Product Data Sheet
00813-0100-4811, Rev FA
December 2010

Guided Wave Radar Level and Interface Transmitter

- *Accurate, direct level measurement virtually unaffected by process conditions*
- *Minimized maintenance with no moving parts and no re-calibration required*
- *Fewer process penetrations and reduced installation costs with a MultiVariable™ level and interface transmitter*
- *Easy installation and commissioning through two-wire technology and user-friendly configuration*
- *Versatile and easy-to-use transmitter with field proven reliability*
- *High application flexibility with a wide range of process connections, probe styles, and accessories*

HART COMMUNICATION PROTOCOL · IEC · WirelessHART · Modbus

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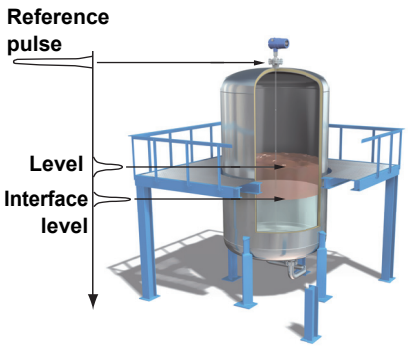
Proven, Reliable, and Easy to Use Guided Wave Radar



MEASUREMENT PRINCIPLE

Low power, nano-second microwave pulses are guided down a probe submerged in the process media. When a microwave pulse reaches a media with a different dielectric constant, part of the energy is reflected back to the transmitter.

The transmitter uses the residual wave of the first reflection for measuring the interface level. Part of the wave, which was not reflected at the upper product surface, continues until it is reflected at the lower product surface. The speed of this wave depends fully on the dielectric constant of the upper product.

The time difference between the transmitted and the reflected pulse is converted into a distance, and the total level or interface level is then calculated. The reflection intensity depends on the dielectric constant of the product. The higher the dielectric constant value, the stronger the reflection.

High application flexibility

GUIDED WAVE RADAR TECHNOLOGY BENEFITS

- No moving parts and no re-calibration minimizes maintenance
- Direct level measurement means no compensation needed for changing process conditions (i.e. density, conductivity, temperature, and pressure)
- Handles vapor and turbulence well
- Suitable for small tanks, difficult tank geometry, and interfering obstacles
- Allows for easy upgrade
- Top down installation minimizes risk for leakages

SPECIAL 3300 FEATURES

Proven High Reliability Increases Uptime

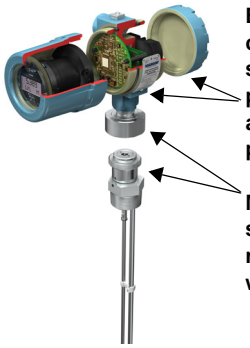
- First 2-wire level and interface transmitter with field proven reliability
- More than 50,000 units installed
- Field demonstrated Mean Time Between Failure over 170 years
- Advanced signal processing for reliable measurement
- Accurate level unaffected by changing process conditions

High Application Flexibility

- Suitable for most liquid storage and monitoring level and interface applications
- A wide selection of process connections and probe styles
- Remote mounting, mounting bracket, Smart Wireless THUM™ Adapter, HART® Tri-loop, and probe centering discs accessories
- External mounting using Rosemount 9901 high quality chambers accessories

Robust Design Reduces Costs And Increases Safety

- Leakage prevention and reliable performance under challenging conditions
- Detachable transmitter head allows tank to remain sealed
- Dual Compartment housing separates cable connections and electronics



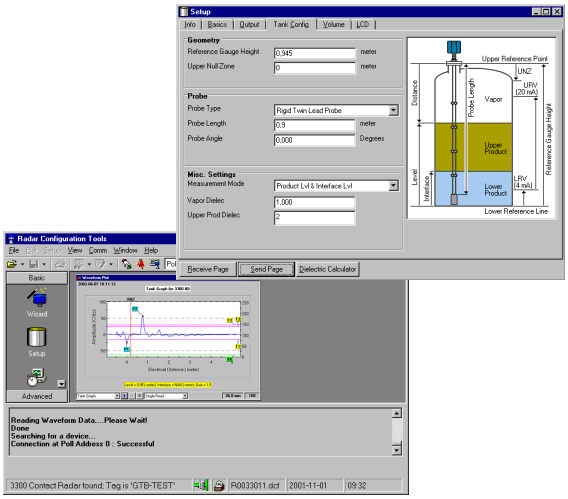
Electronics and cable connections are located in separate compartments, providing safer handling and improved moisture protection

Modular design for reduced spare parts and easy replacement of the head without opening the tank

Easy Installation and Plant Integration

- Seamless system integration with HART, Modbus, or IEC 62591 (*Wireless*HART®) with the THUM adapter
- Allows for easy swap by matching existing tank connections
- Cut-to-fit probes
- Pre-configured or user-friendly configuration with wizard, autoconnect, dielectric calculator, and on-line help
- MultiVariable™ – measures simultaneously level and interface, resulting in fewer process penetrations and reduces installation and wiring cost

Smart Wireless THUM™ Adapter enables access to online configuration, multi-variable data, and diagnostics



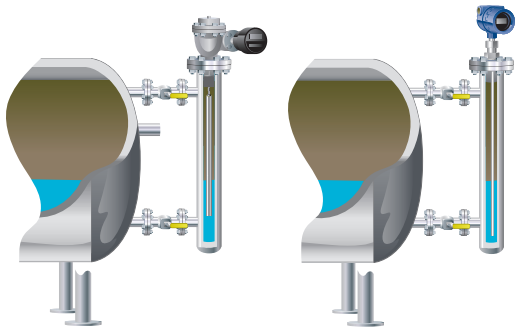
Radar Configuration Tool with installation wizard and waveform plot possibilities provides easy configuration and service

Minimized Maintenance Reduces Cost

- No mechanical moving parts that require maintenance
- User-friendly software provides easy on-line troubleshooting with echo curve tool and logging
- Adjustments without opening tank
- No re-calibration or compensation needed due to changing process conditions

Easy Replacement Of Old Technology And Best Fit For Chambers

- Less need for maintenance reduces costs and improves measurement availability
- Reliable measurement, independent of density, turbulence, and vibrations
- Unaffected by the mechanical configuration of the chamber
- Wide range of options to find the best fit in existing chamber or a complete assembly with Rosemount 9901 high quality chambers



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Rosemount 3301 and 3302 Level and/or Interface in Liquids

Rosemount 3301 and 3302 Guided Wave Radar Level transmitters are versatile and easy-to-use with field proven measurement capabilities. Characteristics include:

- High application flexibility with a wide range of probe styles, process connections, and materials
- HART 4-20 mA, Modbus, or IEC 62591 (*Wireless*HART) with the THUM adapter
- Radar Configuration Tool software package included for easy commissioning and troubleshooting

Additional Information

Specifications: page 10
Certifications: page 22
Dimensional Drawings: page 24.

TABLE 1. 3301 and 3302 Level and/or Interface in Liquids Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery. The Expanded offering is subject to additional delivery lead time.

Model	**Product Description**		
3301	Guided Wave Radar Level Transmitter (interface available for fully submerged probe)		
3302	Guided Wave Radar Level and Interface Transmitter		
Signal Output			
Standard			**Standard**
H	4-20 mA with HART® communication		★
M	RS-485 with Modbus communication(1)		★
Housing Material			
Standard			**Standard**
A	Polyurethane-covered Aluminum		★
S	Stainless Steel, Grade CF8M (ASTM A743)		★
Conduit / Cable Threads			
Standard			**Standard**
1	½–14 NPT		★
2	M20 x 1.5 adapter		★
Operating Temperature and Pressure(2)		**Probe Type**	
Standard			**Standard**
S	- 15 psig (-1bar) to 580 psig (40 bar) @ 302 °F (150 °C)	3301: All 3302: 1A, 2A, 3B, 4A, and 4B	★
Material of Construction(3): Process Connection / Probe		**Probe Type**	
Standard			**Standard**
1	316L SST (EN 1.4404)	3301: All 3302: 1A, 2A, 3B, 4A, and 4B	★
Expanded			
2	Alloy C-276 (UNS N10276). With plate design if flanged version.	3301: 3A, 3B, 4A 3302: 3B and 4A	
3	Alloy 400 (UNS N04400). With plate design if flanged version.	3301: 3A, 3B, 4A, 5A, 5B 3302: 3B and 4A	
7	PTFE covered probe and flange. With plate design.	3301: 4A and 5A, Flanged version 3302: 4A, Flanged version	

TABLE 1. 3301 and 3302 Level and/or Interface in Liquids Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

8	PTFE covered probe	3301: 4A and 5A 3302: 4A		
Sealing, O-ring Material (Consult factory for other o-ring materials)				
Standard				**Standard**
V	Viton® fluoroelastomer			★
E	Ethylene Propylene			★
K	Kalrez® 6375 perfluoroelastomer			★
B	Buna-N			★
Probe Type, model 3301		**Process Connection**	**Probe Lengths**	
Standard				**Standard**
3B	Coaxial, perforated. For level and interface measurement, or easier cleaning.	Flange / 1 in., 1.5 in., 2 in. Thread	Min.: 1 ft. 4 in. (0.4 m). Max: 19 ft. 8 in. (6 m)	★
4B	Rigid Single Lead 0.5 in. (13 mm)(4)	Flange / 1 in., 1.5 in., 2 in. Thread / Tri-Clamp	Min.: 1 ft. 4 in. (0.4 m). Max: 19 ft. 8 in. (6.0 m)	★
5A	Flexible Single Lead with weight	Flange / 1 in., 1.5 in., 2 in. Thread / Tri-Clamp	Min.: 3 ft. 4 in. (1 m). Max: 77 ft. (23.5 m)	★
Expanded				
1A	Rigid Twin Lead	Flange / 1.5 in., 2 in. Thread	Min.: 1 ft. 4 in. (0.4 m). Max: 9 ft. 10 in. (3 m)	
2A	Flexible Twin Lead with weight	Flange / 1.5 in., 2 in. Thread	Min.: 3 ft. 4 in. (1 m). Max: 77 ft. (23.5 m)	
3A	Coaxial (for level measurement)	Flange / 1 in., 1.5 in., 2 in. Thread	Min.: 1 ft. 4 in. (0.4 m). Max: 19 ft. 8 in. (6 m)	
4A	Rigid Single Lead 0.3 in. (8 mm)	Flange / 1 in., 1.5 in., 2 in. Thread / Tri-Clamp	Min.: 1 ft. 4 in. (0.4 m). Max: 9 ft. 10 in. (3 m)	
5B	Flexible Single Lead with chuck	Flange / 1 in., 1.5 in., 2 in. Thread / Tri-Clamp	Min.: 3 ft. 4 in. (1 m). Max: 77 ft. (23.5 m)	
Probe Type, model 3302		**Process Connection**	**Probe Lengths**	
Standard				**Standard**
3B	Coaxial, perforated. For level and interface measurement, or easier cleaning.	Flange / 1 in., 1.5 in., 2 in. Thread	Min.: 1 ft. 4 in. (0.4 m). Max: 19 ft. 8 in. (6 m)	★
4B	Rigid Single Lead 0.5 in. (13 mm)(4)	Flange / 1 in., 1.5 in., 2 in. Thread / Tri-Clamp	Min.: 1 ft. 4 in. (0.4 m). Max: 19 ft. 8 in. (6.0 m)	★
Expanded				
1A	Rigid Twin Lead	Flange / 1.5 in., 2 in. Thread	Min.: 1 ft. 4 in. (0.4 m). Max: 9 ft. 10 in. (3 m)	
2A	Flexible Twin Lead with weight	Flange / 1.5 in., 2 in. Thread	Min.: 3 ft. 4 in. (1 m). Max: 77 ft. (23.5 m)	
4A	Rigid Single Lead 0.3 in. (8 mm)	Flange / 1 in., 1.5 in., 2 in. Thread / Tri-Clamp	Min.: 1 ft. 4 in. (0.4 m). Max: 9 ft. 10 in. (3 m)	
Probe Length Units				
Standard				**Standard**
E	English (feet, inch)			★
M	Metric (meters, centimeters)			★
Total Probe Length (5) (feet/m)				
Standard				**Standard**
xx	0 - 77 ft. or 0-23 m			★

