

Technical Information

Cerabar PMP51B

Process pressure and level measurement in liquids or gases



Digital pressure transmitter with metal process isolating diaphragm

Applications

- Pressure measuring ranges up to 400 bar (6 000 psi)
- Process temperatures up to 400 °C (752 °F) with diaphragm seal
- Accuracy: up to $\pm 0.055\%$

Advantages

The new Cerabar generation introduces a robust pressure transmitter that combines numerous benefits: Easiest local or remote operation, allows condition-based maintenance and offers smart safety in processes. The software is designed to simplify the handling. Intuitive and clear wizard navigation guides the user through the commissioning and verification of the device. The Bluetooth connectivity provides a safe and remote operation. The large display guarantees excellent readability.

Table of contents

About this document	4	Climate class	28
Symbols	4	Atmosphere	29
List of abbreviations	5	Degree of protection	29
Turn down calculation	5	Vibration resistance	29
		Electromagnetic compatibility (EMC)	30
Function and system design	7	Process	31
Measuring principle	7	Process temperature range	31
Measuring system	8	Process pressure range	34
Communication and data processing	9	Ultrapure gas applications	34
Dependability for measuring devices with HART or Bluetooth	9	Steam applications and saturated steam applications	34
		Thermal insulation	34
Input	11	Mechanical construction	38
Measured variable	11	Design, dimensions	38
Measuring range	11	Dimensions	39
		Weight	54
Output	13	Materials in contact with process	55
Output signal	13	Materials not in contact with process	55
Signal on alarm	13	Accessories	56
Load	13		
Damping	14	Human interface	57
Ex connection data	14	Operating concept (not for devices with 4 to 20 mA analog)	57
Linearization	14	Local operation	57
Protocol-specific data	14	Local display	58
Wireless HART data	15	Remote operation	58
		System integration	58
Power supply	16	Supported operating tools	58
Terminal assignment	16		
Available device plugs	16	Certificates and approvals	59
Supply voltage	17	CE mark	59
Potential equalization	18	RCM-Tick marking	59
Terminals	18	Ex approvals	59
Cable entries	18	EAC conformity	59
Cable specification	18	Certificate of current Good Manufacturing Practices (cGMP)	59
Overvoltage protection	18	Drinking water approval	59
		Overfill prevention (in preparation)	59
Performance characteristics	19	Functional safety SIL/ IEC 61508 Declaration of Conformity (optional)	59
Response time	19	Marine approval (pending)	59
Reference operating conditions	19	Radio approval	60
Maximum measured error (total performance)	19	Test reports	60
Resolution	21	Pressure Equipment Directive 2014/68/EU (PED)	60
Total error	21	Oxygen application	61
Long-term stability	22	PWIS-free applications	61
Response time T63 and T90	22	China RoHS symbol	61
Warm-up period	23	RoHS	61
		Additional certification	61
Installation	24	Ordering information	62
Orientation	24	Ordering information	62
Installation instructions	24	Scope of delivery	62
Installation instructions for devices with diaphragm seals	24	Measuring point (tag)	62
Sensor selection and arrangement	25		
Special mounting instructions	26		
Environment	28		
Ambient temperature range	28		
Storage temperature	28		
Operating altitude	28		

Accessories	63
Device-specific accessories	63
Device Viewer	63
Supplementary documentation	64
Standard documentation	64
Supplementary device-dependent documentation	64
Field of Activities	64
Special Documentation	64
Registered trademarks	64

About this document

Symbols

Safety symbols



This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.



This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.



This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.



This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

Ground connection: \perp

Terminal for connection to the grounding system.

Symbols for certain types of information

Permitted: 

Procedures, processes or actions that are permitted.

Forbidden: 

Procedures, processes or actions that are forbidden.

Additional information: 

Reference to documentation: 

Reference to page: 

Series of steps: **1.**, **2.**, **3.**

Result of an individual step: 

Symbols in graphics

Item numbers: 1, 2, 3 ...

Series of steps: **1.**, **2.**, **3.**

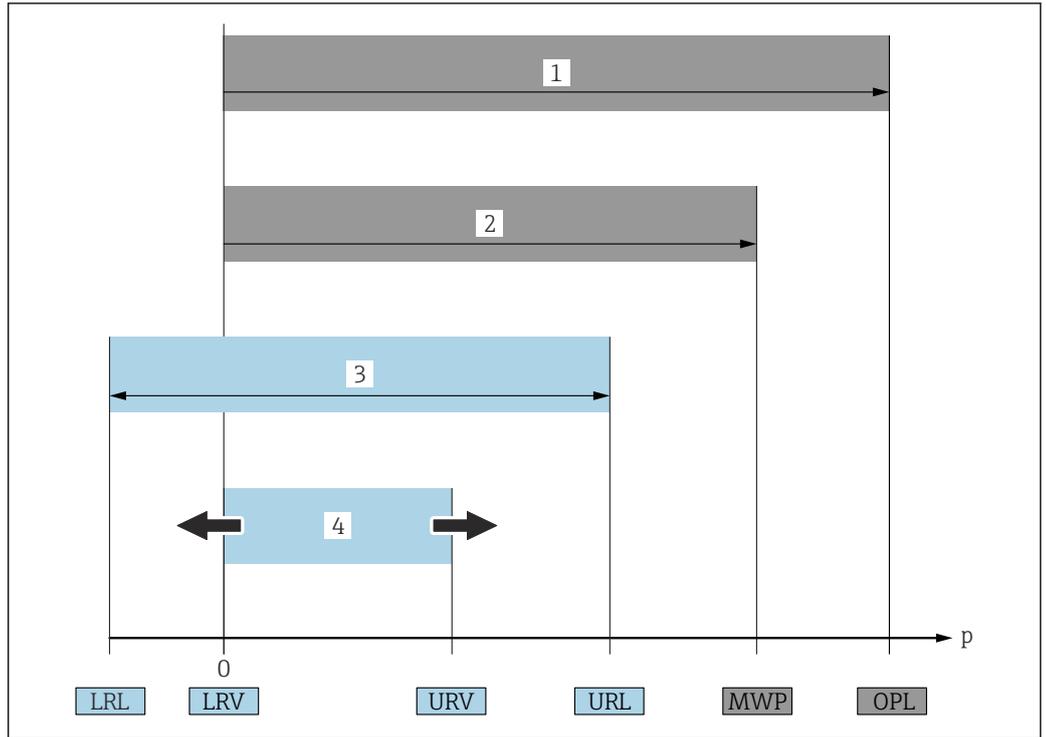
Views: A, B, C, ...

Symbols on the device

Safety instructions:  → 

Observe the safety instructions contained in the associated Operating Instructions.

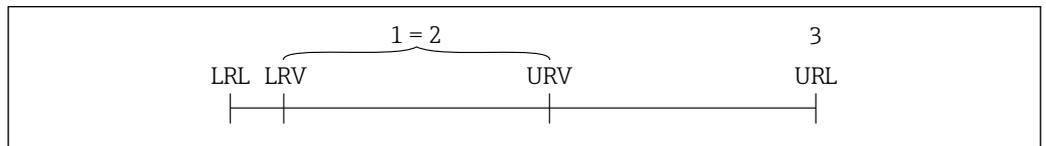
List of abbreviations



A0029505

- 1 OPL: The OPL (over pressure limit = sensor overload limit) for the measuring 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 MWP: The MWP (maximum working pressure) for the sensors 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 sensor measuring range corresponds to the span between the LRL and URL. This sensor 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



A0029545

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

Example:

- Sensor: 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)

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

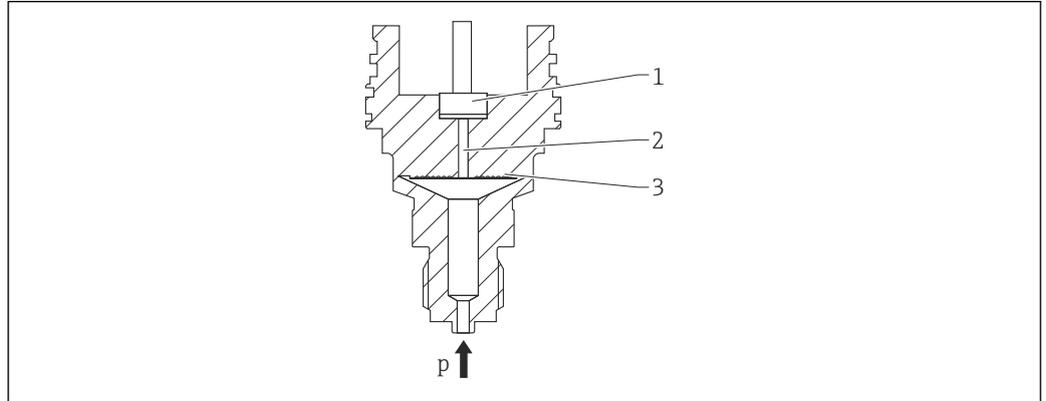
In this example, the TD is 2:1. This span is based on the zero point.

Function and system design

Measuring principle

Metal process isolating diaphragm

Standard measuring device (without a diaphragm seal)



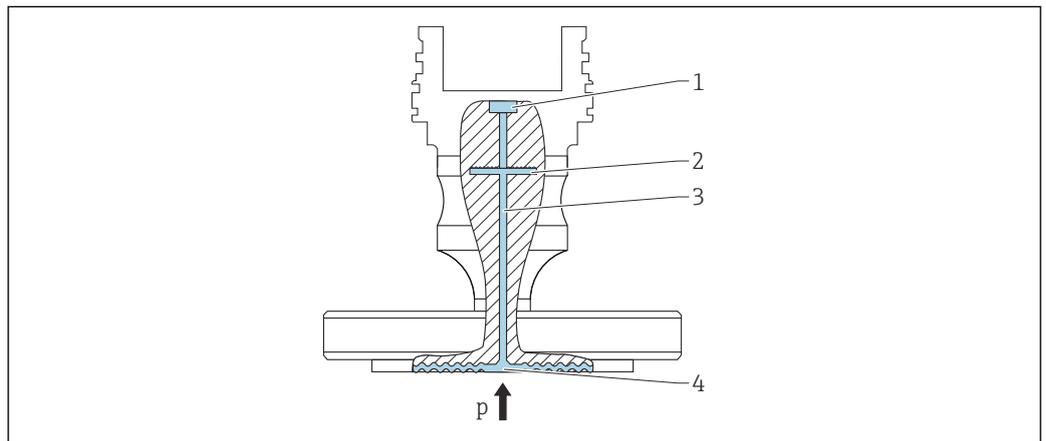
- 1 Measuring element
- 2 Channel with fill fluid
- 3 Metal process isolating diaphragm
- p Pressure

The process pressure causes the metal process isolating diaphragm of the sensor to deflect. A fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Advantages:

- Can be used for high process pressures
- High long-term stability
- High overload resistance
- Secondary containment for enhanced integrity
- Significantly reduced thermal effect e.g. compared to diaphragm seal systems with capillaries

Measuring device with a diaphragm seal



- 1 Measuring element
- 2 Internal process isolating diaphragm
- 3 Channel with fill fluid
- 4 Metal process isolating diaphragm
- p Pressure

The process pressure acts on the process isolating diaphragm of the diaphragm seal and is transferred to the internal process isolating diaphragm by a diaphragm seal fill fluid. The internal process isolating diaphragm is deflected. A fill fluid transfers the pressure to the measuring element

on which a resistance bridge is located. The pressure-dependent change in the bridge output voltage is measured and evaluated.

Advantages:

- Depending on the version, can be used for process pressures up to 400 bar (6 000 psi) and for extreme process temperatures
- High long-term stability
- High overload resistance
- Standard measuring device (without a diaphragm seal): Secondary containment for enhanced integrity

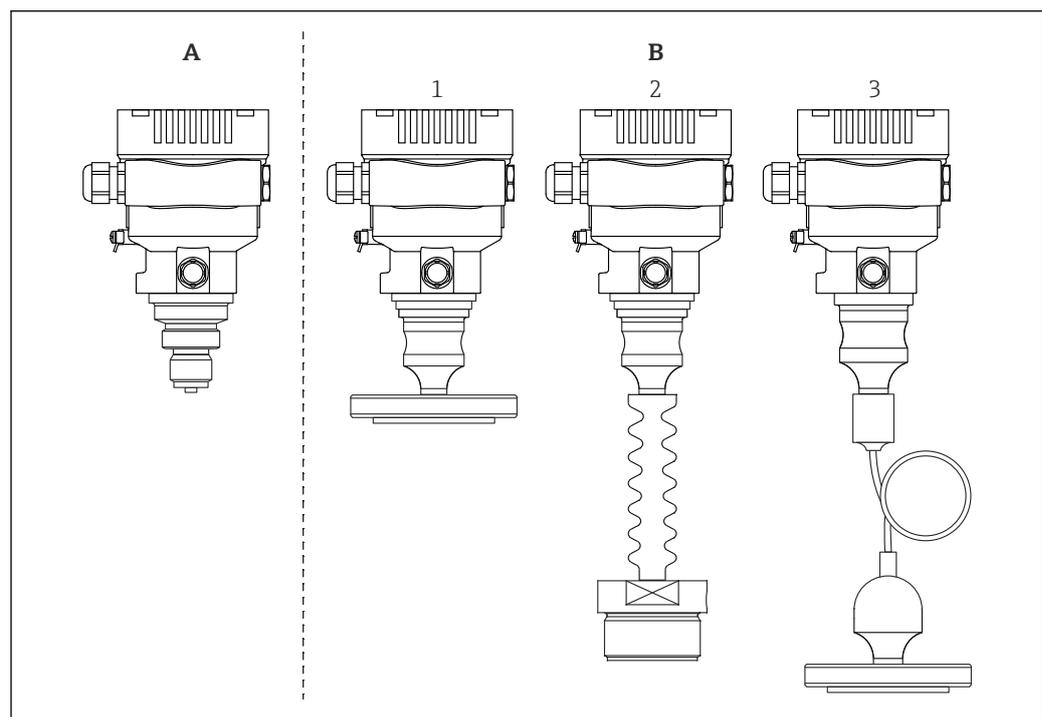
Applications for diaphragm seals

Diaphragm seal systems are 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 - through the use of temperature isolators or capillaries
- In the case of strong vibrations - decouple the process from the measuring device by using a capillary
- In the case of aggressive or corrosive media - through the use of high-durability membrane materials
- In the case of media that crystallize or contain solids - through the choice of suitable coatings
- 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
- For mounting locations that are difficult to access

Measuring system

Device versions

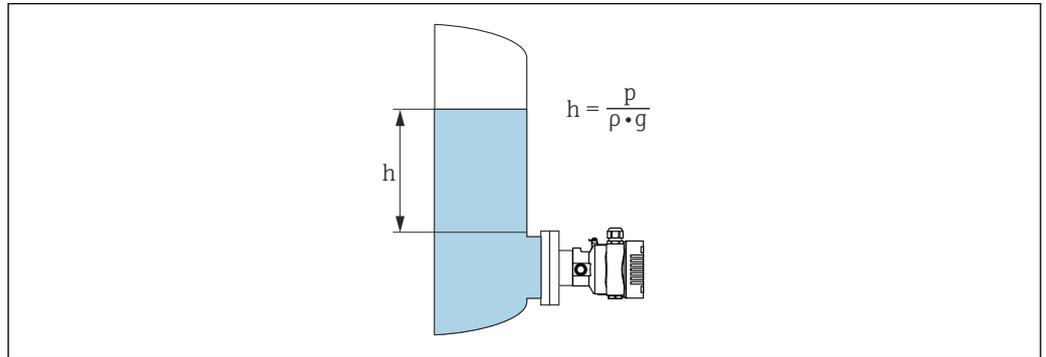


A0043594

- A Standard measuring device (without a diaphragm seal)
 B Measuring device with a diaphragm seal
 1 Compact diaphragm seal type
 2 Temperature isolator diaphragm seal type
 3 Diaphragm seal type with capillary

Level measurement (level, volume and mass)

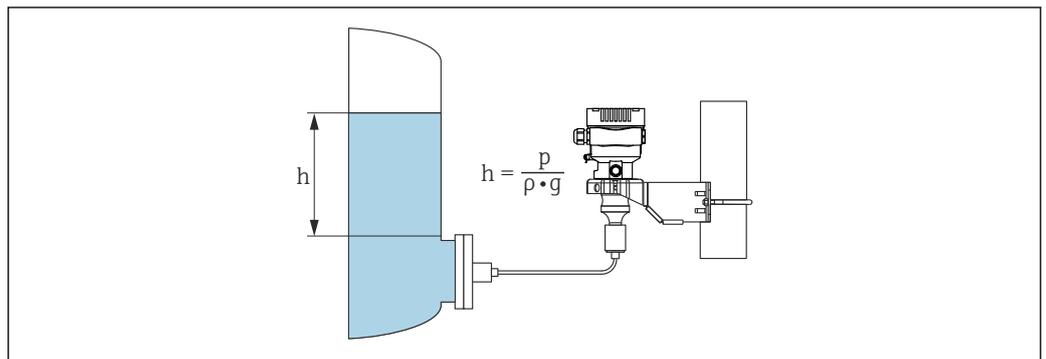
Standard measuring device (without a diaphragm seal)



A0038343

- h* Height (level)
- p* Pressure
- ρ* Density of the medium
- g* Gravitation constant

Measuring device with a diaphragm seal



A0038342

1 Sample illustration: diaphragm seal with capillary

- h* Height (level)
- p* Pressure
- ρ* Density of the medium
- g* Gravitation constant

Advantages:

- Volume and mass measurements in any vessel shape with a freely programmable characteristic curve
- Has a wide range of uses, e.g.
 - For foam formation
 - In vessels with agitators or screen fittings
 - For liquid gases

Communication and data processing

- 4 to 20 mA with HART communication protocol (optional)
- Bluetooth (optional)

Dependability for measuring devices with HART or Bluetooth

IT security

Endress+Hauser can only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings. IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

Device-specific IT security

The device offers specific functions to support protective measures by the operator. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. An overview of the most important functions is provided in the following section:

- Write protection via hardware write protection switch
- Access code (applies for operation via Bluetooth, FieldCare, DeviceCare, ASM, PDM)

Input

Measured variable	Measured process variables <ul style="list-style-type: none"> ■ Absolute pressure ■ Gauge pressure
Measuring range	Depending on the device configuration, the MWP and OPL can differ from the values indicated in the table.

Absolute pressure

Sensor	Maximum sensor measuring range ¹⁾		Smallest calibratable span (preset at factory)
	lower (LRL)	upper (URL)	
	[bar _{abs} (psi _{abs})]	[bar _{abs} (psi _{abs})]	[bar (psi)]
400 mbar (6 psi)	0	+0.4 (+6)	0.02 (0.3) ²⁾
1 bar (15 psi)	0	+1 (+15)	0.05 (1) ³⁾
2 bar (30 psi)	0	+2 (+30)	0.1 (1.5) ³⁾
4 bar (60 psi)	0	+4 (+60)	0.2 (3) ³⁾
10 bar (150 psi)	0	+10 (+150)	0.5 (7.5) ³⁾
40 bar (600 psi)	0	+40 (+600)	2 (30) ³⁾
100 bar (1 500 psi)	0	+100 (+1500)	5 (75) ³⁾
400 bar (6 000 psi)	0	+400 (+6000)	20 (300) ³⁾

- 1) Measuring device with diaphragm seal: Within the sensor measuring range, the minimum upper range value of 80 mbar_{abs} (1.16 psi_{abs}) must be observed.
- 2) Largest factory-configurable turn down: 80:1
- 3) Largest factory-configurable turn down: 100:1

Sensor	MWP	OPL	Vacuum resistance ¹⁾
	[bar _{abs} (psi _{abs})]	[bar _{abs} (psi _{abs})]	[bar _{abs} (psi _{abs})]
400 mbar (6 psi)	4 (60)	6 (90)	<ul style="list-style-type: none"> ■ Silicone oil: 0.01 (0.15) ■ Inert oil: 0.04 (0.6)
1 bar (15 psi)	6.7 (100)	10 (150)	
2 bar (30 psi)	13.3 (200)	20 (300)	
4 bar (60 psi)	18.7 (280.5)	28 (420)	
10 bar (150 psi)	26.7 (400.5)	40 (600)	
40 bar (600 psi)	100 (1500)	160 (2400)	
100 bar (1 500 psi)	100 (1500)	400 (6000)	
400 bar (6 000 psi)	400 (6000)	600 (9000)	

- 1) The vacuum resistance applies for the measuring cell under reference operating conditions. A ceramic process isolating diaphragm is recommended for applications in the limit range. Measuring device with diaphragm seal: observe pressure and temperature application limits of the selected fill fluid.

