Product Data Sheet
00813-0100-4024, Rev DA
July 2004

Rosemount 5600 Series Radar Level Transmitter

THE 5600 SERIES FEATURES:

- *Handles a wide range of process conditions due to high sensitivity and unique signal processing features*
- *High repeatability ensuring an extremely reliable and accurate level transmitter even in the toughest conditions*
- *Ultra-wide power supply, 24-240 V AC/DC, 0-60 Hz*
- *FOUNDATION™ fieldbus or analog 4-20 mA superimposed with HART®*
- *High flexibility with interchangeable transmitter heads and antennas*
- *No moving parts and no contact with the liquid*
- *Intelligent software support for easy configuration and setup*
- *Wide selection of antennas and materials*

Content

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Legendary Rosemount Performance Customized For Your Level Process Applications

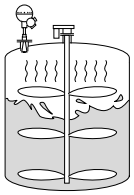
Introduction

The Rosemount 5600 Series is an intelligent non-contacting radar level transmitter. Its high performance microprocessor allows for advanced signal processing and smart echo-tracking features. Together with its high sensitivity the radar transmitter can detect and evaluate all echoes within the tank or vessel. The 5600 Series support and assist the user to a successful configuration of the transmitter in process level applications, from easy to complex process situations.

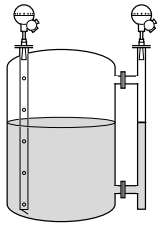
Applications

The Rosemount 5600 uses state-of-the art microwave technology to get highest reliability and precision. It measures the level of liquids and slurries. The transmitter operates in a wide range of temperatures, pressures, vapor gas mixtures, and various process conditions.

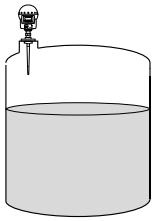
FIGURE 1. Rosemount 5600 Applications



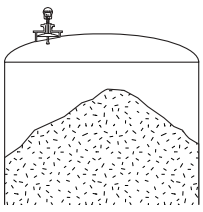
- Applications in process vessels with agitators require a radar transmitter with the 5600's high sensitivity and advanced signal processing to separate the measuring signal from noise created by disturbances.



- Still-pipe or bridle mounting is recommended for LPG applications, where the surface is sometimes boiling, and for some extremely turbulent conditions. The pipe reduces foam and turbulence and also increases surface reflection.



- The Rod antenna is suitable for small nozzle openings on tanks with short measuring range.



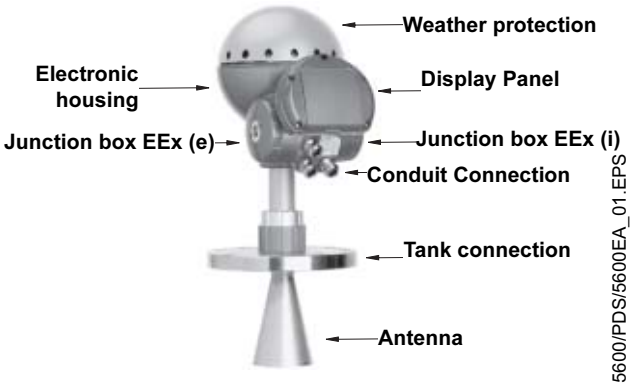
- With the parabolic antenna the 5600 Series is suitable for measurement of various types of solid materials (example: cement).

5600_PDS_BILD_11,_10,_09,_8

Interchangeable Head

A 5600 Radar Level Transmitter consists of a Transmitter Head (TH) and a tank connection including antenna. The TH and the electronics inside are interchangeable without opening the tank.

FIGURE 2. Interchangeable Transmitter Head



Antennas

Rod Antenna

- Suitable for tanks with small openings.
- Existing tank flange can be used as the tank connection.

Cone Antenna

- Suitable for free-propagation and pipe mounted installation.
- Cone extensions are available (see Figure 17 on page 16 and Table 12 on page 22).
- Optional Cone antennas with cleaning/flushing connection are available (see Figure 17 on page 16 and Table 13 on page 22).

Process Seal Antenna

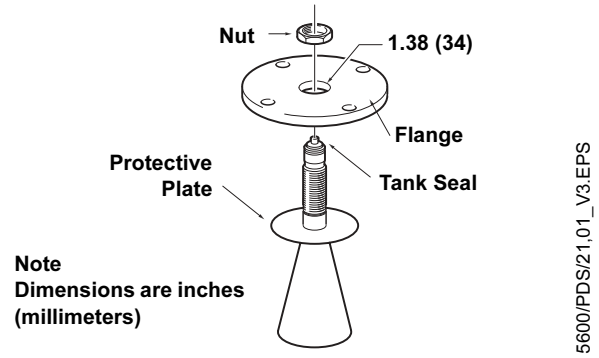
- The dish of the Process Seal is made of PTFE.
- Only exposes material suitable for hygienic or corrosive applications (see Figure 15 on page 15 and Table 10 on page 21).

Parabolic Antenna

- Suitable for solid materials (example: cement).
- Withstand heavy contamination.

Plate Design

FIGURE 3. Plate Design



Cone and Rod antennas, except the Cone with Flushing Connection, are designed with a protective plate as shown in Figure 3. The plate and antenna (stainless steel or optional material) together with the tank seal and o-rings (PTFE or Quartz) are the wetted parts exposed to the tank atmosphere. This allows the use of an existing flange, or a lower cost flange alternative. Loose flanges are available (Table 17 on page 24).

Rosemount 2210 Display Unit

The Rosemount 2210 offers basic configuration using the 4 software keys on the display itself. Data presentation on the LCD can be customized and allows many viewing alternatives. The 2210 is also used if temperature sensors are to be connected to the 5600 Series. See Table 7 on page 18 for available versions.

Electrical Connections

The transmitter has a power supply with an ultra-wide input range from 24 to 240 V AC or DC, 0-60 Hz.

The Transmitter Head has two separate junction boxes. One is for a non-intrinsically safe primary signal output and power supply cables. The other is normally used for intrinsically safe (IS) HART/analog outputs or optionally for a non-IS secondary analog output.

Primary Outputs can be HART or FOUNDATION fieldbus, either IS or Non-IS. The HART and secondary analog outputs can be either active or passive depending on required options.

Mechanical Mounting

The 5600 radar transmitter is easily carried to the tank top and mounted on a suitable nozzle or pipe. The radar transmitter should be installed as follows:

- Antenna oriented perpendicular to a horizontal surface.
- The transmitter should be mounted with as few fittings as possible within the beam angle.
- Filling inlets creating turbulence should preferably be kept at a distance.
- Choose as large antenna diameter as possible. A larger diameter concentrates the radar beam and ensures maximum antenna gain. Increased antenna gain offers greater reflection of weak surface echoes.

FIGURE 4. Rosemount 5600 Beamwidth

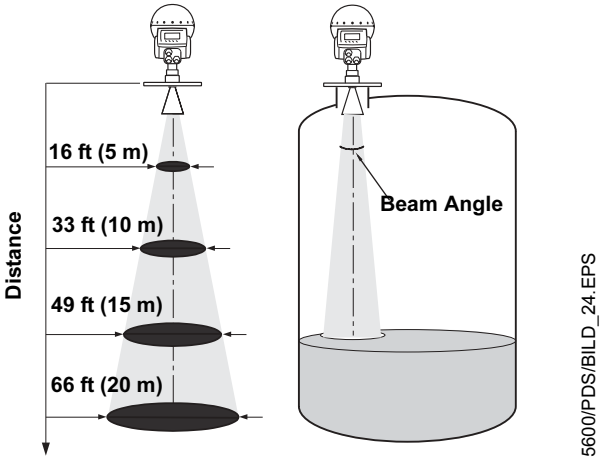
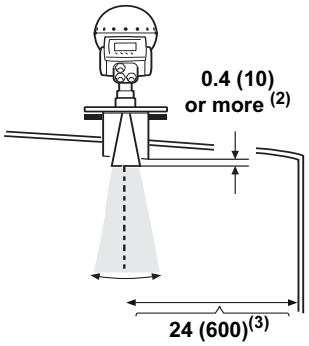


TABLE 1. Rosemount 5600 Beam Diameter and Angle

Antenna Type & Beam Angle	Distance, ft (m)			
	16 (5)	33 (10)	49 (15)	66 (20)
	Beam Diameter, ft (m)			
Cone 3 in 25°	7.2 (2.2)	14 (4.4)	22 (6.7)	29 (8.9)
Rod/Cone 4 in/ Process Seal 4 inch 21°	6.2 (1.9)	12 (3.7)	18 (5.6)	24 (7.4)
Cone 6 in/ Process Seal 6 inch 18°	5.2 (1.6)	10 (3.1)	15 (4.7)	21 (6.3)
Cone 8 inch 15°	4.3 (1.3)	8.5 (2.6)	13 (3.9)	17 (5.3)
Parabolic 10°	3.0 (0.9)	5.6 (1.7)	8.5 (2.6)	11 (3.5)

FIGURE 5. Preferred Mounting (1)



(1) Dimensions are inches (millimeters).

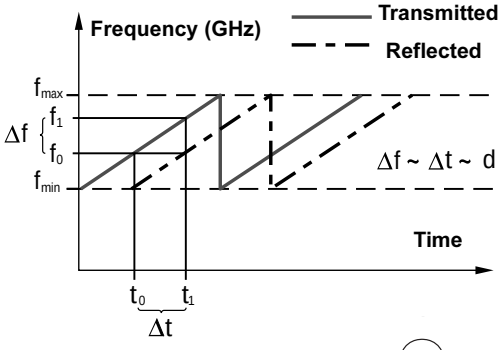
(2) For best measurement performance the nozzle height should be shorter than the antenna or consider an extended cone (Figure 17) for your current transmitter.

