Technical Information
Micropilot FWR30

Free space radar

Battery-operated level sensor for monitoring remote and mobile applications

Application

- Degree of protection: IP66/IP68
- Maximum measuring range: 15 m (49 ft)
- Ambient temperature: −20 to +60 °C (−4 to +140 °F)
- Connectivity: NB-IoT, LTE-M, 2G
- Accuracy: 10 mm (0.39 in)

Your benefits

- Transparency - easy monitoring of level and location of applications
- Flexible and secure integration into cloud platforms, such as Netilion or SupplyCare
- Easy commissioning and flexible installation
- Reliable 80 GHz radar sensor

Endress+Hauser

People for Process Automation

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About this document

Symbols

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.

Communication symbols

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: ↳

Symbols in graphics

Item numbers: 1, 2, 3 …

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

Views: A, B, C, …

Function and system design

Measuring principle

The Micropilot is a "downward-looking" measuring system, operating based on the time-of-flight method (ToF). It measures the distance from the reference point to the product surface. Radar pulses are emitted by an antenna, reflected off the product surface and received again by the radar system.
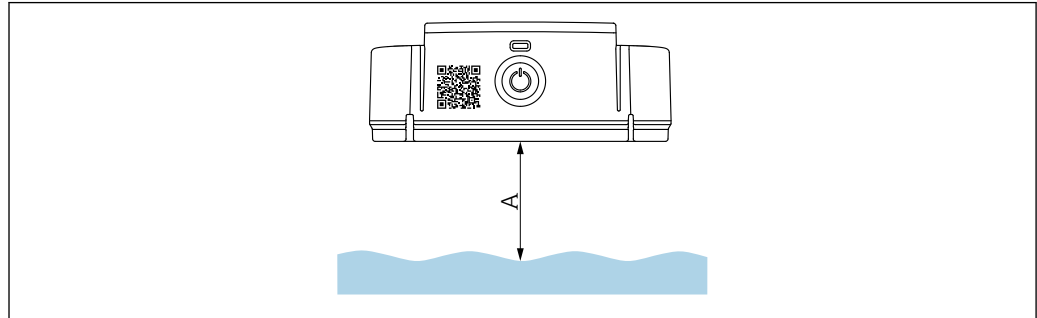
Input

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°

Measuring range   0 to 15 m (0 to 49 ft)

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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

Operating frequency   80 GHz

Blocking distance
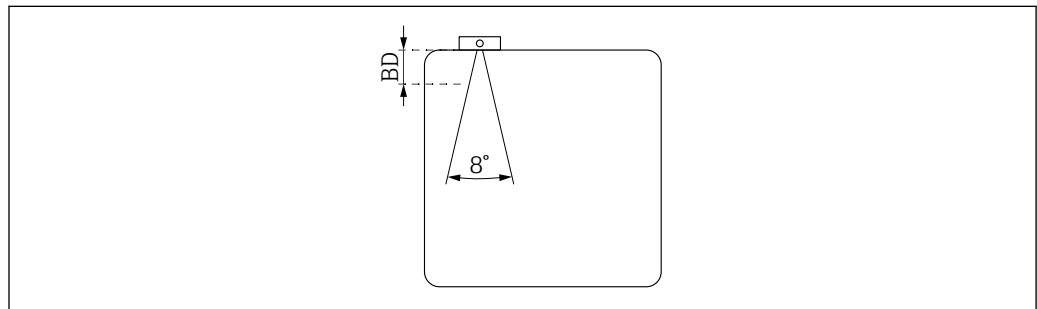
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- No signals are analyzed within the blocking distance (BD)
  For this reason, the blocking distance can be used to suppress interference signals (e.g. from condensate) near the antenna
- Factory setting: 0 mm
- The blocking distance (BD) can be defined 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)

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

Output

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.

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

Power supply

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.

