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71701920
2025-03-31

Technical Information
Liquiphant FTL63

Vibronic
HART

Level switch for liquids specifically for the food and life sciences industries

Application

- Point level switch for all pumpable liquids, for minimum or maximum detection in vessels e.g. process tanks, storage tanks, and piping, even in hazardous areas
- Process temperature range: −50 to +150 °C (−58 to +302 °F)
- Pressures up to 64 bar (928 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

Benefits

- Easy commissioning with plug and play functionality
- Certified, hygienic design (3-A, EHEDG, ASME BPE)
- Proven conformity with materials standards, e.g. EC1935/2004, FDA, GB 4806, cGMP
- Functional safety: monitoring of the vibration frequency of the tuning fork
- Heartbeat Technology via Fieldcare/DTM and the free iOS/Android SmartBlue app
- With *Bluetooth*® wireless technology

Endress+Hauser
People for Process Automation

Table of contents

About this document

Symbols

Safety symbols

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

Hazardous area

Safe area (non-hazardous area)

Communication-specific symbols

Bluetooth
Wireless data transmission between devices over a short distance.

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 overfill 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.

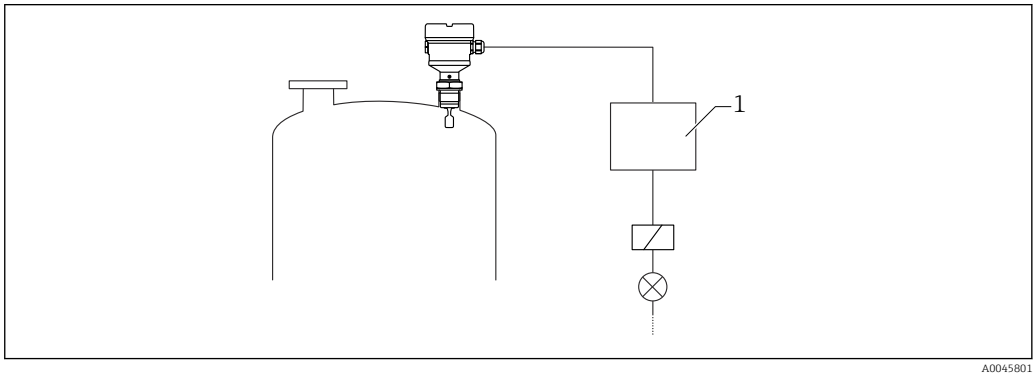
OK status
- In MIN mode, the fork is covered, e.g. Pump dry running protection
- In MAX mode, the fork is not covered e.g. overfill prevention

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. overfill 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



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

Measuring range

Depends on the installation location and the pipe extension ordered
Maximum sensor length 3 m (9.8 ft)

Output

Output signal

SIO (FEL60H electronic insert)

8/16 mA (SIO) with superimposed digital communication protocol HART, 2-wire

Continuous operation (FEL60H electronic insert)

4 to 20 mA proportional to the oscillation frequency with superimposed digital communication protocol HART, 2-wire

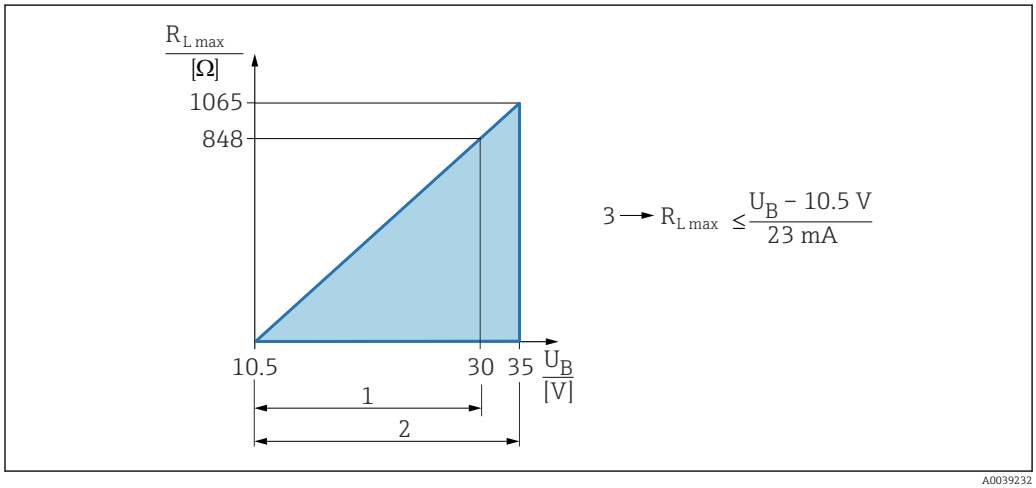
For continuous current output, one of the following modes of operation can be selected:
- 4.0 to 20.5 mA
- NAMUR NE 43: 3.8 to 20.5 mA (factory setting)
- US mode: 3.9 to 20.8 mA

Signal on alarm

Signal on alarm in accordance with NAMUR recommendation NE 43.

4 to 20 mA HART:
- Max. alarm: can be set from 21.5 to 23 mA
- Min. alarm: < 3.6 mA (factory setting)

4 to 20 mA passive, HART



1 Power supply 10.5 to 30 VDC Ex i
2 Power supply 10.5 to 35 VDC, for other types of protection and non-certified device versions
3 R_{Lmax} maximum load resistance
U_B Supply voltage

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

Damping

Damping affects all the outputs (output signal, display) and is only available in the continuous 4 to 20 mA mode.

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
- 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 devices approved for use in explosion hazardous areas.

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
  - 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
Primary variable (PV) parameter (Primary variable) [1]	Point level detection [2]
Secondary variable (SV) parameter (Secondary variable)	Sensor frequency [3]
Tertiary variable (TV) parameter (Third variable)	Fork state [4]
Quaternary variable (QV) 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

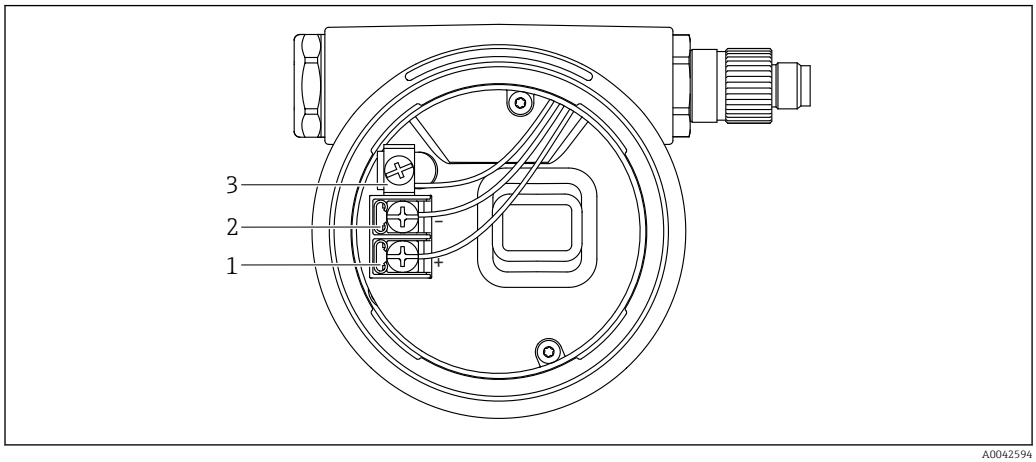
The software package consists of 3 modules. These three modules combined check, evaluate and monitor device functionality and process conditions.

- Heartbeat Diagnostics
- Heartbeat Verification
- Heartbeat Monitoring

Power supply

Terminal assignment

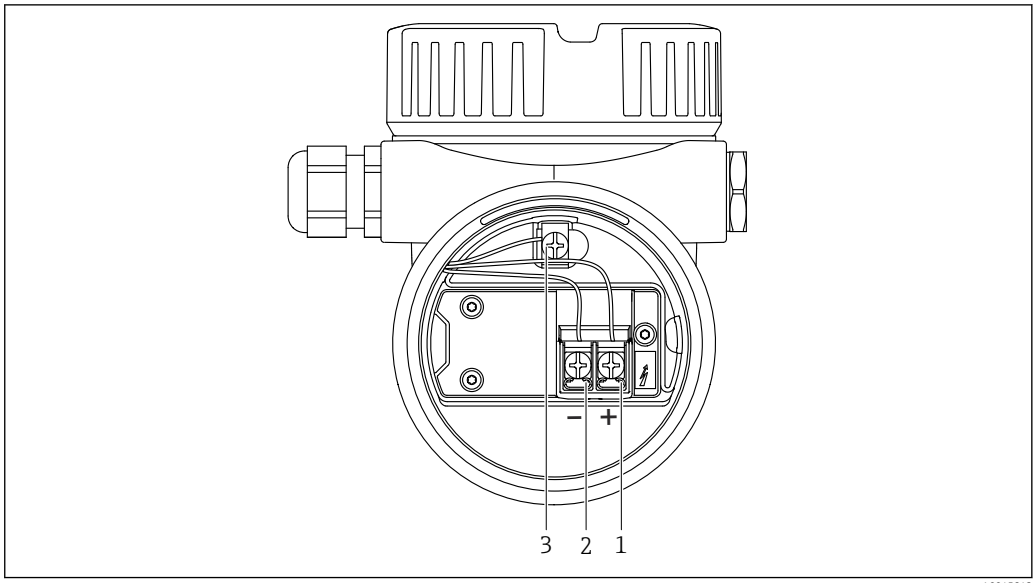
Single-compartment housing



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

1 Positive terminal
2 Negative terminal
3 Internal ground terminal

Dual-compartment housing, L-form



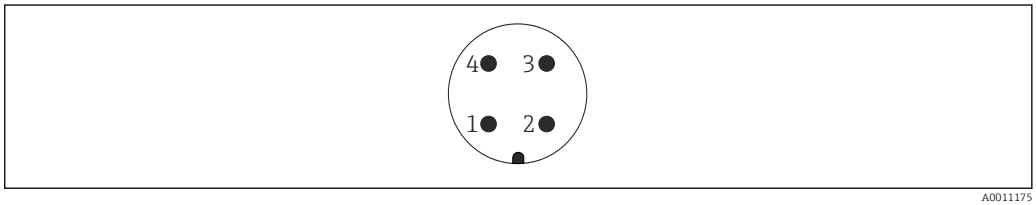
3 Connection terminals and ground terminal in the connection compartment

1 Positive terminal
2 Negative terminal
3 Internal ground terminal

Available connectors

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

M12 plug



4 M12 plug, pin assignment

1 Signal +
2 Not used
3 Signal –
4 Ground

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

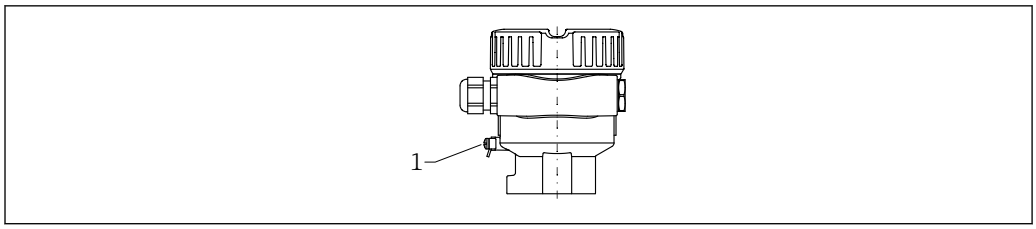
- The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV, Class 2) and must comply with the relevant protocol specifications.
- Comply with the following according to IEC/EN61010-1: provide a suitable circuit breaker for the device.

Potential equalization

WARNING

Explosion Hazard!

▶ Please refer to the separate documentation on applications in hazardous areas for the safety instructions.



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1 Ground terminal for connecting the potential matching line

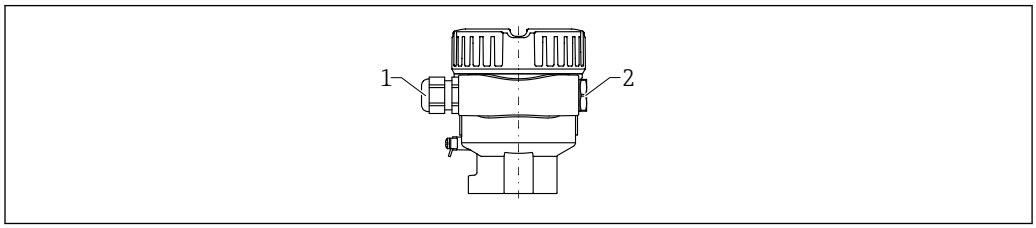
If necessary, the potential matching line can be connected to the external ground terminal of the transmitter before the device is connected.

