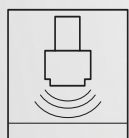
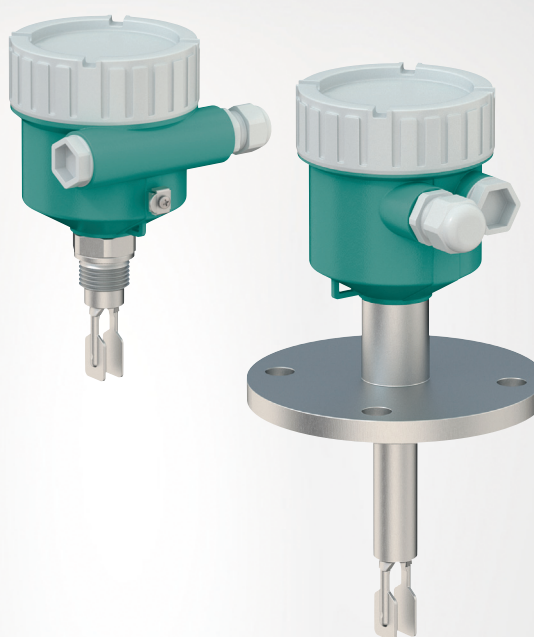


LVL-M4

Vibration Limit Switch

Manual



Your automation, our passion.

 **PEPPERL+FUCHS**

With regard to the supply of products, the current issue of the following document is applicable:
The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

Worldwide

Pepperl+Fuchs Group

Lilienthalstr. 200

68307 Mannheim

Germany

Phone: +49 621 776 - 0

E-mail: info@de.pepperl-fuchs.com

North American Headquarters

Pepperl+Fuchs Inc.

1600 Enterprise Parkway

Twinsburg, Ohio 44087

USA

Phone: +1 330 425-3555

E-mail: sales@us.pepperl-fuchs.com

Asia Headquarters

Pepperl+Fuchs Pte. Ltd.

P+F Building

18 Ayer Rajah Crescent

Singapore 139942

Phone: +65 6779-9091

E-mail: sales@sg.pepperl-fuchs.com

<https://www.pepperl-fuchs.com>

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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) – 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), present document – 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.

Tool Symbols



Flat-blade screwdriver



Allen key



Open-ended wrench

Symbols in Graphics

1, 2, 3 ... Item numbers

A, B, C, ... Views



Explosion-hazardous area



Non-explosion-hazardous area

1.4 Registered Trademarks

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2 Basic Safety Instructions

2.1 Requirements for Personnel

The personnel must fulfill the following requirements to carry out the necessary tasks, e. g. commissioning and maintenance:

- Trained, qualified specialists must have a relevant qualification for the specific function and task
- Are authorized by the plant owner/operator
- Are familiar with federal/national regulations
- Must have read and understood the instructions in the manual and supplementary documentation
- Follow instructions and comply with conditions

2.2 Intended Use

- Only use the device for liquids.
- Improper use can pose hazards.
- Ensure that the device is free of defects while it is in operation.
- Use the device only for media to which the process-wetted materials have an adequate level of resistance.
- Do not exceed or drop below the limit values for the device, see chapter 14 and technical information TI01403O/98/EN.

2.2.1 Incorrect Use

The manufacturer is not liable for damage caused by improper or non-intended use.

Residual Risks

Due to heat transfer from the process, the temperature of the electronics housing and the assemblies contained therein may rise to 80 °C (176 °F) during operation.

Danger of burns from contact with surfaces!

- If necessary, ensure protection against contact to prevent burns.

For requirements concerning functional safety in accordance with IEC 61508, the associated SIL documentation must be observed.

2.3 Workplace Safety

For work on and with the device:

- Wear the required personal protective equipment according to federal/national regulations.

2.4 Operational Safety

Risk of injury!

- Operate the device only if it is in proper technical condition, free from errors and faults.
- The operator is responsible for ensuring failure-free operation of the device.

Modifications to the Device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers.

- If, despite this, modifications are required, consult with Pepperl+Fuchs.

Repair

To ensure continued operational safety and reliability:

- Only perform repair work on the device if this is expressly permitted.
- Observe federal/national regulations pertaining to the repair of an electrical device.
- Use original spare parts and accessories from Pepperl+Fuchs only.

Hazardous Area

To eliminate danger to persons or the facility when the device is used in the hazardous area (e. g. explosion protection):

- Check the nameplate to verify whether the ordered device can be used for the intended purpose in the hazardous area.
- Observe the specifications in the separate supplementary documentation that is an integral part of this manual.

2.5 Product Safety

This device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

The device meets general safety standards and legal requirements. It also complies with the EU directives listed in the device-specific EU Declaration of Conformity. Pepperl+Fuchs confirms this by affixing the CE mark to the device.

2.6 Functional Safety SIL (Optional)

The functional safety manual must be strictly observed for devices that are used in functional safety applications.

2.7 IT Security

We only provide a warranty if the device is installed and used as described in the instruction manuals. The device has safety mechanisms integrated to prevent users from inadvertently changing settings.

Provide additional protection for the device and data transfer to/from the device

- IT security measures defined in the plant owner/operator's own security policy must be implemented by plant owners/operators themselves.

3 Product Description

Vibration limit switch for all liquids, for minimum or maximum detection in tanks, vessels and pipes.

3.1 Product Design

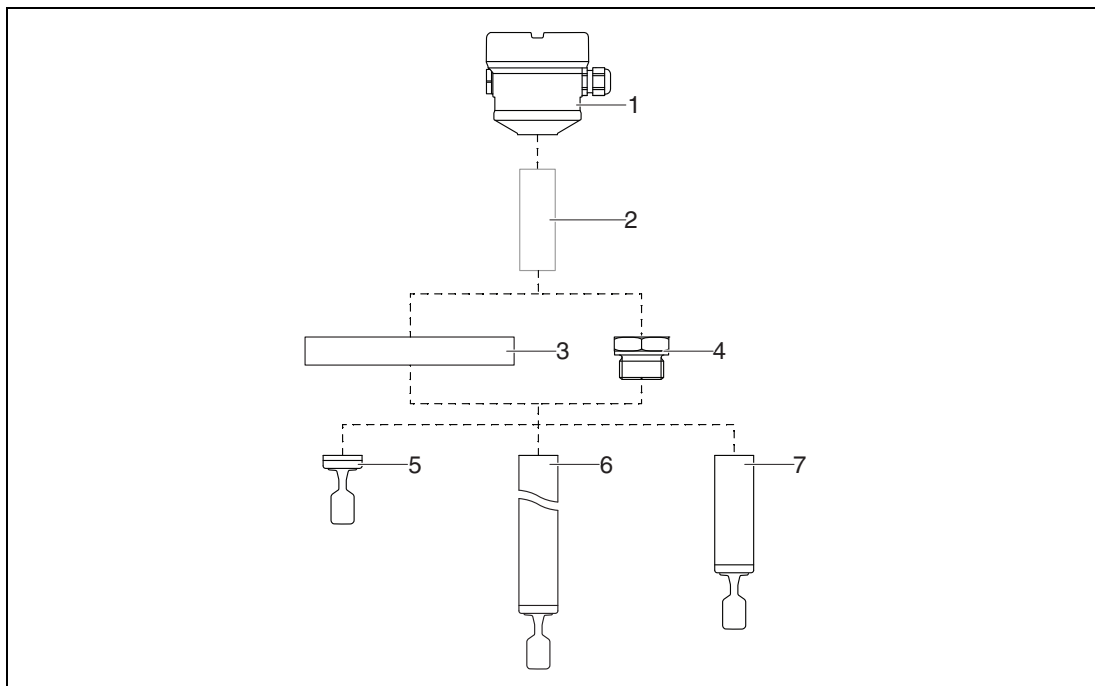


Figure 3.1 Product design

- 1 Housing with electronic insert and cover, optional *Bluetooth*[®] module or LED module
- 2 Temperature spacer, pressure tight feed through (second line of defense), optional
- 3 Process connection with flange (optional)
- 4 Process connection with thread (optional)
- 5 Compact probe version with tuning fork
- 6 Pipe extension probe with tuning fork
- 7 Short tube version of probe with tuning fork

4 Incoming Acceptance and Product Identification

4.1 Incoming Acceptance

Check the following during goods acceptance:

- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If required (see nameplate): Are the Safety Instructions, e. g. SI, provided?



Note

If one of these conditions is not met, please contact the manufacturer's sales office.

4.2 Product Identification

The device can be identified in the following ways:

- Nameplate data
- Extended order code with breakdown of the device features on the delivery note

4.2.1 Nameplate

The information that is required by law and is relevant to the device is shown on the nameplate, e. g.:

- Manufacturer identification
- Order number, extended order code, serial number
- Technical data, degree of protection
- Firmware version, hardware version
- Approval-related information, reference to instruction manuals (SI)
- DataMatrix code (information about the device)

4.2.2 Electronic Insert



Note

Identify the electronic insert via the order code on the nameplate.

4.2.3 Manufacturer Address

Pepperl+Fuchs Group Lilienthalstraße 200, 68307 Mannheim, Germany
--

Internet: www.pepperl-fuchs.com
--

Place of manufacture: See nameplate.

4.3 Storage and Transport

4.3.1 Storage Conditions

Use original packaging.

4.3.2 Storage Temperature

- -40 to +80 °C (-40 to +176 °F)
- optional: -50 °C (-58 °F), -60 °C (-76 °F)

4.3.3 Device Transport



Transporting the Device

1. Transport the device to the measuring point in the original packaging.
2. Hold the device by the housing, temperature spacer, flange or extension pipe.
3. Do not bend, shorten or extend the tuning fork.

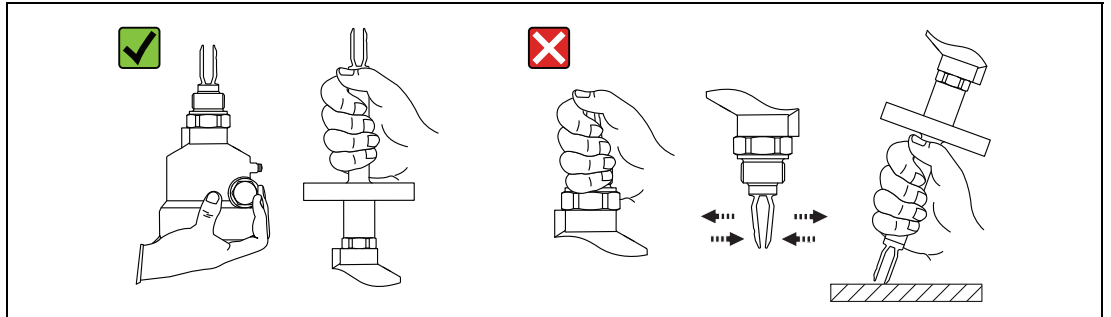


Figure 4.1 Handling the device during transportation

5 Mounting



Warning!

Loss of protection rating if the device is opened in a wet environment.

Only open the device in a dry environment!

Mounting Instructions

- 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)

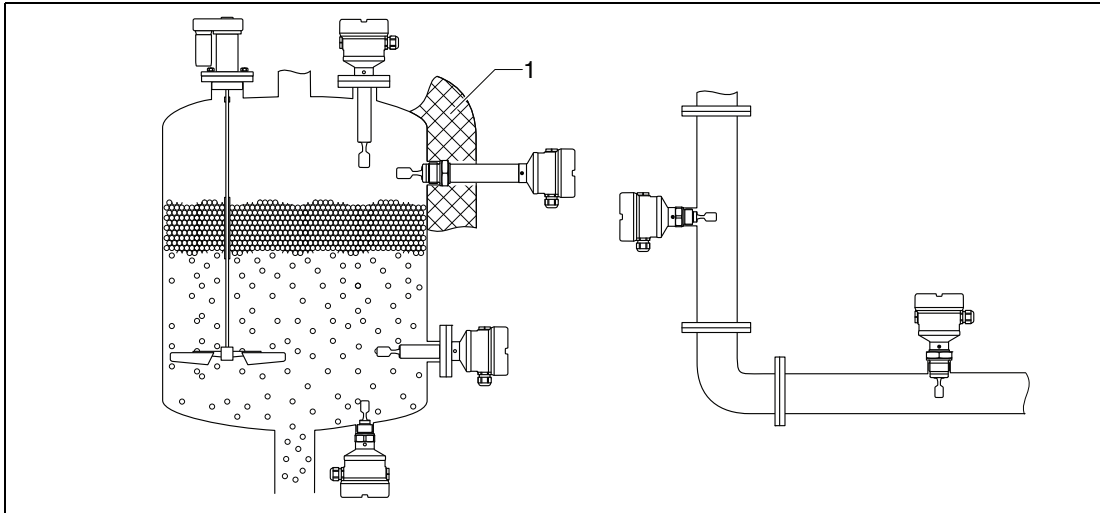


Figure 5.1 Installation examples for a vessel, tank or pipe

- 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.

5.1 Mounting Requirements

5.1.1 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)

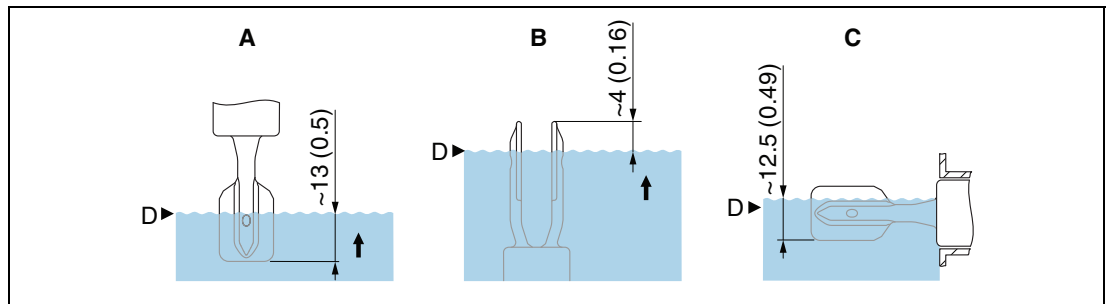


Figure 5.2 Typical switch points, unit of measurement mm (inch)

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

5.1.2 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.

