TI00382P/00/EN/35.24-00
71651076
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Technical Information
Deltabar S
PMD75, FMD77, FMD78

Differential pressure measurement and pressure measurement
HART, PA, FF

Differential pressure transmitter with metallic measuring cells

Applications

The device is used for the following measuring tasks:
- Flow measurement (volume flow or mass flow) in conjunction with primary devices in gases, vapors and liquids
- Level, volume or mass measurements in liquids
- High process temperatures up to 400 °C (752 °F) possible with diaphragm seal mount
- Differential pressure monitoring, e.g. of filters and pumps

Your benefits

- Very good reproducibility and long-term stability
- High reference accuracy up to 0.035 %
- Turn down up to 100:1, higher on request
- Used for flow and differential pressure monitoring up to SIL3, certified to IEC 61508 by TÜV SÜD
- High level of safety during operation thanks to function monitoring from the measuring cell to the electronics
- The patented TempC process membrane for the diaphragm seal reduces the measurement error caused by environmental and process temperature effects to a minimum
- Easy electronics replacement guaranteed with HistoROM®/M-DAT
- Cost-effective installation with Deltabar S FMD77, capillary on low-pressure side

Endress+Hauser
People for Process Automation

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About this document

Document function

The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

Symbols used

Safety symbols

Symbol	Meaning
DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation may result in serious or fatal injury.
CAUTION	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation may result in minor or moderate injury.
NOTICE	**NOTE!** This symbol contains information on procedures and other circumstances that do not result in personal injury.

Electrical symbols

Symbol	Meaning	Symbol	Meaning
	**Protective ground connection** A terminal that must be connected to ground prior to establishing any other connections.		**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.

Symbols for certain types of Information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.
	**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Visual inspection

Symbols in graphics

Symbol	Meaning
1, 2, 3 ...	Item numbers
1. , 2. , 3. ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections

Documentation

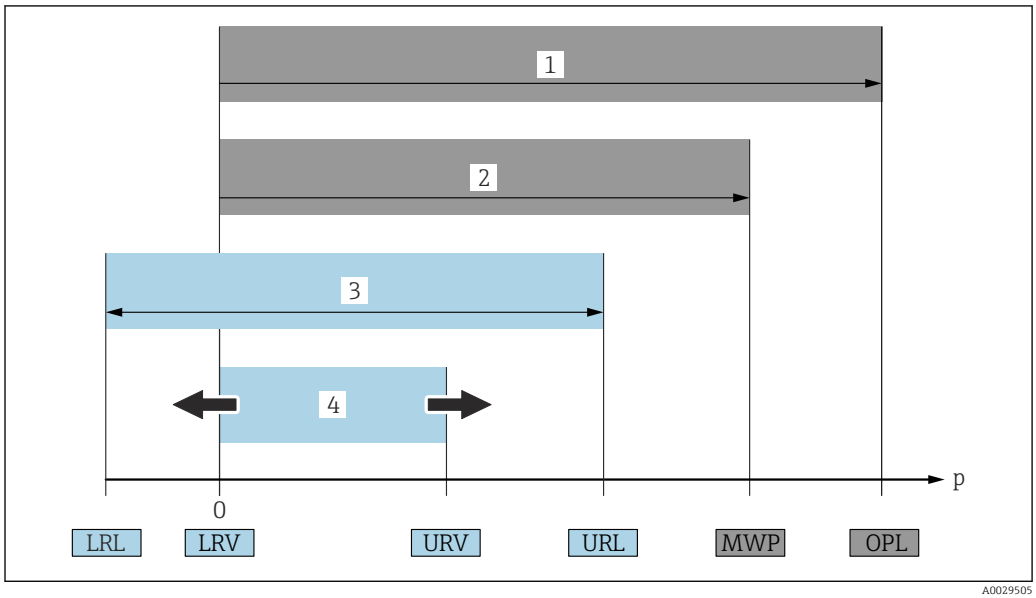
See the "Supplementary documentation" section → 114

The document types listed are available:
In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

Safety Instructions (XA)

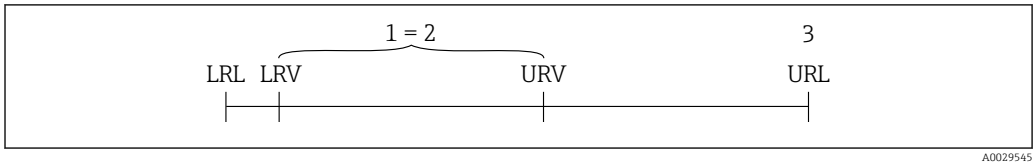
See the "Safety instructions" section

List of abbreviations



1 OPL: The OPL (overpressure limit = measuring cell overload limit) for the device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Pay attention to the pressure/temperature dependency.
2 The MWP (maximum working pressure) for the measuring cells depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Pay attention to the pressure/temperature dependency. The MWP may be applied at the device for an unlimited period of time. The MWP can be found on the nameplate.
3 The maximum measuring range corresponds to the span between the LRL and URL. This measuring range is equivalent to the maximum calibratable/adjustable span.
4 The calibrated/adjusted span corresponds to the span between the LRV and URV. Factory setting: 0 to URL. Other calibrated spans can be ordered as customized spans.
p Pressure
LRL Lower range limit
URL Upper range limit
LRV Lower range value
URV Upper range value
TD Turn down. Example - see the following section.

Turn down calculation



1 Calibrated/adjusted span
2 Zero point-based span
3 Upper range limit

Example:
- Measuring cell: 10 bar (150 psi)
- Upper range limit (URL) = 10 bar (150 psi)
- Calibrated/adjusted span: 0 to 5 bar (0 to 75 psi)
- Lower range value (LRV) = 0 bar (0 psi)
- Upper range value (URV) = 5 bar (75 psi)

$$TD = \frac{URL}{|URV - LRV|}$$

In this example, the TD is therefore 2:1. This measuring span is based on the zero point.

Registered trademarks

HART®

Registered trademark of the FieldComm Group, Austin, USA

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

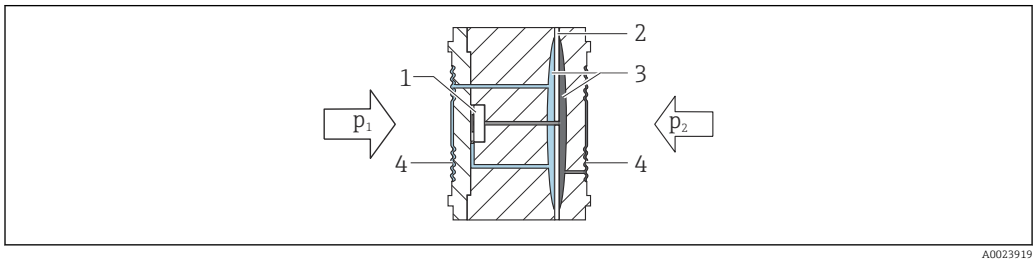
FOUNDATION™Fieldbus

Registered trademark of the FieldComm Group, Austin, Texas, USA

Function and system design

Measuring principle

Metallic membrane



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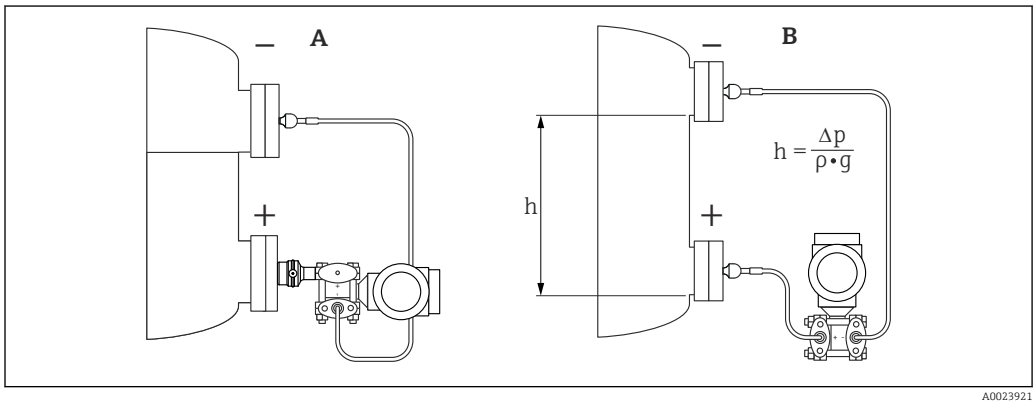
1 Measuring element
2 Overload diaphragm
3 Fill fluid
4 Membrane

The process membranes are deflected on both sides by the acting pressures. A fill fluid transfers the pressure to a resistance bridge (semiconductor technology). The change in the bridge output voltage, which depends on the differential pressure, is measured and processed

Advantages:
- Standard operating pressures: 160 bar (2 400 psi) up to 420 bar (6 300 psi)
- High long-term stability
- Very high single-sided overload resistance

Product design

Level measurement (level, volume and mass):



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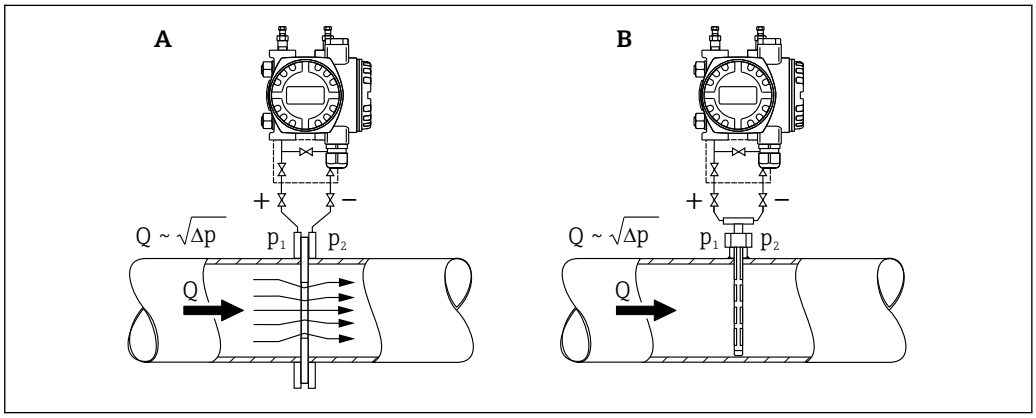
A Level measurement with FMD77
B Level measurement with FMD78
h Height (level)
Δp Differential pressure
ρ Density of the medium
g Gravitational constant

Your benefits

- Selection of the level operating mode which is optimum for your application in the device software
- Volume and mass measurements in any vessel shape 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 vessels with pressure overlay
  - for foam formation
  - in vessels with agitators or screen fittings
  - for liquid gases
  - for standard level measurement

Flow measurement

Flow measurement with Deltabar S and primary device:



A Orifice plate
B Pitot tube
Q Flow
Δp Differential pressure, $\Delta p = p_1 - p_2$

Your benefits

- Choice of four flow modes of operation: volume flow, corrected volume flow (European norm conditions), standard volume flow (American standard conditions) and mass flow
- Choice of diverse flow units with automatic unit conversion
- A specific unit is defined
- 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.

Communication protocol

- 4 to 20 mA with HART communication protocol
- PROFIBUS PA
  - Endress+Hauser devices meet the requirements specified by the FISCO model.
  - Due to a low current consumption of 13 mA ± 1 mA, the following number of devices can be operated on one bus segment if installing as per FISCO: up to 7 devices for Ex ia, CSA IS and FM IS applications or up to 27 devices for all other applications e.g. in non-hazardous areas, Ex nA etc. Further information on PROFIBUS PA can be found in Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and in the PNO Guideline.
- FOUNDATION Fieldbus
  - Endress+Hauser devices meet the requirements specified by the FISCO model.
  - Due to a low current consumption of 15.5 mA ± 1 mA, the following number of devices can be operated on one bus segment if installing as per FISCO: up to 6 devices for Ex ia, CSA IS and FM IS applications or up to 24 devices for all other applications e.g. in non-hazardous areas, Ex nA etc. Further information on FOUNDATION Fieldbus, such as requirements for bus system components, can be found in Operating Instructions BA00013S "FOUNDATION Fieldbus Overview".

Input

Measured variable

Measured process variables

Differential pressure, pressure

Calculated process variables

- Flow rate (volume flow or mass flow)
- Absolute pressure, gauge pressure
- Level (level, volume or mass)

Measuring range

Measuring cell	Maximum measuring range		Smallest calibratable span [1]	MWP	OPL		Min. static pressure [2]	Option [3]
	lower (LRL)	upper (URL)			on one side	on both sides		PN 160
[mbar (psi)]	[mbar (psi)]	[mbar (psi)]	[mbar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[$mbar_{abs}$ (psi_{abs})]	
FMD77, FMD78, PMD75: Option PN 160 / 16 MPa / 2400 psi								
10 (0.15) (PMD75 only)	−10 (-0.15)	+10 (+0.15)	0.25 (0.00375)	160 (2400)	160 (2400)	240 (3600)	0.1 (0.0015)	7B
30 (0.45) (PMD75 only)	−30 (-0.45)	+30 (+0.45)	0.3 (0.0045)					7C
100 (1.5)	−100 (-1.5)	+100 (+1.5)	1/5 (0.015/0.075) [4]	160 (2400)				7D
500 (7.5)	−500 (-7.5)	+500 (+7.5)	5 (0.075)					7F
3000 (45)	−3000 (-45)	+3000 (+45)	30 (0.45)					7H
16000 (240)	−16000 (-240)	+16000 (+240)	160 (2.4)					7L
40000 (600)	−40000 (-600)	+40000 (+600)	400 (6)	160 (2400) [5]	"+" side [6]: 160 (2400)			7M
PMD75: Option PN 420 / 42 MPa / 6300 psi								
100 (1.5)	−100 (-1.5)	+100 (+1.5)	1/5 (0.015/0.075) [4]	420 (6300) [7] [8]	420 (6300)	630 (9450)	0.1 (0.0015)	8D
500 (7.5)	−500 (-7.5)	+500 (+7.5)	5 (0.075)					8F
3000 (45)	−3000 (-45)	+3000 (+45)	30 (0.45)					8H
16000 (240)	−16000 (-240)	+16000 (+240)	160 (2.4)					8L
40000 (600)	−40000 (-600)	+40000 (+600)	400 (6)	420 (6300) [7] [5] [8]	"+" side [6]: 420 (6300)			8M

1) Turndown > 100:1 on request
2) The minimum static pressure specified in the table applies to silicone oil under reference operating conditions. Min. static pressure at 85 °C (185 °F) for silicone oil: up to 10 $mbar_{abs}$ (0.15 psi_{abs}). FMD77 and FMD78: Min. static pressure: 50 $mbar_{abs}$ (0.75 psi_{abs}); observe also the pressure and temperature application limits of the selected fill fluid → 🖹 99. For vacuum applications, follow the installation instructions → 🖹 104.
3) Product Configurator, order code for "Nominal range; PN"
4) Smallest calibratable measuring span for the PMD75: 1 mbar (0.015 psi); smallest calibratable measuring span for the FMD77 and FMD78: 5 mbar (0.075 psi)
5) If pressure is applied on the negative side only, the MWP is 100 bar (1 500 psi).
6) "–" side: 100 bar (1 500 psi)
7) If CRN approval is selected, the following limited MWP values apply (the MWP refer to the maximum temperature of the device in each case): without side vent valves: 262 bar (3 800 psi); with side vent: 179 bar (2 596.2 psi); with copper seals: 124 bar (1 798.5 psi).
8) MWP on both sides only.

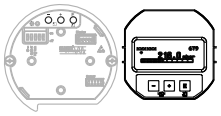
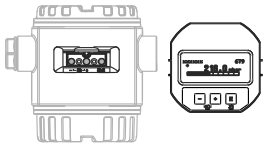
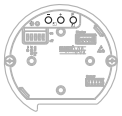
Measuring cell	Maximum measuring range		Smallest calibratable span	MWP	OPL		Min. static pressure [1]	Option [2]
	lower (LRL)	upper (URL)			on one side	on both sides		
bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)	bar (psi)		$mbar_{abs}$ (psi_{abs})	
PMD75: optionally available as a gauge or absolute pressure measuring cell								
160 (2400) gauge	-1 (-15)	160 (2400)	40 (600)	160 (2400)	240 (3600)	- [3]	10	7Q
160 (2400) abs	0	160 (2400)	4 (60)	160 (2400)	240 (3600)	- [3]	10	7V
250 (3750) rel	-1 (-15)	250 (3750)	40 (600)	250 (3750)	375 (5625)	- [3]	10	7R [4]
250 (3750) abs	0	250 (3750)	4 (60)	250 (3750)	375 (5625)	- [3]	10	7W [4]

1) The minimum static pressure specified in the table applies to silicone oil under reference operating conditions. Min. static pressure at 85 °C (185 °F) for silicone oil: up to 10 $mbar_{abs}$ (0.15 psi_{abs}).
2) Product Configurator, order code for "Nominal range; PN"
3) Available only with blind flange on LP side.
4) The 250 bar measuring cell can be used over the entire measuring range with up to 100,000 load changes without specification restrictions.

Output

Output signal

- 4 to 20 mA with superimposed digital communication protocol HART, 2-wire
- Digital communication signal PROFIBUS PA (Profile 3.0), 2-wire
  - Signal coding: Manchester Bus Powered (MBP): Manchester II
  - Transmission rate: 31.25 KBit/s voltage mode
- Digital communication signal FOUNDATION Fieldbus, 2-wire
  - Signal coding: Manchester Bus Powered (MBP): Manchester II
  - Transmission rate: 31.25 KBit/s voltage mode

Output	Internal + LCD	External + LCD	Internal
	   A0021280		
	Option [1]		
4 to 20mA HART	B	A	C
4 to 20mA HART, Li=0	E	D	F
PROFIBUS PA	N	M	O
FOUNDATION Fieldbus	Q	P	R

1) Product Configurator, order code for "Display, operation: "

Signal range

4 to 20 mA

3.8 mA to 20.5 mA

Signal on alarm

4 to 20 mA HART

As per NAMUR NE43.

- Max. alarm: can be set from 21 to 23 mA (factory setting: 22 mA)
- Hold measured value: last measured value is held
- Min. alarm: 3.6 mA

PROFIBUS PA

As per NAMUR NE43.

Can be set in the Analog Input Block.

Options:
- Last Valid Out Value (factory setting)
- Fail Safe Value
- Status bad

FOUNDATION Fieldbus

As per NAMUR NE43.

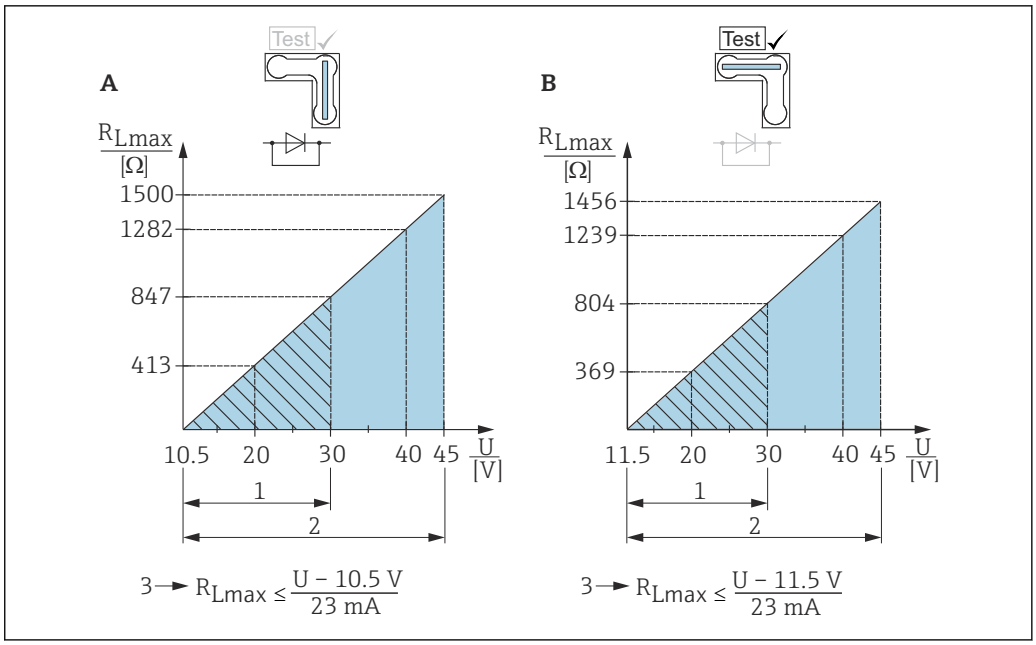
Can be set in the Analog Input Block.

Options:
- Last Good Value
- Fail Safe Value (factory setting)
- Wrong Value

Load

4 to 20 mA HART

In order to guarantee sufficient terminal voltage in two-wire devices, a maximum load resistance R (including line resistance) must not be exceeded depending on the supply voltage U_0 of the supply unit. In the following load diagrams, observe the position of the jumper and the explosion protection:



A Jumper for 4 to 20 mA test signal set to "Non-test" position
B Jumper for 4 to 20 mA test signal set to "Test" position
1 Power supply 10.5 (11.5) to 30 V DC for 1/2 G Ex ia, 1GD Ex ia, 1/2 GD Ex ia, FM IS, CSA IS, IECEx ia, NEPSI Ex ia
2 Power supply 10.5 (11.5) to 45 V DC for devices for non-hazardous areas, 1/2 D, 1/3 D, 2 G Ex d, 3 G Ex nA, FM XP, FM DIP, FM NI, CSA XP, CSA dust ignition-proof, NEPSI Ex d
3 R_{Lmax} maximum load resistance
U Supply voltage

When operating via a handheld terminal or via a PC with an operating program, a minimum communication resistor of 250 Ω must be taken into account.

Damping

A damping affects all outputs (output signal, display):
- Via onsite display, handheld terminal or PC with operating program, continuous from 0 to 999 s
- Also for HART and PROFIBUS PA: Via DIP switch on the electronic insert, switch position "on" = set value and "off"
- Factory setting: 2 s

Alarm current

Designation	Option [1]
Min alarm current	J
HART burst mode PV	J
Min alarm current + HART burst mode PV	J

1) Product Configurator, order code for "Additional options 1" and "Additional options 2"

Firmware version

Designation	Option [1]
02.20.zz, HART 7, DevRev22	72
02.11.zz, HART 5, DevRev21	73
04.00.zz, FF, DevRev07	74
04.01.zz, PROFIBUS PA, DevRev03	75
02.10.zz, HART 5, DevRev21	76
03.00.zz, FF, DevRev06	77

Designation	Option [1]
04.00.zz, PROFIBUS PA	78
02.30.zz, HART 7	71

1) Product Configurator, order code for "Firmware version"

Protocol-specific data HART

Manufacturer ID	17 (11 hex)
Device type ID	23 (17 hex)
Device revision	▪ 21 (15 hex) - SW version 02.1y.zz - HART specification 5 ▪ 22 (16 hex) - SW version 02.2y.zz - HART specification 7
HART specification	▪ 5 ▪ 7
DD revision	▪ 4 (Russian in language selection) for device revision 21 ▪ 3 (Dutch in language selection) for device revision 21 ▪ 1 for device revision 22
Device description files (DTM, DD)	Information and files under: ▪ www.endress.com ▪ www.fieldcommgroup.org
HART load	Min. 250 Ω
HART device variables	The measured values are assigned to the device variables as follows: **Measured values for PV (primary variable)** ▪ Pressure ▪ Flow ▪ Level ▪ Tank content **Measured values for SV, TV (second and third variable)** ▪ Pressure ▪ Totalizer **Measured values for QV (fourth variable)** Temperature
Supported functions	▪ Burst mode ▪ Additional transmitter status ▪ Device locking ▪ Alternative measuring modes

Wireless HART data

Minimum starting voltage	11.5 V (default) or 10.5 V if jumper not set to "Test" position [1]
Start-up current	12 mA
Starting time	10 s
Minimum operating voltage	11.5 V (default) or 10.5 V if jumper not set to "Test" position [1]
Multidrop current	4 mA
Time for connection setup	1 s

1) Or higher if operating near the ambient temperature limits (−40 to +85 °C (−40 to +185))

Protocol-specific data PROFIBUS PA

Manufacturer ID	17 (11 hex)
Identification number	1542 hex
Profile version	3.0 ▪ SW version 03.00.zz ▪ SW version 04.00.zz 3.02 SW version 04.01.zz (device revision 3) Compatibility with SW version 03.00.zz and higher.
GSD revision	▪ 4 (SW version 3.00.zz and 4.00.zz) ▪ 5 (device revision 3)

DD revision	▪ 1 (SW version 3.00.zz and 4.00.zz) ▪ 1 (device revision 3)
GSD file	Information and files under: ▪ www.endress.com ▪ www.profibus.org
DD files	
Output values	**Measured values for PV (via Analog Input Function Block)** ▪ Pressure ▪ Level ▪ Flow ▪ Tank content **Measured values for SV** ▪ Pressure ▪ Temperature **Measured value for QV** Totalizer
Input values	Input value sent from PLC, can be shown on display
Supported functions	▪ Identification & maintenance, simplest device identifier on the control system and nameplate ▪ Condensed status (only with Profile Version 3.02) ▪ Automatic ID number adjustment and switchable to the following ID numbers (only with Profile Version 3.02): ▪ 9700: Profile-specific transmitter identification number with the "Classic" or "Condensed" status. ▪ 1504: Compatibility mode for the old Deltabar S generation (FMD230, FMD630, FMD633, PMD230, PMD235). ▪ 1542: Identification number of the new Deltabar S generation (FMD77, FMD78, PMD75). ▪ Device locking: The device can be locked by hardware or software.

Protocol-specific data FOUNDATION Fieldbus

Manufacturer ID	452B48 hex
Device type	1009 hex
Device revision	▪ 6 - SW version 03.00.zz ▪ 7 - SW version 04.00.zz (FF-912)
DD revision	▪ 3 (device revision 6) ▪ 2 (device revision 7)
CFF revision	▪ 4 (device revision 6) ▪ 1 (device revision 7)
DD files	Information and files under: ▪ www.endress.com ▪ www.fieldcommgroup.org
CFF files	
Device tester version (ITK version)	▪ 5.0 (device revision 6) ▪ 6.01 (device revision 7)
Number of ITK test campaign	▪ IT054700 (Device Revision 6) ▪ IT085400 (Device Revision 7)
Link-Master (LAS) capable	Yes
Choice of "Link Master" and "Basic Device"	Yes; Factory setting: Basic Device
Node address	Factory setting: 247 (F7 hex)
Supported functions	Field diagnostics profile (only with FF912) The following methods are supported: ▪ Reboot ▪ Configure error as warning or alarm ▪ HistoROM ▪ Peakhold ▪ Alarm info ▪ Sensor trim

Number of VCRs	▪ 44 (device revision 6) ▪ 24 (device revision 7)
Number of Link Objects in VFD	50

Virtual communication references (VCRs)

	Device revision 6	Device revision 7
Permanent Entries	44	1
Client VCRs	0	0
Server VCRs	5	10
Source VCRs	8	43
Sink VCRs	0	0
Subscriber VCRs	12	43
Publisher VCRs	19	43

Link settings

	Device revision 6	Device revision 7
Slot time	4	4
Min. Inter PDU delay	12	10
Max. response delay	10	10

Transducer Blocks

Block	Contents	Output values
TRD1 Block	Contains all parameters related to the measurement	▪ Pressure, flow or level (channel 1) ▪ Process temperature (channel 2)
Service Block	Contains service information	▪ Pressure after damping (channel 3) ▪ Pressure peakhold indicator (channel 4) ▪ Counter for max. pressure transgressions (channel 5)
Dp Flow Block	Contains flow and totalizer parameters	Totalizer 1 (channel 6)
Diagnostic block	Contains diagnostic information	Error code via DI channels (channel 0 to 16)
Display block	Contains parameters to configure the onsite display	No output values

Function blocks

Block	Contents	Number Blocks	Execution time		Functionality	
			Device Revision 6	Device Revision 7	Device Revision 6	Device Revision 7
Resource Block	The Resource Block contains all the data that uniquely identify the device. It is an electronic version of a nameplate of the device.	1			enhanced	enhanced
Analog Input Block 1 Analog Input Block 2 Analog Input Block 3	The AI Block receives the measuring data from the Sensor Block, (selectable via a channel number) and makes the data available to other function blocks at its output. Enhancement: Digital outputs for process alarms, fail safe mode	3	45 ms	45 ms (without trend and alarm reports)	enhanced	enhanced
Digital Input Block	This block contains the discrete data of the Diagnose Block (selectable via a channel number 0 to 16) and provides them for other blocks at the output.	1	40 ms	30 ms	standard	enhanced
Digital Output Block	This block converts the discrete input and thus initiates an action (selectable via a channel number) in the DP Flow Block or in the Service Block. Channel 1 resets the counter for max. pressure transgressions.	1	60 ms	40 ms	standard	enhanced
PID Block	This block is used as a proportional-integral-derivative controller and can be used universally for closed-loop-control in the field. It enables cascade mode and feedforward control. Input IN can be indicated on the display. The selection is performed in the Display Block (DISPLAY_MAIN_LINE_CONTENT).	1	120 ms	70 ms	standard	enhanced
Arithmetic Block	This block is designed to permit simple use of popular measurement math functions. The user does not have to know how to write equations. The math algorithm is selected by name, chosen by the user for the function to be performed.	1	50 ms	40 ms	standard	enhanced
Input Selector Block	The Input Selector Block facilitates the selection of up to four inputs and generates an output based on the configured action. This block normally receives its inputs from AI Blocks. The block enables the selection of maximum, minimum, average and 'first good' values. Inputs IN1 to IN4 can be shown on the display. The selection is performed in the Display Block (DISPLAY_MAIN_LINE_CONTENT).	1	35 ms	35 ms	standard	enhanced
Signal Characterizer Block	The Signal Characterizer Block has two sections, each with an output value that is a non-linear function of the input value. The non-linear function is generated by a single look-up table with 21 arbitrary x-y pairs.	1	30 ms	40 ms	standard	enhanced
Integrator Block	The Integrator Block integrates a variable as a function of the time or accumulates the counts from a Pulse Input Block. The block may be used as a totalizer that counts up until reset or as a batch totalizer that has a setpoint, where the integrated or accumulated value is compared to pre-trip and trip settings, generating a binary signal when the setpoint is reached.	1	35 ms	40 ms	standard	enhanced
Analog Alarm Block	This block contains all process alarm conditions (working like a comparator) and represents them at the output.	1	35 ms	35 ms	standard	enhanced

Additional function block information:

Instantiate Function Block	YES	YES
Number of additional instantiatable function blocks	9	4

Energy supply

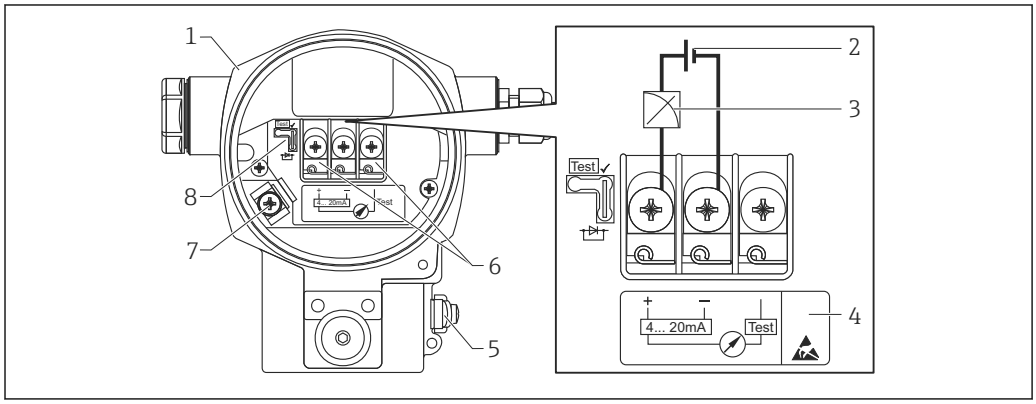
WARNING

An incorrect connection compromises electrical safety!

- When using the measuring instrument in hazardous areas, installation must also comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings .
- All explosion protection data are provided in separate Ex documentation, which is available on request. The Ex documentation is supplied as standard with all Ex devices .
- Devices with integrated overvoltage protection must be grounded → 21.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.