(3) Recommended minimum distance for all antennas. (Shorter distance may apply, consult factory).

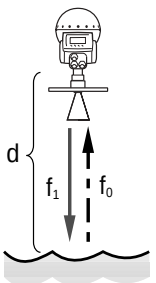
Measurement Principle

The level of the product in the tank is measured by radar signals transmitted from the antenna at the tank top. After the radar signal is reflected by the product surface the echo is picked up by the antenna. As the signal is varying in frequency the echo has a slightly different frequency compared to the signal transmitted at that moment. The difference in frequency is proportional to the distance to the product surface, and can be accurately calculated. This method is called FMCW (Frequency Modulated Continuous Wave) and is used in all high performance radar transmitters.

FIGURE 6. Frequency Modulated Continuous Wave



The FMCW method is based on a radar sweep with continuous changes in frequency.



Measuring Range

The diagrams below show how the measuring range is influenced by the antenna type, dielectric constant of the liquid (ε_r) and the process conditions. For optimum performance the maximum measuring distance should be kept within the range indicated with darker color in the diagrams. Values are valid for free propagation measurement without still-pipes (bridles).

For liquids with ε_r that are smaller than 1.9 such as liquefied gases, an 8 inch or bigger diameter antenna is recommended if measurement is done with free propagation. In this case the measuring range in calm surface tanks is 50 ft (15 m).

To increase the measuring range further in turbulent tanks, a still-pipe can be used. For still-pipe mounted 5600 transmitters the typical measuring range is 115-160 ft (35-50 m) in turbulent tanks with liquids having ε_r less than 1.9.

TABLE 2. Categories of liquids	
a	Oil, gasoline and other hydrocarbons, petrochemicals (dielectric constant, ε_r=1.9-4.0)
b	Alcohols, concentrated acids, organic solvents, oil/water mixtures and acetone (ε_r=4.0-10)
c	Conductive liquids, e.g. water based solutions, dilute acids and alkalis (ε_r > 10)

FIGURE 7. Applications with calm product surface(1)

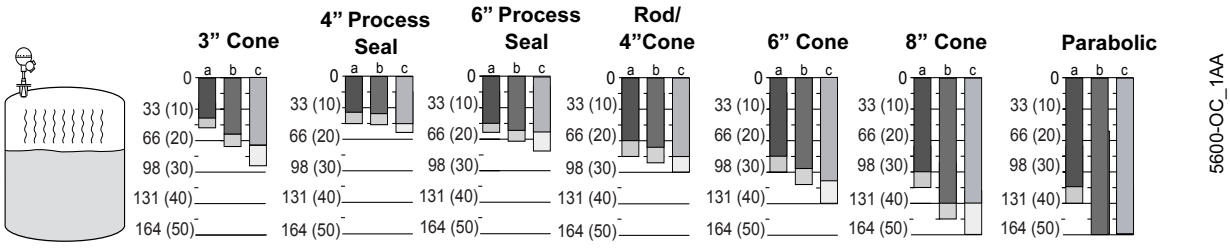


FIGURE 8. Applications where the product is gently stirred, causing minor turbulence(1)

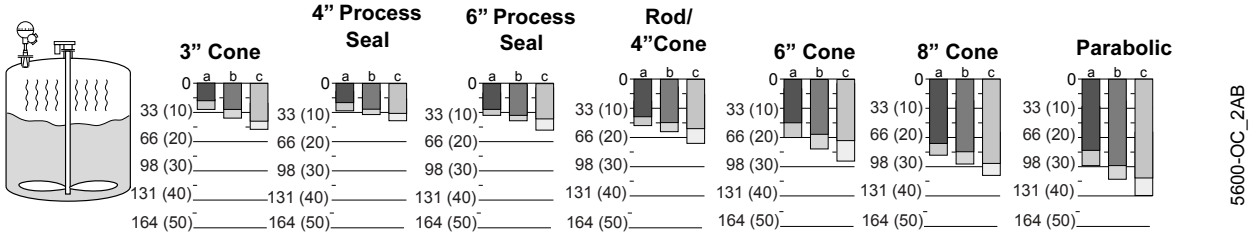
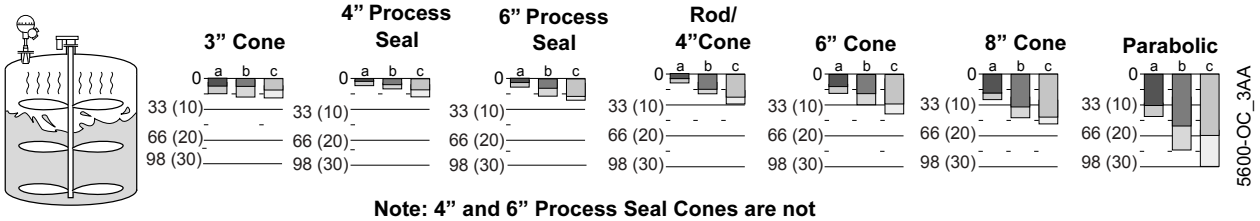


FIGURE 9. Applications with turbulent product surface conditions(1)



Note: 4" and 6" Process Seal Cones are not recommended for turbulent conditions

(1) Measuring range in ft (m).

System Integration

Level values are transmitted from the transmitter as analog 4-20 mA signals superimposed with HART or FOUNDATION™ fieldbus. The analog outputs are either passive for connection to powered cables or active providing signal power for 4-20 mA. Analog outputs can also be specified as intrinsically safe or non-intrinsically safe.

Basic configuration and setup can be done on a HART communicator, via the 2210 Display Unit, AMS, or DeltaV (for FOUNDATION fieldbus).

Rosemount Radar Master is a PC based software package which allows for full configuration, including advanced features such as Spectra plots, offline/online configuration capabilities, logging, extensive online help, etcetera. To communicate with the device using Radar Master either a HART or Modbus Modem (RS485 Sensor Bus Port) is required for the PC. For fieldbus devices Radar Master can only be connected to the Sensor Bus Port (see list of Modems on page 24).

The Rosemount 5600 is a core component of the PlantWeb digital plant architecture.

FIGURE 10. System Integration using the HART Communicator

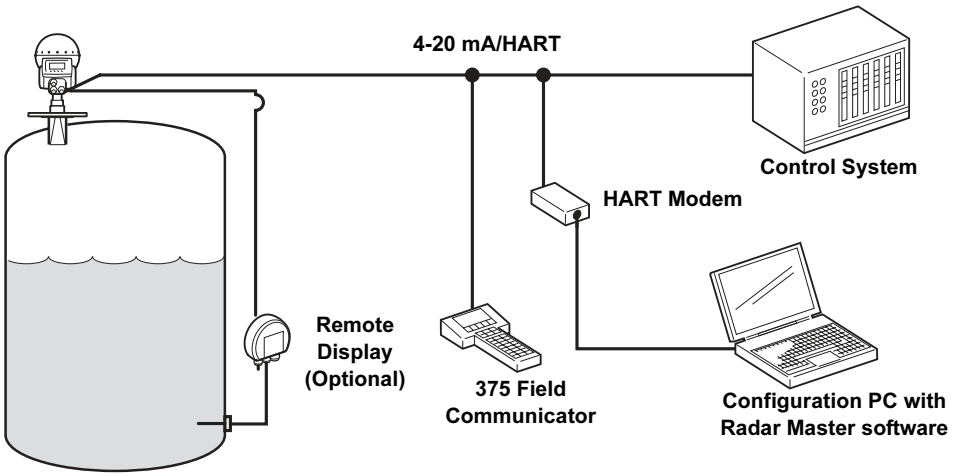
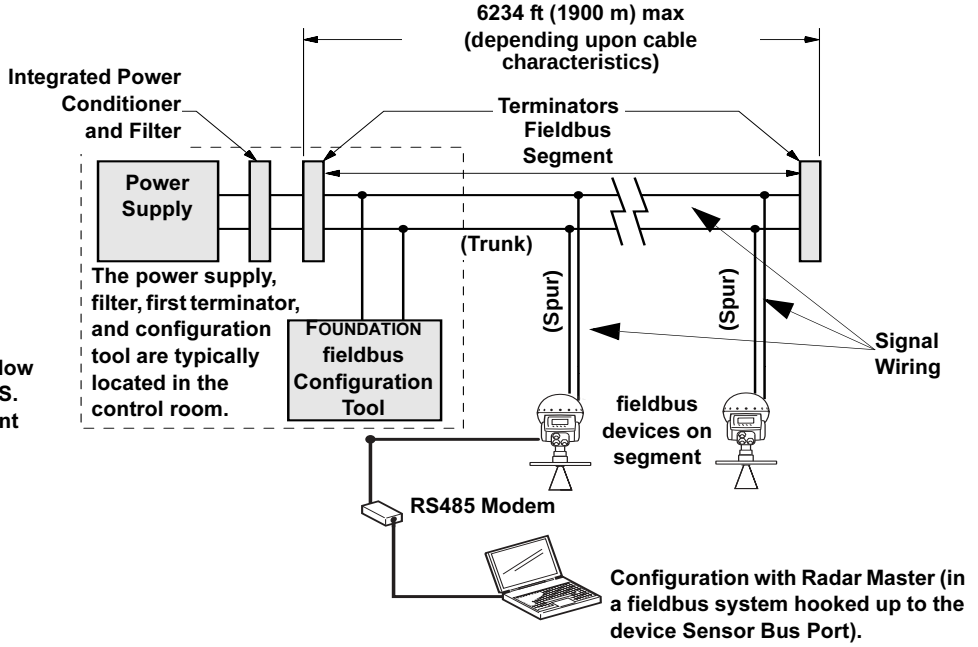


FIGURE 11. FOUNDATION fieldbus field wiring



Note:
Intrinsically safe installations may allow fewer devices per I.S. barrier due to current limitations.