Gauge pressure

Sensor	Maximum sensor measuring range		Smallest calibratable span (preset at factory)
	lower (LRL)	upper (URL)	
	[bar (psi)]	[bar (psi)]	[bar (psi)]
400 mbar (6 psi)	-0.4 (-6)	+0.4 (+6)	0.02 (0.3) ¹⁾
1 bar (15 psi)	-1 (-15)	+1 (+15)	0.05 (1) ²⁾
2 bar (30 psi)	-1 (-15)	+2 (+30)	0.1 (1.5) ²⁾
4 bar (60 psi)	-1 (-15)	+4 (+60)	0.2 (3) ²⁾
10 bar (150 psi)	-1 (-15)	+10 (+150)	0.5 (7.5) ²⁾
40 bar (600 psi)	-1 (-15)	+40 (+600)	2 (30) ²⁾
100 bar (1 500 psi)	-1 (-15)	+100 (+1500)	5 (75) ²⁾
400 bar (6 000 psi)	-1 (-15)	+400 (+6000)	20 (300) ²⁾

1) Largest factory-configurable turn down: 80:1

2) Largest factory-configurable turn down: 100:1

Sensor	MWP	OPL	Vacuum resistance ¹⁾
	[bar (psi)]	[bar (psi)]	[bar _{abs} (psi _{abs})]
400 mbar (6 psi)	4 (60)	6 (90)	<ul style="list-style-type: none"> ■ Silicone oil: 0.01 (0.15) ■ Inert oil: 0.04 (0.6)
1 bar (15 psi)	6.7 (100)	10 (150)	
2 bar (30 psi)	13.3 (200)	20 (300)	
4 bar (60 psi)	18.7 (280.5)	28 (420)	
10 bar (150 psi)	26.7 (400.5)	40 (600)	
40 bar (600 psi)	100 (1500)	160 (2400)	
100 bar (1 500 psi)	100 (1500)	400 (6000)	
400 bar (6 000 psi)	400 (6000)	600 (9000)	

1) The vacuum resistance applies to the measuring cell under reference operating conditions. A ceramic process isolating diaphragm is recommended for applications in the limit range. Measuring device with diaphragm seal: observe pressure and temperature application limits of the selected fill fluid.

Output

Output signal

Current output

4 to 20 mA analog, 2-wire

4 to 20 mA with superimposed digital communication protocol HART, 2-wire

The current output offers a choice of three different operating modes:

- 4.0 to 20.5 mA
- NAMUR NE 43: 3.8 to 20.5 mA (factory setting)
- US mode: 3.9 to 20.8 mA

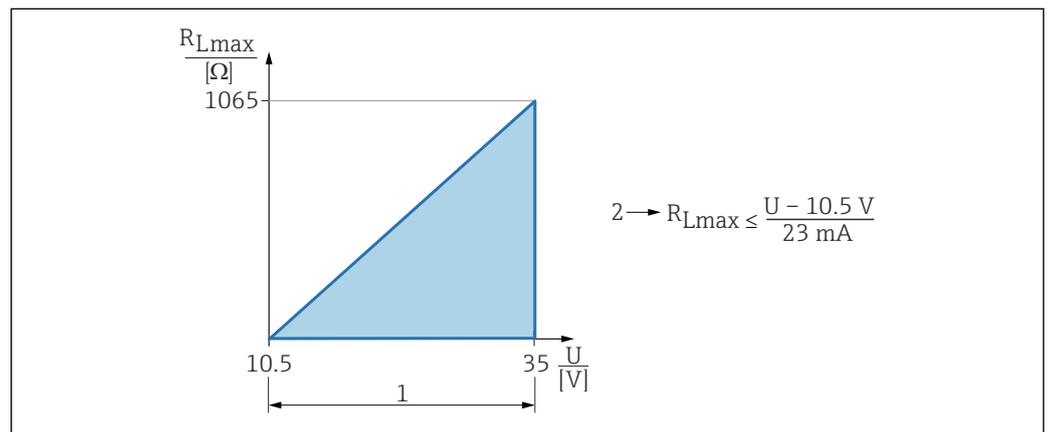
Signal on alarm

Signal on alarm in accordance with NAMUR recommendation NE 43.

- 4 to 20 mA analog:
 - Signal over-range: > 20.5 mA
 - Signal under-range: < 3.8 mA
 - Min alarm (< 3.6 mA, factory setting)
- 4 to 20 mA HART:
 - Options:
 - Max alarm: can be set from 21.5 to 23 mA
 - Min. alarm: < 3.6 mA (factory setting)

Load

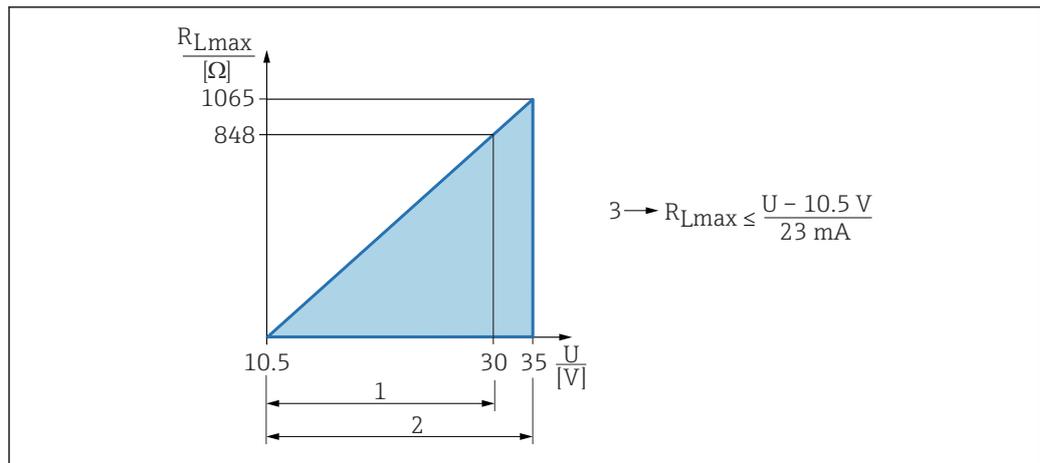
4 to 20 mA Analog



- 1 Power supply 10.5 to 35 V
- 2 R_{Lmax} maximum load resistance
- U Supply voltage

A0039234

4 to 20 mA HART



A0039232

- 1 Power supply 10.5 to 30 VDC Ex i
 2 Power supply 10.5 to 35 VDC, for other types of protection and for non-certified device versions
 3 R_{Lmax} maximum load resistance
 U Supply voltage



Operation via handheld terminal or PC with operating program: take minimum communication resistance of 250 Ω into consideration.

Damping

A damping affects all outputs (output signal, display). Damping can be enabled as follows:

- Via the DIP switch on the electronic insert (analog electronics only)
- Factory setting: 1 s

Ex connection data

See the separate technical documentation (Safety Instructions (XA)) on www.endress.com/download.

Linearization

The device's linearization function allows the user to convert the measured value to any units of height or volume. User-defined linearization tables of up to 32 value pairs can be entered if necessary.

Protocol-specific data

HART

- Manufacturer ID: 17 (0x11{hex})
- Device type ID: 0x112A
- Device revision: 1
- HART specification: 7
- DD revision: 1
- Device description files (DTM, DD) information and files at:
 - www.endress.com
 - www.fieldcommgroup.org
- HART load: min. 250 Ohm

HART device variables (preset at the factory)

The following measured values are assigned to the device variables at the factory:

Device variable	Measured value
Primary variable (PV) ¹⁾	Pressure ²⁾
Secondary variable (SV)	Sensor temperature

Device variable	Measured value
Tertiary variable (TV)	Electronic temperature
Quaternary variable (QV)	Sensor pressure ³⁾

- 1) The PV is always applied to the current output.
- 2) The pressure is the calculated signal after damping and position adjustment.
- 3) The sensor pressure is the raw sensor signal before damping and position adjustment.

Choice of HART device variables

- **Pressure** option (after position correction and damping)
- Scaled variable
- Sensor temperature
- **Sensor pressure** option Sensor Pressure is the raw signal from sensor before damping and position adjustment.
- Electronics temperature
- Percent of range
- **Loop current** option The loop current is the output current set by the applied pressure.

Supported functions

- Burst mode
- Additional transmitter status
- Device locking

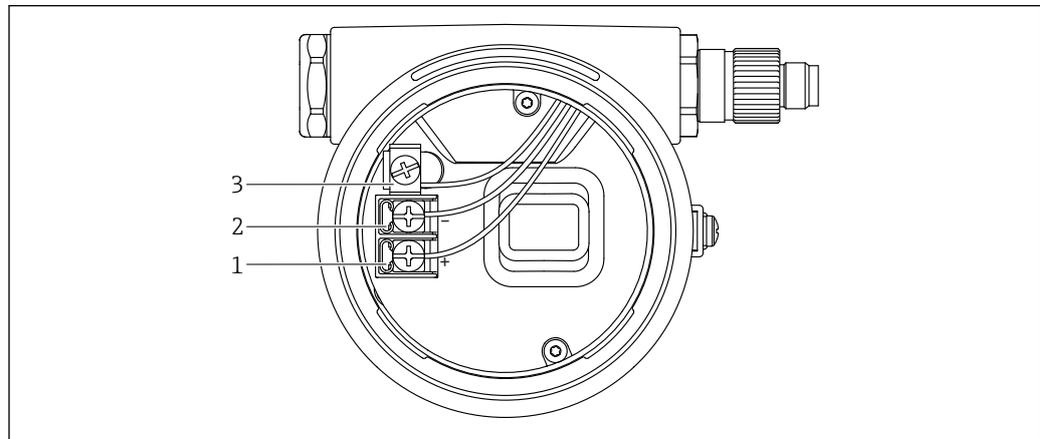
Wireless HART data

- Minimum starting voltage: 10.5 V
- Start-up current: >3.6 mA
- Starting time: <5 s
- Minimum operating voltage: 10.5 V
- Multidrop current: 4 mA

Power supply

Terminal assignment

Single compartment housing



A0042594

 2 Connection terminals and ground terminal in the connection compartment

1 Positive terminal

2 Negative terminal

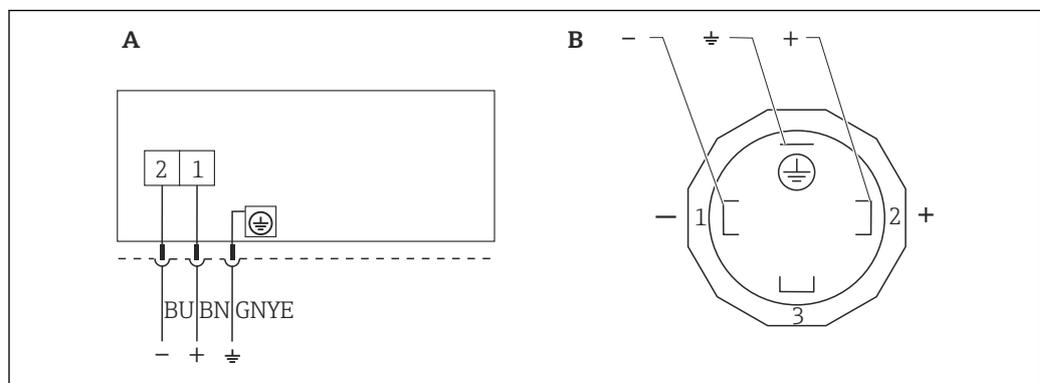
3 Internal ground terminal

Available device plugs

 In the case of devices with a plug, the housing does not have to be opened to establish the connection.

Use the enclosed seals to prevent the penetration of moisture into the device.

Measuring devices with a valve plug



A0023097

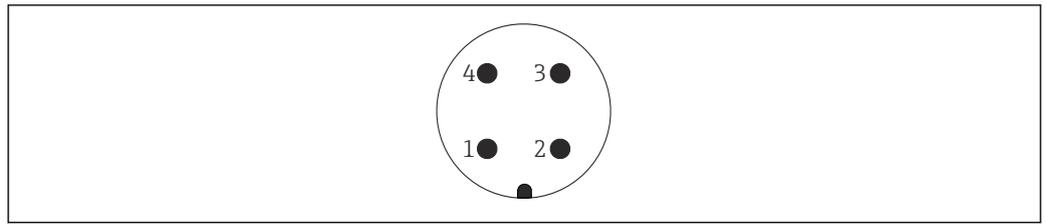
 3 BN = brown, BU = blue, GNYE = green/yellow

A Electrical connection for devices with valve connector

B View of the plug-in connection on the device

Material: PA 6.6

Measuring devices with M12 plug



A0011175

- 1 Signal +
- 2 Not assigned
- 3 Signal -
- 4 Ground

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

Plug-in jack M 12x1, straight

- Material:
 - Body: PBT; union nut: nickel-plated die-cast zinc; seal: NBR
- Degree of protection (fully locked): IP67
- Order number: 52006263

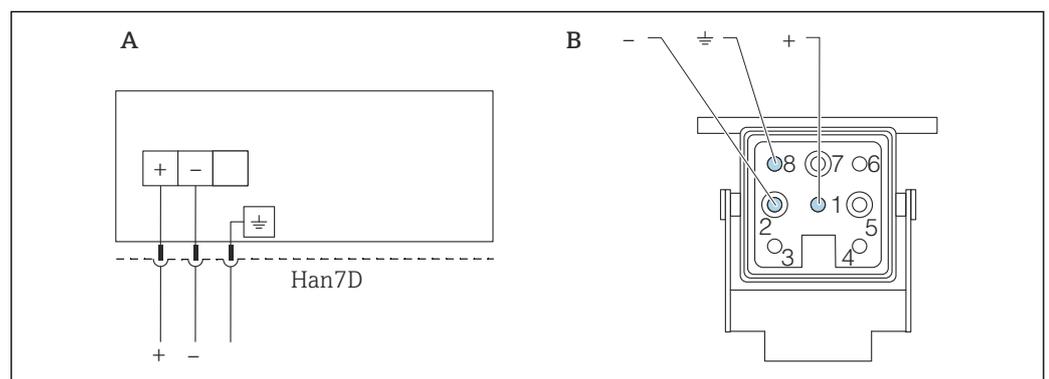
Plug-in jack M 12x1, elbowed

- Material:
 - Body: PBT; union nut: nickel-plated die-cast zinc; seal: NBR
- Degree of protection (fully locked): IP67
- Order number: 71114212

Cable 4x0.34 mm² (20 AWG) with M12 plug-in jack, elbowed, screw plug, length 5 m (16 ft)

- Material: body: TPU; union nut: nickel-plated die-cast zinc; cable: PVC
- Degree of protection (fully locked): IP67/68
- Order number: 52010285
- Cable colors
 - 1 = BN = brown
 - 2 = WT = white
 - 3 = BU = blue
 - 4 = BK = black

Measuring devices with Harting plug Han7D



A0041011

A Electrical connection for devices with Harting plug Han7D
 B View of the plug-in connection on the device

Material: CuZn, contacts for plug-in jack and connector are gold-plated

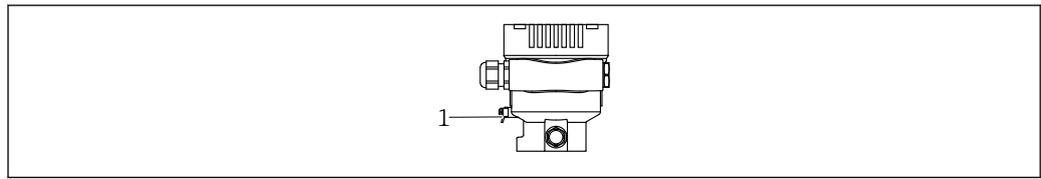
Supply voltage

- Ex d, Ex e, non-Ex: supply voltage: 10.5 to 35 VDC
- Ex i: supply voltage: 10.5 to 30 VDC
- Nominal current: 4 to 20 mA HART

 The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV, Class 2).

A suitable circuit breaker should be provided for the device in accordance with IEC/EN 61010.

Potential equalization



A0045411

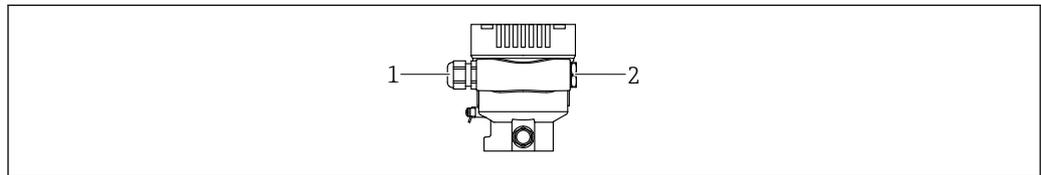
1 Ground terminal for connecting the potential matching line

- i** If necessary, the potential matching line can be connected to the outer ground terminal of the transmitter before the device is connected.
- i** For optimum electromagnetic compatibility:
 - Keep the potential matching line as short as possible
 - Maintain a cross-section of at least 2.5 mm² (14 AWG)

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



A0045413

1 Cable entry
2 Dummy plug

A0045413

The type of cable entry depends on the device version ordered.

- i** Always route connecting cables downwards so that moisture cannot penetrate the connection compartment.

If necessary, create a drip loop or use a weather protection cover.

Cable specification

- The cable outer diameter depends on the cable entry used
- Cable outer diameter
 - Plastic: Ø5 to 10 mm (0.2 to 0.38 in)
 - Nickel-plated brass: Ø7 to 10.5 mm (0.28 to 0.41 in)
 - Stainless steel: Ø7 to 12 mm (0.28 to 0.47 in)

Overvoltage protection

Devices without optional overvoltage protection

Equipment from Endress+Hauser fulfills the requirements of the product standard IEC / DIN EN 61326-1 (Table 2 Industrial Environment).

Depending on the type of port (DC power supply, input/output port) different testing levels according to IEC / DIN EN 61326-1 against transient overvoltages (Surge) are applied (IEC / DIN EN 61000-4-5 Surge):

Test level on DC power ports and input / output ports is 1000 V line to earth

Overvoltage category

Overvoltage category II

Performance characteristics

Response time	<ul style="list-style-type: none"> ▪ Acyclic: min. 330 ms, typically 590 ms (depends on commands and number of preambles) ▪ Cyclic (burst): min. 160 ms, typically 350 ms (depends on commands and number of preambles)
Reference operating conditions	<ul style="list-style-type: none"> ▪ As per IEC 62828-2 ▪ Ambient temperature T_A = constant, in the range +21 to +33 °C (+70 to +91 °F) ▪ Humidity φ = constant, in the range: 5 to 80 % RH \pm 5 % ▪ Ambient pressure p_U = constant, in the range: 860 to 1 060 mbar (12.47 to 15.37 psi) ▪ Position of the measuring cell: horizontal \pm1° ▪ Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value ▪ Membrane material: AISI 316L (1.4435), Alloy C (Alloy C only for standard measuring device (without a diaphragm seal) ▪ Fill fluid: <ul style="list-style-type: none"> ▪ Silicone oil (standard) ▪ Silicone oil, FDA (diaphragm seal) ▪ Supply voltage: 24 V DC \pm3 V DC ▪ Load with HART: 250 Ω ▪ Turn down (TD) = URL/ URV - LRV ▪ Zero based span
Maximum measured error (total performance)	<p>The performance characteristics refer to the accuracy of the measuring device. The factors influencing accuracy can be divided into two groups</p> <ul style="list-style-type: none"> ▪ Total performance of measuring device ▪ Installation factors <p>All performance characteristics are in conformance with $\geq \pm 3$ sigma.</p> <p>The total performance of the measuring device comprises the reference accuracy and the ambient temperature effect and is calculated using the following formula:</p> $\text{Total performance} = \pm \sqrt{(E1)^2 + (E2)^2}$ <p>E1 = Reference accuracy E2 = Ambient temperature effect</p> <p>Influence of diaphragm seal (calculation performed with Applicator "Sizing Diaphragm Seal")</p> <p>Calculation of E2:</p> <p>Ambient temperature effect per \pm28 °C (50 °F) (corresponds to the range from -3 to +53 °C (+27 to +127 °F))</p> $E2 = E2_M + E2_E$ <p>$E2_M$ = Main temperature error $E2_E$ = Electronics error</p> <ul style="list-style-type: none"> ▪ The values apply for process isolating diaphragms made of 316L (1.4435) ▪ The values refer to the calibrated span.

