

# Technical Information

## Liquiphant FTL64

Vibronic  
HART



Point level switch for liquids in high-temperature applications

### Application

- Point level switch for all liquids, for minimum or maximum detection in tanks, vessels and piping, even in hazardous areas
- Particularly suitable for high-temperature applications with up to 280 °C (536 °F)
- Tuning fork and process connection with highly corrosion-resistant Alloy C22 (2.4602) material and PFA-coated (conductive) version available for very aggressive media
- Process temperature range: -60 to +280 °C (-76 to +536 °F)
- Pressures up to 100 bar (1450 psi)
- Viscosities up to 10 000 mPa·s
- Ideal substitute for float switches; reliable function is not affected by flow, turbulence, air bubbles, foam, vibration, solids content or buildup.

### Advantages

- Approved for safety systems with functional safety requirements up to SIL2/SIL3 in accordance with IEC 61508
- Maximum safety thanks to welded gas-tight feedthrough, even if sensor is damaged
- Function safety: monitoring of the oscillation frequency of the tuning fork
- Heartbeat Technology via Fieldcare/DTM and the free iOS/Android SmartBlue app
- Measuring device with Bluetooth® wireless technology

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## About this document

### Symbols

#### Safety symbols



This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.



This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.



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



This symbol contains information on procedures and other facts which do not result in personal injury.

#### Electrical symbols



Ground connection

Grounded clamp, which is grounded via a grounding system.



Protective earth (PE)

Ground terminals, which must be grounded prior to establishing any other connections. The ground terminals are located on the inside and outside of the device.

#### Symbols for certain types of information



Permitted

Procedures, processes or actions that are permitted.



Forbidden

Procedures, processes or actions that are forbidden.



Tip

Indicates additional information



Reference to documentation



Reference to another section



1., 2., 3. Series of steps

#### Symbols in graphics

A, B, C ... View

1, 2, 3 ... Item numbers

## Function and system design

### point level detection

Maximum or minimum detection for liquids in tanks or pipes in all industries. Suitable for leakage monitoring, pump dry-running protection or overflow prevention, for example.

Specific versions are suitable for use in hazardous areas.

The point level switch differentiates between the "covered" and "not covered" conditions.

Depending on the MIN (minimum detection) or MAX (maximum detection) modes, there are two possibilities in each case: OK status and demand mode.

OK status

- In MIN mode, the fork is covered, e.g. Pump dry running protection
- In MAX mode, the fork is not covered e.g. overflow prevention

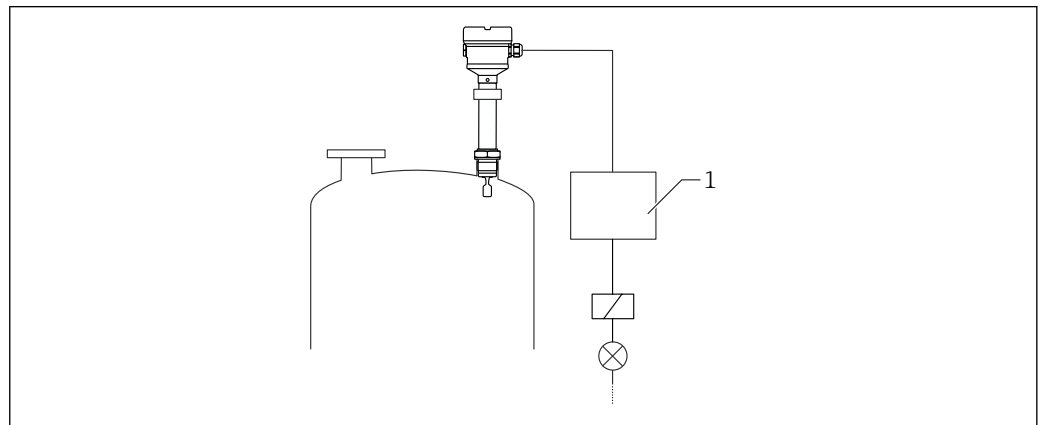
Demand mode

- In MIN mode, the fork is not covered e.g. pump dry running protection
- In MAX mode, the fork is covered e.g. overflow prevention

### Measuring principle

The sensor's tuning fork vibrates at its intrinsic frequency. As soon as the liquid covers the tuning fork, the vibration frequency decreases. The change in frequency causes the point level switch to switch.

### Measuring system



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1 Example of a measuring system

1 Switching unit, PLC etc.

### Dependability for measuring devices with HART or Bluetooth

#### IT security

Endress+Hauser can only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings. IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

#### Device-specific IT security

The device offers specific functions to support protective measures by the operator. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. An overview of the most important functions is provided in the following section:

- Write protection via hardware write protection switch
- Access code (applies for operation via display, Bluetooth, FieldCare, DeviceCare, AMS, PDM ...)

## Input

### Measured variable

Level (point level), MAX or MIN safety

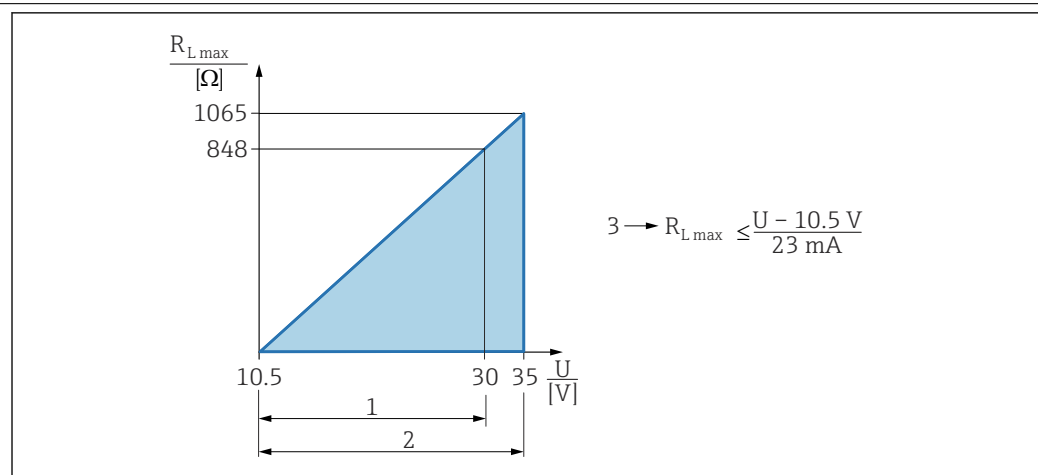
<b>Measuring range</b>	Depends on the installation location and the pipe extension ordered Standard pipe extension up to 3 m (9.8 ft) and up to 6 m (20 ft) on request.
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## Output


<b>Output signal</b>	<b>SIO (FEL60H electronic insert)</b> 8/16 mA (SIO) with superimposed digital communication protocol HART, 2-wire  <b>Continuous operation (FEL60H electronic insert)</b> 4 to 20 mA proportional to the oscillation frequency with superimposed digital communication protocol HART, 2-wire For continuous current output, one of the following modes of operation can be selected: <ul style="list-style-type: none"> <li>■ 4.0 to 20.5 mA</li> <li>■ NAMUR NE 43: 3.8 to 20.5 mA (factory setting)</li> <li>■ US mode: 3.9 to 20.8 mA</li> </ul>
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<b>Signal on alarm</b>	Signal on alarm in accordance with NAMUR recommendation NE 43. 4 to 20 mA HART: <ul style="list-style-type: none"> <li>■ Max. alarm: can be set from 21.5 to 23 mA</li> <li>■ Min. alarm: &lt; 3.6 mA (factory setting)</li> </ul>
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### Load




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 2 Load 4 to 20 mA HART

- 1 Power supply 10.5 to 30 V<sub>DC</sub> Ex i
- 2 Power supply 10.5 to 35 V<sub>DC</sub> for other types of protection and for non-certified device versions
- 3  $R_{Lmax}$  maximum load resistance
- U Supply voltage

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

<b>Damping</b>	Damping affects all the outputs (output signal, display) and is only available in the continuous 4 to 20 mA mode.
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 Damping has no effect on the SIO.

Activating damping:

Via local display, Bluetooth, handheld terminal or PC with operating program, continuous from 0 to 999 s

Factory setting: 1 s

**Switch output**

Preset switching delay times can be ordered:

- 0.5 s when the tuning fork is covered and 1.0 s when the tuning fork is uncovered (factory setting)
- 0.25 s when the tuning fork is covered and 0.25 s when the tuning fork is uncovered (fastest setting)
- 1.5 s when the tuning fork is covered and 1.5 s when the tuning fork is uncovered
- 5.0 s when the tuning fork is covered and 5.0 s when the tuning fork is uncovered



The user can also set the switching delays for when the fork is covered and uncovered in the range from 1 to 60 seconds independently of one another.

(Operation via display, Bluetooth or FieldCare, DeviceCare, AMS, PDM)

**Ex connection data**

See safety instructions (XA): All data relating to explosion protection are provided in separate Ex documentation and are available from the Downloads Area of the Endress+Hauser-website. The Ex documentation is supplied as standard with all Ex devices.

**Protocol-specific data****HART**

- Manufacturer ID: 17 (0x11)
- Device type code: 0x11C4
- Device revision: 1
- HART specification: 7
- DD revision: 1
- Device description files (DTM, DD) information and files at:
  - [www.endress.com](http://www.endress.com)
  - [www.fieldcommgroup.org](http://www.fieldcommgroup.org)
- HART load: min. 250 Ω

*HART device variables (preset at the factory)*

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

Device variable	Measured value
<b>Primary variable (PV)</b> parameter (Primary variable) <sup>1)</sup>	Point level detection <sup>2)</sup>
<b>Secondary variable (SV)</b> parameter (Secondary variable)	Sensor frequency <sup>3)</sup>
<b>Tertiary variable (TV)</b> parameter (Third variable)	Fork state <sup>4)</sup>
<b>Quaternary variable (QV)</b> parameter (Quaternary variable)	Sensor temperature

- 1) The PV is always applied to the current output.
- 2) Point level detection is the initial state depending on the fork state (uncovered/covered) and the safety function (MIN/MAX)
- 3) Sensor frequency is the oscillation frequency of the fork
- 4) Fork state is the fork state (**Fork covered** option/**Fork uncovered** option)

*Choice of HART device variables*

- Level limit detection
- Sensor frequency
- Fork state
- Sensor temperature
- Terminal current

The terminal current is the read-back current on terminal block. Visibility depends on order options or device settings

- Terminal voltage
- Visibility depends on order options or device settings

*Supported functions*

- Burst mode
- Additional transmitter status
- Device locking

**Wireless HART data**

- Minimum start-up voltage: 10.5 V
- Start-up current: > 3.6 mA
- Start-up time: < 8 s
- Minimum operating voltage: 10.5 V
- Multidrop current: 4 mA

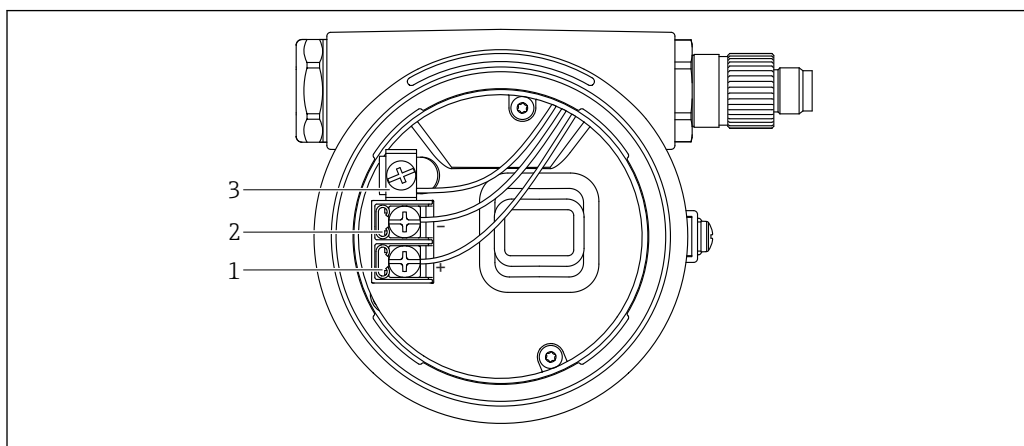
**Heartbeat Technology****Heartbeat Technology module**

The software package consists of 3 modules. These three modules combined check, evaluate and monitor device functionality and process conditions.