Specifications

GENERAL

Product Designation
5600 Series Radar Level Transmitter

Operating Principle
10GHz FMCW radar

Beam Angle
See Figure 2-12 and Table 2-3 on page 9

Microwave Output Power
Max 1.0 mW

Internal Calibration
Internal digital reference for automatic compensation of radar sweep

Signal Processing
Powerful and advanced digital signal processing using FFT and advanced echo handling software

MEASURING PERFORMANCE

Instrument Accuracy (Under reference conditions)
±0.2 in (±5 mm)

Resolution
0.04 in (1 mm)

Repeatability
±0.04 in (±1 mm)

Measuring Range
0-164 ft (0-50 m)

Update Time
100 ms

Processors
32-bit Floating DSP

DISPLAY/CONFIGURATION

Display (factory mounted on transmitter)
Protection class IP67
With weather/dirt protection cover; graphical LCD display 128 by 64 pixels with 4 control soft-keys and 7 text lines with 16 characters/line for display and configuration.

Display (remote mounted)
Same as above, mounted in separate enclosure, protection class IP67; max cable length, display - radar transmitter: 330 ft. (100 m); cable type: 4 wire shielded instrument cable, min. 0.5 mm^2, (AWG 20).

Display with Temperature Inputs (remote mounted)
Same as above, mounted in separate enclosure, protection class IP67; max cable length, display - radar transmitter: 330 ft (100 m); cable type: 4 wire shielded instrument cable, min. 0.5 mm^2, (AWG 20); temperature measurement 1-3 spot elements PT100 or CU100, or 6 spot elements with common return.

HART Device
Emerson Process Management 375 Field Communicator
Emerson Process Management AMS software

PC/remote Configuration
Rosemount Radar Master, Powerful and Interactive Windows based configuration tool.

Recommended PC hardware specification: ≥ 1 GHz processor, ≥ 128 MbRam, Operating system of Win 2000, Win XP, or Win NT.

To communicate with the device using Radar Master either a HART or Modbus Modem (RS485 Sensor Bus Port) is required for the PC.

For fieldbus devices Radar Master can only be connected to the Sensor Bus Port (see listed Modems on page 24).

ELECTRIC

Power Supply
Ultra wide power supply 24-240 V AC or DC 0-60 Hz

Power Consumption
Maximum 10 W, Nominal 5 W

Outputs

Primary Output:
Alternative 1: HART + 4-20 mA current loop
(non-IS or IS option)
Alternative 2: FOUNDATION fieldbus (non-IS or IS option)

Secondary Outputs:
Analog 4-20 mA current loop, active or passive
(non-IS or IS option)

Analog Output Characteristics

Type
Analog 4-20 mA Current Loop, active (with power supplied by the 5600) or passive (for loop-supplied power)

Galvanic Isolation
> 1500 V RMS or DC

Analog Output Characteristics
See Product Certifications on page 11

Range
4-20 mA

Alarm Level
Standard: Low=3.8 mA, High=22 mA or freeze,
NAMUR NE43: High=22.50 mA,
Rosemount: Low=3.75 mA

Resolution
0.5μA (0.003%)

Linearity
±0.01%

Temperature Drift
± 28 ppm/°F (±50 ppm/°C)

Output Impedance
>10 MΩ

Voltage Compliance
7-30 V (passive output)

External Loop Resistance
<700 Ω (passive output with 24 V external supply)
<300 Ω (active output)

Fieldbus Output Characteristics
Fieldbus Voltage limits: 9 to 32 V
Current Draw: 12.5 mA
For I.S. Applications:
U_i < 30 V
I_i < 300 mA
P_i < 1.3 W
C_i = 0 μF
L_i = 0 mH

Output Cabling
Twisted and shielded pair; min. 0.5 mm^2 (AWG 20)

Cable Entries
3 × 1/2 inch NPT; for cable glands or conduit entries
Optional: 1/2 inch NPT Cable Gland Kit
Optional: 1/2 inch NPT/ M20 Adapters (Set of 3)

2210 Display Unit Output Characteristics

With Temperature Output
See Product Certifications on page 11

Without Temperature Output
See Product Certifications on page 11

Temperature Measurement
1-3 spot elements, PT100 or CU100, or 6 spot elements with common return. Input accuracy ±0.9°F (±0.5°C)

Temperature Measurement Output
Average temperature or individual spots (1)

(1) Individual spots not available in Foundation fieldbus devices

Mechanical

Housing/Enclosure

Permanent moulded cast aluminium, chromed and powder painted

Flanges

ANSI, DIN standard,
Material: Stainless steel 316L and Stainless Steel EN 1.4404
Optional: Hot-galvanized carbon steel

Weight, Excluding, Flange

18 lbs (8 kg)

Height Above Flange

15 in (400 mm)

Antenna Dimensions

Cone: See Figure 13 on page 14
Rod: See Figure 12 on page 13
Process Seal: See Figure 15 and Table 6 on page 15
Extended Cone: See Figure 16 on page 16
Cone with Integrated Flushing Connection:
See Figure 17 on page 16
Parabolic: See Figure 18 on page 17

TABLE 3. Antenna material and o-ring selection ● Applicable - Not applicable

	Rod Antenna	Cone Antenna	Process Seal Antenna	Extended Cone Antenna	Cone with Integrated Flushing Connection	Parabolic Antenna
Material:						
Stainless Steel 316L	●(1)	●	-	●	●	●
Hastelloy® C22	-	●	-	-	-	-
Titanium Gr1/Gr2	-	●	-	-	-	-
Tantalum	-	●	-	-	-	-
Monel® 400	-	●	-	-	-	-
PTFE	●(1)	-	●	-	-	-
Tank Seal:						
PTFE	-	●	-	●	●	●
Quartz	-	●	-	●	●	-
O-Rings:						
Viton	●	●	-	●	●	●
Kalrez	●	●	-	●	●	-
EPDM	●	●	-	●	●	-
Buna-N	●	●	-	●	●	-

(1) The Rod antenna is a combination of 316L SST and PTFE.

ENVIRONMENT

Ambient Temperature

-40 to 158°F (-40 to 70°C)

Process Temperature Range (1)

-40 to 752°F (-40 to 400°C)

Flange Temperature Range (1)

TABLE 4. Flange Temperature Range depending on O-ring selection

O-ring Material	Minimum Temperature °F (°C) in air	Maximum Temperature F (°C) in air
Viton	5 (-15)	392 (200)
Ethylene Propylene (EPDM)	-40 (-40)	266 (130)
Kalrez 6375	-4 (-20)	527 (275)
Buna-N	-31 (-35)	230 (110)

Pressure Range (1)

Full vacuum to +798 psig (+55 bar)

Emission Approvals

FCC: K8CPRO, K8CPROX
R&TTE: E813268O-CC

Humidity

IEC 60068-2-3

Climatic Class/Corrosion Class

IEC 68-2-1, IEC 60068-2-52 test KB severity 2

Ingress Protection

IP66, NEMA 4

Vibration

IEC 721-3-4 class 4M4

UV Protection

ISO 4892-2

Electromagnetic Compatibility

EN61326, Immunity EN 50081-2, Emission EN50081-1

Lightning Protection

EN61326, EN61000-4-5, IEC801-5, level 2 kV

Power Supply Fluctuation

IEC 92 Part 504 sec. 3.5

(1) See Figure 12, Figure 13, Figure 15, Figure 16, Figure 17, and Figure 18 for specification of each antenna.

Product Certifications

Approved Manufacturing Locations

Saab Rosemount Tank Radar AB – Gothenburg, Sweden

European Union Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales representative.

ATEX Directive (94/9/EC)

Rosemount Inc. complies with the ATEX Directive.

Ordinary Location Certification for Factory Mutual

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

5600 Series Radar Level Transmitter European ATEX Directive Information

This document lists specific requirements which have to be fulfilled to secure a safe installation and use of 5600 Series Radar Level Transmitter in a hazardous area. Omission may jeopardize safety, and Rosemount will not take any responsibility if requirements as listed below are not fulfilled.

Canadian Registration Number (CRN)

The product design of the Cone Antenna has been accepted and registered for use in Canada.
CRN: 0F1015.9087YTN (other provinces pending).

Hazardous Locations Certifications

ATEX Approvals

5600 Series Level Transmitter

E1 Certificate Number: Sira 03ATEX 1294X
ATEX Category Marking ⟨Ex⟩ II 1/2 G

With Intrinsically Safe Outputs (only)
ATEX Marking: ⟨Ex⟩ II (2) (1) 1/2 G
Safety Coding: EEx de [ib] [ia] IIC T6 (T_{amb} -40°C, +70°C)

With Non-IS Primary Output and IS Display Output
ATEX Marking: ⟨Ex⟩ II (1) 1/2 G
Safety Coding: EEx de [ia] IIC T6 (T_{amb} -40°C, +70°C)

With Non-IS Primary and/or Non-IS Secondary Outputs
ATEX Marking: ⟨Ex⟩ II 1/2 G
Safety Coding: EEx de IIC T6 (T_{amb} -40°C, +70°C)

Max supply voltage: 55 Vdc
Passive analog output 4-20mA,
Label identification = HART passive.
Voltage compliance 7-30V:
U_i < 30 V
I_i < 200 mA
Pi < 1.3 W
C_i = 0 μF
L_i = 0 mH

Active analog output 4-20mA,
Label identification = HART active.
Max load 300Ω:
U_o < 23.1 V
I_o < 125.7 mA
P_o < 0.726 W
C_{ext} <0.14 μF
L_{ext} < 2.2 mH

FOUNDATION Fieldbus,
Label identification = FOUNDATION fieldbus.
U_i < 30 V
I_i < 300 mA
P_i < 1.3 W
C_i = 0 μF
L_i = 0 mH

2210 Display Unit

E1 Certificate Number: Sira 00ATEX 2062
ATEX Category Marking ⟨Ex⟩ II 1/2 G

Without Temperature Inputs
ATEX Marking: ⟨Ex⟩ II 1/2 G
Safety Coding: EEx ib IIC T4 (T_{amb} -40°C, +70°C)

With Temperature Inputs
ATEX Marking: ⟨Ex⟩ II 1/2 G
Safety Coding: EEx ib [ia] IIC T4, (T_{amb} -40°C, +70°C)

Factory Mutual (FM)

5600 Series Level Transmitter

E5 Certificate Number: 4D5A9.AX

With Intrinsically safe outputs
(all versions except those listed below)

Explosion proof with IS outputs for HAZLOC

Class I, Division 1, Group A, B, C and D

Max operating temperature +70°C

Dust ignition proof for use in Class II/III, Division 1, Groups E, F, and G.

