

# Technical Information

## Deltapilot M FMB50, FMB51, FMB52, FMB53

Hydrostatic level measurement  
IO-Link, HART, PA, FF

Pressure transmitter with CONTITE™ measuring cell (condensate-resistant)



### Application

The device is used for the following measuring tasks:

- Hydrostatic pressure measurement in liquids and paste-like media in all areas of process engineering, process measuring technology, pharmaceuticals and the food industry
- Level, volume or mass measurement in liquids

### Your benefits

- Very good reproducibility and long-term stability
- Maximum plant safety provided by one-of-a-kind, condensate-resistant CONTITE measuring cell
- High reference accuracy:  $\pm 0.2\%$  optionally  $\pm 0.1\%$
- Turn down up to 100:1
- Uniform platform for differential pressure, hydrostatics and pressure (Deltabar M – Deltapilot M – Cerabar M)
- Practical user navigation for quick and easy commissioning
- Used for process pressure monitoring up to SIL 2, certified to IEC 61508 Edition 2.0 and IEC 61511 by TÜV NORD
- Usage in drinking water: KTW, NSF

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## About this document

|                          |                                                                                                                                                    |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Document function</b> | This document provides all technical data for the device and gives an overview of the accessories and additional items that can be ordered for it. |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Symbols</b>                                                                                   | <b>Safety symbols</b>                                                                                                                      |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Symbol                                                                                           | Meaning                                                                                                                                    |
|  <b>DANGER</b>  | <b>DANGER!</b><br>This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury. |
|  <b>WARNING</b> | <b>WARNING!</b><br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. |
|  <b>CAUTION</b> | <b>CAUTION!</b><br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.  |
|  <b>NOTICE</b>  | <b>NOTICE!</b><br>This symbol contains information on procedures and other facts which do not result in personal injury.                   |

### Electrical symbols

| Symbol                                                                              | Meaning                                                                                                                          | Symbol                                                                               | Meaning                                                                                                                         |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Protective ground connection</b><br>A terminal which must be connected to ground prior to establishing any other connections. |  | <b>Ground connection</b><br>A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |

### Symbols for certain types of information

| Symbol                                                                              | Meaning                                                                  |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
|  | <b>Permitted</b><br>Procedures, processes or actions that are permitted. |
|  | <b>Forbidden</b><br>Procedures, processes or actions that are forbidden. |
|  | <b>Tip</b><br>Indicates additional information.                          |
|  | Visual inspection                                                        |

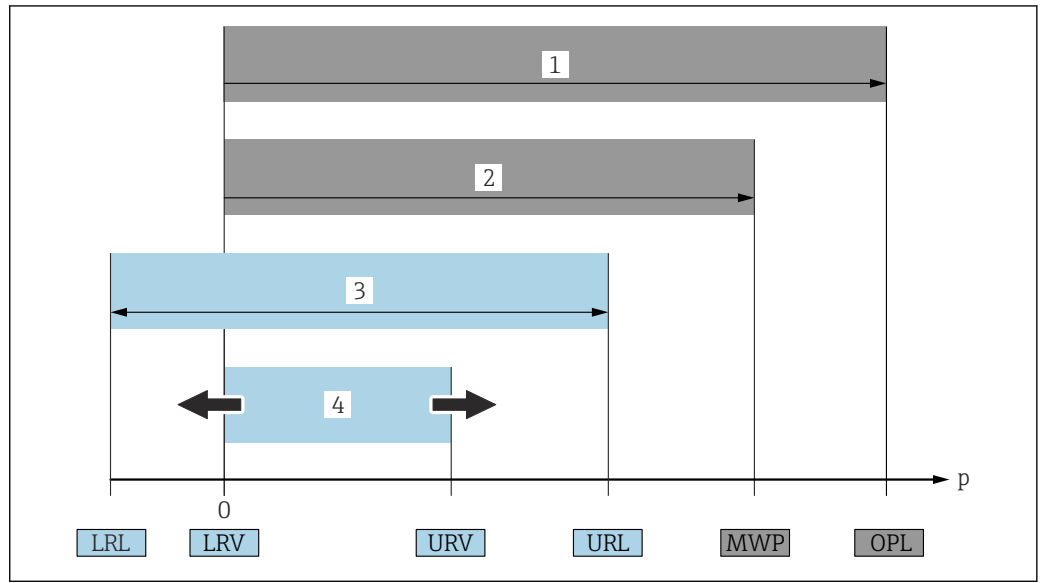
### Symbols in graphics

| Symbol             | Meaning         |
|--------------------|-----------------|
| 1, 2, 3 ...        | Item numbers    |
| 1., 2., 3. ...     | Series of steps |
| A, B, C, ...       | Views           |
| A-A, B-B, C-C, ... | Sections        |

|                      |                                                                                                                                 |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Documentation</b> | See chapter "Additional documentation" →  73 |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------|

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## List of abbreviations



A0029505

- 1 OPL: The OPL (over pressure limit = measuring cell overpressure limit) for the device depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection must be taken into consideration in addition to the measuring cell. Pay attention to the pressure/temperature dependency. OPL (Over Pressure Limit) is a test pressure.
- 2 MWP: The MWP (maximum working pressure) for the measuring cells depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection also has to be taken into consideration besides the measuring cell. Pay attention to the pressure/temperature dependency. The maximum working pressure may be applied to the device for an unlimited period of time. The maximum working pressure can be found on the nameplate.
- 3 The maximum measuring range corresponds to the span between the lower range limit and upper range limit. This measuring range is equivalent to the maximum measuring span that can be calibrated/adjusted.
- 4 The calibrated/adjusted measuring span corresponds to the span between the lower range limit and upper range limit. Factory setting: 0 to upper range limit. Other calibrated spans can be ordered as customized measuring spans.

p Pressure

LRL Lower range limit

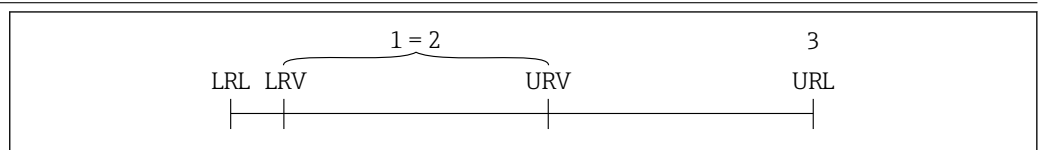
URL Upper range limit

LRV Lower range value

URV Upper range value

TD Turn down. Example - see the following section.

## Turn down calculation



A0029545

1 Calibrated/adjusted measuring span

2 Zero point-based span

3 Upper range limit

Example:

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

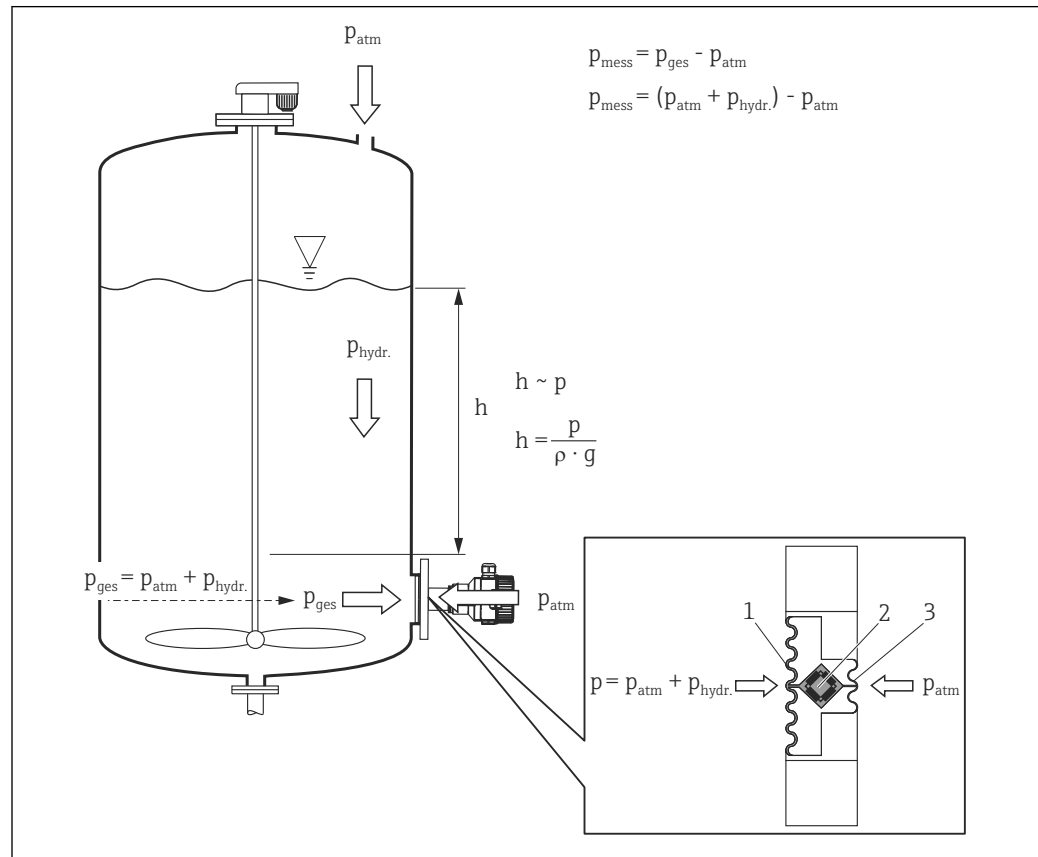
$$TD = \frac{URL}{|URV - LRV|}$$

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

## Function and system design

### Measuring principle

### Hydrostatic level measurement



- 1 Process membrane
- 2 Measuring element
- 3 Rear membrane of the CONTITE™ measuring cell
- $g$  Acceleration due to gravity
- $h$  Level height
- $p_{\text{tot}}$  Total pressure = hydrostatic pressure + atmospheric pressure
- $p_{\text{atm}}$  Atmospheric pressure
- $p_{\text{hydr.}}$  Hydrostatic pressure
- $p_{\text{meas}}$  Measured pressure in the measuring cell = hydrostatic pressure
- $\rho$  Density of the 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.

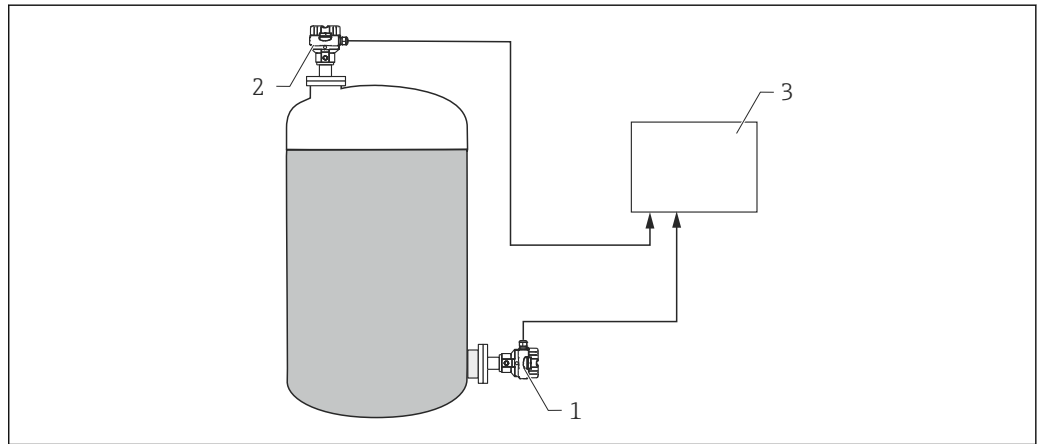
The CONTITE™ measuring cell, which works according to the principle of the gauge pressure measuring cell, constitutes the core of the Deltapilot M. In contrast to conventional gauge pressure measuring cells, the precision measuring element (2) in the CONTITE™ measuring cell is absolutely protected, situated between the process membrane (1) and the rear membrane (3). 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 membrane to the measuring element by means of an oil without any loss in pressure.

Any measurement errors due to fluctuations in temperature are compensated for in the electronics unit by means of the measuring cell temperature.

A linearization function with max. 32 points, which is based on a table entered manually or semi-automatically, can be activated on site or via remote operation. This function facilitates measurement in engineering units, and provides a linear output signal for spherical and horizontal cylindrical vessels, 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 M. The pressure measured 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.



A0023542

- 1 Deltapilot 1 measures the total pressure (hydrostatic pressure and top pressure)
- 2 Deltapilot 2 measures the top pressure
- 3 Signal processing unit determines the difference in pressure and uses this to calculate the level

#### NOTICE

##### Measured errors can occur.

Large measured errors can occur if the ratio of the level to the top pressure is  $>1:6$ . This does not affect reproducibility.

- When selecting the measuring cell, make sure you select measuring ranges that are sufficiently wide (see example).

Example:

- Max. hydrostatic pressure = 600 mbar (9 psi)
- Max. top pressure (Deltapilot 2): 300 mbar (4.5 psi)
- Max. total pressure, measured with Deltapilot 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 Deltapilot 2: 300 mbar (4.5 psi) → measuring cell to be selected: 0 to 400 mbar (0 to 6 psi)

#### NOTICE

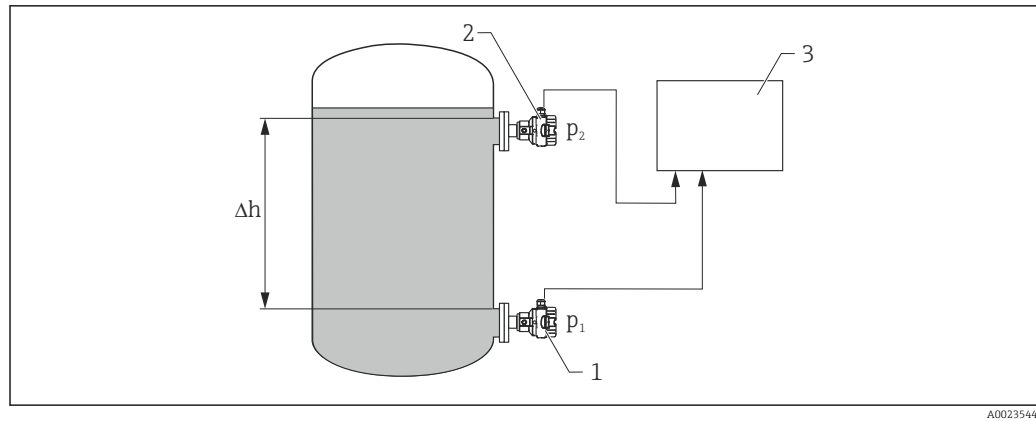
##### Possibility of probe 2 flooding during differential pressure measurement.

Measured errors can occur.

- When installing, make sure that probe 2 cannot be flooded.

### Density measurement

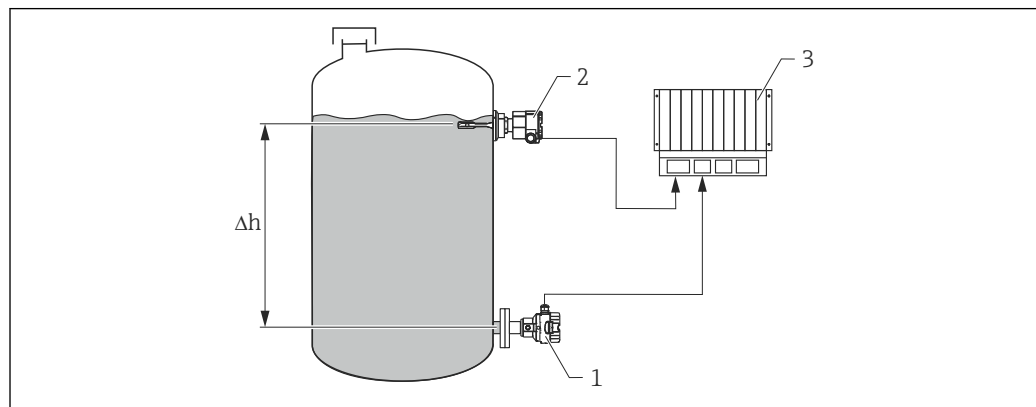
You can measure the density in tanks with pressure overlay using two Deltapilot M and a signal processing unit or a PLC. The signal processing unit or the PLC calculates the density from the known distance between the two Deltapilot M devices  $\Delta h$  and the two measured values  $p_1$  and  $p_2$ .



- 1 Deltapilot 1 determines pressure measured value  $p_1$
- 2 Deltapilot 2 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  $\Delta h$

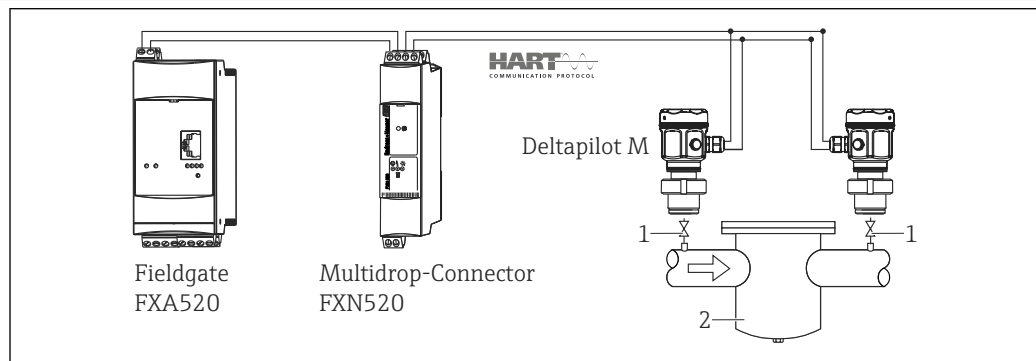
### Level measurement with automatic density correction (with media changing in the tank)

Level measurement with automatic density correction is possible in conjunction with a limit switch such as Liquiphant and a PLC. The limit switch always switches at the same level. In the switch point, the signal processing unit determines the corrected density from the pressure of the Deltapilot M currently measured and the known distance between Deltapilot M and the limit switch. The signal processing unit then calculates the level from the new density and the measured pressure of the Deltapilot M.



- 1 Deltapilot M
- 2 Liquiphant
- 3 PLC

### Electrical differential pressure measurement with gauge pressure measuring cells



- 1 Shutoff valves
- 2 e.g. filter

In the example given, two Deltapilot M devices (each with a gauge pressure measuring cell) are interconnected. The differential pressure can thus be measured using two independent Deltapilot M devices.



 **WARNING**

**Explosion Hazard!**

- If using intrinsically safe devices, strict compliance with the rules for interconnecting intrinsically safe circuits as stipulated in IEC60079-14 (proof of intrinsic safety) is mandatory.

---

**Communication protocol**

- 4 to 20 mA with HART communication protocol
- 4 to 20 mA with IO-Link communication protocol (only for FMB50)
- PROFIBUS PA
  - The Endress+Hauser devices meet the requirements of the FISCO model.
  - Due to a 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 devices for Ex ia, CSA IS and FM IS applications or up to 31 devices 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 a 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 devices for Ex ia, CSA IS and FM IS applications or up to 22 devices 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 | Measured process variables |
|-------------------|----------------------------|
|                   | Hydrostatic pressure       |

### Measuring range

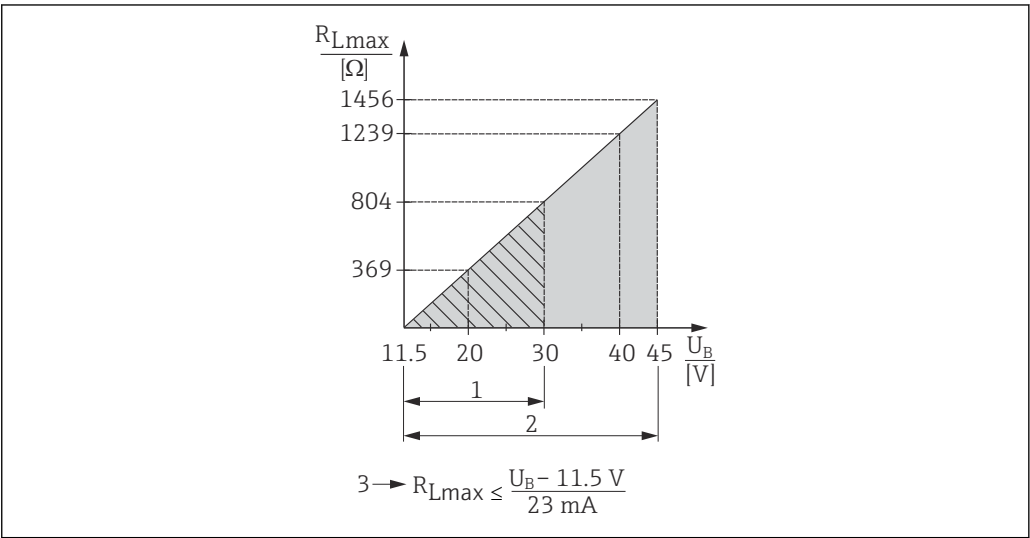
| Measuring cell | Maximum measuring range   |             | Smallest calibratable span (preset at factory) <sup>1)</sup> | MWP         | OPL         | Vacuum resistance <sup>2)</sup>            | Option <sup>3)</sup> |
|----------------|---------------------------|-------------|--------------------------------------------------------------|-------------|-------------|--------------------------------------------|----------------------|
|                | lower (LRL) <sup>4)</sup> | Upper (URL) |                                                              |             |             | Synthetic oil/<br>Inert oil                |                      |
| [bar (psi)]    | [bar (psi)]               | [bar (psi)] | [bar (psi)]                                                  | [bar (psi)] | [bar (psi)] | [bar <sub>abs</sub> (psi <sub>abs</sub> )] |                      |
| 0.1 (1.5)      | -0.1 (-1.5)               | +0.1 (+1.5) | 0.01 (0.15)                                                  | 2.7 (40.5)  | 4 (60)      | 0.01/0.04 (0.145/0.6)                      | 1C                   |
| 0.4 (6)        | -0.4 (-6)                 | +0.4 (+6)   | 0.02 (0.3)                                                   | 5.3 (79.5)  | 8 (120)     |                                            | 1F                   |
| 1.2 (18)       | -1 (-15)                  | +1.2 (+18)  | 0.06 (1)                                                     | 16 (240)    | 24 (360)    |                                            | 1H                   |
| 4 (60)         | -1 (-15)                  | +4 (+60)    | 0.2 (3)                                                      | 16 (240)    | 24 (360)    |                                            | 1M                   |
| 10 (150)       | -1 (-15)                  | +10 (+150)  | 0.5 (7.5)                                                    | 27 (405)    | 40 (600)    |                                            | 1P                   |

- 1) Largest factory-configurable turn down: 20:1, higher available on request.
- 2) The vacuum resistance applies to the measuring cell at reference operating conditions.
- 3) Product Configurator, order code for "Sensor range"
- 4) By default, the device is set to a lower range limit of 0 bar. Please specify in the order if the lower range limit is to be set to a different default value.

