



OPTIWAVE 6300 C Technical Datasheet

Non-contact Radar (FMCW) Level Meter for Solids

- One converter for all antenna types (PTFE Drop, PP Drop and metallic horn)
- The only guarantee for measuring accurately in dusty conditions
- Uses a unique Drop antenna design for very dusty atmospheres



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1.1 The radar solution for solids

This device is a non-contact Radar (FMCW) Level Meter for distance, level, volume and mass measurement of powders, granulates and other solids. It gives a stabler measurement than pulse radar and is well suited to dusty process conditions. The device can operate at very low and very high process temperatures as long as the process connection temperature limits are observed.



- ① Optional touch screen with 4-button operation
- ② 2-wire level meter
- ③ Removable and rotatable converter with quick connector system
- ④ Stainless steel horn or PTFE/PP Drop antennas
- ⑤ Optional flange plate protection (for corrosive products) or antenna extension (for long nozzles)
- ⑥ One converter for all applications

Highlights

- ± 3 mm / ± 0.12 " standard accuracy
- PP or PTFE Drop antenna: its shape prevents product build-up in dusty applications
- Operates up to a flange temperature of 200°C / 390°F and 40 bar / 580 psig
- Measuring range up to 80 m / 260 ft
- Antenna can be extended to suit any nozzle length
- PACTware and DTMs included as standard
- Optional second current output
- Directly-accessible graphic touchscreen/wizard (option)
- An installation wizard specifically for solids that permits the instrument to measure uneven surfaces accurately

Industries

- Minerals & Mining
- Chemical
- Food
- Iron, Steel & Metals
- Pulp & Paper

Applications

- Storage
- Silos
- Hoppers

1.2 Options

Drop antennas



Drop antennas are a unique innovation to measure powders and other solids in very dusty atmospheres. The ellipsoidal shape of the antennas prevents build-up and generates a small beam angle for accurate measurement of silo contents. They have these features:

- 2 antenna sizes: DN80 or DN150.
- An installation wizard specifically for solids that permits the instrument to measure uneven surfaces accurately.
- Antennas can be extended to suit any nozzle length.
- Made of either PP or PTFE.

Horn antennas



Use of metal horn antennas is recommended for measuring granulates, high-pressure and high-temperature applications, cement works or processes with cyclone separators. They are particularly resistant to mechanical shocks. They have these features:

- Made of stainless steel 316L.
- 4 antenna sizes: DN80, DN100, DN150 or DN200.
- Antennas can be extended to suit any nozzle length.

1.3 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 Fourier transformation (FFT) into a frequency spectrum and then the distance is calculated from the spectrum. The level results from the difference between tank height and measuring distance.

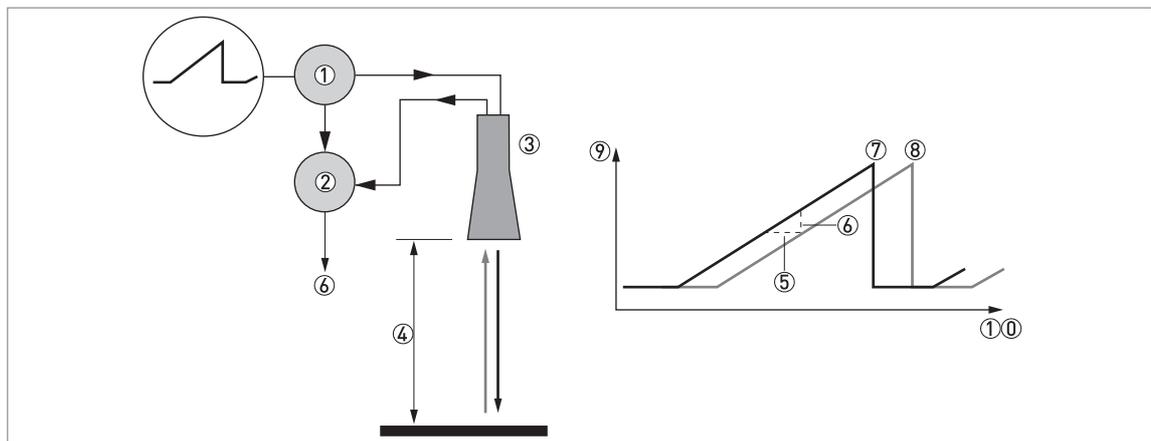


Figure 1-1: Measuring principle of FMCW radar

- 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

2.1 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.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Download Center).*

Measuring system

| | |
|--------------------------|--|
| Measuring principle | 2-wire loop-powered level transmitter; K-band (24...26 GHz) FMCW radar |
| Application range | Level measurement of powders and granulates |
| Primary measured value | Δf (change in frequency) between the emitted and received signal |
| Secondary measured value | Distance, level, volume, mass and reflectivity |

Design

| | |
|-----------------------------------|--|
| Construction | The measurement system consists of a measuring sensor (antenna) and a signal converter which is only available in a compact version |
| Standard | Antenna purging system for horn antenna (supplied with a ¼ NPTF connection – for horn antenna only) |
| Options | Integrated LCD display with sun cover (-20...+60°C / -4...+140°F); if the ambient temperature is not in these limits, the display switches off |
| | 2nd current output |
| | PTFE/PP flange plate protection (for Drop antenna without antenna extensions only) |
| Accessories | Distance piece (for process temperature: +150...+200°C / +300...+390°F) |
| | Weather protection |
| | Antenna extensions of 105 mm / 4.1" length (max. length for Drop antenna versions: 525 mm / 20.7") |
| Max. measuring range | 2° slanted PP flange (for all antennas) |
| | 80 m / 260 ft |
| | Depends on the antenna option, dielectric constant of the product and installation type. Refer also to "Antenna selection". |
| Min. tank height | 0.2 m / 8" |
| Dead zone | Antenna extension length + antenna length + 0.3 m / 12" |
| Beam angle of antenna | Horn / Sheet metal horn DN80 / 3": 10° |
| | Horn / Sheet metal horn DN100 / 4": 8° |
| | Sheet metal horn DN150 / 6": 8° |
| | Sheet metal horn DN200 / 8": 8° |
| | Drop DN80 / 3": 8° |
| Drop DN150 / 6": 4° | |
| Display and user interface | |
| Display | LCD display |
| | 9 lines, 160 × 160 pixels in 8-step grayscale with 4-button keypad |
| Interface languages | English, German, French, Italian, Spanish, Portuguese, Japanese, Simplified Chinese and Russian |

Measurement accuracy

| | |
|--|--|
| Resolution | 1 mm / 0.04" |
| Repeatability | ±1 mm / ±0.04" |
| Accuracy | ±3 mm / ±0.12", when distance < 10 m / 33 ft; ±0.03% of measured distance, when distance > 10 m / 33 ft |
| Reference conditions acc. to EN 60770 | |
| Temperature | +20°C ±5°C / +70°F ±10°F |
| Pressure | 1013 mbara ±20 mbar / 14.69 psia ±0.29 psi |
| Relative air humidity | 60% ±15% |
| Target | Metal plate in an anechoic chamber |

Operating conditions

| | |
|--------------------------|---|
| Temperature | |
| Ambient temperature | -40...+80°C / -40...+175°F (according to the temperature limits of the gasket material. Refer to "Materials" in this table.) Ex: see supplementary operating instructions or approval certificates |
| Storage temperature | -40...+85°C / -40...+185°F |
| Flange temperature | Horn / Sheet metal horn antenna: Standard: -50...+150°C / -58...+300°F Option: -50...+200°C / -58...+390°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 (PTFE): -50...+150°C / -58...+300°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...+210°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 | |
| Operating pressure | Drop antenna (PP): -1...16 barg / -14.5...232 psig; subject to process connection used and flange temperature |
| | Drop antenna (PTFE): -1...40 barg / -14.5...580 psig; subject to process connection used and flange temperature |
| | Horn / Sheet metal horn antenna: Standard: -1...40 barg / -14.5...580 psig; subject to process connection used and flange temperature |
| Other conditions | |
| Dielectric constant (εr) | ≥1.5 |
| Vibration resistance | IEC 60068-2-6 and EN 50178 (10...57 Hz: 0.075 mm / 57...150 Hz:1g) |
| Protection category | IP 66/67 equivalent to NEMA type 4X (housing) and type 6P (antenna) |
| Maximum rate of change | 10 m/min / 33 ft/min |

Installation conditions

| | |
|-----------------------------|--|
| 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 silo (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 silo |
| Process connection position | Make sure that there are not any obstructions directly below the process connection for the device. |
| Dimensions and weights | Refer to "Technical data: Dimensions and weights". |

Materials

| | |
|---|--|
| Housing | Standard: Polyester-coated aluminium |
| | Option: Stainless steel (1.4404 / 316L) ① |
| Wetted parts, including antenna | Horn / Sheet metal horn antenna: Stainless steel (1.4404 / 316L) |
| | Drop antenna: PTFE; PP – a PP or PTFE flange plate protection option is also available |
| Process connection | Stainless steel (1.4404 / 316L) – a PP or PTFE flange plate protection option is also available for the Drop antenna |
| Gaskets (and o-rings for the sealed antenna extension option) | PTFE Drop antenna: FKM/FPM [-40...+150°C / -40...+300°F]; Kalrez® 6375 (-20...+150°C / -4...+300°F); EPDM [-50°C...+150°C / -58...+300°F] ② |
| | PP Drop antenna: FKM/FPM [-40...+100°C / -40...+210°F]; Kalrez® 6375 (-20...+100°C / -4...+210°F); EPDM [-40°C...+100°C / -40...+210°F] ② |
| | Horn / Sheet metal horn antenna: FKM/FPM [-40...+200°C / -40...+390°F]; Kalrez® 6375 (-20...+200°C / -4...+390°F); EPDM [-50°C...+150°C / -58...+300°F] ② |
| Feedthrough | Standard: PEI [-50...+200°C / -58...+390°F – max. range. The feedthrough temperature limits must agree with the temperature limits of the gasket material and antenna type. If the distance piece option is not attached, the maximum temperature is 150°C / 300°F.] |
| | Option: Metaglas® [-30...+200°C / -22...+390°F – max. range. The feedthrough temperature limits must agree with the temperature limits of the gasket material and antenna type. If the distance piece option is not attached, the maximum temperature is 150°C / 300°F.] ③ |
| Weather protection (Option) | Stainless steel (1.4301 / 304) |

