SmartLine® Non-Contact Radar Level Meter
Technical Datasheet

34-VF-03-19
May 2010

Specification

The Universal Radar Solution

The SmartLine Non-Contact Radar Level Meter (FMCW) designed for distance, level and volume measurement of liquids, pastes and slurries. It gives a more stable measurement than pulse radar and is well suited to agitated process conditions. The device can operate at very low and very high process temperatures as long as the process connection temperature limits are observed.

Highlights

- ±3 mm / ±0.12" standard accuracy
- Reliable measurement in difficult process conditions
- Operates up to a flange temperature of 200°C (390°F) and 100 barg (1450 psig)
- Measuring range up to 80 m (260 ft)
- Long antenna versions can be extended to suit nozzle length
- Drop antenna for corrosive liquids (with optional PTFE/PP flange plate) or where product build-up is likely
- Sealed drop antenna extension option for pressurized tanks
- Hygienic antenna for processes where stringent hygiene standards must be obeyed
- PACTware and HART DTMs included as standard
- Optional second current output
- Direct-accessible graphic touchscreen/wizard (option)
- Converter rotates 360°
- Triple barrier gas-tight protection available for working with dangerous gases (using pre-stressed fused glass)

Industries

- Chemicals
- Food & Beverage
- Iron, Steel & Metals
- Minerals & Mining
- Oil & Gas
- Petrochemicals
- Pulp & Paper
- Water & Wastewater

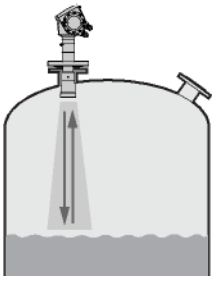
Figure 1 – SmartLine Non-Contact Radar Level Meter

1. Optional touch screen with 4-button operation
2. 2-wire level meter
3. One converter for all applications
4. Antenna extension (for long nozzles)
5. Optional Metaglas barrier
6. Rotatable housing
7. Same housing for Ex d and Non-Ex

Applications

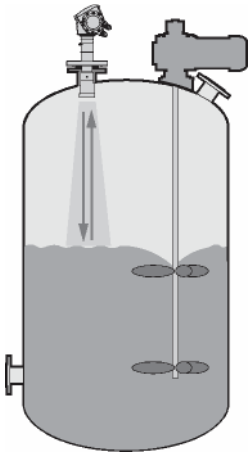
- Tanks with agitators
- Process tanks
- Storage tanks

Applications



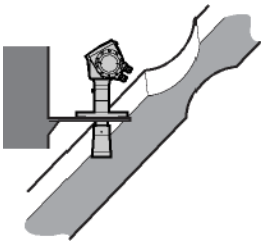
1. Level measurement of liquids in storage tanks

SmartLine Non-Contact Radar can measure the level of a wide range of liquid products on a large variety of installations, including LPG and LNG tanks. It does not require calibration or commissioning when installed. It can measure any liquid within the stated pressure and temperature range, and distances up to 80 m / 260 ft



2. Level measurement of liquids in process tanks

SmartLine Non-Contact Radar can measure level accurately in agitated conditions, such as near to vortexes caused by agitators, and also where foam is present.



3. Open channel metering or flow

SmartLine Non-Contact Radar can measure level in an open channel and convert this measurement into flow values if the characteristics of the channel are known. This solution is the high end alternative to ultrasonic and hydrostatic pressure transmitters.

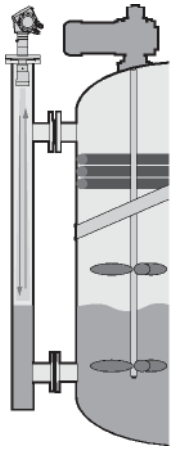
For installation requirements and application needs please refer to the User manual.

Please refer to the User manual for details of how and where to use these products.

4. Measurement of corrosive liquids with drop antenna

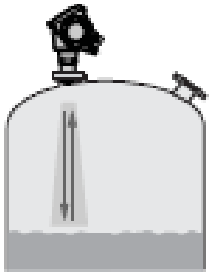
The drop antenna option combines a relatively small radar beam for more precise measurement and a shape that avoids product build-up. If the tank contains corrosive liquids such as acids and alkaline solutions, we recommend the DN 80 / 3¨ drop antenna with the PTFE or PP flange plate option

5. Measurement of liquids in a bypass chamber



The drop antenna option combines a relatively small radar beam for more precise measurement and a shape that avoids product build-up. If the tank contains corrosive liquids such as acids and alkaline solutions, we recommend the DN 80 / 3¨ drop antenna with the PTFE or PP flange plate option

6. Measurement of liquids with a hygienic antenna



The Hygienic antenna option is made of materials that agree with FDA regulations. it is suitable for level measurement in processes that require hygienic equipment (such as the food, beverage and pharmaceutical industries).

For installation requirements and application needs please refer to the User manual.

Please refer to the User manual for details of how and where to use these products.

