TI01507P/00/EN/09.25-00
71712828
2025-08-01

Technical Information
Cerabar PMC71B

Process pressure and level measurement in liquids or gases
4-20mA HART, PROFINET over Ethernet-APL, PROFIBUS PA



Digital pressure transmitter with ceramic process membrane

Application

- Pressure measuring ranges: up to 40 bar (600 psi)
- Completely vacuum resistant: up to +150 °C (302 °F) process temperature
- Accuracy: up to ±0.025%

Advantages

The new Cerabar generation introduces a robust pressure transmitter that combines numerous benefits: Easiest local or remote operation, allows condition-based maintenance and offers smart safety in processes. The firmware is designed to ensure extremely easy handling. Intuitive and clear wizard navigation guides the user through the commissioning and verification of the device. The Bluetooth connectivity provides safe and remote operation. The large display with backlight guarantees excellent readability. The Heartbeat Technology software package offers an on-demand verification and monitoring function to detect undesired anomalies, such as dynamic pressure shocks or changes in the supply voltage. The device features a ceramic membrane for abrasive, corrosive or vacuum applications with integrated membrane breakage diagnostic.

Endress+Hauser
People for Process Automation

Table of contents

About this document 4
Symbols 4
Graphic conventions 4
List of abbreviations 5
Turn down calculation 5

Function and system design 6
Equipment architecture 6
Measuring system 6
Communication and data processing 7
Reliability for devices with HART, Bluetooth, PROFINET over Ethernet-APL , PROFIBUS PA 7

Input 8
Measured variable 8
Measuring range 8

Output 10
Output signal 10
Signal on alarm 10
Load 10
Damping 11
Ex connection data 11
Linearization 11
Protocol-specific data 11
Wireless HART data 13

Power supply 14
Terminal assignment 14
Available device plugs 14
Supply voltage 16
Electrical connection 16
Potential equalization 17
Terminals 17
Cable entries 17
Cable specification 18
Overvoltage protection 18

Performance characteristics 20
Response time 20
Reference operating conditions 20
Total performance 20
Resolution 22
Total error 22
Long-term stability 23
Response time T63 and T90 23
Installation factors 23
Warm-up time 24

Installation 25
Orientation 25
Installation instructions 25
Sensor selection and arrangement 25
Special mounting instructions 26

Environment 28
Ambient temperature range 28
Storage temperature 28
Operating altitude 28
Climate class 28
Degree of protection 28
Vibration resistance 29
Electromagnetic compatibility (EMC) 29

Process 30
Process temperature range 30
Thermal shock 31
Process pressure range 31
Ultrapure gas applications 32
Steam applications and saturated steam applications 32

Mechanical construction 33
Design dimensions 33
Dimensions 34
Weight 45
Materials in contact with process 46
Materials not in contact with process 47
Accessories 49

Operability 50
Operating concept 50
Languages 50
Local operation 50
Local display 51
Remote operation 53
System integration 55
Supported operating tools 55
HistoROM 55

Certificates and approvals 56
CE mark 56
RCM-Tick marking 56
Ex approvals 56
Sanitary compatibility 56
EAC conformity 56
Drinking water approval 56
Overfill protection system 56
Functional safety SIL/ IEC 61508 Declaration of Conformity 56
Marine approval 57
Radio approval 57
CRN approval 57
Test reports 57
Pressure Equipment Directive 2014/68/EU (PED) 57
Oxygen application (optional) 58
China RoHS symbol 58
RoHS 58
PROFINET over Ethernet-APL certification 58
Additional certification 58

Order information 59
Ordering information 59
Scope of delivery 59
Service 59
Measuring point (TAG) 59

Test reports, declarations and inspection certificates 60

Application packages 61
Heartbeat Technology 61
High-temperature version 61

Accessories 62
Device-specific accessories 62
Device Viewer 62

Documentation 62

Registered trademarks 63

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

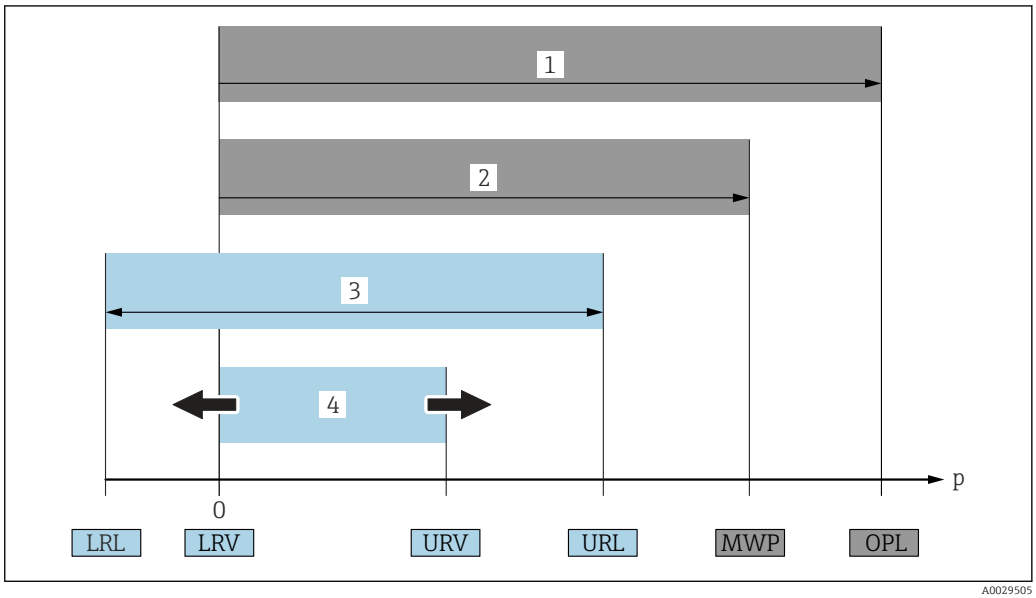
Safety instructions: ⚠ → 📖

Observe the safety instructions contained in the associated Operating Instructions.

Graphic conventions

- Installation, explosion and electrical connection drawings are presented in simplified format
- Devices, assemblies, components and dimensional drawings are presented in reduced-line format
- Dimensional drawings are not to-scale representations; the dimensions indicated are rounded off to 2 decimal places

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.*

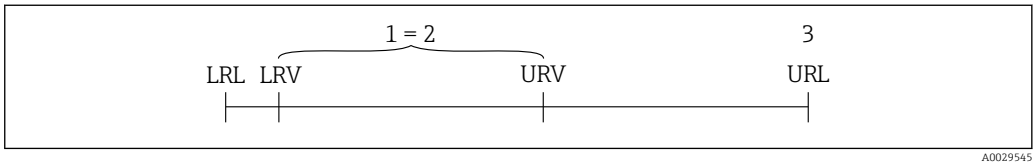
2 *MWP: The MWP (maximum working pressure) for the measuring cells depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection also has to be taken into consideration besides the measuring cell. Observe pressure-temperature dependency. The maximum 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 point-based span*
3 *Upper range limit*

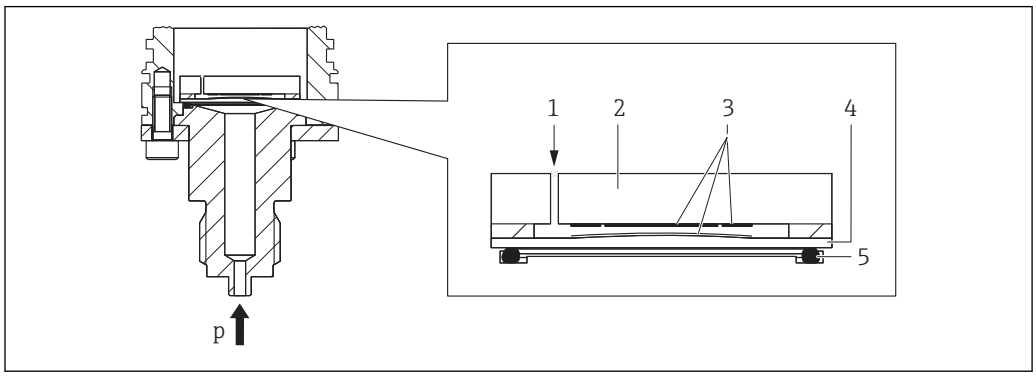
Example:
- Measuring cell: 10 bar (150 psi)
- Upper range limit (URL) = 10 bar (150 psi)
- Calibrated/adjusted span: 0 to 5 bar (0 to 75 psi)
- Lower range value (LRV) = 0 bar (0 psi)
- Upper range value (URV) = 5 bar (75 psi)

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

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

Function and system design

Equipment architecture



A0043088

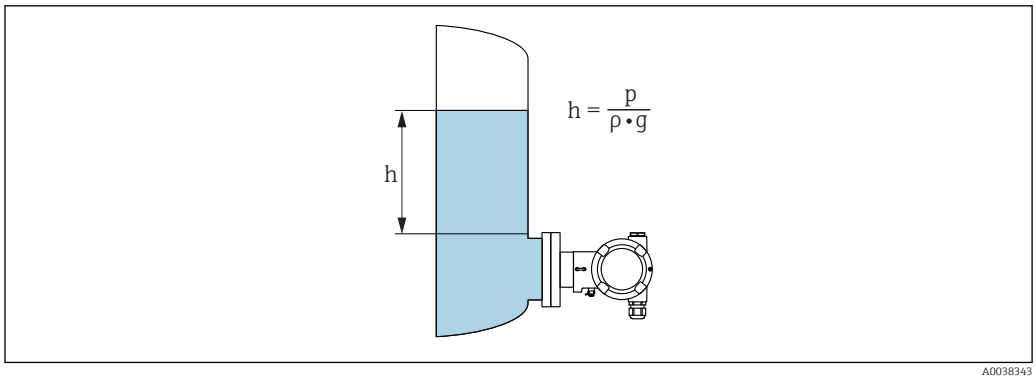
1 Atmospheric pressure (gauge pressure measuring cell)
2 Ceramic meter body
3 Electrodes
4 Ceramic membrane
5 Seal
p Pressure

The ceramic measuring cell (Ceraphire®) is an oil-free measuring cell. The pressure acts directly on the robust ceramic membrane and causes it to deflect. A pressure-dependent change in capacitance is measured at the electrodes of the ceramic meter body and the membrane. The measuring range is determined by the thickness of the ceramic membrane.

Advantages:
- High overload resistance
- Thanks to ultrapure 99.9 % ceramic
  - Extremely high chemical durability
  - Resistant to abrasion and corrosion
  - High mechanical durability
- Suitable for vacuum applications
- Secondary containment for enhanced integrity

Measuring system

Level measurement (level, volume and mass):



A0038343

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 (optional)
- Bluetooth (optional)
- PROFIBUS PA (optional)
- PROFINET over Ethernet-APL (optional): 10BASE-T1L communication protocol

Reliability for devices with HART, Bluetooth, PROFINET over Ethernet-APL , PROFIBUS PA

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.

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		Smallest calibratable span (preset at factory) [1) 2)]	
	lower (LRL)	upper (URL)		
	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar (psi)]	Platinum
100 mbar (1.5 psi)	0	+0.1 (+1.5)	0.005 (0.075) [3)]	20 mbar (0.3 psi)
250 mbar (3.75 psi)	0	+0.25 (+3.75)	0.005 (0.075) [4)]	50 mbar (1 psi)
400 mbar (6 psi)	0	+0.4 (+6)	0.005 (0.075) [5)]	80 mbar (1.2 psi)
1 bar (15 psi)	0	+1 (+15)	0.01 (0.15) [6)]	200 mbar (3 psi)
2 bar (30 psi)	0	+2 (+30)	0.02 (0.3) [6)]	400 mbar (6 psi)
4 bar (60 psi)	0	+4 (+60)	0.04 (0.6) [6)]	800 mbar (12 psi)
10 bar (150 psi)	0	+10 (+150)	0.1 (1.5) [6)]	2 bar (30 psi)
40 bar (600 psi)	0	+40 (+600)	0.4 (6) [6)]	8 bar (120 psi)

1) Turn down > 100:1 on request or can be configured at the device
2) The maximum TD is 5:1 in the case of platinum.
3) Largest factory-configurable turn down: 20:1
4) Largest factory-configurable turn down: 50:1
5) Largest factory-configurable turn down: 80:1
6) Largest factory-configurable turn down: 100:1

Absolute pressure

Measuring cell	MWP	OPL	Vacuum resistance	Burst pressure [1)]
	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar_{abs} (psi_{abs})]	[bar (psi)]
100 mbar (1.5 psi)	2.7 (40.5)	4 (60)	0	4 (60)
250 mbar (3.75 psi)	3.3 (49.5)	5 (75)	0	5 (75)
400 mbar (6 psi)	5.3 (79.5)	8 (120)	0	8 (120)
1 bar (15 psi)	6.7 (100.5)	10 (150)	0	10 (150)
2 bar (30 psi)	12 (180)	18 (270)	0	18 (270)
4 bar (60 psi)	16.7 (250.5)	25 (375)	0	25 (375)
10 bar (150 psi)	26.7 (400.5)	40 (600)	0	40 (600)
40 bar (600 psi)	40 (600)	60 (900)	0	60 (900)

1) The information applies to the standard device (without a diaphragm seal).

Gauge pressure

Measuring cell	Maximum measuring range		Smallest calibratable span (preset at factory) [1) 2)]	
	lower (LRL)	upper (URL)		
	[bar (psi)]	[bar (psi)]	[bar (psi)]	Platinum
100 mbar (1.5 psi)	−0.1 (−1.5)	+0.1 (+1.5)	0.005 (0.075) [3)]	20 mbar (0.3 psi)
250 mbar (3.75 psi)	−0.25 (−3.75)	+0.25 (+3.75)	0.005 (0.075) [4)]	50 mbar (1 psi)

Measuring cell	Maximum measuring range		Smallest calibratable span (preset at factory) [1) 2)]	
	lower (LRL)	upper (URL)		
	[bar (psi)]	[bar (psi)]	[bar (psi)]	Platinum
400 mbar (6 psi)	−0.4 (−6)	+0.4 (+6)	0.005 (0.075) [5)]	80 mbar (1.2 psi)
1 bar (15 psi)	−1 (−15)	+1 (+15)	0.01 (0.15) [6)]	200 mbar (3 psi)
2 bar (30 psi)	−1 (−15)	+2 (+30)	0.02 (0.3) [6)]	400 mbar (6 psi)
4 bar (60 psi)	−1 (−15)	+4 (+60)	0.04 (0.6) [6)]	800 mbar (12 psi)
10 bar (150 psi)	−1 (−15)	+10 (+150)	0.1 (1.5) [6)]	2 bar (30 psi)
40 bar (600 psi)	−1 (−15)	+40 (+600)	0.4 (6) [6)]	8 bar (120 psi)

1) Turn down > 100:1 on request or can be configured at the device
2) The maximum TD is 5:1 in the case of platinum.
3) Largest factory-configurable turn down: 20:1
4) Largest factory-configurable turn down: 50:1
5) Largest factory-configurable turn down: 80:1
6) Largest factory-configurable turn down: 100:1

Gauge pressure

Measuring cell	MWP	OPL	Vacuum resistance	Burst pressure [1)]
	[bar (psi)]	[bar (psi)]	[bar_{abs} (psi_{abs})]	[bar (psi)]
100 mbar (1.5 psi)	2.7 (40.5)	4 (60)	0.7 (10.5)	4 (60)
250 mbar (3.75 psi)	3.3 (49.5)	5 (75)	0.5 (7.5)	5 (75)
400 mbar (6 psi)	5.3 (79.5)	8 (120)	0	8 (120)
1 bar (15 psi)	6.7 (100.5)	10 (150)	0	10 (150)
2 bar (30 psi)	12 (180)	18 (270)	0	18 (270)
4 bar (60 psi)	16.7 (250.5)	25 (375)	0	25 (375)
10 bar (150 psi)	26.7 (400.5)	40 (600)	0	40 (600)
40 bar (600 psi)	40 (600)	60 (900)	0	60 (900)