Process connections

| | |
|-----------------------|--|
| Thread | G 1½ (ISO 228); 1½ NPT (ASME B1.20.1) |
| Flange version | |
| EN 1092-1 | DN80 in PN40, DN100...200 in PN16 or PN40 (Form B1); others on request |
| ASME B16.5 | 3"...8" in 150 lb RF, 3"...4" in 300 lb RF; others on request |
| JIS B2220 | 80...100A in 10K; others on request |
| Other | Others on request |

Electrical connections

| | |
|---------------------------------|---|
| Power supply | Terminals output 1 – Non-Ex / Ex i: 14...30 VDC; min./max. value for an output of 22 mA at the terminal |
| | Terminals output 1 – Ex d: 20...36 VDC; min./max. value for an output of 22 mA at the terminal |
| | Terminals output 2 – Non-Ex / Ex i / Ex d: 10...30 VDC; min./max. value for an output of 22 mA at the terminal (additional power supply needed – output only) |
| Cable entry | M20×1.5; ½ NPT |
| | G ½ (not for FM- and CSA-approved devices. Not for stainless steel housings.) |
| | M25×1.5 (for stainless steel housings only) |
| Cable gland | Standard: none |
| | Options: M20×1.5 (for non-Ex and Ex -approved devices with M20×1.5 and M25×1.5 cable entries); others are available on request |
| Cable entry capacity (terminal) | 0.5...1.5 mm ² |

Input and output

| | |
|-------------------------------------|--|
| Current output | |
| Output signal (Output 1) | 4...20 mA HART® or 3.8...20.5 mA acc. to NAMUR NE 43 ④ |
| Output signal (Output 2 - optional) | 4...20 mA (no HART® signal) or 3.8...20.5 mA acc. to NAMUR NE 43 |
| Resolution | ±3 µA |
| Temperature drift | Typically 25 ppm/K |
| Error signal | High: 22 mA; Low: 3.6 mA acc. to NAMUR NE 43 |

Approvals and certification

| | |
|------------------------------|--|
| CE | This device fulfils the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark. |
| Explosion protection | |
| ATEX KEMA 04ATEX1218 X | II 1 G, 1/2 G, 2 G Ex ia IIC T6...T3; |
| | II 1 D, 1/2 D, 2 D Ex iaD 20 or Ex iaD 20/21 or Ex iaD 21 IP6X T70°C...T95°C; |
| | II 1/2 G, 2 G Ex d[ia] IIC T6...T3; |
| | II 1/2 D, 2 D Ex tD[iaD] A21/20 or Ex tD[iaD] A21 IP6X T70°C...T95°C |
| IECEX IECEX KEM 06.0025 X | Ga Ex ia IIC T6...T3; Ex iaD 20 IP6X T70°C...T95°C; |
| | Ga/Gb Ex d[ia] IIC T6...T3; Ex tD[iaD] A21/20 IP6X T70°C...T95°C |
| FM – Dual Seal-approved | NEC 500 |
| | XP-IS / Cl. I / Div. 1 / Gr. ABCD / T6-T1; |
| | DIP / Cl. II, III / Div. 1 / Gr. EFG / T6-T1; |
| | IS / Cl. I, II, III / Div. 1 / Gr. ABCDEFG / T6-T1; |
| | NI / Cl. I / Div. 2 / Gr. ABCD / T6-T1 |
| | NEC 505 |
| | Cl. I / Zone 0 / AEx d[ia] / IIC / T6-T1; |
| | Cl. I / Zone 0 / AEx ia / IIC / T6-T1; |
| | Cl. I / Zone 2 / AEx nA[ia] / IIC / T6-T1 |
| | Hazardous (Classified) Locations, indoor/outdoor Type 4X and 6P, IP66, Dual Seal |

| | |
|---|--|
| CSA – Dual Seal-approved | CEC Section 18 (Zone ratings) |
| | Cl. I, Zone 1, Ex d, IIC (Antenna: Zone 0) T6; |
| | Cl. I, Zone 0, Ex ia, IIC T6; |
| | Cl. I, Zone 2, Ex nA, IIC T6 |
| | CEC Section 18 and Annex J (Division ratings) |
| | XP-IS, Cl. I, Div. 2, Gr. ABCD; Cl. II, Div. 2, Gr. FG; Cl. III, Div. 2 T6; IS, Cl. I, Div. 1, Gr. ABCD; Cl. II, Gr. FG; Cl. III T6 |
| NEPSI GYJ091178/79 | Ex ia IIC T3~T6 DIP A21/20 T _A T70°C~T95°C IP6X; Ex ia IIC T3~T6 DIP A21/20 T _A T70°C~T95°C IP6X |
| DNV / INMETRO DNV 12.0043 X | Ex ia IIC T6...T3 Ga; Ex ia IIIC T70°C...T95°C Da IP6X; Ex d [ia Ga] IIC T6...T3 Ga/Gb; Ex tb [ia Da] IIIC T70°C...T95°C Db IP6X |
| KGS 11-GA4BO-0325X 11-GA4BO-0326X | Ex ia IIC T6~T3; Ex iaD 20 IP6X T70°C~T95°C; Ex d[ia] IIC T6~T3; Ex tD[iaD] A21/20 IP6X T70°C~T95°C |
| Other standards and approvals | |
| EMC | Electromagnetic Compatibility Directive 2004/108/EC in conjunction with EN 61326-1 (2013) |
| R & TTE | Radio Equipment and Telecommunications Terminal Equipment Directive 1999/5/EC in conjunction with ESTI EN 302 372-1 (2011) and EN 302 372-2 (2011) |
| FCC Rules | Part 15 |
| Industry Canada | RSS-210 |
| LVD | Low-Voltage Directive 2006/95/EC in conjunction with EN 61010-1 (2001) |
| CRN | This certification is for all Canadian provinces and territories. For more data, refer to the website. |
| 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 |

- ① This option is not available for FM- or CSA-approved devices
 ② Kalrez® is a registered trademark of DuPont Performance Elastomers L.L.C.
 ③ Metaglas® is a registered trademark of Herberts Industrieglas, GMBH & Co., KG
 ④ HART® is a registered trademark of the HART Communication Foundation

2.2 Antenna selection

This graph shows which antenna to select for the application based on:

- D, the measuring range and
- ϵ_r , is the dielectric constant of the product being measured

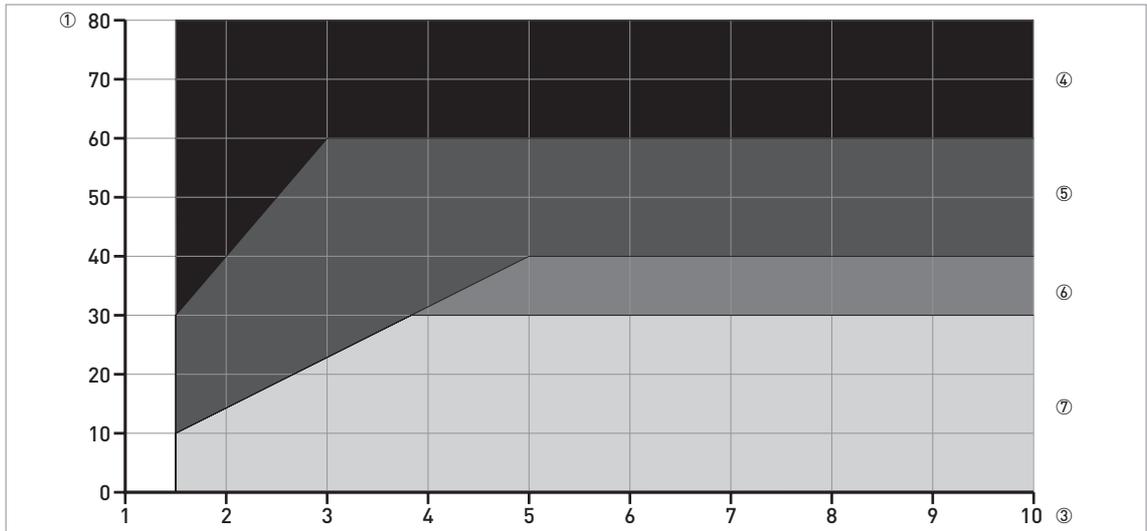


Figure 2-1: Selection of antenna for solid applications (graph of distance in m against ϵ_r)

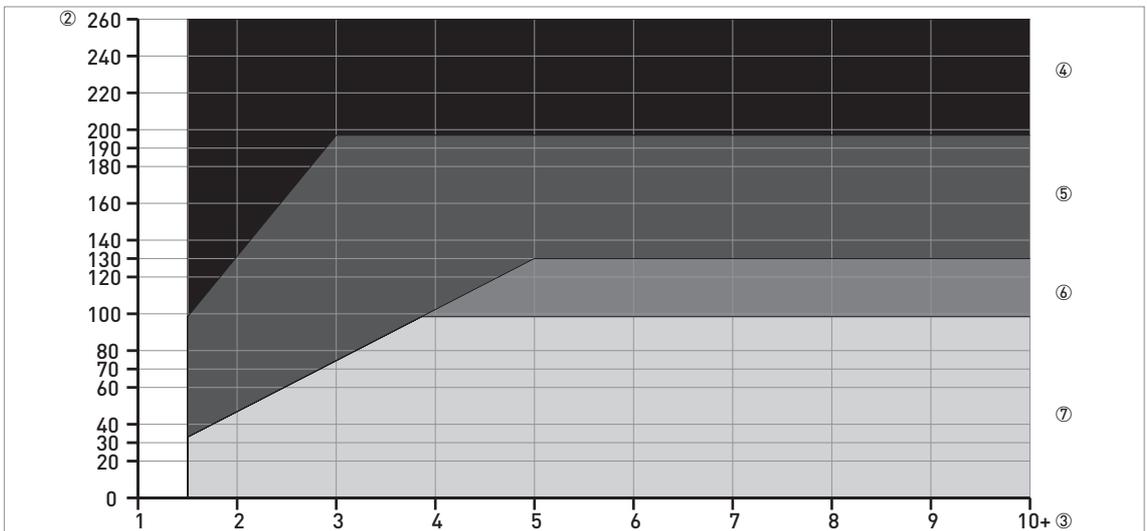


Figure 2-2: Selection of antenna for solid applications (graph of distance in ft. against ϵ_r)

