Reference Manual
00809-XXXX-4811, Rev AA
February 2012

PRELIMINARY

Rosemount 3308

Wireless Guided Wave Radar Level Transmitter

WirelessHART

ROSEMOUNT®

www.rosemount.com

EMERSON™
Process Management

PRELIMINARY

Rosemount 3308

Wireless Guided Wave Radar Level Transmitter

Rosemount 3308 Hardware Revision	**1**
HART® Device Revision	**1**
Field Communicator Field Device Revision	**Dev v1, DD v1**

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.

The United States has two toll-free assistance numbers and one international number.

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

North American Response Center
1-800-654-7768 (*24 hours a day*)
Equipment service needs

International
1-952-906-8888

⚠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 Emerson Process Management Sales Representative.

NOTICE

The Rosemount 3308 and all other wireless devices should be installed only after the Smart Wireless Gateway has been installed and is functioning properly. Wireless devices should also be powered up in order of proximity from the Smart Wireless Gateway, beginning with the closest. This will result in a simpler and faster network installation.

PRELIMINARY

⚠WARNING

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

- Only qualified personnel should perform the installation

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the Product Certifications section for any restrictions associated with a safe installation.

- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices

Process leaks may cause harm or result in death:

- Do not remove the transmitter while in operation
- Install device prior to process start-up
- Install and tighten process connectors before applying pressure

Electrical shock can result in death or serious injury:

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm (8 in.) from all persons.

NOTICE

Power Module Considerations

Each Power Module contains two "C" size primary lithium/thionyl chloride batteries. Each battery contains approximately 2.5 grams of lithium, for a total of 5 grams in each pack. Under normal conditions, the battery materials are self-contained and are not reactive as long as the batteries and the pack integrity are maintained. Care should be taken to prevent thermal, electrical or mechanical damage. Contacts should be protected to prevent premature discharge.

Battery hazards remain when cells are discharged.

Power modules should be stored in a clean and dry area. For maximum battery life, storage temperature should not exceed 30° C.

The Power Module may be replaced in a hazardous area. The Power Module has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

NOTICE

Shipping considerations for wireless products

The unit was shipped to you without the Power Module installed. Please remove the Power Module prior to shipping the unit.

Each Power Module contains two "C" size primary lithium/thionyl chloride batteries. Primary lithium batteries are regulated in transportation by the U.S. Department of Transportation, and are also covered by IATA (International Air Transport Association), ICAO (International Civil Aviation Organization), and ARD (European Ground Transportation of Dangerous Goods). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Please consult current regulations and requirements before shipping

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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 3308 transmitter.

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- Theory of operation
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- Description of the transmitter

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- Mechanical installation
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Section 4: Installation

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SERVICE SUPPORT

To expedite the return process outside of the United States, contact the nearest Emerson Process Management representative.

Within the United States, call the Emerson Process Management Instrument and Valves 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.

⚠CAUTION

Individuals who handle products exposed to a 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 Occupational Safety and Health Administration (OSHA), a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

Emerson Process Management Instrument and Valves Response Center representatives will explain the additional information and procedures necessary to return goods exposed to hazardous substances.

PRODUCT RECYCLING/DISPOSAL

Recycling of equipment and packaging should be taken into consideration and disposed of in accordance with local and national legislation/regulations.

Section 2 Transmitter Overview

SAFETY MESSAGES

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

Warnings

⚠WARNING

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

- Only qualified personnel should perform the installation

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the Product Certifications section for any restrictions associated with a safe installation.

- Before connecting a Field Communicator in an explosive atmosphere, make sure that the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices

Process leaks may cause harm or result in death:

- Do not remove the transmitter while in operation
- Install the transmitter prior to process start-up

Electrical shock could cause death or serious injury:

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm (8 in.) from all persons.

ROSEMOUNT 3308

Features of the Rosemount 3308 Wireless Guided Wave Radar include:

- An installation-ready solution that provides a variety of mounting options, transmitter configurations, and switches
- Flexibility to meet your most demanding applications
- Wireless output with >99% data reliability delivers rich HART® data, protected by industry leading security
- Single or dual switch input with logic for limit contact and opposing contact applications
- The integral LCD conveniently displays the primary switch input and diagnostics of the transmitter
- Simple and easy installation practices currently being used for robust installations

Smart Wireless delivers innovative wireless solutions for level measurement and overall transmitter performance

