

Technical Information

Cerabar PMP51B

Process pressure and level measurement in liquids or gases



Digital pressure transmitter with metal process membrane

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 firmware is designed to ensure extremely easy handling. Intuitive and clear wizard navigation guides the user through the commissioning and verification of the device. The Bluetooth connectivity provides safe and remote operation. The large display guarantees excellent readability.

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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.**

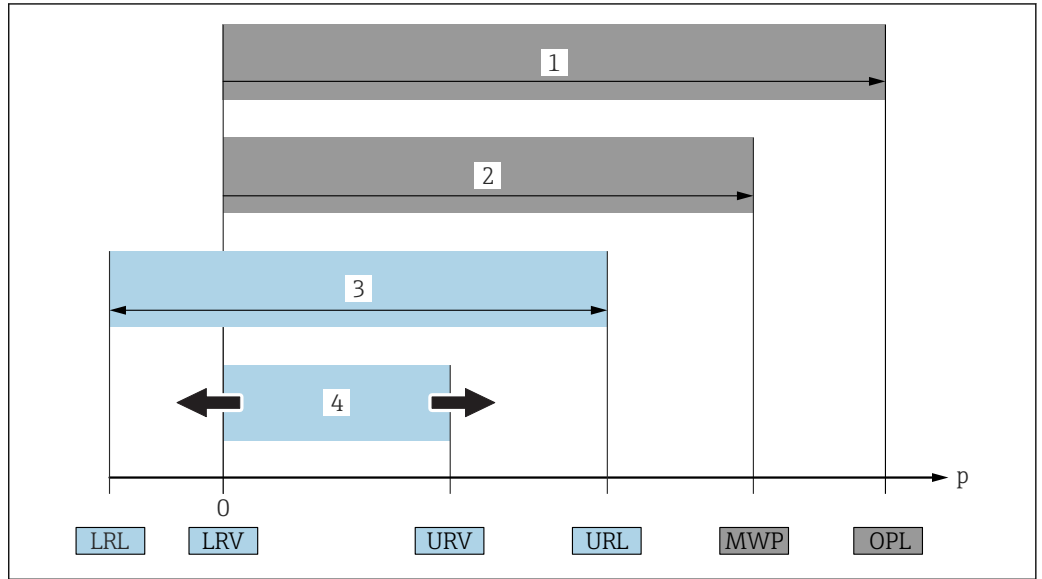
Views: A, B, C, ...

Symbols on the device

Safety instructions:  → 

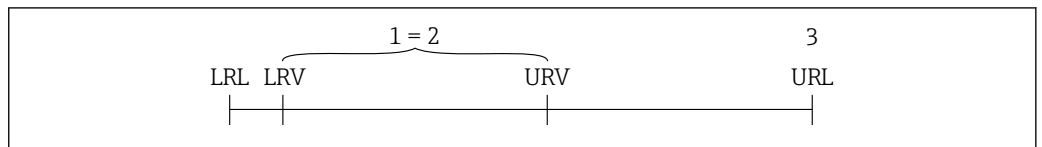
Observe the safety instructions contained in the associated Operating Instructions.

List of abbreviations



- 1 OPL: The OPL (overpressure limit = sensor overload limit) for the device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Pay attention to the pressure/temperature dependency.
 - 2 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



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

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)

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

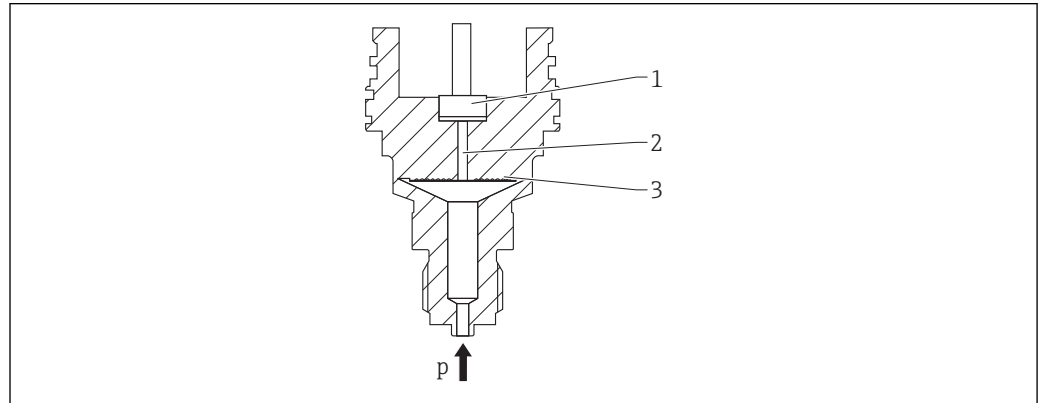
In this example, the TD is 2:1. This span is based on the zero point.

Function and system design

Measuring principle

Metal process membrane

Standard device (without diaphragm seal)



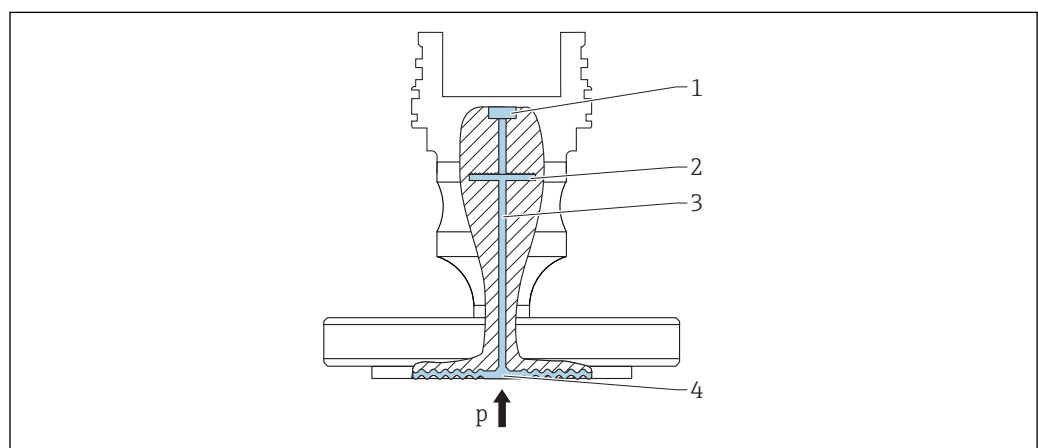
- 1 Measuring element
- 2 Channel with fill fluid
- 3 Metal process membrane
- p Pressure

The pressure deflects the metal process membrane of the sensor. A fill fluid transfers the pressure to a Wheatstone bridge (semi-conductor 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

Device with diaphragm seal



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

The pressure acts on the process membrane of the diaphragm seal and is transferred from a diaphragm seal fill fluid to the internal process membrane. The internal process membrane 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 device (without diaphragm seal): secondary containment for enhanced integrity

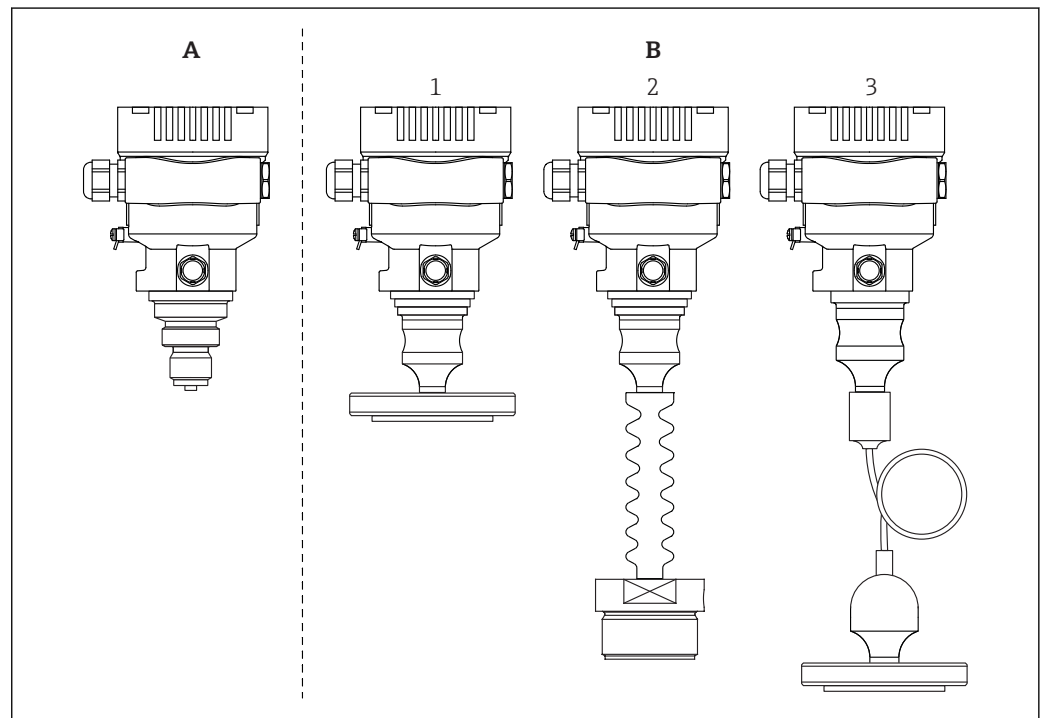
Applications for diaphragm seals

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 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

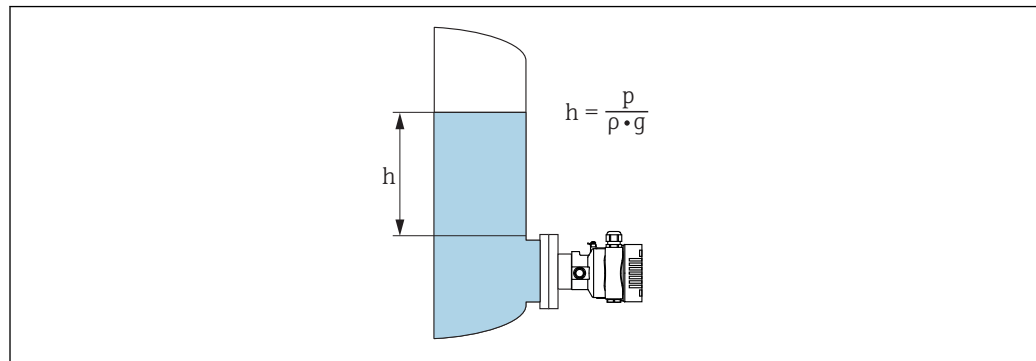
Measuring system

Device versions



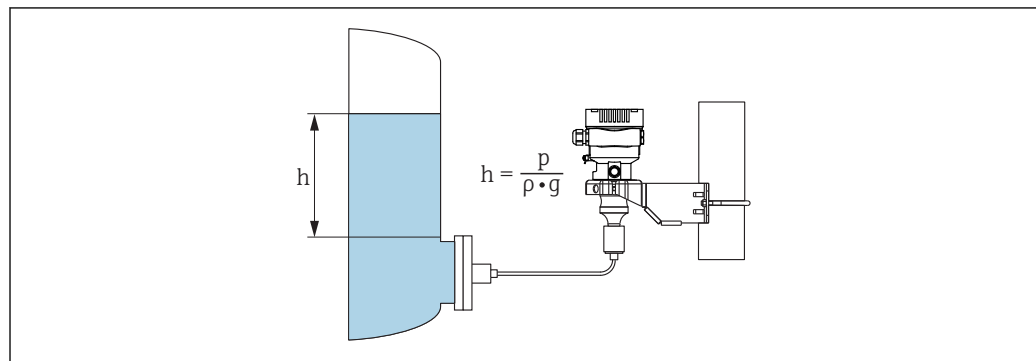
A0043594

- A Standard device (without diaphragm seal)
- B Device with diaphragm seal
- 1 Compact diaphragm seal type
- 2 Diaphragm seal type with temperature isolator
- 3 Diaphragm seal type with capillary


Level measurement (level, volume and mass)*Standard device (without diaphragm seal)*

A0038343

h Height (level)
 p Pressure
 ρ Density of the medium
 g Gravitational constant

Device with diaphragm seal

A0038342

 1 Sample illustration: diaphragm seal with capillary

h Height (level)
 p Pressure
 ρ Density of the medium
 g Gravitational 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 devices with HART, 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 to change the user role (applies for operation via Bluetooth, FieldCare, DeviceCare, AMS, 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 maximum working pressure (MWP) and the overpressure limit (OPL) can deviate from the values in the tables. |

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) | 0.005 (0.075) ²⁾ |
| 1 bar (15 psi) | 0 | +1 (+15) | 0.01 (0.15) ³⁾ |
| 2 bar (30 psi) | 0 | +2 (+30) | 0.02 (0.3) ³⁾ |
| 4 bar (60 psi) | 0 | +4 (+60) | 0.04 (0.6) ³⁾ |
| 10 bar (150 psi) | 0 | +10 (+150) | 0.1 (1.5) ³⁾ |
| 40 bar (600 psi) | 0 | +40 (+600) | 0.4 (6) ³⁾ |
| 100 bar (1 500 psi) | 0 | +100 (+1500) | 1.0 (15) ³⁾ |
| 400 bar (6 000 psi) | 0 | +400 (+6000) | 4 (60) ³⁾ |

1) 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 membrane is recommended for applications in the limit range. Device with diaphragm seal: Observe the 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) | 0.005 (0.075) ¹⁾ |
| 1 bar (15 psi) | -1 (-15) | +1 (+15) | 0.01 (0.15) ²⁾ |
| 2 bar (30 psi) | -1 (-15) | +2 (+30) | 0.02 (0.3) ²⁾ |
| 4 bar (60 psi) | -1 (-15) | +4 (+60) | 0.04 (0.6) ²⁾ |
| 10 bar (150 psi) | -1 (-15) | +10 (+150) | 0.1 (1.5) ²⁾ |
| 40 bar (600 psi) | -1 (-15) | +40 (+600) | 0.4 (6) ²⁾ |
| 100 bar (1 500 psi) | -1 (-15) | +100 (+1500) | 1.0 (15) ²⁾ |
| 400 bar (6 000 psi) | -1 (-15) | +400 (+6000) | 4 (60) 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) |
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| 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 membrane is recommended for applications in the limit range. Device with diaphragm seal: Observe the 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

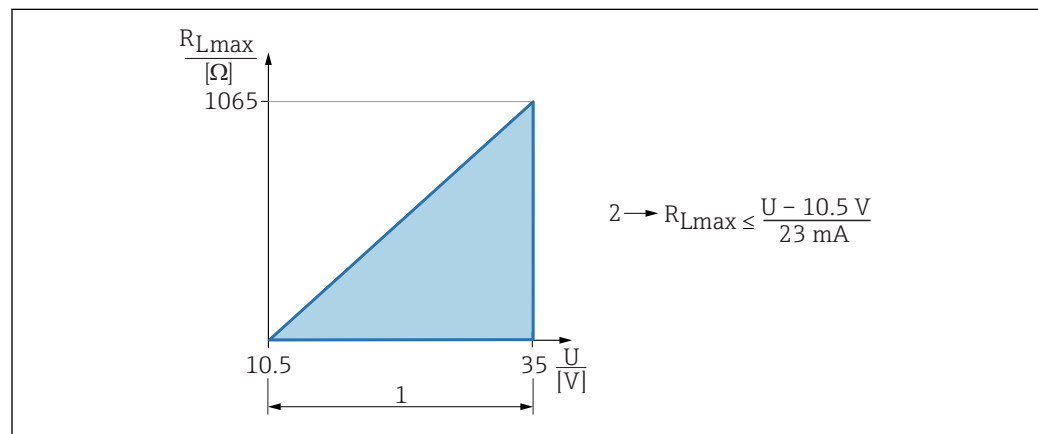
Signal on alarm

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



A0039234

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

| 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
 - Sensor Pressure is the raw signal from sensor before damping and position adjustment.
 - Electronics temperature
 - Percent of range
 - Loop current
 - The loop current is the output current set by the applied pressure.