- Heartbeat Diagnostics
- Heartbeat Verification
- Heartbeat Monitoring

## Power supply

**Terminal assignment****Single compartment housing**

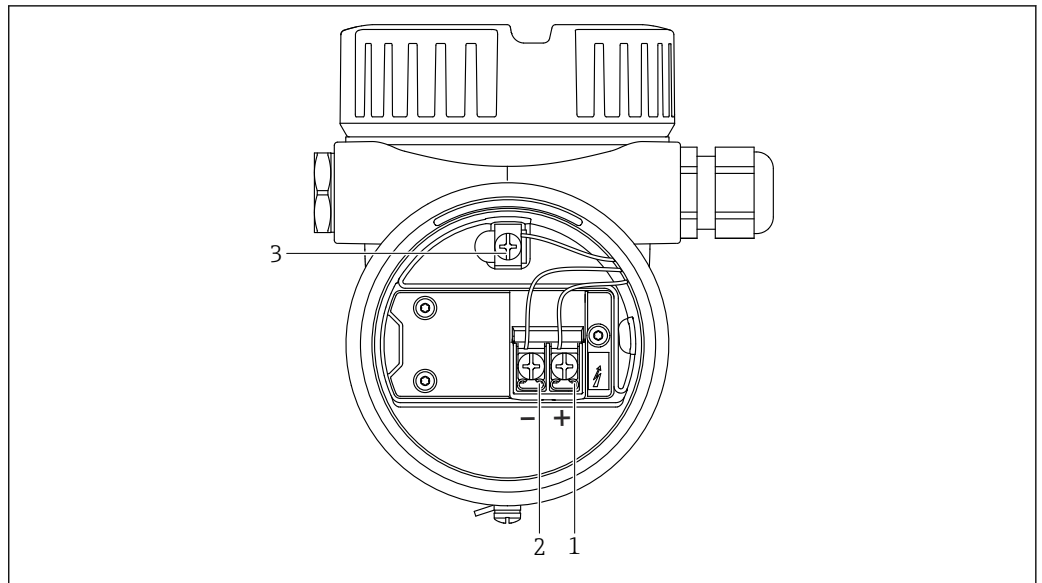
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 3 Connection terminals and ground terminal in the connection compartment

- 1 Positive terminal
- 2 Negative terminal
- 3 Internal ground terminal



### Dual-compartment housing, L-shape



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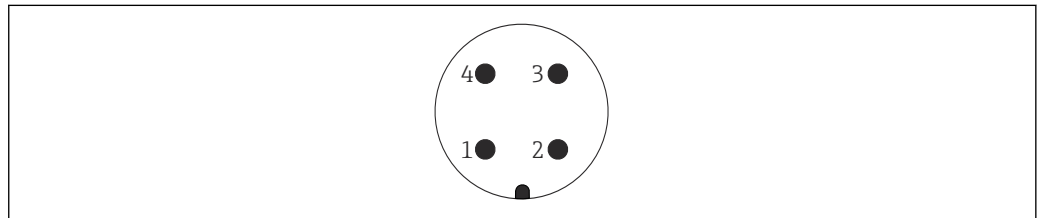
4 Connection terminals and ground terminal in the connection compartment

- 1 Positive terminal
- 2 Negative terminal
- 3 Internal ground terminal

### Available device plugs

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

### M12 plug



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5 M12 plug, pin assignment

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

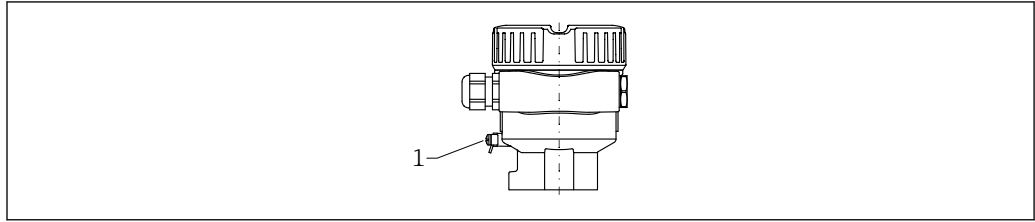
**A** For more details, see the "Accessories" section.

### Supply voltage

- $U = 10.5$  to  $35 V_{DC}$  (Ex d, Ex e, non-Ex)
- $U = 10.5$  to  $30 V_{DC}$  (Ex i)
- Rated current: 4 to 20 mA HART

- i**
  - The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV, Class 2).
  - Comply with the following according to IEC/EN61010-1: provide a suitable circuit breaker for the device.

## Potential equalization



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- 1 Ground terminal for connecting the potential matching line

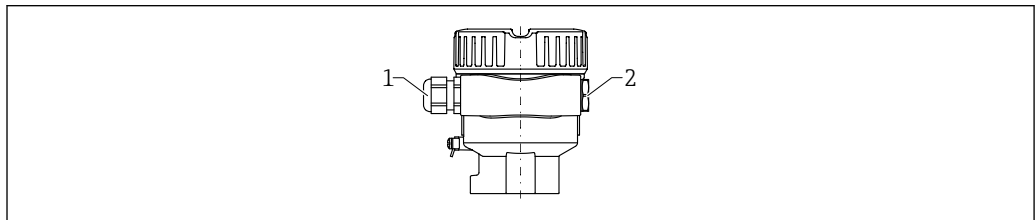
**i** If necessary, the potential matching line can be connected to the outer ground terminal of the transmitter before the device is connected.

- i** For optimum electromagnetic compatibility:
- Keep the potential matching line as short as possible
  - Observe the minimum cross-section of 2.5 mm<sup>2</sup> (14 AWG)

## 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 entries



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- 1 Cable entry  
2 Dummy plug

The type of cable entry depends on the device version ordered.

## Cable specification

- The cable outer diameter depends on the cable entry used
- Cable outer diameter
  - Plastic: Ø5 to 10 mm (0.2 to 0.38 in)
  - Nickel-plated brass: Ø7 to 10.5 mm (0.28 to 0.41 in)
  - Stainless steel: Ø7 to 12 mm (0.28 to 0.47 in)

## Overvoltage protection

### Devices without optional overvoltage protection

Equipment from Endress+Hauser fulfills the requirements of the product standard IEC/DIN EN 61326-1 (Table 2 Industrial Environment).

Depending on the type of port (DC supply, input/output port) different test levels according to IEC/DIN EN 61326-1 against transient overvoltages (Surge) are applied (IEC/DIN EN 61000-4-5): Test level on DC power ports and input/output ports is 1 000 V line to earth

### Devices with optional overvoltage protection

- Spark-over voltage: min. 400 V<sub>DC</sub>
- Tested: According to IEC/DIN EN 60079-14 sub chapter 12.3 (IEC/DIN EN 60060-1 chapter 7)
- Nominal discharge current: 10 kA

### Overvoltage category

Overvoltage category II

### Pollution degree

Pollution degree 2


Performance characteristics

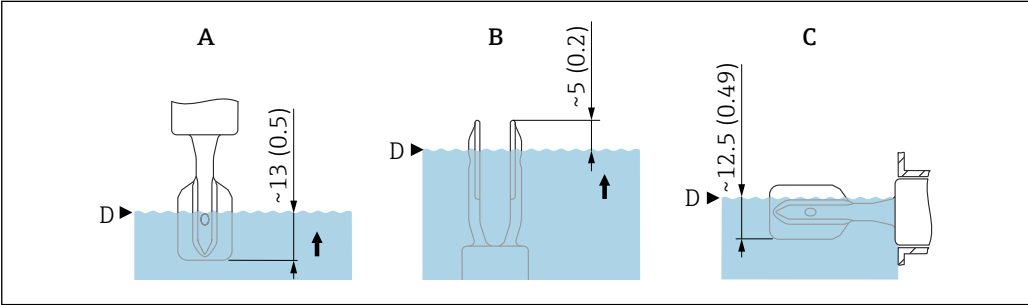
Reference operating conditions


- Ambient temperature: +23 °C (+73 °F)
- Process temperature: +23 °C (+73 °F) ±5 °C (9 °F)
- Medium density (water): 1 g/cm³
- Medium viscosity: 1 mPa·s
- Process pressure: unpressurized
- Sensor installation: vertically from above
- Density selection switch: > 0.7 g/cm³ (SGU)
- Switch direction of sensor: uncovered to covered

Take switch point into consideration

The following are typical switch points, depending on the orientation of the point level switch.  
Water +23 °C (+73 °F)

 Minimum distance between the fork tip and the tank wall or pipe wall: 10 mm (0.39 in)



 6 Typical switch points. Unit of measurement mm (in)

- A Installation from above
- B Installation from below
- C Installation from the side
- D Switch point

Maximum measured error

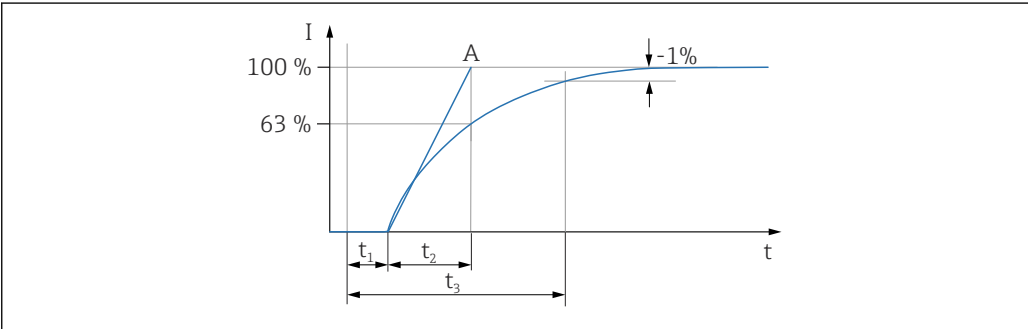
At reference operating conditions: max. ±1 mm (0.04 in)

Resolution

Current output: < 1 µA

Dead time, time constant, settling time

Presentation of the dead time, time constant and settling time as per DIN EN 61298-2



- t<sub>1</sub> Dead time
- t<sub>2</sub> Time constant
- t<sub>3</sub> Settling time
- A Stable full scale value

Dynamic behavior, current output

- Dead time (t<sub>1</sub>): 100 ms
- Time constant T63 (t<sub>2</sub>): can be set from 0 to 999 s
- Settling time (t<sub>3</sub>): minimum 250 ms

### Dynamic behavior, digital output

- Dead time ( $t_1$ ):
  - Minimum: 200 ms
  - Maximum: 800 ms
- Time constant T63 ( $t_2$ ): can be set from 0 to 999 s
- Settling time ( $t_3$ ): minimum 200 ms

### Reading cycle

- Acyclic: maximum 3/s, typically 1/s (depending on command # and number of preambles)
- Cyclic (burst): maximum 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): at least 300 ms

### Hysteresis

At reference operating conditions: 2.5 mm (0.1 in)

### Non-repeatability

0.5 mm (0.02 in)

### Influence of the process temperature

The switch point moves between +1.4 to -5.5 mm (+0.06 to -0.22 in) in the temperature range from -60 to +280 °C (-76 to +536 °F)

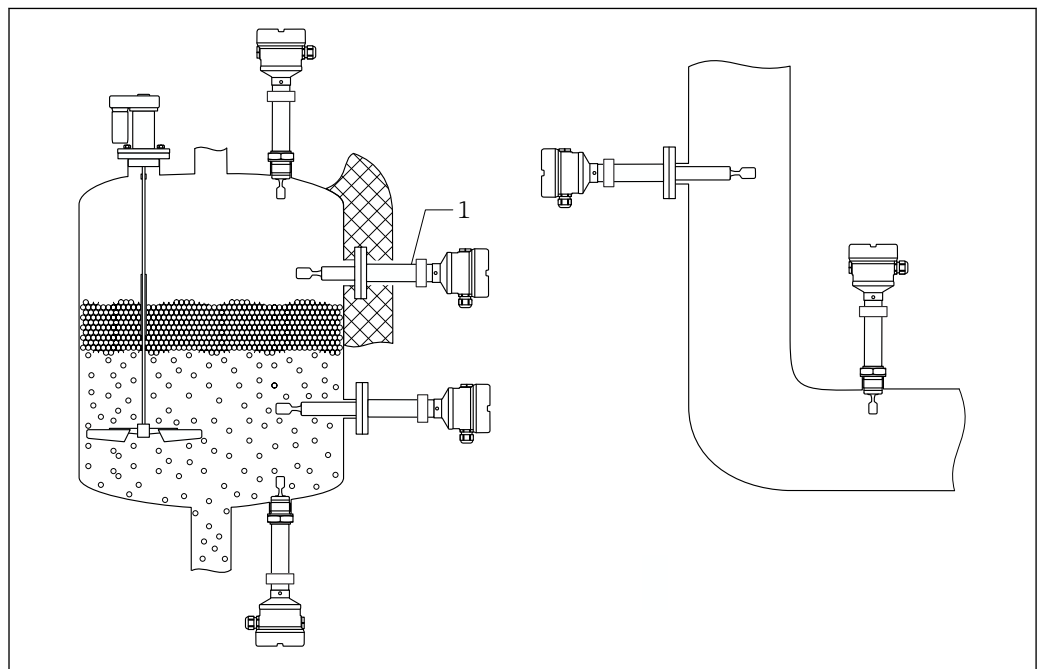
### Influence of the process pressure

The switch point moves between 0 to -3.9 mm (0 to -0.15 in) in the pressure range from -1 to +100 bar (14.5 to 1450 psi)

## Mounting

### Mounting location, orientation

- Any orientation for device with short pipe up to approx. 500 mm (19.7 in)
- Vertical orientation from above for device with long pipe
- Minimum distance between the fork tip and the tank wall or pipe wall: 10 mm (0.39 in)



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7 Installation examples for a vessel, tank or pipe

1 Temperature spacer with gas-tight glass feedthrough for tank with insulation and/or high process temperatures

## Installation instructions

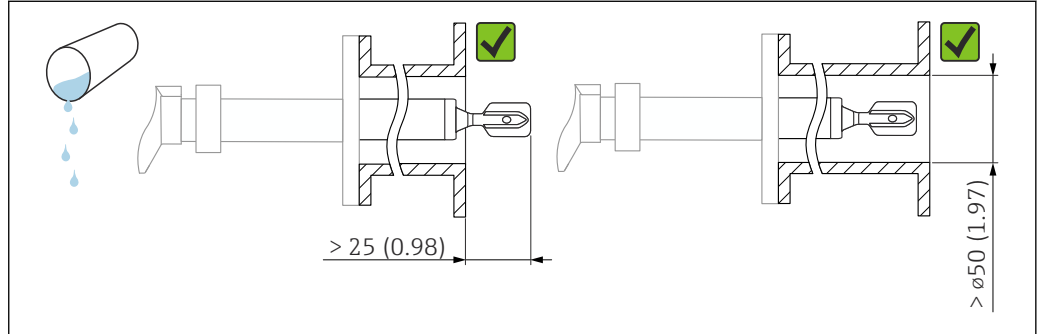
### Take viscosity into consideration

#### Low viscosity



Low viscosity, e.g. water:  $< 2\,000\text{ mPa}\cdot\text{s}$

It is permitted to position the tuning fork within the installation socket.



