

# Technical Information

## Deltabar M PMD55

Differential pressure measurement



Differential pressure transmitter with metal sensor

### Application

The device is used for the following measuring tasks:

- Flow measurement (volume or mass flow) in conjunction with primary elements in gases, vapours and liquids
- Level, volume or mass measurement in liquids
- Differential pressure monitoring, e.g. of filters and pumps

### Your benefits

- Very good reproducibility and long-term stability
- High reference accuracy: 0.1%  
as PLATINUM version: up to 0.075%
- Turn down up to 100:1
- Compact transmitter design
- Quick commissioning via DIP switches
- Standardized platform for differential pressure, hydrostatics, and pressure (Deltabar M – Deltapilot M – Cerabar M)
- Simple, fast commissioning through a user interface designed for real-world applications
- Used for process pressure monitoring up to SIL2, certified to IEC 61508 Edition 2.0 and IEC 61511 by TÜV NORD

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
## About this document

### Symbols





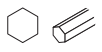
#### Safety symbols

Symbol	Meaning
 <small>A0011189-EN</small>	<b>DANGER!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 <small>A0011190-EN</small>	<b>WARNING!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 <small>A0011191-EN</small>	<b>CAUTION!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or moderate injury.
 <small>A0011192-EN</small>	<b>NOTE!</b> This symbol contains information on procedures and other facts, which do not result in personal injury.









#### Electrical symbols

Symbol	Meaning
 <small>A0018335</small>	<b>Direct current</b> A terminal at which DC voltage is present or through which direct current flows.
 <small>A0018336</small>	<b>Alternating current</b> A terminal at which AC voltage is present or through which alternating current flows.
 <small>A0018337</small>	<b>Direct current and alternating current</b> <ul style="list-style-type: none"> <li>▪ A terminal at which AC voltage or DC voltage is present.</li> <li>▪ A terminal through which alternating current or direct current flows.</li> </ul>
 <small>A0018338</small>	<b>Ground connection</b> A grounded terminal which, from the operator's point of view, is grounded via a grounding system.
 <small>A0018339</small>	<b>Protective ground connection</b> A terminal that must be connected to ground before other connections may be established.
 <small>A0011201</small>	<b>Equipotential connection</b> A connection that must be made with the plant grounding system; depending on national or company codes of practice, this may be a potential matching line or a star-shaped grounding system, for example.



#### Tool symbols

Symbol	Meaning
 <small>A0011219</small>	Phillips head screwdriver
 <small>A0011220</small>	Flat blade screwdriver
 <small>A0013442</small>	Torx screwdriver
 <small>A0011222</small>	Hexagon wrench
 <small>A0011221</small>	Allen key

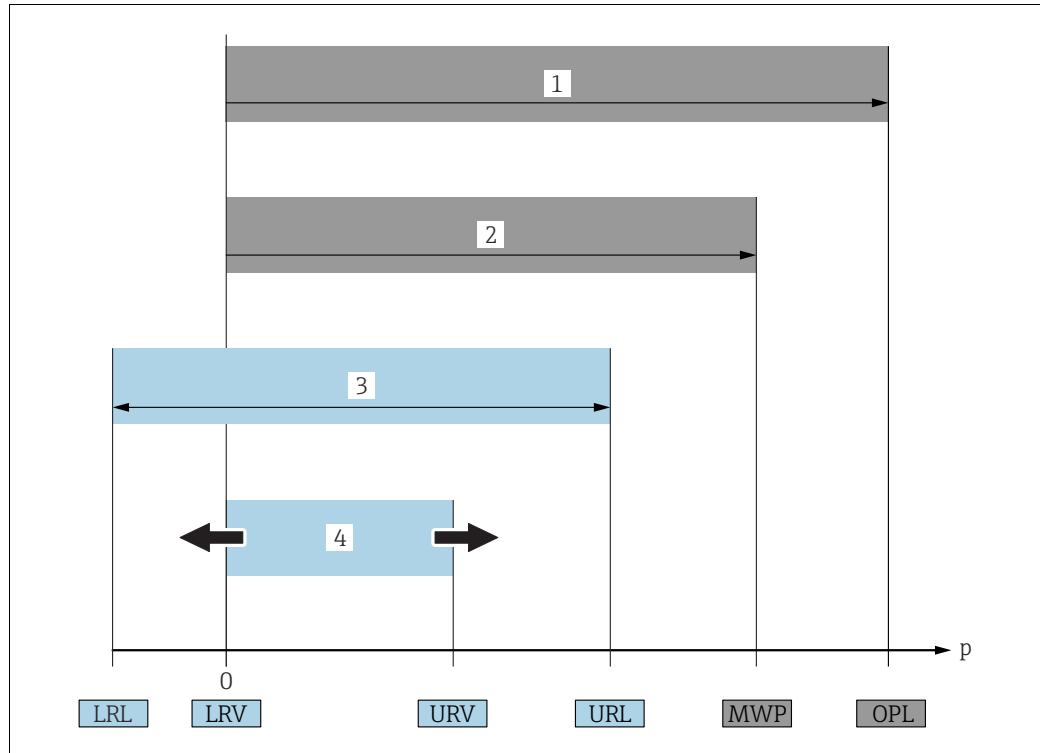
**Symbols for types of information**

Symbol	Meaning
 A0011182	<b>Allowed</b> Indicates procedures, processes or actions that are allowed.
 A0011183	<b>Preferred</b> Indicates procedures, processes or actions that are preferred.
 A0011184	<b>Forbidden</b> Indicates procedures, processes or actions that are forbidden.
 A0011193	<b>Tip</b> Indicates additional information.
 A0015483	<b>Reference to documentation</b> Refers to the relevant device documentation.
 A0015484	<b>Reference to page</b> Refers to the relevant page number.
 A0015486	<b>Reference to graphics</b> Refers to the relevant graphic number and page number.
1. , 2. , ...	Series of steps
 A0015488	<b>Help in the event of a problem</b>

**Symbols in graphics**

Symbol	Meaning
1, 2, 3, 4, ...	Numbering for main positions
1. , 2. , ...	Series of steps
A, B, C, D, ...	Views
A-A, B-B, ...	Sections
 A0011187	<b>Hazardous area</b> Indicates a hazardous area.
 A0011188	Safe area (non-hazardous area) Indicates a non-hazardous area.

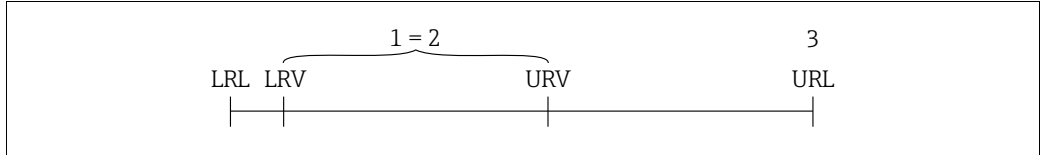
Terms and abbreviations



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Position	Term/Abbreviation	Explanation
1	OPL	The OPL (over pressure limit = sensor overload limit) for the sensors 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. Also observe pressure-temperature dependency. For the relevant standards and additional notes, see the "→ 31" section. The OPL may be applied for a limited time period.
2	MWP	The MWP (maximum working pressure) for the sensors depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Also observe pressure-temperature dependency. For the relevant standards and additional notes, see the "→ 31" section. The MWP may be applied for an unlimited time.
3	Maximum sensor measuring range	Range between LRL and URL. This span is the maximum calibratable/adjustable measuring span.
4	Calibrated/Adjusted measuring span	Range between LRV and URV Factory setting: 0...URL Other calibrated spans can be ordered with customised settings.
p	-	Pressure
-	LRL	Lower range limit
-	URL	Upper range limit
-	LRV	Lower range value
-	URV	Upper range value
-	TD	Turn down

Turn down calculation



A0029545

- 1 Calibrated/Adjusted measuring span
- 2 Zero-based span
- 3 Upper range limit

**Example**

- Sensor: 10 bar (150 psi)
- Upper range limit (URL) = 10 bar (150 psi)
- Calibrated/Adjusted measuring span: 0...5 bar (0...75 psi)
- Lower range value (LRV) = 0 bar
- Upper range value (URV) = 5 bar (75 psi)

Turn down (TD):

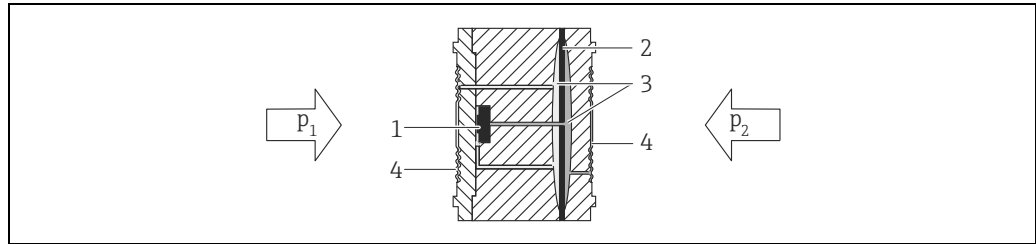
$$TD = \frac{URL}{|URV - LRV|}$$

$$TD = \frac{10 \text{ bar (150 psi)}}{|5 \text{ bar (75 psi)} - 0 \text{ bar (0 psi)}|} = 2$$

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

## Function and system design

### Measuring principle



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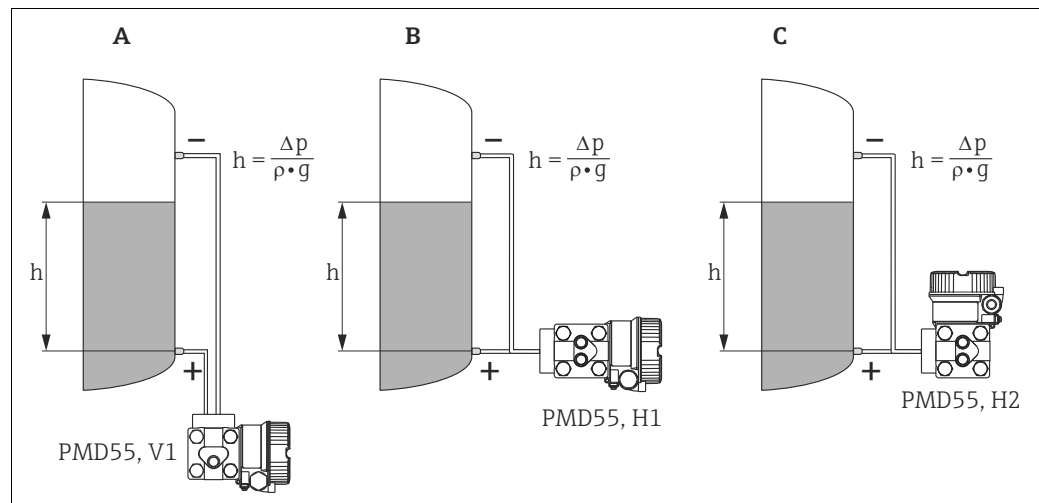
Measuring cell of the Deltabar M

- |   |                                     |
|---|-------------------------------------|
| 1 | Sensing element                     |
| 2 | Overload diaphragm/Middle diaphragm |
| 3 | Filling oil                         |
| 4 | Process isolating diaphragm         |

The metal separating diaphragms (4) are deflected on both sides by the acting pressures  $p_1$  and  $p_2$ . A filling oil (3) transfers the pressure to a resistance circuit bridge (semiconductor technology). The differential-pressure-dependent change of the bridge output voltage is measured and further processed.

### Level measurement (level, volume and mass)

### Design and operation mode



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Level measurement with Deltabar M

- |   |  |
|---|--|
| A | Option V1; vertical impulse line; 90° alignment    |
| B | Option H1; horizontal impulse line; 180° alignment |
| C | Option H2; horizontal impulse line; 90° alignment  |

- |            |                       |
|------------|-----------------------|
| $h$        | Height (level)        |
| $\Delta p$ | Differential pressure |
| $\rho$     | Density of the medium |
| $g$        | Gravitation constant  |

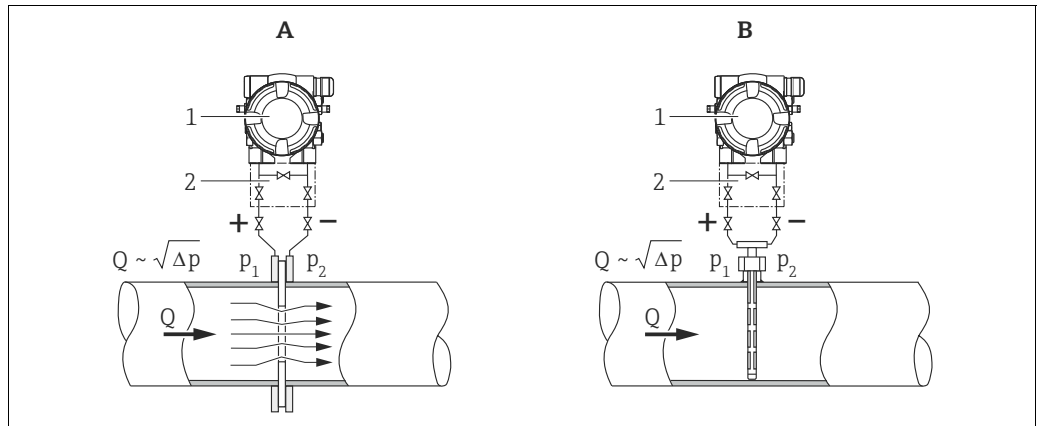
### Your benefits

- Volume and mass measurements in any tank shapes by means of a freely programmable characteristic curve
- Choice of diverse level units
- Has a wide range of uses, e.g.
  - for level measurement in tanks with superimposed pressure
  - in the event of foam formation
  - in tanks with agitators or screen fittings
  - in the event of liquid gases
  - for standard level measurement



Flow measurement

Design and operation mode



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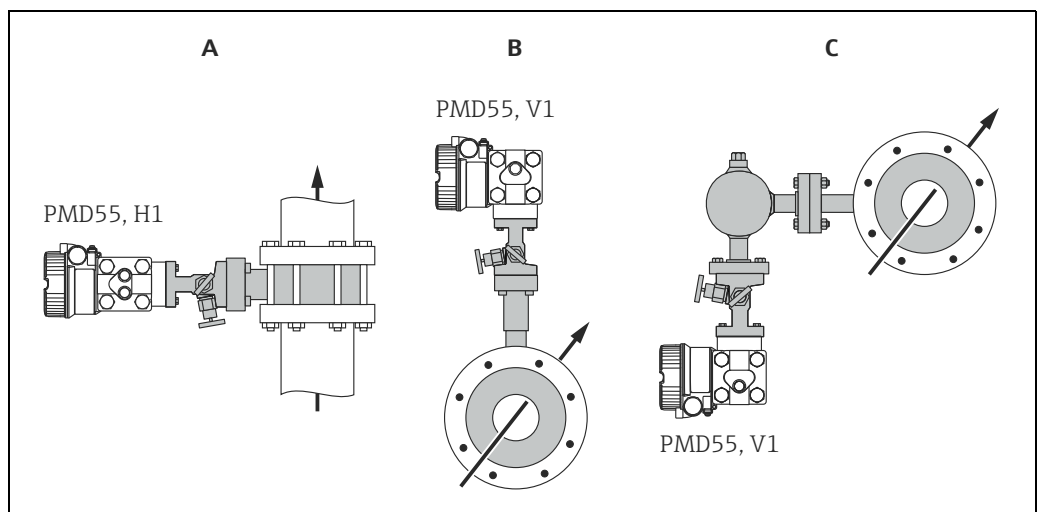
Flow measurement with Deltabar M PMD55 and primary element

- A with orifice plate
- B with Pitot tube
- 1 Deltabar M PMD55
- 2 3-valve manifold
- Q Flow
- $\Delta p$  Differential pressure,  $\Delta p = p_1 - p_2$

Your benefits

- Choice between five flow modes of operation:
  - Volume flow
  - Norm volume flow (European norm conditions)
  - Standard volume flow (American standard conditions)
  - Mass flow
  - %
- Choice of diverse flow units with automatic unit conversion.
- Low flow cut off: when activated, this function suppresses small flows which can lead to large fluctuations in the measured value.
- Contains two totalizers as standard. One totalizer can be reset to zero.
- The totalizing unit can be individually set for each totalizer. This allows independent daily and annual quantity totalizing.