Terminal assignment

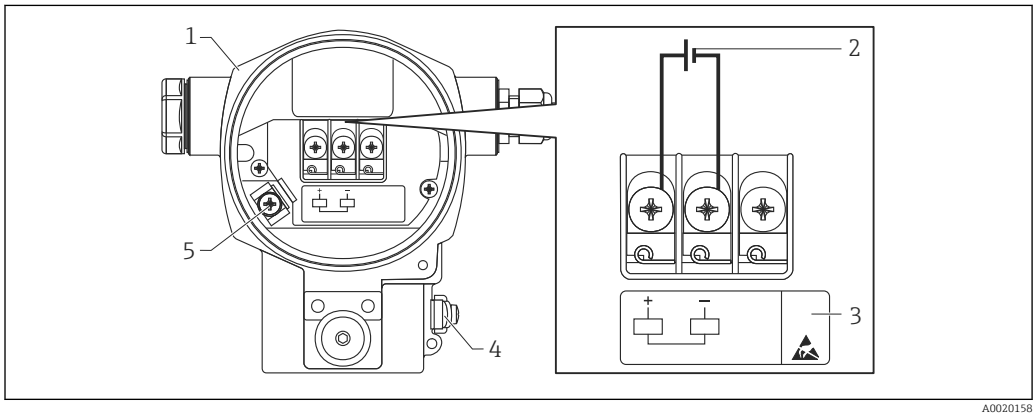
4 to 20 mA HART



A0019989

1 *Housing*
2 *Supply voltage*
3 *4 to 20 mA*
4 *Devices with integrated overvoltage protection are labeled "OVP" (overvoltage protection) here.*
5 *External ground terminal*
6 *4 to 20 mA test signal between positive and test terminal*
7 *Internal ground terminal*
8 *Jumper for 4 to 20 mA test signal → 19*

PROFIBUS PA and FOUNDATION Fieldbus



A0020158

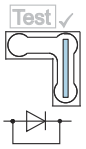
1 *Housing*
2 *Supply voltage*
3 *Devices with integrated overvoltage protection are labeled "OVP" (overvoltage protection) here.*
4 *External ground terminal*
5 *Internal ground terminal*

Supply voltage

4 to 20 mA HART

Electronic version	Jumper for 4 to 20 mA test signal in "Test" position (delivery status)	Jumper for 4 to 20 mA test signal in "Non-test" position
Version for non-hazardous area	11.5 to 45 V DC	10.5 to 45 V DC
Intrinsically safe	11.5 to 30 V DC	10.5 to 30 V DC
▪ Other types of protection ▪ Devices without a certificate	11.5 to 45 V DC (Versions with 35 V DC plug-in connector)	10.5 to 45 V DC (Versions with 35 V DC plug-in connector)

Measuring a 4 to 20 mA test signal

Jumper position for test signal	Description
 A0019992	▪ Measurement of 4 to 20 mA test signal via the positive and test terminal: possible. (Thus, the output current can be measured without interruption via the diode.) ▪ As-delivered state ▪ Minimum supply voltage: 11.5 V DC
 A0019993	▪ Measurement of 4 to 20 mA test signal via the positive and test terminal: not possible. ▪ Minimum supply voltage: 10.5 V DC

PROFIBUS PA

- Version for non-hazardous areas: 9 to 32 V DC
- Ex ia:
  - Installation in bus system according to FISCO model: Ui=17.5 V DC
  - Point-to-point installation: Ui = 24 V DC

FOUNDATION Fieldbus

- Version for non-hazardous areas: 9 to 32 V DC
- Ex ia:
  - Installation in bus system according to FISCO model: Ui=17.5 V DC
  - Point-to-point installation: Ui = 24 V DC

Current consumption

- PROFIBUS PA: 13 mA ±1 mA, switch-on current corresponds to IEC 61158-2, Clause 21
- FOUNDATION Fieldbus: 15.5 mA ±1 mA, switch-on current corresponds to IEC 61158-2, Clause 21

Electrical connection

PROFIBUS PA

The digital communication signal is transmitted to the bus via a two-wire connection. The bus also provides the power supply. For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and the PNO Guideline.

FOUNDATION Fieldbus

The digital communication signal is transmitted to the bus via a two-wire connection. The bus also provides the power supply. For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00013S "FOUNDATION Fieldbus Overview" and the FOUNDATION Fieldbus Guideline.

Terminals

- Supply voltage and internal ground terminal: 0.5 to 2.5 mm² (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm² (20 to 12 AWG)

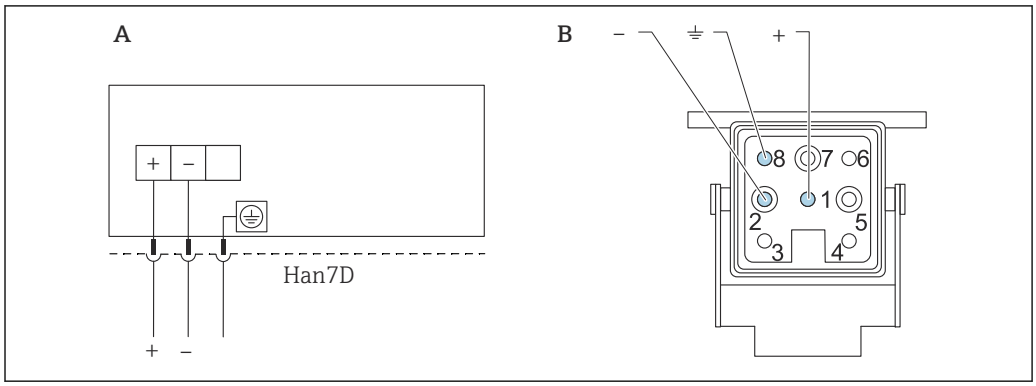
Cable entries

Approval	Cable gland	Clamping range
Standard, II 1/2 G Ex ia, IS	Plastic M20x1.5	5 to 10 mm (0.2 to 0.39 in)
ATEX II 1/2 D, II 1/3 D, II 1/2 GD Ex ia, II 1 GD Ex ia, II 3 G Ex nA	Metal M20x1.5 (Ex e)	7 to 10.5 mm (0.28 to 0.41 in)

For additional technical data, see section on housing → 🖹 45

Connectors

Connection for devices with Harting plug Han7D

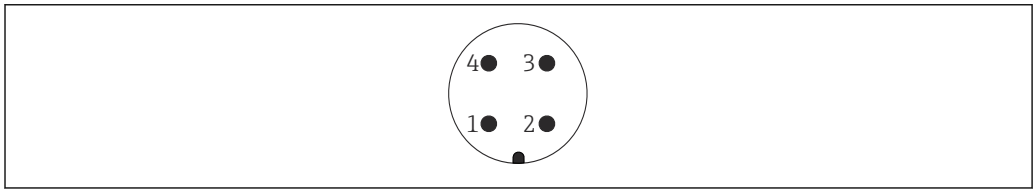


A0019990

A Electrical connection for devices with Harting plug Han7D
B View of the connection on the device
- Brown
⏚ Green/yellow
+ Blue

Material: CuZn, gold-plated contacts of the plug-in jack and plug

Connection of devices with M12 plug



A0011175

1 Signal +
2 Not used
3 Signal –
4 Earth

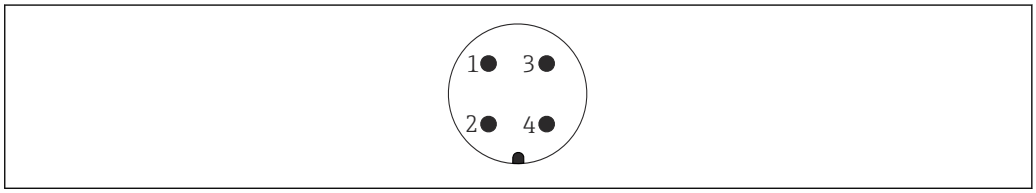
Endress+Hauser offers the following accessories for devices with an M12 plug:

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

Plug-in jack M 12x1, elbowed
- Material: body PBT/PA; coupling nut GD-Zn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 71114212

Cable 4x0.34 mm² (20 AWG) with M12 elbowed socket, screw plug, length 5 m (16 ft)
- Material: body PUR; coupling nut CuSn/Ni; cable PVC
- Degree of protection (fully locked): IP67
- Order number: 52010285

Connection of devices with 7/8" plug



A0011176

1 Signal -
2 Signal +
3 Shield
4 Not used

Male thread: 7/8 - 16 UNC
- Material: 316L (1.4401)
- Degree of protection: IP68

Cable specification

HART

- Endress+Hauser recommends using shielded, twisted-pair two-wire cables.
- Cable outer diameter: 5 to 9 mm (0.2 to 0.35 in) depending on the cable entry used → 20

PROFIBUS PA

Use a twisted, shielded twin-core cable, preferably cable type A.

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

FOUNDATION Fieldbus

Use a twisted, shielded twin-core cable, preferably cable type A.

For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

Start-up current

12 mA

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)].

Overvoltage protection (optionally for HART, PROFIBUS PA and FOUNDATION Fieldbus)

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

Ordering information: Product Configurator, order code for "Additional options 1" or Additional options 2", option "M"

NOTICE

Device could be destroyed!

► Devices with integrated overvoltage protection must be grounded.

Influence of power supply

≤0.0006 % of URL/1 V

Performance characteristics

Response time

HART

- Acyclic: min. 330 ms, typically 590 ms (depending on command # and number of preambles)
- Cyclic (burst): min. 160 ms, typically 350 ms (depending on command # and number of preambles)

PROFIBUS PA

- Acyclic: approx. 60 ms to 70 ms (depending on Min. Slave Interval)
- Cyclic: approx. 10 ms to 13 ms (depending on Min. Slave Interval)

FOUNDATION Fieldbus

- Acyclic: typically 100 ms (for standard bus parameter settings)
- Cyclic: max. 20 ms (for standard bus parameter settings)

Reference operating conditions

- As per IEC 62828-2 / IEC 60770
- Ambient temperature T_A = constant, in the range: +22 to +28 °C (+72 to +82 °F)
- Humidity φ = constant, in the range: 5 to 80 % RH ± 5 %
- Atmospheric pressure p_A = constant, in the range: 860 to 1060 mbar (12.47 to 15.37 psi)
- Position of the measuring cell: horizontal ±1°
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- Zero point-based span
- Membrane material for PMD75: AISI 316L (1.4435), Alloy C276, gold/rhodium-coated, Monel
- Membrane material for FMD77, FMD78: AISI 316L (1.4435)
- Fill fluid: Silicone oil
- Supply voltage: 24 V DC ±3 V DC
- Load with HART: 250 Ω
- Turn down (TD) = URL/ | URV - LRV |

Total performance

The performance characteristics refer to the accuracy of the device. The factors that influence the accuracy can be divided into two groups

- Total performance of device
- Installation factors

All of the performance characteristics meet the requirement of ≥ ± 3 sigma.

The total performance of the device comprises the reference accuracy and the ambient temperature effect and is calculated using the following formula:

Total performance = $\pm \sqrt{ (E1)^2 + (E2)^2 + (E3)^2 }$

E1 = Reference accuracy

E2 = Ambient temperature effect

E3 = Static pressure effect

Calculation of E2:

Ambient temperature effect per ±28 °C (50 °F)

(Corresponds to a range of −3 to +53 °C (+27 to +127 °F))

$E2 = E2_M + E2_E$

$E2_M$ = Main temperature error

$E2_E$ = Electronics error

- The values apply to process membranes made of 316L (1.4435)
- The values refer to the calibrated span.

Calculation of the total performance with the Endress+Hauser Applicator

Detailed inaccuracies, e.g. for other temperature ranges, can be calculated with the Applicator "Sizing Pressure Performance".

A0038927

Calculation of the diaphragm seal error with the Endress+Hauser Applicator

Diaphragm seal errors are not taken into consideration. They are calculated separately in the Applicator "Sizing Diaphragm Seal".

A0038925

Reference accuracy [E1]

Reference accuracy comprises the non-linearity [IEC 62828-1 / DIN EN 61298-2] including the hysteresis [IEC 62828-1 / DIN EN 61298-2] and the non-repeatability [IEC 62828-1 / DIN EN 61298-2] in accordance with the limit point method as per [IEC 62828-1 / DIN EN 60770-2]. Reference accuracy for standard up to TD 100:1, for platinum up to TD 5:1.

PMD75

10 mbar (0.15 psi) measuring cell
- Standard: TD 1:1 = ±0.075 %; TD > 1:1 = ±0.075 % · TD
- Platinum: TD 1:1 = ±0.05 %; TD > 1:1 = ±0.075 % · TD

30 mbar (0.45 psi) measuring cell
- Standard: TD ≤ 3:1 = ±0.075 %; TD > 3:1 = ±0.025 % · TD
- Platinum: TD 1:1 = ±0.05 %; TD > 1:1 to TD ≤ 3:1 = ±0.075 %; TD > 3:1 = ±0.025 % · TD

100 mbar (1.5 psi) measuring cell
- Standard: TD ≤ 5:1 = ±0.05 %; TD > 5:1 = ±(0.009 % · TD + 0.005 %)
- Platinum: TD ≥ 1:1 = ±0.04 %

500 mbar (7.5 psi), 3 bar (45 psi), 16 bar (240 psi), 40 bar (600 psi) measuring cell
- Standard: TD ≤ 15:1 = ±0.05 %; TD > 15:1 = ±(0.0015 % · TD + 0.0275 %)
- Platinum: TD ≥ 1:1 = ±0.035 %

160 bar (2 400 psi) and 250 bar (3 750 psi) gauge pressure measuring cell and absolute pressure measuring cell
- Standard: TD ≤ 5:1 = ±0.10 %; TD > 5:1 = ±0.02 % · TD
- Platinum: -

FMD77

100 mbar (1.5 psi) measuring cell
TD ≤ 5:1 = ±0.10 %; TD > 5:1 = ±0.02 % · TD

500 mbar (7.5 psi) measuring cell
TD ≤ 15:1 = ±0.075 %; TD > 15:1 = ±(0.0015 % · TD + 0.053 %)

3 bar (45 psi) and 16 bar (240 psi) measuring cell
TD ≤ 15:1 = ±0.075 %; TD > 15:1 = ±(0.0015 % · TD + 0.053 %)

FMD77 with capillary on low-pressure side and FMD78

100 mbar (1.5 psi) measuring cell
TD ≤ 5:1 = ±0.15 %; TD > 5:1 = ±0.03 % · TD

500 mbar (7.5 psi) measuring cell
TD ≤ 5:1 = ±0.15 %; TD > 5:1 = ±0.03 % · TD

3 bar (45 psi) and 16 bar (240 psi) measuring cell
TD ≤ 15:1 = ±0.1 %; TD > 15:1 = ±(0.006 % · TD + 0.01 %)

40 bar (600 psi) measuring cell
TD ≤ 15:1 = ±0.1 %; TD > 15:1 = ±(0.006 % · TD + 0.01 %)

Temperature effect [E2]

$E2_M$ - Main temperature error

The output changes due to the effect of the ambient temperature [IEC 62828-1 / IEC 61298-3] with respect to the reference temperature [IEC 62828-1 / DIN 16086]. The values specify the maximum error due to min./max. ambient or process temperature conditions.

10 mbar (0.15 psi) and 30 mbar (0.45 psi) measuring cell
- Standard: ±(0.14 % · TD + 0.04 %)
- Platinum: ±(0.14 % · TD + 0.04 %)

100 mbar (1.5 psi) measuring cell
- Standard: ±(0.07 % · TD + 0.07 %)
- Platinum: ±(0.07 % · TD + 0.07 %)

500 mbar (7.5 psi) measuring cell
- Standard: ±(0.03 % · TD + 0.017 %)
- Platinum: ±(0.03 % · TD + 0.017 %)

3 bar (45 psi), 16 bar (240 psi) and 40 bar (600 psi) measuring cell
- Standard: ±(0.012 % · TD + 0.017 %)
- Platinum: ±(0.012 % · TD + 0.017 %)

160 bar (2 400 psi) gauge pressure measuring cell and absolute pressure measuring cell
- Standard: ±(0.042 % · TD + 0.04 %)
- Platinum: -

250 bar (3 750 psi) gauge pressure measuring cell and absolute pressure measuring cell
- Standard: ±(0.022 % · TD + 0.04 %)
- Platinum: -

$E2_E$ - Electronics error

- Analog output (4 to 20 mA): 0.05 %
- Digital output (HART/PA/FF): 0 %

The additional electronics error that occurs in the temperature range −50 to −41 °C (−58 to −42 °F) is covered by E2LT.

$E2_{LT}$ - low-temperature error

The specifications refer to the calibrated span.

- −40 to +85 °C (−40 to +185 °F): 0 %
- −50 to −41 °C (−58 to −42 °F): 1.5 %

$E3_M$ - Main static pressure error

The static pressure effect refers to the effect on the output due to changes in the static pressure of the process (difference between the output at each static pressure and the output at atmospheric pressure [IEC 62828-2 / IEC 61298-3] and therefore the combination of the influence of the operating pressure on the zero point and the span).

10 mbar (0.15 psi) measuring cell
- Standard
  - Influence on the zero point: ±0.23 · TD % per 7 bar (105 psi)
  - Influence on the span: ±0.035 % per 7 bar (105 psi)
- Platinum
  - Influence on the zero point: ±0.07 % · TD per 7 bar (105 psi)
  - Influence on the span: ±0.035 % per 7 bar (105 psi)

30 mbar (0.45 psi) measuring cell
- Standard
  - Influence on the zero point: ±0.70 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.14 % per 70 bar (1 050 psi)
- Platinum
  - Influence on the zero point: ±0.25 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.14 % per 70 bar (1 050 psi)

100 mbar (1.5 psi) measuring cell
- Standard
  - Influence on the zero point: ±0.203 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.15 % per 70 bar (1 050 psi)
- Platinum
  - Influence on the zero point: ±0.077 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.15 % per 70 bar (1 050 psi)

500 mbar (7.5 psi) measuring cell
- Standard
  - Influence on the zero point: ±0.07 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.10 % per 70 bar (1 050 psi)
- Platinum
  - Influence on the zero point: ±0.028 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.10 % per 70 bar (1 050 psi)

3 bar (45 psi) measuring cell
- Standard
  - Influence on the zero point: ±0.049 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.05 % per 70 bar (1 050 psi)
- Platinum
  - Influence on the zero point: ±0.021 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.05 % per 70 bar (1 050 psi)

16 bar (240 psi) and 40 bar (600 psi) measuring cell
- Standard
  - Influence on the zero point: ±0.049 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.02 % per 70 bar (1 050 psi)
- Platinum
  - Influence on the zero point: ±0.021 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.02 % per 70 bar (1 050 psi)

160 bar (2 400 psi) and 250 bar (3 750 psi) gauge pressure measuring cell and absolute pressure measuring cell
- Standard
  - Influence on the zero point: -
  - Influence on the span: -
- Platinum
  - Influence on the zero point: -
  - Influence on the span: -

Resolution

Current output: 1 µA

Total error

The total error of the device comprises the total performance and the long-term stability effect and is calculated using the following formula:

Total error = total performance + long-term stability

Calculation of the total error with the Endress+Hauser Applicator

Detailed inaccuracies, e.g. for other temperature ranges, can be calculated with the Applicator "Sizing Pressure Performance".

A0038927

Calculation of the diaphragm seal error with the Endress+Hauser Applicator

Diaphragm seal errors are not taken into consideration. They are calculated separately in the Applicator "Sizing Diaphragm Seal".

A0038925

Long-term stability

10 mbar (0.15 psi) and 30 mbar (0.45 psi) measuring cell
- 1 year: ±0.20 %
- 5 years: ±0.28 %
- 10 years: ±0.31 %

100 mbar (1.5 psi) measuring cell
- 1 year: ±0.08 %
- 5 years: ±0.14 %
- 10 years: ±0.27 %

500 mbar (7.5 psi) measuring cell
- 1 year: ±0.03 %
- 5 years: ±0.05 %
- 10 years: ±0.08 %

3 bar (45 psi) measuring cell
- 1 year: ±0.04 %
- 5 years: ±0.08 %
- 10 years: ±0.15 %

16 bar (240 psi) measuring cell
- 1 year: ±0.03 %
- 5 years: ±0.11 %
- 10 years: ±0.21 %

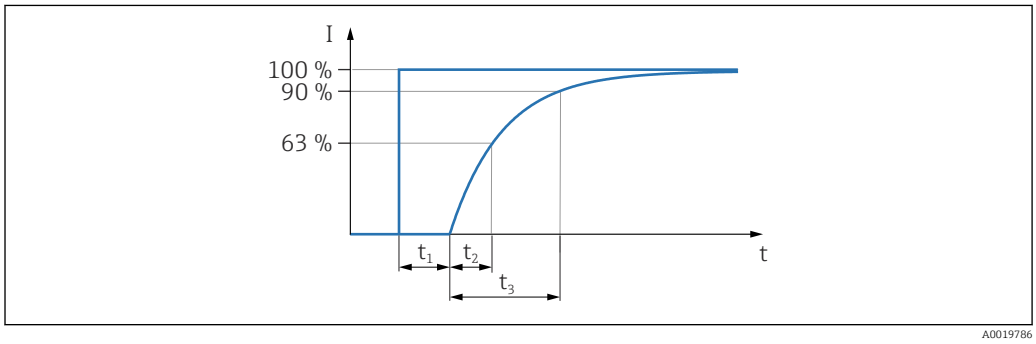
40 bar (600 psi) measuring cell
- 1 year: ±0.05 %
- 5 years: ±0.07 %
- 10 years: ±0.10 %

160 bar (2 400 psi) and 250 bar (3 750 psi) gauge pressure measuring cell and absolute pressure measuring cell
- 1 year: ±0.05 %
- 5 years: ±0.07 %
- 10 years: ±0.10 %

Response time T63 and T90

Dead time, time constant

Representation of dead time and time constant as per IEC62828-1:



Step response time = dead time (t_1) + time constant T90 (t_3) according to IEC62828-1

Dynamic behavior, current output

Type		Measuring cell	Dead time (t_1)	Time constant T63 (t_2)	Time constant T90 (t_3)
PMD75	Max.	▪ 10 mbar (0.15 psi) ▪ 30 mbar (0.45 psi) ▪ 100 mbar (1.5 psi) ▪ 500 mbar (7.5 psi) ▪ 3 bar (45 psi) ▪ 16 bar (240 psi) ▪ 40 bar (600 psi)	45 ms	▪ 450 ms ▪ 450 ms ▪ 60 ms ▪ 45 ms ▪ 40 ms ▪ 60 ms ▪ 60 ms	▪ 1040 ms ▪ 1040 ms ▪ 138 ms ▪ 104 ms ▪ 92 ms ▪ 138 ms ▪ 138 ms
		▪ 160 bar (2 400 psi) ▪ 250 bar (3 750 psi)	50 ms	40 ms	90 ms
FMD77, FMD78	Max.	Dependent on the diaphragm seal			

Dynamic behavior, digital output (HART electronics)

A typical burst rate of 300 ms results in the following behavior:

Type		Measuring cell	Dead time (t_1)	Dead time (t_1) + Time constant T63 (t_2)	Dead time (t_1) + Time constant T90 (t_3)
PMD75	Min.	▪ 10 mbar (0.15 psi) ▪ 30 mbar (0.45 psi) ▪ 100 mbar (1.5 psi) ▪ 500 mbar (7.5 psi) ▪ 3 bar (45 psi) ▪ 16 bar (240 psi) ▪ 40 bar (600 psi) ▪ 160 bar (2 400 psi) ▪ 250 bar (3 750 psi)	205 ms	▪ 655 ms ▪ 655 ms ▪ 265 ms ▪ 250 ms ▪ 245 ms ▪ 265 ms ▪ 265 ms ▪ 295 ms ▪ 295 ms	▪ 1200 ms ▪ 1200 ms ▪ 298 ms ▪ 264 ms ▪ 252 ms ▪ 298 ms ▪ 298 ms ▪ 300 ms ▪ 300 ms
	Max.	▪ 10 mbar (0.15 psi) ▪ 30 mbar (0.45 psi) ▪ 100 mbar (1.5 psi) ▪ 500 mbar (7.5 psi) ▪ 3 bar (45 psi) ▪ 16 bar (240 psi) ▪ 40 bar (600 psi) ▪ 160 bar (2 400 psi) ▪ 250 bar (3 750 psi)	1005 ms	▪ 1455 ms ▪ 1455 ms ▪ 1065 ms ▪ 1050 ms ▪ 1045 ms ▪ 1065 ms ▪ 1065 ms ▪ 1095 ms ▪ 1095 ms	▪ 2000 ms ▪ 2000 ms ▪ 1098 ms ▪ 1064 ms ▪ 1052 ms ▪ 1098 ms ▪ 1098 ms ▪ 1100 ms ▪ 1100 ms
FMD77, FMD78	Max.	Dependent on the diaphragm seal			

Read cycle

- Acyclic: max. 3/s, typically 1/s (depending on command # and number of preambles)
- Cyclic (burst): max. 3/s, typically 2/s

The device offers the BURST MODE function for cyclic value transmission via the HART communication protocol.

Cycle time (update time)

Cyclic (burst): min. 300 ms

Dynamic behavior, PROFIBUS PA

A typical PLC cycle time of 1 s results in the following behavior:

Type		Measuring cell	Dead time (t_1)	Dead time (t_1) + Time constant T63 (t_2)	Dead time (t_1) + Time constant T90 (t_3)
PMD75	Min.	▪ 10 mbar (0.15 psi) ▪ 30 mbar (0.45 psi) ▪ 100 mbar (1.5 psi) ▪ 500 mbar (7.5 psi) ▪ 3 bar (45 psi) ▪ 16 bar (240 psi) ▪ 40 bar (600 psi)	80 ms	▪ 530 ms ▪ 530 ms ▪ 140 ms ▪ 125 ms ▪ 120 ms ▪ 140 ms ▪ 140 ms	▪ 1075 ms ▪ 1075 ms ▪ 173 ms ▪ 139 ms ▪ 127 ms ▪ 173 ms ▪ 173 ms
	Max.	▪ 10 mbar (0.15 psi) ▪ 30 mbar (0.45 psi) ▪ 100 mbar (1.5 psi) ▪ 500 mbar (7.5 psi) ▪ 3 bar (45 psi) ▪ 16 bar (240 psi) ▪ 40 bar (600 psi)	1280 ms	▪ 1730 ms ▪ 1730 ms ▪ 1340 ms ▪ 1325 ms ▪ 1320 ms ▪ 1340 ms ▪ 1340 ms	▪ 2275 ms ▪ 2275 ms ▪ 1373 ms ▪ 1339 ms ▪ 1327 ms ▪ 1373 ms ▪ 1373 ms
FMD77, FMD78	Max.	Dependent on the diaphragm seal			

Read cycle (PLC)

- Acyclic: typically 25/s
- Cyclic: typically 30/s (dependent on the number and type of function blocks used in a closed-control loop)

Cycle time (update time)

Min. 200 ms

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. A new measured value can be determined up to five times a second.

Dynamic behavior, FOUNDATION Fieldbus

A typical configuration for the macro cycle time (host system) of 1 s results in the following behavior:

Type		Measuring cell	Dead time (t_1)	Dead time (t_1) + Time constant T63 (t_2)	Dead time (t_1) + Time constant T90 (t_3)
PMD75	Min.	▪ 10 mbar (0.15 psi) ▪ 30 mbar (0.45 psi) ▪ 100 mbar (1.5 psi) ▪ 500 mbar (7.5 psi) ▪ 3 bar (45 psi) ▪ 16 bar (240 psi) ▪ 40 bar (600 psi)	90 ms	▪ 540 ms ▪ 540 ms ▪ 150 ms ▪ 135 ms ▪ 130 ms ▪ 150 ms ▪ 150 ms	▪ 1085 ms ▪ 1085 ms ▪ 183 ms ▪ 149 ms ▪ 137 ms ▪ 183 ms ▪ 183 ms
	Max.	▪ 10 mbar (0.15 psi) ▪ 30 mbar (0.45 psi) ▪ 100 mbar (1.5 psi) ▪ 500 mbar (7.5 psi) ▪ 3 bar (45 psi) ▪ 16 bar (240 psi) ▪ 40 bar (600 psi)	1090 ms	▪ 1540 ms ▪ 1540 ms ▪ 1150 ms ▪ 1135 ms ▪ 1130 ms ▪ 1150 ms ▪ 1150 ms	▪ 2085 ms ▪ 2085 ms ▪ 1183 ms ▪ 1149 ms ▪ 1137 ms ▪ 1183 ms ▪ 1183 ms
FMD77, FMD78	Max.	Dependent on the diaphragm seal			

Read cycle

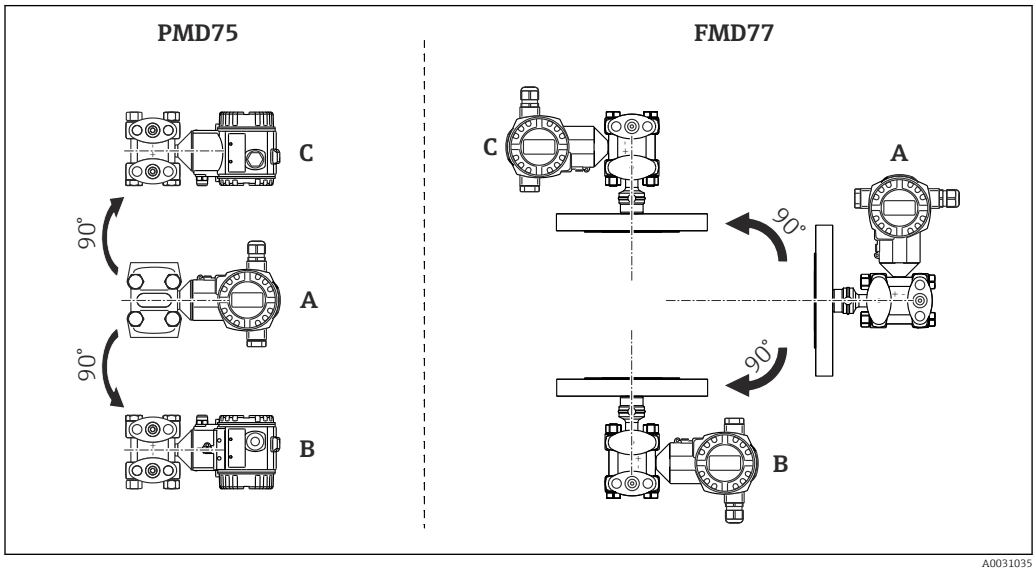
- Acyclic: typically 10/s
- Cyclic: max. 10/s (dependent on the number and type of function blocks used in a closed-control loop)

Cycle time (update time)

Cyclic: min. 100 ms

Installation factors

Influence of installation position



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Device	Calibration position (A)	Device rotated vertically downwards (B)	Device rotated vertically upwards (C)
PMD75 and silicone oil	No additional error	<+4 mbar (+0.06 psi) The value is doubled for inert oil.	<−4 mbar (−0.06 psi) The value is doubled for inert oil.
FMD77 and silicone oil	No additional error	<+32 mbar (+0.46 psi) The value is doubled for inert oil.	<−32 mbar (−0.46 psi) The value is doubled for inert oil.

A position-dependent zero point shift can be corrected. Please refer to the "Commissioning → Position adjustment" section of the Operating Instructions.

Vibration effects

Device/accessory	Measuring cells	Housing	Test standard	Vibration resistance
PMD75	10 mbar (0.15 psi), 30 mbar (0.45 psi)	T14 stainless steel T15 aluminum T17 aluminum	IEC 62828-1 / IEC 61298-3	≤ 0.15% URL to 10 to 38 Hz: ±0.35 mm (0.0138 in); 38 to 2000 Hz: 2 g in all 3 planes
		T14 aluminum	IEC 62828-1 / IEC 61298-3	≤ 0.15% URL to 10 to 60 Hz: ±0.21 mm (0.0083 in); 60 to 2000 Hz: 3 g in all 3 planes
	≥ 100 mbar (1.5 psi)	T14 stainless steel T15 aluminum	IEC 62828-1 / IEC 61298-3	≤ 0.075 % URL to 10 to 38 Hz: ±0.35 mm (0.0138 in); 38 to 2000 Hz: 2 g in all 3 planes
		T14 aluminum	IEC 62828-1 / IEC 61298-3	≤ 0.075 % URL to 10 to 60 Hz: ±0.35 mm (0.0138 in); 60 to 2000 Hz: 5 g in all 3 planes

Warm-up period

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

Mounting

General installation instructions

- A position-dependent zero point shift can be corrected directly at the device via operating keys, and also in hazardous areas in the case of devices with external operation.
  Depending on the installation location, diaphragm seals additionally shift the zero point by → 🖹 100.
- The device housing can be rotated up to 380° .
- Endress+Hauser offers a mounting bracket for installing the device on pipes or walls → 🖹 33.
- Use flushing rings for flange and cell diaphragm seals if buildup or clogging can be expected at the diaphragm seal connection. The flushing ring can be fitted between the process connection and diaphragm seal. Material buildup in front of the process membrane can be flushed away, and the pressure chamber vented, via the two lateral flushing holes.
- When measuring in media containing solids, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.
- Using a valve manifold allows for easy commissioning, installation and maintenance without interrupting the process.
- General recommendations for the piping can be found in the relevant national or international standards.
- Lay the piping with a monotonic gradient of at least 10 %.
- When routing the piping outdoors, ensure sufficient anti-freeze protection, e.g. by using pipe heat tracing.
- Point the cable and plug downwards where possible to prevent moisture from entering (e.g. rain or condensation water).

Measuring arrangement

Flow measurement

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

Level measurement

The PMD75 and FMD77 are best suited to level measurement in open vessels. All Deltabar S devices are suitable for level measurement in closed vessels.

Measuring arrangement for level measurement in open vessels
- PMD75: Mount device below the lower measuring connection. The negative side is open to atmospheric pressure.
- FMD77: Mount device directly on the vessel. The negative side is open to atmospheric pressure.

Measuring arrangement for level measurement in closed vessels and closed vessels with superimposed vapor
- PMD75: Mount device below the lower measuring connection. Always connect the negative side above the maximum level via pressure piping.
- FMD77: Mount device directly on the vessel. Always connect the negative side above the maximum level via pressure piping.
- In the case of level measurement in closed vessels with superimposed vapor, a condensate trap ensures the pressure remains constant on the negative side.

Pressure measurement

- The PMD75 and FMD78 are best suited to differential pressure measurement.
- Measuring arrangement for gases: Mount device above the measuring point.
- Measuring arrangement for liquids and vapors: Mount device below the measuring point.
- For differential pressure measurement in vapors, mount the condensate traps at the same level as the tapping point and at the same distance from the Deltabar S.