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8 Installation example for low-viscosity liquids. Unit of measurement mm (in)

#### High viscosity

##### NOTICE

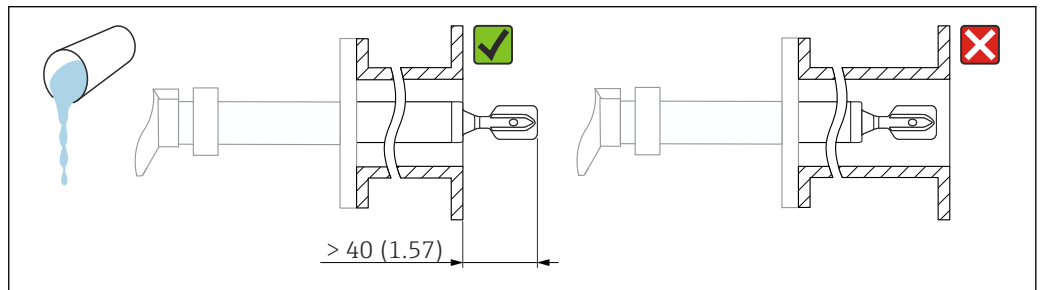
**Highly viscous liquids may cause switching delays.**

- ▶ Make sure that the liquid can run off the tuning fork easily.
- ▶ Deburr the socket surface.



High viscosity, e.g. viscous oils:  $\leq 10\,000\text{ mPa}\cdot\text{s}$

The tuning fork must be located outside the installation socket!

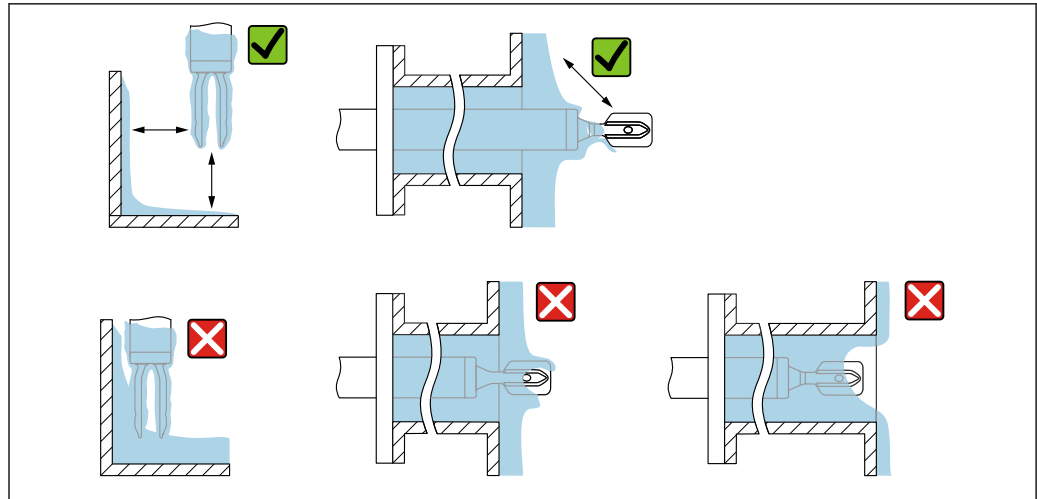


A0042335

9 Installation example for a highly viscous liquid. Unit of measurement mm (in)

### Avoid buildup

- Use short installation sockets to ensure that the tuning fork projects freely into the vessel
- Leave sufficient distance between the buildup expected on the tank wall and the tuning fork

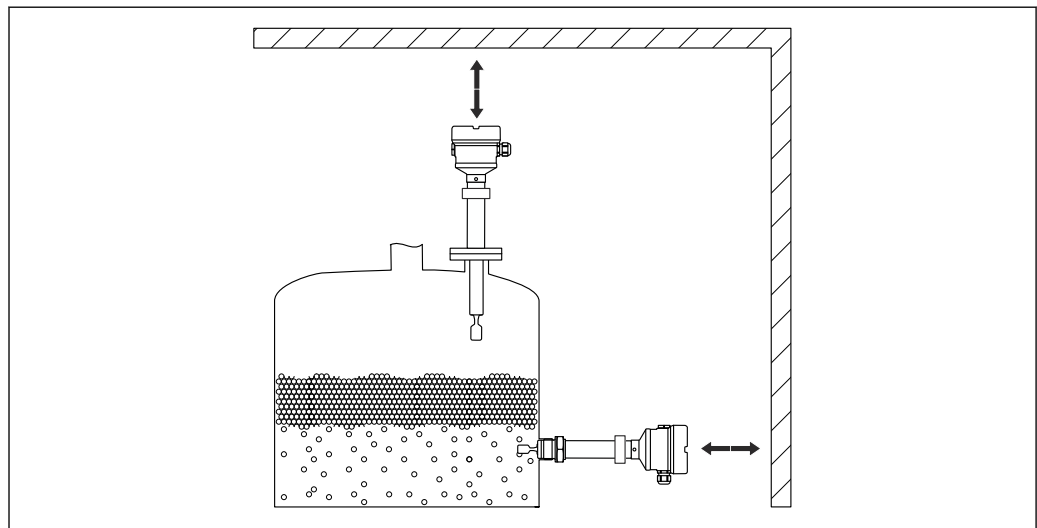


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10 Installation examples for a highly viscous process medium

### Take clearance into consideration

Allow sufficient space outside the tank for mounting, connection and settings involving the electronic insert.



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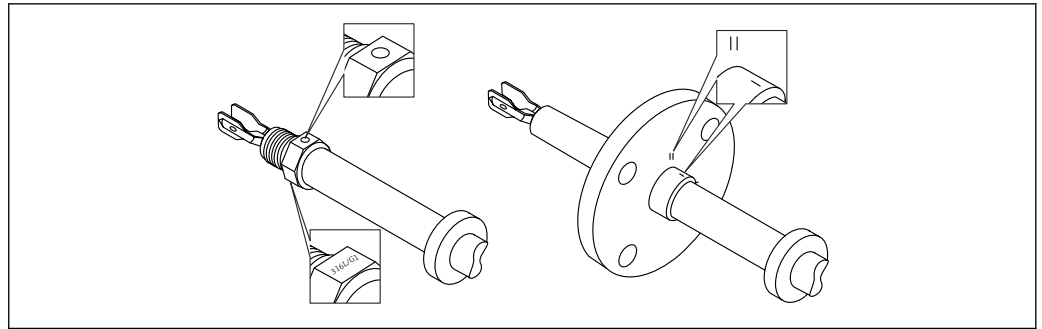
11 Take clearance into consideration

### Aligning the tuning fork using the marking

The tuning fork can be aligned using the marking. Medium can thus run off easily and buildup is avoided.

Markings may include the following:

- Material information, thread name or circle on the hexagonal nut
- II symbol on the back of the flange

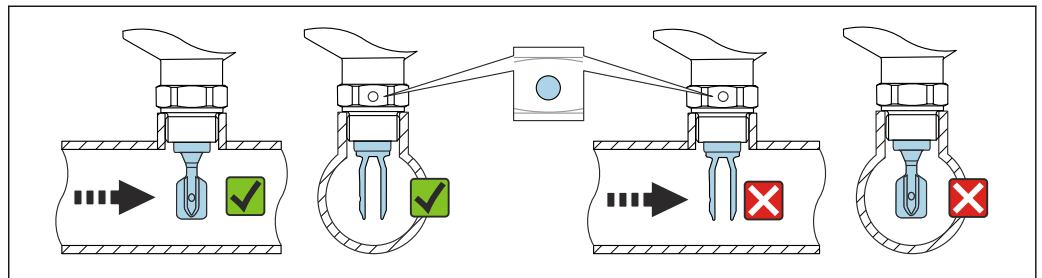


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12 Markings to align the tuning fork

### Installing in pipes

- Flow velocity up to 5 m/s with a viscosity of 1 mPa·s and density of 1 g/cm<sup>3</sup> (SGU). Check for correct functioning in the event of other process medium conditions.
- The flow will not be significantly impeded if the tuning fork is correctly aligned and the marking is pointing in the direction of flow.
- The marking is visible when installed.

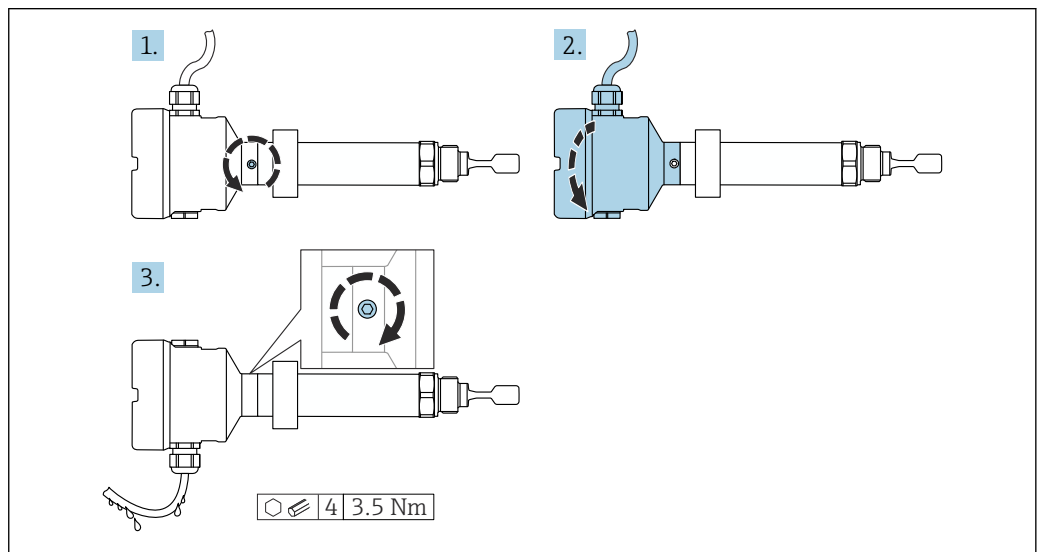


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13 Installation in pipes (take fork position and marking into consideration)

### Align the cable entry

The housing can be turned and the cable aligned by turning the locking screw.



