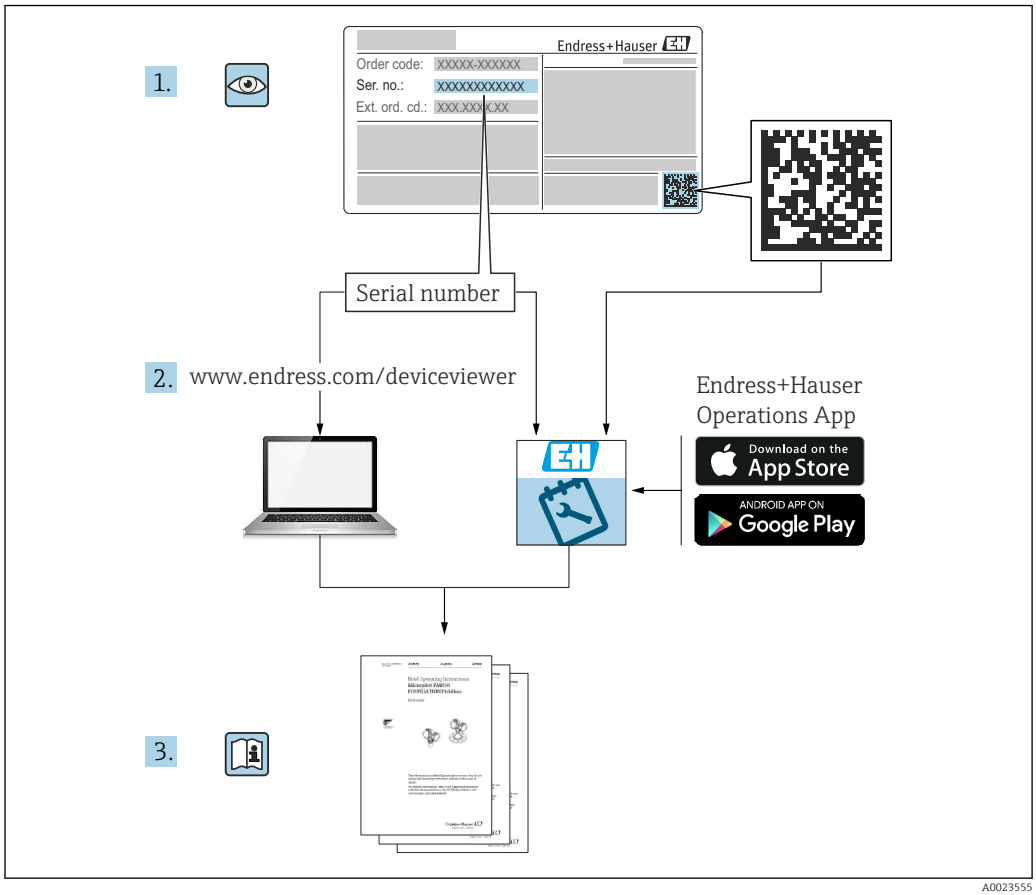
BA02308F/00/EN/03.25-00
71707229
2025-05-16

Valid as of version
01.00.zz (Device firmware)

Operating Instructions
Liquiphant FTL43

Vibronic
HART
Level switch for liquids

Endress+Hauser
People for Process Automation



- Make sure the document is stored in a safe place such that it is always available when working on or with the device
- Avoid danger to individuals or the facility: read the "Basic safety instructions" section carefully, as well as all other safety instructions in the document that are specific to working procedures

The manufacturer reserves the right to modify technical data without prior notice. The Endress+Hauser sales organization will supply you with current information and updates to these instructions.

Table of contents

1 About this document

1.1 Document function

These Operating Instructions contain all the information required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to installation, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.

1.2 Symbols

1.2.1 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 potentially dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

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

NOTICE
This symbol alerts you to a potentially harmful situation. Failure to avoid this situation can result in damage to the product or something in its vicinity.

1.2.2 Tool symbols

Open-ended wrench

1.2.3 Communication-specific symbols

Bluetooth®:
Wireless data transmission between devices over a short distance via radio technology.

1.2.4 Symbols for certain types of information

Permitted:

Procedures, processes or actions that are permitted.

Forbidden:

Procedures, processes or actions that are forbidden.

Additional information:

Reference to documentation:

Reference to page:

Series of steps: 1., 2., 3.

Result of an individual step:

1.2.5 Symbols in graphics

Item numbers: 1, 2, 3 ...

Series of steps: 1., 2., 3.

Views: A, B, C, ...

1.3 List of abbreviations

PN
Nominal pressure

MWP
Maximum working pressure
The MWP is indicated on the nameplate.

DTM
Device Type Manager

Operating tool

The term "operating tool" is used in place of the following operating software:
- FieldCare / DeviceCare, for operation via HART communication and PC
- SmartBlue app for operation using an Android or iOS smartphone or tablet

PLC
Programmable logic controller (PLC)

1.4 Documentation

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

1.5 Registered trademarks

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.

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Bluetooth®
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HART®
Registered trademark of the FieldComm Group, Austin, Texas USA

2 Basic safety instructions

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:
- Trained, qualified specialists must have a relevant qualification for this specific function and task.
- Are authorized by the plant owner/operator.
- Are familiar with federal/national regulations.
- Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:
- Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- Follow the instructions in this manual.

2.2 Intended use

The device described in this manual is intended only for the level measurement of liquids.

Incorrect use
The manufacturer is not liable for damage caused by improper or unintended use.

Avoid mechanical damage:
- Do not touch or clean device surfaces with pointed or hard objects.

Clarification for borderline cases:
- For special media and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but does not accept any warranty or liability.

Residual risks
Due to the transfer of heat from the process and power dissipation within the electronics, the temperature of the housing may increase to up to 80 °C (176 °F) during operation. When in operation, the sensor can reach a temperature close to the medium temperature.

Danger of burns from contact with surfaces!
- In the event of elevated fluid temperatures, ensure protection against contact to prevent burns.

2.3 Workplace safety

For work on and with the device:
- Wear the required personal protective equipment as per national regulations.
- Switch off the supply voltage before connecting the device.

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 that the device is in good working order.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:
- ▶ If modifications are nevertheless required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability:
- ▶ Only use original accessories.

Hazardous area

To eliminate the risk of danger to persons or the facility when the device is used in the approval-related area (e.g. explosion protection, pressure equipment safety):
- ▶ Check the nameplate to verify if the device ordered can be put to its intended use in the hazardous area.
- ▶ Observe the specifications in the separate supplementary documentation included as an integral part of these instructions.

2.5 Product safety

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

The device fulfills general safety requirements and legal requirements. It also complies with the EU directives listed in the device-specific EU declaration of conformity. Endress+Hauser confirms this fact by affixing the CE mark to the device.

2.6 IT security

The manufacturer warranty is valid only if the product is installed and used as described in the Operating Instructions. The product is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the product and associated data transfer, must be implemented by the operators themselves in line with their security standards.

2.7 Device-specific IT security

The device offers specific functions to support protective measures by the operator. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. The user role can be changed with an access code (applies to operation via Bluetooth or FieldCare, DeviceCare or asset management tools (e.g. AMS, PDM).

2.7.1 Access via Bluetooth® wireless technology

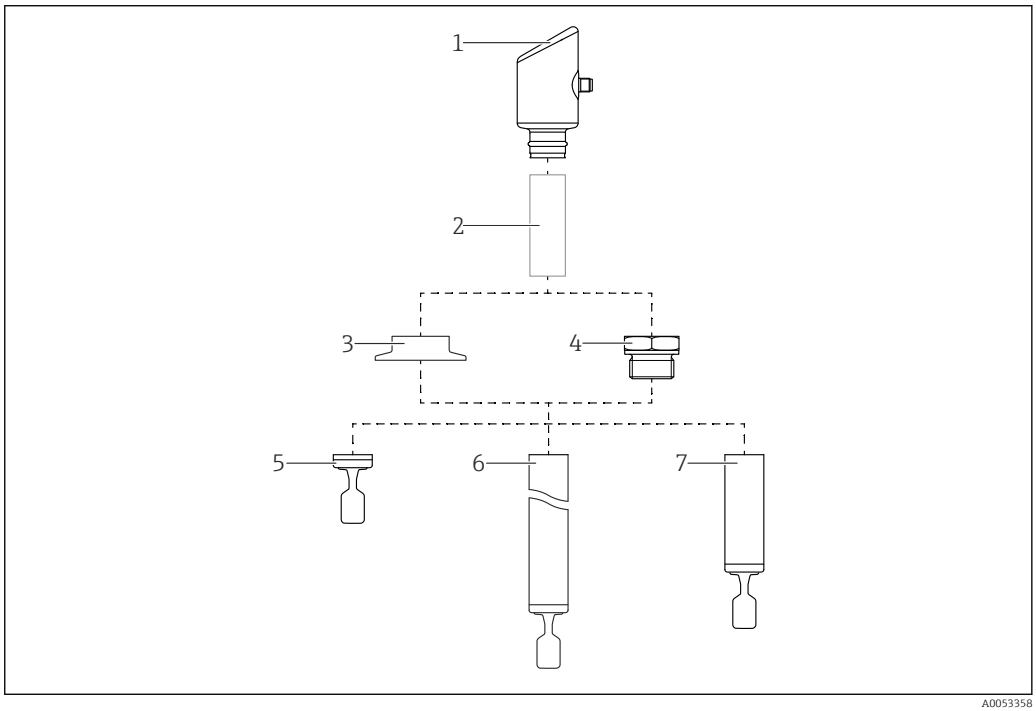
Secure signal transmission via Bluetooth® wireless technology uses an encryption method tested by the Fraunhofer Institute.

- Without the SmartBlue app, the device is not visible via Bluetooth® wireless technology.
- Only one point-to-point connection is established between the device and a smartphone or tablet.
- The Bluetooth® wireless technology interface can be disabled via onsite operation or via SmartBlue.

3 Product description

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

3.1 Product design

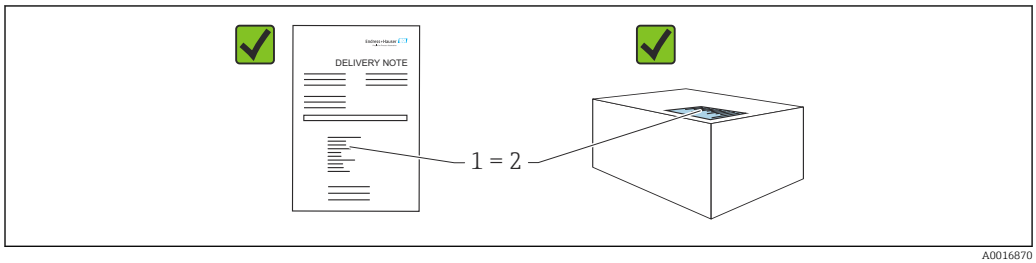


1 Product design

1 Housing with electronics module
2 Temperature spacer, pressure-tight feedthrough (second line of defense), optional
3 Process connection, e.g. clamp/Tri-Clamp
4 Process connection, e.g. thread
5 Compact probe version with tuning fork
6 Pipe extension probe with tuning fork
7 Short pipe version of probe with tuning fork

4 Incoming acceptance and product identification

4.1 Incoming acceptance



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Check the following during incoming acceptance:
- Is the order code on the delivery note (1) identical to the order code on the product sticker (2)?
- Are the goods undamaged?
- Do the data on the nameplate correspond to the order specifications and the delivery note?
- Is the documentation provided?
- If required (see nameplate), are the Safety Instructions (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 identification of the device:
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter the serial numbers from the nameplates in *Device Viewer* (www.endress.com/deviceviewer): all the information about the device is displayed.

