

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*



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Legendary Rosemount Performance Customized For Your Level Process Applications

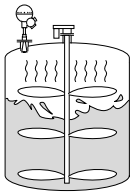
Introduction

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.

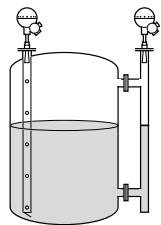
Applications

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.

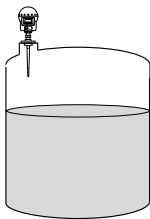
FIGURE 1. Rosemount 5600 Applications



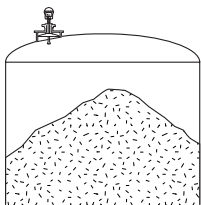
- Applications in process vessels with agitators require a radar transmitter with the 5600's high sensitivity and advanced signal processing to separate the measuring signal from noise created by disturbances.



- Still-pipe or bridle mounting is recommended for LPG applications, where the surface sometimes is 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.



- Solid materials, like cement, often give extremely small radar reflections requiring the most sensitive antenna, the 18 inch parabolic.

Product Data Sheet

00813-0100-4024, Rev CA

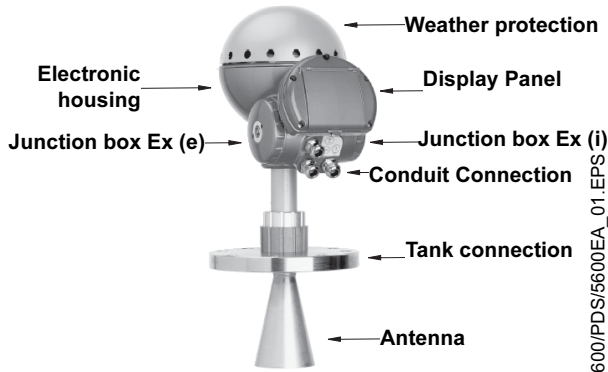
August 2003

Rosemount 5600 Series

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 16 on page 13 and Table 9 on page 19).
- Optional Cone antennas with cleaning/flushing connection are available (see Figure 16 on page 13 and Table 10 on page 19).

Process Seal Antenna

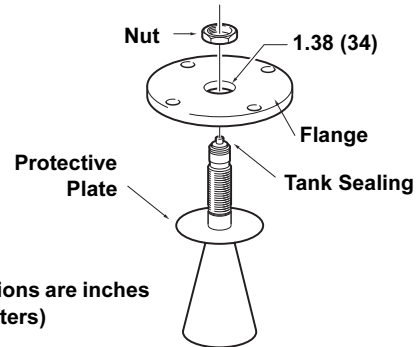
- The dish of the Process Seal is made of PTFE.
- Only exposes material suitable for hygienic or corrosive applications (see Figure 14 on page 12 and Table 7 on page 18).

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 together with the antenna and tank sealing are the only wetted parts, exposing stainless steel (or alternative antenna material) and PTFE to the tank atmosphere. This allows the use of an existing flange, or a lower cost flange alternative. Loose flanges are available (Table 14 on page 21).

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 4 on page 15 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 analog output.

Primary Outputs can be HART or FOUNDATION fieldbus, either IS or Non-IS. HART and additional 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 receiving area concentrates the radar beam and ensures maximum antenna gain. Increased antenna gain offers greater reception of weak surface echoes.

FIGURE 4. Rosemount 5600 Beamwidth

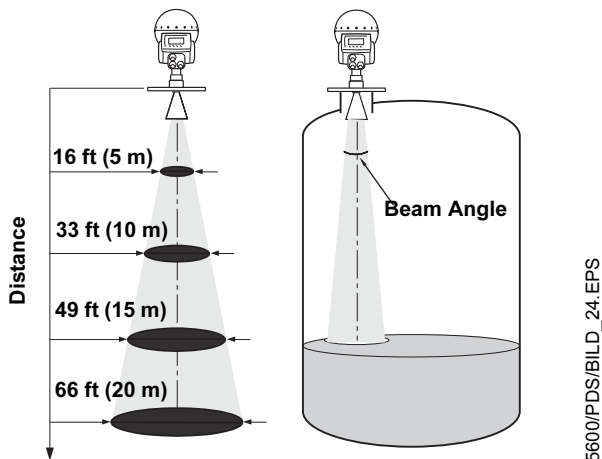
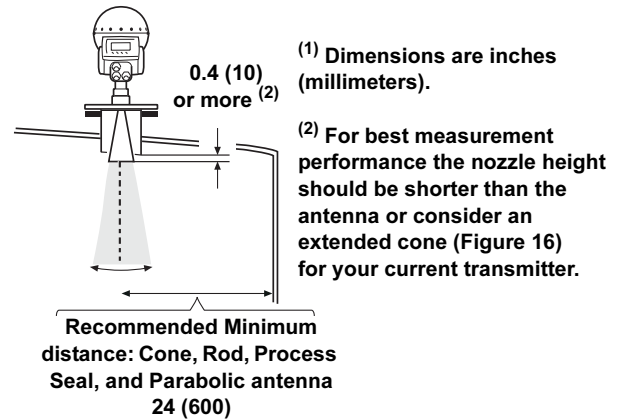


TABLE 1. Rosemount 5600 Beam Diameter and Angle

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)

