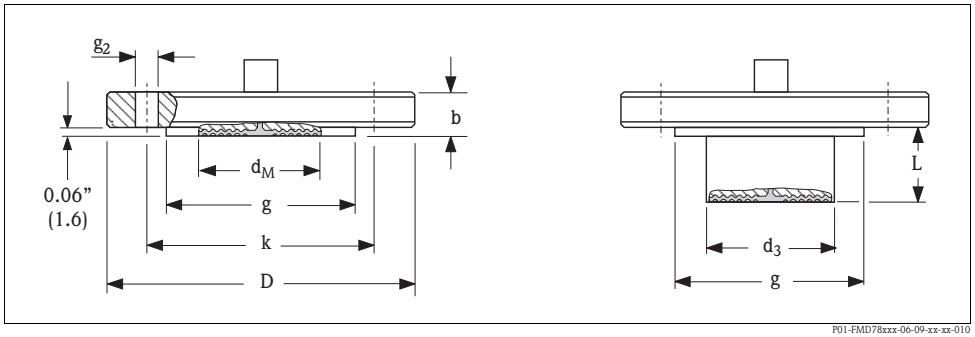
Process connection FMD78, EN/DIN flange, Material AISI 316L

	EN/DIN flange						Bolt holes			Diaphragm seal		
Version	**Nominal diameter**	**Nominal pressure**	**Shape** [1]	**Diameter** **D** [mm]	**Thickness** **b** [mm]	**Raised face** **g** [mm]	**Quantity**	**Diameter** **g_2** [mm]	**Hole circle** **k** [mm]	**max. Diaphragm diameter** **d_M** [mm]	**T_K Process** [mbar/10 K]	**Weight of two diaphragm seals** [kg]
B3	DN 50	PN 10-40	B1 (D)	165	20	102	4	18	125	59	+1.21	6.0
B5	DN 80	PN 10-40	B1 (D)	200	24	138	8	18	160	89	+0.19	10.5
BT	DN 100	PN 10-16	B1 (C)	220	20	–	8	18	180	89	+0.19	9.5
B6	DN 100	PN 25-40	B1 (D)	235	24	162	8	22	190	89	+0.19	13.3

1) Designation as per DIN 2527 in brackets

	JIS flange					Bolt holes			Diaphragm seal		
Version	**Nominal diameter**	**Nominal pressure**	**Diameter** **D** [mm]	**Thickness** **b** [mm]	**Raised face** **g** [mm]	**Quantity**	**Diameter** **g_2** [mm]	**Hole circle** **k** [mm]	**max. Diaphragm diameter** **d_M** [mm]	**T_K Process** [mbar/10 K]	**Weight of two diaphragm seals** [kg]
KF	50 A	10 K	155	16	96	4	19	120	59	+1.21	4.6
KL	80 A	10 K	185	18	127	8	19	150	89	+0.19	7.0
KH	100 A	10 K	210	18	151	8	19	175	89	+0.19	9.4

ANSI flanges, connection dimensions as per ANSI B 16.5, raised face RF



Process connection FMD78, ANSI flange with and without extended diaphragm seal, material AISI 316/AISI 316L

	ANSI Flange							Bolt holes			Diaphragm seal		
Version	**Nominal diameter**	**Class**	**Diameter** **D**	**Thickness** **b**	**Raised face** **g**	**Extension length** **L**	**Extension diameter** d_3	**Quantity**	**Diameter** g_2	**Hole circle** **k**	**max. Diaphragm diameter** d_M	**T_K Process**	**Weight of two diaphragm seals**
		lb_f/in^2	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)		in (mm)	in (mm)	in (mm)	[mbar/ 10 K]	lbs (kg)
AF	2"	150	6 (152.4)	0.75 (19.1)	3.62 (91.9)	–	–	4	0.75 (19.1)	4.75 (120.7)	2.32 (59)	+1.21	11 (5.2)
AR	2"	300	6.5 (165.1)	0.88 (22.5)	3.62 (91.9)	–	–	8	0.75 (19.1)	5 (127)	2.32 (59)	+1.21	15 (6.8)
AG	3"	150	7.5 (190.5)	0.94 (23.9)	5 (127)	–	–	4	0.75 (19.1)	6 (152.4)	3.50 (89)	+0.19	22 (10.2)
AS	3"	300	8.25 (209.5)	1.12 (28.4)	5 (127)	–	–	8	0.88 (22.4)	6.62 (168.1)	3.50 (89)	+0.19	31 (14)
J4	3"	150	7.5 (190.5)	0.94 (23.9)	5 (127)	2 (50.8)	2.85 (76)	4	0.75 (19.1)	6 (152.4)	2.83 (72)	+0.29	26 (12)
						4 (101.6)							29 (13.2)
						6 (152.4)							31 (14.2)
						8 (203.6)							34 (15.4)
AH	4"	150	9 (228.6)	0.94 (23.9)	6.19 (157.2)	–	–	8	0.75 (19.1)	7.5 (190.5)	3.50 (89)	+0.19	32 (14.4)
AT	4"	300	10 (254)	1.25 (31.8)	6.19 (157.2)	–	–	8	0.88 (22.4)	7.88 (200.1)	3.50 (89)	+0.19	52 (23.4)
J5	4"	150	9 (228.6)	0.94 (23.9)	6.19 (157.2)	2 (50.8)	3.7 (94)	8	0.75 (19.1)	7.5 (190.5)	3.50 (89)	+0.19	38 (17.3)
						4 (101.6)							44 (19.8)
						6 (152.4)							49 (22.3)
						8 (203.6)							55 (24.8)

Weight

Housing

	T14		T15	T17
	Aluminum	**AISI 316L/1.4435**	**Aluminum**	**AISI 316L/1.4404**
with electronic insert and display	2.6 lbs (1.2 kg)	4.6 lbs (2.1 kg)	4 lbs (1.8 kg)	2.6 lbs (1.2 kg)
with electronic insert without display	2.4 lbs (1.1 kg)	4.4 lbs (2.0 kg)	3.7 lbs (1.7 kg)	2.4 lbs (1.1 kg)

Process connections

→ See corresponding process connection, starting on page 32.

Material

T14/T15 housing:
- T14 housing, selectable:
  - Die-cast aluminum with protective powder-coating on polyester basis: RAL 5012 (blue), cover: RAL 7035 (grey)
  - Precision cast stainless steel AISI 316L (1.4435)
- T15 housing: Die-cast aluminum with protective powder-coating on polyester basis: RAL 5012 (blue), cover: RAL 7035 (grey)
- External operation (keys and key covering): Polycarbonate PC-FR Lexan UL 940 UL94VO, RAL 7035 (grey)
- Sight glass:
  - Aluminum housing: Polycarbonat (PC), for Dust-Ex, EEx d, FM XP and CSA XP: Mineral glass
  - Stainless steel housing: Mineral glass
- Cable gland: Polyamid (PA)
- Blind plug: PBT-GF30 FR, for Dust Ex, EEx d, FM XP and CSA XP: AISI 316L (1.4435)
- Seal for cable gland and plug: Silicone (VMQ)
- O-ring for cover sealing: EPDM
- Nameplates: AISI 304 (1.4301)

T17 housing:
- Housing: Stainless steel AISI 316L (1.4404)
- Sight glass: Polycarbonat (PC) or mineral glass
- Cable gland: Polyamid (PA), for Dust-Ex: CuZn nickel-plated
- Blind plug: PBT-GF30 FR, for Dust-Ex: AISI 316L (1.4435)
- Seal for cable gland and plug: Silicone (VMQ)
- Pressure compensation filter: PA6 GF10, O-Ring: Silicone (VMQ)
- O-ring for cover sealing: Silicone (VMQ)
- Nameplates: lasered

Miscellaneous:
- Measuring cell PMD70/FMD76, filling oil
  - 10 inH_2O (25 mbar) and 40 inH_2O (100 mbar) measuring cell: Silicone oil
  - 200 inH_2O (500 mbar) and 1200 inH_2O (3000 mbar) measuring cell: Mineral oil
  - for oxygen and ultra pure gas applications: Inert oil (Voltalef 1A)
- Measuring cell PMD75 filling oil, Silicone oil (Wacker AK 20)
- Process diaphragm PMD70/FMD76: Al_2O_3 (Aluminum-oxide-ceramic)
- Mounting accessories: Mounting kit with screws AISI 304 (1.4301)
- Capillary: AISI 316 Ti (1.4571)
- Protective hose for capillary: AISI 304 (1.4301)
- External ground terminal: AISI 304 (1.4301)
- Screws and nuts for side flanges:
  - PMD70: hex-headed bolt DIN 931-M10x50-A2-70, hex-headed nut: DIN 934-M10-A4-70
  - PMD75 PN 160: hex-headed bolt ISO 4014-M12x90-A4
  - PMD75 PN 420: hex-headed nut ISO 4032-M12-A4-bs

→ For process connections, process diaphragms, seals and filling oils see ordering information, page 53 ff.

Planning instructions, diaphragm seal systems

Applications

Diaphragm seal systems should be used if the process media and the device should be separated. Diaphragm seal systems offer clear advantages in the following instances:
- In the case of high process temperatures (→ See also page 30, section "Process temperature limits".)
- In the case of process media that crystallise
- In the case of corrosive or highly various process media or process media with solids content
- In the case of heterogeneous and fibrous process media
- If measuring point cleaning is necessary
- If the measuring point is exposed to vibrations
- For mounting locations that are difficult to access (e.g. better view of display)

Design and operation mode

Diaphragm seals are separating equipment between the measuring system and the process medium.

A diaphragm seal system consists of:
- A diaphragm seal in a one-sided system, e.g. FMD77 or two diaphragm seals, in a two-sided system, e.g. FMD78
- One capillary tube or two capillary tubes
- Fill fluid and
- A differential pressure transmitter.

The process pressure acts via the diaphragm seal membrane on the liquid-filled system, which transfers the process pressure via the capillary tube onto the sensor of the differential pressure transmitter.
Endress+Hauser delivers all diaphragm seal systems as welded versions. The system is hermetically sealed, which ensures the highest reliability.

Note!
The correlations between the individual diaphragm seal components are presented in the following section. For further information and comprehensive diaphragm seal system designs, please contact your local Endress+Hauser Sales Center.

Diaphragm seal

The diaphragm seal determines the application range of the system by
- the diaphragm diameter
- the diaphragms stiffness and material
- the design (oil volume).

Diaphragm diameter

The larger the diaphragm diameter (less stiffness), the smaller the temperature effect on the measurement result.
Note: To keep the temperature effect in practice-oriented limits, you should select diaphragm seals with a nominal diameter of ≥ 3" (DN 80), in as far as the process connection allows for it.

Diaphragm stiffness

The stiffness is dependent on the diaphragm diameter, the material, any available coating and on the diaphragm thickness and shape. The diaphragm thickness and the shape are defined constructively. The stiffness of a diaphragm seal membrane influences the temperature operating range and the measuring error caused by temperature effects.

Capillary

Diaphragm seals are used with the following capillary internal diameters as standard:

- ≤ 2" (DN 50): 0.04" (1 mm)
- > 2" (DN 50): 0.08" (2 mm)

The capillary tube influences the T_K zero point, the ambient temperature operating range and the response time of a diaphragm seal system as a result of its length and internal diameter.
→ See also page 55 ff, sections "Influence of the temperature on the zero point", "Ambient temperature range" and "Response time".
→ Observe the installation instructions regarding capillary tubes. See page 60 ff, section "Installation instructions".

Filling oil

When selecting the filling oil, fluid and ambient temperature as well as the operating pressure are of crucial importance. Observe the temperatures and pressures during commissioning and cleaning. A further selection criterion is the compatibility of the filling oil with the requirements of the process medium. For this reason, only filling oils that are harmless to health are used in the food industry, such as vegetable oil or silicone oil. → See also the following section "Diaphragm seal filling oils".
The filling oil used influences the T_K zero point and the temperature operating range of a diaphragm seal system and the response time. → See also page 55 ff, sections "Influence of the temperature on the zero point" and "Response time".

Differential pressure transmitter

The differential pressure transmitter influences the temperature operating range, the T_K zero point and the response time as a result of the volume of its side flange and as a result of its volume change. The volume change is the volume that has to be shifted to pass through the complete measuring range.
Differential pressure transmitters from Endress+Hauser are optimised with regard to minimum volume change and side flange.

