

## SmartLine® Non-Contact Radar Level Meter for Solids Technical Datasheet

34-VF-03-25  
May 2010

### Specification

#### The Universal Radar Solution

The SmartLine Non-Contact Radar Level Meter (FMCW) for solids is designed for distance, level and volume measurement of powders, granulates and other solids. 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

- $\pm 10$  mm /  $\pm 0.4$ " 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 DTM's 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

Figure 1 – SmartLine Non-Contact Radar Level Meter



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)

## Options



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.



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 316 L or Hastelloy® C-22.
- 2 antenna sizes: DN80 or DN100.
- Antennas can be extended to suit any nozzle length.

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 powders and granulates
Primary measured value	$\Delta f$ (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
Standard	Antenna purging system for horn antenna (supplied with ¼ NPTF connection)
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)
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 (½ angle)	Horn DN80 / 3": 10°
	Horn DN100 / 4": 8°
	Horn DN150 / 6": 8° (pending)
	Drop DN80 / 3": 8°
	Drop DN150 / 6": 4°

### 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	±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 mbar abs ±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 "Material") Ex i: see supplementary operating instructions or approval certificates
Storage temperature	-40...+85°C (-40...+185°F)
<b>Flange temperature</b>	
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 "Material") 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 "Material") 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 "Material") Ex: see supplementary operating instructions or approval certificates
Thermal shock resistance	<40°C/s / <72°F/s
<b>Operating pressure</b>	
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
Horn Antenna	Standard: -1...40 barg / -14.5...580 psig; subject to process connection used and flange temperature
<b>Other Conditions</b>	
Dielectric constant ( $\epsilon_r$ )	$\geq 1.5$
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)
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.

## Material

Housing	Standard: Aluminum
	Option: Stainless steel (1.4404 / 316 L)
Wetted parts, including antenna	<b>Horn antenna:</b> Stainless steel (1.4404 / 316L) <b>Drop antenna:</b> PTFE; PP - a PP or PTFE flange plate option is also available
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
Gaskets (and o-rings for the sealed antenna extension option)	<b>PTFE Drop antennas:</b> 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)
	<b>PP Drop antennas:</b> 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)
	<b>Horn antennas:</b> 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 (-40...+200°C / -40...+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"; NPT 1½"
Flange	
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

## Electrical Connections

Power Supply	<b>Terminals output 1 - Non-Ex / Ex i:</b> 14...30 VDC; min./max. value for an output of 22 mA at the terminal
	<b>Terminals output 1 - Ex d:</b> 20...36 VDC; min./max. value for an output of 22 mA at the terminal
	<b>Terminals output 2 - Non-Ex / Ex i / Ex d:</b> 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

<b>Current Output</b>	
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
<b>PROFIBUS PA</b>	
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.
<b>FOUNDATION Fieldbus</b>	
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 (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 21 IP6X T65°C...T90°C; ATEX II G 1/2, 2 Ex d [ia] IIC T6...T3; ATEX II D 1/2, 2 Ex tD[iaD] A21/20 or Ex tD[iaD] A21 IP6X T65°C...T90°C
IECEx (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
FM - Dual Seal-approved (pending)	<b>NEC 500/ CEC:</b> Cl. I, Div. 1, Gr. ABCD (IS); Cl. I, Div. 1, Gr. ABCD (FM only) (XP); Cl. I, Div. 2, Gr. ABCD (XP/NI); Cl. II, Div. 1, Gr. EFG; Cl. III (FM only) (XP); Cl. II, Div. 1, Gr. EFG; Cl. III (IS); Cl. II/III, Div. 2, Gr. FG (XP/NI) <b>NEC 505/ CEC:</b> Cl. I, Zone 0 AEx ia Gr. IIC (CSA: Ex ia) (IS); Cl. I, Zone 1 AEx d [ia] Gr. IIC (XP); Cl. I, Zone 2 AEx nA [ia] Gr. IIC (CSA: Ex nA [ia]) (IS)
CSA - Dual Seal-approved (pending)	<b>CEC Section 18 (Zone ratings)</b> 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; <b>CEC Section 18 and Annex J (Division ratings)</b> 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
<b>Other standards and approvals</b>	
EMC	EMC Directives 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 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

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

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)

Diagram of the housing front view. Dimension 'a' is the total width. Dimension 'b' is the width of the upper section. Dimension 'c' is the total height.