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-specific information
- DataMatrix code (information about the device)

Compare the data on the nameplate with your order.

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 the original packaging
- Store the device in clean and dry conditions and protect from damage caused by shocks

Storage temperature

−40 to +85 °C (−40 to +185 °F)

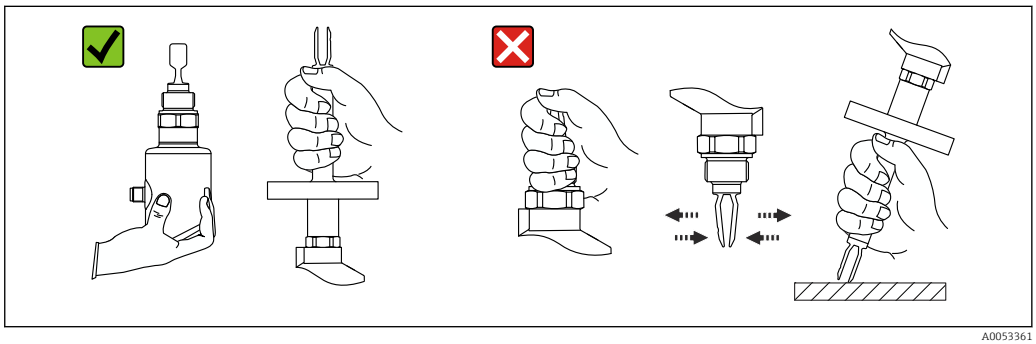
4.3.2 Transporting the product to the measuring point

⚠ WARNING

Incorrect transport!

Housing and tuning fork may become damaged, and there is a risk of injury.

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



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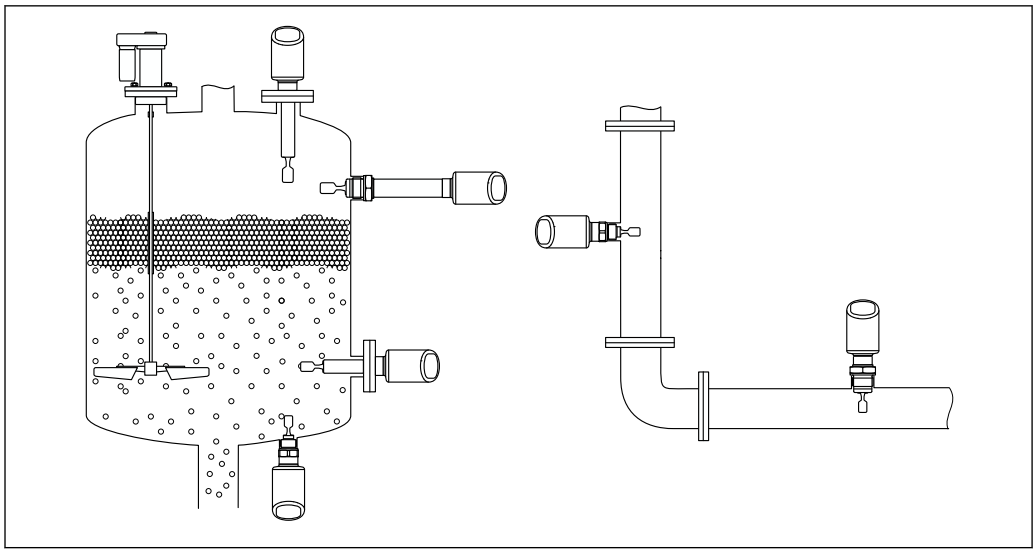
2 *Handling the device*

5 Installation

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



3 *Installation examples for a vessel, tank or pipe*

5.1 Installation requirements

During installation, it is important to ensure that the sealing element used has a permanent operating temperature that corresponds to the maximum temperature of the process.

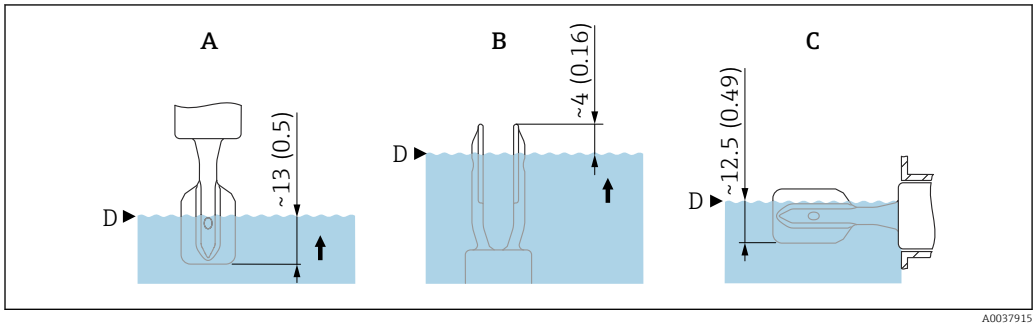
- Devices in North America are intended for indoor use
  Devices are suitable for use in wet environments in accordance with IEC 61010-1
- Protect the housing against impact

5.1.1 Take switch point into consideration

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

Water +23 °C (+73 °F)

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



4 *Typical switch points. Unit of measurement mm (in)*

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

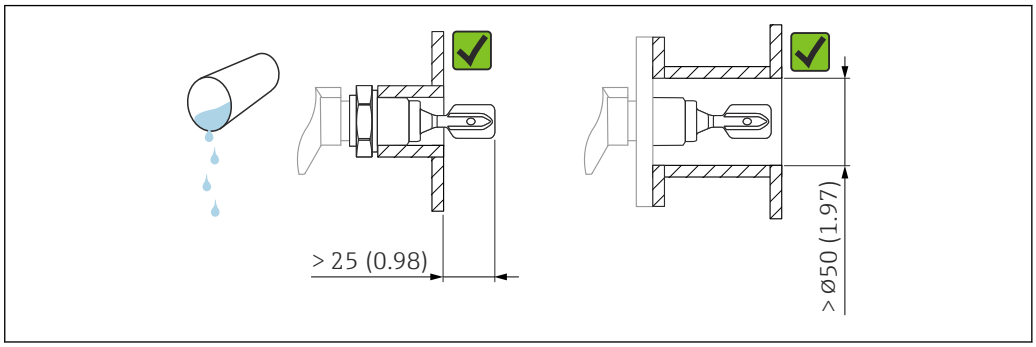
5.1.2 Take viscosity into consideration

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

Low viscosity

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

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



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

High viscosity

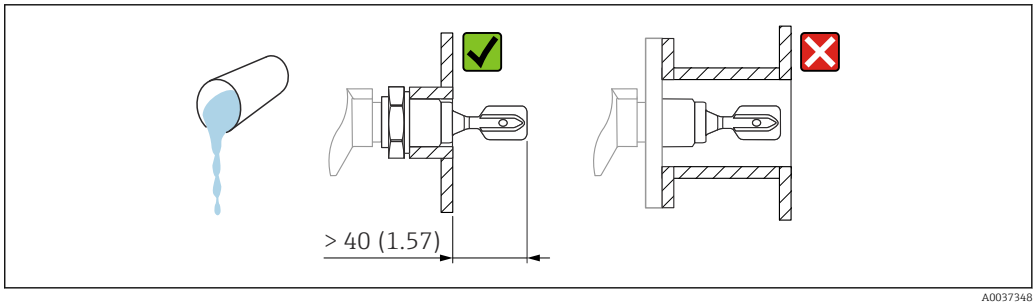
NOTICE

Highly viscous liquids may cause switching delays.

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

High viscosity, e.g. viscous oils: ≤ 10 000 mPa·s

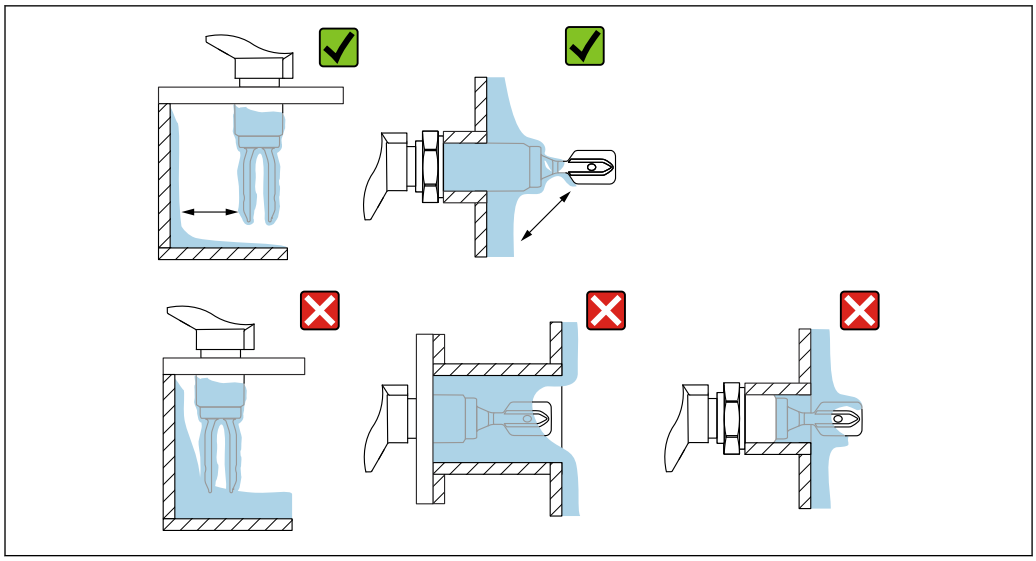
The tuning fork must be located outside the installation socket!



6 *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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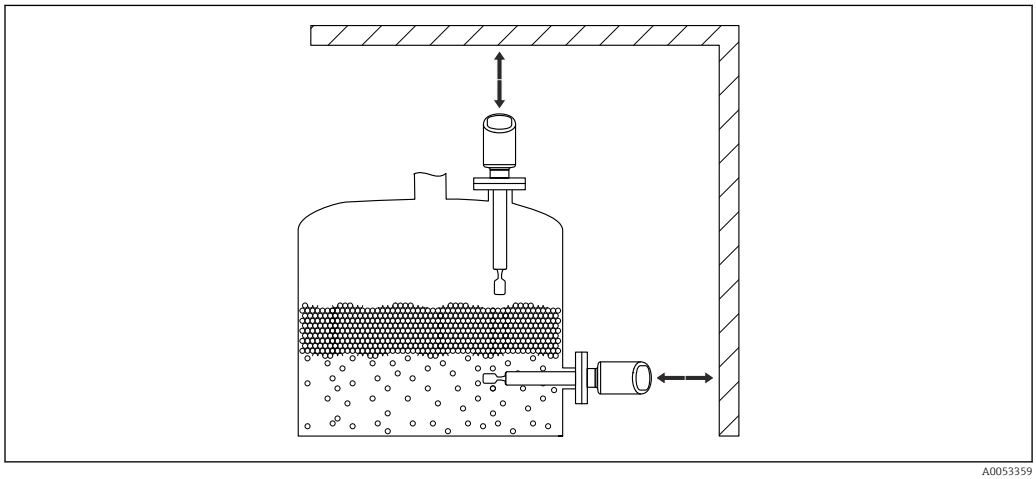
7 *Installation examples for a highly viscous process medium*

5.1.4 Take clearance into consideration

Allow sufficient clearance outside the tank for mounting and electrical connection.



