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Technical Information
Deltabar PMD50

Differential pressure, level and flow measurement in liquids or gases
HART





Differential pressure transmitter with metallic process membrane

Applications

- Pressure measuring ranges: up to 40 bar (600 psi)
- Static pressure: up to 250 bar (3 750 psi)
- Accuracy: up to ±0.05%
- Response time: <100 ms

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

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About this document

Symbols

Warning 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 potentially dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

CAUTION

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

NOTICE

This symbol alerts you to a potentially harmful situation. Failure to avoid this situation can result in damage to the product or something in its vicinity.

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.

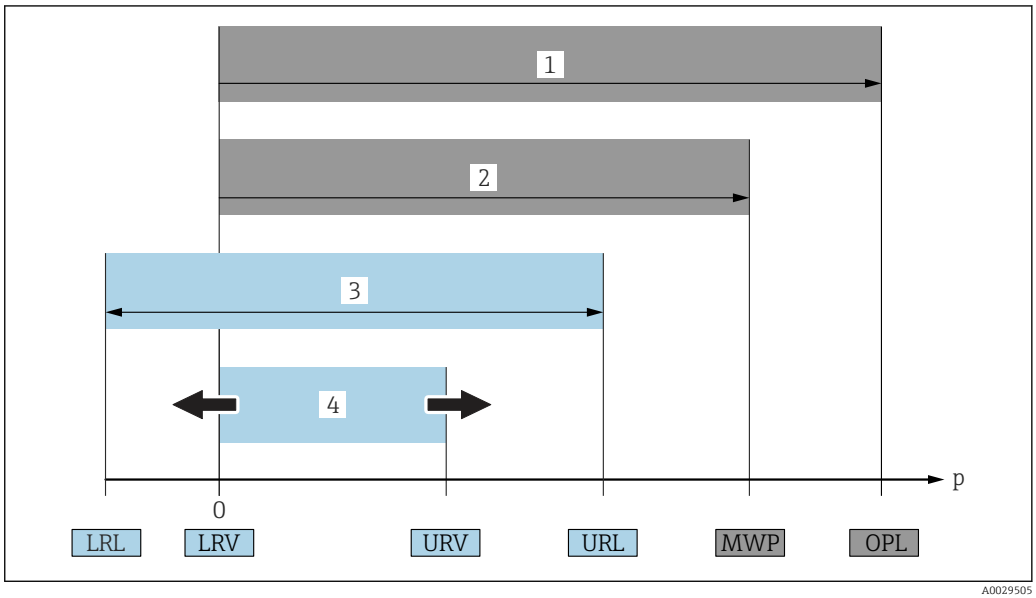
Views: A, B, C, ...

Symbols on the device

Safety instructions: ⚠ → 📖

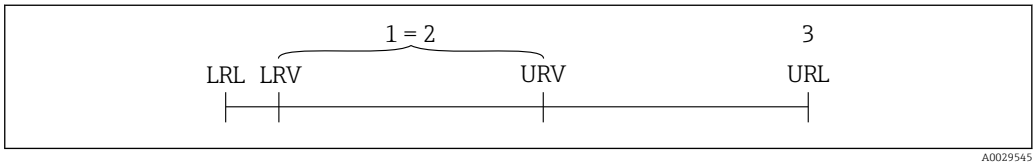
Observe the safety instructions contained in the associated Operating Instructions.

List of abbreviations



1 *OPL: The OPL (over pressure limit = measuring cell overpressure limit) for the device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection must be taken into consideration in addition to the measuring cell. Observe pressure-temperature dependency. OPL (Over Pressure Limit) is a test pressure.*
2 *MWP: 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 also has to be taken into consideration besides the measuring cell. Observe pressure-temperature dependency. The maximum working pressure may be applied at the device for an unlimited period of time. The maximum working pressure 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 span that can be calibrated/adjusted.*
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: 16 bar (240 psi)
- Upper range limit (URL) = 16 bar (240 psi)
- Calibrated/adjusted span: 0 to 8 bar (0 to 120 psi)
- Lower range value (LRV) = 0 bar (0 psi)
- Upper range value (URV) = 8 bar (120 psi)

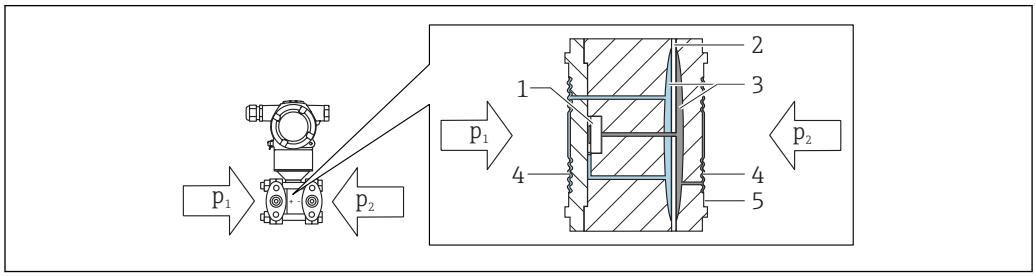
$$TD = \frac{URL}{|URV - LRV|}$$

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

Function and system design

Measuring principle

Measuring cell for differential pressure with metal process membrane



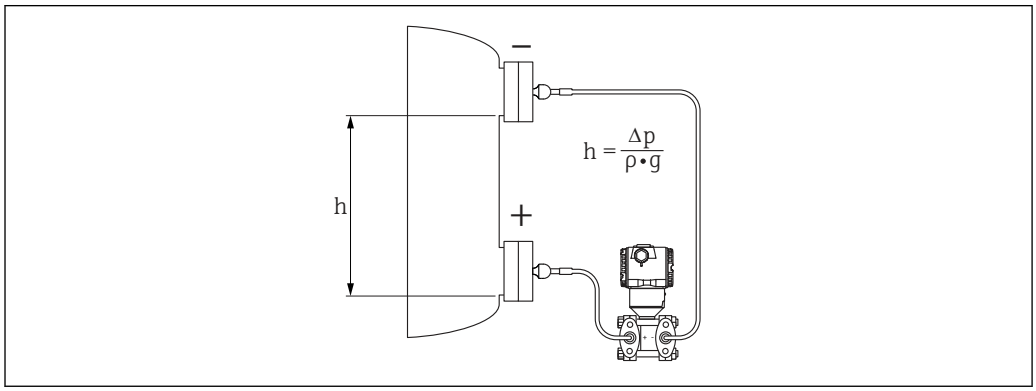
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1 Measuring element
2 Middle diaphragm
3 Fill fluid
4 Process membrane
5 Seal
p_1 Pressure 1
p_2 Pressure 2

The process membrane is deflected on both sides by the acting pressures. A fill fluid transfers the pressure to a side of the measuring element where a resistance bridge is located (semiconductor technology). The change in the bridge output voltage, which depends on the differential pressure, is measured and processed further.

Measuring system

Continuous level measurement (level, volume and mass)



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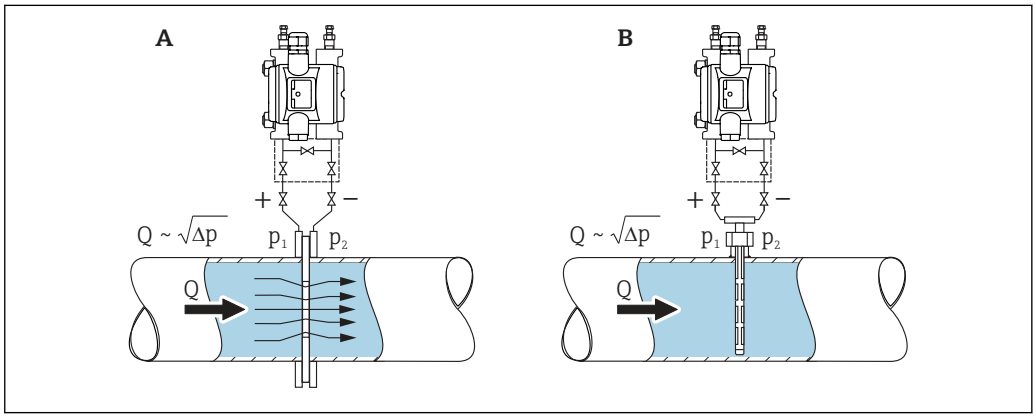
h Height (level)
Δp Differential pressure
ρ Density of the medium
g Gravitation constant

Advantages

- Selection of the level operating mode which is optimum for your application in the device software
- Volume and mass measurements in any vessel shape by means of a freely programmable characteristic curve
- Choice of diverse level units with automatic unit conversion
- A customized unit can be specified.
- Has a wide range of uses, e.g.
  - for level measurement in vessels with pressure overlay
  - for foam formation
  - in vessels with agitators or screen fittings
  - for liquid gases
  - for standard level measurement

Flow measurement

Flow measurement with Deltabar and differential pressure sensor:



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

Advantages:

- A specific unit is defined
- With the **Low flow cut off** parameter, positive zero return can be configured in the lower measuring range.