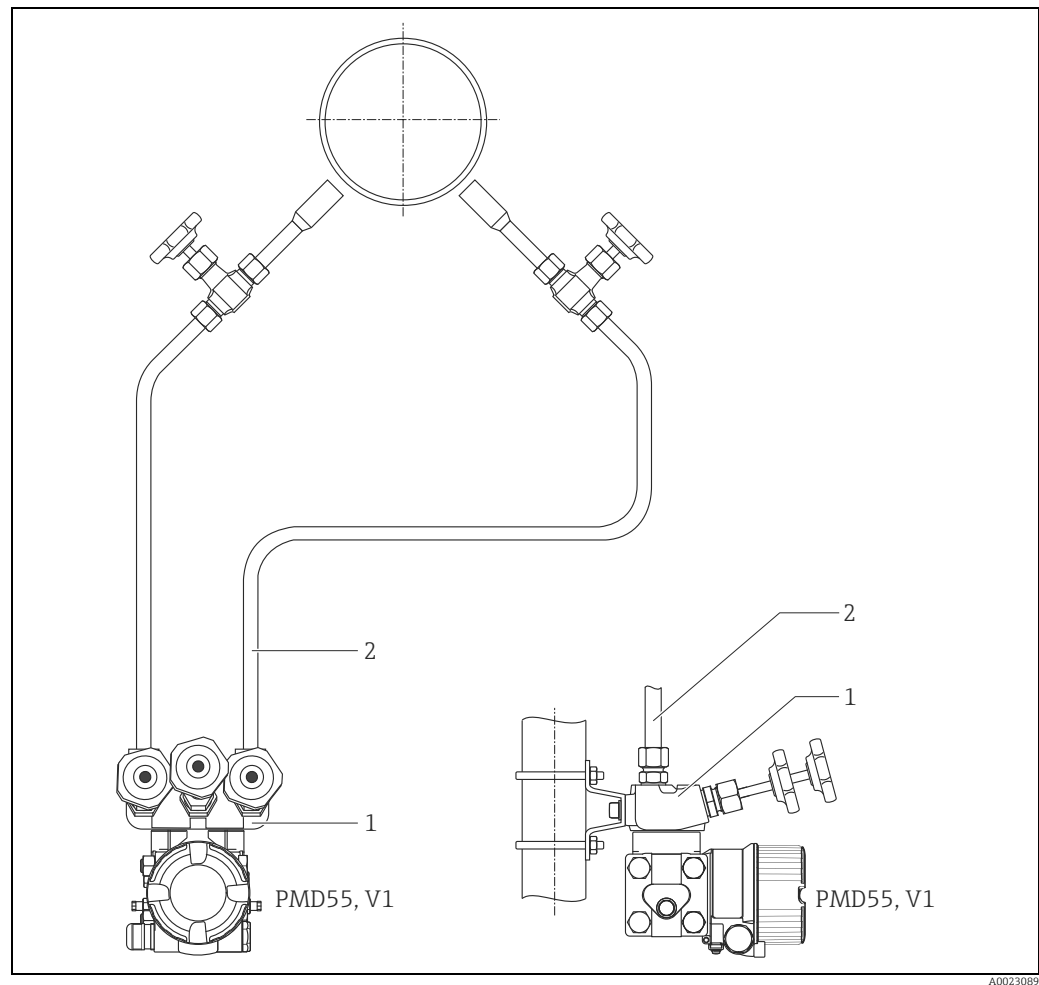
Typical arrangements for flow measurements



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- A Liquid in vertical pipe; H1 option; horizontal impulse line; 180° alignment
- B Gas in horizontal pipe; V1 option; vertical impulse line; 90° alignment
- C Vapour in horizontal pipe; V1 option; vertical impulse line; 90° alignment

## Mounting example



- 1 Valve manifold  
2 Impulse line

## Communication and data processing

- 4 to 20 mA with HART communication protocol
  - PROFIBUS PA
    - The Endress+Hauser devices meet the requirements of the FISCO model.
    - Due to the low current consumption of  $11 \text{ mA} \pm 1 \text{ mA}$ , the following number of devices can be operated on one bus segment if installing as per FISCO:
      - up to 8 Deltabar M for Ex ia, CSA IS and FM IS applications
      - up to 31 Deltabar M for all other applications, e.g. in non-hazardous areas, Ex nA, etc.
- Further information on PROFIBUS PA can be found in Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and in the PNO Guideline.
- FOUNDATION Fieldbus
    - The Endress+Hauser devices meet the requirements of the FISCO model.
    - Due to the low current consumption of  $16 \text{ mA} \pm 1 \text{ mA}$ , the following number of devices can be operated on one bus segment if installing as per FISCO:
      - up to 6 Deltabar M for Ex ia, CSA IS and FM IS applications
      - up to 22 Deltabar M for all other applications, e.g. in non-hazardous areas, Ex nA, etc.
- Further information on FOUNDATION Fieldbus, such as requirements for bus system components can be found in Operating Instructions BA00013S "FOUNDATION Fieldbus Overview".

## Input

**Measured variable** Differential pressure, from which flow (volume or mass current) and level (level, volume or mass) are derived.

### Measuring range

Sensor [mbar (psi)]	Maximum sensor measuring range		Smallest measuring span (factory calibration) <sup>1)</sup> [mbar (psi)]	MWP [bar (psi)]	OPL		Min. operating pressure <sup>2)</sup> [mbar <sub>abs</sub> (psi <sub>abs</sub> )]	Option <sup>3)</sup>
	lower (LRL) [mbar (psi)]	upper (URL) [mbar (psi)]			on one side [bar (psi)]	on both sides [bar (psi)]		
10 (0.15)	-10 (- 0.15)	+10 (+ 0.15)	0.5 (0.0075)	1 (15) <sup>4)</sup>	1 (15) <sup>4)</sup>	1.5 (22.5) <sup>4)</sup>	0.1 (0.0015) <sup>4)</sup>	7B
30 (0.45)	-30 (- 0.45)	+30 (+ 0.45)	1.5 (0.0225)					7C
100 (1.5)	-100 (- 1.5)	+100 (+ 1.5)	5 (0.075)	70 (1050) <sup>5)</sup> 160 (2400) <sup>6)</sup>	70 (1050) <sup>5)</sup> 160 (2400) <sup>6)</sup>	105 (1575) <sup>5)</sup> 240 (3600) <sup>6)</sup>	0.1 (0.0015) <sup>5)</sup> 0.1 (0.0015) <sup>6)</sup>	7D
500 (7.5)	-500 (- 7.5)	+500 (+ 7.5)	25 (0.375)					7F
1000 (15)	-1000 (- 15)	+1000 (+ 15)	50 (0.75)					7G
3000 (45)	-3000 (- 45)	+3000 (+ 45)	150 (2.25)					7H
16000 (240)	-16000 (- 240)	+16000 (+ 240)	800 (12)					7L
40000 (600)	-40000 (- 600)	+40000 (+ 600)	2000 (30)					7M

- 1) Recommended Turn down: Max 100:1.  
Factory calibration Turn down: Max 20:1
- 2) The minimum operating pressure indicated in the table applies to silicone oil under reference operating conditions. Minimum operating pressure at 85°C (185°F) for silicone oil: 10 mbar (0.15 psi) (abs)
- 3) Product Configurator, "Sensor Nominal Value" ordering feature
- 4) Option "2" in the Order Code - Feature 60
- 5) Option "6" in the Order Code - Feature 60
- 6) Option "7" in the Order Code - Feature 60

Nominal Pressure PN	Option <sup>1)</sup>
1 bar / 100 kPa / 14.5 psi	2
70 bar / 7 MPa / 1015 psi	6
160 bar / 16 MPa / 2400 psi	7

- 1) Product Configurator "Nominal Pressure PN" ordering feature

## Output

### Output signal

- 4 to 20 mA with superimposed digital communication protocol HART 6.0, 2-wire
- Digital communication signal PROFIBUS PA (Profile 3.02)
- Digital communication signal FOUNDATION Fieldbus

Output	Option <sup>1)</sup>
4 to 20mA HART	2
PROFIBUS PA	3
FOUNDATION Fieldbus	4

1) Product Configurator "Output" ordering feature

### Signal range – 4 to 20 mA HART

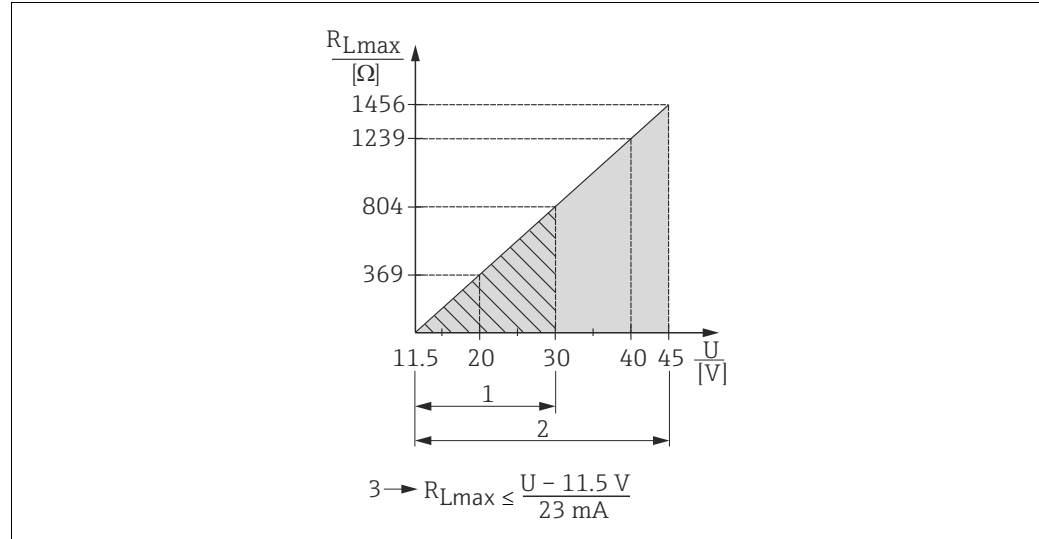
3.8 mA to 20.5 mA

### Signal on alarm

As per NAMUR NE 43

- 4 to 20 mA HART  
Options:
  - Max. alarm\*: can be set from 21...23 mA (factory setting: 22 mA)
  - Keep measured value: last measured value is kept
  - Min. alarm: 3.6 mA
- PROFIBUS PA: can be set in the Analog Input block,  
Options: Last Valid Out Value (factory setting), Fail-safe Value, Status Bad
- FOUNDATION Fieldbus: can be set in the Analog Input block,  
Options: Last Good Value, Fail-safe Value (factory setting), Wrong Value

### Load – 4 to 20 mA



#### Load diagram

1 Supply voltage 11.5 ... 30 V DC for intrinsically safe instrument versions

2 Supply voltage 11.5 ... 45 V DC (versions with plug-in connector 35 V DC) for other types of protection and for uncertified instrument versions

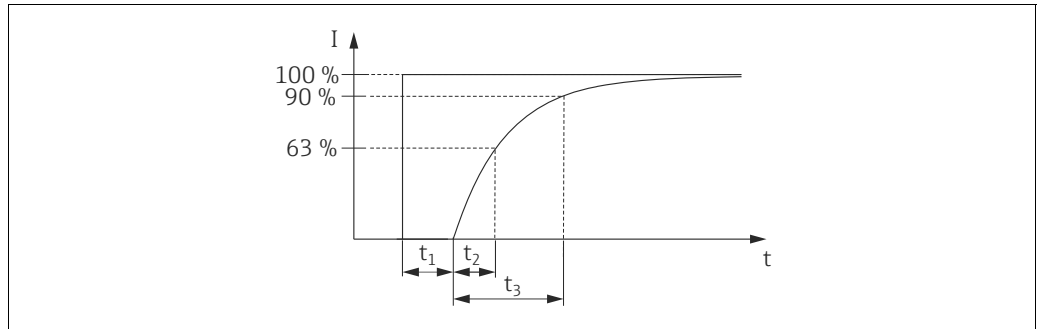
$R_{Lmax}$  Maximum load resistance

$U$  Supply voltage



When operating via a handheld terminal or via PC with an operating program, a minimum communication resistance of 250 Ω must be taken into account.

**Dead time, Time constant**



Presentation of the dead time and the time constant

A0019786

**Dynamic behavior:  
current output**

	Dead time ( $t_1$ ) [ms]	Time constant T63 (= $t_2$ ) [ms]	Time constant T90 (= $t_3$ ) [ms]
max.	60	90	210

**Dynamic behavior:  
digital output  
(HART electronics)**

	Dead time ( $t_1$ ) [ms]	Dead time ( $t_1$ ) [ms] + Time constant T63 (= $t_2$ ) [ms]	Dead time ( $t_1$ ) [ms] + Time constant T90 (= $t_3$ ) [ms]
min.	220	310	370
max.	1020	1110	1170

**Reading cycle**

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

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

**Cycle time (update time)**

Cyclic (Burst): min. 300 ms

**Response time**

- Acyclic: min. 330 ms, typical 590 ms (depends on command # and number of preambles)
- Cyclic (Burst): min. 160 ms, typical 350 ms (depends on command # and number of preambles)

**Dynamic behavior:  
PROFIBUS PA**

	Dead time ( $t_1$ ) [ms]	Dead time ( $t_1$ ) [ms] + Time constant T63 (= $t_2$ ) [ms]	Dead time ( $t_1$ ) [ms] + Time constant T90 (= $t_3$ ) [ms]
min.	95	185	245
max.	1195	1285	1345

**Reading cycle**

- Cyclic: max. 30/s (dependent on the number and type of function blocks used in a closed-control loop)
- Acyclic: typical 25/s

**Cycle time (update time)**

Min. 100 ms. The cycle time in a bus segment in cyclic data communication depends on the number of devices, on the segment coupler used and on the internal PLC cycle time.

**Response time**

- Cyclic: approx. 8 to 13 ms (depends on Min. Slave Interval)
- Acyclic: approx. 23 to 35 ms (depends on Min. Slave Interval)

**Dynamic behavior:  
FOUNDATION Fieldbus**

	Dead time (t <sub>1</sub> ) [ms]	Dead time (t <sub>1</sub> ) [ms] + Time constant T63 (= t <sub>2</sub> ) [ms]	Dead time (t <sub>1</sub> ) [ms] + Time constant T90 (= t <sub>3</sub> ) [ms]
min.	105	195	255
max.	1105	1195	1255

**Reading cycle**

- Cyclic: max. 10/s (dependent on the number and type of function blocks used in a closed-control loop)
- Acyclic: typical 5/s

**Cycle time (update time)**

Cyclic: min. 100 ms

**Response time**

- Cyclic: max. 20 ms (for standard bus parameter settings)
- Acyclic: typical 70 ms (for standard bus parameter settings)

**Damping**

A damping affects all outputs (output signal, display).

- Via onsite display, handheld terminal or PC with operating program, continuous from 0...999 s
- Via DIP-switch on the electronic insert, switch position "on" (= set value) and "off" (= damping switched off)
- Factory setting: 2 s

**Firmware version**

Designation	Option <sup>1)</sup>
01.00.zz, HART, DevRev01	78

1) Product Configurator "Firmware version" ordering feature

**Protocol-specific data**

**HART**

Manufacturer ID	17 (11 hex)
Device Type Code	33 (21 hex)
Device Revision	01 (01 hex) - SW version 01.00.zz
HART specification	6
DD Revision	<ul style="list-style-type: none"> <li>▪ 01 (netherlands)</li> <li>▪ 02 (russian)</li> </ul>
Device description files (DTM, DD)	Information and files can be found: <ul style="list-style-type: none"> <li>▪ www.endress.com</li> <li>▪ www.hartcomm.org</li> </ul>
HART load	Min. 250 Ω
HART device variables	The measured values can be freely assigned to the device variables: <p><b>Measured values for PV (primary variable)</b></p> <ul style="list-style-type: none"> <li>▪ Pressure</li> <li>▪ Flow</li> <li>▪ Level</li> <li>▪ Tank content</li> </ul> <p><b>Measured values for SV, TV (second and third variable)</b></p> <ul style="list-style-type: none"> <li>▪ Pressure</li> <li>▪ Level</li> <li>▪ Totalizer</li> </ul>
Supported functions	<ul style="list-style-type: none"> <li>▪ Burst mode</li> <li>▪ Additional Transmitter Status</li> <li>▪ Device Locking</li> <li>▪ Alternative operating modes</li> </ul>

**PROFIBUS PA**

Manufacturer ID	17 (11 hex)
Ident number	1554 hex
Profile Version	3.02 <ul style="list-style-type: none"> <li>▪ SW Version 01.00.zz</li> </ul>
GSD Revision	5
DD Revision	1
GSD File	Information and files can be found: <ul style="list-style-type: none"> <li>▪ www.endress.com</li> <li>▪ www.profibus.org</li> </ul>
DD Files	
Output values	<p><b>Measured values for PV (via Analog Input Function Block)</b></p> <ul style="list-style-type: none"> <li>▪ Pressure</li> <li>▪ Flow</li> <li>▪ Level</li> <li>▪ Tank content</li> </ul> <p><b>Measured values for SV</b></p> <ul style="list-style-type: none"> <li>▪ Pressure</li> </ul> <p><b>Measured values for QV</b></p> <ul style="list-style-type: none"> <li>▪ Totalizer</li> </ul>
Input values	Input value sent from PLC, can be shown on display
Supported functions	<ul style="list-style-type: none"> <li>▪ Identification &amp; Maintenance <ul style="list-style-type: none"> <li>Simple device identification via control system and nameplate</li> </ul> </li> <li>▪ Condensed status</li> <li>▪ Automatic ident number adaptation and switchable to following ident numbers: <ul style="list-style-type: none"> <li>- 9700: Profile-specific transmitter identification number with the "Classic" or "Condensed" status".</li> <li>- 1554: Identification number for Deltabar M.</li> </ul> </li> <li>▪ Device locking: The device can be locked by hardware or software.</li> </ul>

## Data of the FOUNDATION Fieldbus interface

### Basic data

Device Type	0x1021
Device Revision	01 (hex)
DD Revision	0x01021
CFR Revision	0x000102
ITK Version	5.2.0
ITK Certification Driver No.	IT067600
Link-Master (LAS) capable	Yes
Link Master / Basic Device selectable	Yes; Factory setting: Basic Device
Number of VCRs	44
Number of Link Objects in VFD	50
Number of FB-Schedule Objects	40