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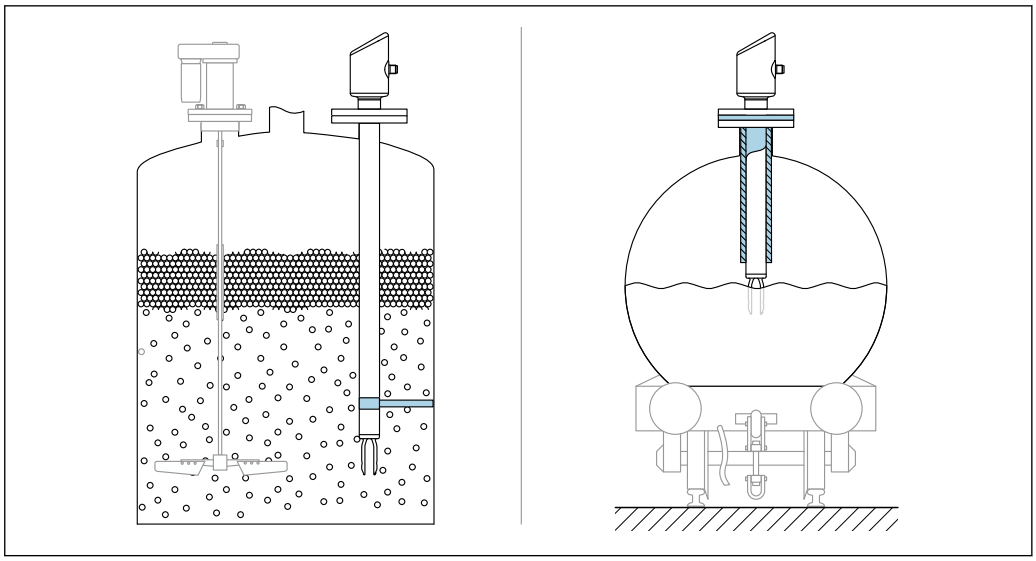
8 *Take clearance into consideration*

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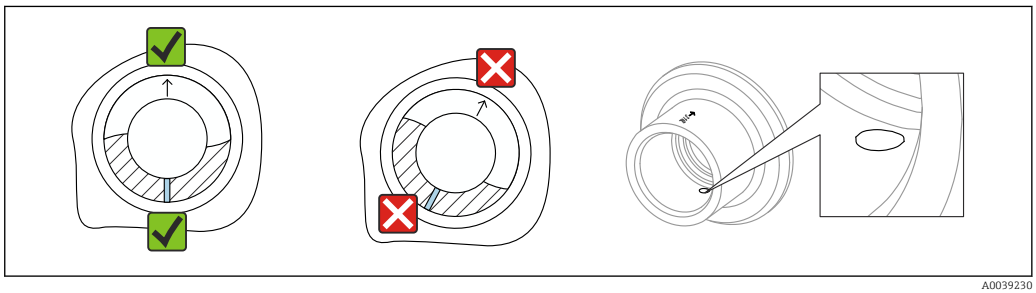
9 *Examples of support in the event of dynamic load*

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.



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10 *Weld-in adapter with leakage hole*

5.2 Installing the device

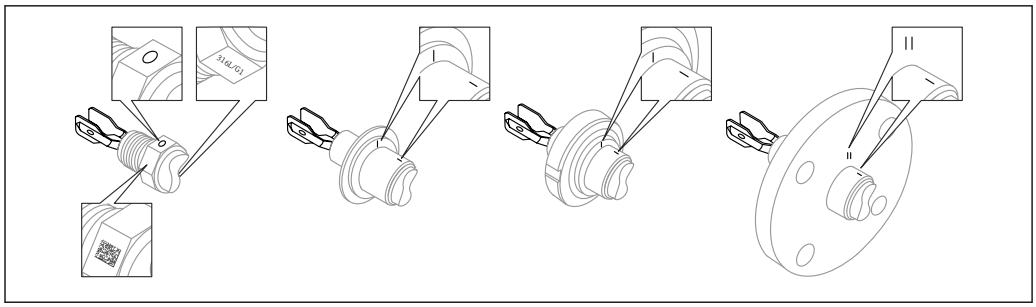
5.2.1 Installation procedure

Align the vibrating fork using the marking

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

- Markings for threaded connections: Circle (material specification/thread designation opposite)
- Markings for flange or clamp connections: Line or double line

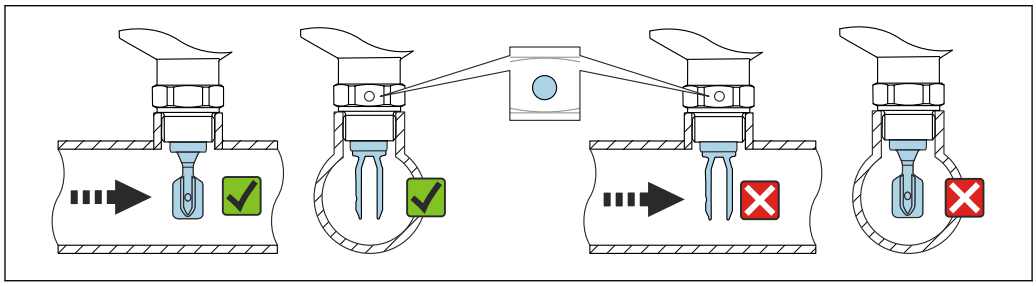
In addition, the threaded connections have a matrix code that is **not** used for alignment.



11 *Position of the vibrating fork when installed horizontally in the vessel using the marking*

Installing the device in piping

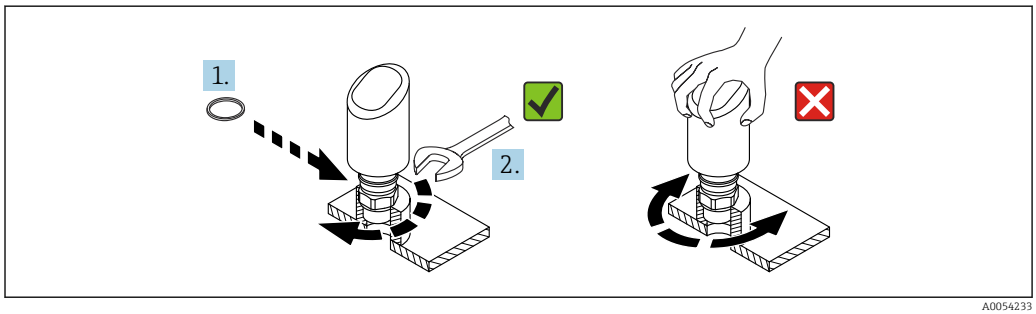
- Flow velocity up to 5 m/s with a viscosity of 1 mPa·s and density of 1 g/cm³ (62.4 lb/ft³) (SGU).
  Check for correct functioning in the event of other process medium conditions.
- The flow will not be significantly impeded if the tuning fork is correctly aligned and the marking is pointing in the direction of flow.
- The marking is visible when installed.



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

Screwing in the device (for process connections with thread)

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



13 *Screwing in the device*

5.3 Post-mounting check

❑ Is the device undamaged (visual inspection)?

❑ Are the measuring point identification and labeling correct (visual inspection)?

❑ Is the device properly secured?

❑ Does the device comply with the measuring point specifications?

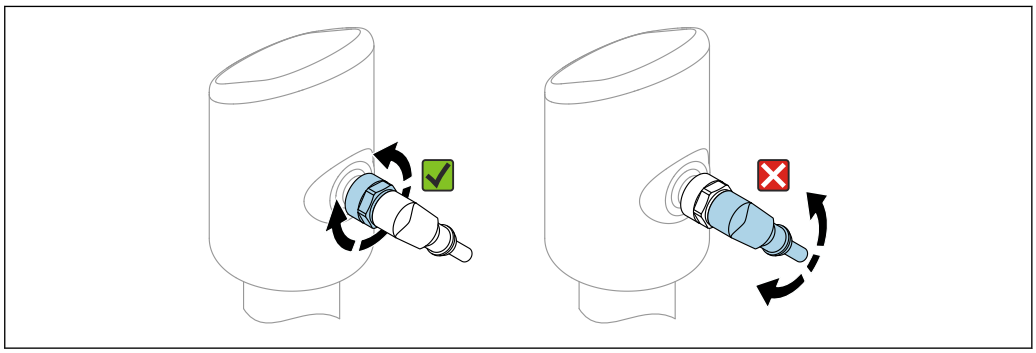
For example:
- Process temperature
- Process pressure
- Ambient temperature
- Measuring range

6 Electrical connection

6.1 Connecting the device

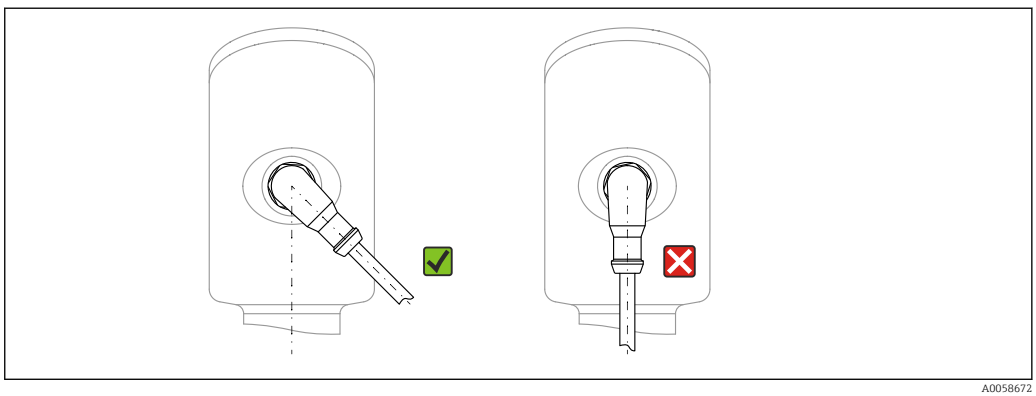
6.1.1 Notes for M12 plug

Turn the plug by the nut only, maximum torque 0.6 Nm (0.44 lbf ft).



14 *M12 plug connection*

Correct alignment of the M12 plug: Approx. 45° to the vertical axis.