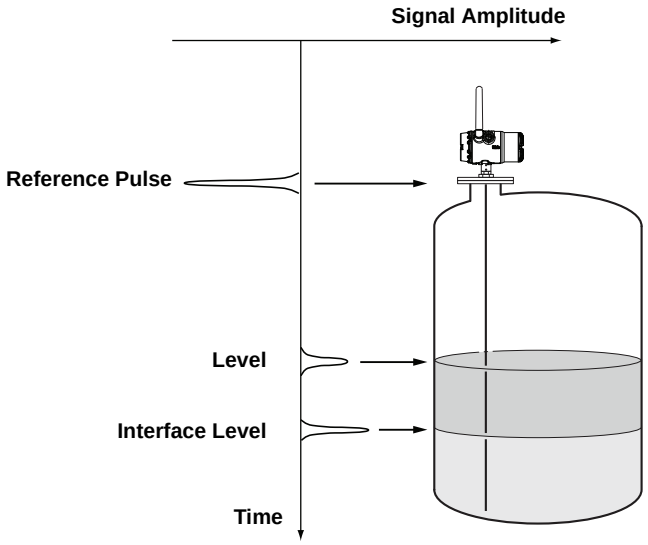
- Self-organizing network delivers information rich data with >99% data reliability and establishes a highly stable network
- Smart Wireless capabilities extend the full benefits of PlantWeb® to previously inaccessible temperature measurement locations
- Emerson SmartPower™ Solutions provide an intrinsically safe Power Module, allowing field replacements without removing the transmitter from the process, keeping personnel safe, and reducing maintenance costs
- Emerson Process Management's layered approach to wireless network security ensures that data transmissions are secure

THEORY OF OPERATION

The Rosemount 3308 Wireless Guided Wave Radar Level Transmitter is a 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.

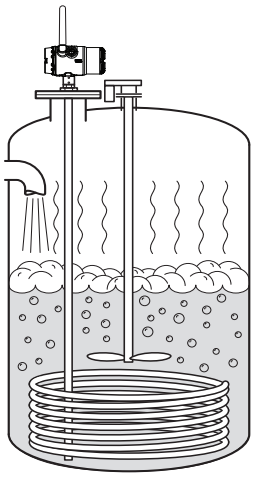


APPLICATION EXAMPLES

The Rosemount 3308 transmitter is suited for aggregate (total) level measurements on most liquids, semi-liquids, and liquid/liquid interfaces.

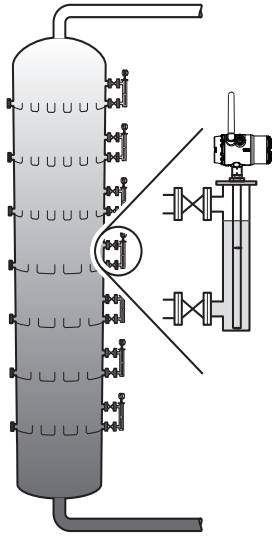
Guided microwave technology offers highest reliability and precision which ensure measurements are virtually unaffected by temperature, pressure, vapor gas mixtures, density, turbulence, bubbling/boiling, low level, varying dielectric media, pH, and viscosity.

Guided wave radar technology in combination with advanced signal processing make the Rosemount 3308 transmitter suitable for a wide range of applications.



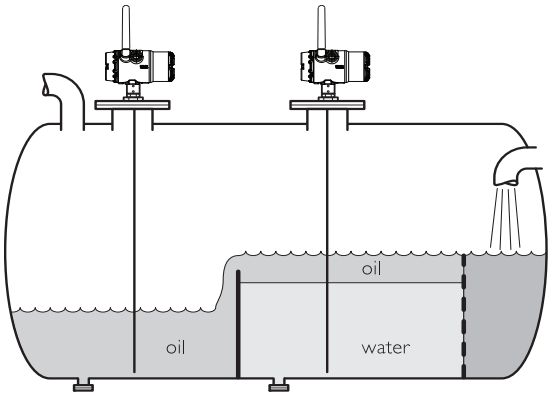
Boiling conditions with vapor and turbulence

For these applications the Coaxial probe is particularly suitable.