Supported functions

- Burst mode
- Additional transmitter status
- Device locking

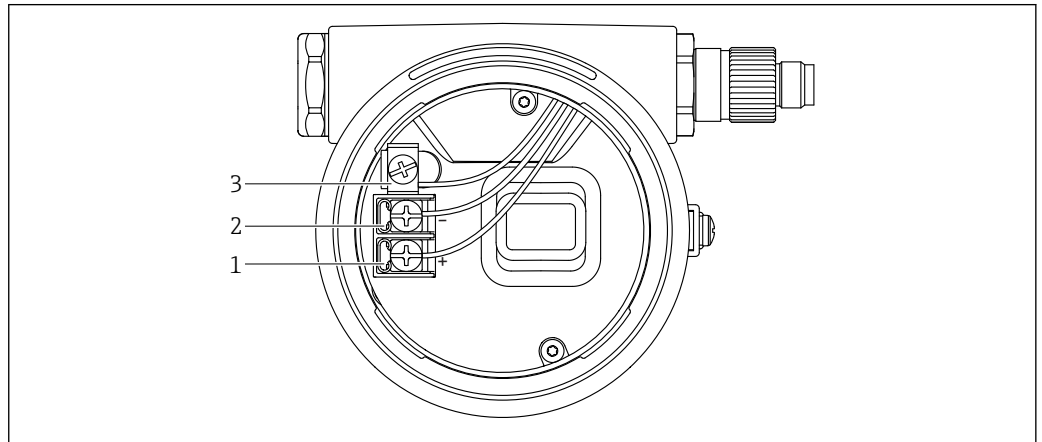
Wireless HART data

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

Power supply

Terminal assignment

Single compartment housing



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2 Connection terminals and ground terminal in the connection compartment

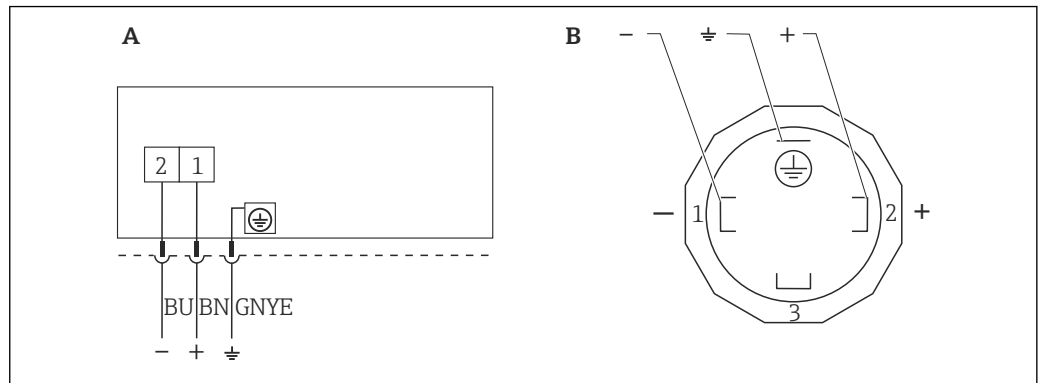
- 1 Positive terminal
- 2 Negative terminal
- 3 Internal ground terminal

Available device plugs

i In the case of devices with a plug, it is not necessary to open the housing for connection purposes.

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

Devices with valve plug



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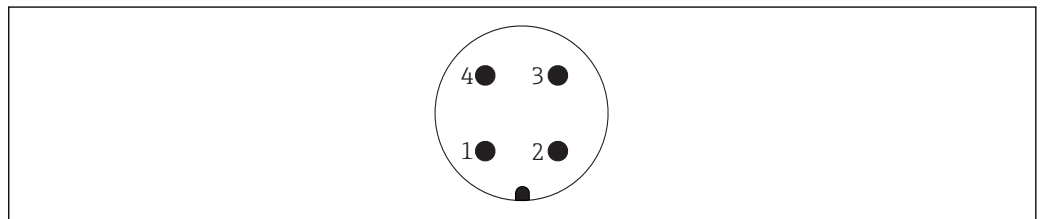
3 BN = brown, BU = blue, GNYE = green/yellow

A Electrical connection for devices with valve connector

B View of the plug-in connection on the device

Material: PA 6.6

Devices with M12 plug



A0011175

| Pin | Analog/HART |
|-----|--------------|
| 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

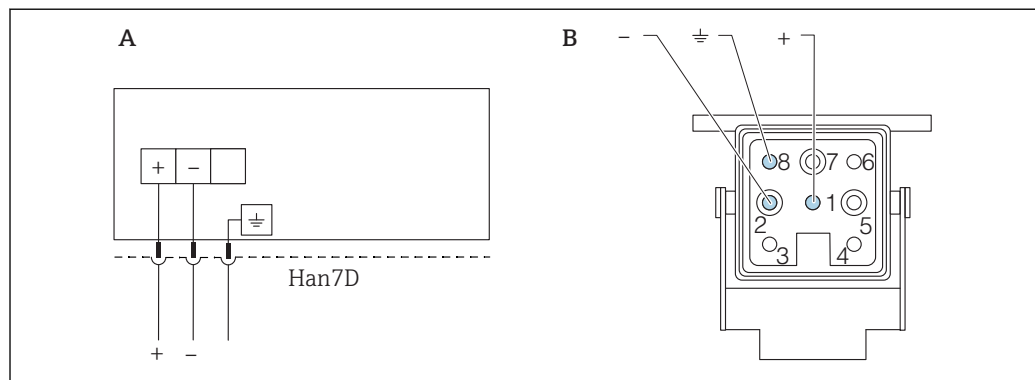
■ 1 = BN = brown

■ 2 = WT = white

■ 3 = BU = blue

■ 4 = BK = black

Devices with a Harting plug Han7D



A Electrical connection for devices with Harting plug Han7D

B View of the plug-in connection on the device

- Brown

⊕ Green/yellow

+ Blue

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

Supply voltage

■ Ex d, Ex e, non Ex: supply voltage: 10.5 to 35 V_{DC}

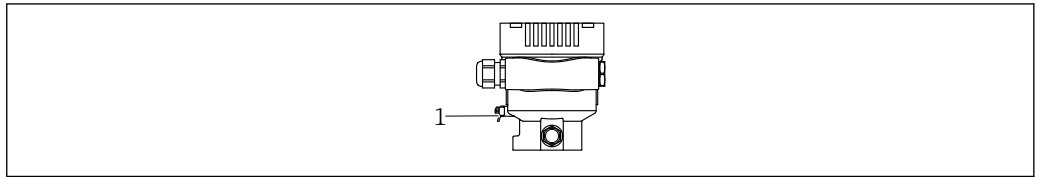
■ Ex i: supply voltage: 10.5 to 30 V_{DC}

■ 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



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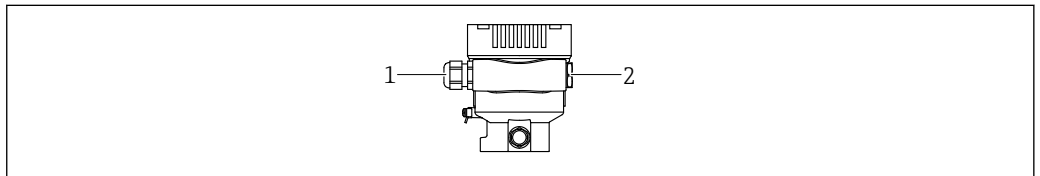
1 Ground terminal for connecting the potential matching line

- 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

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

- HART: acyclic: min. 330 ms, typically 590 ms (depends on commands and number of preambles)
- HART: cyclic (burst): min. 160 ms, typically 350 ms (depends on commands and number of preambles)

Reference operating conditions

- As per IEC 62828-2
- Ambient temperature T_A = constant, in the range of +22 to +28 °C (+72 to +82 °F)
- Humidity φ = constant, in the range of: 5 to 80 % rF \pm 5 %
- Ambient pressure p_A = constant, in the range of: 860 to 1 060 mbar (12.47 to 15.37 psi)
- Position of the measuring cell: horizontal \pm 1°
- 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 device (without diaphragm seal))
- Fill fluid:
 - Silicone oil (standard)
 - Silicone oil, FDA (diaphragm seal)
- Supply voltage: 24 V DC \pm 3 V DC
- Load with HART: 250 Ω
- Turn down (TD) = URL/ |URV - LRV|
- Zero based span

Total performance

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

- Total performance of device
- Installation factors

All of the performance characteristics meet the requirement of $\geq \pm 3$ sigma.

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

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

E1 = Reference accuracy

E2 = Ambient temperature effect

Influence of diaphragm seal (calculation performed with Applicator "Sizing Diaphragm Seal")

Calculation of E2:

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

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

$$E2 = E2_M + E2_E$$

$E2_M$ = Main temperature error

$E2_E$ = Electronics error

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

Reference accuracy [E1]

The reference accuracy comprises the non-linearity according to the limit point method, pressure hysteresis and non-repeatability in accordance with [IEC62828-1 / IEC 61298-2]. Reference accuracy for standard up to TD 100:1, for platinum up to TD 10:1.

Standard device (without diaphragm seal)

| Sensor | Standard | Platinum ¹⁾ |
|--|---|--|
| 400 mbar (6 psi) | TD 1:1 = ±0.075 % TD > 1:1 = ±0.075 % · TD | TD 1:1 = ±0.055 % TD > 1:1 to 10:1 = ±0.055 % · TD |
| 1 bar (15 psi) | TD 1:1 to 2.5:1 = ±0.075 % TD > 2.5:1 = ±0.03 % · TD | TD 1:1 to 2.5:1 = ±0.055 % TD > 2.5:1 to 10:1 = ±0.025 % · TD |
| 2 bar (30 psi) | TD 1:1 to 5:1 = ±0.075 % TD > 5:1 = ±0.015 % · TD | TD 1:1 to 5:1 = ±0.055 % TD > 5:1 to 10:1 = ±0.01 % · TD |
| 4 bar (60 psi) 10 bar (150 psi) 40 bar (600 psi) 100 bar (1500 psi) | TD 1:1 to 10:1 = ±0.075 % TD > 10:1 = ±0.0075 % · TD | TD 1:1 to 10:1 = ±0.055 % |
| 400 bar (6000 psi) | TD 1:1 to 5:1 = ±0.15 % TD > 5:1 = ±0.03 % · TD | TD 1:1 to 5:1 = ±0.1 % TD > 5:1 to 10:1 = ±0.025 % · TD |

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

Device with diaphragm seal

| Sensor | Standard | Platinum |
|--|---|---|
| 400 mbar (6 psi) | TD 1:1 = ±0.15 % TD > 1:1 = ±0.15 % · TD | not available |
| 1 bar (15 psi) | TD 1:1 to 5:1 = ±0.15 % TD > 5:1 = ±0.03 % · TD | TD 1:1 to 2.5:1 = ±0.075 % TD > 2.5:1 to 10:1 = ±0.03 % · TD |
| 2 bar (30 psi) | TD 1:1 to 10:1 = ±0.15 % TD > 10:1 = ±0.015 % · TD | TD 1:1 to 5:1 = ±0.075 % TD > 5:1 to 10:1 = ±0.015 % · TD |
| 4 bar (60 psi) 10 bar (150 psi) 40 bar (600 psi) 100 bar (1500 psi) | TD 1:1 to 10:1 = ±0.15 % TD > 10:1 = ±0.2 % | TD 1:1 to 5:1 = ±0.075 % TD > 5:1 to 10:1 = ±0.075 % · TD |
| 400 bar (6000 psi) | TD 1:1 to 5:1 = ±0.15 % TD > 5:1 = ±0.03 % · TD | TD 1:1 to 5:1 = ±0.15 % TD > 5:1 to 10:1 = ±0.03 % · TD |



Platinum only for direct diaphragm seal mount.

Measuring uncertainty for small absolute pressure measuring ranges

The smallest extended uncertainty of measurement that can be delivered by our standards in the 0.001 to 35 mbar (0.0000145 to 0.5075 psi) range is 0.1 % of the reading + 0.004 mbar (0.000058 psi).

Temperature effect [E2]

E2_M - Main temperature error

The output changes due to the effect of the ambient temperature [IEC 62828-1 / IEC 61298-3] with respect to the reference temperature [IEC 62828-1]. 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
±(0.08 % · TD + 0.16 %)

Standard and platinum: 10 bar (150 psi) and 40 bar (600 psi) sensor
±(0.06 % · TD + 0.06 %)

Standard and platinum: 100 bar (1 500 psi) and 400 bar (6 000 psi) sensor
 $\pm(0.03 \% \cdot TD + 0.12 \%)$

E_{2E} - 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 inaccuracies, e.g. for other temperature ranges, can be calculated with the Applicator "[Sizing Pressure Performance](#)".



A0038927

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

Diaphragm seal errors are not taken into consideration. They are calculated separately in the Applicator "[Sizing Diaphragm Seal](#)".



A0038925

Resolution

Current output: <math><1 \mu\text{A}</math>

Total error

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

Total error = total performance + long-term stability

Calculation of the total error with the Endress+Hauser Applicator

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



A0038927

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

Diaphragm seal errors are not taken into consideration. They are calculated separately in the Applicator "[Sizing Diaphragm Seal](#)".



A0038925

Long-term stability

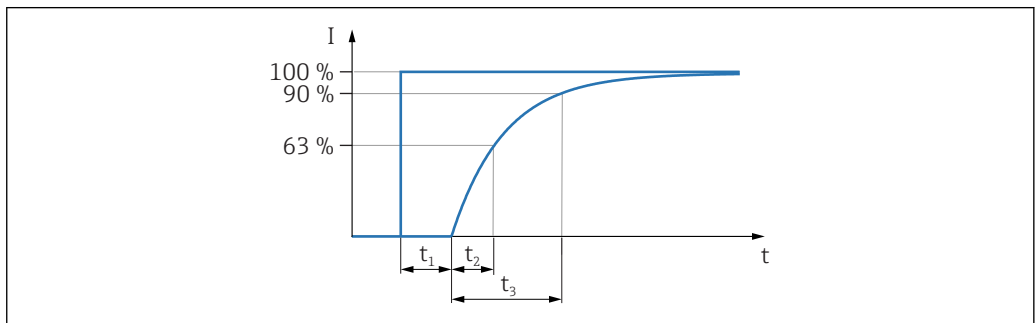
The specifications refer to the upper range limit (URL).

- 1 year: ±0.10 %
- 5 years: ±0.20 %
- 10 years: ±0.25 %

Response time T63 and T90

Dead time, time constant

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



A0019786

Dynamic behavior, current output (analog electronics)

Standard device (without 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

Device with diaphragm seal

Values like standard device (without diaphragm seal) plus influence of diaphragm seal. Calculation with Applicator [Sizing Diaphragm Seal](#).

Dynamic behavior, current output (HART electronics)*Standard device (without 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

Devices with diaphragm seal

Values like standard device (without diaphragm seal) plus influence of diaphragm seal. Calculation with Applicator [Sizing Diaphragm Seal](#).