### Virtual communication references (VCRs)

Permanent Entries	44
Client VCRs	0
Server VCRs	5
Source VCRs	8
Sink VCRs	0
Subscriber VCRs	12
Publisher VCRs	19

### Link settings

Slot time	4
Min. inter PDU delay	12
Max. response delay	40

### Transducer Blocks

Block	Content	Output values
TRD1 Block	Contains all parameters related to the measurement	<ul style="list-style-type: none"> <li>■ Pressure or level (channel 1)</li> <li>■ Process temperature (channel 2)</li> <li>■ Measured pressure value (channel 3)</li> <li>■ Max. pressure (channel 4)</li> <li>■ Level before linearization (channel 5)</li> </ul>
Dp Flow Block	enthält Durchfluss und Summenzähler Parameter	<ul style="list-style-type: none"> <li>■ Totalizer 1 (channel 6)</li> <li>■ Totalizer 2 (channel 7)</li> </ul>
Diagnostic Block	Contains diagnostic information	<ul style="list-style-type: none"> <li>■ Error code via DI channels (channel 10 to 15)</li> </ul>
Display Block	Contains parameters to configure the onsite display	No output values



**Function blocks**

Block	Content	Number of blocks	Execution time	Functionality
Resource Block	The Resource Block contains all the data that uniquely identify the device. It is an electronic version of a nameplate of the device.	1		enhanced
Analog Input Block 1 Analog Input Block 2	The AI Block receives the measuring data from the Sensor Block, (selectable via a channel number) and makes the data available to other function blocks at its output. Enhancement: digital outputs for process alarms, fail safe mode.	2	25 ms	enhanced
Digital Input Block	This block contains the discrete data of the Diagnose Block (selectable via a channel number 10 to 15) and provides them for other blocks at the output.	1	20 ms	standard
Digital Output Block	This block converts the discrete input and thus initiates an action (selectable via a channel number) in the DP Flow Block or in the im TRD1 Block. Channel 20 resets the counter for max. pressure transgressions value and Channel 21 resets the Totalizer.	1	20 ms	standard
PID Block	The PID Block serves as a proportional-integral-derivative controller and is used almost universally for closed-loop-control in the field including cascade and feedforward. Input IN can be indicated on the display. The selection is performed in the Display Block (DISPLAY_MAIN_LINE_CONTENT).	1	40 ms	standard
Arithmetic Block	This block is designed to permit simple use of popular measurement math functions. The user does not have to know how to write equations. The math algorithm is selected by name, chosen by the user for the function to be performed.	1	35 ms	standard
Input Selector Block	The Input Selector Block facilitates the selection of up to four inputs and generates an output based on the configured action. This block normally receives its inputs from AI Blocks. The block performs maximum, minimum, average and 'first good' signal selection. Inputs IN1 to IN4 can be indicated on the display. The selection is performed in the Display Block (DISPLAY_MAIN_LINE_1_CONTENT).	1	30 ms	standard
Signal Characterizer Block	The Signal Characterizer Block has two sections, each with an output that is a nonlinear function of the respective input. The nonlinear function is generated by a single look-up table with 21 arbitrary x-y pairs.	1	40 ms	standard
Integrator Block	The Integrator Block integrates a variable as a function of the time or accumulates the counts from a Pulse Input Block. The block may be used as a totalizer that counts up until reset or as a batch totalizer that has a setpoint, where the integrated or accumulated value is compared to pre-trip and trip settings, generating a binary signal when the setpoint is reached.	1	35 ms	standard

**Additional function block information:**

Instantiate Function Block	YES
Number of instantiate blocks	20

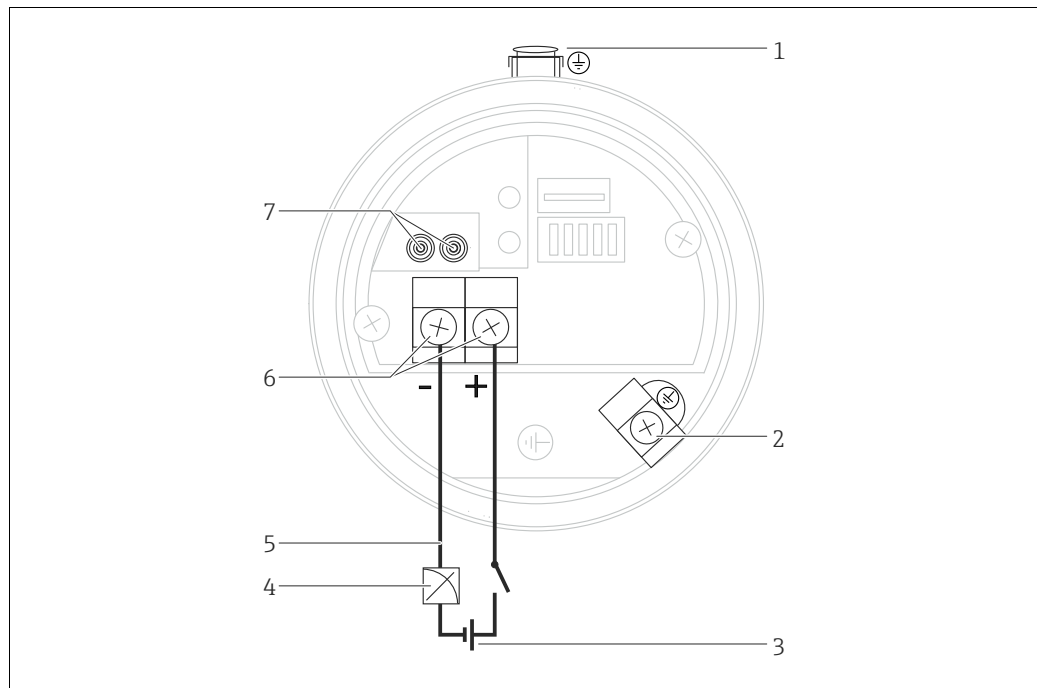
## Power supply

### ⚠ WARNING

#### An incorrect connection compromises electrical safety!

- ▶ When using the measuring device in hazardous areas, the relevant national standards and regulations as well as the safety instructions or installation or control drawings must be observed.  
→ 49, "Safety Instructions" and "Installation/Control Drawings" ordering features.
- ▶ All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas → 49, sections "Safety Instructions" and "Installation/Control drawing".
- ▶ According to IEC/EN61010 a suitable disconnecter has to be installed for the device.
- ▶ HART: Overvoltage protection HAW569-DA2B for the non-hazardous area, ATEX II 2 (1) Ex ia IIC and IEC Ex ia can be ordered as an option (see "Ordering information" ordering feature).
- ▶ Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.
- ▶ The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply.

### Terminal assignment



#### Electrical connection

- 1 External grounding terminal
- 2 Internal grounding terminal
- 3 Supply voltage → 18
- 4 4...20 mA for HART devices
- 5 For HART and FOUNDATION Fieldbus devices: With a handheld terminal, all the parameters can be configured anywhere along the bus line via menu operation.
- 6 Terminals
- 7 For HART devices: test terminals, see section "Taking a 4 to 20 mA test signal"

### Supply voltage

#### 4 to 20 mA HART

Type of protection	Supply voltage
<ul style="list-style-type: none"> <li>▪ Intrinsically safe</li> </ul>	11.5 ... 30 V DC
<ul style="list-style-type: none"> <li>▪ Other types of protection</li> <li>▪ Devices without certificate</li> </ul>	11.5 ... 45 V DC (Versions with plug-in connection 35 V DC)

#### Taking a 4 to 20 mA test signal

A 4 to 20 mA test signal may be measured via the test terminals without interrupting the measurement.

**PROFIBUS PA**

- Version for non-hazardous areas: 9 to 32 V DC

**FOUNDATION Fieldbus**

- Version for non-hazardous areas: 9 to 32 V DC

**Current consumption**

- PROFIBUS PA: 11 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21
- FOUNDATION Fieldbus: 16 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21

**Electrical connection**

Cable entry	Degree of protection	Option <sup>1)</sup>
M20 coupling	IP66/68 NEMA 4x/6P	A
M20 thread	IP66/68 NEMA 4X/6P	B
G ½" thread	IP66/68 NEMA 4X/6P	C
NPT ½" thread	IP66/68 NEMA 4X/6P	D
M12 connector	IP66/67 NEMA 4X/6P	I
7/8" connector	IP66/68 NEMA 4X/6P	M
HAN7D plug 90 degrees	IP65	P
M16 valve connector	IP64	V

1) Product Configurator "Electrical Connection" ordering feature

**PROFIBUS PA**

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply. For further information on the network structure and grounding, and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and the PNO Guideline.

**FOUNDATION Fieldbus**


The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply. For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00013S "FOUNDATION Fieldbus Overview" and the FOUNDATION Fieldbus Guideline.

**Terminals**

- Supply voltage and internal ground terminal: 0.5 ... 2.5 mm<sup>2</sup> (20...14 AWG)
- External ground terminal: 0.5 ... 4 mm<sup>2</sup> (20...14 AWG)

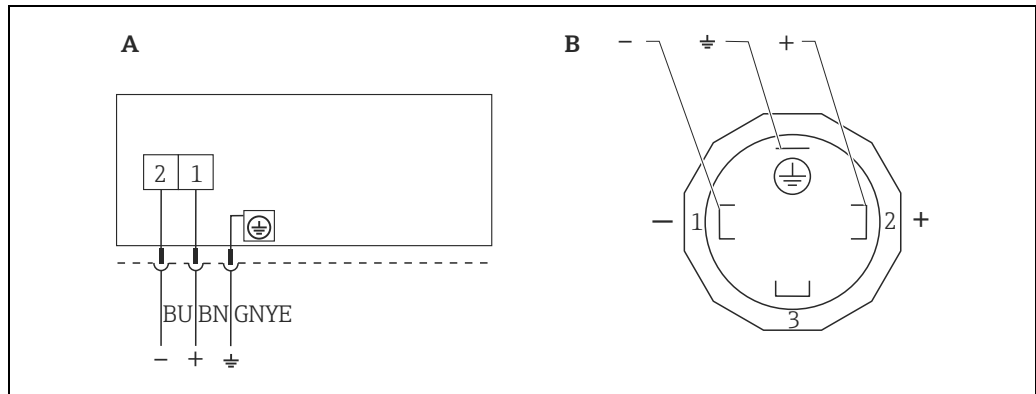
**Cable entry**

Approval	Type	Clamping area
Standard, II1/2G Exia, IS	Plastic M20x1.5	5 to 10 mm (0.2 to 0.39 in)
ATEX II1/2D, II1/2GD Exia, II3G Ex nA	Metal M20x1.5 (Ex e)	7 to 10.5 mm (0.28 to 0.41 in)

For additional technical data, see housing section →  32 ff".

Device plug connectors

Devices with valve connector



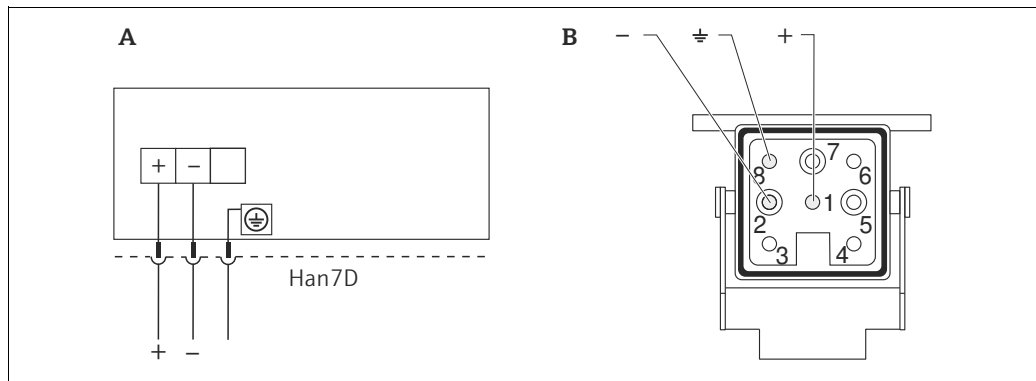
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BN = brown, BU = blue, GNYE = green/yellow

- A Electrical connection for devices with valve connector
- B View of the plug connector at the device

Material: PA 6.6

Devices with Harting plug Han7D



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

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

Devices with M12 plug

PIN assignment for M12 connector

PIN assignment for M12 connector	PIN	Meaning
	1	Signal +
	2	Not assigned
	3	Signal -
	4	Earth

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

Plug-in jack M 12x1, straight

- Material: body PA; coupling nut CuZn, nickel-plated

- Degree of protection (fully locked): IP66/67
- Order number: 52006263

Plug-in jack M 12x1, elbowed

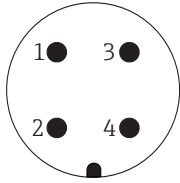
- Material: body PBT/PA; coupling nut GD-Zn, nickel-plated
- Degree of protection (fully locked): IP66/67
- Order number: 71114212

Cable 4x0.34 mm<sup>2</sup> (20 AWG) with M12 socket, elbowed, screw plug, length 5 m (16 ft)

- Material: body PUR; coupling nut CuSn/Ni; cable PVC
- Degree of protection (fully locked): IP66/67
- Order number: 52010285

**Devices with 7/8" plug**

*PIN assignment for 7/8" connector*

PIN assignment for 7/8" connector	PIN	Meaning
	1	Signal -
	2	Signal +
	3	Not assigned
	4	Shield

External thread: 7/8 - 16 UNC

- Material: 316L (1.4401)
- Protection: IP66/68

**Cable specification**

**HART**

- Endress+Hauser recommends using a twisted, shielded two-wire cable.
- The outer diameter of the cable depends on the cable entry used.

**PROFIBUS PA**

Use a twisted, shielded two-wire cable, preferably cable type A



For further information on the cable specifications, see Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning", the PNO Guideline 2.092 PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

**FOUNDATION Fieldbus**

Use a twisted, shielded two-wire cable, preferably cable type A



For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

**Startup current HART**

12 mA or 22 mA (selectable)

**Residual ripple**

Without influence on 4 to 20 mA signal up to ± 5 % residual ripple within the permitted voltage range [according to HART hardware specification HCF\_SPEC-54 (DIN IEC 60381-1)]

**Influence of power supply**

≤ 0.001% of URL/V

## Performance characteristics

### Reference operating conditions

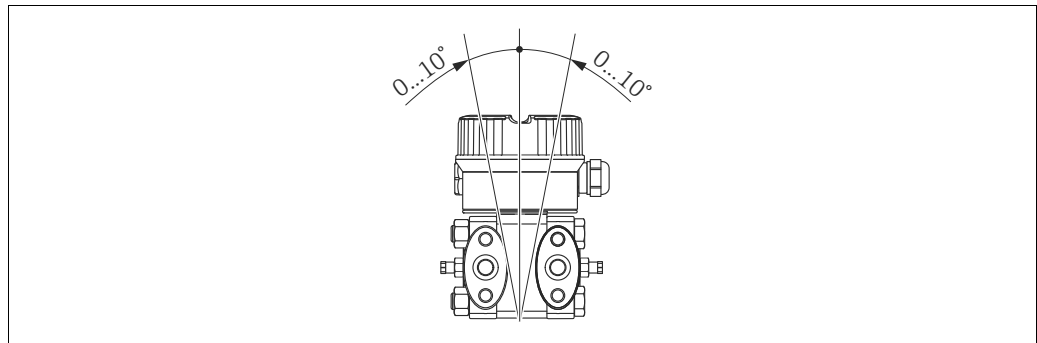
- As per IEC 60770-1 and IEC 61298-1, Sections 5 to 7
- Ambient temperature  $T_U$  = constant, in the range of: +21...+33°C (+70...91 °F)
- Humidity  $\phi$  = constant, in the range of: 5...80 % r.H
- Ambient pressure  $p_U$  = constant, in the range of: 860...1060 mbar (12.47...15.37 psi)
- Position of the measuring cell: constant, in the range of:  $\pm 1^\circ$  horizontally and  $\pm 1^\circ$  vertically
- P1 = high pressure side
- Input of "Lo Trim Sensor" and "Hi Trim Sensor" for lower range value and upper range value
- Measuring span URV - LRV
- Membrane material 316L
- Filling oil: silicone oil
- Side flanges material: AISI 316L
- Supply voltage: 24 V DC  $\pm$  3 V DC
- Load with HART: 250  $\Omega$

### Influence of the installation position

The recommended maximum angle to the axis of the diaphragm is  $10^\circ$  and results in a measuring error of  $\pm 0.72$  mbar (0.01 psi). The value is doubled for devices with inert oil.



Position-dependent zero shift can be corrected → 25, section "General installation instructions".



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### Resolution

- Current output: 1  $\mu$ A
- Display: can be set (factory setting: presentation of the maximum accuracy of the transmitter)

### Vibration effects

Test standard	Vibration effects
GL VI-7-2 <ul style="list-style-type: none"> <li>■ Part 7: Guidelines for the Performance of Type Approvals</li> <li>■ Chapter 2: Test Requirements for Electrical / Electronic Equipment and Systems</li> </ul>	guaranteed for 5 to 25 Hz: $\pm 1.6$ mm (0.06 in); 25 to 100 Hz: 4 g in all 3 planes
IEC 61298-3 IEC 60068-2-6	$\leq$ reference accuracy to 10...60 Hz: $\pm 0.35$ mm (0.01 in); 60...2000 Hz: 5 g in all 3 planes

**Reference accuracy**

The reference accuracy comprises the non-linearity according to limit point setting, hysteresis and non-reproducibility as per IEC 60770.

