Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Deltapilot S FMB70

Hydrostatic level measurement
Pressure sensor with the CONTITE™ measuring cell
Condensate-resistant offering long-term stability; Communication via HART, PROFIBUS PA or FOUNDATION Fieldbus

Application

The hydrostatic pressure sensor is used for the following measuring tasks:
- Hydrostatic pressure measurement in liquids and pastes in all areas of process engineering, process measuring technology, pharmaceuticals and the food industry
- Level, volume or mass measurements in liquids

Your benefits

- Very good reproducibility and long-term stability
- Hermetically sealed CONTITE™ measuring cell:
  - Condensate-resistant and climatic-proofed
  - High reference accuracy: ±0.1 %
  - Minimum temperature effects
- Used for process pressure monitoring up to SIL3, certified according to IEC 61508 by TÜV SÜD
- HistoROM®/M-DAT memory module
- Function-monitored from the measuring cell to the electronics
- Continuous modularity for differential pressure, hydrostatics and pressure (Deltabar S – Deltapilot S – Cerabar S), e.g.
  - replaceable display
  - universal electronics
- Quick commissioning with Quick Setup menu
- Menu-guided operation
- Extensive diagnostic functions

TI416P/00/EN/05.10
No 71111768

Endress+Hauser
People for Process Automation

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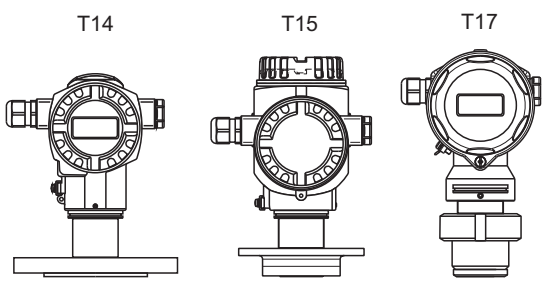
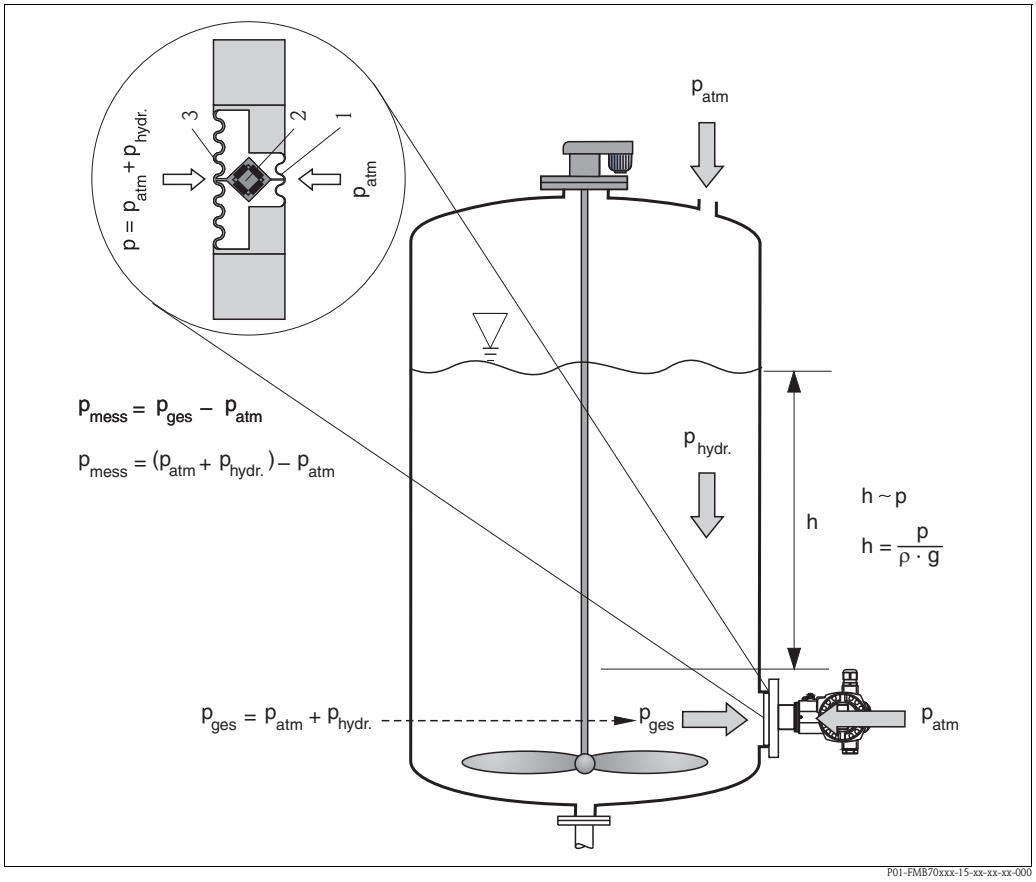
Function and system design

Device selection

Deltapilot S	**FMB70**  P01-FMB70xxx-14-xx-xx-xx-000
Field of application	– Level measurement – Pressure measurement
Industries	Food, pharmaceutical, environment (fresh water and wastewater), chemical
Process connections	– Thread – Flange – Flush-mounted hygienic connections
Process connection material	– AISI 316L/1.4435 or 1.4404 (see "Material" section) – Alloy C276/2.4819
Measuring ranges	From –100 to +100 mbar (-1.5 to +1.5 psi) to –1000 to +10000 mbar (-15 to +150 psi)
OPL [1]	Max. 40 bar (600 psi)
Process temperature range	–10 to +100 °C (+14 to 212 °F), +135 °C (275 °F) for a maximum of 30 minutes
Ambient temperature range	■ –40 to +85 °C (-40 to 185 °F) ■ Separate housing: - 20 to +60 °C (-4 to 140 °F)
Reference accuracy	±0.1% of the set span
Supply voltage	– 4 to 20 mA HART: 10.5 to 45 V DC, Ex ia: 10.5 to 30 V DC – PROFIBUS PA: 9 to 32 V DC – FOUNDATION Fieldbus: 9 to 32 V DC
Output	4 to 20 mA with superimposed HART protocol, PROFIBUS PA or FOUNDATION Fieldbus
Options	– Gold-rhodium coated process isolating diaphragm – 3.1 inspection certificate – 3A and EHEDG approval – HistoROM®/M-DAT memory module – separate housing
Specialties	– Absolutely resistant to condensate thanks to hermetically sealed CONTITE™ cell – Maximum flexibility thanks to modular design – Special cleaning of the transmitter to remove paint-wetting substances, for use in paint shops

1) OPL: over pressure limit; dependent on the lowest-rated element, with regard to pressure, of the selected components

Measuring principle



Deltapilot S hydrostatic level measurement and measuring principle

1 *Rear isolating membrane of the CONTITE™ measuring cell*
2 *Sensing element*
3 *Process isolating diaphragm*

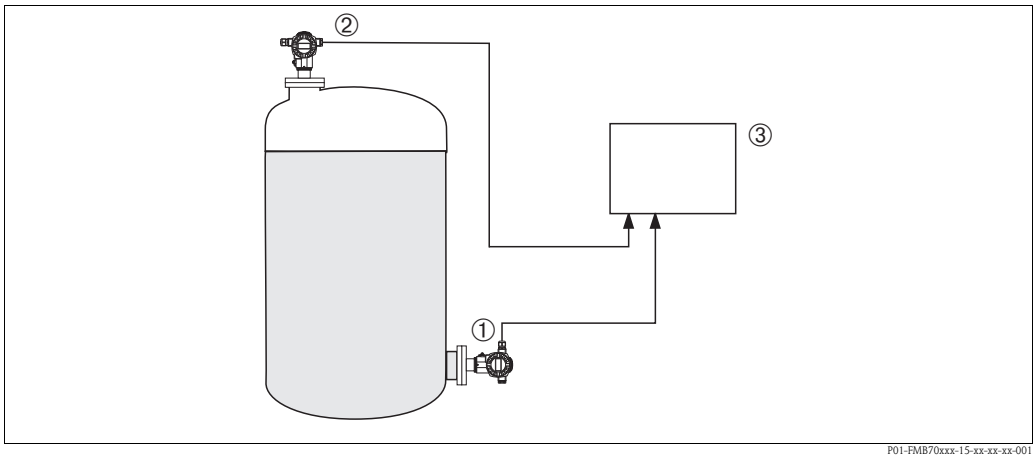
g *Gravitational acceleration*
h *Level height*
p_{tot} *Total pressure = hydrostatic pressure + atmospheric pressure*
p_{atm} *Atmospheric pressure*
$p_{hydr.}$ *Hydrostatic pressure*
p_{meas} *Measured pressure in the measuring cell = hydrostatic pressure*
ρ *Density of medium*

Due to its weight, a liquid column creates hydrostatic pressure. If the density is constant, the hydrostatic pressure depends solely on the height h of the liquid column.
The CONTITE™ measuring cell which works on the principle of the gauge pressure sensor constitutes the core of Deltapilot S. In contrast to conventional gauge pressure sensors, the precision measuring element (2) in the CONTITE™ measuring cell is absolutely protected between the process isolating diaphragm (3) and the rear isolating membrane (1). Thanks to this hermetic sealing of the measuring element, the CONTITE™ measuring cell is absolutely insensitive to condensate/condensation and aggressive gases. The pressure applied is transferred from the process isolating diaphragm to the measuring element by means of an oil without any loss in pressure.
Two temperature sensors are arranged between the process isolating diaphragm and measuring element which measure the distribution of temperature in the cell. The electronics can compensate any measuring errors resulting from fluctuations in temperature with these measured temperature values.

A linearization with max. 32 points, based on a table entered either manually or semi-automatically, can be activated locally or remotely. This function facilitates measurement in engineering units and provides a linear output signal for spherical and horizontal cylindrical tanks, and vessels with a conical outlet.

Level measurement in closed tanks with pressure overlay

You can determine the differential pressure in tanks with pressure overlay using two Deltapilot S probes. The measured pressure values of the two probes are sent to a signal processing unit such as Endress+Hauser RMA or a PLC. The signal processing unit or PLC determines the difference in pressure and uses this to calculate the level and the density where necessary.



Level measurement in a closed tank with pressure overlay

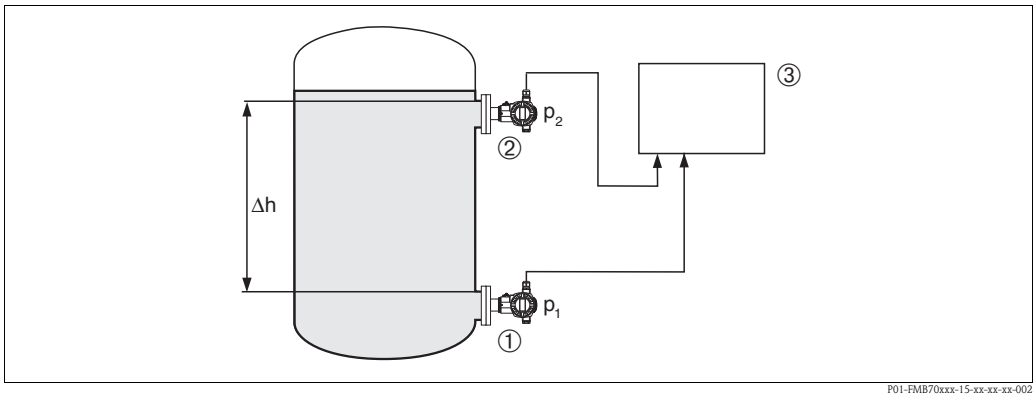
1 Probe 1 measures the total pressure (hydrostatic pressure and top pressure)
2 Probe 2 measures the top pressure
3 The signal processing unit determines the difference in pressure and uses this to calculate the level

Note!
- When selecting the Deltapilot S probes, make sure you select large enough measuring ranges (→ see example).
- The process isolating diaphragm of probe 2 must not be flooded. This generates additional hydrostatic pressure which distorts the measurement.
- The ratio of hydrostatic pressure to top pressure should be no more than 1:6.

Example:
- Max. hydrostatic pressure = 600 mbar (9 psi)
- Max. top pressure (probe 2) = 300 mbar (4.5 psi)
- Max. total pressure, measured with probe 1 = 300 mbar (4.5 psi) + 600 mbar (9 psi) = 900 mbar (13.5 psi) ⇒ measuring cell to be selected: 0 to 1200 mbar (0 to 18 psi)
- Max. pressure, measured with probe 2:300 mbar (4.5 psi) ⇒ measuring cell to be selected: 0 to 400 mbar (6 psi)

Density measurement

You can measure the density in tanks with pressure overlay using two Deltapilot S probes and a signal processing unit or a PLC. The signal processing unit or the PLC calculates the density from the known distance Δh between the two probes and the two measured values p_1 and p_2.



Level measurement in a closed tank with pressure overlay

1 Deltapilot S determines pressure measured value p_1
2 Deltapilot S determines pressure measured value p_2
3 Signal processing unit determines the density from the two measured values p_1 and p_2 and the distance Δh

Communication protocol

- 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 13 mA ± 1 mA, the following number of devices can be operated on one bus segment if installing as per FISCO:
    - up to 7 Deltapilot S for Ex ia, CSA IS and FM IS applications
    - up to 27 Deltapilot S for all other applications, e.g. in non-hazardous areas, Ex nA, etc.

  Further information on PROFIBUS PA can be found in Operating Instructions BA034S "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 15 mA ± 1 mA, the following number of devices can be operated on one bus segment if installing as per FISCO:
    - up to 6 Deltapilot S for Ex ia, CSA IS and FM IS applications
    - up to 24 Deltapilot S 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 BA013S "FOUNDATION Fieldbus Overview".

Input

Measured variable

Hydrostatic pressure

Measuring range

Nominal value	Range limit		Smallest calibratable span	MWP [1]	OPL [2]	Vacuum resistance[3]	Version in the order code[4]
	lower (LRL)[5] [bar (psi)]	upper (URL) [bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	Synthetic oil/ inert oil [bar_{abs} (psi_{abs})]	
100 mbar (1.5 psi)	–0.1 (-1.5)	+0.1 (+1.5)	0.025 (0.375)	2.7 (40.5)	4 (60)	0.01/0.04 (0.15/1)	1C
400 mbar (6 psi)	–0.4 (-6)	+0.4 (+6)	0.04 (0.6)	5.3 (79.5)	8 (120)		1F
1.2 bar (18 psi)	–1.0 (-15)	+1.2 (+18)	0.1 (1.5)	16 (240)	24 (360)		1H
4 bar (60 psi)	–1.0 (-15)	+4 (+60)	0.1 (1.5)	16 (240)	24 (360)		1M
10 bar (150 psi)	–1.0 (-15)	+10 (+150)	0.1 (1.5)	27 (405)	40 (600)		1P

1) The MWP (maximum working pressure) for the measuring device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection (→ 🖹 25 ff) has to taken into consideration in addition to the measuring cell (→ see Table above). Also observe pressure-temperature dependency. For the appropriate standards and further information, see → 🖹 24, "Pressure specifications" section.

2) OPL: over pressure limit depends on the lowest-rated element, with regard to pressure, of the selected components.

3) The vacuum resistance applies for the measuring cell under reference operating conditions.

4) → 🖹 43 ff, "Ordering information" section, feature 40 "Measuring range"

5) By default, the device is set to a lower sensor limit of 0 bar. Please specify in the order if the lower sensor limit is to be set to a different default value.

