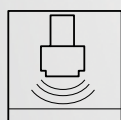


LCR10

Level Radar

Technical Information



Your automation, our passion.

 **PEPPERL+FUCHS**

With regard to the supply of products, the current issue of the following document is applicable:
The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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1 Introduction

1.1 Content of this Document

This document contains information that you need in order to use your product throughout the applicable stages of the product life cycle. These can include the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal



Note

This document does not substitute the instruction manual.



Note

For full information on the product, refer to the instruction manual and further documentation on the Internet at www.pepperl-fuchs.com.

The documentation consists of the following parts:

- Datasheet – product overview
The datasheet contains the essential technical data for product selection.
- Technical information (TI), present document – planning aid
The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
- Manual (BA) – complete information
The manual contains all information from incoming acceptance to disposal.
- Brief instructions (KA) – guide that takes you quickly to the 1st measured value
The brief instructions contain all the essential information from incoming acceptance to initial commissioning.
- Instruction manual (SI) – safety-relevant document
Depending on the approval, the required instruction manuals are supplied with the device.

Additionally, the following parts may belong to the documentation, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Additional documents

1.2 Safety Information

Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismantling lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismantling of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

1.3 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols



Note

This symbol brings important information to your attention.



Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

Symbols for Certain Types of Information and Graphics



Permitted

Procedures, processes or actions that are permitted.



Forbidden

Procedures, processes or actions that are forbidden.

1, 2, 3 ... Item numbers

A, B, C, ... Views

2 Terms and Abbreviations

2.1 Document Types

BA

Document type Manual

KA

Document type Brief Instructions

TI

Document type Technical Information

SI

Document type Instruction manual

2.2 Abbreviations

PN

Nominal pressure

MWP

MWP (**M**aximum **w**orking **p**ressure/max. process pressure)

The MWP can also be found on the nameplate.

ToF

Time **o**f **F**light

ϵ_r

DK value – relative dielectric constant

Operating tool

The term **operating tool** is used in place of the following operating software:
P+F Level (app), for operation using an Android or iOS smartphone or tablet

BD

Blocking **D**istance; no signals are analyzed within the BD.

PLC

Programmable logic **c**ontroller (PLC)

3 Product Life Cycle

3.1 Engineering

- Proven radar measuring technology
- Flooding detection
- 2D/3D drawings
- Spec sheet producer
- Applicator selection tool for selecting the perfect measurement solution



Note

Device not compatible with transmitters and sensors that use ultrasonic measurement technology.

3.2 Procurement

- Best price-performance-ratio radar
- Global availability

3.3 Installation

Rear and front thread for flexible installation

3.4 Commissioning

- Quick and easy setup with the P+F Level app
- No additional tools or adapters required
- Local languages (up to 15)

3.5 Operation

- Continuous self-monitoring
- Diagnostics information according to NAMUR NE107 with remedial measures in the form of plain text messages
- Signal curve via P+F Level (app)
- Encrypted single point-to-point data transmission (tested by Fraunhofer Institute) and password protected communication via *Bluetooth*[®] wireless technology

3.6 Maintenance

- No maintenance required
- Technical experts on-call around the world

3.7 Retirement

- Environmentally responsible recycling concepts
- RoHS compliance (restriction of certain hazardous substances), lead-free soldering of electronic components

4 Measuring Principle

The device is a "downward-looking" measuring system, which functions according to the time-of-flight (ToF) method. It measures the distance from the reference point **R** to the product surface. Radar pulses are emitted by an antenna, reflected off the product surface and received again by the radar system.

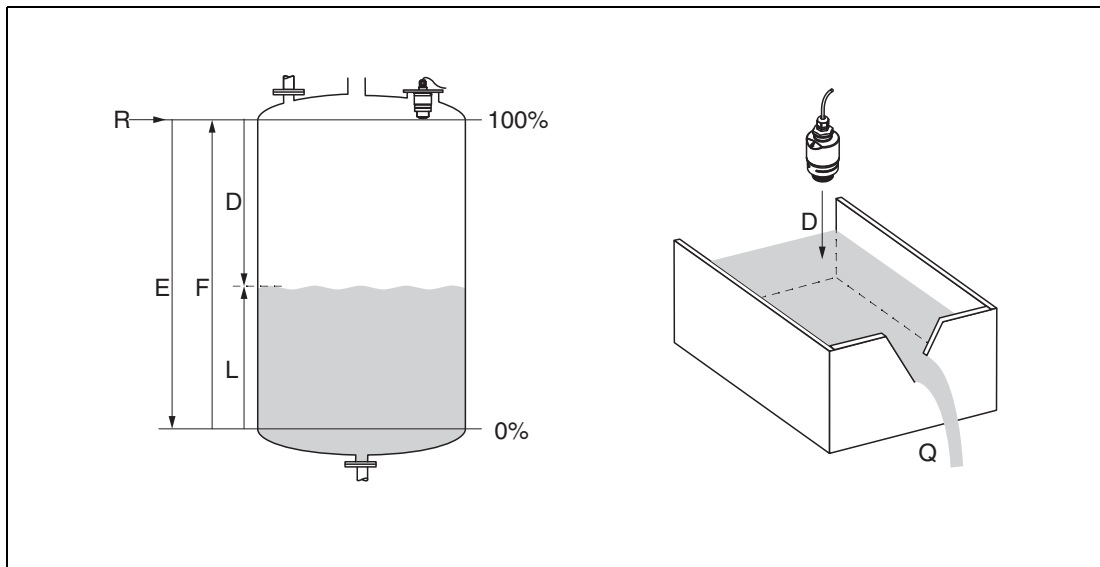


Figure 4.1 Setup parameters of the device

- E** Empty calibration (= zero)
- F** Full calibration (= span)
- D** Measured distance
- L** Level ($L = E - D$)
- Q** Flow rate at measuring weirs or channels (calculated from the level using linearization)
- R** Reference point

4.1 Input

The reflected radar pulses are received by the antenna and transmitted to the electronics. A microprocessor evaluates the signals and identifies the level echo caused by the reflection of the radar pulses at the product surface. This clear signal detection system benefits from over 30 years' experience with time-of-flight procedures.

The distance **D** to the product surface is proportional to the time of flight **t** of the pulse:

$$D = c \times t/2,$$

where **c** is the speed of light.

Based on the known empty distance **E**, the level **L** is calculated:

$$L = E - D$$

4.2 Output

The device is calibrated by entering the empty distance **E** (= zero point) and the full distance **F** (= span).

- Current output: 4 to 20 mA
- Digital output (P+F Level): 0 to 8 m (0 to 26 foot) or 0 to 12 m (0 to 39 foot) in connection with mounted **flooding protection tube** accessory.

5 Input

5.1 Measured Variable

The measured variable is the distance between the reference point and the product surface.
The level is calculated based on **E**, the empty distance entered.

5.2 Measuring Range

Maximum measuring range

- Device with 40 mm (1.5 inch) antenna: 8 m (26 foot)
- Device with 40 mm (1.5 inch) antenna and with mounted **flooding protection tube** accessory: 12 m (39 foot)

Installation requirements

- Recommended tank height > 1.5 m (5 foot) for media with low ϵ_r value
- Open channel minimum width 0.5 m (1.6 foot)
- Calm surfaces
- No agitators
- No buildup
- Relative dielectric constant $\epsilon_r > 4$
Contact Pepperl+Fuchs for lower ϵ_r values

Usable measuring range

The usable measuring range depends on the antenna size, the medium's reflective properties, the installation position and any possible interference reflections.

Media groups

- $\epsilon_r = 4$ to 10
e. g. concentrated acid, organic solvents, ester, aniline, alcohol, acetone.
- $\epsilon_r > 10$
e. g. conductive liquids, aqueous solutions, diluted acids and bases

Reduction of the maximum possible measuring range by:

- Media with bad reflective properties (= low ϵ_r value)
- Formation of buildup, particularly of moist products
- Strong condensation
- Foam generation
- Freezing of sensor

5.3 Operating Frequency

K-band (~ 26 GHz)

5.4 Transmission Power

Mean power density in the direction of the beam

- At a distance of 1 m (3.3 foot): < 12 nW/cm²
- At a distance of 5 m (16 foot): < 0.4 nW/cm²

6 Output

6.1 Output Signal

Output signal 4 to 20 mA

An 4 to 20 mA interface is used for measured value output and to power to the device.

6.2 Digital Output

Bluetooth® Wireless Technology (available as an optional extra)

The device has a *Bluetooth*® wireless technology interface and can be operated and configured via this interface using the P+F Level app.

- The range under reference conditions is 25 m (82 foot).
- Incorrect operation by unauthorized persons is prevented by means of encrypted communication and password encryption.
- The *Bluetooth*® wireless technology interface can be deactivated.

6.3 Signal on Alarm

Depending on the interface, failure information is displayed as follows:

- Current output
Alarm current: 22.5 mA (in accordance with NAMUR recommendation NE 43)
- Operating tool via digital communication P+F Level (app)
 - Status signal (as per NAMUR Recommendation NE 107)
 - Plain text display with remedial action

6.4 Linearization

The linearization function of the device allows the conversion of the measured value into any unit of length, weight, flow or volume.

When operating via P+F Level (app), up to 32 value pairs can be entered manually into the linearization table.

7 Electrical Connection

7.1 Cable Assignment

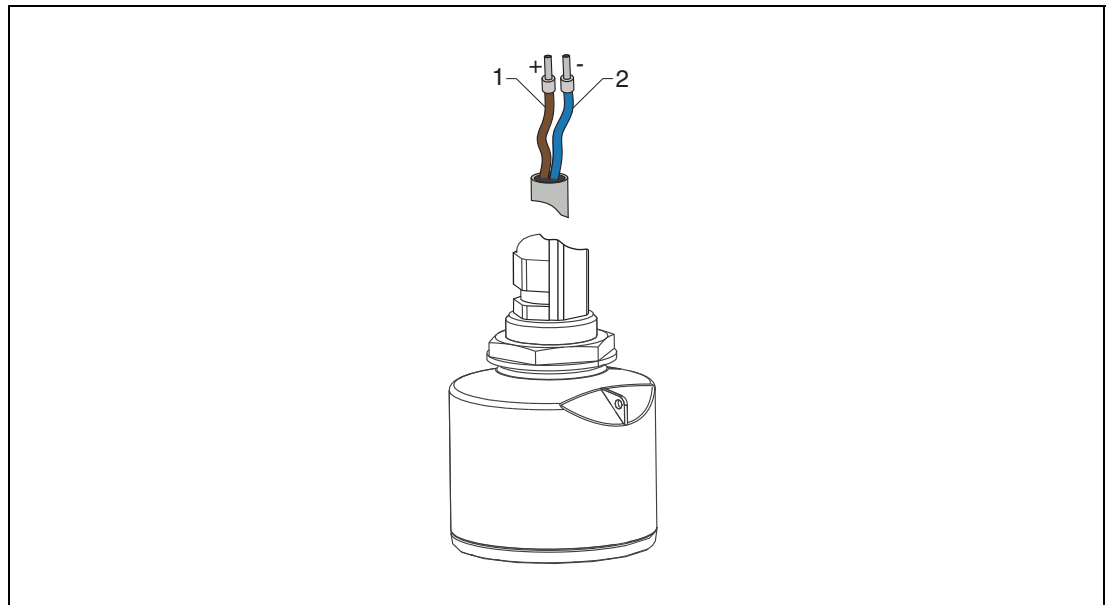


Figure 7.1 Cable assignment

- 1 Plus, brown wire
- 2 Minus, blue wire

7.2 Supply Voltage

10.5 to 30 V DC

An external power supply is necessary.

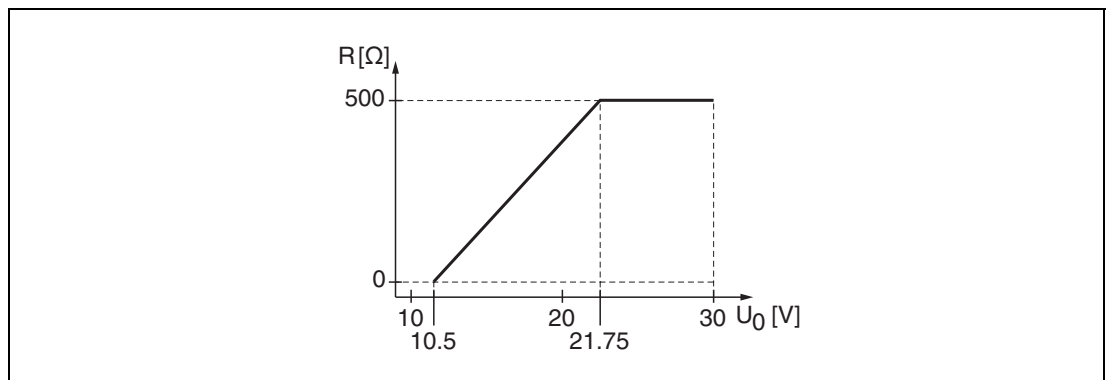


Figure 7.2 Maximum load R , depending on supply voltage U_0 of power supply unit

Battery operation

The sensor's *Bluetooth*® wireless technology communication can be disabled to increase the operating life of the battery.

