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, 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 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

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, PROFIBUS PA or FOUNDATION Fieldbus
- Extensive diagnostic functions

TI382P/24/ae/05.08

Endress+Hauser

People for Process Automation

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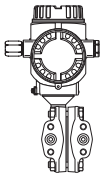
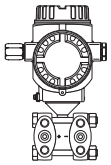
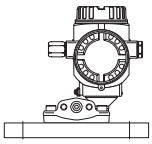
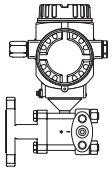
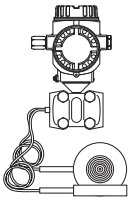
# Function and system design

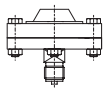
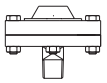
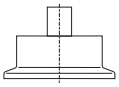
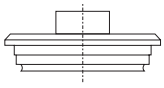
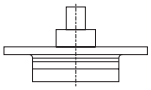
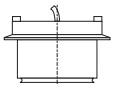
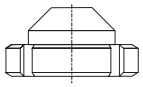
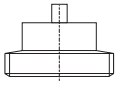
## Device selection

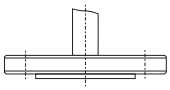
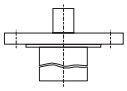
| **Deltabar S – product family** | **PMD70**<br>  <br>P01-PMD70xxx-16-xx-xx-xx-000<br>**With ceramic measuring diaphragms** | **PMD75**<br>  <br>P01-PMD75xxx-16-xx-xx-xx-000<br>**With metallic measuring diaphragms** | **FMD76**<br>  <br>P01-FMD76xxx-16-xx-xx-xx-000<br>**With ceramic measuring diaphragms** | **FMD77**<br>  <br>P01-FMD77xxx-16-xx-xx-xx-000<br>**With metallic measuring diaphragms and diaphragm seal mounted on one side** | **FMD78**<br>  <br>P01-FMD78xxx-16-xx-xx-xx-003<br>**With metallic measuring diaphragms and capillary diaphragm seals** |
|---|---|---|---|---|---|
| Field of application | – Flow<br>– Level<br>– Differential pressure | – Flow<br>– Level<br>– Differential pressure | – Level | – Level | – Level<br>– Differential pressure |
| Process connections | – 1/4 – 18 NPT<br>– RC 1/4 | – 1/4 – 18 NPT<br>– RC 1/4 | Low-pressure side (–):<br>– 1/4 – 18 NPT<br>– RC 1/4<br>High-pressure side (+):<br>– DN 80 – DN 100<br>– ANSI 3" – 4"<br>– JIS 80A – 100A | Low-pressure side (–):<br>– 1/4 – 18 NPT<br>– RC 1/4<br>High-pressure side (+):<br>– DN 50 – DN 100<br>– ANSI 2" – 4"<br>– JIS 80A – 100A | – Wide range of diaphragm seals, → see page 5, section "Overview of diaphragm seal FMD78" |
| Measuring ranges | from –25 to +25 mbar (-10 to +10 $inH_2O$) to –3 to +3 bar (-45 to +45 psi) | from –10 to +10 mbar (-4 to +4 $inH_2O$) to –40 to +40 bar (-600 to +600 psi) | from –100 to +100 mbar (-40 to +40 $inH_2O$) to –3 to +3 bar (-45 to +45 psi) | from –100 to +100 mbar (-40 to +40 $inH_2O$) to –16 bar to +16 bar (-230 to +230 psi) | from –100 to +100 mbar (-40 to +40 $inH_2O$) to –40 to +40 bar (-600 to +600 psi) |
| Overload [1] | on one side: max. 100 bar (1450 psi) on both sides: max. 150 bar (2175 psi) | on one side: max. 420 bar (6100 psi) on both sides: max. 630 bar (8700 psi) | on one side: max. 100 bar (1450 psi) | on one side: max. 160 bar (2320 psi) | on one side: max. 160 bar (2320 psi) on both sides: max. 240 bar (3480 psi) |
| Process temperature range | –20 to +85°C (–4 to +185°F) | –40 to +120°C (–40 to +248°F) | –20 to +85°C (–4 to +185°F) | up to + 350°C (+662°F) | up to +350°C (+662°F) |
| Ambient temperature range | –20 to +85°C (–4 to +185°F) | –40 to +85°C (–40 to +185°F) [2] | –20 to +85°C (–4 to +185°F) | –40 to +85°C (–40 to +185°F) [2] | –40 to +85°C (–40 to +185°F) [2] |
| Ambient temp. remote housing | –40 to +60°C (–40 to +140°F) | | | | |
| Reference Accuracy | – Up to ±0.075% of the set span<br>– 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; EEx ia (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 $p_{stat}$ 700 bar (10,500 psi)<br>– PMD75, FMD77, FMD78: Gold-Rhodium-coated diaphragm, NACE-compliant materials | | | | |
| Specialities (options) | – Metal-free measurement with PVDF flange<br>– Available with Deltatop/ Deltaset as flow compact device | – $p_{stat}$ up to 420 bar (6100 psi)<br>– Diaphragm: tantalum<br>– Available with Deltatop/ Deltaset as flow compact device | – Abrasion-resistant and corrosion-resistant<br>– No diaphragm-seal temperature effects<br>– Metal-free measurement possible with ECTFE-coated process connection | – For high media temperatures | – Wide range of diaphragm seals |
| | – HistoROM®/M-DAT memory module | | | | |

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

2) lower temperature on request

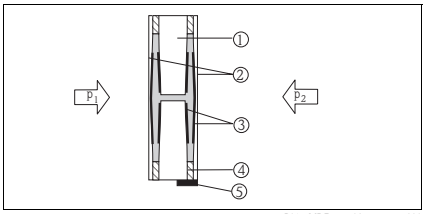
**Overview of diaphragm seal**
**FMD78**

| Design | Diaphr. seal | Connection | Version | Standard | Nominal diameter | Nom. press./Class |
|---|---|---|---|---|---|---|
| Pancake (cell) | Membrane diaphragm seal (MDM) | DIN cell |  P01-FMD78xxx-04-xx-xx-xx-000 | DIN 2501 | – DN 50<br>– DN 80<br>– DN 100 | PN 16 – 400 |
| | | ANSI cell | | ANSI B 16.5 | – 2"<br>– 3"<br>– 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 | 600 psi |
| Tri-Clamp | Membrane diaphragm seal (MDM) | Clamp |  P01-FMD78xxx-03-xx-xx-xx-005 | ISO 2852 | – DN 25 (1")<br>– DN 38 (1 1/2")<br>– DN 51 (2")<br>– 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")<br>– DN 38 (1 1/2")<br>– DN 51 (2") | Dependent on the clamp used |
| Hygienic connections | Membrane diaphragm seal (MDM) | Varivent (EHEDG and 3A approval) |  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<br>– DN 65<br>– DN 80 | PN 25 |
| | | Threaded adapter |  P01-FMD78xxx-03-xx-xx-xx-004 | DIN 11851 | – DN 50<br>– DN 65<br>– 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<br>– DN 80<br>– DN 100 | Up to 40 bar |
| | | ANSI flange | | ANSI B 16.5 | – 2"<br>– 3"<br>– 4" | 150 lbs and 300 lbs |
| | | JIS flange | | B 2220 | – 50 A<br>– 80 A<br>– 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<br>– 4" with 2"/4"/6"/ 8" ext. diaphr. seal | 150 lbs |

## Measuring principle

**Ceramic measuring diaphragms used for PMD70 and FMD76**

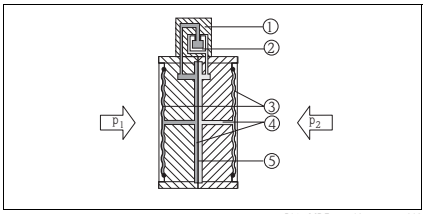


P01-xMD7xxxx-03-xx-xx-xx-000

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

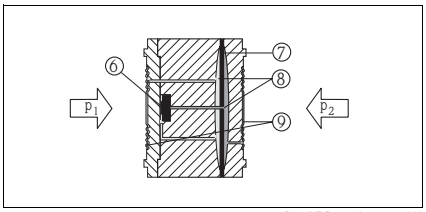
**Metallic measuring diaphragms used for PMD75, FMD77 and FMD78**



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

Metal measuring cell 10 mbar (4 in$H_2O$) and 30 mbar (12 in$H_2O$)

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



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Metal measuring cell as of 100 mbar (40 in$H_2O$)

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 1 $mbar_{abs}$ (0.02 psia)
- Metal-free versions available
- Second process barrier (Secondary Containment) for enhanced integrity

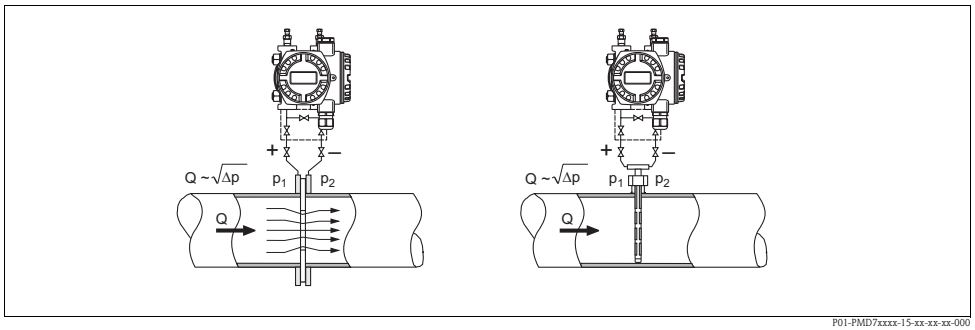
### Metallic measuring diaphragms used for PMD75, FMD77 and FMD78

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

## Flow measurement

### Design and operation mode

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

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

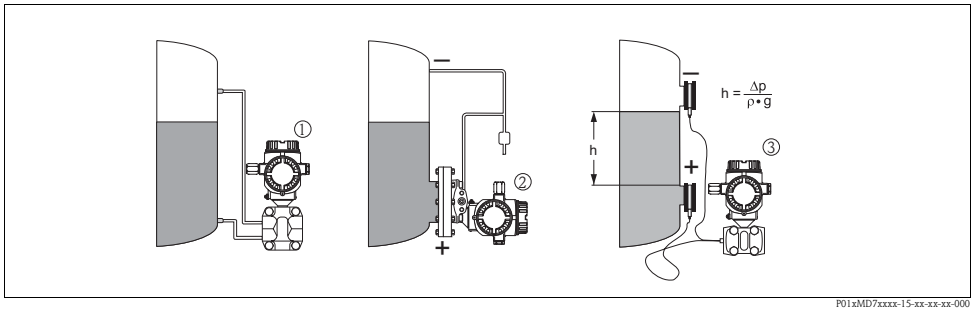
### Your benefits

- 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 customised 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 1000°C (1832°F) and pressures up to 400 bar (6000 psi)

  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

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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 customized 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 or 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".

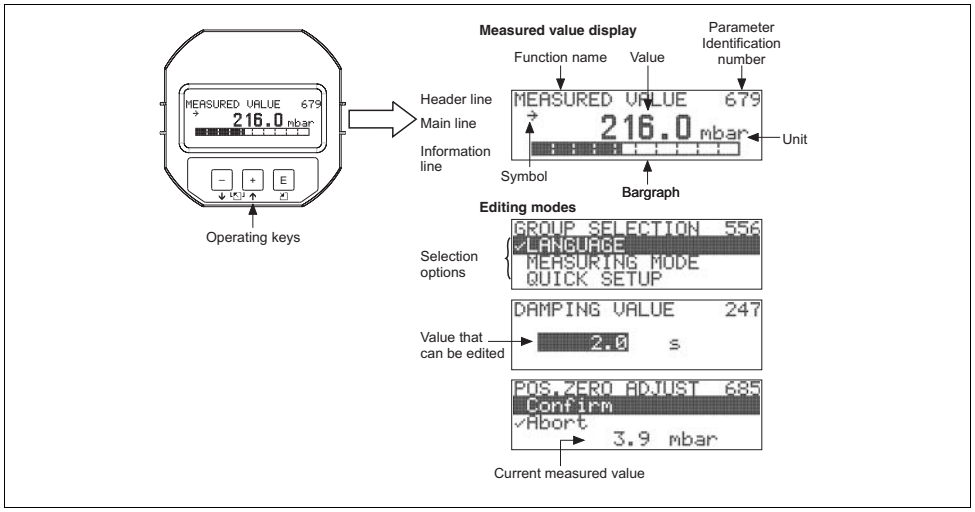
# Human interface

**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 and PROFIBUS PA**

Functions:
- 8-digit measured value display including sign and decimal point, bar graph for 4 to 20 mA HART as current display or for PROFIBUS PA as graphical display of the scaled value of the AI Block
- 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

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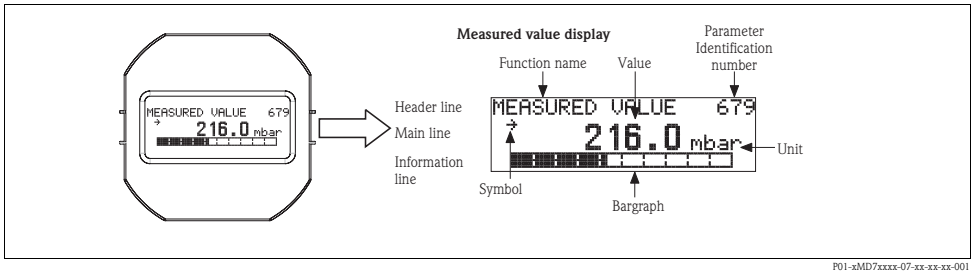
**FOUNDATION Fieldbus**

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)

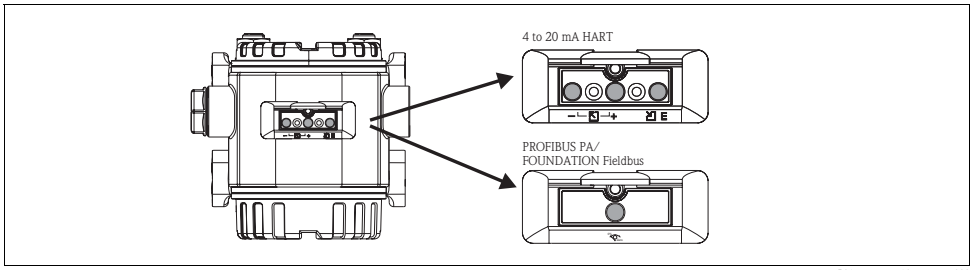



P01-xMD7xxxx-07-xx-xx-xx-001

**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 a local display and a 4 to 20 mA HART or PROFIBUS PA electronic insert have operating keys on the local display.

### Operating keys on the exterior of the device

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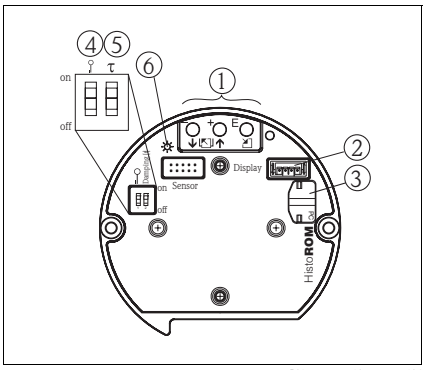
The operating keys located externally on the device work on the Hall sensor principle. As a result, no additional openings are required in the device. This guarantees:
- Complete protection against environmental influences such as moisture and contamination
- Simple operation without any tools
- No wear.

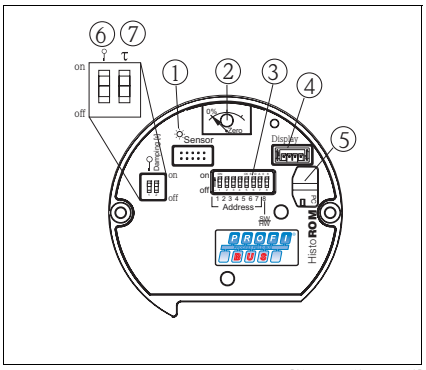
### Operating keys and elements located internally on the electronic insert



P01-xxxxxxxx-19-xx-xx-xx-104

Electronic insert HART

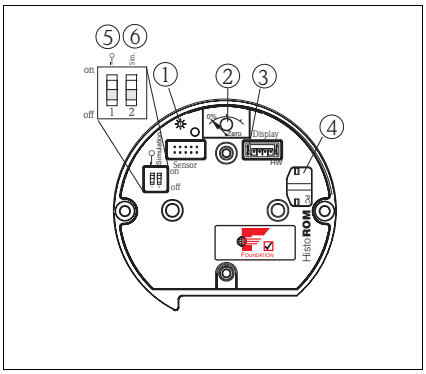
1 Operating keys
2 Slot for optional display
3 Slot for optional HistoROM®/M-DAT
4 DIP-switch for locking/unlocking measured-value-relevant parameters
5 DIP-switch for damping on/off
6 Green LED to indicate value being accepted



P01-xxxxxxxx-19-xx-xx-xx-105

Electronic insert PROFIBUS PA

1 Green LED to indicate value being accepted
2 Key for position calibration and device reset
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



P01-xxxxxxxx-19-xx-xx-xx-106

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 (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 FieldCare

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 61 ff. A CD with the Endress+Hauser 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 FieldCare operating program and the Commubox FXA291 service interface and the ToF Adapter FXA291 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 - Deltabar S" SD189P.
→ For devices with SIL2/IEC 61508 declaration of conformity, see page 61 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 and PROFIBUS PA**

- 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
- Setting bus address (PROFIBUS PA only)

**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.

**FieldCare**

FieldCare is an Endress+Hauser asset management tool based on FDT technology. With FieldCare, you can configure all Endress+Hauser devices as well as devices from other manufacturers that support the FDT standard. The following operating systems are supported: WinNT4.0, Win2000 and Windows XP.

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

Connection options:
- HART via Commubox FXA191 and the RS 232 C serial interface of a computer
- HART via Commubox FXA195 and the USB port on a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card
- Service interface with adapter Commubox FXA291 and ToF Adapter FXA291 (USB).

**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.

**Commubox FXA291**

The Commubox FXA291 connects Endress+Hauser field instruments with CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a personal computer or a notebook. For details refer to TI405C/07/en.

! Note!
For the following Endress+Hauser instruments you need the "ToF Adapter FXA291" as an additional accessory:

- Cerabar S PMC71, PMP7x
- Deltabar S PMD7x, FMD7x
- Deltapilot S FMB70

**ToF Adapter FXA291**

The ToF Adapter FXA291 connects the Commubox FXA291 via the USB interface of a personal computer or a notebook. For details refer to KA271F/00/a2.