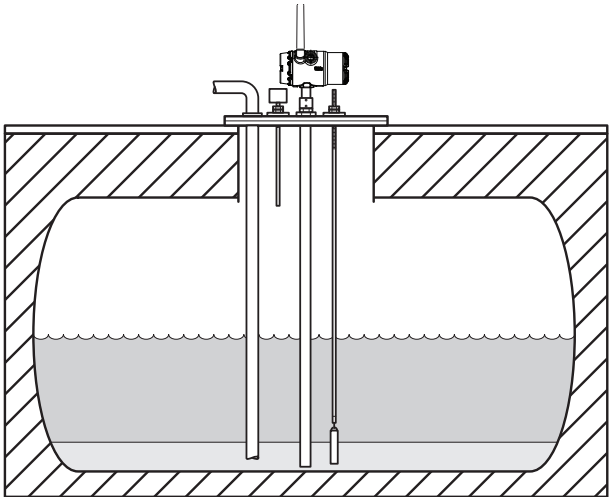
Bridle applications

The Rosemount 3308 transmitter is well suited for bridle applications, such as distillation columns.



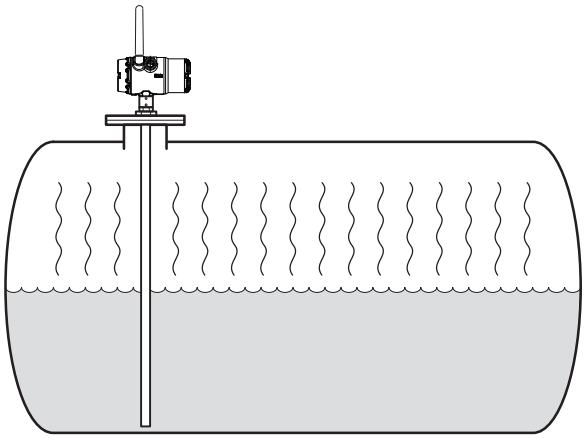
Separator tanks

The Rosemount 3308 measures both level and interface level.



Underground tanks

The Rosemount 3308 transmitter 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.



Small ammonia, NGL and LPG tanks

Guided wave radar technology is a good choice for reliable measurements in small ammonia, NGL and LPG tanks.

SYSTEM ARCHITECTURE

The Rosemount 3308 transmitter is battery powered with wireless communication which means the unit works completely independent.

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.

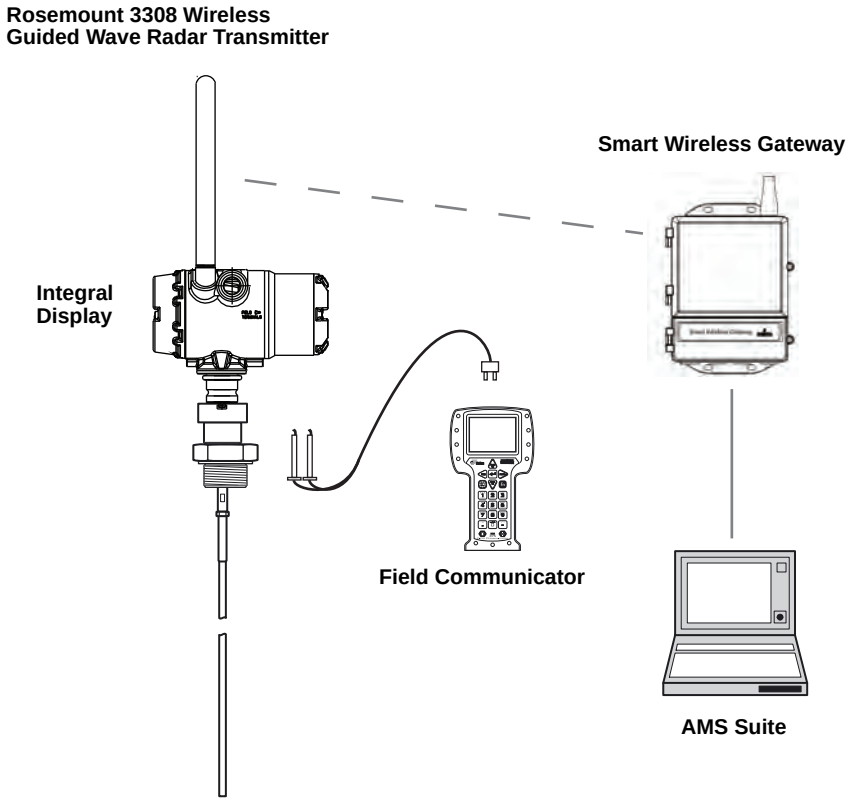
With the HART protocol it is possible to use multidrop configuration. In this case communication is restricted to digital since current is fixed to the 4 mA minimum value.

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 the AMS suite software or by using a Field Communicator. A PC with the Radar Configuration Tool software can also be used for configuration.