Explanation of terms

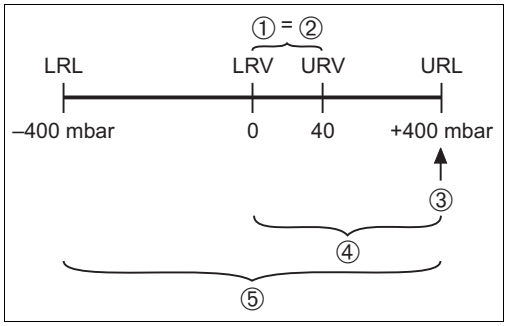
Explanation of the terms "turn down (TD)", "set span" and "zero-based span"

Case 1:
- |Lower range value (LRV)| ≤ |Upper range value (URV)|

Example:
- Lower range value (LRV) = 0 mbar
- Upper range value (URV) = 40 mbar (0.6 psi)
- Nominal value (URL) = 400 mbar (6 psi)

Turn down:
- TD = URL / |URV| = 10:1

Set span:
- URV – LRV = 40 mbar (0.6 psi)
  This span is based on the zero point.



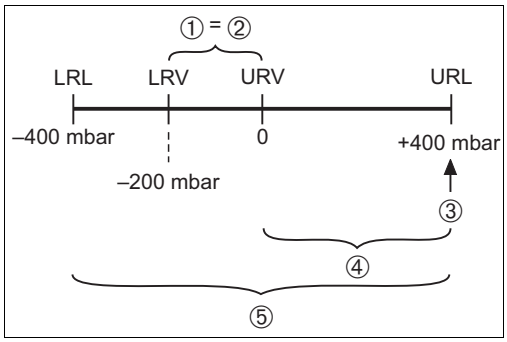
Example: 400 mbar (6 psi) measuring cell

Case 2:
- |Lower range value (LRV)| ≥ |Upper range value (URV)|

Example:
- Lower range value (LRV) = –200 mbar (-3 psi)
- Upper range value (URV) = 0 bar
- Nominal value (URL) = 400 mbar (6 psi)

Turn down:
- TD = URL / |(LRV)| = 2:1

Set span:
- URV – LRV = 200 mbar (3 psi)
  This span is based on the zero point.



Example: 400 mbar (6 psi) measuring cell

1 Set span
2 Zero-based span
3 Nominal value ≙ upper range limit (URL)
4 Nominal measuring range
5 Sensor measuring range
LRL Lower range limit
URL Upper range limit
LRV Lower range value
URV Upper range value

Output

Output signal

- 4 to 20 mA with superimposed digital communication protocol HART 5.0, 2-wire
- Digital communication signal PROFIBUS PA (Profile 3.0)
  - signal coding: Manchester Bus Powered (MBP): Manchester II
  - data transmission rate: 31.25 KBit/s voltage mode
- Digital communication signal FOUNDATION Fieldbus
  - signal coding: Manchester Bus Powered (MBP): Manchester II
  - data transmission rate: 31.25 KBit/s voltage mode

Signal range – 4 to 20 mA HART

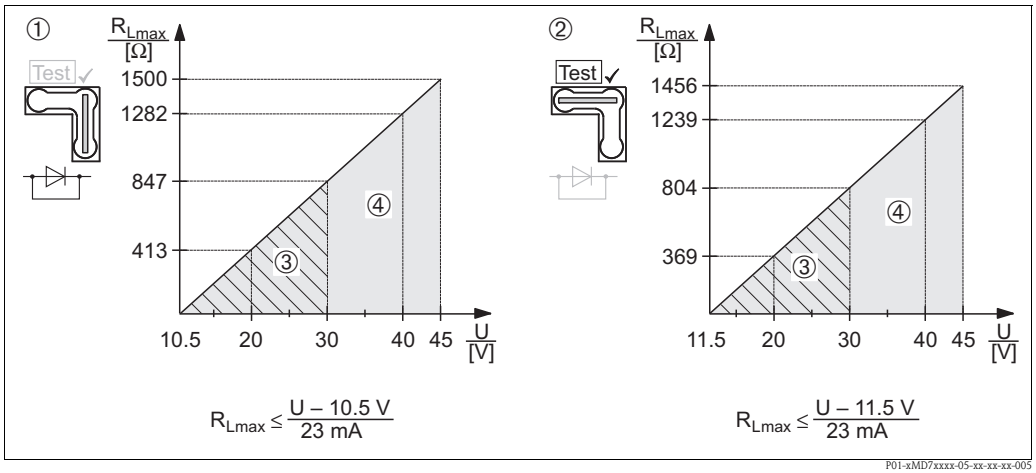
3.8 mA to 20.5 mA

Signal on alarm

As per NAMUR NE 43

- 4 to 20 mA HART
  Options:
  - Max. alarm: can be set from 21 to 23 mA (Factory setting: 22 mA)
  - Hold measured value: last measured value is held
  - Min. alarm: 3.6 mA
- PROFIBUS PA: can be set in the Analog Input block,
  Options: Last Valid Out Value, Fsafe Value (factory setting), 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 HART



P01-xMD7xxxx-05-xx-xx-xx-005

Load diagram, observe the position of the jumper and the explosion protection (→ 🖹 16, "Measuring a 4 to 20 mA test signal" section.)

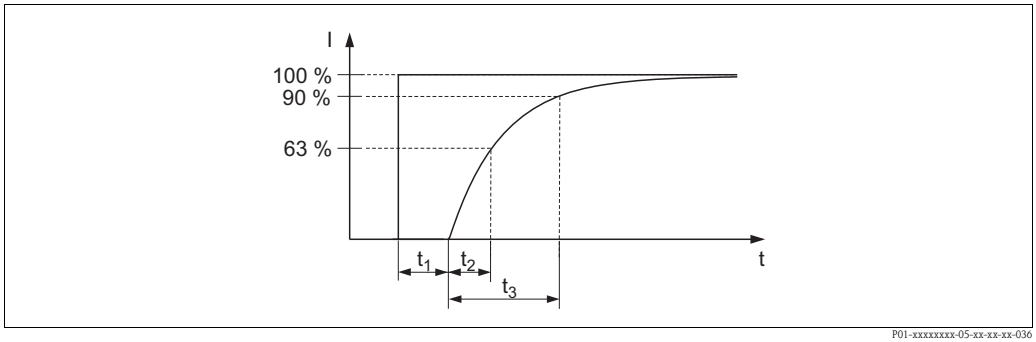
1 Jumper for 4 to 20 mA test signal set to "Non-test" position
2 Jumper for 4 to 20 mA test signal set to "Test" position
3 Power supply 10.5 (11.5) to 30 V DC for 1/2 G, 1 GD, 1/2 GD, FM IS, CSA IS, NEPSI Ex ia and IEC Ex ia
4 Power supply 10.5 (11.5) to 45 V DC for devices for non-hazardous areas, 1/2 D, 1/3 D, 3 G Ex nA, FM DIP, FM NI, CSA dust ignition proof
R_{Lmax} Maximum load resistance
U Supply voltage

Note!
When operating via a handheld terminal or via a PC with an operating program, a minimum communication resistance of 250 Ω must exist within the loop.

Resolution

- Current output: 1 μA
- Display: can be set (factory setting: presentation of the maximum accuracy of the transmitter)

Dead time, time constant



Presentation of the dead time and the time constant

Dynamic behavior, current output

Dead time t_1	Time constant (T63), t_2	Time constant (T90), t_3
40 ms	30 ms	69 ms

Dynamic behavior, HART

Dead time t_1	Time constant (T63), t_2	Time constant (T90), t_3
290 ms	30 ms	69 ms

Reading cycle

- HART commands: 3 to 4 per second on average.
  The Deltapilot S commands the BURST MODE function for cyclic value transmission via the HART communication protocol.

Response time

≤ 250 ms

Cycle time (update time)

On average 250 to 330 ms.

Dynamic behavior, PROFIBUS PA

A typical cyclic parametrization for the PLC of 20 values per second results in the following behavior:

Dead time t_1	Time constant (T63), t_2	Time constant (T90), t_3
290 ms	35 ms	69 ms

Response time

- Cyclic: approx. 10 ms per request
- Acyclic: < 50 ms

All values are typical values.

Cycle time (update time)

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.

Dynamic behavior, FOUNDATION Fieldbus

A typical configuration for the macro cycle time (host system) of 250 ms results in the following behavior:

Dead time t_1	Time constant (T63), t_2	Time constant (T90), t_3
290 ms	35 ms	69 ms

Reading cycle

- Cyclic: up to 5/s, dependent on the number and type of function blocks used in a closed-control loop
- Acyclic: 10/s

Cycle time (update time)

250 ms

Response time

- Cyclic: < 80 ms
- Acyclic: < 40 ms

All values are typical values.

Damping

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

- Via onsite display, handheld terminal or PC with operating program, continuous from 0 to 999 s
- Additionally for HART and PROFIBUS PA: via DIP switch on the electronic insert, switch position "on" = set value and "off"
- Factory setting: 2 s

Data of the FOUNDATION Fieldbus interface

Basic data

Device Type	100B (hex)
Device Revision	06 (hex)
DD Revision	01 (hex)
CFF Revision	01 (hex)
ITK Version	5.0
ITK Certification Driver No.	IT054800
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

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	10

Transducer Blocks

Block	Content	Output values
TRD1 Block	Contains all parameters related to the measurement	■ Pressure or level (channel 1) ■ Process temperature (channel 2)
Service Block	Contains service information	■ Pressure after damping (channel 3) ■ Pressure peakhold indicator (channel 4) ■ Counter for max. pressure transgressions (channel 5)
Diagnostic Block	Contains diagnostic information	Error code via DI channels (channel 0 to 16)
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	45 ms	enhanced
Digital Input Block	This block contains the discrete data of the Diagnose Block (selectable via a channel number 0 to 16) and provides them for other blocks at the output.	1	40 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 Service Block. Channel 1 resets the counter for max. pressure transgressions..	1	60 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	120 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	50 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_CONTENT).	1	35 ms	standard
Signal Characterizer Block	The Signal Characterizer Block has two sections, each with an output that is a non-linear function of the respective input. The non-linear function is generated by a single look-up table with 21 arbitrary x-y pairs.	1	30 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
Analog Alarm Block	This block contains all process alarm conditions (working like a comparator) and represents them at the output.	1	35 ms	standard

Additional function block information:

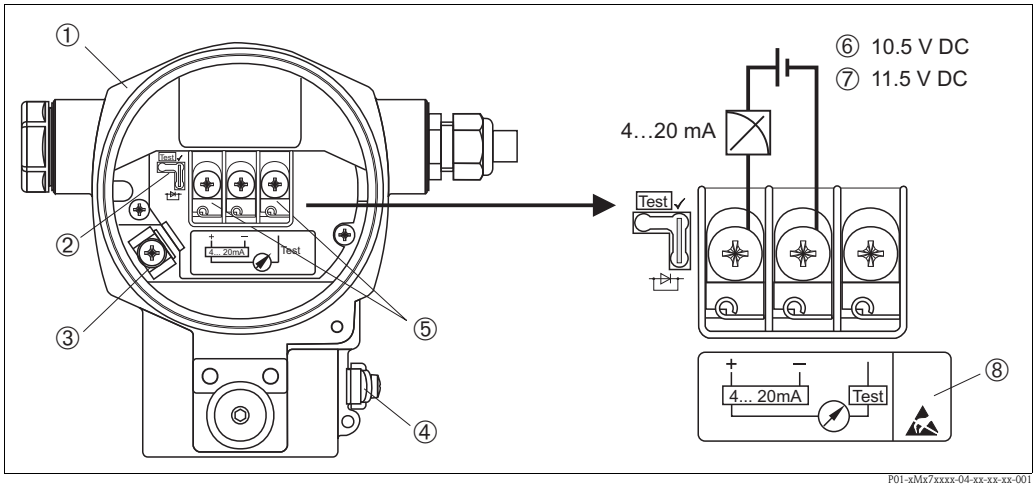
Instantiate Function Block	YES
Number of instantiate blocks	15

Power supply

Electrical connection

Note!
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
  → 📄 48 ff, "Safety Instructions" and "Installation/Control Drawings" sections.
- Devices with integrated overvoltage protection must be grounded. → 📄 23.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.

4 to 20 mA HART



Electrical connection 4 to 20 mA HART, here shown with aluminum housing (T14)

1 Housing
2 Jumper for 4 to 20 mA test signal
→ 📄 16, "Measuring a 4 to 20 mA test signal" section
3 Internal ground terminal
4 External ground terminal
5 4 to 20 mA test signal between positive and test terminal
6 Minimum supply voltage = 10.5 V DC, jumper is set as illustrated in the diagram
7 Minimum supply voltage = 11.5 V DC, jumper is inserted in "Test" position
8 Devices with integrated overvoltage protection are labeled OVP (overvoltage protection) here (→ see also page 23)

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 BA034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and the PNO Guideline.

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

Note!
For further information on the cable specifications, see Operating Instructions BA034S "PROFIBUS DP/PA: Guidelines for planning and commissioning", the PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

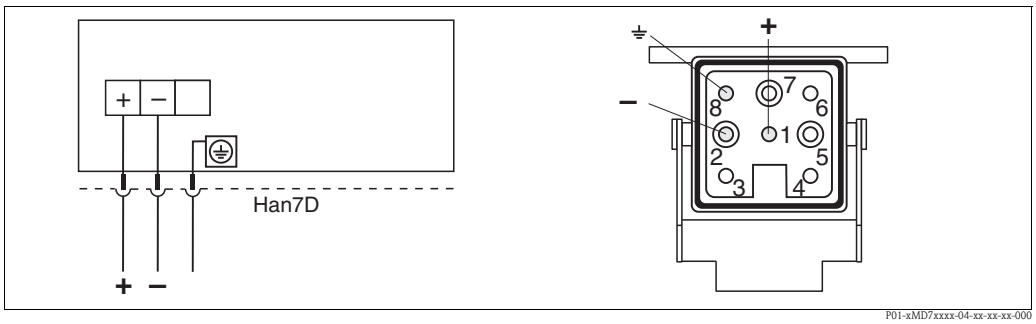
FOUNDATION Fieldbus

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 BA013S "FOUNDATION Fieldbus Overview" and the FOUNDATION Fieldbus Guideline.

