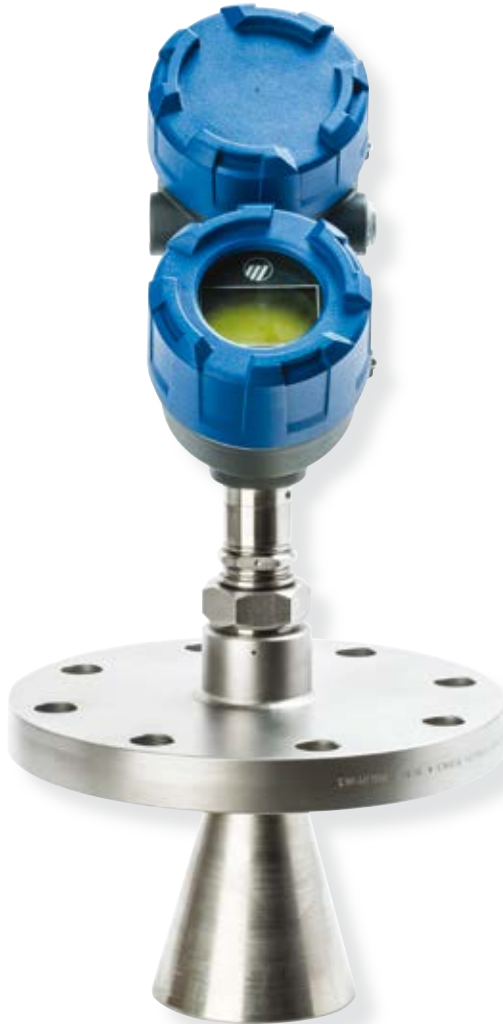
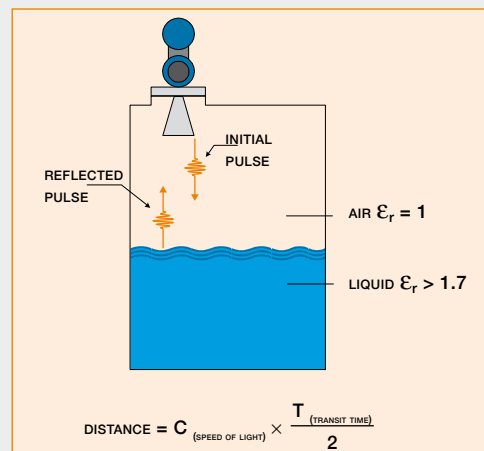


PULSE BURST RADAR



Pulse Burst Radar emits short bursts of energy to a liquid surface. Ultra-high-speed timing circuitry measures the time of the signal reflected off the liquid surface.

Sophisticated signal processing filters out false reflections and other background noises. The exact level is then calculated, by factoring in tank height and other configuration information. The circuitry is extremely energy efficient so no duty cycling is needed as with other radar devices. This allows the device to track high rates of level changes up to 180"/minute (4.5 m/minute).



radar.magnetrol.com

PULSAR® R86**Pulse burst radar level transmitter****DESCRIPTION**

The Pulsar® Model R86 Radar transmitter is the latest generation of an advanced loop-powered 4–20 mA level transmitter with proactive diagnostics provides accurate measurement even in shifting dielectric and varying media.

FEATURES

26 GHz frequency offers smaller beam angle and improved resolution.

Two-wire loop-powered intrinsically safe level transmitter

360° rotatable housing can be dismantled without depressurizing the vessel via “quick connect/disconnect” antenna coupling.

4-button user interface and graphical LCD display provide enhanced depth of data, indicating on-screen waveforms and troubleshooting tips.

Wide range of HTHP antennas, with extensions

Coated Isolation antennas for corrosive applications

False target setup is simple, intuitive and effective.