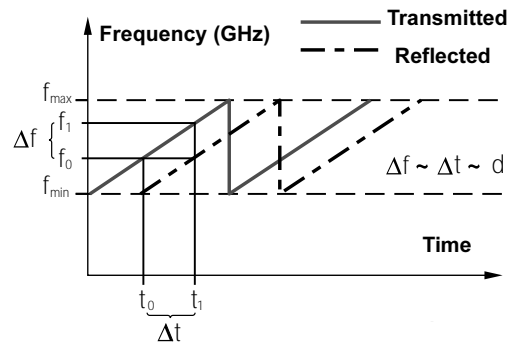
FIGURE 5. Preferred Mounting ⁽¹⁾



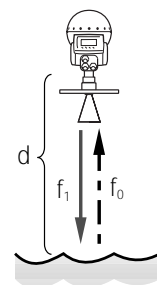
Measurement Principle

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

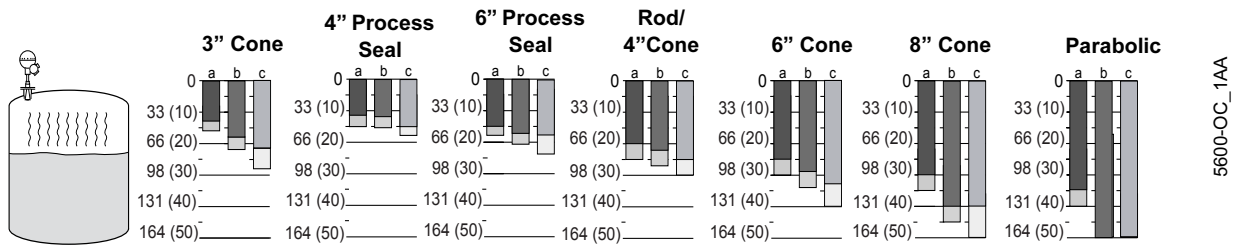
The diagrams below show how the measuring range is influenced by the antenna type, dielectric constant of the liquid (ϵ_r) and the process conditions. For optimum performance the maximum measuring distance should be kept within the range indicated with darker color in the diagrams. Values are valid for 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 in typical cases 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.

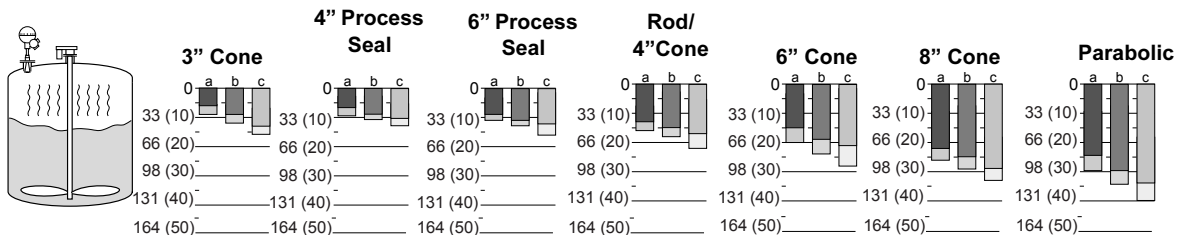
a	Oil, gasoline and other hydrocarbons, petrochemicals (dielectric constant, $\epsilon_r=1.9-4.0$)
b	Alcohols, concentrated acids, organic solvents, oil/water mixtures and acetone ($\epsilon_r=4.0-10$)
c	Conductive liquids, e.g. water based solutions, dilute acids and alkalis ($\epsilon_r > 10$)

FIGURE 7. Applications with calm product surface⁽¹⁾



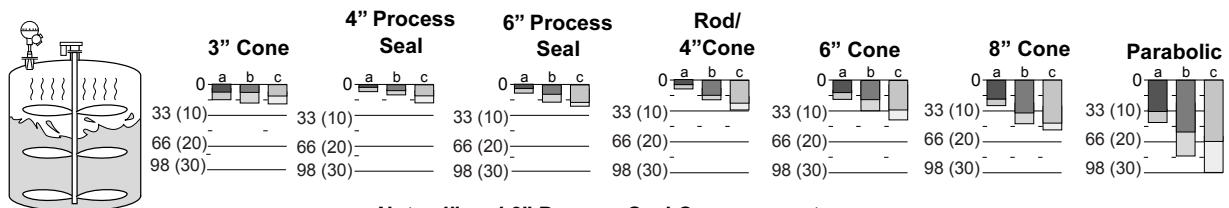
5600-OC_1AA

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



5600-OC_2AB

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



5600-OC_3AA

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

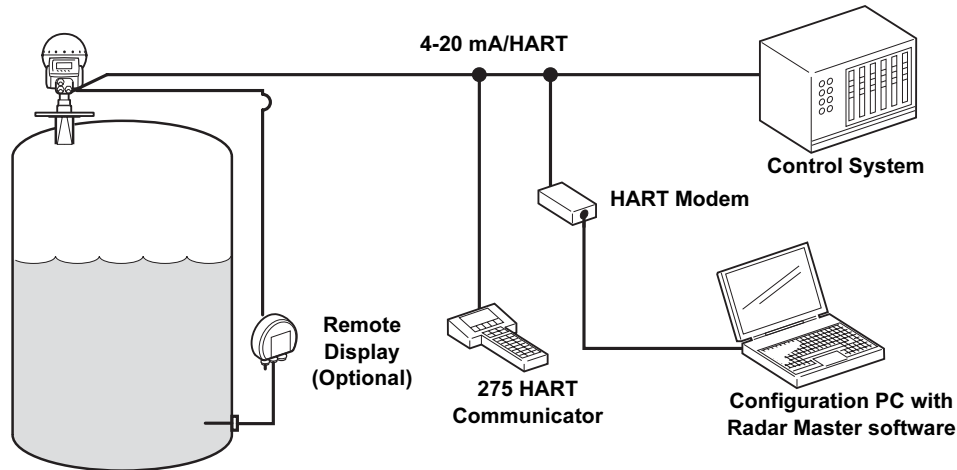
(1) Measuring range in ft (m).