- ① Distance, D [m]
- ② Distance, D [ft]
- ③ Dielectric constant (ϵ_r)
- ④ On request
- ⑤ DN150 horn, DN200 horn and DN150 Drop antenna
- ⑥ DN100 horn, DN150 horn, DN150 Drop and DN200 horn antenna
- ⑦ DN80 horn, DN80 Drop, DN100 horn, DN150 horn, DN150 Drop and DN200 horn antenna

2.3 Guidelines for maximum operating pressure

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

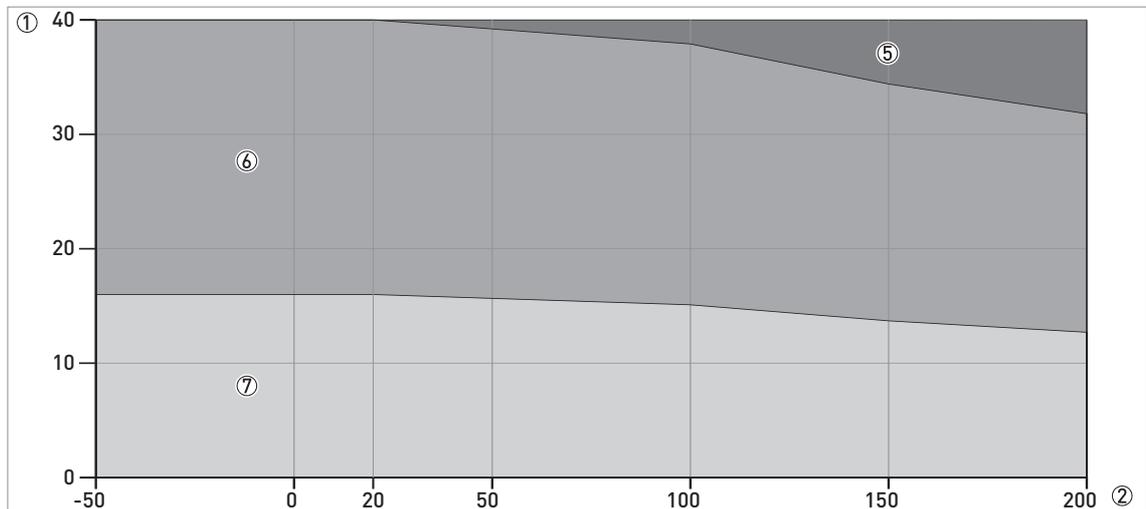


Figure 2-3: Pressure / temperature de-rating (EN 1092-1), flange and threaded connection, in °C and barg

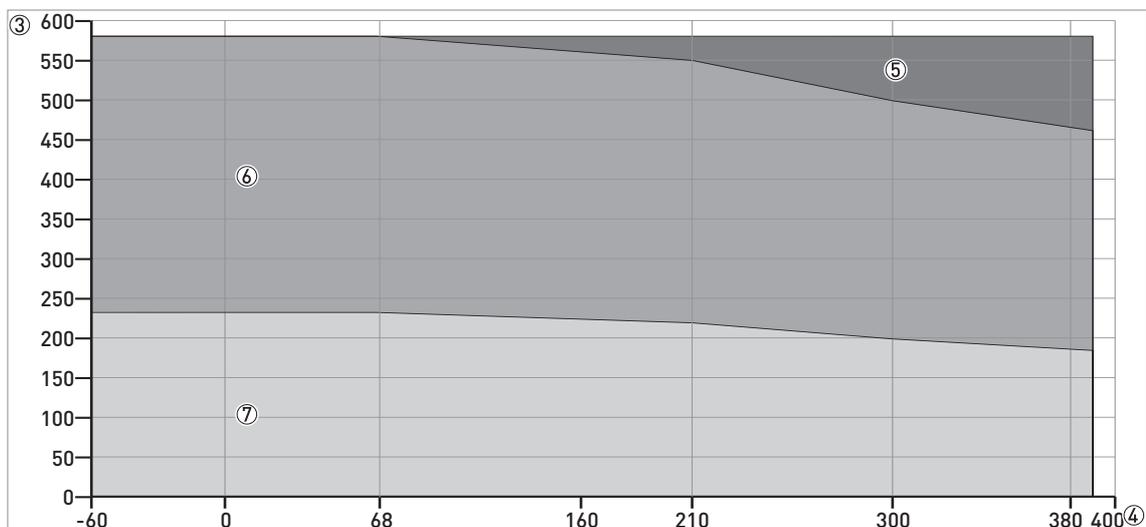


Figure 2-4: Pressure / temperature de-rating (EN 1092-1), flange and threaded connections, in °F and psig

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

CRN certification

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.

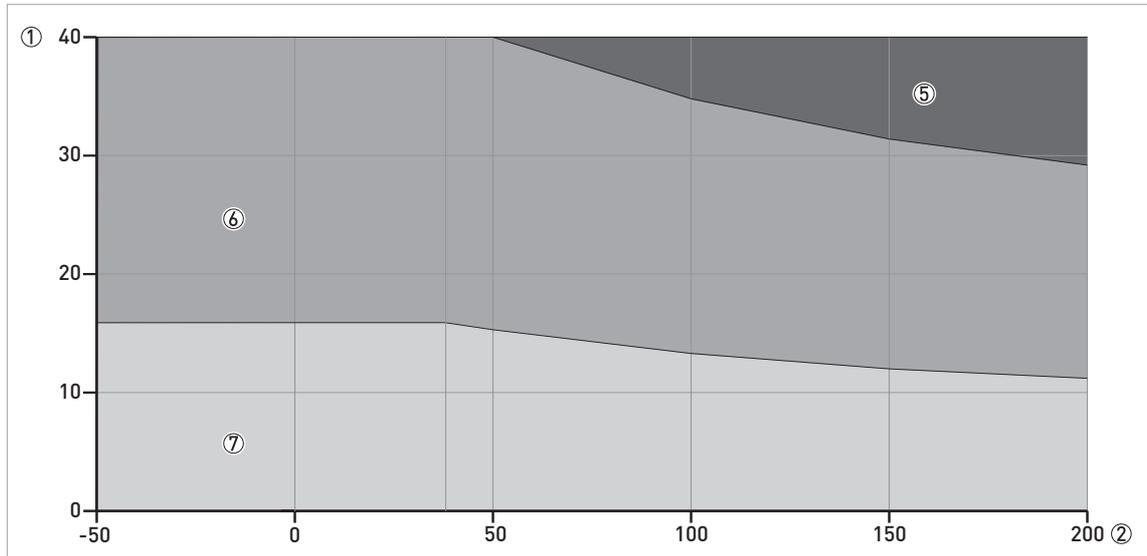


Figure 2-5: Pressure / temperature de-rating (ASME B16.5), flange and threaded connections, in °C and barg

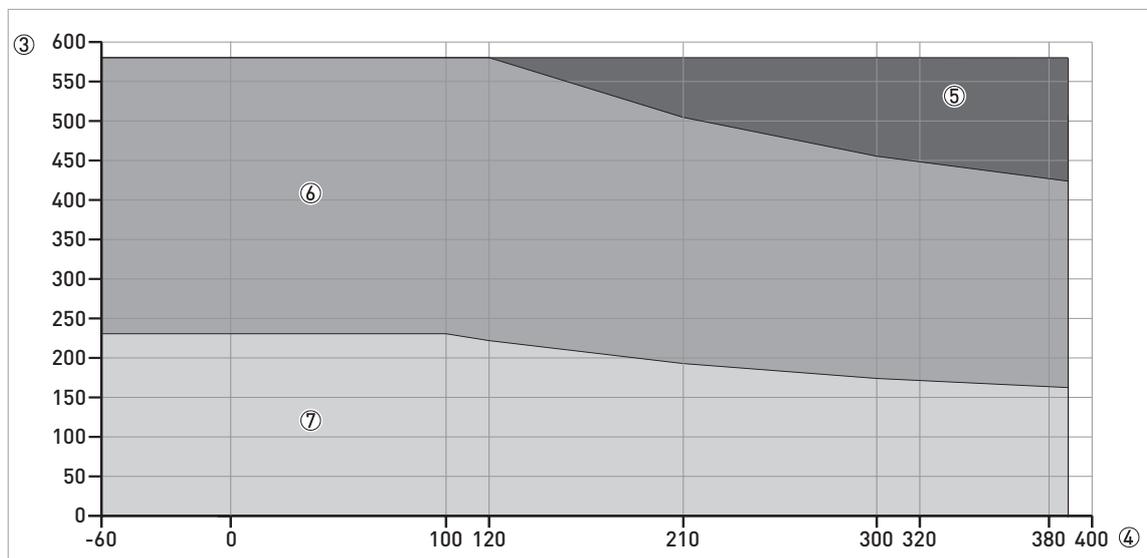


Figure 2-6: Pressure / temperature de-rating (ASME B16.5), flange and threaded connections, in °F and psig

- ① p [barg]
- ② T [°C]
- ③ p [psig]
- ④ T [°F]
- ⑤ Threaded connection, NPT (ASME B1.20.1).
- ⑥ Flange connection, Class 300
- ⑦ Flange connection, Class 150

2.4 Dimensions and weights

Housing

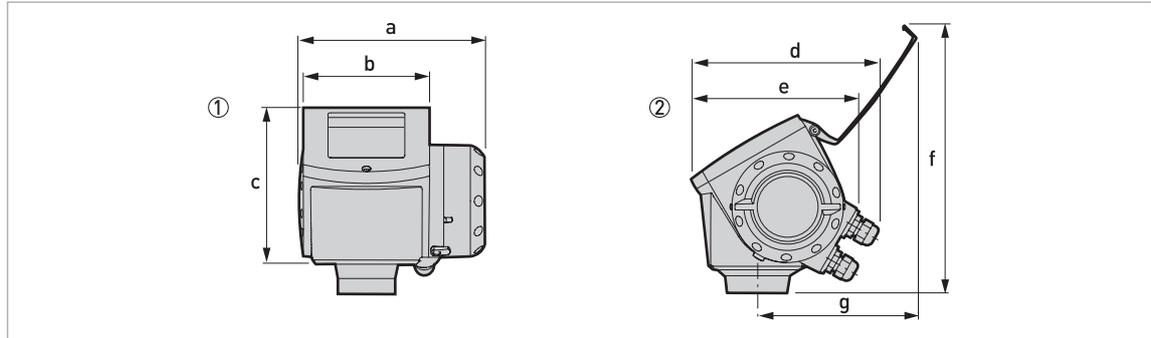


Figure 2-7: Housing dimensions

- ① Housing front view
- ② Housing side view

Dimensions and weights in mm and kg

| | Dimensions [mm] | | | | | | | Weights [kg] |
|---------|-----------------|-----|-------|-------|-----|-----|-----|--------------|
| | a | b | c | d | e | f | g | |
| Housing | 180 | 122 | 158.5 | 182 ① | 167 | 277 | 155 | 3.3 |

① If fitted with standard cable glands

Dimensions and weights in inches and lb

| | Dimensions [inches] | | | | | | | Weights [lb] |
|---------|---------------------|-----|-----|-------|-----|------|-----|--------------|
| | a | b | c | d | e | f | g | |
| Housing | 7.1 | 4.8 | 6.2 | 7.2 ① | 6.5 | 10.9 | 6.1 | 7.3 |

① If fitted with standard cable glands

- Cable glands are delivered on demand with non-Ex, Ex i- and Ex d-approved devices.
- The diameter of the outer sheath of the cable must be 7...12 mm or 0.28...0.47".
- Cable glands for FM- or CSA-approved devices must be supplied by the customer.
- A weather protection cover is available on request with all devices.