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

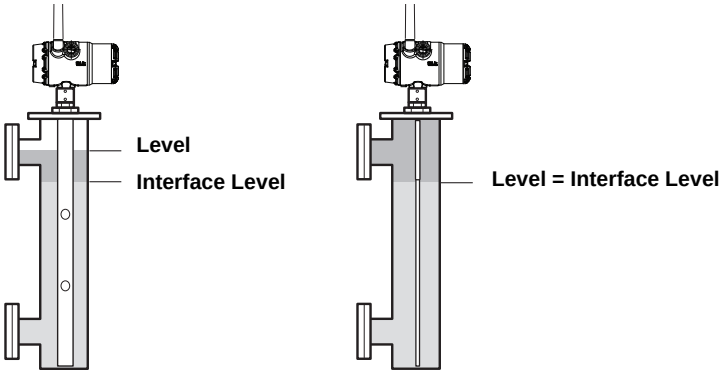
Figure 2-2. System architecture.



Interface

Rosemount 3308 is the ideal choice for measuring the interface of oil and water, or other liquids with significant dielectric differences.

Figure 2-3. Interface measurement with a Rosemount 3308



All 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.
- 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.

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 3308 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.

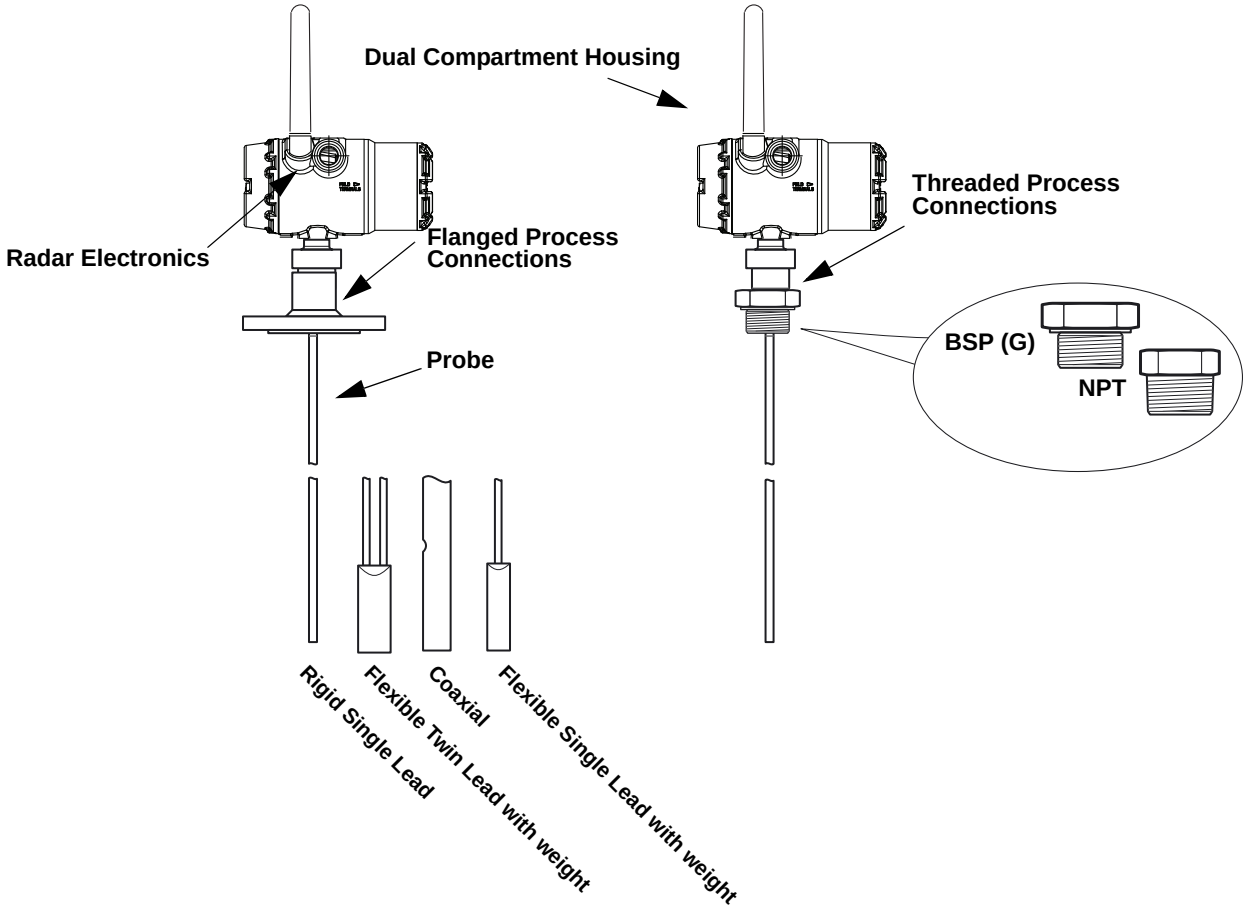
COMPONENTS OF THE TRANSMITTER

The Rosemount 3308 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: Flexible Twin Lead, Rigid Single Lead, Flexible Single Lead, and Coaxial.

Figure 2-4. Transmitter components.



PROBE SELECTION GUIDE

Use the following guidelines to choose appropriate probe for your Rosemount 3308 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.

Transition Zones

The measuring range depends on probe type and properties of the product. The **Upper Transition Zone** is the minimum measurement distance between the upper reference point and the product surface. The Upper Transition 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 Transition Zone**. The **Lower Transition Zone** also varies depending on probe type and product.