Diaphragm seal filling oils

Version [1]	**Filling oil**	**Permissible temperature range at 0.7 psi ≤ p_{abs} ≤ 14.5 psi (0.05 bar ≤ p_{abs} ≤ 1 bar)**	**Permissible temperature range at p_{abs} ≥ 14.5 psi (p_{abs} ≥ 1 bar)**	**Density** **[g/cm³]**	**Viscosity** **cSt at 77°F (25°C)**	**Coefficient of thermal expansion** **[1/K]**	**T_K correction factor**	**Notes**
FMD77: A FMD78: A, 1	Silicone oil (DC200)	–40 to +356°F (–40 to +180°C)	–40 to +482°F (–40 to +250°C)	0.96	100	0.00096	1	
FMD77: V FMD78: C, 3	High-temperature silicone oil (DC704)	+14 to +392°F (–10 to +200°C)	+14 to +662°F (–10 to +350°C)	1.07	37	0.0007	0.72	High temperatures
FMD77: F FMD78: D, 4	Inert oil (Halocarbon)	–40 to +176°F (–40 to +80°C)	–40 to +347°F (–40 to +175°C)	1.87	27	0.000876	0.91	Oil for ultra pure gas and oxygen applications
FMD77: D FMD78: B, 2	Neobee M-20 Vegetable oil	+14 to +248°F (–10 to +120°C)	+14 to +392°F (–10 to +200°C)	0.94	9.5	0.00101	1.05	Suitable for foods FDA 21 CFR 172.856

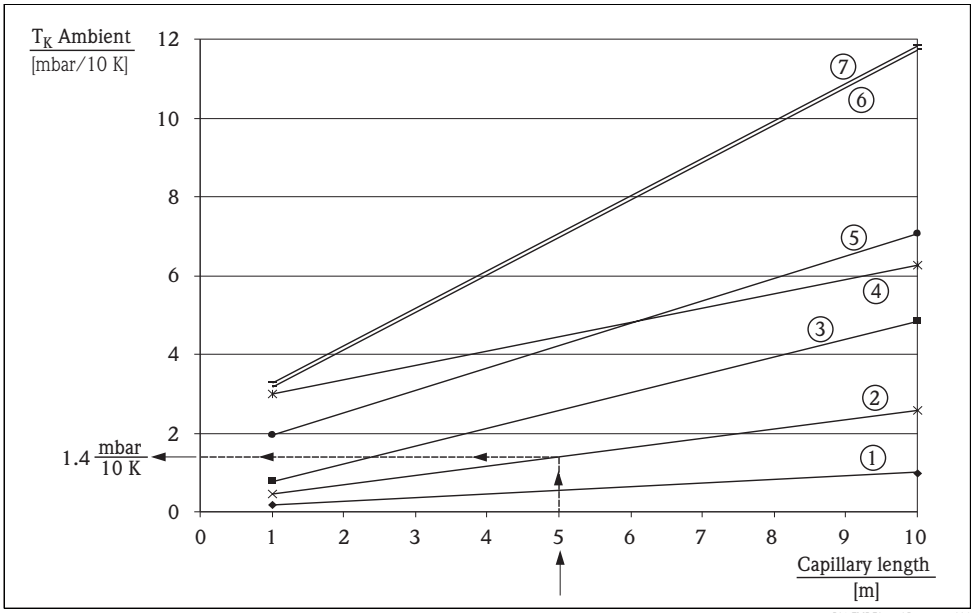
1) Version for feature 90 in the order code

2) Observe temperature limits of the device (see page 29 and 30)

Influence of the temperature on the zero point

A temperature change results in a volume change of the filling oil. The volume change is dependent on the coefficient of thermal expansion of the filling oil and on the volume of the filling oil at calibration temperature (constant in the range: +69.8 to 91.4°F / +21 to +33°C). → See also page 46, section "Diaphragm seal filling oils".
For example, the filling oil expands in the event of a temperature increase. The additional volume presses against the diaphragm seal membrane. The stiffer a diaphragm is, the greater its return force, which counteracts a volume change and acts on the measuring cell together with the operating pressure, thus shifting the zero point. For the "T_K Process", see page 45 ff, section "Process connections FMD78".

The following diagrams display the temperature coefficient "T_K Ambient" dependent on the capillary length. The following application is displayed: capillary temperature and transmitter temperature (ambient temperature) change, the process temperature corresponds to the calibration temperature.
The temperature coefficients obtained from the diagrams apply to silicone oil and the membrane material AISI 316L/1.4435. For other filling oils, these temperature coefficients must be multiplied by the T_K correction factor of the corresponding filling oil. For the T_K correction factors, see page 54, section "Diaphragm seal filling oils".



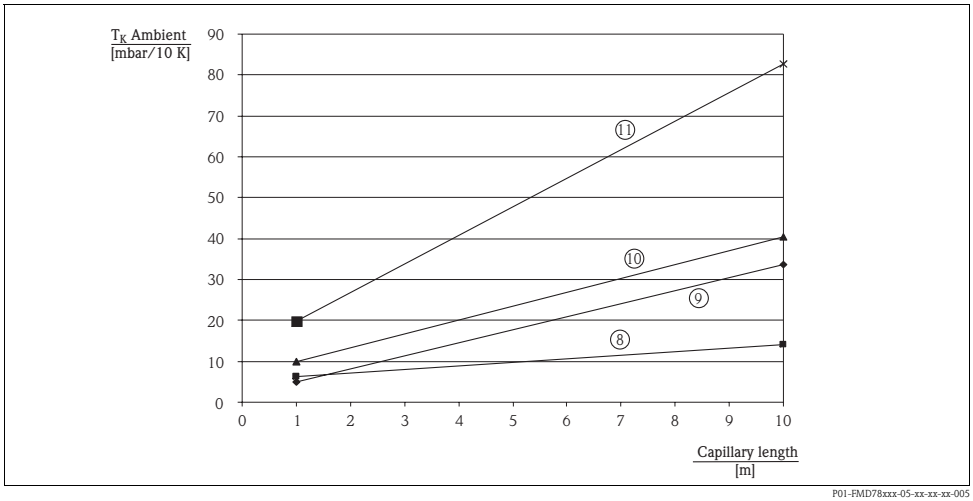
Example for:
– Diaphragm seal versions "B5, EN/DIN Flange DN 80 PN 10-40 B1, AISI 316L"
– Capillary length: 5 m
– Ambient temperature, capillary/transmitter: 45°C
– Filling oil: silicone oil

1. Select characteristic curve type for the diaphragm seal versions "B5" in accordance with the following table.
   Result: characteristic curve type 2
2. Obtain value for T_K Ambient from the diagram.
   Result: 1.4 mbar/10 K
3. $T_{Ambient} - T_{Calibration} = 45°C - 25°C = 20°C \Rightarrow 1.4$ mbar/10 K x 20 K = 2.8 mbar

Result: In this application, the zero point is shifted by 2.8 mbar.

Note!
- The influence of temperature on the zero point can be corrected with position calibration.
- The temperature influence can be minimized by using a filling oil with a smaller coefficient of thermal expansion, shorter capillaries, diaphragm seals with larger diaphragm diameter or by using a smaller capillary internal diameter.

Characteristic type	Version	Diaphragm seal
1	TF	Tri-Clamp, ISO 2852 DN 76.1 (3"), AISI 316L/1.4435
2	GA	Thread ISO 228 G 1/2 B, PN 40, AISI 316L, Separator, PTFE seal
	RL	Thread ANSI 1/2 FNPT, PN 40, AISI 316L, Separator, PTFE seal
	UH	Cell DN 80 PN 16-400, AISI 316L
	UJ	Cell DN 100 PN 16-400, AISI 316L
	VH	Cell 3" 150-2500 lbs, AISI 316L
	VJ	Cell 4" 150-2500 lbs, AISI 316L
	B5	EN/DIN flange DN 80 PN 10-40 B1, AISI 316L
	BT	EN/DIN flange DN 100 PN 10-16 B1, AISI 316L
	B6	EN/DIN flange DN 100 PN 25-40 B1, AISI 316L
	AG	ANSI flange 3" 150 lbs RF, AISI 316/316L
	AS	ANSI flange 3" 300 lbs RF, AISI 316/316L
	AH	ANSI flange 4" 150 lbs RF, AISI 316/316L
	J5	ANSI flange 4" 150 lbs RF, AISI 316/316L, Extensions: 2"/4"/6"/8"
	AT	ANSI flange 4" 300 lbs RF, AISI 316/316L
	KL	JIS flange 80 A 10 K RF, AISI 316L
	KH	JIS flange 100 A 10 K RF, AISI 316L
	MT	DIN 11851 DN 80 PN 25, AISI 316L/1.4435
	M5	DIN 11851 DN 80 PN 25 socket, AISI 316L/1.4435
3	MS	DIN 11851 DN 65 PN 25, AISI 316L/1.4435
	M4	DIN 11851 DN 65 PN 25 socket, AISI 316L/1.4435
	J4	ANSI flange 3" 150 lbs RF, AISI 316/316L, Extensions: 2"/4"/6"/8"
4	SC	Pipe seal diaphragm Tri Clamp, ISO 2852 DN 38 (1 1/2"), AISI 316L/1.4435
	SD	Pipe seal diaphragm Tri Clamp, ISO 2852 DN 51 (2"), AISI 316L/1.4435
5	UF	Cell DN 50 PN 16-400, AISI 316L
	VF	Cell 2" 150-2500 lbs, AISI 316L
	B3	EN/DIN flange DN 50 PN 10-40 B1, AISI 316L
	AF	ANSI flange 2" 150 lbs RF, AISI 316/316L
	AR	ANSI flange 2" 300 lbs RF, AISI 316/316L
	KF	JIS flange 50 A 10 K RF, AISI 316L
	MR	DIN 11851 DN 50 PN 25, AISI 316L/1.4435
	M3	DIN 11851 DN 50 PN 25 socket, AISI 316L/1.4435
6	TD	Tri-Clamp, ISO 2852 DN 51 (2"), DIN 32676 DN 50, AISI 316L/1.4435
7	TK	DRD 65 mm, PN 25, AISI 316L/1.4435
	TR	Varivent Type N for tubes DN 40 – DN 162, PN 40, AISI 316L/1.4435

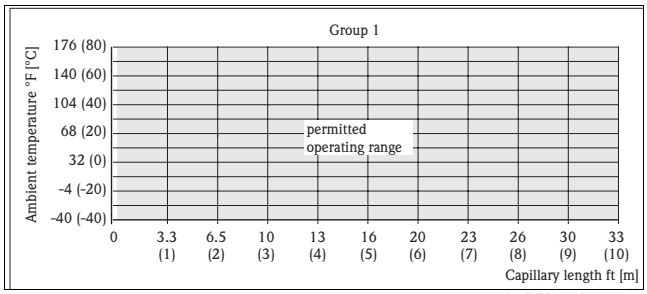


Characteristic type	Version	Diaphragm seal
8	SB	Pipe seal diaphragm Tri-Clamp, ISO 2852 DN 25 (1"), AISI 316L/1.4435
9	WH	Sanitary tank spud, AISI 316L/1.4435, Extensions 2"
10	TC	Tri-Clamp, ISO 2852 DN 38 (1 – 1 1/2"), DIN 32676 DN 40, AISI 316L/1.4435
11	TB	Tri-Clamp, ISO 2852 DN 25 (1"). DIN 32676 DN 25, AISI 316L/1.4435

Ambient temperature range

The filling oil, capillary length, capillary internal diameter, process temperature and the oil volume of the diaphragm seal determine the ambient temperature operating range of the diaphragm seal system.
The following diagrams display the permitted ambient temperature operating range in relation to the capillary length. The diagrams apply to a process temperature of +77°F (+25°C) and to silicone oil.
The operating range can be extended by using a filling oil with a smaller coefficient of expansion and by using shorter capillaries.

Note!
For further information, comprehensive diaphragm seal system designs and measuring technology solutions acting close to the operating limits, please contact your local Endress+Hauser Sales Center.



