MAGNETROL®

AMETEK®
SENSORS, TEST & CALIBRATION

Pulsar® Model R96

Pulse Burst Radar Level Transmitter

DESCRIPTION

The Pulsar® R96 Radar transmitter is the latest generation of Magnetrol® 24 V DC, loop-powered, non-contact radar transmitters. Enhanced performance and innovative diagnostics bring simplicity to an often complicated technology.

This latest entry into the radar level measurement field is designed to provide unparalleled performance and ease of use. PULSAR non-contact radar is the perfect compliment to the MAGNETROL Eclipse® Model 706 Guided Wave Radar transmitter. Together, these transmitters offer the ultimate solution to the vast majority of process level applications.

TECHNOLOGY

The PULSAR Radar transmitter is based on pulse burst radar technology combined with equivalent time sampling circuitry. Short bursts of 6 GHz microwave energy are emitted and subsequently reflected from the liquid level surface. Distance is calculated by the equation **D = Transit time (round-trip)/2**. Liquid level is then calculated by applying the tank height value.

APPLICATIONS

MEDIA: Liquids and slurries; hydrocarbons to water-based media (dielectric 1.7–100)

VESSELS: Most metal and concrete process or storage vessels up to rated temperature and pressure. Pits and sumps as well as glass-lined tanks.

CONDITIONS: Virtually all level measurement and control applications including process conditions exhibiting varying specific gravity and dielectric, visible vapors, high fill/empty rates, turbulence, low to moderate foam and buildup.

FEATURES

- Multivariable two-wire, 24 VDC loop-powered transmitter for level or volume
- Performance not process dependent (changing specific gravity and dielectric have no effect)
- 6 GHz operating frequency offers superior performance in the tougher applications with turbulence, foam, and heavy vapors
- Echo Rejection setup is simple, intuitive and effective
- Antenna designs to +200 °C (+400 °F), -1.0 to 51.7 bar (-14.7 to 750 psig)
- Range up to 40 m (130 ft)
- Quick connect/disconnect antenna coupling allows vessel to remain sealed
- Extremely low output at antenna: < .01 mW (avg), < 2 mW (max); hundreds of times less than a cell phone
- 4-button keypad and graphic LCD display allow for convenient viewing of configuration parameters and echo curve
- Proactive diagnostics advise not only what is wrong, but also offer troubleshooting tips
- Available for use in SIL 2 Loops (92.7 % SFF, with full FMEDA report available)
- PACT*ware*™ PC Program and enhanced DTMs for advanced configuration and troubleshooting
- Available with HART® or FOUNDATION Fieldbus™ digital output

TECHNOLOGY

PULSE BURST RADAR

PULSAR R96 is a top-mounted, downward-looking pulse burst radar operating at 6 GHz. Unlike true pulse devices (e.g. ECLIPSE Guided Wave Radar) which transmit a single, sharp (fast rise-time) waveform of wide-band energy (Figure 1), PULSAR emits short bursts of 6 GHz energy (Figure 2) and measures the transit time of the signal reflected off the liquid surface.

Distance is calculated utilizing the equation Distance equals the Speed of light multiplied by the transit time divided by two (*Distance = C × Transit Time/2*), then developing the level value by factoring in tank height and other configuration information (Figure 3). The exact reference point for distance and level calculations is the sensor reference point (bottom of an NPT thread, top of a BSP thread, or face of a flange).

The exact level measurement is extracted from false target reflections and other background noise via the use of sophisticated signal processing. The new PULSAR Model R96 circuitry is extremely energy efficient so no duty cycling is necessary to accomplish effective measurement.

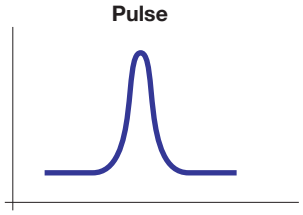


Figure 1

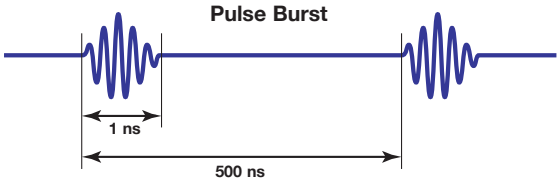


Figure 2

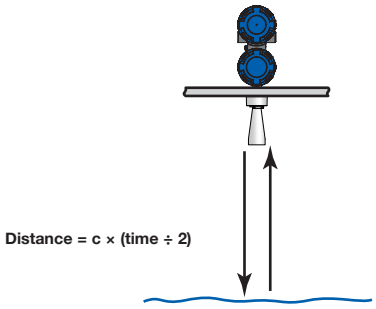


Figure 3

OPERATIONAL CONSIDERATIONS

Radar applications are characterized by three basic conditions:

- Dielectric (process medium)
- Distance (measuring range)
- Disturbances (turbulence, foam, false targets, multiple reflections and rate of change)

The PULSAR R96 Radar transmitter is offered with four antenna configurations:

