

Rosemount 3300 Series

Guided Wave Radar Level and Interface Transmitters



Rosemount 3300 Series

Guided Wave Radar Level and Interface Transmitters

NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

Within the United States, Rosemount Inc. has two toll-free assistance numbers.

Customer Central: 1-800-999-9307 (7:00 a.m. to 7:00 p.m. CST)

Technical support, quoting, and order-related questions.

North American Response Center:

Equipment service needs.

1-800-654-7768 (24 hours a day – Includes Canada)

For equipment service or support needs outside the United States, contact your local Rosemount representative.

CAUTION

The products described in this document are NOT designed for nuclear-qualified applications.

Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Rosemount Sales Representative.

This product is designed to meet FCC and R&TTE requirements for a non-intentional radiator. It does not require any licensing whatsoever and has no tank restrictions associated with telecommunications issues.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Rosemount 3300 Series Guided Wave Radar Level and Interface Transmitters may be protected by one or more of the following U.S. Patent Nos. 5,955,684; 6,148,681; 6,198,424; 6,373,261 and other patents issued or pending in the U.S. and other countries. May depend on model.

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HART is a registered trademark of the HART Communication Foundation.

Teflon, VITON, and Kalrez are registered trademarks of DuPont Performance Elastomers.

Asset Management Solutions is a trademark of Emerson Process Management.

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Section 1 Introduction

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SAFETY MESSAGES

Procedures and instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the safety messages listed at the beginning of each section before performing an operation preceded by this symbol.

⚠ WARNING

Failure to follow these installation guidelines could result in death or serious injury.

- Make sure only qualified personnel perform the installation.
- Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Explosions could result in death or serious injury.

- Verify that the operating environment of the transmitter is consistent with the appropriate hazardous locations certifications.
- Before connecting a HART®-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.

⚠ WARNING

Any substitution of non-recognized parts may jeopardize safety. Repair, e.g. substitution of components etc., may also jeopardize safety and is under no circumstances allowed.

MANUAL OVERVIEW

This manual provides installation, configuration and maintenance information for the Rosemount 3300 Series Radar Transmitter.

Section 2: Transmitter Overview

- Theory of Operation
- Description of the transmitter
- Process and vessel characteristics

Section 3: Installation

- Mounting considerations
- Mechanical installation
- Electrical installation

Section 4: Start-Up

- Configuration instructions
- Configuration using the HART Communicator
- Configuration using the RCT software

Section 5: Operating the Display Panel

- Display functionality
- Error messages

Section 6: Service and Troubleshooting

- Advanced Configuration
- Error and Warning Codes
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Appendix A: Reference Data

- Specifications
- Ordering Information

Appendix B: Product Certifications

- Examples of labels
- European ATEX Directive information
- FM approvals
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- Drawings

SERVICE SUPPORT

To expedite the return process outside of the United States, contact the nearest Rosemount representative.

Within the United States, call the Rosemount National Response Center using the 1-800-654-RSMT (7768) toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the process material to which the product was last exposed.

Rosemount National Response Center representatives will explain the additional information and procedures necessary to return goods exposed to hazardous substance can avoid injury if they are informed of and understand the hazard. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

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Section 2 Transmitter Overview

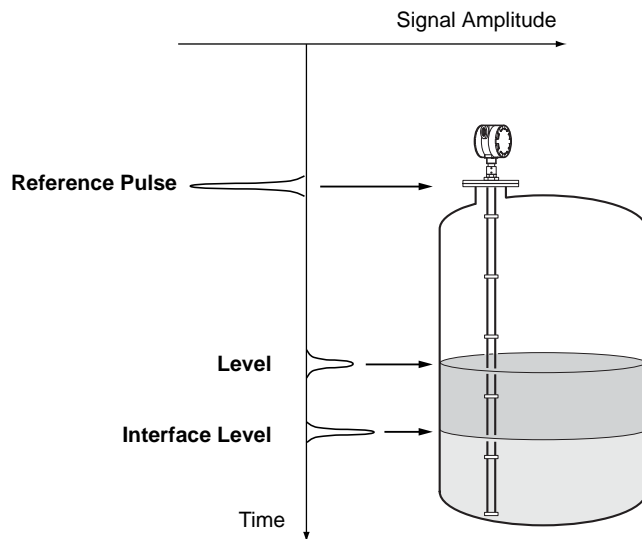
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Applications	page 2-2
Components of the Transmitter	page 2-4
System Architecture	page 2-5
Probe Selection Guide	page 2-6
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THEORY OF OPERATION

The Rosemount 3300 Series Radar Transmitter is a smart, two-wire continuous level transmitter that is based on Time Domain Reflectometry (TDR) principles. Low power nano-second-pulses are guided along a probe immersed in the process media. When a pulse reaches the surface of the material it is measuring, part of the energy is reflected back to the transmitter, and the time difference between the generated and reflected pulse is converted into a distance from which the total level or interface level is calculated (see below).

The reflectivity of the product is a key parameter for measurement performance. A high dielectric constant of the media gives better reflection and a longer measuring range. A calm surface gives better reflection than a turbulent surface.

Figure 2-1. Measurement Principle.



TDR_PRINCIPLES

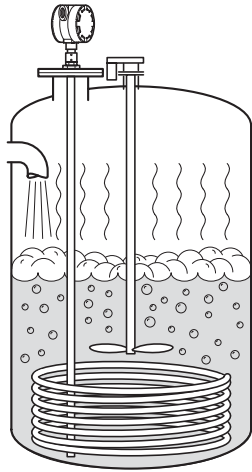
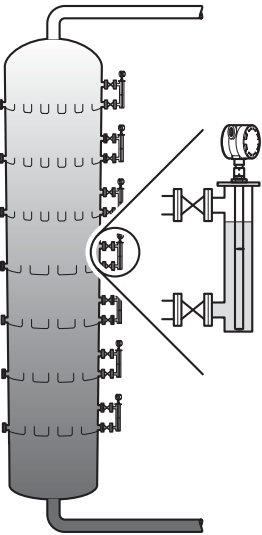
APPLICATIONS

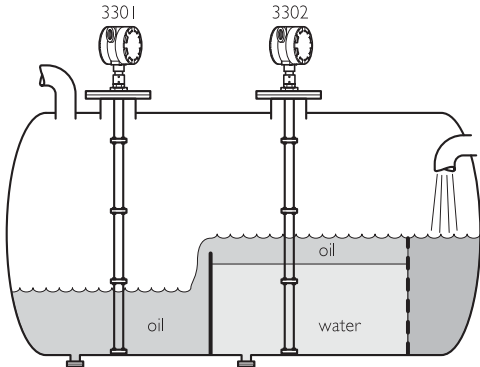
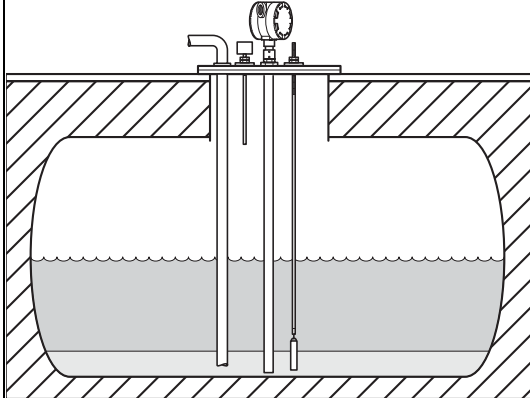
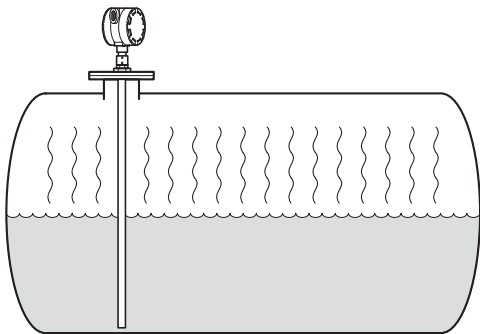
The Rosemount 3300 Series Radar Transmitter program is suited for aggregate (total) level measurements on most liquids, semi-liquids, and liquid/liquid interfaces.

Guided microwave technology offers highest reliability and precision which ensure measurements are virtually unaffected by temperature, pressure, vapor gas mixtures, density, turbulence, bubbling/boiling, low level, varying dielectric media, pH, and viscosity.

Guided wave radar technology in combination with advanced signal processing make the 3300 transmitters suitable for a wide range of applications:

Figure 2-2. Application examples

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">APPLIC TURBULENCE</p> 	<p>Boiling conditions with vapor and turbulence. For these applications the Coaxial probe is particularly suitable.</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">APPLIC BRIDLE</p> 	<p>The Rosemount 3300 Series of transmitters is well suited for bridge applications such as distillation columns.</p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">APPLIC SEPARATOR</p>		<p>Separator tank. The Rosemount 3302 measures both level and interface level.</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">APPLIC SEPARATOR</p>		<p>The Rosemount 3300 series is a good choice for underground tanks since it is installed on the tank top with the radar pulse concentrated near the probe. It can be equipped with probes that are unaffected by high and narrow openings or nearby objects.</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">APPLIC AMMONIA</p>		<p>Guided wave radar technology is a good choice for reliable measurements in small ammonia, NGL and LPG tanks.</p>

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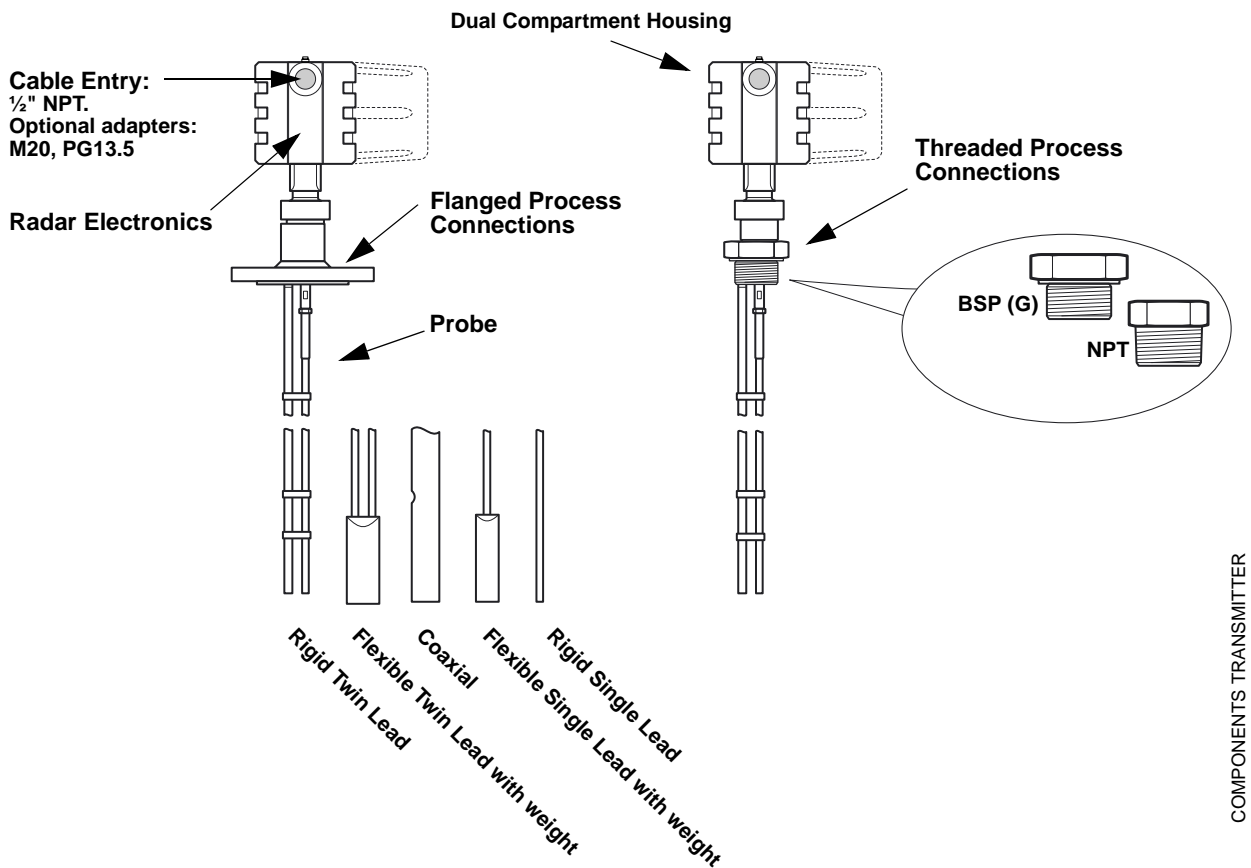
COMPONENTS OF THE TRANSMITTER

The Rosemount 3300 Series Radar Transmitter has an aluminum *transmitter housing* which contains advanced electronics for signal processing.

The *radar electronics* produces an electromagnetic pulse which is guided by the *probe*.

There are different probe types available for various applications: Rigid Twin Lead, Flexible Twin Lead, Rigid Single Lead, Flexible Single Lead, and Coaxial.

Figure 2-3. Transmitter components.



NOTE

Flexible and Rigid probes require different radar electronics and can not be used with the same transmitter head.

COMPONENTS TRANSMITTER

SYSTEM ARCHITECTURE

The Rosemount 3300 Series Radar Transmitter is **loop-powered** which means it uses the same two wires for both power supply and output signal. The output is a **4-20 mA analog signal superimposed with a digital HART** signal.

By using the optional HART Tri-loop, it is possible to convert the HART signal to up to three additional 4-20 mA analog signals.

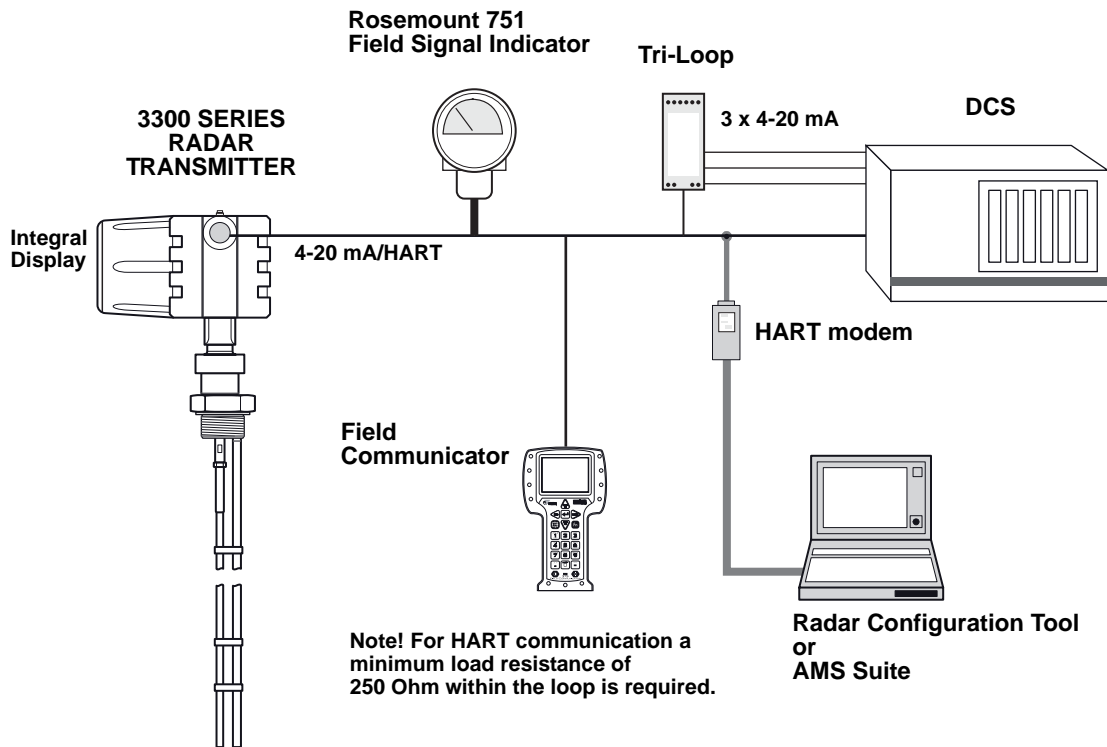
With the HART protocol it is possible to use multidrop configuration. In this case communication is restricted to digital since current is fixed to the 4 mA minimum value.

The transmitter can be connected to display Rosemount 751 Field Signal Indicator or it can be equipped with an integral display.

The transmitter can easily be configured by using a Field Communicator or a PC with the Radar Configuration Tool software. Rosemount 3300 Series transmitters are also compatible with the AMS Suite software which also can be used for configuration.

For HART communication a minimum load resistance of 250 Ohm within the loop is required.

Figure 2-4. System architecture.



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**PROBE SELECTION
GUIDE**

Use the following guidelines to choose appropriate probe for your 3300 transmitter:

Table 2-1. Probe selection guide. G=Good, NR=Not Recommended, AD=Application Dependent (consult factory)

	Coaxial	Rigid Twin Lead	Flexible Twin Lead	Rigid Single Lead	Flexible Single Lead
Measurements					
Level	G	G	G	G	G
Interface (liquid/liquid)	G ⁽¹⁾	G	G	NR	NR
Process Medium Characteristics					
Changing density	G	G	G	G	G
Changing dielectric ⁽²⁾	G	G	G	G	G
Wide pH variations	G	G	G	G	G
Pressure changes	G	G	G	G	G
Temperature changes	G	G	G	G	G
Condensing vapors	G	G	G	G	G
Bubbling/boiling surfaces	G	G	AD	G	AD
Foam (mechanical avoidance)	AD	NR	NR	NR	NR
Foam (top of foam measurement)	NR	AD	AD	AD	AD
Foam (foam and liquid measurement)	NR	AD	AD	NR	NR
Clean liquids	G	G	G	G	G
Liquid with dielectric<2.5	G	AD	AD	AD ⁽³⁾	NR
Coating liquids	NR	NR	NR	AD	AD
Viscous liquids	NR	AD	AD	AD	G
Crystallizing liquids	NR	NR	NR	AD	AD
Solids/Powders	NR	NR	NR	AD	AD
Fibrous liquids	NR	NR	NR	G	G
Tank Environment Considerations					
Probe is close (<12 in./30 cm) to tank wall / disturbing objects	G	AD	AD	NR	NR
High turbulence	G	G	AD	G	AD
Turbulent conditions causing breaking forces	NR	NR	AD	NR	AD
Long and small mounting nozzles (diameter <6 in./15 cm, height>diameter + 4 in./10 cm)	G	AD	NR	NR	NR
Probe might touch nozzle / disturbing object	G	NR	NR	NR	NR
Liquid or vapor spray might touch probe	G	NR	NR	NR	NR
Disturbing EMC environment in tank	AD	NR	NR	NR	NR

(1) Not in fully immersed applications.

(2) For overall level applications a changing dielectric has no effect on the measurement. For interface measurements a changing dielectric of the top fluid will degrade the accuracy of the interface measurement.

(3) OK when installed in pipe.

Dead Zones

The measuring range depends on probe type and properties of the product. The **Upper Dead Zone** is the minimum measurement distance between the upper reference point and the product surface. The Upper Dead Zone varies between 4 - 20 in. (0.1 and 0.5 m) depending on probe type and product.

At the end of the probe the measuring range is reduced by the **Lower Dead Zone**. The **Lower Dead Zone** also varies depending on probe type and product.

Figure 2-5 illustrates how the measuring range is related to the Dead Zones:

Figure 2-5. Dead Zones

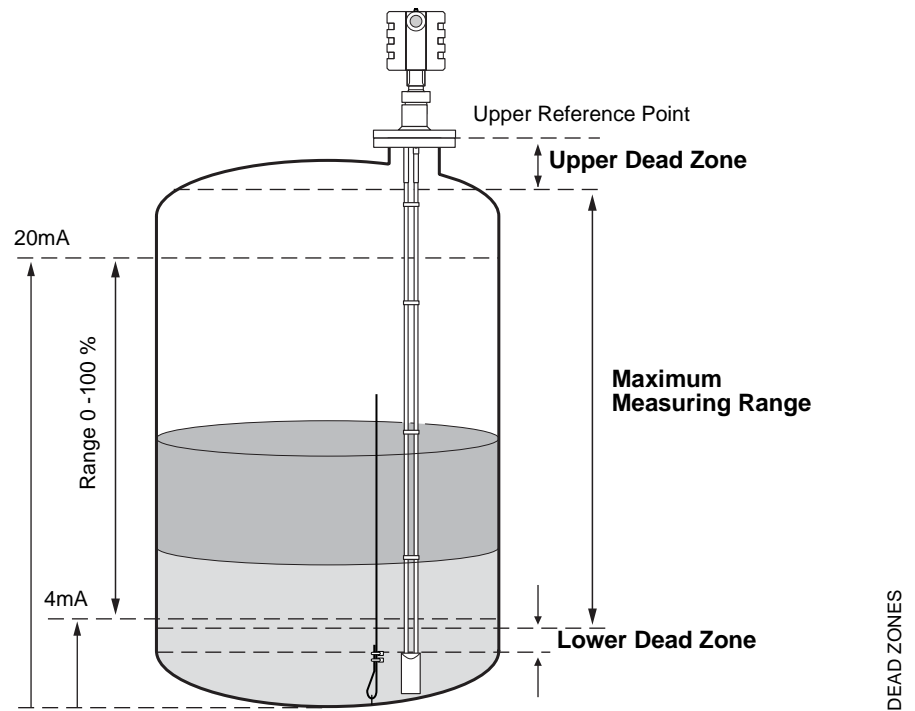


Table 2-2. Dead Zones for different probe types

	Dielectric Constant	Coaxial Probe	Rigid Twin Lead Probe	Flexible Twin Lead Probe	Rigid Single Lead Probe	Flexible Single Lead Probe
Upper Dead Zone	2	4 in. (10 cm)	4 in. (10 cm)	8 in. (20 cm)	4 in. (10 cm)	20 in. (50 cm)
	80	4 in. (10 cm)	4 in. (10 cm)	5.9 in. (15 cm)	4 in. (10 cm)	5.9 in. (15 cm)
Lower Dead Zone	2	2 in. (5 cm)	2.8 in. (7 cm)	5.9 in. (15 cm)	4 in. (10 cm) ⁽¹⁾	4.7 in. (12 cm)
	80	1.2 in. (3 cm)	2 in. (5 cm)	2 in. (5 cm)	2 in. (5 cm)	2 in. (5 cm)

(1) Dead Zone=8 inch (20 cm) when SST centering disc is mounted. The PTFE centering disc does not affect the Dead Zone.

NOTE

The measurement accuracy is reduced in the Dead Zones. It may even be impossible to make any measurements at all in those regions. Therefore the 4-20 mA set points should be configured outside the Dead Zones.

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PROCESS CHARACTERISTICS

The Rosemount 3300 Series has a high sensitivity due to its advanced signal processing and high signal to noise ratio, which makes it able to handle various disturbances. However, the following circumstances should be considered before mounting the transmitter.

Coating

Coating on the probe should be avoided since the sensitivity of the transmitter may be decreased leading to measurement errors. **In viscous or sticky applications, periodic cleaning may be required.**

For viscous or sticky applications, it is important to choose a suitable probe:

Table 2-3. Probe type guide for different product viscosity

Coaxial	Twin Lead	Single Lead
Maximum viscosity		
500 cP	1500 cP	8000 cP ⁽¹⁾⁽²⁾
Coating/Build-up		
Coating not recommended	Thin coating allowed, but no bridging	Coating allowed

(1) Consult factory if agitation/turbulence and high viscous products.

(2) HTHP and HP single probes should be used with precaution in viscous or crystallizing media. Cooling of high temperature vapor in the upper part of the probe may lead to condensation and deposition that blocks the measurement signal.

Maximum measurement error due to coating is 1-10% depending on probe type, dielectric constant, coating thickness and coating height above product surface.

Bridging

Heavy coating that results in product bridging across the two probes for twin lead versions, or between the pipe and the inner rod for coaxial probes, will cause erroneous level readings and must be prevented. Single lead probes are preferred in this case. **If a Twin Lead probe is required, regular cleaning may be necessary.**

Foam

How well the Rosemount 3300 Series Radar Transmitter measures in foamy applications depends upon the properties of the foam; light and airy or dense and heavy, high or low dielectrics, etc. If the foam is conductive and creamy the transmitter will probably measure the surface of the foam. If the foam is less conductive the microwaves will probably penetrate the foam and measure the liquid surface.

Vapor

In some applications, as ammonia, there is heavy vapor above the product surface that will influence the level measurement. The Rosemount 3300 Series Radar Transmitter can be configured to compensate for the influence of vapor.

Measuring Range

The measuring range differs depending on probe type and characteristics of the application. The values given in *Table 2-4* can be used as a guideline for clean liquids.

Table 2-4. Measuring Range

Coaxial	Rigid Twin Lead	Flexible Twin Lead	Rigid Single Lead	Flexible Single Lead
Maximum Measuring Range				
19 ft 8 in. (6 m)	9 ft 10 in. (3 m)	77 ft 1 in. (23.5 m)	9 ft 10 in. (3 m)	77 ft 1 in. (23.5 m)
Minimum Dielectric Constant at Maximum Measuring Range				
Standard & HP: 1.4 HTHP: 2.0 up to 13 ft (4 m) 2.5 up to 19 ft 8 in. (6 m)	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)	2.5 (1.7 if installed in a metallic bypass or stilling well)	2.5 up to 36.1 ft (11 m) 5.0 up to 66 f (20 m) 7.5 up to 77 ft 1 in. (23.5 m)

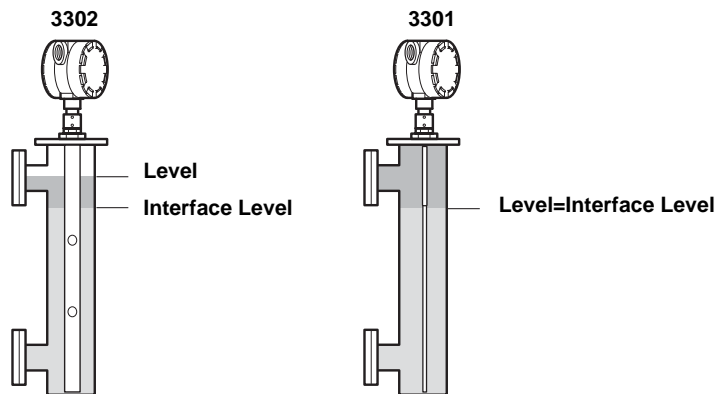
The maximum measuring range differs depending on application according to:

- Disturbing objects close to the probe.
- Media with higher dielectric constant (ϵ_r) gives better reflection and allows a longer measuring range.
- A calm surface gives better reflection than a turbulent surface. For a turbulent surface the measuring range might be reduced.
- Surface foam and particles in the tank atmosphere are also circumstances that might affect measuring performance.
- Coating/contamination can reduce the measuring range.
- Disturbing EMC environment in tank.

Interface

Rosemount 3302 is the ideal choice for measuring the interface of oil and water, or other liquids with significant dielectric differences. It is also possible to measure interface with a Rosemount 3301 in applications where the probe is fully immersed in the liquid.

Figure 2-6. Interface measurement with a Rosemount 3302 and a Rosemount 3301 (fully immersed probe).



BRIDLE_INTERFACE_CA

Coaxial, Rigid twin, Flexible twin and Rigid Single lead probes can be used for measuring interfaces. The coaxial probe is the preferred choice for clean liquids and when the bridle is not fully immersed. In applications with a fully immersed probe, the twin lead probes are recommended for nozzle installations, and the rigid single lead probe is best for bridle mounting.

For measuring the interface level, the transmitter uses the residual wave of the first reflection. 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.

If interface is to be measured, the following criteria have to be fulfilled:

- The dielectric constant of the upper product must be known. The Radar Configuration Tools software has a built-in dielectric constant calculator to assist users in determining the dielectric constant of the upper product (see “Dielectrics” on page 4-21).
- The dielectric constant of the upper product must have a lower dielectric constant than the lower product in order to have a distinct reflection.
- The difference between the dielectric constants for the two products must be larger than 10.
- Maximum 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 inches (0.2 m) for the flexible twin lead probe and 4 inches (0.1 m) for the rigid twin lead and coaxial probes in order to distinguish the echoes of the two liquids.

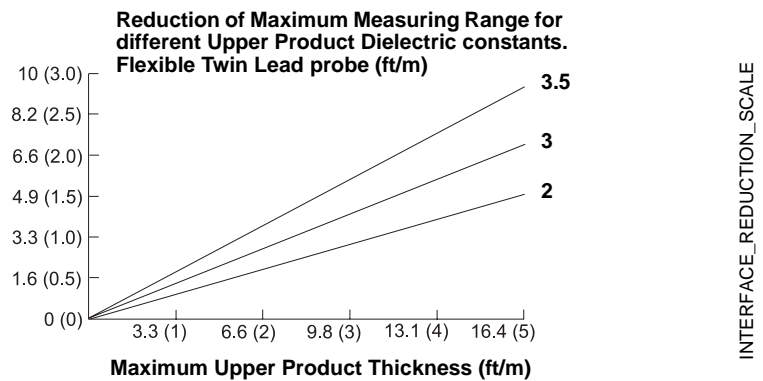
The maximum allowable upper product thickness/measuring range is primarily determined by the dielectric constants of the two liquids.

Target applications include interfaces between oil/oil-like and water/water-like liquids. For such applications the upper product dielectric constant is low (<3) and the lower product dielectric constant is high (>20), and the maximum measuring range is only limited by the length of the coaxial and rigid twin lead probes.

For the flexible twin lead probe, the reduction of maximum measuring range (65 ft/20 m), can be gained from Figure 2-7 on page 2-10.

However, characteristics varies widely between different applications. For other product combinations, consult factory.

Figure 2-7. Reduction of maximum measuring range for Flexible Twin Lead probe



Emulsion Layers

Sometimes there is an emulsion layer (mix of the products) between the two products which, depending on its characteristics, will affect interface measurements.

Please consult factory for guidelines on how to handle emulsion layers.

**VESSEL
CHARACTERISTICS**

Heating Coils, Agitators

The Rosemount 3300 Series Radar Transmitter is relatively insensitive to objects in the tank since the radar signal is transmitted along a probe.

Avoid physical contact between probes and agitators as well as applications with strong fluid movement unless the probe is anchored. If the probe can move within 1 ft (30 cm) away from any object, such as an agitator, during operation then probe tie-down is recommended.

In order to stabilize the probe for side forces, it is possible to hang a weight at the probe end (flexible probes only) or fix/guide the probe to the tank bottom.

Tank Shape

The guided wave radar transmitter is insensitive to the tank shape. Since the radar signal travels along a probe, the shape of the tank bottom has virtually no effect on the measurement performance. The transmitter handles flat or dish-bottom tanks equally well.

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Section 3 Installation

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SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury:

Verify that the operating environment of the transmitter is consistent with the appropriate hazardous locations certifications.

Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Do not remove the gauge cover in explosive atmospheres when the circuit is alive.

⚠ WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

Make sure only qualified personnel perform the installation.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Do not perform any service other than those contained in this manual unless you are qualified.

Process leaks could result in death or serious injury.

Make sure that the transmitter is handled carefully. If the Process Seal is damaged, gas might escape from the tank if the transmitter head is removed from the probe.

⚠ WARNING

High voltage that may be present on leads could cause electrical shock:

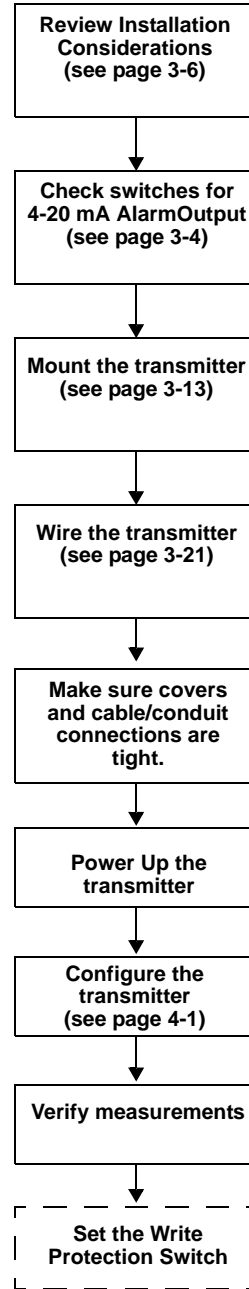
Avoid contact with leads and terminals.

Make sure the main power to the 3300 transmitter is off and the lines to any other external power source are disconnected or not powered while wiring the gauge.

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.

**INSTALLATION
PROCEDURE**

Follow these steps for proper installation:



NOTE!

Disconnect power supply before setting the Write Protection.

BEFORE YOU INSTALL

Alarm and Write Protection Switches

Electronic boards are electrostatically sensitive. Failure to observe proper handling precautions for static-sensitive components can result in damage to the electronic components. Do not remove the electronic boards from the 3300 Radar Transmitter.

NOTE

To ensure long life for your radar transmitter, and to comply with hazardous location installation requirements, tighten covers on both sides of the electronics housing.

Table 3-1. 3300 Radar Transmitter Switch Settings

Switch Bank	Description	Default Setting	Position Settings
Alarm	4–20 mA Alarm Output	High	High, Low
Write Protect	Security Write Protection	Disabled (OFF)	ON = Enabled, OFF = Disabled

Table 3-2. Analog Output: Standard Alarm Values vs. Saturation Values

Level	4–20 mA Saturation Values	4–20 mA Alarm Value
Low	3.9 mA	3.75 mA
High	20.8 mA	21.75 mA

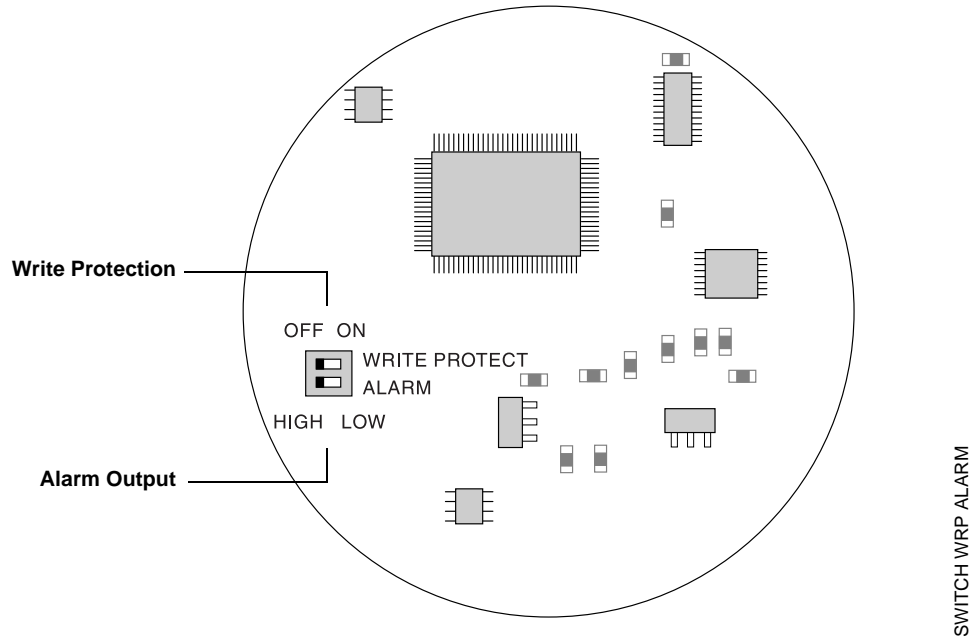
Table 3-3. Analog Output: NAMUR-Compliant Alarm Values vs. Saturation Values

Level	4–20 mA Saturation Values	4–20 mA Alarm Value
Low	3.8 mA	3.6 mA
High	20.5 mA	22.5 mA

The transmitter monitors its own operation. This automatic diagnostic routine is a timed series of checks repeated continuously. If the diagnostic routine detects a failure in the transmitter, the 4–20 mA output is driven upscale (high) or downscale (low) depending on the position of the Alarm switch.

Security write protection prevents unauthorized access to configuration data through the Rosemount Configuration Tool (RCT) software, a Field Communicator or AMS Suite software.

Figure 3-1. Switches for Alarm and Write Protection



To set the Alarm and Write Protect switches do the following:

1. Remove the cover on the circuit side (see main label).
2. To set the 4-20 mA alarm output to Low, move the Alarm switch to the LOW position. HIGH is the factory default setting (see Figure 3-1).
3. To enable the security write protection feature, move the Write Protect switch to the ON position. The OFF position is the factory default setting (see Figure 3-1).
4. Replace and tighten the cover.