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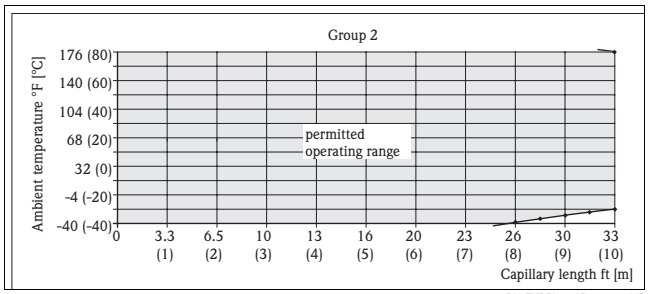

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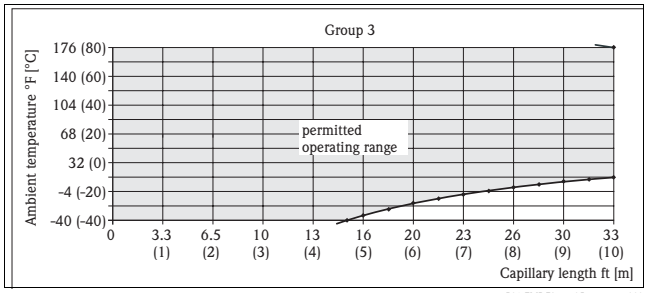

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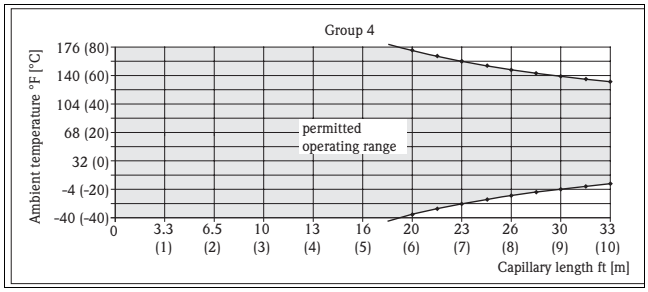

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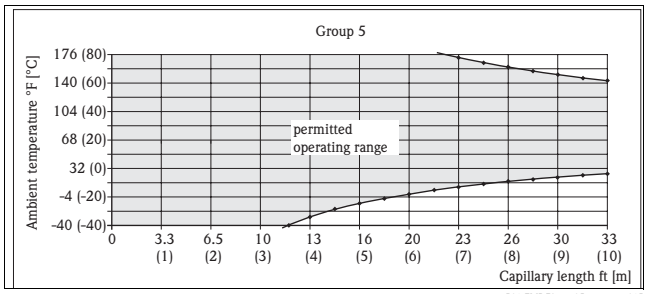

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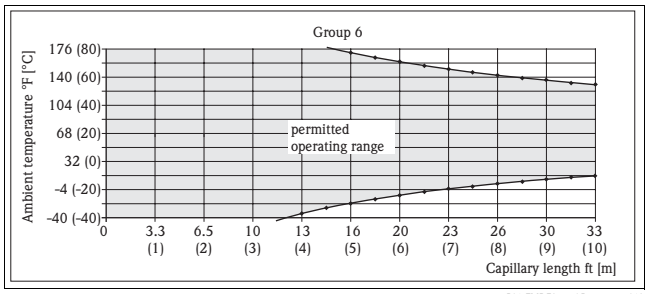

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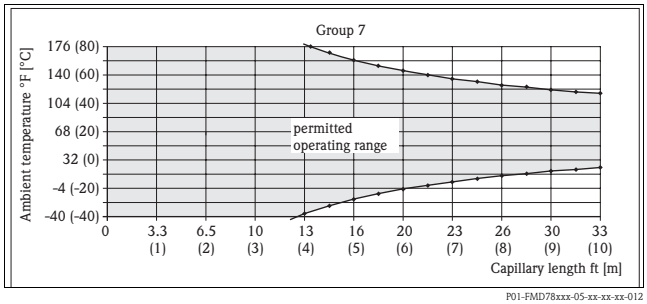

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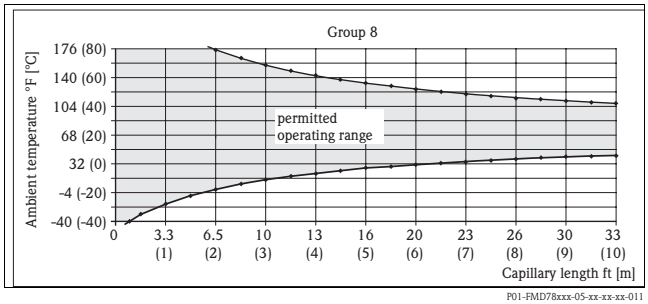

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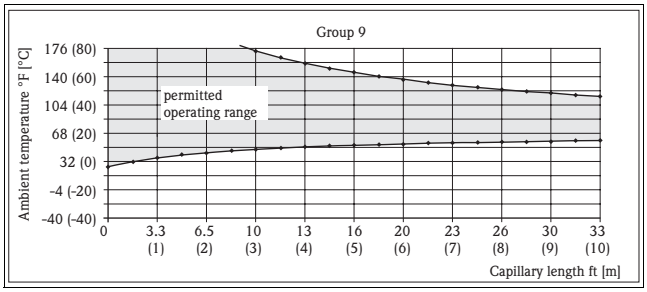

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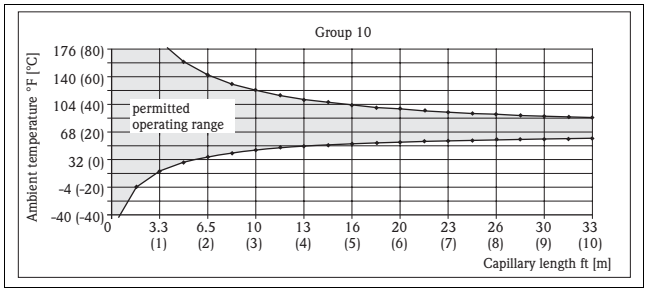

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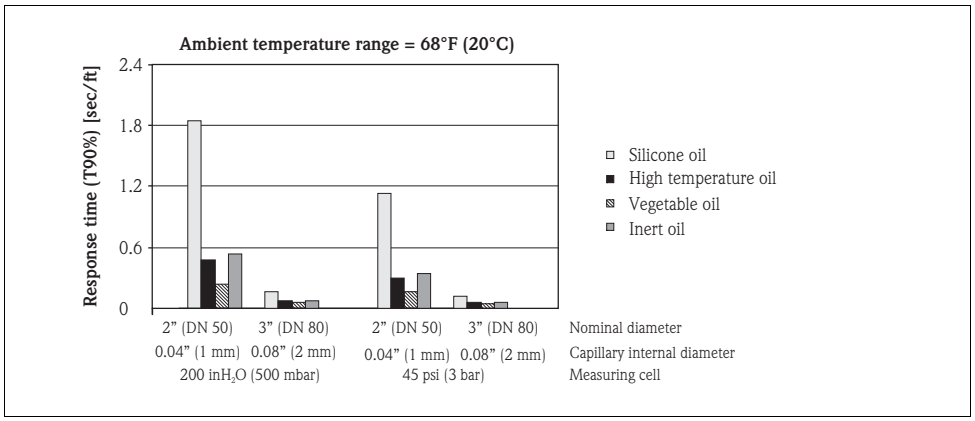
Group	**Version**	**Diaphragm seal**
1	SB	Pipe seal diaphragm Tri-Clamp, ISO 2852 DN 25 (1"), AISI 316L/1.4435
	SC	Pipe seal diaphragm Tri Clamp, ISO 2852 DN 38 (1 1/2"), AISI 316L/1.4435
	SD	Pipe seal diaphragm Tri Clamp, ISO 2852 DN 51 (2"), AISI 316L/1.4435
	GA	Thread ISO 228 G 1/2 B, PN 40, AISI 316L, Separator, PTFE seal
	RL	Thread ANSI 1/2 FNPT, PN 40, AISI 316L, Separator, PTFE seal
2	UF	Cell DN 50 PN 16-400, AISI 316L
	VF	Cell 2" 150-2500 lbs, AISI 316L
	B3	EN/DIN flange DN 50 PN 10-40 B1, AISI 316L
	AF	ANSI flange 2" 150 lbs RF, AISI 316/316L
	AR	ANSI flange 2" 300 lbs RF, AISI 316/316L
	KF	JIS flange 50 A 10 K RF, AISI 316L
	MR	DIN 11851 DN 50 PN 25, AISI 316L/1.4435
	M3	DIN 11851 DN 50 PN 25 socket, AISI 316L/1.4435
3	UH	Cell DN 80 PN 16-400, AISI 316L
	UJ	Cell DN 100 PN 16-400, AISI 316L
	VJ	Cell 4" 150-2500 lbs, AISI 316L
	B5	EN/DIN flange DN 80 PN 10-40 B1, AISI 316L
	BT	EN/DIN flange DN 100 PN 10-16 B1, AISI 316L
	B6	EN/DIN flange DN 100 PN 25-40 B1, AISI 316L
	AH	ANSI flange 4" 150 lbs RF, AISI 316/316L
	J5	ANSI flange 4" 150 lbs RF, AISI 316/316L, Extensions: 2"/4"/6"/8"
	AT	ANSI flange 4" 300 lbs RF, AISI 316/316L
	KH	JIS flange 100 A 10 K RF, AISI 316L
	MT	DIN 11851 DN 80 PN 25, AISI 316L/1.4435
	M5	DIN 11851 DN 80 PN 25 socket, AISI 316L/1.4435
4	VH	Cell 3" 150-2500 lbs, AISI 316L
	AG	ANSI flange 3" 150 lbs RF, AISI 316/316L
	AS	ANSI flange 3" 300 lbs RF, AISI 316/316L
	KL	JIS flange 80 A 10 K RF, AISI 316L
	TD	Tri-Clamp, ISO 2852 DN 51 (2"), DIN 32676 DN 50, AISI 316L/1.4435
	TF	Tri-Clamp, ISO 2852 DN 76.1 (3"), AISI 316L/1.4435
5	J4	ANSI flange 3" 150 lbs RF, AISI 316/316L, Extensions: 2"/4"/6"/8"
6	TK	DRD 65 mm, PN 25, AISI 316L/1.4435
	TR	Varivent Type N for tubes DN 40 – DN 162, PN 40, AISI 316L/1.4435
7	MS	DIN 11851 DN 65 PN 25, AISI 316L/1.4435
	M4	DIN 11851 DN 65 PN 25 socket, AISI 316L/1.4435
8	TC	Tri-Clamp, ISO 2852 DN 38 (1 – 1 1/2"), DIN 32676 DN 40, AISI 316L/1.4435
9	TB	Tri-Clamp, ISO 2852 DN 25 (1"). DIN 32676 DN 25, AISI 316L/1.4435
10	WH	Sanitary tank spud, AISI 316L/1.4435, Extensions 2"

Response time

The viscosity of the filling oil, the capillary length and the capillary internal diameter influence the frictional resistance. The greater the frictional resistance, the longer the response time.
Furthermore, the volume change of the measuring cell influences the response time. The lower the volume change of the measuring cell is, the less filling oil has to be shifted in the diaphragm seal system.

The following diagram shows typical response times (T90) for the various filling oils dependent on the measuring cell and the capillary internal diameter. The values given are in seconds per metre of capillary length and must be multiplied by the actual length of the capillary. The response time of the transmitter must also be taken into consideration.



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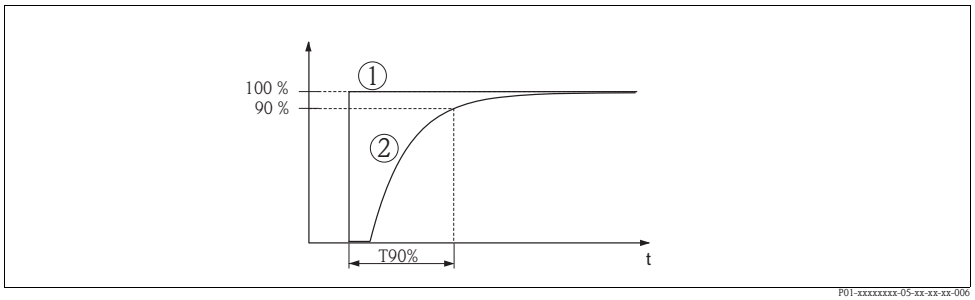

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Presentation of the response time (T90%)

1 Pressure step
2 Output signal

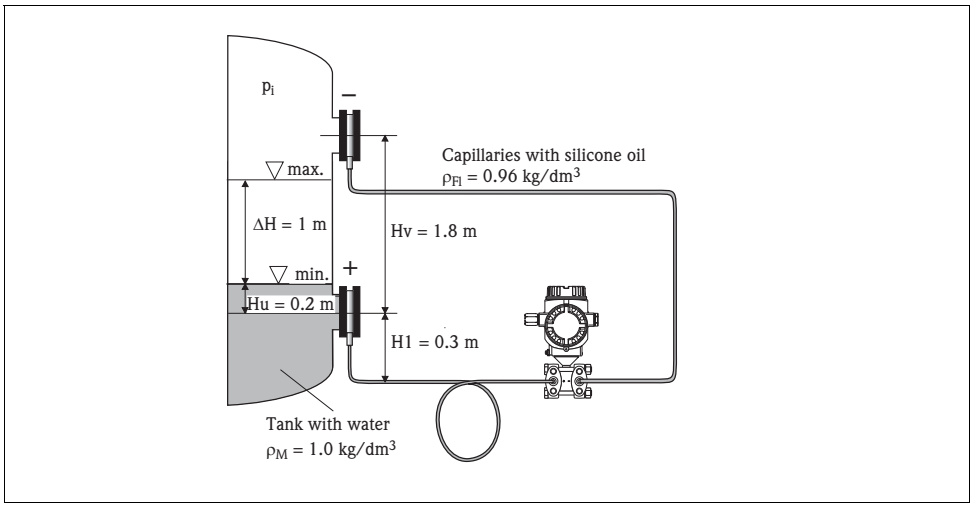
Minimize response time by	Comments
Larger capillary internal diameter	The temperature effect increases with increasing diameter.
Shorter capillaries	–
Filling oil with lower viscosity	– Observe compatibility of the filling oil with the process fluid. – Observe the filling oil operating limits.

