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71654578
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Technical Information
Cerabar PMP50

Pressure and level measurement in liquids or gases
HART

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 ±0.055%

Advantages

- Easy guided commissioning with proven intuitive user interface
- Use of proven software and measuring cell components
- Flexible write protection via hardware and/or software wizard
- Pre-assembled values (pressure and leakage-tested) for faster installation

Endress+Hauser
People for Process Automation

Table of contents

About this document

Symbols

Safety symbols

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

Electrical symbols

Ground connection: ⏚

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: ℹ

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.

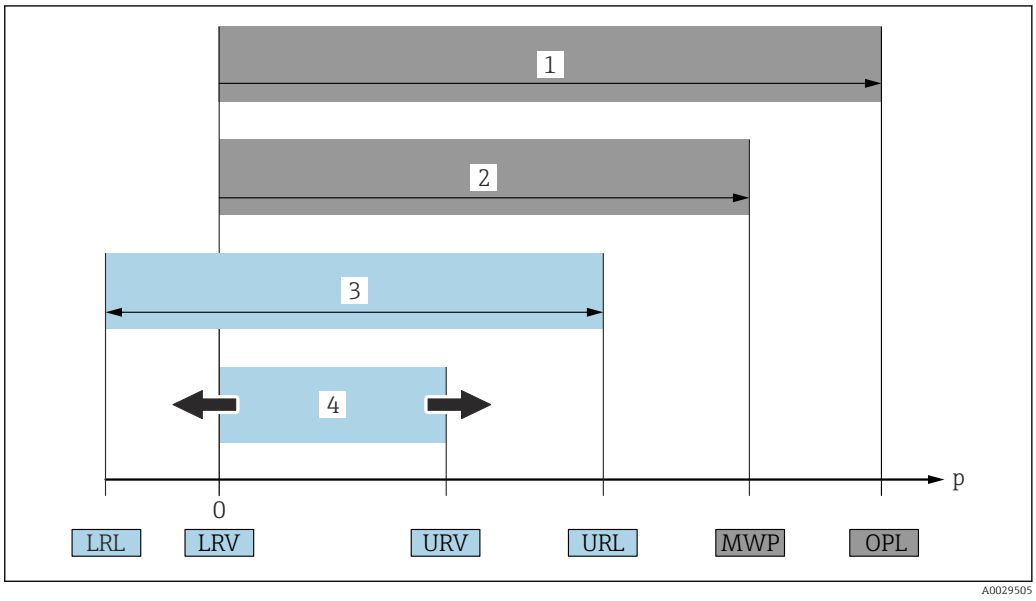
Views: A, B, C, ...

Symbols on the device

Safety instructions: ⚠ → 📖

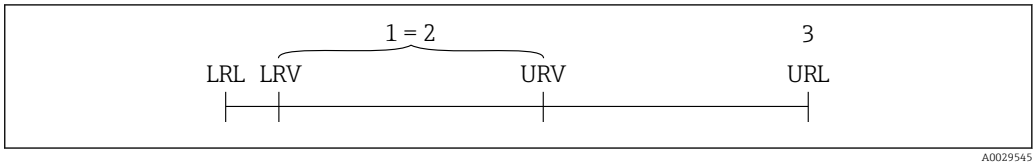
Observe the safety instructions contained in the associated Operating Instructions.

List of abbreviations



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

Turn down calculation



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

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

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

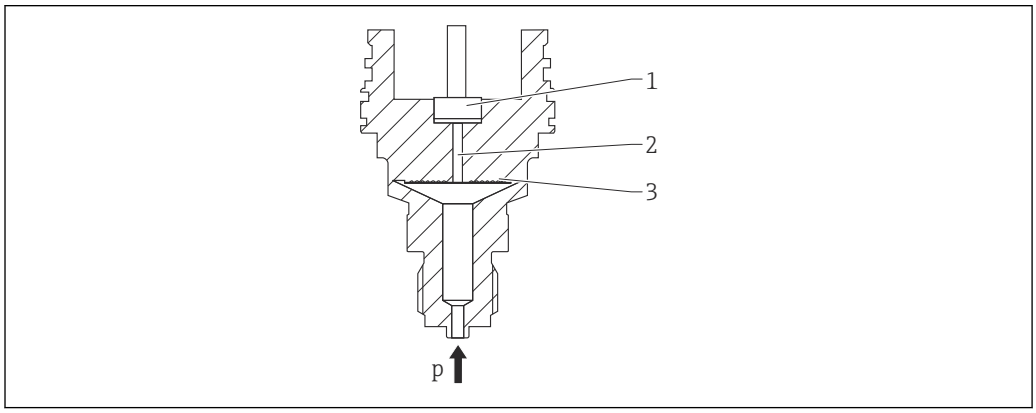
In this example, the TD is therefore 2:1. This measuring span is based on the zero point.

Function and system design

Measuring principle

Metallic membrane

Standard device (without diaphragm seal)



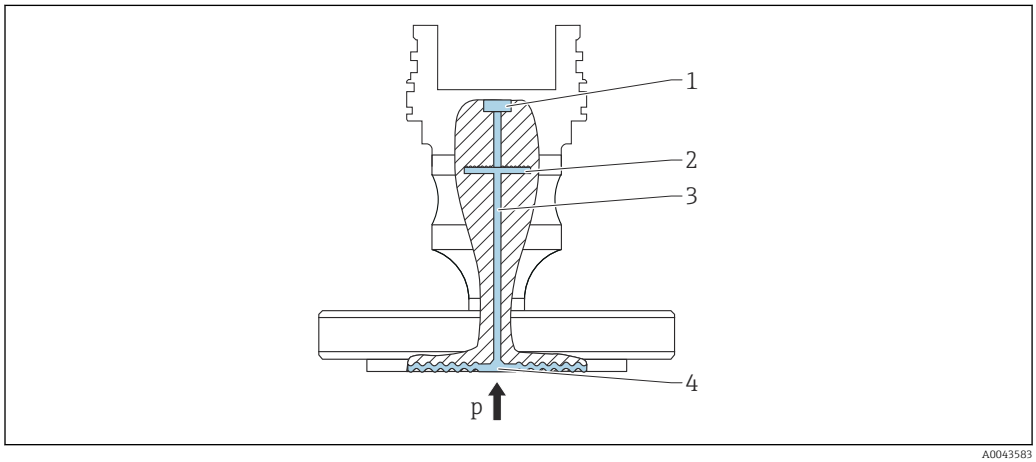
A0043089

1 Measuring element
2 Channel with fill fluid
3 Metallic membrane
p Pressure

The pressure deflects the metallic membrane of the measuring cell. A fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Advantages:
- Can be used for high pressures
- High long-term stability
- High overload resistance
- Secondary containment for enhanced integrity
- Significantly reduced thermal influence

Device with diaphragm seal



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1 Measuring element
2 Internal membrane
3 Channel with fill fluid
4 Metallic membrane
p Pressure

The pressure acts on the membrane of the diaphragm seal and is transferred to the internal membrane by a fill fluid. The internal 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.

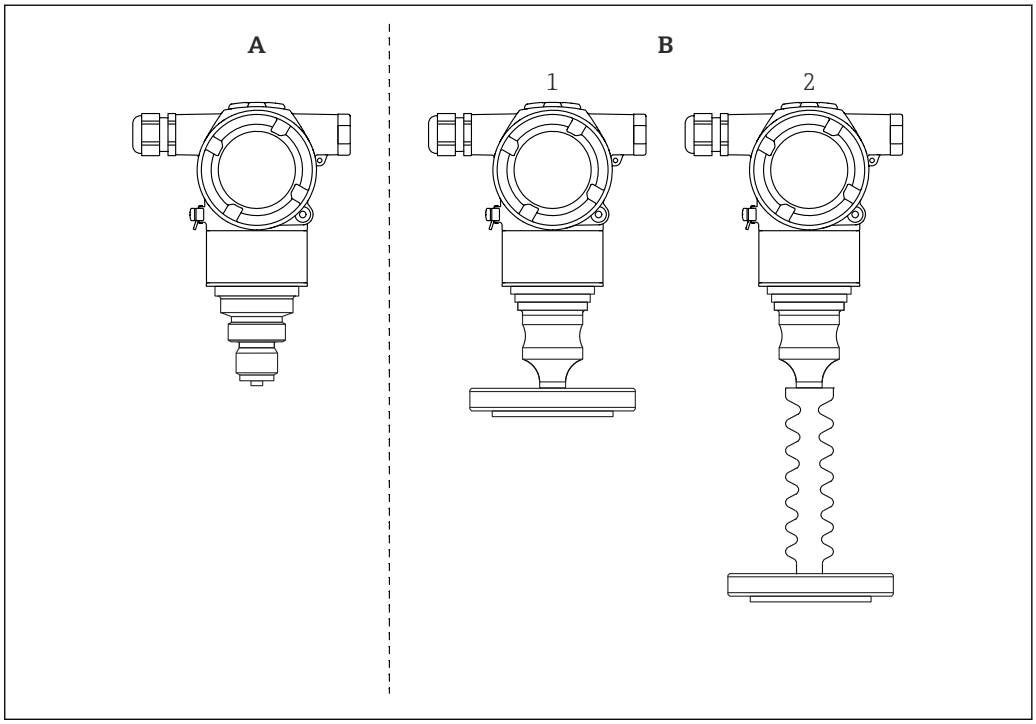
Advantages:
- Depending on the version, can be used for pressures up to 400 bar (6 000 psi) and for extreme process temperatures
- High long-term stability
- High overload resistance
- Standard device (without a diaphragm seal): second process barrier (secondary containment) for maximum reliability

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
- If extreme measuring point cleaning is necessary, or in the event of very damp mounting locations

