



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 (same housing for Ex d and non-Ex)

Highlights

- ± 10 mm / ± 0.4 " 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 transmit frequency and the receive 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.

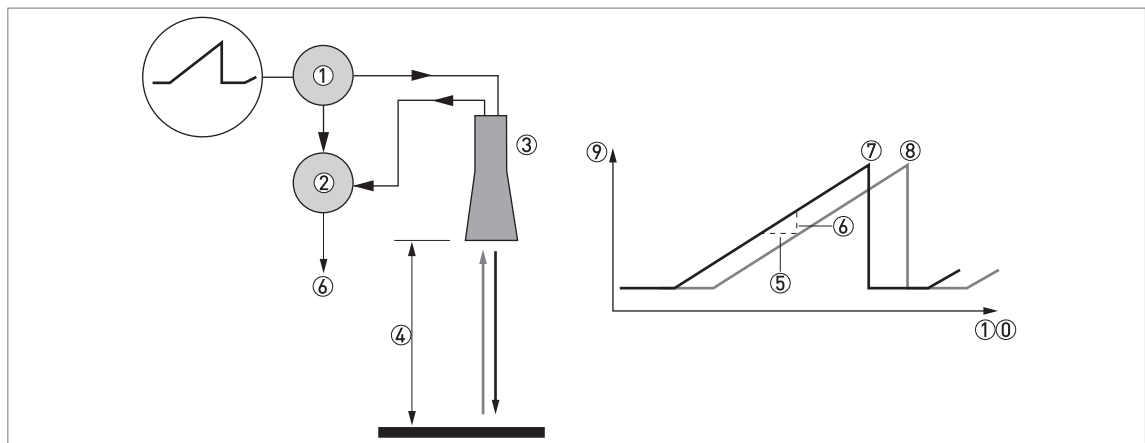


Figure 1-1: Measuring principle of FMCW radar

- 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 representative.*
- *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
	FOUNDATION Fieldbus output (4-wire device with local HART communication)
	PROFIBUS PA output (4-wire device with local HART communication)
	PTFE/PP flange plate protection (for Drop antenna without antenna extensions only) Distance piece (for process temperature: +150...+200°C / +300...+390°F)
Accessories	Weather protection
	Antenna extensions of 105 mm / 4.1" length (max. length for Drop antenna versions: 525 mm / 20.7")
	2° PP slanted flange (for all antennas)
Max. measuring range	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, Chinese (Mandarin) and Russian

Measurement accuracy

Resolution	1 mm / 0.04"
Repeatability	±5 mm / ±0.2"
Accuracy	±10 mm / ±0.4", when distance < 10 m / 33 ft; ±0.1% 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: Aluminium with a polyester topcoat
	Option: Stainless steel (1.4404 / 316L)
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) ①
	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) ①
	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) ①
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.) ②
Weather protection (Option)	Stainless steel (1.4301 / 304)

Process connections

Thread	G 1½; 1½ NPT
Flange version	
EN	DN80...150 in PN16 or PN40; others on request
ASME	3"...8" in 150 lb, 3"...4" in 300 lb; others on request
JIS	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 ③
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
PROFIBUS PA	
Type	4-wire (+ local HART) level transmitter; K-band FMCW radar
Function blocks	7 (level, distance, level conversion, level mass, reflection, ullage conversion and distance mass)
Protocol / Communication standard	PROFIBUS PA protocol that agrees with IEC 61158-2, galvanically isolated
Physical layer types	Standard power signaling, bus powered, non I.S.
Other features	Bus interface with integrated reverse polarity protection
Device power supply (24 V input)	18...30 VDC
Current consumption on PROFIBUS network	20 mA
Output data	Level, distance, level conversion, level mass, reflection, ullage conversion or distance mass
Input data	None
Error current FDE	Typically 0 mA (FDE =Fault Disconnection Electronic)
Address range	0...125. Default address: 126.
FOUNDATION Fieldbus	
Type	4-wire (+ local HART) level transmitter; K-band FMCW radar
Function blocks	1 × Resource Block (RB), 4 × Analog Input Blocks (AI), 1 × Transducer Block (TB)
	Analog Input Block: 50 ms
Protocol / Communication standard	Foundation Fieldbus protocol that agrees with IEC 61158-2, galvanically isolated
ITK version	5.1

Physical layer types	Standard power signaling, bus powered, non I.S.
Other features	Bus interface with integrated reverse polarity protection
Device power supply (24 V input)	18...30 VDC
Bus power supply	9...32 VDC (non-Ex); 9...17.5 VDC (intrinsically-safe)
Basic current	20 mA
Maximum error current	20 mA
Start current after 10 ms	20 mA
Polarity sensitivity	Yes
Minimum cycle time	100 ms
Output data	Level, distance, level conversion, level mass, reflection, ullage conversion or distance mass
Input data	None
Error current FDE	Typically 0 mA (FDE =Fault Disconnection Electronic)
Link Master function	Not supported

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;
	DIP / Cl. II/III / Div. 1 / Gr. EFG / T6;
	IS / Cl. I/II/III / Div. 1 / Gr. ABCDEFG / T6;
	NI / Cl. I / Div. 2 / Gr. ABCD / T6
	NEC 505
	Cl. I / Zone 0 / AEx d[ia] IIC T6;
	Cl. I / Zone 0 / AEx ia IIC T6;
	Cl. I / Zone 2 / AEx nA[ia] IIC T6
	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	Ex dia IIC T3~T6 DIP A21/A20 T _A T70°C~T95°C IP6X;
	Ex ia IIC T3~T6 DIP A21/A20 T _A T70°C~T95°C IP6X
CEPEL / INMETRO CEPEL-EX-1996/11X	BR-Ex ia IIC T6...T3 Ga
	Ex ia IIIC T95°C Da IP67
	BR-Ex d[ia] IIC T6...T3 Gb
	Ex t[ia Da] IIIC T95°C Db IP67
Other standards and approvals	
EMC	Electromagnetic Compatibility Directive 2004/108/EC in conjunction with EN 61326-1 (2006)
R & TTE	Radio Equipment and Telecommunications Terminal Equipment Directive 1999/5/EC in conjunction with ESTI EN 302 372 (2006)
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 Kalrez® is a registered trademark of DuPont Performance Elastomers L.L.C.

② Metaglas® is a registered trademark of Herberts Industrieglas, GMBH & Co., KG

③ 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

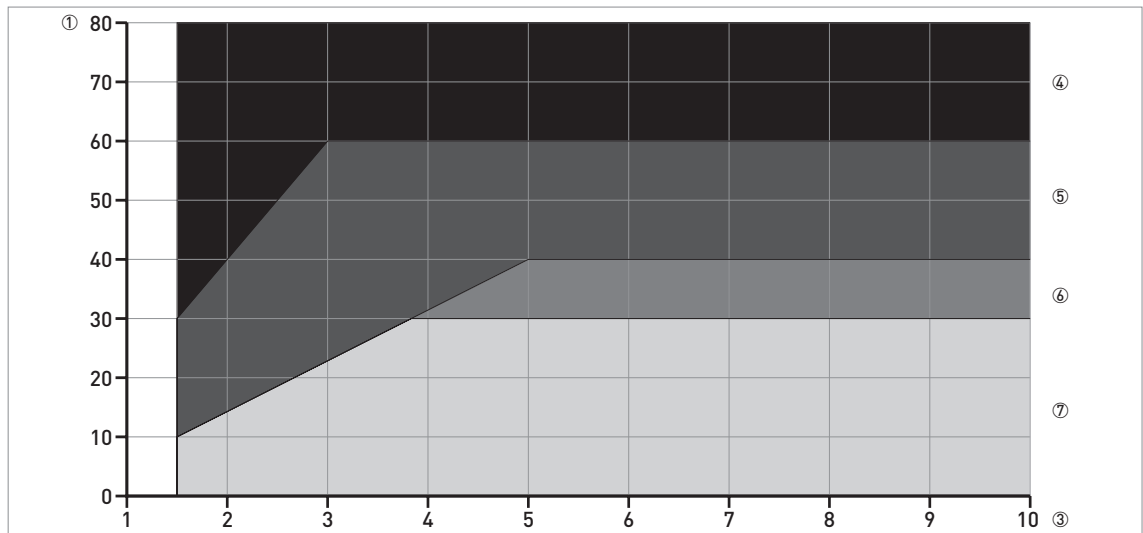


Figure 2-1: Selection of antenna for solid applications (graph of distance in m against ϵ_r)