A0042355

14 Housing with external locking screw and drip loop

## Special mounting instructions

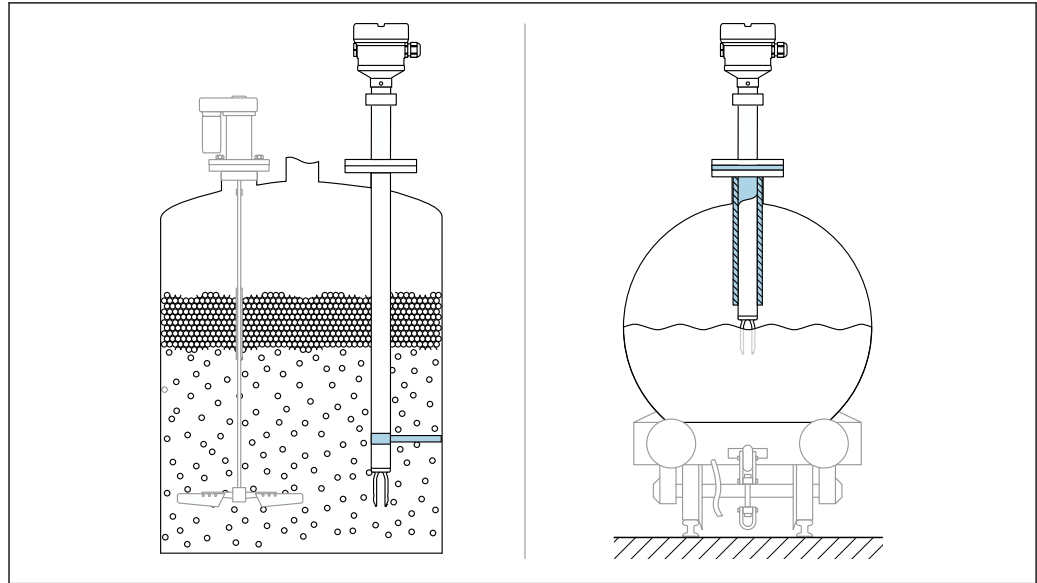
### Support the device

#### NOTICE

If the device is supported incorrectly, shocks and vibrations can damage the coated surface.

- Only use suitable supports.

Support the device in the event of severe dynamic load. Maximum lateral loading capacity of the pipe extensions and sensors: 75 Nm (55 lbf ft).



A0042356

15 Examples of support in the event of dynamic load

**i** Marine approval: In the case of pipe extensions or sensors longer than 1 600 mm, a support is needed at least every 1 600 mm.

### Sliding sleeves

**i** For more details, see the "Accessories" section.

## Environment

### Ambient temperature range

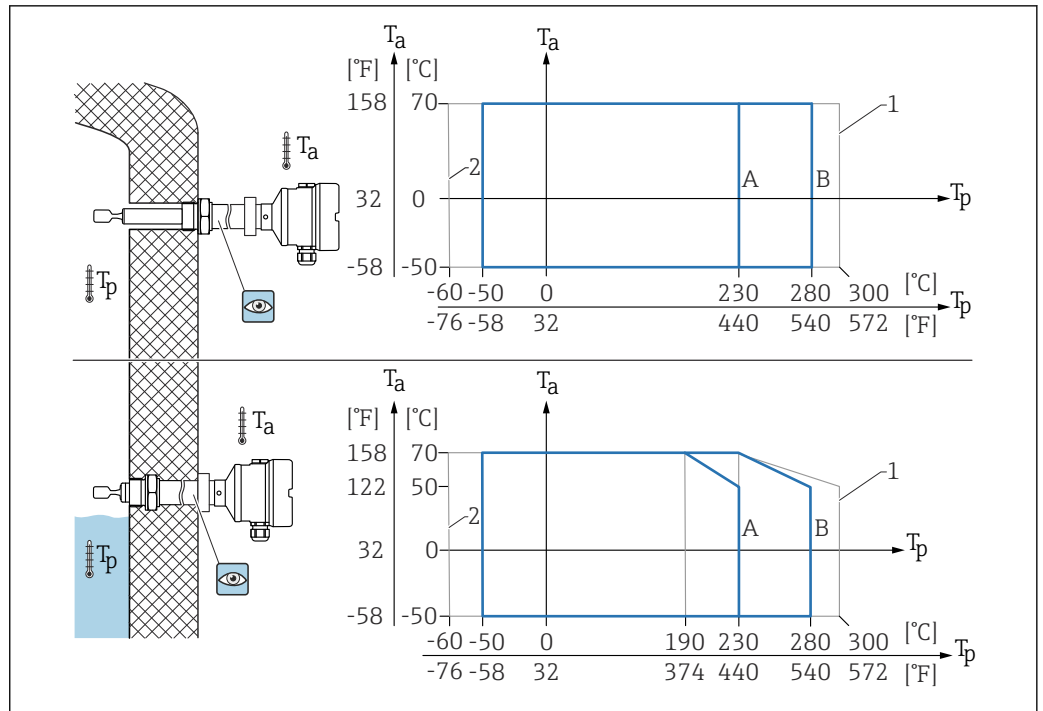
The following values apply up to a process temperature of +90 °C (+194). At higher process temperatures, the permitted ambient temperature is reduced (see diagram).

- Without LCD display: -40 to +70 °C (-40 to +158)
  - With LCD display: -40 to +70 °C (-40 to +158) with limitations in optical properties, such as display speed and contrast
- Can be used without limitations: -20 to +60 °C (-4 to +140 °F)

Optionally available:

- -50 °C (-58 °F) with restricted operating life and performance
  - -60 °C (-76 °F) with restricted operating life and performance,
- i** Below -50 °C (-58 °F): measuring devices can be permanently damaged





16 Permitted ambient temperature  $T_a$  at the housing as a function of the process temperature  $T_p$  in the vessel

- A 230 °C (446 °F) sensor
- B 280 °C (536 °F) sensor
- 1 Max. 50 h on cumulative basis
- 2 Only for ATEX and CSA certificates

Outdoor operation in strong sunlight:

- Mount the device in a shaded location
- Avoid direct sunlight, particularly in warmer climatic regions
- Use a weather protection cover, can be ordered as an accessory

#### Hazardous area

In the hazardous area, the permitted ambient temperature can be limited depending on the zones and gas groups. Pay attention to the information in the Ex documentation (XA).

Storage temperature	<p>–40 to +80 °C (–40 to +176 °F)</p> <p>Optional –50 °C (–58 °F) or –60 °C (–76 °F)</p> <p>With M12 plug, elbowed: –25 to +80 °C (–13 to +176 °F)</p>
Humidity	Operation up to 100 %. Do not open in a condensing atmosphere.
Operating height	Up to 5 000 m (16 404 ft) above sea level.
Climate class	As per IEC 60068-2-38 test Z/AD
Degree of protection	<p>In accordance with DIN EN 60529, NEMA 250</p> <p><b>IP66/IP68 NEMA 4X/6P (1.83 m H<sub>2</sub>O for 24 h)</b></p> <p>Types of housing:</p> <ul style="list-style-type: none"> <li>■ Single compartment; aluminum, coated; Ex d/XP</li> <li>■ Dual-compartment, L-shape; aluminum, 316L; Ex d/XP</li> </ul> <p>Degree of protection for M12 plug</p> <ul style="list-style-type: none"> <li>■ When housing is closed and connecting cable is plugged in: IP66/67 NEMA Type 4X</li> <li>■ When housing is open or connecting cable is not plugged in: IP20, NEMA Type 1</li> </ul>

**NOTICE****M12 plug: Loss of IP protection class due to incorrect installation!**

- ▶ The degree of protection only applies if the connecting cable used is plugged in and screwed tight.
- ▶ The degree of protection only applies if the connecting cable used is specified according to IP67 NEMA Type 4X.



Ordering information: Select the required option in the order code for "Electrical connection". Exclusion criteria are taken into account automatically.

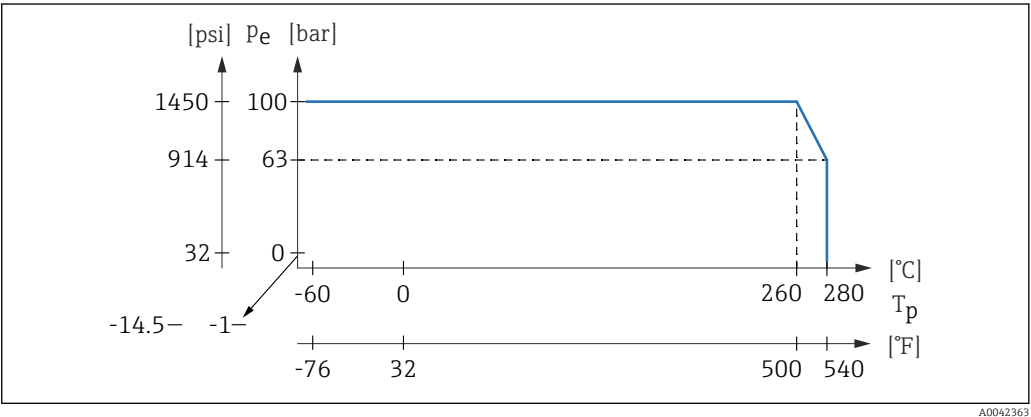
<b>Vibration resistance</b>	As per IEC60068-2-64-2008 $a(\text{RMS}) = 50 \text{ m/s}^2$ , $f = 5 \text{ to } 2000 \text{ Hz}$ , $t = 3 \text{ axes} \times 2 \text{ h}$
<b>Shock resistance</b>	In accordance with IEC60068-2-27-2008: $300 \text{ m/s}^2 [= 30 g_n] + 18 \text{ ms}$ $g_n$ : standard acceleration of gravity
<b>Mechanical load</b>	Support the device in the event of severe dynamic load. Maximum lateral loading capacity of the pipe extensions and sensors: 75 Nm (55 lbf ft). For more details, see the "Supporting the device" section.
<b>Pollution degree</b>	Pollution level 2
<b>Electromagnetic compatibility (EMC)</b>	<ul style="list-style-type: none"> <li>■ Electromagnetic compatibility as per EN 61326 series and NAMUR recommendation EMC (NE21)</li> <li>■ With regard to the safety function (SIL), the requirements of EN 61326-3-x are satisfied</li> <li>■ Maximum deviation under disturbance: <math>&lt; 0.5\%</math> of span</li> </ul> For more details, refer to the EU Declaration of Conformity.

## Process

<b>Process temperature range</b>	<ul style="list-style-type: none"> <li>■ <math>-60 \text{ to } +230 \text{ }^\circ\text{C}</math> (<math>-76 \text{ to } +446 \text{ }^\circ\text{F}</math>)</li> <li>■ <math>-60 \text{ to } +280 \text{ }^\circ\text{C}</math> (<math>-76 \text{ to } +536 \text{ }^\circ\text{F}</math>)/to <math>300 \text{ }^\circ\text{C}</math> (<math>572 \text{ }^\circ\text{F}</math>) for max. 50 h on cumulative basis</li> <li>■ <math>-50 \text{ to } +230 \text{ }^\circ\text{C}</math> (<math>-58 \text{ to } +446 \text{ }^\circ\text{F}</math>) with PFA coating (conductive)</li> </ul> <p>The device can be ordered for use in very aggressive media with a highly corrosion-resistant PFA coating. At medium temperatures up to <math>\geq 150 \text{ }^\circ\text{C}</math> (<math>302 \text{ }^\circ\text{F}</math>), pay attention to the chemical durability and the increasing risk of damage to the coating from diffusion.</p> <p>Observe pressure and temperature dependency,  see the "Process pressure range of the sensors" section.</p>
<b>Thermal shock</b>	Without restrictions within the process temperature range. With PFA coating (conductive): $\leq 120 \text{ K/s}$
<b>Process pressure range</b>	<p> <b>WARNING</b></p> <p><b>The maximum pressure for the device depends on the lowest-rated element, with regard to pressure, of the selected component. This means that it is necessary to pay attention to the process connection as well as the sensor.</b></p> <ul style="list-style-type: none"> <li>▶ For pressure specifications, see the "Mechanical construction" section.</li> <li>▶ Only operate the device within the specified limits!</li> <li>▶ The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the device.</li> </ul> <p>Refer to the following standards for the permitted pressure values of the flanges at higher temperatures:</p> <ul style="list-style-type: none"> <li>■ pR EN 1092-1: With regard to its stability-temperature property, the material 1.4435 is identical to 1.4404, which is classed as 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.</li> <li>■ ASME B 16.5</li> <li>■ JIS B 2220</li> </ul>

In each case, the lowest value from the derating curves of the device and the selected flange applies.

Process pressure range of the sensors



Ordering information: Product Configurator, "Application" feature:

- PN: max. 100 bar (1 450 psi) max. 230 °C (446 °F)
- PN: max. 100 bar (1 450 psi) max. 280 °C (536 °F)
- With PFA coating (conductive): max. 40 bar (580 psi) max. 230 °C (446 °F)

**i** Devices with CRN approval: maximum 90 bar (1 305 psi) for devices with a pipe extension.  
Information on the Endress+Hauser website: [www.endress.com](http://www.endress.com) → Downloads.