TABLE 1. 3301 and 3302 Level and/or Interface in Liquids Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Total Probe Length [5] (inch/cm)			
Standard			**Standard**
xx	0 - 11 in. or 0-99 cm		★
Process Connection - Size / Type (consult factory for other process connections)			
ASME / ANSI Flanges[6] [7]			
Standard			**Standard**
AA	2 in., 150 lb		★
AB	2 in., 300 lb		★
BA	3 in., 150 lb		★
BB	3 in., 300 lb		★
CA	4 in., 150 lb		★
CB	4 in., 300 lb		★
Expanded			
DA	6 in., 150 lb		
EN (DIN) Flanges[6] [7]			
Standard			**Standard**
HB	DN50, PN40		★
IA	DN80, PN16		★
IB	DN80, PN40		★
JA	DN100, PN16		★
JB	DN100, PN40		★
Expanded			
KA	DN150, PN16		
JIS Flanges[6] [7]			
Standard			**Standard**
UA	50A, 10K		★
VA	80A, 10K		★
XA	100A, 10K		★
Expanded			
UB	50A, 20K		
VB	80A, 20K		
XB	100A, 20K		
YA	150A, 10K		
YB	150A, 20K		
ZA	200A, 10K		
ZB	200A, 20K		
Threaded Connections[6]		**Probe Type**	
Standard			**Standard**
RA	1 ½ in. NPT thread	3301: All 3302: 1A, 2A, 3B, 4A, and 4B	★
RC	2 in. NPT thread	3301: 1A, 2A, 3A, 3B, 4A, 4B, 5A, and 5B 3302: 1A, 2A, 3B, 4A, and 4B	★
Expanded			
RB	1 in. NPT thread	3301: 3A, 3B, 4A, 4B, 5A, and 5B 3302: 3B, 4A, and 4B	
SA	1 ½ in. BSP (G 1 ½ inch) thread	3301: All 3302: 1A, 2A, 3B, 4A, and 4B	
SB	1 in. BSP (G 1 inch) thread	3301: 3A, 3B, 4A, 4B, 5A, and 5B 3302: 3B, 4A, and 4B	

TABLE 1. 3301 and 3302 Level and/or Interface in Liquids Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
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Tri-Clamp Fittings[6]		**Probe Type**	
Expanded			
FT	1 ½ in. Tri-Clamp	3301: 4A, 4B, 5A, and 5B 3302: 4A, and 4B	
AT	2 in. Tri-Clamp	3301: 4A, 4B, 5A, and 5B 3302: 4A, and 4B	
BT	3 in. Tri-Clamp	3301: 4A, 4B, 5A, and 5B 3302: 4A, and 4B	
CT	4 in. Tri-Clamp	3301: 4A, 4B, 5A, and 5B 3302: 4A, and 4B	
Proprietary Flanges[8]			
Standard			**Standard**
TF	Fisher - proprietary 316L SST (for 249B cages) Torque Tube Flange		★
TT	Fisher - proprietary 316L SST (for 249C cages) Torque Tube Flange		★
TM	Masoneilan - proprietary 316L SST Torque Tube Flange		★
Hazardous Locations Certifications			
Standard			**Standard**
NA	No Hazardous Locations Certifications		★
E1	ATEX Flameproof[9]		★
E3	NEPSI Flameproof[9]		★
E4	TIIS Flameproof[9]		★
E5	FM Explosion-proof[9]		★
E6	CSA Explosion-proof[9]		★
E7	IECEx Flameproof[9]		★
I1	ATEX Intrinsic Safety		★
I3	NEPSI Intrinsic Safety		★
I5	FM Intrinsic Safety and Non-Incendive		★
I6	CSA Intrinsic Safety and Non-Incendive		★
I7	IECEx Intrinsic Safety		★
Expanded			
KA	ATEX and CSA Flameproof/Explosion-proof[9]		
KB	FM and CSA Explosion-proof[9]		
KC	ATEX and FM Flameproof/Explosion-proof[9]		
KD	ATEX and CSA Intrinsic Safety		
KE	FM and CSA Intrinsic Safety		
KF	ATEX and FM Intrinsic Safety		
Options			
Standard			**Standard**
M1	Integral digital display		★
P1	Hydrostatic testing[10]		★
N2	NACE material recommendation per MR-0175 [11], MR-0103		★
LS	Long stud[12] 9.8 in (250 mm) for flex. single lead probe to prevent contact with wall/nozzle. Standard height is 3.9 in (100 mm)		★
T0	Terminal block without transient protection		★
W3	2.2 lb (1 kg) weight for flexible single lead probe (5A). L=5.5 in. (140 mm). D=1.5 in. (37.5 mm)		★
Expanded			
BR	Mounting Bracket for 1.5 in. NPT Process Connection (RA)		
W2	Short weight for flexible single lead probes[13]. L=2 in. (50 mm). D=1.5 in. (37.5 mm)		

TABLE 1. 3301 and 3302 Level and/or Interface in Liquids Ordering Information

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.
The Expanded offering is subject to additional delivery lead time.

Sx and Px - Centering Discs[14]		**Outer Diameter**	
Standard			**Standard**
S2	2 in. Centering disc[15]	1.8 in. (45 mm)	★
S3	3 in. Centering disc[15]	2.7 in. (68 mm)	★
S4	4 in. Centering disc[15]	3.6 in. (92 mm)	★
P2	2 in. Centering disc PTFE[16]	1.8 in. (45 mm)	★
P3	3 in. Centering disc PTFE[16]	2.7 in. (68 mm)	★
P4	4 in. Centering disc PTFE[16]	3.6 in. (92 mm)	★
Expanded			
S6	6 in. Centering disc[15]	5.55 in. (141 mm)	
S8	8 in. Centering disc[15]	7.40 in. (188 mm)	
P6	6 in. Centering disc PTFE[16]	5.55 in. (141 mm)	
P8	8 in. Centering disc PTFE[16]	7.40 in. (188 mm)	
Remote Housing[17]			
Expanded			
B1	1m / 3.2 ft. Remote Housing Mounting Cable and Bracket		
B2	2m / 6.5 ft. Remote Housing Mounting Cable and Bracket		
B3	3m / 9.8 ft. Remote Housing Mounting Cable and Bracket		
Cx - Special Configuration (Software)			
Standard			**Standard**
C1	Factory configuration (CDS required with order)		★
C4	Namur alarm and saturation levels, high alarm		★
C5	Namur alarm and saturation levels, low alarm		★
C8	Low alarm [18] (standard Rosemount alarm and saturation levels)		★
Qx - Special Certs			
Standard			**Standard**
Q4	Calibration Data Certification		★
Q8	Material Traceability Certification per EN 10204 3.1[19]		★
U1	WHG Overfill Approval. Only available with HART 4-20 mA output (output code H)		★
Expanded			
QG	GOST Primary Verification Certificate		
Consolidate to Chamber			
Expanded			
XC	Consolidate to Chamber		

(1) Requires external 8-30 Vdc power supply.
(2) Process seal rating. Final rating depends on flange and O-ring selection.
(3) For other materials, consult the factory.
(4) Available in SST. Consult the factory for other materials.
(5) Probe weight included if applicable. Give the total probe length in feet and inches or meters and centimeters, depending on selected probe length unit. If tank height is unknown, please round up to an even length when ordering. Probes can be cut to exact length in field. Maximum allowable length is determined by process conditions.
(6) Available in material 316L and EN 1.4404. For other materials consult the factory.
(7) ASME/ANSI: Raised face type for SST flanges. EN: Type A flat face for SST flanges. JIS: Raised face type for SST flanges.
(8) Available in material 316L. For pressure and temperature rating, see page 13.
(9) Probes are intrinsically safe.
(10) Available for flanged connection.
(11) 3301: valid for probe type 3A, 3B, 4A, and 4B. 3302: valid for probe type 3B, 4A, and 4B.
(12) Not available with PTFE covered probes.
(13) Only for Material of Construction code 1 and Probe Type 5A.
(14) Valid for probe type 2A, 4A, and 5A.
(15) Material in accordance with selected material of construction for probe types 2A, 4A, 4B, and 5A.
(16) Available for all SST probes.
(17) Requires software version 10 or higher
(18) The standard alarm setting is high.
(19) Option available for pressure retaining wetted parts.

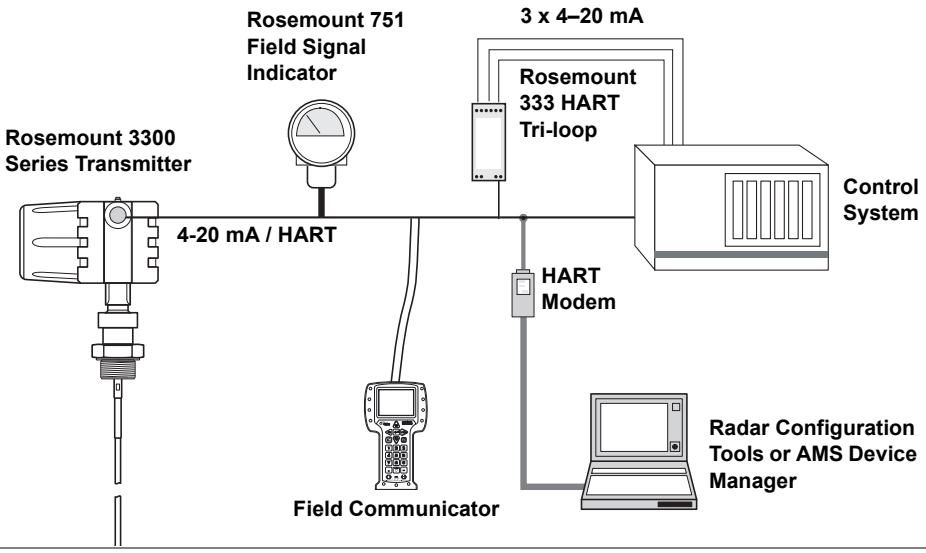
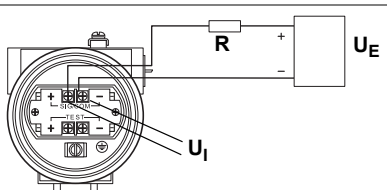
ACCESSORIES ROSEMOUNT 3301 AND 3302

TABLE 2. Accessories

Code	Process Connection - Size/Type (consult factory for other process connections)		
Centering discs[1] [2]		**Outer Diameter**	
Standard			**Standard**
03300-1655-0001	Kit, 2-in. Centering Disc, SST, Rigid Single	1.8 in. (45 mm)	★
03300-1655-0002	Kit, 3-in. Centering Disc, SST, Rigid Single	2.7 in. (68 mm)	★
03300-1655-0003	Kit, 4-in. Centering Disc, SST, Rigid Single	3.6 in. (92 mm)	★
03300-1655-0006	Kit, 2-in. Centering Disc, PTFE, Rigid Single	1.8 in. (45 mm)	★
03300-1655-0007	Kit, 3-in. Centering Disc, PTFE, Rigid Single	2.7 in. (68 mm)	★
03300-1655-0008	Kit, 4-in. Centering Disc, PTFE, Rigid Single	3.6 in. (92 mm)	★
03300-1655-1001	Kit, 2-in. Centering Disc, SST, Single / Twin Flex Lead	1.8 in. (45 mm)	★
03300-1655-1002	Kit, 3-in. Centering Disc, SST, Single / Twin Flex Lead	2.7 in. (68 mm)	★
03300-1655-1003	Kit, 4-in. Centering Disc, SST, Single / Twin Flex Lead	3.6 in. (92 mm)	★
03300-1655-1006	Kit, 2-in. Centering Disc, PTFE, Single / Twin Flex Lead	1.8 in. (45 mm)	★
03300-1655-1007	Kit, 3-in. Centering Disc, PTFE, Single / Twin Flex Lead	2.7 in. (68 mm)	★
03300-1655-1008	Kit, 4-in. Centering Disc, PTFE, Single / Twin Flex Lead	3.6 in. (92 mm)	★
Expanded			
03300-1655-0004	Kit, 6-in. Centering Disc, SST, Rigid Single	5.55 in. (141 mm)	
03300-1655-0005	Kit, 8-in. Centering Disc, SST, Rigid Single	7.40 in. (188 mm)	
03300-1655-0009	Kit, 6-in. Centering Disc, PTFE, Rigid Single	5.55 in. (141 mm)	
03300-1655-0010	Kit, 8-in. Centering Disc, PTFE, Rigid Single	7.40 in. (188 mm)	
03300-1655-1004	Kit, 6-in. Centering Disc, SST, Single / Twin Flex Lead	5.55 in. (141 mm)	
03300-1655-1005	Kit, 8-in. Centering Disc, SST, Single / Twin Flex Lead	7.40 in. (188 mm)	
03300-1655-1009	Kit, 6-in. Centering Disc, PTFE, Single / Twin Flex Lead	5.55 in. (141 mm)	
03300-1655-1010	Kit, 8-in. Centering Disc, PTFE, Single / Twin Flex Lead	7.40 in. (188 mm)	
Vented Flanges[3]			
Expanded			
03300-1812-9001	Fisher 249B/259B[4]		
03300-1812-9002	Fisher 249C[4]		
03300-1812-9003	Masoneilan[4]		
Other			
Standard			**Standard**
03300-7004-0001	Viator HART Modem and cables (RS232 connection)		★
03300-7004-0002	Viator HART Modem and cables (USB connection)		★

(1) If a centering disc is required for a flanged probe the centering disc can be ordered with options Sx or Px on page 8 in the model code. If a centering disc is required for a threaded connection or as a spare part it should be ordered using the item numbers listed below.
(2) To order a centering disc in a different material, consult the factory.
(3) 1½ in. NPT threaded connection (RA) is required.
(4) For pressure and temperature rating, see "Fisher & Masoneilan Flange Rating" on page 13.