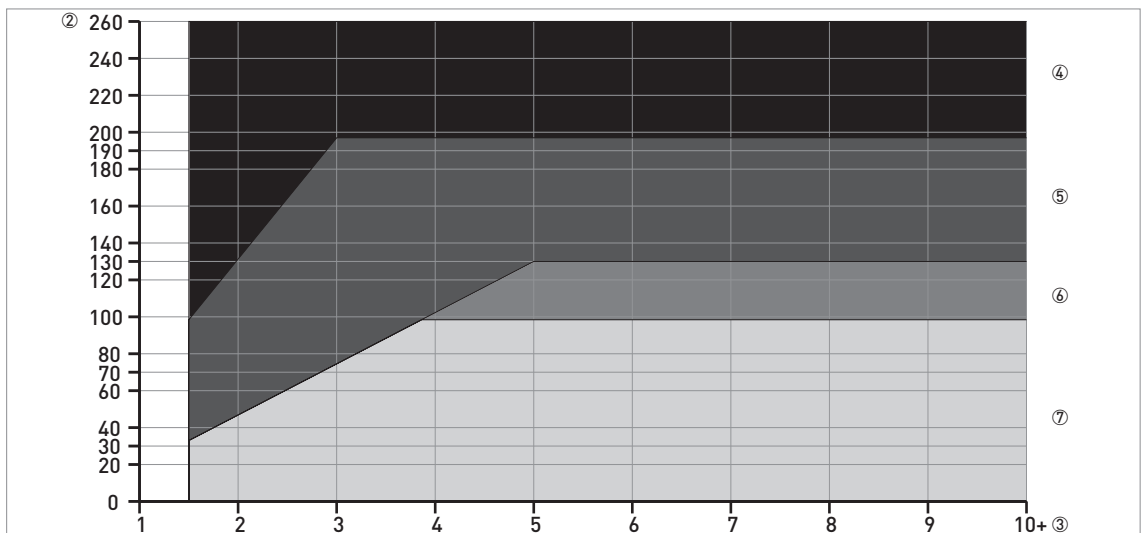


Figure 2-2: Selection of antenna for solid applications (graph of distance in ft. against ϵ_r)

- 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.

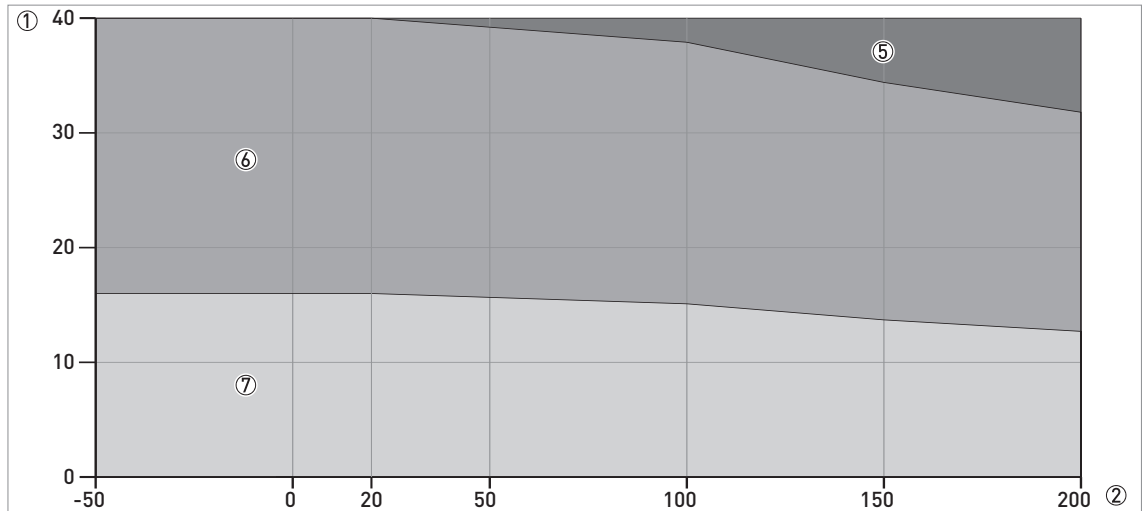


Figure 2-3: Pressure / temperature de-rating (EN 1092-1), flange and threaded connection, in °C and barg

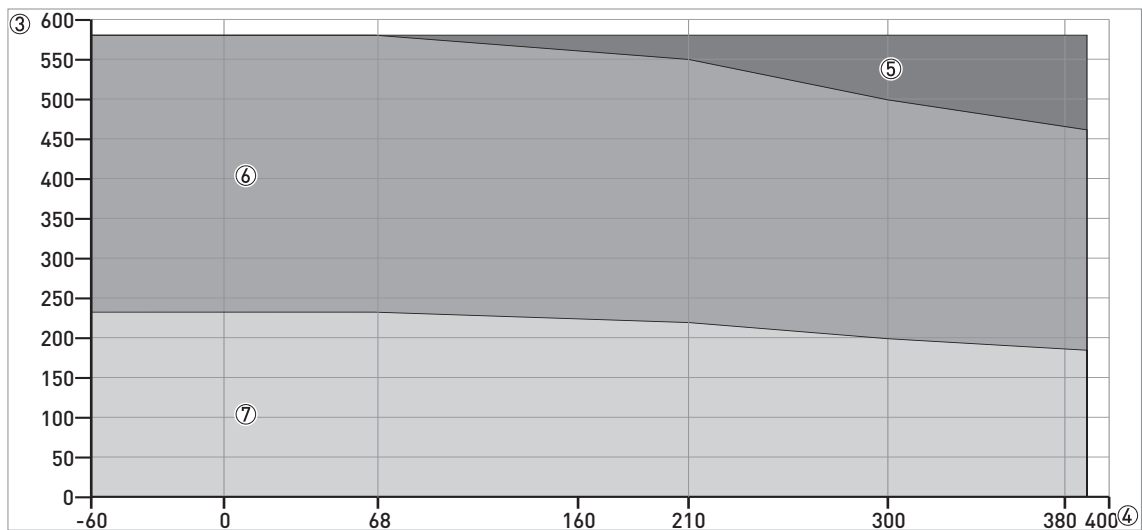


Figure 2-4: Pressure / temperature de-rating (EN 1092-1), flange and threaded connections, in °F and psig

- 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.

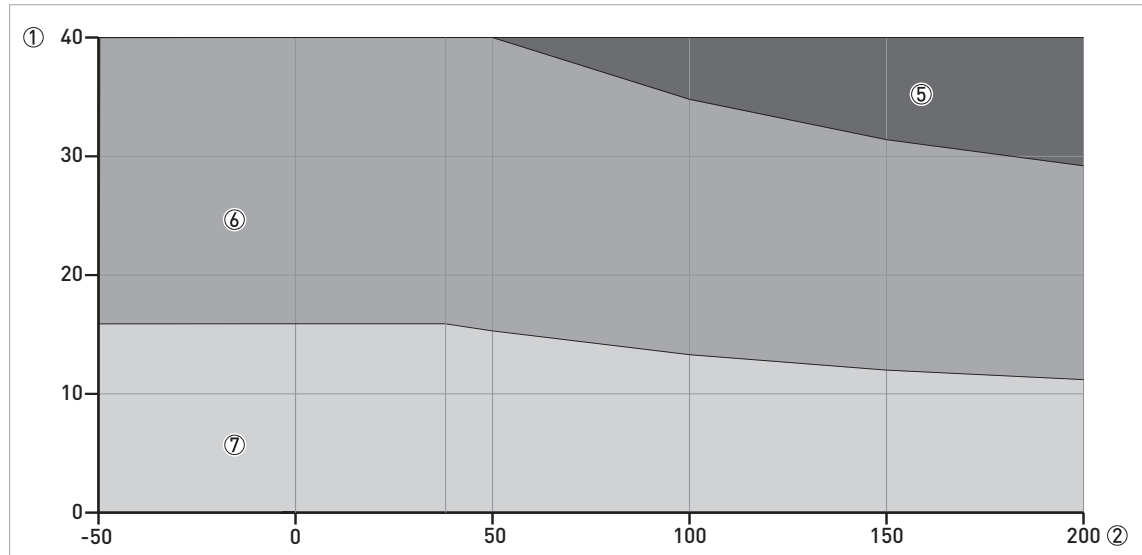


Figure 2-5: Pressure / temperature de-rating (ASME B16.5), flange and threaded connections, in °C and barg

