

RM540

24 GHz Radar (FMCW) Level Transmitter

Specifications 34-VF-03-31, October 2019



For liquids in basic process applications

This device is a non-contact radar level transmitter that uses FMCW technology. It measures distance, level and volume of liquids and pastes. It is a market-entry transmitter that provides accurate readings in closed tanks, in the open air like rivers or dams, and even in fast moving processes.

Features

- FMCW radar level measurement and has more than 28 years of experience with this technology
- Accuracy ± 2 mm / ± 0.08 "
- 2-wire loop-powered 24 GHz transmitter – HART® 7
- Small beam angle (5° with DN150 / 6" PP Drop antenna)
- Flange plate protection and proven Drop antennas made of PP for condensing and corrosive applications
- Ellipsoidal shape and smooth surface of the Drop antenna minimizes scaling
- Extensive choice of process connections (threaded ≥ 1 " and flange \geq DN40)
- DN200 / 8" Metallic Horn antenna for measuring distances up to 100 m / 328 ft
- Antenna extensions to suit any nozzle length
- Process conditions up to +130°C / +266°F at 16 barg / 232 psig
- Empty tank spectrum function eliminates false reflections caused by tank internals
- Intuitive installation wizard for quick on-site set-up

Industries

- Chemical market
- Oil & Gas
- Petrochemicals
- Power
- Steel

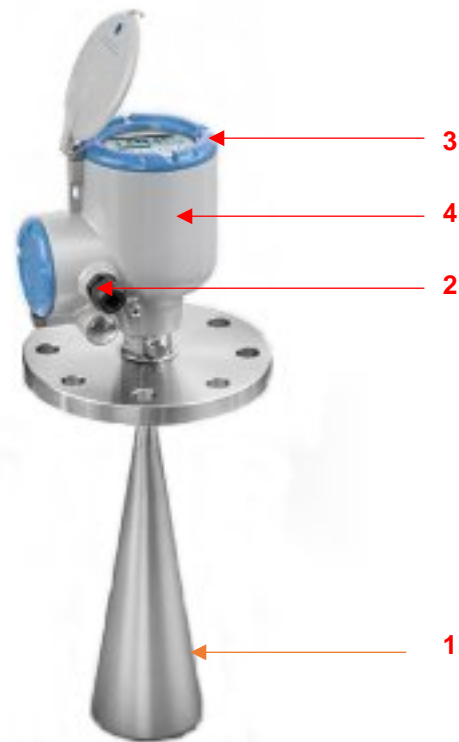


Figure 1– RM540

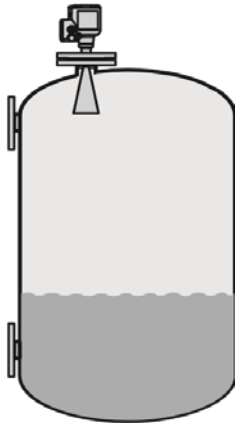
- 1) A large choice of Metallic Horn and Drop antennas. The PP Drop antenna has a small beam angle and is ideal for condensing and corrosive applications.
- 2) 2-wire 24 GHz FMCW radar level transmitter
- 3) Large, backlit LCD screen with 4-button keypad can be used with a bar magnet without opening the housing cover. The software has a quick setup assistant for easy commissioning. 12 languages are available.
- 4) Aluminium or stainless steel housing

Applications

- Storage and process tanks where high accuracy ± 2 mm / 0.08" is specified
- Long measuring range applications
- Measurement of liquids in open air as well as closed

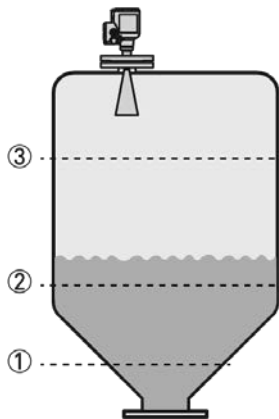
Applications

1. Level measurement of liquids



The level transmitter can measure the level of a wide range of liquid products on a large variety of installations within the stated pressure and temperature range. It does not require any calibration: it is only necessary to do a short configuration procedure.

2. Volume (mass) measurement



A strapping table function is available in the configuration menu for volume or mass measurement. Up to 50 volume (mass) values can be related to level values. For example:

Level 1) = 2 m / Volume 1) = e.g. 0.7 m³

Level 2) = 10 m / Volume 2) = e.g. 5 m³

Level 3) = 20 m / Volume 3) = e.g. 17 m³

This data permits the device to calculate (by linear interpolation) volume or mass between strapping table entries.

PACTware™ software and a DTM (Device Type Manager) is supplied free of charge with the device. This software permits the user to easily configure the device with a computer. It has a conversion table function with a large number of tank shapes.

Measuring principle

A radar signal is emitted via an antenna, reflected from the product surface and received after a time t . The radar principle used is FMCW (Frequency Modulated Continuous Wave).

The FMCW-radar transmits a high frequency signal whose frequency increases linearly during the measurement phase (called the frequency sweep). The signal is emitted, reflected on the measuring surface and received with a time delay, t . Delay time, $t=2d/c$, where d is the distance to the product surface and c is the speed of light in the gas above the product.

For further signal processing the difference Δf is calculated from the actual transmitted frequency and the received frequency. The difference is directly proportional to the distance. A large frequency difference corresponds to a large distance and vice versa. The frequency difference Δf is transformed via a Fast Fourier Transform (FFT) into a frequency spectrum and then the distance is calculated from the spectrum. The level results from the difference between the tank height and the measured distance.

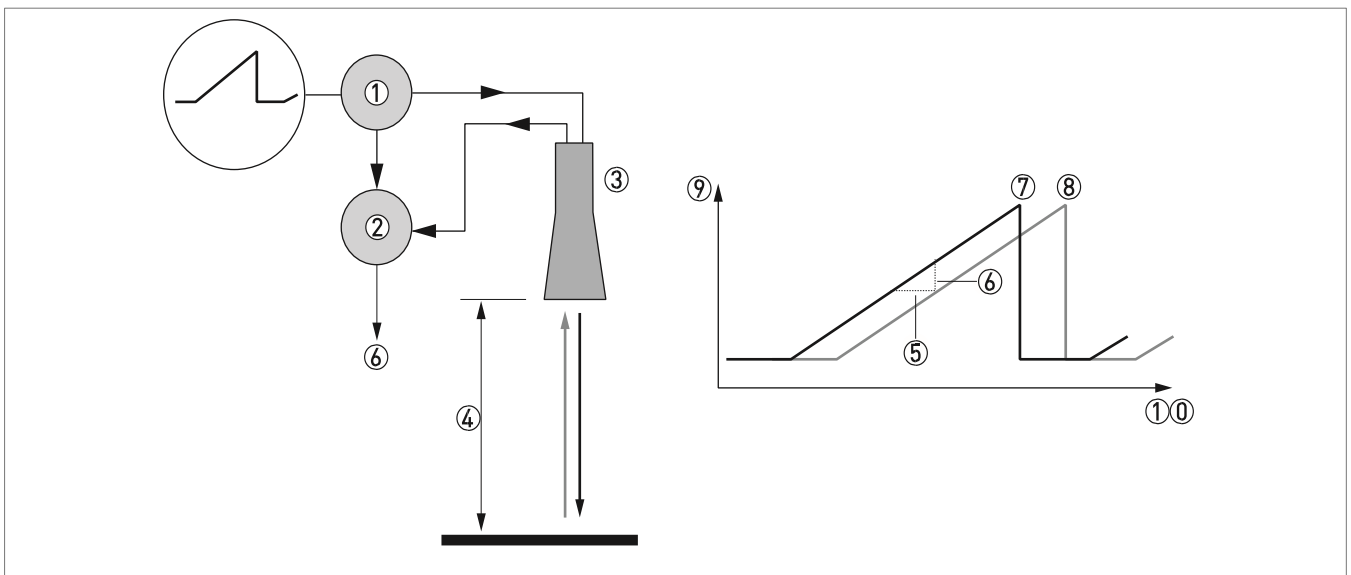


Figure 2: Measuring principle of FMCW radar

- 1) Transmitter
- 2) Mixer
- 3) Antenna
- 4) Distance to product surface, where change in frequency is proportional to distance
- 5) Differential time delay, Δt
- 6) Differential frequency, Δf
- 7) Frequency transmitted
- 8) Frequency received
- 9) Frequency
- 10) Time

Measurement modes

"Direct" mode

If the dielectric constant of the liquid is high ($\epsilon_r \geq 1.4$), the level signal is the reflection on the surface of the liquid.

"TBF Auto" mode

If the dielectric constant of the liquid is low (ϵ_r 1.4...1.5, for long-distance measurement), you must use "TBF Auto" mode to measure level correctly. "TBF Auto" is an automatic mode that lets the device make a selection between "Direct" mode and "TBF" mode. If the device finds a large radar reflection above the "tank bottom area" (the bottom 20% of the tank height), the device will use "Direct" mode. If the device finds a large radar reflection in the "tank bottom area", the device uses TBF mode. This mode can be used only in tanks with flat bottoms or in stilling wells with a reference plate at the bottom.

"Full TBF" mode

TBF = Tank Bottom Following. If the dielectric constant of the liquid is very low ($\epsilon_r < 1.4$), you must use "TBF Full" mode to measure level correctly. The device uses the radar reflection on the bottom of the tank (the signal goes through the liquid). This mode can be used only in tanks with flat bottoms or in stilling wells with a reference plate at the bottom.

Technical data

- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office. Refer to the back page.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the Honeywell Process website
<https://www.honeywellprocess.com/en-US/explore/products/instrumentation/process-level-sensors/Pages/smartline-non-contact-radar-level-meter.aspx>

Measuring system

| | |
|----------------------------|---|
| Measuring principle | 2-wire loop-powered level transmitter; FMCW radar |
| Frequency range | K-band (24...26 GHz) |
| Max. radiated power (EIRP) | < -41.3 dBm according to ETSI EN 307 372 (TLPR) and ETSI EN 302 729 (LPR) |
| Application range | Level measurement of liquids, pastes and slurries |
| Primary measured value | Distance and reflection |
| Secondary measured value | Level, volume and mass |

Design

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| Construction | The measurement system consists of a measuring sensor (antenna) and a signal converter |
| Options | Integrated LCD display (-20...+70°C / -4...+158°F); if the ambient temperature is not in these limits, then this condition can stop the display |
| | Straight antenna extensions (length 105 mm / 4.1") Max. extension length, Metallic Horn antenna: 1050 mm / 41.3" Max. extension length, Drop antenna: 525 mm / 20.7" |
| | Antenna purging system for Metallic Horn antennas (supplied with a 1/8 NPTF connection) |
| | PP flange plate protection and extension protection (PP protective layer for antenna extensions) |
| | Weather protection |
| Max. measuring range (antenna) | Metallic Horn, DN40 (1½"): 15 m / 49.2 ft |
| | Metallic Horn, DN50 (2"): 20 m / 65.6 ft |
| | Metallic Horn, DN65 (2½"): 25 m / 82 ft – for the BM 26 A magnetic level indicator |
| | Metallic Horn, DN80 (3"): 50 m / 164 ft |
| | Metallic Horn, DN100 (4"): 80 m / 262.5 ft |
| | Metallic Horn, DN150 (6") and DN200 (8"): 100 m / 328.1 ft |
| | PP Drop, DN80 (3"): 50 m / 164 ft |
| | PP Drop, DN100 (4"): 80 m / 262.5 ft |
| | PP Drop, DN150 (6"): 100 m / 328.1 ft |
| | Refer also to "Measuring accuracy" on page 12 |
| Min. tank height | 0.2 m / 8" |
| Recommended minimum blocking distance | Antenna extension length + antenna length + 0.1 m / 4" |
| Min. distance for reflection measurement | 1 m / 3.3 ft |

| | |
|-----------------------------------|---|
| Beam angle (antenna) | Metallic Horn, DN 40 (1.5"): 17° |
| | Metallic Horn, DN 50 (2"): 16° |
| | Metallic Horn, DN 65 (2.5"): not applicable. This antenna option is for the BM 26 A magnetic level indicator. |
| | Metallic Horn, DN 80 (3"): 9° |
| | Metallic Horn, DN 100 (4"): 8° |
| | Metallic Horn, DN150 / 6": 6° |
| | Metallic Horn, DN200 / 8": 5° |
| | PP Drop, DN80 / 3": 9° |
| | PP Drop, DN100 / 4": 7° |
| | PP Drop, DN150 / 6": 5° |
| Display and user interface | |
| Display | Backlit LCD display |
| | 128 × 64 pixels in 64-step greyscale with 4-button keypad |
| Interface languages | English, French, German, Italian, Spanish, Portuguese, Chinese (simplified), Japanese, Russian, Czech, Polish and Turkish |

Measuring accuracy

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| Resolution | 1 mm / 0.04" |
| Repeatability | ±1 mm / ±0.04" |
| Accuracy | Standard: ±2 mm / ±0.08", when distance ≤ 10 m / 33 ft; ±0.02% of measured distance, when distance > 10 m / 33 ft. For more data, refer to Measuring accuracy on page 12. |
| Reference conditions acc. to EN 61298-1 | |
| Temperature | +15...+25°C / +59...+77°F |
| Pressure | 1013 mbara ±50 mbar / 14.69 psia ±0.73 psi |
| Relative air humidity | 60% ±15% |
| Target | Metal plate in an anechoic chamber |

Operating conditions

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| Temperature | |
| Ambient temperature | -40...+80°C / -40...+176°F Ex: see supplementary operating instructions or approval certificates |
| Relative humidity | 0...99% |
| Storage temperature | -40...+85°C / -40...+185°F |
| Process connection temperature (higher temperature on request) | Metallic Horn antenna: -50...+130°C / -58...+266°F (the process connection temperature must agree with the temperature limits of the gasket material. Refer to "Materials" in this table.) Ex: see supplementary operating instructions or approval certificates Drop antenna (PP): -40...+100°C / -40...+212°F (the process connection temperature must agree with the temperature limits of the gasket material. Refer to "Materials" in this table.) Ex: see supplementary operating instructions or approval certificates |
| Pressure | |

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|--------------------------------------|---|
| Process pressure | Drop antenna (PP): -1...16 barg / -14.5...232 psig |
| | Metallic Horn antenna: -1...16 barg / -14.5...232 psig |
| | Subject to the process connection used and the process connection temperature. For more data, refer to Guidelines for maximum operating pressure on page 14. |
| Other conditions | |
| Dielectric constant (ϵ_r) | Direct mode: ≥ 1.4 TBF mode: ≥ 1.1 |
| Ingress protection | IEC 60529: IP66 / IP68 (0.1 barg / 1.45 psig) |
| | NEMA 250: NEMA type 4X - 6 (housing) and type 6P (antenna) |
| Maximum rate of change | 60 m/min / 196 ft/min |

Installation conditions

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| Process connection size | The nominal diameter (DN) should be equal to or larger than the antenna diameter. |
| | If the nominal diameter (DN) is smaller than the antenna, either: – provide the means to adapt the device to a larger process connection on the tank (for example, a plate with a slot), or – use the same process connection, but remove the antenna from the device before installation and fit it from inside the tank. |
| Process connection position | Make sure that there are not any obstructions directly below the process connection for the device. For more data, refer to Installation on page Error! Bookmark not defined. |
| Dimensions and weights | For dimensions and weights data, refer to Dimensions and weights on page Error! Bookmark not defined.. |

