

Brief Operating Instructions

Liquiphant FTL51B

Vibronic

HART

Point level switch for liquids

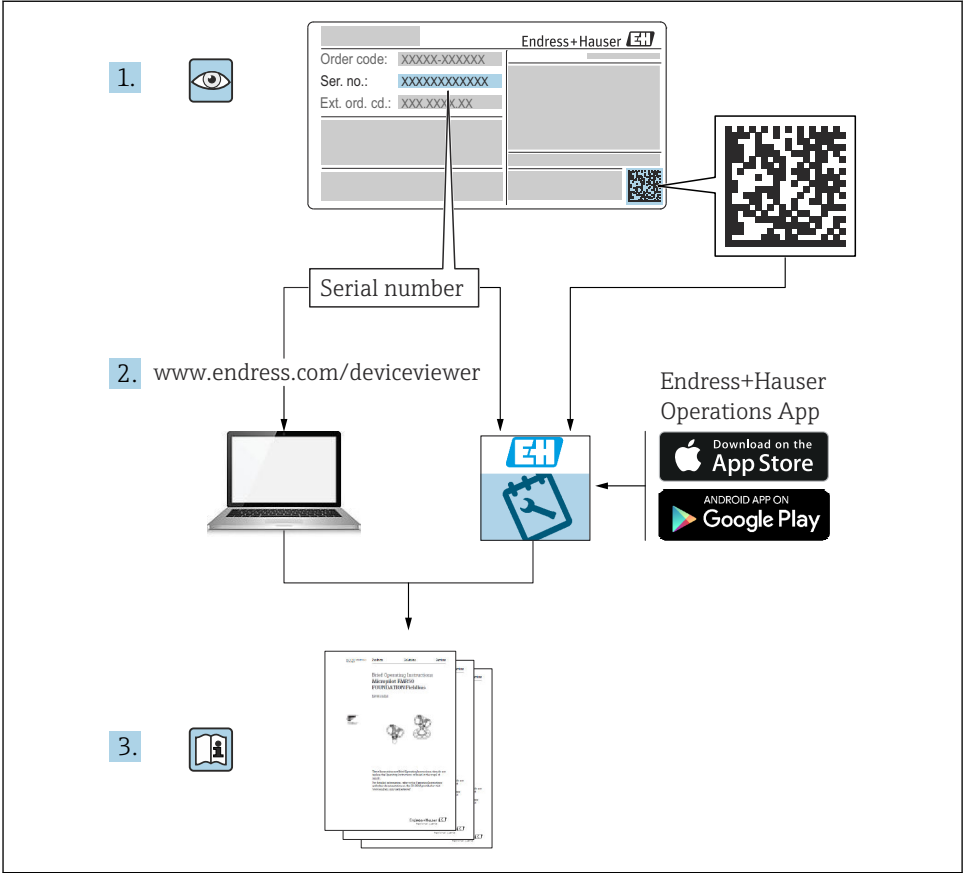


These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the other documentation:
Available for all device versions via:

- Internet: www.endress.com/deviceviewer
- Smart phone/tablet: *Endress+Hauser Operations App*

1 Related documents



A0023555

2 About this document

2.1 Symbols

2.1.1 Safety symbols

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

2.1.2 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.

2.1.3 Tool symbols



Flat-blade screwdriver



Allen key



Open-ended wrench

2.1.4 Communication-specific symbols



Bluetooth

Wireless data transmission between devices over a short distance.

2.1.5 Symbols for certain types of information



Permitted

Procedures, processes or actions that are permitted.




Forbidden


Procedures, processes or actions that are forbidden.



Tip

Indicates additional information

 Reference to documentation

 Reference to another section

   Series of steps

2.1.6 Symbols in graphics

A, B, C ... View

1, 2, 3 ... Item numbers

2.1.7 Registered trademarks

HART®

Registered trademark of the FieldComm Group, Austin, Texas, USA

Bluetooth®

The *Bluetooth*® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by Endress+Hauser is under license. Other trademarks and trade names are those of their respective owners.

Apple®

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.

Android®

Android, Google Play and the Google Play logo are trademarks of Google Inc.

3 Basic safety instructions


3.1 Requirements for the 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

3.2 Intended use

- Only use the device for liquids
- Improper use can pose hazards
- Ensure that the measuring device is free of defects while it is in operation

- Use the device only for media to which the wetted materials have an adequate level of resistance
- Do not exceed or drop below the relevant limit values for the device
 -  For more details, see the Technical Documentation

3.2.1 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.

3.3 Workplace safety

For work on and with the device:

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

3.4 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 the interference-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 Endress+Hauser.

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 Endress+Hauser 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.

3.5 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.

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

3.6 Functional Safety SIL (optional)

The Functional Safety Manual must be strictly observed for devices that are used in functional safety applications.

3.7 IT security



For more information, see the Operating Instructions.

4 Incoming acceptance and product identification

4.1 Incoming acceptance

Check the following during incoming acceptance:

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



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

4.2 Product identification

The following options are available for the identification of the device:

- Nameplate data
- Extended order code with breakdown of the device features on the delivery note
- Enter serial number from nameplates in *W@M Device Viewer*
www.endress.com/deviceviewer. All of the information on the measuring device is displayed along with an overview of the scope of technical documentation provided.
- Enter the serial number on the nameplate into the *Endress+Hauser Operations app* or scan the 2-D matrix code on the nameplate with the *Endress+Hauser Operations app*

4.2.1 Nameplate

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

4.2.2 Manufacturer address

Endress+Hauser SE+Co. KG
Hauptstraße 1
79689 Maulburg, Germany
Place of manufacture: See nameplate.