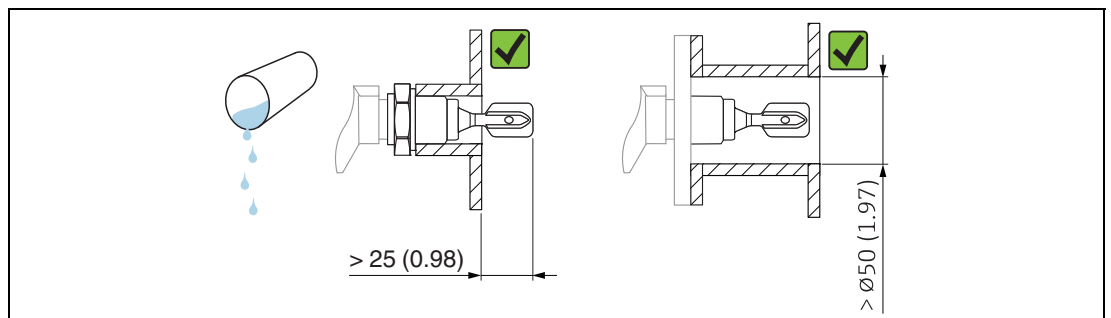


Figure 5.3 Installation example for low-viscosity liquids, unit of measurement mm (inch)

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!

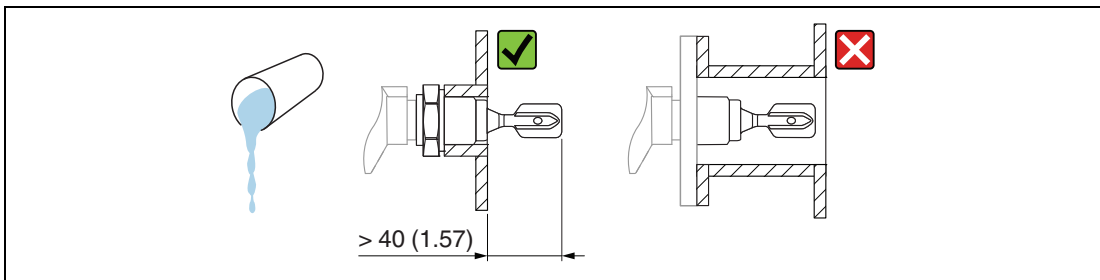


Figure 5.4 Installation example for a highly viscous liquid, unit of measurement mm (inch)

5.1.3

Avoid Buildup

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

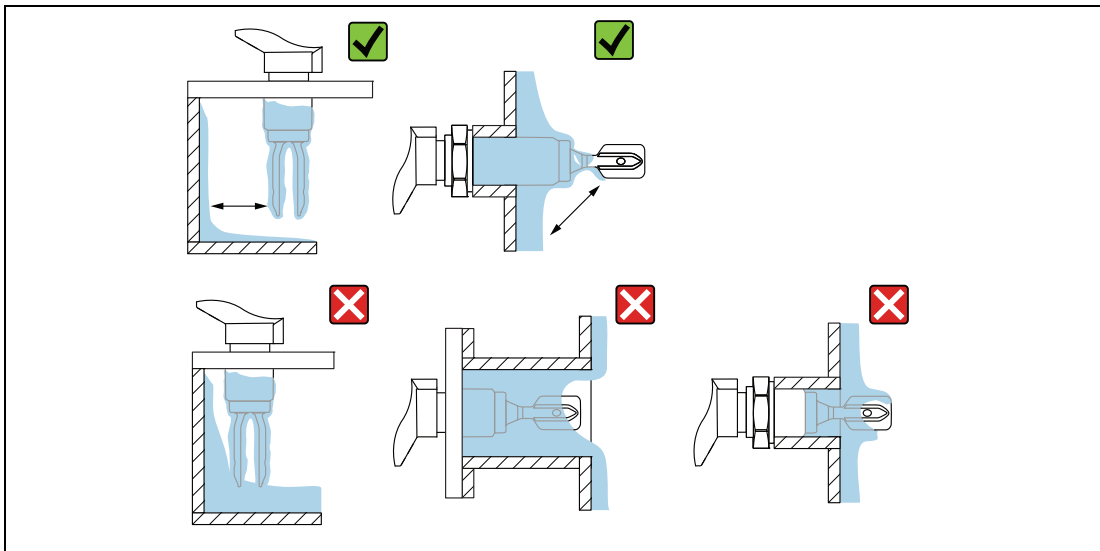


Figure 5.5 Installation examples for a highly viscous process medium

5.1.4 Take Clearance into Consideration

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

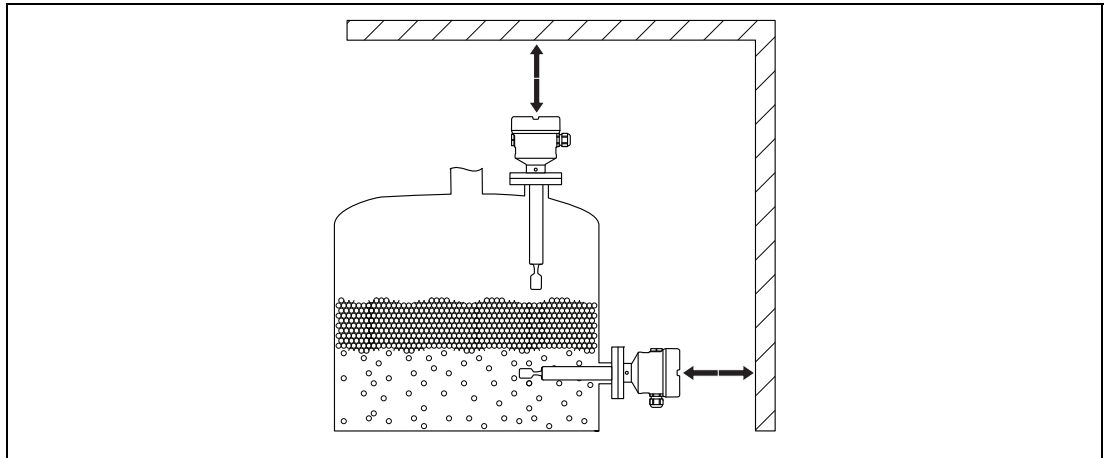


Figure 5.6 Take clearance into consideration

5.1.5 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).

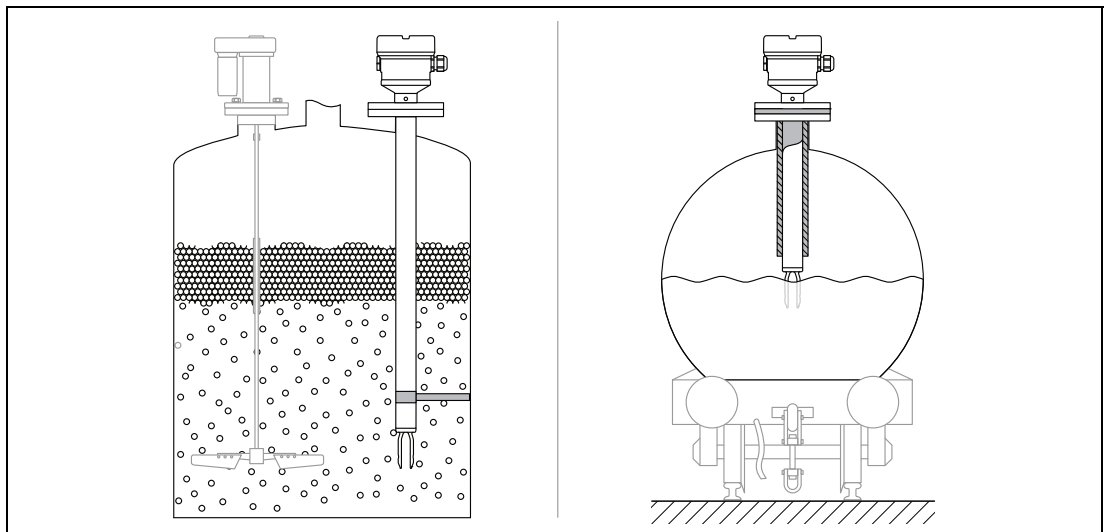


Figure 5.7 Examples of support in the event of dynamic load

5.1.6 Weld-in Adapter with Leakage Hole

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

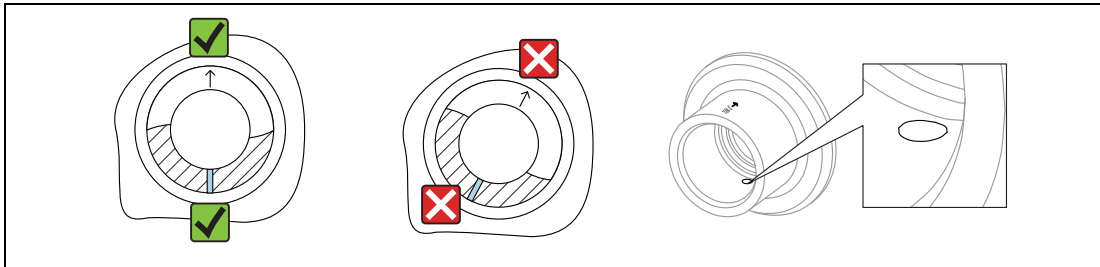


Figure 5.8 Weld-in adapter with leakage hole

5.2 Mounting the Device

Required Tools

- Open-ended wrench for sensor installation
- Allen key for housing locking screw

5.2.1 Installation

Align the Tuning Fork using the Marking

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

Markings may include the following:

- Material specification, thread description or circle on the hexagonal nut or on the weld-in adapter
- The II symbol on the back of the flange or Tri-Clamp

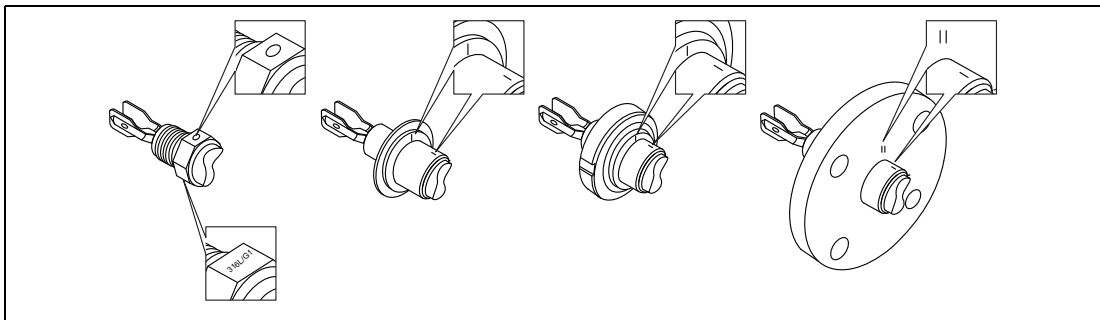


Figure 5.9 Markings to align the tuning fork

Installing in pipes

- Flow velocities up to 5 m/s at a viscosity of 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 is pointing in the direction of flow.
- The marking is visible when installed.

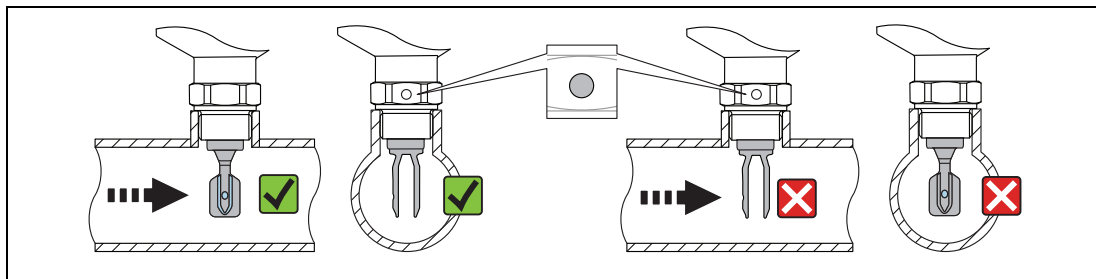


Figure 5.10 Installation in pipes (take fork position and marking into consideration)

Screwing in the Device

- Turn by the hex bolt only, 15 to 30 Nm (11 to 22 lbf foot)
- Do not turn at the housing!

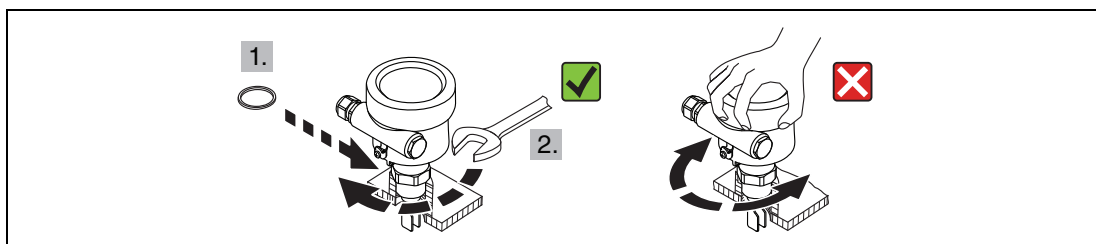


Figure 5.11 Screwing in the device

Aligning the Cable Entry



Note

The locking screw is not tightened when the device is delivered.



Aligning the Cable Entry

1. Loosen the external locking screw (maximum 1.5 turns).
2. Turn the housing, align the cable entry.
Avoid moisture in the housing, provide a loop to allow moisture to drain off.
3. Tighten the external locking screw.