Technical Data

Measuring System

Measurement principle	2-wire loop-powered level transmitter; K-band (24...26 GHz) FMCW radar
Application range	Level measurement of liquids, pastes and slurries
Primary measured value	Δf (change in frequency) between the emitted and received signal
Secondary measured value	Distance, level, volume 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
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 (for Drop antennas without antenna extensions only)
	Distance piece (for process temperature: +150...+200°C) (1)
	Antenna purging system (supplied with ¼ NPTF connection)
Accessories	Weather protection
	Antenna extensions of 105 mm / 4.1¨ length (Max length for Drop antenna versions: 525 mm / 20.7¨; not available for the Hygienic antenna)
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¨ (1 m / 40¨ for hygienic antenna)
Dead zone	Antenna extension length + antenna length + 0.1 m / 4¨ (500 mm / 20¨ for hygienic antenna)
Beam angle of antenna	Horn DN40 / 1.5¨: 20°
	Horn DN50 / 2¨: 15°
	Horn DN80 / 3¨: 10°
	Horn DN100 / 4¨: 8°
	Drop DN80 / 3¨: 8°
	Hygienic DN50 / 2¨: 15°

Display and user interface

Display	LCD display
	9 lines, 160 × 160 pixels in 8-step greyscale with 4-button keypad
Interface languages	English, German, French, Italian, Spanish, Portuguese, Japanese, Chinese (Mandarin) and Russian

Measuring 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

Process conditions

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 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
Hygienic antenna (PEEK):	-20…+150°C / -4…+300°F (the process connection temperature must agree with the temperature limits of the gasket material. Refer to "Materials".) Ex: Pending
Thermal shock resistance	<40°C/s / <72°F/s
Operating pressure	
Drop antenna (PP)	-1…16 bar / -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
Hygienic antenna (PEEK):	-1…10 barg / -14.5…145 psig subject to process connection used and flange temperature
Horn antennas:	Standard: -1…40 barg / -14.5…580 psig; Option: -1…100 barg / -14.5…1450 psig; subject to process connection used and flange temperature
Dielectric constant (ε_r)	$\geq$ 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)

Installation conditions

Process connection size	The process connection should be larger than the antenna diameter.
	If the process connection on the device 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.

Material

Housing	Standard: Aluminium
	Option: Stainless steel (1.4404 / 316 L)
Wetted parts, including antenna	Standard for Horn antenna: Stainless steel (1.4404 / 316L) Option for Horn antenna: Hastelloy® C-22 (2.4602) (2) Standard for Drop antenna: PTFE; PP Hygienic antenna: PEEK - this material agrees with FDA regulations
Process fitting	Standard for Horn and Drop antennas: Stainless steel (1.4404 / 316L) - a PP or PTFE flange plate is also available for the Drop antenna Standard for Hygienic antennas:PEEK Option: Hastelloy® C-22 (2.4602) - for Horn antennas only
Gaskets (and o-rings for the sealed antenna extension option	Hygienic antenna: BioControl®: FKM/FPM (-20…+150°C / -4…+300°F); EPDM (-20°C…+150°C / -4…+300°F) SMS, Tri-Clamp®, DIN 11851: without (3)
	PTFE Drop antennas: FKM/FPM (-40…+150°C / -40…+300°F); Kalrez® 6375 (-20…+150°C / -4…+390°F); EPDM (50°C…+150°C / -58…+300°F) (4)
	PP Drop antennas: FKM/FPM (-40…+100°C / -40…+210°F); Kalrez® 6375 (-20…+100°C / -4…+210°F); EPDM (-40°C…+100°C / -40…+210°F) (4)
	Horn antennas: FKM/FPM (-40…+200°C / -40…+390°F); Kalrez® 6375 (-20…+200°C / -4…+390°F); EPDM (-50°C…+150°C / -58…+300°F) (4)
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.) (5)
Weather protection (Option)	Stainless steel 1.4301 (304)

Process Connections

Thread	G 1½"; NPT 1½"
Flange	
EN	DN40…150 in PN16, PN40, PN63 or PN100; others on request
ASME	1½¨…8¨ in 150 lb, 1½¨...6¨ in 300 lb, 1½¨...4¨ in 600 lb or 900 lb; others on request
JIS	40…100A in 10K; others on request
Hygienic	BioControl® DN50; Tri-Clamp® 2¨; DIN 11851 DN50; SMS 51; others on request
Other	M40 connection for process connections supplied by the customer

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	M20x1.5; ½" NPT G ½" (not for FM- and CSA- approved devices. Not for stainless steel housings) M25x1.5 (For stainless steel housing only)
Cable gland	Standard: none
	Options: M20x1.5 (for non-Ex and Ex -approved devices with M20x1.5 and M25x1.5 cable entries); others are available on request
Cable entry capacity (terminal)	0.5…1.5 mm²

Input and Output

Current Output	
Output signal (Output 1)	4…20 mA HART® or 3.8…20.5 mA acc. to NAMUR NE 43 (6)
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 50 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	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 (RB), 1 × Transducer Block (TB)
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
Current consumption on	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)
Link Master function	Not supported