4.3 Storage and transport

4.3.1 Storage conditions

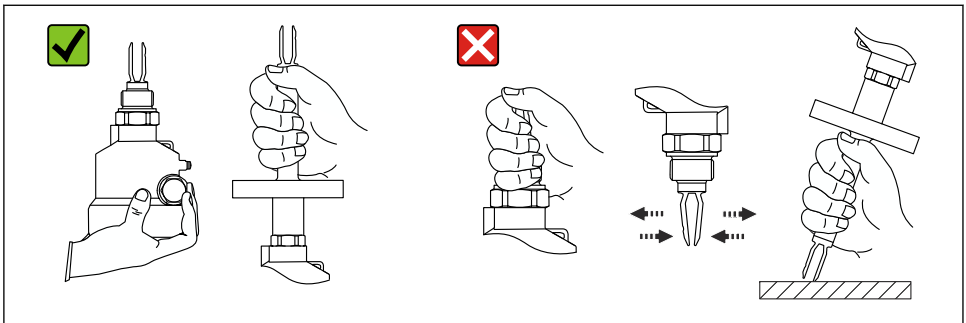
Use original packaging.

Storage temperature

-40 to +80 °C (-40 to +176 °F)
Optional -50 °C (-58 °F) or -60 °C (-76 °F)
With M12 plug, elbowed: -25 to +80 °C (-13 to +176 °F)

4.3.2 Transporting the device

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



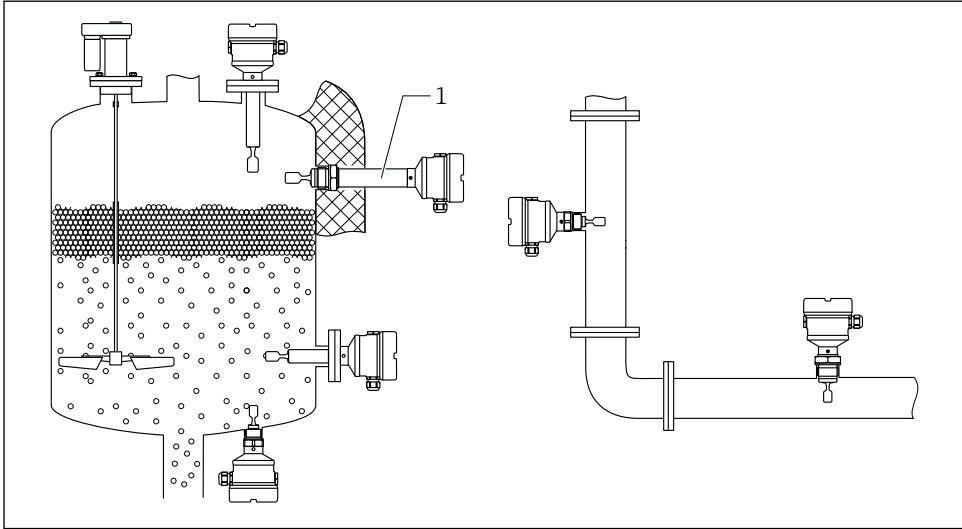
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1 Handling the device during transportation

5 Mounting

Mounting instructions

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



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2 Installation examples for a vessel, tank or pipe

1 Temperature spacer/pressure-tight feedthrough (optional) for tank with insulation and/or high process temperatures

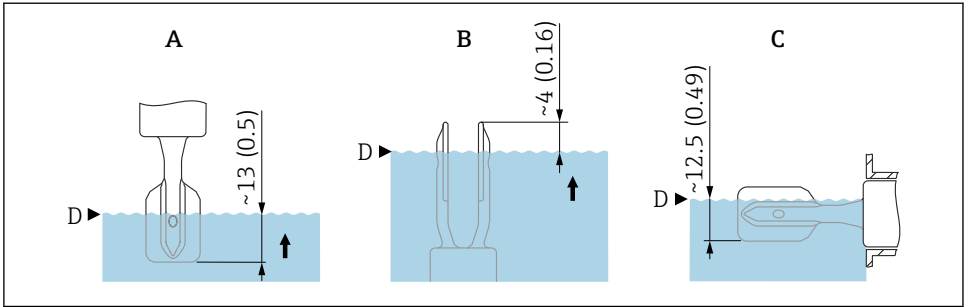
5.1 Mounting requirements

5.1.1 Take switch point into consideration

The following are typical switch points, depending on the orientation of the point level switch.

Water +23 °C (+73 °F)