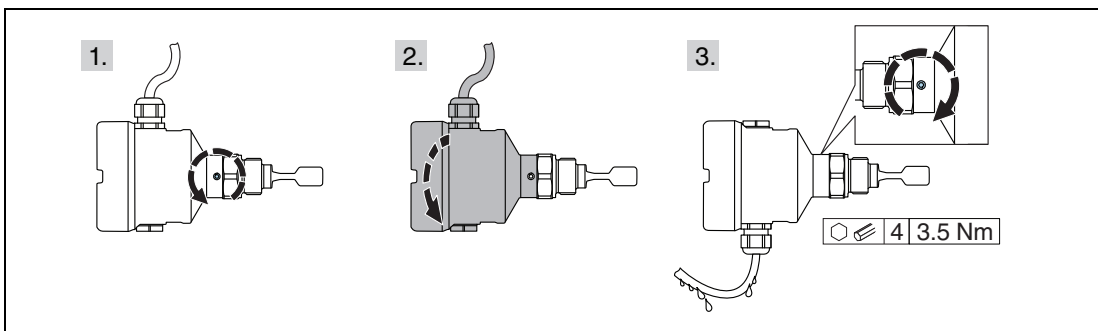


Figure 5.12 Housing with external locking screw

5.3 Sliding Sleeves

- ▶ For more information see chapter 13.

5.4 Post-Mounting Check

- Is the device undamaged (visual inspection)?
- Does the device conform to the measuring point specifications?
For example:
 - Process temperature
 - Process pressure
 - Ambient temperature
 - Measuring range
- Are the measuring point number and labeling correct (visual inspection)?
- Is the device adequately protected against precipitation and direct sunlight?
- Is the device properly secured?

6 Electrical Connection

Required Tools

- Screwdriver for electrical connection
- Allen key for screw of cover lock

6.1 Connection Requirements

6.1.1 Cover with Securing Screw

In the case of devices for use in the hazardous area with a certain type of protection, the cover is sealed by a securing screw.



Note

If the securing screw is not positioned correctly, the cover cannot provide secure sealing.

- Open the cover: Slacken the screw of the cover lock with a maximum of 2 turns so that the screw does not fall out. Fit the cover and check the cover seal.
- Close the cover: Screw the cover securely onto the housing, making sure that the securing screw is positioned correctly. There should not be any gap between the cover and housing.

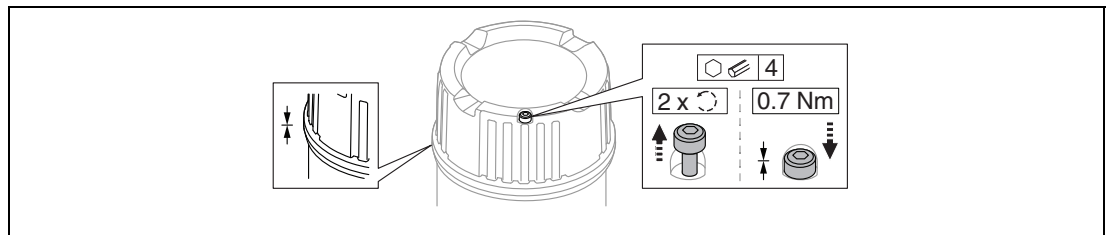


Figure 6.1 Cover with securing screw

6.1.2 Connecting Protective Earth (PE)

The protective earth conductor at the device must only be connected if the device's operating voltage is $\geq 35 \text{ V DC}$ or $\geq 16 \text{ V AC}_{\text{eff}}$.

When the device is used in hazardous areas, it must always be included in the potential equalization of the system, irrespective of the operating voltage.



Note

The plastic housing is available with or without an external protective earth connection (PE). If the operating voltage of the electronic insert is $< 35 \text{ V}$, the plastic housing has no external protective earth connection.

6.2 Connecting the Device



Caution!

Housing thread

The thread of the electronics and connection compartment is coated with lubricant varnish. Avoid additional lubrication.

6.2.1 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 key 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/EN61010-1: 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

$S \leq 2$ VA

Current Consumption

Residual current when blocked: $I \leq 3,8$ 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 mm^2 (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.

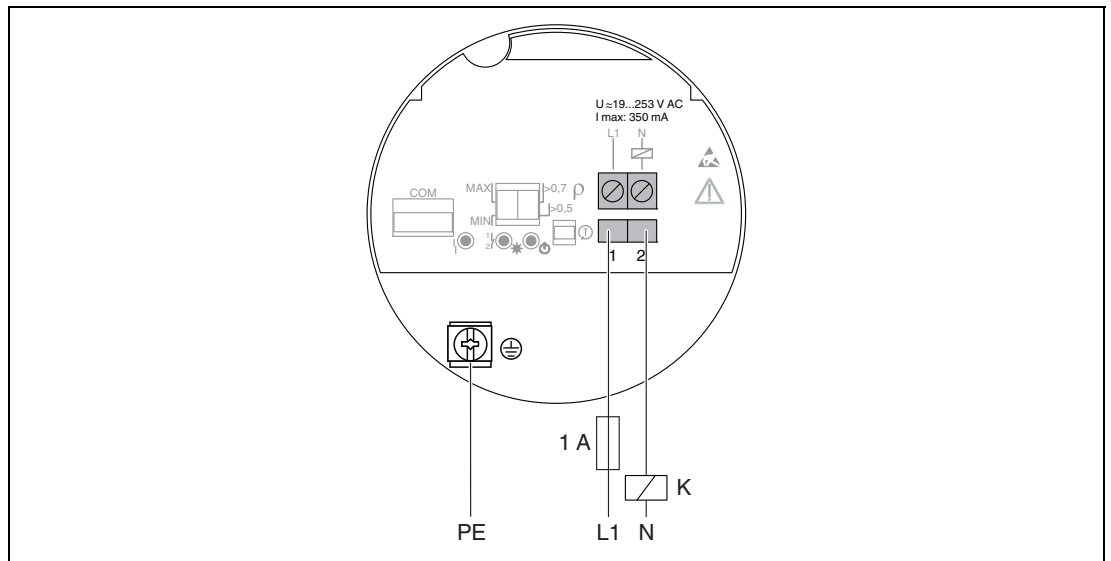


Figure 6.2 2-wire AC, electronic insert FEL61

Behavior of Switch Output and Signaling

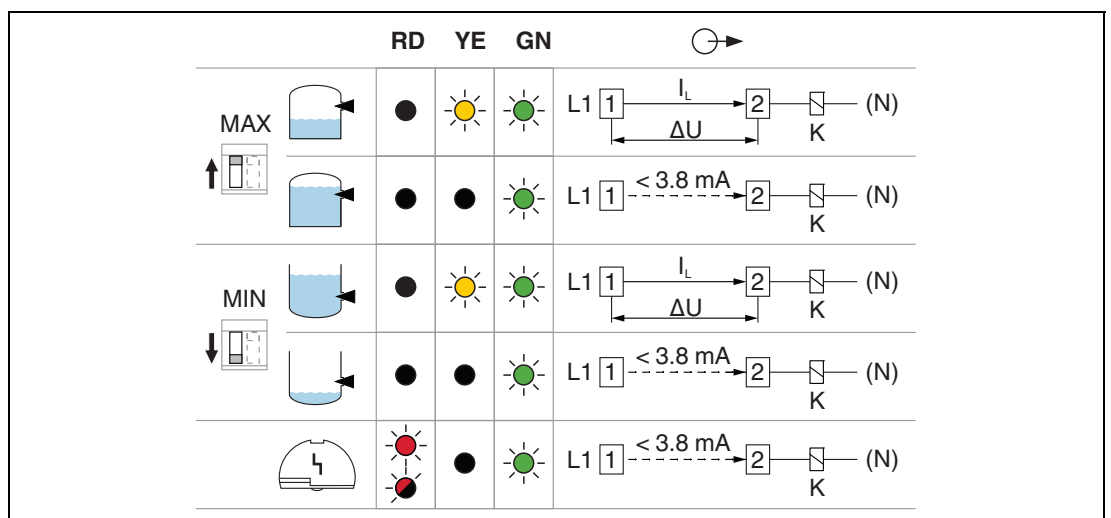


Figure 6.3 Behavior of switch output and signaling, electronic insert FEL61

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

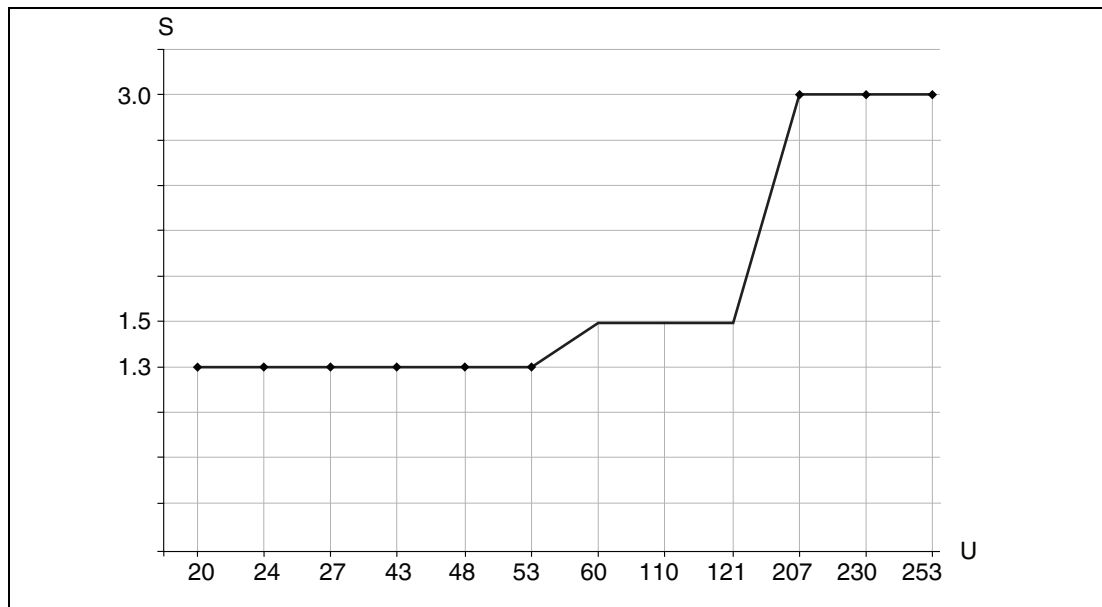


Figure 6.4 Recommended minimum holding power/rated power for load

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

6.2.2 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 key 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 II

Terminal Assignment

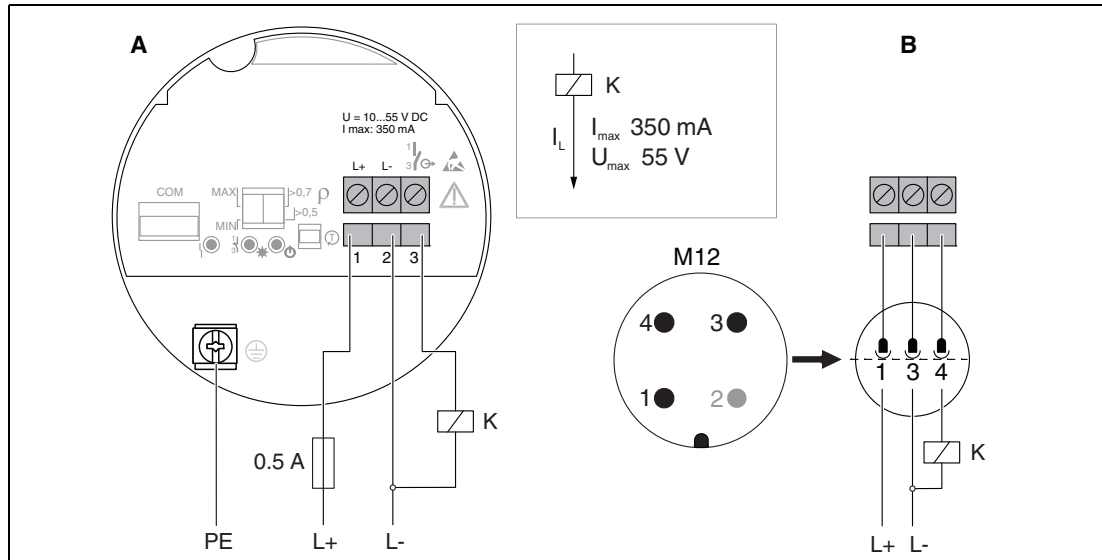


Figure 6.5 3-wire DC-PNP, electronic insert FEL62

- A Connection wiring with terminals
- B Connection wiring with M12 plug in housing according to EN 61131-2 standard

Behavior of Switch Output and Signaling

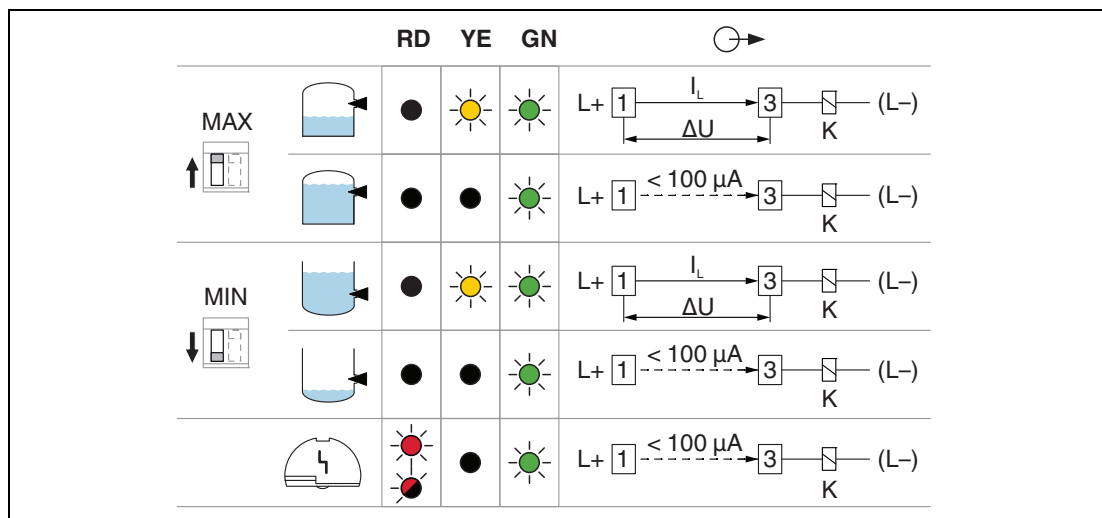


Figure 6.6 Behavior of switch output and signaling, electronic insert FEL62

- 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

6.2.3 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 key 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