The following applies for the root-extracting characteristic curve:

The accuracy data of the Deltabar M is taken into the accuracy calculation of the flow rate with a factor of 0.5.

Measuring cell	% of the set span	
	Standard	Platinum
10 mbar (0.15 psi) 30 mbar (0.45 psi)	<ul style="list-style-type: none"> <li>■ TD 1:1 = ±0.2</li> <li>■ TD &gt; 1:1 = ±(0.2 x TD)</li> </ul>	--
100 mbar (1.5 psi)	<ul style="list-style-type: none"> <li>■ TD 1:1 to TD 4:1 = ±0.1</li> <li>■ TD &gt; 4:1 = ±(0.012 x TD + 0.052)</li> </ul>	<ul style="list-style-type: none"> <li>■ TD 1:1 to TD 4:1 = ±0.075</li> <li>■ TD &gt; 4:1 = ±(0.012 x TD + 0.027)</li> </ul>
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi) 16 bar (240 psi) 40 bar (600 psi)	<ul style="list-style-type: none"> <li>■ TD 1:1 to TD 10:1 = ±0.1</li> <li>■ TD &gt; 10:1 = ±(0.0015 x TD + 0.085)</li> </ul>	<ul style="list-style-type: none"> <li>■ TD 1:1 to TD 10:1 = ±0.075</li> <li>■ TD &gt; 10:1 = ±(0.0015 x TD + 0.060)</li> </ul>

Reference accuracy	Option <sup>1)</sup>
Platinum	D
Standard	G

1) Product Configurator "Reference Accuracy" ordering feature

**Thermal stability current output**

Measuring cell	-10 to +60°C (+14 to +140°F)	-40 to -10°C, +60 to +85°C (-40 to +14°F, +140 to +185°F)
	% of the set span	
10 mbar (0.15 psi) 30 mbar (0.45 psi)	±(0.31 x TD + 0.58)	±(0.45 x TD + 0.54)
100 mbar (1.5 psi)	±(0.18 x TD + 0.3)	±(0.3 x TD + 0.34)
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi)	±(0.08 x TD + 0.3)	±(0.12 x TD + 0.3)
16 bar (240 psi)	±(0.10 x TD + 0.32)	±(0.15 x TD + 0.36)
40 bar (600 psi)	±(0.08 x TD + 0.3)	±(0.37 x TD + 0.32)

**Influence of the static pressure**

Measuring cell	Influence on zero point	Influence on span
10 mbar (0.15 psi)	±0.2 % of URL / 1 bar	±0.2 % of URL / 1 bar
30 mbar (0.45 psi)	±0.07 % of URL / 1 bar	±0.07 % of URL / 1 bar
100 mbar (1.5 psi)	±0.15 % of URL / 70 bar	±0.14 % of URL / 70 bar
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi) 16 bar (240 psi) 40 bar (600 psi)	±0.075 % of URL / 70 bar	±0.14 % of URL / 70 bar



The influence of the static pressure on the zero point can be calibrated out.

**Total performance:  
current output**

The "Total performance" specification comprises the non-linearity including hysteresis, non-reproducibility, the thermal change of the zero point as well as the influence of the line pressure  $p_{st}$ . The line pressure  $p_{st}$  is 70 bar (1050 psi) for the 100 mbar, 500 mbar, 1 bar, 3 bar, 16 bar und 40 bar measuring cell.

Measuring cell	% of the set span			
	Standard, TD 1:1		Platinum, TD 1:1	
	-10 to +60°C (14 to 140°F)	-40 to -10°C; +60 to +85°C (-40 to +14°F; 140 to 185°F)	-10 to +60°C (14 to 140°F)	-40 to -10°C; +60 to +85°C (-40 to +14°F; 140 to 185°F)
10 mbar (0.15 psi)	±0.94	±1.03	--	--
30 mbar (0.45 psi)	±0.92	±1.01	--	--
100 mbar (1.5 psi)	±0.51	±0.66	±0.51	±0.38
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi)	±0.40	±0.44	±0.40	±0.32
16 bar (240 psi)	±0.43	±0.53	±0.43	±0.38
40 bar (600 psi)	±0.40	±0.70	±0.40	±0.33

**Long-term stability**

Measuring cell	% of URL / 1 year	% of URL / 5 years
10 mbar (0.15 psi) 30 mbar (0.45 psi)	±0.25	±1.25
100 mbar (1.5 psi)	±0.18	±0.35
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi) 16 bar (240 psi) 40 bar (600 psi)	±0.05	±0.13

**Total Error**

Measuring cell	% of URL / 1 year	% of URL / 5 years
10 mbar (0.15 psi) 30 mbar (0.45 psi)	±0.97	±0.95
100 mbar (1.5 psi)	±0.26	±0.39
500 mbar (7.5 psi) 1 bar (15 psi) 3 bar (45 psi)	±0.14	±0.18
16 bar (240 psi)	±0.17	±0.20
40 bar (600 psi)	±0.14	±0.18

**Warm-up period**

- 4 to 20 mA HART: ≤5 s
- PROFIBUS PA: ≤8 s
- FOUNDATION Fieldbus: ≤20 s (after a TOTAL-reset ≤45 s)




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## Installation

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### General installation instructions

- The position-dependent zero shift can be corrected directly at the device via operating keys.
- Endress+Hauser offers a mounting bracket for installing the device on pipes or walls →  26, section "Wall and pipe mounting".
- When measuring in media with solid proportions, such as dirty liquids, installing separators and drain valves is useful for capturing and removing sediment.
- Using a three-valve or five-valve manifold allows for easy commissioning, installation and maintenance without interrupting the process.
- General recommendations for the impulse piping can be found in DIN 19210 "Methods for measurement of fluid flow; differential piping for flow measurement devices" or the corresponding national or international standards.
- Install the impulse piping with a continuous gradient of at least 10 %.
- When routing the impulse piping outdoors, ensure that sufficient anti-freeze protection is used, e.g. by using pipe heat tracing.

---

### Measuring arrangement

#### Flow measurement

- Measuring arrangement for gases: Mount device above the measuring point.
- Measuring arrangement for liquids and vapours: Mount the device below the measuring point.
- For flow measurement in vapours, mount the condensate traps at the same level as the same the tapping point and at the same distance from Deltabar M.

#### Level measurement

##### *Measuring arrangement level measurement in open tanks*

- Mount device below the lower measuring connection. The low-pressure side is open to atmosphere pressure.

##### *Measuring arrangement level measurement in closed tanks and closed tanks with superimposed vapor*

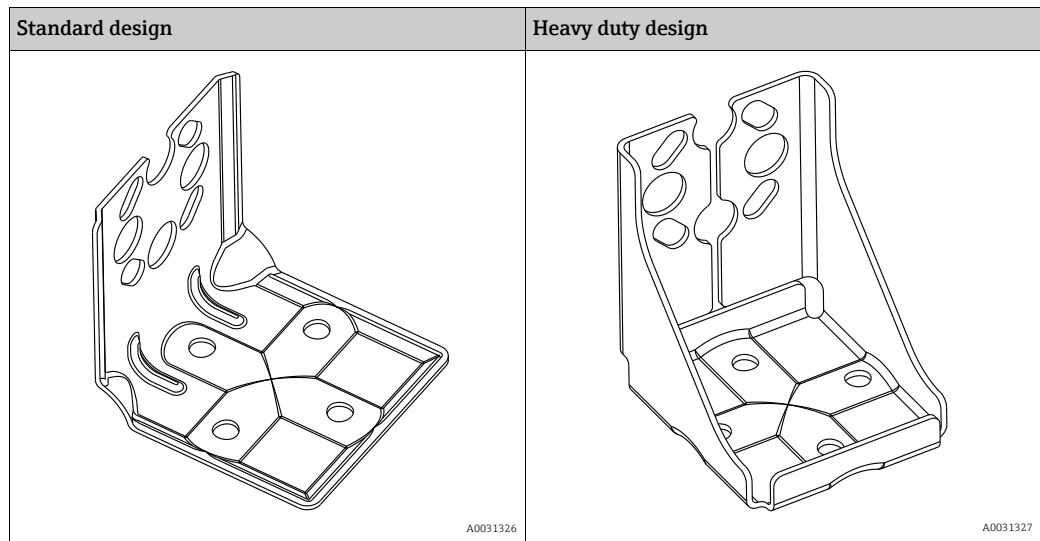
- Mount device below the lower measuring connection. Always connect the low-pressure side above the maximum level.
- In the case of level measurement in closed tanks with superimposed vapor, a condensate trap ensures pressure which remains constant on the low-pressure side.

#### Pressure measurement

- Measuring arrangement for gases: Mount device above the measuring point.
- Measuring arrangement for liquids and vapours: Mount the device below the measuring point.
- For differential pressure measurement in vapor, mount the condensate traps at the same level as the same the tapping point and at the same distance from Deltabar M.

### Wall and pipe-mounting transmitter (optional)

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



The standard mounting bracket version is **not** suitable for use in an application subject to vibrations. The vibration resistance of the reinforced version of the mounting bracket has been tested according to IEC 61298-3, see the "Vibration resistance" section → 29.

When using a valve block, the block's dimensions must be taken into account.

Bracket for wall and pipe mounting including retaining bracket for pipe mounting and two nuts.

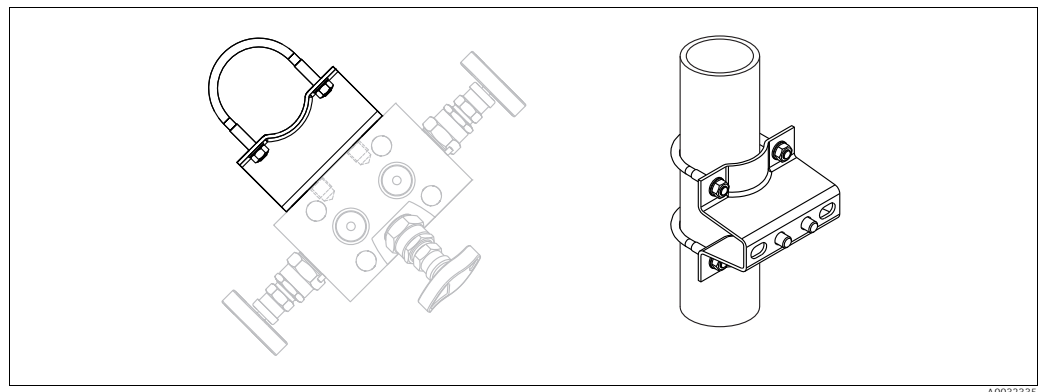
material of the screws used to secure the device depend on the order code.

Technical data (e.g. dimensions or order numbers for screws) see accessory document SD01553P/00/EN.

Ordering information:

- Standard design: Product Configurator "Accessory Enclosed" ordering feature, version "PD"
- Heavy duty design: Product Configurator "Accessory Enclosed" ordering feature, version "PB"
- The adapter plate is part of the delivery if the order option "PB" was selected in combination with the variant H1 or H2 from the process connection.

### Wall and pipe-mounting manifold (optional)

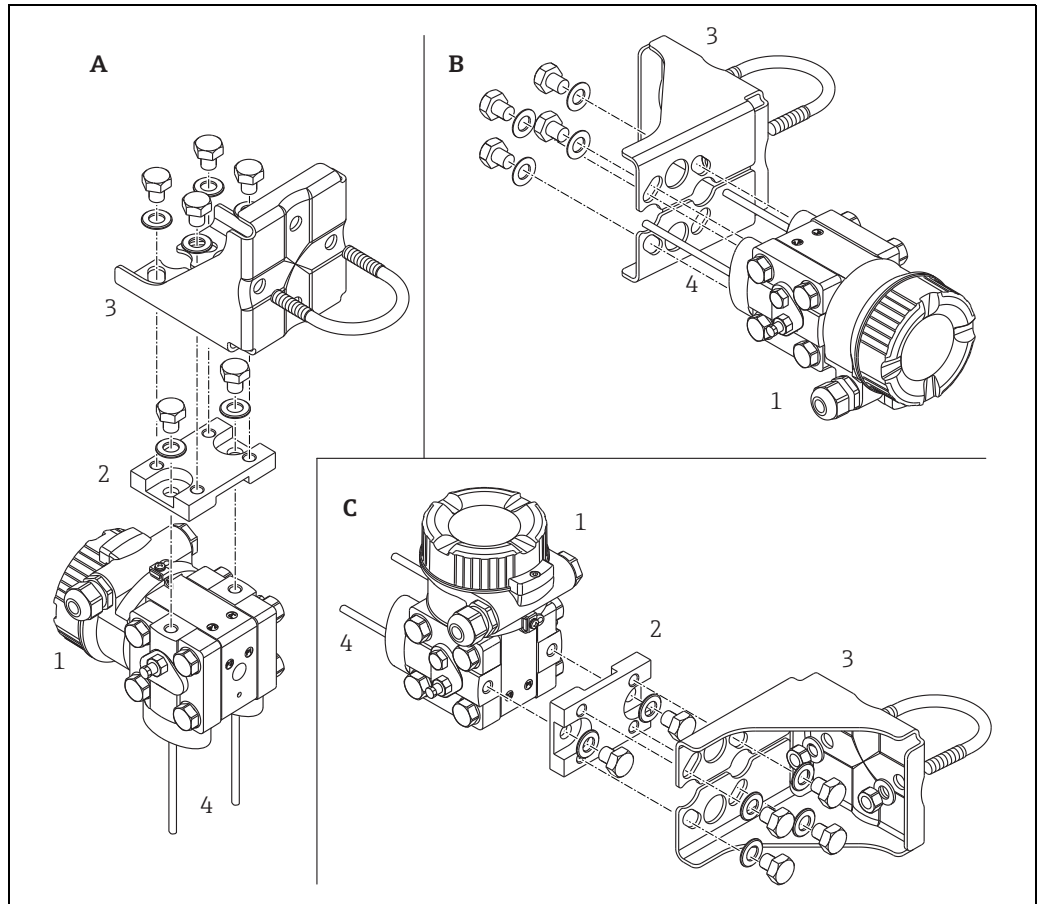


Technical data (e.g. dimensions or order numbers for screws) see accessory document SD01553P/00/EN.

Ordering information:

Product Configurator "Accessory Enclosed" ordering feature, version "PJ"

Typical installation arrangements



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- A Impulse line vertical, version V1, alignment 90°
- B Impulse line horizontal, version H1, alignment 180°
- C Impulse line horizontal, version H2, alignment 90°
- 1 Deltabar M
- 2 Adapter plate
- 3 Mounting bracket
- 4 Pressure line

Position	Process connection	Gland	Installation	Material	Option 1) 2)
A	NPT1/4-18 IEC61518	UNF7/16-20	Impulse line vertical, version V1, alignment 90°	1.4408 / CF3M <sup>3)</sup> / AISI 316L	HAJ
	NPT1/4-18 IEC61518	UNF7/16-20	Impulse line vertical, version V1, alignment 90°	C22.8	HA4
	NPT1/4-18 IEC61518	M10	Impulse line vertical, version V1, alignment 90°	1.4408 / CF3M <sup>3)</sup> / AISI 316L	HBJ
	NPT1/4-18 IEC61518	M10	Impulse line vertical, version V1, alignment 90°	C22.8	HB4
B	NPT1/4-18 IEC61518	UNF7/16-20	Impulse line horizontal, version H1, alignment 180°	1.4408 / CF3M <sup>3)</sup> / AISI 316L	HGJ
	NPT1/4-18 IEC61518	UNF7/16-20	Impulse line horizontal, version H1, alignment 180°	C22.8	HG4
	NPT1/4-18 IEC61518	M10	Impulse line horizontal, version H1, alignment 180°	1.4408 / CF3M <sup>3)</sup> / AISI 316L	HHJ
	NPT1/4-18 IEC61518	M10	Impulse line horizontal, version H1, alignment 180°	C22.8	HH4
C	NPT1/4-18 IEC61518	UNF7/16-20	Impulse line horizontal, version H2, alignment 90°	1.4408 / CF3M <sup>3)</sup> / AISI 316L	HNJ
	NPT1/4-18 IEC61518	UNF7/16-20	Impulse line horizontal, version H2, alignment 90°	C22.8	HN4
	NPT1/4-18 IEC61518	M10	Impulse line horizontal, version H2, alignment 90°	1.4408 / CF3M <sup>3)</sup> / AISI 316L	HOJ
	NPT1/4-18 IEC61518	M10	Impulse line horizontal, version H2, alignment 90°	C22.8	HO4

- 1) Product configurator "Process connection" ordering feature
- 2) Additional technical data see chapter "Mechanical construction"
- 3) Cast equivalent to AISI 316L

**Oxygen applications**

Oxygen and other gases can react explosively to oils, grease and plastics, such that, among other things, the following precautions must be taken:

- All components of the system, such as measuring devices, must be cleaned in accordance with the BAM (DIN 19247) requirements.