Installation instructions

Instructions for diaphragm seal systems

- The diaphragm seal together with the transmitter form a closed, calibrated system, which is filled through ports in the diaphragm seal and in the measuring system of the transmitter. These ports are sealed and must not be opened.
- In the case of devices with diaphragm seals and capillaries, the zero point shift caused by the hydrostatic pressure of the filling liquid column in the capillaries must be taken into account when selecting the measuring cell. If a measuring cell with a small measuring cell is selected, the sensor nominal range can be overdriven as a result of position adjustment. → See the following diagram and the following example.
- When using a mounting bracket, sufficient strain relief must be allowed for in order to prevent the capillary bending down (bending radius ≥ 4" (100 mm).
- The temperature and length of both capillaries should be the same when using two-sided diaphragm seal systems.

Selecting the measuring cell (observe the hydrostatic pressure of the filling fluid column in the capillaries!)



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Pressure on the negative side of the differential pressure transmitter (p_-) when the tank is empty (min. level)

$$p_- = p_{Hv} + p_{H1} = Hv \bullet \rho_{Fl} \bullet g + H1 \bullet \rho_{Fl} \bullet g + p_i$$

$$= 1.8\ m \bullet 0.96 \frac{kg}{dm^3} \bullet 9.81 \frac{m}{s} + 0.3\ m \bullet 0.96 \frac{kg}{dm^3} \bullet 9.81 \frac{m}{s} + p_i$$

$$= 197.77\ mbar + p_i$$

Pressure on the positive side of the differential pressure transmitter (p_+) when the tank is empty (min. level)

$$p_+ = p_{Hu} + p_{H1} = Hu \bullet \rho_M \bullet g + H1 \bullet \rho_{Fl} \bullet g + p_i$$

$$= 0.2\ m \bullet 1 \frac{kg}{dm^3} \bullet 9.81 \frac{m}{s} + 0.3\ m \bullet 0.96 \frac{kg}{dm^3} \bullet 9.81 \frac{m}{s} + p_i$$

$$= 47.87\ mbar + p_i$$

Differential pressure at the transmitter ($\Delta p_{Transmitter}$) when the tank is empty

$$\Delta p_{Transmitter} = p_+ - p_-$$

$$= 47.87\ mbar - 197.77\ mbar$$

$$= -149.90\ mbar$$

Result:
If the tank were full, a differential pressure of –51.80 mbar would be present at the differential pressure transmitter. When the tank is empty, a differential pressure of –149.90 mbar is present. Therefore, a 500 mbar measuring cell is required for this application.

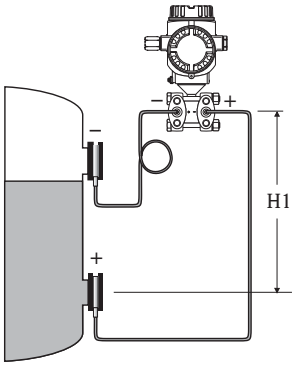
Installation instructions

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 at colder or warmer ambient temperatures
- with a bending radius of ≥ 4" (100 mm).

Vacuum applications

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 following illustration 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 tank), see the following illustration, on the right.



Installation above the lower diaphragm seal

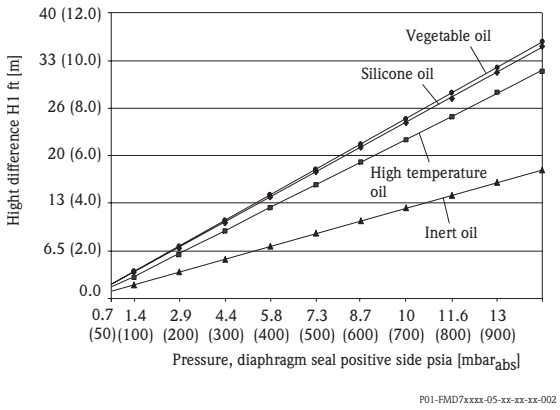


Diagram of maximum installation height above the lower diaphragm seal for vacuum applications dependent on the pressure at the diaphragm seal on the positive side

Certificates and approvals

CE mark

The device meets the legal requirements of the relevant EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

Ex approvals

- ATEX
- FM
- CSA
- NEPSI
- IECEx
- TIIS
- GOST on request

All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.
→ See also page 77 ff, sections "Safety Instructions" and "Installation/Control Drawings".

Marine certificate

- GL: FMD76, FMD78, PMD70, PMD75
- ABS: FMD76, FMD78, PMD70, PMD75

Overspill protection

WHG

CRN approvals

Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→ see page 64, feature 70 "Process connection") has to be ordered with a CSA approval (→ see page 63, feature 10 "Approval"). These devices are fitted with a separate plate bearing the registration number 0F10524.5C.

Pressure Equipment Directive (PED)

– This measuring device corresponds to Article 3 (3) of the EC directive 97/23/EC (Pressure Equipment Directive) and has been designed and manufactured according to good engineering practice.
– FMD78 with pipe diaphragm seal ≥ 1.5"/PN40:
Suitable for stable gases in group 1, category II
– PMD75, PN 420
Suitable for stable gases in group 1, category I

Standards and guidelines

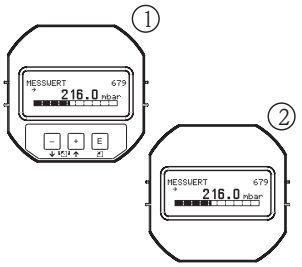
DIN EN 60770 (IEC 60770):
Transmitters for use in industrial-process control systems
Part 1: Methods for inspection and routine testing

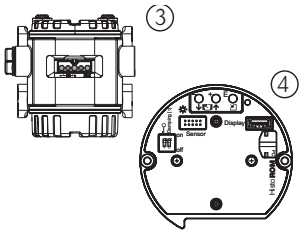
DIN 16086:
Electrical pressure measuring instruments, pressure sensors, pressure transmitters, pressure measuring instruments, concepts, specifications in data sheets

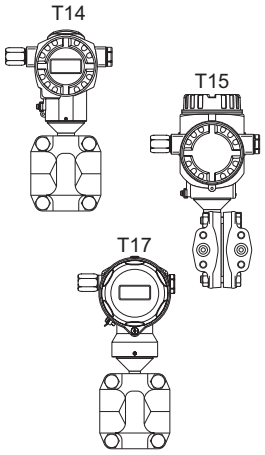
EN 61326:
Electrical equipment for measurement, control and laboratory use – EMC requirements

Ordering information

PMD70







10		Approval:
	A	For non-hazardous areas
	1	ATEX II 1/2 G EEx ia IIC T6
	6	ATEX II 1/2 G EEx ia IIC T6, overspill protection WHG
	2	ATEX II 1/2 D
	4	ATEX II 1/3 D
	8	ATEX II 1 GD EEx ia IIC T6
	3	ATEX II 1/2 GD EEx ia IIC T6
	7	ATEX II 3 G EEx nA II T6
	S	FM IS, Class I, II, III; Division 1, Groups A – G; NI Class I Division 2, Groups A – D; AEx ia
	Q	FM DIP, Class II, III; Division 1, Groups E – G
	R	FM NI, Class I, Division 2, Groups A – D
	U	CSA IS, Class I, II, III Division 1, Groups A – G; Class I Division 2, Groups A – D, Ex ia
	W	CSA Class II, III Division 1, Groups E – G (Dust-Ex)
	H	NEPSI Ex ia IIC T6
	I	IECEx Zone 1 Ex ia IIC T6

20		Output; Operation:
	A	4 to 20 mA HART, operation outside, LCD (→ see Fig. 1, 3)
	B	4 to 20 mA HART, operation inside, LCD (→ see Fig. 1, 4)
	C	4 to 20 mA HART, operation inside (→ see Fig. 4)
	M	PROFIBUS PA, operation outside, LCD (→ see Fig. 2, 3)
	N	PROFIBUS PA, operation inside, LCD (→ see Fig. 2, 4)
	O	PROFIBUS PA, operation inside (→ see Fig.4)
	P	FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. 2, 3)
	Q	FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. 2, 4)
	R	FOUNDATION Fieldbus, operation inside (→ see Fig. 4)

30		Housing; Cable entry; Protection:
	A	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
	B	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
	C	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
	D	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, M12x1 PA plug
	E	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
	F	Aluminum T14 housing, optional side-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
	J	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
	K	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
	L	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
	M	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, M12x1 PA plug
	N	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
	P	Aluminum T15 housing, optional top-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
	1	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
	2	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
	3	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
	4	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, M 12x1 PA plug
	5	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
	6	AISI 316L T14 housing, optional side-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
	R	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Gland M 20x1.5
	S	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Thread G 1/2
	T	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Thread 1/2 NPT
	U	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, M 12x1 PA plug
	V	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, 7/8" FF plug
	Z	Housing: see additional specifications

40		Nominal range; Sensor overload	
		Nominal value	**Overload**
	7B	10 inH_2O/25 mbar/2500 Pa	150 psi/10 bar/1 MPa
	7D	40 inH_2O/100 mbar/10 kPa	240 psi/16 bar/1,6 MPa
	7F	200 inH_2O/500 mbar/50 kPa	1500 psi/100 bar/10 MPa
	7H	45 psi/3 bar/300 kPa	1500 psi/100 bar/10 MPa
	78	Prepared mounting DELTATOP/DELTASET	

PMD70											order code

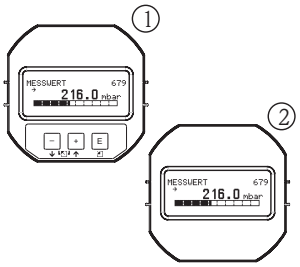
→ For continuation of PMD70 ordering information, see the following page.

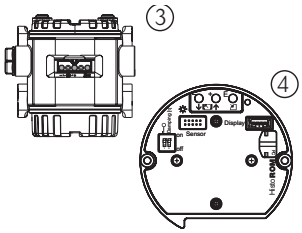
PMD70 (continued)

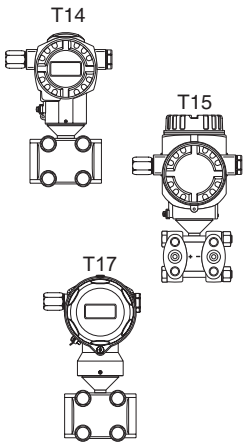
50											**Calibration; Unit:**
										1	Nominal range; mbar/bar
										2	Nominal range; kPa/MPa
										3	Nominal range; mmH_2O/mH_2O
										4	Nominal range; inH_2O/ftH_2O
										6	Nominal range; psi
										8	Adjusted for Deltatop/Deltaset; see additional specification
										B	Customized; see additional specification
										C	Factory certificate 5-point; see additional specification
										D	DKD certificate; see additional specification
										K	Platinum; see additional specification
										L	Platinum and factory certificate 5-point; see additional specification
										M	Platinum and DKD certificate; see additional specification
70											**Process connection; Material:**
										B	1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, C22.8 (CRN)
										D	1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, AISI 316L (CRN)
										F	1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, Alloy C (CRN)
										G	1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, PVDF
										U	RC 1/4 mounting: 7/16 – 20 UNF, AISI 316L (CRN)
										1	1/4 – 18 NPT, mounting: PN 160: M10, C22.8 (CRN)
										2	1/4 – 18 NPT, mounting: PN 160: M10, AISI 316L (CRN)
										3	1/4 – 18 NPT, mounting: PN 160: M10, Alloy C (CRN)
80											**Seal:**
										A	FKM Viton
										B	EPDM
										D	Kalrez
										E	Chemraz
										1	FKM Viton, degreased
										2	FKM Viton, cleaned for oxygen service
100											**Additional option 1:**
										A	not selected
										E	SIL2/IEC 61508 Declaration of conformity
										B	Material test certificate for wetted components, inspection certificate as per EN 10204 3.1 acc. to specification 52005759
										M	Overvoltage protection
										N	HistoROM/M-DAT
										S	GL/ABS marine certificate
										V	Mounting on shut-off valve from above
										W	Mounting on shut-off valve from below
										2	Test report acc. to EN10204 2.2
										3	Routine test with certificate, inspection certificate as per EN 10204 3.1
										4	Overpressure test with certificate, inspection certificate as per EN 10204 3.1
110											**Additional option 2:**
										A	not selected
										E	SIL2/IEC 61508 Declaration of conformity
										B	Material test certificate for wetted components, inspection certificate as per EN10204 3.1 acc. to specification 52005759
										K	Vent valves (2 pieces), Alloy C
										M	Overvoltage protection
										N	HistoROM/M-DAT
										R	Screws 7/16 UNF, length 1-1/2" (4 pieces)
										S	GL/ABS marine certificate
										U	Mounting bracket for wall/pipe, AISI 304
										2	Test report acc. to EN10204 2.2
										3	Routine test with certificate, inspection certificate as per EN 10204 3.1
										4	Overpressure test with certificate, inspection certificate as per EN 10204 3.1
										5	Helium leak test EN 1518 with test certificate, inspection certificate as per EN 10204 3.1