Comply with the following according to 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

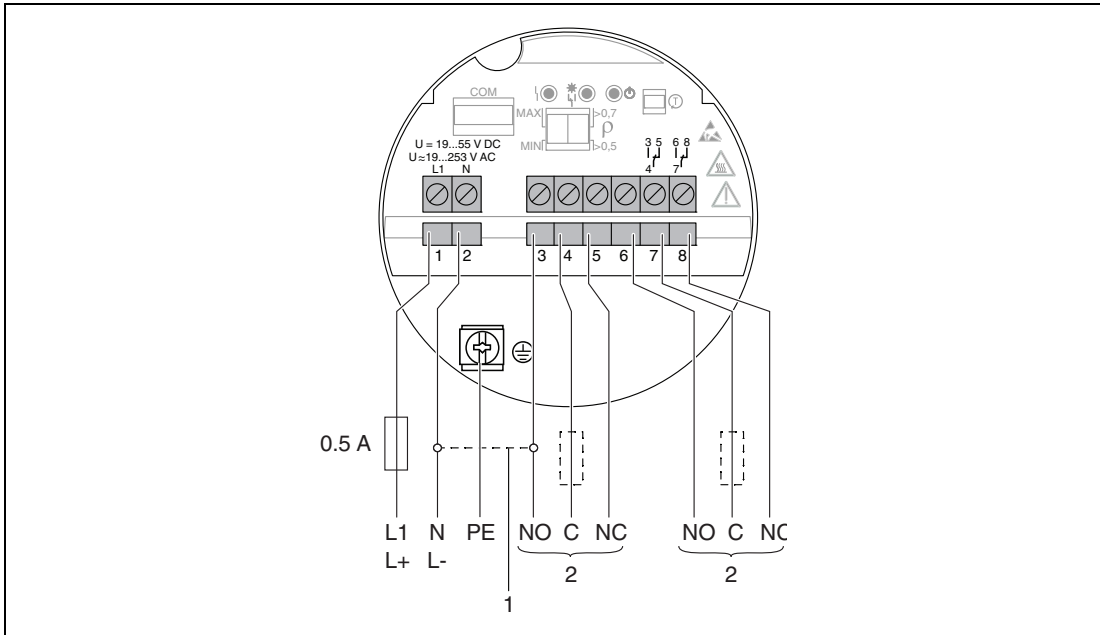


Figure 6.7 Universal current connection with relay output, electronic insert FEL64

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

Behavior of Switch Output and Signaling

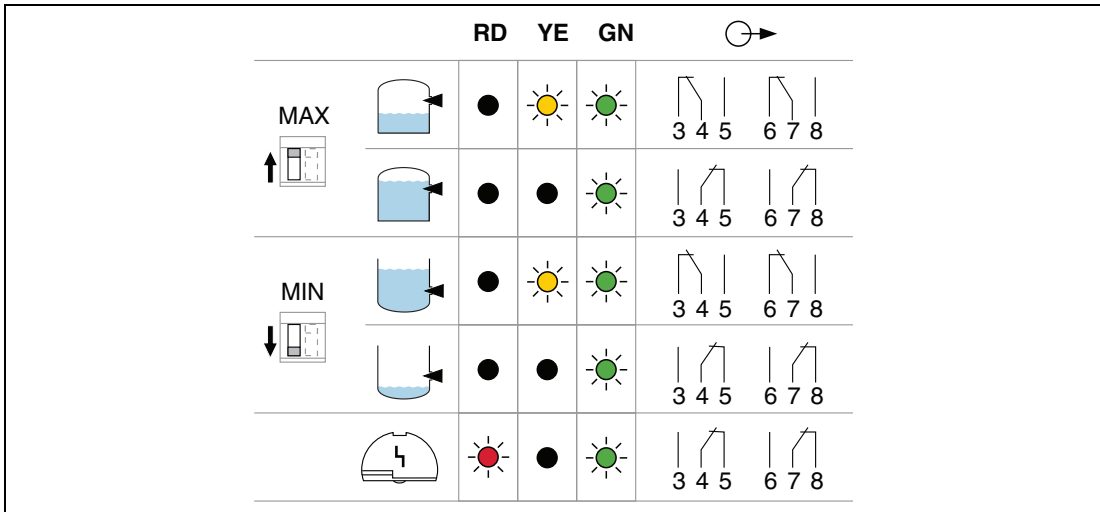


Figure 6.8 Behavior of switch output and signaling, electronic insert FEL64

- 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

6.2.4 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 key 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 power 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 II

Terminal Assignment

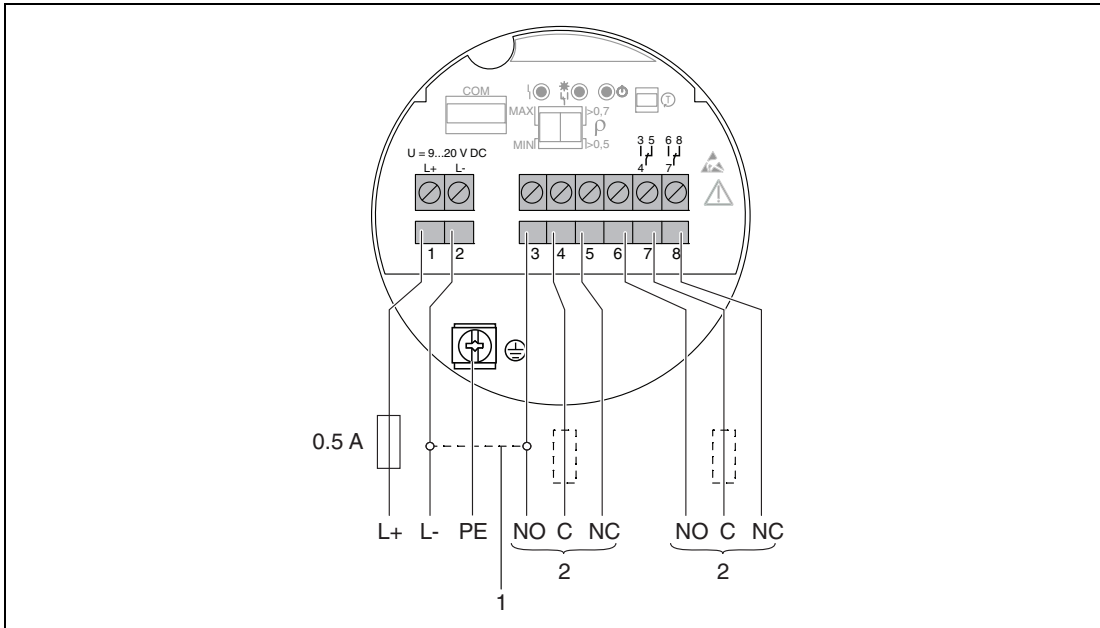


Figure 6.9 DC connection with relay output, electronic insert FEL64DC

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

Behavior of Switch Output and Signaling

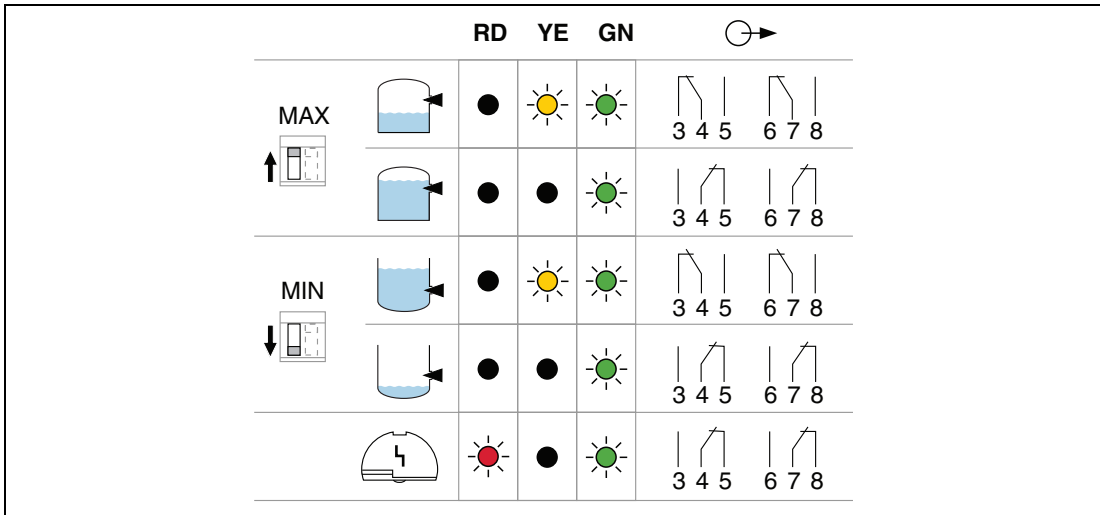


Figure 6.10 Behavior of switch output and signaling, electronic insert FEL64DC

- 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

6.2.5 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

$U = 8.2 \text{ V DC} \pm 20 \%$



Note

Comply with the following according to IEC/EN61010-1: provide a suitable circuit breaker for the device.

Power Consumption

NAMUR IEC 60947-5-6

< 6 mW with $I < 1 \text{ mA}$; < 38 mW with $I = 3.5 \text{ mA}$

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 mm^2 (14 AWG). Use ferrules for the wires.

Overvoltage protection

Overvoltage category II

Terminal Assignment

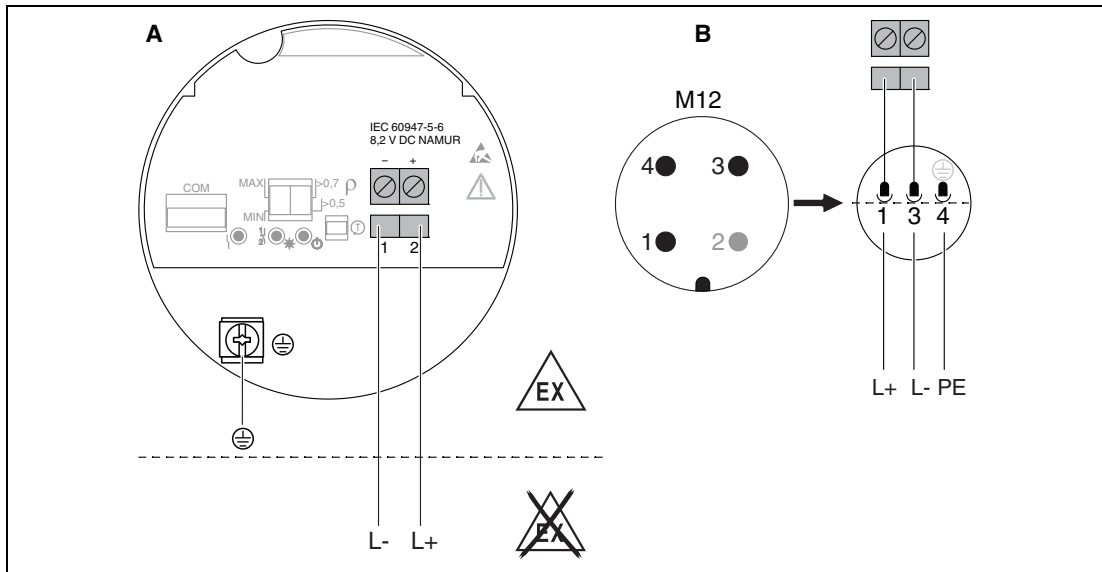


Figure 6.11 2-wire NAMUR > 2.2 mA/< 1.0 mA, electronic insert FEL68

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

Behavior of Switch Output and Signaling

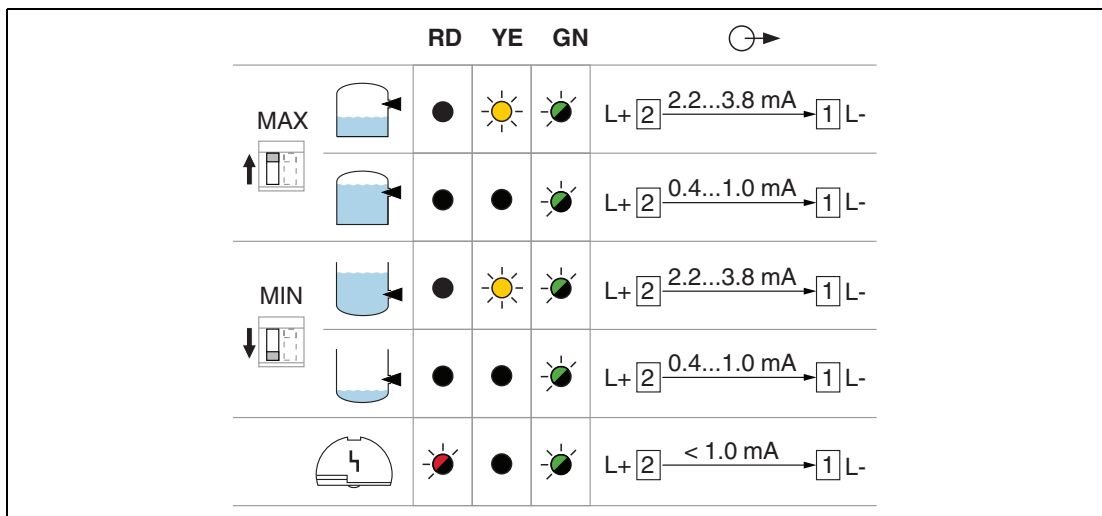


Figure 6.12 Behavior of switch output and signaling, electronic insert FEL68

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 for use in conjunction with the electronic insert FEL68 (2-wire NAMUR) must be ordered separately with the necessary battery.