Ordering information:

Product Configurator "Service" ordering feature, HB option

- Dependent on the materials used, a certain maximum temperature and a maximum pressure for oxygen applications must not be exceeded.

<b>P<sub>max</sub> for Oxygen applications</b>	<b>T<sub>max</sub> for Oxygen applications</b>	<b>Option <sup>1)</sup></b>
30 bar (450 psi)	-18 to +60°C (0 to 140°F)	A (FKM Viton)

1) Product Configurator "Seal" ordering feature

**PWIS cleaning**

Special cleaning of the transmitter to remove paint-wetting impairment substances, for use in paint shops for example.

Ordering information :

Product Configurator "Service" ordering feature, HC option

**Ultra pure gas applications**

Endress+Hauser also offers devices for special applications, such as ultra pure gas, cleaned from oil and grease.

Ordering information :

Product Configurator "Service" ordering feature, HA option

No special restrictions regarding the process conditions apply to these devices.

## Environment

**Ambient temperature range**

- -40 to +85°C (-40 to +185°F)
- Onsite display: -20 to +70°C (-4 to 158°F)  
Enhanced temperature range with limitations concerning display speed and contrast: -40 to +85°C (-40 to +185°F)

For devices for use in hazardous areas, see Safety instructions, Installation or Control Drawing → 49, sections "Safety InstructionSafety Instructions" and "Installation/Control drawings").

**Storage temperature range**

- -40 to +90°C (-40 to +194°F)
- Onsite display: -40 to +85°C (-40 to +185°F)

**Degree of protection**      Ordering information :  
Product Configurator "Electrical Connection" ordering feature

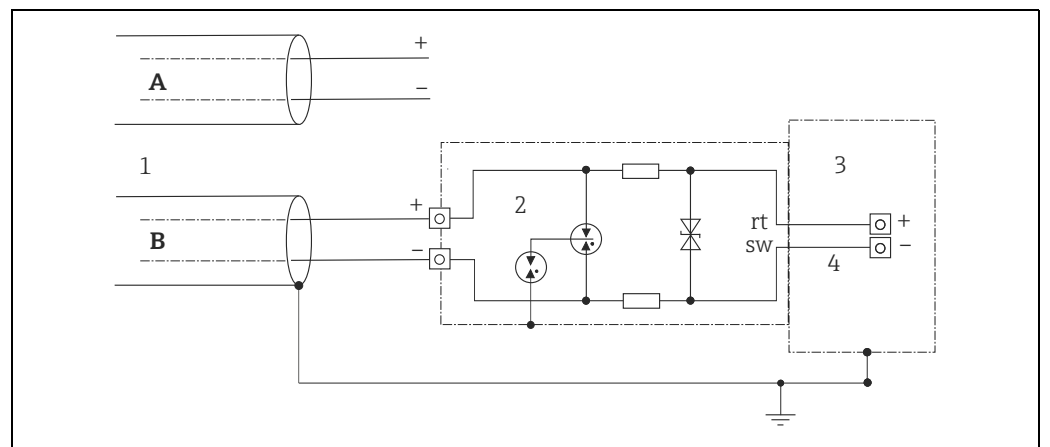
**Climate class**      Class 4K4H (air temperature: -20...55°C (-4...+131°F), relative humidity: 4...100%) fulfilled as per DIN EN 60721-3-4 (condensation possible)

**Vibration resistance**

Device	Test standard	Vibration resistance
PMD55	GL	guaranteed for 5 to 25 Hz: ±1.6 mm (0.06 in); 25 to 100 Hz: 4 g in all 3 planes
	IEC 61298-3	guaranteed for: 10...60 Hz: ±0.35 mm (0.014 in); 60...2000 Hz: 5 g in all 3 planes
PMD55 with mounting bracket (heavy duty design)	IEC 61298-3	guaranteed for: 10...60 Hz: ±0.15 mm (0.006 in); 60...500 Hz: 2 g in all 3 planes

**Overvoltage protection (optional)**

The device can be fitted with overvoltage protection. The overvoltage protection is mounted at the factory on the housing thread (M20x1.5) for the cable gland and is approx. 70 mm (2.76 in) in length (take additional length into account when installing). The device is connected as illustrated in the following graphic. For details refer to TI001013KEN, XA01003KA3 and BA00304KA2. Ordering information: Product Configurator "Accessory Mounted", NA option



- A Without direct shield grounding
- B With direct shield grounding
- 1 Incoming connection cable
- 2 HAW569-DA2B
- 3 Unit to be protected
- 4 Connection cable

**Electromagnetic compatibility**

- Electromagnetic compatibility as per all the relevant requirements of the EN 61326 series and NAMUR Recommendation EMC (NE21).
- Maximum deviation: < 0.5% of span
- Larger deviations possible with 10 mbar (0.15 psi) measuring cell.

Further details can be found in the manufacturer declaration.

## Process

### Process temperature limits (temperature at transmitter)

- Process connections made of 316L: -40 to +85°C (-40 to +185°F)
- Process connections made of C22.8: -10 to +85°C (+14 to +185°F)

The process temperature at the transmitter can be reduced through the use of impulse lines.



- For oxygen applications, observe → [28](#) "Oxygen applications" ordering feature.
- Observe the process temperature range of the seal (see also the following section "Process temperature range, Seals").

### Process temperature range, Seals

Seal	Process temperature range <sup>1)</sup>	Option <sup>2)</sup>
FKM Viton	-20 to +85°C (-4 to +185°F)	A
PTFE	-40 to +85°C (-40 to +185°F)	C
PTFE (EPDM core)	-40 to +85 °C (-40 to +185 °F) <sup>3)</sup>	D
NBR	-20 to +85°C (-4 to +185°F)	F
EPDM	-20 to +85°C (-4 to +185°F)	J

- 1) Restrictions for oxygen applications, → [28](#)
- 2) Product Configurator "Seal" ordering feature
- 3) Only 10 mbar (0.15 psi) und 30 mbar (0.45 psi) measuring cell.

### Pressure specifications

#### **▲ WARNING**

**The maximum pressure for the measuring device depends on the lowest rated element with regard to pressure → [11 ff](#), "Measuring range" ordering feature and → [32 ff](#) "Mechanical construction" ordering feature**

- ▶ The measuring device must be operated only within the specified limits!
- ▶ The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.
- ▶ MWP (Maximum Working Pressure):  
The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of 20°C (68°F) or 100°F (38°C) for ANSI flanges and may be applied to the device for an unlimited time. Observe the pressure-temperature dependency on the MWP.  
The pressure values permitted at higher temperatures can be found in the standards  
EN 1092-1: 2001 Tab. 18  
ASME B 16.5a – 1998 Tab. 2-2.2 F316  
ASME B 16.5a – 1998 Tab. 2.3.8 N10276  
JIS B 2220.
- ▶ OPL (Over Pressure Limit = sensor overload limit):  
The test pressure corresponds to the over pressure limit of the sensor and may only be applied for a limited time period to ensure measurement within specification and in order to avoid permanent damage. In the case of sensor range and process connections where the over pressure limit (OPL) of the process connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If you want to use the entire sensor range, select a process connection with a higher OPL value.
- ▶ Oxygen applications:  
The values for  $p_{\max}$  and  $T_{\max}$  for oxygen service" as per → [28](#) "Oxygen applications" may not be exceeded.

## Mechanical construction

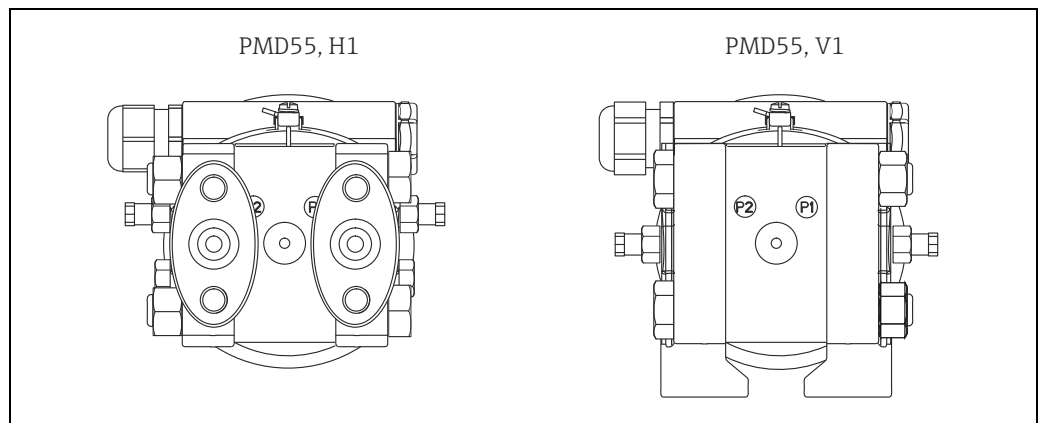
### Housing

Material		Weight kg (lbs)	Option <sup>1)</sup>
Housing <sup>2)</sup>	Cover seal		
Aluminum, without viewing window	EPDM	1.0 (2.21)	A
Aluminum, with viewing window	EPDM	1.1 (2.43)	B

- 1) Product Configurator "Housing" ordering feature
- 2) Degree of protection dependent on cable entry used → 19

### Process connection

#### Oval flange, connection 1/4-18 NPT IEC61518



Designation of the process connections "P1" and "P2"

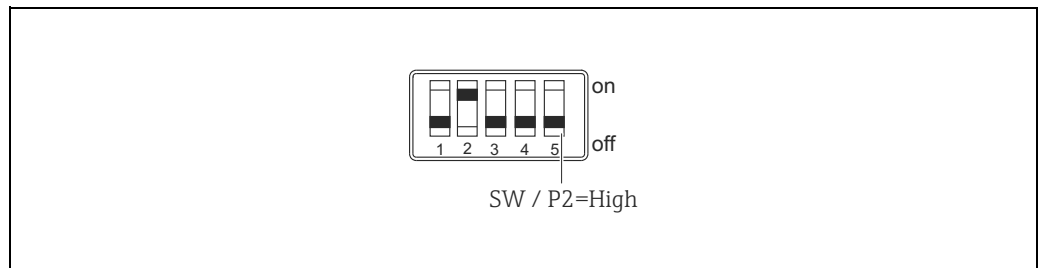
#### Ordering information:

- Product Configurator "Process connection" ordering feature
- As Accessory: Product Configurator "Accessory Enclosed" ordering feature, option "P1"

#### Factory setting

- P1: High pressure side (+)
- P2: Low pressure side (-)

This setting can be changed via a DIP switch in the connection department of the instrument and via the operating menu:

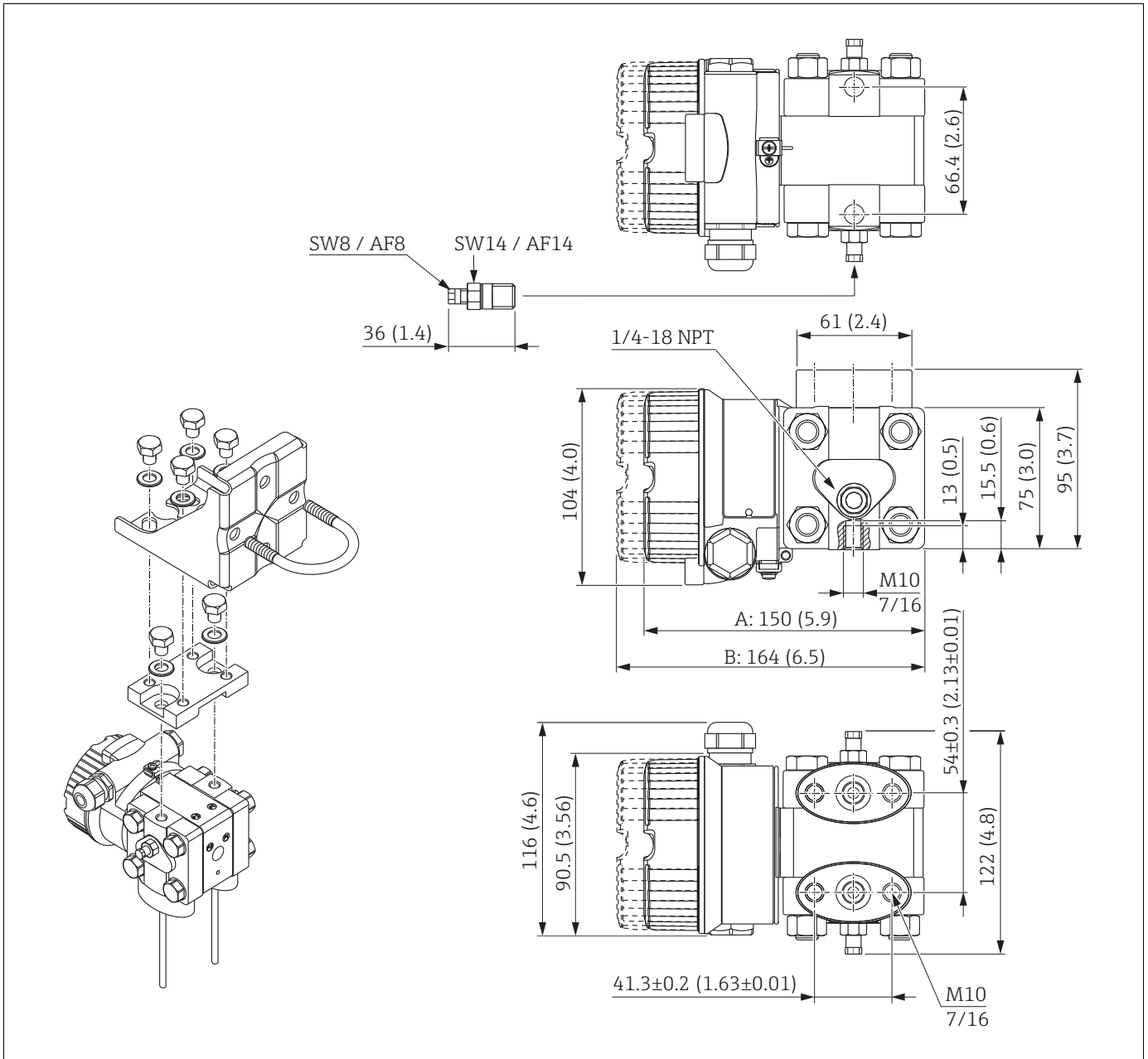


DIP switches in the connection compartment of the device. DIP switch 5 defines the high pressure side.

- DIP5 = off: The high pressure side is defined in the operating menu.  
Menu "Setup", parameter 006: "High pressure side"; default: P1)
- DIP 5 = on: P2 is the high pressure side, independent of the setting in the operating menu.



Dimensions V1 option;  
Impulse pipe vertical;  
alignment 90°



A0023117

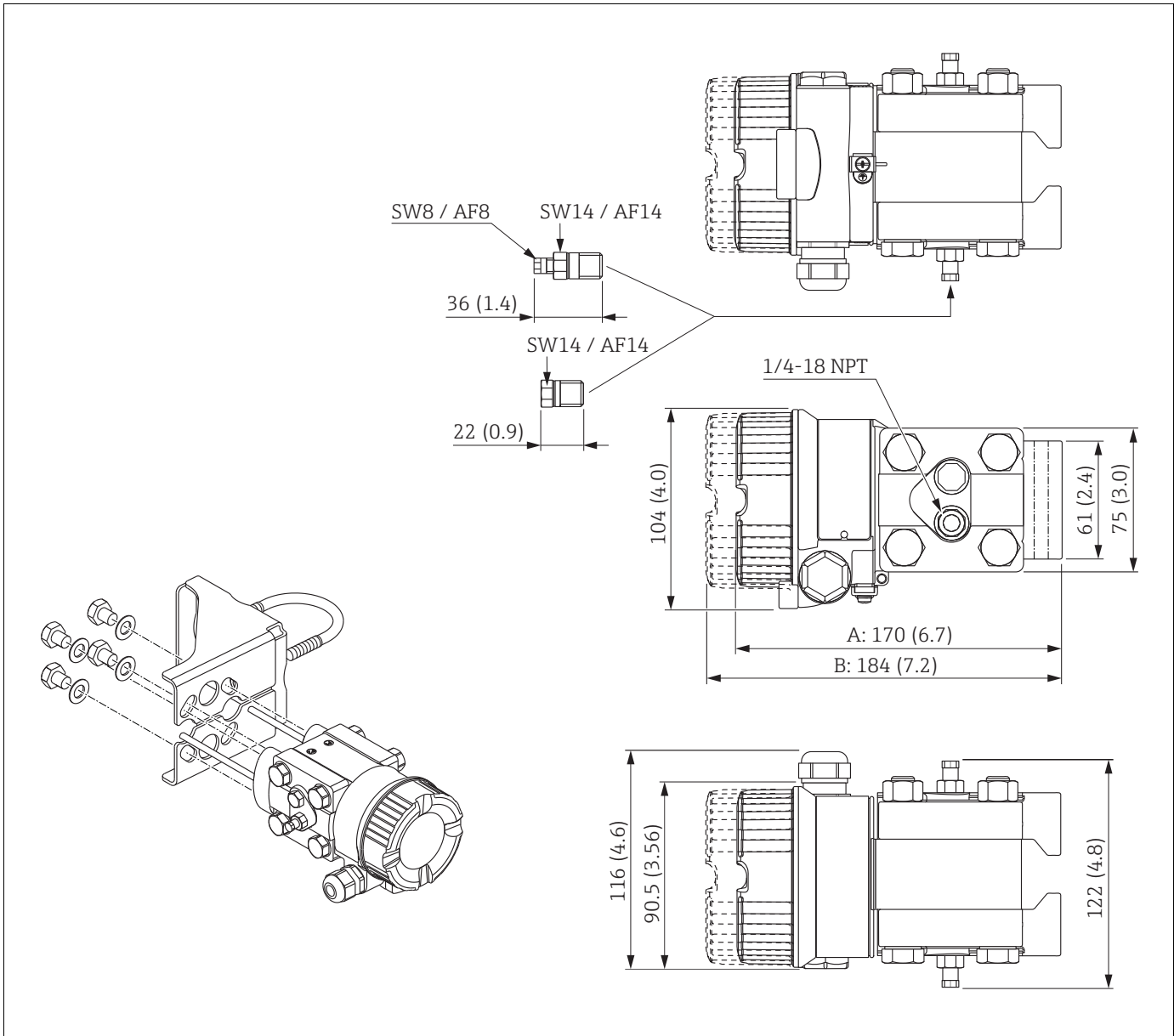
Engineering unit mm (in)

- A Version cover without viewing window
- B Version cover with viewing window.