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



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

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

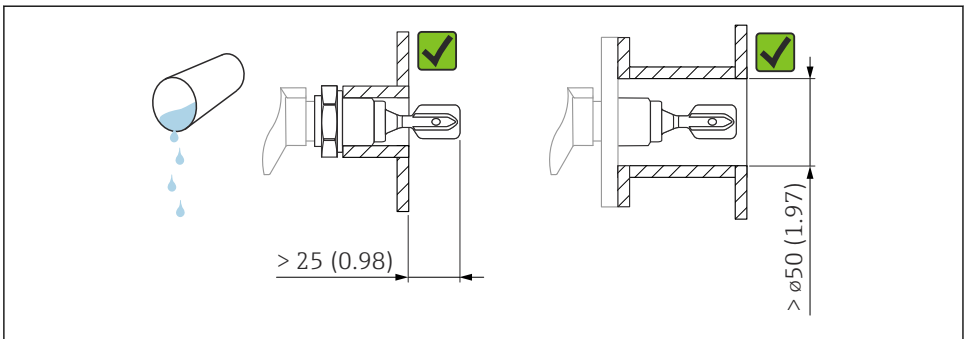
5.1.2 Take viscosity into consideration

Low viscosity



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

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



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

High viscosity

NOTICE

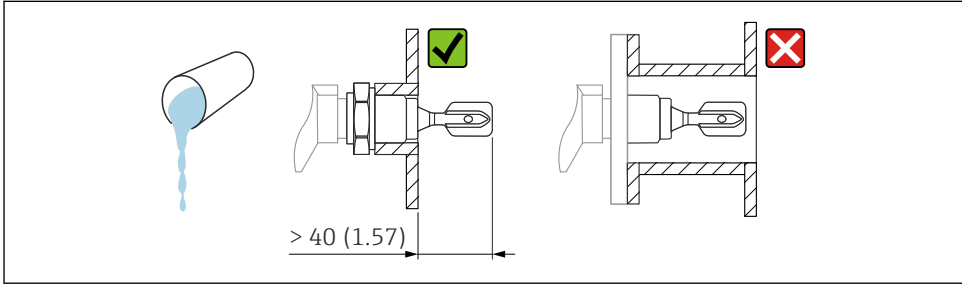
Highly viscous liquids may cause switching delays.

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



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

The tuning fork must be located outside the installation socket!

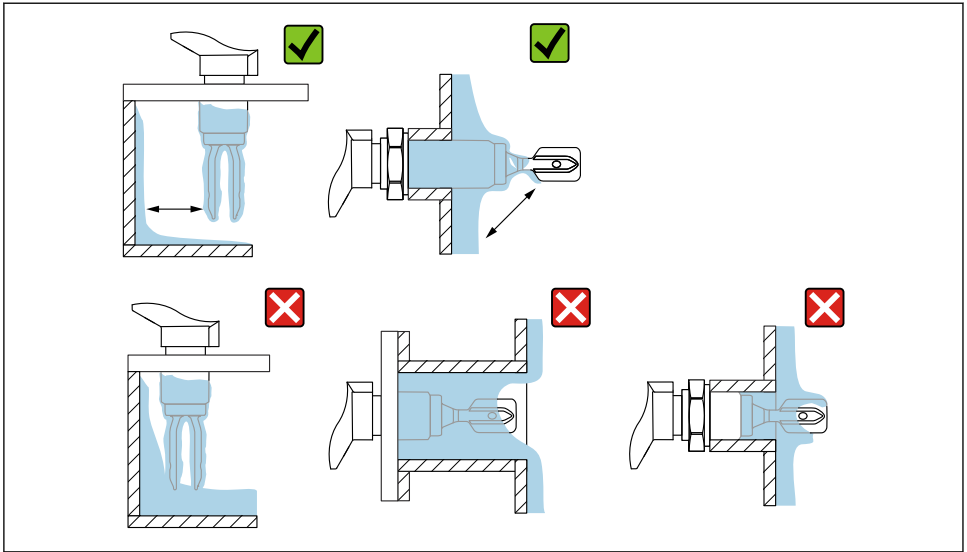


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5 Installation example for a highly viscous liquid. Unit of measurement mm (in)

5.1.3 Avoid buildup

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

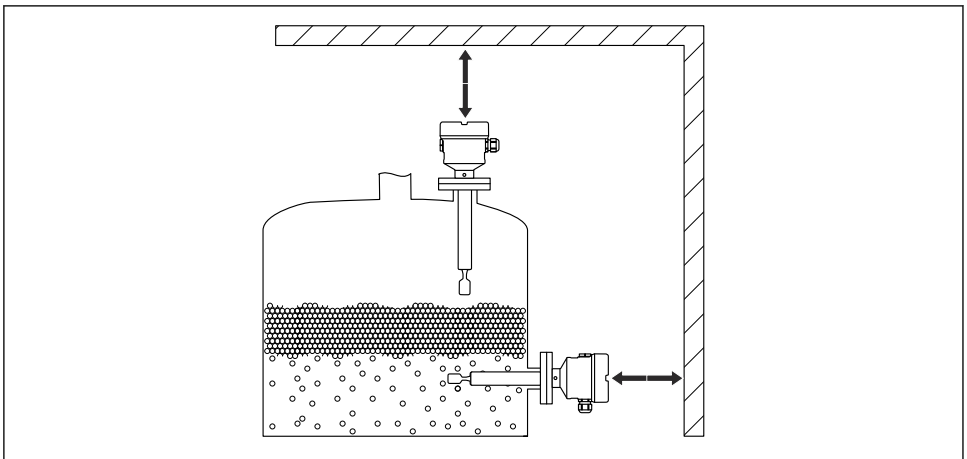


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6 Installation examples for a highly viscous process medium