Weather protection

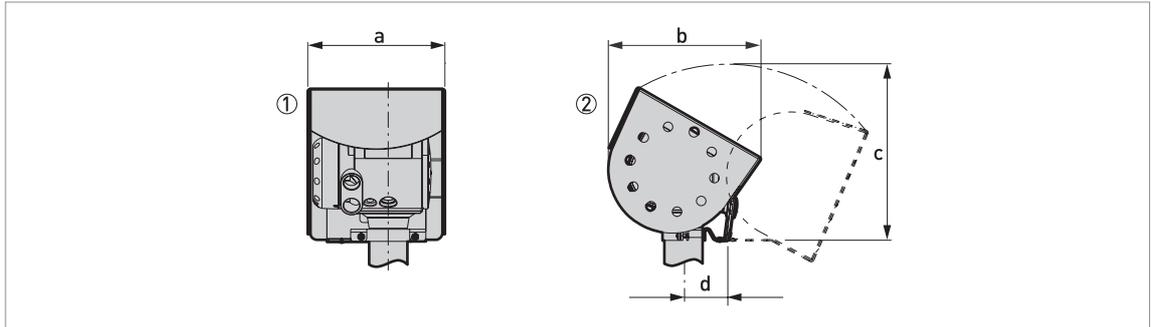


Figure 2-8: Dimensions of the weather protection option

- ① Weather protection, back view
- ② Weather protection, left side view

Dimensions and weights in mm and kg

| | Dimensions [mm] | | | | Weights [kg] |
|--------------------|-----------------|-------|-------|----|--------------|
| | a | b | c | d | |
| Weather protection | 208 | 231.5 | 268 ① | 66 | 2.9 |

① Radius

Dimensions and weights in inches and lb

| | Dimensions [inches] | | | | Weights [lb] |
|--------------------|---------------------|-----|--------|-----|--------------|
| | a | b | c | d | |
| Weather protection | 8.2 | 9.1 | 10.6 ① | 2.6 | 6.4 |

① Radius

DN80/3" horn antenna versions

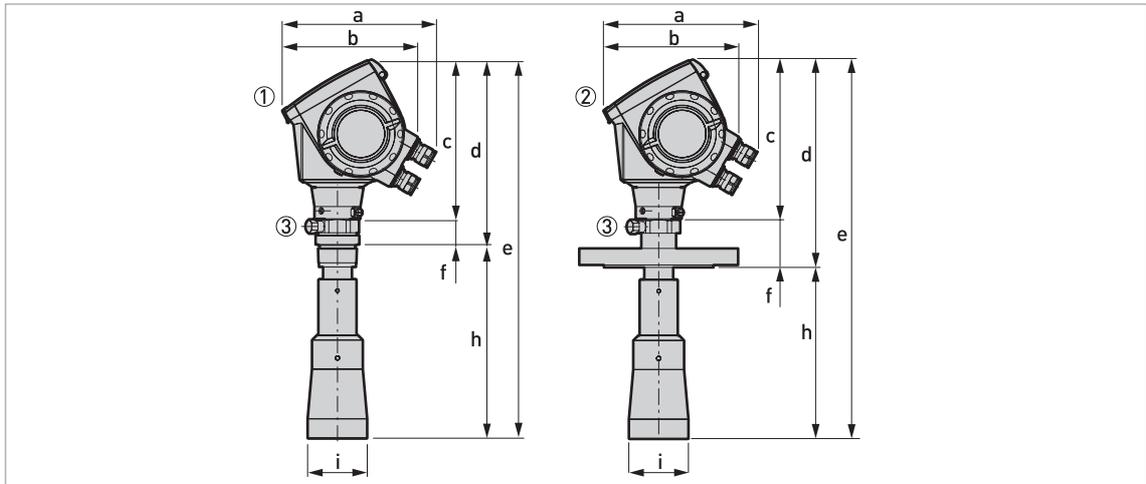


Figure 2-9: DN80/3" horn antenna versions

- ① DN80/3" horn antenna with G 1 1/2 or 1 1/2 NPT thread connection
- ② DN80/3" horn antenna with flange connection
- ③ Antenna purging system (supplied with 1/4 NPTF connection)

Dimensions and weights in mm and kg

| | Dimensions [mm] | | | | | | | | Weights [kg] |
|-------------------|-----------------|-----|-----|-------|-------|------|-------|----|--------------|
| | a | b | c | d | e | f | h | Øi | |
| Thread connection | 182 ① | 167 | 201 | 250 | 496 | 49 | 246 ② | 75 | 6.8 |
| Flange connection | 182 ① | 167 | 201 | 263 ③ | 480 ③ | 62 ③ | 217 ② | 75 | 11.1...18.9 |

- ① If fitted with standard cable glands
- ② Additional antenna extensions of Ø39 × length 105 mm are available
- ③ With distance piece option: add 71 mm to this dimension

Dimensions and weights in inches and lb

| | Dimensions [inches] | | | | | | | | Weights [lb] |
|-------------------|---------------------|-----|-----|--------|--------|-------|-------|----|--------------|
| | a | b | c | d | e | f | h | Øi | |
| Thread connection | 7.2 ① | 6.5 | 7.9 | 9.8 | 19.5 | 1.9 | 9.7 ② | 3 | 15 |
| Flange connection | 7.2 ① | 6.5 | 7.9 | 10.4 ③ | 18.9 ③ | 2.4 ③ | 8.5 ② | 3 | 24.4...41.5 |

- ① If fitted with standard cable glands
- ② Additional antenna extensions of Ø1.5 × length 4.1" are available
- ③ With distance piece option: add 2.8" to this dimension

DN100/4" horn antenna versions

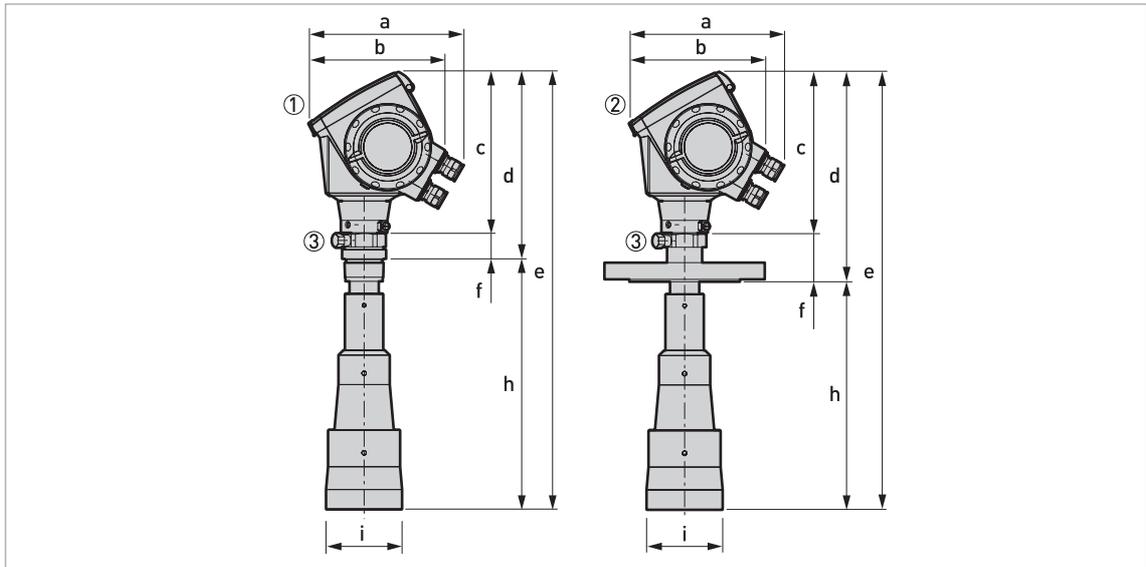


Figure 2-10: DN100/4" horn antenna versions

- ① DN100/4" horn antenna with G 1½ or 1½ NPT thread connection
- ② DN100/4" horn antenna with flange connection
- ③ Antenna purging system (supplied with ¼ NPTF connection)

Dimensions and weights in mm and kg

| | Dimensions [mm] | | | | | | | | Weights [kg] |
|-------------------|-----------------|-----|-----|-------|-------|------|-------|----|--------------|
| | a | b | c | d | e | f | h | Øi | |
| Thread connection | 182 ① | 167 | 201 | 250 | 565 | 49 | 315 ② | 95 | 7.2 |
| Flange connection | 182 ① | 167 | 201 | 263 ③ | 549 ③ | 62 ③ | 286 ② | 95 | 11.6...28.2 |

① If fitted with standard cable glands

② Additional antenna extensions of Ø39 × length 105 mm are available

③ With distance piece option: add 71 mm to this dimension

Dimensions and weights in inches and lb

| | Dimensions [inches] | | | | | | | | Weights [lb] |
|-------------------|---------------------|-----|-----|--------|--------|-------|--------|-----|--------------|
| | a | b | c | d | e | f | h | Øi | |
| Thread connection | 7.2 ① | 6.5 | 7.9 | 9.8 | 22.2 | 1.9 | 12.4 ② | 3.7 | 15.8 |
| Flange connection | 7.2 ① | 6.5 | 7.9 | 10.4 ③ | 21.6 ③ | 2.4 ③ | 11.3 ② | 3.7 | 25.6...62.2 |