Unique commissioning and optimization wizards

Proactive diagnostics

Full vacuum to 160 bar (2320 psi); -70 to +400 °C (-100 to +750 °F)

Measuring range up to 40 m (130 feet)

Suited for SIL 2 loops (full FMEDA report available)

Can be programmed to automatically capture waveform data by time or by event occurrence

Potted electronics

APPLICATIONS

Liquids and slurries, hydrocarbons to water-based media, high temperature/high pressure process or storage vessels

AGENCY APPROVALS

	Ex d	Ex ia	Ex n	Ex t	XP	IS	NI	Other
ATEX	•	•	•					
CCOE	•	•						
CSA					•	•	•	
FM					•	•	•	
EAC (GOST)	•	•						Metrology
IEC	•	•	•					
Marine	Lloyd's Register of Shipping (LRS)							
SIL	SIL 2 (1oo1)							
TÜV/DIBt	WHG § 63, overfill prevention							
Other approvals are available; consult factory for more details.								

PULSAR® R96**Pulse burst radar level transmitter****DESCRIPTION**

The Pulsar® Radar transmitter is a loop-powered, 24 VDC, level transmitter. It has low power consumption, fast response time and is easy to use.

PULSAR is designed to provide unparalleled performance and ease of use. PULSAR non-contact radar is the perfect complement to the Magnetrol® Eclipse® Guided Wave Radar. These transmitters offer the ultimate solution to the vast majority of process level applications.

FEATURES

6 GHz operating frequency offers superior performance in the tougher applications of turbulence, foam, and heavy vapors.

Two-wire, loop-powered intrinsically safe level transmitter

360° rotatable housing can be dismantled without depressurizing the vessel via "quick connect/disconnect" antenna coupling.

4-button user interface and graphical LCD display provide enhanced depth of data, indicating on-screen waveforms and troubleshooting tips.

Two antenna styles up to +200 °C / 51.7 bar (+400 °F / 750 psi):

- horn antenna: 3", 4" and 6"
- dielectric rod antenna: Polypropylene and TFE

Measuring range up to 40 m (130 feet)

False target setup is simple, intuitive and effective

Will reliably track extremely rapid rate of change up to 4.5 m (180") / minute

Suited for SIL 2 loops (full FMEDA report available)

Can be programmed to automatically capture waveform data by time or by event occurrence

Potted electronics

APPLICATIONS

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

VESSELS: Most process or storage vessels up to rated probe temperature and pressure.

CONDITIONS: Virtually all level measurement and control applications including process conditions exhibiting visible vapors, some foam, surface agitation, bubbling or boiling, high fill/empty rates, low level and varying dielectric media or specific gravity.

AGENCY APPROVALS

	Ex d	Ex ia	Ex n	Ex t	XP	IS	NI	Other
ATEX	●	●	●					
CSA					●	●	●	
FM					●	●	●	
EAC (GOST)	●	●						Metrology
IEC	●	●	●					
SIL	SIL 2 (1001)							
Other approvals are available; consult factory for more details.								

MODEL R82

Non-contact radar level transmitter for level, volume and open channel flow applications

**DESCRIPTION**

Model R82 is an economical, loop-powered radar transmitter bringing radar to everyday applications. Ultrasonic devices, frequently used in daily applications, can now be replaced using radar technology with its superior performance.

The electronics are housed in a single compartment cast aluminum or Lexan® housing. R82 measures effectively even when atmospheres above the liquid are saturated with vapor. Pulse Burst technology and advanced signal processing manage common disturbances such as false echoes caused by obstructions, multi-path reflections from tank sidewalls or turbulence caused by agitators, aggressive chemicals, or aerators.

FEATURES

Two-wire loop-powered intrinsically safe transmitter

26 GHz frequency.

Fast and easy configuration via 2-line x 16 character display and 4-button keypad.

Intuitive false target profiling

Rotatable microwave beam for optimized operation

Encapsulated PP or Tefzel® antennas in lengths of 50 mm (2") and 200 mm (8")

Process

temperature: -40 to +93 °C (-40 to +200 °F)

pressure: vacuum to 13.8 bar (200 psi)

dielectric: 1.7 – 100

Suited for SIL 1 loops (full FMEDA report available)

APPLICATIONS

Open channel flow flumes and weirs

Paint, ink and solvent tanks

Chemical storage

Thick and viscous media

Batch and day tanks

AGENCY APPROVALS

	Ex d	Ex ia	Ex n	Ex t	XP	IS	NI	Other
ATEX		●						
CCOE		●						
cFMus						●	●	
EAC (GOST)		●						Metrology
IEC		●						
Inmetro		●						
SIL	SIL 1 (1001)							
Other approvals are available; consult factory for more details.								