5.1.4 Take clearance into consideration

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

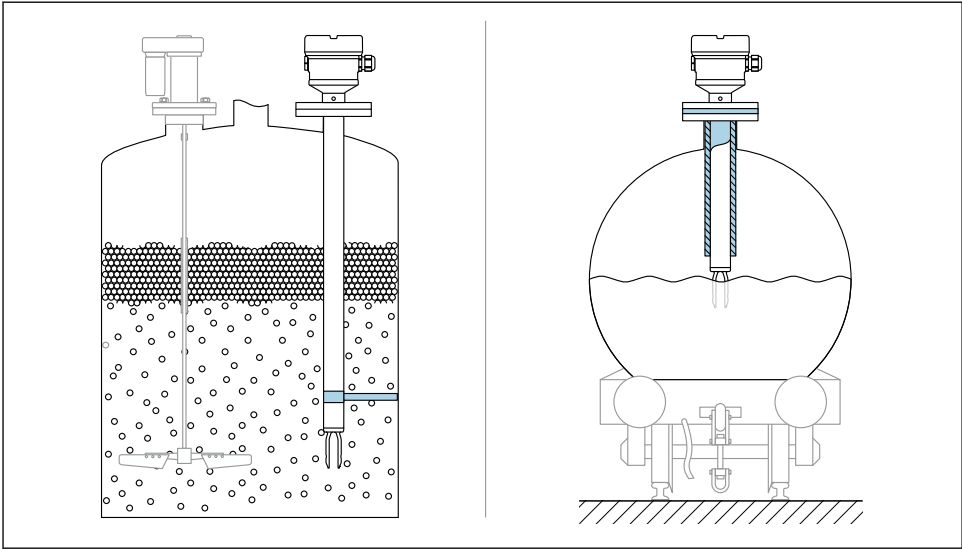


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7 Take clearance into consideration


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 ft).



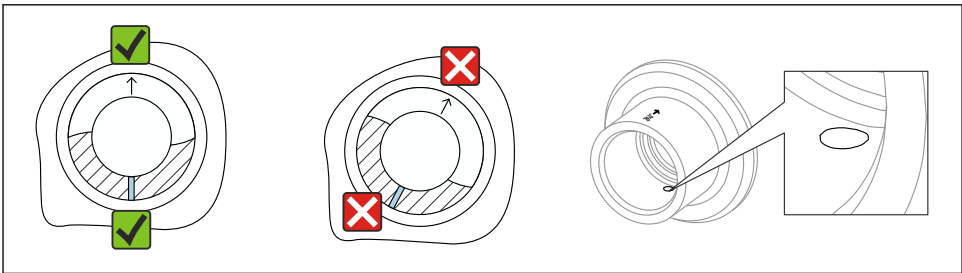
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 8 Examples of support in the event of dynamic load


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

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.



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 9 Weld-in adapter with leakage hole

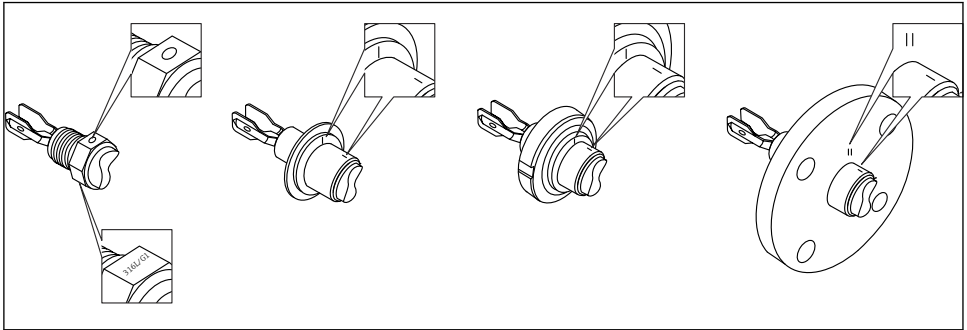
5.2 Mounting the device

5.2.1 Required tool

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

5.2.2 Aligning the tuning fork using the marking

The correct alignment allows the medium to flow easily off the tuning fork and prevents the formation of buildup.

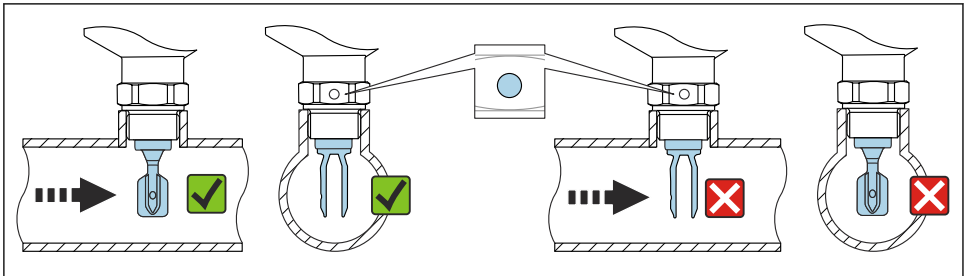


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10 Markings to align the tuning fork

5.2.3 Installing in pipes

- Flow velocity up to 5 m/s with a viscosity of 1 mPa·s and density of 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.

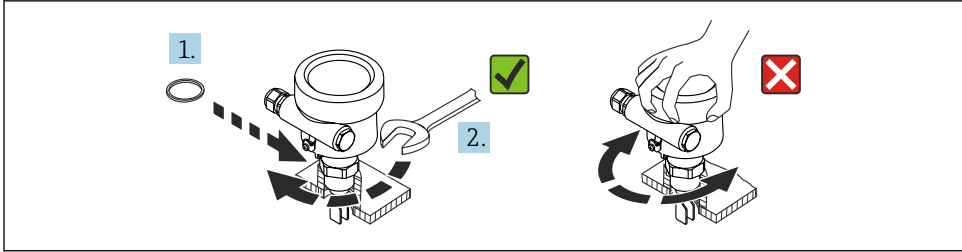


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11 Installation in pipes (take fork position and marking into consideration)