1) The information applies to the standard device (without a 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

PROFINET with Ethernet-APL

10BASE-T1L, 2-wire 10 Mbit

PROFIBUS PA

According to EN 50170 Volume 2, IEC 61158-2

Signal coding:
Manchester Bus Powered (MBP) type 1

Data transmission rate:
31.25 kBit/s, voltage mode

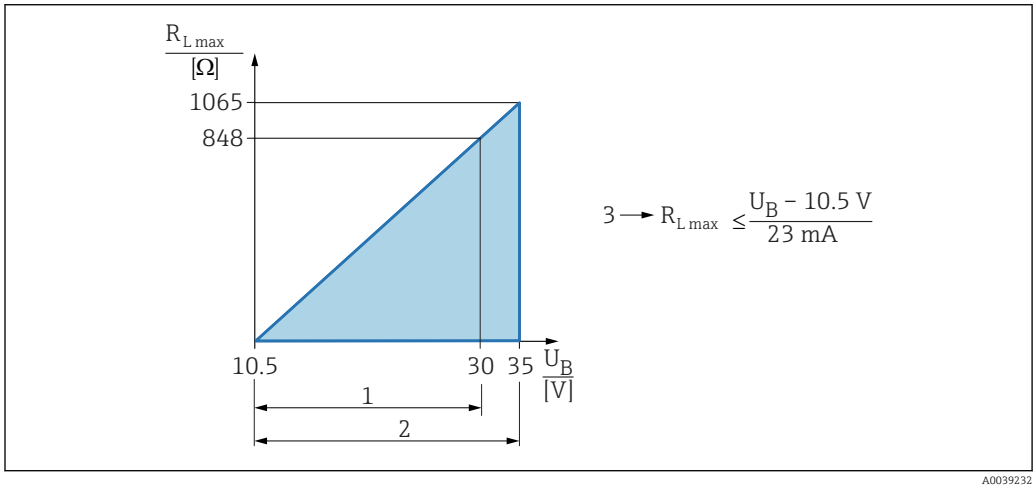
Galvanic isolation:
Yes

Signal on alarm

- 4 to 20 mA HART:
  Options:
  - Max alarm: can be set from 21.5 to 23 mA
  - Min. alarm: < 3.6 mA (factory setting)
  - Signal on alarm in accordance with NAMUR recommendation NE 43.
- PROFINET over Ethernet-APL:
  - According to "Application layer protocol for decentralized periphery", Version 2.4
  - Diagnostics according to PROFINET PA Profile 4.02
- PROFIBUS PA
  - Diagnostics in accordance with PROFIBUS PA Profile 3.02
  - Status signal (as per NAMUR recommendation NE 107) plain text display

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_B Supply voltage

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

Damping

A damping affects all outputs (output signal, display). Damping can be enabled as follows:
- Via the onsite display, Bluetooth, handheld terminal or PC with operating program, continuous from 0 to 999 seconds
- Factory setting: 1 s

Ex connection data

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

Linearization

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

Protocol-specific data

HART

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

HART device variables (preset at the factory)

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

Device variable	Measured value
Primary variable (PV) [1]	Pressure [2]
Secondary variable (SV)	Sensor temperature
Tertiary variable (TV)	Electronic temperature
Quaternary variable (QV)	Sensor pressure [3]

1) The PV is always applied to the current output.
2) The pressure is the calculated signal after damping and position adjustment.
3) The Sensor pressure is the raw 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
- Terminal current
  The terminal current is the read-back current on terminal block.
- Terminal voltage 1
  Visibility depends on order options or device settings
- **Noise of pressure signal** option and **Median of pressure signal** option
  Visible if Heartbeat Technology ordered
- 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

PROFINET over Ethernet-APL

Protocol	Application layer protocol for decentral device periphery and distributed automation, Version 2.4
Communication type	Ethernet Advanced Physical Layer 10BASE-T1L
Conformity class	Conformance Class B
Netload Class	Netload Class II
Baud rates	Automatic 10 Mbit/s with full-duplex detection
Periods	From 32 ms
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Media Redundancy Protocol (MRP)	Yes
System redundancy support	System redundancy S2 (2 AR with 1 NAP)
Device profile	Application interface identifier 0xB310 Generic device
Manufacturer ID	0x11
Device type ID	A22A
Device description files (GSD, FDI, DTM, DD)	Information and files at: ▪ www.endress.com On the product page for the device: Documents/Software → Device drivers ▪ www.profibus.org
Supported connections	▪ 2 x AR (IO Controller AR) ▪ 1 x AR (IO-Supervisor Device AR connection allowed) ▪ 1 x Input CR (Communication Relation) ▪ 1 x Output CR (Communication Relation) ▪ 1 x Alarm CR (Communication Relation)
Configuration options for device	▪ Manufacturer-specific software (FieldCare, DeviceCare) ▪ Web browser ▪ Device master file (GSD), can be read out via the integrated web server of the device ▪ DIP switch for setting the service IP address
Configuration of the device name	▪ DCP protocol ▪ Process Device Manager (PDM) ▪ Integrated web server
Supported functions	▪ Identification & maintenance Simple device identification via: ▪ Control system ▪ Nameplate ▪ Measured value status The process variables are communicated with a measured value status ▪ Blinking feature via the local display for simple device identification and assignment ▪ Device operation via operating tools (e.g. FieldCare, DeviceCare, SIMATIC PDM)
System integration	For information on system integration, see Operating Instructions ▪ Cyclic data transmission ▪ Overview and description of the modules ▪ Status coding ▪ Startup parameterization ▪ Factory setting

PROFIBUS PA

Manufacturer ID:
17 (0x11)

Ident number:
0x1573 or 0x9700

Profile version:
3.02

GSD file and version
Information and files at:
- www.endress.com
  On the product page for the device: Documents/Software → Device drivers
- www.profibus.com

Output values

Analog Input:
- Pressure
- Scaled variable
- Sensor temperature
- Sensor pressure
- Electronics temperature
- **Median of pressure signal** option (only available if the "Heartbeat Verification + Monitoring" application package was selected).
- **Noise of pressure signal** option (only available if the "Heartbeat Verification + Monitoring" application package was selected).

Digital Input:
ℹ Only available if the "Heartbeat Verification + Monitoring" application package was selected

Heartbeat Technology → SSD: Statistical Sensor Diagostics

Heartbeat Technology → Process Window

Input values

Analog Output:
Analog value from PLC to be indicated on the display

Supported functions

- Identification & maintenance
  Simple device identification via control system and nameplate
- Automatic Ident Number Adoption
  GSD compatibility mode for generic profile 0x9700 "Transmitter with 1 Analog Input"
- Physical Layer Diagnostics
  Installation check of the PROFIBUS segment and device using terminal voltage and message monitoring
- PROFIBUS upload/download
  Reading and writing parameters is up to ten times faster with PROFIBUS upload/download
- Condensed status
  Straightforward and self-explanatory diagnostic information through categorization of occurring diagnostic messages

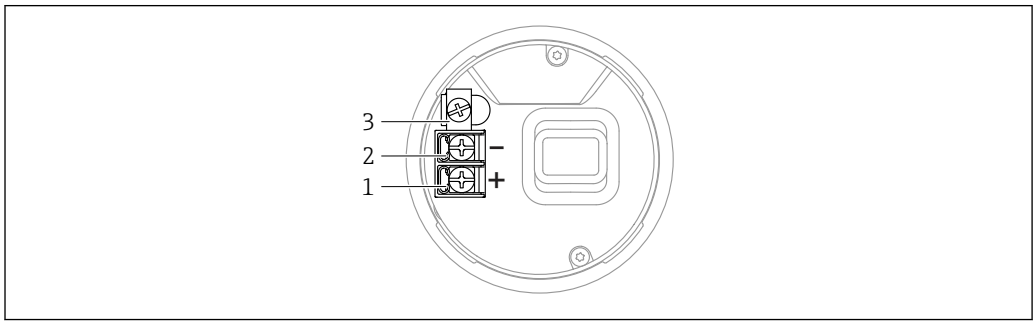
Wireless HART data

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

Power supply

Terminal assignment

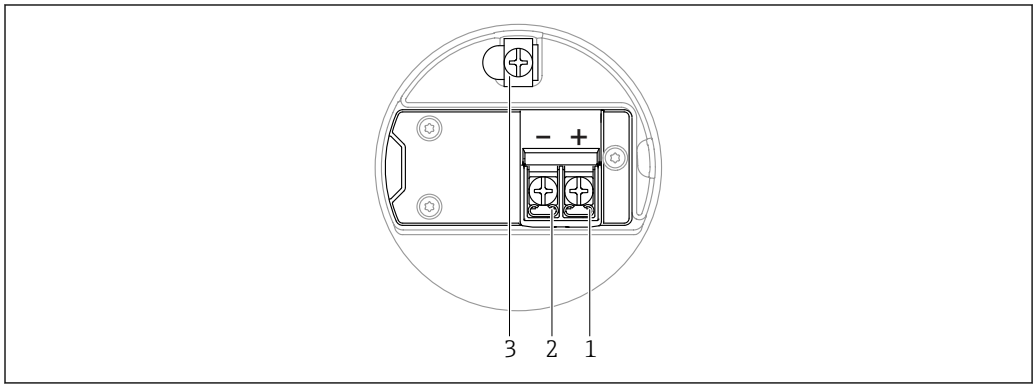
Single compartment housing



1 *Connection terminals and ground terminal in the connection compartment*

1 *Plus terminal*
2 *Minus terminal*
3 *Internal ground terminal*

Dual-compartment housing



2 *Connection terminals and ground terminal in the connection compartment*

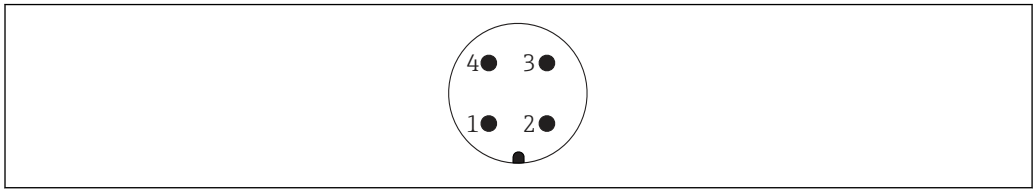
1 *Plus terminal*
2 *Minus terminal*
3 *Internal ground terminal*

Available device plugs

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

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

Devices with M12 plug



3 *View of the plug-in connection on the device*

Pin	HART PROFIBUS PA
1	Signal +
2	Not used

Pin	HART PROFIBUS PA
3	Signal –
4	Earth

Pin	PROFINET over Ethernet-APL
1	APL signal -
2	APL signal +
3	Shielding
4	Not used

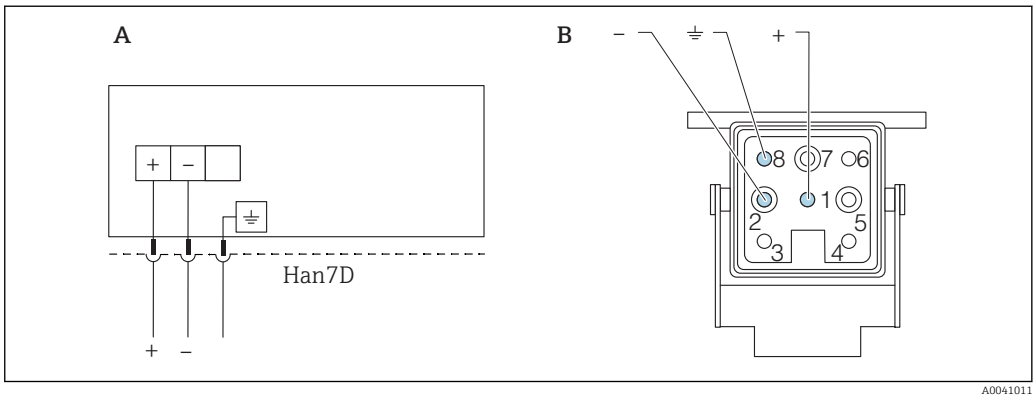
Endress+Hauser offers the following accessories for devices with an M12 plug:

Plug-in jack M 12x1, straight
- Material:
  Body: PBT; union nut: nickel-plated die-cast zinc; seal: NBR
- Degree of protection (fully locked): IP67
- Order number: 52006263

Plug-in jack M 12x1, angled (not for PROFINET over Ethernet-APL)
- Material:
  Body: PBT; union nut: nickel-plated die-cast zinc; seal: NBR
- Degree of protection (fully locked): IP67
- Order number: 71114212

Cable 4x0.34 mm^2 (20 AWG) with M12 plug-in jack, elbowed, screw plug, length 5 m (16 ft)
- Material: body: TPU; union nut: nickel-plated die-cast zinc; cable: PVC
- Degree of protection (fully locked): IP67/68
- Order number: 52010285
- Cable colors
  - 1 = BN = brown
  - 2 = WT = white
  - 3 = BU = blue
  - 4 = BK = black

Devices with a Harting plug Han7D



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

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

Supply voltage

- Analog/HART: Ex d, Ex e, non-Ex: supply voltage: 10.5 to 35 V_{DC}
- Analog/HART: Ex i: supply voltage: 10.5 to 30 V_{DC}
- HART: Nominal current: 4 to 20 mA HART
- PROFINET over Ethernet-APL: APL power class A (9.6 to 15 V_{DC} 540 mW)
- PROFIBUS PA
  - Non-hazardous, Ex d, Ex e: 9 to 32 V_{DC}
  - Ex i FISCO principle: 9 to 17.5 V_{DC}
  - Ex i entity concept: 9 to 24 V_{DC}
  - Nominal current: 14 mA
  - Failure current FDE (Fault Disconnection Electronic) 0 mA

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

Depending on the supply voltage at the time of power-on:
- The background lighting is deactivated (supply voltage <15 V 12 V)
- The Bluetooth function (order option) is also deactivated (supply voltage <12 V 10 V).

Analog/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.

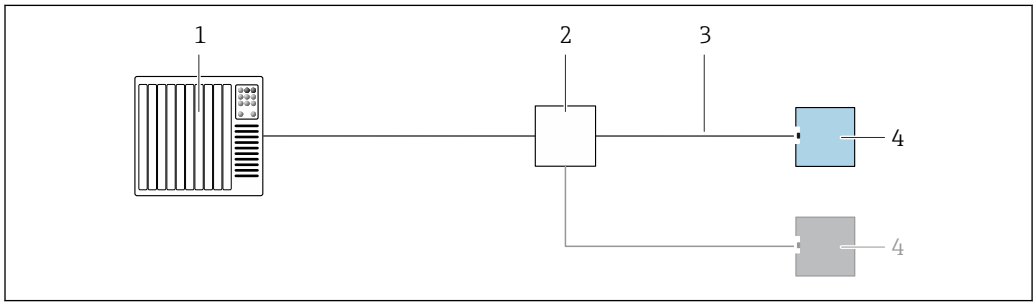
PROFINET over Ethernet-APL: The APL field switch must be tested to ensure it meets safety requirements (e.g. PELV, SELV, Class 2) and must comply with the relevant protocol specifications.