Reference accuracy [E1]

The reference accuracy comprises the non-linearity according to the limit point method, pressure hysteresis and non-repeatability in accordance with [IEC 62828-1 / IEC 61298-2]. Reference accuracy for standard up to TD 100:1, for platinum up to TD 10:1.

Standard measuring device (without a diaphragm seal)

400 mbar (6 psi) sensor

- Standard: TD 1:1 = $\pm 0.075\%$; TD > 1:1 = $\pm 0.075\% \cdot \text{TD}$
- Platinum: TD 1:1 = $\pm 0.055\%$; TD > 1:1 to 10:1 = $\pm 0.055\% \cdot \text{TD}$

1 bar (15 psi) sensor

- Standard: TD $\leq 2.5:1$ = $\pm 0.075\%$; TD > 2.5:1 = $\pm 0.03\% \cdot \text{TD}$
- Platinum: TD $\leq 2.5:1$ = $\pm 0.055\%$; TD > 2.5:1 to 10:1 = $\pm 0.025\% \cdot \text{TD}$

2 bar (30 psi) sensor

- Standard: TD $\leq 5:1$ = $\pm 0.075\%$; TD > 5:1 = $\pm 0.015\% \cdot \text{TD}$
- Platinum: TD $\leq 5:1$ = $\pm 0.055\%$; TD > 5:1 to 10:1 = $\pm 0.01\% \cdot \text{TD}$

4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi) and 100 bar (1500 psi) sensor

- Standard: TD $\leq 10:1$ = $\pm 0.075\%$; TD > 10:1 = $\pm 0.0075\% \cdot \text{TD}$
- Platinum: TD $\leq 10:1$ = $\pm 0.055\%$

400 bar (6000 psi) sensor

- Standard: TD $\leq 5:1$ = $\pm 0.15\%$; TD > 5:1 = $\pm 0.03\% \cdot \text{TD}$
- Platinum: TD $\leq 5:1$ = $\pm 0.1\%$; TD > 5:1 to 10:1 = $\pm 0.025\% \cdot \text{TD}$

Platinum not for flush mount process connections G ½, G ¾ and M20.

Measuring device with a diaphragm seal

400 mbar (6 psi) sensor

- Standard: TD 1:1 = $\pm 0.15\%$; TD > 1:1 = $\pm 0.15\% \cdot \text{TD}$
- Platinum: not available

1 bar (15 psi) sensor

- Standard: TD 1:1 to 5:1 = $\pm 0.15\%$; TD > 5:1 = $\pm 0.03\% \cdot \text{TD}$
- Platinum: TD 1:1 to 2.5:1 = $\pm 0.075\%$; TD > 2.5:1 to 10:1 = $\pm 0.03\% \cdot \text{TD}$

2 bar (30 psi) sensor

- Standard: TD 1:1 to 10:1 = $\pm 0.15\%$; TD > 10:1 = $\pm 0.015\% \cdot \text{TD}$
- Platinum: TD 1:1 to 5:1 = $\pm 0.075\%$; TD > 5:1 to 10:1 = $\pm 0.015\% \cdot \text{TD}$

4 bar (60 psi), 10 bar (150 psi), 40 bar (600 psi) and 100 bar (1500 psi) sensor

- Standard: TD 1:1 to 10:1 = $\pm 0.15\%$; TD > 10:1 = $\pm 0.2\%$
- Platinum: TD 1:1 to 5:1 = $\pm 0.075\%$; TD > 5:1 to 10:1 = $\pm 0.075\% \cdot \text{TD}$

400 bar (6000 psi) sensor

- Standard: TD 1:1 to 5:1 = $\pm 0.15\%$; TD > 5:1 = $\pm 0.03\% \cdot \text{TD}$
- Platinum: TD 1:1 to 5:1 = $\pm 0.15\%$; TD > 5:1 to 10:1 = $\pm 0.03\% \cdot \text{TD}$



Platinum only for direct diaphragm seal mounting.

Temperature effect [E2]*E_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.

Standard and platinum: 400 mbar (6 psi), 1 bar (15 psi), 2 bar (30 psi) and 4 bar (60 psi) sensor
 $\pm(0.08\% \cdot \text{TD} + 0.16\%)$

Standard and platinum: 10 bar (150 psi) and 40 bar (600 psi) sensor
 $\pm(0.06\% \cdot \text{TD} + 0.06\%)$

Standard and platinum: 100 bar (1500 psi) and 400 bar (6000 psi) sensor
 $\pm(0.03\% \cdot \text{TD} + 0.12\%)$

E_E - Electronics error

- Analog output (4 to 20 mA): 0.2 %
- Digital output (HART): 0 %

Calculation of the total performance with the Endress+Hauser Applicator

Detailed measured errors, such as for other temperature ranges, for example, 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. Diaphragm seal errors are calculated separately in the Applicator "[Sizing Diaphragm Seal](#)".



A0038925

Resolution

Current output: <1 µA

Total error

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

$$\text{Total error} = \text{total performance} + \text{long-term stability}$$

Calculation of the total error with the Endress+Hauser Applicator

Detailed measured errors, such as for other temperature ranges, for example, 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. Diaphragm seal errors are calculated separately in the Applicator "[Sizing Diaphragm Seal](#)".



A0038925

Long-term stability

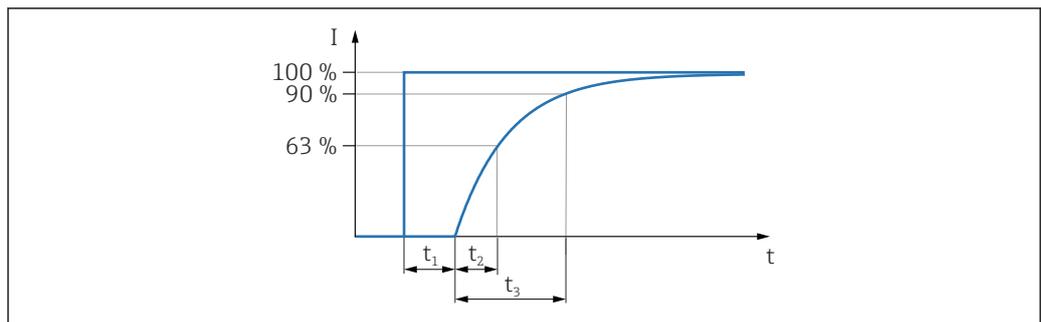
The specifications refer to the upper range limit (URL).

- 1 year: $\pm 0.10\%$
- 5 years: $\pm 0.20\%$
- 10 years: $\pm 0.25\%$

Response time T63 and T90

Dead time, time constant

Presentation of the dead time and the time constant as per DIN 16086:



A0019786

Dynamic behavior, current output (analog electronics)

Standard measuring device (without a diaphragm seal)

- Dead time (t_1): maximum 50 ms
- Time constant T63 (t_2): maximum 40 ms
- Time constant T90 (t_3): maximum 90 ms

Measuring device with a diaphragm seal

Values such as standard measuring device (without a diaphragm seal) plus influence of the diaphragm seal. Calculate with the Applicator [Sizing Diaphragm Seal](#).

Dynamic behavior, current output (HART electronics)

Standard measuring device (without a diaphragm seal)

- Dead time (t_1): maximum 50 ms
- Time constant T63 (t_2): maximum 85 ms
- Time constant T90 (t_3): maximum 200 ms

Measuring devices with a diaphragm seal

Values such as standard measuring device (without a diaphragm seal) plus influence of the diaphragm seal. Calculate with the Applicator [Sizing Diaphragm Seal](#).

Dynamic behavior, digital output (HART electronics)

Standard measuring device (without a diaphragm seal)

- Dead time (t_1):
 - Minimum 210 ms
 - Maximum 1010 ms
- Time constant T63 (t_2):
 - Minimum 285 ms
 - Maximum 1085 ms
- Time constant T90 (t_3):
 - Minimum 345 ms
 - Maximum 1145 ms

Measuring devices with a diaphragm seal

Values such as standard measuring device (without a diaphragm seal) plus influence of the diaphragm seal. calculate with the Applicator.

Reading cycle

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

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

Cycle time (update time)

Cyclic (burst): min. 300 ms

Warm-up period

≤5 s

Installation

Orientation

- A position-dependent zero point shift (when the vessel is empty the measured value does not display zero) can be corrected
- Diaphragm seals also shift the zero point, depending on the installation position
- The use of shutoff devices and/or siphons is recommended for mounting
- The orientation depends on the measuring application

Installation instructions

- The standard measuring devices (without diaphragm seals) are mounted according to the same guidelines as manometers (DIN EN837-2)
- To ensure optimum readability of the onsite display, align the housing and onsite display
- Endress+Hauser offers a mounting bracket for installing the measuring device on pipes or walls
- Use flushing rings for flanges, flange and cell diaphragm seals if buildup or clogging can be expected at the process isolating diaphragm
 - The flushing ring is clamped between the process connection and the flange, flange or cell diaphragm seal
 - Material buildup in front of the process isolating diaphragm is flushed away and the pressure chamber is vented via the two lateral flushing holes
- When measuring in media containing solids (e.g. 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
- When mounting the device, establishing the electrical connection and during operation: prevent the penetration of moisture into the housing
- Point the cable and connector downwards as much as possible to prevent the penetration of moisture (e.g. rain water or condensation)

Installation instructions for devices with diaphragm seals

General information

A diaphragm seal together with the transmitter form a closed, calibrated system, which is 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, a position adjustment can cause the sensor to go over range (position adjustment due to zero point offset, caused by the orientation of the fill fluid liquid column). Perform zero point adjustment if necessary.

For devices with a capillary, use a suitable bracket (mounting bracket) for mounting.

When mounting, sufficient strain relief must be provided for the capillary to prevent the capillary from bending (capillary bending radius ≥ 100 mm (3.94 in)).

Mount the capillary so that it is vibration-free (in order to avoid additional pressure fluctuations).

Do not mount capillaries in the vicinity of heating or cooling lines and protect against direct sunlight.

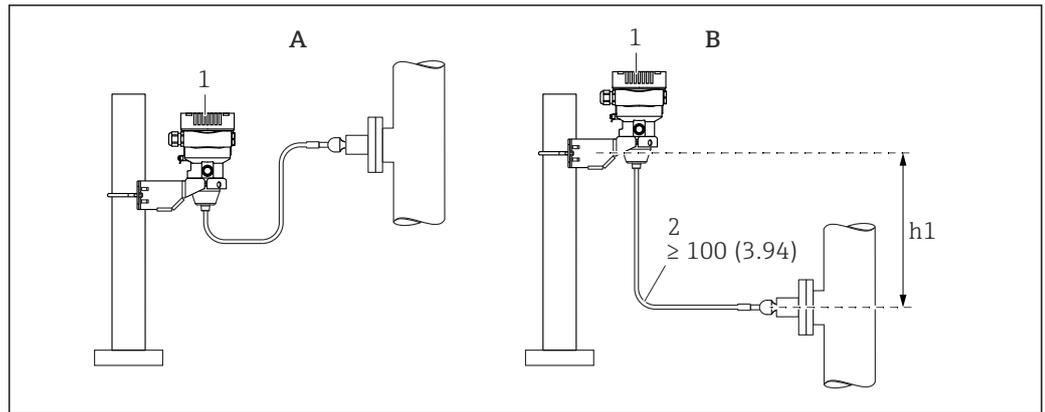
More detailed installation instructions are provided in the Applicator "[Sizing Diaphragm Seal](#)".

Vacuum application

For vacuum applications, pressure transmitters with a ceramic process isolating diaphragm (oil-free) are preferable.

For applications under vacuum, mount the pressure transmitter below the diaphragm seal. This prevents additional vacuum loading of the diaphragm seal caused by the presence of the fill fluid in the capillary.

If the pressure transmitter is installed above the diaphragm seal, do not exceed the maximum height difference h_1 . The height difference h_1 is displayed in the Applicator "[Sizing Diaphragm Seal](#)".



A0038734

A Recommended installation with vacuum application

B Installation above the diaphragm seal

h_1 Height difference

1 Measuring device

2 Ensure strain relief to prevent the capillary from bending (bending radius ≥ 100 mm (3.94 in)).

The maximum height difference depends on the density of the diaphragm seal fill fluid and the smallest ever absolute pressure that is permitted to occur at the diaphragm seal (empty vessel).

Sensor selection and arrangement

Mounting the measuring device

Pressure measurement in gases

Mount the measuring device with the shutoff device above the tapping point so that any condensate can flow into the process.

Pressure measurement in vapors

A siphon reduces the temperature to almost the ambient temperature. The defined water column only causes minimal (negligible) measured errors and minimal (negligible) thermal effects on the device.

Observe the maximum permitted ambient temperature of the transmitter!

- Ideally, mount the measuring device with the O-shaped siphon below the tapping point
The device may also be mounted above the tapping point
- Fill the siphon with liquid before commissioning

Pressure measurement in liquids

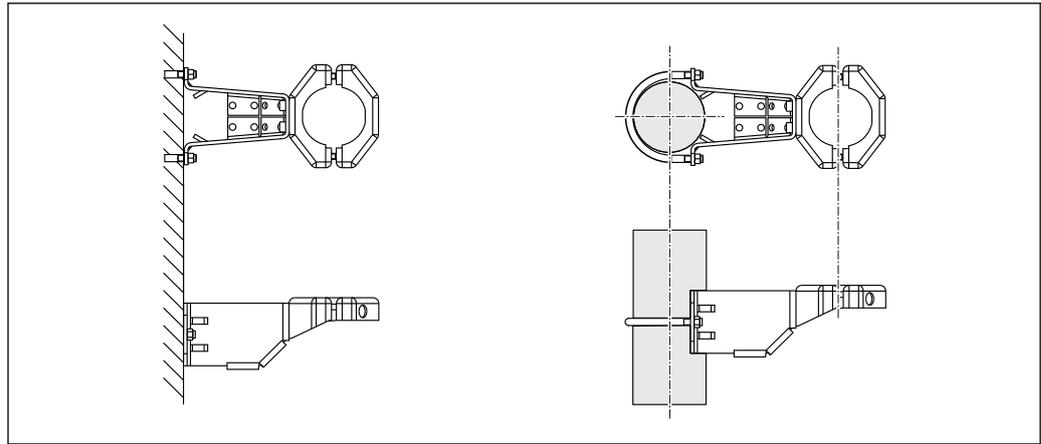
Mount the measuring device with the shutoff device below or at the same level as the tapping point.

Level measurement

- Always mount the measuring device below the lowest measuring point
- Do not install the measuring device at the following positions:
 - In the filling curtain
 - In the tank outlet
 - In the suction area of a pump
 - At a point in the tank which could be affected by pressure pulses from the agitator
- Mount the measuring device downstream from a shutoff device: the calibration and function check can be carried out more easily

Mounting bracket for measuring device or separate housing

The measuring device or separate housing can be mounted on walls or pipes (for pipes with a diameter ranging from 1 1/4" to 2") with the mounting bracket.



Ordering information:

- Can be ordered via the Product Configurator
- Can be ordered as a separate accessory, part number 71102216

i If the measuring device is ordered with a separate housing, the mounting bracket is included in the delivery.

Special mounting instructions

Wall and pipe mounting with a manifold (optional)

If the measuring device is mounted on a shutoff device (e.g. manifold or shutoff valve), then use the holder provided for this purpose. This makes it easier to disassemble the measuring device.

For technical data, see the SD01553P accessory document.

Sensor, remote (separate housing)

The measuring device housing (including the electronic insert) is mounted at a distance from the measuring point.

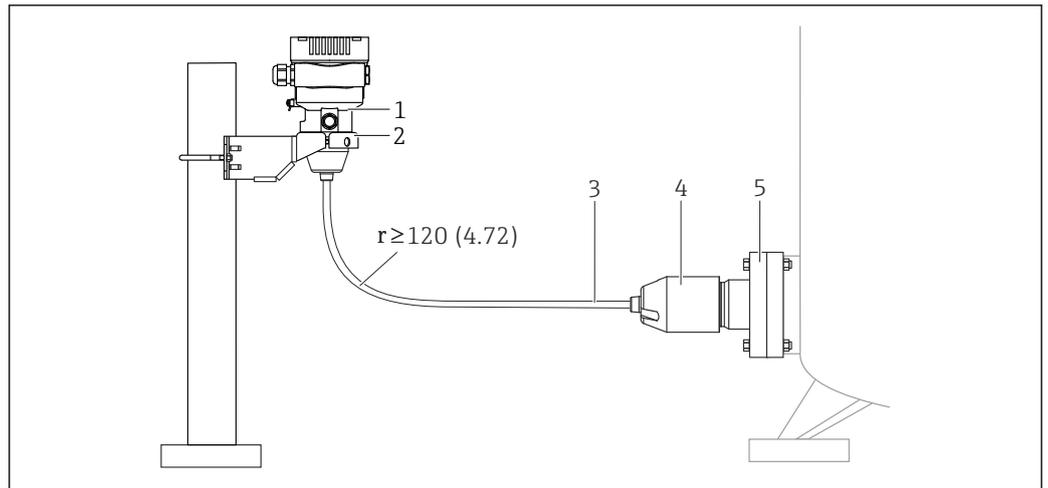
This version therefore facilitates trouble-free measurement

- Under particularly difficult measuring conditions (at installation locations that are cramped or difficult to access)
- If the measuring point is exposed to vibrations

Cable versions:

- PE: 2 m (6.6 ft), 5 m (16 ft) and 10 m (33 ft)
- FEP: 5 m (16 ft).

The sensor is delivered with the process connection and cable already mounted. The housing (including the electronic insert) 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 (including the electronic insert) and the sensor.



A0038412

- 1 Sensor, remote (including electronic insert)
- 2 Mounting bracket enclosed, suitable for wall or pipe mounting
- 3 Cable, both ends are fitted with a socket
- 4 Process connection adapter
- 5 Process connection with sensor

Ordering information:

- Remote sensor (including electronic insert) including the mounting bracket can be ordered via the Product Configurator
- The mounting bracket can also be ordered as a separate accessory, part number 71102216

Technical data for cables:

- 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

Reduction of installation height

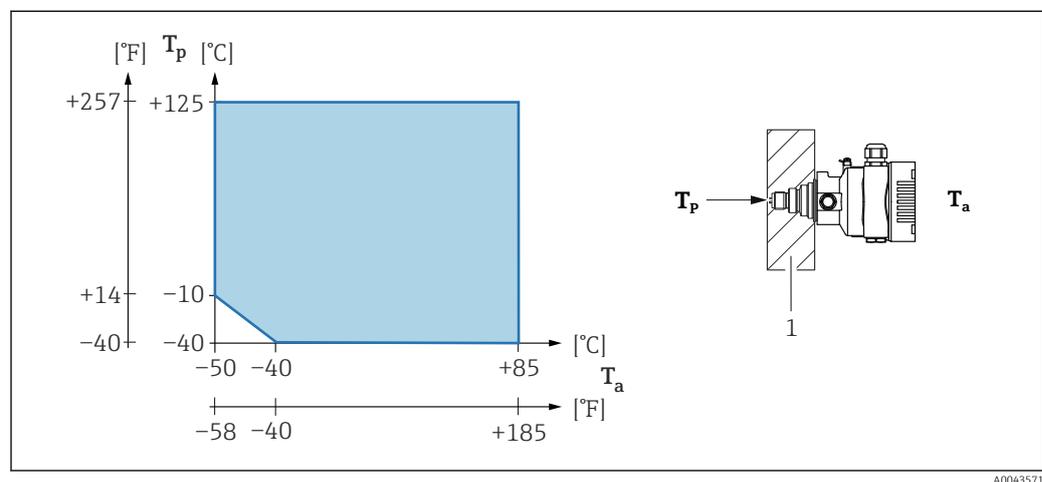
If this version is used, the installation height of the process connection is reduced compared to the dimensions of the standard version.