5.2.4 Screwing in the device

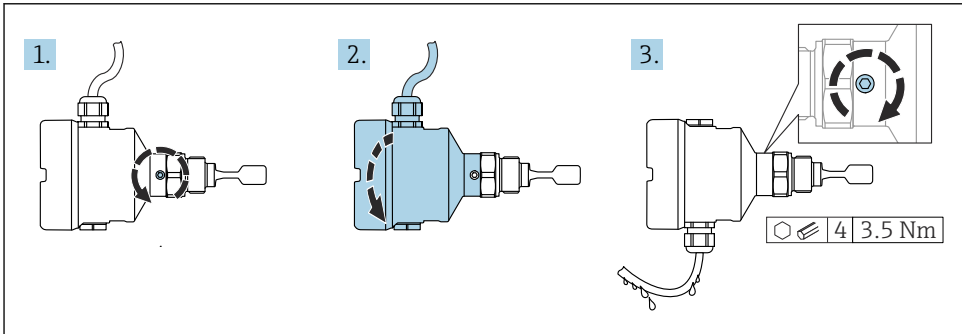
- Turn by the hex bolt only, 15 to 30 Nm (11 to 22 lbf ft)
- Do not turn at the housing!




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 12 *Screwing in the device*

5.2.5 Aligning the cable entry



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 13 *Housing with external locking screw and drip loop*

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

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.

5.2.6 Turning the housing

The housing can be rotated up to 380° by loosening the locking screw.

NOTICE

The housing cannot be unscrewed fully.

- ▶ Loosen the external locking screw by a maximum of 1.5 turns. If the screw is unscrewed too much or completely (beyond the screw anchor point), small parts (counter disk) can become loose and fall out.
- ▶ Tighten the securing screw (hexagon socket 4 mm (0.16 in)) with maximum 3.5 Nm (2.58 lbf ft)±0.3 Nm (±0.22 lbf ft).

5.2.7 Closing the housing cover

NOTICE

Thread and housing cover damaged from dirt and fouling!

- ▶ Remove contamination (e.g. sand) from the threads of the cover and housing.
- ▶ If you continue to encounter resistance when closing the cover, check the thread again for fouling.



Housing thread

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

- ❌ Avoid additional lubrication.

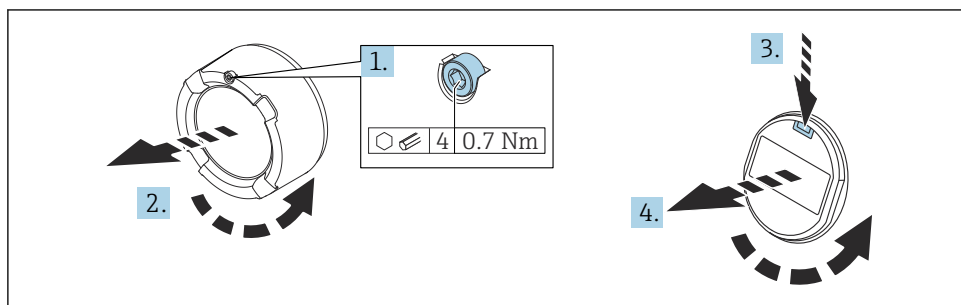
5.2.8 Turning the display module

⚠ WARNING

Supply voltage switched on!

Risk of electric shock and/or explosion!


- ▶ Switch off the supply voltage before opening the device.




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1. If fitted: release the screw of the cover lock for the electronics compartment cover using the Allen key.
2. Unscrew the cover from the housing and inspect the cover seal.
3. Press the release mechanism and remove the display module.

4. Turn the display module to the desired position: maximum $4 \times 90^\circ$ in each direction. Insert the display module into the desired position until it clicks into place. Screw the cover tightly back onto the housing. If fitted: tighten the screw of the cover lock using the Allen key 0.7 Nm (0.52 lbf ft) $\pm 0.2 \text{ Nm}$ ($\pm 0.15 \text{ lbf ft}$).

 In the case of a dual-compartment housing, the display can be mounted in the electronics compartment as well as in the connection compartment.

5.3 Sliding sleeves

 For more information, see the Operating Instructions.

5.4 Post-mounting check

- ☐ Is the device undamaged (visual inspection)?
- ☐ Does the measuring device meet 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 from wet conditions and direct sunlight?
- ☐ Is the device properly secured?

6 Electrical connection

6.1 Required tool

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

6.2 Connecting requirements

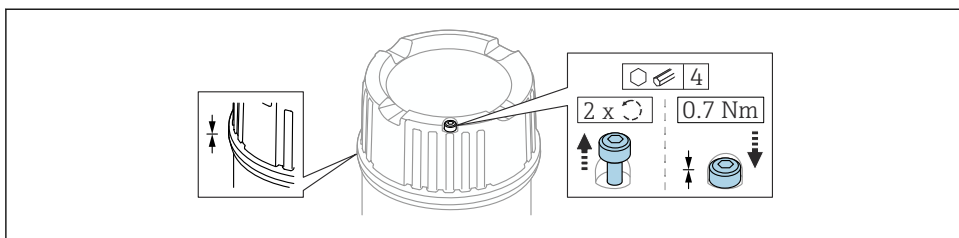
6.2.1 Cover with securing screw

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.

NOTICE

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.



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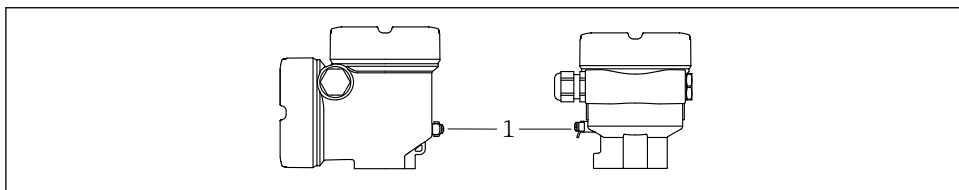
14 Cover with securing screw

6.2.2 Potential equalization

⚠ WARNING

Explosion Hazard!