15 *Alignment of M12 plug*

6.1.2 Potential equalization

If necessary, establish potential equalization using the process connection or the grounding clamp supplied by the customer.

6.1.3 Supply voltage

DC 12 to 30 V on a DC power unit

The power unit must be safety-approved (e.g. PELV, SELV, Class 2) and must comply with the relevant protocol specifications.

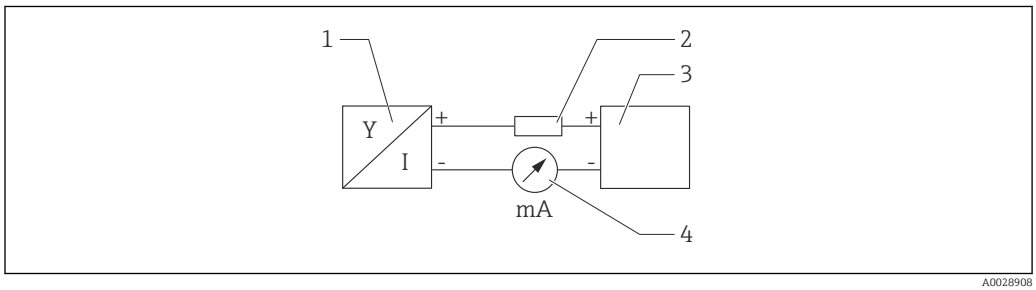
For 4 to 20 mA, the same requirements apply as for HART. A galvanically isolated active barrier must be used for devices approved for use in explosion hazardous areas.

Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.

6.1.4 Power consumption

- Non-hazardous area: To meet device safety specifications according to the IEC 61010 standard, the installation must ensure that the maximum current is limited to 500 mA.
- Hazardous area: The maximum current is restricted to Ii = 100 mA by the transmitter power supply unit when the measuring instrument is used in an intrinsically safe circuit (Ex ia).

6.1.5 4 to 20 mA HART



16 *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 communication resistor of 250 Ω

6.1.6 Overvoltage protection

The device satisfies the IEC 61326-1 product standard (Table 2 Industrial environment). Depending on the type of connection (DC power supply, input line, output line), different test levels are used to prevent transient overvoltages (IEC 61000-4-5 Surge) in accordance with IEC EN 61326-1: Test level for DC power supply lines and IO lines: 1000 V wire to ground.

Overvoltage category

In accordance with IEC 61010-1, the device is intended for use in networks with overvoltage protection category II.

6.1.7 Terminal assignment

⚠ WARNING

Supply voltage might be connected!

Risk of electric shock and/or explosion

- Ensure that no supply voltage is applied when connecting.
- The supply voltage must match the specifications on the nameplate.
- A suitable circuit breaker should be provided for the device in accordance with IEC 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.
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.

⚠ WARNING

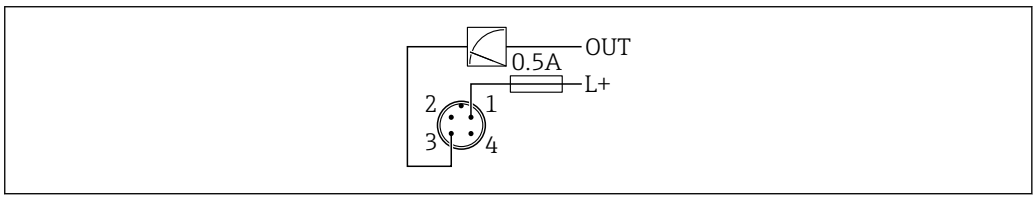
An incorrect connection compromises the electrical safety!

- Non-hazardous area: To meet device safety specifications according to the IEC 61010 standard, the installation must ensure that the maximum current is limited to 500 mA.
- Hazardous area: The maximum current is restricted to Ii = 100 mA by the transmitter power supply unit when the measuring instrument is used in an intrinsically safe circuit (Ex ia).
- When using the device in hazardous areas, comply with the corresponding national standards and the information in the Safety Instructions (XAs).
- All explosion-protection information is provided in separate explosion-protection (Ex) documentation. This Ex documentation can be requested. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.

Connect the device in the following order:

1. Check that the supply voltage corresponds to the supply voltage indicated on the nameplate.
2. Connect the device as indicated in the following diagram.
3. Switch on the supply voltage.

2-wire



1 Supply voltage L+, brown wire (BN)
3 OUT (L-), blue wire (BU)

6.2 Ensuring the degree of protection

For mounted M12 connecting cable: IP66/68/69, NEMA type 4X/6P

NOTICE

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 the intended protection class.

6.3 Post-connection check

❑ Is the device or cable undamaged (visual check)?

❑ Does the cable used comply with the requirements?

❑ Is the mounted cable strain-relieved?

❑ Is the screw connection properly mounted?

❑ Does the supply voltage match the specifications on the nameplate?

❑ No reverse polarity, terminal assignment correct?

❑ If power is supplied: Is the device ready for operation and is the operating status LED lit?

7 Operation options

7.1 Overview of operation options

- Operation via LED indicator operating key
- Operation via Bluetooth® wireless technology
- Operation via Endress+Hauser operating tool
- Operation via handheld, Fieldcare, DeviceCare, AMS and PDM

7.2 Structure and function of the operating menu

The complete operating menu is available via the operating tools (FieldCare, DeviceCare, SmartBlue) in order to make more complex settings on the device.

Wizards help the user to commission the various applications. The user is guided through the individual configuration steps.

7.2.1 Overview of the operating menu

"Guidance" menu

The Guidance main menu contains functions that enable the user to carry out basic tasks quickly, e.g. commissioning. This menu primarily consists of guided wizards and special functions covering multiple areas.

"Diagnostics" menu

Diagnostic information and settings as well as help for troubleshooting.

"Application" menu

Functions for detailed adjustment of the process for optimum integration of the device into the application.

"System" menu

System settings for device management, user administration or safety.

7.2.2 User roles and related access authorization

This device supports 2 user roles: **Maintenance** and **Operator**
- The **Maintenance** user role (as delivered to customer) has read/write access.
- The **Operator** user role has read access only.

The current user role is displayed in the main menu.

The device parameters can be fully configured with the **Maintenance** user role. Afterwards, access to the configuration can be locked by assigning a password. This password acts as an access code and protects device configuration from unauthorized access.

Blocking changes the **Maintenance** user role to the **Operator** user role. The configuration can be accessed again by entering the access code.

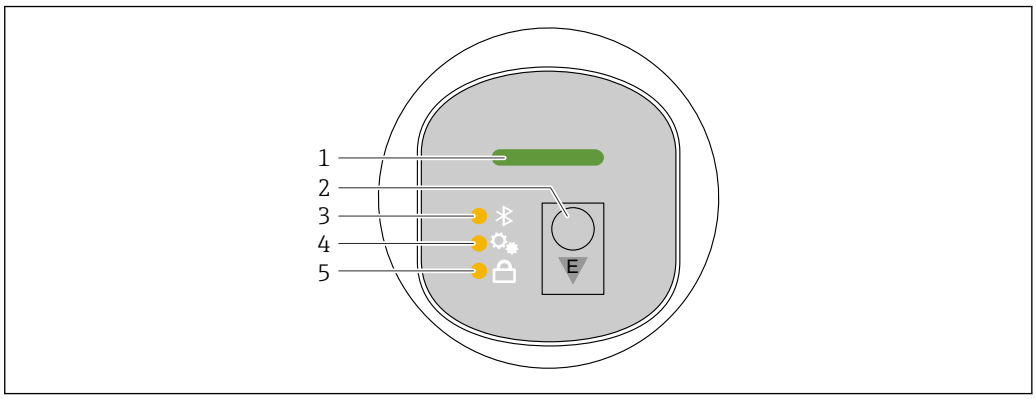
If an incorrect access code is entered, the user obtains the access rights of the**Operator** role.

Assign password, change user role:

▶ Navigation: System → User management

7.3 Access to operating menu via LED indicator

7.3.1 Overview



1 Operating status LED
2 Operating key "E"
3 Bluetooth LED
4 Trigger proof test or function test LED
5 Keypad lock LED

Operation via the LED indicator is not possible if the Bluetooth® connection is enabled.

Operating status LED (1)

See diagnostic events section.

Bluetooth LED (3)

- LED lit: Bluetooth® connection enabled
- LED not lit: Bluetooth® connection disabled or Bluetooth® option not ordered
- LED flashing: Bluetooth® connection established

Trigger proof test or function test LED (4)

LED flashing: Proof test or function test currently running.

See "Proof test function" section

Keypad lock LED (5)

- LED lit: Key locked
- LED not lit: Key released

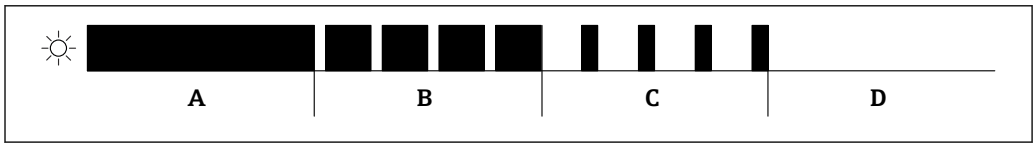
7.3.2 Operating

The device is operated by pressing operating key "E" briefly (< 2 s) or pressing and holding it (> 2 s).

Navigation and LED flashing status

Press operating key "E" briefly: Switch between the functions
Press and hold down operating key "E": Select a function

The LED flashes if a function is selected.
Different flashing states indicate whether the function is active or inactive:



17 *Graphic display of different flashing states of the LEDs when a function is selected*

A Function active
B Function active and selected
C Function inactive and selected
D Function inactive

Disabling the keypad lock

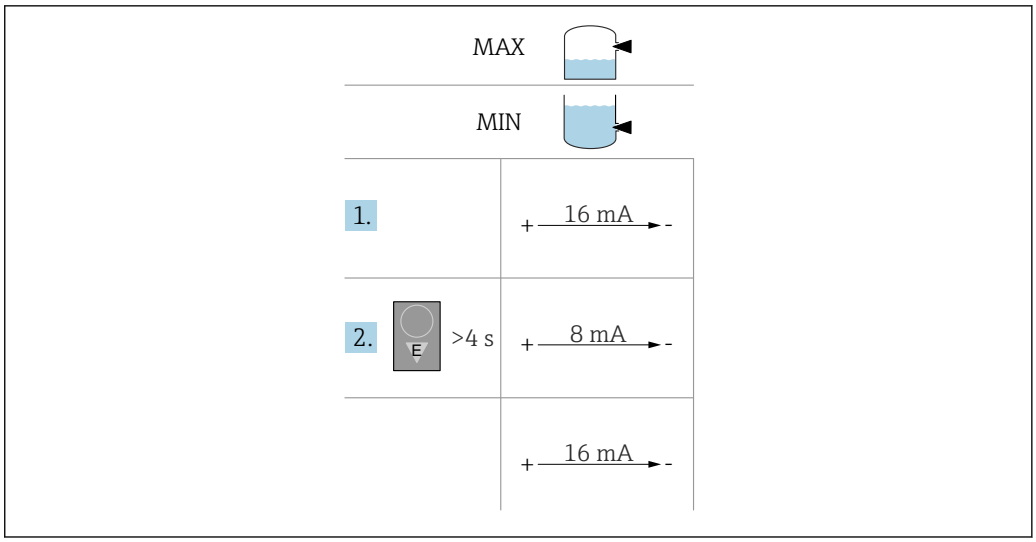
1. Press and hold down operating key "E".
   ↳ Bluetooth LED flashes.
2. Briefly press operating key "E" repeatedly until the keypad lock LED flashes.
3. Press and hold down operating key "E".
   ↳ Keypad lock is disabled.