Use conductors rated at least 85°C

Shall be installed in accordance with System control drawing 9150074-994.

With Non-IS Secondary Outputs (codes 1 and 3)

Explosion proof

Class I, Division 1, Group A, B, C and D

Max operating temperature +70°C

Dust ignition proof for use in Class II/III, Division 1, Groups E, F, and G.

Use conductors rated at least 85°C

2210 Display Unit

E5 Certificate: 4D5A9.AX

All Versions

Intrinsic Safe for HAZLOC

Class I, Division 1, Group A, B, C and D T4

Max operating temperature +70°C

Shall be installed in accordance with System control drawing 9150074-997.

Canadian Standards Association (CSA)

5600 Series Level Transmitter

E6 Certificate Number: 2003.153280-1346169

With Non-IS Primary and/or Secondary Outputs

Explosion proof Ex de IIC T6

Shall be installed in accordance with System control drawing 9150074-937.

Factory seal, conduit seal not required.

With IS Display Outputs, IS Primary and/or Secondary Outputs

Explosion proof Ex de [ib/ia] IIC T6

Shall be installed in accordance with System control drawing 9150074-939.

Factory seal, conduit seal not required.

2210 Display Unit

E6 Certificate Number: 2003.153280-1346165

Without Temperature Inputs

Intrinsically safe EEx ib IIC T4, (T_{amb} -40°C, +70°C)

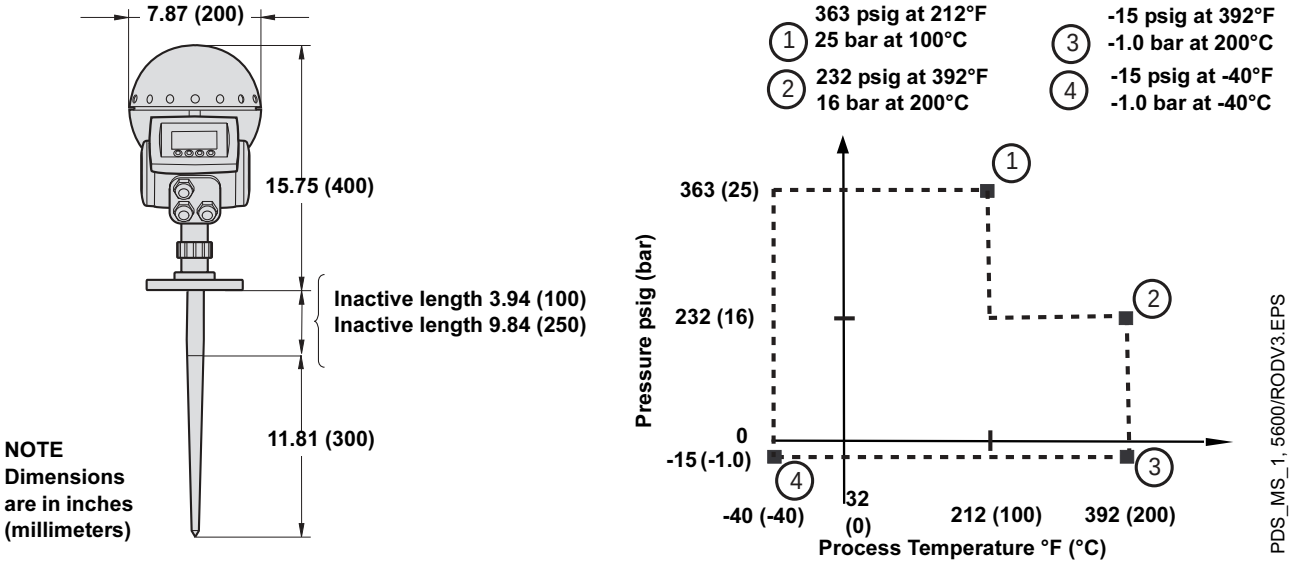
With Temperature Inputs

Intrinsically safe EEx ib [ia] IIC T4, (T_{amb} -40°C, +70°C)

Shall be installed in accordance with System control drawing 9150074-944.

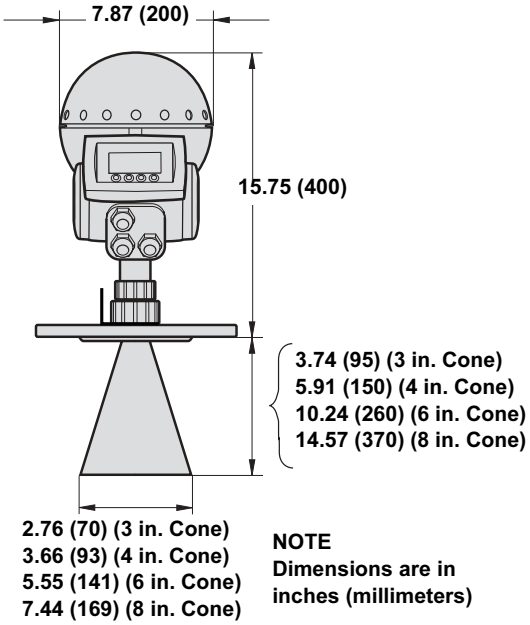
Dimensional Drawings

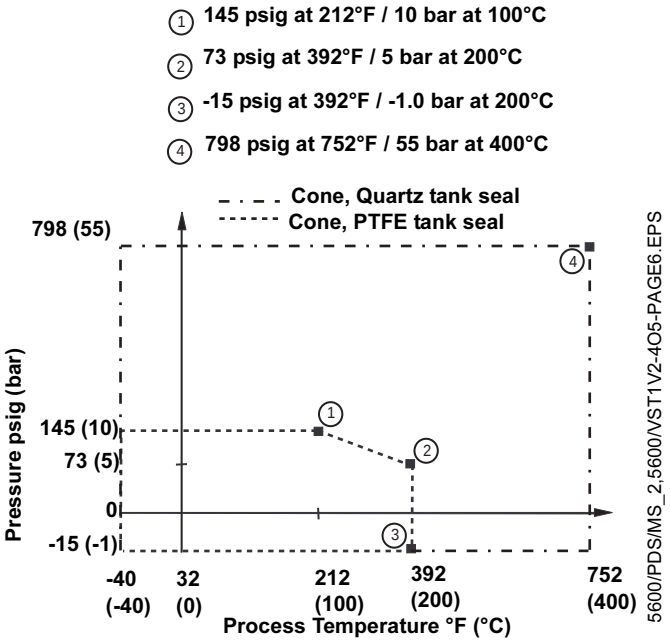
FIGURE 12. Rod Dimensions



Note: Pressure rating may be lower depending on flange selection.
Minimum / maximum flange temperature rating depends on O-ring selection (See Table 5 and Figure 14 on page 14).

FIGURE 13. Cone Dimensions



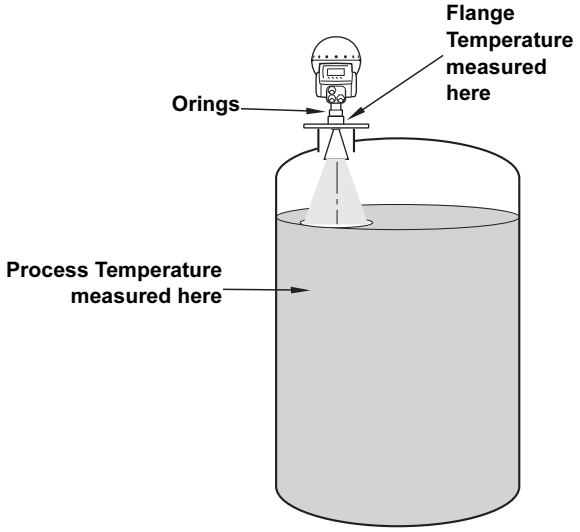


Note: Pressure rating may be lower depending on flange selection.
Minimum / maximum flange temperature rating depends on O-ring selection (See Table 5 and Figure 14).