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

Figure 2-5. Transition Zones

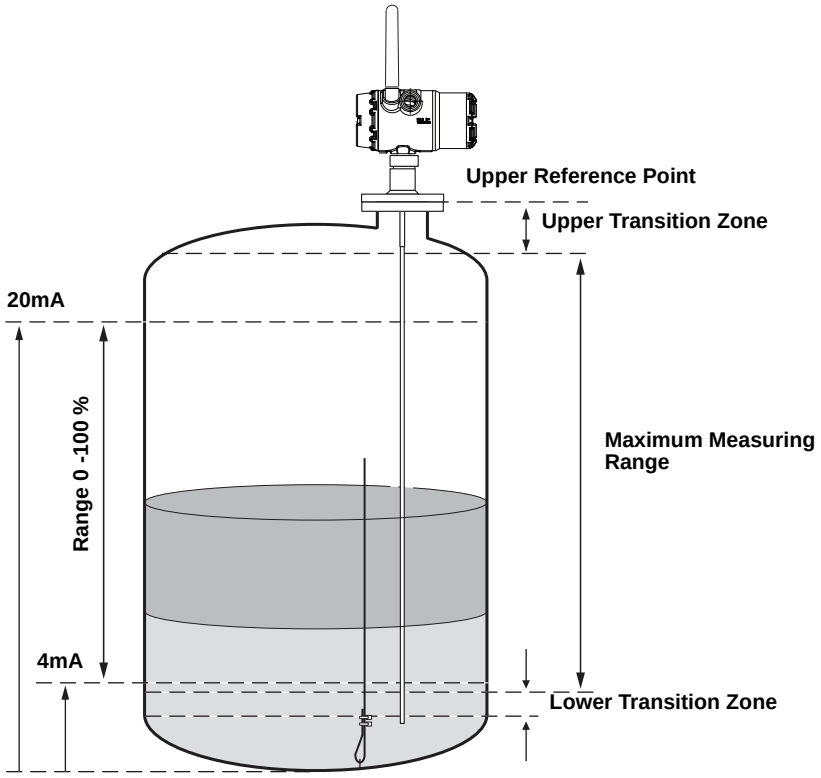


Table 2-2. Transition Zones for different probe types

	Dielectric Constant	Coaxial Probe	Flexible Twin Lead Probe	Rigid Single Lead Probe	Flexible Single Lead Probe
Upper Transition Zone	2	TO BE ADDED			
	80				
Lower Transition Zone	2				
	80				

NOTE
The measurement accuracy is reduced in the Transition Zones. It may even be impossible to make any measurements at all in those regions. Therefore, the alarm limit points should be configured outside the Transition Zones.

SERVICE SUPPORT

To expedite the return process outside of North America, contact your Emerson Process Management representative,

Within the United States, call the Emerson Process Management Response Center toll-free number 1 800 654 7768. The center, which is 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.

⚠CAUTION

Individuals who handle products exposed to a 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.

SHIPPING CONSIDERATIONS FOR WIRELESS PRODUCTS (LITHIUM BATTERIES)

The unit was shipped with the Power Module not installed. Please remove the Power Module from the unit before shipping.