# 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 | | Smallest calibratable span [5] | MWP [1] | Overload [2] | | Min. operating pressure [3] | Versions in the order code [4] | |
|---|---|---|---|---|---|---|---|---|---|
| | lower (LRL) | upper (URL) | | | on one side | on both sides | | PN 160 [6] (2320 psi) | PN 420 [6] (6100 psi) |
| mbar | mbar | mbar | mbar ($inH_2O$) | bar (psi) | bar (psi) | bar (psi) | $mbar_{abs}$ (psia) | | |
| 10 [7] (4 $inH_2O$) | –10 (-4 $inH_2O$) | +10 (+4 $inH_2O$) | 0.25 (0.10) | 160 (2320) | 160 (2320) | 240 (3480) | 0.1 (0.001) | 7B | – |
| 30 [7] (12 $inH_2O$) | –30 (-12 $inH_2O$) | +30 (+12 $inH_2O$) | 0.3 (0.12) | 160 (2320) | 160 (2320) | 240 (3480) | 0.1 (0.001) | 7C | – |
| 100 (40 $inH_2O$) | –100 (-40 $inH_2O$) | +100 (+40 $inH_2O$) | 1/5 [8] (0.4/2) | 160 (2320) | 160 (2320) | 240 (3480) | 0.1 (0.001) | 7D | – |
| 500 (200 $inH_2O$) | –500 (-200 $inH_2O$) | +500 (+200 $inH_2O$) | 5 (2) | 160/420 [9] (2320/6100) | 160/420 (2320/6100) | 240/630 | 0.1 (0.001) | 7F | 8F |
| 3000 (45 psi) | –3000 (-45 psi) | +3000 (+45 psi) | 30 (12) | 160/420 [9] (2320/6100) | 160/420 (2320/6100) | 240/630 | 0.1 (0.001) | 7H | 8H |
| 16000 (240 psi) | –16000 (-240 psi) | +16000 (+240 psi) | 160 (65) | 160/420 [9] (2320/6100) | 160/420 (2320/6100) | 240/630 | 0.1 (0.001) | 7L | 8L |
| 40000 (600 psi) | –40000 (-600 psi) | +40000 (+600 psi) | 400 (160) | 160/420 [9] (2320/6100) | + side: 160/420 [10] (2320/6100) | 240/630 | 0.1 (0.001) | 7M | 8M |

**PMD70, FMD76 (with ceramic measuring diaphragms)**

| Nominal value | Measurement limit | | Smallest calibratable span [5] | MWP [1] | Overload [2] | | Min. operating pressure [3] | Order code [4] |
|---|---|---|---|---|---|---|---|---|
| | lower (LRL) | upper (URL) | | | on one side | on both sides | | |
| mbar | mbar ($inH_2O$) | mbar ($inH_2O$) | mbar ($inH_2O$) | bar (psi) | bar (psi) | bar (psi) | $mbar_{abs}$ (psia) | |
| 25 (10 $inH_2O$) | –25 (-10 ) | +25 (+10) | 0.25 (0.1) | 10 (145) | 10 (145) | 15 (217) | 1 (0.015) | 7B |
| 100 (40 $inH_2O$) | –100 (-40 ) | +100 (+40) | 1 (0.4) | 16 (240) | 16 (240) | 24 (348) | 1 (0.015) | 7D |
| 500 (200 $inH_2O$) | –500 (-200) | +500 (+200) | 5 (2) | 100 (1450) | 100 (1450) | 150 (2175) | 1 (0.015) | 7F |
| 3000 (1200 $inH_2O$) | –3000 (-1200) | +3000 (+1200) | 30 (12) | 100 (1450) | 100 (1450) | 150 (2175) | 1 (0.015) | 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 29 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 28, "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 28, section "Pressure specifications".
3 The minimum operating pressure indicated in the table applies to silicone oil under reference operating conditions.
Min. operating pressure at 85°C (185°F) for silicone oil: 10 $mbar_{abs}$ (4 $inH_2O$).
FMD77 and FMD78: Min. operating pressure: 50 $mbar_{abs}$ (20 $inH_2O$); observe also the pressure and temperature application limits of the selected filling oil on page 51. For vacuum applications, please observe the installation instructions on Page 57 ff.
4) Versions in the order code → See also page 60 ff, feature 40 "Nominal range; PN"
5) 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: 1 mbar (0.4 $inH_2O$); minimum span that can be calibrated for FMD77 and FMD78: 5 mbar (2 $inH_2O$)
9) For PMD75 with CRN-approved process connections, the MWP is 315 bar (4570 psi).
10) "–" side: 100 bar (1450 psi)

**Explanation of terms**

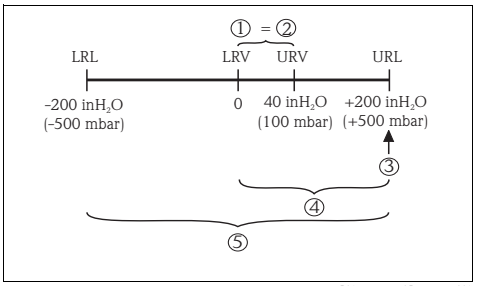
**Explanation of the terms: Turn down (TD), set span and zero based span**

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

Example:
- Lower range value (LRV) = 0 mbar
- Upper range value (URV) = 100 mbar (40 in$H_2O$)
- Nominal value (URL) = 500 mbar (200 in$H_2O$)

Turn down:
- TD = URL / |URV| = 5:1

set span:
- URV – LRV = 100 mbar (40 in$H_2O$)
  This span is based on the zero point.



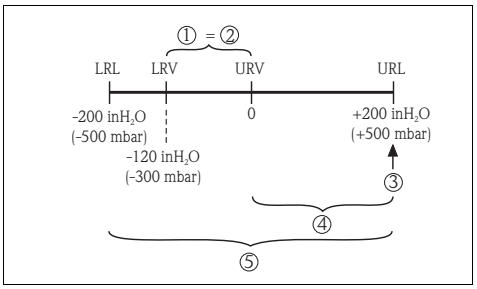

Example: 500 mbar (200 in$H_2O$) sensor

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

Example:
- Lower range value (LRV) = –300 mbar (-120 in$H_2O$)
- Upper range value (URV) = 0 bar
- Nominal value (URL) = 500 mbar (200 in$H_2O$)

Turn down:
- TD = URL / |(LRV)| = 1,67:1

set span:
- URV – LRV = 300 mbar (120 in$H_2O$)
  This span is based on the zero point.




Example: 500 mbar (200 in$H_2O$) sensor

1 Set span
2 Zero based span
3 Nominal value i 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

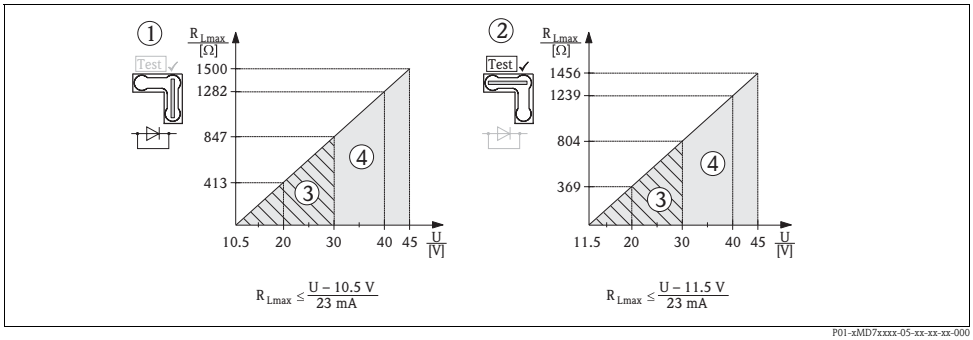
**Output signal**
- 4 to 20 mA with superimposed digital communication protocol HART 5.0, 2-wire
- Digital communication signal PROFIBUS PA (Profile 3.0)
- Digital communication signal FOUNDATION Fieldbus

**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 16, 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**

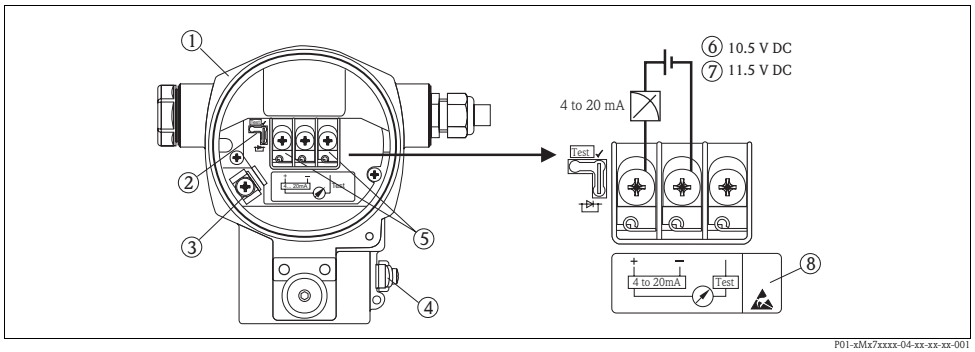
- Via on-site display, handheld terminal or PC with operating program, continuous from 0 to 999 s
- Additionally for HART and PROFIBUS PA: via DIP-switch on the electronic insert, switch position "on" = set value and "off"
- Factory setting: 2 s

# 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 74, section "Safety Instructions" and "Installation/Control Drawings".
- Devices with integrated overvoltage protection must be grounded. → See also page 26.
- 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 16, section "Measuring 4 to 20 mA test signal" .
3 Internal ground terminal
4 External ground 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 26).

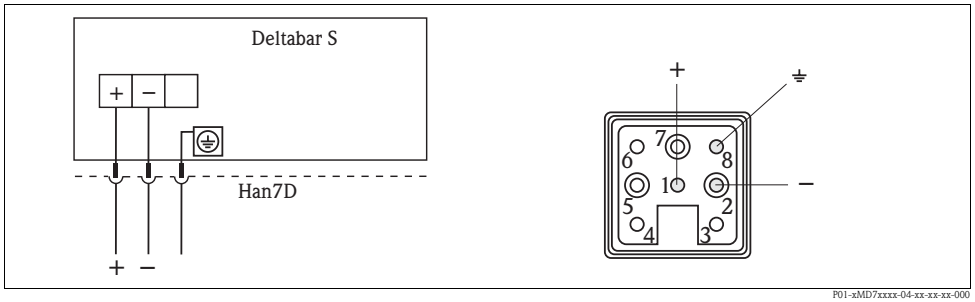
### PROFIBUS PA

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

### FOUNDATION Fieldbus

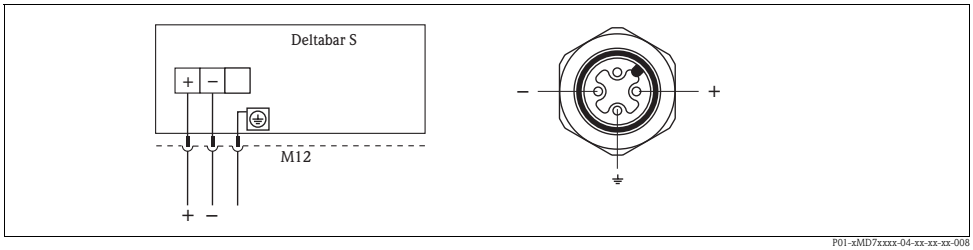
The two-wire cable must be connected to the "FF+" and "FF–" terminals.

### 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




P01-xMD7xxxx-04-xx-xx-xx-008

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

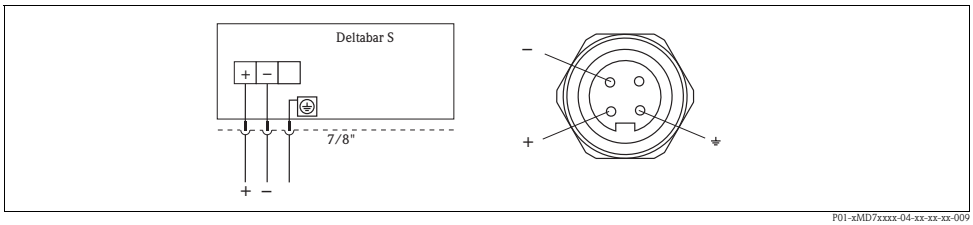
Endress+Hauser offers for devices with M12 plug the following accessories:

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

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

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

### Devices with 7/8" plug




P01-xMD7xxxx-04-xx-xx-xx-009

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.)<br>– Delivery status<br>– minimum supply voltage: 11.5 V DC |
|   | – Measuring 4 to 20 mA test signal via plus and test terminal: not possible.<br>– 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 74, 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 60 ff, feature 30 "Housing, Cable entry, Protection".

**Cable specification**

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

**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: +21 to +33°C (+69.8 to +91.4°F)
- Humidity φ = constant, in the range of: 5 to 80 % r.H
- Ambient pressure $p_U$ = constant, in the range of: 860 to 1060 mbar (12 to 15 psi)
- 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
- Side flanges material PMD75: AISI 316L/1.4435
- Supply voltage: 24 V DC ± 3 V DC
- Load with HART: 250 Ω

**Long-term stability**

Measuring cells ≥ 500 mbar (200 in$H_2O$):
- ±0.05% of URL/year
- ±0.125% of URL/5 years

Measuring cells ≤ 100 mbar (40 in$H_2O$):
- ±0.18% of URL/year

**Influence of the installation position**

- PMD70, FMD76: ≤ 3 mbar (1.2 in$H_2O$) [1, 3]
- PMD75: ≤ 4 mbar (1.6 in$H_2O$) [1, 3]
- FMD77: ≤ 32 mbar (12.8 in$H_2O$) [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 22, section "General installation instructions" and page 57 ff, section "Installation instructions, Diaphragm seal systems".

**Vibration effects**

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

# Performance characteristics – metallic diaphragms

**Reference accuracy – PMD75, FMD77, FMD78**

The reference accuracy comprises the non-linearity according to limit point setting, hysteresis and non-reproducibility 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**

10 mbar, 30 mbar (4 in$H_2O$, 12 in$H_2O$) measuring cells:
- TD 1:1: ±0.15% of the set span
- TD > 1:1: ±0.15% of the set span x TD

100 mbar (40 in$H_2O$) 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 ≥ 500 mbar (200 in$H_2O$):
- 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 ≥ 100 mbar (40 in$H_2O$):
- TD 1:1: ±0.05 % of the set span

**FMD77 (influence of the diaphragm seal included)**

100 mbar (40 in$H_2O$) measuring cell:
- TD 1:1 to TD 4:1: ±0.15% of the set span
- TD > 4:1: ±(0.03 x TD + 0.03)% of the set span

Measuring cells ≥ 500 mbar (200 in$H_2O$):
- 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

**FMD78 (influence of the diaphragm seal included)**

100 mbar (40 in$H_2O$) measuring cell:
- TD 1:1 to TD 4:1: ±0.15% of the set span
- TD > 4:1: ±(0.03 x TD + 0.03)% of the set span

Measuring cells ≥ 500 mbar (200 in$H_2O$):
- TD 1:1 to TD 4:1: ±0.15% of the set span
- TD > 4:1: ±(0.02 x TD + 0.07) % 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 ($p_{st}$ = 70 bar/1015 psi).

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

1. for measuring ranges ≥ 500 mbar (200 in$H_2O$) to TD 2:1
2. All specifications apply to the temperature range –10 to +60°C (+14 to +140°F).

**Total Error**

The total error comprises the long-term stability and the total performance:

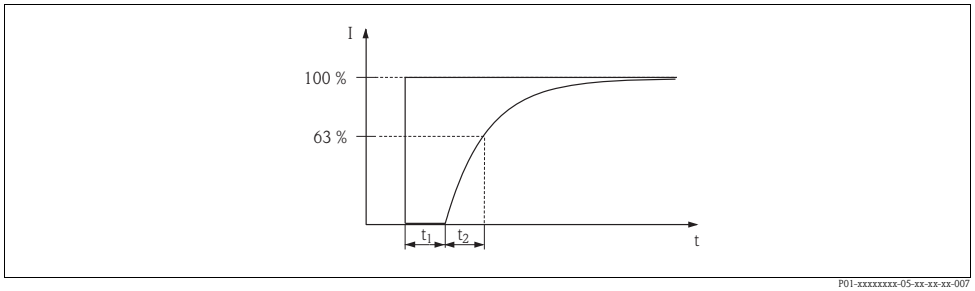
AISI 316L/1.4435, Alloy, Gold-Rhodium coated or Monel membrane:
- 10 mbar, 30 mbar and 100 mbar (4, 12, 40 in$H_2O$) measuring cell = 0.33% of URL/year
- ≥ 500 mbar (200 in$H_2O$) measuring cell = 0.20% of URL/year

Tantal membrane:
- 10 mbar, 30 mbar and 100 mbar (4, 12, 40 in$H_2O$) measuring cell = 0.48% of URL/year
- ≥ 500 mbar (200 in$H_2O$) measuring cell = 0.35% of URL/year

**Warm-up period – PMD75, FMD77, FMD78**

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

**Dead time, Time constant (T63) – PMD75, FMD77, FMD78**




Presentation of the dead time and the time constant

| Type | Dead time $t_1$ | Time constant (T63), $t_2$ |
|---|---|---|
| PMD75 HART | 45 ms | ■ 10 mbar and 30 mbar (4 and 12 in$H_2O$) measuring cell: 200 ms<br>■ 100 mbar (40 in$H_2O$) measuring cell: 60 ms<br>■ 500 mbar (200 in$H_2O$) measuring cell: 45 ms<br>■ 3 bar (43 psi) measuring cell: 40 ms<br>■ 16 bar and 40 bar (232 and 580 psi) 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/1.4435, Alloy, Gold-Rhodium coated or Monel membrane | | Tantalum membrane | |
|---|---|---|---|---|
| | Influence of the operating pressure on the zero point | Influence of the operating pressure on the span | Influence of the operating pressure on the zero point | Influence of the operating pressure on the span |
| 10 mbar (4 $inH_2O$) | ±0.15 % of URL/7 bar (100 psi) | ±0.035 % of URL/7 bar (100 psi) | ±0.28 % of URL/7 bar (100 psi) | ±0.28 % of URL/7 bar (100 psi) |
| 30 mbar (12 $inH_2O$) | ±0.35 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) | ±0.70 % of URL/70 bar (1015 psi) | ±0.70 % of URL/70 bar (1015 psi) |
| 100 mbar (40 $inH_2O$) | ±0.15 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) | ±0.42 % of URL/70 bar (1015 psi) | ±0.42 % of URL/70 bar (1015 psi) |
| 500 mbar (200 $inH_2O$) | ±0.075 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) |
| 3 bar (43 psi) | ±0.075 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) |
| 16 bar (232 psi) | ±0.075 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) |
| 40 bar (600 psi) | ±0.075 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) |

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**

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

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

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

25 mbar (10 in$H_2O$) measuring cell:
- TD 1:1: ±0.15% of the set span
- TD > 1:1: ±0.15% of the set span x TD

100 mbar (40 in$H_2O$) 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

500 mbar (200 in$H_2O$), 3 bar (43 psi) 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,
100 mbar (40 in$H_2O$), 500 mbar (200 in$H_2O$), 3 bar (43 psi) 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 ($p_{st}$ = 70 bar / 1015 psi).

- ±0.15% of the set span [1, 2]

1. for measuring ranges ≥ 500 mbar (200 in$H_2O$), TD 1:1
2. All specifications apply to the temperature range –10 to +60°C (+14 to +140°F).

**Total Error**

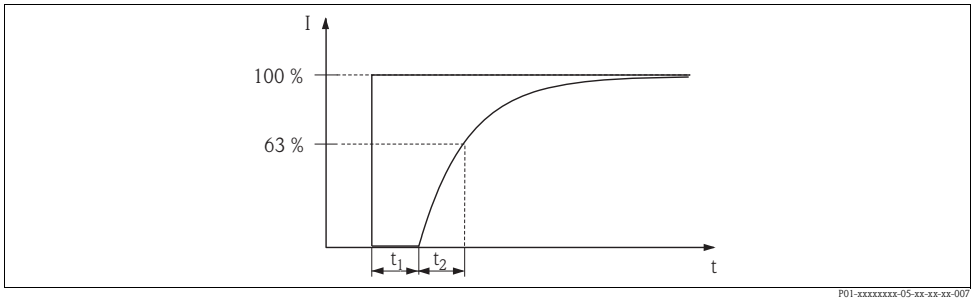
The total error comprises the long-term stability and the total performance:

- 25 mbar (10 in$H_2O$) and 100 mbar (40 in$H_2O$) measuring cell = 0.33% of URL/year
- 500 mbar (200 in$H_2O$) and 3 bar (43 psi) measuring cell = 0.20% of URL/year

**Warm-up period – PMD70, FMD76**

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

**Dead time, Time constant (T63) – PMD75, FMD77, FMD78**




Presentation of the dead time and the time constant

| Type | Dead time $t_1$ | Time constant (T63), $t_2$ |
|---|---|---|
| PMD70, FMD76<br>HART | 90 ms | ■ 25 mbar (10 in$H_2O$) measuring cell: 4700 ms<br>■ 100 mbar (40 in$H_2O$) measuring cell: 280 ms<br>■ 500 mbar (200 in$H_2O$) measuring cell: 210 ms<br>■ 3 bar (43 psi) 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 |
|---|---|---|
| 25 mbar (10 in$H_2O$) | ±0.7 % of URL/7 bar (101 psi) | ±0.14 % of URL/7 bar (101 psi) |
| 100 mbar (40 in$H_2O$) | ±0.175 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) |
| 500 mbar (200 in$H_2O$) | ±0.075 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) |
| 3 bar (43 psi) | ±0.075 % of URL/70 bar (1015 psi) | ±0.14 % of URL/70 bar (1015 psi) |

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**

–10 to +60°C (+14 to +140°F):
- 25 mbar (10 in$H_2O$) measuring cell: ±(0.35 x TD + 0.05)% of the set span
- ≥100 mbar (40 in$H_2O$) measuring cells: ±(0.05 x TD + 0.05)% of the set span

–20 to –10°C, +60 to +85°C (–4 to +14°F, +140 to +185°F):
- 25 mbar (10 in$H_2O$) measuring cell: ±(0.3 x TD + 0.15)% of the set span
- ≥ 100 mbar (40 in$H_2O$) 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 57 ff, "Installation instructions, Diaphragm seal systems").
- The housing of the Deltabar S can be rotated up to 380°. → See also page 24, section "Rotate the housing".
- Endress+Hauser offers a mounting bracket for installing the device on pipes or walls. → See also page 23, 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.
- 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 57 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 same 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 superimposed vapour

- PMD70, PMD75: Mount device below the lower measuring connection. Always connect the negative side above the maximum level.