TABLE 5. Flange Temperature Range depending on O-ring selection

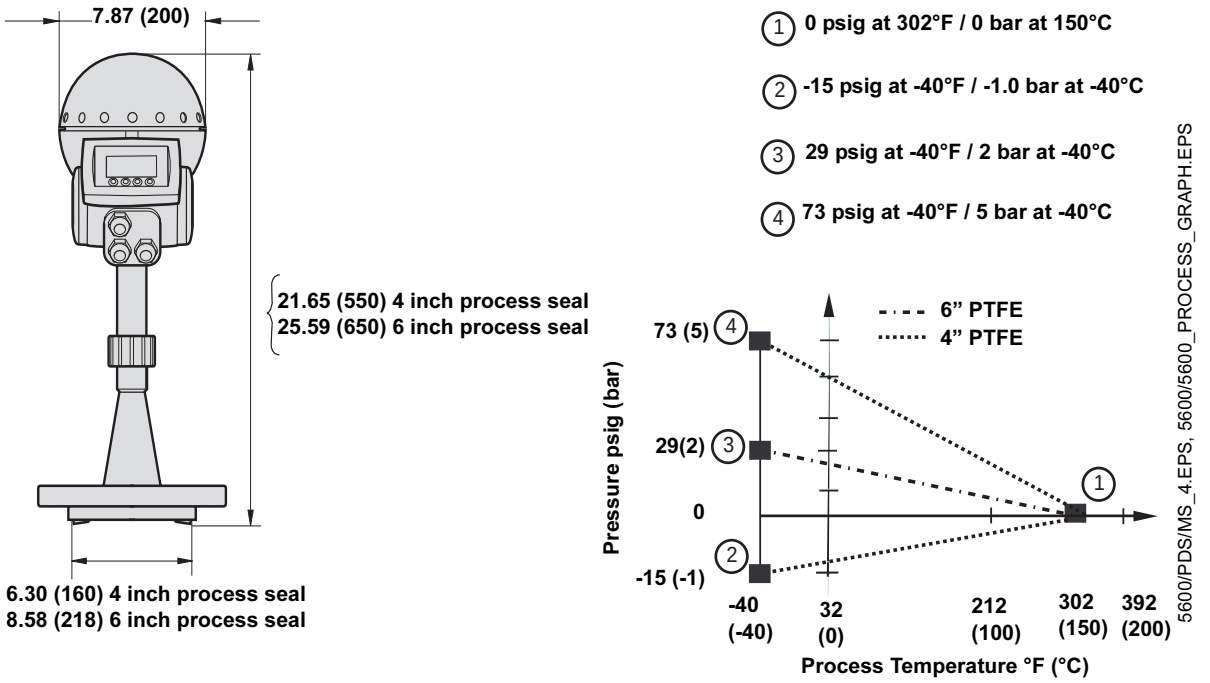
O-ring Material	Minimum Temperature °F (°C) in air	Maximum Temperature F (°C) in air
Viton	5 (-15)	392 (200)
Ethylene Propylene (EPDM)	-40 (-40)	266 (130)
Kalrez 6375	-4 (-20)	527 (275)
Buna-N	-31 (-35)	230 (110)

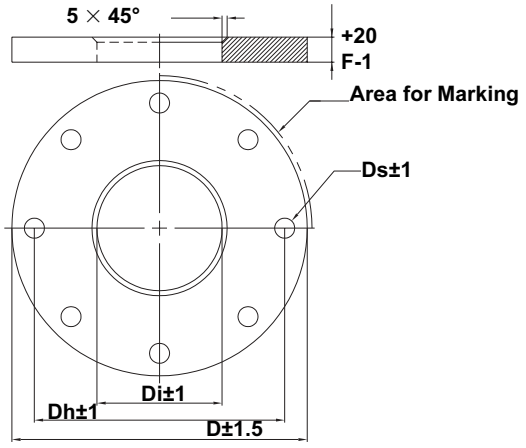
FIGURE 14. Temperature Rating Considerations



Note
Flange temperature depends on mounting conditions, such as nozzle position, distance to max product level, nozzle height, presence of insulation, etc.

FIGURE 15. Process Seal Dimensions



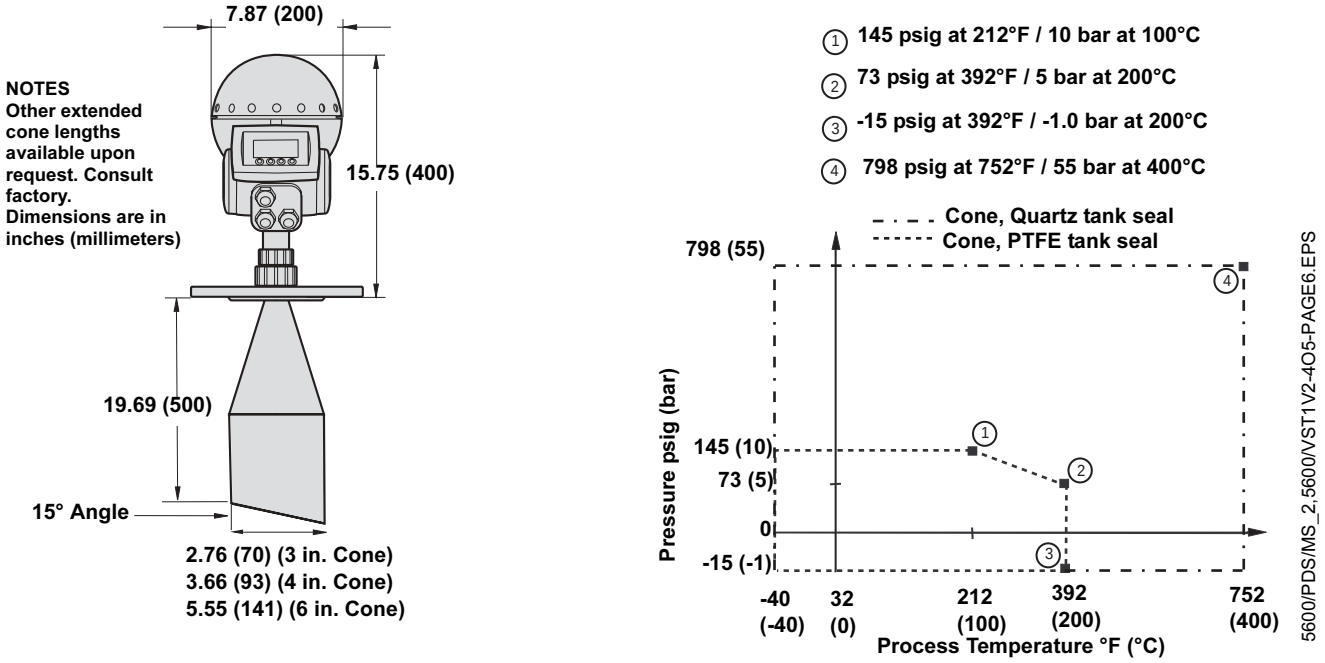


Note
Dimensions are in inches (millimeters)

TABLE 6. Dimensions for Stainless Steel Flange and Galvanized Carbon Steel Dimensions are in inches (millimeters)

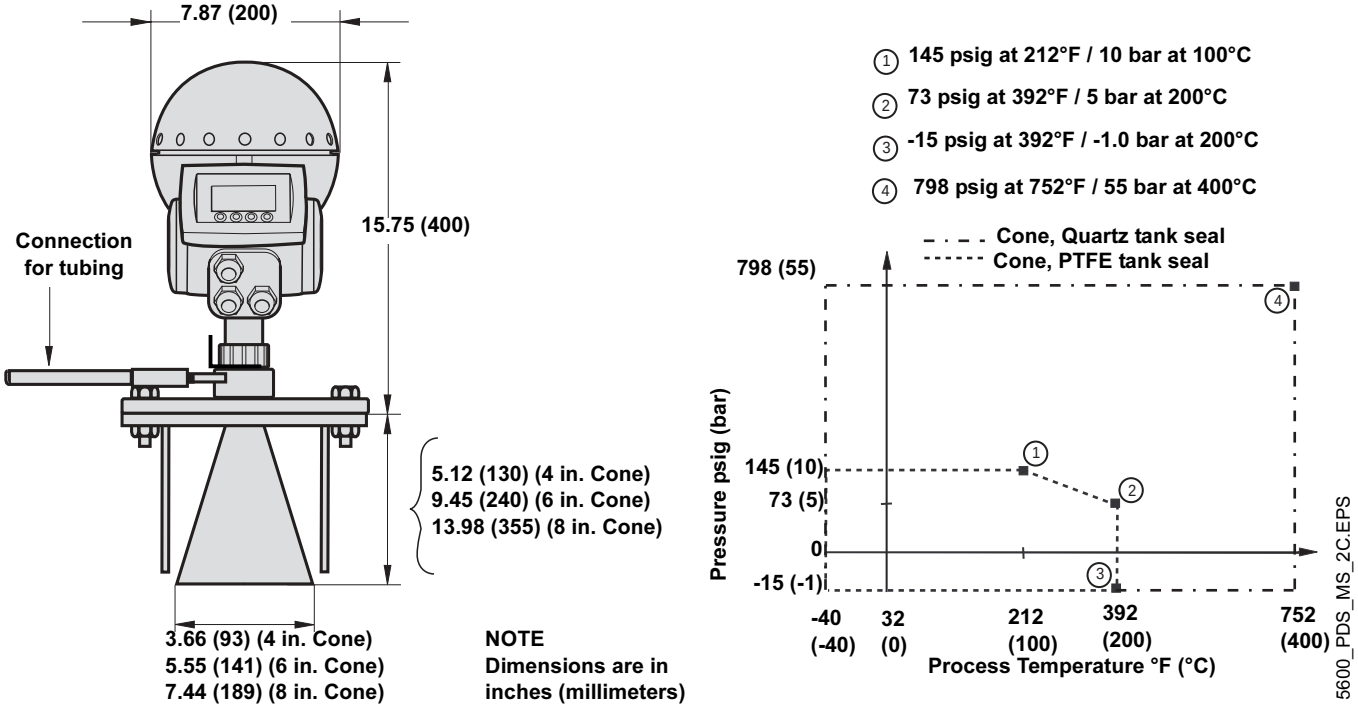
Flange	Di	D	Dh	Ds	F
ANSI 4 inch Class 150	3.78 (96)	9.02 (229)	7.52 (191)	0.87 (22)	0.87 (22)
ANSI 6 inch Class 150	4.94 (125.5)	10.98 (279)	9.49 (241)	0.87 (22)	0.87 (22)
DN100 PN16	3.78 (96)	8.66 (220)	7.09 (180)	0.71 (18)	0.87 (22)
DN150 PN16	4.94 (125.5)	11.22 (285)	9.45 (240)	0.87 (22)	0.87 (22)