Performance characteristics

Reference operating conditions	• Temperature = +24 °C (+75 °F) ±5 °C (±9 °F) • Pressure = 960 mbar abs. (14 psia) ±100 mbar (±1.45 psi) • Humidity = 60 % ±15 % • Reflector: metal plate with diameter ≥ 1 m (40 in) • No major interference reflections inside the signal beam
Maximum measured error	Accuracy: ±10 mm (0.39 in) within the entire measuring range
Influence of ambient temperature	Temperature coefficient: ≤ ± 4 mm (0.16 in) per 10 K

Installation

Mounting location Indoors or outdoors.

Installation on vertical pipes
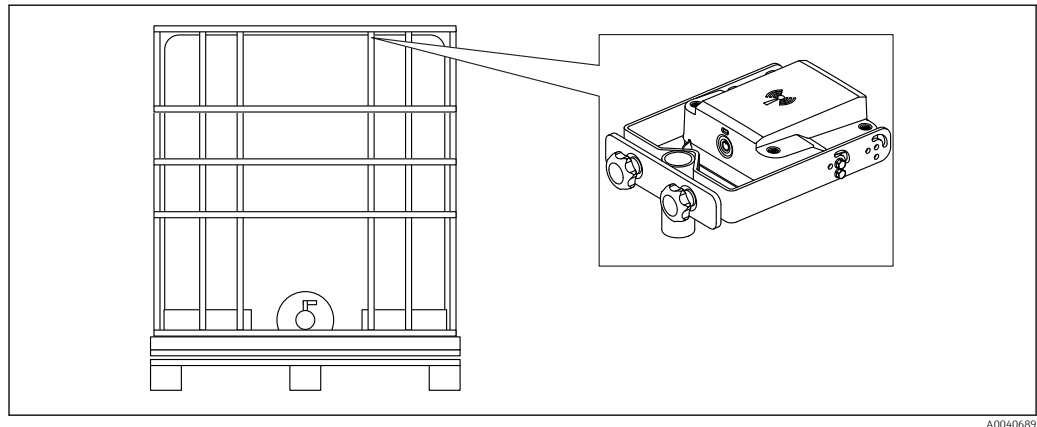
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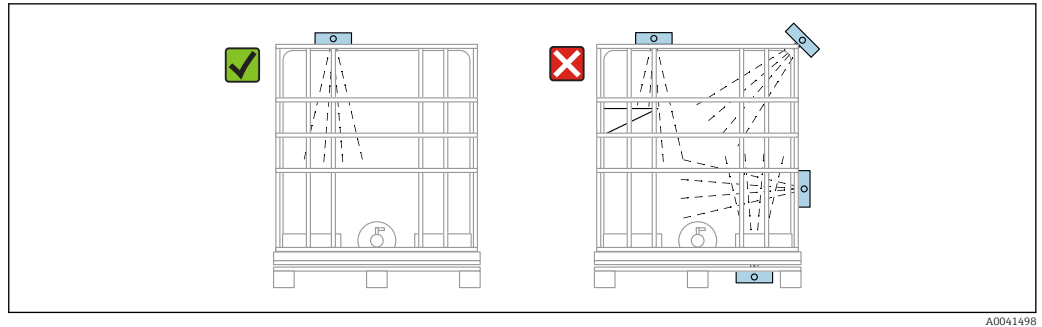
Installation with mounting bracket pipe/IBC.

