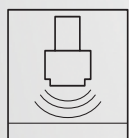
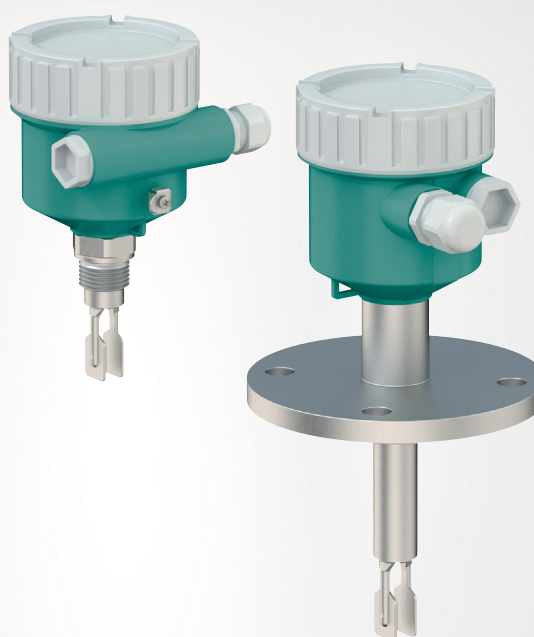


LVL-M4

Vibration Limit Switch

Technical Information



Your automation, our passion.

 **PEPPERL+FUCHS**

With regard to the supply of products, the current issue of the following document is applicable:
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1 Introduction

1.1 Content of this Document

This document contains information that you need in order to use your product throughout the applicable stages of the product life cycle. These can include the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal



Note

This document does not substitute the instruction manual.



Note

For full information on the product, refer to the instruction manual and further documentation on the Internet at www.pepperl-fuchs.com.



Note

For specific device information such as the year of construction, scan the QR code on the device. As an alternative, enter the serial number in the serial number search at www.pepperl-fuchs.com.

The documentation consists of the following parts:

- Datasheet – product overview
The datasheet contains the essential technical data for product selection.
- Technical information (TI), present document – planning aid
The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
- Manual (BA) – complete information
The manual contains all information from incoming acceptance to disposal.
- Brief instructions (KA) – guide that takes you quickly to the 1st measured value
The brief instructions contain all the essential information from incoming acceptance to initial commissioning.
- Instruction manual (SI) – safety-relevant document
Depending on the approval, the required instruction manuals are supplied with the device.

Additionally, the following parts may belong to the documentation, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Functional safety manual
- Additional documents

1.2 Safety Information

Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismantling lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismantling of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols



Note

This symbol brings important information to your attention.



Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.



Reference to another section or to further documentation



Permitted

Procedures, processes or actions that are permitted.



Forbidden

Procedures, processes or actions that are forbidden.

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 in Graphics

1, 2, 3 ... Item numbers

A, B, C, ... Views



Explosion-hazardous area



Non-explosion-hazardous area

1.4 Registered Trademarks

Android®

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Apple, the Apple logo, iPhone, and iPod touch are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.

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2 Function and System Design

2.1 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 device differentiates between the **covered** and **not covered** conditions.

Depending on the MIN (minimum detection) or MAX (maximum detection) modes, there are 2 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

2.2 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 device to switch.

2.3 Measuring System

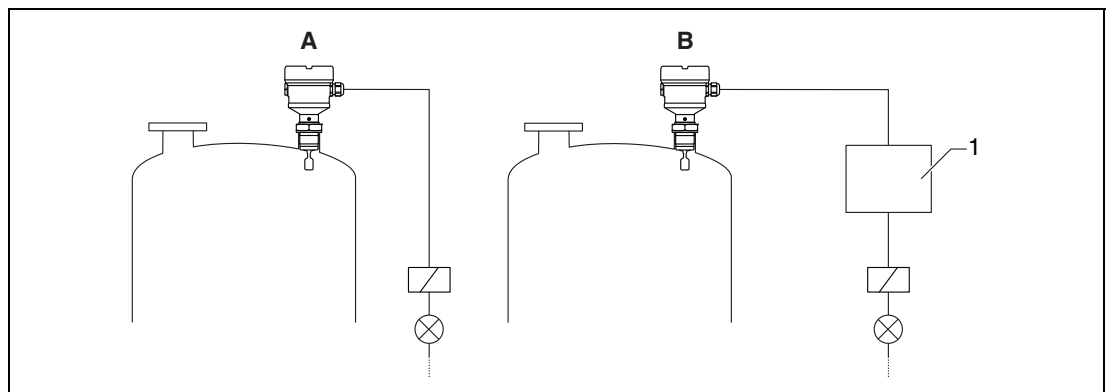


Figure 2.1 Example of a measuring system

- A** Device for direct connection of a load
B Device for connection to a separate switching unit or PLC
1 Switching unit, PLC etc.

2.4 Dependability

Device-Specific IT Security

The device settings and the diagnostic data can be read out via *Bluetooth*[®]. Device settings cannot be changed via *Bluetooth*[®].

3 Input

3.1 Measured Variable

Level (point level), MAX or MIN safety

3.2 Measuring Range

Depends on the installation location and the pipe extension ordered

Maximum sensor length 6 m (20 ft)

4 Output

4.1 Output and Input Versions

Electronic Inserts

2-wire AC (electronic insert FEL61)

- 2-wire AC version
- Switches the load directly into the power supply circuit via an electronic switch.

3-wire DC-PNP (electronic insert FEL62)

- 3-wire DC version
- Switches the load via the transistor (PNP) and separate connection, e. g. in conjunction with programmable logical controllers (PLC)
- Ambient temperature -60 °C (-76 °F), optionally available to order low-temperature electronic inserts are marked LT

Universal current connection, relay output (electronic insert FEL64)

- Switches the loads via 2 volt-free changeover contacts
- Ambient temperature -60 °C (-76 °F), optionally available to order low-temperature electronic inserts are marked LT

Direct current connection, relay output (electronic insert FEL64DC)

- Switches the loads via 2 volt-free changeover contacts
- Ambient temperature -60 °C (-76 °F), optionally available to order low-temperature electronic inserts are marked LT

2-wire NAMUR > 2.2 mA/< 1.0 mA (electronic insert FEL68)

- For separate switching device
- Signal transmission H-L edge 2.2 to 3.8/0.4 to 1.0 mA as per IEC 60917-5-6 (NAMUR) on 2-wire cable
- Ambient temperature -50 °C (-58 °F), optionally available to order low-temperature electronic inserts are marked LT

4.2 Output Signal

Switch Output

Preset switching delay times for the point level switches can be ordered for the following areas:

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

COM Interface

For connecting to modules VU120 or VU121 (no modifying effect)

Bluetooth® wireless technology (optional)

The device has a *Bluetooth®* wireless technology interface. Device data and diagnostic data can be read out using the free P+F Level app.

4.3 Safety Related Output Values

The safety related documents (SI) are available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

Enter the order designation in the search field → Select the appropriate product → Open the product detail page → Open the **Documents** tab.

The specific safety-related documents are included with the devices as standard.

5 Electronic Inserts

5.1 2-Wire AC (Electronic Insert FEL61)

- 2-wire AC version
- Switches the load directly into the power supply circuit via an electronic switch; always connect in series with a load
- Functional testing without level change
A functional test can be performed on the device using the test button on the electronic insert.

Supply Voltage

U = 19 to 253 V AC, 50 Hz/60 Hz

Residual voltage when switched through: typically 12 V



Note

Observe the following as per IEC/EN 61010-1: Provide a suitable circuit breaker for the device, and limit the current to 1 A, e. g. by installing a 1 A fuse (slow-blow) in the phase (not the neutral conductor) of the supply circuit.

Power Consumption

$S \leq 2 \text{ VA}$

Current Consumption

Residual current when blocked: $I \leq 3.8 \text{ mA}$

The red LED flashes in the event of an overload or short-circuit. Check for an overload or short-circuit every 5 s. The test is deactivated after 60 s.

Connectable Load

- Load with a minimum holding power/rated power of 2.5 VA at 253 V (10 mA) or 0.5 VA at 24 V (20 mA)
- Load with a maximum holding power/rated power of 89 VA at 253 V (350 mA) or 8.4 VA at 24 V (350 mA)
- With overload and short-circuit protection

Behavior of Output Signal

- OK status: load on (switched through)
- Demand mode: load off (blocked)
- Alarm: load off (blocked)

Terminals

Terminals for cable cross-section up to 2.5 mm² (14 AWG). Use ferrules for the wires.

Overvoltage protection

Overvoltage category II

Terminal Assignment

Always connect an external load. The electronic insert has integrated short-circuit protection.

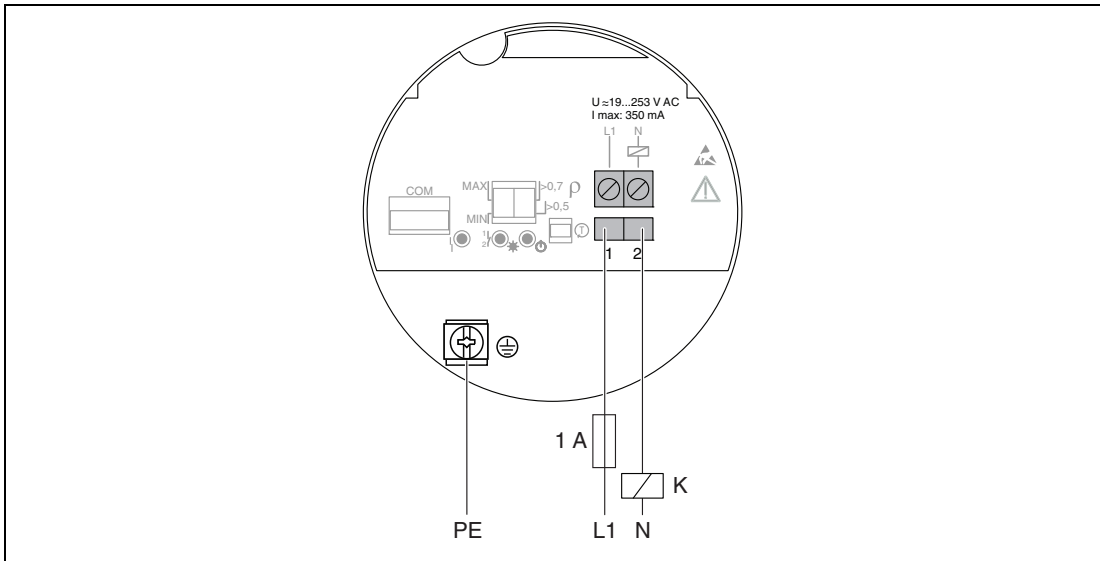


Figure 5.1 2-wire AC, electronic insert FEL61

Behavior of Switch Output and Signaling

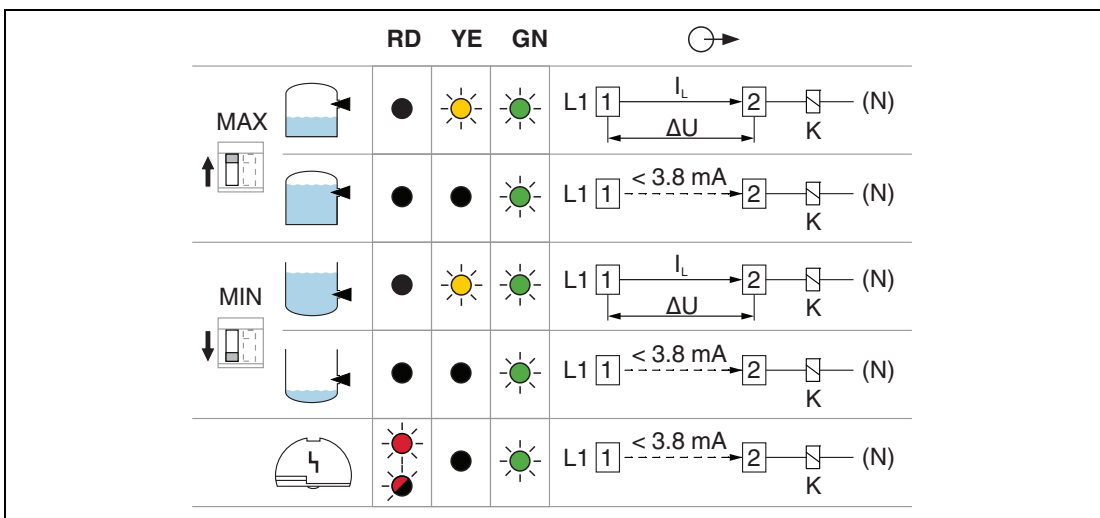


Figure 5.2 Behavior of switch output and signaling, electronic insert FEL61

MAX DIP switch for setting MAX safety mode

MIN DIP switch for setting MIN safety mode

RD LED red for warning or alarm

YE LED yellow, switch status

GN LED green, operational status, device on

I_L Load current switched through

Selection Tool for Relays

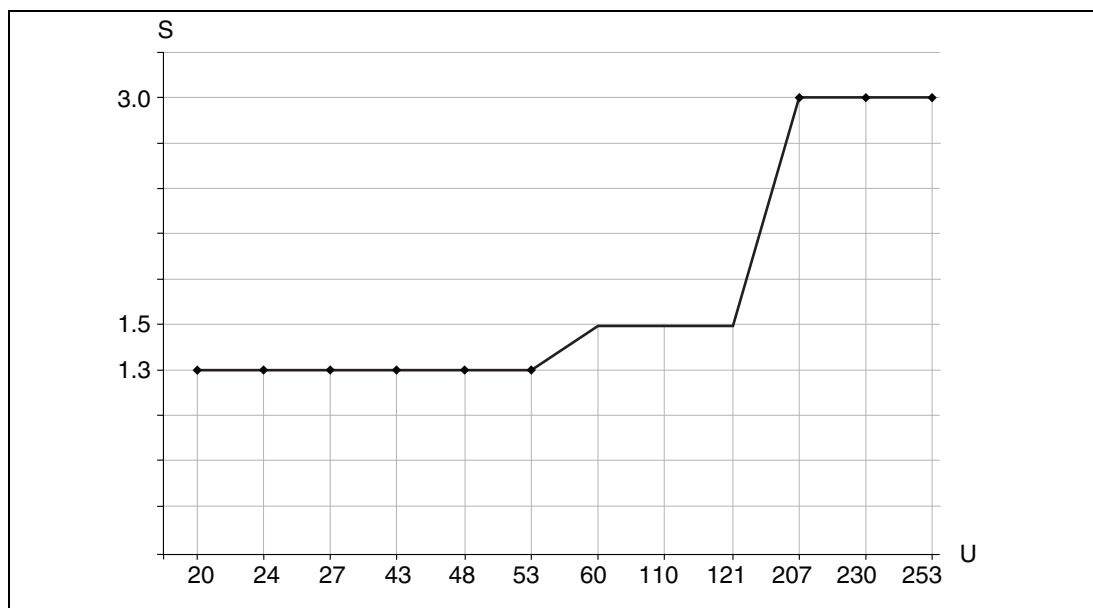


Figure 5.3 Recommended minimum holding power/rated power for load

S Holding power/rated power in VA

U Operating voltage in V

AC Mode

- Operating voltage: 24 V, 50 Hz/60 Hz
- Holding power/rated power: > 0.5 VA, < 8.4 VA
- Operating voltage: 110 V, 50 Hz/60 Hz
- Holding power/rated power: > 1.1 VA, < 38.5 VA
- Operating voltage: 230 V, 50 Hz/60 Hz
- Holding power/rated power: > 2.3 VA, < 80.5 VA

5.2 3-Wire DC-PNP (Electronic Insert FEL62)

- 3-wire DC version
- Preferably in conjunction with programmable logic controllers (PLC), DI modules as per EN 61131-2. Positive signal at switch output of electronics module (PNP)
- Functional testing without level change
A functional test can be performed on the device using the test button on the electronic insert or using the test magnet (can be ordered as an option) with the housing closed.

Supply Voltage



Warning!

Risk of potentially life-threatening electric shock!

Failure to use the prescribed power unit.

The electronic insert may only be powered by devices with safe galvanic isolation, as per IEC 61010-1.

$U = 10 \text{ to } 55 \text{ V DC}$



Note

Observe the following as per IEC/EN 61010-1: Provide a suitable circuit breaker for the device, and limit the current to 500 mA, e. g. by installing a 0.5 A fuse (slow-blow) in the supply circuit.

Power Consumption

$P \leq 0.5 \text{ W}$

Current Consumption

$I \leq 10 \text{ mA}$, without load

The red LED flashes in the event of an overload or short-circuit. Check for an overload or short-circuit every 5 s.

Load Current

$I \leq 350 \text{ mA}$, with overload and short-circuit protection

Capacitance Load

$C \leq 0.5 \mu\text{F}$ at 55 V, $C \leq 1.0 \mu\text{F}$ at 24 V

Residual Current

$I < 100 \mu\text{A}$, for blocked transistor

Residual Voltage

$U < 3 \text{ V}$, for switched through transistor

Behavior of Output Signal

- OK status: switched through
- Demand mode: blocked
- Alarm: blocked

Terminals

Terminals for cable cross-section up to 2.5 mm^2 (14 AWG). Use ferrules for the wires.

