Operating Instructions
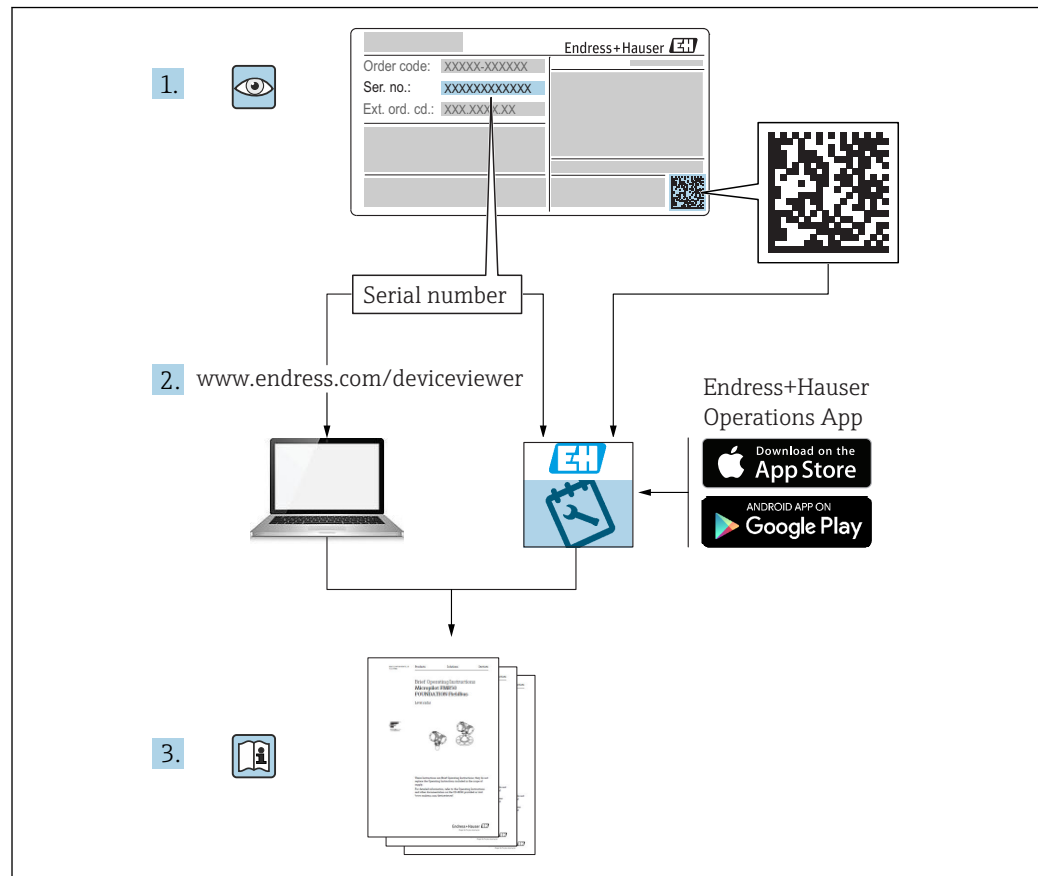# **Micropilot FWR30**

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

Endress+Hauser [EH]

People for Process Automation

A0023555

- 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.

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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   Communication symbols

1.2.3   Symbols for certain types of information

Permitted: ☑

Procedures, processes or actions that are permitted.

Forbidden: ☒

Procedures, processes or actions that are forbidden.