Materials

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|---|--|
| Housing | Standard: Polyester-coated aluminium |
| | Option: Stainless steel (1.4404 / 316L) – non-Ex devices only. Ex approvals will be available in the second quarter of 2018. |
| Wetted parts, including antenna | Metallic Horn antenna: Stainless steel (1.4404 / 316L) |
| | Standard for Drop antenna: PP |
| | Option for Drop antenna: PP flange plate protection and PP protective layer for antenna extensions |
| Process connection | Stainless steel (1.4404 / 316L) – a PP flange plate protection option is also available for the Drop antenna |
| Gaskets (and O-rings for the sealed antenna extension option) | PP Drop antenna: FKM/FPM (-40...+100°C / -40...+212°F); Kalrez® 6375 (-20...+100°C / -4...+212°F); EPDM (-40°C...+100°C / -40...+212°F) 1 |
| | Metallic Horn antenna: FKM/FPM (-40...+130°C / -40...+266°F); Kalrez® 6375 (-20...+130°C / -4...+266°F); EPDM (-50°C...+130°C / -58...+266°F) |
| Feedthrough | PEI (-50...+130°C / -58...+266°F) This is the maximum range. The feedthrough temperature limits must agree with the temperature limits of the gasket material and antenna type. |
| Cable gland | Standard: none |
| | Options: Plastic (Non-Ex: black, Ex i-approved: blue); nickel-plated brass; stainless steel; M12 (4-pin connector) |
| Weather protection (Option) | Stainless steel (1.4404 / 316L) |

Process connections

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|-----------------------|--|
| Thread | G 1 A...1½ A (ISO 228); 1...1½ NPT (ASME B1.20.1) |
| Flange version | |
| EN 1092-1 | Low-pressure flanges: DN50...200 in PN01; Standard flanges: DN40 in PN40, DN50...200 in PN16 and PN40 (Type B1); others on request Optional flange facing for standard flanges: Type A |
| ASME B16.5 | Low-pressure flanges: 2"...8" in 150 lb (max. 15 psig); Standard flanges: 1½"...8" in 150 lb RF and 300 lb RF; others on request Optional flange facing for standard flanges: FF (Flat Face) |
| JIS B2220 | 40...200A in 10K RF; others on request |
| Other | Others on request |

Electrical connections

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|---------------------------------|---|
| Power supply | Terminals output – Non-Ex / Ex i: 12...30 V DC; min./max. value for an output of 21.5 mA at the terminals Terminals output – Ex d: 16...36 V DC; min./max. value for an output of 21.5 mA at the terminals |
| Maximum current | 21.5 mA |
| Current output load | Non-Ex / Ex i: $R_L [\Omega] \leq ((U_{ext} - 12 \text{ V}) / 21.5 \text{ mA})$. For more data, refer to Minimum power supply voltage on page Error! Bookmark not defined. Ex d: $R_L [\Omega] \leq ((U_{ext} - 16 \text{ V}) / 21.5 \text{ mA})$. For more data, refer to Minimum power supply voltage on page Error! Bookmark not defined. |
| Cable entry | Standard: M20×1.5; Options: ½ NPT; 4-pin male M12 connector |
| Cable gland | Standard: none Options: M20×1.5 (cable diameter: 7...12 mm / 0.28...0.47"); others are available on request |
| Cable entry capacity (terminal) | 0.5...3.31 mm² (AWG 20...12) |

Input and output

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|------------------------------|---|
| Current output | |
| Output signal | Standard: 4...20 mA Options: 3.8...20.5 mA acc. to NAMUR NE 43; 4...20 mA (reversed); 3.8...20.5 mA (reversed) acc. to NAMUR NE 43 |
| Output type | Passive |
| Resolution | ±5 µA |
| Temperature drift | Typically 50 ppm/K |
| Error signal | High: 21.5 mA; Low: 3.5 mA acc. to NAMUR NE 43 |
| HART® | |
| Description | Digital signal transmitted with the current output signal (HART® protocol) 2 |
| | Version 7.4 |
| | Load ≥ 250 Ω |
| Digital temperature drift | Max. ±15 mm / 0.6" for the full temperature range |
| Multi-drop operation | Yes. Current output = 4 mA. Enter Program mode to change the polling address (1...63). |
| Available drivers | FC475, AMS, PDM, FDT/DTM |
| PROFIBUS PA (pending) | |

TECHNICAL DATA

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|---------------------------------------|--|
| Type | PROFIBUS MBP interface that agrees with IEC 61158-2 with 31.25 kbit/s; voltage mode (MBP = Manchester-Coded, Bus-Powered) |
| Function blocks | 1 × Transducer Block Level (TB-Level), 1 × Physical Block (PB), 4 × Analog Input Block (AI), 1 × Totalizer Function Block (TOT) |
| Device power supply | 9...32 V DC – bus powered; no additional power supply required |
| Polarity sensitivity | No |
| Basic current | 18 mA |
| FOUNDATION™ fieldbus (pending) | |
| Physical layer | FOUNDATION™ fieldbus protocol that agrees with IEC 61158-2 and FISCO model; galvanically isolated |
| Communication standard | H1 |
| ITK version | 6.3 |
| Function blocks | 1 × Enhanced Resource Block (RB), 1 × Customer Level Transducer Block (LEVELTB), 1 × Customer Converter Transducer Block (CONVTB), 1 × Customer Diagnosis Transducer Block (DIAGTB), 4 × Analog Input Block (AI), 1 × Digital Input (DI), 1 × Integrator Block (IT), 1 × Proportional Integral Derivate Block (PID), 1 × Arithmetic Block (AR) |
| | Analog Input Block: 10 ms |
| | Digital Input Block: 20 ms |
| | Integrator Block: 15 ms |
| | Proportional Integral Derivate Block: 25 ms |
| Device power supply | Not intrinsically safe: 9...32 V DC |
| | Intrinsically safe: 9...24 V DC |
| Basic current | 18 mA |
| Maximum error current FDE | 25.5 mA (= basic current + error current = 18 mA + 7.5 mA) |
| Polarity sensitivity | No |
| Minimum cycle time | 250 ms |
| Output data | Level, distance, volume, ullage volume, mass, ullage mass |
| Input data | None |
| Link Active Scheduler | Supported |
| NAMUR NE 107 data | Supported with FF field diagnosis (FF-891) |

Approvals and certification

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|-----------------------------|---|
| CE | The device meets the essential requirements of the EU Directives. The manufacturer certifies successful testing of the product by applying the CE marking. |
| | For more data about the EU Directives and European Standards related to this device, refer to the EU Declaration of Conformity. You can download this document free of charge from the website (Download Center). |
| Vibration resistance | EN 60068-2-6 and EN 60721-3-4 (1...9 Hz: 3 mm / 10...200 Hz:1g, 10g shock ½ sinus: 11 ms) |
| Explosion protection | |
| ATEX (EU Type Approval) | II 1/2 G Ex ia IIC T6...T* Ga/Gb; ③ |
| | II 1/2 D Ex ia IIIC T85°C...T*°C Da/Db; ④ |
| | II 1/2 G Ex db ia IIC T6...T* Ga/Gb; ③ |
| | II 1/2 D Ex ia tb IIIC T85°C...T*°C Da/Db ④ |
| ATEX (Type Approval) | II 3 G Ex ic IIC T6...T* Gc; ③ |
| | II 3 D Ex ic IIIC T85°C...T*°C Dc ④ |
| IECEx | Ex ia IIC T6...T* Ga/Gb; ③ |
| | Ex ia IIIC T85°C...T*°C Da/Db; ④ |
| | Ex db ia IIC T6...T* Ga/Gb; ③ |
| | Ex ia tb IIIC T85°C...T*°C Da/Db; ④ |
| | Ex ic IIC T6...T* Gc; ③ |
| | Ex ic IIIC T85°C...T*°C Gc ④ |
| cQPSus | Division ratings |
| | XP-IS, Class I, Div 1, GPS ABCD, T6...Tx; |
| | DIP, Class II, III, Div 1, GPS EFG, T85°C...T*°C; ④ |
| | IS, Class I, Div 1, GPS ABCD, T6...Tx; |
| | IS, Class II, III, Div 1, GPS EFG, T85°C...T*°C; ④ |
| | NI, Class I, Div 2, GPS ABCD, T6...Tx; |
| | NI, Class II, III, Div 2, GPS FG, T85°C...T*°C ④ |
| | Zone ratings |
| | Class I, Zone 1, AEx db ia [ia Ga] IIC T6...T* Gb (US) – antenna suitable for Zone 0; Ex db ia [ia Ga] IIC T6...T* Gb (Canada) – antenna suitable for Zone 0; ③ |
| | Class I, Zone 0, AEx ia IIC T6...T* Ga (US); Ex ia IIC T6...T* Ga (Canada); ③ |
| | Zone 20, AEx ia IIIC T85°C...T*°C Da (US); Ex ia IIIC T85°C...T*°C Da (Canada); ④ |
| | Zone 21, AEx ia tb [ia Da] IIIC T85°C...T*°C Db (US) – antenna suitable for Zone 20 Ex ia tb [ia Da] IIIC T85°C...T*°C Db (Canada) – antenna suitable for Zone 20 ④ |

| Other standards and approvals | |
|-------------------------------|--|
| Electromagnetic compatibility | EU: Electromagnetic Compatibility directive (EMC) |
| Radio approvals | EU: Radio Equipment directive (RED) |
| | FCC Rules: Part 15 |
| | Industry Canada: RSS-211 |
| Electrical safety | EU: Agrees with the safety part of the Low Voltage directive (LVD) |
| | USA and Canada: Agrees with NEC and CEC requirements for installation in ordinary locations |
| NAMUR | NAMUR NE 21 Electromagnetic Compatibility (EMC) of Industrial Process and Laboratory Control Equipment |
| | NAMUR NE 43 Standardization of the Signal Level for the Failure Information of Digital Transmitters |
| | NAMUR NE 53 Software and Hardware of Field Devices and Signal Processing Devices with Digital Electronics |
| | NAMUR NE 107 Self-Monitoring and Diagnosis of Field Devices |
| CRN | Pending. This certification is applicable for all Canadian provinces and territories. For more data, refer to the website. |
| Construction code | Option: NACE MR 0175 / MR 0103 / ISO 15156; ASME B31.3 |

- 1) Kalrez® is a registered trademark of DuPont Performance Elastomers L.L.C.
- 2) HART® is a registered trademark of the HART Communication Foundation
- 3) T* = T5 or T4. For more data, refer to the related Ex approval certificate.
- 4) T*°C = 100°C or 130°C. For more data, refer to the related Ex approval certificate.
- 5) T* = 100°C or 130°C. For more data, refer to the related Ex approval certificate.

Measuring accuracy

Use these graphs to find the measuring accuracy for a given distance from the transmitter.

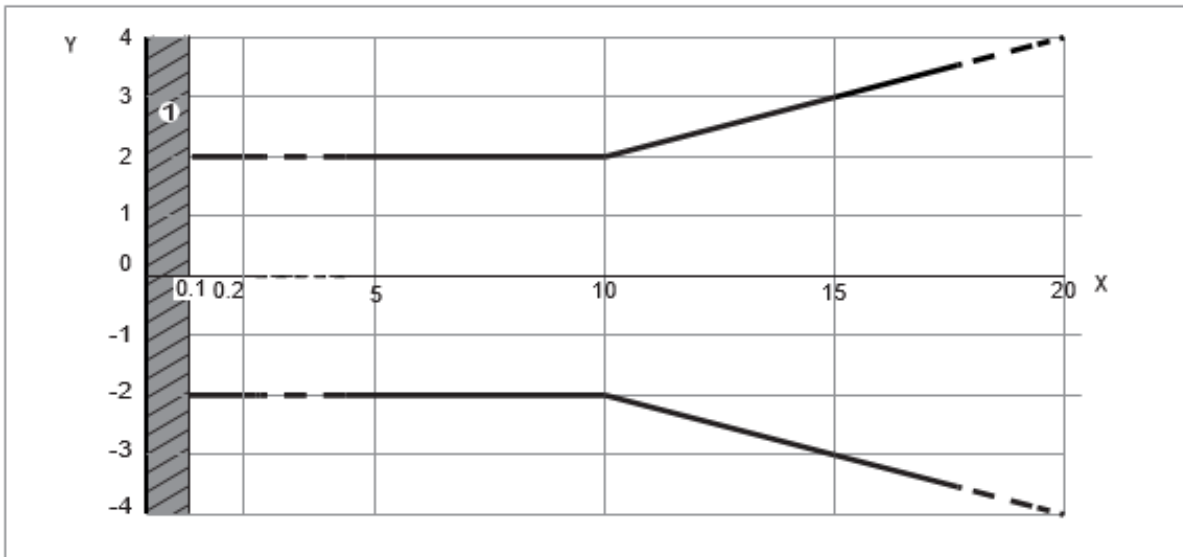
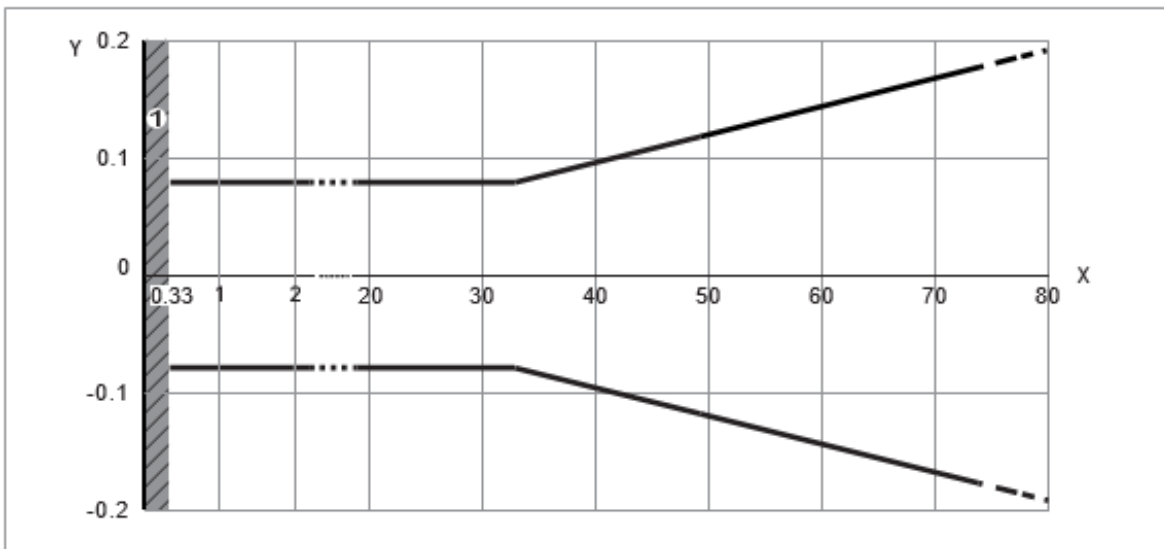


Figure 3: Measuring accuracy (graph of measuring accuracy in mm against measuring distance in m)

X: Measuring distance from the thread stop or flange facing of the process connection [m]

Y: Measuring accuracy [+yy mm / -yy mm]

1) Minimum recommended blocking distance = antenna extension length + antenna length + 100 mm



**Figure 4:
Measuring accuracy (graph of measuring accuracy in inches against measuring distance in ft)**

X: Measuring distance from the thread stop or flange facing of the process connection [ft]

Y: Measuring accuracy [+yy inches / -yy inches]

1) Minimum recommended blocking distance = antenna extension length + antenna length + 3.94"

To calculate the accuracy at a given distance from the antenna, refer to Technical data on page [Error! Bookmark not defined.](#) (measuring accuracy).

Minimum power supply voltage

Use these graphs to find the minimum power supply voltage for a given current output load.