Overvoltage protection

Overvoltage category I

Terminal Assignment

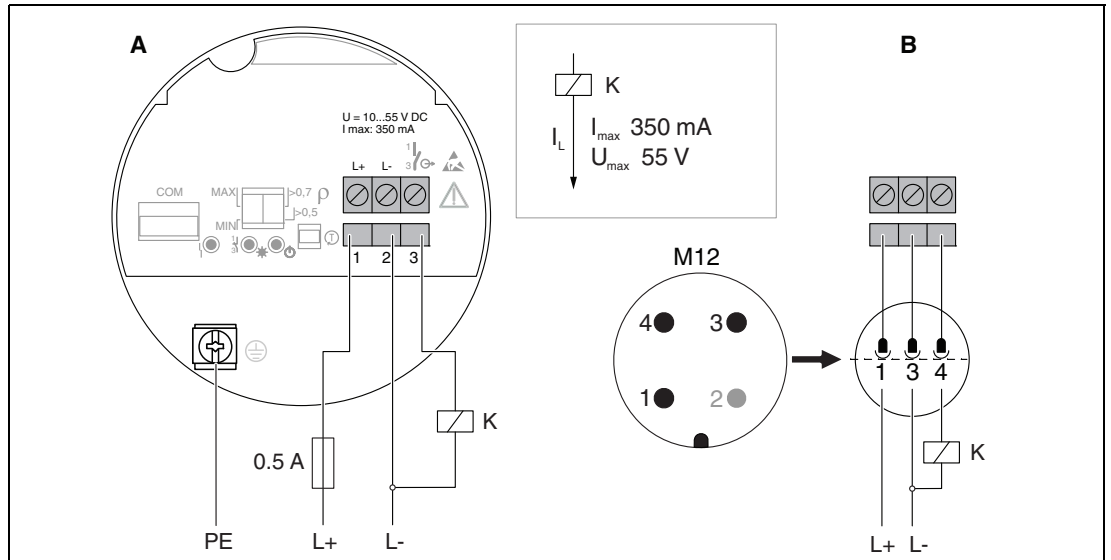


Figure 5.4 3-wire DC-PNP, electronic insert FEL62

- A Connection wiring with terminals
- B Connection wiring with M12 plug in housing as per EN 61131-2 standard

Behavior of Switch Output and Signaling

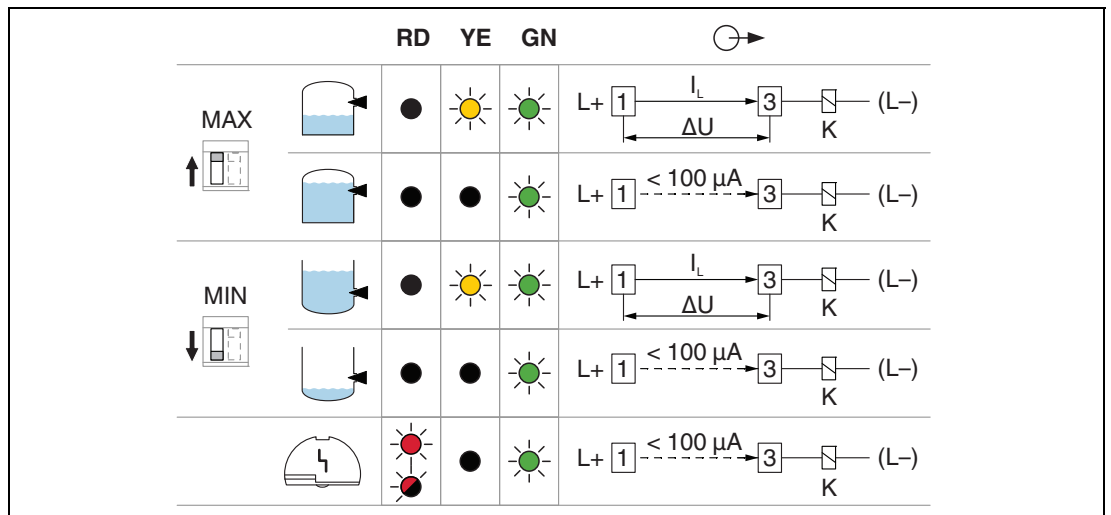


Figure 5.5 Behavior of switch output and signaling, electronic insert FEL62

- MAX** DIP switch for setting MAX safety mode
- MIN** DIP switch for setting MIN safety mode
- RD** LED red for warning or alarm
- YE** LED yellow, switch status
- GN** LED green, operational status, device on
- I_L Load current switched through

5.3 Universal Current Connection with Relay Output (Electronic Insert FEL64)

- Switches the loads via 2 volt-free changeover contacts
- 2 galvanically isolated changeover contacts (DPDT), both changeover contacts switch simultaneously.
- Functional testing without level change. A functional test can be performed on the device using the test button on the electronic insert or using the test magnet (can be ordered as an option) with the housing closed.



Warning!

Risk of burns by hot surface

An fault at the electronic insert can cause the permitted temperature for touch-safe surfaces to be exceeded.

Do not touch the electronics in the event of a fault!

Supply Voltage

$U = 19 \text{ to } 253 \text{ V AC, } 50 \text{ Hz/60 Hz} / 19 \text{ to } 55 \text{ V DC}$



Note

Observe the following as per IEC/EN 61010-1: Provide a suitable circuit breaker for the device, and limit the current to 500 mA, e. g. by installing a 0.5 A fuse (slow-blow) in the power supply circuit.

Power Consumption

$S < 25 \text{ VA, } P < 1.3 \text{ W}$

Connectable Load

Loads switched via 2 volt-free changeover contacts (DPDT)

- $I_{AC} \leq 6 \text{ A (Ex de 4 A), } U_{\sim} \leq 253 \text{ V AC; } P_{\sim} \leq 1500 \text{ VA, } \cos \varphi = 1, P_{\sim} \leq 750 \text{ VA, } \cos \varphi > 0.7$
- $I_{DC} \leq 6 \text{ A (Ex de 4 A) to } 30 \text{ V DC, } I_{DC} \leq 0.2 \text{ A to } 125 \text{ V}$

According to IEC 61010, the following applies: Total voltage from relay outputs and power supply $\leq 300 \text{ V}$.

Use electronic insert FEL62 DC PNP for small DC load currents, e. g. for connection to a PLC.

Relay contact material: silver/nickel AgNi 90/10

When connecting a device with high inductance, provide a spark suppressor to protect the relay contact. A fine-wire fuse (depending on the connected load) protects the relay contact in the event of a short-circuit.

Both relay contacts switch simultaneously.

Behavior of Output Signal

- OK status: relay energized
- Demand mode: relay de-energized
- Alarm: relay de-energized

Terminals

Terminals for cable cross-section up to 2.5 mm^2 (14 AWG). Use ferrules for the wires.

Overvoltage protection

Overvoltage category II

Terminal Assignment

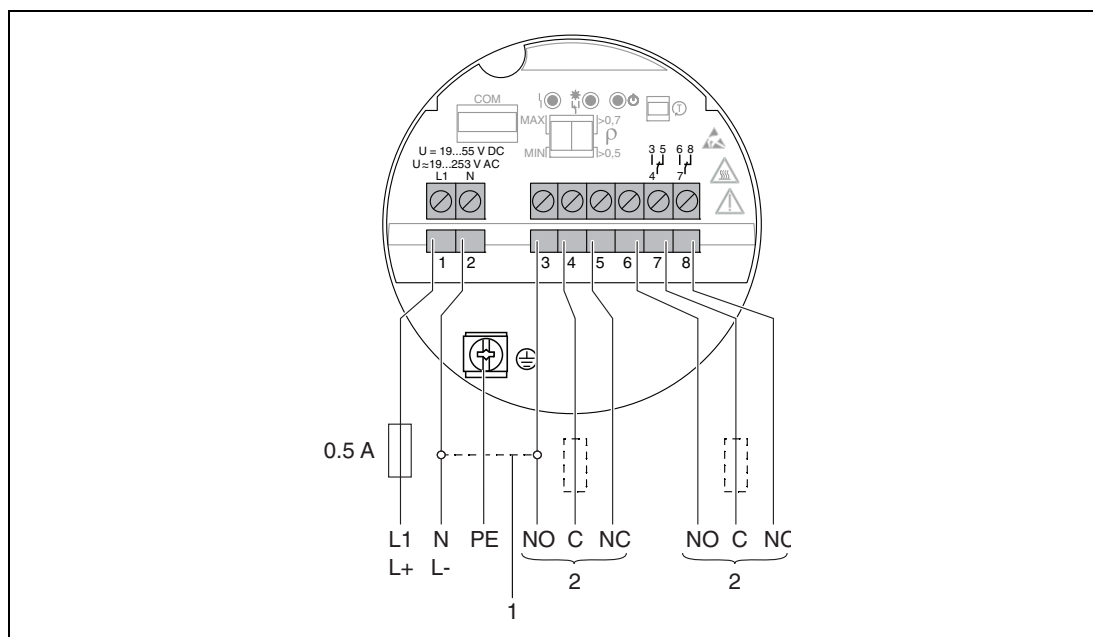


Figure 5.6 Universal current connection with relay output, electronic insert FEL64

- 1 When bridged, the relay output works with NPN logic
- 2 Connectable load

Behavior of Switch Output and Signaling

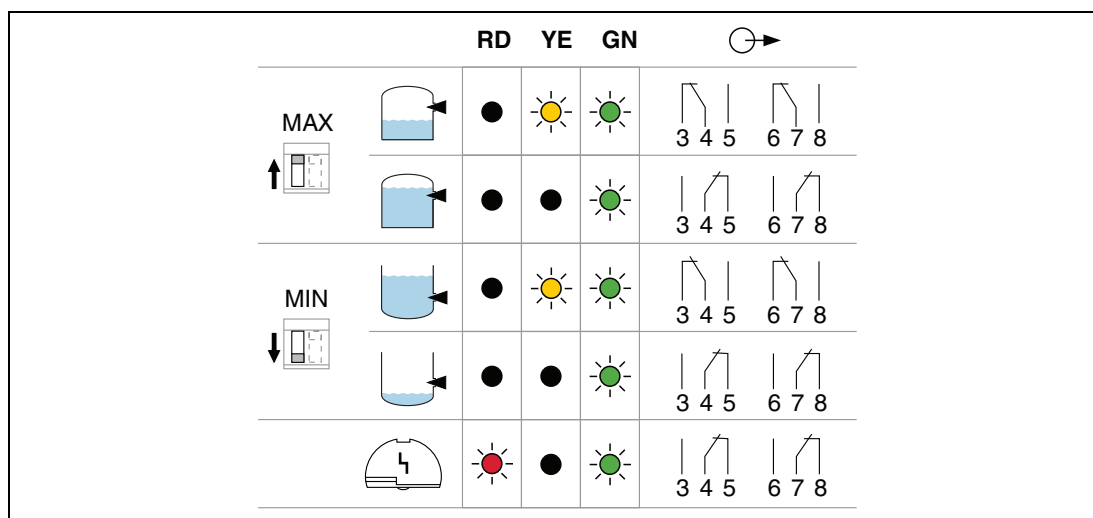


Figure 5.7 Behavior of switch output and signaling, electronic insert FEL64

- MAX** DIP switch for setting MAX safety mode
- MIN** DIP switch for setting MIN safety mode
- RD** LED red for alarm
- YE** LED yellow, switch status
- GN** LED green, operational status, device on

5.4 DC Connection, Relay Output (Electronic Insert FEL64DC)

- Switches the loads via 2 volt-free changeover contacts
- 2 galvanically isolated changeover contacts (DPDT), both changeover contacts switch simultaneously.
- Functional testing without level change. Functional testing of the entire device can be performed using the test button on the electronic insert or with the test magnet (can be ordered as an option) with the housing closed.

Supply Voltage

$U = 9 \text{ to } 20 \text{ V DC}$



Note

Observe the following as per IEC/EN 61010-1: Provide a suitable circuit breaker for the device, and limit the current to 500 mA, e. g. by installing a 0.5 A fuse (slow-blow) in the supply circuit.

Power Consumption

$P < 1.0 \text{ W}$

Connectable Load

Loads switched via 2 volt-free changeover contacts (DPDT)

- $I_{AC} \leq 6 \text{ A}$ (Ex de 4 A), $U_{\sim} \leq 253 \text{ V AC}$; $P_{\sim} \leq 1500 \text{ VA}$, $\cos \varphi = 1$, $P_{\sim} \leq 750 \text{ VA}$, $\cos \varphi > 0.7$
- $I_{DC} \leq 6 \text{ A}$ (Ex de 4 A) to 30 V DC, $I_{DC} \leq 0.2 \text{ A}$ to 125 V

According to IEC 61010, the following applies: Total voltage from relay outputs and power supply $\leq 300 \text{ V}$.

Preferably use electronic insert FEL62 DC PNP for small DC load currents, e. g. connection to a PLC.

Relay contact material: silver/nickel AgNi 90/10

When connecting a device with high inductance, provide spark quenching to protect the relay contact. A fine-wire fuse (depending on the connected load) protects the relay contact in the event of a short-circuit.

Behavior of Output Signal

- OK status: relay energized
- Demand mode: relay de-energized
- Alarm: relay de-energized

Terminals

Terminals for cable cross-section up to 2.5 mm^2 (14 AWG). Use ferrules for the wires.

Overvoltage protection

Overvoltage category I

Terminal Assignment

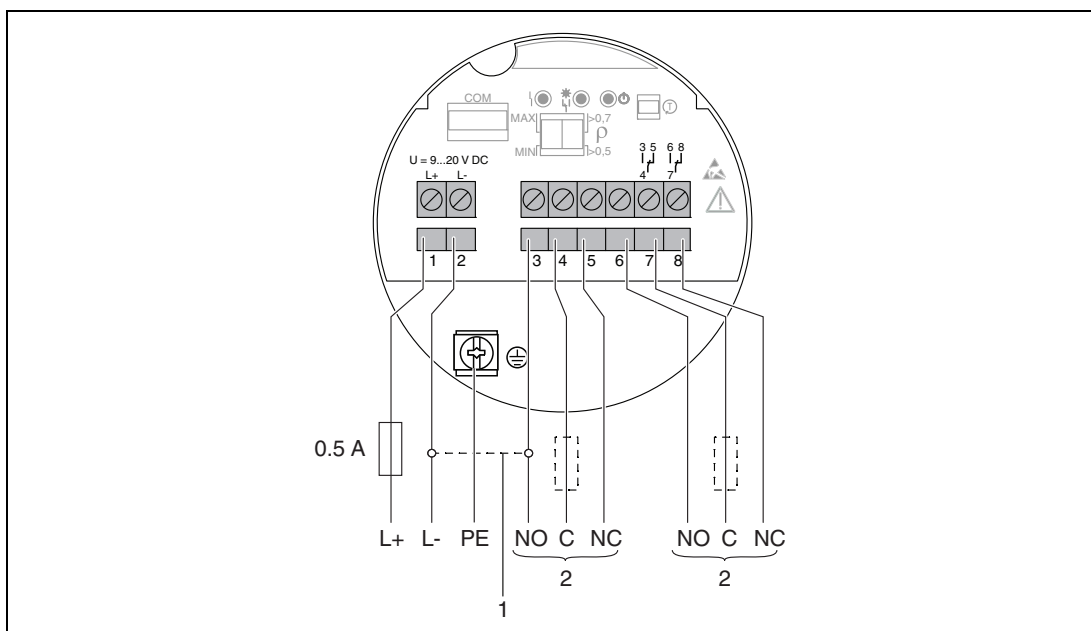


Figure 5.8 DC connection with relay output, electronic insert FEL64DC

- 1 When bridged, the relay output works with NPN logic
- 2 Connectable load

Behavior of Switch Output and Signaling

		RD	YE	GN	→
MAX ↑		●	☀	☀	3 4 5 6 7 8
		●	●	☀	3 4 5 6 7 8
MIN ↓		●	☀	☀	3 4 5 6 7 8
		●	●	☀	3 4 5 6 7 8
		●	●	☀	3 4 5 6 7 8

Figure 5.9 Behavior of switch output and signaling, electronic insert FEL64DC

- MAX** DIP switch for setting MAX safety mode
- MIN** DIP switch for setting MIN safety mode
- RD** LED red for alarm
- YE** LED yellow, switch status
- GN** LED green, operational status, device on

5.5 2-Wire NAMUR > 2.2 mA/< 1.0 mA (Electronic Insert FEL68)

- To connect to switch amplifiers according to NAMUR (IEC 60947-5-6), a permanent power supply for the electronic insert must be ensured.
- Signal transmission H-L edge 2.2 to 3.8 mA/0.4 to 1.0 mA according to NAMUR (IEC 60947-5-6) on 2-wire cabling
- Functional testing without level change. A functional test can be performed on the device using the test key on the electronic insert or using the test magnet (can be ordered as an option) with the housing closed.
The functional test can also be triggered by interrupting the supply voltage or activated directly from the switch amplifier.

Supply Voltage

U = 8.2 V DC



Note

Observe the following as per IEC/EN61010-1: Provide a suitable circuit breaker for the device.

Power Consumption

NAMUR IEC 60947-5-6

< 6 mW with I < 1 mA; < 38 mW with I = 3.5 mA

Connection Data Interface

NAMUR IEC 60947-5-6

Behavior of Output Signal

- OK status: output current 2.2 to 3.8 mA
- Demand mode: output current 0.4 to 1.0 mA
- Alarm: output current < 1.0 mA

Terminals

Terminals for cable cross-section up to 2.5 mm² (14 AWG). Use ferrules for the wires.

Overvoltage protection

Overvoltage category I

Terminal Assignment

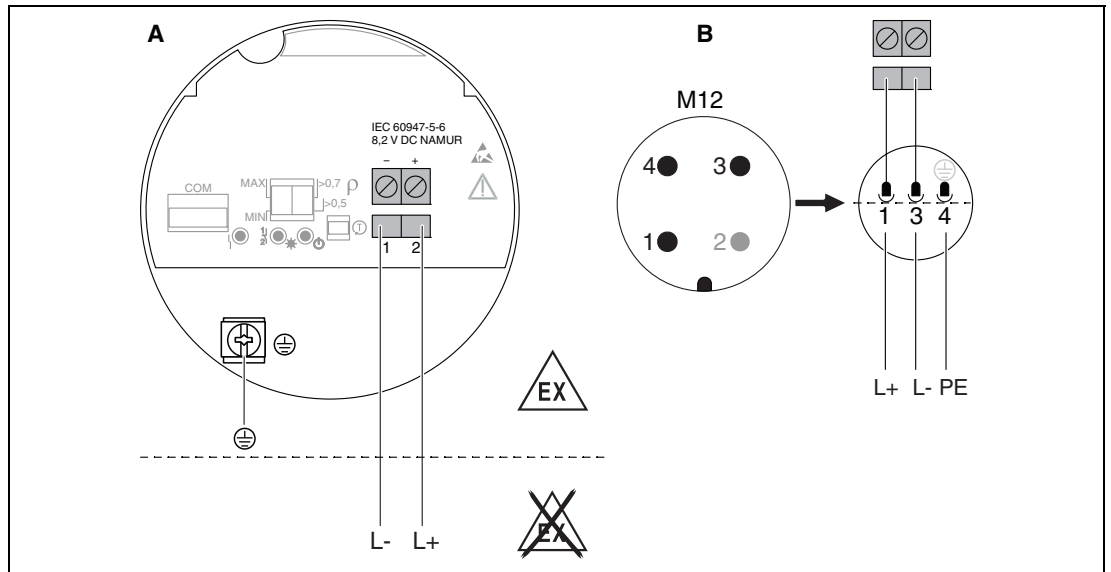


Figure 5.10 2-wire NAMUR > 2.2 mA / < 1.0 mA, electronic insert FEL68

- 1 Connection wiring with terminals
- 2 Connection wiring with M12 plug in housing according to EN 61131-2

Behavior of Switch Output and Signaling

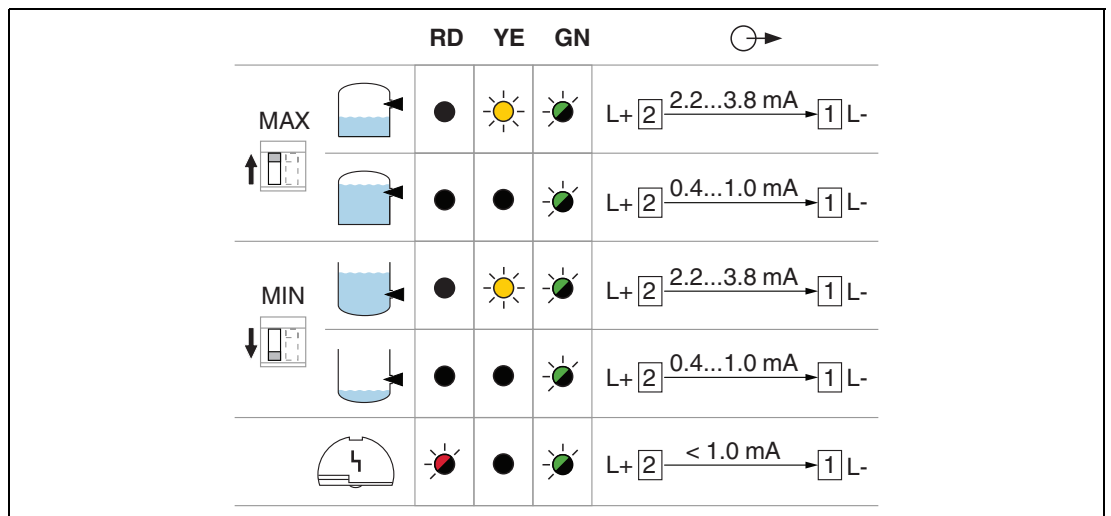


Figure 5.11 Behavior of switch output and signaling, electronic insert FEL68

- MAX** DIP switch for setting MAX safety mode
- MIN** DIP switch for setting MIN safety mode
- RD** LED red for alarm
- YE** LED yellow, switch status
- GN** LED green, operational status, device on



Note

The *Bluetooth*[®] module must be ordered separately, including the required battery, for use in conjunction with electronic insert FEL68 (2-wire NAMUR).