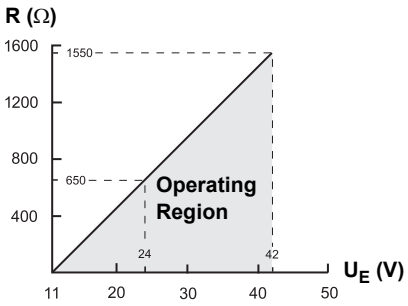
Functional Specification

General	
Field of Application	Liquids and semi-liquids level or liquid/liquid interfaces • Model 3301, for level or submerged probe interface measurement • Model 3302, for level and interface measurements
Measurement Principle	Time Domain Reflectometry (TDR). (See “Measurement Principle” on page 2 for a description of how it works)
Microwave Output Power	Nominal 50 μW, Max. 2 mW
Telecommunication (FCC and R&TTE)	FCC part 15 (1998) subpart B and R&TTE (EU directive 99/5/EC). The 3300 Series is considered to be an *unintentional radiator* under the Part 15 rules
Humidity	0 to 100% relative humidity
Start-up time	< 10 s
4–20 mA HART (Output Option Code H) – (See Ordering Information Table 1 on page 4)	
Output	Two-wire, 4–20 mA. Digital process variable is superimposed on 4–20 mA signal, and available to any host that conforms to the HART protocol (HART rev. 5). The HART signal can be used in a multidrop mode. 
HART Tri-loop	 By sending the digital HART signal to the optional HART Tri-loop, it is possible to have up to three additional 4–20 mA analog signals. See the Rosemount 333 HART Tri-loop Product Data Sheet (Document No. 00813-0100-4754) for additional information.
Smart Wireless THUM™ Adapter	 The optional THUM adapter can be mounted directly on the transmitter or by using a remote mounting kit. IEC 62591 (*Wireless*HART) enables access to multi-variable data and diagnostics, and adds wireless to almost any measurement point. See the Rosemount Smart Wireless THUM adapter Product Data Sheet (Document No. 00813-0100-4075) and Smart Wireless THUM Adapter for Rosemount Process Level Transmitter Applications (Document No. 00840-0100-4026).
External Power Supply	The input voltage (U_i) for HART is 11 to 42 Vdc (11 to 30 Vdc in IS applications, and 16 to 42 Vdc in Explosion-proof/Flameproof applications). When a Smart Wireless THUM adapter is fitted, it adds a maximum drop of 2.5 Vdc in the connected loop.  R = Load Resistance (Ω); U_E = External Power Supply Voltage (Vdc); and U_I = Input Voltage (Vdc)
IS Electrical Parameters	U_i = 30 V, I_i = 130 mA, P_i = 1 W, L_i = 0, C_i = 0
Signal on Alarm	Standard: Low = 3.75 mA. High = 21.75 mA; Namur NE43: Low = 3.6 mA. High = 22.5 mA
Saturation Levels	Standard: Low = 3.9 mA. High=20.8 mA; Namur NE43: Low = 3.8 mA. High = 20.5 mA

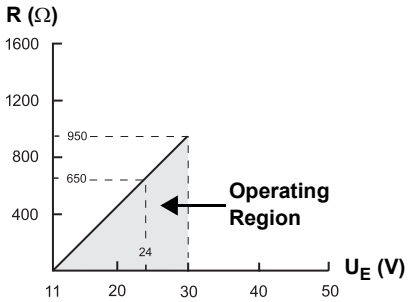
Load Limitations

Maximum load resistance is determined by the voltage level of the external power supply, as described by:

Non-Hazardous Installations

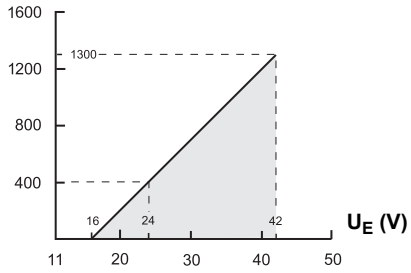


Intrinsically Safe Installations



U_E =External Power Supply Voltage; R (Ω) = Maximum Load Resistance

Explosion-proof/Flameproof (Ex d) Installations



NOTE
For the Ex d case, the diagram is only valid if the HART load resistance is at the + side, otherwise the load resistance value is limited to 300 Ω.

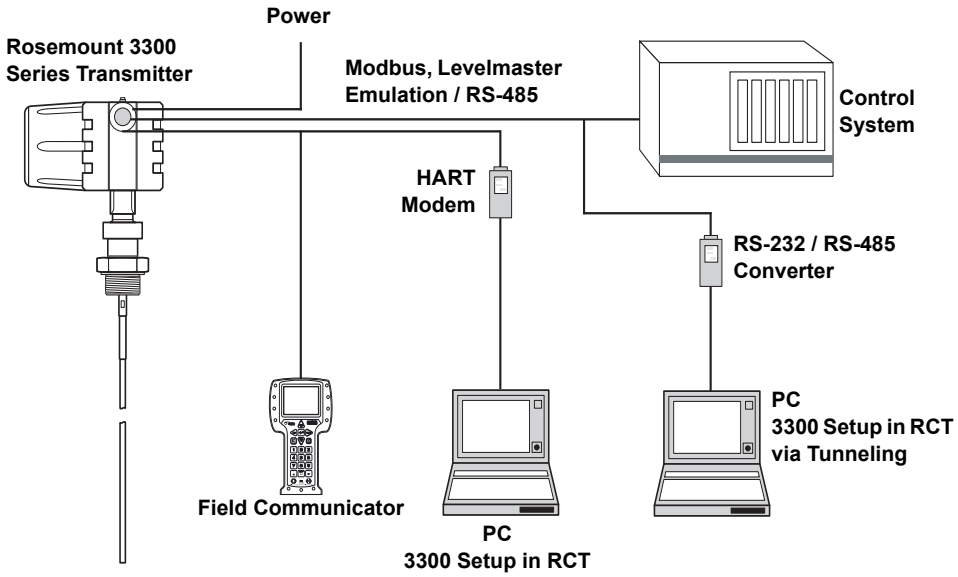
MODBUS (Output Option Code M) – (See Ordering Information Table 1 on page 4)

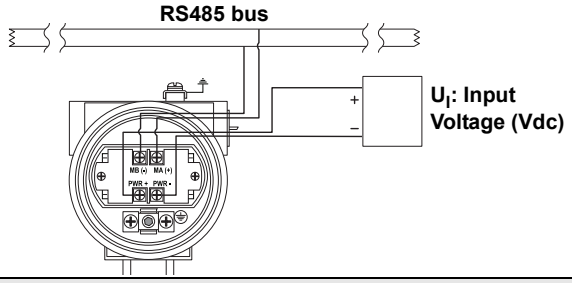
Output

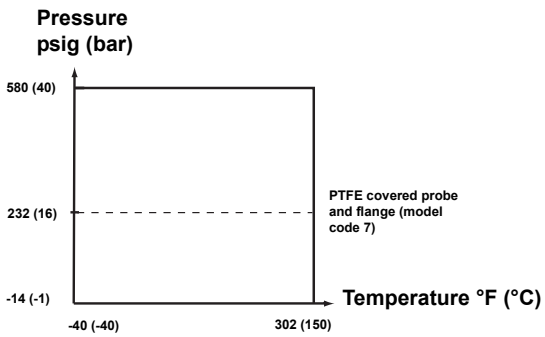
The RS-485 Modbus version communicates by Modbus RTU, Modbus ASCII, and Levelmaster protocols.

8 data bits, 1 start bit, 1 stop bit, and software selectable parity.
Baud Rate: 1200, 2400, 4800, 9600 (default), and 19200 bits/s.
Address Range: 1 to 255 (default device address is 246).

HART communication is used for configuration via the HART terminals or tunneling via the RS-485



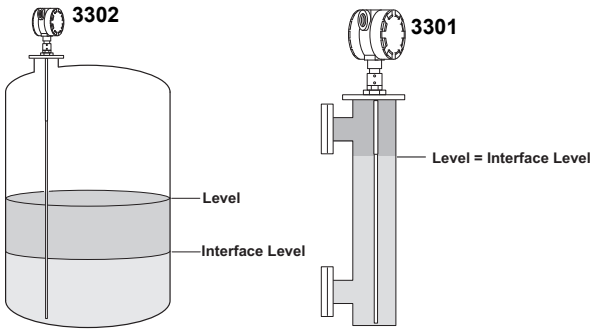
External Power Supply	The input voltage (U_I) for Modbus is 8 to 30 Vdc. Power consumption: < 0.5 W (with HART address=1) < 1.2 W (incl. four HART slaves) 
Display and Configuration	
Integral Display (Options Code M1)	The integral display toggles between the following variables: level, distance, volume, internal temperature, interface distance, interface level, peak amplitudes, interface thickness, percent of range, and analog current output
	Note: The Integral Display cannot be used to configure the transmitter
Remote Display	Data can be read remotely by using the four-digit Rosemount 751 Field Signal Indicator. For further information, see the Rosemount 751 Product Data Sheet (Document Number 00813-0100-4378)
Configuration Tools (See earlier “Output” diagrams)	Emerson Field Communicator (e.g. 375/475 Field Communicator), Radar Configuration Tools (RCT) software package for PC (included with delivery of transmitter), or Emerson AMS™ Device Manager for PC (visit www.emersonprocess.com/AMS for further information), or or DeltaV or any other DD (Device Description) compatible host systems
	Notes: • DTM (compliant with version 1.2 of the FDT/DTM specification) is also available supporting configuration in for instance Yokogawa Fieldmate/PRM, E+H™ FieldCare, and PactWare™ • To communicate using RCT or AMS Device Manager, a HART modem is required. The HART modem is available as an RS232 or USB version (see “Accessories Rosemount 3301 and 3302” on page 9) • The transmitter can be pre-configured by selecting Options code C1 (page 8) and sending a completed Configuration Data Sheet (CDS). The CDS is available from www.rosemount.com
Output Units	For Level, Interface, and Distance: ft, inch, m, cm, or mm For Volume: ft^3, $inch^3$, US gals, Imp gals, barrels, yd^3, m^3, or liters
Output Variables	**Model 3301:** Level, Distance (to product surface), Volume, Internal Temperature, and Peak Amplitudes. (For submerged probe interface measurements: Interface Level and Interface Distance) **Model 3302:** Level, Distance (to product surface), Volume, Interface Level, Interface Distance, Upper Product Thickness, Internal Temperature, and Peak Amplitudes
Damping	0 to 60 s (10 s is the default value)
Temperature Limits	
Ambient Temperature	The maximum and minimum ambient temperature for the electronics depends on the process temperature *and* on the approval (see “Product Certifications” on page 22). • The temperature range for the optional Integral Display is –40 °F (–40 °C) to 185 °F (85 °C) • To lower the temperature around the electronics, a Remote Mounting Connection can be used. The maximum temperature for the Remote Housing Connection at the vessel connection point is 302 °F (150 °C).
Storage Temperature	–40 to 176 °F (–40 to 80 °C)

Process Temperature and Pressure Rating	
Process Temperature	**Max. Rating, Standard Tank Connections**  Final rating depends on flange and O-ring selection. Table 3 on page 14 gives the temperature ranges for standard tank seals with different O-ring materials.
	Notes: • The maximum product temperature is at the lower part of the flange • The maximum temperature for the Remote Housing Connection at the vessel connection point is 302 °F(150 °C)
ASME / ANSI Flange Rating	316L SST Flanges according to ASME B16.5 Table 2-2.3. Max. 302 °F/580 psig (150 °C/40 bar)
EN Flange Rating	1.4404 according to EN 1092-1 material group 13E0. Max. 302 °F/580 psig (150 °C/40 bar)
Fisher & Masoneilan Flange Rating	316L SST Flanges according to ASME B16.5 Table 2-2.3. Max. 302 °F/580 psig (150 °C/40 bar)
JIS Flange Rating	316L SST Flanges according to JIS B2220 material group 2.3. Max. 302 °F/580 psig (150 °C/40 bar)
Tri-Clamps Rating	Maximum pressure is 16 bar for 1.5 in. (37.5 mm) and 2 in. (50 mm) housing; and 10 bar for 3 in. (75 mm) and 4 in. (100 mm) housing. The final rating depends on the clamp and gasket.
Plate Design	Certain models of flanged Alloy and PTFE covered probes have a tank connection design with a protective flange plate of the same material as the probe and with a backing flange in 316L / EN 1.4404. The protective flange plate prevents the backing flange from being exposed to the tank atmosphere For Alloy C-276 and Alloy 400, probes with flange plate design is available up to Class 300/PN 40. For PTFE, probes with flange plate design is available up to Class 150/PN 16
Flange Connection Rating	See Table 4 for the conditions used for flange strength calculations