PMD70											complete order code

PMD75







10				**Approval:**								
	A			For non-hazardous areas								
	1			ATEX II 1/2 G EEx ia IIC T6								
	6			ATEX II 1/2 G EEx ia IIC T6, overspill protection WHG								
	2			ATEX II 1/2 D								
	4			ATEX II 1/3 D								
	8			ATEX II 1 GD EEx ia IIC T6								
	3			ATEX II 1/2 GD EEx ia IIC T6								
	5			ATEX II 2 G EEx d IIC T6								
	7			ATEX II 3 G EEx nA II T6								
	S			FM IS, Class I, II, III Division 1, Groups A – G; NI Class I Division 2, Groups A – D; AEx ia								
	T			FM XP, Class I Division 1, Groups A – D; AEx d								
	Q			FM DIP, Class II, III Division 1, Groups E – G								
	R			FM NI, Class I, Division 2, Groups A – D								
	U			CSA IS, Class I, II, III Division 1, Groups A – G; Class I Division 2, Groups A – D, Ex ia								
	V			CSA XP, Class I Division 1, Groups B – D; Ex d								
	W			CSA Class II, III Division 1, Groups E – G (Dust-Ex)								
	G			NEPSI Exd IIC T6								
	H			NEPSI Ex ia IIC T6								
	I			IECEx Zone 1 Ex ia IIC T6								
	K			TIIS Ex ia IIC T6								
	L			TIIS Ex d IIC T6								
	B			Combined certificates: ATEX II 1/2 G EEx ia IIC T6 + II G EEx d IIC T6								
	C			Combined certificates: FM IS and XP Class I Division 1, Groups A – D								
	D			Combined certificates: CSA IS and XP Class I Division 1, Groups A – D								
	E			Combined certificates: FM/CSA IS and XP Class I Division 1, Groups A – D								
20				**Output; Operation:**								
		A		4 to 20 mA HART, operation outside, LCD (→ see Fig. 1, 3)								
		B		4 to 20 mA HART, operation inside, LCD (→ see Fig. 1, 4)								
		C		4 to 20 mA HART, operation inside (→ see Fig. 4)								
		M		PROFIBUS PA, operation outside, LCD (→ see Fig. 2, 3)								
		N		PROFIBUS PA, operation inside, LCD (→ see Fig. 2, 4)								
		O		PROFIBUS PA, operation inside (→ see Fig.4)								
		P		FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. 2, 3)								
		Q		FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. 2, 4)								
		R		FOUNDATION Fieldbus, operation inside (→ see Fig. 4)								
30				**Housing; Cable entry, Protection:**								
			A	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5								
			B	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread G 1/2								
			C	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT								
			D	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, M12x1 PA plug								
			E	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug								
			F	Aluminum T14 housing, optional side-mounted display, IP 65/NEMA 4X, Han7D plug, 90°								
			J	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5								
			K	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Thread G 1/2								
			L	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT								
			M	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, M12x1 PA plug								
			N	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug								
			P	Aluminum T15 housing, optional top-mounted display, IP 65/NEMA 4X, Han7D plug, 90°								
			1	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5								
			2	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread G 1/2								
			3	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT								
			4	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, M 12x1 PA plug								
			5	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug								
			6	AISI 316L T14 housing, optional side-mounted display, IP 65/NEMA 4X, Han7D plug, 90°								
			R	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Gland M 20x1.5								
			S	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Thread G 1/2								
			T	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Thread 1/2 NPT								
			U	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, M 12x1 PA plug								
			V	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, 7/8" FF plug								
			Z	Housing: see additional specifications								

PMD75												order code

→ For continuation of PMD75 ordering information, see the following page.

PMD75 (continued)

40	Nominal range; Overload pressure:		
		Nominal value	**Overload**
	7B	4 inH_2O/10 mbar/1 kPa	2400 psi/160 bar/16 MPa
	7C	12 inH_2O/30 mbar/3 kPa	2400 psi/160 bar/16 MPa
	7D	40 inH_2O/100 mbar/10 kPa	2400 psi/160 bar/16 MPa
	7F	200 inH_2O/500 mbar/50 kPa	2400 psi/160 bar/16 MPa
	7H	45 psi/3 bar/300 kPa	2400 psi/160 bar/16 MPa
	7L	240 psi/16 bar/1,6 MPa	2400 psi/160 bar/16 MPa
	7M	40 bar/4 MPa/600 psi	2400 psi/160 bar/16 MPa
	8F	200 inH_2O/500 mbar/50 kPa	6300 psi/420 bar/42 MPa
	8H	45 psi/3 bar/300 kPa	6300 psi/420 bar/42 MPa
	8L	240 psi/16 bar/1.6 MPa	6300 psi/420 bar/42 MPa
	8M	600 psi/40 bar/4 MPa	6300 psi/420 bar/42 MPa
	78	Prepared for Deltatop/Deltaset; PN = 160 bar (2320 psi)	
	88	Prepared for Deltatop/Deltaset; PN = 420 bar (6090 psi)	

50	Calibration; Unit:	
	1	Nominal range; mbar/bar
	2	Nominal range; kPa/MPa
	3	Nominal range; mmH_2O/mH_2O
	4	Nominal range; inH_2O/ftH_2O
	6	Nominal range; psi
	8	Adjusted for Deltatop/Deltaset; see additional specification
	B	Customized; see additional specification
	C	Factory certificate 5-point; see additional specification
	D	DKD certificate; see additional specification
	K	Platinum; see additional specification
	L	Platinum and factory certificate 5-point; see additional specification
	M	Platinum and DKD certificate; see additional specification

60	Membrane material:	
	1	AISI 316L SS
	2	Alloy C
	3	Monel
	5	Tantalum
	6	AISI 316L SS with Gold-Rhodium coating

70	Process connection; Material:	
	B	1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, C22.8 (CRN)
	C	1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, C22.8, side vent, including 4 fastening bolt connections (AISI 316L) mounted
	D	1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, AISI 316L (CRN)
	E	1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, AISI 316L, side vent, including 4 fastening bolt connections (AISI 316L) mounted
	F	1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, Alloy C (CRN), without screws/vents
	H	1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, Alloy C, side vent, without screws/vents
	U	RC 1/4 mounting: 7/16 – 20 UNF, AISI 316L (CRN)
	V	RC 1/4 mounting: 7/16 – 20 UNF, C22.8, side vent, including 4 fastening bolt connections (AISI 316L) mounted
	W	Prepared for diaphragm seal mount
	1	1/4 – 18 NPT, mounting: PN 160: M10, PN 420: M12, C22.8 (CRN)
	2	1/4 – 18 NPT, mounting: PN 160: M10, PN 420: M12, AISI 316L (CRN)
	3	1/4 – 18 NPT, mounting: PN 160: M10, PN 420: M12, Alloy C (CRN)

80	Seal:	
	A	FKM Viton
	C	PTFE, glass-filled
	F	NBR
	K	Copper seal ring, cleaned for oxygen service
	1	FKM Viton, degreased
	2	FKM Viton, cleaned for oxygen service
	3	PTFE, glass-filled, cleaned for oxygen service
	H	Copper seal ring

PMD75												order code

→ For continuation of PMD75 ordering information, see the following page.

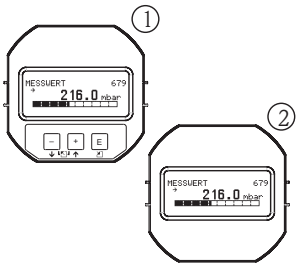
PMD75 (continued)

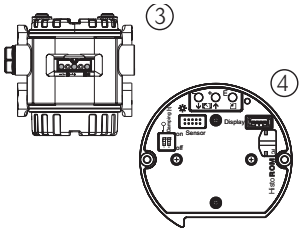
100		Additional option 1:
	A	not selected
	E	SIL2/IEC 61508 Declaration of conformity
	B	Material test certificate for wetted components, inspection certificate as per EN 10204 3.1 acc. to specification 52005759
	C	NACE MR0175 (wetted parts)
	D	Material test certificate for wetted components as per EN 10204 3.1 and NACE MR0175 material, inspection certificate as per EN 10204 acc. to specification 52010806
	M	Overvoltage protection
	N	HistoROM/M-DAT
	S	GL/ABS marine certificate
	V	Mounting on shut-off valve from above
	W	Mounting on shut-off valve from below
	2	Test report acc. to EN10204 2.2
	3	Routine test with certificate, inspection certificate as per EN 10204 3.1
	4	Overpressure test with certificate, inspection certificate as per EN 10204 3.1

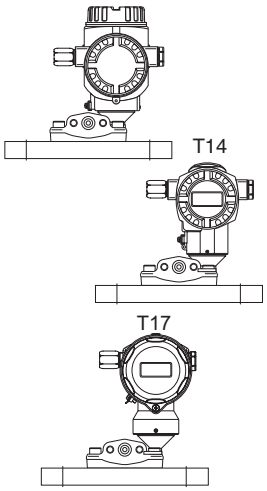
110		Additional option 2:
	A	not selected
	E	SIL2/IEC 61508 Declaration of conformity
	B	Material test certificate for wetted components, inspection certificate as per EN 10204 3.1 acc. to specification 52005759
	K	Vent valves (2 pieces), Alloy C
	L	Vent valves (4 pieces), Alloy C
	M	Overvoltage protection
	N	HistoROM/M-DAT
	R	Screws 7/16 UNF, length 1 1/2" (4 pieces)
	S	GL/ABS marine certificate
	U	Mounting bracket for wall/pipe, AISI 304
	2	Test report acc. to EN10204 2.2
	3	Routine test with certificate, inspection certificate as per EN 10204 3.1
	4	Overpressure test with certificate, inspection certificate as per EN 10204 3.1
	5	Helium leak test EN 1518 with test certificate inspection certificate as per EN 10204 3.1

PMD75	complete order code

FMD76







10				Approval:
	A			For non-hazardous areas
	1			ATEX II 1/2 G EEx ia IIC T6
	6			ATEX II 1/2 G EEx ia IIC T6, overspill protection WHG
	2			ATEX II 1/2 D EEx ia IIC T6
	8			ATEX II 1 GD EEx ia IIC T6
	3			ATEX II 1/2 GD EEx ia IIC T6
	7			ATEX II 3 G EEx nA II T6
	S			FM IS, Class I, II, III Division 1, Groups A – G; NI Class I Division 2, Groups A – D; AEx ia
	R			FM NI, Class I, Division 2, Groups A – D
	U			CSA IS, Class I, II, III Division 1, Groups A – G; Class I Division 2, Groups A – D, Ex ia
	H			NEPSI Ex ia IIC T6
	I			IECEx Zone 1 Ex ia IIC T6

20			Output; Operation:
	A		4 to 20 mA HART, operation outside, LCD (→ see Fig. 1, 3)
	B		4 to 20 mA HART, operation inside, LCD (→ see Fig. 1, 4)
	C		4 to 20 mA HART, operation inside (→ see Fig. 4)
	M		PROFIBUS PA, operation outside, LCD (→ see Fig. 2, 3)
	N		PROFIBUS PA, operation inside, LCD (→ see Fig. 2, 4)
	O		PROFIBUS PA, operation inside (→ see Fig.4)
	P		FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. 2, 3)
	Q		FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. 2, 4)
	R		FOUNDATION Fieldbus, operation inside (→ see Fig. 4)

30				Housing; Cable entry, Protection:
	A			Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
	B			Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
	C			Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
	D			Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, M12x1 PA plug
	E			Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
	F			Aluminum T14 housing, optional side-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
	J			Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
	K			Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
	L			Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
	M			Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, M12x1 PA plug
	N			Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
	P			Aluminum T15 housing, optional top-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
	1			AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
	2			AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
	3			AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
	4			AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, M 12x1 PA plug
	5			AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
	6			AISI 316L T14 housing, optional side-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
	R			AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Gland M 20x1.5
	S			AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Thread G 1/2
	T			AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Thread 1/2 NPT
	U			AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, M 12x1 PA plug
	V			AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, 7/8" FF plug
	Z			Housing: see additional specifications

40				Nominal range; Overload pressure:	
				Nominal value	**Overload**
			7D	40 inH_2O/100 mbar/10 kPa	240 psi/16 bar/1,6 MPa
			7F	200 inH_2O/500 mbar/50 kPa	1500 psi/100 bar/10 MPa
			7H	45 psi/3 bar/300 kPa	1500 psi/100 bar/10 MPa

FMD76											order code

→ For continuation of FMD76 ordering information, see the following page.