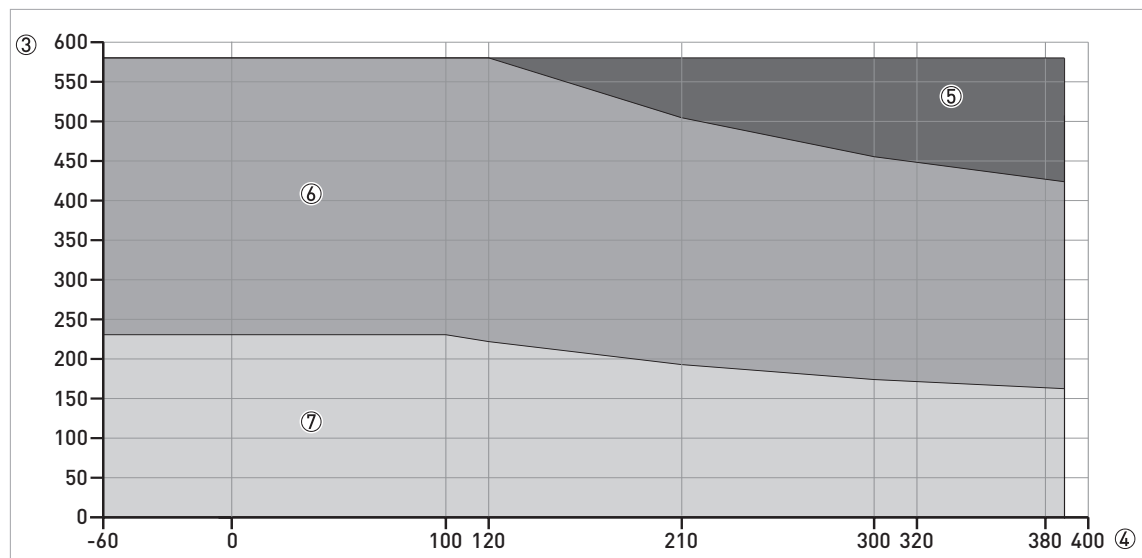


Figure 2-6: Pressure / temperature de-rating (ASME B16.5), flange and threaded connections, in °F and psig

- 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

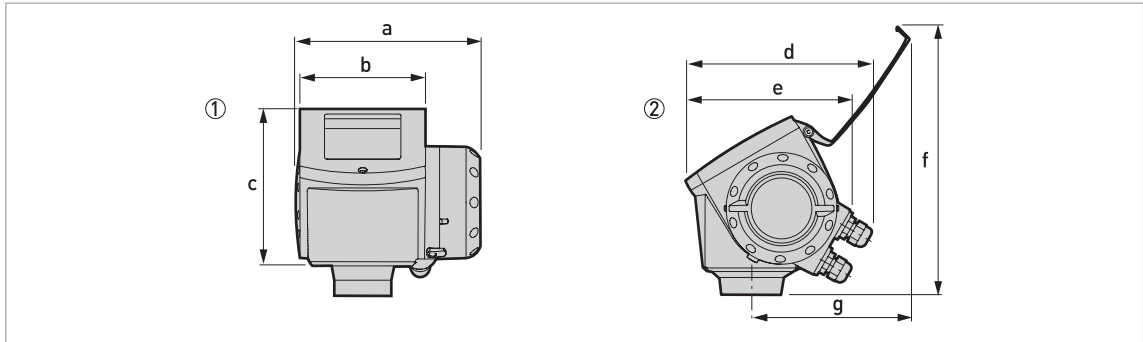


Figure 2-7: Housing dimensions

- 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 6...12 mm or 0.2...0.5".
- 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

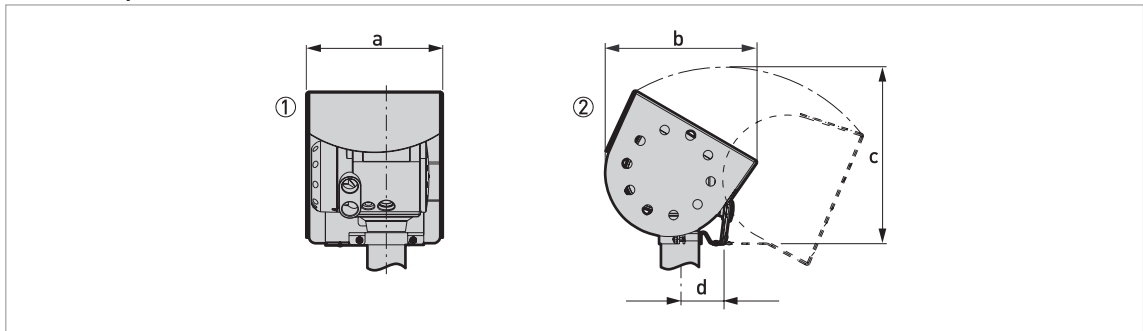


Figure 2-8: Dimensions of the weather protection option

- 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

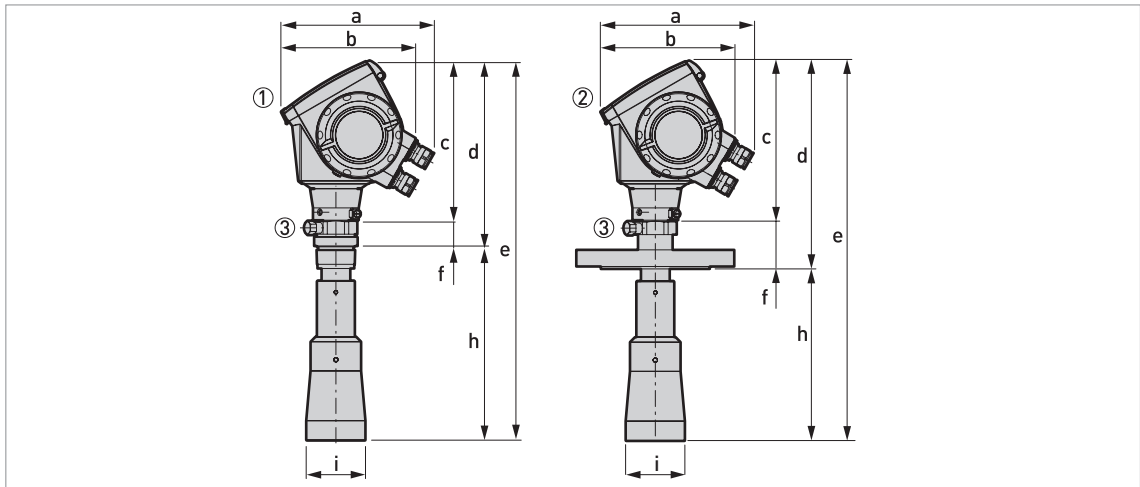


Figure 2-9: DN80/3" horn antenna versions

- ① DN80/3" horn antenna with G 1½ or 1½ NPT thread connection
- ② DN80/3" 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	496	49	246 ②	75	6.8
Flange connection	182 ①	167	201	263	480	62	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

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	18.9	2.4	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