Interface Measurements

Considerations

The Rosemount 3302 is a good choice for measuring the interface of oil and water, or other liquids with significant dielectric differences. It is also possible to measure interfaces with a Rosemount 3301 in applications where the probe is fully submerged in the liquid. If interface is to be measured, follow these criteria:



Interface Measurement with a Rosemount 3302 and a Rosemount 3301 (fully submerged probe)

- The dielectric constant of the upper product must be known and should not vary. The Radar Configuration Tools software has a built-in dielectric constant calculator to assist the user in determining the dielectric constant of the upper product
- The dielectric constant of the upper product must have a lower dielectric constant than the lower product to have a distinct reflection
- The difference between the dielectric constants for the two products must be larger than 10
- Max. dielectric constant for the upper product is 10 for the coaxial probe and 5 for twin lead probes
- The upper product thickness must be larger than 8 in. (0.2 m) for the flexible twin lead probe; 4 in. (0.1 m) for the rigid twin lead, and coaxial probes in order to distinguish the echoes of the two liquids
- Sometimes there is an emulsion layer (mix of the products) between the two products which can affect interface measurements. For guidelines on emulsion situations, consult your local Emerson Process Management representative

TABLE 3. Temperature ranges for standard tank seals with different O-ring materials

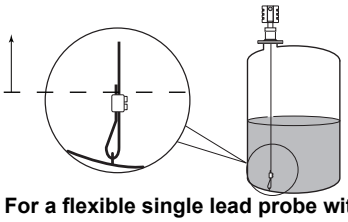
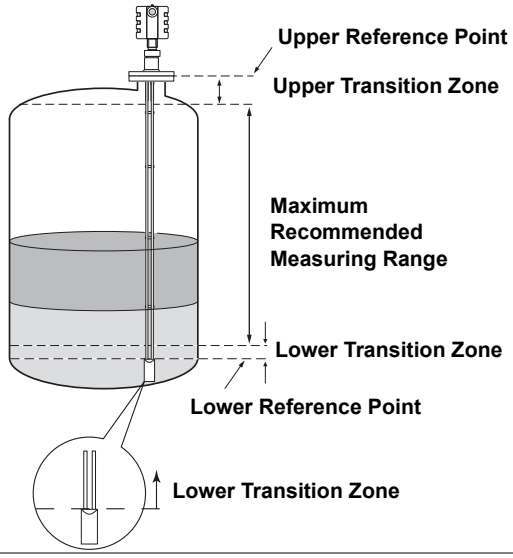
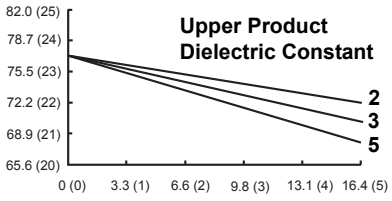
Tank seal with different O-ring material	Min. Temperature °F (°C) in air	Max. Temperature °F (°C) in air
Viton®	5 (-15)	302 (150)
Ethylene Propylene (EPDM)	-40 (-40)	266 (130)
Kalrez® 6375	14 (-10)	302 (150)
Buna-N	-31 (-35)	230 (110)

NOTE!
Always check the chemical compatibility of the o-ring material with your application.

TABLE 4. Conditions used for flange strength calculations

	Bolting material	Gasket	Flange material	Hub material
ASME / ANSI	SST SA193 B8M Class 2	Soft (1a) with min. thickness 1.6 mm	SST A182 Gr. F316L and EN 10222-5-1.4404	SST SA479M 316L and EN 10272-1.4404
EN, JIS	EN 1515-1/-2 group 13E0, A4-70	Soft (EN 1514-1) with min. thickness 1.6 mm		

Performance Specification

General	
Reference Conditions	Twin Lead probe, 77 °F (25 °C) water
Reference Accuracy	± 0.2 in. (5 mm) for probes ≤16.4 ft. (5 m) ± 0.1% of measured distance for rigid probes >16.4 ft. (5 m) ± 0.15% of measured distance for flexible probes >16.4 ft. (5 m)
Repeatability	± 0.04 in. (1 mm)
Ambient Temperature Effect	Less than 0.01% of measured distance per °C
Update Interval	1 per second
Measuring Range	
Transition Zones	These zones are areas where measurements are non-linear or have reduced accuracy. If measurements are desired at the very top of a tank, it is possible to mechanically extend the nozzle and use a coaxial probe. The upper transition zone is then moved into the extension. See Table 5 on page 16. **Lower Transition Zone**  **For a flexible single lead probe with chuck, the lower transition zone is measured upwards from the upper part of the clamp.** 
Measuring Range and Minimum Dielectric Constant	16 in. (0.4 m) to 77 ft. (23.5 m) See Table 6 on page 16 for each probe's measuring range and minimum dielectric constant. Due to the measuring range depending on the application and factors described below, the values are a guideline for clean liquids. For more information, ask your local Emerson Process Management representative. Different parameters (factors) affect the echo and therefore the maximum measuring range differs depending on application according to: • Disturbing objects close to the probe • Media with higher dielectric constants (ε_r) give better reflection and allow a longer measuring range • Surface foam and particles in the tank atmosphere may affect measuring performance • Heavy coating or contamination on the probe should be avoided since it can reduce measuring range and might cause erroneous level readings **Note:** See Table 7 on page 17 for the measuring range when using the Remote Housing
Interface Measuring Range	Target applications include interfaces between oil; oil-like and water; and water-like liquids with a low (<3) upper product dielectric constant and a high (>20) lower product dielectric constant. For such applications, the max measuring range is only limited by the length of the coaxial, rigid twin and rigid single lead probes. For the flexible twin lead probe, the maximum measuring range will be reduced depending on the maximum upper product thickness according to the diagram (inset, right). **Example:** If the Upper Product Dielectric Constant is 2, and the Upper Product Thickness is 5 ft. (1.5 m), the Maximum Measuring Range is 75.5 ft. (23 m). **Maximum Measuring Range, Flexible Twin Lead Probe, ft. (m)**  However, characteristics vary between different applications. For other product combinations, consult your local Emerson Process Management representative.

Environment	
Vibration Resistance	Polyurethane-covered aluminum housing: IEC 60770-1. SST housing: IACS E10
Electromagnetic Compatibility	Emission and Immunity: meets EN 61326-1 (2006) and amendment A1, class A equipment intended for use in industrial locations if installed in metallic vessels or still-pipes. When rigid/flexible single and twin lead probes are installed in non-metallic or open vessels, influence of strong electromagnetic fields might affect measurements
Built-in Lightning Protection	Meets EN 61000-4-4 Severity Level 4 and EN 61000-4-5 Severity Level 4
Coating (See Table 8 on page 17)	• Single lead probes are preferred when there is a risk for contamination (because coating can result in product bridging across the two leads for twin versions; between the inner lead and outer pipe for the coaxial probe) • PTFE probes are recommended for viscous or sticky applications. Periodic cleaning might be required • Maximum error due to coating is 1 to 10% depending on probe type, dielectric constant, coating thickness, and coating height above product surface
CE-mark	The 4–20 mA HART version (Output Option Code H) complies with applicable directives (EMC and ATEX)

TABLE 5. Transition Zones

	Dielectric Constant	Rigid Single Lead	Flexible Single Lead	Coaxial	Rigid Twin Lead	Flexible Twin Lead
Upper(1) Transition Zone	**80**	4 in. (10 cm)	5.9 in. (15 cm)	4 in. (10 cm)	4 in. (10 cm)	5.9 in. (15 cm)
	2	4 in. (10 cm)	20 in. (50 cm)	4 in. (10 cm)	4 in. (10 cm)	8 in. (20 cm)
Lower(2) Transition Zone	**80**	2 in. (5 cm)	2 in. (5 cm) (4) (3)	1.2 in. (3 cm)	2 in. (5 cm)	2 in. (5 cm (4))
	2	4 in. (10 cm) (5)	6.3 in. (16 cm) - long weight, short weight, and chuck(4) (5)	2 in. (5 cm)	2.8 in. (7 cm)	5.9 in. (15 cm)(4) (5)
	Note: The 4–20 mA set points are recommended to be configured between the transition zones, within the measuring range.					

(1) The distance from the upper reference point where measurements have reduced accuracy.
(2) The distance from the lower reference point where measurements have reduced accuracy.
(3) The measuring range for the PTFE covered Flexible Single Lead probe includes the weight when measuring on a high dielectric media.
(4) Note that the weight length or chuck fastening length adds to non-measurable area and is not included in the diagram. See "Dimensional Drawings" on page 24.
(5) When using a metallic centering disc, the lower transition zone is 8 in. (20 cm), including weight if applicable. When using a PTFE centering disc, the lower transition zone is not affected.

TABLE 6. Measuring Range and Minimum Dielectric Constant

Rigid Single Lead	Flexible Single Lead	Coaxial	Rigid Twin Lead	Flexible Twin Lead
Maximum Measuring Range				
9 ft 10 in. (3 m) for 8 mm probes (code 4A) 14 ft 9 in. (4.5 m) for 13 mm probes (code 4B)	77 ft 1 in. (23.5 m)	19 ft 8 in. (6 m)	9 ft 10 in. (3 m)	77 ft 1 in. (23.5 m)
Minimum Dielectric Constant				
2.5 (or 1.7 if installed in a metallic bypass or stilling well)(1)	2.5 up to 36 ft (11 m)(2) 5.0 up to 66 ft (20 m) 7.5 up to 77 ft 1 in. (23.5 m)	1.5	1.9	1.6 up to 33 ft (10 m) 2.0 up to 66 ft (20 m) 2.4 up to 77 ft 1 in. (23.5 m)

(1) May be lower depending on installation.
(2) In pipes with a diameter less than 8 in. (20 cm), the minimum Dielectric Constant is 2.0.

TABLE 7. Measuring Range When Using Remote Housing

Rigid Single Lead	Flexible Single Lead	Coaxial	Rigid Twin Lead	Flexible Twin Lead
Maximum Measuring Range				
9 ft. 10 in. (3 m) - for 8 mm probes 14 ft. 9 in. (4.5 m) - for 13 mm probes	77 ft. 1 in. (23.5 m)	19 ft. 8 in. (6 m)	9 ft. 10 in. (3 m)	77 ft. 1 in. (23.5 m)
Minimum Dielectric Constant with 1 m Remote Housing				
2.7 (2.0 if installed in a metallic bypass or stilling well)(1)	2.7 up to 36 ft. (11 m) 6 up to 66 ft. (20 m) 10 up to 72 ft. (22 m)	1.5	2.1	1.7 up to 33 ft. (10 m) 2.2 up to 66 ft. (20 m) 2.6 up to 72 ft. (22 m)
Maximum Measuring Range with 2 m Remote Housing				
3.3 (2.2 if installed in a metallic bypass or stilling well)(1)	3.2 up to 36 ft. (11 m) 8 up to 67 ft. (20.5 m)	1.6	2.5	1.8 up to 33 ft. (10 m) 2.4 up to 67 ft. (20.5 m)
Maximum Measuring Range with 3 m Remote Housing				
3.8 (2.5 if installed in a metallic bypass or stilling well)(1)	3.7 up to 36 ft. (11 m) 11 up to 62 ft. (19 m)	1.7	2.8	2.0 up to 33 ft. (10 m) 2.7 up to 62 ft. (19 m)

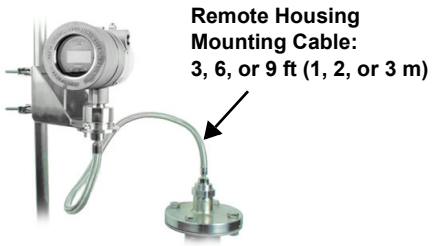
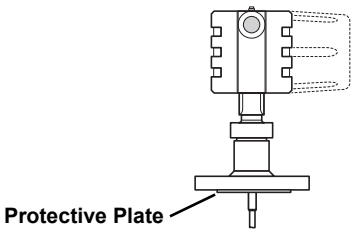
(1) May be lower depending on installation.