Rosemount 3300 Series

MOUNTING CONSIDERATIONS

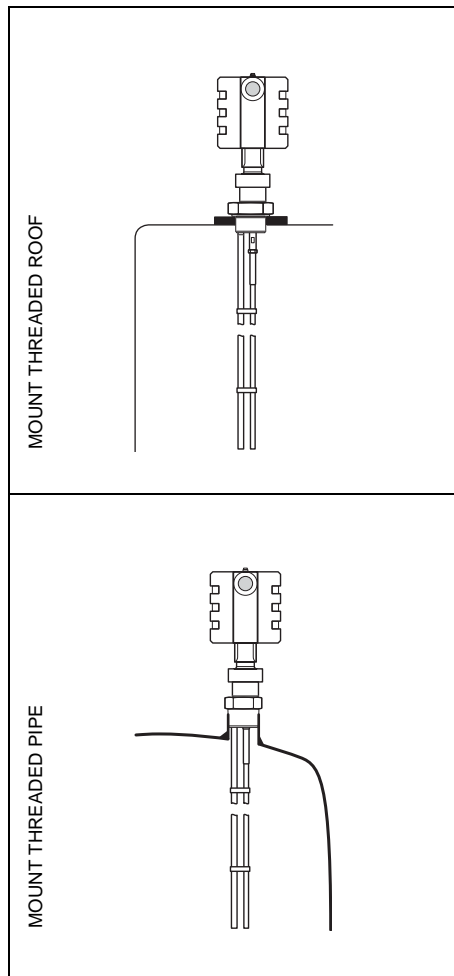
Before you install the Rosemount 3300 Series Radar Transmitter, be sure to consider specific mounting requirements, vessel characteristics and process characteristics.

Process Connection

The 3300 Series has a threaded connection for easy mounting on the tank roof. It can also be mounted on a nozzle by using different flanges.

Threaded Connection

Figure 3-2. Mounting on tank roof using threaded connection

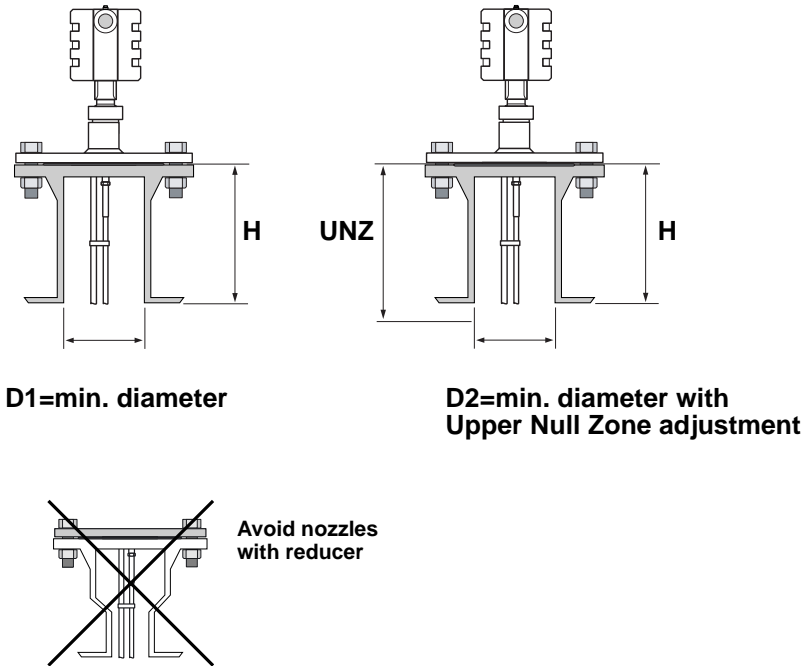


Mounting on tank roof.

Mounting in threaded pipe.

Flange Connection on Nozzles

Figure 3-3. Mounting in nozzles



NO_REDUCER/NOZZLE MOUNT V3

The transmitter can be mounted in nozzles by using an appropriate flange. It is recommended that the nozzle size is within the dimensions given in Table 3-4. For small nozzles it may be necessary to increase the Upper Null Zone (UNZ) in order to reduce the measuring range in the upper part of the tank. By setting the UNZ equal to the nozzle height, the impact on the measurement due to interfering echoes from the nozzle will be reduced to a minimum. See also section "Disturbances at the Top of the Tank" on page 6-11. Amplitude Threshold adjustments may also be needed in this case.

NOTE
 Except for the Coaxial Probe the probe must not be in contact with the nozzle.

Table 3-4. Minimum nozzle diameter D1/D2 and maximum nozzle height H (inch/mm).

	Rigid Twin Lead	Flexible Twin Lead	Coaxial	Single Lead	Flexible Single
D1⁽¹⁾	4/100	4/100	> Probe diameter	6/150	6/150
D2⁽²⁾	2/50	2/50	> Probe diameter	2/50 ⁽³⁾ 1.5/38 ⁽⁴⁾	2/50
H⁽⁵⁾	4/100 + D ⁽⁶⁾	4/100 + D ⁽⁶⁾	-	4/100 + D ⁽⁶⁾	4/100 + D ⁽⁶⁾ ⁽⁷⁾

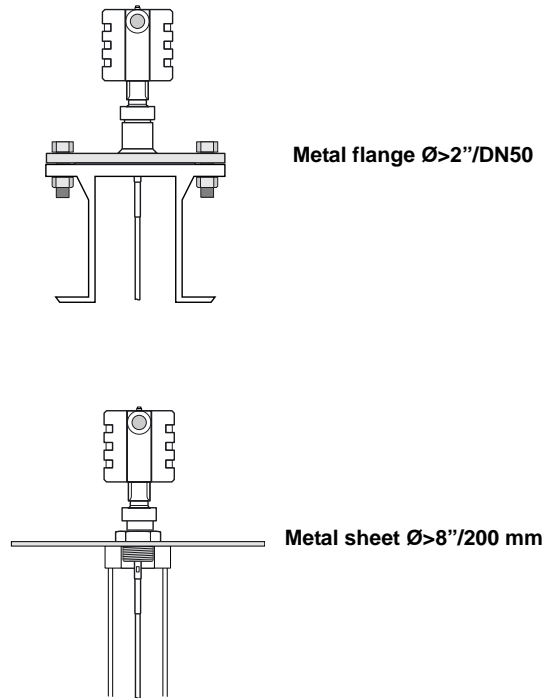
(1) Upper Null Zone=0.
 (2) Upper Null Zone>0.
 (3) Process connection 1.5 inch.
 (4) Process connection 1 inch.
 (5) Recommended maximum nozzle height. For coaxial probes there is no limitation on nozzle height.
 (6) Nozzle diameter.
 (7) For tall nozzles the Long Stud version is recommended (option code LS).

Rosemount 3300 Series

Installation of Single Lead Probes in Non-metallic Tanks

For optimal single lead probe performance in non-metallic tanks the probe must be mounted with a metal flange, or screwed in to a metal sheet ($d > 8$ in./200 mm) if the threaded version is used.

Figure 3-4. Mounting in non-metallic tanks.



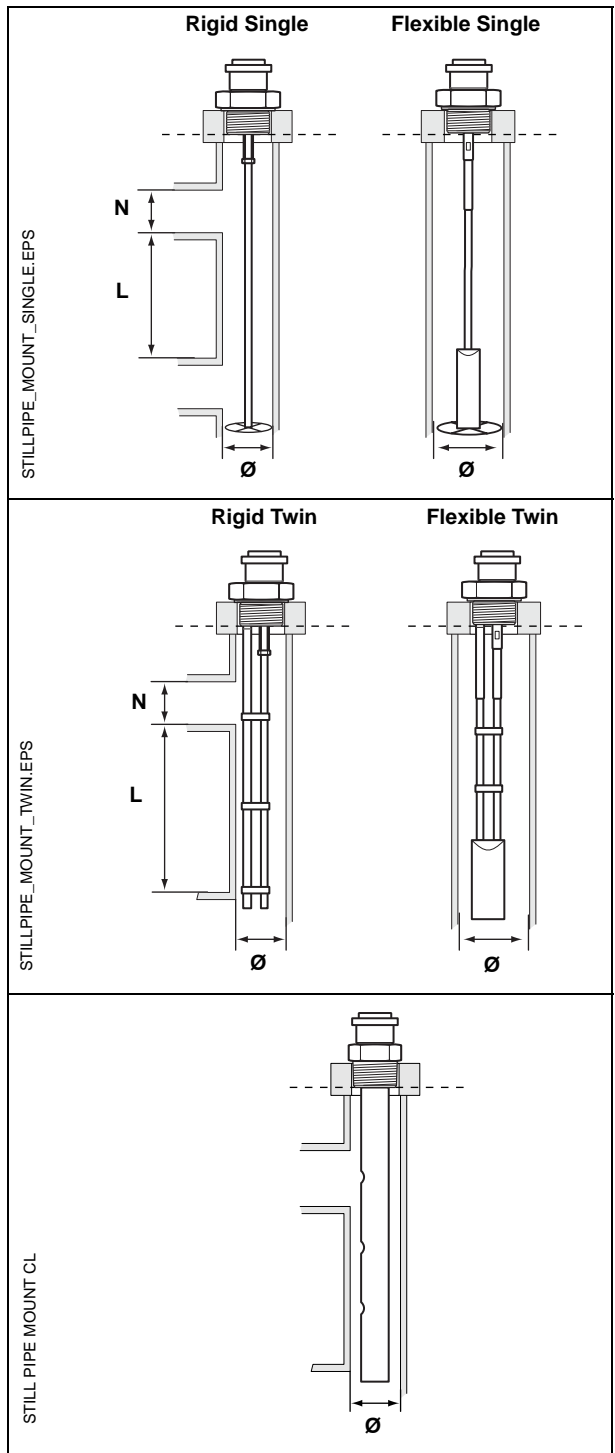
NON-METAL_METALSHEET/NON-METAL_FLANGE

Avoid disturbing EMC environment near the tank. Installation in metallic tank is recommended.

Mounting in Still pipes/by-pass pipes

In order to prevent the probe from contacting the bridle wall when replacing displacers or installing in pipes, **centering discs** are available for the Rigid Single, Flexible Single and Flexible Twin Lead probes. The disc is attached to the end of the probe and thus keeps the probe centered in the bridle. The discs are available in stainless steel and teflon (PTFE). See also "Mounting a Centering Disc for Pipe Installations" on page 3-20.

Figure 3-5. Mounting in Still Pipes.



Note! It is not recommended that flexible probes are installed in by-pass pipes.

Rigid Single Lead.
 Pipe diameter $\emptyset \geq 2$ inch (50 mm).
 Inlet pipe diameter $N < \emptyset$.
 $L \geq 12$ inch (300 mm).

Flexible Single Lead.
 Pipe diameter $\emptyset \geq 4$ inch (100 mm).
Note! For smaller pipes please consult factory.

Make sure that the probe is at the center of the Still pipe by, for example, using a centering disc.

Note! It is not recommended that flexible probes are installed in by-pass pipes.

Rigid Twin Lead.
 Pipe diameter $\emptyset \geq 2$ inch (50 mm).
 Inlet pipe diameter $N < \emptyset$.
 $L \geq 12$ inch (300 mm).
 The center rod must be placed more than 0.6 inch/15 mm away from the pipe wall.

Flexible Twin Lead.
 Pipe diameter $\emptyset \geq 4$ inch (100 mm).
Note! For smaller pipes please consult factory.
 The center rod must be placed more than 0.6 inch/15 mm away from the pipe wall. The probe may under no circumstances get into contact with the pipe wall. It is recommended that a centering disc is used.

Coaxial Lead.
 Pipe diameter $\emptyset \geq 1.5$ inch (38 mm).

Rosemount 3300 Series

Free Space

For easy access to the transmitter make sure that it is mounted with sufficient service space. For maximum measurement performance the transmitter should not be mounted too close to the tank wall or other objects in the tank.

If the probe is mounted close to a wall, nozzle or other tank obstruction noise might appear in the level signal. Therefore the following minimum clearance, according to the table below, must be maintained:

Figure 3-6. Free Space Requirement

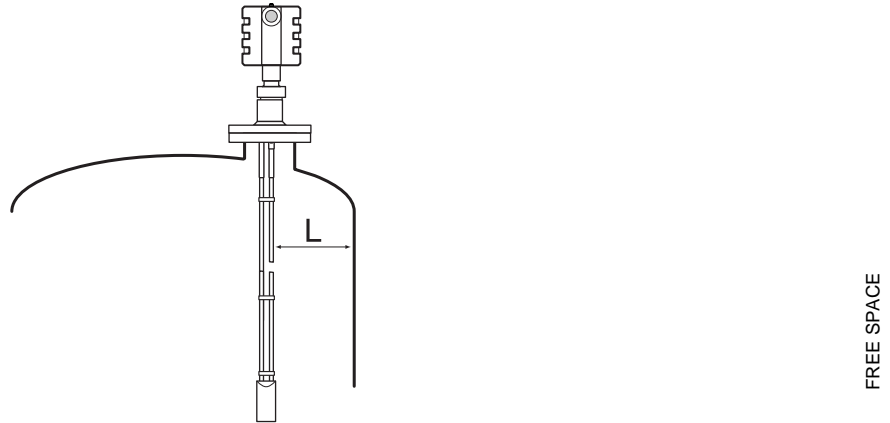


Table 3-5. Recommended minimum free space **L** to tank wall or other objects in the tank.

Coaxial	Rigid Twin	Flexible Twin
0 in. (0 mm)	4 in. (100 mm)	4 in. (100 mm)

Table 3-6. Recommended **minimum** free space **L** to tank wall or other objects in the tank for Single Lead probes.

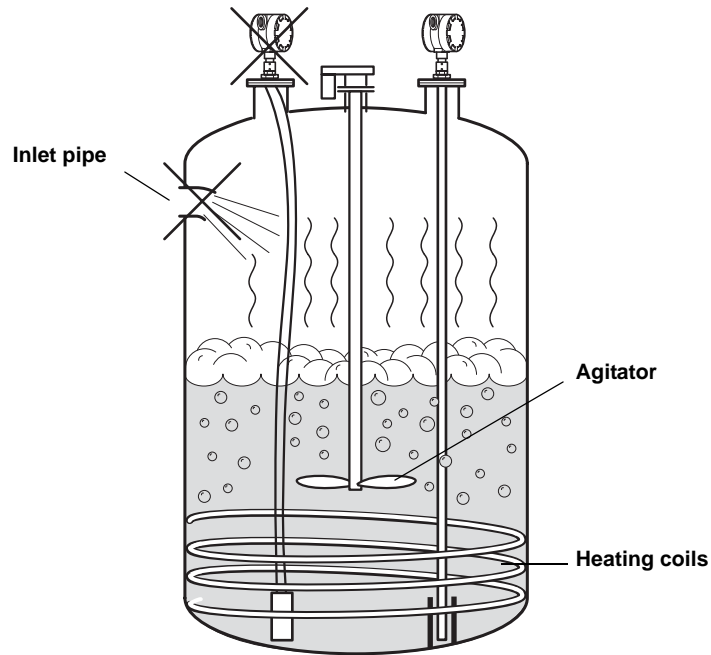
Rigid Single/Flexible Single	
4 in. (100 mm)	Smooth metal wall.
12 in. (300 mm)	Disturbing objects such as pipes and beams, concrete or plastic tank walls, rugged metal tank walls.

Recommended Mounting Position

When finding an appropriate mounting position for the transmitter the conditions of the tank must be carefully considered. The transmitter should be mounted so that the influence of disturbing objects is reduced to a minimum.

In case of turbulence the probe may need to be anchored to the bottom. See *“Mechanical Installation”* on page 3-13 for more information.

Figure 3-7. Mounting Position



The following guidelines should be considered when mounting the transmitter:

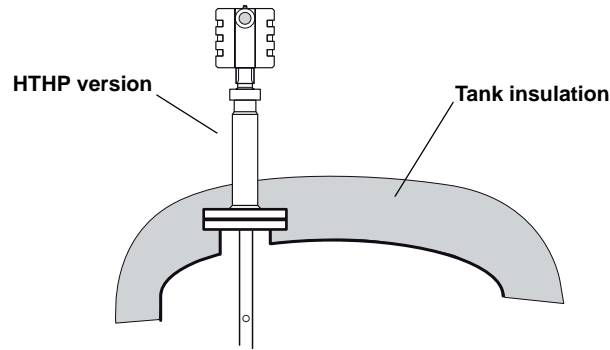
- Do not mount close to inlet pipes.
- Do not mount close to agitators. If the probe can move to within 30 cm away from an agitator a probe tie-down is recommended.
- If the probe tends to sway due to turbulent conditions in the tank, the probe should be anchored to the tank bottom.
- Avoid mounting close to heating coils.
- Make sure that the nozzle does not extend into the tank.
- Make sure that the probe does not come into contact with the nozzle or other objects in the tank.
- Position the probe such that it is subject to a minimum of lateral force.

NOTE!

Violent fluid movements causing high sideway forces may break rigid probes.

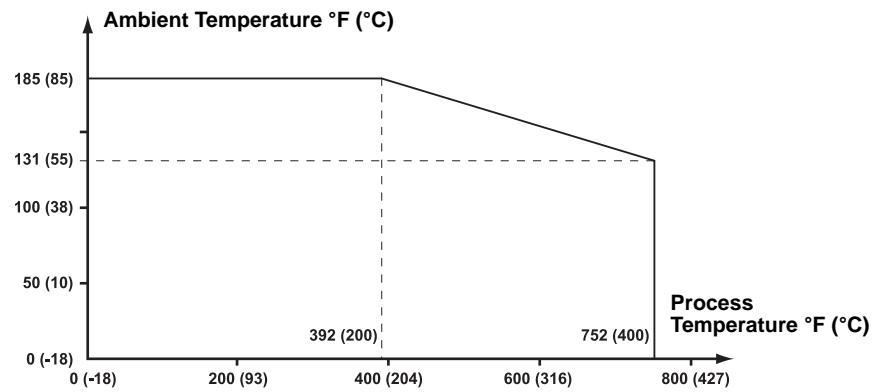
Insulated Tanks

For insulated tanks the permitted ambient temperature is limited above a certain process temperature. Limitations depend on the thickness of the tank insulation, see "Ambient Temperature" on page A-6 for more information.



INSULATEDTANK.EPS

Figure 3-8. Maximum ambient temperature vs. process temperature.



AMBIENT_PROC_TEMP.EPS

MECHANICAL INSTALLATION

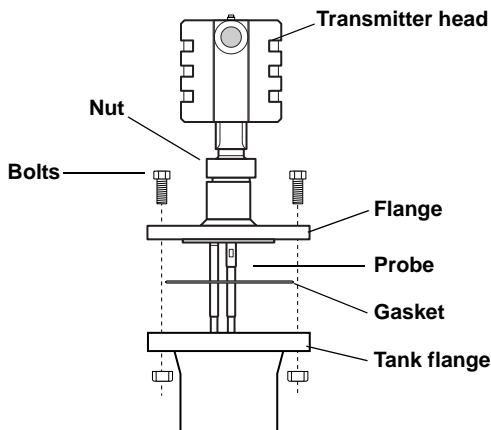
Mount the transmitter with flange on a nozzle on top of the tank. The transmitter can also be mounted on a threaded connection. Make sure only qualified personnel perform the installation.

NOTE

If you need to remove the transmitter head from the probe, make sure that the Process Seal is carefully protected from dust and water. See "Service" on page 6-9 for further information.

Figure 3-9. Tank connection with flange.

TRANSMITTER_MOUNT_FLANGE.EPS



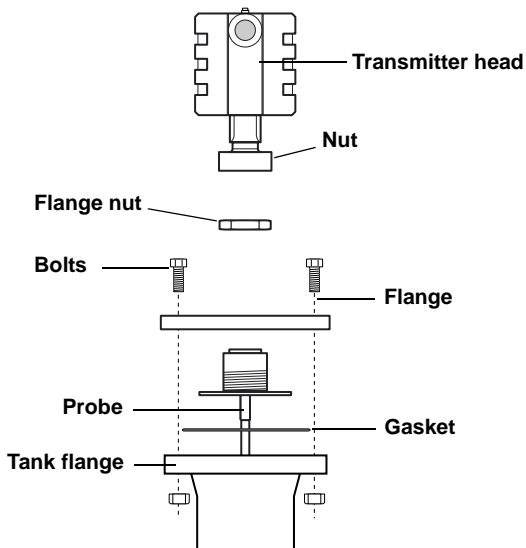
1. Place a gasket on top of the tank flange.
2. Lower the transmitter and probe with flange into the tank.
3. Tighten the bolts.
4. Loosen the nut that connects the transmitter housing to the probe slightly.
5. Rotate the transmitter housing so the cable entries/display face the desired direction.
6. Tighten the nut.

NOTE!

PTFE covered probes must be handled carefully to prevent damage to the coating.

Figure 3-10. Tank connection with loose flange ("plate design").

TRANSMITTER_MOUNT_PLATE_BA.EPS



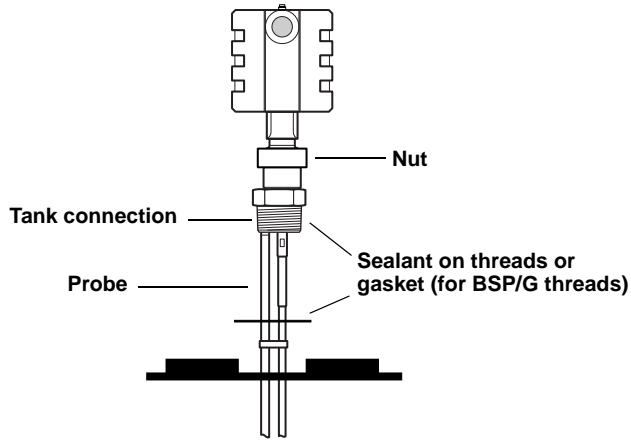
The transmitter is delivered with head, flange and probe assembled into one unit. If, for some reason, these parts have been disassembled mount the transmitter as described below:

1. Place a gasket on top of the tank flange.
2. Mount the flange on the probe and tighten the flange nut.
3. Mount the transmitter head.
4. Lower the transmitter and probe with flange into the tank.
5. Tighten the bolts.
6. Loosen the nut that connects the transmitter housing to the probe slightly.
7. Rotate the transmitter housing so the cable entries/display face the desired direction.
8. Tighten the nut.

Rosemount 3300 Series

Figure 3-11. Threaded tank connection.

TRANSMITTER_MOUNT_THREAD.EPS



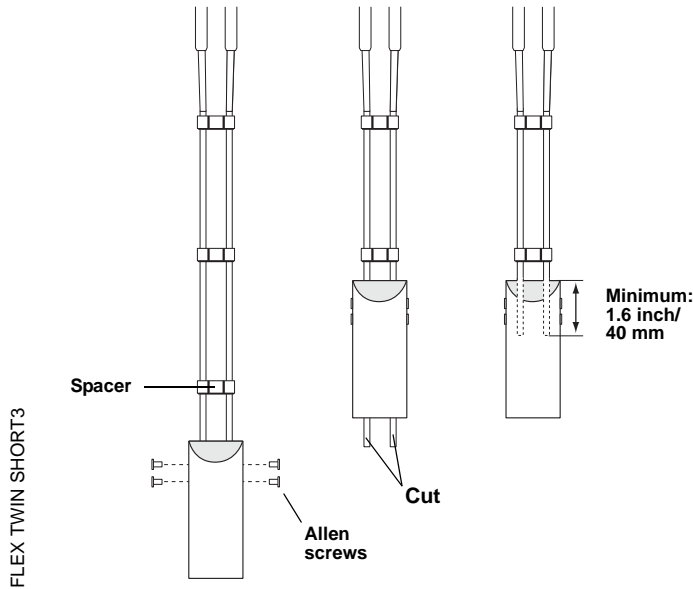
1. For tank connections with BSP/G threads, place a gasket on top of the tank flange, or use a sealant on the threads of the tank connection.
2. Lower the transmitter and probe into the tank.
3. Screw the adapter into the process connection.
4. Loosen the nut that connects the transmitter housing to the probe slightly.
5. Rotate the transmitter housing so the cable entries/display face the desired direction.
6. Tighten the nut.

NOTE!

For adapters with NPT threads, pressure-tight joints require a sealant.

Shortening the Probe

Flexible Twin/Single Lead



1. Mark off the required probe length. Add at least 1.6 inch/40 mm to the required probe length to be inserted into the weight.
2. Loosen the Allen screws.
3. Slide the weight upwards as much as needed in order to cut the probe.
4. Cut the probe. If necessary, remove a spacer to make room for the weight.
5. Slide the weight down to the required cable length.
6. Tighten the screws.
7. Update the transmitter configuration to the new probe length, see "Probe Length" on page 4-9.

If the weight was removed from the cables when cutting, make sure that at least 1.6 inch/40 mm of the cable is inserted when the weight is replaced.

Rigid Single Lead

1. Cut the Single Lead probe to the desired length.
2. Update the transmitter configuration to the new probe length, see "Probe Length" on page 4-9.

NOTE!

The PTFE covered probes must not be cut in field.

Rosemount 3300 Series

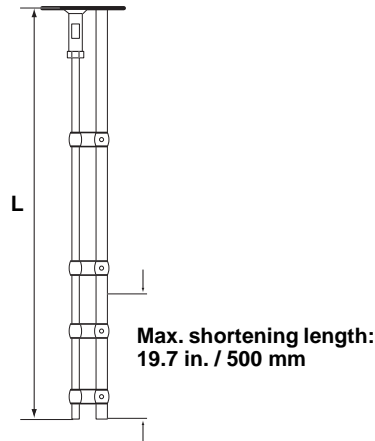
Rigid Twin Lead

The spacers are put closer together at the probe end. The maximum amount that can be cut away is related to the ordering length **L**.

To cut a Rigid Twin Lead probe do the following:

L > 46.5 in. (1180 mm)

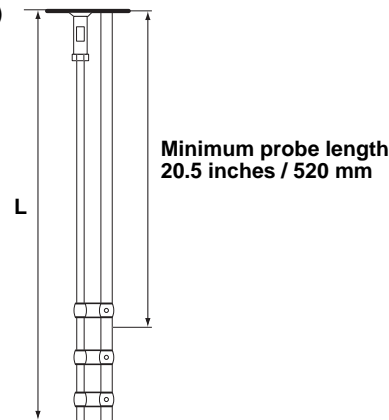
RIGIDTWIN_SHORT_BA.EPS



1. Cut the rods to the desired length:
 - You may cut up to 19.7 inch (500 mm) from the probe end for probe length **L** above 46.5 in. (1180 mm).
 - For probe length 20.5 to 46.5 in. (520 to 1180 mm) the minimum length is 20.5 in. (520 mm).
 - For probe length 15.7 to 20.5 in. (400 to 520 mm) the minimum length is 15.7 in. (400 mm).

**20.5 < L < 46.5 inch
(520 mm < L < 1180 mm)**

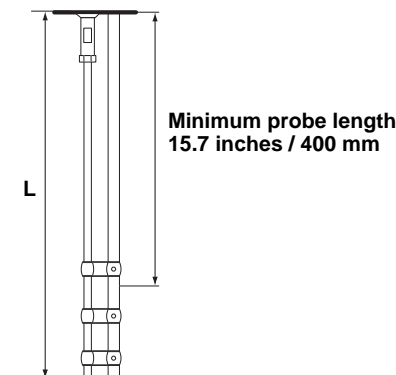
RIGIDTWIN_SHORT_BA_2.EPS



2. Update the transmitter configuration to the new probe length, see "Probe Length" on page 4-9.

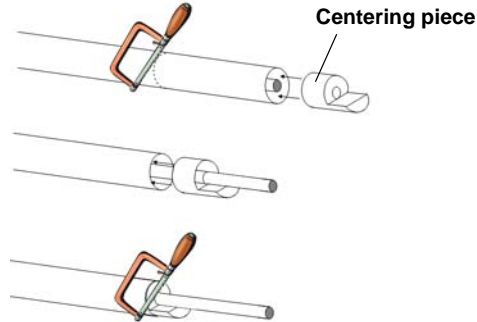
**15.7 < L < 20.5 inch
(400 < L < 520 mm)**

RIGIDTWIN_SHORT_BA_3.EPS



Coaxial

COAXIAL_CUT.TIF



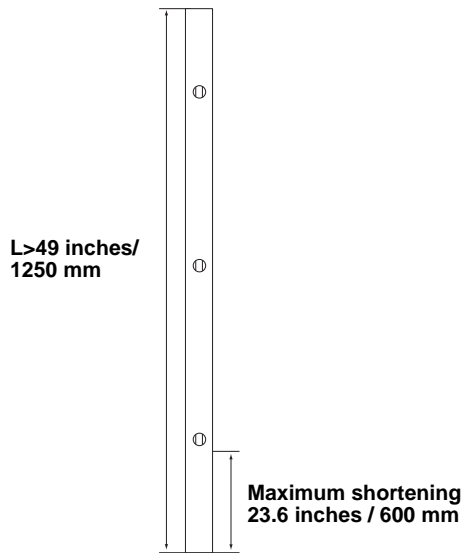
To cut a coaxial probe do the following:

NOTE!

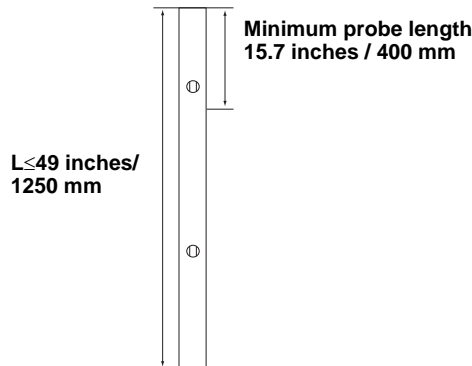
The HTHP coaxial probe must not be cut in field.

1. Insert the centering piece. **(The centering piece is delivered from factory and should be used to prevent the spacers centering the rod from coming loose).**
2. Cut the tube to the desired length.
3. Move the centering piece.
4. Cut the rod inside the tube. Make sure that the rod is fixed with the centering piece while cutting.
 - Pipes longer than 49 inches/1250 mm can be shortened by as much as 23.6 inches/600 mm.
 - Pipes shorter than 49 inches/1250 mm can be cut as long as the remaining length is not less than 15.7 inches/400 mm.
5. Update the transmitter configuration to the new probe length, see "Probe Length" on page 4-9.

COAXIAL SHORT1

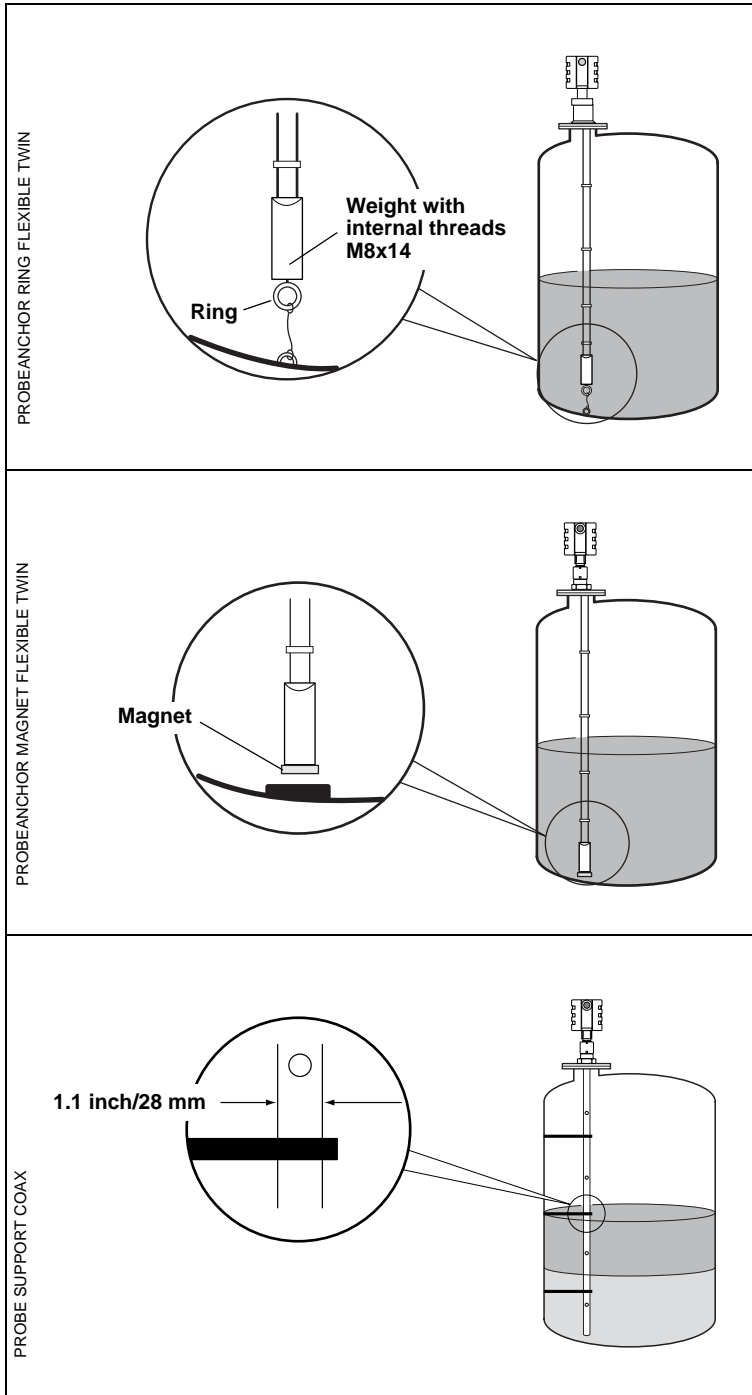


COAXIAL SHORT2



Anchoring

In turbulent tanks it may be necessary to fix the probe. Depending on the probe type different methods can be used to guide the probe to the tank bottom. This may be needed in order to prevent the probe from hitting the tank wall or other objects in the tank, as well as preventing a probe from breaking.



Flexible Twin/Single Lead probe with weight and ring.

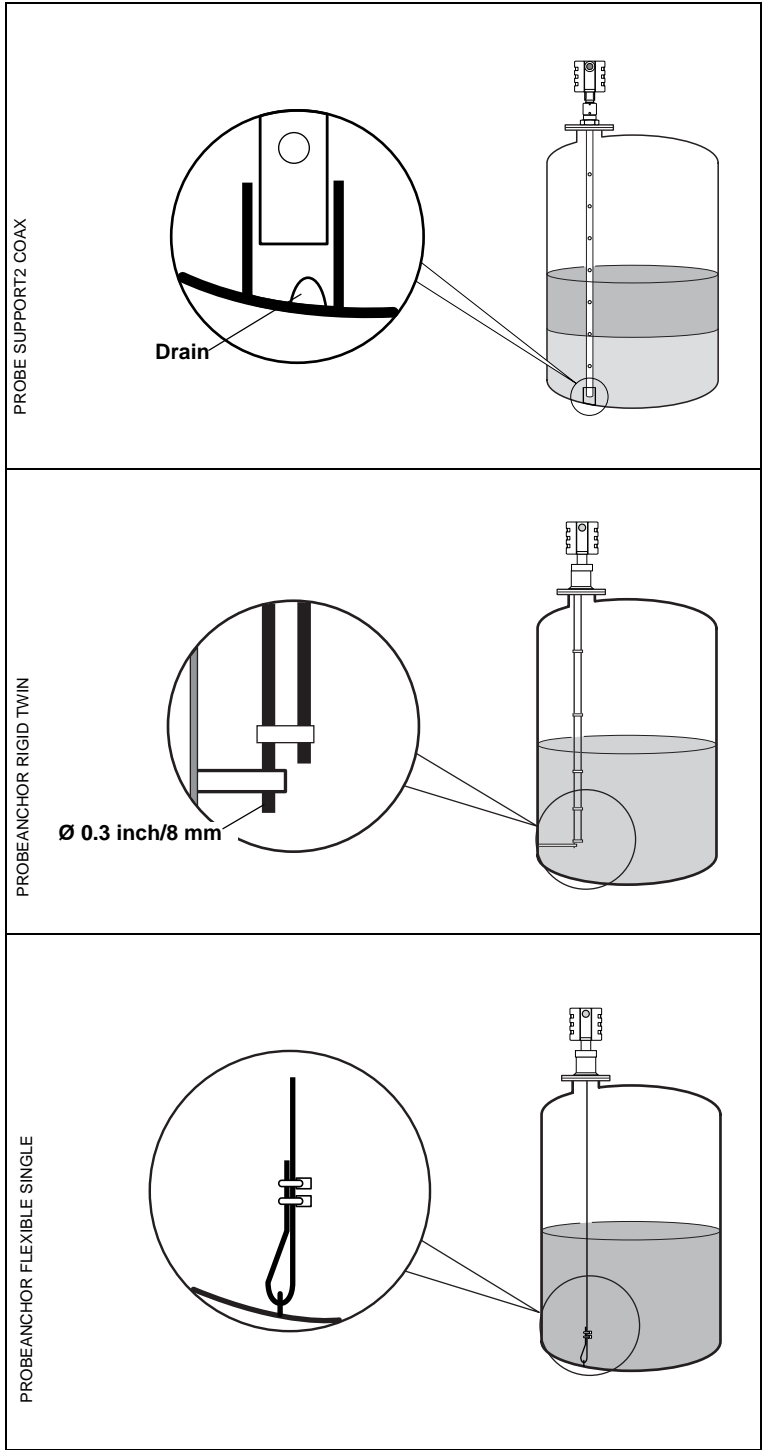
A ring (customer supplied) can be attached to the weight in a threaded (M8x14) hole at the end of the weight. Attach the ring to a suitable anchoring point.