Designation	Material	Weight	Option <sup>1)</sup>
		kg (lbs)	
NPT 1/4-18 IEC61518 UNF 7/16-20	1.4408 / CF3M <sup>2)</sup> / AISI 316L	3 (6.62)	HAJ
NPT 1/4-18 IEC61518 UNF 7/16-20	C22.8		HA4
NPT 1/4-18 IEC61518 M10	1.4408 / CF3M <sup>2)</sup> / AISI 316L		HBJ
NPT 1/4-18 IEC61518 M10	C22.8		HB4

- 1) Product Configuration "Process Connection" ordering feature
- 2) Cast equivalent to AISI 316L

Dimensions H1 option;  
Impulse pipe horizontal;  
alignment 180°



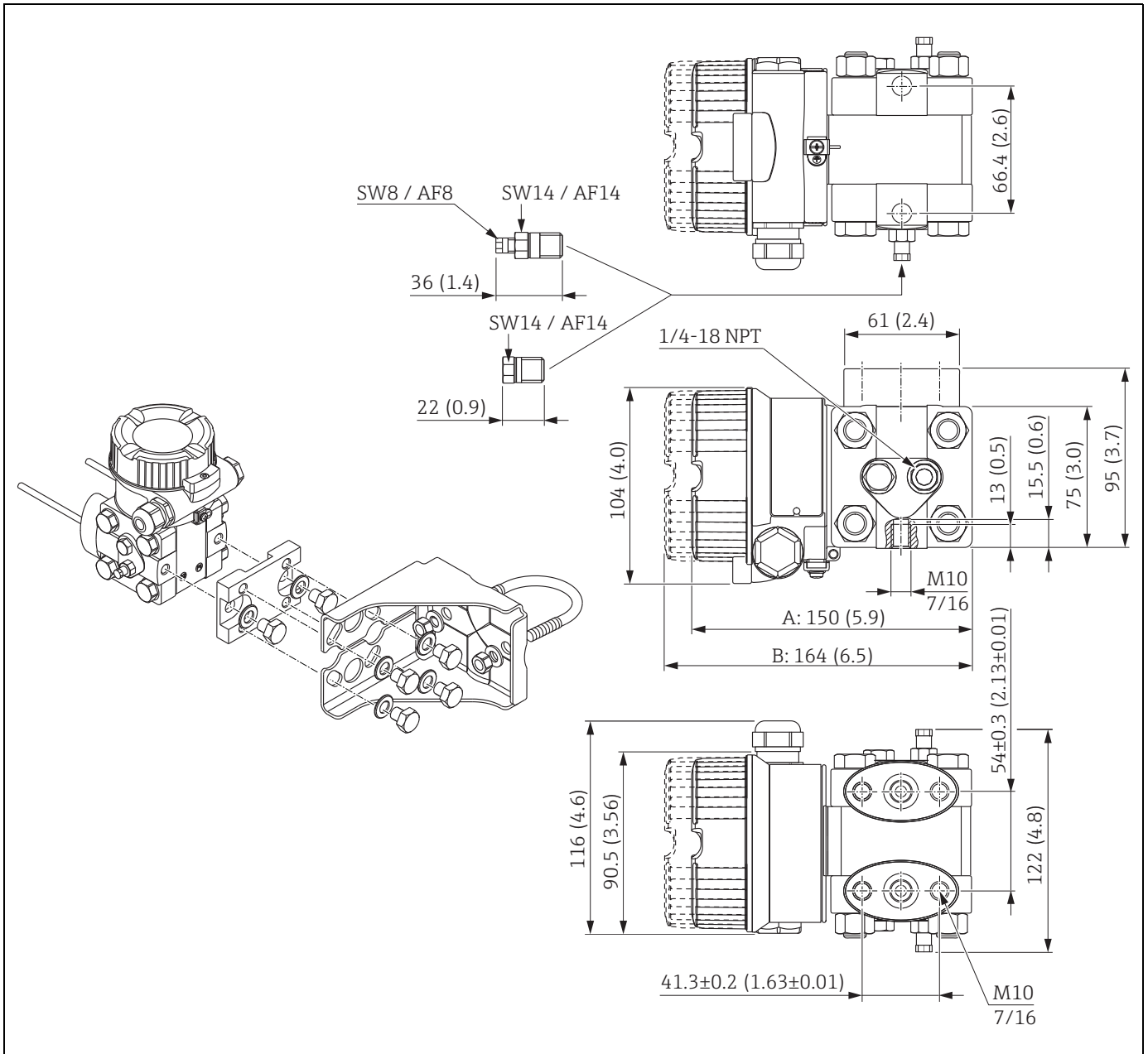
Engineering unit mm (in)

- A Version cover without viewing window
- B Version cover with viewing window.

Designation	Material	Weight	Option <sup>1)</sup>
		kg (lbs)	
NPT 1/4-18 IEC61518 UNF 7/16-20	1.4408 / CF3M <sup>2)</sup> / AISI 316L	3 (6.62)	HGJ
NPT 1/4-18 IEC61518 UNF 7/16-20	C22.8		HG4
NPT 1/4-18 IEC61518 M10	1.4408 / CF3M <sup>2)</sup> / AISI 316L		HHJ
NPT 1/4-18 IEC61518 M10	C22.8		HH4

- 1) Product Configuration "Process Connection" ordering feature
- 2) Cast equivalent to AISI 316L

Dimensions H2 option;  
Impulse pipe horizontal;  
alignment 90°



A0023121

Engineering unit mm (in)

A Version cover without viewing window  
B Version cover with viewing window.

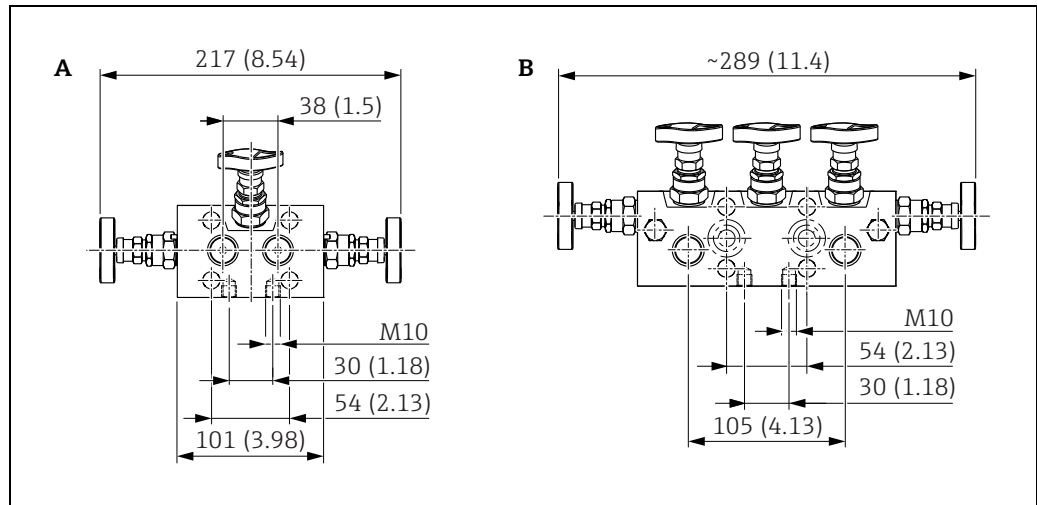
Designation	Material	Weight	Option <sup>1)</sup>
		kg (lbs)	
NPT 1/4-18 IEC61518 UNF 7/16-20	1.4408 / CF3M <sup>2)</sup> / AISI 316L	3 (6.62)	HNJ
NPT 1/4-18 IEC61518 UNF 7/16-20	C22.8		HN4
NPT 1/4-18 IEC61518 M10	1.4408 / CF3M <sup>2)</sup> / AISI 316L		HOJ
NPT 1/4-18 IEC61518 M10	C22.8		HO4

1) Product Configuration "Process Connection" ordering feature

2) Cast equivalent to AISI 316L

**Valve manifold DA63M (optional)**

Endress+Hauser supplies milled valve manifolds via the transmitter's product structure in the following versions:



A0032404

Engineering unit mm (in)

A 3-way valve manifold  
B 5-way valve manifold

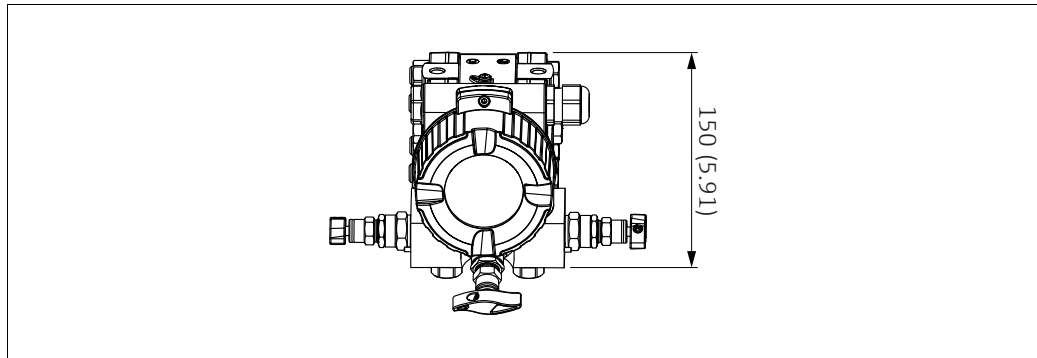
3-way or 5-way valve manifolds in 316L or AlloyC can be

- ordered as an **enclosed** accessory (screws and seals for mounting are enclosed)
- ordered as a **mounted** accessory (mounted valve manifolds are supplied with a documented leakage test).

Certificates ordered with the equipment (e.g. 3.1 material certificate and NACE) and tests (e.g. PMI and pressure test) apply to the transmitter and the valve manifold.

For other details (order option, dimension, weight, materials), see SD01553P/00/EN "Mechanical accessories for pressure measuring devices".

During the operating life of the valves, it may be necessary to re-tighten the packing.

**Mounting on valve manifold**

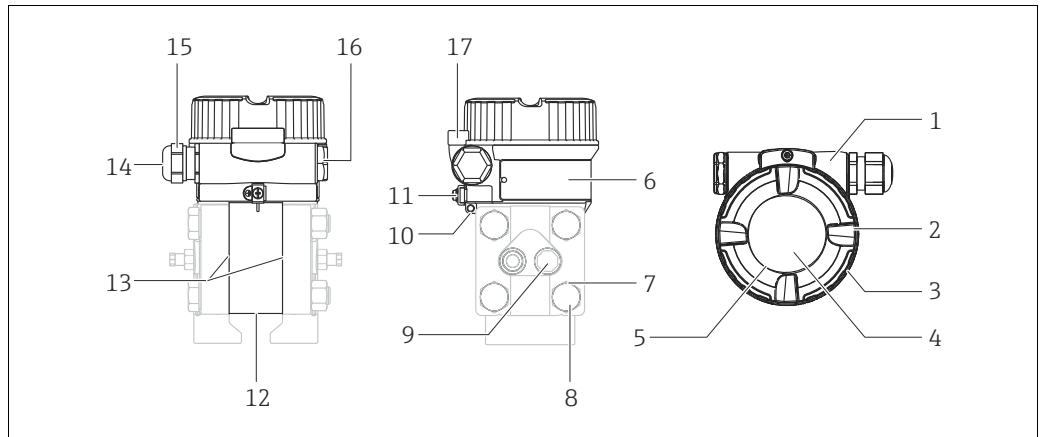
A0032406

Engineering unit mm (in)

Ordering information:

Product Configurator, order code for "Accessories mounted".

**Materials not in contact with process**     **Housing**



Front view, right-hand side view, top view.

A0023122

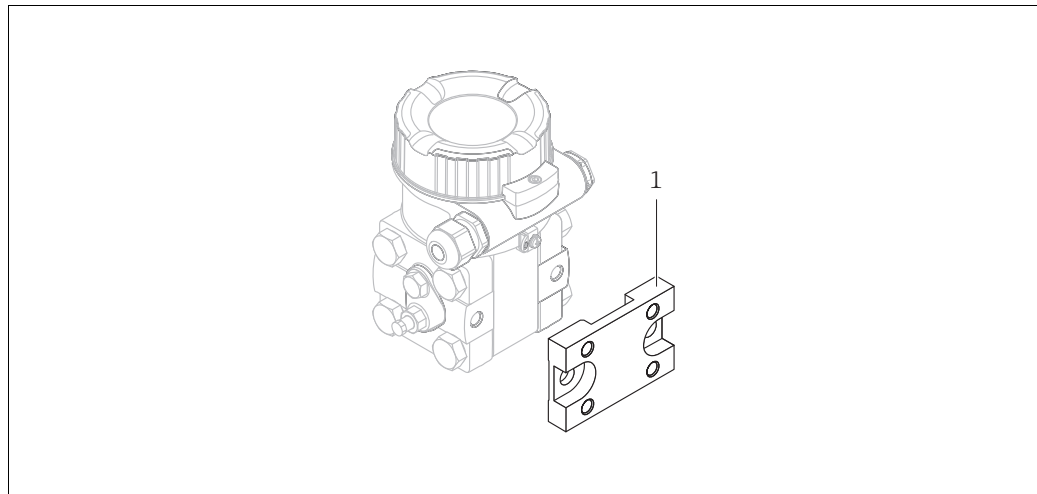
Item number	Component part	Material
1	F30 housing, RAL 5012 (blue)	Die-cast aluminum with protective powder-coating on polyester base
2	Cover, RAL 7035 (gray)	Die-cast aluminum with protective powder-coating on polyester base
3	Cover seal	EPDM
4	Sight glass	Mineral glass
5	Sight glass seal	Silicone (VMQ)
6	Nameplates	Plastic film
7	Plain washer	A4
8	Screws	AISI 316 L (1.4404)
9	Screw	AISI 316 L (1.4404)
10	External ground terminal	AISI 304 (1.4301)
11	Attachement for tie-on label	AISI 304 (1.4301)/ AISI 316 (1.4401)
12	Pressure compensation filter	Silicone
13	Sealing ring	EPDM
14	Seal of cable gland and blind plug	EPDM/NBR
15	Cable gland	Polyamide (PA) or CuZn nickel-plated
16	Blind plug	PBT-GF30 FR for dust ignition-proof, Ex d, FM XP and CSA XP: AISI 316L (1.4435)
17	Cover clamp	Clamp AISI 316L (1.4435), screw A4

**Filling oil**

Oil	Option <sup>1)</sup>
Silicone oil	1
Inert oil	2

1) Product Configurator "Fill Fluid" ordering feature

### Connecting parts



A0023123

Item number	Component part	Material
1	Adapter plate for mounting bracket	AISI 304

### Materials in contact with process

#### Side flanges

Endress+Hauser supplies side flanges made of stainless steel AISI 316L as per material numbers 1.4404 or 1.4408 or side flanges of C22.8 (Zn 5-8 / 1.0460 + Zn 5-8) with zinc plating. The zinc-plated carbon steel side flange is not recommended for water application due to hydrogen diffusion. Endress+Hauser recommends the use of side flanges made of 316L.

#### Process isolating diaphragm

Material	Option <sup>1)</sup>
316L	A
Alloy C	C

1) Product Configurator "Process isolating diaphragm material" ordering feature

#### Oval flange adapters

AISI 316L (1.4404)

#### Vent valves

AISI 316L (1.4404)

#### TSE Certificate of Suitability (Transmissible Spongiform Encephalopathy)

The following applies to all process wetted device components:

- They do not contain any materials derived from animals.
- No additives or operating materials derived from animals are used in production or processing.