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

Note!
For further information on the cable specifications, see Operating Instructions BA013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

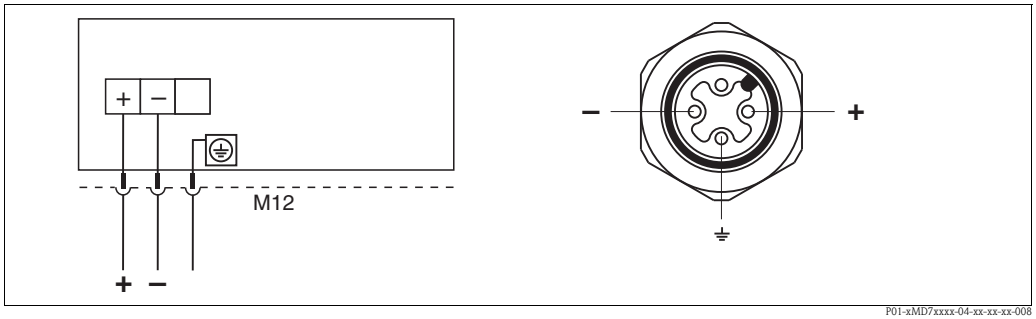
Devices with Harting plug Han7D



Left: electrical connection for devices with Harting plug Han7D
Right: view of the plug connector at the device

Material: CuZn

Devices with M12 plug



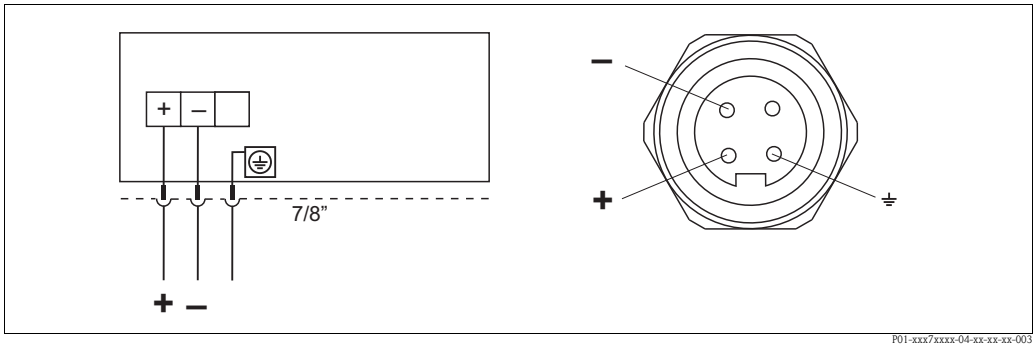
Left: electrical connection for devices with M12 plug
Right: view of the plug at the device

Endress+Hauser offers the following accessories for devices with an M12 plug:
Plug-in jack M 12x1, straight
- Material: body PA; coupling nut CuZn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 52006263

Plug-in jack M 12x1, elbowed
- Material: body PBT/PA; coupling nut GD-Zn, nickel-plated
- Degree of protection (fully locked): IP67
- Order number: 71091284

Cable 4x0.34 mm² (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): IP67
- Order number: 52010285

Devices with 7/8" plug



Left: electrical connection for devices with 7/8" plug
Right: view of the plug at the device

External thread: 7/8 – 16 UNC
- Material: housing / body CuZn, nickel-plated
- Protection: IP68
- Order number: 52010285

Cable gland

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, II1/3D, II1/2GD Exia, II1GD Exia, II3G Ex nA	Metal M20x1.5 (Ex e)	7 to 10.5 mm (0.28 to 0.41 in)

Terminals

For wire cross-sections of 0.5 to 2.5 mm² (20 to 14 AWG)

Measuring a 4 to 20 mA test signal

A 4 to 20 mA test signal may be measured via the positive and test terminal without interrupting the measurement. The minimum supply voltage of the device can be reduced by simply changing the position of the jumper. As a result, operation is also possible with lower voltage sources. Observe the position of the jumper in accordance with the following table.

Jumper position for test signal	Description
	– Measuring 4 to 20 mA test signal via the plus and test terminal: possible. (Thus, the output current can be measured without interruption via the diode.) – Delivery status – Minimum supply voltage: 11.5 V DC
	– Measuring 4 to 20 mA test signal via the plus and test terminal: not possible. – Minimum supply voltage: 10.5 V DC

Supply voltage

Note!
- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings.
- 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. → 48 ff, "Safety Instructions" and "Installation/Control Drawings" sections.

4 to 20 mA HART

- Version for non-hazardous areas, jumper for 4 to 20 mA test signal in "Test" position (delivery status): 11.5 to 45 V DC
- Version for non-hazardous areas, jumper for 4 to 20 mA test signal in "Non-test" position: 10.5 to 45 V DC

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: 13 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21
- FOUNDATION Fieldbus: 15 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21

Cable entry

→ 43 ff, feature 30 "Housing; Cable entry; Degree of protection".

Cable specification

- Endress+Hauser recommends using shielded, twisted-pair two-wire cables.
- Terminals for core cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)
- Cable outer diameter: 5 to 9 mm (0.2 to 0.35 in)

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

≤ 0.0006% of URL/1 V

Performance characteristics

Reference operating conditions

- As per IEC 60770
- Ambient temperature T_A = constant, in the range of: +21 to +33 °C (+70 to 91 °F)
- Humidity φ = constant, in the range of: 5 to 80 % rH
- Ambient pressure p_A = constant, in the range of: 860 to 1060 mbar (12.47 to 15.37 psi)
- Position of the measuring cell = constant, in range: horizontally ±1°
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- Zero based span
- Process isolating diaphragm material: Alloy C276 (2.4819)
- Filling oil: synthetic oil/inert oil
- Supply voltage: 24 V DC ± 3 V DC
- Load with HART: 250 Ω

Long-term stability

- 100 mbar (1.5 psi) measuring cell: ±0.18 % of URL/year / ±0.45 % of URL/5 years
- 400 mbar (6 psi), 1200 mbar (18 psi) measuring cell: ±0.1 % of URL/year / ±0.25 % of URL/5 years
- 4000 mbar (6 psi), 10000 mbar (150 psi) measuring cell: ±0.05 % of URL/year / ±0.125 % of URL/5 years

Influence of the installation position

- Maximum: ±2.3 mbar (0.0345 psi). The value is doubled for devices with inert oil.

Note!
Position-dependent zero shift can be corrected. See → 19, "General installation instructions" section.

Reference accuracy

The reference accuracy comprises the non-linearity (terminal based), hysteresis and non-reproducibility as per IEC 60770. The data refer to the calibrated span.

Measuring cell	% of the set span
100 mbar (1.5 psi)	■ TD 1:1 to TD 2:1 = ±0.15 ■ TD > 2:1 to TD 4:1 = ±0.075 x TD
400 mbar (6 psi)	■ TD 1:1 to TD 4:1 = ±0.15 ■ TD > 4:1 to TD 10:1 = ±0.0375 x TD
1200 mbar (18 psi)	■ TD 1:1 to TD 2:1 = ±0.1 ■ TD > 2:1 to TD 12:1 = ±0.05 x TD
4000 mbar (60 psi)	■ TD 1:1 to TD 4:1 = ±0.1 ■ TD > 4:1 to TD 40:1 = ±0.025 x TD
10000 mbar (150 psi)	■ TD 1:1 to TD 2.5:1 = ±0.1 ■ TD > 2.5:1 = ±0.04 x TD

Total performance

The "Total performance" specification comprises the non-linearity including hysteresis, non-reproducibility as well as the thermal change in the zero point.
All specifications apply to the temperature range –10 to +60 °C (+14 to +140 °F) and a turn down of 1:1.

Measuring cell	% of URL
100 mbar (1.5 psi), 400 mbar (6 psi)	■ ±0.35
1200 mbar (18 psi), 4000 mbar (60 psi), 10000 mbar (150 psi)	■ ±0.15

Total error

The total error comprises the long-term stability and the total performance.
All specifications apply to the temperature range –10 to +60 °C (+14 to +140 °F) and a turn down of 1:1.

Measuring cell	% of URL/year
100 mbar (1.5 psi)	■ ±0.53
400 mbar (6 psi)	■ ±0.45
1200 mbar (18 psi)	■ ±0.25
4000 mbar (60 psi), 10000 mbar (150 psi)	■ ±0.20

Warm-up period

- 4 to 20 mA HART: 10 s
- PROFIBUS PA: 6 s
- FOUNDATION Fieldbus: 50 s

Thermal change of the zero output and the output span

Measuring cell	–10 to +60 °C (+14 to 140 °F)	+60 to +85 °C (+140 to 185 °F)
	% of the set span	
100 mbar (1.5 psi)	±(0.3 x TD + 0.02)	±(0.4 x TD + 0.04)
400 mbar (6 psi)	±(0.25 x TD + 0.01)	±(0.3 x TD + 0.02)
1200 mbar (18 psi), 4000 mbar (60 psi), 10000 mbar (150 psi)	±(0.1 x TD + 0.01)	±(0.15 x TD + 0.02)

These values specify the thermal change for the most unfavorable situation where the process temperature and the ambient temperature change independently of each other.

Operating conditions (Installation)

General installation instructions

- The position-dependent zero point shift can be corrected directly at the device via an operating key, and also in hazardous areas in the case of devices with external operation.
- The housing of the Deltapilot S can be rotated up to 380°. See → 📄 21, "Turning the housing" section.
- The on-site display can be rotated in 90° stages.
- Endress+Hauser offers a mounting bracket for installing the device on pipes or walls. See → 📄 19, "Wall and pipe-mounting" section.

Level measurement

- Always install the device below the lowest measuring point.
- Do not install the device at the following positions:
  - in the filling curtain
  - in the tank outflow
  - or at a point in the tank that can be affected by pressure pulses from the agitator
- The adjustment and functional test can be carried out more easily if you mount the device downstream of a shutoff device.
- Deltapilot S must be included in the insulation for media that can harden when cold.

Pressure measurement in gases

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

Pressure measurement in steams

- Mount Deltapilot S with siphon below the tapping point.
  The siphon reduces the temperature to almost the ambient temperature.
- Fill the siphon with liquid before commissioning.

Pressure measurement in liquids

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

Wall and pipe-mounting

Endress+Hauser offers a mounting bracket for installing the device on pipes or walls. → 📄 45 ff, feature 110, "Additional option 2" or separate accessory (part number: 71102216).
For the dimensions, see → 📄 32.

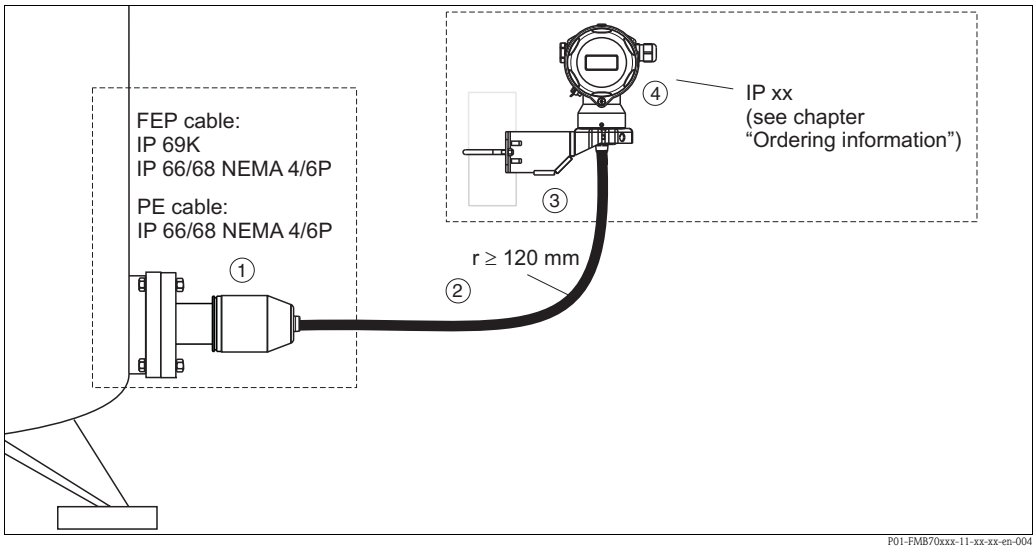
"Separate housing" version

With the "separate housing" version, you are able to mount the housing with the electronics insert at a distance from the measuring point. This version facilitates trouble-free measurement:
- Under particularly difficult measuring conditions (at installation locations that are cramped or difficult to access)
- If rapid cleaning of the measuring point is required
- If the measuring point is exposed to vibrations
- For compact installations

You can choose between different cable versions:
- PE (2 m (6.6 ft), 5 m (16 ft) and 10 m (33 ft))
- FEP (5 m (16 ft)).

→ 📄 45 ff, feature 110, "Additional option 2", version "G".

For the dimensions, see → 📄 32.



In the case of the "separate housing" version, the sensor is delivered with the process connection and cable ready mounted. The housing and a mounting bracket are enclosed as separate units. The cable is provided with a socket at both ends. These sockets are simply connected to the housing and the sensor.

1 Process connection with sensor
2 Cable, both ends are fitted with a socket
3 Mounting bracket provided, suitable for pipe and wall mounting
4 Housing with electronic insert

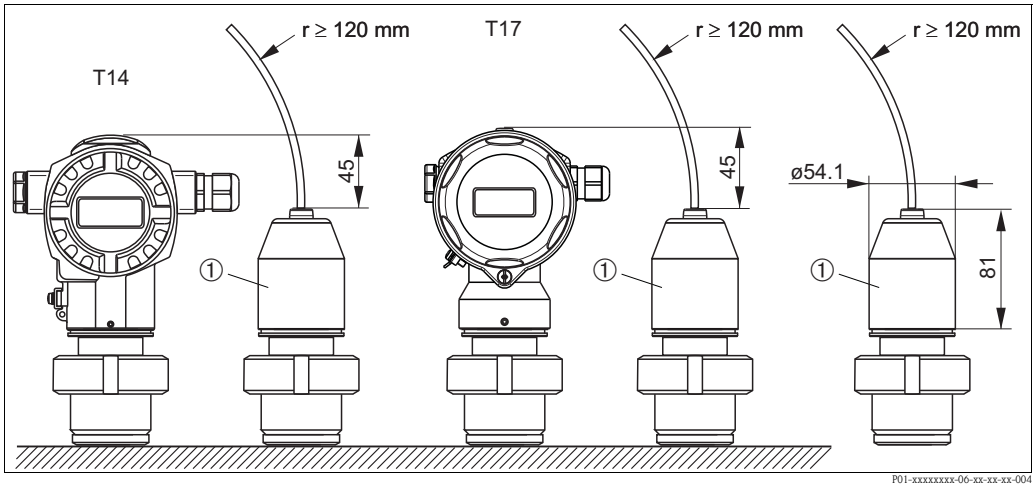
Degree of protection for the process connection and sensor with the use of
- FEP cable:
  - IP 69K
  - IP 66 NEMA 4/6P
  - IP 68 (1.83 mH_2O for 24 h) NEMA 4/6P
- PE cable:
  - IP 66 NEMA 4/6P
  - IP 68 (1.83 mH_2O for 24 h) NEMA 4/6P

Technical data of the PE and FEP cable:
- Minimum bending radius: 120 mm
- Cable extraction force: max. 450 N
- Resistance to UV light

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

Reduction of the installation height

If the separate housing is used, the installation height of the process connection is reduced compared to the dimensions of the standard version.



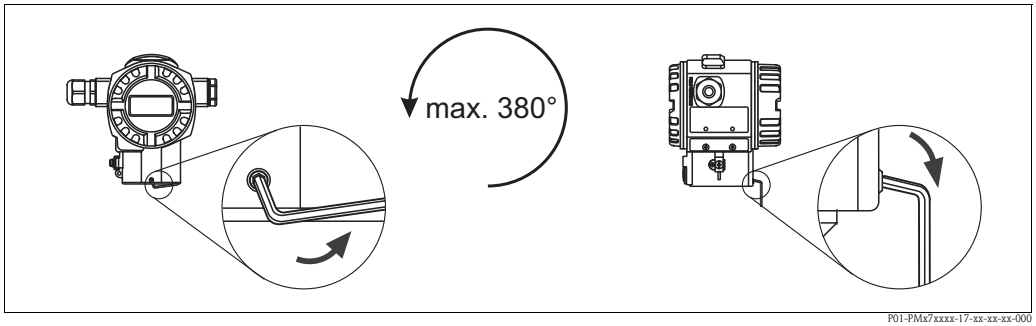
Reduction of the installation height of the process connection when using the separate housing
1 Process connection adapter

Turning the housing

The housing can be rotated up to 380° by loosening the Allen screw.