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



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1 Ground terminal for connecting the potential matching line

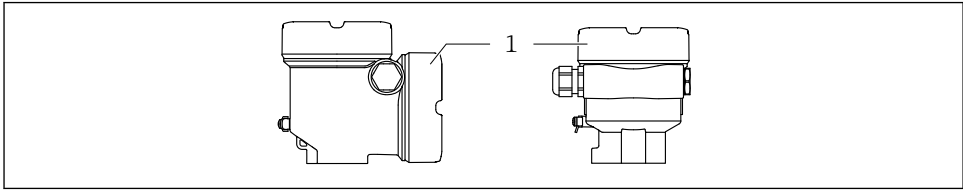
The protective ground on the device must not be connected. If necessary, the potential matching line can be connected to the outer ground terminal of the transmitter before the device is connected.



For optimum electromagnetic compatibility:

- Keep the potential matching line as short as possible
- Observe the minimum cross-section of 2.5 mm^2 (14 AWG)

6.3 Connecting the device



A0046355

1 Connection compartment cover



Housing thread

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

❌ Avoid additional lubrication.

6.3.1 Supply voltage

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



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

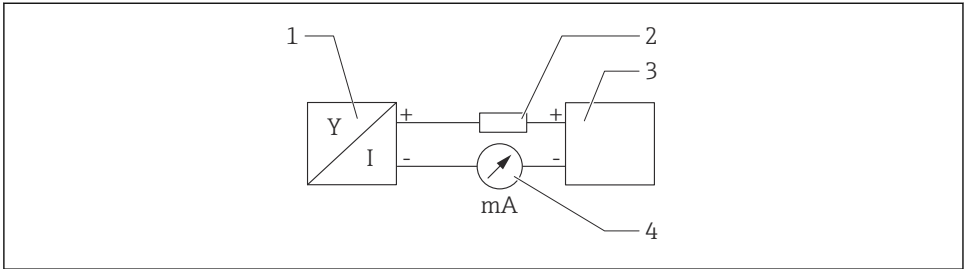
6.3.2 Terminals

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


6.3.3 Cable specification

- The cable outer diameter depends on the cable entry used
- Cable outer diameter
 - Plastic: $\varnothing 5$ to 10 mm (0.2 to 0.38 in)
 - Nickel-plated brass: $\varnothing 7$ to 10.5 mm (0.28 to 0.41 in)
 - Stainless steel: $\varnothing 7$ to 12 mm (0.28 to 0.47 in)

6.3.4 4-20 mA HART



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 15 Block diagram of HART connection

- 1 Device with HART communication
- 2 HART communication resistor
- 3 Power supply
- 4 Multimeter or ammeter



The HART communication resistor of 250 Ω in the signal line is always necessary in the case of a low-impedance power supply.

Take the voltage drop into consideration:

Maximum 6 V for a 250 Ω communication resistor

6.3.5 Wiring

WARNING

Supply voltage might be connected!

Risk of electric shock and/or explosion!

- ▶ If the device is used in hazardous areas, make sure to comply with national standards and the specifications in the Safety Instructions (XAs). The specified cable gland must be used.
- ▶ The supply voltage must match the specifications on the nameplate.
- ▶ Switch off the supply voltage before connecting the device.
- ▶ If necessary, the potential matching line can be connected to the outer ground terminal of the transmitter before the device is connected.
- ▶ A suitable circuit breaker should be provided for the device in accordance with IEC/EN 61010.
- ▶ The cables must be adequately insulated, with due consideration given to the supply voltage and the overvoltage category.
- ▶ The connecting cables must offer adequate temperature stability, with due consideration given to the ambient temperature.
- ▶ Only operate the device with the covers closed.

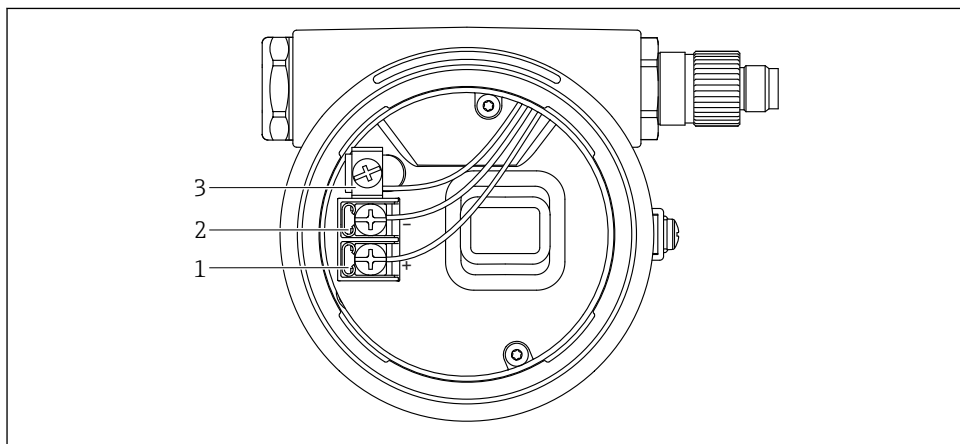
Connect the device in the following order:

1. Release the cover lock (if provided).
2. Unscrew the cover.


3. Guide the cables into the cable glands or cable entries. Use a suitable tool with width across flats AF24/25 (8 Nm (5.9 lbf ft)) for the M20 cable gland.
4. Connect the cable.
5. Tighten the cable glands or cable entries so that they are leak-tight. Counter-tighten the housing entry.
6. Screw the cover securely back onto the connection compartment.
7. If fitted: tighten the screw of the cover lock using the Allen key 0.7 Nm (0.52 lbf ft) ± 0.2 Nm (0.15 lbf ft).