Measuring system

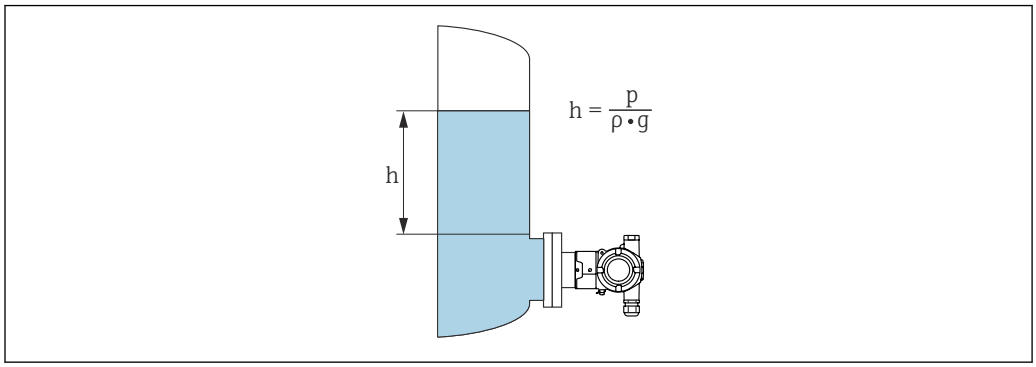
Device versions



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

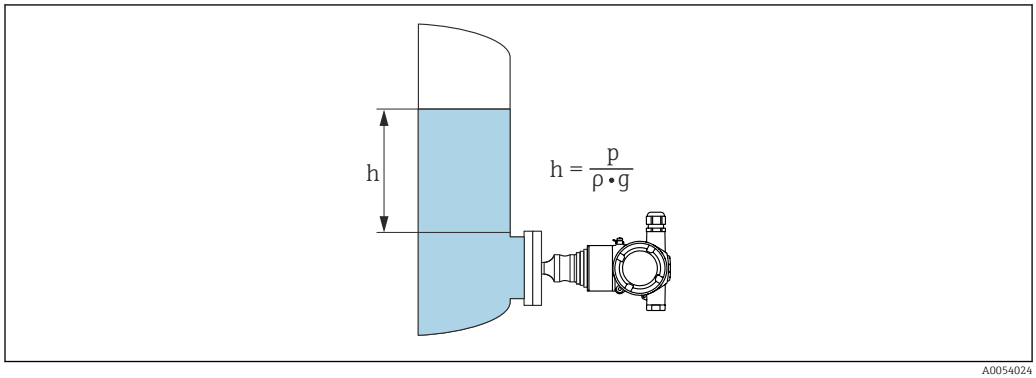
Level measurement (level, volume and mass)

Standard device (without diaphragm seal)



h *Height (level)*
p *Pressure*
ρ *Density of the medium*
g *Acceleration due to gravity*

Device with diaphragm seal



h *Height (level)*
p *Pressure*
ρ *Density of the medium*
g *Acceleration due to gravity*

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

Dependability

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 to operation via FieldCare, DeviceCare, Asset Management Tools. e.g. AMS, PDM)

Function/interface	Factory setting	Recommendation
Access code (FieldCare connection)	Not enabled (0000)	Assign a customized access code during commissioning.
Service interface (CDI)	Enabled	On an individual basis following risk assessment.
Write protection via hardware write protection switch	Not enabled	On an individual basis following risk assessment.

Protecting access via a password

Protect write access to the parameters of the device via the operating tool e.g. FieldCare., DeviceCare). Access authorization is clearly regulated through the use of a user-specific access code.

General notes on the use of passwords

- Assign a secure password when defining and managing the access code.
- The user is responsible for managing the access code and for using the code with due care.

Input

Measured variable

Measured process variables

- 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

Measuring cell	Maximum measuring range [1]		Smallest (factory-preconfigured) calibratable span [2]
	lower (LRL)	upper (URL)	
	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar (psi)]
1 bar (15 psi)	0	+1 (+15)	0.05 (0.75) [3]
4 bar (60 psi)	0	+4 (+60)	0.20 (3) [3]
10 bar (150 psi)	0	+10 (+150)	0.5 (7.5) [3]
40 bar (600 psi)	0	+40 (+600)	2 (30) [3]
100 bar (1 500 psi)	0	+100 (+1500)	5 (75) [3]
400 bar (6 000 psi)	0	+400 (+6000)	20 (300) [3]

1) Device with diaphragm seal: Within the measuring range, the minimum upper range value of 80 $mbar_{abs}$ (1.16 psi_{abs}) must be observed.
2) For platinum, the maximum TD is 5:1.
3) Largest factory-configurable turn down: max. 20:1

Absolute pressure

Measuring cell	MWP	OPL	Vacuum resistance [1]	Burst pressure [2]
	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar (psi)]
1 bar (15 psi)	6.7 (100)	10 (150)	▪ Silicone oil: 0.01 (0.15) ▪ Inert oil: 0.04 (0.6)	100 (1450)
4 bar (60 psi)	18.7 (280.5)	28 (420)		100 (1450)
10 bar (150 psi)	26.7 (400.5)	40 (600)		100 (1450)
40 bar (600 psi)	100 (1500)	160 (2400)		250 (3625)
100 bar (1 500 psi)	100 (1500)	400 (6000)		1000 (14500)
400 bar (6 000 psi)	400 (6000)	600 (9000)		2000 (29000)

1) The vacuum resistance applies for the measuring cell under reference operating conditions. Device with diaphragm seal: Observe the pressure and temperature application limits of the selected fill fluid.
2) The data provided apply for the standard device (without diaphragm seal).

Gauge pressure

Measuring cell	Maximum measuring range		Smallest (factory-preconfigured) calibratable span [1) 2)]
	lower (LRL)	upper (URL)	
	[bar (psi)]	[bar (psi)]	[bar (psi)]
1 bar (15 psi)	−1 (−15)	+1 (+15)	0.05 (0.75)
4 bar (60 psi)	−1 (−15)	+4 (+60)	0.20 (3)
10 bar (150 psi)	−1 (−15)	+10 (+150)	0.5 (7.5)
40 bar (600 psi)	−1 (−15)	+40 (+600)	2 (30)
100 bar (1500 psi)	−1 (−15)	+100 (+1500)	5 (75)
400 bar (6000 psi)	−1 (−15)	+400 (+6000)	20 (300)

1) Turn down > 20:1 configurable on request or on the device
2) For platinum, the maximum is TD 5:1.

Gauge pressure

Measuring cell	MWP	OPL	Vacuum resistance [1)]	Burst pressure [2)]
	[bar (psi)]	[bar (psi)]	[bar_{abs} (psi_{abs})]	[bar (psi)]
1 bar (15 psi)	6.7 (100)	10 (150)	▪ Silicone oil: 0.01 (0.15) ▪ Inert oil: 0.04 (0.6)	100 (1450)
4 bar (60 psi)	18.7 (280.5)	28 (420)		100 (1450)
10 bar (150 psi)	26.7 (400.5)	40 (600)		100 (1450)
40 bar (600 psi)	100 (1500)	160 (2400)		250 (3625)
100 bar (1500 psi)	100 (1500)	400 (6000)		1000 (14500)
400 bar (6000 psi)	400 (6000)	600 (9000)		2000 (29000)

1) The vacuum resistance applies for the measuring cell under reference operating conditions. A ceramic 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.
2) The data provided apply for the standard device (without diaphragm seal).

Output

Output signal

Current output

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

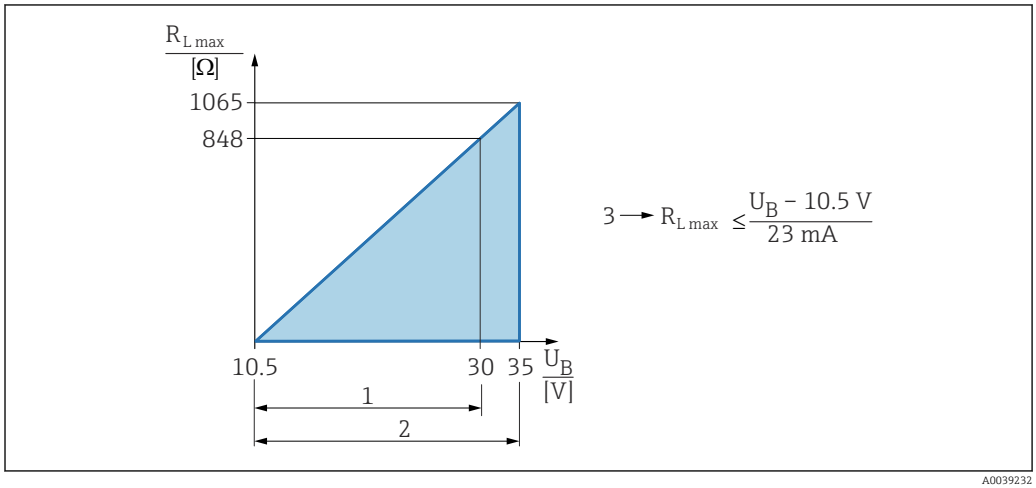
Signal on alarm

Signal on alarm in accordance with NAMUR recommendation NE 43.

4 to 20 mA 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 HART



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

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

Damping

Damping affects all outputs (output signal, color display). Damping can be enabled as follows:
- Handheld device or PC with operating program: continuous from 0 to 999 s
- Factory setting: 1 s

Ex connection data

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

Linearization

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

Protocol-specific data

HART

- Manufacturer ID: 17 (0x11{hex})
- Device type ID: 0x11E0
- Device revision: 1
- HART specification: 7

- DD revision: 1
- Device description files (DTM, DD) information and files at:
  - www.endress.com
  - www.fieldcommgroup.org
- HART load: min. 250 Ohm

HART device variables (preset at the factory)

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

Device variable	Measured value
Primary variable (PV) [1]	Pressure [2]
Secondary variable (SV)	Sensor temperature
Tertiary variable (TV)	Electronics 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 signal of the measuring cell 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

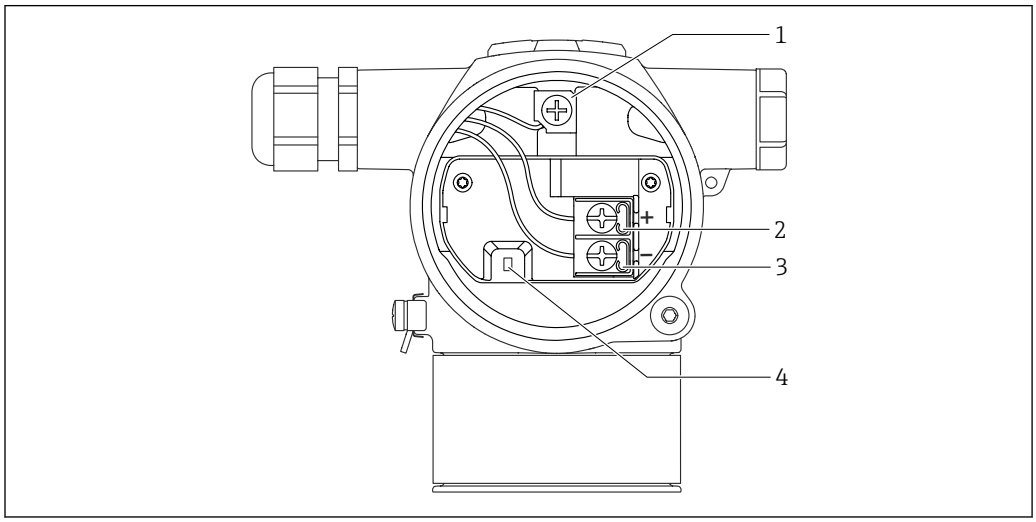
Wireless HART data

- Minimum starting voltage: 11.5 V
- Start-up current: 3.6 mA
- Start-up time: <5 s
- Minimum operating voltage: 10.5 V
- Multidrop current: 4 mA

Energy supply

Terminal assignment

Dual-compartment housing



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1 Internal ground terminal
2 Positive terminal
3 Negative terminal
4 Interlock diode: An interlock diode is used for uninterrupted measurement of the output signal.