DN100/4" horn antenna versions

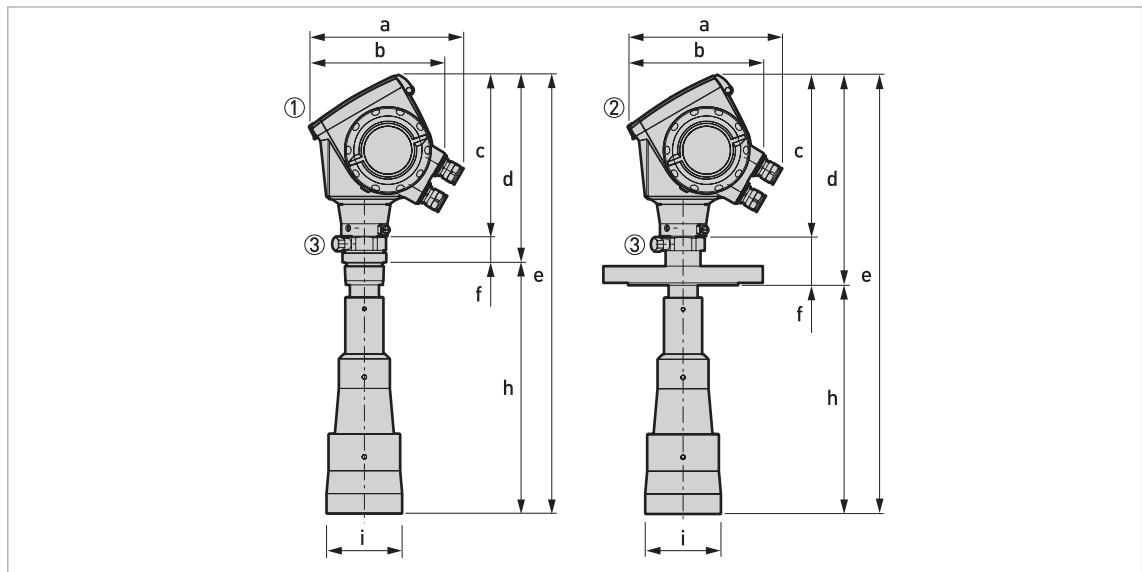


Figure 2-10: DN100/4" horn antenna versions

- ① DN100/4" horn antenna with G 1 1/2 or 1 1/2 NPT thread connection
- ② DN100/4" 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	565	49	315 ②	95	7.2
Flange connection	182 ①	167	201	263	549	62	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

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	21.6	2.4	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

Sheet metal horn antenna versions

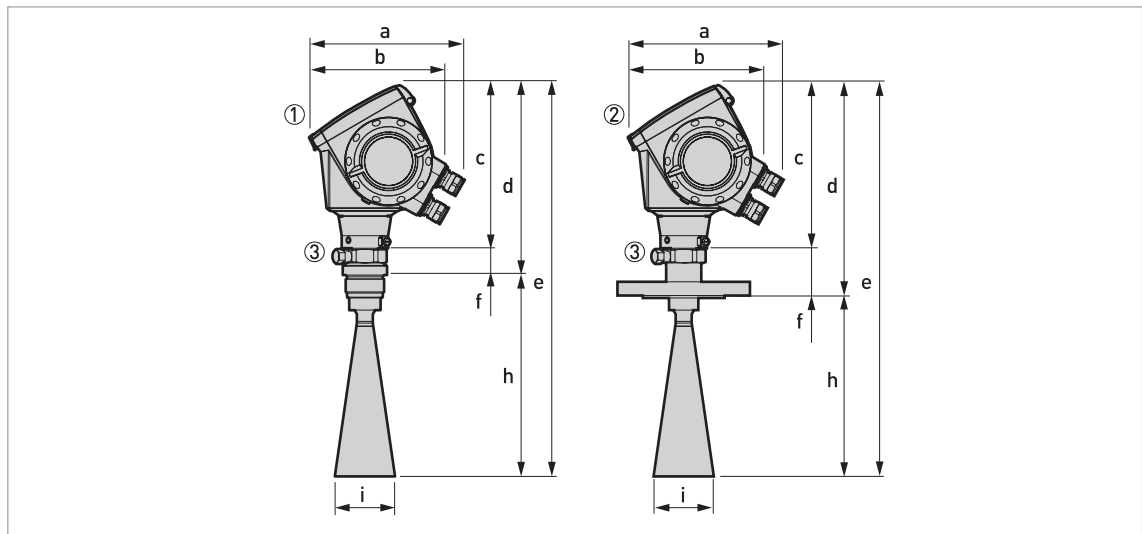


Figure 2-11: DN80/3", DN100/4", DN150/6" and DN200/8" sheet metal horn antenna versions

- 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	234	483	33	249 ②	75	4.9
	DN100/4"	182 ①	167	201	234	552	33	318 ②	95	5.1
	DN150/6"	182 ①	167	201	234	720	33	486 ②	144	5.5
	DN200/8"	182 ①	167	201	234	878	33	644 ②	190	6.1
Flange connection	DN80/3"	182 ①	167	201	262	483	62	221 ②	75	9.2
	DN100/4"	182 ①	167	201	262	552	62	290 ②	95	9.5
	DN150/6"	182 ①	167	201	262	720	62	458 ②	144	14.4
	DN200/8"	182 ①	167	201	262	878	62	616 ②	190	15.0

① If fitted with standard cable glands

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

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	9.2	19.0	1.3	9.8 ②	3.0	10.8
	DN100/4"	7.2 ①	6.5	7.9	9.2	21.7	1.3	12.5 ②	3.7	11.1
	DN150/6"	7.2 ①	6.5	7.9	9.2	28.3	1.3	19.1 ②	5.7	12.2
	DN200/8"	7.2 ①	6.5	7.9	9.2	34.6	1.3	25.4 ②	7.5	13.4
Flange connection	DN80/3"	7.2 ①	6.5	7.9	10.3	19.0	2.4	8.7 ②	3.0	20.2
	DN100/4"	7.2 ①	6.5	7.9	10.3	21.7	2.4	11.4 ②	3.7	20.8
	DN150/6"	7.2 ①	6.5	7.9	10.3	28.3	2.4	18.0 ②	5.7	31.6
	DN200/8"	7.2 ①	6.5	7.9	10.3	34.6	2.4	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

DN80/3" Drop antenna versions

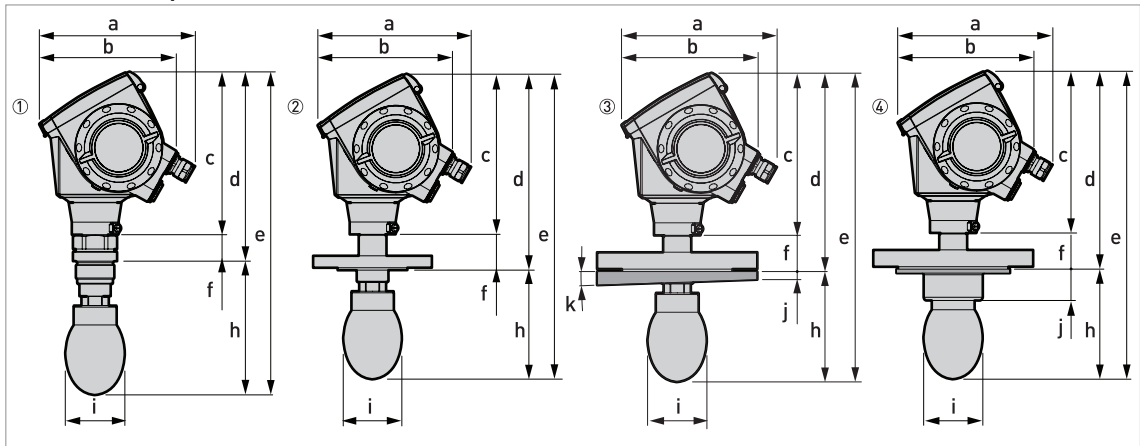


Figure 2-12: DN80/3" Drop antenna versions

- 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)

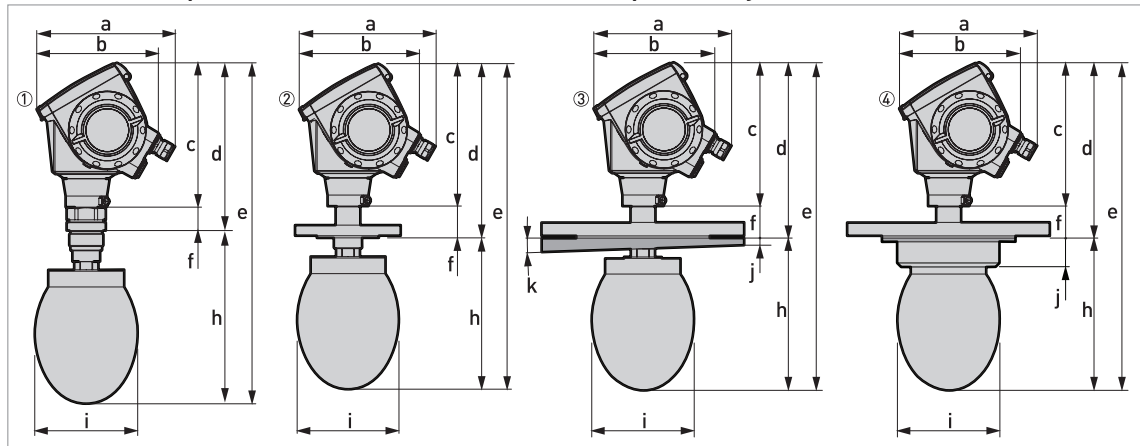


Figure 2-13: DN150/6" Drop antenna versions (PP material option only)

