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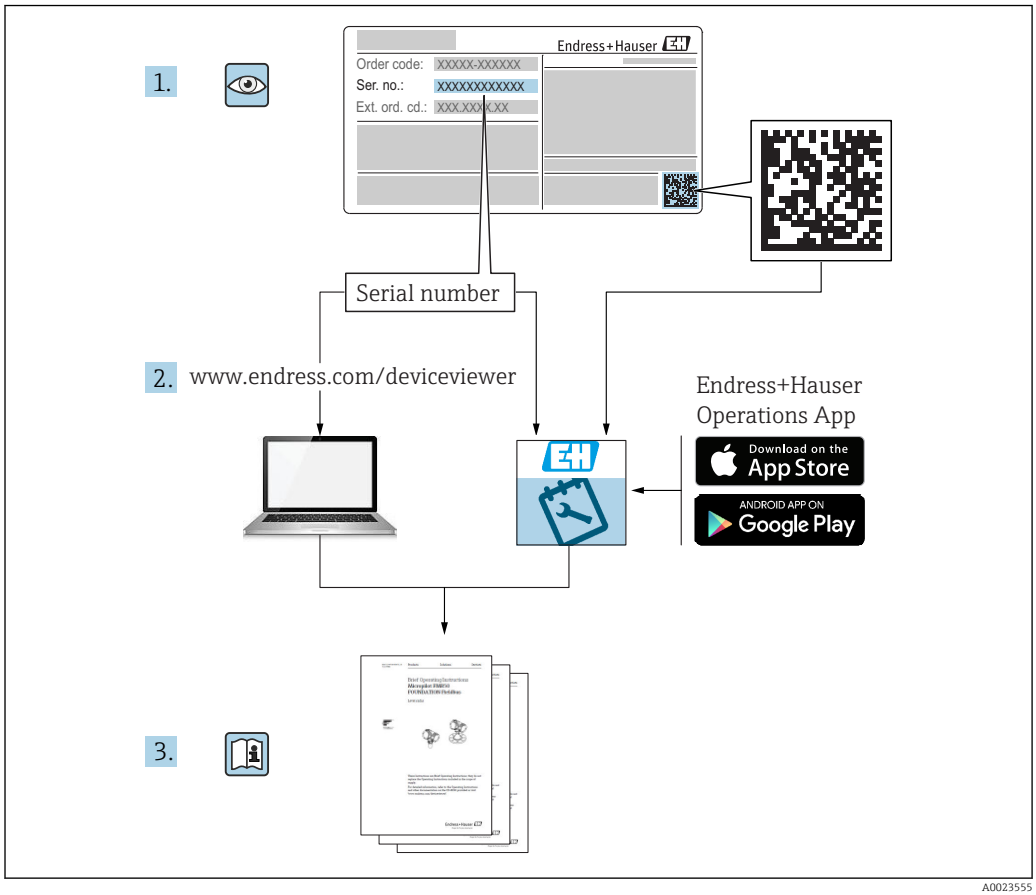
2020-05-27

Operating Instructions
Micropilot FWR30

Free space radar
Battery-operated level sensor for monitoring remote and mobile applications

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.
- To 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. Your 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 that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

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 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.

1.2.2 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:

1.2.3 Symbols in graphics

Item numbers: 1, 2, 3 ...

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

Views: A, B, C, ...

1.3 Documentation

All available documents can be downloaded using:
- the serial number of the device (see cover page for description) or
- the data matrix code of the device (see cover page for description) or
- the "Downloads" area of the website www.endress.com

1.3.1 Supplementary device-dependent documentation

Additional documents are supplied depending on the device version ordered: Always comply strictly with the instructions in the supplementary documentation. The supplementary documentation is an integral part of the device documentation.

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 beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- Follow instructions and comply with conditions

The operating personnel must fulfill the following requirements:
- Being instructed and authorized according to the requirements of the task by the facility's owner-operator
- Following the instructions in these Operating Instructions

2.2 Designated use

The Micropilot FWR30 is a battery-operated level sensor with cellular radio transmission.

Application:
Independent radar sensor for remote monitoring of levels.

2.2.1 Incorrect use

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

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

2.3 Workplace safety

For work on and with the device:
- Wear the required personal protective equipment according to federal/national regulations.