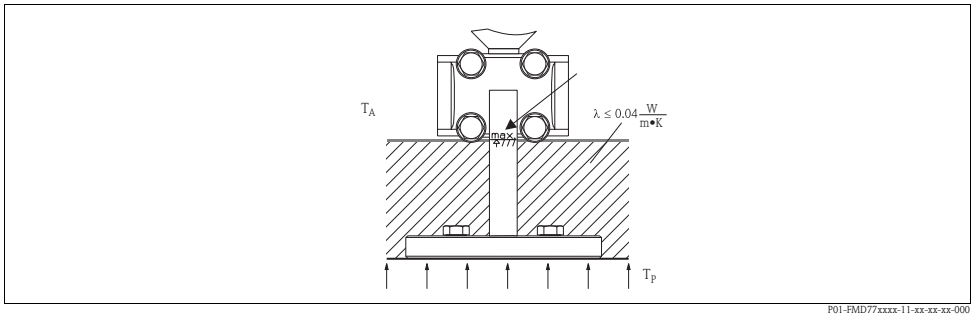
- FMD76, FMD77: Mount device direct on the tank. Always connect the negative side above the maximum level.
- In the case of level measurement in closed tanks with superimposed vapour, a condensate trap ensures pressure which remains constant on the minus side.

**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 same 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 labeled 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".



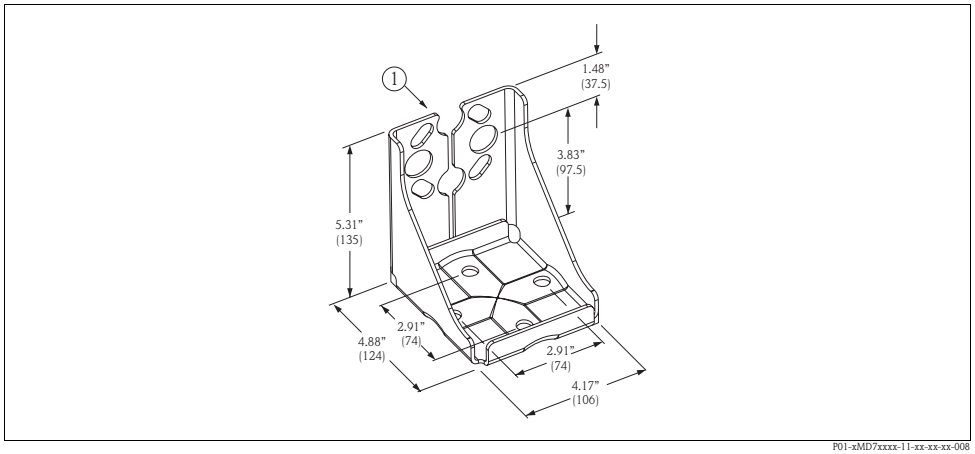

Maximum permitted insulation height

| | **FMD77** |
|---|---|
| Ambient temperature ($T_A$) | ≤ 70°C (158°F) |
| Process temperature ($T_P$) | max. 350°C (622°F), depending on the diaphragm seal filling oil used (→ see page 51) |

**Wall- and pipe-mounting**

Endress+Hauser offers a mounting bracket for installing the device on pipes or walls. → See also page 61 ff, feature 110, "Additional options 2".

Note!
If a valve block is used, its dimensions should also be taken into consideration Refer to page 76.




Mounting bracket for wall and pipe-mounting. Order number: 52024609

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

1 Device mounting

**"Remote housing" version**

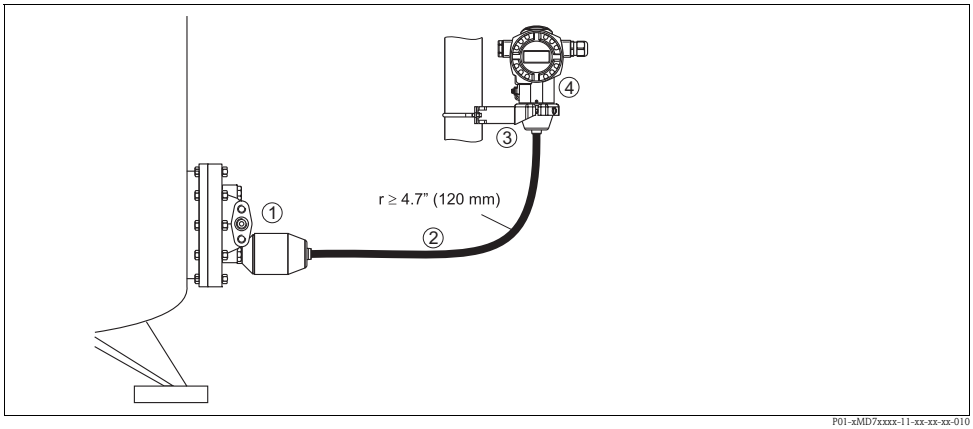
With the "remote housing" version, you are able to mount the housing with the electronics insert at a distance from the measuring point. This facilitates trouble-free measurement:
- Under particularly difficult measuring conditions (at installation locations that are cramped or difficult to access)
- If rapid cleaning of the measuring point is required
- If the measuring point is exposed to vibrations.

IP 69K applies for the process connection with sensor if FEP cable are used.

You can choose between different cable versions:
- PE (2 m, 5 m and 10 m / 6, 16, 33 feet)
- FEP (5 m / 16 ft).

→ See also Page 61 ff, Feature 110, "Additional options 2", Version "G".

→ For the dimensions, see Page 48.

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In the case of the "remote housing" version, the sensor is delivered with the process connection and cable already mounted. The housing and a mounting bracket are enclosed as separate units. The cable is provided with a socket at both ends. These sockets are simply connected to the housing and the sensor.

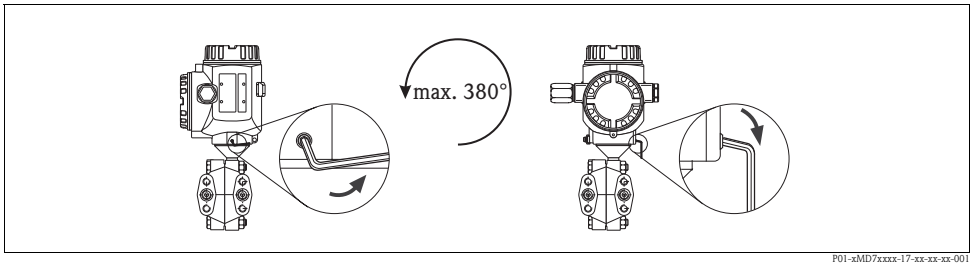
1 Process connection with sensor
2 Cable, both ends are fitted with a socket
3 Mounting bracket provided, suitable for pipe and wall mounting
4 Housing

Technical data of the PE and FEP cable:
- Minimum bending radius: 120 mm (4.72")
- Resistance to UV light

**Rotating 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).




P01-xMD7xxxx-17-xx-xx-xx-001

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 500 mbar or 3000 mbar measuring cell | 30 bar (435 psi) | 60°C (140°F) |
| PMD70 – * * * ** * * * 2 * *, Devices with 25 mbar or 100 mbar measuring cell | PN of the flange | 60°C (140°F) |
| PMD75 – * * * ** * * * K * * | 160 bar (2320 psi) | 85°C (185°F) |
| PMD75 – * * * ** * * * 2 * * | 160 bar (2320 psi) | 60°C (140°F) |
| PMD75 – * * * ** * * * 3 * * | 160 bar (2320 psi) | 60°C (140°F) |
| FMD76 – * * * ** * T * * *, Devices with 500 mbar or 3000 mbar measuring cell | 30 bar (435 psi) | 60°C (140°F) |
| FMD76 – * * * ** * T * * *, Devices with 25 mbar or 100 mbar measuring cell | PN of the measuring cell | 60°C (140°F) |
| FMD77 – * * * ** T * F * * | PN of the flange | 60°C (140°F) |
| FMD78 – * * * ** * ** 4 * * FMD78 – * * * ** * ** D * * | 90 bar (1300 psi) | 85°C (185°F) |

**Ultra pure gas applications**

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

→ See also page 61 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 62 "Ordering information PMD75", page 68 "Ordering information FMD77" or page 72 "Ordering information FMD78", feature 60 "Membrane material".

# Operating conditions (Environment)

**Ambient temperature range**

- PMD75, FMD77, FMD78: –40 to +85°C (–40 to +185°F), devices for lower temperatures on request
- PMD70, FMD76: –20 to +85°C (–4 to +185°F)
- On-site display: –20 to +70°C (–4 to +158°F)
  Extended temperature application range with restrictions in optical properties such as display speed and contrast: –40 to +85°C (–40 to +185°F)
- Separate housing: –40 to +60°C (–40 to +140°F)

For devices for use in hazardous areas, see Safety instructions, Installation or Control Drawing (→ See also page 74, 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 +100°C (–40 to +212°F)
- Local display: –40 to +85°C (–40 to +185°F)
- Separate housing: –40 to +60°C (–40 to +140°F)

**Degree of protection**

- → See page 65 ff, feature 30 "Housing, Cable entry, Protection".
- Degree of protection IP 68 (NEMA 6P) for T17 housing: 1.83 m$H_2O$ (6 ft$H_2O$) for 24 h
- Degree of protection IP 69K for process connection with sensor with separate housing and FEP cable.

**Climate class**

Class 4K4H (air temperature: –20 to 55°C/–4 to +131F, 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 display on side (T14) | GL | guaranteed for: 2 to 18 Hz: ±4 mm (0.16"); 18 to 500 Hz: 5 g in all 3 planes |
| PMD75 | optional display on side (T14) | IEC 61298-3 | guaranteed for: 10 to 60 Hz: ±0.35 mm (0.01"); 60 to 2000 Hz: 5 g in all 3 planes |
| PMD75 | optional display on top (T15) | | |
| with mounting bracket | | IEC 61298-3 | guaranteed for: 10 to 60 Hz: ±0.15 mm (0.006"); 60 to 500 Hz: 2 g in all 3 planes |

**Electromagnetic compatibility**

- Electromagnetic compatibility to EN 61326 and NAMUR recommendation EMC (NE21). For details refer to the declaration of conformity.
- With enhanced interference immunity against electromagnetic fields as per EN 61000-4-3: 30 V/m with closed cover (for devices with T14 or T15 housing)
- Maximum deviation: < 0.5% of span [1]
- All EMC measurements were performed with a turn down (TD) = 2:1.

1) Larger deviations possible with PMD70 with 25 mbar or 100 mbar sensor (10 or 40 in$H_2O$)

**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 61 ff, feature 100 "Additional options 1" and feature 110 "Additional options 2", version "M Overvoltage protection".

Note!
Devices with integrated overvoltage protection must be grounded.

# 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 100 mm (4"): –40 to +120°C (–40 to +248°F), with side flanges C22.8 and impulse piping longer than 100 mm (4"): –10 to +120°C (14 to +248°F)
- FMD77 and FMD78, depending on the diaphragm seal and filling oil: up to + 400°C (+752°F)

Note!
- For oxygen applications, observe page 25 "Oxygen applications" section.
- PMD70, FMD76, PMD75 and FMD78: Observe the Process temperature range of the seal. → See also the following section "Process temperature range, seals".
- FMD77 and FMD78: Observe the temperature application limits of the diaphragm seal oil. → See also page 51, sections "Diaphragm seal filling oils".

- FMD77 and FMD78: Do not use diaphragm seals with 0.09 mm (0.004") PTFE foil on AISI 316L (1.4435/ 1.4405) for vacuum applications, upper temperature limit +204°C (+400°F).

**Process temperature range, seals**

**PMD70 (with ceramic measuring diaphragms)**

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

**FMD76 (with ceramic measuring diaphragms)**

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

**PMD75 (with metallic measuring diaphragms)**

| Versions for feature 80 in the order code | Seal | Process temperature range [1] |
|---|---|---|
| A | FKM Viton | –20 to +85°C (–4 to +185°F) |
| C | PTFE | –40 to +85°C (–40 to +185°F) |
| F | NBR | –20 to +85°C (–4 to +185°F) |
| H | Copper | –40 to +85°C (–40 to +185°F) |
| K | Copper, cleaned for oxygen service | –20 to +85°C (–4 to +185°F) |
| 1 | FKM Viton, cleaned from oil and greace | –10 to +85°C (+14 to +185°F) |
| 2 | FKM Viton, cleaned for oxygen service | –10 to +60°C (+14 to +140°F) |
| 3 | PTFE, cleaned for oxygen service | –20 to +60°C (–4 to +140°F) |

1) lower temperature on request

**FMD77 (with metallic measuring diaphragms)**

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

1) lower temperature on request

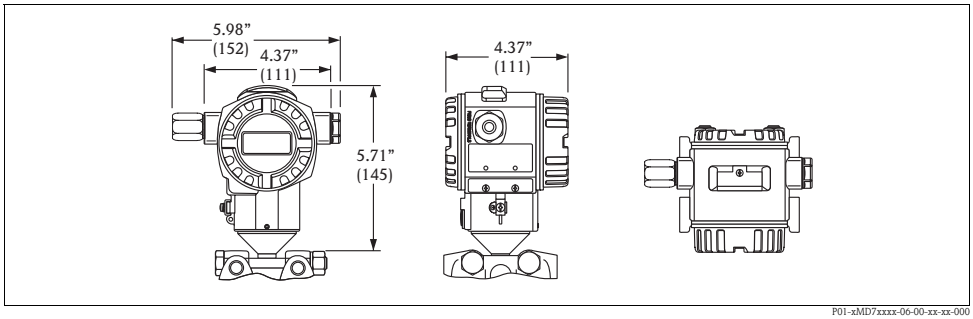
**Pressure specifications**

- 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 12 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 20°C (68°F) or 100°F for ANSI flanges and may be applied to the device for an unlimited time. 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" (→ page 25) and "Process temperature limits" (→ page 26) sections.
- The test pressure corresponds to the over pressure limit of the measuring instrument (Over pressure limits OPL = 1.5 x MWP) and may fit only temporally limited, so that no permanent damage develops.
- 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 25, "Oxygen applications" may not be exceeded.

1) With regard to its stability property, the material 1.4435 is identical to 1.4404 which is grouped under 13E0 in EN 1092-1 Tab. 18. the chemical composition of the two materials can be identical.

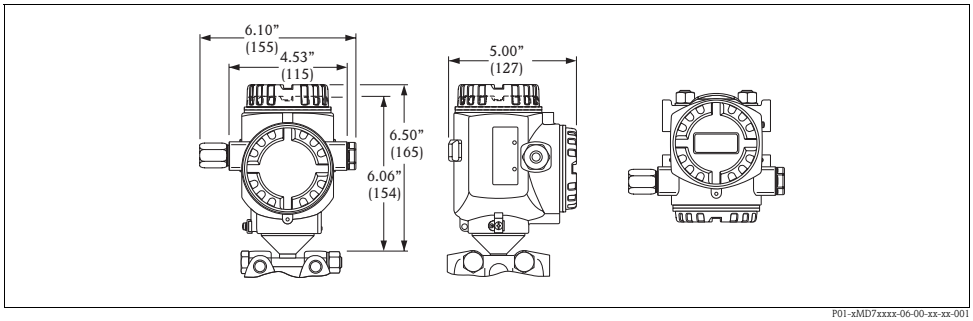
# Mechanical construction

**Housing dimensions T14, optional display on the side**



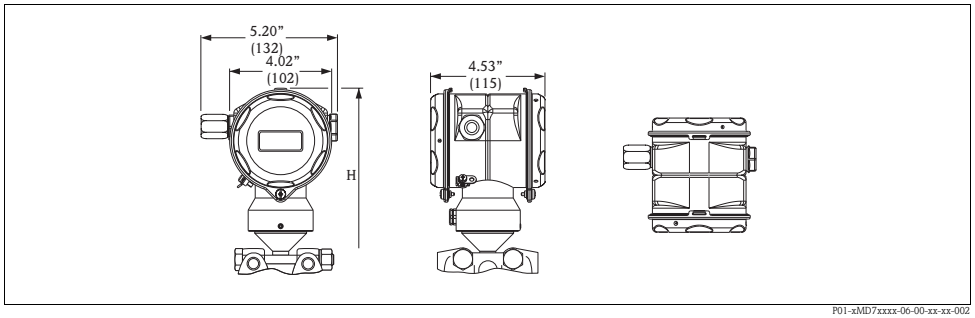

Front view, left-hand side view, top view
→ See the process connection in question for installation height. Housing weight see page 49.

**Housing dimensions T15, optional display on the top**




Front view, left-hand side view, top view
→ See the process connection in question for installation height. Housing weight see page 49.

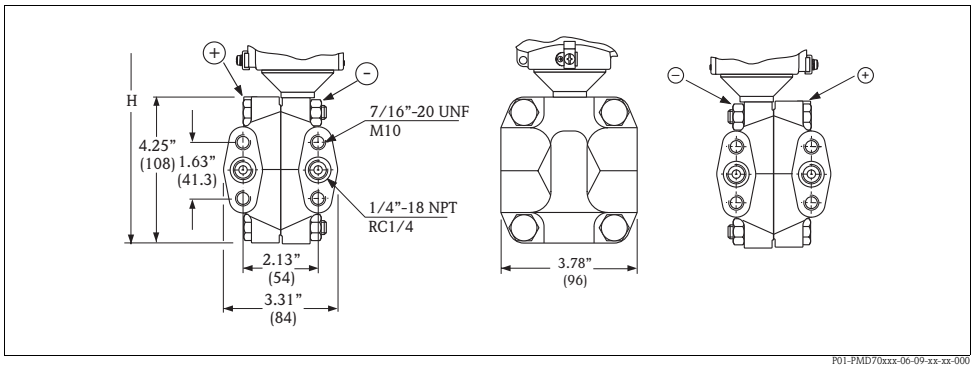
**Housing dimensions T17, optional display on the top**




Front view, left-hand side view, top view
→ See the process connection in question for installation height. Housing weight see page 49.

**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 61, feature 70 "Process connection") has to be ordered with a CSA approval (→ see page 60, 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 30, section "Device height H"

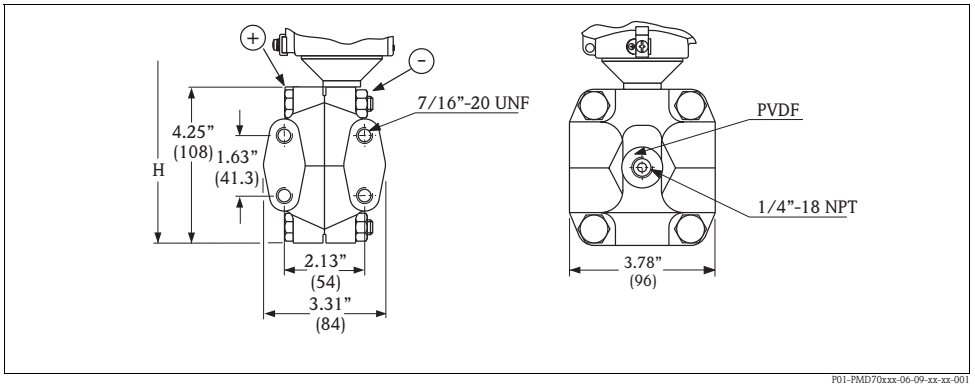
| Version | Connection | Mounting | Material | Accessories | Weight [1] kg (lbs) |
|---|---|---|---|---|---|
| B | 1/4-18 NPT IEC 61518 | 7/16-20 UNF | Steel C 22.8 | 2 vent valves (AISI 316L/1.4404) included | 4.0 (8.8) |
| D | 1/4-18 NPT IEC 61518 | 7/16-20 UNF | AISI 316L [2] | | 4.0 (8.8) |
| F | 1/4-18 NPT IEC 61518 | 7/16-20 UNF | Alloy C276 [3] | Vent valves (Alloy C276/2.4819), see page 68 feature 110 "Additional options 2". | 4.2 (9.3) |
| U | RC 1/4 | 7/16-20 UNF | AISI 316L [2] | 2 vent valves (AISI 316L/1.4404) included | 4.0 (8.8) |
| 1 | 1/4-18 NPT IEC 61518 | PN 160: M10 | Steel C 22.8 | | 4.0 (8.8) |
| 2 | 1/4-18 NPT IEC 61518 | PN 160: M10 | AISI 316L [2] | | 4.0 (8.8) |
| 3 | 1/4-18 NPT IEC 61518 | PN 160: M10 | Alloy C276 [3] | Vent valves (Alloy C276/2.4819), see page 68, feature 110 "Additional options 2". | 4.2 (9.3) |

1) Process connection weight, for housing weight see page 49

2) AISI 316L SS/1.4435

3) Alloy C276/2.4819

**Process connections PMD70 with ceramic measuring diaphragms (continued)**




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

H Device height → see section below "Device height H"