Potential equalization

No special measures for potential equalization are required.

Note

Various power supply units can be ordered as an accessory from Pepperl+Fuchs.

7.3

Power Consumption

Maximum input power: 675 mW

Current consumption

- Maximum input current: <25 mA
- Maximum start-up current: 3.6 mA

7.4

Starting Time

First stable measured value after 20 s (with supply voltage = 24 V DC)

7.5

Power Supply Failure

The configuration remains stored in the sensor.

7.6

Connecting the Device

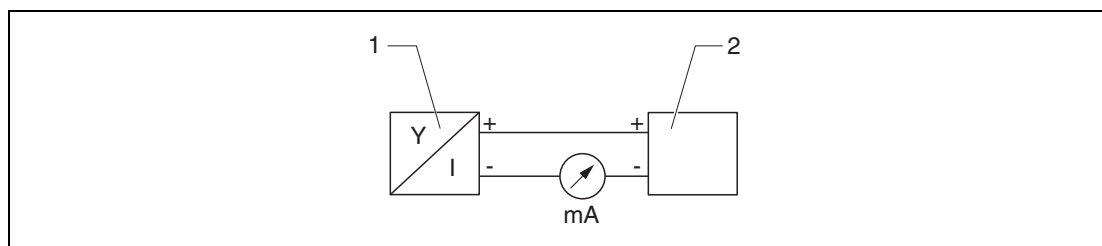


Figure 7.3 Block diagram of HART connection

- 1 Device
- 2 Power supply

7.7

Cable Specification

Unshielded cable, wire cross-section 0.75 mm²

- Resistant to UV and weather conditions as per ISO 4892-2
- Flame resistance according to IEC 60332-1-2

According to IEC/EN 60079-11 section 10.9, the cable is designed for a tensile strength of 30 N (6.74 lbf) (over a period of 1 h).

The device is supplied with 10 m (33 foot) cable length as standard.

7.8

Overvoltage Protection

The device is equipped with integrated overvoltage protection.

8 Performance Characteristics

8.1 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 inch)
- No major interference reflections inside the signal beam

8.2 Maximum Measured Error

Typical data under reference operating conditions: DIN EN 61298-2, percentage values in relation to the span.

Output, digital

(P+F Level (app))

- Sum of non-linearity, non-repeatability and hysteresis: ± 5 mm (± 0.2 inch)
- Offset/zero point: ± 4 mm (± 0.16 inch)

Output, analog

Only relevant for 4 to 20 mA current output; add error of the analog value to the digital value

- Sum of non-linearity, non-repeatability and hysteresis: ± 0.02 %
- Offset/zero point: ± 0.03 %

Differing values in near-range applications

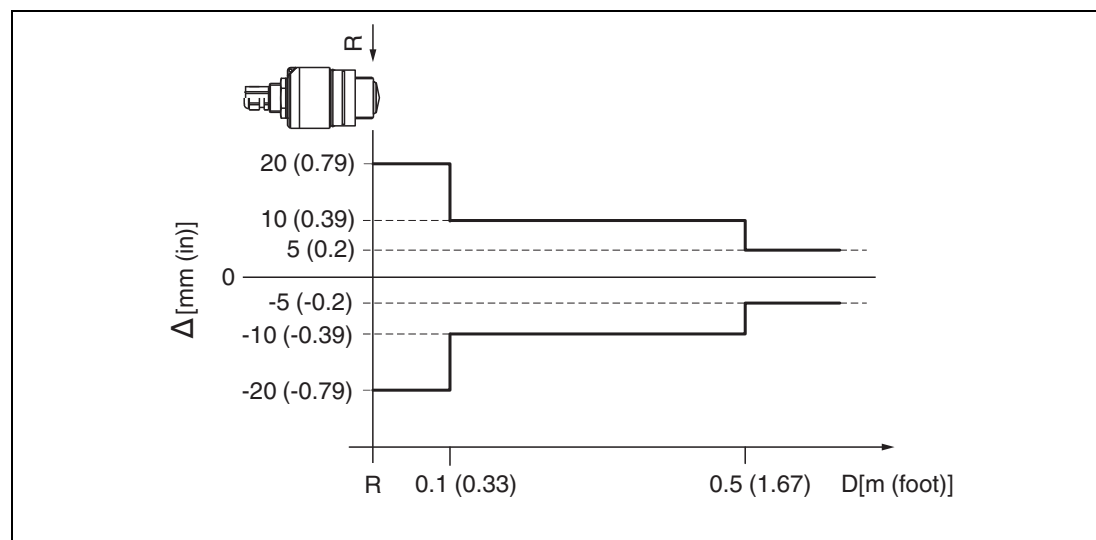


Figure 8.1 Maximum measured error in near-range applications; values for standard version

- Δ Maximum measured error
R Reference point of the distance measurement
D Distance from reference point of antenna

8.3 Measured Value Resolution

Dead band as per EN61298-2:

- Digital: 1 mm (0.04 inch)
- Analog: 4 μ A

8.4 Response Time

The response time can be configured. The following step response times apply (in accordance with DIN EN 61298-2) when damping is switched off:

Tank height

< 5 m (16 foot)

Sampling rate

1 s⁻¹

Response time

< 3 s

In accordance with DIN EN 61298-2, the step response time is the time following an abrupt change in the input signal up until the changed output signal has adopted 90 % of the steadystate value for the first time.

8.5 Influence of Ambient Temperature

The measurements are carried out in accordance with EN 61298-3

- Digital (Bluetooth® wireless technology):
Standard version: average $T_C = \pm 3 \text{ mm } (\pm 0.12 \text{ inch})/10 \text{ K}$
- Analog (current output):
 - Zero point (4 mA): average $T_C = 0.02 \text{ %}/10 \text{ K}$
 - Span (20 mA): average $T_C = 0.05 \text{ %}/10 \text{ K}$

9 Installation

9.1 Installation Conditions

Installation types

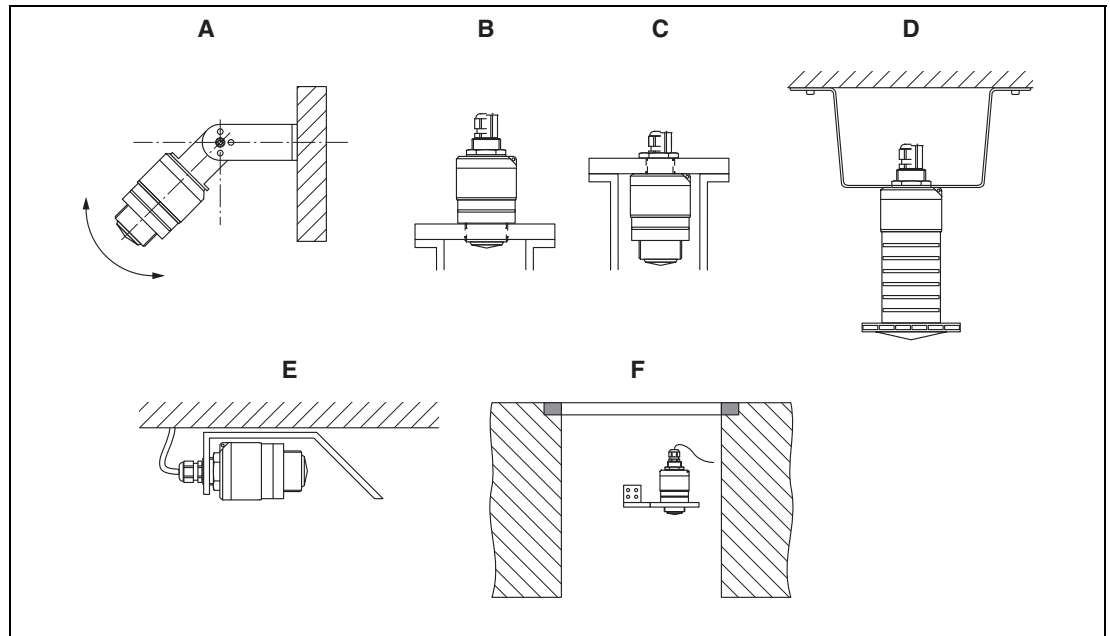


Figure 9.1 Wall, ceiling or nozzle installation

- A** Wall or ceiling mount, adjustable
- B** Mounted at front thread
- C** Mounted at rear thread
- D** Ceiling installation with counter nut
- E** Horizontal installation with reflector plate
- F** Shaft wall mounting



Caution!

The sensor cables are not designed as supporting cables. Do not use them for suspension purposes.

Always operate the device in a vertical position in free-space applications.

Position for installation on a vessel

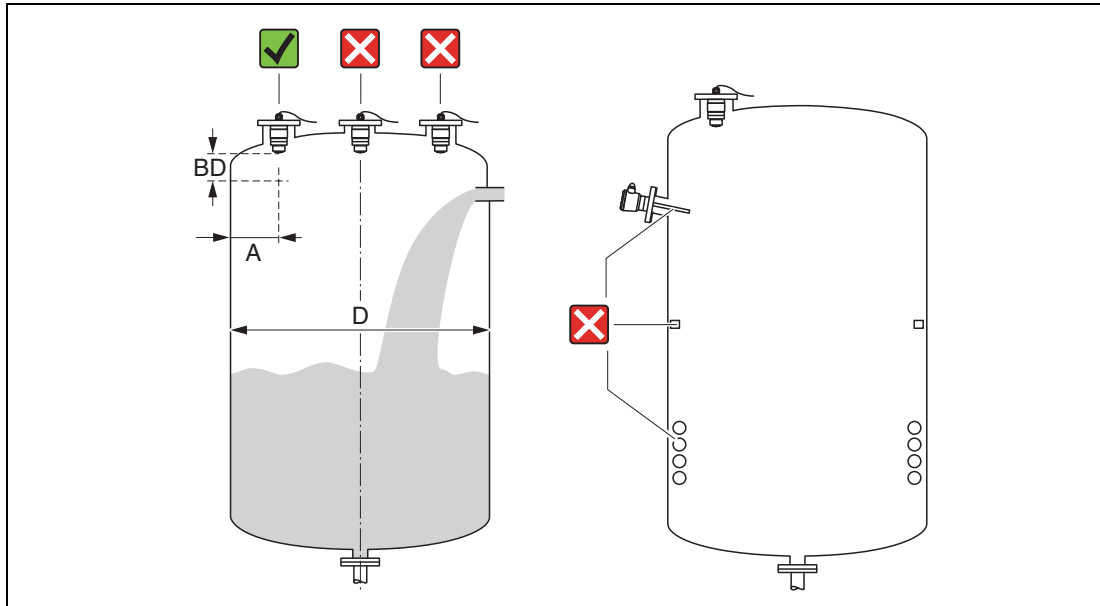


Figure 9.2 Installation position on a vessel

- If possible install the sensor so that its lower edge projects into the vessel.
- Recommended distance **A** wall – nozzle outer edge: $\sim 1/6$ of the vessel diameter **D**. Under no circumstances should the device be mounted closer than 15 cm (5.91 inch) to the vessel wall.
- Do not install the sensor in the middle of the vessel.
- Avoid measurements through the filling curtain.
- Avoid equipment such as limit switches, temperature sensors, baffles, heating coils etc.
- No signals are evaluated within the Blocking distance (BD). It can therefore be used to suppress interference signals (e. g. the effects of condensate) in the vicinity of the antenna.

An automatic Blocking distance of at least 0.1 m (0.33 foot) is configured as standard. However, this can be overwritten manually (0 m (0 foot) is also permitted).

Automatic calculation:

Blocking distance = Empty calibration – Full calibration – 0.2 m (0.656 foot).

Each time a new entry is made in the **Empty calibration** parameter or **Full calibration** parameter, the **Blocking distance** parameter is recalculated automatically using this formula.