① If fitted with standard cable glands

② Additional antenna extensions of Ø1.5 × length 4.1" are available

③ With distance piece option: add 2.8" to this dimension

Sheet metal horn antenna versions

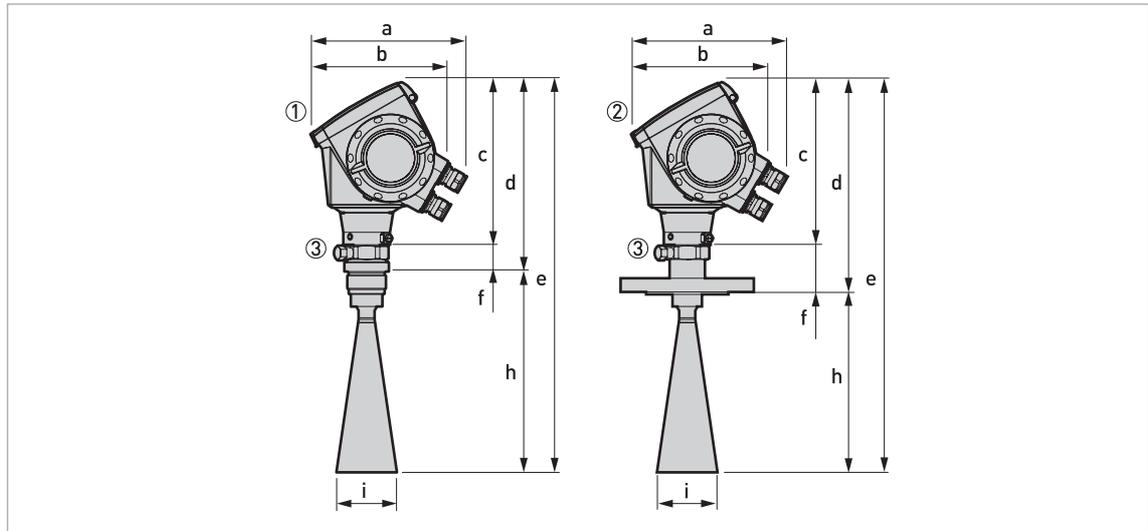


Figure 2-11: DN80/3", DN100/4", DN150/6" and DN200/8" sheet metal horn antenna versions

- ① Sheet metal horn antenna (DN80/3", DN100/4", DN150/6" or DN200/8") with G 1½ or 1½ NPT thread connection
- ② Sheet metal horn antenna (DN80/3", DN100/4", DN150/6" or DN200/8") with flange connection
- ③ Antenna purging system (supplied with ¼ NPTF connection)

Dimensions and weights in mm and kg

| | | Dimensions [mm] | | | | | | | | Weights [kg] |
|-------------------|----------|-----------------|-----|-----|-------|-------|------|-------|-----|--------------|
| | | a | b | c | d | e | f | h | Øi | |
| Thread connection | DN80/3" | 182 ① | 167 | 201 | 250 | 499 | 49 | 249 ② | 75 | 4.9 |
| | DN100/4" | 182 ① | 167 | 201 | 250 | 568 | 49 | 318 ② | 95 | 5.1 |
| | DN150/6" | 182 ① | 167 | 201 | 250 | 736 | 49 | 486 ② | 144 | 5.5 |
| | DN200/8" | 182 ① | 167 | 201 | 250 | 894 | 49 | 644 ② | 190 | 6.1 |
| Flange connection | DN80/3" | 182 ① | 167 | 201 | 262 ③ | 483 ③ | 62 ③ | 221 ② | 75 | 9.2 |
| | DN100/4" | 182 ① | 167 | 201 | 262 ③ | 552 ③ | 62 ③ | 290 ② | 95 | 9.5 |
| | DN150/6" | 182 ① | 167 | 201 | 262 ③ | 720 ③ | 62 ③ | 458 ② | 144 | 14.4 |
| | DN200/8" | 182 ① | 167 | 201 | 262 ③ | 878 ③ | 62 ③ | 616 ② | 190 | 15.0 |

① If fitted with standard cable glands

② Additional antenna extensions of Ø39 × length 105 mm are available

③ With distance piece option: add 71 mm to this dimension

Dimensions and weights in inches and lb

| | | Dimensions [inches] | | | | | | | | Weights [lb] |
|-------------------|----------|---------------------|-----|-----|--------|--------|-------|--------|-----|--------------|
| | | a | b | c | d | e | f | h | Øi | |
| Thread connection | DN80/3" | 7.2 ① | 6.5 | 7.9 | 9.8 | 19.6 | 1.9 | 9.8 ② | 3.0 | 10.8 |
| | DN100/4" | 7.2 ① | 6.5 | 7.9 | 9.8 | 22.4 | 1.9 | 12.5 ② | 3.7 | 11.1 |
| | DN150/6" | 7.2 ① | 6.5 | 7.9 | 9.8 | 29.0 | 1.9 | 19.1 ② | 5.7 | 12.2 |
| | DN200/8" | 7.2 ① | 6.5 | 7.9 | 9.8 | 35.2 | 1.9 | 25.4 ② | 7.5 | 13.4 |
| Flange connection | DN80/3" | 7.2 ① | 6.5 | 7.9 | 10.3 ③ | 19.0 ③ | 2.4 ③ | 8.7 ② | 3.0 | 20.2 |
| | DN100/4" | 7.2 ① | 6.5 | 7.9 | 10.3 ③ | 21.7 ③ | 2.4 ③ | 11.4 ② | 3.7 | 20.8 |
| | DN150/6" | 7.2 ① | 6.5 | 7.9 | 10.3 ③ | 28.3 ③ | 2.4 ③ | 18.0 ② | 5.7 | 31.6 |
| | DN200/8" | 7.2 ① | 6.5 | 7.9 | 10.3 ③ | 34.6 ③ | 2.4 ③ | 24.3 ② | 7.5 | 32.9 |

① If fitted with standard cable glands

② Additional antenna extensions of Ø1.5 × length 4.1" are available

③ With distance piece option: add 2.8" to this dimension

DN80/3" Drop antenna versions

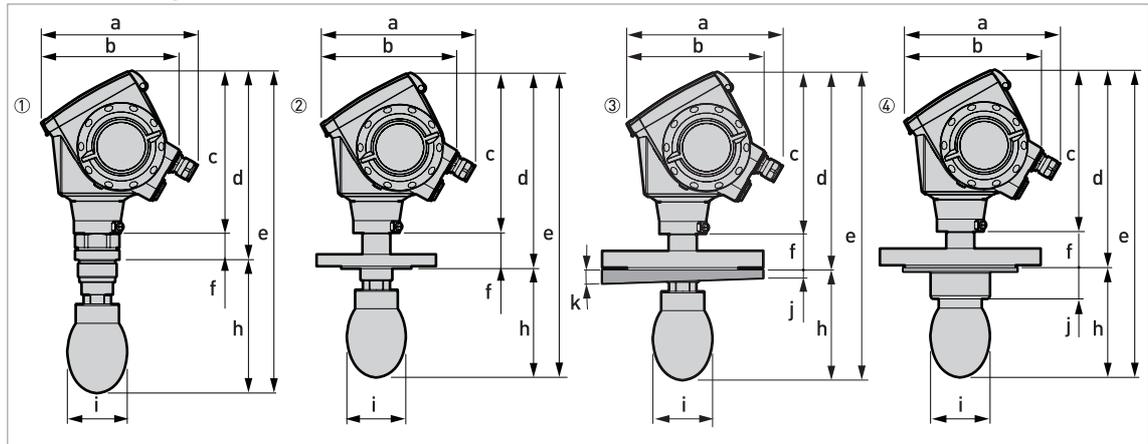


Figure 2-12: DN80/3" Drop antenna versions

- ① DN80/3" Drop antenna with G 1½ or 1½ NPT thread connection
- ② DN80/3" Drop antenna with flange connection
- ③ DN80/3" Drop antenna with slanted flange connection (PP material option only)
- ④ DN80/3" Drop antenna, with PP or PTFE flange plate protection option

Dimensions and weights in mm and kg

| | Dimensions [mm] | | | | | | | | | | Weights [kg] |
|---|-----------------|-----|-----|-----|-----|----|----------|----|----|----|--------------|
| | a | b | c | d | e | f | h | Øi | j | k | |
| Thread connection | 182 ① | 167 | 201 | 234 | 399 | 33 | 165 ② | 74 | - | - | 5.7...6.1 |
| Flange connection | 182 ① | 167 | 201 | 246 | 383 | 45 | 137 ② | 74 | - | - | 6.3...26 |
| Flange connection with slanted flange option | 182 ① | 167 | 201 | 246 | 383 | 45 | 137 ② | 74 | 10 | 2° | 6.4...26.6 |
| Flange connection with flange plate protection option | 182 ① | 167 | 201 | 246 | 383 | 45 | 137 | 74 | 39 | - | 6.6...26.8 |

① If fitted with standard cable glands

② Additional antenna extensions of Ø39 × length 105 mm are available. Do not attach more than 5 antenna extensions.

Dimensions and weights in inches and lb

| | Dimensions [inches] | | | | | | | | | | Weights [lb] |
|---|---------------------|-----|-----|-----|------|-----|----------|-----|-----|----|--------------|
| | a | b | c | d | e | f | h | Øi | j | k | |
| Thread connection | 7.2 ① | 6.5 | 7.9 | 9.2 | 15.7 | 1.3 | 6.5 ② | 2.9 | - | - | 12.6...13.4 |
| Flange connection | 7.2 ① | 6.5 | 7.9 | 9.7 | 15.1 | 1.8 | 5.4 ② | 2.9 | - | - | 13.9...57.3 |
| Flange connection with slanted flange option | 7.2 ① | 6.5 | 7.9 | 9.7 | 15.1 | 1.8 | 5.4 ② | 2.9 | 0.4 | 2° | 14.1...58.6 |
| Flange connection with flange plate protection option | 7.2 ① | 6.5 | 7.9 | 9.7 | 15.1 | 1.8 | 5.4 | 2.9 | 1.5 | - | 13.9...59.1 |

① If fitted with standard cable glands

② Additional antenna extensions of Ø1.5 × length 4.1" available. Do not attach more than 5 antenna extensions.