6.3.6 Terminal assignment

Single compartment housing

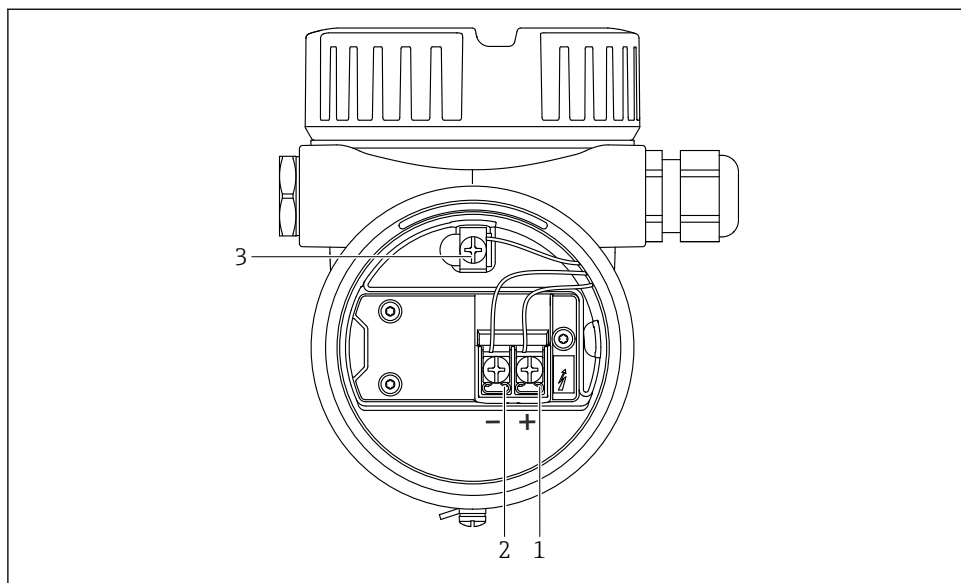


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 16 Connection terminals and ground terminal in the connection compartment

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

Dual-compartment housing, L-shape

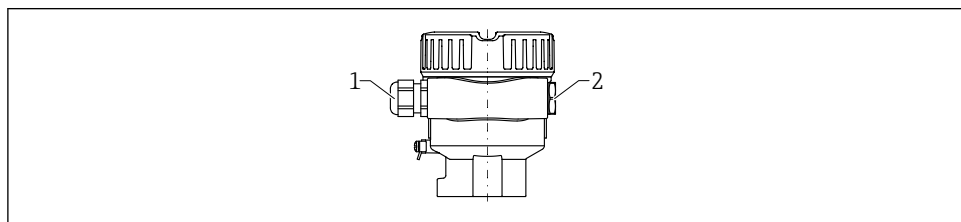


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 17 Connection terminals and ground terminal in the connection compartment

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

6.3.7 Cable entries



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- 1 Cable entry
- 2 Dummy plug

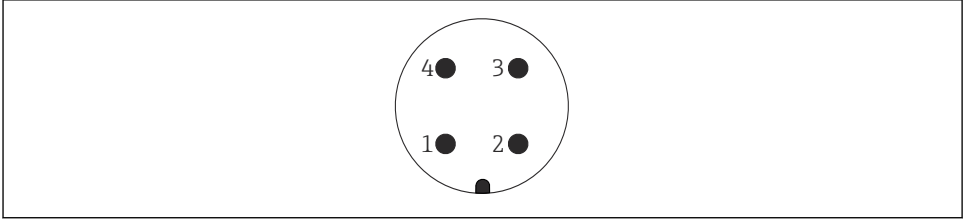
The type of cable entry depends on the device version ordered.

6.3.8 Available device plugs



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

M12 plug



A0011175

18 M12 plug, pin assignment

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

6.4 Ensuring the degree of protection

6.4.1 Degree of protection

In accordance with DIN EN 60529, NEMA 250

IP66/IP68 NEMA 4X/6P (1.83 m H₂O for 24 h)

Types of housing:

- Single compartment; aluminum, coated; Ex d/XP
- Dual-compartment, L-shape; aluminum, 316L; Ex d/XP

Degree of protection for M12 plug

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

NOTICE

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

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



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

6.5 Post-connection check

- ☐ Are the device and cables free from damage (visual check)?

- ☐ Do the cables used meet 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?
- ☐ Are all housing covers installed and firmly tightened?
- ☐ Optional: Are covers tightened with a securing screw?

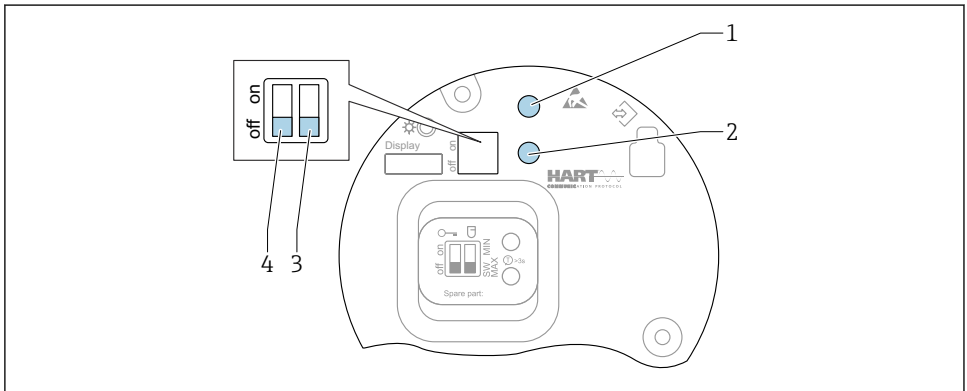
7 Operation options



For additional information about the connection, see the Operating Instructions for the device. Documentation currently available on the Endress+Hauser- website:

www.endress.com → Downloads.