Each Power Module contains two "C" size primary lithium/thionyl chloride batteries. Primary lithium batteries (charged or discharged) are regulated during transportation by the U.S. Department of Transportation. They are also covered by IATA (International Air Transport Association), ICAO (International Civil Aviation Organization), and ARD (European Ground Transportation of Dangerous Goods). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Consult current regulations and requirements before shipping.

PRODUCT RECYCLING/DISPOSAL

Recycling of equipment and packaging should be taken into consideration and disposed of in accordance with local and national legislation/regulations.

Section 3 Wireless Configuration

SAFETY MESSAGES

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

Warnings

⚠WARNING

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

- Only qualified personnel should perform the installation

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the Product Certifications section for any restrictions associated with a safe installation.

- Before connecting a Field Communicator in an explosive atmosphere, make sure that the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices

Process leaks may cause harm or result in death:

- Do not remove the transmitter while in operation
- Install the transmitter prior to process start-up

Electrical shock could cause death or serious injury:

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock

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Probe Connection; warnings associated with probe connections

WIRELESS CONSIDERATIONS

General

The Wireless Guided Wave Radar Transmitter has the capability to measure level, distance, interface level or volume. The Rosemount 3308 converts the measurement data into mapped variables and diagnostic information that are transmitted through a wireless signal.

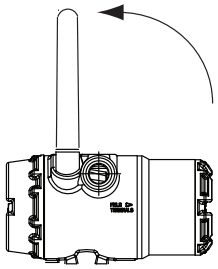
Power Up Sequence

The Smart Wireless Gateway (Gateway) should be installed and functioning properly before any wireless field devices are powered. Install the Black Power Module, SmartPower™ Solutions model number 701PBKKF into the 3308 transmitter to power the device. Wireless devices should also be powered up in order of proximity from the Gateway, beginning with the closest. This will result in a simpler and faster network installation. Enable Active Advertising on the Gateway to ensure that new devices join the network faster. For more information, see the Gateway Product Manual (Document Number 00809-0200-4420).

Antenna Position

The antenna should be positioned vertically, either straight up or straight down. It should be approximately 3 ft (1 m) from any large structure, building, or conductive surface to allow for clear communication to other devices.

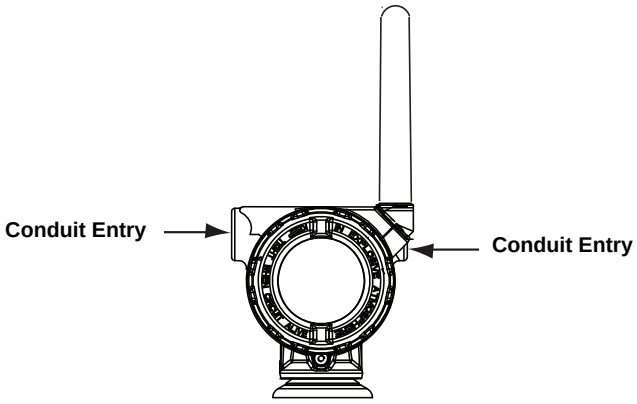
Figure 3-1. Recommended Antenna Position



Conduit Entries

Unit comes with both conduit entries sealed with conduit plugs using an approved thread sealant.

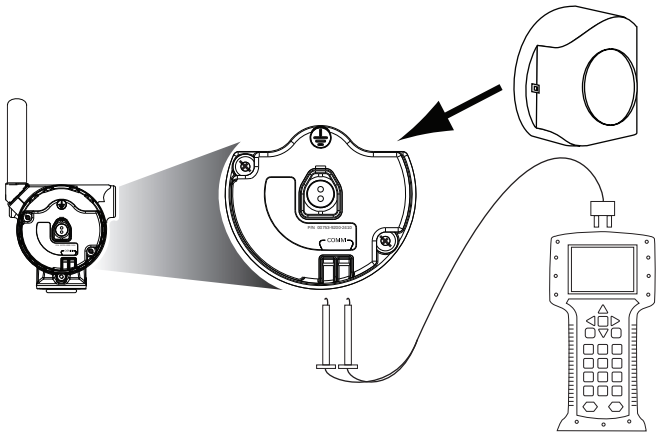
Figure 3-2. Conduit Entries



Field Communicator Connections

The Power Module needs to be installed in the device for the Field Communicator to interface with the Rosemount 3308 transmitter. This transmitter uses the Black Power Module; please order model number 701PBKKF. Field communication with this device requires a HART-based Field Communicator using the correct Rosemount 3308 Wireless DD. Field communicator connections are located on the terminal block. The correct DD for the available protocol should be selected. Refer to Figure 3-3 for instructions on connecting the Field Communicator to the Rosemount 3308.