PROFIBUS PA:
- Use only suitable and certified PROFIBUS PA components (e.g. DP/PA segment coupler) for the power supply.
- FISCO/FNICO-compliant according to IEC 60079-27
- The supply is not polarity-dependent

Electrical connection

Connection examples

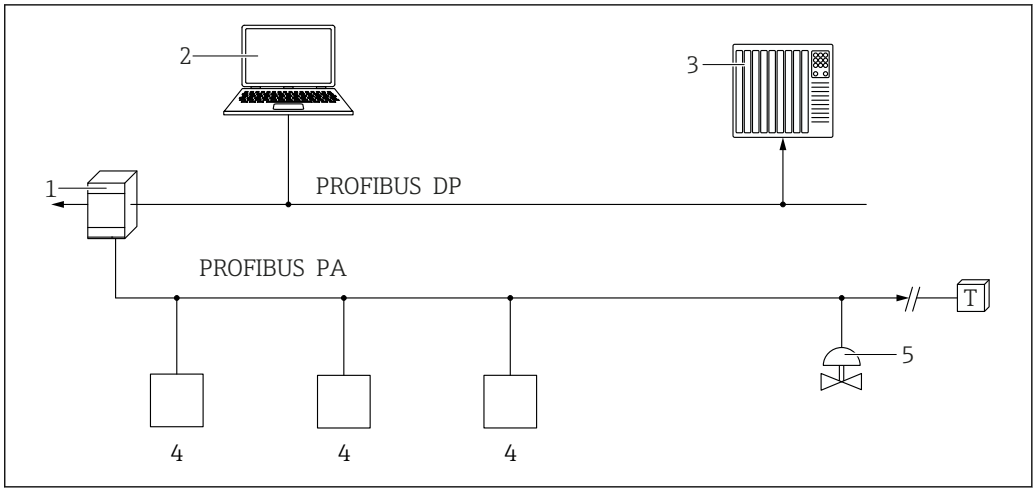
PROFINET over Ethernet-APL



4 *Connection example for PROFINET over Ethernet-APL*

1 Automation system
2 APL field switch
3 Observe cable specifications
4 Transmitter

PROFIBUS PA



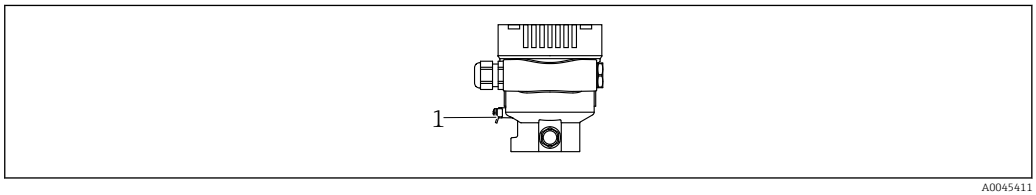
1 Segment coupler
2 Computer with PROFIusb and operating tool (e.g. DeviceCare/FieldCare)
3 PLC (programmable logic controller)
4 Transmitter
5 Additional functions (valves etc.)

Potential equalization

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

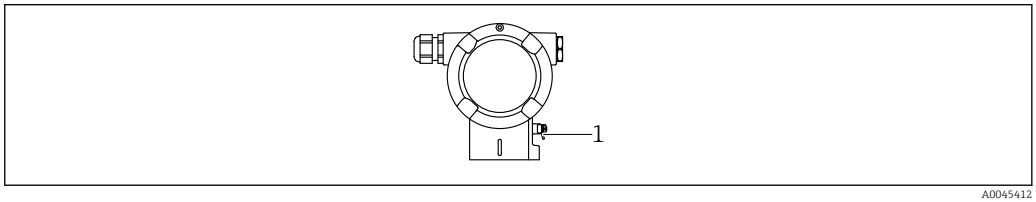
For optimum electromagnetic compatibility:
- Use the shortest possible potential matching line.
- Ensure a cross-section of at least 2.5 mm² (14 AWG).

Single-compartment housing



1 Ground terminal for connecting the potential matching line

Dual-compartment housing



1 Ground terminal for connecting the potential matching line

Terminals

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

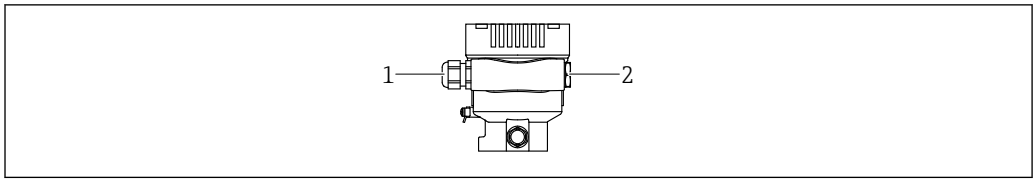
Cable entries

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.

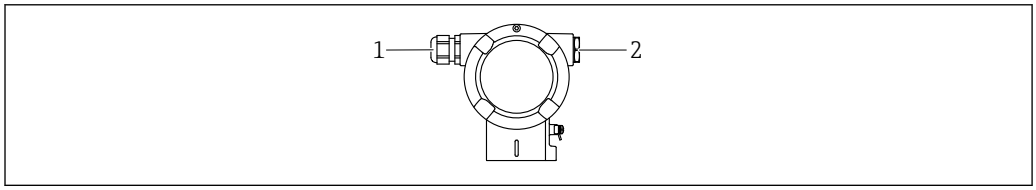
Single-compartment housing



A0045413

1 Cable entry
2 Blind plug

Dual-compartment housing



A0045414

1 Cable entry
2 Blind plug

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)

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

For further information on the cable specification:
- Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning"
- PROFIBUS Assembling Guideline 8.022
- IEC 61158-2 (MBP).

PROFINET with Ethernet-APL

The reference cable type for APL segments is fieldbus cable type A, MAU type 1 and 3 (specified in IEC 61158-2). This cable meets the requirements for intrinsically safe applications according to IEC TS 60079-47 and can also be used in non-intrinsically safe applications.

Cable type	A
Cable capacitance	45 to 200 nF/km
Loop resistance	15 to 150 Ω/km
Cable inductance	0.4 to 1 mH/km

Further details are provided in the Ethernet-APL Engineering Guideline (https://www.ethernet-apl.org).

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 against transient overvoltages are applied (IEC/DIN EN 61000-4-5 Surge):
Test level on DC power ports and input/output ports is 1 000 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

NOTICE

The device may be damaged by excessively high electrical voltages.

- ▶ Always ground the device with integrated overvoltage protection.

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)
- PROFINET with Ethernet-APL: cyclic: min. 32 ms
- PROFIBUS PA:
  - Acyclic: approx. 60 ms to 70 ms (depending on Min. Slave Interval)
  - Cyclic: approx. 10 ms to 13 ms (depending on Min. Slave Interval)

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°
- 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 that influence the accuracy can be divided into two groups

- Total performance of device
- Installation factors

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

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

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

E1 = Reference accuracy

E2 = Temperature effect

Calculation of E2:

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 refer to the calibrated span.

Calculation of the total performance with the Endress+Hauser Applicator

Detailed inaccuracies, e.g. for other temperature ranges or the high-temperature version of the device can be calculated with the Applicator "Sizing Pressure Performance".

A0038927

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]. Reference accuracy for standard up to TD 100:1, for platinum up to TD 5:1.

Gauge pressure measuring cells

Measuring cell	Standard	Platinum
100 mbar (1.5 psi)	TD 1:1 to 10:1 = ±0.075 % TD > 10:1 = ±0.0075 % · TD	TD 1:1 = ±0.05 % TD > 1:1 to TD 5:1 = ±0.075 %
250 mbar (3.75 psi)	TD 1:1 to 10:1 = ±0.075 % TD > 10:1 = ±0.0075 % · TD	TD 1:1 to TD 5:1 = ±0.05 %
400 mbar (6 psi) 1 bar (15 psi)	TD 1:1 to 10:1 = ±0.05 % TD > 10:1 = ±0.005 % · TD	TD 1:1 to TD 5:1 = ±0.035 %
2 bar (30 psi)	TD 1:1 to 10:1 = ±0.05 % TD > 10:1 = ±0.005 % · TD	TD 1:1 = ±0.025 % TD > 1:1 to TD 5:1 = ±0.035 %
4 bar (60 psi)	TD 1:1 to 10:1 = ±0.05 % TD > 10:1 = ±0.005 % · TD	TD 1:1 to TD 5:1 = ±0.025 %
10 bar (150 psi) 40 bar (600 psi)	TD 1:1 to 10:1 = ±0.05 % TD > 10:1 = ±0.005 % · TD	TD 1:1 to TD 5:1 = ±0.035 %

Absolute pressure measuring cells

Measuring cell	Standard	Platinum
100 mbar (1.5 psi)	TD 1:1 to 10:1 = ±0.075 % TD > 10:1 = ±0.0075 % · TD	TD 1:1 = ±0.05 % TD > 1:1 to TD 5:1 = ±0.075 %
250 mbar (3.75 psi)	TD 1:1 to 10:1 = ±0.075 % TD > 10:1 = ±0.0075 % · TD	TD 1:1 = ±0.05 % TD > 1:1 to TD 5:1 = ±0.05 %
400 mbar (6 psi) 1 bar (15 psi)	TD 1:1 to 10:1 = ±0.05 % TD > 10:1 = ±0.005 % · TD	TD 1:1 = ±0.035 % TD > 1:1 to TD 5:1 = ±0.035 %
2 bar (30 psi)	TD 1:1 to 10:1 = ±0.05 % TD > 10:1 = ±0.005 % · TD	TD 1:1 = ±0.025 % TD > 1:1 to TD 5:1 = ±0.035 %
4 bar (60 psi)	TD 1:1 to 10:1 = ±0.05 % TD > 10:1 = ±0.005 % · TD	TD 1:1 = ±0.025 % TD > 1:1 to TD 5:1 = ±0.025 %
10 bar (150 psi) 40 bar (600 psi)	TD 1:1 to 10:1 = ±0.05 % TD > 10:1 = ±0.005 % · TD	TD 1:1 = ±0.035 % TD > 1:1 to TD 5:1 = ±0.035 %

Measuring uncertainty for small absolute pressure measuring ranges

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

Temperature effect [E2]

$E2_M$ - Main temperature error

The output changes due to the effect of the ambient temperature [IEC 62828-1] 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), 250 mbar (3.75 psi) and 400 mbar (6 psi) measuring cell
- Standard: ± (0.07 % · TD + 0.038 %)
- Platinum: ± (0.07 % · TD + 0.038 %)

High-temperature version: 100 mbar (1.5 psi), 250 mbar (3.75 psi) and 400 mbar (6 psi) measuring cell
- −20 to −10 °C (−4 to +14 °F) and +60 to +150 °C (+140 to +302 °F)
  - Standard: ± (0.128 % · TD + 0.226 %)
  - Platinum: ± (0.128 % · TD + 0.226 %)
- −10 to +60 °C (+14 to +140 °F)
  - Standard: ± (0.088 % · TD + 1.27 %)
  - Platinum: ± (0.88 % · TD + 1.27 %)

1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi) and 40 bar (600 psi) measuring cell
- Standard: ± (0.065 % · TD + 0.02 %)
- Platinum: ± (0.065 % · TD + 0.02 %)

High-temperature version: 1 bar (15 psi), 2 bar (30 psi), 4 bar (60 psi), 10 bar (150 psi) and 40 bar (600 psi) measuring cell
- −20 to −10 °C (−4 to +14 °F) and +60 to +150 °C (+140 to +302 °F)
  - Standard: ± (0.088 % · TD + 0.250 %)
  - Platinum: ± (0.088 % · TD + 0.250 %)
- −10 to +60 °C (+14 to +140 °F)
  - Standard: ± (0.088 % · TD + 1.17 %)
  - Platinum: ± (0.88 % · TD + 1.17 %)

$E2_E$ - Electronics error

- 4 to 20 mA: 0.05 %
- Digital output HART: 0 %
- Digital output PROFINET: 0 %
- Digital output PROFIBUS PA: 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 measurement errors, e.g. for other temperature ranges or the high-temperature version of the device can be calculated with the Applicator "Sizing Pressure Performance".

A0038927

Long-term stability

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

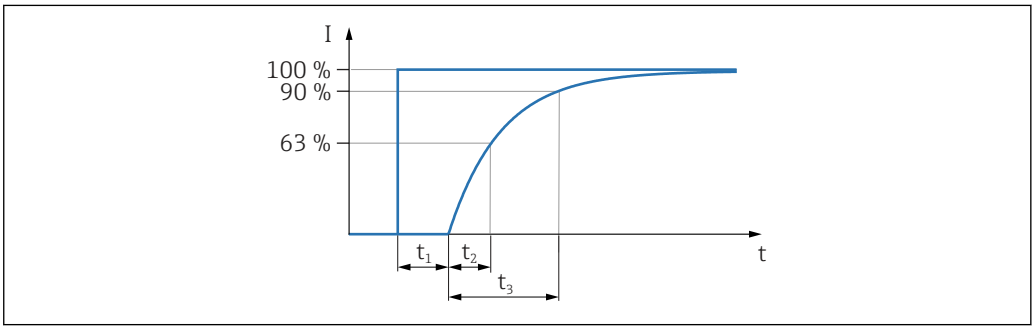
Gauge pressure measuring cells
- 1 year: ± 0.05 %
- 5 years: ± 0.08 %
- 10 years: ± 0.10 %
- 15 years: ± 0.11 %

Absolute pressure measuring cells
- 1 year: ± 0.05 %
- 5 years: ± 0.15 %
- 10 years: ± 0.20 %
- 15 years: ± 0.23 %

Response time T63 and T90

Dead time, time constant

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



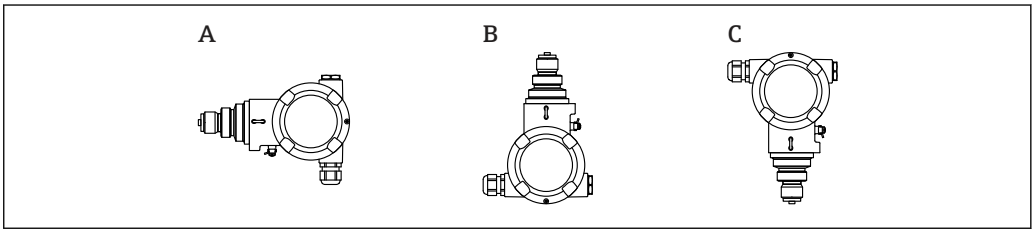
A0019786

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

Dynamic behavior, current output

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

Installation factors



A0052060

- A: Axis of membrane horizontal: calibration position, no measurement error
- B: Membrane pointing upwards: measurement error ≤ +0.2 mbar (+0.003 psi)
- B: Membrane pointing downwards: measurement error ≤ −0.2 mbar (−0.003 psi)

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

Warm-up time

As per IEC 62828-4: ≤5 s

Installation

Orientation

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

Installation instructions

- The devices are installed according to the same guidelines as pressure gauges (DIN EN837-2).
- To ensure optimal readability of the local display, align the housing and local display.
- Endress+Hauser offers a mounting bracket for installing the device on pipes or walls.
- Use flushing rings for flanges if there is a risk of medium buildup or clogging at the process connection
  - The flushing ring is clamped between the process connection and process
  - Material buildup in front of the membrane is flushed away and the pressure chamber is vented via the two lateral flushing holes.
- For measurements in media containing solids (e.g. dirty liquids), it makes sense to install separators and drain valves.
- Using a valve allows for easy commissioning, installation and maintenance without interrupting the process.
- When installing the device, establishing the electrical connection and during operation: prevent moisture from entering the housing.
- Point the cable and connector downwards where possible to prevent moisture from entering (e.g. rain or condensation water).

Sensor selection and arrangement

Installing 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 steam

Observe the maximum permitted ambient temperature of the transmitter!

Installation:
- Preferably install the device with a circular siphon below the tapping point.
  The device may also be installed above the tapping point.
- Fill the siphon with fluid before commissioning.