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.

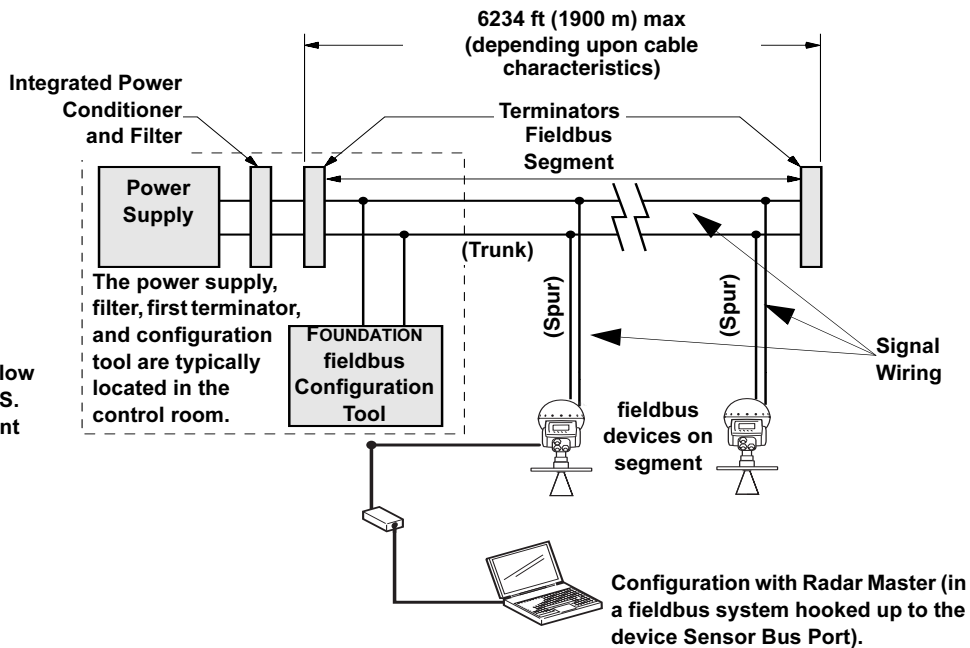
Basic configuration and setup can be done on a HART communicator, via the 2210 Display Unit, AMS, or DeltaV (for FOUNDATION fieldbus). Rosemount Radar Master is a PC based software package which allows for full configuration, including advanced features such as Spectra plots, offline/online configuration capabilities, logging, extensive online help, etcetera. To communicate with the device using Radar Master a HART Modem is required in between (see HART Modem on page 21).

FIGURE 10. System Integration using the HART Communicator



5600/PDS/BILD_1.EPS

FIGURE 11. FOUNDATION fieldbus field wiring



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

5600/PDS/5600_01A.EPS

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

Temperature measurement

1-3 spot elements, PT100 or CU100, or 6 spot elements with common return. Input accuracy $\pm 0.9^{\circ}\text{F}$ ($\pm 0.5^{\circ}\text{C}$)

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

Rosemount Hand-held communicator R275
Rosemount AMS software

PC/remote configuration ⁽¹⁾

(NOTE: HART Modem required, see page 21)

Rosemount Radar Master, Powerful Windows based configuration software.

(1) Recommended PC hardware specification: ≥ 1 GHz processor, ≥ 128 MbRam, Operating system of Win NT or Win2000.

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 (optional 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) or passive (without loop supply)

Galvanic isolation

> 1500 V RMS or DC

Analog Output Characteristics

See Hazardous Locations Certification on page 1

Range

4-20 mA

Alarm level

3.8 mA, 22 mA or freeze; NAMUR, Rosemount Alarm levels available

Resolution

0.5 μ A (0.003%)

Linearity

\pm 0.01%

Temperature drift

\pm 28 ppm/ $^{\circ}$ F (\pm 50 ppm/ $^{\circ}$ C)

Output impedance

>10 M Ω

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

$C_i = 0$ μ F

$L_i = 0$ mH

Output cabling

Twisted and shielded pair; min. 0.5 mm² (AWG 20)

Cable entries

3 \times 1/2 inch NPT; for cable glands or conduit entries

Optional: cable gland kit, incl 3 \times EEx e approved (CENELEC) 1/2 inch NPT cable glands

Optional: 3 \times EEx e approved (CENELEC) adapters 1/2 inch NPT/M20

Display Output Characteristics

With Temperature Output

See Hazardous Locations Certification on page 1

Without Temperature Output

See Hazardous Locations Certification on page 1

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, excl, flange

18 lbs (8 kg)

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	-	●	-	-	-	-
Tantalum	-	●	-	-	-	-
Monel® 400	-	●	-	-	-	-
PTFE	● ⁽¹⁾	-	●	-	-	-
Tank Sealing:						
PTFE	-	●	-	●	●	●
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)

Tank Sealing Temperature Range with different O-rings (see Figure 12, Figure 13, Figure 14, Figure 15, and Figure 16)

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

Emission approvals

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

Humidity

IEC 60068-2-3

Height above flange

15 in (400 mm)

Antenna Dimensions

Cone: See Figure 13 on page 11
Rod: See Figure 12 on page 11
Process Seal: See Figure 14, and Table 1-1 on page 12
Extended Cone: See Figure 15 on page 1-13
Cone with Integrated Flushing Connection: See Figure 16 on page 1-13
Parabolic: See Figure 17 on page 14

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

Product Certificates

Approved Manufacturing Locations

Saab - Rosemount – 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.