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

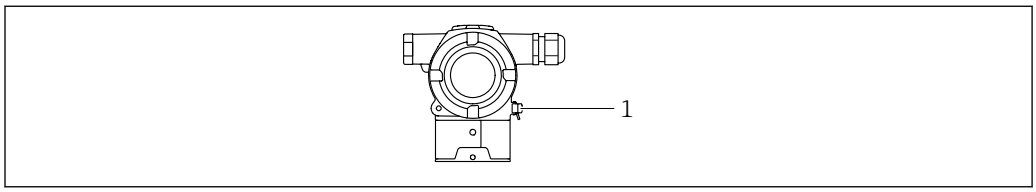
The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV, Class 2) and must comply with the relevant protocol specifications. For 4 to 20 mA, the same requirements apply as for HART.

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

Power consumption

To ensure the safety of the device, the maximum supply current must be limited to 500 mA (e.g. connect a fuse upstream).

Potential equalization



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1 Ground terminal for connecting the potential matching line

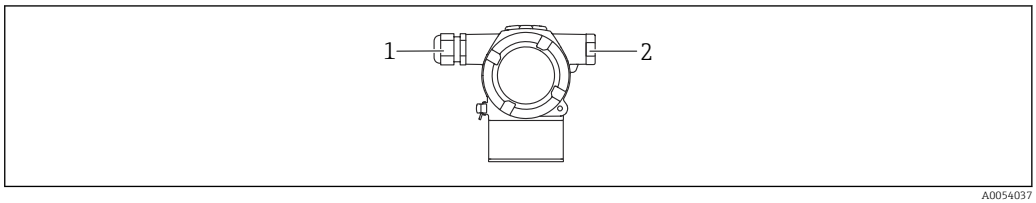
If necessary, the potential matching line can be connected to the outer ground terminal of the device before the device is connected.

For optimum electromagnetic compatibility:
- Potential matching line as short as possible
- Maintain a cross-section of at least 2.5 mm^2 (14 AWG)

Terminals

- Supply voltage and internal ground terminal: 0.5 to 2.5 mm^2 (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm^2 (20 to 12 AWG)

Cable entries



1 Cable entry
2 Dummy plug

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

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

Devices with optional overvoltage protection

- Spark-over voltage: min. 400 V DC
- Tested according to IEC/DIN EN 60079-14 sub chapter 12.3 (IEC/DIN EN 60060-1 chapter 7)
- Nominal discharge current: 10 kA

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: 5 to 80 % RH ± 5 %
- Ambient pressure p_A = constant, in the range of: 860 to 1060 mbar (12.47 to 15.37 psi)
- Position of the measuring cell: horizontal ±1°
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- 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 ±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 influencing accuracy can be divided into two groups

- Total performance of device
- Installation factors

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

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

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

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))

$E2 = E2_M + E2_E$

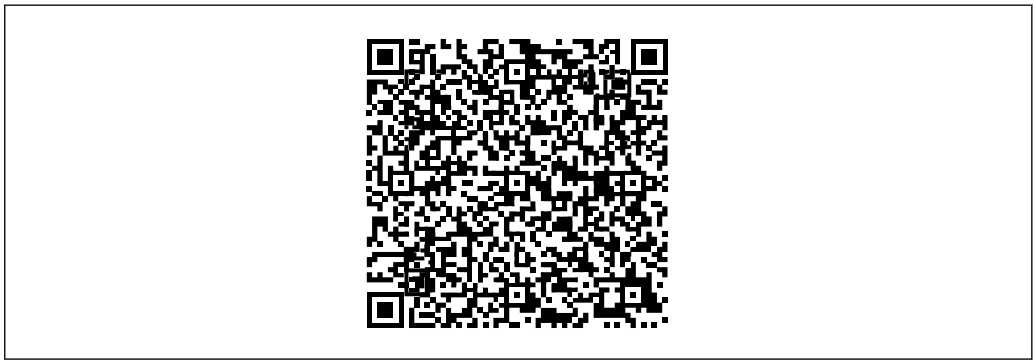
$E2_M$ = Main temperature error

$E2_E$ = Electronics error

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

Calculation of the total performance with the Endress+Hauser Applicator

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



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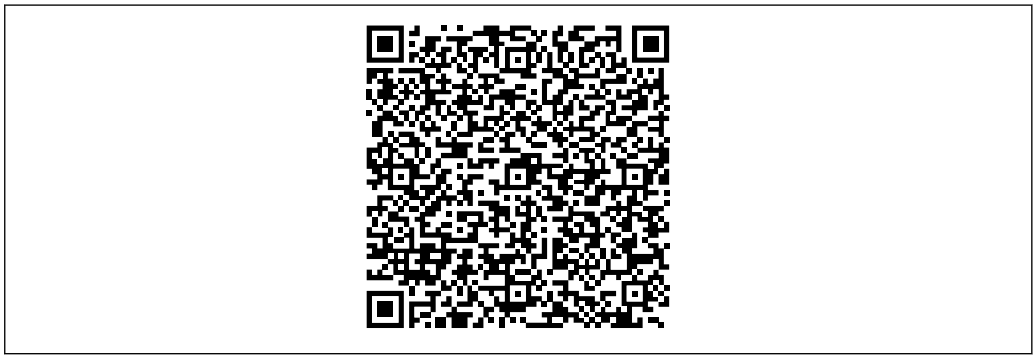
Calculation of the diaphragm seal error with the Endress+Hauser Applicator

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



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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 20:1, for platinum up to TD 5:1.

Standard device (without diaphragm seal)

Measuring cell	Standard	Platinum
1 bar (15 psi)	TD 1:1 to 10:1 = ±0.065 % TD > 10:1 = ±0.0065 % · TD	TD 1:1 to 51:1 = ±0.055 %
4 bar (60 psi) 10 bar (150 psi) 40 bar (600 psi)	TD 1:1 to 10:1 = ±0.065 % TD > 10:1 = ±0.0065 % · TD	TD 1:1 to 5:1 = ±0.055 %
100 bar (1 500 psi)	TD 1:1 to 10:1 = ±0.065 % TD > 10:1 = ±0.0065 % · TD	TD 1:1 to 5:1 = ±0.055 %
400 bar (6 000 psi)	TD 1:1 to 5:1 = ±0.15 % TD > 5:1 = ±0.03 % · TD	TD 1:1 to 5:1 = ±0.1 %

Devices with diaphragm seal

Measuring cell	Standard	Platinum
1 bar (15 psi)	TD 1:1 to 5:1 = ±0.15 %	not available
4 bar (60 psi) 10 bar (150 psi) 40 bar (600 psi) 100 bar (1 500 psi)	TD 1:1 to 5:1 = ±0.15 %	not available
400 bar (6 000 psi)	TD 1:1 to 5:1 = ±0.15 %	not available

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.

1 bar (15 psi) and 4 bar (60 psi) measuring cell
Standard and platinum: ± (0.08 % · TD + 0.16 %)

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

100 bar (1 500 psi) and 400 bar (6 000 psi) measuring cell
Standard and platinum: ± (0.003 % · TD + 0.12 %)

$E2_E$ - Electronics error

Digital output HART: 0 %

Resolution

Current output: <1 µA

Total error

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

Total error = total performance + long-term stability

Calculation of the total error with the Endress+Hauser Applicator

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

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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 "Sizing Diaphragm Seal" Applicator.

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Long-term stability

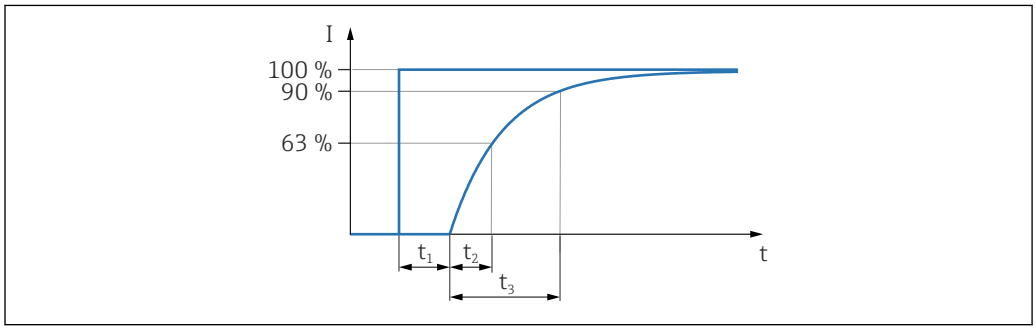
The specifications refer to the upper range limit (URL).

- 1 year: ± 0.1 %
- 5 years: ± 0.2 %
- 10 years: ± 0.25 %

Response time T63 and T90

Dead time, time constant

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



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

Dynamic behavior, current output (HART electronics)

≥ 1 bar (15 psi) standard measuring device (without diaphragm seal)

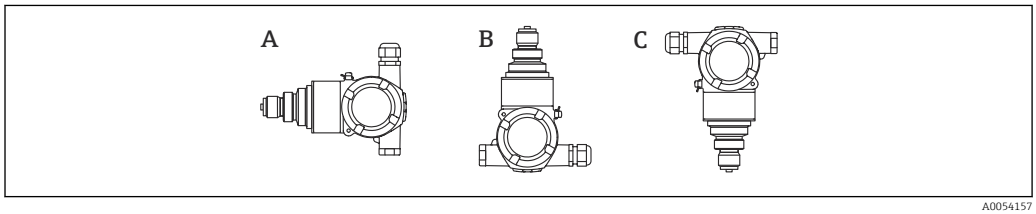
- Dead time (t_1): maximum 50 ms
- Time constant T63 (t_2): maximum 85 ms
- Time constant T90 (t_3): maximum 200 ms

Devices with diaphragm seal

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

Installation factors

Devices without a diaphragm seal



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The value is doubled for devices with inert oil.

- A: Axis of membrane horizontal: calibration position, no measurement error
- Process connections G ½, ½ MNPT
  - B: Membrane pointing upwards: measurement error ≤ +4 mbar (+0.06 psi)
  - B: Membrane pointing downwards: measurement error ≤ −4 mbar (−0.06 psi)

A position-dependent zero point shift can be corrected on the device.

Devices with diaphragm seals

Take into account the additional influence of the hydrostatic pressure of the diaphragm seal oil.