Pulsar® Model R80 80 GHz FMCW Radar Level Transmitter

DESCRIPTION

The Pulsar® Model R80 radar transmitter is the latest generation of Magnetrol® 24 VDC, loop-powered, non-contact radar transmitters. Utilizing Frequency Modulated Continuous Wave (FMCW) radar technology, this transmitter offers enhanced performance, proactive diagnostics, and various configuration wizards to bring simplicity to an often complex technology.

This latest entry into the radar level measurement field is designed to provide unparalleled performance and ease of use. The 80 GHz Pulsar Model R80 is the perfect complement to our 6 GHz Pulsar Model R96 and 26 GHz Model R86 radar transmitters. Together, this transmitter family, along with the acclaimed Model 706 GWR transmitter, offers the ultimate solution set for those difficult industrial process level applications.

TECHNOLOGY

The Pulsar Model R80 radar transmitter is based on FMCW radar technology. Transmitting a continuous signal with a constantly changing frequency down toward the process medium, the difference in the frequencies detected between the transmitted signal and return echoes is a function of the distance.

Level is then calculated based on transmitter configuration.

APPLICATIONS

MEDIA: Liquids, slurries and solids; dry bulk solids to water-based media (dielectric 1.4–100)

VESSELS: Most process or storage vessels up to rated temperature and pressure. Silos, pits, and sumps as well as glass-lined tanks.

CONDITIONS: Virtually all level measurement and control applications including those exhibiting varying 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, volume, or flow
- Performance not process dependent (changing specific gravity and dielectric have no effect)
- 80 GHz operating frequency offers superior performance, smaller antennas, better accuracy and enhanced resolution
- Antenna designs up to +200 °C (+400 °F), -1 to 70 bar (-14.5 to 1000 psi)
- Available with hygienic (15 Ra) surface finish and Tri-Clamp process connections
- 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
- SIL 2 suitable (92.3% SFF, with full FMEDA report available)
- PACTware™ PC program and enhanced DTMs for advanced configuration and troubleshooting
- Available with HART® digital output

TECHNOLOGY

FREQUENCY MODULATED CONTINUOUS WAVE (FMCW) RADAR

The Pulsar R80 is a top-mounted, downward-facing FMCW radar transmitter operating at 80 GHz. Unlike previous Pulsar transmitters that emit short bursts of 6 or 26 GHz energy and measure the transit time of the signal reflected off the product surface, FMCW devices transmit a continuous signal with a constantly changing frequency down toward the product surface.

The detected difference in frequencies between the transmitted signal and return echo is a function of the distance. See Figure 1 at right. Level is then calculated by factoring in tank height and other configuration information.

FMCW captures its process variable information in the frequency domain, which supports more accurate signal conversion. The main advantage of FMCW is that it

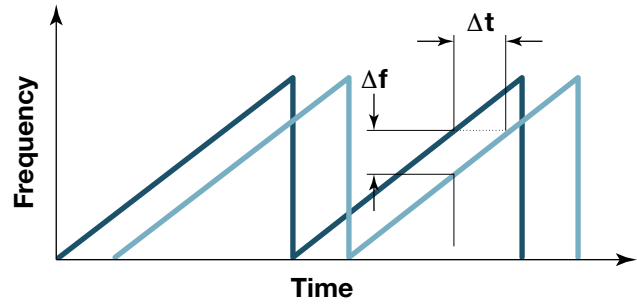


Figure 1

utilizes higher receiving sensitivity and higher-strength signals over pulse systems, allowing it to perform better in difficult situations where there may be turbulence, foam, dust, or excessive vapors.

OPERATIONAL CONSIDERATIONS

All radar applications, regardless of the operating frequency, are characterized by three basic conditions:

- Dielectric (process medium)
- Distance (measuring range)
- Disturbances (factors such as turbulence, foam, false targets, multiple reflections, etc.)