- 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 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 Theoretical data for nozzle position

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

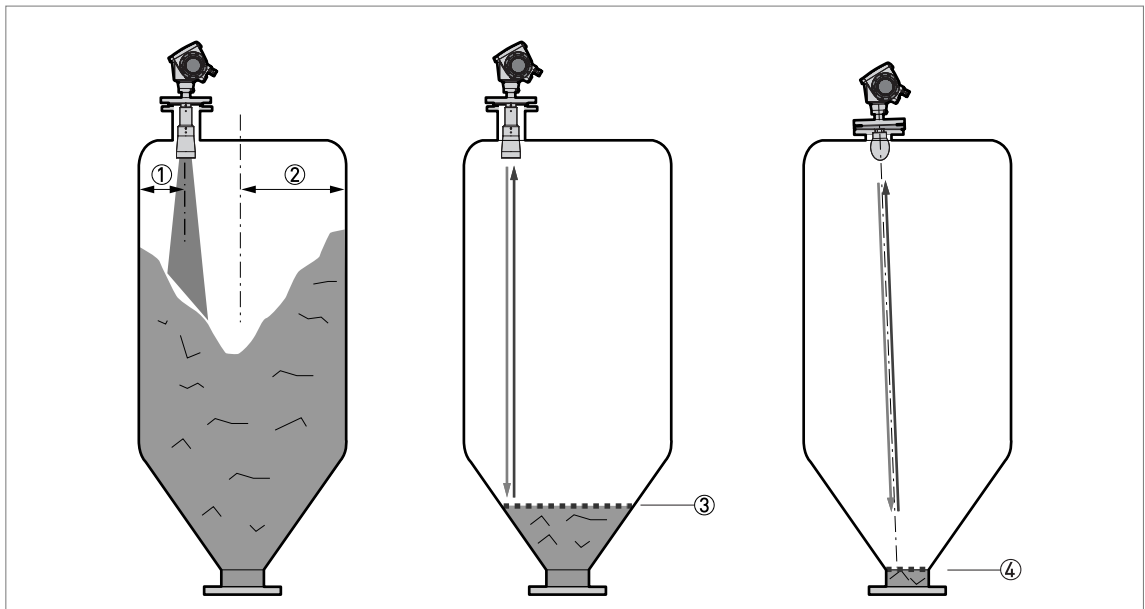


Figure 3-1: Recommended nozzle position for solids

- ① Position of the process fitting from the silo wall, $r/2$ (for DN80, DN100 or DN150 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 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.

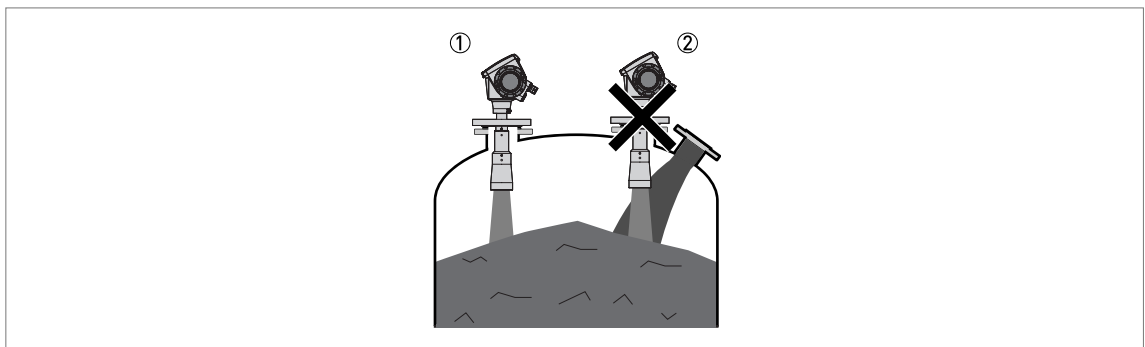


Figure 3-2: Product inlets

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

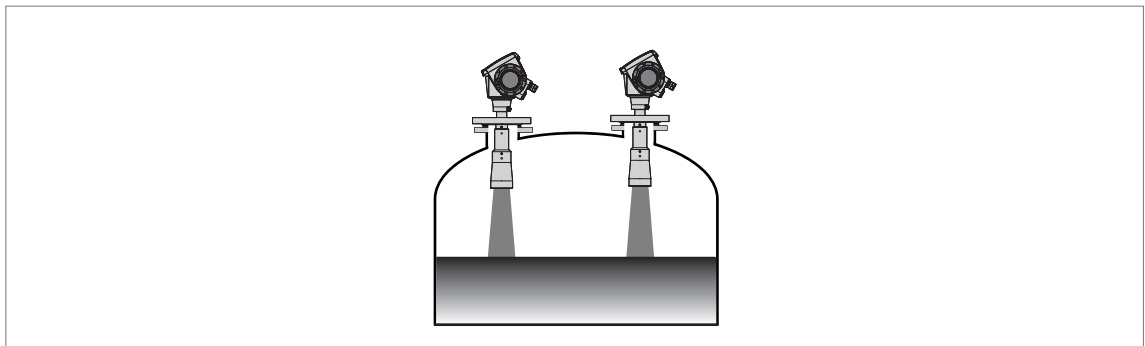


Figure 3-3: More than 1 FMCW radar level meter can be operated in a silo

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.

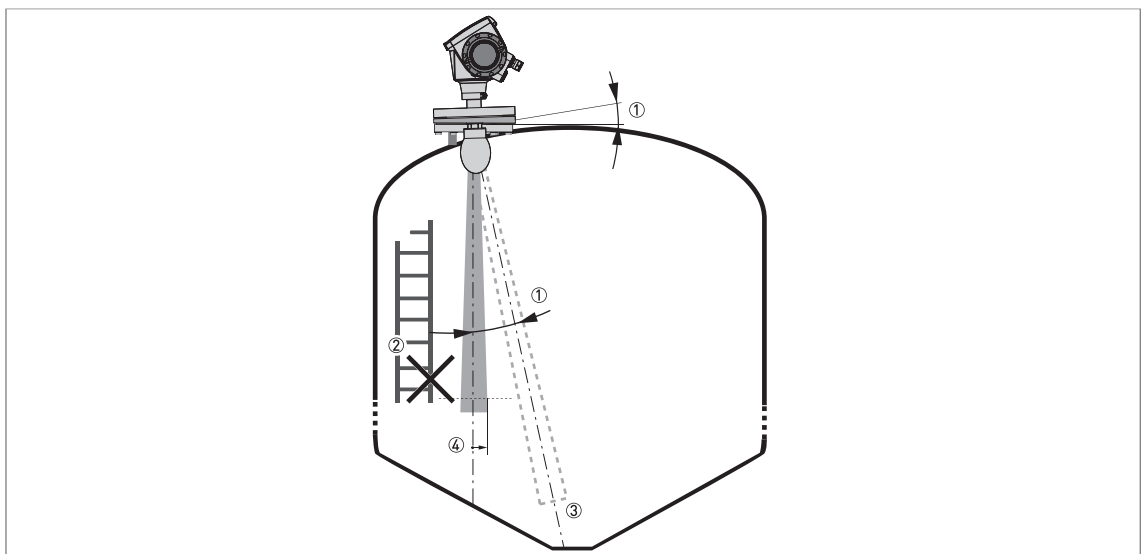


Figure 3-4: General installation recommendations

- 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 If there are too many objects in the radar footprint, do an empty spectrum scan. Refer to the handbook for the procedure.
- ③ Conical silo bottoms. Refer to the handbook for fine adjustment of the device.
- ④ Radius of radar footprint (DN80 horn antenna): increments of 90 mm/m or 1.1"/ft (5°)
 Radius of radar footprint (DN100 horn antenna, DN150 horn antenna, DN200 horn antenna and DN80 Drop antenna): increments of 70 mm/m or 0.83"/ft (4°)
 Radius of radar footprint (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