For optimum electromagnetic compatibility:
- Potential matching line as short as possible
- Observe a cross-section of at least 2.5 mm² (14 AWG)

Terminals

- Supply voltage and internal ground terminal: 0.5 to 2.5 mm² (20 to 14 AWG)
- External ground terminal: 0.5 to 4 mm² (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)
  - Stainless steel, hygienic: Ø9 to 12 mm (0.35 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_{DC}
- Tested: According to IEC/DIN EN 60079-14 sub chapter 12.3 (IEC/DIN EN 60060-1 chapter 7)
- Nominal discharge current: 10 kA

Overvoltage category

Overvoltage category II

Pollution degree

Pollution degree 2

Performance characteristics

Reference operating condition

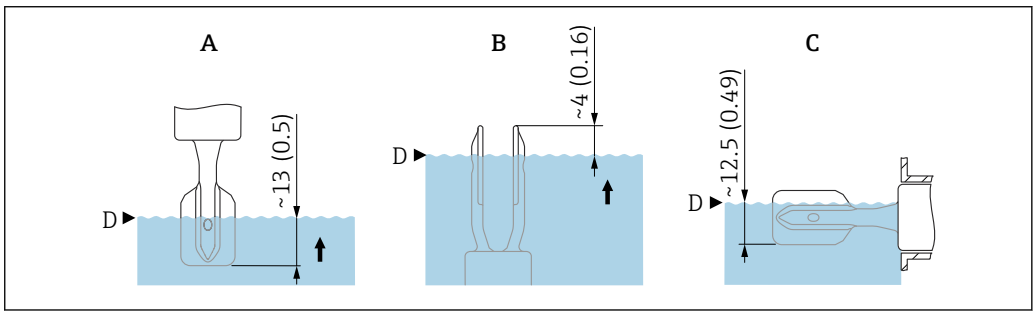
- Ambient temperature:+23 °C (+73 °F)
- Process temperature: +23 °C (+73 °F)
- Medium density (water): 1 g/cm³ (62.4 lb/ft³)
- Medium viscosity: 1 mPa·s
- Process pressure: atmospheric pressure/unpressurized
- Sensor installation: vertically and from above
- Density switch: > 0.7 g/cm³ (43.7 lb/ft³) (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 tuning fork and the tank wall or pipe wall: 10 mm (0.39 in)



5 *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

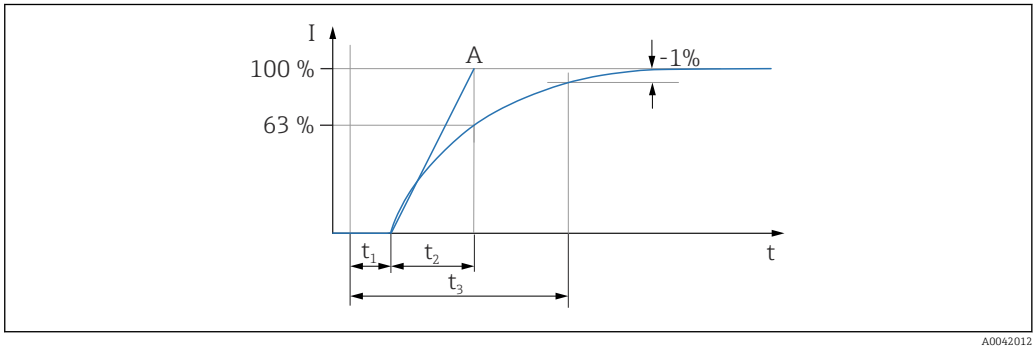
At reference operating conditions: max. ± 1 mm (0.04 in) at switch point

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_1 Dead time
t_2 Time constant
t_3 Settling time
A Stable full scale value

Dynamic behavior, current output

- Dead time (t_1): 100 ms
- Time constant T63 (t_2): can be set from 0 to 999 s
- Settling time (t_3): 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

Typically 2.5 mm (0.1 in)

Non-repeatability

0.5 mm (0.02 in)

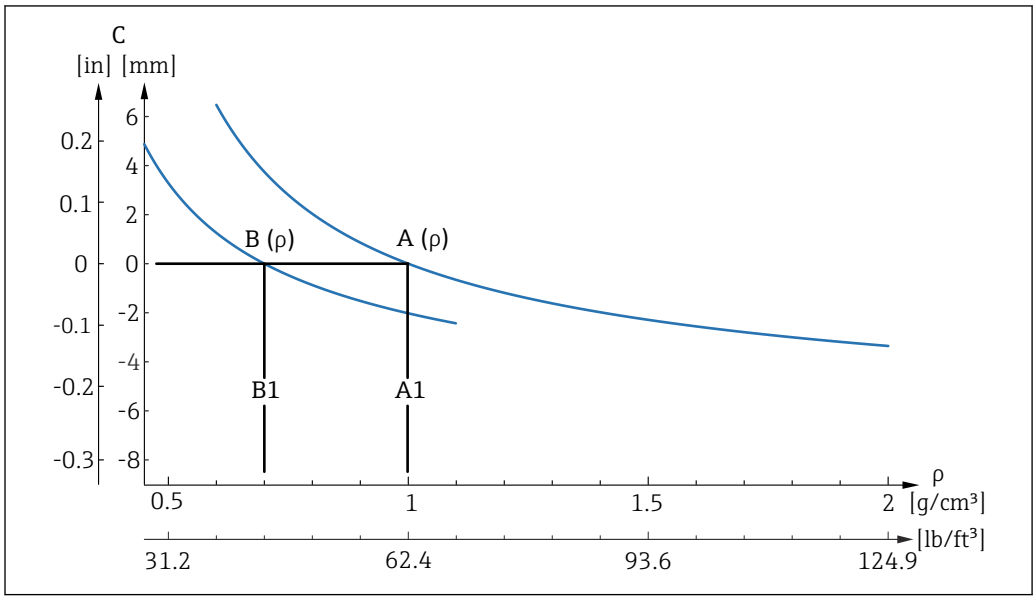
Influence of the process temperature

The switch point moves from +1.4 to −2.6 mm (+0.06 to −0.1 in) in the temperature range of −50 to +150 °C (−58 to +302 °F)

Influence of the process pressure

The switch point moves from 0 to 2.6 mm (0 to 0.1 in) in the pressure range of −1 to +64 bar (−14.5 to +928 psi)

Influence of the process medium density (at room temperature and normal pressure)



6 Switch point deviation over density, 316L

A Set density (ρ) > 0.7 g/cm³ (43.7 lb/ft³)
A1 Reference operating condition ρ = 1 g/cm³ (62.4 lb/ft³)
B Set density (ρ) > 0.5 g/cm³ (31.2 lb/ft³)
B1 Reference operating condition ρ = 0.7 g/cm³ (43.7 lb/ft³)
C Switch point deviation

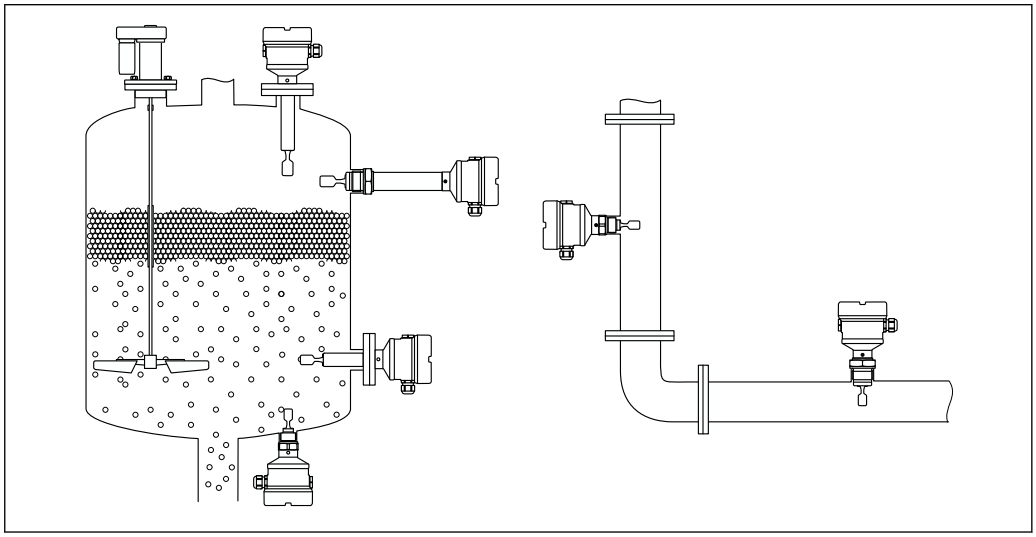
Density setting
- $TC_{typ.}$, [mm/10 k]
  - ρ > 0.7 g/cm³ (43.7 lb/ft³): −0.2
  - ρ > 0.5 g/cm³ (31.2 lb/ft³): −0.2
- $Pressure_{typ.}$, [mm/10 bar]
  - ρ > 0.7 g/cm³ (43.7 lb/ft³): −0.3
  - ρ > 0.5 g/cm³ (31.2 lb/ft³): −0.4

Installation

Mounting location, orientation

Mounting instructions

- Any orientation for compact version or version with a pipe length of up to 500 mm (19.7 in)approx.
- Vertical orientation from above for device with long pipe
- Minimum distance between the tuning fork 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*

Installation instructions

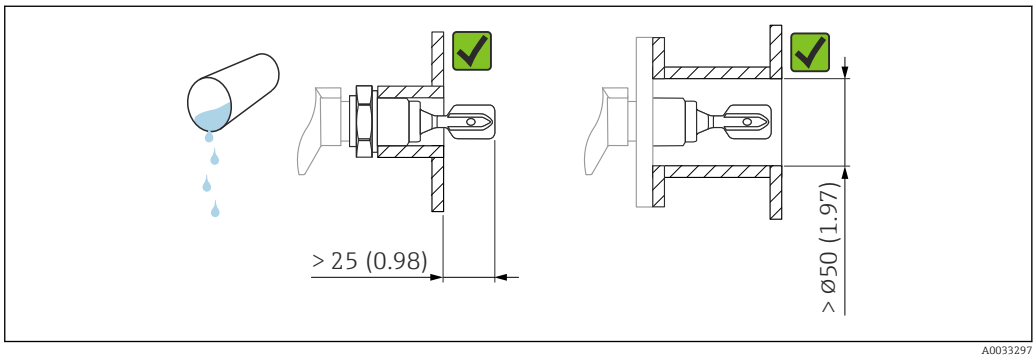
Take viscosity into consideration

Viscosity values
- Low viscosity : < 2 000 mPa·s
- High viscosity: > 2 000 to 10 000 mPa·s

Low viscosity

Low viscosity, e.g. water: < 2 000 mPa·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

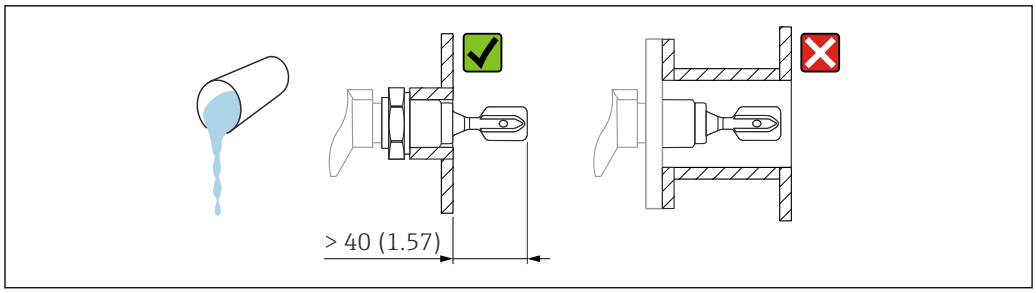
NOTICE

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: ≤ 10 000 mPa·s

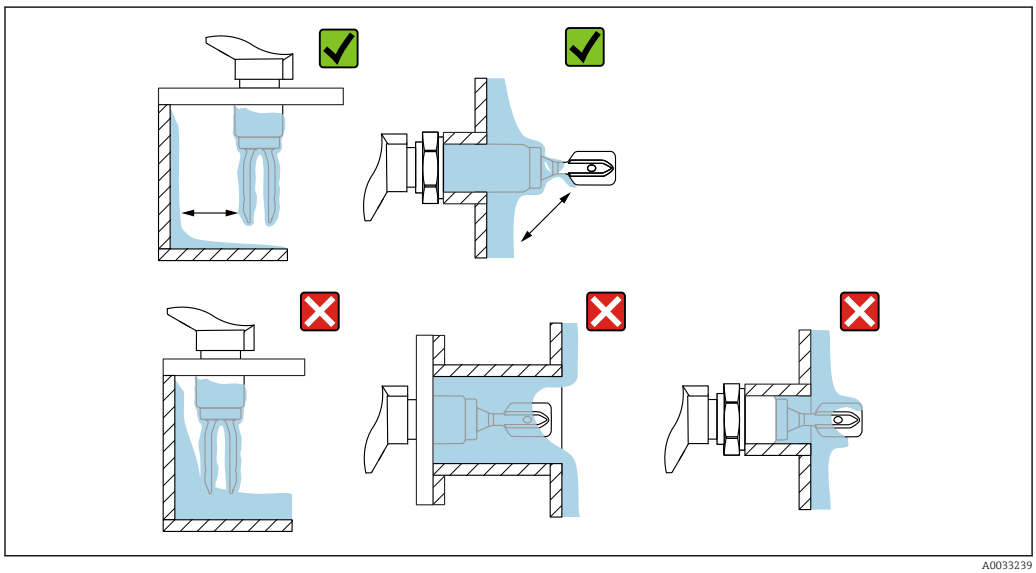
The tuning fork must be located outside the installation socket!