The Pulsar Model R80 Radar transmitter is offered with several horn antenna sizes and configurations:

- 3/4" NPT (G 3/4), 1 1/2" NPT (G 1 1/2)
- 2" (DN 50), 3" (DN 80), 4" (DN 100)
- 2" Tri-Clamp, 3" Tri-Clamp

Since larger horns yield stronger signals and smaller beam angles, the 3" horn antenna should ideally be used to ensure the best possible performance in all operational conditions. However, as that is often impractical, other antenna sizes are available.

Maximum measuring range (distance) is measured from the sensor reference point (bottom of NPT thread, gasket face of BSP thread, or gasket face of flange) to the bottom of the tank. Refer to Figure 2.

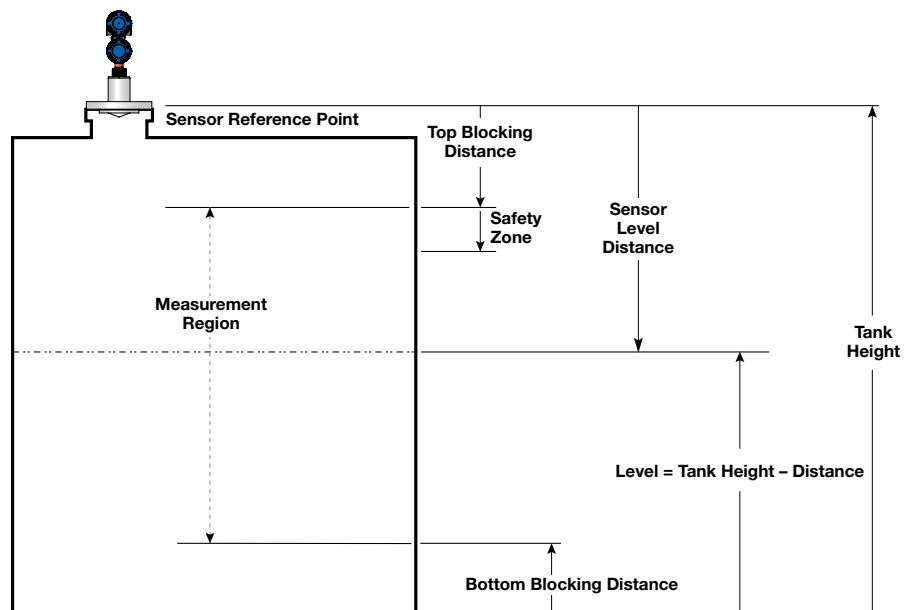


Figure 2

AGENCY APPROVALS



These devices are in compliance with the RED-directive 2014/53/EU, the EMC directive 2014/30/EU, the PED-directive 2014/68/EU, the ATEX directive 2014/34/EU and RoHS directive 2011/65/EU.



MANF YEAR:
INPUT: $U_m=36V$
OUTPUT: 4–20mA
THREADED ENTRY:
MAX PRESS:
REFER TO INSTRUCTION MANUAL



PULSAR®
MODEL:
SERIAL:

XP-IS
FM21US0091X / FM21CA0059X
CL I, DIV 1, GP B,C,D,T4...T3
CL I, ZONE 0 AEx/Ex ia/ib + H2 T4...T3 Ga/Gb
 $T_a = -40^{\circ}C$ to $+70^{\circ}C$
TYPE 4X, IP67

FM21ATEX0058X
II 1/2 G Ex ia/ib + H2 T4...T3 Ga/Gb
II 2 G Ex db ia IIB + H2 T4...T3 Gb
 $T_a = -40^{\circ}C$ to $+70^{\circ}C$
IP67

IECEx FMG 21.0012X
Ex ia/ib IIB + H2 T4...T3 Ga/Gb
Ex db ia IIB + H2 T4...T3 Gb
 $T_a = -40^{\circ}C$ to $+70^{\circ}C$
IP67