Additional information: ℹ️

Reference to documentation: 📖

Reference to page: 📄

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

Result of an individual step: ↳

1.2.4   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 ℃ (212 ℉).
▶ 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.
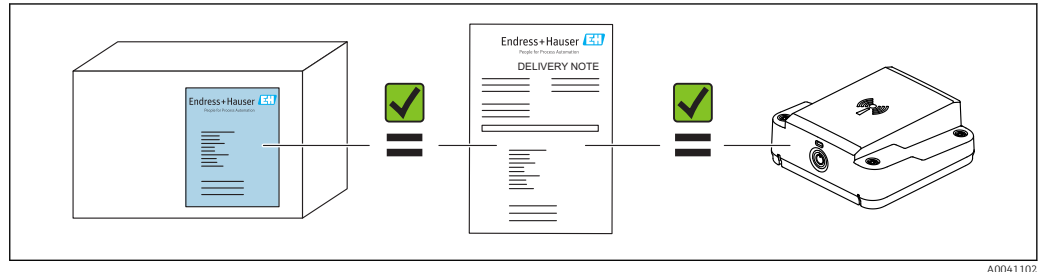
3 Product description

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 Netilion Cloud Service via a cellular radio connection.

4   Incoming acceptance and product identification

4.1   Incoming acceptance

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

Indoors or outdoors.

Installation on vertical pipes

A0040689
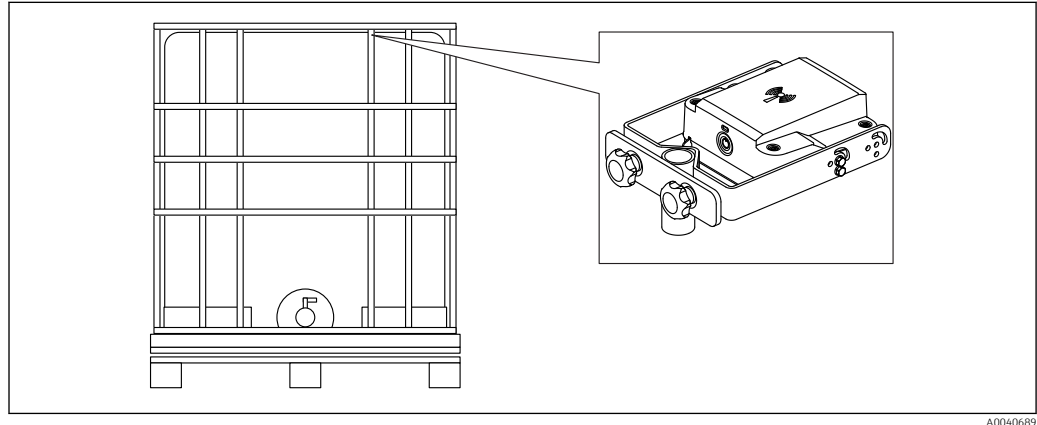
Installation with mounting bracket pipe/IBC.

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)
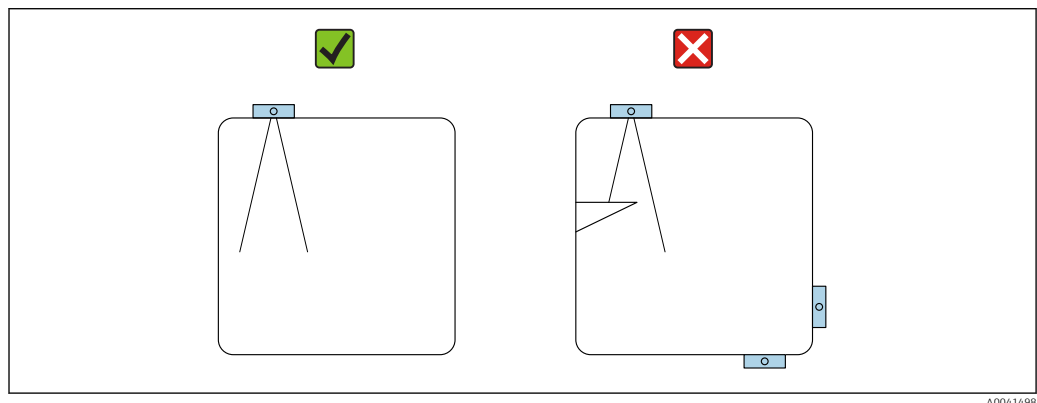
A0041498
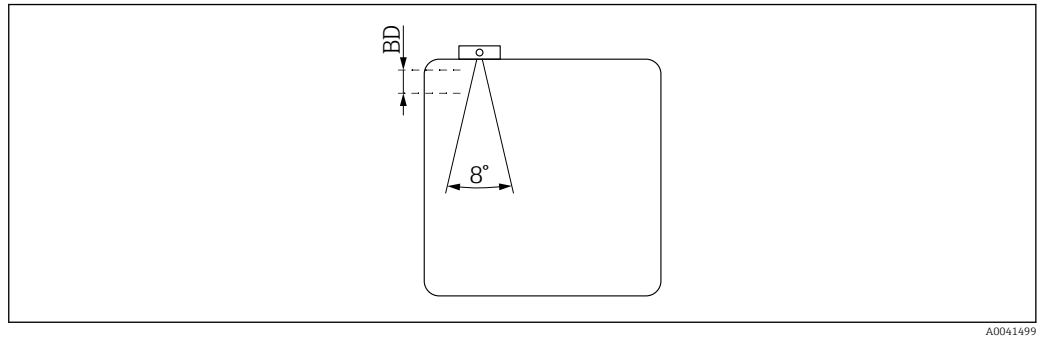
Blocking distance