Hazardous Locations Installations

5600 Series Level Transmitter

- E1** Certificate Number: Sira 03ATEX 1294X
With Non-IS Primary output and IS Display Output:
 ATEX Category Marking Ex II (1) 1/2 G
 EEx de [ia] IIC T6, (T_{amb} -40°C, +70°C)
With IS Primary and Secondary Outputs and IS Display Output:
 ATEX Category Marking Ex II (2) (1) 1/2 G
 EEx de [ib] [ia] IIC T6 (T_{amb} -40°C, +70°C)
With Non-IS Outputs (Display Output not available):
 ATEX Category Marking Ex II 1/2 G
 EEx de IIC T6, (T_{amb} -40°C, +70°C)

Passive analog output 4-20mA,
 Label identification = HART passive.
 Voltage compliance 7-30V:
 $U_i < 30 \text{ V}$
 $I_i < 200 \text{ mA}$
 $P_i < 1.3 \text{ W}$
 $C_i = 0 \text{ } \mu\text{F}$
 $L_i = 0 \text{ mH}$

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

FOUNDATION Fieldbus,
 Label identification = FOUNDATION fieldbus.
 $U_i < 30 \text{ V}$
 $I_i < 300 \text{ mA}$
 $P_i < 1.3 \text{ W}$
 $C_i = 0 \text{ } \mu\text{F}$
 $L_i = 0 \text{ mH}$

Factory Mutual (FM) approval.

Certificate: J.I. 4D5A9.AX

- E5 With Intrinsically safe outputs:**
(All versions except those listed below)
 Explosionproof with IS outputs for HAZLOC
 Class I, Division 1, Group A, B, C and D,
 Max operating temperature +70°C
 Use conductors rated at least 85°C
 Shall be installed in accordance with System control drawing 9150074-994.
- E5 With Secondary output code 1 or 3:**
 Explosionproof
 Class I, Division 1, Group A, B, C and D,
 Max operating temperature +70°C
 Use conductors rated at least 85°C

2210 Display Unit

SIRA / ATEX Intrinsically safe certification.
Equipment group II, Category 2 (1) G
Certificate: SIRA 00ATEX2062

- E1 With Display Panel Code P or R:**
 ATEX Category Marking Ex II 2 G
 EEx ib IIC T4, (T_{amb} -40°C, +70°C)
- E1 With Display Panel Code T:**
 ATEX Category Marking Ex II 2 (1) G
 EEx ib [ia] IIC T4, (T_{amb} -40°C, +70°C)
- Connector X2:
 $U_i < 12 \text{ V}$
 $I_i < 400 \text{ mA}$
 $P_i < 0.7 \text{ W}$
 Optional TP 40, connector X17 and X18:
 $U_o = 5.88 \text{ V}$
 $I_o = 172.4 \text{ mA}$
 $P_o = 0.253 \text{ W}$

North American Certifications

Factory Mutual (FM) Approvals

Certificate: J.I. 4D5A9.AX

- E5 With Display panel code P or R or T:**
 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.

Dimensional Drawings

FIGURE 12. Rod Dimensions

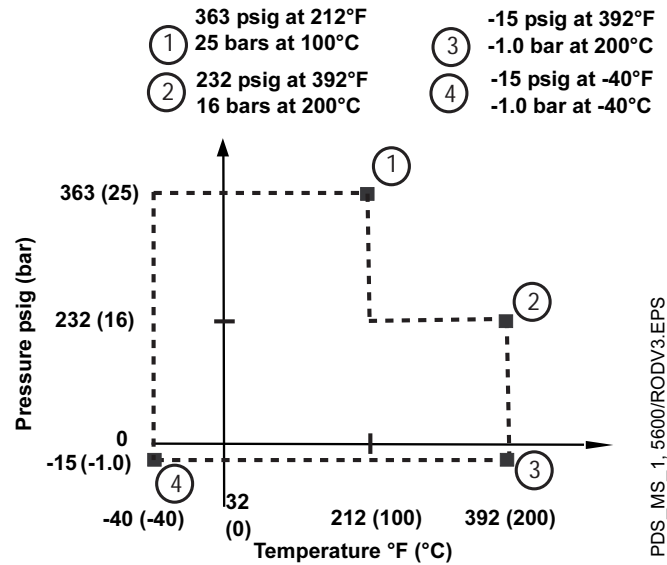
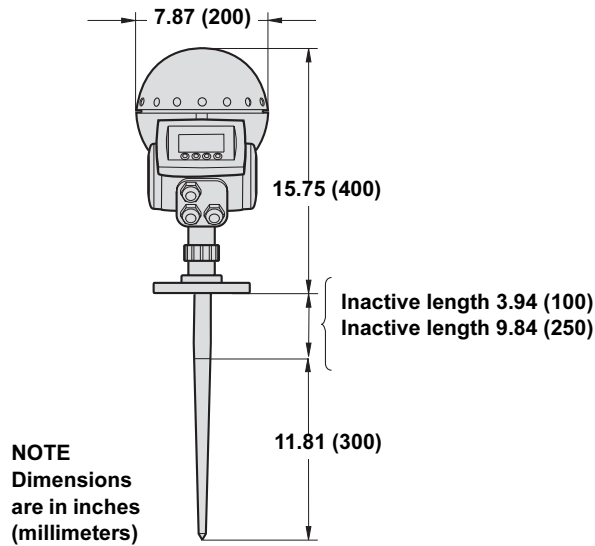