Ordering information:

- Type code, additional options, feature **Accessories mounted**, option **VB** (Bluetooth module VU121 for NAMUR output)
 - Type code, additional options, feature **Application package**, option **LL** (Prepared for verification and monitoring)
-

6 Indication and Communication

6.1 LED module VU120 (optional)

6.1.1 Supply Voltage

U = 12 to 55 V DC

U = 19 to 253 V AC, 50 Hz/60 Hz

6.1.2 Power Consumption

S < 6 VA, P ≤ 0.7 W

6.1.3 Current Consumption

I_{max} = 0.4 A

6.1.4 Signaling of Operational Status

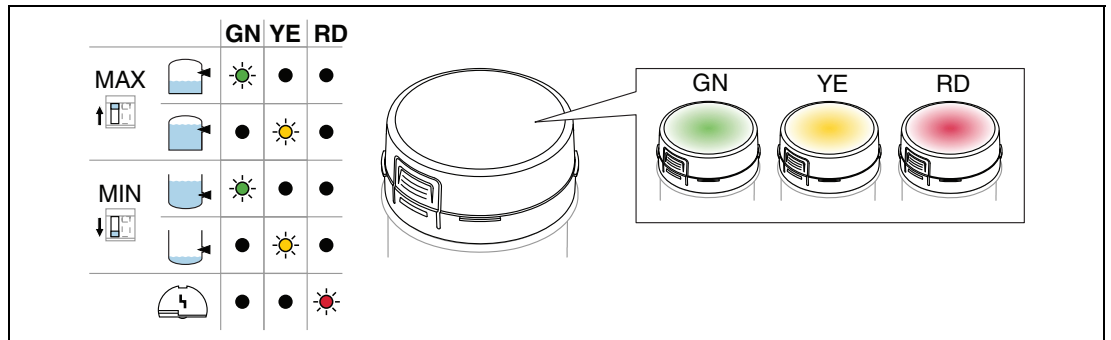


Figure 6.1 LED module VU120, the LED lights up in green (GN), yellow (YE) or red (RD)

A brightly lit LED indicates the operational status (switch status or alarm status).
The LED module can be connected to the following electronic inserts:
FEL62, FEL64, FEL64DC.

► For more information see chapter 12 and 16.



Note

For further information on connection and switching states, refer to the associated manual. The currently available documentation are available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

Enter the order designation in the search field → Select the appropriate product → Open the product detail page → Open the **Documents** tab.

6.2 **Bluetooth® module VU121 (optional)**

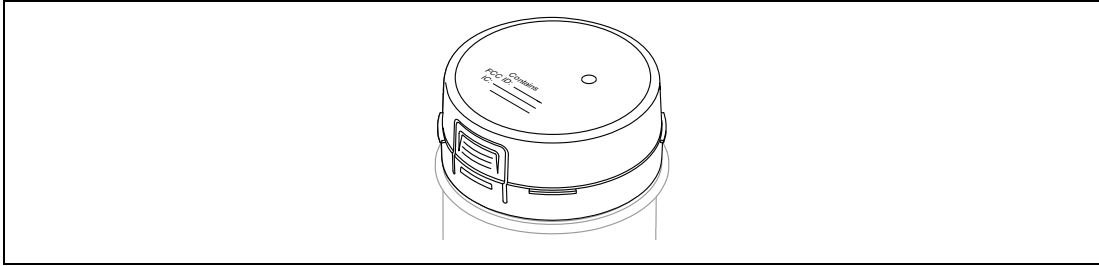


Figure 6.2 *Bluetooth®* module VU121

- The *Bluetooth®* module can be connected via the COM interface to the following electronic inserts: FEL61, FEL62, FEL64, FEL64 DC, FEL68 (2-wire NAMUR).
 - The *Bluetooth®* module is only available in conjunction with the following option: Type code, additional options, feature **Application package**, option **LL** (Prepared for verification and monitoring)
 - The *Bluetooth®* module with battery is suitable for use in explosion-hazardous areas.
 - The *Bluetooth®* module must be ordered separately, including the required battery, for use in conjunction with electronic insert FEL68 (2-wire NAMUR).
- For more information see chapter 12 and 16.

Note

For further information about the connection, refer to the associated manual. The currently available documentation are available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

Enter the order designation in the search field → Select the appropriate product → Open the product detail page → Open the **Documents** tab.

6.2.1 **Batteries - Use and Handling**

Use of a special battery in conjunction with electronic insert FEL68 (2-wire NAMUR):

- For energy-related reasons, the *Bluetooth®* module VU121 requires a special battery when operated with electronics insert FEL68 (2-wire NAMUR).
- Service life: The service life of the *Bluetooth®* module without replacing the battery is at least 5 years with a maximum of 60 downloads of complete datasets (at ambient temperatures between 10 to 40 °C (50 to 104 °F)).
The battery service life is calculated based on the scenario that the sensor is connected and powered.

Additional Information

The battery is categorized as dangerous goods when transported by air and may not be installed in the device when shipped.

Replacement batteries can be purchased from a specialist retailer.

Only the following types of AA 3.6 V lithium batteries made by the manufacturers listed below are suitable as replacement batteries:

- SAFT LS14500
- TADIRAN SL-360/s
- XENOENERGY XL-060F

Isolation Lug in Battery Compartment



Note

The removal of the isolation lug in the battery compartment of the *Bluetooth*[®] module results in early discharging of the battery irrespective of whether the sensor is powered or not.

When the sensors are in storage, the isolation lug must remain in the battery compartment of the *Bluetooth*[®] module.

6.2.2

Approvals

The *Bluetooth*[®] module is approved for use in the following types of protection for devices: Ex i, Ex d, Ex e or Ex t. The temperature class of the device is limited to T4 to T1 if the *Bluetooth*[®] module is used in type of protection Ex i /IS in conjunction with electronic insert FEL68 (2-wire NAMUR) and the required battery in the *Bluetooth*[®] module.

6.2.3

Additional Technical Data

- Free-field range: 50 m (165 foot) max.
 - Operation radius with intervisibility around the device: 10 m (33 foot)
-



Note

Further information to radio approvals is available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

Enter the order designation in the search field → Select the appropriate product → Open the product detail page → Open the **Documents** tab.

6.2.4

Functions

- ▶ For more information see chapter 12.

7 Performance Characteristics

7.1 Reference Operating Conditions

- Ambient temperature: +23 °C (+73 °F)
- Process temperature: +23 °C (+73 °F)
- Density (water): 1 g/cm³
- Medium viscosity: 1 mPa·s
- Process pressure: ambient 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 device:
water +23 °C (+73 °F)



Note

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

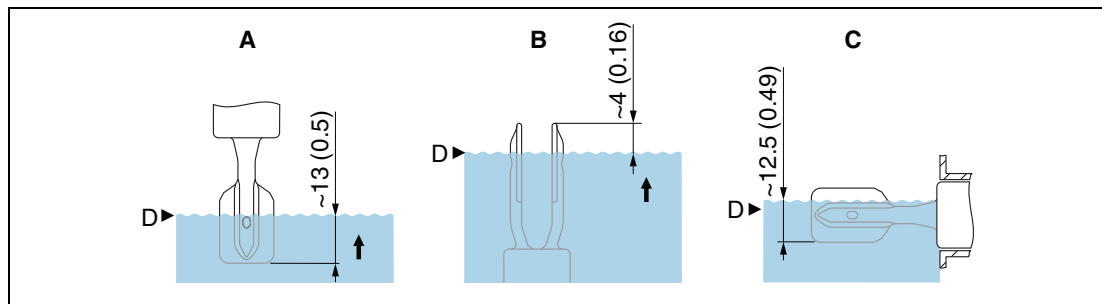


Figure 7.1 Typical switch points, unit of measurement mm (inch)

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

7.2 Maximum Measured Fault

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

7.3 Hysteresis

Typically 2.5 mm (0.1 inch)

7.4 Non-Repeatability

0.5 mm (0.02 inch)

7.5 Influence of the Process Temperature

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

7.6 Influence of the Process Pressure

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

7.7 Influence of the Density of the Process Medium (at Room Temperature and Normal Pressure)

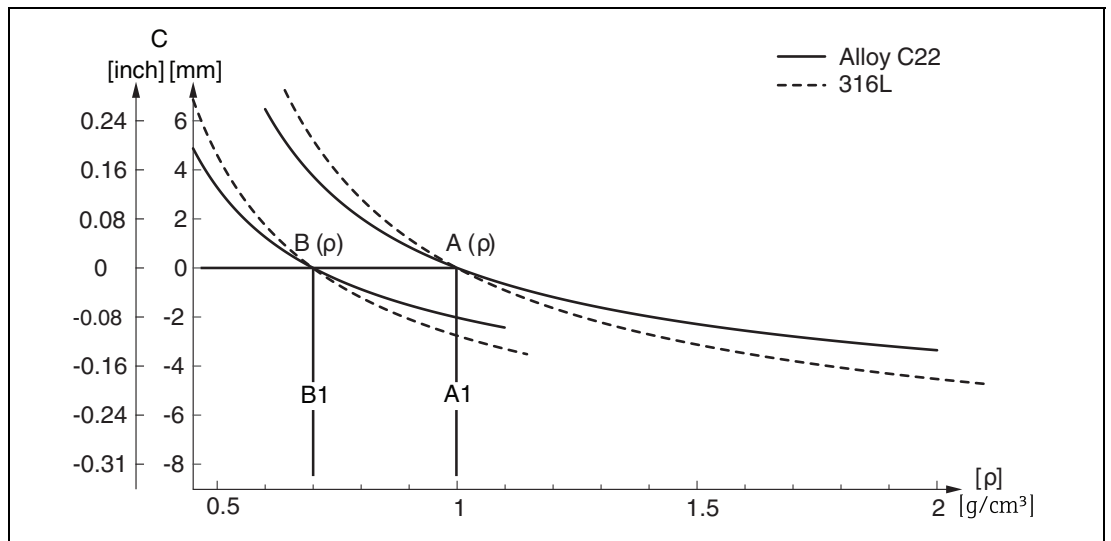


Figure 7.2 Switch point deviation over density

- A** Density switch setting ($\rho > 0.7$)
- A1** Reference operating condition $\rho = 1 \text{ g/cm}^3$
- B** Density switch setting ($\rho > 0.5$)
- B1** Reference operating condition $\rho = 0.7 \text{ g/cm}^3$
- C** Switch point deviation

Density setting

- TK_{typ} , [mm/10 k]
 - $\rho > 0.7$: -0.2
 - $\rho > 0.5$: -0.2
- $Pressure_{typ}$, [mm/10 bar]
 - $\rho > 0.7$: -0.3
 - $\rho > 0.5$: -0.4

8 Mounting



Note

Open the device only in a dry environment!

8.1 Mounting Location, Orientation

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

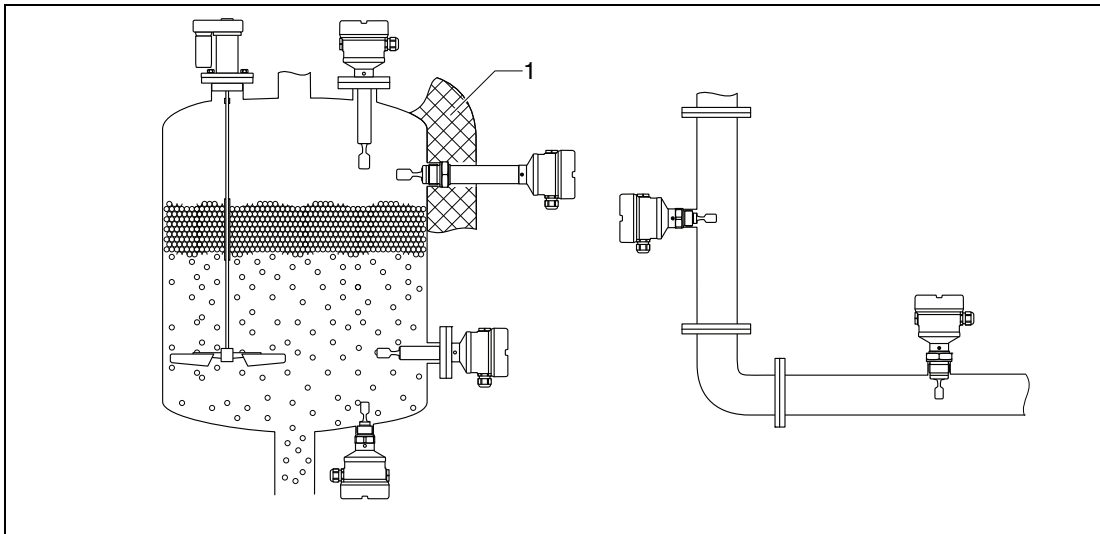


Figure 8.1 Installation examples for a vessel, tank or pipe

- 1 Vessel insulation (example with temperature spacer/pressure-tight feedthrough)
If process temperatures are high, the device should be included in a vessel insulation system to prevent the electronics from heating as a result of thermal radiation or convection.

8.2 Installation Instructions

8.2.1 Take Viscosity into Consideration



Note

Viscosity values

- Low viscosity : < 2000 mPa·s
- High viscosity: > 2000 to 10000 mPa·s

Low Viscosity



Note

Low viscosity, e. g. water: < 2000 mPa·s

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

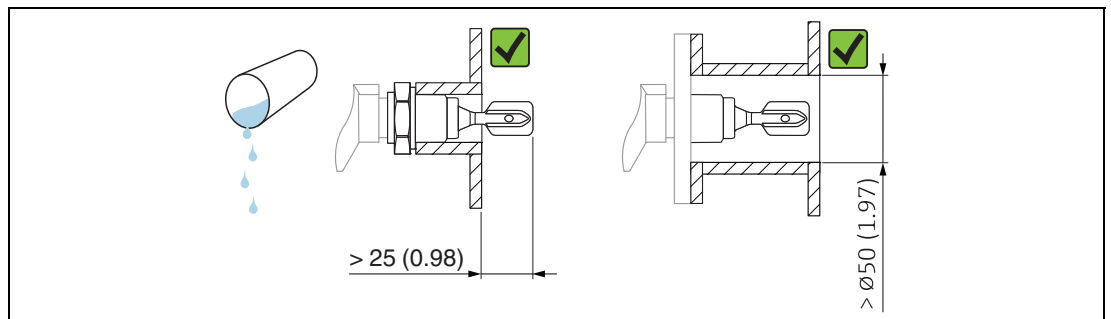


Figure 8.2 Installation example for low-viscosity liquids, unit of measurement mm (inch)

High Viscosity



Note

Highly viscous liquids may cause switching delays.

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



Note

High viscosity, e. g. viscous oils: < 10000 mPa·s

The tuning fork must be located outside the installation socket!

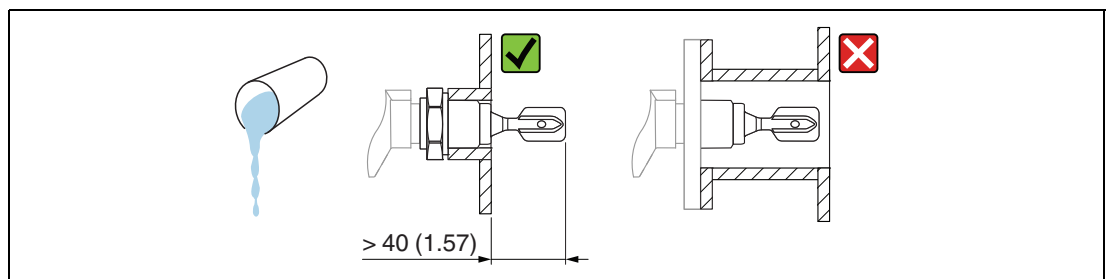


Figure 8.3 Installation example for a highly viscous liquid, unit of measurement mm (inch)

8.2.2 Avoid Buildup

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

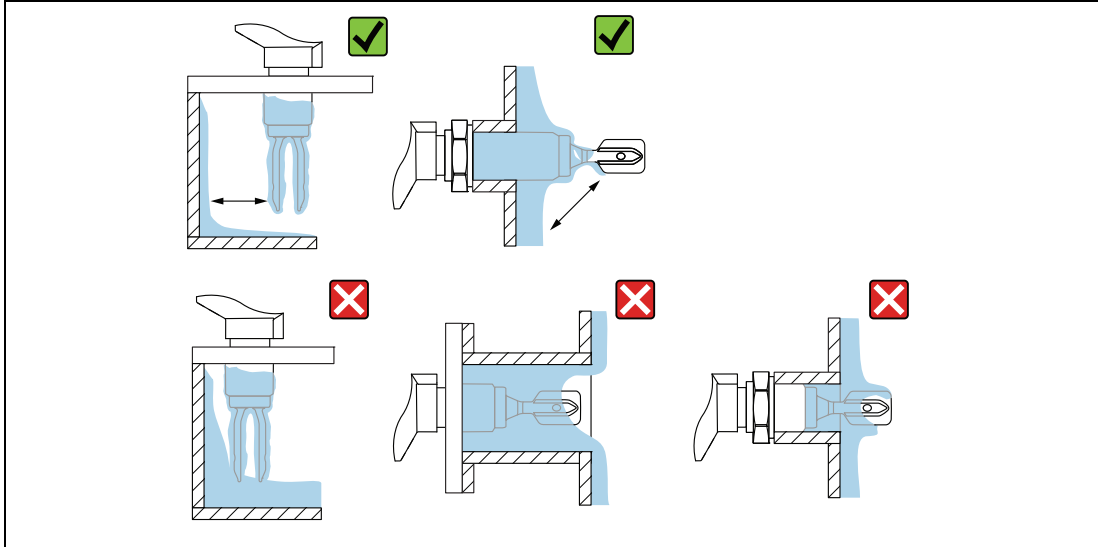


Figure 8.4 Installation examples for a highly viscous process medium

8.2.3 Take Clearance into Consideration

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

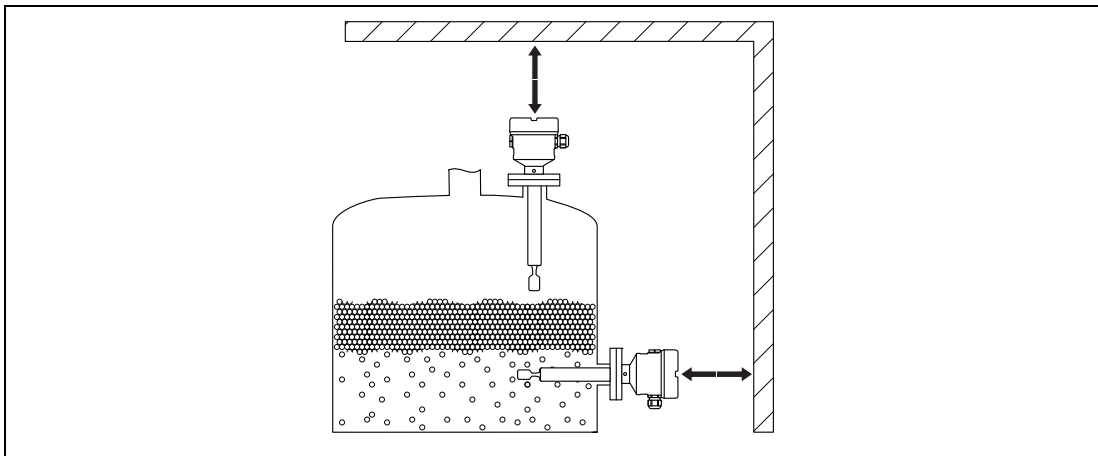


Figure 8.5 Take clearance into consideration

8.2.4 Align the Tuning Fork with 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 specification, thread description or circle on the hexagonal nut or on the weld-in adapter
- The || symbol on the back of the flange or Tri-Clamp

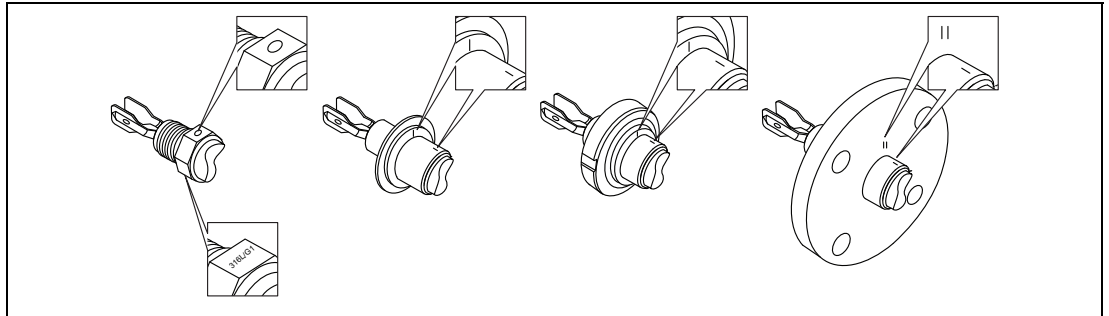


Figure 8.6 Markings to align the tuning fork

8.2.5 Installing in Pipes

Flow velocity up to 5 m/s with viscosity 1 mPa·s and density 1 g/cm³ (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 on the adapter is pointing in the direction of flow.