A0041499

- 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: 0 mm
- 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
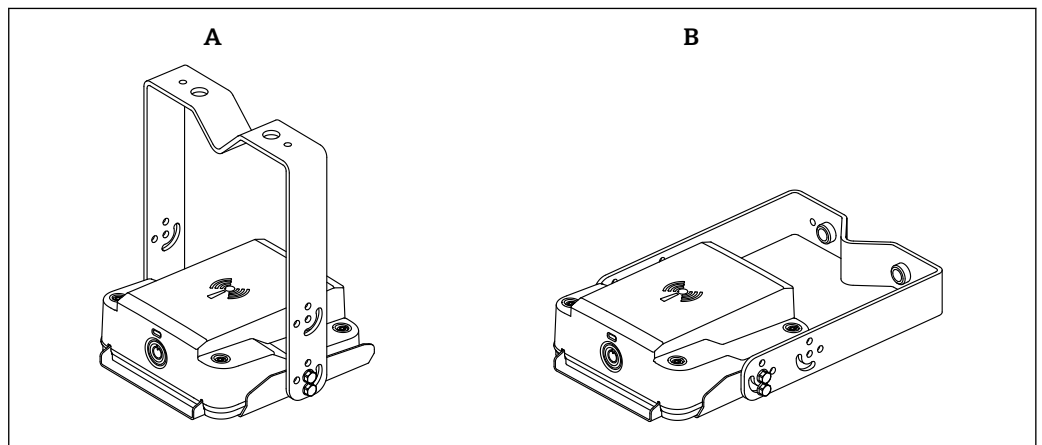
A0040688

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.
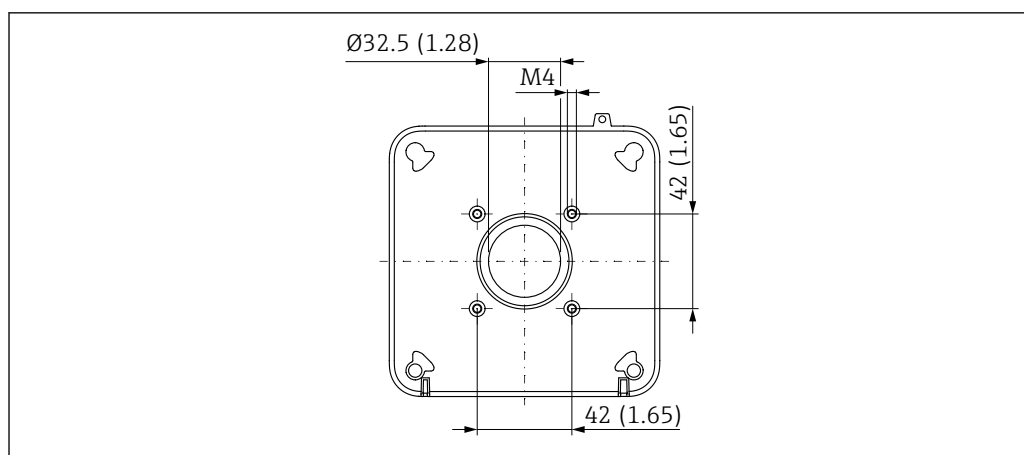
A0041312

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   Connecting the measuring device

6.1.1   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.