FIGURE 13. Cone Dimensions

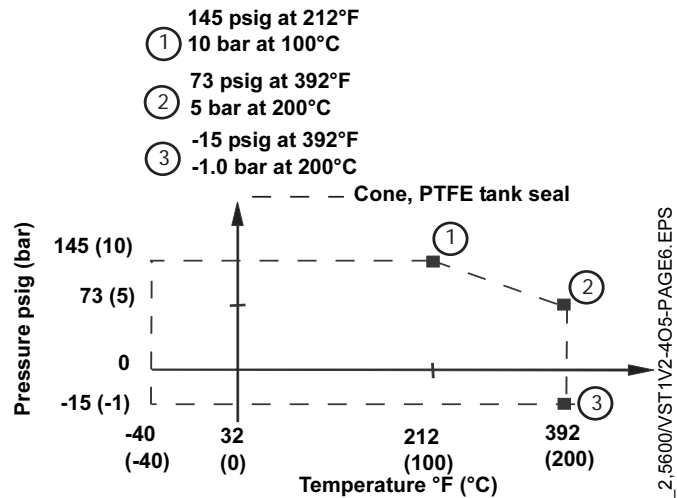
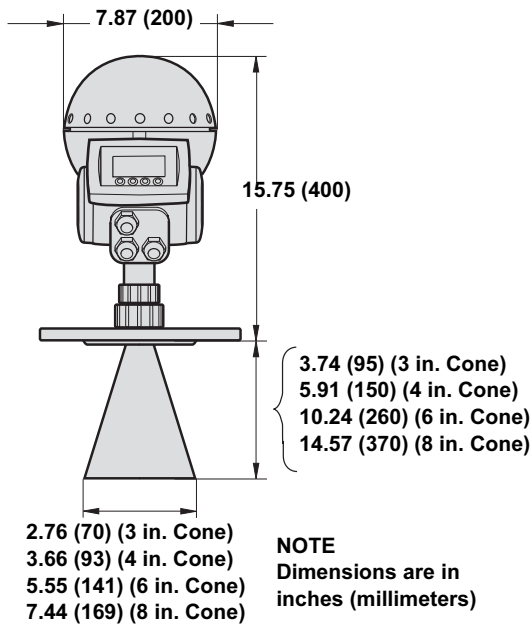


FIGURE 14. Process Seal Dimensions

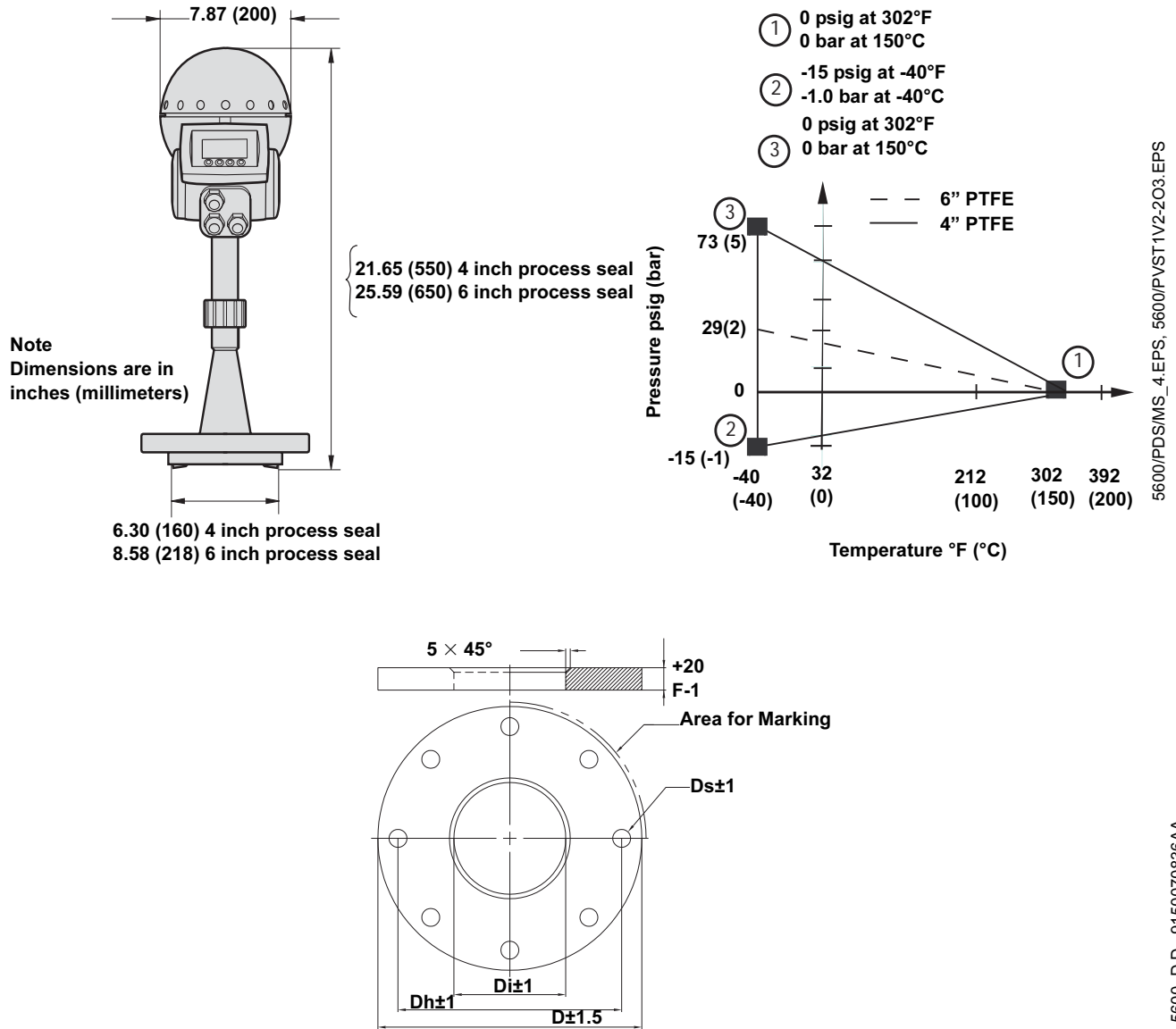


Table 1-1. Process Seal Dimensions for Galvanized Carbon and Stainless Steel Flange
Dimensions are in inches (millimeters)