FIGURE 16. Extended Cone Dimensions for Stainless Steel Flange



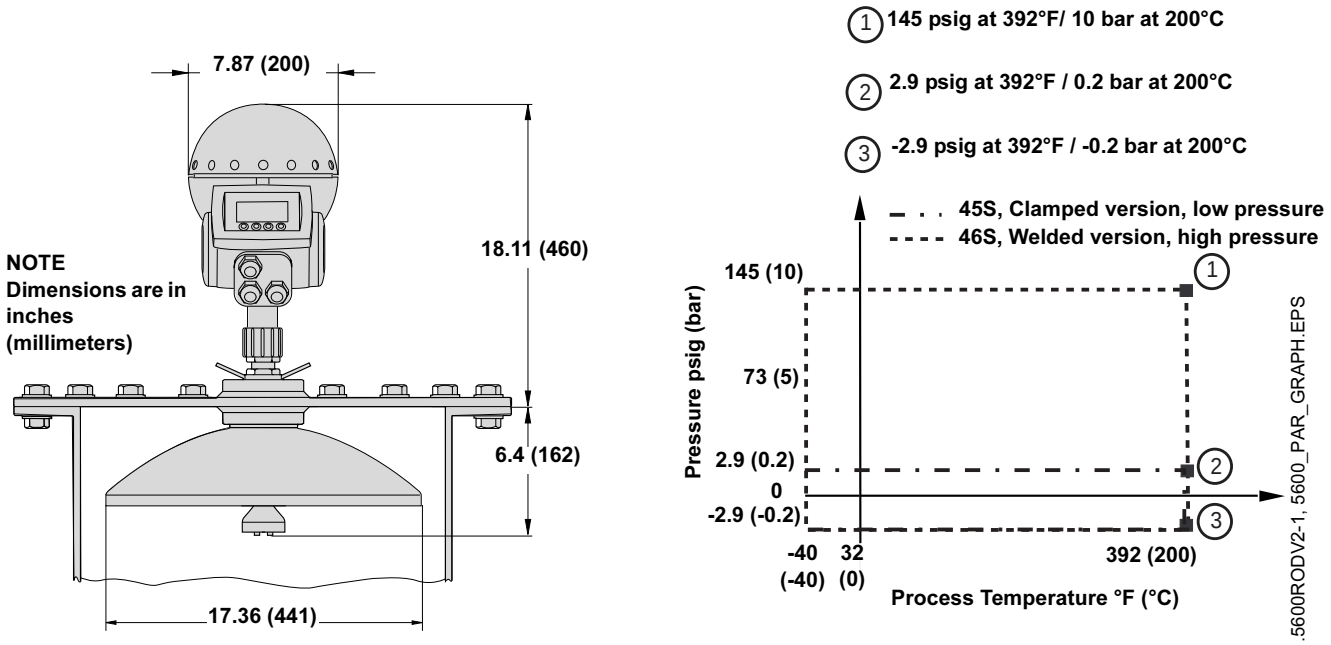
Note: Pressure rating may be lower depending on flange selection.
Minimum / maximum flange temperature rating depends on O-ring selection (See Table 5 and Figure 14 on page 14).

FIGURE 17. Cone with Integrated Flushing Connection Dimensions for Stainless Steel Flange



Note: Pressure rating may be lower depending on flange selection.
Minimum / maximum flange temperature rating depends on O-ring selection (See Table 5 and Figure 14 on page 14).

FIGURE 18. Parabolic Dimensions for Stainless Steel Flange



Ordering Information

TABLE 7. Rosemount 5600 Radar Transmitter Selection

Model	Product Description
5601	Radar Level Transmitter for Process Applications
Code	**Frequency Band**
U	US Market Only (10 GHz)
S	Switzerland Market Only (10 GHz)
A	All Other Markets (10 GHz)
Code	**Product Certification**
NA	None
E1	ATEX Flameproof
E5	FM Explosionproof
E6	CSA Explosionproof
Code	**Power Supply**
P	24-240 V DC/AC 0-60 Hz
Code	**Primary Output**
5A	4-20 mA with HART communication, Passive Output
5B	4-20 mA with HART communication, Passive Output, Intrinsically Safe Circuit (1)
5C	4-20 mA with HART communication, Active Output
5D	4-20 mA with HART communication, Active Output, Intrinsically Safe Circuit (1)
7A	Foundation Fieldbus
7B	Foundation Fieldbus, Intrinsically Safe Circuit (1)
Code	**Secondary Output**
0	None
1	4-20 mA, Passive Output (2)
2	4-20 mA, Passive Output, Intrinsically Safe Circuit (1)
3	4-20 mA, Active Output (2)
4	4-20 mA, Active Output, Intrinsically Safe Circuit (1)
Code	**Display Unit**
N	None
P	LOI, Factory mounted on transmitter
R	LOI, Remote mounted
T	LOI, Remote mounted with temp inputs (1-6 spot elements with common returns)
Code	**Volume Calculation**
E	Basic Volume Equations (Standard)
V	Strapping Table, up to 100 points
Typical Model Number: 5601 S E1 P 5A 0 P E Antenna Selection (3)	

(1) Intrinsically safe circuit only applicable if product certificate codes E1, E5, or E6 is selected.

(2) Not allowed in combination with Display Unit codes P, R, or T.

(3) Select the antenna type and options using Table 8, Table 9, Table 10, Table 12, and Table 13.

TABLE 8. Rod Antenna

Code	Antenna Type	Antenna Size	Antenna Material	Note
	Rod			
11S		1.5 in. threaded version	SST 316L and PTFE	Inactive Length 4 inch (100 mm)
12S		2 in. (DN50) nozzles	SST 316L and PTFE	Inactive Length 4 inch (100 mm)
13S		3 in. (DN80) nozzles	SST 316L and PTFE	Inactive Length 4 inch (100 mm)
14S		4 in. (DN100) nozzles	SST 316L and PTFE	Inactive Length 4 inch (100 mm)
11L		1.5 in. threaded version	SST 316L and PTFE	Inactive Length 10 inch (250 mm)
12L		2 in. (DN50) nozzles	SST 316L and PTFE	Inactive Length 10 inch (250 mm)
13L		3 in. (DN80) nozzles	SST 316L and PTFE	Inactive Length 10 inch (250 mm)
14L		4 in. (DN100) nozzles	SST 316L and PTFE	Inactive Length 10 inch (250 mm)
1XX		Customer specific rod or material		Consult Factory
Code		**Tank Seal**		
N		Not Applicable		
Code		**O-ring Material**		
V		Viton		
K		Kalrez 6375		
E		EPDM		
B		Buna-N		
Code		**Process Connection**		
NR		Antenna with Plate Design *NOTE: Customer supplied flange or see Table 17 on page 24 for flange options*		
XX		Special Process Connection		Consult Factory
		Threaded Version		
TN		Threaded 1.5 in. NPT		
TB		Threaded 1.5 in. G		
Code		**Options**		
Q8		Material Traceability Certification per EN 10204 3.1.B		
Typical Model Number: Selected code from Table 7 on page 18 11S N F TN				

TABLE 9. Cone Antenna

Code	Antenna Type	Antenna Size	Antenna Material	Note
	Cone			
23S		3 in. (DN80) nozzles	SST 316L	Pipe Installation Only
24S		4 in. (DN100) nozzles	SST 316L	Free propagation or 4” pipe
26S		6 in. (DN150) nozzles	SST 316L	Free propagation or 6” pipe
28S		8 in. (DN200) nozzles	SST 316L	Free propagation only
23H		3 in. (DN80) nozzles	Hastelloy C22	Longer Lead-time, Consult Factory
24H		4 in. (DN100) nozzles	Hastelloy C22	Longer Lead-time, Consult Factory
26H		6 in. (DN150) nozzles	Hastelloy C22	Longer Lead-time, Consult Factory
28H		8 in. (DN200) nozzles	Hastelloy C22	Longer Lead-time, Consult Factory
23T		3 in. (DN80) nozzles	Titanium Gr 1/2	Longer Lead-time, Consult Factory
24T		4 in. (DN100) nozzles	Titanium Gr 1/2	Longer Lead-time, Consult Factory
26T		6 in. (DN150) nozzles	Titanium Gr 1/2	Longer Lead-time, Consult Factory
28T		8 in. (DN200) nozzles	Titanium Gr 1/2	Longer Lead-time, Consult Factory
23M		3 in. (DN80) nozzles	Monel 400	Longer Lead-time, Consult Factory
24M		4 in. (DN100) nozzles	Monel 400	Longer Lead-time, Consult Factory
26M		6 in. (DN150) nozzles	Monel 400	Longer Lead-time, Consult Factory
28M		8 in. (DN200) nozzles	Monel 400	Longer Lead-time, Consult Factory
23Z		3 in. (DN80) nozzles	Tantalum	Longer Lead-time, Consult Factory
24Z		4 in. (DN100) nozzles	Tantalum	Longer Lead-time, Consult Factory
26Z		6 in. (DN150) nozzles	Tantalum	Longer Lead-time, Consult Factory
28Z		8 in. (DN200) nozzles	Tantalum	Longer Lead-time, Consult Factory
2XX		Customer specific cone or material		Consult Factory
Code		**Tank Seal**		
P		PTFE		
Q		Quartz		
Code		**O-ring Material**		
V		Viton		
K		Kalrez 6375		
E		EPDM		
B		Buna-N		
Code		**Process Connection**		
NR		Antenna with Plate Design		
		NOTE: Customer supplied flange or see Table 17 on page 24 for flange options		
XX		Special Process Connection		Consult Factory
Code		**Options**		
Q8		Material Traceability Certification per EN 10204 3.1.B		
Typical Model Number: Selected code from Table 7 on page 18 24S P V NR				