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

1) Process connection weight, for housing weight see page 55

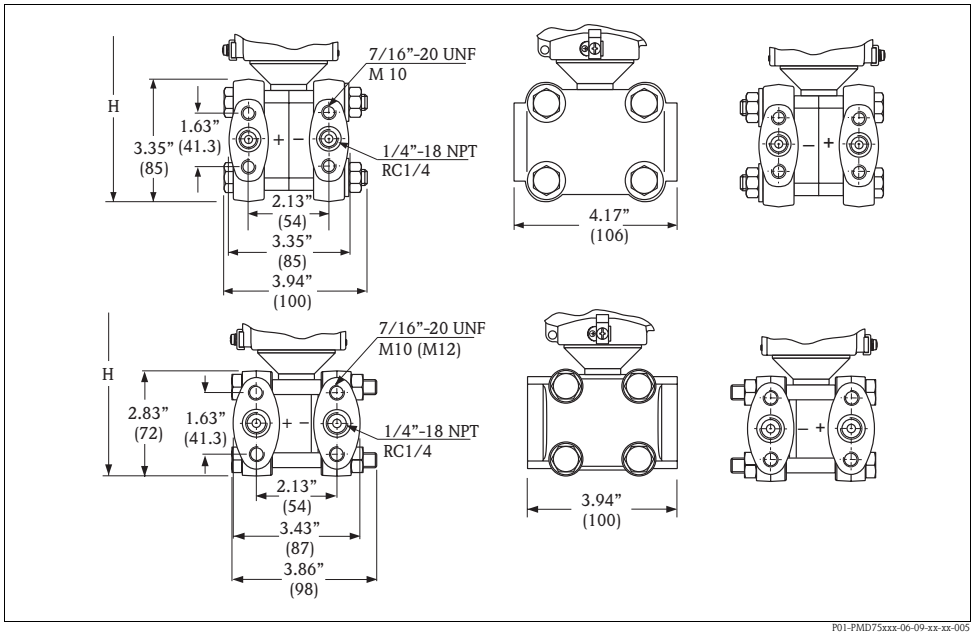
### Device height H

| Description | Device height H |
|---|---|
| T14 housing, optional side-mount display | 253 mm (9.96") |
| T15 housing, optional top-mount display, flat cover | 259 mm (10.2") |
| T15 housing, optional top-mount display, high cover | 270 mm (10.6") |
| T17 housing, optional side-mount display | 269 mm (10.5") |

**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 63, feature 70 "Process connection") has to be ordered with a CSA approval (→ see page 62, 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 10 mbar (4 in$H_2O$) and 30 mbar (12 in$H_2O$) measuring cell; below: Measuring cell ≥ 100 mbar (40 in$H_2O$)

H Device height → see page 33, section "Device height H"

| Version | Connection | Mounting | Material | Accessories | Weight [1] kg (lbs) |
|---|---|---|---|---|---|
| B | 1/4-18 NPT IEC 61518 | 7/16-20 UNF | Steel C 22.8 | 2 vent valves (AISI 316L/1.4404) included | 4.2 (9.3) |
| D | 1/4-18 NPT IEC 61518 | 7/16-20 UNF | AISI 316L [2] | | 4.2 (9.3) |
| F | 1/4-18 NPT IEC 61518 | 7/16-20 UNF | Alloy C276 [3] | Vent valves (Alloy C276/2.4819), see page 71, feature 110 "Additional options 2". | 4.5 (9.9) |
| U | RC 1/4 | 7/16-20 UNF | AISI 316L [2] | 2 vent valves (AISI 316L/1.4404) included | 4.2 (9.3) |
| 1 | 1/4-18 NPT IEC 61518 | – PN 160: M10<br>– PN 420: M12 | Steel C 22.8 | | 4.2 (9.3) |
| 2 | 1/4-18 NPT IEC 61518 | – PN 160: M10<br>– PN 420: M12 | AISI 316L [2] | | 4.2 (9.3) |
| 3 | 1/4-18 NPT IEC 61518 | – PN 160: M10<br>– PN 420: M12 | Alloy C276 [3] | Vent valves (Alloy C276/2.4819), see page 71, feature 110 "Additional options 2". | 4.5 (9.9) |

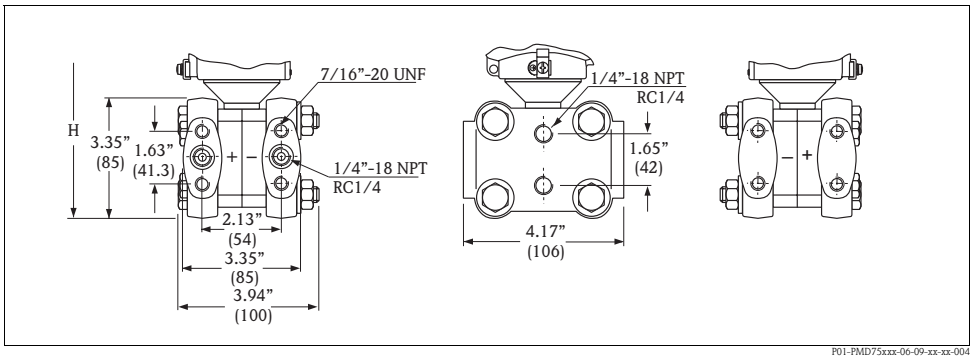
1) Weight of process connections without vent valves with 10 mbar or 30 mbar (4 or 12 in$H_2O$) sensors, process connections without vent valves with sensors ≥ 100 mbar (40 in$H_2O$) weght approx. 800 g (1.7 lb) less. Housing weight see page 49.

2) AISI 316L SS /1.4435 or 1.4404

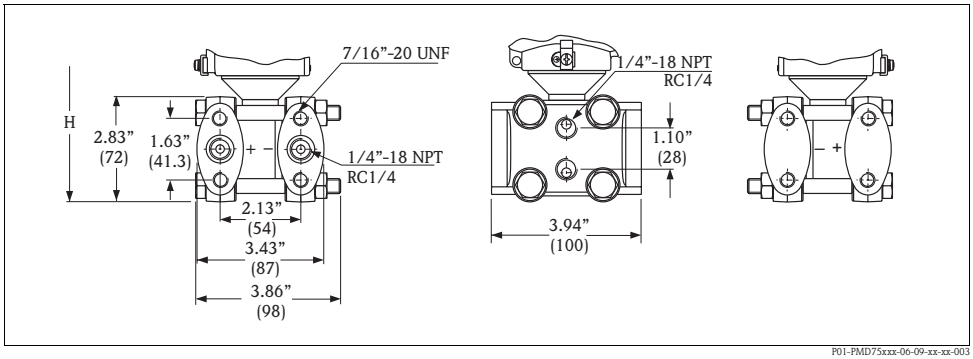
3) Alloy C276/2.4819

**Process connections PMD75 with metallic measuring diaphragms (continued)**

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




Process connection PMD75, 10 mbar and 30 mbar (4 or 12 in$H_2O$) measuring cell




Process connection PMD75, nominal value ≥ 100 mbar (40 in$H_2O$)

H Device height → see page 33, section "Device height H"

| Version | Connection | Mounting | Material | Accessories | Weight [1] kg (lbs) |
|---|---|---|---|---|---|
| C | 1/4-18 NPT IEC 61518 | 7/16-20 UNF | Steel C 22.8 | 4 locking screws and 2 vent valves included (AISI 316L/1.4404) | 4.2 (9.3) |
| E | 1/4-18 NPT IEC 61518 | 7/16-20 UNF | AISI 316L [2] | | 4.2 (9.3) |
| H | 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". | 4.5 (9.9) |
| V | RC 1/4 | 7/16-20 UNF | AISI 316L [2] | 4 looking screws and 2 vent valves included (AISI 316L/1.4404) | 4.2 (9.3) |

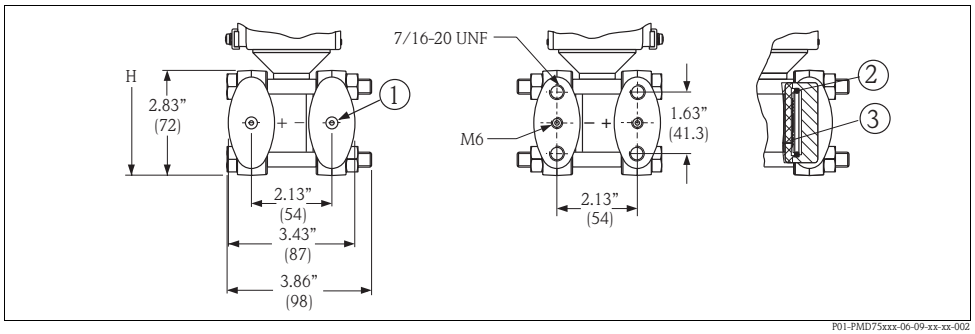
1) Weight of process connections without vent valves with 10 mbar or 30 mbar (4 or 12 in$H_2O$) sensors, process connections without vent valves with sensors ≥ 100 mbar 40 in$H_2O$) weght approx. 800 g (1.7 lb) less. Housing weight see page 49

2) PN 160 bar (2320 psi) measuring cells: AISI 316L/1.4435, PN 420 bar (6100 psi) measuring cells: AISI 316L SS /1.4435 or 1.4404

3) Alloy C276/2.4819

**Process connections PMD75 with metallic measuring diaphragms (continued)**

### 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

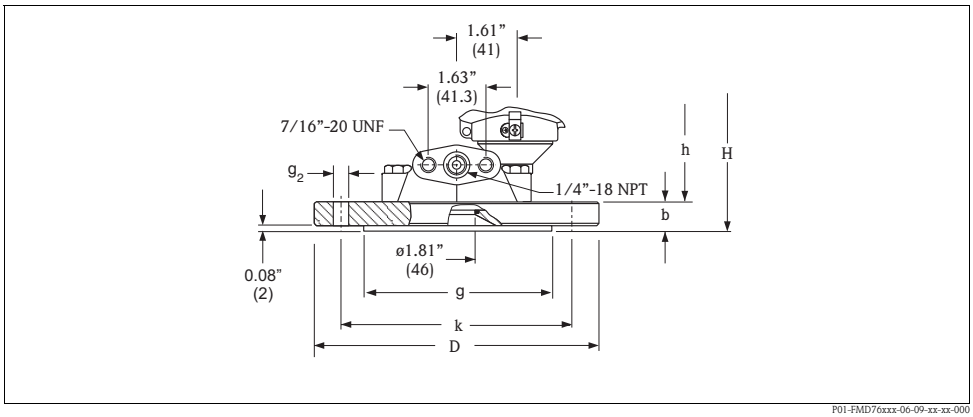
| Description | Device height H [1] |
|---|---|
| T14 housing, optional side-mount display | 217 mm / 8.54" (230 mm / 9.05") |
| T15 housing, optional top-mount display, flat cover | 223 mm / 8.78" (236 mm / 9.29") |
| T15 housing, optional top-mount display, high cover | 234 mm / 9.21" (247 mm / 9.72")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

1) Values for devices with 10 mbar and 30 mbar (4 or 12 in$H_2O$) 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 66, feature 70 "Process connection") has to be ordered with a CSA approval (→ see page 65, 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 36, 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] | **Bolt 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 49

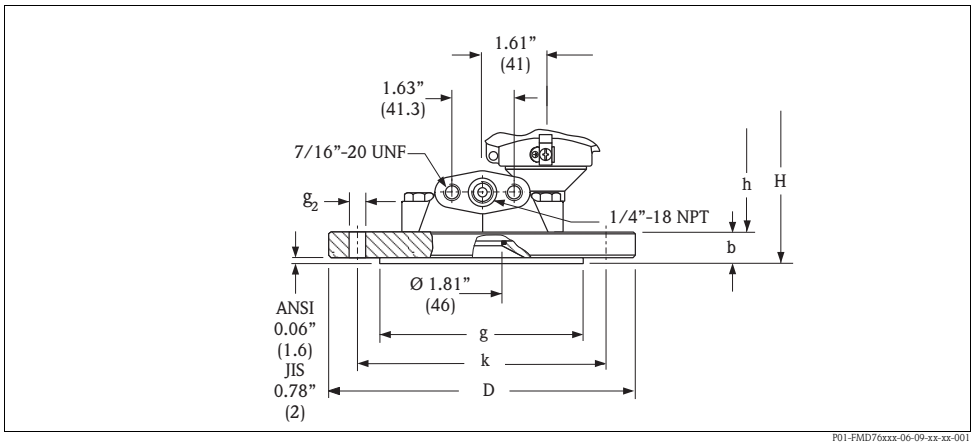
3) AISI 316L SS/1.4435

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

**Process connection FMD76 with ceramic measuring diaphragms (continued)**

**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 36, 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**<br>**D**<br>in (mm) | **Thickness**<br>**b**<br>in (mm) | **Raised face**<br>**g**<br>in (mm) | **Quantity** | **Diameter**<br>**$g_2$**<br>in (mm) | **Bolt circle**<br>**k**<br>in (mm) | **Flange weight** [1]<br>lbs (kg) |
| **ANSI flange**s | | | | | | | | | | |
| 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 flange**s | | | | | | | | | | |
| 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 49

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

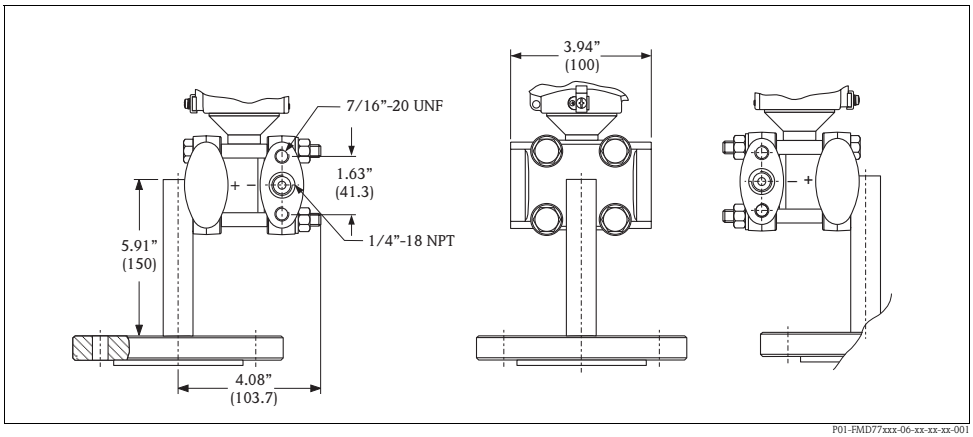
3) ECTFE coating on AISI 316L/1.4435.
When operating in hazardous area, avoid electrostatic charge of the plastic surfaces.

**Process connection FMD76 with ceramic measuring diaphragms (continued)**

**Device height H, devices with flange**

| Description | Device height H (h + b) |
|---|---|
| T14 housing, optional side-mount display | 175 mm (6.89") + flange thickness b (see tables) |
| T15 housing, optional top-mount display, flat cover | 181 mm (7.12") + flange thickness b (see tables) |
| T15 housing, optional top-mount display, high cover | 192 mm (7.56") + flange thickness b (see tables) |
| T17 housing, optional side-mount display | 191 mm (7.52") + flange thickness b (see tables) |

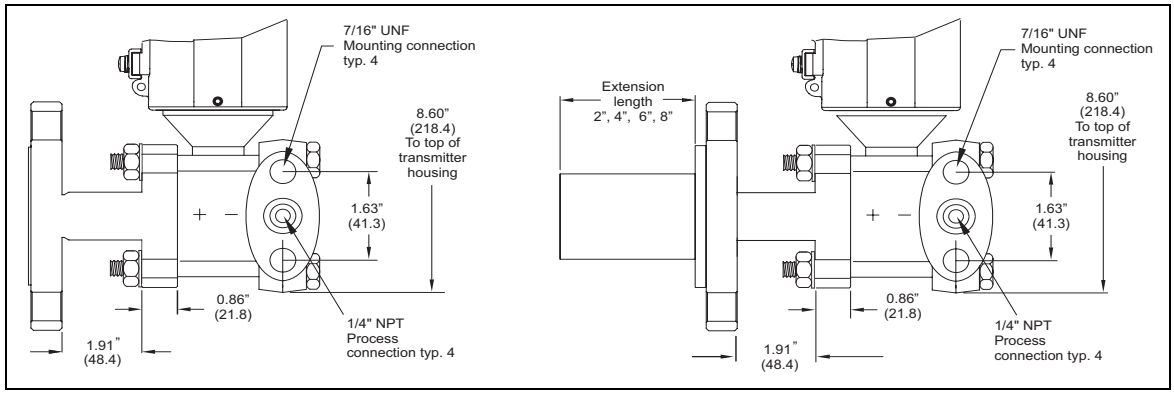
**Process connections FMD77 with metallic measuring diaphragms, low-pressure side**




Low-pressure side: connection 1/4-18 NPT, mounting optionally 7/16-20 UNF,
Side flanges material of the basic device: AISI 316L/1.4435 or 1.4404
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 69 Process Connection ordering information)

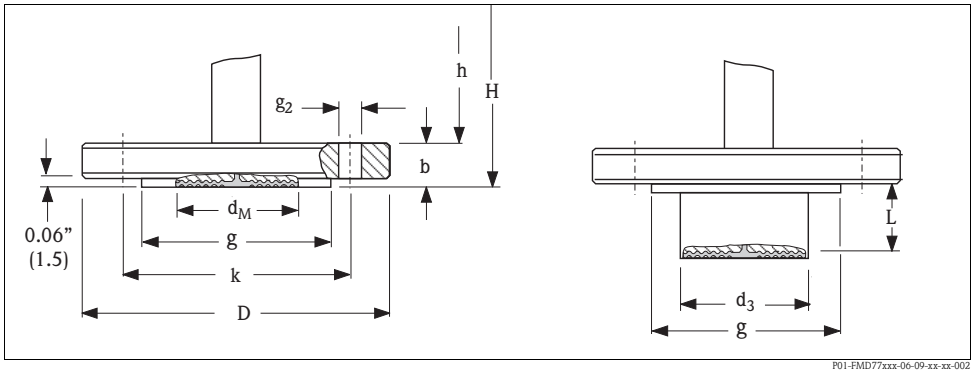


**Process connections FMD77 with metallic measuring diaphragms, high-pressure side**

Note!

- Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→ see page 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.
- 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 51, 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 39, → section "Device height H"
h Height of the device without flange thickness b

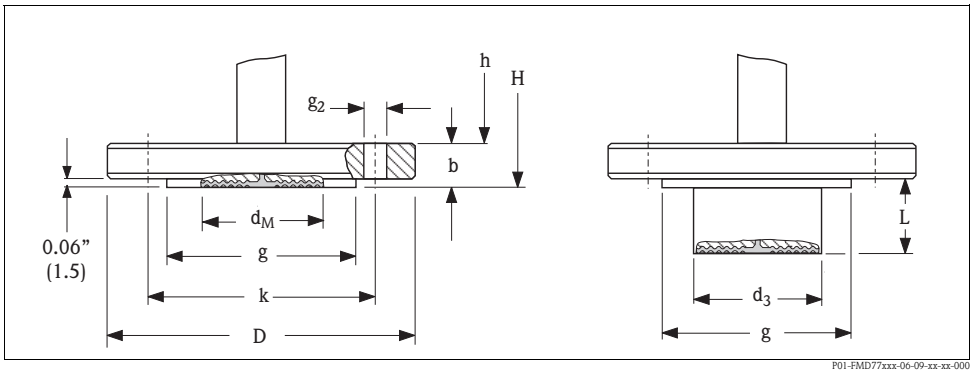
| | Flange | | | | | | | | Bolt holes | | | Diaphragm seal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Version** | **Nominal diameter** | **Nominal pressure** | **Shape** [1] | **Diameter** **D** [mm] | **Thickness** **b** [mm] | **Raised face** **g** [mm] | **Extension 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 | +1.25 | 3.0 |
| B | DN 80 | PN 10-40 | B1 (D) | 200 | 24 | 138 | – | – | 8 | 18 | 160 | 89 | +0.23 | +0.18 | 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 | +0.28 | 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 49

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

## 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

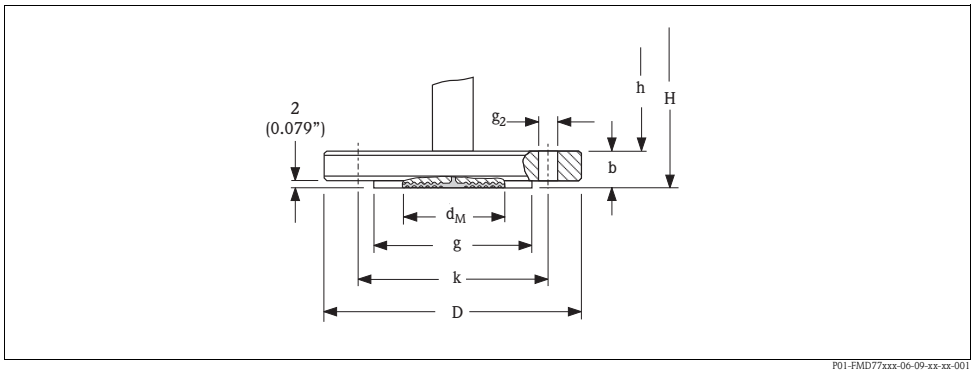
H Device height → see page 39, section "Device height H"
h Height of the device without flange thickness b

| | 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./sq.in | 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 | +0.90 | 5.7 (2.6) |
| P | 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 | +0.18 | 11.2 (5.1) |
| Q | 3 | 150 | 7.5 (190.5) | 0.94 (23.9) | 5 (127) | 2 (50.8) | 2.85 (72.4) | 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 | 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 49

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

## 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

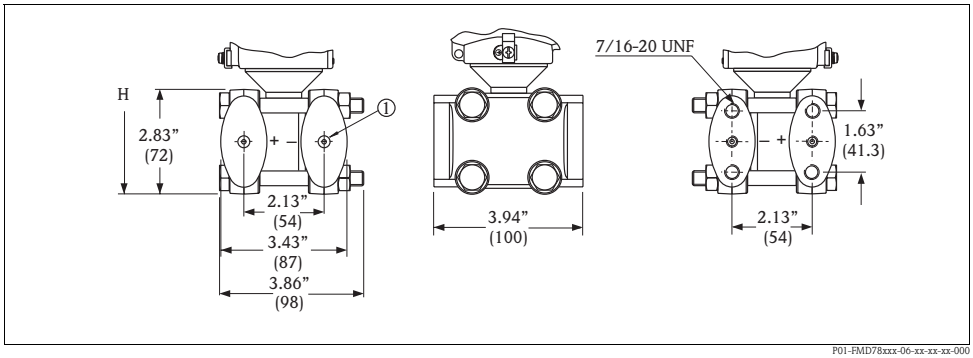
| | Flange | | | | | Bolt holes | | | Diaphragm seal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Version** | **Nominal diameter** | **Nominal pressure** | **Diameter** | **Thickness** | **Raised face** | **Quantity** | **Diameter** | **Bolt circle** | **max. Diaphragm diameter** | **$T_K$ 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 (lb) |
| 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 | +0.60 | 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 | +0.31 | 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 49

### 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

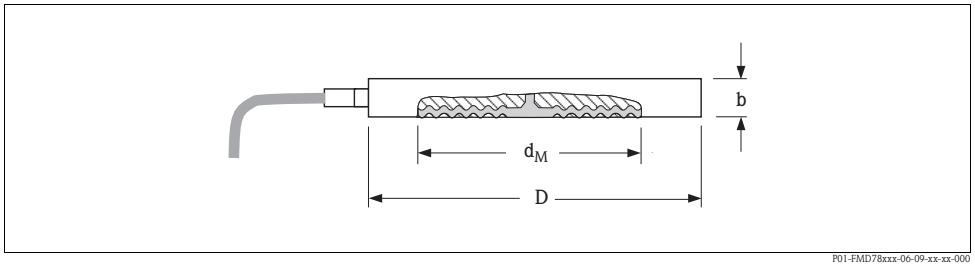
| Description | Device height |
|---|---|
| T14 housing, optional side-mount display | 217 mm (8.54") |
| T15 housing, optional top-mount display, flat cover | 223 mm (8.78") |
| T15 housing, optional top-mount display, high cover | 234 mm (9.21") |
| T17 housing, optional side-mount display | 233 mm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

**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 51, section "Diaphragm seal filling oils".
- The temperature coefficient "$T_K$ Ambient" is listed in relation to the capillary length on page 52 in the "Influence of the temperature on the zero point" section.
- The weights of the diaphragm seals are given in the tables. See page 49 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.