FOR US/CANADA DIVISIONS: INSTALL SEAL WITHIN 18 INCHES / UN SCELLEMENT DOIT ETRE INSTALLE A MOINS DE 18 INCHES DU BOITIER
FOR CANADA ZONES: INSTALL SEAL WITHIN 50MM / UN SCELLEMENT DOIT ETRE INSTALLE A MOINS DE 50 MM DU BOITIER

Explosion/Flame Proof - Intrinsically Safe



MANF YEAR:
THREADED ENTRY:
MAX PRESS:
REFER TO INSTRUCTION MANUAL



PULSAR®
MODEL:
SERIAL:

IS
FM21US0091X / FM21CA0059X
CL I, II, III, DIV 1, GP A,B,C,D,E,F,G T4...T3
CL I, ZONE 0 AEx/Ex ia IIC T4...T3 Ga
CL I, ZONE 2 AEx/Ex ic IIC T4...T3 Gc
 $T_a = -40^{\circ}C$ to $+70^{\circ}C$
TYPE 4X, IP67

FM21ATEX0058X
II 1 G Ex ia IIC T4...T3 Ga
 $T_a = -40^{\circ}C$ to $+70^{\circ}C$
IP67

IECEx FMG 21.0012X
Ex ia IIC T4...T3 Ga
Ex ic IIC T4...T3 Gc
 $T_a = -40^{\circ}C$ to $+70^{\circ}C$
IP67

ENTITY
 $U_i(V_{max})=28.6V$ $I_i(I_{max})=140mA$
 $P_i=1W$ $C_i=4.4nF$ $L_i=2.7uH$

Intrinsically Safe



MANF YEAR:
INPUT: $U_m=36V$
OUTPUT: 4–20mA
THREADED ENTRY:
MAX PRESS:
REFER TO INSTRUCTION MANUAL



PULSAR®
MODEL:
SERIAL:

DIP-IS
FM21US0091X / FM21CA0059X
CL I, II, III, DIV 1, GP E,F,G T4...T3
 $T_a = -15^{\circ}C$ to $+70^{\circ}C$
TYPE 4X, IP67

FM21ATEX0058X
II 2 D Ex ia tb IIC T100°C Db
 $T_a = -15^{\circ}C$ to $+70^{\circ}C$
IP67

IECEx FMG 21.0012X
Ex ia tb IIC T100°C Db
 $T_a = -15^{\circ}C$ to $+70^{\circ}C$
IP67

FOR US/CANADA DIVISIONS: INSTALL SEAL WITHIN 18 INCHES / UN SCELLEMENT DOIT ETRE INSTALLE A MOINS DE 18 INCHES DU BOITIER
FOR CANADA ZONES: INSTALL SEAL WITHIN 50MM / UN SCELLEMENT DOIT ETRE INSTALLE A MOINS DE 50 MM DU BOITIER

Dust Ignition Proof



MANF YEAR:
INPUT: $U_m=36V$
OUTPUT: 4–20mA
THREADED ENTRY:
MAX PRESS:
REFER TO INSTRUCTION MANUAL



PULSAR®
MODEL:
SERIAL:

AEx/Ex ec $T_a = -15^{\circ}C$ to $+70^{\circ}C$
 $T_a = -40^{\circ}C$ to $+70^{\circ}C$

FM21US0091X / FM21CA0059X
CL I, II, III, DIV 2, GP A,B,C,D,E,F,G T4...T3
CL I, ZONE 2 AEx/Ex ec IIC T4...T3
TYPE 4X, IP67

FM21ATEX0059X
II 3 G Ex ec IIC T4...T3 Gc
II 3 G Ex ic IIC T4...T3 Gc
IP67

IECEx FMG 21.0012X
Ex ec IIC T4...T3 Gc
IP67

Non-Incendive, Increased Safety

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
ETSI	EN 302 372 V2.1.1 (2016-12)	EN 302 729 V2.1.1 (2016-12)