## Output

| Output signal                       | <ul style="list-style-type: none"><li>4 to 20 mA with superimposed digital communication protocol HART 6.0, 2-wire</li><li>Digital communication IO-Link, 3-wire (only for FMB50)</li><li>Digital communication signal PROFIBUS PA (Profile 3.02)</li><li>Digital communication signal FOUNDATION Fieldbus</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |                      |                |   |                                     |   |             |   |                     |   |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------------------|----------------|---|-------------------------------------|---|-------------|---|---------------------|---|
|                                     | <table><tr><th>Output</th><th>Option <sup>1)</sup></th></tr><tr><td>4 to 20mA HART</td><td>2</td></tr><tr><td>4 to 20mA, IO-Link (only for FMB50)</td><td>7</td></tr><tr><td>PROFIBUS PA</td><td>3</td></tr><tr><td>FOUNDATION Fieldbus</td><td>4</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Output | Option <sup>1)</sup> | 4 to 20mA HART | 2 | 4 to 20mA, IO-Link (only for FMB50) | 7 | PROFIBUS PA | 3 | FOUNDATION Fieldbus | 4 |
| Output                              | Option <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |                      |                |   |                                     |   |             |   |                     |   |
| 4 to 20mA HART                      | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |                      |                |   |                                     |   |             |   |                     |   |
| 4 to 20mA, IO-Link (only for FMB50) | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |                      |                |   |                                     |   |             |   |                     |   |
| PROFIBUS PA                         | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |                      |                |   |                                     |   |             |   |                     |   |
| FOUNDATION Fieldbus                 | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |                      |                |   |                                     |   |             |   |                     |   |
|                                     | 1) Product Configurator, order code for "Output"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |                      |                |   |                                     |   |             |   |                     |   |
| Signal range 4 to 20 mA             | 4 to 20 mA HART and IO-Link: 3.8 to 20.5 mA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |                      |                |   |                                     |   |             |   |                     |   |
| Signal on alarm                     | <p>As per NAMUR NE 43</p> <ul style="list-style-type: none"><li>4 to 20 mA HART:<br/>Options:<ul style="list-style-type: none"><li>Max. alarm: can be set from 21 to 23 mA (factory setting: 22 mA)</li><li>Hold measured value: last measured value is held</li><li>Min. alarm: 3.6 mA</li></ul></li><li>IO-Link:<ul style="list-style-type: none"><li>Max. alarm: permanently set to 22 mA</li><li>Min. alarm: 3.6 mA</li><li>Hold measured value: last measured value is held</li></ul></li><li>PROFIBUS PA: can be set in the Analog Input block<br/>Options: Last Valid Out Value (factory setting), Fail-safe Value, Status Bad</li><li>FOUNDATION Fieldbus: can be set in the Analog Input block<br/>Options: Last Good Value, Fail-safe Value (factory setting), Wrong Value</li></ul> |        |                      |                |   |                                     |   |             |   |                     |   |

### Load - 4 to 20 mA HART

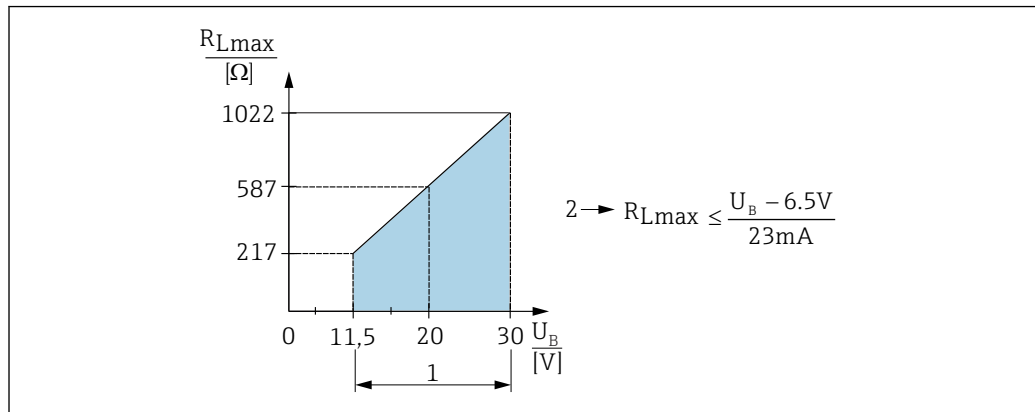


- 1 Supply voltage 11.5 to 30 V DC for intrinsically safe device versions (not for analog)
- 2 Supply voltage 11.5 to 45 V DC (versions with plug-in connector 35 V DC) for other types of protection and for uncertified device versions
- 3  $R_{Lmax}$  maximum load resistance
- $U_B$  Supply voltage

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

**Load for current output in the case of an IO-Link device**

In order to guarantee sufficient terminal voltage, a maximum load resistance  $R_L$  (including line resistance) must not be exceeded depending on the supply voltage  $U_B$  of the supply unit.



A0045615

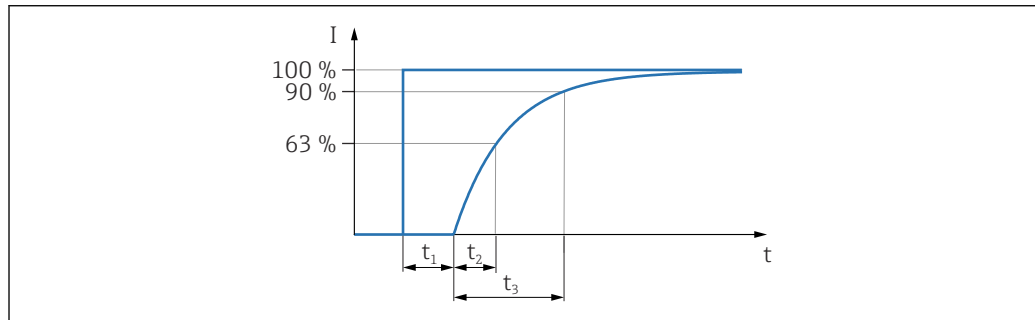
- 1 Power supply 11.5 to 30 V<sub>DC</sub>  
 2  $R_{Lmax}$  maximum load resistance  
 $U_B$  Supply voltage

If the load is too high, the device performs the following points:

- Output of failure current and display of "M803" (Output: MIN alarm current)
- Periodic checking to establish if it is possible to quit fault state

**Dead time, time constant**

Presentation of the dead time and the time constant:



A0019786

**Dynamic behavior, current output (HART electronics)**

|      | Device                  | Dead time ( $t_1$ ) [ms] | Time constant T63 (= $t_2$ ) [ms] | Time constant T90 (= $t_3$ ) [ms] |
|------|-------------------------|--------------------------|-----------------------------------|-----------------------------------|
| Max. | FMB50                   | 60                       | 90                                | 210                               |
| Max. | FMB51<br>FMB52<br>FMB53 | 500                      | 250                               | -                                 |

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

|      | Device                  | 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. | FMB50                   | 220                      | 310                                                          | 370                                                          |
| Max. |                         | 1020                     | 1110                                                         | 1170                                                         |
| Min. | FMB51<br>FMB52<br>FMB53 | 660                      | 910                                                          | -                                                            |
| Max. |                         | 1460                     | 1710                                                         | -                                                            |

**Reading cycle**

- Acyclic: max. 3/s, typically 1/s (depending on command # and number of preambles)
- Cyclic (burst): max. 3/s, typically 2/s

The device offers the BURST MODE function for cyclic value transmission via the HART communication protocol.

#### Cycle time (update time)

Cyclic (burst): min. 300 ms

#### Response time



When recording step responses, it is important to bear in mind that the response times of the measuring cell might be added to the specified times.

- Acyclic: min. 330 ms, typically 590 ms (depending on command # and number of preambles)
- Cyclic (burst): min. 160 ms, typically 350 ms (depending on command # and number of preambles)

#### Dynamic behavior, PROFIBUS PA

|      | Device         | Dead time ( $t_1$ ) [ms] | Dead time ( $t_1$ ) [ms] +<br>Time constant T63 (= $t_2$ ) [ms] | Dead time ( $t_1$ ) [ms] +<br>Time constant T90 (= $t_3$ ) [ms] |
|------|----------------|--------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|
| Min. | FMB50          | 95                       | 185                                                             | 245                                                             |
| Max. |                | 1195                     | 1285                                                            | 1345                                                            |
| Min. | FMB51          | 535                      | 785                                                             | -                                                               |
| Max. | FMB52<br>FMB53 | 1635                     | 1885                                                            | -                                                               |

#### Reading cycle (SPS)

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

#### 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

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

#### Dynamic behavior, FOUNDATION Fieldbus

|      | Device         | Dead time ( $t_1$ ) [ms] | Dead time ( $t_1$ ) [ms] +<br>Time constant T63 (= $t_2$ ) [ms] | Dead time ( $t_1$ ) [ms] +<br>Time constant T90 (= $t_3$ ) [ms] |
|------|----------------|--------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|
| Min. | FMB50          | 105                      | 195                                                             | 255                                                             |
| Max. |                | 1105                     | 1195                                                            | 1255                                                            |
| Min. | FMB51          | 545                      | 795                                                             | -                                                               |
| Max. | FMB52<br>FMB53 | 1545                     | 1795                                                            | -                                                               |

#### Reading cycle

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

#### Cycle time (update time)

Cyclic: min. 100 ms

#### Response time

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

| IO-Link |      | Dead time (t <sub>1</sub> ) [ms] | Time constant (T63), t <sub>2</sub> [ms] | Time constant (T90), t <sub>3</sub> [ms] |
|---------|------|----------------------------------|------------------------------------------|------------------------------------------|
|         | Min. | 60 ms + cycle time               | 90 ms + cycle time                       | 210 ms + cycle time                      |

**Reading cycle**

- Acyclic: cyclic/n where n is dependent on the size of the acyclic data
- Cyclic: min. 100/s

**Cycle time (update time)**

Cyclic: min. 10 ms

**Response time**

Cyclic: &lt;10 ms at 38.4 kbps



When recording step responses, it is important to bear in mind that the response times of the measuring cell might be added to the specified times.

**Damping**

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

- Via local display (not analog), handheld terminal or PC with operating program continuously from 0 to 999 s
- Via the DIP switch on the electronic insert (not IO-Link), "on" (= set value) and "off" (= damping switched off)
- Factory setting: 2 s

**Firmware version**

| Designation                     | Option <sup>1)</sup> |
|---------------------------------|----------------------|
| 01.00.zz, FF, DevRev01          | 76                   |
| 01.00.zz, PROFIBUS PA, DevRev01 | 77                   |
| 01.00.zz, HART, DevRev01        | 78                   |

1) Product Configurator, "Firmware version" ordering feature

**Galvanic isolation**

The following devices have a galvanic isolation between electronic and probe:

- FMB51, FMB52, FMB53
- FMB50 with separate housing

**HART protocol-specific data**

|                                    |                                                                                                                                                                                                                                                             |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manufacturer ID                    | 17 (11 hex)                                                                                                                                                                                                                                                 |
| Device type ID                     | 35 (23 hex)                                                                                                                                                                                                                                                 |
| Device revision                    | 01 (01 hex) - SW version 01.00.zz                                                                                                                                                                                                                           |
| HART specification                 | 6                                                                                                                                                                                                                                                           |
| DD revision                        | <ul style="list-style-type: none"> <li>■ 01 (Dutch))</li> <li>■ 02 (Russian))</li> </ul>                                                                                                                                                                    |
| Device description files (DTM, DD) | Information and files under: <ul style="list-style-type: none"> <li>■ <a href="http://www.endress.com">www.endress.com</a></li> <li>■ <a href="http://www.fieldcommgroup.org/registered-products">www.fieldcommgroup.org/registered-products</a></li> </ul> |
| HART load                          | Min. 250 Ω                                                                                                                                                                                                                                                  |

|                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HART device variables | <p>The following measured values are assigned to the device variables:</p> <p><b>Measured values for PV (primary variable)</b></p> <ul style="list-style-type: none"> <li>■ Pressure</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> </ul> <p><b>Measured values for QV (fourth device variable)</b></p> <p>Temperature</p> |
| Supported functions   | <ul style="list-style-type: none"> <li>■ Burst mode</li> <li>■ Additional transmitter status</li> <li>■ Device locking</li> <li>■ Alternative modes of operation</li> </ul>                                                                                                                                                                                                                                                                                                  |

**Wireless HART data**

|                           |                                             |
|---------------------------|---------------------------------------------|
| Minimum starting voltage  | 11.5 V <sup>1)</sup>                        |
| Start-up current          | 12 mA (default) or 22 mA (customer setting) |
| Starting time             | 5 s or 7 s for rod/cable version            |
| Minimum operating voltage | 11.5 V <sup>1)</sup>                        |
| Multidrop current         | 4 mA                                        |
| Time for connection setup | 1 s                                         |

1) Or higher if operating near ambient temperature limits (−40 to +85 °C (−40 to +185))

**IO-Link protocol-specific data (only for FMB50)**

IO-Link is a point-to-point connection for communication between the device and an IO-Link master. The IO-Link communication interface enables direct access to the process and diagnostic data. It also provides the option of configuring the device while in operation.

*The device supports the following features:*

|                                          |                                                                                                                                                                  |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IO-Link specification                    | Version 1.1                                                                                                                                                      |
| IO-Link Smart Sensor Profile 2nd Edition | <p>Supported:</p> <ul style="list-style-type: none"> <li>■ Identification</li> <li>■ Diagnosis</li> <li>■ Digital Measuring Sensor (as per SSP 4.3.3)</li> </ul> |
| IO-Link transfer rate                    | COM2; 38.4 kBaud                                                                                                                                                 |
| Minimum cycle time                       | 10 ms                                                                                                                                                            |
| Process data width                       | <p>14 bytes process data</p> <p>2 bytes diagnostic data</p>                                                                                                      |
| IO-Link data storage                     | Yes                                                                                                                                                              |
| Block configuration according to V1.1    | Yes                                                                                                                                                              |
| Device operational                       | 5 s after the supply voltage is applied, the device is operational (first valid measured value after 2 s)                                                        |

**Device description**

In order to integrate field devices into a digital communication system, the IO-Link system requires a description of the device parameters such as output data, input data, data format, quantity of data and supported IO-Link transfer rate.

These data are contained in the device description (IODD <sup>1)</sup>) which is made available to the IO-Link master via generic modules during commissioning of the communication system.



The IODD can be downloaded as follows:

- Endress+Hauser: [www.endress.com](http://www.endress.com)
- IODDfinder: <https://ioddfinder.io-link.com/#/>

#### Protocol-specific data PROFIBUS PA

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manufacturer ID     | 17 (11 hex)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Ident number        | 1554 hex                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Profile Version     | 3.02<br>SW Version 01.00.zz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| GSD Revision        | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DD Revision         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| GSD File            | Information and files can be found:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| DD Files            | <ul style="list-style-type: none"> <li>▪ <a href="http://www.endress.com">www.endress.com</a></li> <li>▪ <a href="http://www.profibus.org">www.profibus.org</a></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Output values       | <b>Measured values for PV (via Analog Input Function Block)</b> <ul style="list-style-type: none"> <li>▪ Pressure</li> <li>▪ Level</li> <li>▪ Tank content</li> </ul> <b>Measured values for SV</b> <ul style="list-style-type: none"> <li>▪ Pressure</li> <li>▪ Temperature</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<br/>Simple device identification via control system and nameplate</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>▪ 1503: 1503: Compatibility mode for the old Deltapilot M (DB50, DB50L, DB51, DB52, DB53).</li> <li>▪ 1555: Identification number for the new Deltapilot M (FMB50, FMB51, FMB52, FMB53).</li> </ul> </li> <li>▪ Device locking: The device can be locked by hardware or software.</li> </ul> |

#### FOUNDATION Fieldbus protocol-specific data

|                                           |                                                                                                                                                                                                                                                             |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device type                               | 0x1023                                                                                                                                                                                                                                                      |
| Device revision                           | 01 (hex)                                                                                                                                                                                                                                                    |
| DD revision                               | 0x01021                                                                                                                                                                                                                                                     |
| Device description files (DTM, DD)        | Information and files under: <ul style="list-style-type: none"> <li>▪ <a href="http://www.endress.com">www.endress.com</a></li> <li>▪ <a href="http://www.fieldcommgroup.org/registered-products">www.fieldcommgroup.org/registered-products</a></li> </ul> |
| CFF revision                              | 0x000102                                                                                                                                                                                                                                                    |
| ITK version                               | 5.2.0                                                                                                                                                                                                                                                       |
| ITK certification driver no.              | IT067500                                                                                                                                                                                                                                                    |
| Link Master functionality supported (LAS) | 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                                                                                                                                                                                                                                                          |

1) IO Device Description



**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> |
| Diagnostic Block | Contains diagnostic information                     | Error code via DI channels (channel 10 to 15)                                                                                                                                                                                                                      |
| 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<br>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 Diagnostic 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 TRD1 Block. Channel 20 resets the counter for max. pressure transgressions value.                                                                              | 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      |

| Block                      | Content                                                                                                                                                                                                                                                                                                                                                                                                   | Number of blocks | Execution time | Functionality |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------|---------------|
| 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 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                | 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 value 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 blocks                      | Yes |
| Number of additional instantiate function blocks | 20  |

## Power supply

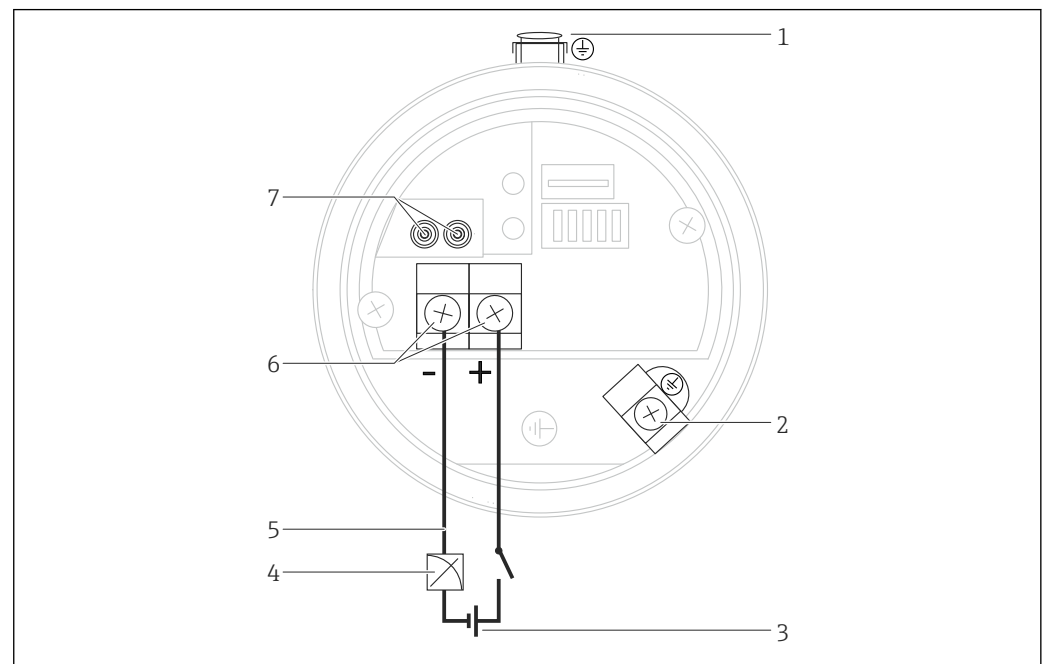
### **⚠ WARNING**

#### **Limitation of electrical safety due to incorrect connection!**

- ▶ 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 Ex documentation, which is available upon request. The Ex documentation is supplied as standard with all Ex devices .
- ▶ In accordance with IEC/EN61010 a suitable circuit breaker must be provided 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" section).
- ▶ Protective circuits against reverse polarity, HF influences and overvoltage peaks are integrated.

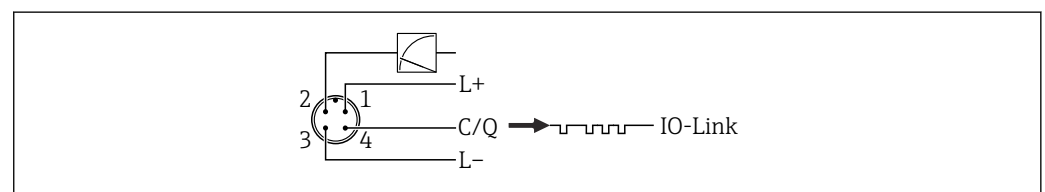
### Terminal assignment

#### HART, PROFIBUS PA, FOUNDATION Fieldbus



- 1 External ground terminal (only for devices with certain approvals or if "Measuring point" (TAG) is ordered)
- 2 Internal ground terminal
- 3 Supply voltage → 20
- 4 4 to 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 4 to 20 mA test signal" → 20

#### IO-Link



- 1 Supply voltage +
- 2 4-20 mA
- 3 Supply voltage -
- 4 C/Q (IO-Link communication)

**Supply voltage****4 to 20 mA HART**

| Explosion protection                                                                                               | Supply voltage                                                |
|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Intrinsically safe                                                                                                 | 11.5 to 30 V DC                                               |
| <ul style="list-style-type: none"> <li>Other types of protection</li> <li>Devices without a certificate</li> </ul> | 11.5 to 45 V DC<br>(versions with 35 V DC plug-in connection) |

*Measuring 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.

**IO-Link**

- 11.5 to 30 V DC if only the analog output is used
- 18 to 30 V DC if IO-Link is used

**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**

- IO-Link < 60 mA
- 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 gland                       | IP66/68 NEMA 4X/6P                                  | A                    |
| G ½" thread                     | IP66/68 NEMA 4X/6P                                  | C                    |
| NPT ½" thread                   | IP66/68 NEMA 4X/6P                                  | D                    |
| M12 plug                        | IP66/67 NEMA 4X/6P                                  | I                    |
| 7/8" plug                       | IP66/68 NEMA 4X/6P                                  | M                    |
| HAN7D plug 90 deg.              | IP65                                                | P                    |
| PE cable 5m<br>(Only for FMB50) | IP66/68 NEMA4X/6P + pressure compensation via cable | S                    |
| 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 twin-core connecting cable. The bus line 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 twin-core connecting cable. The bus line 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**

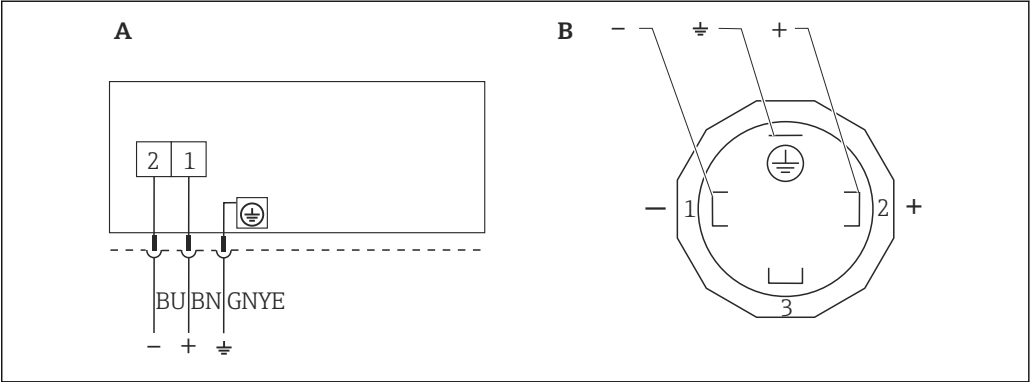
- Supply voltage and internal ground terminal: 0.5 to 2.5 mm<sup>2</sup> (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm<sup>2</sup> (20 to 12 AWG)

| Cable entry | Approval                                                          | Type                 | Clamping area                  |
|-------------|-------------------------------------------------------------------|----------------------|--------------------------------|
|             | Standard, CSA GP<br>FM/ CSA IS                                    | Plastic M20x1.5      | 5 to 10 mm (0.2 to 0.39 in)    |
|             | ATEX II1/2D Ex t, II1/2GD Ex ia,<br>II3G Ex nA,<br>IEC Ex t Da/Db | Metal M20x1.5 (Ex e) | 7 to 10.5 mm (0.28 to 0.41 in) |

For other technical data, see the housing section → 35

Connector

Devices with valve connector (HART)



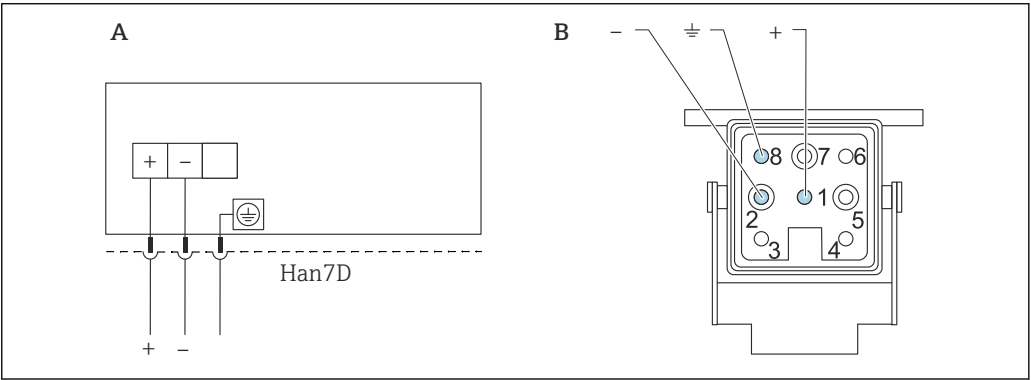
1 BN = brown, BU = blue, GNYE = green

A Electrical connection for devices with valve connector

B View of the plug connector at the device

Material: PA 6.6

Connecting devices with Harting plug Han7D (HART)