Figure 3-3. Field Communicator Connection Diagram



Mechanical

Location

When choosing an installation location and position, take into account access to the transmitter for easy Power Module replacement. For best performance, the antenna should be vertical with space between objects in a parallel metal plane, such as a pipe or metal framework, as the pipes or framework may adversely affect the antenna's performance.

Electrical

The Rosemount 3308 Wireless Guided Wave Radar transmitter is self-powered. The Black Power Module contains two "C" size primary lithium/thionyl chloride batteries. Each battery contains approximately 2.5 grams of lithium, for a total of 5 grams in each Power Module. Under normal conditions, the battery materials are self-contained and are not reactive as long as the batteries and the Power Module are maintained. Care should be taken to prevent thermal, electrical, or mechanical damage. Contacts should be protected to prevent premature discharge.

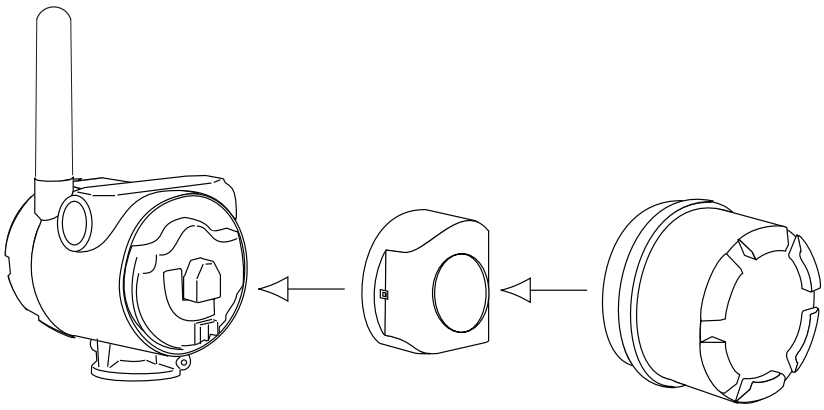
⚠ Use caution when handling the power module; it may be damaged if dropped from heights in excess of 20 ft (6.10 m).

POWER MODULE INSTALLATION

NOTE
Wireless devices should be powered up in order of proximity from the Smart Wireless Gateway, beginning with the closest device to the Smart Wireless Gateway. This will result in a simpler and faster network installation.

1. Install the Power Module.

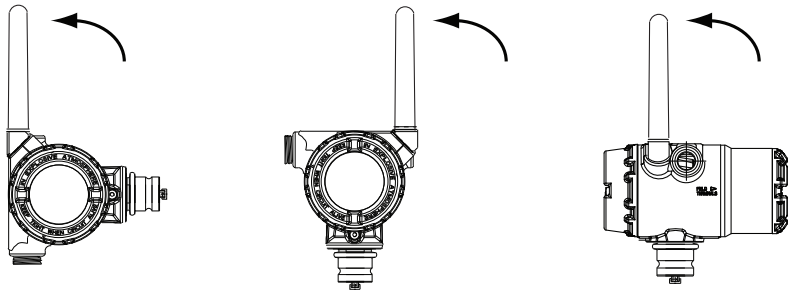
Figure 3-4. Black Power Module Installation



NOTE
Use caution when handling the power module, it may be damaged if dropped from heights in excess of 20 ft (6 m).

2. Close the housing cover and tighten to site or safety specifications. Always ensure a proper seal by installing the electronics housing covers so that metal touches metal, but do not over tighten.
3. Position the antenna such that it is vertical, either straight up or straight down, as shown in Figure 3-5. The antenna should be approximately 3 ft (1 m) from any large structures or buildings to allow clear communication to other devices.

Figure 3-5. Possible Antenna Rotations



TO BE UPDATED

NOTE
Possible antenna rotation shown. Antenna rotation allows for best installation practices in any configuration.

DEVICE CONFIGURATION

Remove the Power Module-side housing cover to expose the terminal block and HART communication terminals, then connect the Power Module to power the unit for configuration.

The Rosemount 3308 transmitter will receive any HART communication from a handheld Field Communicator or AMS Wireless Configurator. When using a Field Communicator, any configuration changes must be sent to the transmitter using the **Send** key (F2). AMS Wireless Configurator configuration changes are implemented when the **Apply** button is clicked.

AMS® Wireless Configurator

AMS Wireless Configurator is capable of connecting to devices directly, using a HART modem, or remotely using the Gateway.