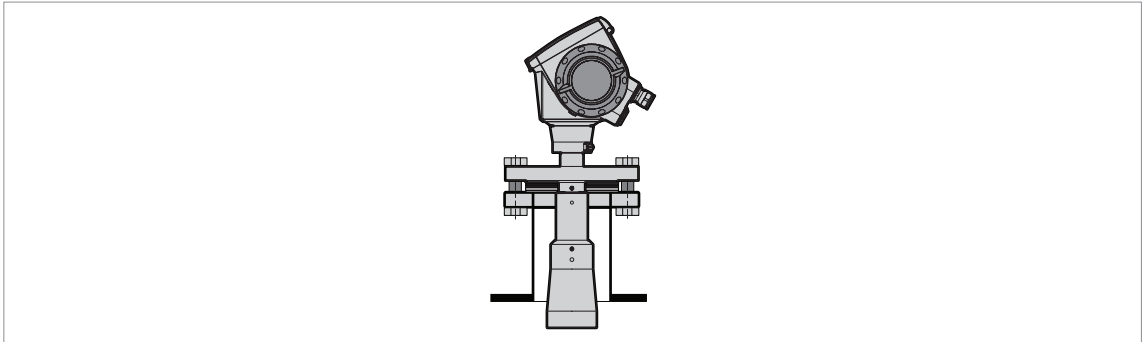


Figure 3-5: Flange connection

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

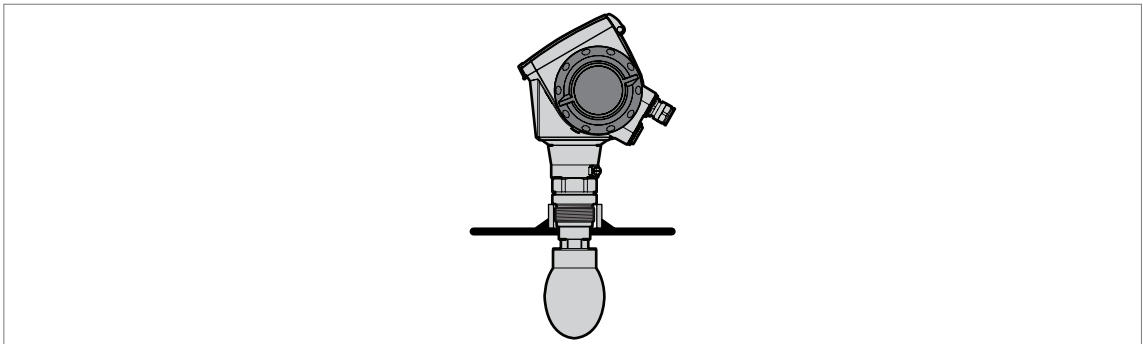


Figure 3-6: Threaded connection

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

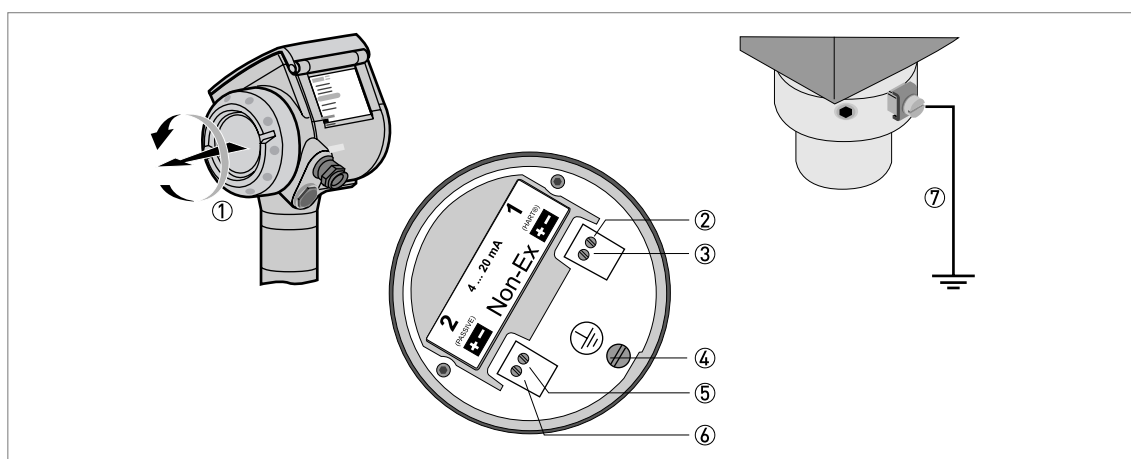


Figure 4-1: Electrical installation

- 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

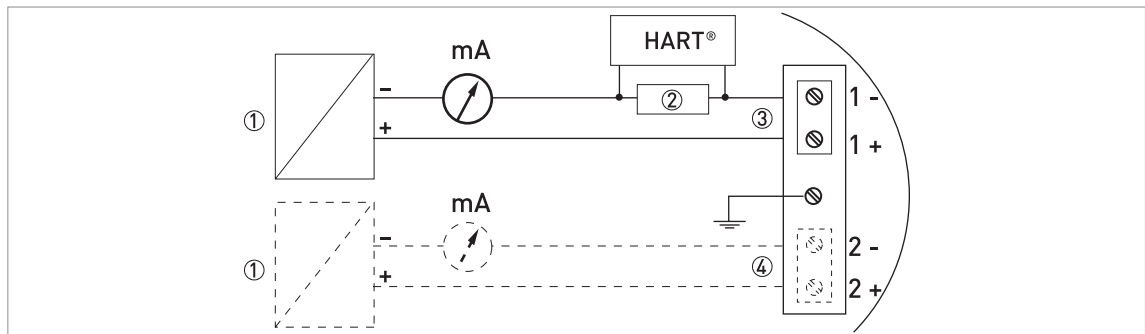


Figure 4-2: Electrical connections for non-Ex devices

- 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 CD-ROM delivered with the device or it can be downloaded free of charge from the website (Download Center).

4.2.3 PROFIBUS PA

For electrical data for PROFIBUS PA networks, refer to the PROFIBUS PA supplement. You can find this documentation on the CD-ROM delivered with the device or it can be downloaded free of charge from the website (Downloadcenter).

4.2.4 FOUNDATION Fieldbus

For electrical data for FOUNDATION Fieldbus networks, refer to the FOUNDATION Fieldbus supplement. You can find this documentation on the CD-ROM delivered with the device or it can be downloaded free of charge from the website (Downloadcenter).

4.3 Protection category

The device fulfills all requirements per protection category IP 66/67 (equivalent to NEMA type 4X (housing) and type 6P (antenna)).

Make sure that the cable gland is watertight.