A Electrical connection for devices with Harting plug Han7D

B View of the connection on the device

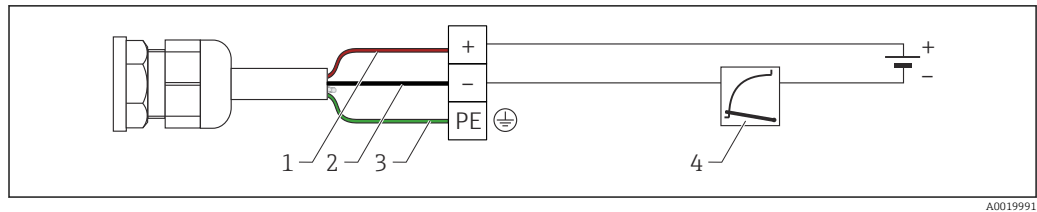
- Brown

Green/yellow

Blue

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

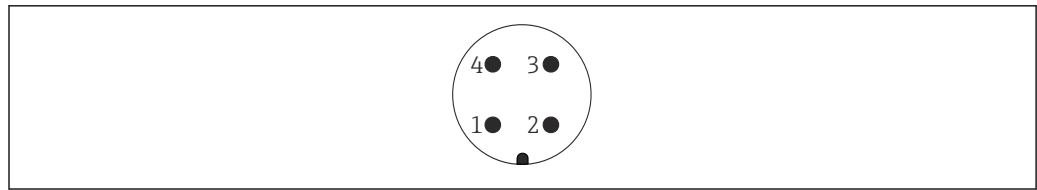
### Connecting the cable version (FMB50 only)



A0019991

- 1 RD = red
- 2 BK = black
- 3 GNYE = green
- 4 4 to 20 mA

### Connecting devices with M12 plug (HART, PROFIBUS PA)



A0011175

- 1 Signal +
- 2 Not assigned
- 3 Signal -
- 4 Earth

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): IP66/67
- Order number: 52006263

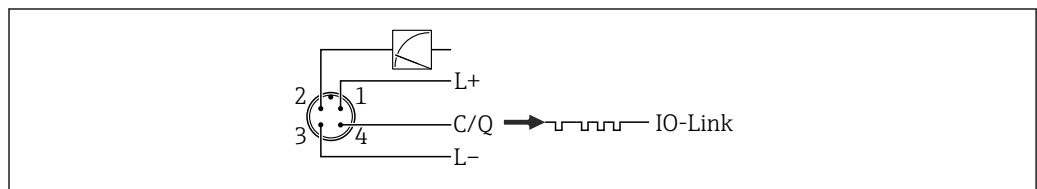
Plug-in jack M 12x1, elbowed

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

Cable 4 x 0.34 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

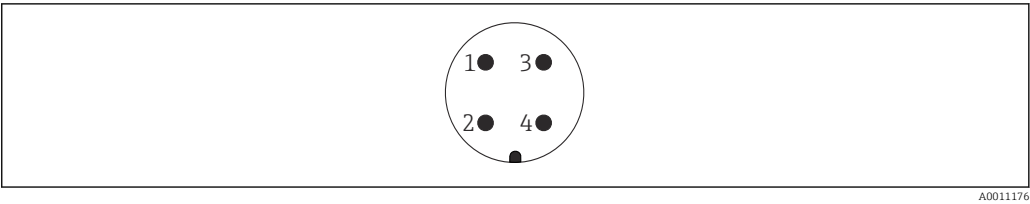
### Connecting devices with M12 plug (IO-Link)



A0045628

- 1 Supply voltage +
- 2 4-20 mA
- 3 Supply voltage -
- 4 C/Q (IO-Link communication)

Connecting devices with 7/8" plug (HART, FOUNDATION Fieldbus)

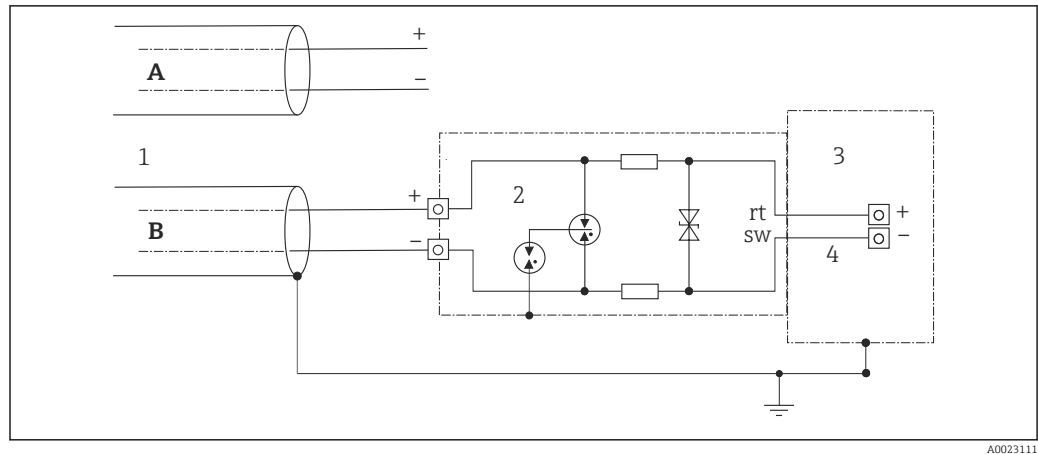


- 1    *Signal -*
- 2    *Signal +*
- 3    *Shield*
- 4    *Not assigned*

External thread: 7/8 - 16 UNC  
■ Material: 316L (1.4401)  
■ Degree of protection: IP66/68

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cable specification               | <p><b>HART</b></p> <ul style="list-style-type: none"><li>■ Endress+Hauser recommends using twisted, shielded twin-core cables.</li><li>■ The cable outer diameter depends on the cable entry used.</li></ul> <p><b>IO-Link</b></p> <p>Endress+Hauser recommends using twisted, four-core cable.</p> <p><b>PROFIBUS PA</b></p> <p>Endress+Hauser recommends using twisted, shielded twin-core cable, preferably cable type A.</p> <p> For further information regarding 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).</p> <p><b>FOUNDATION Fieldbus</b></p> <p>Use a twisted, shielded twin-core cable, preferably cable type A.</p> <p> For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).</p> |
| Start-up current                  | <ul style="list-style-type: none"><li>■ 12 mA or 22 mA (selectable)</li><li>■ IO-Link: 12 mA</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Residual ripple                   | No 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Overvoltage protection (optional) | <p>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.</p> <p>For details refer to TI01013KDE, XA01003KA3 and BA00304KA2.</p> <p>Ordering information:</p> <p>Product Configurator, order code for "Mounted accessories", option NA</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Wiring



A0023111

- 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



## Performance characteristics of metallic process membrane

### Reference operating conditions

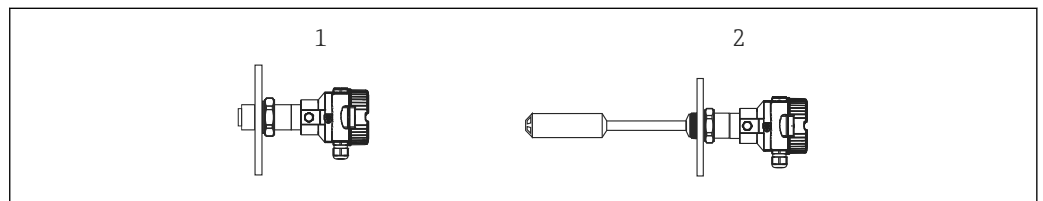
- As per IEC 62828-2
- Ambient temperature  $T_A$  = constant, in the range: +21 to +33 °C (+70 to +91 °F)
- Humidity  $\phi$  = constant, in the range: 5 to 80 % rH
- Atmospheric pressure  $p_A$  = constant, in the range: 860 to 1060 mbar (12.47 to 15.37 psi)
- Position of the measuring cell = constant, in the range:  
FMB50: horizontally  $\pm 1^\circ$   
FMB51/FMB52/FMB53: vertically  $\pm 1^\circ$
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- Zero-point based span
- Material of the process membrane: Alloy C276 (2.4819) and Alloy C276 (2.4819) with coating (AuRh or AuPt)
- Measuring cell material (meter body): Alloy C276 (2.4819), 316L (1.4435)
- Fill fluid: synthetic oil (FDA)/inert oil
- Supply voltage: 24 V DC  $\pm 3$  V DC
- Load for HART: 250  $\Omega$

### Influence of the orientation

- <2.3 mbar (0.0345 psi) if synthetic oil is used (FDA).
- <5 mbar (0.075 psi) if inert oil is used.

 A position-dependent zero shift can be corrected →  28.

### Calibration position



A0023545

- 1 FMB50  
2 FMB51, FMB52, FMB53

To minimize the effect of the orientation (e.g. in the case of vertical device installation), position offset is preset at the factory.

### Resolution

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

### Reference accuracy

The reference accuracy comprises the non-linearity according to the limit point method, pressure hysteresis and non-repeatability in accordance with [IEC62828-1/IEC 61298-2].

| Measuring cell     | Reference accuracy in % of the calibrated span                                                             |                                                                                                                            |                                                                                                                               |
|--------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
|                    | TD                                                                                                         | "Standard" option <sup>1)</sup>                                                                                            | "Platinum" option <sup>1)</sup>                                                                                               |
| 100 mbar (1.5 psi) | <ul style="list-style-type: none"> <li>■ TD 1:1 to TD 2:1</li> <li>■ TD &gt; 2:1 to TD 4:1</li> </ul>      | <ul style="list-style-type: none"> <li>■ <math>\pm 0.2</math></li> <li>■ <math>\pm 0.1 \times \text{TD}</math></li> </ul>  | <ul style="list-style-type: none"> <li>■ <math>\pm 0.15</math></li> <li>■ <math>\pm 0.075 \times \text{TD}</math></li> </ul>  |
| 400 mbar (6 psi)   | <ul style="list-style-type: none"> <li>■ TD 1:1 to TD 4:1</li> <li>■ TD &gt; 4:1 to TD 10:1</li> </ul>     | <ul style="list-style-type: none"> <li>■ <math>\pm 0.2</math></li> <li>■ <math>\pm 0.05 \times \text{TD}</math></li> </ul> | <ul style="list-style-type: none"> <li>■ <math>\pm 0.15</math></li> <li>■ <math>\pm 0.0375 \times \text{TD}</math></li> </ul> |
| 1.2 bar (18 psi)   | <ul style="list-style-type: none"> <li>■ TD 1:1 to TD 2:1</li> <li>■ TD &gt; 2:1 to TD 12:1</li> </ul>     | <ul style="list-style-type: none"> <li>■ <math>\pm 0.2</math></li> <li>■ <math>\pm 0.1 \times \text{TD}</math></li> </ul>  | <ul style="list-style-type: none"> <li>■ <math>\pm 0.1</math></li> <li>■ <math>\pm 0.05 \times \text{TD}</math></li> </ul>    |
| 4 bar (60 psi)     | <ul style="list-style-type: none"> <li>■ TD 1:1 to TD 4:1</li> <li>■ TD &gt; 4:1 to TD 20:1</li> </ul>     | <ul style="list-style-type: none"> <li>■ <math>\pm 0.2</math></li> <li>■ <math>\pm 0.05 \times \text{TD}</math></li> </ul> | <ul style="list-style-type: none"> <li>■ <math>\pm 0.1</math></li> <li>■ <math>\pm 0.025 \times \text{TD}</math></li> </ul>   |
| 10 bar (150 psi)   | <ul style="list-style-type: none"> <li>■ TD 1:1 to TD 2.5:1</li> <li>■ TD &gt; 2.5:1 to TD 20:1</li> </ul> | <ul style="list-style-type: none"> <li>■ <math>\pm 0.2</math></li> <li>■ <math>\pm 0.08 \times \text{TD}</math></li> </ul> | <ul style="list-style-type: none"> <li>■ <math>\pm 0.1</math></li> <li>■ <math>\pm 0.04 \times \text{TD}</math></li> </ul>    |

1) Product Configurator, order code for "Reference accuracy"

**Thermal change in the zero output and the output span**

| Version                         | Measuring cell                                                 | -10 to +60 °C<br>(+14 to +140 °F)  | +60 to +85 °C<br>(+140 to +185 °F) | Only FMB50:<br>+85 to +100 °C<br>(+185 to +212 °F) |
|---------------------------------|----------------------------------------------------------------|------------------------------------|------------------------------------|----------------------------------------------------|
|                                 |                                                                | % of the calibrated measuring span |                                    |                                                    |
| FMB50<br>FMB51/52/53<br>snap-on | 100 mbar<br>(1.5 psi)                                          | < (0.32 + 0.30 x TD)               | < (0.34 + 0.40 x TD)               | < (0.34 + 0.55 x TD)                               |
| FMB51/52/53<br>welded           | 100 mbar<br>(1.5 psi)                                          | < (0.32 + 0.50 x TD)               | < (0.34 + 0.60 x TD)               | -                                                  |
| FMB50/51/52/53                  | 400 mbar<br>(6 psi)                                            | < (0.31 + 0.25 x TD)               | < (0.32 + 0.30 x TD)               | -                                                  |
|                                 | 1.2 bar<br>(18 psi),<br>4 bar (60 psi),<br>10 bar<br>(150 psi) | < (0.31 + 0.10 x TD)               | < (0.32 + 0.15 x TD)               | < (0.33 + 0.20 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.

| Total performance in % of the URL |                                                          |                                   |                                    |                                                    |
|-----------------------------------|----------------------------------------------------------|-----------------------------------|------------------------------------|----------------------------------------------------|
| Version                           | Measuring cell                                           | -10 to +60 °C<br>(+14 to +140 °F) | +60 to +85 °C<br>(+140 to +185 °F) | Only FMB50:<br>+85 to +100 °C<br>(+185 to +212 °F) |
| FMB50<br>FMB51/52/53<br>snap-on   | 100 mbar<br>(1.5 psi)                                    | <0.35                             | <0.45                              | <0.6                                               |
| FMB51/52/53<br>welded             | 100 mbar<br>(1.5 psi)                                    | <0.8                              | <1                                 | -                                                  |
| FMB50/51/52/53                    | 400 mbar<br>(6 psi)                                      | <0.35                             | <0.45                              | <0.6                                               |
|                                   | 1.2 bar (18 psi),<br>4 bar (60 psi),<br>10 bar (150 psi) | <0.15                             | <0.2                               | <0.25                                              |

**Long-term stability**

| Measuring cell                        | Long-term stability [%]                                                                                                                                      |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 100 mbar (1.5 psi)                    | <ul style="list-style-type: none"> <li>&lt;0.18 of the upper range limit (URL) / year</li> <li>&lt;0.45 of the upper range limit (URL) / 5 years</li> </ul>  |
| 400 mbar (6 psi),<br>1.2 bar (18 psi) | <ul style="list-style-type: none"> <li>&lt;0.1 of the upper range limit (URL) / year</li> <li>&lt;0.25 of the upper range limit (URL) / 5 years</li> </ul>   |
| 4 bar (60 psi),<br>10 bar (150 psi)   | <ul style="list-style-type: none"> <li>&lt;0.05 of the upper range limit (URL) / year</li> <li>&lt;0.125 of the upper range limit (URL) / 5 years</li> </ul> |

**Total error**

The total error comprises the long-term stability and the total performance:

| Measuring cell                        | % of the URL/year (in the permitted temperature range)                                 |
|---------------------------------------|----------------------------------------------------------------------------------------|
| 100 mbar (1.5 psi)                    | <ul style="list-style-type: none"> <li>Snap-on: ±0.63</li> <li>Welded: ±1.0</li> </ul> |
| 400 mbar (6 psi),<br>1.2 bar (18 psi) | ±0.61                                                                                  |
| 4 bar (60 psi),<br>10 bar (150 psi)   | ±0.27                                                                                  |
|                                       | ±0.25                                                                                  |

---

**Warm-up time**

- 4 to 20 mA HART:
  - FMB50 =  $\leq 5$  s
  - FMB51/FMB52/FMB53 =  $\leq 8$  s
- IO-Link:  $< 1$  s
- PROFIBUS PA:  $\leq 8$  s
- FOUNDATION Fieldbus:  $\leq 20$  s ( $\leq 45$  s after a TOTAL reset)

## Installation

### General installation instructions

The position-dependent zero point shift can be corrected:

- directly at the device via operating keys on the electronic insert
- directly at the device via operating keys on the display
- via digital communication if the cover is not open.

Endress+Hauser offers a mounting bracket for installing the device on pipes or walls.

### FMB50

#### 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 calibration and functional test can be carried out more easily if you mount the device downstream of a shutoff device.
- Deltapilot M must be included in the insulation for media that can harden when cold.

#### Pressure measurement in gases

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

#### Pressure measurement in steams

Use a siphon if measuring pressure in steams.

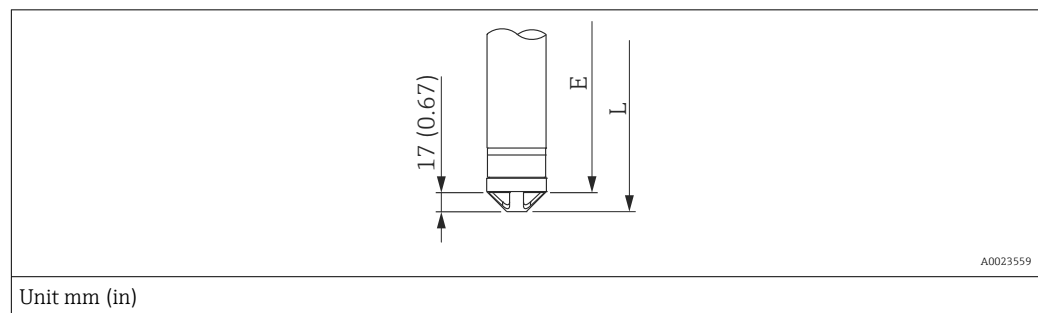
The siphon reduces the temperature to almost the ambient temperature.

#### Pressure measurement in liquids

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

### FMB51/FMB52/FMB53

- When mounting rod and cable versions, make sure that the probe head is located at a point as free as possible from flow. To protect the probe from impact resulting from lateral movement, mount the probe in a guide tube (preferably made of plastic) or secure it with a clamping fixture.
- In the case of devices for hazardous areas, comply strictly with the safety instructions when the housing cover is open.
- The length of the extension cable or the probe rod is based on the planned level zero point. The height of the protective cap must be taken into consideration when designing the layout of the measuring point. The level zero point (E) corresponds to the position of the process membrane. Level zero point = E; top of the probe = L.



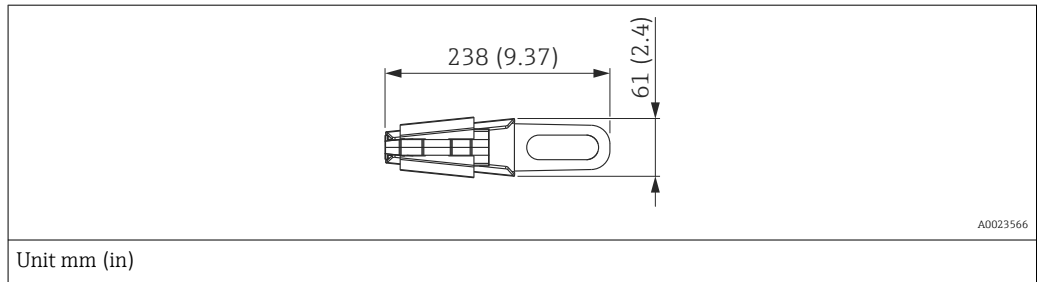
Suspension clamp (required for FMB53)

Material: → 57

Ordering information:

Order number: 52010869

Product Configurator, order code for "Accessory enclosed", option "PO".



#### Additional installation instructions

##### PE cable length > 300 m (984 ft)

Two suspension clamps must be used for PE cables longer than 300 m (984 ft).

##### Cable length tolerances

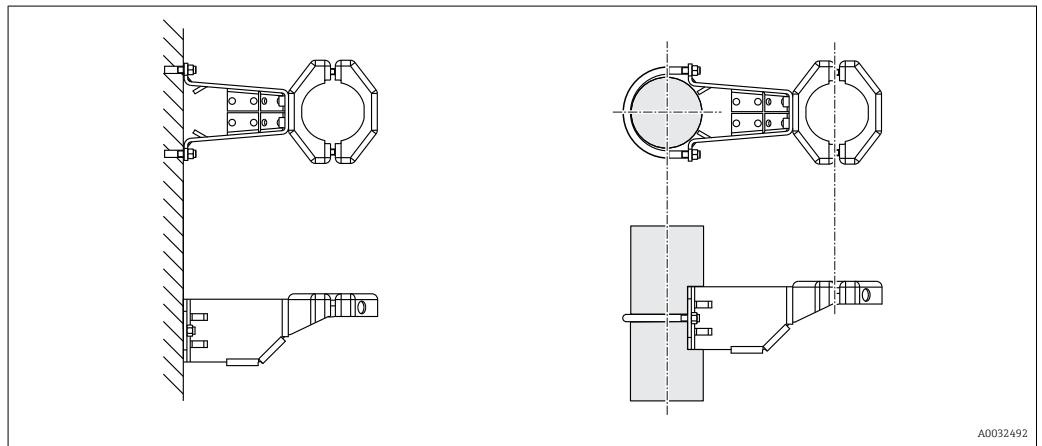
- FMB52
  - Cable length < 5 m (16 ft): up to -35 mm (-1.38 in)
  - Cable length 5 to 10 m (16 to 33 ft): up to -75 mm (-2.95 in)
  - Cable length 10 to 100 m (33 to 328 ft): up to -100 mm (-3.94 in)
- FMB53
  - Cable length < 5 m (16 ft): up to ±17.5 mm (0.69 in)
  - Cable length 5 to 10 m (16 to 33 ft): up to ±37.5 mm (1.48 in)
  - Cable length 10 to 100 m (33 to 328 ft): up to ±50 mm (1.97 in)

##### Rod length tolerances

FMB51: Rod length < 4000 mm (157 in): up to -4 mm (-0.16 in)

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

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



##### Ordering information:

- included in the delivery for the FMB50/51/52 with a separate housing (available for order via feature "Separate housing") and for the FMB53
- available for order as a separate accessory (Part No.: 71102216).

Further details →  51.

**"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 allows for 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 and
- If the measuring point is exposed to vibrations.

You can choose between different cable versions:

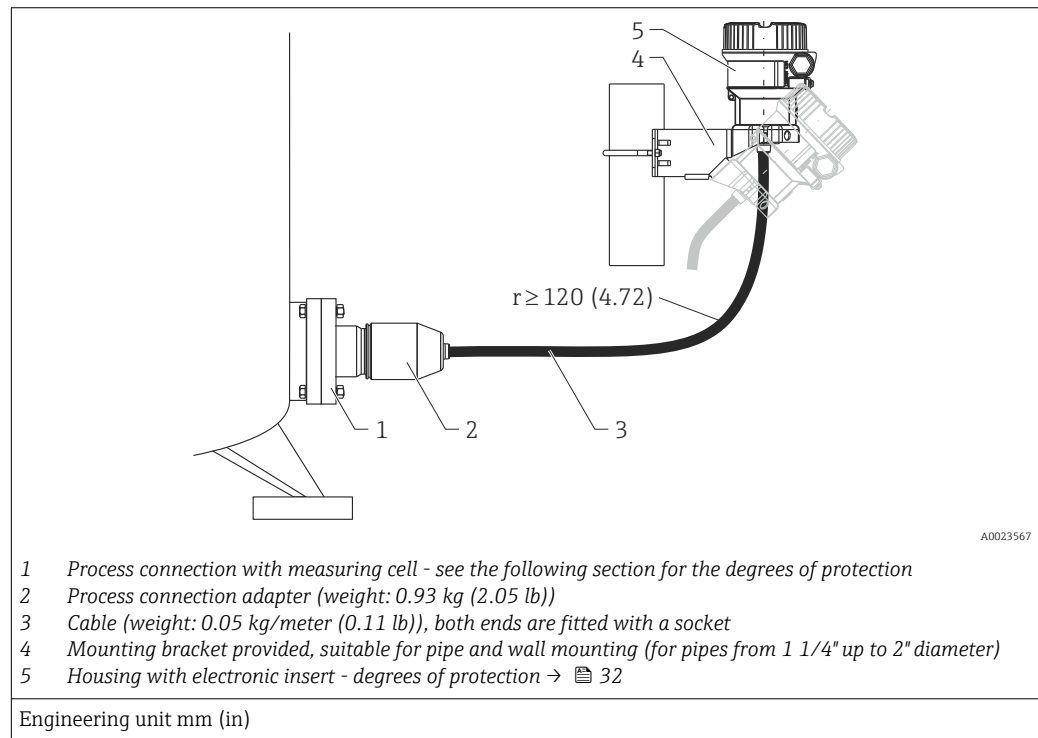
- PE: 2 m (6.6 ft), 5 m (16 ft) and 10 m (33 ft)
- FEP: 5 m (16 ft).