Warm-up time (according to IEC62828-4) ≤ 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 water pocket pipes is recommended for mounting
- The orientation depends on the measuring application

Installation instructions

- The standard devices (without diaphragm seals) are mounted according to the same guidelines as pressure gauges (DIN EN837-2)
- To ensure optimal readability of the local display, adjust the housing and local display
- Endress+Hauser offers a mounting bracket to mount the device on pipes or walls
- Use flushing rings for flanges, flange seals and pancake seals if buildup or clogging can be expected at the process membrane
 - The flushing ring is clamped between the process connection and the flange, flange seal or pancake seal
 - Material buildup in front of the process membrane 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 plug downwards as much as possible to prevent moisture from entering (e.g. rainwater or condensation)

Installation instructions for devices with diaphragm seals

General information

A diaphragm seal and the transmitter together form a closed, calibrated system that has been filled through openings in the diaphragm seal and in the transmitter's measurement system. These openings are sealed and must not be opened.

In the case of devices with diaphragm seals and capillaries, the zero point shift caused by the hydrostatic pressure of the filling fluid column in the capillaries must be taken into account when selecting the measuring cell. Perform zero point adjustment if necessary. 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 liquid column of the fill fluid).

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 them against direct sunlight.

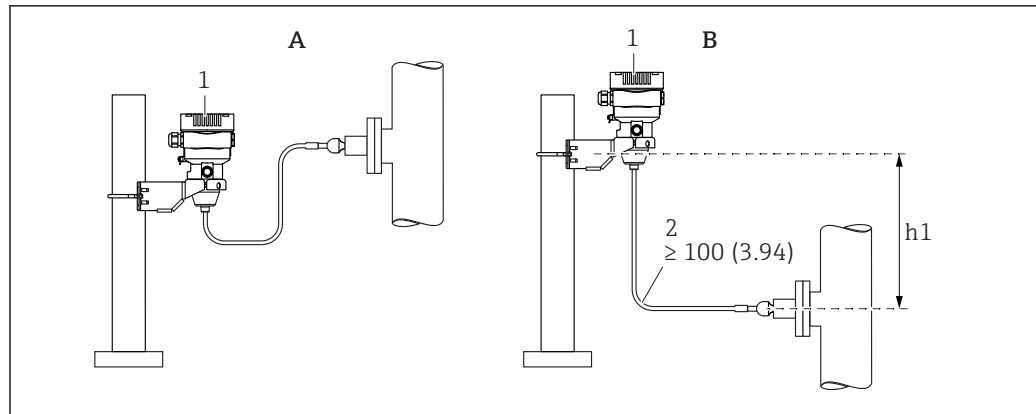
More detailed installation instructions are provided in the Applicator "[Sizing Diaphragm Seal](#)".

Vacuum applications

In vacuum applications, ideally use pressure transmitters with a ceramic measuring membrane (oil-free).

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

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



A0038734

A Recommended installation in a vacuum application

B Installation above the diaphragm seal

$h1$ Height difference

1 Device

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

The maximum height difference depends on the density of the diaphragm seal fill fluid and the lowest absolute pressure that can ever occur at the diaphragm seal (empty container).

Sensor selection and arrangement

Mounting the device

Pressure measurement in gases

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

Pressure measurement in vapors

A water pocket pipe 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 device with the O-shaped water pocket pipe below the tapping point
 - The device may also be mounted above the tapping point
- Fill the water pocket pipe with liquid before commissioning

Pressure measurement in liquids

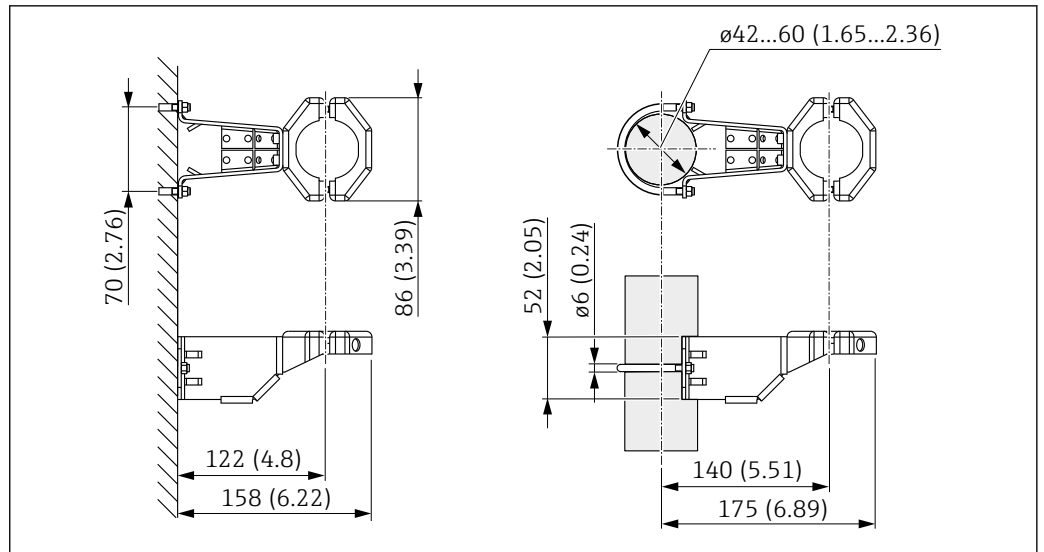
Mount the device with the shutoff device below or at the same level as the tapping point.

Level measurement

- Always mount the device below the lowest measuring point
- Do not install the 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 device downstream from a shutoff device: the calibration and function check can be carried out more easily

Mounting bracket for device or separate housing

The device or the separate housing can be mounted on walls or pipes (for pipes with a diameter of 1 ¼" to 2") using the mounting bracket.



A0028493

Unit of measurement mm (in)

Ordering information:

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



The mounting bracket is included in the delivery if you order the device with a separate housing.

Special mounting instructions

Wall and pipe mounting with a manifold (optional)

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

For technical data, see the SD01553P accessory document.

Sensor, remote (separate housing)

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

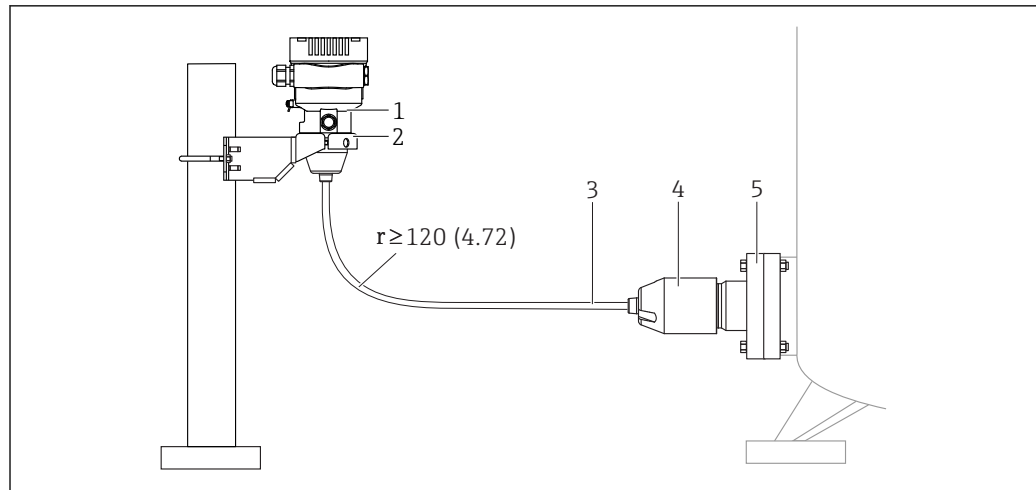
This version therefore facilitates trouble-free measurement:

- 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:

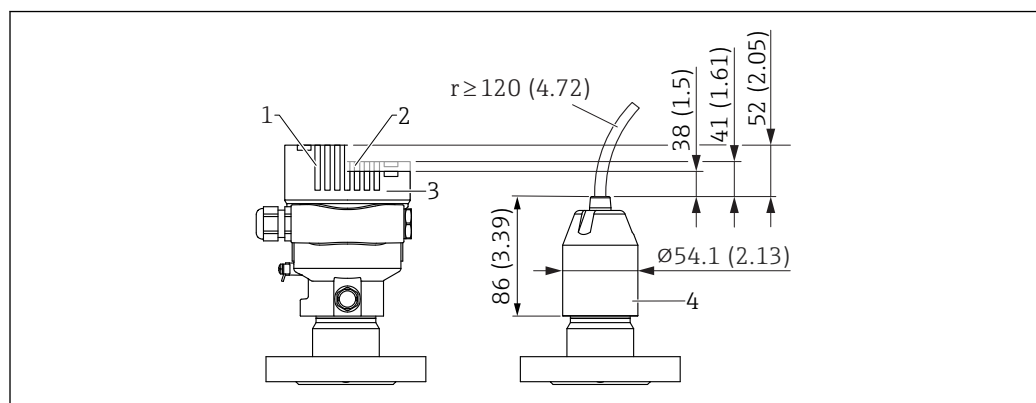
- Minimum bending radius: 120 mm (4.72 in)
- Cable extraction force: max. 450 N (101.16 lbf)
- Resistance to UV light

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.

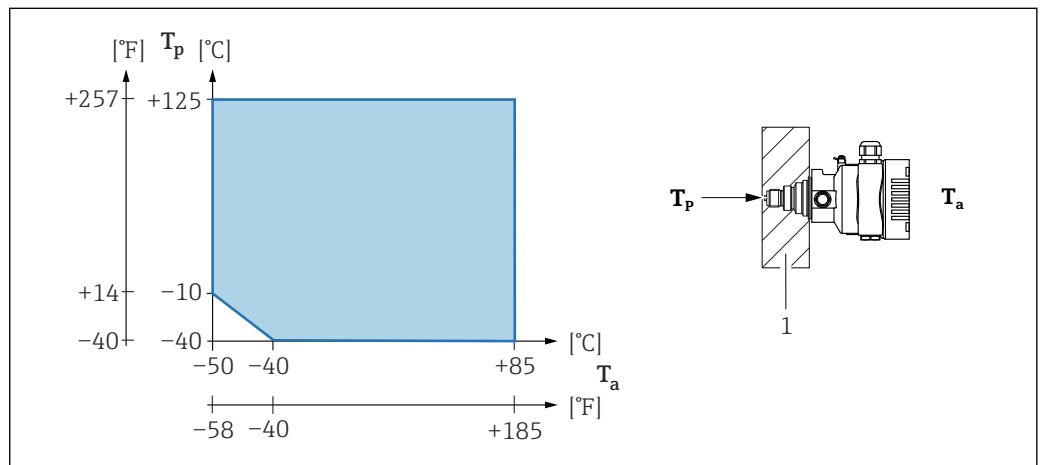


A0047094

- 1 Device with display, cover with glass viewing window (devices for Ex d, dust Ex)
- 2 Device with display, cover with plastic viewing window
- 3 Device without display, cover without viewing window
- 4 Process connection adapter

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: 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 additionally occur in the application: use a device with a capillary. Diaphragm seal with temperature isolator: use a mounting bracket!</p> <p>Ambient temperature T_a depending on the process temperature T_p</p> <p>The process connection must be fully insulated for ambient temperatures below -40 °C (-40 °F).</p> |
|----------------------------------|---|



1 Insulation material

| | |
|----------------------------|--|
| Hazardous area | <ul style="list-style-type: none"> ■ For devices for use in hazardous areas, see the Safety Instructions, Installation Drawing or Control Drawing ■ Devices that have the most common explosion protection certificates (e.g. ATEX/ IEC Ex, etc.) can be used in explosive atmospheres up to the ambient temperature. |
| Storage temperature | <ul style="list-style-type: none"> ■ Without LCD display: Standard: -40 to +90 °C (-40 to +194 °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 | <p>Operation in very corrosive environment</p> <p>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 and</p> |

the stainless steel housing. 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

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, IP66/68 TYPE 4X/6P
- Dummy plug transport protection: IP22, TYPE 2
- Plug HAN7D, 90 deg. IP65 NEMA Type 4X
- Plug M12

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 |
|--|---|-------|
| Device | 10 Hz to 60 Hz: ±0.35 mm (0.0138 in) 60 Hz to 1000 Hz: 5 g | 30 g |
| Device with a "compact" or "temperature isolator" type of diaphragm seal ¹⁾ | 10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g | 30 g |

- 1) Use either a device with a temperature isolator or with a capillary in applications with very high temperatures. If vibrations additionally occur in the application, Endress+Hauser recommends the use of a device with a capillary. If a device with a temperature isolator or capillary is used, the device 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.

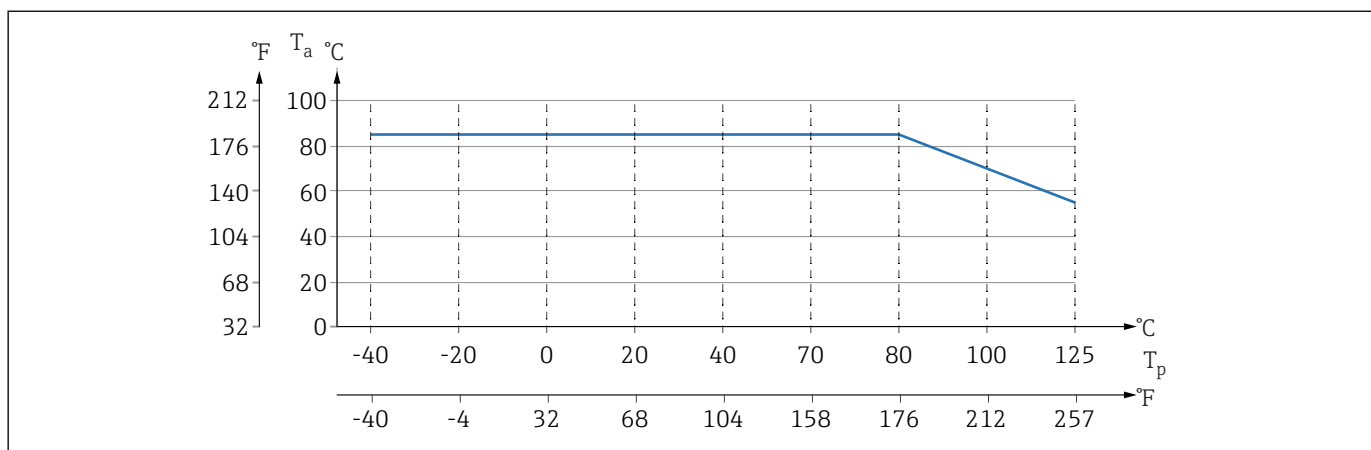
Process

Process temperature range Standard device (without 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 device.



A0043292

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 system, such as measuring devices, must be cleaned in accordance with the national requirements.
- Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded with oxygen applications.

The cleaning of the device (not accessories) is offered as an optional service.