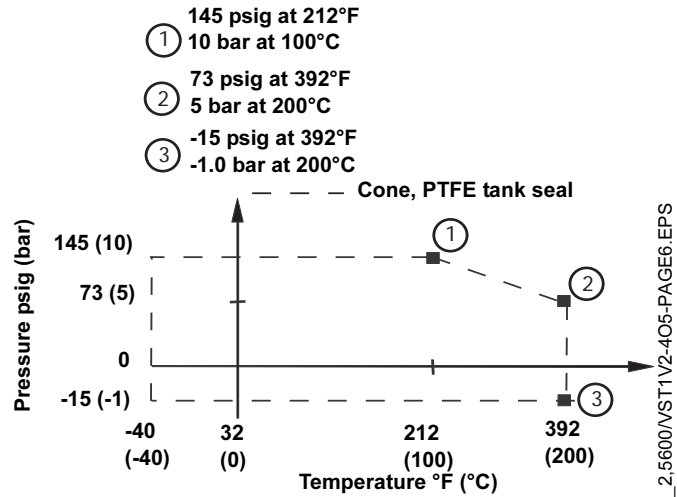
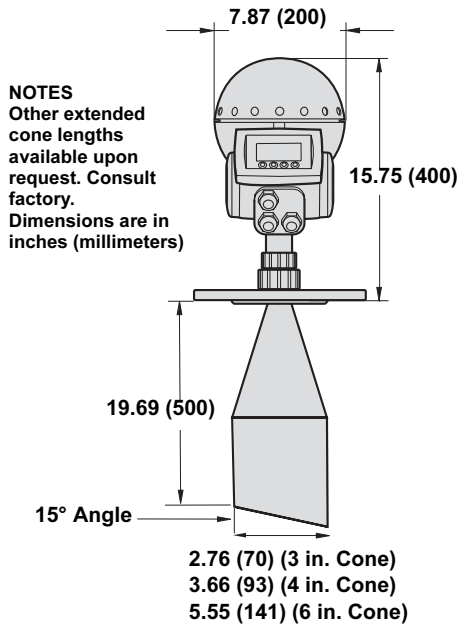
Flange	Di	D	Dh	DS	F
ANSI 4 inch Class 150	3.78 (96)	9.02 (229)	7.52 (191)	0.87 (22)	0.87 (22)
ANSI 6 inch Class 150	4.94 (125.5)	10.98 (279)	9.49 (241)	0.87 (22)	0.87 (22)
DN100 PN16	3.78 (96)	8.66 (220)	7.09 (180)	0.71 (18)	0.87 (22)
DN150 PN16	4.94 (125.5)	11.22 (285)	9.45 (240)	0.87 (22)	0.87 (22)

Product Data Sheet

00813-0100-4024, Rev CA
August 2003

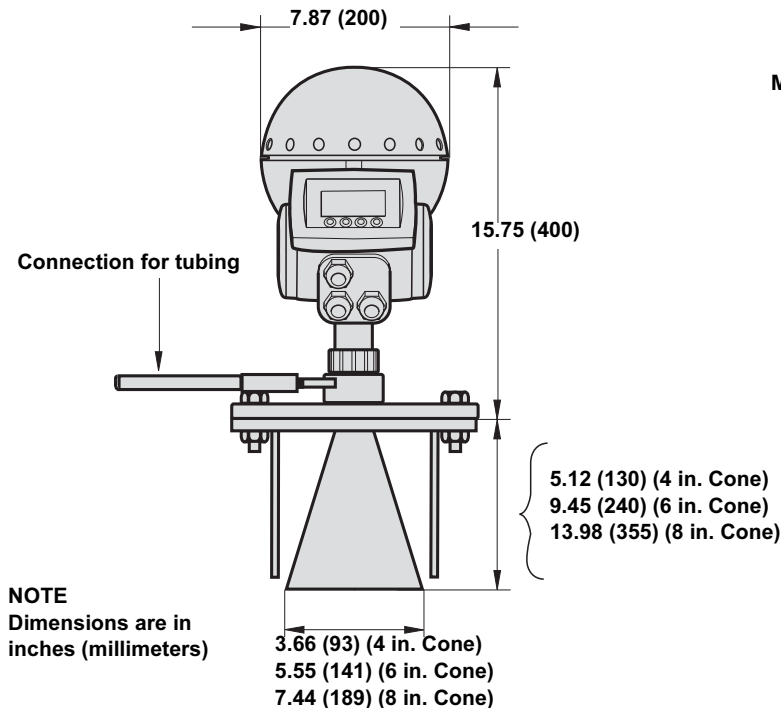
Rosemount 5600 Series

FIGURE 15. Extended Cone Dimensions for Stainless Steel Flange



5600/PDS/MS_2_5600/VST1V2-405-PAGE6.EPS

FIGURE 16. Cone with Integrated Flushing Connection Dimensions for Stainless Steel Flange