Flexible Twin/Single Lead probe with weight and magnet.

A magnet (customer supplied) can be fastened in a threaded (M8x14) hole at the end of the weight. The probe can then be guided by placing a suitable metal plate beneath the magnet.

Coaxial probe fixed to the tank wall.

The coaxial probe can be guided to the tank wall by fixtures fastened to the tank wall. Fixtures are customer supplied. Make sure the probe can move freely due to thermal expansion without getting stuck in the fixture.



Coaxial probe.

The Coaxial probe can be guided by a tube welded on the tank bottom. Tubes are customer supplied. Make sure that the probe can move freely in order to handle thermal expansion.

Rigid Twin Lead probe.

The Rigid Twin Lead probe can be secured to the tank wall by cutting the center rod and putting a fixture at the end of the outer rod.

The fixture is customer supplied. Make sure the probe is only guided and not fastened in the fixture to be able to move freely for thermal expansion.

Flexible Single Lead probe.

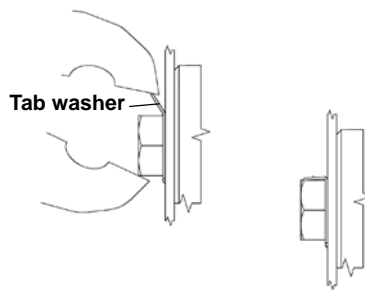
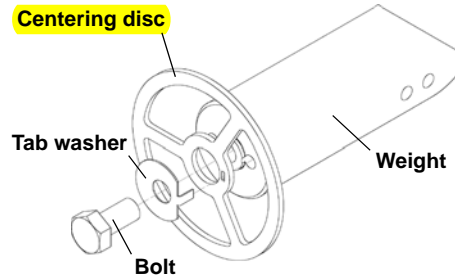
The probe rope itself can be used for anchoring. Pull the probe rope through a suitable anchoring point, e.g. a welded eye and fasten it with two clamps.

The length of the loop will add to the dead zone. The location of the clamps will determine the beginning of the dead zone. **The probe length should be configured as the length from the underside of the flange to the top clamp.** See section "Dead Zones" on page 2-7 for further information on Dead Zones.

Rosemount 3300 Series

Mounting a Centering Disc for Pipe Installations

Flexible Single/Twin Lead probe



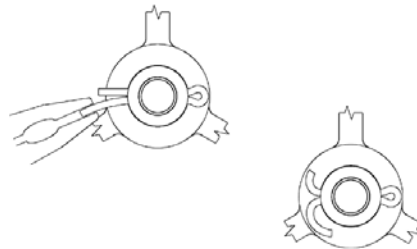
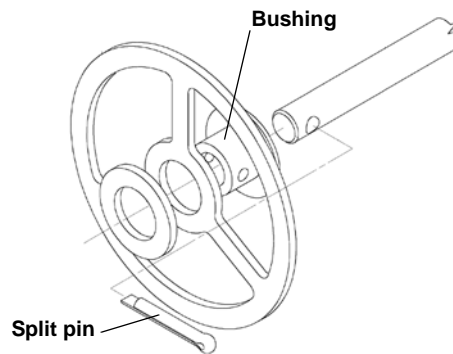
1. Mount the centering disc at the end of the weight.
2. Make sure that the tab washer is properly inserted in the centering disc.
3. Fasten the centering disc with the bolt.

4. Secure the bolt by folding the tab washer.

NOTE!

Centering discs made of PTFE must not be used with the Rosemount 3300 HTHP version.

Rigid Single Lead probe



1. Mount the centering disc at the end of the probe.
2. Fasten the disc by inserting the split pin through the bushing and the probe.

3. Secure the split pin.

NOTE!

Centering discs may not be used with PTFE covered probes.

ELECTRICAL INSTALLATION

Cable/conduit entries


The electronics housing has two entries for ½ - 14 NPT. Optional M20×1.5 and PG 13.5 adapters are also available. The connections are made in accordance with local or plant electrical codes.

Make sure that unused ports are properly sealed to prevent moisture or other contamination from entering the terminal block compartment of the electronics housing.

NOTE!

Use the enclosed metal plug to seal the unused port.

Grounding

The housing should always be grounded in accordance with national and local electrical codes. Failure to do so may impair the protection provided by the equipment. The most effective grounding method is direct connection to earth ground with minimal impedance. There are two grounding screw connections provided. One is inside the Field Terminal side of the housing and the other is located on top of the housing. The internal ground screw is identified by a ground symbol: .

NOTE!

Grounding the transmitter via threaded conduit connection may not provide sufficient ground.

NOTE!

In the Explosion-proof/Flame-proof version the electronics is grounded via the transmitter housing. After installation and commissioning make sure that no ground currents exist due to high ground potential differences in the installation.

Cable Selection

Use shielded twisted pair wiring for the Rosemount 3300 Series in order to comply with EMC regulations. The cables must be suitable for the supply voltage and approved for use in hazardous areas, where applicable. For instance, in the U.S., explosion-proof conduits must be used in the vicinity of the vessel. For the ATEX flame proof approval version of the 3300 Series, suitable conduits with sealing device or flame proof (EEx d) cable glands must be used depending on local requirements.

Use 18 AWG to 12 AWG in order to minimize the voltage drop to the transmitter.

Hazardous Areas

When the 3300 transmitter is installed in hazardous area, local regulations and specifications in applicable certificates must be observed.

Rosemount 3300 Series

Power Requirements

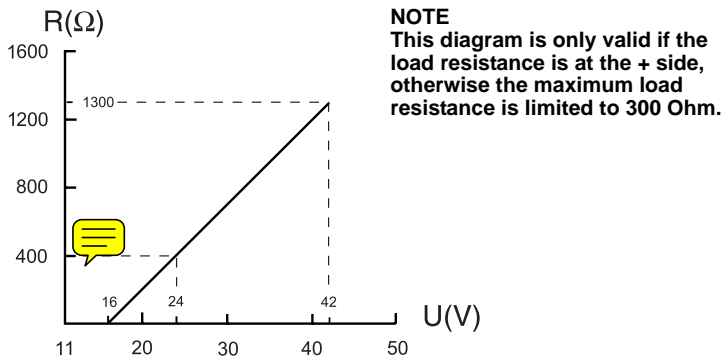
Terminals in the transmitter housing provide connections for signal cables.

The 3300 transmitter is loop-powered and operates with power supplies ranging from 11 to 42 VDC. For Intrinsically Safe output the supply voltage must be within 11 to 30 VDC. For Explosion-proof/Flame-proof the supply voltage must be within 16 to 42 VDC.

Maximum Loop Resistance

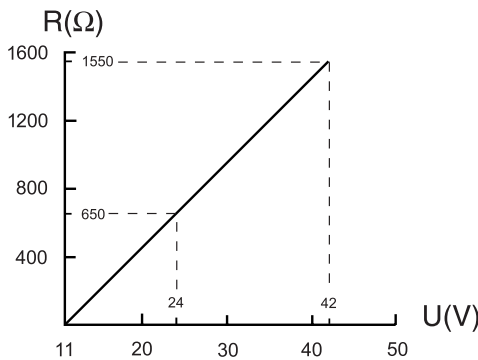
The maximum current loop resistance can be gained from the following diagrams:

Figure 3-12. Explosion-proof /Flame-proof installations



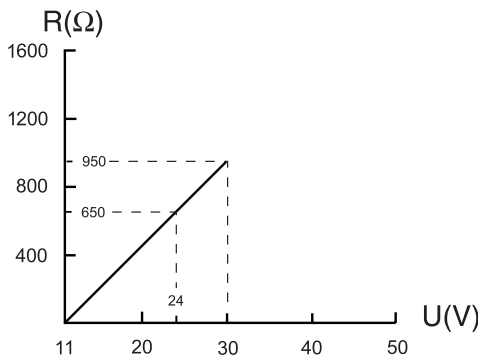
MAX_LOAD_EX

Figure 3-13. Non-hazardous installations



MAX_LOAD_NON_INTRNSIC

Figure 3-14. Intrinsically Safe installations



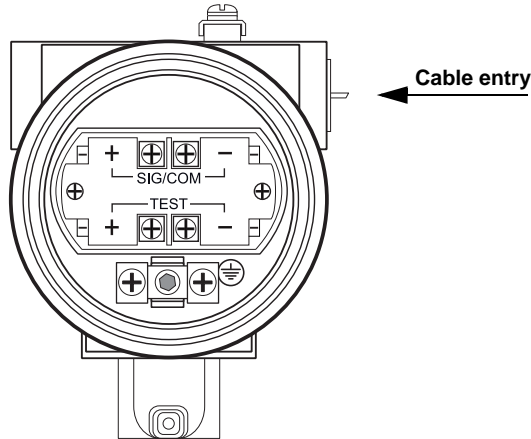
MAX_LOAD_INTRNSIC

Connecting the Transmitter

The 3300 Series is a two-wire loop powered transmitter accepting power supplies ranging from 11 VDC to 42 VDC. It uses 4-20 mA power superimposed with a HART signal.

To connect the transmitter:

1. Make sure that the power supply is disconnected.
2. Remove the cover on the transmitter housing terminal side (see label).



3. Pull the cable through the cable gland/conduit.
4. Connect wires according to Figure 3-15 for non-intrinsically safe output and according to Figure 3-16 for Intrinsically safe output. Make sure that the transmitter housing is grounded (see "Grounding" on page 3-21).
5. Replace the cover, tighten the cable gland and connect the power supply.

CONNECT_TRANSMITTER.EPS

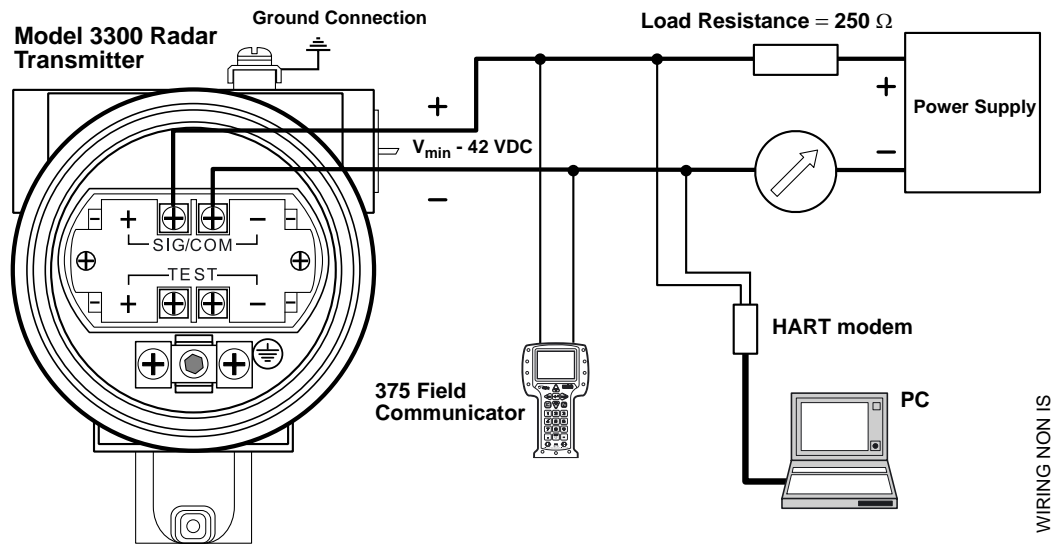
Non-Intrinsically Safe Output

For non-intrinsically safe installations, wire the transmitter as shown in Figure 3-15.

NOTE!

Make sure that the power supply is off when connecting the transmitter.

Figure 3-15. Wiring diagram for non-intrinsically safe installations.



For HART communication a minimum load resistance of 250 Ohm within the loop is required. For maximum load resistance see Figure 3-12 (Explosion/Flame Proof) and Figure 3-13 (Non-hazardous installations).

The power supply voltage ranges from V_{min} VDC to 42 VDC where V_{min} is the minimum voltage given by:

11 V	Non-hazardous locations certification
16 V	Explosion-proof/flame-proof certification



For Explosion-proof/Flame-proof applications the resistance between the negative terminal on the transmitter and the power supply must not exceed 300 Ohm.

NOTE!

EEx d version: If there is a risk for a difference in voltage potential between transmitter ground and power supply ground, a galvanic isolator is required.

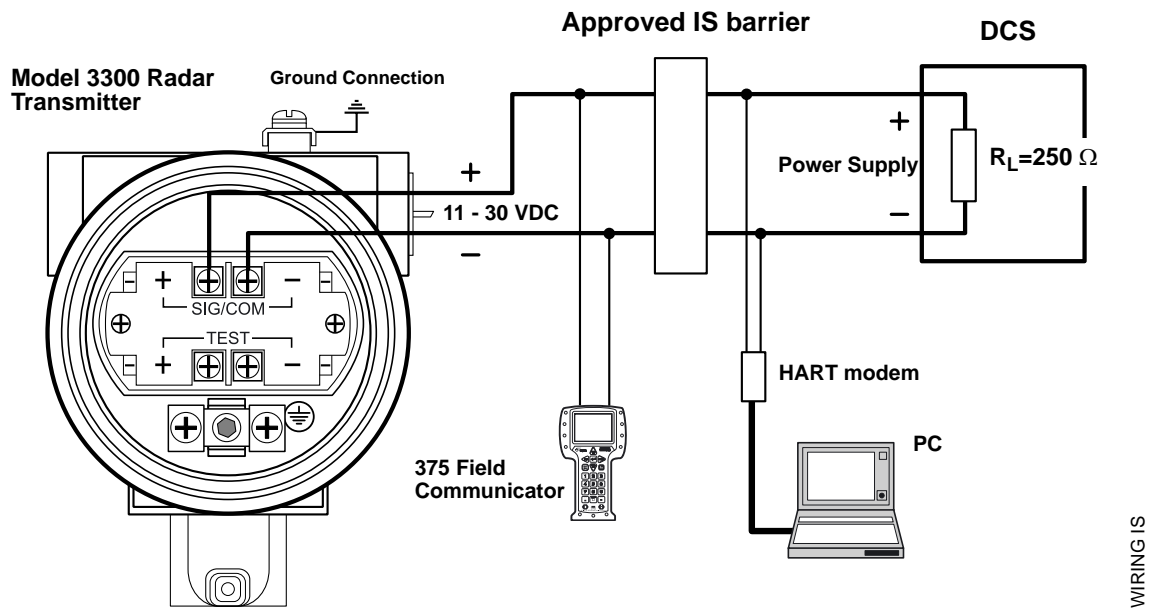
Intrinsically Safe Output

For intrinsically safe installations wire the transmitter as shown in Figure 3-16.

NOTE!

Make sure that the instruments in the loop are installed in accordance with intrinsically safe field wiring practices and System Control Drawings when applicable.

Figure 3-16. Wiring diagram for intrinsically safe installations



For HART communication a minimum load resistance of 250 Ohm within the loop is required. For maximum load resistance see Figure 3-14.

The power supply voltage ranges from 11 V to 30 V.

IS parameters

Ui=30 V.

li=130 mA.

Pi=1 W.

Ci=0.

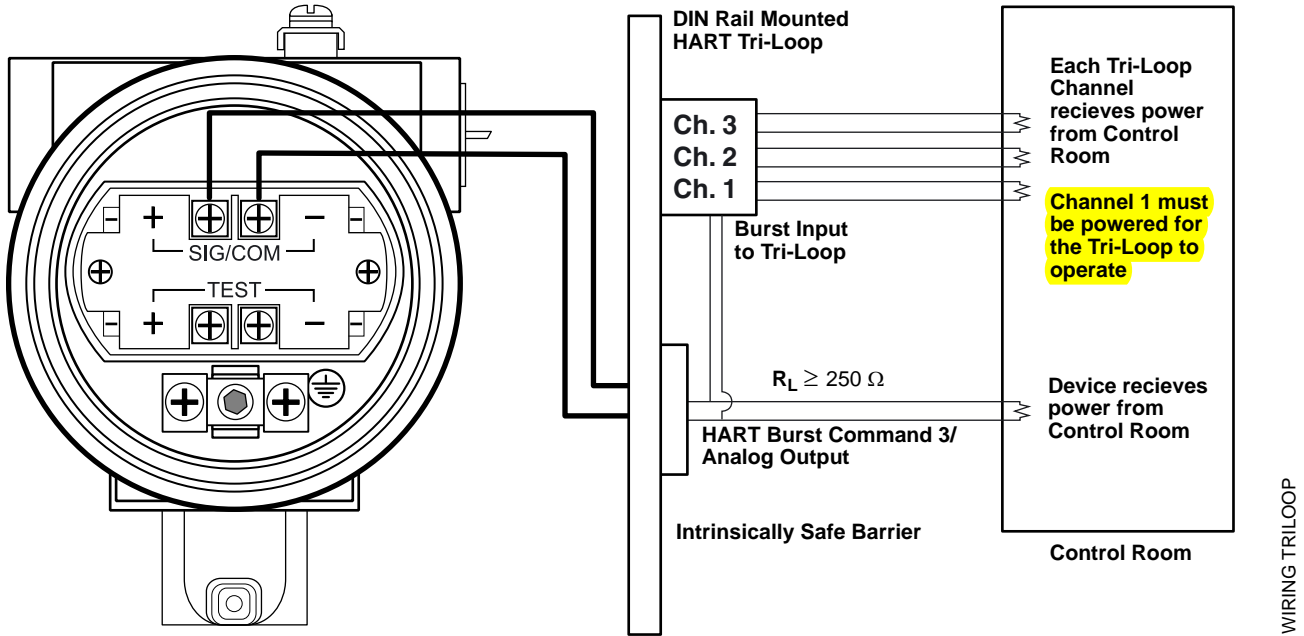
Li=0.

OPTIONAL DEVICES

Tri-Loop

The Model 3300 transmitter outputs a HART signal with four process variables. By using the Model 333 HART Tri-Loop up to three additional analog 4-20 mA outputs are provided.

Figure 3-17. Wiring diagram for HART Tri-Loop

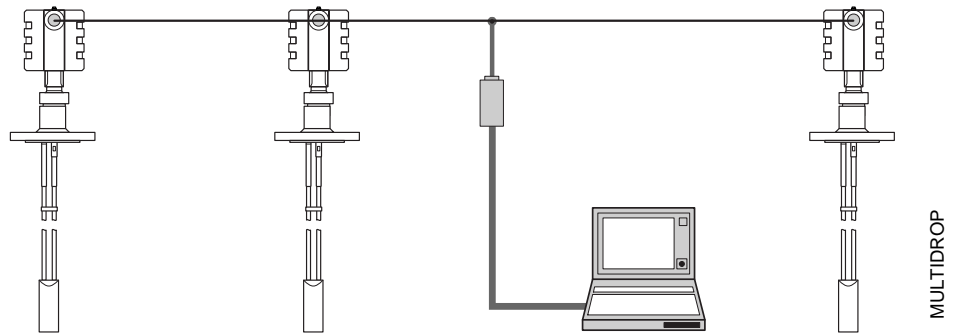


Configure Channels 1, 2, and 3 to reflect the units as well as Upper Range Values and Lower Range Values for your secondary, tertiary and fourth variables (variable assignment is configured in the Model 3300). It is also possible to enable or disable a channel from this menu. See "Special Functions" on page 4-24 for further information on how to install a Tri-Loop.

Using More than one transmitter on the bus

The 3300 transmitter can be run in multidrop mode. In the multidrop mode each transmitter has a unique HART address.

Figure 3-18. Multidrop connection



The poll address can be changed by using a 375 Field Communicator or by using the Rosemount Configuration Tools software.

To change the poll address using a 375 Field Communicator choose HART command [1, 4, 5, 2, 1].

To change the poll address using the Rosemount Configuration Tools (RCT) software do the following:

1. Choose the View>Device Commands option.
or
choose the Device Commands icon from the Project Bar Advanced section.

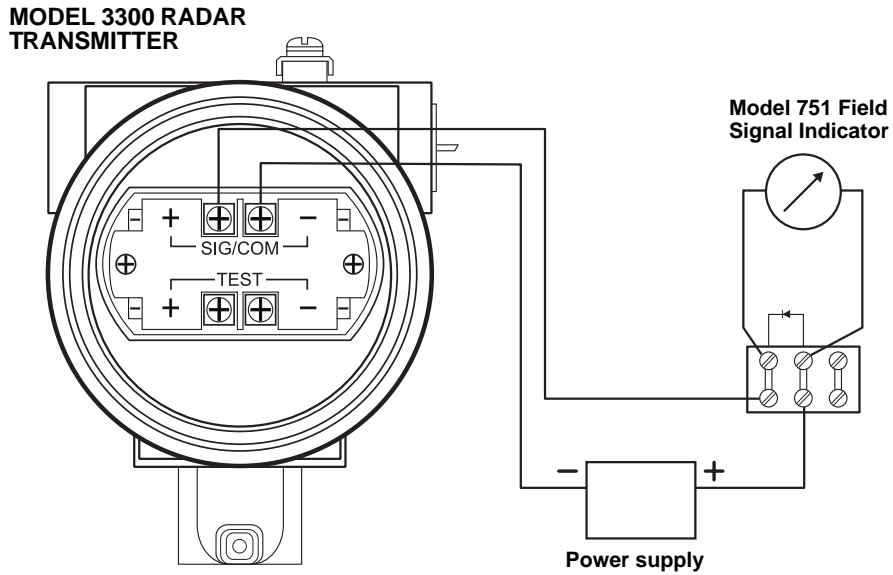


2. Open the Details folder.
3. Choose the Set Poll Address option.
4. Set the desired address.

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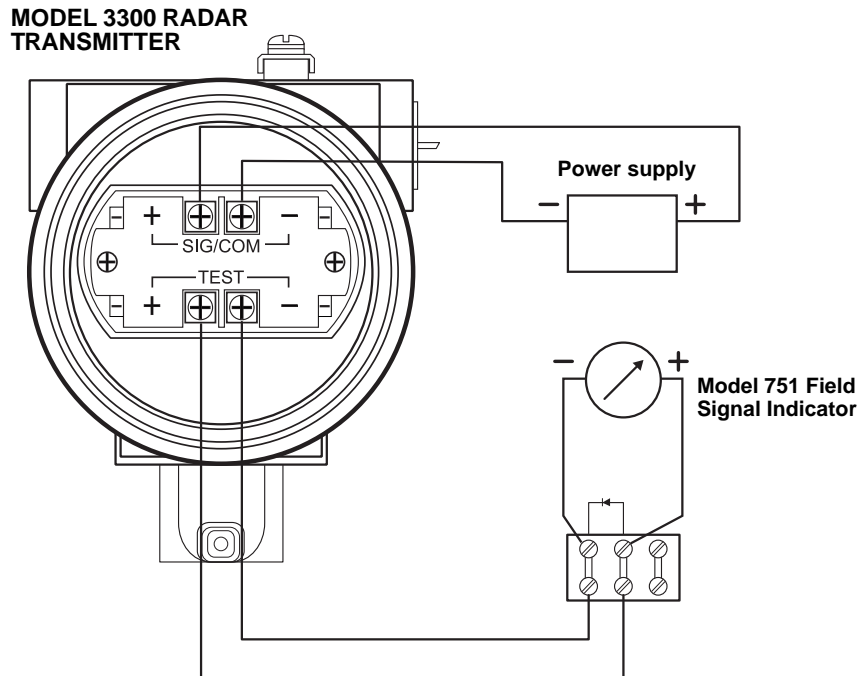
751 Field Signal Indicator

Figure 3-19. Wiring diagram for 3300 transmitter with 751 Field Signal Indicator



WIRING_751.EPS

Figure 3-20. Alternative wiring diagram for 3300 transmitter with 751 Field Signal Indicator



WIRING_751_ALTERNATIVE.EPS

Section 4 Start-Up

Safety messages	page 4-1
Configuration Parameters	page 4-2
Configuration using a 375 Field Communicator	page 4-7
Configuration using The Radar Configuration Tool	page 4-14
Special Functions	page 4-24

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the safety messages listed at the beginning of each section before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury:

Verify that the operating environment of the gauge is consistent with the appropriate hazardous locations certifications.

Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Do not remove the gauge cover in explosive atmospheres when the circuit is alive.

⚠ WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

Make sure only qualified personnel perform the installation.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Do not perform any service other than those contained in this manual unless you are qualified.

Rosemount 3300 Series

CONFIGURATION PARAMETERS

The Rosemount 3301 transmitter can be configured for level and volume measurements. The Rosemount 3302 is designed to measure interface level and interface distance as well.

The 3300 transmitter can be pre-configured according to the ordering specifications in the Configuration Data Sheet.

Basic Configuration

The basic transmitter configuration includes setting the tank geometry parameters. For interface measurements the dielectric constant of the top liquid must also be given. For some applications with heavy vapor, the vapor dielectric must be given as well.

Figure 4-1. Tank Geometry

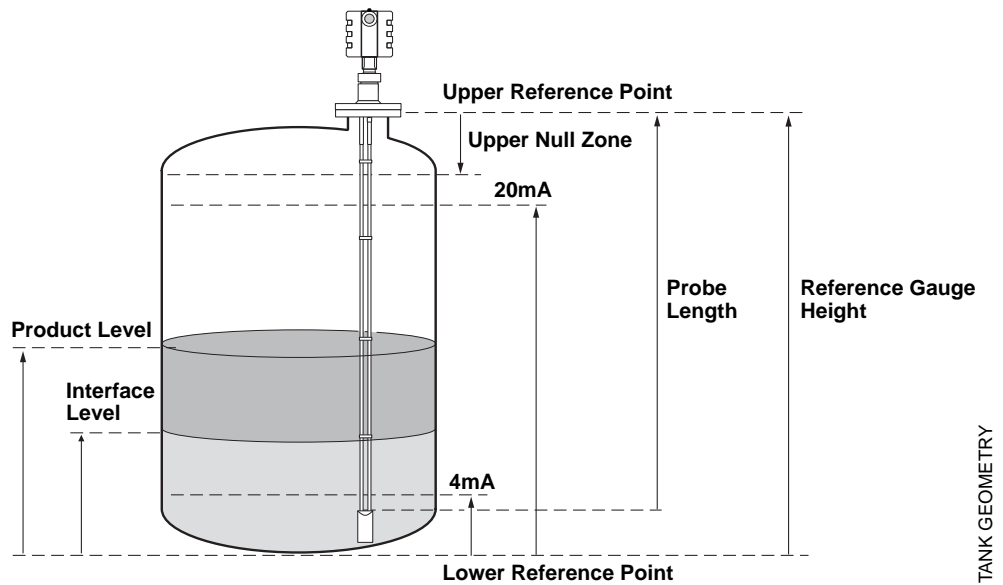
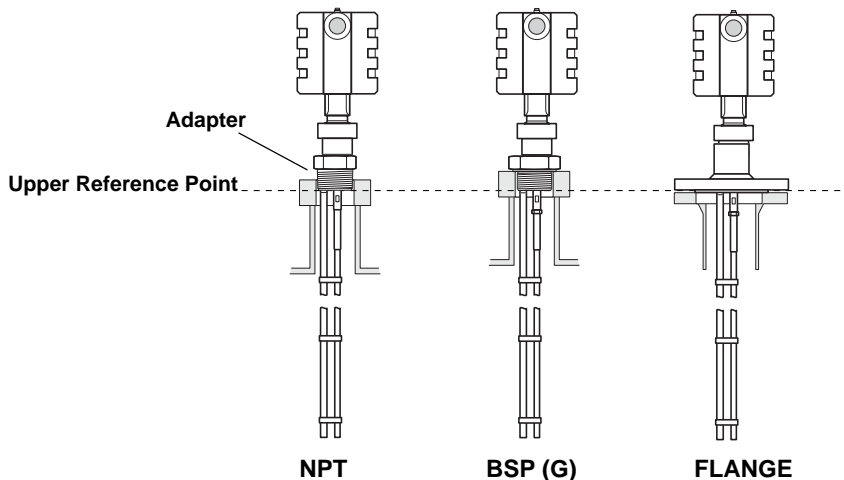


Figure 4-2. Upper Reference Point

For the different tank connections the **Upper Reference Point** is located at the underside of the threaded adapter or at the underside of the welded flange, as illustrated in Figure 4-2:



Reference Gauge Height

The Reference Gauge Height is the distance from the Upper Reference Point to the bottom of the tank. The transmitter measures the distance to the product surface and subtracts this value from the Reference Gauge Height to determine the level.

Probe Length

The probe length is the distance between the Upper Reference Point and the end of the probe. **If a weight is used at the end of the probe it shall not be included.**

For Flexible Single Lead probes anchored with clamps, the probe length should be configured as the distance between the underside of the flange and the upper clamp (see “Anchoring” on page 3-18).

This parameter is pre-configured at factory. It must be changed if the probe is shortened.

Probe Type

The transmitter is designed to optimize measurement performance for each probe type.

This parameter is pre-configured at factory. This value needs to be changed if the probe type is changed.

Flexible and Rigid probes require different radar electronics and can not be used with the same transmitter head.

Dielectric Constant of Upper Product

For interface measurements the dielectric constant of the upper product is essential in order to obtain good accuracy. See section “Interface” on page 2-9 for further information on dielectric constants.

If the dielectric constant of the lower product is significantly smaller than the dielectric constant of water, you may need to make special adjustments. See section “Interface Measurements for Semi-Transparent Bottom Products” on page 6-5 for further information.

For level measurements the Upper Product Dielectric parameter corresponds to the actual dielectric constant of the product in the tank. Normally this parameter does not need to be changed even if the actual dielectric constant of the product deviates from the Upper Product Dielectric parameter value. However, for some products measurement performance can be optimized by setting the proper product dielectric constant.

Dielectric Constant of Vapor

In some applications there is heavy vapor above the product surface having a significant influence on the level measurement. In such cases the vapor dielectric can be entered to compensate for this effect.

The default value is equal to 1 which corresponds to the dielectricity of vacuum. Normally this value does not need to be changed since the effect on measurement performance is very small for most vapors.

Upper Null Zone

This parameter should only be changed if there are measurement problems in the upper part of the tank. Such problems may occur if there are disturbing objects close to the probe. By setting the Upper Null Zone the measuring range is reduced. See *Section 6: Disturbances at the Top of the Tank* for further information.

4 mA point

The 4 mA point should be set above the Lower Dead Zone (see *Section 2: Dead Zones*). If the 4 mA point is set to a point within the Dead Zone or below the probe end, the full range of the analog output is not used.

20 mA point

Make sure that the 20 mA point is below the Upper Null Zone.

The 20 mA point should be set below the Upper Dead Zone (see *“Dead Zones” on page 2-7*). If the 20 mA point is set to a point within the Dead Zone the full range of the analog output is not used.

Probe angle

If the transmitter is not mounted vertically, the angle from the vertical position must be given.

Volume Configuration

For volume calculations you can choose one of the standard tank shapes or the strapping option. Choose None if volume calculation is not used.

Tank Type

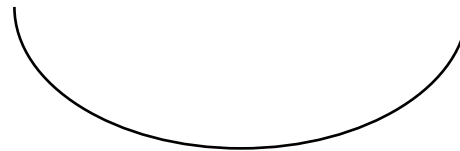
You can choose one of the following options:

- Strap table
- Vertical Cylinder
- Horizontal Cylinder
- Vertical Bullet
- Horizontal Bullet
- Sphere
- None

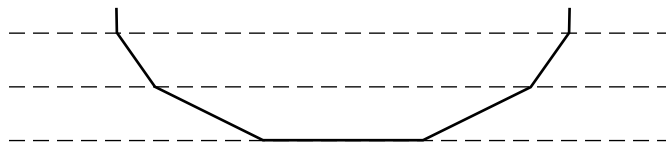
Strapping Table

Use a strapping table if a standard tank type does not provide sufficient accuracy. Use most of the strapping points in regions where the tank shape is non-linear. A maximum of 10 points can be added to the strapping table.

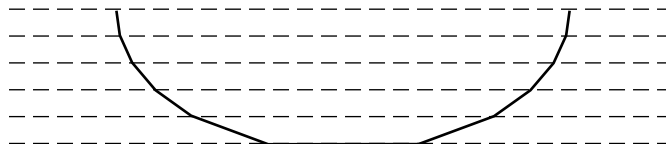
Figure 4-3. Strapping points



Actual tank bottom may look like this.



Using only 3 strapping points results in a level-to-volume profile that is more angular than the actual shape.

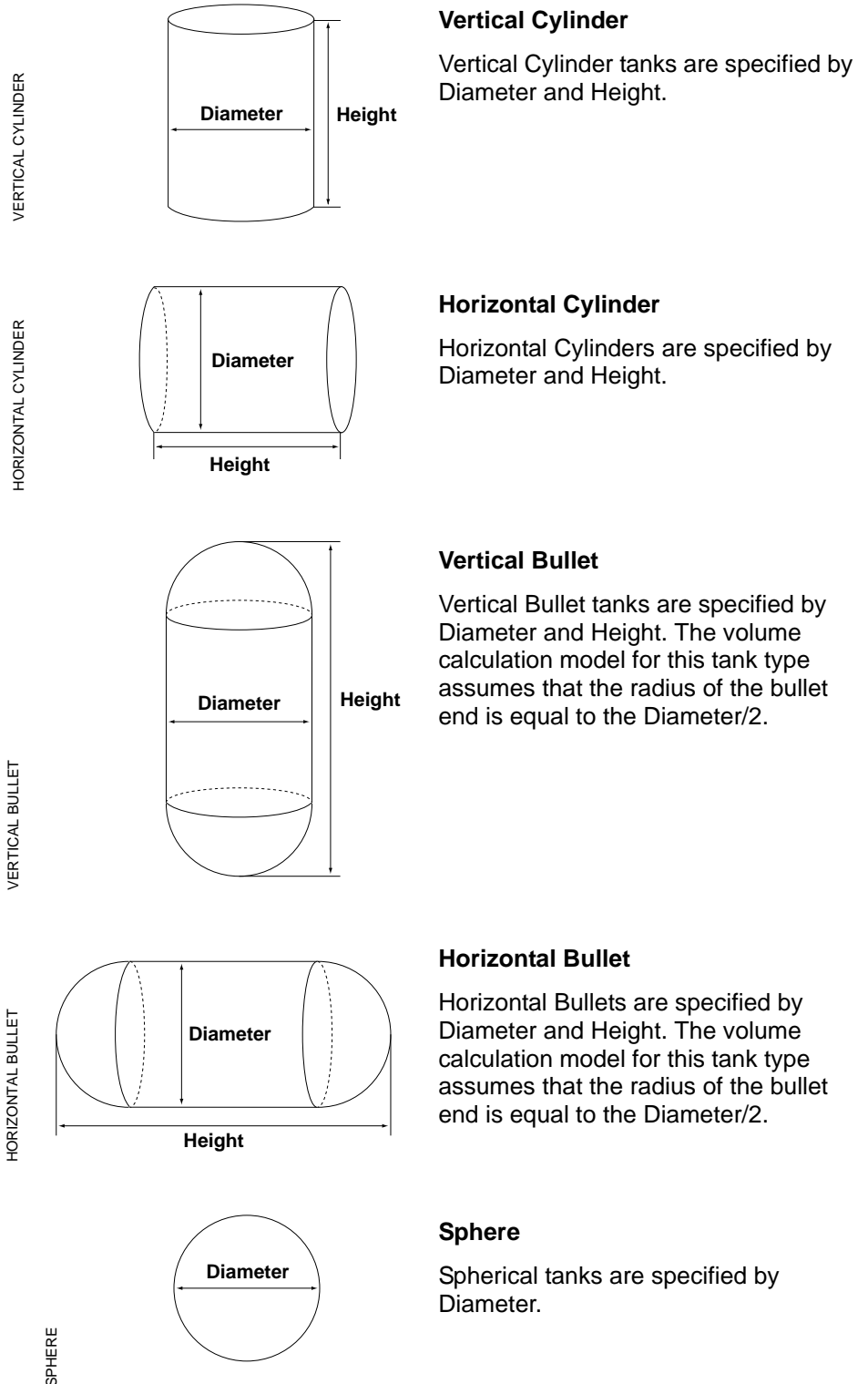


Using 6 of the points at the bottom of the tank yields a level-to-volume profile that is similar to the actual tank bottom.