The marking is visible when installed.

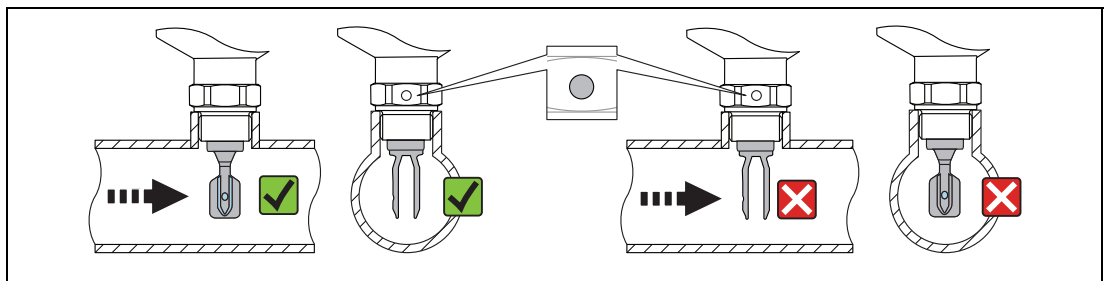


Figure 8.7 Installation in pipes (take fork position and marking into consideration)

8.2.6 Aligning the Cable Entry

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

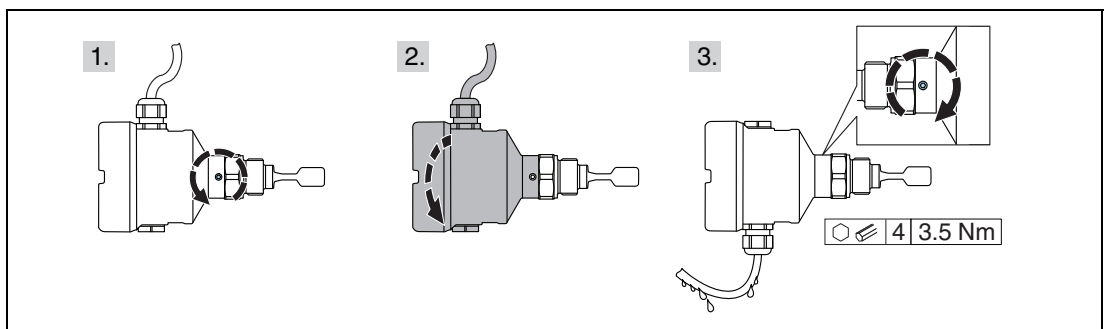


Figure 8.8 Housing with external locking screw and drip loop

8.3 Special Mounting Instructions

8.3.1 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 foot).

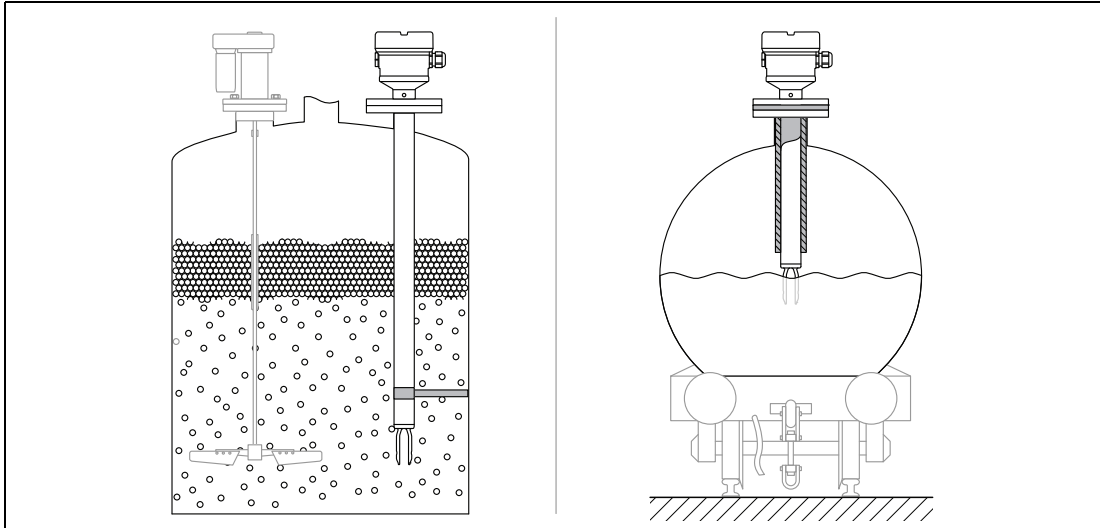


Figure 8.9 Examples of support in the event of dynamic load

8.3.2 Weld-in Adapter with Leakage Hole

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

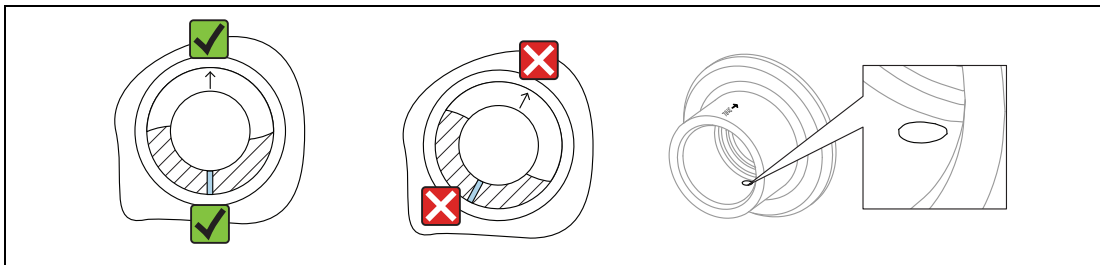


Figure 8.10 Weld-in adapter with leakage hole

8.3.3 Sliding Sleeves

- For more information see chapter 16.

9 Environment

9.1 Ambient Temperature Range



Warning!

Permitted connection voltage exceeded!

For electrical safety reasons, the maximum connection voltage for all electronic inserts at ambient temperatures below -40 °C (-40 °F) is limited to a maximum of 35 V DC.

-40 to +70 °C (-40 to +158 °F)

Optionally available:

- -50 °C (-58 °F)
- -60 °C (-76 °F)

The minimum permitted ambient temperature of the plastic housing is limited to -20 °C (-4 °F), for North America, **indoor use** applies.

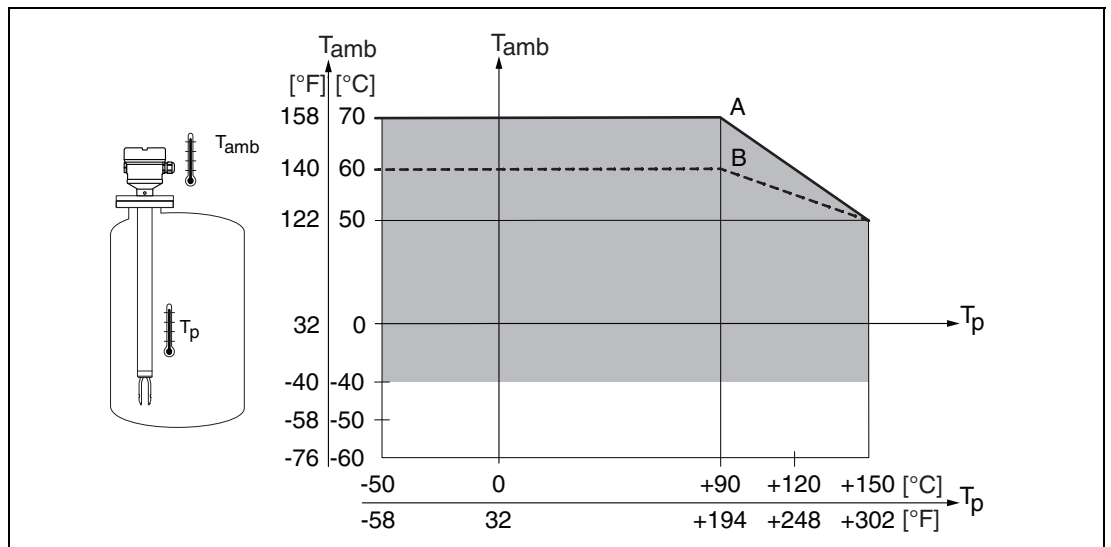


Figure 9.1 Permitted ambient temperature T_{amb} at the housing as a function of the process temperature T_p in the vessel:

- A** Device without LED module; at process temperature and FEL64 $T_p > 90$ °C, max. load current 4 A
- B** Device with LED module; at process temperature and FEL64 $T_p > 90$ °C, max. load current 2 A

For devices with a temperature spacer, the following ambient temperatures apply across the entire process temperature range:

- A: 70 °C (158 °F)
- B: 60 °C (140 °F)

Outdoor operation in strong sunlight:

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

Ordering information, optionally available

- Ambient temperature -50 °C (-58 °F)
Type code, additional options, feature **Test, certificate, declaration**, option **U1**
- Ambient temperature -60 °C (-76 °F)
Type code, additional options, feature **Test, certificate, declaration**, option **U2**

Low-temperature electronic inserts are marked **LT**.



Note

- Low temperatures are not possible for SIL.
 - *Bluetooth*[®] module:
 - -50 °C (-58 °F) for non-Ex, Ex ia and Ex d
 - -60 °C (-76 °F) for non-Ex
 - LED module:
 - -50 °C (-58 °F) for non-Ex, Ex ia and Ex d
 - -60 °C (-76 °F) for non-Ex
-

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 (SI).

9.2 Storage Temperature

-40 to +80 °C (-40 to +176 °F)

Optional: -50 °C (-58 °F), -60 °C (-76 °F)

9.3 Humidity

Operation up to 100 %. Do not open in a condensing atmosphere.

9.4 Operating Altitude

According to IEC 61010-1 Ed.3:

- Up to 2000 m (6600 foot) above sea level
- Can be extended to 3000 m (9800 foot) above sea level if overvoltage protection is used.

9.5 Climate Class

According to IEC 60068-2-38 test Z/AD

9.6 Degree of Protection

According to DIN EN 60529, NEMA 250

IP66/IP68 NEMA 4X/6P

Type of housing:

- Single compartment, plastic
- Single compartment, aluminum, coated, Ex d/XP
- Single compartment, 316L, cast, Ex d/XP
- Dual compartment L-shaped, aluminum, coated, Ex d/XP



Note

Select the required option in the type code: feature **Electrical connection**.

If the **M** option (Plug M12) is selected as the electrical connection, then IP66/67 NEMA TYPE 4x is valid for all housing types.

9.7 Vibration Resistance

According to IEC 60068-2-64-2009

$a(\text{RMS}) = 50 \text{ m/s}^2$, $f = 5 \text{ to } 2000 \text{ Hz}$, $t = 3 \text{ axes} \times 2 \text{ h}$

For increased oscillations or vibrations, the additional option of type code, feature **Application, temperature** option **B** 100 bar (1450 psi) process pressure is recommended.

9.8 Shock Resistance

According to IEC 60068-2-27-2008: $300 \text{ m/s}^2 [= 30 g_n] + 18 \text{ ms}$

g_n : standard acceleration of gravity

9.9 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 foot).

- ▶ For more information see chapter 8.3.

9.10 Pollution Degree

Pollution degree 2

9.11 Electromagnetic Compatibility

- Electromagnetic compatibility according to EN 61326 series and NAMUR recommendation EMC (NE21)
- The requirements of EN 61326-3-1 for the safety function (SIL) are fulfilled.
- ▶ Details are available in the supplementary Functional Safety Manual.

10 Process

10.1 Process Temperature Range

-50 to +150 °C (-58 to +302 °F)

Pay attention to the pressure and temperature dependence.

- ▶ For additional details see chapter 10.3.

10.2 Thermal Shock

≤ 120 K/s

10.3 Process Pressure Range



Warning!

The maximum pressure for the measuring device is dependent on the lowest-rated element, with regard to pressure, of the selected components. This means that it is necessary to pay attention to the process connection as well as the sensor.

- For pressure specifications, see chapter 11.
 - The measuring device must be operated only within the specified limits!
 - The Pressure Equipment Directive (2014/68/EU) uses the abbreviation **PS**. The abbreviation **PS** corresponds to the MWP (maximum working pressure) of the measuring device.
-

Refer to the following standards for the permitted pressure values of the flanges at higher temperatures:

- 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 table 18. The chemical composition of the two materials can be identical.
- ASME B 16.5
- JIS B 2220

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



Note

Devices with CRN approval: maximum 90 bar (1305 psi) for devices with a pipe extension. Additional information on the Pepperl+Fuchs website: www.pepperl-fuchs.com.

Process Pressure Range of the Sensors

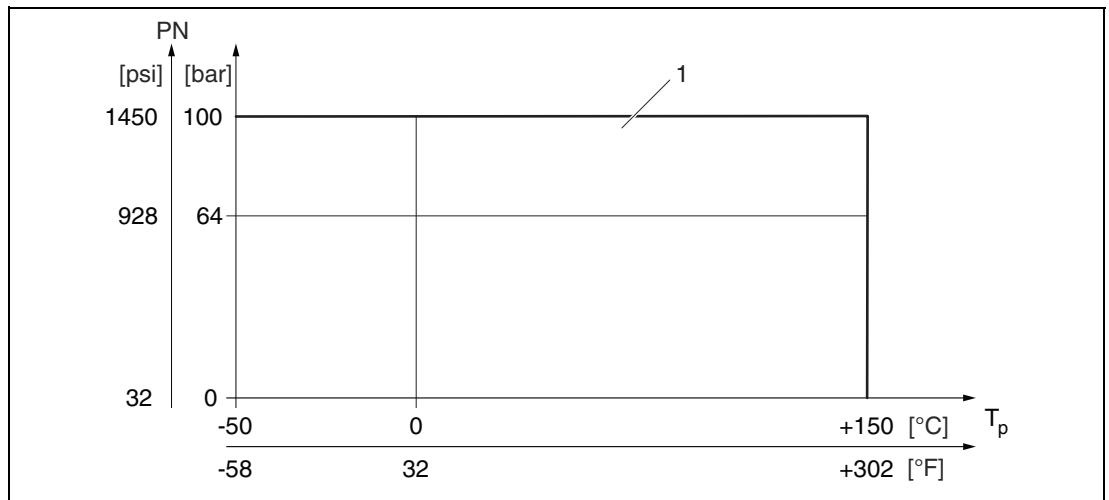


Figure 10.1 Process temperature

- 1 Permitted pressure rating if the following option is selected:
Type code, feature **Application, temperature**, Option **B**, 100 bar (1450 psi).

► For exceptions see page 48.

Canadian CRN approval: The maximum permissible process pressure is limited to 90 bar (1305 psi) only in connection with the CRN approval.

More details on the maximum pressure values are available in the download area of the product detail page under www.pepperl-fuchs.com.

Optionally available:

- PN: 64 bar (928 psi) at max. 150 °C (302 °F)
- PN: 100 bar (1450 psi) at max. 150 °C (302 °F)

10.4

Test Pressure

- PN = 64 bar (928 psi): Test pressure = 1.5 x PN maximum 100 bar (1450 psi) depending on process connection selected
- Membrane burst pressure at 200 bar (2900 psi)
- PN = 100 bar (1450 psi): Test pressure = 1.5 x PN maximum 150 bar (2175 psi) depending on process connection selected
- Membrane burst pressure at 400 bar (5800 psi)

The instrument function is limited during the pressure test.

The mechanical integrity is guaranteed at pressures up to 1.5 times the process nominal pressure (PN).

10.5 Density

Liquids with density > 0.7 g/cm³

Switch position > 0.7 g/cm³ (as-delivered state)

Liquids with density 0.5 g/cm³

Switch position > 0.5 g/cm³ (can be configured via DIP switch)

Liquids with density > 0.4 g/cm³

- Optionally available, not suitable for SIL applications.
- Fixed value that cannot be edited. The function of the DIP switch is interrupted.

10.6 Viscosity

≤ 10000 mPa·s

10.7 Pressure Tightness

Up to vacuum



Note

In vacuum evaporation plants: select the 0.4 g/cm³ density setting.

10.8 Solids Contents

Ø ≤ 5 mm (0.2 inch)

11 Mechanical Construction



Note

The following dimensions are rounded values. For this reason, they may deviate slightly from the dimensions given on www.pepperl-fuchs.com.