- Polypropylene Dielectric Rod
- TFE Dielectric Rod
- 4" Horn
- 6" Horn

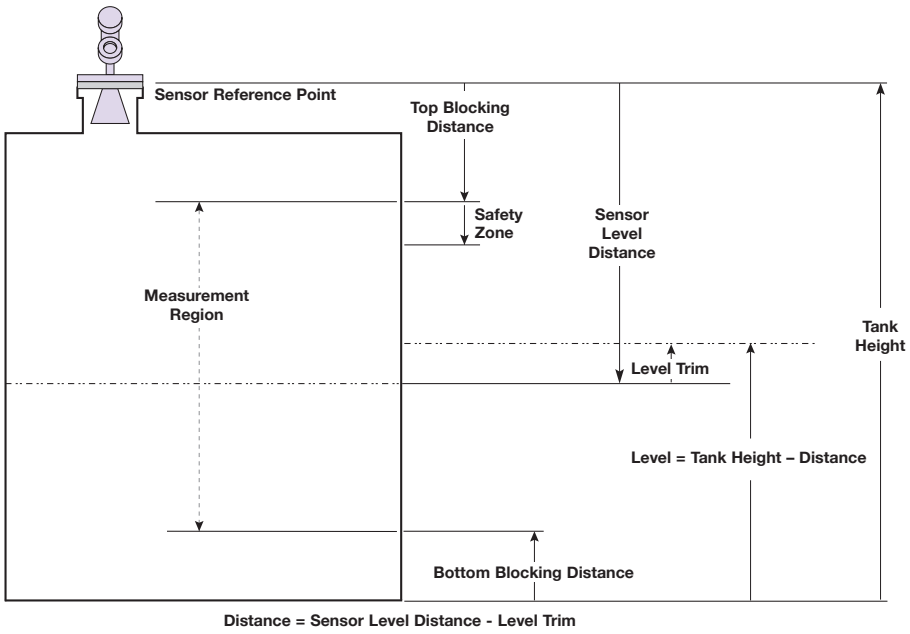


Figure 4

Maximum measuring range (distance) is measured from the sensor reference point (bottom of NPT thread, top of BSP thread, or face of flange) to the bottom of the tank. Refer to Figure 4.

Ideally, the 6" horn antenna should be used to ensure the best possible performance in all operational conditions. However, since that is impractical in most cases, other antennas are available. The chart shows the maximum measuring range of each antenna based on dielectric and turbulence. Refer to Figure 5.

Obstructions, noise and media buildup drastically decrease reliable measurement. Although it is theoretically possible to measure a liquid level on the antenna, liquid should not be allowed closer than 50 mm (2") from the bottom of the antenna due to the decrease in accuracy when liquid level is present on the antenna. Refer to Figure 6.

R96 Maximum Recommended Measuring Range in m (ft)						
	Turbulence None or Light			Turbulence Medium or Heavy		
Dielectric >	1.7 - 3	3 - 10	10 - 100	1.7 - 3	3 - 10	10 - 100
Antenna Type						
Dielectric Rod	5 (16)	12 (39)	20 (66)	3 (10)	9 (29)	12 (39)
4" Horn						
6" Horn	10 (33)	25 (82)	40 (131)	5 (16)	12 (39)	16 (52)

Figure 5

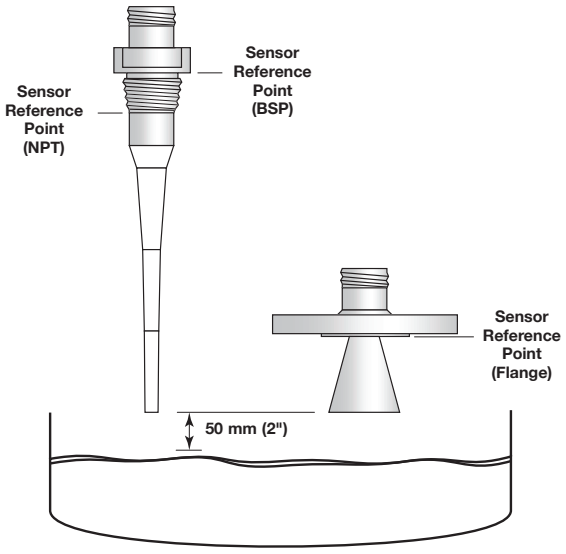


Figure 6

MOUNTING

The PULSAR Model R96 Radar transmitter can be mounted on a vessel using a variety of process connections. Generally either a threaded or flanged connection is used.

LOCATION

Ideally, the Radar transmitter should be mounted 1/2 radius from center of the tank providing an unobstructed signal path to the liquid surface where it should illuminate (with microwave energy) the largest possible surface area. Do not install in center of tank top or within 45 cm (18") of tank wall. Tank walls may produce reflections that must be minimized during field configuration (Antenna Orientation). Refer to Figure 7.

BEAM ANGLE

The various antenna designs exhibit different beam patterns. Figure 9 shows the beam spread for all PULSAR antennas. Ideally the beam pattern should illuminate the maximum liquid surface with a minimum striking other objects in the vessel including the tank wall. Use these drawings to determine the optimum installation location.

OBSTRUCTIONS

Almost any object that falls within the beam pattern will cause reflections that may be misinterpreted as a false liquid level. Although the PULSAR Model R96 has a powerful Echo Rejection routine, all possible precautions should be taken to minimize false target reflections with proper installation and orientation. Refer to Figures 8 & 9.

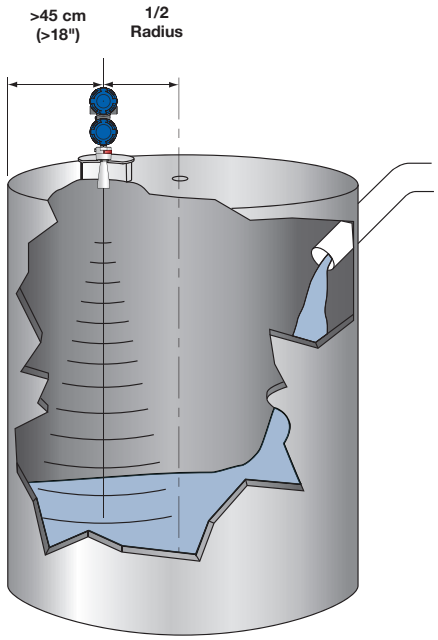


Figure 7

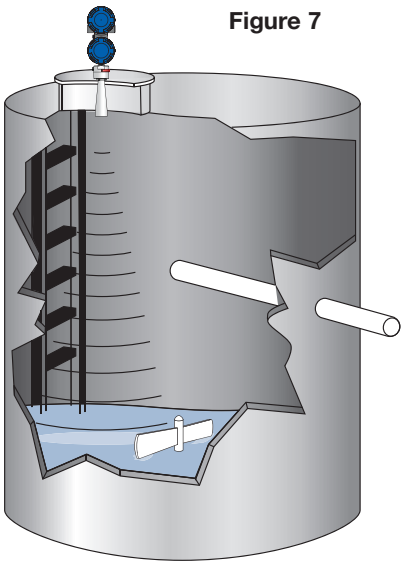


Figure 8

Antenna Beam Angle (∝) / Distance, D	Beam Spread, W @-3dB; m (ft)		
	Dielectric Rod 25°	4" Horn 25°	6" Horn 17°
3 (10)	1,4 (4.5)		1,0 (3.0)
6 (20)	2,7 (8.9)		1,8 (6.0)
9 (30)	4,11 (3.3)		2,7 (9.0)
12 (40)	5,4 (17.8)		3,7 (12.0)
15 (50)	6,8 (22.2)		4,6 (15.0)
18 (60)	8,1 (26.6)		5,5 (18.0)
20 (65)	8,8 (28.9)		6,0 (19.5)
30 (98)	*		9,0 (29.3)
40 (130)	*		12,0 (39.0)

*Dielectric rod and 4" horn not recommended beyond 20 m (65 ft).