Advantages of using siphons:
- Protects the measuring instrument from hot, pressurized media by forming and accumulating condensate
- Dampens 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

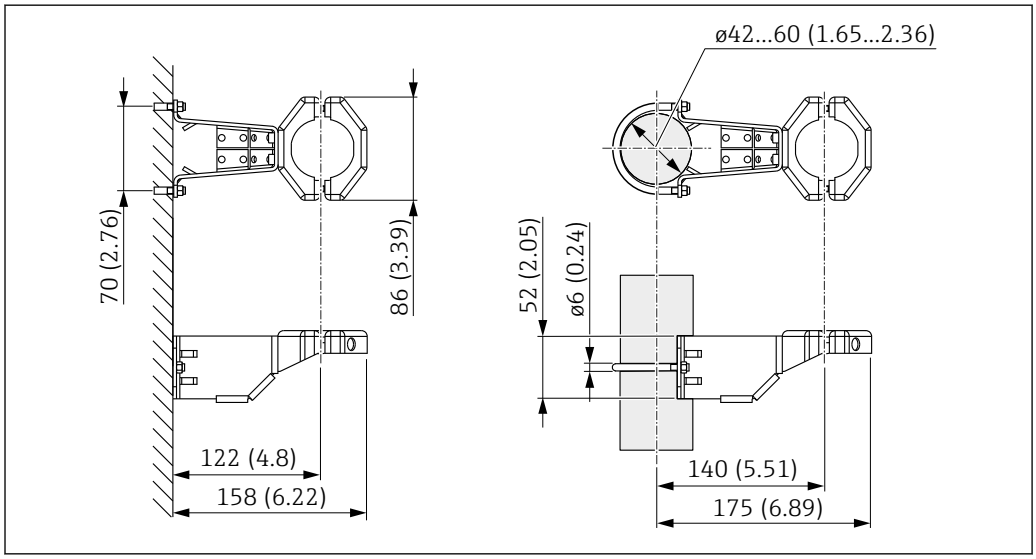
Mount the device with the shutoff device below or at the same level as the tapping point.

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
- Install the device downstream from a shutoff device: the functional test and adjustment can then be carried out more easily.

Mounting bracket for device or separate housing

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



Unit of measurement mm (in)

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

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

Special mounting instructions

Wall and pipe mounting with a manifold (optional)

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

For technical data, see the SD01553P accessory document.

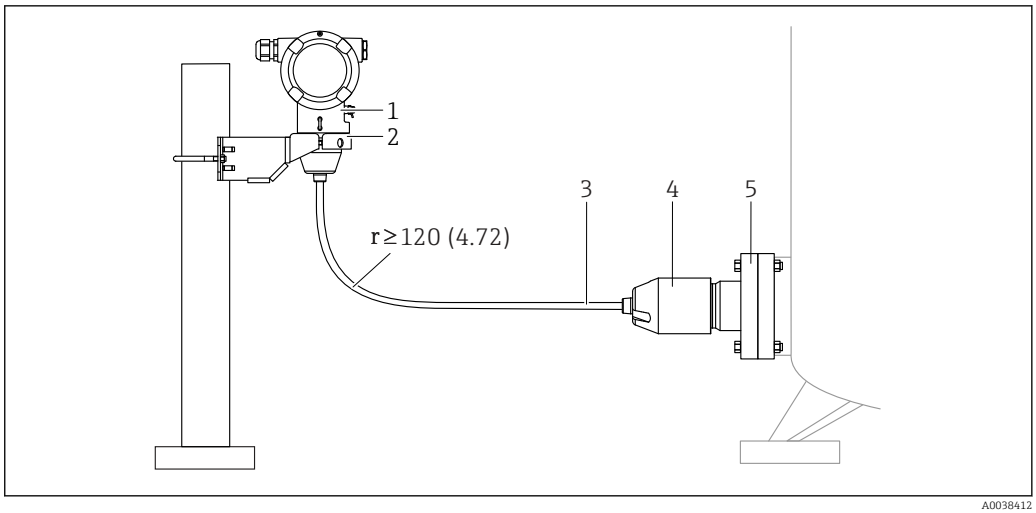
Sensor, remote (separate housing)

The housing of the device (including electronic insert) is mounted away from the measuring point.

This version thus facilitates trouble-free measurement
- Under particularly difficult measuring conditions (at installation locations that are cramped or difficult to access)
- If the measuring point is exposed to vibrations

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

The sensor is supplied with the process connection and cable fitted. The housing (including electronic insert) and a mounting bracket are enclosed as separate units. The cable is provided with a socket at both ends. These sockets are simply connected to the housing (including electronic insert) and the sensor.



A0038412

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

Ordering information:
- Sensor, remote (including electronic insert), and mounting bracket can be ordered via the Product Configurator
- Mounting bracket can also be ordered as a separate accessory, part number 71102216

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

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

Reduction of the installation height

If the "Remote sensor" version is used, the installation height of the process connection is reduced compared to the dimensions of the standard version. For dimensions, see "Mechanical construction" section.

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.

- Without segment display or graphic display:
  Standard:−40 to +85 °C (−40 to +185 °F)
- With segment display or graphic 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
- Separate housing: −20 to +60 °C (−4 to +140 °F)

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

- Without device display:
  Standard: −40 to +90 °C (−40 to +194 °F)
- With device display: −40 to +85 °C (−40 to +185 °F)
- Separate housing: −40 to +60 °C (−40 to +140 °F)

With M12 plug, elbowed: −25 to +85 °C (−13 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.

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
- HAN7D plug, 90 degrees, IP65 NEMA Type 4X
- M12 plug
  When housing is closed and connecting cable is plugged in: IP66/67 NEMA Type 4X
  When housing is open or connecting cable is not plugged in: IP20, NEMA Type 1

NOTICE

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

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

Process connection and process adapter when using the separate housing

FEP cable

- IP69 (on sensor side)
- IP66 TYPE 4/6P
- IP68 (1.83 mH_2O for 24 h) TYPE 4/6P

PE cable

- IP66 TYPE 4/6P
- IP68 (1.83 mH_2O for 24 h) TYPE 4/6P

Vibration resistance

Aluminum single-compartment housing

Description	Sinusoidal vibration IEC62828-1	Shock
Device	10 Hz to 60 Hz: ±0.35 mm (0.0138 in) 60 Hz to 1000 Hz: 5 g	30 g
High-temperature device version [1]	10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g	30 g
Device with Ex d and XP version [2]	10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g	30 g

1) Non-flush mount process connections with thread are limited to 10 Hz to 150 Hz 0.2 g.
2) Not for the high-temperature version with Ex d and XP.

Aluminum dual-compartment housing

Description	Sinusoidal vibration IEC62828-1	Shock
Device	10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g	30 g
High-temperature device version [1]	10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g	30 g
Device with Ex d version [2]	10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g	30 g

1) Non-flush mount process connections with thread are limited to 10 Hz to 150 Hz 0.2 g.
2) Not for the high-temperature version with Ex d and XP.

Stainless steel dual-compartment housing and stainless steel precision-cast dual-compartment housing

Description	Sinusoidal vibration IEC62828-1	Shock
Device	10 Hz to 60 Hz: ±0.15 mm (0.0059 in) 60 Hz to 1000 Hz: 2 g	15 g
Device in high-temperature version	10 Hz to 150 Hz: 0.2 g	15 g
Device with Ex d version [1]	10 Hz to 150 Hz: 0.2 g	15 g

1) Not for the high-temperature version with Ex d and XP.

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

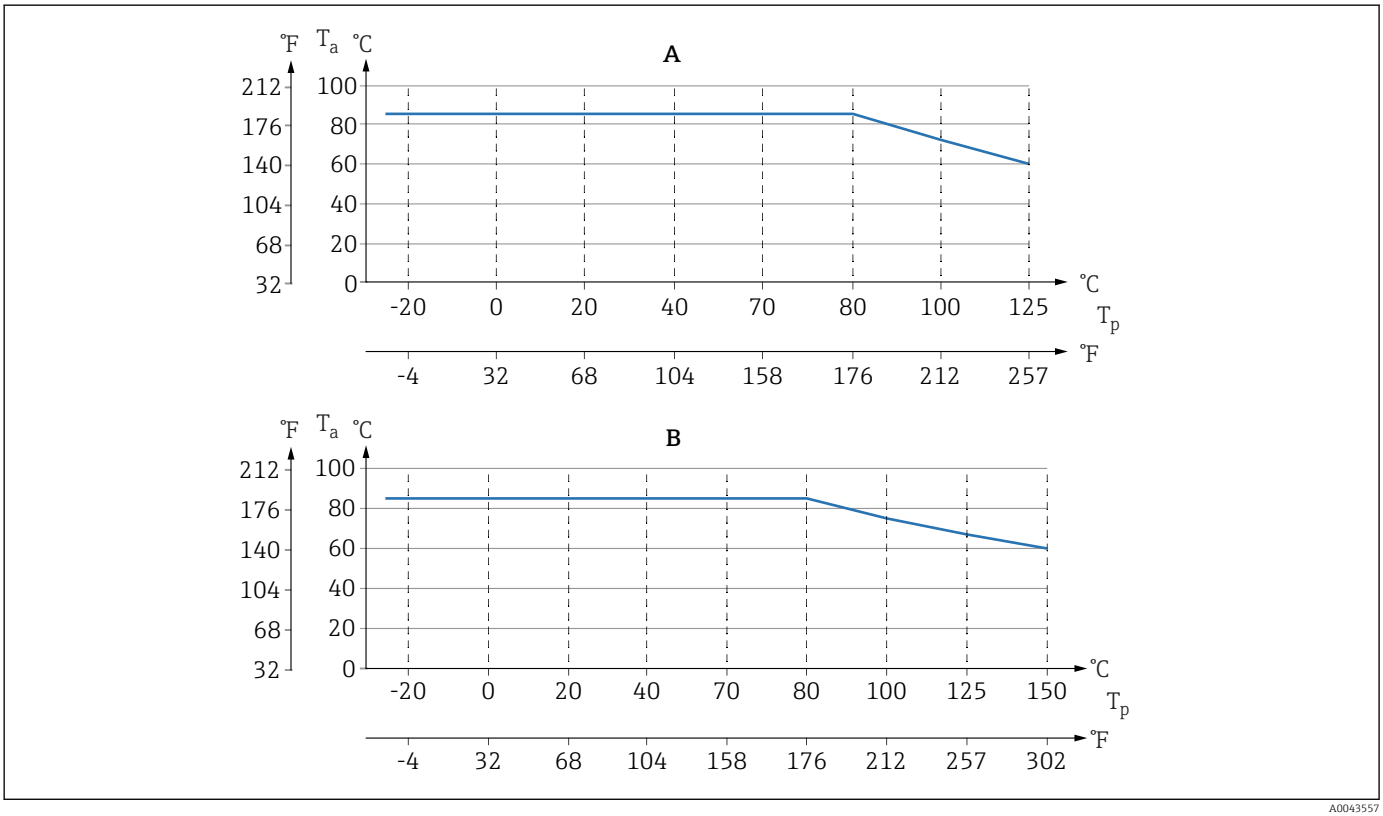
The permitted process temperature depends on the process connection, process seal, ambient temperature and the type of approval.

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

The process temperature ranges indicated refer to the permanent operation of the device (maximum 5 °C (41 °F) deviation is permitted)

−40 to +125 °C (−40 to +257 °F)

High-temperature version: −25 to +150 °C (−13 to +302 °F)



5 *Values apply for vertical mounting without insulation.*

A *All versions except B*
B *"High-temperature version"*
T_p *Process temperature*
T_a *Ambient temperature*

Seals

Pay attention to the process temperature range of the seal. The temperatures indicated depend on the resistance of the seal to the medium.

Seal	Temperature	Temperature High-temperature version
FKM	−25 to +150 °C (−13 to +302 °F)	-
FKM Cleaned for oxygen service	−10 to +60 °C (+14 to +140 °F)	-
FFKM Perlast G75LT	−20 to +125 °C (−4 to +257 °F)	−20 to +150 °C (−4 to +302 °F)
FFKM Kalrez 6375	+5 to +125 °C (+41 to +257 °F)	+5 to +150 °C (+41 to +302 °F)
FFKM Chemraz 505	−10 to +125 °C (+14 to +257 °F)	−10 to +150 °C (+14 to +302 °F)

Seal	Temperature	Temperature High-temperature version
EPDM	−40 to +125 °C (−40 to +257 °F)	−25 to +150 °C (−13 to +302 °F)
HNBR	−25 to +125 °C (−13 to +257 °F)	-

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.

Devices with measuring cells, nominal value < 10 bar (150 psi)

T_{max}	P_{max}
60 °C (140 °F)	Overpressure limit (OPL) of the measuring cell and depending on the process connection used
Devices with PVDF threads [1]: 60 °C (140 °F)	15 bar (225 psi)

1) Only mount with the enclosed mounting bracket!

Devices with measuring cells, nominal value ≥ 10 bar (150 psi)

T_{max}	P_{max}
60 °C (140 °F)	40 bar (600 psi)

Thermal shock

Applications with jumps in temperature

Extreme jumps in temperature can result in temporary measuring errors. Temperature compensation takes place after a few minutes. Internal temperature compensation is faster the smaller the jump in temperature and the longer the time interval involved.

For more information: contact the Endress+Hauser sales office.

Process pressure range

Pressure specifications

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

Components are: process connection, optional mounting parts, or accessories.

⚠ WARNING

Incorrect design or use of the device may cause injury due to bursting parts!

- 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 MWP. For flanges, refer to the following standards for the permitted pressure values at higher temperatures: EN 1092-1 (with regard to their stability/temperature property, the materials 1.4435 and 1.4404 are grouped together under EN 1092-1; the chemical composition of the two materials can be identical.), ASME B 16.5a, JIS B 2220 (the latest version of the standard applies in each case). Maximum working pressure data that deviate from this are provided in the relevant sections of the Technical Information.
- The overpressure limit is the maximum pressure that a device may be subjected to during a test. The overpressure limit exceeds the maximum working pressure by a certain factor. 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.
- The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PT". The abbreviation "PT" corresponds to the OPL (Over Pressure Limit) of the device. OPL (Over Pressure Limit) is a test pressure.
- 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.

Steam applications and saturated steam applications

For steam and saturated steam applications: Use a device with a metallic membrane or provide a siphon for temperature decoupling when installing.

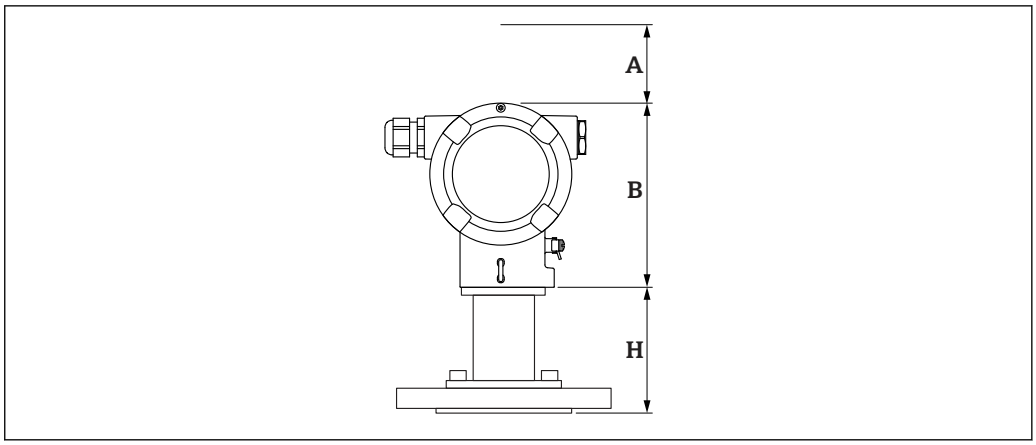
Mechanical construction

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).