Enabling or disabling Bluetooth® connection

1. If necessary, disable the keypad lock.
2. Repeatedly press the "E" key briefly until the Bluetooth LED flashes.
3. Press and hold down operating key "E".
   ↳ Bluetooth® connection is enabled (Bluetooth LED is lit) or Bluetooth® is disabled (Bluetooth LED goes out).

7.3.3 Proof test function

For proof testing in safety instrumented systems according to WHG



1. Make sure that no undesired switching operations are triggered!
   ↳ The function test must take place when the device condition is 'OK status' (16 mA): MAX safety and sensor uncovered or MIN safety and sensor covered. If necessary, disable the keypad lock (see "Disabling the keypad lock" section). Repeatedly press operating key "E" key briefly until the 'Trigger proof test or function test' LED flashes.
2. Press and hold down operating key "E" for more than 4 s.
   ↳ The device function check is performed.
   The output changes from the OK status to demand mode (8 mA).
   The 'Trigger proof test or function test' LED flashes while the function check is ongoing.

The proof test or function test LED is lit continuously for 12 s on successful completion of the function check. The keypad lock LED and Bluetooth LED are off. The device switches back to normal operation.

The 'Trigger proof test or function test' LED, keypad lock LED and Bluetooth LED flash quickly for 12 s if the function check is not completed successfully.

If the Bluetooth LED, proof test or function test LED and keypad lock LED flash simultaneously, the proof test cannot be carried out.

The proof test is not performed in demand mode.

Duration of function check: 10 s at least

The function test can also be performed via digital communication interfaces (e.g. HART, DeviceCare, SmartBlue app).

7.4 Access to the operating menu via the operating tool

7.4.1 Connecting the operating tool

Access via the operating tool is possible:

- Via HART communication, e.g. Commubox FXA195
- Via Bluetooth® wireless technology (optional) with the SmartBlue app

FieldCare

Function range

FDT-based plant asset management tool from Endress+Hauser. FieldCare can configure all smart field devices in a system and helps you manage them. By using the status information, FieldCare is also a simple but effective way of checking their status and condition.

Access is via digital communication (Bluetooth, HART communication)

Typical functions:
- Configuration of transmitter parameters
- Loading and saving of device data (upload/download)
- Documentation of the measuring point
- Visualization of the measured value memory (line recorder) and event logbook

For additional information on FieldCare: See Operating Instructions for FieldCare

DeviceCare

Range of functions

Tool to connect and configure Endress+Hauser field devices.

For details, see Innovation Brochure IN01047S.

FieldXpert SMT70, SMT77

The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous (Ex Zone 2) and non-hazardous areas. It is suitable for commissioning and maintenance staff. It manages Endress+Hauser and third-party field instruments with a digital communication interface and documents the progress of the work. The SMT70 is designed as a complete solution. It comes with a pre-installed driver library and is an easy-to-use, touch-enabled tool for managing field devices throughout their entire life cycle.

Technical Information TI01342S

The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.

Technical Information TI01418S

7.4.2 Operation via the SmartBlue app

The device can be operated and configured with the SmartBlue App.

- The SmartBlue App must be downloaded onto a mobile device for this purpose
- For information on the compatibility of the SmartBlue App with mobile devices, see **Apple App Store (iOS devices)** or **Google Play Store (Android devices)**
- Incorrect operation by unauthorized persons is prevented by means of encrypted communication and password encryption
- The Bluetooth® function can be deactivated after initial device setup

18 *QR code for free Endress+Hauser SmartBlue App*

Download and installation:

1. Scan the QR code or enter **SmartBlue** in the search field of the Apple App Store (iOS) or Google Play Store (Android).
2. Install and start the SmartBlue app.
3. For Android devices: enable location tracking (GPS) (not required for iOS devices).
4. Select a device that is ready to receive from the device list displayed.

Login:

1. Enter the user name: admin
2. Enter the initial password: serial number of the device
3. Change the password after logging in for the first time

Notes on the password and reset code
- If the user-defined password is lost, access can be restored via a reset code. The reset code is the serial number of the device in reverse. The original password is once again valid after the reset code has been entered.
- The reset code can also be changed in addition to the password.
- If the user-defined reset code is lost, the password can no longer be reset via the SmartBlue app. Contact Endress+Hauser Service in this case.

8 System integration

8.1 Overview of device description files

- Manufacturer ID: 17 (0x0011)
- Device type ID: 0x11DF
- HART specification: 7.6
- DD files, information and files can be found at:
  - www.endress.com
  - www.fieldcommgroup.org

8.2 Measured variables via HART protocol

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

Device variable	Measured value
The Primary variable (PV) (Primary variable) [1]	The **Level limit detection** option [2]
Secondary variable (SV) (Secondary variable)	The **Sensor frequency** option [3]

Device variable	Measured value
Tertiary variable (TV) (Third variable)	The **State of vibrating fork** option [4]
Quaternary variable (QV) (Quaternary variable)	Sensor temperature

1) Primary variable (PV) is always applied to the current output.
2) **Level limit detection** option is the initial state depending on the fork state (uncovered/covered) and the safety function (MIN/MAX)
3) **Sensor frequency** option is the oscillation frequency of the fork
4) **State of vibrating fork** option describes the fork state (Fork covered/Fork uncovered)

The assignment of the measured values to the device variables can be changed in the following submenu:
Application → HART output → HART output

In a HART Multidrop loop, only one device may use the analog current value for signal transmission. For all other devices in the **"Loop current mode" parameter**, select the **Disable** option.

8.2.1 Device variables and measured values

The following codes are assigned to the device variables at the factory:

The device variables can be queried via HART® command 9 or 33 from a HART® master.

8.2.2 System units

The oscillation frequency is specified in Hz. The temperature can be displayed in °C, °F or K.

9 Commissioning

9.1 Preliminaries

⚠ WARNING

Settings on the current output can result in a safety-related condition (e.g., product overflow)!

- ▶ Check current output settings.
- ▶ The setting of the current output depends on the setting in the **Assign PV** parameter.

9.2 Installation and function check

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

- "Post-mounting check" section
- "Post-connection check" section

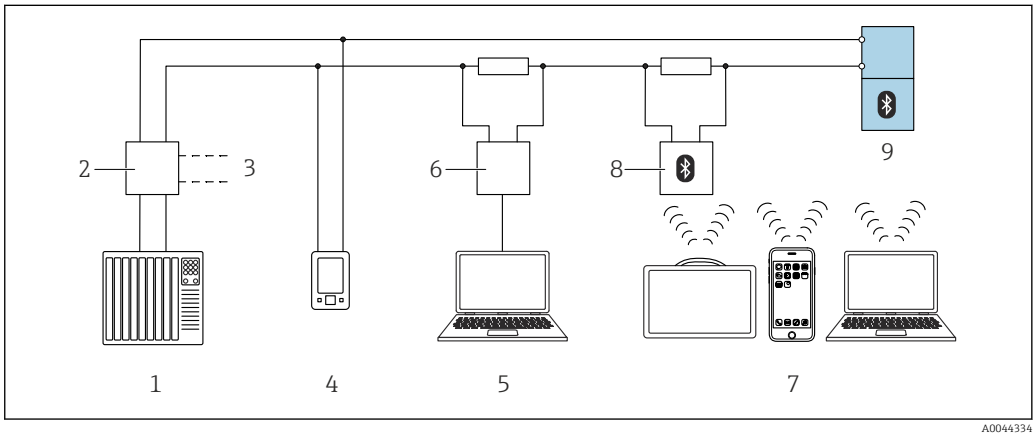
9.3 Overview of commissioning options

- Commissioning with the SmartBlue app
- Commissioning via FieldCare/DeviceCare/Field Xpert
- Commissioning via additional operating tools (AMS, PDM, etc.)

9.4 Commissioning via FieldCare/DeviceCare

1. Download the DTM: http://www.endress.com/download -> Device Driver -> Device Type Manager (DTM)
2. Update the catalog.
3. Click the **Guidance** menu and start the **Commissioning** wizard.

9.4.1 Connecting via FieldCare, DeviceCare and FieldXpert



19 *Options for remote operation via HART protocol*

1 *PLC (programmable logic controller)*
2 *Transmitter power supply unit, e.g. RN42*
3 *Connection for Commubox FXA195 and AMS Trex™ device communicator*
4 *AMS Trex™ device communicator*
5 *Computer with operating tool (e.g. DeviceCare/FieldCare , AMS Device View, SIMATIC PDM)*
6 *Commubox FXA195 (USB)*
7 *Field Xpert SMT70/SMT77, smartphone or computer with operating tool (e.g. DeviceCare)*
8 *Bluetooth modem with connecting cable (e.g. VIATOR)*
9 *Transmitter*

9.5 Commissioning via additional operating tools (AMS, PDM, etc.)

Download the device-specific drivers: https://www.endress.com/en/downloads

For more details, see the help for the relevant operating tool.

9.6 Configuring the device address via software

See "HART address" parameter
Enter the address to exchange data via the HART protocol.
- Guidance → Commissioning → HART address
- Application → HART output → Configuration → HART address
- Default HART address: 0

9.7 Simulation

9.7.1 "Simulation" submenu

Process variables and diagnostic events can be simulated with the **Simulation** submenu.

Navigation: Diagnostics → Simulation

During simulation of the switch output or current output, the device issues a warning message for the duration of the simulation.

9.8 Advanced sensor monitoring

The Advanced sensor monitoring function is enabled by default.

This diagnostic function detects if the oscillation of the sensor is disturbed by external influences, for example:
- Strong vibrations from the outside. (e.g. from pumps)
- Turbulence around the vibrating fork if the sensor is installed incorrectly
- Very high flow velocity in pipes

The device issues a warning if these conditions could affect the oscillation of the sensor. The warning is displayed via the available communication interfaces. The switch output and the current output remain unchanged.

If this warning is already in place when performing a function test (proof test), the warning is converted to a fault. In this case, the device enters the safe state. The fault is not reset until the device is restarted.

The function can be activated or deactivated via the SmartBlue app for example:

Navigation: Diagnostics → Diagnostic settings → Properties → 946 Advanced sensor monitoring

9.9 Protecting settings from unauthorized access

9.9.1 Software locking or unlocking

Locking via password in FieldCare/DeviceCare/SmartBlue app

Access to parameter configuration of the device can be locked by assigning a password. When the device is delivered from the factory, the user role is set to **Maintenance** option. The device parameters can be fully configured with the **Maintenance** option user role. Afterwards, access to the configuration can be locked by assigning a password. The **Maintenance** option switches to the **Operator** option as a result of this locking. The configuration can be accessed by entering the password.