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

Avoid buildup

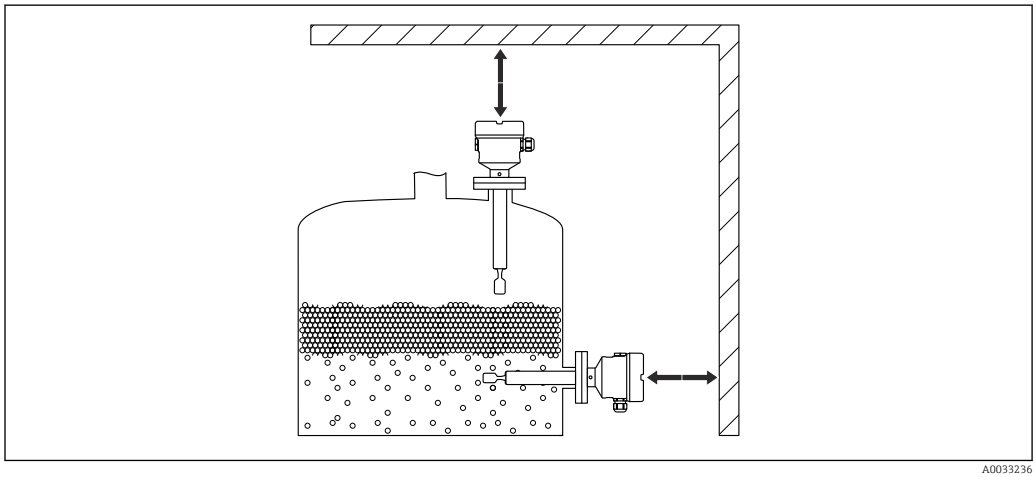
- Use short installation sockets to ensure that the tuning fork projects freely into the vessel
- Leave sufficient distance between the buildup expected on the tank wall and the tuning fork



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.

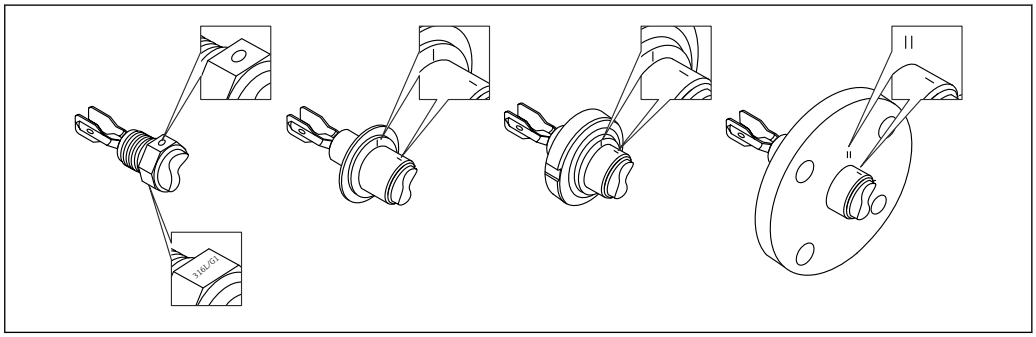


11 *Take clearance into consideration*

Aligning the tuning fork using the marking

The tuning fork can be aligned using the marking in such a way that the medium drains off easily and buildup is avoided.

Markings on process connection:
Material specification, thread designation, circle, line or double line



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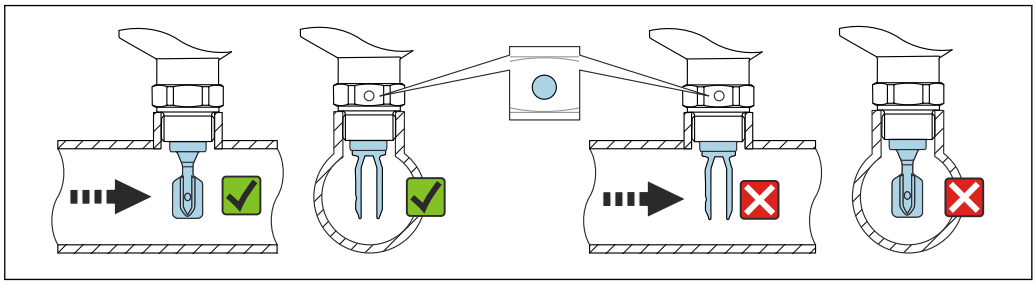
12 *Position of the tuning fork when installed horizontally in the vessel using the marking*

Installing the device in piping

- Flow velocity up to 5 m/s with a viscosity of 1 mPa·s and density of 1 g/cm³ (62.4 lb/ft³) (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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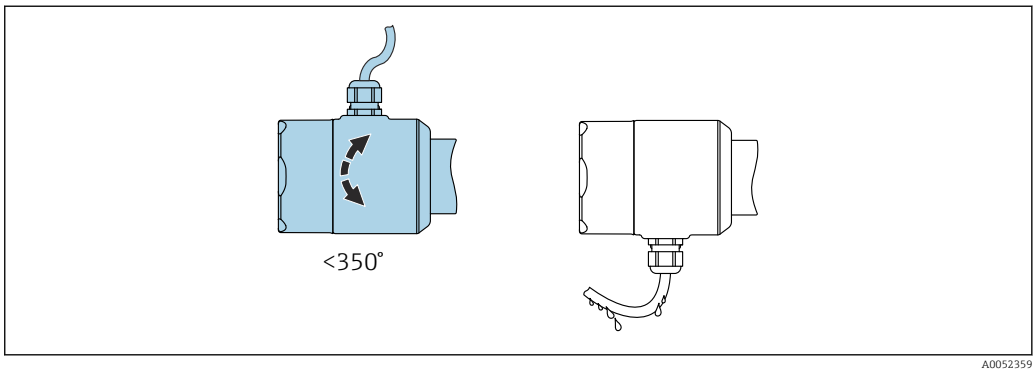
13 *Installation in pipes (take fork position and marking into consideration)*

Aligning the cable entry

All housings can be aligned.

Housing without locking screw

The device housing can be rotated up to 350°.



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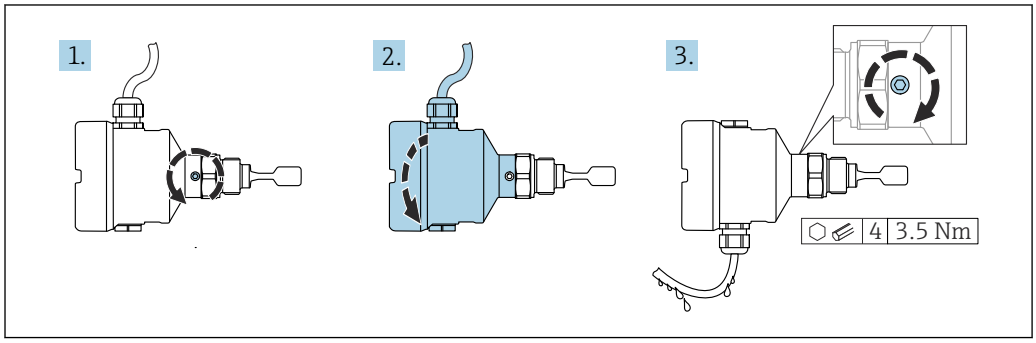
14 *Housing without locking screw with drip loop*

Housing with locking screw

Housings with locking screw:
- The housing can be turned and the cable aligned by turning the locking screw.
- The locking screw is not tightened when the device is delivered.

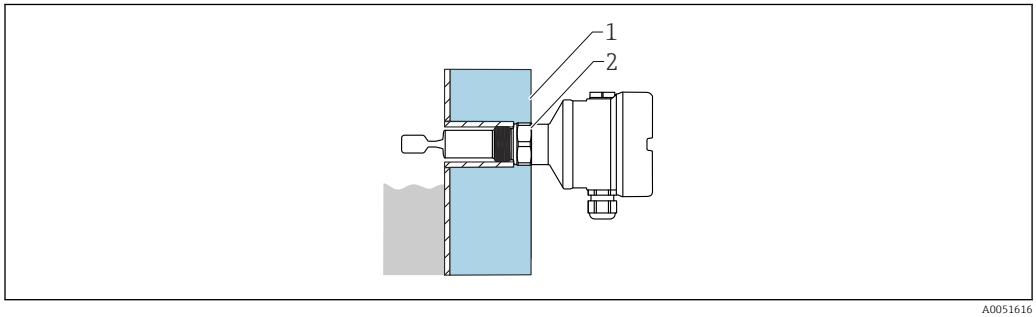


15 *Housing with external locking screw and drip loop*

Special mounting instructions

Vessel with heat insulation

If process temperatures are high, the device should be incorporated in the usual vessel insulation system to prevent the electronics from heating as a result of thermal radiation or convection. The insulation in this case should not be higher than the neck of the device.

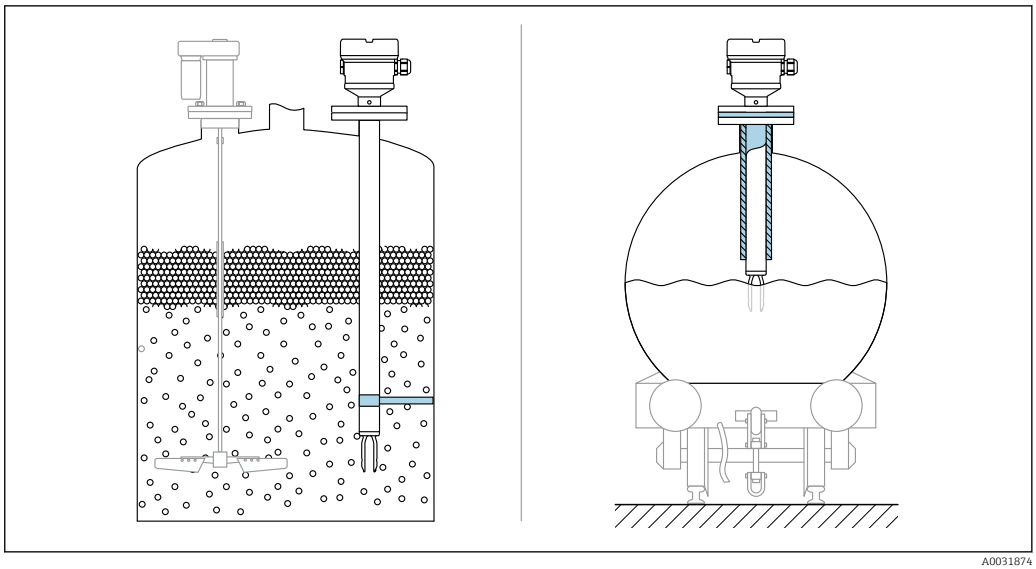


16 *Vessel with heat insulation (example)*

1 *Vessel insulation*
2 *Insulation up to the housing neck max.*

Support the device

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).



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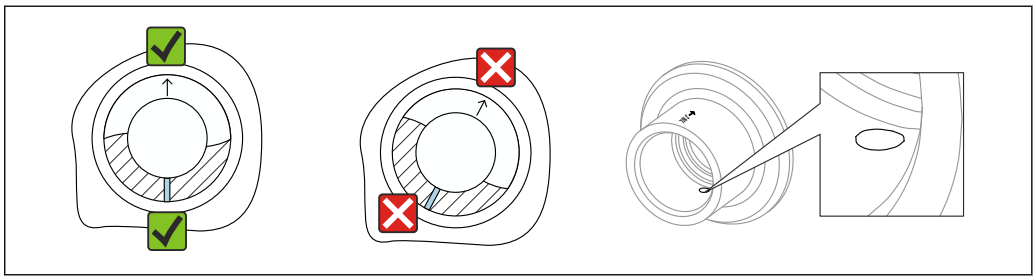
17 *Examples of support in the event of dynamic load*

Weld-in adapter with leakage hole

Weld in the weld-in adapter in such a way that the leakage hole is pointing downwards. This enables any leaks to be detected quickly.