# Operability

## Operating concept

### Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnosis
- Expert level

### Quick and safe commissioning

Guided menus for applications

### Reliable operation

- Local operation possible in several languages
- Standardized operation at the device and in the operating tools
- Parameters relating to measured values can be locked/unlocked using the device's write protection switch, using the device software or via remote control

### Efficient diagnostic behavior increases measurement availability

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

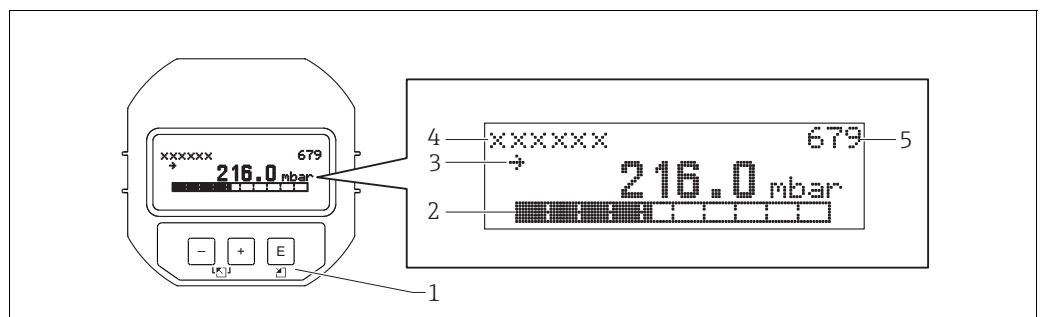
## Local operation

### Local display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation. The local display shows measured values, dialog texts as well as fault and notice messages in plain text, thereby supporting the user at every stage of operation. The liquid crystal display of the device can be turned in 90° stages. Depending on the orientation of the device, this makes it easy to operate the device and read the measured values.

#### Functions

- 8-digit measured value display including sign and decimal point, bar graph for 4 to 20 mA HART as current display; or for PROFIBUS PA as graphic display of the standardized value of the AI Block; for FOUNDATION Fieldbus as graphic display of the transducer output in relation to the set pressure range.
- Simple and complete menu guidance as parameters are split into several levels and groups
- Each parameter is given a 3-digit ID number for easy navigation
- Possibility of configuring the display to suit individual requirements and preferences, such as language, alternating display, contrast setting, display of other measured values such as sensor temperature etc.
- Comprehensive diagnostic functions (fault and warning message, peak-hold indicators etc.)



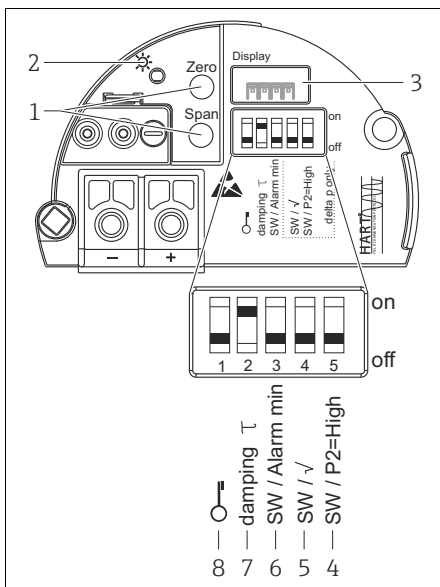
- 1 Operating keys
- 2 Bar graph
- 3 Symbol
- 4 Header line
- 5 Parameter identification number

#### Ordering information:

Product Configurator, "Output, Operation" ordering feature

Function	Operation via display		
	HART	PROFIBUS PA	FOUNDATION Fieldbus
Position adjustment (zero point correction)	✓	✓	✓
Setting lower range value and upper range value - reference pressure present at the device	✓	✓	✓
Device reset	✓	✓	✓
Locking and unlocking parameters relevant to the measured value	✓	✓	✓
Value acceptance indicated by the green LED	—	—	—
Switching damping on and off	✓	✓	✓

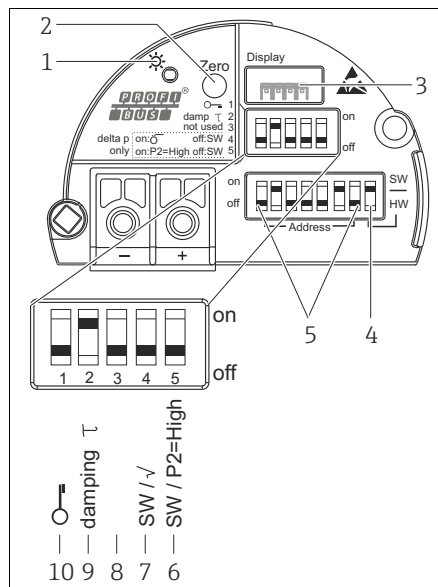
Operating keys and elements located internally on the electronic insert



A0023125

HART electronic insert

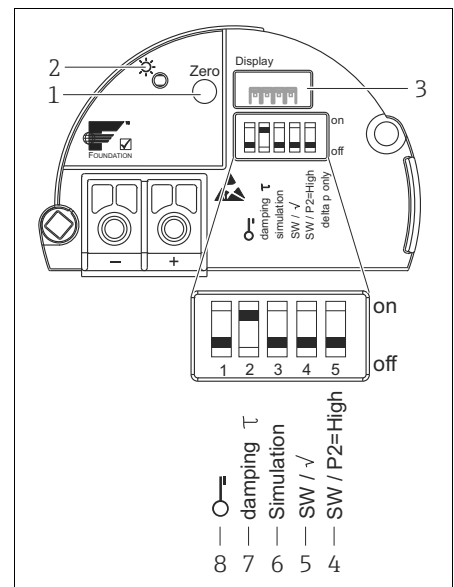
- 1 Operating keys for lower range value (zero) and upper range value (span)
- 2 Green LED to indicate successful operation
- 3 Slot for optional local display
- 4 DIP switch for defining high pressure side
- 5 DIP switch for defining operating mode and output characteristics
- 6 DIP switch for alarm current SW / Alarm Min (3.6 mA)
- 7 DIP switch for switching damping on/off
- 8 DIP switch for locking/unlocking parameters relevant to the measured value



A0023126

PROFIBUS PA electronic insert

- 1 Green LED to indicate successful operation
- 2 Operating key for position zero adjustment or reset (Zero)
- 3 Slot for optional local display
- 4 DIP-switch for bus address SW / HW
- 5 DIP-switch for hardware address
- 6 DIP switch for defining high pressure side
- 7 DIP switch for defining operating mode and output characteristics
- 8 Not used
- 9 DIP switch for switching damping on/off
- 10 DIP switch for locking/unlocking parameters relevant to the measured value



A0023127

FOUNDATION Fieldbus electronic insert

- 1 Operating key for position zero adjustment or reset (Zero)
- 2 Green LED to indicate successful operation
- 3 Slot for optional local display
- 4 DIP switch for defining high pressure side
- 5 DIP switch for defining operating mode and output characteristics
- 6 DIP-switch for simulation mode
- 7 DIP switch for switching damping on/off
- 8 DIP switch for locking/unlocking parameters relevant to the measured value

Function	Operation with operating keys and operating elements on the electronic insert		
	HART	PROFIBUS PA	FOUNDATION Fieldbus
Position adjustment (zero point correction)	✓	✓	✓
Setting lower range value and upper range value - reference pressure present at the device	✓	—	—
Device reset	✓	✓	✓
Locking and unlocking parameters relevant to the measured value	✓	✓	✓
Value acceptance indicated by the green LED	✓	✓	✓
Switching damping on and off	✓	✓	✓



Ordering information:  
Product Configurator, "Output, Operation" ordering feature

## Operating languages

You can also choose another language in addition to the standard language "English":

Designation	Option <sup>1)</sup>
English	AA
German	AB
French	AC
Spanish	AD
Italian	AE
Dutch	AF
Chinese	AK
Japanese	AL

1) Product Configurator "Additional Operation Language" ordering feature

## Remote operation

All software parameters are accessible depending on the position of the write protection switch on the device.

Hardware and software for remote operation	HART	PROFIBUS PA	FOUNDATION Fieldbus
FieldCare → <a href="#">41 ff</a>	✓ <sup>1)</sup>	✓ <sup>2)</sup>	✓
FieldXpert SFX100 → <a href="#">41 ff</a>	✓	–	✓
NI-FBUS Configurator → <a href="#">42 ff</a>	–	–	✓

1) Commubox FXA195 required → [41 ff](#)

2) Profiboard or Proficard required → [42 ff](#)

### FieldCare

FieldCare is an Endress+Hauser asset management tool based on FDT technology. With FieldCare, you can configure all Endress+Hauser devices as well as devices from other manufacturers that support the FDT standard.

FieldCare supports the following functions:

- Configuration of transmitters in offline and online mode
- Loading and saving device data (upload/download)
- HistoROM<sup>®</sup>/M-DAT analysis
- Documentation of the measuring point

Connection options:

- HART via Commubox FXA195 and the USB port on a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card
- Service interface with Commubox FXA291 and ToF adapter FXA291 (USB).

For further information, please contact your local Endress+Hauser Sales Center.

### Field Xpert SFX100

Field Xpert is an industrial PDA with integrated 3.5" touchscreen from Endress+Hauser based on Windows Mobile. It offers wireless communication via the optional VIATOR Bluetooth modem. Field Xpert also works as a stand-alone device for asset management applications. For details refer to BA00060S/00/EN.

### Commubox FXA195

For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to TIO0404F/00/EN.

**Commubox FXA291**

The Commubox FXA291 connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) with the USB interface of a PC or laptop. For details refer to TI00405C/07/EN.



For the following Endress+Hauser devices you will also need the "ToF adapter FXA291" as an accessory:

- Cerabar S PMC71, PMP7x
- Deltabar S PMD7x, FMD7x
- Deltapilot S FMB70

**ToF Adapter FXA291**

The ToF adapter FXA291 connects the Commubox FXA291 with devices from the ToF platform, pressure devices and the Gammapilot via the USB interface of a PC or laptop. For details refer to KA00271F.

**Profiboard**

For connecting a PC to the PROFIBUS.

**Proficard**

For connecting a laptop to the PROFIBUS

**FF configuration program**

FF configuration program, such as NI-FBUS Configurator, to

- connect devices with "FOUNDATION Fieldbus signal" into an FF-network
- set FF-specific parameters

Remote operation via:

- Operation with NI-FBUS Configurator:

The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the fieldbus concepts.

You can use the NI-FBUS Configurator to configure a fieldbus network as follows:

- Set block and device tags
- Set device addresses
- Create and edit function block control strategies (function block applications)
- Configure vendor-defined function and transducer blocks
- Create and edit schedules
- Reading and writing of data from control and regulation systems
- Invoke methods specified in the manufacturer-specific DD (e.g. basic device settings)
- Display DD menus (e.g. tab for calibration data)
- Download a configuration
- Verify a configuration and compare it to a saved configuration
- Monitor a downloaded configuration
- Replace a virtual device by a real device
- Save and print a configuration





**System integration**

The device can be given a tag name (max. 8 alphanumeric characters)

Designation	Option <sup>1)</sup>
Tagging (TAG), see additional spec.	Z1
Bus address, see additional spec.	Z2

1) Product configurator "Marking" ordering feature

## Certificates and approvals

<b>CE mark</b>	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.
<b>RoHS</b>	The measuring system complies with the substance restrictions of the Restriction on Hazardous Substances Directive 2011/65/EU (RoHS 2).
<b>RCM-Tick marking</b>	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 are labelled with the RCM- Tick marking on the name plate.  <div style="text-align: center;">  </div> <p style="text-align: right; font-size: small;">A0027319-DE</p>
<b>Ex approvals</b>	<ul style="list-style-type: none"> <li>■ ATEX</li> <li>■ FM</li> <li>■ CSA</li> <li>■ NEPSI</li> <li>■ IECEX</li> </ul> <p>All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas. →  49, "Safety Instructions" ordering feature and "Installation/Control Drawings".</p>
<b>EAC conformity</b>	The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity together with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.
<b>Functional safety SIL</b>	The Deltabar M with 4 to 20 mA output signal has been developed to assessed and certified by TÜV NORD CERT as per IEC 61508 Edition 2.0 and IEC 61511. These devices can be used to monitor the process level and pressure up to SIL 2. For a detailed description of the safety functions with Deltabar M, settings and functional safety data, see the "Functional safety manual - Deltabar M" SD00347P. Ordering information: Product Configurator "Other approvals" ordering feature, "LA" option
<b>AD2000</b>	The pressure retaining material 316L (1.4435/1.4404) corresponds to AD2000 - W2/W10.
<b>CRN approval</b>	Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→  46 ff, feature 110 "Process connection") must be ordered with a CSA approval (→  46 ff, feature 10 "Approval"). These devices are fitted with a separate plate bearing the registration number OF13907.5C.
<b>Pressure Equipment Directive 2014/68/EU (PED)</b>	<p><b>Pressure equipment with allowable pressure ≤ 200 bar (2 900 psi)</b></p> <p>Pressure equipment (having a maximum allowable pressure PS ≤ 200 bar (2 900 psi)) can be classified as pressurized equipment in accordance with Pressure Equipment Directive 2014/68/EU. If the maximum allowable pressure is ≤ 200 bar (2 900 psi) and the pressurized volume of the pressure equipment is ≤ 0.1 l, the pressure equipment is subject to the Pressure Equipment Directive (cf. Pressure Equipment Directive 2014/68/EU, Article 4, point 3). The Pressure Equipment Directive only requires that the pressure equipment shall be designed and manufactured in accordance with the "sound engineering practice of a Member State".</p> <p><i>Reasons:</i></p> <ul style="list-style-type: none"> <li>■ Pressure Equipment Directive (PED) 2014/68/EU Article 4, point 3</li> <li>■ Pressure equipment directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05 + A-06</li> </ul>

*Note:*

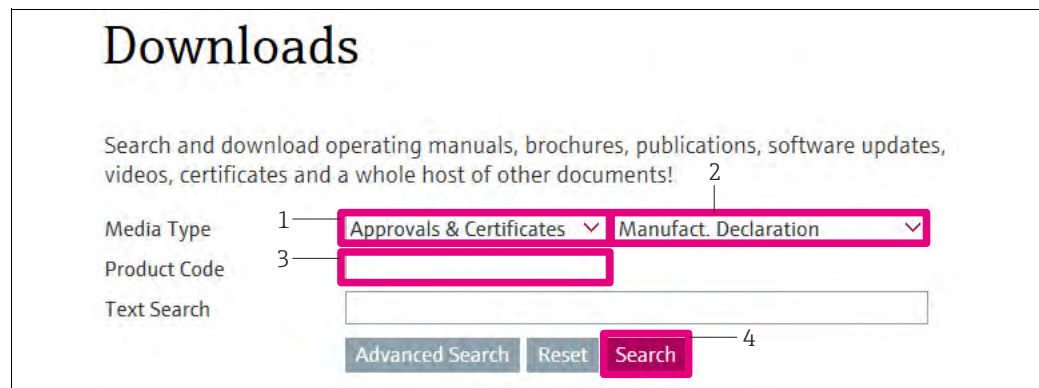
A partial examination shall be performed for pressure instruments that are part of safety equipment for the protection of a pipe or vessel from exceeding allowable limits (equipment with safety function in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

**Manufacturer declaration**

- FDA conformity
- TSE-free, materials free from animal origin
- Regulation EC 2023/ 2006 (GMP)
- Regulation (EC) No. 1935/2004 on materials intended to come into contact with food

**Downloading the manufacturer declaration**

<http://www.endress.com/en/download>



1. Enter desired product code
2. Select "Approvals & Certificates"
3. Select "Manufact. Declaration"
4. Click on "Start Search"

The available downloads are displayed.

**Standards and guidelines**

DIN EN 60770 (IEC 60770):  
Transmitters for use in industrial-process control systems  
Part 1: Methods for inspection and routine testing

DIN 16086:  
Electrical pressure measuring instruments, pressure sensors, pressure transmitters, pressure measuring instruments,  
concepts, specifications in data sheets

EN 61326-X:  
EMC product family standard for electrical equipment for measurement, control and laboratory use.

EN 60529:  
Degrees of protection by housing (IP code)

**Drinking water approval**

NSF 61  
Ordering information:  
Product Configurator, "Additional approval" ordering feature, option "LR"

**Classification of process sealing between electrical systems and (flammable or combustible) process fluids in accordance with ANSI/ISA 12.27.01**

Endress+Hauser instruments are designed according to ANSI/ISA 12.27.01 either as single seal or dual seal devices with annunciation, allowing the user to waive the use and save the cost of installing external secondary process seals in the conduit as required by the process sealing sections of ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC). These instruments comply with the North-American installation practice and provide a very safe and cost-saving installation for pressurized applications with hazardous fluids.  
Further information can be found in the control drawings of the relevant devices.

**Inspection certificate**

Designation	Option <sup>1)</sup>
EN10204-3.1 material wetted parts, inspection certificate	JA <sup>2)</sup>
NACE MR0175 wetted parts	JB <sup>2)</sup>
EN10204-3.1 AD2000 material wetted parts, expecting process membrane, inspection certificate	JF
EN10204-3.1 Helium leak test, inspection certificate	KD
EN10204-3.1 pressure test, inspection certificate	KE

- 1) Product Configurator "Test, Certificate" ordering feature
- 2) The selection of this feature for coated process isolating diaphragm / process connections refers to the metallic base material.