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

Standard device (without diaphragm seal)

- Process connections with internal process membrane: -40 to +125 °C (-40 to +257 °F) ; 150 °C (302 °F) for max. one hour
- Process connections with flush membrane:
 - 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)

Devices with 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

Diaphragm seal with tantalum membrane

-70 to +300 °C (-94 to +572 °F)

Devices with PTFE-coated diaphragm seal process membrane

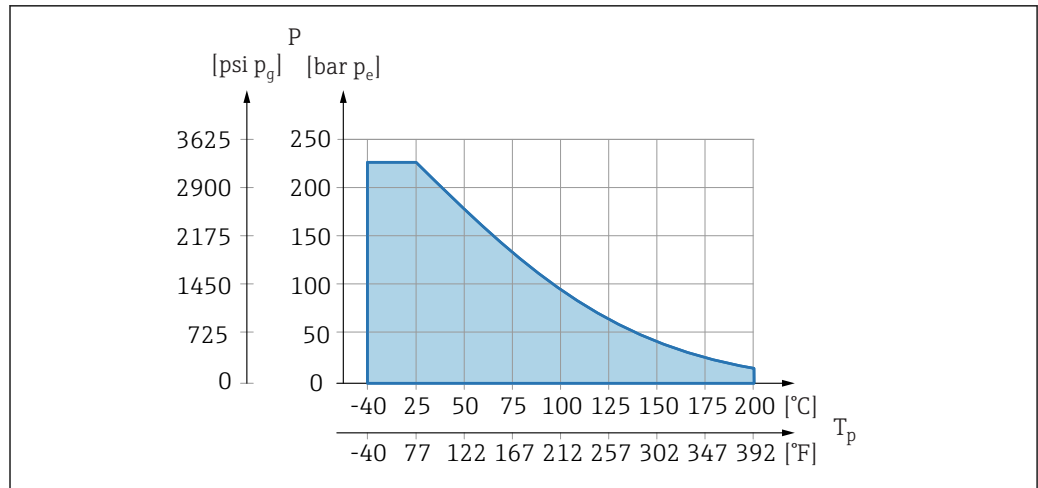
The anti-stick coating has very good anti-friction properties and protects the process membrane against abrasive media.

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.

Area of application of the 0.25 mm (0.01 in) PTFE foil on AISI 316L (1.4404/1.4435) process membrane, see the following graphic:



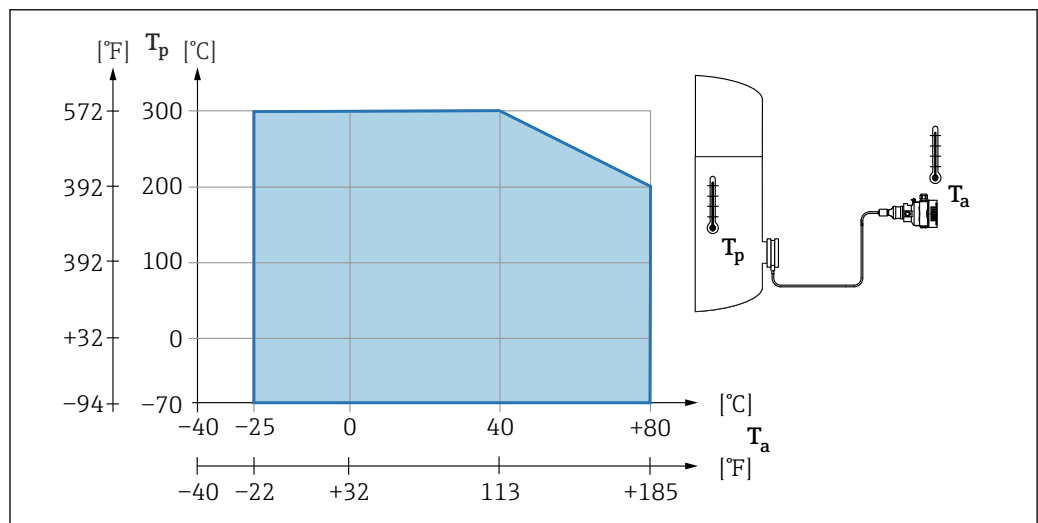
A0045213

i For vacuum applications: $p_{abs} \leq 1$ bar (14.5 psi) to 0.05 bar (0.725 psi) to max. +150 °C (302 °F).
 If a PTFE coating has been selected, a conventional process membrane is always delivered.

Diaphragm seal capillary armor

Process temperature depending on the ambient temperature.

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



A0038661

Process pressure range**Pressure specifications****⚠ WARNING**

The maximum pressure for the device depends on the lowest-rated component with regard to pressure (components are: process connection, optional mounted parts or accessories).

- ▶ Only operate the device within the specified limits for the components!
- ▶ MWP (maximum working pressure): The MWP is specified on the nameplate. This value is based on a reference temperature of +20 °C (+68 °F) and may be applied to the device for an unlimited period of 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 overpressure limit corresponds to the overpressure limit OPL of the entire device. 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 device.
- ▶ In the case of sensor range and process connection combinations where the overpressure 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} .

Burst pressure

The following data apply for the standard device (without diaphragm seal).

Measuring range 400 mbar (6 psi) to 10 bar (150 psi)

Burst pressure: 100 bar (1 450 psi)

Measuring range 40 bar (600 psi)

Burst pressure: 250 bar (3 625 psi)

Measuring range 100 bar (1 500 psi)

Burst pressure: 1 000 bar (14 500 psi)

Measuring range 400 bar (6 000 psi)

Burst pressure: 2 000 bar (29 000 psi)

Measuring range 700 bar (10 500 psi)

Burst pressure: 2 800 bar (40 600 psi)

Ultrapure gas applications

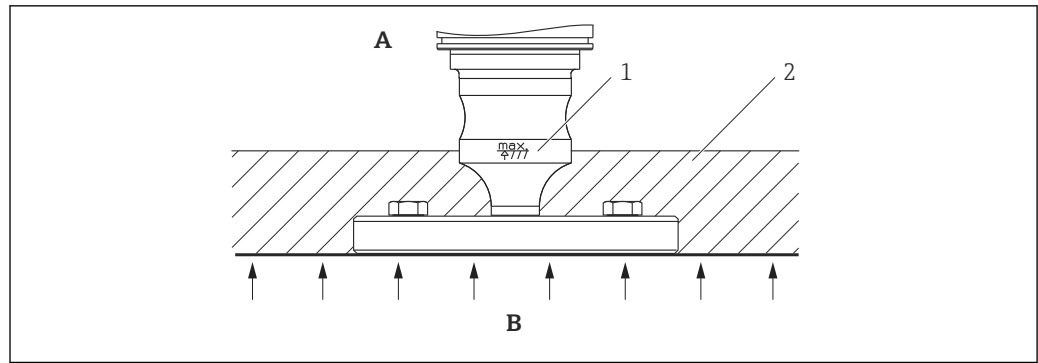
Endress+Hauser also offers devices for special applications, such as for ultrapure gas, that are cleaned of oil and grease. No special restrictions regarding the process conditions apply to these devices.

Steam applications and saturated steam applications

For steam and saturated steam applications: Use a device with a metal process membrane or provide a water pocket pipe for temperature decoupling when installing.

Thermal insulation**Thermal insulation with diaphragm seal directly mounted**

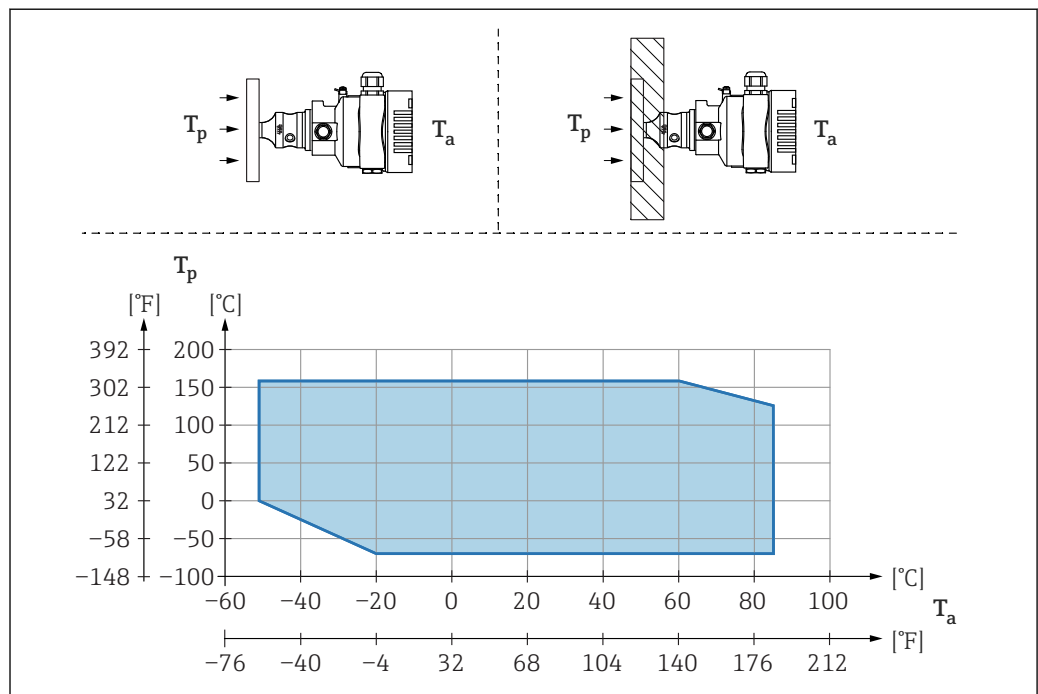
The device may only be insulated up to a certain height. The maximum permitted insulation height is indicated on the device and applies to an insulation material with a heat conductivity $\leq 0.04 \text{ W}/(\text{m} \times \text{K})$ and to the maximum permitted ambient and process temperature. The data were determined under the most critical application "quiescent air". Maximum permitted insulation height, indicated here on a device with a flange:



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) |

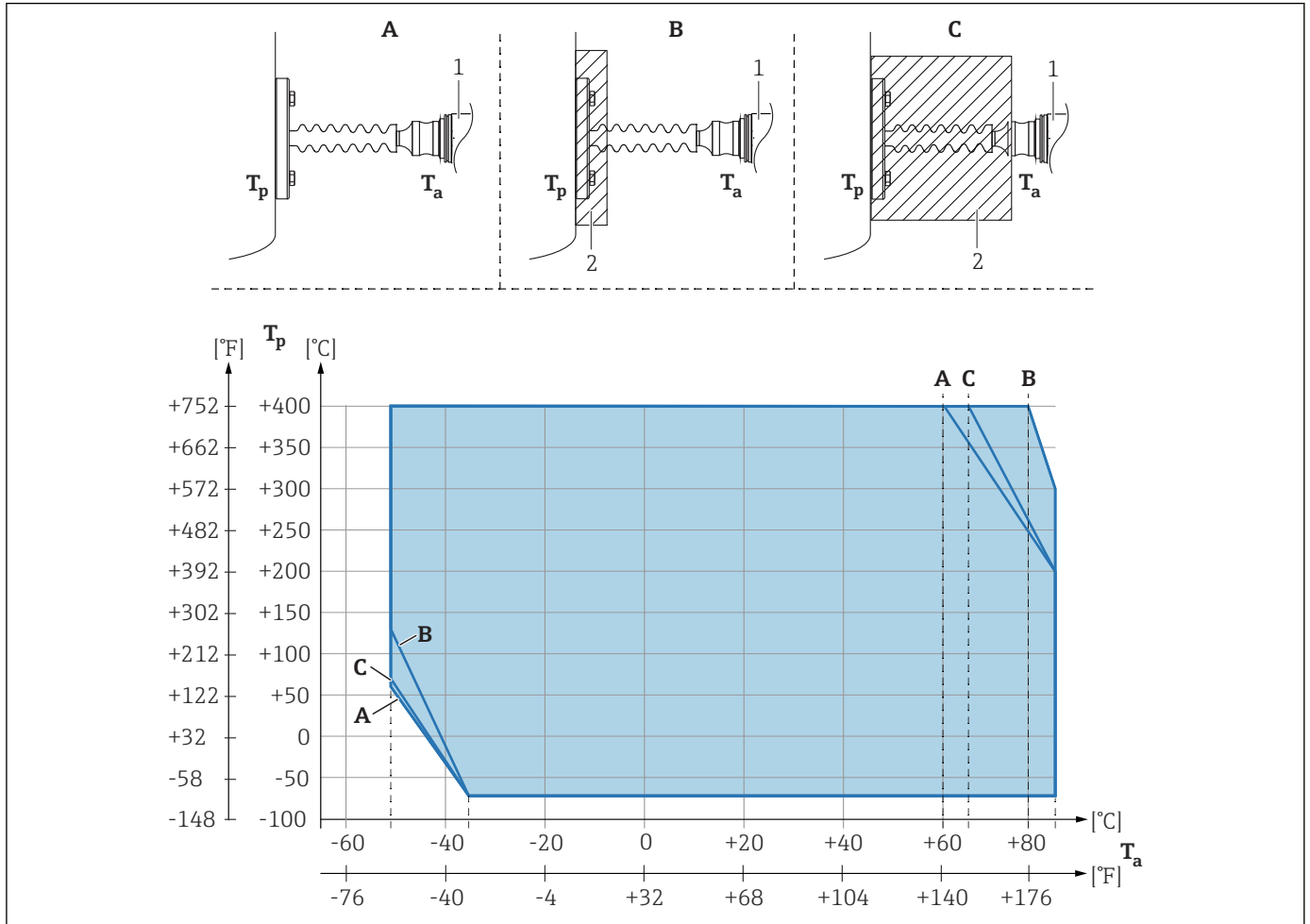
Thermal insulation when mounting with a "Temperature isolator" diaphragm seal type

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"

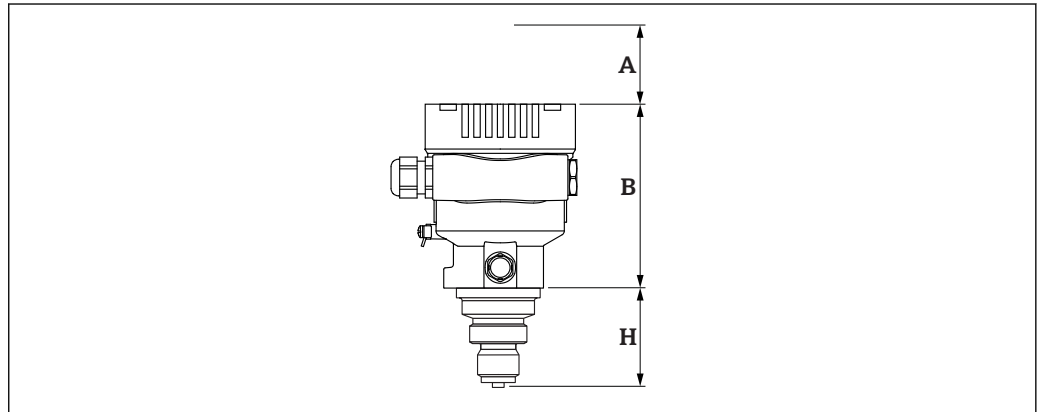
The following dimensions are rounded values. For this reason, the dimensions may deviate from the values on www.endress.com.