Environment

Ambient temperature range	<p>The following values apply up to a process temperature of +85 °C (+185 °F). At higher process temperatures, the permitted ambient temperature is reduced.</p> <ul style="list-style-type: none"> ■ Without LCD display: <ul style="list-style-type: none"> Standard: -40 to +85 °C (-40 to +185 °F) ■ With LCD display: -40 to +85 °C (-40 to +185 °F) with limitations in optical properties such as display speed and contrast. Can be used without limitations up to -20 to +60 °C (-4 to +140 °F) ■ Devices with PVC-coated capillary armor: -25 to +80 °C (-13 to +176 °F) ■ Separate housing: -20 to +60 °C (-4 to +140 °F) <p>Applications with very high temperatures: use diaphragm seals with a temperature isolator or capillaries. Use a mounting bracket!</p> <p>If vibrations also occur in the application: use a measuring device with a capillary. Diaphragm seal with temperature isolator: use a mounting bracket!</p>
----------------------------------	--

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 measuring devices for use in hazardous areas, see Safety Instructions, Installation or Control Drawing
- Measuring devices with common explosion protection certificates (e.g. ATEX-/ IEC Ex, etc.) can be used in hazardous areas up to the ambient temperature.

Storage temperature	<ul style="list-style-type: none"> ■ Without LCD display: -40 to +90 °C (-40 to +194 °F) ■ Without LCD display: -40 to +90 °C (-40 to +194 °F); optional -50 °C (-58 °F) ■ With LCD display: -40 to +85 °C (-40 to +185 °F) ■ Separate housing: -40 to +60 °C (-40 to +140 °F) <p>With M12 plug, elbowed: -25 to +85 °C (-13 to +185 °F)</p> <p>Devices with PVC-coated capillary armor: -25 to +90 °C (-13 to +194 °F)</p>
----------------------------	---

Operating altitude	Up to 5 000 m (16 404 ft) above sea level.
---------------------------	--

Climate class	<p>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.</p> <p>Condensation is possible.</p>
----------------------	---

Atmosphere

Operation in very corrosive environment

For corrosive environments (e.g. maritime environment / coastal areas), Endress+Hauser recommends the use of a PVC-coated capillary armor or a PTFE capillary armor for capillaries. The transmitter can be additionally protected by a special coating (Technical Special Product (TSP)).

Degree of protection

Test as per IEC 60529 and NEMA 250-2014

Housing and process connection

IP66/68, TYPE 4X/6P
(IP68: (1.83 mH₂O for 24 h))

Cable entries

- Gland M20, plastic, IP66/68 TYPE 4X/6P
- Gland M20, brass nickel plated, IP66/68 TYPE 4X/6P
- Gland M20, 316L, IP66/68 TYPE 4X/6P
- Thread M20, IP66/68 TYPE 4X/6P
- Thread G1/2, IP66/68 TYPE 4X/6P
- Thread NPT1/2, IP66/68 TYPE 4X/6P
- Dummy plug transport protection: IP22, TYPE 2
- Plug HAN7D, 90 deg. IP65 NEMA Type 4X
- Plug M12

If the G1/2 thread is selected, the device is delivered with an M20 thread as standard and a G1/2 adapter is included with the delivery, along with the corresponding documentation

When housing is closed and connecting cable is plugged in: IP66/67 NEMA Type 4X
When housing is open or connecting cable is not plugged in: IP20, NEMA Type 1

NOTICE

Plug M12 and plug HAN7D: incorrect mounting can invalidate the IP protection class!

- ▶ The degree of protection only applies if the connecting cable used is plugged in and screwed tight.
- ▶ The degree of protection only applies if the connecting cable used is specified according to IP67 NEMA Type 4X.
- ▶ The IP protection classes are only maintained if the dummy cap is used or the cable is connected.

Process connection and process adapter when using the separate housing

FEP cable

- IP69 (on sensor side)
- IP66 TYPE 4/6P
- IP68 (1.83 mH₂O for 24 h) TYPE 4/6P

PE cable

- IP69 (on sensor side)
- IP66 TYPE 4/6P
- IP68 (1.83 mH₂O for 24 h) TYPE 4/6P

Vibration resistance

Single compartment housing

Mechanical construction	Sine wave oscillation IEC 61298-3:2008	Shock
Measuring device	10 Hz to 60 Hz: ±0.35 mm (0.0138 in) 60 Hz to 1000 Hz: 5 g	30 g
Measuring device with "Compact" or "Temperature isolator" diaphragm seal type ¹⁾	10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g	30 g

1) For applications with very high temperatures, either a measuring device with a temperature isolator or with a capillary can be used. If vibrations also occur in the application, Endress+Hauser recommends using a measuring device with a capillary. If a measuring device with a temperature isolator or capillary is used, it must be mounted with a mounting bracket.

**Electromagnetic
compatibility (EMC)**

- Electromagnetic compatibility as per EN 61326 series and NAMUR recommendation EMC (NE21)
- With regard to the safety function (SIL), the requirements of EN 61326-3-x are satisfied
- Maximum deviation with interference influence: < 0.5% of span with full measuring range (TD 1:1)

For more details refer to the EU Declaration of Conformity.

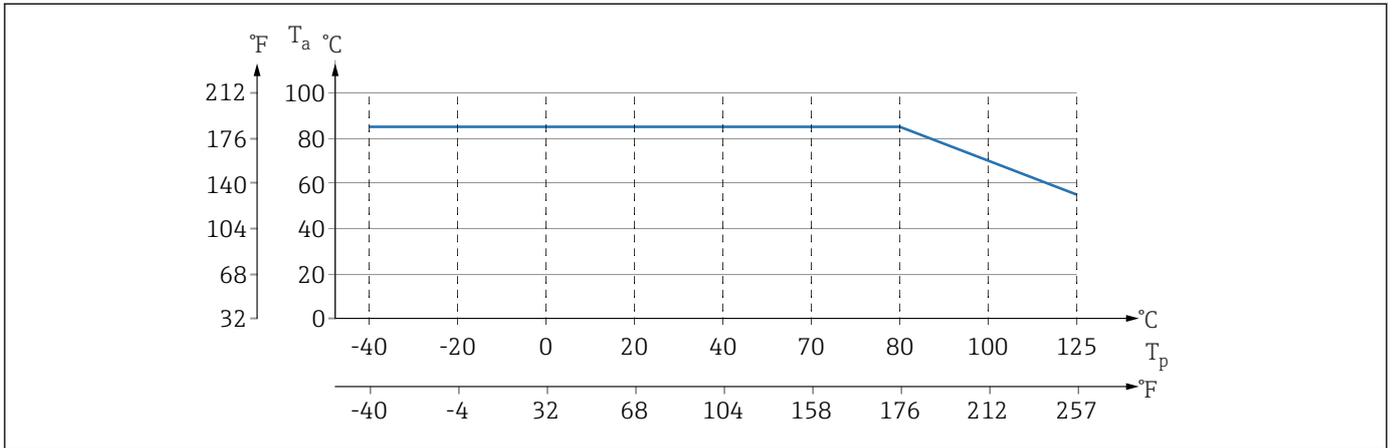
Process

Process temperature range Standard measuring device (without a diaphragm seal)

NOTICE

The permitted process temperature depends on the process connection, process seal, ambient temperature and the type of approval.

- ▶ All the temperature data in this document must be taken into consideration when selecting the measuring device.



4 Values apply for vertical mounting without insulation.

T_p Process temperature
 T_a Ambient temperature

Diaphragm seal fill fluid

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

Fill fluid	Density ¹⁾ kg/m ³
Silicone oil	970
High-temperature oil	995
Low-temperature oil	940
Vegetable oil	920
Inert oil	1900

- 1) Density of the diaphragm seal fill fluid at 20 °C (68 °F).

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, negative pressure and temperature ranges, are done separately in the Applicator "[Sizing Diaphragm Seal](#)".



A0038925

Oxygen applications (gaseous)

Oxygen and other gases can react explosively to oils, grease and plastics. The following precautions must be taken:

- All components of the plant, such as the measuring devices, must be cleaned according to national requirements.
- Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded for oxygen applications.

Cleaning of the measuring device (not device accessories) is offered as an optional service.

- p_{max} : depends on the lowest-rated element, with regard to pressure, of the selected components: over pressure limit (OPL) of the sensor, process connection (1.5 x PN) or fill fluid (80 bar (1 200 psi))
- T_{max} environment: 60 °C (140 °F)

Standard measuring device (without a diaphragm seal)

- Process connections with internal process isolating diaphragm: -40 to +125 °C (-40 to +257 °F); 150 °C (302 °F) for max. one hour
- Process connections with flush mount process isolating diaphragm:
 - Thread (ISO228, ASME, metric DIN13) and flanges (EN, ASME, JIS): -40 to +100 °C (-40 to +212 °F)
 - Exceptions with seal supplied (M20 x 1.5, G1/2 DIN3852): -20 to +85 °C (-4 to +185 °F)

Measuring devices with a diaphragm seal

- Depends on diaphragm seal and fill fluid: -70 °C (-94 °F) up to +400 °C (+752 °F)
- Observe the maximum gauge pressure and maximum temperature

Devices with PTFE-coated diaphragm seal process isolating diaphragm

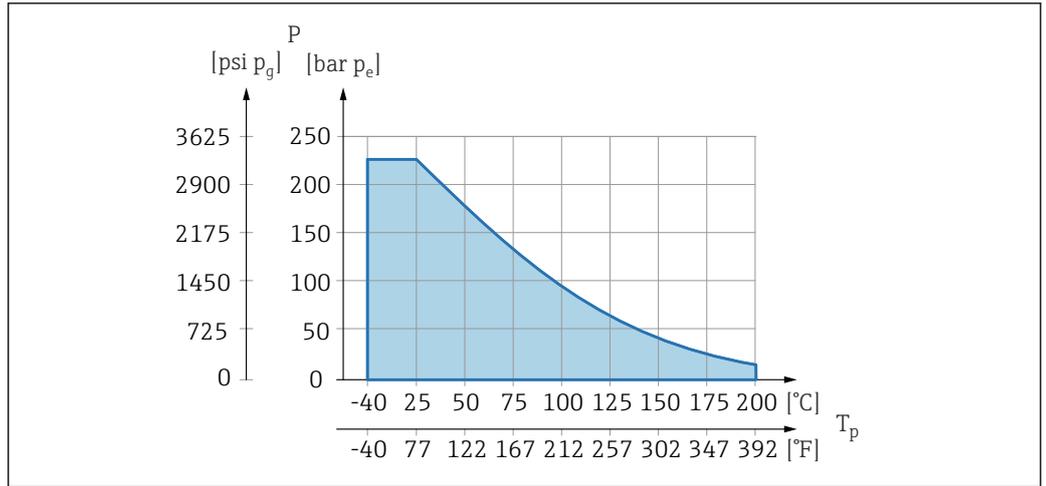
The non-stick coating has excellent gliding properties and is used to protect the process isolating diaphragm against abrasive media.

NOTICE

Destruction of the device due to incorrect use of PTFE coating!

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

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



A0045213

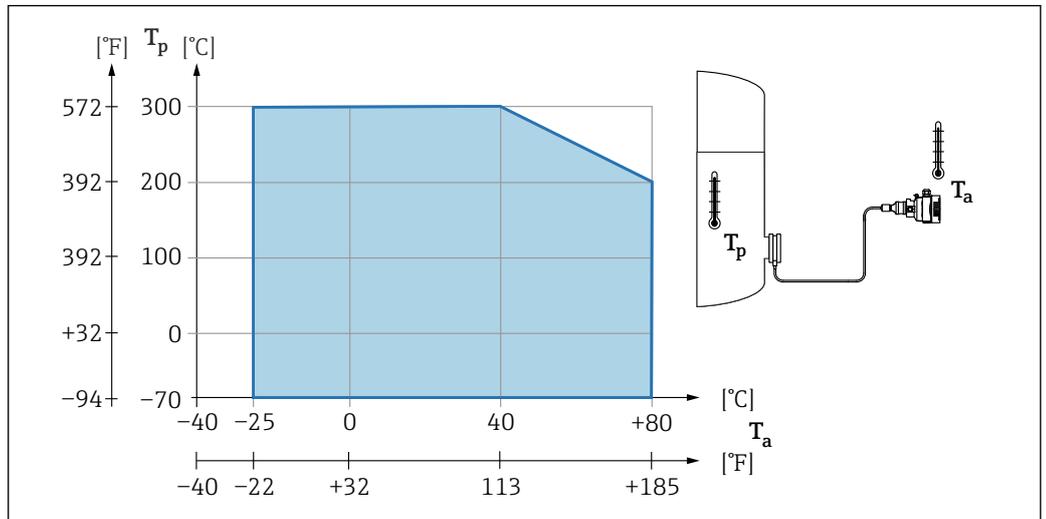
i For vacuum applications: $p_{abs} \leq 1$ bar (14.5 psi) to 0.05 bar (0.725 psi) up to max. +150 °C (302 °F).

If PTFE coating was selected, a conventional process isolating diaphragm is always supplied.

Diaphragm seal capillary armor

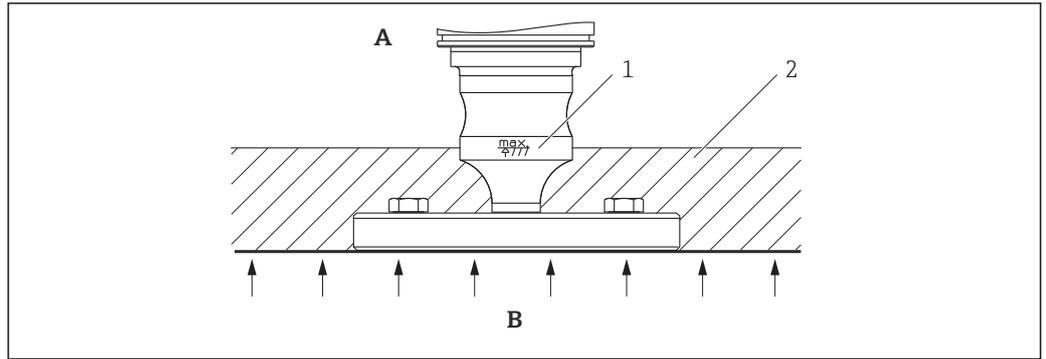
Process temperature depending on the ambient temperature.

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



A0038681

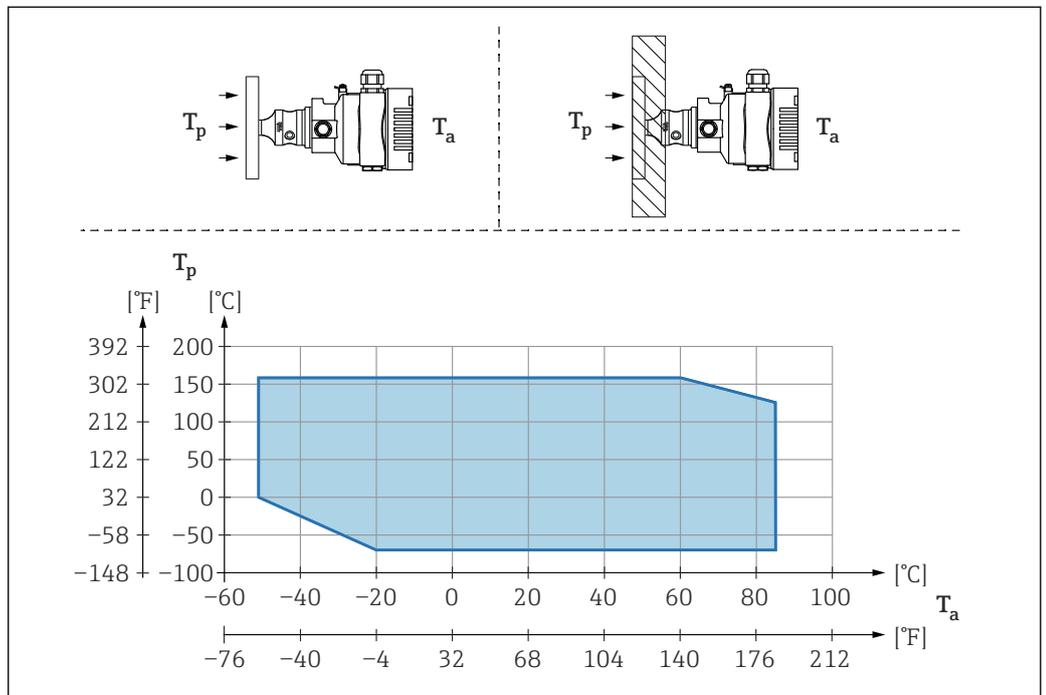
Process pressure range	<p>Pressure specifications</p> <p>⚠ WARNING</p> <p>The maximum pressure for the measuring device depends on the lowest-rated element with regard to pressure (components are: process connection, optional mounted parts or accessories).</p> <ul style="list-style-type: none"> ▶ Only operate the measuring device within the prescribed limits of the components! ▶ MWP (maximum working pressure): The MWP 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. Note temperature dependence of MWP. For flanges, refer to the following standards for the permitted pressure values at higher temperatures: 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). MWP data that deviate from this are provided in the relevant sections of the Technical Information. ▶ The test pressure corresponds to the overpressure limit (OPL) of the overall system. This value refers to a reference temperature of +20 °C (+68 °F). ▶ The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device. ▶ In the case of sensor range and process connection combinations where the over pressure limit (OPL) of the process connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If the entire sensor range must be used, select a process connection with a higher OPL value (1.5 x PN; MWP = PN). ▶ Oxygen applications: do not exceed values for P_{max} and T_{max}. <p>Burst pressure</p> <p>The following specifications apply for standard measuring devices (without a diaphragm seal).</p> <p>Measuring range 400 mbar (6 psi) to 10 bar (150 psi) Burst pressure: 100 bar (1 450 psi)</p> <p>Measuring range 40 bar (600 psi) Burst pressure: 250 bar (3 625 psi)</p> <p>Measuring range 100 bar (1 500 psi) Burst pressure: 1 000 bar (14 500 psi)</p> <p>Measuring range 400 bar (6 000 psi) Burst pressure: 2 000 bar (29 000 psi)</p> <p>Measuring range 700 bar (10 500 psi) Burst pressure: 2 800 bar (40 600 psi)</p>
Ultrapure gas applications	<p>Endress+Hauser also offers measuring devices for special applications, such as for ultrapure gas, which are cleaned from oil and grease. No special restrictions regarding the process conditions apply to these measuring devices.</p>
Steam applications and saturated steam applications	<p>For steam and saturated steam applications: use a measuring device with a metal process membrane, or provide a siphon for temperature isolation when installing.</p>
Thermal insulation	<p>Thermal insulation with diaphragm seal directly mounted</p> <p>The measuring device may only be insulated up to a certain height. The maximum permitted insulation height is indicated on the measuring device and applies to an insulation material with a heat conductivity $\leq 0.04 \text{ W/(m x K)}$ and to the maximum permitted ambient and process temperature. The data were determined under the most critical application "quiescent air". Maximum permitted insulation height, here indicated on a measuring device with a flange:</p>