TABLE 10. Process Seal Antenna

Code	Antenna Type	Antenna Size	Antenna Material	Note
	Process Seal			
34S		4 in. (DN100) nozzles	PTFE	
36S		6 in. (DN150) nozzles	PTFE	
Code		**Tank Seal**		
P		PTFE		
Code		**O-ring Material**		
N		Not Applicable		
Code		**Process Connection**		
NF		None, Customer to supply flange per dimensions on Figure 15		
XX		Special Process Connection		Consult Factory
		Stainless Steel Flange		
CA		4 in. ANSI Class 150		
DA		6 in. ANSI Class 150		
JA		DN100 PN16		
KA		DN150 PN16		
		Galvanized Carbon Steel Flange		
CC		4 in. ANSI Class 150		Longer Lead-Time, Consult Factory
DC		6 in. ANSI Class 150		Longer Lead-Time, Consult Factory
JC		DN100 PN16		Longer Lead-Time, Consult Factory
KC		DN150 PN16		Longer Lead-Time, Consult Factory
Code		**Options**		
Q8		Material Traceability Certification per EN 10204 3.1.B		
Typical Model Number: Selected code from Table 7 on page 18 34S P N JA				

TABLE 11. Parabolic Antenna

Code	Antenna Type	Antenna Size	Antenna Material	Note
	Parabolic			
45S		ø18 in. (440mm)	SST with Integrated Inclination	Clamped version
46S		ø18 in. (440mm)	SST with Integrated Inclination	Welded version
4XX		Customer Specific	Customer Specific	Consult Factory
Code		**Tank Seal**		
P		PTFE		
Code		**O-ring Material**		
V		Viton		
Code		**Process Connections**		
NF		None, Flange Ready		
XX		Special Process Connection		Consult Factory
Code		**Options**		
Q8		Material Traceability Certification per EN 10204 3.1.B		
Typical Model Number: Selected code from Table 7 on page 18 45S P V NR				

TABLE 12. Extended Cone Antenna

Code	Antenna Type	Antenna Size	Antenna Material	Note
	Extended			
73S		3 in. (DN80) nozzles	SST 316L	Standard length 20 inch (500 mm)
74S		4 in. (DN100) nozzles	SST 316L	Standard length 20 inch (500 mm)
76S		6 in. (DN150) nozzles	SST 316L	Standard length 20 inch (500 mm)
7XX		Customer specific extended cone or material		Consult Factory
Code		**Tank Seal**		
P		PTFE		
Q		Quartz		
Code		**O-ring Material**		
V		Viton		
K		Kalrez 6375		
E		EPDM		
B		Buna-N		
Code		**Process Connections**		
NR		Antenna with Plate Design		
		NOTE: Customer supplied flange or see Table 17 on page 24 for flange options		
XX		Special Process Connection		Consult Factory
Code		**Options**		
Q8		Material Traceability Certification per EN 10204 3.1.B		
Typical Model Number: Selected code from Table 7 on page 18 76S P V NR				

TABLE 13. Cone Antenna with Integrated Flushing Connection

Code	Antenna Type	Antenna Size	Antenna Material	Note
	Cone with Integrated Flushing Connection			
94S		4 in. (DN100) nozzles	SST 316L	Consult Factory
96S		6 in. (DN150) nozzles	SST 316L	Consult Factory
98S		8 in. (DN200) nozzles	SST 316L	Consult Factory
Code		**Tank Seal**		
P		PTFE		
Q		Quartz		
Code		**O-ring Material**		
V		Viton		
K		Kalrez 6375		
E		EPDM		
B		Buna-N		
Code		**Process Connection**		
XX		Special Process Connection		Consult Factory
		Stainless Steel Flange Welded to Antenna		
CL		4 in. ANSI Class 150		Max 101 psig at 392°F (7 bar at 200°C)
DL		6 in. ANSI Class 150		Max 145 psig at 392°F (10 bar at 200°C)
FL		8 in. ANSI Class 150		Max 145 psig at 392°F (10 bar at 200°C)
JL		DN100 PN16		Max 72 psig at 392°F (5 bar at 200°C)
KL		DN150 PN16		Max 87 psig at 392°F (6 bar at 200°C)
LL		DN200 PN16		Max 87 psig at 392°F (6 bar at 200°C)
Code		**Options**		
Q8		Material Traceability Certification per EN 10204 3.1.B		
Typical Model Number: Selected code from Table 7 on page 18 94S P K KL				

TABLE 14. Transmitter Options (multiple selections allowed)

Code	Options
	Material Trraceability Certification
Q8	Material Traceability Certification per EN 10204 3.1B
	Calibration Data Certification
Q4	Calibration Data Certificate
	Software Configuration
C1	Custom Software Configuration (CDS required with order)
	Alarm Limits
C4	NAMUR Alarm Level, High Alarm
C8	Low Alarm (Standard Rosemount Alarm)
	Conduit Adapters
G1	1/2 inch NPT Cable Gland Kit
G2	1/2 inch NPT/ M20 Adapters (Set of 3)
	Special Procedures
P1	Hydrostatic Testing

TABLE 15. Typical Model Code Examples

5601 A E1 P 5A 0 P E 24S P V NR
ATEX approval, passive HART primary output and display mounted on transmitter. Basic Volume calculation. Antenna is a 4 inch Cone, SST with PTFE Seal and Viton O-rings. No options.
5601 U E5 P 7A 2 T V 94S P K CL C1
FM approval, FOUNDATION™ fieldbus output and remote mounted display with temp inputs and a secondary 4-20mA passive IS output. Volume table with up to 100 points. 4 inch Cone Antenna with integrated cleaning, PTFE seal and kalrez o-rings for high temperature and pressure. Flange is ANSI 4 inch Class 150 stainless steel. Custom configuration selected.

Accessories

TABLE 16. Accessories Part Numbers

Part Number	Description	Note
Modems		
03300-7004-0001	HART Modem and cables	Viator by MacTec
05600-5004-0001	K2 RS485 Modbus Modem	For Sensor Bus Port connection
Antenna Accessories		
05600-5001-0001	PTFE Protective Cover (PTFE Bag)	For Parabolic Antenna only

Rod and Cone Antenna Flanges

TABLE 17. Non-welded Flange Part Numbers

Stainless Steel Flanges			
Part Number	**Flange Size**	**Dimensions**	**Material**
05600-1811-0211	ANSI 2 inch Class 150	Acc. To ANSI B16.5	SST 316L (1)
05600-1811-0231	ANSI 2 inch Class 300	Acc. To ANSI B16.5	SST 316L (1)
05600-1811-0311	ANSI 3 inch Class 150	Acc. To ANSI B16.5	SST 316L
05600-1811-0331	ANSI 3 inch Class 300	Acc. To ANSI B16.5	SST 316L
05600-1811-0411	ANSI 4inch Class 150	Acc. To ANSI B16.5	SST 316L
05600-1811-0431	ANSI 4 inch Class 300	Acc. To ANSI B16.5	SST 316L
05600-1811-0611	ANSI 6 inch Class 150	Acc. To ANSI B16.5	SST 316L
05600-1811-0811	ANSI 8 inch Class 150	Acc. To ANSI B16.5	SST 316L
05600-1810-0231	DN50 PN40	Acc. To EN 1092-1	EN 1.4404 (2)
05600-1810-0311	DN80 PN16	Acc. To EN 1092-1	EN 1.4404 (2)
05600-1810-0331	DN80 PN40	Acc. To EN 1092-1	EN 1.4404 (2)
05600-1810-0411	DN100 PN16	Acc. To EN 1092-1	EN 1.4404 (2)
05600-1810-0431	DN100 PN40	Acc. To EN 1092-1	EN 1.4404 (2)
05600-1810-0611	DN150 PN16	Acc. To EN 1092-1	EN 1.4404 (2)
05600-1810-0811	DN200 PN16	Acc. To EN 1092-1	EN 1.4404 (2)
Galvanized Carbon Steel Flanges (Note: Longer Lead-time, Consult Factory)			
Part Number	**Flange Size**	**Dimensions**	**Material**
05600-1811-0210	ANSI 2 inch Class 150	Acc. To ANSI B16.5	CS (1)
05600-1811-0230	ANSI 2 inch Class 300	Acc. To ANSI B16.5	CS (1)
05600-1811-0310	ANSI 3 inch Class 150	Acc. To ANSI B16.5	CS
05600-1811-0330	ANSI 3 inch Class 300	Acc. To ANSI B16.5	CS
05600-1811-0410	ANSI 4 inch Class 150	Acc. To ANSI B16.5	CS
05600-1811-0430	ANSI 4 inch Class 300	Acc. To ANSI B16.5	CS
05600-1811-0610	ANSI 6 inch Class 150	Acc. To ANSI B16.5	CS
05600-1811-0810	ANSI 8 inch Class 150	Acc. To ANSI B16.5	CS
05600-1810-0230	DN50 PN40	Acc. To EN 1092-1	CS (2)
05600-1810-0310	DN80 PN16	Acc. To EN 1092-1	CS (2)
05600-1810-0330	DN80 PN40	Acc. To EN 1092-1	CS (2)
05600-1810-0410	DN100 PN16	Acc. To EN 1092-1	CS (2)
05600-1810-0430	DN100 PN40	Acc. To EN 1092-1	CS (2)
05600-1810-0610	DN150 PN16	Acc. To EN 1092-1	CS (2)
05600-1810-0810	DN200 PN16	Acc. To EN 1092-1	CS (2)

(1) Use gasket type Ia.