Your benefits

- Simple mounting by optimally aligning the housing
- Good, accessible device operation
- Optimum readability of the onsite display (optional)



Aligning the housing by releasing the setscrew
T14 and T15 housing: 2 mm (0.08 in) Allen screw; T17 housing: 3 mm (0.12 in) Allen screw

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.
– Dependent on the materials used, a certain maximum temperature and a maximum pressure for oxygen applications must not be exceeded. The maximum temperature T_{max} for oxygen applications is 60 °C (140 °F).

The devices suitable for gaseous oxygen applications are listed in the following table with the specification p_{max}.

Order code for devices [1]cleaned for oxygen applications	**p_{max} for oxygen applications**
FMB70 – * * * ** * *** F * *	Dependent on the lowest-rated element, with regard to pressure, of the selected components: Over pressure limit (OPL) of sensor or process connection (1.5 x PN)[2]

1) Only devices, not accessories or enclosed accessories.

2) → 🖹 7, "Measuring range" and → 🖹 25 ff, "Mechanical construction" section.

Silicone-free applications

Special cleaning of the transmitter to remove paint-wetting substances, for use in paint shops → 🖹 44 "Fill fluid" version "L".

Applications with hydrogen

With regard to materials in which hydrogen formation takes place, hydrogen atoms can diffuse through the metals of the sensor. This can result in incorrect measurement results.
Endress+Hauser offers process isolating diaphragms with gold-rhodium coating for this application.

→ 🖹 44 "FMB70 ordering information", feature 60 "Material of the process isolating diaphragm" version "6".

Operating conditions (Environment)

Ambient temperature range

- –40 to +85 °C (-40 to +185 °F)
  Lower temperatures on request
- Onsite display: –20 to +70°C (-4 to +158 °F)
  Extended temperature application range with restrictions in optical properties such as display speed and contrast: –40 to +85 °C (-40 to +185 °F)
- Separate housing: -20 to +60 °C (-4 to +140 °F) (installation without insulation)

For devices for use in hazardous areas, see Safety Instructions, Installation or Control Drawing. (→ 🖹 48 ff, "Safety Instructions" and "Installation/Control Drawings" sections)

The device can be used in this temperature range. The values of the specification, such as thermal change, may be exceeded.

Storage temperature range

- –40 to +90 °C (-40 to +194 °F)
- Onsite display: –40 to +85 °C (-40 to +185 °F)
- Separate housing: -40 to +60 °C (-40 to +140 °F)

Degree of protection

- → 🖹 43 ff, feature 30 "Housing; Cable entry; Degree of protection"
- Degree of protection IP 68 for T17 housing: 1.83 mH_2O for 24 h
- Separate housing → 🖹 20

Climate class

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

Vibration resistance

Device/accessory	Test standard	Vibration resistance
FMB70	GL	Guaranteed for: 3 to 25 Hz: ±1.6 mm (0.063 in); 25 to 100 Hz: 4 g in all 3 planes
FMB70 with mounting bracket	IEC 61298-3	Guaranteed for: 10 to 60 Hz: ±0.15 mm (0.0059 in); 60 to 500 Hz: 2 g in all 3 planes

Electromagnetic compatibility

- Electromagnetic compatibility to EN 61326 and NAMUR recommendation EMC (NE21). For details refer to the Declaration of Conformity.
- Maximum deviation: < 0.5 % of span
- All EMC measurements were performed with a turn down (TD) = 2:1.

Overvoltage protection (optional)

- Overvoltage protection:
  – Nominal functioning DC voltage: 600 V
  – Nominal discharge current: 10 kA
- Surge current check $\hat{i}$ = 20 kA as per DIN EN 60079-14: 8/20 µs satisfied
- Arrester AC current check I = 10 A satisfied

→ 🖹 43 ff, feature 100 "Additional option 1" and feature 110 "Additional option 2", version "M Overvoltage protection".

Note!
Devices with integrated overvoltage protection must be grounded.

Operating conditions (Process)

Process temperature limits

- –10 to +100 °C (+14 to 212 °F)
- Up to +135°C (+275°F) short-term (for 30 minutes) for cleaning purposes

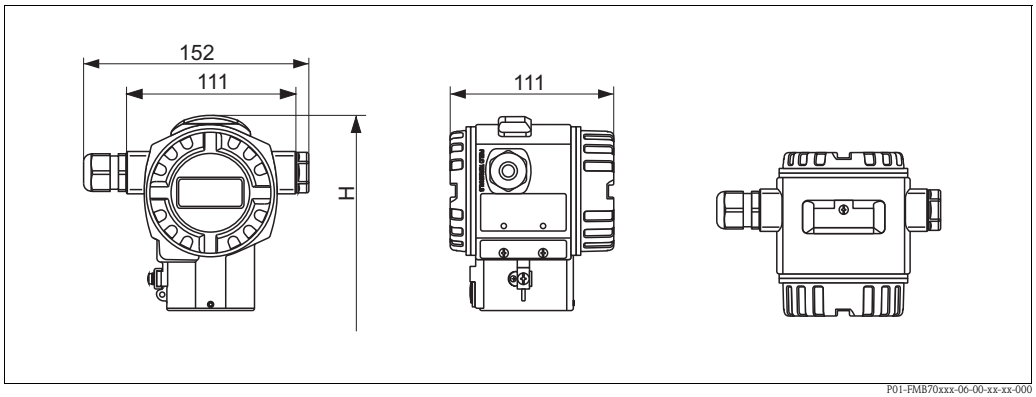
Pressure specifications

- The maximum pressure for the measuring device depends on the lowest-rated element with regard to pressure.
  See the following sections:
  – → 🖹 7 ff, "Measuring range" section
  – "Mechanical construction" section
  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 pressure-temperature dependency.
- The pressure values permitted at higher temperatures can be found in the following standards:
  – EN 1092-1: 2001 Tab. 18 [1]
  – ASME B 16.5a – 1998 Tab. 2-2.2 F316
  – ASME B 16.5a – 1998 Tab. 2.3.8 N10276
  – JIS B 2220
- The test pressure corresponds to the over pressure limit of the measuring device (OPL = 1.5 x MWP) and may only be applied temporarily so that no permanent damage develops.
- The Pressure Equipment Directive (EC Directive 97/23/EC) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.
- 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 (1.5 x PN; MWP = PN).
- In oxygen applications, the values for "p_{max} and T_{max} for oxygen applications" as per → 🖹 22, "Oxygen applications" may not be exceeded.

1) With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1: 2001 Tab. 18. The chemical composition of the two materials can be identical.

Mechanical construction

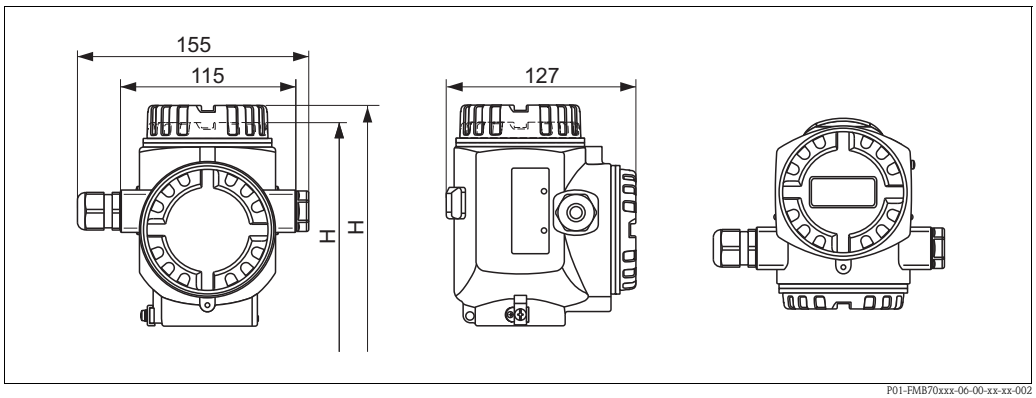
Dimensions of T14 housing, optional display on the side



P01-FMB70xxx-06-00-xx-xx-000

Front view, left-hand side view, top view
→ See appropriate process connection for installation height H. For housing weight see → 32

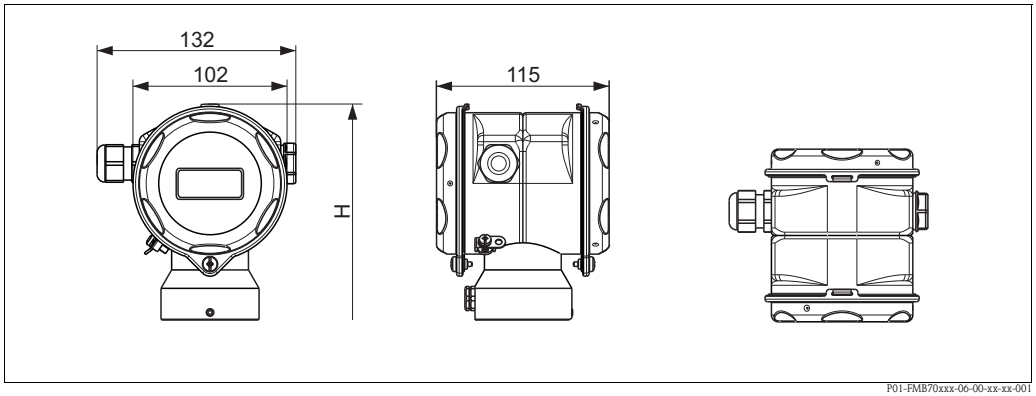
Dimensions of T15 housing, optional display on the top



P01-FMB70xxx-06-00-xx-xx-002

Front view, left-hand side view, top view
→ See appropriate process connection for installation height H. For housing weight see → 32

Dimensions of T17 housing (hygienic), optional display on the side



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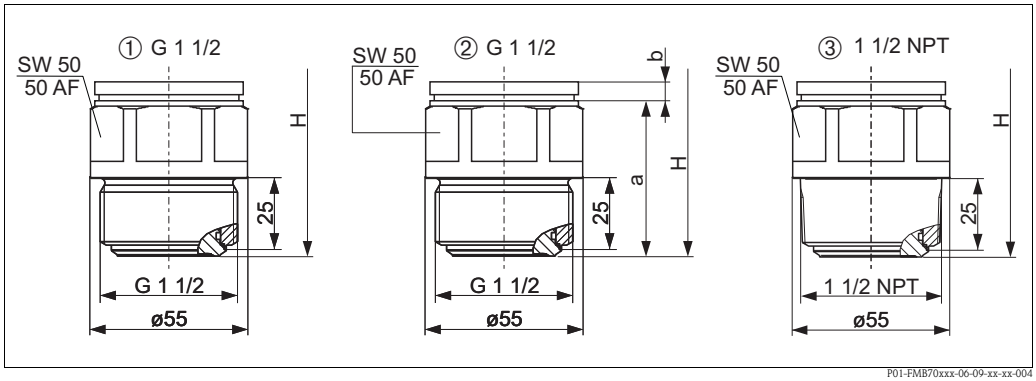
Front view, left-hand side view, top view
→ See appropriate process connection for installation height H. For housing weight see → 32

Process connections

Threaded connection ISO 228 and NPT



FMB70 with thread,
→ See following table for installation height. For weight see → 🖹 32

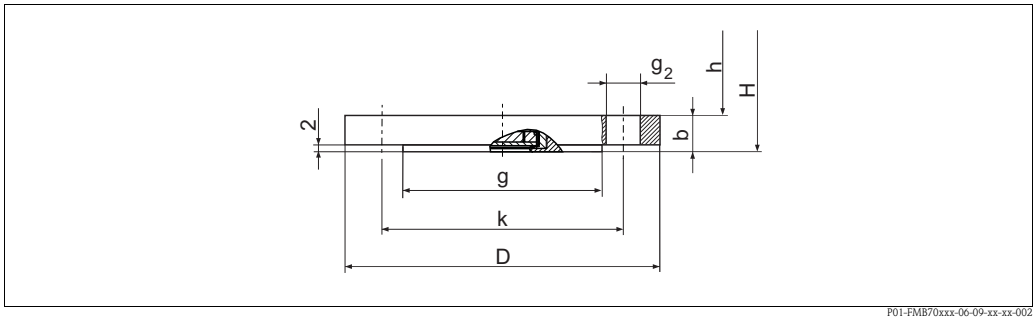
1 Thread ISO 228 G 1 1/2 A;
Material version 1G: AISI 316L (1.4435)
2 Thread ISO 228 G 1 1/2 A;
Material version 1H: b = top section AISI 316L (1.4404), a = bottom section Alloy C276 (2.4819)
3 Thread ANSI 1 1/2 MNPT;
Material version 2D: AISI 316L (1.4435)

Installation height H for devices with threaded connection

Description	Device height H
T14 housing, optional display on the side	185 mm (7.28 in)
T15 housing without display, flat cover	191 mm (7.52 in)
T15 housing with display, high cover	203.5 mm (8.01 in)
T17 housing, optional display on the side	201 mm (7.91)

Note!
Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→ 🖹 43 ff, feature 70 "Process connection") has to be ordered with a CSA approval (→ 🖹 43 ff, feature 10 "Approval"). These devices are fitted with a separate plate bearing the registration number CRN OF1987.7C.

EN/DIN flanges, connection dimensions as per EN 1092-1/DIN 2527



FMB70, flange with raised face

H: device height = height of the device without flange h + flange thickness b
Height h see → 🖹 28

	Flange [1]								Boltholes			
Version	**Material[2]**	**Nominal diameter**	**Nominal pressure**	**Shape[3]**	**Diameter** **D** [mm]	**Thick-ness** **b** [mm]	**Raised face diameter** **g** [mm]	**Raised face height** **f** [mm]	**Quan-tity**	**Diameter** **g_2** [mm]	**Hole circle** **k** [mm]	**Flange weight [4]** [kg]
CE	AISI 316L	DN 40	PN 10/16	B1 (C)	150	18	88	2	4	18	110	2.6
CF	AISI 316L	DN 50	PN 10/16	B1 (C)	165	18	102	2	4	18	125	3.3
CG	AISI 316L	DN 80	PN 10/16	B1 (C)	200	20	138	2	8	18	160	5.1
CH	AISI 316L	DN 100	PN 10/16	B1 (C)	220	20	158	2	8	18	180	6.3

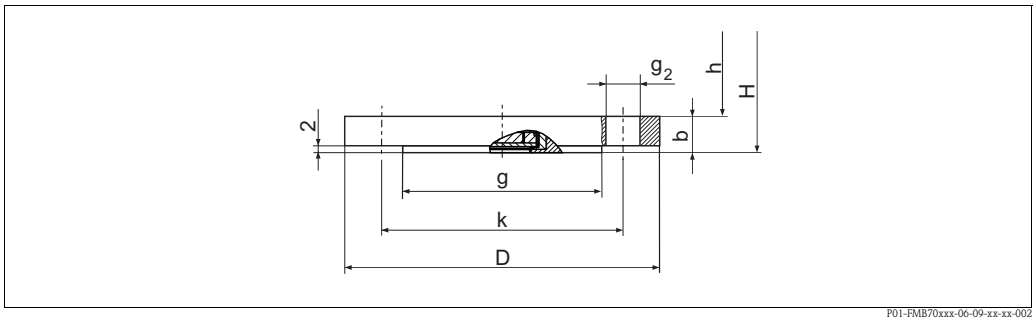
1) The roughness of the surface in contact with the medium, including the sealing surface of the flanges (all standards) is Ra 0.8 µm (31.5 min). Lower surface roughness on request.

2) Endress+Hauser supplies DIN/EN stainless steel flanges as per AISI 316L (DIN/ EN material number 1.4404 or 14435). With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13E0 in EN 1092-1: 2001 Tab.18. The chemical composition of the two materials can be identical.