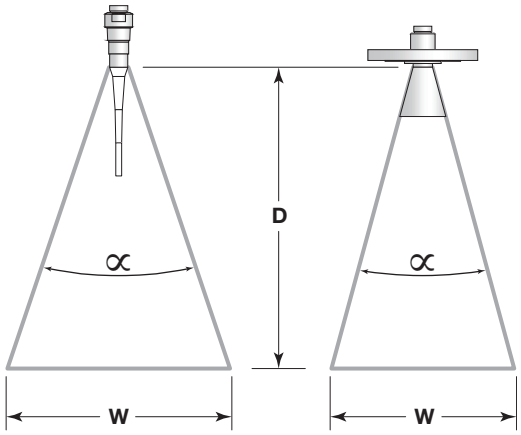
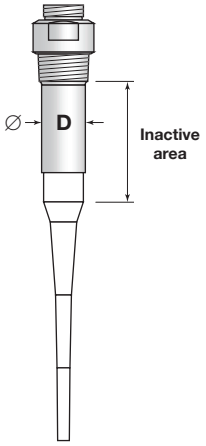


Figure 9

NOZZLES

Improper installation in a nozzle creates "ringing" (undesired signals) which will adversely affect measurement. The antenna should always be mounted so the active section of the antenna is a minimum of 13 mm (0.5") below the nozzle. Be sure to include any nozzle dimension ***inside*** the vessel. Refer to Figure 10. Antenna extensions are offered to allow the PULSAR Model R96 transmitter to work reliably in nozzles with "L" dimensions of 25 mm (1"), 100 mm (4"), 200 mm (8") or 300 mm (12"). Standard antennas are shown below for reference.



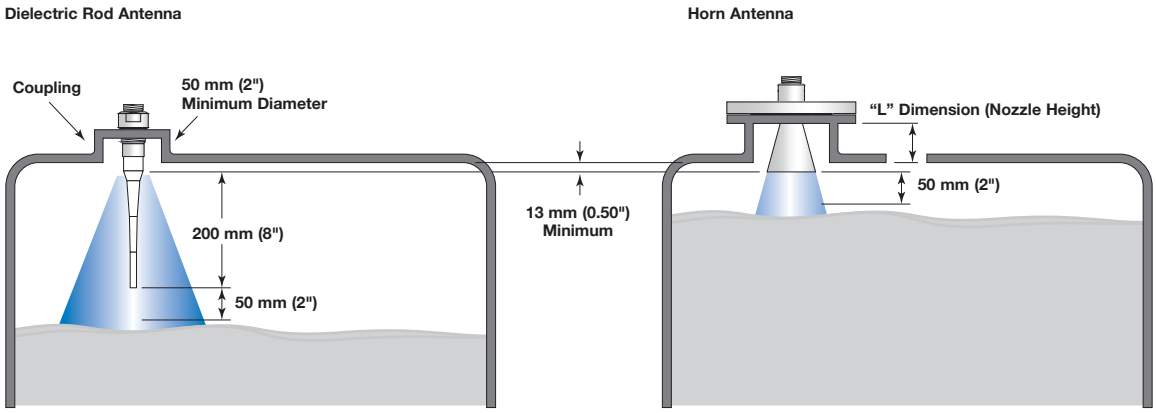
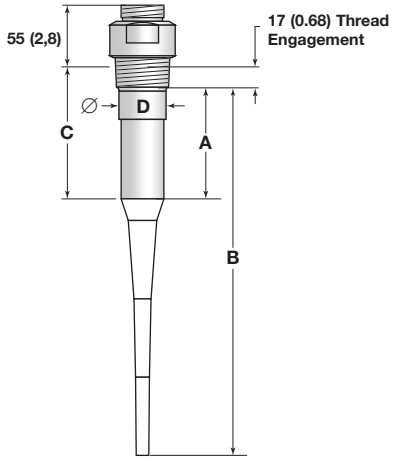


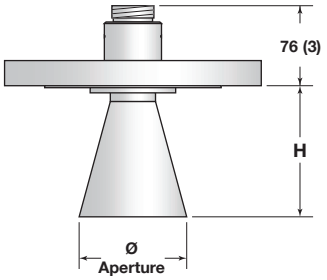
Figure 10



DIELECTRIC RODS – mm (inches)

Model #	Antenna Extension (maximum "L" dimension)	All	All	BSP
8th Digit		Dim A	Dim B	Dim C
0	25 (1)	58 (2.3)	282 (11.1)	76 (3.0)
1	100 (4)	160 (6.3)	389 (15.3)	185 (7.3)
2	200 (8)	267 (10.5)	493 (19.4)	287 (11.3)
3	300 (12)	368 (14.5)	594 (23.4)	389 (15.3)

Antenna Extension O.D. Dimension D	
TFE Rod	∅ 38 (1.50)
PP Rod	∅ 38 (1.50)



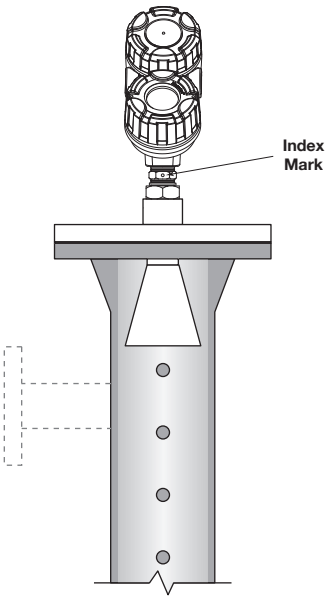
HORNS – mm (inches)