11.1 Design, Dimensions

Device Height

The device height is calculated from the following components:

- Housing including cover
- Temperature spacer and/or pressure-tight feed through (second line of defense), optional
- Pipe extension, short pipe or compact 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 into consideration the installation distance (space that is used to install the device)

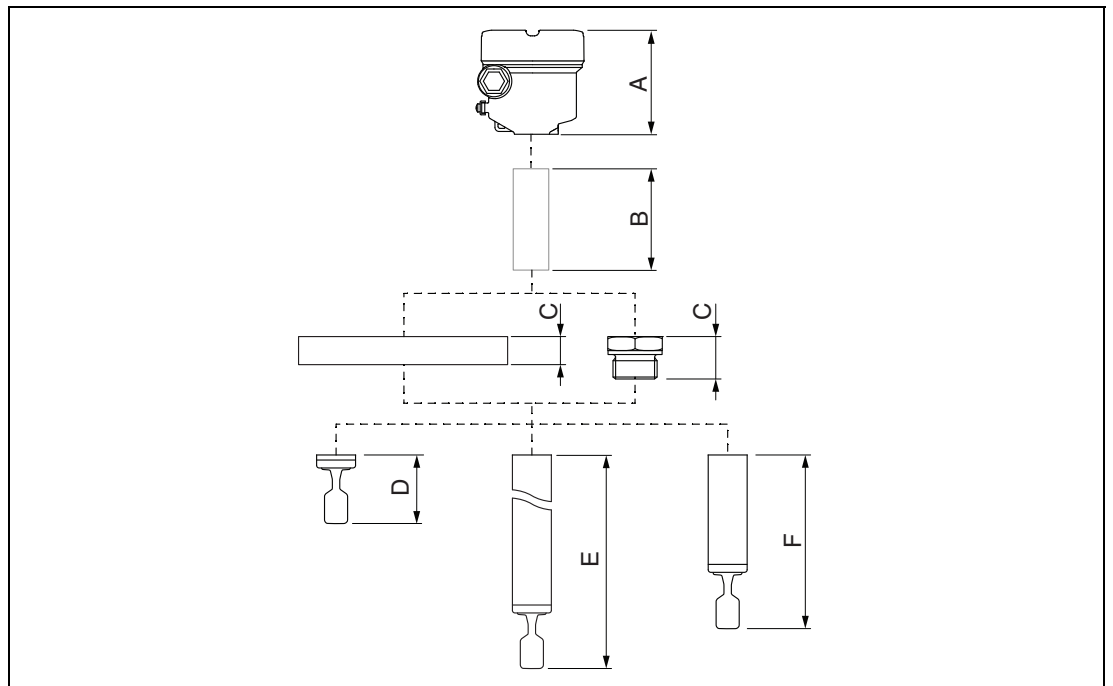


Figure 11.1 Components for determining the height of the device

- A** Housing including cover
- B** Temperature spacer, pressure-tight feed through (optional), details in the type code, depending on the process connection, up to 60 mm (2.36 inch). For details, see type code.
- C** Process connection, flange or thread
- D** Tuning fork
- E** Pipe extension with tuning fork
- F** Short pipe with tuning fork

Housing and Cover

All housings can be aligned. The locking screw on metal housings can be used to secure the alignment of the housing.

Devices with a *Bluetooth*[®] or LED module require a high cover (transparent plastic cover or aluminum cover with sight glass). The *Bluetooth*[®] or LED module cannot be used in conjunction with the 316L single compartment housing, cast.

Dimensions of housing and cover

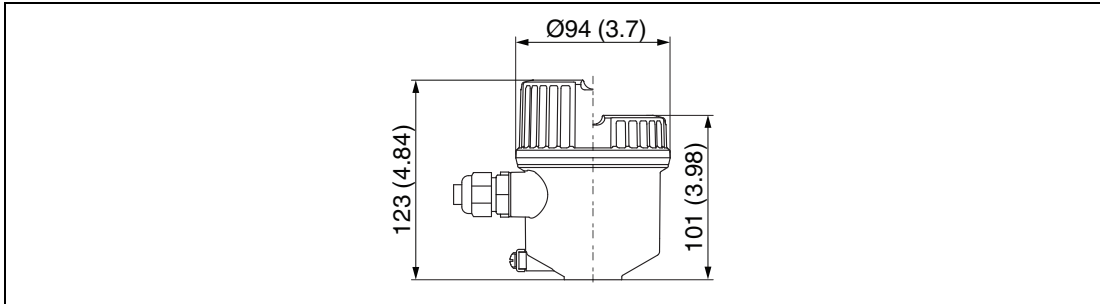


Figure 11.2 Single compartment, plastic, unit of measurement mm (inch)

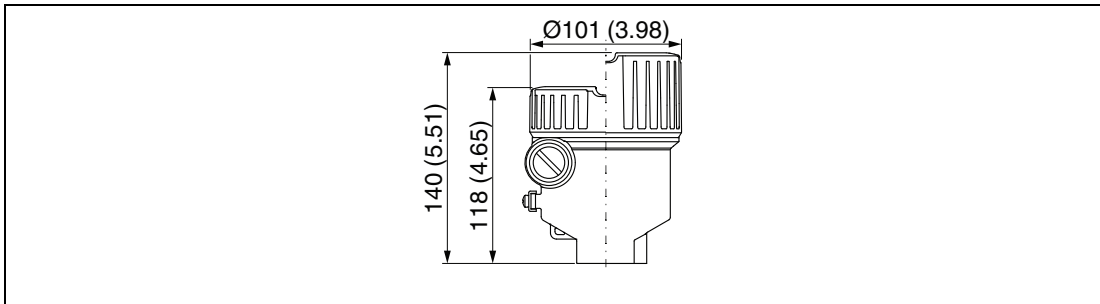


Figure 11.3 Single compartment, aluminum, coated, suitable for Ex d/XP area, unit of measurement mm (inch)

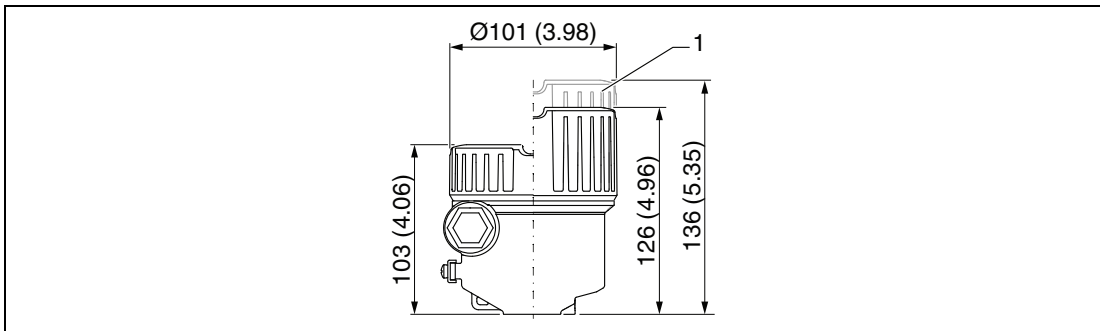


Figure 11.4 Single compartment, aluminum, coated, unit of measurement mm (inch)

- 1 Cover for Ex ec approval

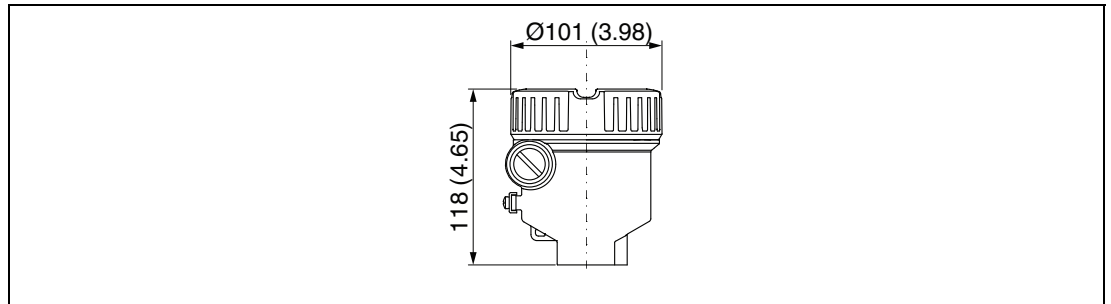


Figure 11.5 Single compartment 316L, cast, with Ex d/XP approval also, unit of measurement mm (inch)

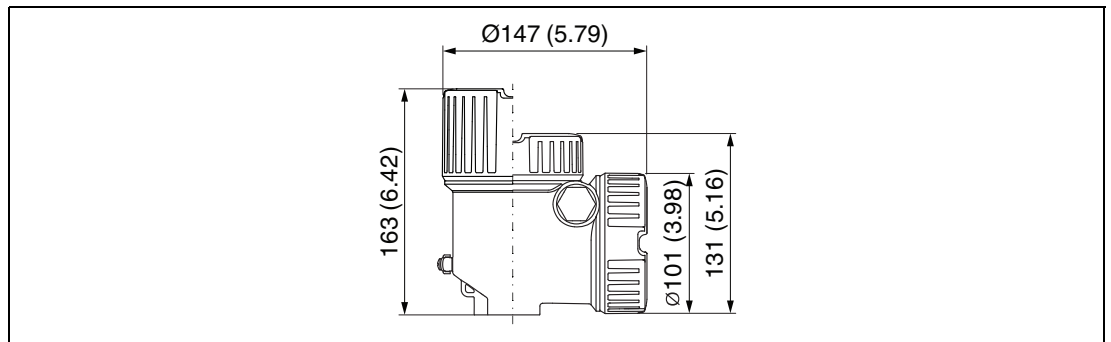


Figure 11.6 Dual compartment, L-shaped, aluminum, coated, with Ex d/XP approval also, unit of measurement mm (inch)

Ground terminal

- Ground terminal inside the housing, max. conductor cross-section 2.5 mm² (14 AWG)
- Ground terminal outside the housing, max. conductor cross-section 4 mm² (12 AWG)
- If safety extra-low voltage is used to supply power to electronic inserts, do not connect protective ground

Cable glands

Cable diameter:

- Plastic: Ø5 to 10 mm (0.2 to 0.38 inch)
- Nickel-plated brass: Ø7 to 10.5 mm (0.28 to 0.41 inch)
- Stainless steel: Ø7 to 12 mm (0.28 to 0.47 inch)

The scope of delivery comprises:

- 1 cable gland installed
- 1 cable gland sealed with dummy plug



Note

A second cable gland (not installed) is also included in the scope of delivery of the relay electronics.

Exceptions: With Ex d/XP, only threaded entries are permitted.

Temperature Spacer, Pressure-Tight Feed Through (optional)

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

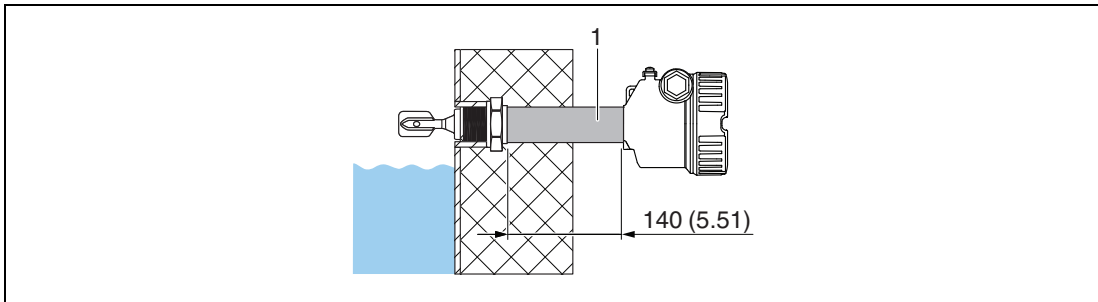


Figure 11.7 Unit of measurement mm (inch)

1 Temperature spacer or pressure-tight feed through

Type code, feature **Sensor design**, optional:

- Option **TD** for temperature spacer
- Option **DF** for pressure tight feed through (second line of defense)
In the event of damage to the sensor, protects the housing from exposure to vessel pressures up to 100 bar (1450 psi).

Note

Option **DF** (pressure-tight feed through) can only be selected in conjunction with the **TD** option (temperature spacer).

Probe Design

Compact

- Material: 316L or Alloy C
- Sensor length L: depends on process connection
See **Process connections** section: thread G, ASME B1.20.3 MNPT, EN10226 R, Tri-Clamp

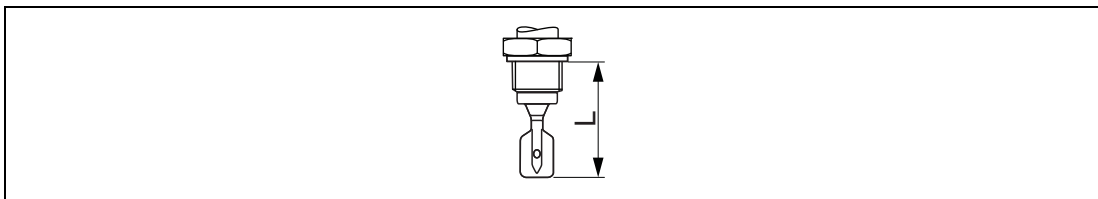


Figure 11.8 Probe design: compact, sensor length L

Short pipe

- Material: 316L, sensor length L: depends on process connection
- Material: Alloy C, sensor length L: depends on process connection
- Sensor length L:
 - Flange = 115 mm (4.53 inch)
 - Thread G3/4 = 115 mm (4.53 inch)
 - Thread G1 = 118 mm (4.65 inch)
 - Thread NPT, R = 99 mm (3.9 inch)
 - Tri-Clamp = 115 mm (4.53 inch)

Pipe extension

- Material: 316L, sensor length L: 117 to 6000 mm (4.7 to 236 inch)
- Material: Alloy C, sensor length L: 148 to 3000 mm (5.9 to 118 inch)
- Length tolerances L:
 - < 1 m (3.3 foot) = -5 mm (-0.2 inch),
 - 1 to 3 m (3.3 to 9.8 foot) = (-10 mm (-0.39 inch)

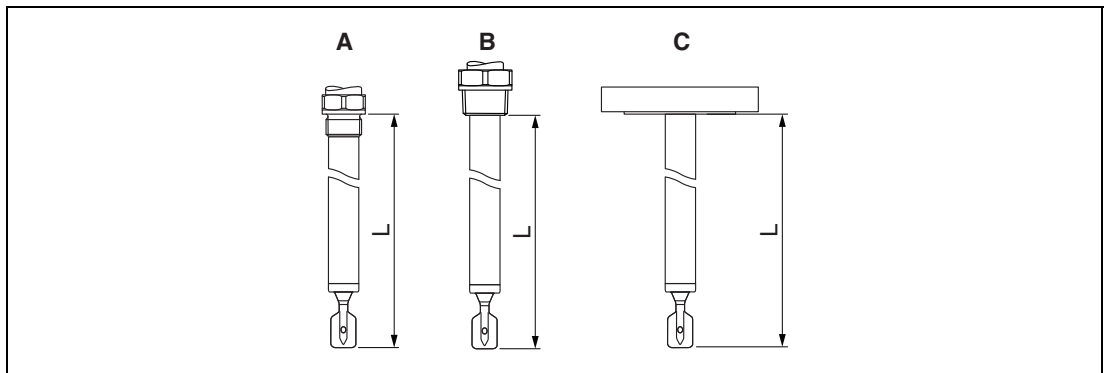


Figure 11.9 Probe designs: pipe extension, short pipe, sensor length L

- A** G3/4, G1
- B** NPT3/4, NPT1, R3/4, R1
- C** Flange, Tri-Clamp

Tuning Fork

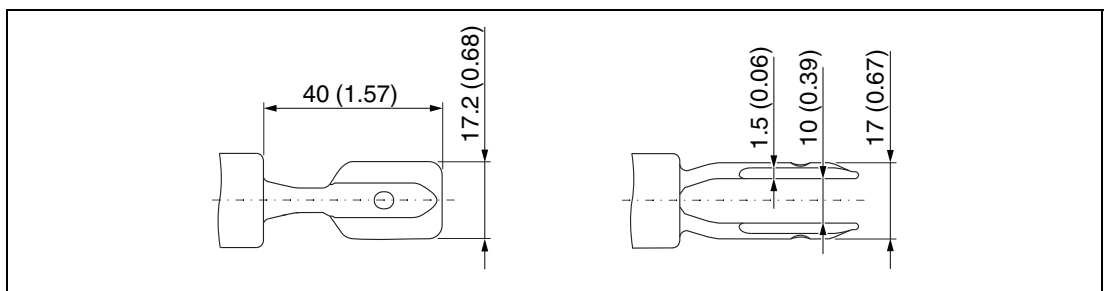


Figure 11.10 Tuning fork, unit of measurement mm (inch)

Process Connections

Height of process connection

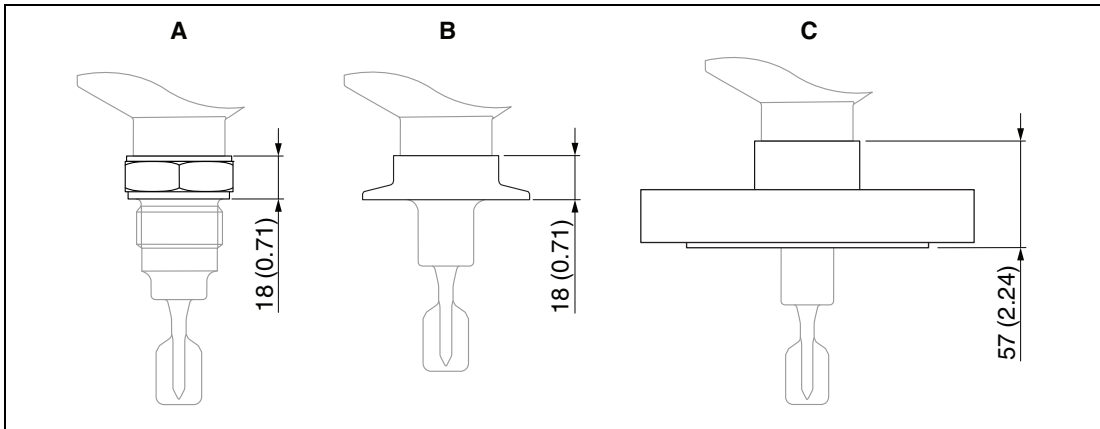


Figure 11.11 Height of process connection, unit of measurement mm (inch)

- A** Process connection with threaded connection
- B** Process connection with Clamp
- C** Process connection with flange

Thread ISO 228 G for installing in weld-in adapter

G3/4, G1 suitable for installing 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: 0.2 kg (0.44 lb)
- Accessory: weld-in adapter

The weld-in adapter is not included in the scope of delivery.