2.4 Operational safety

Risk of injury!
- Operate the device only if it is in proper technical condition, free from errors and faults.
- The operator is responsible for 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:
- Carry out repairs on the device only if they are 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 avoid danger to individuals or the facility when the device is used in the approval-related area (e. g. explosion protection, pressure vessel safety):
- Check the nameplate to verify if the device ordered can be put to its intended use in the approval-related area.
- Observe the specifications in the separate supplementary documentation that is an integral part of these Instructions.

2.4.1 Safety notice for the device battery

⚠ CAUTION

Risk of fire or burns if the device battery is handled incorrectly!
- Do not charge or open the battery, expose it to fire or heat it above 100 °C (212 °F).
- Only replace the battery with a ER34615 battery (lithium-thionyl chloride primary battery, size D). The use of any other battery can present a fire or explosion hazard.
- Dispose of the used battery immediately as per national regulations.
- Keep used batteries out of the reach of children. Do not open used batteries or expose them to fire.

2.5 Product safety

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

2.6 IT security

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

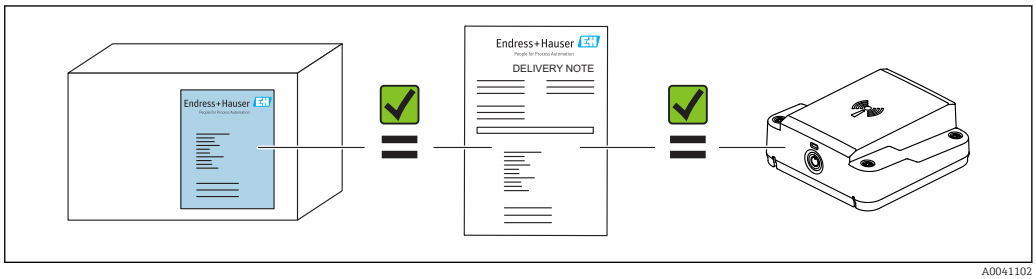
3 Product description

3.1 Product design

The Micropilot FWR30 is powered by an internal battery. The IP66/68 housing contains a sensor. The sensor measures the level. The device reports the level to the Endress+Hauser cloud via a cellular radio connection. The values can be accessed via the Netilion Value, Netilion Inventory or SupplyCare Hosting digital applications.

4 Incoming acceptance and product identification

4.1 Incoming acceptance



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4.2 Product identification

4.2.1 Manufacturer address

Endress+Hauser SE+Co. KG
Hauptstraße 1
79689 Maulburg, Germany

Address of the manufacturing plant: See nameplate.

4.3 Storage and transport

4.3.1 Storage temperature

–20 to +60 °C (–4 to +140 °F)

Battery discharge is at its lowest if the battery is stored at temperatures from 0 to +30 °C (+32 to +86 °F).

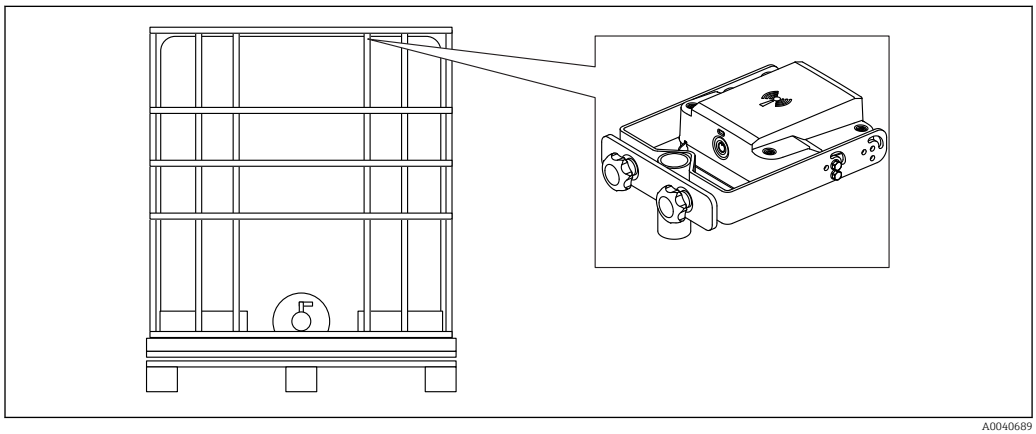
5 Installation

5.1 Mounting the measuring device

5.1.1 Mounting location

The device can be mounted indoors or outdoors.