Approvals

CE	This device fulfils the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark.
ATEX (approval for Hygienic antennas and fieldbus outputs pending)	ATEX II G 1, 1/2, 2 Ex ia IIC T6...T3; ATEX II D 1, 1/2, 2 Ex iaD 20 or Ex iaD 20/21 or Ex iaD 21 IP6X T65°C...T90°C; ATEX II G 1/2, 2 Ex d [ia] IIC T6...T3; ATEX II D 1, 1/2, 2 Ex tD[iaD] A21/20 or Ex tD[iaD] A21 IP6X T65°C...T90°C; ATEX II G 3 Ex nA IIC T6…T3
IECEx (approval pending)	Zone 0 Ex ia IIC T6…T3; Ex iaD 20 IP6X T65°C…T 90°C Zone 0/1 Ex d[ia] IIC T6…T3; Ex tD[iaD] A20/21 IP6X T65°C…T 90°C (pending)
FM Dual Seal-approved (approval for hygienic antenna and fieldbus output options pending)	**NEC 500** XP-IS: Cl. I, Div. 1, Gr. ABCD (also applicable to these conditions: Cl. II/III, Div. 2, Gr. FG); DIP: Cl. II/III, Div. 1, Gr. EFG; IS: Cl. I/II/III, Div. 1, Gr. ABCDEFG; NI: Cl. I, Div. 2, Gr. ABCD; **NEC 505** XP-IS: Cl. I, Zone 0, AEx d [ia], IIC; IS: Cl. I, Zone 0, AEx ia, IIC; NI: Cl. I, Zone 2, AEx nA [ia], IIC Temperature class: T6 Ta=60°C; T4A Ta=85°C Hazardous (Classified) Locations, indoor/outdoor Type 4X and 6P, IP66, Dual Seal
CSA - Dual Seal-approved (approval for Drop antenna, hygienic antenna and fieldbus output options pending)	**CEC Section 18 (Zone ratings)** Cl. I, Zone 1, Ex d [ia], IIC (Probe: Zone 0); Cl. I, Zone 0, Ex ia, IIC; Cl. I, Zone 2, Ex nA [ia], IIC; **CEC Section 18 and Annex J (Division ratings)** XP-IS, Cl. II, Div. 2, Gr. FG; Cl. III, Div. 2; IS, Cl. I, Div. 2, Gr. ABCD; Cl. II, Gr. FG; Cl. III
NEPSI (approval pending)	Ex dia IIC T3…T6; Ex ia IIC T3…T6
CEPEL / INMETRO (pending)	Ex d[ia] IIC T3…T6; Ex ia IIC T3…T6
Other standards and approvals	
EMC	EMC Directives 2004 / 108 / EC in conjunction with EN 61326-1 (2006).
LVD	Low-Voltage Directives 2006 / 95 / EC in conjunction with EN 61010-1 (2001).
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
Construction code	On request: NACE MR0175 / ISO 15156

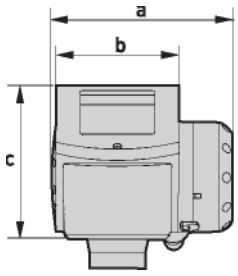
1 the device has a distance piece if it has the flange options that follow: 6¨ in 300 lb, 3¨...4¨ in 600 lb and 1½¨...4¨ in 900 lb
2 Hastelloy® is a registered trademark of Haynes International, Inc.
3 Tri-Clamp® is a registered trademark of Ladish Co., Inc. BioControl® is a registered trademark of Neumo-Ehrenberg-Group.
4 Kalrez® is a registered trademark of DuPont Performance Elastomers L.L.C.
5 Metaglas® is a registered trademark of Herberts Industrieglas, GMBH & Co., KG
6 HART® is a registered trademark of the HART Communication Foundation

Dimensions and Weight

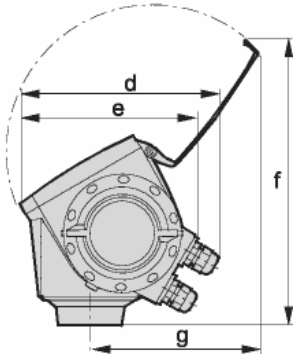
Note:

- 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.

Dimensions in mm (inches) and kg (lbs)



Housing front view



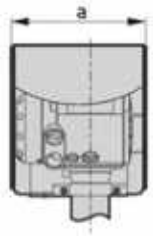
Housing side view

Dimensions mm (inches)

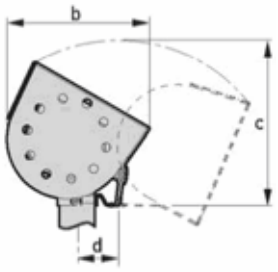
	a	b	c	d	e	f	g	Weight kg (lbs)
Housing	180 (7.1)	122 (4.8)	158.5 (6.2)	182 (1) (7.2)	167 (6.7)	277 (10.9)	155 (6.10)	3.3 (7.3)

1 if fitted with cable glands

Dimensions and Weight in mm (inches) and kg (lbs)



Weather protection back view

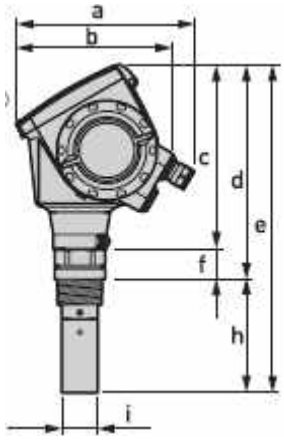


Weather protection left side

	Dimensions mm (inches)				
	a	b	c	d	Weight kg (lbs)
Weather protection	208 (8.2)	231.5 (9.1)	268 (1) (10.6)	66 (2.6)	2.9 (6.4)

1 radius

Dimensions and Weight in mm (inches) and kg (lbs)

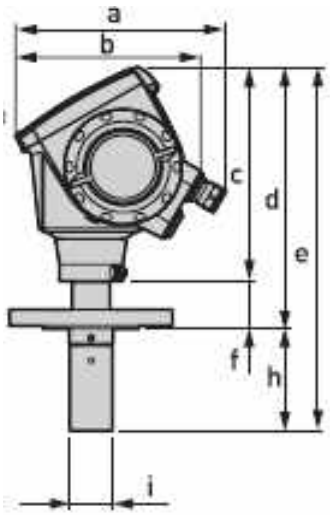


Antenna with thread connection

	Dimensions mm (inches)								Weight kg (lbs)
	a	b	c	d	e	f	h	i	
DN40/1.5" Antenna	194 (1) (7.6)	170 (6.7)	201 (7.9)	233 (9.2)	359 (14.1)	32 (1.3)	126 (3) (4.9)	39 (1.5)	5.1 (11.2)
DN50/2" Antenna	182 (1) (7.2)	167 (6.5)	201 (7.9)	234 (9.2)	370 (14.5)	32 (1.3)	136 (5.3)	43 (1.7)	5.3 (11.6)