A0020474

- A Ambient temperature
- B Process temperature
- 1 Maximum permitted insulation height
- 2 Insulation material

Mounting with a "Compact" diaphragm seal type



A0040383

- T_a Ambient temperature at transmitter
- T_p Maximum process temperature

T_a	T_p
+85 °C (+185 °F)	-70 to +120 °C (-94 to +248 °F)
+60 °C (+140 °F)	-70 to +160 °C (-94 to +320 °F)
-20 °C (-4 °F)	-70 to +160 °C (-94 to +320 °F)
-50 °C (-58 °F)	0 to +160 °C (+32 to +320 °F)

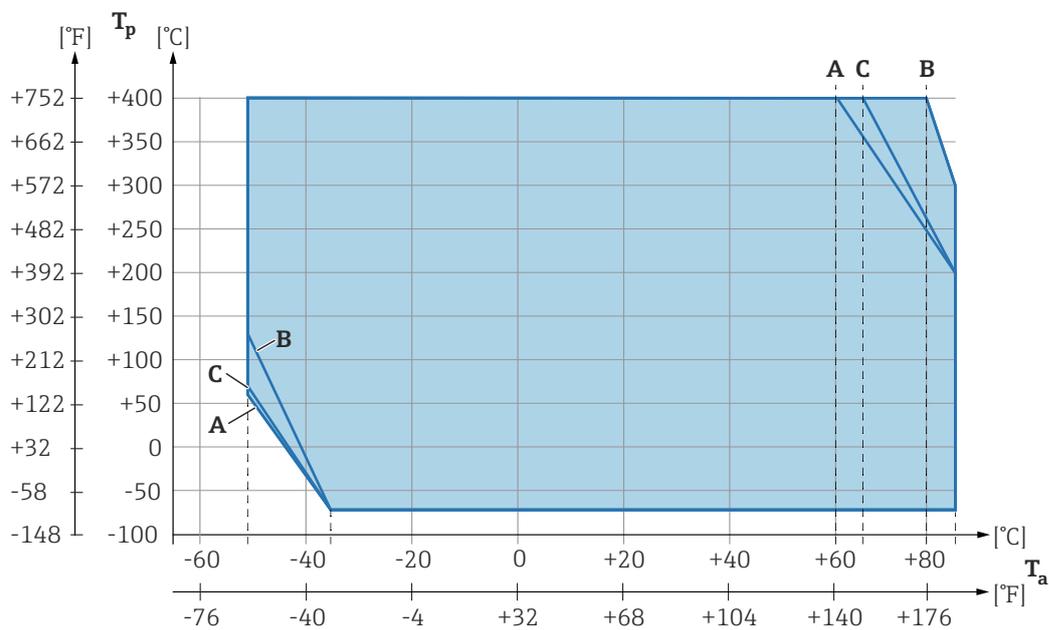
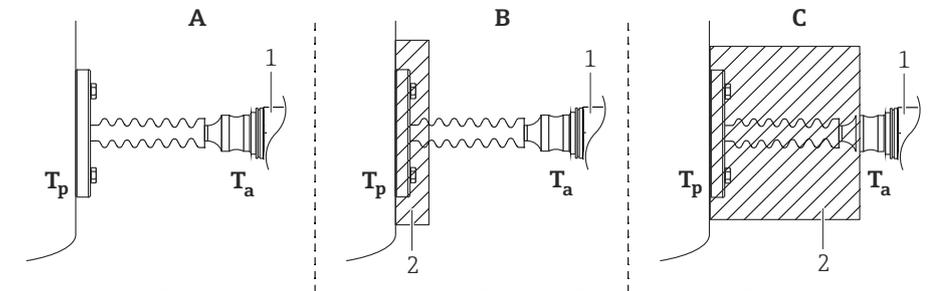
Thermal insulation when mounting with a "Temperature isolator" diaphragm seal type

Use of temperature isolators in the event of constant extreme medium temperatures which cause the maximum permissible electronics temperature of +85 °C (+185 °F) to be exceeded. Diaphragm seal systems with temperature isolators can be used up to a maximum temperature of +400 °C (+752 °F) depending on the fill fluid used. To minimize the influence of rising heat, mount the device horizontally or with the housing pointing downwards. The additional installation height brings about

a zero point shift due to the hydrostatic column in the temperature isolator. This zero point shift can be corrected on the device.

The maximum ambient temperature T_a at the transmitter depends on the maximum process temperature T_p .

The maximum process temperature depends on the diaphragm seal fill fluid used.



A0039378

- A No insulation
- B Insulation 30 mm (1.18 in)
- C Maximum insulation
- 1 Transmitter
- 2 Insulation material

Item	T_a ¹⁾	T_p ²⁾
A	60 °C (140 °F)	400 °C (752 °F) ³⁾
	85 °C (185 °F)	200 °C (392 °F)
	-50 °C (-58 °F)	60 °C (140 °F)
	-35 °C (-31 °F)	-70 °C (-94 °F)
B	80 °C (176 °F)	400 °C (752 °F) ³⁾
	85 °C (185 °F)	300 °C (572 °F)
	-50 °C (-58 °F)	130 °C (266 °F)
	-35 °C (-31 °F)	-70 °C (-94 °F)
C	67 °C (153 °F)	400 °C (752 °F) ³⁾
	85 °C (185 °F)	200 °C (392 °F)

Item	T_a ¹⁾	T_p ²⁾
	-50 °C (-58 °F)	70 °C (158 °F)
	-35 °C (-31 °F)	-70 °C (-94 °F)

- 1) Maximum ambient temperature at transmitter
- 2) Maximum process temperature
- 3) Process temperature: max. +400 °C (+752 °F), depending on the diaphragm seal fill fluid used

Mechanical construction



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

Search for product → Start configuration → after configuration, click "CAD"

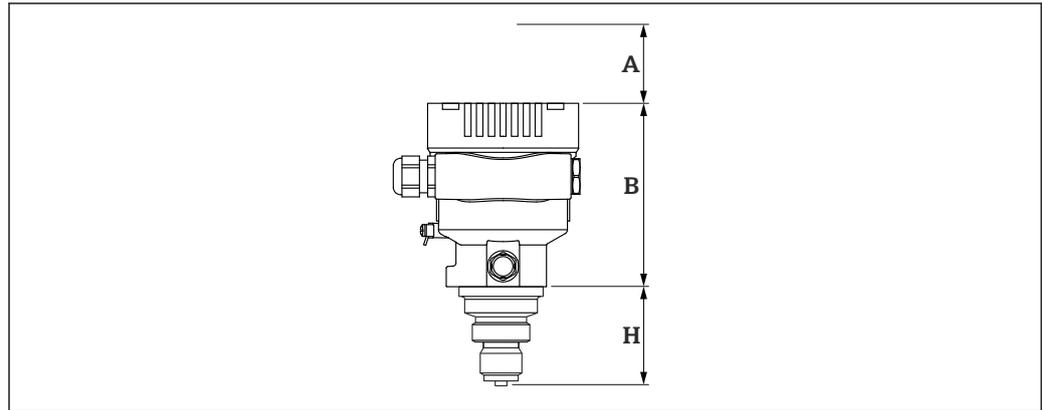
The following dimensions are rounded values. For this reason, the dimensions may deviate from the values on www.endress.com.

Design, dimensions

Standard measuring device height (without a diaphragm seal)

The device height is calculated from

- the height of the housing
- the height of the individual process connection



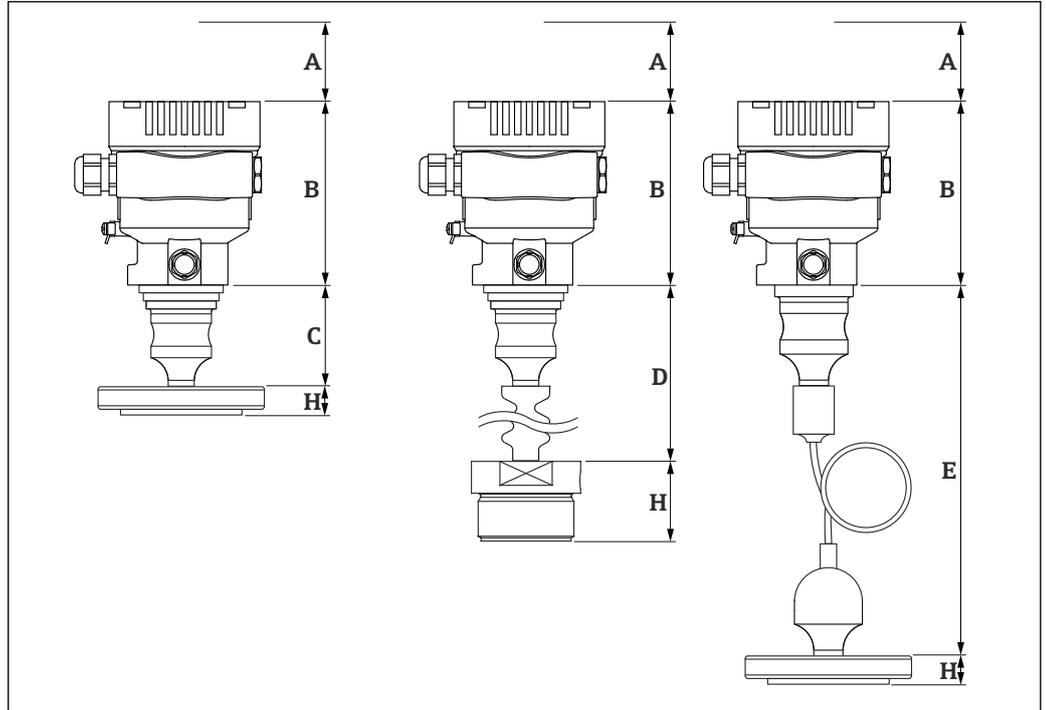
A0043567

- A *Installation clearance*
B *Height of the housing*
H *Height of the process connection*

Device height, diaphragm seal

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 individual process connection

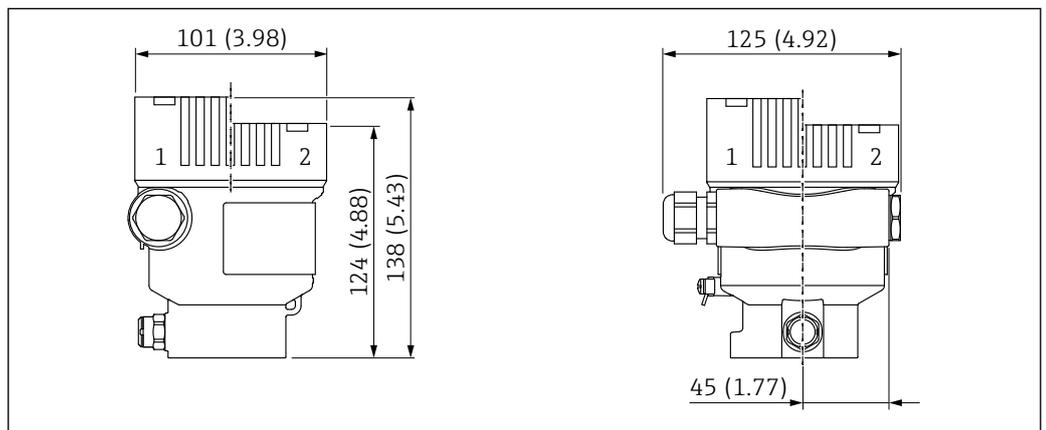


A0043568

- A Installation clearance
- B Height of the housing
- C Height of the mounted parts, here with the "Compact" diaphragm seal type for example
- D Height of the mounted parts, here with the "Temperature isolator" diaphragm seal type for example
- E Height of the mounted parts, here with the "Capillary" diaphragm seal type for example
- H Height of the process connection

Dimensions

Single compartment housing

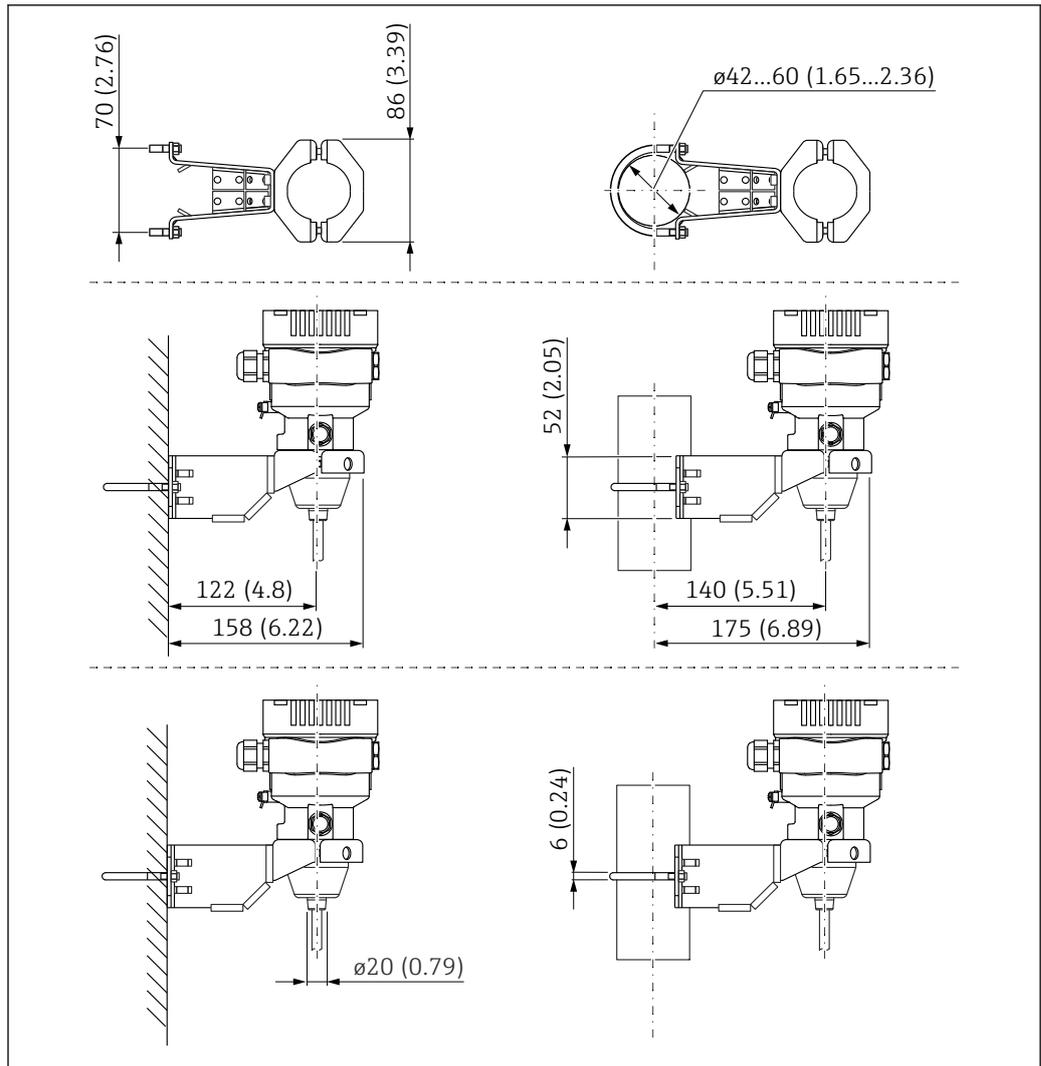


A0038380

Unit of measurement mm (in)

- 1 122 mm (4.80 in) height with cover with plastic viewing window; 138 mm (5.43 in) height with cover with glass viewing window (devices for Ex d, dust Ex)
- 2 Cover without viewing window

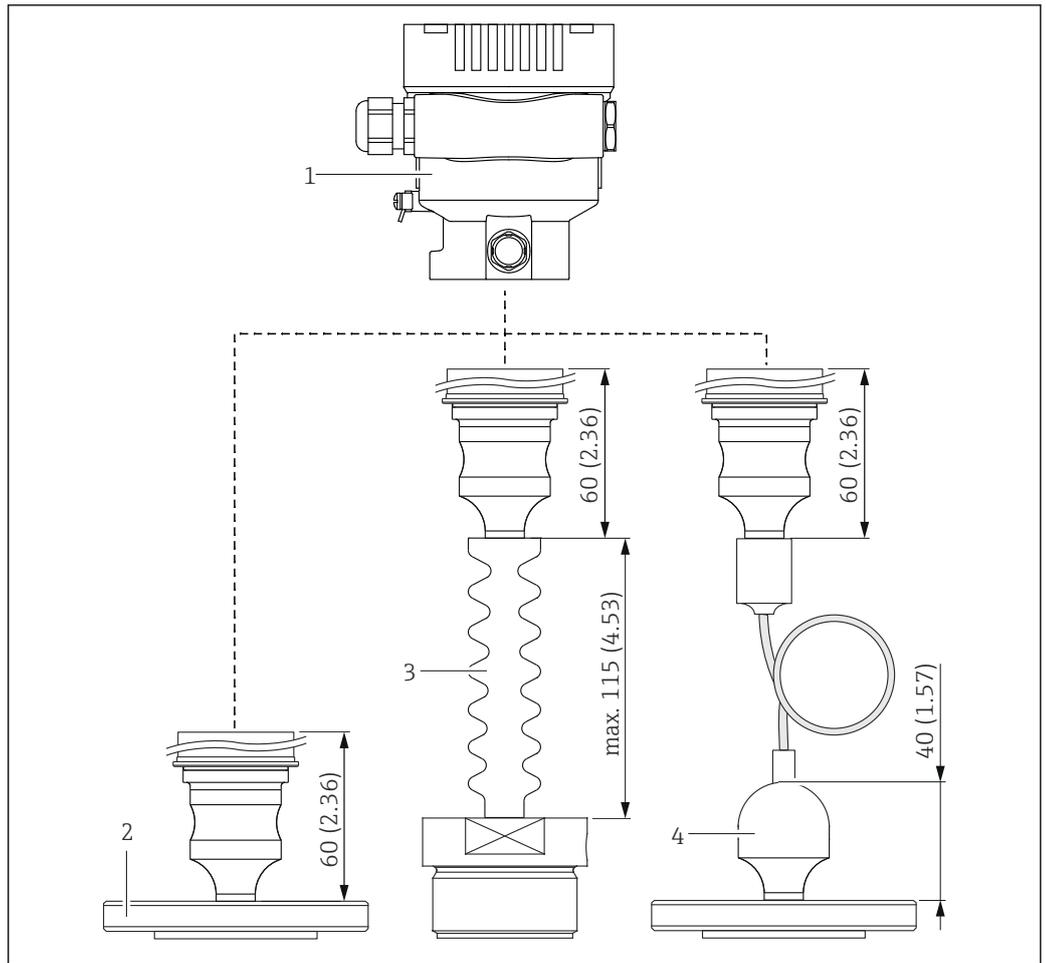
Sensor, remote (separate housing)



A0038214

Unit of measurement mm (in)

Mounted parts, diaphragm seal



A0043563

- 1 Housing
- 2 Diaphragm seal, here e.g. flange diaphragm seal
- 3 Diaphragm seal with temperature isolator
- 4 Process connections with capillary lines are 40 mm (1.57 in) higher than process connections without capillary lines