STRAPPING POINTS

Standard Tank Shapes

Figure 4-4. Standard tank shapes



**CONFIGURATION USING
A 375 FIELD
COMMUNICATOR**

This section describes how to configure the 3300 transmitter by using a 375 Field Communicator. A 275 HART Communicator may also be used.

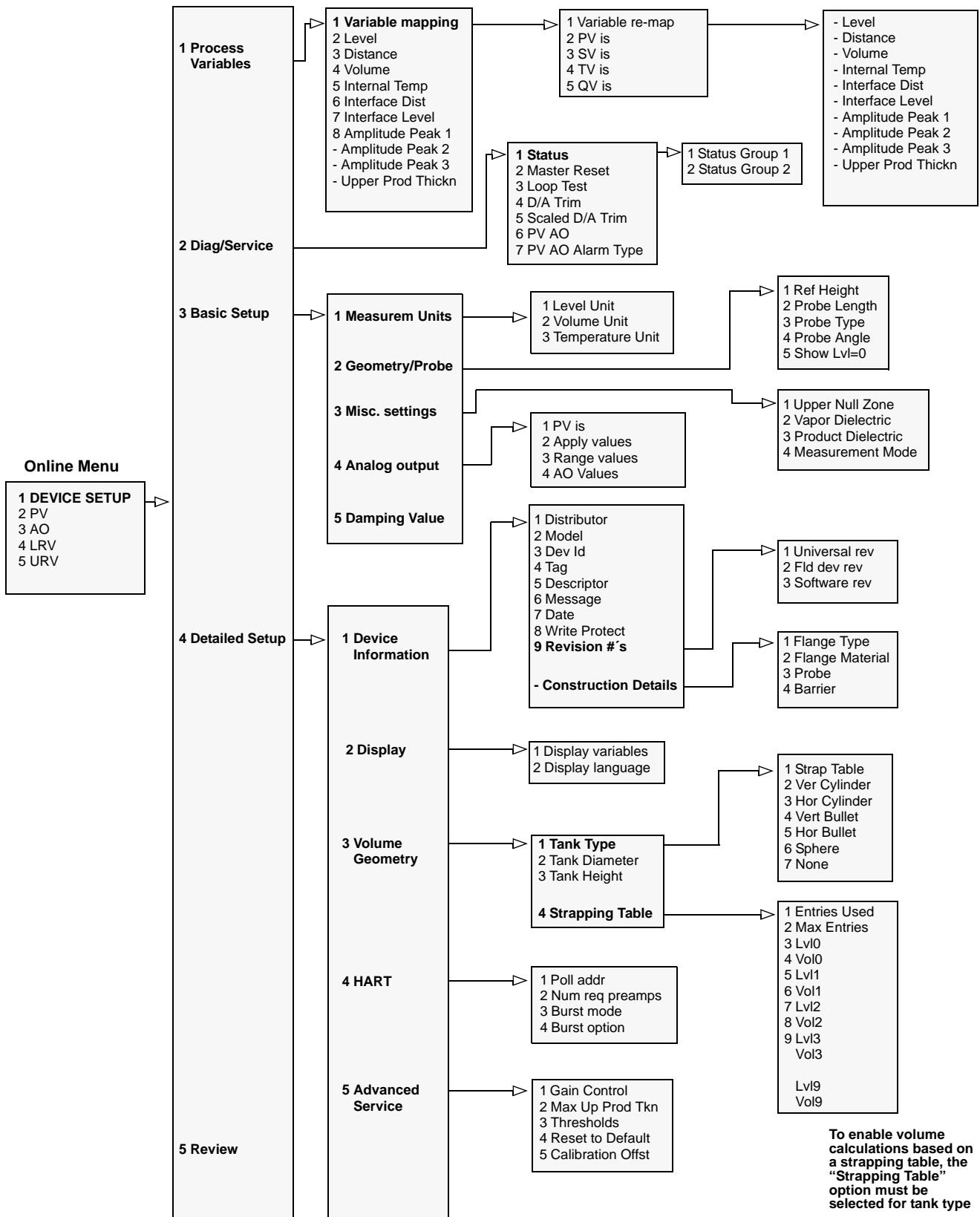
For information on all the capabilities, refer to the 375 Field Communicator Product Manual (document 00809-0100-4276).

Figure 4-5. The 375 Field Communicator.



375_FIELDCOM.EPS

Figure 4-6. HART Communicator Menu Tree corresponding to Device Revision 2.



BASIC CONFIGURATION

This section describes the various HART commands used to configure the 3300 Series of transmitters for level measurements. The transmitter outputs a 4 - 20 mA signal proportional to the primary variable. Three additional variables are available through the HART signal.

Transmitter Variables

HART Comm	1, 1, 1, 1
-----------	------------

You may assign up to four transmitter variables. Typically, the primary variable (PV) is configured to be Aggregate Level, Interface Level or Volume.

For the model 3301 the primary variable is typically set to be Level. If the transmitter is in the Immerse Probe mode (see section Measurement Mode) the PV is normally set to Interface Level.

For the model 3302 the PV is typically set to Interface Level, but Level and other options may also be used.

Measurement Units

HART Comm	1, 3, 1
-----------	---------

Set transmitter units for level and temperature.

Reference Gauge Height

HART Comm	1, 3, 2, 1
-----------	------------

The Reference Gauge Height is the distance from the Upper Reference Point to the bottom of the tank (see Figure 4-1 on page 4-2). When setting the Reference Gauge Height, keep in mind that this value is used for all level measurements performed by the 3300 Series transmitter.

The Reference Gauge Height must be set in linear (level) units, such as feet or meters, regardless of primary variable assignment.

Probe Length

HART Comm	1, 3, 2, 2
-----------	------------

The probe length is the distance from the Upper Reference Point to the end of the probe, see Figure 4-1. If the probe is anchored to a weight do not include the height of the weight. This parameter is pre-configured at factory. The Probe Length needs to be changed if, for example, the probe is shortened.

Rosemount 3300 Series

Probe Type

HART Comm	1, 3, 2, 3
-----------	------------

The transmitter automatically makes an initial calibration based on the type of probe that is used. This parameter is pre-configured at factory and only needs to be set if the probe is changed to another type. Choose one of the following options:

- Rigid Twin
- Flexible Twin
- Coaxial, Coaxial HP, Coaxial HTHP
- Rigid Single, Rigid Single HTHP, Rigid Single PTFE
- Flexible Single, Flexible Single HTHP, Flexible Single PTFE

NOTE

Flexible and Rigid probes require different radar electronics and can not be used with the same transmitter head.

Product Dielectric

HART Comm	1, 3, 3, 3
-----------	------------

For interface measurements the dielectric constant of the upper product is essential for calculating the interface level and the upper product thickness. By default the Product Dielectric parameter is about 2.

If the dielectric constant of the lower product is significantly smaller than the dielectric constant of water, you may need to make special adjustments. See section *“Interface Measurements for Semi-Transparent Bottom Products”* on page 6-5 for further information. The dielectric constant of the product is used for setting the appropriate signal amplitude thresholds, see Section 6: Service and Troubleshooting for more information on amplitude threshold settings. Normally this parameter does not need to be changed for level measurements. However, for some products measurement performance can be optimized by setting the proper product dielectric constant.

The Rosemount Configuration Tool (RCT) software includes a Dielectric Chart which lists the dielectric constants of a wide range of products. RCT also includes a tool which allows you to calculate dielectric constants based on measurements of the Upper Product Thickness.

Vapor Dielectric

HART Comm	1, 3, 3, 2
-----------	------------

In some applications there is heavy vapor above the product surface having a significant influence on the level measurement. In such cases the vapor dielectric can be entered to compensate for this effect.

The default value is equal to 1 which corresponds to the dielectric constant of vacuum. Normally this value does not need to be changed since the effect on measurement performance is very small for most vapors.

Measurement Mode

HART Comm	1, 3, 3, 4
-----------	------------

Normally the Measurement Mode does not need to be changed. The transmitter is pre-configured according to the specified model:

Table 4-1. Measurement Mode

Model	Measurement Mode
3301	Level ⁽¹⁾ , Interface Immersed probe
3302	Level, Level and Interface ⁽¹⁾ , Interface Immersed probe

(1) Default setting

Interface Immersed Probe is used for applications where the probe is fully immersed in liquid. In this mode the transmitter ignores the upper product level. See *Section 6: Interface Measurements with Fully Immersed Probes* for more information.

NOTE!

Only use *Interface Immersed Probe* for applications where interface is measured for a fully immersed probe.

Probe Angle

HART Comm	1, 3, 2, 4
-----------	------------

Enter the angle between the probe and the vertical line. The default value is equal to zero. Do not change this value if the transmitter is mounted with the probe along the vertical line (which is normally the case).

Maximum Upper Product Thickness

HART Comm	1, 4, 5, 2
-----------	------------

For interface measurements the Maximum Upper Product Thickness parameter may be used in special cases when the dielectric constant of the upper product is relatively high. By setting this parameter you can avoid that interface measurements are getting out of range.

Damping

HART Comm	1, 3, 5
-----------	---------

The default Damping value is 10. Normally this value does not need to be changed. The Damping parameter determines how quickly the transmitter responds to level changes and how robust the measurement signal is against noise. See *“High Level Rates” on page 6-7* for more information.

Display Panel

HART Comm	1, 4, 2
-----------	---------

Choose which variables to be displayed and the desired language to be used. The display toggles between the selected variables every two seconds.

Rosemount 3300 Series

4 and 20 mA Points

HART Comm	1, 3, 4, 3
-----------	------------

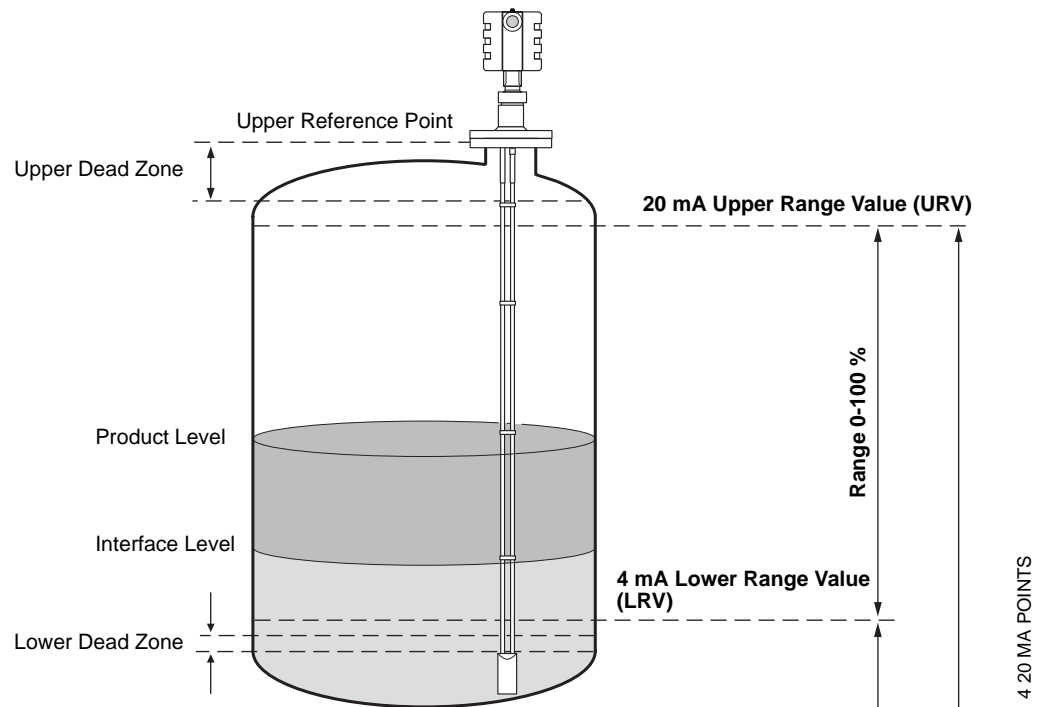
When setting the range values, it is possible to enter the values directly using the keypad on the Field Communicator, or you may use actual values (HART command [1, 3, 4, 2]). **Keep in mind that the 20 mA value should be below the Upper Dead Zone.** If the 20 mA point is set to a point within the Dead Zone the full range of the analog output is not used.

Also make sure that the 20 mA value is below the Upper Null Zone (UNZ). (This parameter may be used if there are measurement problems in the upper part of the tank, see *Section 6: Disturbances at the Top of the Tank*). The UNZ is equal to zero in the default configuration.

The 4 mA point should be above the Lower Dead Zone. If the 4 mA point is set to a point within the Dead Zone or below the probe end (tank bottom for example), the full range of the analog output is not used.

See *Section 2: Dead Zones* for more information on the size of Upper and Lower Dead Zones.

Figure 4-7. Range Values



VOLUME CONFIGURATION

Transmitter Variables

HART Comm	1, 1, 1, 1
-----------	------------

Select the Volume option in order to configure the transmitter for volume measurements.

Volume Units

HART Comm	1, 3, 1, 2
-----------	------------

Choose one of the following units:

- Gallons
- Liters
- Imperial Gallons
- Cubic Meters
- Barrels
- Cubic Yards
- Cubic Feet
- Cubic Inch

Tank Type

HART Comm	1, 4, 3, 1
-----------	------------

Choose a standard tank shape, or select the strapping option. Standard shapes are: Vertical Cylinder, Horizontal Cylinder, Vertical Bullet, Horizontal Bullet or Sphere. (If Primary Variable is Level choose None for Tank Type).

If your tank does not correspond to any of the above tank shapes, select Strap Table.

Tank Dimensions

HART Comm	1, 4, 3, 2-3
-----------	--------------

If a standard tank type was chosen, enter the diameter and height of the tank. See "Volume Configuration" on page 4-5 for information on how to specify tank dimensions.

Strapping Table

HART Comm	1, 4, 3, 4
-----------	------------

If tank type Strapping Table was chosen, enter how many entries you will use and the actual level and volume points. You can enter from 2 to 10 points. The strapping points must be entered such that the first point corresponds to the lowest level, and the last point corresponds to the topmost level of the tank.

Rosemount 3300 Series

CONFIGURATION USING THE RADAR CONFIGURATION TOOL

The Radar Configuration Tool (RCT) is a user-friendly software tool that allows you to configure the Rosemount 3300 transmitter. You can choose either of the following two methods to configure a 3300 transmitter:

- Start the Wizard for a guided installation if you are unfamiliar with the Rosemount 3300.
- Use the Setup function if you are already familiar with the configuration process or if you just want to change the current settings.

Installing the RCT software

To install the Rosemount Configuration Tool:

1. Insert the installation CD into your CD-ROM drive.
2. If the installation program is not automatically started, from the windows Start Bar choose Run and type D:\Setup.exe where D is the CD-ROM drive.
3. Follow the instructions on the screen.
4. For optimum performance set COM Port Buffers to 1, see "To set the COM port buffers" on page 4-26.

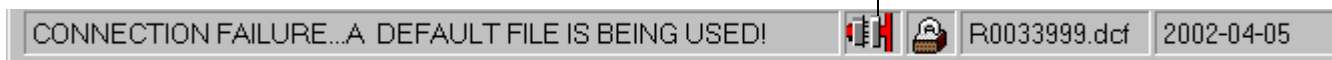
To start the RCT:

1. From the Start menu click Programs>RCT Tools>RCT.
2. In the RCT Status Bar check that RCT communicates with the transmitter:

Communication is established (green symbol)



Communication is not established (red symbol)

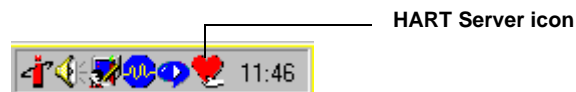


Specifying the COM Port

If communication is not established open the HART Communication Server window and check that the right COM Port is selected.

To check the current COM port settings do the following:

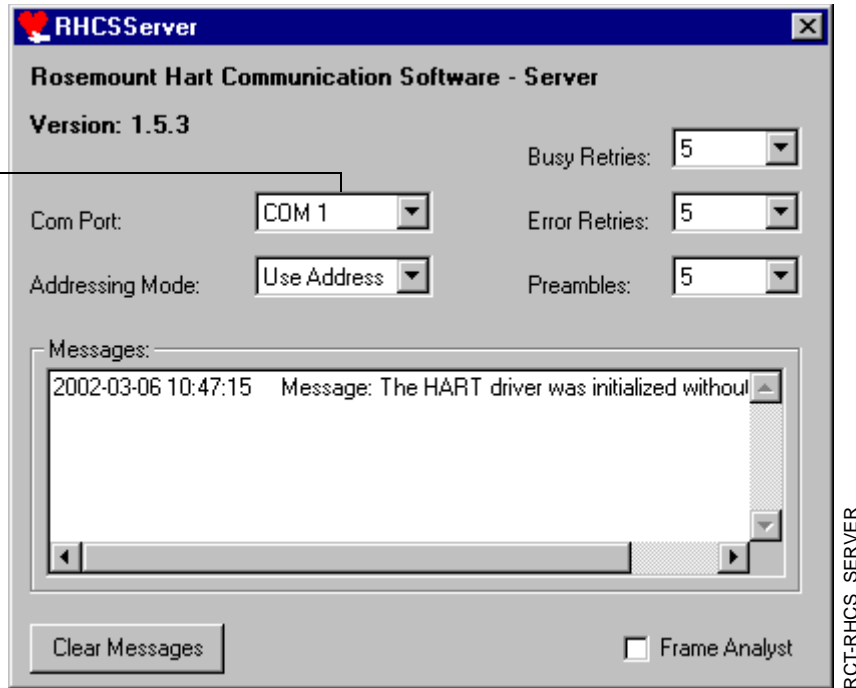
1. Locate the HART Server icon in the lower right corner of the screen.



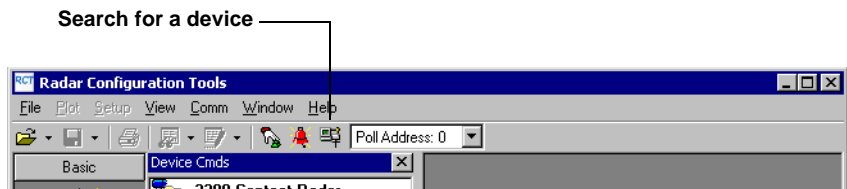
2. Double-click the HART Server icon.

Figure 4-8. RHCS Server window

Check that the selected COM port matches the connected port on the PC.



3. Check the COM port.
4. Choose the COM Port option that matches the COM Port connected to the transmitter.
5. If communication is intermittent, increase *Busy Retries* and *Error Retries* to 5 and 5 respectively.
6. Click the Search for a device icon in the RCT tool bar:



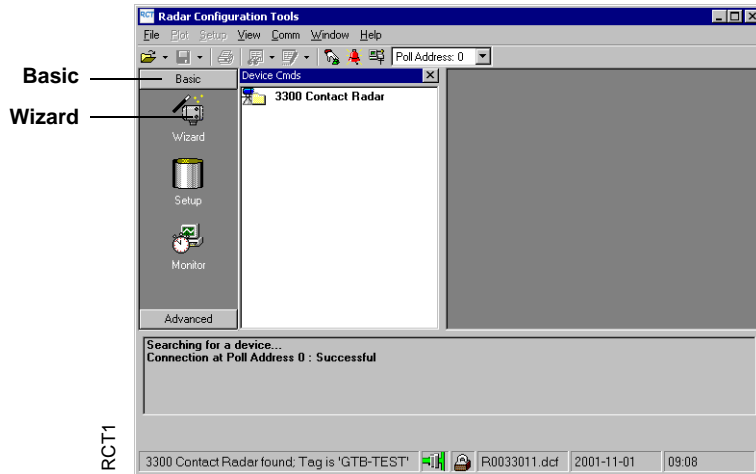
Help In RCT

Help is accessed by pressing the F1 key or by selecting the Contents option from the Help menu. If the F1 key is pressed a help text appears with information about the window that is currently open. If a menu option is selected a help text appears with information about that particular menu.

Rosemount 3300 Series

Using the Setup Wizard To install a 3300 transmitter by using the installation **Wizard** do the following:

Figure 4-9. RCT workspace



1. Start the RCT software.
2. In the RCT workspace click the Wizard icon (make sure that the Basic section is open), or choose the View>Wizard menu option.

Figure 4-10. RCT Wizard

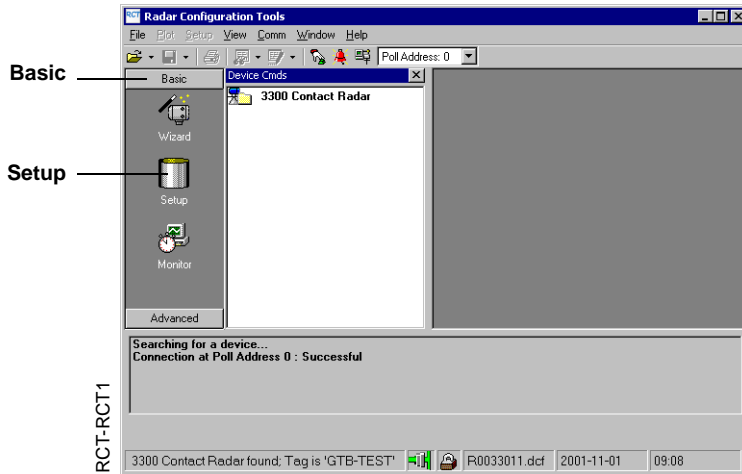


3. Click the **Start** button and follow the instructions. Now you will be guided through a number of dialogs allowing you to configure the transmitter.

Using the Setup Function

To install a 3300 transmitter by using the **Setup** function do the following:

Figure 4-11. RCT workspace



1. Start the RCT software.
2. In the RCT workspace click the Setup icon (make sure that the Basic area is open), or choose the View>Setup menu option.

Figure 4-12. Setup Info



3. Choose the appropriate tab:
 - Info:** information about the device.
 - Basics:** Set Probe Type and measurement units.
 - Analog:** Variable assignment and range value settings.
 - Tank Config:** Tank height and other geometry settings, dielectric constants for vapor and upper product.
 - Volume:** specification of tank geometry for volume calculations.
 - LCD:** display panel settings.

NOTE

When working with the Setup window keep in mind that for all tabs except the Info tab, data is updated by clicking the Receive button. To download data to the transmitter click the Send button.

Rosemount 3300 Series

Setup - Info

The **Title** tab shows information about the connected transmitter.

Figure 4-13. Setup Title tab



Device Name: designation of the current transmitter model.

EEPROM ID: current transmitter database version.

Device Type: designates the transmitter type. 33 is used for the Rosemount 3300.

Device ID: a unique identifier for each Rosemount 3300 Series transmitter.

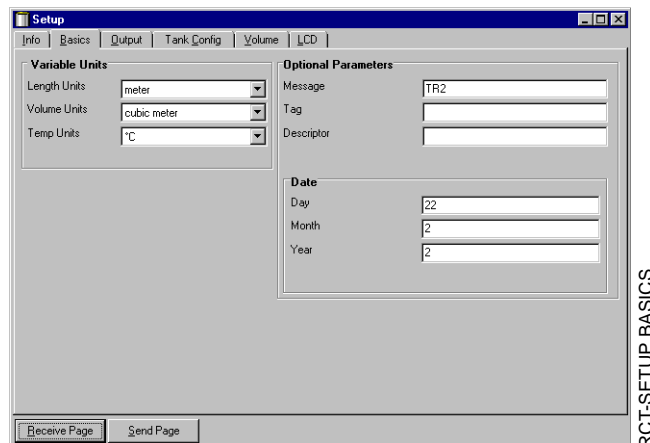
Hardware Rev: the current revision of the transmitter electronic board.

Software Rev: the current revision of the transmitter software that controls measurement, communication, internal checks etc.

Setup - Basics

The **Basics** tab lets you choose **Measurement Units** for Level, Volume and Temperature. These units are used wherever measurement and configuration data is presented.

Figure 4-14. Setup Basic tab

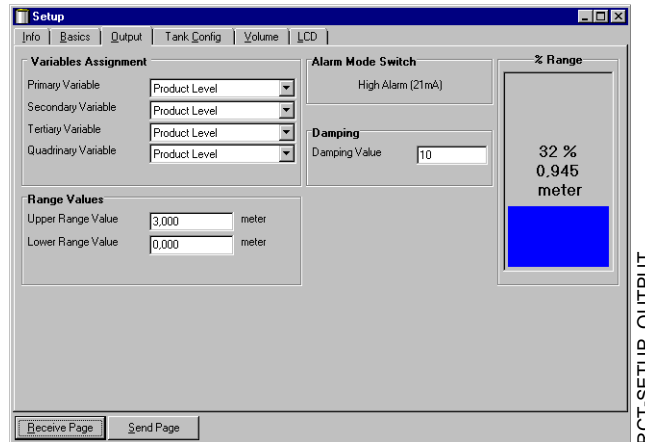


This window also allows you to enter some general information about the transmitter like Message, Tag, Descriptor and Date. This information is not required for the operation of the transmitter and can be left out if desired.

Setup - Output

The **Output** tab lets you assign up to four transmitter variables.

Figure 4-15. Setup output tab



Typically, the **Primary Variable (PV)** is configured to be Product Level, Interface Level or Volume.

Other variables like Product Distance, Interface Distance, Upper Product Thickness, etc. are available as well.

For the Rosemount 3301 the primary variable is typically set to be Level. If the transmitter is in the Immersed Probe mode (see section Measurement Mode) the PV is normally set to Interface Level.

For the Rosemount 3302 the PV is typically set to Interface Level, but Level and other options may also be used.

Set the **Lower Range Value** (4 mA) and the **Upper Range Value** (20 mA) to the desired values. Keep in mind that the 20 mA value should be below the Upper Dead Zone, and the 4 mA point should be above the Lower Dead Zone if you want to use the full 4-20 mA range within the measuring range of the transmitter.

Also make sure that the 20 mA value is set below the Upper Null Zone (UNZ). (the UNZ parameter may be used if there are measurement problems in the upper part of the tank, see Section 6: Disturbances at the Top of the Tank). The UNZ is equal to zero in the default configuration.

See Section 2: Dead Zones for more information on Upper and Lower Dead Zones.

See Section 4: Basic Configuration for more information on setting the Upper and Lower Range values.

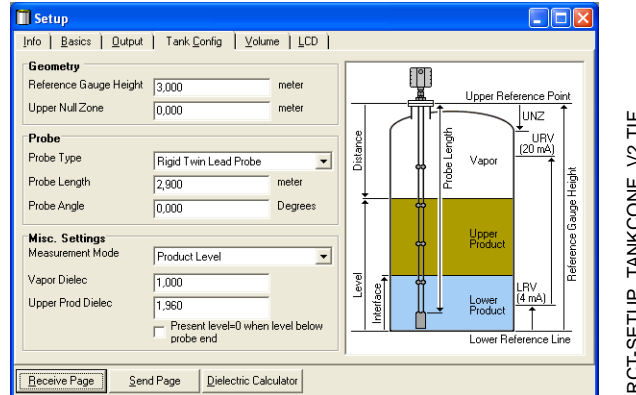
The default **Damping** value is 10. Normally this value does not need to be changed. The Damping parameter may be changed if there are high filling rates, see "High Level Rates" on page 6-7 for more information.

Rosemount 3300 Series

Setup - Tank Config

The **Tank Configuration** tab contains information on tank geometry parameters and dielectrics.

Figure 4-16. Setup Tank Configuration tab



Tank Geometry

The **Reference Gauge Height** is the distance from the Upper Reference Point to the bottom of the tank (see Figure 4-1 on page 4-2). When setting the Reference Gauge Height, keep in mind that this value is used for all level and volume measurements performed by the 3300 transmitter.

The Reference Gauge Height must be set in linear (level) units, such as feet or meters, regardless of primary variable assignment.

The **Upper Null Zone (UNZ)** should not be changed unless there are disturbances at the top of the tank. By increasing the Upper Null Zone value measurements in this region can be avoided. See *Section 6: Disturbances at the Top of the Tank* for more information on how to use the UNZ. The UNZ is equal to zero in the factory configuration.

Probe

The 3300 Series transmitter automatically makes some initial calibrations based on the chosen **Probe Type**. The following Probe Types are available:

- Rigid Twin
- Flexible Twin
- Coaxial, Coaxial HP, Coaxial HTHP
- Rigid Single, Rigid Single HTHP, Rigid Single PTFE
- Flexible Single, Flexible Single HTHP, Flexible Single PTFE

NOTE

Flexible and Rigid probes require different radar electronics and can not be used with the same transmitter head

The **Probe Length** is the distance from the Upper Reference Point to the end of the probe, see Figure 4-1. If the probe is anchored to a weight do not include the height of the weight.

The **Probe Angle** is the angle between the probe and the vertical line. Set this value equal to zero if the transmitter is mounted with the probe along the vertical line (which is normally the case).

Measurement Mode

Normally the Measurement Mode does not need to be changed. The transmitter is pre-configured according to the specified model:

Table 4-2. Measurement Mode

Model	Measurement Mode
3301	Level ⁽¹⁾ , Interface Immersed probe
3302	Level, Level and Interface ⁽¹⁾ , Interface Immersed probe

(1) Default setting

Interface Immersed Probe is used for applications where the probe is fully immersed in liquid. In this mode the transmitter ignores the upper product level. See “Section 6: Interface Measurements with Fully Immersed Probes” for more information.

NOTE!

Only use *Interface Immersed Probe* for applications where interface is measured for a fully immersed probe.

Dielectrics

In some applications there is heavy vapor above the product surface having a significant influence on the level measurement. In such cases the **Vapor Dielectric** can be entered to compensate for this effect.

The default value is equal to 1 which corresponds to the dielectric constant of vacuum. Normally this value does not need to be changed since the effect on measurement performance is very small for most vapors.

For interface measurements the dielectric constant of the upper product is essential for calculating interface level and the upper product thickness. By default the **Upper Product Dielectric** parameter is about 2.

If the dielectric constant of the lower product is significantly smaller than the dielectric constant of water, you may need to make special adjustments. See section “Interface Measurements for Semi-Transparent Bottom Products” on page 6-5 for further information.

The dielectric constant of the product is used for setting the appropriate signal amplitude thresholds, see Section 6: Service and Troubleshooting for more information on amplitude threshold settings. Normally this parameter does not need to be changed for level measurements. However, for some products measurement performance can be optimized by setting the proper product dielectric constant.

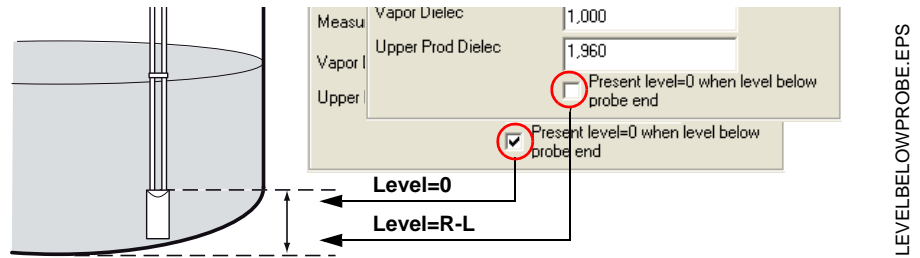
RCT contains tools to estimate the dielectric constant of the current product:

- The **Dielectric Chart** lists the dielectric constant of a large number of products. Use one of the two following methods to view the Dielectric Chart:
 - Choose the View>Dielectric>Dielectric Chart menu option.
 - Click the Dielectric Chart icon in the Project Bar Advanced section.
- The **Dielectric Calculator** lets you calculate the dielectric constant of the Upper Product based on the following input:
 - actual upper product thickness,
 - the dielectric constant value stored in the transmitter, and
 - the upper product thickness presented by the transmitter.

Measurements Below Probe End

The *Present Level=0...* check box controls how the level value is presented when the tank is almost empty. By selecting this check box the Level is set equal to zero as long as the product surface is below the probe.

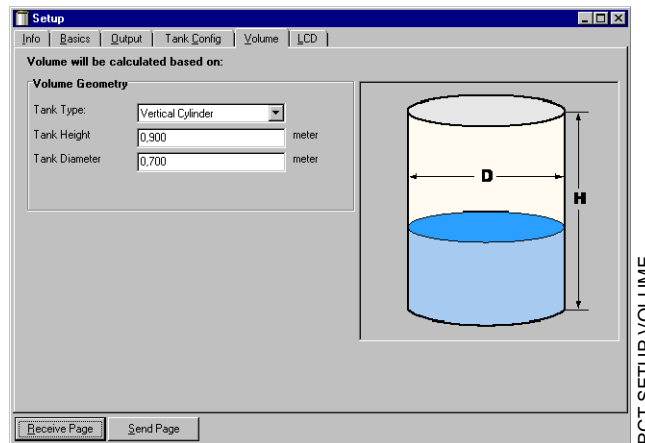
If the check box is not selected, the Level value is equal to the difference between Reference Gauge Height **R** and Probe Length **L** when the product surface is below the probe (see “Basic Configuration” on page 4-2 for information on tank geometry).



Setup - Volume

The **Volume** tab lets you configure the transmitter for volume calculations.

Figure 4-17. Setup Volume tab



You can choose one of the standard tank shapes or the strapping option. Choose None if volume calculation is not used at all.

Choose one of the following options:

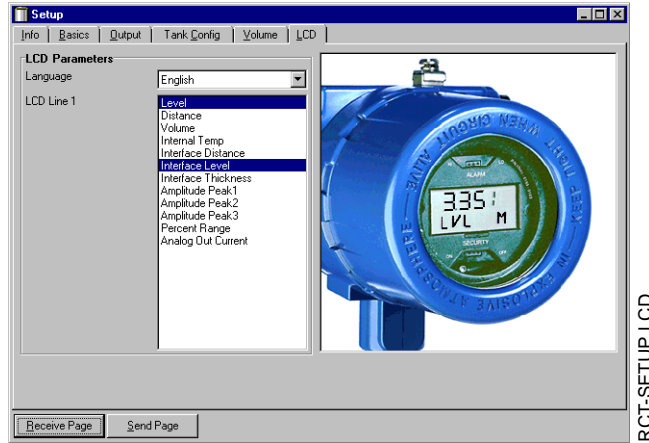
- Vertical Cylinder
- Horizontal Cylinder
- Vertical Bullet
- Horizontal Bullet
- Sphere
- Strap table
- None

See *Section 4: Volume Configuration* for more information on Volume configuration.

Setup - LCD

The **LCD** tab lets you specify which parameters to appear on the display panel. The display has two rows, the upper row with five characters is for the measured value and the lower row with six characters for the value name. The display toggles between the different variables every 2 seconds.

Figure 4-18. Setup LCD tab



Choose one of the following options:

Table 4-3. LCD parameters

Parameter	Description
Level	Product level.
Distance	Distance from the upper reference point to the product surface.
Volume	Total product volume.
Internal Temperature	Temperature inside the transmitter housing.
Interface Distance	Distance between the upper reference point and the interface between the upper and lower product.
Interface Level	Level of the lower product.
Interface Thickness	Thickness of the upper product.
Amplitude Peak 1	Signal amplitude of the reflected signal from the reference pulse.
Amplitude Peak 2	Signal amplitude of the reflected signal from the product surface.
Amplitude Peak 3	Signal amplitude of the reflected signal from the surface of the bottom product (interface measurements).
Percent Range	Level value in percent of total measurement range.
Analog Output Current	4 -20 mA current.

Rosemount 3300 Series

SPECIAL FUNCTIONS

TriLoop

The Rosemount 333 HART Tri-Loop HART-to-Analog Signal Converter is capable of converting a digital HART burst signal into three additional 4-20 mA analog signals.

To set the Rosemount 3300 transmitter up for the HART Tri-Loop do the following:

1. Make sure that the 3300 transmitter is properly configured.
2. If RCT is used for the 3300 setup, it is recommended that the **Receive Buffer and Transfer Buffer** for the selected COM port are adjusted as described below in section "To set the COM port buffers." Otherwise the Burst Mode can not be turned off by RCT (for further information on other options for turning off the Burst Mode see "To turn off the Burst Mode.")
3. Assign transmitter variables Primary Variable, Secondary Variable etc. HART command [1,1,1,1].
RCT: Setup>Output tab.