Warm-up time (according to IEC62828-4)

≤5 s

Mounting

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 is recommended for mounting
- The orientation depends on the measuring application

Installation instructions

- The standard devices (without diaphragm seal) are mounted according to the same guidelines as pressure gauges (DIN EN837-2).
- To ensure optimal readability of the color display, align the housing and color display.
- Endress+Hauser offers a mounting bracket for installing the device on pipes or walls.
- For measurements in media containing solides (e.g. dirty liquids), it makes sense to install strainer and drain valves.
- 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 downwards where possible to prevent moisture from entering (e.g. rain or condensation water).

Installation instructions for devices with diaphragm seals

General information

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

Perform zero adjustment if necessary.

Additional installation instructions are provided in the Applicator "Sizing Diaphragm Seal".

Vacuum applications

For vacuum applications, pressure transmitters with a ceramic measuring membrane (oil-free) are preferable.

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

Observe the maximum permitted ambient temperature of the transmitter!

Mounting:
- Preferably mount the device with an O-shaped siphon below the tapping point. The device may also be mounted above the tapping point
- Fill the siphon with liquid before commissioning

Advantages of using siphons:
- Protection of the measuring instrument from hot, pressurised media by forming and accumulating condensate
- Damping of pressure shocks
- The defined water column only causes minimal (negligible) measurement errors and minimal (negligible) thermal effects on the device.

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

Pressure measurement in liquids

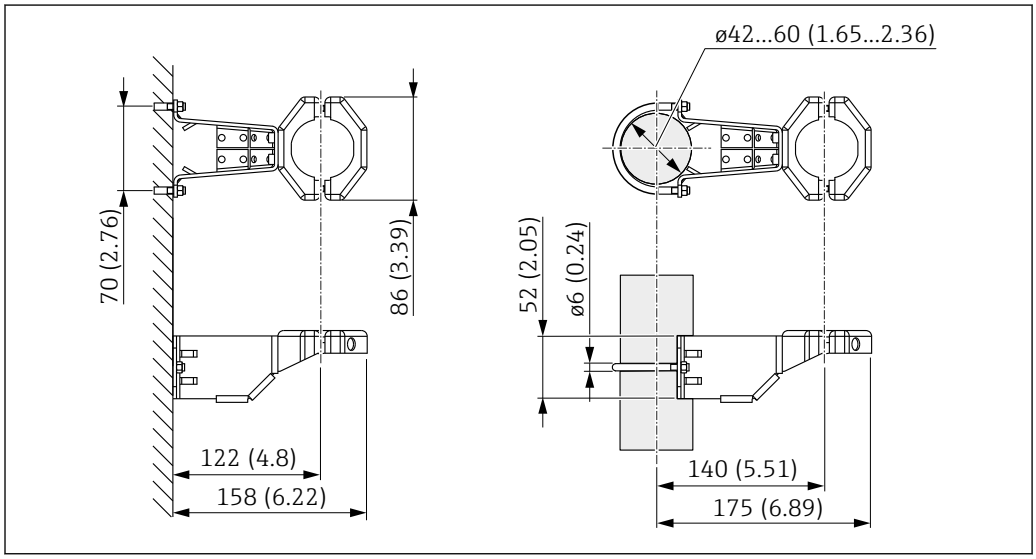
Mount the device with the shutoff device below or at the same level as the tapping point.

Level measurement

- Always install 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 that could be affected by pressure pulses from the agitator
- Mount the device downstream from a shutoff device: the functional test and adjustment can then be carried out more easily.

Mounting bracket for device

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



Unit of measurement mm (in)

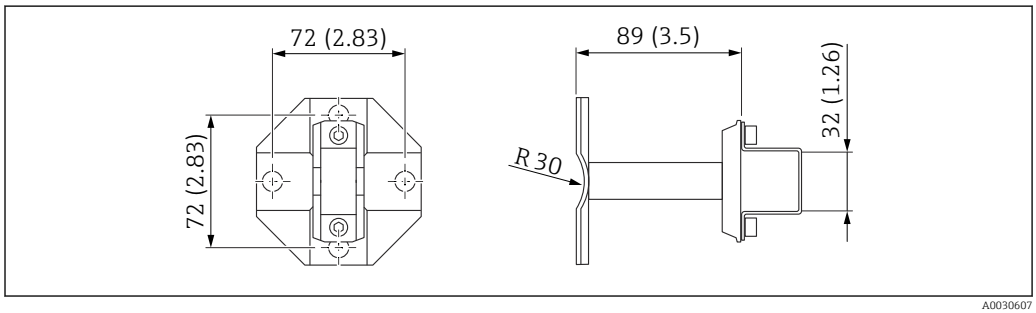
Ordering information:
- Can be ordered via the Product Configurator
- Can be ordered as a separate accessory, part number 71102216

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.



Environment

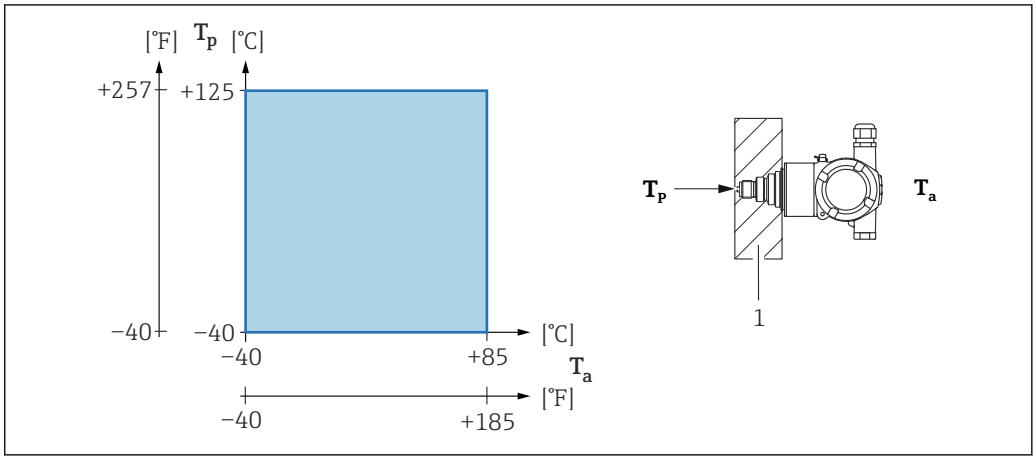
Ambient temperature range

The following values apply up to a process temperature of +85 °C (+185 °F). The permitted ambient temperature is reduced at higher process temperatures.
- Standard:–40 to +85 °C (–40 to +185 °F)
- With color display: –40 to +85 °C (–40 to +185 °F) with limitations in optical properties such as the display speed and contrast. Can be used without limitations up to –20 to +60 °C (–4 to +140 °F)

Applications with very high temperatures: diaphragm seal with temperature isolator

Ambient temperature T_a depending on the process temperature T_p

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



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1 Insulation material

Hazardous area

- 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

With color display: –40 to +85 °C (–40 to +185 °F)

Operating altitude

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

Climate class

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

Condensation is possible.

Atmosphere

Operation in very corrosive environment

Endress+Hauser recommends the stainless steel housing for corrosive environments, e.g. maritime environment/coastal proximity).

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 mH_2O 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

Vibration resistance

Aluminum dual compartment housing

Mechanical construction	Sinusoidal vibration IEC62828-1/IEC61298-3	Shock
Device	10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g	30 g
Device with "Compact" diaphragm seal type [1]	10 Hz to 60 Hz: 0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g	30 g
Device with "Temperature isolator" diaphragm seal type [2]	10 Hz to 150 Hz: 0.2 g	15 g

1) For applications with very high temperatures, a device with a temperature isolator can be used. If a device with a temperature isolator is used, it must be mounted with a mounting bracket.
2) If a device with a temperature isolator is used, it must be mounted with a mounting bracket.

Stainless steel dual compartment housing

Mechanical construction	Sinusoidal vibration IEC62828-1/IEC61298-3	Shock
Device	10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g	15 g
Device with "Compact" or "Temperature isolator" diaphragm seal [1]	10 Hz to 150 Hz: 0.2 g	15 g

1) For applications with very high temperatures, a device with a temperature isolator can be used. If a device with a temperature isolator is used, it must be mounted with a mounting bracket.

Electromagnetic compatibility (EMC)

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

For more details refer to the EU Declaration of Conformity.

Process

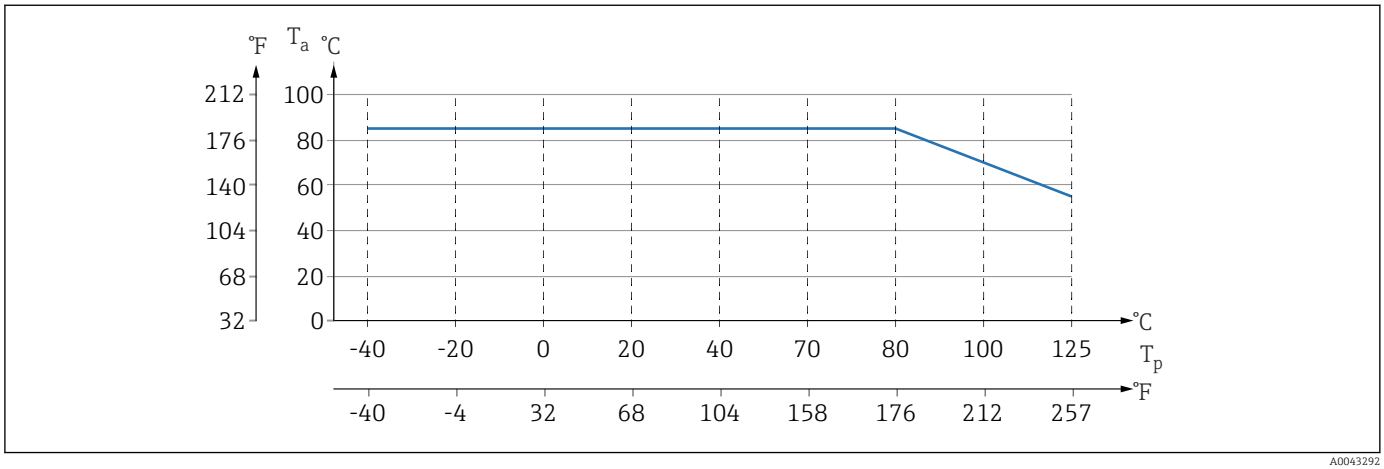
Process temperature range

Standard 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.