Housing front view

Diagram of the housing side view. Dimension 'd' is the width of the upper section. Dimension 'e' is the width of the lower section. Dimension 'f' is the total height. Dimension 'g' is the width of the base.

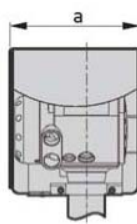
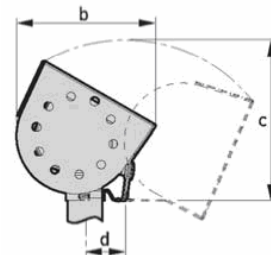
Housing side view

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

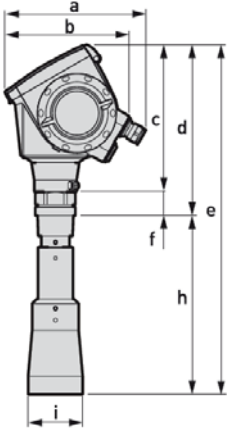
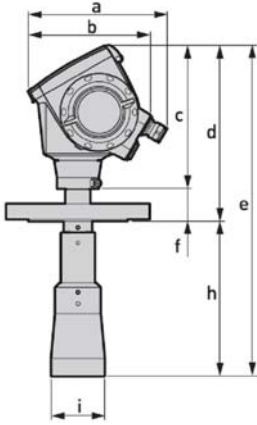
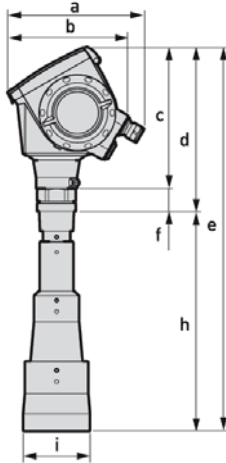
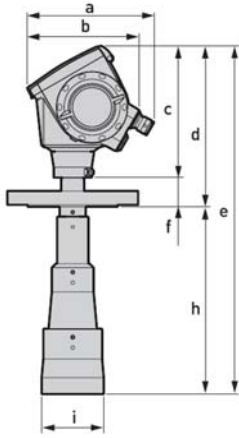
Dimensions and Weight in mm (inches) and kg (lbs)

					
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

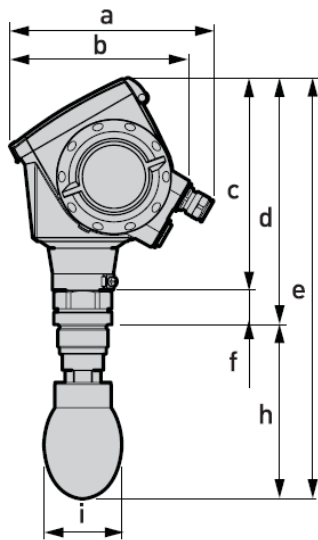


# Dimensions and Weight in mm (inches) and kg (lbs)

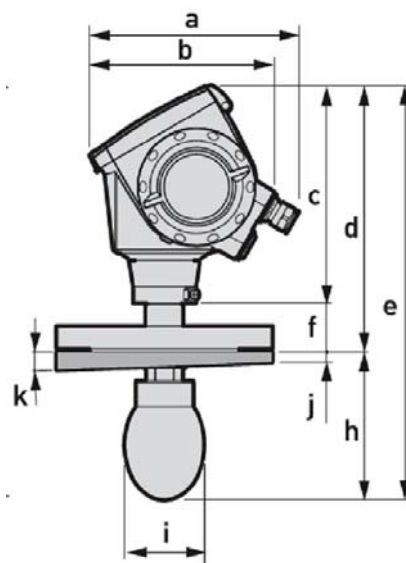
<div>  <p>DN80 long antenna with G 1 1/2 or 1 1/2 NPT connection</p>  <p>DN80 long antenna with flange connection</p> </div>									
<div>  <p>DN100 long antenna with G 1 1/2 or 1 1/2 NPT connection</p>  <p>DN100/4" long horn antenna with flange connection</p> </div>									
	Dimensions mm (inches)								
	a	b	c	d	e	f	h	i	Weight kg (lbs)
DN80 Thread	182 (1) (7.2)	167 (6.5)	201 (7.9)	233 (9.7)	479 (18.2)	32 (1.3)	246 (2) (9.7)	75 (3.0)	6.8 (15)
DN80 Flange	182 (1) (7.2)	167 (6.5)	201 (7.9)	246 (9.7)	463 (18.2)	45 (1.8)	217 (2) (8.5)	75 (3.0)	6.9...26.2 (15.2...57.8)
DN100 Thread	182 (1) (7.2)	167 (6.5)	201 (7.9)	233 (9.7)	548 (20.9)	32 (1.3)	315 (2) (12.4)	95 (3.7)	7.2 (15.8)
DN100 Flange	182 (1) (7.2)	167 (6.5)	201 (7.9)	246 (9.7)	532 (21.6)	45 (1.8)	286 (2) (11.3)	95 (3.7)	7.9...27.2 (17.4...60)