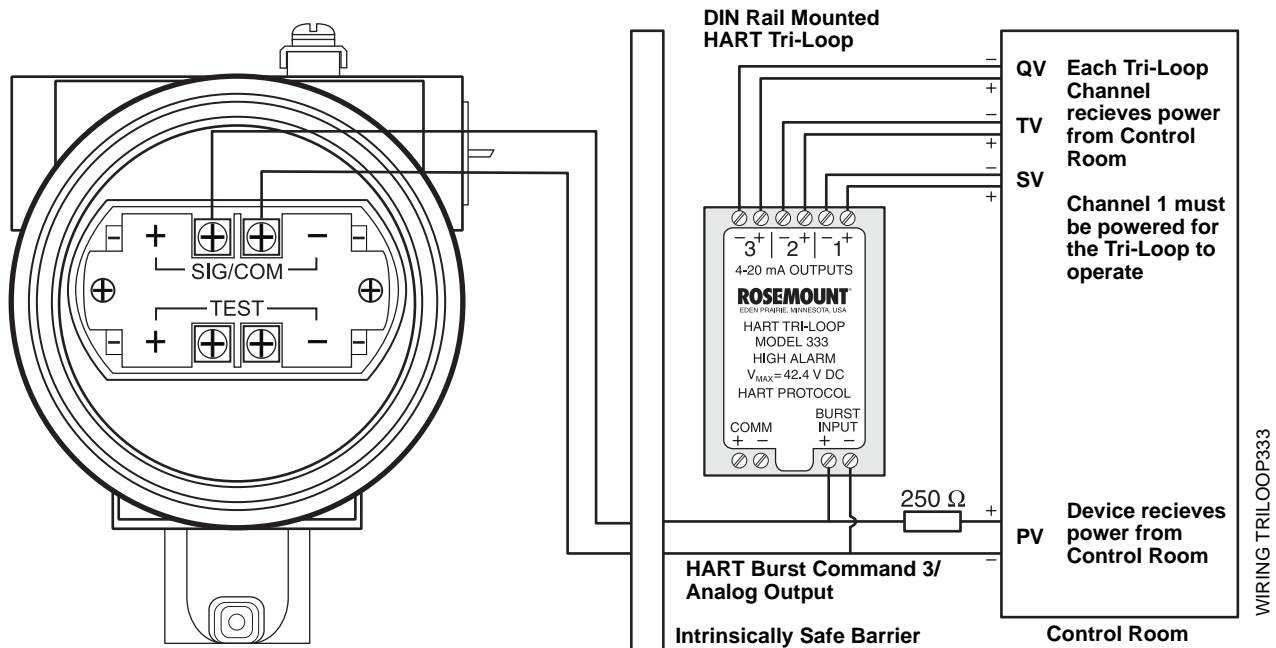
Variables Assignment

4. Configure variable units: Length, Volume and Temperature.
HART command [1,3,2,1-3].
RCT: Setup>Basics tab.

Variable Units

5. Set the 3300 in Burst mode.
 HART command [1, 4, 5, 2, 3].
 RCT: Device Commands>Details>Set Burst Mode option.
6. Select Burst option 3=Process variables and current (Process vars/crnt).
 HART command [1,4,5,2,4].
7. Install the Tri-Loop. Connect Channel 1 wires, and optionally wires for Channel 2 and Channel 3.
8. Configure Tri-Loop Channel 1:
 - a. Assign variable: Tri-Loop HART command [1,2,2,1,1].
 Make sure that the SV, TV, and QV match the configuration of the 3300 transmitter.
 - b. Assign units: Tri-Loop HART command [1,2,2,1,2]. Make sure that the same units are used as for the 3300 transmitter.
 - c. Set the Upper Range Value and the Lower Range Value: Tri-Loop HART command [1,2,2,1,3-4].
 - d. Enable the channel. Tri-Loop HART command [1,2,2,1,5].
9. (Optional) Repeat steps a-d for Channels 2 and 3.
10. Connect wires to Tri-Loop Burst Input.
11. Enter the desired tag, descriptor and message information:
 Tri-Loop HART command [1,2,3].
12. (Optional) If necessary, perform an analog output trim for Channel 1 (and Channel 2 and 3 if they are used).
 Tri-Loop HART command [1,1,4].

Figure 4-19. Tri-Loop wiring.



See the reference manual for the *Model 333 HART Tri-Loop HART-to-Analog Signal Converter* for further information on how to install and configure the Tri-Loop.

To turn off the Burst Mode

In order to turn off the Burst Mode use one of the following options:

- The RCT program (requires that the Receive and Transfer Buffers for the selected COM Port is adjusted)
- The Rosemount Burst Mode Switch software
- A 375 Field Communicator
- The AMS software

To set the COM port buffers

In order to be able to communicate with the 3300 in Burst Mode the Receive and Transfer Buffers need to be adjusted as follows:

1. In the *MS Windows Control Panel* open the **System** option.
2. Choose the **Hardware** tab and click the **Device Manager** button.
3. Expand the **Ports** node in the tree view.
4. Click the right mouse button on the selected COM port and choose **Properties**.
5. Select the **Port Settings** tab and click the **Advanced** button.
6. Drag the *Receive Buffer* and *Transfer Buffer* slides to 1.
7. Click the **OK** button.
8. Reboot the computer.

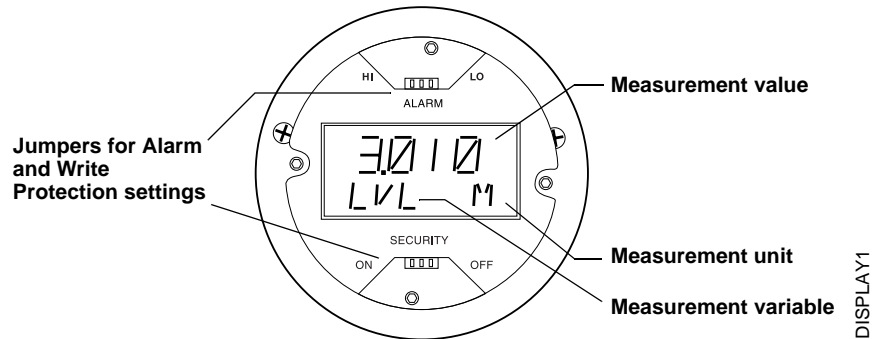
Section 5 Operating the Display Panel

Display Functionality page 5-1
Error Messages page 5-2

DISPLAY FUNCTIONALITY

The Rosemount 3300 transmitter uses the display for presentation of measurement variables. The display has two rows, the upper row with five characters is for the measured value and the lower row with six characters for the value name and measurement unit. The display toggles between the different variables every 2 seconds. Variables to be presented are configurable by using a Field Communicator or by using the Radar Configuration Tools software.

Figure 5-1. Presentation of measurement data



Model 3300 can display the following variables:

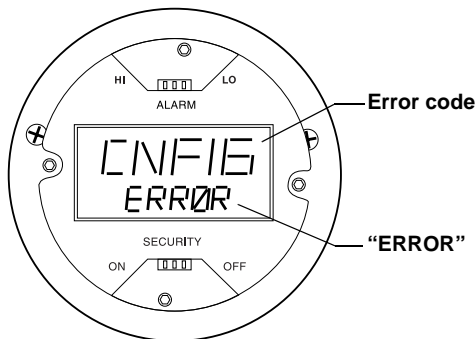
- Level
- Distance
- Volume
- Internal Temperature
- Interface Distance
- Interface Level
- Amplitude 1, 2 and 3 (see chapter 6 for more information)
- Interface Thickness
- Percent of range
- Analog current out

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ERROR MESSAGES

The display can also be used for presentation of software errors. The upper row shows error codes and the lower row shows 'ERROR'.

Figure 5-2. Presentation of error messages



DISPLAY ERROR

The following errors can be displayed:

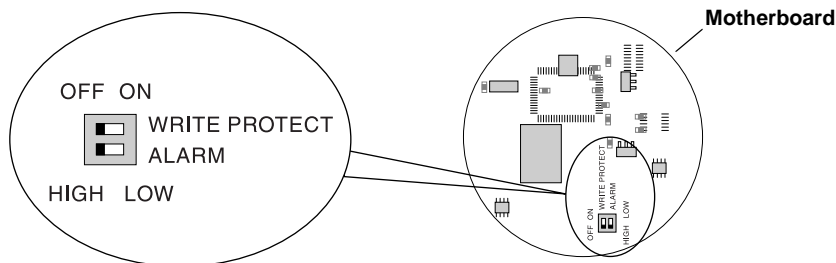
Code	Error
CNFIG	Invalid Configuration
00001	Ram Failure
00002	ROM Checksum
00006	Waveform Acquisition Failure
00007	EEprom Factory Checksum
00008	EEprom User Checksum
00010	Software Error
00013	Probe Failure

See also "Errors" on page 6-22.

ALARM AND WRITE PROTECTION

When mounting the Integral Display panel it is important that the Alarm and Write Protection switches on the transmitter mother board are correctly set. Make sure that the Alarm switch is in the HIGH position and the Write Protection switch is in the OFF position, see Figure 5-3. See also *Section 3: Before You Install* for more information.

Figure 5-3. Alarm and Write Protection switches.



SWITCH_WRP_ALARM_DISPLAY

Once the motherboard positions are set, then the display positions become the master.

Section 6 Service and Troubleshooting

Safety messages	page 6-1
Advanced Configuration	page 6-2
Service	page 6-9
Diagnostic Messages	page 6-21

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury.
Verify that the operating environment of the gauge is consistent with the appropriate hazardous locations certifications.
Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
Do not remove the gauge cover in explosive atmospheres when the circuit is alive.
Failure to follow safe installation and servicing guidelines could result in death or serious injury.
Make sure only qualified personnel perform the installation.
Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.
Do not perform any service other than those contained in this manual unless you are qualified.

High voltage that may be present on leads could cause electrical shock.
Avoid contact with leads and terminals.
Make sure the main power to the Rosemount 3300 Transmitter is off and the lines to any other external power source are disconnected or not powered while wiring the gauge.
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.

Process leaks could result in death or serious injury.
Make sure that the transmitter is handled carefully. If the Process Seal is damaged, gas might escape from the tank if the transmitter head is removed from the probe.

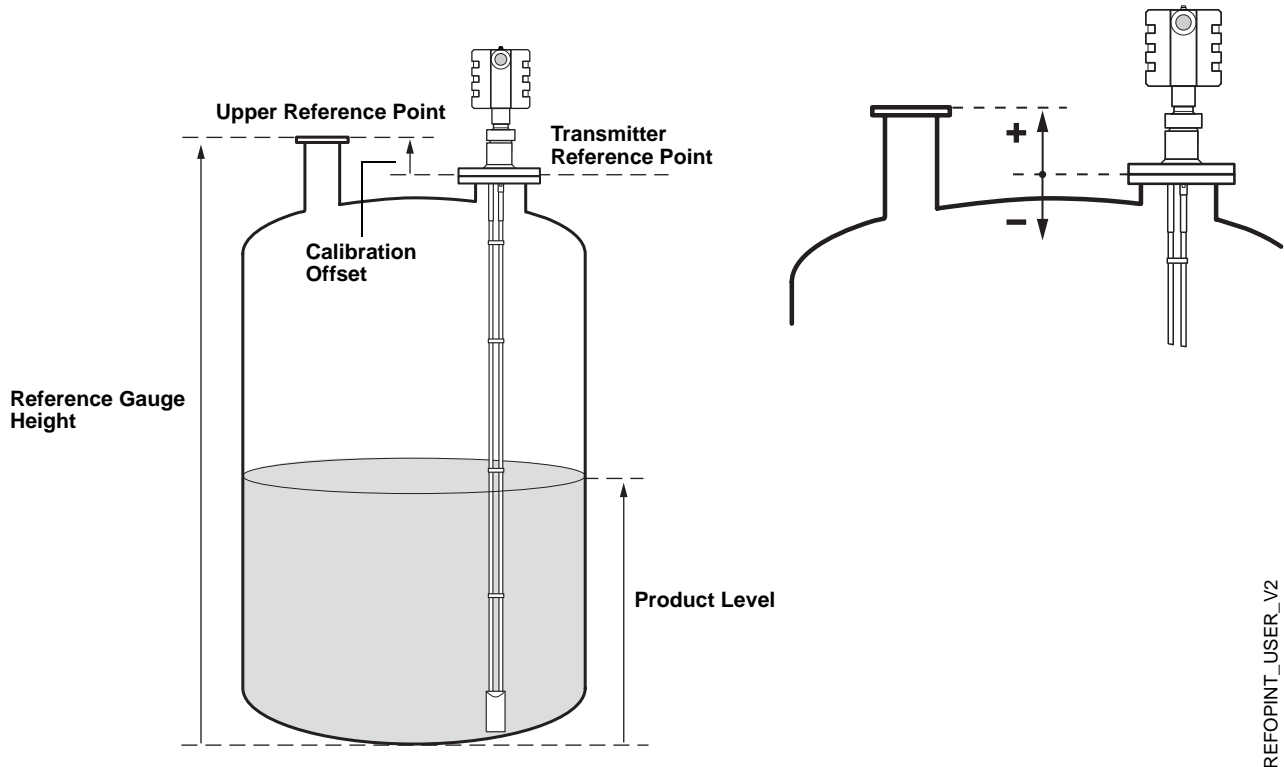
ADVANCED CONFIGURATION

This section covers non-standard configuration.

User defined Upper Reference Point

If you want to specify your own Upper Reference Point you can do this by setting the **Calibration Offset** parameter.

Figure 6-1. Tank Geometry



REFOPINT_USER_V2

To set the desired upper reference point do the following:

1. Adjust the **Reference Gauge Height** to the distance from the tank bottom to the desired **Upper Reference Point**.
2. Add the distance between the **Upper Reference Point** and the **Transmitter Reference Point** to the Calibration Offset value that is stored in the transmitter database.

With the HART Communicator the Calibration Offset is available as HART Fast Key sequence [1, 4, 5, 5].

In Radar Configuration Tool (RCT) the Calibration Offset is available under the Advanced section in the RCT Project Bar: Device Commands>Basic>Set Calibration Offset.

Plotting the Measurement Signal

The Radar Configuration Tool (RCT) has powerful tools for advanced troubleshooting. By using the Waveform Plot function you get an instant view of the tank signal. Measurement problems can be solved by studying the position and amplitude of the different pulses.

To plot the measurement signal:


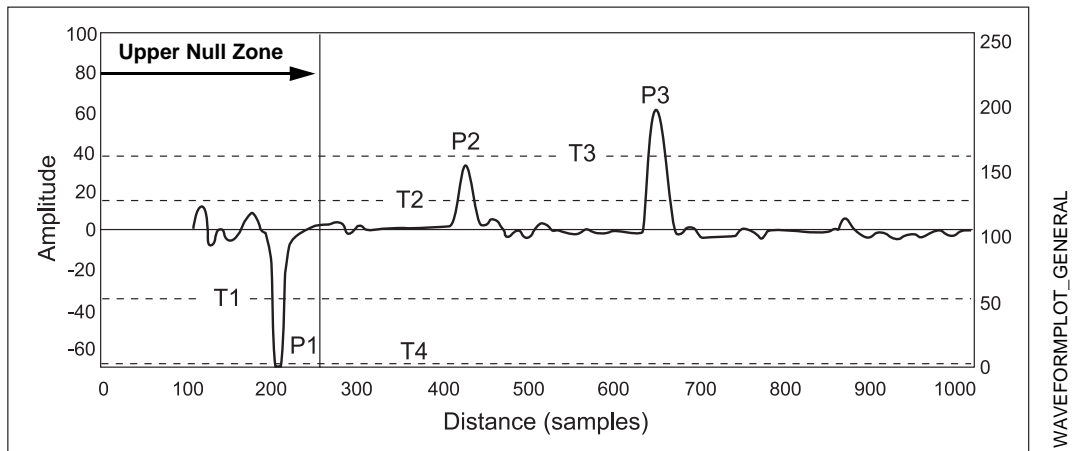
1. Start the Radar Configuration Tool program.
2. Choose the **View>Plotting** menu option, or choose the Plotting icon in the RCT workspace (Advanced page at the left side of the workspace) and click the Read  button.

Figure 6-2. Waveform plot in RCT



In a typical measurement situation the following pulses appear in the diagram:

P1 - Reference pulse. This pulse is caused by the transition between transmitter head and probe. It is used by the transmitter as a reference at level measurements.

P2 - Product surface. This pulse is caused by a reflection on the product surface. In Measurement Mode=Interface when Immersed Probe however, P2 indicates the interface since the surface of the upper product is ignored.

P3 - Interface or probe end. This pulse is caused by reflection on the interface between an upper product and a bottom product with a relatively high dielectric constant. It may also be caused by the probe end if there is no product above. This pulse is shown when the transmitter is in Measurement Mode=Level & Interface.

Different amplitude thresholds are used in order to filter out unwanted signals. The following amplitude thresholds are used for the 3300 transmitter:

T1 - amplitude threshold for detection of the Reference pulse P1.

T2 - amplitude threshold for detection of the product level peak P2.

T3 - amplitude threshold for detection of the interface level peak P3.

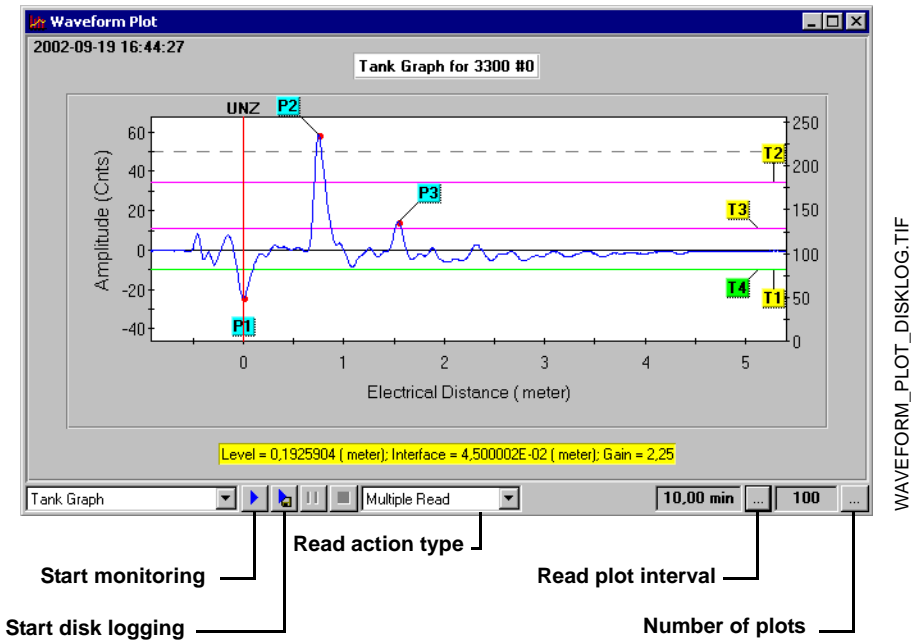
T4 - amplitude threshold that is used to detect whether the probe is fully immersed in the upper product or not.

Normally the thresholds are adjusted to approximately 50% of the signal peak amplitude. To adjust the **Amplitude Thresholds** open the Advanced section in the RCT Project Bar and choose Device Commands>Details>Set Nominal Thresholds. To reset the default values set Amplitude Threshold=0 (zero).

Logging and saving to disk

The Waveform plot can be automatically logged and saved to file by specifying the read plot interval and the number of plots to log.

Figure 6-3. Disk logging Waveform plot



The **Read Plot Interval** entry field specifies the time interval between plots that are saved to disk. For example, type 10 if you want the waveform plot to be updated every ten minutes.

Number of plots to log specifies the maximum number of plot files that will be stored. The default value is 100.

Click the **Start Disk Logging** button to start the log. Make sure that Read Action type is set to Multiple Read. Otherwise RCT will only save one log file. Choose a destination folder and enter a file name. **For each new file the corresponding number is appended to the end of the file name.**

Interface Measurements for Semi-Transparent Bottom Products

In interface applications where the bottom product has a low dielectric constant, or if the signal is attenuated in the upper product, the amplitude of the reflected signal is relatively low and difficult for the transmitter to detect. In such a case it may be possible to detect the reflected signal if the corresponding amplitude threshold is adjusted.

The Radar Configuration Tool (RCT) lets you view a waveform plot to analyze the measurement signal. The plot shows the signal and the thresholds used for the different amplitude peaks. By adjusting amplitude threshold T3 it is possible to detect even weak interface signals.

Guidelines for amplitude threshold settings:

- The amplitude threshold T3 should be approximately 50 % of the interface signal amplitude.
- Threshold T3 should not be less than 3.
- If possible, T3 should be higher than T2.

You can use the RCT software or a 375 Field Communicator to change the amplitude thresholds. For the Field Communicator use the HART command [1, 4, 5, 3]. See also “Amplitude Threshold Settings” on page 6-13.

RCT lets you view a plot of the measurement signal along with the current thresholds:


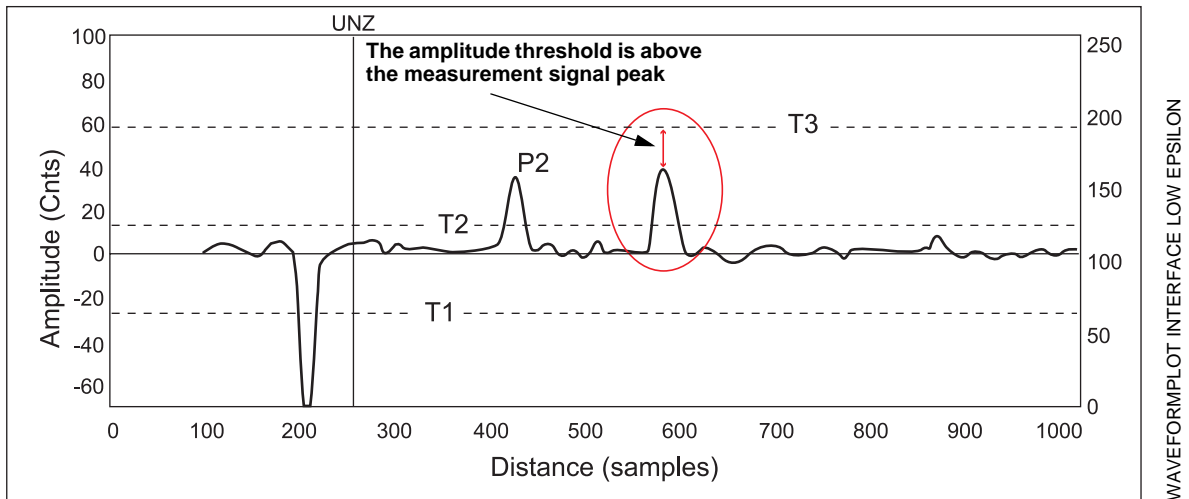
1. From the **View** menu choose the **Plotting** option, or double-click the Plotting icon in the Advanced section of the RCT Project Bar.
2. Click the Read button .
3. To adjust the **Amplitude Thresholds** open the Advanced section in the RCT Project Bar and choose Device Commands>Details>Set Nominal Thresholds.

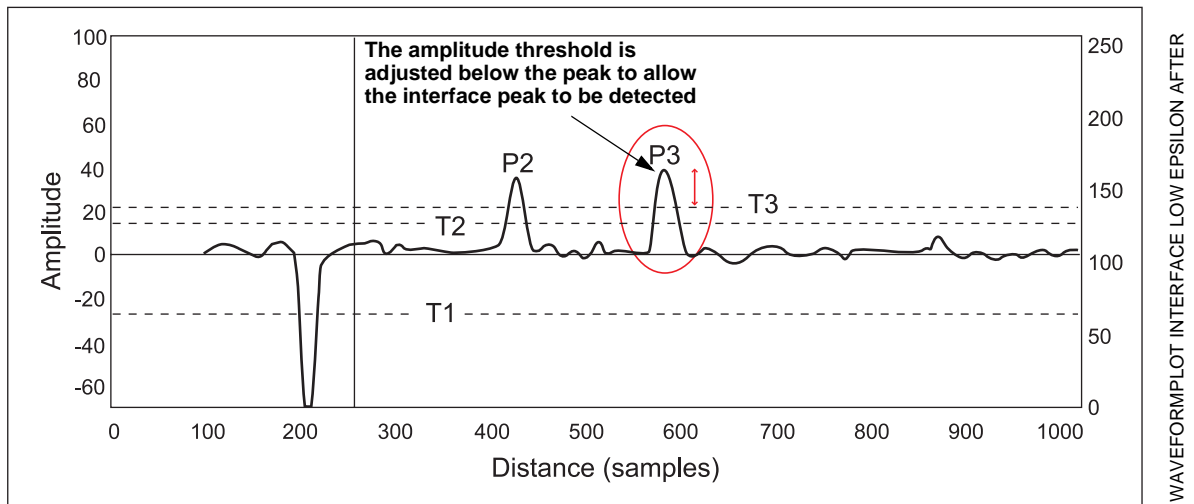
Figure 6-4. Waveform plot indicating that the amplitude threshold for the interface peak is too high.



WAVEFORMPLOT INTERFACE LOW EPSILON

Figure 6-4 illustrates a situation where amplitude threshold T3 is too high. The signal amplitude peak at the interface between the upper and lower products is not detected in this case. By adjusting amplitude threshold T3, the peak at the interface between the upper and lower products is detected as illustrated in Figure 6-5:

Figure 6-5. After changing the amplitude threshold the transmitter detects the interface

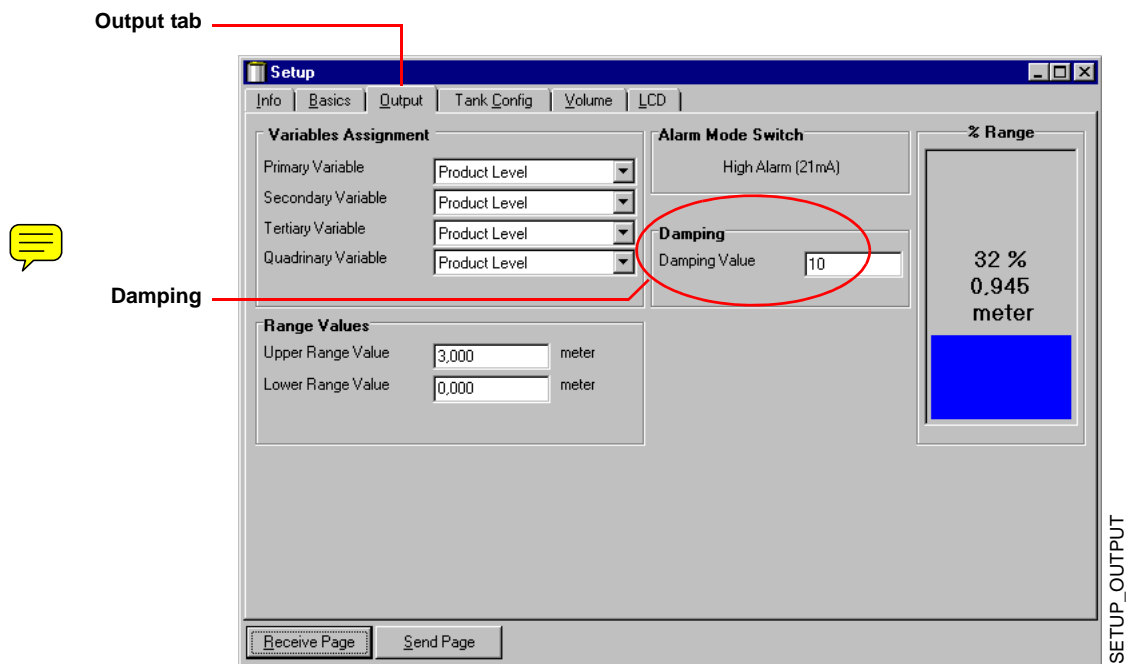


High Level Rates

The measurement signal is filtered in order to minimize the influence of disturbing noise. In most measurement situations this does not have a noticeable effect on the response time to level changes. If high level rates occur it may however be necessary to reduce the damping value in order to allow the transmitter to respond quicker. **If there is too much noise the damping value may be increased in order to get a stable measurement signal.**

You can use the RCT software or a 375 Field Communicator to change the Damping value. For the HART Communicator use the key sequence [1, 3, 5].

In the RCT software open the **Setup>Output** tab and enter the desired Damping value:



The Damping parameter determines how quickly the transmitter responds to level changes and how robust the measurement signal is against noise. Technically, **a damping value of 10 means that in 10 seconds the output from the transmitter is about 63% of the new level value.** Consequently, when there are rapid level changes in the tank, it may be necessary to decrease the Damping value for the transmitter to be able to track the surface. On the other hand, in noisy environments, and if level rates are low, it may be better to increase the damping value to have a stable output signal.

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Interface Measurements with Fully Immersed Probes

The 3300 series has a measurement option which makes it possible to handle interface measurements when the product level is not visible, for example in a full bridle pipe as illustrated in Figure 6-6. In this case the probe is fully immersed into the upper product, and only the interface level is detected by the transmitter. Even if the upper product level drops, it is ignored by the transmitter which continues to measure only the interface level, but the measurement accuracy is reduced since the transmitter does not take into account the influence of the air gap above the product surface.

The Measurement Mode parameter is available via the HART command [1, 3, 3, 4]. Choose the *Interface when Immersed Probe* option.

Measurement mode *Interface when Immersed Probe* can also be activated in the RCT software:

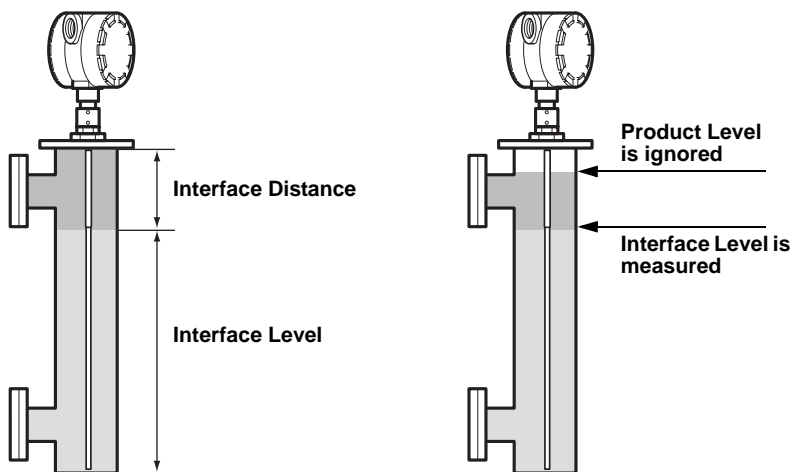
1. Open the Setup window.
2. Select the Tank Config tab.
3. Choose Measurement Mode *Interface when Immersed Probe*.
4. Click the Send Page button.

NOTE!

Do not use Measurement Mode *Interface when Immersed Probe* in “standard” applications when both Interface Level and Product Level are measured.

If the product level drops, the air filled region in the upper part of the pipe will slightly reduce the measurement accuracy of the interface level. To achieve high accuracy in this measurement mode the probe must be fully immersed.

Figure 6-6. Interface Level measurements in a full bridle pipe.



BRIDLE_INTERFACE_IMMERSDED.EPS

NOTE!

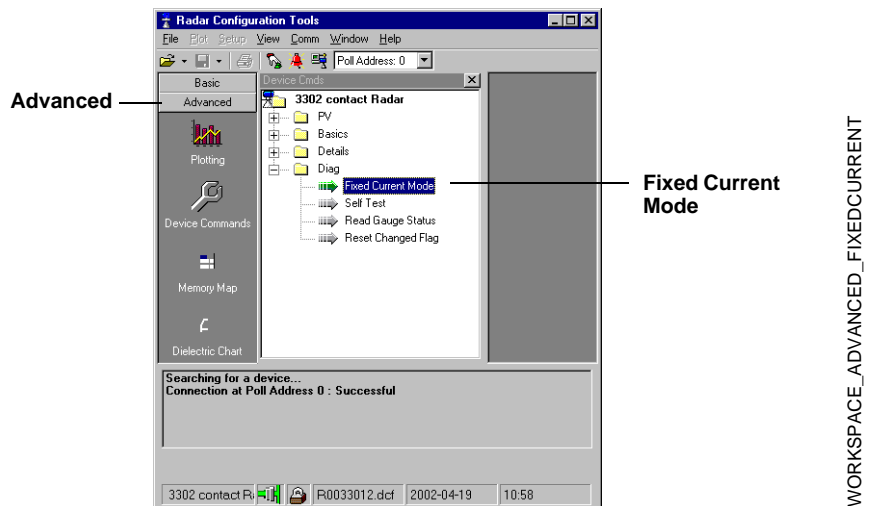
Adjust Threshold T2 if the level pulse is not detected.

SERVICE

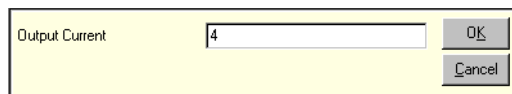
Analog Output Calibration

To calibrate the Analog Output current do the following:

1. Start RCT and make sure that the transmitter communicates with the PC (see Section 4: Installing the RCT software).
2. Open the Advanced section in the RCT workspace Project Bar and click the Device Commands icon, or choose the Device Commands option from the View menu.
3. Open the folder named Diag and double-click the Fixed Current Mode option.



4. Set the output current to 4 mA.



5. Measure the output current.
6. Open the folder named Details.
7. Choose the Trim DAC Zero option and enter the measured output current.
8. In the Diag folder double-click the Fixed Current Mode option and set the output current to 20 mA.
9. Measure the output current.
10. In the Details folder double-click the Trim DAC Gain option and enter the measured output current.
11. In the Diag folder double-click the Fixed Current Mode option and set the output current to 0 mA in order to leave the Fixed Current mode.

Level and Distance Calibration

When calibrating the transmitter it is important that the product surface is calm and that the tank is not being filled or emptied.

A complete calibration is performed in two steps:

1. Calibrate the Distance measurement by adjusting the Calibration Offset parameter.
2. Calibrate the Level measurement by adjusting the Reference Gauge Height.

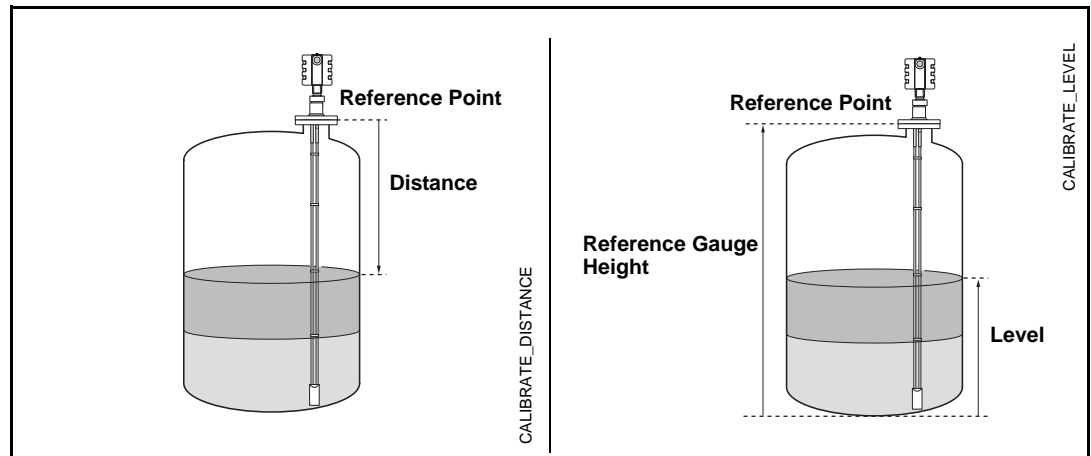
Distance calibration

1. Measure the actual distance between the Upper Reference Point and the product surface.
2. Adjust the Calibration Offset so that the Distance measured by the transmitter corresponds to the actual distance.
The Calibration Offset parameter is available via HART command [1, 4, 5, 5],
or
RCT: open the Advanced section in the Project Bar and choose Device Commands>Basics>Set Calibration Offset.

Level calibration

1. Measure the actual Product Level.
2. Adjust the Reference Gauge Height so that the measured Product Level corresponds with the actual level.

Figure 6-7. Distance and Level calibration



Disturbances at the Top of the Tank

Using the Trim Near Zone Function

For transmitters using the Guided Wave Radar technology the performance in the Near Zone (referred to as the region between 0-1.6 ft (0-0.5 m) below the Upper Reference Point) is normally somewhat limited. However, the 3300 transmitter is equipped with software functionality that minimizes the Upper Dead Zone. The factory setting is normally sufficient and doesn't need to be repeated after installation.

However, since the setting is optimized depending on actual installation, further trimming may be necessary in the case of unfavorable conditions. This may for example be the case if a Single Lead probe is mounted in a small nozzle, or if there are disturbing obstacles in the Near Zone. The trimming means that the measurement performance in the Near Zone is maintained even under these conditions and prevents false echo indication.