Test pressure	Test pressure = 1.5 · PN <ul style="list-style-type: none"><li>■ Maximum 100 bar (1 450 psi) at 230 °C (446 °F) and 280 °C (536 °F)</li><li>■ Membrane burst pressure at 200 bar (2 900 psi)</li></ul> The device function is limited during the pressure test. The mechanical integrity is guaranteed at pressures up to 1.5 times the process nominal pressure PN.
State of aggregation	Liquid
Medium density	<b>Liquids with density &gt; 0.7 g/cm<sup>3</sup></b> Setting > 0.7 g/cm <sup>3</sup> (as-delivered state) <b>Liquids with density 0.5 to 0.8 g/cm<sup>3</sup></b> Setting > 0.5 g/cm <sup>3</sup> (can be ordered as preset value or user-configurable) <b>Liquids with density &gt; 0.4 g/cm<sup>3</sup> (not for devices with SIL approval)</b> Setting > 0.4 g/cm <sup>3</sup> (can be ordered as preset value or user-configurable)
Viscosity	≤ 10 000 mPa·s
Pressure tightness	Up to vacuum <b>i</b> In vacuum evaporation plants, select the 0.4 g/cm <sup>3</sup> density setting.
Solids contents	∅ ≤ 5 mm (0.2 in)

Mechanical construction

**i** For the dimensions, see the Product Configurator: [www.endress.com](http://www.endress.com)

Search for product → click "Configuration" to the right of the product image → after configuration click "CAD"

The following dimensions are rounded values. For this reason, they may deviate slightly from the dimensions given on [www.endress.com](http://www.endress.com).

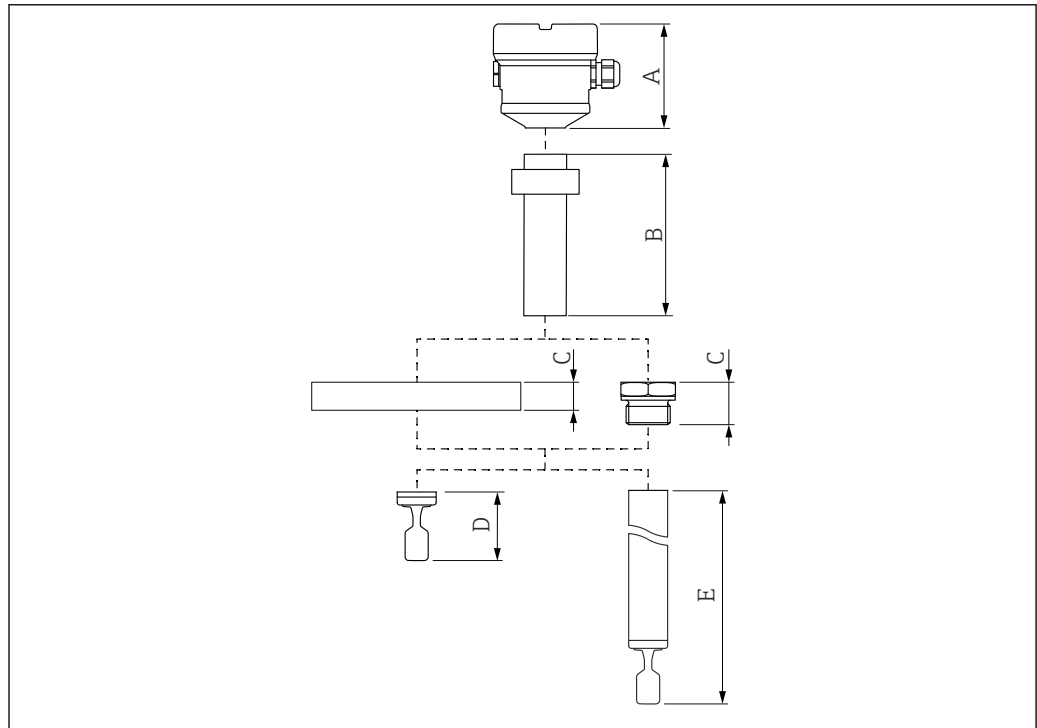
**Design, dimensions****Device height**

The device height consists of the following components:

- Housing including cover
- Temperature spacer with gas-tight glass feedthrough (second line of defense)
- Compact version or pipe extension
- Process connection (flange, thread)

The individual heights of the components can be found in the following sections:

- Determine device height and add individual heights
- Take the installation clearance into consideration (space that is needed to install the device)



A0042418

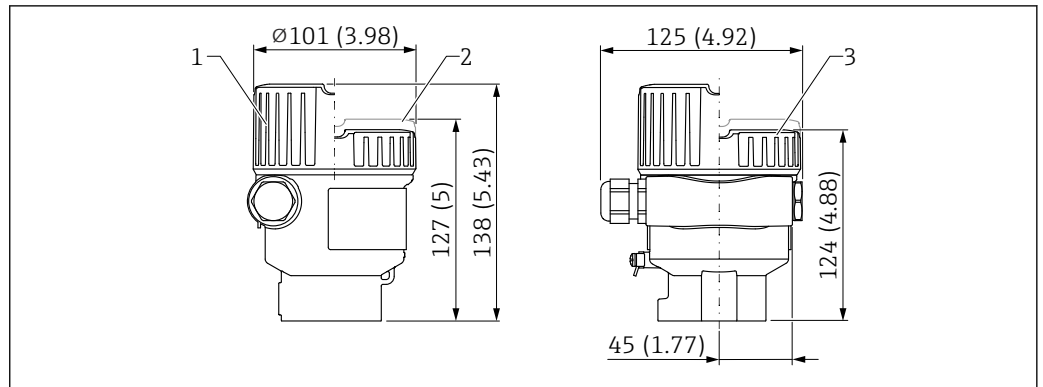
17 Components to determine the device height

- A Housing including cover
- B Temperature spacer with gas-tight glass feedthrough → 2 lengths available, depending on the process temperature
- C Process connection (flange, thread)
- D Tuning fork
- E Pipe extension with tuning fork

**Dimensions****Housing and cover**

All housings can be aligned. In the case of metal housings, the housing alignment can also be fixed with the locking screw.

### Single compartment housing

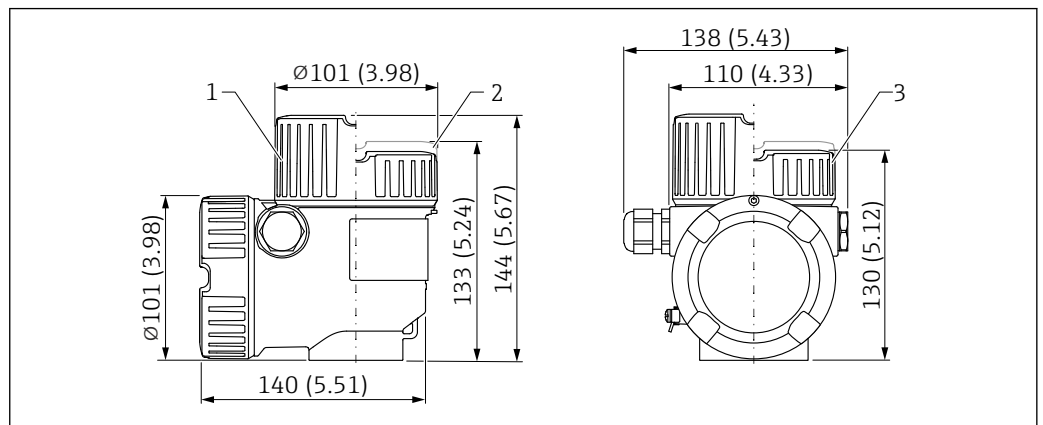


A0045829

Unit of measurement mm (in)

- 1 Cover with glass viewing window (devices for Ex d, dust Ex)
- 2 Cover with plastic viewing window
- 3 Cover without viewing window

### Dual compartment housing, L-form



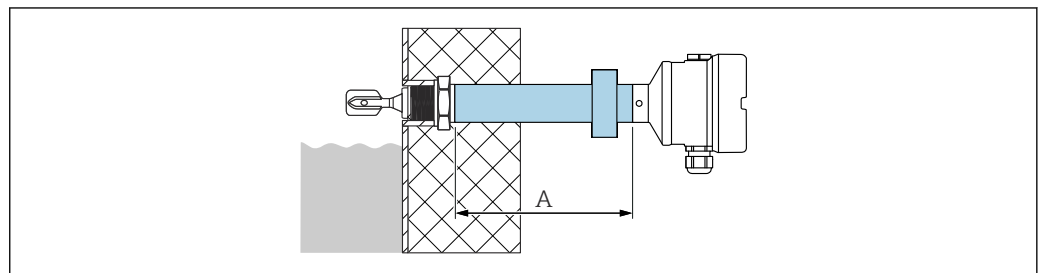
A0045828

Unit of measurement mm (in)

- 1 Cover with glass viewing window (devices for Ex d, dust Ex)
- 2 Cover with plastic viewing window
- 3 Cover without viewing window

### Temperature spacer

- Provides sealed insulation for the vessel and a normal ambient temperature for the housing
- If the sensor is damaged, protects the housing from vessel pressures up to 100 bar (1 450 psi)



A0042352

18 Temperature spacer with gas-tight glass feedthrough

A 2 lengths available depending on the process temperature

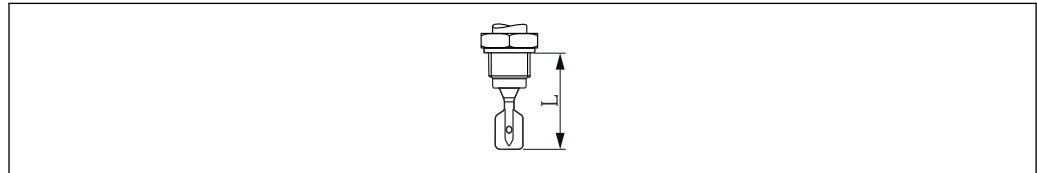
Product Configurator, "Application" feature:

- 230 °C (446 °F): approx. 160 mm (6.3 in)
- 280 °C (536 °F): approx. 200 mm (7.87 in)
- PFA (conductive) 230 °C (446 °F): approx. 160 mm (6.3 in)

### Probe design

#### Compact

- Material: 316L or Alloy C22
- Sensor length L: depends on process connection  
See section on process connections: thread ASME B1.20.3, MNPT, EN10226, R, ISO228, G

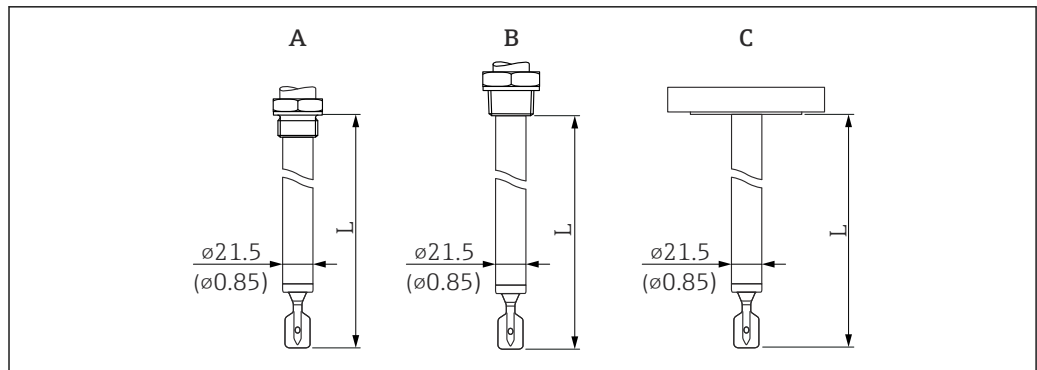


A0042435

19 Compact, sensor length L

### Pipe extension

- Material: 316L, sensor length L: 148 to 3 000 mm (5.83 to 118.11 in)
  - Material: Alloy C22, sensor lengths L: 148 to 3 000 mm (5.83 to 118.11 in)
  - Material: 316L substrate material coated with PFA (conductive), sensor lengths L: 148 to 3 000 mm (5.83 to 118.11 in)
- i** Only available with flange as a process connection.