Ordering information:

- Product Configurator, order code for "Separate housing" or
- Product Configurator, order code for "Accessory enclosed" ordering feature, option PA

Dimensions →  51

In the case of the "separate housing" version, the measuring cell 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 measuring cell.



Degree of protection for the process connection and measuring cell with the use of

- FEP cable:
  - IP 69 <sup>2)</sup>
  - IP 66 NEMA 4/6P
  - IP 68 (1.83 mH<sub>2</sub>O for 24 h) NEMA 4/6P
- PE cable:
  - IP 66 NEMA 4/6P
  - IP 68 (1.83 mH<sub>2</sub>O for 24 h) NEMA 4/6P

Technical data of the PE and FEP cable:

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

2) Designation of the IP protection class according to DIN EN 60529. Previous designation "IP69K" according to DIN 40050 Part 9 is no longer valid (standard withdrawn on November 1, 2012). The tests required by both standards are identical.

Use in hazardous area:

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

## 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 instruments, must be cleaned in accordance with the BAM (DIN 19247) requirements.
- Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded for oxygen applications.

The maximum temperature  $T_{\max}$  for oxygen applications is 60 °C (140 °F).

The devices that are suitable for gaseous oxygen applications are indicated by  $p_{\max}$  in the following table.

| Order code for devices <sup>1)</sup> , cleaned for oxygen applications | $p_{\max}$ for oxygen applications                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FMB50 <sup>2)</sup>                                                    | <ul style="list-style-type: none"> <li>■ Depends on the lowest-rated element, with regard to pressure, of the selected components: overpressure limit of the measuring cell, process connection (1.5 x PN) <sup>3)</sup></li> <li>■ Depends on the fill fluid <sup>4)</sup></li> </ul>                                       |
| FMB51 <sup>2)</sup>                                                    | <ul style="list-style-type: none"> <li>■ Depends on the lowest-rated element, with regard to pressure, of the selected components: overpressure limit of the measuring cell or the process connection (1.5 x PN) <sup>3)</sup></li> <li>■ Depends on fill fluid <sup>4)</sup></li> <li>■ Depends on seal material</li> </ul> |

1) Device only, not accessory or enclosed accessory

2) Product Configurator, order code for "Service", option "HB"

3) →  10, "Measuring range" section and →  37, "Mechanical construction" section

4) Oxygen applications possible with FKM seal and inert oil.

## PWIS cleaning

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

Ordering information:

Ordering information: Product Configurator, "Service" ordering feature, option HC

The stability of the materials used must be checked before using them in the medium.

The protective cap of the process isolating diaphragm must be removed if necessary (FMB51/ FMB52/ FMB53).

## Applications with hydrogen

A **gold-coated** metal process membrane offers universal protection against hydrogen diffusion, both in gas applications and in applications with water-based solutions.

### Applications with hydrogen in aqueous solutions

A **gold/rhodium-coated** metallic process membrane (AU/Rh) offers effective protection against hydrogen diffusion.

## Special measuring cells for acids, alkalis or sea water (not FMB50)

For acids, alkalis or sea water, Endress+Hauser offers process membranes with a gold/platinum coating.

 With temperature exposure (up to 85 °C (185 °F)) there is an additional zero point deviation of 1.1 mbar (0.0165 psi).

Ordering information:

Product Configurator, order code for "Membrane material", option N

## Environment

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ambient temperature range</b> | <b>Device</b> <ul style="list-style-type: none"> <li>Without LCD display: -40 to +85 °C (-40 to +185 °F) (-25 to +85 °C (-13 to +185 °F) under static conditions with IO-Link)</li> <li>Without LCD with IO-Link <b>with</b> current output: +70 °C (+158 °F)</li> <li>Without LCD with IO-Link <b>without</b> current output: +80 °C (+176 °F)</li> <li>With LCD display: -20 to +70 °C (-4 to +158 °F)<br/>Extended temperature operation range (-40 to +85 °C (-40 to +185 °F)) with limitations in optical properties, such as display speed and contrast, for example</li> <li>With separate housing (not for diaphragm seals): -20 to +60 °C (-4 to +140 °F) (Installation without insulation)</li> </ul> |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Included, optional accessories

M12 plug-in jack, 90° angle and 5 meter cable: -25 to +70 °C (-13 to +158 °F)

| Ambient temperature limits | Version                                  | FMB50                          | FMB51 | FMB52                                                                                           | FMB53 |
|----------------------------|------------------------------------------|--------------------------------|-------|-------------------------------------------------------------------------------------------------|-------|
|                            | Without LCD display                      | -40 to +85 °C (-40 to +185 °F) |       | With PE cable: -40 to +70 °C (-40 to +158 °F)<br>With FEP cable: -40 to +80 °C (-40 to +176 °F) |       |
|                            | With LCD display <sup>1)</sup>           | -20 to +70 °C (-4 to +158 °F)  |       |                                                                                                 |       |
|                            | With M12 plug , elbowed                  | -25 to +85 °C (-13 to +185 °F) |       | With PE cable: -25 to +70 °C (-13 to +158 °F)<br>With FEP cable: -25 to +80 °C (-13 to +176 °F) |       |
|                            | With separate housing (PE and FEP cable) | -20 to +60 °C (-4 to +140 °F)  |       |                                                                                                 |       |
|                            |                                          |                                |       |                                                                                                 |       |

1) Extended temperature application range (-40 to +85 °C (-40 to +185 °F)) with restrictions in optical properties such as display speed and contrast

| Storage temperature range | Version                             | FMB50                          | FMB51 | FMB52                                                                                           | FMB53 |
|---------------------------|-------------------------------------|--------------------------------|-------|-------------------------------------------------------------------------------------------------|-------|
|                           | Without LCD display                 | -40 to +90 °C (-40 to +194 °F) |       | With PE cable: -40 to +70 °C (-40 to +158 °F)<br>With FEP cable: -40 to +80 °C (-40 to +176 °F) |       |
|                           | With LCD display <sup>1)</sup>      | -40 to +85 °C (-40 to +185 °F) |       |                                                                                                 |       |
|                           | With M12 plug, elbowed              | -25 to +70 °C (-13 to +158 °F) |       | With PE cable: -25 to +70 °C (-13 to +158 °F)<br>With FEP cable: -25 to +70 °C (-13 to +158 °F) |       |
|                           | With separate housing and FEP cable | -20 to +60 °C (-4 to +140 °F)  |       |                                                                                                 |       |

1) Extended temperature application range (-40 to +85 °C (-40 to +185 °F)) with restrictions in optical properties such as display speed and contrast

|                      |                                                                                                                                                     |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Climate class</b> | Class 4K4H (air temperature: -20 to +55 °C (-4 to +131 °F), relative humidity: 4 to 100%) satisfied as per DIN EN 60721-3-4 (condensation possible) |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|

|                             |                                                                                                                                                                                                                                                                            |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Degree of protection</b> | Depending on the used electrical connection →  20<br>F31 housing: IP 68 (1,83 mH2O for 24 h)<br>Ordering information:<br>Product Configurator, "Electrical connection" ordering feature |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



| Vibration resistance | Device/accessory                          | Test standard                                                                                                                                                                                                | Vibration resistance                                                                           |
|----------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
|                      | FMB50, FMB52, FMB53                       | 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:<br>5 to 25 Hz: $\pm 1.6$ mm (0.06 in);<br>25 to 100 Hz:<br>4 g in all 3 axes   |
|                      | FMB50, FMB52, FMB53 with mounting bracket | IEC 62828-1 / IEC 61298-3<br>IEC 60068-2-6                                                                                                                                                                   | Guaranteed for:<br>10 to 60 Hz: $\pm 0.15$ mm (0.01 in);<br>60 to 500 Hz:<br>2 g in all 3 axes |
|                      | FMB51                                     | IEC 62828-1 / IEC 61298-3<br>IEC 60068-2-6                                                                                                                                                                   | Guaranteed for:<br>10 to 60 Hz: $\pm 0.075$ mm (0.003 in)<br>60 to 150 Hz 1g in all 3 axes     |

#### Electromagnetic compatibility

- Electromagnetic compatibility as per all the relevant requirements of the EN 61326 series and NAMUR Recommendation EMC (NE21).
- Max. deviation during EMC-tests : < 0.5 % of the span
- All tests were performed with full measurement range (TD 1:1).

Further details can be found in the manufacturer declaration.

## Process

| Process temperature range | FMB50                                                                     | FMB51                             | FMB52                                                                                           | FMB53 |
|---------------------------|---------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------|-------|
|                           | -10 to +100 °C (+14 to +212 °F)<br>135 °C (275 °F) for 30 min.<br>maximum | -10 to +85 °C<br>(+14 to +185 °F) | With PE cable: -10 to +70 °C (+14 to +158 °F)<br>With FEP cable: -10 to +80 °C (+14 to +176 °F) |       |
|                           |                                                                           |                                   | Min. process temperature when using the KALREZ seal: -3 °C (+27 °F)                             |       |

**Lateral load FMB51 (static)** ≤30 Nm (22.13 lbf ft)

### Pressure specifications



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

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

#### WARNING

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

- ▶ Only operate the device within the specified limits for the components!
- ▶ MWP (maximum working pressure): The maximum working pressure is specified on the nameplate. This value refers to a reference temperature of +20 °C (+68 °F) and may be present at the device for an unlimited time. Observe the temperature dependency of the maximum working pressure. For flanges, refer to the following standards for the permitted pressure values at higher temperatures: EN 1092-1 (with regard to their stability/temperature property, the materials 1.4435 and 1.4404 are grouped together under EN 1092-1; the chemical composition of the two materials can be identical.), ASME B 16.5a, JIS B 2220 (the latest version of the standard applies in each case). MWP data that deviate from this is provided in the relevant sections of the Technical Information.
- ▶ The overpressure limit is the maximum pressure that a device may be subjected to during a test. The overpressure limit exceeds the maximum working pressure by a certain factor. This value refers to a reference temperature of +20 °C (+68 °F).
- ▶ The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the device.
- ▶ The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PT". The abbreviation "PT" corresponds to the OPL (Overpressure Limit) of the device.
- ▶ In the case of measuring cell range and process connection combinations where the overpressure limit of the process connection is less than the nominal value of the measuring cell, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If the entire measuring cell range must be used, select a process connection with a higher OPL value (1.5 x PN; MWP = PN).
- ▶ Oxygen applications: In oxygen applications, the values for  $p_{\max}$  and  $T_{\max}$  for oxygen applications may not be exceeded.

## Mechanical construction

Device height

**The device height is calculated from**

- the height of the housing
- the height of the relevant process connection.

The individual heights of the components are listed in the following sections. To calculate the device height simply add up the individual heights of the components. If necessary, the installation clearance (the space used to install the device) must also be taken into account. You can use the following table for this:

| Section                | Page | Height |
|------------------------|------|--------|
| Height of housing      | → 35 |        |
| Process connections    | → 37 |        |
| Installation clearance | -    |        |
| Device height          |      |        |

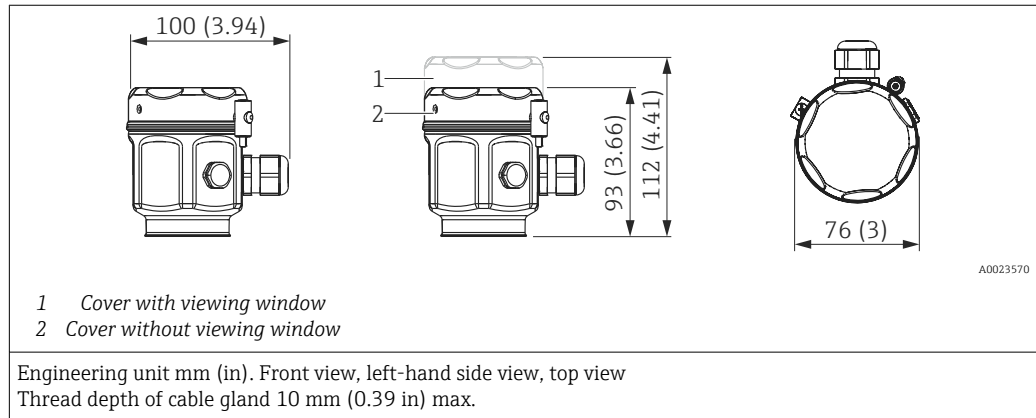
F31 housing, aluminum

1 Cover with viewing window  
2 Cover without viewing window

Engineering unit mm (in). Front view, left-hand side view, top view

| Material                                         | Weight kg (lbs) |                 | Option <sup>1)</sup> |
|--------------------------------------------------|-----------------|-----------------|----------------------|
|                                                  | With display    | Without display |                      |
| Aluminium <sup>2)</sup>                          | 1.1 (2.43)      | 1.0 (2.21)      | I                    |
| Aluminum with glass viewing window <sup>2)</sup> |                 |                 | J                    |

1) Product Configurator, "Housing" ordering feature  
2) Degree of protection dependent on cable entry used → 32

**F15 housing, stainless steel  
(hygienic)**

| Material                                                  | Weight kg (lbs) |                 | Option <sup>1)</sup> |
|-----------------------------------------------------------|-----------------|-----------------|----------------------|
|                                                           | With display    | Without display |                      |
| Stainless steel <sup>2)</sup>                             | 1.1 (2.43)      | 1.0 (2.21)      | Q                    |
| Stainless steel with glass viewing window <sup>2)</sup>   |                 |                 | R                    |
| Stainless steel with plastic viewing window <sup>2)</sup> |                 |                 | S                    |

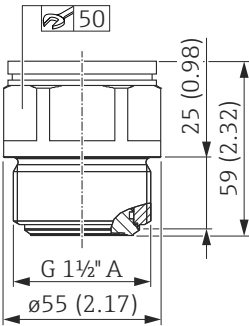
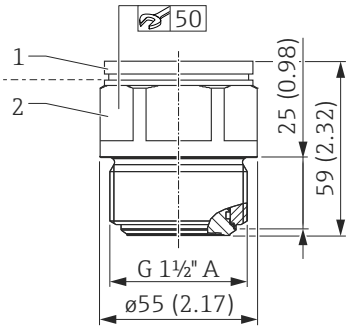
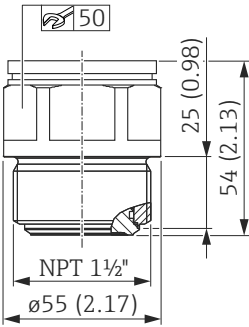
- 1) Product Configurator, "Housing" ordering feature  
2) Degree of protection depends on the cable entry used → 32

**Diameter of process membrane** 35.8 mm (1.41 in)

**Explanation of terms**

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

Process connections FMB50, FMB51, FMB52      ISO 228 G and NPT threaded connection

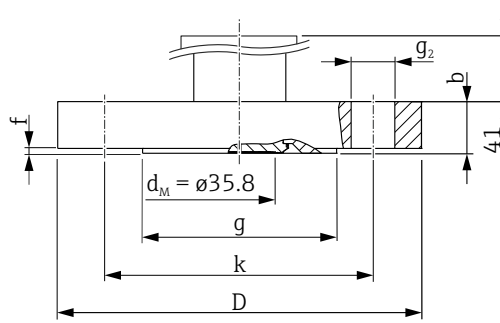
|                                                                                                                   |                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <p><b>A</b></p>  <p>A0023581</p> | <p><b>B</b></p>  <p>A0023582</p> |
| <p><b>C</b></p>  <p>A0023584</p> |                                                                                                                     |
| Unit mm (in)                                                                                                      |                                                                                                                     |

| Item | Designation               | Material                                                                       | Weight     | Option <sup>1)</sup> |
|------|---------------------------|--------------------------------------------------------------------------------|------------|----------------------|
|      |                           |                                                                                | kg (lb)    |                      |
| A    | ISO 228 G 1 1/2" A thread | AISI 316L (1.4435)                                                             | 0.8 (1.76) | GGJ                  |
| B    | ISO 228 G 1 1/2" A thread | ■ 1: Top section AISI 316L (1.4435)<br>■ 2: Bottom section Alloy C276 (2.4819) | 0.8 (1.76) | GGC                  |
| C    | ANSI 1 1/2" MNPT thread   | AISI 316L (1.4435)                                                             | 0.8 (1.76) | RGJ                  |

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

Process connections FMB50,  
FMB51, FMB52

## EN flanges, connection dimensions in accordance with EN 1092-1



A0020004

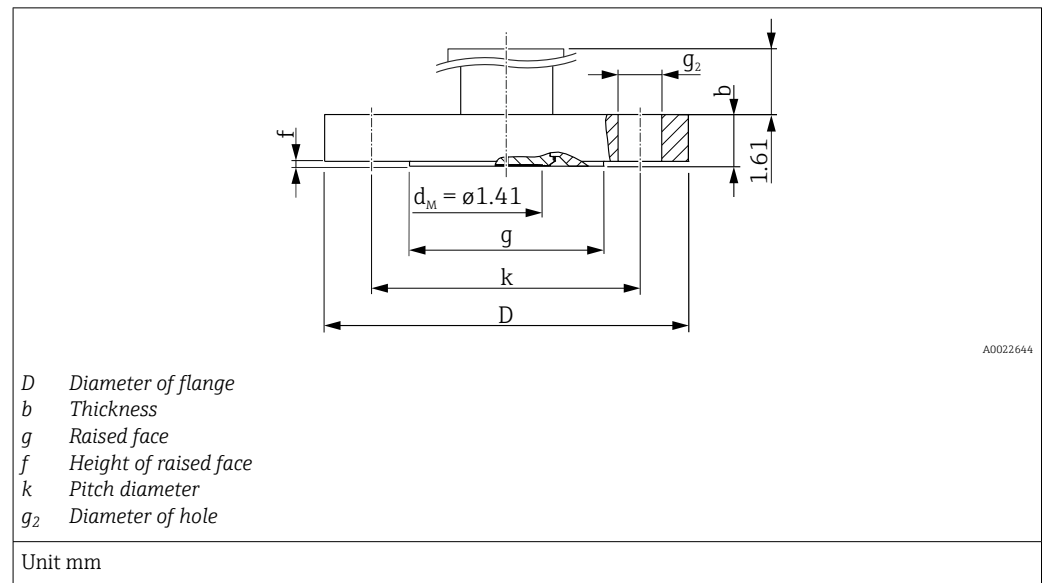
*D* Diameter of flange  
*b* Thickness  
*g* Raised face  
*f* Height of raised face  
*k* Pitch diameter  
*g<sub>2</sub>* Diameter of hole

Unit mm

| Flange <sup>1) 2)</sup> |          |      |      |      |      |      | Boltholes |                |      | Weight       | Option <sup>3)</sup> |
|-------------------------|----------|------|------|------|------|------|-----------|----------------|------|--------------|----------------------|
| DN                      | PN       | Form | D    | b    | g    | f    | Quantity  | g <sub>2</sub> | k    |              |                      |
|                         |          |      | [mm] | [mm] | [mm] | [mm] |           | [mm]           | [mm] | [kg (lb)]    |                      |
| DN 40                   | PN 10-40 | B1   | 150  | 18   | 88   | 2    | 4         | 18             | 110  | 3.05 (6.72)  | CEJ                  |
| DN 50                   | PN 10-40 | B1   | 165  | 20   | 102  | 2    | 4         | 18             | 125  | 3.75 (8.27)  | CFJ                  |
| DN 80                   | PN 10-40 | B1   | 200  | 24   | 138  | 2    | 8         | 18             | 160  | 5.55 (12.24) | CGJ                  |
| DN 100                  | PN 10-16 | B1   | 220  | 20   | 158  | 2    | 8         | 18             | 180  | 6.75 (14.88) | CHJ                  |

- 1) The roughness of the surface in contact with the medium including the raised face of the flange (all standards) is  $R_a 10$  to  $12.5 \mu\text{m}$  (394 to 492  $\mu\text{in}$ ). Lower surface roughness available on request.
- 2) Material AISI 316L: Endress+Hauser supplies DIN/EN stainless steel flanges as per AISI 316L (DIN/EN material number 1.4404 or 1.4435). With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13EO in EN 1092-1: 2001 Tab. 18. The chemical composition of the two materials can be identical.
- 3) Product Configurator, order code for "Process connection"

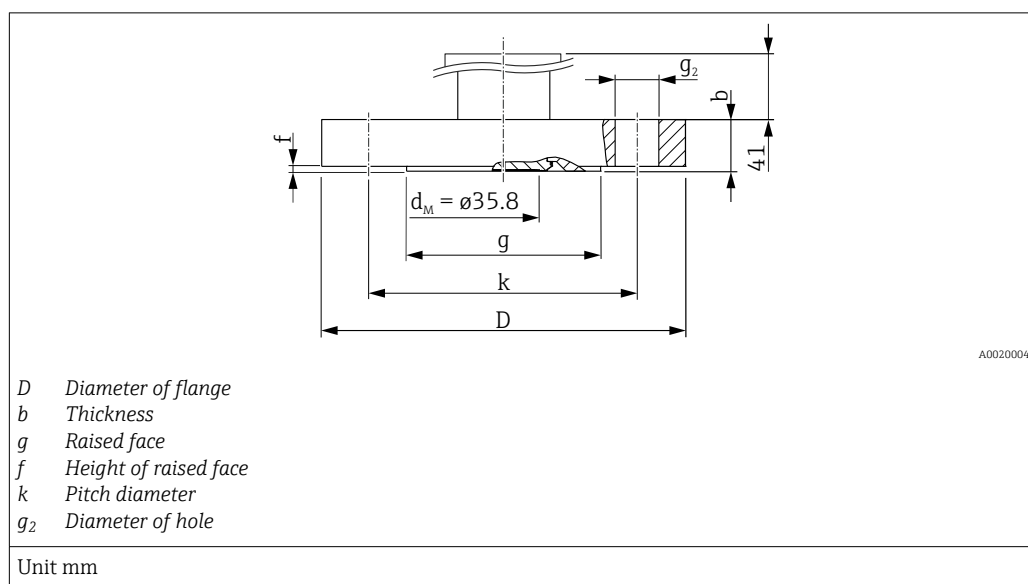
## ASME flanges, connection dimensions as per ASME B 16.5, raised face RF



| Flange <sup>1) 2)</sup> |             |      |      |      |      | Boltholes |       |      | Weight       | Option <sup>3)</sup>  |
|-------------------------|-------------|------|------|------|------|-----------|-------|------|--------------|-----------------------|
| NPS                     | Class       | D    | b    | g    | f    | Quantity  | $g_2$ | k    |              |                       |
| [in]                    | [lb./sq in] | [in] | [in] | [in] | [in] |           | [in]  | [in] | [kg (lb)]    |                       |
| 1 ½                     | 150         | 5    | 0.69 | 2.88 | 0.06 | 4         | 0.62  | 3.88 | 2.55 (5.62)  | AEJ<br>(not FMB51/52) |
| 2                       | 150         | 6    | 0.75 | 3.62 | 0.06 | 4         | 0.75  | 4.75 | 3.45 (7.61)  | AFJ                   |
| 3                       | 150         | 7.5  | 0.94 | 5    | 0.06 | 4         | 0.75  | 6    | 6.15 (13.56) | AGJ                   |
| 4                       | 150         | 9    | 0.94 | 6.19 | 0.06 | 8         | 0.75  | 7.5  | 8.25 (18.19) | AHJ                   |

- 1) The roughness of the surface in contact with the medium including the raised face of the flange (all standards) is  $R_a 3.2$  to  $6.3 \mu\text{m}$  (125 to 250  $\mu\text{in}$ ). Lower surface roughness available on request.
- 2) Material AISI 316/316L: Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated).
- 3) Product Configurator, "Process connection" ordering feature