To trim the Near Zone performance do the following:

1. Make sure that the product level is below the Near Zone region (0-1.6 ft (0-0.5 m) below the Upper Reference Point).
2. Start the Radar Configuration Tools (RCT).
3. Choose the **Device Commands** option from the View menu.
4. Open the **Details** folder.
5. Click the **Trim Near Zone** option.
6. Select the **Update** option and click the OK button.

NOTE!

The Trim Near Zone function should only be used for reducing impact from constant disturbances. It is not suitable for occasional disturbances.

To reset the transmitter to factory settings do the following:

1. Start the Radar Configuration Tools (RCT).
2. Choose the **Device Commands** option from the View menu.
3. Open the **Details** folder.
4. Click the **Trim Near Zone** option.
5. Select the **Reset to Factory Settings** option and click the OK button.

Changing the Upper Null Zone

Measurements are not performed within the Upper Null Zone (UNZ). By setting the UNZ parameter to zero, measurements can be performed in the region close to the flange (Near Zone). However, it is very important that there are no disturbances in that region if UNZ is set to zero.

If there are measurement problems in the upper part of the tank you may use the Trim Near Zone function as described above.

If the desired measurement range is below the Near Zone, or if disturbing objects are located below the Near Zone, the Upper Null Zone parameter can be used to avoid measurements above a certain level.

To set the Upper Null Zone do one of the following:

1. Select the HART command [1, 3, 3, 1].
2. Enter the desired value,

or

1. Start the **Radar Configuration Tool (RCT)**.
2. Click the **Setup** icon in the RCT workspace Project Bar.
3. Choose the **Tank Config** tab in the Setup window.
4. Click the Receive Page button.
5. Type the desired value in the Upper Null Zone field.
6. Click the Send Page button. Now the Upper Null Zone is stored in the transmitter memory.

Figure 6-8. Upper Null Zone

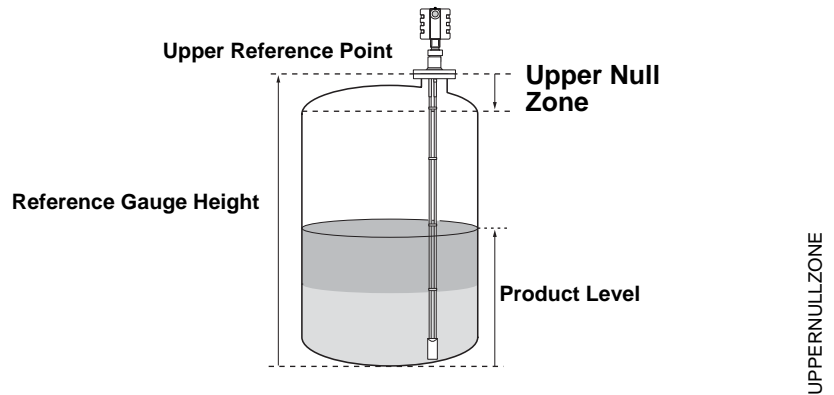
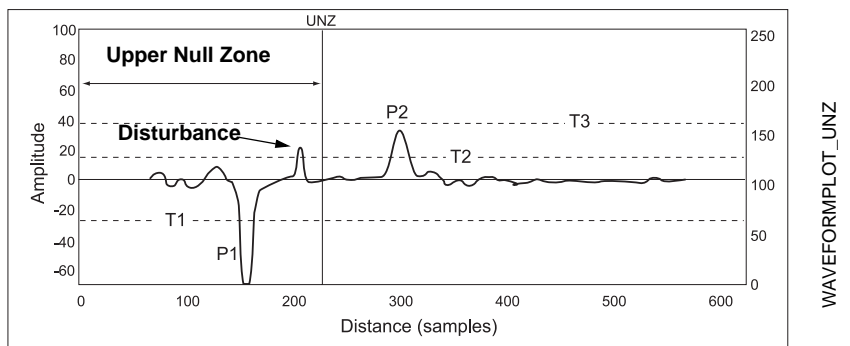


Figure 6-9. Identifying the Upper Null Zone in the RCT Waveform Plot



Amplitude Threshold Settings

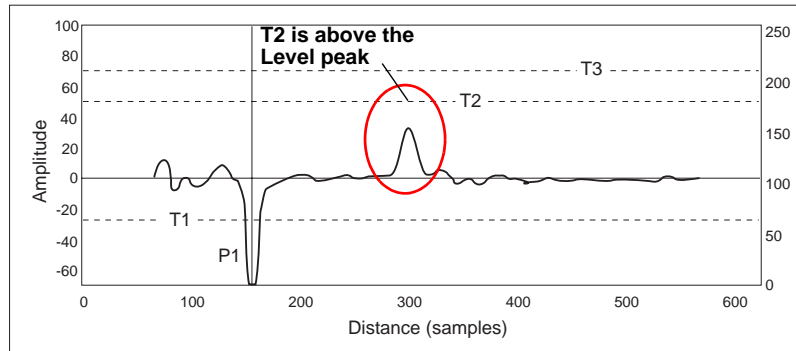
The amplitude thresholds are automatically adjusted to appropriate values in order to filter out noise and other non-valid measurements from the measurement signal.

The amplitude of the measurement signal, i.e. the amplitude of the signal that is reflected by the product surface, is related to the actual dielectric constant of the product. The amplitude threshold that is used by the transmitter is based on the parameter configuration of the current product dielectric constant (see Section 4: Basic Configuration). Normally no other threshold adjustment is needed, but if the transmitter still does not track the product surface correctly it may be necessary to adjust the threshold values.

The Radar Configuration Tool (RCT) has a plot function allowing you to view the reflections along the probe.

If the amplitude threshold is too high the product level is not detected as illustrated in Figure 6-10.

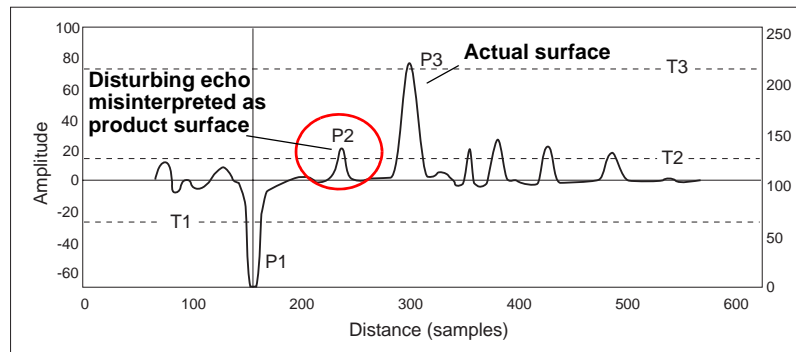
Figure 6-10. Example 1: amplitude threshold T2 is too high.



WAVEFORMPLOT THRESHOLD HIGH

If there are disturbing objects in the tank the threshold must be carefully set in order to avoid locking on the wrong amplitude peak. In Figure 6-11 the transmitter has locked on a peak above the actual product surface, i.e. a disturbance was interpreted as the product surface, whereas the actual product surface was interpreted as an interface or the probe end.

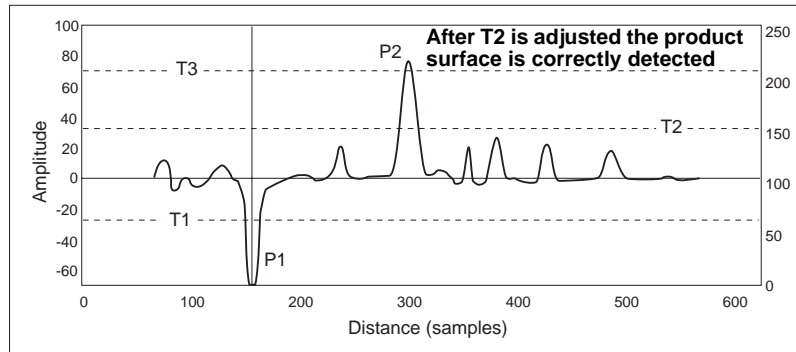
Figure 6-11. Example 2: amplitude threshold T2 is too low.



WAVEFORMPLOT THRESHOLD LOW

By adjusting the amplitude threshold T2 the product surface is detected correctly as illustrated in Figure 6-12.

Figure 6-12. Waveform plot after threshold T2 was adjusted



WAVEFORM PLOT THRESHOLD ADJUSTED

To adjust the amplitude thresholds select HART command [1, 4, 5, 3]
or

1. Start the Radar Configuration Tool (RCT).
2. Choose the **Device Commands** option from the View menu.
3. Open the **Details** folder.
4. Click the **Set Nominal Thresholds** option.

The thresholds T2 and T3 should be set to about 50% of the measured signal amplitude for the product surface and the interface peaks, respectively.

NOTE

Amplitude thresholds should not be set to values less than 3.

NOTE

Check that the dielectric constant parameter setting is reasonably close to the actual dielectric constant value of the upper product before changing the amplitude thresholds.

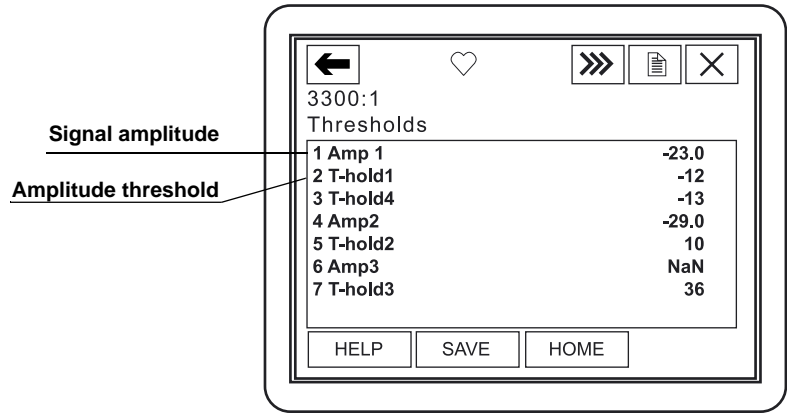
NOTE

Default Amplitude thresholds can be set by typing 0 as the new threshold value.

Using the 375 Field Communicator

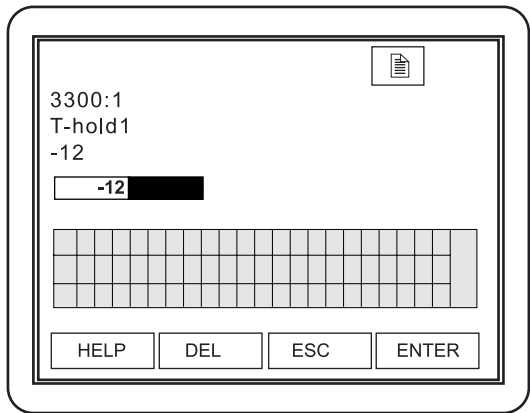
To adjust amplitude threshold value:

1. Select HART command [1, 4, 5, 3].
The different amplitude thresholds appear on the display.



375_DISPLAY_THRESHOLDS.EPS

2. Open the desired amplitude threshold for editing.



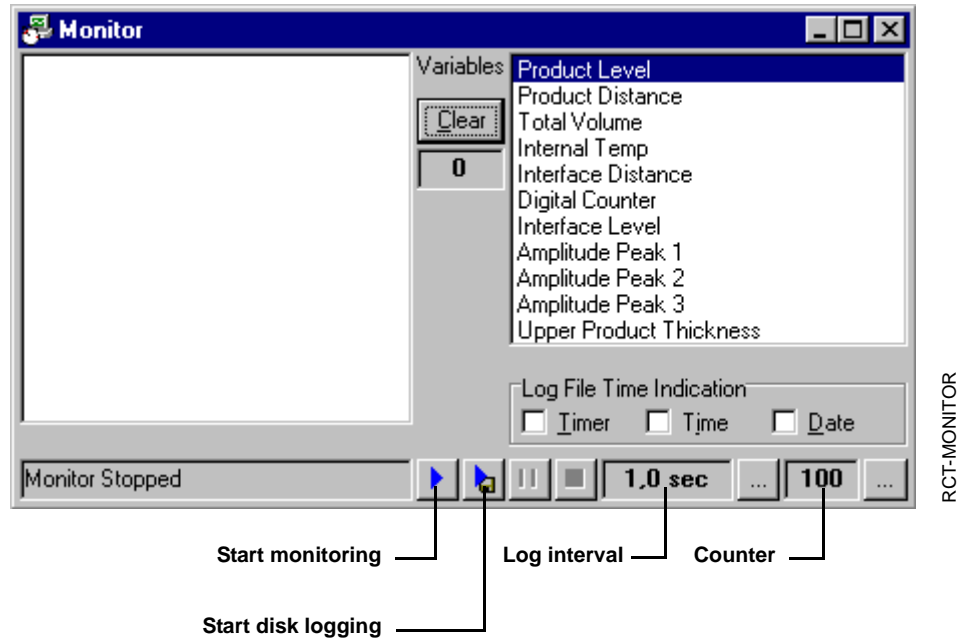
375_DISPLAY_SET_THRESHOLDS.EPS

3. Type the desired threshold value and click the ENTER button.
4. Click the SAVE button to store the new value in the transmitter database.


Logging Measurement Data

To start logging do the following:



1. Click the Monitor icon in the RCT workspace or choose the *Monitor* option from the *View* menu.



2. Choose the desired variables to be monitored and click the Start Monitor

 button.

Saving the log to disk

1. Choose the desired variables to be monitored.
2. Click the Log interval button  and enter a time interval. For example, type 10 if you want data to be logged every tenth second.
3. Click the Counter button and enter the maximum number of files to be stored. The Counter is used to limit the amount of data stored on the hard disk. **Each time the maximum number of entries in a log file is reached, the current log file is saved and a new file is created.** This procedure continues up to the maximum number of files given by the Counter value. The **file size is limited to 60,000 entries** which can easily be handled by spreadsheet programs like MS Excel.
4. Select the desired options for Timer, Time and Date. By selecting a check box the corresponding time indication is stored for each log entry in the log file.
5. Click the Start disk logging  button.
6. Choose a destination folder and enter a file name.

Saving the Transmitter Configuration

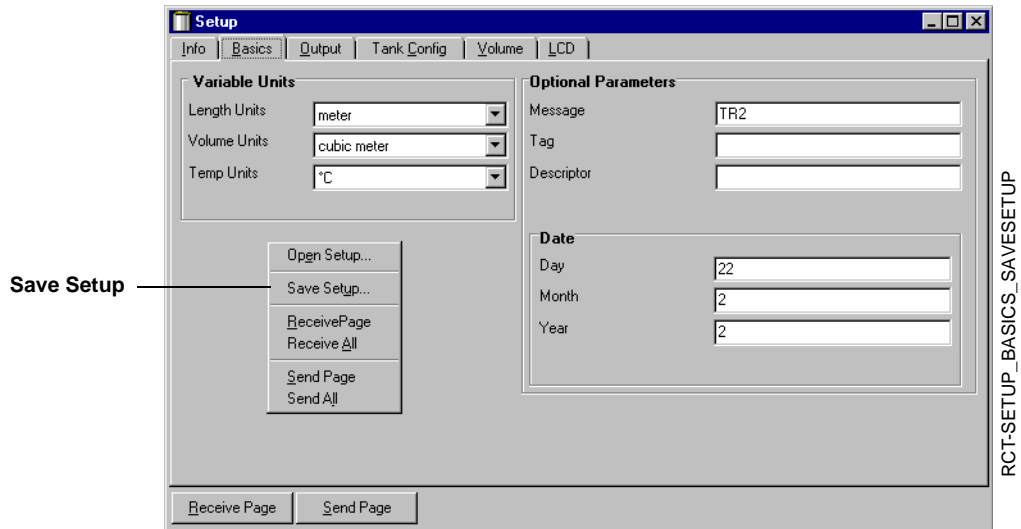
The Radar Configuration Tool offers different methods to save the current transmitter configuration:

- Save only the configuration specified in the Setup window.
- Use the more extensive function in the Memory Map window.

You can use a stored configuration file as a backup of the current configuration, or it can be distributed for service purposes.

To save the current transmitter setup do the following:

1. Click the Setup icon in the RCT workspace or choose the *Setup* option from the *View* menu to open the Setup window.

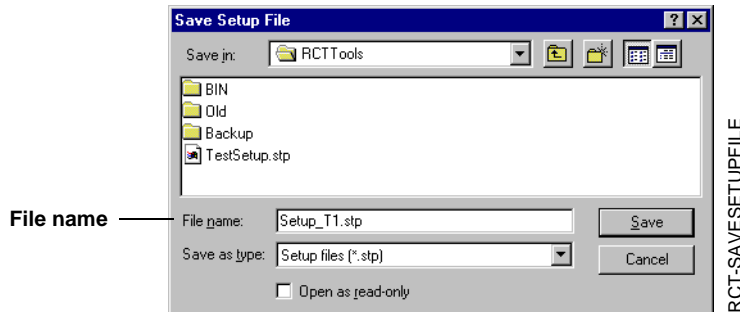


2. Click the right mouse button and choose the **Receive All** option, or from the Setup menu choose the **Receive All** option. Alternatively, you can use the Receive Page option on each individual page.

NOTE!

All pages must be received before the setup can be saved.

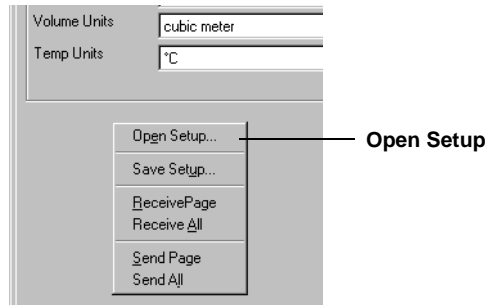
3. Click the right mouse button and choose the **Save Setup** option.



4. Choose a destination folder and enter a file name.
5. Click the **Save** button.

To load a setup

1. Click the Setup icon in the RCT workspace or choose the *Setup* option from the *File* menu.



2. In the *Setup* window click the right mouse button and choose the **Open Setup** option, or from the *File* menu choose the **Open Setup** option.
3. Open the source folder and select the desired setup file.
4. Click the **Open** button.

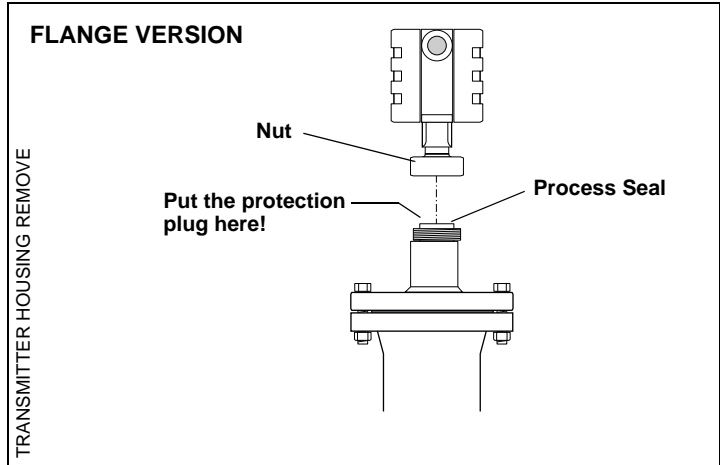
Memory Map

The Memory Map window lets you view the current transmitter database registers. It is also possible to save the current database for backup or service purposes, and it is also possible to download a backup database to the transmitter. To save configuration data in the Memory Map window:

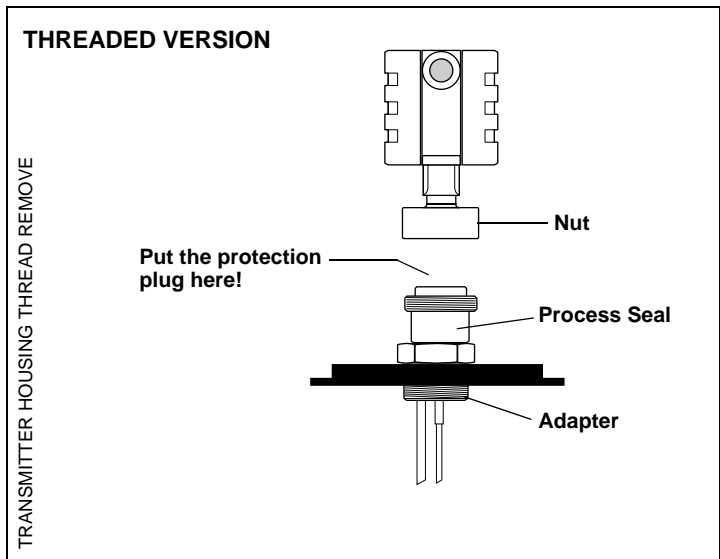
1. Start the RCT program.
2. Choose the **View>Memory** option, or click the **Memory Map** icon in the RCT workspace (Advanced section at the left side of the workspace window).
3. Choose the All EE option from the drop-down list.
4. Click the Receive button. (It may take a few minutes to read the database).
5. Click the right mouse button and choose the Save Memory As option.
6. Type the desired file name and click the OK button. Now the current database is stored.

See the Online Help in RCT for further information on how to open a saved database and how to download a database to the transmitter.

Removing the Transmitter Head



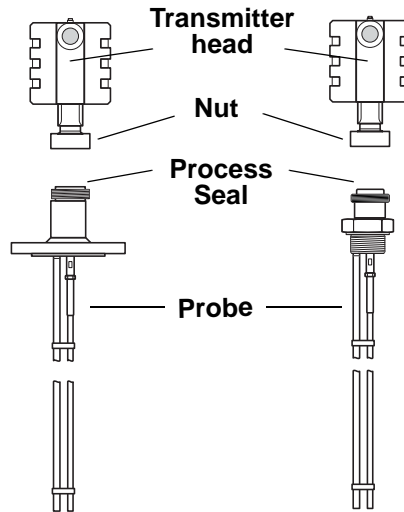
1. Loosen the nut that connects the transmitter housing to the Process Seal.
2. Carefully lift the transmitter head.
3. Make sure that the upper surface of the Process Seal is clean and the spring-loaded pin at the center of the Process Seal is properly inserted (the pin should move back when pushed into the hole).
4. Attach the protection plug to the Process Seal.



NOTE

Do not remove the Process Seal from the adapter!

Changing the Probe



PROBE CHANGE FL_BA/PROBE CHANGE THREAD_BA

1. Loosen the nut.
2. Remove the transmitter head from the old probe.
3. On the new probe, make sure that the protection plug is removed and the upper surface of the Process Seal is clean. Also make sure that the spring-loaded pin at the center of the Process Seal is properly inserted.
4. Mount the transmitter head on the new probe.
5. Fasten the nut again.
6. If the new probe is not of the same type as the old one, update the transmitter configuration by setting the Probe Type parameter to the appropriate value:
HART Fast Key sequence [1, 3, 2, 3],
or
RCT Setup/Tank Config.
7. Measure the probe length and enter the measured value:
HART Fast Key sequence [1, 3, 2, 2],
or
RCT Setup/Tank Config.
8. Verify that the transmitter is calibrated.

NOTE

Flexible and Rigid probes require different radar electronics and can not be used with the same transmitter head.

**DIAGNOSTIC
MESSAGES**

Troubleshooting

If there is a malfunction despite the absence of diagnostic messages, see Table 6-1 for information on possible causes.

Table 6-1. Troubleshooting chart

Symptom	Possible cause	Action
No HART communication.	<ul style="list-style-type: none"> • COM Port configuration does not match the connected COM Port. • Cables may be disconnected. • Wrong HART address is used. • Hardware failure. 	<ul style="list-style-type: none"> • Check that correct COM Port is selected in the HART server (see "Specifying the COM Port" on page 4-14. • Check wiring diagram. • Verify that the 250 Ohm resistor is in the loop. • Check cables. • Make sure that correct HART short address is used. Try address=0. • Check Analog Output current value to verify that transmitter hardware works.
Analog Out is set in Alarm.		Use the command "Read Gauge Status" in order to check active errors.
Both P2 and P3 are detected but Interface Level is reported as Not A Number (NAN) in the waveform plot.	Measurement Mode is set to "Level Only".	Set Measurement Mode to "Level and Interface" (see "Basic Configuration" on page 4-9).
Both Level and Interface Level are reported as NAN.	Probe is not connected.	Use the command "Read Gauge Status" and check if error "Probe Failure" is active. If this is the case, check the probe connection.
Both P2 and P3 are detected but the interface level is equal to the product Level.	<ul style="list-style-type: none"> • P3 is identified as a double bounce. • P2 and P3 are very close. 	Adjust thresholds T2 and T3, see "Amplitude Threshold Settings" on page 6-13 for more information.
P2 is detected but Level is incorrectly reported as Full or Empty.		Use the command "Read Gauge Status" and check if the warning "Probe Immersed" is active. If this is the case check that: <ul style="list-style-type: none"> • the transmitter is configured with correct probe type, • the reference pulse (P1) is below amplitude threshold T4. If not, adjust T4 to an appropriate value.
The reference pulse is not detected.	<ul style="list-style-type: none"> • The tank is full. • The transmitter is configured with wrong probe type. • Amplitude Threshold T1 is not correct. 	<ul style="list-style-type: none"> • Check the product level. • Check that correct probe type is configured. • Check Amplitude Threshold T1.
Level accuracy seems off.	<ul style="list-style-type: none"> • Configuration error. 	<ul style="list-style-type: none"> • Check the Reference Gauge Height parameter. • Check status information and diagnostic information.
Integral display does not work.		<ul style="list-style-type: none"> • Check the display configuration. • Check loop power. • Check Display connection.

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Errors

Table 6-2 is a list of diagnostic messages that may be displayed on the Integral Display, on the 375 Field Communicator, in AMS Suite or by the Radar Configuration Tools (RCT) software. **Errors normally result in Analog Output alarm.**

Errors are indicated in RCT by the message "Transmitter malfunction":



To see the error message do one of the following:


- Click the Read Gauge Status icon  in the toolbar at the top of the RCT workspace.
- 1. Open the Advanced section in the RCT workspace Project Bar and click the Device Commands icon,
or
choose the Device Commands option from the View menu.
2. Open the folder named Diag and double-click the Read Gauge Status option.

Table 6-2. Error messages.

Message	Description	Action
Invalid configuration. LCD error code: CNFIG.	At least one configuration parameter is outside allowed range. NOTE: the default values are used until the problem is solved.	<ul style="list-style-type: none"> • Load default database and restart the transmitter. • Contact Saab Rosemount service department if the problem persists.
RAM failure was detected during startup test. LCD error code: 00001.	The transmitter performs an immediate reset.	Contact Rosemount service department.
FEPROM failure was detected during startup test.	The transmitter performs an immediate reset.	Contact Rosemount service department.
Waveform acquisition failure. LCD error code: 00006.	This error is probably caused by hardware failure.	Contact Rosemount service department.
EEPROM factory checksum. LCD error code: 00007.	Checksum error in the factory configuration parameters. Can be caused by power failure during configuration or by hardware error. NOTE: the default values are used until the problem is solved.	Contact Rosemount service department.
EEPROM user checksum error. LCD error code: 00008.	Caused by error in the User Configuration parameters. Can be caused by power failure during configuration or by hardware error. NOTE: the default values are used until the problem is solved	<ul style="list-style-type: none"> • Load default database and restart the transmitter. • Contact Saab Rosemount service department if the problem persists.
Software error. LCD error code: 00010.		Contact Rosemount service department.
Probe failure. LCD error code: 00013.	Probe is not detected.	Check that the probe is correctly mounted (see "Changing the Probe" on page 6-20).

Warnings

Table 6-3 is a list of diagnostic messages that may be displayed on the Integral Display, on the Model 375 Field Communicator or by the Radar Configuration Tools (RCT) software. Warnings are less serious than errors and in most cases do not result in Analog Output alarms.

Warnings are indicated by a message at the bottom of the RCT workspace. To see the warning message do one of the following:


- Click the Read Gauge Status icon  in the toolbar at the top of the RCT workspace.
- 1. Open the Advanced section in the RCT workspace Project Bar and click the Device Commands icon,
 or
 choose the Device Commands option from the View menu.
 2. Open the folder named Diag and double-click the Read Gauge Status option.

Table 6-3. Warning messages.

Message	Description	Action
Reference pulse not found.	Possible cause: <ul style="list-style-type: none"> • Reference pulse immersed in high dielectric liquid. • Wrong threshold level T1. • Hardware error. 	<ul style="list-style-type: none"> • View the waveform plot and check amplitude threshold T1. • Check that the tank is not overfull.
No level pulse is found.	Possible cause: <ul style="list-style-type: none"> • Wrong threshold level T2. • Liquid level in Dead Zone or below probe end. 	<ul style="list-style-type: none"> • View the waveform plot and check amplitude threshold T2.
Interface pulse not found.	Possible cause: <ul style="list-style-type: none"> • Wrong threshold level T3. • Interface level too close to the upper product level. • No level pulse detected. 	<ul style="list-style-type: none"> • View the waveform plot and check amplitude threshold T3.
Internal temperature out of range.	-40 °C<Internal Temperature<85 °C.	Contact Rosemount service department.
Volume computation warning.	<ul style="list-style-type: none"> • Volume configuration error. • Strapping table error. 	<ul style="list-style-type: none"> • Check that correct tank type is selected for volume configuration. • Check that tank dimensions for volume are correct. • If strapping table is used, check the level vs. volume points.
Immersed probe.	<ul style="list-style-type: none"> • Wrong threshold level T4. • Reference pulse immersed in liquid. 	<ul style="list-style-type: none"> • View the waveform plot and check amplitude threshold T4.

Rosemount 3300 Series

Reference Manual
00809-0100-4811, Rev CA
February 2006

Appendix A Reference Data

Specifications	page A-1
Dimensional drawings	page A-7
Ordering Information	page A-12
Spare Parts	page A-18

SPECIFICATIONS

General	
Product	Rosemount Series 3300 Guided Wave Radar Level and Interface Transmitter; Model 3301 for Level (Interface available for fully immersed probe). Model 3302 for Level and Interface.
Measurement principle	Time Domain Reflectometry (TDR).
Reference Conditions	Twin Lead probe, 77 °F (25 °C) water
Microwave Output Power	Nominal 50 µW, Max. 2 mW.
CE-mark	Complies with applicable directives (R&TTE, EMC, ATEX)
Start-up time	< 10 s
Display / Configuration	
Integral Display	The integral display toggles between the following variables: level, distance, volume, internal temperature, interface distance, interface level, peak amplitudes, interface thickness, percent of range, analog current output. Note! The Display can not be used for configuration purposes.
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) and Volume. With fully immersed probe: Interface Level and Interface Distance. Model 3302: Level, Distance (to product surface), Volume, Interface Level, Interface Distance and Upper Product Thickness.
HART® device for remote configuration	Rosemount hand-held communicator Model 375.
PC for remote configuration	Radar Configuration Tools software package. Rosemount AMS software.
Damping	0-60 s (10 s, default value)
Electric	
Power supply	Loop-powered (2-wire), 11 - 42 VDC (11 -30 VDC in IS applications, 16-42 VDC in Explosion-proof/Flame-proof applications).
Output	Analog 4 - 20 mA, HART.
Signal on alarm	Standard: Low=3.75 mA, High=21.75 mA Namur NE 43: Low=3.60 mA, High=22.50 mA.
Saturation levels	Standard: Low=3.9 mA, High=20.8 mA Namur NE 43: Low=3.8 mA, High=20.5 mA.
IS parameters	U _i = 30 V, I _i = 130 mA, P _i = 1 W, L _i = 0, C _i = 0.
Cable entry	½ - 14 NPT for cable glands or conduit entries. Optional: M20 x 1.5 conduit/cable adapter or PG 13.5 conduit/cable adapter.
Output Cabling	Twisted shielded pairs, 18-12 AWG.

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Mechanical	
Probes	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: 1.3 ft (0.4 m) to 9.8 ft (3 m). Flexible Single Lead: 3.3 ft (1 m) to 77.1 ft (23.5 m). For further information see "Probe Selection Guide" on page 2-6.
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).
Material exposed to tank atmosphere	<ul style="list-style-type: none"> • 316/316L SST (EN 1.4404), PTFE, PFA⁽¹⁾ and O-ring materials (model code 1) • Hastelloy[®] C276 (UNS N10276), PTFE, PFA⁽¹⁾ and O-ring materials (model code 2) • Monel[®] 400 (UNS N04400), Teflon (PTFE, PFA) and O-ring materials (model code 3) • PTFE⁽²⁾ (model code 7) • PTFE⁽²⁾, 316L SST (EN 1.4404) and O-ring materials (model code 8) • 316L SST (EN 1.4404), Ceramics (Al₂O₃), Graphite, (HTHP probe, model code H) • 316L SST (EN 1.4404), Ceramics (Al₂O₃), Graphite, PFA (HP probe, model code P) (See "Ordering Information" on page A-12).
Dimensions	See "Dimensional drawings" on page A-7.
Probe angle	0 to 90 degrees from vertical axis.
Housing / Enclosure	Polyurethane-covered Aluminium.
Flanges, Threads	See "Ordering Information" on page A-12.
Height above flange	See "Dimensional drawings" on page A-7.
Environment	
Ambient temperature	-40 °F to +185 °F (-40 °C to +85 °C), depends on approval (see App. B). For the LCD display the temperature range is -4 °F to +185 °F (-20 °C to +85 °C). See temperature diagrams on page A-6.
Storage temperature	-40 °F to + 176 °F (-40 °C to +80 °C).
Process temperature ⁽³⁾	Standard: -40 °F to +302 °F (-40 °C to +150 °C). HTHP: -76 °F to +752 °F (-60 °C to +400 °C). HP: -76 °F to +392 °F (-60 °C to +200 °C). See temperature and pressure diagrams on page A-4.
Process pressure ⁽³⁾	Standard ⁽⁴⁾ : Full vacuum to 580 psig (-1 to 40 Bar). HTHP: Full vacuum to 5000 psig (-1 to 345 Bar). HP: Full vacuum to 5000 psig (-1 to 345 Bar). See temperature and pressure diagrams on page A-4.
Humidity	0 - 100 % relative humidity
Ingress protection	NEMA 4X, IP 66.
Telecommunication (FCC and R&TTE)	FCC part 15 (1998) subpart B and R&TTE (EU directive 97/23/EC). Considered to be an unintentional radiator under the Part 15 rules.
Factory sealed	Yes.
Vibration resistance	IEC 721-3-4 Class 4M4.
Electromagnetic compatibility	Emission and Immunity: meets EN 61326-1 (1997) 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.
Pressure Equipment Directive (PED)	Complies with 97/23/EC article 3.3.
Ordinary Location FM 3810,	Compliance.
Boiler Approval CSA B51-97	Compliance.

Measuring Performance	
Reference accuracy	± 0.2 inch (5 mm) for probes ≤ 16.4 ft (5 m). $\pm 0.1\%$ of measured distance for probes >16.4 ft (5 m).
Repeatability	± 0.04 inch (1 mm).
Ambient Temperature Effect	Less than 0.01 % of measured distance per °C.
Update interval	1 per second
Measuring range	16 inch (0.4 m) to 77 ft (23.5 m).

- (1) PFA is a fluoropolymer with properties similar to PTFE.
- (2) 1 mm PTFE cover.
- (3) Final rating may be lower depending on flange and O-ring selection.
- (4) For PTFE Covered Probe and Flange (model code 7) max pressure is 232 psig (16 Bar).

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Process Temperature and Pressure Rating

The tank connection consists of tank seal and a flange (EN, ANSI, Fisher or Masoneilan) or NPT or BSP/G threads (1 or 1.5 in. depending on probe type, see "Ordering Information".).

Flange dimensions follows standard ANSI B 16.5 and EN 1092-1 type 05 (DIN 2527 type B) blind flanges if the transmitter is ordered with a flange.

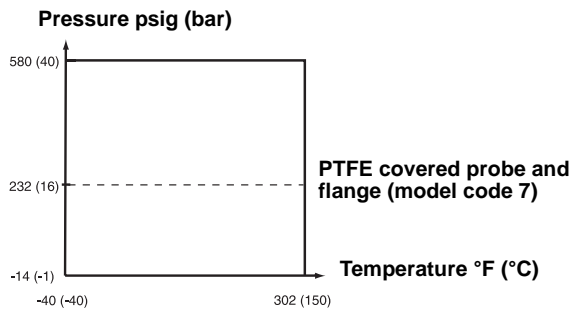
The tables below show temperature and pressure ratings for the following tank connection types:

- Standard (Std)
- High Temperature and High Pressure (HTHP)
- High Pressure (HP)

NOTE!