### Diaphragm seal cell structure




Process connection FMD78, material AISI 316L SS

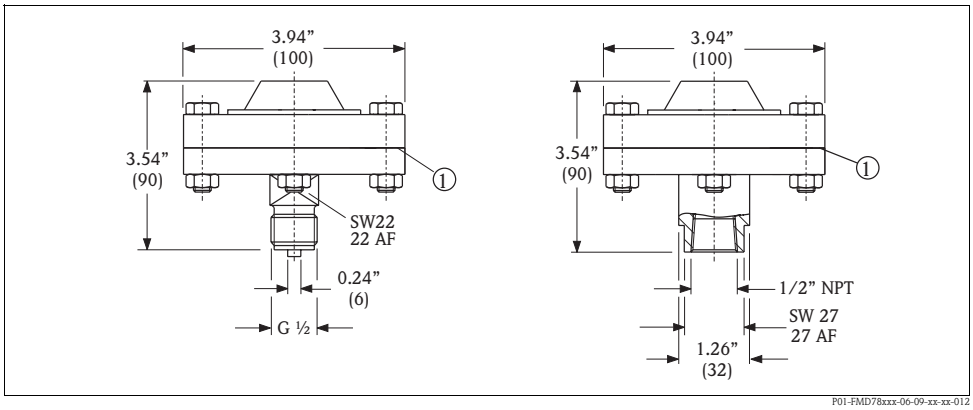
| | Flange, DIN | | | | Diaphragm seal | | |
|---|---|---|---|---|---|---|---|
| **Version** | **Nominal diameter** | **Nominal pressure** [1] | **Diameter** **D** [mm] | **Thickness** **b** [mm] | **max. Diaphragm diameter** $d_M$ [mm] | $T_K$ **Process** [mbar/10K] | **Weight of two diaphragm seals** [kg] |
| UF | DN 50 | PN 16-400 | 102 | 20 | 59 | +2.00 | 2.6 |
| UH | DN 80 | PN 16-400 | 136 | 20 | 89 | +0.20 | 4.6 |
| UJ | DN 100 | PN 16-400 | 158 | 20 | 89 | +0.30 | 6.2 |

| | Flange, ANSI | | | | Diaphragm seal | | |
|---|---|---|---|---|---|---|---|
| **Version** | **Nominal diameter** [in] | **Nominal pressure** [1] lb/sq.in | **Diameter** **D** in (mm) | **Thickness** **b** in (mm) | **max. Diaphragm diameter** $d_M$ in (mm) | $T_K$ **Process** [mbar/10K] | **Weight of two diaphragm seals** lbs (kg) |
| VF | 2 | 150-2500 | 3.99 (99) | 0.79 (20) | 2.32 (59) | +1.25 | 5.7 (2.6) |
| VH | 3 | 150-2500 | 5.00 (127) | 0.79 (20) | 3.50 (89) | +0.25 | 10.1 (4.6) |
| VJ | 4 | 150-2500 | 6.22 (158) | 0.79 (20) | 3.50 (89) | +0.19 | 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 28, section "Pressure specifications".

**Process connection FMD78 with metallic measuring diaphragms (continued)**

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

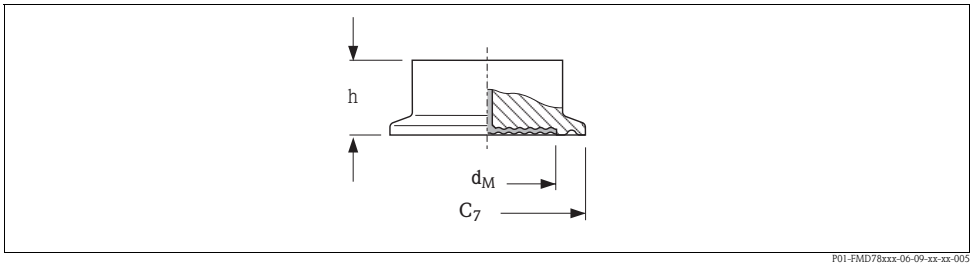



Process connection FMD78, left: with threaded connection ISO 228 G 1/2 B, right: with threaded connection ANSI 1/2 MNPT

1 PTFE seal as standard max. 260 °C/500 °F (higher temperatures on request)

| Version | Material | Nominal pressure | $T_K$ Process<br>[mbar/10 K] | Weight of two diaphragm seals<br>lbs (kg) |
|---|---|---|---|---|
| GA | AISI 316L SS | 600 psi (PN 40) | +0.75 | 6.4 (2.9) |
| RL | AISI 316L SS | 600 psi (PN 40) | +0.55 | 6.4 (2.9) |

### Tri-Clamp ISO 2852

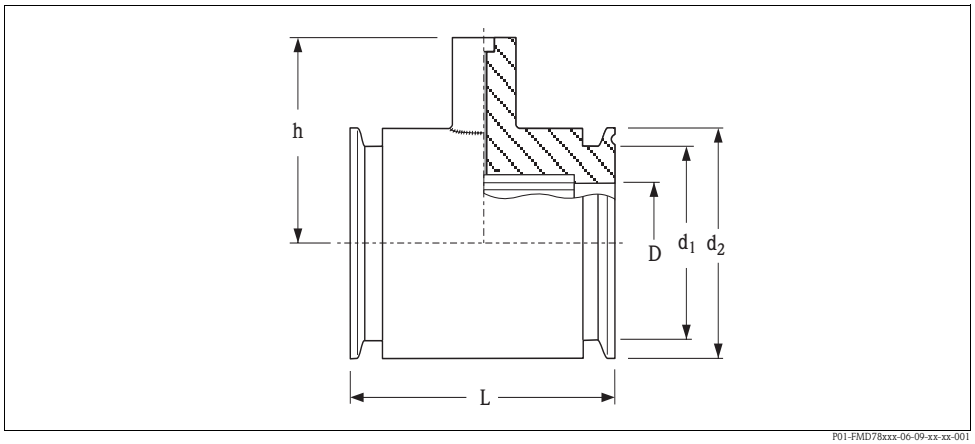



Process connection FMD78, Material: AISI 316L/1.4435, surface roughness of the wetted surfaces ≤ 0.8 µm (30 µinch) as standard. Lower surface roughness on request.

| Version | Nominal diameter ISO 2852 | Nominal diameter DIN 32676 | Nominal diameter<br>inch | Diameter<br>$C_7$<br>in (mm) | max. Diaphragm diameter<br>$d_M$<br>in (mm) | Height<br>h<br>in (mm) | $T_K$ Process<br>[mbar/10 K] | Weight of two diaphragm seals<br>lbs (kg) |
|---|---|---|---|---|---|---|---|---|
| TB | DN 25 | DN 25 | 1 | 1.99 (50.5) | 0.94 (24) | 1.46 (37) | +10.45 | 1.4 (0.64) |
| TC | DN 38 | DN 40 | 1-1/2 | 1.99 (50.5) | 1.42 (36) | 1.18 (30) | +2.40 | 4.4 (2.0) |
| TD | DN 51 | DN 50 | 2 | 2.5 (64) | 1.89 (48) | 1.18 (30) | +1.00 | 4.8 (2.2) |
| TF | DN 76.1 | – | 3 | 3.6 (91) | 2.87 (73) | 1.18 (30) | +0.20 | 5.3 (2.4) |

**Process connection FMD78 with metallic measuring diaphragms (continued)**

### Tri-Clamp pipe diaphragm seal ISO 2852

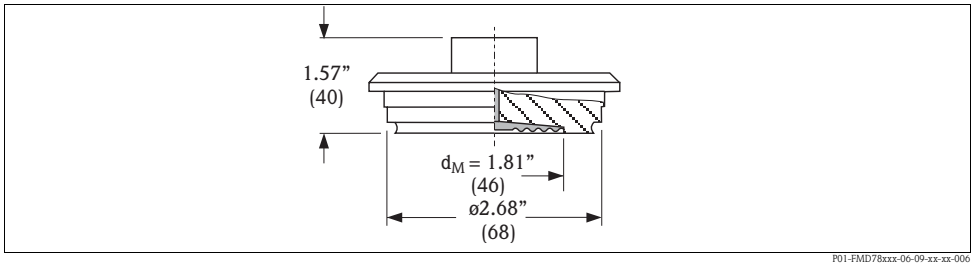



Process connection FMD78, Material: AISI 316L, surface roughness of the wetted surfaces ≤ 0.8 µm (30 µinch) as standard. Lower surface roughness on request.

| 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) | +4.49 | 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) | +3.46 | 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) | +2.69 | 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

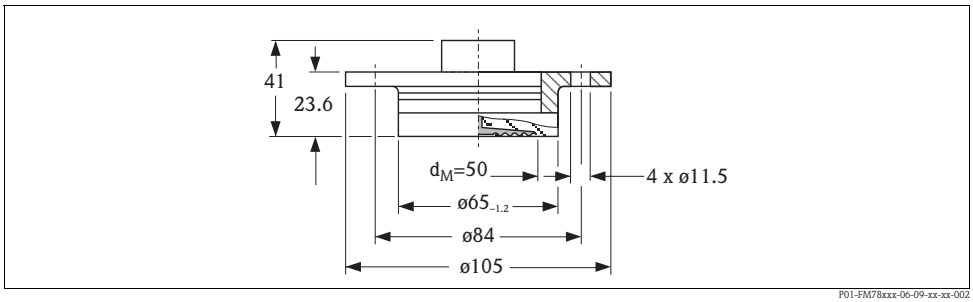



Process connection FMD78, surface roughness of the wetted surfaces ≤ 0.8 µm (30 µinch) as standard. Lower surface roughness on request.

| 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) | +1.65 | 2.6 (5.7 lbs) |

**Process connection FMD78 with metallic measuring diaphragms (continued)**

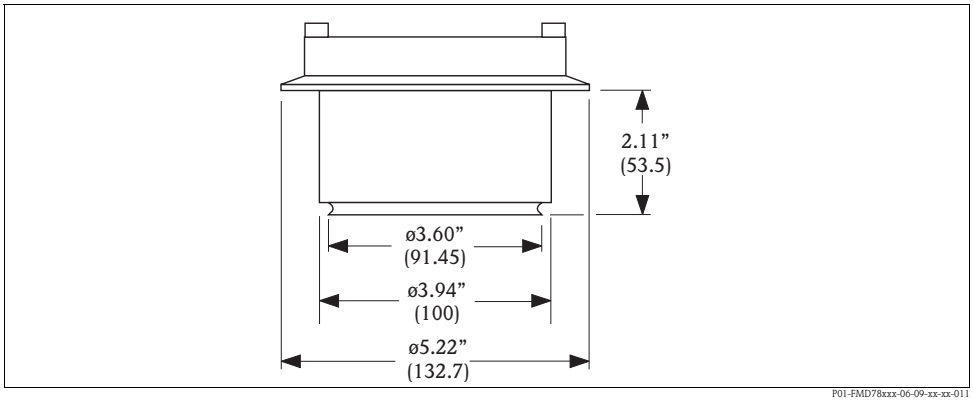
### DRD 65 mm




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

| Version | Material | Nominal pressure | $T_K$ Process<br>[mbar/10 K] | Weight of two diaphragm seals<br>kg |
|---|---|---|---|---|
| TK | AISI 316L/1.4435 | PN 25 (360 psi) | +1.25 | 1.5 (3.3 lbs) |

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

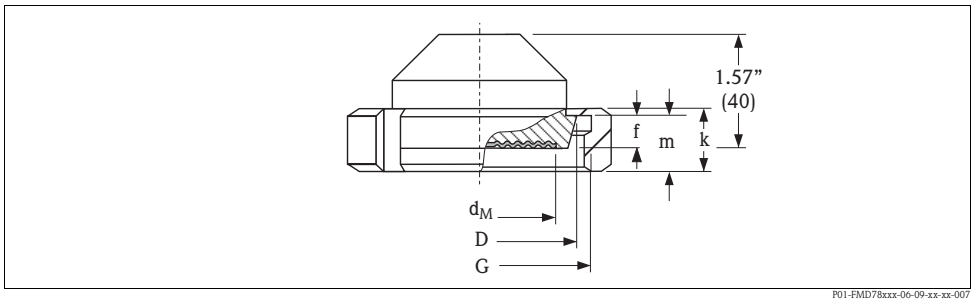



Process connection FMD78, surface roughness of the wetted surfaces ≤ 0.8 µm (30 µinch) as standard. Lower surface roughness on request.

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

**Process connection FMD78 with metallic measuring diaphragms (continued)**

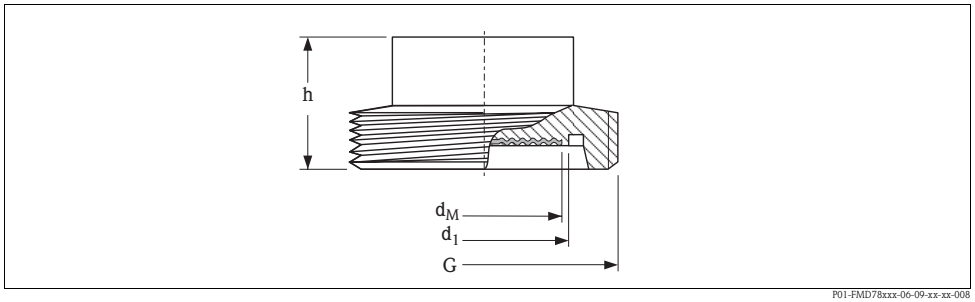
### Taper adapter with coupling nut, DIN 11851 (dairy fitting)




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

| | Taper adapter | | | | Slotted nut | | | Diaphragm seal | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Version | Nominal diameter | Nominal pressure | Diameter<br>D<br>[mm] | Adapter height<br>f<br>[mm] | Thread<br>G | Height<br>k<br>[mm] | Height<br>m<br>[mm] | max. Diaphragm diameter<br>$d_M$<br>[mm] | $T_K$ Process<br>[mbar/10 K] | Weight of two diaphragm seals<br>[kg] |
| MR | DN 50 | PN 25 | 68.5 | 11 | Rd 78 x 1/6" | 22 | 19 | 52 | +0.90 | 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 | +0.30 | 5.1 |

### Threaded adapter, DIN 11851 (dairy fitting)

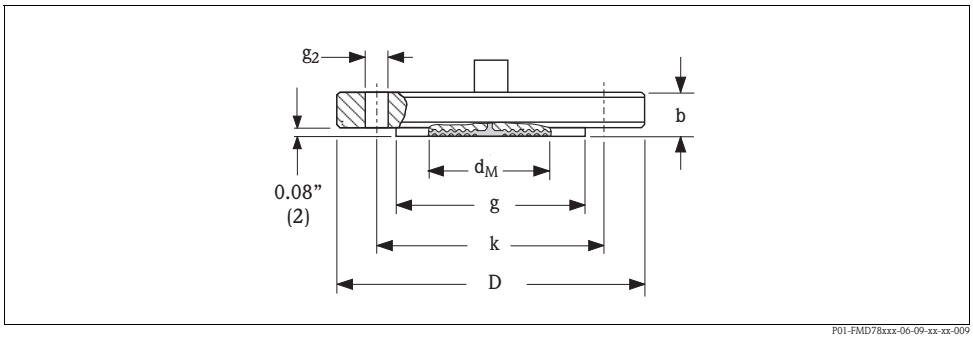



Process connection FMD78, material AISI 316L/1.4435, surface roughness of the wetted surfaces ≤ 0.8 µm (30 µinch) as standard. Lower surface roughness on request.

| | Threaded adapter | | | | | Diaphragm seal | | |
|---|---|---|---|---|---|---|---|---|
| Version | Nominal diameter | Nominal pressure | Diameter<br>$d_1$<br>[mm] | Height<br>h<br>[mm] | Thread<br>G | max. Diaphragm diameter<br>$d_M$<br>[mm] | $T_K$ Process<br>[mbar/10 K] | Weight of two diaphragm seals<br>[kg] |
| M3 | DN 50 | PN 25 | 54 | 35 | Rd 78 x 1/6" | 52 | +0.95 | 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 |

**Process connection FMD78 with metallic measuring diaphragms (continued)**

**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

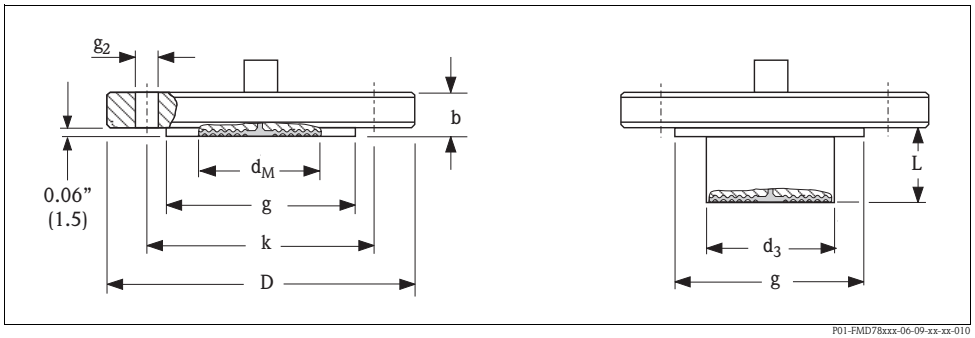
| | EN/DIN flange | | | | | | Bolt holes | | | Diaphragm seal | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Version** | **Nominal diameter** | **Nominal pressure** | **Shape** [1] | **Diameter** **D** [mm] | **Thickness** **b** [mm] | **Raised face** **g** [mm] | **Quantity** | **Diameter** **$g_2$** [mm] | **Bolt 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 | +1.50 | 6.0 |
| B5 | DN 80 | PN 10-40 | B1 (D) | 200 | 24 | 138 | 8 | 18 | 160 | 89 | +0.20 | 10.5 |
| BT | DN 100 | PN 10-16 | B1 (C) | 220 | 20 | – | 8 | 18 | 180 | 89 | +0.35 | 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] | **Bolt 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 | +0.81 | 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 | +0.25 | 9.4 |