Installation on vertical pipes



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Installation with mounting bracket pipe/IBC.

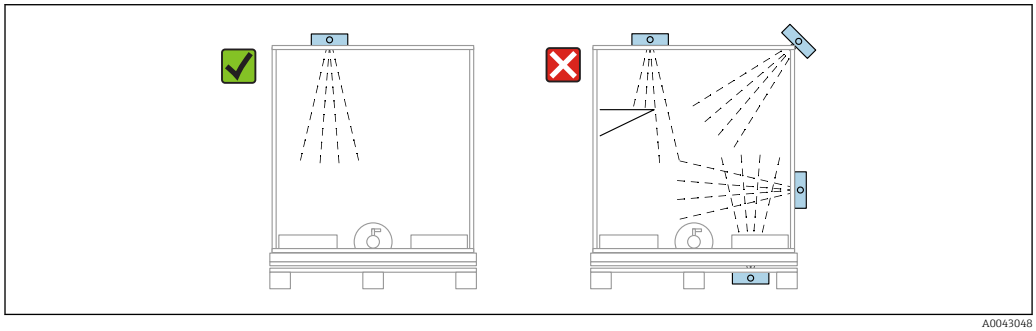
Installation on non-conductive plastic IBC tanks with tubular cage or mesh frame

Installation with "Mounting bracket pipe/IBC".

The mounting bracket pipe/IBC is also suitable for IBC tanks with mesh.

Mounting instructions

- Mount the measuring device in a horizontal position so that it is parallel to the tank ceiling.
  Otherwise, undesired reflections from the surroundings can cause interference signals
- The radar antenna should never be covered by metal objects
- If mounting outdoors, do not mount on a depression of the IBC tank
  Water can collect and interfere with the measurement. The measuring device may not stand in water.
- Do not mount any objects which may cause interference, such as tank internal fittings, grids or agitators, below or in the direct vicinity of the radar (see the graphic below)



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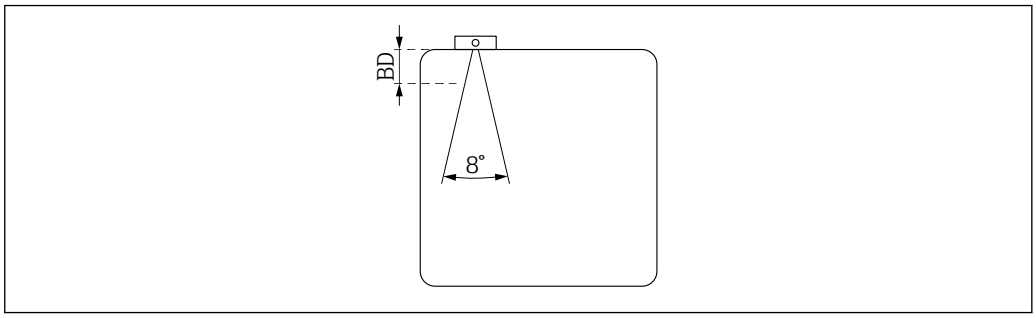
Blocking distance



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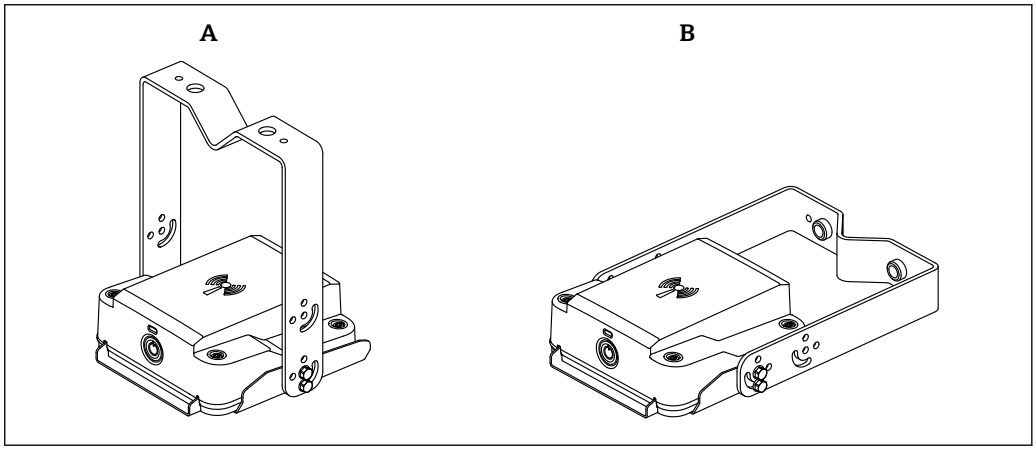
- No signals are analyzed within the blocking distance (BD)
  For this reason, the blocking distance can be used to suppress interference signals (e.g. from condensate) near the antenna
- Factory setting: automatic
- The blocking distance (BD) can be defined in the cloud or set automatically
  The setting is made in the blocking distance parameter
  The following formula is used for the automatic setting:
  Empty tank - full tank - 100 mm (3.94 in) = blocking distance (min. 0 mm)