If the result of the calculation is a value < 0.1 m (0.33 foot), the Blocking distance of 0.1 m (0.33 foot) will continue to be used.

Nozzle installation

The antenna should be located out of the nozzle for optimum measurement.
The interior of the nozzle must be smooth and may not contain any edges or welded joints.
The edge of the nozzle should be rounded if possible.

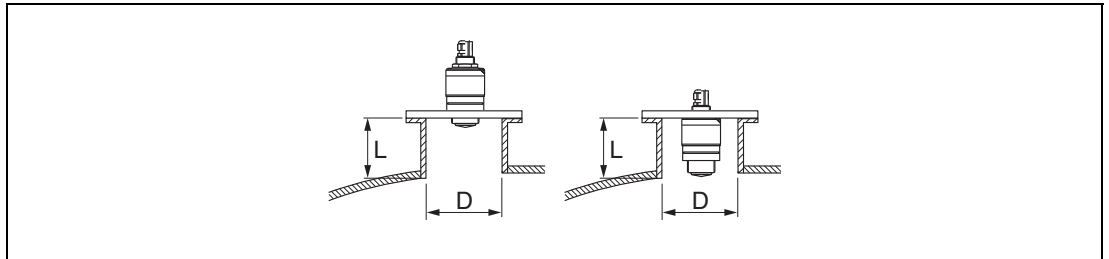


Figure 9.3 Nozzle installation

D Nozzle diameter

L Nozzle length

The maximum length of the nozzle **L** depends on the nozzle diameter **D**. Please note the limits for the diameter and length of the nozzle.

Installation outside nozzle

- D: min. 40 mm (1.5 inch)
- L: max. $D \times 1.5$

Installation inside nozzle

- D: min. 80 mm (3 inch)
- L: max. 140 mm (5.5 inch) + $D \times 1.5$

Device alignment for installation on a vessel

- Align the antenna vertically to the product surface.
- Align the eyelet with lug towards the vessel wall as well as possible.

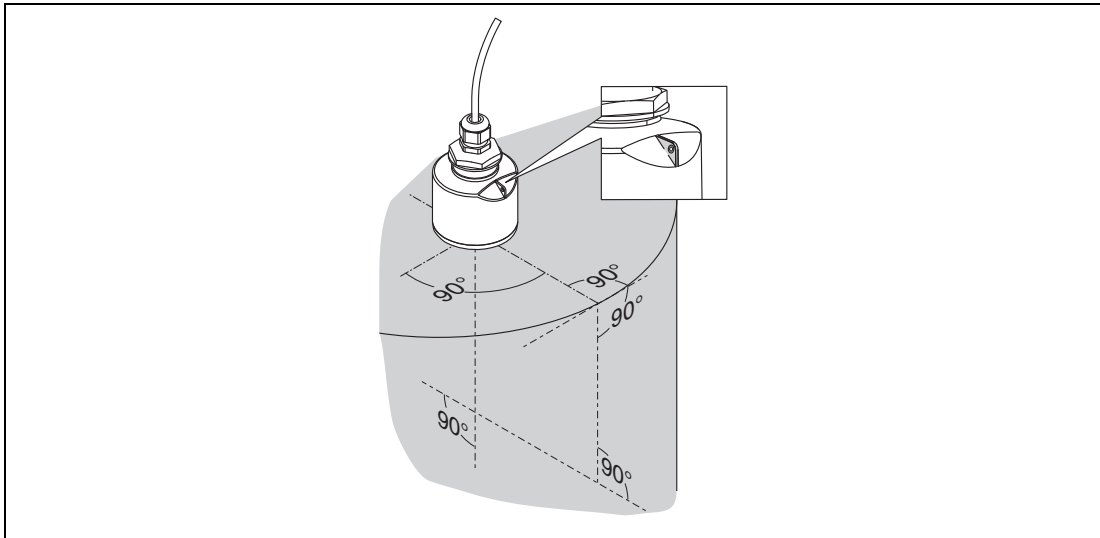


Figure 9.4 Device alignment for installation on a vessel

Beam angle

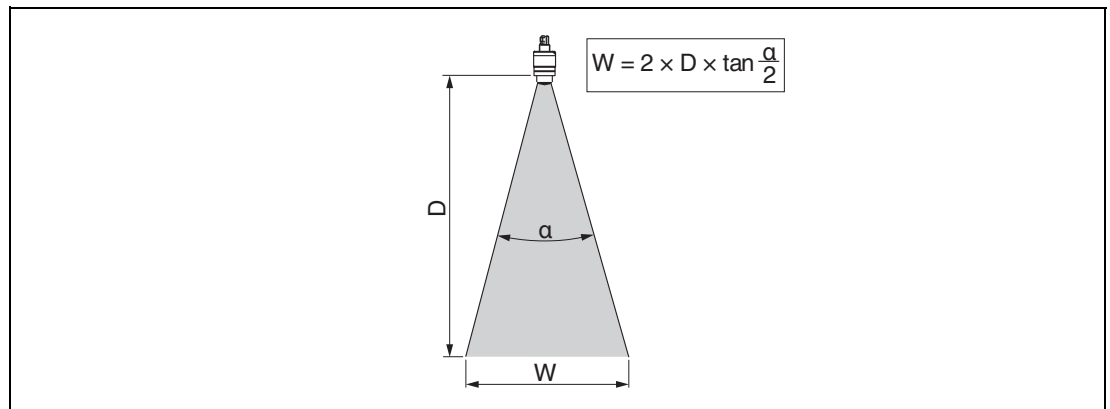


Figure 9.5 Relationship between beam angle α , distance D and beamwidth diameter W

The beam angle is defined as the angle α , at which the power density of the radar waves reaches half the value of the maximum power density (3 dB width). Microwaves are also emitted outside the signal beam and can be reflected off interfering installations.

Beam diameter **W** as a function of beam angle α and distance **D**.

40 mm (1.5 inch) antenna, α 30 °

$$W = D \times 0.54$$

40 mm (1.5 inch) antenna with flooding protection tube, α 12 °

$$W = D \times 0.21$$

Measurement in plastic vessels

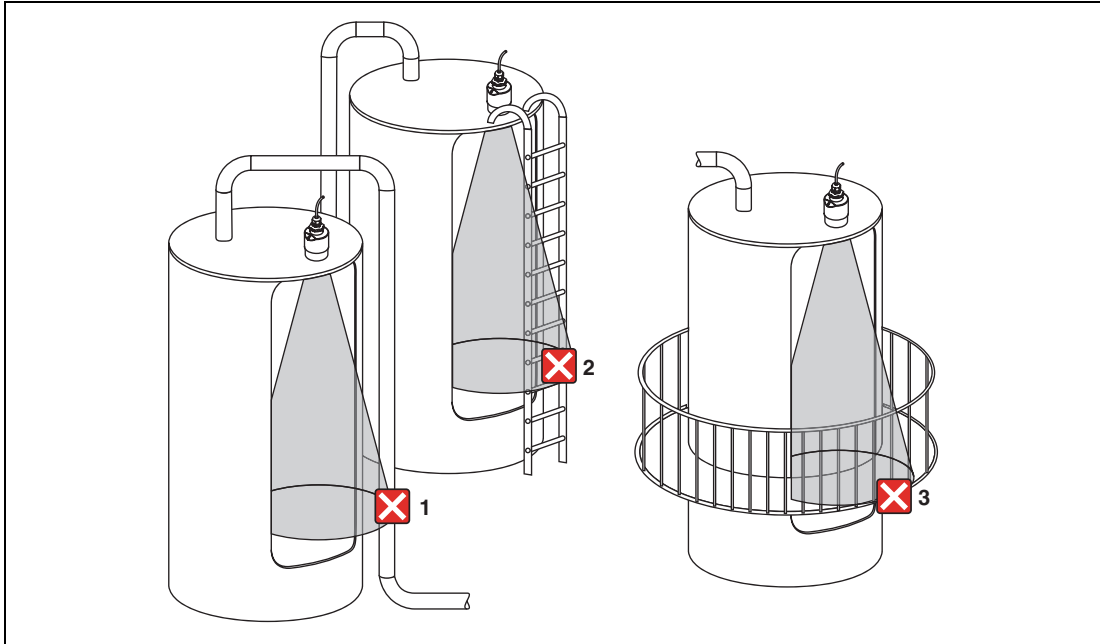


Figure 9.6 Measurement in a plastic vessel with a metallic, interfering installation outside of the vessel

- 1 Pipe, tubing
- 2 Ladder
- 3 Grate, railing

If the outer wall of the vessel is made of a non-conductive material (e. g. GFR), microwaves can also be reflected by interfering installations outside of the vessel.

Please ensure there are no interfering installations made of a conductive material in the signal beam (see the beam angle section for information on calculating the beamwidth diameter).

Please contact the manufacturer for further information.

Weather protection cover

For outdoor use, a weather protection cover is recommended.

The weather protection cover is available as an accessory.

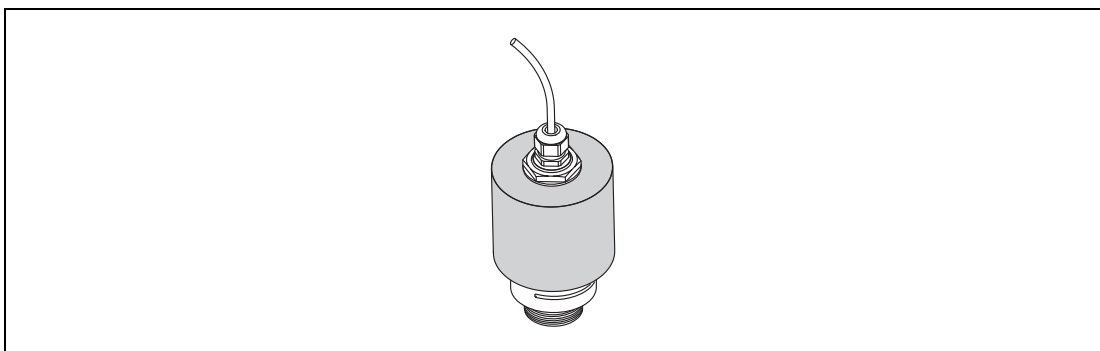


Figure 9.7 Weather protection cover with 40 mm (1.5 inch) antenna

Note

The sensor is not completely covered by the weather protection cover.



Use of flooding protection tube

The flooding protection tube ensures the sensor measures the maximum level even if it is completely flooded.

In free-field installations and/or in applications where there is a risk of flooding, the flooding protection tube must be used.

The flooding protection tube can be ordered as an accessory or together with the device via the ordering option **Accessory enclosed**.

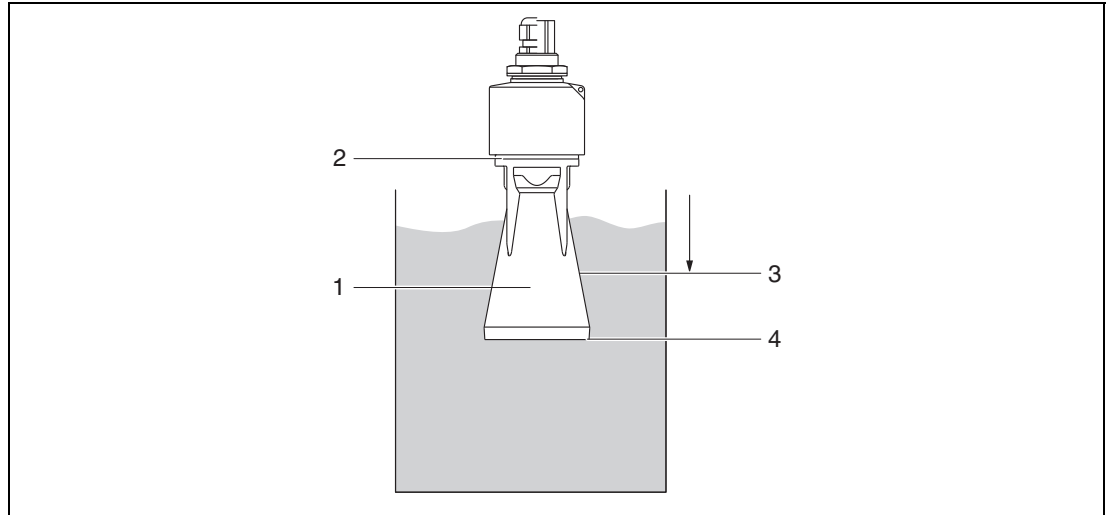


Figure 9.8 Function of flooding protection tube

- 1 Air pocket
- 2 O-ring (EPDM) seal
- 3 Blocking distance
- 4 Max. level

The tube is screwed directly onto the sensor and seals off the system by means of an O-ring making it air-tight. In the event of flooding, the air pocket that formed in the tube ensures the measurement of the maximum level at the end of the tube. Due to the fact that the blocking distance is inside the tube, multiple echoes are not analyzed.