**Process connection FMD78 with metallic measuring diaphragms (continued)**

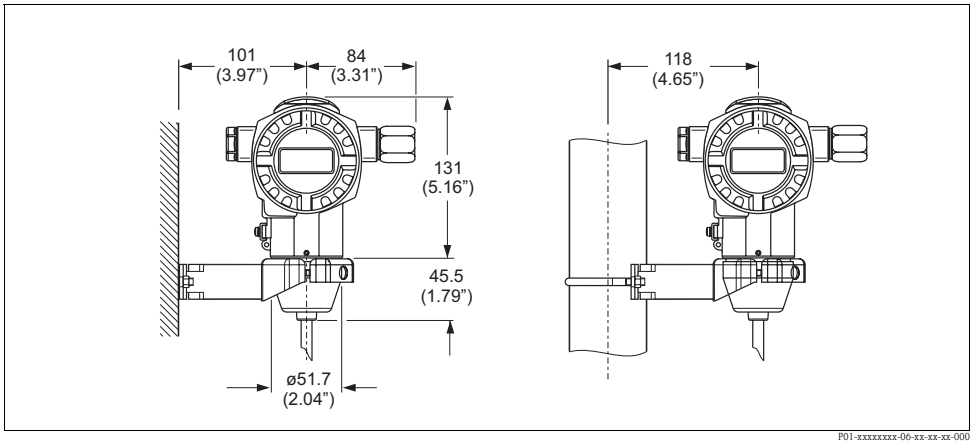
**ANSI flanges, connection dimensions as per ANSI B 16.5, raised face RF**



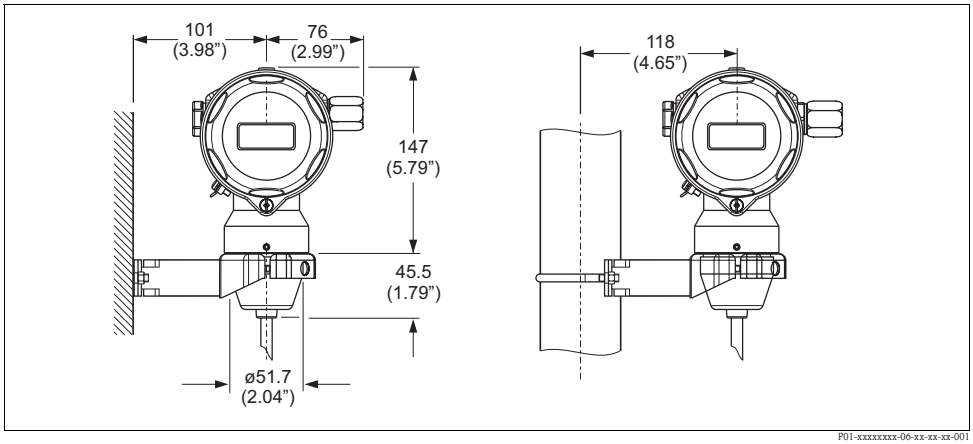

Process connection FMD78, ANSI flange with and without extended diaphragm seal, material AISI 316/AISI 316L

| | 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** **$d_M$** | **$T_K$ Process** | **Weight of two diaphragm seals** |
| | | lb/sq.in | 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) | +1.10 | 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) | +0.75 | 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) | +0.40 | 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) | +0.35 | 31 (14) |
| J4 | 3 | 150 | 7.5 (190.5) | 0.94 (23.9) | 5 (127) | 2 (50.8) | 3 (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) | +0.25 | 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) |

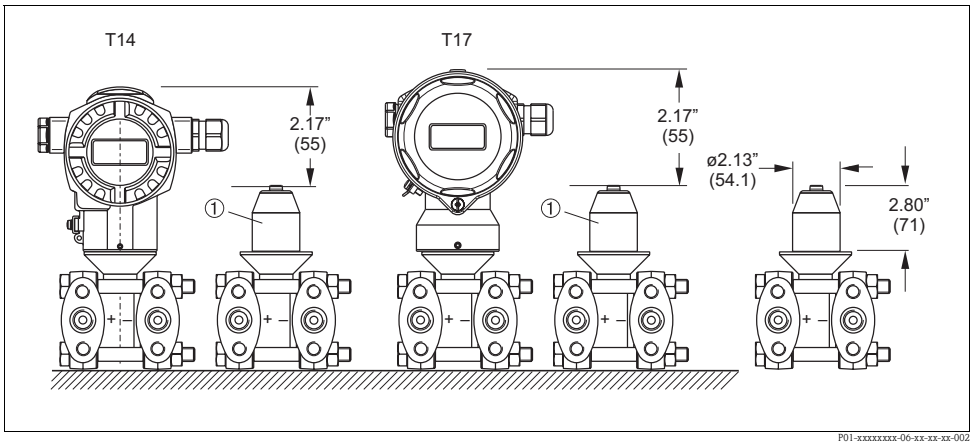
**"Remote housing" version**




Dimensions T14 housing, optional display on the side. Housing weight see page 49.




Dimensions T17 housing, optional display on the side. Housing weight see page 49.




Reduction of the mounting height of the process connection, for application of the remote housing.
1 Process connection adapter.

If the remote housing is used, the mounting height of the process connection is reduced by approx. 55 mm (2.16") as compared to the dimensions of the standard version.

**Weight**

**Housing**

| | T14 | | T15 | T17 | Remote housing |
|---|---|---|---|---|---|
| | **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) | Weight of housing T14, T15 or T17 + 1.1 lbs (0.5 kg).<br>Weight of sensor + 1.1 lbs (0.5 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**

- Process connections PMD70 with ceramic measuring diaphragms: starting on page 29
- Process connections PMD75 with metallic measuring diaphragms: starting on page 31
- Process connection FMD76 with ceramic measuring diaphragms: starting on page 34
- Process connections FMD77 with metallic measuring diaphragms, low-pressure side: starting on page 36
- Process connection FMD78 with metallic measuring diaphragms: starting on page 40

**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, 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)
- Bind 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

**Cable for remote housing:**
- Structure of PE cable:
  Slip-resistant cable with strain-relief members made of Dynemo; shielded using aluminum-coated film; insulated with polyethylene (PE), black; copper wires, twisted
- Structure of FEP cable:
  Slip-resistant cable; shielded using galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper wires, twisted

**Miscellaneous:**
- Measuring cell PMD70/FMD76, filling oil
  - 10 and 40 in$H_2O$ (25 and 100 mbar) measuring cell: Silicone oil
  - 200 and 1200 in$H_2O$ (500 and 3000 mbar) measuring cell: Mineral oil
  - for oxygen and ultra pure gas applications: Inert oil (Voltalef 1A)
- Measuring cell PMD75/FMD77 and FMD78, filling oil Silicone oil (Wacker AK20)
  - for oxygen and ultra pure gas applications: Inert oil (Halocarbon 6.3)
- Membrane material:
  - PMD70/FMD76: $Al_2O_3$ (Aluminum-oxide-ceramic)
  - PMD75, FMD77, FMD78:
    - AISI 316L (1.4435)
    - Alloy C276 (2.4819)
    - Monel 400 (2.4360)
    - Tantal
    - AISI 316L (1.4435) with Gold-Rhodium coating (FMD77/FMD78 only)
    - AISI 316L (1.4435) with 0.09 mm PTFE foil (FMD77/FMD78 only)
- Process diaphragm PMD70/FMD76: $Al_2O_3$ (Aluminum-oxide-ceramic)
- Mounting accessories: mounting bracket with screws AISI 304 (1.4301)
- Capillary: AISI 316 Ti (1.4571)
- Protective hose for capillary: AISI 304 (1.4301)
- External earth 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

# 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 26, 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 good and rapid measuring point cleaning is necessary
- If the measuring point is exposed to vibrations
- For mounting locations that are difficult to access

**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 52 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 57 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 52 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 0.05 bar ≤ $p_{abs}$ ≤ 1 bar | Permissible temperature range at $p_{abs}$ ≥ 1 bar | Density [g/cm³] | Viscosity [cSt at 25°C (77°F)] | Coefficient of thermal expansion [1/K] | $T_K$ correction factor | Notes |
|---|---|---|---|---|---|---|---|---|
| FMD77: A<br>FMD78: A, 1 | Silicone oil (DC200) | –40 to +180°C<br>(–40 to +356°F) | –40 to +250°C<br>(–40 to +482°F) | 0.96 | 100 | 0.00096 | 1 | suitable for foods<br>FDA 21 CFR 175.105 |
| FMD77: V<br>FMD78: C, 3 | High-temp. oil (DC704) | –10 to +200°C<br>(+14 to +392°F) | –10 to +350°C<br>(+14 to +662°F) | 1.07 | 37 | 0.0007 | 0.72 | high temperatures |
| FMD77: F<br>FMD78: D, 4 | Inert oil (Halocarbon) | –40 to +80°C<br>(–40 to +176°F) | –40 to +175°C<br>(–40 to +662°F) | 1.87 | 27 | 0.000876 | 0.91 | Oil for ultra pure gas and oxygen applications |
| FMD77: D<br>FMD78: B, 2 | Neobee M-20 Vegetable oil | –10 to +120°C<br>(+14 to +248°F) | –10 to +200°C<br>(+14 to +392°F) | 0.94 | 9.5 | 0.00101 | 1.05 | suitable for foods<br>FDA 21 CFR 172.856 |
| FMD77: L<br>FMD78: E, 5 | Low temperature oil | –70 to +80°C[2]<br>(–94 to 176°F) | –70 to +180°C[2]<br>(–94 to +356°F) | 0.92 | 4.4 | – | – | low temperatures |

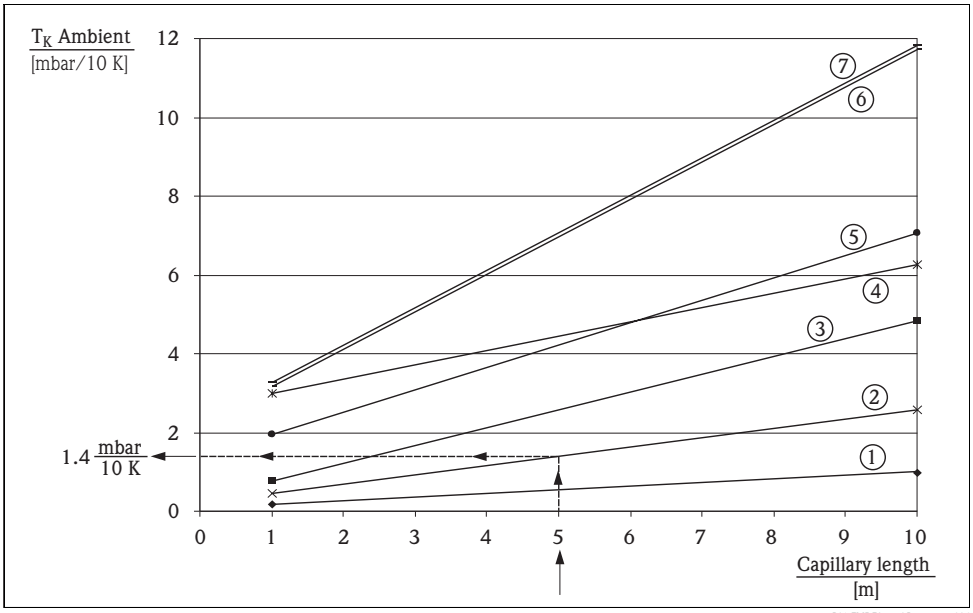
1) Version for feature 90 in the order code

2) Observe temperature limits of the device (→ page 25 and page 26)

**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: +21 to +33°C / +69.8 to 91.4°F). See also page 51, 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 40 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 51, section "Diaphragm seal filling oils".



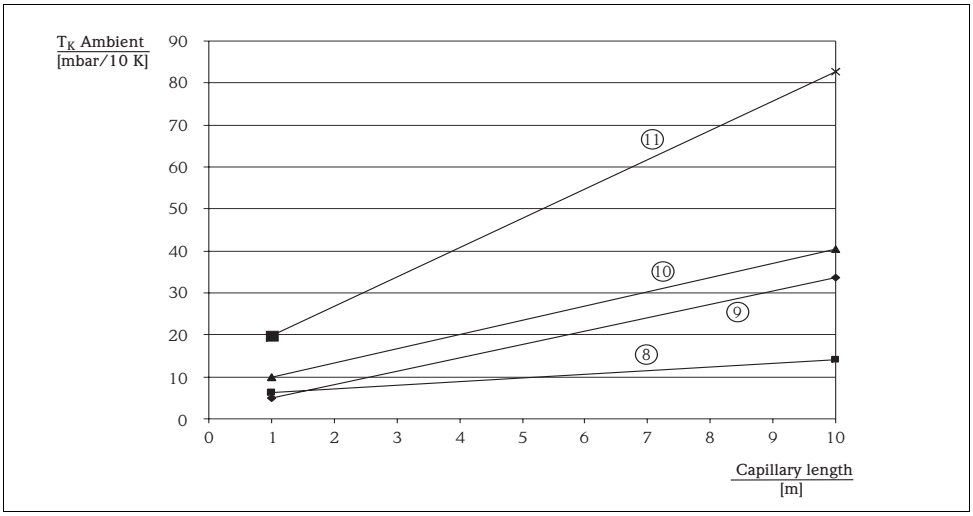

**Example** for:
– Diaphragm seal versions "B5, EN/DIN Flange DN 80 PN 10-40 B1, AISI 316L"
– Capillary length: 5 m
– Ambient temperature, capillary/transmitter: 45°C
– Filling oil: silicone oil

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 minimised 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 |

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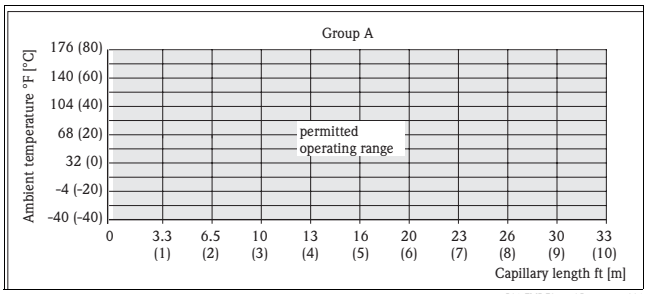
| Characteristic type | Version | Diaphragm seal |
|---|---|---|
| 8 | SB | Pipe seal diaphragm Tri-Clamp, ISO 2852 DN 25 (1"), AISI 316L/1.4435 |
| 9 | WH | Sanitary tank spud, AISI 316L/1.4435, Extensions 2" |
| 10 | TC | Tri-Clamp, ISO 2852 DN 38 (1 – 1 1/2"), DIN 32676 DN 40, AISI 316L/1.4435 |
| 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 +25°C (+77°F) 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!

- Endress+Hauser recommends using low temperature oil for applications that require short response times or that are near the lower temperature limit. → See also page 51, "Diaphragm seal filling oils" section.
- 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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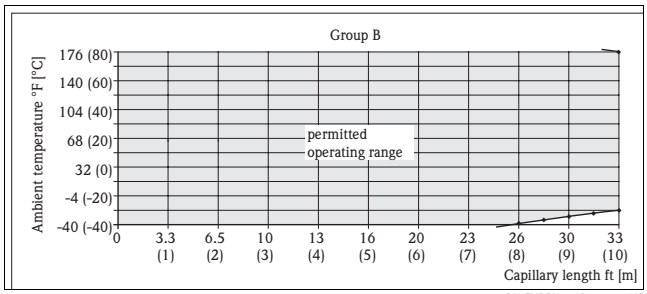

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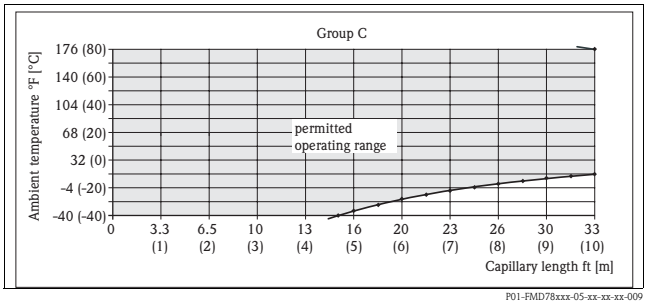

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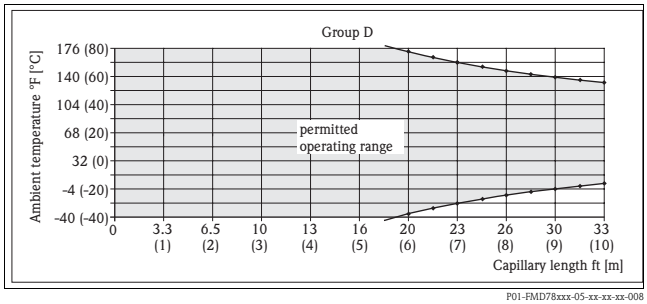

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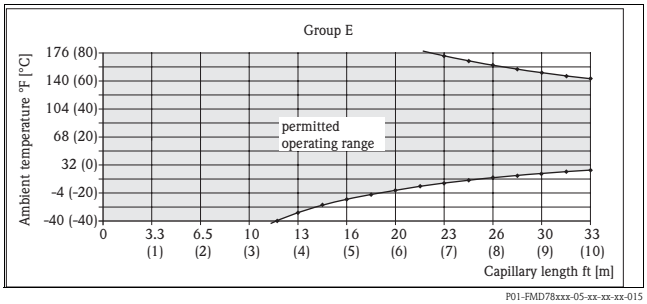

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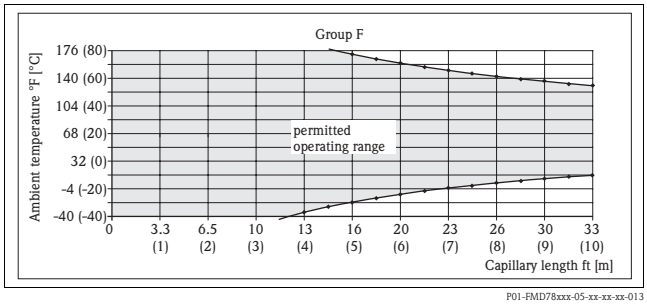

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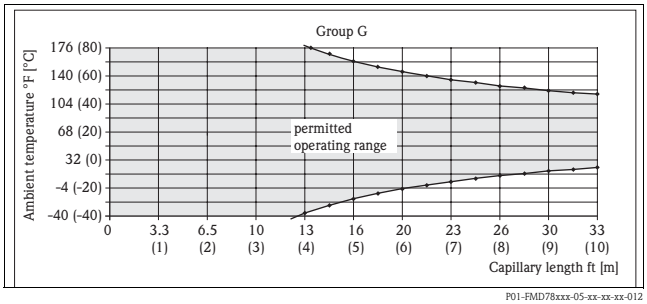

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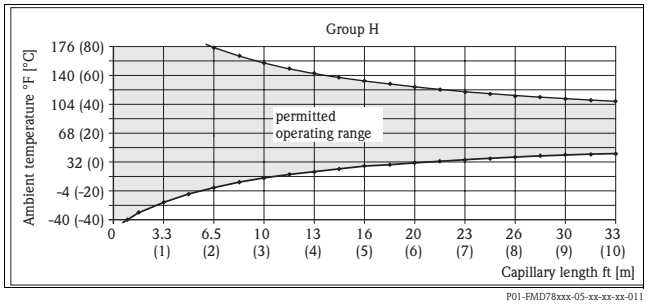

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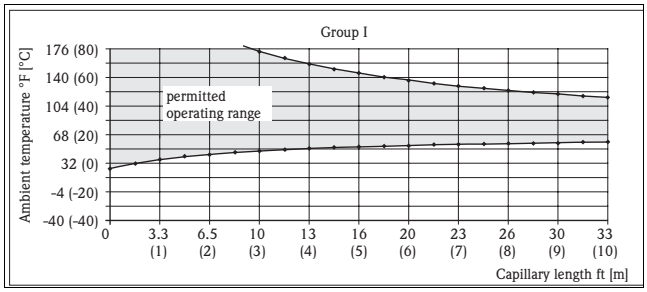


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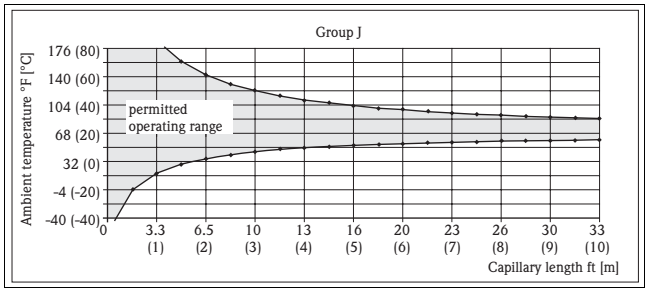