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

- Differential 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.

PN 160/16 MPa/2400 psi

Measuring cell	Maximum measuring range		Smallest calibratable measuring span (preset at factory) [1) 2)]
	Lower (LRL)	Upper (URL)	
[mbar (psi)]	[mbar (psi)]	[mbar (psi)]	[mbar (psi)]
100 (1.5)	−100 (-1.5)	+100 (+1.5)	1 (0.015)
500 (7.5)	−500 (-7.5)	+500 (+7.5)	5 (0.075)
3000 (45)	−3000 (-45)	+3000 (+45)	30 (0.45)
16000 (240)	−16000 (-240)	+16000 (+240)	160 (2.4)
40000 (600)	−40000 (-600)	+40000 (+600)	400 (6)

1) Turn down > 100:1 on request
2) The maximum TD is 5:1 in the case of platinum.

PN 160/16 MPa/2400 psi

Measuring cell	MWP	OPL		Burst pressure [1) 2)]
		[bar (psi)]	on both sides	
[mbar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]
100 (1.5)	160 (2400) [3)]	160 (2400)	240 (3600)	470 (6815)
500 (7.5)	160 (2400) [3)]	160 (2400)	240 (3600)	470 (6815)
3000 (45)	160 (2400) [3)]	160 (2400)	240 (3600)	470 (6815)
16000 (240)	160 (2400) [3) 4)]	160 (2400)	240 (3600)	470 (6815)
40000 (600)	160 (2400) [3) 4)]	"+" side: 160 (2400) "–" side: 100 (1500)	240 (3600)	470 (6815)

1) Applies to the process seal materials FKM, PTFE, FFKM, EPDM and for pressure applied on both sides.
2) If the side vent valves (sv) option is selected and a PTFE seal is used, the burst pressure is 470 bar (6 815 psi).
3) If CRN approval is selected, the following limited MWP values apply: with copper seals: 124 bar (1 798.5 psi)
4) If pressure is applied on the negative side only, the MWP is 100 bar (1 500 psi).

Standard: PN 250 / 25 MPa / 3626 psi

Measuring cell	Maximum measuring range		Smallest calibratable measuring span (preset at factory) [1) 2)]
	Lower (LRL)	Upper (URL)	
[mbar (psi)]	[mbar (psi)]	[mbar (psi)]	[mbar (psi)]
100 (1.5)	−100 (-1.5)	+100 (+1.5)	1 (0.015)
500 (7.5)	−500 (-7.5)	+500 (+7.5)	5 (0.075)
3000 (45)	−3000 (-45)	+3000 (+45)	30 (0.45)
16000 (240)	−16000 (-240)	+16000 (+240)	160 (2.4)
40000 (600)	−40000 (-600)	+40000 (+600)	400 (6)

1) Turn down > 100:1 on request
2) The maximum TD is 5:1 in the case of platinum.

Standard: PN 250 / 25 MPa / 3626 psi

Measuring cell	MWP [1]	OPL		Burst pressure [2] [3] [4]
		[bar (psi)]	on both sides	
[mbar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]
100 (1.5)	250 (3626) [5]	250 (3626)	375 (5625)	695 (10078)
500 (7.5)	250 (3626) [5]	250 (3626)	375 (5625)	695 (10078)
3000 (45)	250 (3626) [5]	250 (3626)	375 (5625)	695 (10078)
16000 (240)	250 (3626) [5] [6]	250 (3626)	375 (5625)	695 (10078)
40000 (600)	250 (3626) [5] [6]	"+" side: 250 (3626) "-" side: 100 bar (1 500 psi)	375 (5625)	695 (10078)

1) MWP only on both sides.
2) Applies to the process seal materials FKM, FFKM, EPDM and for pressure applied on both sides.
3) If the side vent valves (sv) option is selected, the burst pressure is 690 bar (10 005 psi).
4) For the process seal material PTFE, the burst pressure is 690 bar (10 005 psi).
5) If a CRN approval is selected, the following limited MWPs apply: with side venting: 179 bar (2 596.2 psi); with copper seals: 124 bar (1 798.5 psi)
6) If pressure is applied on the negative side only, the MWP is 100 bar (1 500 psi).

Minimum static pressure

- Minimum static pressure at reference operating conditions for silicone oil: 25 mbar (0.0375 psi) $_{abs}$
- Minimum static pressure for 85 °C (185 °F) silicone oil: to 250 mbar (4 psi) $_{abs}$

Option as gauge pressure measuring cell (all measuring cells)
- Minimum static pressure at reference operating conditions for silicone oil: 10 mbar (0.15 psi) $_{abs}$
- Minimum static pressure for 85 °C (185 °F) silicone oil: to 10 mbar (0.15 psi) $_{abs}$

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

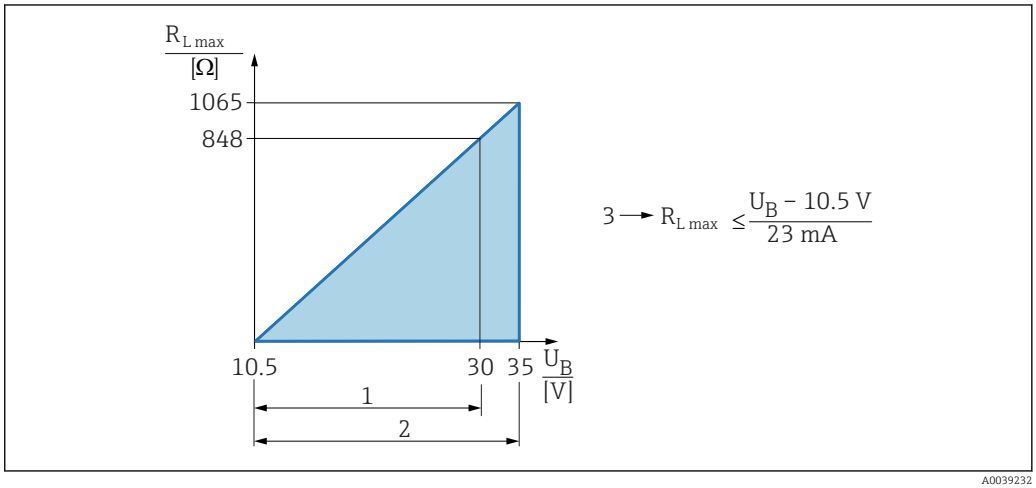
Signal on alarm

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.

Flow measurement with Deltabar and differential pressure sensor

Low flow cut off parameter: When the **Low flow cut off** parameter is activated, small flows which can lead to large fluctuations in the measured value are suppressed.

The **Low flow cut off** parameter is set to 5% by default when the **Output current transfer function** parameter is set to **Square root** option.

Protocol-specific data

HART

- Manufacturer ID: 17 (0x11{hex})
- Device type ID: 0x11E1
- 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

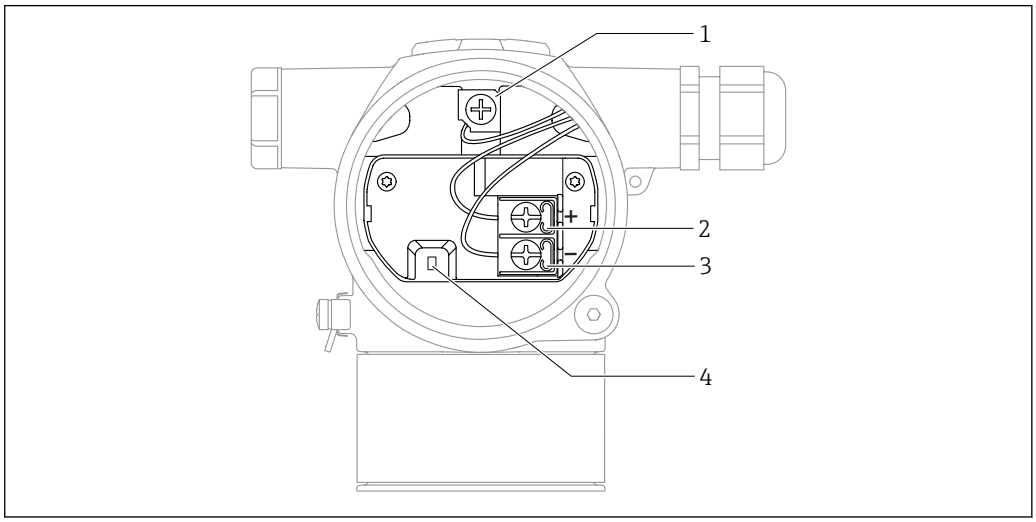
Wireless HART data

- 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

Power supply

Terminal assignment

Dual compartment housing



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

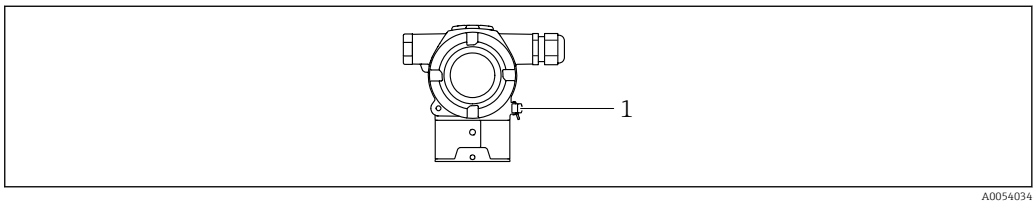
The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV, Class 2) and must comply with the relevant protocol specifications. For 4 to 20 mA, the same requirements apply as for HART.