1 if fitted with standard cable glands
2 1½" NPT or G process connections available
3 additional antenna extensions of Ø39 (1.5) × length 105 (4.1) are available

Dimensions and Weight in mm (inches) and kg (lbs)



DN40/50 long antenna

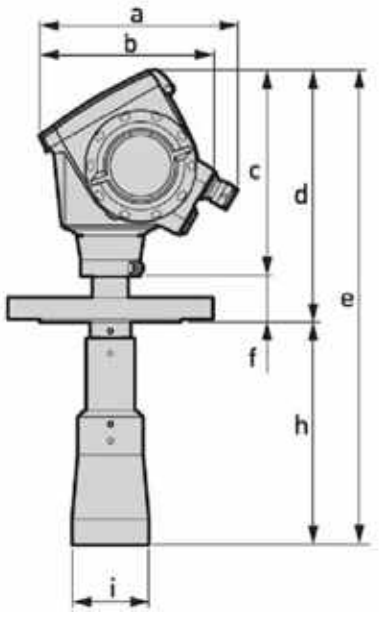
	Dimensions mm (inches)								
	A	b	c	d	e	f	h	i	Weight kg (lbs)
DN40 long	194 (1) (7.6)	170 (6.7)	201 (7.9)	246 (3) (9.7)	342 (3) (13.5)	45 (3) (1.8)	96 (2) (3.8)	39 (1.5)	6.6…14.1 (14.4…31.1)
DN50 long	182 (1) (7.2)	167 (6.5)	201 (7.9)	246 (3) (9.7)	353 (3) (13.9)	45 (3) (1.8)	107 (2) (4.2)	43 (1.7)	6.8…14.3 (14.8…31.5)

1 if fitted with standard cable glands

2 additional antenna extensions of Ø39 (1.5) × length 105 (4.1) are available

3 with ¼ NPTF purge connection option: add 17 (0.7) to this dimension. With distance piece option: add 71 (2.8) to this dimension

Dimensions and Weight in mm (inches) and kg (lbs)

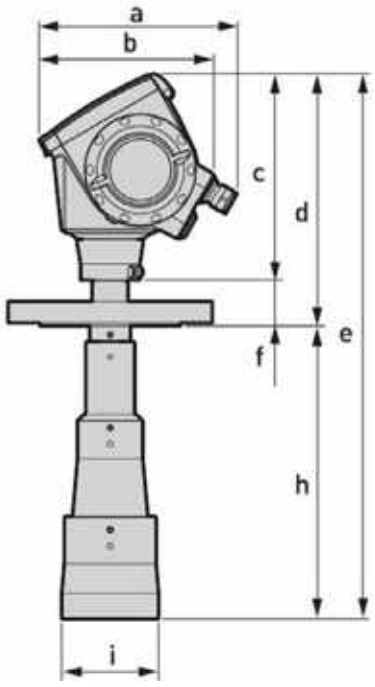


DN80 long antenna

	Dimensions mm (inches)								Weight kg (lbs)
	a	b	c	d	e	f	h	i	
DN80 long	182 (1) (7.2)	167 (6.5)	201 (7.9)	246 (3) (9.7)	463 (3) (18.2)	45 (3) (1.8)	217 (2) (8.5)	75 (3.0)	11.1…18.9 (24.4…41.5)

1 if fitted with standard cable glands
2 additional antenna extensions of Ø39 (1.5) × length 105 (4.1) are available
3 with ¼ NPTF purge connection option: add 17 (0.7) to this dimension. With distance piece option: add 71 (2.8) to this dimension

Dimensions and Weight in mm (inches) and kg (lbs)

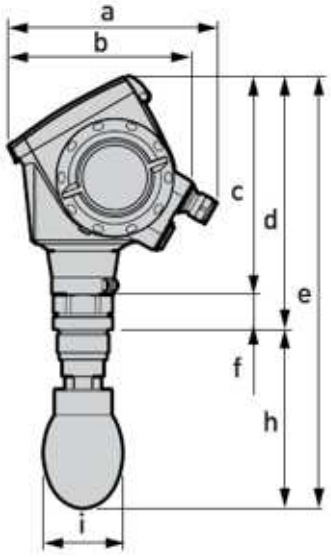


DN100/4" long horn antenna

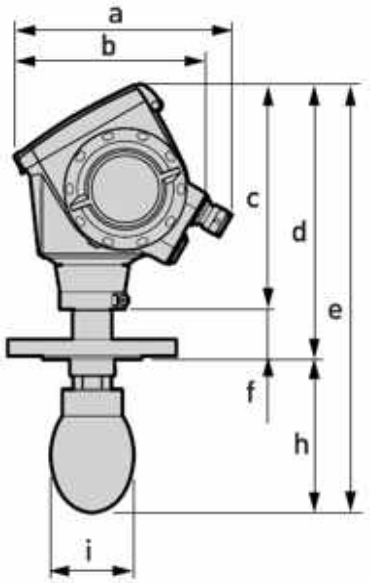
	Dimensions mm (inches)								Weight kg (lbs)
	a	b	c	d	e	f	h	i	
DN100 long	182 (1) (7.2)	167 (6.5)	201 (7.9)	246 (3) (9.7)	532 (3) (20.9)	45 (3) (1.8)	286 (2) (11.3)	95 (3.7)	11.6…28.2 (25.6…62.2)