1 *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 bar (0.725 psi) [1]	P_{abs} ≥1 bar (14.5 psi) [2]
Silicone oil	−40 to +180 °C (−40 to +356 °F)	−40 to +250 °C (−40 to +482 °F)
High-temperature oil	−20 to +200 °C (−4 to +392 °F)	−20 to +400 °C (−4 to +752 °F) [3] [4] [5]
Inert oil	−40 to +100 °C (−40 to +212 °F)	−40 to +175 °C (−40 to +347 °F) [6] [7]

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

Fill fluid	Density [1] kg/m³
Silicone oil	970
High-temperature oil	995
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".

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

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

- p_{max}: Depends on the lowest-rated element, with regard to pressure, of the selected components: Over pressure limit (OPL) of the measuring cell, 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 membrane: −40 to +125 °C (−40 to +257 °F) ; 150 °C (302 °F) for max. one hour
- Process connections with flush membrane:
  Flanges (EN, ASME, JIS): −40 to +100 °C (−40 to +212 °F)

Devices with diaphragm seal

- Depends on diaphragm seal and fill fluid: −40 °C (−40 °F) up to +400 °C (+752 °F)
- A4 screws of process connection, threaded separator: T_{min} −60 °C (−76 °F)
- Observe the maximum gauge pressure and maximum temperature

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 maximum working pressure is specified on the nameplate. This value refers to a reference temperature of +20 °C (+68 °F) and may be applied to the device for an unlimited time. Note temperature dependence of maximum working pressure. 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 (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 (OPL) is the maximum pressure that a device may be subjected to during a test. 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 measuring cell range and process connection combinations where the overpressure limit (OPL) of the process connection is less than the nominal value of the measuring cell, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If the entire measuring cell 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

As of the specified burst pressure, the complete destruction of the pressure-bearing parts and/or a device leak must be expected. It is therefore imperative to avoid such operating conditions by carefully planning and sizing your facility.

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.

Hydrogen applications

A **gold-coated** metal membrane provides universal protection against hydrogen diffusion, both in gas applications and in applications with aqueous solutions.

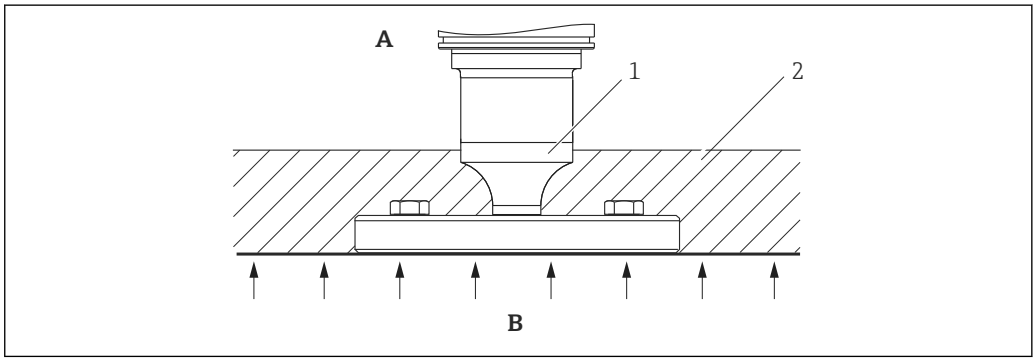
Steam applications and saturated steam applications

For steam and saturated steam applications: Use a device with a metallic 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 ≤ 0.04 W/(m x K) and to the maximum permitted ambient and process temperature. The data were determined under the most critical application "quiescent air". Maximum permitted insulation height, here indicated on a device with a flange:



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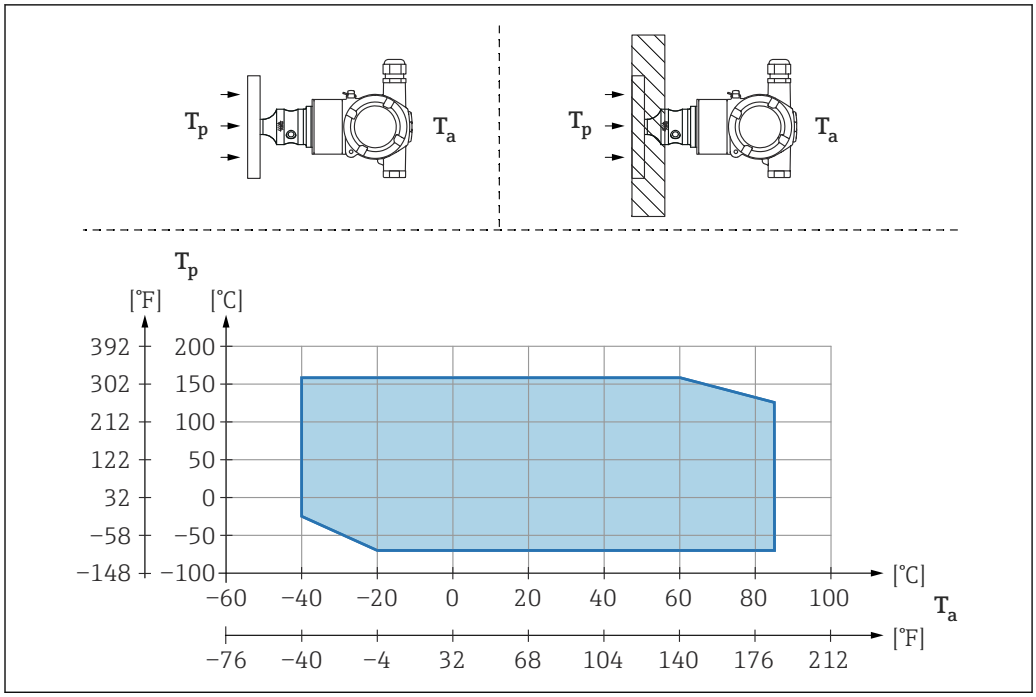
A Ambient temperature
B Process temperature
1 Maximum permitted insulation height
2 Insulation material

Mounting with "Compact" diaphragm seal type



T_a *Ambient temperature at transmitter*
T_p *Maximum process temperature*

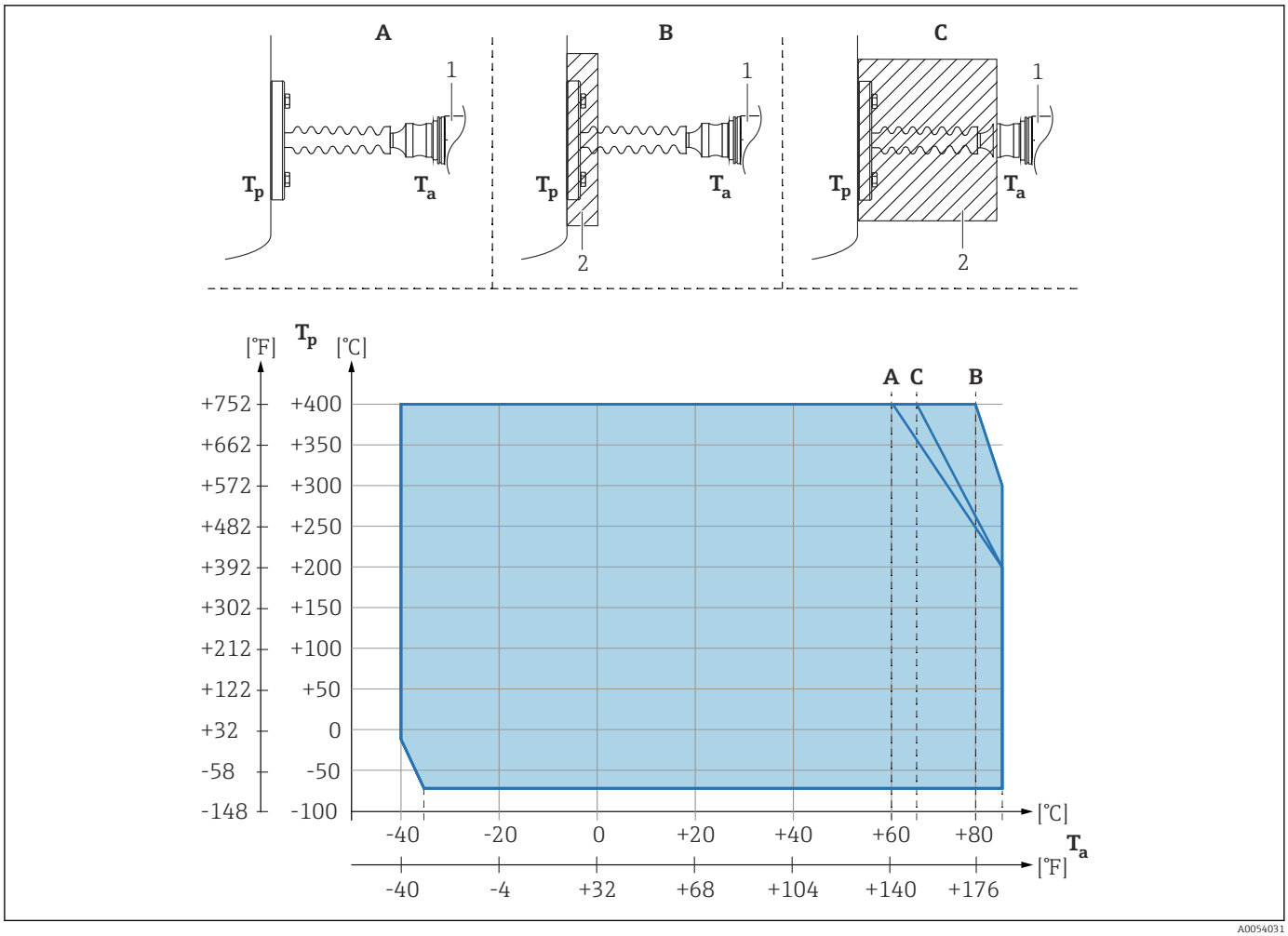
T_a	T_p
+85 °C (+185 °F)	−70 to +120 °C (−94 to +248 °F)
+60 °C (+140 °F)	−70 to +160 °C (−94 to +320 °F)
−20 °C (−4 °F)	−70 to +160 °C (−94 to +320 °F)

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 fill fluid used.