FMD76 (continued)

50	Calibration; Unit:
1	Nominal range; mbar/bar
2	Nominal range; kPa/MPa
3	Nominal range; mmH_2O/mH_2O
4	Nominal range; inH_2O/ftH_2O
6	Nominal range; psi
B	Customized; see additional specification
C	Factory certificate 5-point; see additional specification
D	DKD certificate; see additional specification
K	Platinum; see additional specification
L	Platinum and factory certificate 5-point; see additional specification
M	Platinum and DKD certificate: see additional specification

70	Process connection low-pressure side; Material; Seal:
	Mounting: 7/16 – 20 UNF
B	1/4 – 18 NPT IEC 61518, C22.8, FKM Viton (CRN)
D	1/4 – 18 NPT IEC 61518, AISI 316L, FKM Viton (CRN)
F	1/4 – 18 NPT IEC 61518, Alloy C, FKM Viton (CRN)
G	1/4 – 18 NPT IEC 61518, PVDF, FKM Viton, Safety instructions, observe electrostatic charge.
K	1/4 – 18 NPT IEC 61518, AISI 316L, EPDM (CRN)
L	1/4 – 18 NPT IEC 61518, Alloy C, EPDM (CRN)
M	1/4 – 18 NPT IEC 61518, AISI 316L, Kalrez (CRN)
N	1/4 – 18 NPT IEC 61518, Alloy C, Kalrez (CRN)
P	1/4 – 18 NPT IEC 61518, AISI 316L, Chemraz (CRN)
Q	1/4 – 18 NPT IEC 61518, Alloy C, Chemraz (CRN)
S	1/4 – 18 NPT IEC 61518, AISI 316L, FKM Viton, degreased (CRN)
T	1/4 – 18 NPT IEC 61518, AISI 316L, FKM Viton, cleaned for oxygen service (CRN)
U	RC 1/4, AISI 316L, FKM Viton (CRN)

80	Process connection high-pressure side; Material:
	EN/DIN flanges
B	DN 80 PN 10-40 B1, AISI 316L
D	DN 80 PN 10-40, AISI 316L with ECTFE coating Safety instructions, observe electrostatic charge!
E	DN 80 PN 10-40 B1, Alloy C276
F	DN 100 PN 10-16 B1, AISI 316L
G	DN 100 PN 25-40 B1, AISI 316L
H	DN 100 PN 25-40, AISI 316L with ECTFE coating Safety instructions, observe electrostatic charge!
J	DN 100 PN 25-40 B1, Alloy C276
L	DN 100 PN 10-16, AISI 316L with ECTFE coating Safety instructions, observe electrostatic charge!
M	DN 100 PN 10-16 B1, Alloy C276
	ANSI flanges
P	3" 150 lbs RF, AISI 316/316L (CRN)
R	3" 150 lbs, AISI 316/316L with ECTFE coating Safety instructions, observe electrostatic charge!
S	3" 150 lbs RF, Alloy C276 (CRN)
T	4" 150 lbs RF, AISI 316/316L (CRN)
U	4" 150 lbs, AISI 316/316L with ECTFE coating Safety instructions, observe electrostatic charge!
V	4" 150 lbs RF, Alloy C276 (CRN)
W	4" 300 lbs RF, AISI 316/316L (CRN)
	JIS flanges
1	10K 80A RF, AISI 316L
3	10K 80A RF, Alloy C276
4	10K 100A RF, AISI 316L

FMD76											order code

→ For continuation of FMD76 ordering information, see the following page.

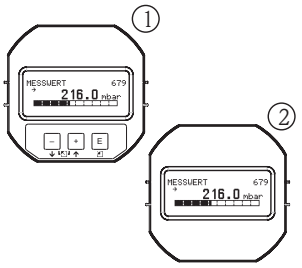
FMD76 (continued)

100										**Additional option 1:**	
										A	not selected
										E	SIL2/IEC 61508 Declaration of conformity
										B	Material test certificate for wetted components, inspection certificate as per EN 10204 3.1 acc. to specification 52005759
										M	Overvoltage protection
										N	HistoROM/M-DAT
										S	GL/ABS marine certificate
										2	Test report acc. to EN10204 2.2
										3	Routine test with certificate, inspection certificate as per EN 10204 3.1
										4	Overpressure test with certificate, inspection certificate as per EN 10204 3.1

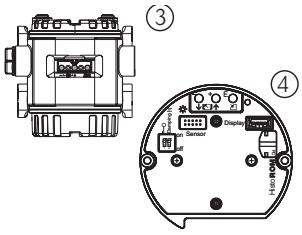
110										**Additional option 2:**	
										A	not selected
										E	SIL2/IEC 61508 Declaration of conformity
										K	Vent valves (2 pieces), Alloy C
										M	Overvoltage protection
										N	HistoROM/M-DAT
										R	Screws 7/16 UNF, length 1 1/2" (4 pieces)
										S	GL/ABS marine certificate
										U	Mounting bracket for wall/pipe, AISI 304
										2	Test report acc. to EN10204 2.2
										3	Routine test with certificate, inspection certificate as per EN 10204 3.1
										4	Overpressure test with certificate, inspection certificate as per EN 10204 3.1
										5	Helium leak test EN 1518 with test certificate, inspection certificate as per EN 10204 3.1

FMD76										complete order code

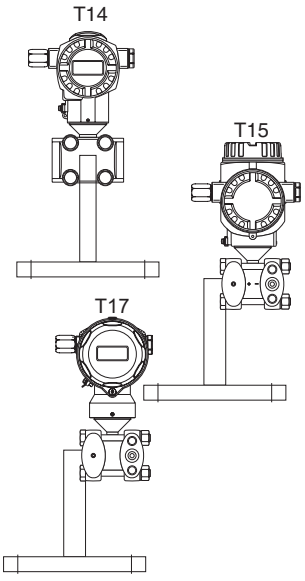
FMD77



10	Approval:
A	For non-hazardous areas
1	ATEX II 1/2 G EEx ia IIC T6
6	ATEX II 1/2 G EEx ia IIC T6, overspill protection WHG
2	ATEX II 1/2 D
4	ATEX II 1/3 D
8	ATEX II 1 GD EEx ia IIC T6
3	ATEX II 1/2 GD EEx ia IIC T6
5	ATEX II 2 G EEx d IIC T6
7	ATEX II 3 G EEx nA II T6
S	FM IS, Class I, II, III Division 1, Groups A – G; NI Class I Division 2, Groups A – D; AEx ia
T	FM XP, Class I Division 1, Groups A – D; AEx ia
Q	FM DIP, Class II, III Division 1, Groups E – G
R	FM NI, Class I, Division 2, Groups A – D
U	CSA IS, Class I, II, III Division 1, Groups A – G; Class I Division 2, Groups A – D, Ex ia
V	CSA XP, Class I Division 1, Groups B – D; Ex d
W	CSA Class II, III Division 1, Groups E – G (Dust-Ex)
G	NEPSI Ex d IIC T6
H	NEPSI Ex ia IIC T6
I	IECEx Zone 1 Ex ia IIC T6
K	TIIS Ex ia IIC T6
L	TIIS Ex d IIC T6
B	Combined certificates: ATEX II 1/2 G EEx ia IIC T6 + II G EEx d IIC T6
C	Combined certificates: FM IS and XP Class I Division 1, Groups A – D
D	Combined certificates: CSA IS and XP Class I Division 1, Groups A – D
E	Combined certificates: FM/CSA IS and XP Class I Division 1, Groups A – D



20		Output; Operation:
	A	4 to 20 mA HART, operation outside, LCD (→ see Fig. 1, 3)
	B	4 to 20 mA HART, operation inside, LCD (→ see Fig. 1, 4)
	C	4 to 20 mA HART, operation inside (→ see Fig. 4)
	M	PROFIBUS PA, operation outside, LCD (→ see Fig. 2, 3)
	N	PROFIBUS PA, operation inside, LCD (→ see Fig. 2, 4)
	O	PROFIBUS PA, operation inside (→ see Fig.4)
	P	FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. 2, 3)
	Q	FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. 2, 4)
	R	FOUNDATION Fieldbus, operation inside (→ see Fig. 4)



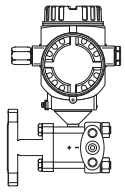
30			Housing; Cable entry, Protection:
		A	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
		B	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
		C	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
		D	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, M12x1 PA plug
		E	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
		F	Aluminum T14 housing, optional side-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
		J	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
		K	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
		L	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
		M	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, M12x1 PA plug
		N	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
		P	Aluminum T15 housing, optional top-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
		1	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
		2	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
		3	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
		4	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, M 12x1 PA plug
		5	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
		6	AISI 316L T14 housing, optional side-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
		R	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Gland M 20x1.5
		S	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Thread G 1/2
		T	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Thread 1/2 NPT
		U	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, M 12x1 PA plug
		V	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, 7/8" FF plug
		Z	Housing: see additional specifications

FMD77														order code

→ For continuation of FMD77 ordering information, see the following page.

FMD77 (continued)

40				**Nominal range; Overload pressure:**									
					Nominal value							**Overload**	
				7D	40 inH_2O/100 mbar/10 kPa							2400 psi/160 bar/16 MPa	
				7F	200 inH_2O/500 mbar/50 kPa							2400 psi/160 bar/16 MPa	
				7H	45 psi/3 bar/300 kPa							2400 psi/160 bar/16 MPa	
				7L	240 psi/16 bar/1.6 MPa							2400 psi/160 bar/16 MPa	
50					**Calibration, Units:**								
					1	Calibration: nominal range, mbar/bar							
					2	Calibration: nominal range, kPa/MPa							
					3	Calibration: nominal range, mmH_2O/mH_2O							
					4	Calibration: nominal range, inH_2O/ftH_2O							
					6	Calibration: nominal range, psi							
					B	Custom calibration: see additional specification							
					C	Factory calibration: see additional specification, Factory calibration certificate, 5-point							
					D	DKD calibration: see additional specification							
60						**Membrane material (high-pressure side):**							
						1	AISI 316L						
						2	Alloy C						
						3	Monel						
						5	Tantalum						
						6	AISI 316L with Gold-Rhodium coating						
						7	AISI 316L with 0.09 mm PTFE foil (not for vacuum applications)						
70							**Process connection low-pressure side; Material; Seal:**						
							Mounting: 7/16 – 20 UNF						
						B	1/4 – 18 NPT IEC 61518, C22.8, FKM Viton (CRN)						
						D	1/4 – 18 NPT IEC 61518, AISI 316L, FKM Viton (CRN)						
						F	1/4 – 18 NPT IEC 61518, Alloy C276, FKM Viton (CRN)						
						H	1/4 – 18 NPT IEC 61518, AISI 316L, PTFE, glass-filled + C4-ring (CRN)						
						J	1/4 – 18 NPT IEC 61518, Alloy C, PTFE, glass-filled + C4-ring (CRN)						
						K	1/4 – 18 NPT IEC 61518, AISI 316L, EPDM (CRN)						
						L	1/4 – 18 NPT IEC 61518, Alloy C, EPDM (CRN)						
						M	1/4 – 18 NPT IEC 61518, AISI 316L, Kalrez (CRN)						
						N	1/4 – 18 NPT IEC 61518, Alloy C, Kalrez (CRN)						
						P	1/4 – 18 NPT IEC 61518, AISI 316L, Chemraz (CRN)						
						Q	1/4 – 18 NPT IEC 61518, Alloy C, Chemraz (CRN)						
						S	1/4 – 18 NPT IEC 61518, AISI 316L, degreased (CRN)						
						T	1/4 – 18 NPT IEC 61518, AISI 316L, cleaned for oxygen service (CRN)						
						U	RC 1/4, AISI 316L, FKM Viton (CRN)						
80									**Process connection high-pressure side; Material:**				
									EN/DIN flanges				
								A	DN 50 PN 10-40 B1, AISI 316L				
								B	DN 80 PN 10-40 B1, AISI 316L				
								C	DN 80 PN 10-40 B1, extended diaphragm seal: 50 mm/100 mm/200 mm, extended diaphragm seal: see additional specification				
								F	DN 100 PN 10-16 B1, AISI 316L				
								G	DN 100 PN 25-40 B1, AISI 316L				
									ANSI flanges				
								N	2" 150 lbs, RF, AISI 316/316L, B16.5 (CRN)				
								P	3" 150 lbs, RF, AISI316/ 316L, B16.5 (CRN)				
								Q	3" 150 lbs RF, AISI 316/316L, extended diaphragm seal: 2"/4"/6"/8", extended diaphragm seal: see additional specification				
								T	4" 150 lbs RF, AISI 316L (CRN)				
								W	4" 300 lbs RF, AISI 316L (CRN)				
								5	3" 150 lbs RF, compact, AISI 316/316L, B16.5				
								6	3" 300 lbs RF, compact, AISI 316/316L, B16.5				
								7	3" 150 lbs RF, compact, AISI 316/316L, extended diaphragm seal: 2"/4"/6"/8"				
								8	4" 150 lbs RF, compact, AISI 316/316L, B16.5				
									JIS flanges				
								X	10K 50A RF, AISI 316L				
								1	10K 80A RF, AISI 316L				
								4	10K 100 A RF, AISI 316L				
FMD77													order code



Compact flange, version 5, 6, 7, 8

→ For continuation of FMD77 ordering information, see the following page.