Model #	Antenna Extension (maximum "L" dimension)	4" Horn	6" Horn
8th Digit		Dim H	Dim H
1	100 (4)	117 (4.6)	↓
2	200 (8)	213 (8.4)	211 (8.3)
3	300 (12)	315 (12.4)	315 (12.4)
Aperture		95 (3.75)	146 (5.75)

STANDPIPES AND STILLWELLS

The PULSAR Model R96 can be mounted in a standpipe or stillwell but certain items must be considered:

- Metal stillwells only: Sizes 4–8 inches (100–200 mm).
- Diameter must be consistent throughout length; no reducers.
- Use only horn antennas sized to pipe ID; 4–6" (100–150 mm); 8" pipe can use a 6" horn.
- Stillwell length must cover complete range of measurement (i.e., liquid must be in stillwell).
- Welds should be smooth.
- Vents: holes < 13 mm (0.5") diameter, slots < 13 mm (0.5") width.
- If an isolation valve is used, it must be a full port ball valve with an I.D. equal to the pipe diameter.
- Bridles/Bypass Installations: The launcher (index mark) should be rotated 90° from process connections.
- Configuration must include a non-zero entry for PIPE I.D.
- There will be some increased dielectric sensitivity; system GAIN will be reduced when PIPE ID > 0.
- There will be a slight reduction in Maximum Range based on the table at right.



Maximum Range

PIPE I.D.		Propagation	Maximum Range	
inch	mm	Speed Factor	feet	meters
4	100	0.955	62.7	19.1
6	150	0.98	64.3	19.6
8	200	0.99	65.0	19.8

Figure 11

MOUNTING

ORIENTATION

The PULSAR Model R96 transmitter utilizes a linearly polarized, microwave beam that can be rotated to improve its performance. Proper orientation can minimize unwanted target reflections, decrease sidewall reflections (multipath) and maximize direct reflections from the liquid surface. The index mark located on the side of the launcher is oriented in the same direction as the polarization. 45° is initially recommended. Refer to Figure 12.

The index mark is also present for reference (1 dot: GP/IS or 2 dots: XP). The launcher is considered to be at 0° when the index mark is closest to the tank wall.