Installation on ceiling or walls



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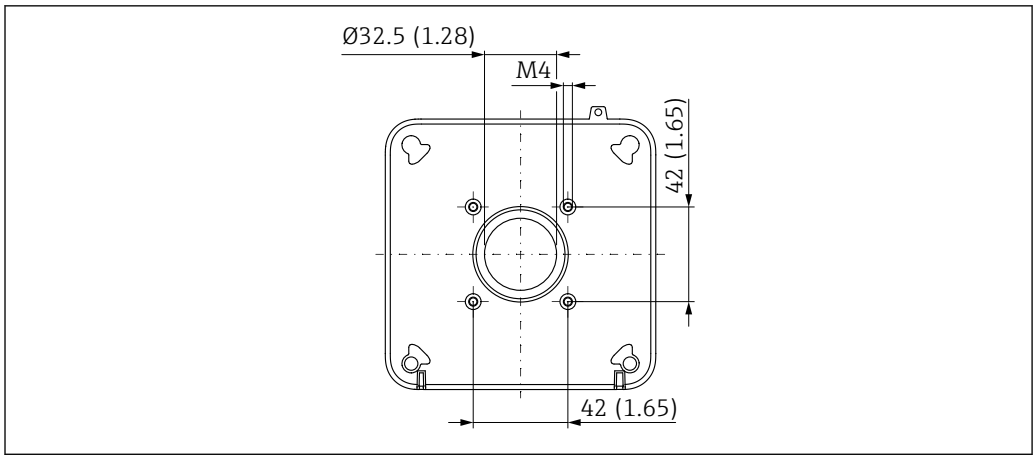
Installation with "Mounting bracket wall/ceiling".

Individual installation

The measuring device can also be installed without using the two mounting brackets. An individual bracket can be attached to the underside using the screw thread. The measuring device can also be attached using commercially available Velcro or adhesive tape. Both mounting kits available include the same base plate, which makes other custom installations possible. If the radar antenna is covered by metal objects, the measuring signal will be distorted.



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5.2 Post-installation check

- Is the device undamaged (visual inspection)?
- Does the device comply with the measuring point specifications?
  - Ambient temperature
  - Measuring range
- Are the measuring point identification and labeling correct (visual inspection)?
- Check that all screws are firmly seated.
- Is the measuring device mounted in a horizontal position so that it is parallel to the tank ceiling?

6 Electrical connection

6.1 Supply voltage

Replaceable battery, standard size, lithium (D), 3.6 V, 19 Ah (included in the delivery)
Designation in accordance with IEC: ER34615 (primary battery lithium thionyl chloride); product recommendation: Tadiran SL-2880

The measuring device determines the battery charge state automatically. The LED flashes red every 10 seconds if the battery charge state is low or critical.

In addition to the recommended Tadiran SL-2880 battery type, it is also possible to use a Tadiran SL-2870 battery. The indicated battery lives can differ in this case, however.

6.1.1 Safety notice for the device battery

⚠ CAUTION

Risk of fire or burns if the device battery is handled incorrectly!

- Do not charge or open the battery, expose it to fire or heat it above 100 °C (212 °F).
- Only replace the battery with a ER34615 battery (lithium-thionyl chloride primary battery, size D). The use of any other battery can present a fire or explosion hazard.
- Dispose of the used battery immediately as per national regulations.
- Keep used batteries out of the reach of children. Do not open used batteries or expose them to fire.