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18 *Weld-in adapter with leakage hole*

Environment

Ambient temperature range

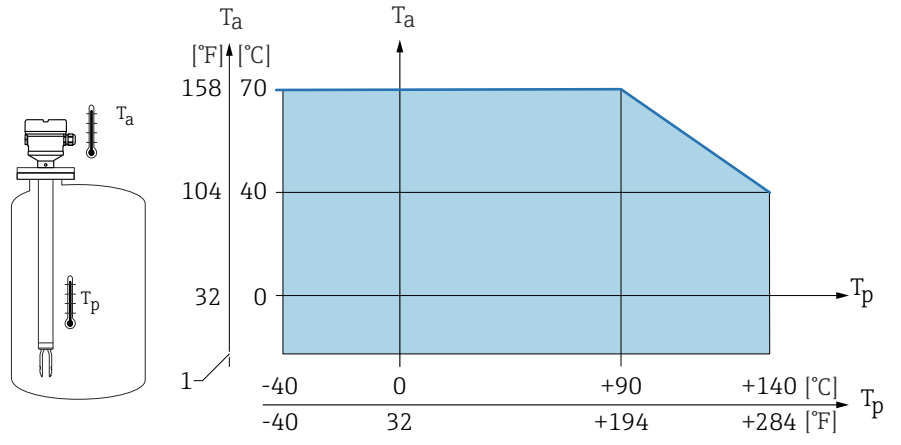
The following values apply up to a process temperature of +90 °C (+194 °F). At higher process temperatures, the permitted ambient temperature is reduced (see diagram).
- Without LCD display: −40 to +70 °C (−40 to +158 °F)
- With LCD display: −40 to +70 °C (−40 to +158 °F) with limitations in optical properties, such as display speed and contrast
  Can be used without limitations: −20 to +60 °C (−4 to +140 °F)

Optionally available to order:
- −50 °C (−58 °F) with restricted operating life and performance
- −60 °C (−76 °F) with restricted operating life and performance,
  Below −50 °C (−58 °F): devices can be permanently damaged

The following ambient temperature applies over the entire process temperature range for devices with a temperature spacer: +70 °C (+158 °F)

Outdoor operation in strong sunlight:
- Mount the device in a shaded location
- Avoid direct sunlight, particularly in warmer climatic regions
- Use a protective cover, can be ordered as an accessory

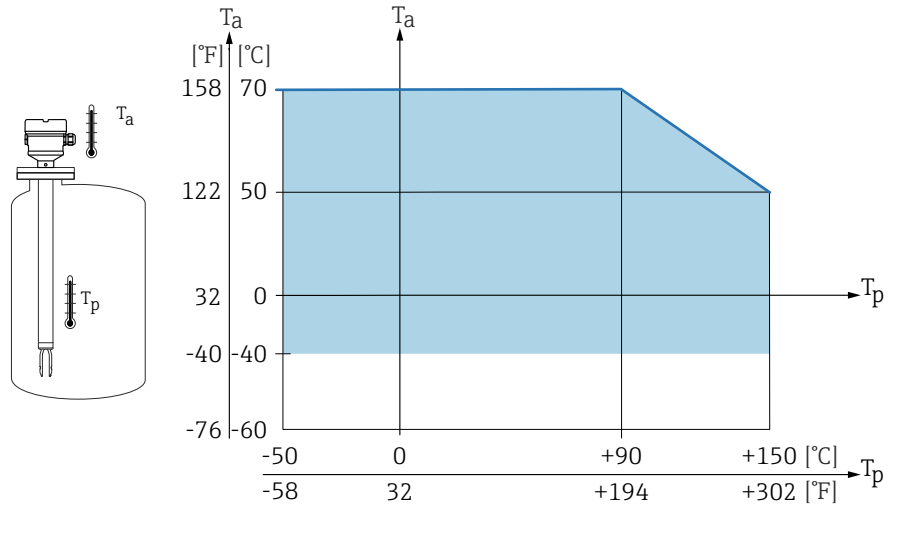
Single compartment housing (plastic)



19 *Permitted ambient temperature T_a at the housing as a function of the process temperature T_p in the vessel*

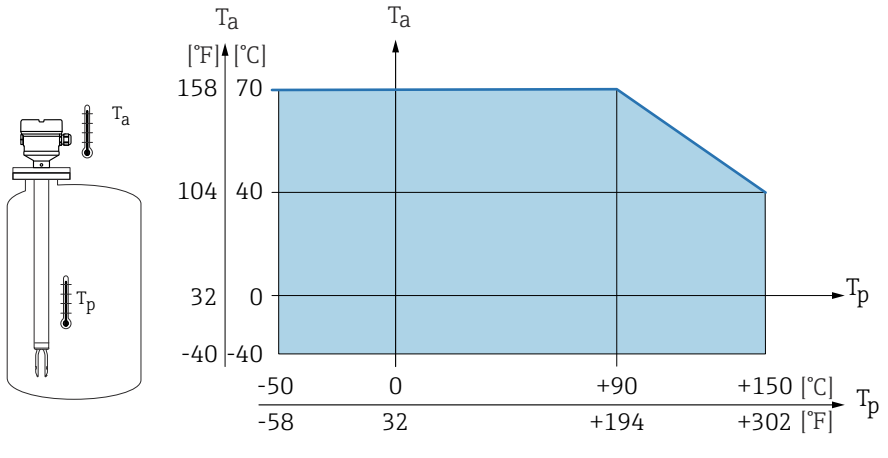
1 *Europe: −20 °C (−4 °F)*
CSA GP: 0 °C (32 °F) indoor use

Single compartment and dual compartment housing (aluminum, coated)



20 *Permitted ambient temperature T_a at the housing as a function of the process temperature T_p in the vessel*

Single compartment housing (316 L, hygiene)



21 *Permitted ambient temperature T_a at the housing as a function of the process temperature T_p in the vessel*

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

−40 to +80 °C (−40 to +176 °F)
Optional −50 °C (−58 °F) or −60 °C (−76 °F)

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

Testing according to IEC 60529 and NEMA 250

IP68 test condition: 1.83 m H_2O for 24 h

Housing
See cable entries

Cable entries
- M20 coupling, plastic, IP66/68 NEMA Type 4X/6P
- M20 coupling, nickel-plated brass, IP66/68 NEMA Type 4X/6P
- M20 coupling, 316L, IP66/68 NEMA Type 4X/6P
- M20 coupling, 316L, hygienic, IP66/68/69 NEMA Type 4X/6P
- M20 thread, IP66/68 NEMA Type 4X/6P
- G ½ thread, NPT ½ , IP66/68 NEMA Type 4X/6P

Degree of protection for M12 plug
- When housing is closed and connecting cable is plugged in: IP66/67 NEMA Type 4X
- When housing is open or connecting cable is not plugged in: IP20, NEMA Type 1

NOTICE

M12 plug: 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.

If the "M12 plug" option is selected as the electrical connection, **IP66/67 NEMA Type 4X** applies for all housing types.

Vibration resistance

As per IEC60068-2-64-2008
a(RMS) = 50 m/s^2, f = 5 to 2 000 Hz , t = 3 axes x 2 h

Shock resistance

In accordance with IEC60068-2-27-2008: 300 m/s² [= 30 g_n] + 18 ms

g_n: standard acceleration of gravity

Mechanical load

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.

Pollution degree

Pollution level 2

Electromagnetic compatibility (EMC)

- Electromagnetic compatibility as per EN 61326 series and NAMUR recommendation EMC (NE21)
- With regard to the safety function (SIL), the requirements of EN 61326-3-x are satisfied
- Maximum deviation under disturbance: < 0.5% of span

For more details, refer to the EU Declaration of Conformity.

Process

Process temperature range

−50 to +150 °C (−58 to +302 °F)

Observe pressure and temperature dependency, see the "Process pressure range of the sensors" section.

Thermal shock

≤ 120 K/s

Process pressure range

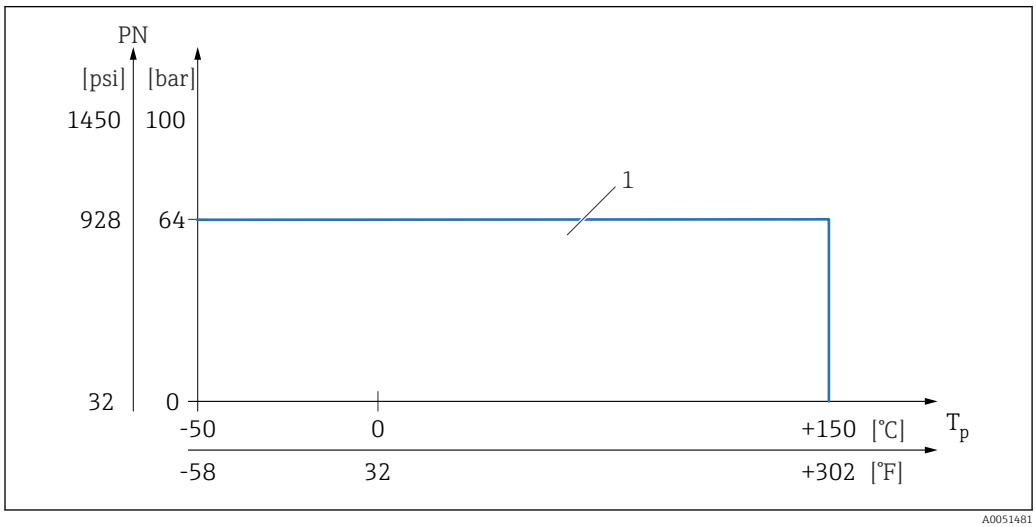
−1 to +64 bar (−14.5 to 928 psi) for a maximum of 150 °C (302 °F)

WARNING

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.

- ▶ Pressure specifications, Technical Information, "Mechanical construction" section.
- ▶ Only operate the device within the specified limits!
- ▶ The Pressure Equipment Directive (2014/68/EU) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the device.

Process pressure range of the sensors



1 PN: 64 bar (928 psi) for a maximum of 150 °C (302 °F), refer to "Process connections" section for exceptions

Overpressure limit

- PN = 64 bar (928 psi): overpressure limit = 1.5 · PN maximum 100 bar (1 450 psi) depending on the selected process connection
- Membrane burst pressure at 200 bar (2 900 psi)

The device function is limited during the pressure test.

Mechanical integrity is guaranteed up to 1.5 times the process nominal pressure PN.

Medium density

Liquids with density > 0.7 g/cm³ (43.7 lb/ft³)
Setting > 0.7 g/cm³ (43.7 lb/ft³), as supplied to the customer

Liquids with density 0.5 g/cm³ (31.2 lb/ft³)
Setting > 0.5 g/cm³ (31.2 lb/ft³), can be ordered as preset value or configurable

Liquids with density > 0.4 g/cm³ (25.0 lb/ft³)
- Setting > 0.4 g/cm³ (25.0 lb/ft³), can be ordered as preset value or configurable
- SIL for defined media and process parameters on request

For information on medium differentiation/density detection: Documentation Liquiphant density (FEL60D) with density computer FML621 (Endress+Hauser website www.endress.com → Downloads)

Viscosity

≤ 10 000 mPa·s

Pressure tightness

Up to vacuum

In vacuum evaporation plants, select the 0.4 g/cm³ (25.0 lb/ft³)/ density setting.