DN150/6" Drop antenna versions (PP material option only)

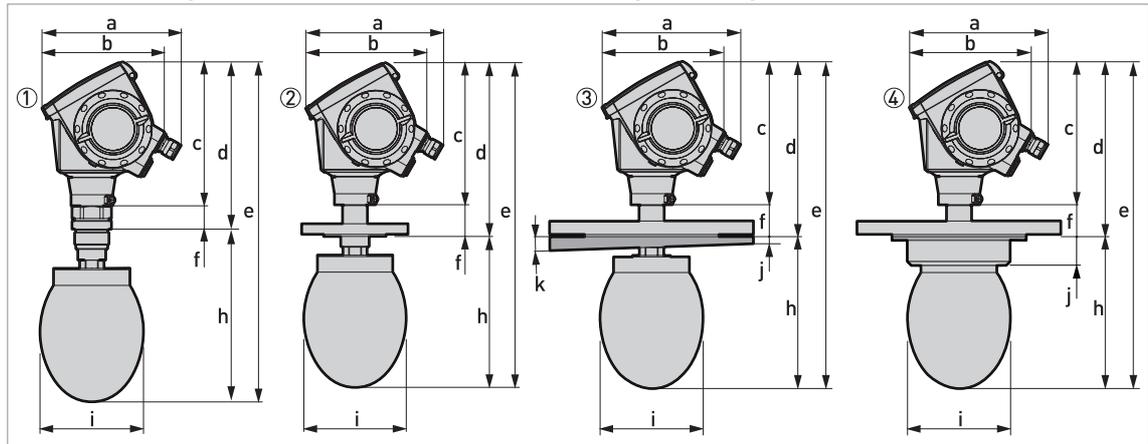


Figure 2-13: DN150/6" Drop antenna versions (PP material option only)

- ① DN150/6" Drop antenna with flange connection
- ② DN150/6" Drop antenna with thread connection
- ③ DN150/6" Drop antenna with slanted flange connection
- ④ DN150/6" Drop antenna, with flange plate protection option

Dimensions and weights in mm and kg

| | Dimensions [mm] | | | | | | | | | | Weights [kg] |
|---|-----------------|-----|-----|-----|-----|----|----------|-----|----|----|--------------|
| | a | b | c | d | e | f | h | Øi | j | k | |
| Thread connection | 182 ① | 167 | 201 | 234 | 476 | 33 | 242 ② | 144 | - | - | 7.4 |
| Flange connection | 182 ① | 167 | 201 | 246 | 460 | 45 | 214 ② | 144 | - | - | 8...27.3 |
| Flange connection with slanted flange option | 182 ① | 167 | 201 | 246 | 460 | 45 | 214 ② | 144 | 10 | 2° | 8.1...27.9 |
| Flange connection with flange plate protection option | 182 ① | 167 | 201 | 246 | 460 | 45 | 214 | 144 | 39 | - | - |

① If fitted with standard cable glands

② Additional antenna extensions of Ø39 × length 105 mm are available. Do not attach more than 5 antenna extensions.

Dimensions and weights in inches and lb

| | Dimensions [inches] | | | | | | | | | | Weights [lb] |
|---|---------------------|-----|-----|-----|------|-----|----------|-----|-----|----|--------------|
| | a | b | c | d | e | f | h | Øi | j | k | |
| Thread connection | 7.2 ① | 6.5 | 7.9 | 9.2 | 18.7 | 1.3 | 9.5 ② | 5.7 | - | - | 16.3 |
| Flange connection | 7.2 ① | 6.5 | 7.9 | 9.7 | 18.1 | 1.8 | 8.4 ② | 5.7 | - | - | 17.6...60.2 |
| Flange connection with slanted flange option | 7.2 ① | 6.5 | 7.9 | 9.7 | 18.1 | 1.8 | 8.4 ② | 5.7 | 0.4 | 2° | 17.8...61.5 |
| Flange connection with flange plate protection option | 7.2 ① | 6.5 | 7.9 | 9.7 | 18.1 | 1.8 | 8.4 | 5.7 | 1.5 | - | - |

① If fitted with standard cable glands

② Additional antenna extensions of Ø1.5 × length 4.1" are available. Do not attach more than 5 antenna extensions.

3.1 Intended use

This radar level transmitter measures distance, level, mass, volume and reflectivity of granulates and powders.

It can be installed on silos, hoppers and bunkers.

3.2 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.

3.3 How to prepare the silo before you install the device

To avoid measuring errors and device malfunction, obey these precautions.

3.3.1 Recommended mounting position

Follow these recommendations to make sure that the device measures correctly.

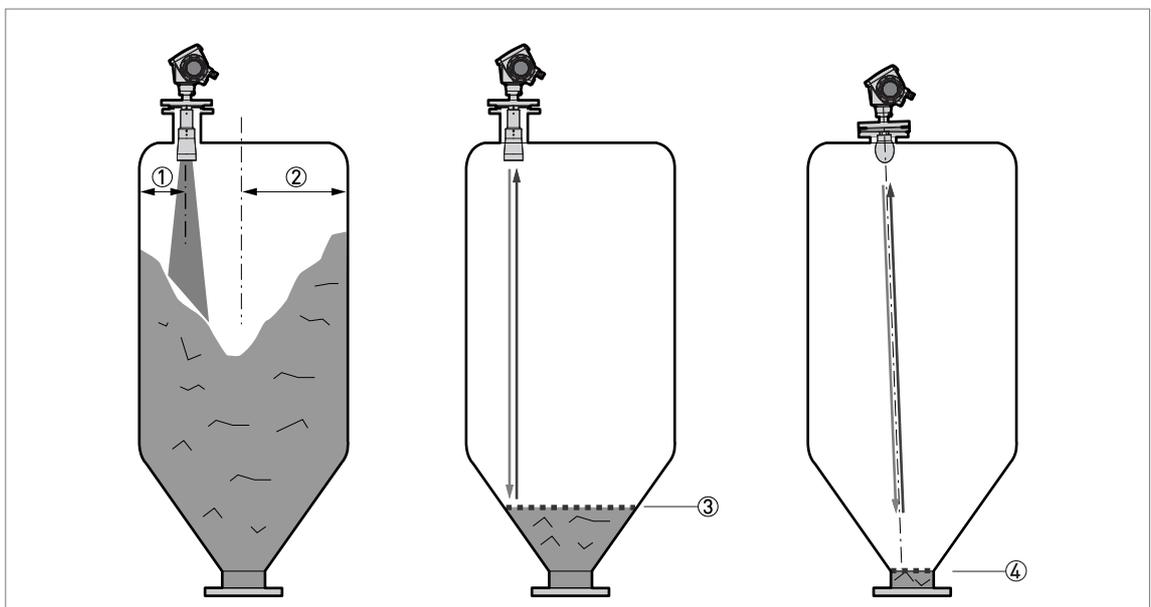


Figure 3-1: Recommended nozzle position for solids

- ① Position of the process fitting from the silo wall, $r/2$ (for DN80, DN100, DN150 or DN200 horn antennas, and DN80 or DN150 Drop antennas)
- ② Radius of the silo, r
- ③ The minimum measured level for a device without a 2° slanted PP flange option
- ④ The minimum measured level for a device with a 2° slanted PP flange option

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

If it is necessary to measure to the bottom of the silo, a 2° slanted PP flange option is available for all antennas. For more data, refer to Installation recommendations for solids on page 26.

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

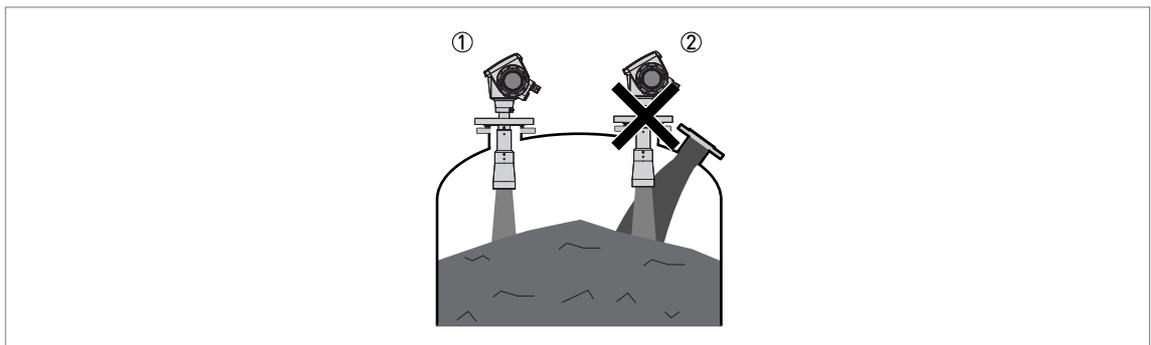


Figure 3-2: Product inlets

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

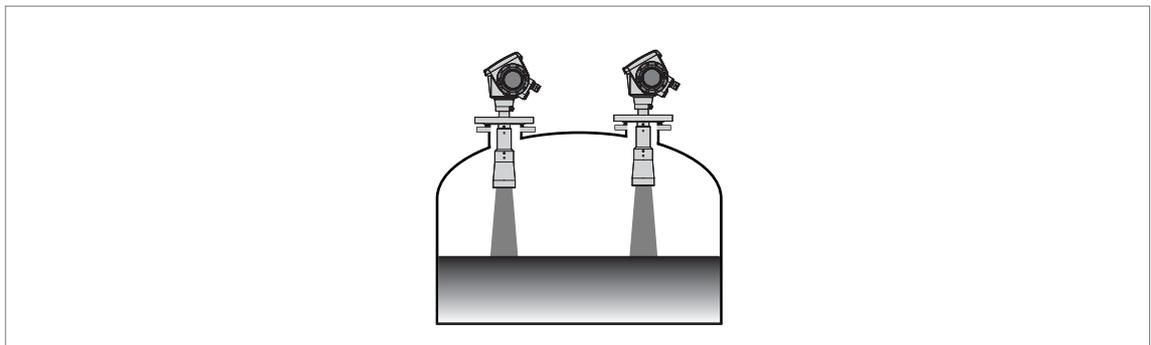


Figure 3-3: More than 1 FMCW radar level meter can be operated in a silo

More than 1 FMCW radar level meter can be operated in a silo.

3.4 Installation recommendations for solids

Do not install the device above objects in the silo (ladder, supports etc.). Objects in the silo can cause parasite radar signals, the device will not measure correctly.

If it is not possible to install the device on another part of the silo, do an empty spectrum scan.