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



1 Ground terminal for connecting the potential matching line

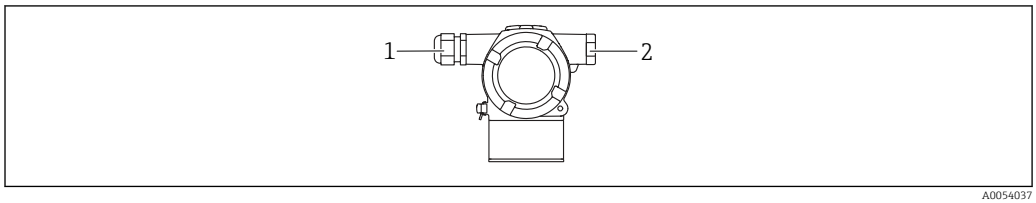
If necessary, the potential matching line can be connected to the outer ground terminal of the device before the device is connected.

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 inner ground terminal
  Clamping range: 0.5 to 2.5 mm^2 (20 to 14 AWG)
- External ground terminal
  Clamping range: 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)
- 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 +22 to +28 °C (+72 to +82 °F)
- Humidity φ = constant, in the range: 5 to 80 % rF ± 5 %
- Atmospheric pressure p_U = constant, in the range: 860 to 1060 mbar (12.47 to 15.37 psi)
- Position of the measuring cell: horizontal ±1°
- Membrane material: AISI 316L (1.4435), Alloy C276
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- Supply voltage: 24 V DC ±3 V DC
- Load with HART: 250 Ω
- Turn Down TD= URL/ | URV - LRV |
- Zero point-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 = $\pm \sqrt{ ((E1)^2 + (E2)^2 + (E3)^2)}$

E1 = Reference accuracy

E2 = Ambient temperature effect

Calculation of E2:

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

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

$E2 = E2_M + E2_E$

$E2_M$ = Main temperature error

$E2_E$ = Electronics error

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

Calculation of the total performance with the Endress+Hauser Applicator

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



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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 100:1, for platinum up to TD 5:1.

Measuring cell	Standard	Platinum
100 mbar (1.5 psi)	TD ≤ 4:1 =±0.065 % TD > 4:1 =±(0.012 %· TD + 0.017 %)	TD ≥ 1:1 to 5:1 = ±0.05 %
500 mbar (7.5 psi) 3 bar (45 psi) 16 bar (240 psi) 40 bar (600 psi)	TD ≤ 10:1 =±0.065 % TD > 10:1 =±(0.0015 % · TD + 0.050 %)	TD ≥ 1:1 to 5:1 = ±0.05 %

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.

100 mbar (1.5 psi) measuring cell
- Standard: ±(0.18 % · TD + 0.1 %)
- Platinum: ±(0.18 % · TD + 0.1 %)

500 mbar (7.5 psi), 3 bar (45 psi), 16 bar (240 psi), 40 bar (600 psi) measuring cell
- Standard: ±(0.1 % · TD + 0.1 %)
- Platinum: ±(0.1 % · TD + 0.1 %)

$E2_E$ - Electronics error

Digital output HART: 0 %

$E3_M$ - Main static pressure error

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

100 mbar (1.5 psi) measuring cell
- Standard
  - Influence on the zero point: ±0.35 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.15 % per 70 bar (1 050 psi)
- Platinum
  - Influence on the zero point: ±0.29 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.14 % per 70 bar (1 050 psi)

500 mbar (7.5 psi) measuring cell
- Standard
  - Influence on the zero point: ±0.09 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.14 % per 70 bar (1 050 psi)
- Platinum
  - Influence on the zero point: ±0.09 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.14 % per 70 bar (1 050 psi)

3 bar (45 psi), 16 bar (240 psi), 40 bar (600 psi) measuring cell
- Standard
  - Influence on the zero point: ±0.075 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.14 % per 70 bar (1 050 psi)
- Platinum
  - Influence on the zero point: ±0.075 % · TD per 70 bar (1 050 psi)
  - Influence on the span: ±0.14 % per 70 bar (1 050 psi)

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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Long-term stability

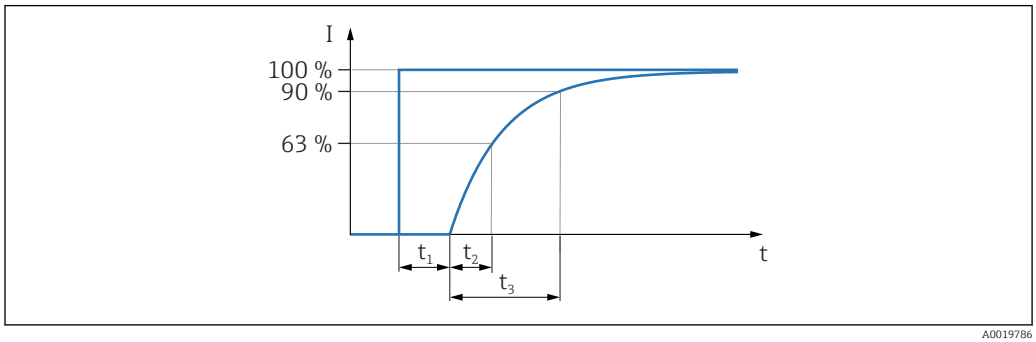
100 mbar (1.5 psi) measuring cell
- 1 year: ±0.07 %
- 5 years: ±0.20 %
- 10 years: ±0.33 %

500 mbar (7.5 psi), 3 bar (45 psi), 16 bar (240 psi) and 40 bar (600 psi) measuring cell
- 1 year: ±0.05 %
- 5 years: ±0.15 %
- 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)

Recommendation:
- Use maximum values in control or safety circuits where response times are relevant
- Typically use step response time from 0% to 100%

100 mbar (1.5 psi) sensor:
- Dead time (t_1): maximum 50 ms, nominal 30 ms
- Time constant T63 (t_2): maximum 90 ms, nominal 70 ms
- Time constant T90 (t_3): maximum 150 ms, nominal 95 ms

All other sensors:
- Dead time (t_1): maximum 50 ms, nominal 30 ms
- Time constant T63 (t_2): maximum 85 ms, nominal 60 ms
- Time constant T90 (t_3): maximum 150 ms, nominal 90 ms