3) Designation as per DIN 2526 in brackets.

4) Weight incl. pipe and measuring cell, housing weight, see → 🖹 32

ANSI flanges, connection dimensions as per ANSI B 16.5, raised face RF



FMB70, flange with raised face

H: device height = height of the device without flange h + flange thickness b
Height h see → 🖹 28

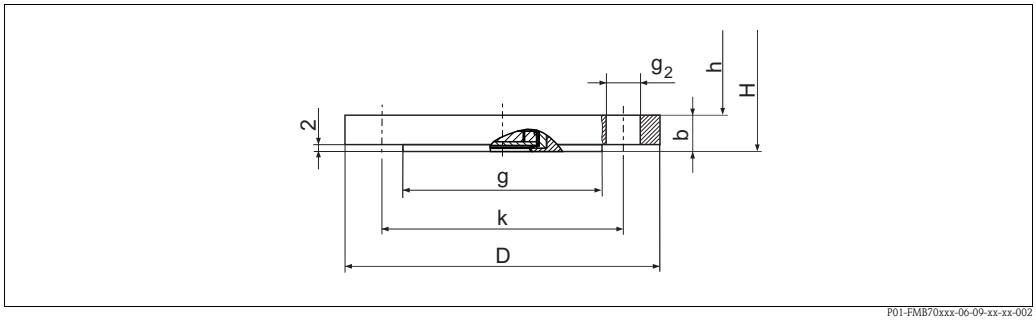
	Flange [1]							Boltholes			
Version	**Material[2]**	**Nominal diameter** [in]	**Class** [lb./sq in]	**Diameter** **D** [in] *[mm]*	**Thick-ness** **b** [in] *[mm]*	**Diameter of raised face** **g** [in] *[mm]*	**Raised face height** **f** [in] *[mm]*	**Quan-tity**	**Diameter** **g_2** [in] *[mm]*	**Hole circle** **k** [in] *[mm]*	**Flange weight [3]** [kg]
AE	AISI 316/ 316L	1 1/2	150	5 *127*	0.69 *17.5*	2.88 *73.2*	0.06 *1.6*	4	0.62 *15.7*	3.88 *98.6*	2.1
AF	AISI 316/ 316L	2	150	6 *152.4*	0.75 *19.1*	3.62 *91.9*	0.06 *1.6*	4	0.75 *19.1*	4.75 *120.7*	3.0
AG	AISI 316/ 316L	3	150	7.5 *190.5*	0.94 *23.9*	5 *127*	0.06 *1.6*	4	0.75 *19.1*	6 *152.4*	5.7
AH	AISI 316/ 316L	4	150	9 *228.6*	0.94 *23.9*	6.19 *157.2*	0.06 *1.6*	8	0.75 *19.1*	7.5 *190.5*	7.8

1) The roughness of the surface in contact with the medium, including the sealing surface of the flanges (all standards) is Ra 0.8 µm (31.5 min). Lower surface roughness on request.

2) Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated).

3) Weight incl. pipe and measuring cell, housing weight, see → 🖹 32

JIS flanges, connection dimensions as per JIS B 2220 BL, raised face RF



FMB70, flange with raised face, material: AISI 316L (1.4435)

H: device height = height of the device without flange + flange thickness b
Height h see → 28.

	Flange [1]						Boltholes			
Version	**Nominal diameter**	**Nominal pressure**	**Diameter** **D** [mm]	**Thick ness** **b** [mm]	**Raised face diameter** **g** [mm]	**Raised face height** **f** [mm]	**Quantity**	**Diameter** **g_2** [mm]	**Hole circle** **k** [mm]	**Flange weight [2]** [kg]
KE	40 A	10 K	140	16	81	2	4	19	105	2.1
KF	50 A	10 K	155	16	96	2	4	19	120	2.5
KL	80 A	10 K	185	18	126	2	8	19	150	3.8
KH	100 A	10 K	210	18	151	2	8	19	175	4.9

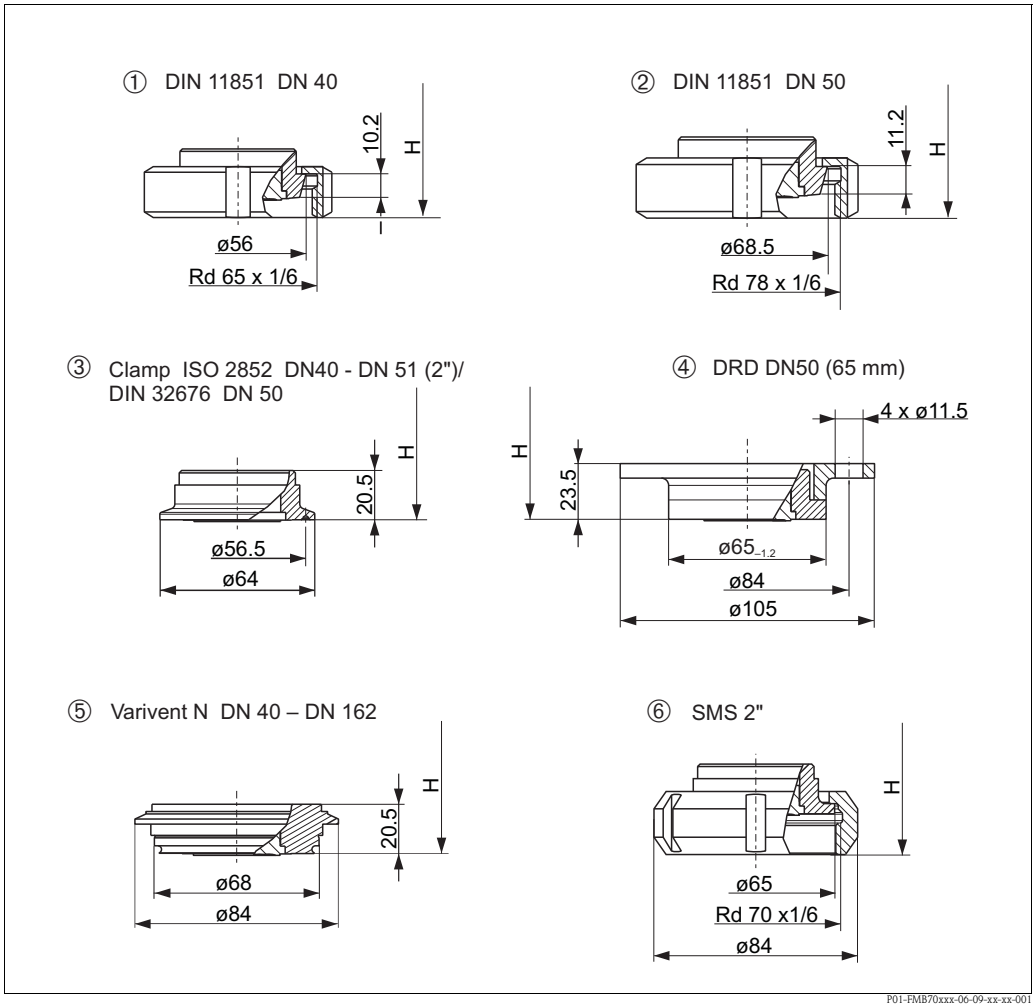
1) The roughness of the surface in contact with the medium, including the sealing surface of the flanges (all standards) is Ra 0.8 µm (31.5 min). Lower surface roughness on request.

2) Weight incl. pipe and measuring cell, housing weight, see → 32

Installation height H for devices with flange

Description	Device height H
T14 housing, optional display on the side	190 mm (7.48 in)
T15 housing without display, flat cover	196 mm (7.72 in)
T15 housing with display, high cover	208.5 mm (8.21 in)
T17 housing, optional display on the side	206 mm (8.11 in)

Hygienic connections



Process connections FMB70, hygienic connections, material AISI 316L (1.4435)
Surface roughness of the surfaces in contact with the medium $R_a \leq 0.76\ \mu m$ (30 µin) as standard. Lower surface roughness on request.
For weight see → *32*

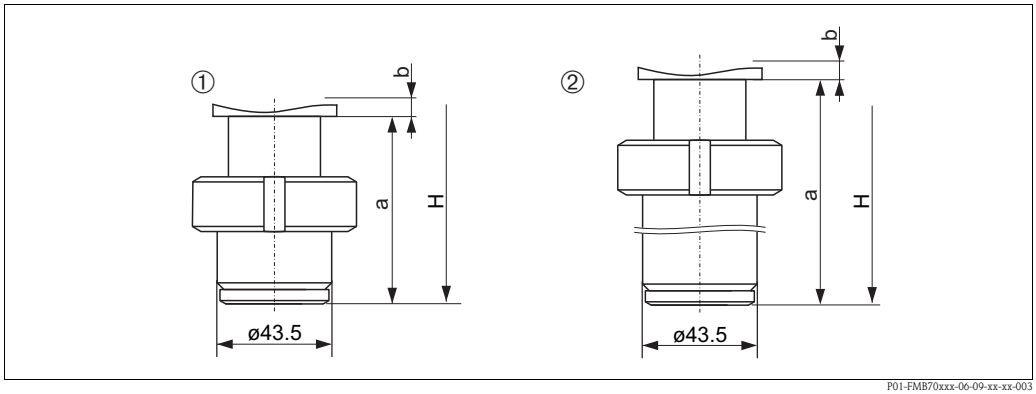
1 Version M2 [1]: DIN 11851 DN 40 PN 25, EHEDG, 3A
2 Version M3 [1]: DIN 11851 DN 50 PN 25, EHEDG, 3A
3 Version TD [1]: Tri-Clamp ISO 2852 DN 40 – DN 51 (2"), DN 32675 DN 50, EHEDG, 3A
4 Version TK: DRD DN50 (65 mm) PN 25, slotted nut AISI 304 (1.4301)
5 Version TR: Varivent type N for pipes 40 – 162, PN 40, EHEDG, 3A
6 Version UE [1]: SMS 2", PN25, EHEDG

Installation height H for devices with hygienic connection

Description	Device height H
T14 housing, optional display on the side	188 mm (7.4 in)
T15 housing without display, flat cover	194 mm (7.64 in)
T15 housing with display, high cover	206.5 mm (8.13 in)
T17 housing, optional display on the side	204 mm (8.03 in)

1) Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (DIN/EN material number 1.4301) or in AISI 304L (DIN/EN material number 1.4307).

Universal process adapter



Process connection FMB70, material: b = top section AISI 316L (1.4404), a = bottom section AISI 316L (1.4435); Surface roughness of the surfaces in contact with the medium $R_a \leq 0.76$ µm (30 µin) as standard. Lower surface roughness on request.

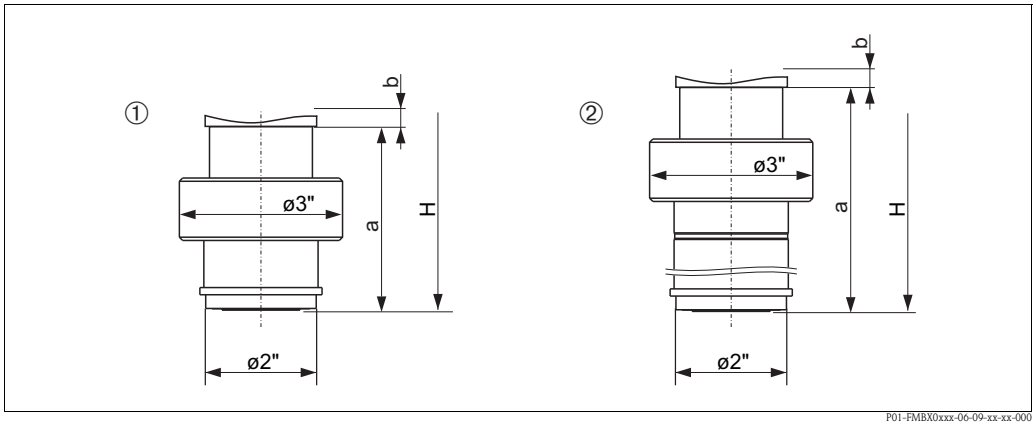
1 Version 00 [1]: universal process adapter incl. silicone molded seal FDA 21CFR177.2600/USP Class VI-70C, EHEDG, 3A
2 Version 57 [1]: universal process adapter, 6 inch extension incl. silicone molded seal FDA 21CFR177.2600/USP Class VI-70C, EHEDG, 3A

Installation height H for devices with universal process adapter

Description	Device height H, universal process adapter	Device height H, universal process adapter, 6 inch extension
T14 housing, optional display on the side	197 mm (7.76 in)	308 mm (12.1 in)
T15 housing without display, flat cover	203 mm (7.99 in)	314 mm (12.4 in)
T15 housing with display, high cover	215.5 mm (8.48 in)	326.5 mm (12.9 in)
T17 housing, optional display on the side	213 mm (8.39 in)	324 mm (12.8 in)

1) Endress+Hauser supplies these slotted nuts in stainless steel AISI 304 (DIN/EN material number 1.4301) or in AISI 304L (DIN/EN material number 1.4307).

Anderson process adapter



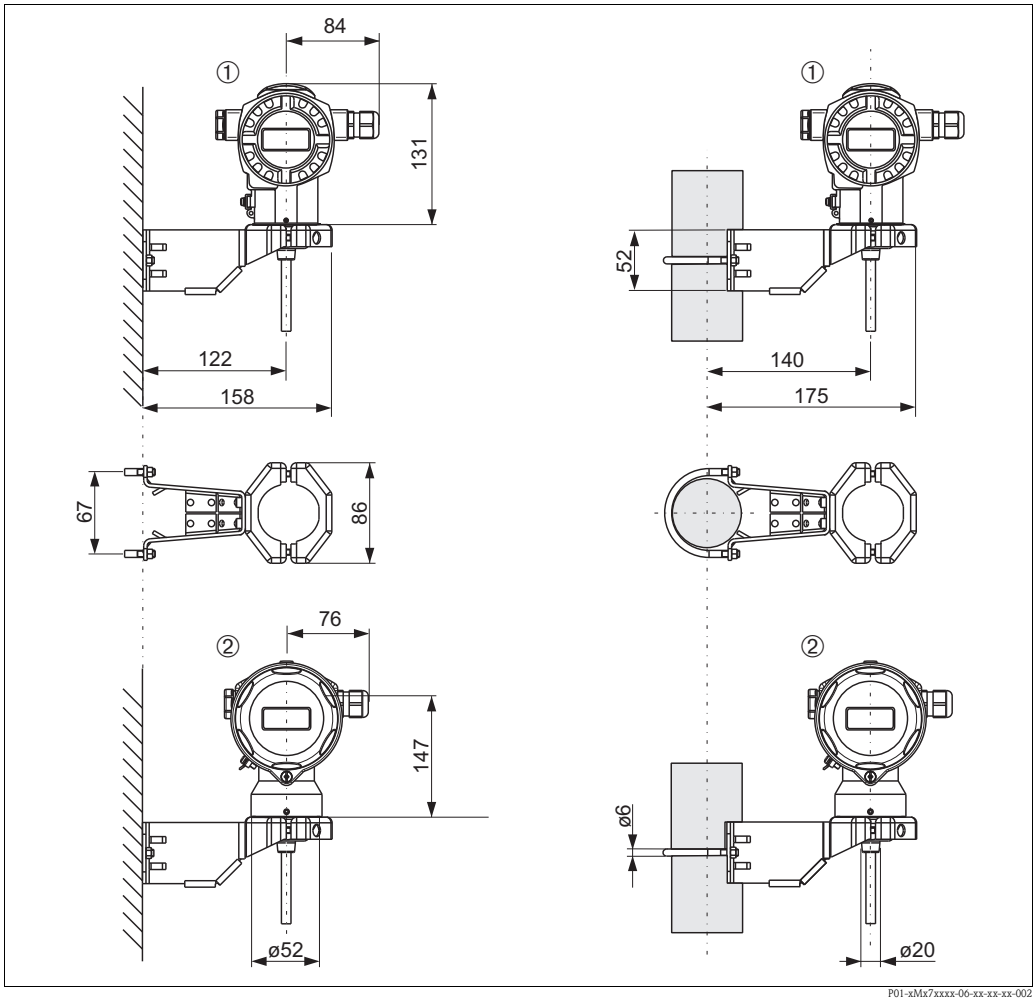
Process connection FMB70, material: b = top section AISI 316L (1.4404), a = bottom section AISI 316L (1.4435), slotted nut AISI 316L (1.4404); Surface roughness of the surfaces in contact with the medium $R_a \leq 0.76$ µm (30 µin) as standard. Lower surface roughness on request.