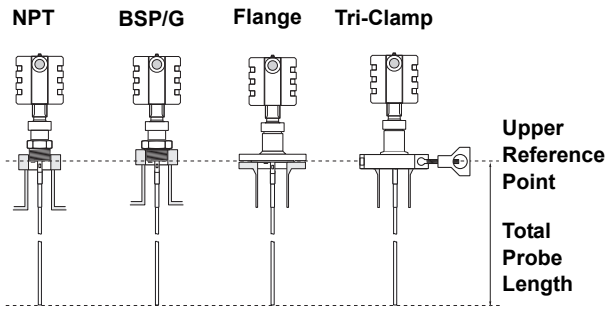
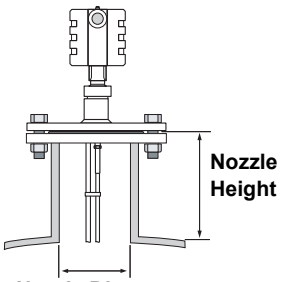
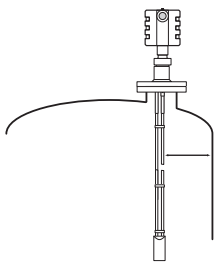
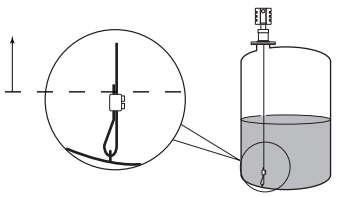
TABLE 8. Maximum recommended Viscosity and Coating / Build-up

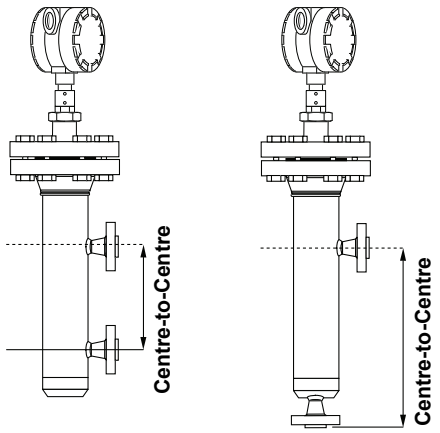
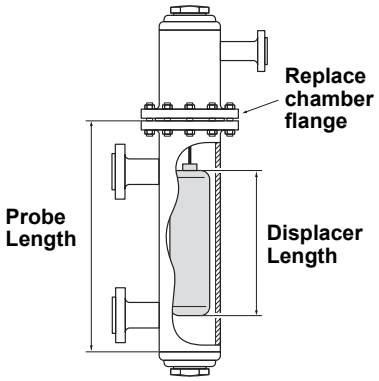
Coaxial	Twin Lead	Single Lead
Maximum Viscosity		
500 cP	1500 cP	8000 cP (1)
Coating / Build-up		
Coating not recommended	Thin coating allowed, but no bridging	Coating allowed

(1) Consult your local Emerson Process Management representative in the case of agitation/turbulence and high viscous products.

Physical Specification

Housing and Enclosure	
Type	Dual compartment (removable without opening the tank). Electronics and cabling are separated. Two entries for conduit or cable connections. The transmitter housing can be rotated in any direction.
Electrical Connection	½ - 14 NPT for cable glands or conduit entries. Optional: M20 x 1.5 conduit/cable adapter or PG 13.5 conduit/cable adapter. Recommended output cabling is twisted shielded pairs, 18-12 AWG.
Housing Material	Polyurethane-covered Aluminium or SST Grade CF8M (ASTM A743)
Ingress Protection	NEMA 4X, IP 66, IP 67
Factory Sealed	Yes
Weight	Transmitter Head (TH): 5.5 lb (2.5 kg) in Aluminum, 11 lb (5 kg) in SST
Remote Housing Mounting	Kit that includes a flexible armored extension cable and a bracket for wall or pipe mounting. See Figure 1-7 on page 30 for the dimensions. 
Tank Connection and Probe	
Tank Connection	The tank connection consists of a tank seal, a flange, Tri-Clamp, or NPT or BSP/G threads. Certain models of flanged Alloy and PTFE covered probes have a tank connection design with a protective flange plate of the same material as the probe and with a backing flange in 316L / EN 1.4404. The protective flange plate prevents the backing flange from being exposed to the tank atmosphere. See “Dimensional Drawings” on page 24.  **Tank Seal with Plate Design**
Flange Dimensions	Follows ASME B 16.5, JIS B2220, and EN 1092-1 standards for blind flanges. For Proprietary Fisher® and Masoneilan® flanges, see “Proprietary Flanges” on page 30
Vented Flanges	Available with Masoneilan and Fisher vented flanges. Vented flanges must be ordered as accessories with a 1½-in. NPT threaded process connection (code RA); see Table 2 on page 9. As an alternative to a vented flange, it is possible to use a flushing connection ring on top of the standard nozzle.
Probe Versions	Coaxial, Rigid Twin and Rigid Single Lead, Flexible Twin and Flexible Single Lead.
	For guidelines on which probe to select depending on application, see the Technical Note Guided Wave Radar Application Guidelines (Document No. 00840-2600-4811)
	For interface measurements Rigid Single probe is the best choice for chamber mounting. The Twin or Coaxial probe is the preferred choice for clean, low dielectric constant liquids
Material Exposed To Tank Atmosphere	• Material model code 1: 316L SST (EN 1.4404), PTFE, PFA, and O-ring materials • Material model code 2: Alloy C-276 (UNS N10276), PTFE, PFA, and O-ring materials • Material model code 3: Alloy 400 (UNS N04400), PTFE, PFA, and O-ring materials • Material model code 7: PTFE • Material model code 8: PTFE, 316 L SST (EN 1.4404), and O-ring materials
Pressure Equipment Directive (PED)	Complies with 97/23/EC article 3.3

Total Probe Length	This is defined from the upper reference point to the end of the probe (weight included, if applicable).  Select the probe length according to the required measuring range (the probe must be hung and fully extended through the entire distance where level readings are desired).
Cut-to-fit probes	Most of the probes can be cut in field. However, there are some restrictions for the standard coaxial probes: these can be cut up to 2 ft. (0.6 m). Probes shorter than 4.1 ft. (1.25 m) can be cut to the minimum length of 1.3 ft. (0.4 m). The PTFE covered probes cannot be cut in the field.
Minimum and Maximum Probe Length	Coaxial: 1.3 ft (0.4 m) to 19.7 ft (6 m). Rigid Twin Lead: 1.3 ft (0.4 m) to 9.8 ft (3 m). Flexible Twin Lead: 3.3 ft (1 m) to 77.1 ft (23.5 m). Rigid Single Lead (0.3 in./8 mm): 1.3 ft (0.4 m) to 9.8 ft (3 m) Rigid Single Lead (0.5 in./13 mm): 1.3 ft (0.4 m) to 19.7 ft (6.0 m) Flexible Single Lead: 3.3 ft (1 m) to 77.1 ft (23.5 m)
Probe Angle	0 to 90 degrees from vertical axis
Tensile Strength	Flexible Single Lead probe: 2698 lb (12 kN). Flexible Twin Lead probe: 2023 lb (9 kN)
Collapse Load	Flexible Single Lead probe: 3597 lb (16 kN)
Sideway Capacity	Coaxial probe: 73.7 ft. lbf, 3.7 lb at 19.7 ft. (100 Nm, 1.67 kg at 6 m) Rigid Twin Lead: 2.2 ft. lbf, 0.22 lb at 9.8 ft. (3 Nm, 0.1 kg at 3 m) Rigid Single Lead: 4.4 ft. lbf, 0.44 lb at 9.8 ft. (6 Nm, 0.2 kg at 3 m)
Maximum Recommended Nozzle Height	4 in. (10 cm) + nozzle diameter For coaxial probes, there are no restrictions
Minimum Clearance (See Table 9 on page 21)	  **Clearance to tank wall**
Other Mechanical Considerations	To get best possible performance, the following must be considered before installing the transmitter: • Inlets should be kept at a distance in order to avoid product filling on the probe • Avoid physical contact between probes and agitators, as well as applications with strong fluid movement unless the probe is anchored • Probe tie-down is recommended if the probe can move to within 1 ft. (30 cm) of any object during operations • In order to stabilize the probe for side forces, it is possible to fix or guide the probe to the tank bottom • For optimal single lead probe performance in non-metallic vessels, the probe must either be mounted with a 2-in. / DN 50 or larger metallic flange, or a metal sheet with an 8-in. diameter (200 mm) or larger must be used (see the Reference Manual for placement)  **Flexible single lead probe with chuck. See the Reference Manual for more anchoring options.**
	See the Reference Manual (Document No. 00809-0100-4811) for more mechanical installation information

Weight	Flange: depends on flange size Coaxial probe: 0.67 lb/ft. (1 kg/m) Rigid Single Lead probe (0.3 in./8 mm): 0.27 lb/ft. (0.4 kg/m) Rigid Single Lead probe (0.5 in./13 mm): 0.71 lb/ft. (1.06 kg/m) Rigid Twin Lead probe: 0.40 lb/ft. (0.6 kg/m) Flexible Single Lead probe: 0.05 lb/ft. (0.07 kg/m) Flexible Twin Lead probe: 0.09 lb/ft. (0.14 kg/m) End weight: 0.88 lb (0.40 kg) for single probes, 1.3 lb (0.60 kg) for twin probes
Chamber / Pipe Installations	
Rosemount 9901 Chamber	Rosemount 9901 allows external mounting of process level instrumentation. It supports a variety of process connections, and optional drain and vent connections. The Rosemount 9901 chamber is designed to the ASME B31.3 standard, and is Pressure Equipment Directive (PED) compliant. Use option code XC to order together with the 3300 Series transmitters. The probe length to use for a Rosemount 9901 chamber can be calculated with this formula: **Side-and-Side dimension:** Probe length=Centre-to-Centre dimension+19 in. (48 cm) **Side-and-Bottom dimension:** Probe length=Centre-to-Centre dimension+4 in. (10 cm) Use a centering disc the same diameter as the chamber if the probe length >3.3 ft. (1 m). See “Probe Type in Chamber Considerations” on page 20 and “Centering Discs” on page 21 for which probe and disc to use. **Side-and-Side dimension** **Side-and-Bottom dimension** 
	For additional information, see the Rosemount 9901 Chamber for Process Level Instrumentation Product Data Sheet (Document Number 00813-0100-4601)
Existing Chamber	A Rosemount 3300 Series transmitter is the perfect replacement in an existing displacer chamber. Proprietary flanges are offered, enabling use of existing chambers to make installation easy. **Considerations when changing to 3300:** The 3300 series flange choice and probe length must be correctly matched to the chamber. Both standard ANSI and EN (DIN), as well as proprietary chamber flanges, are available. See “Proprietary Flanges” on page 30 to identify the proprietary flanges. See “Probe Type in Chamber Considerations” on page 20 and “Centering Discs” on page 21 for which probe and disc to use. See Table 10 on page 21 for guidelines on the required probe length. 
	For additional information, see the Replacing Displacers with Guided Wave Radar Technical Note (Document Number 00840-2200-4811)
Probe Type in Chamber Considerations	When installing a Rosemount 3300 in a chamber, the single lead probe is recommended.
	The recommended minimum chamber diameter is 4 in. (100 mm) for Single Flexible probe and 3 in. (75 mm) for the Single Rigid probe. The probe should be centered to prevent it touching the sides of the well.
	The probe length determines if a Single Rigid or Single Flexible probe should be used: • Less than 19.7 ft. (6.0 m): Rigid Single Probe is recommended. Use a centering disc for probe > 3.3 ft. (1 m). If installation requires less head-space, use a Flexible Single Probe with a weight and centering disc. • More than 19.7 ft. (6.0 m): Use Flexible Single Probe with a weight and centering disc.
	A short weight is available for the single flexible SST probe. It is used for measuring close to the probe end and shall be used where the measuring range must be maximized. The height is 2 in. (50 mm) and the diameter is 1.5 in. (37.5 mm). The option code is W2. If a heavier weight is needed, option code W3 can be used (height is 5.5 in. (140 mm) and the diameter is 1.5 in. (37.5 mm).

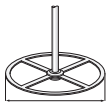
Centering Discs	To prevent the probe from contacting the chamber or pipe wall, centering discs are available for rigid single, flexible single, and flexible twin lead probes. The disc is attached to the end of the probe. Discs are made of stainless steel, Alloy C-276, Alloy 400, or PTFE. See Table 11 for Dimension D. Table 12 shows which centering disc diameter to choose for a particular pipe.  **D**

TABLE 9. Minimum Clearance

	Coaxial	Rigid Twin Lead	Flexible Twin Lead	Rigid Single Lead	Flexible Single Lead
Recommended nozzle diameter	Enough space to fit the probe(1)	4 in. (10 cm) or more	4 in. (10 cm) or more	6 in. (15 cm) or more	6 in. (15 cm) or more
Min. nozzle diameter(2)	Enough space to fit the probe(1)	2 in. (5 cm)	2 in. (5 cm)	2 in. (5 cm)	2 in. (5 cm)
Min. clearance to tank wall or obstruction(3)	0 in. (0 cm)	4 in. (10 cm)	4 in. (10 cm)	4 in. (10 cm) if smooth metallic wall. 12 in. (30 cm) if disturbing objects, rugged metallic or concrete/plastic wall.	4 in. (10 cm) if smooth metallic wall. 12 in. (30 cm) if disturbing objects, rugged metallic or concrete/plastic wall.
Min. pipe / bypass diameter	1.5 in. (3.8 cm)	2 in. (5 cm) (4)	Consult your local Emerson Process Management representative.	2 in. (5 cm) (5)	Consult your local Emerson Process Management representative.