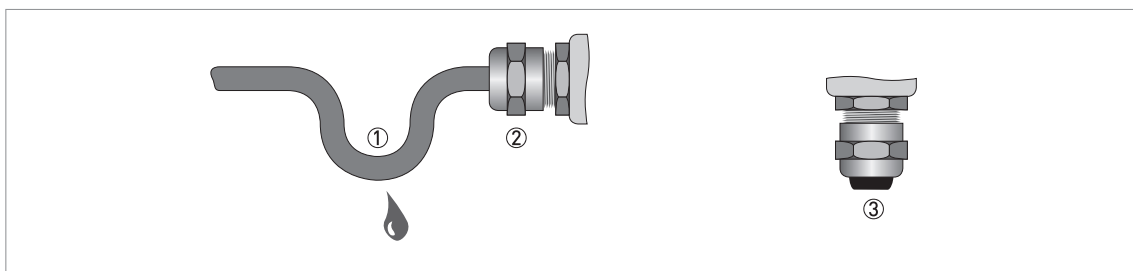


Figure 4-3: How to make the installation agree with protection category IP 67

- 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

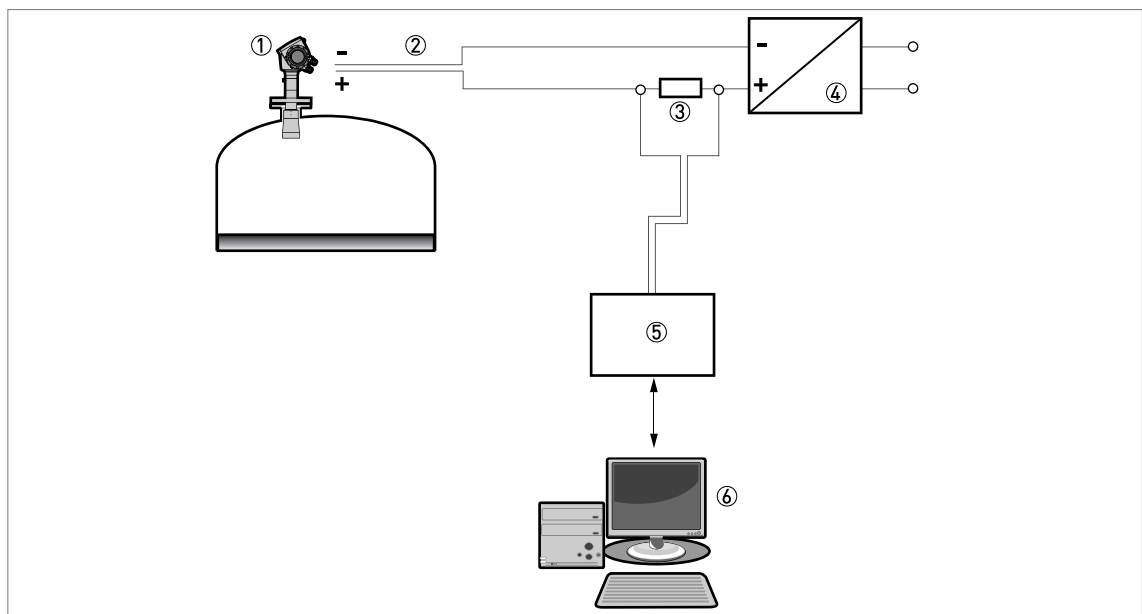


Figure 4-4: Point-to-point connection (non-Ex)

- 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

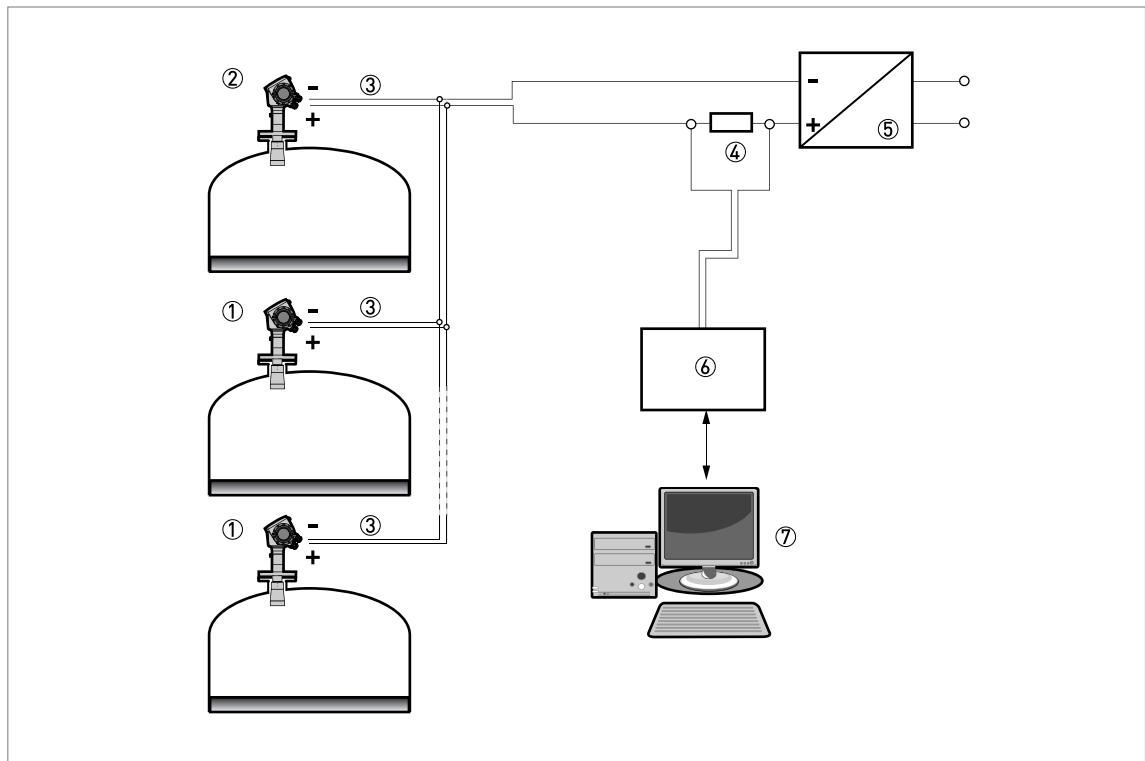


Figure 4-5: Multi-drop network (non-Ex)

- 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

4.4.4 Fieldbus networks

FOUNDATION Fieldbus™ network (non-Ex)

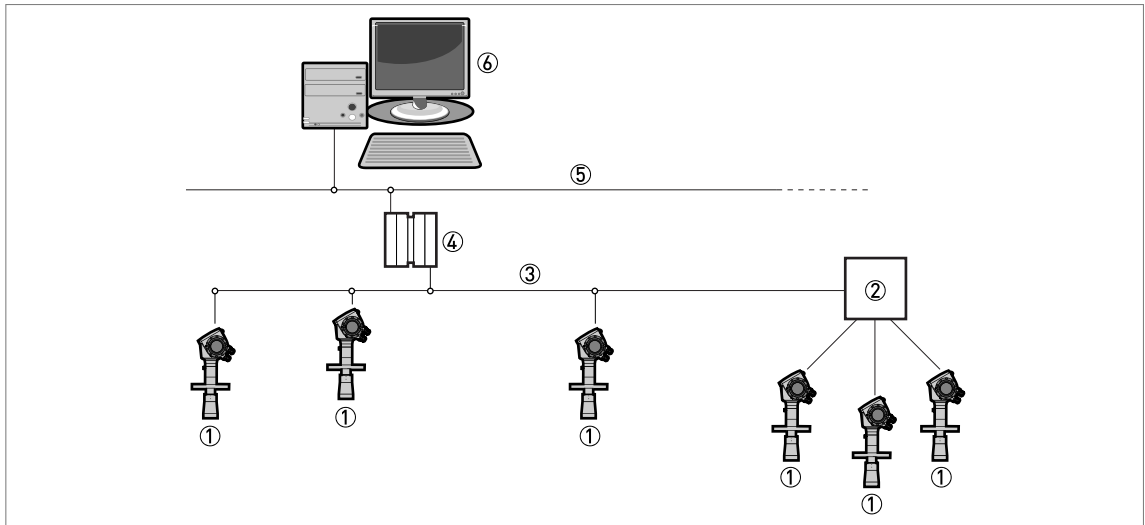


Figure 4-6: FOUNDATION Fieldbus™ network (non-Ex)

- ① Field device
- ② Junction box
- ③ H1 network
- ④ H1/HSE converter
- ⑤ High Speed Ethernet (HSE)
- ⑥ Workstation

It is necessary to have a separate power supply to energize devices with the FOUNDATION™ Fieldbus output option (4-wire device with local HART® connection). The FF terminal is connected to a Fieldbus Power Hub. The 24 VDC terminal energizes the device. The power supply is not shown in the illustration.