Measuring arrangement for devices with diaphragm seals – FMD77 and FMD78

→ 🖹 100

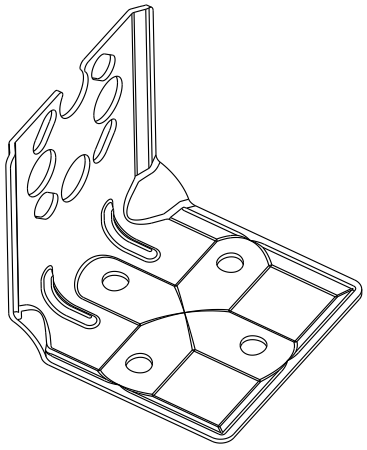
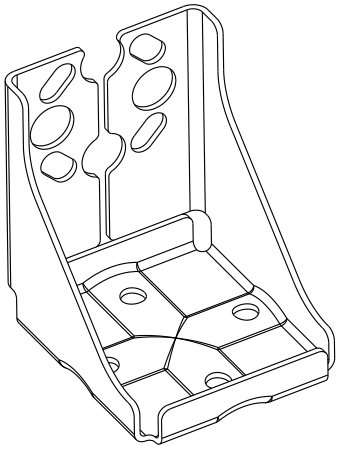
Orientation

The orientation may cause a zero point shift.

This position-dependent zero point shift can be corrected directly at the device via the operating key, and also in hazardous areas in the case of devices with external operation (position adjustment).

Wall and pipe mounting, transmitter (optional)

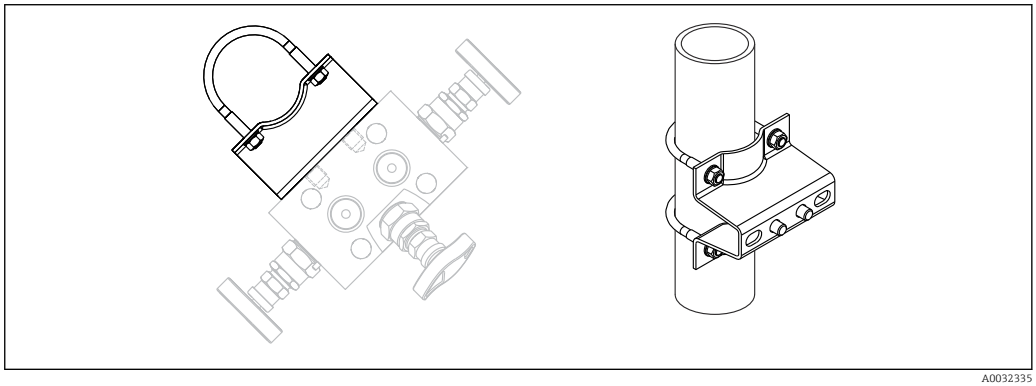
Endress+Hauser offers the following mounting bracket for installing the device on pipes or walls:

Standard version	Heavy-duty version
 A0031326	 A0031327

- The standard mounting bracket version is **not** suitable for use in an application subject to vibrations.
- The vibration resistance of the heavy-duty mounting bracket has been tested according to IEC 61298-3, see the "Vibration resistance" section → 🖹 37.
- If a valve manifold is used, its dimensions should also be taken into consideration.
- Bracket for wall and pipe mounting including retaining bracket for pipe mounting and two nuts.
- The material of the screws used to secure the device depend on the order code.
- For the technical data (such as the dimensions or order numbers for screws), see the document SD01553P/00/EN.

Ordering information:
- Standard version: Product Configurator, order code for "Additional options" option "Q" or
- Standard version: Product Configurator, order code for "Accessories enclosed" option "PD"
- Heavy-duty version: Product Configurator, order code for "Additional options" option "U" or
- Heavy-duty version: Product Configurator, order code for "Accessories enclosed" option "PB"

Wall and pipe mounting, valve manifold (optional)



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For the technical data (such as the dimensions or order numbers for screws), see the document SD01553P/00/EN.

Ordering information:

Product Configurator, order code for "Accessories enclosed", option "PJ"

"Separate housing" version

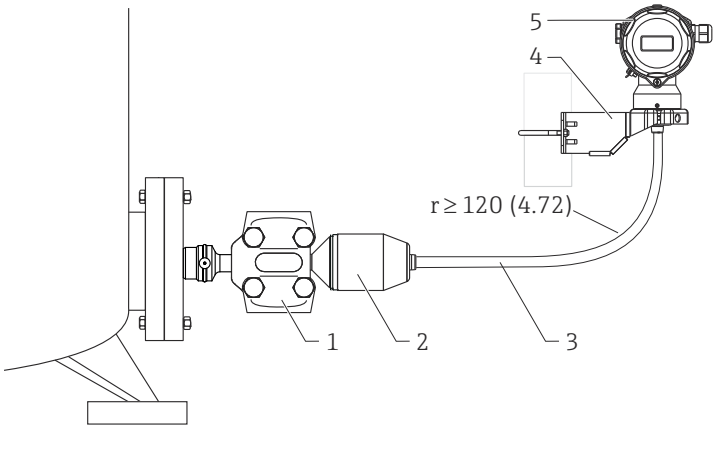
With the "separate housing" version, you are able to mount the housing with the electronics insert at a distance from the measuring point. This version facilitates trouble-free measurement
- Under particularly difficult measuring conditions (at installation locations that are cramped or difficult to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

You can choose between different cable versions:
- PE: 2 m (6.6 ft), 5 m (16 ft) and 10 m (33 ft)
- FEP: 5 m (16 ft).

Ordering information: Product Configurator, order code for "Additional options 2", option "G".

Dimensions → 🖹 44

In the case of the "separate housing" version, the measuring cell is delivered with the process connection and cable ready 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 measuring cell.



1 Process connection with measuring cell - For degrees of protection, see the following section
2 Process connection adapter (weight: 0.93 kg (2.05 lb))
3 Cable (weight: 0.05 kg/meter (0.11 lb)), both ends are fitted with a socket
4 Mounting bracket provided, suitable for pipe and wall mounting
5 Housing with electronic insert - degrees of protection → 🖹 45

Unit mm (in)

Degree of protection for the process connection and measuring cell with the use of
- FEP cable:
  - IP 69 [1)]
  - IP 66 NEMA 4/6P
  - IP 68 (1.83 mH_2O for 24 h) NEMA 4/6P
- PE cable:
  - IP 66 NEMA 4/6P
  - IP 68 (1.83 mH_2O for 24 h) NEMA 4/6P

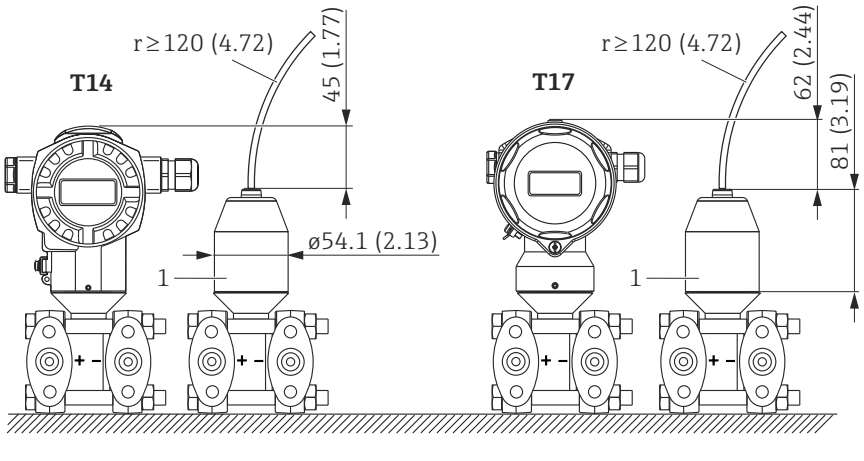
Technical data of the PE and FEP cable:
- Minimum bending radius: 120 mm (4.72 in)
- Cable extraction force: max. 450 N (101.16 lbf)
- Resistance to UV light

Use in hazardous area:
- Intrinsically safe installations (Ex ia/IS)
- FM/CSA IS: for Div. 1 installation only

1) Designation of the IP protection class according to DIN EN 60529. Previous designation "IP69K" according to DIN 40050 Part 9 is no longer valid (standard withdrawn on November 1, 2012). The tests required by both standards are identical.

Reduction of the installation height

If the separate housing is used, the installation height of the process connection is reduced compared to the dimensions of the standard version.



1 Process connection adapter

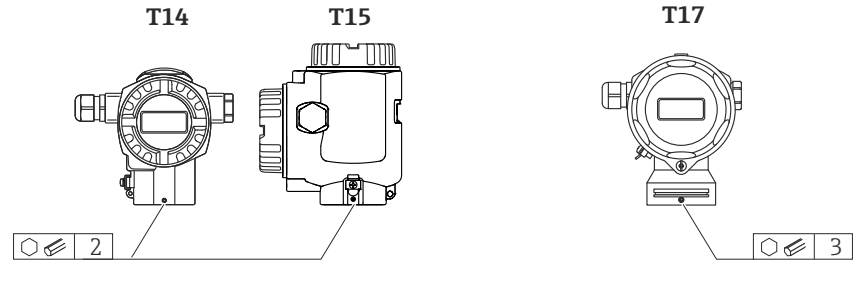
Unit mm (in)

Turning the housing

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

Your benefits

- Easy installation due to optimum alignment of housing
- Good, accessible device operation
- Optimum readability of the onsite display (optional).



Environment

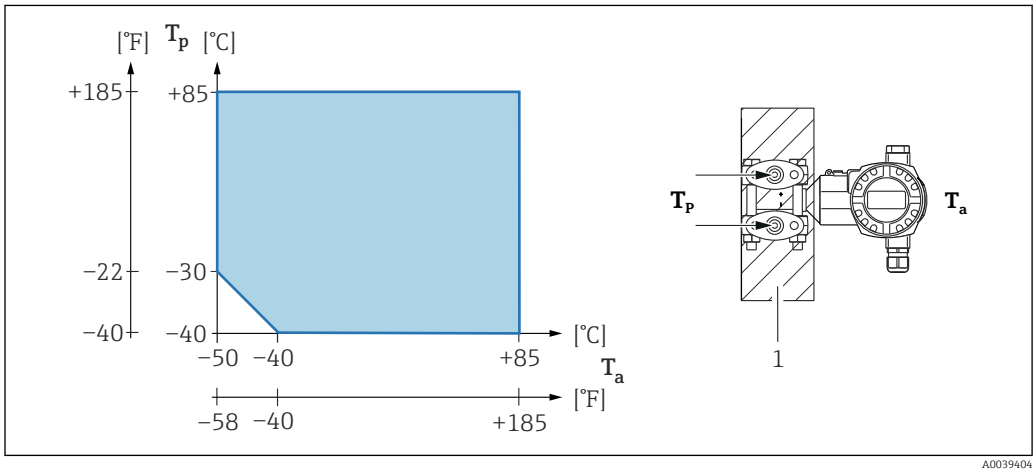
Ambient temperature range

Version	PMD75	FMD77	FMD78
Without LCD display	−50 to +85 °C (−58 to +185 °F) [1] −54 to +85 °C (−65 to +185 °F) [2]		
With LCD display [3]	−20 to +70 °C (−4 to +158 °F)		
With separate housing	-	−20 to +60 °C (−4 to +140 °F)	
Diaphragm seal systems [4]	-	→ 🖹 102	

1) If the temperature is below −40 °C (−40 °F), the chance of failure increases. Product Configurator, order code for "Test, Certificate" option "JN".
2) If the temperature is below −40 °C (−40 °F), the chance of failure increases. Product Configurator, order code for "Test, Certificate" option "JT".
3) Extended temperature application range (−50 to +85 °C (−58 to +185 °F)) with restrictions in optical properties, such as display speed and contrast
4) Ambient temperature range and process temperature range are mutually dependent - see "Heat insulation" section → 🖹 102

PMD75: Ambient temperature T_a depending on the process temperature T_p

The process connection must be fully insulated for ambient temperatures below −40 °C (−40 °F).



1 Insulation material

Hazardous area

- For devices for use in hazardous areas, see Safety Instructions, Installation or Control Drawing.
- Pressure measuring instruments that have the usual explosion protection certificates (e.g. ATEX-/CSA-/FM-/IEC Ex, etc) can be used in hazardous areas at ambient temperatures down to −50 °C (−58 °F) (order code for "Test, Certificate" option "JN"). The functionality of the explosion protection is also guaranteed for ambient temperatures down to −50 °C (−58 °F).
- Pressure measuring instruments that have the usual explosion protection certificates (e.g. ATEX-/IEC Ex, etc.) can be used in hazardous areas at ambient temperatures down to −54 to +85 °C (−65 to +185 °F)(order code for "Test, Certificate" option "JT"). The functionality of the explosion protection is also guaranteed for ambient temperatures down to −50 °C (−58 °F). At temperatures ≤ −50 °C (−58 °F), explosion protection is guaranteed by the housing in the case of flameproof enclosure (Ex d) type of protection. The functionality of the transmitter cannot be fully guaranteed.

Storage temperature range

- −40 to +90 °C (−40 to +194 °F)
  Option −50 to +90 °C (−58 to +194 °F) order code 580 "Test, Certificate" option "JN". If the temperature is below −40 °C (−40 °F), the probability of a failure increases.
  Option −54 to +90 °C (−65 to +194 °F) order code 580 "Test, Certificate" option "JT". If the temperature is below −40 °C (−40 °F), the probability of a failure increases.
- Local display: −40 to +85 °C (−40 to +185 °F)
- Separate housing:−40 to +60 °C (−40 to +140 °F)
- Devices with PVC-armored capillary: −25 to +80 °C (−13 to +176 °F)

Degree of protection

Depends on the deployed
- housing: → 🖹 45
- separate housing: → 🖹 79

Climate class

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

Electromagnetic compatibility

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

For further details refer to the Declaration of Conformity.

Vibration resistance

Device/accessory	Measuring cells	Housing	Test standard	Vibration resistance
PMD75	10 mbar (0.15 psi), 30 mbar (0.45 psi)	T14 stainless steel T15 aluminum T17 aluminum	IEC 62828-1 / IEC 61298-3	Guaranteed for 10 to 38 Hz: ±0.35 mm (0.0138 in); 38 to 2000 Hz: 2 g in all 3 axes
		T14 aluminum	IEC 62828-1 / IEC 61298-3	Guaranteed for 10 to 60 Hz: ±0.21 mm (0.0083 in); 60 to 2000 Hz: 3 g in all 3 axes
PMD75 FMD78 transmitter	≥ 100 mbar (1.5 psi)	T14 stainless steel T15 aluminum	IEC 62828-1 / IEC 61298-3	Guaranteed for 10 to 38 Hz: ±0.35 mm (0.0138 in); 38 to 2000 Hz: 2 g in all 3 axes
		T14 aluminum	IEC 62828-1 / IEC 61298-3	Guaranteed for 10 to 60 Hz: ±0.35 mm (0.0138 in); 60 to 2000 Hz: 5 g in all 3 axes
PMD75 and FMD78 transmitters with mounting bracket (heavy duty design)	All	All	IEC 62828-1 / IEC 61298-3	Guaranteed for 10 to 60 Hz: ±0.15 mm (0.0059 in); 60 to 500 Hz: 2 g in all 3 axes
FMD77	All	All	IEC 62828-1 / IEC 61298-3	Guaranteed for 10 to 60 Hz: ±0.075 mm (0.0030 in); 60 to 150 Hz: 1 g in all 3 axes
Process connection with capillary	All	All	IEC 62828-1 / IEC 61298-3	Guaranteed for 10 to 60 Hz: ±0.35 mm (0.0138 in); 60 to 1000 Hz: 5 g in all 3 axes

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 requirements.
- Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded for oxygen applications.

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

HB = Cleaned for oxygen service

Order code for devices [1], cleaned for oxygen applications	p_{max} for oxygen applications	T_{max} for oxygen applications
PMD75 – * * * * * * * * K * * or PMD75 – * * * * * * * * H * * HB	80 bar (1 200 psi)	60 °C (140 °F)
PMD75 – * * * * * * * * 2 * * or PMD75 – * * * * * * * * A * * HB	80 bar (1 200 psi)	60 °C (140 °F)
PMD75 – * * * * * * * * 3 * * or PMD75 – * * * * * * * * C * * HB	80 bar (1 200 psi)	60 °C (140 °F)
FMD77 – * * * * * T * F * * or FMD77 – * * * * * D * F * * HB	PN of the flange, max. 80 bar (1 200 psi)	60 °C (140 °F)
FMD78 – * * * * * * * * 4 * * or FMD78 – * * * * * * * * 6 * * HB FMD78 – * * * * * * * * D * * or FMD78 – * * * * * * * * F * * HB	PN of the flange, max. 80 bar (1 200 psi)	60 °C (140 °F)

1) Devices only, not accessories or enclosed accessories.

Ultrapure gas applications

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

Ordering information:
- PMD75: Product Configurator, order code for "Seal"
- FMD77: Product Configurator, order code for "Process connection low-pressure side; Material; Seal".

Hydrogen applications

A **gold-coated** metal process isolating diaphragm offers universal protection against hydrogen diffusion, both in gas applications and in applications with aqueous solutions.

Applications with hydrogen in aqueous solutions

A **gold/rhodium-coated** metal process isolating diaphragm (AU/Rh) offers effective protection against hydrogen diffusion.

Operation in very corrosive environment

PMD75: For corrosive environments (e.g. maritime environment / coastal areas), Endress+Hauser recommends the protective terminal for maritime environments (available as mounted accessory).

Diaphragm seal FMD78 and FMD77 with capillary on low-pressure side:

For corrosive environments (e.g. maritime environment / coastal areas), Endress+Hauser recommends the use of a PVC or PTFE armor for the capillaries (→ 🖹 85). The transmitter can also be protected by a special coating (**T**echnical **S**pecial **P**roduct (TSP)).

Process

Process temperature limits (temperature at transmitter)

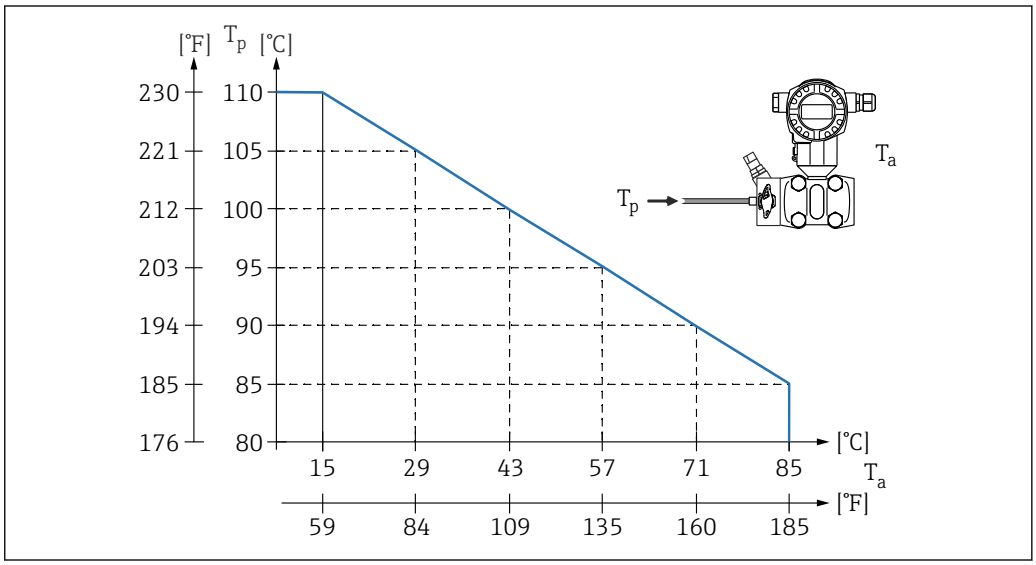
PMD75

- Process connections made of 316L or Alloy C276:
  −50 to +85 °C (−58 to +185 °F)
- Process connections made of C22.8: −10 to +85 °C (+14 to +185 °F)
- For oxygen applications, → 🖹 38, see the "Oxygen applications" section.
- Observe the process temperature range of the seal. See also the following section "Process temperature range, seals".

PMD75 with valve manifold

The maximum permitted process temperature at the manifold is 110 °C (230 °F).

For process temperatures >85 °C (185 °F)C where non-insulated side flanges are installed horizontally on a valve manifold, a reduced ambient temperature applies (see the following graphic).



T_a *Maximum ambient temperature at the manifold*
T_p *Maximum process temperature at the manifold*

FMD77

- Depends on the design (see the following table)
- Dependent on diaphragm seal and fill fluid: → 🖹 99−70 to +400 °C (−94 to +752 °F)
- For oxygen applications, → 🖹 38, see the "Oxygen applications" section.
- Observe the process temperature range of the seal. See also the following section "Process temperature range, seals".
- Observe the temperature application limits of the diaphragm seal oil. → 🖹 99, "Diaphragm seal fill fluid" section.
- Please observe the maximum gauge pressure and maximum temperature.

Design	Temperature isolator	Temperature	Option [1]
Transmitter horizontal	long	400 °C (752 °F)	MA
Transmitter vertical	long	300 °C (572 °F)	MB
Transmitter horizontal	short	200 °C (392 °F)	MC

Design	Temperature isolator	Temperature	Option [1]
Transmitter vertical	short	200 °C (392 °F)	MD
U-bracket, transmitter horizontal (for devices which require a CRN approval)	-	400 °C (752 °F)	[2]

1) Product Configurator, order code for "Process connection"
2) In combination with CSA approval.

FMD78

- Dependent on diaphragm seal and fill fluid: −70 to +400 °C (−94 to +752 °F)
- For oxygen applications, → 🖹 38, see the "Oxygen applications" section.
- Observe the temperature application limits of the diaphragm seal oil. → 🖹 99, "Diaphragm seal fill fluid" section.
- Please observe the maximum gauge pressure and maximum temperature.

FMD77 and FMD78: Devices with PTFE-coated membrane

The non-stick coating has excellent gliding properties and is used to protect the membrane against abrasive media.

NOTICE

The device can be damaged if the PTFE foil is used for anything other than the designated purpose!

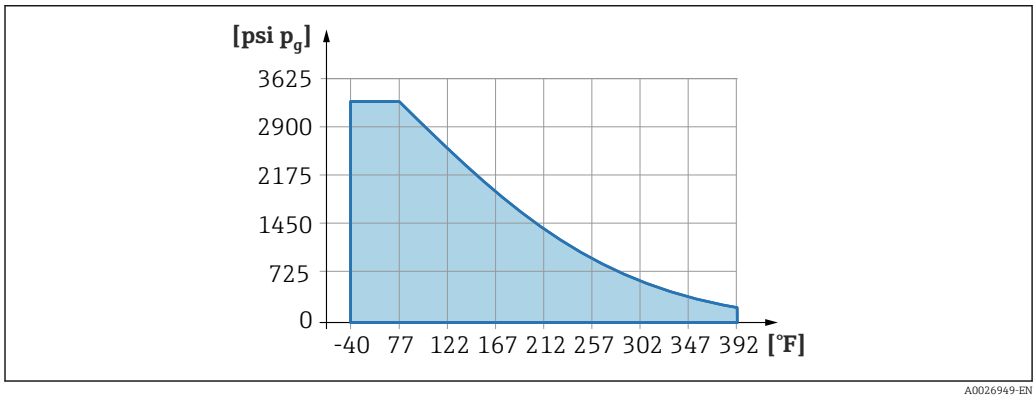
▶ The PTFE foil is designed to protect the unit against abrasion. It does not provide protection against corrosive media.

FMD77 and FMD78: Diaphragm seal with tantalum membrane

−70 to +300 °C (−94 to +572 °F)

Range of application of the PTFE foil

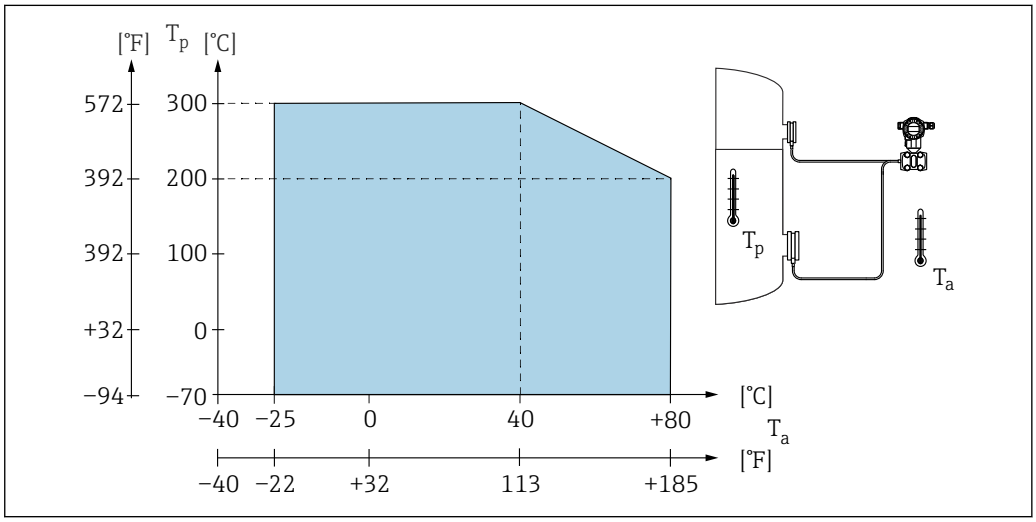
For the range of application of the 0.25 mm (0.01 in) PTFE foil on an AISI 316L (1.4404/1.4435) membrane, see the following diagram:



For vacuum applications: p_{abs} ≤ 1 bar (14.5 psi) to 0.05 bar (0.725 psi) up to +150 °C (302 °F) max.

Process temperature limits of capillary armoring: FMD77 and FMD78

- 316L: No restrictions
- PTFE: No restrictions
- PVC: See the following diagram



Process temperature range, seals

PMD75

Seal	Process temperature range	Option [1]
FKM	−20 to +110 °C (−4 to +230 °F) [2]	A
PTFE [3]	−40 to +110 °C (−40 to +230 °F) [2] [4]	C
NBR	−20 to +85 °C (−4 to +185 °F)	F
Copper	−40 to +85 °C (−40 to +185 °F)	H
Copper, cleaned for oxygen service	−20 to +60 °C (−4 to +140 °F)	K or H [5]
FKM, cleaned from oil+grease	−20 to +110 °C (−4 to +230 °F)	1
FKM, cleaned for oxygen service	−20 to +60 °C (−4 to +140 °F)	2 or A [5]
PTFE [3], cleaned for oxygen applications	−20 to +60 °C (−4 to +140 °F)	3 or C [5]
EPDM [6] [7]	−40 to +85 °C (−40 to +185 °F)	J

1) Product Configurator, order code for "Seal"
2) For process temperatures > 85 °C (185 °F) pay attention to the ambient temperature and installation → 🖹 39
3) For 10 mbar (0.15 psi) and 30 mbar (0.45 psi) measuring cells: in the case of constantly high pressure (≥ 63 bar (913.5 psi)) and low process temperature at the same time (<−10 °C (+14 °F) use FKM or EPDM seals.
4) For pressures > 160 bar (2 320 psi) process temperature is limited to −20 °C (−4 °F)
5) with option "HB", see Product Configurator, order code for "Service"
6) Always on LP side with blind flange (see Product Configurator, order code for "Process connection").
7) Deviations outside the reference accuracy are possible at temperatures <−20 °C (−4 °F).

FMD77 (with diaphragm seal)

Seal on the LP side (−)	Process temperature range [1]	OPL bar (psi)	PN bar (psi)	Option [2]
FKM	−20 to +85 °C (−4 to +185 °F)	See the "Measuring range" section "FMD77, FMD78, PMD75: Option PN 160 / 16 MPa / 2400 psi" → 🖹 10.		B, D, F, U
PTFE	−40 to +85 °C (−40 to +185 °F)			H, J
EPDM	−40 to +85 °C (−40 to +185 °F)			K, L
FKM, cleaned from oil+grease	−10 to +85 °C (+14 to +185 °F)			S
FKM, cleaned for oxygen service [3]	−10 to +60 °C (+14 to +140 °F)			T or D [4]
Kalrez, Compound 6375	0 to +5 °C (+32 to +41 °F)	44 to 49 (660 to 735)	29 to 33 (435 to 495)	M, N
	+5 to +10 °C (+41 to +50 °F)	49 to 160 (735 to 2400)	33 to 107 (495 to 1605)	
	+10 to +85 °C (+50 to +185 °F)	160 (2400)	107 (1605)	
Chemraz, Compound 505	−10 to +25 °C (+14 to +77 °F)	130 to 160 (1950 to 2400)	87 to 107 (1305 to 1605)	P, Q
	+25 to +85 °C (+77 to +185 °F)	160 (2400)	107 (1605)	
Diaphragm seal and capillary, welded	Observe the temperature application limits of the diaphragm seal oil. → 🖹 99, "Diaphragm seal fill fluid" section.			

1) Lower temperatures on request
2) Product Configurator, order code for "Process connection, LP side; seal:"
3) Observe "Oxygen applications" section
4) With option "HB", see Product Configurator, order code for "Service"

Pressure specifications

WARNING

The maximum pressure for the measuring instrument depends on the lowest-rated element with regard to pressure.

- For pressure specifications, see the "Measuring range" section and the "Mechanical construction" section.
- The measuring instrument must be operated only within the specified limits!
- MWP (maximum working pressure): The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of +20 °C (+68 °F) and may be applied to the device for an unlimited time. Observe the temperature dependency of the MWP. For the pressure values permitted at higher temperatures for flanges, please refer to standards EN 1092-1 (with regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under EN 1092-1; the chemical composition of the two materials can be identical.), ASME B 16.5a, JIS B 2220 (the latest version of the standard applies in each case).
- The test pressure corresponds to the over pressure limit of the individual measuring cells (OPL = 1.5 x MWP) and may be applied only for a limited period of time to prevent any lasting damage.
- The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring instrument.
- In the case of measuring cell range and process connection combinations where the overpressure limit (OPL) of the process connection is less than the nominal value of the measuring cell, 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 measuring cell range, select a process connection with a higher OPL value (1.5 x PN; MWP = PN)
- In oxygen applications, the values for "p_{max} and T_{max} for oxygen applications must not be exceeded → 🖹 38.
- The measuring cells have been designed for high pressure ratings with load change. Check the zero point regularly in the event of very frequent load changes up to the nominal pressure 0 to 420 bar (0 to 6 092 psi).
- For the 10 mbar (0.15 psi) and 30 mbar (0.45 psi) measuring cells: Check the zero point regularly at pressures ≥ 63 bar (913.5 psi).
- For the PMD75, the MWP applies to the temperature ranges specified in the "Ambient temperature range" → 🖹 36 and "Process temperature limits" → 🖹 39 sections.

Burst pressure

Device	Measuring range	Burst pressure [1]
PMD75 PN160	≤40 bar (580 psi)	690 bar (10 005 psi) [2]
		600 bar (8 700 psi) [3]
PMD75 PN420	≤40 bar (580 psi)	1 600 bar (23 200 psi) [2] [4] [5]

1) Excluding FMD77 and FMD78 with mounted diaphragm seal systems
2) Applies to the process seal materials FKM, PTFE, NBR, EPDM and for pressure applied on both sides.
3) Applies to the process seal material PTFE and for side vent.
4) If the side vent valves (sv) option is selected, the burst pressure is 690 bar (10 005 psi)
5) For the process seal material PTFE (PN250), the burst pressure is 1 250 bar (18 125 psi)

Mechanical construction

For the dimensions, see the Product Configurator: www.endress.com

Search for product → click "Configuration" to the right of the product image → after configuration click "CAD"

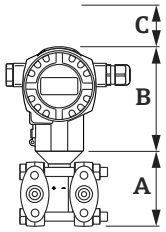
The following dimensions are rounded values. For this reason, they may deviate slightly from the dimensions given on www.endress.com.

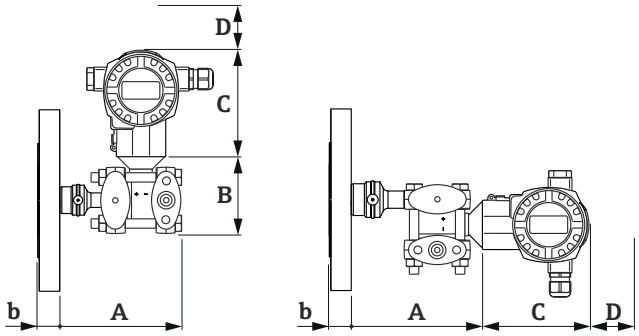
Device height

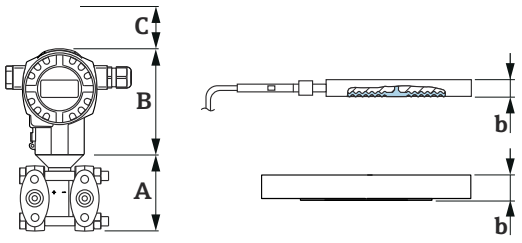
The device height is calculated from

- the height of the housing
- the height of optional mounted parts such as temperature isolators or capillaries
- the height of the relevant process connection.