A0042431

20 Pipe extension, sensor length L. Unit of measurement mm (in)

- A G 3/4, G 1  
B NPT 3/4, NPT 1, R 3/4, R 1  
C Flange

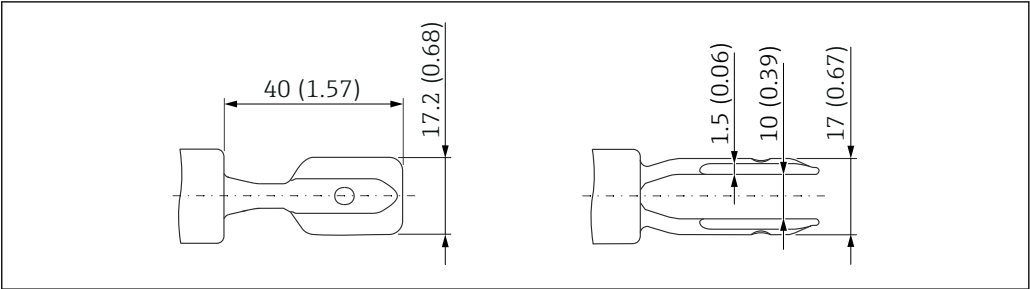
### Coating material and layer thickness

**i** The maximum diameter  $\varnothing$  depends on the coating material.

#### PFA (conductive), optional

- Lower limit: 0.45 mm (0.02 in)
- Upper limit: 1.6 mm (0.06 in)
- Maximum diameter:  $\varnothing$  24.6 mm (0.97 in)

Tuning fork

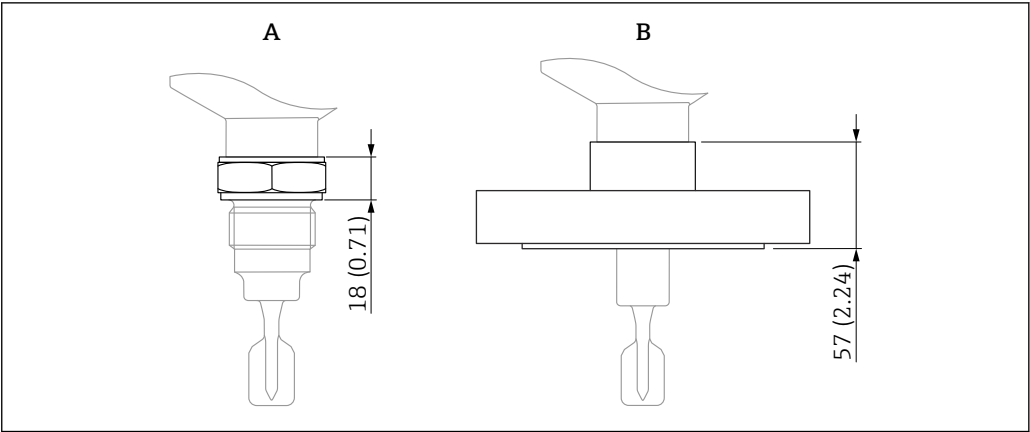


A0038269

21 Tuning fork. Unit of measurement mm (in)

Process connections

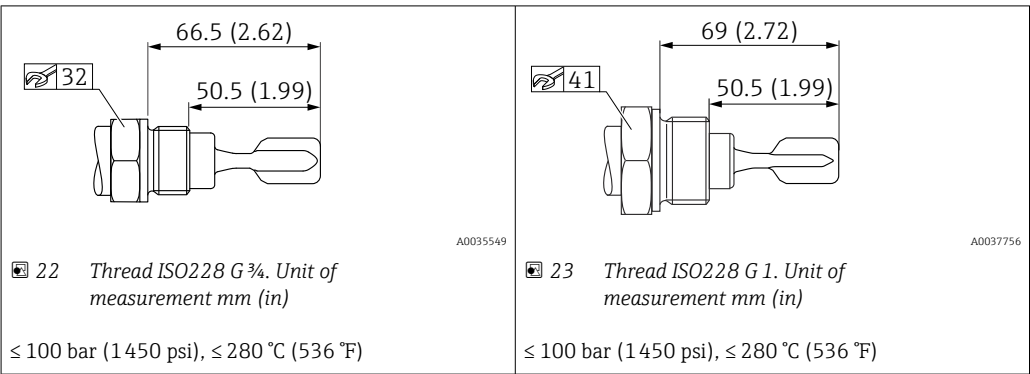
Height of process connection



A0046798

- A Process connection with threaded connection
- B Process connection with flange

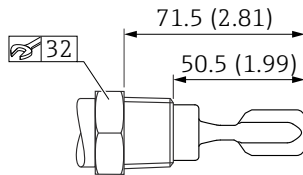
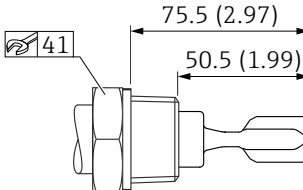
Thread ISO228 G



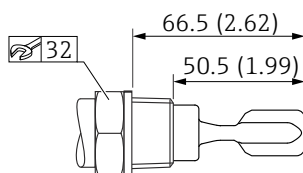
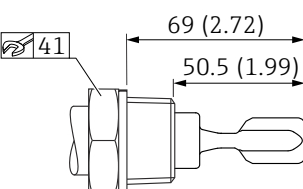
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### Thread ASME B1.20.3, MNPT

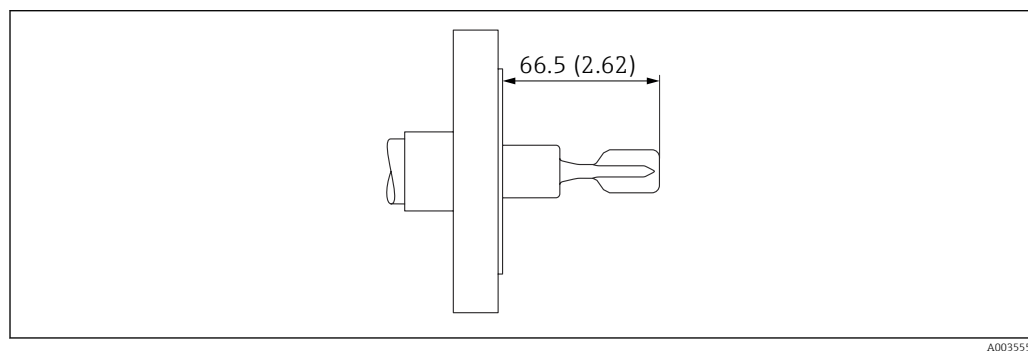
 <p><b>24</b> Thread ASME B1.20.3, MNPT ¾. Unit of measurement mm (in)</p> <p>≤ 100 bar (1 450 psi), ≤ 280 °C (536 °F)</p>	 <p><b>25</b> Thread ASME B1.20.3, MNPT 1. Unit of measurement mm (in)</p> <p>≤ 100 bar (1 450 psi), ≤ 280 °C (536 °F)</p>
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### Thread EN10226, R

 <p><b>26</b> Thread EN10226, R ¾. Unit of measurement mm (in)</p> <p>≤ 100 bar (1 450 psi), ≤ 280 °C (536 °F)</p>	 <p><b>27</b> Thread EN10226, R 1. Unit of measurement mm (in)</p> <p>≤ 100 bar (1 450 psi), ≤ 280 °C (536 °F)</p>
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### Flanges

AlloyC22-plated flanges are available for higher chemical resistance.  
The flange carrier material is made of 1.4462 and is welded to an AlloyC22 disk.



**28** Example with flange. Unit of measurement mm (in)

**i** In the event of high temperatures: pay attention to the pressure loading capacity of the flange depending on the temperature!

### ASME B16.5 flanges, RF

Pressure rating	Type	Material	Weight
Cl.150	NPS 1"	316/316L	1.0 kg (2.21 lb)
Cl.150	NPS 1-½"	316/316L	1.5 kg (3.31 lb)
Cl.150	NPS 2"	316/316L	2.4 kg (5.29 lb)
Cl.150	NPS 2"	Alloy C22>1.4462	2.4 kg (5.29 lb)
Cl.150	NPS 3"	316/316L	4.9 kg (10.8 lb)



Pressure rating	Type	Material	Weight
Cl.150	NPS 4"	316/316L	7.0 kg (15.44 lb)
Cl.300	NPS 1-½"	316/316L	2.7 kg (5.95 lb)
Cl.300	NPS 2"	316/316L	3.2 kg (7.06 lb)
Cl.300	NPS 2"	Alloy C22>1.4462	3.2 kg (7.06 lb)
Cl.300	NPS 3"	316/316L	6.8 kg (14.99 lb)
Cl.300	NPS 4"	316/316L	11.5 kg (25.6 lb)
Cl.600	NPS 2"	Alloy C22>1.4462	6.8 kg (14.99 lb)
Cl.600	NPS 2"	316/316L	4.2 kg (9.26 lb)
Cl.600	NPS 3"	316/316L	6.8 kg (14.99 lb)
Cl.600	NPS 4"	316/316L	17.3 kg (38.15 lb)

*ASME B16.5 flanges, FF*

Pressure rating	Type	Material	Weight
Cl.150	NPS 1"	316/316L	1.0 kg (2.21 lb)
Cl.150	NPS 2"	316/316L	2.4 kg (5.29 lb)
Cl.300	NPS 1-½"	316/316L	2.7 kg (5.95 lb)
Cl.300	NPS 2"	316/316L	3.2 kg (7.06 lb)
Cl.300	NPS 4"	316/316L	11.5 kg (25.36 lb)
Cl. 600	NPS 2"	Alloy C22>1.4462	4.2 kg (9.26 lb)
Cl. 600	NPS 2"	316/316L	4.2 kg (9.26 lb)
Cl. 600	NPS 3"	316/316L	6.8 kg (14.99 lb)
Cl. 600	NPS 4"	316/316L	17.3 kg (38.15 lb)

*ASME B16.5 flanges, RTJ*

Pressure rating	Type	Material	Weight
Cl.300	NPS 2"	316/316L	3.2 kg (7.06 lb)
Cl.300	NPS 3"	316/316L	6.8 kg (14.99 lb)
Cl.300	NPS 4"	316/316L	11.5 kg (25.36 lb)
Cl.600	NPS 2"	316/316L	17.3 kg (38.15 lb)

*EN flanges EN 1092-1, A*

Pressure rating	Type	Material	Weight
PN25/40	DN25	316L (1.4404)	1.3 kg (2.87 lb)
PN25/40	DN32	316L (1.4404)	2.0 kg (4.41 lb)
PN25/40	DN40	316L (1.4404)	2.4 kg (5.29 lb)
PN25/40	DN50	316L (1.4404)	3.2 kg (7.06 lb)
PN25/40	DN65	316L (1.4404)	4.3 kg (9.48 lb)
PN25/40	DN80	316L (1.4404)	5.9 kg (13.01 lb)
PN25/40	DN100	316L (1.4404)	7.5 kg (16.54 lb)
PN100	DN50	316L (1.4404)	5.5 kg (12.13 lb)

*EN flanges EN 1092-1, B1*

Pressure rating	Type	Material	Weight
PN10/16	DN50	316L (1.4404)	2.5 kg (5.51 lb)
PN10/16	DN80	316L (1.4404)	4.8 kg (10.58 lb)
PN10/16	DN100	316L (1.4404)	5.2 kg (11.47 lb)
PN25/40	DN25	Alloy C22>1.4462	1.4 kg (3.09 lb)
PN25/40	DN25	316L (1.4404)	1.4 kg (3.09 lb)
PN25/40	DN50	Alloy C22>1.4462	3.2 kg (7.06 lb)
PN25/40	DN50	316L (1.4404)	3.2 kg (7.06 lb)
PN25/40	DN80	316L (1.4404)	5.9 kg (13.01 lb)
PN25/40	DN80	Alloy C22>316L	5.2 kg (11.47 lb)
PN63	DN50	316L (1.4404)	4.5 kg (9.92 lb)

*EN flanges EN 1092-1, E*

Type	Material	Pressure rating	Weight
DN50	316L (1.4404)	PN25/40	3.2 kg (7.06 lb)

*JIS flanges B2220*

Pressure rating	Type	Material	Weight
20K	20K 50A	316L (1.4404)	1.9 kg (4.19 lb)

*Process connection, sealing surface*

- Thread ISO228, G
- Thread ASME, MNPT
- Thread EN10226, R
- Flange ASME B16.5, RF (Raised Face)
- Flange ASME B16.5, FF (Flat Face)
- Flange ASME B16.5, RTJ (Ring Type Joint)
- Flange EN1092-1, Form A
- Flange EN1092-1, Form B1
- Flange EN1092-1, Form E
- Flange JIS B2220, RF (Raised Face)
- Flange HG/T20592, RF (Raised Face)
- Flange HG/T20615, RF (Raised Face)
- Flange HG/T20615, RJ (Ring Joint)

**Weight****Housing**

Weight including electronics and display:

- Single-compartment housing: 1.1 kg (2.43 lb)
- Dual-compartment housing, L-shape, aluminum: 1.7 kg (3.75 lb)
- Dual-compartment housing, L-shape, stainless steel: 4.3 kg (9.48 lb)

**Gas-tight feedthrough**

0.2 kg (0.44 lb)

**Probe length (Ra < 3.2 µm/126 µin)**

- 1000 mm: 0.9 kg (1.98 lb)
- 100 in: 2.3 kg (5.07 lb)

**Pipe extension**

- 1000 mm: 0.9 kg (1.98 lb)
- 100 in: 2.3 kg (5.07 lb)

**Process connection**

See "Process connections" section

**Weather protection cover, plastic**

0.2 kg (0.44 lb)

**Weather protection cover, metal**

0.93 kg (2.05 lb)

---

**Materials**

**Materials in contact with process**

*Process connection and pipe extension*

316L (1.4435)

- Optional 2.4602 (AlloyC22)
- Optional PFA coating (conductive)

*Tuning fork*

S31803 (1.4462)

- Optional 2.4602 (AlloyC22)
- Optional PFA coating (conductive)

*Flanges*

316L (1.4404)

- Optional PFA coating (conductive)
- Flange plating: AlloyC22

**Materials not in contact with process**

*Single compartment housing and cover*

Polyester powder coating on aluminum as per EN1706 AC43400 (reduced copper content ≤ 0.1 % to prevent corrosion)

*Dual compartment housing and cover, L-form*

- Polyester powder coating on aluminum as per EN1706 AC43400 (reduced copper content ≤ 0.1 % to prevent corrosion)
- Stainless steel (ASTM A351 : CF3M (cast equivalent to material AISI 316L)/DIN EN 10213 : 1.4409)

*Aluminum housing nameplate*

Adhesive plastic film label

*Nameplate of stainless steel housing*

Lasered onto housing

*Wired-on nameplate*

- Stainless steel
- Plastic film
- Provided by customer
- RFID tag: polyurethane potting compound

*Cable entries*

- M20 gland:  
Plastic, brass nickel plated or 316L (depends on version ordered)  
Dummy plug made of plastic, aluminum or 316L (depends on version ordered)
- Thread M20:  
Dummy plug made of aluminum or 316L (depends on version ordered)
- Thread G ½:  
Adapter made of aluminum or 316L (depends on version ordered)  
If the G ½ thread is selected, the device is provided with an M20 thread as standard and an adapter to G ½ is included, along with the associated documentation
- Thread NPT ½:  
Dummy plug made of aluminum or 316L (depends on version ordered)
- M12 plug:  
CuZn nickel-plated or 316L (depends on version ordered)  
Dummy plug made of aluminum or 316L (depends on version ordered)

**Surface roughness**

The surface roughness of the metal surface in contact with the process is  $R_a < 3.2 \mu\text{m}$  (126  $\mu\text{in}$ ).