PROFIBUS PA/DP network (non-Ex)

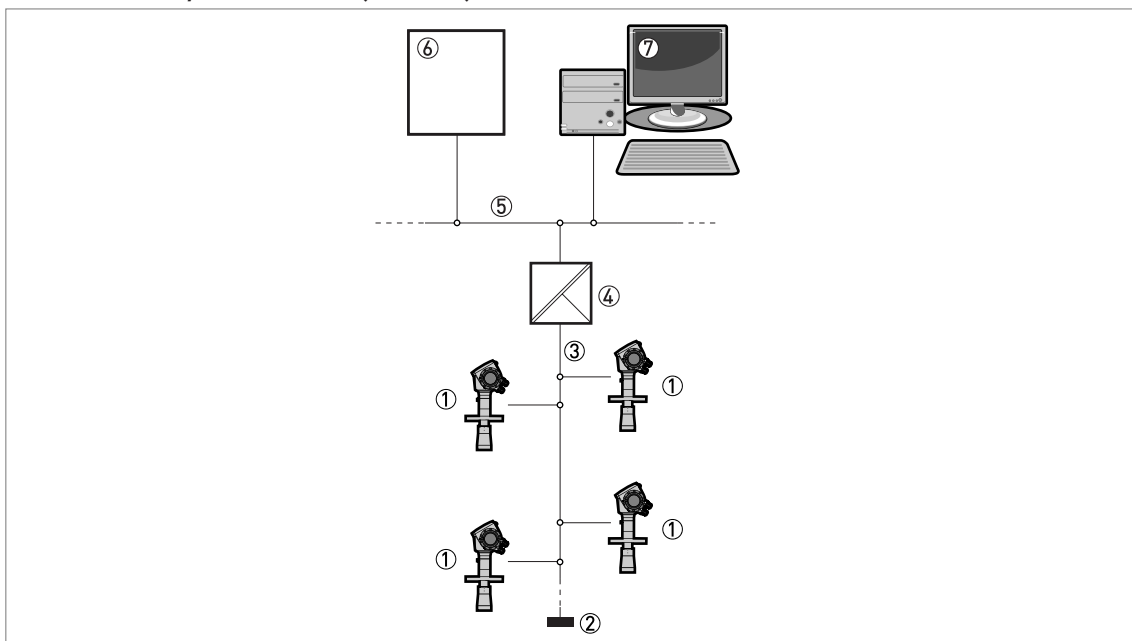


Figure 4-7: PROFIBUS PA/DP network (non-Ex)

- ① Field device
- ② Bus termination
- ③ PROFIBUS PA bus segment
- ④ Segment coupler (PA/DP link)
- ⑤ PROFIBUS DP bus line
- ⑥ Control system (PLC / Class 1 master device)
- ⑦ Engineering or operator workstation (Control tool / Class 2 master device)

*It is necessary to have a separate power supply to energize devices with the PROFIBUS PA output option (4-wire device with local HART[®] connection). The **PROFIBUS PA** terminal is connected to a segment coupler. The **24 VDC** terminal energizes the device. The power supply is not shown in the illustration.*

You can help us to assist you as quickly as possible by giving us a few items of information.

Then just fax them to us. Your personal consultant will contact you within 24 hours.

5.1 Device data

Connection type	<input type="checkbox"/> Flange	<input type="checkbox"/> Threaded	Specify standard and size:
Connection material	<input type="checkbox"/> 316L	<input type="checkbox"/> With PP or PTFE flange plate protection ①	<input type="checkbox"/> With PP slanted flange (2°)
Antenna type and material	<input type="checkbox"/> Horn, 316L	<input type="checkbox"/> Drop, PP	<input type="checkbox"/> Drop, PTFE
Antenna extensions for high nozzles ②	<input type="checkbox"/> Without	<input type="checkbox"/> With	Specify number:
Feedthrough/Sealing ③	<input type="checkbox"/> Standard/ FKM/FPM (-40...+200°C)	<input type="checkbox"/> Standard/ Kalrez® 6375 (-20...+200°C)	<input type="checkbox"/> Standard/ EPDM (-50...+150°C)
	<input type="checkbox"/> Metaglas®/ FKM/FPM (-30...+200°C)	<input type="checkbox"/> Metaglas®/ Kalrez® 6375 (-20...+200°C)	<input type="checkbox"/> Metaglas®/ EPDM (-30...+150°C)
Outputs	<input type="checkbox"/> 1 output 4...20 mA/HART®	<input type="checkbox"/> 2 outputs 4...20 mA HART® + 4...20 mA	<input type="checkbox"/> PROFIBUS PA (4-wire + local HART®)
	<input type="checkbox"/> FOUNDATION Fieldbus (4-wire + local HART®)		
Display	<input type="checkbox"/> Without	<input type="checkbox"/> With	Specify language:
Approvals	<input type="checkbox"/> No Ex	<input type="checkbox"/> ATEX Ex ia	<input type="checkbox"/> ATEX Ex d[ia]
	<input type="checkbox"/> IECEx Ex ia	<input type="checkbox"/> IECEx Ex d[ia]	<input type="checkbox"/> NEPSI Ex ia
	<input type="checkbox"/> NEPSI Ex dia	<input type="checkbox"/> FM IS Class 1 Div. 1 (Dual Seal)	<input type="checkbox"/> FM XP-IS Class 1 Div. 1 (Dual Seal)
	<input type="checkbox"/> CSA IS Class 1 Div. 1 (Dual Seal)	<input type="checkbox"/> CSA XP-IS Class 1 Div. 2 (Dual Seal)	<input type="checkbox"/> INMETRO BR-Ex ia
	<input type="checkbox"/> INMETRO BR-Ex d[ia]		

① For devices with the Drop antenna option

② None for devices with the flange plate protection option. Max. 5 antenna extensions for devices with the Drop antenna option. Max. 10 antenna extensions for devices with the horn antenna option.

③ The temperature limits for the feedthrough and gasket materials must agree with the temperature limits of the antenna type.

5.2 Rating data

Product name:	
Operating pressure:	
Rated pressure:	
Process connection temperature:	
Ambient temperature:	
Dielectric constant:	
Measurand (level, volume,...):	
Silo height:	
Comments (indoors, exposed to weather, ...):	

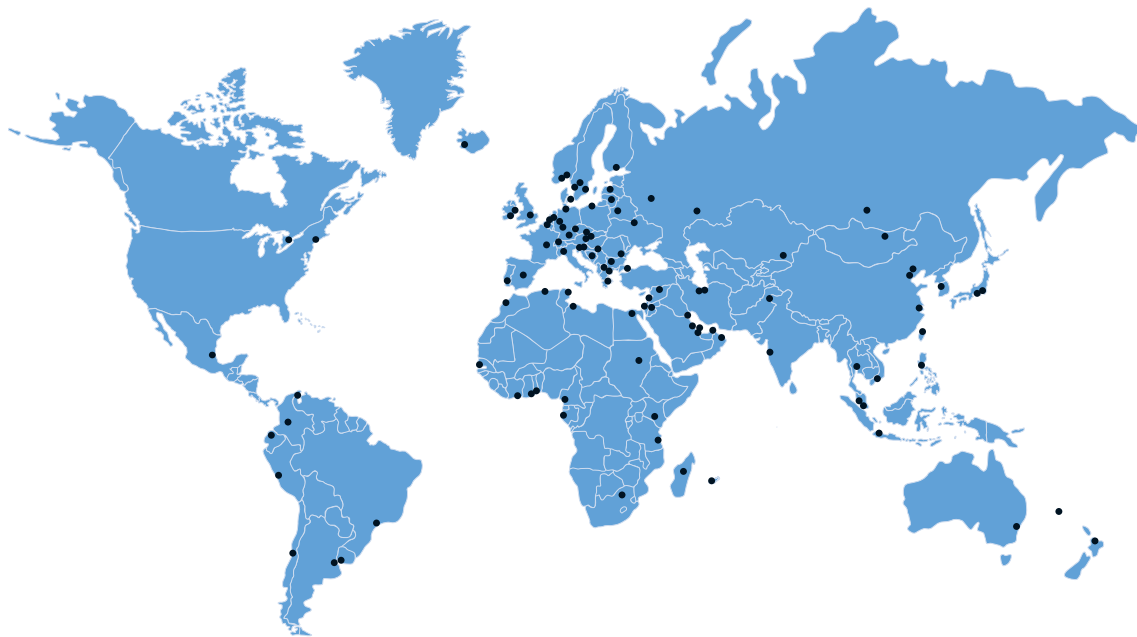
5.3 Contact data

Company:	
Contact person:	
Telephone number:	
Fax number:	
E-mail:	









KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers

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www.krohne.com

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