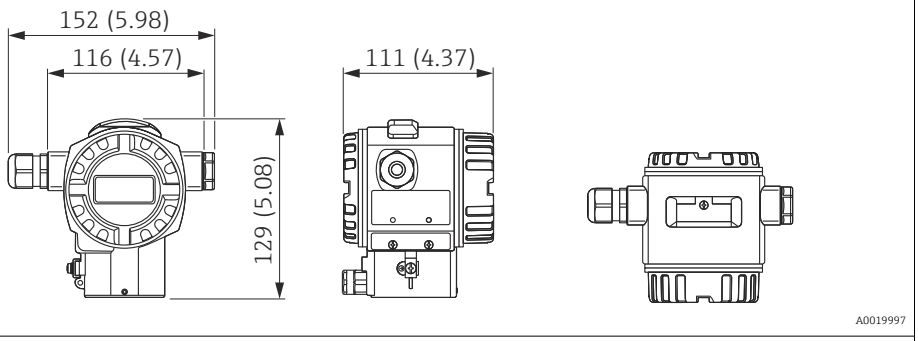
The individual heights of the components are listed in the following sections. To calculate the device height simply add up the individual heights of the components. If necessary, the installation clearance (the space used to install the device) must also be taken into account. You can use the following table for this purpose:

Designation	Item	Dimension	Example with PMD75
Side flanges	(A)	85 mm (3.35 in)	 A0023927
Housing height	(B)	→ 45 ff.	
Installation clearance	(C)	-	
Device height			

Designation	Item	Dimension	Example with FMD77
Mounted parts	(A)	→ 52	 A0025880
Side flanges	(B)	85 mm (3.35 in)	
Housing height	(C)	→ 45 ff.	
Installation clearance	(D)	-	
Process connections	(b)	→ 47	
Device height			

Designation	Item	Dimension	Example with FMD78
Side flanges	(A)	85 mm (3.35 in)	 A0025881
Housing height	(B)	→ 45 ff.	
Installation clearance	(C)	-	
Process connections	(b)	→ 47	
Device height			

T14 housing, optional display on the side

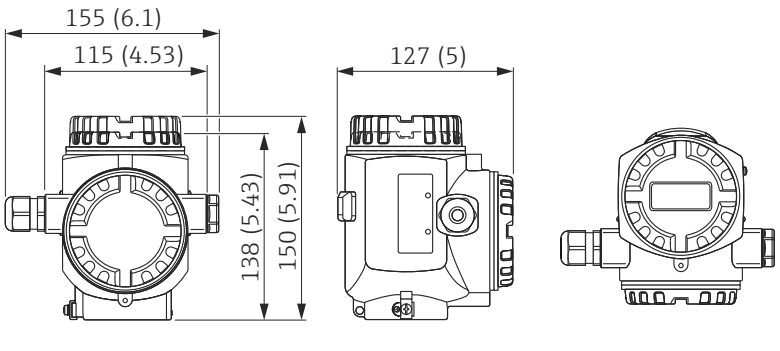


Engineering unit mm (in). Front view, left-hand side view, top view

Material		Degree of protection	Cable entry	Weight in kg (lb)		Option [1]
Housing	Cover seal			with display	without display	
Aluminum	EPDM	IP66/67 NEMA 6P	M20 gland	1.2 (2.65)	1.1 (2.43)	A
		IP66/67 NEMA 6P	G ½" thread			B
		IP66/67 NEMA 6P	NPT ½" thread			C
		IP66/67 NEMA 6P	M12 plug			D
		IP66/67 NEMA 6P	7/8" plug			E
		IP65 NEMA 4	HAN7D plug 90 degrees			F
	FVMQ	IP66/67 NEMA 6P	M20 gland			G
	FVMQ	IP66/67 NEMA 6P	NPT ½" thread			H
316L	EPDM	IP66/67 NEMA 6P	M20 gland	2.1 (4.63)	2.0 (4.41)	1
		IP66/67 NEMA 6P	G ½" thread			2
		IP66/67 NEMA 6P	NPT ½" thread			3
		IP66/67 NEMA 6P	M12 plug			4
		IP66/67 NEMA 6P	7/8" plug			5
		IP65 NEMA 4	HAN7D plug 90 degrees			6
	FVMQ	IP66/67 NEMA 6P	M20 gland			7
	FVMQ	IP66/67 NEMA 6P	NPT ½" thread			8

1) Product Configurator, order code for "Housing, cover seal, cable entry, degree of protection"

T15 housing, optional display on the top

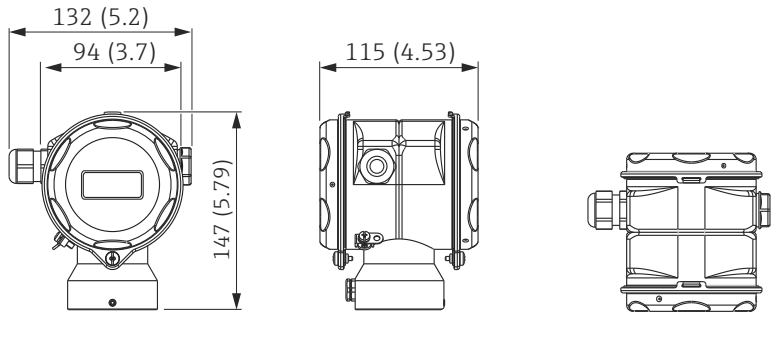


Engineering unit mm (in). Front view, left-hand side view, top view

Material		Degree of protection	Cable entry	Weight in kg (lb)		Option [1]
Housing	Cover seal			with display	without display	
Aluminum	EPDM	IP66/67 NEMA 6P	M20 gland	1.8 (3.97)	1.7 (3.75)	J
		IP66/67 NEMA 6P	G ½" thread			K
		IP66/67 NEMA 6P	NPT ½" thread			L
		IP66/67 NEMA 6P	M12 plug			M
		IP66/67 NEMA 6P	7/8" plug			N
		IP65 NEMA 4	HAN7D plug 90 degrees			P

1) Product Configurator, order code for "Housing, cover seal, cable entry, degree of protection"

T17 housing (hygienic), optional display on the side

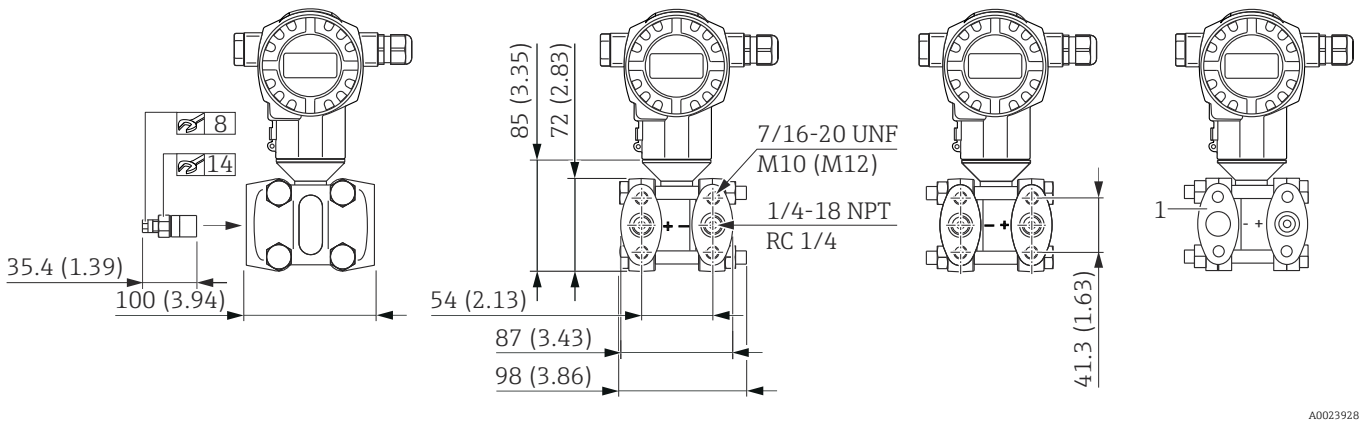


Engineering unit mm (in). Front view, left-hand side view, top view

Material		Degree of protection [1]	Cable entry	Weight in kg (lb)		Option [2]
Housing	Cover seal			with display	without display	
316L	EPDM	IP66/68 NEMA 6P	M20 gland	1.2 (2.65)	1.1 (2.43)	R
		IP66/68 NEMA 6P	G ½" thread			S
		IP66/68 NEMA 6P	NPT ½" thread			T
		IP66/68 NEMA 6P	M12 plug			U
		IP66/68 NEMA 6P	7/8" plug			V

1) Degree of protection IP 68: 1.83 mH_2O for 24 h
2) Product Configurator, order code for "Housing, cover seal, cable entry, degree of protection"

Process connections PMD75 Oval flange, connection 1/4-18 NPT or RC 1/4



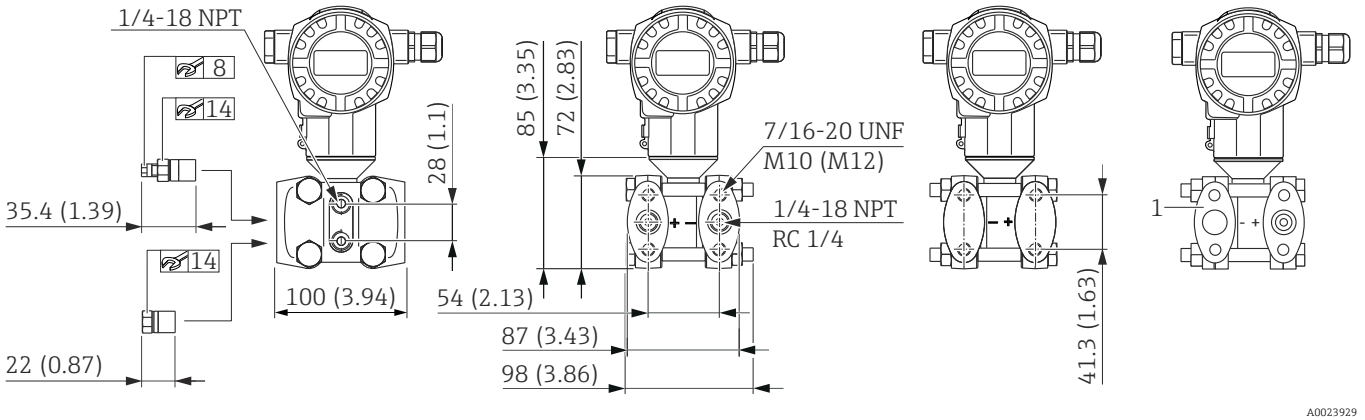
1 blind flange

Unit mm (in). Front view, left-hand side view, right-hand side view. Nuts are always located on the minus side.

Connection	Fixing	Material	Accessories	Weight [1] kg (lbs)	Option [2]
1/4-18 NPT IEC 61518	7/16-20 UNF	Steel C 22.8 (1.0460/Zn5) [3]	incl. 2 vent valves AISI 316L (1.4404)	4.2 (9.26)	B
1/4-18 NPT IEC 61518	7/16-20 UNF	1.4408 / CF3M [4] / AISI 316L			D [5]
		AISI 316L (1.4404) [6]			
1/4-18 NPT IEC 61518	7/16-20 UNF	Alloy C276 (2.4819)	Vent valves Alloy C276 (2.4819) [7]	4.5 (9.92)	F [5]
RC 1/4	7/16-20 UNF	1.4408 / CF3M [4] / AISI 316L	incl. 2 vent valves AISI 316L (1.4404)	4.2 (9.26)	U
		AISI 316L (1.4404) [6]			
1/4-18 NPT IEC 61518	▪ PN 160: M10 ▪ PN 420: M12	Steel C 22.8 (1.0460/Zn5) [3]			1
1/4-18 NPT IEC 61518	▪ PN 160: M10 ▪ PN 420: M12	AISI 316L (1.4404)			2
1/4-18 NPT IEC 61518	▪ PN 160: M10 ▪ PN 420: M12	Alloy C276 (2.4819)	Vent valves Alloy C276 (2.4819) [7]	4.5 (9.92)	3
HP: 1/4-18 NPT IEC 61518 LP: blind flange	7/16-20 UNF	AISI 316L (1.4404)	incl. vent valve AISI 316L (1.4404)	4.2 (9.26)	Q [5]
HP: 1/4-18 NPT IEC 61518 LP: blind flange	7/16-20 UNF	Alloy C276 (2.4819)	without vent valve [7].	4.5 (9.92)	S [5]

1) Weight of process connections without vent valves with 10 mbar (0.15 psi)or 30 mbar (0.45 psi)measuring cell, process connections without vent valves with measuring cells ≥ 100 mbar (1.5 psi) weigh approx. 800 g (28.22 oz) less.
2) Product Configurator, order code for "Process connection"
3) The C22.8 side flanges are coated with anti-corrosion protection (zinc, chrome). To prevent the formation of hydrogen and thereby diffusion through the process membrane, Endress+Hauser recommends the use of 316L side flanges for applications involving water. Hydrogen diffusion through the process membrane causes measurement errors, or can lead to a device failure in extreme cases.
4) Cast equivalent to material AISI 316L
5) These process connections are CRN-approved. If the CRN approval option is ordered, the MWP for the variants without side vent is limited to a MWP of 262 bar (3 800 psi) (at 120 °C (248 °F))
6) For devices with a CSA approval: Product Configurator, order code for "Approval", options D, E, F, U, V, W and X
7) Product Configurator, order code for "Additional options 2"

Process connections PMD75 Oval flange, connection 1/4-18 NPT or RC 1/4, with side vent



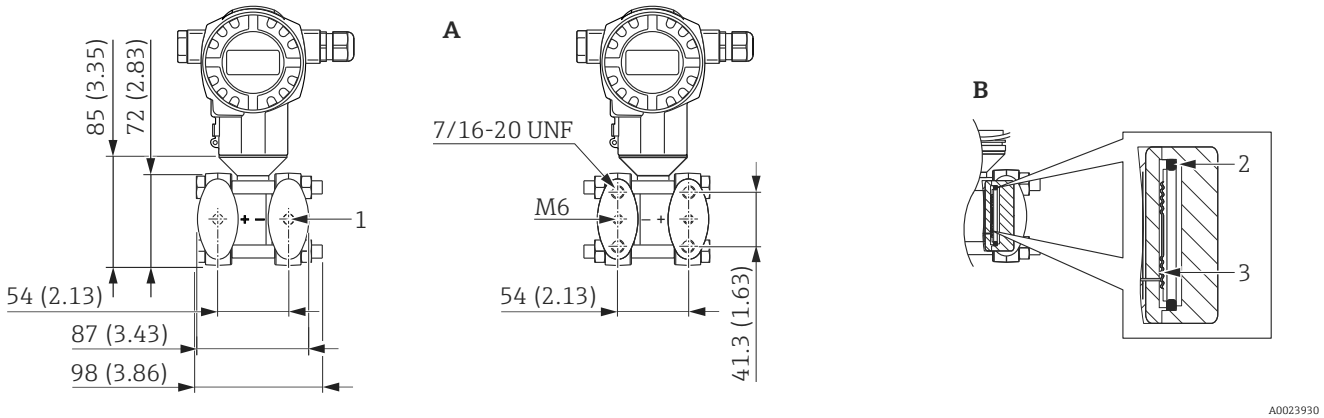
1 blind flange

Unit mm (in). Front view, left-hand side view, right-hand side view. Nuts are always located on the minus side.

Connection	Fixing	Material	Accessories	Weight [1] kg (lbs)	Option [2]
1/4-18 NPT IEC 61518	7/16-20 UNF	Steel C 22.8 (1.0460/Zn5) [3]	4 locking screws and 2 vent valves AISI 316L (1.4404)	4.2 (9.26)	C
1/4-18 NPT IEC 61518	7/16-20 UNF	1.4408 / CF3M [4] / AISI 316L			E [5]
		AISI 316L (1.4404) [6]			
1/4-18 NPT IEC 61518	7/16-20 UNF	Alloy C276 (2.4819)	Vent valves Alloy C276 (2.4819) [7]	4.5 (9.92)	H [5]
RC 1/4	7/16-20 UNF	1.4408 / CF3M [4] / AISI 316L	4 locking screws and 2 vent valves AISI 316L (1.4404)	4.2 (9.26)	V
		AISI 316L (1.4404) [6]			
HP: 1/4-18 NPT IEC 61518 LP: blind flange	7/16-20 UNF	AISI 316L (1.4404)	incl. locking screws and vent valve AISI 316L (1.4404)	4.2 (9.26)	R [5]
HP: 1/4-18 NPT IEC 61518 LP: blind flange	7/16-20 UNF	Alloy C276 (2.4819)	Vent valve Alloy C276 (2.4819) [7]	4.5 (9.92)	T [5]

1) Weight of process connections without vent valves with 10 mbar (0.15 psi)or 30 mbar (0.45 psi)measuring cell, process connections without vent valves with measuring cells ≥ 100 mbar (1.5 psi) weigh approx. 800 g (28.22 oz) less.
2) Product Configurator, order code for "Process connection"
3) The C22.8 side flanges are coated with anti-corrosion protection (zinc, chrome). To prevent the formation of hydrogen and thereby diffusion through the process membrane, Endress+Hauser recommends the use of 316L side flanges for applications involving water. Hydrogen diffusion through the process membrane causes measurement errors, or can lead to a device failure in extreme cases.
4) Cast equivalent to material AISI 316L
5) These process connections are CRN-approved. If the CRN approval option is ordered, the MWP for the variants with side vent is limited to a MWP of 179 bar (2 600 psi) (at 120 °C (248 °F))
6) For devices with a CSA approval: Product Configurator, order code for "Approval", options D, E, F, U, V, W and X
7) Product Configurator, order code for "Additional options 2"

Process connections PMD75 Oval flange, prepared for diaphragm seal mount



A Prepared for diaphragm seal mount
B Position of copper seal
1 Diaphragm seal mount
2 Copper ring seal
3 Process isolating diaphragm

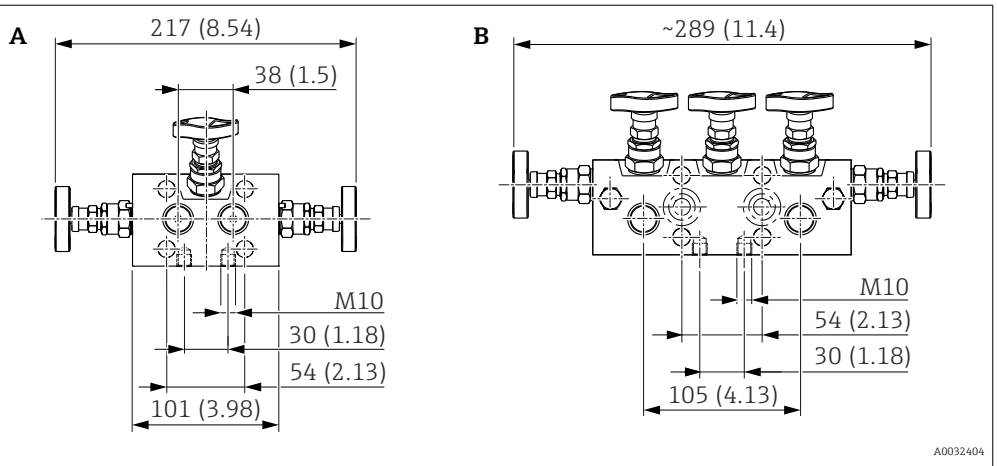
Engineering unit mm (in). Left-hand side view, right-hand side view. Nuts are always located on the minus side.

Material	Option [1]
1.4408 / CF3M [2] / AISI 316L	W
AISI 316L (1.4404) [3]	

1) Product Configurator, order code for "Process connection"
2) Cast equivalent to material AISI 316L
3) For devices with CSA approval: Product Configurator, order code for "Approval", options D, E, F, U, V, W and X

Valve manifold DA63M- (optional)

Endress+Hauser supplies milled valve manifolds via the transmitter's product structure in the following versions:



A 3-way valve manifold
B 5-way valve manifold

Engineering unit mm (in)

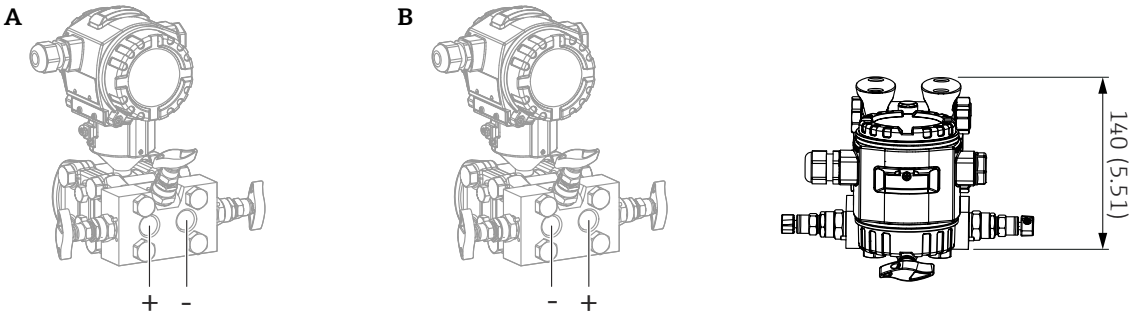
3-way or 5-way valve manifolds in 316L or AlloyC can be
- ordered as an **enclosed** accessory (screws and seals for mounting are enclosed)
- ordered as a **mounted** accessory (mounted valve manifolds are supplied with a documented leakage test).

Certificates ordered with the equipment (e.g. 3.1 material certificate and NACE) and tests (e.g. PMI and pressure test) apply to the transmitter and the valve manifold.

For other details (order option, dimension, weight, materials), see SD01553P/00/EN "Mechanical accessories for pressure measuring devices".

During the operating life of the valves, it may be necessary to re-tighten the packing.

Mounting on valve manifold



Engineering unit mm (in)

Item	Designation	Option [1]
A	Mounting from above on valve manifold	NV
B	Mounting from below on valve manifold	NW

1) Product Configurator, order code for "Accessories mounted"

FMD77: Selecting the process connection and capillary line

The device can be fitted with different process connections on the high-pressure side (HP) and on the low-pressure side (LP).

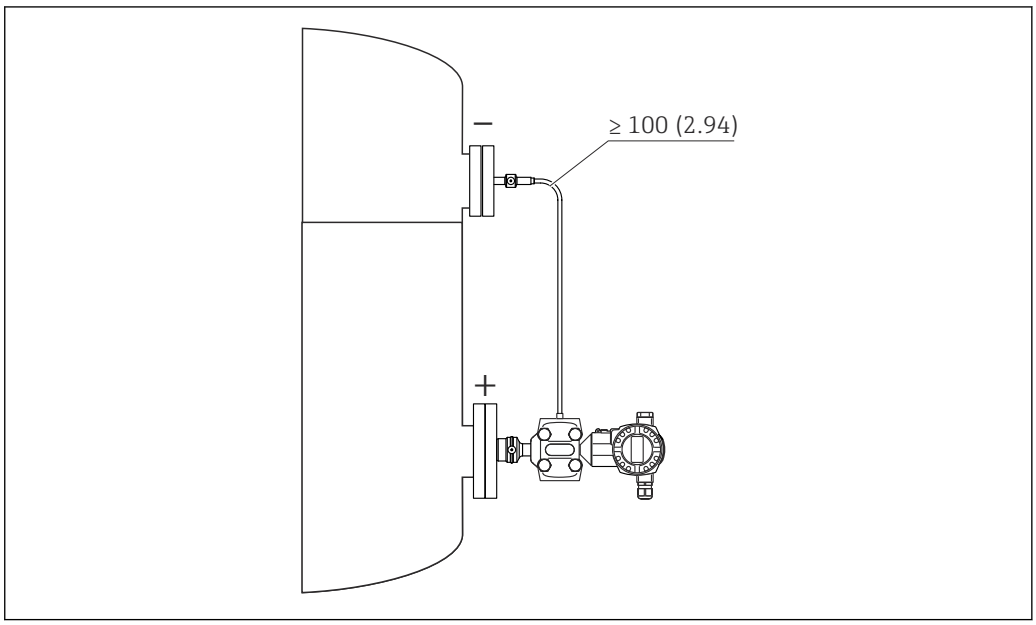
The FMD77 can also be fitted with capillary lines on the low-pressure side (LP).

When using diaphragm seal systems with a capillary, sufficient strain relief must be provided to prevent the capillary from bending (capillary bending radius ≥ 100 mm (3.94 in)).

Example:
- Process connection on high-pressure side = DN80 flange
- Process connection on low-pressure side = DN50 flange

Your benefits:
- Thanks to the variety of order options, the devices can be optimally adapted to the given installation situation
- Reduced costs due to optimum system design
- Easier installation due to adjusted length of capillary line
- Easier adaptation to existing installation situations

Ordering information:
- Process connections are indicated in the relevant section by HP (high-pressure side) and LP (low-pressure side)
- Order details for capillary lengths → 📄 87



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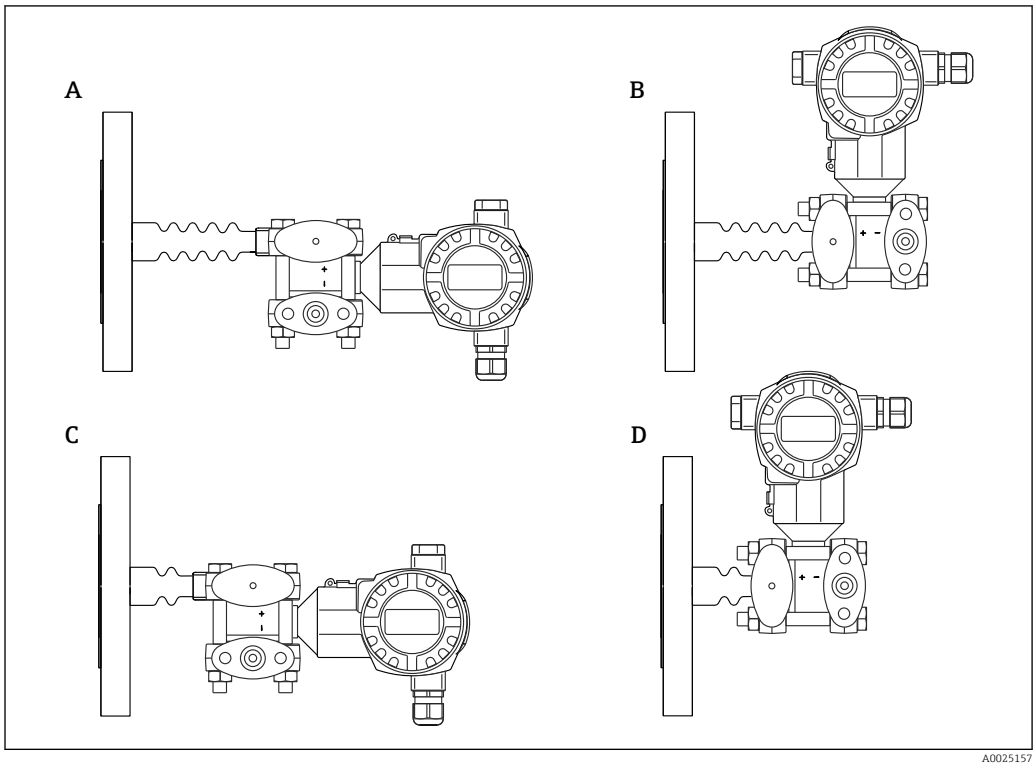
Due to the use of different process connections and capillary lines, it is essential that the device be designed/ordered using the "Applicator Sizing Diaphragm Seal" selection tool, which is available free of charge. Additional information can be found in the "Planning instructions for diaphragm seal systems" section → 📄 96

FMD77 - Overview



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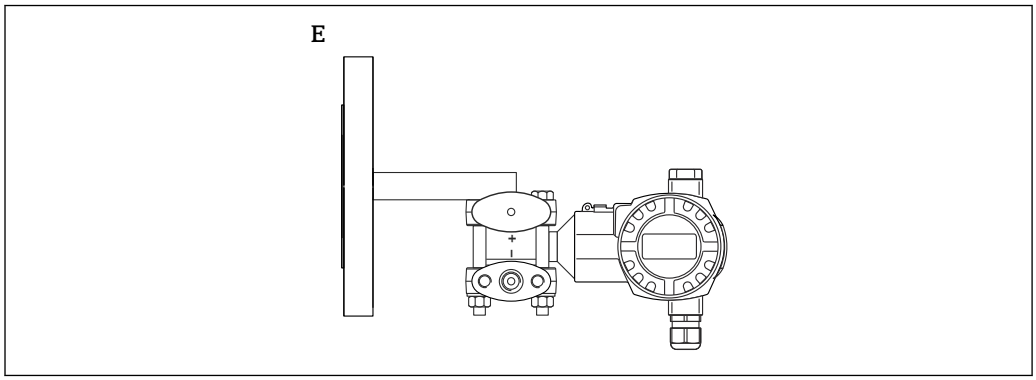
Item	Design	Temperature isolator	Page	Option [1]
A	Transmitter horizontal	long	→ 53	MA [2]
B	Transmitter vertical	long	→ 53	MB
C	Transmitter horizontal	short	→ 53	MC
D	Transmitter vertical	short	→ 53	MD

1) Product Configurator, order code for "Design; temperature isolator"
2) Standard



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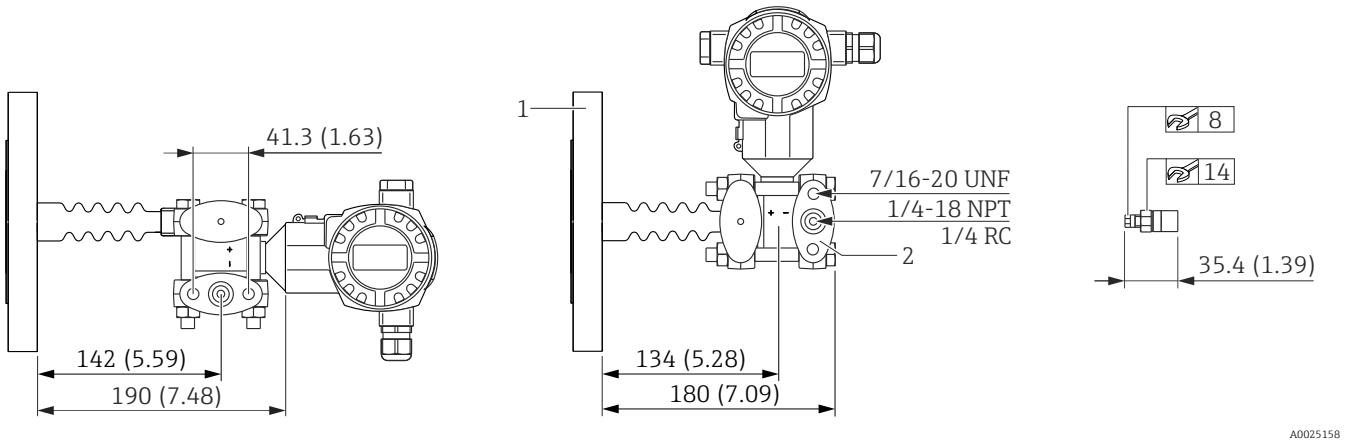
Item	Design	Page	Option [1]
E	U-bracket, Transmitter horizontal (for devices which require a CRN approval)	→ 54	In combination with CSA approval.

1) Product Configurator, order code for "Process connection"

Process connections FMD77 with diaphragm seal, high-pressure side

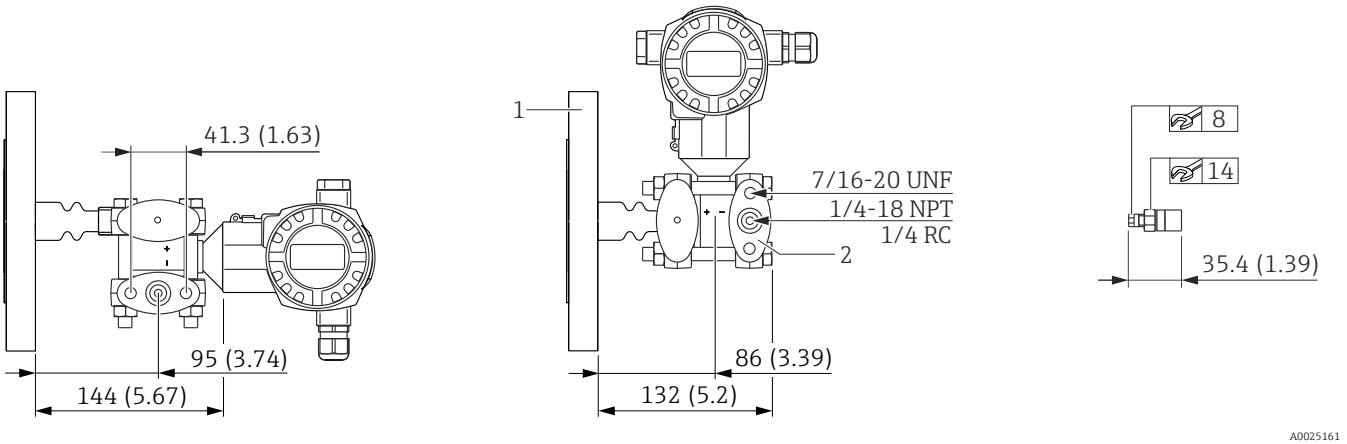
Device with long temperature isolator



1 High-pressure side: see "Process connections FMD77 with diaphragm seal, high-pressure side" section
2 Low-pressure side: see "Process connections FMD77 with diaphragm seal, low-pressure side" section → 62

Engineering unit mm (in).