## JIS flanges, connection dimensions in accordance with JIS B 2220 BL, raised face RF

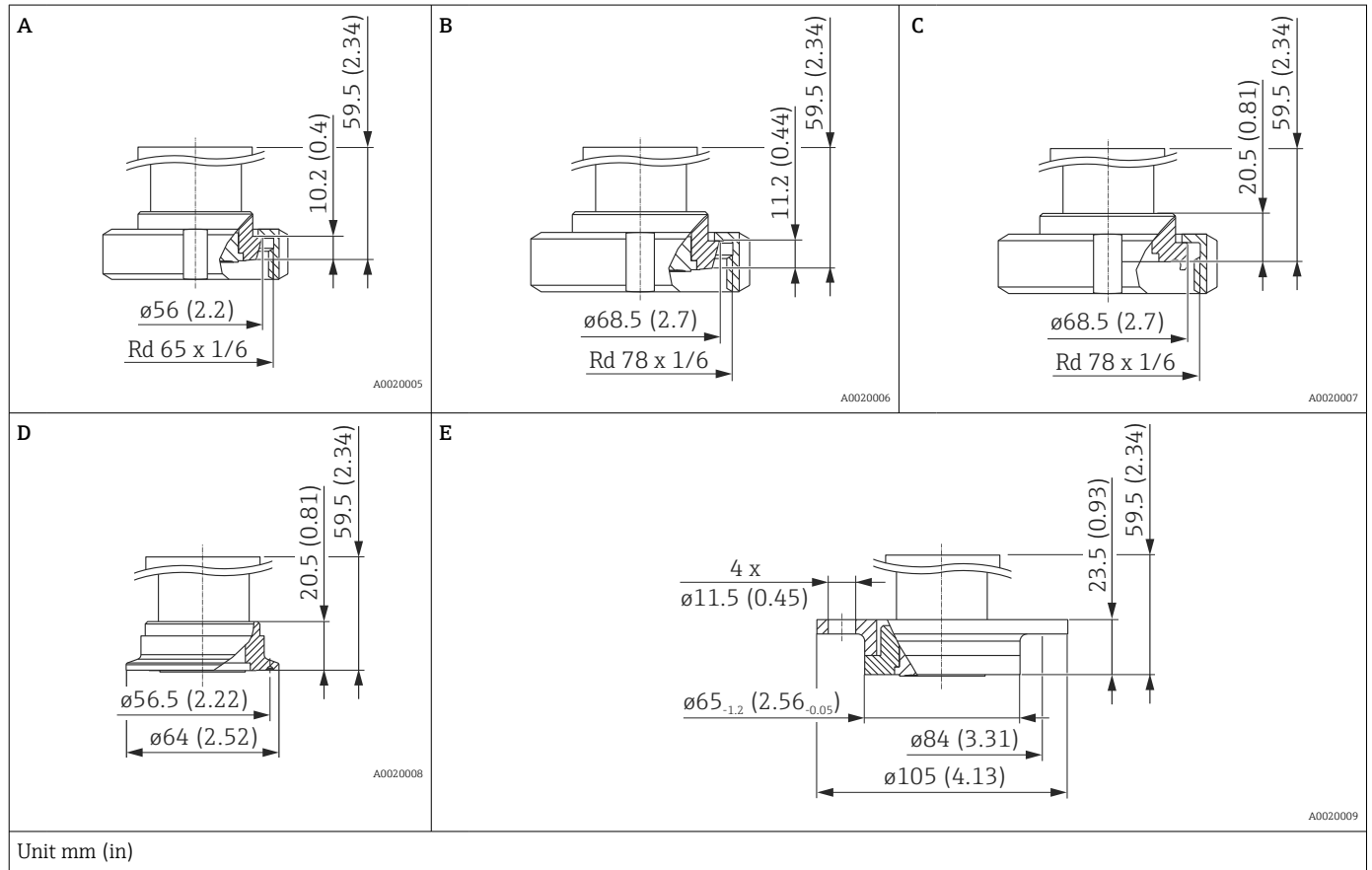


| Flange <sup>1) 2)</sup> |      |      |      |      |      | Boltholes |                |      | Weight       | Option <sup>3)</sup> |
|-------------------------|------|------|------|------|------|-----------|----------------|------|--------------|----------------------|
| A                       | K    | D    | b    | g    | f    | Quantity  | g <sub>2</sub> | k    |              |                      |
|                         |      | [mm] | [mm] | [mm] | [mm] |           | [mm]           | [mm] | [kg (lb)]    |                      |
| 40 A                    | 10 K | 140  | 16   | 81   | 2    | 4         | 19             | 105  | 2.55 (5.62)  | KEJ                  |
| 50 A                    | 10 K | 155  | 16   | 96   | 2    | 4         | 19             | 120  | 2.95 (6.50)  | KFJ                  |
| 80 A                    | 10 K | 185  | 18   | 126  | 2    | 8         | 19             | 150  | 4.25 (9.37)  | KGJ                  |
| 100 A                   | 10 K | 210  | 18   | 151  | 2    | 8         | 19             | 175  | 5.35 (11.79) | KHJ                  |

- 1) The roughness of the surface in contact with the medium including the raised face of the flange (all standards) is  $R_a 3.2$  to  $6.3 \mu\text{m}$  (125 to 250  $\mu\text{in}$ ). Lower surface roughness available on request.
- 2) Material AISI 316L (1.4435)
- 3) Product Configurator, order code for "Process connection"

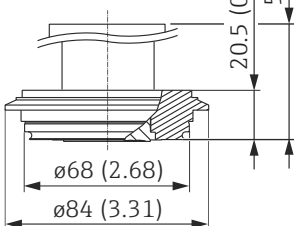
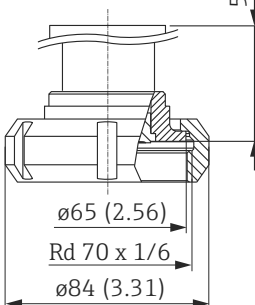
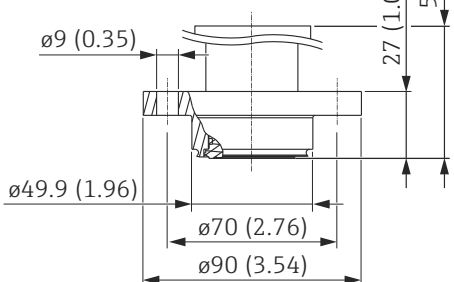


# Process connections FMB50      Hygienic connections



| Item <sup>1)</sup> | Designation                                                | PN    | Material              | Weight     | Option <sup>2)</sup> |
|--------------------|------------------------------------------------------------|-------|-----------------------|------------|----------------------|
|                    |                                                            |       |                       | kg (lb)    |                      |
| A                  | DIN 11851 DN 40                                            | PN 25 | AISI 316L<br>(1.4435) | 0.7 (1.54) | MZJ <sup>3)</sup>    |
| B                  | DIN 11851 DN 50                                            | PN 25 |                       | 0.9 (1.98) | MRJ <sup>3)</sup>    |
| C                  | DIN 11864-1 A DN 50<br>DIN 11866-A pipe, slotted nut, 316L | PN 16 |                       | 1 (2.21)   | NDJ <sup>3)</sup>    |
| D                  | Tri-Clamp ISO 2852 DN 40 - DN 51 (2"),<br>DIN 32676 DN 50  | -     |                       | 0.7 (1.54) | TDJ                  |
| E                  | DRD DN 50 (65 mm), slip-on flange AISI 304 (1.4301)        | PN 25 |                       | 1.1 (1.98) | TIJ                  |

- 1) Roughness of the surface in contact with the medium is  $R_a < 0.76 \mu\text{m}$  (30  $\mu\text{in}$ ) as standard. Lower surface roughness available on request.
- 2) Product Configurator, order code for "Process connection"
- 3) 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).

|                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>F</b>  <p>Technical drawing of FMB50 valve showing dimensions: 20.5 (0.81) mm for the top flange thickness, 59.5 (2.34) mm for the total height, 68 (2.68) mm for the inner diameter, and 84 (3.31) mm for the outer diameter. Reference A0020010.</p> | <b>G</b>  <p>Technical drawing of FMB51 valve showing dimensions: 59.5 (2.34) mm for the total height, 65 (2.56) mm for the inner diameter, Rd 70 x 1/6 for the thread, and 84 (3.31) mm for the outer diameter. Reference A0020011.</p> | <b>H</b>  <p>Technical drawing of FMB52 valve showing dimensions: 9 (0.35) mm for the top flange thickness, 59.5 (2.34) mm for the total height, 27 (1.06) mm for the top flange height, 49.9 (1.96) mm for the inner diameter, 70 (2.76) mm for the inner diameter, and 90 (3.54) mm for the outer diameter. Reference A0020012.</p> |
| Unit mm (in)                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                         |

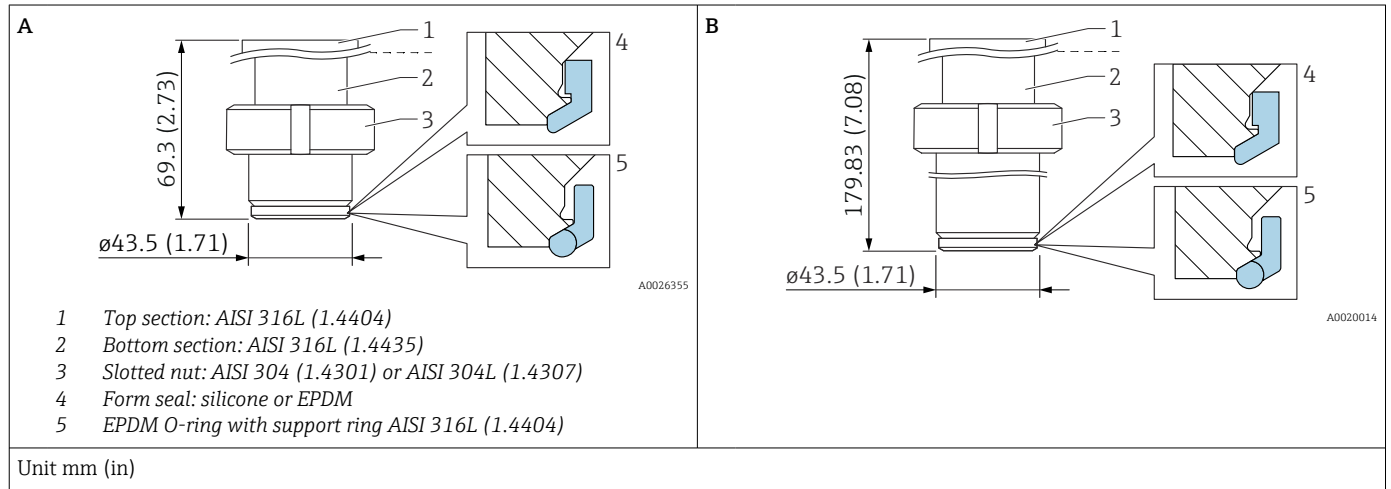
| Item <sup>1)</sup> | Designation                        | PN    | Material              | Weight<br>kg (lb) | Option <sup>2)</sup> |
|--------------------|------------------------------------|-------|-----------------------|-------------------|----------------------|
| F                  | Varivent type N for 40 – 162 pipes | PN 40 | AISI 316L<br>(1.4435) |                   | TRJ                  |
| G                  | SMS 2"                             | PN 25 |                       | 1 (2.21)          | TXJ <sup>3)</sup>    |
| H                  | NEUMO, D50                         | PN 16 |                       | 0.7 (1.54)        | S4J                  |

1) Roughness of the surface in contact with the medium is  $R_a < 0.76 \mu\text{m}$  (30  $\mu\text{in}$ ) as standard. Lower surface roughness available on request.

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

3) 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



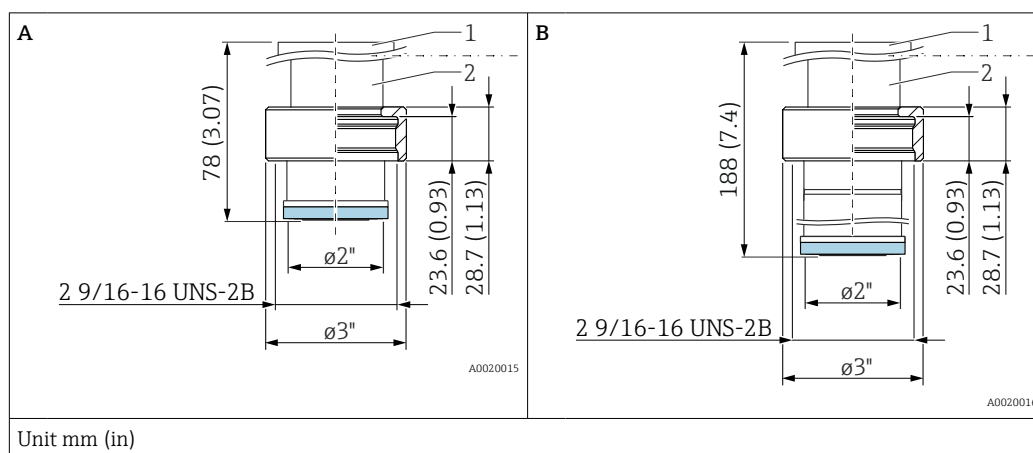
- Roughness of the surface in contact with the medium is  $R_a < 0.76 \mu\text{m}$  (30  $\mu\text{in}$ ) as standard. Surface finish  $R_a < 0.38 \mu\text{m}$  (15  $\mu\text{in}$ ) electropolished (wetted), ordering information: Product Configurator, order code for "Service", option "HK"
- Silicone form seal:  
FDA 21CFR177.2600/USP Class VI, order number: 52023572
- EPDM form seal:  
FDA (177.2600), USP Class VI; 5 pcs, order number: 71100719
- EPDM O-ring with AISI 316L (1.4404) support ring:  
FDA (177.2600), USP Class VI; 1 pc., order number: 71431380

| Item | Designation                                                                                       | PN        | Weight     | Option <sup>1)</sup> |
|------|---------------------------------------------------------------------------------------------------|-----------|------------|----------------------|
|      |                                                                                                   | bar (psi) | kg (lb)    |                      |
| A    | Universal process adapter<br>Form seal made of silicone (4)                                       | 10 (145)  | 0.8 (1.76) | UPJ                  |
|      | Universal process adapter<br>EPDM form seal (4)                                                   |           |            | URJ                  |
|      | Universal process adapter<br>EPDM O-ring with support ring (5) <sup>2)</sup>                      |           |            | UNJ                  |
| B    | Universal process adapter<br>6 inch extension,<br>form seal made of silicone (4)                  |           | 1.7 (3.75) | UQJ                  |
|      | Universal process adapter<br>6 inch extension,<br>EPDM O-ring with support ring (5) <sup>2)</sup> |           |            | UOJ                  |

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

2) With EHEDG approval.

## Anderson process adapter



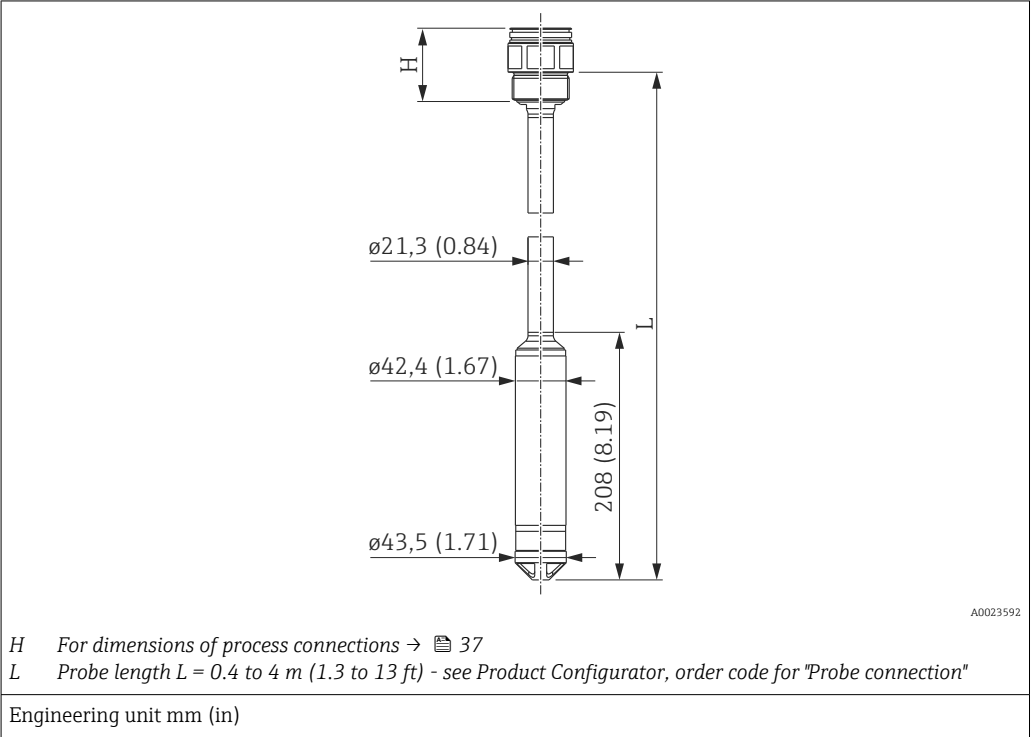
| Item <sup>1)</sup> | Designation                                                                              | PN        | Material                                                                                                                                                                  | Weight     | Option <sup>2)</sup> |
|--------------------|------------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------|
|                    |                                                                                          | bar (psi) |                                                                                                                                                                           | kg (lb)    |                      |
| A                  | Anderson short process adapter 2-3/16", 316L, incl. silicone form seal FDA 21CFR177.2600 | 3.5 (50)  | <ul style="list-style-type: none"> <li>1: Top section AISI 316L (1.4404)</li> <li>2: Bottom section AISI 316L (1.4435)</li> <li>Slotted nut AISI 316L (1.4404)</li> </ul> | 1.5 (3.31) | USJ                  |
| B                  | Anderson long process adapter 6-1/2", 316L, incl. silicone form seal FDA 21CFR177.2600   |           |                                                                                                                                                                           | 2.9 (6.39) | UTJ                  |

1) Roughness of the surface in contact with the medium is  $R_a < 0.76 \mu\text{m}$  (30  $\mu\text{in}$ ) as standard. Lower surface roughness available on request.

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

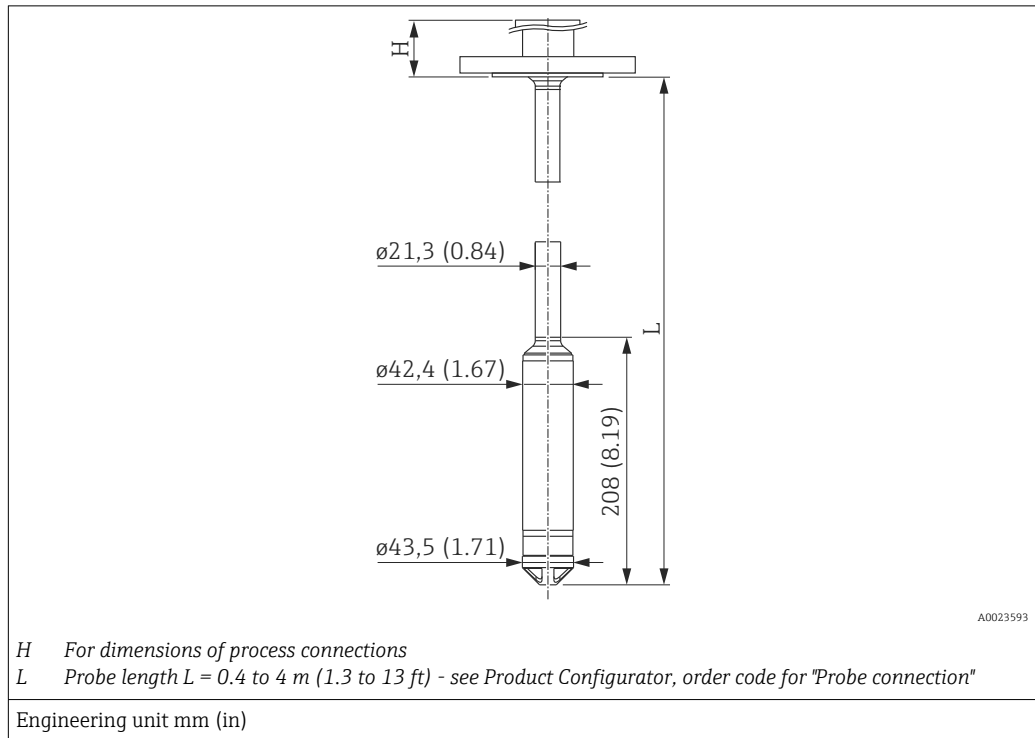
Process connections FMB51  
(rod version)

Threaded connection ISO 228 and NPT



| Process connection incl. measuring cell                                          | Weight                      |
|----------------------------------------------------------------------------------|-----------------------------|
| Housing weight                                                                   | → 35                        |
| Process connection weight                                                        | → 37                        |
| Pipe incl. cable                                                                 | 0.77 kg/m (1.70 lbs/3.3 ft) |
| Threaded connection incl. measuring cell tube and measuring cell                 | 1.65 kg (3.64 lb)           |
| Flange connection incl. measuring cell tube and measuring cell, without a flange | -                           |
| Total weight of device                                                           |                             |

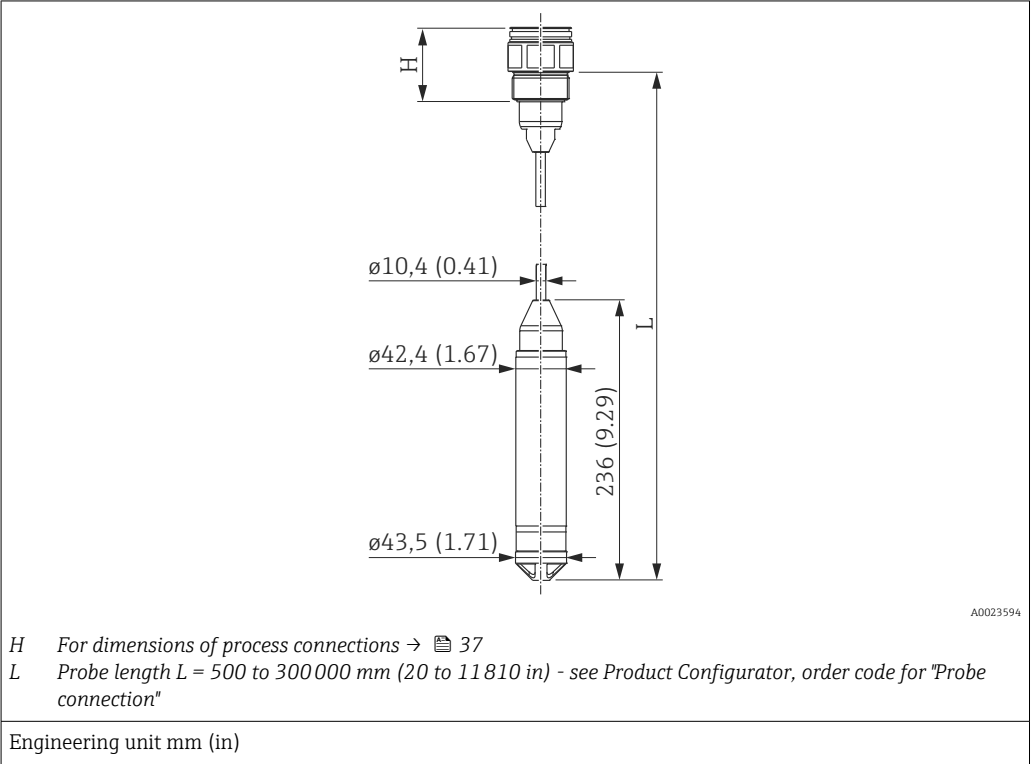
## EN/DIN, ANSI and JIS flanges



| Process connection incl. measuring cell                                          | Weight                      |
|----------------------------------------------------------------------------------|-----------------------------|
| Housing weight                                                                   | → 35                        |
| Process connection weight                                                        | → 37                        |
| Pipe incl. cable                                                                 | 0.77 kg/m (1.70 lbs/3.3 ft) |
| Threaded connection incl. measuring cell tube and measuring cell                 | -                           |
| Flange connection incl. measuring cell tube and measuring cell, without a flange | 1.30 kg (2.87 lb)           |
| Total weight of device                                                           |                             |