6.2.6 LED Module VU120 (optional)

Supply Voltage

$U = 12 \text{ to } 55 \text{ V DC}$

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

Power Consumption

$S < 6 \text{ VA, } P \leq 0.7 \text{ W}$

Current Consumption

$I_{\text{max}} = 0.4 \text{ A}$

Connecting the LED Module



Note

In the case of devices for use in the hazardous area with a certain type of protection, the cover is sealed by a securing screw.

► For more information see chapter 6.1.1.

- Required tools: crimper, flat-blade screwdriver
- Use the wire end ferrules supplied.

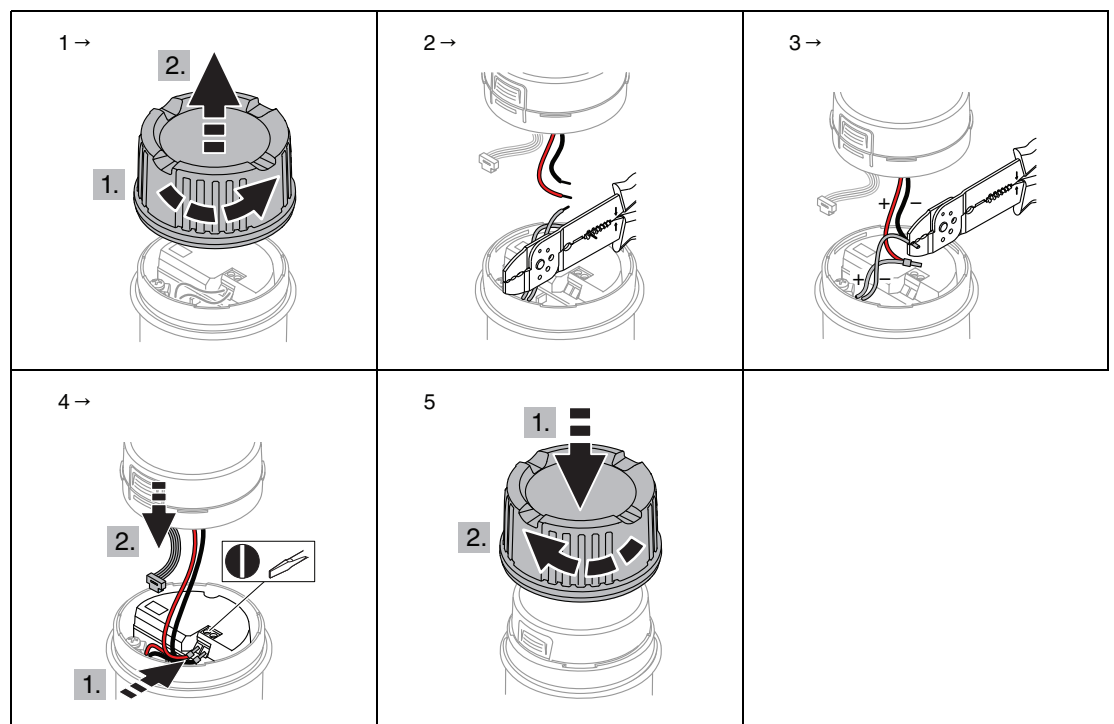


Figure 6.13 Connecting the LED module

Operational Status Signaling

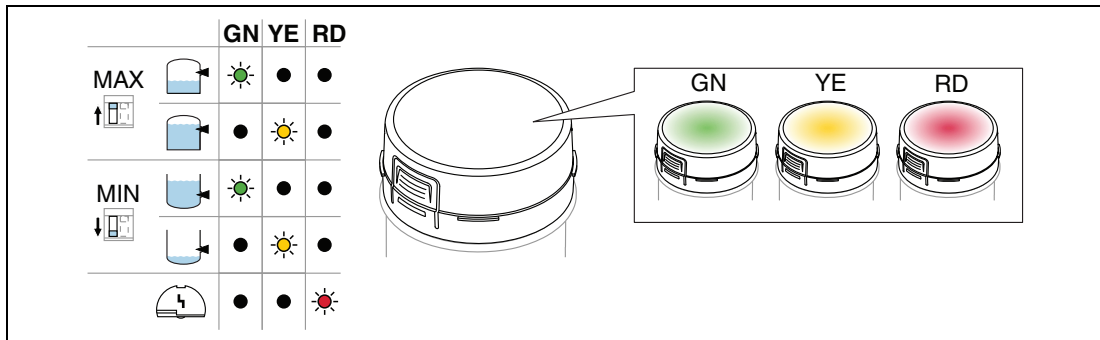


Figure 6.14 LED module VU120, the LED lights up in green (GN), yellow (YE) or red (RD)

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.

The three colors of the LED flash one after another as a chaser light during the functional test.

6.2.7 Bluetooth® Module VU121 (optional)

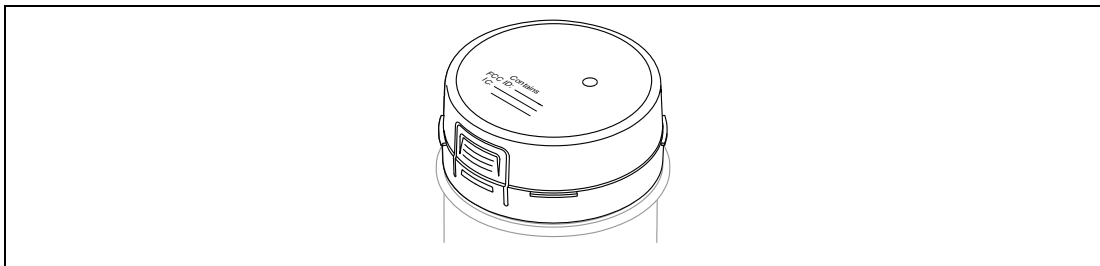


Figure 6.15 Bluetooth® module VU121

- The Bluetooth® module can be connected via the COM interface to the following electronic inserts: FEL61, FEL62, FEL64, FEL64 DC und FEL68 (2-wire NAMUR).
- The Bluetooth® module is only available in conjunction with the option **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).

Batteries – Use and Handling

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

- For energy reasons, the *Bluetooth*[®] module VU121 requires a special battery when operated with the electronic insert FEL68 (2-wire NAMUR).
- Service life: At ambient temperatures from 10 to 40 °C (50 to 104 °F), 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
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.

Connecting the *Bluetooth*[®] Module



Note

In the case of devices for use in the hazardous area with a certain type of protection, the cover is sealed by a securing screw.

► For more information see chapter 6.1.1.

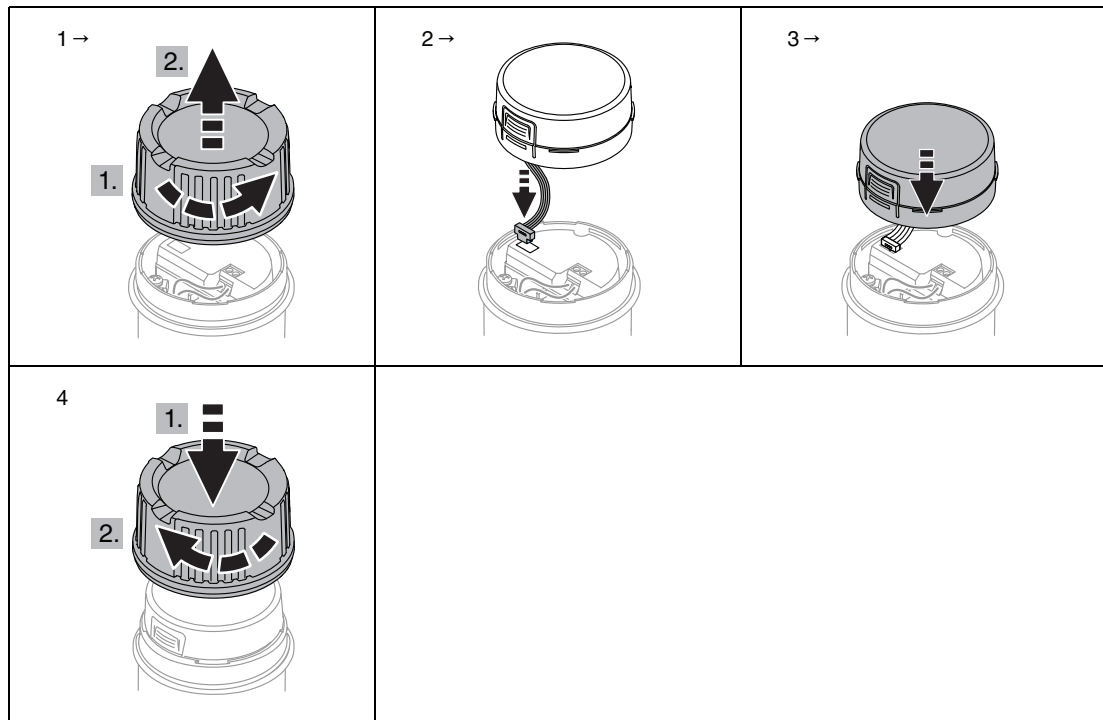


Figure 6.16 Connecting the *Bluetooth*[®] module

6.2.8 Connecting the Cables

Required tools

- Flat-blade screwdriver (0.6 mm x 3.5 mm) for terminals
- Suitable tool with width across flats AF24/25 (8 Nm (5.9 lbf foot)) for M20 cable gland

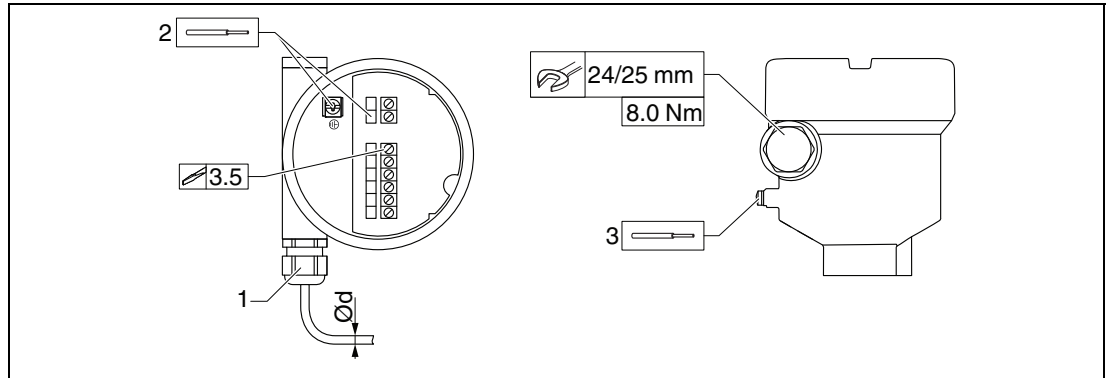


Figure 6.17 Example of coupling with cable entry, electronic insert with terminals

- 1 M20 coupling (with cable entry), example
 - 2 Conductor cross-section maximum 2.5 mm² (AWG 14), ground terminal inside the housing and terminals on the electronics
 - 3 Conductor cross-section maximum 4.0 mm² (AWG 12), ground terminal outside the housing (example of plastic housing with external protective ground connection (PE))
- Ød** Nickel-plated brass 7 to 10.5 mm (0.28 to 0.41 inch)
Ød Plastic 5 to 10 mm (0.2 to 0.38 inch)
Ød Stainless steel 7 to 12 mm (0.28 to 0.47 inch)



Note

Pay attention to the following when using the M20 coupling

Following cable entry:

- Counter-tighten the coupling.
- Tighten the union nut of the coupling with a torque of 8 Nm (5.9 lbf foot).
- Screw the enclosed coupling into the housing with a torque of 3.75 Nm (2.76 lbf foot).

6.3 Post-Connection Check

- Is the device or cable undamaged (visual inspection)?
- Do the cables used comply with the requirements?
- Do the mounted cables have adequate strain relief?
- Are the cable glands mounted and firmly tightened?
- Does the supply voltage match the information on the nameplate?
- No reverse polarity, is terminal assignment correct?
- If supply voltage is present, is the green LED lit?
- Are all the housing covers installed and tightened?
- Optional: Is the cover tightened with securing screw?