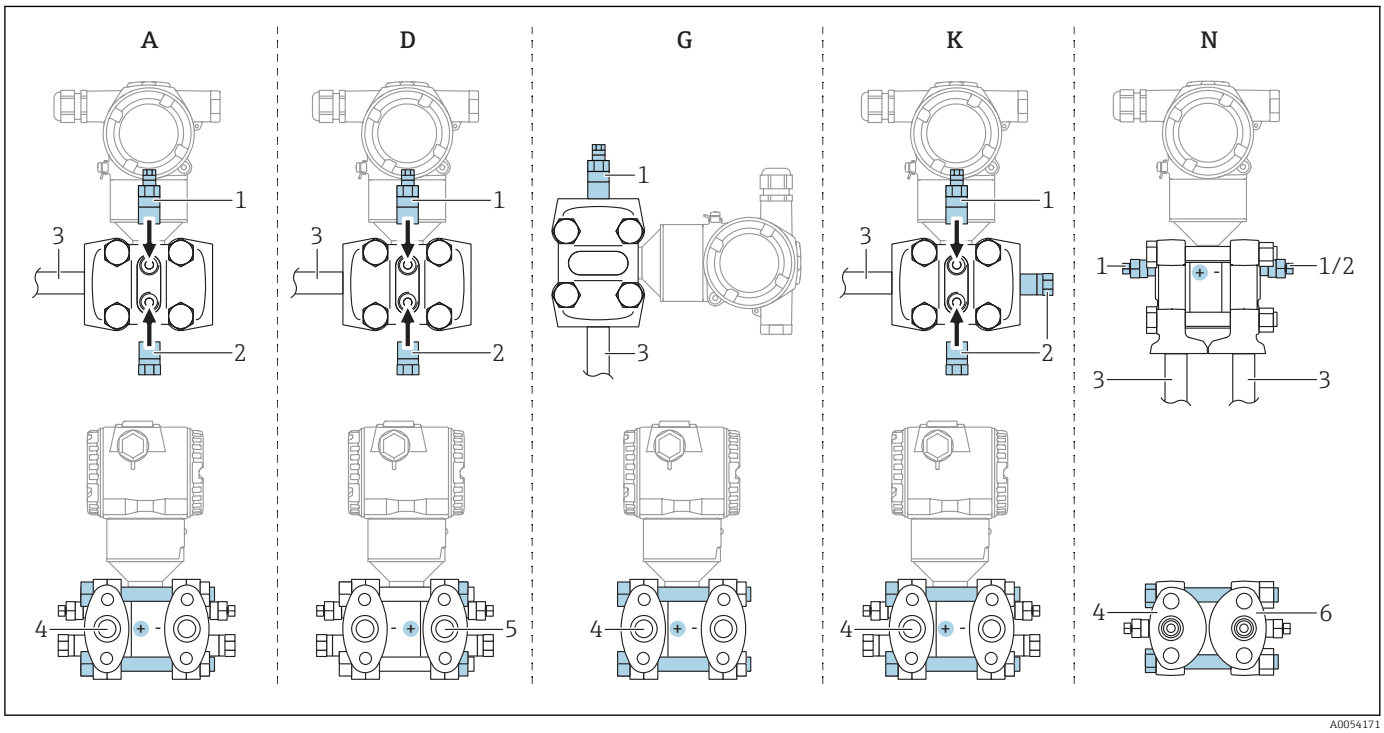
Warm-up time

As per IEC 62828-4: ≤5 s

Mounting

Orientation

The installation depends on the supply and proper connection of the impulse lines.



1 A, D, G, K, N: order options

A Horizontal impulse line, left side high pressure (screw head side), with side vent Thread on one side and side thread for horizontal impulse line
D Horizontal impulse line, right side high pressure (screw nuts side), with side vent Thread on one side and side thread for horizontal impulse line
G Horizontal impulse line, left or right side high pressure (screw head side), with side vent Thread on each side for vertical impulse line.
K Universal side flange, left or right side high pressure (screw head side), with vent. Thread on each side and side thread for universal mounting.
N Bottom process connection, left side high pressure (screw head side), vent. Thread on each side and side thread for mounting on existing manifolds.
1 Vent valve
2 Sealing plug
3 Impulse line
4 High pressure side (screw head side)
5 High pressure side (screw nuts side)
6 IEC upright, view from below

Sensor selection and arrangement

Flow measurement

Flow measurement in gases

Mount the device above the measuring point so that the condensate can drain into the process pipe.

Flow measurement in vapors

- Mount the device below the measuring point.
- Mount the condensate traps at the same level as the tapping points and at the same distance to the device.
- Prior to commissioning, fill the piping to the height of the condensate traps

Flow measurement in liquids

- Mount the device below the measuring point so that the impulse lines are always filled with liquid and gas bubbles can rise back into the process piping.
- When measuring in media with solid parts, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.

Level measurement

Level measurement in open vessels

- Mount the device below the lower measuring connection so that the impulse lines are always filled with liquid.
- The low-pressure side is open to atmospheric pressure.
- When measuring in media with solid parts, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.

Level measurement in a closed vessel

- Mount the device below the lower measuring connection so that the impulse lines are always filled with liquid.
- Always connect the low-pressure side above the maximum level
- When measuring in media with solid parts, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.

Level measurement in a closed vessel with superimposed vapor

- Mount the device below the lower measuring connection so that the impulse lines are always filled with liquid.
- Always connect the low-pressure side above the maximum level
- The condensate trap ensures constant pressure on the low-pressure side
- When measuring in media with solid parts, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.

Pressure measurement

Pressure measurement with 160 bar (2 400 psi) and 250 bar (3 750 psi) measuring cell

Mount the device above the measuring point so that the condensate can drain into the process pipe.

Differential pressure measurement

Differential pressure measurement in gases and vapors

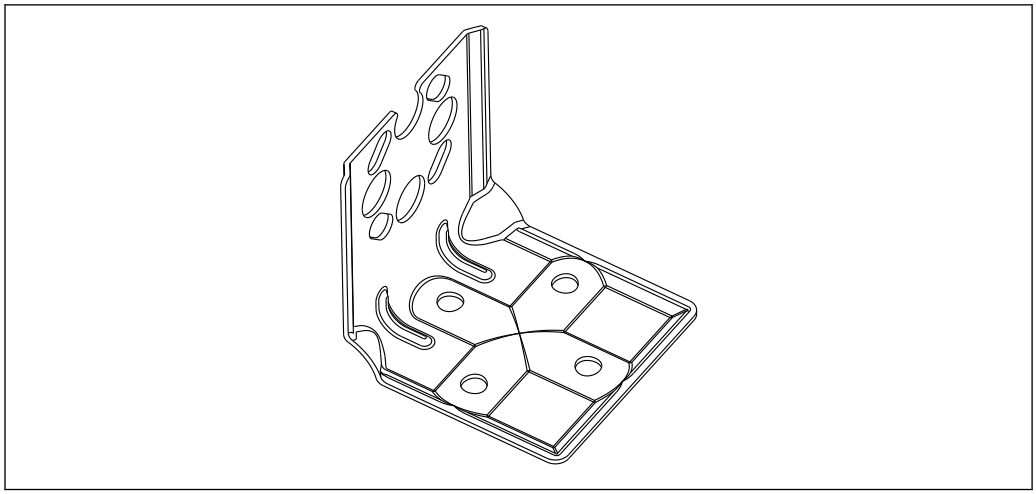
Mount the device above the measuring point so that the condensate can drain into the process pipe.

Differential pressure measurement in liquids

Mount the device below the measuring point so that the impulse lines are always filled with liquid and gas bubbles can rise back into the process piping.

Wall and pipe mounting

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



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- If a valve manifold is used, its dimensions should also be taken into consideration
- Bracket for wall and pipe mounting including retaining bracket for pipe mounting and two nuts
- The material of the screws used to secure the device depends on the order code

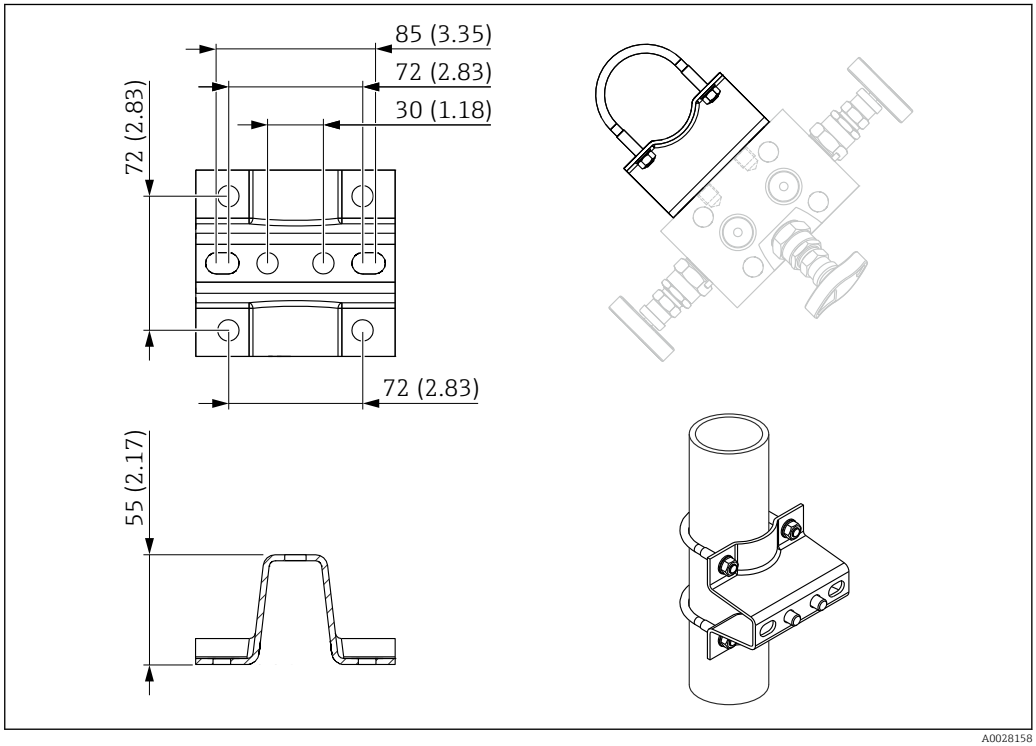
For technical data (e.g. materials, dimensions or order numbers), see the accessory document SD01553P.

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.