7.1 4 to 20 mA HART (FEL60H) electronic insert



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

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

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

i The setting of the DIP switches on the electronic insert has priority over the settings made via other operation methods (e.g. FieldCare/DeviceCare).

7.2 Overview of operating options

- Operation via operating keys and DIP switches on the electronic insert
- Operation via optical operating keys on the device display (optional)
- Operation via Bluetooth® wireless technology (with optional device display with Bluetooth) with Smartblue app or FieldXpert, DeviceCare
- Operation via operating tool (Endress+Hauser FieldCare/DeviceCare, handheld terminal, AMS, PDM, ...)

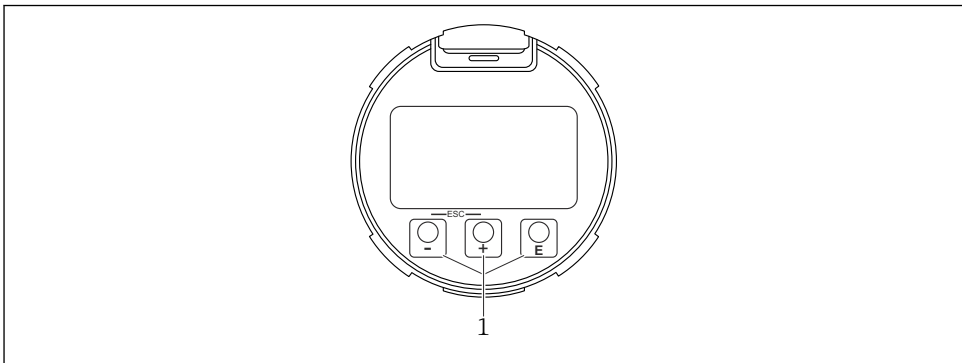
7.3 Access to the operating menu via the local display

7.3.1 Device display (optional)

Possible to operate the optical operating keys through the cover. No need to open the device.

i Backlighting is switched on or off depending on the supply voltage and the current consumption.

i The device display is also optionally available with Bluetooth® wireless technology.



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20 Graphic display with optical operating keys (1)

7.3.2 Operation via Bluetooth® wireless technology (optional)

Prerequisite

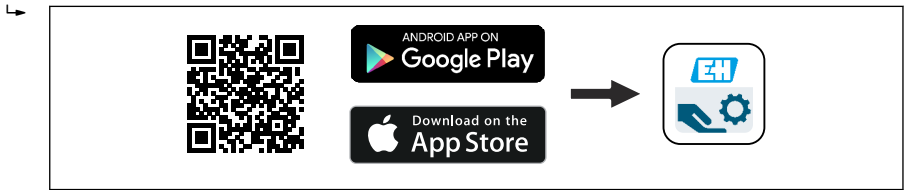
- Device with device display including Bluetooth
- Smartphone or tablet with Endress+Hauser SmartBlue app or PC with DeviceCare from version 1.07.05 or FieldXpert SMT70

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

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

SmartBlue app

1. Scan the QR code or enter "SmartBlue" in the search field of the App Store or Google Play.



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2. Start the SmartBlue app.
3. Select device from livelist displayed.
4. Login:
 - ↳ Enter the user name: admin
Password: serial number of the device.
5. Change the password after logging in for the first time!

Prerequisites

System requirements

The SmartBlue app is available to download for smartphones or tablets.

- Devices with iOS: 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 serial number of the device serves as the initial password when the connection is established for the first time.

Please note the following

If the Bluetooth display is removed from one device and installed in another device:

- All the log-in data are only saved in the Bluetooth display and not in the device
- The password changed by the user is also saved in the Bluetooth display

7.4 Access to the operating menu via the operating tool



For more information, see the Operating Instructions.

8 Commissioning

8.1 Preliminaries

WARNING

The settings of the current output are relevant for safety!

Incorrect settings may cause the product to overflow or a pump to run dry.

- ▶ The setting for the current output depends on the setting in the **Assign PV** parameter.
- ▶ After changing the setting of the current output: check the settings for the range (Lower range value output (LRV) and Upper range value output (URV)) and reconfigure them if necessary!



8.1.1 As-delivered state

If no customized settings were ordered:

- **Assign PV** parameter Level limit detection (8/16 mA mode)
- MAX safety mode
- Alarm condition set to min. 3.6 mA
- DIP switch for locking in OFF position
- Bluetooth switched on
- Density range $> 0.7 \text{ g/cm}^3$
- Switching times 0.5 s when the fork is covered and 1.0 s when it is uncovered
- HART burst mode switched off

8.2 Function check

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

-  Checklist in "Post-mounting check" section
-  Checklist in "Post-connection check" section

8.3 Switching on the device



All configuration tools provide a commissioning assistant that supports the user when setting the most important configuration parameters (**Guidance** menu **Commissioning** wizard).

8.4 Further information



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



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www.addresses.endress.com