**Calibration; Unit**

Designation	Option <sup>1)</sup>
Nominal value; mbar/bar	B
Nominal value; kPa/MPa	C
Nominal value; mm/mH <sub>2</sub> O	D
Nominal value; inH <sub>2</sub> O/ftH <sub>2</sub> O	E
Nominal value; psi	F
Customized pressure; see additional specification	J
Customized level; see additional spec.	K
Customized flow; see additional spec.	L

- 1) Product Configurator "Calibration; Unit" ordering feature

**Calibration**

Designation	Option <sup>1)</sup>
Factory calib. certificate 5-point	F1
DKD/DAkkS calib. certificate 10-point	F2

- 1) Product Configurator "Calibration" ordering feature

**Service**

Designation	Option <sup>1)</sup>
Cleaned from oil+grease <sup>2)</sup>	HA
Cleaned for oxygen service <sup>2)</sup>	HB
Cleaned from PWIS (PWIS = paint wetting impairment substances) <sup>2)</sup>	HC
Adjusted min alarm current	IA
Adjusted HART Burst Mode PV	IB

- 1) Product Configurator "Service" ordering feature
- 2) Only device, not accessory or enclosed accessory

## Ordering information

Detailed ordering information is available as follows:

- In the Product Configurator on the Endress+Hauser website: [www.endress.com](http://www.endress.com) → Click "Corporate" → Select your country → Click "Products" → Select the product using the filters and search field → Open product page → The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: [www.addresses.endress.com](http://www.addresses.endress.com)



### 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 measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic generation of the order code with its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

## Configuration data sheet

### Pressure

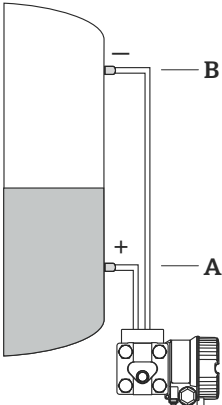
If the option "J" was selected in the "Kalibration; Einheit" ordering feature of the Product Configurator, the following configuration data sheet must be completed and included with the order.

Pressure Engineering Unit	
<input type="checkbox"/> mbar	<input type="checkbox"/> mmH <sub>2</sub> O
<input type="checkbox"/> bar	<input type="checkbox"/> mmHg
<input type="checkbox"/> psi	<input type="checkbox"/> Pa
<input type="checkbox"/> inH <sub>2</sub> O	<input type="checkbox"/> kPa
<input type="checkbox"/> ftH <sub>2</sub> O	<input type="checkbox"/> MPa
<input type="checkbox"/> kgf/cm <sup>2</sup>	
Calibration Range / Output	
Low range value (LRV): _____	[Pressure engineering unit]
Upper range value (URV): _____	[Pressure engineering unit]
Display Information	
1st Value Display <sup>1)</sup>	2nd Value Display <sup>1)</sup>
<input type="checkbox"/> Main Value	<input type="checkbox"/> none (Default)
	<input type="checkbox"/> Main Value [%]
	<input type="checkbox"/> Pressure
	<input type="checkbox"/> Current [mA] (HART only)
	<input type="checkbox"/> Temperature
<sup>1)</sup> Depending on sensor and communication variant	
Damping	
Damping: _____	sec (Default 2 sec)

Smallest span (factory calibration) → 11

**Level**

If the option "K" was selected in the "Kalibration; Einheit" ordering feature of the Product Configurator, the following configuration data sheet must be completed and included with the order.

Pressure Engineering Unit	Output Unit (Scaled unit)																																			
<input type="checkbox"/> mbar <input type="checkbox"/> mmH <sub>2</sub> O <input type="checkbox"/> mmHg <input type="checkbox"/> Pas <input type="checkbox"/> bar <input type="checkbox"/> mH <sub>2</sub> O <input type="checkbox"/> kPa <input type="checkbox"/> psi <input type="checkbox"/> ftH <sub>2</sub> O <input type="checkbox"/> kgf/cm <sup>2</sup> <input type="checkbox"/> MPa <input type="checkbox"/> inH <sub>2</sub> O	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Mass</th> <th style="width: 15%;">Length</th> <th style="width: 15%;">Volume</th> <th style="width: 15%;">Volume</th> <th style="width: 15%;">Percent</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> kg</td> <td><input type="checkbox"/> m</td> <td><input type="checkbox"/> l</td> <td><input type="checkbox"/> gal</td> <td><input type="checkbox"/> %</td> </tr> <tr> <td><input type="checkbox"/> t</td> <td><input type="checkbox"/> dm</td> <td><input type="checkbox"/> hl</td> <td><input type="checkbox"/> lgal</td> <td></td> </tr> <tr> <td><input type="checkbox"/> lb</td> <td><input type="checkbox"/> cm</td> <td><input type="checkbox"/> m<sup>3</sup></td> <td></td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> mm</td> <td><input type="checkbox"/> ft<sup>3</sup></td> <td></td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> ft</td> <td><input type="checkbox"/> in<sup>3</sup></td> <td></td> <td></td> </tr> <tr> <td></td> <td><input type="checkbox"/> inch</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Mass	Length	Volume	Volume	Percent	<input type="checkbox"/> kg	<input type="checkbox"/> m	<input type="checkbox"/> l	<input type="checkbox"/> gal	<input type="checkbox"/> %	<input type="checkbox"/> t	<input type="checkbox"/> dm	<input type="checkbox"/> hl	<input type="checkbox"/> lgal		<input type="checkbox"/> lb	<input type="checkbox"/> cm	<input type="checkbox"/> m <sup>3</sup>				<input type="checkbox"/> mm	<input type="checkbox"/> ft <sup>3</sup>				<input type="checkbox"/> ft	<input type="checkbox"/> in <sup>3</sup>				<input type="checkbox"/> inch			
Mass	Length	Volume	Volume	Percent																																
<input type="checkbox"/> kg	<input type="checkbox"/> m	<input type="checkbox"/> l	<input type="checkbox"/> gal	<input type="checkbox"/> %																																
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	<input type="checkbox"/> mm	<input type="checkbox"/> ft <sup>3</sup>																																		
	<input type="checkbox"/> ft	<input type="checkbox"/> in <sup>3</sup>																																		
	<input type="checkbox"/> inch																																			
<p>Empty pressure [a]: Low pressure value (empty) _____ [Pressure engineering unit]</p> <p>Full pressure [b]: High pressure value (full) _____ [Pressure engineering unit]</p>	<p>Empty calibration [a]: Low level value (empty) _____ [Scaled Unit]</p> <p>Full calibration [b]: High level value (full) _____ [Scaled Unit]</p>																																			
<p><b>Example</b></p>  <p style="text-align: right; font-size: small;">A0023130</p> <p>A    50 mbar (1 psi) / 3 m<sup>3</sup> (106 ft<sup>3</sup>)                      B    500 mbar (7.5 psi) / 100 m<sup>3</sup> (3532 ft<sup>3</sup>).</p>																																				
Display Information																																				
<p>1st Value Display <sup>1)</sup></p> <p><input type="checkbox"/> Main Value</p>	<p>2nd Value Display <sup>1)</sup></p> <p><input type="checkbox"/> none (Default)</p> <p><input type="checkbox"/> Main Value [%]</p> <p><input type="checkbox"/> Pressure</p> <p><input type="checkbox"/> Current [mA] (HART only)</p> <p><input type="checkbox"/> Temperature</p>																																			
<p><sup>1)</sup> Depending on sensor and communication variant</p>																																				
Damping																																				
<p>Damping: _____ sec (Default 2 sec)</p>																																				

**Flow**

If the option "L" was selected in the "Calibration; Unit" ordering feature of the Product Configurator, the following configuration data sheet must be completed and included with the order.

Pressure Engineering Unit	Flow Unit / Measured Value (PV)
<input type="checkbox"/> mbar <input type="checkbox"/> mmH <sub>2</sub> O <input type="checkbox"/> mmHg <input type="checkbox"/> Pa <input type="checkbox"/> bar <input type="checkbox"/> mH <sub>2</sub> O  <input type="checkbox"/> psi <input type="checkbox"/> ftH <sub>2</sub> O <input type="checkbox"/> kgf/cm <sup>2</sup> <input type="checkbox"/> kPa <input type="checkbox"/> <input type="checkbox"/> inH <sub>2</sub> O <input type="checkbox"/> <input type="checkbox"/> MPa	<input type="checkbox"/> Mass <input type="checkbox"/> Volume <input type="checkbox"/> Volume <input type="checkbox"/> Volume <input type="checkbox"/> Percent <div style="display: flex; justify-content: space-between; font-size: small;"> <div>Operation Condition</div> <div>Norm Condition</div> <div>Standard Condition</div> </div> <input type="checkbox"/> kg/s <input type="checkbox"/> m <sup>3</sup> /s <input type="checkbox"/> Nm <sup>3</sup> /s <input type="checkbox"/> Sm <sup>3</sup> /s <input type="checkbox"/> % <input type="checkbox"/> kg/min <input type="checkbox"/> m <sup>3</sup> /min <input type="checkbox"/> Nm <sup>3</sup> /min <input type="checkbox"/> Sm <sup>3</sup> /min <input type="checkbox"/> kg/h <input type="checkbox"/> m <sup>3</sup> /h <input type="checkbox"/> Nm <sup>3</sup> /h <input type="checkbox"/> Sm <sup>3</sup> /h <input type="checkbox"/> t/s <input type="checkbox"/> l/s <input type="checkbox"/> Nm <sup>3</sup> /d <input type="checkbox"/> Sm <sup>3</sup> /d <input type="checkbox"/> t/min <input type="checkbox"/> l/min <input type="checkbox"/> t/h <input type="checkbox"/> l/h <input type="checkbox"/> SCFS <input type="checkbox"/> oz/s <input type="checkbox"/> US Gal/s <input type="checkbox"/> SCFM <input type="checkbox"/> oz/min <input type="checkbox"/> US Gal/min <input type="checkbox"/> SCF3 <input type="checkbox"/> lb/s <input type="checkbox"/> US Gal/h <input type="checkbox"/> SCFD <input type="checkbox"/> lb/min <input type="checkbox"/> ACFS <input type="checkbox"/> lb/h <input type="checkbox"/> ACFM <input type="checkbox"/> <input type="checkbox"/> ACFH  Default: Volume; m <sup>3</sup> /h
Output Characteristic	
<input type="checkbox"/> linear (HART only)	<input type="checkbox"/> square root (HART only)
<b>Operation Point</b> Max Pressure    _____ [Pressure engineering unit] Max Flow    _____ [flow unit] LRV    _____ [Pressure engineering unit]  (Lower Range Value (HART only))	<b>Operation Point</b> Max Pressure    _____ [Pressure engineering unit] Max Flow    _____ [flow unit] LRV    _____ [flow unit]  (Lower Range Value (HART only))
Low flow cut off	
Value: _____ [%]    (default = 5)	
Display Information	
1st Value Display <sup>1)</sup> <input type="checkbox"/> Main Value	2nd Value Display <sup>1)</sup> <input type="checkbox"/> none (Default) <input type="checkbox"/> Main Value [%] <input type="checkbox"/> Pressure <input type="checkbox"/> Current [mA] (HART only) <input type="checkbox"/> Temperature <input type="checkbox"/> Totalizer 1 <input type="checkbox"/> Totalizer 2
<sup>1)</sup> Depending on sensor and communication variant	
Damping	
Damping: _____ sec (Default 2 sec)	



## Additional documentation

<b>Field of Activities</b>	Pressure measurement, powerful instruments for process pressure, differential pressure, level and flow: FA00004P/00/EN
<b>Technical Information</b>	<ul style="list-style-type: none"> <li>■ EMC test procedures TI00241F/00/EN</li> <li>■ Cerabar M: TI00436P/00/EN</li> <li>■ Deltapilot M: TI00437P/00/EN</li> </ul>
<b>Operating Instructions</b>	<ul style="list-style-type: none"> <li>■ 4 to 20 mA HART: BA00382P/00/EN</li> <li>■ PROFIBUS PA: BA00383P/00/EN</li> <li>■ FOUNDATION Fieldbus: BA00384P/00/EN</li> </ul>
<b>Brief operating instruction</b>	<ul style="list-style-type: none"> <li>■ 4 to 20 mA HART: KA01027P/00/EN</li> <li>■ PROFIBUS PA: KA01028P/00/EN</li> <li>■ FOUNDATION Fieldbus: KA01029P/00/EN</li> </ul>
<b>Functional safety manual (SIL)</b>	Deltabar M (4 to 20 mA): SD00347P/00/EN

**Safety Instructions**

Directive	Approval	Category	Electronics	Documentation	Option <sup>1)</sup>
ATEX	Ex ia IIC	II 1/2 G	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00457P/00	BA
	Ex t IIIC	II 1/2 D	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00458P/00	BB
	Ex d IIC	II 2G	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00459P/00	BC
	Ex nA IIC	II 3 G	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00461P/00	BD
	Ex ic IIC	II 3 G	- 4...20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA01301P/00	BG
	Ex ia IIC Ex ia D	II 1/2 G II 1/2 D	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00460P/00	B1
	Ex ia IIC Ex d IIC	II 1/2 G II 2 G	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00505P/00	8A

1) Product Configurator "Approval" ordering feature

Directive	Approval	Electronics	Documentation	Option <sup>1)</sup>
NEPSI	Ex ia IIC T6	- 4 to 20 mA HART	- XA00534P/00	NA
	Ex d IIC T6 Gb	- 4 to 20 mA HART	- XA00514P/00	NB

1) Product Configurator "Approval" ordering feature

Directive	Approval	Electronics	Option <sup>1)</sup>
TIIS	Ex ia IIC T4	- 4 to 20 mA HART	TA

1) Product Configurator "Approval" ordering feature

Directive	Approval	EPL	Electronics	Documentation	Option <sup>1)</sup>
IECEX	Ex ia IIC	Ga/Gb	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00462P/00	IA
	Ex d IIIC	Gb	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00463P/00	IB
	Ex t IIIC	Da/Db	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00490P/00	ID
	Ex ic IIC	Gc	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00492P/00	IE
	Ex ia IIC Ex ia IIIC	Ga/Gb Da/Db	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA00491P/00	I1

1) Product Configurator "Approval" ordering feature

Directive	Approval	Electronics	Documentation	Option <sup>1)</sup>
INMETRO	Ex ia IIC T6...T4 Ga/Gb	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	- XA01303P/00	MA

1) Product Configurator "Approval" ordering feature

**Installation/Control Drawings**

Directive	Approval	Electronics	Documentation	Option <sup>1)</sup>
FM	IS Cl.I,II,III Div.1 Gr. A-G, AEx ia NI Cl. I Div.2 Gr.A-D	- 4 to 20 mA HART - PROFIBUS PA, FOUNDATION Fieldbus	- ZD00234P/00 - XA00565P/00	FA
	FM XP Cl.I,II Div.1 Gr.A-G Zone 1 IIC T6 (Conduit seal not required), Zone 1,2	- 4 to 20 mA HART - PROFIBUS PA - FOUNDATION Fieldbus	--	FB
	FM DIP Cl.II,III Div.1 Gr.E-G, Zone 2 1,2,2	--	--	FC
	FM NI Cl.I Div.2 Gr.A-D, Zone 2	--	--	FD
	FM IS/XP Cl.I,II Div.1 Gr.A-G, Zone 1,2	- PROFIBUS PA, FOUNDATION Fieldbus	- XA00568P/00	F1
CSA	C/US IS Cl.I,II,III Div.1 Gr A-G C/US IS Cl.I Div.2 Gr A-D, Ex ia	- 4 to 20 mA HART - PROFIBUS PA, FOUNDATION Fieldbus	- XA00557P/00 - XA00559P/00	CA
	CSA C/US XP Cl.I,II Div.1 Gr.B-G, Ex d, (Conduit seal not required), Zone 1,2	--	--	CB
	CSA C/US Cl.II,III Div.1 Gr.E-G, US: Zone 2 1,2,2	--	--	CC
	CSA C/US IS/XP Cl.I,II Div.1Gr.A-G/B-G, Zone 1,2	- 4 to 20 mA HART - PROFIBUS PA, FOUNDATION Fieldbus	- XA00576P/00 - XA00562P/00	C1

1) Product Configurator "Approval" ordering feature

**Combined certificate**

Directive	Approval	Electronics	Documentation	Option <sup>1)</sup>
FM/CSA	FM/CSA IS + XP Cl.I,II Div.1 Gr.A-D/B-G FM IS/FM XP Cl.I,II Div.1 Gr.A-G + CSA IS/XP Cl.I,II Div.1 Gr.A-G, FM/CSA: Zone 1,2	- 4 to 20 mA HART  PROFIBUS PA, FOUNDATION Fieldbus	- ZD00247P/00 - XA00576P/00 - ZD00250P/00  - XA00568P/00 - XA00562P/00	8B

1) Product Configurator "Approval" ordering feature

## Accessories

**Manifolds**

→  36.

For details see SD01553P/00/EN "Mechanical accessories for pressure measuring devices".

**Additional mechanical accessories**

Oval flange adapters, pressure gauge valves, shutoff valves, siphons, condensate pots, cable shortening kits, adapter test, flushing rings, block&bleed valves, protective roofs.

For details see SD01553P/00/EN "Mechanical accessories for pressure measuring devices".

## Registered trademarks

**HART®**

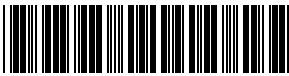
Registered trademark of the FieldComm Group, Austin, USA

**PROFIBUS®**

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

**FOUNDATION™ Fieldbus**

Registered trademark of the FieldComm Group, Austin, USA



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[www.addresses.endress.com](http://www.addresses.endress.com)

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