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Environment

Ambient temperature range

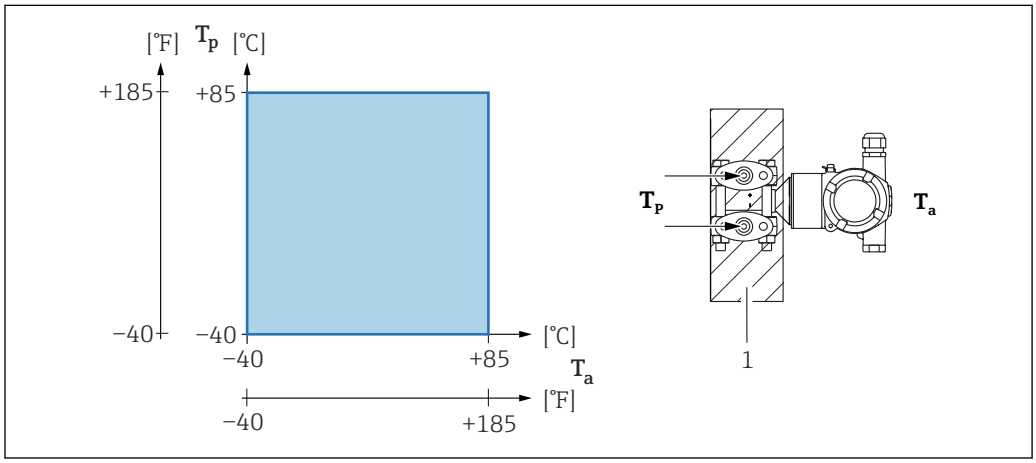
The following values apply up to a process temperature of +85 °C (+185 °F). The permitted ambient temperature is reduced at higher process temperatures.

- Standard: −40 to +85 °C (−40 to +185 °F)
  Standard: −40 to +85 °C (−40 to +185 °F)
- With graphical display: −40 to +85 °C (−40 to +185 °F) with limitations in optical properties such as display speed and contrast for example. Can be used without limitations up to −20 to +60 °C (−4 to +140 °F)
  Segment display: up to −50 to +85 °C (−58 to +185 °F) with restricted operating life and performance

Devices with inert oil: minimum process and ambient temperature −20 °C (−4 °F)

Ambient temperature T_a depending on the process temperature T_p

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



1 Insulation material

Hazardous area

For devices for use in hazardous areas, see the Safety Instructions, Installation Drawing or Control Drawing.

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 4K26 (air temperature: −20 to +50 °C (−4 to +122 °F), relative air humidity: 4 to 100 %) in accordance with IEC/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).

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

Measuring range	Sinusoidal oscillation IEC62828-1/IEC61298-3	Shock
0.1 to 250 bar (1.5 to 3 750 psi)	10 Hz to 60 Hz: ±0.35 mm (0.0138 in) 60 Hz to 1000 Hz: 5 g	30 g

Stainless steel dual compartment housing

Measuring range	Sinusoidal oscillation IEC62828-1/IEC61298-3	Shock
0.1 to 250 bar (1.5 to 3 750 psi)	10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 500 Hz: 2 g	15 g

Electromagnetic compatibility (EMC)

- Electromagnetic compatibility as per IEC 61326 series and NAMUR recommendation EMC (NE21)
- With regard to the safety function (SIL), the requirements of IEC 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

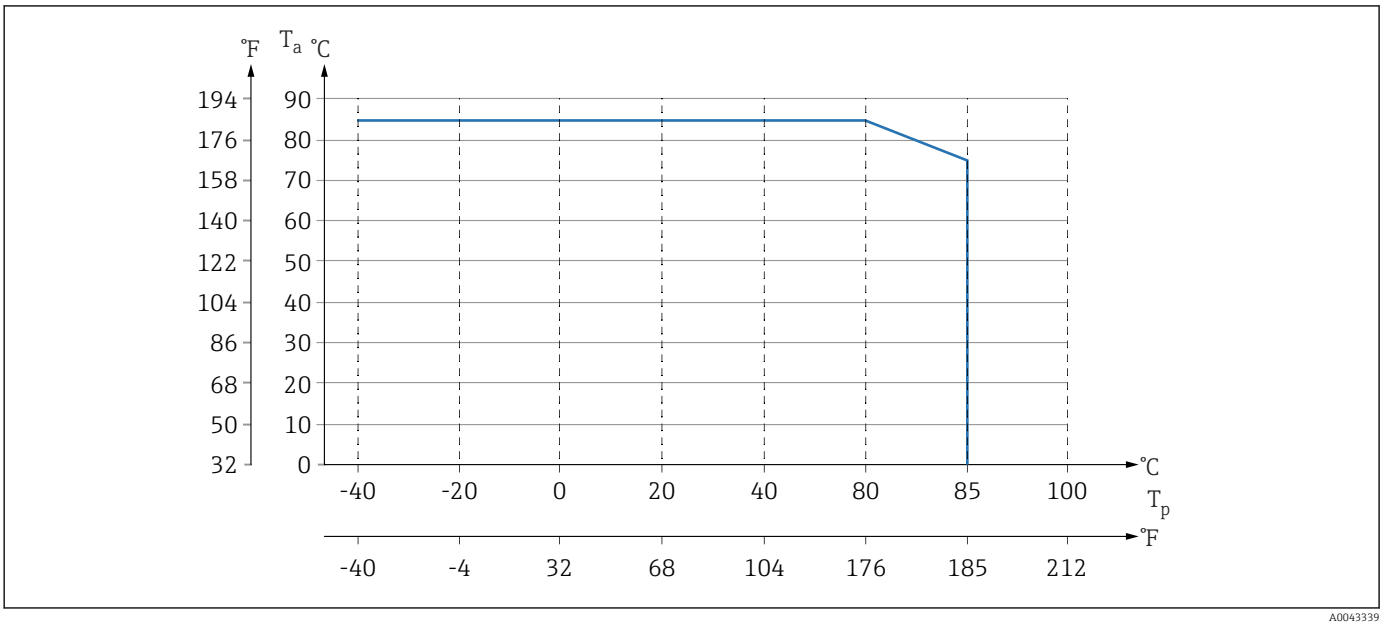
Process temperature range

NOTICE

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

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

Devices without a manifold



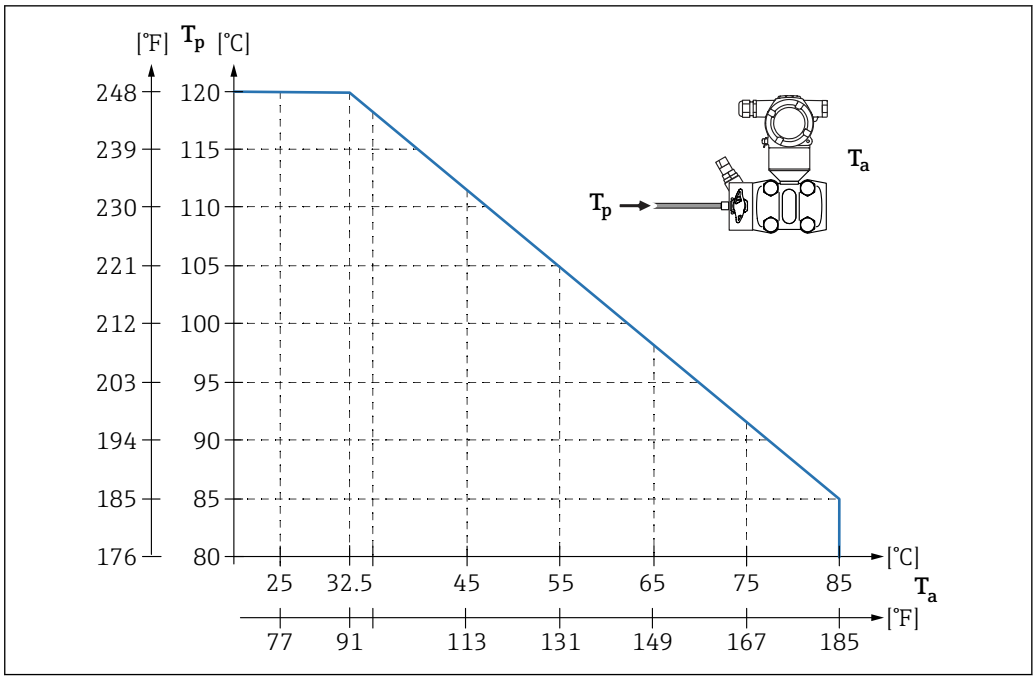
2 *Values apply for vertical mounting without insulation.*

T_p *Process temperature*
T_a *Ambient temperature*

Devices with a manifold

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

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



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

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}: 80 bar (1 200 psi)
- T_{max}: 60 °C (140 °F)

Seals

Seal	Temperature	Pressure specifications
FKM	−20 to +85 °C (−4 to +185 °F)	PN > 160 bar (2 320 psi): T_{min} −15 °C (+5 °F)
FKM Cleaned of oil and grease	−10 to +85 °C (+14 to +185 °F)	-
FKM Cleaned for oxygen service	−10 to +60 °C (+14 to +140 °F)	-
FFKM	−10 to +85 °C (+14 to +185 °F)	MWP: 160 bar (2 320 psi)
	−25 to +85 °C (−13 to +185 °F)	MWP: 100 bar (1 450 psi)
EPDM	−40 to +85 °C (−40 to +185 °F)	-
PTFE	−40 to +85 °C (−40 to +185 °F)	PN > 160 bar (2 320 psi) Minimum process temperature: −20 °C (−4 °F)
PTFE Cleaned for oxygen applications	−20 to +60 °C (−4 to +140 °F)	PN > 160 bar (2 320 psi) Minimum process temperature: −20 °C (−4 °F)

Process temperature range (temperature at transmitter)

Device without a manifold

- −40 to +85 °C (−40 to +185 °F)
- Pay attention to the process temperature range of the seal

Device with a manifold

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

For process temperatures >85 °C (185 °F) where non-insulated side flanges are installed horizontally on a manifold, a reduced ambient temperature applies up to a maximum ambient temperature, calculated according to the following formula:

$T_{Ambient_Temperature_max} = 85\ °C - 2.8 \cdot (T_{Process_Temperature} - 85\ °C)$

$T_{Ambient_Temperature_max} = 185\ °F - 2.8 \cdot (T_{Process_Temperature} - 185\ °F)$

$T_{Ambient_Temperature_max}$ = maximum ambient temperature in °C or °F

$T_{Process_Temperature}$ = process temperature at a manifold in °C or °F

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.