1 Version 60: Anderson short process adapter 2-3/16", 316L, 3A, incl. silicone molded seal, 3A
2 Version 62: Anderson long process adapter 6-1/2", 316L, 3A, incl. silicone molded seal, 3A

Installation height H for devices with Anderson process adapter

Description	Device height H, Anderson short	Device height H, Anderson long
T14 housing, optional display on the side	206 mm (8.11 in)	316 mm (12.4 in)
T15 housing without display, flat cover	216 mm (8.5 in)	326 mm (12.8 in)
T15 housing with display, high cover	227 mm (8.94 in)	337 mm (13.3 in)
T17 housing, optional display on the side	221 mm (8.7 in)	331 mm (13 in)

Wall and pipe mounting with mounting bracket



①*Dimensions of T14 housing, optional display on the side. For the weight, see the following section.*

②*Dimensions of T17 housing, optional display on the side. For the weight, see the following section.*

Weight

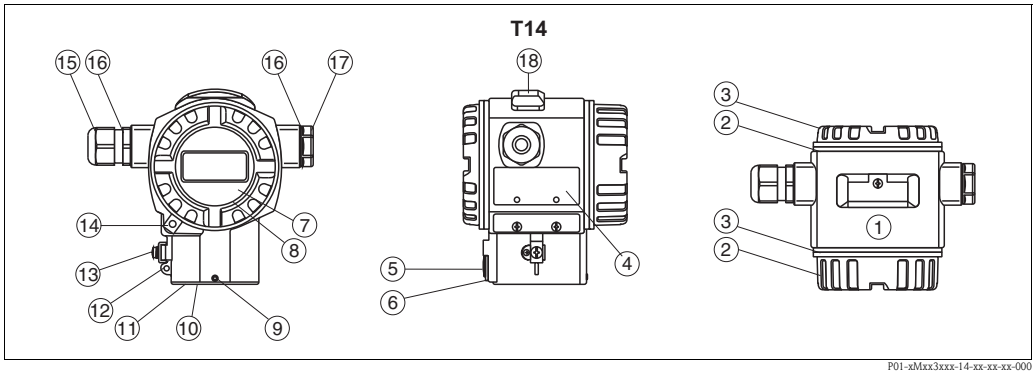
Housing

	T14	T15	T17	Separate housing
With electronic insert and display	1.2 kg (2.65 lbs)	1.8 kg (3.97 lbs)	1.2 kg (2.65 lbs)	Weight of housing T14 or T17 + 0.5 kg (1.10 lbs) Weight of sensor + 0.5 kg (1.10 lbs)
With electronic insert without display	1.1 kg (2.43 lbs)	1.7 kg (3.75 lbs)	1.1 kg (2.43 lbs)	

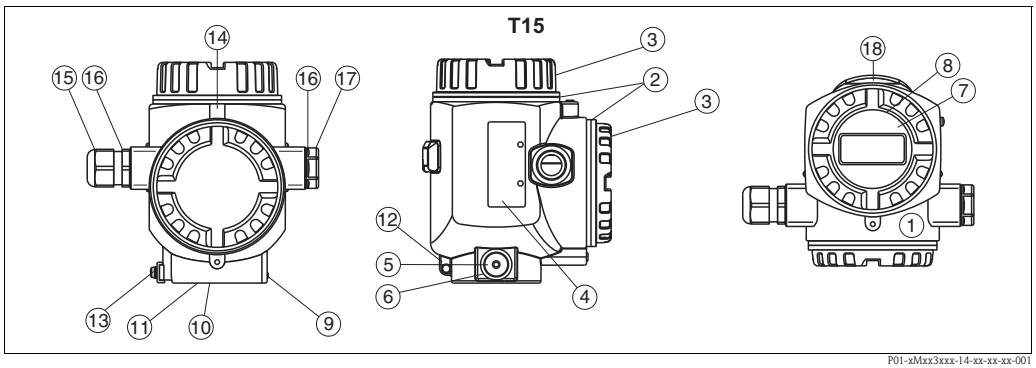
Process connections

- Version 1G, thread ISO 228 G 1 1/2 A: 0.8 kg (1.76 lbs)
- Version 1H, thread ISO 228 G 1 1/2 A: 0.8 kg (1.76 lbs)
- Version 2D, thread ANSI 1 1/2 MNPT: 0.8 kg (1.76 lbs)
- Version M2: DIN 11851 DN 40 PN 25: 0.7 kg (1.54 lbs)
- Version M3: DIN 11851 DN 50 PN 25: 0.9 kg (1.98 lbs)
- Version TD: Tri-Clamp ISO 2852 DN 40 – DN 51 (2"), DN 32675 DN 50: 0.7 kg (1.54 lbs)
- Version TK: DRD DN50 (65 mm) PN 25: 1.1 kg (1.98 lbs)
- Version TR: Varivent type N for pipes 40 – 162, PN 40: 1.0 kg (2.21 lbs)
- Version UE: SMS 2", PN25: 0.7 kg (1.54 lbs)
- Version 56: ISO 2853 2" IDF: 0.8 kg (1.76 lbs)
- Version 00: universal process adapter: 0.8 kg (1.76 lbs)
- Version 57: universal process adapter with 6 inch extension: 1.7 kg (3.75 lbs)
- Flanges, → 🗎 26

Material (not wetted) **Housing**

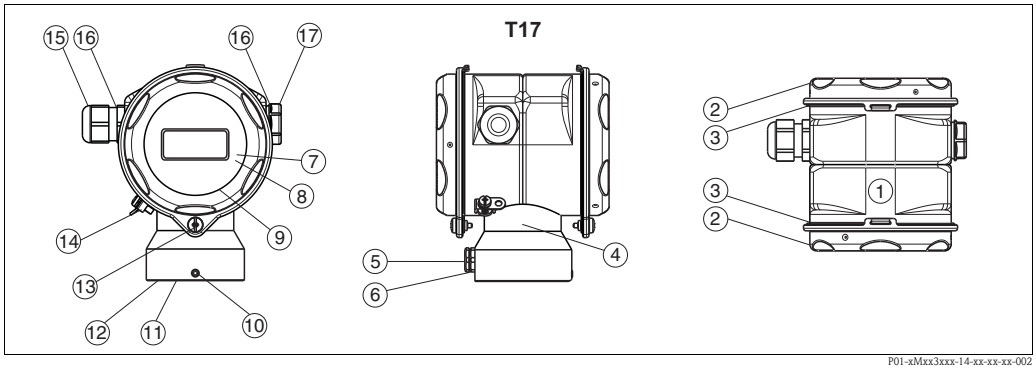


Front view, left-hand side view, top view



Front view, left-hand side view, top view

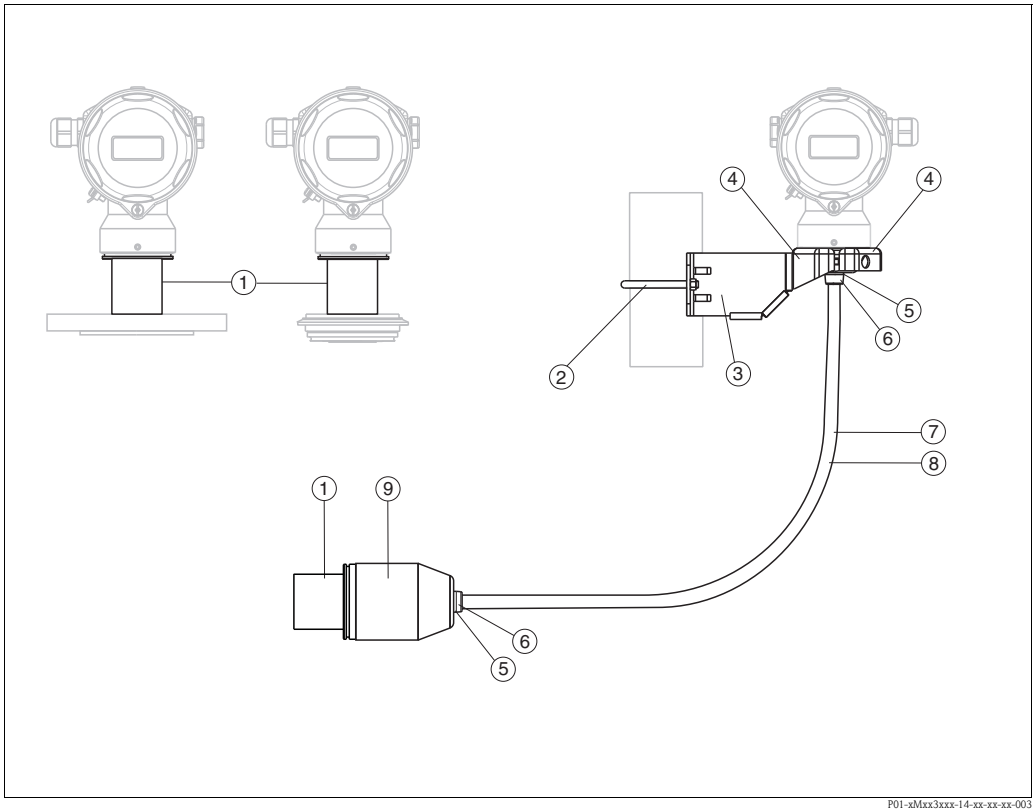
Item number	Component part	Material
1	T14 and T15 housing, RAL 5012 (blue)	Die-cast aluminum with protective powder-coating on polyester base
2	Cover, RAL 7035 (gray)	Die-cast aluminum with protective powder-coating on polyester base
3	Cover seal	EPDM
4	Nameplates	AISI 304 (1.4301)
5	Pressure compensation filter	PA6 GF10
6	Pressure compensation filter, O-ring	Silicone (VMQ)
7	Sight glass	Mineral glass
8	Sight glass seal	Silicone (VMQ)
9	Screw	A4
10	Sealing ring	EPDM
11	Snap ring	PA66-GF25
12	Snap ring for nameplates	AISI 304 (1.4301)/ AISI 316 (1.4401)
13	External ground terminal	AISI 304 (1.4301)
14	Cover clamp	Clamp AISI 316L (1.4435), screw A4
15	Cable gland	Polyamide (PA)
16	Seal of cable gland and blind plug	Silicone (VMQ)
17	Blind plug	PBT-GF30 FR, for dust ignition-proof: AISI 316L (1.4435)
18	External operation (keys and key cover), RAL 7035 (gray)	Polycarbonate PC-FR, screw A4



Front view, left-hand side view, top view

Item number	Component part	Material
1	T17 housing	AISI 316L (1.4404)
2	Cover	
3	Cover seal	EPDM
4	Nameplates	Lasered
5	Pressure compensation filter	PA6 GF10
6	Pressure compensation filter, O-ring	Silicone (VMQ)
7	Sight glass for non-hazardous area, ATEX Ex ia, NEPSI Zone 0/1 Ex ia, IECEx Zone 0/1 Ex ia, FM NI, FM IS, CSA IS	Polycarbonate (PC)
8	Sight glass for ATEX 1/2 D, ATEX 1/3 D, ATEX 1 GD, ATEX 1/2 GD, ATEX 3 G, FM DIP, CSA dust ignition-proof	Mineral glass
9	Sight glass seal	EPDM
10	Screw	A2-70
11	Sealing ring	EPDM
12	Snap ring	PA6
13	Screw	A4-50
14	External ground terminal	AISI 304 (1.4301)
15	Cable gland	Polyamide PA, for dust ignition-proof: CuZn nickel-plated
16	Seal of cable gland and blind plug	Silicone (VMQ)
17	Blind plug	PBT-GF30 FR, for dust ignition-proof: AISI 316L (1.4435)

Connecting parts



Front view, left-hand side view, top view

Item number	Component part	Material
1	Connection between the housing and process connection	AISI 316L (1.4404)
2	Mounting bracket	Bracket AISI 304 (1.4301), AISI 304L (1.4306)
3		Screw and nuts A2-70
4		Half-shells: AISI 304L (1.4306)
5	Seal for cable from separate housing	EPDM
6	Gland for cable from separate housing	AISI 316L (1.4404)
7	PE cable for separate housing	Abrasion-proof cable with strain-relief Dynema members; shielded using aluminum-coated film; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant
8	FEP cable for separate housing	Abrasion-proof cable; shielded using galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper wires, twisted, UV-resistant
9	Process connection adapter for separate housing	AISI 316L (1.4404)

Filling oil

- Synthetic oil polyalphaolefin FDA 21 CFR 172.882
- Inert oil
- Inert oil, cleaned for silicone-free service

Material (wetted)

Process connections

Note!
Process-wetted device components are listed in the "Mechanical construction" (→ 🖹 25) and "Ordering information" (→ 🖹 43) sections.

Process isolating diaphragm

- Process isolating diaphragm: Alloy C276 (2.4819), Ø 35.8 mm (1.41 in)
- Process isolating diaphragm: Alloy C276 (2.4819) with gold-rhodium coating, Ø 35.8 mm (1.41 in)

TSE Certificate of Suitability

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.

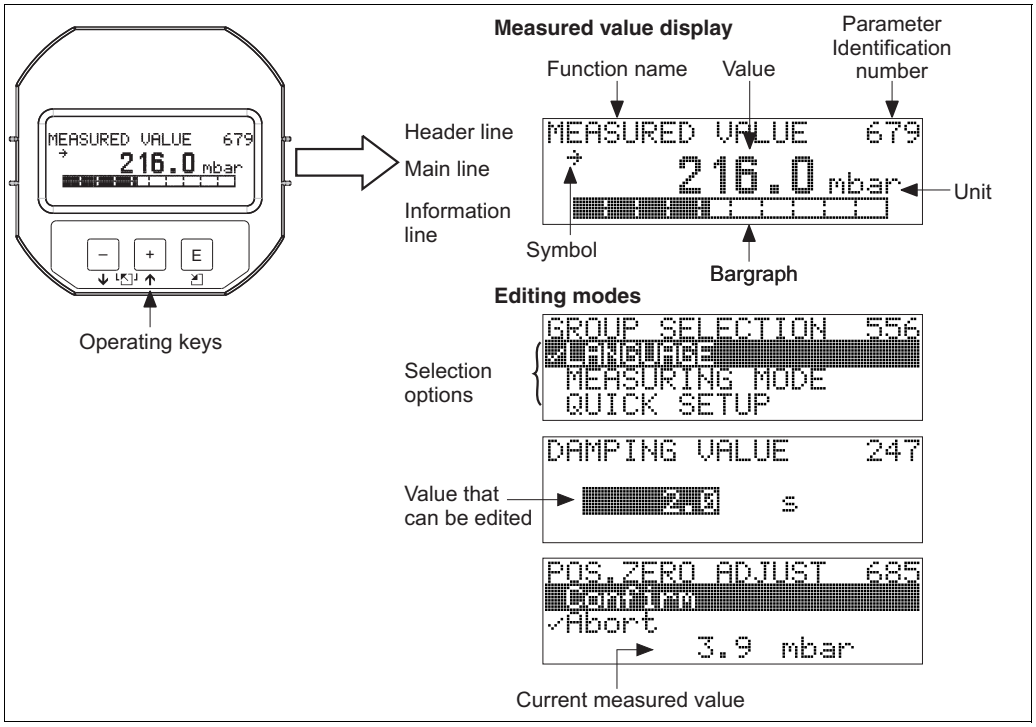
Human interface

Operating elements

Onsite display (optional)

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

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.
- Simple and complete menu guidance thanks to separation of the parameters into several levels and groups.
- Each parameter is given a 3-digit ID number for easy navigation.
- Option for configuring the display according to individual requirements and preferences, such as language, alternating display, display of other measured values such as sensor temperature, contrast setting.
- Comprehensive diagnostic functions (fault and warning message, peak-hold indicators, etc.).
- Rapid and safe commissioning with the Quick Setup menus.