1 if fitted with standard cable glands
2 additional antenna extensions of Ø39 (1.5) × length 105 (4.1) are available
3 with ¼ NPTF purge connection option: add 17 (0.7) to this dimension. With distance piece option: add 71 (2.8) to this dimension

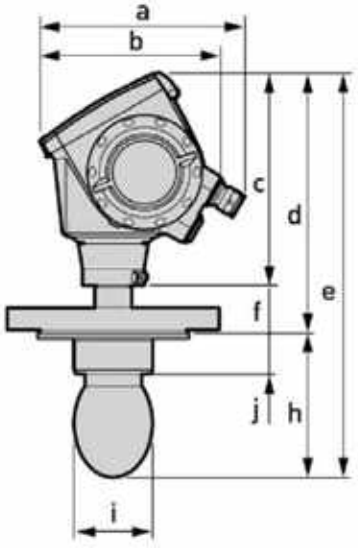
Dimensions and Weight in mm (inches) and kg (lbs)



DN80/3” drop antenna, with G 1½ or 1½ NPT thread conn



DN80/3” drop antenna, without plate

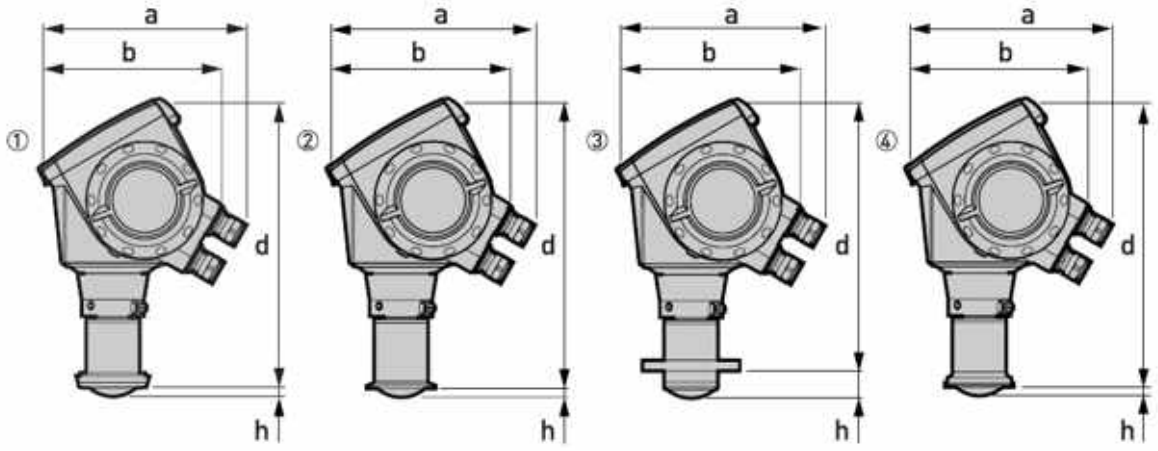


DN80/3” drop antenna, with plate

	Dimensions mm (inches)									Weight kg (lbs)
	a	b	c	d	e	f	h	i	j	
Thread	182 (1) (7.2)	167 (6.5)	201 (7.9)	234 (9.2)	399 (15.7)	33 (1.3)	165 (2) (6.5)	74 (2.9)	-	5.7…6.1 (12.6…13.4)
Flange	182 (1) (7.2)	167 (6.5)	201 (7.9)	246 (9.7)	383 (15.1)	45 (1.8)	137 (2) (4.5)	74 (2.9)	-	6.3…26 (13.9…57.3)
Flange with plate	182 (1) (7.2)	167 (6.5)	201 (7.9)	246 (9.7)	383 (15.1)	45 (1.8)	137 (2) (5.4)	74 (2.9)	39* (1.5)	6.6…26.8 (13.9…59.1)

1 if fitted with standard cable glands
2 additional antenna extensions of Ø39 (1.5) × length 105 (4.1) are available. Do not attach more than 5 antenna extensions.

Dimensions and Weight in mm (inches) and kg (lbs)



1 DN50/2¨ Hygienic antenna with DIN 11851 connection
2 DN50/2¨ Hygienic antenna with Tri-Clamp® connection
3 DN50/2¨ Hygienic antenna with Neumo BioControl® connection
4 DN50/2¨ Hygienic antenna with SMS connection