OPL and MWP

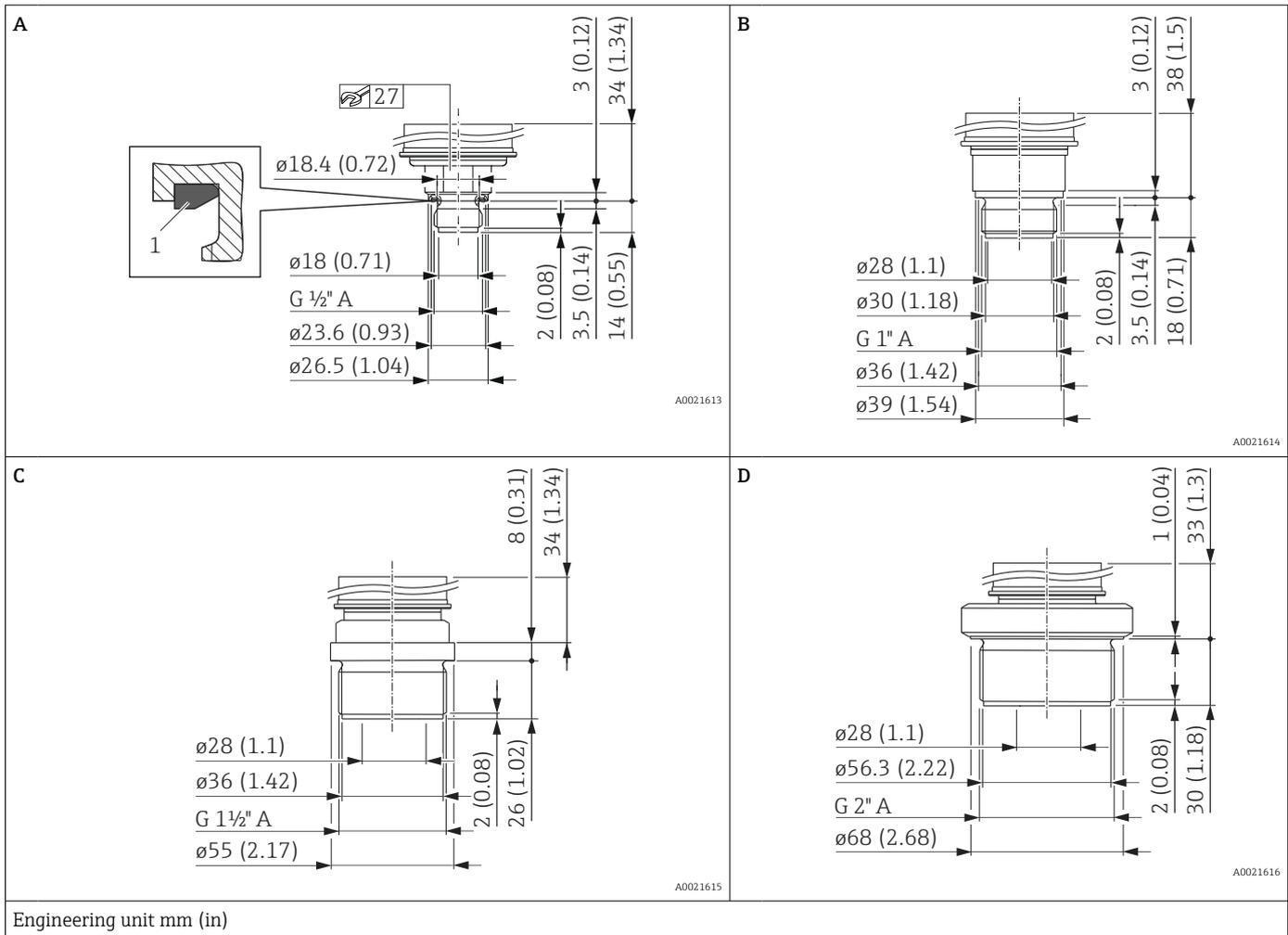
The maximum OPL and MWP of the sensor can deviate from the maximum OPL and MWP of the process connection.

For the maximum OPL and MWP, see the technical documentation of the process connection.

Explanation of terms

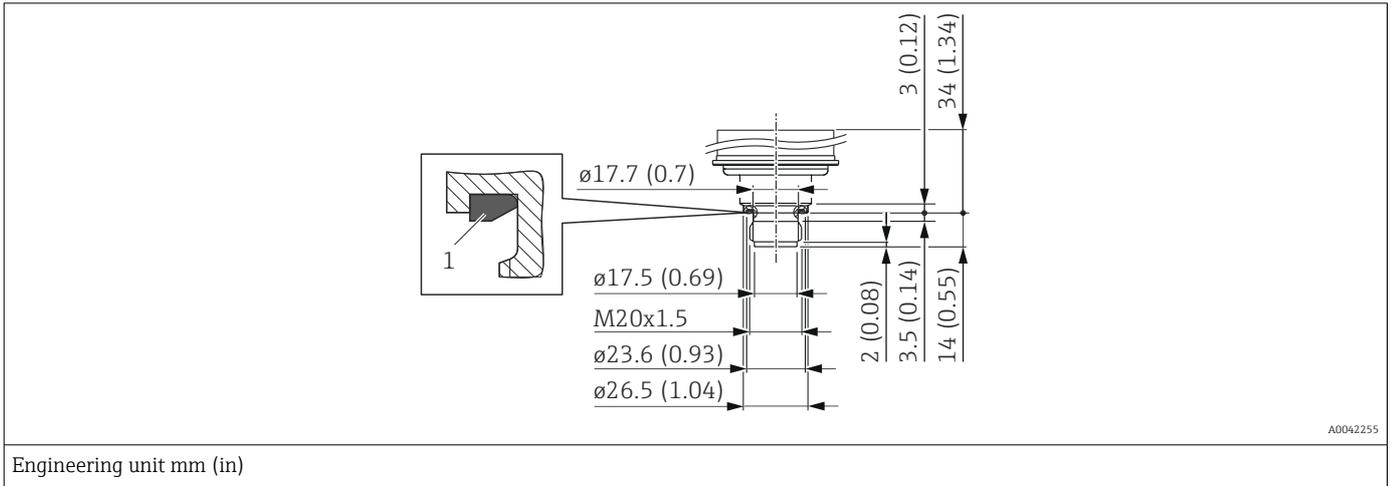
- DN or NPS or A = alphanumeric designation of the flange size
- PN or Class or K = alphanumeric pressure rating of a component

Thread ISO 228 G, flush mount process isolating diaphragm, standard (without diaphragm seal)



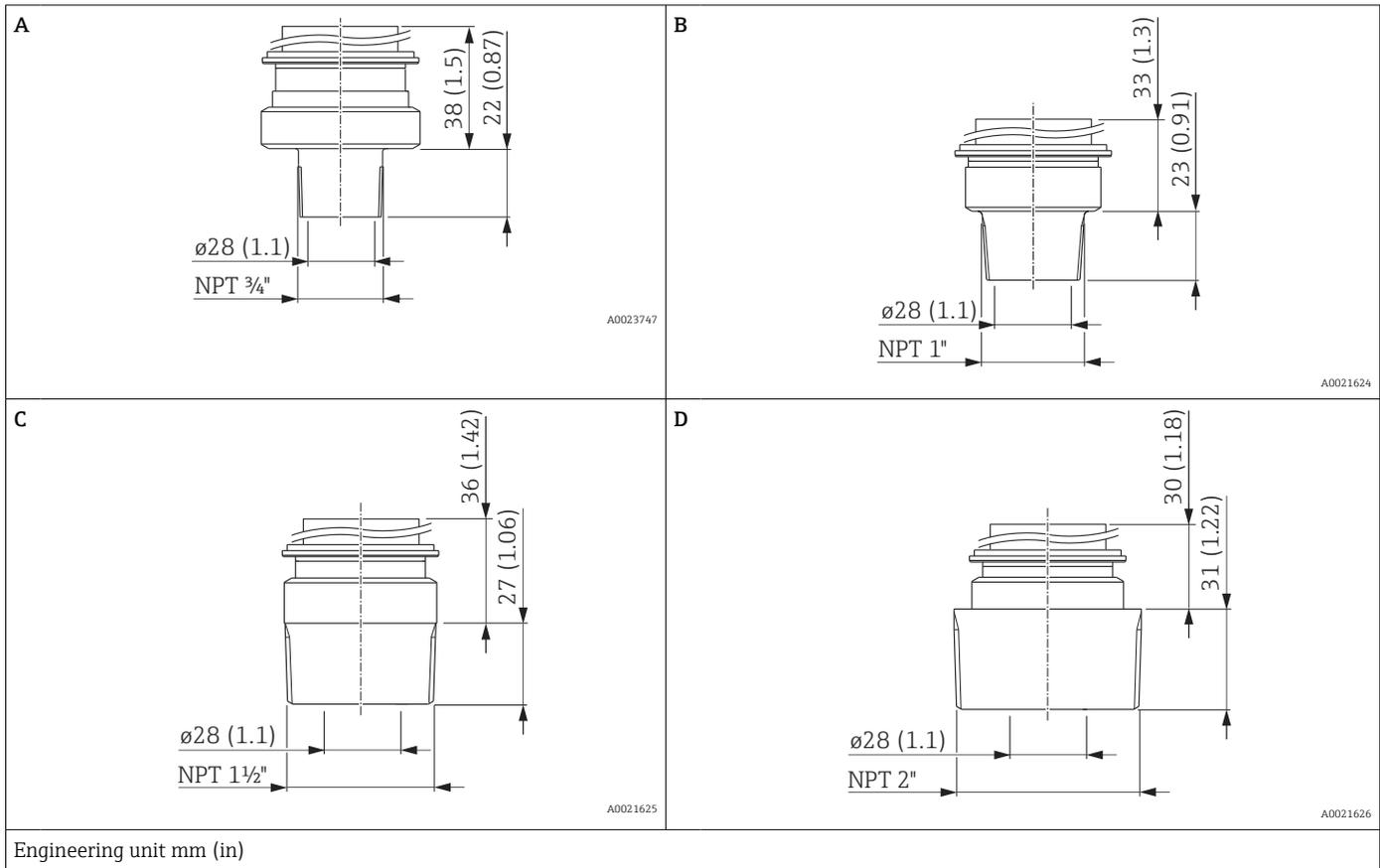
Item	Designation	Material	Weight
			kg (lb)
A	Thread ISO 228 G 1/2" A, DIN 3852 FKM form seal (item 1) pre-installed	AISI 316L	0.4 (0.88)
B	Thread ISO 228 G 1" A	AISI 316L	0.7 (1.54)
C	Thread ISO 228 G 1 1/2" A	AISI 316L	1.1 (2.43)
D	Thread ISO 228 G 2" A	AISI 316L	1.5 (3.31)

Thread DIN, flush mount process isolating diaphragm, standard (without diaphragm seal)



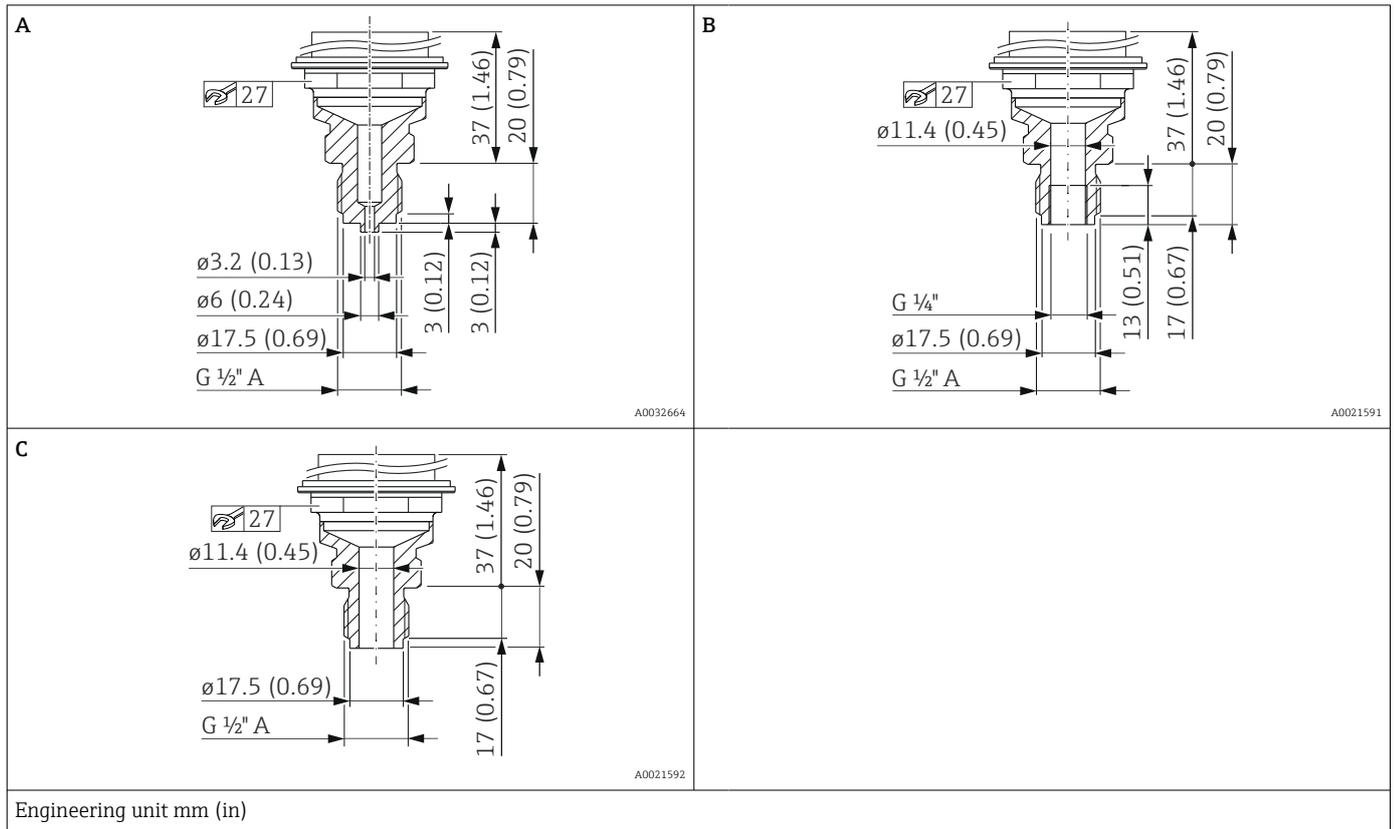
Designation	Material	Weight
		kg (lb)
Thread DIN 16288 M20 FKM 80 flat seal (item 1) pre-installed	AISI 316L	0.4 (0.88)
Thread DIN 16288 M20 FKM 80 flat seal (item 1) pre-installed	Alloy C276 (2.4819)	0.4 (0.88)

Thread ANSI, flush mount process isolating diaphragm, standard (without diaphragm seal)



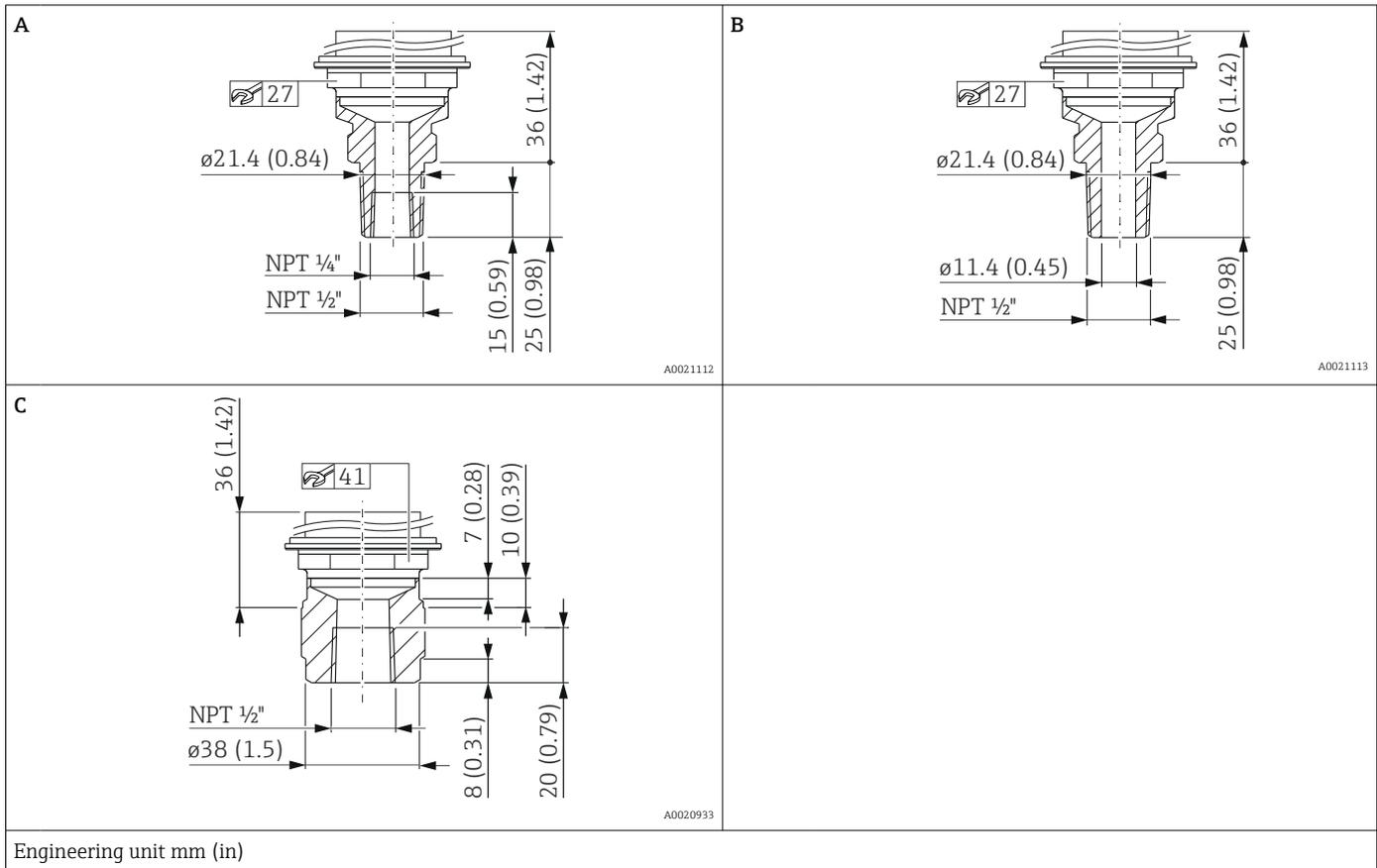
Item	Designation	Material	Weight
			kg (lb)
A	ANSI 3/4" MNPT	AISI 316L	0.6 (1.32)
B	ANSI 1" MNPT	AISI 316L	0.7 (1.54)
B	ANSI 1" MNPT	Alloy C276 (2.4819)	0.7 (1.54)
C	ANSI 1 1/2" MNPT	AISI 316L	1 (2.21)
C	ANSI 1 1/2" MNPT	Alloy C276 (2.4819)	1 (2.21)
D	ANSI 2" MNPT	AISI 316L	1.3 (2.87)

Thread ISO 228 G, internal process isolating diaphragm, standard (without diaphragm seal)



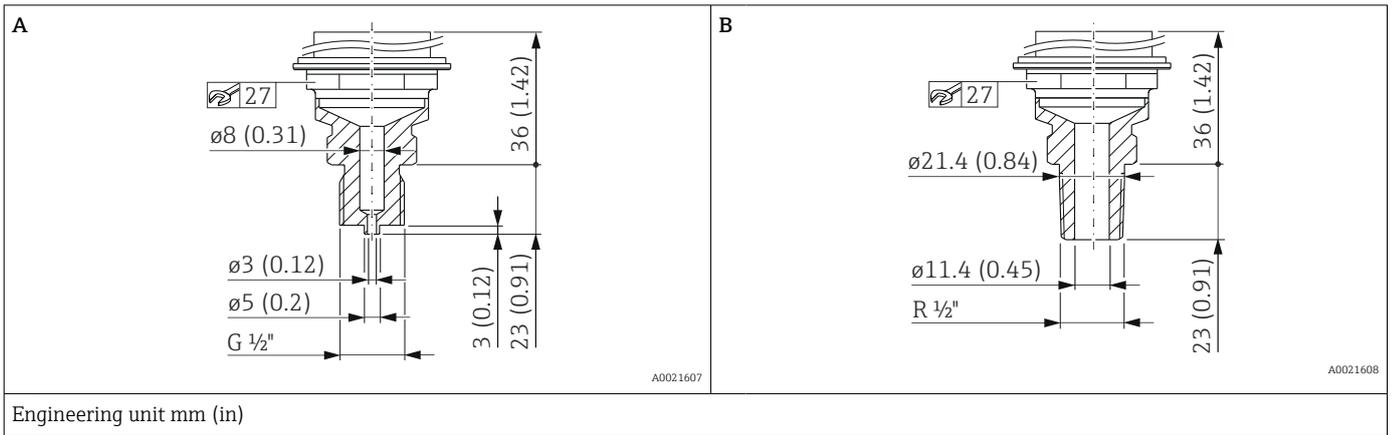
Item	Designation	Material	Weight
			kg (lb)
A	Thread ISO 228 G 1/2" A EN837	AISI 316L	0.63 (1.39)
A	Thread ISO 228 G 1/2" A EN837	Alloy C276 (2.4819)	0.63 (1.39)
B	Thread ISO 228 G 1/2" A, G 1/4" (female)	AISI 316L	0.63 (1.39)
		Alloy C276 (2.4819)	0.63 (1.39)
C	Thread ISO 228 G 1/2" A, Hole 11.4 mm (0.45 in)	AISI 316L	0.63 (1.39)
		Alloy C276 (2.4819)	0.63 (1.39)