7 Operation Options

7.1 Overview of Operation Options

7.1.1 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)

7.1.2 Elements on the Electronic Insert

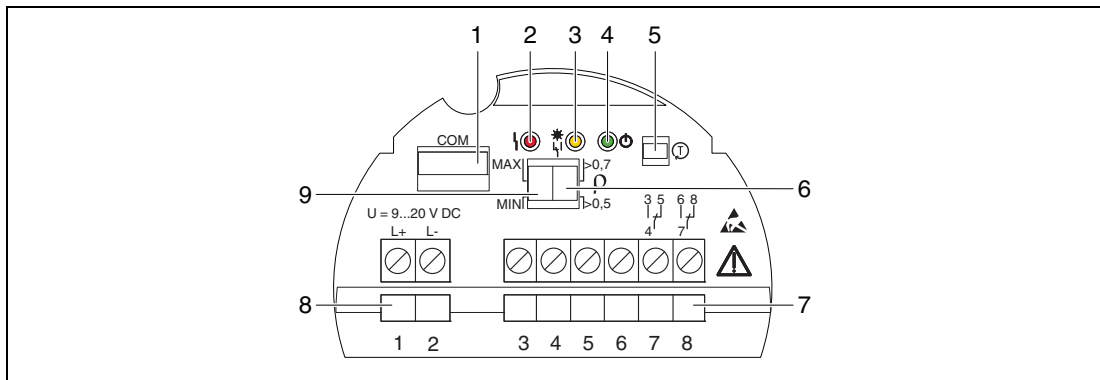


Figure 7.1 Example of electronic insert FEL64DC

- 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

7.1.3 **Bluetooth® Wireless Technology**

Access via **Bluetooth®** wireless technology

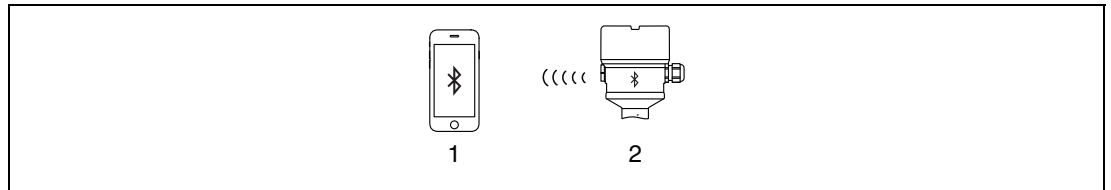


Figure 7.2 Remote operation via **Bluetooth®** wireless technology

- 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.

7.1.4 **LED Module VU120 (optional)**

Depending on the MAX/MIN setting, an LED indicates the operational status (switch status or alarm status) in green, yellow and red. The LED lights up very brightly and can be easily identified from a distance.

Connection to the following electronic inserts: FEL62, FEL64, FEL64 DC.

- ▶ For more information see chapter 6.2.6.

8 Commissioning

8.1 Function Check

Before commissioning the measuring point, check whether the post-installation and post-connection checks have been performed:

- ▶ Post-mounting check see chapter 5.4
- ▶ Post-connection check see chapter 6.3

8.2 Functional Test Using the Key on the Electronic Insert

- The functional test must be performed in the OK state: MAX safety and sensor free or MIN safety and sensor covered.
- The LEDs flash one after another as a chaser light during the functional test.
- When performing the proof test in safety instrumented systems according to SIL or WHG: comply with the instructions in the safety manual.

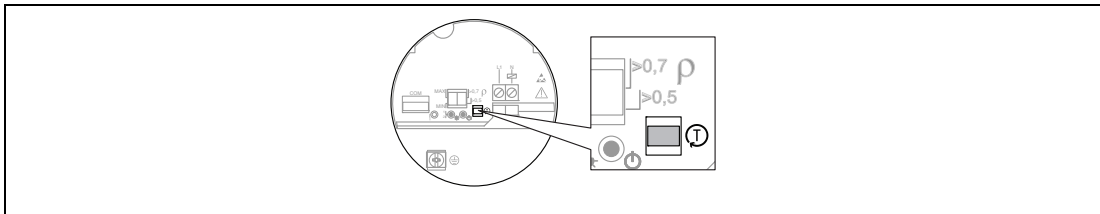


Figure 8.1 Key for the functional test for electronic inserts FEL61/62/64/64DC/68



Testing Function

1. Make sure no undesired switching operations are triggered!
2. Press the **T** key on the electronic insert for at least 1 s (e. g. with a screwdriver).
 - ↳ The device functional test is performed. The output changes from the OK state to demand mode.
 - Functional test duration: at least 10 s or until the key is released if the key is pressed for > 10 s.

The device returns to normal operation if the internal test is successful.



Note

If the housing may not be opened during operation due to explosion protection requirements, e. g. Ex d /XP, the functional test can also be started from the outside with the test magnet (optionally available), (FEL62, FEL64, FEL64DC, FEL68).

- ▶ For more information see chapter 8.3.

8.2.1 FEL61 Switching Behavior and Signaling

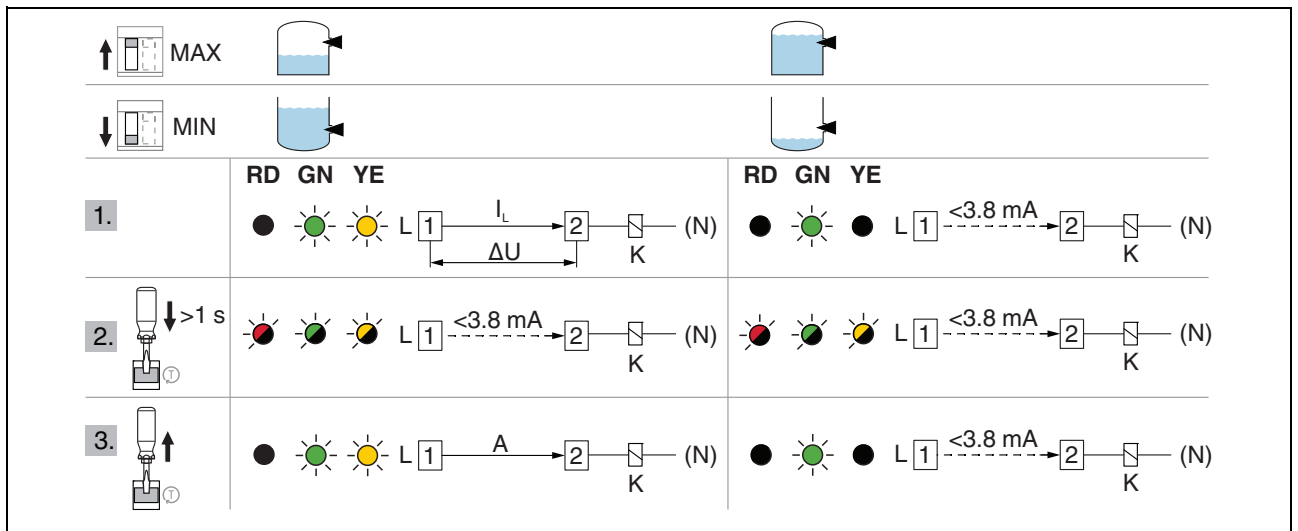


Figure 8.2 FEL61 switching behavior and signaling

- A** After the test key is pressed, the load is switched off for at least 10 s ($I < 3.8\text{ mA}$) even if the key is pressed for $< 10\text{ s}$.
If the key is pressed for $> 10\text{ s}$, the load remains switched off ($I < 3.8\text{ mA}$) until the test key is released.
The load is then switched on again.

8.2.2 FEL62 Switching Behavior and Signaling

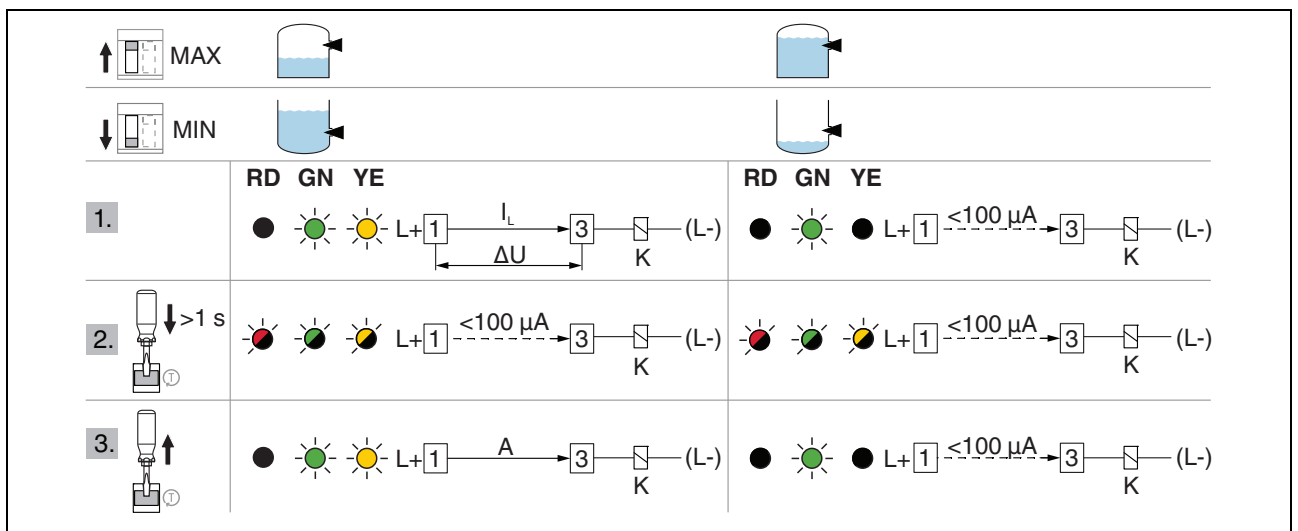


Figure 8.3 FEL62 switching behavior and signaling

- A** After the test key is pressed, the DC-PNP output is switched off for at least 10 s ($I < 100\ \mu\text{A}$) even if the key is pressed for $< 10\text{ s}$.
If the key is pressed for $> 10\text{ s}$, the DC-PNP output remains switched off ($I < 100\ \mu\text{A}$) until the test key is released.
The DC-PNP output is then switched on again.

8.2.3 FEL64, FEL64DC Switching Behavior and Signaling

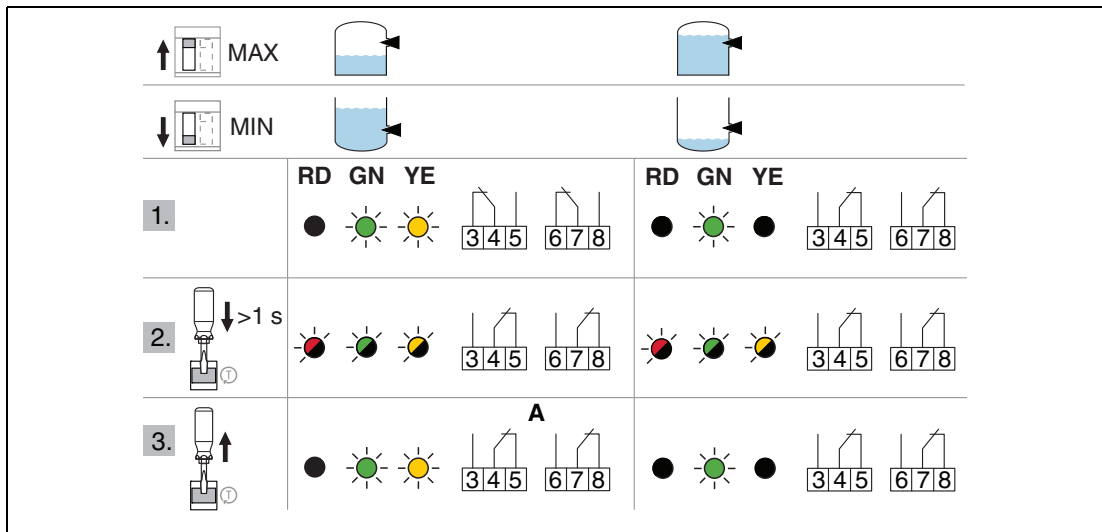


Figure 8.4 FEL64, FEL64DC switching behavior and signaling

- A** After the test key is pressed, the relay is de-energized for at least 10 s even if the key is pressed for < 10 s.
 If the test key is pressed for > 10 s, the relay remains de-energized until the test key is released.
 The relay is then energized again.

8.2.4 FEL68 Switching Behavior and Signaling

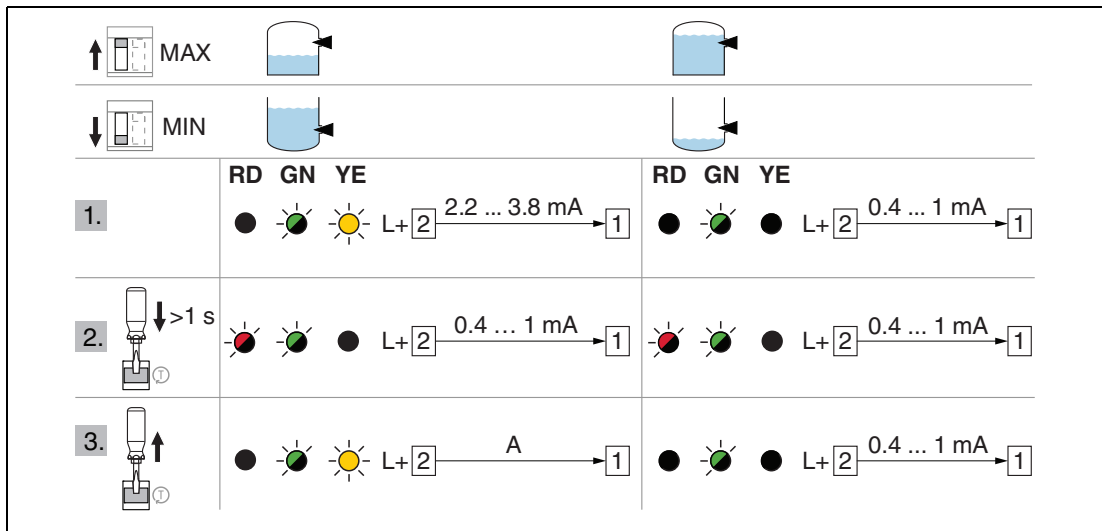


Figure 8.5 NAMUR electronics switching behavior and signaling

- A** After the test key is pressed, the current is 0.4 to 1 mA for at least 10 s even if the key is pressed for < 10 s.
 If the key is pressed for > 10 s, the current remains at 0.4 to 1 mA until the test key is released.
 The current is then 2.2 to 3.8 mA again afterwards.

8.3 Functional Test of the Electronic Switch with a Test Magnet

Perform functional test of the electronic switch without opening the device:



Testing Function

Hold the test magnet against the marking on the nameplate on the outside.