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)
	−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)
	−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)
	−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 fill fluid used

Mechanical Construction

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

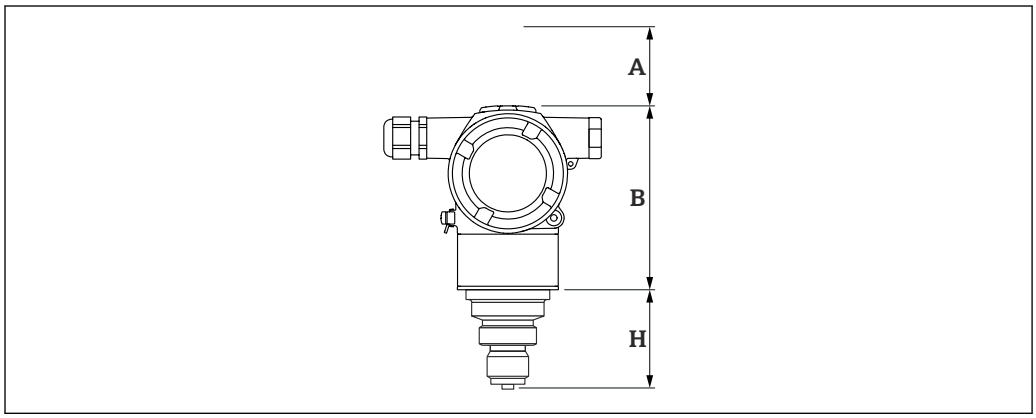
Search for product → Start configuration → after configuration, click "CAD"

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



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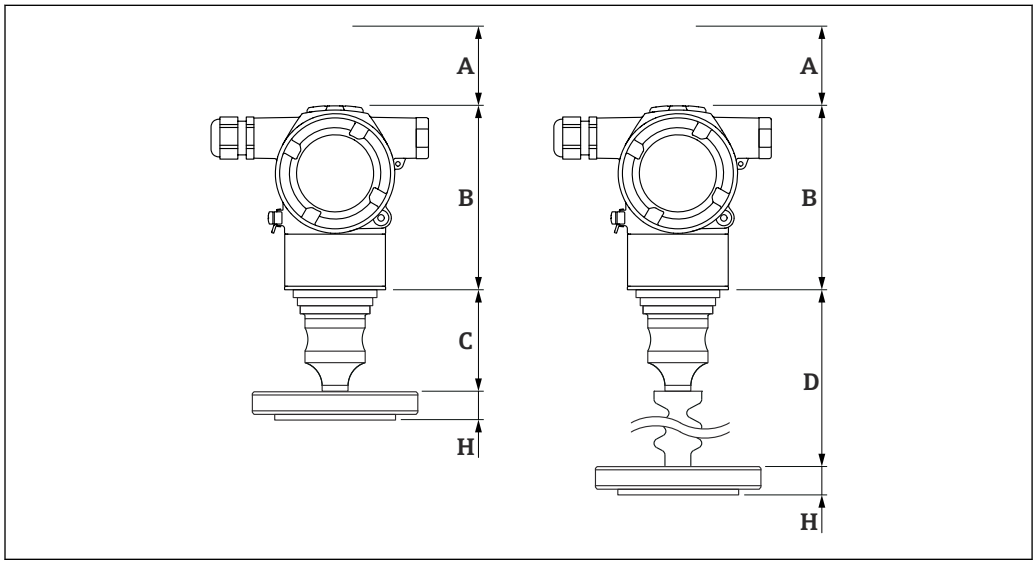
A Installation clearance
B Height of the housing
H Height of the process connection

Device height, diaphragm seal

The device height is calculated from
- the height of the housing
- the height of optional mounting parts such as temperature isolators
- the height of the individual process connection



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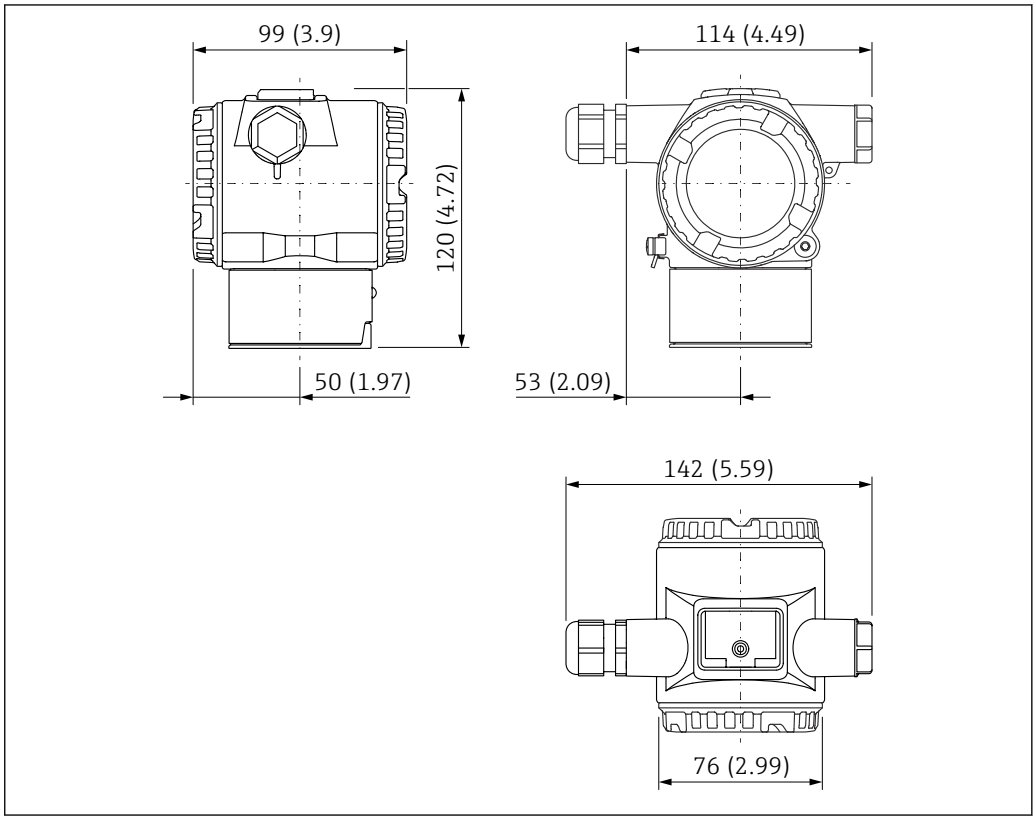
A Installation clearance
B Height of the housing
C Height of the mounted parts, here with the "Compact" diaphragm seal type for example
D Height of the mounted parts, here with the "Temperature isolator" diaphragm seal type for example
H Height of the process connection

Dimensions

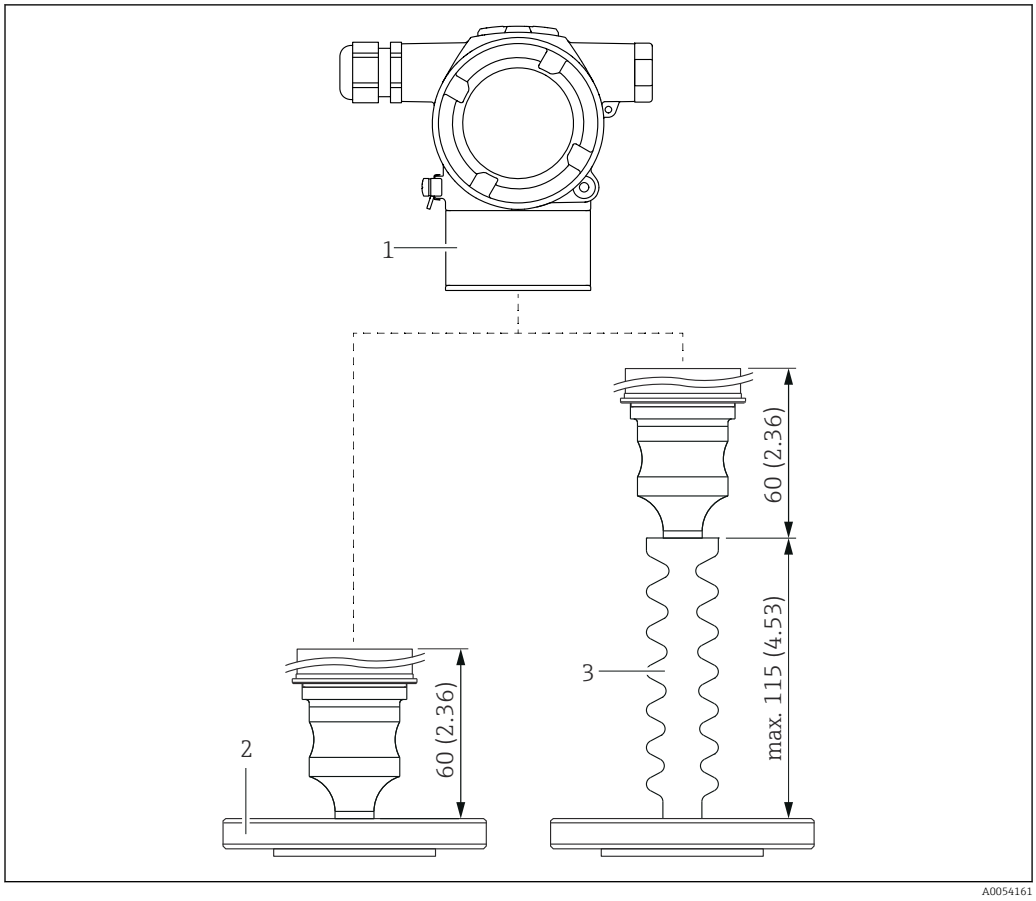
Dual compartment housing



Unit of measurement mm (in)

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

Mounted parts, diaphragm seal



1 Housing
2 Diaphragm seal, here, e.g. flange diaphragm seal
3 Diaphragm seal with temperature isolator

OPL and MWP

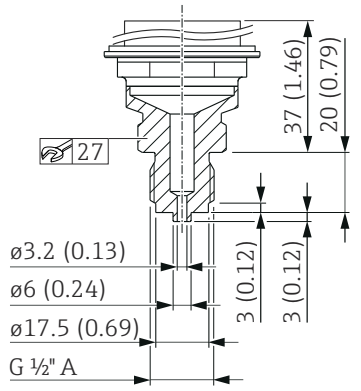
The maximum overpressure limit (OPL) and the maximum working pressure (MWP) of the sensor can deviate from the maximum OPL and MWP of the process connection.