6.1.2 Battery life

Measuring interval of 8 hours
Transmission interval of 8 hours: battery life > 8 years

Measuring interval of 6 hours
Transmission interval of 12 hours: battery life > 10 years

Measuring interval of 1 hour
- Transmission interval of 24 hours: battery life > 10 years
- Transmission interval of 4 hours: battery life > 5 years
- Transmission interval of 1 hour: battery life approx. 500 days

Measuring interval of 1 minute
- Transmission interval of 1 hour: battery life approx. 400 days
- Transmission interval of 15 minutes: battery life approx. 140 days

Calculation only applies to TADIRAN SL-2880 battery at approx. +25 °C (+77 °F). A strong cellular radio signal is required. The actual battery life can vary greatly and depends on a number of factors including the network provider, temperature or humidity. High transmission rates reduce the battery life.

7 Operation options

7.1 Overview of operation options

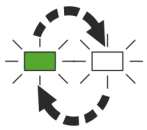
7.1.1 Operation via activation button on device

The blue activation button is locked while an action is being performed and until the action has been completed.

Activating the measuring device - measure and transmit

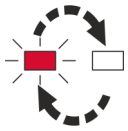
1. Press the blue activation button briefly (>2 seconds) until the LED is lit green.

2. The LED flashes green during transmission.



3. The LED is lit green continuously (for 10 seconds) if transmission is successful.

4. The LED flashes red or is lit red (for 10 seconds) if transmission fails.

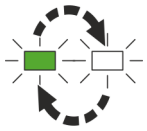


See Section 10.1.3

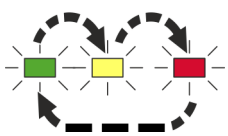
Deactivating the measuring device – measure, transmit and switch off

1. Press the blue activation button for longer (>7 seconds) until the LED is lit red.

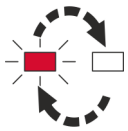
2. The LED flashes green during transmission.



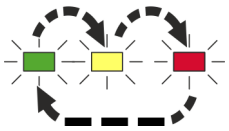
3. The LED flashes green, yellow and red alternately if transmission is successful.
   The measuring device is now deactivated.
   This status is then displayed in the digital application.



4. The LED flashes red or is lit red (for 10 seconds) if transmission fails.



5. The LED then flashes green, yellow and red alternately to indicate the deactivation of the measuring device.



Here, the deactivation status is not displayed in the digital application because transmission did not take place.
To subsequently activate the measuring device, press the blue activation button again (see Step 1).

The measuring device can also be deactivated via the cloud.

7.1.2 Operation via cloud and app

The measuring device is operated via:
- Netilion Value / Netilion Inventory: https://netilion.endress.com
- SupplyCare Hosting: https://portal.endress.com

8 Commissioning

8.1 Preparatory steps

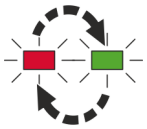
The device can be commissioned with the following digital applications:
- Netilion Value: https://Netilion.endress.com/app/value
- Netilion Inventory: https://Netilion.endress.com/app/inventory
- SupplyCare Hosting: https://portal.endress.com
  SupplyCare Hosting is commissioned by Endress+Hauser Service staff.

Commissioning is completed by pressing the blue activation button on the measuring device.

8.2 Function check

Perform the function check:

▶ Press the blue activation button 3 times.
  ↳ The LED flashes red and green alternately 6 times.



8.3 Configuration management

All parameters can be accessed via Netilion Value, Netilion Inventory oder SupplyCare Hosting.

If a parameter is changed in the cloud, the change becomes active with the next transmission.

9 Operation

9.1 Initiating the measurement

The measuring and transmission interval is configured using Endress+Hauser Cloud Services.

The measuring device can be activated by the following events:
- if the next measuring interval is reached (time-based)
- if the activation button is pressed (user-activated)

9.2 Reading measured values

The measured values can be read via the services offered.

For other functionalities of Endress+Hauser Services, see https://netilion.endress.com

or

Technical Information of SupplyCare Hosting

9.3 Displaying the measured value history

The measured value history can be read via the services offered.