The password is defined under:

System menu **User management** submenu

The user role is changed from the **Maintenance** option to **Operator** option under:

System → User management

Deactivating the lock via FieldCare/DeviceCare/SmartBlue app

After entering the password, you can enable parameter configuration of the device as an **Operator** option with the password. The user role then changes to **Maintenance** option.

If necessary, the password can be deleted in User management: System → User management

10 Operation

10.1 Reading off the device locking status

10.1.1 LED indicator

Keypad lock LED
- LED lit: Device is locked
- LED not lit: Device is unlocked

10.1.2 Operating tool

Operating tool (FieldCare/DeviceCare/FieldXpert/SmartBlue app)

Navigation: System → Device management → Locking status

10.2 Reading off measured values

The measured values can be read off via the operating tool.

Navigation: **Application** menu → **Measured values** submenu

10.3 Adapting the device to process conditions

The following menus are available for this purpose:
- Basic settings in the **Guidance** menu
- Advanced settings in:
  - **Diagnostics** menu
  - **Application** menu
  - **System** menu

For details, see the "Description of device parameters" documentation.

10.3.1 Level limit detection

Operating as a point level switch in the 8/16 mA mode.

Output of point level:
- 8 mA (demand mode: MIN uncovered or MAX covered)
- 16 mA (OK status: MIN covered or MAX uncovered)

1. Navigation: Application → Sensor → Sensor configuration
2. Set the Mode of operation to Level limit detection.
3. Set the Safety function to MIN (dry-running prevention) or MAX (overfill protection), according to the application.
4. Set the **Density setting** parameter according to the application (> 0.4 g/cm³ (> 25.0 lb/ft³), > 0.5 g/cm³ (> 31.2 lb/ft³), > 0.7 g/cm³ (> 43.7 lb/ft³)).
5. Optionally: Set the **Switching delay uncovered to covered** parameter and the **Switching delay covered to uncovered** parameter.

10.3.2 Sensor frequency

Continuous operation in the 4 to 20 mA mode. Loop current proportional to oscillation frequency of fork.

1. Navigation: Application → Sensor → Sensor configuration

2. Set the **Mode of operation** parameter to the **Sensor frequency** option.
3. Set the **Density setting** parameter according to the application (> 0.4 g/cm³ (> 25.0 lb/ft³), > 0.5 g/cm³ (> 31.2 lb/ft³), > 0.7 g/cm³ (> 43.7 lb/ft³)).
   ↳ This is used to ensure that the **State of vibrating fork** parameter (covered/uncovered) continues to be displayed correctly.
4. Navigation: Guidance → Commissioning
5. Set the **Lower range value output** parameter to the frequency that should correspond to a 4 mA output current.
6. Set the **Upper range value output** parameter to the frequency that should correspond to a 20 mA output current.

10.4 Heartbeat Technology (optional)

10.4.1 Heartbeat Verification

"Heartbeat Verification" wizard
This wizard is used to start an automatic verification of the device functionality. The results can be documented as a verification report.
- The wizard can be used via the operating tools
- The wizard guides the user through the entire process for creating the verification report

10.4.2 Heartbeat Verification/Monitoring

The **Heartbeat** submenu is only available during operation via FieldCare, DeviceCare or the SmartBlue app. The submenu contains the wizards that are available with the Heartbeat Verification and Heartbeat Monitoring application packages.

Documentation on the Heartbeat Technology: Endress+Hauser website: www.endress.com → Downloads.

10.4.3 Mode of medium detection

Standard setting of the "Mode of operation" (factory setting): "Level limit detection" of liquids. This setting is suitable for most applications.

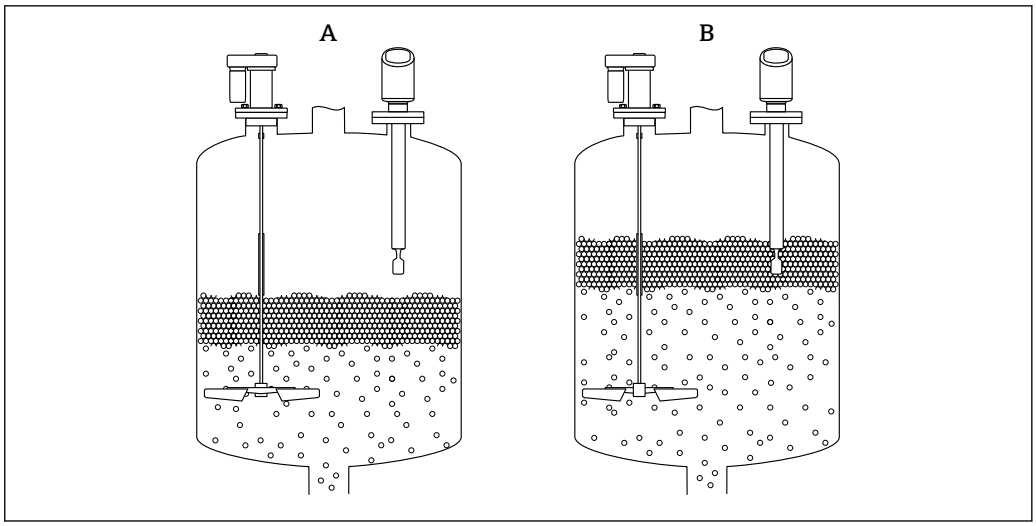
The following options can be selected in combination with the Heartbeat Verification + Monitoring application package:
- Detect foam
- Ignore foam

"Detect foam" option

Area of application: point level measurement in liquids with foam generation. The device detects the foam and switches as soon as the vibrating fork is immersed in the foam.
Detection of light foams, for example:
- Beer foam
- Milk foam

Influences on switching behavior:
- Particularly large air bubbles in the foam
- Significantly reduced liquid content in the foam
- Change in the properties of the foam during operation

Application in accordance with the WHG (German Water Resources Act) is not possible in this mode.



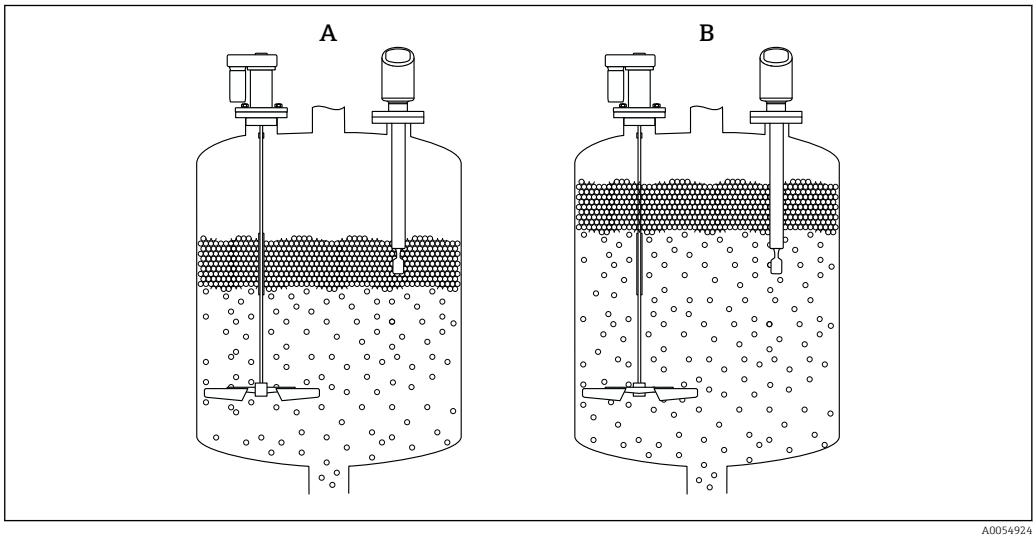
20 *Functionality for Detect foam*

A uncovered
B covered

"Ignore foam" option

Area of application: point level measurement in liquids with foam generation. The device only switches when immersed in a homogeneous liquid. In this setting, the device does not react to the foam (the foam is ignored).

Application in accordance with the WHG (German Water Resources Act) is not possible in this mode.



21 *Functionality for Ignore foam*

A uncovered
B covered

10.5 Proof test for WHG devices (optional) [1)]

The "Proof test" module contains the **Proof test** wizard required at appropriate intervals for the following applications: WHG (German Water Resources Act):
- The wizard can be used via the operating tools (SmartBlue app, DTM).
- The wizard guides the user through the entire process for creating the verification report.
- The verification report can be saved as a PDF file.

10.6 Displaying the measured value history

See Special Documentation for SD Heartbeat Technology.

11 Diagnostics and troubleshooting

11.1 General troubleshooting

11.1.1 General errors

Device not starting
- Possible cause: Supply voltage does not match the specification on the nameplate
  Remedial action: Apply the correct voltage
- Possible cause: The polarity of the supply voltage is wrong
  Remedial action: Correct the polarity
- Possible cause: Load resistance too high
  Remedial action: Increase the supply voltage to reach the minimum terminal voltage

LEDs flashing when device is started
Possible cause: Electromagnetic interference influence
Remedial action: Check grounding of the device

HART communication not working
- Possible cause: Communication resistor missing or incorrectly installed
  Remedial action: Install the communication resistor (250 Ω) correctly
- Possible cause: Commubox is connected incorrectly
  Remedial action: Connect Commubox correctly

11.1.2 Error - SmartBlue operation with Bluetooth®

Operation via SmartBlue is only possible on devices that have a display with Bluetooth (optionally available).

1) Only available for devices with WHG approval

Device is not visible in the live list
- Possible cause: No Bluetooth connection available
  Remedial action: Enable Bluetooth in the field device via display or software tool and/or in the smartphone/tablet
- Possible cause: Bluetooth signal outside range
  Remedial action: Reduce distance between field device and smartphone/tablet
  The connection has a range of up to 25 m (82 ft)
  Operating radius with intervisibility 10 m (33 ft)
- Possible cause: Geopositioning is not enabled on Android devices or is not permitted for the SmartBlue app
  Remedial action: Enable/permit the geopositioning service on Android device for the SmartBlue app
- Display does not have Bluetooth

Device appears in the live list but a connection cannot be established
- Possible cause: The device is already connected with another smartphone/tablet via Bluetooth
  Only one point-to-point connection is permitted
  Remedial action: Disconnect the smartphone/tablet from the device
- Possible cause: Incorrect user name and password
  Remedial action: The standard user name is "admin" and the password is the device serial number indicated on the device nameplate (only if the password was not changed by the user beforehand)
  If the password has been forgotten, contact Endress+Hauser Service (www.addresses.endress.com)

Connection via SmartBlue not possible
- Possible cause: Incorrect password entered
  Remedial action: Enter the correct password, paying attention to lower/upper case
- Possible cause: Forgotten password
  If the password has been forgotten, contact Endress+Hauser Service (www.addresses.endress.com)

Login via SmartBlue not possible
- Possible cause: Device is being put into operation for the first time
  Remedial action: Enter the user name "admin" and the password (device serial number), paying attention to lower/upper case
- Possible cause: The electric current and voltage are not correct.
  Remedial action: Increase the supply voltage.