Non-Ex and Hazardous Location approved (Ex i / IS) devices



Figure 5:
Minimum power supply voltage for an output of 21.5 mA at the terminals (Non-Ex and Hazardous Location approval (Ex i / IS))

X: Power supply U [V DC]

Y: Current output load R_L [Ω]

Hazardous Location (Ex d / XP/NI) approved devices

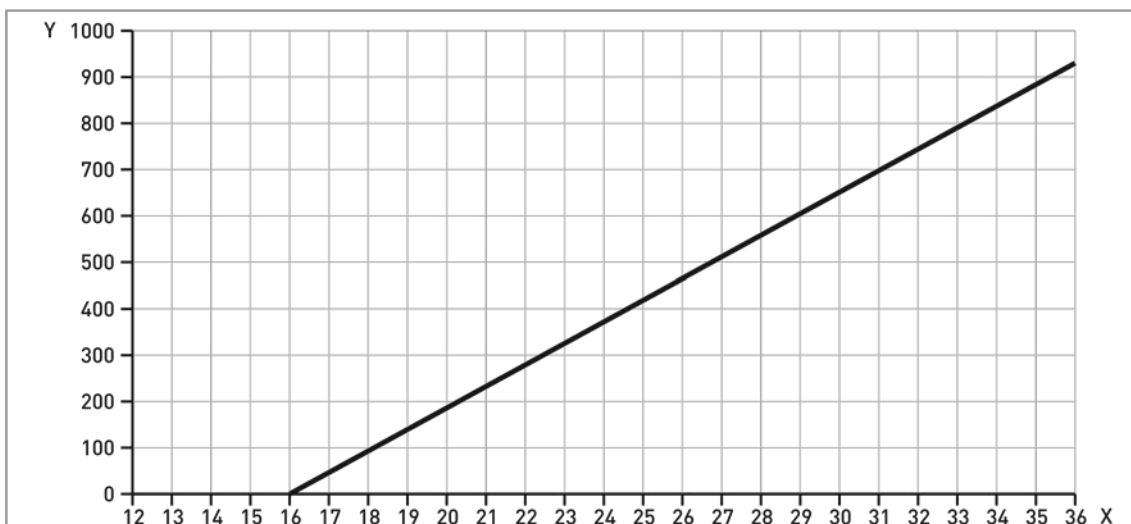


Figure 6: Minimum power supply voltage for an output of 21.5 mA at the terminals (Hazardous Location approval (Ex d / XP/NI))

X: Power supply U [V DC]

Y: Current output load R_L [Ω]

Guidelines for maximum operating pressure

Make sure that the devices are used within their operating limits.

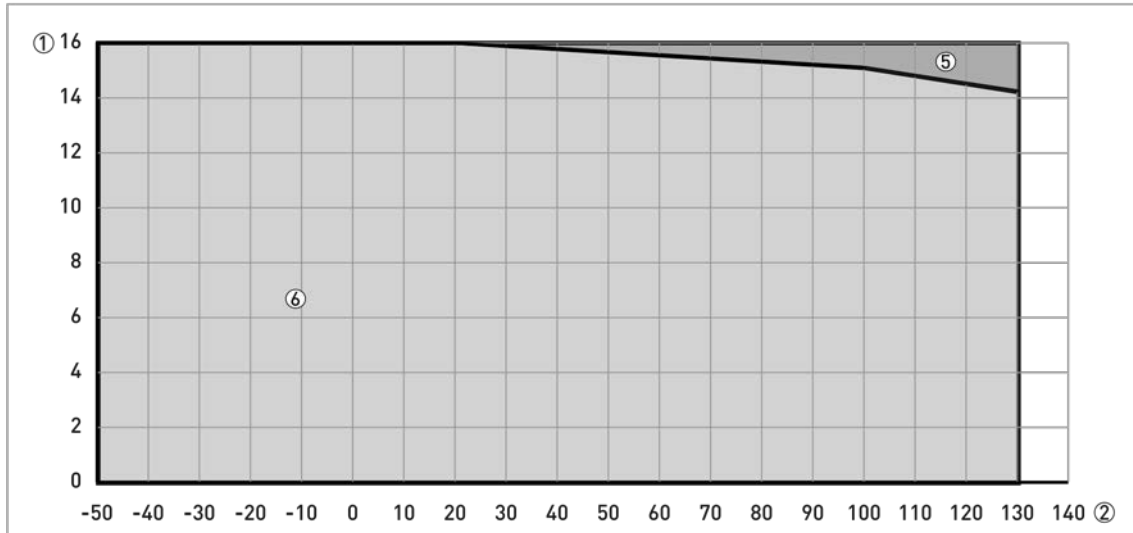


Figure 7: Pressure / temperature de-rating (EN 1092-1), flange and threaded connection, in °C and barg

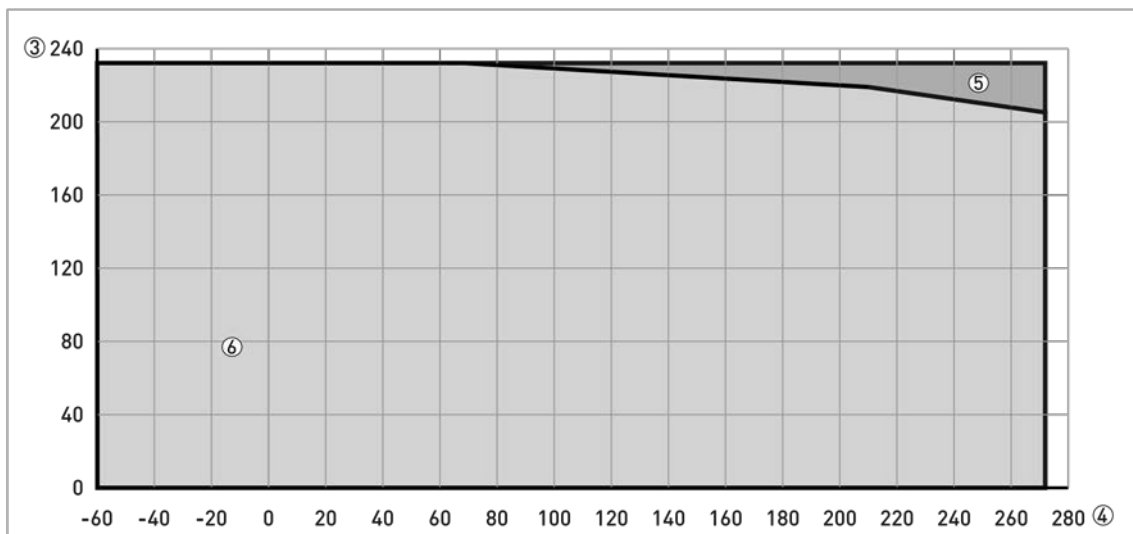


Figure 8: Pressure / temperature de-rating (EN 1092-1), flange and threaded connections, in °F and psig

- 1) Process pressure, p [barg]
- 2) Process connection temperature, T [°C]
- 3) Process pressure, p [psig]
- 4) Process connection temperature, T [°F]
- 5) Threaded connection, G (ISO 228-1)
- 6) Threaded connection, G (ISO 228-1).
- 7) Flange connection, PN40.
- 8) Flange connection, PN16

CRN certification (pending)

There is a CRN certification option for devices with process connections that agree with ASME standards. This certification is necessary for all devices that are installed on a pressure vessel and used in Canada.

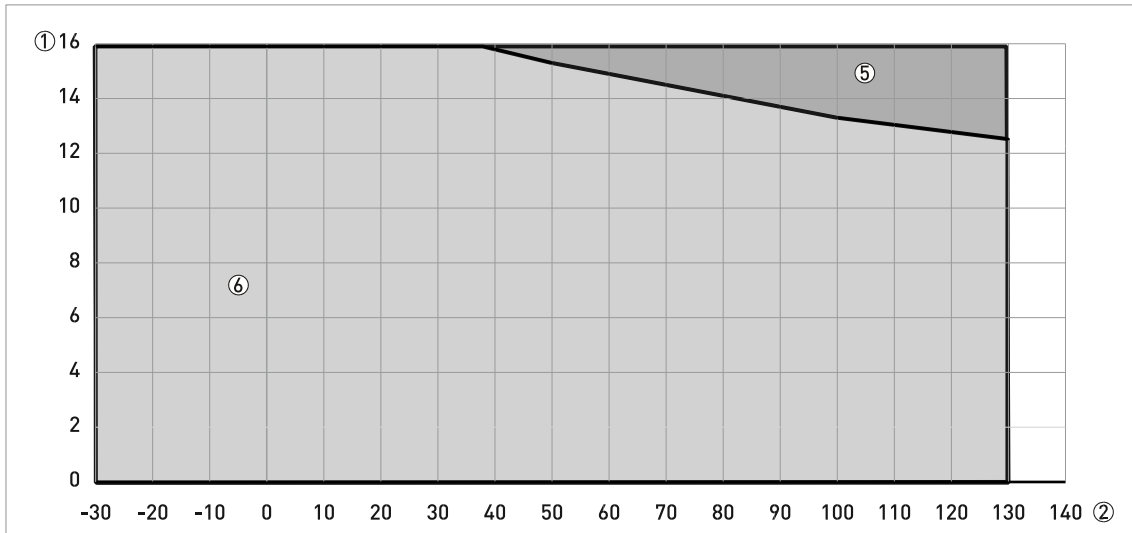


Figure 9: Pressure / temperature de-rating (ASME B16.5), flange and threaded connections, in °C and barg

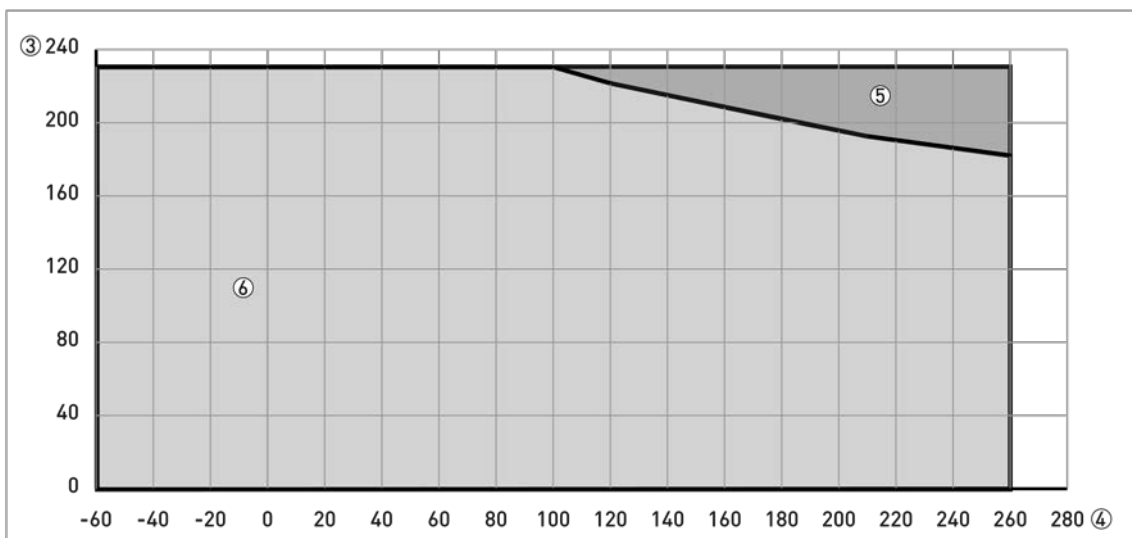


Figure 10: Pressure / temperature de-rating (ASME B16.5), flange and threaded connections, in °F and psig

- 1) Process pressure, p [barg]
- 2) Process connection temperature, T [°C]
- 3) Process pressure, p [psig]
- 4) Process connection temperature, T [°F]
- 5) Threaded connection, NPT (ASME B1.20.1). Flange connection, Class 300.
- 6) 6 Flange connection, Class 150

Dimensions and weights

Metallic Horn antennas with threaded connections

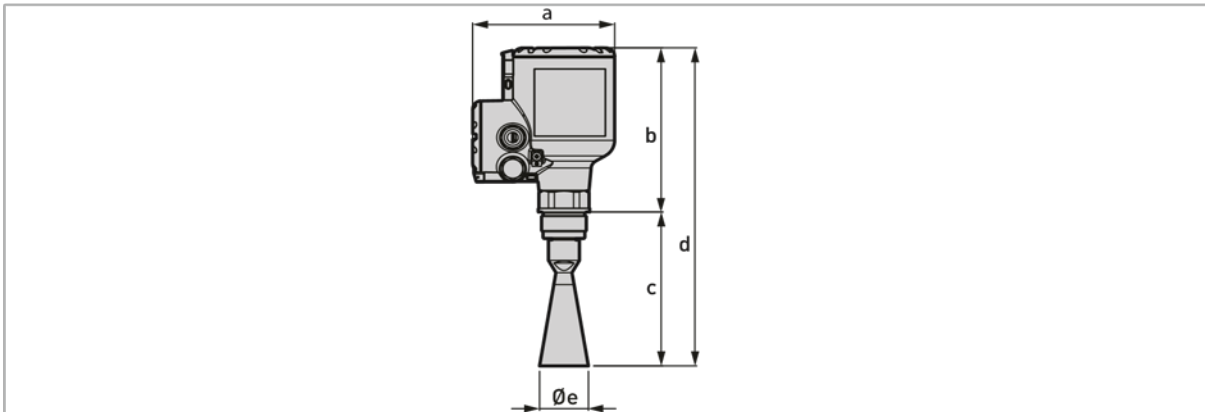


Figure 11: Metallic Horn antennas with G or NPT threaded connections

- The diameter of the outer sheath of the cable must be 7...12mm or 0.28...0.47".
- Cable glands for cQPSus-approved devices must be supplied by the customer.
- A weather protection cover is available as an accessory with all devices.

Metallic Horn antennas with threaded connections: Dimensions in mm

| Horn antenna version | Dimensions [mm] | | | | |
|----------------------|-----------------|-----|-------|-------|-----|
| | a | b | c | d | Øe |
| DN40/1½" | 151 | 185 | 143 ① | 328 ① | 39 |
| DN50/2" | 151 | 185 | 157 ① | 342 ① | 43 |
| DN65/2½" | 151 | 185 | 232 | 417 | 65 |
| DN80/3" | 151 | 185 | 267 ① | 452 ① | 75 |
| DN100/4" | 151 | 185 | 335 ① | 520 1 | 95 |
| DN150/6" | 151 | 185 | 490 ① | 675 ① | 140 |
| DN200/8" | 151 | 185 | 662 ① | 847 ① | 190 |

1) This is the dimension without the antenna extension option. A maximum of 10 antenna extensions are available. Each antenna extension is 105 mm long.

Metallic Horn antennas with threaded connections: Dimensions in inches

| Horn antenna version | Dimensions [inches] | | | | |
|----------------------|---------------------|-------|---------|---------|------|
| | a | b | c | d | Øe |
| DN40/1½" | 5.94 | 11.14 | 5.63 ① | 12.91 ① | 1.54 |
| DN50/2" | 5.94 | 11.14 | 6.18 ① | 13.46 ① | 1.69 |
| DN65/2½" | 5.94 | 11.14 | 9.13 | 16.42 | 2.56 |
| DN80/3" | 5.94 | 11.14 | 10.51 ① | 17.80 ① | 2.95 |
| DN100/4" | 5.94 | 11.14 | 13.19 ① | 20.47 ① | 3.74 |
| DN150/6" | 5.94 | 11.14 | 19.29 ① | 26.57 ① | 5.51 |
| DN200/8" | 5.94 | 11.14 | 26.06 ① | 33.35 ① | 7.48 |

1) This is the dimension without the antenna extension option. A maximum of 10 antenna extensions are available. Each antenna extension is 4.1" long.