Installation with mounting bracket, adjustable

The mounting bracket is available as an accessory.

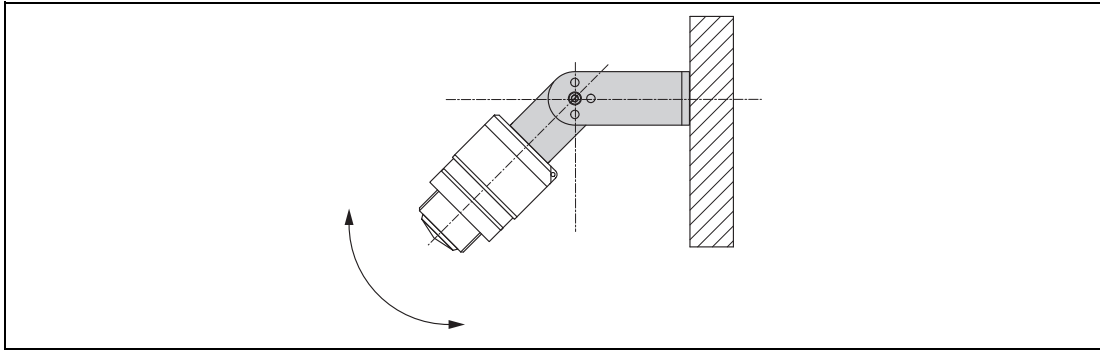


Figure 9.9 Installation with mounting bracket, adjustable

- Wall or ceiling installation is possible.
- Using the mounting bracket, position the antenna so that it is perpendicular to the product surface.



Caution!

There is no conductive connection between the mounting bracket and transmitter housing. Electrostatic charging possible.

Integrate the mounting bracket in the local potential equalization system.

Cantilever installation, with pivot

The cantilever, wall bracket and mounting frame are available as accessories.

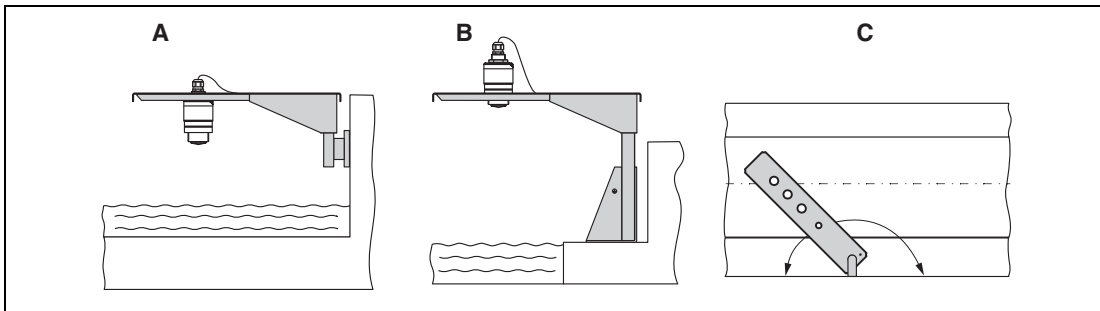


Figure 9.10 Cantilever installation, with pivot

- A** Cantilever with wall bracket
- B** Cantilever with mounting frame
- C** Cantilever can be turned (e. g., in order to position the device over the center of the flume)

Installation of horizontal mounting bracket for sewer shafts

The horizontal mounting bracket is available as an accessory.

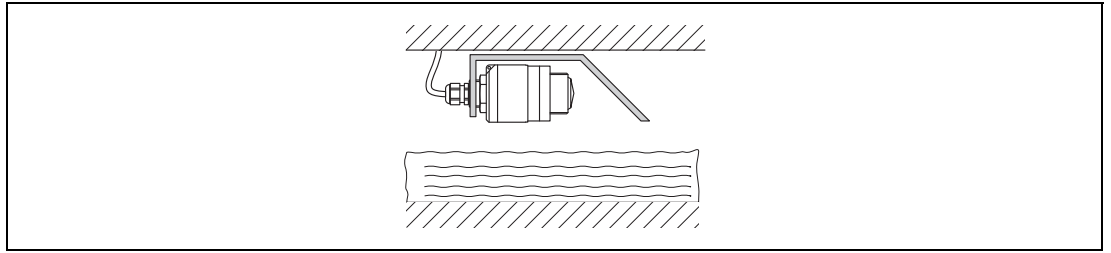


Figure 9.11 Installation of horizontal mounting bracket for sewer shafts

Mounting in a shaft

The pivoted mounting bracket is available as an accessory.

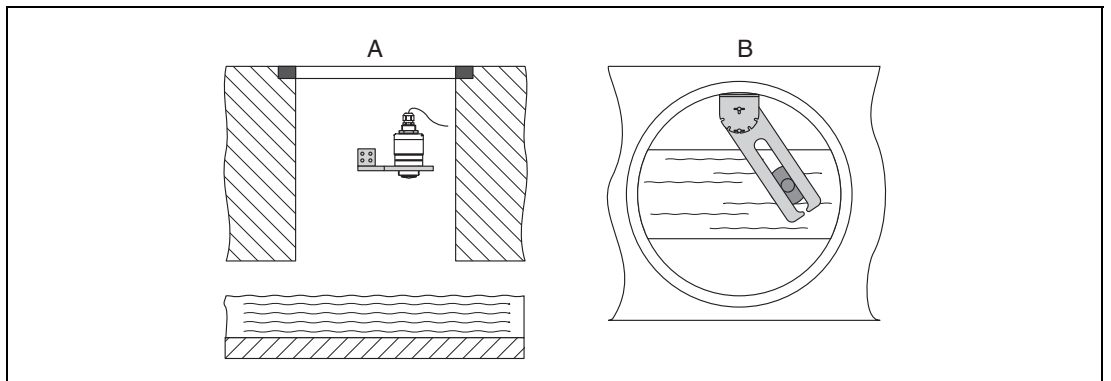


Figure 9.12 Mounting in a shaft, pivotable and adjustable

- A** Arm with wall bracket
- B** Pivotable and adjustable arm (e. g. to align the device with the center of a channel)

10 Environment

10.1 Ambient Temperature Range

Measuring device: -40 to +60 °C (-40 to +140 °F)



Operating the Device Outdoors in Strong Sunlight

1. Mount the device in the shade.
2. Avoid direct sunlight, particularly in warm climatic regions.
3. Use a weather protection cover.

10.2 Storage Temperature

-40 to +80 °C (-40 to +176 °F)

10.3 Climate Class

DIN EN 60068-2-38 (test Z/AD)

10.4 Operating Altitude according to IEC 61010-1 Ed.3

Generally up to 2000 m (6600 foot) above sea level.

10.5 Degree of Protection

Tested according to:

- IP66, NEMA 4X
- IP68, NEMA 6P (24 h at 1.83 m (6.00 foot) under water)

10.6 Vibration Resistance

DIN EN 60068-2-64/IEC 60068-2-64: 20 to 2 000 Hz, 1 (m/s²)/Hz

10.7 Electromagnetic Compatibility (EMC)

Electromagnetic compatibility in accordance with all of the relevant requirements outlined in the EN 61000 series and NAMUR Recommendation EMC (NE 21). Details are provided in the Declaration of Conformity, refer to www.pepperl+fuchs.de.

11 Process

11.1 Process Temperature, Process Pressure

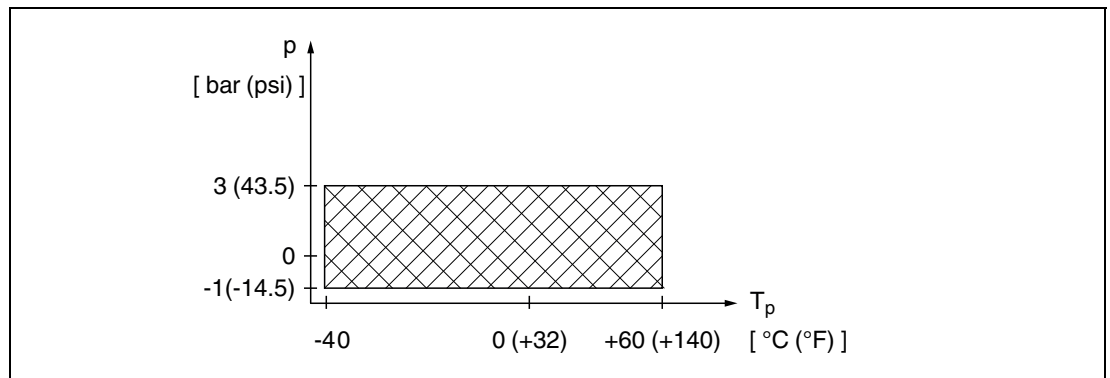


Figure 11.1 Permitted range for process temperature and process pressure

Process temperature range

-40 to +60 °C (-40 to +140 °F)

Process pressure range

- $p_{rel} = -1$ to 3 bar (-14.5 to 43.5 psi)
- $p_{abs} < 4$ bar (58 psi)

11.2 Dielectric Constant

For liquids

- $\epsilon_r \geq 4$
- Contact Pepperl+Fuchs for lower ϵ_r values



Note

For dielectric constants (DC values) of many media commonly used in various industries refer to internet.

12 Mechanical Construction

12.1 Dimensions

40 mm (1.5 inch) antenna with G1-1/2 or MNPT1-1/2 thread

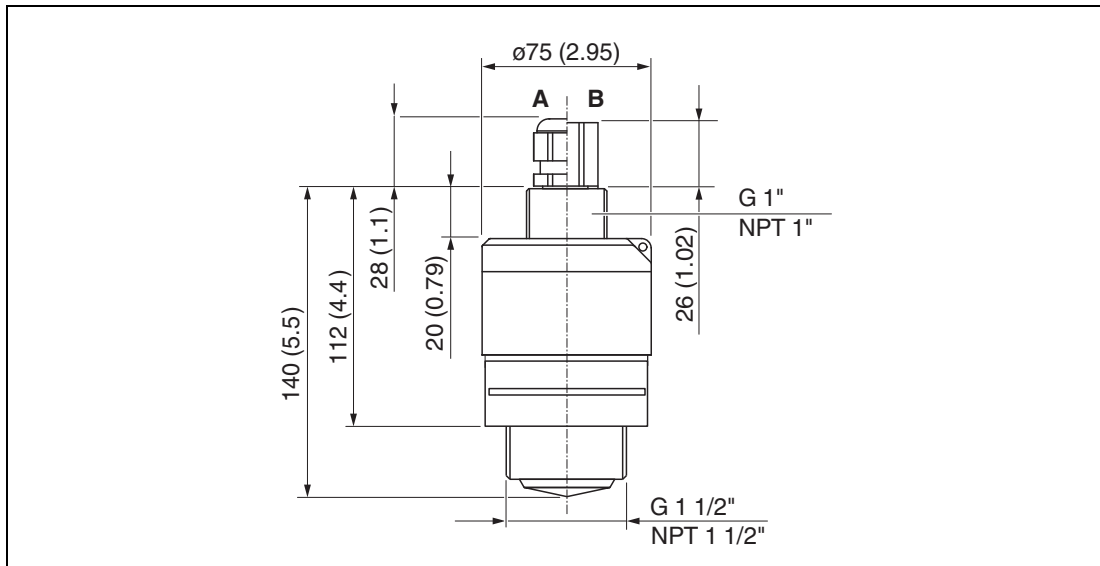


Figure 12.1 Dimensions of G1-1/2 or MNPT1-1/2 process connection thread, engineering unit: mm (inch)

- A Cable gland
- B FNPT1/2 conduit

40 mm (1.5 inch) antenna with flooding protection tube 40 mm (1.5 inch)

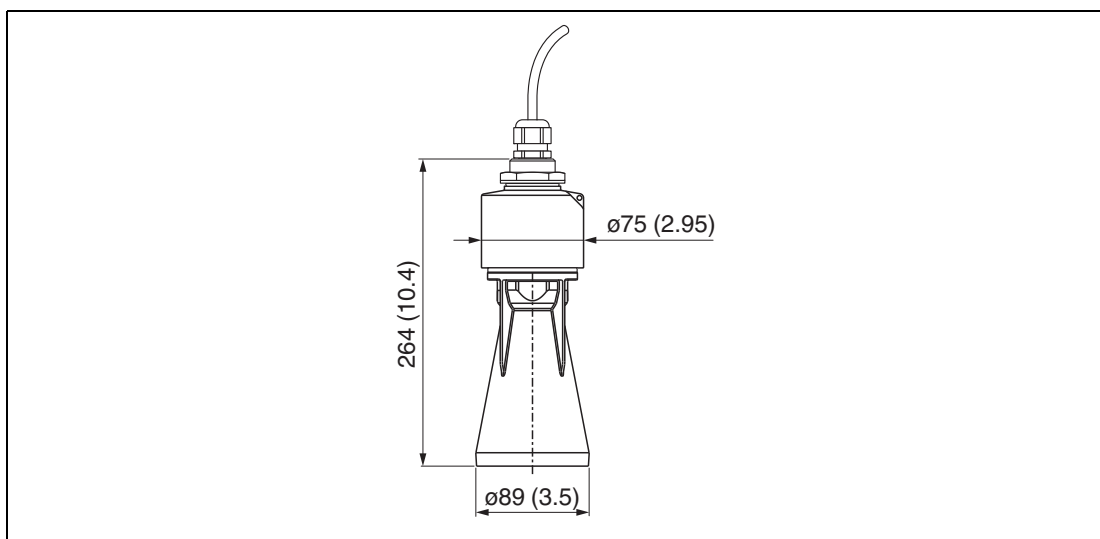


Figure 12.2 Dimensions of 40 mm (1.5 inch) antenna mounted with flooding protection tube, engineering unit: mm (inch)

The flooding protection tube can be ordered together with the device via the ordering option **Accessory enclosed**.