↳ Simulation is possible in the case of the FEL62, FEL64, FEL64DC, FEL68 electronic inserts.

The functional test with the test magnet acts in the same way as the functional test using the test key on the electronic insert.

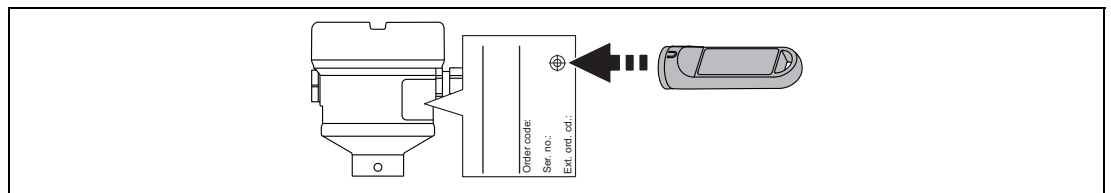


Figure 8.6 Functional test with test magnet

8.4 Switching on the Device

During the power-up time, the device output is in the safety-oriented state, or in the alarm state if available:

- For electronic insert FEL61, the output will be in the correct state after a maximum of 4 s following power-up.
- For electronic inserts FEL62, FEL64, FEL64DC, the output will be in the correct state after a maximum of 3 s following power-up.
- For electronic insert FEL68 NAMUR, a functional test is always performed upon power-up. The output is in the correct state after a maximum of 10 s.

8.5 Establishing a Connection via P+F Level App

8.5.1 Requirements

Device Requirements

Commissioning via P+F Level app is only possible if a *Bluetooth*[®] module is installed in the device.

System Requirements

The P+F Level app is available for download for mobile smartphone or tablet devices in the Google Play Store for Android, and in the App Store for iOS.

- iOS devices:
 - iPhone 5S or higher as of iOS11
 - iPad 5th Generation or higher as of iOS11;
 - iPod Touch 6th Generation or higher as of iOS11
- Devices with Android: from Android 6.0 and *Bluetooth*[®] 4.0

Initial Password

The ID number on the nameplate of the *Bluetooth*[®] module is used as the initial password when establishing the connection for the first time.



Note

It is important to note the following if the *Bluetooth*[®] module is removed from one device and installed in another device: all log-in data are only stored in the *Bluetooth*[®] module and not in the device. This also applies to the password changed by the user.

8.5.2

Preparatory Steps

Note down the ID number of the *Bluetooth*[®] module. The ID number on the nameplate of the Bluetooth module is used as the initial password when establishing the connection for the first time.

The high cover with the window must be used for devices that are operated with the *Bluetooth*[®] module.

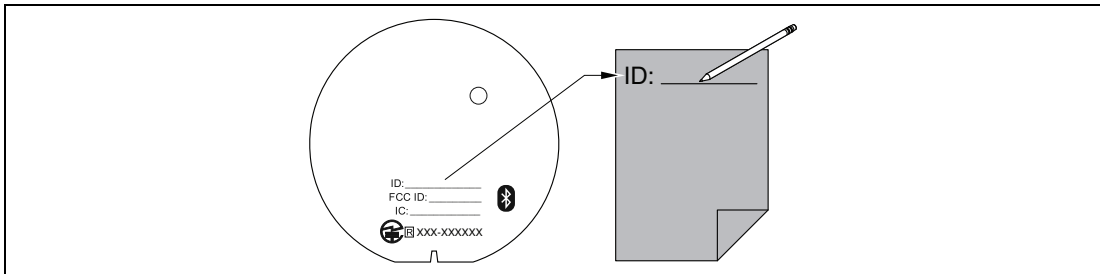


Figure 8.7

8.5.3

Establishing a Connection via P+F Level App

Downloading and Installing P+F Level App



1. Enter **P+F Level** in the search field of the app store.



Figure 8.8 App stores

2. Install the P+F Level app.
3. Start the P+F Level app.
4. Select device from livelist displayed.
5. Log-in:
 - ↳ User name: admin
 - Password: ID number on the *Bluetooth*[®] module
6. Tap the icons for more information.



Note

Change the password after logging in for the first time!

Saving PDF Reports



Note

The PDF reports generated in the P+F Level app are not automatically saved and must therefore be actively saved on the smartphone or tablet.

9 Operation

9.1 Menu Assembly

The following data can be read out via the optional Bluetooth module and the associated Pepperl+Fuchs P+F Level app.

9.1.1 Diagnostics Menu

Settings and information concerning diagnostics as well as help for troubleshooting.

Diagnostics

► Active diagnostics
Actual Diagnostics
Timestamp
► Diagnostic list
Diagnostics 1
Timestamp
Diagnostics 2
Timestamp
Diagnostics 3
Timestamp
Diagnostics 4
Timestamp
Diagnostics 5
Timestamp

9.1.2 Application Menu

Functions for detailed process adaptation to integrate the device optimally into your application.

Application

► Operating mode
MIN/MAX setting
Density setting
Switching delay uncovered to covered
Switching delay covered to uncovered
► Output
Output state

9.1.3 System Menu

System settings concerning device management, user administration or safety.

System

Electronic type
▶ Bluetooth configuration
BLE HW revision
▶ Information
Device tag
Serial number
Firmware version
Device name
Order code
Manufacturer
Manufacturer ID
ENP version
Operating time
Number of system starts
Time stamp of last proof test
Date of proof test
Frequency at delivery status
Current frequency
Upper alarm frequency
Upper warning frequency
Lower alarm frequency
Battery status
Electronics temperature
Minimum electronics temperature
Maximum electronics temperature

9.2 Proof testing for SIL/WHG devices



Note

Available only for devices with SIL or WHG approval.

The **SIL Prooftest**, **WHG Prooftest** module or **SIL/WHG Prooftest** module includes a wizard for the proof testing that is required at appropriate intervals for the following applications: SIL (IEC61508/), 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.

10 Diagnostics and Troubleshooting

The device indicates warnings and faults via *Bluetooth*[®] in the P+F Level app and via the LEDs on the electronic insert. All the device warnings and faults are for information purposes only and do not have a safety function. The faults diagnosed by the device are displayed in the P+F Level app in accordance with NE107. Depending on the diagnostic message, the device behaves as per a warning or fault condition.

The device behaves in accordance with NAMUR Recommendation NE131 **NAMUR standard device requirements for field devices for standard applications**.

If using NAMUR electronics, insert or replace the battery in the *Bluetooth*[®] module.

10.1 Diagnostic Information via LEDs

10.1.1 LED on Electronic Insert

LED green not lit

Possible cause: No power supply

Troubleshooting: Check plug, cable and power supply.

LED flashes red

Possible cause: Overload or short-circuit in load circuit

Troubleshooting: Clear the short-circuit.

Reduce maximum load current to below 350 mA.

LED red continuously lit

Possible cause: Internal sensor error or electronic fault

Troubleshooting: Replace device.

No LED is lit (only applies for FEL61)

Possible cause: load current > 3.8 mA in the blocked state

Troubleshooting: Replace electronics.

10.1.2 P+F Level App

Device is not visible in the live list

Possible cause: No *Bluetooth*[®] connection available.

The device is already connected to another smartphone or tablet.

No cable is connected to the *Bluetooth*[®] module.

Troubleshooting:

- Connect the *Bluetooth*[®] module to the COM interface.
- Enable *Bluetooth*[®] function on smartphone or tablet.
- If using NAMUR electronics, insert or replace the battery in the *Bluetooth*[®] module.

Device is visible in the live list but cannot be accessed via P+F Level App

- Possible cause on Android end device

Troubleshooting:

- Check whether the location function is enabled for the app.
- Check whether the location function for the app was approved the first time.
- GPS or positioning function must be activated for certain Android versions in conjunction with *Bluetooth*[®].
- Activate GPS, close the app fully and restart, enable the positioning function for the app

- Possible cause on Apple end device

Troubleshooting:

- Log in as normal.
- Enter the user name: admin.
- Enter initial password (serial number of *Bluetooth*[®] module), paying attention to lower/upper case.

Login via P+F Level App not possible

Possible cause: Device is being put into operation for the first time.

Troubleshooting: Enter initial password (ID number of *Bluetooth*[®] module) and change it, paying attention to lower/upper case.

No communication with device via P+F Level App

- Possible cause: Incorrect password entered

Troubleshooting: Enter correct password.

- Possible cause: Forgotten password

Troubleshooting: Contact Pepperl+Fuchs service.

10.2 Firmware History

V01.01.zz (01.2019)

- Valid for electronic inserts: FEL61, FEL62, FEL64, FEL68
- Valid from documentation version: BA01894O/00/EN/01.19
- Changes: none; 1st version (original software)

11 Maintenance

No special maintenance work is required.

11.1 Maintenance Tasks

11.1.1 Cleaning

It is not permitted to use the device with abrasive media. Material abrasion on the tuning fork can result in the device malfunctioning.

- Clean the tuning fork as necessary.
- Cleaning is also possible in the installed state, e. g. CIP Cleaning in Place and SIP Sterilization in Place.

12 Repair

12.1 General Information

12.1.1 Repair Concept

Pepperl+Fuchs repair concept

- Devices have a modular design
- Customers can carry out repairs



Note

For more information on service and spare parts, please contact your Pepperl+Fuchs sales representative.

12.1.2 Repair of Ex-Certified Devices



Warning!

Risk of explosion!

Incorrect repair can affect electrical safety!

- Only specialist personnel or the Pepperl+Fuchs service team may carry out repairs on Ex-certified devices.
 - Relevant standards and national regulations on hazardous areas, safety instructions and certificates must be observed.
 - Use only original Pepperl+Fuchs spare parts.
 - Please note the device designation on the nameplate. Only identical parts may be used as replacements.
 - Carry out repairs according to the instructions.
 - Only the Pepperl+Fuchs service team is permitted to modify a certified device and convert it to another certified version.
 - All repairs and modifications must be documented.
-

12.2 Spare Parts

Some replaceable device components are identified by means of a spare part nameplate. This contains information about the spare part.



Note

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.

12.3 Return

The device must be returned if the wrong device has been ordered or delivered. As an ISO-certified company and also due to legal regulations, Pepperl+Fuchs is obliged to follow certain procedures when handling any returned products that have been in contact with medium.

To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Pepperl+Fuchs website at www.pepperl-fuchs.com.

12.4 Disposal



If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to Pepperl+Fuchs for disposal under the applicable conditions.

12.4.1 Battery disposal

- The end user is legally obliged to return used batteries.
- The end user can return old batteries or electronic assemblies containing these batteries free of charge to Pepperl+Fuchs.



In accordance with German law regulating the use of batteries (BattG §28 Para 1 Number 3), this symbol is used to denote electronic assemblies that must not be disposed of as household waste.

13 Accessories

13.1 Enclosed Accessories

These accessories can be ordered together with the device or can be ordered separately.

13.1.1 Test Magnet

Order number: 71580748

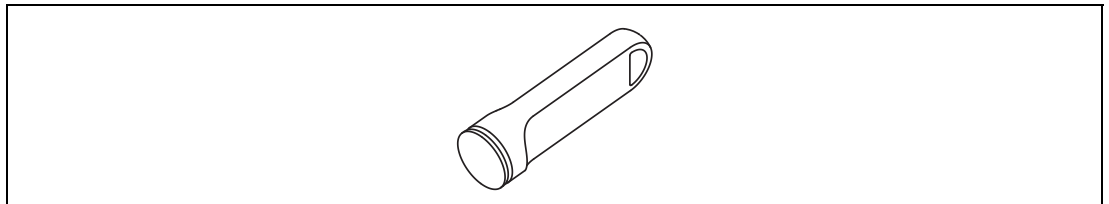


Figure 13.1 Test magnet

13.1.2 Weather Protection Cover for Dual-Compartment Housing, Aluminum

Material: stainless steel 316L

Order number: 71580795

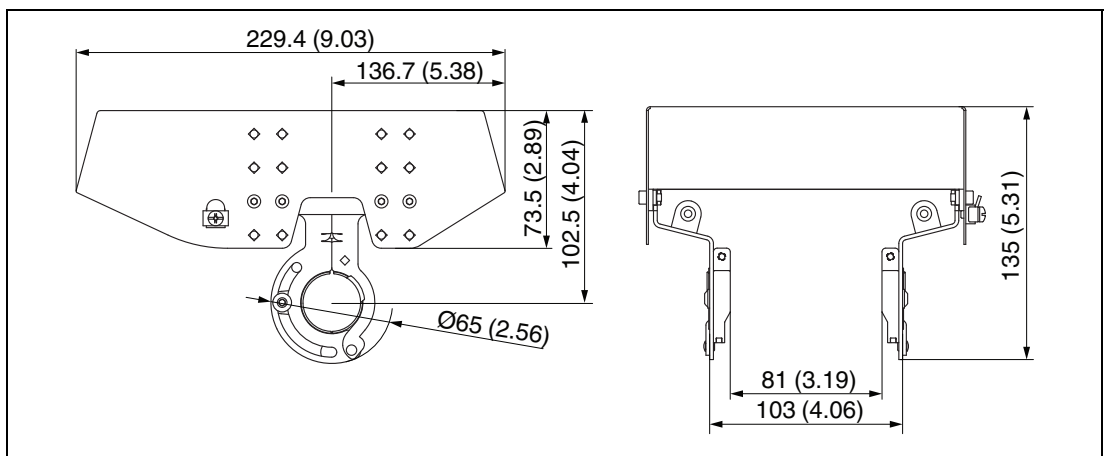


Figure 13.2 Weather protection cover for dual-compartment housing, aluminum, unit of measurement mm (inch)

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

Material: plastic

Order number: 71580796

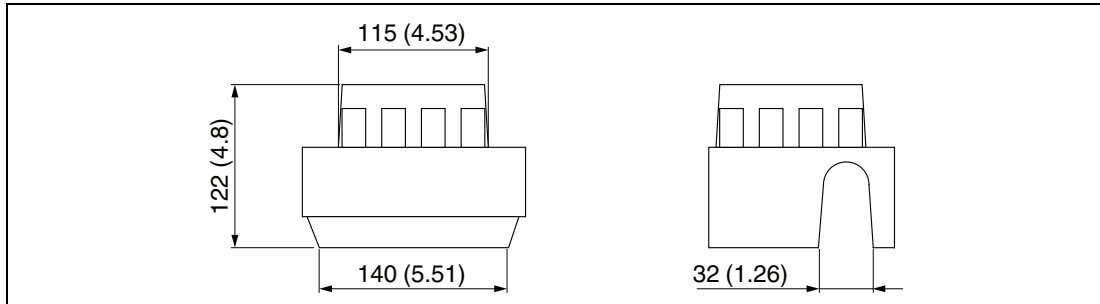


Figure 13.3 Protective cover for single compartment housing, aluminum or 316L, unit of measurement mm (inch)

13.2 Additional Accessories

These accessories can be ordered separately.