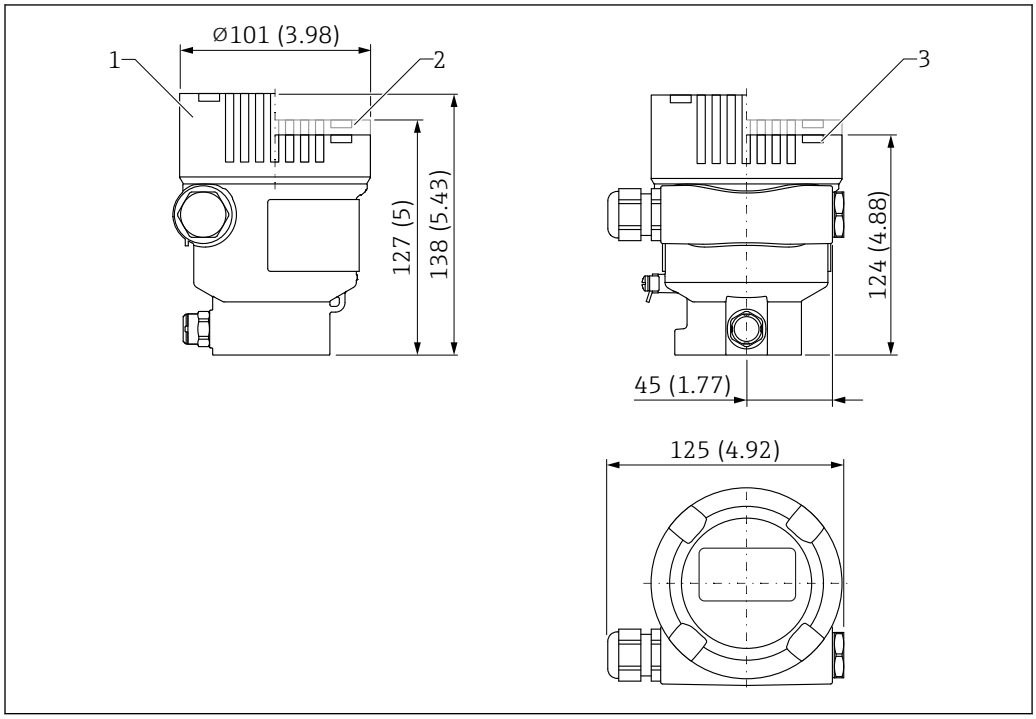


A0043569

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

Dimensions

Single-compartment housing

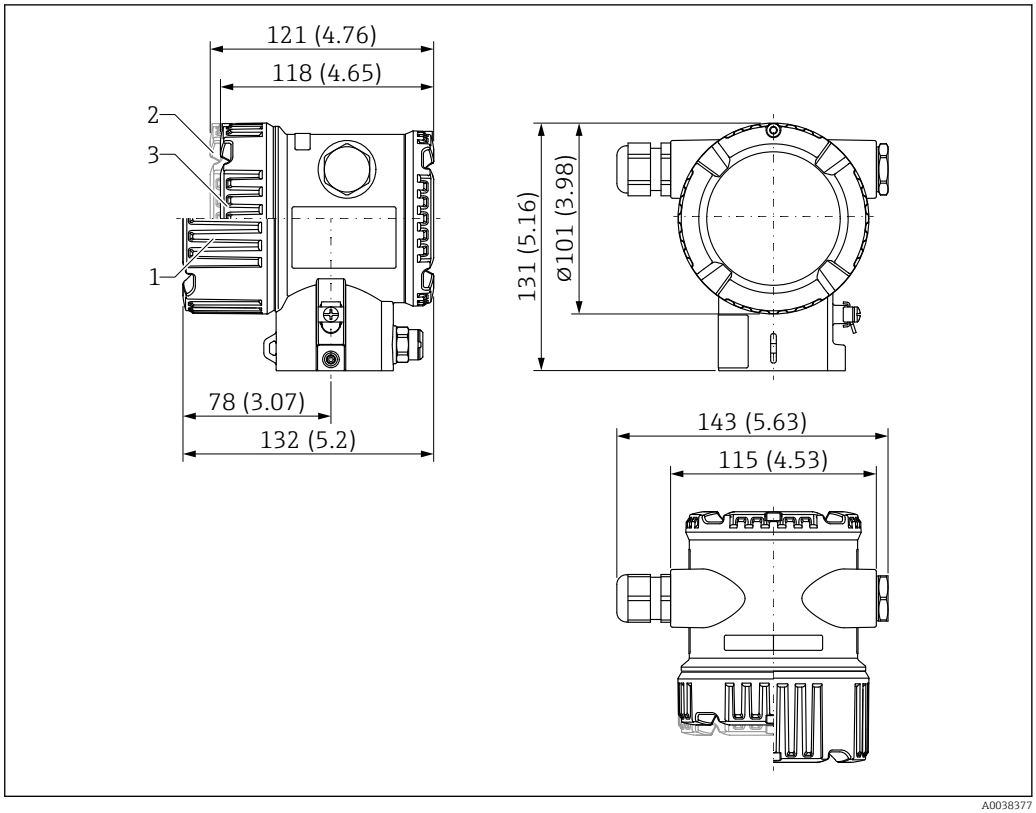


Unit of measurement mm (in)

1 *Device with display, cover with sight glass made of glass (devices for Ex d/XP, dust Ex): 138 mm (5.43 in)*
2 *Device with display, cover with plastic sight glass: 127 mm (5 in)*
3 *Device without display, cover without sight glass: 124 mm (4.88 in)*

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

Dual-compartment housing

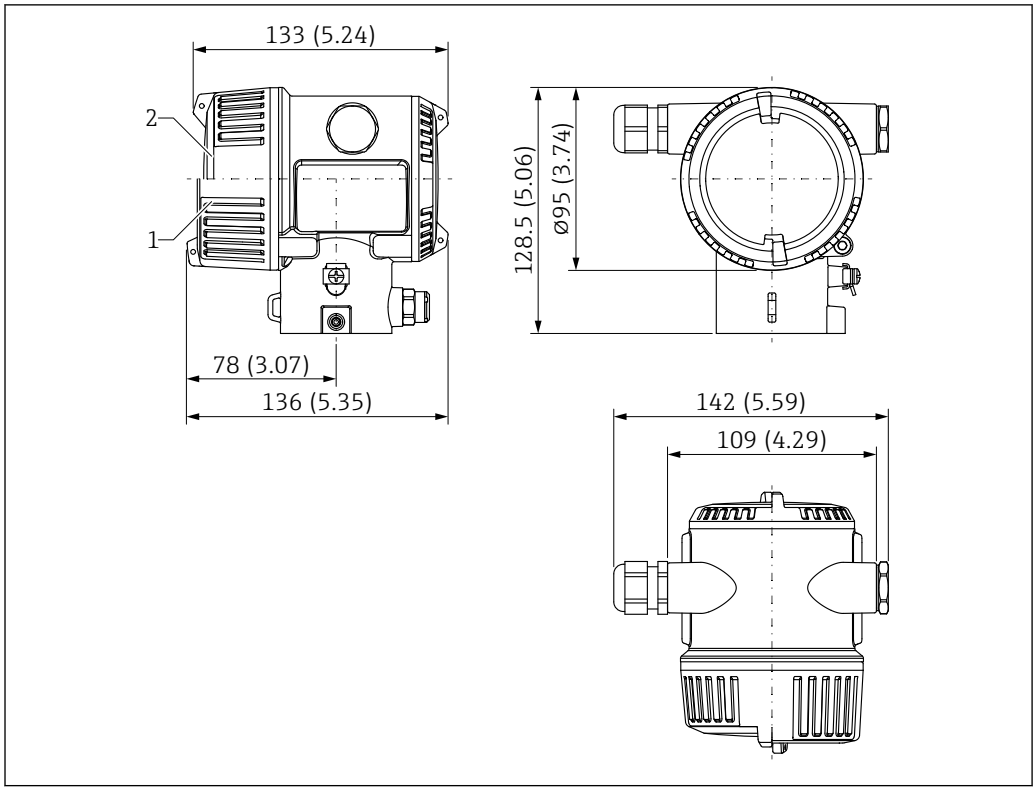


Unit of measurement mm (in)

1 Device with display, cover with sight glass made of glass (devices for Ex d/XP, dust Ex): 132 mm (5.2 in)
2 Device with display, cover with plastic sight glass: 121 mm (4.76 in)
3 Device without display, cover without sight glass: 118 mm (4.65 in)

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

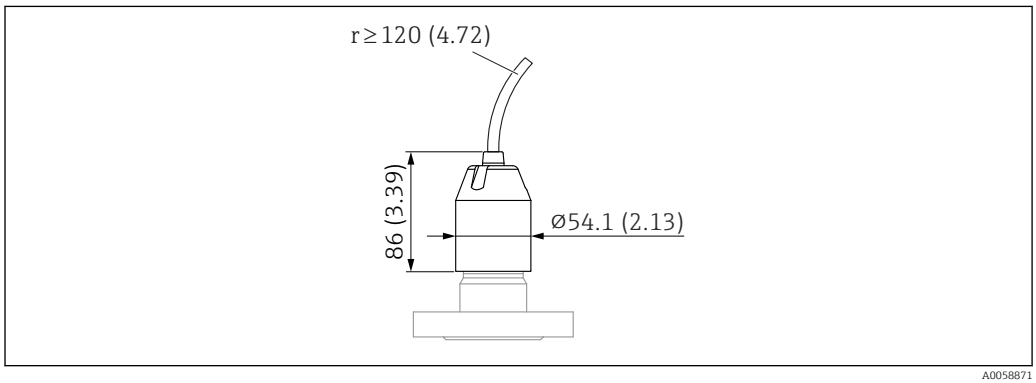
Stainless steel dual-compartment housing, precision cast



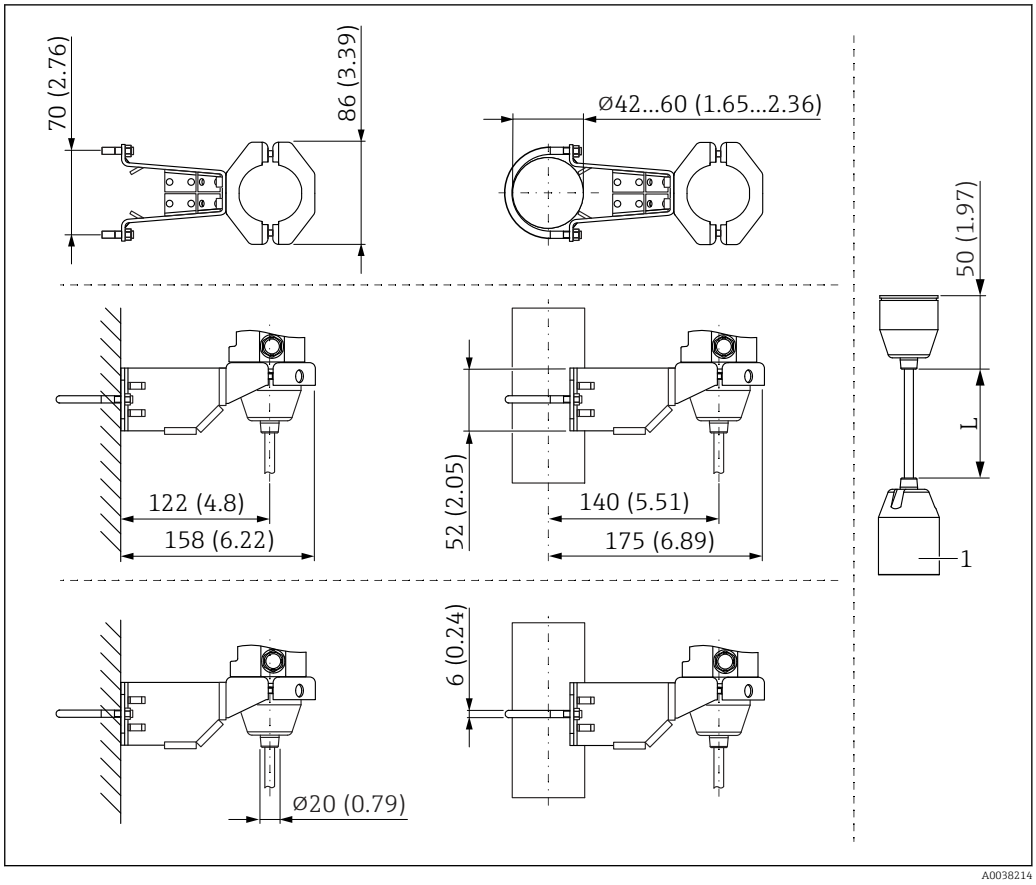
Unit of measurement mm (in)

1 Device with display, cover with sight glass made of glass (devices for Ex d/XP, dust Ex): 136 mm (5.35 in)
2 Device without display, cover without sight glass: 133 mm (5.24 in)

Sensor, remote (separate housing)



Bracket and cable length



Unit of measurement mm (in)

1 86 mm (3.39 in)
L Length of cable versions

Maximum working pressure and overpressure limit

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

Explanation of terms

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

Outer diameter of capillary

Designation	Outer diameter
Flexible armor made from 316L	8 mm (0.31 in)
Flexible armor with PVC-coating	10 mm (0.39 in)
Flexible armor with PTFE-coating	12.5 mm (0.49 in)

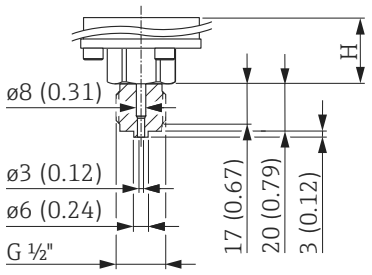
Height H

Process connection	Height H	
	Standard	Ex d version
FNPT1/2 MNPT1/2 MNPT1/2 FNPT1/4 G1/2 M20x1.5 B0202 B0203	28 mm (1.1 in)	94 mm (3.7 in)
MNPT1-1/2 MNPT2 G1-1/2 G2 M44x1.25	59 mm (2.32 in)	125 mm (4.92 in)
Flanges	83 mm (3.27 in)	150 mm (5.91 in)

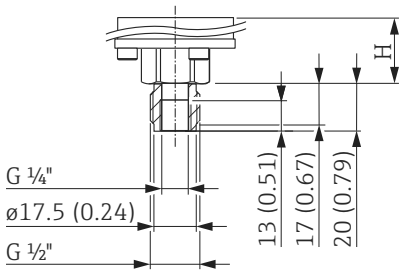
Process connection	Height H	
	High-temperature version	Ex d high-temperature version
FNPT1/2 MNPT1/2 MNPT1/2 FNPT1/4 G1/2 M20x1.5 B0202 B0203	107 mm (4.21 in)	173 mm (6.81 in)
MNPT1-1/2 MNPT2 G1-1/2 G2 M44x1.25	59 mm (2.32 in)	125 mm (4.92 in)
Flanges	83 mm (3.27 in)	150 mm (5.91 in)

Thread ISO228 G, internal membrane

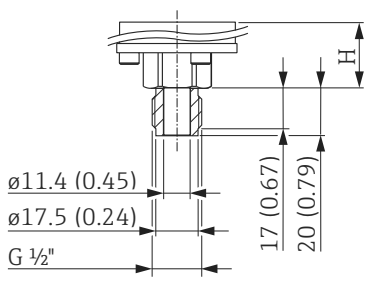
A



B



C

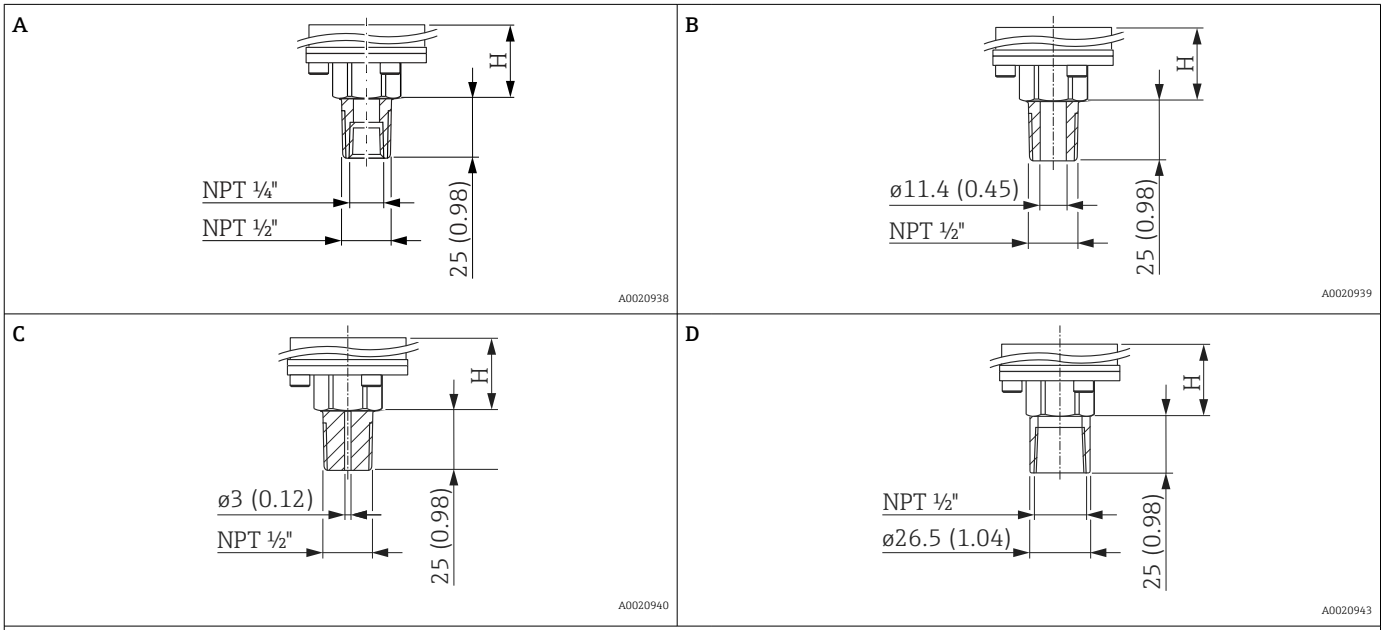


Unit mm (in)