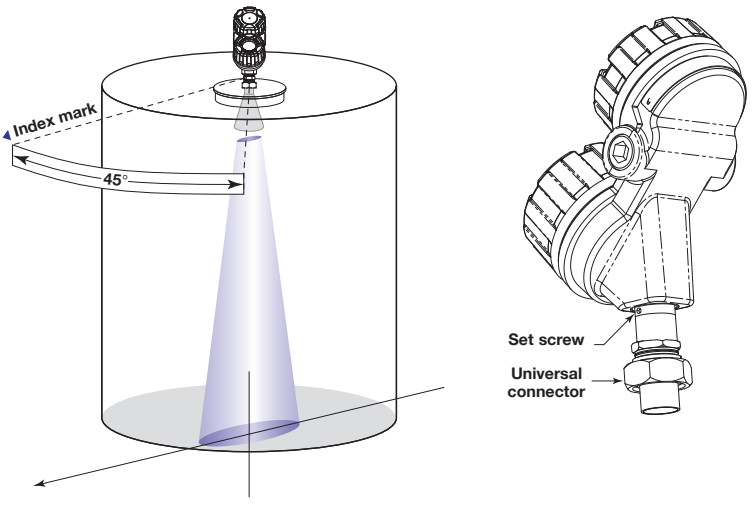


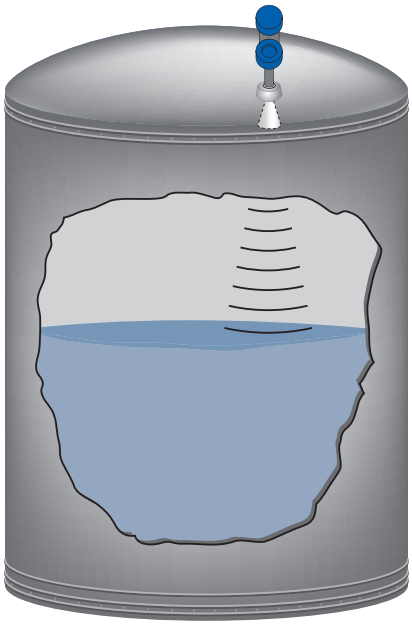
Figure 12

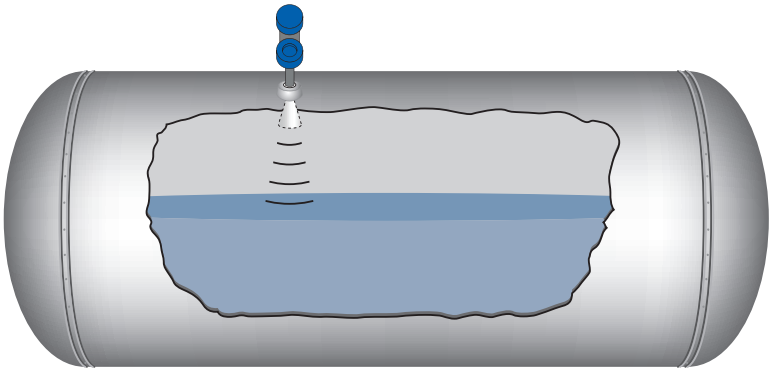
APPLICATIONS

PULSE BURST RADAR

STORAGE AND INTERMEDIATE HOLDING TANKS

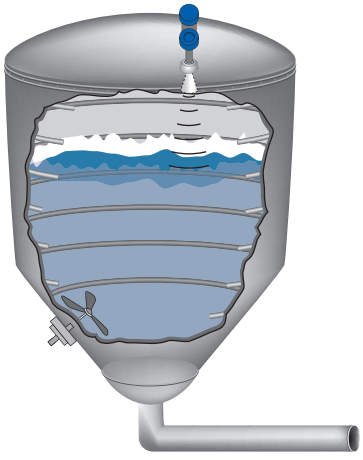
CONDITIONS – Calm Surfaces





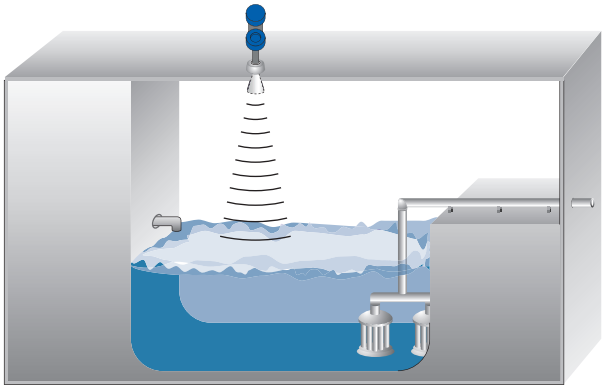
REACTORS

CONDITIONS – Turbulence and Foam



ENCLOSED SUMPS

CONDITIONS – Turbulence, Foam, and Changing Dielectric

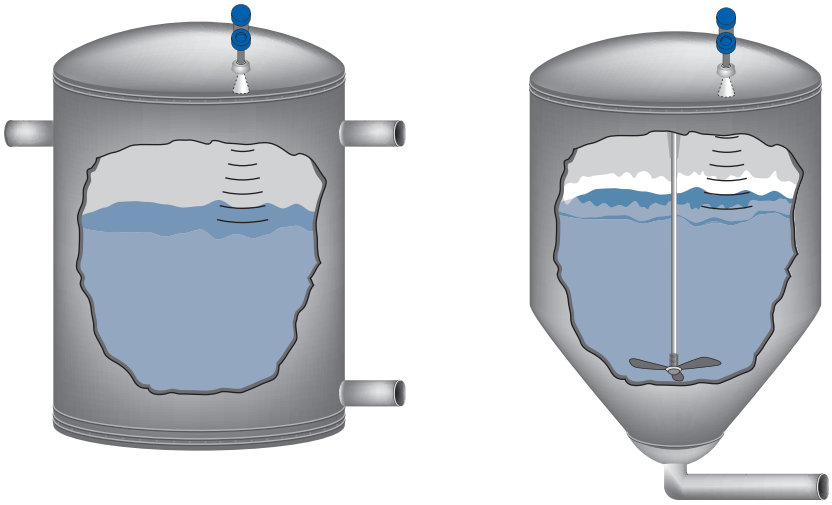


APPLICATIONS

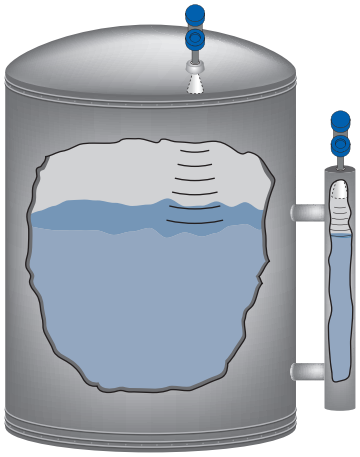
PULSE BURST RADAR

MIXERS AND BLENDING VESSELS

CONDITIONS – Turbulence, Foam, and Changing Dielectric



CHAMBERS AND BYPASS



PROBLEMATIC APPLICATIONS

GUIDED WAVE RADAR ALTERNATIVE

Some applications can be problematic for Non-Contact Radar. The following are examples of when Guided Wave Radar is recommended.

- Extremely low dielectric media (ε_r<1.7)
- Very weak reflections from the liquid surface (particularly during turbulence) can cause poor performance.
- Tanks heavily cluttered with false targets (mixers, pumps, ladders, pipes, etc.)
- During times of very low liquid levels of low dielectric media, the metal tank bottom may be detected, which can deteriorate performance.
- Foam can either absorb or reflect the microwave energy depending upon the depth, dielectric, density and wall thickness of the bubbles. Due to typical variations in the amount (depth) of foam, it is impossible to quantify performance. It may be possible to receive most, some or none of the transmitted energy.
- Extremely high liquid level (Overflow) conditions when liquid very near the antenna can cause erroneous readings and measurement failure.

  Refer to ECLIPSE Model 706 Guided Wave Radar bulletin BE57-106.

AGENCY APPROVALS

These units are in compliance with the RED-directive 2014/53/EU, the PED-directive 2014/68/EU and the ATEX directive 2014/34/EU.

Explosion Proof **US/Canada:** Class I, Div 1, Group B, C, D, T4 Class I, Zone 1 A Ex db ia IIB + H2 T4 Class I, Zone 1 Ex d ia IIB + H2 T4 Ta = -40 ºC to +70 ºC Type 4X, IP67 **Flame Proof** **ATEX – FM14ATEX0058X** II 1/2 G Ex db ia IIB + H2 T4… T1 Ga/Gb Ta = -40 ºC to +70 ºC IP67 **IEC- IECEx FMG 15.0034X** Ex db ia IIB + H2 T4…T1 Ga/Gb Ta = -40 ºC to +70 ºC IP67	**Non- Incendive** **US/Canada:** Class I, II, III, Div 2, Group A, B, C, D, E, F, G, T4 Class I, Zone 2 AEx nA ia IIC T4 Class I, Zone 2 Ex nA ia IIC T4 Ta = -40 ºC to +70 ºC Type 4X, IP67 **Non- Sparking** **ATEX - FM14ATEX0059X** II 3 G Ex nA IIC T4 Gc Ta = -15 ºC to +70 ºC IP67 **IEC – IECEx FMG 15.0034X** Ex nA IIC T4 Gc Ta = -15 ºC to + 70 ºC IP67
Intrinsically Safe **US/Canada:** Class I, II, III, Div 1, Group A, B, C, D, E, F, G, T4 Class I, Zone 0 AEx ia IIC T4 Class I, Zone 0 Ex ia IIC T4 Ga Ta =-40 ºC to + 70 ºC Type 4X, IP67 **ATEX – FM14ATEX0058X:** II 1 G Ex ia IIC T4 Ga Ta = -40 ºC to +70 ºC IP67 **IEC – IECEx FMG 15.0034X:** Ex ia IIC T4 Ga Ta = -40 ºC to +70 ºC IP67	