13.2.1 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.

Order number: 71580806

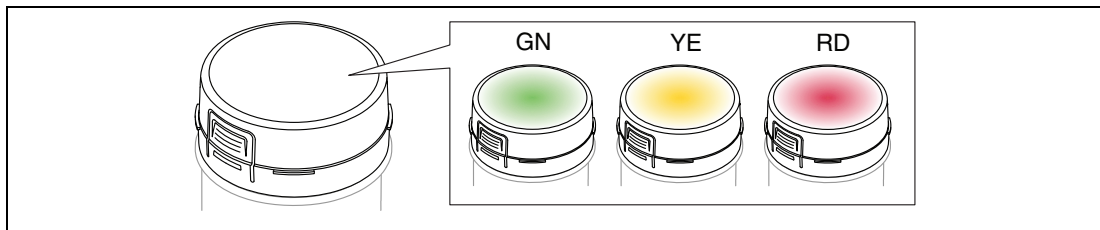


Figure 13.4 LED module VU120, the LED lights up in green (GN), yellow (YE) or red (RD)

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

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.

13.2.2 **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).

- *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

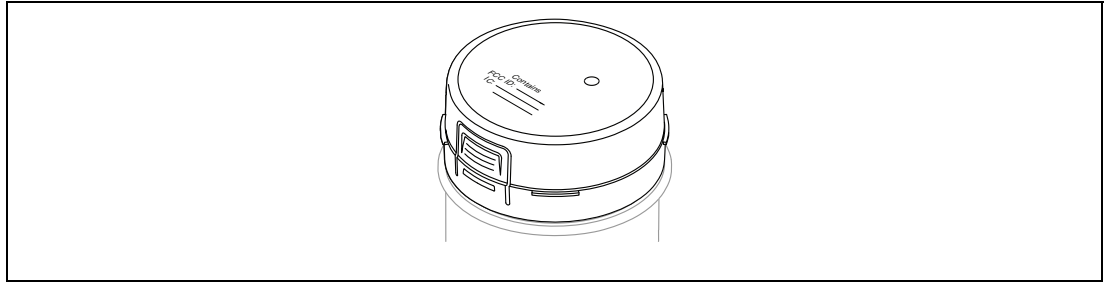


Figure 13.5 *Bluetooth®* module VU121



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

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.

13.2.3 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
- Order number: 032798

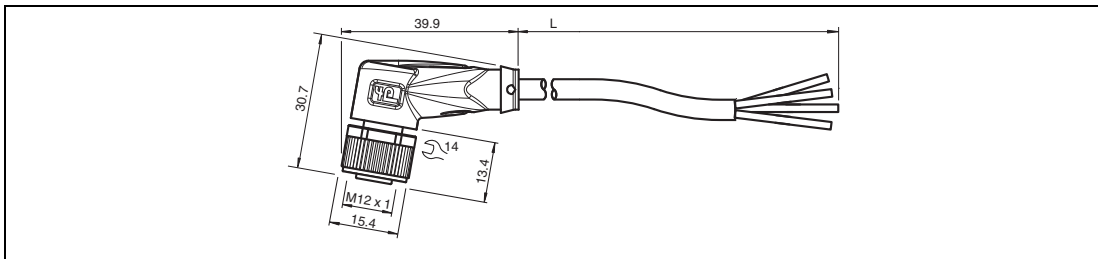


Figure 13.6 Female cordset V1-W-5M-PVC, unit of measurement mm

13.2.4 Sliding Sleeves for Unpressurized Operation

Switch point, infinitely adjustable.

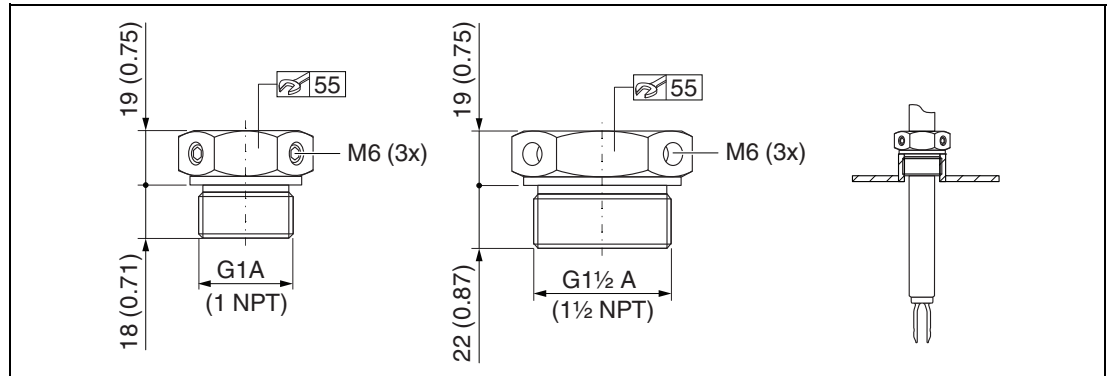


Figure 13.7 Sliding sleeves for unpressurized operation $p_e = 0$ bar (0 psi), unit of measurement mm (inch)

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

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.

13.2.5 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

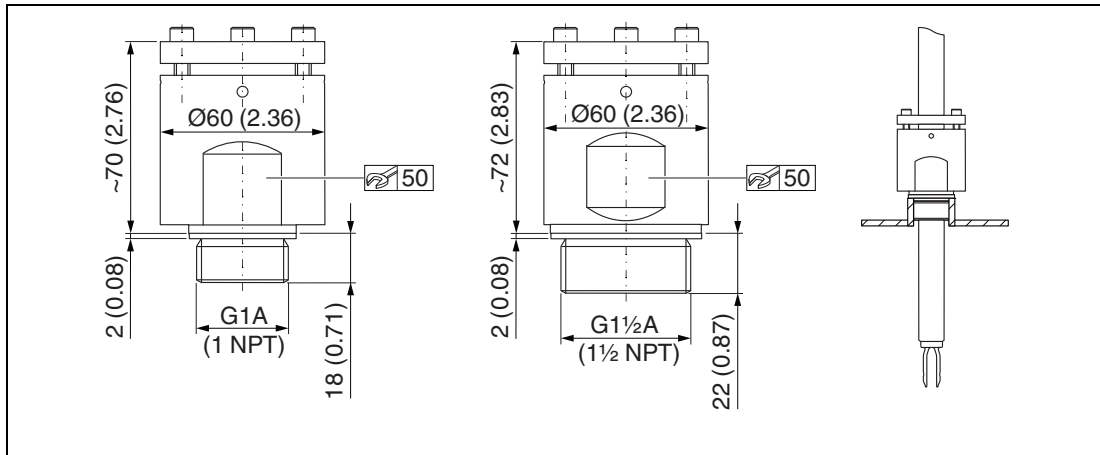


Figure 13.8 High pressure sliding sleeves, unit of measurement mm (inch)

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

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.

14 Technical Data

14.1 Input

14.1.1 Measured Variable

Level (point level), MAX or MIN safety

14.1.2 Measuring Range

Depends on the installation location and the pipe extension ordered
Maximum sensor length 6 m (20 foot)

14.2 Output

14.2.1 Output and Input Variants

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 potential-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 load via 2 potential-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

14.2.2 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.

14.2.3 Safety-Related Connection Data

See safety instructions (SI): All data relating to explosion protection are provided in separate Ex documentation and are available from the product detail page of the Pepperl+Fuchs website.

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

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

14.3 Environment

14.3.1 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.

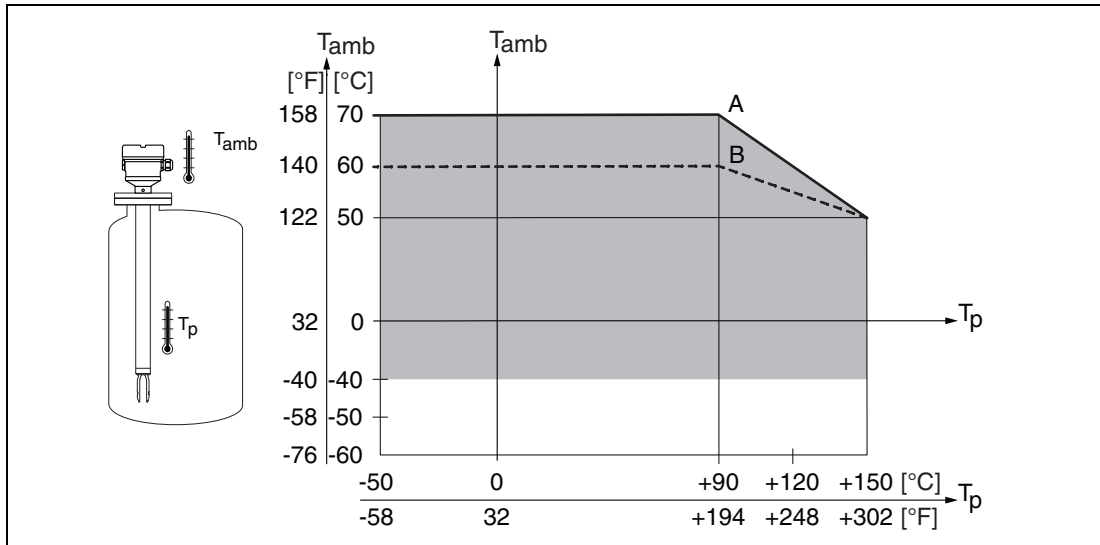


Figure 14.1 Permitted ambient temperature T_{amb} at the housing as a function of the process temperature T_p in the vessel:

- 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.

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).

14.3.2 Storage Temperature

-40 to +80 °C (-40 to +176 °F)

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

14.3.3 Humidity

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

14.3.4 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.

14.3.5 Climate Class

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

14.3.6 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.

14.3.7 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.

14.3.8 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

14.3.9 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 5.1.5.

14.3.10 Pollution Degree

Pollution degree 2

14.3.11 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.

14.4 Process

14.4.1 Process Temperature Range

-50 to +150 °C (-58 to +302 °F)

Pay attention to the pressure and temperature dependence.

- For additional details 14.4.3.

14.4.2 Thermal Shock

≤ 120 K/s

14.4.3 Process Pressure Range



Warning!

The maximum pressure for the 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 document TI014030/98/EN.
- The 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 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

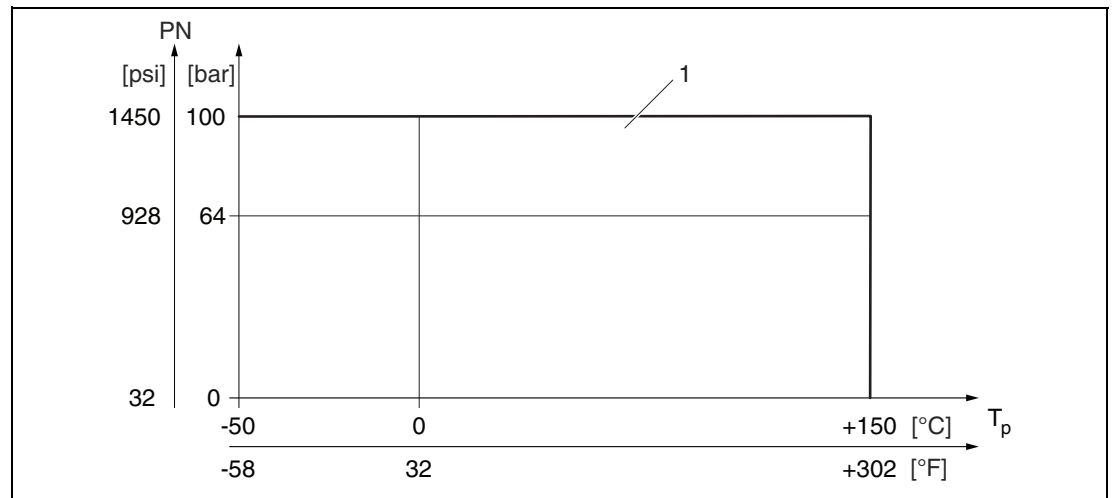


Figure 14.2 Process temperature

- 1** Permitted pressure rating if the following option is selected:
 Type code, feature **Application, temperature**, Option **B**, 100 bar (1450 psi).
- ▶ For exceptions, see document TI01403O/98/EN.
- 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)

14.4.4 Overpressure Limit

- 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 device function is limited during the pressure test.

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

14.4.5 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.

14.4.6 Viscosity

≤ 10000 mPa·s

14.4.7 Pressure Tightness

Up to vacuum



Note

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

14.4.8 Solids Contents

Ø ≤ 5 mm (0.2 inch)

14.5 Additional Technical Data



Note

Further technical data can be found in document TI01403O/98/EN or 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.

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Your automation, our passion.

Explosion Protection

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- 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