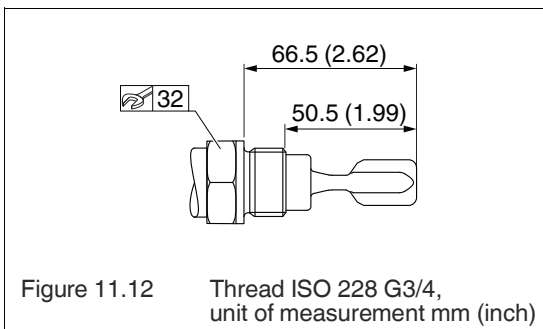


Figure 11.12 Thread ISO 228 G3/4, unit of measurement mm (inch)

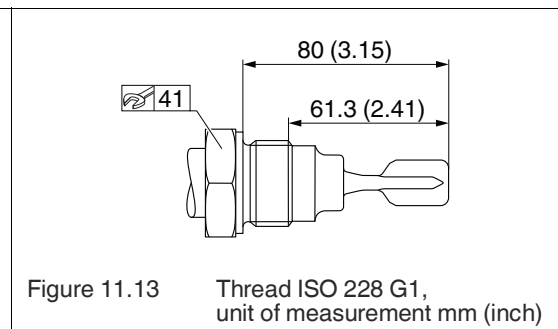
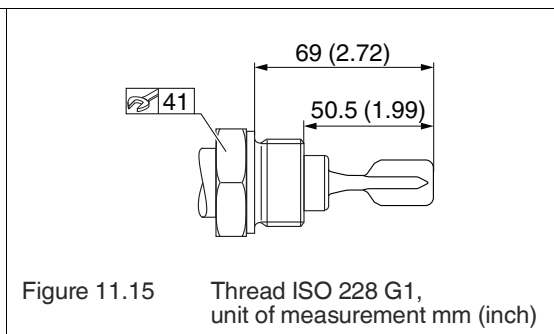
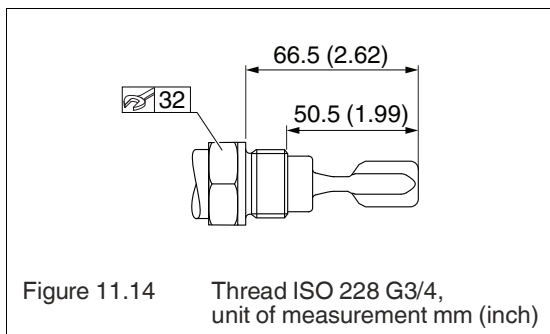
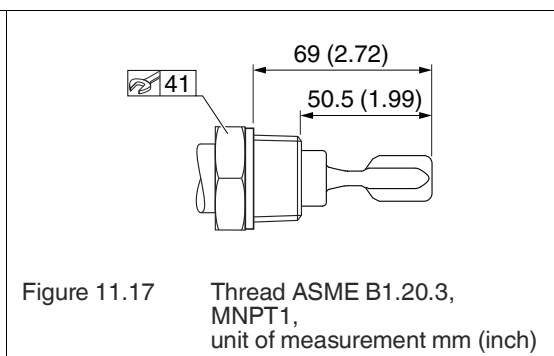
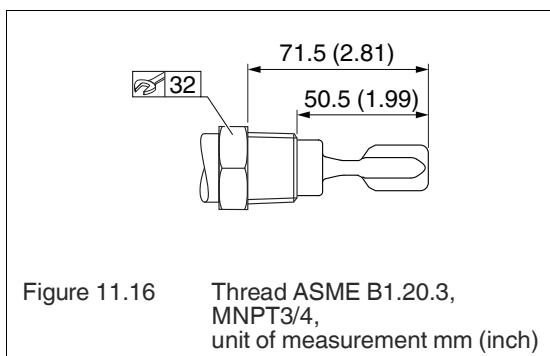


Figure 11.13 Thread ISO 228 G1, unit of measurement mm (inch)

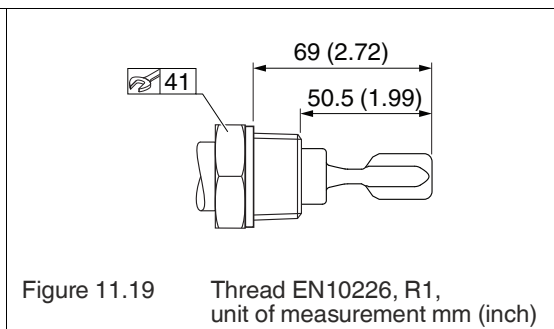
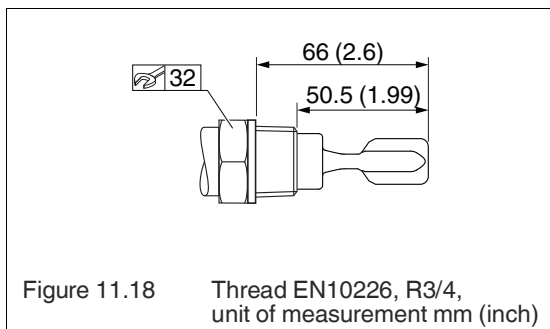
Thread ISO 228 G with flat seal



Thread ASME B1.20.3, MNPT



Thread EN 10226, R



Tri-Clamp

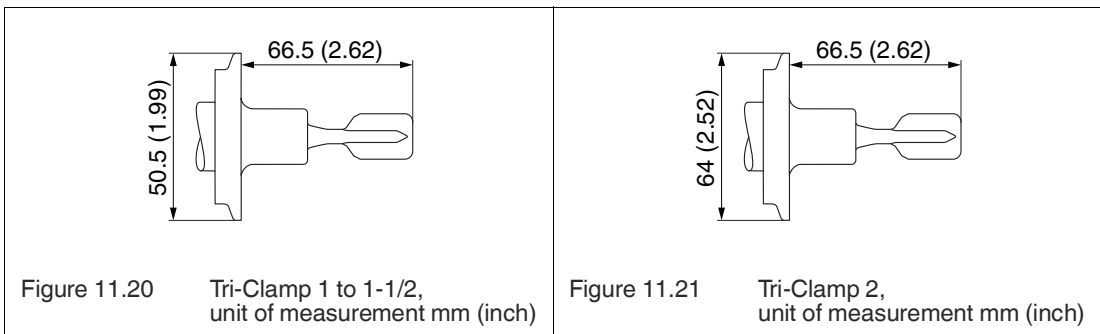
Version ISO 2852 DN25-38 (1 to 1-1/2 inch), DIN 32676 DN25-40

- Material: 316L
- Pressure rating: ≤ 25 bar (363 psi)
- Temperature: ≤ 150 °C (302 °F)
- Weight: 0.22 kg (0.49 lb)

Version ISO 2852 DN40-51 (2 inch), DIN 32676 DN25-40

- Material: 316L
- Pressure rating: ≤ 25 bar (363 psi)
- Temperature: ≤ 150 °C (302 °F)
- Weight: 0.3 kg (0.66 lb)

The maximum temperature and the maximum pressure are dependent on the clamping ring and the seal used. The lowest value applies in each case.



Sensor dimensions in the case of flanges

Alloy C22-plated flanges are available for higher chemical resistance.

The flange carrier material is made of 316L and is welded to an Alloy C22 disk.

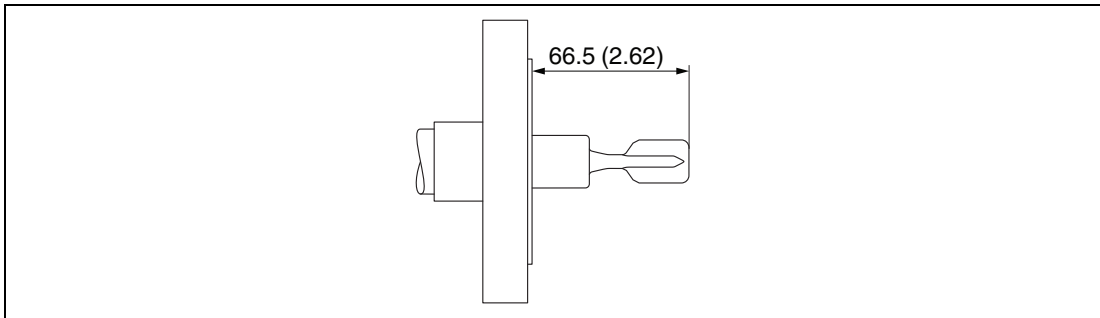


Figure 11.22 Example with flange, unit of measurement mm (inch)

ASME B16.5 flanges, RF (Raised Face)

Pressure rating	Type	Material	Weight
Cl.150	NPS1	316/316L	1.0 kg (2.21 lb)
Cl.150	NPS1-1/4	316/316L	1.2 kg (2.65 lb)
Cl.150	NPS2	316/316L	2.4 kg (5.29 lb)
Cl.150	NPS2	Alloy C22 > 316/316L	2.4 kg (5.29 lb)
Cl.150	NPS1-1/2	316/316L	1.5 kg (3.31 lb)
Cl.150	NPS3	316/316L	4.9 kg (10.8 lb)
Cl.150	NPS4	316/316L	7.0 kg (15.44 lb)
Cl.300	NPS1-1/4	316/316L	2.0 kg (4.41 lb)
Cl.300	NPS1-1/2	316/316L	2.7 kg (5.95 lb)
Cl.300	NPS2	316/316L	3.2 kg (7.06 lb)
Cl.300	NPS3	316/316L	6.8 kg (14.99 lb)
Cl.300	NPS3	Alloy C22 > 316/316L	6.8 kg (14.99 lb)
Cl.300	NPS4	316/316L	11.5 kg (25.6 lb)
Cl.600	NPS2	316/316L	4.2 kg (9.26 lb)
Cl.600	NPS3	316/316L	6.8 kg (14.99 lb)

Table 11.1

ASME B16.5 flanges, FF (Flat Face)

Pressure rating	Type	Material	Weight
Cl.150	NPS1	316/316L	1.0 kg (2.21 lb)
Cl.150	NPS2	316/316L	2.4 kg (5.29 lb)
Cl.300	NPS1-1/2	316/316L	2.7 kg (5.95 lb)
Cl.300	NPS2	316/316L	3.2 kg (7.06 lb)

Table 11.2

ASME B16.5 flanges, RTJ (Ring Type Joint)

Pressure rating	Type	Material	Weight
Cl.300	NPS2	316/316L	3.2 kg (7.06 lb)
Cl.300	NPS4	316/316L	11.5 kg (25.6 lb)
Cl.600	NPS2	316/316L	4.2 kg (9.26 lb)
Cl.600	NPS3	316/316L	6.2 kg (13.67 lb)

Table 11.3

EN flanges EN 1092-1, form A

Pressure rating	Type	Material	Weight
PN6	DN40	316L (1.4404)	1.4 kg (3.09 lb)
PN6	DN50	316L (1.4404)	1.6 kg (3.53 lb)
PN10/16	DN80	316L (1.4404)	4.8 kg (10.58 lb)
PN10/16	DN100	316L (1.4404)	5.6 kg (12.35 lb)
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)
PN40	DN50	316L (1.4404)	3.2 kg (7.06 lb)
PN100	DN50	316L (1.4404)	5.5 kg (12.13 lb)

Table 11.4

EN flanges EN 1092-1, form B1

Pressure rating	Type	Material	Weight
PN6	DN32	316L (1.4404)	1.2 kg (2.65 lb)
PN6	DN50	316L (1.4404)	1.6 kg (3.53 lb)
PN6	DN50	Alloy C22 > 316L	1.6 kg (3.53 lb)
PN10/16	DN100	316L (1.4404)	5.6 kg (12.35 lb)
PN10/16	DN100	Alloy C22 > 316L	5.6 kg (12.35 lb)
PN25/40	DN25	316L (1.4404)	1.4 kg (3.09 lb)
PN25/40	DN25	Alloy C22 > 316L	1.4 kg (3.09 lb)
PN25/40	DN50	316L (1.4404)	3.2 kg (7.06 lb)
PN25/40	DN50	Alloy C22 > 316L	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)
PN100	DN50	316L (1.4404)	5.5 kg (12.13 lb)

Table 11.5

EN flanges EN 1092-1, form C

Type	Material	Pressure rating	Weight
DN32	316L (1.4404)	PN6	1.2 kg (2.65 lb)
DN50	316L (1.4404)	PN25/40	3.2 kg (7.06 lb)

Table 11.6

EN flanges EN 1092-1, form D

Type	Material	Pressure rating	Weight
DN32	316L (1.4404)	PN6	1.2 kg (2.65 lb)
DN50	316L (1.4404)	PN25/40	3.2 kg (7.06 lb)

Table 11.7

EN flanges EN 1092-1, form E

Type	Material	Pressure rating	Weight
DN32	316L (1.4404)	PN6	1.2 kg (2.65 lb)
DN50	316L (1.4404)	PN25/40	3.2 kg (7.06 lb)

Table 11.8

JIS flanges B2220

Pressure rating	Type	Material	Weight
10K	10K 25A	316L (1.4404)	1.3 kg (2.87 lb)
10K	10K 40A	316L (1.4404)	1.5 kg (3.31 lb)
10K	10K 50A	316L (1.4404)	1.7 kg (3.75 lb)
10K	10K 50A	Alloy C22 > 316L	1.7 kg (3.75 lb)
10K	10K 80A	316L (1.4404)	2.2 kg (4.85 lb)
10K	10K100 A	316L (1.4404)	2.8 kg (6.17 lb)

Table 11.9

Process connection, seal surface

- Thread ISO 228, G
- Thread ASME, MNPT
- Thread EN 10226, R
- Tri-Clamp ISO 2852
- Flange ASME B16.5, RF (Raised Face)
- Flange ASME B16.5, FF (Flat Face)
- Flange ASME B16.5, RTJ (Ring Type Joint)
- Flange EN 1092-1, form A
- Flange EN 1092-1, form B1
- Flange EN 1092-1, form C
- Flange EN 1092-1, form D
- Flange EN 1092-1, 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)

11.2 Weight

Basic Weight: 0.65 kg (1.43 lb)

The basic weight comprises:

- Sensor (compact)
- Electronic insert
- Housing: single compartment, plastic with cover
- Thread, G3/4

Note

Differences in weight result from the housing, LED or *Bluetooth*[®] module (incl. high cover).

In Addition to the Basic Weight:

Bluetooth[®] module

0.1 kg (0.22 lb)

LED module

0.1 kg (0.22 lb)

Housing

- Single compartment, aluminum, coated: 0.8 kg (1.76 lb)
optional with LED module or *Bluetooth*[®] module with high cover: 0.38 kg (0.84 lb)
- 316L cast: 1.21 kg (2.67 lb)
- Dual compartment, L-shaped, aluminum, coated: 1.22 kg (2.69 lb)
optional with LED module or *Bluetooth*[®] module with high cover: 0.38 kg (0.84 lb)

Temperature spacer

0.6 kg (1.32 lb)

Pressure-tight feed through

0.7 kg (1.54 lb)

Pipe extension

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

Process connections

See **Process Connection** section

Plastic protective cover

0.2 kg (0.44 lb)

Weather protection cover, metal

0.93 kg (2.05 lb)



11.3 Materials

Materials in Contact with Process

Process connection and pipe extension

316L (1.4404 or 1.4435)

Flanges

- See **Flanges** section
- Flange plating: Alloy C22 (2.4602)

Tuning fork

316L (1.4435), optional (Alloy C22)

Seals

Flat seal for process connection G3/4 or G1: fiber-reinforced elastomer seal, asbestos-free as per DIN 7603

Scope of delivery with flat seal according to DIN 7603:

- Metrical threads G3/4, G1 standard
- Metrical threads G3/4, G1 for installation in weld-in adapter

Scope of delivery without seal:

- Tri-Clamp
- Flanges
- R and NPT thread

Materials not in Contact with Process

Plastic housing

- Housing: PBT/PC
- Dummy cover: PBT/PC
- Transparent cover: PBT/PC or PA12
- Cover seal: EPDM
- Potential equalization: 316L
- Seal under potential equalization: EPDM
- Plug: PBT-GF30-FR
- M20 cable gland: PA
- Seal on plug and cable gland: EPDM
- Adapter as substitute for cable glands: 316L
- Nameplate: plastic foil
- TAG plate: plastic film, metal, or provided by customer

Aluminum housing, coated

- Housing: EN AC 44300 aluminum
- Dummy cover: EN AC 44300 aluminum
- Cover with sight glass: EN AC 44300 aluminum, PC Lexan 943A synthetic glass
- Cover with viewing window made of polycarbonate, optionally available to order. For Ex d applications, the sight glass is made from borosilicate.
- Cover seal materials: HNBR
- Cover seal materials: FVMQ (in low-temperature version only)
- Nameplate: plastic foil
- TAG plate: plastic film, stainless steel, or provided by customer
- M20 cable glands: select material (stainless steel, nickel-plated brass, polyamide)

Stainless steel housing

- Housing: stainless steel AISI 316L (1.4409)
- Cover: AISI 316L (1.4409)
- Cover seal materials: FVMQ (in low temperature version only)
- Cover seal materials: HNBR
- Nameplate: stainless steel 316L
- TAG sign: plastic film, stainless steel, or provided by customer
- M20 cable glands: select material (stainless steel, nickel-plated brass, polyamide)

Process connections

- Process connection: 316L (1.4404), optional 2.4602 (AlloyC22)
- Flanges:
 - According to EN/DIN: 316L (1.4404)
 - According to ASME: 316/316L
 - According to JIS : 316L (1.4404)
- Flange plating: AlloyC22 (2.4602)
- Flat seal for G3/4 or G1 process connection: elastomer fiber, asbestos-free

11.4 Surface Roughness

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

12 Operability

12.1 Operating Concept

- Operation with button and DIP switches on the electronic insert
- Display with optional *Bluetooth*[®] module and P+F Level app via *Bluetooth*[®] wireless technology
- Indication of operational status (switch status or alarm status) with optional LED module (lights visible from the outside)

For plastic housing and aluminum housing (standard and Ex d) in conjunction with the DC-PNP (electronic insert FEL62) and relay electronics (electronic inserts FEL64, FEL64DC)

12.2 Elements on the Electronic Insert

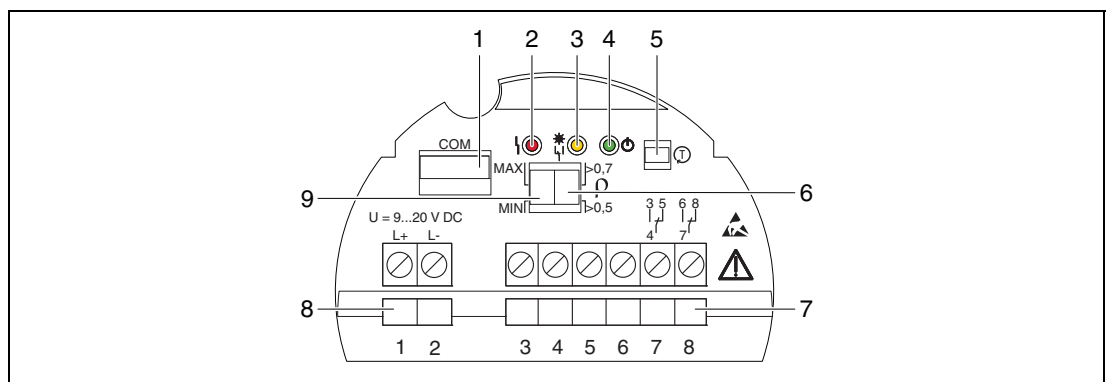


Figure 12.1 Example of electronic insert FEL64DC

- 1 COM interface for additional modules (LED module, *Bluetooth*[®] module)
- 2 LED, red, for warning or alarm
- 3 LED, yellow, switch status
- 4 LED, green, operational status (device is on)
- 5 Test button, activates functional test
- 6 DIP switch for setting density 0.7 or 0.5
- 7 Terminals (3 to 8), relay contact
- 8 Terminals (1 to 2), power supply
- 9 DIP switch for configuring MAX/MIN safety mode

12.3 Terminals

Terminals for cable cross-section up to 2.5 mm² (14 AWG). Use ferrules for the wires.