(2) Gasket type according to EN 1514-1 and bolting according to EN1515-2.

Application and Configuration Data Sheet

★ Indicates Default Factory Configuration

Customer Information, Model Number, and Tagging Information (Required for C1 option)

Customer/ End User: _____ Salesperson: _____

Customer Contact: _____ P.O. Number: _____

Phone Number: _____ Line Item: _____

E-mail Address: _____ Ultimate Destination: _____

Model Number: |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_| - |_|_|_|_|_|_|_| - |_|_|_|_|_|_|_|_|_|_|
(Options)

Software Tag: |_|_|_|_|_|_|_|_| (8 characters max) Hardware Tag: |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_| (21 characters max)

Process Information (Information for preorder support)

Process Name: _____ Product Type: _____

Process Description: _____

Dielectric Constant: ❑ 1.4-2.5 ❑ 4.0-10 ❑ Unknown
❑ 2.5-4.0 ❑ >10 ❑ Process is water-based

Process Temperature: Minimum: _____ ❑ °F ❑ °C Maximum: _____ ❑ °F ❑ °C

Process Pressure: Minimum: _____ ❑ psig ❑ bar Maximum: _____ ❑ psig ❑ bar

Rapid Level Changes: (>100 mm/s, 4 in/s) ❑ No ❑ Yes

Solid Product ❑ No ❑ Yes

Foam Type: ❑ None ❑ Light (Airy) ❑ Heavy (Dense)
Foam Present: ❑ Not Applicable ❑ Occasionally ❑ Constantly
Foam Thickness: _____ ❑ Inches ❑ Millimeters

Turbulence Type: (See page 5 for details) ❑ Calm Surface ❑ Gently Stirred ❑ Turbulent Conditions

Turbulence due to: ❑ Not Applicable ❑ Agitation ❑ Flowing
❑ Splash Loading ❑ Vortex

★ Indicates Default Factory Configuration

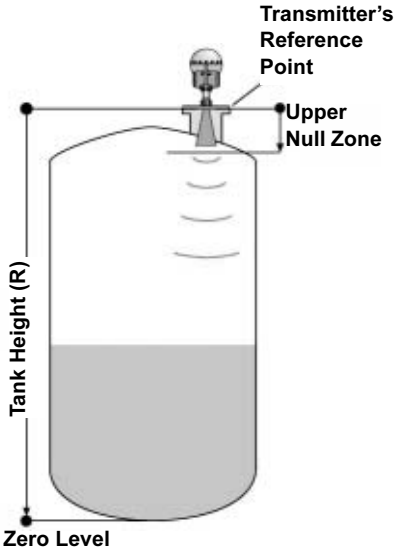
Tank Geometry (Required for C1 option)

Tank Shape[1]:

Select a Tank Type corresponding to the actual tank on which the device is mounted. If the device is mounted on a Tank Type that is not available as an individual selection choose Unknown.

❑ **Unknown★** ❑ Vertical Cylinder ❑ Horizontal Cylinder

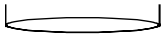
❑ Spherical ❑ Cubical[2]



Tank Bottom[3]:

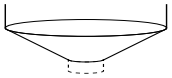
Select a Tank Bottom Type that corresponds to the actual shape of the tank bottom.

❑ **Unknown★** ❑ Flat[4]



❑ Dome/Dish/Bullet

❑ Cone



❑ Other
(Inclined or obstructed due to heating coils, pipes, etc.).

Tank Height: _____ ❑ m ❑ **mm★** ❑ ft ❑ in

(1) See page 28 for examples of each tank type.

(2) A cubical tank type is defined as a box shaped tank with right angles.

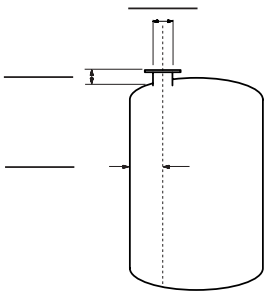
(3) Tank Bottom Type is only applicable for Vertical Cylinder and Cubical Tanks.

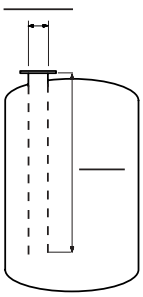
(4) Bottom of the tank is <5°.

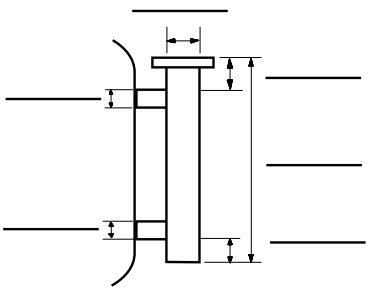
Fitting Dimensions (Information for preorder support)

Please fill in the dimensions (according to selected variable unit)

❑ Nozzle ❑ Stilling Well ❑ Bypass Pipe







★ Indicates Default Factory Configuration

Analog Output (4-20mA analog output) (Not applicable for FOUNDATION fieldbus devices) (Required for C1 option)

Primary Variables (Analog Output 1):

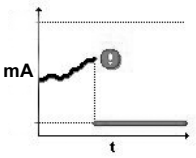
PV Source (Var. Assignment):
- ❑ **Level★**
- ❑ Distance
- ❑ Level Rate
- ❑ Volume (See page 28)
- ❑ Temperature 1 (See page 27)
- ❑ Signal Strength

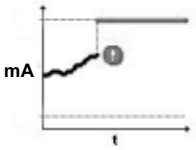
Lower Range Value (4mA): _____

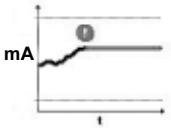
Upper Range Value (20mA): _____

Alarm Mode:
- ❑ Low
- ❑ **High★**
- ❑ Freeze

See Alarm Level on page 8 for specification







Secondary Variable (Optional Analog Output 2):

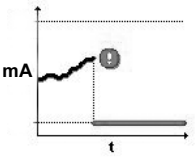
SV Source (Var. Assignment):
- ❑ Level
- ❑ **Distance★**
- ❑ Level Rate
- ❑ Temperature 1
- ❑ Volume
- ❑ Signal Strength

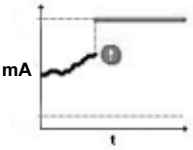
Lower Range Value (4mA): _____

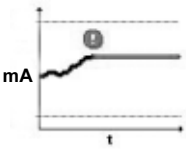
Upper Range Value (20mA): _____

Alarm Mode:
- ❑ Low
- ❑ **High★**
- ❑ Freeze

See Alarm Level on page 8 for specification







Temperature Measurement (Required for C1 option) (If applicable)

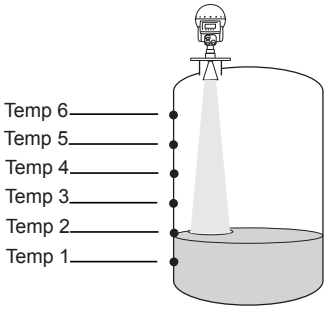
Number of Temperature Sensors (1-6): _____

Type of Temperature Sensor:
- ❑ **Pt100★**
- ❑ Cu90

Measurement Units:
- ❑ °F
- ❑ **°C★**
- ❑ °K

LOI is required

Temperature Sensor Locations:



★ Indicates Default Factory Configuration

Volume Calculation (Required for C1 option) (If applicable)

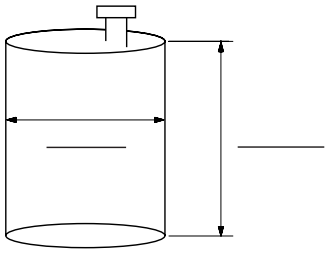
Volume is calculated based on ideal shapes or by an entered Strapping table (up to 100 points). The Configuration Data Sheet (CDS) allows for up to 20 strapping points to be pre-configured at factory using the C1 (CDS) option.

Measurement Units:

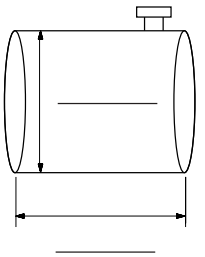
❑ ft^3 ❑ m^3 ❑ liters ❑ US gals ❑ bbl

If your transmitter is ideal shape, please select what ideal shape to use. Add the dimensions for the selected shape.

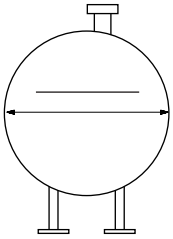
❑ Vertical Cylinder



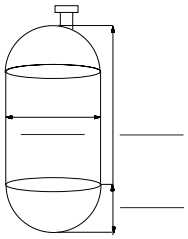
❑ Horizontal Cylinder



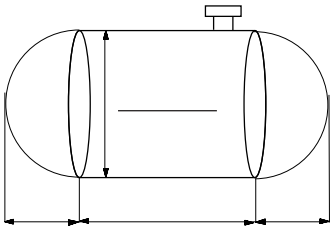
❑ Sphere



❑ Vertical Cylinder with Bullet Ends



❑ Horizontal Cylinder with Bullet Ends



☐ Strapping Table
(Up to 100 points can be used. Provide an additional file with volume table to be imported if more than 20 points are required.)

	Level	Volume
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Product Data Sheet
00813-0100-4024, Rev DA
July 2004

Rosemount 5600 Series

Emerson Process Management

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