For other functionalities of Endress+Hauser Services, see https://netilion.endress.com

or

Technical Information of SupplyCare Hosting

9.4 Use cases

9.4.1 Status transmission

If the measuring device has not yet been commissioned and the user presses the activation button, a status transmission is activated nonetheless.
- The measuring device updates the status values
- The measuring device synchronizes the time if necessary
- The measuring device transmits all status values to the cloud

The following status values are transmitted to the cloud:
- Activation status
- Battery status
- Position
- Signal quality of connectivity
- Current event (event ID)

9.4.2 Performing a manual measurement

1. Press the activation button
2. The measurement is performed
3. Measured values are transmitted to the cloud.

9.4.3 Automatic transmission of measured values

When the transmission interval is reached:

- The measuring device synchronizes the configuration from the cloud
- The measuring device transmits all of the saved measured values and status values to the cloud such as
  - Level
  - Position
  - Ambient temperature

If the device does not have any reception, up to 100 measured values are saved in the device and transmitted during the next connection.

9.4.4 Firmware update

Update via cloud

A firmware update can be performed via the cloud. The next time the measuring device is connected to the cloud, the firmware is transmitted to the device. After it has been checked by the measuring device, the firmware is updated. Once it has been updated successfully, the measuring device sends a message to the cloud.

The LED flashes orange during the firmware update.

9.4.5 Deactivating the measuring device

There are two possible ways to deactivate the measuring device:
- Deactivation is initiated via the cloud
  The next time the measuring device is connected to the cloud, the status values are transmitted and the deactivation is indicated in the cloud.
- Deactivation by pressing and holding the blue activation button

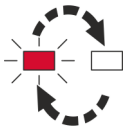
9.4.6 Activating the measuring device after deactivation

To activate the device after deactivation, the device must first be reactivated with its settings in the cloud. Then the blue activation button on the device must be pressed.

10 Diagnostics and troubleshooting

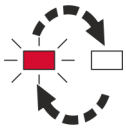
10.1 Diagnostics information via LED

10.1.1 The LED flashes red every 10 seconds



- **Reason:** Battery charge state is low or critical
- **Solution:** Replace the battery

10.1.2 The LED flashes red for 10 seconds

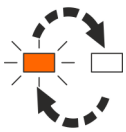


- **Reason:** Cloud transmission error:
  - No SIM card or card blocked
  - No network service
  - Data connection to provider has failed
- **Solution:**
  - Check whether the SIM card is correctly inserted and enabled
  - Check whether the network service is available
  - Notify the Service Department

10.1.3 The LED is lit red continuously for 10 seconds

- **Reason:** Cloud transmission error. Energy is low or hardware error which cannot be communicated to the cloud.
- **Solution:** Wait for 1 hour and then commission the device again (initiate cloud transmission).

10.1.4 LED flashing orange



- **Reason:** Firmware or certificate being updated
- **Solution:** Wait until the update is finished

10.2 List of diagnostic events

Diagnostic number: F270
Short text: Main electronics defective
Remedial measures:
- Contact the Service Department
- Replace device

Diagnostic number: F331
Short text: Firmware update failed
Remedial measures:
Repeat firmware update

Diagnostic number: F400
Short text: Communication error
Remedial measures:
Check connection and repeat

Diagnostic number: F430
Short text: Configuration incorrect
Remedial measures:
- Reconfigure in the cloud
- Contact the Service Department

Diagnostic number: F465
Short text: SIM card is defective
Remedial measures:
Check the SIM card

Diagnostic number: S825
Short text: Operating temperature
Remedial measures:
- Check the ambient temperature
- Check process temperature

Diagnostic number: C890
Short text: Battery weak
Remedial measures:
Prepare to replace the battery

Diagnostic number: M891
Short text: Empty battery
Remedial measures:
Replace the battery

Diagnostic number: F909
Short text: Request overload
Remedial measures:
- Wait > 15 minutes between the data requests
- Contact the Service Department

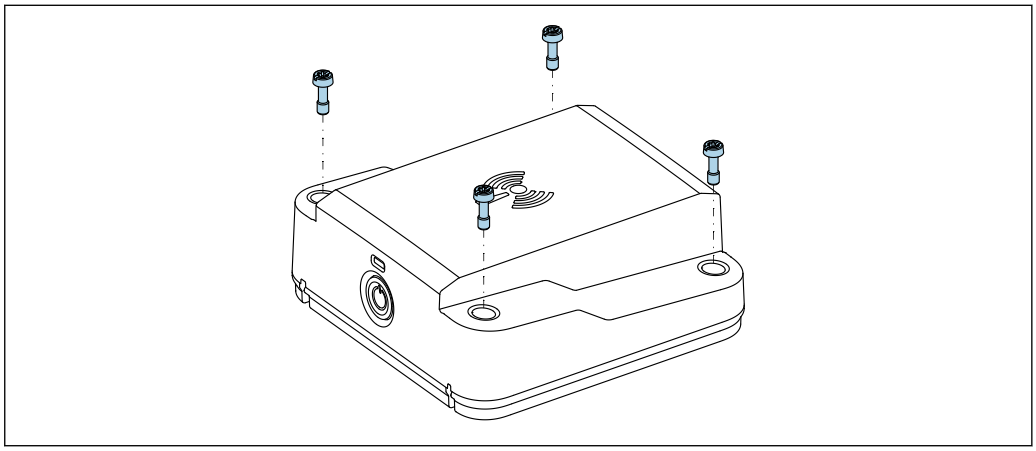
Diagnostic number: S911
Short text: Device location invalid or unknown
Remedial measures:
Contact the Service Department