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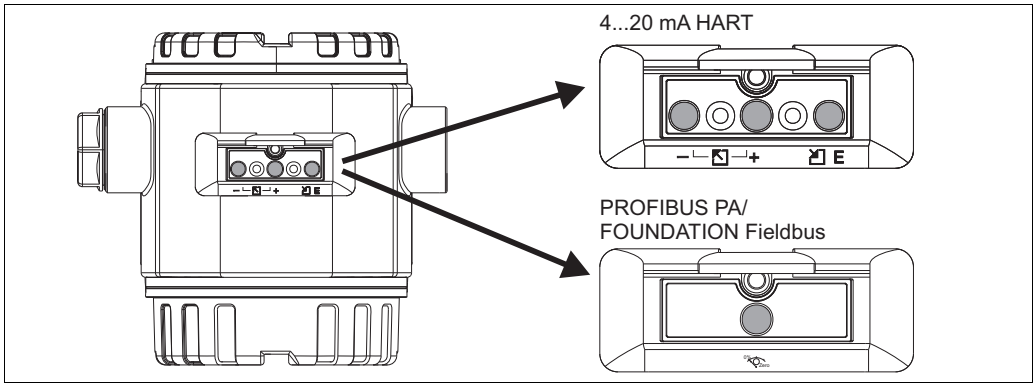
Operating keys on the exterior of the device

With the aluminum housing (T14 and T15), the operating keys are located either outside of the housing, under the protection cap or inside on the electronic insert. With the T17 housing (stainless steel), the operating keys are located inside the housing on the electronic insert.



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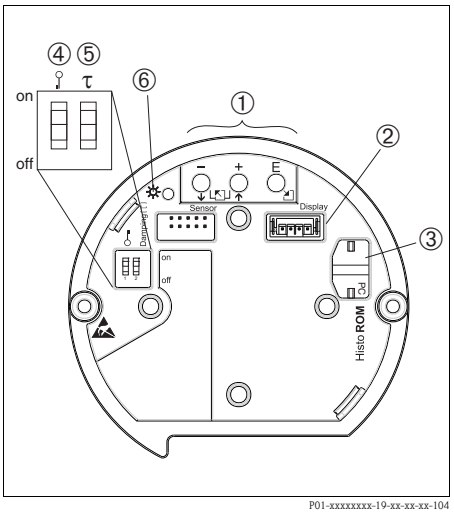
The operating keys located externally on the device work on the Hall sensor principle. As a result, no additional openings are required in the device. This guarantees:
- Complete protection against environmental influences such as moisture and contamination
- Simple operation without any tools
- No wear

Operating keys and elements located internally on the electronic insert



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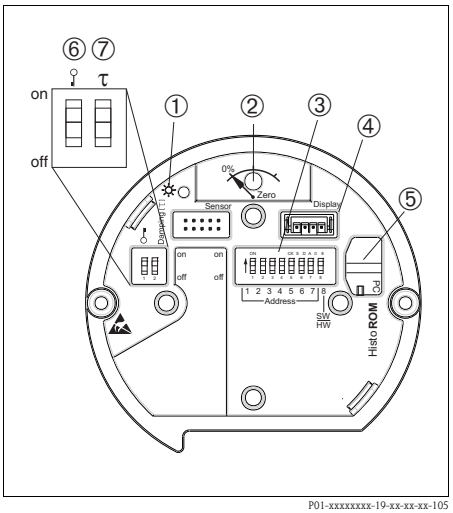
Electronic insert HART

1 *Operating keys*
2 *Slot for optional display*
3 *Slot for optional HistoROM®/M-DAT*
4 *DIP-switch for locking/unlocking parameters relevant to the measured values*
5 *DIP-switch for damping on/off*
6 *Green LED to indicate value being accepted*



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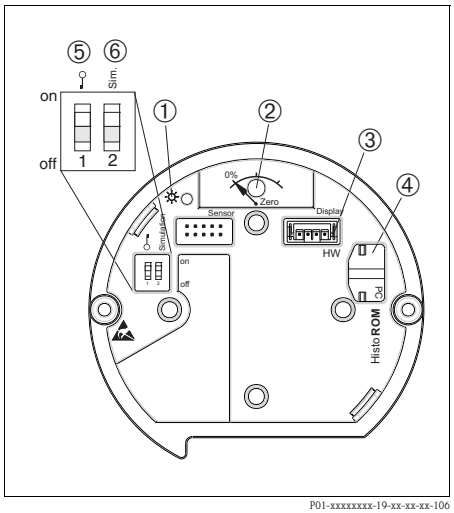
Electronic insert PROFIBUS PA

1 *Green LED to indicate value being accepted*
2 *Key for position adjustment and device reset*
3 *DIP-switch for bus address*
4 *Slot for optional display*
5 *Slot for optional HistoROM®/M-DAT*
6 *DIP-switch for locking/unlocking parameters relevant to the measured values*
7 *DIP-switch for damping on/off*



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Electronic insert FOUNDATION Fieldbus

1 *Green LED to indicate value being accepted*
2 *Key for position adjustment and device reset*
3 *Slot for optional display*
4 *Slot for optional HistoROM®/M-DAT*
5 *DIP-switch for locking/unlocking parameters relevant to the measured values*
6 *DIP-switch for simulation mode on/off*

Local operation

Function	External operation (operating keys, optional, not T17 housing)	Internal operation (electronic insert)	Display (optional)
Position adjustment (zero point correction)	X	X	X
Setting lower-range value and upper-range value – reference pressure present at the device	X (HART only)	X (HART only)	X
Device reset	X	X	X
Locking and unlocking parameters relevant to the measured value	—	X	X
Value acceptance indicated by green LED	X	X	X
Switching damping on and off	—	X (HART and PA only)	X
Setting bus address (PA)	—	X	X
Switching simulation mode on and off (FOUNDATION Fieldbus)	—	X	X

Remote operation

Depending on the position of the write protection switch on the device, all software parameters are accessible.

HART

Remote operation via:
- Handheld terminal Field Communicator 375 (see "Hardware and software for onsite and remote operation" section → 📄 40)
- FieldCare (see "Hardware and software for onsite and remote operation" section → 📄 40 ff) with Commubox FXA195 (see "Hardware and software for onsite and remote operation" section → 📄 40)
- Field Xpert:
  Field Xpert is an industrial PDA with integrated 3.5" touchscreen from Endress+Hauser based on Windows Mobile. It communicates via wireless with the optional VIATOR Bluetooth modem connected to a HART device point-to-point or wireless via WiFi and Endress+Hauser's Fieldgate FXA520. Field Xpert also works as a stand-alone device for asset management applications. For details, refer to BA060S/04/EN.

PROFIBUS PA

Remote operation via:
- FieldCare (see "Hardware and software for onsite and remote operation" section → 📄 40)
  - Profiboard: For connecting a PC to PROFIBUS
  - Proficard: For connecting a laptop to PROFIBUS

FOUNDATION Fieldbus

Remote operation via:
- Handheld terminal Field Communicator 375 (see "Hardware and software for onsite and remote operation" section → 📄 40)
- Use an FF-configuration program for example NI-FBUS Configurator, to
  - connect devices with "FOUNDATION Fieldbus signal" into an FF-network
  - set FF-specific parameters

  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 concept.
  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
  - Read and write to function block control strategies (function block applications)
  - Invoke Device Description (DD) methods

– Display DD menus
– 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

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

Hardware and software for onsite and remote operation

Commubox FXA195

For intrinsically safe HART communication with FieldCare via the USB interface. For details refer to TI404F/00/EN.

Commubox FXA291

The Commubox FXA291 connects Endress+Hauser field devices with a CDI interface (=Endress+Hauser Common Data Interface) to the USB interface of a personal computer or a notebook. For details refer to TI405C/07/EN.

Note!
For the following Endress+Hauser devices you need the "ToF adapter FXA291" as an additional 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 of the ToF platform, pressure equipment and Gammapilot via the USB interface of a personal computer or a notebook. For details refer to KA271F.

Field Communicator 375

With a handheld terminal, all the parameters can be configured anywhere along the bus line via menu operation.

HistoROM®/M-DAT (optional)

HistoROM®/M-DAT is a memory module which can be attached to every electronic insert. The HistoROM®/M-DAT can be retrofitted at any stage (order number: 52027785).

Your benefits

- Quick and safe commissioning of the same measuring points by copying the configuration data of one transmitter to another transmitter.
- Reliable process monitoring thanks to cyclical recording of pressure and sensor temperature measured values.
- Simple diagnosis by recording diverse events such as alarms, configuration changes, counters for measuring range undershoot and overshoot for pressure and temperature as well as user limit overshoot and undershoot for pressure and temperature etc.
- Analysis and graphic evaluation of the events and process parameters via software (contained in scope of supply).

HistoROM®/M-DAT can be ordered via feature 100 "Additional option 1" or feature 110 "Additional option 2" or as a spare part. → 🖹 45 ff. A CD with an Endress+Hauser operating program is also included in the scope of delivery.
You can copy data from one transmitter to another transmitter when operating a FOUNDATION Fieldbus device via an FF configuration program. You need the Endress+Hauser FieldCare operating program and the Commubox FXA291 service interface and the ToF adapter FXA291 to be able to access the data and events saved in the HistoROM®/M-DAT.
FieldCare and the service interface Commubox FXA291 and the ToF adapter FXA291.

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®/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 see → www.endress.com

Certificates and approvals

CE mark

The device meets the legal requirements of the relevant EC directive.
Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

Ex approvals

- ATEX
- FM
- CSA
- NEPSI
- IECEx
- GOST on request

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.
→ 48 ff, "Safety Instructions" and "Installation/Control Drawings" sections.

Suitability for hygienic processes

The Deltapilot S is suitable for use in hygienic processes.
Overview of suitable process connections from → 25.
Many versions meet the requirements of 3A-Sanitary Standard No. 74 and are certified by the EHEDG.
Suitable fittings and seals must be used to ensure hygiene-compliant design according to the specifications of 3A and EHEDG.

Note!
The gap-free connections can be cleaned without residue using the usual cleaning methods.

Functional safety SIL/ IEC 61508 Declaration of Conformity (optional)

The Deltapilot S devices with 4 to 20 mA output signal have been developed to IEC 61508 standard. These devices can be used to monitor the process level and pressure up to SIL 3.
→ For a detailed description of the safety functions with Deltapilot S, settings and characteristic quantities for functional safety, please refer to the "Functional Safety Manual - Deltapilot S" SD213P.
→ For devices with SIL / IEC 61508 Declaration of Conformity see → 43 ff, feature 100 "Additional option 1" and feature 110 "Additional option 2" version E "SIL / IEC 61508, Declaration of Conformity".

Overfill protection

WHG. See "Ordering information" → 43 (see also ZE266P).

CRN approvals

Some device versions have CRN approval. For a CRN-approved device, a CRN-approved process connection (→ 43 ff, feature 70 "Process connection") has to be ordered with a CSA approval (→ 43 ff, feature 10 "Approval"). These devices are fitted with a separate plate bearing the registration number CRN OF1987.7C.

Standards and guidelines

DIN EN 60770 (IEC 60770):
Transmitters for use in industrial-process control systems
Part 1: Methods for performance evaluation

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

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

Pressure Equipment Directive (PED)

The Deltapilot S device corresponds to Article 3 (3) of the EC directive 97/23/EC (Pressure Equipment Directive) and has been designed and manufactured according to good engineering practice.

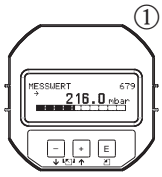
Marine approval

GL (German Lloyd)

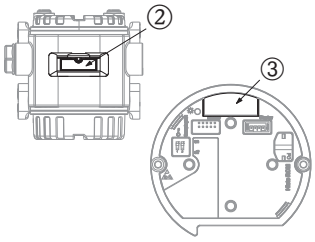
Ordering information

FMB70

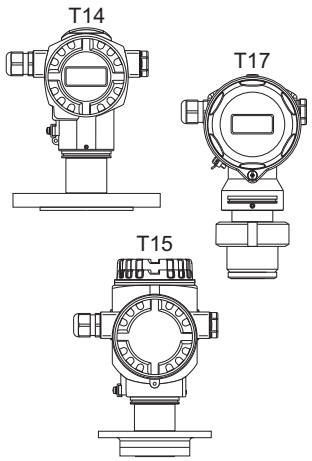
This overview does not mark options which are mutually exclusive.