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 ℃ (212 ℉).
- ▶ 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.

Battery life

A [1]	B [2]	D [3] [4]
1 hour	24 hours	> 15 years
6 hours	12 hours	> 10 years
8 hours	8 hours	> 8 years
1 hour	4 hours	> 5 years
1 hour	1 hour	500 days
1 minute	1 hour	400 days
1 minute	15 minutes	140 days

1)   Measuring interval
2)   Transmission interval
3)   Battery life approx.
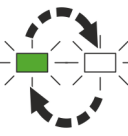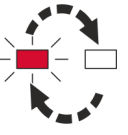4)   Calculation only applies to TADIRAN SL-2880 battery at approx. +25 ℃ (+77 ℉). A strong cellular radio
       signal is required. The actual battery life can vary greatly and depends on a number of factors including the
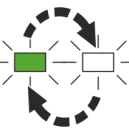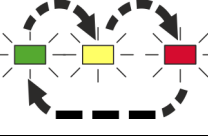   network provider, temperature or humidity. High transmission rates reduce the battery life.
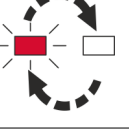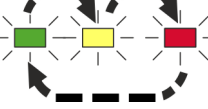
7   Operation options

7.1   Overview of operation options

7.1.1   Operation via activation button on device

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

Action	Procedure	LED
Activating the measuring device - measure and transmit	Press the blue activation button briefly (>2 seconds) until the LED is lit green	
	The LED flashes green during transmission	
	The LED is lit green continuously (for 10 seconds) if transmission is successful	
	The LED flashes red or is lit red (for 10 seconds) if transmission fails	

Action	Procedure	LED
Deactivating the measuring device – measure, transmit and switch off	Press the blue activation button for longer (>7 seconds) until the LED is lit red	
	The LED flashes green during transmission	
	The LED flashes green, yellow and red alternately if transmission is successful. The measuring device is now deactivated.	
	The LED flashes red or is lit red (for 10 seconds) if transmission fails. The LED then flashes green, yellow and red alternately to indicate the deactivation of the measuring device. The measuring device can also be deactivated via the Value App In order to activate the measuring device again, the blue activation button must be pressed again The blue activation button is locked while an action is being performed and until the action has been completed	

7.1.2   Operation via cloud and app

The measuring device is operated via Netilion Value.

https://netilion.endress.com

8   Commissioning

8.1   Preparatory steps

Before the measuring device is commissioned, the measuring device must be connected via Netilion Value. A user account in the Netilion Cloud is required for this purpose.

Using a smartphone or tablet, scan the QR code on the enclosed Special Documentation in order to access Netilion Value. Alternatively, enter the following link: netilion.endress.com

Netilion explains how to install a Netilion account and the Value Service.

8.2   Function check

8.3   Powering up the measuring device

Commission the measuring device step by step using the Netilion Value web app.

Commissioning is completed by activating the activation button on the measuring device.

8.4   Configuration management

All parameters can be accessed via the Netilion cloud.

If a parameter in the Netilion cloud is modified, it is transmitted to the device during the next transmission.

9 Operation

9.1 Initiating the measurement

The interval for measurement and transmission is configured in Netilion Value.

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

Netilion Value can be used to read the measured values. In addition to reading the last measured value, the web app provides the option of displaying the measured value history.

9.3 Displaying the measured value history

The measured value history can be read and exported in Netilion Value.

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, then a status transmission is activated.
• 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 and previous 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 Netilion.

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
  • location
  • ambient temperature

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.