Position	Description	Material	Order option [1]
A	Thread ISO228 G ½" A EN837	AISI 316L	WBJ
		Alloy C276 (2.4819)	WBC
		PVDF ▪ Only mount with a mounting bracket (included) ▪ MWP 10 bar (150 psi), OPL max. 15 bar (225 psi) ▪ Process temperature range: −10 to +60 °C (+14 to +140 °F)	WBE
B	Thread ISO228 G ½" A, G ¼" (female)	AISI 316L	WXJ
		Alloy C276 (2.4819)	WXC
C	Thread ISO228 G ½" A, Bore 11.4 mm (0.45 in)	AISI 316L	WWJ
		Alloy C276 (2.4819)	WWC

1) Product Configurator order code for "Process connection"

Thread ASME B1.20.1, NPT, internal membrane



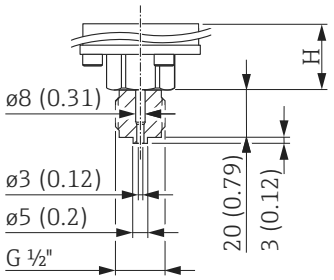
Unit mm (in)

Position	Description	Material	Order option [1]
A [2]	Thread ASME MNPT ½", FNPT ¼"	AISI 316L	VXJ
		Alloy C276 (2.4819)	VXC
B	Thread ASME MNPT ½", Bore 11.4 mm (0.45 in)	AISI 316L	VWJ
		Alloy C276 (2.4819)	VWC
C	Thread ASME MNPT ½", Bore 3 mm (0.12 in)	**PVDF** ▪ Only mount with a mounting bracket (included) ▪ MWP 10 bar (150 psi), OPL max. 15 bar (225 psi) ▪ Process temperature range: −10 to +60 °C (+14 to +140 °F)	VVE
D	Thread ASME FNPT ½"	AISI 316L	VNJ
		Alloy C276 (2.4819)	VNC

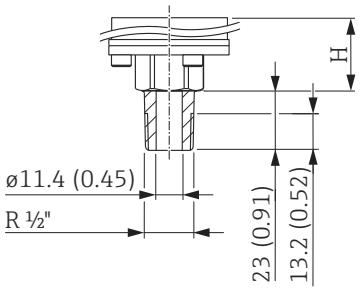
1) Product Configurator order code for "Process connection"
2) URL max. 100 bar (1 500 psi)

Thread JIS, internal membrane

A



B



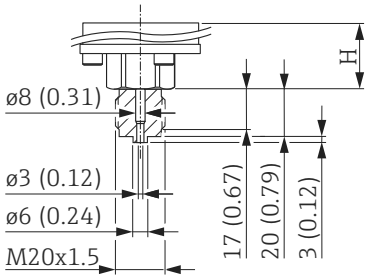
Unit mm (in)

Position	Description	Material	Order option [1]
A	JIS B0202 G ½" (male)	AISI 316L	ZBJ
B	JIS B0203 R ½" (male)		ZJJ

1) Product Configurator order code for "Process connection"

Thread, metric (DIN 13), internal membrane

A

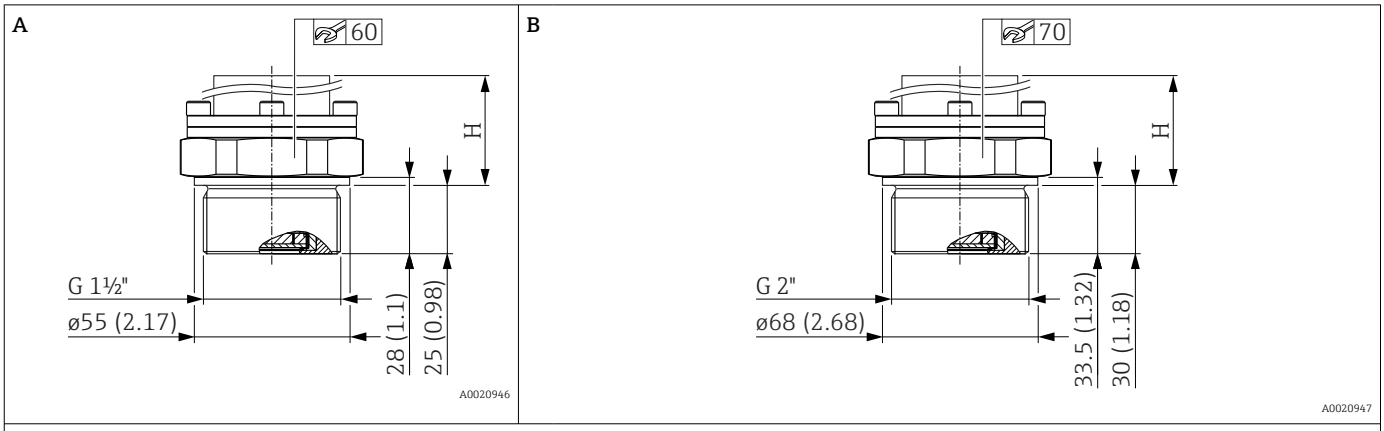


Unit mm (in)

Position	Description	Material	Order option [1]
A	DIN 13 M20 x 1.5, 3 mm (0.12 in)	AISI 316L	XZJ
		Alloy C276 (2.4819)	XZC

1) Product Configurator order code for "Process connection"

Thread ISO 228 G, flush membrane

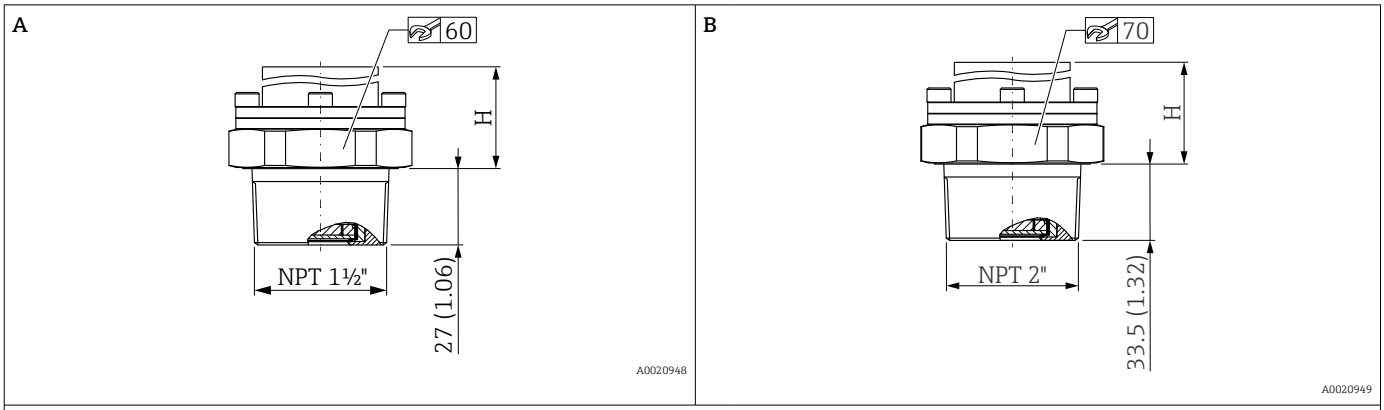


Unit mm (in).

Item	Designation	Material	Order option [1]
A	Thread ISO 228 G 1½" A	AISI 316L	WNJ
		Alloy C276 (2.4819)	WNC
B	Thread ISO 228 G 2" A	AISI 316L	WPJ
		Alloy C276 (2.4819)	WPC

1) Product Configurator order code for "Process connection"

Thread ASME, NPT, flush membrane

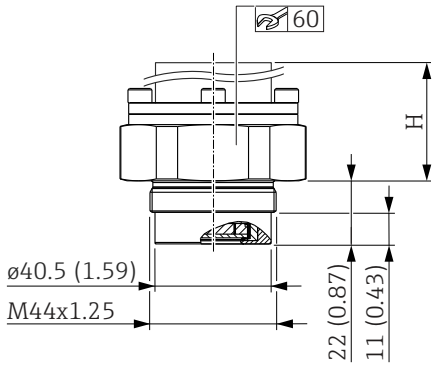


Unit mm (in)

Position	Description	Material	Order option [1]
A	Thread ASME 1 ½" MNPT	AISI 316L	VLJ
B	Thread ASME 2" MNPT	AISI 316L	VMJ

1) Product Configurator order code for "Process connection"

Thread DIN 13, flush membrane



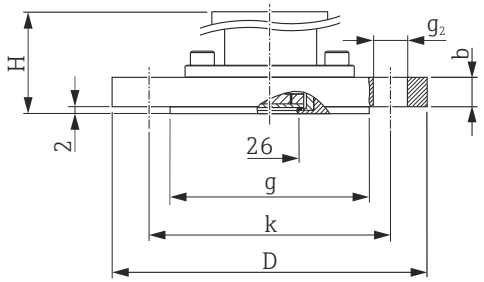
Unit mm (in)

Description	Material	Order option [1]
DIN 13 M44 x 1.25	AISI 316L	X7J
	Alloy C276 (2.4819)	X7C

1) Product Configurator order code for "Process connection"

Flange EN1092-1, flush membrane

Connection dimensions according to EN1092-1.



A0020955

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

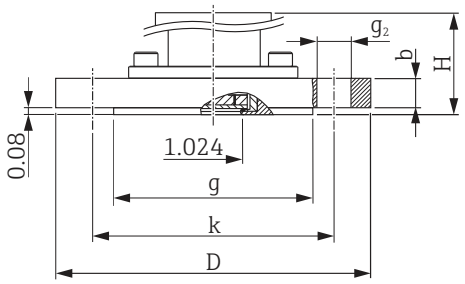
Unit mm

Flange							Boltholes			Order option [1]
Material	DN	PN	Form	D	b	g	Number	g_2	k	
				mm	mm	mm		mm	mm	
AISI 316L	DN 25	PN 10-40	B1	115	18	68	4	14	85	H0J
AlloyC22	DN25	PN 10-40	B1	115	18	68	4	14	85	H0M
AISI 316L	DN 32	PN 10-40	B1	140	18	78	4	18	100	H1J
AISI 316L	DN 40	PN 10-40	B1	150	18	88	4	18	110	H2J
PVDF [2] [3]	DN 40	PN 10-16	B2	150	21.4	88	4	18	110	EPE
ETFE [3]	DN 40	PN 10-40	B2	150	21	88	4	18	110	H2N
AISI 316L	DN 50	PN 10-40	B1	165	20	102	4	18	125	H3J
AlloyC22	DN 50	PN 10-40	B1	165	20	102	4	18	125	H3M
PVDF [2] [3]	DN 50	PN 10-16	B2	165	21.4	102	4	18	125	EQE
ETFE [3]	DN 50	PN 25-40	B2	165	21	102	4	18	125	E2N
AISI 316L	DN 80	PN 10-40	B1	200	24	138	8	18	160	H5J
ETFE [3]	DN 80	PN 25-40	B2	200	25	138	8	18	160	E4N

1) Product Configurator order code for "Process connection"
2) MWP 10 bar (150 psi), OPL max. 15 bar (225 psi); process temperature range: −10 to +60 °C (+14 to +140 °F)
3) ETFE coating on AISI 316L (1.4404). When operating in hazardous areas, avoid electrostatic charging of the plastic surfaces.

Flange ASME B16.5, RF, flush membrane

Connection dimensions in accordance with ASME B16.5, raised face RF



A0034685

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

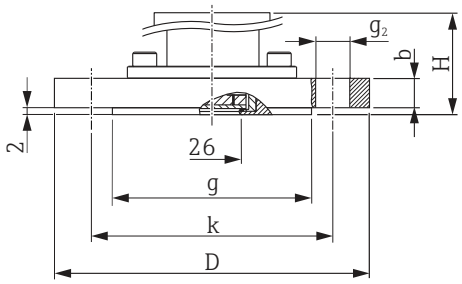
Unit in

Flange						Boltholes			Order option [1]
Material	NPS	Class	D	b	g	Number	g_2	k	
	in		in	in	in		in	in	
AISI 316/316L [2] [3]	1	150	4.25	1.18	2	4	0.62	3.12	AAJ
AISI 316/316L [2] [3]	1	300	4.88	1.18	2	4	0.75	3.5	AMJ
AISI 316/316L [2]	1 ½	150	5	0.69	2.88	4	0.62	3.88	ACJ
AISI 316/316L [2]	1 ½	300	6.12	0.81	2.88	4	0.88	4.5	APJ
AISI 316/316L [2]	2	150	6	0.75	3.62	4	0.75	4.75	ADJ
ETFE [4]	2	150	6	0.75	3.62	4	0.75	4.75	ADN
AISI 316/316L [2]	2	300	6.5	0.88	3.62	8	0.75	5	AQJ
AISI 316/316L [2]	3	150	7.5	0.94	5	4	0.75	6	AFJ
ETFE [4]	3	150	7.5	0.94	5	4	0.75	6	AFN
PVDF [5]	3	150	7.5	0.94	5	4	0.75	6	AFE
AISI 316/316L [2]	3	300	8.25	1.12	5	8	0.88	6.62	ASJ
AISI 316/316L [2]	4	150	9	0.94	6.19	8	0.75	7.5	AGJ
ETFE [4]	4	150	9	0.94	6.19	8	0.75	7.5	AGN
AISI 316/316L [2]	4	300	10	1.25	6.19	8	0.88	7.88	ATJ

1) Product Configurator order code for "Process connection"
2) Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)
3) Screws must be 15 mm (0.59 in) longer than the standard flange screws
4) ETFE coating on AISI 316/316L. When operating in hazardous areas, avoid electrostatic charging of the plastic surfaces.
5) MWP 10 bar (150 psi), OPL max. 15 bar (225 psi); process temperature range: −10 to +60 °C (+14 to +140 °F)

Flange JIS B2220, RF, flush membrane

Connection dimensions in accordance with JIS B 2220 BL, raised face RF



A0034684

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

Unit mm

Flange						Boltholes			Order option [1]
Material	A [2]	K [3]	D	b	g	Number	g_2	k	
			mm	mm	mm		mm	mm	
AISI 316L (1.4435)	40 A	10 K	140	16	81	4	19	105	PCJ
	50 A	10 K	155	16	96	4	19	120	PDJ
	80 A	10 K	185	18	127	8	19	150	PFJ
	100 A	10 K	210	18	151	8	19	175	PGJ

1) Product Configurator order code for "Process connection"
2) Alphanumeric designation of the flange size.
3) Alphanumeric pressure rating of a component.

Weight

Housing

Weight including electronics and display.