Design, dimensions

Height of standard device (without diaphragm seal)

The device height is calculated from

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



A0043567

A *Installation clearance*

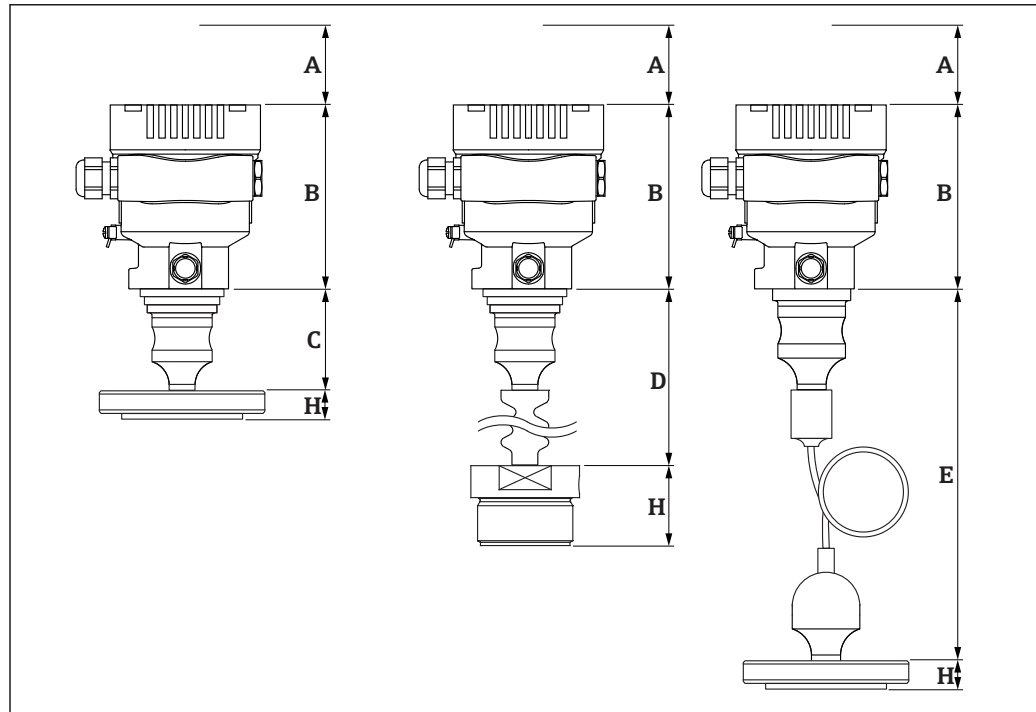
B *Height of the housing*

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

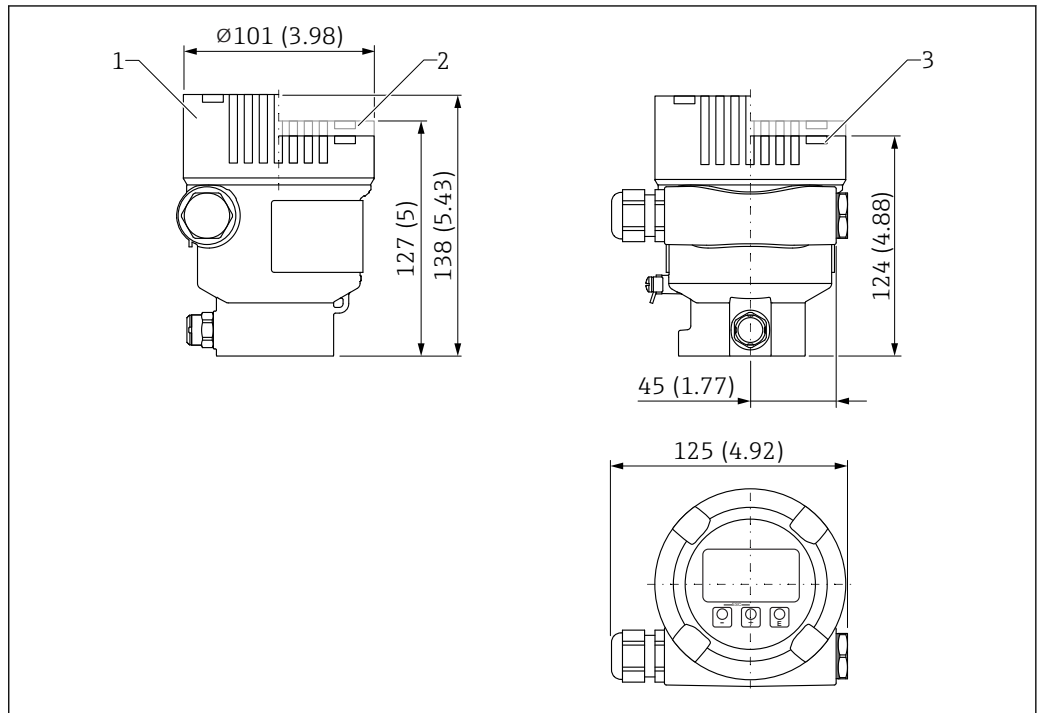


A0043568

- 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

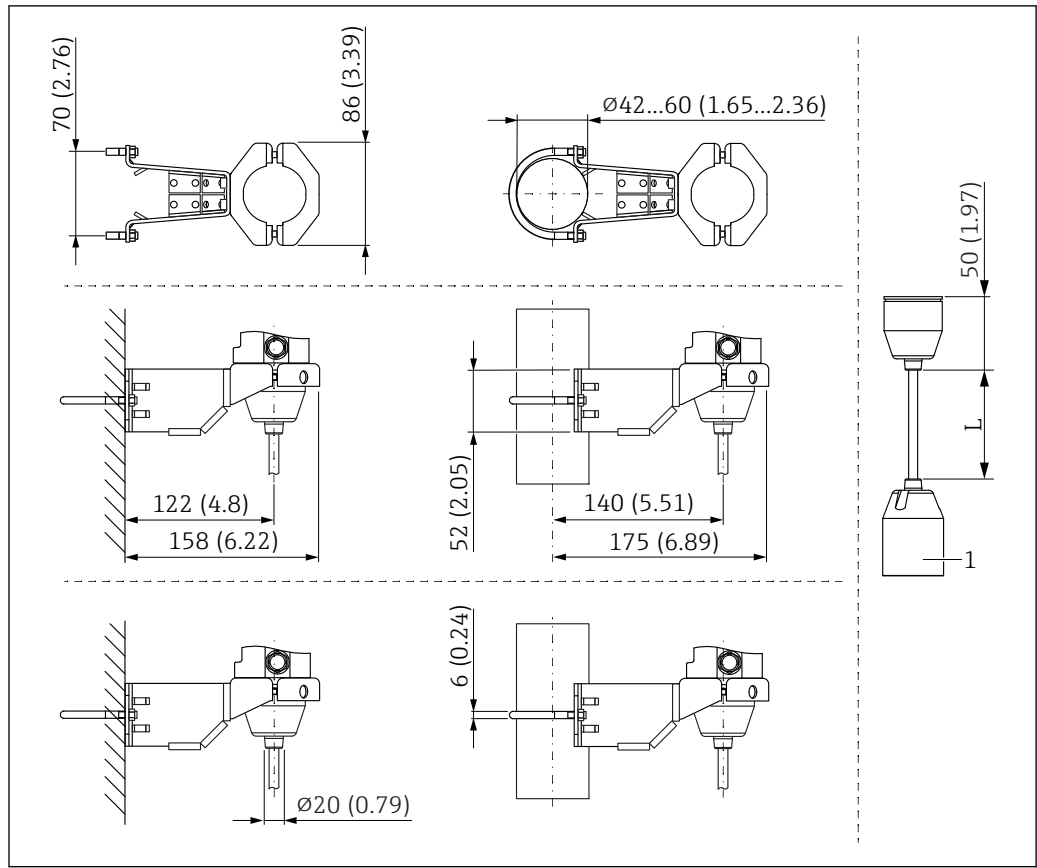
Unit of measurement mm (in)

- 1 Device with display, cover with glass viewing window (devices for Ex d, dust Ex): 138 mm (5.43 in)
- 2 Device with display, cover with plastic viewing window: 127 mm (5 in)
- 3 Device without display, cover without viewing window: 124 mm (4.88 in)



Cover optionally with ANSI Safety Red (color RAL3002) coating.

Sensor, remote (separate housing)



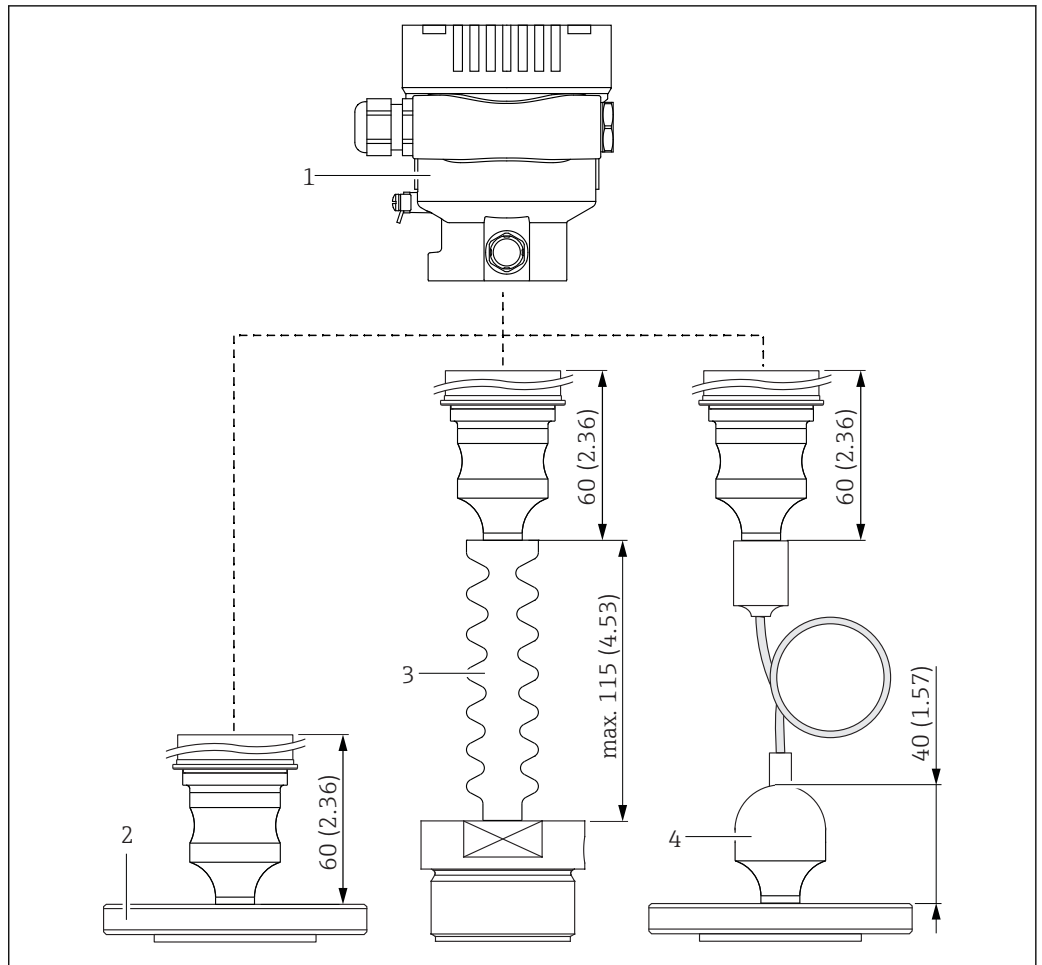
A0038214

Unit of measurement mm (in)

1 86 mm (3.39 in)

L Length of cable versions

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

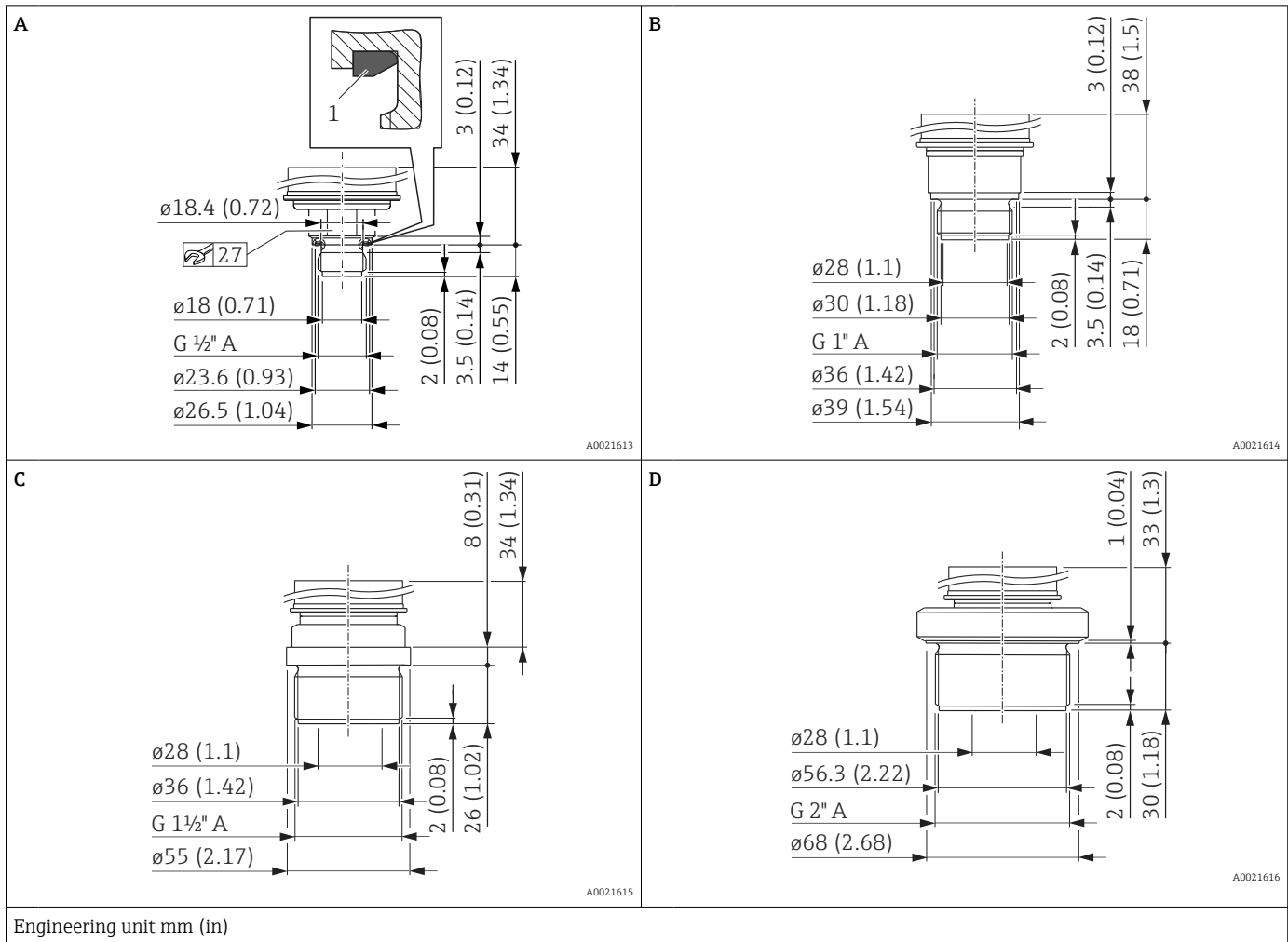
The maximum overpressure limit (OPL) and the maximum working pressure (MWP) of the sensor can deviate from the maximum OPL and MWP of the process connection.