Device with short temperature isolator

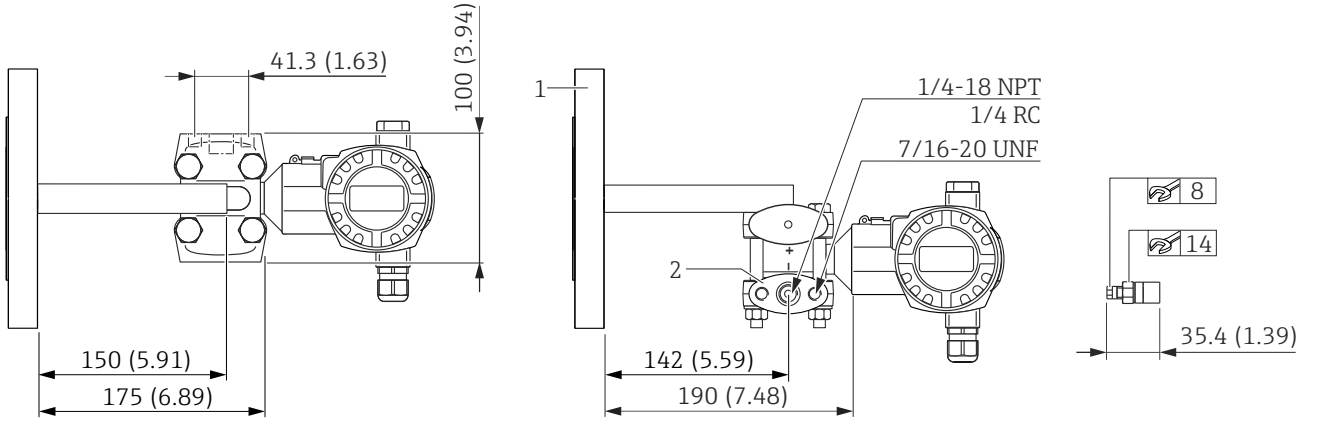


1 High-pressure side: see "Process connections FMD77 with diaphragm seal, high-pressure side" section
2 Low-pressure side: see "Process connections FMD77 with diaphragm seal, low-pressure side" section → 62

Engineering unit mm (in).

Process connections FMD77 with diaphragm seal, high-pressure side

U-bracket with CRN approval



1 High-pressure side: see "Process connections FMD77 with diaphragm seal, high-pressure side" section
2 Low-pressure side: see "Process connections FMD77 with diaphragm seal, low-pressure side" section → 62

Engineering unit mm (in).

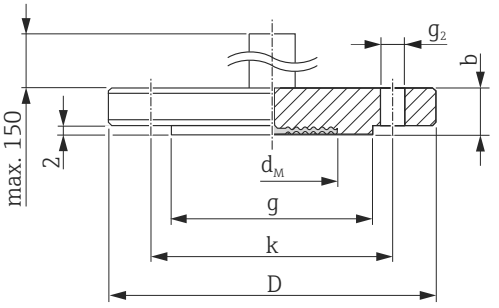
Explanation of terms

- DN or NPS or A = alphanumeric designation of the flange size
- PN or Class or K = alphanumeric pressure rating of a component

Process connections FMD77 with diaphragm seal

- The following drawings illustrate how the system works in principle. In other words, the dimensions of a diaphragm seal supplied may deviate from the dimensions given in this document.
- Observe the information in the "Planning instructions for diaphragm seal systems" section → 96
- For further information please contact your local Endress+Hauser Sales Center.

EN flanges, connection dimensions in accordance with EN 1092-1



D *Diameter of flange*
b *Thickness*
g *Raised face*
k *Pitch diameter*
g_2 *Diameter of hole*
d_M *Max. diameter of process membrane*

Unit mm

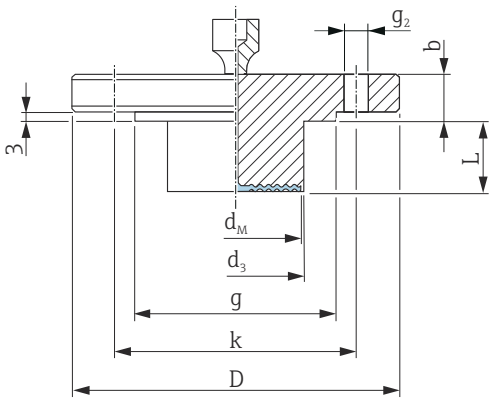
Flange [1) 2) 3)]						Boltholes			Diaphragm seal	Option	
DN	PN	Form	D	b	g	Quantity	g_2	k	Weight		
			[mm]	[mm]	[mm]		[mm]	[mm]	[kg (lb)]	HP [4)]	LP [5)]
50	10-40	B1	165	20	102	4	18	125	3.0 (6.62)	A [6) 7)]	TA [6) 7)]
80	10-40	B1	200	24	138	8	18	160	5.2 (11.47)	B [6) 7)]	TB [6) 7)]
100	10-16	B1	220	20	–	8	18	180	4.8 (10.58)	F	TC
100	25-40	B1	235	24	162	8	22	190	6.7 (14.77)	G	TD

1) Material: AISI 316L
2) The roughness of the surface in contact with the medium including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum, gold > 316L or PTFE is R_a< 0.8 µm (31.5 µin). Lower surface roughness available on request.
3) The flange raised face is made of the same material as the process membrane.
4) Product Configurator, order code for "Process connection, HP/HP+LP:"
5) Product Configurator, order code for "Alternative process connection LP side:"
6) Alternatively available with the TempC process membrane.
7) Alternatively available with gold-coated TempC process membrane (Product Configurator, order code for "Membrane material" option "G/D").

Maximum diameter of the process membrane $Ød_M$

DN	PN	$Ød_M$ (mm)					
		316L TempC	316L	Alloy C276	Tantalum	Monel (Alloy 400)	PTFE
50	PN 10-40	61	58	57	60	59	52
DN 80	PN 10-40	89	89	89	92	89	80
DN 100	PN 10-16	-	80	90	92	89	-
DN 100	PN 25-40	-	80	90	92	89	-

EN flanges with barrel, connection dimensions as per EN 1092-1



A0023947

D *Diameter of flange*
b *Thickness*
d_3 *Barrel diameter*
L *Barrel length*
g *Raised face*
k *Pitch diameter*
g_2 *Diameter of hole*
d_M *Max. diameter of process membrane*

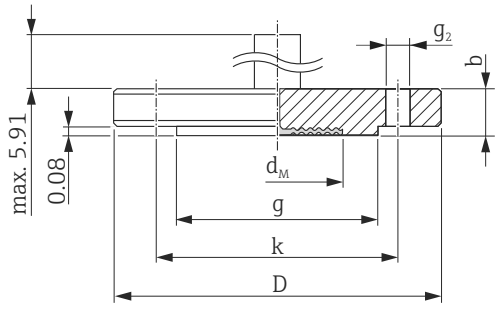
Unit mm

Flange [1) 2)]								Boltholes			Diaphragm seal		Option [3)] (HP + LP)
DN	PN	Form	D	b	g	L	d_3	Quantity	g_2	k	d_M	Weight	
			[mm]	[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[kg (lb)]	
80	10-40	B1	200	24	138	50	76	8	18	160	72	6.2 (13.67)	C
						100						6.7 (14.77)	
						200						7.8 (17.20)	

1) Material: AISI 316L
2) In the case of process membranes made of Alloy C276, Monel or tantalum, the raised face of the flange and the barrel pipe are made of 316L.
3) Product Configurator, order code for "Process connection, HP/HP+LP:"

Process connections FMD77 with diaphragm seal

ASME flanges, connection dimensions in accordance with B 16.5, raised face RF



D *Diameter of flange*
b *Thickness*
g *Raised face*
k *Pitch diameter*
g_2 *Diameter of hole*
d_M *Max. diameter of process membrane*

Unit in

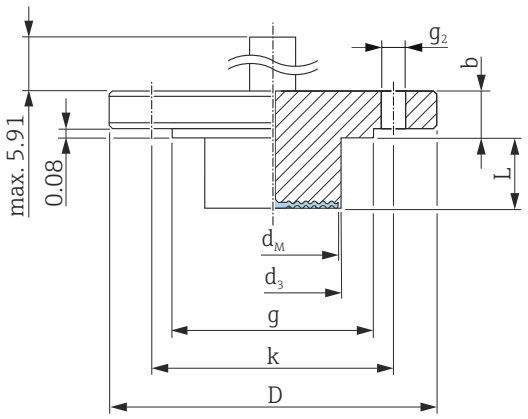
Flange [1) 2) 3)]					Boltholes			Diaphragm seal	Option	
NPS	Class	D	b	g	Quantity	g_2	k	Weight		
[in]	[lb./sq.in]	[in]	[in]	[in]		[in]	[in]	[kg (lb)]	HP [4)]	LP [5)]
2	150	6	0.75	3.62	4	0.75	4.75	2.6 (5.73)	N [6) 7)]	TE [6) 7)]
2	300	6.5	0.88	3.62	8	0.75	5	3.4 (7.5)	O [6) 7)]	TF [6) 7)]
2	400/600	6.5	1	3.62	8	0.75	5	4.3 (9.48)	J	-
3	150	7.5	0.94	5	4	0.75	6	5.1 (11.25)	P [6) 7)]	TG [6) 7)]
3	300	8.25	1.12	5	8	0.75	6	7.0 (15.44)	R [6) 7)]	TH [6) 7)]
4	150	9	0.94	6.19	8	0.75	7.5	7.2 (15.88)	T	TI
4	300	10	1.25	6.19	8	0.88	7.88	11.7 (25.8)	W	TJ

1) Material: AISI 316/316L. Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)
2) The roughness of the surface in contact with the media, including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum, gold or PTFE is R_a< 0.8 µm (31.5 µin). Lower surface roughness available on request.
3) The flange raised face is made of the same material as the process membrane.
4) Product Configurator, order code for "Process connection, HP/HP+LP:"
5) Product Configurator, order code for "Alternative process connection LP side:"
6) Alternatively available with the TempC process membrane.
7) Alternatively available with gold-coated TempC process membrane (Product Configurator, order code for "Membrane material" option "G/D").

Maximum diameter of the process membrane $Ød_M$

NPS	Class	$Ød_M$ (in)				
		316L TempC	316L	Alloy C276	Tantalum	Monel (Alloy 400)
2	150	2.40	-	2.44	2.44	2.44
2	300	2.40	-	2.44	2.44	2.44
2	400/600	-	2.05	2.44	2.44	2.44
3	150	3.50	-	3.62	3.62	3.62
3	300	3.50	-	3.62	3.62	3.62
4	150	-	3.15	3.62	3.62	3.62
4	300	-	3.15	3.62	3.62	3.62

ASME flanges with barrel, connection dimensions as per ASME B 16.5, raised face RF



D *Diameter of flange*
b *Thickness*
d_3 *Barrel diameter*
L *Barrel length*
g *Raised face*
k *Pitch diameter*
g_2 *Diameter of hole*
d_M *Max. diameter of process membrane*

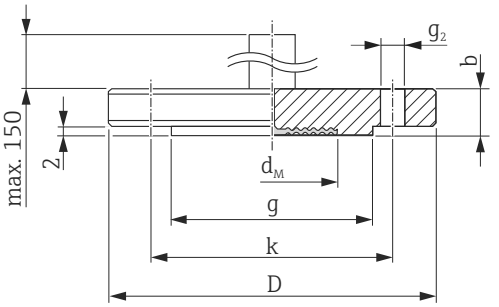
Unit in

Flange [1) 2)]							Boltholes			[3)]	Weight	Option [4)] (HP + LP)
NPS	Class	D	b	g	L	d_3	Quantity	g_2	k	d_M		
[in]	[lb./sq.in]	[in]	[in]	[in]	[in]	[in]		[in]	[in]		[kg (lb)]	
3	150	7.5	0.94	5	2	2.99	4	0.75	6	2.83	6 (13.23)	Q
					4						6.6 (14.55)	
					6						7.1 (15.66)	
					8						7.7 (16.98)	

1) Material: AISI 316/316L
2) In the case of process membranes made of Alloy C276, Monel or tantalum, the raised face of the flange and the barrel pipe are made of 316L.
3) Diaphragm seal
4) Product Configurator, order code for "Process connection, HP/HP+LP:"

Process connections FMD77 with diaphragm seal

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



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D *Diameter of flange*
b *Thickness*
g *Raised face*
k *Pitch diameter*
g_2 *Diameter of hole*
d_M *Max. diameter of process membrane*

Unit mm

Flange [1) 2) 3)]					Boltholes			Diaphragm seal	Option	
A	K	D	b	g	Quantity	g_2	k	Weight		
		[mm]	[mm]	[mm]		[mm]	[mm]	[kg (lb)]	HP [4)]	LP [5)]
50	10	155	16	96	4	19	120	2.3 (5.07)	X	TK
80	10	185	18	126	8	19	150	3.5 (7.72)	1	TL
100	10	210	18	151	8	19	175	4.7 (10.36)	4	TM

1) Material: AISI 316
2) The roughness of the surface in contact with the medium including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum or PTFE is R_a< 0.8 µm (31.5 µin). Lower surface roughness available on request.
3) The flange raised face is made of the same material as the process membrane.
4) Product Configurator, order code for "Process connection, HP/HP+LP:"
5) Product Configurator, order code for "Alternative process connection LP side:"

Maximum diameter of the process membrane Ød$_M$

A [1)]	K [2)]	Ød$_M$ (mm)					
		316L TempC	316L	Alloy C276	Tantalum	Monel (Alloy 400)	PTFE
50	10	-	52	62	60	59	-
80	10	-	80	-	-	-	-
100	10	-	80	-	-	-	-

1) Alphanumeric designation of the flange size.
2) Alphanumeric pressure rating of a component.

Process connections FMD77 with diaphragm seal, low-pressure side

Process connection low-pressure side	Material	Seal	Option [1]
Fixing: 7/16 – 20 UNF, process membrane low-pressure side AISI 316L			
1/4 – 18 NPT IEC 61518	C22.8	FKM	B
1/4 – 18 NPT IEC 61518,	AISI 316L	FKM	D
1/4 – 18 NPT IEC 61518	Alloy C276	FKM	F
1/4 – 18 NPT IEC 61518	AISI 316L	PTFE+C4-ring	H
1/4 – 18 NPT IEC 61518	Alloy C276	PTFE+C4-ring	J
1/4 – 18 NPT IEC 61518	AISI 316L	EPDM	K
1/4 – 18 NPT IEC 61518	Alloy C276	EPDM	L
1/4 – 18 NPT IEC 61518	AISI 316L	Kalrez	M
1/4 – 18 NPT IEC 61518	Alloy C276	Kalrez	N
1/4 – 18 NPT IEC 61518	AISI 316L	Chemraz	P
1/4 – 18 NPT IEC 61518	Alloy C276	Chemraz	Q
1/4 – 18 NPT IEC 61518	AISI 316L	FKM, cleaned from oil+grease	S
1/4 – 18 NPT IEC 61518	AISI 316L	FKM, cleaned for oxygen service	T
RC 1/4	AISI 316L	FKM	U
LP diaphragm seal and capillary	AISI 316L	welded	1

1) Product Configurator, order code for "Process connection, LP side; seal:"

FMD78: Selecting the process connection and capillary line

The device can be fitted with different process connections on the high-pressure side (HP) and on the low-pressure side (LP).

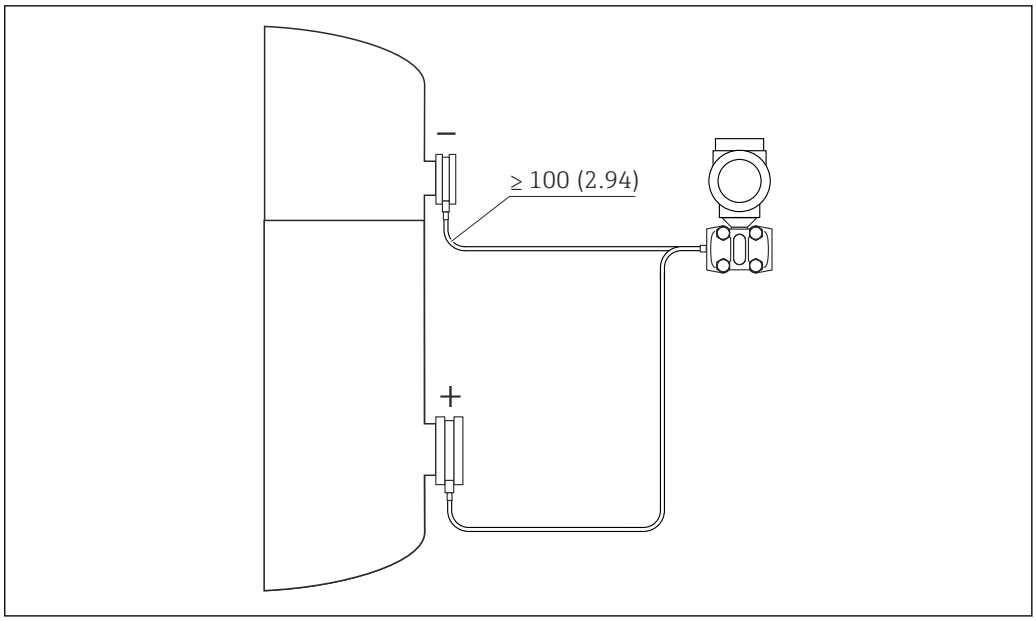
The FMD78 can also be fitted with different capillary lengths on the high-pressure side (HP) and on the low-pressure side (LP).

When using diaphragm seal systems with a capillary, sufficient strain relief must be provided to prevent the capillary from bending (capillary bending radius ≥ 100 mm (3.94 in)).

Example:
- Process connection on high-pressure side = DN80 flange
- Process connection on low-pressure side = DN50 flange
- Capillary length on high-pressure side = 2 m (6.6 ft)
- Capillary length on low-pressure side = 5 m (16 ft)

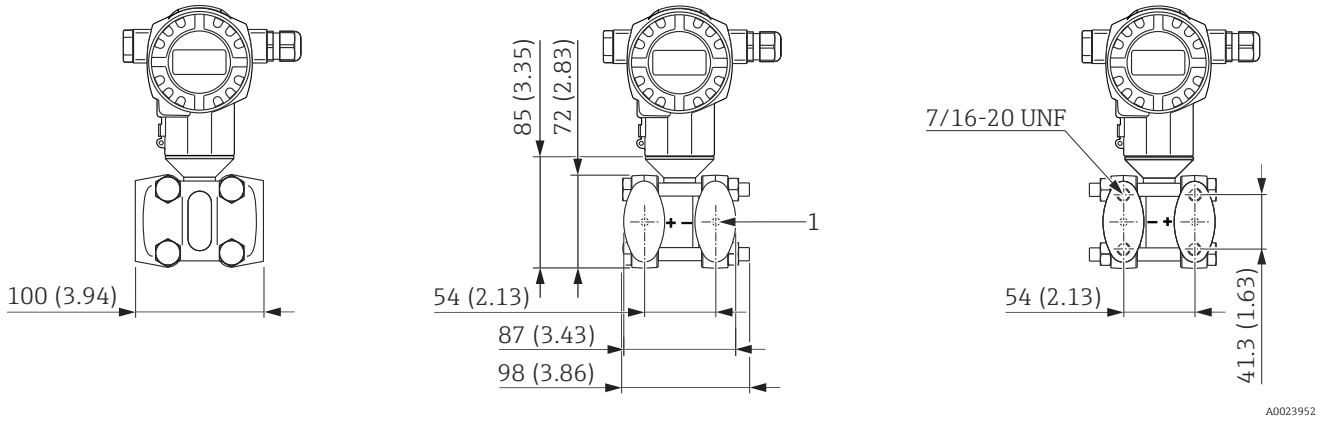
Your benefits:
- Thanks to the variety of order options, the devices can be optimally adapted to the given installation situation
- Reduced costs due to optimum system design
- Easier installation due to adjusted length of capillary on low-pressure side and high-pressure side
- Easier adaptation to existing installation situations

Ordering information:
- Process connections are indicated in the relevant section by HP (high-pressure side) and LP (low-pressure side)
- Order details for capillary lengths → 📄 87



Due to the use of different process connections and capillary lines, it is essential that the device be designed/ordered using the "Applicator Sizing Diaphragm Seal" selection tool, which is available free of charge. Additional information can be found in the "Planning instructions, diaphragm seal systems" section → 96

FMD78 basic device



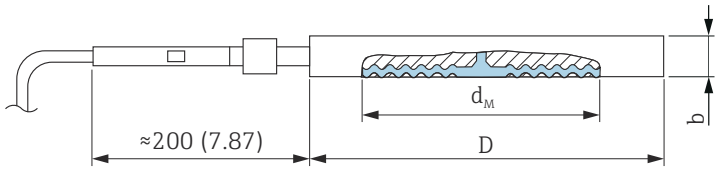
1 Diaphragm seal mount

Engineering unit mm (in). Front view, left-hand side view, right-hand side view. Nuts are always located on the minus side.

Process connections FMD78 with diaphragm seal

- The following drawings illustrate how the system works in principle. In other words, the dimensions of a diaphragm seal supplied may deviate from the dimensions given in this document.
- Observe the information in the "Planning instructions for diaphragm seal systems" section → 🖹 96
- For further information please contact your local Endress+Hauser Sales Center.

Pancake seal



D *Diameter*
d_M *Max. diameter of process membrane*
b *Thickness*

Unit mm (in)

Flange					Diaphragm seal	Option	
Material	DN	PN	D	b	Weight of two diaphragm seals		
					[kg (lb)]	HP [1]	LP [2]
			[mm]	[mm]			
AISI 316L	50	16-400 [3]	102	20 - 22	2.6 (5.73)	UF [4]	UL
	80	16-400	138	20 - 22	4.6 (10.14)	UH	UM
	100	16-400	162	20 - 22	6.2 (13.67)	UJ	UN

1) Product Configurator, order code for "Process connection, HP/HP+LP:"
2) Product Configurator, order code for "Alternative process connection LP side:"
3) For PTFE coating MWP = 250 bar (3 625 psi), for details see "Application of PTFE foil" → 🖹 39
4) With TempC process membrane

Flange					Diaphragm seal	Option	
Material	NPS	Class	D	b	Weight of two diaphragm seals		
					[kg (lb)]	HP [1]	LP [2]
AISI 316L	2	150-2500	3.9	0.79 - 0.87	2.6 (5.73)	VF [3]	UP
	3	150-2500	5	0.79 - 0.87	4.6 (10.14)	VH [3]	UR
	4	150-2500	6.22	0.79 - 0.87	6.2 (13.67)	VJ	US

1) Product Configurator, order code for "Process connection, HP/HP+LP:"
2) Product Configurator, order code for "Alternative process connection LP side:"
3) With TempC process membrane

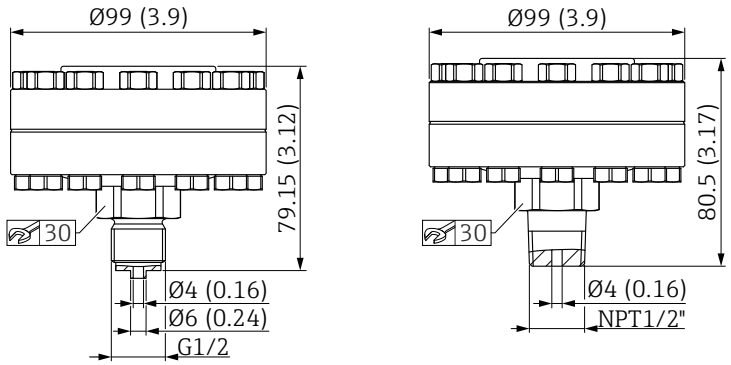
Maximum diameter of the process membrane $Ød_M$

DN	PN	$Ød_M$ (mm)					
		316L TempC	316L	Alloy C276	Tantalum	Monel (Alloy 400)	PTFE
50	16-400	61	58	62	60	59	52
80	16-400	89	89	90	92	89	80
100	16-400	-	89	90	92	89	-

NPS	Class	$Ød_M$ (in)					
in		316L TempC	316L	Alloy C276	Tantalum	Monel (Alloy 400)	PTFE
2	150-2500	2.40	2.05	2.32	2.36	2.32	2.05
3	150-2500	3.50	3.50	3.54	3.62	3.50	3.14
4	150-2500	-	3.14	3.50	3.62	3.50	-

Process connections FMD78 with diaphragm seal

Separator with TempC process membrane

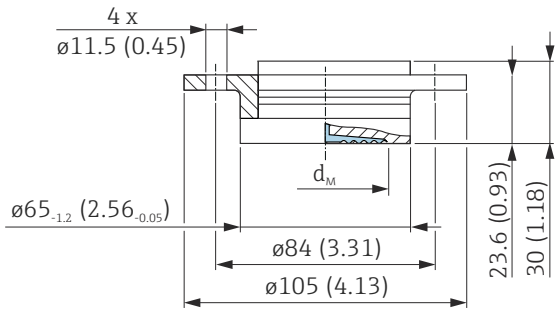


Unit mm (in)

Item	Designation	Material	Measuring range	PN	Weight	Option [1]
			bar (psi)		kg (lb)	
A	Threaded, ISO228 G½ EN837 with metal seal (silver-plated) −60 to +400 °C (−76 to +752 °F)	AISI 316L, screws made of A4	≤ 40 (580)	40	2.35 kg (5.18 lb)	GA
B	Threaded, ASME MNPT ½ with metal seal (silver-plated) −60 to +400 °C (−76 to +752 °F)				2.35 kg (5.18 lb)	RL

1) Product Configurator, order code for "Process connection"

DRD DN50 (65 mm)



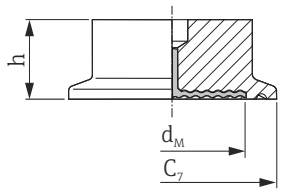
d_M *Max. diameter of process membrane*

Unit mm (in)

Material [1]	PN	d_M		Weight	Option	
		Standard	TempC			
		[mm]	[mm]	[kg (lb)]	HP [2]	LP [3]
AISI 316L	25	50	48	0.75 (1.65)	TK [4] [5]	UH [4] [5]

1) Surface roughness of the surfaces in contact with the medium R_a < 0.76 µm (29.9 µin) as standard.
2) Product Configurator, order code for "Process connection, HP/HP+LP:"
3) Product Configurator, order code for "Alternative process connection LP side:"
4) Alternatively available with TempC process membrane.
5) Including slip-on flange.

Tri-Clamp ISO 2852



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C7 *Diameter of flange*
h *Height*
d_M *Max. diameter of process membrane*

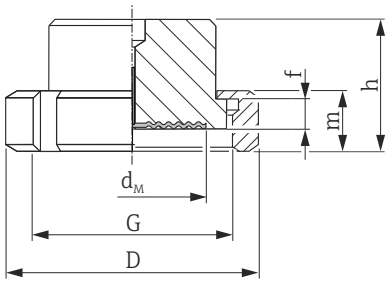
Unit mm (in)

Material [1]	DN ISO 2852	DN DIN 32676	NPS	C_7	d_M		h	Weight	Option	
					Standard	TempC				
			[in]	[mm]	[mm]	[mm]	[mm]	[kg (lb)]	HP [2]	LP [3]
AISI 316L	25 / 33.7	25	1	50.5	24	-	37	0.32 (0.71)	TB	UA
	38	40	1 ½	50.5	36	36	30	1 (2.21)	TC [4] [5]	UB [4] [5]
	51 / 40	50	2	64	48	41	30	1.1 (2.43)	TD [4] [5]	UC [4] [5]
	63.5	-	2 ½	77.5	61	61	30	0.7 (1.54)	TE [6]	UD [6]
	76.1	65	3	91	73	61	30	1.2 (2.65)	TF [5]	UE [5]

1) Surface roughness of the surfaces in contact with the medium R_a < 0.76 µm (29.9 µin) as standard. Lower surface roughness available on request.
2) Product Configurator, order code for "Process connection, HP/HP+LP:"
3) Product Configurator, order code for "Alternative process connection LP side:"
4) Optionally available diaphragm seal version for use in biochemical processes, surfaces in contact with medium R_a < 0.38 µm (15 µin)), electropolished; order using order code for "Additional options", option "O".
5) Alternatively available with TempC process membrane.
6) With TempC process membrane

Process connections FMD78 with diaphragm seal

SMS nozzle with coupling nut



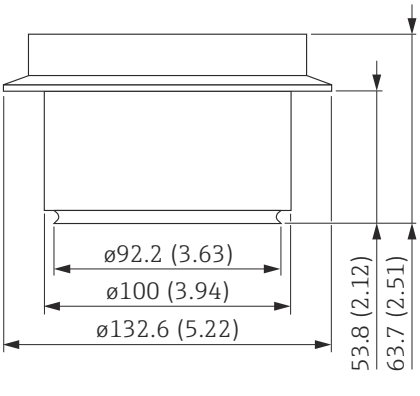
D *Diameter*
f *Nozzle height*
G *Thread*
h *Height*
m *Height*
d_M *Max. diameter of process membrane*

Unit mm (in)

Material [1]	NPS	PN	D	f	G	m	h	d_M	Weight	Option	
			[mm]	[mm]		[mm]	[mm]	[mm]	[kg (lb)]	HP [2]	LP [3]
AISI 316L	1 ½	25	74	4	Rd 60 – 1/6	25	57	36	0.65 (1.43)	TH [4]	UF [4]
	2	25	84	4	Rd 70 – 1/6	26	62	48	1.05 (2.32)	TI [4]	UG [4]

1) Roughness of surfaces in contact with the medium R_a < 0.76 µm (29.9 µin) as standard.
2) Product Configurator, order code for "Process connection, HP/HP+LP:"
3) Product Configurator, order code for "Alternative process connection LP side:"
4) With TempC process membrane

Hygienic connection, sanitary tank spud, barrel (extended diaphragm seal) 2"

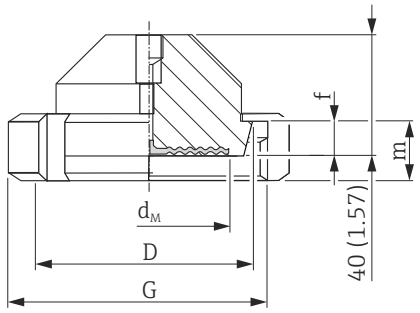


Unit mm (in)

Material [1]	Weight kg (lbs)	Option [2]
AISI 316L	2.5 (5.51)	WH [3] [4]

1) Surface roughness of the surfaces in contact with the medium R_a < 0.76 µm (29.9 µin) as standard. Lower surface roughness on request.
2) Product Configurator, order code for "Process connection, HP/HP+LP:"
3) With TempC process membrane
4) EPDM seal enclosed

Taper adapter with grooved union nut, DIN 11851



D *Diameter*
f *Nozzle height*
G *Thread*
m *Height*
d_M *Max. diameter of process membrane*

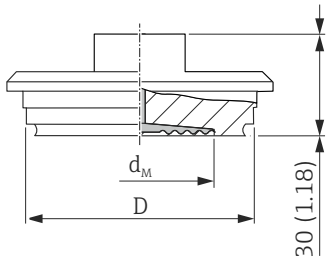
Unit mm (in)

Material 1)	Taper adapter				Slotted nut		Diaphragm seal			Option	
							d_M		Weight		
	DN	PN	D	f	G	m	Standard	TempC			
		[bar]	[mm]	[mm]		[mm]	[mm]	[mm]	[kg (lb)]	HP 2)	LP 3)
AISI 316L	32	40	50	10	Rd 58 x 1/6"	21	32	28	0.45 (0.99)	MI 4)	TP 4)
	40	40	56	10	Rd 65 x 1/6"	21	38	36	0.45 (0.99)	MZ 4)	TU 4)
	50	25	68.5	11	Rd 78 x 1/6"	19	52	48	1.1 (2.43)	MR 5)	TR 5)
	65	25	86	12	Rd 95 x 1/6"	21	66	61	2.0 (4.41)	MS 5)	TS 5)
	80	25	100	12	Rd 110 x 1/4"	26	81	61	2.55 (5.62)	MT 5)	TT 5)

1) Roughness of wetted surfaces R_a < 0.76 µm (29.9 µin) as standard.
2) Product Configurator, order code for "Process connection, HP/HP+LP:"
3) Product Configurator, order code for "Alternative process connection LP side:"
4) With TempC process membrane
5) Alternatively available with TempC process membrane.

Process connections FMD78 with diaphragm seal

Varivent for pipes



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D Diameter
d_M Max. diameter of process membrane

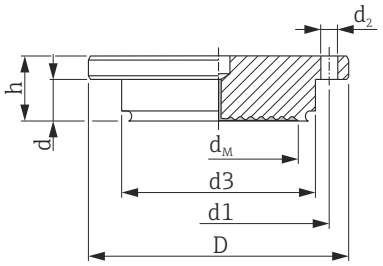
Unit mm (in)

Material [1]	Designation	DN	PN	D	d_M		Weight	Option	
					Standard	TempC			
				[mm]	[mm]	[mm]	[kg (lb)]	HP [2]	LP [3]
AISI 316L	Type F for pipes	25 - 32	40	50	34	36	0.4 (0.88)	TU [4]	UK [4]
AISI 316L	Type N for pipes	40 - 162	40	68	58	61	0.8 (1.76)	TR [5]. [6]	-

1) Roughness of surfaces in contact with the medium R_a < 0.76 µm (29.9 µin) as standard.
2) Product Configurator, order code for "Process connection, HP/HP+LP:"
3) Product Configurator, order code for "Alternative process connection LP side:"
4) With TempC process membrane
5) Optionally available diaphragm seal version for use in biochemical processes, surfaces in contact with medium R_a< 0.38 µm (15 µin)), electropolished; order using order code for "Additional options", option "O"
6) Alternatively available with TempC process membrane.