1 if fitted with standard cable glands

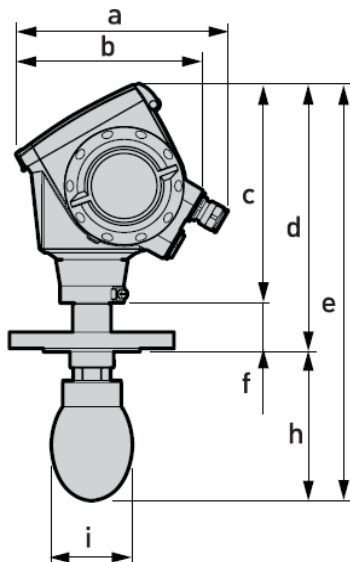
2 additional antenna extensions of Ø39 (1.5") x length 105 mm (4.1") are available



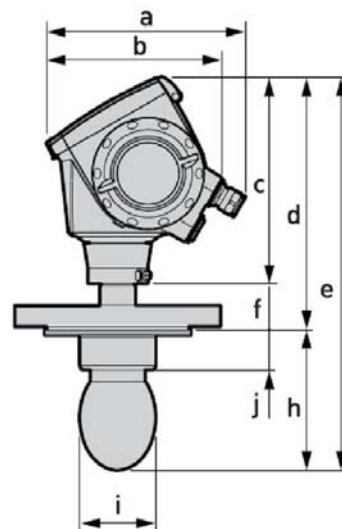
DN80/3" drop antenna, with G 1½ or 1½ NPT thread conn



DN80/3" drop antenna, with slanted flange



DN80/3" drop antenna, with flange connection



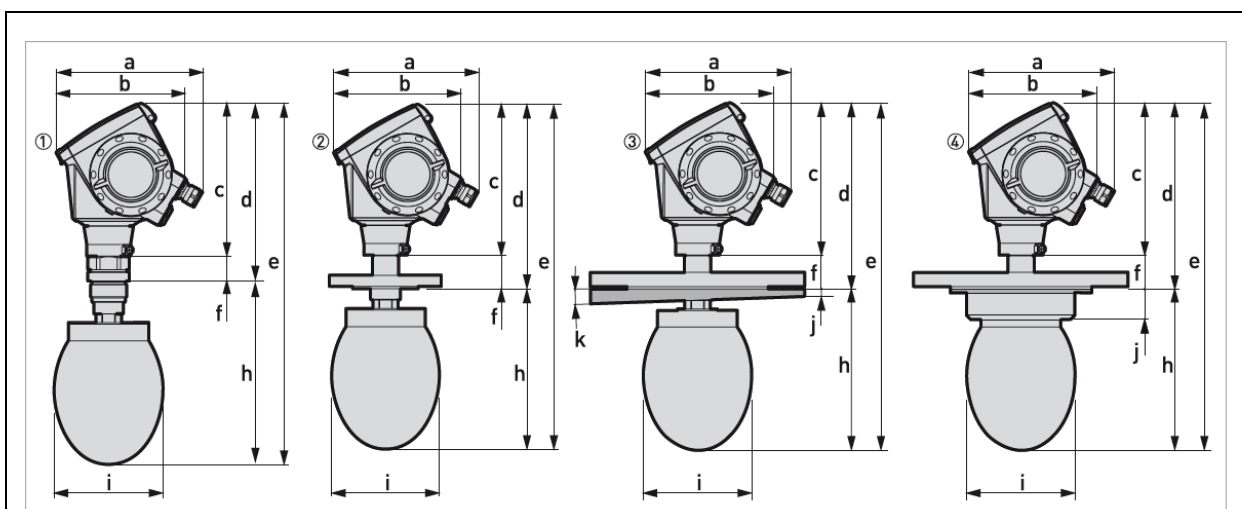
DN80/3" drop antenna, with flange plate protection

	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)
Slanted Flange (3)	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)	10 (0.4)	6.4...26.6 (14.1...58.6)
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.