Solids contents

Ø ≤ 5 mm (0.2 in)

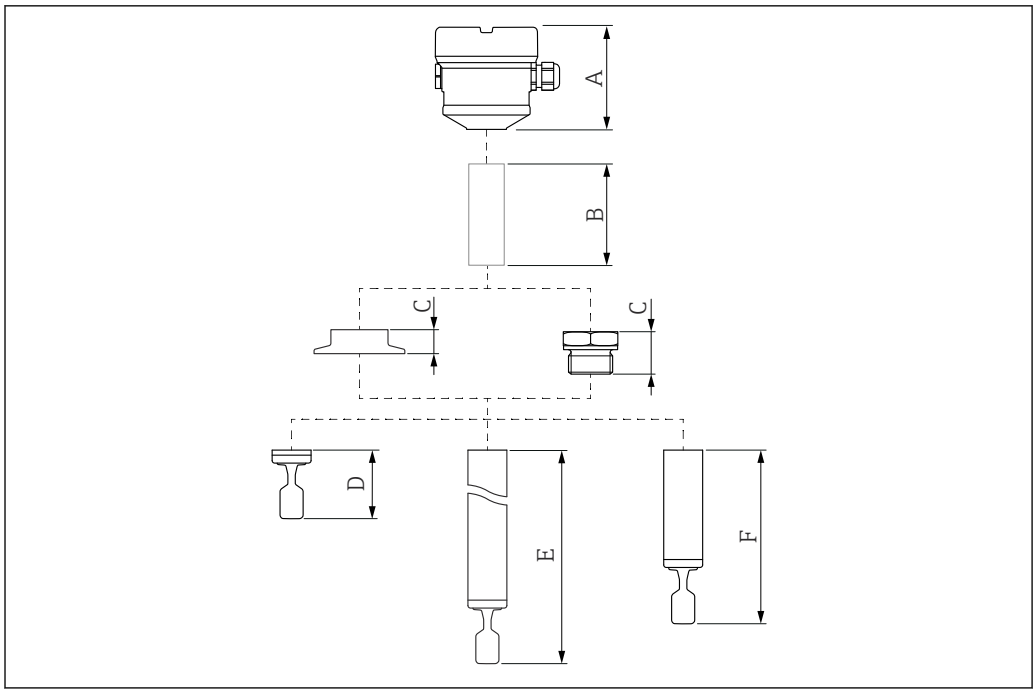
Mechanical construction

Design, dimensions

Device height

The device height consists of the following components:
- Housing including cover
- Temperature spacer and/or pressure-tight feedthrough (second line of defense), optional
- Compact version, pipe extension or short pipe version
- Process connection

The individual heights of the components can be found in the following sections:
- Determine the height of the device and add the individual heights
- Take the installation clearance into consideration (space that is needed to install the device)



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22 *Components to determine the device height*

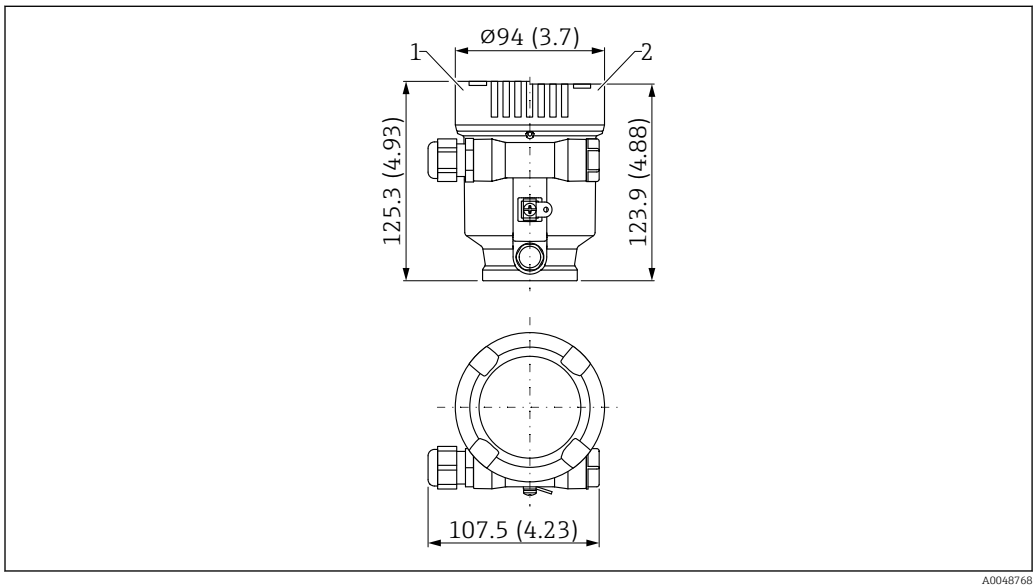
A Housing including cover
B Temperature spacer, pressure-tight feedthrough (optional)
C Process connection
D Probe design: compact version with tuning fork
E Probe design: pipe extension with tuning fork
F Probe design: short pipe version with tuning fork

Dimensions

Housing and cover

All housings can be aligned. The housing alignment can be fixed on housings with a locking screw.

Single compartment housing, plastic



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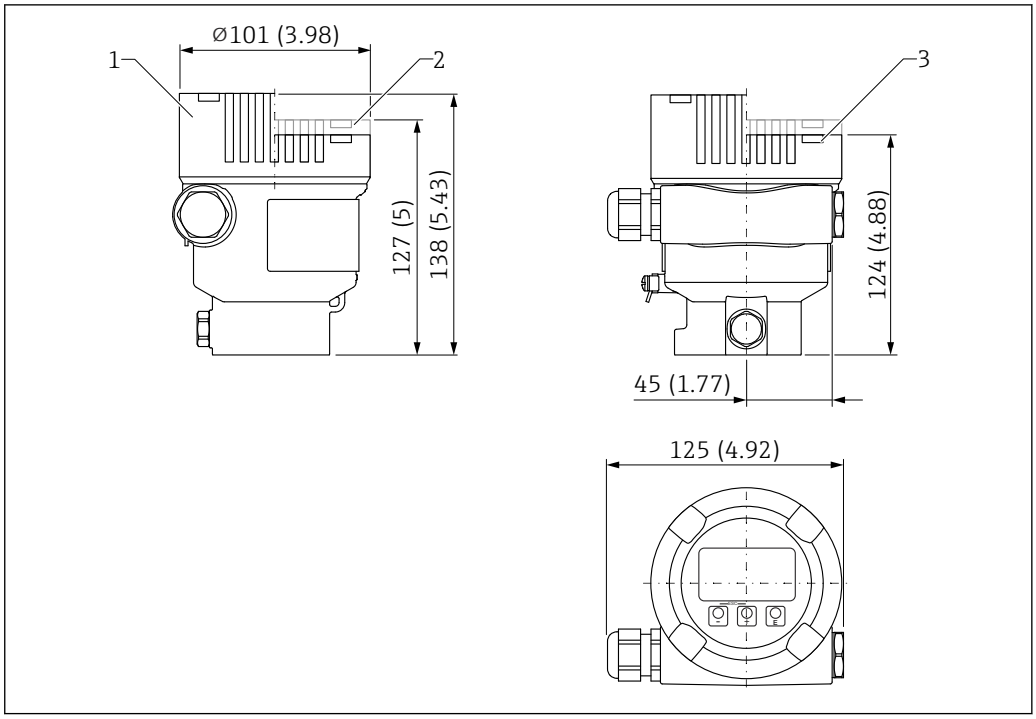
23 *Dimensions; single compartment housing, plastic; incl. M20 coupling and plug, plastic. Unit of measurement mm (in)*

1 Height with cover comprising plastic sight glass
2 Height with cover without sight glass

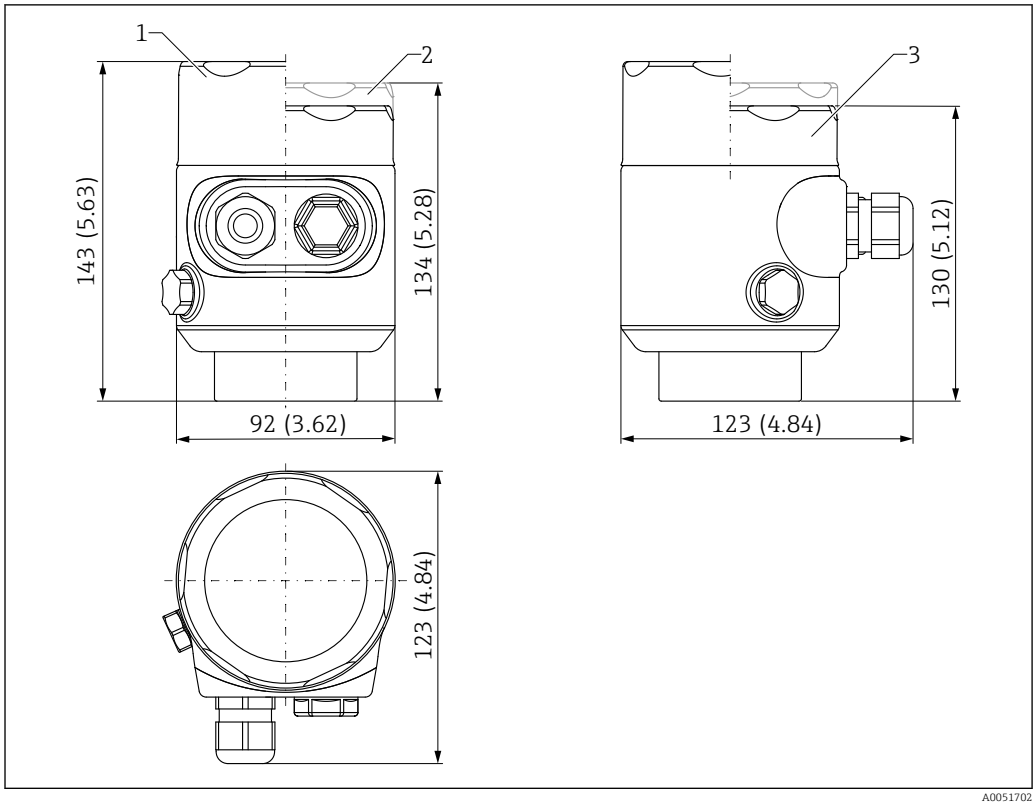
Single-compartment housing, aluminum, coated



24 Dimensions of single-compartment housing, aluminium, coated. Unit of measurement mm (in)

1 Height with cover comprising glass sight glass (devices for Ex d/XP, dust Ex)
2 Height with cover comprising plastic sight glass
3 Height with cover without sight glass

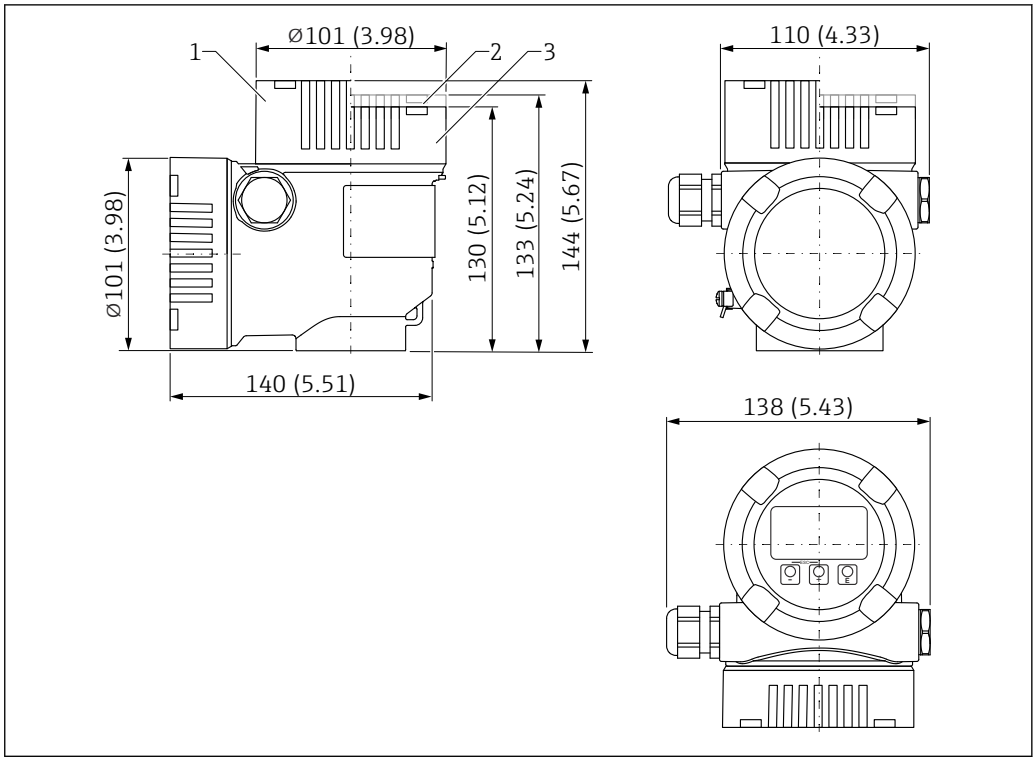
Single-compartment housing, 316L, hygienic



25 Dimensions of single-compartment housing, 316 L, hygienic. Unit of measurement mm (in)

1 Height with cover comprising sight glass made of glass
2 Height with cover comprising plastic sight glass
3 Height with cover without sight glass

Dual-compartment housing, L-form, aluminum, coated

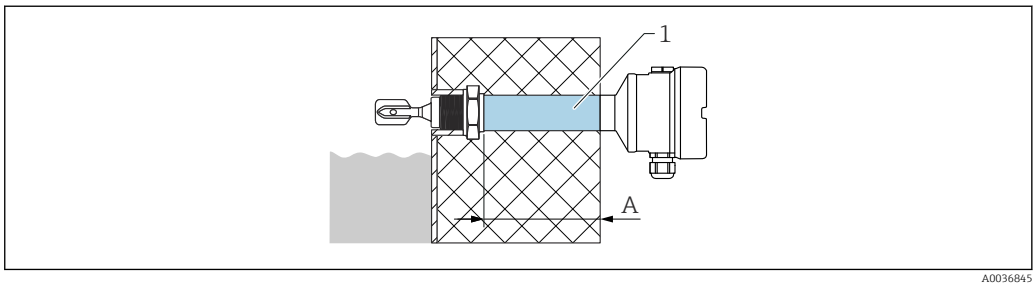


26 *Dimensions of dual-compartment housing, L-form, aluminum, coated. Unit of measurement mm (in)*

1 *Height for cover with glass sight glass (devices for Ex d/XP, dust Ex)*
2 *Height for cover with plastic sight glass*
3 *Height with cover without sight glass*

Temperature spacer, pressure-tight feedthrough (optional)

Provides sealed insulation for the vessel and a normal ambient temperature for the housing



1 *Temperature spacer and/or pressure-tight feedthrough with maximum insulation length*
A *140 mm (5.51 in)*

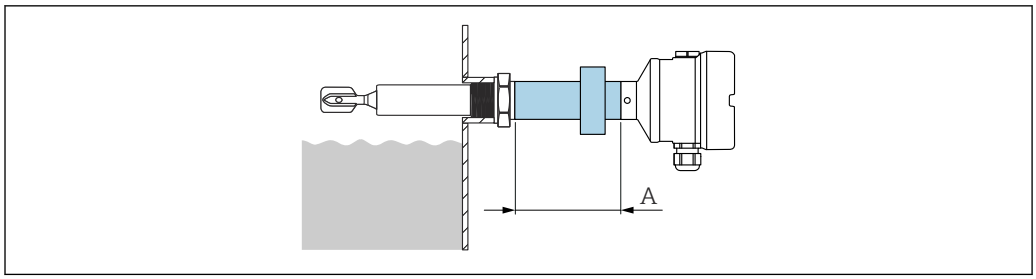
Product Configurator, feature "Sensor design":
- Temperature spacer
- Pressure-tight feedthrough (second line of defense)
  If the sensor is damaged, this protects the housing from vessel pressures up to 100 bar (1 450 psi).