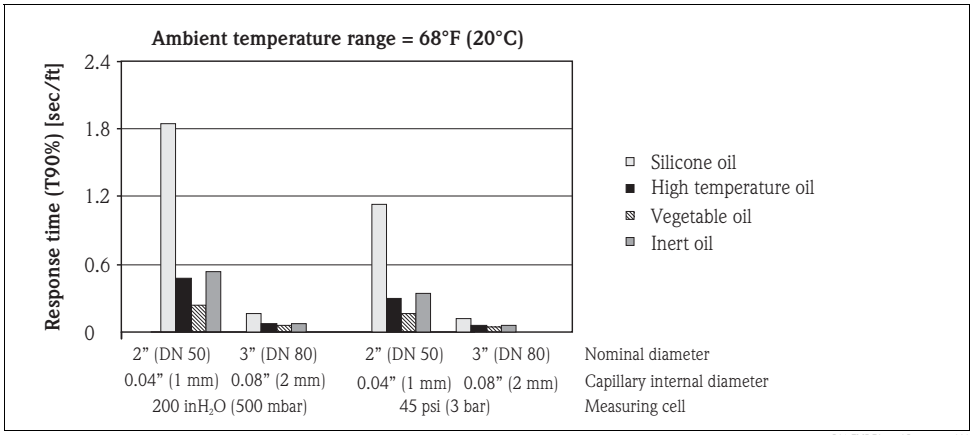

P01-FMD78xxx-05-xx-xx-xx-014

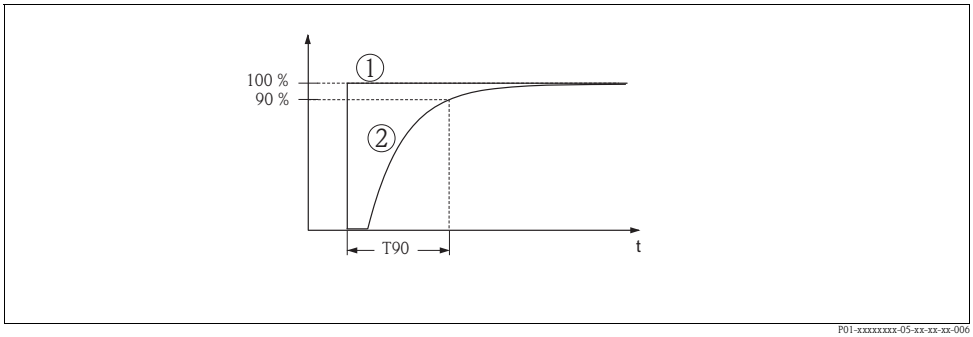
| Group | **Version** | **Diaphragm seal** |
|---|---|---|
| A | SB | Pipe seal diaphragm Tri-Clamp, ISO 2852 DN 25 (1"), AISI 316L/1.4435 |
| | SC | Pipe seal diaphragm Tri Clamp, ISO 2852 DN 38 (1 1/2"), AISI 316L/1.4435 |
| | SD | Pipe seal diaphragm Tri Clamp, ISO 2852 DN 51 (2"), AISI 316L/1.4435 |
| | 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 |
| B | 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 |
| C | 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 |
| D | 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 |
| E | J4 | ANSI flange 3" 150 lbs RF, AISI 316/316L, Extensions: 2"/4"/6"/8" |
| F | 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 |
| G | MS | DIN 11851 DN 65 PN 25, AISI 316L/1.4435 |
| | M4 | DIN 11851 DN 65 PN 25 socket, AISI 316L/1.4435 |
| H | TC | Tri-Clamp, ISO 2852 DN 38 (1 – 1 1/2"), DIN 32676 DN 40, AISI 316L/1.4435 |
| I | TB | Tri-Clamp, ISO 2852 DN 25 (1"). DIN 32676 DN 25, AISI 316L/1.4435 |
| J | 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.




Presentation of the response time (T90%)

1 Pressure step
2 Output signal

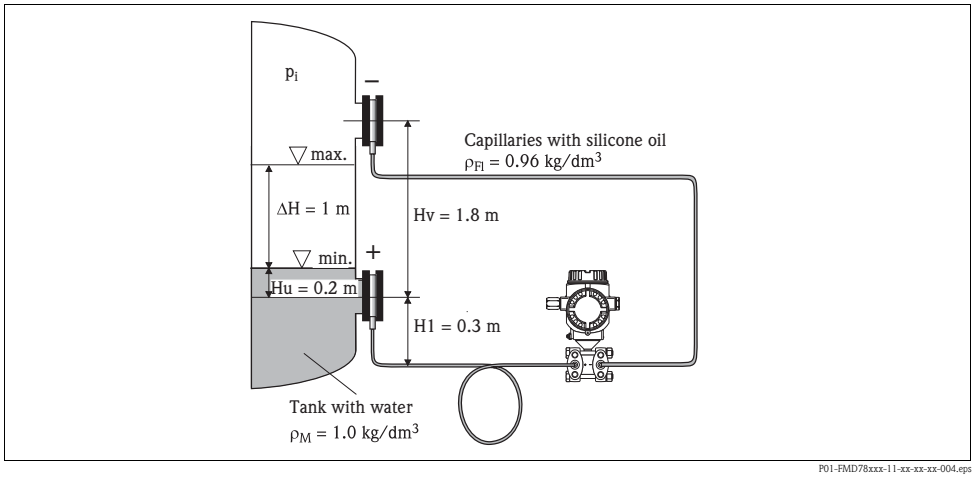
| **Minimize response time by** | **Comments** |
|---|---|
| Larger capillary internal diameter | The temperature effect increases with increasing diameter. |
| Shorter capillaries | – |
| Filling oil with lower viscosity | – Observe compatibility of the filling oil with the process fluid.<br>– Observe 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 range is selected, the sensor nominal range can be overdriven as a result of position adjustment. → See the following diagram and the following example.
- For devices with capillary a suitable fastening device (mounting bracket) is recommended.
- When using a mounting bracket, sufficient strain relief must be allowed for to prevent the capillary bending down (bending radius ≥ 100 mm / 4").
- 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!)**




P01-FMD78xxx-11-xx-xx-xx-004.eps

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.

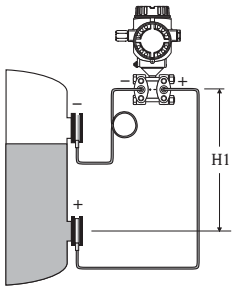
**Installation instructions**

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 if the ambient temperature is below ore above the reference temperature
- with a bending radius of ≥ 100 mm (4").

**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 then 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

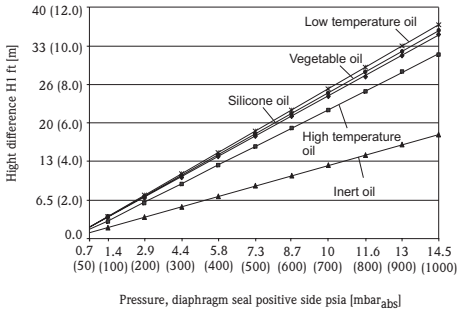



Diagram of maximum installation height above the lower diaphragm seal for vacuum applications dependent on the pressure at the diaphragm seal on the positive side

# 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 74 ff, sections "Safety Instructions" and "Installation/Control Drawings".

**Marine certificate**

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

**Overspill protection**

WHG (German Water Resources Act). See "Ordering information" → 60 (see also ZE259P/00/de).

**CRN approvals**

Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→ see page 61, feature 70 "Process connection") has to be ordered with a CSA approval (→ see page 60, feature 10 "Approval"). These devices are fitted with a separate plate bearing the registration number 0F10524.5C.

**Pressure Equipment Directive (PED)**

The devices PMD70, PMD75, FMD76, FMD77 und FMD78 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.

Additionally applies:
- 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

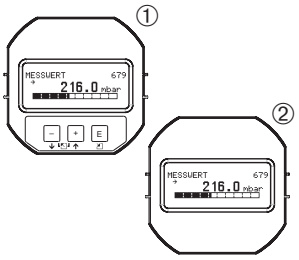
DIN 16086:
Electrical pressure measuring instruments, pressure sensors, pressure transmitters, pressure measuring instruments, concepts, specifications in data sheets

EN 61326-X:
EMC product family standard for electrical equipment for measurement, control and laboratory use.

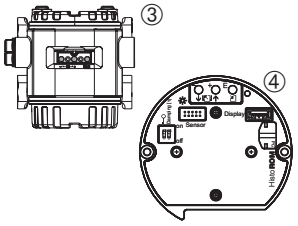
# Ordering information

**PMD70**

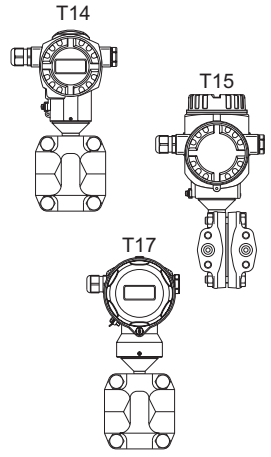
This overview does not mark options which are mutually exclusive.




| 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 0/1 Ex ia IIC T6 |




| 20 | Output; Operation: |
|---|---|
| A | 4...20 mA HART, SIL operation outside, LCD (→ see Fig. ¿, o) |
| B | 4...20 mA HART, SIL operation inside, LCD (→ see Fig. ¿, p) |
| C | 4...20 mA HART, SIL operation inside (→ see Fig. p) |
| M | PROFIBUS PA, operation outside, LCD (→ see Fig. ¿, o) |
| N | PROFIBUS PA, operation inside, LCD (→ see Fig. ¿, p) |
| O | PROFIBUS PA, operation inside (→ see Fig. p) |
| P | FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. n, o) |
| Q | FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. n, p) |
| R | FOUNDATION Fieldbus, operation inside (→ see Fig. p) |




| 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; PN: | |
|---|---|---|
| | **Nominal value** | **PN** |
| 7B | 10 in$H_2O$/25 mbar/2500 Pa | 150 psi/10 bar/1 MPa |
| 7D | 40 in$H_2O$/100 mbar/10 kPa | 240 psi/16 bar/1.6 MPa |
| 7F | 200 in$H_2O$/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<br>Note application limits pressure/temp. |

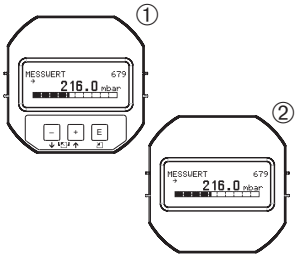
| | | |
|---|---|---|
| **100** | | **Additional option 1:** |
| | A | not selected |
| | E | SIL2/IEC 61508 Declaration of conformity |
| | B | Material test certificate for wetted components, inspection certificate as per EN 10204 3.1 acc. to specification 52005759 |
| | M | Overvoltage protection |
| | 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,<br>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 |
| | G | Separate housing, cable length see additional spec. + mounting bracket, wall/pipe, 316L |
| | 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) for oval flange adapter PZO |
| | 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,<br>inspection certificate as per EN 10204 3.1 |
| | Z | Special version, to be specified |

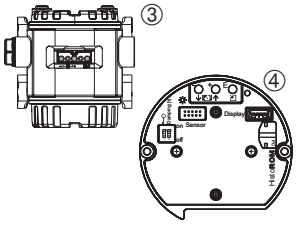
| | |
|---|---|
| | |
| PMD70 | complete order code |

**PMD75**

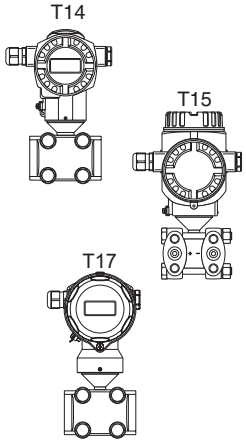
This overview does not mark options which are mutually exclusive.




| 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 0/1 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 |
| F | Combined certificates: ATEX II EEx ia / EEx d + FM/CSA IS + XP; ATEX II 1/2G EEx ia IIC T6+; ATEX II 2G EEx d IIC T6+; FM/CSA IS + XP Cl.I Div.1 Gr.A-D |




| 20 | Output; Operation: |
|---|---|
| A | 4...20 mA HART, SIL operation outside, LCD (→ see Fig. ¿, o) |
| B | 4...20 mA HART, SIL operation inside, LCD (→ see Fig. ¿, p) |
| C | 4...20 mA HART, SIL operation inside (→ see Fig. p) |
| M | PROFIBUS PA, operation outside, LCD (→ see Fig. ¿, o) |
| N | PROFIBUS PA, operation inside, LCD (→ see Fig. ¿, p) |
| O | PROFIBUS PA, operation inside (→ see Fig. p) |
| P | FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. n, o) |
| Q | FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. n, p) |
| R | FOUNDATION Fieldbus, operation inside (→ see Fig. p) |




| 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, M 12x1 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; PN: | | |
|---|---|---|---|
| | | **Nominal value** | **PN** |
| | 7B | 4 in$H_2O$/10 mbar/1 kPa | 2400 psi/160 bar/16 MPa |
| | 7C | 12 in$H_2O$/30 mbar/3 kPa | 2400 psi/160 bar/16 MPa |
| | 7D | 40 in$H_2O$/100 mbar/10 kPa | 2400 psi/160 bar/16 MPa |
| | 7F | 200 in$H_2O$/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 |
| | 8F | 200 in$H_2O$/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; m$H_2O$/m$H_2O$ |
| | 4 | Nominal range; in$H_2O$/ft$H_2O$ |
| | 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 |
| | 2 | Alloy C |
| | 3 | Monel |
| | 5 | Tantalum |
| | 6 | AISI 316L with Gold-Rhodium coating |

| 70 | Process connection; Material: | |
|---|---|---|
| | B | 1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, C22.8 (CRN), including 2 vent valves (AISI 316L) |
| | C | 1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, C22.8, side vent, including 4 fastening bolt connections and 2 vent valves (AISI 316L) |
| | D | 1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, AISI 316L (CRN), including 2 vent valves (AISI 316L) |
| | E | 1/4 – 18 NPT IEC 61518, mounting: 7/16 – 20 UNF, AISI 316L, side vent, including 4 fastening bolt connections and 2 vent valves (AISI 316L) |
| | 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), including 2 vent valves (AISI 316L) |
| | V | RC 1/4 mounting: 7/16 – 20 UNF, C22.8, side vent, including 4 fastening bolt connections and 2 vent valves (AISI 316L) |
| | W | Prepared for diaphragm seal mount |
| | 1 | 1/4 – 18 NPT, mounting: PN 160: M10, PN 420: M12, C22.8 (CRN), including 2 vent valves (AISI 316L) |
| | 2 | 1/4 – 18 NPT, mounting: PN 160: M10, PN 420: M12, AISI 316L (CRN), including 2 vent valves (AISI 316L) |
| | 3 | 1/4 – 18 NPT, mounting: PN 160: M10, PN 420: M12, Alloy C (CRN) |

| | | |
|---|---|---|
| PMD75 | | order code |

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

**PMD75 (continued)**

| | | |
|---|---|---|
| **80** | **Seal:** | |
| | A | FKM Viton |
| | C | PTFE |
| | F | NBR |
| | K | Copper seal ring, cleaned for oxygen service |
| | 1 | FKM Viton, degreased |
| | 2 | FKM Viton, cleaned for oxygen service<br>Note application limits pressure/temp. |
| | 3 | PTFE, cleaned for oxygen service |
| | H | Copper seal ring |

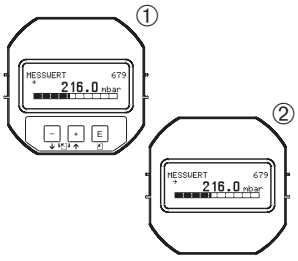
| | | |
|---|---|---|
| **100** | **Additional option 1:** | |
| | A | not selected |
| | E | SIL2/IEC 61508 Declaration of conformity |
| | B | Material test certificate for wetted components, inspection certificate as per EN 10204 3.1 acc. to specification 52005759 |
| | C | NACE MR0175 (wetted parts) |
| | 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 |
| | G | Separate housing, cable length see additional spec. + mounting bracket, wall/pipe, 316L |
| | 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) for oval flange adapter PZO |
| | 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,<br>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 |

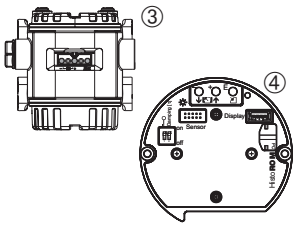
| | |
|---|---|
| | |
| PMD75 | complete order code |

**FMD76**

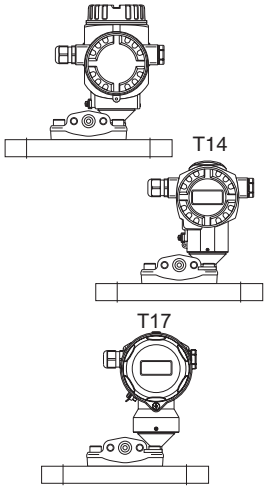
This overview does not mark options which are mutually exclusive.




| 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 0/1 Ex ia IIC T6 |




| 20 | | Output; Operation: |
|---|---|---|
| A | | 4...20 mA HART, SIL operation outside, LCD (→ see Fig. ¿, o) |
| B | | 4...20 mA HART, SIL operation inside, LCD (→ see Fig. ¿, p) |
| C | | 4...20 mA HART, SIL operation inside (→ see Fig. p) |
| M | | PROFIBUS PA, operation outside, LCD (→ see Fig. ¡, o) |
| N | | PROFIBUS PA, operation inside, LCD (→ see Fig. n, p) |
| O | | PROFIBUS PA, operation inside (→ see Fig. p) |
| P | | FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. n, o) |
| Q | | FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. n, p) |
| R | | FOUNDATION Fieldbus, operation inside (→ see Fig. p) |




| 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, IP66/67/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, M 12x1 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; PN: | |
|---|---|---|---|
| | | **Nominal value** | **PN** |
| 7D | | 40 in$H_2O$/100 mbar/10 kPa | 240 psi/16 bar/1.6 MPa |
| 7F | | 200 in$H_2O$/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 | Customised; 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,<br>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<br>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<br>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<br>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<br>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<br>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 |

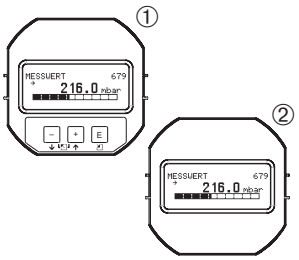
→ For continuation of FMD76 ordering information, see the following page.