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

Explanation of terms

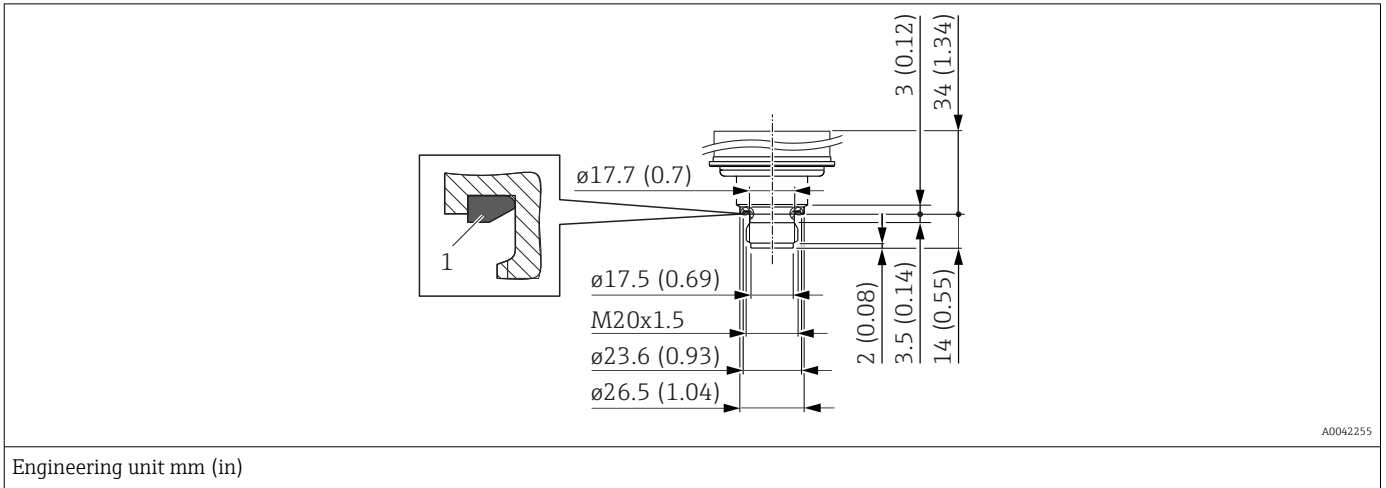
- DN or NPS or A = alphanumeric designation of the flange size
- PN or Class or K = alphanumeric pressure rating of a component

Thread ISO 228 G, flush membrane, standard (without diaphragm seal)



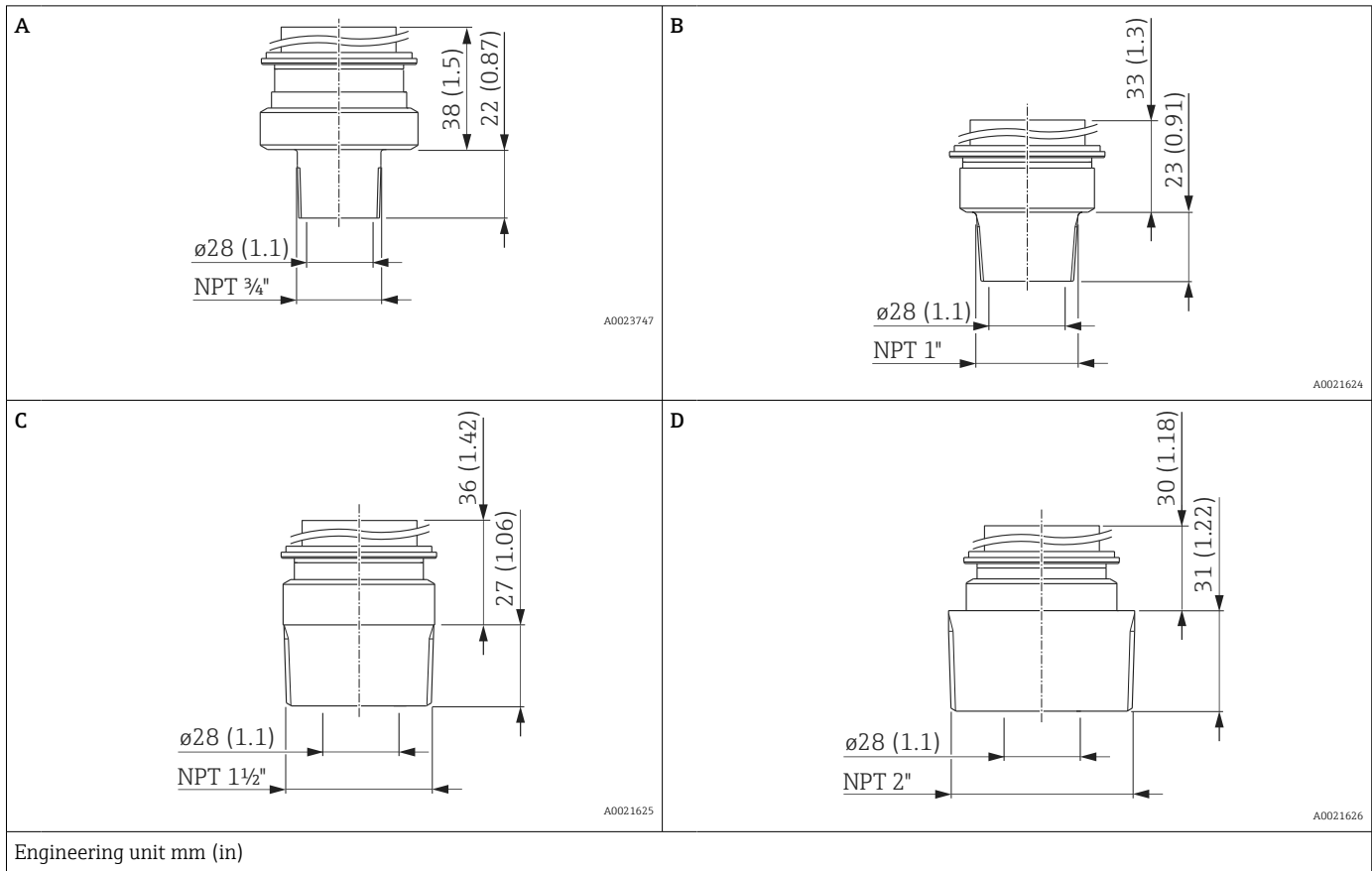
| Item | Designation | Material | Weight |
|------|---|-----------|------------|
| | | | kg (lb) |
| A | Thread ISO 228 G 1/2" A, DIN 3852 FKM form seal (item 1) pre-installed | AISI 316L | 0.4 (0.88) |
| B | Thread ISO 228 G 1" A | AISI 316L | 0.7 (1.54) |
| C | Thread ISO 228 G 1 1/2" A | AISI 316L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

Thread DIN, flush membrane, standard (without diaphragm seal)



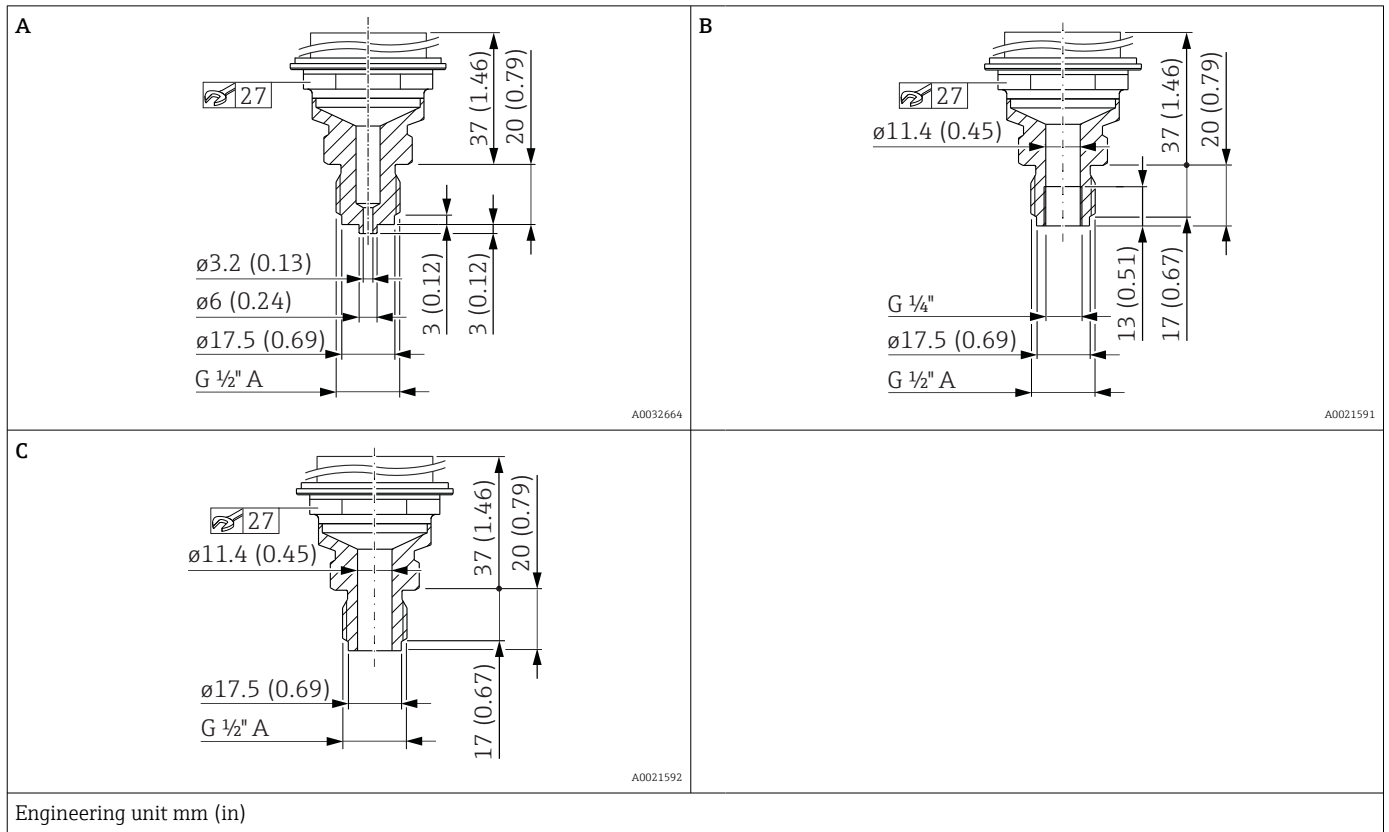
| Designation | Material | Weight |
|---|---------------------|------------|
| | | kg (lb) |
| Thread DIN 16288 M20 FKM 80 flat seal (item 1) pre-installed | AISI 316L | 0.4 (0.88) |
| Thread DIN 16288 M20 FKM 80 flat seal (item 1) pre-installed | Alloy C276 (2.4819) | 0.4 (0.88) |

Thread ASME, flush membrane, standard (without diaphragm seal)



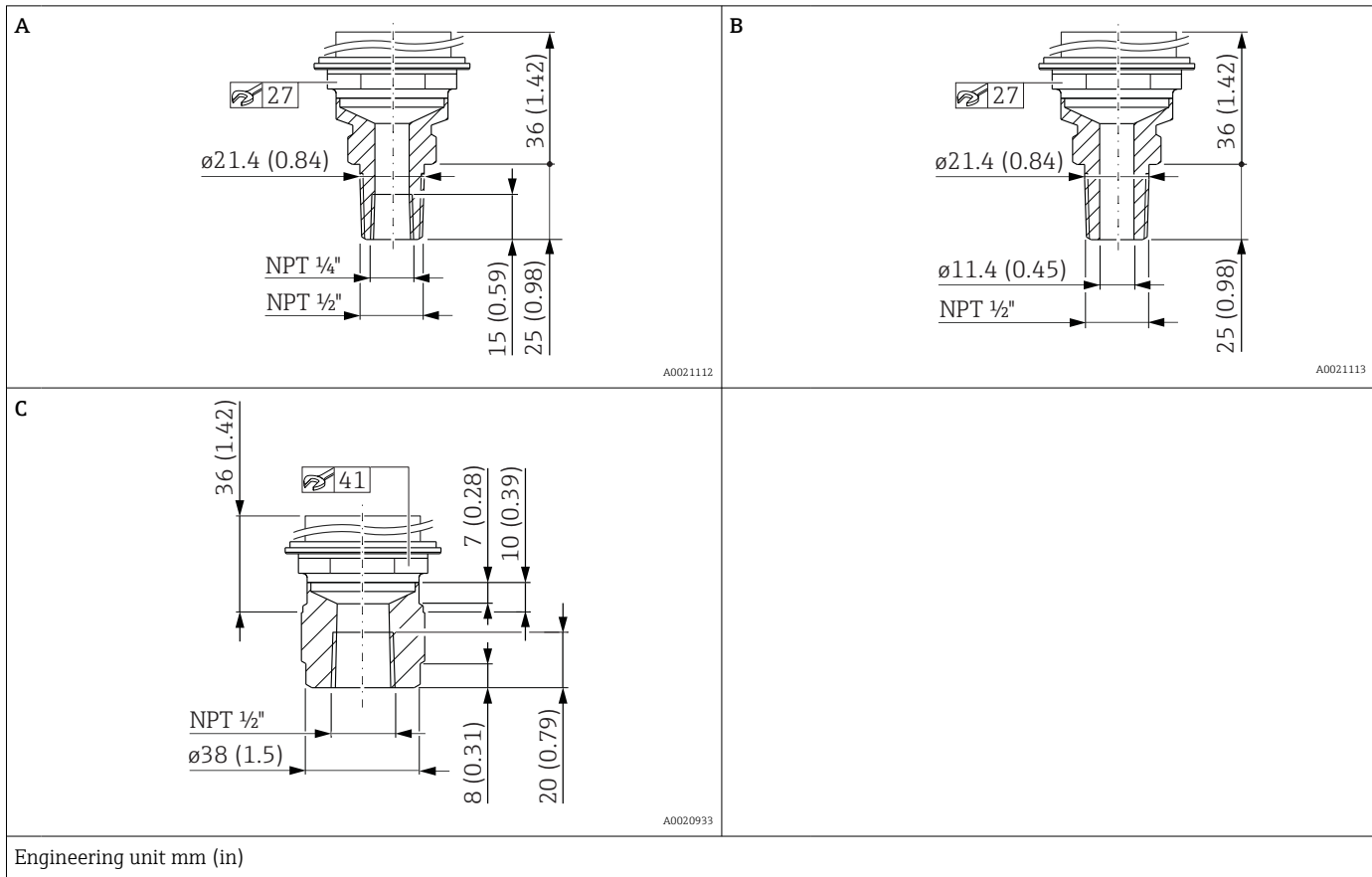
| Item | Designation | Material | Weight |
|------|-------------------------|---------------------|------------|
| | | | kg (lb) |
| A | Thread ASME 3/4" MNPT | AISI 316L | 0.6 (1.32) |
| B | Thread ASME 1" MNPT | AISI 316L | 0.7 (1.54) |
| B | Thread ASME 1" MNPT | Alloy C276 (2.4819) | 0.7 (1.54) |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