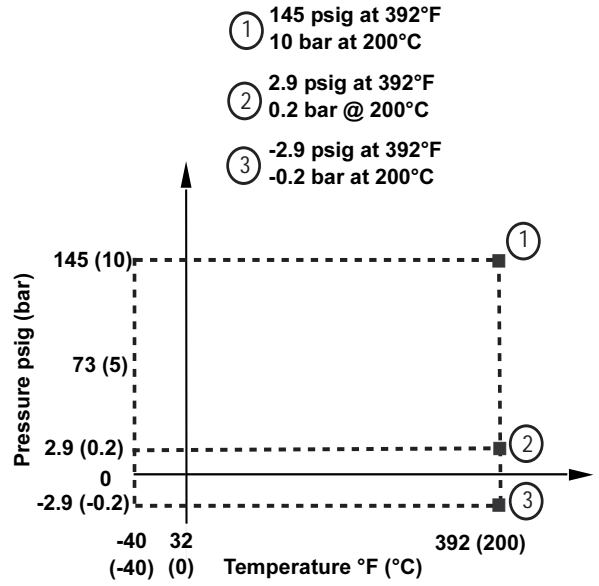
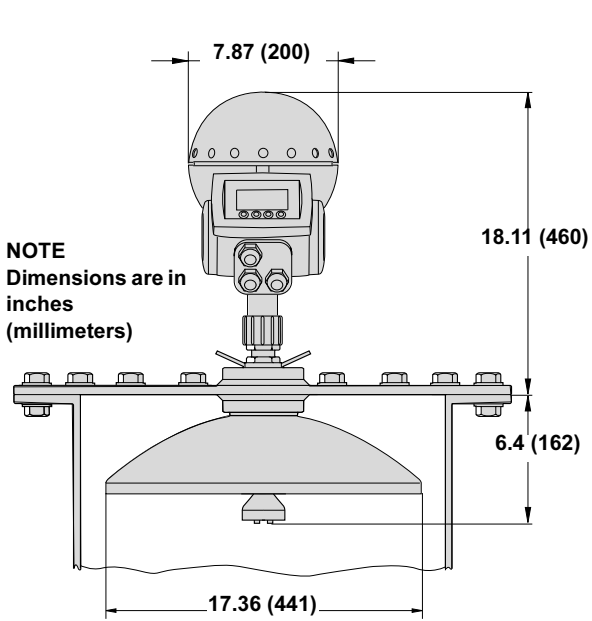


Maximum: 145 psig at 392°F (10bar at 200°C)

5600_PDS_MS_2C.EPS

Rosemount 5600 Series

FIGURE 17. Parabolic Dimensions for Stainless Steel Flange



.5600RODV2-1.EPS

Ordering Information

TABLE 4. 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
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
5C	4-20 mA with HART communication, Active Output
5D	4-20 mA with HART communication, Active Output, Intrinsically Safe Circuit
7A	Foundation Fieldbus
7B	Foundation Fieldbus, Intrinsically Safe Circuit
Code	Secondary Output
0	None
1	4-20 mA, Passive Output ⁽¹⁾
2	4-20 mA, Passive Output, Intrinsically Safe Circuit
3	4-20 mA, Active Output ⁽¹⁾
4	4-20 mA, Active Output, Intrinsically Safe Circuit
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 ⁽²⁾	

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

(2) Select the antenna type and options using Table 5, Table 6, Table 7, Table 9, and Table 10.

TABLE 5. 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 Sealing				
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		
		<i>NOTE: Customer supplied flange or see Table 14 on page 21 for flange options</i>		
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 4 on page 15 11S N F TN				

TABLE 6. 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
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 Sealing			
P	PTFE			
Code	O-ring Material			
V	Viton			
K	Kalrez 6375			
E	EPDM			
B	Buna-N			
Code	Process Connection			
NR	Antenna with Plate Design <i>NOTE: Customer supplied flange or see Table 14 on page 21 for flange options</i>			
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 4 on page 15 24S P V NR				

TABLE 7. 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 Sealing				
P		PTFE		
Code O-ring Material				
N		Not Applicable		
Code Process Connection				
NF		None, Customer to supply flange per dimensions on Figure 14		
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 4 on page 15 34S P N JA				

TABLE 8. Parabolic Antenna

Code	Antenna Type	Antenna Size	Antenna Material	Note
Parabolic				
45S		ø18 in. (440mm)	SST with Integrated Inclination	-2.9 to 2.9 psi (-0.2 to 0.2 bar)
46S		ø18 in. (440mm)	SST with Integrated Inclination	-2.9 to 145 psi (-0.2 to 10 bar)
4XX		Customer Specific	Customer Specific	Consult Factory
Code Tank Sealing				
P		PTFE		
Code O-ring Material				
V		Viton		
Code Process Connections				
NR		Antenna with Plate Design <i>NOTE: Customer supplied flange or see Table 14 on page 21 for flange options</i>		
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 4 on page 15 45S P V NR				

TABLE 9. 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 Sealing		
P		PTFE		
Code		O-ring Material		
V		Viton		
K		Kalrez 6375		
E		EPDM		
B		Buna-N		
Code		Process Connections		
NR		Antenna with Plate Design <i>NOTE: Customer supplied flange or see Table 14 on page 21 for flange options</i>		
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 4 on page 15 76S P V NR				

TABLE 10. 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 Sealing		
P		PTFE		
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 4 on page 15 94S P K KL				

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TABLE 11. Transmitter Options (multiple selections allowed)

Code	Options
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 12. Typical Model Code Examples

5601 A E5 P 5A 0 P E 24S P V NR
FM 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 NA P 7A 2 T V 94S P K CL C1
No Ex-approvals, 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 13. Accessories Part Numbers

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

Flange

TABLE 14. 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 4 inch 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.

★ Indicates Default Factory Configuration

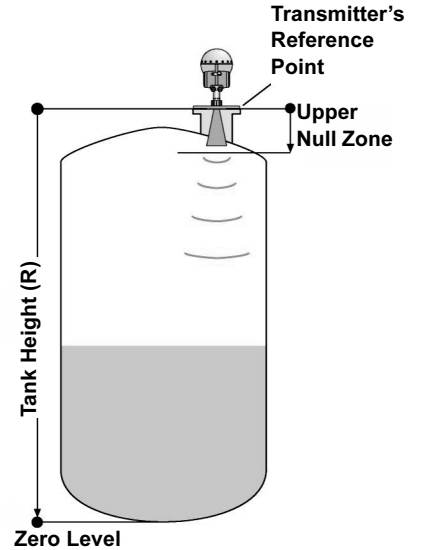
Tank Geometry

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.).