Counter nut for process connection, rear side

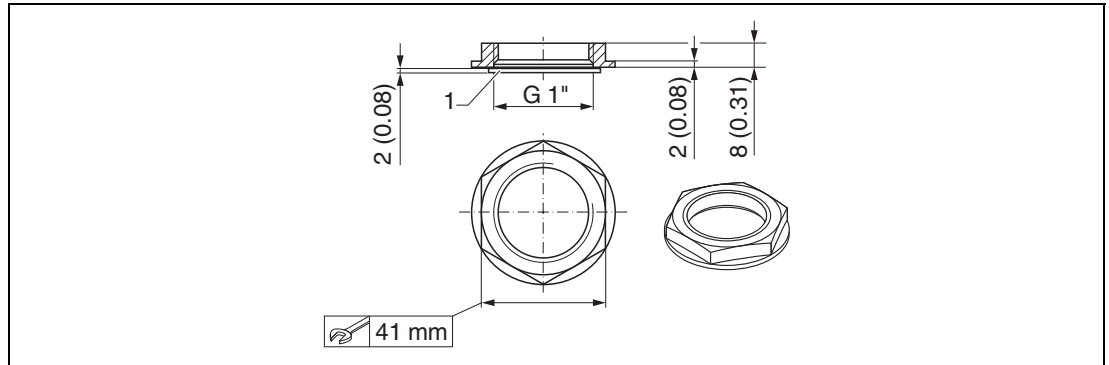


Figure 12.3 Dimensions of counter nut for process connection, rear side, engineering unit: mm (inch)

1 Seal

- The counter nut with seal (EPDM) is included in the scope of supply.
- Material: PA66

12.2 Weight

Weight (incl. 10 m (33 foot) cable): approx. 3 kg (6.6 lb)

12.3 Materials

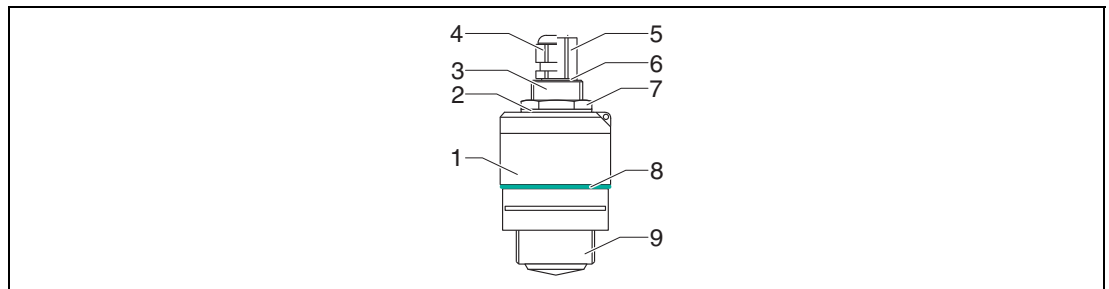


Figure 12.4

- 1 Sensor housing; PVDF
- 2 Seal; EPDM
- 3 Process connection, rear side; PVDF
- 4 Cable gland; PA
- 5 Pipe adapter; CuZn nickel-plated
- 6 O-ring; EPDM
- 7 Counter nut; PA6.6
- 8 Design ring; PBT-PC
- 9 Process connection, front side; PVDF

12.4 Connecting Cable

Standard cable length: 10 m (33 foot)

If longer cable lengths are required, an extension cable must be used. In this case, the total cable length (sensor cable + extension cable) must not exceed 300 m (984 foot).

Material: PVC

13 Operability

13.1 Operating Concept

- 4 to 20 mA, HART
- P+F Level (app) via *Bluetooth*® wireless technology

13.2 Operation via Bluetooth Wireless Technology

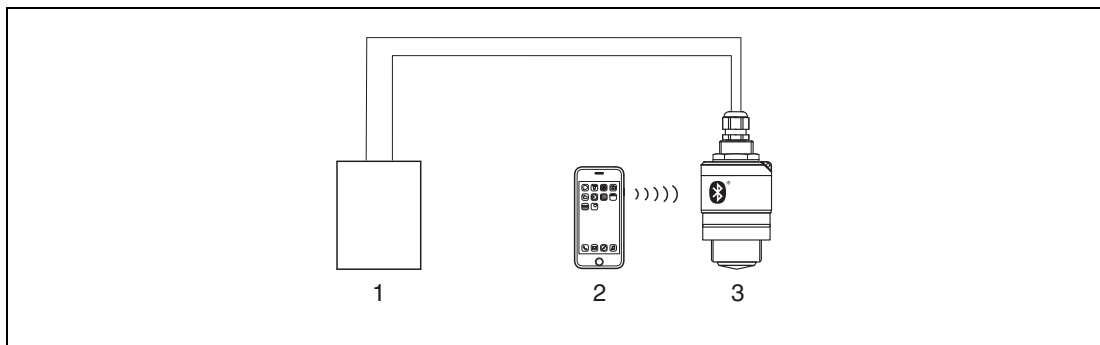


Figure 13.1 Possibilities for remote operation via *Bluetooth*® wireless technology

- 1 Transmitter power supply
- 2 Smartphone/Tablet with P+F Level (app)
- 3 Signal converter with *Bluetooth*® wireless technology

14 Certificates and Approvals

14.1 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.

Pepperl+Fuchs confirms successful testing of the device by affixing to it the CE mark.

14.2 RoHS

The measuring system complies with the substance restrictions of the Restriction on Hazardous Substances Directive 2011/65/EU (RoHS 2).

14.3 RCM-Tick Marking

The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products are labeled with the RCM-Tick marking on the name plate.



Figure 14.1

14.4 Approvals

- Non-hazardous area
- CSA C/US General Purpose

14.5 Explosion-Protected Smartphones and Tablets

Only mobile end devices with Ex approval may be used in hazardous areas. Pepperl+Fuchs offers mobile end devices for use in hazardous areas.



Note

For further information, refer to the internet at www.pepperl-fuchs.com.

14.6 Pressure Equipment

Pressure equipment with allowable pressure ≤ 200 bar (2900 psi)

Pressure instruments with a flange and threaded boss that do not have a pressurized housing do not fall within the scope of the Pressure Equipment Directive, irrespective of the maximum allowable pressure.

Reasons:

According to Article 2, point 5 of EU Directive 2014/68/EU, pressure accessories are defined as "devices with an operational function and having pressure-bearing housings".

If a pressure instrument does not have a pressure-bearing housing (no identifiable pressure chamber of its own), there is no pressure accessory present within the meaning of the Directive.

14.7 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.

Operating the Device 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 foot) above the ground.

5. Observe the requirements of EN 302729-1/2

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
Poland	Krakow Fort Skala	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

Table 14.1 Astronomy stations overview

14.8 FCC/Industry Canada

This device complies with Part 15 of the FCC Rules [and with Industry Canada licence-exempt RSS standard(s)]. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

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.
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 made to this equipment not expressly approved by Pepperl+Fuchs may void the FCC authorization to operate this equipment.



Note

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
 - Increase the separation between the equipment and receiver.
 - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
 - Consult the dealer or an experienced radio/TV technician for help.
-



Note

- 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.
 - Only for usage without the accessory "flooding protection tube", i. e. NOT in the free-field: This device shall be installed and operated in a completely enclosed container to prevent RF emissions, which can otherwise interfere with aeronautical navigation.
-

FCC/Industry Canada IDs

Tank level-probing radar

- HVIN: LCR10X
 - FCC ID: IRELCR2XKT
 - Industry Canada ID: 7037A-2KT

Level-probing radar:

- HVIN: LCR10+R7X
 - FCC ID: IRELCR2XKL
 - Industry Canada ID: 7037A-2KL

14.9 Japanese Radio Law

Japanese Radio Law and Japanese Telecommunications Business Law Compliance

This device is granted pursuant to the Japanese Radio Law (電波法) and the Japanese Telecommunications Business Law (電気通信事業法). This device should not be modified (otherwise the granted designation number will become invalid).

Certified No.: R 202-LSF004

The products are labeled with the Technical Conformity Mark (GITEKI) from Japanese Ministry of Internal Affairs and Communications (MIC) on the name plate.



Figure 14.2

14.10 Other Standards and Guidelines

- IEC/EN 61010-1
Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures
- IEC/EN 55011
"EMC Emission, RF Emission for Class B". Industrial, scientific and medical equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement
- IEC/EN 61000-4-2
EMC Immunity, ESD (Performance Criteria A). Electromagnetic compatibility (EMC): Testing and measurement techniques – Electrostatic discharge immunity test (ESD)
- IEC/EN 61000-4-3
EMC Immunity, RF field susceptibility (Performance Criteria A). Electromagnetic compatibility (EMC): Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
- IEC/EN 61000-4-4
EMC Immunity, bursts (Performance Criteria B). Electromagnetic compatibility (EMC): Testing and measurement techniques – Electrical fast transient/burst immunity test
- IEC/EN 61000-4-5
EMC Immunity, surge (Performance Criteria B). Electromagnetic compatibility (EMC): Testing and measurement techniques - Surge immunity test
- IEC/EN 61000-4-6
EMC Immunity, conducted RF (Performance Criteria A). Electromagnetic compatibility (EMC): Testing and measurement techniques – Immunity to conducted disturbances induced by radiofrequency fields
- IEC/EN 61000-4-8
EMC Immunity, magnetic fields 50 Hz. Electromagnetic compatibility (EMC): Testing and measurement techniques – Power frequency magnetic field immunity test
- EN 61000-6-3
EMC Emission, conducted RF. EMC: Radiated interference – Residential, commercial and light industry environment
- NAMUR NE 21
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 43
Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 107
Status classification as per NE 107
- NAMUR NE 131
Requirements for field devices for standard applications
- IEEE 802.15.1
Requirements for the *Bluetooth*[®] wireless technology interface

15 Ordering Information

This overview does not mark options which are mutually exclusive.

Device	
LCR10	Level radar

Antenna, maximum measuring range	
1	40 mm/1-1/2 inch, -40 ... 60 °C (-40 ... 140 °F), measuring range up to 8 m in liquids
X	Special version

Process connection rear side, material	
G31	Thread ISO228 G1, PVDF
N31	Thread ASME MNPT1, PVDF, FNPT1/2 conduit
XXX	Special version

Process connection front side, material	
D	Thread ASME MNPT1-1/2, PVDF
5	Thread ISO228 G1-1/2, PVDF
X	Special version

Cable length	
2	10 m/32 foot
9	Special version

Power supply, output, operation	
IQ	2-wire, 4 to 20 mA, Bluetooth (app) configuration
XX	Special version

Approval	
NA	Version for non-hazardous area
CG	CSA C/US General Purpose
XX	Special version

Additional Options

Accessory enclosed **	
R7	Flooding protection tube, PBT-PC metallized, suitable for 40 mm/1-1/2 inch antenna with process connection front side G1-1/2, measuring range up to 12 m in liquids

Marking	
Z1	Tagging (TAG), see additional specification

16 Accessories

16.1 Enclosed Accessories

These accessories can be ordered together with the device via the ordering option **Accessory enclosed**.