10	Approval:
A	For non-hazardous areas
F	Version for non-hazardous areas, WHG overfill protection
E	Combined certificates: ATEX II Ex ia + FM IS + CSA IS ATEX II 1/2G Ex ia IIC T6+ FM/CSA IS Class I,II,III Division 1 Groups A-G FM: Zone 0, 1, 2, 20, 21, 22/CSA Zone 0, 1, 2
1	ATEX II 1/2 G Ex ia IIC T6
6	ATEX II 1/2 G Ex ia IIC T6, overfill protection WHG
2	ATEX II 1/2 D
4	ATEX II 1/3 D
8	ATEX II 1 GD Ex ia IIC T6
3	ATEX II 1/2 GD Ex ia IIC T6
7	ATEX II 3 G Ex nA II T6
S	FM IS, Class I, II, III Division 1, Groups A – G; NI Class I Division 2, Groups A – D; AEx ia
Q	FM DIP, Class II, III Division 1, Groups E – G, Zone 21, 22
R	FM NI, Class I, Division 2, Groups A – D, Zone 2
U	CSA IS, Class I, II, III Division 1, Groups A – G, Class I Division 2, Groups A – D, Ex ia, Zone 0, 1, 2
W	CSA Class II, III Division 1, Groups E – G (Dust-Ex)
H	NEPSI Ex ia IIC T6
I	IECEx Zone 0/1 Ex ia IIC T6



20	Output; Operation:
A	4 to 20 mA HART, operation outside, LCD (→ see Fig. ①, ②)
B	4 to 20 mA HART, operation inside, LCD (→ see Fig. ①, ③)
C	4 to 20 mA HART, operation inside (→ see Fig. ③)
M	PROFIBUS PA, operation outside, LCD (→ see Fig. ①, ②)
N	PROFIBUS PA, operation inside, LCD (→ see Fig. ①, ③)
O	PROFIBUS PA, operation inside (→ see Fig. ③)
P	FOUNDATION Fieldbus, operation outside, LCD (→ see Fig. ①, ②)
Q	FOUNDATION Fieldbus, operation inside, LCD (→ see Fig. ①, ③)
R	FOUNDATION Fieldbus, operation inside (→ see Fig. ③)



30	Housing; Cable entry; Protection:
A	Aluminum T14 housing, optional display on the side, IP 66/67/NEMA 4X/ 6P, Gland M 20x1.5
B	Aluminum T14 housing, optional display on the side, IP 66/67/NEMA 4X/ 6P, Thread G 1/2
C	Aluminum T14 housing, optional display on the side, IP 66/67/NEMA 4X/ 6P, Thread 1/2 NPT
D	Aluminum T14 housing, optional display on the side, IP 66/67/NEMA 4X/ 6P, M 12x1 PA plug
E	Aluminum T14 housing, optional display on the side, IP 66/67/NEMA 4X/ 6P, 7/8" FF plug
F	Aluminum T14 housing, optional display on the side, IP 65/NEMA 4X, Han7D plug, 90°
J	Aluminum T15 housing, optional display on the top, IP 66/67/NEMA 4X/ 6P, Gland M 20x1.5
K	Aluminum T15 housing, optional display on the top, IP 66/67/NEMA 4X/ 6P, Thread G 1/2
L	Aluminum T15 housing, optional display on the top, IP 66/67/NEMA 4X/ 6P, Thread 1/2 NPT
M	Aluminum T15 housing, optional display on the top, IP 66/67/NEMA 4X/ 6P, M 12x1 PA plug
N	Aluminum T15 housing, optional display on the top, IP 66/67/NEMA 4X/ 6P, 7/8" FF plug
P	Aluminum T15 housing, optional display on the top, IP 65/NEMA 4X, Han7D plug, 90°
R	T17 316L Hygiene IP66/68 NEMA6P; M20 gland, T17 = side cover
S	T17 316L Hygiene IP66/68 NEMA6P; G1/2 thread, T17 = side cover
T	T17 316L Hygiene IP66/68 NEMA6P; NPT1/2 thread, T17 = side cover
U	T17 316L Hygiene IP66/68 NEMA6P; M12 plug, T17 = side cover
V	T17 316L Hygiene IP66/68 NEMA6P; 7/8" plug, T17 = side cover

40	Sensor range; Sensor over pressure limit (= OPL):	
	Sensors for gauge pressure	
	Measuring limits [1]:	
	Sensor rated value (URL)	**OPL (over pressure limit)**
1C	100 mbar/10 kPa/1.5 psi/1 mH_2O/40 inH_2O [1]	4 bar/400 kPa/60psi/40 mH_2O/1600 inH_2O
1F	400 mbar/40 kPa/6psi/4 mH_2O/160 inH_2O [1]	8 bar/800 kPa/120 psi/80 mH_2O/3200 inH_2O
1H	1.2 bar/120 kPa/18 psi/12 mH_2O/480 inH_2O [2]	24 bar/2.4 MPa/350 psi/240 mH_2O/10000 inH_2O
1M	4 bar/400 kPa/60 psi/40 mH_2O/1600 inH_2O [2]	24 bar/2.4 MPa/350 psi/240 mH_2O/10000 inH_2O
1P	10 bar/1 MPa/150 psi/100 mH_2O/4000 inH_2O [2]	40 bar/4 MPa/600 psi/400 mH_2O/16000 inH_2O

1) –100 % to +100 % of sensor nominal value

2) –1.0 bar to +100 % of sensor nominal value

FMB70 (continued)

50	**Calibration; Unit:**
A	Sensor range; %
1	Sensor range; mbar/bar
2	Sensor range; kPa/MPa
3	Sensor range; mmH_2O/mH_2O
4	Sensor range; inH_2O/ftH_2O
6	Sensor range; psi
B	Customer-specific; see additional specification
C	Factory calibration certificate, 5-point; see additional specification
D	DKD certificate; see additional specification

60	**Process isolating diaphragm material; Seal:**
2	Alloy C276; welded
6	Alloy C276 with gold-rhodium coating; welded

70	**Process connection; Material:**
	Threaded connections
1G	Thread ISO 228 G 1 1/2, AISI 316L
1H	Thread ISO 228 G 1 2/2, Alloy C
2D	Thread ANSI MNPT 1 1/2, AISI 316L (CRN)
	EN/DIN flanges
CE	DN 40 PN 10/16 B1, AISI 316L (CRN)
CF	DN 50 PN 10/16 B1, AISI 316L (CRN)
CG	DN 80 PN 10/16 B1, AISI 316L (CRN)
CH	DN 100 PN 10/16 B1, AISI 316L (CRN)
	ANSI flanges
AE	1 1/2" 150 lbs RF, AISI 316/316L (CRN)
AF	2" 150 lbs RF, AISI 316/316L (CRN)
AG	3" 150 lbs RF, AISI 316/316L (CRN)
AH	4" 150 lbs RF, AISI 316/316L (CRN)
	JIS flanges
KE	10K 40A RF, AISI 316L
KF	10K 50A RF, AISI 316L
KL	10K 80A RF, AISI 316L
KH	10K 100A RF, AISI 316L
	Hygienic connections
M2	DIN 11851 DN 40 PN 25 slotted nut, AISI 316L (CRN), EHEDG, 3A
M3	DIN 11851 DN 50 PN25 slotted nut, AISI 316L (CRN), EHEDG, 3A
S4	NEUMO BioControl D50 PN16, 316L, 3A
ND	DIN11864-1 A DN50 PN16 tube DIN11866-A, threaded conn., 316L, EHEDG, 3A
TD	Tri-Clamp ISO 2852 DN 40 – DN 51 (2"), DIN 32676 DN 50, AISI 316L, EHEDG, 3A (CRN)
TK	DRD DN50 (65 mm) PN 25, AISI 316L
TR	Varivent type N for pipes DN 40 – DN 162, EHEDG, 3A (CRN)
UE	SMS 2" PN 25, AISI 316L, EHEDG, 3A
00	Universal adapter 44 mm including silicon shape seal, EHEDG, 3A (CRN)
01	Universal adapter 44 mm including EPDM shape seal, EHEDG, (CRN)
57	Universal adapter 44 mm, 6" extension including silicon shape seal, EHEDG, 3A (CRN)
58	Universal adapter 44 mm, 6" extension including EPDM shape seal, EHEDG, (CRN)
60	Anderson short 2-3/16", 316L, 3A, incl. silicone seal
62	Anderson long 6-1/2", 316L, 3A, incl. silicone seal

90	**Fill fluid:**
C	Synthetic oil (FDA)
F	Inert oil
L	Inert oil, cleaned for silicone-free service

FMB70 (continued)

100	**Additional option 1:**	
	A	Not selected
	E	SIL2/IEC61508 Declaration of Conformity
	B	Material test certificate for wetted components, inspection certificate as per EN 10204 3.1 acc. to specification 52005759
	M	Overvoltage protection
	J	Software setting, see additional spec.
		Min alarm current
		HART burst mode PV
		Min alarm current + HART burst mode PV
	N	HistoROM/M-DAT
	S	GL (German Lloyd) marine certificate
	2	Test report acc. to EN10204 -2.2
	3	Individual test with certificate, inspection certificate as per EN 10204-3.1
	4	Overpressure test with certificate, inspection certificate as per EN 10204-3.1

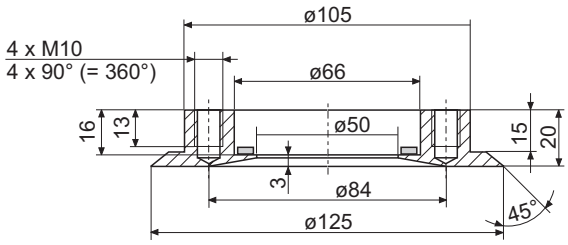
110	**Additional option 2:**	
	A	Not selected
	E	SIL2/IEC61508 Declaration of Conformity
	G	Separate housing, cable length see additional spec. + mounting bracket, wall/pipe, 316L (FM/CSA IS: for Div. 1 installation only)
	M	Overvoltage protection
	J	Software setting, see additional spec.
		Min alarm current
		HART burst mode PV
		Min alarm current + HART burst mode PV
	N	HistoROM/M-DAT
	S	GL (German Lloyd) marine certificate
	U	Mounting bracket, pipe/wall mounting, AISI 304
	2	Test report acc. to EN 10204-2.2
	3	Individual testing with test certificate, inspection certificate as per EN10204 -3.1
	4	Overpressure test with certificate, inspection certificate as per EN 10204-3.1

995	**Identification:**	
	Z1	Measuring point (TAG)
	Z2	Bus address

FMB70	Order code

Accessories

Welding flanges



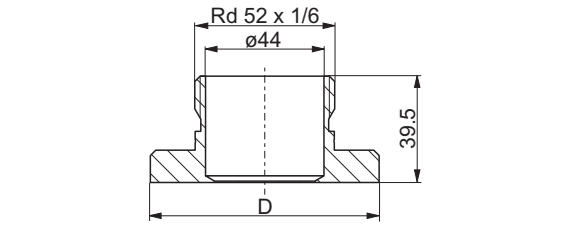
P01-DB5xxxx-06-xx-xx-xx-032

Welding flange for flush-mounted installation for devices with a DRD flange

Version	Order number
DRD DN50 (65 mm), AISI 316L (1.4435)	52002041
DRD (DN50) 65 mm, AISI 316L (1.4435) with inspection certificate EN 10204 3.1 material	52011899
DRD DN50 (65 mm), AISI 304 (1.4301)	916743-0000

Note!
- Order number for a replacement PTFE flat seal (5 pieces): 52024228

Welding neck for universal process adapter

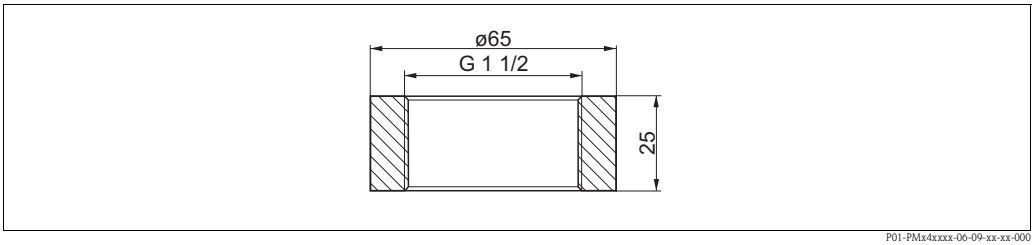


P01-PMC45xxx-06-xx-xx-xx-000

Welding neck for the flush-mounted installation of a Deltapilot S with a universal process adapter

Diameter D	Material	Order number
65 mm	AISI 316L (1.4435)	214880-0002
65 mm	AISI 316L (1.4435) with inspection certificate EN 10204 3.1 material	52010174
85 mm	AISI 316L (1.4435)	52006262
85 mm	AISI 316L (1.4435) with inspection certificate EN 10204 3.1 material	52010173

Welding neck for ISO G 1 1/2 thread



Welding neck for the flush-mounted installation of a Deltapilot S with thread ISO 228 G 1 1/2 A, AISI 316L (1.4435) Order number: 52024469, order number with 3.1 inspection certificate: 52024470

Note!
- Endress+Hauser offers a pressure sensor dummy for the welding necks with order numbers 52024469 and 52024470. Order number for pressure sensor dummy: 52024471

Adapter

You can use the following adapters to mount an FMB70 with a universal process connection in a DRD, sanitary or clamp connection:

Version	Order number
DRD DN50 (65 mm), AISI 304 (1.4301)	917656-0001
Sanitary connection DIN 11851 DN 40, AISI 304 (1.4301)	917656-0002
Sanitary connection DIN 11851 DN 50, AISI 304 (1.4301)	917656-0000
Tri-Clamp ISO 2852 DN 40-51 (2")/DIN 32676 DN 50, AISI 304 (1.4301)	917650-0002

HistoROM®/M-DAT

HistoROM®/M-DAT is a memory module which can be attached to every electronic insert. The HistoROM®/M-DAT can be retrofitted at any stage. → For further information see → 📄 40.
- Order number: 52027785

Wall and pipe-mounting

Endress+Hauser offers a mounting bracket for installing the device on pipes or walls. → 📄 45 ff, feature 110, "Additional option 2" or as separate accessory (part number.: 71102216).
For the dimensions, see → 📄 32.

Additional documentation

Field of Activities

- Pressure measurement, powerful instruments for process pressure, differential pressure, level and flow: FA004P/00/EN

Technical Information

- EMC test procedures: TI241F/00/EN
- Technical Information for Deltabar S: TI382P/00/EN
- Technical Information for Cerabar S: TI383P/00/EN

Operating Instructions

4 to 20 mA HART:
- Deltapilot S: BA332P/00/EN
- Description of device functions Cerabar S/Deltabar S/Deltapilot S: BA274P/00/EN

PROFIBUS PA:
- Deltapilot S: BA356P/00/EN
- Description of device functions Cerabar S/Deltabar S/Deltapilot S: BA296P/00/EN

FOUNDATION Fieldbus:
- Deltapilot S: BA372P/00/EN
- Description of device functions Cerabar S/Deltabar S/Deltapilot S: BA303P/00/EN

Brief Operating Instructions

- 4 to 20 mA HART, Deltapilot S: KA1020P/00/EN
- PROFIBUS PA, Deltapilot S: KA1023P/00/EN
- FOUNDATION Fieldbus, Deltapilot S: KA1026P/00/EN

Functional safety manual (SIL)

- Deltapilot S (4 to 20 mA): SD213P/00/EN

Safety Instructions

Certificate/type of protection	Electronics	Documentation	Version in the order code
ATEX II 1/2 G Ex ia IIC T6	– 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	– XA283P	1
ATEX II 1/2 D	– 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	– XA284P	2
ATEX II 1/3 D	– 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	– XA285P	4
ATEX II 1 GD Ex ia IIC T6	– 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	– XA287P	8
ATEX II 1/2 GD Ex ia IIC T6	– 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	– XA286P	3
ATEX II 3 G Ex nA II T6	– 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	– XA288P	7
ATEX II Ex ia + FM IS + CSA IS ATEX II 1/2G Ex ia IIC T6+ FM/CSA IS CL.I,II,III Div.1 Gr.A-G	– 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	– XA252P	E

Certificate/type of protection	Electronic insert	Documentation	Version in the order code
IECEx Zone 0/1 Ex ia IIC T6	– 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	– XB010P	I

Certificate/type of protection	Electronic insert	Documentation	Version in the order code
NEPSI Ex ia IIC T4/T6	– 4 to 20 mA HART, PROFIBUS PA, FOUNDATION Fieldbus	– XA435P	H

Installation/Control Drawings

Certificate/type of protection	Electronics	Documentation	Version in the order code
FM IS Class I, II, III, Division 1, Groups A – G; NI, Class I Division 2, Groups A – D; AEx ia	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– ZD214P – ZD216P	S
CSA IS Class I, II, III, Division 1, Groups A – G; Class I Division 2, Groups A – G	– 4 to 20 mA HART – PROFIBUS PA, FOUNDATION Fieldbus	– ZD215P – ZD217P	U

Overfill protection

- WHG: ZE266P/00/DE

Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

Tel. +41 61 715 81 00
Fax +41 61 715 25 00
www.endress.com
info@ii.endress.com

Endress+Hauser
People for Process Automation

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