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

Sensor, remote (separate housing)

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

Process connections

Threaded connection			Flanges	
Weight [1]	Order option [2]		Weight [1]	Order option [2]
0.80 kg (1.76 lb)	VLJ		2.30 kg (5.07 lb)	AAJ
1.20 kg (2.65 lb)	VMJ		8.50 kg (18.74 lb)	AMJ
0.60 kg (1.32 lb)	VNC		2.10 kg (4.63 lb)	ACJ
0.60 kg (1.32 lb)	VNJ		3.30 kg (7.28 lb)	APJ
0.60 kg (1.32 lb)	VXC		3.10 kg (6.84 lb)	ADJ
0.60 kg (1.32 lb)	VVE		3.10 kg (6.84 lb)	ADN
0.60 kg (1.32 lb)	VWC		4.00 kg (8.82 lb)	AQJ
0.60 kg (1.32 lb)	VWJ		5.70 kg (12.57 lb)	AFJ
0.60 kg (1.32 lb)	VXJ		5.70 kg (12.57 lb)	AFN
0.60 kg (1.32 lb)	WBC		1.60 kg (3.53 lb)	AFE
0.60 kg (1.32 lb)	WBE		7.5 kg (16.54 lb)	ASJ
0.60 kg (1.32 lb)	WBJ		7.60 kg (16.76 lb)	AGJ
0.60 kg (1.32 lb)	WXC		7.80 kg (17.20 lb)	AGN
0.60 kg (1.32 lb)	WXJ		12.40 kg (27.34 lb)	ATJ
0.60 kg (1.32 lb)	WWJ		3.70 kg (8.16 lb)	E2N
0.60 kg (1.32 lb)	WWC		5.20 kg (11.47 lb)	E4N
0.9 (1.98)	WNC		1.30 kg (2.87 lb)	EPE
0.8 (1.76)	WNJ		1.40 kg (3.09 lb)	EQE
1.2 (2.65)	WPC		1.90 kg (4.19 lb)	H0J
1.2 (2.65)	WPJ		2.00 kg (4.41 lb)	H0M
0.90 (1.98)	X7C		2.50 kg (5.51 lb)	H1J
0.90 (1.98)	X7J		3.00 kg (6.62 lb)	H2J
0.60 (1.32)	XZC		3.50 kg (7.72 lb)	H3J
0.60 (1.32)	XZJ		5.80 kg (12.79 lb)	H5J
0.60 (1.32)	ZBJ		3.00 kg (6.62 lb)	H2N
0.60 (1.32)	ZJJ		3.80 kg (8.38 lb)	H3M
-	-		2.90 kg (6.39 lb)	PDJ
-	-		3.90 kg (8.60 lb)	PFJ
-	-		5.30 kg (11.69 lb)	PGJ
-	-		2.50 kg (5.51 lb)	PCJ

1) Total weight consisting of sensor assembly and process connection.
2) Product Configurator order code for "Process connection"

Accessories

Mounting bracket: 0.5 kg (1.10 lb)

Materials in contact with process

Membrane material

Al_2O_3 aluminum oxide ceramic, ultrapure 99.9%, Ceraphire® (see also www.endress.com)

Seal

- FKM
- EPDM (FDA 21 CFR 177.2600)
- HNBR (FDA 21 CFR 177.2600)
- FFKM Perlast G75LT
- FFKM Chemraz 505
- FFKM Kalrez 6375

Process connections

See the specific process connection.

Accessories

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

Materials not in contact with process

Single compartment housing, aluminum, coated

- Housing: EN AC-43400 aluminum
- Housing coating, cover: polyester
- EN AC-43400 aluminum cover with Lexan 943A PC sight glass
  EN AC-443400 aluminum cover with borosilicate sight glass; dust-Ex for Ex d/XP
- Dummy cover: EN AC-43400 aluminum
- Cover sealing materials: HNBR
- Cover sealing materials: FVMQ (in low temperature version only)
- Plug: PBT-GF30-FR or aluminum
- Plug sealing material: EPDM
- Nameplate: plastic foil
- TAG plate: plastic foil, stainless steel or provided by the customer

The cable entry with material specification can be ordered via the product structure "Electrical connection".

Dual compartment housing, aluminum, coated

- Housing: EN AC-43400 aluminum
- Housing coating, cover: polyester
- EN AC-43400 aluminum cover with Lexan 943A PC sight glass
  EN AC-443400 aluminum cover with borosilicate sight glass; dust-Ex for Ex d/XP
- Dummy cover: EN AC-43400 aluminum
- Cover sealing materials: HNBR
- Cover sealing materials: FVMQ (in low temperature version only)
- Plug: PBT-GF30-FR or aluminum
- Plug sealing material: EPDM
- Nameplate: plastic foil
- TAG plate: plastic foil, stainless steel or provided by the customer

The cable entry with material specification can be ordered via the product structure "Electrical connection".

Dual compartment housing; 316L

- Housing: stainless steel AISI 316L (1.4409)
  Stainless steel (ASTM A351 : CF3M (cast equivalent to AISI 316L material)/DIN EN 10213 : 1.4409)
- Dummy cover: stainless steel AISI 316L (1.4409)
- Cover: stainless steel AISI 316L (1.4409) with borosilicate sight glass
- Cover sealing materials: HNBR
- Cover sealing materials: FVMQ (in low temperature version only)
- Plug: stainless steel
- Plug sealing material: EPDM
- Nameplate: stainless steel
- TAG plate: plastic foil, stainless steel or provided by the customer

The cable entry with material specification can be ordered via the product structure "Electrical connection".

Electrical connection

Coupling M20, plastic
- Material: PA
- Seal on cable gland: EPDM
- Dummy plug: plastic

Coupling M20, nickel-plated brass
- Material: nickel-plated brass
- Seal on cable gland: EPDM
- Dummy plug: plastic

Coupling M20, 316L
- Material: 316L
- Seal on cable gland: EPDM
- Dummy plug: plastic

M20 coupling, 316 L, hygiene
- Material: 316L
- Seal on cable gland: EPDM

M20 thread
The device is supplied with M20 thread as standard.
Transport plug: LD-PE

Thread G ½
The device is supplied as standard with an M20 thread and an enclosed adapter to G ½ including documentation (aluminum housing, 316L housing, hygienic housing) or with a mounted adapter to G ½ (plastic housing).
- Adapter made of PA66-GF or aluminum or 316L (depends on housing version ordered)
- Transport plug: LD-PE

NPT ½ thread
The device is supplied as standard with an NPT ½ thread (aluminum housing, 316L housing) or with a mounted adapter to NPT ½ (plastic housing, hygienic housing).
- Adapter made of PA66-GF or 316L (depends on housing version ordered)
- Transport plug: LD-PE

Thread NPT ¾
The device is supplied with NPT ¾ thread as standard.
Transport plug: LD-PE

M20 coupling, blue plastic
- Material: PA, blue
- Seal on cable gland: EPDM
- Dummy plug: plastic

M12 plug
- Material: nickel-plated CuZn or 316L (depends on housing version ordered)
- Transport cap: LD-PE

HAN7D plug
Material: aluminum, die-cast zinc, steel

Valve plug ISO44000 M16
- Material: PA6
- Transport plug: LD-PE

Separate housing

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

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.

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks
- Guidance
- Diagnostics
- 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 or SmartBlue
- Menu guidance with brief explanations of the individual parameter functions
- Standardized operation at the device and in the operating tools
- PROFINET over Ethernet-APL: access to the device via web server

Integrated HistoROM data memory
- Adoption of data configuration when electronics modules are replaced
- Up to 100 event messages recorded in the device

Efficient diagnostic behavior increases measurement reliability
- Remedial action is integrated in plain text
- Various simulation options

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

Languages

The operating language of the local display (optional) can be selected via the Product Configurator.

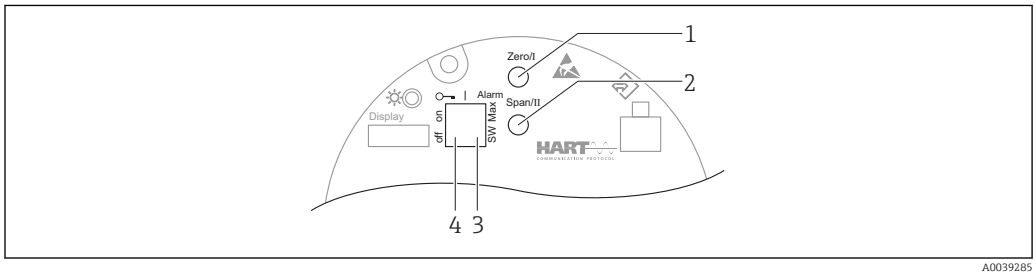
If no particular operating language has been selected, the local display is delivered from the factory with English.

The operating language can be changed subsequently via the **Language** parameter.

Local operation

Operating keys and DIP switches on the electronic insert

HART

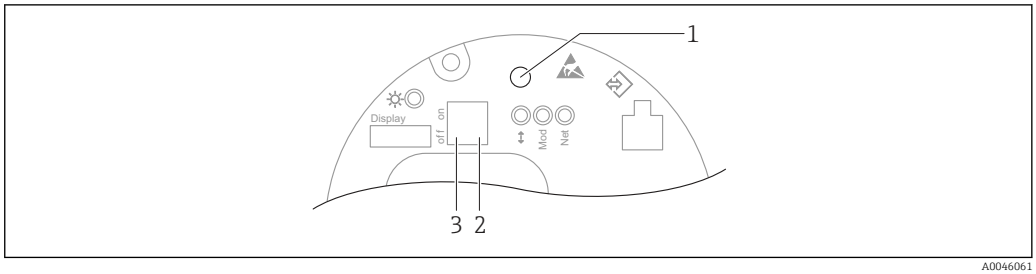


A0039285

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

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

PROFINET with Ethernet-APL

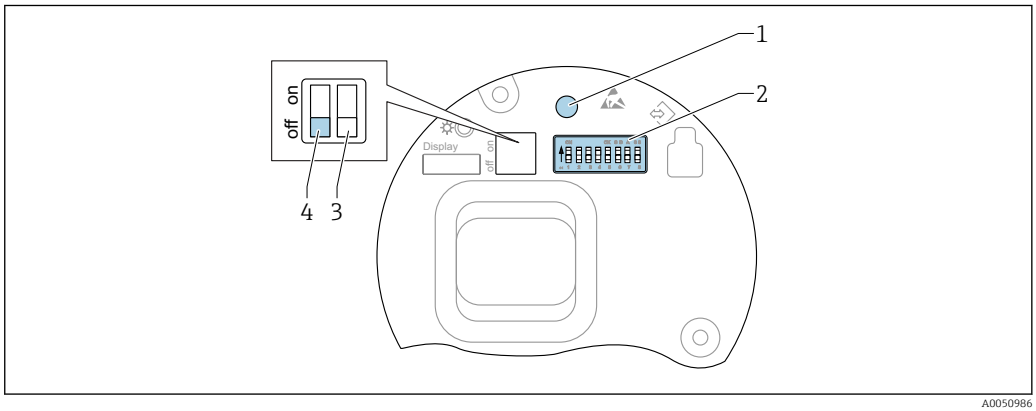


A0046061

1 Operating key for position adjustment (zero point correction) and device reset
2 DIP switch for setting the service IP address
3 DIP switch for locking and unlocking the device

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

PROFIBUS PA



A0050986

1 Operating key for position adjustment (zero point correction), reset device (reset) and password (for Bluetooth login and user role)
2 DIP switch for address configuration
3 DIP switch with no function
4 DIP switch for locking and unlocking the device

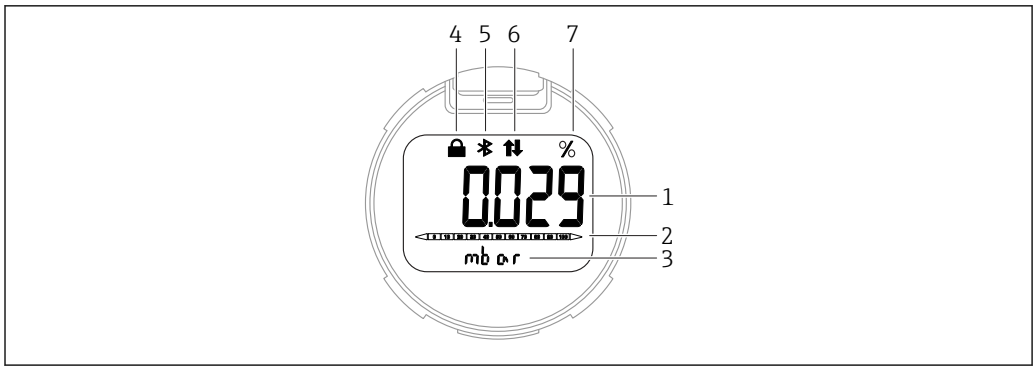
The setting of the DIP switches on the electronic insert has priority over the settings made via other operation methods (e.g. FieldCare/DeviceCare).

Local display

Device display (optional)

Functions:
- Display measured values and fault and notice messages
- Background lighting, which switches from green to red in the event of an error
- The device display can be removed for easier operation

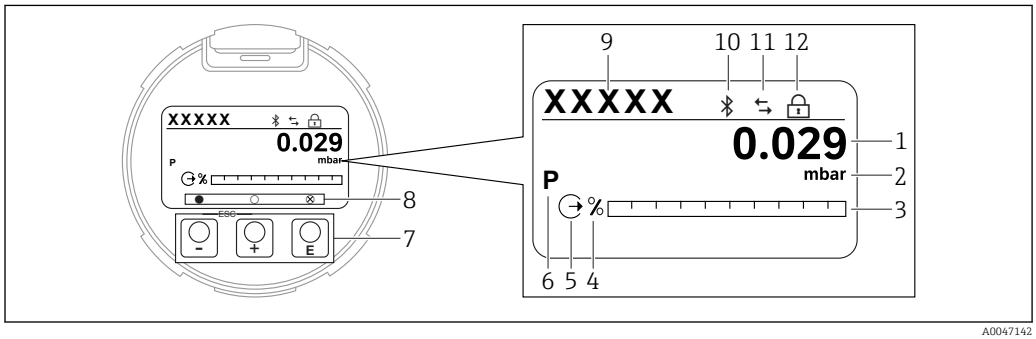
The device displays are available with the additional option of Bluetooth® wireless technology.



6 Segment display

1 *Measured value (up to 5 digits)*
2 *Bar graph (refers to the specified pressure range) proportional to the current output (not for PROFINET over Ethernet-APL or PROFIBUS PA)*
3 *Unit of measured value*
4 *Locking (symbol appears when device is locked)*
5 *Bluetooth (symbol flashes if Bluetooth connection is active)*
6 *HART communication, PROFINET over Ethernet-APL communication or PROFIBUS PA communication (symbol appears when communication is enabled)*
7 *Measured value output in %*

The following graphics are examples. The display depends on the display settings.