Diagnostic number: S941
Short text: Lost echo
Remedial measures:
Check sensitivity settings

11 Maintenance

11.1 Maintenance tasks

11.1.1 Replacing the battery



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Replacing the battery

1. Loosen all 4 screws.
2. Replace the battery.
3. Tighten the screws with 1.2 Nm (0.89 lbf ft).
4. Press the activation button.
   ↳ Status transmission is triggered.

The device is operational again.

Battery type:
- Standard size, lithium (D), 3.6 V, 19 Ah
- Specification according to IEC:
  ER34615 (primary lithium-thionyl chloride battery)
- Product recommendation:
  Tadiran SL-2880

12 Repair

Repairs are not possible.

12.1 Return

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

1. Refer to the website for more information:
   http://www.endress.com/support/return-material
2. Return the device if the wrong device was ordered or delivered.

12.2 Disposal

As required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), Endress+Hauser products are marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Such products may not be disposed of as unsorted municipal waste and can be returned to Endress+Hauser for disposal under the conditions stipulated in the General Terms and Conditions or as individually agreed by Endress+Hauser.

12.2.1 Battery disposal

- In some countries, the end user is legally obliged to return used batteries.
- The end user can return old batteries to Endress+Hauser free of charge.

In accordance with German law regulating the use of batteries (BattG §17 Para Number 3), this symbol is used to denote electronic assemblies that must not be disposed of as municipal waste.

13 Accessories

13.1 Device-specific accessories

- Mounting bracket pipe/IBC
- Mounting bracket wall/ceiling

14 Technical data

14.1 Input

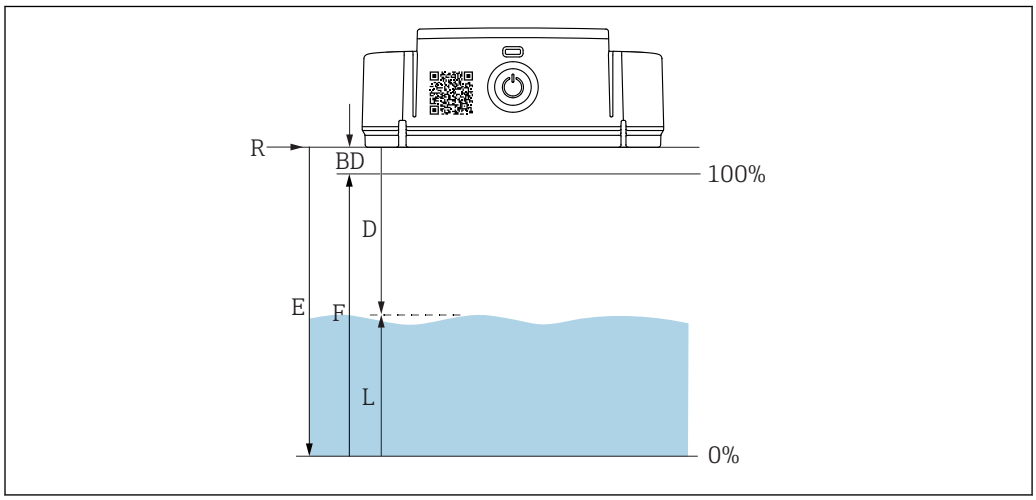
14.1.1 Measured variable

Measured process variables

- **Level:** 0 to 15 m (0 to 49 ft) ±10 mm (0.39 in)
- **Ambient temperature:** −20 to +60 °C (−4 to +140 °F) with an accuracy of ± 2 °C (4 °F)
- **Position:** Angle of device to the horizontal
  - The measurement is perpendicular to the product surface.
  - Range: 0 to 180°
  - The position angle can only be measured if the sensor does not move.