Process connections FMD78 with diaphragm seal

NEUMO BioControl



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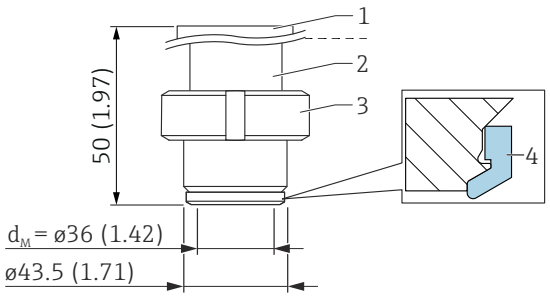
D Diameter
d Height
d1/ d3 diameter
d_2 *Diameter of hole*
d_M *Max. diameter of process membrane*

Unit mm (in)

Material [1]	NEUMO BioControl (Process temperature range: −10 to +200 °C (+14 to +392 °F))								Diaphragm seal			Option	
									d_M		Weight		
	DN [2]	PN [3]	D	d	d_2	d_3	d_1	h	Standard	TempC			
		[bar]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg (lb)]	HP [4]	LP [5]
AISI 316L	50	16	90	-	4 x Ø 9	50	70	27	40	36	1.1 (2.43)	S4 [6]	TV
	80	16	140	25	4 x Ø 11	87.4	115	37	61	61	2.6 (5.73)	S6 [6]	TW

1) Surface roughness of the surfaces in contact with the medium R_a < 0.76 µm (29.9 µin) as standard.
2) Nominal diameter
3) Nominal pressure
4) Product Configurator, order code for "Process connection, HP/HP+LP:"
5) Product Configurator, order code for "Alternative process connection LP side:"
6) With TempC process membrane

Universal process adapter



1 Top section: AISI 316L (1.4404)
2 Bottom section: AISI 316L (1.4435)
3 Slotted nut: AISI 304 (1.4301) or AISI 304L (1.4307)
4 Molded seal: Silicone

Unit mm (in)

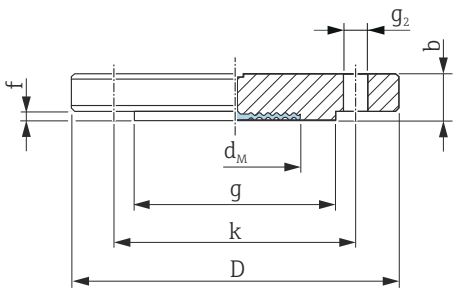
- The roughness of the surface in contact with the medium R_a < 0.76 µm (30 µin)
- Temperature operating range: −60 to +150 °C (−76 to +302 °F)
- Silicone form seal: FDA 21CFR177.2600/USP Class VI, order number: 52023572

Designation	PN	Weight	Option	
		[kg (lb)]	HP [1]	LP [2]
Universal process adapter Silicone form seal (4)	10	0.8 (1.76)	00 [3]	UT

1) Product Configurator, order code for "Process connection, HP/HP+LP:"
2) Product Configurator, order code for "Alternative process connection LP side:"
3) With TempC process membrane.

Process connections FMD78 with diaphragm seal

EN flanges, connection dimensions in accordance with EN 1092-1 / JIS flanges, connection dimensions in accordance with JIS B 2220 BL



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D *Diameter of flange*
b *Thickness*
g *Raised face*
f *Thickness of raised face*
k *Pitch diameter*
g_2 *Diameter of hole*

Unit mm

Flange [1) 2) 3)]							Boltholes			Diaphragm seal	Option	
DN	PN	Form	D	b	g	f	Quantity	g_2	k	Weight		
			[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[kg (lb)]	HP [4)]	LP [5)]
50	10-40	B1	165	20	102	3	4	18	125	3.0 (6.62)	B3 [6) 7)]	TA [6) 7)]
80	10-40	B1	200	24	138	3.5	8	18	160	5.3 (11.69)	B5 [6) 7)]	TB [6) 7)]
100	10-16	B1	220	20	158	4	8	18	180	4.5 (9.92)	BT	TC
100	25-40	B1	235	24	162	5	8	22	190	7 (15.44)	B6	TD

1) Material: AISI 316L
2) The roughness of the surface in contact with the medium, including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum, gold or PTFE, is R_a< 0.8 µm (31.5 µin). Lower surface roughness available on request.
3) The flange raised face is made of the same material as the process membrane.
4) Product Configurator, order code for "Process connection, HP/HP+LP:"
5) Product Configurator, order code for "Alternative process connection LP side:"
6) Alternatively available with TempC process membrane.
7) Alternatively available with gold-coated TempC process membrane (Product Configurator, order code for "Membrane material" option "G").

Flange [1) 2) 3)]						Boltholes			Diaphragm seal	Option	
A	K	D	b	g	f	Quantity	g_2	k	Weight		
		[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[kg (lb)]	HP [4)]	LP [5)]
50	10	155	16	96	2	4	19	120	2.3 (5.07)	KF	TK
80	10	185	18	127	2	8	19	150	3.3 (7.28)	KL	TL
100	10	210	18	151	2	8	19	175	4.4 (9.7)	KH	TM

1) Material: AISI 316L
2) The roughness of the surface in contact with the medium, including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum or PTFE is R_a < 0.8 µm (31.5 µin). Lower surface roughness available on request.
3) The flange raised face is made of the same material as the process membrane.
4) Product Configurator, order code for "Process connection, HP/HP+LP:"
5) Product Configurator, order code for "Alternative process connection LP side:"

Maximum diameter of the process membrane $Ød_M$

DN	PN	$Ød_M$ (mm)					
		316L TempC	316L	Alloy C276	Tantalum	Monel (Alloy 400)	PTFE
50	PN 10-40	61	58	57	60	59	52
DN 80	PN 10-40	89	89	89	92	89	80
DN 100	PN 10-16	-	80	90	92	89	-
DN 100	PN 25-40	-	80	90	92	89	-

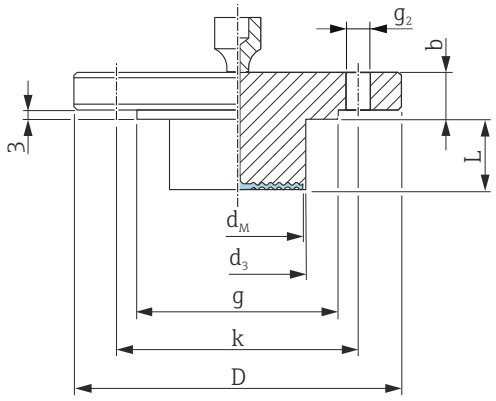
Maximum diameter of the process membrane $Ød_M$

A [1]	K [2]	$Ød_M$ (mm)					
		316L TempC	316L	Alloy C276	Tantalum	Monel (Alloy 400)	PTFE
50	10	-	52	62	60	59	-
80	10	-	80	-	-	-	-
100	10	-	80	-	-	-	-

1) Alphanumeric designation of the flange size.
2) Alphanumeric pressure rating of a component.

Process connections FMD78 with diaphragm seal

EN flanges with barrel, connection dimensions as per EN 1092-1



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D *Diameter of flange*
b *Thickness*
g *Raised face*
k *Pitch diameter*
g_2 *Diameter of hole*
d_M *Max. diameter of process membrane*
d_3 *Barrel diameter*
L *Barrel length*

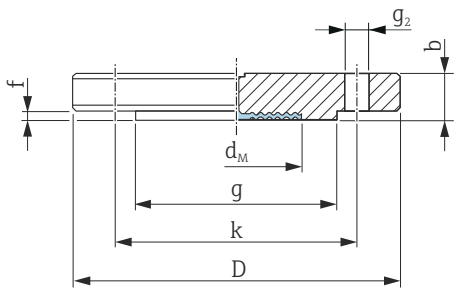
Unit mm

Flange [1) 2)]								Boltholes			Diaphragm seal		Option [3)] (HP + LP)
DN	PN	Form	D	b	g	L	d_3	Quantity	g_2	k	d_M [mm]	Weight	
			[mm]	[mm]	[mm]	[mm]	[mm]		[mm]	[mm]		[kg (lb)]	
80	10-40	B1	200	24	138	50	76	8	18	160	72	6.2 (13.67)	D4
						100						6.7 (14.77)	
						200						7.8 (17.20)	

1) Material: AISI 316L
2) In the case of process membranes made of Alloy C276, Monel or tantalum, the raised face of the flange and the barrel pipe are made of 316L.
3) Product Configurator, order code for "Process connection, HP/HP+LP:"

Process connections FMD78 with diaphragm seal

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



D *Diameter of flange*
b *Thickness*
g *Raised face*
f *Thickness of raised face*
k *Pitch diameter*
g_2 *Diameter of hole*

Unit in

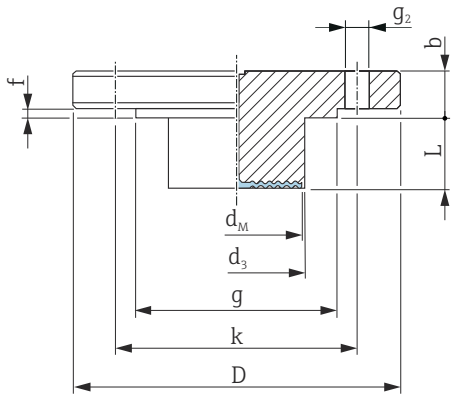
Flange [1) 2) 3)]						Boltholes			Diaphragm seal	Option	
NPS	Class	D	b	g	f	[4)]	g_2	k	Weight		
[in]	[lb./sq.in]	[in]	[in]	[in]	[in]		[in]	[in]	[kg (lb)]	HP [5)]	LP [6)]
2	150	6	0.75	3.62	0.06	4	0.75	4.75	2.2 (4.85)	AF [7) 8)]	TE [7) 8)]
2	300	6.5	0.88	3.62	0.06	8	0.75	5	3.4 (7.5)	AR [7) 8)]	TF [7) 8)]
2	400/600	6.5	1	3.62	0.25	8	0.75	5	4.3 (9.48)	AJ	-
3	150	7.5	0.94	5	0.06	4	0.75	6	5.1 (11.25)	AG [7) 8)]	TG [7) 8)]
3	300	8.25	1.12	5	0.06	8	0.88	6	7.0 (15.44)	AS [7) 8)]	TH [7) 8)]
4	150	9	0.94	6.19	0.06	8	0.75	7.5	7.2 (15.88)	AH	TI
4	300	10	1.25	6.19	0.06	8	0.88	7.88	11.7 (25.8)	AT	TJ

1) Material AISI 316/316L: Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual-rated)
2) The roughness of the surface in contact with the medium, including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum, gold or PTFE, is $R_a < 0.8$ µm (31.5 µin). Lower surface roughness on request.
3) The flange raised face is made of the same material as the process membrane.
4) Quantity
5) Product Configurator, order code for "Process connection, HP/HP+LP:"
6) Product Configurator, order code for "Alternative process connection LP side:"
7) Alternatively available with the TempC process membrane.
8) Alternatively available with gold-coated TempC process membrane (Product Configurator, order code for "Membrane material", option "G").

Maximum diameter of the process membrane $Ød_M$

NPS	Class	$Ød_M$ (in)				
		316L TempC	316L	Alloy C276	Tantalum	Monel (Alloy 400)
2	150	2.40	-	2.44	2.44	2.44
2	300	2.40	-	2.44	2.44	2.44
2	400/600	-	2.05	2.44	2.44	2.44
3	150	3.50	-	3.62	3.62	3.62
3	300	3.50	-	3.62	3.62	3.62
4	150	-	3.15	3.62	3.62	3.62
4	300	-	3.15	3.62	3.62	3.62

ASME flanges with barrel, connection dimensions as per ASME B 16.5, raised face RF



D *Diameter of flange*
b *Thickness*
g *Raised face*
k *Pitch diameter*
g_2 *Diameter of hole*
d_M *Max. diameter of process membrane*
d_3 *Barrel diameter*
L *Barrel length*

Unit in

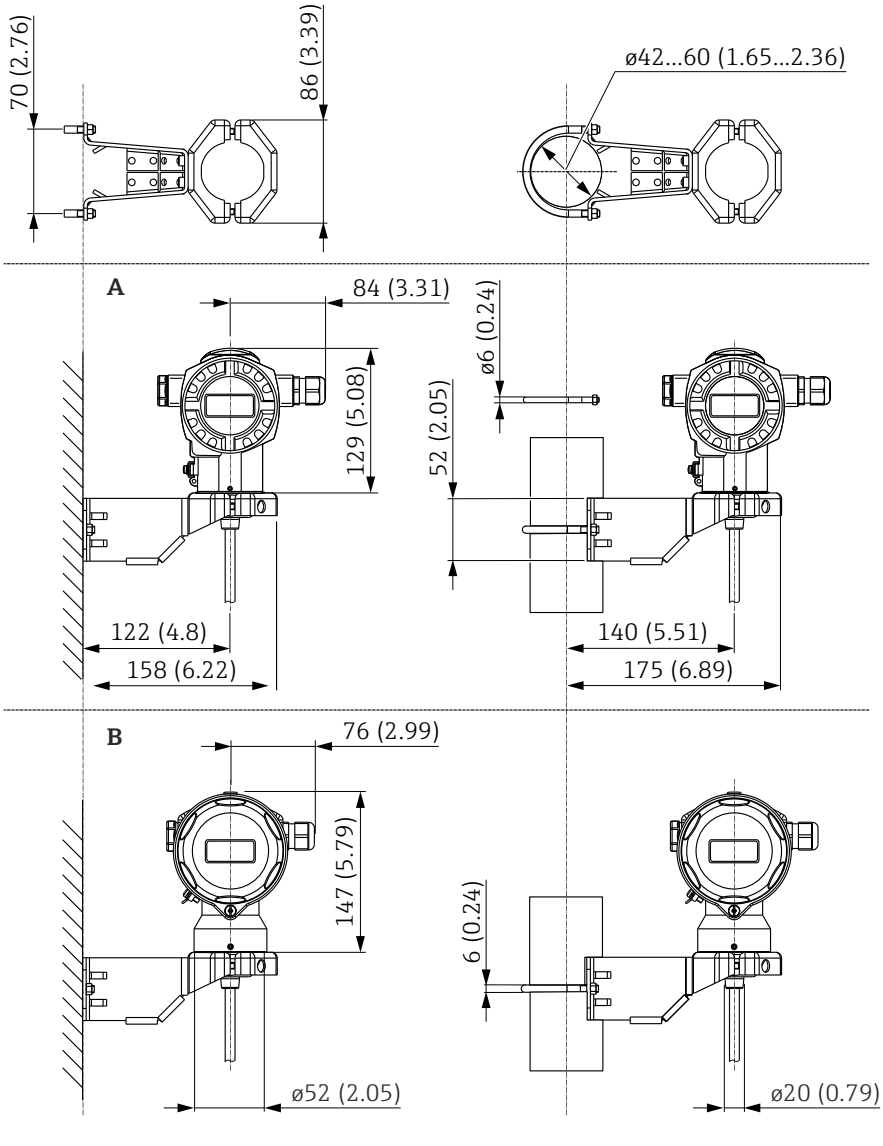
Flange [1) 2)]						Boltholes			Diaphragm seal		Option [3)] (HP + LP)
NPS	Class	D	b	g	f	[4)]	g_2	k	d_M	Weight	
[in]	[lb./sq.in]	[in]	[in]	[in]	[in]		[in]	[in]	[in]	[kg (lb)]	
3	150	7.5	0.94	5	0.06	4	0.75	6	2.83	[5)]	J4 [5)]
4	150	9	0.94	6.19	0.06	8	0.75	7.5	3.5	[5)]	J5 [5)]

1) Material: AISI 316/316L. Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)
2) In the case of process membranes made of Alloy C276, Monel or tantalum, the raised face of the flange and the barrel pipe are made of 316L.
3) Product Configurator, order code for "Process connection, HP/HP+LP:"
4) Quantity
5) Choice of 2", 4", 6" or 8" barrel (extended diaphragm seal), for diameter and weight of barrel (extended diaphragm seal) see the following table

Option [1)]	NPS	Class	(L)	d_3	Weight
	[in]	[lb./sq.in]	in (mm)	in (mm)	[kg (lb)]
J4	3	150	2 (50.8) / 4 (101.6) / 6 (152.4) / 8 (203.2)	2.99 (76)	6.0 (13.2) / 6.6 (14.5) / 7.1 (15.7) / 7.8 (17.2)
J5	4	150	2 (50.8) / 4 (101.6) / 6 (152.4) / 8 (203.2)	3.7 (94)	8.6 (19) / 9.9 (21.8) / 11.2 (24.7) / 12.4 (27.3)

1) Product Configurator, order code for "Process connection"

Separate housing: Wall and pipe mounting with mounting bracket



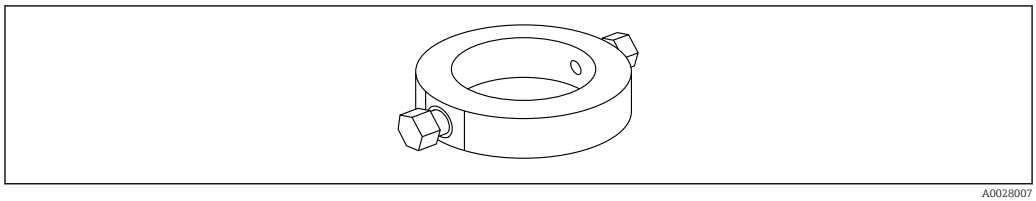
Engineering unit mm (in)

Item	Designation	Weight in kg (lb)		Option [1]
		Housing (T14 or T17)	Mounting bracket	
A	Dimensions with T14 housing, optional side display	→ 🖹 45	0.5 (1.10)	U
B	Dimensions with T17 housing, optional side display			

1) Product Configurator, order code for "Additional options 2", version "G"

Also available for order as a separate accessory: part number 71102216

Flushing rings



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Use flushing rings if there is a risk of medium buildup or clogging at the process connection. The flushing ring is fitted between the process connection and the process connection provided by the customer.

Using the two lateral flushing holes, medium buildup or clogging in front of the process isolating diaphragm can be rinsed away and the pressure chamber vented.

Various nominal widths and forms allow adaption to the respective process flange.

For other details (dimension, weight, materials), see SD01553P/00/EN "Mechanical accessories for pressure measuring devices".

Order options

Flushing rings can be ordered as a separate accessory or as an order option for the device.

Material	Nominal diameter	Approval [1]	Accessory [2] Part number	Order option [3] [4]	
				FMD77	FMD78 [5]
AISI 316L	EN1092-1				
	DN25	-	71377379	-	-
	DN50	-	71377380	PP	PP
	DN80	-	71377383	PQ	PQ
	ASME B16.5				
	NPS 1"	-	71377369	-	-
	NPS 2"	CRN	71377370	PL	PL
	NPS 3"	CRN	71377371	PM	PM

1) CSA approval: Product Configurator, order code for "Approval"
2) Inspection certification according to EN10204-3.1 material
3) Product Configurator order code for "Accessories enclosed"
4) Certificates ordered with the equipment (3.1 material certificate and NACE declaration of conformity and PMI tests) apply to the transmitters and flushing rings listed in the table.
5) Scope of delivery: 2 x

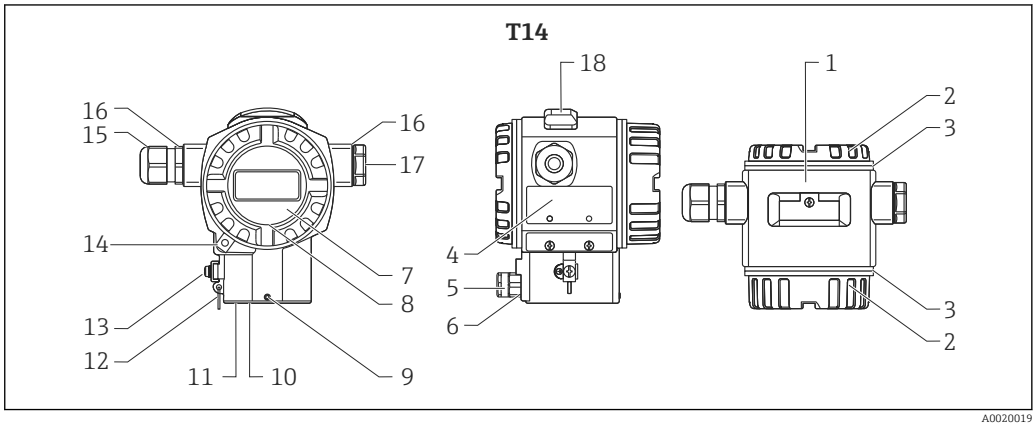
Endress+Hauser offers additional flushing rings as **T**echnical **S**pecial **P**roducts (TSP).

Weight

Component part	Weight
Housing	See "Housing" section
Process connection	See "Process connections" section
Capillary with armoring made of AISI 316L (1.4404)	0.16 kg/m (0.35 lb/m) + 0.2 kg (0.44 lb) (weight per capillary line)
Capillary with armoring made of AISI 316L (PVC)	0.21 kg/m (0.46 lb/m) + 0.2 kg (0.44 lb) (weight per capillary line)
Capillary with armoring made of AISI 316L (PTFE)	0.29 kg/m (0.64 lb/m) + 0.2 kg (0.44 lb) (weight per capillary line)

Materials not in contact with process

Transmitter housing



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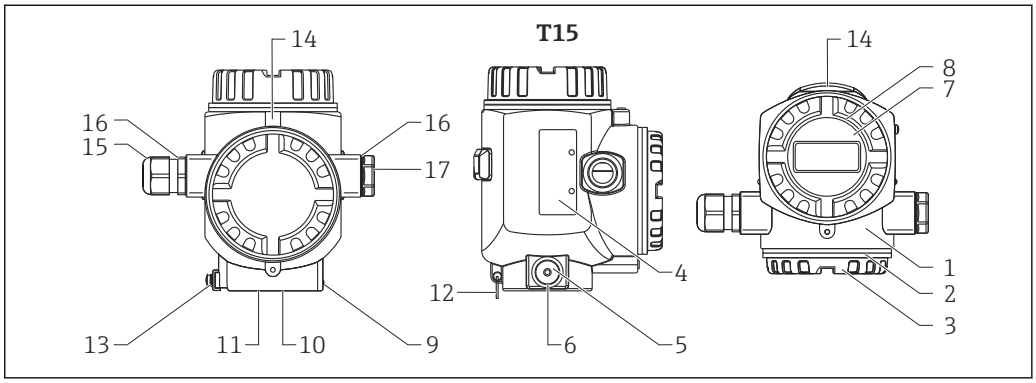

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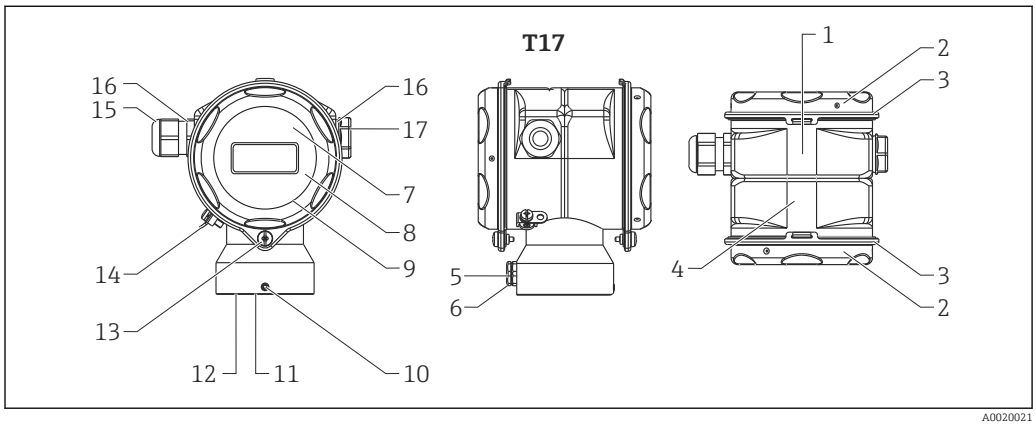
Item number	Component	Material
1	T14 and T15 housing, RAL 5012 (blue)	▪ Die-cast aluminum with protective powder-coating on polyester base ▪ Coating on thread: Heat-curing lubricant varnish
1	T14 housing	▪ Precision casting AISI 316L (1.4435) ▪ Coating on thread: Heat-curing lubricant varnish
2	Cover, RAL 7035 (gray)	Die-cast aluminum with protective powder-coating on polyester base
		Precision cast AISI 316L (1.4435) (cover made of 316L if T14 housing made of 316L)
4	Nameplates	▪ AISI 316L (1.4404), if T14 housing is precision-cast ▪ Anodized aluminum, if housing T14/T15 of die-cast aluminum
5	Pressure compensation filter	AISI 316L (1.4404) and PBT-FR
6	Pressure compensation filter, O-ring	VMQ or EPDM
7	Sight glass	Mineral glass
8	Sight glass seal	Silicone (VMQ)
9	Screw	A4
10	Sealing ring	EPDM
11	Snap ring	PA66-GF25
12	Rope for nameplates	AISI 316 (1.4401)
13	External ground terminal	AISI 316L (1.4404)
14	Cover clamp	AISI 316L (1.4435) clamp, A4 screw

Item number	Component	Material
15	Cable entry	Polyamide (PA) or CuZn nickel-plated
16	Seal of cable entry and plug	Silicone (VMQ)
17	Plug T15 housing	PBT-GF30 FR, for dust ignition-proof and Exd: AISI 316L (1.4435)

	Plug T14 housing	▪ Non-Ex and Ex ia: PBT-GF30 FR
		▪ All other versions:
		  ▪ Housing made of die-cast aluminum: Plug made of die-cast aluminum
		  ▪ Housing made of precision casting AISI 316L (1.4435): Plug made of precision casting AISI 316L (1.4435)

18	External operation (keys and key cover), RAL 7035 (gray)	Polycarbonate PC-FR, screw A4

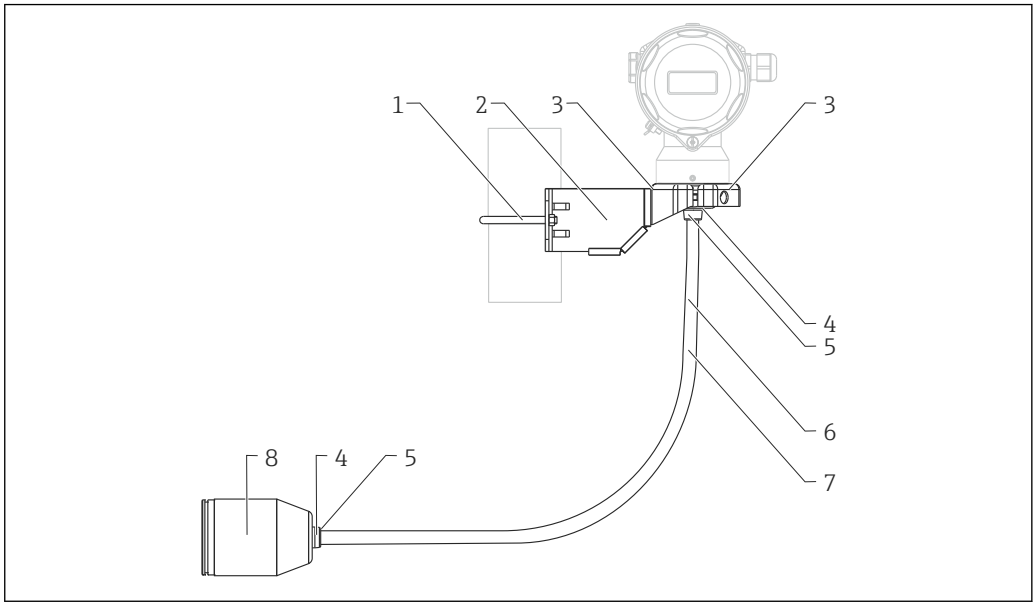


A0020021

Item number	Component	Material
1	T17 housing	AISI 316L (1.4404)
2	Cover	
3	Cover seal	EPDM
4	Nameplates	Lasered on
5	Pressure compensation filter	AISI 316L (1.4404) and PBT-FR
6	Pressure compensation filter, O-ring	VMQ or EPDM
7	Sight glass for non-hazardous area, ATEX Ex ia, NEPSI Zone 0/1 Ex ia, IECEx Zone 0/1 Ex ia, FM NI, FM IS, CSA IS	Polycarbonate (PC)
8	Sight glass for ATEX 1/2 D, ATEX 1/3 D, ATEX 1 GD, ATEX 1/2 GD, ATEX 3 G, FM DIP, CSA dust ignition-proof	Mineral glass
9	Sight glass seal	EPDM
10	Screw	A2-70
11	Sealing ring	EPDM
12	Snap ring	PA6
13	Screw	A4-50 Coating on thread: Heat-curing lubricant varnish
14	External ground terminal	AISI 316L (1.4404)
15	Cable entry	Polyamide PA, for dust ignition-proof: CuZn nickel-plated

Item number	Component	Material
16	Seal of cable entry and plug	Silicone (VMQ)
17	Plug	PBT-GF30 FR, for dust ignition-proof: AISI 316L (1.4435)

Connecting parts



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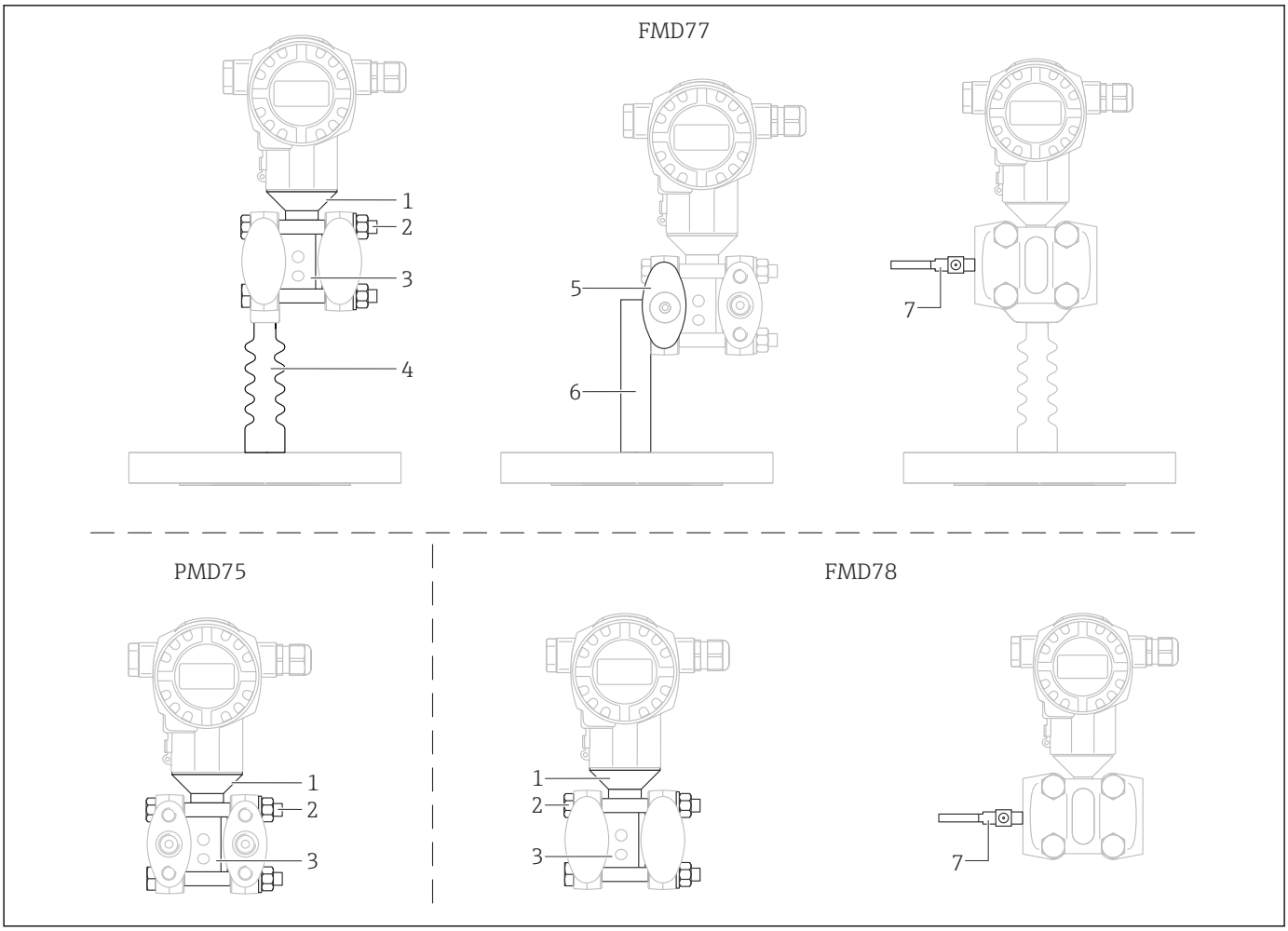
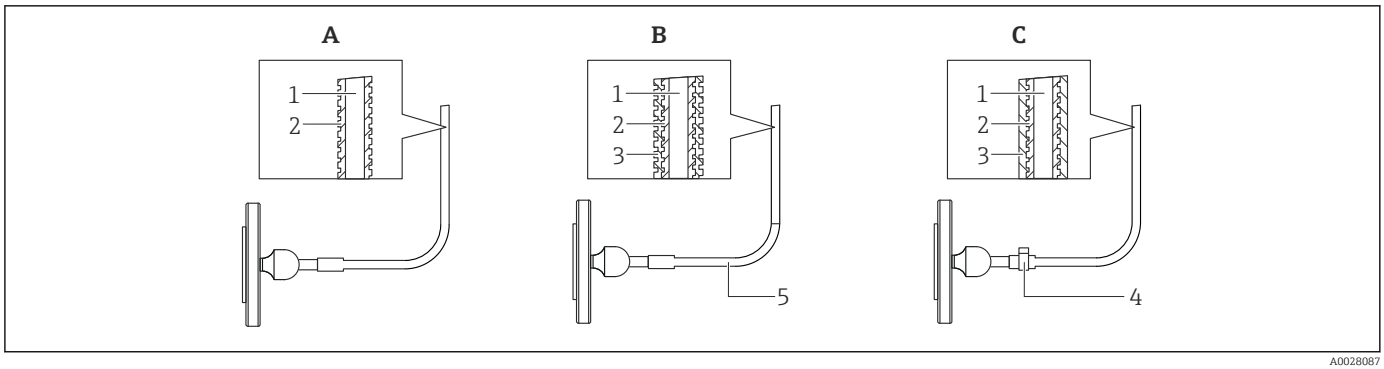
Item number	Component	Material
1	Mounting bracket	Bracket AISI 316L (1.4404)
2		Screw and nuts A4-70
3		Half-shells: AISI 316L (1.4404)
4	Seal for cable from separate housing	EPDM
5	Gland for cable from separate housing	AISI 316L (1.4404)
6	PE cable for separate housing	Abrasion-resistant cable with Dynema strain-relief members; shielded with aluminum-coated film; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant
7	FEP cable for separate housing	Abrasion-resistant cable; shielded with galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper wires, twisted, UV-resistant
8	Process connection adapter for separate housing	AISI 316L (1.4404)



Item number	Component	Material
1	Connection between the housing and process connection	AISI 316L (1.4404)
2	Screws and nuts	PMD75 PN 160, FMD77, FMD78: ▪ Hex.-headed bolt DIN 931-M12x90-A4-70 ▪ Hex.-headed nut DIN 934-M12-A4-70 PMD75 PN 420: ▪ Hex.-headed bolt ISO 4014-M12x90-A4 ▪ Hex.-headed nut ISO 4032-M12-A4-bs
3	Cell body	AISI 316L (1.4404)
4	Temperature isolator	AISI 316L (1.4404)
5	Side flanges	1.4408 / CF3M [1] / AISI 316L
6	U-bracket	AISI 304 (1.4301)
7	Heat-shrink tube (available only if flexible armor for capillary has PVC coating or PTFE hose)	Polyolefin

1) Cast equivalent to material AISI 316L



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Item	Component	A Standard [1] Armor for capillary	B PVC-coated Armor for capillary	C PTFE hose Armor for capillary
1	Capillary	AISI 316 Ti (1.4571)	AISI 316 Ti (1.4571)	AISI 316 Ti (1.4571)
2	Flexible armor for capillary	AISI 316L (1.4404) [2]	AISI 316L (1.4404)	AISI 316L (1.4404)
3	Coating/armor	-	PVC [3]	PTFE [4]
4	Single-ear clamp	-	-	1.4301
5	Shrink tubing at capillary junction	-	Polyolefin	-

1) If no option is specified when ordering, order option "SA" is supplied.
2) Product Configurator, order code for "Armor for capillary:" option "SA"
3) Product Configurator, order code for "Armor for capillary:" option "SB"
4) Product Configurator, order code for "Armor for capillary:" option "SC"

Materials in contact with process

NOTICE

- The device components in contact with the process are specified in the "Mechanical construction" → 44 and "Ordering information" → 108 sections.