12.4 Local Operation

Operation at Electronic Insert

MAX/MIN fail-safe mode

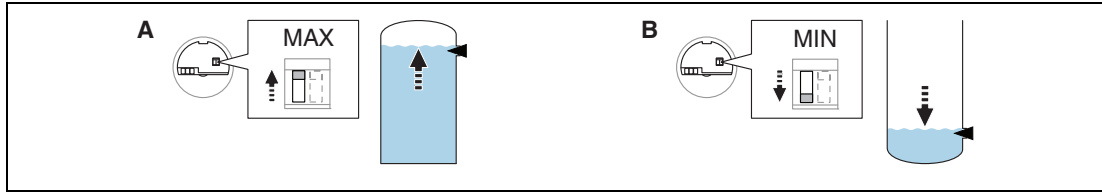


Figure 12.2 Switch position on the electronic insert for fail-safe mode MAX/MIN

A MAX (maximum fail-safe mode)

B MIN (minimum fail-safe mode)

- Minimum/maximum quiescent current safety can be switched at the electronic insert
- MAX = Maximum safety: When the tuning fork is covered, the output switches in the direction of demand. Use this for overfill prevention, for example.
- MIN = Minimum safety: When the tuning fork is uncovered, the output switches in the direction of demand. Use this for dry-running protection of pumps, for example.

Density switchover

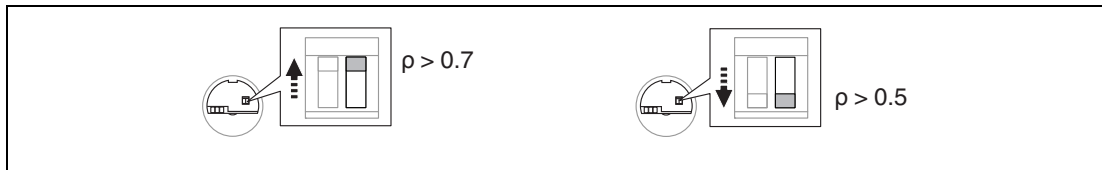


Figure 12.3 Switch position on the electronic insert for density

Liquids with density $> 0.7 \text{ g/cm}^3$

Switch position $> 0.7 \text{ g/cm}^3$ (as-delivered state)

Liquids with density 0.5 g/cm^3

Switch position $> 0.5 \text{ g/cm}^3$ (can be configured via DIP switch)

Liquids with density $> 0.4 \text{ g/cm}^3$

- Optionally available, not suitable for SIL applications.
- Fixed value that cannot be edited. The function of the DIP switch is interrupted.

Functional test of the electronic switch with a test magnet

The test magnet can be ordered as an option: Type code, additional options, feature **Accessory enclosed** option **ST** (test magnet).

The functional test with the test magnet can be performed without opening the device. To perform the test, hold the test magnet against the marking on the nameplate of the housing. The functional test with the test magnet acts in the same way as the functional test using the test button on the electronic insert.

The functional test can be applied for the following electronic inserts: FEL62, FEL64, FEL64DC, FEL68.

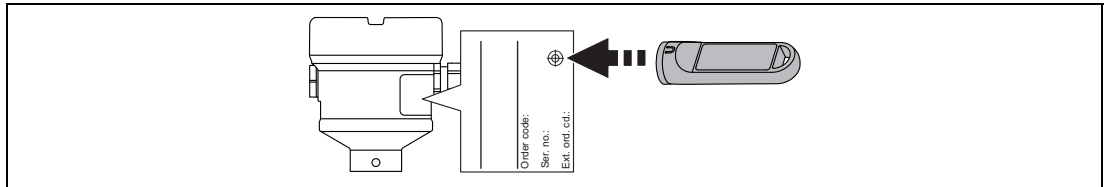


Figure 12.4 Functional test with test magnet

12.5 Local Display

LED Module VU120 (optional)

A brightly lit LED indicates the operational status (switch status or alarm status). The LED module can be connected to the following electronic inserts: FEL62, FEL64, FEL64DC.

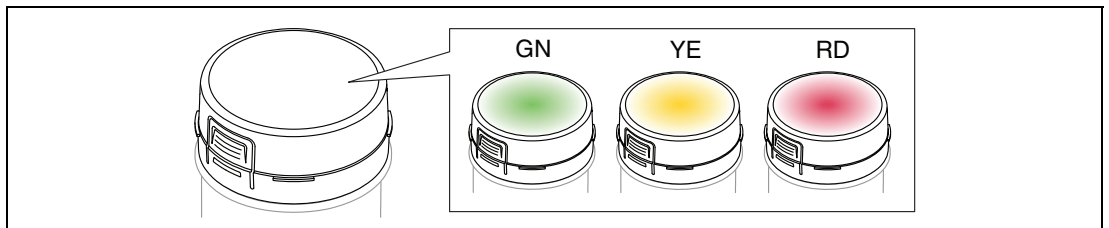


Figure 12.5 LED module VU120, the LED lights up in green (GN), yellow (YE) or red (RD)

► For more information see chapter 6.1 and 16.

12.6 Remote Interrogation

Bluetooth® Wireless Technology

Access via **Bluetooth®** wireless technology

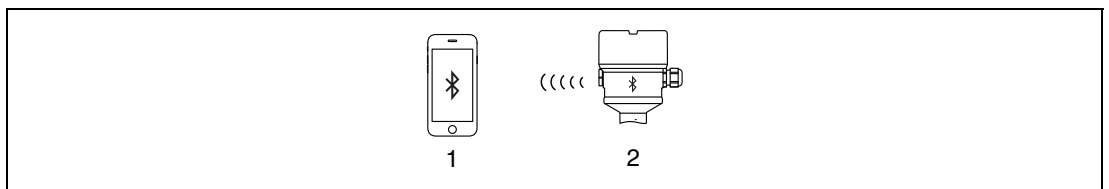


Figure 12.6 Remote operation via **Bluetooth®** wireless technology

- 1 Mobile phone or tablet with P+F Level app
- 2 Device with optional **Bluetooth®** module

Bluetooth® Module VU121 (optional)

Functions

- Connection via COM interface: *Bluetooth*® module for device diagnostics via a mobile phone app or tablet app
- Display the battery status via app when used with electronic insert FEL68 (NAMUR)
- User guidance (wizard) for SIL/WHG proof testing
- Visible in the live-list 10 s seconds after the *Bluetooth*® search commences
- Data can be read from the *Bluetooth*® module 60 s after the supply voltage is switched on
- Display of the current vibration frequency and the switching state of the device

The yellow LED flashes when the *Bluetooth*® module is connected to another *Bluetooth*® device, e. g. cellular phone.

- ▶ For more information see chapter 6.1 and 16.

Verification and monitoring

- ▶ Additional details see chapter 15.

12.7 Diagnostic Information

Verification

The electronics module and the tuning fork are checked using Heartbeat Technology, and a verification of the device is performed. The switch output is not changed during this test. The test can be performed at any time and does not influence the switch output in the safety circuit. In the case of proof-testing, the P+F Level app supports users in every step of the test. The switch output is also switched during this test. During the proof test, alternative monitoring measures must be taken to ensure process safety.

Proof Test

During the proof test, the P+F Level app provides support for each individual stage of the test (proof-test wizard). The switch output is also switched during this test. During the proof test, alternative monitoring measures must be taken to ensure process safety.

Evaluation of the Vibration Frequency

If the vibration frequency exceeds the upper warning frequency, a warning is displayed. A warning is activated when the fork becomes corroded, for example. The switch output remains in the current state. The warning is displayed in the P+F Level app and output in the protocol. When a warning occurs, it is necessary to check the device sensor.

The current oscillation frequency must be in the range between the upper and lower alarm frequency. If the current oscillation frequency is above the upper alarm frequency or below the lower alarm frequency, an alarm is output. The output switches to the safety-related state.

13 Certificates and Approvals



Note

For further information is available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

Enter the order designation in the search field → Select the appropriate product → Open the product detail page → Open the **Documents** tab.

13.1 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. Pepperl+Fuchs confirms successful testing of the device by affixing to it the CE mark.

13.2 RCM-Tick 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 are labeled with the RCM-Tick marking on the name plate.



Figure 13.1

13.3 Approvals for Explosions-Hazardous Areas

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 Ex devices.



Note

Ex temperature class: T1 to T6

If using type of protection Ex i and electronic insert FEL68 (NAMUR) and the *Bluetooth*[®] module in addition (battery required): T4 to T1.

Explosion-Protected Mobile Phones and Tablets

If used in hazardous areas, mobile end devices with an Ex approval must be used. Pepperl+Fuchs offers mobile devices for use in explosion-hazardous areas.

13.4 Overfill Protection

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

Approved for overfill protection and leakage detection.



Note

Ordering information: Type code, additional options, feature **Additional approval**, option **WH**

13.5 Functional Safety

The device has been developed according to the IEC 61508 standard. The device is suitable for overfill prevention and dry-running protection up to SIL 2 (SIL 3 with homogeneous redundancy).

For a detailed description of the safety functions with this device, settings and functional safety data, see the **Functional Safety Manual**.



Note

Ordering information: Type code, additional options, feature **Additional approval**, option **SL**
Subsequent confirmation of usability according to IEC 61508 is not possible.

13.6 Radio Approval

For further information is available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

13.7 Inspection Certificates

Test, Certificate, Declaration

The following documents can be ordered:

- Inspection certificate 3.1, EN 10204 (material certificate, wetted parts)
- NACE MR0175/ISO 15156 (wetted parts), declaration
- NACE MR0103/ISO 17945 (wetted parts), declaration
- AD 2000 (wetted parts), declaration, excluding cast parts
- Pressure test, internal procedure, test report

13.8 Service

- Cleaned of oil+grease (wetted)
- PWIS-free (paint-wetting impairment substances)
- Switching delay setting to be spec.
- Setting for MIN safety mode
- Default density setting > 0.4 g/cm³
- Default density setting > 0.5 g/cm³

Hard-copy product documentation

Hard-copy versions of the test reports, declarations and inspection certificates can also be ordered.

Ordering information: Type code, additional options, feature **Service**, option **P1**
(Product documentation on paper)

The documents are then provided with the device upon delivery.

13.9 Pressure Equipment Directive

Pressure equipment with allowable pressure ≤ 200 bar (2900 psi)

Pressure instruments with a flange and threaded boss that do 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.

13.10 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, Pepperl+Fuchs devices are designed as either single seal or dual seal devices with a warning message. This allows the user to waive the use of - and save the cost of installing - an external secondary process seal in the protective conduit 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. More information is provided in the Safety Instructions (SI) for the relevant device.



Note

Aluminum, stainless steel and plastic housing are approved as single-seal devices.

13.11 China RoHS Symbol

China RoHS 1, law SJ/T 11363-2006: The measuring system complies with the substance restrictions of the Restriction on Hazardous Substances Directive (RoHS).

13.12 RoHS

The measuring system complies with the substance restrictions of the Restriction on Hazardous Substances Directive 2011/65/EU (RoHS 2).

13.13 Additional Certification

ASME B 31.3

Design and materials in accordance with ASME B31.3. 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.

14 Ordering Information

14.1 Type Code

This overview does not mark options which are mutually exclusive.

L	V	L	-	M	4	-	(1)	(2)	(3)	(4)	-	(5)	(6)	(7)	(8)	(9)	(10)	-	(11)	(12)	.	L
---	---	---	---	---	---	---	-----	-----	-----	-----	---	-----	-----	-----	-----	-----	------	---	------	------	---	---

LVL-M4	Device
LVL-M4	Vibration limit switch for liquids

(1)	Type of probe
A	Compact version
B	Short tube version
C	Tube extension
X	Special version

(2)	Process connection, sealing surface
A	Flange ASME B16.5, RF (Raised Face)
B	Flange ASME B16.5, FF (Flat Face)
C	Flange ASME B16.5, RJF (Ring Type Joint)
D	Thread ASME B1.20.3, NPT
E	Flange EN 1092-1, Form A
F	Flange EN 1092-1, Form B1
G	Flange EN 1092-1, Form C
H	Flange EN 1092-1, Form D
I	Flange EN 1092-1, Form E
J	Thread EN 10226, R
K	Flange HG/T20592, RF (Raised Face)
L	Flange HG/T20615, RF (Raised Face)
M	Flange HG/T20615, RJ (Ring Joint)
N	Thread ISO 228, G
P	Flange JIS B2220, RF (Raised Face)
T	Tri-Clamp ISO 2852
X	Special version

(3)	Process connection
ASME B16.5 flanges	
A31	NPS 1 inch, Cl.150, 316/316L
A41	NPS 1-1/4 inch, Cl.150, 316/316L
A42	NPS 1-1/4 inch, Cl.300, 316/316L
A51	NPS 1-1/2 inch, Cl.150, 316/316L
A52	NPS 1-1/2 inch, Cl.300, 316/316L
A61	NPS 2 inch, Cl.150, 316/316L

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(3)	Process connection
A62	NPS 2 inch, Cl.300, 316/316L
A6C	NPS 2 inch, Cl.150, Alloy C22 > 316/316L
A7C	NPS 3 inch, Cl.300, Alloy C22 > 316/316L
A81	NPS 3 inch, Cl.150, 316/316L
A82	NPS 3 inch, Cl.300, 316/316L
A91	NPS 4 inch, Cl.150, 316/316L
A92	NPS 4 inch, Cl.300, 316/316L
A95	NPS 2 inch, Cl.600, 316/316L
A97	NPS 3 inch, Cl.600, 316/316L
E35	1-1/2 inch, Cl.150, 316L
E45	2 inch, Cl.150, 316L
E55	3 inch, Cl.150, 316L
E65	1-1/2 inch, Cl.300, 316L
E75	2 inch, Cl.300, 316L
E85	3 inch, Cl.300, 316L
E95	2 inch, Cl.600, 316L
EN 1092-1 flanges	
C45	DN25 PN25/40, Alloy C22 > 316L
C71	DN50 PN6, Alloy C22 > 316L
C75	DN50 PN25/40, Alloy C22 > 316L
C95	DN80 PN25/40, Alloy C22 > 316L
CA3	DN100 PN10/16, Alloy C22 > 316L
D75	DN50 PN40, 316L
D95	DN80 PN40, 316L
F45	DN25 PN25/40, 316L
F51	DN32 PN6, 316L
F55	DN32 PN25/40, 316L
F61	DN40 PN6, 316L
F62	DN40 PN40, 316L
F65	DN40 PN25/40, 316L
F71	DN50 PN6, 316L
F75	DN50 PN25/40, 316L
F85	DN65 PN25/40, 316L
F93	DN80 PN10/16, 316L
F95	DN80 PN25/40, 316L
F99	DN50 PN100, 316L
FA3	DN100 PN10/16, 316L
FA5	DN100 PN25/40, 316L
JIS B2220 flanges	

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(3) Process connection	
J13	10K 25A, 316L
J16	10K 40A, 316L
J17	10K 50A, 316L
J19	10K 80A, 316L
J1A	10K 100A, 316L
J1C	10K 50A, Alloy C22 > 316L
ISO 228 threads, EN 10226 threads, ASME B1.20.3 threads	
G21	G3/4 inch, 316L, installation > accessory weld-in adapter
G2C	3/4 inch, Alloy C22
G31	1 inch, 316L
G3C	1 inch, Alloy C22
G3E	G1 inch, 316L, installation > accessory weld-in adapter
G41	3/4 inch, 316L
Tri-Clamp ISO 2852	
T51	DN25-38 (1 to 1-1/2 inch), 316L, DIN 32676 DN25/40
T61	DN40-51 (2 inch), 316L, DIN 32676 DN50
XXX	Special version
(4) Sensor length, material	
A	Compact version, Alloy C22
B	Compact version, 316L
C	Short tube version, Alloy C22
D	Short tube version, 316L
E	Tube extension, length L in mm, Alloy C22, Ra < 3.2 µm/126 µinch
F	Tube extension, length L in mm, 316L, Ra < 3.2 µm/126 µinch
G	Tube extension, length L in inch, Alloy C22, Ra < 3.2 µm/126 µinch
H	Tube extension, length L in inch, 316L, Ra < 3.2 µm/126 µinch
X	Special version
(5) Housing, material	
A	Single compartment, aluminum, coated
D	Dual compartment, L-shape, aluminum, coated
G	Single compartment, 316L, cast
P	Single compartment, plastic
X	Special version
(6) Electrical connection	
A	Gland M20, plastic, IP66/68, NEMA type 4X/6P
B	Gland M20, brass nickel plated, IP66/68, NEMA type 4X/6P
C	Gland M20, 316L, IP66/68, NEMA type 4X/6P

(6)	Electrical connection
F	Thread M20, IP66/68, NEMA type 4X/6P
G	Thread G1/2, IP66/68, NEMA type 4X/6P
H	Thread NPT1/2, IP66/68, NEMA type 4X/6P
I	Thread NPT3/4, IP66/68, NEMA type 4X/6P
M	Plug M12, IP66/67, NEMA type 4X
X	Special version

(7)	Application, temperature
A	Process: max. 150 °C/302 °F, max. 64 bar
B	Process: max. 150 °C/302 °F, max. 100 bar
C	Process: max. 80 °C/176 °F, max. 25 bar
X	Special version

(8)	Surface refinement
A	Standard Ra < 3.2 µm/126 µinch
X	Special version

(9)	Electrical output
A	FEL61, 2-wire, 19 to 253 V AC with test button
B	FEL64DC, relay DPDT, 9 V DC to 20 V DC, contact 253 V/6 A with test button
E	FEL62, 3-wire PNP, 10 V DC to 55 V DC with test button
N	FEL64, relay DPDT, 19 V AC to 253 V AC/19 V DC to 55 V DC, contact 253 V/6 A with test button
M	FEL68, 2-wire NAMUR with test button
X	Special version

(10)	Display, operation
A	Without display, switch
B	LED module VU120 visible from the outside, switch
X	Special version

(11)	Approval
NA	Version for non-hazardous area
CC	CSA C/US Cl. I Div. 2 Gr.A-D
CG	CSA C/US General Purpose
CI	CSA C/US IS Cl. I, II, III Div. 1 Gr. A-G, Cl. I Zone 0, AEx/Ex ia IIC T6, (max. T4 if NAMUR with Bluetooth is used)
CD	CSA C/US XP Cl. I Div.1 Gr. A/B-D, Cl. II, III Div. 1 Gr. E-G, Cl. I Div. 2 Gr. A-D, Cl. I Zone 1, AEx/Ex d IIC T6
E2	ATEX/IEC II 1/2G, 2G Ex ia IIC T6 Ga/Gb (max. T4 if NAMUR with Bluetooth is used)
E3	ATEX/IEC II 1/2G, 2G Ex db IIC T6 Ga/Gb
E5	ATEX/IEC II 1/2G, 2G Ex ia IIC T6 Ga/Gb, II 1/2D, 2D Ex ia IIIC Da/Db (max. T4 if NAMUR with Bluetooth is used)
EA	ATEX/IEC II 1G Ex ia IIC T6 Ga (max. T4 if NAMUR with Bluetooth is used)

(11)	Approval
EC	ATEX/IEC II 1/2G, 2G Ex de IIC T6 Ga/Gb
EM	ATEX/IEC II 3G Ex ec IIC T6 Gc, II 3D Ex tc IIIC Dc
ES	ATEX/IEC II 1/2G, 2G Ex db IIC T6 Ga/Gb, II 1/2D, 2D Ex ta/tb IIIC Da/Db
UA	UK Ex ia IIC T6 Ga (max. T4 if NAMUR with Bluetooth is used)
UB	UK Ex ia IIC T6 Ga/Gb (max. T4 if NAMUR with Bluetooth is used)
UC	UK Ex db II C T6 Ga/Gb
UD	UK Ex de II C T6 Ga/Gb
UK	UK Ex ia IIC T6 Ga/Gb, UK Ex ia IIIC Da/Db (max. T4 if NAMUR with Bluetooth is used)
UL	UK Ex ec IIC T6 Gc, UK Ex tc IIIC Dc
UM	UK Ex db IIC T6 Ga/Gb, UK Ex ta/tb IIIC Da/Db
UR	Non-hazardous area and UK marking

Additional Options

(12)	Application package
HH	Verification and monitoring
LL	Prepared for verification and monitoring
XX	Special version

(12)	Service
D1	Presetting density > 0.4 g/cm ³
D2	Presetting density > 0.5 g/cm ³
P1	Product documentation on paper
S1	Cleaned from oil and grease (wetted parts)
S3	Adjustment switching delay according to specification
S7	PWIS free (paint-wetting impairment substances)
S8	Adjustment MIN safety circuit
XX	Special version

(12)	Test, certificate, declaration
DD	Pressure test, internal procedure, test report
N1	NACE MR0175/ISO 15156 (wetted parts), declaration
N2	NACE MR0103/ISO 17945 (wetted parts), declaration
N3	AD 2000 (wetted parts), declaration, excepting castings
S5	Inspection certificate 3.1, EN 10204 (material certificate wetted parts)
U1	Ambient temperature -50 °C/-58 °F
U2	Ambient temperature -60 °C/-76 °F
XX	Special version

(12)	Additional approval
SL	SIL Functional Safety
WH	WHG overfill protection, leakage
(12)	Sensor design
DF	Pressure tight feed through (second line of defense)
TD	Temperature spacer
XX	Special version
(12)	Accessory mounted
BL	Bluetooth module VU121
VB	Bluetooth module VU121 for NAMUR output
XX	Special version
(12)	Accessory enclosed
ST	Test magnet
WP	Weather protection cover, plastic
WS	Weather protection cover, 316L
XX	Special version
(12)	Marking
S9	Tagging (TAG), see additional specification
XA	Tag plate, stainless steel
XB	Adhesive label
XC	Supplied label/plate
L	Sensor length, tube extension
Length	Option E, Alloy C22, length L in mm, 148 mm to 3000 mm
Length	Option F, 316L, length L in mm, 117 mm to 6000 mm
Length	Option G, Alloy C22, length L in inch, 5.83 inch to 118.11 inch
Length	Option H, 316L, length L in inch, 4.61 inch to 236.22 inch

14.2 TAG

Measuring Point (TAG)

The device can be ordered with a tag name.