## Operability

**Operating concept****Operator-oriented menu structure for user-specific tasks**

- Guidance
- Diagnostics
- Application
- System

**Fast and safe commissioning**

- Interactive wizard with graphical user interface for guided commissioning in FieldCare, DeviceCare or DTM, AMS and PDM-based third-party tools or SmartBlue
- Menu guidance with short explanations of the individual parameter functions
- Standardized operation at the device and in the operating tools

**Integrated HistoROM data memory**

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

**Efficient diagnostic behavior increases measurement availability**

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

**Bluetooth (optionally integrated in local display)**

- Quick and easy setup with SmartBlue app or PC with DeviceCare, version 1.07.05 and higher, or FieldXpert SMT70
- No additional tools or adapters required
- Encrypted single point-to-point data transmission (tested by Fraunhofer Institute) and password-protected communication via *Bluetooth*® wireless technology

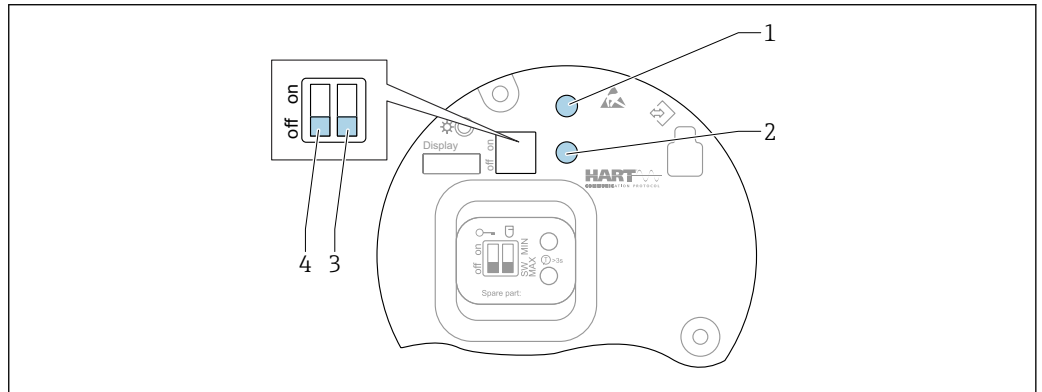
**Languages****Operating languages**

- **English** option (default factory setting is **English** option, unless a different language is ordered)
- Deutsch
- Français
- Español
- Italiano
- Nederlands
- Portuguesa
- Polski
- русский язык (Russian)
- Türkçe
- 中文 (Chinese)
- 日本語 (Japanese)
- 한국어 (Korean)
- Bahasa Indonesia

- tiếng Việt (Vietnamese)
- čeština (Czech)
- Svenska

## Local operation

### 4 to 20 mA HART (FEL60H) electronic insert




A0046129

#### 29 Operating keys and DIP switches on the 4 to 20 mA HART electronic insert

- 1 Operating key for reset password (for Bluetooth login and Maintenance user role)
- 1+2 Operating keys for device reset (as-delivered state)
- 2 Operating key for "Proof test" wizard (> 3 s)
- 3 DIP switch for safety function, software-defined (SW, default = MAX) or permanently MIN (in the SW switch position, the MIN or MAX setting is defined by the software. MAX is the default value. In the MIN switch position, the setting is permanently MIN irrespective of the software).
- 4 DIP switch for locking and unlocking the device

- Minimum/maximum quiescent current safety can be switched at the electronic insert
- MAX = maximum safety: when the tuning fork is covered the output switches to demand mode, e.g. use for overfill protection
- MIN = minimum safety: when the tuning fork is uncovered, the output switches to demand mode, e.g. use to prevent pumps from running dry

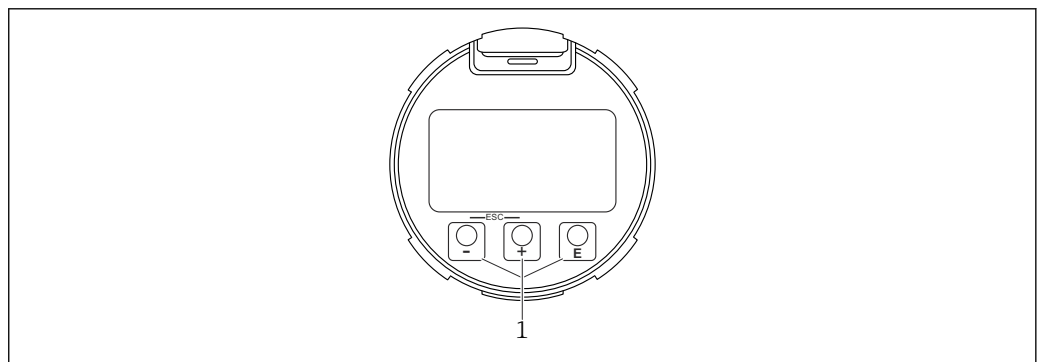
-  The setting of the DIP switches on the electronic insert has priority over the settings made via other operation methods (e.g. FieldCare/DeviceCare).
  - Density switchover: A density preset can be ordered as an option or configured via display, Bluetooth and HART.

## Local display

### Device display (optional)


Functions:

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



A0039284

#### 30 Graphic display with optical operating keys (1)

<b>Remote operation</b>	<p><b>Via HART protocol</b></p> <p><b>Via service interface (CDI)</b></p> <p><b>Operation via Bluetooth® wireless technology (optional)</b></p> <p>Prerequisite</p> <ul style="list-style-type: none"> <li>■ Measuring device with display including Bluetooth</li> <li>■ Smartphone or tablet with Endress+Hauser SmartBlue app or PC with DeviceCare from version 1.07.05 or FieldXpert SMT70</li> </ul> <p>The connection has a range of up to 25 m (82 ft). The range can vary depending on environmental conditions such as attachments, walls or ceilings.</p> <p> The operating keys on the display are locked as soon as the device is connected via Bluetooth.</p>
<b>System integration</b>	<p><b>HART</b></p> <p>Version 7</p>
<b>Supported operating tools</b>	<p>Smartphone or tablet with Endress+Hauser SmartBlue app, DeviceCare from version 1.07.05, FieldCare, DTM, AMS and PDM</p>
<b>HistoROM data management</b>	<p>When replacing the electronic insert, the stored data is transferred by reconnecting the HistoROM.</p> <p>The device serial number is saved in the HistoROM. The electronics serial number is saved in the electronics.</p>

## Certificates and approvals

Current certificates and approvals for the product are available via the Product Configurator at [www.endress.com](http://www.endress.com).

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


The **Configuration** button opens the Product Configurator.

## Ordering information

Detailed ordering information is available from the nearest sales organization [www.addresses.endress.com](http://www.addresses.endress.com) or in the Product Configurator under [www.endress.com](http://www.endress.com):

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

The **Configuration** button opens the Product Configurator.

-  **Product Configurator - the tool for individual product configuration**
- Up-to-the-minute configuration data
  - Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
  - Automatic verification of exclusion criteria
  - Automatic creation of the order code and its breakdown in PDF or Excel output format
  - Ability to order directly in the Endress+Hauser Online Shop

<b>TAG</b>	<p><b>Measuring point (TAG)</b></p> <p>The device can be ordered with a tag name.</p>
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**Location of the tag name**

Select in the additional specification:

- Stainless steel wired-on tag plate
- Plastic film
- Plate provided
- RFID TAG
- RFID TAG + stainless steel wired-on tag plate
- RFID TAG + plastic film
- RFID TAG + plate provided

**Definition of tag name**

Specify in the additional specification:

3 lines with a maximum of 18 characters per line

The specified tag name appears on the selected plate and/or on the RFID TAG.

**Visualization in SmartBlue app**

The first 32 characters of the tag name

The tag name can always be changed specifically for the measuring point via Bluetooth.

**Test reports, declarations and inspection certificates**

All test reports, declarations and inspection certificates are provided electronically in the *W@M Device Viewer*:

Enter the serial number from the nameplate ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer))

**Product documentation on paper**

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

## Application packages

**Heartbeat Technology module****Heartbeat Diagnostics**

Continuously monitors and assesses the device condition and process conditions. Generates diagnostic messages when certain events occur and provides troubleshooting measures in accordance with NAMUR NE 107.

**Heartbeat Verification**

Performs a verification of the current device condition on demand and generates the Heartbeat Technology verification report showing the verification result.

**Heartbeat Monitoring**

Continuously provides device and/or process data for an external system. Analysis of this data forms the basis for process optimization and predictive maintenance.

**Heartbeat Diagnostics**

Diagnostic messages output to:

- the local display
- an asset management system (e.g. FieldCare or DeviceCare)
- an automation system (e.g. PLC)

**Heartbeat Verification**

- Device monitoring in installed state without interrupting the process, including report
- Clear measuring point assessment (Passed/Failed) with high total test coverage within the framework of manufacturer specifications
- Can be used to document normative requirements

The "Heartbeat Verification" module contains the **Heartbeat Verification** wizard, which verifies the current instrument health and creates the Heartbeat Technology verification report:


- The **Heartbeat Verification** wizard can be used via the SmartBlue app
- The **Heartbeat Verification** wizard guides the user through the entire process for creating the verification report
- The operating hours counter, minimum/maximum temperature indicator and minimum/maximum frequency indicator are displayed.

- If the oscillation frequency of the fork increases, a corrosion warning appears.
- The order configuration of the oscillation frequency in air is indicated in the verification report.
  - A high oscillation frequency is an indicator of corrosion.
  - A lower oscillation frequency indicates buildup or a sensor covered by the medium.
  - Deviations in the oscillation frequency compared to the oscillation frequency on delivery may be caused by the process temperature and pressure.
- Frequency history: Last 16 sensor frequencies that were stored at the time of the Heartbeat Verification

### Heartbeat Monitoring

- **Loop diagnostics** wizard: Detection of elevated measuring circuit resistance values or declining power supply
- **Process window** wizard: Two frequency limits for monitoring the upper and lower range of the oscillation frequency (can be defined independently of one another). Changes in the process can be identified, e.g. corrosion or buildup.

### Proof testing

-  The proof test is only available for devices with SIL or WHG approval.

A proof test is required at appropriate intervals in the following applications: SIL (IEC61508/IEC61511), WHG (German Water Resources Act).

The **Proof test** wizard is available with the ordered SIL or WHG approval. The wizard guides the user through the entire process for creating the verification report. The verification report can be saved as a PDF file.

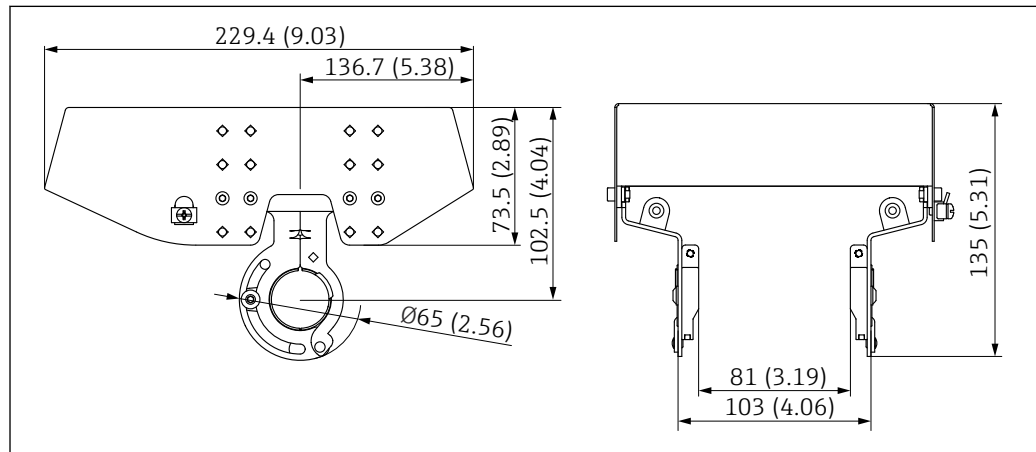
## Accessories

### Device Viewer

All the spare parts for the device, along with the order code, are listed in the *Device Viewer* ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)).