Delta ferrite content

A delta ferrite content of ≤ 3% can be guaranteed and certified for the wetted parts of the FMD78 if option "8" is selected in the "Additional options 1" or "Additional options 2" order code in the Product Configurator.

TSE Certificate of Suitability (Transmissible Spongiform Encephalopathy)

The following applies to all device components in contact with the process:

- They do not contain any materials derived from animals.
- No additives or operating materials derived from animals are used in production or processing.

Process connections

- "Clamp connections" and "Hygienic process connections": AISI 316L (DIN/EN material number 1.4435)
- Endress+Hauser supplies DIN/EN process connections with threaded connections made of stainless steel as per AISI 316L (DIN/EN material number 1.4404 or 14435). With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13E0 in EN 1092-1: 2001 Tab. 18. The chemical composition of the two materials can be identical.
- Some process connections are also available in Alloy C276 (DIN/EN material number 2.4819). For this purpose see the information in the "Mechanical construction" section.
- Side flanges: 316L, C 22.8 with zinc plating or alloy C 276. The C22.8 side flanges are coated with anti-corrosion protection (zinc, chrome). To prevent the formation of hydrogen and thereby diffusion through the process membrane, Endress+Hauser recommends the use of 316L side flanges for applications involving water. Hydrogen diffusion through the process membrane causes measurement errors, or can lead to a device failure in extreme cases.

Process membrane

Measuring cell	Designation	Option [1]
FMD77	AISI 316L, TempC, high-pressure side (HP)	E
	AISI 316 L with gold coating (25 µm), TempC, high-pressure side (HP) [2]	D
	AISI 316L, high-pressure side (HP)	1
	Alloy C 276, high-pressure side (HP) [3]	2
	Monel (2.4360), high-pressure side (HP) [3]	3
	Tantalum (UNS R05200), high-pressure side (HP) [3]	5
	AISI 316L with gold-rhodium coating, high-pressure side (HP)	6
	AISI 316L with 0.25 mm (0.01 in)PTFE coating, high-pressure side (HP)	8
FMD77 with capillaries on low-pressure side (LP)	AISI 316L, TempC, high-pressure side (HP) + low-pressure side (LP)	F
	AISI 316L with gold coating (25 µm), TempC, high-pressure side (HP) + low-pressure side (LP) [2]	G
	AISI 316L, high-pressure side (HP) + low-pressure side (LP)	H
	AISI C 276, high-pressure side (HP) + low-pressure side (LP)	J
	Monel (2.4360), high-pressure side (HP) + low-pressure side (LP)	K
	Tantalum (UNS R05200), high-pressure side (HP) + low-pressure side (LP)	L
	AISI 316L with gold-rhodium coating, high-pressure side (HP) + low-pressure side (LP)	M
	AISI 316L with 0.25 mm (0.01 in)PTFE coating, high-pressure side (HP) + low-pressure side (LP)	N
FMD78	AISI 316L with gold coating (25 µm), TempC [2]	G
	AISI 316L, TempC	E
	AISI 316L	1
	Alloy C 276 [3]	2
	Monel (2.4360) [3]	3
	Tantalum (UNS R05200) [3]	5
	AISI 316L with gold-rhodium coating	6
	AISI 316L with 0.25 mm (0.01 in) PTFE foil (FDA 21 CFR 177.1550)	8
PMD75	AISI 316L	1
	Alloy C 276 (2.4819)	2
	Monel (2.4360)	3
	Tantalum (UNS R05200)	5
	Alloy C 276 with gold-rhodium coating	6

1) Product Configurator, order code for "Membrane material"
2) The TempC gold-plated process membrane does not provide corrosion protection!
3) The material used in the raised face of the flange is the same as that used in the process membrane. For devices with a barrel (extended diaphragm seal), the raised face of the flange and the barrel pipe are made from 316L.

Seals

Device	Designation	Option [1]
PMD75	FKM	A
	PTFE (PN160bar/16MPa/2400psi)	C [2]
	PTFE (PN250bar/25MPa/3625psi)	D [2]
	NBR	F
	Copper seal ring	H
	Copper seal ring, oxygen service, observe pressure and temperature application limits	K
	FKM, cleaned from oil+grease	1
	FKM, cleaned for oxygen service, note pressure and temperature application limits	2
	PTFE, cleaned for oxygen service, observe pressure and temperature application limits	3
	EPDM	J [3]

1) Product Configurator, order code for "Seal"
2) Suitable for foodstuffs FDA21 CFR 177.1550
3) Suitable for drinking water NSF61.

Fill fluid

FMD77: Fill fluid of diaphragm seal

Process connection	Designation	Option [1] [2]!
High-pressure side (HP)	Silicone oil (food-safe FDA 21 CFR 175.105)	A
	Vegetable oil (food-safe FDA 21 CFR 172.856)	D
	Inert oil	F
	Low-temperature oil	L
	High-temperature oil	V
Low-pressure side (LP)	..... m capillary, silicone oil (food-safe FDA 21 CFR 175.105)	M
	..... m capillary, vegetable oil (food-safe FDA 21 CFR 172.856)	N
	..... m capillary, inert oil	O
	..... m capillary; low-temperature oil	P
	..... m capillary; high-temperature oil	Q
	..... ft capillary, silicone oil (food-safe FDA 21 CFR 175.105)	R
	..... ft capillary, vegetable oil (food-safe FDA 21 CFR 172.856)	S
	..... ft capillary, inert oil	T
	..... ft capillary; low-temperature oil	U
	..... ft capillary; high-temperature oil	W

1) Product Configurator, order code for "Fill fluid"
2) For diaphragm seal devices with 3-A and EHEDG certificates, only select fill fluid with FDA approval

FMD77: Fill fluid of measuring cell

FMD77	Designation	Option [1]
With capillary on low-pressure side (LP)	Silicone oil	Standard, if no option was selected.
	Inert oil, PWIS-free	HC
Without capillary on low-pressure side (LP)	Silicone oil	Standard, if no option was selected.

FMD77	Designation	Option [1]
	Inert oil, cleaned for oxygen service	HB
	Inert oil, PWIS-free	HC

1) Product Configurator, order code for "Service"

FMD78: Fill fluid of diaphragm seal

Capillary length;	Designation	Option [1]
Symmetrical	.....ft capillary; silicone oil (food-safe FDA 21 CFR 175.105)	A [2]
	..... ft capillary; vegetable oil (food-safe FDA 21 CFR 172.856)	B [2]
	..... ft capillary; high-temperature oil	C [2]
	..... ft capillary; inert oil, oxygen service, observe pressure/temp. application limits	D [2]
	..... ft capillary; low-temperature oil	E [2]
	..... ft capillary, inert oil	F [2]
	..... m capillary; silicone oil (food-safe FDA 21 CFR 175.105)	1 [2]
	..... m capillary; vegetable oil (food-safe FDA 21 CFR 172.856)	2 [2]
	..... m capillary; high-temperature oil	3 [2]
	..... m capillary; inert oil, oxygen service, observe pressure/temp. application limits	4 [2]
	..... m capillary; low-temperature oil	5 [2]
	..... m capillary, inert oil	6 [2]
Asymmetrical Low-pressure side (LP) [3]	..... m capillary, silicone oil (food-safe FDA 21 CFR 175.105), LP-side	M [2]
	..... m capillary, vegetable oil (food-safe FDA 21 CFR 172.856), LP-side	N [2]
	..... m capillary, inert oil, LP side	O [2]
	..... m capillary, low-temperature oil, LP side	P [2]
	..... m capillary, high-temperature oil, LP side	Q [2]
	..... ft capillary, silicone oil (food-safe FDA 21 CFR 175.105), LP-side	R [2]
	..... ft capillary; vegetable oil (food-safe FDA 21 CFR 172.856), LP-side	S [2]
	..... ft capillary, inert oil, LP side	T [2]
	..... ft capillary, low-temperature oil, LP side	U [2]
	..... ft capillary, high-temperature oil, LP side	W [2]
Asymmetrical High pressure side (HP) [4]	..... ft capillary, HP side	V [5]
	..... m capillary, HP side	W [5]

1) For diaphragm seal devices with 3-A and EHEDG certificates, only select fill fluids with FDA approval!
2) Product Configurator, order code for "Fill fluid"
3) If the capillary length for asymmetrical LP or HP is identical, select a symmetrical capillary length when ordering.
4) If the capillary length for asymmetrical LP or HP is identical, select a symmetrical capillary length when ordering.
5) Product Configurator, order code for "Additional options 2"

FMD78: Fill fluid of measuring cell

Designation	Option [1]
Silicone oil	Standard, if no option was selected.
Inert oil, PWIS-free	HC

1) Product Configurator, order code for "Service"

PMD75: Fill fluid of measuring cell

Designation	Option
Silicone oil	Standard, if no option was selected.
Inert oil, FKM, oxygen service	2 [1]
Inert oil, PTFE, oxygen service	3 [1]
Inert oil, copper seal ring, oxygen service	K [1]
Inert oil, PWIS-free	HC [2]
Inert oil, cleaned for oxygen service	HB [2]

1) Product Configurator, order code for "Seal"
2) Product Configurator, oder code for "Service"

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnosis

Quick and safe commissioning

Guided menus for applications

Reliable operation

- Local operation possible in several languages
- Standardized operation at the device and in the operating tools
- Parameters relating to measured values can be locked/unlocked using the device's write protection switch, using the device software or via remote operation

Efficient diagnostics increase measurement availability

- Remedial measures are integrated in plain text
- Diverse simulation options

Local operation

Functions

Function	External operation (operating keys, optional, not T17 housing)	Internal operation (electronic insert)	Onsite display (optional)
Position adjustment (zero point correction)	✔	✔	✔
Setting lower range value and upper range value - reference pressure present at the device	✔ (HART only)	✔ (HART only)	✔
Device reset	✔	✔	✔
Locking and unlocking parameters relevant to the measured value	—	✔	✔
Value acceptance indicated by the green LED	✔	✔	✔
Switching damping on and off	✔ (only if display is connected)	✔ (HART and PA only)	✔
Configuring the bus address of the device (PA)	—	✔	✔
Switching simulation mode on and off (FOUNDATION Fieldbus)	—	✔	✔

Operating the device using onsite display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation. The onsite 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.

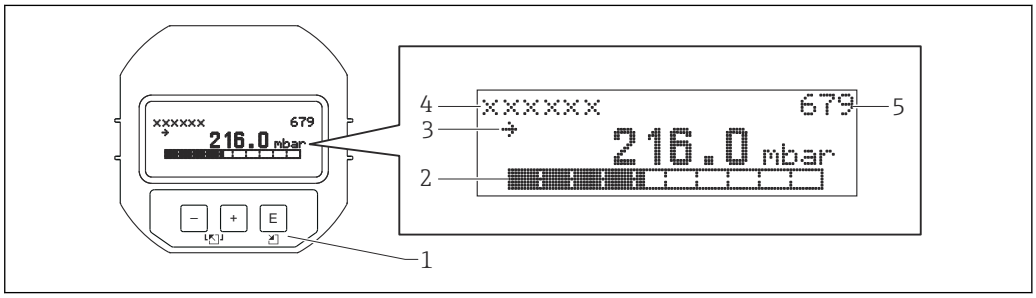
The display can be removed for easy operation.

The device display can be turned in 90° steps.

Depending on the installation position of the device, this makes it easy to operate the device and read the measured value.

Functions:
- 8-digit measured value display including sign and decimal point and bar graph for
  - 4 to 20 mA HART (bar graph from 4 to 20 mA)
  - PROFIBUS PA (bar graph as graphic display of standardized value of AI block)
  - FOUNDATION Fieldbus (bar graph as graphic display of transducer output).
-
- Simple and complete menu guidance due to breakdown of parameters into several levels and groups
- Menu guidance in up to 8 languages
- Each parameter is given a 3-digit ID number for easy navigation.
- Option for configuring the display according to individual requirements and preferences, such as language, alternating display, display of other measured values such as sensor temperature, contrast setting.
- Comprehensive diagnostic functions (fault and warning message, peak-hold indicators, etc.).
- Rapid and safe commissioning with the Quick Setup menus

Overview



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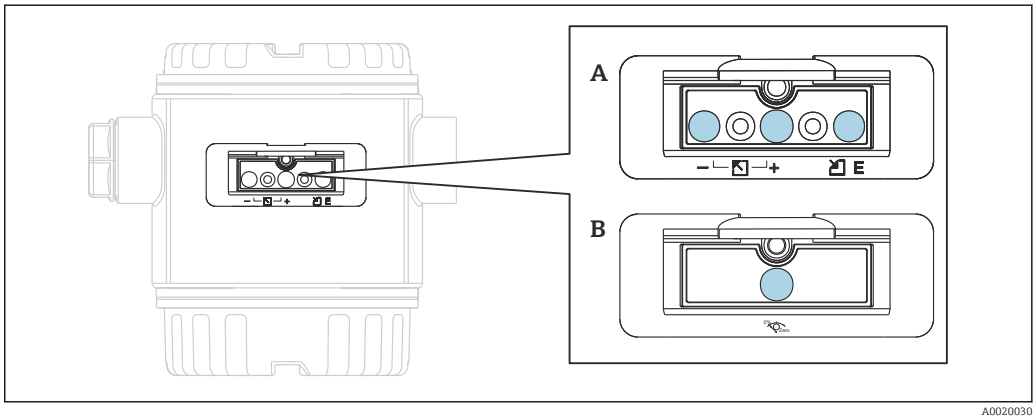
1 Operating keys
2 Bargraph
3 Symbol
4 Header
5 Parameter ID number

Operating keys on the exterior of the device

With the aluminum housing (T14), the operating keys are located either outside on the housing, under the protection cap or inside on the electronic insert. With the stainless steel housing (T17), the operating keys are always located inside the housing on the electronic insert.



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A 4 to 20 mA HART
B PROFIBUS PA and FOUNDATION Fieldbus

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.

Ordering information:

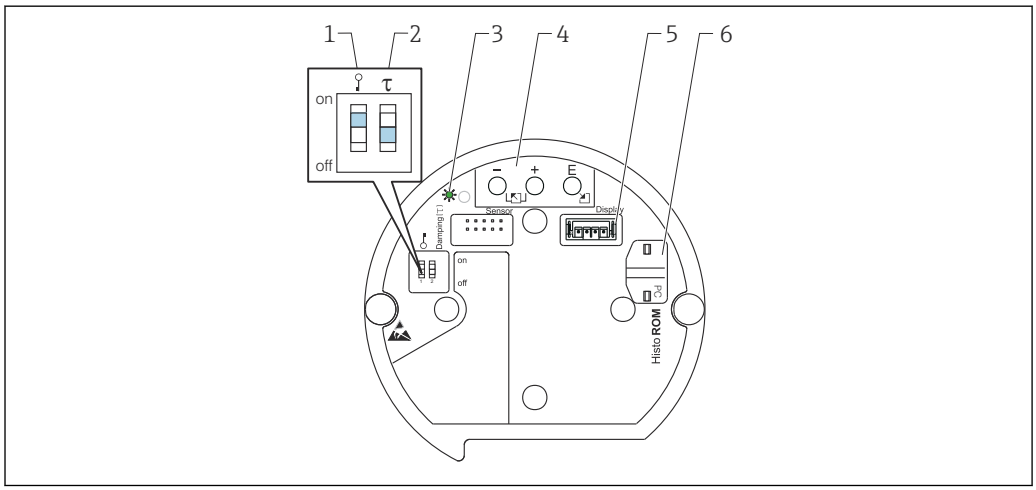
Product Configurator, order code for "Output, operation"

Operating keys and elements located internally on the electronic insert

Ordering information:

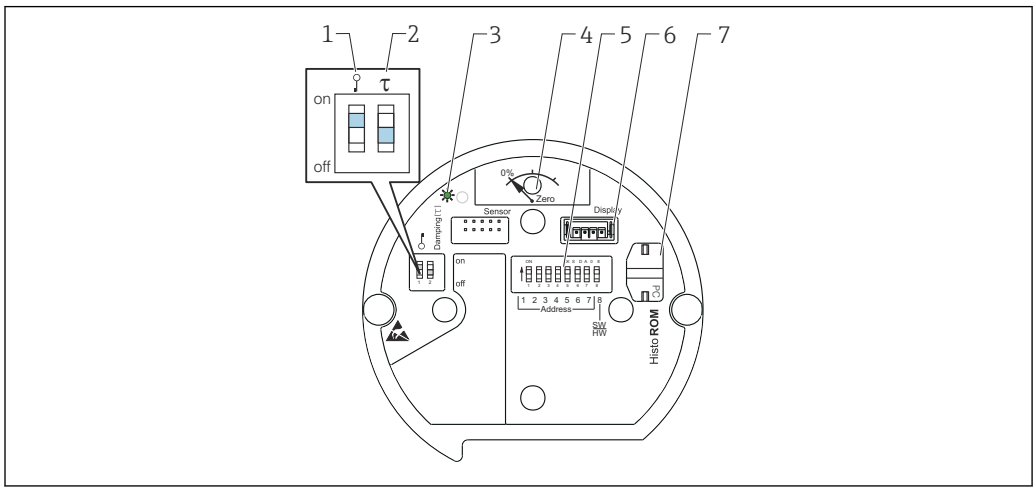
Product Configurator, order code for "Output, operation"

HART



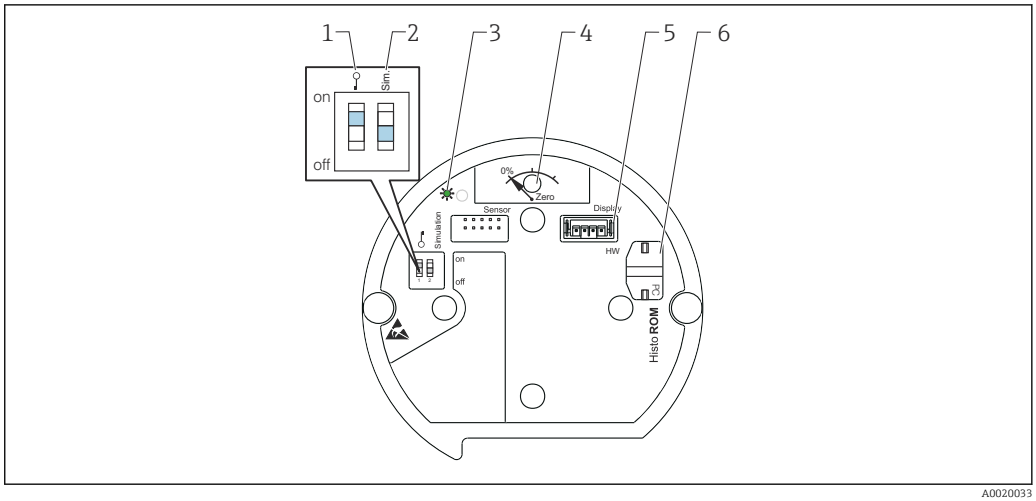
1 DIP switch for locking/unlocking parameters relevant to the measured value
2 DIP switch for switching damping on/off
3 Green LED to indicate value being accepted
4 Operating keys
5 Slot for optional display
6 Slot for optional HistoROM®/M-DAT

PROFIBUS PA



1 DIP switch for locking/unlocking parameters relevant to the measured value
2 DIP switch for switching damping on/off
3 Green LED to indicate value being accepted
4 Key for position adjustment and device reset
5 DIP switch for bus address
6 Slot for optional display
7 Slot for optional HistoROM®/M-DAT

FOUNDATION Fieldbus



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

Remote operation

All software parameters are accessible depending on the position of the write protection switch on the device.

Hardware and software for remote operation	HART	PROFIBUS PA	FOUNDATION Fieldbus
FieldCare	✔	✔	✔
FieldXpert SFX100	✔	–	✔
NI-FBUS Configurator	–	–	✔
HistoROM®/M-DAT	✔	✔	✔

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.

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

Connection options:
- HART via Commubox FXA195 and USB interface of a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card
- Service interface with Commubox FXA291 and ToF adapter FXA291 (USB).

For further information, please contact your local Endress+Hauser Sales Center.

Field Xpert SFX100

Field Xpert is an industrial PDA with integrated 3.5" touchscreen from Endress+Hauser based on Windows Mobile. It offers wireless communication via the optional VIATOR Bluetooth modem from Endress+Hauser. Field Xpert also works as a stand-alone device for asset management applications. For details, refer to BA00060S/04/EN.

Commubox FXA195

For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to TI00404F/00/EN.

Commubox FXA291

The Commubox FXA291 connects Endress+Hauser field devices with a CDI interface (=Endress +Hauser Common Data Interface) to the USB interface of a personal computer or a notebook. For details refer to TI00405C/07/EN.

For the following Endress+Hauser devices 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 with devices of the ToF platform, pressure equipment and Gammapilot via the USB interface of a personal computer or a notebook. For details refer to KA00271F.

Profiboard

For connecting a PC to the PROFIBUS.

Proficard

For connecting a laptop to the PROFIBUS.

FF configuration program

FF configuration program, such as NI-FBUS Configurator, to
- connect devices with "FOUNDATION Fieldbus signal" into an FF-network
- set FF-specific parameters

Operation with NI-FBUS Configurator:

The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the fieldbus concepts.

You can use the NI-FBUS Configurator to configure a fieldbus network as follows:
- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Read and write to function block control strategies (function block applications)
- Invoke methods specified in the manufacturer-specific DD (e.g. basic device settings)
- Display DD menus (e.g. tab for calibration data)
- Download a configuration
- Verify a configuration and compare it to a saved configuration
- Monitor a downloaded configuration
- Replace devices
- Save and print a configuration

HistoROM®/M-DAT (optional)

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

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

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, 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.

Ordering information:

Product Configurator, order code for "Additional options:", version "N" or

Product Configurator, order code for "Application package:", option "EN" or

as a separate accessory (part no.: 52027785).

For further information, please contact your local Endress+Hauser Sales Center.

System integration

The device can be given a tag name (max. 8 alphanumeric characters).

Designation	Option [1]
Measuring point (TAG), see additional specifications	Z1
Bus address, see additional spec.	Z2

1) Product Configurator, order code for "Identification"

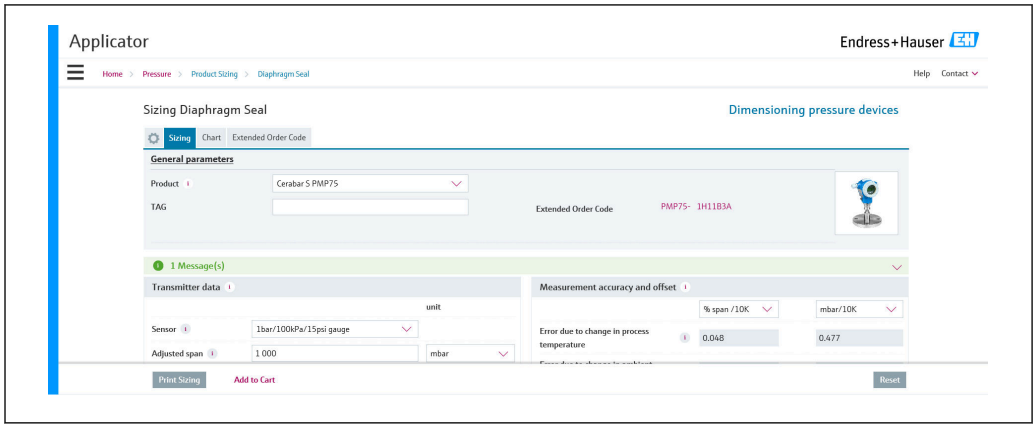
Planning instructions for diaphragm seal systems

NOTICE

Diaphragm seal systems sized/ordered incorrectly

The performance and permitted area of application of a diaphragm seal system depend on the membrane used, the fill fluid, the connection, the design and the prevailing process and ambient conditions.

- ▶ To help you select the right diaphragm seal systems for your particular applications, Endress +Hauser provides its customers with the "Applicator Sizing Diaphragm Seal" selection tool, which is available free of charge at "www.endress.com/applicator" or as a download.



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For further details, or for information on an optimum diaphragm seal solution, your local Endress+Hauser Sales Center is also always happy to help.

Applications

Diaphragm seal systems should be used if the process and the device need to be separated. Diaphragm seal systems offer clear advantages in the following instances:

- In the case of extreme process temperatures
- For aggressive media
- In the case of process media that crystallize
- 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 extreme measuring point cleaning is necessary, or in the event of very damp mounting locations
- If the measuring point is exposed to severe 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.

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 process membrane of the diaphragm seal on the liquid-filled system, which transfers the process pressure via the capillary tube onto the measuring cell 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.

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

Diameter of process membrane

The greater the diameter of the process membrane (less stiff), the smaller the temperature effect on the measurement result.

Stiffness of process membrane

The stiffness depends on the diameter of the process membrane, the material, any existing coating, the thickness and shape of the process membrane. The process membrane thickness and the shape are determined by the design. The stiffness of a process membrane of a diaphragm seal influences the temperature application range and the measurement error caused by temperature effects.

The Endress+Hauser TempC process membrane: maximum accuracy and process safety during pressure and differential pressure measurement with diaphragm seals

To measure with even greater accuracy in these applications and increase process safety, Endress +Hauser has developed the TempC process membrane which is based on a completely revolutionary technology. This process membrane guarantees the utmost level of accuracy and process safety in diaphragm seal applications.
- The very low temperature effect minimizes the effect of process temperature and ambient temperature fluctuations, thereby guaranteeing accurate and reliable measurements. Measurement inaccuracies caused by temperature are reduced to a minimum.
- The TempC process membrane can be used at temperatures between −70 °C (−94 °F) and +400 °C (+752 °F). This guarantees maximum process safety even in the event of very long sterilization and cleaning cycles (SIP/CIP) in tanks and pipes at high temperatures.
- Smaller instrumentation dimensions are possible thanks to the TempC process membrane. With a smaller process connection, the new membrane measures at least as accurately as a conventional membrane with a larger diameter.
- Due to the geometry of the membrane, an overshoot occurs initially immediately following a temperature shock. This results in a transient response, the duration and deviation of which are significantly less compared to traditional membrane types. In the case of batch processes, these shorter recovery times mean a far higher level of availability of the production facilities. The effect of the overshoot on the output signal can be reduced by setting a damping in the case of TempC process membranes.

Ordering information:

See the Product Configurator for the individual process connection and the choice of process membrane.

Selection in the Applicator:

Under "Transmitter data" in the "Membrane material" field.

Capillary

Diaphragm seals are used with the following capillary internal diameters as standard:
- ≤ DN 50: 1 mm (0.04 in)
- > DN 50: 2 mm (0.08 in)

The capillary tube influences the thermal change, the ambient temperature operating range and the response time of a diaphragm seal system as a result of its length and internal diameter.

Fill fluid

When selecting the fill fluid, the medium temperature and ambient temperature, as well as the process pressure, are of crucial importance. Observe the temperatures and pressures during commissioning and cleaning. A further selection criterion is the compatibility of the fill fluid with the requirements of the medium. For this reason, only fill fluids that are harmless to health are used in the food industry, such as vegetable oil or silicone oil.

The fill fluid used influences the thermal change, the temperature operating range of a diaphragm seal system and the response time. A temperature change results in a volume change of the fill fluid. The volume change is dependent on the expansion coefficient and on the volume of the fill fluid at calibration temperature (constant in the range: +21 to +33 °C (+70 to +91 °F)). The application range can be extended by a fill fluid with a lower expansion coefficient and a shorter capillary.

For example, the fill fluid expands in the event of a temperature increase. The additional volume presses against the process membrane of a diaphragm seal. The stiffer a process membrane is, the greater its return force, which counteracts a volume change and acts on the measuring cell together with the process pressure, thus shifting the zero point.

Differential pressure transmitter

The differential pressure transmitter influences the temperature operating range, the TK 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 in order to pass through the complete measuring range.

Differential pressure transmitters from Endress+Hauser are optimized with regard to the minimum volume change and side flange.

Diaphragm seal fill fluid

Fill fluid	P_{abs} = 0.05 bar (0.725 psi) [1]	P_{abs} = ≥1 bar (14.5 psi) [2]
Silicone oil	−40 to +180 °C (−40 to +356 °F)	−40 to +250 °C (−40 to +482 °F)
High-temperature oil	−20 to +200 °C (−4 to +392 °F)	−20 to +400 °C (−4 to +752 °F) [3] [4] [5]
Low-temperature oil	−70 to +120 °C (−94 to +248 °F)	−70 to +180 °C (−94 to +356 °F)
Vegetable oil	−10 to +160 °C (+14 to +320 °F)	−10 to +220 °C (+14 to +428 °F)
Inert oil	−40 to +100 °C (−40 to +212 °F)	−40 to +175 °C (−40 to +347 °F) [6] [7]

1) Permitted temperature range at p_{abs} = 0.05 bar (0.725 psi) (observe temperature limits of the device and the system!)
2) Permitted temperature range at p_{abs} ≥1 bar (14.5 psi) (observe temperature limits of the device and the system!)
3) 325 °C (617 °F) at ≥1 bar (14.5 psi) absolute pressure.
4) 350 °C (662 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 200 hours).
5) 400 °C (752 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 10 hours).
6) 150 °C (302 °F) at ≥1 bar (14.5 psi) absolute pressure.
7) 175 °C (347 °F) at ≥1 bar (14.5 psi) absolute pressure (max. 200 hours).

The calculation of the operating temperature range of a diaphragm seal system depends on the fill fluid, capillary length and capillary internal diameter, process temperature and oil volume of the diaphragm seal. Detailed calculations, e.g. for temperature ranges, vacuum pressure and temperature ranges, are done separately in the Applicator "Sizing Diaphragm Seal".

A0038925

Operating temperature range

The operating temperature range of a diaphragm seal system depends on the fill fluid, capillary length and internal diameter, process temperature and oil volume of the diaphragm seal.