Mechanical construction

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

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

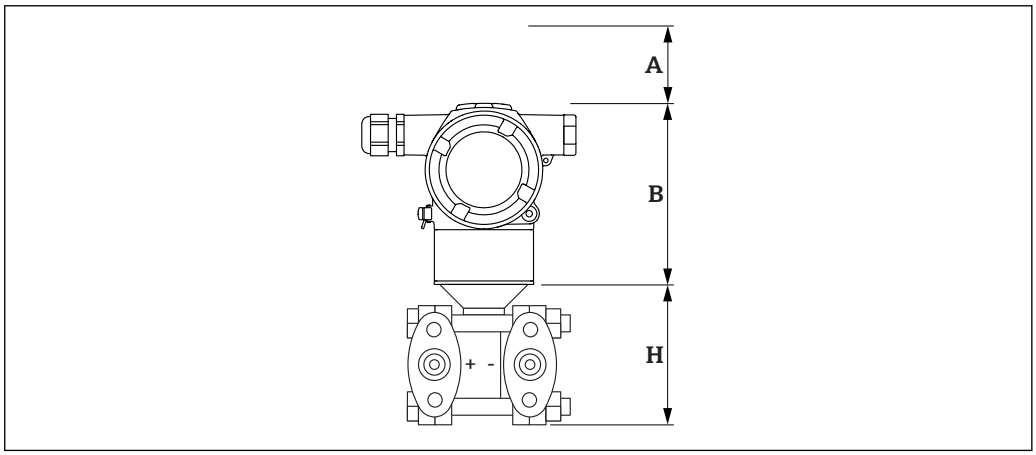
The following dimensions are rounded values. For this reason, the dimensions may deviate from the values on www.endress.com.

Design, dimensions

Device height

The device height is calculated from
- the height of the housing
- the height of the individual process connection

The individual heights of the components are listed in the following sections. To calculate the device height, add the individual heights of the components. Take the installation clearance into consideration (space that is used to install the device).

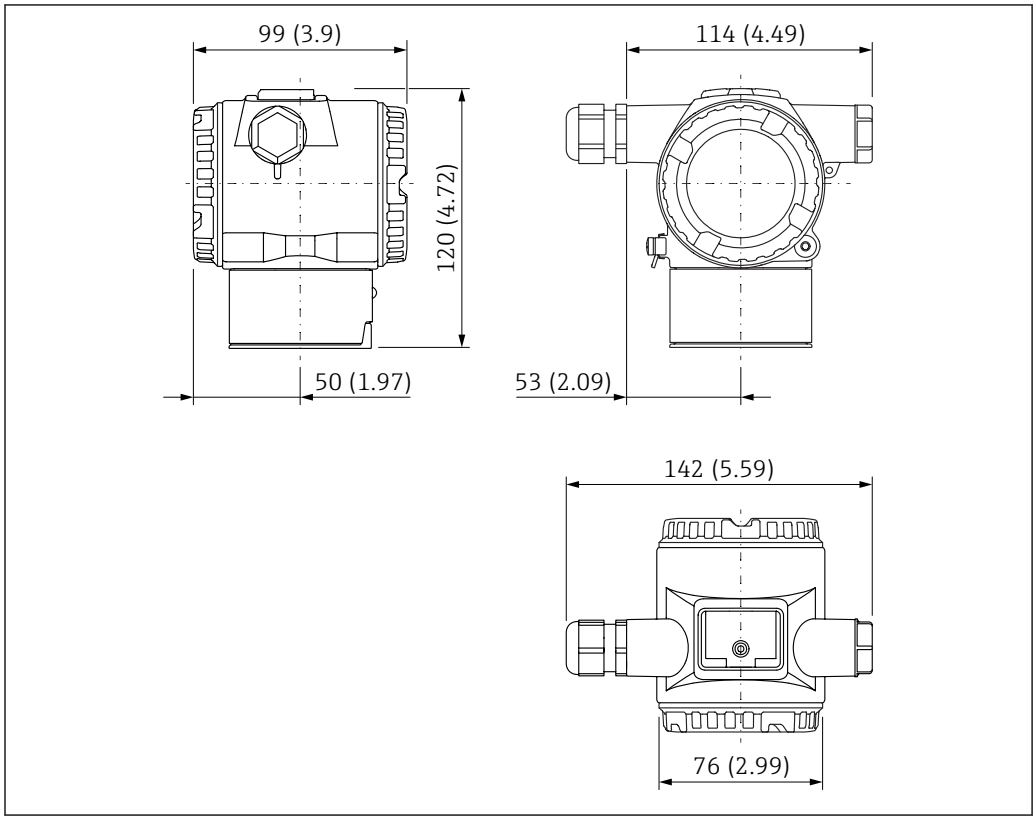


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A Installation clearance
B Height of the housing
H Height of the sensor assembly

Dimensions

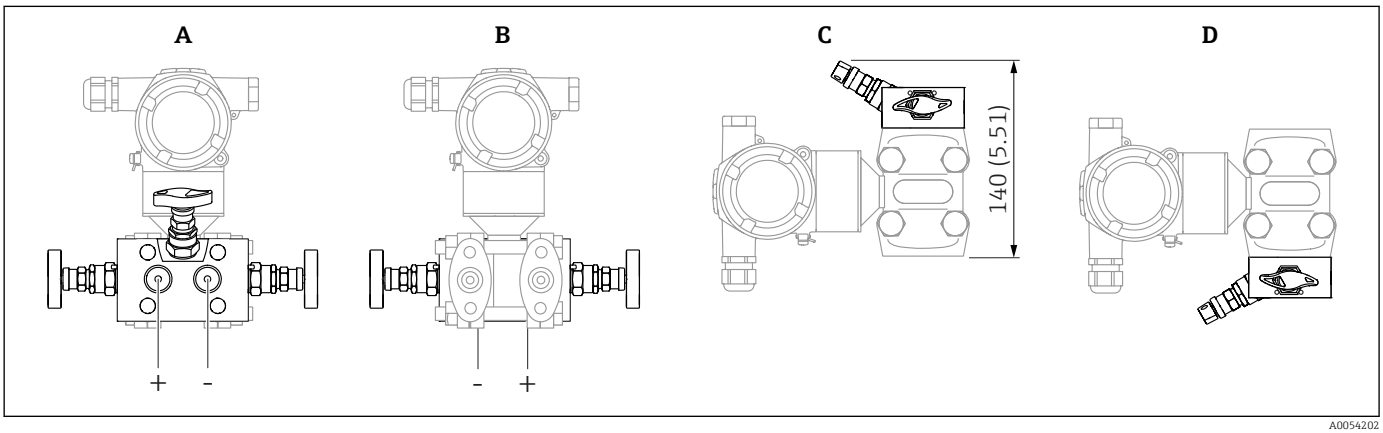
Dual compartment housing



Unit of measurement mm (in)