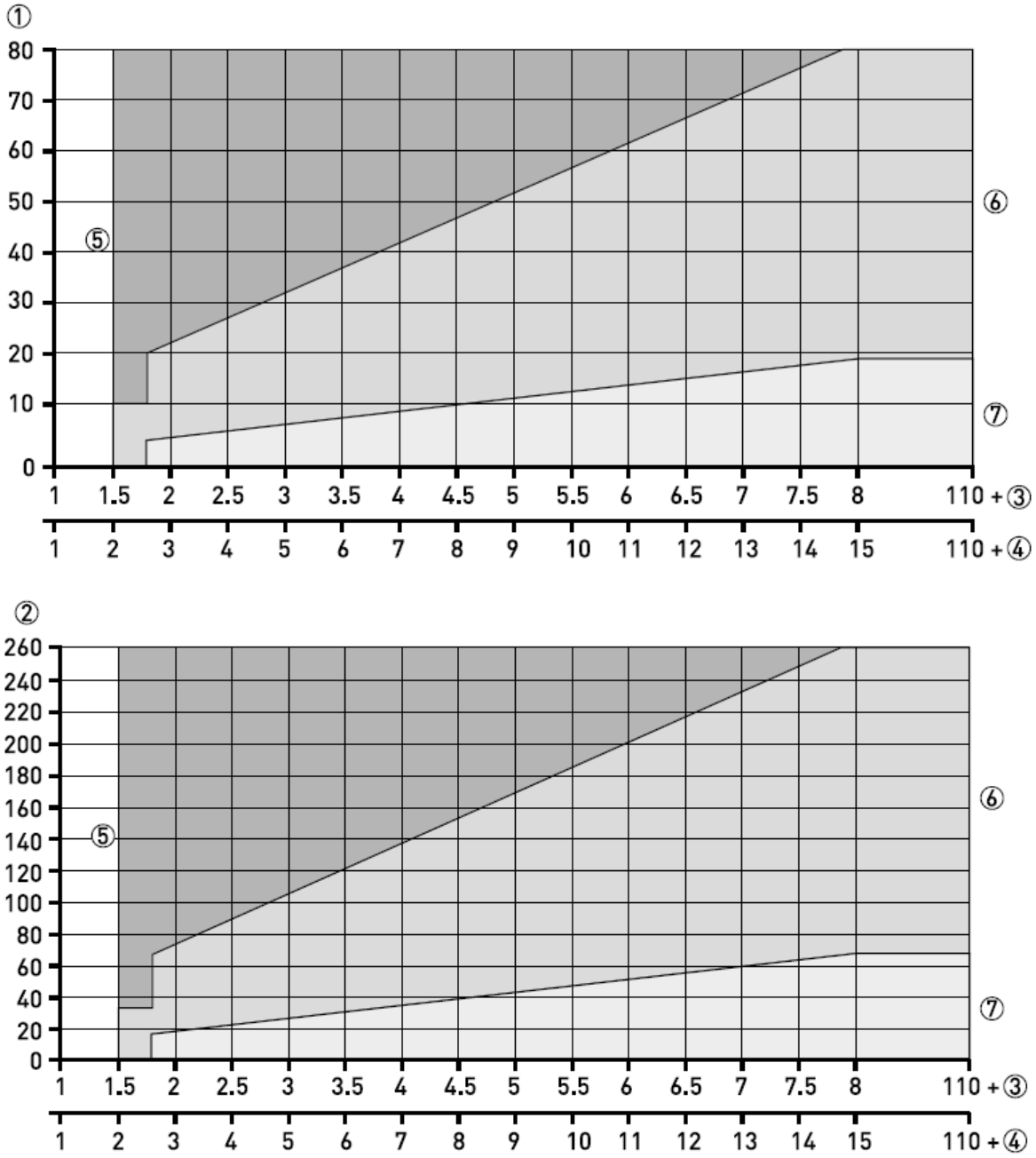
	Dimensions mm (inches)				
	a	b	d	h	Weight kg (lbs)
DIN 11851 connection	182 (1) (7.2)	167 (6.5)	264 (10.4)	8 (0.3)	3.8 (8.4)
Tri-Clamp® connection	182 (1) (7.2)	167 (6.5)	264 (10.4)	8 (0.3)	3.7 (8.2)
Neumo BioControl® connection	182 (1) (7.2)	167 (6.5)	247 (9.7)	25 (1.0)	4.0 (8.8)
SMS connection	182 (1) (7.2)	167 (6.5)	264 (10.4)	8 (0.3)	3.8 (8.4)

1 if fitted with standard cable glands

Antenna selection: liquid applications

The graphs below show which antenna to select for the application based on:

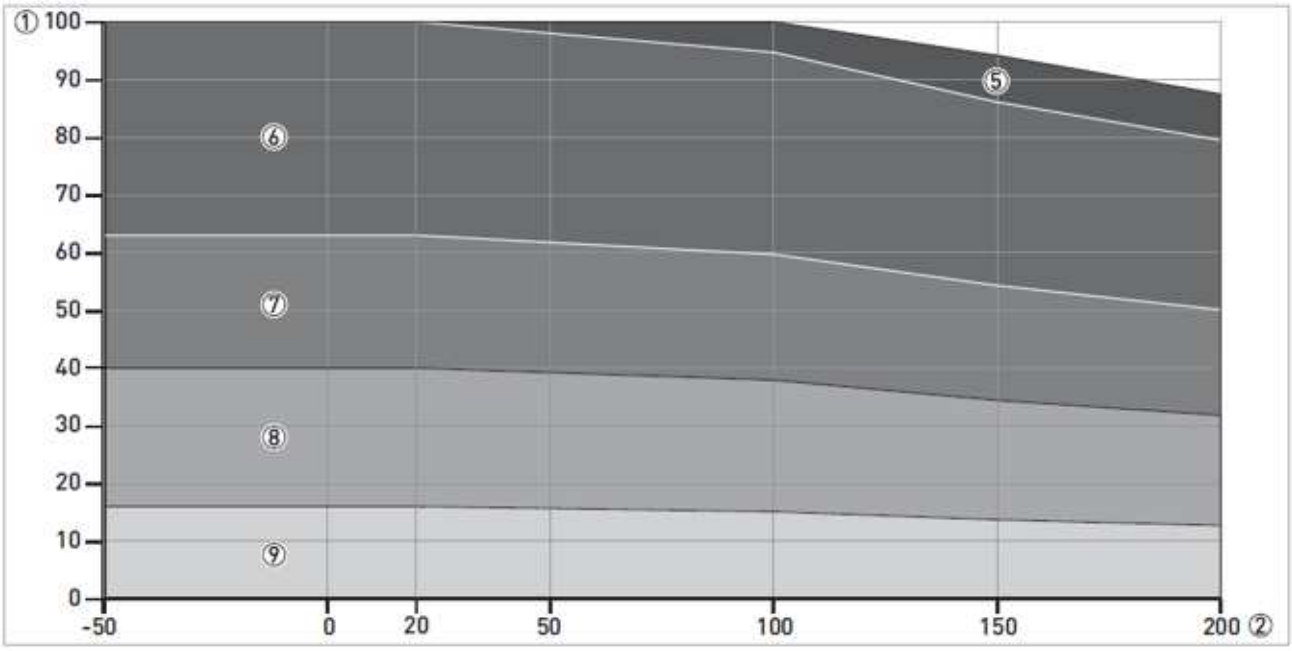
- D, the measuring range,
- ε_r is the dielectric constant of the product being measured and
- the application.