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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Installation on ceiling or walls
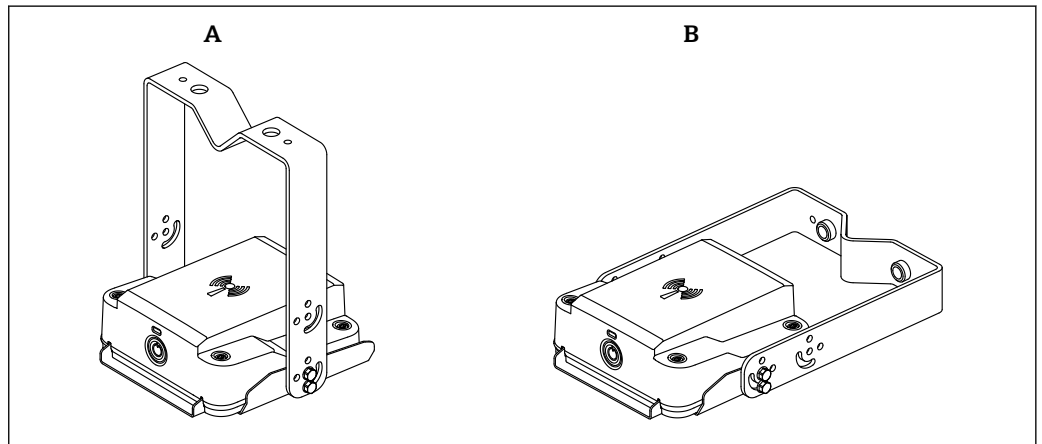
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Installation with "Mounting bracket wall/ceiling".

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.
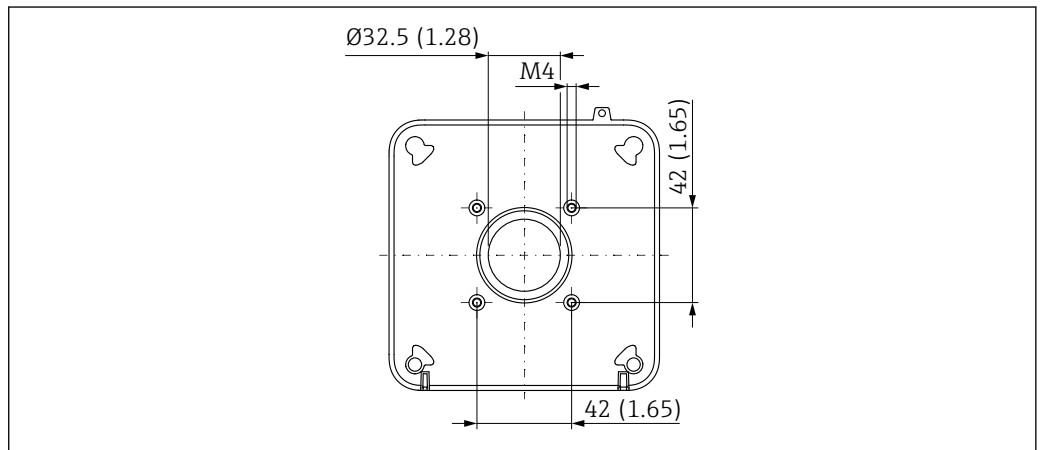
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Mounting kit	Mounting kit pipe / IBC

Mounting bracket IBC/pipe
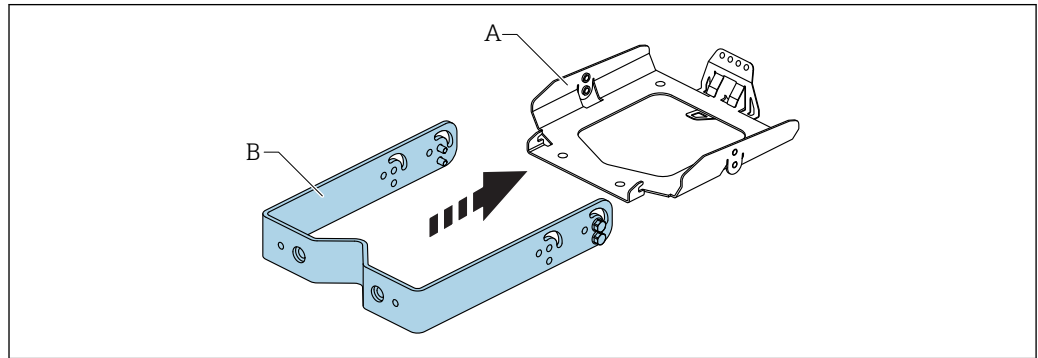
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The IBC base holder (B) is attached to the adapter plate (A).