Metallic Horn antenna versions with standard flange connections

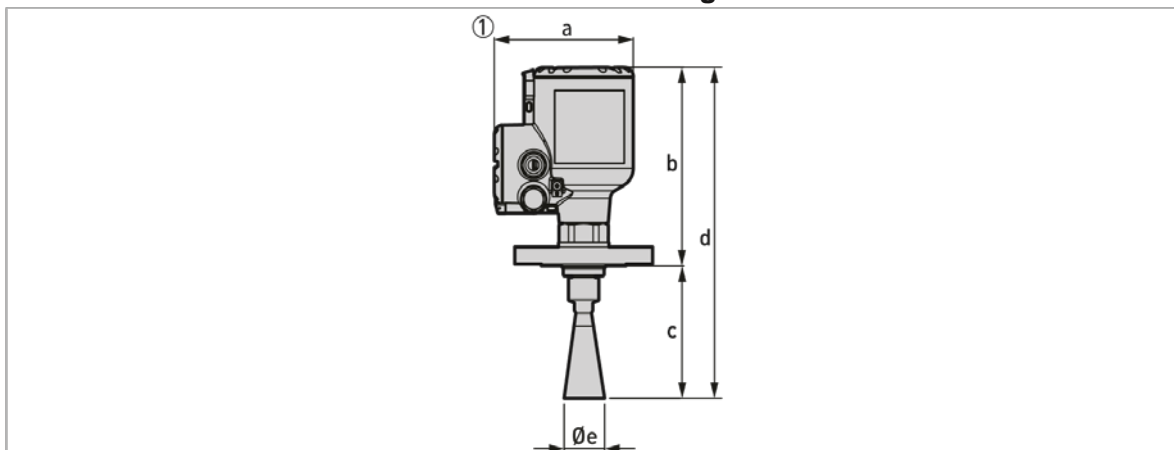


Figure 12: Metallic Horn antennas with standard flange connections

1) Metallic Horn antenna with a flange connection

- The diameter of the outer sheath of the cable must be 7...12mm or 0.28...0.47".
- Cable glands for cQPSus-approved devices must be supplied by the customer.
- A weather protection cover is available as an accessory with all devices.

Metallic Horn antennas with standard flange connections: Dimensions in mm

| Horn antenna version | Dimensions [mm] | | | | |
|----------------------|-----------------|-------------|-------------|-------------|-----|
| | a | b | c | d | Øe |
| DN40/1½" | 151 | 203...215.6 | 130...143 ① | 333...358 ① | 39 |
| DN50/2" | 151 | 203...215.6 | 144...157 ① | 347...372 ① | 43 |
| DN65/2½" | 151 | 203...215.6 | 219...230 | 422...447 | 65 |
| DN80/3" | 151 | 203...215.6 | 254...267 ① | 457...482 ① | 75 |
| DN100/4" | 151 | 203...215.6 | 322...335 ① | 525...550 ① | 95 |
| DN150/6" | 151 | 203...215.6 | 477...490 ① | 680...705 ① | 140 |
| DN200/8" | 151 | 203...215.6 | 649...662 ① | 852...877 ① | 190 |

1) These are the minimum and maximum values without the antenna extension option. A maximum of 10 antenna extensions are available. Each antenna extension is 105 mm long.

Metallic Horn antennas with standard flange connections: Dimensions in inches

| Horn antenna version | Dimensions [inches] | | | | |
|----------------------|---------------------|-------------|-----------------|-----------------|------|
| | a | b | c | d | Øe |
| DN40/1½" | 5.94 | 7.99...8.49 | 5.12...5.63 ① | 13.11...14.09 ① | 1.54 |
| DN50/2" | 5.94 | 7.99...8.49 | 5.67...6.18 ① | 13.66...14.64 ① | 1.69 |
| DN65/2½" | 5.94 | 7.99...8.49 | 8.62...9.05 | 16.61...17.60 | 2.56 |
| DN80/3" | 5.94 | 7.99...8.49 | 10.00...10.51 ① | 17.99...18.98 ① | 2.95 |
| DN100/4" | 5.94 | 7.99...8.49 | 12.68...13.19 ① | 20.67...21.65 ① | 3.74 |
| DN150/6" | 5.94 | 7.99...8.49 | 18.78...19.29 ① | 26.77...27.76 ① | 5.51 |
| DN200/8" | 5.94 | 7.99...8.49 | 25.55...26.06 ① | 33.54...34.53 ① | 7.48 |

1) These are the minimum and maximum values without the antenna extension option. A maximum of 10 antenna extensions are available. Each antenna extension is 4.1" long.

Metallic Horn antenna versions with low-pressure flange connections

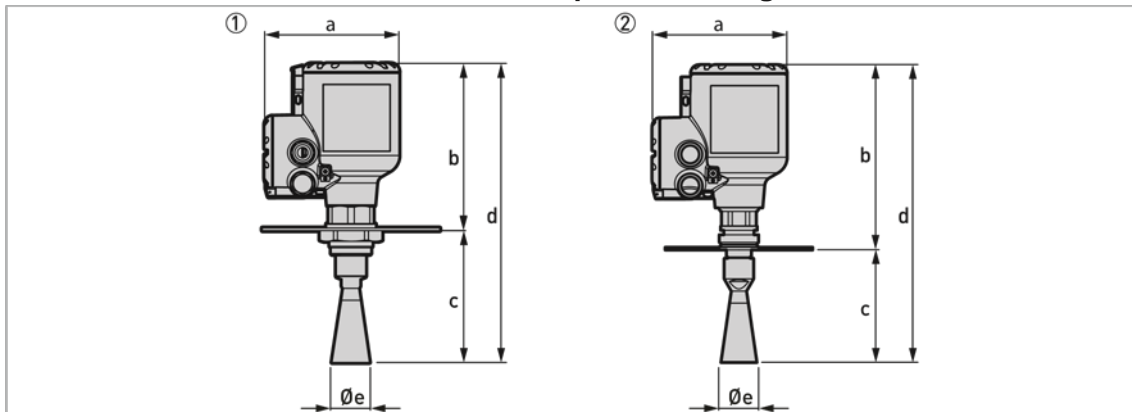


Figure 13: Metallic Horn antennas with low-pressure flange connections

1) Metallic Horn antenna with a low-pressure flange attached to a G threaded connection (ISO 228-1) 2) Metallic Horn antenna with a low-pressure flange attached to an NPT threaded connection (ASME B1.20.1)

- The diameter of the outer sheath of the cable must be 7...12mm or 0.28...0.47".
- Cable glands for cQPSus-approved devices must be supplied by the customer.
- A weather protection cover is available as an accessory with all devices.

Metallic Horn antennas with low-pressure flange connections: Dimensions in mm

| Horn antenna version | Dimensions [mm] | | | | | | Øe |
|----------------------|-----------------|-----|-----|-------|-------|-------|-----|
| | a | b | | c | d | | |
| | | G | NPT | | G | NPT | |
| DN40/1½" | 151 | 215 | 247 | 138 ① | 328 ① | 385 ① | 39 |
| DN50/2" | 151 | 215 | 247 | 152 ① | 342 ① | 399 ① | 43 |
| DN65/2½" | 151 | 215 | 247 | 227 | 417 | 474 | 65 |
| DN80/3" | 151 | 215 | 247 | 262 ① | 452 ① | 507 ① | 75 |
| DN100/4" | 151 | 215 | 247 | 331 ① | 521 ① | 578 ① | 95 |
| DN150/6" | 151 | 215 | 247 | 486 ① | 675 ① | 733 ① | 140 |
| DN200/8" | 151 | 215 | 247 | 657 ① | 847 ① | 904 ① | 190 |

1) This is the dimension without the antenna extension option. A maximum of 10 antenna extensions are available. Each antenna extension is 105 mm long.

Metallic Horn antennas with low-pressure flange connections: Dimensions in inches

| Horn antenna version | Dimensions [inches] | | | | | | Øe |
|----------------------|---------------------|------|------|---------|---------|---------|------|
| | a | b | | c | d | | |
| | | G | NPT | | G | NPT | |
| DN40/1½" | 5.94 | 8.46 | 9.72 | 5.43 ① | 12.91 ① | 15.16 ① | 1.54 |
| DN50/2" | 5.94 | 8.46 | 9.72 | 5.98 ① | 13.46 ① | 15.71 ① | 1.69 |
| DN65/2½" | 5.94 | 8.46 | 9.72 | 8.94 ① | 16.42 ① | 18.66 | 2.56 |
| DN80/3" | 5.94 | 8.46 | 9.72 | 10.31 ① | 17.80 ① | 19.96 ① | 2.95 |
| DN100/4" | 5.94 | 8.46 | 9.72 | 13.03 ① | 20.51 ① | 22.76 ① | 3.74 |
| DN150/6" | 5.94 | 8.46 | 9.72 | 19.13 ① | 26.57 ① | 28.86 ① | 5.51 |
| DN200/8" | 5.94 | 8.46 | 9.72 | 25.87 ① | 33.35 ① | 35.59 ① | 7.48 |

1) This is the dimension without the antenna extension option. A maximum of 10 antenna extensions are available. Each antenna extension is 4.1" long.

Drop antennas with threaded connections

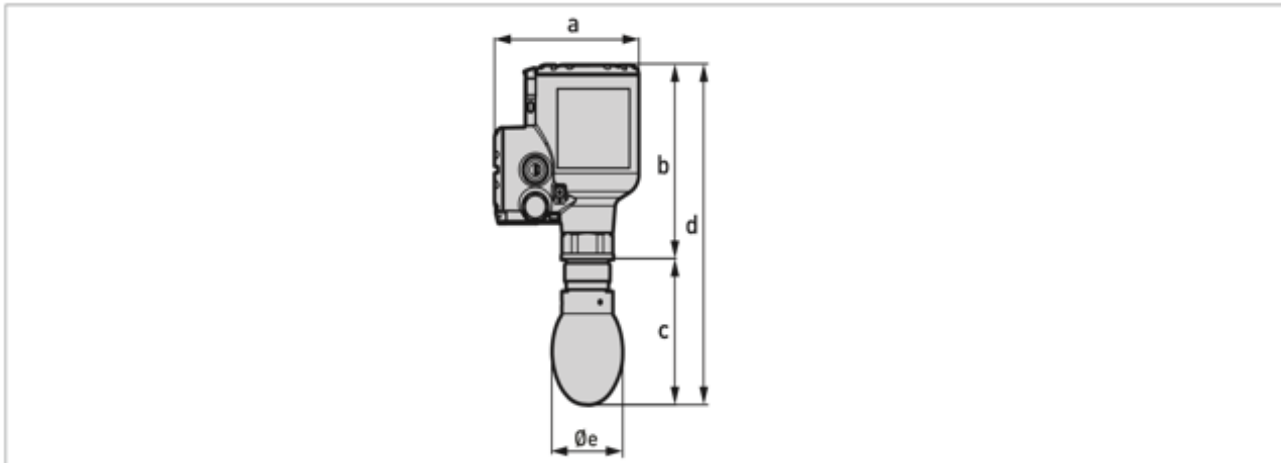


Figure 14: Drop antenna with threaded connections

- The diameter of the outer sheath of the cable must be 7...12mm or 0.28...0.47".
- Cable glands for cQPSus-approved devices must be supplied by the customer.
- A weather protection cover is available as an accessory with all devices.

Drop antennas with threaded connections: Dimensions in mm

| Drop antenna version | Dimensions [mm] | | | | |
|----------------------|-----------------|-----|-------|-------|-----|
| | a | b | c | d | Øe |
| DN80/3" | 151 | 185 | 137 ① | 322 ① | 74 |
| DN100/4" | 151 | 185 | 160 ① | 345 ① | 94 |
| DN150/6" | 151 | 185 | 216 ① | 401 ① | 144 |

1) This is the dimension without the antenna extension option. A maximum of 5 antenna extensions are available. Each antenna extension is 105 mm long.

Drop antennas with threaded connections: Dimensions in inches

| Drop antenna version | Dimensions [inches] | | | | |
|----------------------|---------------------|------|----------|---------|------|
| | a | b | c | d | Øe |
| DN80/3" | 5.94 | 7.28 | 5.39 ① | 12.68 ① | 2.91 |
| DN100/4" | 5.94 | 7.28 | 6.30 1 ① | 13.58 ① | 3.70 |
| DN150/6" | 5.94 | 7.28 | 8.50 ① | 15.78 ① | 5.67 |

1) This is the dimension without the antenna extension option. A maximum of 5 antenna extensions are available. Each antenna extension is 4.1" long.

Drop antennas with standard flange connections

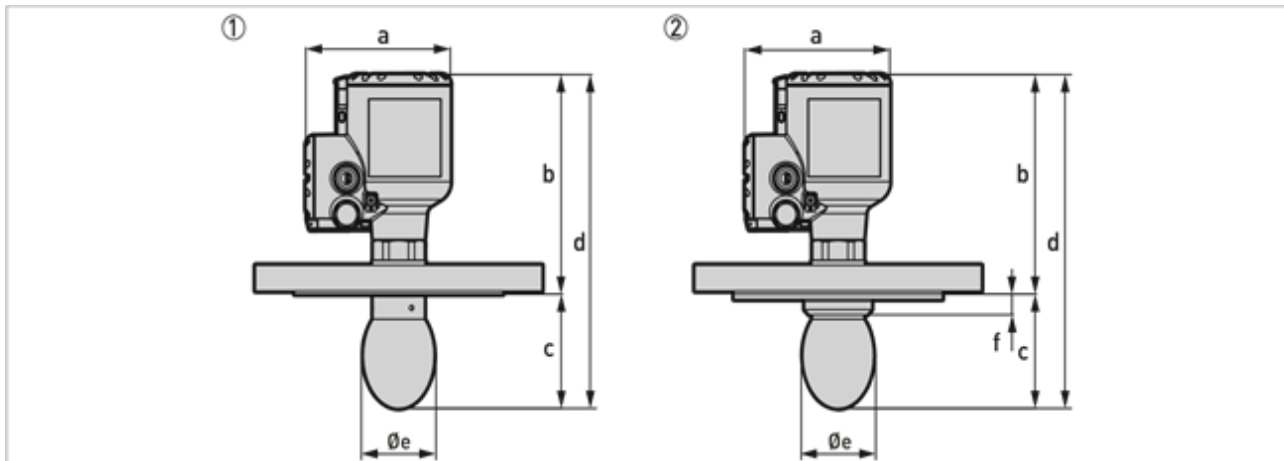


Figure 15: Drop antennas with standard flange connections

- 1) Drop antenna with a flange connection
 - 2) Drop antenna with a flange connection and a flange plate protection option
- The diameter of the outer sheath of the cable must be 7...12mm or 0.28...0.47".
 - Cable glands for cQPSus-approved devices must be supplied by the customer.
 - A weather protection cover is available as an accessory with all devices.