16.1.1 Device-Specific Accessories

Flooding protection tube 40 mm (1.5 inch)

Suitable for use with devices with a 40 mm (1.5 inch) antenna and G1-1/2 process connection on front.

The flooding protection tube can be ordered together with the device via the ordering option **Accessory enclosed**.

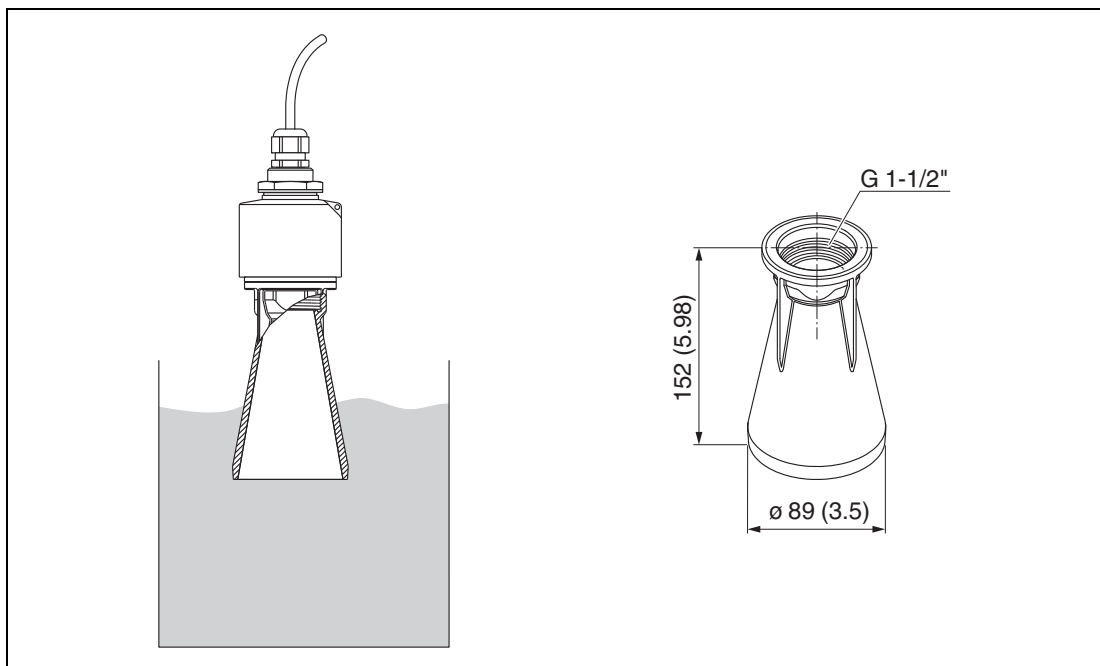


Figure 16.1 Dimensions of 40 mm (1.5 inch) flooding protection tube, engineering unit: mm (inch)

Material: PBT-PC, metalized

Option: R7

16.2 Further Accessories

These accessories can be ordered separately.

16.2.1 Device-Specific Accessories

Weather protection cover

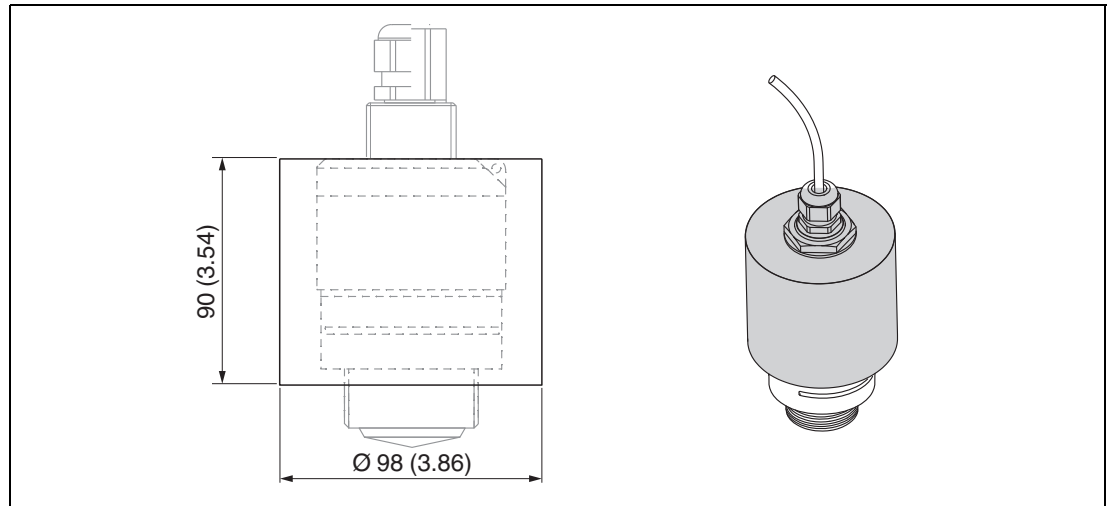


Figure 16.2 Dimensions of weather protection cover, engineering unit: mm (inch)

Material: PVDF

Order number: 52025686



Note

The sensor is not completely covered.

Securing nut G1-1/2

Suitable for devices with G1-1/2 and MNPT1-1/2 process connection.

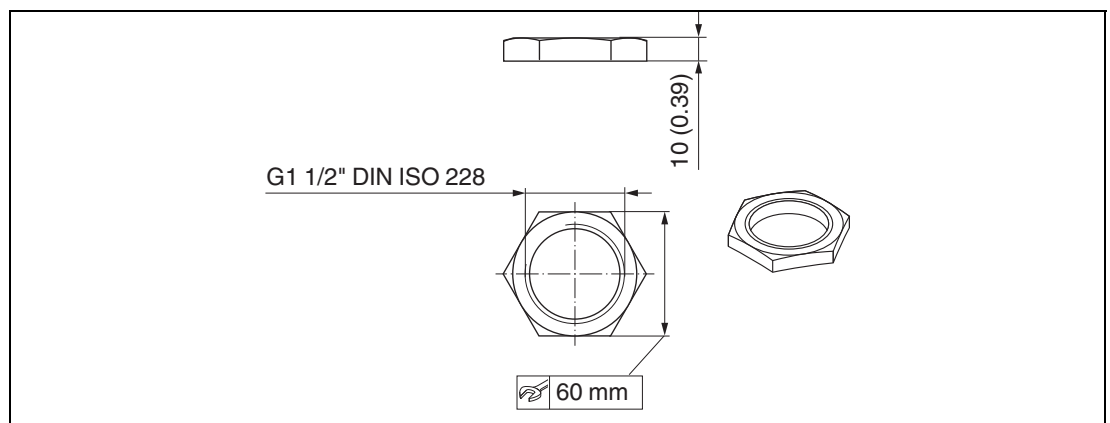


Figure 16.3 Dimensions of securing nut, engineering unit: mm (inch)

Material: PC

Order number: 52014146

Mounting bracket, adjustable

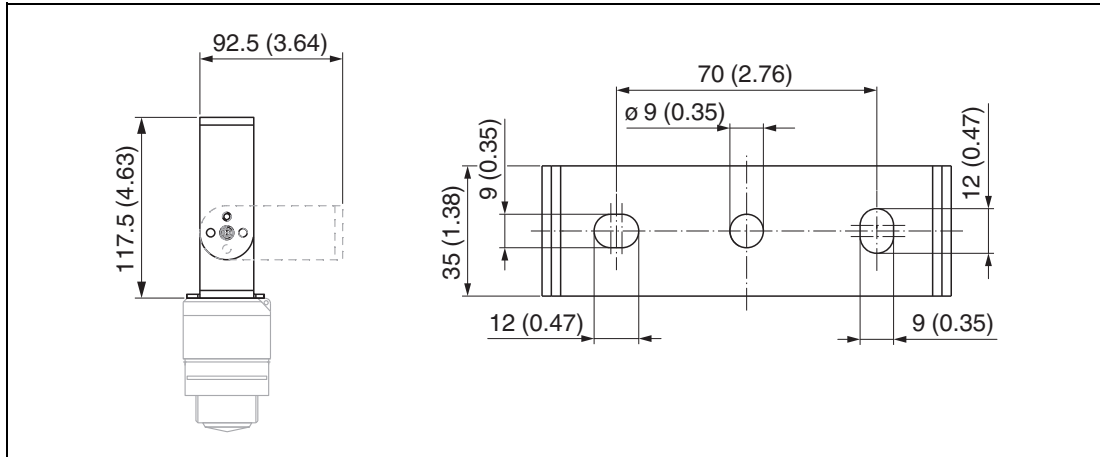


Figure 16.4 Dimensions of mounting bracket, engineering unit: mm (inch)

Consists of:

- 1 × mounting bracket, 316L (1.4404)
- 1 × mounting bracket, 316L (1.4404)
- 3 × screws, A4
- 3 × securing disks, A4

Order number: 71325079

Angle bracket for wall mounting

Angle bracket for G1-1/2 process connection: 71452324, also suitable for MNPT1-1/2

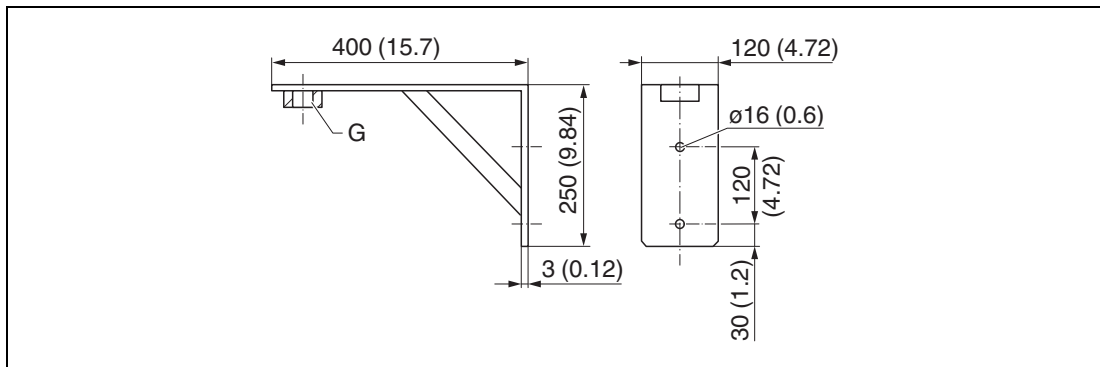


Figure 16.5 Dimensions of angle bracket, engineering unit: mm (inch)

G Sensor connection in accordance with ordering option **Process connection front side**

Weight: 3.4 kg (7.5 lb)

Material: 316L (1.4404)

Order number: 71452324

Cantilever with pivot

Installation type sensor process connection rear side

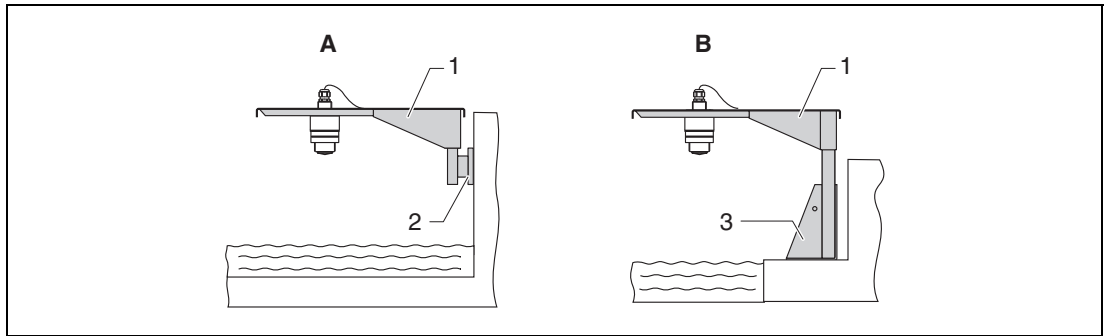


Figure 16.6 Installation type sensor process connection rear side

- A** Installation with cantilever and wall bracket
B Installation with cantilever and mounting frame
1 Cantilever
2 Wall bracket
3 Mounting frame