**FMD76 (continued)**

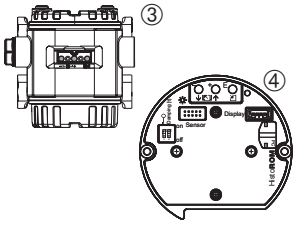
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **100** | | | | | | | | | **Additional option 1:** | |
| | | | | | | | | | A | not selected |
| | | | | | | | | | E | SIL2/IEC 61508 Declaration of conformity |
| | | | | | | | | | B | Material test certificate for wetted components, 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 |
| | | | | | | | | | G | Separate housing, cable length see additional spec. + mounting bracket, wall/pipe, 316L |
| | | | | | | | | | 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) for oval flange adapter PZO |
| | | | | | | | | | 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**

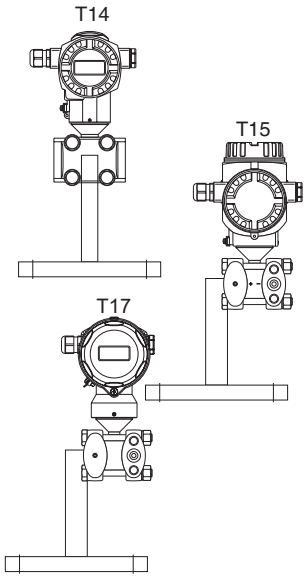
This overview does not mark options which are mutually exclusive.




| 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 0/1 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 |
| F | Combined certificates: ATEX II EEx ia / EEx d + FM/CSA IS + XP; ATEX II 1/2G EEx ia IIC T6+; ATEX II 2G EEx d IIC T6+; FM/CSA IS + XP Cl.I Div.1 Gr.A-D |




| 20 | Output; Operation: |
|---|---|
| A | 4...20 mA HART, SIL operation outside, LCD (→ see Fig. ¿, o) |
| B | 4...20 mA HART, SIL operation inside, LCD (→ see Fig. ¿, p) |
| C | 4...20 mA HART, SIL operation inside (→ see Fig. p) |
| M | PROFIBUS PA, operation outside, LCD (→ see Fig. ¿, o) |
| N | PROFIBUS PA, operation inside, LCD (→ see Fig. ¿, p) |
| O | PROFIBUS PA, operation inside (→ see Fig. p) |
| P | FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. n, o) |
| Q | FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. n, p) |
| R | FOUNDATION Fieldbus, operation inside (→ see Fig. p) |




| 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 display on the top, IP 66/67/NEMA 6P, Gland M 20x1.5 |
| K | Aluminum T15 housing, optional display on the top, IP 66/67/NEMA 6P, Thread G 1/2 |
| L | Aluminum T15 housing, optional display on the top, IP 66/67/NEMA 6P, Thread 1/2 NPT |
| M | Aluminum T15 housing, optional display on the top, IP 66/67/NEMA 6P, M 12x1 PA plug |
| N | Aluminum T15 housing, optional display on the top, IP 66/67/NEMA 6P, 7/8" FF plug |
| P | Aluminum T15 housing, optional display on the top, 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; PN: | | |
|---|---|---|---|
| | | **Nominal value** | **PN** |
| | 7D | 40 in$H_2O$/100 mbar/10 kPa | 2400 psi/160 bar/16 MPa |
| | 7F | 200 in$H_2O$/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 |

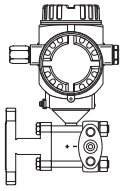
| 50 | Calibration, Units: | |
|---|---|---|
| | 1 | Calibration: nominal range, mbar/bar |
| | 2 | Calibration: nominal range, kPa/MPa |
| | 3 | Calibration: nominal range, mm$H_2O$/m$H_2O$ |
| | 4 | Calibration: nominal range, in$H_2O$/ft$H_2O$ |
| | 6 | Calibration: nominal range, psi |
| | B | Custom 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+C4-ring (CRN) |
| | J | 1/4 – 18 NPT IEC 61518, Alloy C, PTFE+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, cleaned from oil and greace (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 flange**s |
| | 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 flange**s |
| | N | 2" 150 lbs, RF, AISI 316/316L (CRN) |
| | P | 3" 150 lbs, RF, AISI316/ 316L (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 flange**s |
| | 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, DC 200 |
| | D | Neobee M-20 |
| | L | Low temperature oil |
| | V | High-temperature oil, DC 704 |
| | F | Inert oil, Halocarbon |

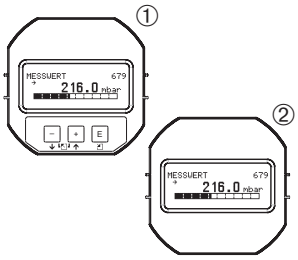
| | | |
|---|---|---|
| **100** | **Additional options 1:** | |
| | A | Additional options 1 not selected |
| | B | Material test certificate for wetted components, inspection certificate as per EN 10204 3.1 acc. to specification 52005759 |
| | C | NACE MR0175 material |
| | D | Material test certificate 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 |
| | E | SIL 2/IEC 61508 declaration of conformity |
| | G | Separate housing, cable length see additional spec. + mounting bracket, wall/pipe, 316L |
| | M | Overvoltage protection |
| | N | HistoROM module |
| | R | Screws 7/16 UNF, length 1 1/2" (4 pieces) for oval flange adapter PZO |
| | 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 |

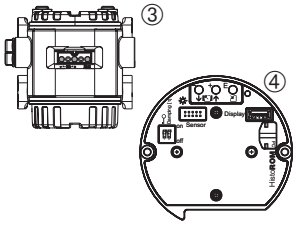
| | |
|---|---|
| FMD77 | complete order code |

**FMD78**

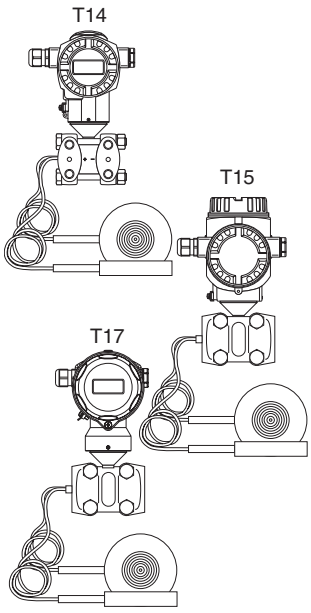
This overview does not mark options which are mutually exclusive.




| 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 0/1 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 |
| F | Combined certificates: ATEX II EEx ia / EEx d + FM/CSA IS + XP; ATEX II 1/2G EEx ia IIC T6+; ATEX II 2G EEx d IIC T6+; FM/CSA IS + XP Cl.I Div.1 Gr.A-D |




| 20 | | Output; Operation: |
|---|---|---|
| | A | 4...20 mA HART, SIL operation outside, LCD (→ see Fig. ¿, o) |
| | B | 4...20 mA HART, SIL operation inside, LCD (→ see Fig. ¿, p) |
| | C | 4...20 mA HART, SIL operation inside (→ see Fig. p) |
| | M | PROFIBUS PA, operation outside, LCD (→ see Fig. ¿, o) |
| | N | PROFIBUS PA, operation inside, LCD (→ see Fig. ¿, p) |
| | O | PROFIBUS PA, operation inside (→ see Fig. p) |
| | P | FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. n, o) |
| | Q | FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. n, p) |
| | R | FOUNDATION Fieldbus, operation inside (→ see Fig. p) |




| 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, M 12x1 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; PN: | | |
|---|---|---|---|
| | | **Nominal value** | **PN** |
| | 7D | 40 in$H_2O$/100 mbar/10 kPa | 2400 psi/160 bar/16 MPa |
| | 7F | 200 in$H_2O$/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, mm$H_2O$/m$H_2O$ |
| | 4 | Calibration: nominal range, in$H_2O$/ft$H_2O$ |
| | 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: | |
|---|---|---|
| | | **Membrane diaphragm seal cell structure** |
| | UF | Pancake (cell) DN 50 PN 16-400, AISI 316L |
| | UH | Pancake (cell) PN 16-400, AISI 316L |
| | UJ | Pancake (cell) PN 16-400, AISI 316L |
| | VF | Pancake (cell) 2" 150-2500 lbs, AISI 316L (CRN) |
| | VH | Pancake (cell) 3" 150-2500 lbs, AISI 316L (CRN) |
| | VJ | Pancake (cell) 4" 150-2500 lbs, AISI 316L (CRN) |
| | | **Threaded connections** |
| | GA | Thread ISO 228 G 1/2 B, PN 40, AISI 316L, separator, PTFE seal |
| | RL | Thread ANSI 1/2 MNPT, PN 40, AISI 316L, separator, PTFE seal |
| | | **Clamp connections** |
| | TB | Tri-Clamp, ISO 2852 DN 25 (1"), DIN 32676 DN 25, 3-A, AISI 316L |
| | TC | Tri-Clamp, ISO 2852 DN 25 – DN 38 (1 – 1 1/2"), 3-A, AISI 316L |
| | TD | Tri-Clamp, ISO 2852 DN 40 – DN 51 (2")/DN 50, 3-A, AISI 316L |
| | TF | Tri-Clamp, ISO 2852 DN 70 – DN 76.1 (3"), 3-A, AISI 316L |
| | | **Pipe diaphragm seal Clamp** |
| | SB | Tri-Clamp, ISO 2852 DN 25 (1"), 3-A, AISI 316L |
| | SC | Tri-Clamp, ISO 2852 DN 38 (1 1/2"), 3-A, AISI 316L, 3.1 + P ressure test acc. to PED Cat. II |
| | SD | Tri-Clamp, ISO 2852 DN 51 (2"), 3-A, AISI 316L, 3.1 + Pressure test acc. to PED Cat. II |
| | | **Hygienic connections** |
| | TR | Varivent model N for pipes DN 40 – DN 162, PN 40, 3-A, AISI 316L |
| | TK | DRD 65 mm, PN 25, 3-A, AISI 316L |
| | WH | Sanitary tank spud, 3-A, AISI 316L, extended diaphragm seal 2" |
| | MR | DIN 11851 DN 50 PN 25, 3-A, AISI 316L |
| | MS | DIN 11851 DN 65 PN 25, 3-A, AISI 316L |
| | MT | DIN 11851 DN 80 PN 25, 3-A, AISI 316L |
| | M3 | DIN 11851 DN 50 PN 25 socket, 3-A, AISI 316L |
| | M4 | DIN 11851 DN 65 PN 25 socket, 3-A, AISI 316L |
| | M5 | DIN 11851 DN 80 PN 25 socket, 3-A, 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 (CRN) |
| | AR | 2" 300 lbs RF, AISI 316/316L (CRN) |
| | AG | 3" 150 lbs RF, AISI 316/16L (CRN) |
| | AS | 3" 300 lbs RF, AISI 316/316L (CRN) |
| | J4 | 3" 150 lbs RF, AISI 316/316L, extended diaphragm seal: 2"/4"/6"/8" (CRN), extended diaphragm seal: see additional specification |
| | AH | 4" 150 lbs RF, AISI 316/316L (CRN) |
| | AT | 4" 300 lbs RF, AISI 316/316L (CRN) |
| | J5 | 4" 150 lbs RF, AISI 316/316L, extended diaphragm seal: 2"/4"/6"/8" (CRN), 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, vegetable oil, Neobee M-20 |
| | 3 | ...m capillary, high temperature oil (DC704) |
| | 4 | ...m capillary, oil for oxygen service (Halocarbon) |
| | 5 | ...m capillary, low temperature oil |
| | A | ...ft capillary, silicone oil (DC200) |
| | B | ...ft capillary, vegetable oil, Neobee M-20 |
| | C | ...ft capillary, high temperature oil (DC704) |
| | D | ...ft capillary, oil for oxygen service (Halocarbon) |
| | E | ...ft capillary, low temperature oil |

| | | |
|---|---|---|
| **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 |
| | E | SIL2/IEC61508 Declaration of conformity |
| | G | Separate housing, cable length see additional spec. + mounting bracket, wall/pipe, 316L |
| | M | Overvoltage protection |
| | N | HistoROM module |
| | 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/Deltapilot S,
  For process pressure, differential pressure, flow and level measurement: IN010P/00/en

**Field of Activities**

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

**Technical Information**

- Cerabar S: TI383P/24/ae
- Deltapilot S: TI416P/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/Deltapilot S, Pressure and Differential pressure transmitters: BA274P/00/en

PROFIBUS PA:
- Deltabar S: BA294P/00/en
- Description of device functions Cerabar S/Deltabar S/Deltapilot 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

**Brief operating instructions**

- 4 to 20 mA HART, Deltabar S: KA1018P/00/en
- PROFIBUS PA, Deltabar S: KA1021P/00/en
- FOUNDATION Fieldbus, Deltabar S: KA1024P/00/en

**Manual for Functional Safety (SIL)**

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

**Safety Instructions**

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

**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 to20 mA HART<br>– PROFIBUS PA, FOUNDATION Fieldbus | – ZD141P<br>– 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<br>– PROFIBUS PA, FOUNDATION Fieldbus | – ZD142P<br>– ZD189P |
| FM IS + XP Class I, Division 1, Groups A – D | PMD75, FMD77, FMD78 | – 4 to 20 mA HART<br>– PROFIBUS PA, FOUNDATION Fieldbus | – ZD186P<br>– ZD190P |
| CSA IS + XP Class I, Division 1, Groups A – D | PMD75, FMD77, FMD78 | – 4 to 20 mA HART<br>– PROFIBUS PA, FOUNDATION Fieldbus | – ZD153P<br>– ZD191P |
| FM/CSA IS + XP Class I, Division 1, Groups A – D | PMD75, FMD77, FMD78 | – 4 to 20 mA HART<br>– PROFIBUS PA, FOUNDATION Fieldbus | – ZD153P + ZD186P<br>– ZD190P + ZD191P |

| Certificate/Type of Protection | Device | Electronic insert | Documentation |
|---|---|---|---|
| ATEX II EEx ia / EEx d + FM/CSA IS + XP<br>ATEX II 1/2G EEx ia IIC T6+ ATEX II 2G EEx d IIC T6+ FM/CSA IS + XP Cl.I Div.1 Gr.A-D | PMD75, FMD77, FMD78 | – 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus | – in preparation |

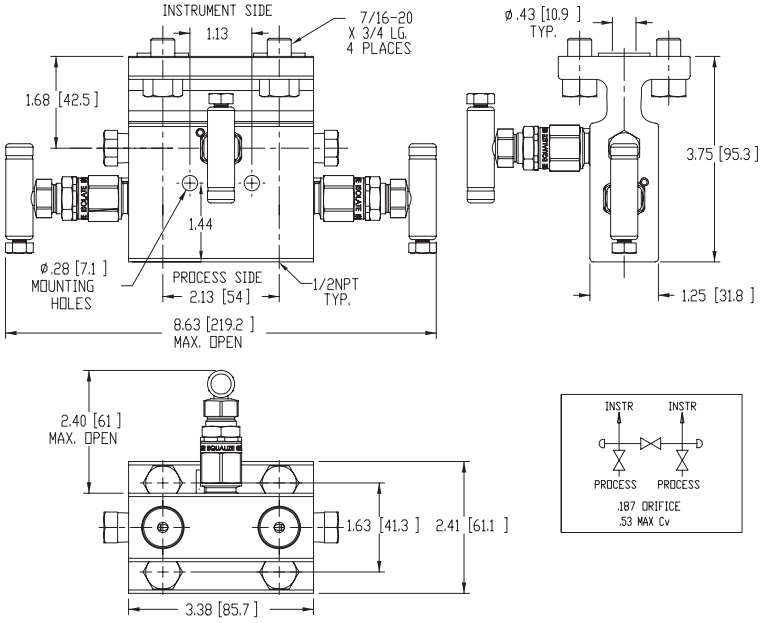
**Overspill protection**

- WHG: ZE260P/00/de

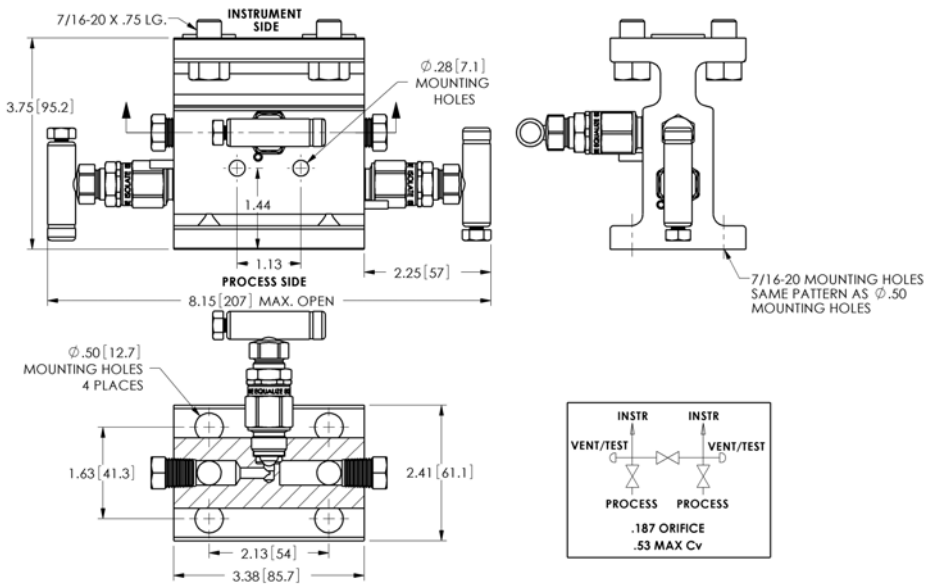
# Accessories

## 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<br>Direct Mount<br>Inlet: 1/2" FNPT, Outlet:Flanged/Flanged<br>Body: 316 Stainless, 3.1 Mat. Cert. Included<br>Stem/tip: 316SS/Carbide Ball w/ Nickel Chrome Binder<br>Seat Material: Integral, Packing: **PTFE**<br>with 7/16" UNF, 3/4" 316SS bolts | 6,000 psi at 200 F<br>4,000 psi at 450 F Max |
| 71037613 | 316 SS 3-Valve Manifold with Grafoil packing | 3-Valve Manifold, hard seat configuration<br>Direct Mount<br>Inlet: 1/2" FNPT, Outlet:Flanged/Flanged<br>Body: 316 Stainless, 3.1 Mat. Cert. Included<br>Stem/tip: 316SS/Carbide Ball w/ Nickel Chrome Binder<br>Seat Material: Integral, Packing: **grafoil**<br>with 7/16" UNF, 3/4" 316SS bolts | 6,000 psi at 200 F<br>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<br>Direct Mount, Double Flanged<br>Inlet: F;anged/Flanged, Outlet:Flanged/Flanged<br>Body: 316 Stainless, 3.1 Mat. Cert. Included<br>Stem/tip: 316SS/Carbide Ball w/ Nickel Chrome Binder<br>Seat Material: Integral, Packing: **PTFE**<br>with 7/16" UNF, 3/4" 316SS bolts | 6,000 psi at 200 F<br>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<br>Gas Metering<br>Direct Mount<br>Inlet: 1/2" FNPT, Outlet:Flanged/Flanged<br>Body: 316 Stainless, 3.1 Mat. Cert. Included<br>Stem/tip: 316/316SS NRT<br>Seat Material: Delrin, Packing: **PTFE**<br>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<br>Standard<br>Direct Mount<br>Inlet: 1/2" FNPT, Outlet:Flanged/Flanged<br>Body: 316 Stainless, 3.1 Mat. Cert. Included<br>Stem/tip: 316SS/Carbide Ball w/ Nickel Chrome Binder<br>Seat Material: Integral, Packing: **grafoil**<br>with 7/16" UNF, 1" 316SS bolts | 6,000 psi at 200 F<br>1,500 psi at 1,000 F Max |
| | | **Accessories & Spare Parts** | |
| 71037615 | 316 SS Mounting Bracket for manifold | Mounting Bracket (SS)<br>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 | |

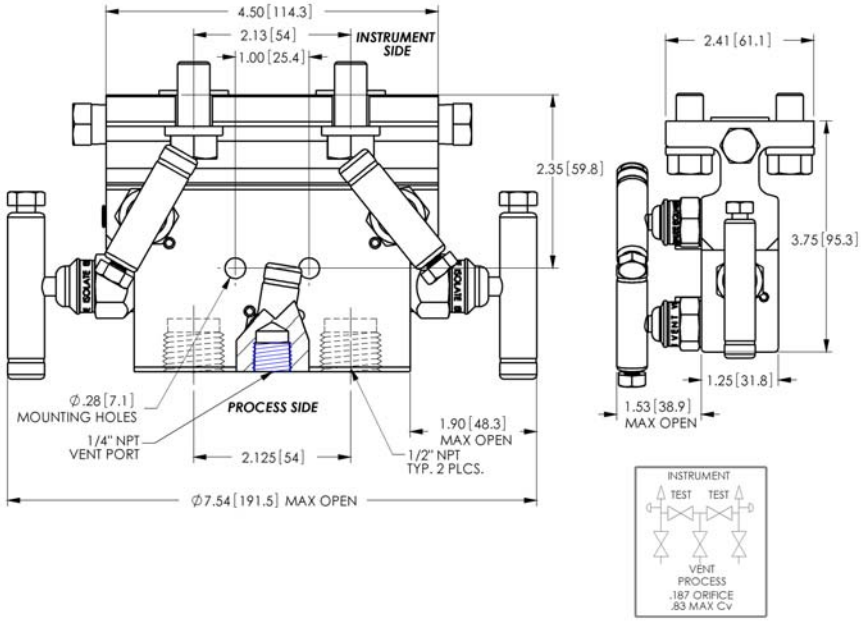



Three valve manifold, single flange;
71037612
71037613

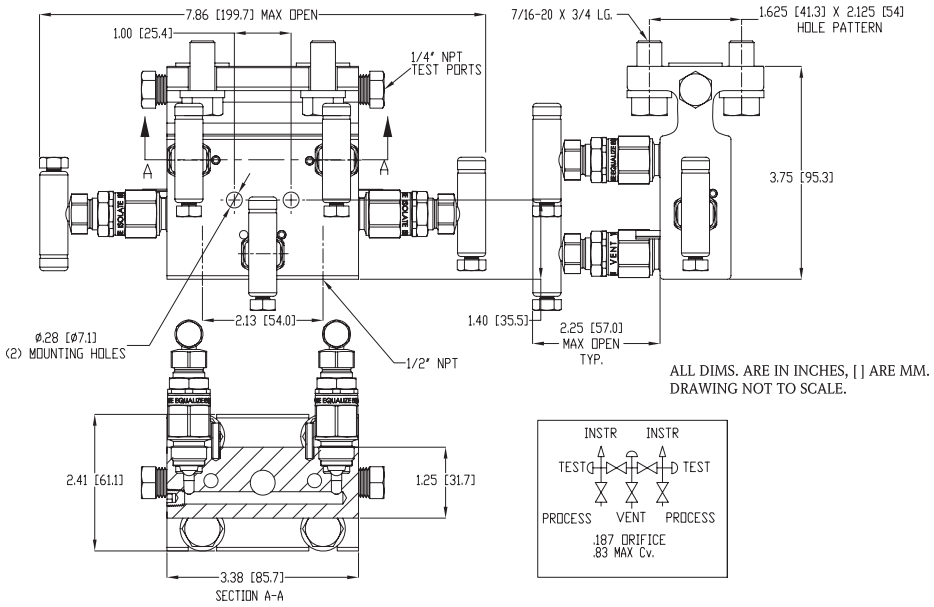



Three valve manifold, double flange:
71037614

**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 |
|---|---|---|
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