Drop antennas with standard flange connections: Dimensions in mm

| Drop antenna version | Dimensions [mm] | | | | | |
|----------------------|-----------------|-------------|-------------|-------------|-----|------|
| | a | b | c | d | Øe | f |
| DN80/3" | 151 | 203...215.6 | 124...136 ① | 327...352 ① | 74 | 20 ② |
| DN100/4" | 151 | 203...215.6 | 147...159 ① | 350...375 ① | 94 | 20 ② |
| DN150/6" | 151 | 203...215.6 | 203...216 ① | 411...436 ① | 144 | 20 ② |

- 1) These are the minimum and maximum values without the antenna extension option. A maximum of 5 antenna extensions are available. Each antenna extension is 105 mm long.
- 2) If the device has the PP flange protection option

Drop antennas with standard flange connections: Dimensions in inches

| Drop antenna version | Dimensions [inches] | | | | | |
|----------------------|---------------------|-------------|---------------|-----------------|------|--------|
| | a | b | c | d | Øe | f |
| DN80/3" | 5.94 | 7.99...8.49 | 4.88...5.35 ① | 12.87...13.86 ① | 2.91 | 0.79 ② |
| DN100/4" | 5.94 | 7.99...8.49 | 5.79...6.26 ① | 13.78...14.76 ① | 3.70 | 0.79 ② |
| DN150/6" | 5.94 | 7.99...8.49 | 7.99...8.46 ① | 15.98...16.97 ① | 5.67 | 0.79 ② |

- 1) These are the minimum and maximum values without the antenna extension option. A maximum of 5 antenna extensions are available. Each antenna extension is 4.1" long.
- 2) If the device has the PP flange protection option

Drop antennas with low-pressure flange connections

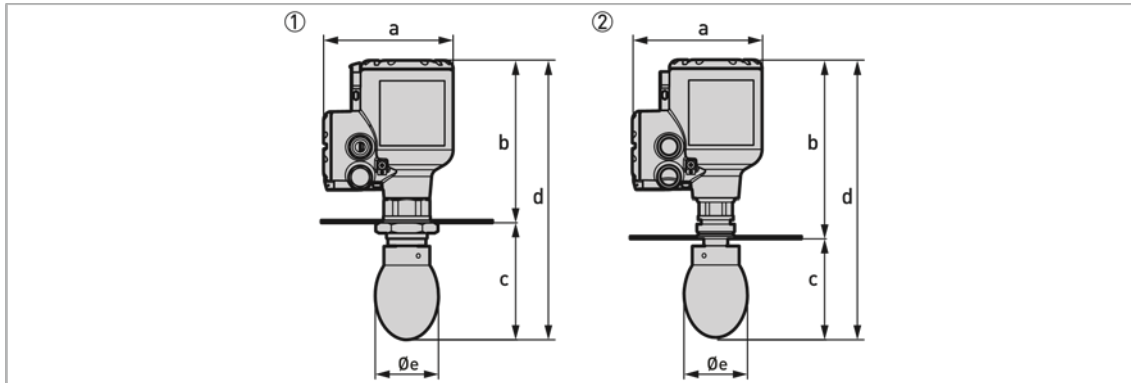


Figure 16: Drop antennas with low-pressure flange connections

- 1) Metallic Horn antenna with a low-pressure flange attached to a G threaded connection (ISO 228-1)
- 2) Metallic Horn antenna with a low-pressure flange attached to an NPT threaded connection (ASME B1.20.1)
 - The diameter of the outer sheath of the cable must be 7...12mm or 0.28...0.47".
 - Cable glands for cQPSus-approved devices must be supplied by the customer.
 - A weather protection cover is available as an accessory with all devices.

Drop antennas with low-pressure flange connections: Dimensions in mm

| Drop antenna version | Dimensions [mm] | | | | | | |
|----------------------|-----------------|-----|-----|-------|-------|-------|-----|
| | a | b | | c | d | | Øe |
| | | G | NPT | | G | NPT | |
| DN80/3" | 151 | 188 | 220 | 136 ① | 324 ① | 356 ① | 74 |
| DN100/4" | 151 | 188 | 220 | 159 ① | 347 ① | 379 ① | 94 |
| DN150/6" | 151 | 188 | 220 | 217 ① | 405 ① | 437 ① | 144 |

1) This is the dimension without the antenna extension option. A maximum of 5 antenna extensions are available. Each antenna extension is 105 mm long.

Drop antennas with low-pressure flange connections: Dimensions in inches

| Drop antenna version | Dimensions [mm] | | | | | | |
|----------------------|-----------------|------|------|--------|---------|---------|------|
| | a | b | | c | d | | Øe |
| | | G | NPT | | G | NPT | |
| DN80/3" | 5.94 | 7.40 | 8.66 | 5.35 ① | 12.76 ① | 14.01 ① | 2.91 |
| DN100/4" | 5.94 | 7.40 | 8.66 | 6.26 ① | 13.66 ① | 14.92 ① | 3.70 |
| DN150/6" | 5.94 | 7.40 | 8.66 | 8.54 ① | 15.94 ① | 17.20 ① | 5.67 |

1) This is the dimension without the antenna extension option. A maximum of 5 antenna extensions are available. Each antenna extension is 4.1" long.

Purging option

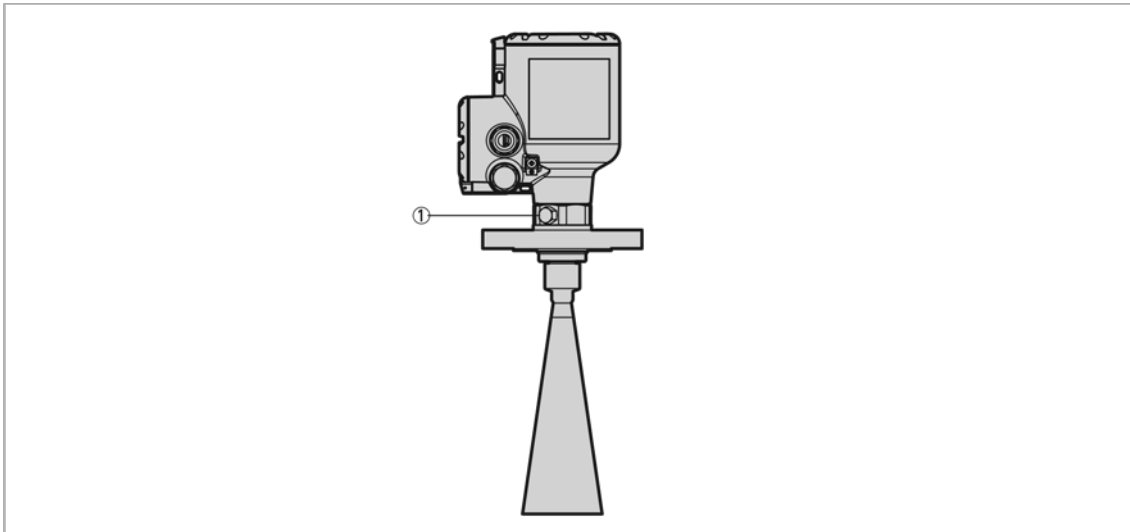


Figure 17: Purging options

- 1) 1/8 NPTF threaded connection for purging system (the plug is supplied by the manufacturer)

Purging system

This option is available for all Metallic Horn antennas. Flange connections must have a pressure rating of PN16 (EN1092-1), PN40 (EN1092-1), Class150 (ASMEB16.5), Class300 (ASMEB16.5), or must be a low-pressure flange (PN01/ 15psig).

Weather protection option

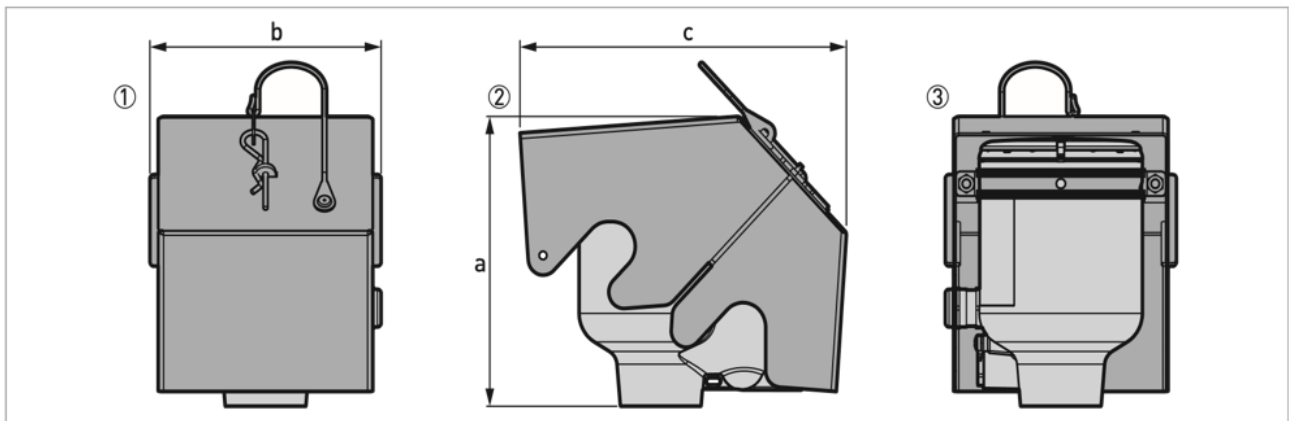


Figure 18: Weather protection option

- 1) Front view (with weather protection closed)
- 2) Left side (with weather protection closed)
- 3) Rear view (with weather protection closed)

Weather protection: Dimensions and weights

| | Dimensions | | | | | | Weights [kg] | |
|--------------------|------------|--------|------|--------|------|--------|--------------|------|
| | a | | b | | c | | | |
| | [mm] | [inch] | [mm] | [inch] | [mm] | [inch] | [kg] | [lb] |
| Weather protection | 177 | 6.97 | 153 | 6.02 | 216 | 8.50 | 1.3 | 2.9 |

Converter weight

| Type of housing | Weights | |
|---------------------------------|---------|------|
| | [kg] | [lb] |
| Compact aluminium housing | 2.1 | 4.6 |
| Compact stainless steel housing | 4.5 | 9.9 |

Antenna option weights

| Antenna options | Min./Max. weights | |
|--|-------------------|-------------|
| Standard options, without converter | [kg] | [lb] |
| DN40 / 1.5" Metallic Horn antenna with process connection, standard length ① | 2.3...58.7 | 5...129.1 |
| DN50 / 2" Metallic Horn antenna with process connection, standard length ① | 2.3...58.7 | 5...129.1 |
| DN65 / 2.5" Metallic Horn antenna with process connection, standard length ① | 2.5...58.9 | 5.5...129.6 |
| DN80 / 3" Metallic Horn antenna with process connection, standard length ① | 2.5...58.9 | 5.5...129.6 |
| DN100 / 4" Metallic Horn antenna with process connection, standard length ① | 2.6...59 | 5.7...129.8 |
| DN150 / 6" Metallic Horn antenna with process connection, standard length ① | 3...59.4 | 6.6...130.7 |
| DN200 / 8" Metallic Horn antenna with process connection, standard length ① | 3.7...60 | 8.1...132 |
| DN80 PP Drop antenna with process connection, standard length ① | 2.7...59.1 | 5.9...130 |
| DN100 PP Drop antenna with process connection, standard length ① | 3.1...59.5 | 6.8...131.2 |
| DN150 PP Drop antenna with process connection, standard length ① | 4.5...60.9 | 9.9...134 |

Antenna extension options

| | [kg] | [lb] |
|--------------------------------------|-------|--------|
| Straight extension, length 105 mm ② | +0.92 | +2.03 |
| Straight extension, length 210 mm ② | +1.84 | +4.06 |
| Straight extension, length 315 mm ② | +2.76 | +6.08 |
| Straight extension, length 420 mm ② | +3.68 | +8.11 |
| Straight extension, length 525 mm ② | +4.60 | +10.14 |
| Straight extension, length 630 mm ③ | +5.52 | +12.17 |
| Straight extension, length 735 mm ③ | +6.44 | +14.20 |
| Straight extension, length 840 mm ③ | +7.36 | +16.23 |
| Straight extension, length 945 mm ③ | +8.28 | +18.25 |
| Straight extension, length 1050 mm ③ | +9.20 | +20.28 |

Other options

| | [kg] | [lb] |
|--|------|-------|
| Flange plate option, DN80 PP Drop antenna | +0.1 | +0.22 |
| Flange plate option, DN100 PP Drop antenna | +0.2 | +0.44 |
| Flange plate option, DN150 PP Drop antenna | +0.3 | +0.66 |

- 1) Standard length = without antenna extensions
- 2) This option is for Metallic Horn and Drop antennas
- 3) This option is for Metallic Horn antennas

Intended use

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

This radar level transmitter measures distance, level, mass, volume and reflectivity of liquids, pastes and slurries.

It can be installed on tanks, reactors, open channels and open water.

Pre-installation requirements

Obey the precautions that follow to make sure that the device is correctly installed.

- Make sure that there is sufficient space on all sides.
- Protect the signal converter from direct sunlight. If necessary, install the weather protection accessory.
- Do not subject the signal converter to heavy vibrations. The devices are tested for vibration and agree with EN 50178 and IEC 60068-2-6.

Installation

Pressure and temperature ranges

The process connection temperature range must agree with the temperature limits of the gasket material. The operating pressure range is subject to the process connection used and the flange temperature.

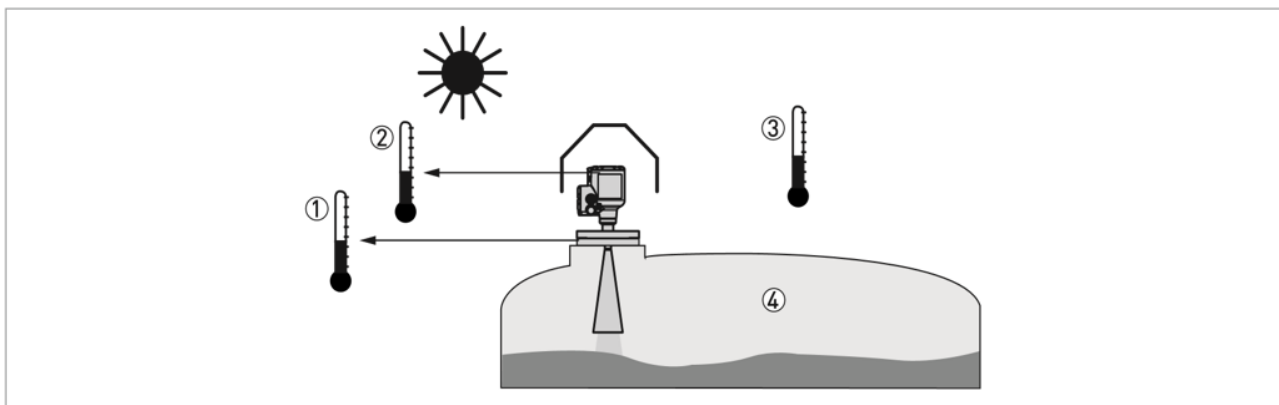


Figure 19: Pressure and temperature ranges

- 1) Temperature at the process connection
Non-Ex devices: The temperature range depends on the type of antenna, process connection and the seal material.
Refer to the table that follows.
Devices with Hazardous Location approvals: see supplementary instructions
- 2) Ambient temperature for operation of the display
-20...+70°C / -4...+158°F.
If the ambient temperature is not between these limits, then it is possible that the display screen will not operate temporarily. The device continues to measure level and send an output signal.
- 3) Ambient temperature.
Non-Ex devices: -40...+80°C / -40...+176°F.
Devices with Hazardous Location approvals: see supplementary instructions
- 4) Process pressure.
Depends on the type of antenna and process connection. Refer to the table that follows.

Maximum process connection temperature and operating pressure

| Antenna type | Maximum process connection temperature | | Maximum operating pressure | |
|---------------|--|--------|----------------------------|--------|
| | [°C] | [°F] | [barg] | [psig] |
| PP Drop | +100 | +212 | 16 | 232 |
| Metallic Horn | +130 ① | +266 ① | 16 | 232 |

1) The maximum process connection temperature must agree with the temperature limits of the gasket material

For more data on pressure ratings, refer to *Guidelines for maximum operating pressure on page 14*.

Recommended mounting position

Follow these recommendations to make sure that the device measures correctly. They have an effect on the performance of the device.