Cantilever (short) with pivot, sensor process connection on rear

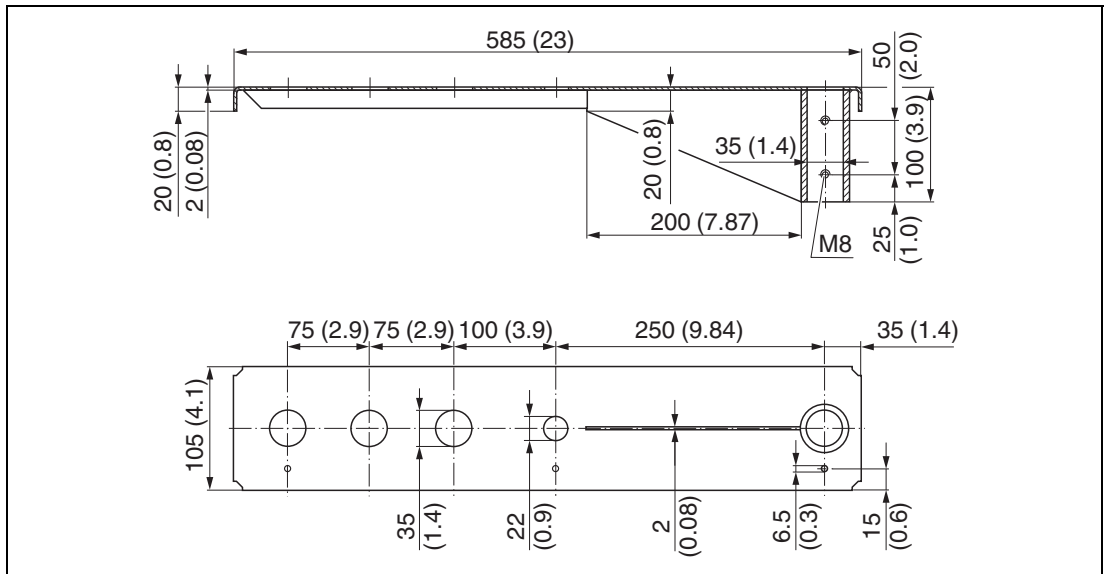


Figure 16.7 Dimensions of cantilever (short) with pivot for sensor process connection on rear, engineering unit: mm (inch)

Weight: 2.1 kg (4.63 lb)

Material: 316L (1.4404)

Order number: 71452315



Note

- 35 mm (1.38 inch) openings for all G1 or MNPT1 connections on rear
- 22 mm (0.87 inch) opening can be used for an additional sensor.
- Retaining screws are included in delivery.

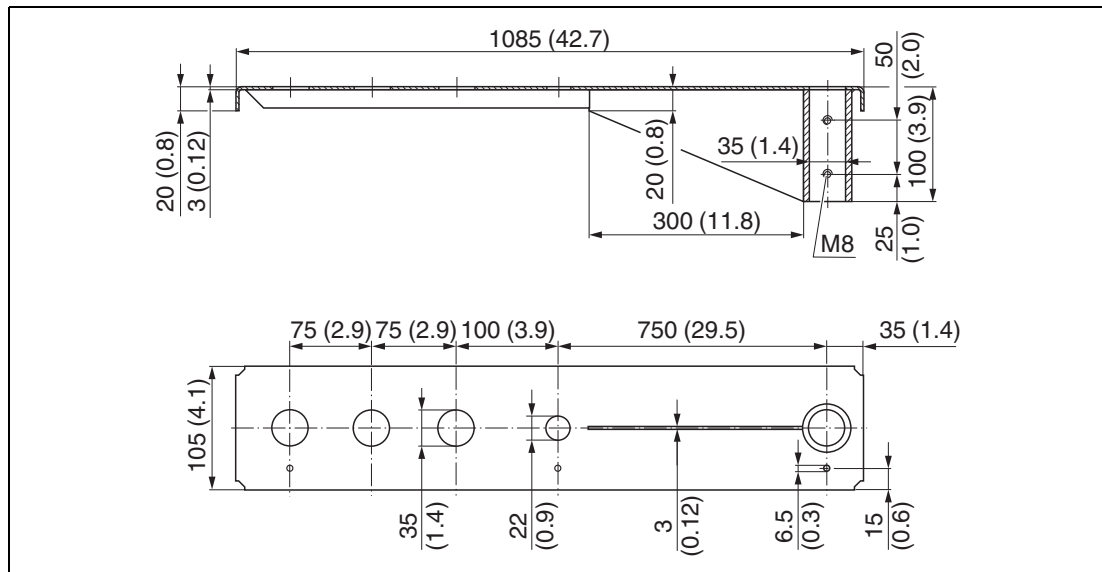
Cantilever (long) with pivot, sensor process connection on rear

Figure 16.8 Dimensions of cantilever (long) with pivot for sensor process connection on rear, engineering unit: mm (inch)

Weight: 4.5 kg (9.92 lb)

Material: 316L (1.4404)

Order number: 71452316

Note

- 35 mm (1.38 inch) openings for all G1 or MNPT1 connections on rear
- 22 mm (0.87 inch) opening can be used for an additional sensor.
- Retaining screws are included in delivery.

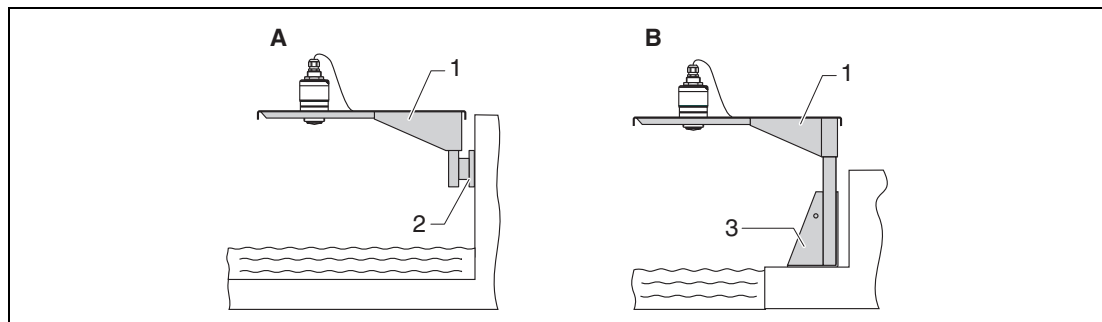
Installation type sensor process connection front side

Figure 16.9 Installation type sensor process connection front side

- A** Installation with cantilever and wall bracket
- B** Installation with cantilever and mounting frame
- 1** Cantilever
- 2** Wall bracket
- 3** Mounting frame

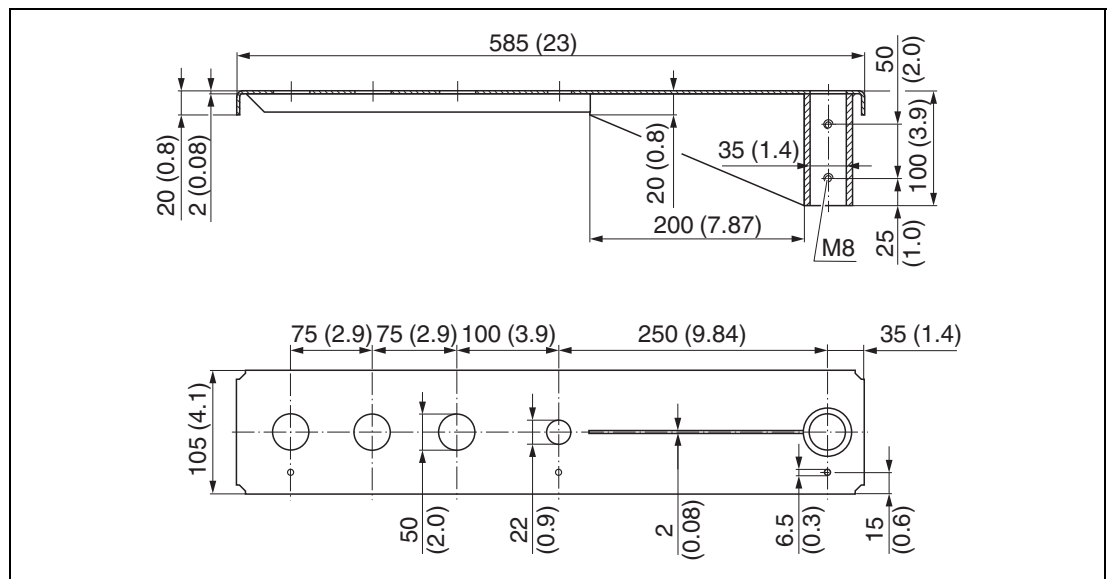
Cantilever (short) with pivot, G1-1/2 sensor process connection on front

Figure 16.10 Dimensions of cantilever (short) with pivot for G1-1/2 sensor process connection on front, engineering unit: mm (inch)

Weight: 1.9 kg (4.19 lb)

Material: 316L (1.4404)

Order number: 71452318

**Note**

- 50 mm (2.17 inch) openings for all G1-1/2 (MNPT1-1/2) connections on front
- 22 mm (0.87 inch) opening can be used for an additional sensor.
- Retaining screws are included in delivery.

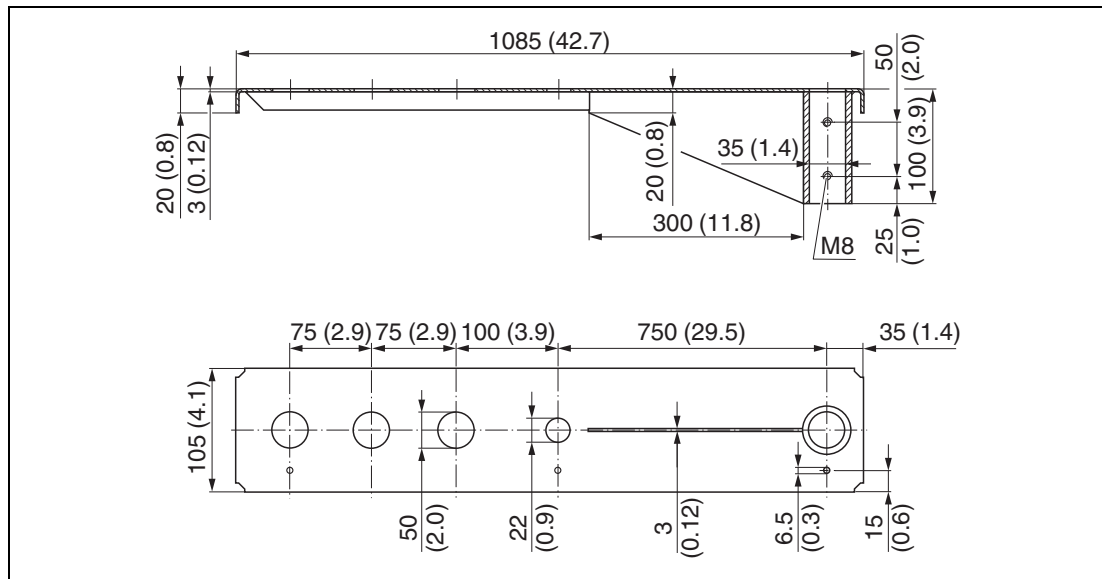
Cantilever (long) with pivot, G1-1/2 sensor process connection on front

Figure 16.11 Dimensions of cantilever (long) with pivot for G1-1/2 sensor process connection on front, engineering unit: mm (inch)

Weight: 4.4 kg (9.7 lb)

Material: 316L (1.4404)

Order number: 571452319

Note

- 50 mm (2.17 inch) openings for all G1-1/2 (MNPT1-1/2) connections on front
- 22 mm (0.87 inch) opening can be used for an additional sensor.
- Retaining screws are included in delivery.