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

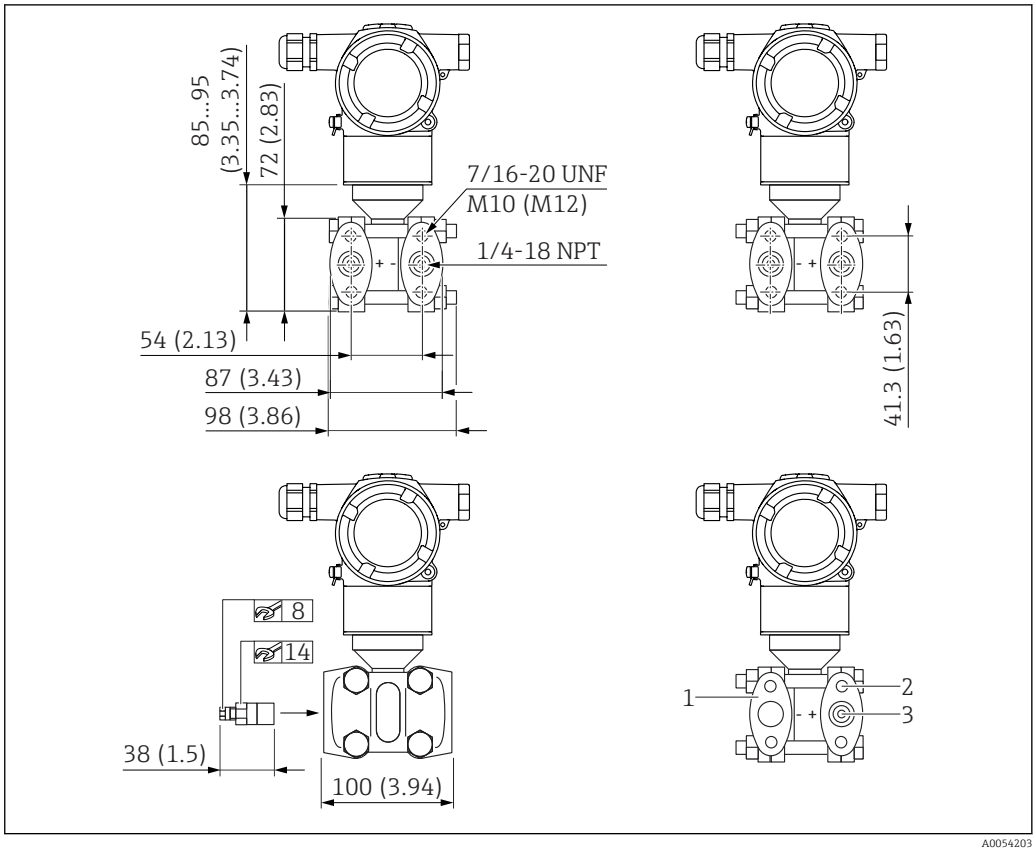
Mounting on manifold



Unit of measurement mm (in)

A Mounted backside of manifold
B Mounted front side of manifold
C Mounting from below on manifold
D Mounting from above on manifold

Oval flange connection 1/4-18 NPT



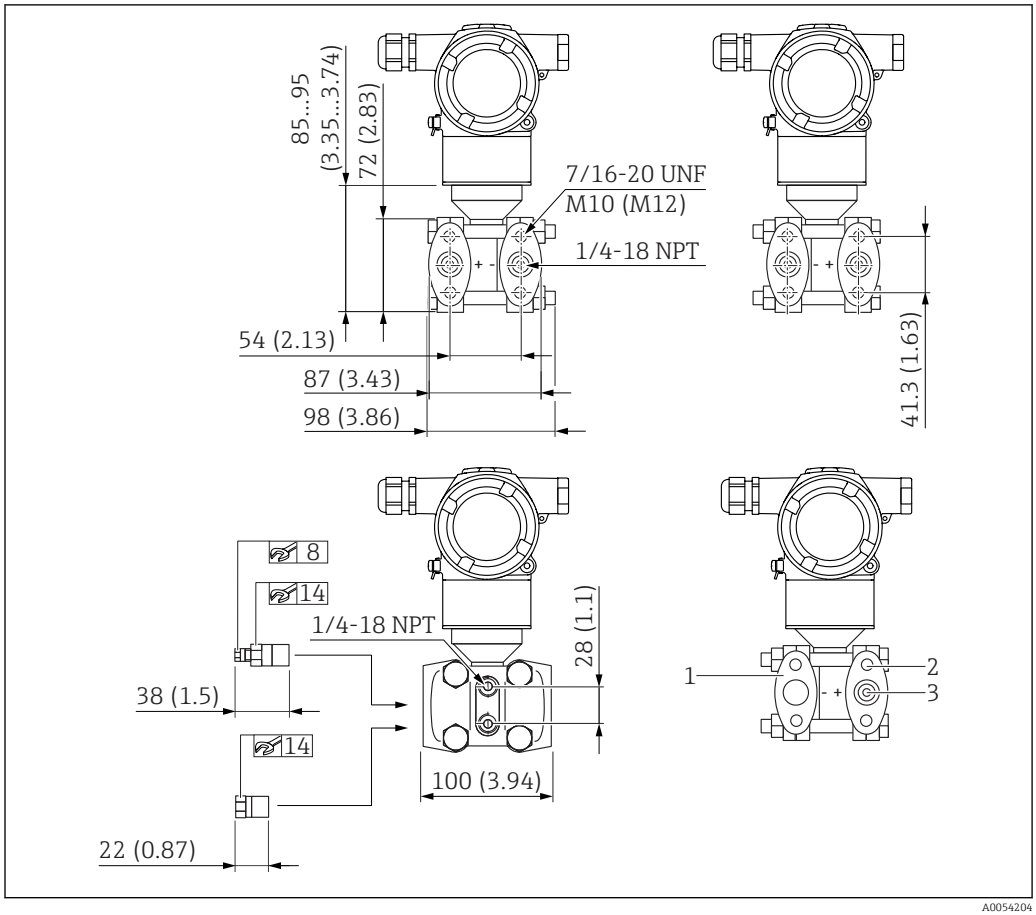
3 Front view, left-hand side view, right-hand side view. Unit of measurement mm (in)

1 Blind flange
2 Thread depth: 15 mm (0.59 in)
3 Thread depth: 12 mm (0.47 in)(±1 mm (0.04 in))
4 Height depends on hardware version

Connection	Fastening	Equipment	Option [1]
1/4-18 NPT IEC 615618	7/16-20 UNF screws (PN160 - PN250)	Includes 2 vent valves	SAJ
1/4-18 NPT IEC 61518 With blind flange on LP side (Version with absolute pressure measuring cell or gauge pressure measuring cell)	7/16-20 UNF screws (PN160 - PN250)	Includes 1 vent valve	SAJ

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

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



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

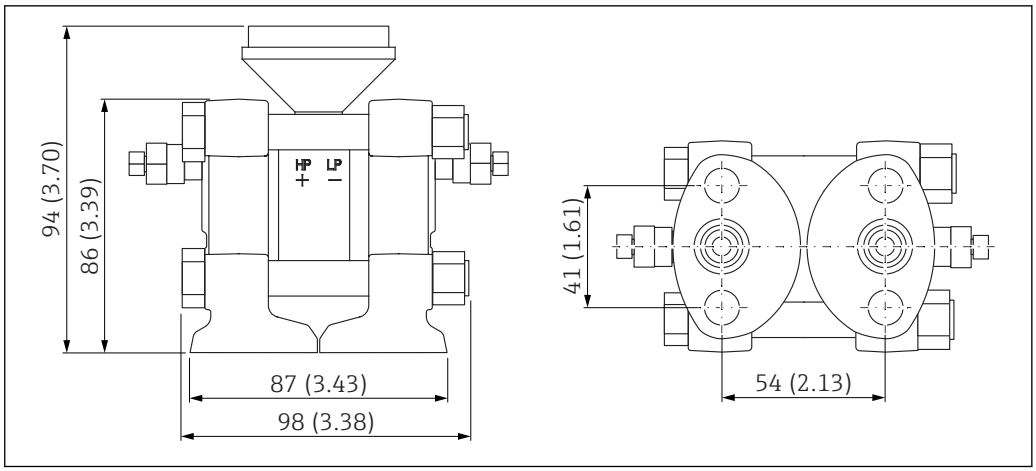
1 Blind flange
2 Thread depth: 15 mm (0.59 in)
3 Thread depth: 12 mm (0.47 in)(±1 mm (0.04 in))
4 Height depends on hardware version

Connection	Fastening	Equipment	Option [1]
1/4-18 NPT IEC 615618	7/16-20 UNF screws (PN160 - PN250)	Includes 4 locking screws 2 vent valves	SAJ
1/4-18 NPT IEC 61518 With blind flange on LP side (Version with absolute pressure measuring cell or gauge pressure measuring cell)	7/16-20 UNF screws (PN160 - PN250)	Includes 2 locking screws 1 vent valve	SAJ

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

Bottom process connection, NPT1/4-18 IEC61518 UNF7/16-20

For mounting on IEC manifolds in an upright position.



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)

Process connections

- Process connections made of 316L: max. 3.2 kg (7.06 lb)
- Super Duplex: max. 3.14 kg (6.92 lb)

Accessories

Mounting bracket: 0.5 kg (1.10 lb)

Materials in contact with process

Process membrane material

- 316L (1.4435)
- Alloy C276

Membrane coating

Gold, 25 µm

Seal

- PTFE
- FKM (FDA 21 CFR 177.2600)
- EPDM
- FFKM

Cell body

316L (1.4404)

Process connections

- NPT1/4-18 IEC61518 UNF7/16-20
  Side flange: AISI 316/316L (1.4408) / CF3M (cast equivalent to material AISI 316L)
- NPT1/4-18 DIN19213 M12
  Side flange: AISI 316/316L (1.4408) / CF3M (cast equivalent to material AISI 316L)
- NPT1/4-18 coplanar IEC
  Side flange: Super Duplex (1.4469) (resistant to sea water, Super Duplex cast)

Vent valves

Depending on process connection ordered:
AISI 316L (1.4404)

Locking screws

AISI 316L (1.4404)

For Alloy C276 process connections, locking screws are not included but must/can be ordered separately as an enclosed accessory.