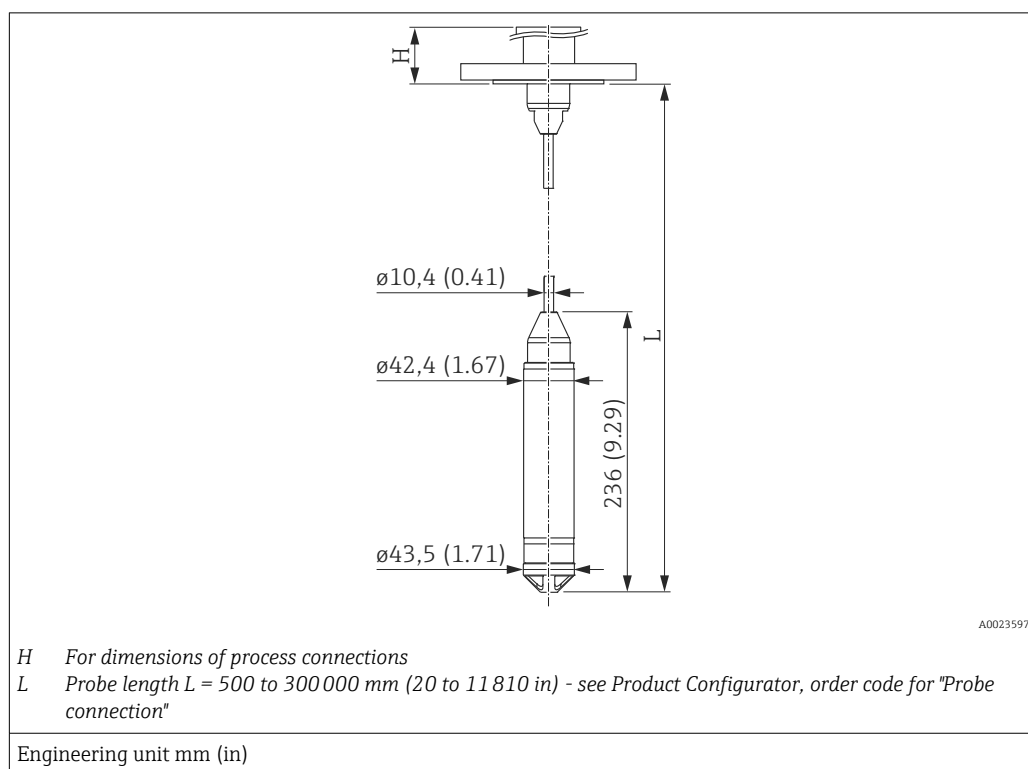
Process connections FMB52  
(cable version)

Threaded connection ISO 228 and NPT



| Process connection incl. measuring cell                                          | Weight                      |
|----------------------------------------------------------------------------------|-----------------------------|
| Housing weight                                                                   | → 35                        |
| Process connection weight                                                        | → 37                        |
| PE cable                                                                         | 0.13 kg/m (0.28 lbs/3.3 ft) |
| FEP cable                                                                        | 0.18 kg/m (0.40 lbs/3.3 ft) |
| Threaded connection incl. measuring cell tube and measuring cell                 | 1.65 kg (3.64 lb)           |
| Flange connection incl. measuring cell tube and measuring cell, without a flange | -                           |
| Total weight of device                                                           |                             |

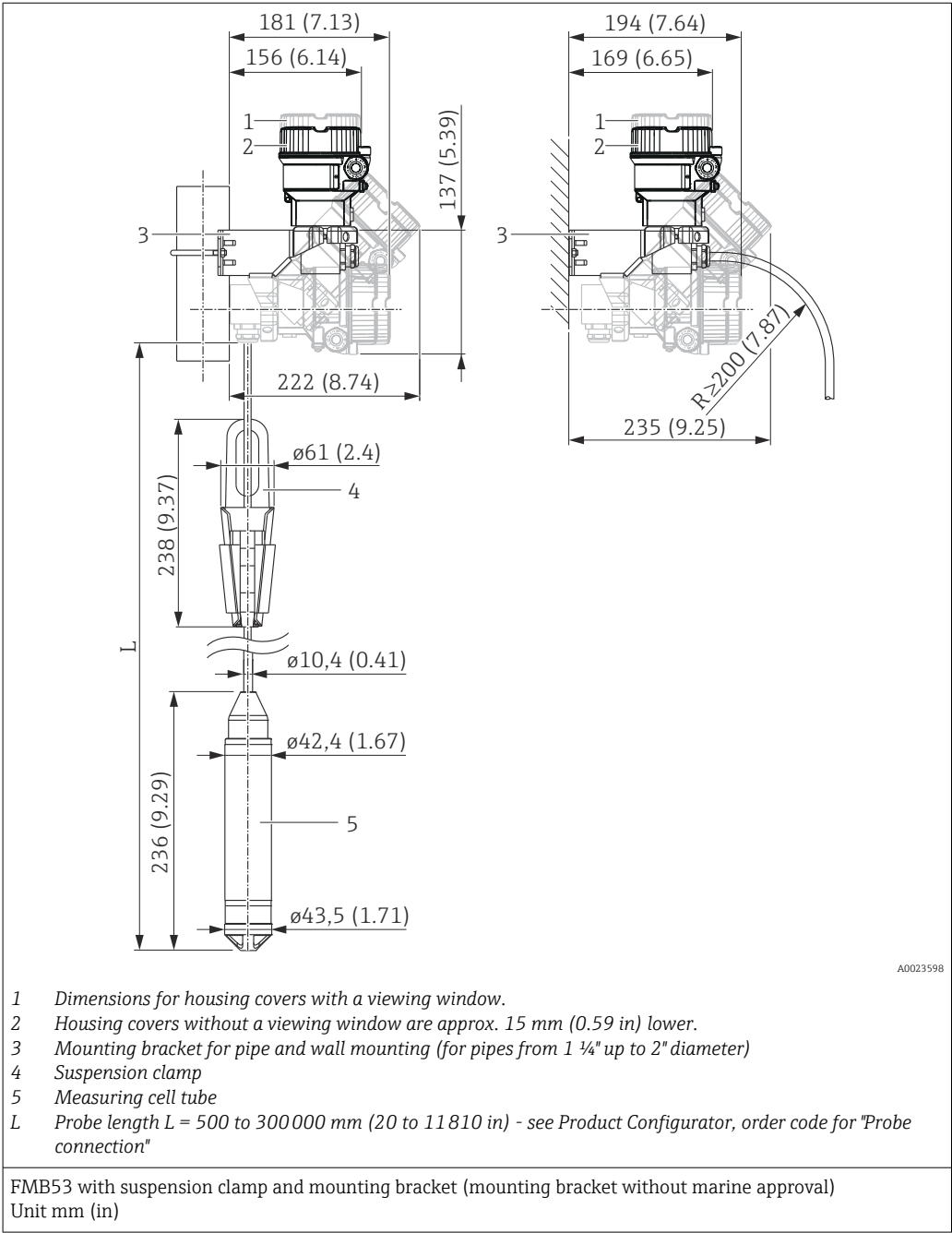
## EN/DIN, ANSI and JIS flanges



| Process connection incl. measuring cell                                          | Weight                      |
|----------------------------------------------------------------------------------|-----------------------------|
| Housing weight                                                                   | → 35                        |
| Process connection weight                                                        | → 37                        |
| PE cable                                                                         | 0.13 kg/m (0.28 lbs/3.3 ft) |
| FEP cable                                                                        | 0.18 kg/m (0.40 lbs/3.3 ft) |
| Flange connection incl. measuring cell tube and measuring cell, without a flange | 1.30 kg (2.87 lb)           |
| Total weight of device                                                           |                             |

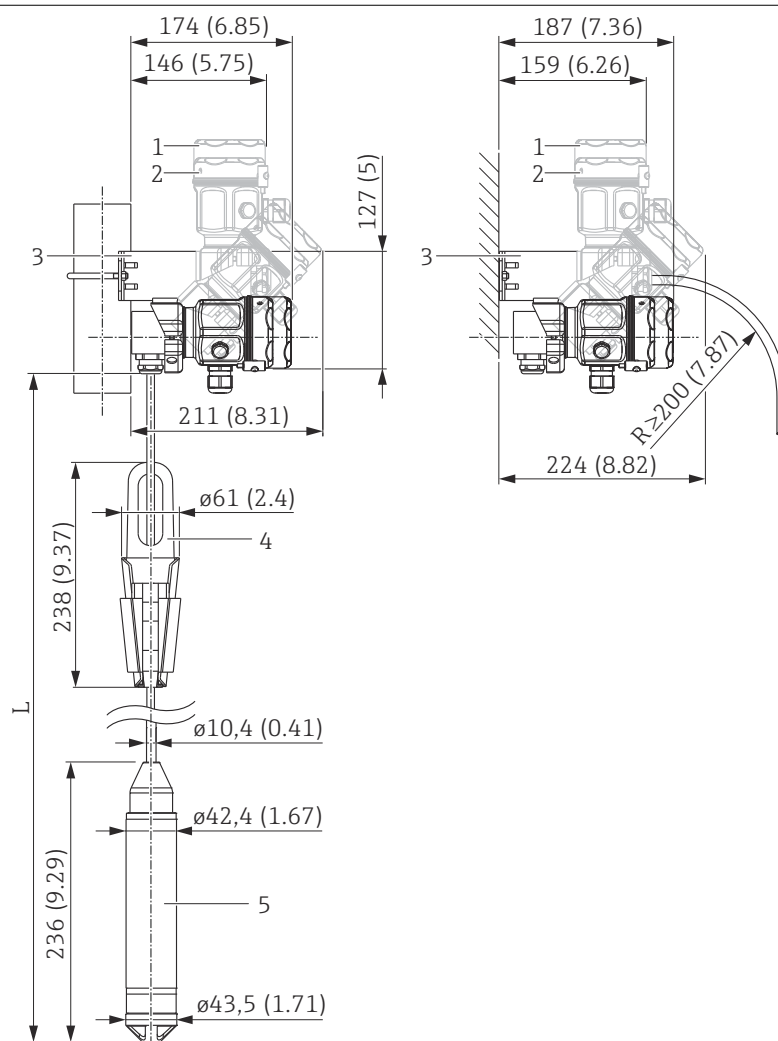


**Dimensions of FMB53 with  
F31 housing, suspension  
clamp and mounting bracket**



| Process connection incl. measuring cell                            | Weight                      |
|--------------------------------------------------------------------|-----------------------------|
| Housing weight                                                     | → 35                        |
| PE cable (cable length > 120 m (394 ft) = Delivery on cable reel)  | 0.13 kg/m (0.28 lbs/3.3 ft) |
| FEP cable (cable length > 120 m (394 ft) = Delivery on cable reel) | 0.18 kg/m (0.40 lbs/3.3 ft) |
| Mounting bracket                                                   | 0.2 kg (0.44 lb)            |
| Pipe bend incl. cable entry                                        | 0.65 kg (1.43 lb)           |
| Suspension clamp                                                   | 0.4 kg (0.88 lb)            |
| Measuring cell tube incl. measuring cell                           | 1.0 kg (2.21 lb)            |
| Total weight of device                                             |                             |

# Dimensions of FMB53 with F15 housing, suspension clamp and mounting bracket



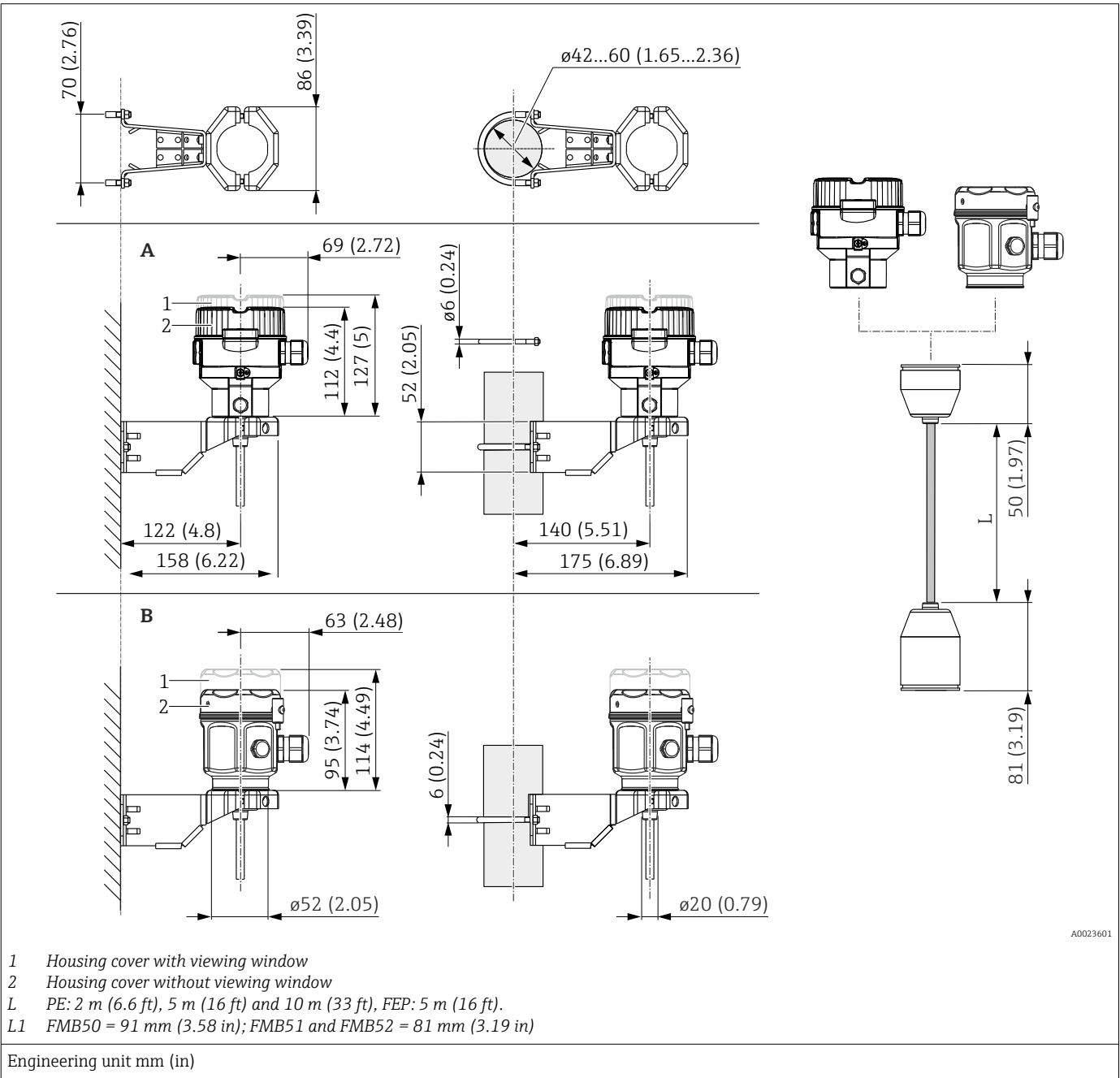
A0023600

- 1 Dimensions for housing covers with a viewing window.
- 2 Housing covers without a viewing window are approx. 15 mm (0.59 in) lower.
- 3 Mounting bracket for pipe and wall mounting (for pipes from 1 1/4" up to 2" diameter)
- 4 Suspension clamp
- 5 Measuring cell tube
- L Probe length L = 500 to 300 000 mm (20 to 11 810 in) - see Product Configurator, order code for "Probe connection"

FMB53 with suspension clamp and mounting bracket (mounting bracket without marine approval)  
Engineering unit mm (in)

| Process connection incl. measuring cell                            | Weight                      |
|--------------------------------------------------------------------|-----------------------------|
| Housing weight                                                     | → 36                        |
| PE cable (cable length > 120 m (394 ft) = Delivery on cable reel)  | 0.13 kg/m (0.28 lbs/3.3 ft) |
| FEP cable (cable length > 120 m (394 ft) = Delivery on cable reel) | 0.18 kg/m (0.40 lbs/3.3 ft) |
| Mounting bracket                                                   | 0.2 kg (0.44 lb)            |
| Pipe bend incl. cable entry                                        | 0.65 kg (1.43 lb)           |
| Suspension clamp                                                   | 0.4 kg (0.88 lb)            |
| Measuring cell tube incl. measuring cell                           | 1.0 kg (2.21 lb)            |
| Total weight of device                                             |                             |

Wall and pipe mounting with  
mounting bracket



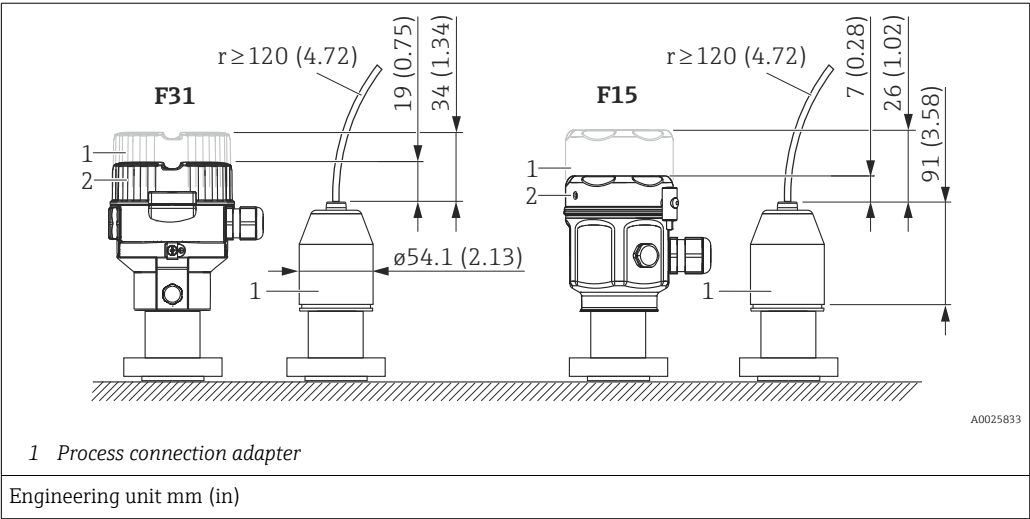
| Item | Designation                 | Weight (kg (lb))     |                  | Option <sup>1)</sup> |
|------|-----------------------------|----------------------|------------------|----------------------|
|      |                             | Housing (F31 or F15) | Mounting bracket |                      |
| A    | Dimensions with F31 housing | → 35                 | 0.5 (1.10)       | U                    |
| B    | Dimensions with F15 housing |                      |                  |                      |

1) Product Configurator, "Separate housing" ordering feature

Also available for order as a separate accessory: Part number 71102216

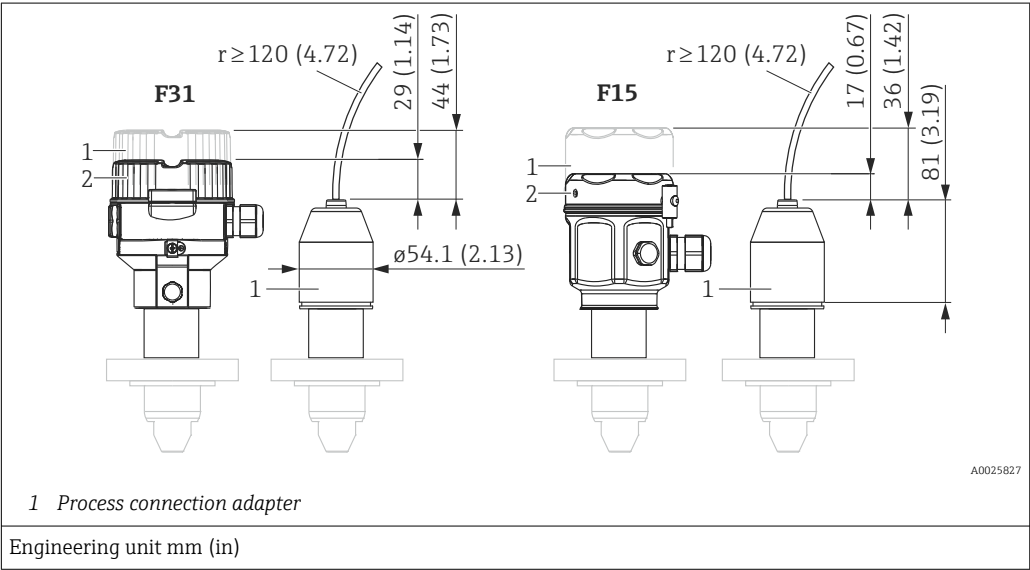
**FMB50: Reduction in installation height**

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

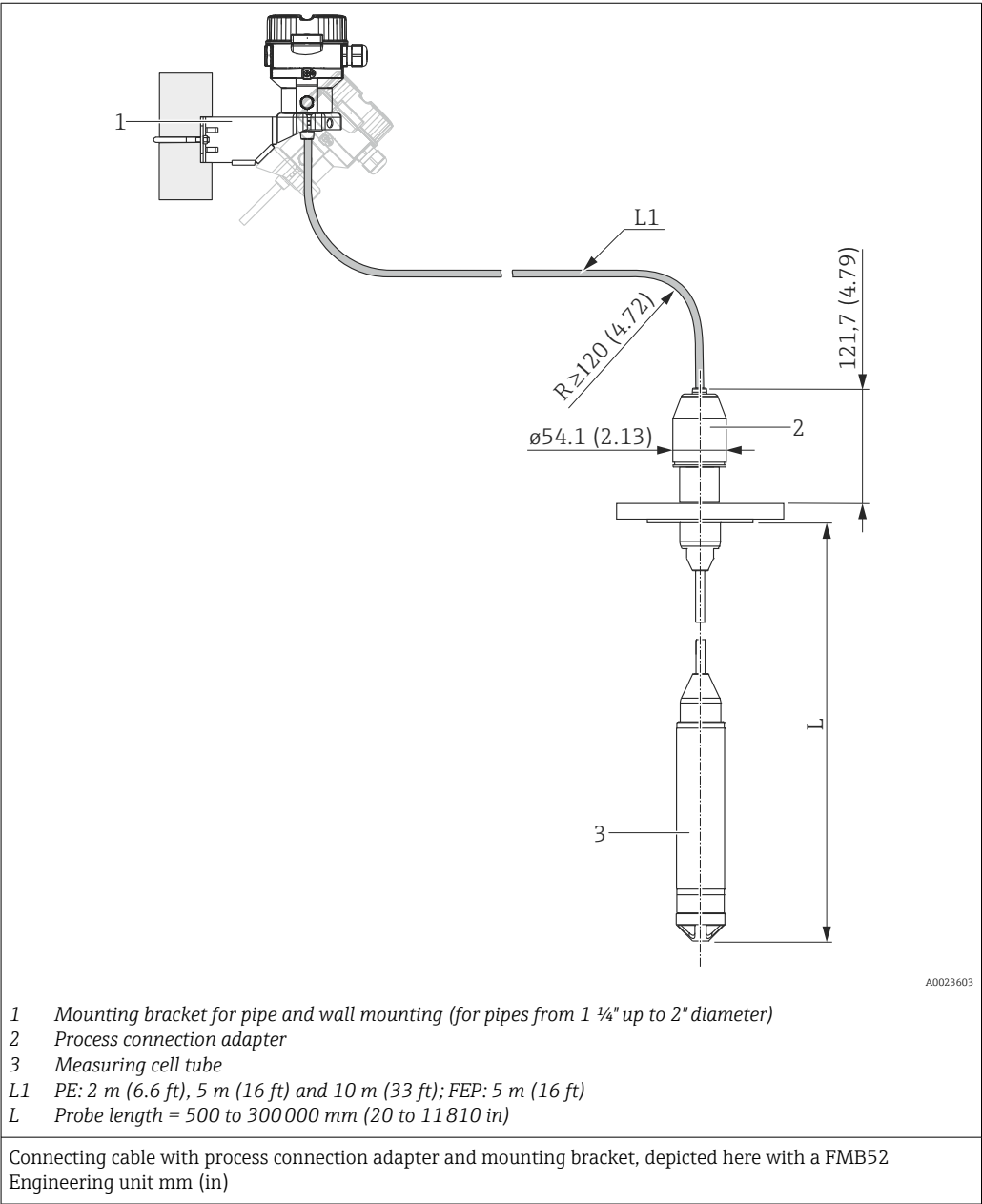


**FMB51, FMB52: Reduction in installation height**

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

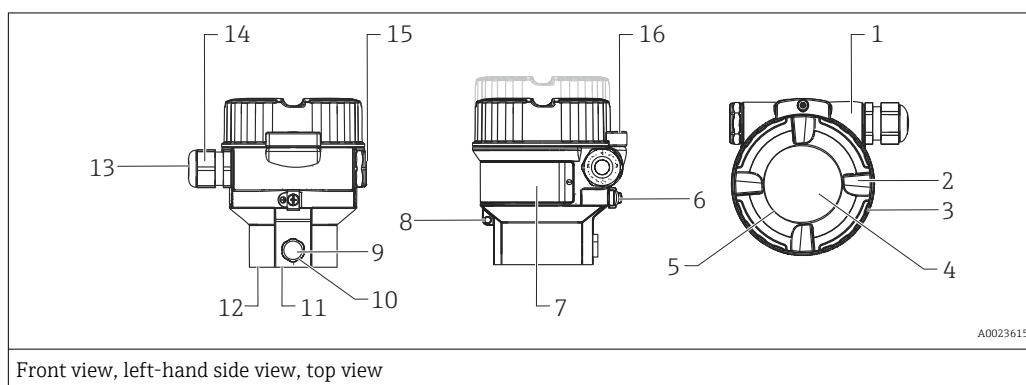


Example for a "Separate housing version"



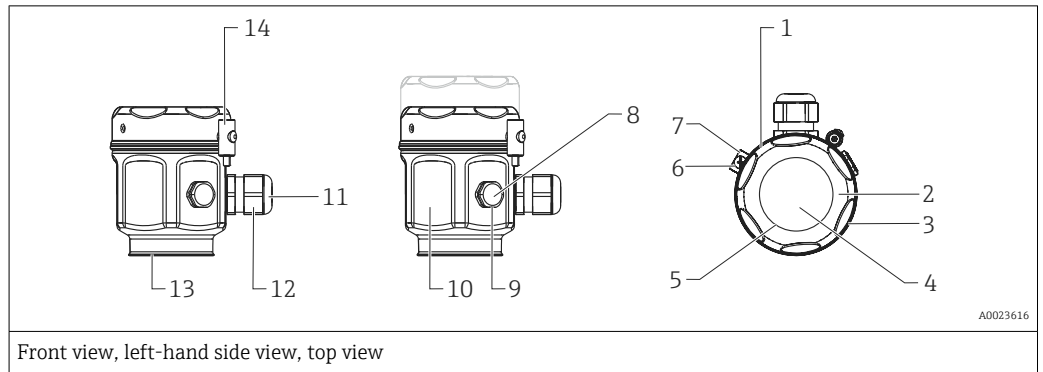
| Process connection incl. measuring cell | Weight                                     |
|-----------------------------------------|--------------------------------------------|
| Separate housing for FMB50              | Weight of housing → 35 + 0.5 kg (1.10 lb)  |
| Separate housing for FMB51 and FMB52    | Weight of housing → 35 + 0.65 kg (1.43 lb) |
| Process connection adapter              | 0.4 kg (0.88 lb)                           |
| Mounting bracket                        | 0.2 kg (0.44 lb)                           |
| Pipe bend incl. cable entry             | 0.65 kg (1.43 lb)                          |
| PE cable 2 m (6.6 ft)                   | 0.16 kg (0.35 lb)                          |
| PE cable 5 m (16 ft)                    | 0.32 kg (0.71 lb)                          |
| Total weight of device                  |                                            |

 Ordering information for FMB50, FMB51, FMB52: Product Configurator, order code for "Separate housing".