We recommend that you prepare the installation when the tank is empty.

Recommended nozzle position for liquids, pastes and slurries

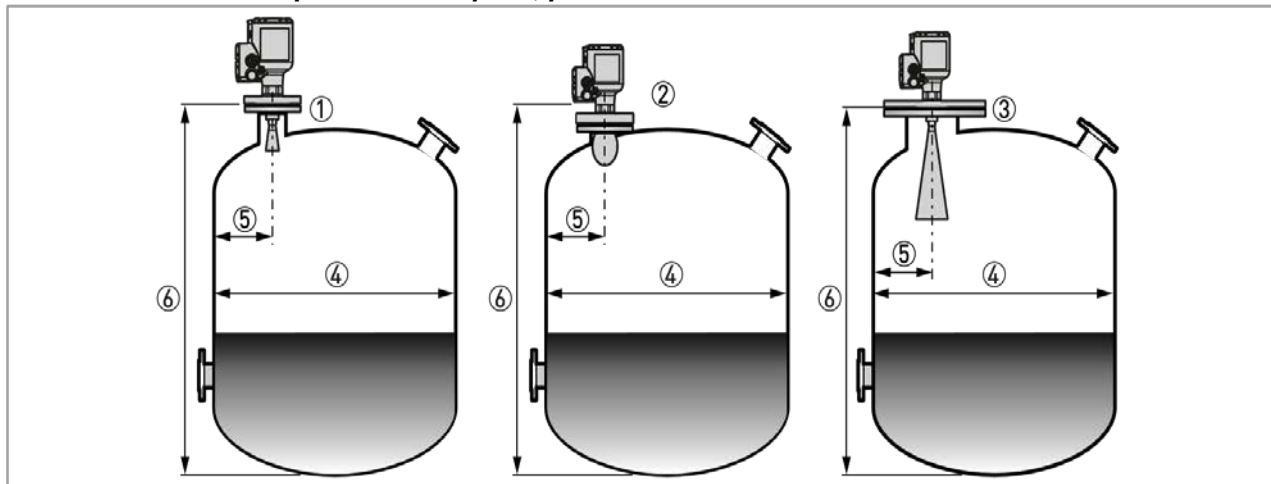


Figure 20: Recommended nozzle position for liquids, pastes and slurries

- 1) Nozzle or socket for the DN40 or DN50 Metallic Horn antennas
- 2) Nozzle or socket for the DN80 or DN100 Metallic Horn antenna, and the DN80 Drop antenna
- 3) Nozzle or socket for the DN150 or DN200 Metallic Horn antenna, and the DN100 or DN150 Drop antenna
- 4) Tank diameter
- 5) Minimum distance of the nozzle or socket from the tank wall (depends on the antenna type and size – refer to items 1, 2 and 3 in this list):
 - DN40 or DN50 Metallic Horn: $1/5 \times \text{tank height}$
 - DN80 or DN100 Metallic Horn: $1/10 \times \text{tank height}$
 - DN80 Drop: $1/10 \times \text{tank height}$
 - DN150 or DN200 Metallic Horn: $1/20 \times \text{tank height}$
 - DN100 or DN150 Drop: $1/20 \times \text{tank height}$
- Maximum distance of the nozzle or socket from the tank wall (depends on the antenna type and size – refer to items 1, 2 and 3 in this list):
 - Metallic Horn or Drop: $1/3 \times \text{tank diameter}$
- 6) Tank height

If there is a nozzle on the tank before installation, the nozzle must be a minimum of 200mm/ 7.9" from the tank wall. The tank wall must be flat and there must not be obstacles adjacent to the nozzle or on the tank wall.

Number of devices that can be operated in a tank

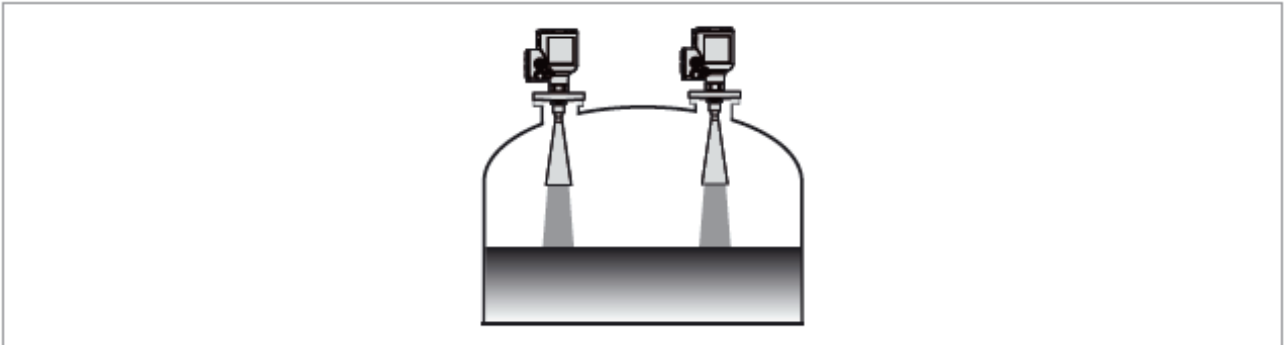


Figure 21: There is no maximum limit to the number of devices that can be operated in the same tank

There is no maximum limit to the number of devices that can be operated in the same tank. They can be installed adjacent to other radar level transmitters.

Mounting restrictions

LPR and TLPR devices

LPR [Level Probing Radar] devices measure level in the open air or in a closed space (a metallic tank etc.). **TLPR [Tank Level Probing Radar]** devices measure level in a closed space only. You can use LPR devices for TLPR applications.

Causes of interference signals

- Objects in the tank or pit.
- Sharp corners that are perpendicular to the path of the radar beam.
- Sudden changes in tank diameter in the path of the radar beam.

Do not install the device above objects in the tank (ladder, supports etc.) or pit. Objects in the tank or pit can cause interference signals. If there are interference signals, the device will not measure correctly.

If it is not possible to install the device on another part of the tank or pit, do an empty spectrum scan. For more data, refer to the handbook.

Equipment and obstacles: how to prevent measurement of interference signals

Do not put the device immediately above equipment and obstacles in a tank or pit. This can have an effect on the performance of the device.

If possible, do not install a nozzle on the tank centerline.

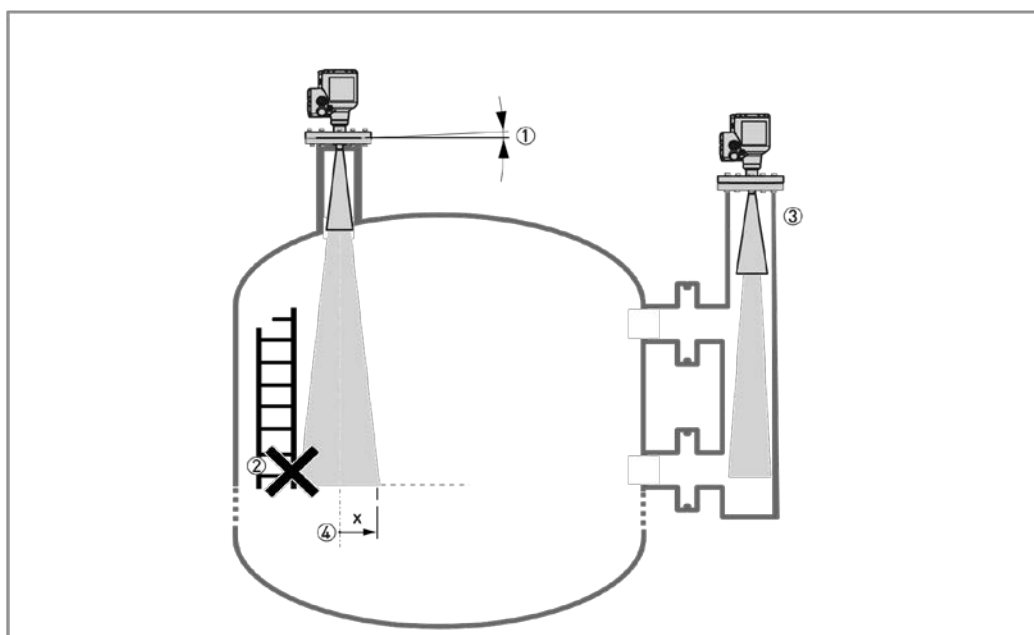


Figure 22: Equipment and obstacles: how to prevent measurement of interference signals

- 1) Do not tilt the device more than 2°
- 2) We recommend that you do an empty spectrum recording if there are too many obstacles in the radar beam (refer to the handbook).
- 3) If there are too many obstacles in the tank, you can install the device on a standpipe. For more data about how to install the device on standpipes, refer to Standpipes (stilling wells and bypass chambers) on page [Error! Bookmark not defined.](#)
- 4) Beam radius of the antenna: refer to the table below. The beam radius increases by increments of "x" mm for each metre of distance from the antenna.

Beam radius of the antenna

| Antenna type | Beam angle | Beam radius, x | |
|---------------------------|------------|----------------|---------|
| | | [mm/m] | [in/ft] |
| Metallic Horn, DN40 (1½") | 17° | 150 | 1.8 |
| Metallic Horn, DN50 (2") | 16° | 141 | 1.7 |
| Metallic Horn, DN65 (2½") | 10° 1 | 1 | 1 |
| Metallic Horn, DN80 (3") | 9° | 79 | 0.9 |
| Metallic Horn, DN100 (4") | 8° | 70 | 0.8 |
| Metallic Horn, DN150 (6") | 6° | 53 | 0.6 |
| Metallic Horn, DN200 (8") | 5° | 44 | 0.5 |
| PP Drop DN80 (3") | 9° | 79 | 0.9 |
| PP Drop, DN100 (4") | 7° | 61 | 0.7 |
| PP Drop, DN150 (6") | 5° | 44 | 0.5 |

- 1) This antenna option is specially made for the BM 26 A

Product inlets

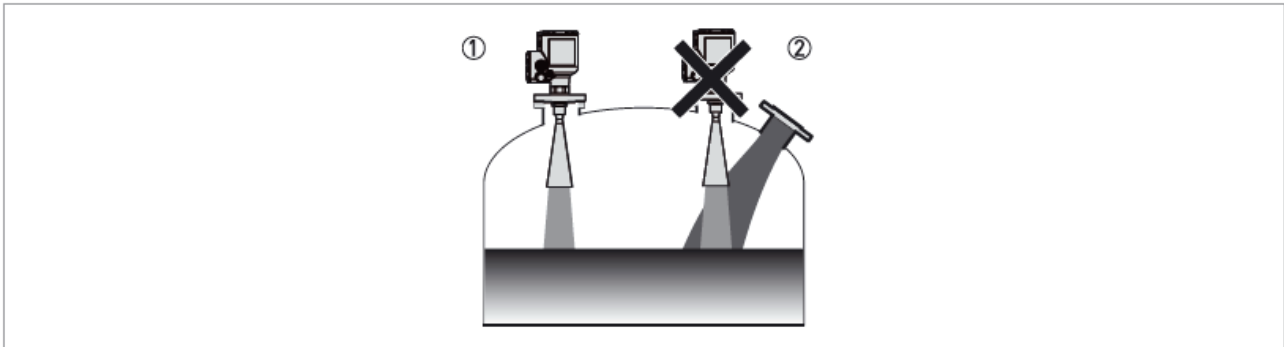


Figure 23: Product Inlets

- 1) The device is in the correct position
- 2) The device is too near to the product inlet.

Do not put the device near to the product inlet. If the product that enters the tank touches the antenna, the device will measure incorrectly. If the product fills the tank directly below the antenna, the device will also measure incorrectly.

For more data about the measuring range of each type of antenna, refer to [Measuring accuracy](#) on page 12

Process connections

All the procedures that follow are applicable to Metallic Horn and Drop antennas.

Flange connections

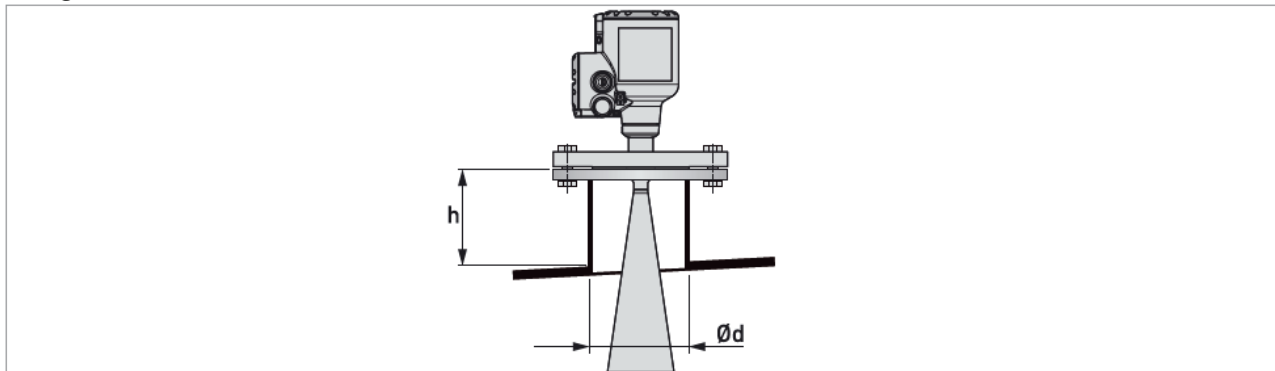


Figure 24: Flange connections

Ød = nozzle diameter

h = nozzle height

Recommended nozzle size for flange connections

The nozzle must be as short as possible. Refer to the table below for the maximum height of the nozzle:

| Nozzle and antenna diameter, Ød | | Maximum nozzle height, h | | | |
|------------------------------------|--------|--------------------------|---------|--------------|--------|
| | | Metallic Horn antenna | | Drop antenna | |
| [mm] | [inch] | [mm] | [inch] | [mm] | [inch] |
| 40 | 1½ | 140 ① | 5.51 ① | — | — |
| 50 | 2 | 150 ① | 5.91 ① | — | — |
| 80 | 3 | 260 ① | 10.24 ① | 60 ① | 2.36 ① |
| 100 | 4 | 330 ① | 12.99 ① | 70 ① | 2.76 ① |
| 150 | 6 | 490 ① | 19.29 ① | 100 ① | 3.94 ① |
| 200 | 8 | 660 ① | 25.98 ① | — | — |

- 1) If the device has antenna extensions, this option extends the maximum nozzle height. Add the length of the antenna extensions attached to the device to this value.

Threaded connections

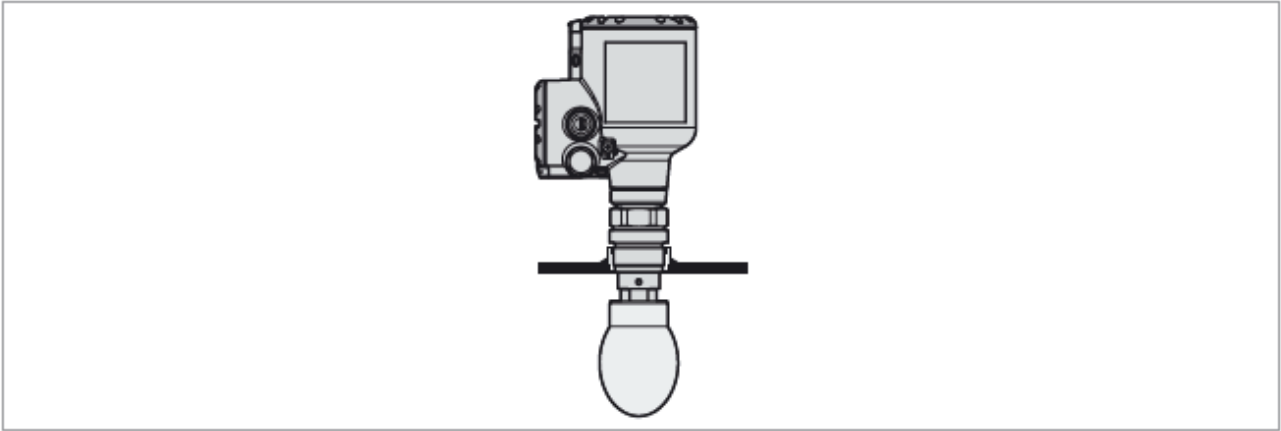


Figure 25: Threaded connections

Recommended socket size for threaded connections

The socket must be as short as possible. If the socket is in a recess, then use the maximum limits for nozzle dimensions (flange connections) in this section.