We recommend that you configure the device when the silo is empty.

For the best device performance, the antenna should be silo-intrusive. Refer to the illustration that follows.

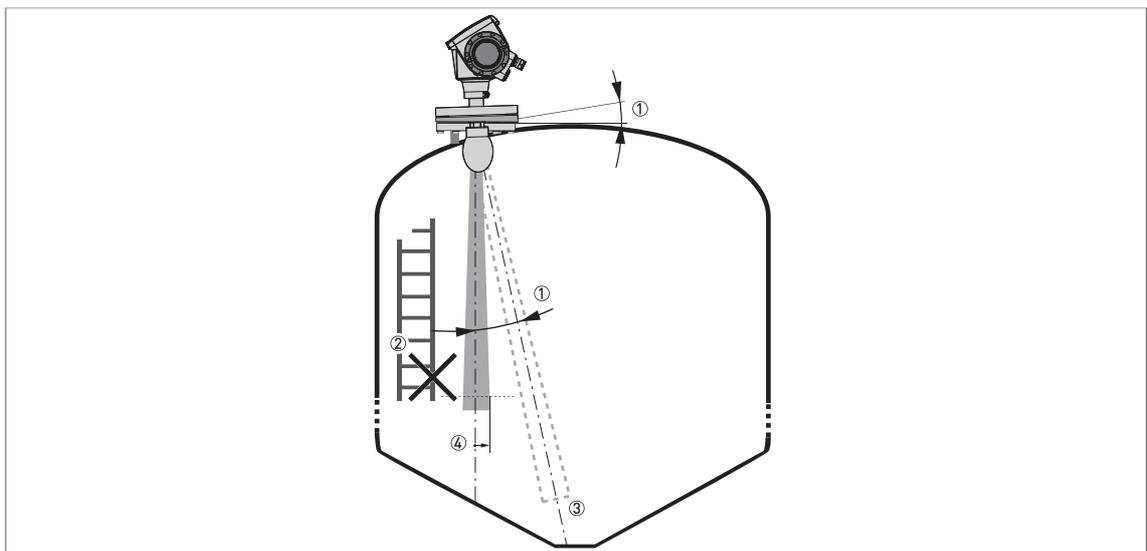


Figure 3-4: General installation recommendations

- ① The level transmitter can continue to measure to the bottom of the silo if you tilt the device as shown in the illustration (a 2° slanted flange option is available for all antennas)
- ② We recommend that you do an empty spectrum recording if there are too many obstacles in the radar beam. Refer to the handbook for the procedure.
- ③ Conical silo bottoms. Refer to the handbook for fine adjustment of the device.
- ④ Beam radius (DN80 horn antenna): increments of 90 mm/m or 1.1"/ft (5°)
 Beam radius (DN100 horn antenna, DN150 horn antenna, DN200 horn antenna or DN80 Drop antenna): increments of 70 mm/m or 0.83"/ft (4°)
 Beam radius (DN150 Drop antenna): increments of 35 mm/m or 0.42"/ft (2°)

3.5 How to install the device on the silo

3.5.1 How to install a device with a flange connection

Equipment needed:

- Device
- Gasket (not supplied)
- Nuts and bolts (not supplied)
- Wrench (not supplied)

Requirements for flange connections

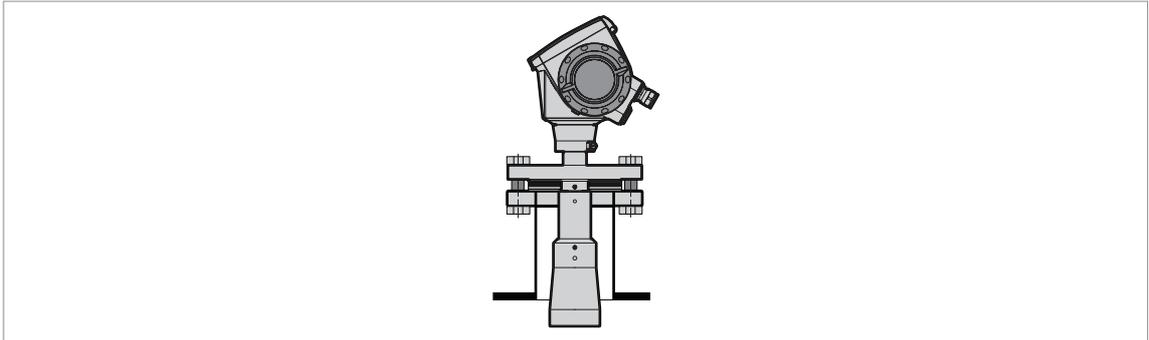


Figure 3-5: Flange connection

For more data, refer to the handbook.

3.5.2 How to install a device with a threaded connection

Equipment needed:

- Device
- Gasket for G 1½ connection (not supplied)
- 50 mm / 2" wrench (not supplied)

Requirements for threaded connections

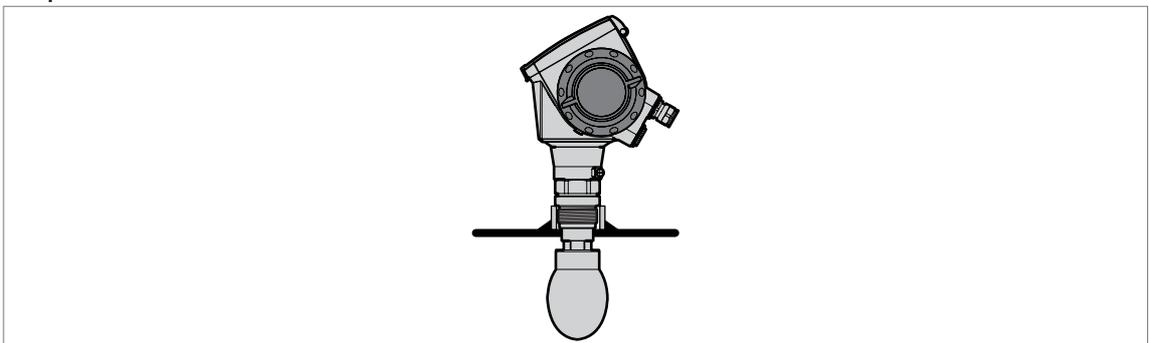


Figure 3-6: Threaded connection

For more data, refer to the handbook.

4.1 Safety instructions

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

Observe the national regulations for electrical installations!

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Electrical installation: outputs 1 and 2

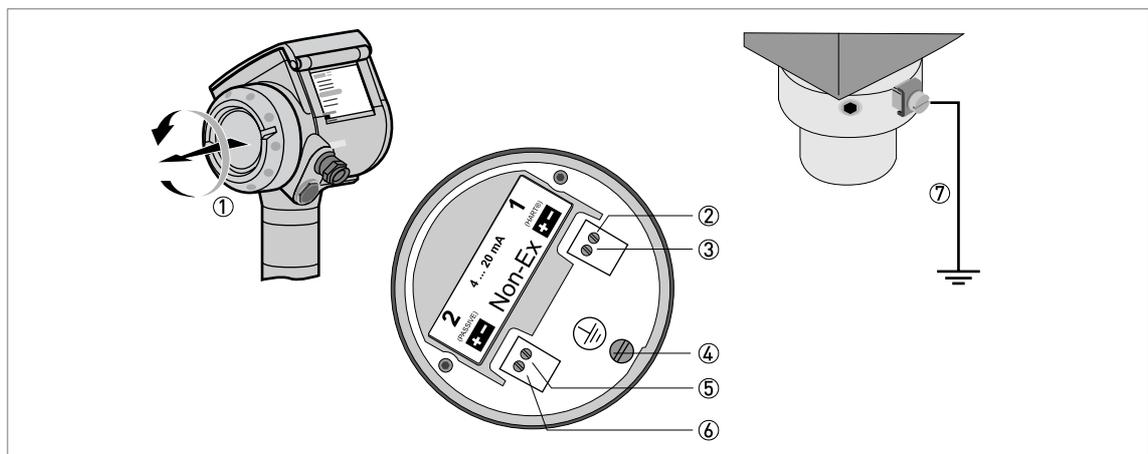


Figure 4-1: Electrical installation

- ① Terminal compartment cover
- ② Output 1: current output -
- ③ Output 1: current output +
- ④ Grounding terminal in the housing
- ⑤ Output 2: current output - (option)
- ⑥ Output 2: current output + (option)
- ⑦ Grounding terminal between the process connection and the converter

Output 1 energizes the device and is used for HART® communication. If the device has the second current output option, use a separate power supply to energize output 2.

4.2.1 Non-Ex devices

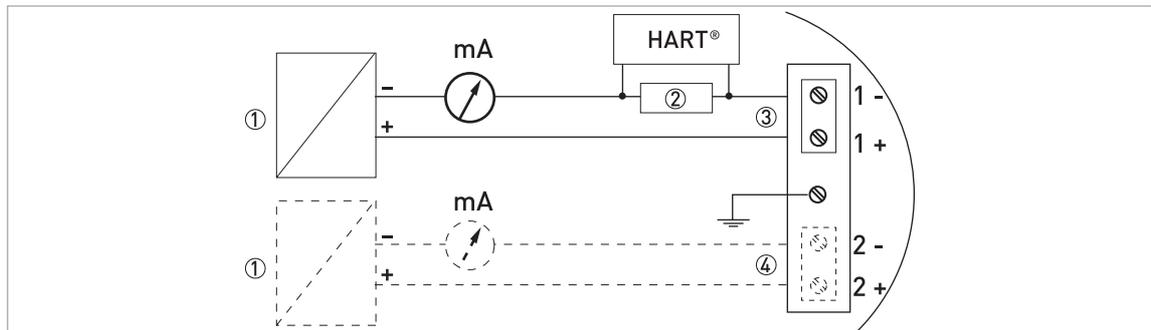


Figure 4-2: Electrical connections for non-Ex devices

- ① Power supply
- ② Resistor for HART® communication
- ③ Output 1: 14...30 VDC for an output of 22 mA at the terminal
- ④ Output 2: 10...30 VDC for an output of 22 mA at the terminal

4.2.2 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, FM, CSA, ...). You can find this documentation on the DVD-ROM delivered with the device or it can be downloaded free of charge from the website (Download Center).

4.3 Protection category

The device fulfils all requirements per protection category IP 66/67. It also fulfils all requirements per NEMA type 4X (housing) and type 6P (antenna).