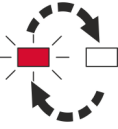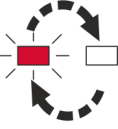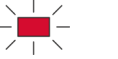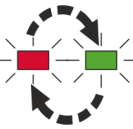The LED flashes green and red alternately while the firmware is being updated.

9.4.5   Deactivating the measuring device

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

10   Diagnostics and troubleshooting

10.1   Diagnostics information via LED

LED	LED status	Reason	Solution
	The LED flashes red every 10 seconds	Battery charge state is low or critical	Replace the battery
	The LED flashes red for 10 seconds	Cloud transmission error: • No SIM card or card blocked • No network service • Data connection to provider has failed	• Check whether the SIM card is correctly inserted and enabled • Check whether the network service is available • Notify the Service Department
	The LED is lit red continuously for 10 seconds	Cloud transmission error: energy is low or hardware error which cannot be communicated to the cloud	Wait for 15 minutes and then commission the device again (initiate cloud transmission)
	The LED flashes red and green alternately	The firmware is being updated	Wait until the update is finished

10.2   Status signals

F A0032902	**"Failure (F)" option** A device error has occurred. The measured value is no longer valid.	
C A0032903	**"Function check (C)" option** The device is in service mode (e.g. during a simulation).	
S A0032904	**"Out of specification (S)" option** The device is being operated: • Outside its technical specifications (e.g. during warmup or cleaning processes) • Outside the parameter configuration undertaken by the user (e.g. level outside of configured range)	
M A0032905	**"Maintenance required (M)" option** Maintenance is required. The measured value is still valid.	

10.3   Status symbol (symbol for event level)

|		
⊗	**"Alarm" status** Measurement is interrupted. The signal outputs assume the defined alarm condition. A diagnostic message is generated.	
⚠	**"Warning" status** The device continues to measure. A diagnostic message is generated.	

10.4   List of diagnostic events

Diagnostic number	Short text	Remedial measures	Status signal	Diagnostic behavior
270	Main electronics defective	• Contact the Service Department • Replace device	F	Alarm
331	Firmware update has failed	• Update the device firmware • Restart device	F	Warning
400	Communication error	Check connection and repeat	F	Alarm
430	Configuration incorrect	• Reconfigure in the cloud • Contact the Service Department	F	Alarm
465	SIM card is defective	Check the SIM card	F	Alarm
825	Operating temperature	• Check the ambient temperature • Check the process temperature	S	Warning
890	Battery weak	Prepare to replace the battery	C	Warning
891	Empty battery	Replace the battery	M	Warning
909	Request overload	• Wait > 15 minutes between the data requests • Contact the Service Department	F	Alarm
911	Device location invalid or unknown	Contact the Service Department	S	Warning
941	Lost echo	Check DC value setting	S	Warning

11 Maintenance

11.1 Maintenance tasks

11.1.1 Replacing the battery

A0040732
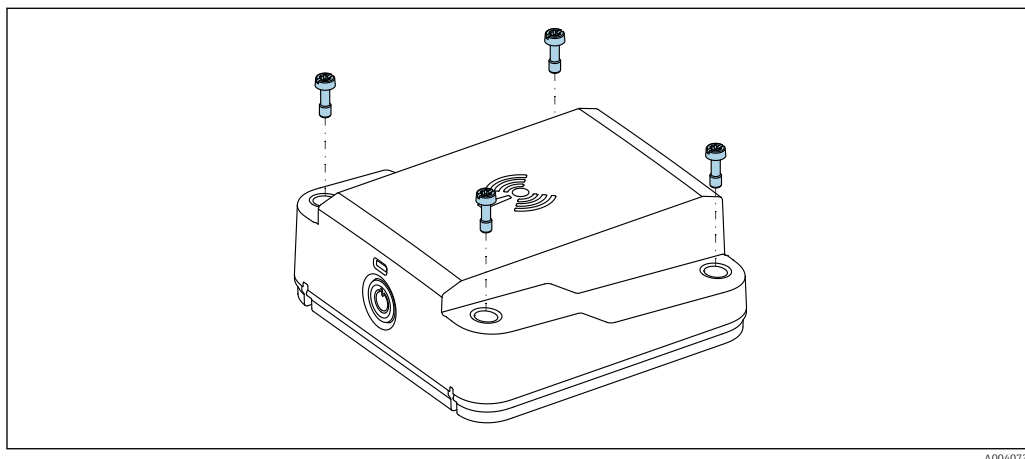
Release the 4 screws, replace the battery, tighten the screws with 1.2 Nm (0.89 lbf ft).