3 Slanted flange is 2° (dimension k)



- 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 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)	476 (18.7)	33 (1.3)	242 (2) (9.5)	144 (5.7)	-	7.4 (16.3)
Flange	182 (1) (7.2)	167 (6.5)	201 (7.9)	246 (9.7)	460 (18.1)	45 (1.8)	214 (2) (8.4)	144 (5.7)	-	8...27.3 (17.6...60.2)
Slanted Flange (3)	182 (1) (7.2)	167 (6.5)	201 (7.9)	246 (9.7)	460 (18.1)	45 (1.8)	214 (2) (8.4)	144 (5.7)	10 (0.4)	8.1...27.9 (17.8...61.5)
Flange with plate	182 (1) (7.2)	167 (6.5)	201 (7.9)	246 (9.7)	460 (18.1)	45 (1.8)	214 (2) (8.4)	144 (5.7)	39 (1.5)	8.3...28.1 (18.3...62)

1 if fitted with standard cable glands

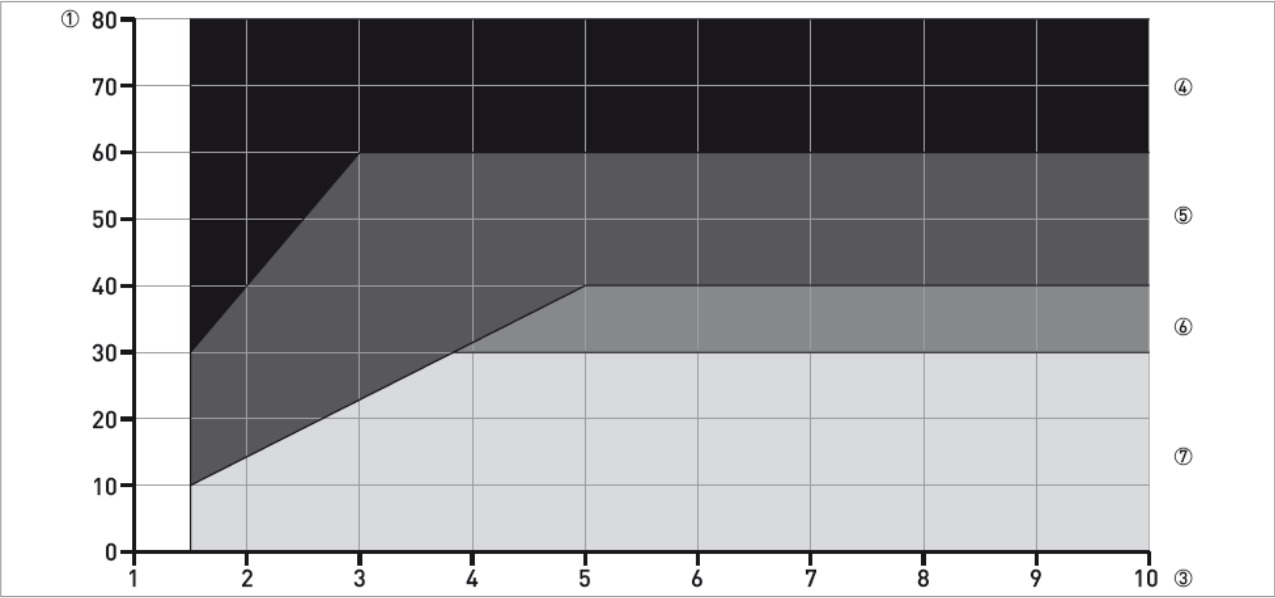
2 additional antenna extensions of Ø39 (1.5) × length 105 (4.1) are available. Do not attach more than 5 antenna extensions.