FMD77 (continued)

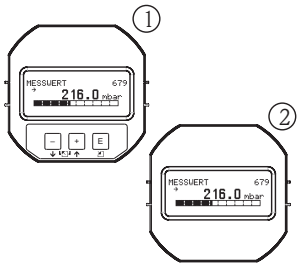
90	Fill fluid:
A	Silicone oil (DC200)
D	Neobee M-20
V	High temperature silicone oil (DC704)
F	Inert oil (Halocarbon)

100	Additional options 1:
A	Additional options 1 not selected
B	Material test certificate for wetted components, inspection certificate as per EN 10204 3.1 acc. to specification 52005759
C	NACE MR0175 material
D	Material test certificate for wetted components as per EN 10204 3.1 and NACE MR0175 material, inspection certificate as per EN 10204 acc. to specification 52010806
M	Overvoltage protection
N	HistoROM module
2	Test report acc. to EN 10204 2.2
3	Routine test with certificate, inspection certificate as per EN 10204 3.1
4	Overpressure test with certificate, inspection certificate as per EN 10204 3.1

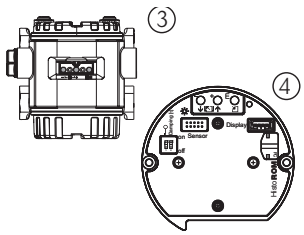
110	Additional options 2:
A	Additional options 2 not selected
M	Overvoltage protection
N	HistoROM module
R	Screws 7/16 UNF, length 1 1/2" (4 pieces)
2	Test report acc. to EN 10204 2.2
3	Routine test with certificate, inspection certificate as per EN 10204 3.1
4	Overpressure test with certificate, inspection certificate as per EN 10204 3.1

FMD77	complete order code

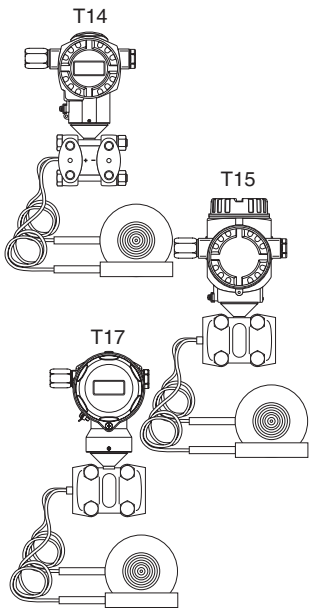
FMD78



10	Approval:
A	For non-hazardous areas
1	ATEX II 1/2 G EEx ia IIC T6
6	ATEX II 1/2 G EEx ia IIC T6, overspill protection WHG
2	ATEX II 1/2 D
4	ATEX II 1/3 D
8	ATEX II 1 GD EEx ia IIC T6
3	ATEX II 1/2 GD EEx ia IIC T6
5	ATEX II 2 G EEx d IIC T6
7	ATEX II 3 G EEx nA II T6
S	FM IS, Class I, II, III Division 1, Groups A – G; NI Class I Division 2, Groups A – D; AEx ia
T	FM XP, Class I Division 1, Groups A – D; AEx ia
Q	FM DIP, Class II, III Division 1, Groups E – G
R	FM NI, Class I, Division 2, Groups A – D
U	CSA IS, Class I, II, III Division 1, Groups A – G; Class I Division 2, Groups A – D, Ex ia
V	CSA XP, Class I Division 1, Groups B – D; Ex d
W	CSA Class II, III Division 1, Groups E – G (Dust-Ex)
G	NEPSI Ex d IIC T6
H	NEPSI Ex ia IIC T6
I	IECEx Zone 1 Ex ia IIC T6
K	TIIS Ex ia IIC T6
L	TIIS Ex d IIC T6
B	Combined certificates: ATEX II 1/2 G EEx ia IIC T6 + II G EEx d IIC T6
C	Combined certificates: FM IS and XP Class I Division 1, Groups A – D
D	Combined certificates: CSA IS and XP Class I Division 1, Groups A – D
E	Combined certificates: FM/CSA IS and XP Class I Division 1, Groups A – D



20	Output; Operation:
A	4 to 20 mA HART, operation outside, LCD (→ see Fig. 1, 3)
B	4 to 20 mA HART, operation inside, LCD (→ see Fig. 1, 4)
C	4 to 20 mA HART, operation inside (→ see Fig. 4)
M	PROFIBUS PA, operation outside, LCD (→ see Fig. 2, 3)
N	PROFIBUS PA, operation inside, LCD (→ see Fig. 2, 4)
O	PROFIBUS PA, operation inside (→ see Fig.4)
P	FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. 2, 3)
Q	FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. 2, 4)
R	FOUNDATION Fieldbus, operation inside (→ see Fig. 4)



30	Housing; Cable entry, Protection:
A	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
B	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
C	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
D	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, M12x1 PA plug
E	Aluminum T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
F	Aluminum T14 housing, optional side-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
J	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
K	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
L	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
M	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, M12x1 PA plug
N	Aluminum T15 housing, optional top-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
P	Aluminum T15 housing, optional top-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
1	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Gland M 20x1.5
2	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread G 1/2
3	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, Thread 1/2 NPT
4	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, M 12x1 PA plug
5	AISI 316L T14 housing, optional side-mounted display, IP 66/67/NEMA 6P, 7/8" FF plug
6	AISI 316L T14 housing, optional side-mounted display, IP 65/NEMA 4X, Han7D plug, 90°
R	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Gland M 20x1.5
S	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Thread G 1/2
T	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, Thread 1/2 NPT
U	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, M 12x1 PA plug
V	AISI 316L T17 housing, optional side-mounted display, IP 66/68/NEMA 6P, 7/8" FF plug
Z	Housing: see additional specifications

FMD78												order code

→ For continuation of FMD78 ordering information, see the following page.

FMD78 (continued)

40	Nominal range; Overload pressure:	
	Nominal value	**Overload**
7D	40 inH_2O/100 mbar/10 kPa	2400 psi/160 bar/16 MPa
7F	200 inH_2O/500 mbar/50 kPa	2400 psi/160 bar/16 MPa
7H	45 psi/3 bar/300 kPa	2400 psi/160 bar/16 MPa
7L	240 psi/16 bar/1.6 MPa	2400 psi/160 bar/16 MPa
7M	600 psi/40 bar/4 MPa	2400 psi/160 bar/16 MPa

50	Calibration, Units:
1	Calibration: nominal range, mbar/bar
2	Calibration: nominal range, kPa/MPa
3	Calibration: nominal range, mmH_2O/mH_2O
4	Calibration: nominal range, inH_2O/ftH_2O
6	Calibration: nominal range, psi
B	Custom calibration: see additional specification
C	Factory calibration: see additional specification, Factory calibration certificate, 5-point
D	DKD calibration: see additional specification, DKD-Certificate

60	Membrane material:
1	AISI 316L
2	Alloy C
3	Monel
5	Tantalum
6	AISI 316L with Gold-Rhodium coating
7	AISI 316L with 0.09 mm PTFE foil (not for vacuum applications)

80	Process connection, Material:
	Pancake seal
UF	Cell DN 50 PN 16-400, AISI 316L
UH	Cell DN 80 PN 16-400, AISI 316L
UJ	Cell DN 100 PN 16-400, AISI 316L
VF	2" 150-2500 lbs, AISI 316L
VH	3" 150-2500 lbs, AISI 316L
VJ	4" 150-2500 lbs, AISI 316L
	Threaded connections
GA	Thread ISO 228 G 1/2 B, PN 40, AISI 316L, separator, PTFE, glass-filled seal
RL	Thread ANSI 1/2 MNPT, PN 40, AISI 316L, separator, PTFE, glass-filled seal
	Annular flow-through tri-clamp seal
SB	Tri-Clamp, ISO 2852 DN 25 (1"), AISI 316L
SC	Tri-Clamp, ISO 2852 DN 38 (1-1/2"), AISI 316L, 3.1 + Pressure test acc. to PED Cat. II
SD	Tri-Clamp, ISO 2852 DN 51 (2"), AISI 316L, 3.1 + Pressure test acc. to PED Cat. II
	Hygienic connections
TB	Tri-Clamp, ISO 2852 DN 25 (1"), DIN 32676 DN 25, AISI 316L
TC	Tri-Clamp, ISO 2852 DN 25 – DN 38 (1" to 1-1/2"), AISI 316L
TD	Tri-Clamp, ISO 2852 DN 40 – DN 51 (2")/DN 50, AISI 316L
TF	Tri-Clamp, ISO 2852 DN 70 – DN 76.1 (3"), AISI 316L
TR	Varivent model N for pipes DN 40 – DN 162, PN 40, AISI 316L
TK	DRD 65 mm, PN 25, AISI 316L
WH	Sanitary tank spud, AISI 316L, extended diaphragm seal 2"
MR	DIN 11851 DN 50 PN 25, AISI 316L
MS	DIN 11851 DN 65 PN 25, AISI 316L
MT	DIN 11851 DN 80 PN 25, AISI 316L
M3	DIN 11851 DN 50 PN 25 socket, AISI 316L
M4	DIN 11851 DN 65 PN 25 socket, AISI 316L
M5	DIN 11851 DN 80 PN 25 socket, AISI 316L
	EN/DIN flanges
B3	DN 50 PN 10-40 B1, AISI 316L
B5	DN 80 PN 10-40 B1, AISI 316L
BT	DN 100 PN 10-16 B1, AISI 316L
B6	DN 100 PN 25-40 B1, AISI 316L

FMD78												order code

→ For continuation of FMD78 ordering information, see the following page.

FMD78 (continued)

80	Process connection, Material (continued):
	ANSI flanges
AF	2" 150 lbs RF, AISI 316/316L
AR	2" 300 lbs RF, AISI 316/316L
AG	3" 150 lbs RF, AISI 316/16L
AS	3" 300 lbs RF, AISI 316/316L
J4	3" 150 lbs RF, AISI 316/316L, extended diaphragm seal: 2"/4"/6"/8", extended diaphragm seal: see additional specification
AH	4" 150 lbs RF, AISI 316/316L
AT	4" 300 lbs RF, AISI 316/316L
J5	4" 150 lbs RF, AISI 316/316L, extended diaphragm seal: 2"/4"/6"/8", extended diaphragm seal: see additional specification
	JIS flanges
KF	10K 50A RF, AISI 316L
KL	10K 80A RF, AISI 316L
KH	10K 100A RF, AISI 316L

90	Capillary, Fill fluid:
1	...m capillary, silicone oil (DC200)
2	...m capillary, Neobee M-20
3	...m capillary, high temperature silicone oil (DC704)
4	...m capillary, Inert oil (Halocarbon), cleaned for oxygen service
A	...ft capillary, silicone oil (DC200)
B	...ft capillary, Neobee M-20
C	...ft capillary, high temperature silicone oil (DC704)
D	...ft capillary, Inert oil (Halocarbon), cleaned for oxygen service

100	Additional options 1:
A	Additional options 1 not selected
B	Material test certificate for wetted components, inspection certificate as per EN 10204 acc. to specification 52005759
C	NACE MR0175 material
D	Material test certificate for wetted components as per EN 10204 3.1 and NACE MR0175 material, inspection certificate as per EN 10204 acc. to specification 52010806
M	Overvoltage protection
N	HistoROM module
S	GL/ABS marine certificate
2	Test report acc. to EN 10204 2.2
3	Routine test with certificate, inspection certificate as per EN 10204 3.1
4	Overpressure test with certificate, inspection certificate as per EN 10204 3.1

110	Additional options 2:
A	Additional options 2 not selected
M	Overvoltage protection
N	HistoROM module
R	Screws 7/16 UNF, length 1 1/2" (4 pieces)
S	GL/ABS marine certificate
U	Mounting bracket for wall and pipe, AISI 304
2	Test report acc. to EN 10204 2.2
3	Routine test with certificate, inspection certificate as per EN 10204 3.1
4	Overpressure test with certificate, inspection certificate as per EN 10204 3.1

FMD78	complete order code

Further documentation

Innovation

- Cerabar S/Deltabar S,
  For process pressure, differential pressure, flow and level measurement: IN001P/00/en

Field of Activities

- Pressure measurement: Powerful instruments for process pressure, differential pressure, level and flow: FA004P/00/en

Technical Information

- Deltabar S: TI382P/24/ae
- Deltatop/Deltaset: TI297P/00/en
- EMC test basic principles: TI241F/00/en

Operating Instructions

4 to 20 mA HART:
- Deltabar S: BA270P/00/en
- Description of device functions Cerabar S/Deltabar S, Pressure and Differential pressure transmitters: BA274P/00/en

PROFIBUS PA:
- Deltabar S: BA294P/00/en
- Description of device functions Cerabar S/Deltabar S, Pressure and Differential pressure transmitters: BA296P/00/en

FOUNDATION Fieldbus:
- Deltabar S: BA301P/00/en
- Description of device functions Cerabar S/Deltabar S, Pressure and Differential pressure transmitters: BA303P/00/en

Manual for Functional Safety (SIL)

- Deltabar S (4 to 20 mA): SD189P/00/en

Installation/ Control Drawings

Certificate/Type of Protection	Device	Electronic insert	Documentation
FM IS Class I, II, III, Division 1, Groups A – G; NI, Class I Division 2, Groups A – D; AEx ia	PMD70, PMD75, FMD76, FMD77, FMD78	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– ZD141P – ZD188P
CSA IS Class I, II, III, Division 1, Groups A – G; Class I Division 2, Groups A – G	PMD70, PMD75, FMD76, FMD77, FMD78	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– ZD142P – ZD189P
FM IS + XP Class I, Division 1, Groups A – D	PMD75, FMD77, FMD78	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– ZD186P – ZD190P
CSA IS + XP Class I, Division 1, Groups A – D	PMD75, FMD77, FMD78	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– ZD153P – ZD191P
FM/CSA IS + XP Class I, Division 1, Groups A – D	PMD75, FMD77, FMD78	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– ZD153P + ZD186P – ZD190P + ZD191P

Safety instructions

- Safety instructions for ATEX (XA), IECEx (XB) and NEPSI (XC) European hazardous standards are available on request from Endress+Hauser.