**Materials not in contact with process**     **F31 housing**


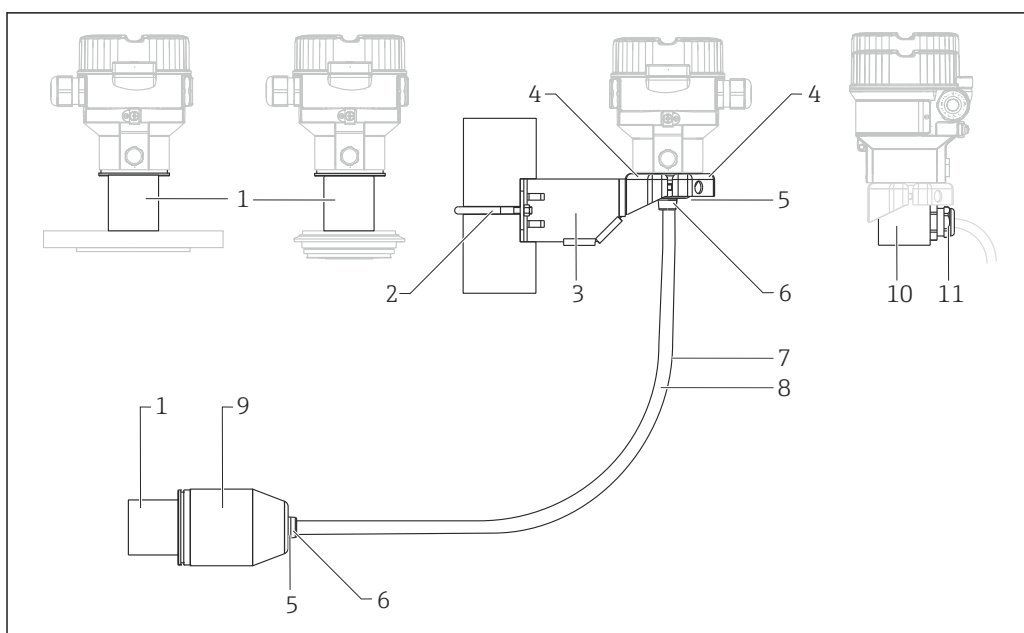
| Item number | Component                            | Material                                                                                                              |
|-------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| 1           | F31 housing, RAL 5012 (blue)         | Polyester powder coating on aluminum as per EN1706 AC43400 (reduced copper content $\leq 0.1\%$ to prevent corrosion) |
| 2           | Cover, RAL 7035 (gray)               | Polyester powder coating on aluminum as per EN1706 AC43400 (reduced copper content $\leq 0.1\%$ to prevent corrosion) |
| 3           | Cover seal                           | HNBR                                                                                                                  |
| 4           | Sight glass                          | Mineral glass                                                                                                         |
| 5           | Sight glass seal                     | Silicone (VMQ)                                                                                                        |
| 6           | External ground terminal             | AISI 304 (1.4301)                                                                                                     |
| 7           | Nameplates                           | Plastic film                                                                                                          |
| 8           | Fastening for wired-on tag plate     | AISI 304 (1.4301)/AISI 316 (1.4401)                                                                                   |
| 9           | Pressure compensation filter         | AISI 316L (1.4404) and PBT-FR                                                                                         |
| 10          | Pressure compensation filter, O-ring | VMQ or EPDM                                                                                                           |
| 11          | Sealing ring                         | EPDM                                                                                                                  |
| 12          | Snap ring                            | PC Plastic                                                                                                            |
| 13          | Seal of cable gland and plug         | EPDM/NBR                                                                                                              |
| 14          | Cable gland                          | Polyamide PA, for dust ignition-proof: CuZn nickel-plated                                                             |
| 15          | Plug                                 | PBT-GF30 FR<br>for dust ignition-proof, Ex d, FM XP and CSA XP: AISI 316L (1.4435)                                    |
| 16          | Cover clamp                          | AISI 316L (1.4435) clamp, A4 screw                                                                                    |

### F15 housing



| Item number | Component                                                                                                        | Material                                                  |
|-------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| 1           | F15 housing                                                                                                      | AISI 316L (1.4404)                                        |
| 2           | Cover                                                                                                            |                                                           |
| 3           | Cover seal                                                                                                       | Silicone with PTFE coating                                |
| 4           | 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)                                        |
| 4           | 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                                             |
| 5           | Sight glass seal                                                                                                 | Silicone (VMQ)                                            |
| 6           | External ground terminal                                                                                         | AISI 304 (1.4301)                                         |
| 7           | Fastening for wired-on tag plate                                                                                 | AISI 304 (1.4301)/AISI 316 (1.4401)                       |
| 8           | Pressure compensation filter                                                                                     | AISI 316L (1.4404) and PBT-FR                             |
| 9           | Pressure compensation filter, O-ring                                                                             | VMQ or EPDM                                               |
| 10          | Nameplates                                                                                                       | Lasered on                                                |
| 11          | Cable gland                                                                                                      | Polyamide PA, for dust ignition-proof: CuZn nickel-plated |
| 12          | Seal of cable gland and plug                                                                                     | NBR/Silicone/EPDM                                         |
| 13          | Sealing ring                                                                                                     | EPDM                                                      |
| 14          | Screw                                                                                                            | A4-50                                                     |

## Connecting parts



A0023617

| Item number | Component                                                                                                 | Material                                                                                                                                                                        |
|-------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1           | Connection between the housing and process connection                                                     | AISI 316L (1.4404)                                                                                                                                                              |
| 2           | Mounting bracket                                                                                          | Bracket AISI 316L (1.4404)                                                                                                                                                      |
| 3           |                                                                                                           | Screw and nuts A4-70                                                                                                                                                            |
| 4           |                                                                                                           | Half-shells: AISI 316L (1.4404)                                                                                                                                                 |
| 5           | Seal for cable from separate housing                                                                      | FKM, EPDM                                                                                                                                                                       |
| 6           | <ul style="list-style-type: none"> <li>Gland for cable from separate housing:</li> <li>Screws:</li> </ul> | <ul style="list-style-type: none"> <li>AISI 316L (1.4404)</li> <li>A2</li> </ul>                                                                                                |
| 7           | PE cable for separate housing                                                                             | Abrasion-resistant cable with Dynema strain-relief members; shielded with aluminum-coated film; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant |
| 8           | FEP cable for separate housing                                                                            | Abrasion-resistant cable; shielded with 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)                                                                                                                                                              |
| 10          | Housing adapter                                                                                           | FMB50, FMB51, FMB52: AISI 316L (1.4404)<br>FMB53: AISI 304 (1.4301)                                                                                                             |
| 11          | Cable gland:<br>Sealing insert:<br>O-ring:                                                                | CuZn nickel-plated<br>TPE-V<br>NBR                                                                                                                                              |



Fill fluid

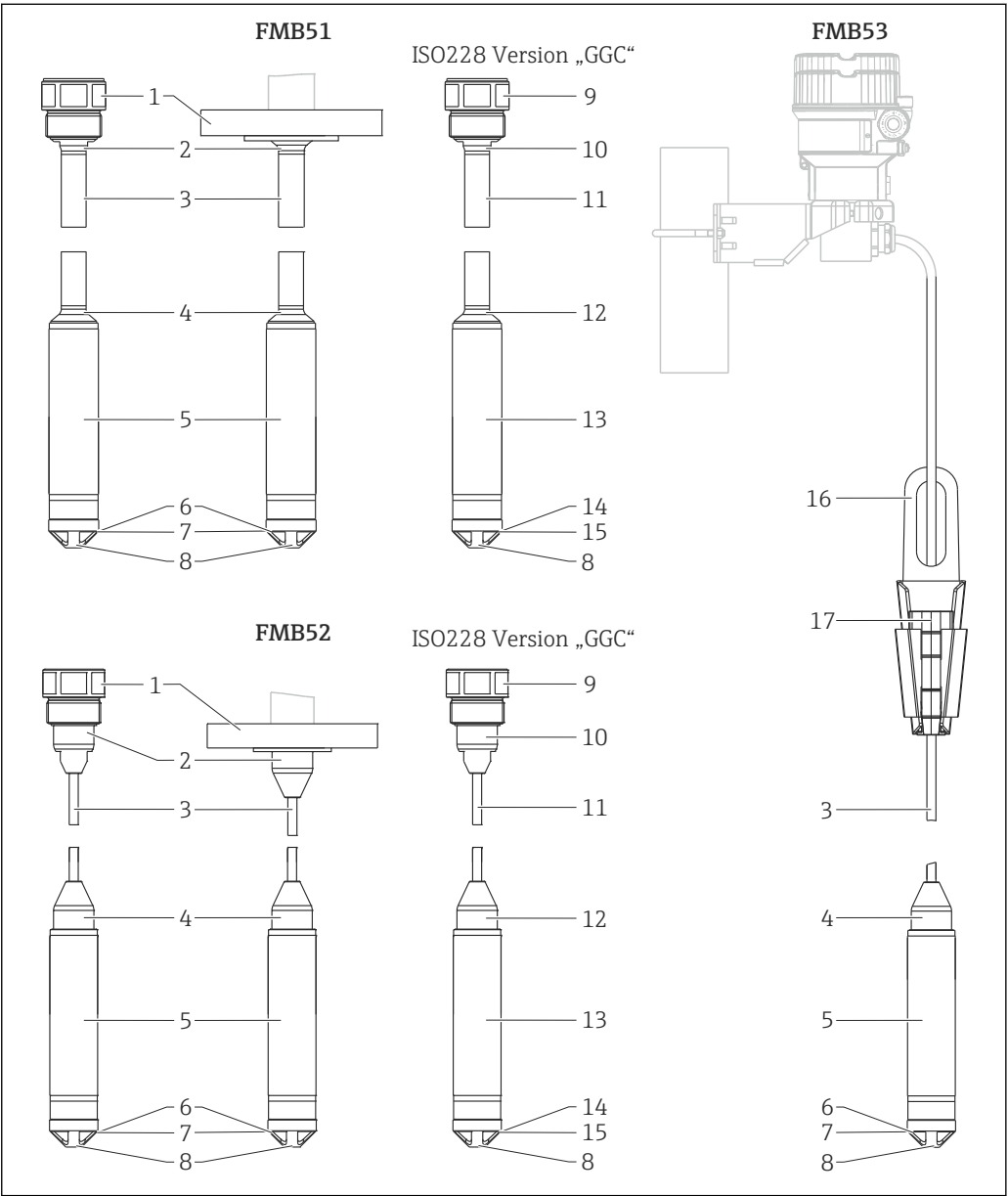
| Designation                                               | Option <sup>1)</sup> |
|-----------------------------------------------------------|----------------------|
| Inert oil                                                 | 2                    |
| Synthetic oil polyalphaolefin FDA 21 CFR 178.3620, NSF H1 | 3                    |

1) Product Configurator, order code for "Fill fluid"

Materials in contact with process

NOTICE

- ▶ Device components in contact with the process are listed in the "Mechanical construction" → 35 and "Ordering information" → 70 sections.



A0023619

| Item number | Component          | Material           |
|-------------|--------------------|--------------------|
| 1           | Process connection | → 37               |
| 2           | Socket             | AISI 316L (1.4404) |
| 3           | Rod                | AISI 316L (1.4404) |

| Item number | Component                             | Material                                                                                                                                                                                     |
|-------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | PE cable                              | Abrasion-proof cable; shielded using galvanized steel wire netting and aluminum-coated film; insulated with polyethylene (PE-LD), black/blue; copper wires, twisted, UV-resistant            |
|             | PE cable<br>(Usage in drinking water) | Abrasion-proof cable; shielded using galvanized steel wire netting and aluminum-coated film; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant                 |
| 3           | FEP cable                             | Abrasion-proof cable; shielded using galvanized steel wire netting and aluminum-coated film; insulated with fluorinated ethylene propylene (FEP), black; copper wires, twisted, UV-resistant |
| 4           | Socket                                | AISI 316L (1.4404)                                                                                                                                                                           |
| 5           | Probe tube                            | AISI 316L (1.4404)                                                                                                                                                                           |
| 6           | Process membrane and meter body       | → 58                                                                                                                                                                                         |
| 7           | Seals                                 | → 59                                                                                                                                                                                         |
| 8           | Protective cap                        | POM                                                                                                                                                                                          |
| 9           | Process connection                    | Alloy C276 (2.4819)                                                                                                                                                                          |
| 10          | Socket                                | Alloy C4 (2.4610)                                                                                                                                                                            |
| 11          | Rod                                   | Alloy C4 (2.4610)                                                                                                                                                                            |
| 12          | Socket                                | Alloy C4 (2.4610)                                                                                                                                                                            |
| 13          | Probe tube                            | Alloy C22 (2.4602)                                                                                                                                                                           |
| 14          | Process membrane and meter body       | → 58                                                                                                                                                                                         |
| 15          | Seals                                 | → 59                                                                                                                                                                                         |
| 16          | Suspension clamp                      | AISI 316L (1.4404)                                                                                                                                                                           |
| 17          | Clamping jaw                          | PA-GF                                                                                                                                                                                        |

### DIN/EN flanges

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

### Process membrane

| Process membrane    | Coating       | Meter body                                           | FMB50 | FMB51 | FMB52 | Option <sup>1)</sup> |
|---------------------|---------------|------------------------------------------------------|-------|-------|-------|----------------------|
| Alloy C276 (2.4819) | -             | 316L (1.4435) oder Alloy C276 (2.4819) <sup>2)</sup> | ✓     | ✓     | ✓     | B                    |
| Alloy C276 (2.4819) | Gold-rhodium  | Alloy C276 (2.4819)                                  | ✓     | ✓     | ✓     | L                    |
| Alloy C276 (2.4819) | Gold-platinum | Alloy C276 (2.4819)                                  | —     | ✓     | ✓     | N                    |

1) Product Configurator, order code for "Membrane material"

2) The material of the meter body corresponds to the material of the process connection.

| Process membrane    | Coating       | Meter body          | FMB53 | Option <sup>1)</sup> |
|---------------------|---------------|---------------------|-------|----------------------|
| Alloy C276 (2.4819) | -             | 316L (1.4435)       | ✓     | B                    |
| Alloy C276 (2.4819) | Gold-rhodium  | Alloy C276 (2.4819) | ✓     | L                    |
| Alloy C276 (2.4819) | Gold-platinum | Alloy C276 (2.4819) | ✓     | N                    |

1) Product Configurator, order code for "Membrane material"

**Seals**

| Designation       | Option <sup>1)</sup> |
|-------------------|----------------------|
| FKM               | A <sup>2)</sup>      |
| EPDM              | J <sup>2)</sup>      |
| Kalrez 6375       | L <sup>2)</sup>      |
| None, welded cell | U                    |

- 1)     Product Configurator, order code for "Seal"  
2)     Not FMB50

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

The following applies to all device components in contact with the process:

- 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 can be locked/unlocked using the device's write protection switch (not IO-Link), 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

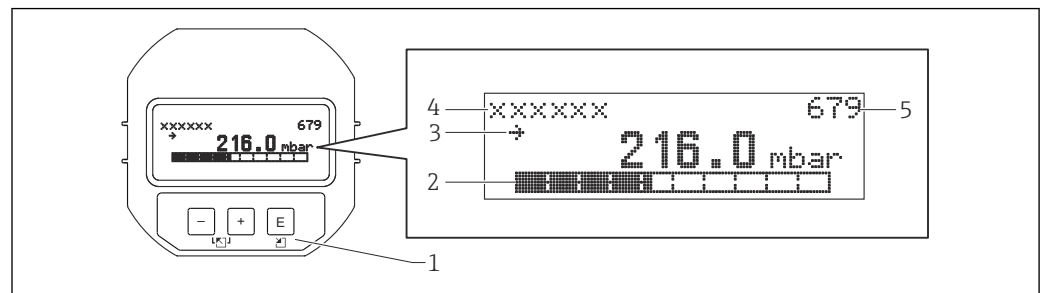
#### Local display (optional)

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

Functions:

- 8-digit measured value display, including algebraic sign and decimal point, in relation to the set pressure range.
  - Bar graph for 4 to 20 mA HART as current display
  - Bar graph for IO-Link as current display
  - Bar graph for PROFIBUS PA as graphic display of the standardized value of the AI Block
  - Bar graph for FOUNDATION Fieldbus as graphic display of the transducer output
- 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.
- Option for configuring the display according to individual requirements and preferences, such as language, alternating display, display of other measured values such as measuring cell temperature, contrast setting
- Comprehensive diagnostic functions (fault and warning message, maximum/minimum indicators, etc.)

#### Overview



A0016498

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

Ordering information: Product Configurator, order code for "Output, Operation"

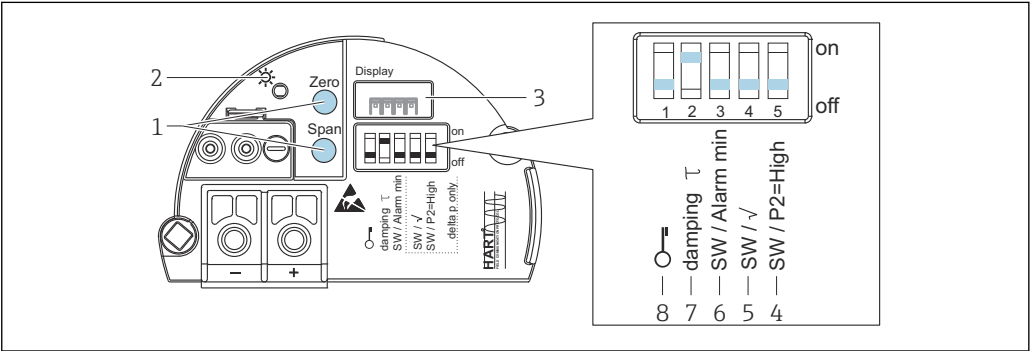
| Function                                                                                   | Operation via display |         |             |                     |
|--------------------------------------------------------------------------------------------|-----------------------|---------|-------------|---------------------|
|                                                                                            | HART                  | IO-Link | 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                            | ✓                     | ✓       | ✓           | ✓                   |
| Switching damping on and off                                                               | ✓                     | ✓       | ✓           | ✓                   |

Operating keys and elements located inside on the electronic insert

| Function                                                                                   | Operation with operating keys and elements on the electronic insert |         |             |                     |
|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---------|-------------|---------------------|
|                                                                                            | HART                                                                | IO-Link | 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                                                               | ✓                                                                   | —       | ✓           | ✓                   |

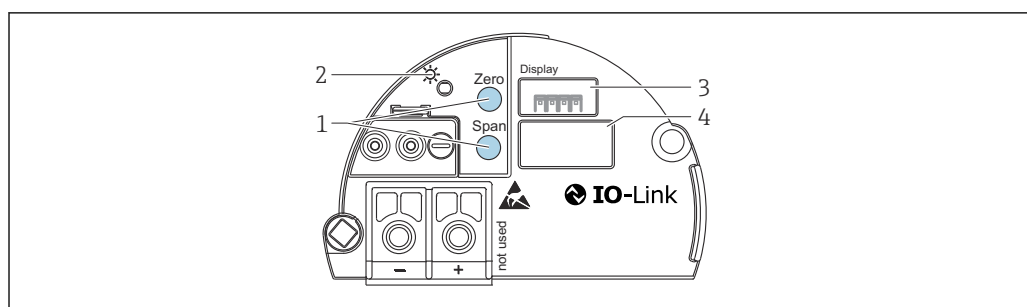
Ordering information:  
Product Configurator, "Output, Operation" ordering feature

HART



- 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 only for Deltabar M
- 5 DIP switch only for Deltabar M
- 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

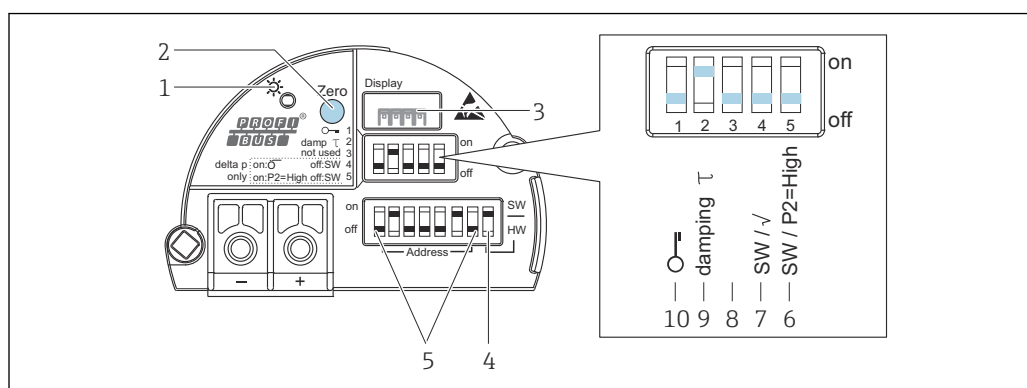
## IO-Link



A0045576

- 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 Slot for M12 plug

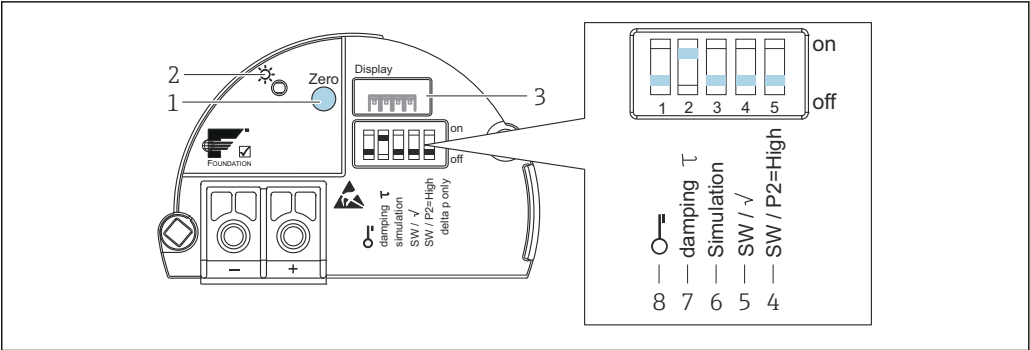
## PROFIBUS PA



A0032659

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

FOUNDATION Fieldbus



A0032660

- 1 Operating key for position zero adjustment (Zero) or reset
- 2 Green LED to indicate successful operation
- 3 Slot for optional local display
- 4 DIP switch only for Deltabar M
- 5 DIP switch only for Deltabar M
- 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

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

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

| Hardware and software for remote operation | HART            | IO-Link         | PROFIBUS PA     | FOUNDATION Fieldbus |
|--------------------------------------------|-----------------|-----------------|-----------------|---------------------|
| FieldCare → 63                             | ✓ <sup>1)</sup> | ✓ <sup>2)</sup> | ✓ <sup>3)</sup> | ✓                   |
| FieldXpert SFX100 → 64                     | ✓               | —               | —               | ✓                   |
| NI-FBUS Configurator → 64                  | —               | —               | —               | ✓                   |
| Field Xpert SMT70, SMT77 → 64              | ✓ <sup>1)</sup> | ✓ <sup>2)</sup> | —               | ✓                   |

- 1) Commubox FXA195 required
- 2) SFP20 required
- 3) Profifboard or Proficard required

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 of device data (upload/download)
- Documentation of measuring point

Connection options:

- HART via Commubox FXA195 and the USB port of a computer
- IO-Link with FieldPort SFP20 and the USB port of a computer and IO-Link IODD Interpreter DTM
- PROFIBUS PA via segment coupler and PROFIBUS interface card



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 from Endress+Hauser. Field Xpert also works as a stand-alone device for asset management applications. For details, refer to BA00060S/04/EN.