3 Slanted flange is 2° (dimension k)

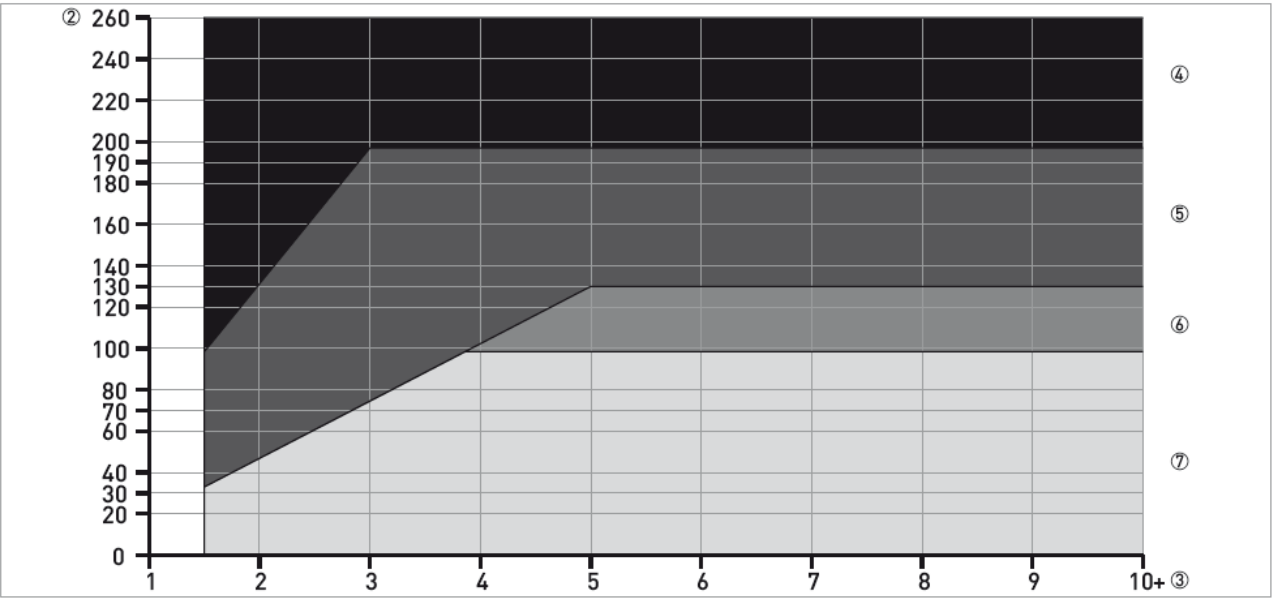
## Antenna selection: liquid applications

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

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



Selection of antenna for solid applications (graph of distance in m against  $\Sigma r$ )



Selection of antenna for solid applications (graph of distance in ft. against  $\Sigma r$ )

- 1 Distance, D [m]
- 2 Distance, D [ft]
- 3 Dielectric constant ( $\Sigma r$ )
- 4 On request
- 5 DN 150 Drop antenna
- 6 DN 100 horn and DN 150 Drop antenna
- 7 DN 80 horn, DN 80 Drop, DN 100 horn and DN 150 Drop antenna

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## Ordering Information

Contact your nearest Honeywell sales office, or

**In the U.S.:**

Honeywell Process Solutions  
Honeywell International Inc  
2500 West Union Hills Drive  
Phoenix, AZ 85027 1-800-343-0228

**In Europe and Africa:**

Honeywell S. A.  
Avenue du Bourget 1  
1140 Brussels, Belgium

**In Asia:**

Honeywell Asia Pacific Inc.  
Honeywell Building,  
17 Changi Business Park Central 1  
Singapore 486073  
Republic of Singapore

**In Canada:**

The Honeywell Centre  
155 Gordon Baker Rd.  
North York, Ontario M2H 3N7  
1-800-461-0013

**In Eastern Europe:**

Honeywell Praha,  
s.r.o. Budejovicka 1  
140 21 Prague 4,  
Czech Republic

**In the Pacific:**

Honeywell Pty Ltd.  
5 Thomas Holt Drive  
North Ryde NSW Australia 2113  
(61 2) 9353 7000

**In Latin America:**

Honeywell Inc.  
480 Sawgrass Corporate Parkway,  
Suite 200 Sunrise, FL 33325  
(954) 845-2600

**In the Middle East:**

Honeywell Middle East Ltd.  
Khalifa Street,  
Sheikh Faisal Building  
Abu Dhabi, U. A. E.

**In Japan:**

Honeywell K.K.  
14-6 Shibaura 1-chrome  
Minato-ku, Tokyo, Japan 105-0023

Or, visit Honeywell on the World Wide Web at: <http://www.honeywell.com/ps>  
*Specifications are subject to change without notice.*