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



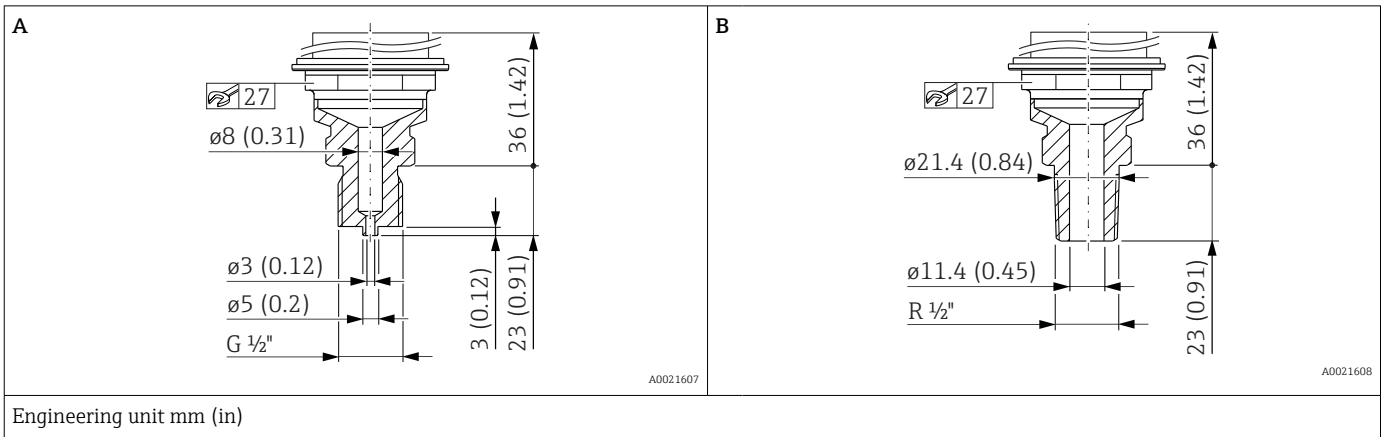
| Item | Designation | Material | Weight |
|------|--|---------------------|-------------|
| | | | kg (lb) |
| A | Thread ISO 228 G 1/2" A EN837 | AISI 316L | 0.63 (1.39) |
| A | Thread ISO 228 G 1/2" A EN837 | Alloy C276 (2.4819) | 0.63 (1.39) |
| B | Thread ISO 228 G 1/2" A, G 1/4" (female) | AISI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

Thread ASME, internal process membrane, standard (without diaphragm seal)



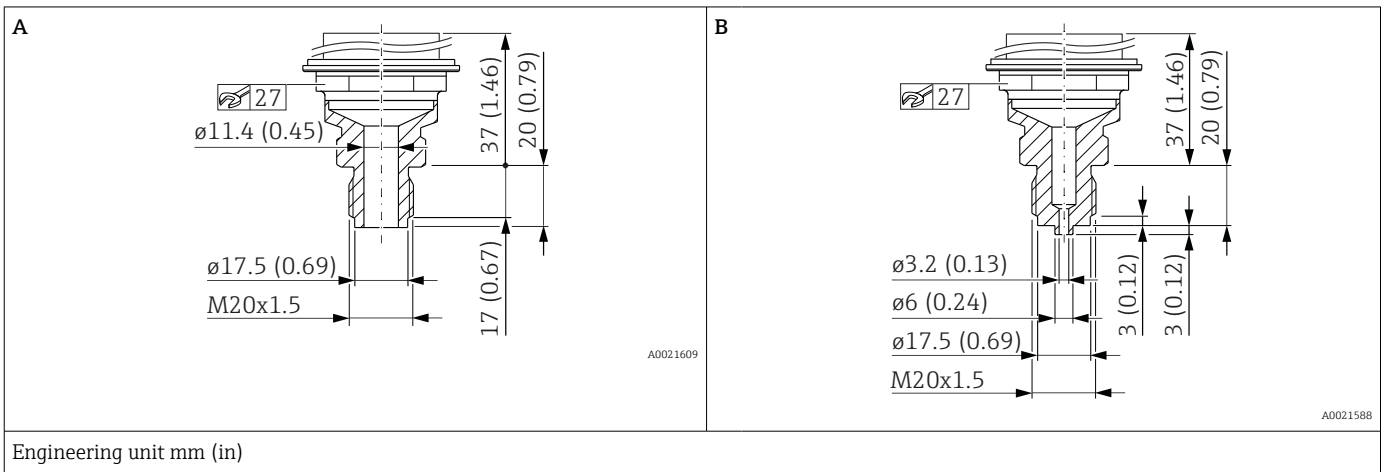
| Item | Designation | Material | Weight |
|------|--|---------------------|-------------|
| | | | kg (lb) |
| A | Thread ASME 1/2" MNPT, 1/4" FNPT | AISI 316L | 0.63 (1.39) |
| A | Thread ASME 1/2" MNPT, 1/4" FNPT | Alloy C276 (2.4819) | 0.63 (1.39) |
| B | Thread ASME 1/2" MNPT, Bore 11.4 mm (0.45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

Thread JIS, internal process membrane, 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) |

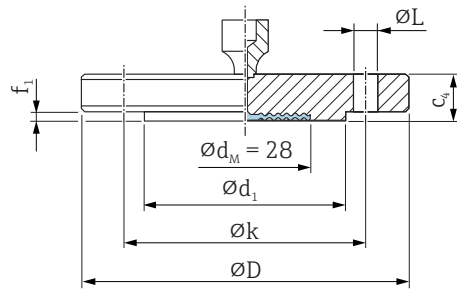
Thread DIN 13, internal process membrane, standard (without diaphragm seal)



| 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 membrane, 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 diameter
- ØL Diameter of hole
- Ød_M Max. diameter of process membrane

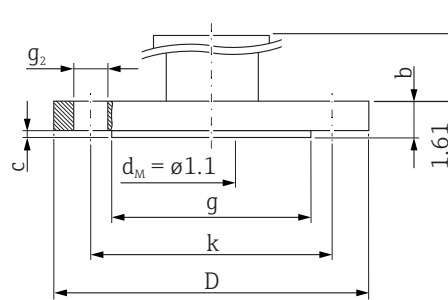
Engineering unit mm

| Flange ^{1) 2)} | | | | | | | Boltholes | | | Weight |
|-------------------------|----------|------|-----|----------------|-----------------|----------------|-----------|----|-----|--------------|
| DN | PN | Form | ØD | c ₄ | Ød ₁ | f ₁ | Quantity | ØL | Øk | kg (lb) |
| | | | 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 membrane.

Flange ASME, flush membrane, standard (without diaphragm seal)

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



A0022645

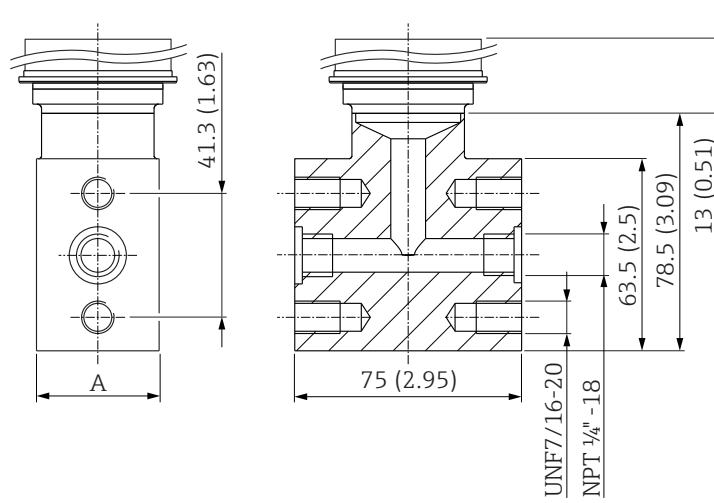
- D* Diameter of flange
- b* Thickness
- g* Raised face
- c* Thickness of raised face
- m* Width of raised face
- k* Pitch diameter
- g₂* Diameter of hole
- d_M* Max. diameter of process membrane

Engineering unit in.

| Flange ¹⁾ | | | | | | | Boltholes | | | Weight |
|----------------------|-------|------|------|------|------|------|-----------|----------------|------|--------------|
| NPS | Class | D | b | g | c | m | Quantity | g ₂ | k | |
| in | | 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



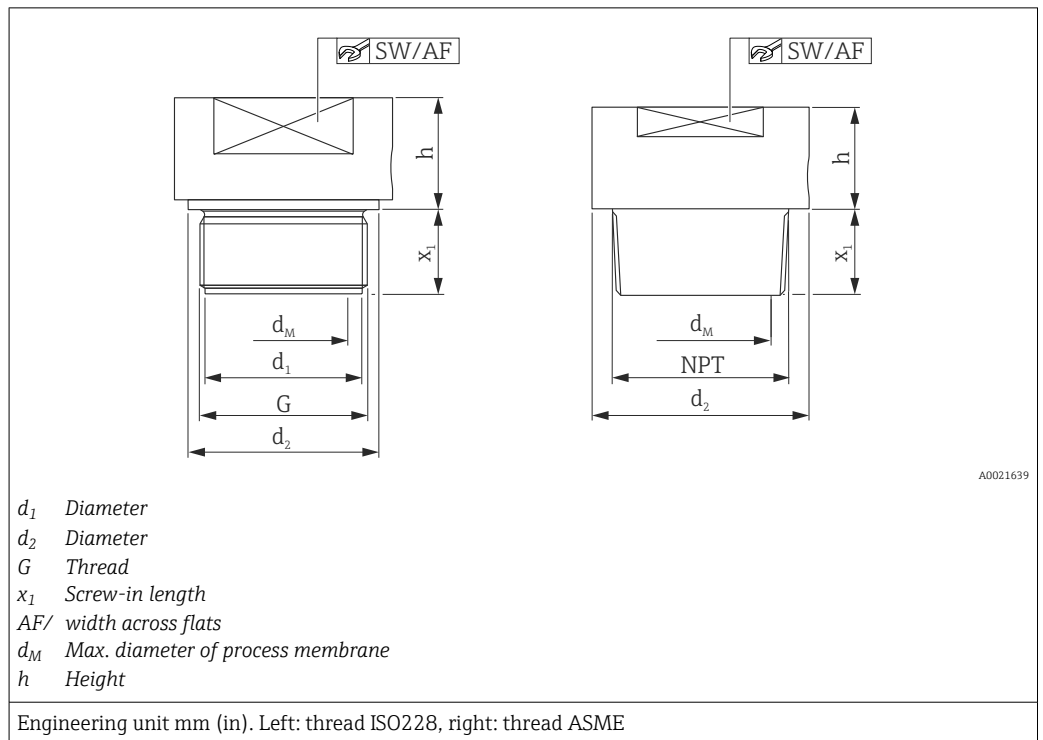
A0021632

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 ASME, flush membrane, diaphragm seal



A0021639

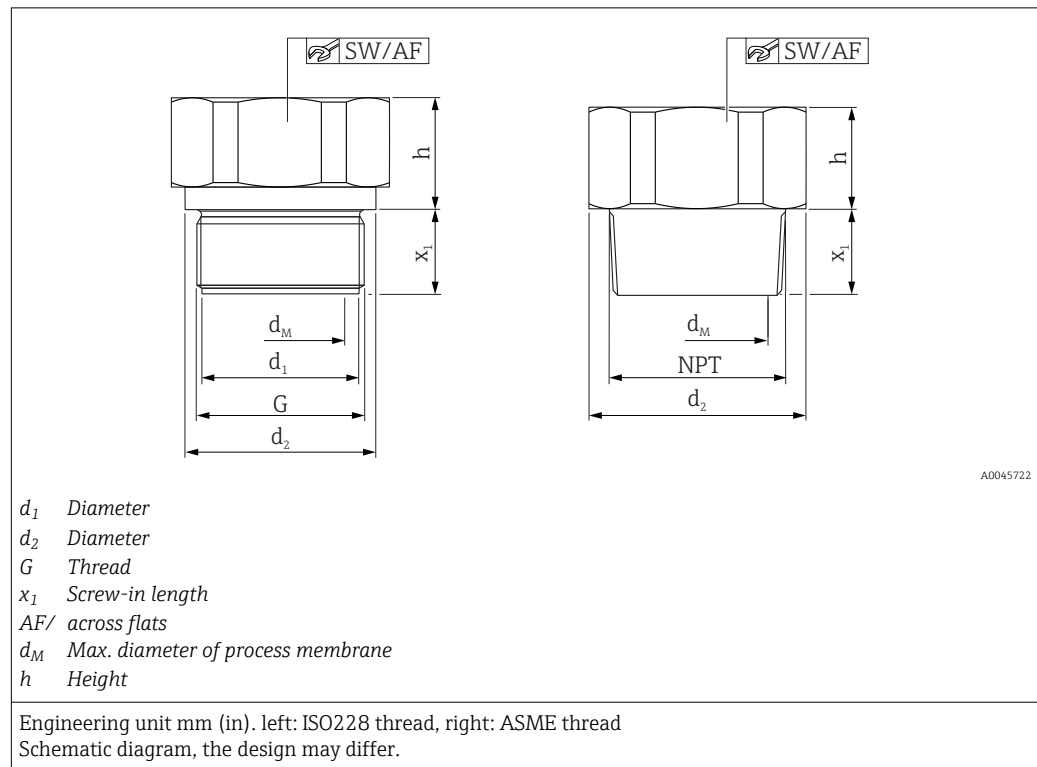
| Material | G | PN | d ₁ | d ₂ | x ₁ | AF | d _M ¹⁾ | h | Weight |
|------------|----------|-----|----------------|----------------|----------------|----|------------------------------|----|------------|
| | | | mm | mm | | | mm | | mm |
| AISI 316L | G 1" A | 400 | 30 | 39 | 21 | 32 | 30 | 19 | 0.4 (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 | | | | | | | | | 1.0 (2.21) |
| AISI 316L | G 2" | 400 | 56 | 68 | 30 | 60 | 50 | 20 | 1.9 (4.19) |
| Alloy C276 | | | | | | | | | 2.1 (4.63) |

1) Maximum membrane diameter

| Material | MNPT | PN | d ₁ | d ₂ | x ₁ | AF | d _M ¹⁾ | h | Weight |
|------------|-----------|-----|----------------|----------------|----------------|----|------------------------------|----|------------|
| | | | mm | 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 | | | | | | | | | 1.0 (2.21) |
| AISI 316L | 2" MNPT | 400 | - | 78 | 30 | 65 | 38 | 25 | 1.8 (3.97) |
| Alloy C276 | | | | | | | | | 2.0 (4.41) |

1) Maximum membrane diameter

ISO228 thread, ASME thread, flush membrane, diaphragm seal, TempC membrane

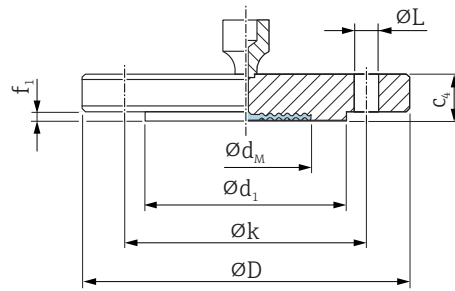


| Thread | | | | | | | Diaphragm seal | | |
|------------|----------|------------------|----------------|----------------|----------------|----|----------------|------|-------------|
| Material | G | Nominal pressure | d ₁ | d ₂ | x ₁ | AF | d _M | h | Weight |
| | | PN | [mm] | [mm] | [mm] | | [mm] | [mm] | [mm] |
| AISI 316L | G 1" A | 400 | 30 | 39 | 21 | 41 | 28 | 19 | 0.35 (0.77) |
| Alloy C276 | | | | | | | | | 0.38 (0.84) |
| AISI 316L | G 1 ½" A | 400 | - | 55 | 30 | 46 | 41 | 20 | 0.73 (1.61) |
| Alloy C276 | | | | | | | | | 0.79 (1.74) |
| AISI 316L | G 2" | 400 | - | 68 | 30 | 60 | 48 | 20 | 1.20 (2.65) |
| Alloy C276 | | | | | | | | | 1.30 (2.87) |

| Thread | | | | | | | Diaphragm seal | | |
|------------|-----------|------------------|----------------|----------------|----------------|----|----------------|------|-------------|
| Material | MNPT | Nominal pressure | d ₁ | d ₂ | x ₁ | AF | d _M | h | Weight |
| | | PN | [mm] | [mm] | [mm] | | [mm] | [mm] | [mm] |
| AISI 316L | 1" MNPT | 400 | - | 45 | 23 | 41 | 28 | 16 | 0.38 (0.84) |
| Alloy C276 | | | | | | | | | 0.41 (0.90) |
| AISI 316L | 1 ½" MNPT | 400 | - | 60 | 30 | 46 | 41 | 20 | 0.70 (1.54) |
| Alloy C276 | | | | | | | | | 0.76 (1.68) |
| AISI 316L | 2" MNPT | 400 | - | 60 | 34 | 46 | 48 | 21 | 1.10 (2.43) |
| Alloy C276 | | | | | | | | | 1.19 (2.62) |

Flange EN1092-1, flush membrane, diaphragm seal

Connection dimensions according to EN1092-1.