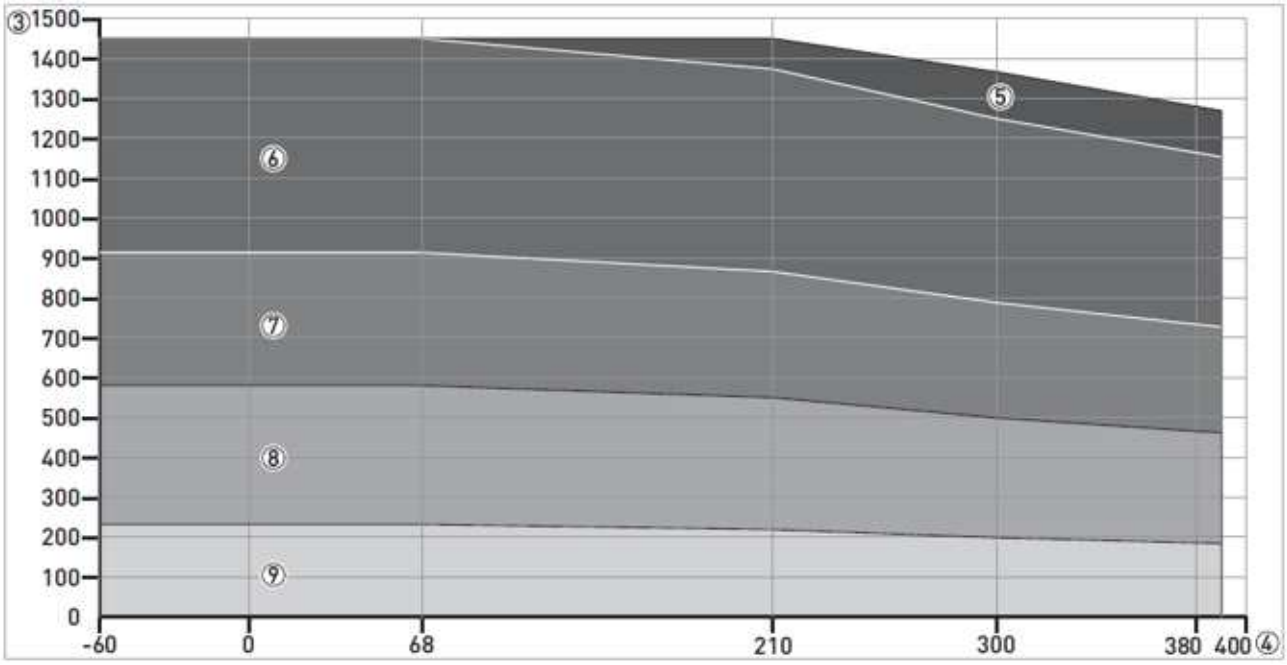
1 Distance, D [m]
2 Distance, D [ft]
3 Dielectric constant (ε_r) range for storage/agitator applications
4 Dielectric constant (ε_r) range for process/agitator applications
5 DN 80 or DN 100 Horn antenna in a still well
6 DN 80 or DN 100 Horn antenna with or without a still well, or DN 80 Drop antenna without a still well
7 DN40, DN 50, DN 80 or DN 100 Horn antenna with or without a still well, DN 80 Drop antenna without a still well or Hygienic antenna