FM3600:2011, FM3610:2010, FM3611:2004, FM3615:2006, FM3616:2011, FM3810:2005, ANSI/ISA60079-0:2013, ANSI/ISA 60079-1:2015, ANSI/ISA 60079-11:2013, ANSI/ISA 60079-15:2012, ANSI/ISA 60079-26:2011, NEMA 250:2003, ANSI/IEC 60529:2004, C22.2 No. 0.4:2009, C22.2 No. 0.5:2008, C22.2 No. 30:2007, C22.2 No. 94:2001, C22.2 No. 213:2012, C22.2 No. 1010.1:2009, CAN/CSA 60079-0:2011, CAN/CSA 60079-1:2011, CAN/CSA 60079-11:2014, CAN/CSA 60079-15:2012, C22.2 No. 60529:2005, EN60079-0:2012+A11:2013, EN60079-1:2014, EN60079-11:2012, EN60079-15:2010, EN60079-26:2015, EN60079-31:2014, EN60529+A1:1991-2000, IEC60079-0:2011, IEC60079-1:2014, IEC60079-11:2011, IEC60079-15:2010, IEC60079-26:2006, IEC60079-31:2008

“This equipment with chargeable non-conductive parts, e.g. enclosure’s paint and antenna use PTFE, Co-polymer Polypropylene or Noryl En265, is provided with a warning label referring to the safety measures that must be taken if there is electrostatic charging during operation. For use in hazardous area, the equipment and side to be installed, e.g. tank, must be connected to earth and be attention to not only the measuring object, e.g. liquids, gases, powders and etc., but also the related conditions, e.g. tank container, vessel and etc. (According to IEC 60079- 32-1).”

FCC (ID# LPN-R9C) Compliance Statement:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Telecommunications Approvals

Agency	In-Tank	Out of Tank
FCC	47 CFR, Part 15, Subpart C,Section 15.209 Unintentional Radiators	47 CFR, Part 15, Subpart C, Section 15.256
ISED	RSS-211	RSS-211

TRANSMITTER SPECIFICATIONS

FUNCTIONAL/PHYSICAL

System Design		
Measurement Principle		Pulse burst radar 6 GHz
Input		
Measured Variable		Level, determined by the time-of-flight of radar pulse reflections
Span		0,2 to 40 m (0.5 to 130 ft)
Output		
Type		4 to 20 mA with HART: 3.8 mA to 20.5 mA useable (per NAMUR NE43)
		FOUNDATION Fieldbus™: H1 (ITK Ver. 6.1.2)
Resolution	Analog:	.003 mA
	Digital Display:	1 mm
Loop Resistance		591 ohms @ 24 V DC and 22 mA
Diagnostic Alarm		Selectable: 3.6 mA, 22 mA (meets requirements of NAMUR NE 43), or
		HOLD last output
Diagnostic Indication		Meets requirements of NAMUR NE107
Damping		Adjustable 0-10
User Interface		
Keypad		4-button menu-driven data entry
Display		Graphic Liquid Crystal Display
Digital Communication		HART Version 7–with Field Communicator, FOUNDATION Fieldbus™, AMS, or FDT
		DTM (PACT*ware*™), EDDL
Menu Languages	Transmitter LCD:	English, French, German, Spanish, Russian
	HART DD:	English, French, German, Spanish, Russian, Chinese, Portuguese
	FOUNDATION Fieldbus™ Host System:	English
Power (Measured at instrument terminals)		HART: General Purpose (Weather proof)/Intrinsically Safe/Explosion-proof:
		11 V DC minimum under certain conditions (refer to I/O Manual BE58-602)
		FOUNDATION Fieldbus™: 9 to 17.5 V DC
		FISCO, FNICO, Explosion Proof, General Purpose and Weather Proof
Housing		
Material		IP67/die-cast aluminum A413 (<0.6 % copper); optional stainless steel
Net/Gross Weight	Aluminum:	2,0 kg (4.5 lbs.)
	Stainless Steel:	4,50 kg (10.0 lbs.)
Overall Dimensions		H 212 mm (8.34") × W 102 mm (4.03") × D 192 mm (7.56")
Cable Entry		1/2" NPT or M20
SIL 2 Hardware (Safety Integrity Level)		Safe Failure Fraction = 92.7 % (HART only)
		Functional Safety to SIL 2 as 1oo1 in accordance with IEC 61508
		(Full FMEDA report available upon request)

ENVIRONMENT

Operating Temperature	-40 °C to +80 °C (-40 °F to +175 °F); LCD viewable -20 °C to +70 °C (-5 °F to +160 °F)
Storage Temperature	-45 °C to +85 °C (-50 °F to +185 °F)
Humidity	0–99 %, non-condensing
Electromagnetic Compatibility	Meets CE requirement (EN 61326) and NAMUR NE 21
Surge Protection	Meets CE EN 61326 (1000V)
Shock/Vibration	ANSI/ISA-S71.03 Class SA1 (Shock); ANSI/ISA-S71.03 Class VC2 (Vibration)

PERFORMANCE

Reference Conditions		Reflection from ideal reflector at +20 °C (+70 °F)
Linearity		± 8 mm (0.3") or 0.1 % of tank height (whichever is greater)
Measured Error		± 8 mm (0.3") or 0.1 % of tank height (whichever is greater) (Performance will degrade slightly within 1,5 m (60") of antenna)
Resolution		1 mm or 0.1"
Repeatability		± 5 mm (0.2") or 0.05 % of tank height (whichever is greater)
Response Time		< 2 seconds (configuration dependent)
Initialization Time		< 30 seconds
Ambient Temperature Effect	Digital:	Horn Antenna: Average 3 mm (0.12") / 10 K, max of ± 10 mm (0.4") over the entire temperature range -40 °C to +80 °C (-40 °F to +175 °F)
		Rod Antenna: Average 0.2 inch (5 mm) / 10 K, max of ± 15 mm (0.59") over the entire temperature range -40 °C to +80 °C (-40 °F to +175 °F)
	Analog:	Current Output (additional error with reference to 16 mA span)
		Average 0.03 % / 10 K. max 0.45 % over entire temperature range -40 °C to +80 °C (-40 °F to +175 °F)
Maximum Rate of Change		450 cm (180")/minute