Location of the Tag Name

Select in the additional specification:

- Tag plate, stainless steel
- Plastic film
- Plate provided

Definition of the Tag Name

Specify in the additional specification:

3 lines containing up to 18 characters each

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

Presentation in the P+F Level App

The first 32 characters of the tag name

The tag name can always be changed specifically for the measuring point via *Bluetooth*[®].

15 Application Packages

15.1 Verification and Monitoring

Type code, additional options, feature **Application package**, option **HH** (Verification and monitoring) can only be selected in conjunction with optional *Bluetooth*[®] module: Type code, additional options, feature **Accessory mounted**, option **BL**

15.2 Prepared for Verification and Monitoring

In conjunction with electronic insert FEL68 (2-wire NAMUR): Type code, additional options, feature **Application package**, option **LL** (Prepared for verification and monitoring)

The *Bluetooth*[®] module, including the required battery, must be ordered separately in this case: Type code, additional options, feature **Accessory mounted**, option **VB** (Bluetooth module VU121 for NAMUR output).

15.3 Proof Testing for SIL/WHG Devices



Note

Only available for devices with SIL or WHG approval.

The **SIL Proof Test**, **WHG Proof Test** or **SIL/WHG Proof Test** module includes a wizard for the proof testing that is required at appropriate intervals for the following applications: SIL (IEC 61508/IEC 61511), WHG (German Federal Water Act):

- The wizard can be used via the P+F Level app.
- The wizard guides the user through the entire process of generating the verification report.
- The verification report can be saved as a PDF file.

16 Accessories

16.1 Enclosed Accessories

These accessories can be ordered together with the device via the type code, additional options, feature **Accessory enclosed** or can be ordered separately.

16.1.1 Test Magnet

Type code, additional options, feature **Accessory enclosed**, Option **ST**

Order number: 71580748

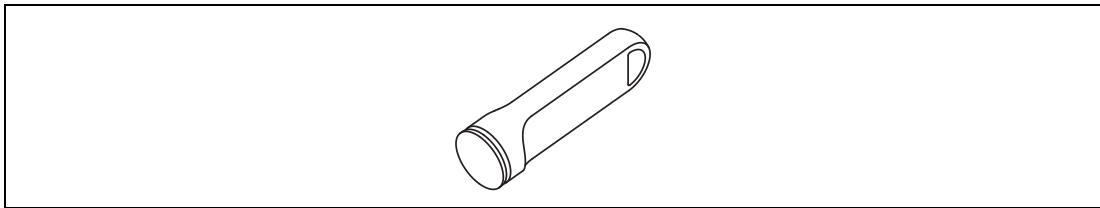


Figure 16.1 Test magnet

16.1.2 Weather Protection Cover for Dual-Compartment Housing, Aluminum

Type code, additional options, feature **Accessory enclosed**, Option **WS**

Material: stainless steel 316L

Order number: 71580795

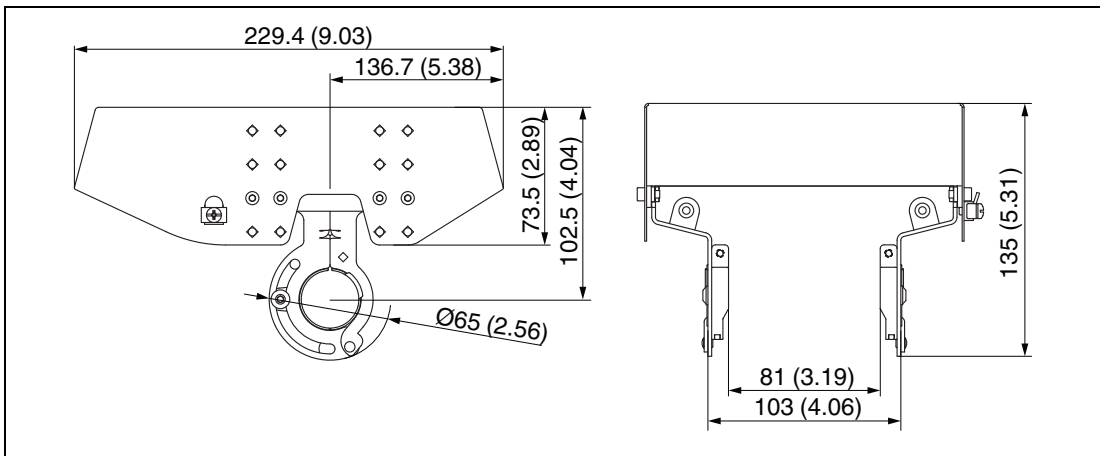


Figure 16.2 Weather protection cover for dual-compartment housing, aluminum, unit of measurement mm (inch)

16.1.3 Protective Cover for Single Compartment Housing, Aluminum or 316L

Type code, additional options, feature **Accessory enclosed**, Option **WP**

Material: plastic

Order number: 71580796

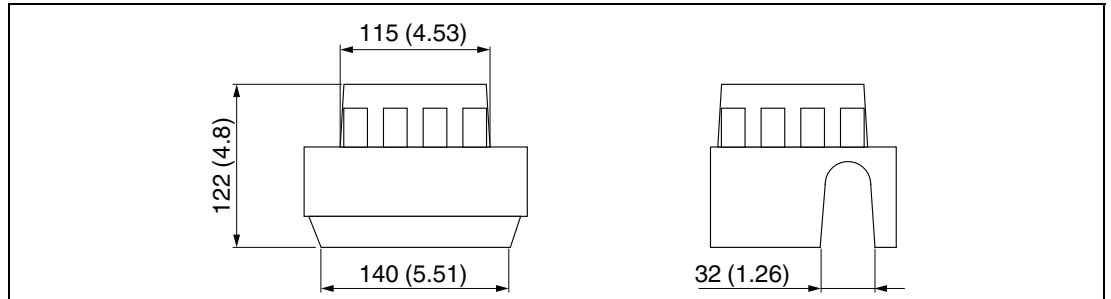


Figure 16.3 Protective cover for single compartment housing, aluminum or 316L, unit of measurement mm (inch)

16.2 Additional Accessories

These accessories can be ordered separately.

16.2.1 LED Module VU120 (optional)

A brightly lit LED indicates the operational status (switch status or alarm status). The LED module can be connected to the following electronic inserts: FEL62, FEL64, FEL64DC.

Type code, feature **Display, operation**, option **B**

Order number:71580806

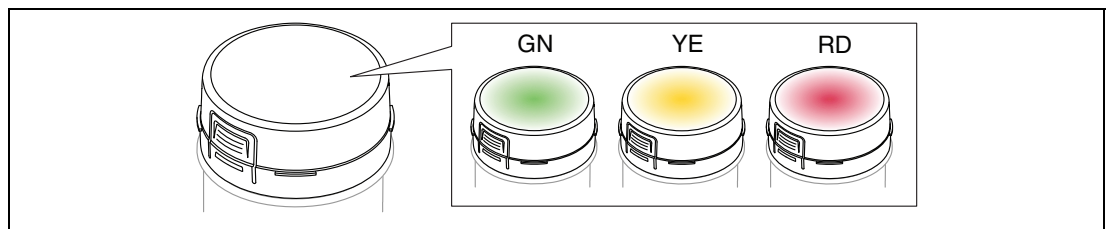


Figure 16.4 LED module VU120, the LED lights up in green (GN), yellow (YE) or red (RD)



Note

A tall cover is required (transparent plastic cover or aluminum cover with sight glass) when using or retrofitting the LED module. Use with the LED module is not possible for the single compartment housing, 316L cast. The cover depends on the housing and approval of the device.



Note

For further information is available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

Enter the order designation in the search field → Select the appropriate product → Open the product detail page → Open the **Documents** tab.

16.2.2 **Bluetooth® Module VU121 (optional)**

The *Bluetooth*® module can be connected to the following electronic inserts via the COM interface: FEL61, FEL62, FEL64, FEL64DC, FEL68 (2-wire NAMUR).

Type code, additional options, feature **Accessory mounted**

- *Bluetooth*® module without battery for use in conjunction with electronic inserts FEL61, FEL62, FEL64 and FEL64DC
Order number: 71580803
- *Bluetooth*® module with battery for use in conjunction with electronic insert FEL68 (2-wire NAMUR)
Order number: 71580800

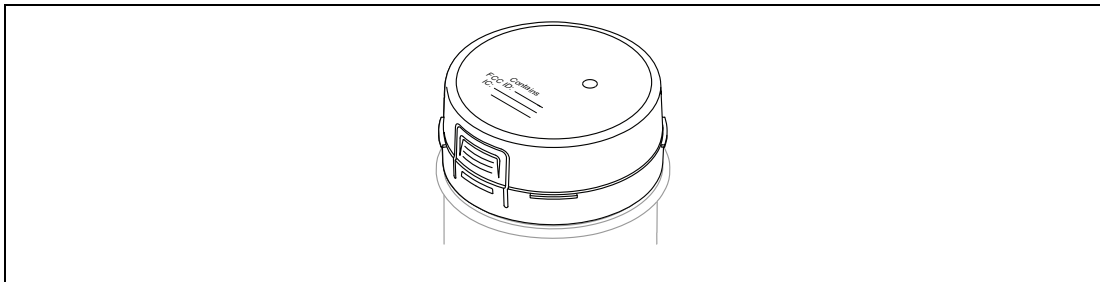


Figure 16.5 *Bluetooth*® module VU121

Note

A tall cover is required (transparent plastic cover or aluminum cover with sight glass) when using or retrofitting the *Bluetooth*® module. Use with the *Bluetooth*® module is not possible for the single compartment housing, 316L cast. The cover depends on the housing and approval of the device.

Note

For further information is available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

Enter the order designation in the search field → Select the appropriate product → Open the product detail page → Open the **Documents** tab.

16.2.3 Female Cordset V1-W-5M-PVC

- Interfaces
 - Connector, socket, M12, angled, A-coded
 - Cable 5 m (16 foot)
- Ambient temperature
 - Connector: -40 to 90 °C (-40 to 194 °F)
 - Cable, fixed: -25 to 70 °C (-13 to 158 °F)
 - Cable, flexing: -5 to 70 °C (23 to 158 °F)
- Material
 - Connector
 - Screw connection: zinc diecast, nickel-plated
 - Body: TPU, black
 - Seal: FKM
 - Cable: PVC
- Degree of protection: IP68/IP69
- Border number: 032798

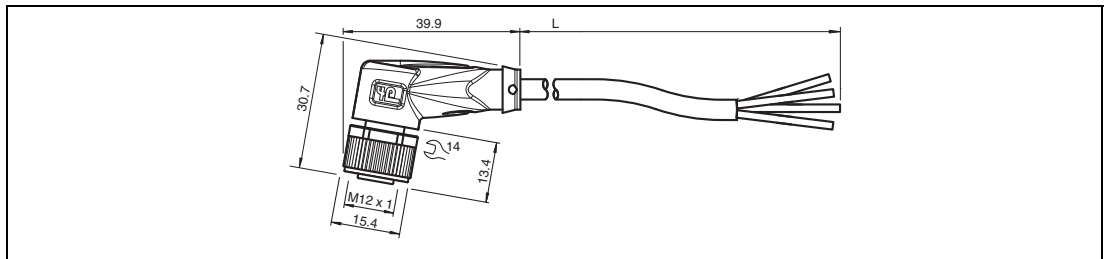


Figure 16.6 Female cordset V1-W-5M-PVC, unit of measurement mm

16.2.4 Sliding Sleeves for Unpressurized Operation

Switch point, infinitely adjustable.

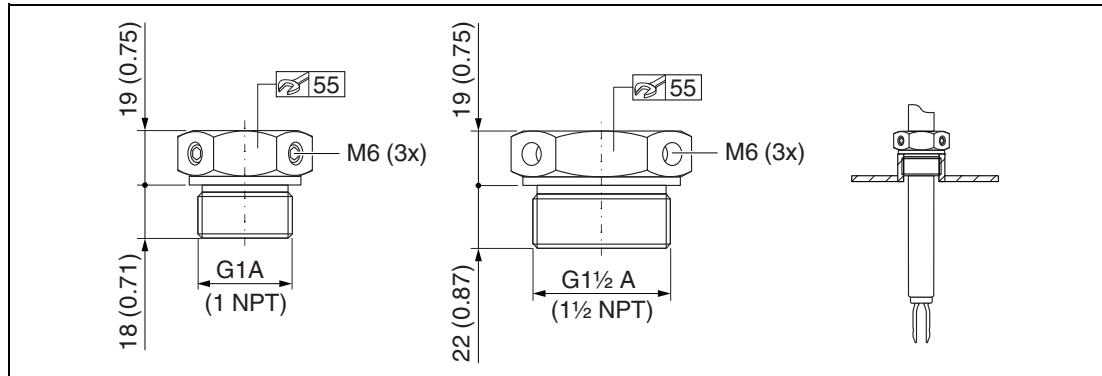


Figure 16.7 Sliding sleeves for unpressurized operation $p_e = 0$ bar (0 psi), unit of measurement mm (inch)

G1, 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

NPT1, 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

G1-1/2, 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

NPT1-1/2, 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

Note

For further information is available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

Enter the order designation in the search field → Select the appropriate product → Open the product detail page → Open the **Documents** tab.



16.2.5 High Pressure Sliding Sleeves

- Switch point, infinitely adjustable
- Use in hazardous areas
- Seal package made of graphite
- Graphite seal available as spare part 71078875
- In the case of G1, G1-1/2: seal is included in the delivery

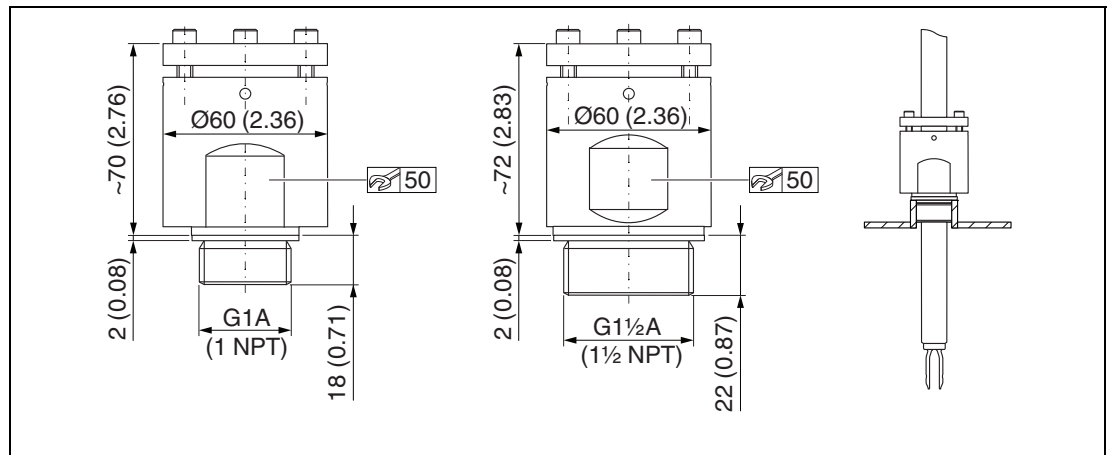


Figure 16.8 High pressure sliding sleeves, unit of measurement mm (inch)

G1, 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

G1, DIN ISO 228/1

- Material: Alloy C22
- Weight: 1.13 kg (2.49 lb)
- Approval: with inspection certificate EN 10204 - 3.1 material
- Order number: 71118691

NPT1, 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

NPT1, ASME B 1.20.1

- Material: Alloy C22
- Weight: 1.13 kg (2.49 lb)
- Approval: with inspection certificate EN 10204 - 3.1 material
- Order number: 71118694

G1-1/2, 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

G1-1/2, DIN ISO 228/1

- Material: Alloy C22
- Weight: 1.32 kg (2.91 lb)
- Approval: with inspection certificate EN 10204 - 3.1 material
- Order number: 71118693

NPT1-1/2, 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

NPT1-1/2, ASME B 1.20.1

- Material: Alloy C22
- Weight: 1.32 kg (2.91 lb)
- Approval: with inspection certificate EN 10204 - 3.1 material
- Order number: 71118695



Note

For further information is available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

Enter the order designation in the search field → Select the appropriate product → Open the product detail page → Open the **Documents** tab.

17 Supplementary Documentation



Note

For further information is available on the product detail page of the devices on the Internet at www.pepperl-fuchs.com.

Enter the order designation in the search field → Select the appropriate product → Open the product detail page → Open the **Documents** tab.

17.1 Technical Information (TI)

Planning aid

The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

17.2 Manual (BA)

Your reference guide

This document contains all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

17.3 Brief Instructions (KA)

Guide that takes you quickly to the 1st measured value

This document contains all the essential information from incoming acceptance to initial commissioning.

17.4 Instruction Manual (SI)

Depending on the approval, the following instruction manuals (SI) are supplied with the device. These documents are an integral part of the manual.



Note

The nameplate indicates the instruction manual (SI) that are relevant to the device.

Your automation, our passion.

Explosion Protection

- Intrinsic Safety Barriers
- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity

Pepperl+Fuchs Quality

Download our latest policy here:

www.pepperl-fuchs.com/quality