Thread ANSI, internal process isolating diaphragm, standard (without diaphragm seal)



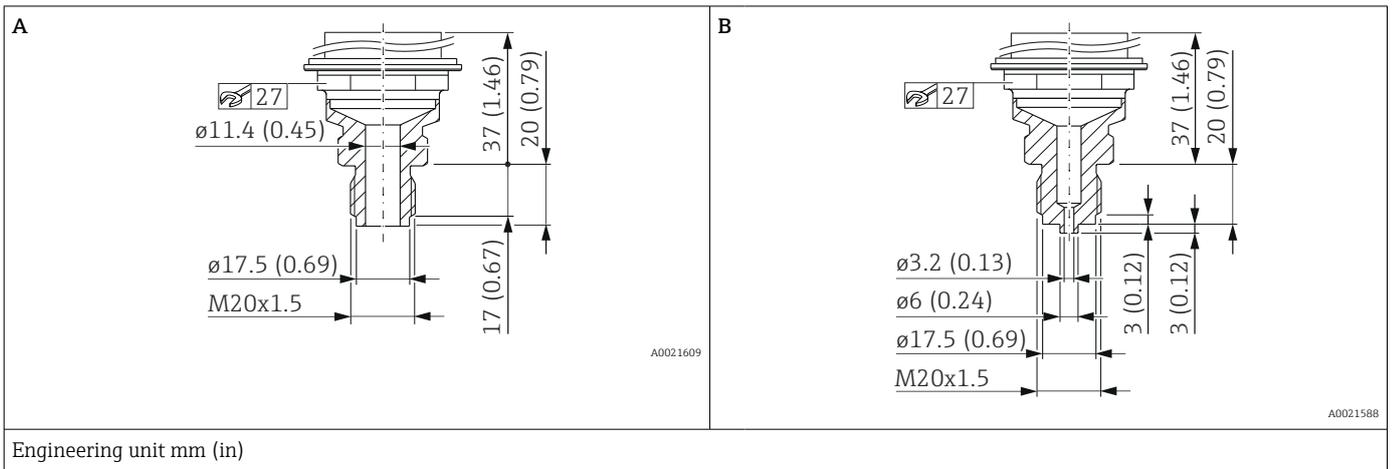
Item	Designation	Material	Weight
			kg (lb)
A	ANSI 1/2" MNPT, 1/4" FNPT	AISI 316L	0.63 (1.39)
A	ANSI 1/2" MNPT, 1/4" FNPT	Alloy C276 (2.4819)	0.63 (1.39)
B	ANSI 1/2" MNPT, Hole 11.4 mm (0.45 in) = 400 bar (6000 psi) Hole 3.2 mm (0.13 in) = 700 bar (10500 psi)	AISI 316L	0.63 (1.39)
B	ANSI 1/2" MNPT, Hole 11.4 mm (0.45 in) = 400 bar (6000 psi) Hole 3.2 mm (0.13 in) = 700 bar (10500 psi)	Alloy C276 (2.4819)	0.63 (1.39)
C	ANSI 1/2" FNPT	AISI 316L	0.7 (1.54)
C	ANSI 1/2" FNPT	Alloy C276 (2.4819)	0.7 (1.54)

Thread JIS, internal process isolating diaphragm, standard (without diaphragm seal)



Item	Designation	Material	Weight
			kg (lb)
A	JIS B0202 G 1/2" (male)	AISI 316L	0.6 (1.32)
B	JIS B0203 R 1/2" (male)	AISI 316L	0.6 (1.32)

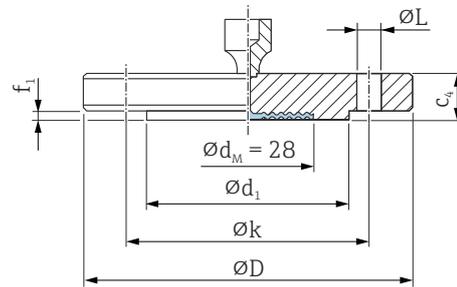
Thread DIN 13, internal process isolating diaphragm, standard (without diaphragm seal)



Item	Designation	Material	Weight
			kg (lb)
A	DIN 13 M20 x 1.5 11.4 mm (0.45 in)	AISI 316L	0.6 (1.32)
A	DIN 13 M20 x 1.5 11.4 mm (0.45 in)	Alloy C276 (2.4819)	0.6 (1.32)
B	DIN 13 M20 x 1.5, EN837 3 mm (0.12 in)	AISI 316L	0.6 (1.32)
B	DIN 13 M20 x 1.5, EN837 3 mm (0.12 in)	Alloy C276 (2.4819)	0.6 (1.32)

Flange EN1092-1, flush mount process isolating diaphragm, standard (without diaphragm seal)

Connection dimensions according to EN1092-1.



A0045473

- ØD Diameter of flange
- c₄ Thickness
- Ød₁ Raised face
- f₁ Raised face
- Øk Pitch circle
- ØL Diameter of hole
- Ød_M Max. diameter of the process isolating diaphragm

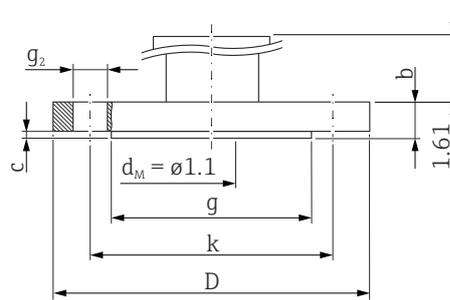
Engineering unit mm

Flange ^{1) 2)}							Boltholes			Weight
DN	PN	Shape	ØD	c ₄	Ød ₁	f ₁	Number	ØL	Øk	
			mm	mm	mm	mm			mm	mm
DN 25	PN 10-40	B1	115	18	68	2	4	14	85	1.38 (3.04)
DN 32	PN 10-40	B1	140	18	78	2	4	18	100	2.03 (4.48)
DN 40	PN 10-40	B1	150	18	88	3	4	18	110	2.35 (5.18)
DN 50	PN 10-40	B1	165	20	102	3	4	18	125	3.2 (7.06)
DN 80	PN 10-40	B1	200	24	138	3	8	18	160	5.54 (12.22)

- 1) Material: AISI 316L
- 2) The flange raised face is made from the same material as the process isolating diaphragm.

Flange ASME, flush mount process isolating diaphragm, standard (without diaphragm seal)

Connection dimensions in accordance with ASME B 16.5, raised face RF (raised face RF except 1", see Table)



A0022645

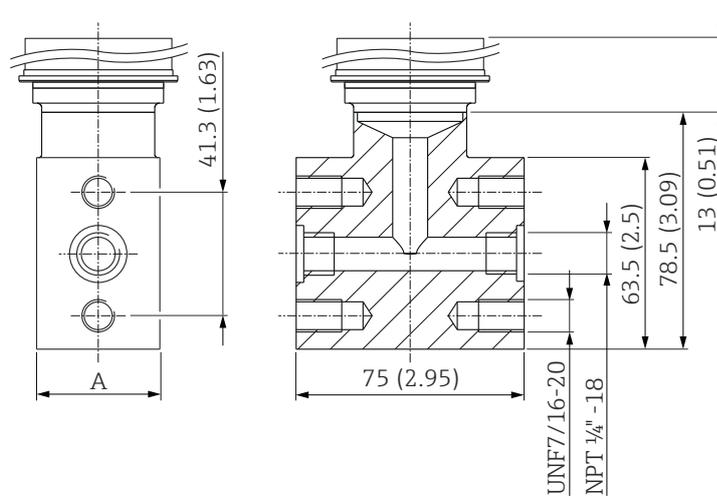
- D* Diameter of flange
- b* Thickness
- g* Raised face
- c* Thickness of raised face
- m* Width of raised face
- k* Pitch circle
- g₂* Diameter of hole
- d_M* Max. diameter of the process isolating diaphragm

Engineering unit in.

Flange ¹⁾							Boltholes			Weight
NPS	Class	D	b	g	c	m	Number	g ₂	k	kg (lb)
in		in	in	in	in	in		in	in	
1	150	4.25	0.61	2.44	0.08	-	4	0.62	3.13	1.1 (2.43)
1	300	4.88	0.69	2.2	0.06	0.2	4	0.75	3.5	1.3 (2.87)
1 ½	150	5	0.69	2.88	0.08	0.52	4	0.62	3.88	1.5 (3.31)
1 ½	300	6.12	0.81	2.88	0.08	0.52	4	0.88	4.5	2.6 (5.73)
2	150	6	0.75	3.62	0.08	-	4	0.75	4.75	2.4 (5.29)
2	300	6.5	0.88	3.62	0.08	-	8	0.75	5	3.2 (7.06)
3	150	7.5	0.94	5	0.08	-	4	0.75	6	4.9 (10.8)
3	300	8.25	1.12	5	0.08	-	8	0.88	6.62	6.7 (14.77)
4	150	9	0.94	6.19	0.08	-	8	0.75	7.5	7.1 (15.66)
4	300	10	1.25	6.19	0.08	-	8	0.88	7.88	11.6 (25.88)

1) Material: AISI 316/316L; combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)

Oval flange



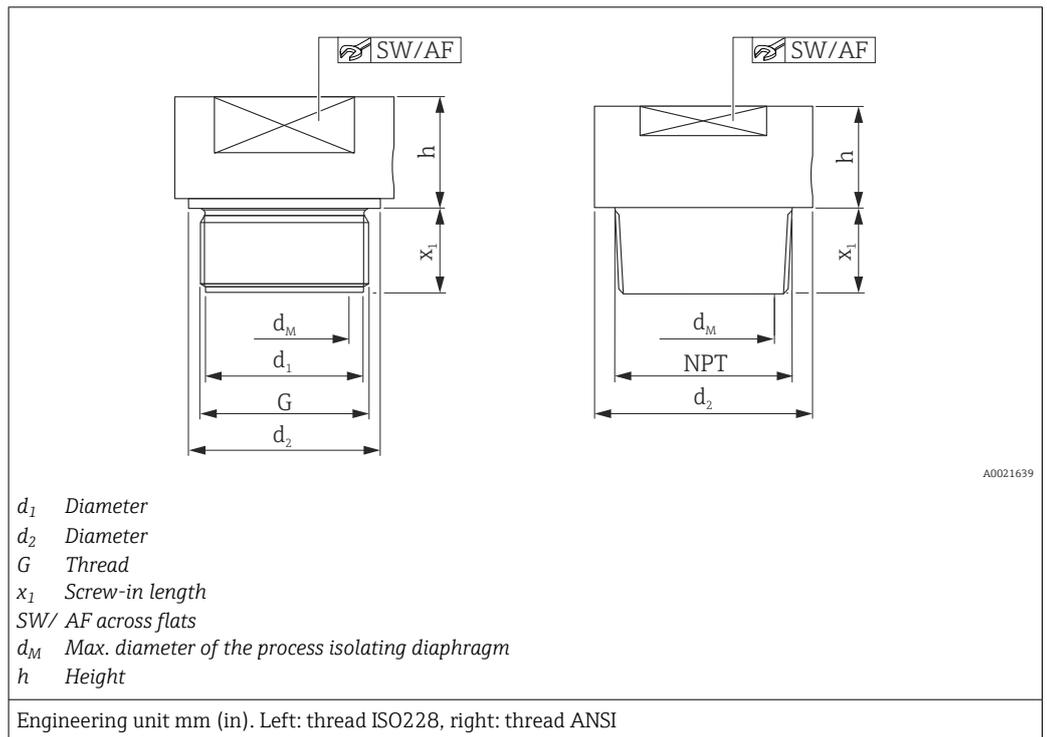
A0021632

A Sensor <40 bar (600 psi): 40 mm (1.57 in); sensor ≥40 bar (600 psi): 45 mm (1.77 in)

Engineering unit mm (in)

Material	Designation	Weight
		kg (lb)
AISI 316L (1.4404)	Oval flange adapter 1/4-18 NPT as per IEC 61518 Mounting: 7/16-20 UNF	1.9 (4.19)

Thread ISO228 , thread ANSI, flush mount process isolating diaphragm, diaphragm seal



Material	G	PN	d_1	d_2	x_1	SW/AF	$d_M^{1)}$	h	Weight
			mm	mm			mm		
AISI 316L	G 1" A	400	30	39	21	32	30	19	0.4 (0.88)
Alloy C276									0.5 (1.1)
AISI 316L	G 1 ½" A	400	43	54.4	30	41	42	20	0.9 (1.98)
Alloy C276									44
AISI 316L	G 2"	400	56	68	30	60	50	20	1.9 (4.19)
Alloy C276									65

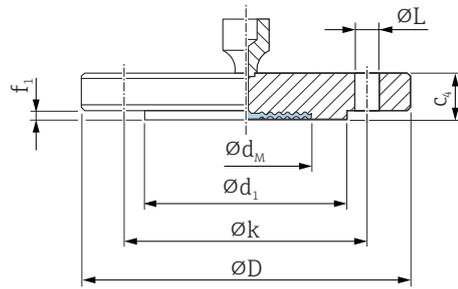
1) Maximum membrane diameter

Material	MNPT	PN	d_1	d_2	x_1	SW/AF	$d_M^{1)}$	h	Weight
			mm	mm			mm		
AISI 316L	1" MNPT	400	-	45	28	41	24	17	0.6 (1.32)
Alloy C276									0.7 (1.54)
AISI 316L	1 ½" MNPT	400	-	60	30	41	36	20	0.9 (1.98)
Alloy C276									52
AISI 316L	2" MNPT	400	-	78	30	65	38	25	1.8 (3.97)
Alloy C276									2.0 (4.41)

1) Maximum membrane diameter

Flange EN1092-1, flush mount process isolating diaphragm, diaphragm seal

Connection dimensions according to EN1092-1.



A0045226

$\varnothing D$ Diameter of flange
 c_4 Thickness
 $\varnothing d_1$ Raised face
 f_1 Raised face
 $\varnothing k$ Pitch circle
 $\varnothing L$ Diameter of hole
 $\varnothing d_M$ Max. diameter of the process isolating diaphragm

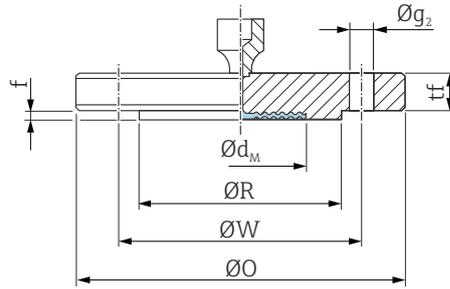
Engineering unit mm

Flange ^{1) 2) 3) 4)}							Boltholes			Diaphragm seal	
DN	PN	Shape	$\varnothing D$	c_4	$\varnothing d_1$	f_1	Number	$\varnothing L$	$\varnothing k$	$\varnothing d_M$ ⁵⁾	Weight
			mm	mm	mm	mm		mm	mm	mm	mm
DN 25	PN 10-40	B1	115	18	68	2	4	14	85	34	1.38 (3.04)
DN 32	PN 10-40	B1	140	18	78	2	4	18	100	43	2.03 (4.48)
DN 40	PN 10-40	B1	150	18	88	3	4	18	110	48	2.35 (5.18)
DN 50	PN 10-40	B1	165	20	102	3	4	18	125	62	3.2 (7.06)
DN 80	PN 10-40	B1	200	24	138	3	8	18	160	92	5.54 (12.22)
DN 80	PN 100	B2	230	32	138	3	8	26	180	92	8.85 (19.51)

- 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 $R_a < 0.8 \mu\text{m}$ ($31.5 \mu\text{in}$). Lower surface roughness on request.
- 3) The flange raised face is made from the same material as the process isolating diaphragm.
- 4) Supplied with conventional process isolating diaphragm if a PTFE membrane coating is ordered.
- 5) Maximum membrane diameter

Flange ASME B16.5, flush mount process isolating diaphragm, diaphragm seal

Connection dimensions in accordance with ASME B 16.5, raised face RF



A0045230

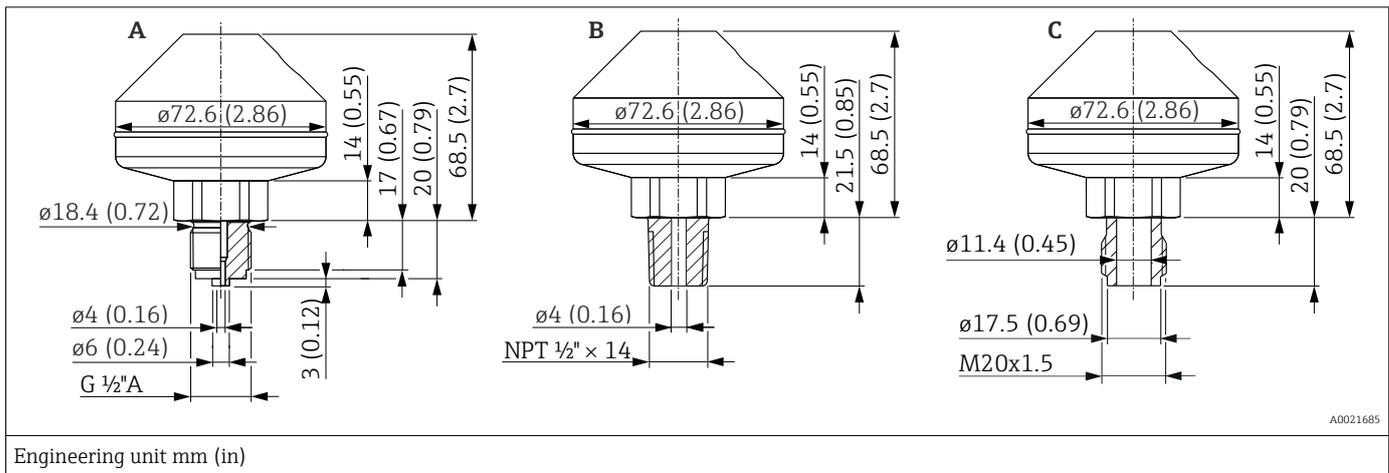
- ØØ Diameter of flange
- tf Thickness
- ØR Raised face
- f Raised face
- ØW Pitch circle
- Øg₂ Diameter of hole
- Ød_M Max. membrane diameter

Engineering unit in

Flange ^{1) 2) 3)}						Boltholes			Diaphragm seal	
NPS	Class	ØØ	tf	ØR	f	Number	Øg ₂	ØW	Ød _M ⁴⁾	Weight
in		in	in	in	in		in	in	in	kg (lb)
1	150	4.25	0.50	2	0.06	4	5/8	3.12	1.35	1.2 (2.65)
1	300	4.88	0.62	2	0.06	4	3/4	3.5	1.35	1.5 (3.31)
1 ½	150	5	0.62	2.88	0.06	4	5/8	3.88	1.89	1.6 (3.53)
1 ½	300	6.12	0.75	2.88	0.06	4	7/8	4.5	1.89	2.7 (5.95)
2	150	6	0.69	3.62	0.06	4	3/4	4.75	2.45	2.5 (5.51)
2	300	6.5	0.81	3.62	0.06	8	3/4	5	2.45	3.4 (7.5)
3	150	7.5	0.88	5	0.06	4	3/4	6	3.63	5.1 (11.25)
3	300	8.25	1.06	5	0.06	8	7/8	6.62	3.63	7.0 (15.44)

- 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 $R_a < 0.8 \mu\text{m}$ (31.5 μin). Lower surface roughness on request.
- 3) The flange raised face is made from the same material as the process isolating diaphragm.
- 4) Maximum membrane diameter

Separator, thread, ISO228, ASME, DIN, welded, diaphragm seal



Item	Designation	Material	Measuring range	PN	Weight
			bar (psi)		kg (lb)
A	Welded, ISO228 G 1/2 A EN837	AISI 316L	≤ 160 (2320)	PN 160	1.43 (3.15)
B	Welded, ANSI MNPT 1/2				
C	Welded, thread DIN13 M20x1.5				

Weight

Housing

Weight including electronics and display.