14.1.2 Measuring range

0 to 15 m (0 to 49 ft)



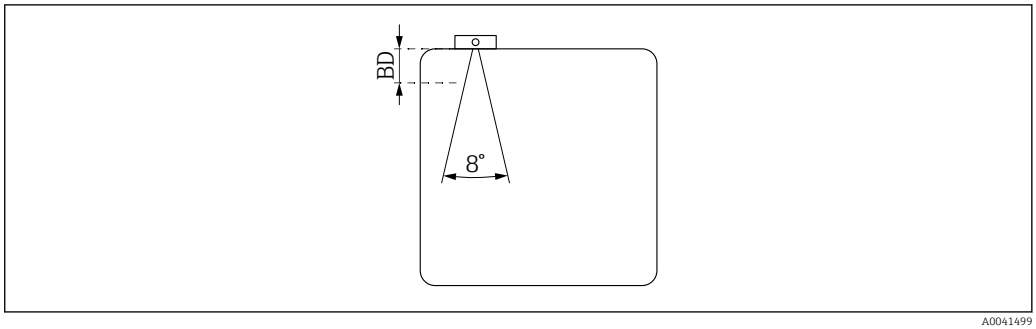
1 *Calibration parameter*

E *Empty calibration (= zero)*
F *Full calibration (= span)*
D *Measured distance*
L *Level (L = E - D)*
R *Reference point*
BD *Blocking distance*

14.1.3 Operating frequency

80 GHz

14.1.4 Blocking distance



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- No signals are analyzed within the blocking distance (BD)
  For this reason, the blocking distance can be used to suppress interference signals (e.g. from condensate) near the antenna
- Factory setting: automatic
- The blocking distance (BD) can be defined in the cloud or set automatically
  The setting is made in the blocking distance parameter
  The following formula is used for the automatic setting:
  Empty tank - full tank - 100 mm (3.94 in) = blocking distance (min. 0 mm)

14.1.5 Operable flow range

The sensitivity of the sensor can be configured using a "sensitivity parameter" (high, medium, low).

14.2 Output

14.2.1 Output signal

Cellular radio NB-IoT, LTE-M with 2G fallback

- 2G GPRS/EDGE
  GSM850, EGSM900, DCS1800, PCS1900
- 4G LTE-M1 (LTE Cat-M1)
  - LTE-FDD: B2/B3/B4/B5/B8/B18/B19/B20/B26
  - LTE-TDD: B39
- 4G LTE-NB1 (NB-IoT)
  LTE-FDD: B2/B3/B8/B20

The cellular radio signal is selected automatically by the device. The selection depends on availability. The priority is 4G (LTE-M1 or LTE-NB1). If neither of the two cellular radio signals is available, the 2G (GPRS or EDGE) cellular radio signal is selected.

Transmission interval

The transmission interval can be set between 15 minutes and 24 hours.

The battery life depends on the transmission interval.

In the event of a poor network connection, select a transmission interval > 1 hour

14.2.2 Protocol-specific data

The FWR30 uses:
- internet protocol TCP/IP and the secure transport layer TLS (v1.2)
- application layer protocol HTTPS

14.3 Environment

14.3.1 Ambient temperature range

−20 to +60 °C (−4 to +140 °F)

14.3.2 Storage temperature

−20 to +60 °C (−4 to +140 °F)

Battery discharge is at its lowest if the battery is stored at temperatures from 0 to +30 °C (+32 to +86 °F).

14.3.3 Humidity

0 to 95%

14.3.4 Climate class

DIN EN 60068-2-38/IEC 68-2-38: Test Z/AD

14.3.5 Operating altitude according to DIN EN 61010-1 Ed. 3

Up to 2 000 m (6 600 ft) above sea level.

14.3.6 Degree of protection

IP66, IP68

14.3.7 Vibration and shock resistance

In accordance with DIN EN 60068-2-27 / IEC 60068-2-27: 18 ms, 30g, half-sine

14.3.8 Electromagnetic compatibility

In accordance with IEC/EN 61326-1

14.4 Process

Measurement directly through the tank (electrically non-conductive tank walls). No contact is made with the process medium.

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