Neither version can be ordered for Ex d

The "Pressure-tight feedthrough" version can only be selected in conjunction with the "Temperature spacer" option.

Ex d glass feedthrough for pipe extensions

If a pipe extension is required in combination with an Ex d approval, the following design is used:



27 Ex d glass feedthrough for pipe extensions

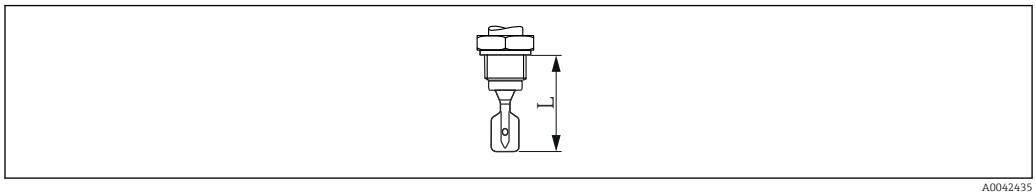
A 76 mm (2.99 in)

Probe design

Compact version

Sensor length L: depends on process connection

For more details, see the "Process connections" section.



28 Probe design: Compact version, sensor length L

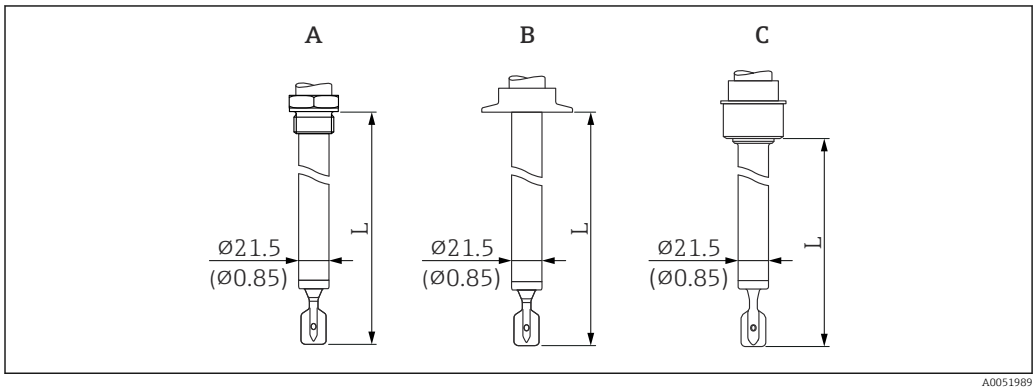
Short pipe version

Sensor length L: depends on process connection

- Thread G 1 approx. 118 mm (4.65 in)
- Ingold, flush-mounted tank connection, DIN11851 pipe union, Varivent, Clamp/Tri-Clamp approx. 115 mm (4.53 in)
- Flush-mounted 1" (G 1 welding boss from Endress+Hauser) approx. 104 mm (4.09 in)

Pipe extension

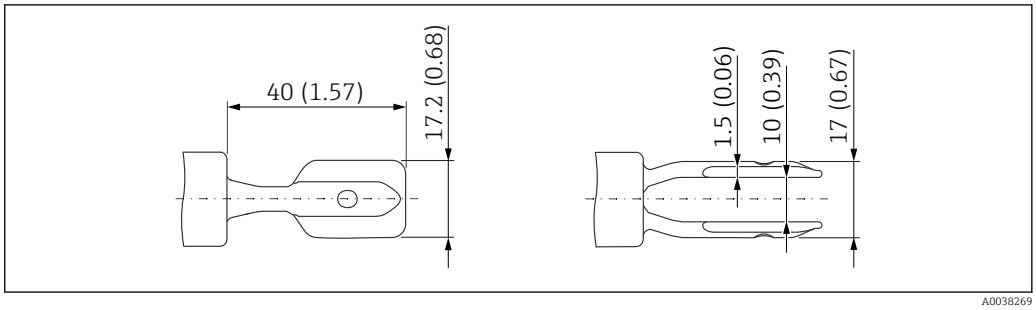
- Sensor lengths L: 148 to 3 000 mm or 5.83 to 118.11 in
- Length tolerances L: < 1 m (3.3 ft) = −5 mm (−0.2 in), 1 to 3 m (3.3 to 9.8 ft) = −10 mm (−0.39 in)



29 Probe designs: pipe extension, short pipe (sensor length L). Unit of measurement mm (in)

A Thread G 1
B For example, clamp/Tri-Clamp, Varivent
C Flush-mounted tank connection for installation in weld-in adapter

Tuning fork



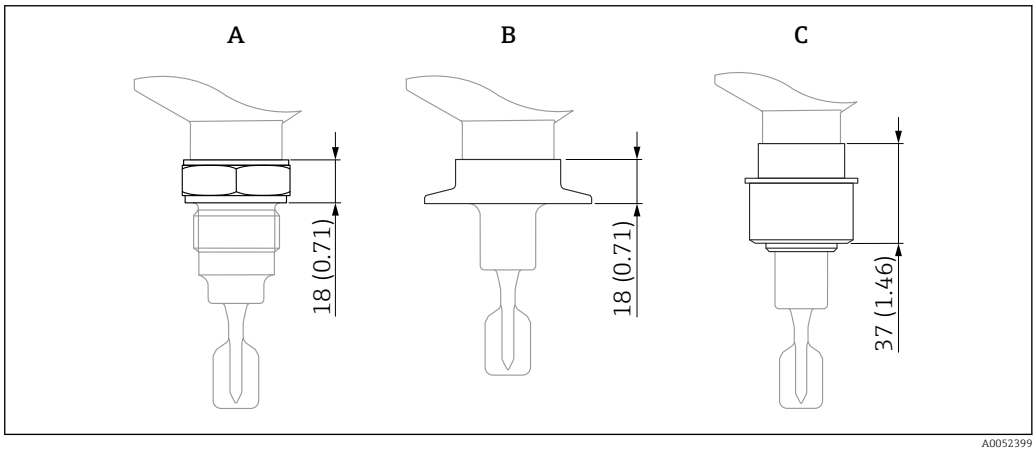
30 *Tuning fork. Unit of measurement mm (in)*

Process connections

Process connection, sealing surface

- Thread ISO228, G
- Ingold
- Flush-mounted tank connection
- DIN11851 pipe union
- Varivent (Varinline)
- Clamp/Tri-Clamp

Height of process connection



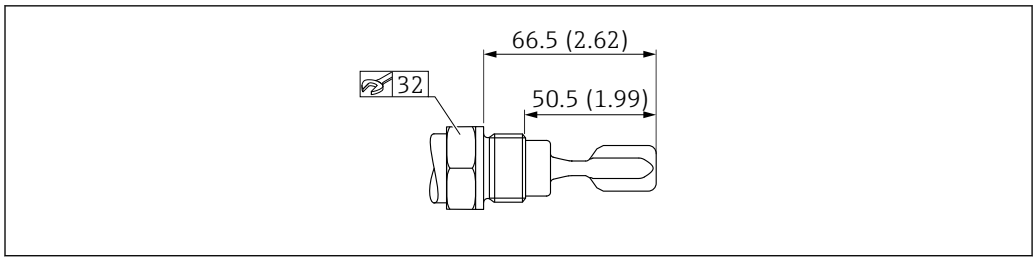
31 *Maximum height specification for the process connections. Unit of measurement mm (in)*

A Process connection with threaded connection
B For example: Clamp/Tri-Clamp, Varivent
C Flush-mounted tank connection for installation in welding neck

Thread ISO228 G ¾ for installation in weld-in adapter

G ¾ with defined thread start for flush mounting in weld-in adapter
- Only for sensor design: compact version
- Material: 316L
- Pressure rating, temperature: ≤ 40 bar (580 psi), ≤ +100 °C (+212 °F)
- Pressure rating, temperature: ≤ 25 bar (363 psi), ≤ +150 °C (+302 °F)
- Weight: 0.2 kg (0.44 lb)
- Accessories: weld-in adapter, optionally available as "Accessory enclosed"

A seal is not included in the delivery. The maximum temperature and maximum pressure depend on the clamping ring and sealing element used (according to the process connection design). The lowest value applies in each case.

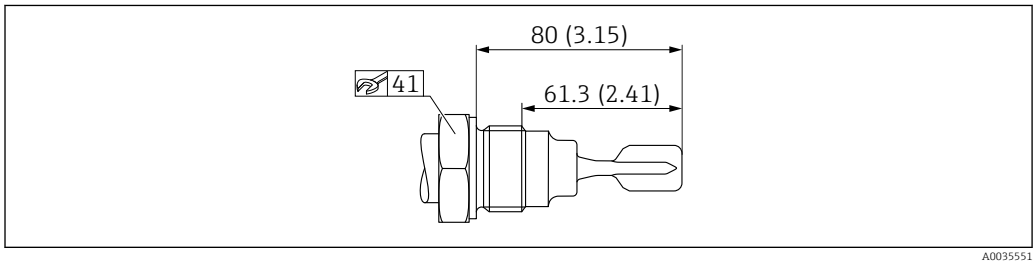


32 *Thread ISO228 G ¾. Unit of measurement mm (in)*

Thread ISO228 G 1 for installation in weld-in adapter

G 1 with defined thread start, comprising sealing surface for flush mounting in weld-in adapter
- Material: 316L
- Pressure rating, temperature: ≤ 40 bar (580 psi), ≤ +100 °C (+212 °F)
- Pressure rating, temperature: ≤ 25 bar (363 psi), ≤ +150 °C (+302 °F)
- Weight: 0.33 kg (0.73 lb)
- Accessories: weld-in adapter, optionally available as "Accessory enclosed"

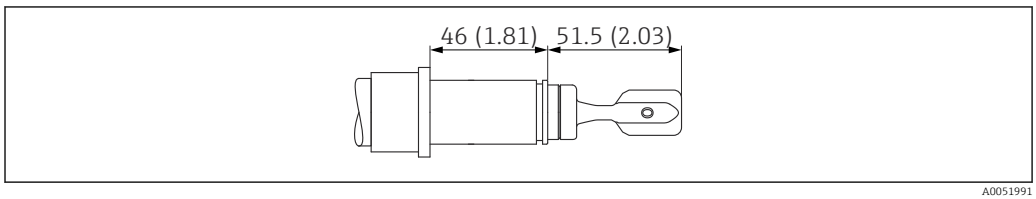
A seal is not included in the delivery. The maximum temperature and maximum pressure depend on the clamping ring and sealing element used (according to the process connection design). The lowest value applies in each case.