If the device has antenna extensions, this option extends the maximum socket height. Add the length of the antenna extensions attached to the device to this value.

LPR devices: recommendations for pits and tanks made of non-conductive materials

These instructions are for LPR equipment only.

Device installation on tanks made of a non-conductive material

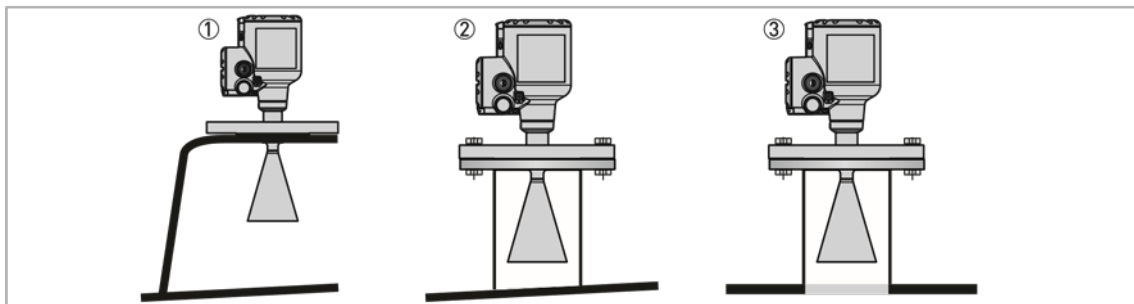


Figure 26: Device installation on tanks made of a non-conductive material

- 1) LPR equipment on a basic support (for indoor installations)
- 2) LPR equipment on a sealed support
- 3) LPR equipment on a tank made of conductive material, but with a non-conductive, sealed "window"

If the device cannot go in the tank and the tank is made of a non-conductive material (plastic etc.), you can attach a support to the top of the tank without a hole in the tank roof. We recommend that you put the antenna as near as possible to the top of the tank.

If the tank is outdoors, we recommend that you seal the support. If rain is on the top of the tank and directly below the device, this can have an effect on the device performance.

If device is used in dusty conditions, we recommend that you seal the support. If dust is on the top of the tank and directly below the device, this can have an effect on the device performance.

Open pits

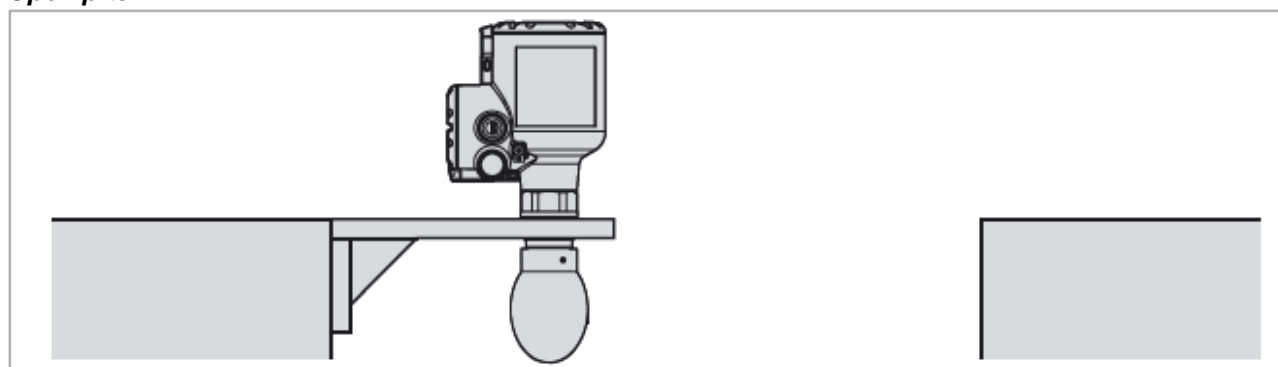


Figure 27: Open pits

If the device must measure the level of product in a pit, you can attach a support to the side of the pit or above the pit.

Standpipes (stilling wells and bypass chambers)

These instructions are applicable for devices with Metallic Horn antenna options only. Use a standpipe if:

- There is highly conductive foam in the tank.
- The liquid is very turbulent or agitated.
- There are too many other objects in the tank.
- The device is measuring a liquid (petro-chemicals) in a tank with a floating roof.
- The device is installed in a horizontal cylindrical tank.

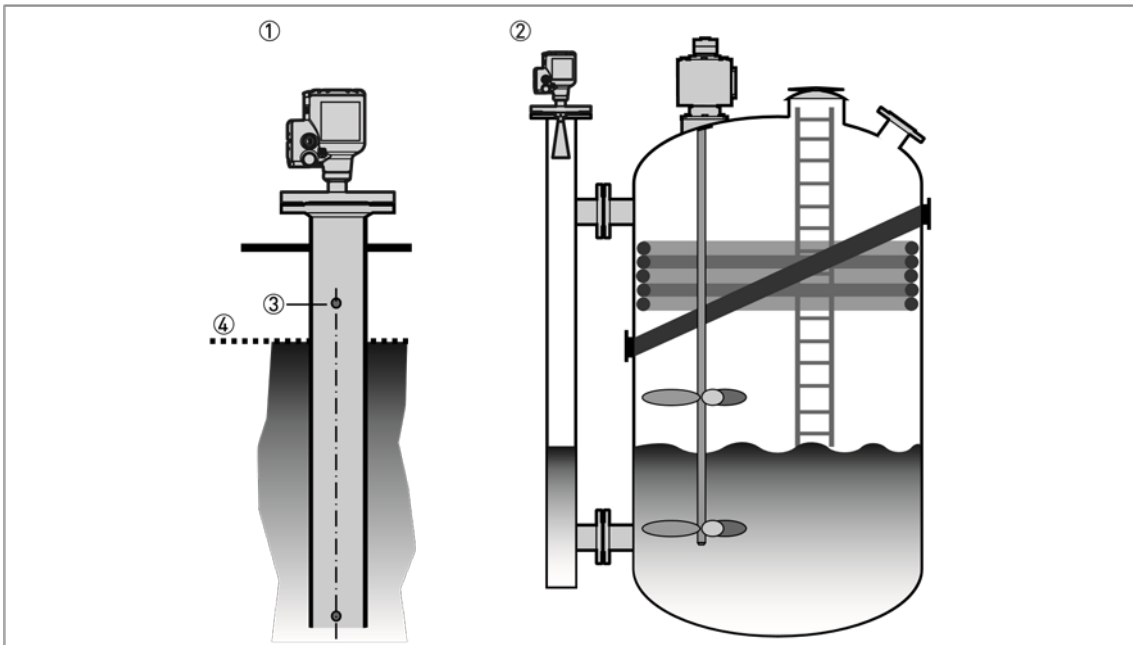


Figure 28: Installation recommendations for standpipes (stilling wells and bypass chambers)

- 1) A stilling well solution
- 2) A bypass chamber solution
- 3) Air circulation hole
- 4) Level of the liquid

- The standpipe must be electrically conductive.
- The inside diameter of the standpipe must not be more than 5mm/ 0.2" over the diameter of the antenna (for a high-dielectric constant liquid).
- The standpipe must be straight. There must be no sudden changes in internal diameter greater than 1mm/ 0.04".
- The standpipe must be vertical.
- Recommended surface roughness: $\leq \pm 0.1\text{mm} / 0.004"$.
- Make sure that there are no deposits at the bottom of the standpipe.
- Make sure that there is liquid in the standpipe.

You must drill an air circulation hole.

Installation in tanks containing one liquid and foam

- Drill an air circulation hole (max. Ø10 mm / 0.4") in the stilling well above the maximum level.
- Remove the burr from the hole.

Installation in tanks containing one liquid or more without foam

- Drill an air circulation hole (max. Ø10 mm / 0.4") in the stilling well above the maximum level.
- Drill 1 or more liquid circulation holes in the stilling well (if there is more than 1 liquid in the tank). These holes help the liquid to move freely between the stilling well and the tank.
- Remove the burr from the hole.

Stilling wells: floating roofs

If the device must be installed on a tank with a floating roof, install it in a stilling well made of metal.

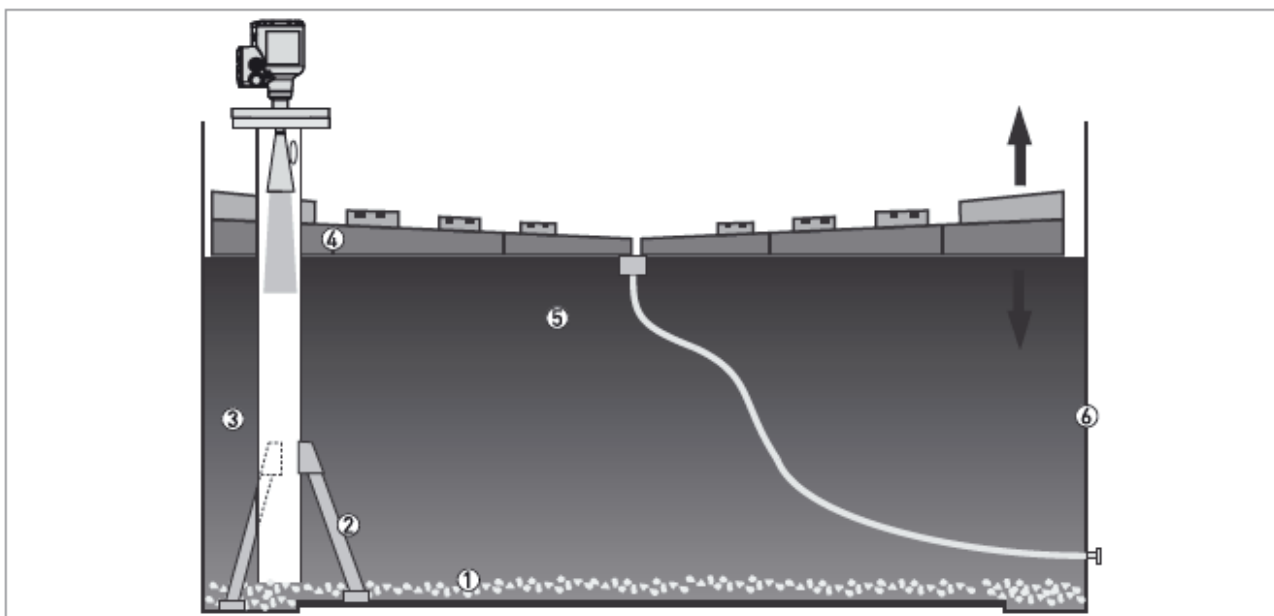


Figure 29: Floating roofs

- 1) Sediment
- 2) Support fixtures
- 3) Stilling well
- 4) Floating roof
- 5) Product
- 6) Tank

Stilling wells: horizontal cylindrical tanks

We recommend that you install the device in a stilling well if the device:

- is for a horizontal cylindrical tank,
- is in a metallic tank,
- measures a product with a high dielectric constant and
- is on the centerline of the tank.

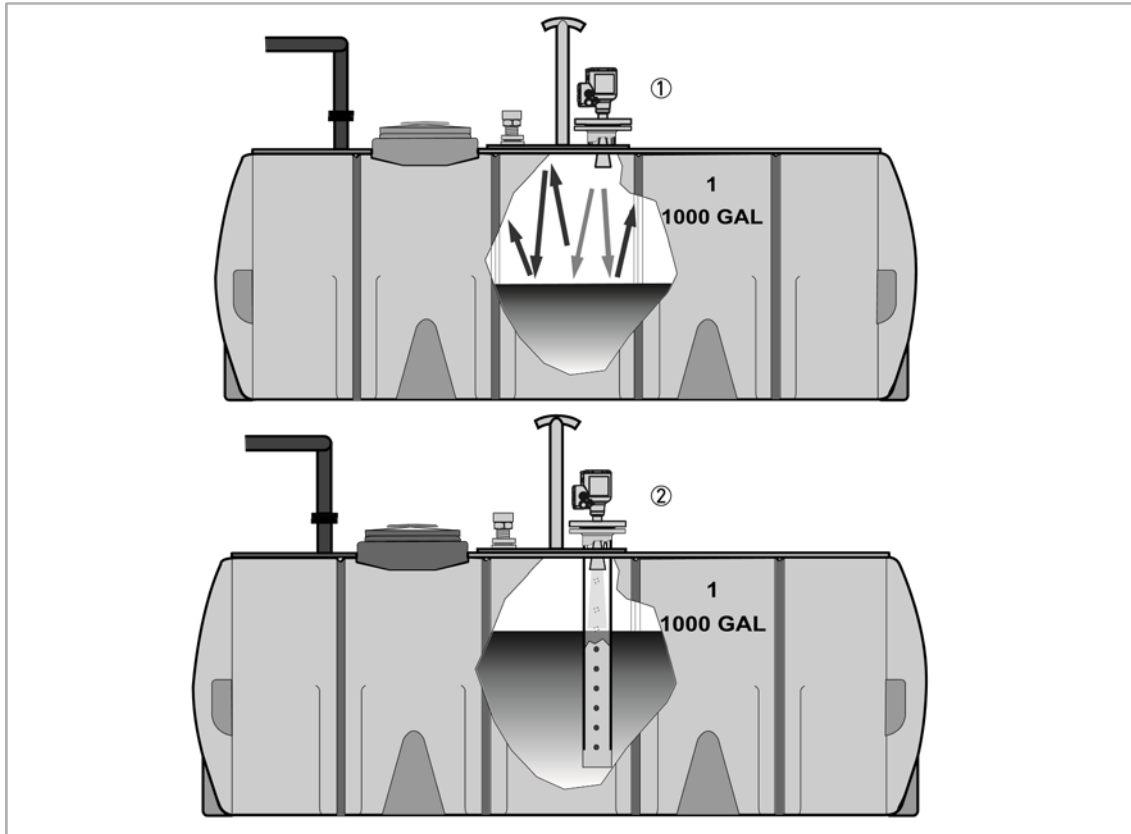


Figure 30: Horizontal cylindrical tanks

- 1) The device is installed without a stilling well. There are multiple reflections. Refer to the CAUTION! that follows.
- 2) The device is installed in a stilling well and measures correctly.

If the device is installed in horizontal cylindrical tank that contains a high dielectric constant liquid without a stilling well, do not put it on the tank centerline. This will cause multiple reflections and the device will not measure accurately. Use the device software to keep the effects of multiple reflections to a minimum. For more data, refer to "Function description" in the handbook.

Bypass chambers

Installation next to tanks containing one liquid and foam

- The top process connection of the bypass chamber must be above the maximum level of liquid.
- The bottom process connection of the bypass chamber must be below the lowest measured level of liquid.

Installation next to tanks containing more than one liquid

- The top process connection of the bypass chamber must be above the maximum level of liquid.
- The bottom process connection of the bypass chamber must be below the lowest measured level of liquid.
- Additional process connections are necessary for the liquids to circulate freely along the length of the bypass chamber.