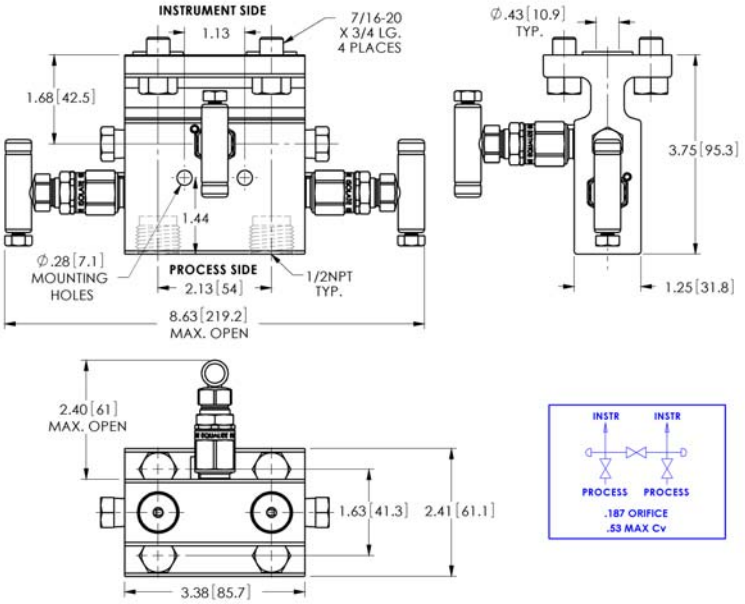
Overspill protection

- WHG: ZE260P/00/de

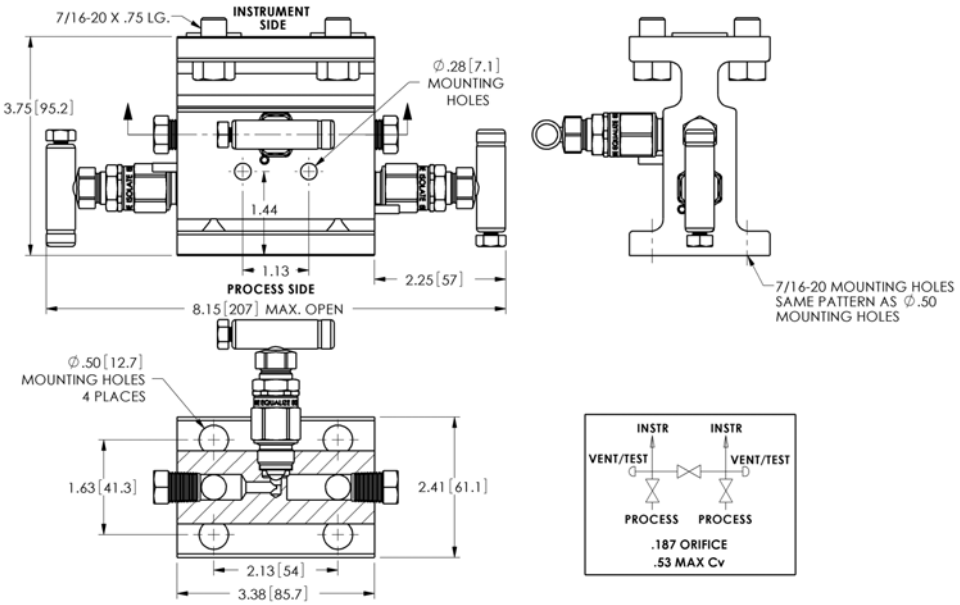
Accessories

Manifold valves

Part No.	Type	Description	MWP
		3-Valve Manifolds	
71037612	316 SS 3-Valve Manifold with Teflon packing	3-Valve Manifold, hard seat configuration Direct Mount Inlet: 1/2" FNPT, Outlet:Flanged/Flanged Body: 316 Stainless, 3.1 Mat. Cert. Included Stem/tip: 316SS/Carbide Ball w/ Nickel Chrome Binder Seat Material: Integral, Packing: **PTFE** with 7/16" UNF, 3/4" 316SS bolts	6,000 psi at 200 F 4,000 psi at 450 F Max
71037613	316 SS 3-Valve Manifold with Grafoil packing	3-Valve Manifold, hard seat configuration Direct Mount Inlet: 1/2" FNPT, Outlet:Flanged/Flanged Body: 316 Stainless, 3.1 Mat. Cert. Included Stem/tip: 316SS/Carbide Ball w/ Nickel Chrome Binder Seat Material: Integral, Packing: **grafoil** with 7/16" UNF, 3/4" 316SS bolts	6,000 psi at 200 F 1,500 psi at 1,000 F Max
71037614	316 SS 3-Valve Manifold Double Flanged with Teflon packing	3-Valve Manifold, hard seat configuration Direct Mount, Double Flanged Inlet: F;anged/Flanged, Outlet:Flanged/Flanged Body: 316 Stainless, 3.1 Mat. Cert. Included Stem/tip: 316SS/Carbide Ball w/ Nickel Chrome Binder Seat Material: Integral, Packing: **PTFE** with 7/16" UNF, 3/4" 316SS bolts	6,000 psi at 200 F 1,500 psi at 1,000 F Max
		5-Valve Manifolds	
71037616	316 SS 5-Valve Manifold Gas Metering with Teflon packing	5-Valve Manifold, soft seat configuration Gas Metering Direct Mount Inlet: 1/2" FNPT, Outlet:Flanged/Flanged Body: 316 Stainless, 3.1 Mat. Cert. Included Stem/tip: 316/316SS NRT Seat Material: Delrin, Packing: **PTFE** with 7/16" UNF, 1" 316SS bolts	6,000 psi at 200 F Max
71037617	316 SS 5-Valve Manifold with Grafoil packing	5-Valve Manifold, hard seat configuration Standard Direct Mount Inlet: 1/2" FNPT, Outlet:Flanged/Flanged Body: 316 Stainless, 3.1 Mat. Cert. Included Stem/tip: 316SS/Carbide Ball w/ Nickel Chrome Binder Seat Material: Integral, Packing: **grafoil** with 7/16" UNF, 1" 316SS bolts	6,000 psi at 200 F 1,500 psi at 1,000 F Max
		Accessories & Spare Parts	
71037615	316 SS Mounting Bracket for manifold	Mounting Bracket (SS) for 3-Valve Manifold or 5-Valve Manifold	
71037618	Teflon Flange Seal	1 PTFE flange seal for 3-valve and 5-valve manifolds	
71037619	Grafoil Flange Seal	1 grafoil flange seal for 3-valve and 5-valve manifolds	
		Assembly to Transmitter	
71038037	Manifold Assembly	Assemble 3-Valve or 5-Valve Manifold to transmitter	

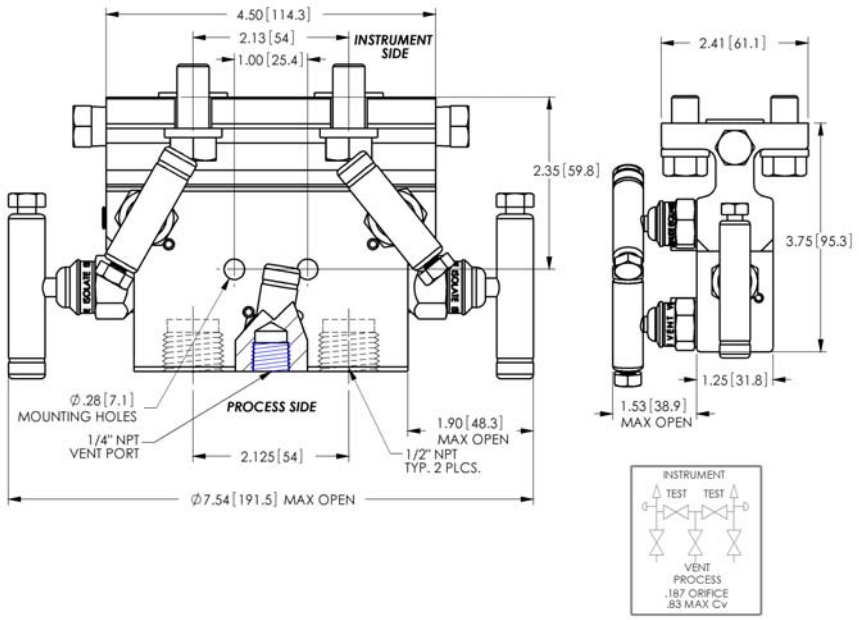


Three valve manifold:
71037612
71037613

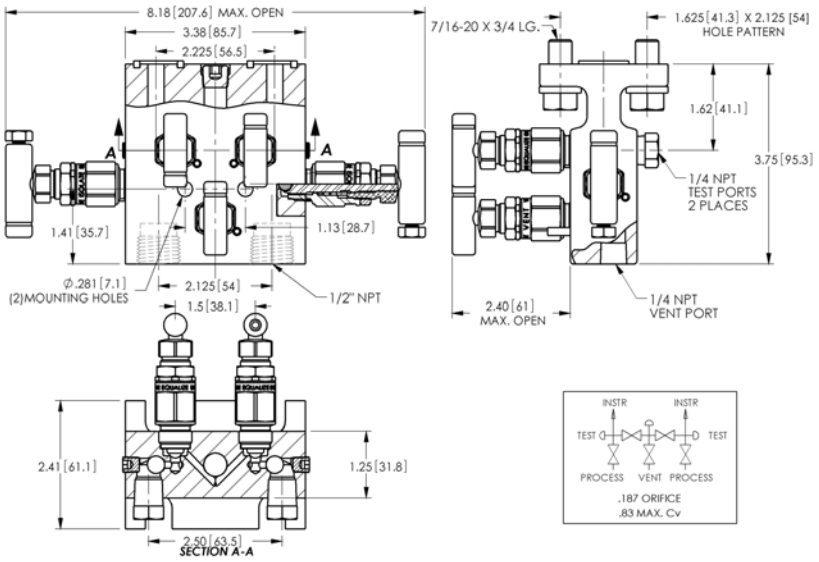


Three valve manifold, double flanged:
71037614

Five valve manifolds



Five valve manifold, gas metering:
71037616



Five valve manifold:
71037617

Futbol
Offset center mounting block, 1/2" FNPT adapter, 316 SS with PTFE seal (2 required per transmitter) with Teflon washers and 7/16" UNF mounting bolts.
Part no. PZO-RA112

United States	Canada	Mexico
Endress+Hauser, Inc. 2350 Endress Place Greenwood, IN 46143 Tel. 317-535-7138 Sales 888-ENDRESS Service 800-642-8737 fax 317-535-8498 inquiry@us.endress.com www.us.endress.com	Endress+Hauser Canada 1075 Sutton Drive Burlington, ON L7L 5Z8 Tel. 905-681-9292 800-668-3199 Fax 905-681-9444 infor@ca.endress.com www.ca.endress.com	Endress+Hauser, México, S.A. de C.V. Fernando Montes de Oca 21 Edificio A Piso 3 Fracc. Industrial San Nicolás 54030. Tlalnepantla de Baz Estado de México Tel: +52 55 5321 2080 Fax +52 55 5321 2099 eh.mexico@mx.endress.com www.mx.endress.com

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