Device cannot be operated via SmartBlue
- Possible cause: Incorrect password entered
  Remedial action: Enter the correct password, paying attention to lower/upper case
- Possible cause: Forgotten password
  If the password has been forgotten, contact Endress+Hauser Service (www.addresses.endress.com)
- Possible cause: **Operator** option has no authorization
  Remedial action: Change to the **Maintenance** option

11.1.3 Measures

For information on measures in the case of an error message: See "Diagnostic list" section.

If the measures do not rectify the fault, contact your Endress+Hauser office.

11.1.4 Additional tests

If no clear cause of the error can be identified or the source of the problem can be both the device and the application, the following additional tests can be performed:

1. Check that the device concerned is functioning correctly. Replace the device if the digital value does not correspond to the expected value.
2. Switch on simulation and check the current output. Replace the device if the current output does not correspond to the simulated value.
3. Reset the device to the factory setting.

11.1.5 Behavior of the device in the event of a power outage

In the event of an unexpected power outage, the dynamic data are stored permanently (according to NAMUR NE 032).

11.1.6 Behavior of the current output in the event of a failure

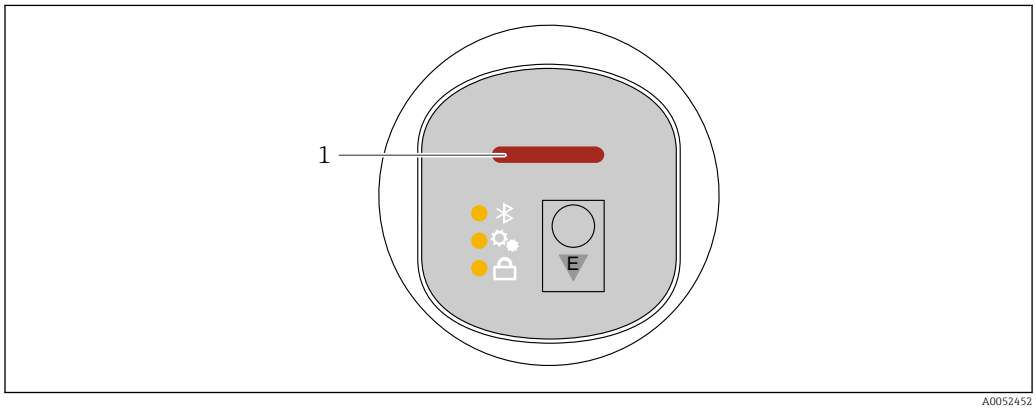
The behavior of the current output in the event of failures is defined by the **Failure behavior current output** parameter.

The device does not have a DIP switch

Parameter overview with brief description

Parameter	Description	Selection / User entry
Failure behavior current output	Defines which current the output assumes in the case of an error. Min.: < 3.6 mA Max.: > 21.5 mA Note: The hardware DIP Switch for alarm current (if available) has priority over software setting.	▪ Min. ▪ Max.
Failure current	Enter current output value in alarm condition.	21.5 to 23 mA

11.2 Diagnostic information on operating status LED



1 Operating status LED

Minimum detection:
- **Yellow LED** (8 mA) = vibrating fork uncovered
- Green LED (16 mA) = vibrating fork covered
- **Red LED** (< 3.6 mA/> 21 mA) = fault

Maximum detection:
- **Green LED** (16 mA) = vibrating fork uncovered
- **Yellow LED** (8 mA) = vibrating fork covered
- **Red LED** (< 3.6 mA/> 21 mA) = fault

LED flashing = a function is currently running:
- In the case of Bluetooth connection (SmartBlue app)
- When searching for a device (Squawk HART) or device identification
  LED flashes independently of the LED color currently displayed.

11.3 Diagnostic event in the operating tool

If a diagnostic event has occurred in the device, the status signal appears in the top left status area of the operating tool together with the corresponding symbol for the event level according to NAMUR NE 107:

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)

Click the status signal to see the detailed status signal.

The diagnostic events and remedial measures can be printed from the **Diagnostic list** submenu.

11.4 Adapting the diagnostic information

The event level can be configured:

Navigation: Diagnostics → Diagnostic settings → Configuration

11.5 Pending diagnostic messages

Pending diagnostic messages can be displayed in the **Active diagnostics** parameter.

Navigation: Diagnostics → Active diagnostics

11.6 Diagnostic list

All of the diagnostic messages currently pending can be displayed in the **Diagnostic list** submenu.

Navigation: Diagnostics → Diagnostic list

11.6.1 List of diagnostic events

Some of the remedial actions of the generic software are not applicable (e.g. electronics replacement is not possible).

The device must be replaced in these cases.

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
Diagnostic of sensor				
004	Sensor defective	1. Restart device 2. Replace electronics 3. Replace device	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
007	Sensor defective	1. Check fork 2. Replace device	F	Alarm
042	Sensor corroded	1. Check fork 2. Replace device	F	Alarm
049	Sensor corroded	1. Check fork 2. Replace device	M	Warning [1)]
061	Sensor electronics faulty	Replace electronics	F	Alarm
062	Sensor connection faulty	1. Check Main to sensor connection 2. Replace electronics	F	Alarm
081	Sensor initialization faulty	1. Restart device 2. Contact service	F	Alarm
Diagnostic of electronic				
201	Electronics faulty	1. Restart device 2. Replace electronics	F	Alarm
203	HART Device Malfunction	Check device specific diagnosis.	S	Warning
204	HART Electronic Defect	Check device specific diagnosis.	F	Alarm
242	Firmware incompatible	1. Check software 2. Flash or change main electronic module	F	Alarm
252	Module incompatible	1. Check if correct electronic module is plugged 2. Replace electronic module	F	Alarm
270	Main electronics defective	Replace main electronics or device.	F	Alarm
272	Main electronics faulty	1. Restart device 2. Contact service	F	Alarm
273	Main electronics defective	Replace main electronics or device.	F	Alarm
282	Data storage inconsistent	Restart device	F	Alarm
283	Memory content inconsistent	1. Restart device 2. Contact service	F	Alarm
287	Memory content inconsistent	1. Restart device 2. Contact service	M	Warning
388	Electronics and HistoROM defective	1. Restart device 2. Replace electronics and HistoROM 3. Contact service	F	Alarm
Diagnostic of configuration				
410	Data transfer failed	1. Retry data transfer 2. Check connection	F	Alarm
412	Processing download	Download active, please wait	C	Warning
420	HART Device Configuration Locked	Check device locking configuration.	S	Warning
421	HART Loop Current fixed	Check Multi-drop mode or current simulation.	S	Warning
431	Trim required	Carry out trim	C	Warning

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
437	Configuration incompatible	1. Update firmware 2. Execute factory reset	F	Alarm
438	Dataset different	1. Check dataset file 2. Check device parameterization 3. Download new device parameterization	M	Warning
441	Current output 1 saturated	1. Check process 2. Check current output settings	S	Warning
484	Failure mode simulation active	Deactivate simulation	C	Alarm
485	Process variable simulation active	Deactivate simulation	C	Warning
491	Current output simulation active	Deactivate simulation	C	Warning
495	Diagnostic event simulation active	Deactivate simulation	S	Warning
538	Configuration Sensor Unit invalid	1. Check sensor configuration 2. Check device configuration	M	Warning
Diagnostic of process				
801	Supply voltage too low	Increase supply voltage	F	Alarm
802	Supply voltage too high	Decrease supply voltage	S	Warning
805	Loop current faulty	1. Check wiring 2. Replace electronics or device	F	Alarm
806	Loop diagnostics	1. Only with a passive I/O: Check supply voltage of current loop. 2. Check wiring and connections.	M	Warning [1)]
807	No Baseline due to insuf. volt. at 20 mA	Increase supply voltage	M	Warning
825	Electronics temperature out of range	1. Check ambient temperature 2. Check process temperature	S	Warning
826	Sensor temperature out of range	1. Check ambient temperature 2. Check process temperature	S	Warning [1)]
842	Process limit	1. Check process density 2. Check fork	F	Alarm
846	HART Non-Primary Variable Out of Limit	Check device specific diagnosis.	S	Warning
847	HART Primary Variable Out of Limit	Check device specific diagnosis.	S	Warning
848	HART Device Variable Alert	Check device specific diagnosis.	S	Warning
900	Process alert frequency too low	Check process conditions	M	Warning [1)]
901	Process alert frequency too high	Check process conditions	M	Warning [1)]
946	Vibration detected	Check installation	S	Warning

1) Diagnostic behavior can be changed.

11.7 Event logbook

11.7.1 Event history

The **"Event logbook" submenu** provides a chronological overview of the event messages that have occurred [2)].

Navigation: Diagnostics → Event logbook

A maximum of 100 event messages can be displayed in chronological order.

The event history includes entries for:
- Diagnostic events
- Information events

In addition to the operating time when the event occurred, each event is also assigned a symbol that indicates whether the event has occurred or is finished:
- Diagnostic event
  - ⊕: Occurrence of the event
  - ⊖: End of the event
- Information event
  ⊕: Occurrence of the event

11.7.2 Filtering the event logbook

Filters can be used to determine which category of event messages is displayed in the **Event logbook** submenu.

Navigation: Diagnostics → Event logbook

Filter categories

- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information

11.7.3 Overview of information events

Not all of the following information events occur.

Info number	Info name
I1000	--------(Device ok)
I1079	Sensor changed
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I11074	Device verification active
I1110	Write protection switch changed
I11104	Loop diagnostics
I11284	DIP MIN setting to HW active

2) If the device is operated via FieldCare, the event list can be displayed using the FieldCare function "Event List".

Info number	Info name
I11285	DIP SW setting active
I1151	History reset
I1154	Reset terminal voltage min/max
I1155	Reset electronics temperature
I1157	Memory error event list
I1256	Display: access status changed
I1264	Safety sequence aborted
I1335	Firmware changed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1440	Main electronic module changed
I1444	Device verification passed
I1445	Device verification failed
I1461	Sensor verification failed
I1512	Download started
I1513	Download finished
I1514	Upload started
I1515	Upload finished
I1551	Assignment error fixed
I1552	Failed: Main electronic verification
I1554	Safety sequence started
I1555	Safety sequence confirmed
I1556	Safety mode off
I1956	Reset

11.8 Resetting the device

11.8.1 Reset via digital communication

The device can be reset with the **Device reset** parameter.

Navigation: System → Device management

Any customer-specific configuration carried out at the factory is not affected by a reset (customer-specific configuration remains).

11.8.2 Resetting the password via the operating tool

Enter a code to reset the current "Maintenance" password.
The code is delivered by your local support.

Navigation: System → User management → Reset password → Reset password

For details see the "Description of device parameters" documentation.

11.9 Device information

All device information is contained in the **Information** submenu.