(1) Probe diameter is 1.1 in. (28 mm) for standard probe.
(2) Requires special configuration and setting of Upper Null Zone.
(3) Minimum clearance from tank bottom for the coaxial and rigid single probes is 0.2 in. (5 mm).
(4) The center-most lead must be at least 0.6 in. (15 mm) away from the pipe/bypass wall.
(5) The probe must be centered in the pipe/bypass. A centering disc (see "Centering Discs" on page 21 and "Rosemount 3301 and 3302 Level and/or Interface in Liquids" on page 4) can be used to prevent the probe from contacting the chamber wall.

TABLE 10. Required probe length in chambers

Chamber Manufacturer	Probe Length(1)
Major torque-tube manufacture (249B, 249C, 2449K, 249N, 259B)	Displacer+9 in. (229 mm)
Masoneilan (Torque tube operated), proprietary flange	Displacer+8 in. (203 mm)
Other - torque tube(2)	Displacer+8 in. (203 mm)
Magnetrol (spring operated)(3)	Displacer+between 7.8 in. (195 mm) to 15 in. (383 mm)
Others - spring operated(2)	Displacer+19.7 in. (500 mm)

(1) If flushing ring is used, add the ring height to the probe length.
(2) For other manufacturers, there are small variations. This is an approximate value, actual length should be verified.
(3) Lengths vary depending on model, SG and rating, and should be verified.

TABLE 11. Centering Discs Dimensions

Disc Size	Actual Disc Diameter
2 in.	1.8 in. (45 mm)
3 in.	2.7 in. (68 mm)
4 in.	3.6 in. (92 mm)
6 in.	5.55 in. (141 mm)
8 in.	7.40 in. (188 mm)

TABLE 12. Centering disc size recommendation for different pipe schedules

	Pipe Schedule					
Pipe Size	5s, 5	10s,10	40s, 40	80s, 80	120	160
2 in.	2 in.	2 in.	2 in.	2 in.	NA(1)	NA(2)
3 in.	3 in.	3 in.	3 in.	3 in.	NA(1)	2 in.
4 in.	4 in.	4 in.	4 in.	4 in.	4 in.	3 in.
5 in.	4 in.	4 in.	4 in.	4 in.	4 in.	4 in.
6 in.	6 in.	6 in.	6 in.	6 in.	4 in.	4 in.
7 in.	NA(1)	NA(1)	6 in.	6 in.	NA(1)	NA(1)
8 in.	8 in.	8 in.	8 in.	8 in.	6 in.	6 in.

(1) Schedule is not available for pipe size.
(2) No centering disc is available.

Product Certifications

SAFETY NOTE

A safety isolator such as a zener barrier is always needed for intrinsic safety.

Probes covered with plastic and/or with plastic discs may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Therefore, when the probe is used in a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.

Factory Mutual (FM) Approval

Project ID: 3013394

E5 Explosion-proof for use in Class I, Div. 1, Groups B, C, and D;
Dust Ignition Proof for use in Class II/III, Div. 1, Groups E, F, and G;
With Intrinsically Safe connections to Class I, II, III, Div. 1, Groups A, B, C, D, E, F, and G.
Temperature Class T5 @ +85 °C.
Ambient temperature limits -50 °C to +85 °C.
Approval valid for Modbus and HART option.

I5 Intrinsically Safe for Class I, II, III, Div. 1, Groups A, B, C, D, E, F, and G,
Class I, Zone 0, AEx ia IIC T4 T_a=70 °C.
Temp code T4 at 70 °C max ambient.
Control Drawing: 9150077-944.
Non-Incendive Class I, Div. 2, Groups A, B, C, and D;
Suitable for Class II, III, Div. 2, Groups F and G.
Non-incendive maximum operating parameters: 42 V, 25 mA.
Temp code T4A at 70 °C max ambient.
Approval valid for HART option.

EU Conformity

The most recent revision of the EC declaration of conformity can be found at www.rosemount.com.

ATEX Approval CE

E1 Flameproof:
II 1/2 GD T80°C.
EEx d [ia] IIC T6 (-40°C<T_a<+75°C).
KEMA 01ATEX2220X.
U_m = 250 V.
Approval valid for HART option.

SPECIAL CONDITIONS FOR SAFE USE (X)

On application of the Rosemount 3300 Series Guided Wave Radar Level and Interface Transmitters equipped with plastic materials in an explosive gas atmosphere, requiring the use of apparatus of equipment category 1G, precaution shall be taken to avoid danger of ignition due to electrostatic charges on the enclosure.

I1 Intrinsic Safety:
II 1 G Ex ia IIC T4 Ga (-50 °C ≤ T_a ≤ +70 °C).
BAS02ATEX1163X
U_i=30 V, I_i=130 mA, P_i=1.0 W, L_i=C_i=0.
Input Voltage range
Loop-powered (2-wire):
Functional voltage range: 11-42 Vdc
Intrinsically safe version: 11-30 Vdc
Max Power rating: 1.0 W

Ambient temperature limit: -50 °C ≤ T_a ≤ +70 °C

Approval valid for HART option.

SPECIAL CONDITIONS FOR SAFE USE (X)

The apparatus is not capable of withstanding the 500 V test as defined in clause 6.3.12 of EN 60079-11:2007. This must be considered in any installation.

The Series 3300 enclosure is made of aluminium alloy and given a protective polyurethane paint finish; however, care should be taken to protect it from impact or abrasion if located in zone 0.

N1 Non-Incendive:
II 3G Ex nAnL IIC T4 (-40 °C ≤ T_a ≤ +70 °C).
Baseefa08ATEX0002X
U_N=42.4 V
Approval valid for HART option.

SPECIAL CONDITIONS FOR SAFE USE (X):

The external supply must be provided with transient and over voltage protection.

The apparatus is not capable of withstanding the 500 V test to earth for one minute as defined in Clause 34.2 of EN 60079-15. This must be taken into consideration during installation.

The cable entry to the equipment must use ATEX Certified Cable glands or be blanked to maintain a degree of protection of IP54.

Canadian Standards Association (CSA) Approval

Cert. no 1250250.

E6 Explosion-proof: Class I, Div. 1, Groups C and D.
Dust Ignition Proof: Class II, Div. 1 and 2, Groups G and coal dust.
Class III, Div. 1, Haz. Loc.
[Ex ia IIC T6].
Ambient temperature limits -50 °C to +85 °C.
Approval valid for Modbus and HART option.

I6 Intrinsically Safe: Ex ia IIC T4,
Class I, Div. 1, Groups A, B, C, and D.
Temp code T4.
Installation Drawing: 9150077-945.
Non-Incendive: Class III, Div. 1, Haz. Loc.
Class I, Div 2, Groups A, B, C, and D.
Ambient temperature limits -50 °C to +70 °C.
Approval valid for HART option.

National Supervision and Inspection Center for Explosion Protection and Safety of Instrumentation (NEPSI) Approvals

E3 Flameproof: GYJ071096
Ex dia IIC T6 (-20 °C<T_a<+60 °C). DIP A21 T_A T6 IP66
U_m=250 V
Approval valid for HART and Modbus options.

I3 Intrinsically Safe: GYJ06459X, GYJ06460X
Ex ia IIC T4 (-20 °C<T_a<+60 °C).
U_i=30 Vdc, I_i=130 mA, P_i=1.0 W, C_i=0 nF, L_i=0 H.
Approval valid for HART option.

Overfill Protection

Cert no: Z-65.16-416

U1 TÜV-tested and approved by DIBt for overfill protection according to the German WHG regulations

Technology Institution of Industrial Safety (TIIS) Approval

E4 Flameproof with Intrinsically Safe probe: TC18544, TC18545
Transmitter: Ex d [ia] IIB T6 ($T_{a,\ max}$ = 60 °C)
U_m=250 V
Probe: Ex ia IIB T6
U_o=25.2 V, I_o=159 mA, P_o=1.0 W
Approval valid for HART option.
Installation drawing: 03300-00408.

IECEx Approval

E7 Flameproof:
Ex d [ia] IIC T6 (T_{amb} = -20 °C + 60 °C) IP66
IECEx TSA 04.0013X
Approval valid for HART option.

SPECIAL CONDITIONS FOR SAFE USE (X)

The programming port must not be used in the hazardous area.

The apparatus metallic enclosure must be electrically bonded to earth. The conductor used for the connection shall be equivalent to a copper conductor of 4 mm^2 minimum cross-sectional area.

Where it is required that an unused conduit entry is to be closed by means of the blanking plug, the plug supplied by the equipment manufacturer with this equipment is certified for this purpose under this certification.

Maximum Voltage U_m = 250 V.

I7 Intrinsic Safety:
Ex ia IIC T4 (T_a = 60 °C) IP66
IECEx TSA 04.0006X
U_i = 30 V, I_i = 130 mA, P_i = 1 W, C_i = 0 nF, L_i = 0 mH
Approval valid for HART option.

SPECIAL CONDITIONS FOR SAFE USE (X)

The programming port must not be used in the hazardous area.

The apparatus metallic enclosure must be electrically bonded to the earth. The conductor used for the connection shall be equivalent to a copper conductor of 4 mm^2 minimum cross-sectional area.

The input parameters stated above must be taken into consideration during the installation of the apparatus.

For information on hazardous locations installations, refer to the Rosemount 3300 Series Reference Manual (Document no. 00809-0100-4811).

Dimensional Drawings

Figure 1-1. Rigid Single Lead

Dimensions are in inches (millimeters)

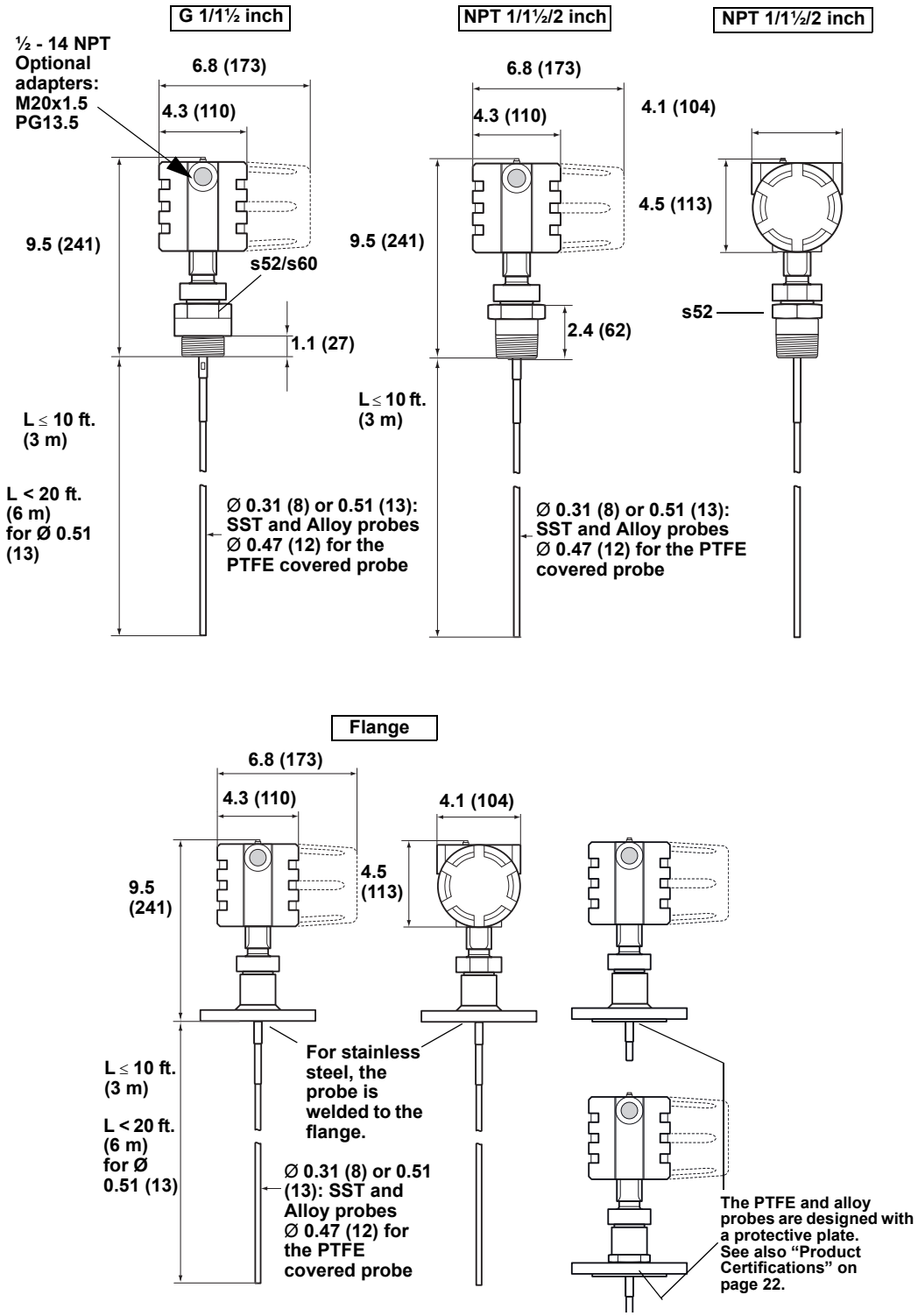


Figure 1-2. Flexible Single Lead

Dimensions are in inches (millimeters)