- Single compartment housing: 1.1 kg (2.43 lb)
- Dual compartment housing
 - Aluminum: 1.4 kg (3.09 lb)
 - Stainless steel: 3.3 kg (7.28 lb)

Sensor, remote (separate housing)

- Housing: see the Housing section
- Housing adapter: 0.55 kg (1.21 lb)
- Process connection adapter: 0.36 kg (0.79 lb)
- Cable:
 - PE cable 2 meters: 0.18 kg (0.40 lb)
 - PE cable 5 meters: 0.35 kg (0.77 lb)
 - PE cable 10 meters: 0.64 kg (1.41 lb)
 - FEP cable 5 meters: 0.62 kg (1.37 lb)
- Mounting bracket: 0.46 kg (1.01 lb)

Process connections

Weight, see the specific process connection.

Ex d version: 0.63 kg (1.39 lb)

Accessories

Mounting bracket: 0.5 kg (1.10 lb)

Temperature isolator

0.34 kg (0.75 lb)

Materials in contact with process**Membrane material**

- 316L (1.4435)
- 316L (1.4435), TempC
TempC Membrane stands for "Temperature Compensatory Membrane". This membrane reduces process and ambient temperature influences for diaphragm seals compared to conventional systems.
- Alloy C276
The flange raised face is made from the same material as the process isolating diaphragm.
- Tantalum
The flange raised face is made from the same material as the process isolating diaphragm.
- Monel (Alloy 400)
The flange raised face is made from the same material as the process isolating diaphragm.

Membrane coating

PTFE, 0.25 mm (0.01 in)
PTFE standard material only for conventional membrane

Process connections

See the specific process connection.

Accessories

For technical data (e.g. materials, dimensions or order numbers), see the accessory document SD01553P.

Materials not in contact with process**Single compartment housing and cover**

Polyester powder coating on aluminum as per EN1706 AC43400 (reduced copper content ≤ 0.1 % to prevent corrosion)

Dual compartment housing and cover

Polyester powder coating on aluminum as per EN1706 AC43400 (reduced copper content to prevent corrosion)

Separate housing

- Mounting bracket
 - Bracket: AISI 316L (1.4404)
 - Screw and nuts: A4-70
 - Half-shells: AISI 316L (1.4404)
- Seal for cable from separate housing: EPDM
- Gland for cable of separate housing: AISI 316L (1.4404)
- PE cable for separate housing: abrasion-proof cable with strain-relief Dynema members; shielded using aluminum-coated foil; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant
- FEP cable for separate housing: abrasion-proof cable; shielded using galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper cores, twisted, UV-resistant
- Process connection adapter for separate housing: AISI 316L (1.4404)

Aluminum housing nameplate

- Plastic adhesive label
- Versions that can be ordered for use at reduced ambient temperatures: metal wired-on tag plate made of 316L (1.4404)

Cable entries

- M20 gland:
Plastic, brass nickel plated or 316L (depends on version ordered)
Dummy plug made of plastic, aluminum or 316L (depends on version ordered)
- Thread M20:
Dummy plug made of aluminum or 316L (depends on version ordered)
- Thread G1/2:
Adapter made of aluminum or 316L (depends on version ordered)
If the G1/2 thread is selected, the device is delivered with an M20 thread as standard and a G1/2 adapter is included with the delivery, along with the corresponding documentation

- Thread NPT1/2:
Dummy plug made of aluminum or 316L (depends on version ordered)
- Plug M12:
CuZn nickel-plated or 316L (depends on version ordered)
Dummy plug made of aluminum or 316L (depends on version ordered)
- Plug HAN7D:
Aluminum, die-cast zinc, steel
Dummy plug made of aluminum or 316L (depends on version ordered)

Fill fluid

- Silicone oil
- Silicone oil, FDA
- Vegetable oil, FDA
- High-temperature oil
- Low-temperature oil
- Inert oil

Connecting parts

- Connection between housing and process connection: AISI 316L (1.4404)
- Measuring cell body: AISI 316L (1.4404)
- Connection between measuring cell body and capillary: AISI 316L (1.4404)
- Heat shrink tube (only available for capillary with PTFE capillary armor or PVC-coated capillary armor): polyolefin

Armor for capillary

AISI 316L

- Capillary: AISI 316 Ti (1.4571)
- Protective hose for capillary: AISI 316L (1.4404)

PVC-coated

- Capillary: AISI 316 Ti (1.4571)
- Protective hose for capillary: AISI 316L (1.4404)
- Coating: PVC
- Heat shrink tube at capillary junction: polyolefin

PTFE-armored

- Capillary: AISI 316 Ti (1.4571)
- Protective hose for capillary: AISI 316L (1.4404)
- Armor: PTFE
- Single-ear clamp: 1.4301

Accessories



For technical data (e.g. materials, dimensions or order numbers), see the accessory document SD01553P.

Human interface

Operating concept (not for devices with 4 to 20 mA analog)

Operator-oriented menu structure for user-specific tasks

- User navigation
- Diagnostics
- Application
- System

Fast and safe commissioning

- Interactive wizard with graphical user interface for guided commissioning in FieldCare, DeviceCare or DTM, AMS and PDM-based third-party tools or SmartBlue
- Menu guidance with brief descriptions of the individual parameter functions
- Standardized operation at the device and in the operating tools

Efficient diagnostics increase measurement availability

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

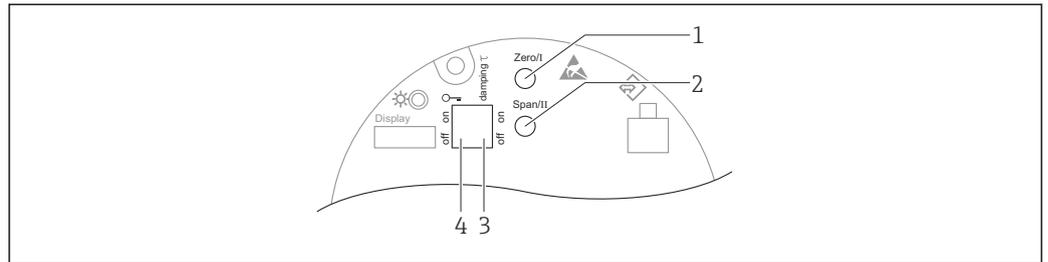
Bluetooth module (optionally integrated in onsite display)

- Quick and easy setup with SmartBlue App or PC with DeviceCare, version 1.07.00 and higher or FieldXpert SMT70
- No additional tools or adapters required
- Encrypted single point-to-point data transmission (tested by Fraunhofer Institute) and password-protected communication via *Bluetooth*® wireless technology

Local operation

Operating keys and DIP switches on the electronic insert

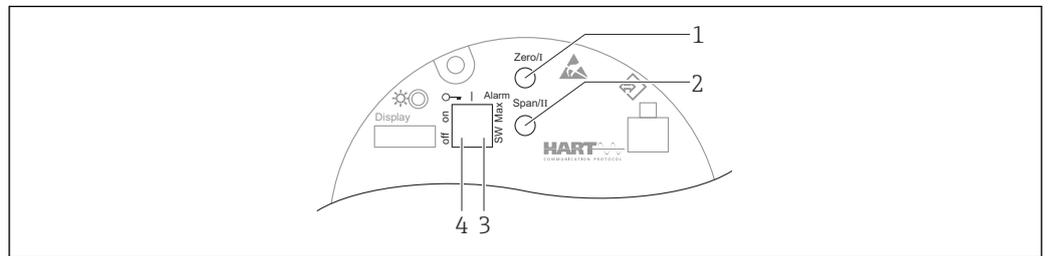
Analog 4 to 20 mA



A0039284

- 1 Operating key for lower range value (Zero)
- 2 Operating key for upper range value (Span)
- 3 DIP switch for damping
- 4 DIP switch for locking and unlocking the measuring device

HART



A0039285

- 1 Operating key for lower range value (Zero)
- 2 Operating key for upper range value (Span)
- 3 DIP switch for alarm current
- 4 DIP switch for locking and unlocking the measuring device



The setting of the DIP switches has priority over other operation methods (e.g. FieldCare/ DeviceCare).

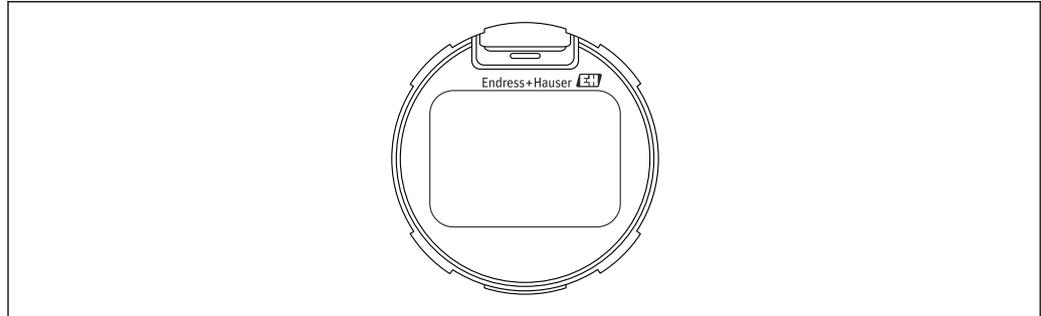
Local display**Device display (optional)**

Functions:

Display of measured values and fault and notice messages



The device displays are available with the additional option of Bluetooth® wireless technology.



A0043059

5 Segment display

Remote operation**Via HART protocol****Via service interface (CDI)****Operation via Bluetooth® wireless technology (optional)**

Prerequisite

- Measuring device with Bluetooth display
- Smartphone or tablet with Endress+Hauser SmartBlue App or PC with DeviceCare, version 1.07.00 and higher, or FieldXpert SMT70

The connection range is up to 25 m (82 ft). The range can vary depending on ambient conditions such as fixtures, walls or ceilings.



The operating keys on the display are locked as soon as the device is connected via Bluetooth.

System integration**HART**

Version 7

Supported operating tools

Smartphone or tablet with Endress+Hauser SmartBlue (App), DeviceCare version 1.07.00 and higher, FieldCare, DTM, AMS and PDM

Certificates and approvals



Certificates, approvals and other documentation currently available can be accessed on the Endress+Hauser website: www.endress.com → Downloads.

CE mark	The device meets the legal requirements of the relevant EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.
RCM-Tick marking	<p>The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products bear the RCM-Tick marking on the nameplate.</p> <div style="text-align: center;">  </div> <p style="text-align: right; font-size: small;">A0029561</p>
Ex approvals	<ul style="list-style-type: none"> ■ ATEX ■ CSA (in preparation) ■ NEPSI (in preparation) ■ INMETRO (in preparation) ■ KC (in preparation) ■ EAC (in preparation) ■ JPN (in preparation) ■ Also combinations of different approvals <p>All the data related to explosion protection is provided in separate Ex documentation which is also available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.</p> <p>Additional approvals in preparation.</p> <p>Explosion-protected smartphones and tablets</p> <p>If used in hazardous areas, mobile end devices with an Ex approval must be used.</p>
EAC conformity	<p>The measuring device meets the legal requirements of the applicable EAC Directives. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.</p> <p>Endress+Hauser confirms successful testing of the measuring device by affixing to it the EAC mark.</p>
Certificate of current Good Manufacturing Practices (cGMP)	<p>The certificate is available in English only and covers the following topics:</p> <ul style="list-style-type: none"> ■ Materials of construction of product wetted parts ■ TSE compliance ■ Polishing and surface finish ■ Material/ compound compliance table e.g. USP Class VI, FDA conformity
Drinking water approval	NSF/ANSI 61 drinking water approval
Overfill prevention (in preparation)	The measuring device is tested in accordance with the approval guidelines for overfill protection units (ZG-ÜS:2012-07) as overfill protection as per Section 63 of the German Water Resources Act (WHG).
Functional safety SIL/ IEC 61508 Declaration of Conformity (optional)	The measuring devices with a 4-20 mA output signal have been developed in accordance with the IEC 61508 standard. These measuring devices can be used to monitor the process level and pressure up to SIL 3. For a detailed description of the safety functions, settings and functional safety data, see the "Functional Safety Manual".
Marine approval (pending)	<ul style="list-style-type: none"> ■ ABS (American Bureau of Shipping) ■ LR (Lloyd's Register) ■ BV (Bureau Veritas) ■ DNV GL (Det Norske Veritas / Germanischer Lloyd)

Radio approval

Displays with Bluetooth LE have radio licenses according to CE and FCC. The relevant certification information and labels are provided on display.

Test reports**Test, report, declarations**

- Inspection certificate 3.1, EN10204 (material certificate, wetted metallic parts)
- NACE MRO175 / ISO 15156 (wetted metallic parts), declaration
- NACE MRO103 / ISO 17945 (wetted metallic parts), declaration
- AD 2000 (wetted metal parts), declaration, excluding process isolating diaphragm
- ASME B31.3 process piping, declaration
- ASME B31.1 power piping, declaration
- Pressure test, internal procedure, test report
- Helium leak test, internal procedure, test report
- PMI test, internal procedure (wetted metallic parts), test report
- Standard measuring device (without a diaphragm seal): liquid penetrant test ISO23277-1 (PT), wetted/pressurized metallic parts, test report
- Standard measuring device (without a diaphragm seal): liquid penetrant test ASME VIII-1 (PT), wetted/pressurized metallic parts, test report
- Welding documentation, wetted/pressurized seams, declaration

Test reports, declarations and inspection certificates are available in electronic format in the Device Viewer: enter the serial number of the nameplate (www.endress.com/deviceviewer).

Applicable for the order codes "Calibration" and "Test, certificate" .

Product documentation on paper

Test reports, declarations and inspection certificates in hard copy can optionally be ordered with the order option "Product documentation on paper". These documents are supplied with the ordered product.

Calibration

5-point calibration certificate

10-point calibration certificate, traceable to ISO/IEC 17025

Manufacturer declarations

Depending on the desired configuration, the following documents can be additionally ordered with the measuring device:

- FDA conformity
- TSE-free: materials free from animal origin
- Regulation (EC) No. 2023/2006 (GMP)

Downloading the Declaration of Conformity

www.endress.com → Download

Pressure Equipment Directive 2014/68/EU (PED)**Pressure equipment with allowable pressure ≤ 200 bar (2 900 psi)**

Pressure equipment (with a maximum allowable pressure $PS \leq 200$ 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:

- Measuring devices with thread and internal process isolating diaphragm PN > 200:
Suitable for stable gases in group 1, category I, module A
- Measuring devices with separators PN 400:
Suitable for stable gases in group 1, category I, module A

Oxygen application	Verified cleaned, suitable for O2 service (wetted parts)
PWIS-free applications	Special cleaning of the transmitter to remove paint-wetting impairment substances, for use in paint shops, for instance.
China RoHS symbol	The measuring device is visibly identified according to SJ/T 11363-2006 (China-RoHS).
RoHS	The measuring system complies with the substance restrictions of the Restriction on Hazardous Substances Directive 2011/65/EU (RoHS 2).
Additional certification	<p>Classification of process sealing between electrical systems and (flammable or combustible) process liquids in accordance with UL 122701 (previously ANSI/ISA 12.27.01)</p> <p>Endress+Hauser devices are designed according to UL 122701 (previously ANSI/ISA 12.27.01) and allow 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 devices comply with the North-American installation practice and provide a very safe and cost-saving installation for pressurized applications with hazardous process media. The devices are assigned to "single seal" as follows:</p> <p>CSA C/US IS, XP, NI: 400 bar (6 000 psi)</p> <p>Further information can be found in the control drawings of the relevant devices.</p> <p>Metrological accreditation</p> <p>With the order option "China", the measuring device is supplied with a Chinese nameplate in accordance with the Chinese Quality Law.</p>

Ordering information

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator under www.endress.com :

1. Click Corporate
2. Select the country
3. Click Products
4. Select the product using the filters and search field
5. Open the product page

The Configuration button opens the Product Configurator.

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

Scope of delivery

The scope of delivery comprises:

- Measuring device
- Optional accessories

Documentation supplied:

- Brief Operating Instructions
- Final inspection report
- Additional safety instructions for devices with approvals (e.g. ATEX, IECEx, NEPSI, etc.)
- Optional: factory calibration form, test certificates

 The Operating Instructions are available on the Internet at:

www.endress.com → Download

Measuring point (tag)

- Order code: marking
- Option: Z1, tagging (TAG), see additional specification
- Location of tag identifier: to be selected in the additional specifications
 - Tag plate, stainless steel
 - Self-adhesive paper label
 - Supplied plate
 - RFID TAG
 - RFID TAG + tag plate stainless steel
 - RFID TAG + self-adhesive paper label
 - RFID TAG + supplied label/plate
- Definition of tag name: to be defined in the additional specifications
3 lines, each containing up to maximum 18 characters
The specified tag name appears on the selected label and/or the RFID TAG
- Identification on electronic nameplate (ENP): 32 digits

Accessories

Device-specific accessories

Mechanical accessories

- Mounting bracket for housing
- Mounting bracket for block & bleed valves
- Block&bleed valves
- Water siphon (PZW)
- Flushing rings
- Weather protection covers



For technical data (e.g. materials, dimensions or order numbers), see the accessory document SDO1553P.

Plug connectors

- Plug connector M12 90 deg, IP67 5m cable, union nut, Cu Sn/Ni
- Plug connector M12, IP67 union nut, Cu Sn/Ni
- Plug connector M12, 90 deg IP67 union nut, Cu Sn/Ni



The IP protection classes are only maintained if the dummy cap is used or the cable is connected.

Weld-in accessory



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

Device Viewer

All the accessories for the measuring device, along with the order code, are listed in the *Device Viewer* (www.endress.com/deviceviewer).

Supplementary 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 the serial number from the nameplate or scan the 2D matrix code (QR code) on the nameplate

Standard documentation

- **Technical Information: planning guide**
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
- **Brief Operating Instructions: takes you quickly to the 1st measured value**
The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning
- **Operating Instructions: reference manual**
The Operating Instructions contain all the information that is required in the various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal

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.

Field of Activities

-  Document FA00004P
Pressure measurement, powerful instruments for process pressure, differential pressure, level and flow

Special Documentation

-  Document SD01553P
Mechanical accessories for pressure measuring devices
The documentation provides an overview of available manifolds, oval flange adapters, pressure gauge valves, shutoff valves, siphons, condensate pots, cable shortening kits, test adapters, flushing rings, Block&Bleed valves and protective roofs.

Registered trademarks

HART®

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

Bluetooth®

The Bluetooth® wordmark and logos are registered trademarks of Bluetooth SIG, Inc. and any use of these trademarks by Endress+Hauser is licensed. Other trademarks and trade names are those of their respective owners.



71521417

www.addresses.endress.com