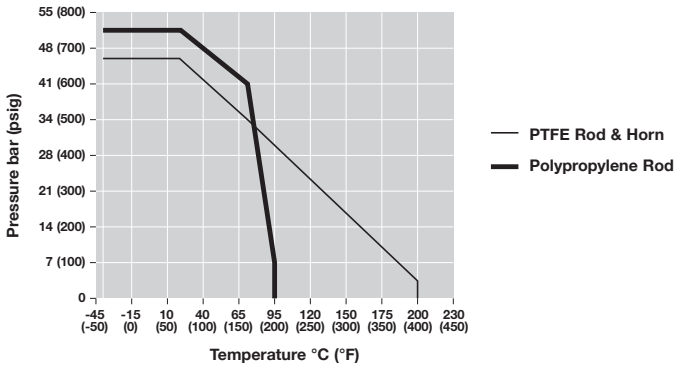
FOUNDATION Fieldbus™	
ITK Version	6.1.2
H1 Device Class	Link Master (LAS)—selectable ON/OFF
H1 Profile Class	31PS, 32L
Function Blocks	(6) AI, (2) Transducer, (1) Resource, (1) Arithmetic, (1) Signal Characterizer, (2) PID, (1) Input Selector
Quiescent Current	17 mA
Execution Time	15 ms (30 ms PID Block)
Device Revision	01
DD Version	0x01

ANTENNA SPECIFICATIONS

FUNCTIONAL/PHYSICAL

Model	Dielectric Rod TFE	Dielectric Rod Polypropylene	4" and 6" Horn
Materials	316 SS (Hastelloy® C opt.), Viton® O-rings	316 SS, Polypropylene, Viton® O-rings	316 SS (Hastelloy C opt.), Viton® O-rings
Process Connection	1 1/2" NPT and BSP, ASME or EN flanges	1 1/2" NPT and BSP, ASME or EN flanges	ASME or EN flanges
Maximum Process Temperature	+200 °C @ 3.5 bar (+400 °F @ 50 psig)	+95 °C @ 3.5 bar (+200 °F @ 50 psig)	+200 °C @ 3.5 bar (+400 °F @ 50 psig)
Maximum Process Pressure	-1.0 to 46.5 bar @ +20 °C (-14.7 to 675 psig @ +70 °F)	-1.0 to 51.7 bar @ +20 °C (-14.7 to 750 psig @ +70 °F)	-1.0 to 46.5 bar @ +20 °C (-14.7 to 675 psig @ +70 °F)
Minimum Dielectric (application dependent)	2.0	2.0	1.7 (1.4 with stillwells)

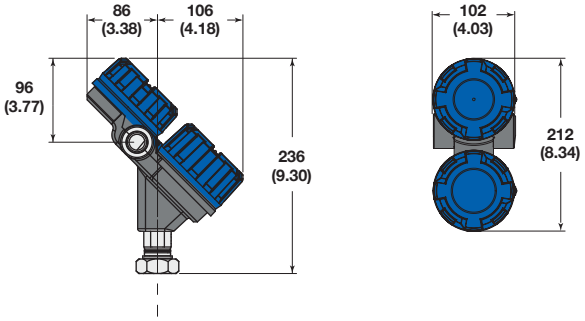
TEMPERATURE/PRESSURE CHART



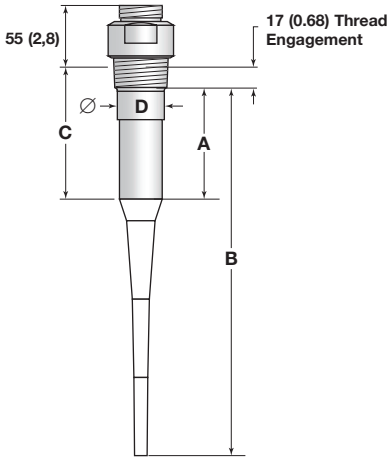
DIMENSIONAL SPECIFICATIONS

MM (INCHES)

TRANSMITTER



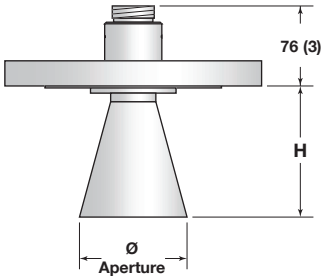
ANTENNAS



DIELECTRIC RODS – mm (inches)

Model #	Antenna Extension (maximum "L" dimension)	All	All	BSP
8th Digit		Dim A	Dim B	Dim C
0	25 (1)	58 (2.3)	282 (11.1)	76 (3.0)
1	100 (4)	160 (6.3)	389 (15.3)	185 (7.3)
2	200 (8)	267 (10.5)	493 (19.4)	287 (11.3)
3	300 (12)	368 (14.5)	594 (23.4)	389 (15.3)

Antenna Extension O.D. Dimension D	
TFE Rod	∅ 38 (1.50)
PP Rod	∅ 38 (1.50)



HORNS – mm (inches)

Model #	Antenna Extension (maximum "L" dimension)	4" Horn	6" Horn
8th Digit		Dim H	Dim H
1	100 (4)	117 (4.6)	↓
2	200 (8)	213 (8.4)	211 (8.3)
3	300 (12)	315 (12.4)	315 (12.4)
Aperture		95 (3.75)	146 (5.75)

O-RING (SEAL) SELECTION CHART

Material	Code	Maximum Temperature	Maximum Pressure	Min. Temp.	Recommended For Use In	Not Recommended For Use In
Viton® GFLT	0	+200 °C @ 16 bar (+400 °F @ 232 psig)	51.7 bar @ +20 °C (750 psig @ +70 °F)	-40 °C (-40 °F)	General purpose, ethylene	Ketones (MEK, acetone), skydrol fluids, amines, anhydrous ammonia, low molecular weight esters and ethers, hot hydrofluoric or chlorosulfuric acids, sour HCs