The range of application can be extended by using a fill fluid with a smaller expansion coefficient and a shorter capillary.

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, the less filling oil has to be shifted in the diaphragm seal system.

To help you select the right diaphragm seal systems for your particular applications, Endress+Hauser provides its customers with the "Applicator Sizing Diaphragm Seal" selection tool, which is available free of charge at "www.endress.com/applicator" or can be ordered on a DVD.

Cleaning instructions

Endress+Hauser offers flushing rings as accessories to clean process isolating diaphragms without taking the transmitters out of the process.

For further information please contact your local Endress+Hauser Sales Center.

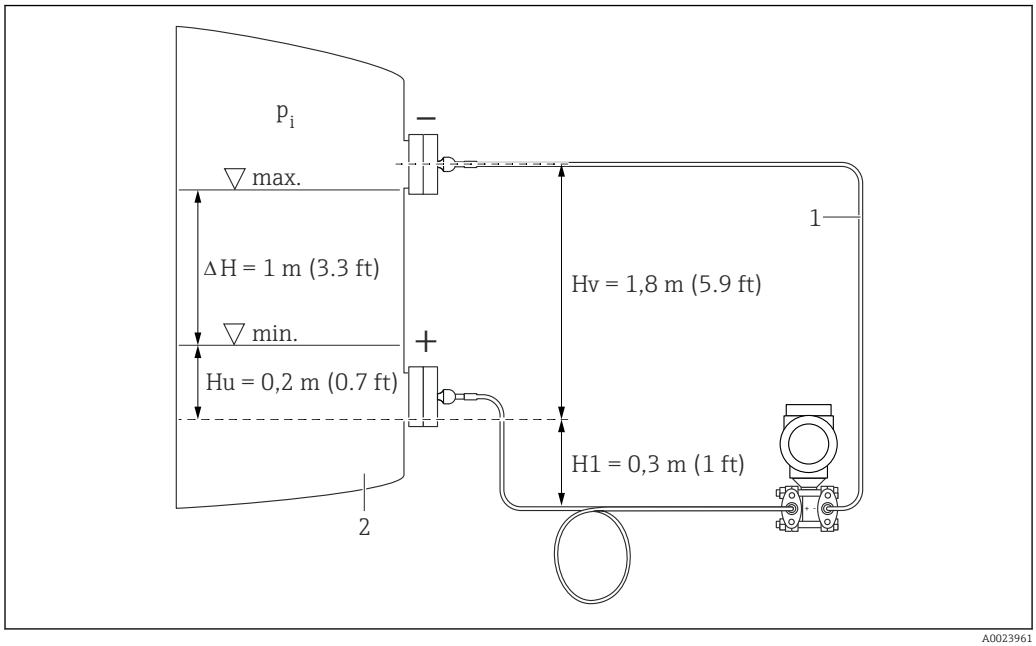
We recommend you perform CIP (cleaning in place (hot water)) before SIP (sterilization in place (steam)) for pipe diaphragm seals. The frequent use of sterilization in place (SIP) will increase the stress on the process isolating diaphragm. Under unfavorable circumstances, frequent temperature changes can lead - on the long term - to material fatigue of the process isolating diaphragm and possibly to a leakage.

Installation instructions

Diaphragm seal systems

- A diaphragm seal together with the transmitter form a closed, calibrated system, which has been filled through openings in the diaphragm seal and in the transmitter's measurement system. These openings 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 measuring range can be overdriven as a result of position adjustment (see the figure and the example below).
- For devices with a capillary a suitable fastening device (mounting bracket) is recommended.
- When mounting, sufficient strain relief must be provided for the capillary line to prevent the capillary from bending (capillary bending radius ≥ 100 mm (3.94 in)
- For more detailed installation instructions, Endress+Hauser provides its customers with the free "Applicator Sizing Diaphragm Seal" selection tool, which is available online at "www.endress.com/applicator" or as a download.

Selection of the measuring cell (observe the hydrostatic pressure of the fill fluid column in the capillaries!)



1 *Capillary with silicone oil: ρ_{FI} = 0.96 kg (2.12 lb) dm³*

2 *Vessel with water: ρ_M = 1.0 kg (2.21 lb) dm³*

Pressure on the negative side of the differential pressure transmitter (p−) when the vessel is empty (minimum level):

$$p_{-} = p_{HV} + p_{H1} = Hv \cdot \rho_{FI} \cdot g + H1 \cdot \rho_{FI} \cdot g + p_i$$
$$= 1{,}8\ m \cdot 0{,}96 \frac{kg}{dm^3} \cdot 9{,}81 \frac{m}{s^2} + 0{,}3\ m \cdot 0{,}96 \frac{kg}{dm^3} \cdot 9{,}81 \frac{m}{s^2} + p_i$$
$$= 197{,}77\ mbar + p_i$$

A0023962

Pressure on the positive side of the differential pressure transmitter (p+) when the vessel is empty (minimum level):

$$p_{+} = p_{HU} + p_{H1} = Hu \cdot \rho_{M} \cdot g + H1 \cdot \rho_{FI} \cdot g + p_i$$
$$= 0{,}2\ m \cdot 1 \frac{kg}{dm^3} \cdot 9{,}81 \frac{m}{s^2} + 0{,}3\ m \cdot 0{,}96 \frac{kg}{dm^3} \cdot 9{,}81 \frac{m}{s^2} + p_i$$
$$= 47{,}87\ mbar + p_i$$

A0023981

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

$$\Delta p_{Transmitter} = p_{+} - p_{-}$$
$$= 47{,}87\ mbar - 197{,}77\ mbar$$
$$= -149{,}9\ mbar$$

A0023982

Result:

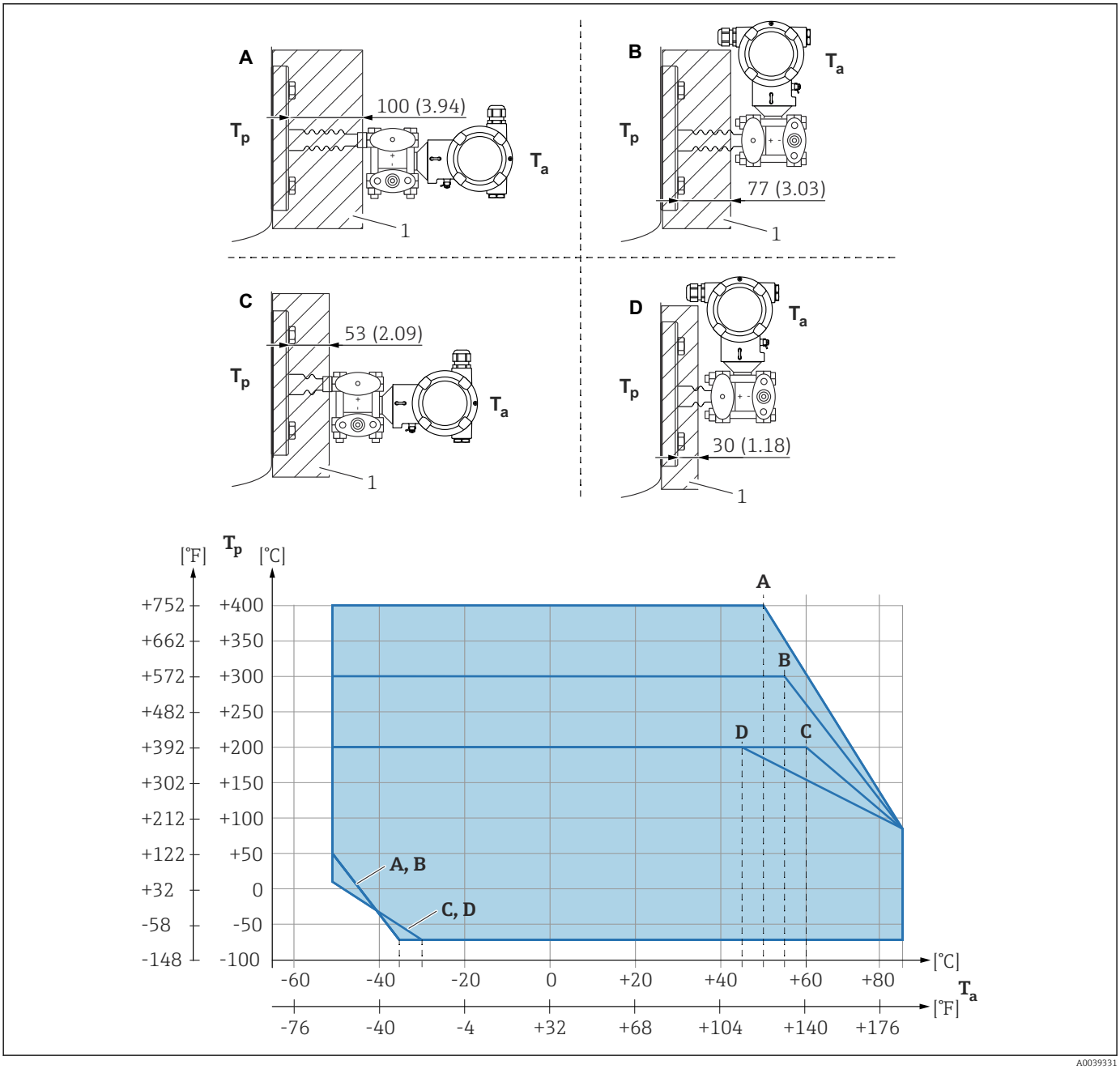
When the vessel is full, a differential pressure of −51.80 mbar (−0.762 psi) would be present at the differential pressure transmitter. When the vessel is empty, a differential pressure of −149.90 mbar (−2.2485 psi) is present. A 500 mbar (7.5 psi) measuring cell is therefore necessary for this application.

Capillary

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 the capillaries if the ambient temperature is below or above the reference temperature
- with a bending radius ≥ 100 mm (3.94 in)
- When using diaphragm seal systems with a capillary, sufficient strain relief must be provided to prevent the capillary from bending (capillary bending radius ≥ 100 mm (3.94 in)).
- In the case of devices with 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, a position adjustment can cause range violation.

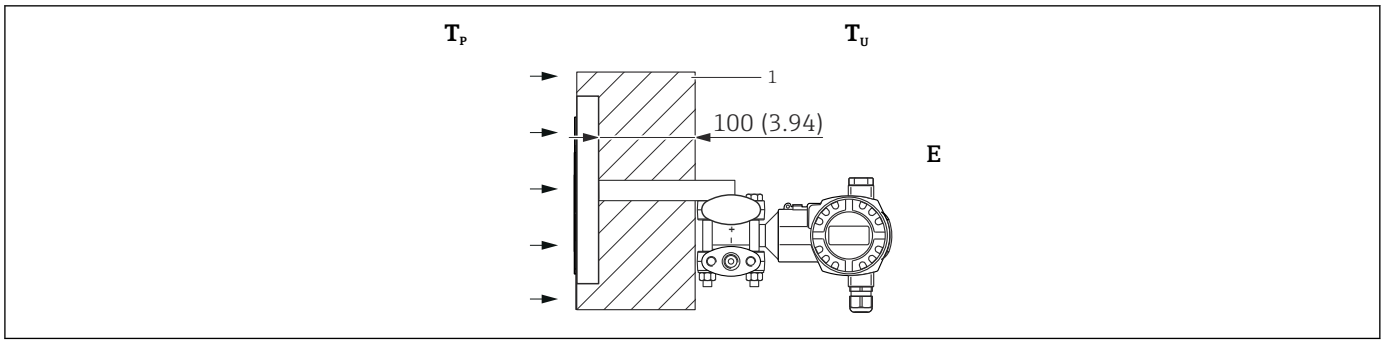
Heat insulation – FMD77

The FMD77 must only be insulated up to a certain height. The maximum permitted insulation height applies to an insulation material with a heat conductivity ≤ 0.04 W/(m x K) and to the maximum permitted ambient and process temperature. The data were determined under the most critical application "quiescent air".



1 Insulation material
A Transmitter horizontal, temperature isolator long
B Transmitter vertical, temperature isolator long
C Transmitter horizontal, temperature isolator short
D Transmitter vertical, temperature isolator short

Without insulation, the ambient temperature decreases by 5 K.



1 Insulation material

Item	Design	Ambient temperature T_A	Process temperature T_P	Option [1]
E	U-bracket, transmitter horizontal (for devices which require a CRN approval)	≤ 70 °C (158 °F)	Max. 350 °C (662 °F) depending on the diaphragm seal fill fluid used	[2]

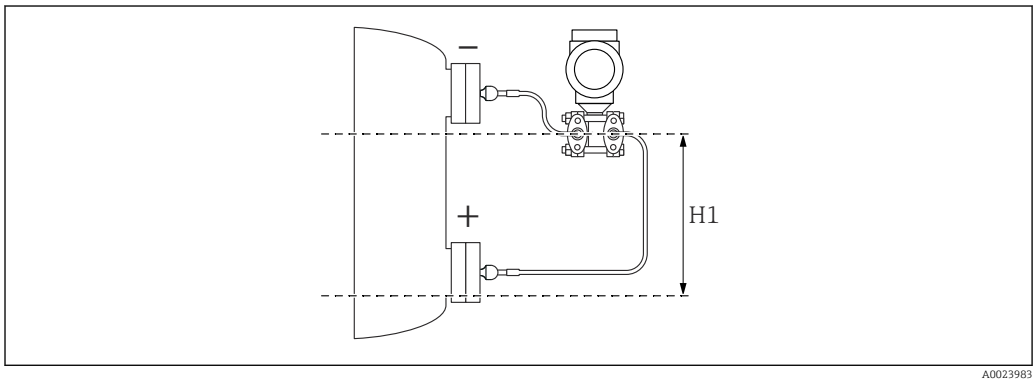
1) Product Configurator, order code for "Process connection"
2) In combination with CSA approval.

Vacuum applications

Mounting instructions

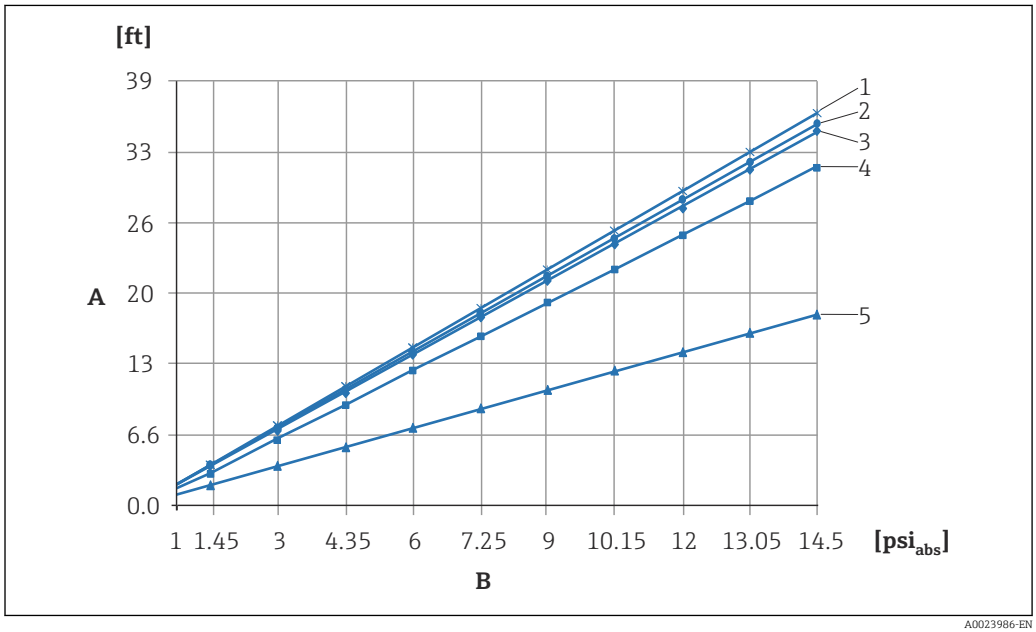
For applications under vacuum, Endress+Hauser recommends mounting the pressure transmitter below the lower diaphragm seal. This prevents a vacuum load of the diaphragm seal caused by the presence of filling oil in the capillaries.

When the pressure transmitter is mounted above the lower diaphragm seal, the maximum height difference H1, in accordance with the following illustrations, must not be exceeded:



A0023983

The maximum height difference is dependent on the density of the filling oil and the lowest pressure that is ever allowed to occur at the diaphragm seal on the positive side (empty vessel), see the following illustration:



A0023986-EN

A *Height difference H1*
B *Pressure at diaphragm seal*
1 *Low-temperature oil*
2 *Vegetable oil*
3 *Silicone oil*
4 *High-temperature oil*
5 *Inert oil*

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

Other certificates and approvals for the product are available under https://www.endress.com-> Downloads.

TSE (BSE) compliance (ADI free - Animal Derived Ingredients)

As the manufacturer, Endress+Hauser states:
- That the parts of this product in contact with the process are not made from materials derived from animals **or**
- at least comply with the requirements of guidelines outlined in EMA/410/01 rev. 3 (TSE (BSE) compliance).

Corrosion test

Standards and test methods:
- 316L: ASTM A262 Practice E and ISO 3651-2 Method A
- Alloy C22 and Alloy C276: ASTM G28 Practice A and ISO 3651-2 Method C
- 22Cr duplex, 25Cr duplex: ASTM G48 Practice A or ISO 17781 and ISO 3651-2 Method C

The corrosion test is confirmed for all wetted and pressure-bearing parts.

A 3.1 material certificate must be ordered as confirmation of the test.

Suitable for hygiene applications

For information on installation and approvals, see documentation SD02503F "Hygiene approvals".

For information on 3-A and EHEDG-tested adapters, see documentation TI00426F "Weld-in adapter, process adapter and flanges".

Certificate of current Good Manufacturing Practices (cGMP)

Product Configurator, order code for "Test, Certificate" option "JG"
- The certificate is only available in English
- Materials of construction of product wetted parts
- TSE compliance
- Polishing and surface finish
- Material/ compound compliance table (USP Class VI, FDA conformity)

CRN approval

PMD75

A CRN approval is available for some device versions. These devices are fitted with a separate plate bearing the registration number CRN 0F20813.5C. A CRN-approved process connection can be obtained in one of the following ways:
- CRN-approved process connection must be ordered with a CSA approval
- CRN-approved process connection must be ordered with the "CRN" option in the order code for "Additional approval".

FMD77, FMD78

A CRN approval is available for some device versions. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device. These devices are fitted with a separate plate bearing the registration number CRN 0F10524.5C.

Ordering information:

Product Configurator, order code for "Process connection; material" and

Product Configurator, order code for "Approval" (only in conjunction with an approved process connection)

Pressure Equipment Directive 2014/68/EU (PED)

Pressure equipment with allowable pressure ≤ 200 bar (2 900 psi)

Pressure equipment (with a maximum allowable pressure PS ≤ 200 bar (2 900 psi)) can be classified as pressure accessories in accordance with Pressure Equipment Directive 2014/68/EU. If the maximum allowable pressure is ≤ 200 bar (2 900 psi) and the pressurized volume of the pressure equipment is ≤ 0.1 l, the pressure equipment is subject to the Pressure Equipment Directive (cf.

Pressure Equipment Directive 2014/68/EU, Article 4, point 3). The Pressure Equipment Directive only requires that the pressure equipment shall be designed and manufactured in accordance with the "sound engineering practice of a Member State".

Reasons:

- Pressure Equipment Directive (PED) 2014/68/EU Article 4, point 3
- Pressure Equipment Directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05 + A-06

Note:

A partial examination shall be performed for pressure instruments that are part of safety equipment for the protection of a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

Pressure equipment with allowable pressure > 200 bar (2 900 psi)

Pressure equipment designated for application in every process fluid having a pressurized volume of <0.1 l and a max. allowable pressure PS > 200 bar (2 900 psi) must satisfy the essential safety requirements set out in Annex I of the Pressure Equipment Directive 2014/68/EU. According to Article 13 pressure equipment shall be classified by category in accordance with Annex II. Taking into account the low pressurized volume discussed above, the pressure devices are classed as category I pressure equipment. These devices must then bear the CE marking.

Reasons:

- Pressure Equipment Directive 2014/68/EU, Article 13, Annex II
- Pressure Equipment Directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05

Note:

A partial examination shall be performed for pressure instruments that are part of safety equipment for the protection of a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

The following also applies:

- FMD78 with pipe diaphragm seal ≥ 1.5"/PN40:
  Suitable for stable gases in group 1, category II, module A2
- PMD75, PN 420
  Suitable for stable gases in group 1, category I, module A

Classification of process sealing between electrical systems and (flammable or combustible) process fluids in accordance with ANSI/ISA 12.27.01

Endress+Hauser devices are designed in accordance with ANSI/ISA 12.27.01, allowing the user to waive the use of - and save the cost of installing - external secondary process seals in the conduit as required by the process sealing sections of ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC). These instruments comply with the North-American installation practice and provide a very safe and cost-saving installation for pressurized applications with hazardous fluids. Please refer to the following table for the seal class assigned (single seal or dual seal):

Device	Approval	Single seal MWP
PMD75	CSA C/US IS, XP	420 bar (6 300 psi)
FMD77	CSA C/US IS, XP	160 bar (2 400 psi)
FMD78	CSA C/US IS, XP	160 bar (2 400 psi)

Further information can be found in the control drawings of the relevant devices.

Inspection certificate

Designation	FMD77	FMD78	PMD75	Option
3.1 Material documentation, wetted metal parts, EN10204-3.1 inspection certificate	✔	✔	✔	B [1) 4)]
Conformity to NACE MR0175, wetted metallic parts	✔	✔	✔	C [1) 4)]

Designation	FMD77	FMD78	PMD75	Option
EN10204-3.1 material, NACE MR0175, wetted metal parts, inspection certificate	✔	✔	✔	D [1) 4)]
Individual test, test report	✔	✔	✔	3 [1) 2)]
Pressure test, internal procedure, test report	✔	✔	✔	4 [1) 2)]
EN10204-3.1 material wetted parts +Ra, Ra= surface roughness, dimensional check, inspection certificate	–	✔	–	6 [1) 2)]
Delta-Ferrite measurement, internal procedure, wetted metallic parts, inspection certificate	–	✔	–	8 [1) 2)]
3.1 Material documentation, wetted metal parts, EN10204-3.1 inspection certificate	✔	✔	✔	JA [3) 4)]
Conformity to NACE MR0175, wetted metallic parts	✔	✔	✔	JB [3) 4)]
Conformity to NACE MR0103, wetted metallic parts	✔	✔	✔	JE [3) 4)]
Helium leak test, internal procedure, inspection certificate	✔	✔	✔	KD [3)]
Pressure test, internal procedure, inspection certificate	✔	✔	✔	KE [3)]
PMI test (XRF), internal procedure, metal parts in contact with the medium	✔	✔	✔	KG [3)]
Welding documentation, wetted/pressurized seams	—	✔	—	KS

1) Product Configurator, order code for "Additional options 1"
2) Product Configurator, order code for "Additional options 2"
3) Product Configurator, order code for "Test, Certificate"
4) The choice of this feature for coated process isolating diaphragms/process connections refers to the metal base material.

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Special device versions

Endress+Hauser offers special device versions as **T**echnical **S**pecial **P**roducts (TSP).

For further information please contact your local Endress+Hauser Sales Center.

Scope of delivery

- Measuring device
- Optional accessories
- Brief Operating Instructions
- Calibration certificates
- Optional certificates

Measuring point (TAG)

Order code	895: Marking
Option	Z1: Tagging (TAG), see additional spec.
Position of the measuring point marking	To be selected in the additional specifications: ▪ Tag plate Stainless Steel ▪ Self-adhesive paper label ▪ Supplied label/plate ▪ RFID TAG ▪ RFID TAG + Tag plate Stainless Steel ▪ RFID TAG + Self-adhesive paper label ▪ RFID TAG + Supplied label/plate
Definition of the measuring point designation	To be defined in the additional specifications: 3 lines containing up to 18 characters each The measuring point designation appears on the selected label and/or the RFID TAG.
Identification on electronic nameplate (ENP)	32 characters

Configuration data sheet

Pressure

The following configuration data sheet must be completed and included with the order if the option "E" or "H" has been selected in the Product Configurator, order code for "Calibration; Unit".

Pressure unit

❑ mbar	❑ mmH_2O [1]	❑ mmHg [2]	❑ Pascals	❑ torr
❑ bar	❑ mH_2O [1]	❑ inHg [2]	❑ hPa	❑ g/cm^2
❑ psi	❑ ftH_2O [1]	❑ gf/cm^2	❑ kPa	❑ kg/cm^2
	❑ inH_2O [1]	❑ kgf/cm^2	❑ MPa	❑ lb/ft^2
				❑ atm

1) The conversion factor for the pressure unit is based on a reference temperature of 4 °C (39.2 °F).
2) The conversion factor of the pressure unit refers to a reference temperature of 0 °C (32 °F).

Calibration Range / Output

Low range value (LRV):	_____	[Pressure engineering unit]
Upper range value (URV):	_____	[Pressure engineering unit]

Display

Display of the content of the main line (option depends on sensor and communication variant)

- ❑ Primary value [PV] (default)
- ❑ Main Value [%]
- ❑ Pressure
- ❑ Current [mA] (HART only)
- ❑ Temperature
- ❑ Error number
- ❑ Alternating display

Damping

Damping: _____ sec (Default 2 sec)

Smallest calibratable span (preset at factory)→ 🖹 10

Level

The following configuration data sheet must be completed and included with the order if the option "F" or "T" has been selected in the Product Configurator, order code for "Calibration; Unit".

Pressure unit

- ❑ mbar
- ❑ bar
- ❑ psi
- ❑ mmH_2O [1]
- ❑ mH_2O [1]
- ❑ ftH_2O [1]
- ❑ inH_2O [1]
- ❑ mmHg [2]
- ❑ inHg [2]
- ❑ gf/cm^2
- ❑ kgf/cm^2
- ❑ Pascals
- ❑ hPa
- ❑ kPa
- ❑ MPa
- ❑ torr
- ❑ g/cm^2
- ❑ kg/cm^2
- ❑ lb/ft^2
- ❑ atm

Output unit (scaled unit)

Mass	Lengths	Volume	Volume	Percent
❑ kg	❑ m	❑ l	❑ USgal	❑ %
❑ t	❑ dm	❑ hl	❑ impgal	
❑ lb	❑ cm	❑ m^3	❑ USbblPE TR	
	❑ mm	❑ ft^3		
	❑ ft			
	❑ inch			

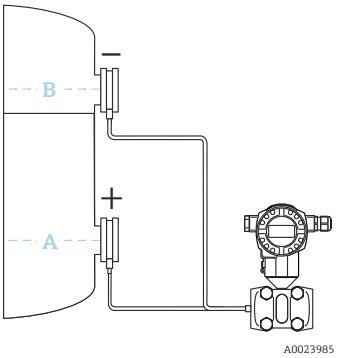
Empty calibration [a]:
Low pressure value (empty) _____ [Pressure engineering unit]

Full calibration [b]:
High pressure value (full) _____ [Pressure engineering unit]

Empty calibration [a]:
Low level value (empty) _____ [Scaled Unit]

Full calibration [b]:
High level value (full) _____ [Scaled Unit]

Example



A *500 mbar (7.25 psi) / 100 m^3*
B *50 mbar (1 psi) / 3 m^3*

1) The conversion factor for the pressure unit is based on a reference temperature of 4 °C (39.2 °F).
2) The conversion factor of the pressure unit refers to a reference temperature of 0 °C (32 °F).

Display

Display of the content of the main line (option depends on sensor and communication variant)

- ❑ Primary value [PV] (default)
- ❑ Main Value [%]
- ❑ Pressure
- ❑ Current [mA] (HART only)
- ❑ Temperature
- ❑ Level before Lin.
- ❑ Tank content
- ❑ Error number
- ❑ Alternating display

Damping

Damping: _____ sec (Default 2 sec)

Flow

The following configuration data sheet must be completed and included with the order if the option "G" or "J" has been selected in the Product Configurator, order code for "Calibration; Unit".

Pressure unit

- ❑ mbar
- ❑ bar
- ❑ psi
- ❑ mmH_2O [1]
- ❑ mH_2O
- ❑ ftH_2O
- ❑ inH_2O
- ❑ mmHg [2]
- ❑ inHg
- ❑ gf/cm^2
- ❑ kgf/cm^2
- ❑ Pascals
- ❑ hPa
- ❑ kPa
- ❑ MPa
- ❑ torr
- ❑ g/cm^2
- ❑ kg/cm^2
- ❑ lb/ft^2
- ❑ atm

Flow Unit / Measured Value (PV)

Mass	Volume Operation Conditions	Volume Norm Conditions	Volume Standard Conditions
❑ kg/s	❑ m^3/s	❑ Nm^3/s	❑ Sm^3/s
❑ kg/min	❑ m^3/min	❑ Nm^3/m	❑ Sm^3/min
❑ kg/h	❑ m^3/h	❑ in	❑ Sm^3/h
❑ t/s	❑ l/s	❑ Nm^3/h	❑ Sm^3/d
❑ t/min	❑ l/min	❑ Nm^3/d	❑ Scf/s
❑ t/h	❑ l/h		❑ Scf/min
❑ oz/s	❑ US Gal/s		❑ Scf/h
❑ oz/min	❑ US Gal/min		❑ Scf/d
❑ lb/s	❑ US Gal/h		
❑ lb/min	❑ ACFS		
❑ lb/h	❑ ACFM		
	❑ ACFH		
	❑ bbl/s [3] (USbl/sPETR [4])		
	❑ bbl/min [3] (USbl/mPETR [4])		
	❑ bbl/h [3] (USbl/hPETR [4])		
	❑ bbl/d [3] (USBL/hPETR [4])		

1) The conversion factor for the pressure unit is based on a reference temperature of 4 °C (39.2 °F).
2) The conversion factor of the pressure unit refers to a reference temperature of 0 °C (32 °F).
3) Term used in device and operating software. bbl = US Barrel (oil)
4) Order designation

Output Characteristic

❑ linear (HART only)
Operation Point

Maximum pressure _____ [Pressure engineering unit]

Max Flow _____ [flow unit]

LRV _____ [Pressure engineering unit]

(Lower Range Value (HART only))

❑ square root (HART only)
Operation Point

Maximum pressure _____ [Pressure engineering unit]

Max Flow _____ [flow unit]

LRV _____ [Pressure engineering unit]

(Lower Range Value (HART only))

Low flow cut off

Value: _____ [%] (default = 5%)

Display

Display of the content of the main line (option depends on sensor and communication variant)

- ❑ Primary value [PV] (default)
- ❑ Main Value [%]
- ❑ Pressure
- ❑ Current [mA] (HART only)
- ❑ Temperature
- ❑ Flow
- ❑ Totalizer 1
- ❑ Totalizer 2
- ❑ Error number
- ❑ Alternating display

Damping		
Damping:	_____	sec (Default 2 sec)

Accessories

HistoROM®/M-DAT

The HistoROM®/M-DAT is a memory module that can be attached to any electronic insert.

Ordering information:

Product Configurator, order code for "Additional options 1" or Additional options 2", version "N" or

as a separate accessory (part no.: 52027785).

Welding flanges and weld-in adapters

For details, refer to TI00426F/00/EN "Weld-in adapters, process adapters and flanges".

Manifolds

See the → 50.

For further details, see SD01553P/00/EN "Mechanical accessories for pressure measuring devices".

Additional mechanical accessories

Oval flange adapters, pressure gauge valves, shutoff valves, siphons, condensate pots, cable shortening kits, test adapters, mounting brackets, flushing rings, block&bleed valves and protective roofs.

For details see SD01553P/00/EN "Mechanical accessories for pressure measuring devices".

Service-specific accessories

Accessories	Description
DeviceCare SFE100	Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus field devices Technical Information TI01134S DeviceCare is available for download at www.software-products.endress.com. You need to register in the Endress+Hauser software portal to download the application.
FieldCare SFE500	FDT-based plant asset management tool FieldCare can configure all smart field units in your plant and helps you manage them. By using the status information, FieldCare is also a simple but effective way of checking the status and condition of the field devices. Technical Information TI00028S
Field Xpert SMT70, SMT77	The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous (Ex Zone 2) and non-hazardous areas. It is suitable for commissioning and maintenance staff. It manages Endress+Hauser and third-party field instruments with a digital communication interface and documents the progress of the work. The SMT70 is designed as a complete solution. It comes with a pre-installed driver library and is an easy-to-use, touch-enabled tool for managing field devices throughout their entire life cycle. The Field Xpert SMT77 for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1. It is suitable for commissioning and maintenance staff for easy management of field instruments with a digital communication interface. The touch-enabled tablet PC is designed as a complete solution. It comes with comprehensive pre-installed driver libraries and offers users a modern software user interface to manage field instruments throughout the entire life cycle.

Documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

Standard documentation

Document type: Operating Instructions (BA)
Installation and initial commissioning – contains all the functions in the operating menu that are needed for a routine measuring task. Functions beyond this scope are not included.

Document type: Brief Operating Instructions (KA)
Quick guide to the first measured value – includes all essential information from incoming acceptance to electrical connection.

Document type: Safety Instructions, certificates
Depending on the approval, safety instructions are supplied with the device, e.g. XA. This documentation is an integral part of the Operating Instructions.
Information on the Safety Instructions (XA) that are relevant for the device is provided on the nameplate.

Supplementary device-dependent documentation

Additional documents are supplied depending on the device version ordered: Always comply strictly with the instructions in the supplementary documentation. The supplementary documentation is an integral part of the device documentation.

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