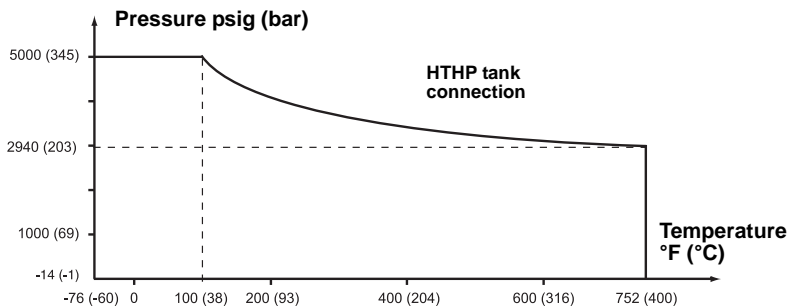
Final rating may be lower depending on flange and o-ring selection.

Figure A-1. Process temperature and pressure diagram for standard tank connections.



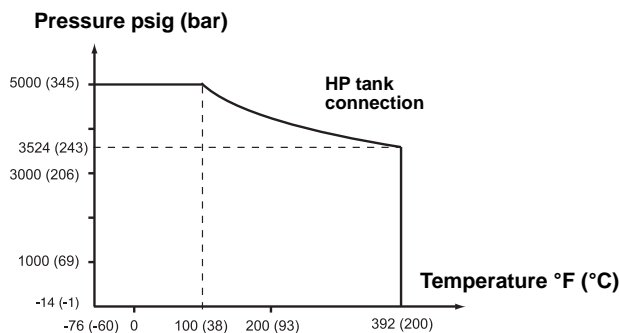
PRESSURE_TEMP_STANDARD.EPS

Figure A-2. Process temperature and pressure diagram for HTHP tank connection.



PRESSURE_TEMP_HTHP.EPS

Figure A-3. Process temperature and pressure diagram for HP tank connection.



PRESSURE_TEMP_HP.EPS

The HP and HTHP versions have a ceramic tank seal, and graphite gaskets - no O-rings are used.

The difference between the HP and HTHP versions is spacer material; PFA for HP, and ceramics for HTHP. Ceramic spacers allow for usage in applications with higher temperature.

The following table gives the temperature ranges for tank seal with different O-ring material (applicable for the Standard Tank Connection):

Table A-1. Temperature range for different tank seal material.

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)

Flange connection rating

Flange strength calculations are made with the following conditions:

	Bolting material	Gasket		Flange material	Hub material
		Standard/HTHP	HP/HTHP		
ANSI	Stainless steel SA193 B8M C1.2	Soft (1a) with min. thickness 1.6 mm.	Spiral wound gasket with nonmetallic filler (1b)	Stainless steel A182 Gr. F316L and EN 10222-5-1.4404.	Stainless steel A479M 316L or EN 10272-1.4404.
EN	EN 1515-1/-2 group 13E0, A4-70.	Soft (EN 1514-1) with min. thickness 1.6 mm.	Spiral wound gasket with nonmetallic filler (EN 1514-2)		

Calculations show that the following rating applies:

ANSI

According to ANSI B16.5 Table 2-2.3.

Standard: max. 302 °F/580 psig (150 °C/40 Bar).

HP/HTHP: Class 2500.

EN

According to EN 1092-1 Table 18, material group 13E0.

Standard: maximum 302 °F/580 psig (150 °C/40 Bar).

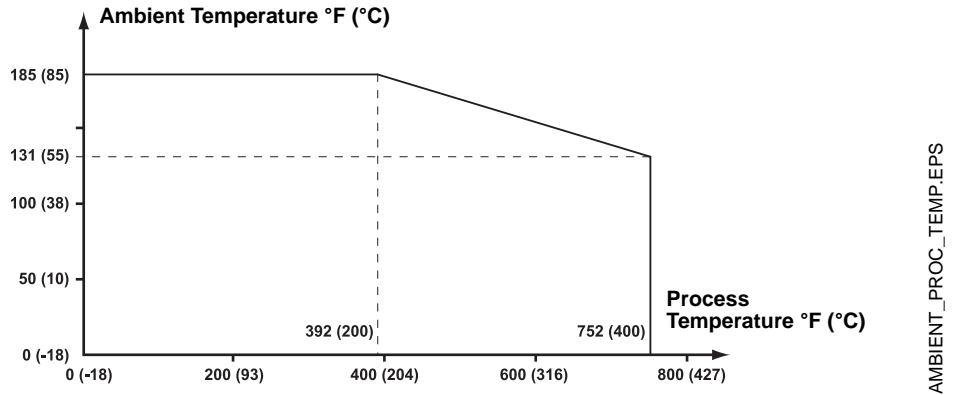
HP/HTHP: PN 320.

Ambient Temperature

When the Rosemount 3300 is installed in high temperature applications, it is important that the maximum ambient temperature is considered. Tank insulation should not exceed 4 inches (10 cm).

The diagram below shows the maximum ambient temperature vs. process temperature:

Figure A-4. Maximum ambient temperature vs. process temperature.

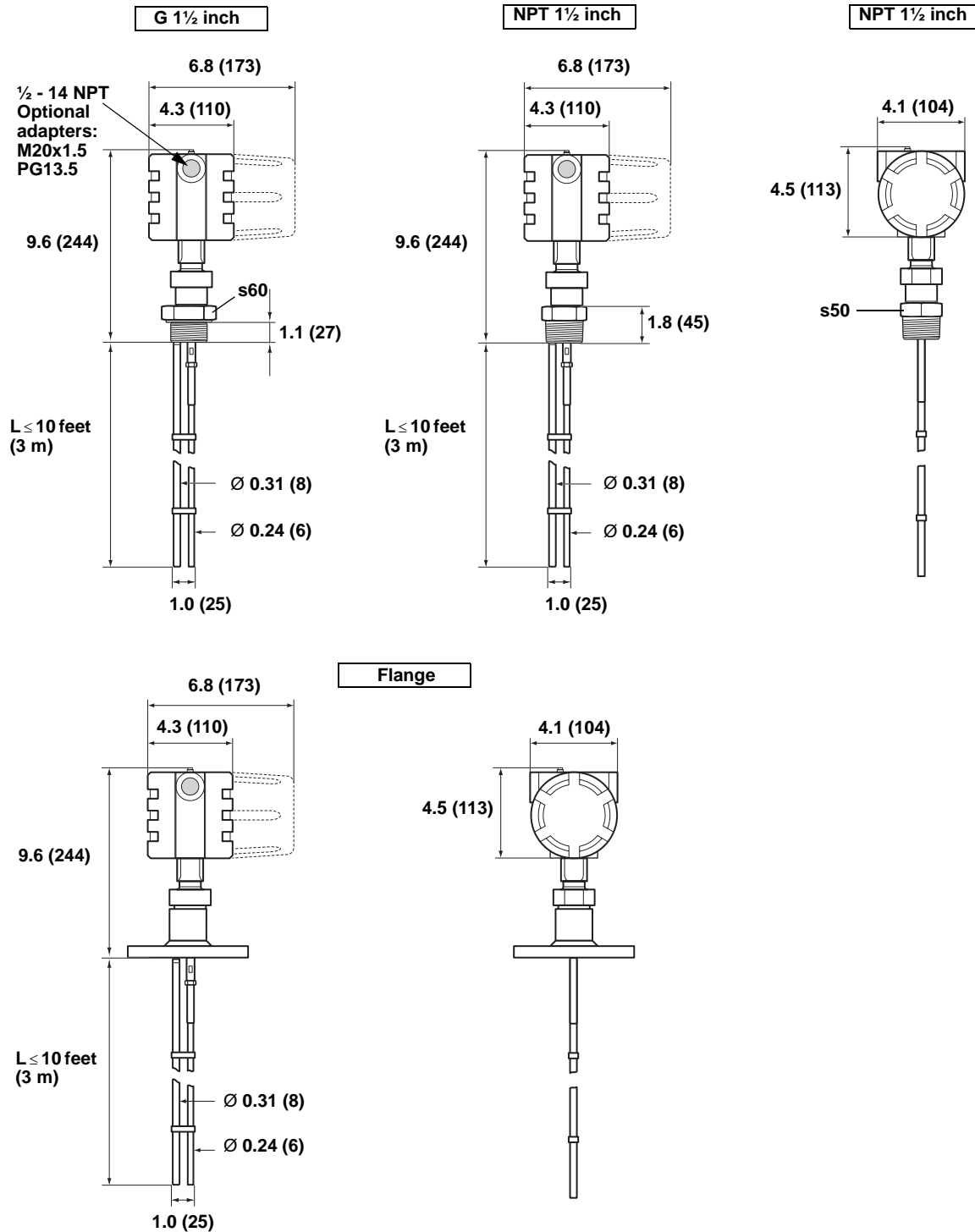


NOTE!

Maximum ambient temperature also depends on hazardous locations certifications.

**DIMENSIONAL
 DRAWINGS**

Figure A-5. Rigid Twin Lead



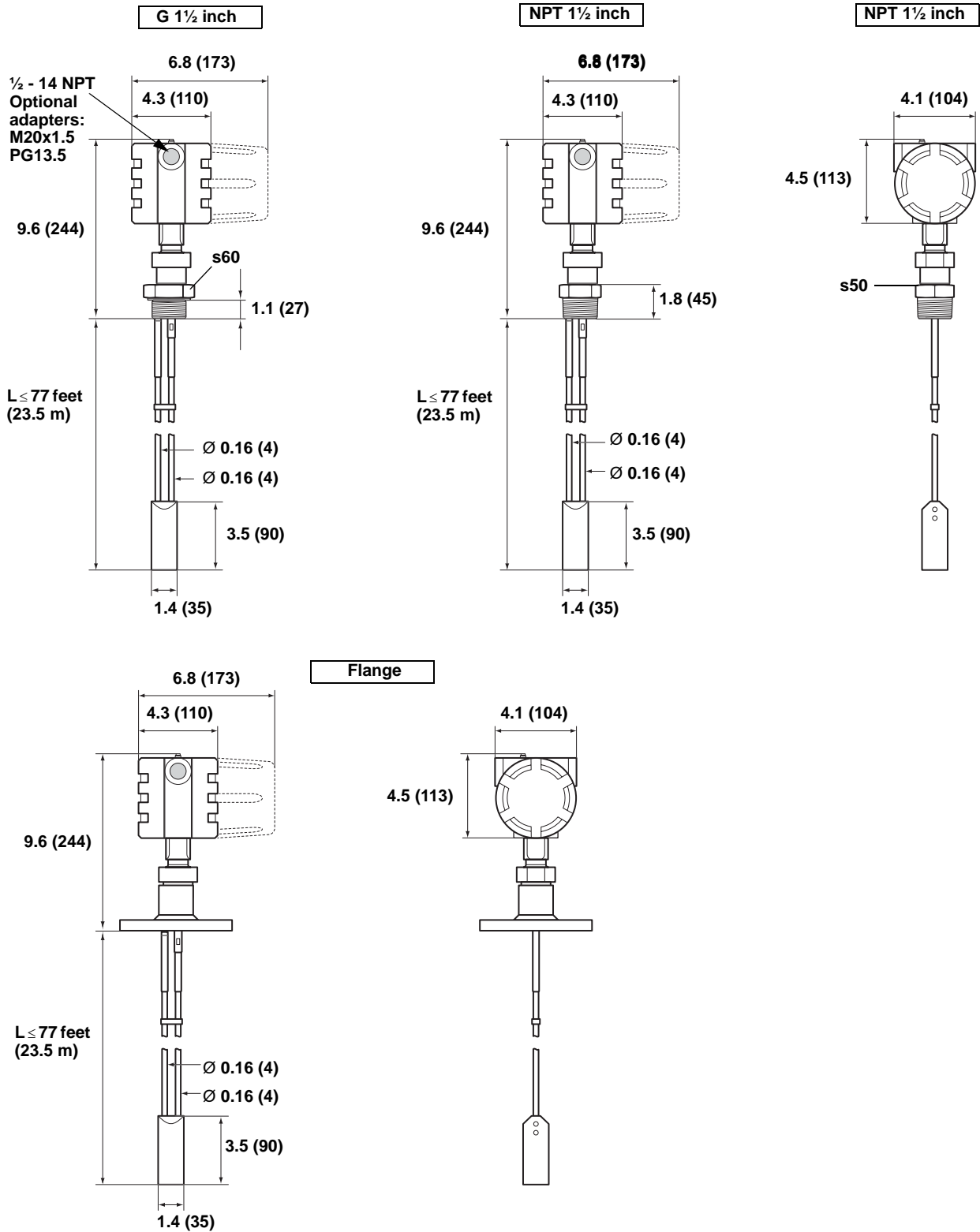
RIGID_TWIN_LEAD.EPS

TWIN-LEAD-FLANGE_CA.EPS

Dimensions are in inches (millimeter).

Rosemount 3300 Series

Figure A-6. Flexible Twin Lead

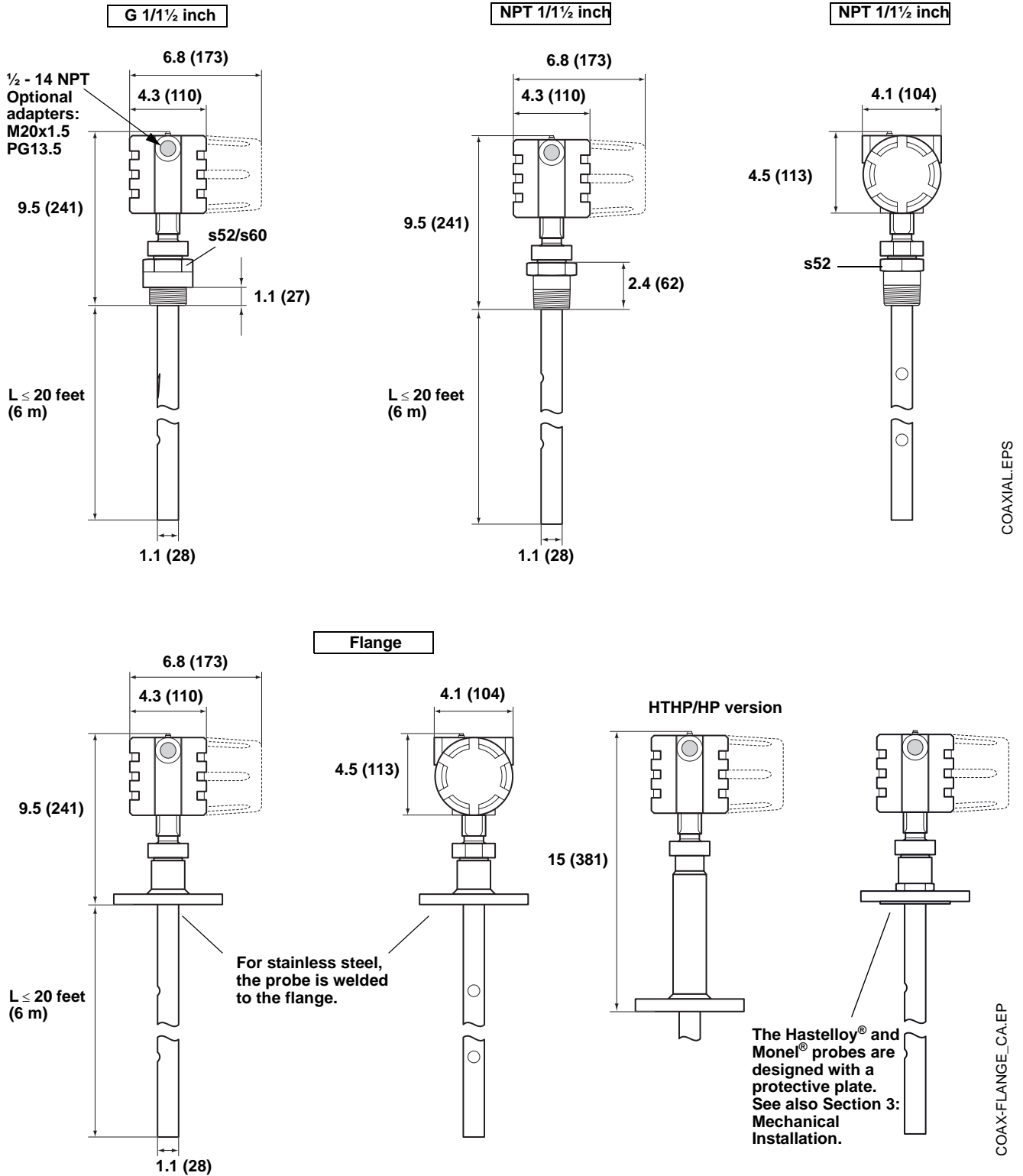


FLEX-TWIN-LEAD.EPS

FLEX-TWIN-LEAD-FLANGE_CA.EPS

Dimensions are in inches (millimeter).

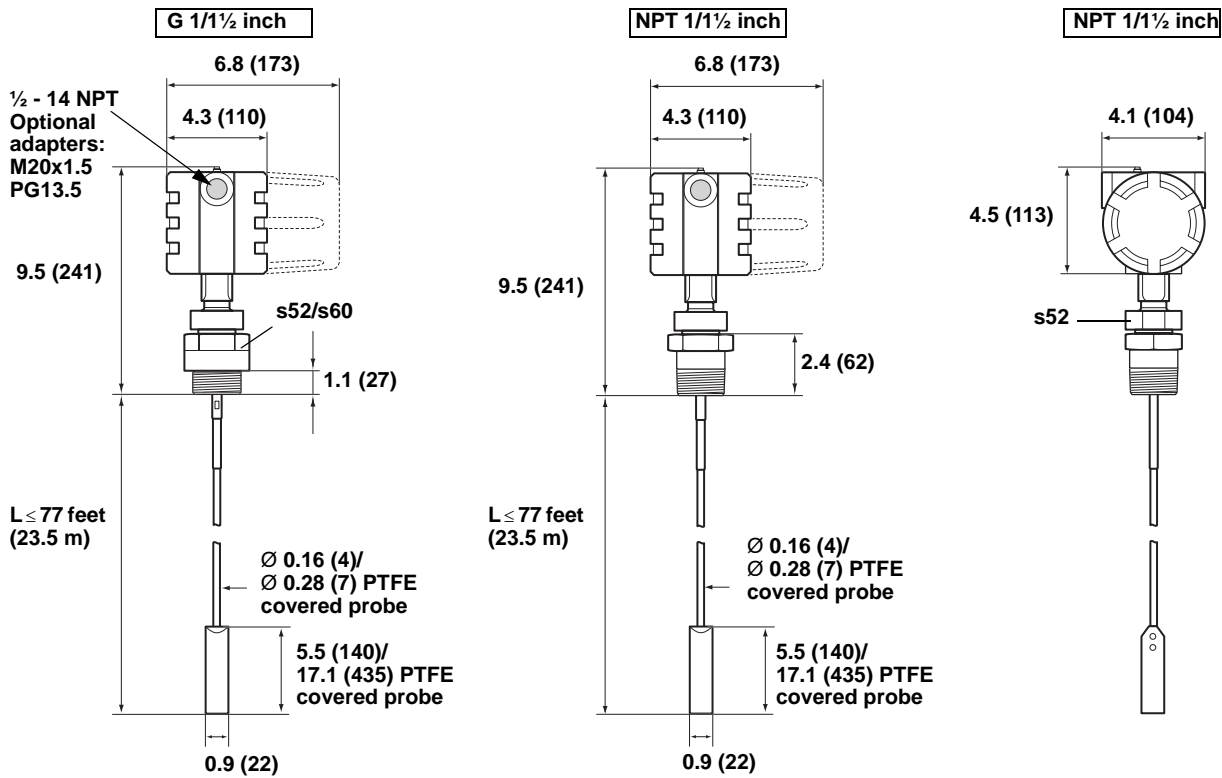
Figure A-7. Coaxial



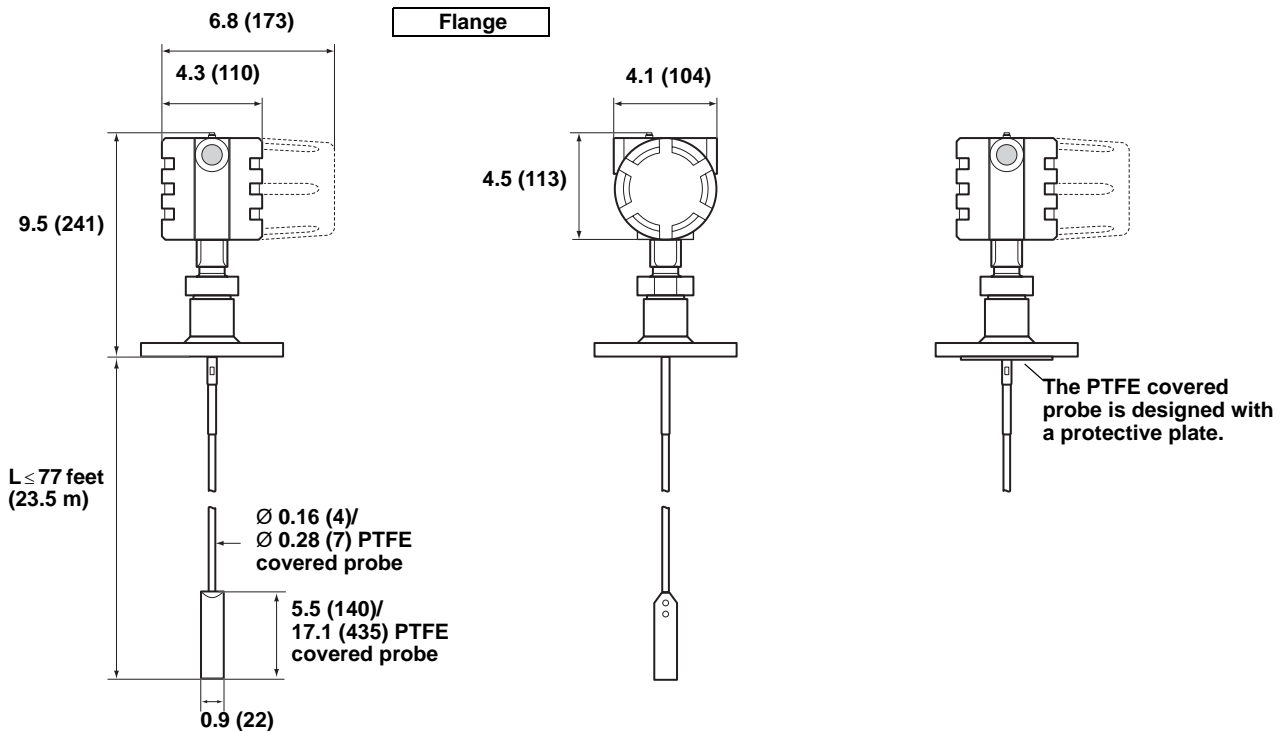
Dimensions are in inches (millimeter).

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Figure A-8. Flexible Single Lead



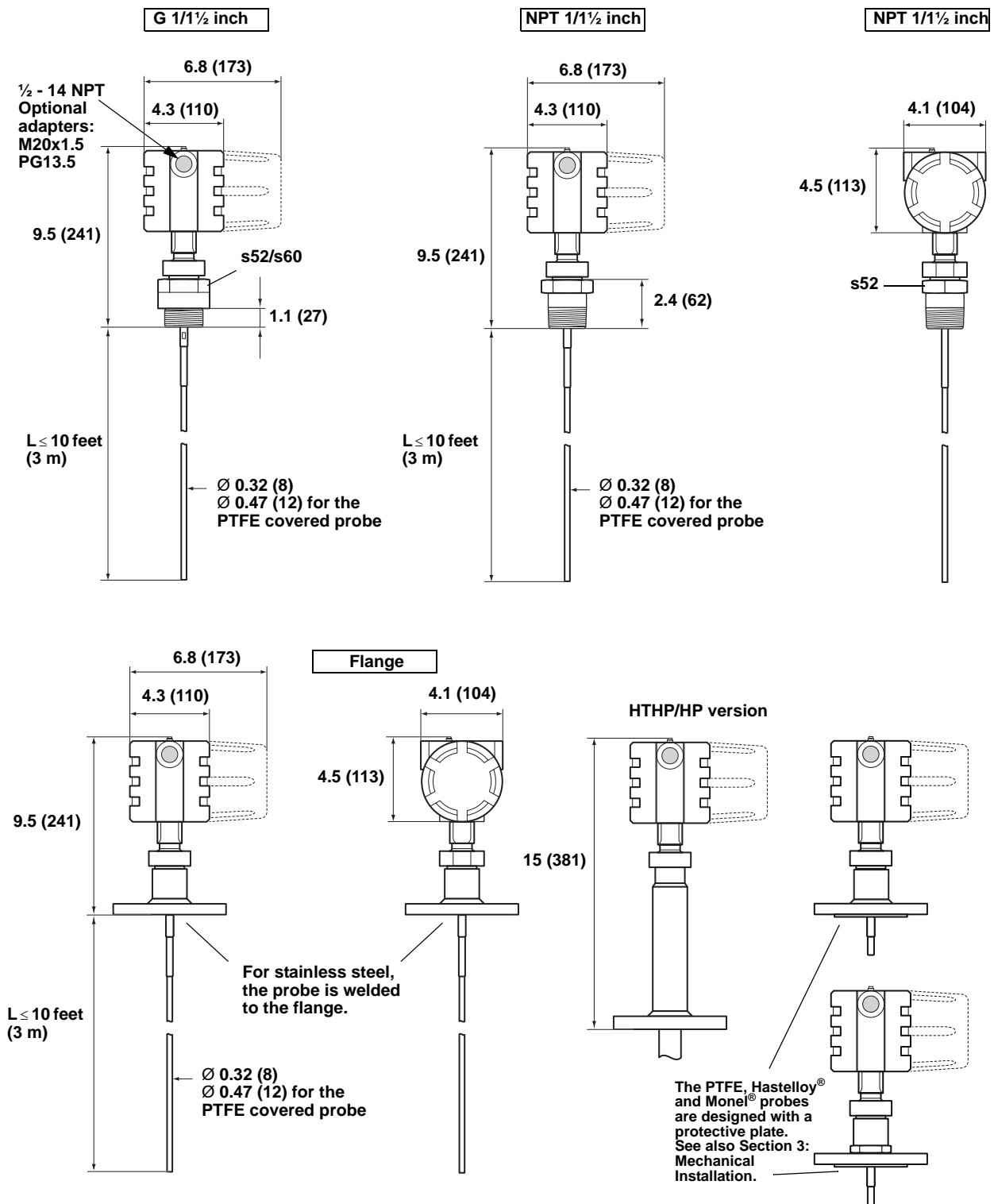
FLEX-SINGLE-LEAD.EPS



FLEX-SINGLE-LEAD-FLANGE_CA.EPS

Dimensions are in inches (millimeter).

Figure A-9. Rigid Single Lead



RIGID-SINGLE-LEAD.EPS

RIGID-SINGLE-LEAD-FLANGE.EPS

Dimensions are in inches (millimeter).

Rosemount 3300 Series

ORDERING INFORMATION

Model Code 3301, Level in Liquids

Model	Product Description		
3301	Guided Wave Radar Level Transmitter (interface available for fully immersed probe)		
Code	Signal Output		
H	4-20 mA with HART® communication		
Code	Housing Material		
A	Polyurethane-covered Aluminum		
Code	Conduit / Cable Threads		
1	½ - 14 NPT		
2	M20 x 1.5 adapter		
3	PG 13.5 adapter		
Code	Operating Temperature and Pressure		
S	- 15 psig (-1bar) to 580 psig (40 bar) @ 302 °F (150 °C) ⁽¹⁾		
H	High Temp / High Pressure ⁽²⁾ : 2940 psi @ 750 °F and 5000 psi @ 100 °F (203 bar @ 400 °C and 345 bar @ 38 °C) according to ANSI Class 2500 (Probe Type 3A, 3B and 4A)		
P	High Pressure ⁽²⁾ . Max 500 °F (200 °C): 3500 psi @ 500 °F and 5000 psi @ 100 °F (243 bar @ 200 °C and 345 bar @ 38 °C) according to ANSI Class 2500 (Probe Type 3A, 3B and 4A)		
Code	Material of Construction ⁽³⁾ : Process Connection / Probe		
1	316 / 316 L SST (EN 1.4404)		
2	Hastelloy® C-276 (UNS N10276). Available for probe type 3A, 3B and 4A.		
3	Monel® 400 (UNS N04400). Available for probe type 3A, 3B and 4A		
7	PTFE covered probe and flange. Available for probe type 4A and 5A, Flanged versions		
8	PTFE covered probe. Available for probe type 4A and 5A		
Code	Sealing, O-ring Material (Consult factory for other o-ring materials)		
N	None ⁽⁴⁾		
V	Viton® fluoroelastomer		
E	Ethylene Propylene		
K	Kalrez® 6375 perfluoroelastomer		
B	Buna-N		
Code	Probe Type	Process Connection	Probe Lengths
1A	Rigid Twin Lead	Flange or 1.5 inch Thread	Min: 1 ft 4 in. (0.4 m). Max: 9 ft 10 in. (3 m)
2A	Flexible Twin Lead with weight	Flange or 1.5 inch Thread	Min: 3 ft 4 in. (1 m). Max: 77 ft 1 in. (23.5 m)
3A	Coaxial	Flange, 1 or 1.5 inch Thread	Min: 1 ft 4 in. (0.4 m). Max: 19 ft 8 in. (6 m)
3B	Coaxial, perforated for easier cleaning	Flange, 1 or 1.5 inch Thread	Min: 1 ft 4 in. (0.4 m). Max: 19 ft 8 in. (6 m)
4A	Rigid Single Lead	Flange, 1 or 1.5 inch Thread	Min: 1 ft 4 in. (0.4 m). Max: 9 ft 10 in. (3 m)
5A	Flexible Single Lead with weight	Flange, 1 or 1.5 inch Thread	Min: 3 ft 4 in. (1 m). Max: 77 ft 1 in. (23.5 m)
5B	Flexible Single Lead with chuck ⁽⁵⁾	Flange, 1 or 1.5 inch Thread	Min: 3 ft 4 in. (1 m). Max: 77 ft 1 in. (23.5 m)
Code	Probe Length Units		
E	English (feet, inch)		
M	Metric (meters, centimeters)		
Code	Total Probe Length ⁽⁶⁾ (feet/m)		
xx	0 - 77 ft or 0-23 m		
Code	Total Probe Length ⁽⁶⁾ (inch/cm)		
xx	0 - 11 inch or 0-99 cm		

Code	Process Connection - Size / Type (consult factory for other process connections)
ANSI Flanges in 316L SST (ASME A182)	
AA	2 inch ANSI, 150 lb
AB	2 inch ANSI, 300 lb
AC	2 inch ANSI, 600 lb (HTHP / HP units)
AD	2 inch ANSI, 900 lb (HTHP / HP units)
AE	2 inch ANSI, 1500 lb (HTHP / HP units)
BA	3 inch ANSI, 150 lb
BB	3 inch ANSI, 300 lb
BC	3 inch ANSI, 600 lb (HTHP / HP units)
BD	3 inch ANSI, 900 lb (HTHP / HP units)
BE	3 inch ANSI, 1500 lb (HTHP / HP units)
CA	4 inch ANSI, 150 lb
CB	4 inch ANSI, 300 lb
CC	4 inch ANSI, 600 lb (HTHP / HP units)
CD	4 inch ANSI, 900 lb (HTHP / HP units)
CE	4 inch ANSI, 1500 lb (HTHP / HP units)
DA	6 inch ANSI, 150 lb
EN (DIN) Flanges in 316L SST (EN 1.4404)	
HB	DN50, PN40
HC	DN50, PN64 (HTHP / HP units)
HD	DN50, PN100 (HTHP / HP units)
IA	DN80, PN16
IB	DN80, PN40
IC	DN80, PN64 (HTHP / HP units)
ID	DN80, PN100 (HTHP / HP units)
JA	DN100, PN16
JB	DN100, PN40
JC	DN100, PN64 (HTHP / HP units)
JD	DN100, PN100 (HTHP / HP units)
KA	DN150, PN16
Threaded Connections	
RA	1 ½ inch NPT thread
RB	1 inch NPT thread (only available for probe type 3A, 3B, 4A, 5A, 5B)
SA	1 ½ inch BSP (G 1 ½ inch) thread
SB	1 inch BSP (G 1 inch) thread (only available for probe type 3A, 3B, 4A, 5A, 5B)
Proprietary Flanges	
TF	Fisher - proprietary 316 Stainless Steel (for 249B cages) Torque Tube Flange
TT	Fisher - proprietary 316 Stainless Steel (for 249C cages) Torque Tube Flange
TM	Masoneilan - proprietary 316 Stainless Steel Torque Tube Flange

- (1) Process seal rating. Final rating depends on flange and O-ring selection. See "Process Temperature and Pressure Rating" on page A-4.
- (2) Requires option None for sealing (no O-ring). Only for SST (Material of Construction model code 1).
- (3) For other materials, consult factory.
- (4) Requires High Temperature High Pressure (code H) or High Pressure (code P) probe.
- (5) Extra length for fastening is added in factory.
- (6) 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.

Rosemount 3300 Series

Code Hazardous Locations Certifications	
NA	No Hazardous Locations Certifications
E1	ATEX Flameproof
E5	FM Explosion Proof
E6	CSA Explosion Proof
E7	IECEx Flameproof
I1	ATEX Intrinsic Safety
I5	FM Intrinsic Safety and Non-Incendive
I6	CSA Intrinsic Safety and Non-Incendive
I7	IECEx Intrinsic Safety
KA	ATEX and CSA Flameproof/Explosionproof
KB	FM and CSA Explosionproof
KC	ATEX and FM Flameproof/Explosionproof
KD	ATEX and CSA Intrinsic Safety
KE	FM and CSA Intrinsic Safety
KF	ATEX and FM Intrinsic Safety
Code Options	
M1	Integral digital display
BT	Bar Code Tag with tag number and purchase order number
P1	Hydrostatic testing
N2	NACE material recommendation per MR 01-75 ⁽¹⁾
LS	Long stud 9.8 in (250 mm) for flex. single lead probe to prevent contact with wall/nozzle. Standard height is 3.9 in (100 mm)
CP	Centering disc PTFE ⁽²⁾⁽³⁾
CS	Centering disc SST ⁽²⁾⁽³⁾
T0	Terminal block without transient protection
Cx - Special Configuration (Software)	
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 ⁽⁴⁾ (standard Rosemount alarm and saturation levels)
Qx - Special Certs	
Q4	Calibration Data Certification
Q8	Material Traceability Certification per EN 10204 3.1B ⁽⁵⁾

- (1) Valid for probe type 3A, 3B and 4A.
- (2) Not available with PTFE covered probes.
- (3) Valid for probe type 2A, 4A and 5A. Flanged connections only.
- (4) The standard alarm setting is high.
- (5) Option available for pressure retaining wetted parts.

Example Model String: 3301-H-A-1-S-1-V-1A-M-02-05-AA-I1-M1C1. E-02-05, means 2 ft and 5 inch probe length. M-02-05, means 2.05 m.

Model Code 3302, Level and Interface in Liquids

Model	Product Description		
3302	Guided Wave Radar Level and Interface Transmitter		
Code	Signal Output		
H	4-20 mA with HART® communication		
Code	Housing Material		
A	Polyurethane-covered Aluminum		
Code	Conduit / Cable Threads		
1	½ - 14 NPT		
2	M20 x 1.5 adapter		
3	PG 13.5 adapter		
Code	Operating Temperature and Pressure		
S	- 15 psig (-1bar) to 580 psig (40 bar) @ 302 °F (150 °C) ⁽¹⁾		
H	High Temp / High Pressure ⁽²⁾ : 2940 psi @ 750 °F and 5000 psi @ 100 °F (203 bar @ 400 °C and 345 bar @ 38 °C) according to ANSI Class 2500 (Probe Type 3A, 3B and 4A)		
P	High Pressure ⁽²⁾ . Max 500 °F (200 °C): 3500 psi @ 500 °F and 5000 psi @ 100 °F (243 bar @ 200 °C and 345 bar @ 38 °C) according to ANSI Class 2500 (Probe Type 3A, 3B and 4A)		
Code	Material of Construction ⁽³⁾ : Process Connection / Probe		
1	316 / 316 L SST (EN 1.4404)		
2	Hastelloy® C-276 (UNS N10276). Available for probe type 3B and 4A.		
3	Monel® 400 (UNS N04400). Available for probe type 3B and 4A		
7	PTFE covered probe and flange. Available for probe type 4A, Flanged version		
8	PTFE covered probe. Available for probe type 4A		
Code	Sealing, O-ring Material (Consult factory for other o-ring materials)		
N	None ⁽⁴⁾		
V	Viton® fluoroelastomer		
E	Ethylene Propylene		
K	Kalrez® 6375 perfluoroelastomer		
B	Buna-N		
Code	Probe Type	Process Connection	Probe Lengths
1A	Rigid Twin Lead	Flange or 1.5 in. Thread	Min: 1 ft 4 in. (0.4 m). Max: 9 ft 10 in. (3 m)
2A	Flexible Twin Lead with weight	Flange or 1.5 in. Thread	Min: 3 ft 4 in. (1 m). Max: 77 ft 1 in. (23.5 m)
3B	Coaxial for interface measurements	Flange, 1 or 1.5 in. Thread	Min: 1 ft 4 in. (0.4 m). Max: 19 ft 8 in. (6 m)
4A	Rigid Single Lead	Flange, 1 or 1.5 in. Thread	Min: 1 ft 4 in. (0.4 m). Max: 9 ft 10 in. (3 m)
Code	Probe Length Units		
E	English (feet, inch)		
M	Metric (meters, centimeters)		
Code	Total Probe Length ⁽⁵⁾ (feet/m)		
xx	0 - 77 ft or 0-23 m		
Code	Total Probe Length ⁽⁵⁾ (inch/cm)		
xx	0 - 11 inch or 0-99 cm		

(1) Process seal rating. Final rating depends on flange and O-ring selection. See "Process Temperature and Pressure Rating" on page A-4.