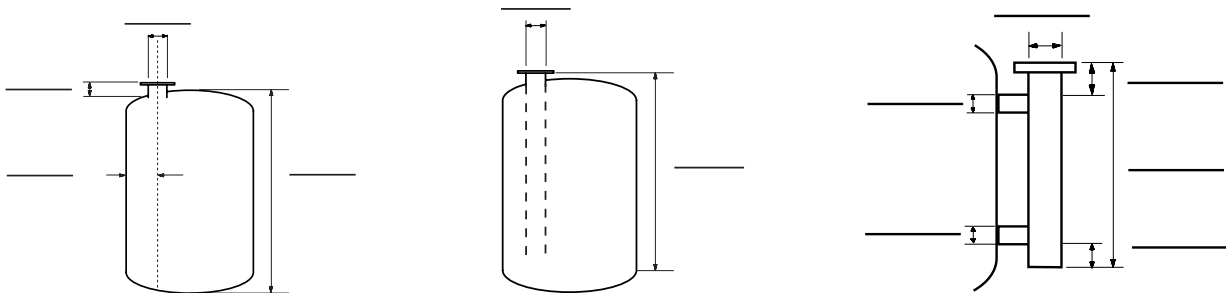
Tank Height: _____
 m mm★ ft in

(1) See page 25 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

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)

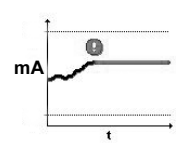
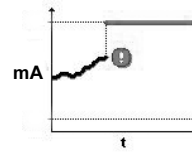
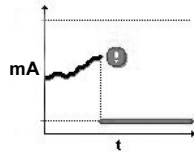
Primary Variables (Analog Output 1):

- PV Source (Var. Assignment):
- | | | |
|---|--|--|
| <input type="checkbox"/> Level★ | <input type="checkbox"/> Distance | <input type="checkbox"/> Level Rate |
| <input type="checkbox"/> Volume (See page 25) | <input type="checkbox"/> Temperature 1 (See page 24) | <input type="checkbox"/> Signal Strength |

Lower Range Value (4mA): _____

Upper Range Value (20mA): _____

- Alarm Mode: Low High Freeze★



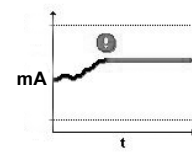
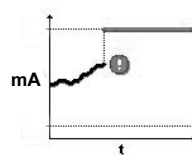
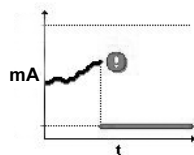
Secondary Variable (Optional Analog Output 2):

- SV Source (Var. Assignment):
- | | | |
|--|------------------------------------|--|
| <input type="checkbox"/> Level | <input type="checkbox"/> Distance★ | <input type="checkbox"/> Level Rate |
| <input type="checkbox"/> Temperature 1 | <input type="checkbox"/> Volume | <input type="checkbox"/> Signal Strength |

Lower Range Value (4mA): _____

Upper Range Value (20mA): _____

- Alarm Mode: Low High Freeze★



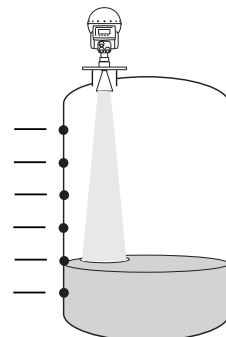
Temperature Measurement (If applicable)

Number of Temperature Sensors (1-6): _____

- Type of Temperature Sensor:
- | |
|---------------------------------|
| <input type="checkbox"/> Pt100★ |
| <input type="checkbox"/> Cu90 |

Temperature Sensor Locations:

- Measurement Units:
- | |
|------------------------------|
| <input type="checkbox"/> °F |
| <input type="checkbox"/> °C★ |
| <input type="checkbox"/> °K |



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★ Indicates Default Factory Configuration

Volume Calculation (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 CI (CDS) option. Provide an additional file with volume table to be imported if more than 20 points are required.

Measurement Units:

ft³

m³

liters

US gals

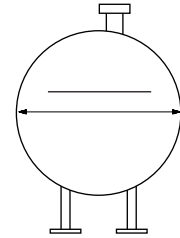
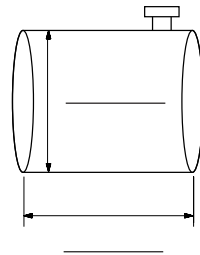
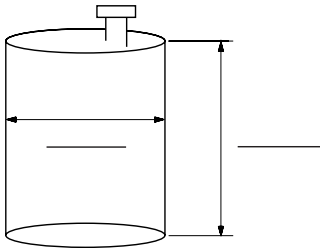
bbl

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

Vertical Cylinder

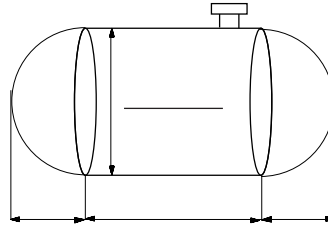
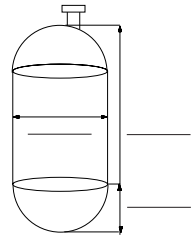
Horizontal Cylinder

Sphere



Vertical Cylinder with Bullet Ends

Horizontal Cylinder with Bullet Ends



Strapping Table (Up to 100 points can be used. Data may be submitted to the factory using a data spreadsheet program.)

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

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