Mounting frame (short) for cantilever with pivot

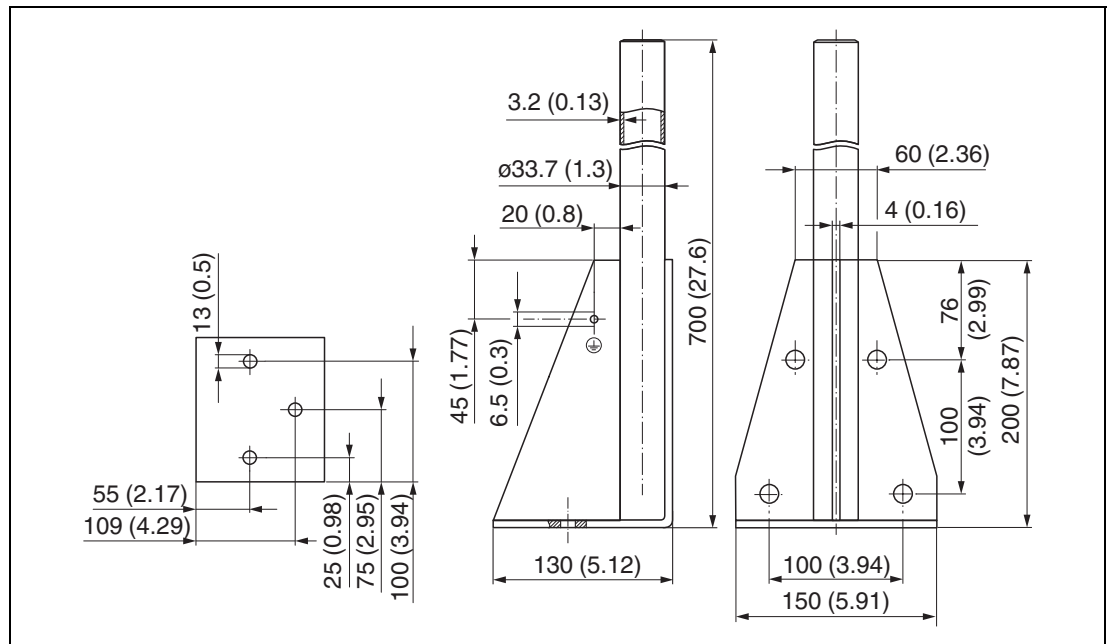


Figure 16.12 Dimensions of mounting frame (short), engineering unit: mm (inch)

Weight: 3.2 kg (7.06 lb)

Material: 316L (1.4404)

Order number: 71452327

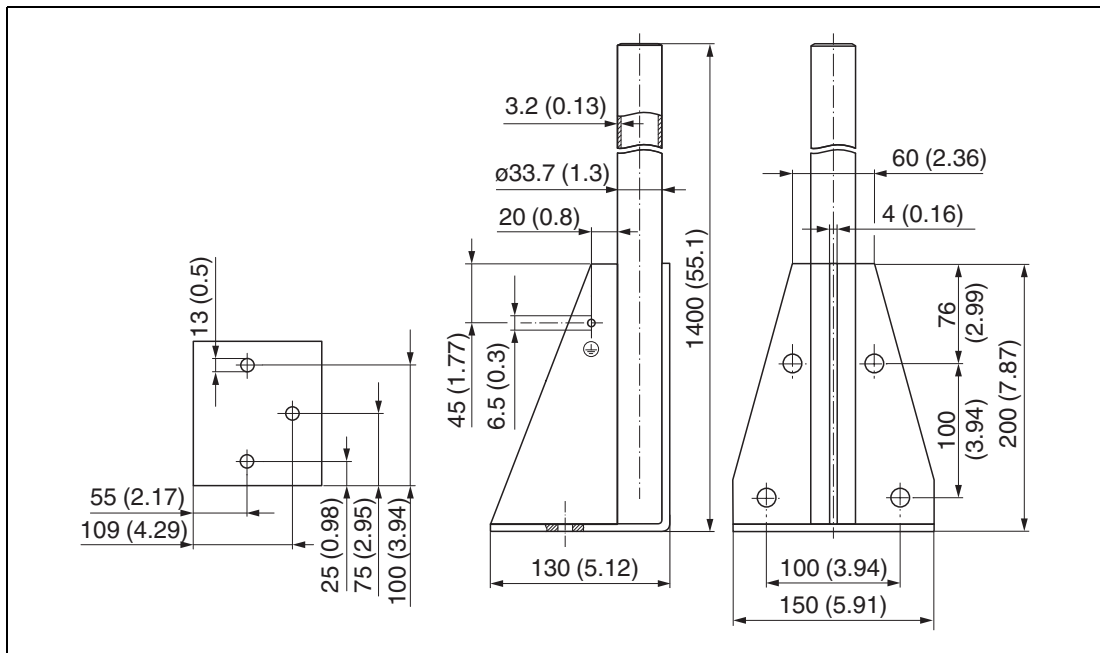
Mounting frame (long) for cantilever with pivot

Figure 16.13 Dimensions of mounting frame (long), engineering unit: mm (inch)

Weight: 4.9 kg (10.08 lb)

Material: 316L (1.4404)

Order number: 71452326

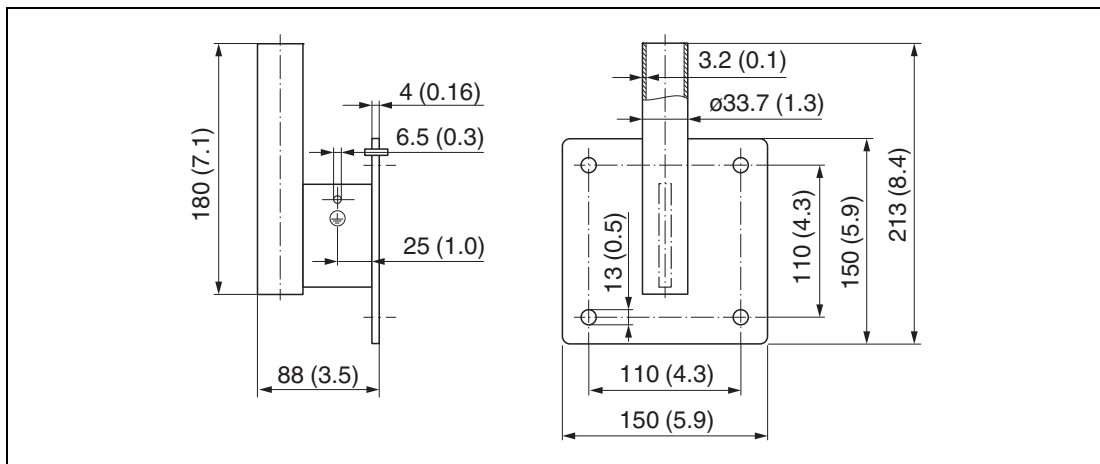
Wall bracket for cantilever with pivot

Figure 16.14 Dimensions of wall bracket, engineering unit: mm (inch)

Weight: 1.4 kg (3.09 lb)

Material: 316L (1.4404)

Order number: 71452323

Technical drawing of a cable gland assembly. The drawing includes a side view, a top view, and an isometric view.

Side View Dimensions:

- Overall width: 185
- Base width: 105
- Height of the base: 75
- Height of the side flange: 1.5

Top View Dimensions:

- Overall width: 155
- Overall height: 110 ± 2
- Central hole diameter: $\varnothing 35$
- Distance from center to side flange: 12
- Distance from center to side flange: 10
- Distance from center to side flange: $\varnothing 5.6$
- Distance from center to side flange: 10
- Distance from center to side flange: 10
- Distance from center to side flange: 15
- Distance from center to side flange: 5
- Distance from center to side flange: 15

Isometric View:

- Shows the assembly with a cable gland and a cable.

Order number: 71093130

Pivoted mounting bracket for sewer channel

The pivotable mounting bracket is used to install the device in a manhole over a sewer channel.

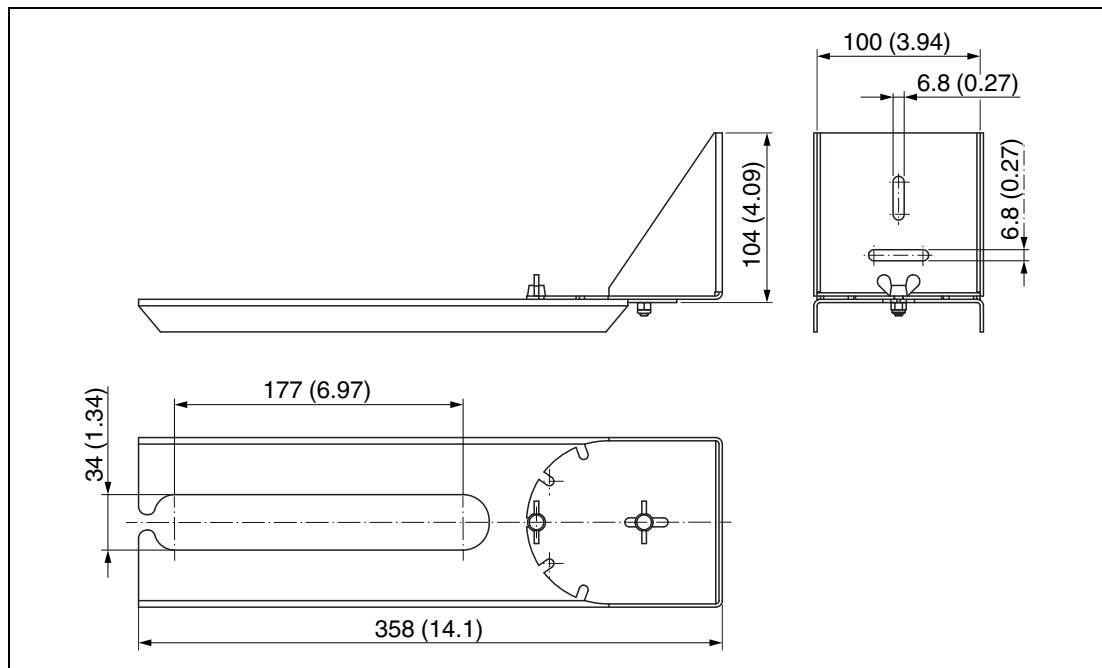


Figure 16.16 Dimensions of the pivotable mounting bracket, engineering unit: mm (inch)

Material: 316L (1.4404)

Order number: 71429910

Horizontal mounting bracket for sewer shafts

The Horizontal mounting bracket for sewer shafts is used for installation in confined spaces.

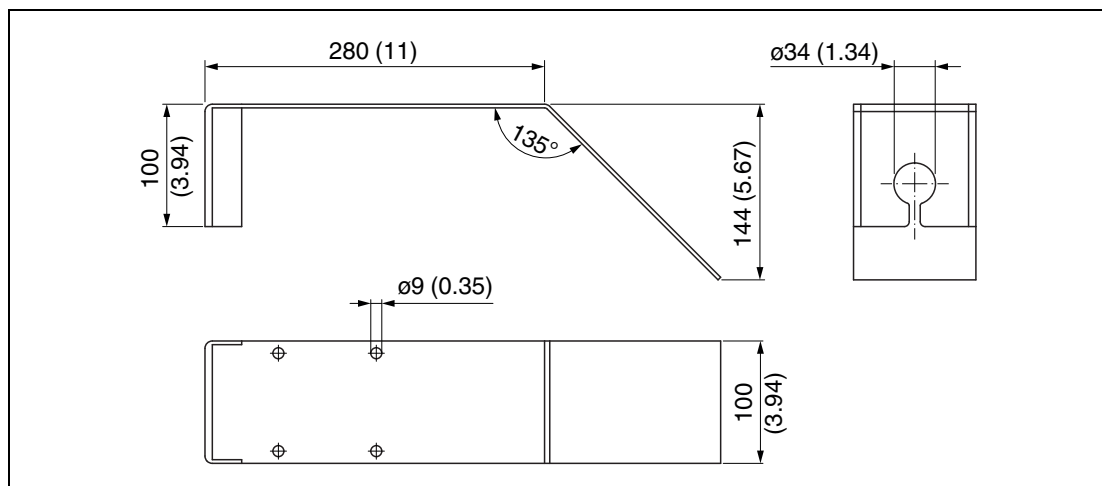


Figure 16.17 Dimensions of horizontal mounting bracket for sewer shafts, engineering unit: mm (inch)

Material: 316L (1.4404)

Order number: 71429905

17 Documentation

The following document types are available on the Pepperl+Fuchs website:
www.pepperl-fuchs.com → search → model number → product detail page → documents.

17.1 Technical Information (TI)

Planning aid

The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

17.2 Manual (BA)

Your reference guide

This document contains 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.

17.3 Brief Instructions (KA)

Guide that takes you quickly to the 1st measured value

This document contains all the essential information from incoming acceptance to initial commissioning.

17.4 Instruction Manual (SI)

Depending on the approval, the following instruction manuals (SI) are supplied with the device. These documents are an integral part of the manual.



Note

The nameplate indicates the instruction manual (SI) that are relevant to the device.

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- Signal Conditioners
- FieldConnex® Fieldbus
- Remote I/O Systems
- Electrical Ex Equipment
- Purge and Pressurization
- Industrial HMI
- Mobile Computing and Communications
- HART Interface Solutions
- Surge Protection
- Wireless Solutions
- Level Measurement

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity

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