Guidelines for maximum operating pressure

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

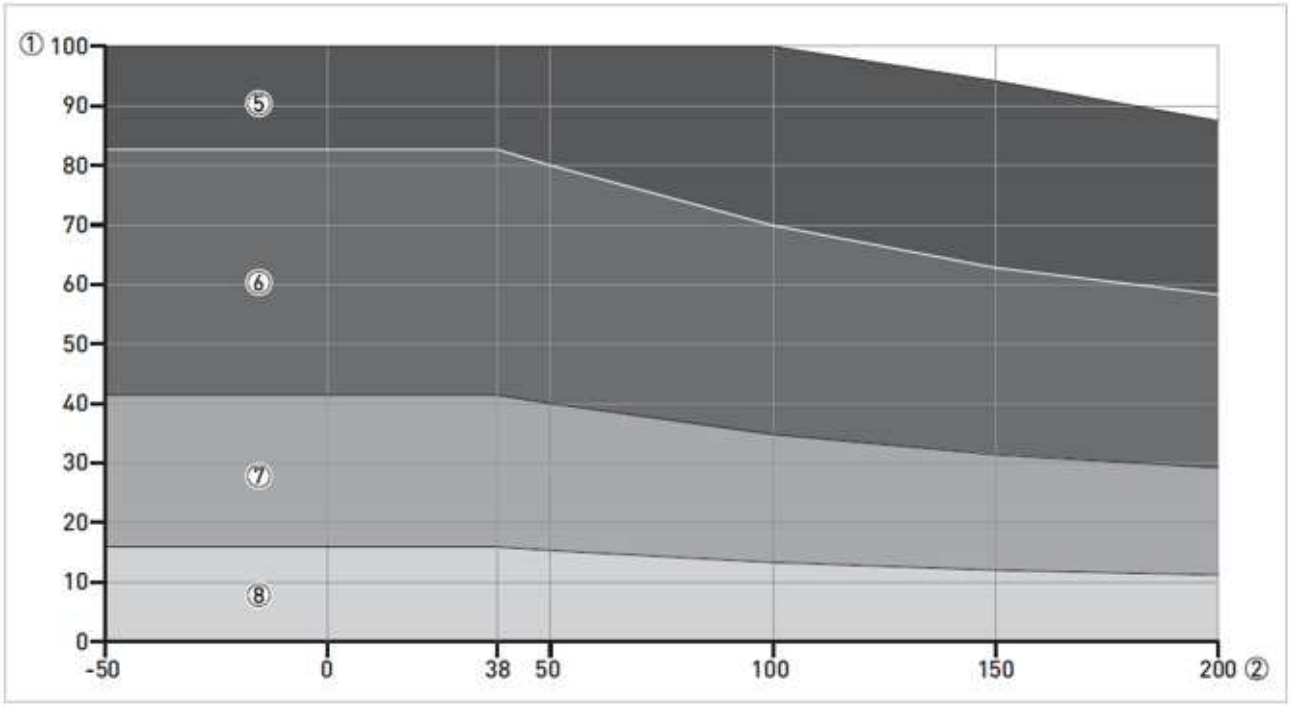


Pressure / temperature de-rating (EN 1092-1), flange and threaded connection, in °C and barg

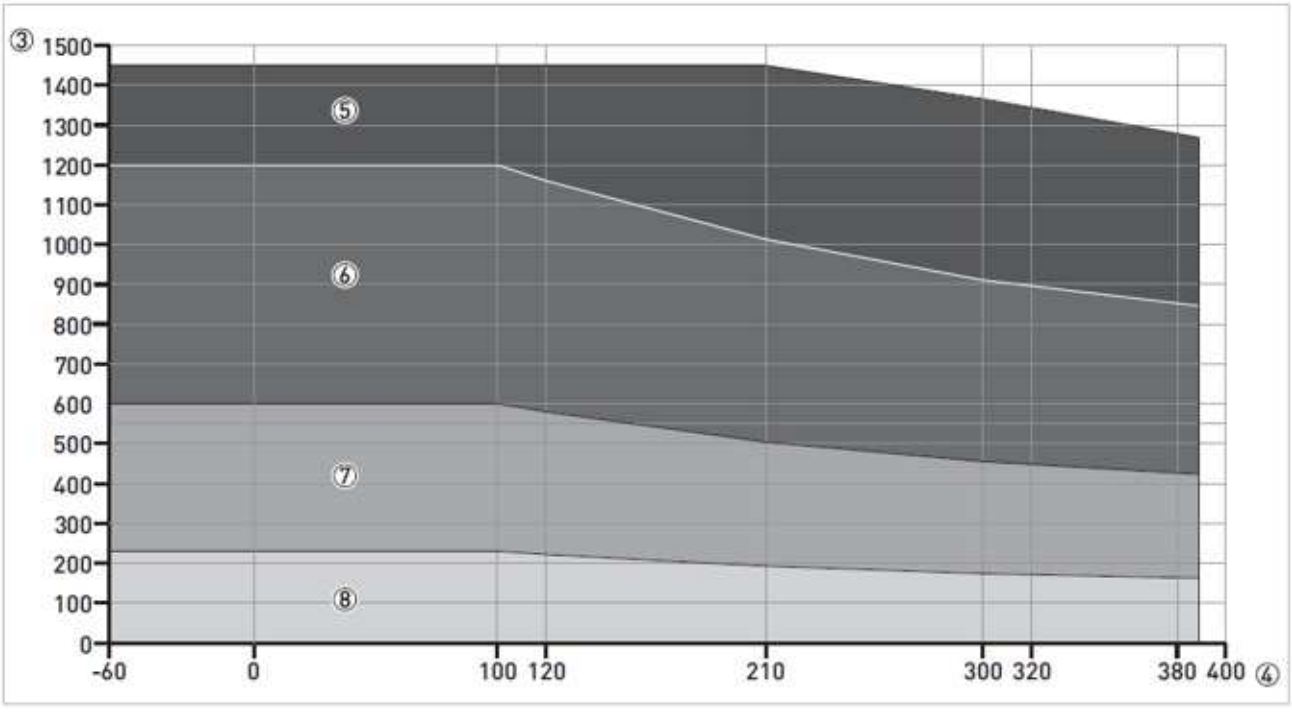


Pressure / temperature de-rating (EN 1092-1), flange and threaded connections, in °F and psig

1 p [barg]
2 T [°C]
3 p [psig]
4 T [°F]
5 Threaded connection, G (ISO 228-1)
6 Flange connection, PN100
7 Flange connection, PN63
8 Flange connection, PN40
9 Flange connection, PN16



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



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 Flange connection, Class 900 and Class 1500. Threaded connection, NPT (ASME B1.20.1).
6 Flange connection, Class 600
7 Flange connection, Class 300
8 Flange connection, Class 150