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
- Inert oil (not suitable for temperatures below −20 °C (−4 °F))

Connecting parts

Connection between housing and process connection: AISI 316L (1.4404)

- Connection between housing and process connection: AISI 316L (1.4404)
- Screws and nuts
  - PN 160: hex.-headed bolt DIN 931-M12x90-A4-70
  - PN 160: hex.-headed nut DIN 934-M12-A4-70
  - PN 250: hex.-headed bolt ISO 4014-M12x90-A4
  - PN 250: hex.-headed nut ISO 4032-M12-A4-bs
- Side flanges: AISI 316/316L (1.4408) / CF3M (cast equivalent to material AISI 316L)

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

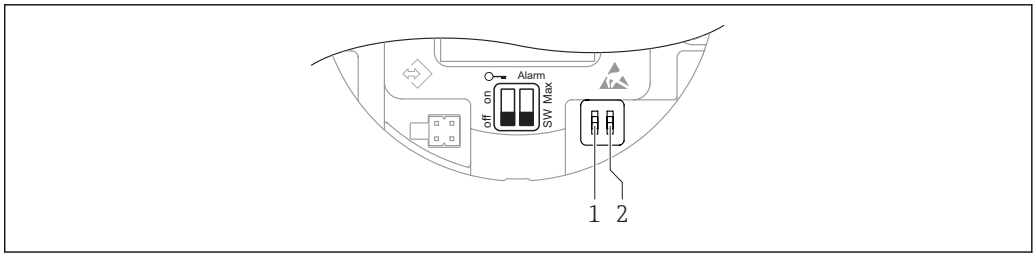
Quick and safe commissioning
- Interactive wizard with graphical user interface for guided commissioning in FieldCare, DeviceCare or DTM, AMS and PDM-based third-party tools
- Menu guidance with brief descriptions of the individual parameter functions

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



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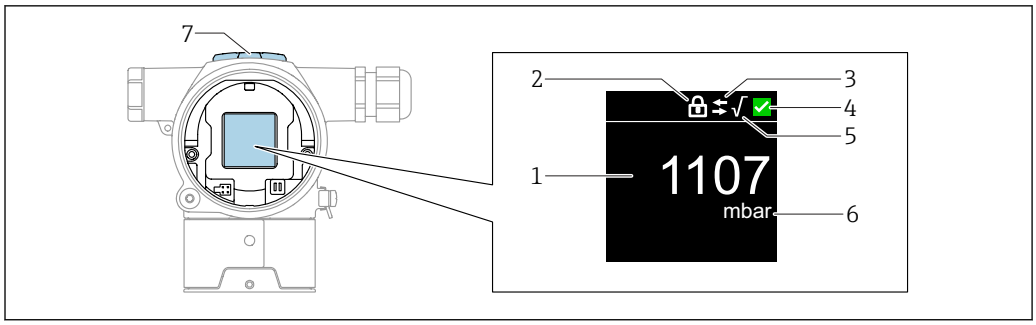
1 DIP switch for locking and unlocking the device
2 DIP switch for alarm current

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.

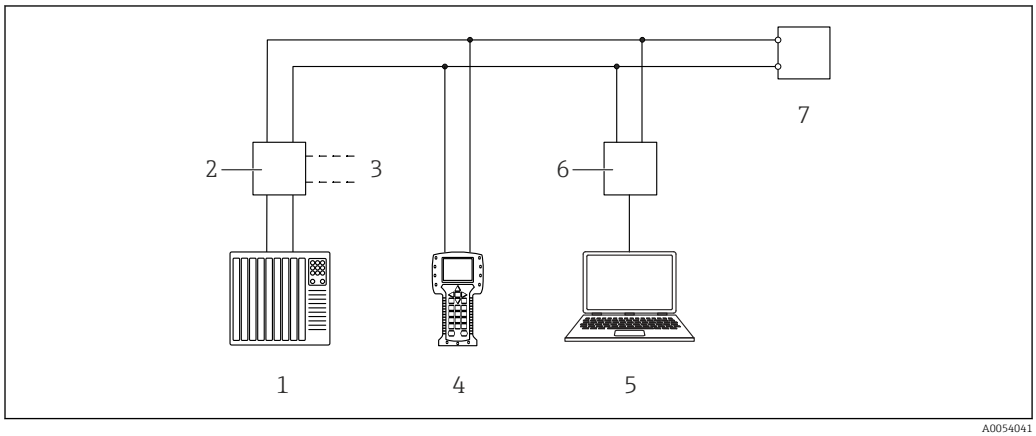


5 Color display

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 Square root extraction (appears when applied to measured value)
6 Measured value output in %
7 Magnetic keys (Zero and Span)

Remote operation

Via HART protocol



6 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:

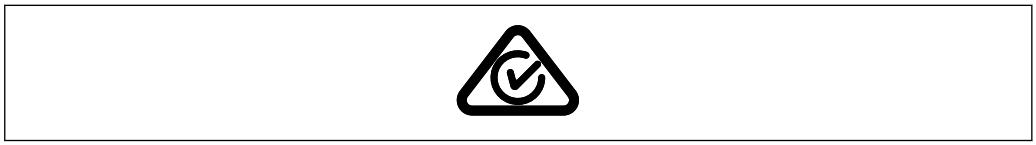
1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

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.



A0029561

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

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

- ABS (American Bureau of Shipping)
- LR (Lloyd's Register)
- BV (Bureau Veritas)
- DNV (Det Norske Veritas)
- CCS (China Classification Society)

CRN approval (under development)

A CRN approval (Canadian Registration Number) is available for some device versions. These devices are equipped with a separate plate bearing a registration number (in preparation).

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 a maximum allowable pressure of less than 200 bar, and a pressure-bearing volume of less than 0,1 liters

Pressure equipment is subject to the Pressure Equipment Directive if the maximum allowable pressure is less than 200 bar and the pressure-bearing volume of the pressure equipment is less than 0,1 liters.

Pressure equipment with a maximum allowable pressure of less than 200 bar may be classified as pressure-bearing equipment parts in accordance with Pressure Equipment Directive 2014/68/EU.

The Pressure Equipment Directive merely specifies that the pressure equipment must be designed in accordance with sound engineering practice.

Reference:
- Druckgeräterichtlinie DGRL (PED) 2014/68/EU, Artikel 4, Absatz 3
- Pressure equipment directive 2014/68/EU, Commission´s Working Group "Pressure", Guideline A-05 and A-06

Pressure equipment that form parts of a safety instrumented system intended to protect a pipe or vessel against exceeding the permissible limits must be considered separately.

Druckgeräterichtlinie 2014/68/EU, Art. 2, Abs. 4 (Ausrüstungsteil mit Sicherheitsfunktion)

Pressure equipment with a maximum allowable pressure of more than 200 bar, and a pressure-bearing volume of less than 0,1 liters

Pressure equipment intended for use in any process fluids with a pressure-bearing volume of less than 0,1 liters and a maximum allowable pressure (PS) greater than 200 barmust comply with the essential safety requirements of Annex I of Pressure Equipment Directive 2014/68/EU. According to Article 13, pressure equipment must be classified into categories in accordance with Annex II. Due to

the small volume, this pressure equipment can be assigned to Category I. It must therefore bear a CE marking.

Reference:
- Druckgeräterichtlinie DGRL (PED) 2014/68/EU, Artikel 13, Anhang II
- Pressure equipment directive 2014/68/EU, Commission´s Working Group "Pressure", Guideline A-05

Pressure equipment that form parts of a safety instrumented system intended to protect a pipe or vessel against exceeding the permissible limits must be considered separately.

Druckgeräterichtlinie 2014/68/EU, Art. 2, Abs. 4 (Ausrüstungsteil mit Sicherheitsfunktion)

Special cases - pressure equipment
- Devices with diaphragm seals larger than 1,5" / PN 40: suitable for stable gases of Group 1, Category I, Module A
- Devices with inline seals larger than 1,5" / PN 40: suitable for stable gases of Group 1, Category II, Module A2

SD01893P
- Devices with threads and internal membrane
- Devices with threaded connection

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

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

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
(https://www.endress.com/de/pages/supporting-tools/device-viewer)

Accessories

Device-specific accessories

Mechanical accessories

- Mounting bracket for housing
- Mounting bracket for manifolds
- Manifolds:
  - Manifolds can be ordered as a separate accessory (screws and seals for mounting are enclosed).
  - Manifolds can be ordered as a **separate** accessory (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.
- Oval flange adapter
- Calibration adapter 5/16"-24 UNF, to screw into vent valves
- 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.

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