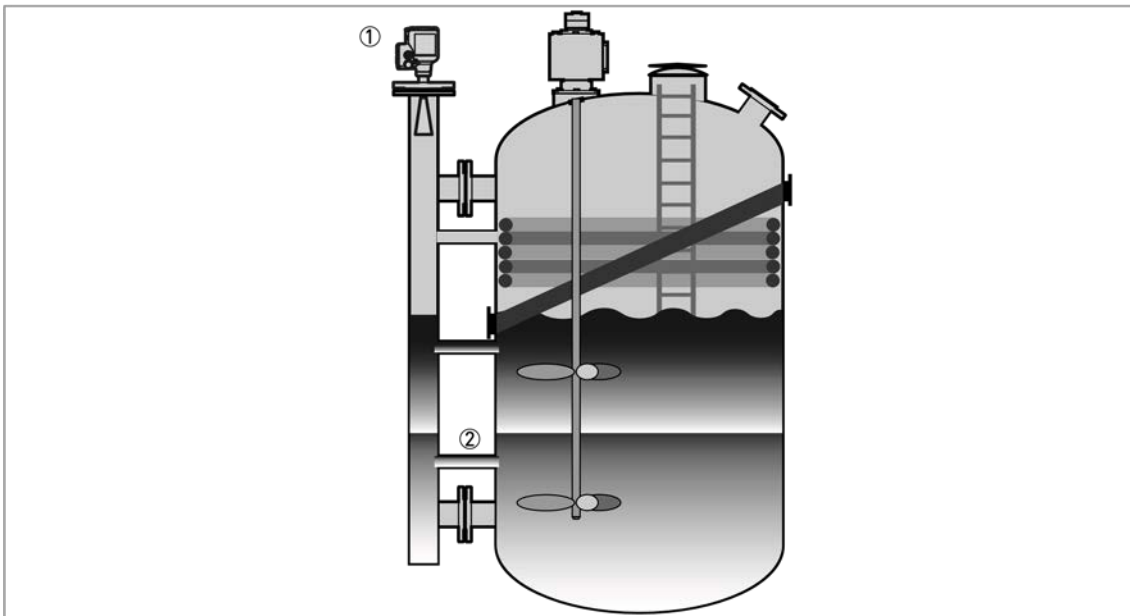


Figure 31: Installation recommendations for bypass chambers that contain more than one liquid

- 1) Bypass chamber
- 2) Additional process connection

Electrical installation: output options with cable gland

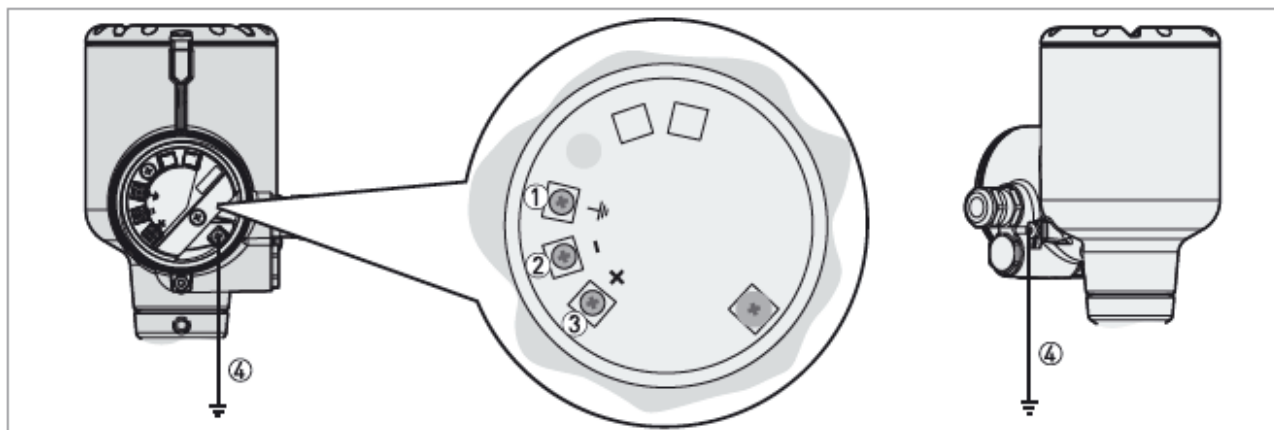


Figure 32: terminals for electrical installation: standard cable gland

- 1) Grounding terminal in the housing 9 (if the electrical cable is shielded)
- 2) Current output
- 3) Current output +
- 4) Location of the external grounding terminal (at the bottom of the converter)

Electrical power to the output terminal energizes the device. The output terminal is also used for HART® communication.

Electrical installation: output options with an M12 male connector

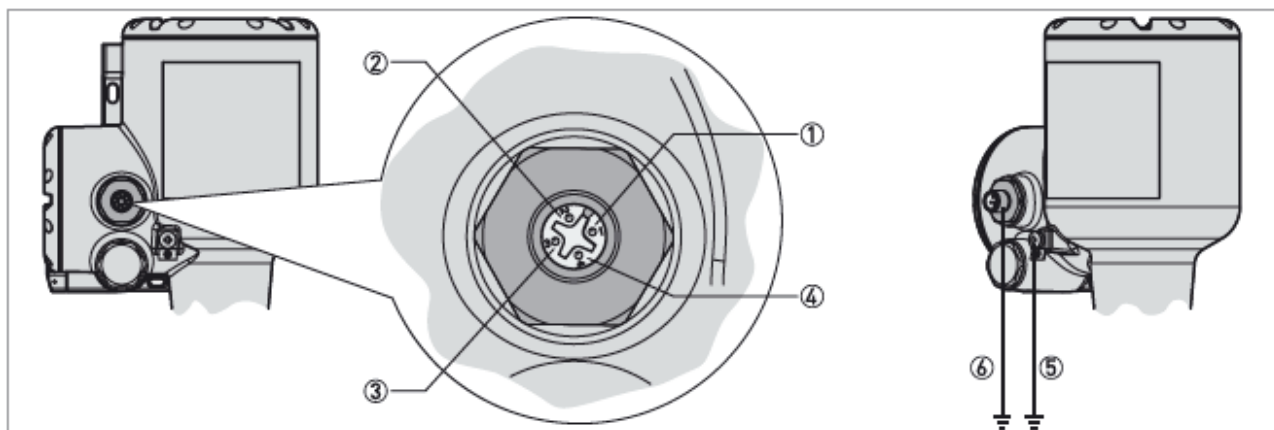


Figure 33: Terminals for electrical installation: 4-pin male M12 connector

- 1) Pin 1: current output+
- 2) Pin 2: not connected
- 3) Pin 3: current output
- 4) Pin 4: not connected
- 5) Grounding terminal (external thread of the connector)
- 6) Location of the external grounding terminal (at the bottom of the converter)

Electrical power to the output terminal energizes the device. The output terminal is also used for HART® communication.

Non-Ex devices

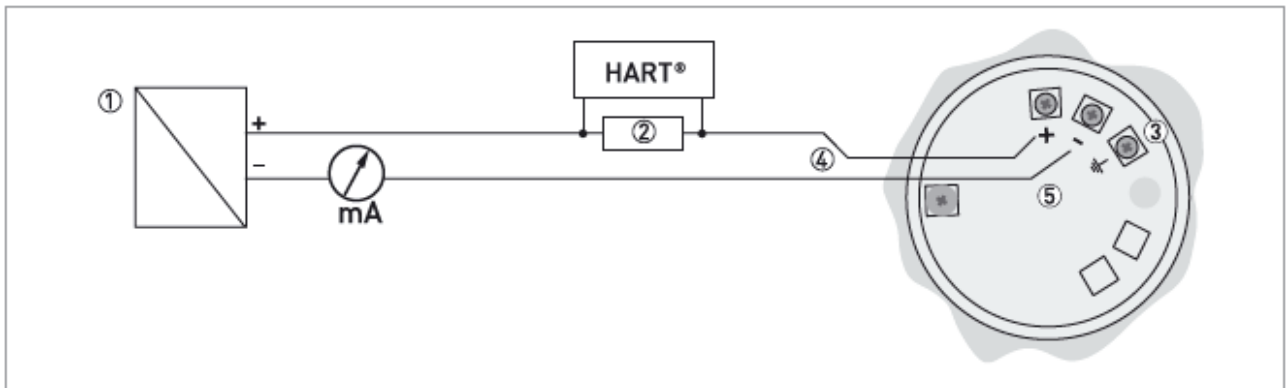


Figure 34: Electrical connectors for non-Ex

- 1) Power
- 2) Resistor for HART® communication (typically 250 ohms)
- 3) Optional connection to the grounding terminal
- 4) Output: 12...30 VDC for an output of 21.5 mA at the terminal
- 5) Device

Devices for hazardous locations

- For electrical data for device operation in hazardous locations, refer to the related certificates of compliance and supplementary instructions (ATEX, IECEx etc.). This documentation can be downloaded from Honeywell Process website
<https://www.honeywellprocess.com/en-US/explore/products/instrumentation/process-level-sensors/Pages/smartline-non-contact-radar-level-meter.aspx>

Networks

General information

The device uses the HART® communication protocol. This protocol agrees with the HART® Communication Foundation standard. The device can be connected point-to-point. It can also have a polling address of 1 to 63 in a multi-drop network.

The device output is factory-set to communicate point-to-point. To change the communication mode from **point-to-point** to **multi-drop**, refer to "Network configuration" in the handbook.

Point-to-point connection

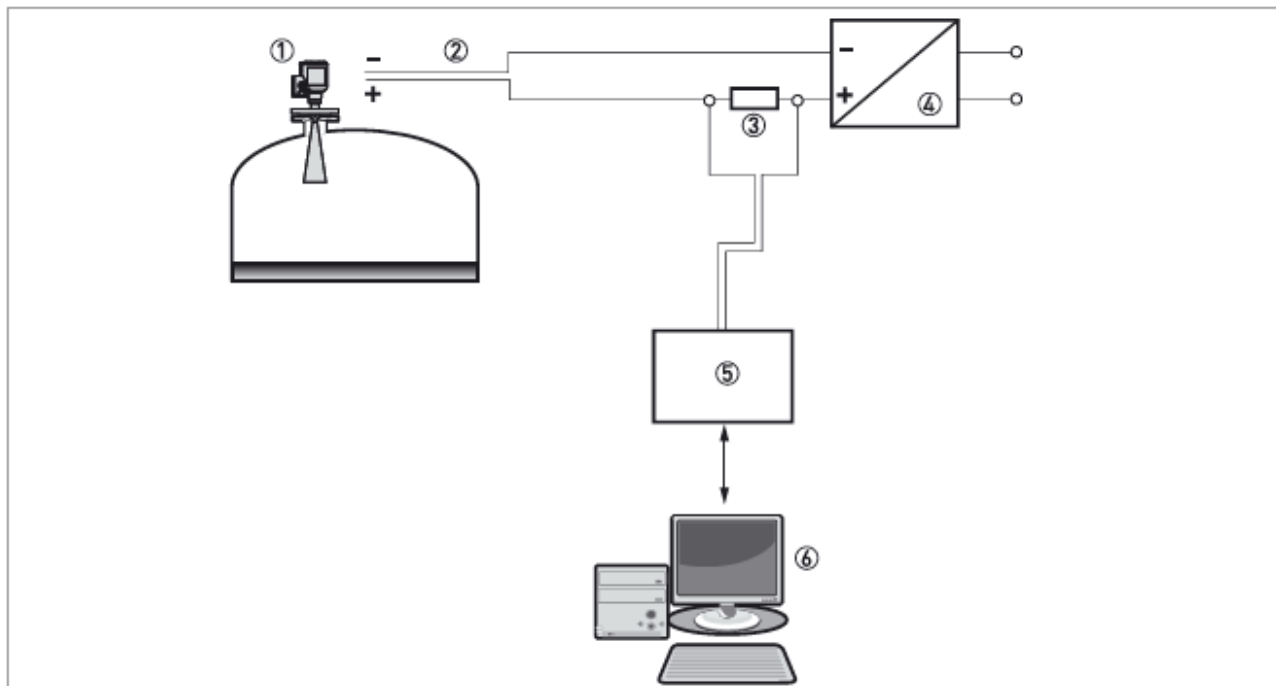


Figure 35: Point to point connection (non-Ex)

- 1) Address of the device (0 for point-to-point connection)
- 2) 4...20 mA + HART®
- 3) Resistor for HART® communication (typically 250 ohms)
- 4) Power supply
- 5) HART® converter
- 6) HART® communication software

Multi-drop networks

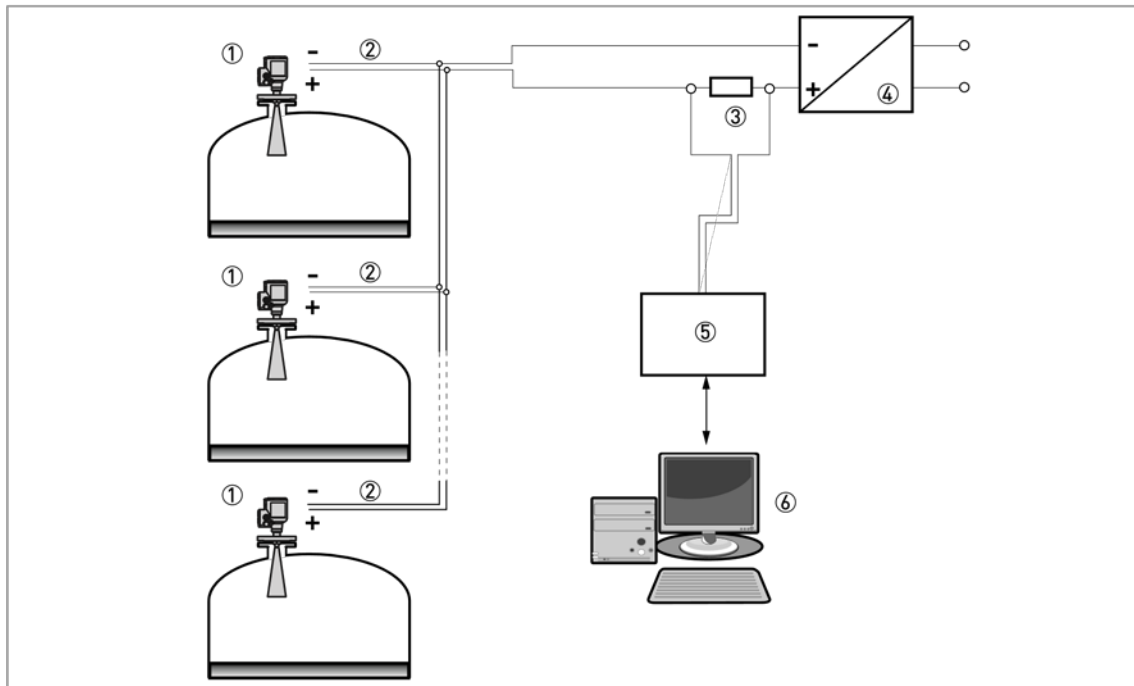


Figure 36: Multi-drop network (non-Ex)

- 1) Address of the device (each device must have a different address in multidrop networks)
- 2) 4mA + HART®
- 3) Resistor for HART® communication (typically 250 ohms)
- 4) Power supply
- 5) HART® converter
- 6) HART® communication software

This image shows a full page of blank graph paper. The grid consists of thin, light gray horizontal and vertical lines that intersect to form small squares across the entire surface. There are no margins, text, or other markings on the paper.

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Sales and Service

For application assistance, current specifications, pricing, or name of the nearest Authorized Distributor, contact one of the offices below.

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