Explanation of terms

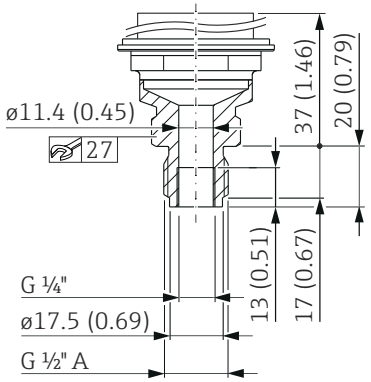
- DN or NPS = alphanumeric identifier of the flange size
- PN or Class = alphanumeric pressure rating of a component

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

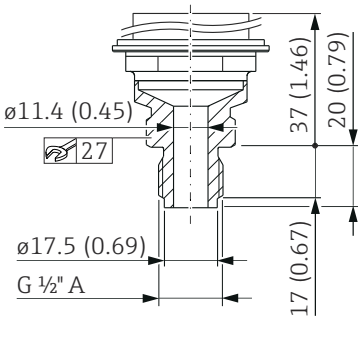
A



B



C



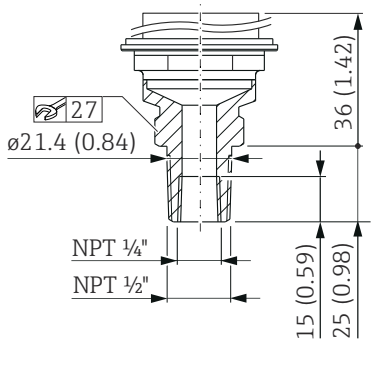
Unit mm (in)

Item	Designation	Material	Weight	Option [1]
			kg (lb)	
A	Thread ISO 228 G ½" A EN837 Bore 11.4 mm (0.45 in) = 400 bar (6 000 psi)	AISI 316L	0.63 (1.39)	WBJ
B	Thread ISO 228 G ½" A, G ¼" (internal) bore 11.4 mm (0.45 in) = 400 bar (6 000 psi)	AISI 316L	0.63 (1.39)	WXJ
C	Thread ISO 228 G ½" A, Bore 11.4 mm (0.45 in) = 400 bar (6 000 psi)	AISI 316L	0.63 (1.39)	WWJ

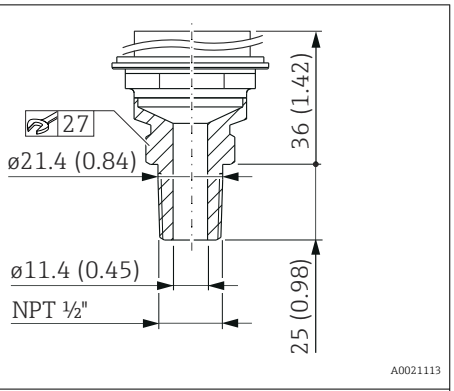
1) Product Configurator order code for "Process connection"

Thread ASME B1.20.1, internal membrane, standard (without diaphragm seal)

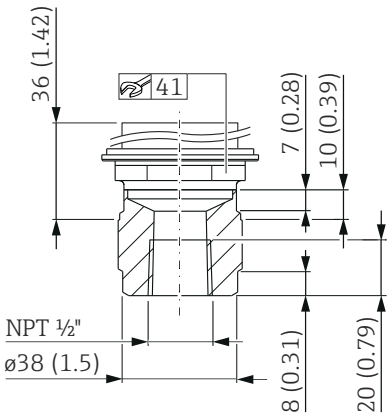
A



B



C

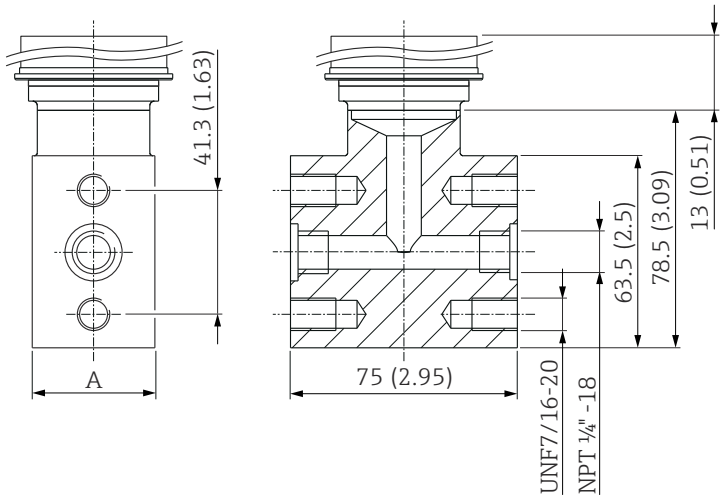


Unit mm (in)

Item	Designation	Material	Weight	Option [1]
			kg (lb)	
A	Thread ASME ½" MNPT, ¼" FNPT	AISI 316L	0.63 (1.39)	VXJ
B	Thread ASME ½" MNPT, Bore 11.4 mm (0.45 in) = 400 bar (6 000 psi)	AISI 316L	0.63 (1.39)	VWJ
C	Thread ASME ½" FNPT	AISI 316L	0.7 (1.54)	VNJ

1) Product Configurator order code for "Process connection"

Oval flange



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

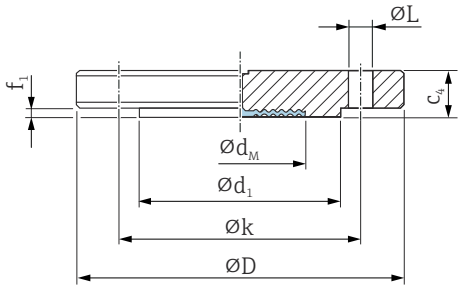
Unit mm (in)

Material	Designation	Weight	Option [1]
		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)	SA0

1) Product Configurator order code for "Process connection"

Flange EN1092-1, flush membrane, diaphragm seal

Connection dimensions according to EN1092-1.



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ØD Diameter of flange
c_4 Thickness
Ød$_1$ Raised face
f_1 Raised face
Øk Pitch diameter
ØL Diameter of hole
Ød$_M$ Max. diameter of membrane

Engineering unit mm

Flange [1) 2) 3)]							Boltholes			Diaphragm seal	Option [4)]
DN	PN	Form	ØD	c_4	Ød$_1$	f_1	Number	ØL	Øk	Weight	
			mm	mm	mm	mm		mm	mm	kg (lb)	
DN 25	PN 10-40	B1	115	18	68	2	4	14	85	1.38 (3.04)	H0J
DN 32	PN 10-40	B1	140	18	78	2	4	18	100	2.03 (4.48)	H1J
DN 40	PN 10-40	B1	150	18	88	3	4	18	110	2.35 (5.18)	H2J
DN 50	PN 10-40	B1	165	20	102	3	4	18	125	3.2 (7.06)	H3J
DN 80	PN 10-40	B1	200	24	138	3	8	18	160	5.54 (12.22)	H5J

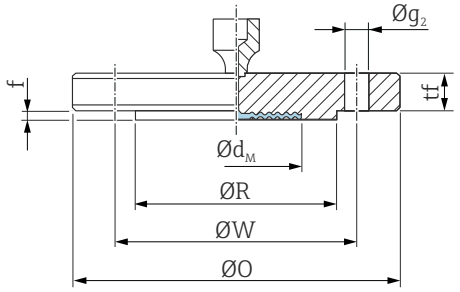
1) Material: AISI 316L
2) The roughness of the surface in contact with the medium including the raised face of the flanges (all standards) made of Alloy C276 or gold is R_a< 0.8 µm (31.5 µin). Lower surface roughness on request.
3) The flange raised face is made of the same material as the membrane.
4) Product Configurator order code for "Process connection"

Maximum diameter of membrane Ød$_M$

DN	PN	Ød$_M$ (mm)		
		316L TempC membrane	316L	Alloy C276
DN 25	PN 10-40	28	-	33
DN 32	PN 10-40	-	34	42
DN 40	PN 10-40	-	38	48
DN 50	PN 10-40	61	-	57
DN 80	PN 10-40	89	-	89

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
Øg$_2$ Diameter of hole
Ød$_M$ Max. diameter of the membrane

Engineering unit in

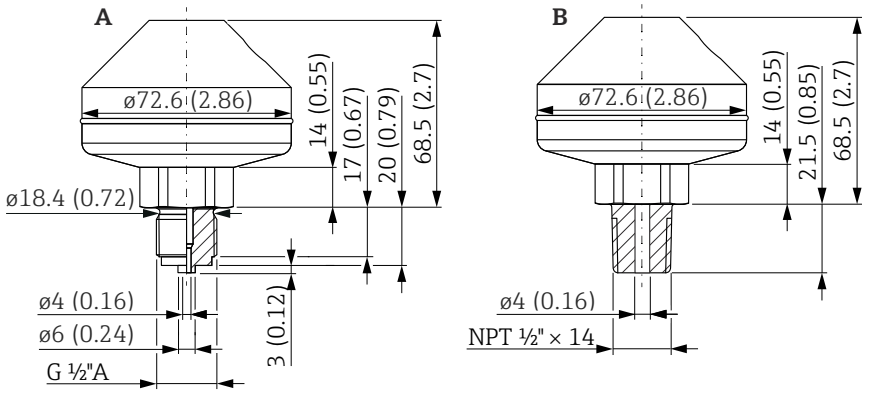
Flange [1) 2) 3)]						**Boltholes**			**Diaphragm seal**	**Option** [4)]
NPS	**Class**	**ØO**	**tf**	**ØR**	**f**	**Number**	**Øg$_2$**	**ØW**	**Weight**	
in		**in**	**in**	**in**	**in**		**in**	**in**	**kg (lb)**	
1	150	4.25	0.50	2	0.06	4	5/8	3.12	1.2 (2.65)	AAJ
1	300	4.88	0.62	2	0.06	4	3/4	3.5	1.5 (3.31)	AMJ
1 ½	150	5	0.62	2.88	0.06	4	5/8	3.88	1.6 (3.53)	ACJ
1 ½	300	6.12	0.75	2.88	0.06	4	7/8	4.5	2.7 (5.95)	APJ
2	150	6	0.69	3.62	0.06	4	3/4	4.75	2.5 (5.51)	ADJ
2	300	6.5	0.81	3.62	0.06	8	3/4	5	3.4 (7.5)	AQJ
3	150	7.5	0.88	5	0.06	4	3/4	6	5.1 (11.25)	AFJ
3	300	8.25	1.06	5	0.06	8	7/8	6.62	7.0 (15.44)	ASJ

1) Material AISI 316/316L: Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)
2) The roughness of the surface in contact with the medium including the raised face of the flanges (all standards) made of Alloy C276 or gold is R_a < 0.8 µm (31.5 µin). Lower surface roughness on request.
3) The flange raised face is made of the same material as the membrane.
4) Product Configurator order code for "Process connection"

Maximum diameter of membrane Ød$_M$

NPS	Class	Ød$_M$ (in)		
		316L TempC membrane	316L	Alloy C276
1	150	1.10	-	1.30
1	300	1.10	-	1.30
1 ½	150	-	1.50	1.89
1 ½	300	-	1.50	1.89
2	150	2.40	-	2.44
2	300	2.40	-	2.44
3	150	3.50	-	3.62
3	300	3.50	-	3.62

Barrier, thread, ISO228, ASME welded, diaphragm seal, TempC membrane



Unit mm (in)

Item	Designation	Material	Measuring range	PN	Weight	Option [1]
			bar (psi)		kg (lb)	
A	Welded, ISO228 G ½ A EN837	AISI 316L	≤ 160 (2320)	PN 160	1.43 (3.15)	W4J
B	Welded, ANSI MNPT ½					V4J

1) Product Configurator order code for "Process connection"

Weight

Housing

Weight including electronics and color display

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

Temperature isolator

- Temperature isolator, short,: 0.19 kg (0.42 lb)
- Temperature isolator, long: 0.34 kg (0.75 lb)

Process connections

Weight, see the specific process connection.