33 *Thread ISO228 G 1. Unit of measurement mm (in)*

Ingold fitting

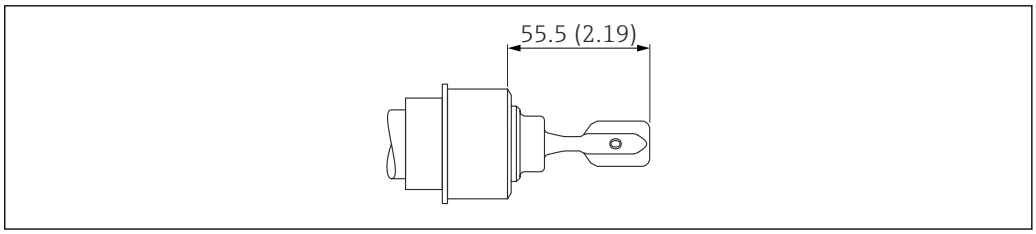
Ingold fitting 25 x 46 mm (2.52 in)
- Material: 316L
- Pressure rating: ≤ 16 bar (232 psi)
- Temperature: ≤ 150 °C (302 °F)
- Weight: 0.2 kg (0.44 lb)
- Scope of delivery: cap-nut G 1¼, seal



34 *Ingold fitting 25 x 46 mm (2.52 in). Unit of measurement mm (in)*

Flush-mounted tank connection for installation in weld-in adapter

- Material: 316L
- Pressure rating, temperature: ≤ 40 bar (580 psi), ≤ +100 °C (+212 °F)
- Pressure rating, temperature: ≤ 25 bar (363 psi), ≤ 140 °C (284 °F)
- Weight: 0.44 kg (0.97 lb)
- Accessories: weld-in adapter, optionally available as "Accessory enclosed"
- Scope of delivery: cap-nut, seal



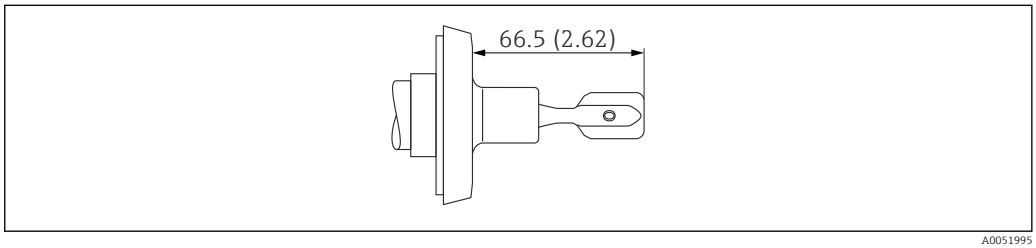
35 *Flush-mounted tank connection. Unit of measurement mm (in)*

DIN11851 pipe union

DN32 PN25
- Material: 316L
- Slotted nut
- Pressure rating, temperature: ≤ 40 bar (580 psi), ≤ +100 °C (+212 °F)
- Pressure rating, temperature: ≤ 25 bar (363 psi), ≤ 140 °C (284 °F)
- Weight: 0.3 kg (0.66 lb)

DN40 PN25
- Material: 316L
- Slotted nut
- Pressure rating, temperature: ≤ 40 bar (580 psi), ≤ +100 °C (+212 °F)
- Pressure rating, temperature: ≤ 25 bar (363 psi), ≤ 140 °C (284 °F)
- Weight: 0.35 kg (0.77 lb)

A seal is not included in the delivery. The maximum temperature and maximum pressure depend on the clamping ring and sealing element used (according to the process connection design). The lowest value applies in each case.

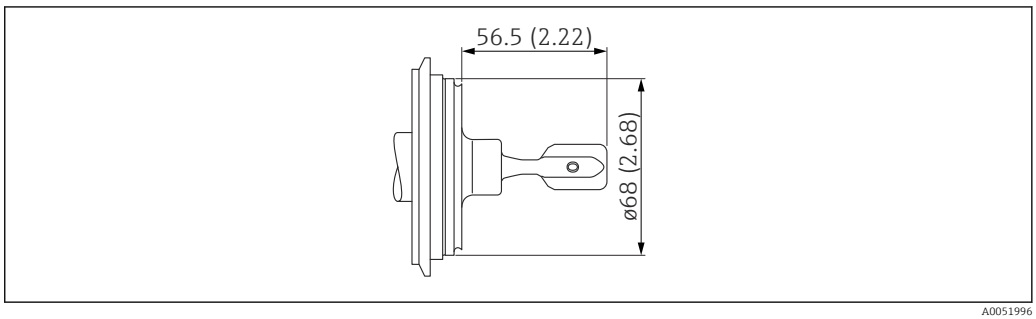


36 *DIN11851 pipe union. Unit of measurement mm (in)*

Varivent (Varinline)

Varivent N pipe DN65-162 PN25
- Material: 316L
- Pressure rating: ≤ 25 bar (363 psi)
- Temperature: ≤ 150 °C (302 °F)
  Suitable for GEA Tuchenhagen
- Weight: 0.72 kg (1.59 lb)

A seal is not included in the delivery. The maximum temperature and maximum pressure depend on the clamping ring and sealing element used (according to the process connection design). The lowest value applies in each case.



37 *Varivent N pipe DN65-162 PN25. Unit of measurement mm (in)*

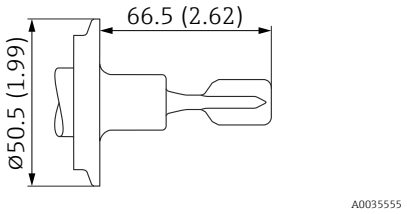
Tri-Clamp

ISO 2852 DN25-38 (1 to 1 ½"), DIN 32676 DN25-40
- Material: 316L
- Pressure rating: ≤ 25 bar (363 psi)
- Temperature: ≤ 150 °C (302 °F)
- Weight: 0.3 kg (0.66 lb)

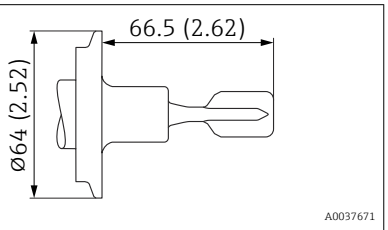
ISO 2852 DN40-51 (2"), DIN 32676 DN50
- Material: 316L
- Pressure rating: ≤ 25 bar (363 psi)
- Temperature: ≤ 150 °C (302 °F)
- Weight: 0.3 kg (0.66 lb)

The Tri-Clamp connection is compatible with NA Connect.

A seal is not included in the delivery. The maximum temperature and maximum pressure depend on the clamping ring and sealing element used (according to the process connection design). The lowest value applies in each case.



38 *Tri-Clamp 1 to 1 ½". Unit of measurement mm (in)*



39 *Tri-Clamp 2". Unit of measurement mm (in)*

Weight

Housing
Weight including electronics and display (graphic display) without cover:

Single compartment housing
- Plastic: 0.5 kg (1.10 lb)
- Aluminum, coated: 1.2 kg (2.65 lb)
- 316L, hygiene: 1.2 kg (2.65 lb)

Dual compartment housing, L-form
Aluminum, coated: 1.7 kg (3.75 lb)

Temperature spacer
0.6 kg (1.32 lb)

Pressure-tight feedthrough
0.7 kg (1.54 lb)

Ex d glass feedthrough
0.5 kg (1.10 lb)

Pipe extension
- 1 000 mm: 0.9 kg (1.98 lb)
- 50 in: 1.15 kg (2.54 lb)

Process connection

See "Process connections" section

Protective cover, plastic
0.2 kg (0.44 lb)

Protective cover, 316L
0.93 kg (2.05 lb)

Materials

Materials in contact with process

Process connection and pipe extension

316L (1.4404 or 1.4435)

Tuning fork

316L (1.4435)

Seals

Scope of delivery including seal
- Ingold fitting, seal material: EPDM (in compliance with FDA, USP Class VI)
- Flush-mounted tank connection for installation in welding neck, seal material: silicone

Materials not in contact with process

Single compartment housing, plastic

- Housing: PBT/PC
- Dummy cover: PBT/PC
- Cover with sight glass: PBT/PC and PC
- Cover seal: EPDM
- Potential equalization: 316L
- Seal under potential equalization: EPDM
- Plug: PBT-GF30-FR
- Seal on plug: EPDM
- Nameplate: plastic foil
- TAG plate: plastic foil, metal or provided by the customer

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

Single compartment housing, aluminum, coated

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

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

Single compartment housing, 316L, hygienic

- Housing: stainless steel 316 L (1.4404)
- Dummy cover: stainless steel 316 L (1.4404)
- Cover stainless steel 316 L (1.4404) with PC Lexan 943A sight glass
  Cover stainless steel 316 L (1.4404) with borosilicate sight glass; can optionally be ordered as a mounted accessory
- Cover sealing materials: VMQ
- Potential equalization: 316L
- Seal under potential equalization: EPDM
- Plug: PBT-GF30-FR or stainless steel
- Plug sealing material: EPDM
- Nameplate: stainless steel housing labeled directly
- TAG plate: plastic foil, stainless steel or provided by the customer

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

Dual compartment housing, L-shaped, aluminum, coated

- Housing: EN AC-43400 aluminum
- Housing coating, cover: polyester
- EN AC-43400 aluminum cover with Lexan 943A PC sight glass
  EN AC-443400 aluminum cover with borosilicate sight glass; dust-Ex for Ex d/XP
- Dummy cover: EN AC-43400 aluminum
- Cover sealing materials: HNBR
- Cover sealing materials: FVMQ (in low temperature version only)
- Plug: PBT-GF30-FR or aluminum

- Plug sealing material: EPDM
- Nameplate: plastic foil
- TAG plate: plastic foil, stainless steel or provided by the customer

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

Wired-on nameplate

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

Electrical connection

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

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

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

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

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

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

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

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

Surface roughness

Surface roughness of the surface in contact with the process:
Ra < 1.5 µm (59 µin), CoC ASME BPE

Optional:
- Ra < 0.3 µm (12 µin) mechanically polished (3-A, EHEDG)
- Ra < 0.38 µm (15 µin) electropolished (3-A, EHEDG, CoC ASME BPE)
  In this version, the parts in contact with the process are made of 316L (1.4435) in accordance with BN2 (delta ferrite content > 1 %

Display and user interface

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

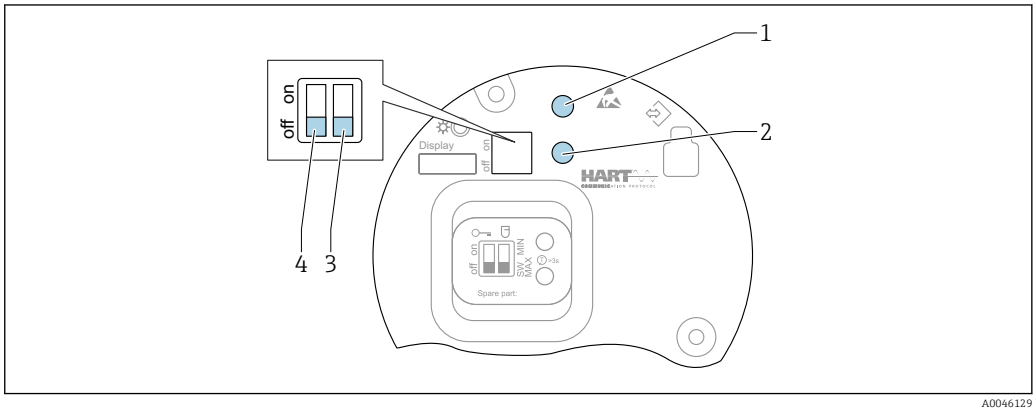
The operating language of the local display (optional) can be selected via the Product Configurator.

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

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

Onsite operation

FEL60H electronic insert



40 Operating keys and DIP switch on FEL60H electronic insert

1 Operating key for reset password (for Bluetooth login and Maintenanceuser 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

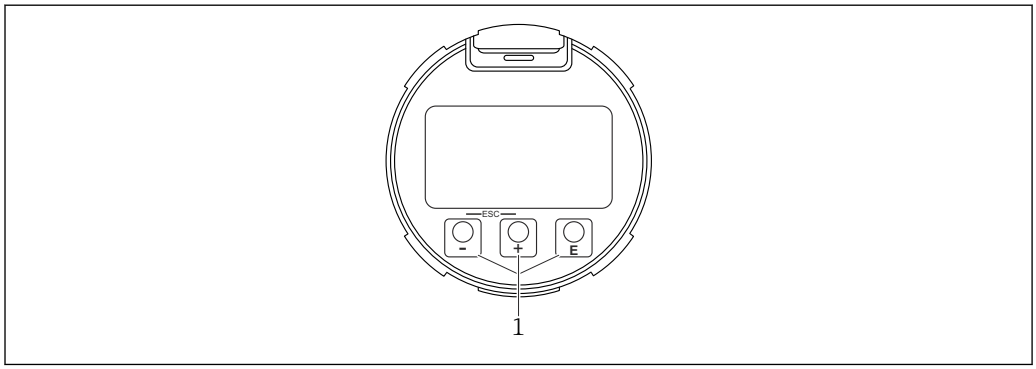
- Minimum/maximum quiescent current safety can be switched at the electronic insert
- MAX = maximum safety: when the tuning fork is covered the output switches to demand mode, e.g. use for overfill protection
- MIN = minimum safety: when the tuning fork is uncovered, the output switches to demand mode,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



41 Graphic display with optical operating keys (1)

Remote operation

Via HART protocol

Via service interface (CDI)

Operation via Bluetooth® wireless technology (optional)

Prerequisite
- Measuring device with display including Bluetooth
- Smartphone or tablet with Endress+Hauser SmartBlue app or PC with DeviceCare from version 1.07.05 or FieldXpert SMT70

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

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

System integration

HART

Version 7

Supported operating tools

Smartphone or tablet with Endress+Hauser SmartBlue app, DeviceCare from version 1.07.05, FieldCare, DTM, AMS and PDM

HistoROM data management

When replacing the electronic insert, the stored data is transferred by reconnecting the HistoROM.