The base holder (B) can be mounted on struts with a diameter of 15 to 30 mm (0.59 to 1.18 in) and on square pipes.

IBC mesh-frame adapter
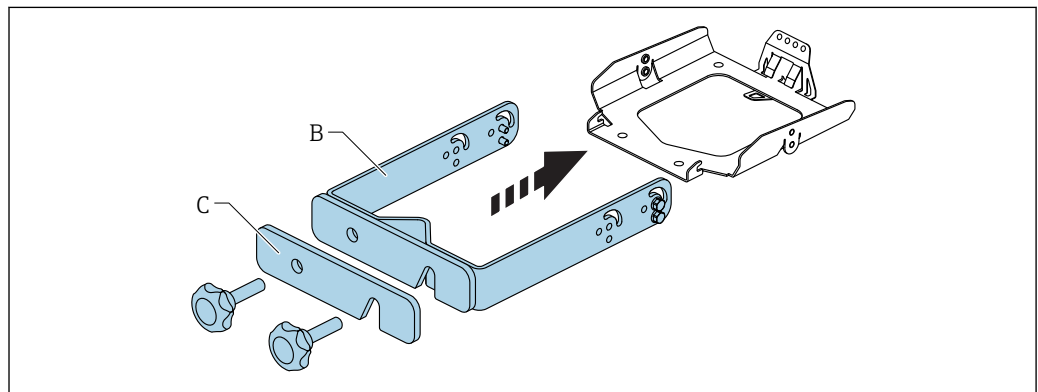
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The IBC mesh-frame adapter (C) is attached to the IBC base holder (B).

Mounting the FWR30 on the adapter plate
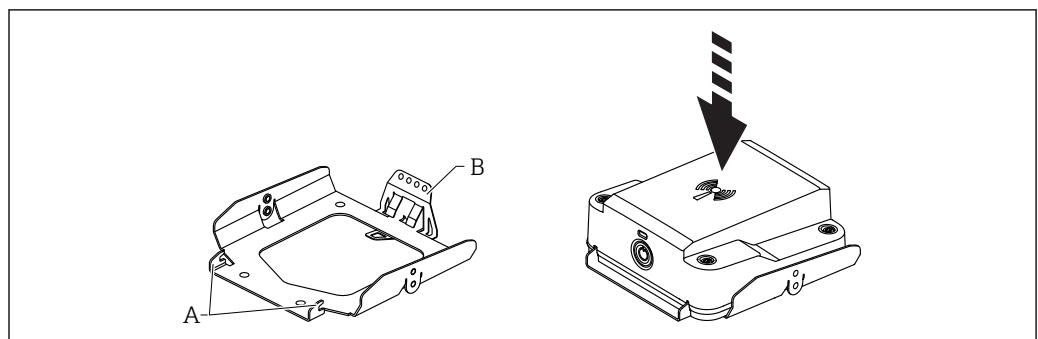
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1. The hooks (A) and the spring (B) are used to secure the FWR30 in the adapter plate.
2. The spring (B) is used to release the FWR30 from the adapter plate.