Accessories

Mounting bracket: 0.5 kg (1.10 lb)

Materials in contact with process

Process membrane material

- 316L (1.4435)
- 316L (1.4435), TempC membrane
  TempC membrane stands for "Temperature Compensatory Membrane".
  This process membrane reduces process and ambient temperature effects for diaphragm seals compared to conventional systems.
- Alloy C276, TempC membrane
  TempC membrane stands for "Temperature Compensatory Membrane".
  This process membrane reduces process and ambient temperature effects for diaphragm seals compared to conventional systems.

Membrane coating

- Standard device (without a diaphragm seal): gold, 25 µm
- Device with diaphragm seal: gold, 25 µm
  The TempC gold-plated membrane does not offer corrosion protection!

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

Dual compartment housing and cover

- Polyester powder coating on aluminum as per EN1706 AC43400 (reduced copper content ≤0.1 % to prevent corrosion)
- Stainless steel (ASTM A351 : CF3M (cast equivalent to material AISI 316L) / DIN EN 10213 : 1.4409)

Aluminum housing nameplate

Metal nameplate made of 316L (1.4404)

Nameplate of stainless steel housing

Metal nameplate 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)

Fill fluid

- Silicone oil
- Silicone oil, FDA 21 CFR 175.105
- Vegetable oil, FDA 21 CFR 172.856
- High-temperature oil
- Inert oil (not suitable for temperatures below −20 °C (−4 °F))

Connecting parts

- Connection between housing and process connection: AISI 316L (1.4404)
- Measuring cell body: AISI 316L (1.4404)

Accessories

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

Display and user interface

Operating concept

Operator-oriented menu structure for user-specific tasks
- User navigation
- Diagnosis
- Application
- System

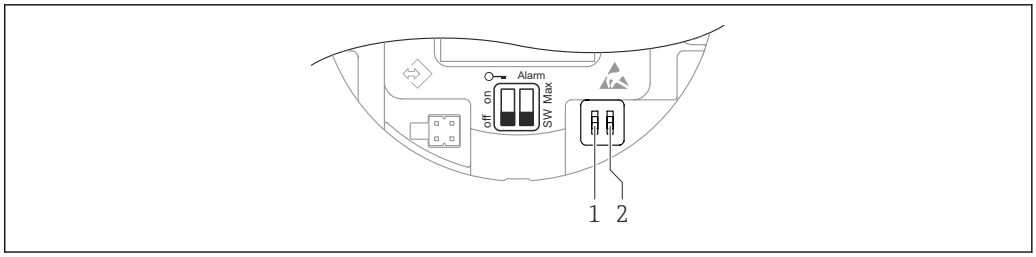
Quick and safe commissioning
- Interactive wizard with graphical user interface for guided commissioning in FieldCare, DeviceCare or DTM, AMS and PDM-based third-party tools
- Menu guidance with brief descriptions of the individual parameter functions

Efficient diagnostics increase measurement reliability
- Remedial measures are integrated in plain text
- Diverse simulation options

Onsite operation

Operating keys and DIP switches on the electronic insert

HART



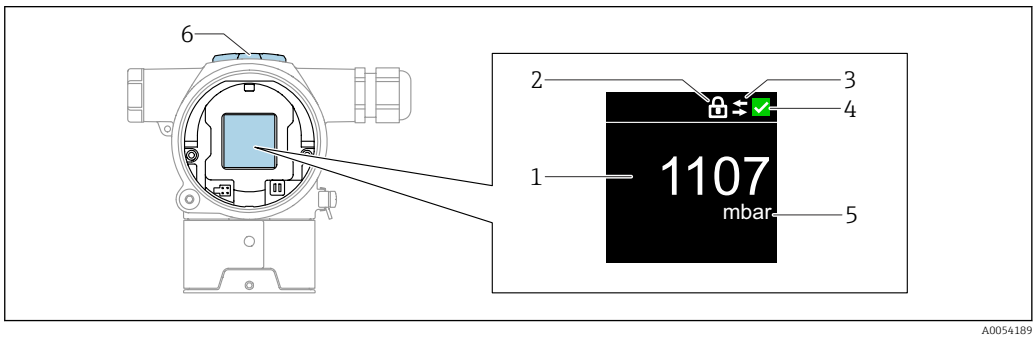
1 DIP switch for locking and unlocking the device
2 DIP switch for alarm current

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

Color display and magnetic button

Functions that can be executed with the magnetic button:
- Zero point and span
- Turning the display
- Position adjustment
- Resetting user role password
- Device reset

The brightness of the color display is adjusted depending on the supply voltage and the current consumption.

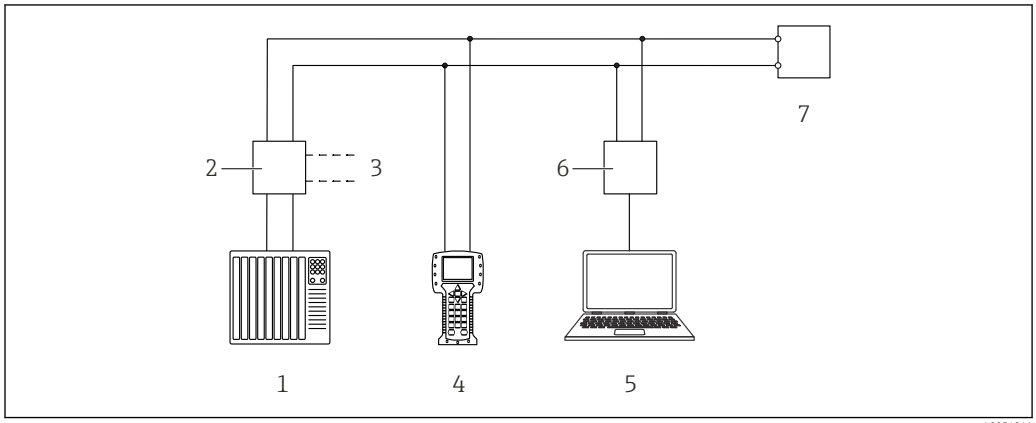


2 Color display

1 Measured value (up to 5 digits)
2 Locking (symbol appears when device is locked)
3 HART communication (symbol appears when HART communication is enabled)
4 Status symbol according to NAMUR
5 Measured value output in %
6 Magnetic keys (Zero and Span)

Remote operation

Via HART protocol



3 Options for remote operation via HART protocol

1 PLC (programmable logic controller)
2 Transmitter power supply unit, e.g. RN221N (with communication resistor)
3 Connection for Commubox FXA195 and AMS Trex™ device communicator
4 AMS Trex™ device communicator
5 Computer with operating tool (e.g. DeviceCare/FieldCare , AMS Device View, SIMATIC PDM)
6 Commubox FXA195 (USB)
7 Device

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.

System integration

HART

Version 7

Supported operating tools

DeviceCare as of Version 1.07.00, FieldCare, DTM, AMS and PDM

Certificates and approvals

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

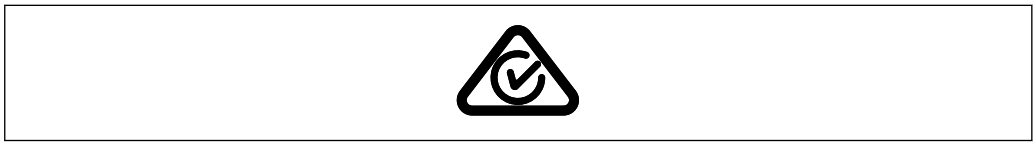
1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

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.



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Hazardous area approvals

- ATEX
- FM
- NEPSI
- UKCA
- INMETRO
- KC
- JPN
- Combinations of different approvals also

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.

Corrosion test

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

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

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

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.

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 (Det Norske Veritas)

CRN approval (under development)

A CRN approval (Canadian Registration Number) is available for some device versions. These devices are fitted with a separate plate bearing the registration number CRN xxxxxxx.yy. In order to obtain a

CRN-approved device, a CRN-approved process connection must be ordered along with the option "CRN" in the order code for "Additional approvals".

Test reports (optional)

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 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
- Welding documentation, wetted/pressurized seams, declaration

All 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" .

Calibration

Factory calibration certificate, 5-point

Manufacturer declarations

Various manufacturer declarations can be downloaded from the Endress+Hauser website. Other manufacturer declarations can be ordered from the Endress+Hauser sales office.

Downloading the Declaration of Conformity

www.endress.com → Download

Pressure Equipment Directive 2014/68/EU (PED)

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

Pressure equipment (maximum allowable pressure (MWP) PS ≤ 200 bar (2 900 psi)) can be classified as pressure accessories in accordance with Pressure Equipment Directive 2014/68/EU. If the maximum allowable pressure is ≤ 200 bar (2 900 psi) and the pressurized volume of the pressure equipment is ≤ 0.1 l, the pressure equipment is subject to the Pressure Equipment Directive (cf. Pressure Equipment Directive 2014/68/EU, Article 4, point 3). The Pressure Equipment Directive only requires that the pressure equipment shall be designed and manufactured in accordance with the “sound engineering practice of a Member State”.

Reasons:

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

Note:

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

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

Pressure equipment designated for application in every process fluid having a pressurized volume of < 0.1 l and a maximum 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 categories in accordance with Annex II. Taking into account the low volume specified above, the pressure instruments can be categorized as category I pressure equipment. They must then bear a CE mark.

Reasons:

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

Note:

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

The following also applies:

- Devices with thread and internal 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 (optional)

Verified cleaned, suitable for O2 service (wetted parts)

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

Classification of process sealing between electrical systems and (flammable or combustible) process fluids according to UL 122701 (formerly ANSI/ISA 12.27.01)

Endress+Hauser devices are designed in compliance with UL 122701 (formerly ANSI/ISA 12.27.01), allowing users to eliminate the need for external secondary process seals in the piping, as specified in the process seal sections of ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC), thereby saving on costs. These devices comply with North American installation practices and provide a highly secure and cost-effective installation solution for pressure-bearing applications involving hazardous media. The devices are assigned to "single seal" as follows:

FM C/US IS, XP, DIP:

400 bar (6 000 psi)

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

Order 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 *Device Viewer*:
Enter the serial number from the nameplate (www.endress.com/deviceviewer)

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 **separate** 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.
- Siphons (PZW)
- Weather protection covers

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

Device Viewer

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

Documentation

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

Standard documentation

- 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.

Registered trademarks

HART®
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People for Process Automation