Battery type: standard size, lithium (D), 3.6 V, 19 Ah

Designation in accordance with IEC: ER34615 (primary battery lithium thionyl chloride); 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

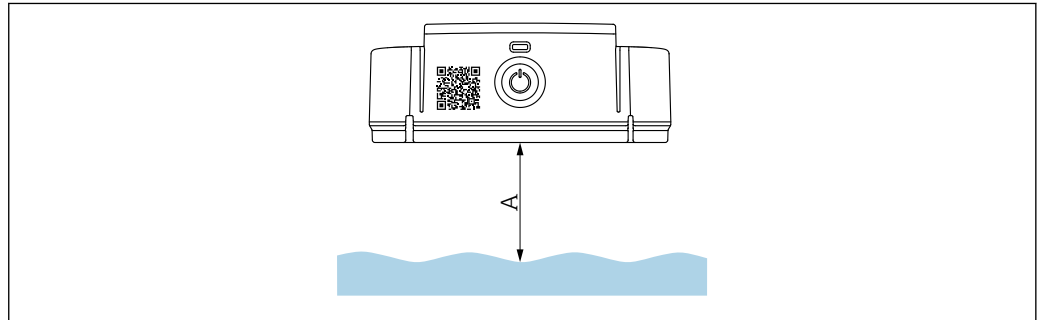### 14.1.1   Measured variable

Measured process variables

- Level: 0 to 15 m (0 to 49 ft) ±10 mm (0.39 in)
- Ambient temperature: –20 to +60 ℃ (–4 to +140 ℉) with an accuracy of ± 2 ℃ (4 ℉)
- Position: Angle of device to the horizontal
  The measurement is perpendicular to the product surface
  Range: 0 to 180°

14.1.2   Measuring range

0 to 15 m (0 to 49 ft)

A   Distance to level surface

Level in mm = tank empty - distance to level surface

Level in % = (tank empty - distance to level surface) / tank full · 100 %
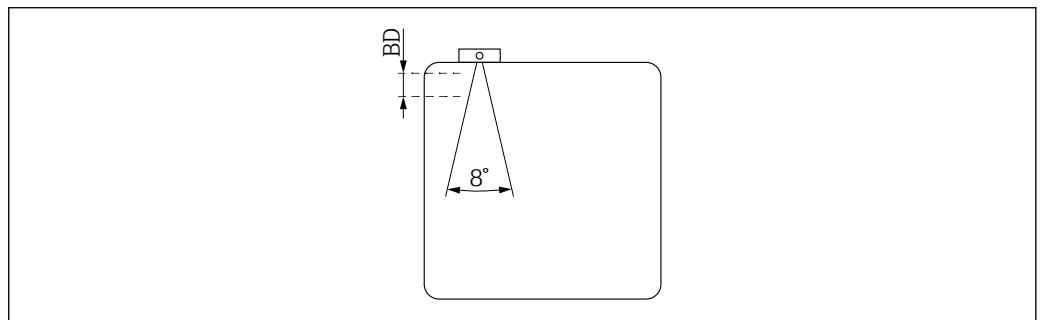
Tank empty = from the measuring device to the bottom

Tank full = from the bottom to the measuring device

14.1.3   Operating frequency

80 GHz

14.1.4   Blocking distance

- 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: 0 mm
- 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
- 4G LTE-M1 (LTE Cat-M1)
- 4G LTE-NB1 (NB-IoT)

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

15 minutes to 24 hours.

The battery life depends on the transmission interval.

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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