### **Field Xpert SMT70, SMT77**

The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous (Ex Zone 2) and non-hazardous areas. It is suitable for commissioning and maintenance staff. It manages Endress+Hauser and third-party field instruments with a digital communication interface and documents the progress of the work. The SMT70 is designed as a complete solution. It comes with a pre-installed driver library and is an easy-to-use, touch-enabled tool for managing field devices throughout their entire life cycle.

The Field Xpert SMT77 for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1. It is suitable for commissioning and maintenance staff for easy management of field instruments with a digital communication interface. The touch-enabled tablet PC is designed as a complete solution. It comes with comprehensive pre-installed driver libraries and offers users a modern software user interface to manage field instruments throughout the entire life cycle.

Required tool for IO-Link: "IO-Link IODD Interpreter DTM" on [www.endress.com](http://www.endress.com)

### **FieldPort SFP20**

The FieldPort SFP20 is a USB interface for the configuration of Endress+Hauser IO-Link devices, and also of devices from other vendors. Combined with the IO-Link CommDTM and the IODD Interpreter, the FieldPort SFP20 complies with the FDT/DTM standards.

### **Commubox FXA195**

For intrinsically safe HART communication with FieldCare via the USB port. For details refer to TI00404F/00/EN.

### **Profiboard**

For connecting a PC to PROFIBUS.

### **Proficard**

For connecting a laptop to 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 NI-FBUS Configurator:*

The NI-FBUS Configurator is an easy-to-use graphical environment for creating linkages, loops, and a schedule based on the FOUNDATION 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 measuring cell-specific parameters



- Create and edit schedules
- Read and write to control systems and control loops
- 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 with 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> |
|---------------------------------------------|----------------------|
| Measuring point (TAG), see additional spec. | Z1                   |
| Bus address, see additional spec.           | Z2                   |

1) Product Configurator, order code for "Marking"

## IO-Link Smart Sensor Profile 2nd Edition

### Supports

- Identification
- Diagnosis
- Digital Measuring Sensor (as per SSP 4.3.3)

## IO-Link (optional)

### *Operating concept for devices with IO-Link*

- Operator-oriented menu structure for user-specific tasks
- Fast and safe commissioning

### *Efficient diagnostic behavior increases measurement availability*

- Remedial measures
- Simulation options

### *IO-Link information*

IO-Link is a point-to-point connection for communication between the measuring device and an IO-Link master. The measuring device features an IO-Link communication interface type 2 (pin 4) with a second IO function on pin 2. This requires an IO-Link-compatible assembly (IO-Link master) for operation. The IO-Link communication interface enables direct access to the process and diagnostic data. It also provides the option of configuring the measuring device while in operation.

### Characteristics of the IO-Link interface:

- IO-Link specification: Version 1.1
- IO-Link Smart Sensor Profile 2nd Edition
- Speed: COM2; 38.4 kBaud
- Minimum cycle time: 10 ms
- Process data width: 14 Byte
- IO-Link data storage: Yes
- Block configuration: Yes
- Device operational: The measuring device is operational 5 seconds after the supply voltage is applied

### *IO-Link download*

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

- Select "Device Driver" from the search options shown
- For "Type", select "IO Device Description (IODD)"  
Select IO-Link (IODD)  
IODD for Deltapilot FMB50
- Under the product root, select the desired device and follow any further instructions.

<https://ioddfinder.io-link.com/>

Search by

- Manufacturer
- Article number
- Product type

#### **Device Search (IO-Link)**

The Device Search parameter is used to uniquely identify the device during installation.

## Certificates and approvals

Current certificates and approvals for the product are available at [www.endress.com](http://www.endress.com) on the relevant product page:

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

|                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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 marking</b>                                                | <p>The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products bear the RCM marking on the nameplate.</p> <div style="text-align: center;">  </div> <p style="text-align: right; font-size: small;">A0029561</p> |
| <b>Ex approvals</b>                                               | <ul style="list-style-type: none"> <li>■ ATEX</li> <li>■ IECEX</li> <li>■ FM</li> <li>■ CSA</li> <li>■ NEPSI</li> <li>■ Combinations of different approvals also</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 Ex devices .</p>                                                                                                                                                                                                                        |
| <b>EAC conformity</b>                                             | <p>The measuring system meets the legal requirements of the applicable EAC guidelines. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.</p> <p>The manufacturer confirms successful testing of the device by affixing to it the EAC mark.</p>                                                                                                                                                                                                                                                                              |
| <b>Suitable for hygiene applications</b>                          | <p>For information on installation and approvals, see documentation SD02503F "Hygiene approvals".</p> <p>For information on 3-A and EHEDG-tested adapters, see documentation TI00426F "Weld-in adapter, process adapter and flanges".</p>                                                                                                                                                                                                                                                                                                                                       |
| <b>Certificate of current Good Manufacturing Practices (cGMP)</b> | <p>Product Configurator, order code for "Test, Certificate" option "JG"</p> <ul style="list-style-type: none"> <li>■ The certificate is only available in English</li> <li>■ Materials of construction of product wetted parts</li> <li>■ TSE compliance</li> <li>■ Polishing and surface finish</li> <li>■ Material/ compound compliance table (USP Class VI, FDA conformity)</li> </ul>                                                                                                                                                                                       |
| <b>Certificate of Compliance ASME BPE 2012 (only FMB50)</b>       | <p>Ordering information:</p> <p>Product Configurator, "Additional approval" ordering feature, option "LW"</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Functional safety SIL</b>                                      | <p>The Deltapilot 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 Deltapilot M, settings and functional safety data, see the "Functional safety manual - Deltapilot M" SD00347P.</p> <p>Ordering information:</p>                                                                                                                            |

Product Configurator, "Additional approval" ordering feature, option "LA"

#### CRN approval

Some device versions have CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device. These devices are fitted with a separate plate bearing the registration number 0F14101.5.

Ordering information:

Product Configurator, "Process connection" ordering feature and

Product Configurator, "Approval" ordering feature

#### AD2000

The pressure retaining material 316L (1.4435/1.4404) corresponds to AD2000 - W2/W10.

#### Pressure Equipment Directive 2014/68/EU (PED)

##### Pressure equipment with allowable pressure $\leq 200$ bar (2 900 psi)

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

Reasons:

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

Note:

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

#### 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                                                                        | FMB50 | FMB51 | FMB52 | FMB53 | Option <sup>1)</sup> |
|------------------------------------------------------------------------------------|-------|-------|-------|-------|----------------------|
| 3.1 Material documentation, wetted metal parts, EN10204-3.1 inspection certificate | ✓     | ✓     | ✓     | ✓     | JA <sup>2)</sup>     |
| Declaration of Conformity NACE MR0175, wetted metal parts                          | ✓     | ✓     | ✓     | ✓     | JB <sup>2)</sup>     |
| Declaration of Conformity NACE MR0103, wetted metal parts                          | ✓     | ✓     | ✓     | ✓     | JE <sup>2)</sup>     |
| Conformity to AD2000, wetted metallic parts, excepting process membrane            | ✓     | —     | —     | —     | JF                   |
| Surface finish measurement ISO4287/Ra, wetted metal parts, inspection certificate  | ✓     | —     | —     | —     | KB                   |
| Helium leak test, internal procedure, inspection certificate                       | ✓     | ✓     | ✓     | ✓     | KD                   |
| Pressure test, internal procedure, inspection certificate                          | ✓     | ✓     | ✓     | —     | KE                   |

| Designation                                                                                                                       | FMB50 | FMB51 | FMB52 | FMB53 | Option <sup>1)</sup> |
|-----------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|----------------------|
| 3.1 Material certificate+delta ferrite measurement, internal procedure, wetted metallic parts, EN10204-3.1 inspection certificate | ✓     | —     | —     | —     | KF                   |
| 3.1 Material certificate+PMI test (XRF), internal procedure, wetted metallic parts, EN10204-3.1 inspection certificate            | ✓     | ✓     | ✓     | ✓     | KG                   |

1) Product Configurator, order code for "Test, Certificate"

2) The selection of this feature for coated process membranes/process connections refers to the metallic base material.

## 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

#### Special device versions

Endress+Hauser offers special device versions as **Technical Special Products (TSP)**.

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

#### Scope of delivery

- Device
- Optional accessories
- Brief Operating Instruction
- Calibration certificates
- Optional certificates

#### Measuring point (TAG)

|                                              |                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Order code for                               | 895: Marking                                                                                                                                                                                                                                                                                                                                        |
| Option                                       | Z1: Tagging (TAG), see additional spec.                                                                                                                                                                                                                                                                                                             |
| Location of measuring point identification   | To be selected in the additional specification: <ul style="list-style-type: none"> <li>■ Tie-on label, stainless steel</li> <li>■ Adhesive paper label</li> <li>■ Label provided</li> <li>■ RFID TAG</li> <li>■ RFID TAG + tie-on label, stainless steel</li> <li>■ RFID TAG + adhesive paper label</li> <li>■ RFID TAG + label provided</li> </ul> |
| Definition of measuring point identification | To be specified in additional specification:<br>3 lines each with a maximum of 18 characters<br><br>The measuring point designation appears on the selected label and/or the RFID TAG.                                                                                                                                                              |
| Identification on electronic nameplate (ENP) | 32 characters                                                                                                                                                                                                                                                                                                                                       |
| Identification on display module             | 10 characters                                                                                                                                                                                                                                                                                                                                       |

#### Configuration data sheet



IO-Link: The following data can only be selected for cyclic data and not for acyclic data.

**Pressure**

If the option "J" was selected for the order code for "Calibration; Unit" in the Product Configurator, the following configuration data sheet must be completed and included with the order.

| Pressure unit                 |                                             |                                              |                              |
|-------------------------------|---------------------------------------------|----------------------------------------------|------------------------------|
| <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"/> kgf/cm <sup>2</sup> | <input type="checkbox"/> kPa |
| <input type="checkbox"/> psi  | <input type="checkbox"/> ftH <sub>2</sub> O |                                              | <input type="checkbox"/> MPa |
|                               | <input type="checkbox"/> inH <sub>2</sub> O |                                              |                              |

| Calibration range / output |                       |
|----------------------------|-----------------------|
| Lower range value (LRV):   | _____ [Pressure unit] |
| Upper range value (URV):   | _____ [Pressure unit] |

| Display                             |                                                   |
|-------------------------------------|---------------------------------------------------|
| 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              |

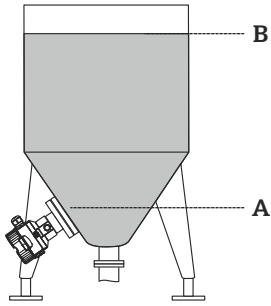
1) (Depending on measuring cell and communication version)

| Damping  |                           |
|----------|---------------------------|
| Damping: | _____ sec (Default 2 sec) |

Smallest calibratable span (preset at factory) →  10

**Level**

If the option "K" was selected for the order code for "Calibration; Unit" in the Product Configurator, the following configuration data sheet must be completed and included with the order.

| Pressure unit                                                                                 |                                                                                                                                                                                         | Output unit (scaled unit)                                                                                                                                                        |                                                                                                  |                                                                                                                                                                                                    |                                                                                                                                                                                                        |                                                                         |                                       |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------|
| <input type="checkbox"/> mbar<br><input type="checkbox"/> bar<br><input type="checkbox"/> psi | <input type="checkbox"/> mmH <sub>2</sub> O<br><input type="checkbox"/> mH <sub>2</sub> O<br><input type="checkbox"/> ftH <sub>2</sub> O<br><input type="checkbox"/> inH <sub>2</sub> O | <input type="checkbox"/> mmHg<br><input type="checkbox"/> kgf/cm <sup>2</sup><br><br><input type="checkbox"/> Pa<br><input type="checkbox"/> kPa<br><input type="checkbox"/> MPa | Mass<br><input type="checkbox"/> kg<br><input type="checkbox"/> t<br><input type="checkbox"/> lb | Lengths<br><input type="checkbox"/> m<br><input type="checkbox"/> dm<br><input type="checkbox"/> cm<br><input type="checkbox"/> mm<br><input type="checkbox"/> ft<br><input type="checkbox"/> inch | Volume<br><input type="checkbox"/> l<br><input type="checkbox"/> hl<br><input type="checkbox"/> m <sup>3</sup><br><input type="checkbox"/> ft <sup>3</sup><br><input type="checkbox"/> in <sup>3</sup> | Volume<br><input type="checkbox"/> gal<br><input type="checkbox"/> lgal | Percent<br><input type="checkbox"/> % |
| Empty pressure [a]: _____<br>Low pressure value (empty) [Pressure engineering unit]           |                                                                                                                                                                                         | Empty calibration [a]: _____<br>Low level value (empty) [Scaled unit]                                                                                                            |                                                                                                  | <b>Example</b><br>                                                                                              |                                                                                                                                                                                                        |                                                                         |                                       |
| Full pressure [b]: _____<br>High pressure value (full) [Pressure engineering unit]            |                                                                                                                                                                                         | Full calibration [b]: _____<br>High level value (full) [Scaled unit]                                                                                                             |                                                                                                  | A 0 mbar / 0m<br>B 300 mbar (4.5 psi) / 3 m (9.8 ft)                                                                                                                                               |                                                                                                                                                                                                        |                                                                         |                                       |

A0023621

| Display                             |                                                                                                                                                                                                                      |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1st Value Display <sup>1)</sup>     | 2nd Value Display                                                                                                                                                                                                    |
| <input type="checkbox"/> Main value | <input type="checkbox"/> None (Default)<br><input type="checkbox"/> Main Value [%]<br><input type="checkbox"/> Pressure<br><input type="checkbox"/> Current [mA] (HART only)<br><input type="checkbox"/> Temperature |

1) (Depending on measuring cell and communication version)

| Damping  |                           |
|----------|---------------------------|
| Damping: | _____ sec (Default 2 sec) |



## Supplementary documentation



- For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)): Enter the serial number from the nameplate
  - *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2D matrix code (QR code) on the nameplate

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard documentation                       | <ul style="list-style-type: none"><li>■ <b>Technical Information: planning guide</b><br/>The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device</li><li>■ <b>Brief Operating Instructions: takes you quickly to the 1st measured value</b><br/>The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning</li><li>■ <b>Operating Instructions: reference manual</b><br/>The Operating Instructions contain all the information that is required in the various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal</li></ul> |
| Supplementary device-dependent documentation | Additional documents are supplied depending on the device version ordered: Always comply strictly with the instructions in the supplementary documentation. The supplementary documentation is an integral part of the device documentation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Field of Activities                          | Pressure measurement, powerful instruments for process pressure, differential pressure, level and flow:<br><br>FA00004P/00/EN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Safety instructions                          | See Download area of the website.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Special Documentation                        | <div> Document SD01553P</div> <p>Mechanical accessories for pressure measuring devices</p> <p>The documentation provides an overview of available manifolds, oval flange adapters, pressure gauge valves, shutoff valves, siphons, condensate pots, cable shortening kits, test adapters, flushing rings, block-and-bleed valves and protective roofs.</p>                                                                                                                                                                                                                                                                                                                                                                                                                |

## Accessories

**Weld-in adapter, Process adapter and Flanges** See technical information TI00426F/00.

**Mounting bracket for wall and pipe mounting** →  29

**Suspension clamp (FMB53 only)** →  29

**Extension cable shortening kit (FMB53 only)** See Product Configurator, "Accessory enclosed" ordering feature, option "PW" or can be ordered as a separate accessory (part no. 71125862).  
For details refer to SD00553P/00/A2.

**M12 connector** →  21

**Adapter Uni for FMB50** For dimensions and technical data, see Technical Information TI00426F.

| Designation                                                                                       | FMB50 | FMB51 | FMB52 | FMB53 | Option <sup>1)</sup> |
|---------------------------------------------------------------------------------------------------|-------|-------|-------|-------|----------------------|
| Weld-in adapter G1-1/2, 316L                                                                      | ✓     | ✓     | ✓     | -     | QJ                   |
| Weld-in tool adapter Uni D65/D85, Brass                                                           | ✓     | -     | -     | -     | Q1                   |
| Weld-in adapter Uni D85, 316L                                                                     | ✓     | -     | -     | -     | Q2                   |
| Weld-in adapter Uni D85, 316L, 3.1 EN10204-3.1 material, inspection certificate                   | ✓     | -     | -     | -     | Q3                   |
| Weld-in adapter Uni 6" D85, 316L                                                                  | ✓     | -     | -     | -     | Q5                   |
| Weld-in adapter Uni 6" D85, 316L, 3.1 EN10204-3.1 material, inspection certificate                | ✓     | -     | -     | -     | Q6                   |
| Welding jig adapter Uni 6" D85, brass                                                             | ✓     | -     | -     | -     | Q7                   |
| Weld-in adapter G1-1/2, 316L, 3.1 EN10204-3.1 material, inspection certificate                    | ✓     | ✓     | ✓     | -     | QK                   |
| Weld-in tool adapter G1-1/2, Brass                                                                | ✓     | ✓     | ✓     | -     | QL                   |
| Weld-in flange DRD DN50 65mm, 316L                                                                | ✓     | -     | -     | -     | QP                   |
| Weld-in fl. DRD DN50 65mm, 316L 3.1 EN10204-3.1 material, inspection certificate                  | ✓     | -     | -     | -     | QR                   |
| Weld-in tool flange DRD DN50 65mm, Brass                                                          | ✓     | -     | -     | -     | QS                   |
| Weld-in adapter Uni D65, 316L                                                                     | ✓     | -     | -     | -     | QT                   |
| Weld-in adapter Uni D65, 316L, 3.1 EN10204-3.1 material, inspection certificate                   | ✓     | -     | -     | -     | QU                   |
| Adapter Uni > DIN11851 DN40, 316L, 3.1, slotted-nut, EN10204-3.1 material, inspection certificate | ✓     | -     | -     | -     | R1                   |
| Adapter Uni > DIN11851 DN50, 316L, 3.1, slotted-nut, EN10204-3.1 material, inspection certificate | ✓     | -     | -     | -     | R2                   |
| Adapter Uni > DRD DN50 65mm, 316L, 3.1 EN10204-3.1 material, inspection certificate               | ✓     | -     | -     | -     | R3                   |
| Adapter Uni > Clamp 2", 316L, 3.1 EN10204-3.1 material, inspection certificate                    | ✓     | -     | -     | -     | R4                   |
| Adapter Uni > Clamp 3", 316L, 3.1 EN10204-3.1 material, inspection certificate                    | ✓     | -     | -     | -     | R5                   |
| Adapter Uni > Varivent, 316L, 3.1 EN10204-3.1 material, inspection certificate                    | ✓     | -     | -     | -     | R6                   |
| Adapter Uni > DIN11851 DN40, 316L, slotted-nut                                                    | ✓     | -     | -     | -     | RA                   |

| Designation                                    | FMB50 | FMB51 | FMB52 | FMB53 | Option <sup>1)</sup> |
|------------------------------------------------|-------|-------|-------|-------|----------------------|
| Adapter Uni > DIN11851 DN50, 316L, slotted-nut | ✓     | -     | -     | -     | RB                   |
| Adapter Uni > DRD DN50 65mm, 316L              | ✓     | -     | -     | -     | RC                   |
| Adapter Uni > Clamp 2", 316L                   | ✓     | -     | -     | -     | RD                   |
| Adapter Uni > Clamp 3", 316L                   | ✓     | -     | -     | -     | RE                   |
| Adapter Uni > Varivent N, 316L                 | ✓     | -     | -     | -     | RF                   |

1) Product Configurator, "Enclosed accessories" section

#### Service-specific accessories

| Accessories              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DeviceCare SFE100        | <p>Configuration tool for HART, PROFIBUS and FOUNDATION Fieldbus field devices</p> <p> Technical Information TI01134S</p> <p> DeviceCare is available for download at <a href="http://www.software-products.endress.com">www.software-products.endress.com</a>. You need to register in the Endress+Hauser software portal to download the application.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| FieldCare SFE500         | <p>FDT-based plant asset management tool</p> <p>FieldCare can configure all smart field units in your plant and helps you manage them. By using the status information, FieldCare is also a simple but effective way of checking the status and condition of the field devices.</p> <p> Technical Information TI00028S</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| FieldPort SFP20          | <p><b>Mobile configuration tool for all IO-Link devices:</b></p> <ul style="list-style-type: none"> <li>■ Pre-installed device and CommDTMs in FieldCare</li> <li>■ Pre-installed device and CommDTMs in FieldXpert</li> <li>■ M12 connection for IO-Link field devices</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Field Xpert SMT70, SMT77 | <p>The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous (Ex Zone 2) and non-hazardous areas. It is suitable for commissioning and maintenance staff. It manages Endress+Hauser and third-party field instruments with a digital communication interface and documents the progress of the work. The SMT70 is designed as a complete solution. It comes with a pre-installed driver library and is an easy-to-use, touch-enabled tool for managing field devices throughout their entire life cycle.</p> <p>The Field Xpert SMT77 for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1. It is suitable for commissioning and maintenance staff for easy management of field instruments with a digital communication interface. The touch-enabled tablet PC is designed as a complete solution. It comes with comprehensive pre-installed driver libraries and offers users a modern software user interface to manage field instruments throughout the entire life cycle.</p> |

## Registered trademarks

- KALREZ®  
Registered label of E.I. Du Pont de Nemours & Co., Wilmington, USA
- TRI-CLAMP®  
Registered label of Ladish & Co., Inc., Kenosha, USA
- HART®  
Registered trademark of the FieldComm Group, Austin, USA
-  IO-Link  
Registered trademark of the IO-Link Community.
- PROFIBUS PA®  
Trademark of the PROFIBUS User Organization, Karlsruhe, Germany
- FOUNDATION™ Fieldbus  
Registered trademark of the FieldComm Group, Austin, USA
- GORE-TEX® trademark of W.L. Gore & Associates, Inc., USA



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

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