FCC/ISED TLPR Use Configurations for Enclosed Tank Applications Only

Antenna Type	Frequency Band (GHz)	Reinforced Fiberglass Tank	Concrete Tank	Metal Tank
¾"	77 to 81	Allowed	Allowed	Allowed
1½"	77 to 81	Allowed	Allowed	Allowed
2"	77 to 81	Allowed	Allowed	Allowed
3"	77 to 81	Allowed	Allowed	Allowed

FCC/ISED LPR Use Configurations

Antenna Type	Frequency Band (GHz)	Open Air / Tank
2"	77 to 81	Allowed
3"	77 to 81	Allowed

SPECIFICATIONS

FUNCTIONAL/PHYSICAL

System Design	
Measurement Principle	Frequency Modulated Continuous Wave (FMCW) Radar 80 GHz
Input	
Measured Variable	Level, determined by the difference in modulated frequencies
Span	Liquids: 0.2 to 30 meters (0.5 to 100 feet) Solids: 0.2 to 60 meters (0.5 to 200 feet)
Output	
Type	4–20 mA with HART: 3.8 mA to 20.5 mA useable (per NAMUR NE43)
Resolution	Analog: .003 mA / Digital Display: 1 mm
Loop Resistance	GP/IS: 590 ohms @ 24 VDC and 22 mA XP/Flameproof: 500 ohms @ 24 VDC 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 seconds
User Interface	
Keypad	4-button menu-driven data entry
Display	Graphic Liquid Crystal Display
Digital Communication	HART ver. 7–w/ Field Communicator, AMS, or FDT DTM (PACTware™), FDI/EDDL
Menu Languages	Transmitter LCD: English, French, German, Spanish, Russian, Portuguese, Polish HART DD: English, French, German, Spanish, Russian, Chinese, Portuguese, Polish
Voltage (Measured at instrument terminals)	HART: General Purpose (Weather proof)/Intrinsically Safe/Explosion-proof: 11 VDC minimum at terminals under certain conditions (refer to Manual 58-604)
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.)
Cable Entry	½" NPT or M20
SIL 2 Hardware (Safety Integrity Level)	Safe Failure Fraction = 92.3% (HART only); Functional Safety to SIL 2 as 1oo1 in accordance with IEC 61508 (Full FMEDA report available upon request)

ENVIRONMENTAL

Ambient Operating Temperature	-40 to +160 °F (-40 to +70 °C); LCD viewable -20 to +70 °C (-5 to +160 °F)
Storage Temperature	-45 to +85 °C (-50 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	≤ 1mm
Measured Error	≤ 1mm (Performance in bulk solids will depend heavily on the application)
Resolution	0.1 inch or 1mm
Repeatability	≤ 1mm
Response Time	< 3 seconds (configuration dependent)
Initialization Time	< 30 seconds (configuration dependent)
Ambient Temperature Effect	Digital: < 3 mm/10 K, 10 mm maximum Analog: < 0.03 %/10 K or 0.3 % maximum relating to the 16.7 mA span)
Maximum Rate of Change	450 cm (180 inches)/minute