The device serial number is saved in the HistoROM. The electronics serial number is saved in the electronics.

Certificates and approvals

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

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

CE mark

The measuring system meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity together with the standards applied. Endress +Hauser confirms successful testing of the device by affixing to it the CE mark.

RCM marking

The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products bear the RCM marking on the nameplate.

A0029561

Ex-approval

All data relating to explosion protection are provided in separate Ex documentation and are available from the Downloads Area. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.

Explosion-protected smartphones and tablets

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

Material compliance for contact with food

The device has been developed for food contact applications. Versions can be selected that meet the following requirements:
- EU Food Contact Material (EC) 1935/2004
- US Food Contact Material FDA CFR 21
- CN Food Contact Material GB 4806

Hygienic design compliance

3-A and EHEDG-certified versions of the sensor are suitable for Cleaning-in-Place (CIP) and Sterilization-in-Place (SIP) without removing them from the plant. This means that the sensor does not need to be removed during cleaning. The maximum permitted pressure and temperature values for sensor and adapter must not be exceeded (see notes in this TI).

- Notes on installation and certification in accordance with 3-A and EHEDG:
  SD02503F document "Hygienic approvals"
- Information on 3-A and EHEDG-certified adapters:
  TI00426F document "Weld-in adapters, process adapters and flanges"

cGMP

The device was developed for life sciences applications. You can select versions with a cGMP declaration (Current Good Manufacturing Practice) for process-wetted parts with the following content in English:
- Materials of construction
- Polishing and surface treatment
- Materials and compounds compliance table: USP, FDA
- TSE/BSE-compliant based on EMA/410/01 Rev.3

General material compliance

Endress+Hauser guarantees compliance with all relevant laws and regulations, including the current guidelines for materials and substances.

Examples:
- RoHS
- China RoHS
- REACH
- POP VO (Stockholm Convention)

For further information and general declarations of compliance, see the Endress+Hauser website www.endress.com

Overfill protection

Before mounting the device, observe the documentation from the WHG approvals (German Federal Water Act).

Approved for overfill protection and leakage detection.

Product Configurator: feature "Additional approval"

Functional safety

The Liquiphant has been developed according to the IEC 61508 standard. The device is suitable for overfill protection and dry-running protection up to SIL 2 (SIL 3 with homogeneous redundancy). A detailed description of the safety functions with Liquiphant, settings and functional safety data are provided in the "Functional Safety Manual" on the Endress+Hauser website: www.endress.com → Downloads.

Product Configurator: feature "Additional approval"

Subsequent confirmation of usability according to IEC 61508 is not possible.

Radio approval

Further information and currently available documentation can be found on the Endress+Hauser website: www.endress.com → Downloads.

CRN approval

Versions with a CRN approval (Canadian Registration Number) are listed in the corresponding registration documents. CRN-approved devices are marked with a registration number.

Any restrictions regarding the maximum process pressure values are listed on the CRN certificate.

Product Configurator: feature "Additional approval"

Service

- Cleaned of oil+grease (wetted)
- PWIS-free (paint-wetting impairment substances)
  The plastic protective cover and weld-in adapters are exempted from PWIS cleaning
- Switching delay setting to be spec.
- Setting for MIN safety mode
- Setting for HART burst mode PV
- Setting for max. alarm current
- Default density setting > 0.4 g/cm³ (25.0 lb/ft³)
- Default density setting > 0.5 g/cm³ (31.2 lb/ft³)
- Bluetooth communication is disabled on delivery

Test, certificate, declaration

- Inspection certificate 3.1, EN10204 (material certificate, wetted parts)
- AD 2000 (wetted parts), declaration, excluding cast parts
- CoC ASME BPE, declaration
- ASME B31.3 process piping, declaration
- Compliance with requirements derived from cGMP, declaration
- EU Food Contact Material (EC) 1935/2004
- US Food Contact Material FDA CFR 21
- CN Food Contact Material GB 4806
- Surface roughness test ISO4287/Ra, (wetted parts), test report
- Delta-ferrite test, internal procedure (wetted parts), test report

Documentation currently available on the Endress+Hauser website: www.endress.com → Downloads or with the serial number of the device under Online Tools in the Device Viewer.

TSE (BSE) compliance (ADI free - Animal Derived Ingredients)

As the manufacturer, Endress+Hauser states:

- That the parts of this product in contact with the process are not made from materials derived from animals **or**
- at least comply with the requirements of guidelines outlined in EMA/410/01 rev. 3 (TSE (BSE) compliance).

Pressure Equipment Directive

Pressure equipment with permitted pressure ≤ 200 bar (2 900 psi)

Pressure instruments with a process connection that does not have a pressurized housing do not fall within the scope of the Pressure Equipment Directive, irrespective of the maximum allowable pressure.

Reasons:

According to Article 2, point 5 of EU Directive 2014/68/EU, pressure accessories are defined as "devices with an operational function and having pressure-bearing housings".

If a pressure instrument does not have a pressure-bearing housing (no identifiable pressure chamber of its own), there is no pressure accessory present within the meaning of the Directive.

Process seal as per ANSI/ISA 12.27.01

North American practice for the installation of process seals.

In accordance with ANSI/ISA 12.27.01, Endress+Hauser devices are designed as either single seal or dual seal devices with a warning message. This allows the user to forego the use of - and save the cost of installing - an external secondary process seal in the mating pipe as required in 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.

Please refer to the Safety Instructions (XA) of the relevant device for further information.

EAC conformity

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.

The manufacturer confirms successful testing of the device by affixing to it the EAC mark.

ASME B 31.3/31.1

Design and materials in accordance with ASME B31.3/31.1. The welds are through-penetration welded and meet the requirements of the ASME Boiler and Pressure Vessel Code, Section IX and EN ISO 15614-1.

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

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

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

TAG

Measuring point (tag)

The device can be ordered with a tag name.

Location of tag name
In the additional specification, select:
- Stainless steel wired-on tag plate
- Paper adhesive label
- Tag provided by the customer
- RFID TAG
- RFID TAG + stainless steel wired-on tag plate
- RFID TAG + paper adhesive label
- RFID TAG + TAG provided by the customer
- IEC61406 stainless steel TAG
- IEC61406 stainless steel TAG + NFC TAG
- IEC61406 stainless steel TAG, stainless steel TAG
- IEC61406 stainless steel TAG + NFC, stainless steel TAG
- IEC61406 stainless steel TAG, plate provided
- IEC61406 stainless steel TAG + NFC, plate provided

Definition of tag name
In the additional specification, specify:
3 lines of maximum 18 characters each
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.

Display in electronic nameplate (ENP)
The first 32 characters of the tag name

Test reports, declarations and inspection certificates

All test reports, declarations and inspection certificates are provided electronically in the *Device Viewer*:
Enter the serial number from the nameplate (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 provides a 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.

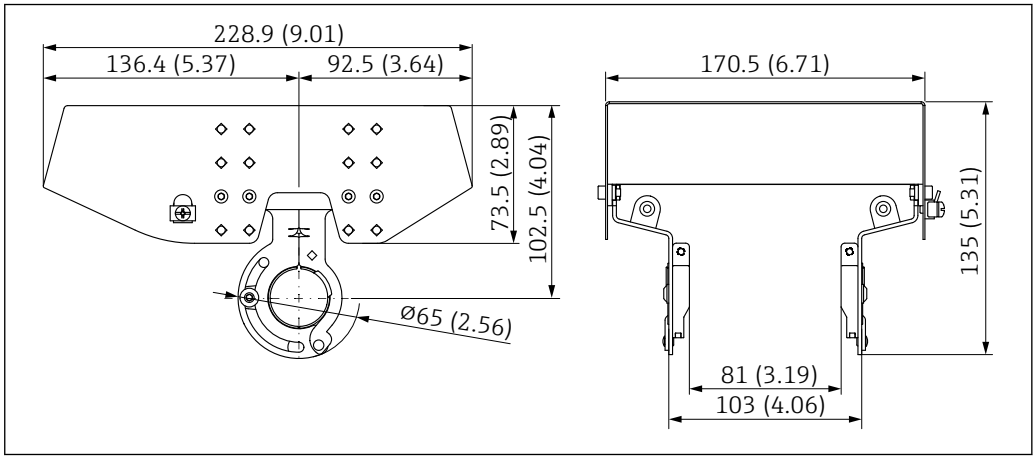
Accessories

Device Viewer

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

Weather protection cover for dual compartment housing

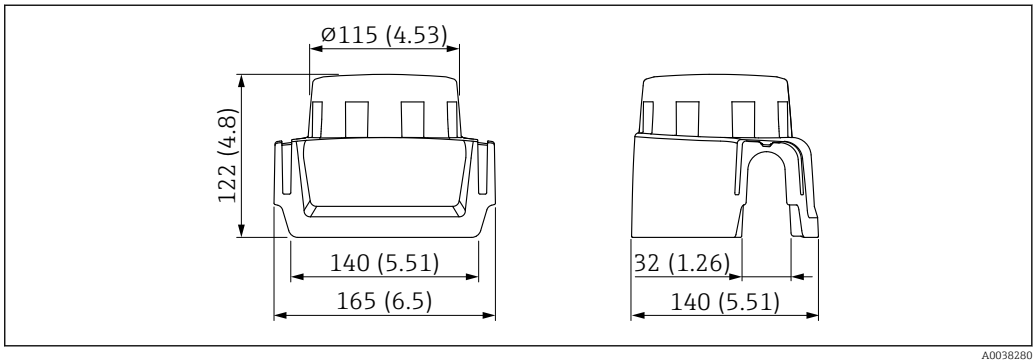
- Material: stainless steel 316L
- Order number: 71438303



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

Protective cover for aluminum single compartment housing

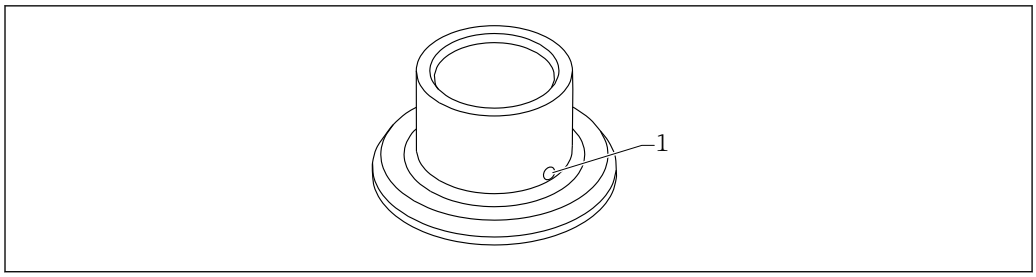
- Material: plastic
- Order number: 71438291



43 *Protective cover for aluminum single compartment housing. Unit of measurement mm (in)*

Weld-in adapter

Various weld-in adapters are available for installation in vessels or pipes. The adapters are optionally available with inspection certificate 3.1 EN10204.



44 *Weld-in adapter with leakage hole (sample view)*

1 Leakage hole

Weld in the weld-in adapter in such a way that the leakage hole is pointing downwards. This enables any leaks to be detected quickly.

- G 1, Ø53 mounting on the pipe
- G 1, Ø60 flush mount on the vessel
- G ¾, Ø55 flush mount
- G 1 sensor adjustable
- RD52 sensor adjustable

For detailed information, see "Technical Information" TI00426F (Weld-in adapters, process adapters and flanges)

Available in the Download Area of the Endress+Hauser website (www.endress.com/downloads).

M12 socket

The M12 sockets listed are suitable for use in the temperature range −25 to +70 °C (−13 to +158 °F).

M12 socket IP69
- Terminated at one end
- Angled
- 5 m (16 ft) PVC cable (orange)
- Slotted nut 316L (1.4435)
- Body: PVC
- Order number: 52024216

M12 socket IP67
- Angled
- 5 m (16 ft) PVC cable (gray)
- Slotted nut Cu Sn/Ni
- Body: PUR
- Order number: 52010285

Documentation

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

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.

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.

Special Documentation

- SD02874F: Heartbeat Verification + Monitoring application package
- SD02530P: Graphic display with Bluetooth, radio approval
- SD01622P: Weld-in adapter (installation instructions)
- TI00426F: Weld-in adapters, process adapters and flanges (overview)

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