Make sure that the cable gland is watertight.

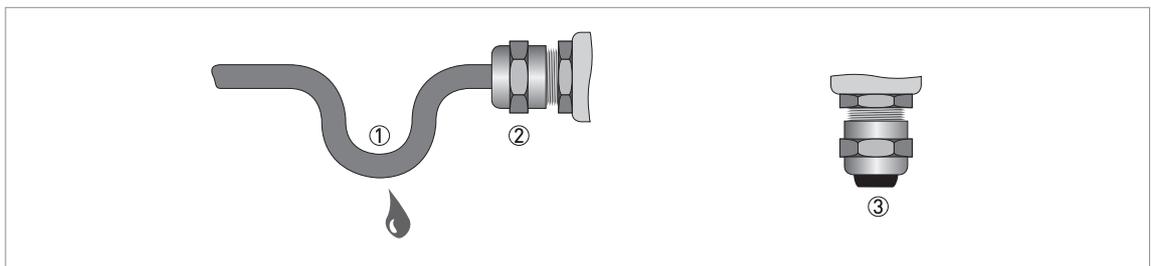


Figure 4-3: How to make the installation agree with protection category IP 67

- Make sure that the gaskets are not damaged.
- Make sure that the electrical cables are not damaged.
- Make sure that the electrical cables agree with the national electrical code.
- The cables are in a loop in front of the device ① so water does not go into the housing.
- Tighten the cable feedthroughs ②.
- Close unused cable feedthroughs with dummy plugs ③.

4.4 Networks

4.4.1 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 operate in a multi-drop network of up to 15 devices.

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.

4.4.2 Point-to-point connection

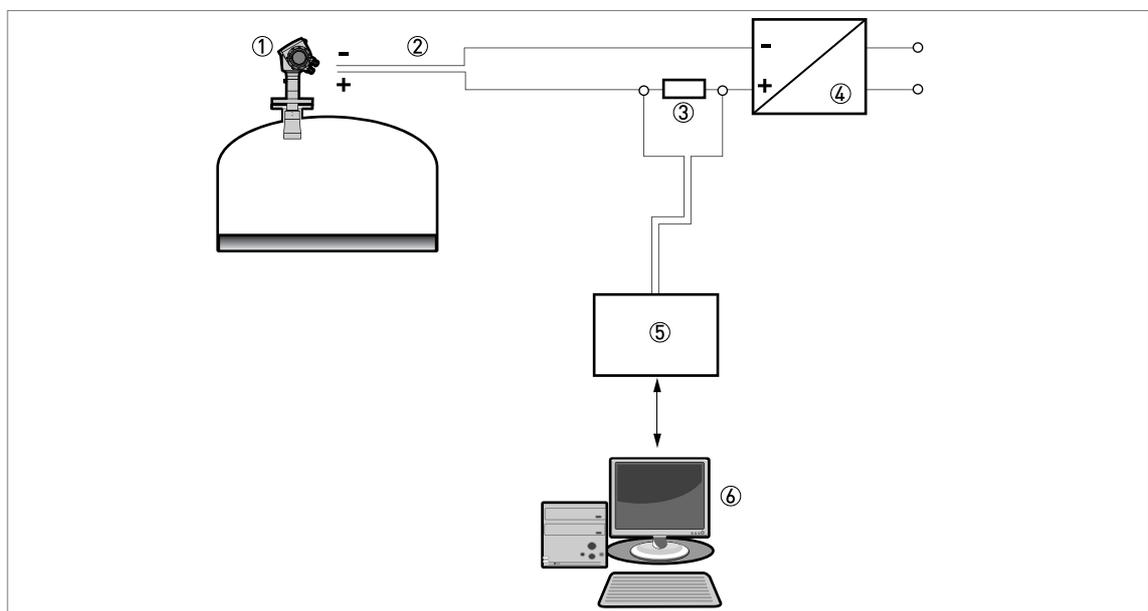


Figure 4-4: Point-to-point connection (non-Ex)

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

4.4.3 Multi-drop networks

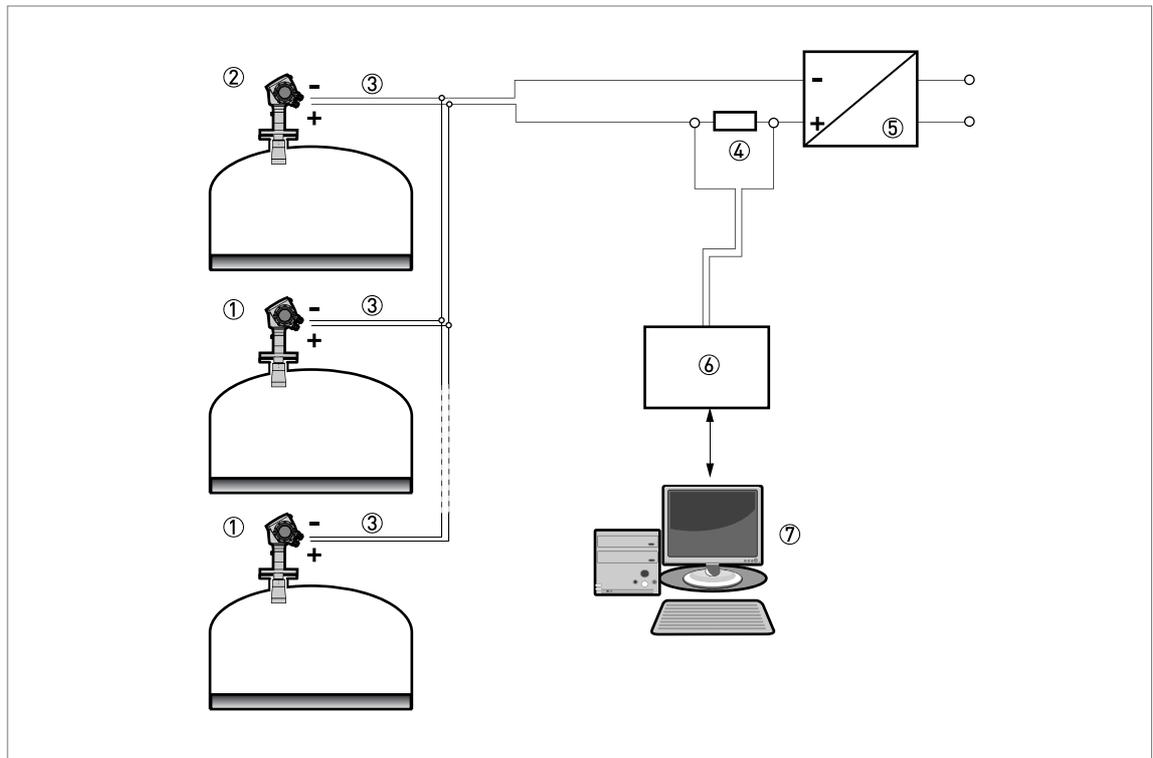


Figure 4-5: Multi-drop network (non-Ex)

- ① Address of the device (n+1 for multidrop networks)
- ② Address of the device (1 for multidrop networks)
- ③ 4 mA + HART®
- ④ Resistor for HART® communication
- ⑤ Power supply
- ⑥ HART® converter
- ⑦ HART® communication software

5.1 Order code

Make a selection from each column to get the full order code. The characters of the order code highlighted in light grey describe the standard.

| | | |
|------|---|---|
| VF63 | 4 | OPTIFLEX 6300 C 24 GHz Non-contact Radar (FMCW) level meter for solids |
| | | Approval |
| | 0 | Without |
| | 2 | ATEX Ex ia IIC T3...T6 + DIP ① |
| | 3 | ATEX Ex d[ia] IIC T3...T6 + DIP ① |
| | 6 | FM IS CL I/II/III, DIV 1, GPS A-G; CL I, Zone 0, AEx ia IIC T3...T6 |
| | 7 | FM XP-IS/DIP CL I/II/III, DIV 1, GPS A-G; CL I, Zone 0, AEx d [ia] IIC T3...T6 |
| | B | INMETRO Ex ia IIC T3...T6 + DIP ① |
| | C | INMETRO Ex d ia IIC T3...T6 + DIP ① |
| | E | NEPSI Ex ia IIC T3 ~ T6 + DIP ① |
| | F | NEPSI Ex d ia IIC T3 ~ T6 + DIP ① |
| | H | CSA IS CL I/II/III, DIV 1, GPS A-G; CL I, Zone 0, Ex ia IIC T3...T6 |
| | K | CSA XP-IS/DIP CL I/II/III, DIV 2, GPS A-D, F, G; CL I, Zone 0, Ex d IIC T3...T6 |
| | M | IECEX Ex ia IIC T2...T6 + DIP ① |
| | N | IECEX Ex d ia IIC T2...T6 + DIP ① |
| | R | KGS Ex ia IIC T3 – T6 + DIP ① |
| | S | KGS Ex d[ia] IIC T3 – T6 + DIP ① |
| | | Material of Process Connection / Antenna type and material (pressure) |
| | 0 | 316L (1.4404) / Horn 316L (40 barg / 580 psig) – Drop PTFE (40 barg / 580 psig) – Drop PP (16 barg / 232 psig) |
| | | Antenna type |
| | 6 | Horn DN80 (Ø75 mm / 2.95") long with purging system / max +200°C (+392°F) |
| | G | Horn DN100 (Ø95 mm / 3.74") long with purging system / max +200°C (+392°F) |
| | P | Drop PTFE DN80 (Ø75 mm / 2.95") long / max +150°C (+302°F) |
| | S | Drop PP DN80 (Ø75 mm / 2.95") long / max +100°C (+212°F) |
| | T | Drop PP DN150 (Ø144 mm / 5.67") long / max +100°C (+212°F) |
| | V | Sheet metal horn DN80 (Ø75 mm / 2.95") long + purging system / max +200°C (+392°F) |
| | W | Sheet metal horn DN100 (Ø95 mm / 3.74") long + purging system / max +200°C (+392°F) |
| | X | Sheet metal horn DN150 (Ø140 mm / 5.51") long + purging system / max +200°C (+392°F) |
| | Y | Sheet metal horn DN200 (Ø190 mm / 7.48") long + purging system / max +200°C (+392°F) |
| VF63 | 4 | Order code (complete this code on the pages that follow) |



KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature assemblies
- Pressure transmitters
- Analysis products
- Products and systems for the oil & gas industry
- Measuring systems for the marine industry

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