Mounting bracket wall/ceiling

Mounting bracket
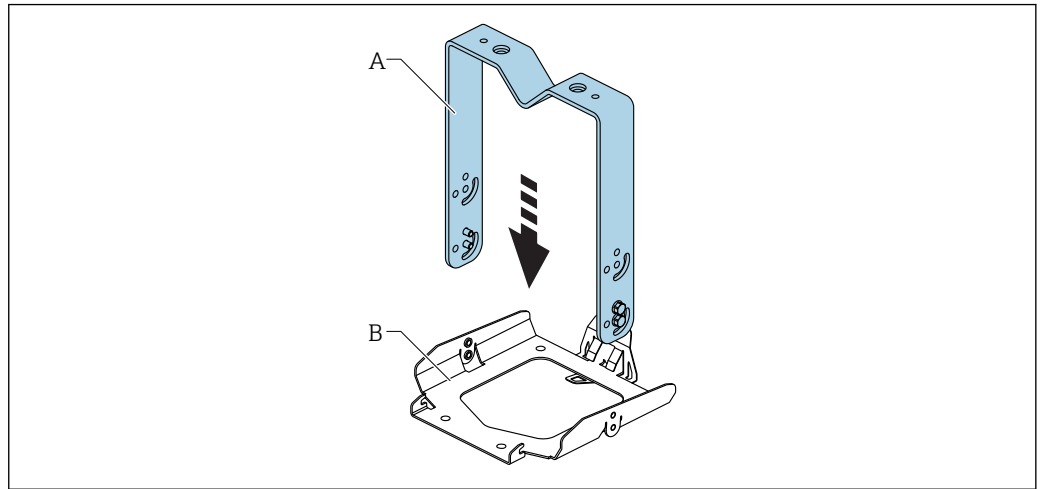
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The mounting bracket (A) is attached to the adapter plate (B).

Mounting the FWR30 on the adapter plate
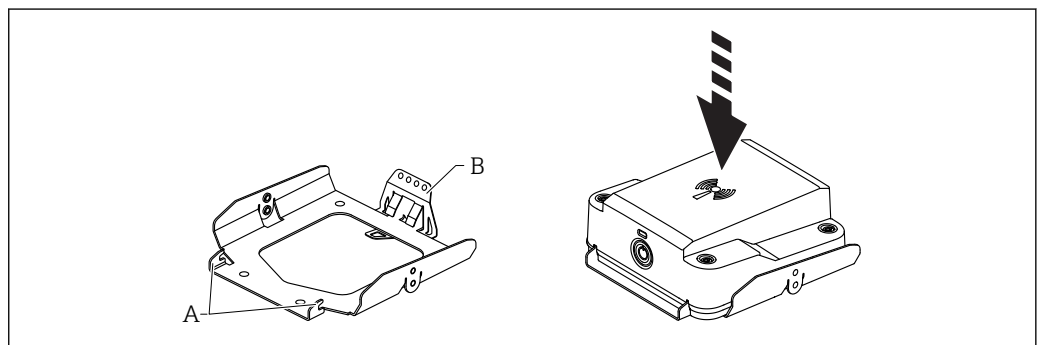
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1. The hooks (A) and the spring (B) are used to secure the FWR30 in the adapter plate.
2. The spring (B) is used to release the FWR30 from the adapter plate.

Beam angle	8°

Environment

Ambient temperature range	−20 to +60 °C (−4 to +140 °F)
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).
Humidity	0 to 95%
Climate class	DIN EN 60068-2-38/IEC 68-2-38: Test Z/AD

Operating altitude according to DIN EN 61010-1 Ed. 3	Up to 2 000 m (6 600 ft) above sea level.
Degree of protection	IP66, IP68
Vibration and shock resistance	In accordance with DIN EN 60068-2-27 / IEC 60068-2-27: 18 ms, 30g, half-sine
Electromagnetic compatibility	In accordance with IEC/EN 61326-1

Process

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

Mechanical construction

For the dimensions, see the Product Configurator: www.endress.com

Search for product → click "Configuration" to the right of the product image → after configuration click "CAD"

The following dimensions are rounded values. For this reason, they may deviate slightly from the dimensions given on www.endress.com.