TRANSMITTER

MODEL NUMBER

1 - 3 | BASIC MODEL NUMBER

R96	Through-Air Radar Level Transmitter- 6 GHz Pulse Radar

4 | POWER

5	24 V DC, Two-wire

5 | SIGNAL OUTPUT

1	4–20 mA with HART
2	FOUNDATION Fieldbus™

6 | SAFETY OPTIONS

0	None (FOUNDATION Fieldbus™ only) (5th digit = 2)
1	SIL 2 Hardware - HART only (5th digit = 1)

7 | ACCESSORIES

0	No Digital Display and Keypad
A	Digital Display and Keypad

8 | CLASSIFICATION

0	General Purpose, Weatherproof (IP 67)
1	Intrinsically Safe (FM & CSA)
3	Explosion-proof (FM & CSA)
A	Intrinsically Safe (ATEX/IEC)
B	Flame-proof (ATEX/IEC)
C	Non-sparking (ATEX)

9 | HOUSING

1	Die-cast Aluminum, Dual-compartment, 45-degree
2	Investment Cast, Stainless Steel, Dual-compartment, 45-degree

10 | CONDUIT CONNECTION

0	1/2" NPT
1	M20
2	1/2" NPT with sunshade
3	M20 with sunshade

R	9	6	—	5				—			
1	2	3		4	5	6	7		8	9	10

1 - 2 | TECHNOLOGY / OPERATING FREQUENCY

R A	PULSAR radar antennas / 6 GHz

3 | CONFIGURATION / STYLE

A	TFE
B	Polypropylene (Material of Construction codes A and K only)

4 | MATERIAL OF CONSTRUCTION

A	316/316L stainless steel
B	Hastelloy C
K	316/316L SS; ASME B31.1 and ASME B31.3 (meets CRN specifications)

5 - 6 | PROCESS CONNECTION - SIZE/TYPE ①

Threaded

31	1 1/2" NPT thread
32	1 1/2" BSP (G 1 1/2) thread

ASME Flanges		EN Flanges		
43	2" 150# ASME raised face flange	DA	DN 50, PN 16	EN 1092-1 Type A
44	2" 300# ASME raised face flange	DB	DN 50, PN 25/40	EN 1092-1 Type A
45	2" 600# ASME raised face flange	DD	DN 50, PN 63	EN 1092-1 Type B2
53	3" 150# ASME raised face flange	EA	DN 80, PN 16	EN 1092-1 Type A
54	3" 300# ASME raised face flange	EB	DN 80, PN 25/40	EN 1092-1 Type A
55	3" 600# ASME raised face flange	ED	DN 80, PN 63	EN 1092-1 Type B2
63	4" 150# ASME raised face flange	FA	DN 100, PN 16	EN 1092-1 Type A
64	4" 300# ASME raised face flange	FB	DN 100, PN 25/40	EN 1092-1 Type A
65	4" 600# ASME raised face flange	FD	DN 100, PN 63	EN 1092-1 Type B2
73	6" 150# ASME raised face flange	GA	DN 150, PN 16	EN 1092-1 Type A
74	6" 300# ASME raised face flange	GB	DN 150, PN 25/40	EN 1092-1 Type A
75	6" 600# ASME raised face flange	GD	DN 150, PN 63	EN 1092-1 Type B2

① Metal flanges welded to antenna; Plastic flanges and metal flanges with threaded antenna connection ordered separately. Refer to Optional Flanges chart on page 15.

7 | O-RINGS

0	Viton® GFLT

8 | ANTENNA EXTENSION

0	For nozzle height ≤ 25 mm (1") (For threaded process connection only)
1	For nozzle height ≤ 100 mm (4")
2	For nozzle height ≤ 200 mm (8")
3	For nozzle height ≤ 300 mm (12")

R	A		—				0	—		0	0
1	2	3		4	5	6	7		8	9	10

HORN MODEL NUMBER

1 - 2 | TECHNOLOGY / OPERATING FREQUENCY

R A	PULSAR radar antennas / 6 GHz

3 | CONFIGURATION / STYLE

4	4" horn
6	6" horn

4 | MATERIAL OF CONSTRUCTION

A	316/316L stainless steel
B	Hastelloy C
K	316/316L SS; ASME B31.1 and ASME B31.3 (meets CRN specifications)

5 - 6 | PROCESS CONNECTION - SIZE/TYPE (metal flanges welded to antenna)

ASME Flanges		EN Flanges		
63	4" 150# ASME raised face flange	FA	DN 100, PN 16	EN 1092-1 Type A
64	4" 300# ASME rased face flange	FB	DN 100, PN 25/40	EN 1092-1 Type A
65	4" 600# ASME raised face flange	FD	DN 100, PN 63	EN 1092-1 Type B2
73	6" 150# ASME raised face flange	GA	DN 150, PN 16	EN 1092-1 Type A
74	6" 300# ASME raised face flange	GB	DN 150, PN 25/40	EN 1092-1 Type A
75	6" 600# ASME raised face flange	GD	DN 150, PN 63	EN 1092-1 Type B2

7 | O-RINGS

0	Viton® GFLT

8 | ANTENNA EXTENSION

1	For nozzle height ≤ 100 mm (4") -Configuration Style code 4 only
2	For nozzle height ≤ 200 mm (8")
3	For nozzle height ≤ 300 mm (12")

R	A		—				0	—		0	0
1	2	3		4	5	6	7		8	9	10

OPTIONAL MOUNTING FLANGES FOR 1 1/2" NPT THREADED VERSIONS - ASME RF (metal) / ASME FF (plastic)

(for use with Dielectric Rod Antennas; Extension Codes 1–3 only)

Part Number: 004-6852	2"		3"		4"		6"	
	150#	300#	150#	300#	150#	300#	150#	300#
316/316L stainless steel	-001	-005	-002	-006	-003	-007	-004	-008
304/304L stainless steel	-009	-013	-010	-014	-011	-015	-012	-016
Carbon steel	-017	-021	-018	-022	-019	-023	-020	-024
Hastelloy C	-025	-029	-026	-030	-027	-031	-028	-032
Monel	-033	-037	-034	-038	-035	-039	-036	-040
Kynar	-041	-045	-042	-046	-043	-047	-044	-048
PVC	-049	-053	-050	-054	-051	-055	-052	-056
Polypropylene	-057	-061	-058	-062	-059	-063	-060	-064
TFE	-065	-069	-066	-070	-067	-071	-068	-072

QUALITY ASSURANCE - ISO 9001

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