(2) Requires option None for sealing (no O-ring). Only for SST (Material of Construction model code 1).

(3) For other materials, consult factory.

(4) Requires High Temperature High Pressure (code H) or High Pressure (code P) probe.

(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.

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Code	Process Connection - Size / Type (consult factory for other process connections)
ANSI Flanges in 316L SST (ASME A182)	
AA	2 inch ANSI, 150 lb
AB	2 inch ANSI, 300 lb
AC	2 inch ANSI, 600 lb (HTHP / HP units)
AD	2 inch ANSI, 900 lb (HTHP / HP units)
AE	2 inch ANSI, 1500 lb (HTHP / HP units)
BA	3 inch ANSI, 150 lb
BB	3 inch ANSI, 300 lb
BC	3 inch ANSI, 600 lb (HTHP / HP units)
BD	3 inch ANSI, 900 lb (HTHP / HP units)
BE	3 inch ANSI, 1500 lb (HTHP / HP units)
CA	4 inch ANSI, 150 lb
CB	4 inch ANSI, 300 lb
CC	4 inch ANSI, 600 lb (HTHP / HP units)
CD	4 inch ANSI, 900 lb (HTHP / HP units)
CE	4 inch ANSI, 1500 lb (HTHP / HP units)
DA	6 inch ANSI, 150 lb
EN (DIN) Flanges in 316L SST (EN 1.4404)	
HB	DN50, PN40
HC	DN50, PN64 (HTHP / HP units)
HD	DN50, PN100 (HTHP / HP units)
IA	DN80, PN16
IB	DN80, PN40
IC	DN80, PN64 (HTHP / HP units)
ID	DN80, PN100 (HTHP / HP units)
JA	DN100, PN16
JB	DN100, PN40
JC	DN100, PN64 (HTHP / HP units)
JD	DN100, PN100 (HTHP / HP units)
KA	DN150, PN16
Threaded Connections	
RA	1 ½ inch NPT thread
RB	1 inch NPT thread (only available for probe type 3B and 4A)
SA	1 ½ inch BSP (G 1 ½ inch) thread
SB	1 inch BSP (G 1 inch) thread (only available for probe type 3B and 4A)
Proprietary Flanges.	
TF	Fisher - proprietary 316 Stainless Steel (for cage 249B) Torque Tube Flange
TT	Fisher - proprietary 316 Stainless Steel (for cage 249C) Torque Tube Flange
TM	Masonellan - proprietary 316 Stainless Steel Torque Tube Flange

Hazardous Locations Certifications	
NA	No Hazardous Locations Certifications
E1	ATEX Flameproof
E5	FM Explosion Proof
E6	CSA Explosion Proof
E7	IECEX Flameproof
I1	ATEX Intrinsic Safety
I5	FM Intrinsic Safety and Non-Incendive
I6	CSA Intrinsic Safety and Non-Incendive
I7	IECEX Intrinsic Safety
KA	ATEX and CSA Flameproof/Explosionproof
KB	FM and CSA Explosionproof
KC	ATEX and FM Flameproof/Explosionproof
KD	ATEX and CSA Intrinsic Safety
KE	FM and CSA Intrinsic Safety
KF	ATEX and FM Intrinsic Safety
Options	
M1	Integral digital display
BT	Bar Code Tag with tag number and purchase order number
P1	Hydrostatic testing
N2	NACE material recommendation per MR 01-75 ⁽¹⁾
CP	Centering disc PTFE ⁽²⁾
CS	Centering disc SST ⁽²⁾
T0	Terminal block without transient protection
Cx - Special Configuration (Software)	
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 ⁽³⁾ (standard Rosemount alarm and saturation levels)
Qx - Special Certs	
Q4	Calibration Data Certification
Q8	Material Traceability Certification per EN 10204 3.1B ⁽⁴⁾

(1) Valid for probe type 3B and 4A.

(2) Valid for probe type 2A, 4A and 5A. Flanged connections only.

(3) The standard alarm setting is high.

(4) Option available for pressure retaining wetted parts.

Example Model String: 3302-H-A-1-S-1-V-1A-M-02-05-AA-I1-M1C1. E-02-05 means 2 ft and 5 inch probe length. M-02-05 means 2.05 m.

Rosemount 3300 Series

SPARE PARTS

Spare parts list Transmitter head Model 3301/3302

Model	Product Description		
3301	Transmitter head Model 3301		
3302	Transmitter head Model 3302		
Code	Signal Output		
H	4-20 mA with HART communication		
Code	Housing Material		
A	Polyurethane-covered Aluminum		
Code	Conduit Threads/Cable Threads		
1	½ - 14 NPT		
2	M20x1.5 adapter		
3	PG 13.5 adapter		
Code	Operating Temperature and Pressure		
N	Not applicable		
Code	Material of Construction: Process Connection/Probe		
0	Not applicable		
Code	Sealing, O-ring Material (Consult factory for other o-ring materials)		
N	Not applicable		
Code	Probe Type	Applicable for Model	Allowable Process Connection
9R	For rigid probes	3301 & 3302	Flange or 1.5 " Thread
9F	For flexible probes	3301 & 3302	Flange or 1.5 " Thread
Code	Probe Length Unit		
N	Not applicable		
Code	Total Probe Length (feet/m)		
00	Not applicable		
Code	Total Probe Length (inch/cm)		
00	Not applicable		
Code	Hazardous Locations Certifications		
NA	No hazardous Locations Certifications		
E1	ATEX Flame-proof		
E5	FM Explosion-proof		
E6	CSA Explosion-proof		
E7	IECEX Flame-proof		
I1	ATEX Intrinsic Safety		
I5	FM Intrinsic Safety and Non-Incendive		
I6	CSA Intrinsic Safety and Non-Incendive		
I7	IECEX Intrinsic Safety		
KA	ATEX and CSA Flame-proof/Explosion-proof		
KB	FM and CSA Explosion-proof		
KC	ATEX and FM Flame-proof/Explosion-proof		
KD	ATEX and CSA Intrinsic Safety		
KE	FM and CSA Intrinsic Safety		
KF	ATEX and FM Intrinsic Safety		

Code	Options
M1	Integral Digital Display
BT	Bar Code Tag
T0	Terminal block without transient protection
Cx - Special Configuration (Software)	
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 ⁽¹⁾ (standard Rosemount alarm and saturation levels)
Cx - Special Certs	
Q4	Calibration Data Certification

(1) The standard alarm setting is high.

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Spare parts list Probe Model 3301/3302

Model	Product Description			
3309	Spare probe			
Code	Signal Output			
N	Not applicable			
Code	Housing Material			
N	Not applicable			
Code	Conduit Threads/Cable Threads			
0	Not applicable			
Code	Operating Temperature and Pressure			
S	Standard: -15 psig (-1 Bar) to 580 psig (40 Bar) @ 302 °F (150 °C) ⁽¹⁾			
H	High Temp / High Pressure			
P	High Pressure			
Code	Material of Construction: Process Connection/Probe			
1	316 / 316L SST (EN 1.4404), Teflon (PTFE, PFA)			
2	Hastelloy C276, Teflon (PTFE, PFA). Available for probe type 3A, 3B and 4A (with plate design if not threaded)			
3	Monel 400, Teflon (PTFE, PFA). Available for probe types 3A, 3B and 4A (with plate design if not threaded)			
7	PTFE Covered Probe and Flange valid for probe 4A, 5A flanged version only (with plate design)			
8	PTFE Covered Probe and Flange valid for probe 4A, 5A			
Code	Sealing, O-ring Material (Consult factory for other o-ring materials)			
V	Viton			
E	Ethylene Propylene			
K	Kalrez 6375			
B	Buna-N			
N	None (HP/HTHP)			
Code	Probe Type	Applicable for Model	Allowable Process Connection	Probe Length
1A	Rigid Twin Lead.	3301 & 3302	Flange or 1.5 " Thread	Min: 1 ft 11 inch (0.6 m) Max: 9 ft 10 inch (3 m)
2A	Flexible Twin Lead with weight	3301 & 3302	Flange or 1.5 " Thread	Min: 3 ft 3 inch (1 m) Max: 65 ft 7 inch (20 m)
3A	Coaxial	3301	Flange or 1", 1.5 " Thread	Min: 1 ft 3 inch (0.4 m) Max: 19 ft 8 inch (6 m)
3B	Coaxial perforated, for interface or easier cleaning	3301 & 3302	Flange or 1", 1.5 " Thread	Min: 1ft 3 inch (0.4 m) Max: 19 ft 8 inch (6 m)
4A	Rigid Single Lead	3301	Flange or 1", 1.5 " Thread	Min: 1 ft 11 inch (0.6 m) Max: 9 ft 10 inch (3 m)
5A	Flexible Single Lead with weight d=4 mm	3301	Flange or 1", 1.5 " Thread	Min: 3 ft 3 inch (1 m) Max: 65 ft 7 inch (20 m)
5B	Flexible Single Lead with chuck d=4 mm ⁽²⁾	3301	Flange or 1", 1.5 " Thread	Min: 3 ft 3 inch (1 m) Max: 65 ft 7 inch (20 m)
Code	Probe Length Unit			
E	English (feet, inch)			
M	Metric (meters, centimeters)			
Code	Total Probe Length ⁽³⁾ (feet/m)			
xx	0-65 feet or 0-20 m			
Code	Total Probe Length ⁽³⁾ (inch/cm)			
xx	0-11 inches or 0-99 centimeters			

(1) Process seal rating. Final rating depends on flange and O-ring selection, see "Process Temperature and Pressure Rating" on page A-4.

(2) Extra length for fastening is added in factory.

(3) Probe weight included if applicable. Give the total probe length in feet and inches or meters and centimeters, depending on selected probe length unit (see Model String Example). 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.

Reference Manual

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Rosemount 3300 Series

Code	Process Connection - Size/Type (consult factory for other process connections)
ANSI Flanges in ASME A182 Gr. F316L SST	
AA	2 inch ANSI, 150 lb
AB	2 inch ANSI, 300 lb
AC	2 inch ANSI, 600 lb (HTHP / HP)
AD	2 inch ANSI, 900 lb (HTHP / HP)
AE	2 inch ANSI, 1500 lb (HTHP / HP)
BA	3 inch ANSI, 150 lb
BB	3 inch ANSI, 300 lb
BC	3 inch ANSI, 600 lb (HTHP / HP)
BD	3 inch ANSI, 900 lb (HTHP / HP)
BE	3 inch ANSI, 1500 lb (HTHP / HP)
CA	4 inch ANSI, 150 lb
CB	4 inch ANSI, 300 lb
CC	4 inch ANSI, 600 lb (HTHP / HP)
CD	4 inch ANSI, 900 lb (HTHP / HP)
CE	4 inch ANSI, 1500 lb (HTHP / HP)
DA	6 inch ANSI, 150 lb
EN (DIN) Flanges in 10222-5-1.4404 SST	
HB	DN50, PN40
HC	DN50, PN64 (HTHP / HP)
HD	DN50, PN100 (HTHP / HP)
IA	DN80, PN16
IB	DN80, PN40
IC	DN80, PN64
ID	DN80, PN100
JA	DN100, PN16
JB	DN100, PN40
JC	DN100, PN64 (HTHP / HP)
JD	DN100, PN100 (HTHP / HP)
KA	DN150, PN16
Proprietary Flanges	
TF	Fisher - Proprietary 316 Stainless Steel (for cage 249B) Torque Tube Flange. Outer diameter: 9.0 in. (228.6 mm).
TT	Fisher - Proprietary 316 Stainless Steel (for cage 249C) Torque Tube Flange. Outer diameter: 5.7 in. (144.5 mm).
TM	Masoneilan - Proprietary 316 Stainless Steel Torque Tube Flange. Outer diameter: 7.5 in. (191 mm).
Threaded	
RA	1.5 inch NPT thread
RB	1 inch NPT thread (only available for probe type 3A, 3B, 4A, 5A, 5B)
SA	1½ inch BSP (G 1½ inch) thread
SB	1 inch BSP (G 1 inch) thread (only available for probe type 3A, 3B, 4A, 5A, 5B)
Antenna with plate design for customer supplied flange	
PA	Antenna with 2 in. / DN50 plate
PB	Antenna with 3 in. / DN80 plate
PC	Antenna with 4 in. / DN100 plate
PD	Antenna with 6 in. / DN150 plate
PE	Antenna with 8 in. / DN200 plate

Rosemount 3300 Series

Hazardous Locations Certifications	
NA	Not applicable
Options	
P1	Hydrostatic testing
N2	NACE material recommendation per MR 01-75 ⁽¹⁾
LS	Long Stud 9.8 in. (250 mm) for Flexible Single Lead probe. Prevents the wire from contacting wall/nozzle. Standard height is 3.9 in. (100 mm).
CP	Centering disc PTFE ⁽²⁾
CS	Centering disc SST ⁽²⁾
Qx - Special Certs	
Q8	Material Traceability Certification per EN 10204 3.1B ⁽³⁾

- (1) Valid for probe type 3A, 3B and 4A.
 (2) Valid for probe type 2A, 4A and 5A. Flanged connections only.
 (3) Option available for pressure retaining wetted parts

Spare parts list Other Spares and Accessories Model 3301/3302

Code	Process Connection - Size/Type (consult factory for other process connections)
Display kit and covers	
03300-0670-0002	Integral Display Kit (including cover)
03300-0670-0001	Integral Display Kit (does not include cover)
03300-7002-0001	Integral Display Cover (long)
03300-7002-0002	Electronics cover
03300-7002-0003	O-ring for Electronics cover, Integral display cover (pkg of 12)
Other spares	
03300-7003-0001	Transient Terminal block assembly
03300-7001-0001	End piece kit Rigid Twin lead
03300-7001-0002	Weight kit Flexible Twin lead
03300-7001-0003	Weight kit Flexible Single lead
Other accessories	
03300-7004-0001	Viatec HART Modem and cables (RS 232 connection)
03300-7004-0002	Viatec HART Modem and cables (USB connection)
00822-0100-4747	Rosemount Radar Configuration Tool (RCT)
Cable glands	
03300-7000-0001	Cable Gland 8-15mm, 1/2NPT Mo Brass Nickel Plated, KV1
03300-7000-0002	Cable Gland 4-8mm, 1/2NPT Brass, KVE7, EExd
03300-7000-0003	Cable Gland 8-11mm, 1/2NPT Brass, KVE8, EExd
03300-7000-0004	Cable Gland 6-12mm, 1/2 NPT Polyamide Grey
Centering discs⁽¹⁾	
03300-1655-0001	Kit, 2 Inch Centering Disk, SS, Rigid Single
03300-1655-0002	Kit, 3 Inch Centering Disk, SS, Rigid Single
03300-1655-0003	Kit, 4 Inch Centering Disk, SS, Rigid Single
03300-1655-0004	Kit, 6 Inch Centering Disk, SS, Rigid Single
03300-1655-0005	Kit, 8 Inch Centering Disk, SS, Rigid Single
03300-1655-0006	Kit, 2 Inch Centering Disk, PTFE, Rigid Single
03300-1655-0007	Kit, 3 Inch Centering Disk, PTFE, Rigid Single
03300-1655-0008	Kit, 4 Inch Centering Disk, PTFE, Rigid Single
03300-1655-0009	Kit, 6 Inch Centering Disk, PTFE, Rigid Single
03300-1655-0010	Kit, 8 Inch Centering Disk, PTFE, Rigid Single
03300-1655-1001	Kit, 2 Inch Centering Disk, SS, Single / Twin Flex Lead
03300-1655-1002	Kit, 3 Inch Centering Disk, SS, Single / Twin Flex Lead
03300-1655-1003	Kit, 4 Inch Centering Disk, SS, Single / Twin Flex Lead
03300-1655-1004	Kit, 6 Inch Centering Disk, SS, Single / Twin Flex Lead
03300-1655-1005	Kit, 8 Inch Centering Disk, SS, Single / Twin Flex Lead
03300-1655-1006	Kit, 2 Inch Centering Disk, PTFE, Single / Twin Flex Lead
03300-1655-1007	Kit, 3 Inch Centering Disk, PTFE, Single / Twin Flex Lead
03300-1655-1008	Kit, 4 Inch Centering Disk, PTFE, Single / Twin Flex Lead
03300-1655-1009	Kit, 6 Inch Centering Disk, PTFE, Single / Twin Flex Lead
03300-1655-1010	Kit, 8 Inch Centering Disk, PTFE, Single / Twin Flex Lead

(1) If a centering disc is required for a flanged probe the centering disc can be ordered with options CS or CP 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.

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Appendix B Product Certifications

Safety Messages	page B-1
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European ATEX Directive Information	page B-3
Hazardous Locations Certifications	page B-5
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Approval Drawings	page B-11

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury:

Verify that the operating environment of the gauge is consistent with the appropriate hazardous locations certifications.

Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.

Do not remove the gauge cover in explosive atmospheres when the circuit is alive.

⚠ WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury:

Make sure the transmitter is installed by qualified personnel and in accordance with applicable code of practice.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

Do not perform any service other than those contained in this manual unless you are qualified.

⚠ CAUTION

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

⚠ WARNING

High voltage that may be present on leads could cause electrical shock:

Avoid contact with leads and terminals.

Make sure the main power to the Radar Transmitter is off and the lines to any other external power source are disconnected or not powered while wiring the transmitter.

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.

EU CONFORMITY

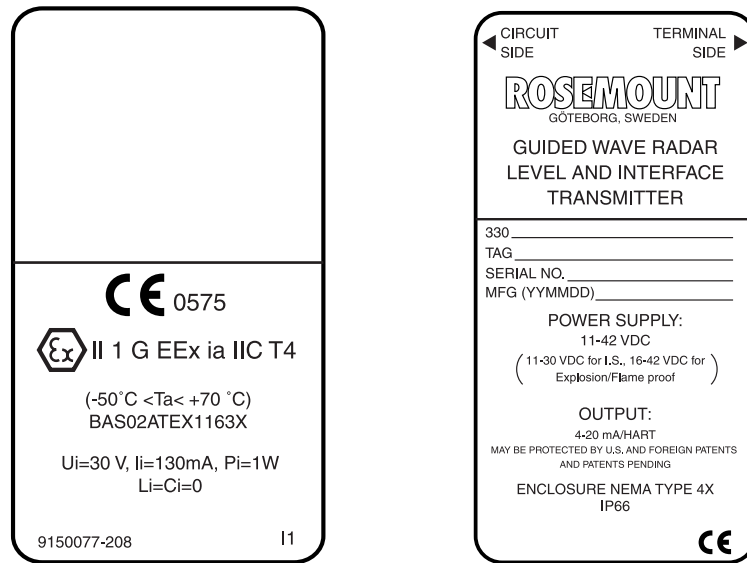
The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales representative.

**EUROPEAN ATEX
 DIRECTIVE
 INFORMATION**

Intrinsic Safety

The Rosemount 3300 Series Guided Wave Radar Level and Interface Transmitter that has the following label attached has been certified to comply with Directive 94/9/EC of the European Parliament and the Council as published in the Official Journal of the European Communities No. L 100/1 on 19-April-1994.

Figure B-1. Approval Label ATEX (BASEEFA) and Name Plate



APPROVALS-ATEX_BAS_11/NAMEPLATE

The following information is provided as part of the label of the transmitter:

- Name and address of the manufacturer (Rosemount).
- CE Conformity Marking



- Complete model number
- The serial number of the device
- Year of construction
- Marking for explosion protection:



- EEx ia IIC T4 (-50 °C ≤ Ta ≤ +70 °C)
 Ui=30 V, li=130 mA, Pi=1 W, Ci=0, Li=0
- BASEEFA ATEX certificate number: BAS02ATEX1163X

Special Conditions for Safe Use (X):

The apparatus is not capable of withstanding the 500 V test as defined in clause 6.4.12 of EN 50020. This must be considered during installation.

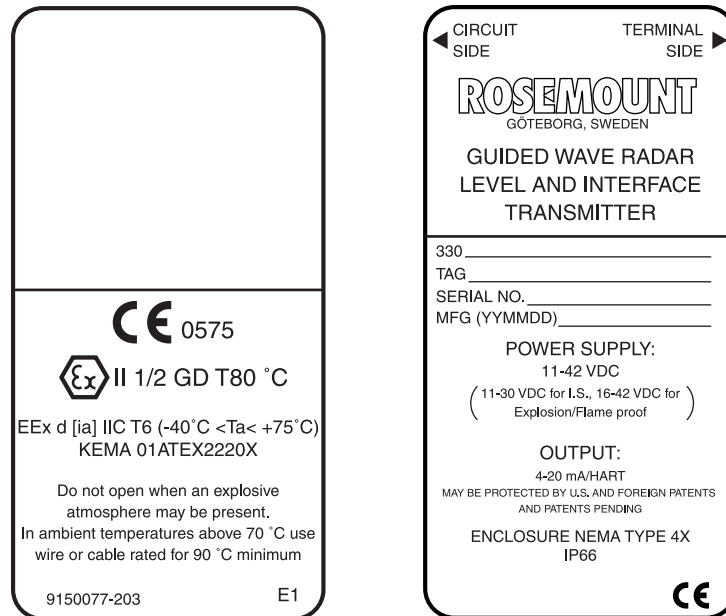
When used in a potentially explosive atmosphere where the use of equipment-category 1 apparatus is required, appropriate measures must be taken to prevent electrostatic discharge.

Rosemount 3300 Series

Flameproof

The Rosemount 3300 Series Guided Wave Radar Level and Interface Transmitter that has the following label attached has been certified to comply with Directive 94/9/EC of the European Parliament and the Council as published in the Official Journal of the European Communities No. L 100/1 on 19-April-1994.

Figure B-2. Approval Label
ATEX (KEMA) and Name Plate



APPROVALS-ATEX_KEMA_E1/NAMEPLATE

The following information is provided as part of the label of the transmitter:

- Name and address of the manufacturer (Rosemount).
- CE Conformity Marking

CE 0575

- Complete model number
- The serial number of the device
- Year of construction
- Marking for explosion protection:

Ex II 1/2 GD T80 °C

- EEx d [ja] IIC T6 (-40 °C <Ta < +75 °C)
- KEMA ATEX certificate number: KEMA 01ATEX2220X
- $U_m=250$ V.

Special Conditions for Safe Use (X):

When used in a potentially explosive atmosphere where the use of equipment-category 1 apparatus is required, appropriate measures must be taken to prevent electrostatic discharge.

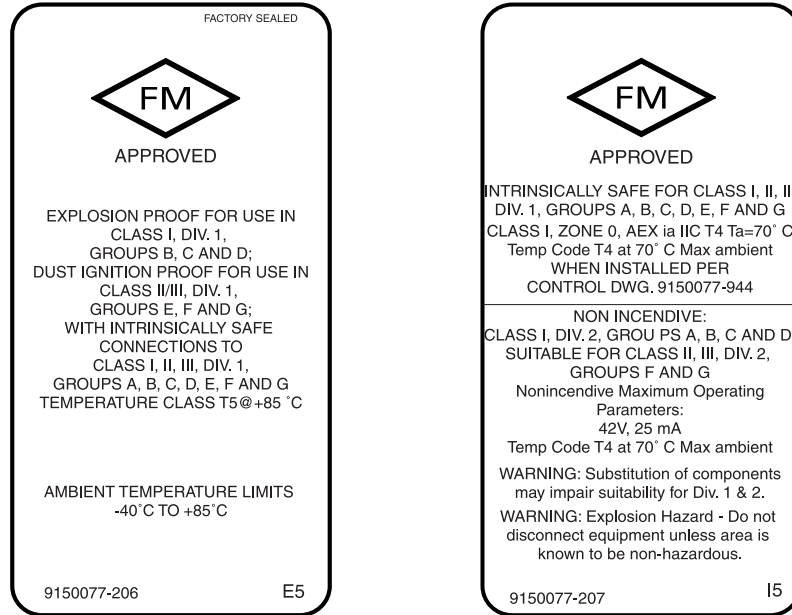
**HAZARDOUS
 LOCATIONS
 CERTIFICATIONS**

**Factory Mutual (FM)
 Approvals**

The Rosemount 3300 Series Guided Wave Radar Level and Interface Transmitters that have the following labels attached have been certified to comply with the requirements of the approval agencies noted.

Project ID: 3013394

Figure B-3. Approval Labels
 Factory Mutual (FM)



APPROVALS-FM_E5, FM_I5

For connection in ambients above 70 °C, use wiring rated for 90 °C minimum.

- E5** Explosion-Proof for Class I, Division 1, Groups B, C and D.
 Dust-Ignition proof for Class II/III, Division 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: -40°C to + 85°C
 Factory Sealed.
- I5** Intrinsically Safe for Class I, II, III, Division 1, Groups A, B, C, D, E, F and G.
 Intrinsically Safe for Class I, Zone 0, AEX ia IIC T4 Ta=70°C.
 Temperature code T4 at 70°C max ambient.
 Control Drawing: 9150077-944.
 Non-incendive for Class I, Division 2, Groups A, B, C and D.
 Suitable for Class II, III, Division 2, Groups F and G.
 Non-incendive maximum operating parameters: 42 V, 25 mA.
 Temperature code T4 at 70°C max ambient.

Rosemount 3300 Series

Canadian Standards Association (CSA) Approval

Cert. no. 2002.1250250.

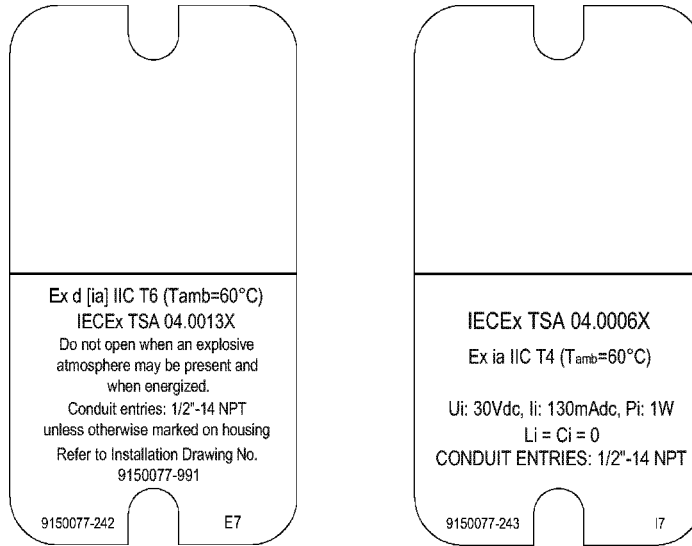
Figure B-4. Approval Label
Canadian Standards Association (CSA)



- E6** Explosion-Proof for Class I, Division 1, Groups C and D.
Dust-Ignition proof for Class II, Division 1 and 2, Groups G and Coal Dust.
Dust-Ignition proof for Class III, Division 1, Hazardous Locations [Ex ia IIC T6].
Ambient temperature limits: -40°C to + 85°C.
Factory Sealed.
- I6** Intrinsically Safe: Ex ia IIC T4.
Intrinsically Safe for Class I, Division 1, Groups A, B, C and D.
Temperature code T4.
Control Drawing: 9150077-945.
Non-incendive for Class III, Division 1, Hazardous Locations.
Non-incendive for Class I, Division 2, Groups A, B, C and D.
Ambient temperature limits: -40 °C to + 70 °C.

IECEX Approval

Figure B-5. Approval Labels
IECEX.



APPROVALS-IECEX_E7.TIF, IECEX_I7.TIF

E7 Flameproof:

Ex d [ia] IIC T6 ($T_{amb} = +60\text{ °C}$).
IECEX TSA 04.0013X.

Conditions of Certification

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 mm² 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 $U_m=250\text{ V}$.

I7 Intrinsic Safety:

Ex ia IIC T4 ($T_{amb} = +60\text{ °C}$).
IECEX TSA 04.0006X.
 $U_i=30\text{ V}$, $I_i=130\text{ mA}$, $P_i=1\text{ W}$, $C_i=0\text{ nF}$, $L_i=0\text{ mH}$.

Conditions of Certification

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 mm² minimum cross-sectional area.

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

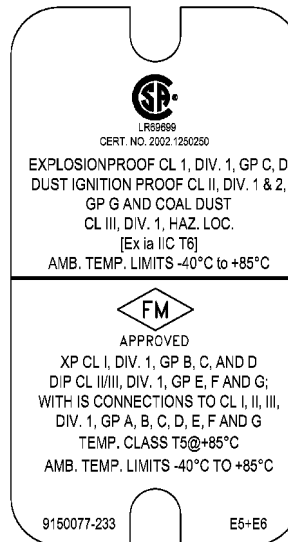
COMBINATION OF APPROVALS

Figure B-6. Approval Label
ATEX Flame-Proof and
Canadian Standards Association
(CSA) Explosion-Proof.



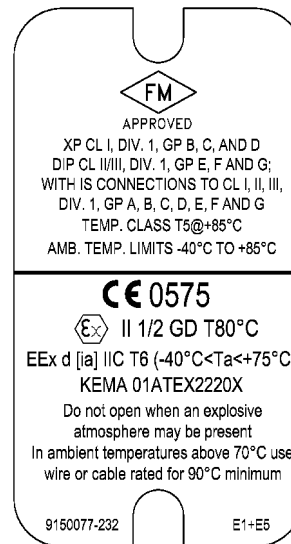
ATEX_CSA_E1_E6.TIF

Figure B-7. Approval Label
CSA Explosion-Proof and
FM Explosion-Proof.



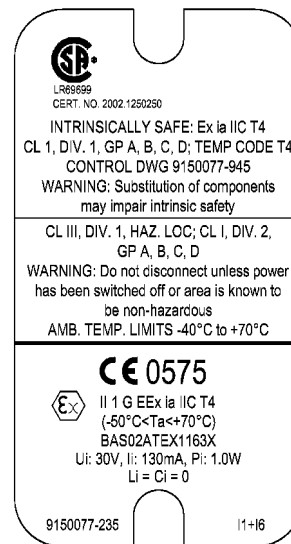
FM_CSA_E5_E6.TIF

Figure B-8. Approval Label
 ATEX Flame-Proof and
 FM Explosion-Proof.



ATEX_FM_E1_E5.TIF

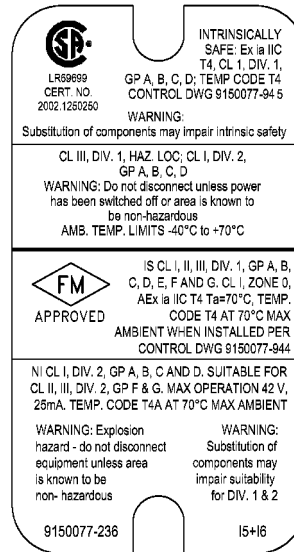
Figure B-9. Approval Label
 ATEX Intrinsic Safety and
 CSA Intrinsic Safety.



ATEX_CSA_I1_I6.TIF

Rosemount 3300 Series

Figure B-10. Approval Label
FM Intrinsic Safety and
CSA Intrinsic Safety.



FM_CSA_I5_I6.TIF

Figure B-11. Approval Label
ATEX Intrinsic Safety and
FM Intrinsic Safety.



ATEX_FM_I1_I5.TIF

APPROVAL DRAWINGS

This section contains Factory Mutual installation drawings and Canadian Standards installation drawings. You must follow the installation guidelines presented in order to maintain certified ratings for installed transmitters.

This section contains the following drawings:

Saab Rosemount drawing 9150077-944, Issue 1:

System Control Drawing for hazardous location installation of intrinsically safe FM approved apparatus.

Saab Rosemount drawing 9150077-945, Issue 1:

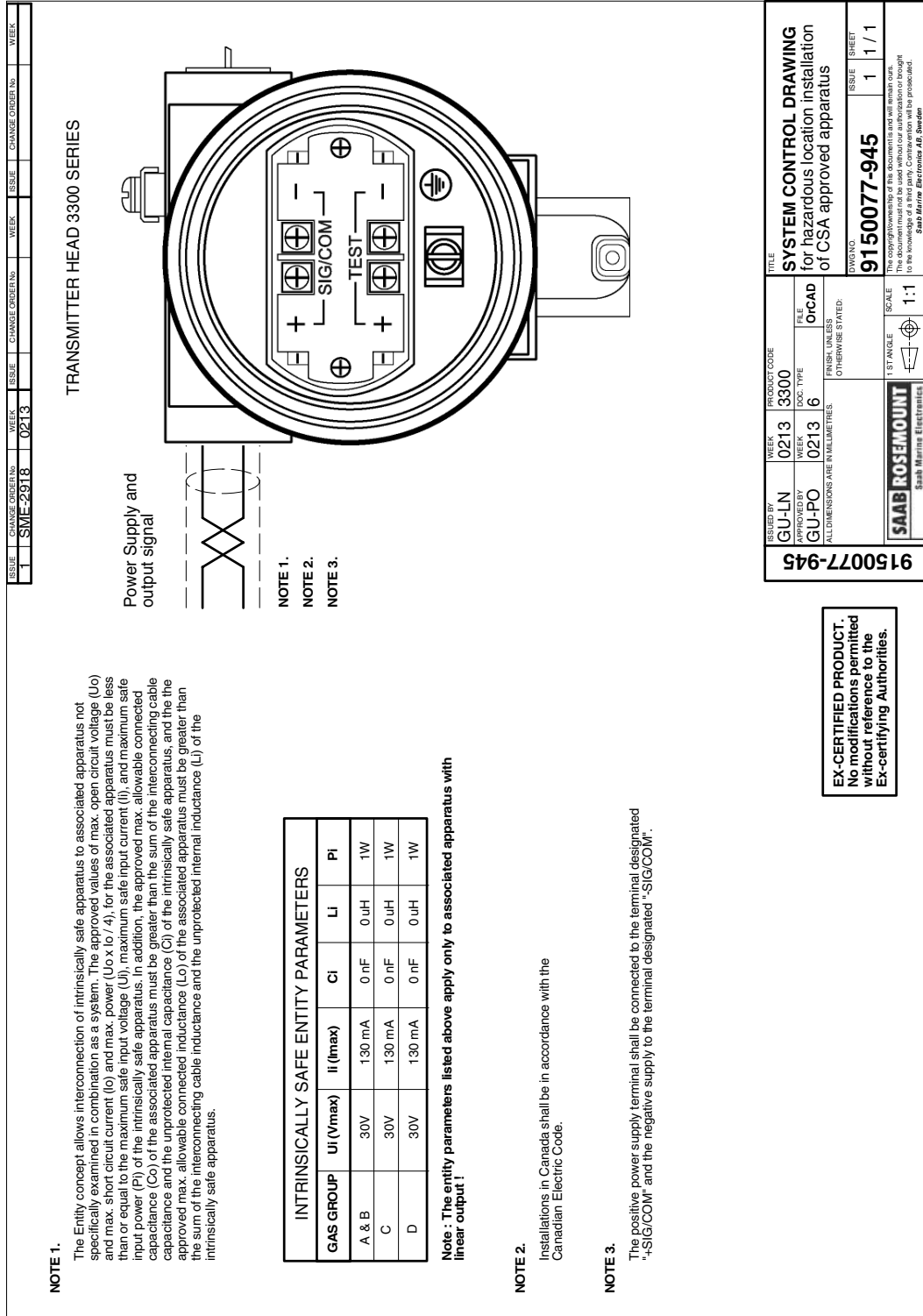
System Control Drawing for hazardous location installation of CSA approved apparatus.

Saab Rosemount drawing 9150077-991, Issue 1:

IECEX Flameproof System Control Drawing.

System Control Drawing for hazardous location installation of SSA (IECEX) approved apparatus.

Figure B-13. System Control Drawing for hazardous location installation of CSA approved apparatus.



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Rosemount 3300 Series

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