Dimensions

Housing

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Accessories

Mounting bracket pipe/IBC

138.4 (5.45)
170 (6.69)
182.6 (7.19)
218.5 (8.6)
258.5 (10.2)
146.8 (5.78)
33 (1.3)
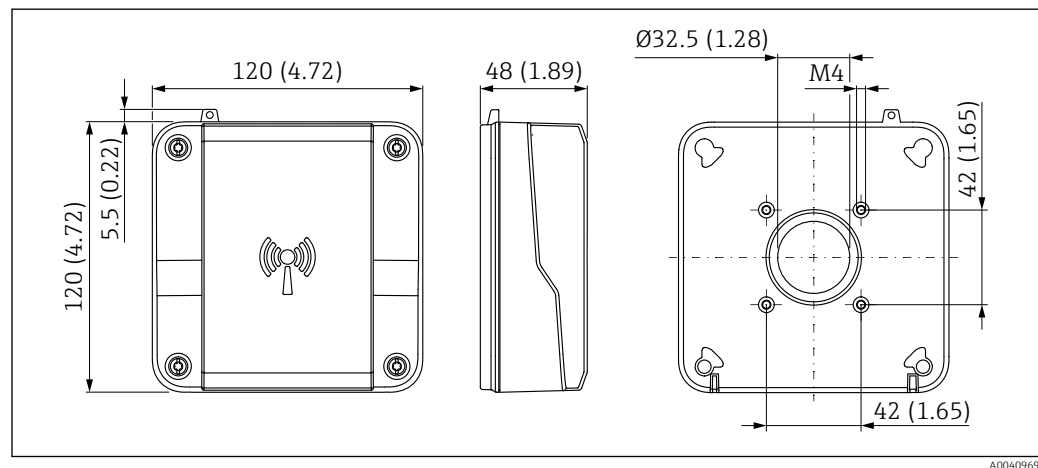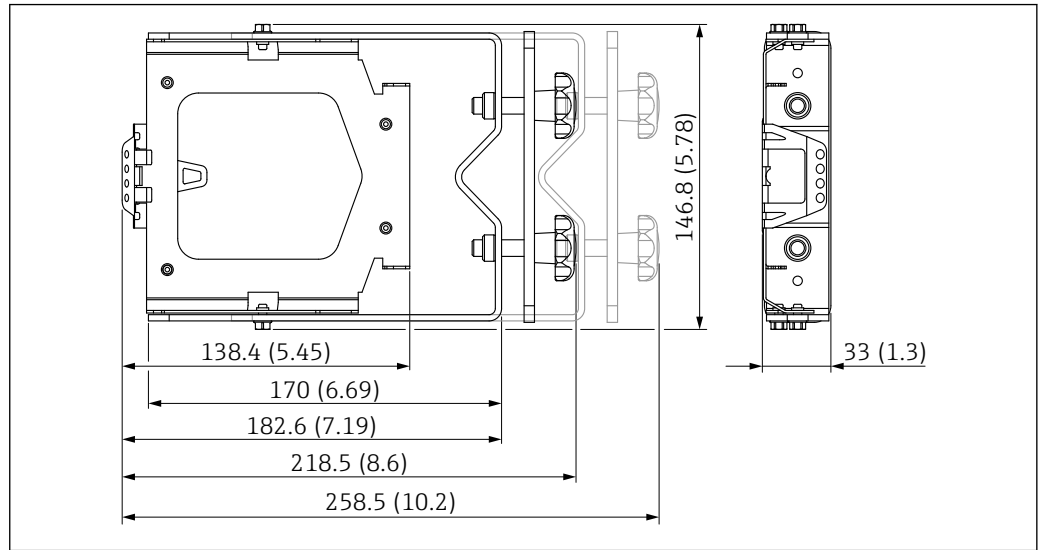
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Mounting bracket wall/ceiling