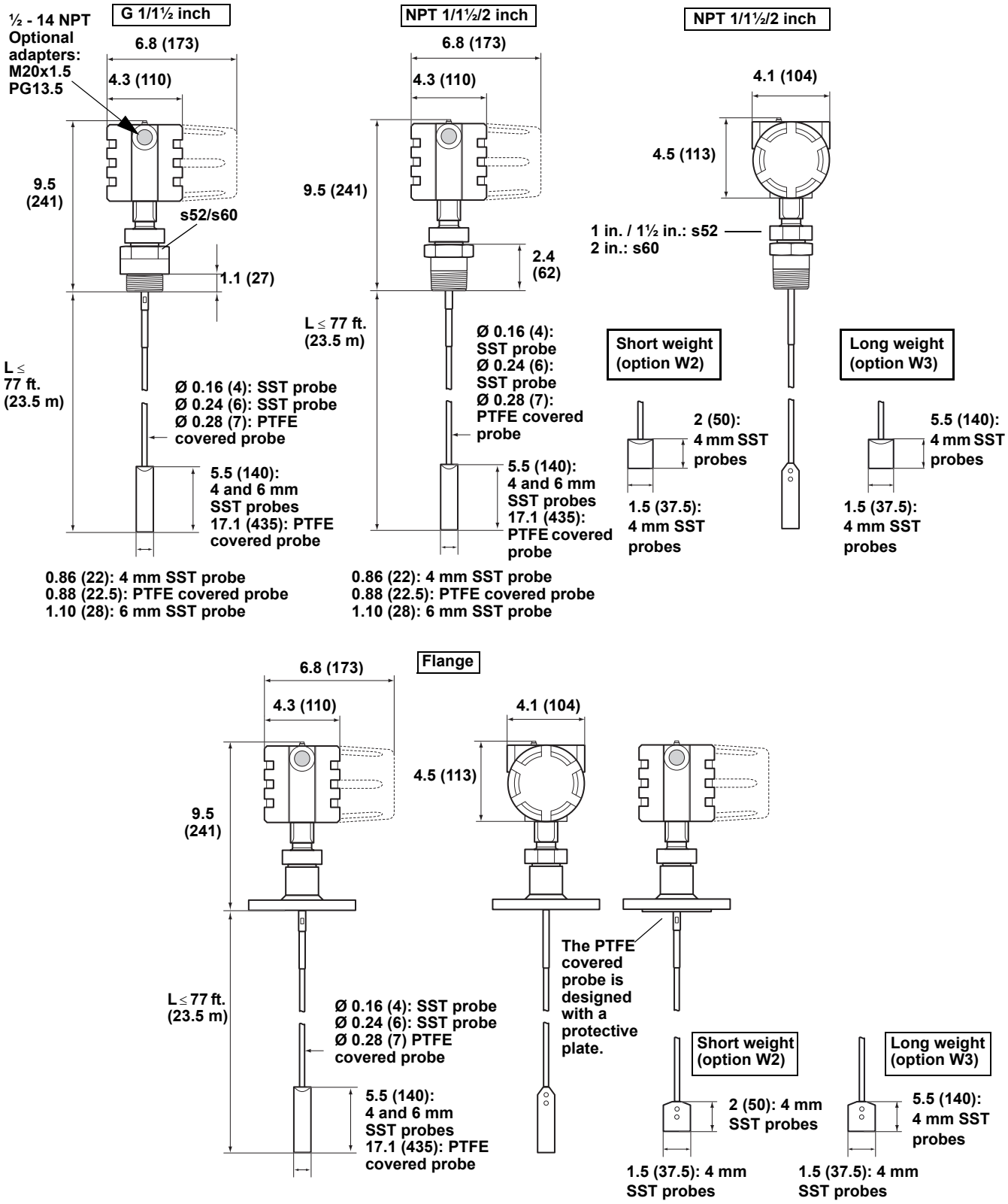


Figure 1-3. Coaxial

Dimensions are in inches (millimeters)

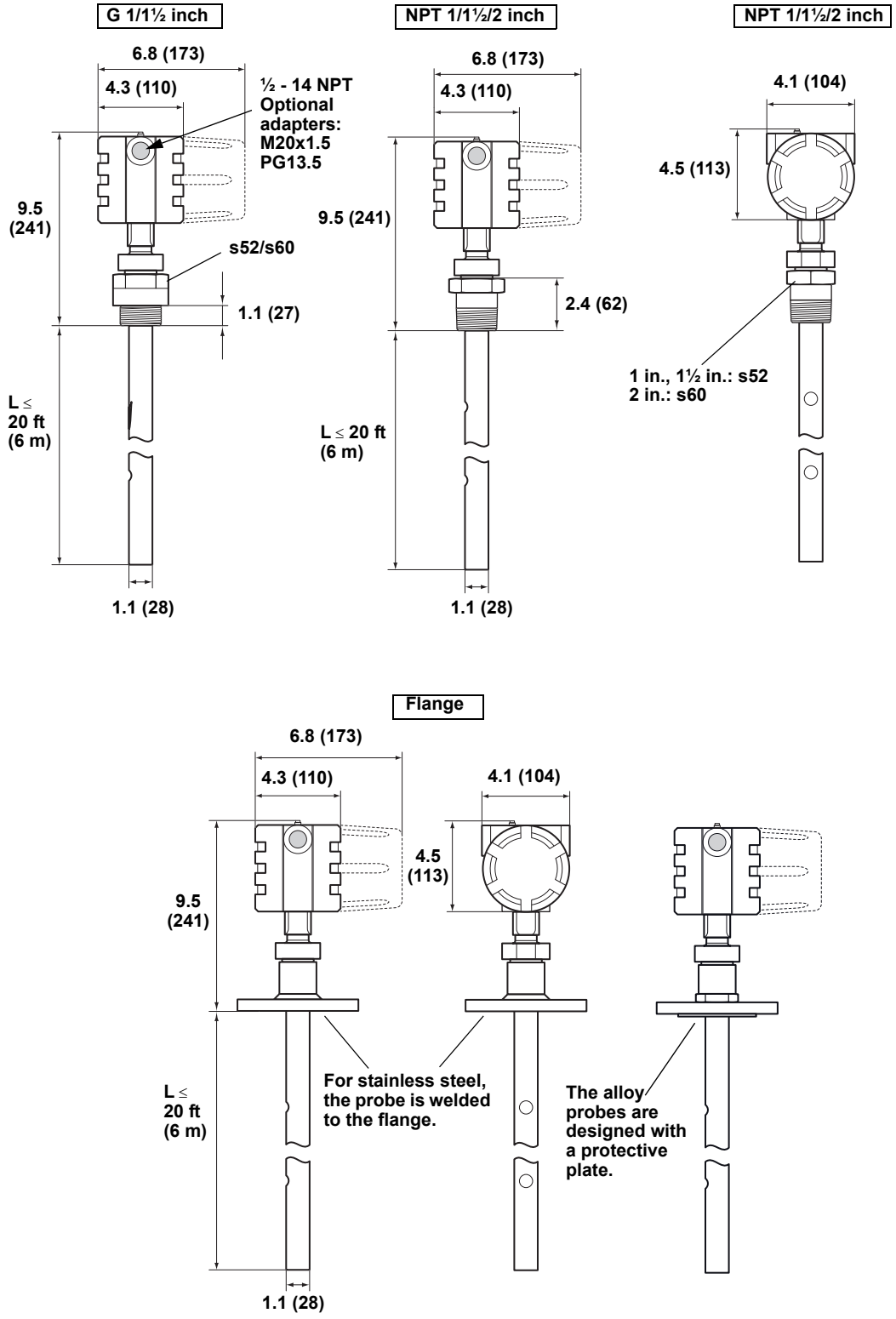


Figure 1-4. Rigid Twin Lead

Dimensions are in inches (millimeters)

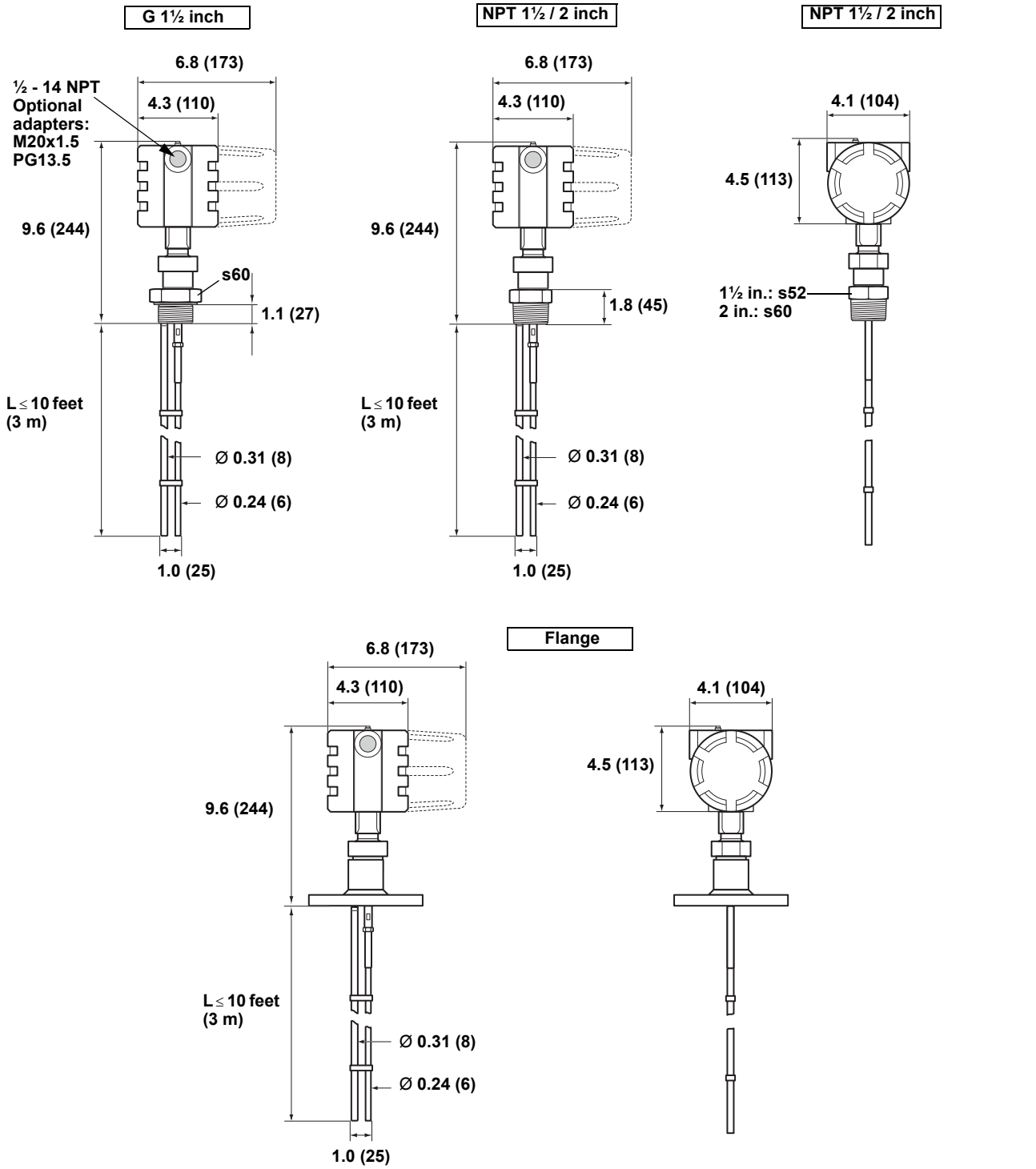


Figure 1-5. Flexible Twin Lead

Dimensions are in inches (millimeters)