A0045226

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

Engineering unit mm

| Flange ^{1) 2) 3) 4)} | | | | | | | Boltholes | | | Diaphragm seal |
|-------------------------------|----------|------|-----|----------------|-----------------|----------------|-----------|----|-----|----------------|
| DN | PN | Form | ØD | c ₄ | Ød ₁ | f ₁ | Quantity | ØL | Øk | Weight |
| | | | mm | 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) |
| DN 80 | PN 100 | B2 | 230 | 32 | 138 | 3 | 8 | 26 | 180 | 8.85 (19.51) |

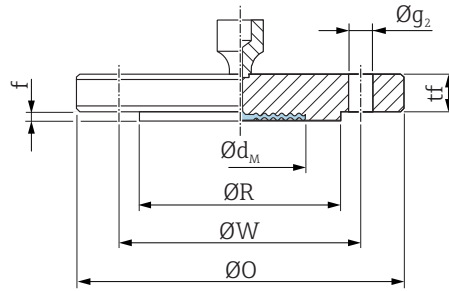
- 1) Material: AISI 316L
- 2) The roughness of the surface in contact with the medium including the raised face of the flanges (all standards) made of Alloy C276, Monel, tantalum, gold > 316L or PTFE is R_a < 0.8 µm (31.5 µin). Lower surface roughness on request.
- 3) The flange raised face is made from the same material as the process membrane.
- 4) Supplied with conventional process membrane if a PTFE membrane coating is ordered.

Maximum diameter of membrane $\varnothing d_M$

| DN | PN | $\varnothing d_M$ (mm) | | | | | |
|-------|------------|------------------------|------|------------|----------|----------------------|------|
| | | 316L TempC | 316L | Alloy C276 | Tantalum | Monel (Alloy 400) | PTFE |
| DN 25 | PN 10-40 | 28 | - | 33 | 33 | 33 | 28 |
| DN 32 | PN 10-40 | - | 34 | 42 | 42 | 34 | - |
| DN 40 | PN 10-40 | - | 38 | 48 | 51 | 42 | - |
| DN 50 | PN 10-40 | 61 | - | 57 | 60 | 59 | 52 |
| DN 50 | PN 100-160 | - | 52 | 62 | 60 | 59 | - |
| DN 80 | PN 10-40 | 89 | - | 89 | 92 | 89 | 80 |
| DN 80 | PN 100 | - | 80 | 90 | 92 | 90 | - |

Flange ASME B16.5, flush membrane, diaphragm seal

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



A0045230

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

Engineering unit in

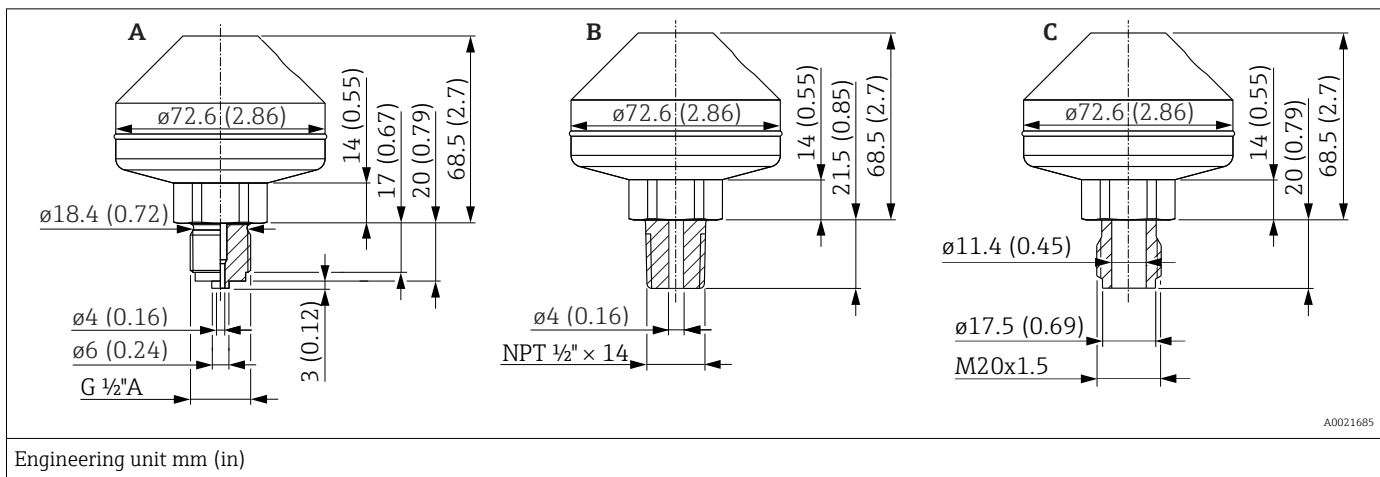
| Flange ^{1) 2) 3)} | | | | | | Boltholes | | | Diaphragm seal |
|----------------------------|-------|------|------|------|------|-----------|-----------------|------|----------------|
| NPS | Class | ØO | tf | ØR | f | Quantity | Øg ₂ | ØW | Weight |
| in | | in | in | in | in | | in | in | kg (lb)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

- 1) Material AISI 316/316L: Combination of AISI 316 for necessary pressure resistance and AISI 316L for necessary 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 membrane.

Maximum diameter of membrane $\varnothing d_M$

| NPS | Class | $\varnothing d_M$ (in) | | | | |
|-----|-------|------------------------|------|------------|----------|-------------------|
| | | 316L TempC | 316L | Alloy C276 | Tantalum | Monel (Alloy 400) |
| 1 | 150 | 1.10 | - | 1.30 | 1.34 | 1.30 |
| 1 | 300 | 1.10 | - | 1.30 | 1.34 | 1.30 |
| 1 ½ | 150 | - | 1.50 | 1.89 | 2.01 | 1.89 |
| 1 ½ | 300 | - | 1.50 | 1.89 | 2.01 | 1.89 |
| 2 | 150 | 2.40 | - | 2.44 | 2.44 | 2.44 |
| 2 | 300 | 2.40 | - | 2.44 | 2.44 | 2.44 |
| 3 | 150 | 3.50 | - | 3.62 | 3.62 | 3.62 |
| 3 | 300 | 3.50 | - | 3.62 | 3.62 | 3.62 |

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



| Item | Designation | Material | Measuring range | PN | Weight |
|------|------------------------------|-----------|-----------------|--------|-------------|
| | | | bar (psi) | | kg (lb) |
| A | Welded, ISO228 G ½ A EN837 | AISI 316L | ≤ 160 (2320) | PN 160 | 1.43 (3.15) |
| B | Welded, ANSI MNPT ½ | | | | |
| 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 the process and environmental influences for diaphragm seals compared to conventional systems
- Alloy C276
The flange raised face is made from the same material as the process membrane
- Tantalum
The flange raised face is made from the same material as the process membrane
- Monel (Alloy 400)
The flange raised face is made from the same material as the process membrane

Membrane coating


PTFE, 0.25 mm (0.01 in)

PTFE is standard only with conventional membranes

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)

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

- Adhesive polyester 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 21 CFR 175.105
- Vegetable oil, FDA 21 CFR 172.856
- 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 SDO1553P.

Operability

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 short explanations of the individual parameter functions
- Standardized operation at the device and in the operating tools

Efficient diagnostic behavior increases measurement availability

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

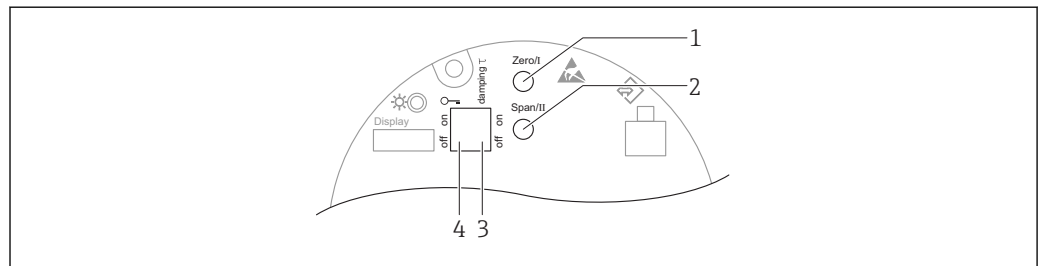
Bluetooth module (optionally integrated in local display)

- 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

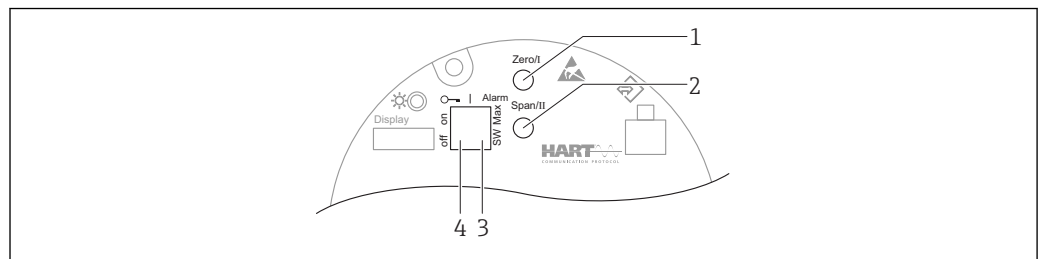
Analog 4 to 20 mA



A0039244

- 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 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 device




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

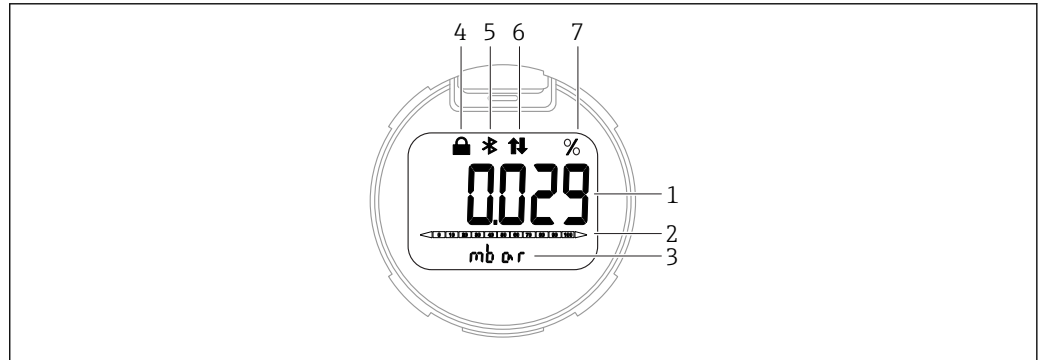
Local display

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.



A0043599

 5 Segment display

- 1 Measured value
- 2 Bar graph proportional to the current output
- 3 Unit of measured value
- 4 Locked (symbol appears when the device is locked)
- 5 Bluetooth (symbol flashes if Bluetooth connection is active) (only HART)
- 6 HART communication (symbol appears if HART communication is active) , or (only HART)
- 7 Measured value output in %

Remote operation

Via HART protocol

Via service interface (CDI)

With the Commubox FXA291, a CDI connection is established with the device interface and a Windows PC/notebook with a USB port.

Operation via Bluetooth® wireless technology (optional)

Prerequisite

- Device with Bluetooth display
- Smartphone or tablet with Endress+Hauser SmartBlue app or PC with DeviceCare from version 1.07.00 or FieldXpert SMT70

The connection has a range of up to 25 m (82 ft). The range can vary depending on environmental conditions such as attachments, walls or ceilings.

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 that are 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 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.



A0029561

Ex approvals

- ATEX
- CSA (in preparation)
- NEPSI (in preparation)
- INMETRO (in preparation)
- KC (in preparation)
- EAC (in preparation)
- JPN (in preparation)
- Also combinations of different approvals

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.

Additional approvals in preparation.

Explosion-protected smartphones and tablets

If used in hazardous areas, mobile end devices with an Ex approval must be used.

EAC conformity

The 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.

Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

Drinking water approval

NSF/ANSI 61 drinking water approval

Overfill protection (in preparation)

The 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 devices with a 4-20 mA output signal have been developed according to the IEC 61508 standard. These 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)

- 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, certificate, declarations**

- Inspection certificate 3.1, EN10204 (material certificate, wetted metallic parts)
- NACE MR0175 / ISO 15156 (wetted metallic parts), declaration
- NACE MR0103 / ISO 17945 (wetted metallic parts), declaration
- AD 2000 (wetted metal parts), declaration, excluding process membrane
- 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 device (without diaphragm seal): dye penetration test ISO23277-1 (PT), wetted/pressurized metal parts, test report
- Standard device (without diaphragm seal): dye penetration test ASME VIII-1 (PT), wetted/pressurized metal parts, test report
- Welding documentation, wetted/pressurized seams, declaration

Test reports, declarations and inspection certificates are provided electronically 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

A variety of manufacturer declarations can be downloaded from the Endress+Hauser website. Other manufacturer declarations can be ordered through the Endress+Hauser sales office.

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 (maximum working pressure PS ≤ 200 bar (2 900 psi)) can be classified as pressure accessories according to the Pressure Equipment Directive 2014/68/EU. If the maximum working 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 (see Pressure Equipment Directive 2014/68/EU, Art.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 a safety instrumented system 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) shall 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 a safety instrumented system 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:

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

| | |
|---------------------------------|--|
| Oxygen application | Verified cleaned, suitable for O ₂ 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 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 according to 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 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 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 the nearest sales organization www.addresses.endress.com or in the Product Configurator under www.endress.com:

1. Select the product using the filters and search field.
2. 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 information specific to the measuring point, such as the 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:

- Device
- Optional accessories

Accompanying documentation:

- 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

Test reports, declarations and inspection certificates

All test reports, declarations and inspection certificates are provided electronically in the *W@M Device Viewer*:

Enter the serial number from the nameplate (www.endress.com/deviceviewer)



Product documentation on paper

Test reports, declarations and inspection certificates in hard copy can optionally be ordered with feature 570 "Service", Version I7 "Product documentation on paper". The documents are then provided with the device upon delivery.

Accessories

Device-specific accessories

Mechanical accessories

- Mounting bracket for housing
- Mounting bracket for block & bleed valves
- Block&Bleed valves:
 - Block&Bleed valves can be ordered as **enclosed** accessories (seal for mounting is enclosed)
 - Block&Bleed valves can be ordered as **mounted** accessories (mounted manifolds are supplied with a documented leak test)
 - Certificates (e.g. 3.1 material certificate and NACE) and tests (e.g. PMI and pressure test) that are ordered with the device apply for the transmitter and the manifold
 - During the operating life of the valves, it may be necessary to re-tighten the pack
- Water pocket pipes (PZW)
- Flushing rings
- Weather protection covers



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

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 spare parts for the 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 devices for process pressure, differential pressure, level and flow

Special Documentation



Document SD01553P

Mechanical accessories for pressure equipment

The documentation provides an overview of available manifolds, oval flange adapters, pressure gauge valves, shutoff valves, water pocket pipes, condensate pots, cable shortening kits, test adapters, flushing rings, Block&Bleed valves and protective roofs.

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