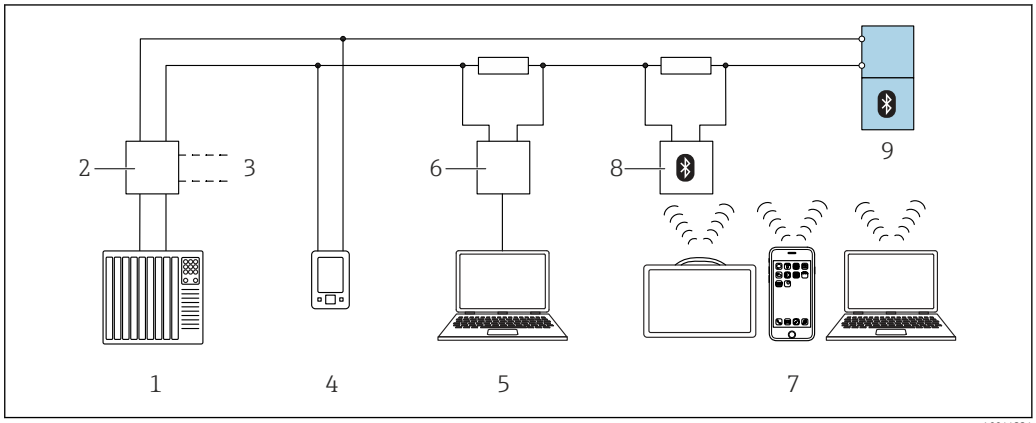


7 Graphic display with optical operating keys.

1 *Measured value (up to 12 digits)*
2 *Unit of measured value*
3 *Bar graph (refers to the specified pressure range) proportional to the current output (not for PROFINET over Ethernet-APL or PROFIBUS PA)*
4 *Bar graph unit*
5 *Symbol for current output (not for PROFINET over Ethernet-APL or PROFIBUS PA)*
6 *Symbol for displayed measured value (e.g. p = pressure)*
7 *Optical operating keys*
8 *Symbols for key feedback. Different display symbols are possible: circle (not filled in) = key pressed briefly; circle (filled in) = key pressed for longer; circle (with X) = no operation possible due to Bluetooth connection*
9 *Device Tag*
10 *Bluetooth (symbol flashes if Bluetooth connection is active)*
11 *HART communication, PROFINET over Ethernet-APL communication or PROFIBUS PA communication (symbol appears when communication is enabled)*
12 *Locking (symbol appears when device is locked)*

Remote operation

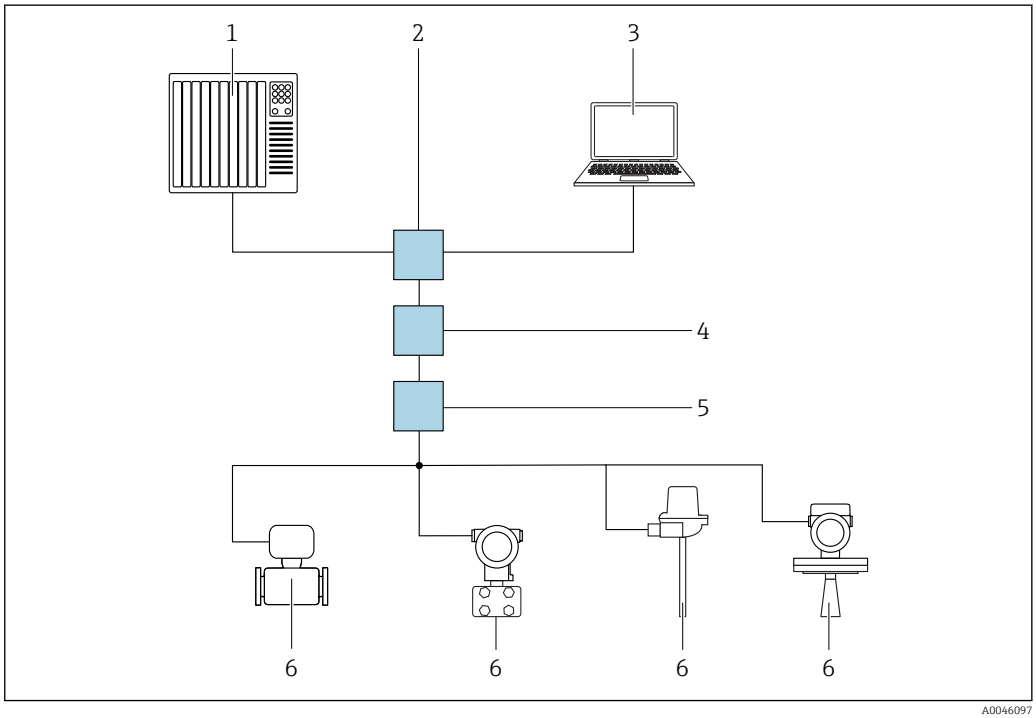
Via HART protocol or Bluetooth



8 *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 *Field Xpert SMT70/SMT77, smartphone or computer with operating tool (e.g. DeviceCare/FieldCare, AMS Device View, SIMATIC PDM)*
8 *Bluetooth modem with connecting cable (e.g. VIATOR)*
9 *Transmitter*

Via PROFINET over Ethernet-APL network



9 *Options for remote operation via PROFINET over Ethernet-APL network: star topology*

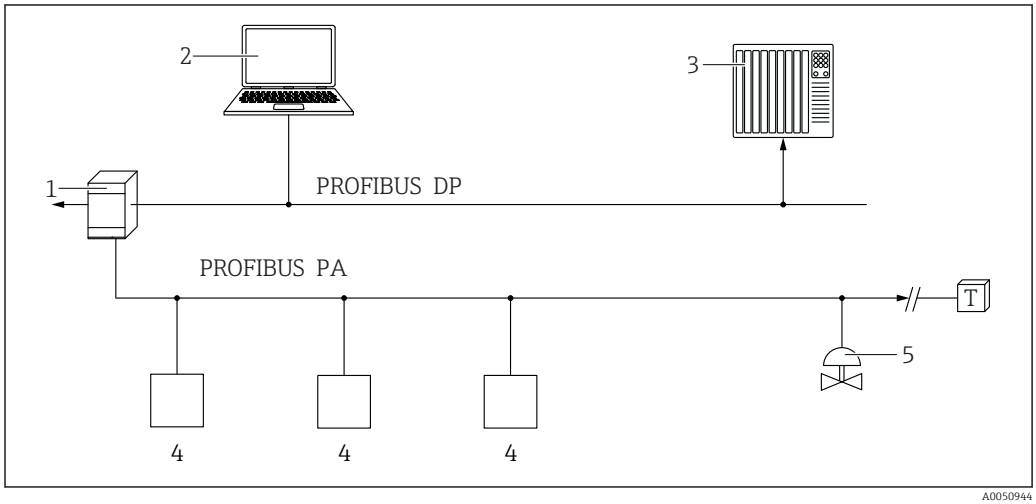
1 *Automation system, e.g. Simatic S7 (Siemens)*
2 *Ethernet switch*
3 *Computer with web browser (e.g., Microsoft Edge) for accessing the integrated device web server or computer with operating tool (e.g. FieldCare, DeviceCare, SIMATIC PDM) with iDTM PROFINET Communication*
4 *APL power switch (optional)*
5 *APL field switch*
6 *APL field device*

Call up the website via the computer in the network. The IP address of the device must be known.

The IP address can be assigned to the device in a variety of ways:
- Dynamic Configuration Protocol (DHCP), factory setting
  The automation system (e.g. Siemens S7) automatically assigns the IP address to the device.
- Software addressing
  The IP address is entered via the IP address parameter.
- .DIP switch for service
  The device then has the fixed IP address 192.168.1.212.
  The IP address is only adopted following a restart.
  The IP address can now be used to establish the connection to the network.

The default setting is that the device uses the Dynamic Configuration Protocol (DHCP). The automation system (e.g. Siemens S7) automatically assigns the IP address of the device.

Via PROFIBUS PA protocol



1 *Segment coupler*
2 *Computer with PROFIusb and operating tool (e.g. DeviceCare/FieldCare)*
3 *PLC (programmable logic controller)*
4 *Transmitter*
5 *Additional functions (valves etc.)*

Via Web browser (for devices with PROFINET)

Function scope

Thanks to the integrated Web server the device can be operated and configured via a Web browser. The structure of the operating menu is the same as for the local display. In addition to the measured values, device status information is also displayed and allows users to monitor the status of the device. Furthermore the device data can be managed and the network parameters can be configured.

Via service interface (CDI)

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

Operation via Bluetooth® wireless technology (optional)

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

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

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

System integration	**HART** Version 7 **PROFINET over Ethernet-APL** PROFINET Profile 4.02 **PROFIBUS PA** PROFIBUS PA Profile Version 3.02
Supported operating tools	Smartphone or tablet with Endress+Hauser SmartBlue (app), DeviceCare, version 1.07.00 and higher, FieldCare, DTM, AMS and PDM. PC with Web server via fieldbus protocol.
HistoROM	When replacing the electronic insert, the stored data is transferred by reconnecting the HistoROM. The device does not work without HistoROM. The device serial number is saved in the HistoROM. The electronics serial number is saved in the electronics.

Certificates and approvals

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

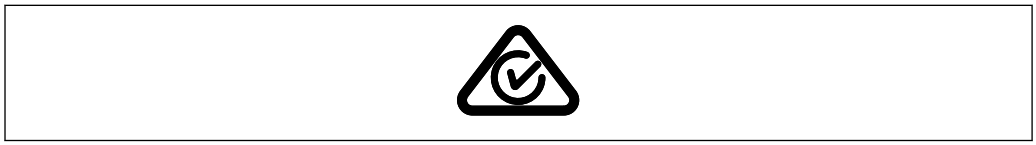
1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

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

Ex approvals

- ATEX
- CSA
- NEPSI
- UKCA
- INMETRO
- KC
- EAC
- 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.

Explosion-protected smartphones and tablets

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

Sanitary compatibility

The following applies for the ceramic membrane:

The US Food & Drug Administration (FDA) has no objections to the use of ceramics made from aluminum oxide as a surface material in contact with foodstuffs. This declaration is based on the FDA certificates of our ceramic suppliers.

EAC conformity

The device meets the legal requirements of the applicable EAC Directives. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.

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

Drinking water approval

- NSF/ANSI 61 drinking water approval
- KTW drinking water approval W 270

Overfill protection system

The device is tested in accordance with the approval guidelines for overfill protection units (ZG-ÜS:2012-07) as overfill protection as per Section 63 of the German Water Resources Act (WHG).

Functional safety SIL/ IEC 61508 Declaration of Conformity

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 GL (Det Norske Veritas / German Lloyd)

Radio approval

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

CRN approval

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 0F23358.5C. 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

Test, certificate, declarations

- Inspection certificate 3.1, EN10204 (material certificate, wetted metallic parts)
  The selection of this feature for coated process membranes/process connections refers to the metallic base material.
- NACE MR0175 / ISO 15156 (wetted metallic parts), declaration
- NACE MR0103 / ISO 17945 (wetted metallic parts), declaration
- AD 2000 (wetted metal parts), declaration, excluding membrane
- Pressure test, internal procedure, test report
- Helium leak test, internal procedure, test report
- PMI test, internal procedure (wetted metallic parts), test report

All test reports, declarations and inspection certificates are provided electronically in the Device Viewer: Enter the serial number of the nameplate (https://www.endress.com/de/pages/supporting-tools/device-viewer).

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

Product documentation on paper

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

Calibration

5-point calibration certificate

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

Manufacturer declarations

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 working pressure PS ≤ 200 bar (2 900 psi)) can be classified as pressure accessories in accordance with Pressure Equipment Directive 2014/68/EU. If the maximum working pressure is ≤ 200 bar (2 900 psi) and the pressurized volume of the pressure equipment is ≤ 0.1 l, the pressure equipment is subject to the Pressure Equipment Directive (see Pressure Equipment Directive 2014/68/EU, 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 a safety instrumented system for the protection of a pipe or vessel from exceeding allowable limits (equipment with safety function in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

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).

PROFINET over Ethernet-APL certification

PROFINET over Ethernet-APL interface

The device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e. V.). The measuring system meets all the requirements of the following specifications:

- Certified according to:
  - Test specification for PROFINET devices
  - PROFINET Security Level – Netload Class
- The device can also be operated with certified devices of other manufacturers (interoperability)

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:

CSA C/US IS, XP, NI:

Up to 40 bar (600 psi).

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

Metrological approval

If you select the "China" order option, the device is delivered with a Chinese nameplate according to the Chinese Quality Act.

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

Service

The following services, among others, can be selected using the Product Configurator.

- Cleaned of oil+grease (wetted)
- Verified cleaned, suitable for O2 applic. (wetted)
- PWIS-free (paint-wetting impairment substances)
  (The plastic protective cover is excluded from the PWIS cleaning)
- ANSI Safety Red coating, coated housing cover
- Set HART burst mode PV
- Set max. alarm current
- Bluetooth communication is disabled on delivery
- Product documentation on paper
  A printed (hard copy) version of test reports, declarations and inspection certificates can optionally be ordered via the **Service**, Version, **Product documentation on paper** option. The required documents can be selected under the feature **Test, certificate, declaration** and are then included with the device on delivery.

Measuring point (TAG)

- Order code: marking
- Option: Z1, tagging (TAG), see additional specification
- Location of tag identifier: to be selected in the additional specifications
  - Stainless steel wired-on tag plate
  - Paper adhesive label
  - Plate provided
  - RFID tag
  - RFID tag + stainless steel wired-on tag plate
  - RFID tag + paper adhesive label
  - RFID tag + supplied label/plate
- Definition of tag name: to be defined in the additional specifications
  3 lines of maximum 18 characters each
  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
(https://www.endress.com/de/pages/supporting-tools/device-viewer)

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

Application packages

Heartbeat Technology

Availability

Available in all device versions.

Heartbeat Verification + Monitoring, optional.

Heartbeat Diagnostics

- Continuous self-monitoring of the device
- Diagnostic messages output to
  - the local display
  - an asset management system (e.g. FieldCare or DeviceCare)
  - an automation system (e.g. PLC)
  - web server

Heartbeat Verification

- Monitoring of the installed device without interrupting the process, including a verification report
- Clear measuring point assessment (pass/fail) with high total test coverage as part of the manufacturer's specification
- Can be used to document normative requirements
- Meets the requirements for measurement traceability in accordance with ISO 9001 (ISO9001:2015 Section 7.1) ((HART: As of firmware 01.01.xx) (PROFIBUS PA: As of firmware 01.00.xx)). The verification report can be generated via Bluetooth and digital communication interface.

Heartbeat Monitoring

- Statistical Sensor Diagnostics: statistical analysis and evaluation of the pressure signal, including signal noise, to detect process anomalies (e.g. blocked impulse lines)
- Loop Diagnostics: detection of elevated measuring circuit resistance values or declining power supply (only with current output)
- Process Window: user-definable pressure and temperature limits to detect dynamic pressure surges or faulty trace heating systems or insulation
- Continuously supplies additional monitoring data to an external condition monitoring system for the purpose of predictive maintenance or process monitoring

Detailed description

See Special Documentation for SD Heartbeat Technology.

High-temperature version

High-temperature version 150 °C (302 °F) process, optionally available.

Accessories

Device-specific accessories

Mechanical accessories

- Mounting bracket for housing
- Prepared for sealing, PMO-compliant
- Mounting bracket for block & bleed valves
- Block&Bleed valves:
  - Block&Bleed valves can be ordered as **enclosed** accessories (seal for mounting is enclosed)
  - Block and 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)
- Flushing rings
- Weather protective cover

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

Plug connectors

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

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

Weld-in accessory

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

Device Viewer

All the spare parts for the device, along with the order code, are listed in the *Device Viewer* (https://www.endress.com/de/pages/supporting-tools/device-viewer).

Documentation

The following document types are available in the Downloads area of the Endress+Hauser website (www.endress.com/downloads), depending on the device version:

Document type	Purpose and content of the document
Technical Information (TI)	**Planning aid for your device** 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 (KA)	**Guide that 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 (BA)	**Your reference document** The Operating Instructions contain all the information that is required in 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.
Description of Device Parameters (GP)	**Reference for your parameters** The document provides a detailed explanation of each individual parameter. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

Document type	Purpose and content of the document
Safety instructions (XA)	Depending on the approval, safety instructions for electrical equipment in hazardous areas are also supplied with the device. These are an integral part of the Operating Instructions. The nameplate indicates which Safety Instructions (XA) apply to the device.
Supplementary device-dependent documentation (SD/FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is a constituent part of the device documentation.

Registered trademarks

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

PROFINET®
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

PROFIBUS®
PROFIBUS and the associated trademarks (The Association Trademark, the Technology Trademarks, the Certification Trademark and the Certified by PI Trademark) are registered trademarks of the PROFIBUS User Organization e.V. (Profibus User Organization), Karlsruhe - Germany

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

Apple®
Apple, the Apple logo, iPhone, and iPod touch are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.

Android®
Android, Google Play and the Google Play logo are trademarks of Google Inc.

KALREZ®
Registered trademark of DuPont Performance Elastomers L.L.C., Wilmington, USA



www.addresses.endress.com

Endress+Hauser

People for Process Automation