ANTENNA SPECIFICATIONS

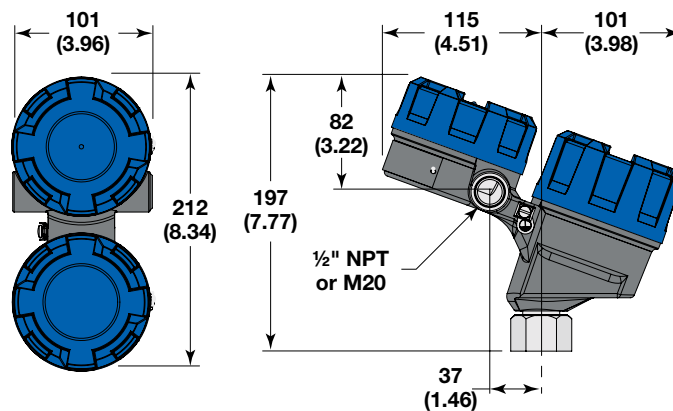
FUNCTIONAL/PHYSICAL

Antenna Material	316 SS, PEEK, PTFE, PEK
Process Seal Material	PTFE, PEEK with O-rings
Maximum Process Temperature	Up to +176 °C @ 70 bar (+350 °F @ 1000 psi)
Maximum Process Pressure	PEEK with O-rings: -1 to 70 bar @ +20 °C (-14.7 to 1000 psi @ +70 °F) 4mm PTFE lens: -1 to 5 bar @ +20 °C (-14.7 to 70 psi @ +70 °F) 8mm PTFE lens: -1 to 27 bar @ +20 °C (-14.7 to 400 psi @ +70 °F)
Vacuum Service	<10-8 cc/sec @ 1 atmosphere helium
Minimum Dielectric (application dependent)	1.7 (1.4 with stillwells)

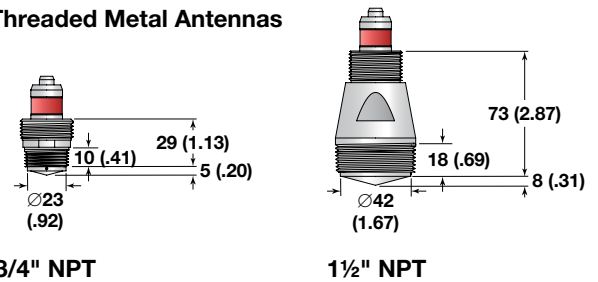
DIMENSIONAL SPECIFICATIONS

MM (INCHES)

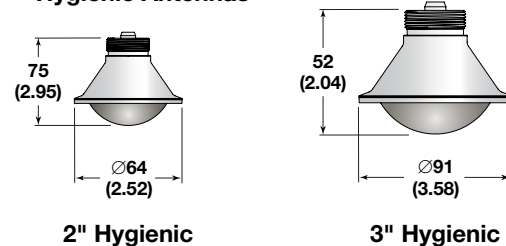
Transmitter



Threaded Metal Antennas

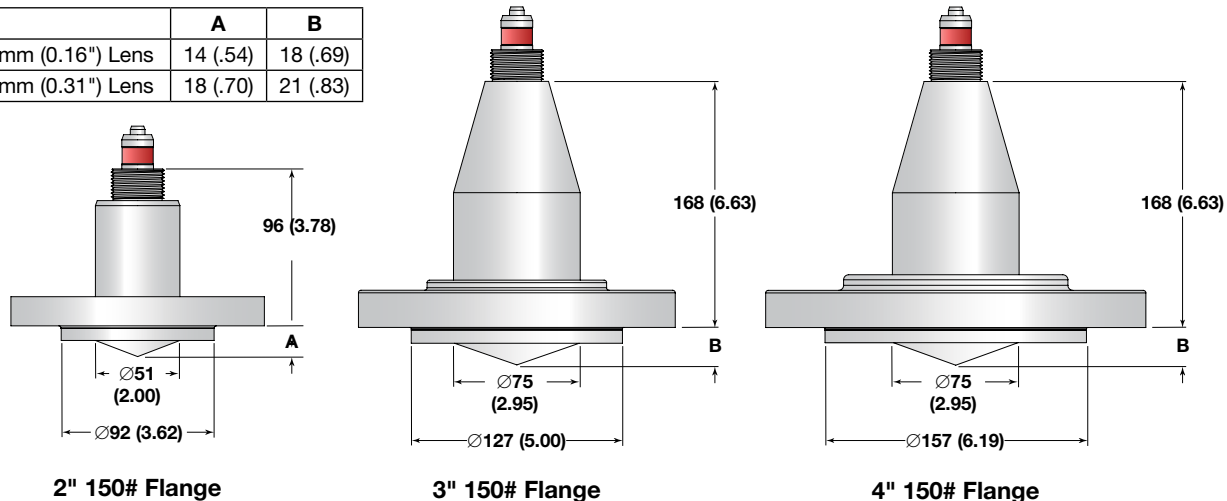


Hygienic Antennas



Flanged Encapsulated Antennas

	A	B
4 mm (0.16") Lens	14 (.54)	18 (.69)
8 mm (0.31") Lens	18 (.70)	21 (.83)



Bulk Solids Antennas