138.4 (5.45)
170 (6.69)
182.6 (7.19)
222.6 (8.76)
146.8 (5.78)
33 (1.3)
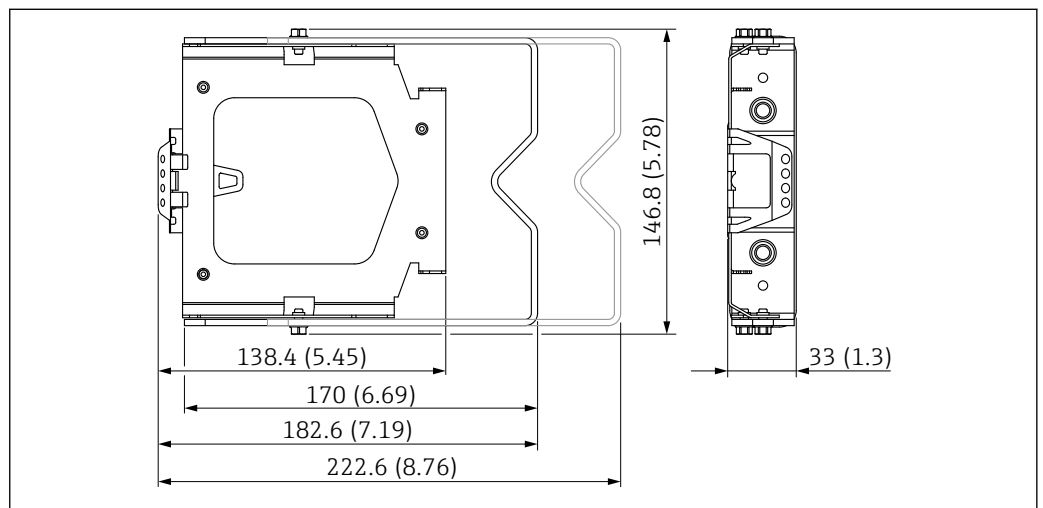
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Weight	**Housing** • Weight with original battery: 0.5 kg (1.1 lb) • Weight without battery: 0.4 kg (0.88 lb) **Accessories** • Mounting bracket pipe/IBC: 0.86 kg (1.90 lb) • Mounting bracket wall/ceiling: 0.45 kg (0.99 lb)
Materials	**Housing** Plastic PBT/PC **Accessories** • Mounting bracket pipe/IBC: AISI316 L (1.4404) • Mounting bracket universal: AISI316 L (1.4404)

Human interface

Operating concept	• Straightforward operation without wiring • Configuration via cloud using Web application • Connection status displayed via LED

Certificates and approvals

ℹ️ Currently available certificates and approvals can be called up via the product configurator.

CE mark	The measuring system meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
RoHS	The measuring system complies with the substance restrictions of the Restriction on Hazardous Substances Directive 2011/65/EU (RoHS 2).
EN 302729-1/2 radio standard	The devices comply with the LPR (Level Probing Radar) radio standard EN 302729-1/2 and are approved for unrestricted use inside and outside of closed vessels in countries of the EU and EFTA. As a prerequisite, the countries in question must have already implemented this standard. The following countries are those that have currently implemented the standard: Belgium, Bulgaria, Germany, Denmark, Estonia, France, Greece, UK, Ireland, Iceland, Italy, Liechtenstein, Lithuania, Latvia, Malta, The Netherlands, Norway, Austria, Poland, Portugal, Romania, Sweden, Switzerland, Slovakia, Spain, Czech Republic and Cyprus. Implementation is still underway in all of the countries not listed.

Please note the following for operation of the devices outside of closed vessels:

1. The device must be mounted in accordance with the instructions in the "Installation" section.

2. Installation must be carried out by properly trained, expert staff.

3. The device antenna must be installed in a fixed location pointing vertically downwards.

4. The installation site must be located at a distance of 4 km from the astronomy stations listed below or otherwise approval must be provided by the relevant authority. If the device is installed at a distance of 4 to 40 km from one of the listed stations, it must not be installed at a height of more than 15 m (49 ft) above the ground.

Astronomy stations

Country	Name of the station	Latitude	Longitude
Germany	Effelsberg	50°31'32" North	06°53'00" East
Finland	Metsähovi	60°13'04" North	24°23'37" East
	Tuorla	60°24'56" North	24°26'31" East
France	Plateau de Bure	44°38'01" North	05°54'26" East
	Floirac	44°50'10" North	00°31'37" West
Great Britain	Cambridge	52°09'59" North	00°02'20" East
	Damhall	53°09'22" North	02°32'03" West
	Jodrell Bank	53°14'10" North	02°18'26" West
	Knockin	52°47'24" North	02°59'45" West
	Pickmere	53°17'18" North	02°26'38" West
Italy	Medicina	44°31'14" North	11°38'49" East
	Noto	36°52'34" North	14°59'21" East
	Sardinia	39°29'50" North	09°14'40" East