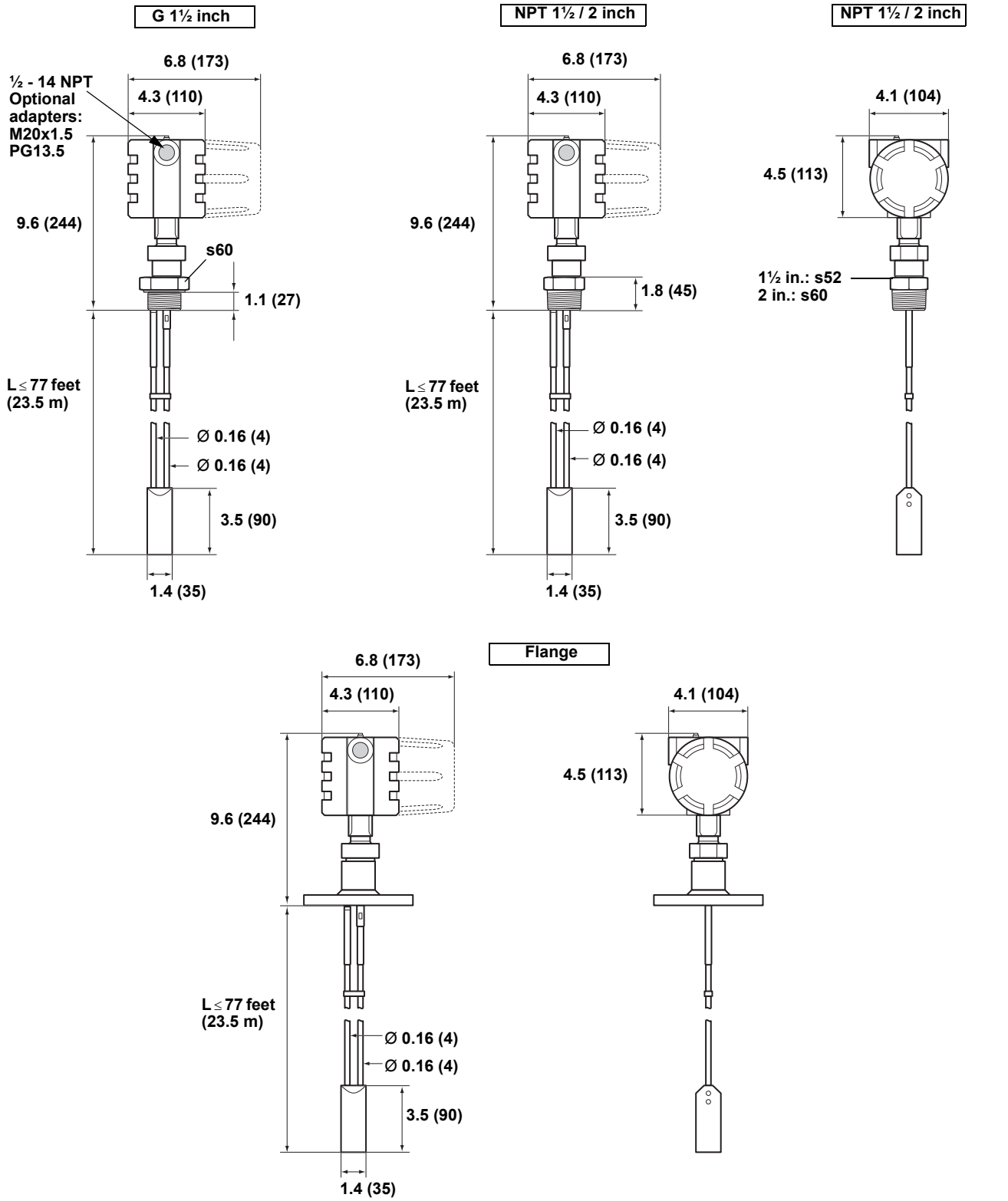
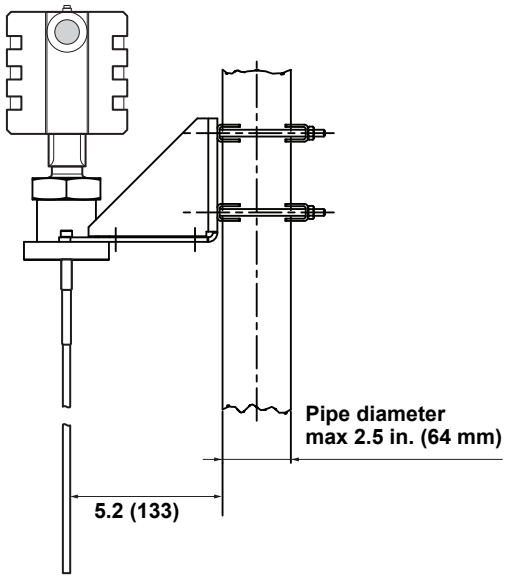
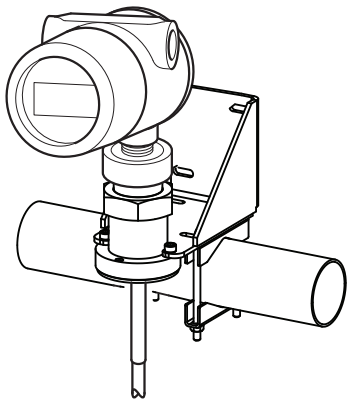


Figure 1-6. Bracket mounting.

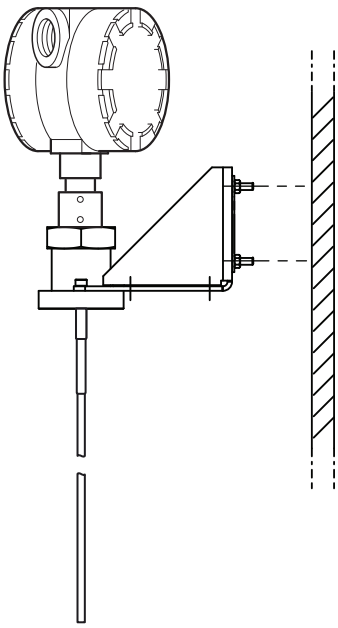
Dimensions are in inches (millimeters)



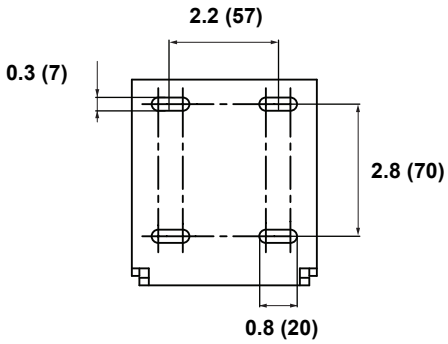
Pipe mounting (vertical pipe)



Pipe mounting (horizontal pipe)



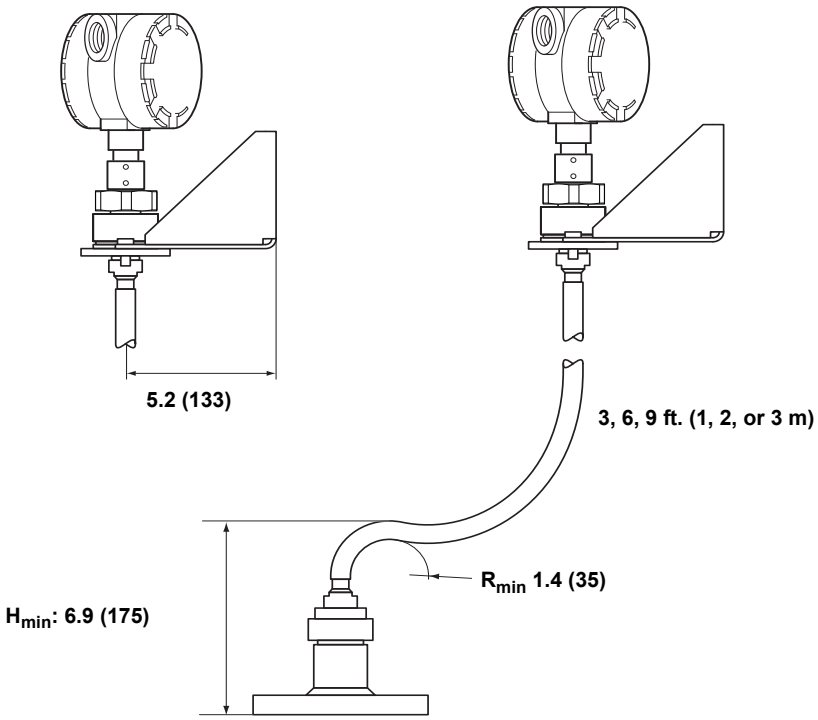
Wall mounting



Hole pattern wall mounting

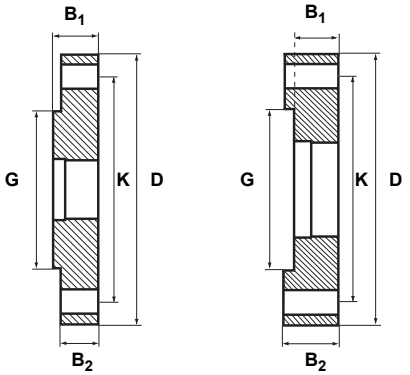
Figure 1-7. Remote housing.

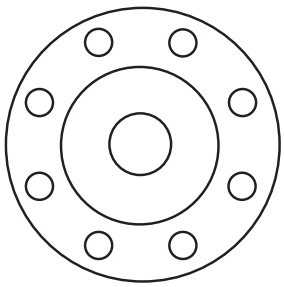
Dimensions are in inches (millimeters)



PROPRIETARY FLANGES

Raised Face **Recessed Face**





Dimensions are in inches (millimeter).

D: Outside diameter
B1: Flange thickness with gasket surface
B2: Flange thickness without gasket surface
F=B_1-B_2: Gasket surface thickness
G: Gasket surface diameter
 # Bolts: Number of Bolts
K: Bolt hole circle diameter

NOTE
Dimensions may be used to aid in the identification of installed flanges. It is not intended for manufacturing use.

TABLE 13. Dimensions of proprietary flanges

Special Flanges(1)	D	B_1	B_2	F	G	# Bolts	K
Fisher 249B/259B(2)	9.00 (228.6)	1.50 (38.2)	1.25 (31.8)	0.25 (6.4)	5.23 (132.8)	8	7.25 (184.2)
Fisher 249C(3)	5.69 (144.5)	0.94 (23.8)	1.13 (28.6)	-0.19 (-4.8)	3.37 (85.7)	8	4.75 (120.65)
Masoneilan(2)	7.51 (191.0)	1.54 (39.0)	1.30 (33.0)	0.24 (6.0)	4.02 (102.0)	8	5.87 (149.0)

(1) These flanges are also available in a vented version.
(2) Flange with raised face.
(3) Flange with recessed face.

Rosemount 3300 Series

Rosemount Level Solutions

Emerson provides a complete range of Rosemount products for level measurement applications.

Vibrating Fork Switches – Point Level Detection

For high and low alarms, overfill protection, pump control, including wide pressure and temperature requirements, and hygienic applications. Flexible mounting. Immune to changing process conditions and suitable for most liquids.
The product line consists of:

- Rosemount 2160 Wireless
- Rosemount 2130 Enhanced
- Rosemount 2120 Full-featured
- Rosemount 2110 Compact

Differential Pressure – Level or Interface Measurement

Flexible mounting for liquid tank levels, including those with wide temperature and pressure requirements. Can be isolated by valves. Unaffected by: vapor space changes, surface conditions, foam, corrosive fluids, internal tank equipment. Optimize performance with direct mount, Tuned-System Assemblies:

- Rosemount DP Level Transmitters and Remote Seals
- Rosemount 3051S_L, 3051L, and 2051L Liquid Level Transmitters

Ultrasonic – Level Measurement

Top mounted, non-contacting for simple tank and open air level measurements. Unaffected by fluid properties such as: density, viscosity, dirty coating and corrosiveness. Appropriate for routine applications outside of explosion proof areas.
The product line consists of:

- Rosemount 3100 Series Ultrasonic Process Level Transmitters

Guided Wave Radar – Level and Interface Measurement

Top mounted, direct level and interface measurement of liquids or solids, including those with wide temperature and pressure requirements. Unaffected by changing process conditions. Good fit for small spaces and easy swap for older technologies.
The product line consists of:

- Rosemount 5300 Series – Accurate, superior performance transmitter in most applications including process vessels and control
- Rosemount 3300 Series – Versatile and easy-to-use transmitter in most liquid storage and monitoring applications

Non-contacting Radar – Level Measurement

Top mounted, direct level measurement for liquids or solids, including those with wide temperature and pressure requirements. Can be isolated by valves. Unaffected by changing process conditions. Good for dirty, coating and corrosive applications.
The product line consists of:

- Rosemount 5400 Series – Accurate, superior performance 2-wire transmitters for most liquid level applications and process conditions
- Rosemount 5600 Series – 4-wire transmitters with maximum sensitivity and performance for solids, challenging reactors, rapid level changes and excessive process conditions

Chambers for Process Level Instrumentation

- Rosemount 9901 – High quality chambers for external mounting of level measurement and control instrumentation on process vessels

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