Navigation: System → Information

For details see the "Description of device parameters" documentation.

11.10 Firmware history

11.10.1 Version

01.00.00
Initial software

12 Maintenance

12.1 Maintenance work

12.1.1 Exterior cleaning

The cleaning agents used should not corrode the surface and the seals.

The following cleaning agents can be used:

- Ecolab P3 topaktive 200
- Ecolab P3 topaktive 500
- Ecolab P3 topaktive OKTO
- Ecolab P3 topax 66
- Ecolab TOPAZ AC5
- 30 % H_2O_2 solution (vaporisation)

Observe the degree of protection of the device.

13 Repair

13.1 General notes

13.1.1 Repair concept

The Endress+Hauser repair concept is devised in such a way that repairs can only be carried out through device replacement.

13.1.2 Replacing a device

After the device is replaced, previously saved parameters can be copied to the newly installed device.

After an entire device has been replaced, the parameters can be downloaded to the device again via the communication interface. The data must have been uploaded to the PC or the SmartBlue app beforehand using the "FieldCare/DeviceCare" software.

13.2 Return

The requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the web page for information:
   https://www.endress.com/support/return-material
   ↳ Select the region.
2. If returning the device, pack the device in such a way that it is reliably protected against impact and external influences. The original packaging offers the best protection.

13.3 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 the manufacturer for disposal under the applicable conditions.

14 Accessories

Accessories currently available for the product can be selected via the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Spare parts & Accessories**.

14.1 Device-specific accessories

14.1.1 M12 socket

M12 socket, straight
- Material:
  Body: PA; union nut: stainless steel; seal: EPDM
- Degree of protection (fully locked): IP69
- Order number: 71638191

M12 socket, elbowed
- Material:
  Body: PA; union nut: stainless steel; seal: EPDM
- Degree of protection (fully locked): IP69
- Order number: 71638253

14.1.2 Cables

Cable 4 x 0.34 mm^2 (20 AWG) with M12 socket, elbowed, screw plug, length 5 m (16 ft)
- Material: body: TPU; union nut: nickel-plated die-cast zinc; cable: PVC
- Degree of protection (fully locked): IP68/69
- Order number: 52010285
- Wire colors
  - 1 = BN = brown
  - 2 = WT = white
  - 3 = BU = blue
  - 4 = BK = black

14.1.3 Welding neck, process adapter and flange

For details, refer to TI00426F/00/EN "Weld-in adapters, process adapters and flanges".

14.2 DeviceCare SFE100

Configuration tool for IO-Link, HART, PROFIBUS and FOUNDATION Fieldbusfield devices
DeviceCare is available for download free of charge at www.software-products.endress.com. You need to register in the Endress+Hauser software portal to download the application.

Technical Information TI01134S

14.3 FieldCare SFE500

FDT-based plant asset management tool
It can configure all intelligent field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.

Technical Information TI00028S

14.4 Device Viewer

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

14.5 Field Xpert SMT70

Universal, high-performance tablet PC for device configuration in Ex Zone 2 and non-Ex areas

For details, see "Technical Information" TI01342S

14.6 Field Xpert SMT77

Universal, high-performance tablet PC for device configuration in Ex Zone 1 areas

For details, see "Technical Information" TI01418S

14.7 SmartBlue app

Mobile app for easy configuration of devices on site via Bluetooth® wireless technology.

15 Technical data

15.1 Output

15.1.1 Output signal

SIO

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

Continuous operation

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

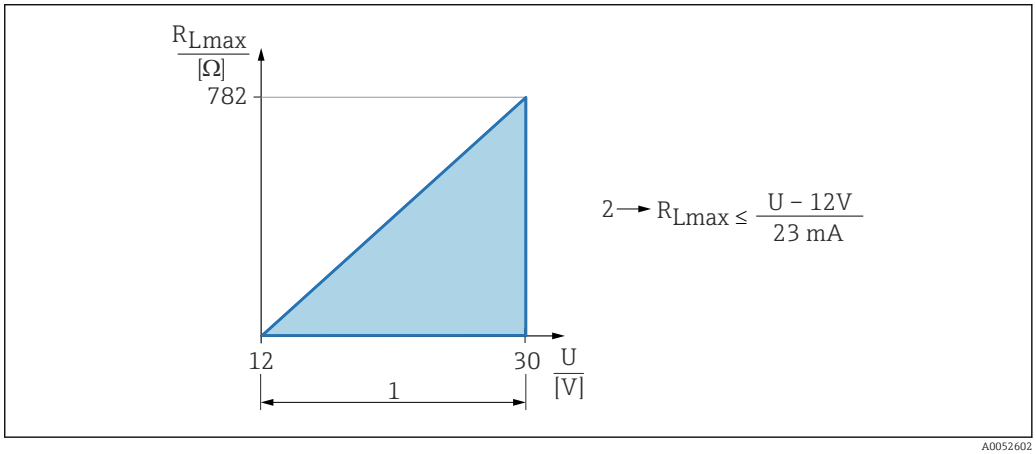
The current output offers a choice of three different operating modes:
- 4.0 to 20.5 mA
- NAMUR NE 43: 3.8 to 20.5 mA (factory setting)
- US mode: 3.9 to 20.5 mA

15.1.2 Signal on alarm for devices with current output

Current output
Signal on alarm in accordance with NAMUR recommendation NE 43.
- Max. alarm: can be set from 21.5 to 23 mA
- Min. alarm: < 3.6 mA (factory setting)

15.1.3 Load

In order to guarantee sufficient terminal voltage, a maximum load resistance R_L (including line resistance) must not be exceeded, depending on the supply voltage U of the supply unit.



1 Power supply 12 to 30 V
2 R_{Lmax} maximum load resistance
U Supply voltage

If load is too great:
- Failure current is indicated and error message is displayed (indication: MIN alarm current)
- Periodic checking to establish if it is possible to quit fault state

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

15.1.4 Damping

A damping affects all continuous outputs. Damping can be enabled as follows:
- Via Bluetooth, handheld terminal or PC with operating program, continuous from 0 to 999 s, in steps of 0.1 s
- Factory setting: 1 s (can be configured from 0 to 999 s)

15.1.5 Ex connection data

See the separate technical documentation (Safety Instructions (XA)) on www.endress.com/download.

15.1.6 Protocol-specific data

Manufacturer ID:
17(0x0011)

Device type ID:
0x11DF

Device revision:
1

HART specification:
7.6

DD version:
1

Device description files (DTM, DD)
Information and files available at:
- www.endress.com
  On the product page for the device: Documents/Software → Device drivers
- www.fieldcommgroup.org

HART load:
Min. 250 Ω

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

Device variable	Measured value
Primary variable (PV) [1]	Level limit detection [2]
Secondary variable (SV)	Sensor frequency [3]
Tertiary variable (TV)	State of vibrating fork [4]
Quaternary variable (QV)	Sensor temperature

1) The PV is always applied to the current output.
2) Level limit detection is the initial state depending on the fork state (uncovered/covered) and the safety function (MIN/MAX)
3) Sensor frequency is the oscillation frequency of the fork
4) State of vibrating fork describes the fork state (Fork covered/Fork uncovered)

Choice of HART device variables
- Level limit detection
- Sensor frequency
- State of vibrating fork
- Sensor temperature
- Electronics temperature
- Measured current [3)]
- Terminal voltage [3)]
- Not used

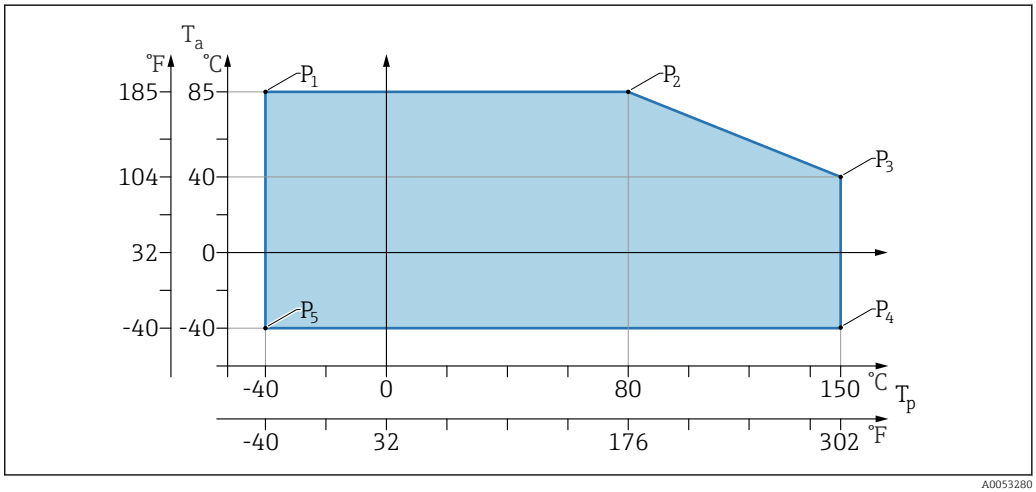
15.2 Environment

15.2.1 Ambient temperature range

–40 to +85 °C (–40 to +185 °F)

The permitted ambient temperature is reduced at higher process temperatures.

The following information only takes functional aspects into consideration. Additional restrictions may apply for certified device versions.



22 *Ambient temperature T_a depending on the process temperature T_p*

P	T_p	T_a
P1	–40 °C (–40 °F)	+85 °C (+185 °F)
P2	+80 °C (+176 °F)	+85 °C (+185 °F)
P3	+150 °C (+302 °F)	+40 °C (+77 °F)
P4	+150 °C (+302 °F)	–40 °C (–40 °F)
P5	–40 °C (–40 °F)	–40 °C (–40 °F)

15.2.2 Storage temperature

–40 to +85 °C (–40 to +185 °F)

15.2.3 Operating height

Up to 5 000 m (16 404 ft) above sea level

3) Visible depending on the order options or device settings

15.2.4 Climate class

According to IEC 60068-2-38 test Z/AD (relative humidity 4 to 100 %).

15.2.5 Degree of protection

Test as per IEC 60529 Edition 2.2 2013-08/ DIN EN 60529:2014-09 and NEMA 250-2014

For mounted M12 connecting cable: IP66/68/69, NEMA type 4X/6P

/IP68,: (1.83 mH_2O for 24 h))

15.2.6 Pollution degree

Pollution degree 2 in accordance with IEC 61010-1.

15.2.7 Vibration resistance

- Stochastic noise (random sweep) as per DIN EN 60068-2-64 Case 2/ IEC 60068-2-64 Case 2
- Guaranteed for 5 to 2 000 Hz: 1.25 $(m/s^2)^2/Hz$, ~ 5 g

15.2.8 Shock resistance

- Test standard: IEC 60068-2-27 Case 2
- Shock resistance: 30 g (18 ms) in all 3 axes

15.2.9 Electromagnetic compatibility (EMC)

- Electromagnetic compatibility as per IEC 61326 series and NAMUR recommendation EMC (NE21)
- Maximum deviation under interference influence: < 0.5 %

For more details refer to the EU Declaration of Conformity.

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www.addresses.endress.com

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