Country	Name of the station	Latitude	Longitude
Poland	Fort Skala Krakow	50°03'18" North	19°49'36" East
Russia	Dmitrov	56°26'00" North	37°27'00" East
	Kalyazin	57°13'22" North	37°54'01" East
	Pushchino	54°49'00" North	37°40'00" East
	Zelenchukskaya	43°49'53" North	41°35'32" East
Sweden	Onsala	57°23'45" North	11°55'35" East
Switzerland	Bleien	47°20'26" North	08°06'44" East
Spain	Yebes	40°31'27" North	03°05'22" West
	Robledo	40°25'38" North	04°14'57" West
Hungary	Penc	47°47'22" North	19°16'53" East

As a general rule, the requirements outlined in EN 302729-1/2 must be observed.

FCC

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

[Any] changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The devices are compliant with the FCC Code of Federal Regulations, CFR 47, Part 15, Sections 15.205, 15.207, 15.209.

In addition, the devices are compliant with Section 15.256 . For these LPR (Level Probe Radar) applications the devices must be professionally installed in a downward operating position. In addition, the devices are not allowed to be mounted in a zone of 4 km around RAS stations and within a radius of 40 km around RAS stations the maxium operation height of devices is 15 m (49 ft) above ground.

Contains transmitter module FCC ID: XMR201707BG96

Industry Canada

Canada CNR-Gen Section 7.1.3

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

[Any] changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Contains transmitter module IC ID: 10224A-201709BG96

- The installation of the LPR/TLPR device shall be done by trained installers, in strict compliance with the manufacturer's instructions.
- The use of this device is on a "no-interference, no-protection" basis. That is, the user shall accept operations of high-powered radar in the same frequency band which may interfere with or damage this device. However, devices found to interfere with primary licensing operations will be required to be removed at the user's expense.
- This device shall be installed and operated in a completely enclosed container to prevent RF emissions, which can otherwise interfere with aeronautical navigation.
- The installer/user of this device shall ensure that it is at least 10 km from the Dominion Astrophysical Radio Observatory (DRAO) near Penticton, British Columbia. The coordinates of the DRAO are latitude 49°19′15″ N and longitude 119°37′12″ W. For devices not meeting this 10 km separation (e.g., those in the Okanagan Valley, British Columbia,) the installer/user must coordinate with, and obtain the written concurrence of, the Director of the DRAO before the equipment can be installed or operated. The Director of the DRAO may be contacted at 250-497-2300 (tel.) or 250-497-2355 (fax). (Alternatively, the Manager, Regulatory Standards Industry Canada, may be contacted.)

> The model FWR30 fulfills the requirements for use as LPR (Level Probe Radar).

Radiofrequency radiation exposure information	This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps. Ce transmetteur ne doit pas etre place au meme endroit ou utilise simultanement avec un autre transmetteur ou antenne.

Radio approval	Cellular radio: RED approvals

Other standards and guidelines	• EN 61010-1 • EN 61326-1 EMC

Ordering information

Detailed ordering information is available for your nearest sales organization www.addresses.endress.com or in the Product Configurator under www.endress.com :

1. Click Corporate
2. Select the country
3. Click Products
4. Select the product using the filters and search field
5. Open the product page

The Configuration button to the right of the product image opens the Product Configurator.

> **Product Configurator - the tool for individual product configuration**
> - Up-to-the-minute configuration data
> - Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
> - Automatic verification of exclusion criteria
> - Automatic creation of the order code and its breakdown in PDF or Excel output format
> - Ability to order directly in the Endress+Hauser Online Shop

Accessories

Device-specific accessories	• Mounting bracket pipe/IBC • Mounting bracket wall/ceiling

Supplementary documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from nameplate
- *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2D matrix code (QR code) on the nameplate

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.

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