### Weather protection cover for dual compartment housing

- Material: stainless steel 316L
- Order number: 71438303

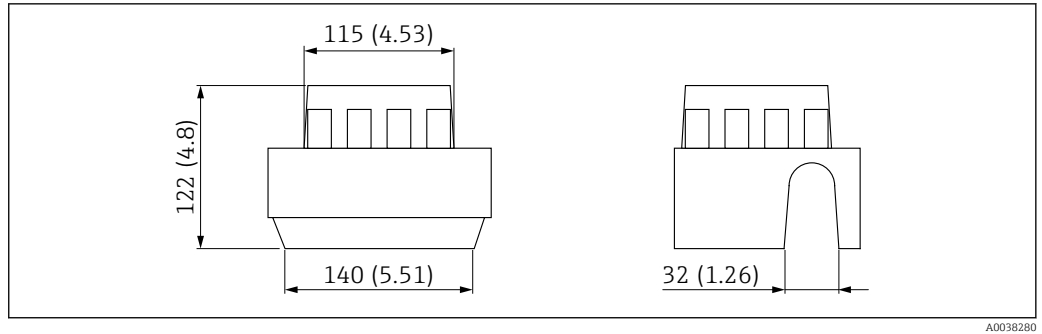


 31 Weather protection cover for dual compartment housing. Unit of measurement mm (in)

### Weather protection cover for single compartment housing, aluminum

- Material: plastic
- Order number: 71438291





A0038280

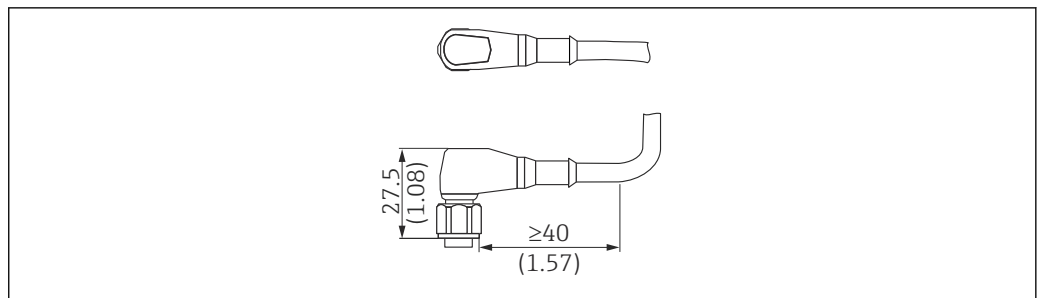
32 Weather protection cover for single compartment housing, aluminum. Unit of measurement mm (in)

## Plug-in jack

**i** The plug-in jacks listed are suitable for use in the temperature range  $-25$  to  $+70$  °C ( $-13$  to  $+158$  °F).

### Plug-in jack M12 IP69

- Terminated at one end
- Elbowed 90°
- 5 m (16 ft) PVC cable (orange)
- Slotted nut 316L (1.4435)
- Body: PVC (orange)
- Order number: 52024216

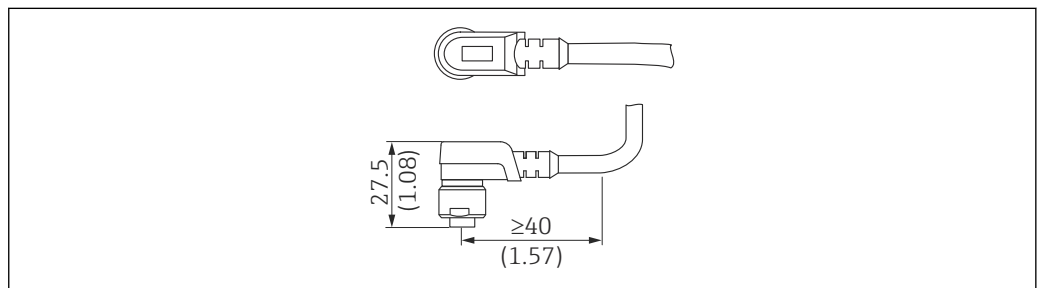


A0023713

33 Plug-in jack M12 IP69. Unit of measurement mm (in)

### Plug-in jack M12 IP67

- Elbowed 90°
- 5 m (16 ft) PVC cable (gray)
- Slotted nut Cu Sn/Ni
- Body: PUR (black)
- Order number: 52010285

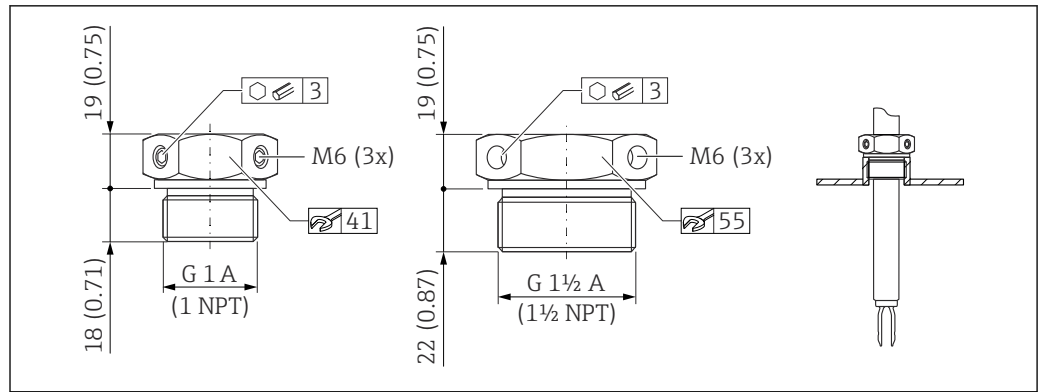


A0022292

34 Plug-in jack M12 IP67. Unit of measurement mm (in)

## Sliding sleeves for unpressurized operation

Switch point, infinitely adjustable.



A0037666

35 Sliding sleeves for unpressurized operation  $p_e = 0$  bar (0 psi). Unit of measurement mm (in)

G 1, DIN ISO 228/1

- Material: 1.4435 (AISI 316L)
- Weight: 0.21 kg (0.46 lb)
- Order number: 52003978
- Order number: 52011888, approval: with inspection certificate EN 10204 - 3.1 material

NPT 1, ASME B 1.20.1

- Material: 1.4435 (AISI 316L)
- Weight: 0.21 kg (0.46 lb)
- Order number: 52003979
- Order number: 52011889, approval: with inspection certificate EN 10204 - 3.1 material

G 1 1/2, DIN ISO 228/1

- Material: 1.4435 (AISI 316L)
- Weight: 0.54 kg (1.19 lb)
- Order number: 52003980
- Order number: 52011890, approval: with inspection certificate EN 10204 - 3.1 material

NPT 1 1/2, ASME B 1.20.1

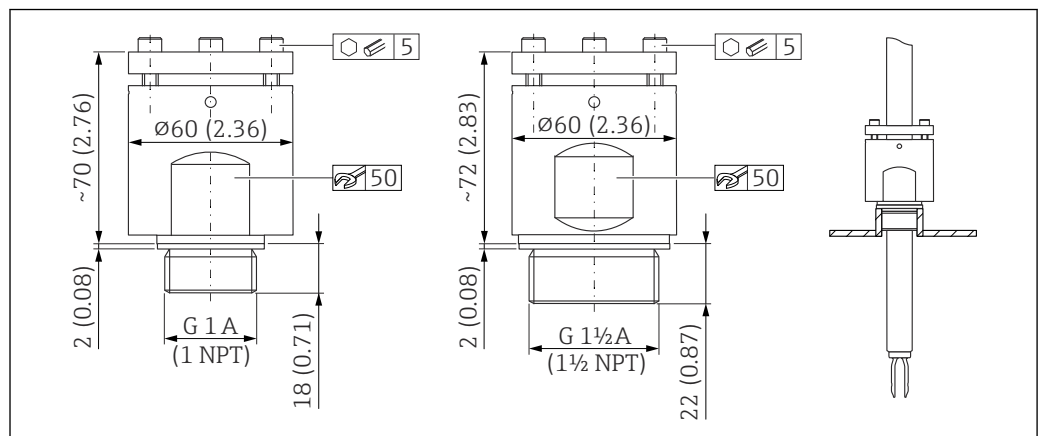
- Material: 1.4435 (AISI 316L)
- Weight: 0.54 kg (1.19 lb)
- Order number: 52003981
- Order number: 52011891, approval: with inspection certificate EN 10204 - 3.1 material

More detailed information and documentation are available:

- Product Configurator on the Endress+Hauser website [www.endress.com](http://www.endress.com)
- Endress+Hauser sales organization [www.addresses.endress.com](http://www.addresses.endress.com)

## High pressure sliding sleeves

- Switch point, infinitely adjustable
- Use in explosive atmospheres
- Seal package made of graphite
- Graphite seal available as spare part 71078875
- For G 1, G 1 1/2: seal is included in the delivery



A0037667

36 High pressure sliding sleeves. Unit of measurement mm (in)

G 1, DIN ISO 228/1

- Material: 1.4435 (AISI 316L)
- Weight: 1.13 kg (2.49 lb)
- Order number: 52003663
- Order number: 52011880, approval: with inspection certificate EN 10204 - 3.1 material

G 1, DIN ISO 228/1

- Material: AlloyC22
- Weight: 1.13 kg (2.49 lb)
- Approval: with inspection certificate EN 10204 - 3.1 material
- Order number: 71118691

NPT 1, ASME B 1.20.1

- Material: 1.4435 (AISI 316L)
- Weight: 1.13 kg (2.49 lb)
- Order number: 52003667
- Order number: 52011881, approval: with inspection certificate EN 10204 - 3.1 material

NPT 1, ASME B 1.20.1

- Material: AlloyC22
- Weight: 1.13 kg (2.49 lb)
- Approval: with inspection certificate EN 10204 - 3.1 material
- Order number: 71118694

G 1½, DIN ISO 228/1

- Material: 1.4435 (AISI 316L)
- Weight: 1.32 kg (2.91 lb)
- Order number: 52003665
- Order number: 52011882, approval: with inspection certificate EN 10204 - 3.1 material

G 1½, DIN ISO 228/1


- Material: AlloyC22
- Weight: 1.32 kg (2.91 lb)
- Approval: with inspection certificate EN 10204 - 3.1 material
- Order number: 71118693

NPT 1½, ASME B 1.20.1

- Material: 1.4435 (AISI 316L)
- Weight: 1.32 kg (2.91 lb)
- Order number: 52003669
- Order number: 52011883, approval: with inspection certificate EN 10204 - 3.1 material


NPT 1½, ASME B 1.20.1

- Material: AlloyC22
- Weight: 1.32 kg (2.91 lb)
- Approval: with inspection certificate EN 10204 - 3.1 material
- Order number: 71118695

 More detailed information and documentation are available:

- Product Configurator on the Endress+Hauser website [www.endress.com](http://www.endress.com)
- Endress+Hauser sales organization [www.addresses.endress.com](http://www.addresses.endress.com)

## Supplementary documentation

 The certificates, approvals and other documentation currently available can be accessed as follows:

Endress+Hauser website: [www.endress.com](http://www.endress.com) → Downloads.

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### Standard documentation

#### Document type: Operating Instructions (BA)

Installation and initial commissioning – contains all functions in the operating menu that are required for a typical measuring task. Functions beyond this scope are not included.

#### Document type: Description of Device Parameters (GP)

The document is part of the Operating Instructions and serves as a reference for parameters, providing a detailed explanation of each individual parameter of the operating menu.

#### Document type: Brief Operating Instructions (KA)

Quick guide to the first measured value – includes all essential information from incoming acceptance to electrical connection.

**Document type: Safety Instructions, certificates**

Depending on the approval, Safety Instructions are supplied with the device, e.g. XA. This documentation is an integral part of the Operating Instructions.

The nameplate indicates which Safety Instructions (XA) apply to the device in question.

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**Supplementary device-  
dependent documentation****Special Documentation**

- SD02874F: Heartbeat Verification + Monitoring application package
- SD02530P: Graphic display with Bluetooth, radio approval
- SD02398F: Sliding sleeve for Liquiphant (installation instructions)
- TI00426F: Adapter and flanges (overview)

## Registered trademarks

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