When configuring on the bench with a HART modem, double click the device icon, then choose the Configure/Setup tab (or right click and select Configure/Setup). Configure the device settings using the Direct Connection menu.

When configuring with the Gateway, double click the device icon then choose the Configure/Setup tab (or right click and select Configure/Setup). Configure the device settings using the Wireless Connection menu.

DEVICE NETWORK CONFIGURATION

To communicate with the Gateway, and ultimately the host system, the transmitter must be configured to communicate with the wireless network.

Using a Field Communicator or AMS Wireless Configurator, enter the **Network ID** and **Join Key** so they match the Network ID and Join Key of the Gateway and the other devices in the network. If the Network ID and Join Key are the same as the Gateway, the transmitter will not communicate with the network. The Network ID and Join Key may be obtained from the Gateway on the **Setup>Network>Settings** page on the Gateway's integrated web server, shown in Figure 3-6.

Figure 3-6. Gateway Network Settings

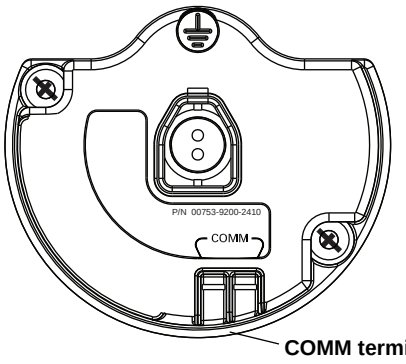
AMS

Right click on the Rosemount 3308 transmitter and select **Configure**. When the menu opens, select **Join Device to Network** and complete the method to enter the Network ID and Join Key.

Field Communicator

Connect the field communicator leads to the COMM terminals on the terminal block as shown in Figure 3-7.

Figure 3-7. Terminal Block with COMM terminals



The Network ID and Join Key may be changed in the wireless device on a Field Communicator by using the Fast Key Sequence shown in Table 3-1.

Table 3-1. Rosemount 3308 Fast Key Sequence

Function	Key Sequence	Menu Items
Join Device to Network	**2, 1, 2**	Network ID, Set Join Key

Fast Key Sequences

Table 3-1 lists the fast key sequence for common transmitter functions.

Table 3-2. Rosemount 3308 Fast Key Sequence

Function	Key Sequence	Menu Items
Device Information	**2, 2, 4**	Manufacturer, Model, Final Assembly Number, Universal, Field Device, Software, Hardware Descriptor, Message, Date, Model Number, I, II, III, SI Unit Restriction, Country
Guided Setup	**2, 1**	Join Device to Network, Configure Update Rate, Configure Sensor, Calibrate Sensor, Configure Display, Configure Process Alarms
Manual Setup	**2, 2**	Wireless, Process Sensor, Percent of Range, Device Temperature, Device Information, Device Configure, Other
Wireless	**2, 2, 1**	Network ID, Join Device to Network, Configure Update Rate, Configure Broadcast Power Level, Power Mode, Power Source

REMOVE POWER MODULE

If doing a bench top configuration, after the sensor and network have been configured, remove the Power Module and replace the transmitter cover. The Power Module should be inserted only when the device is ready for commissioning.

Section 4 Installation

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

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.

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the Product Certifications section for any restrictions associated with a safe installation.

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.

In an Explosion-proof/Flameproof installation, do not remove the transmitter cover when power is applied to the unit.

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.

- Do not remove the transmitter while in operation
- Install device prior to process start-up

⚠WARNING

Electrical shock can result in death or serious injury:

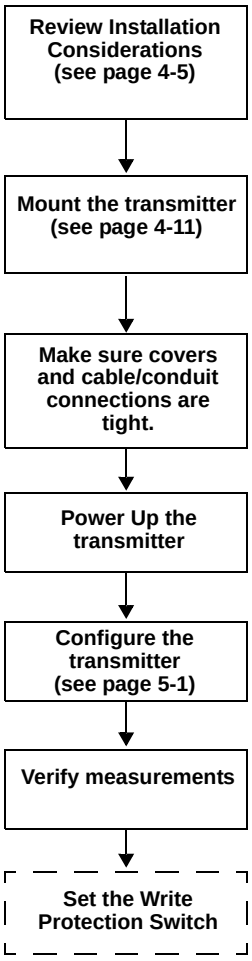
- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

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.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm (8 in.) from all persons.

INSTALLATION PROCEDURE

Follow these steps for proper installation:



BEFORE YOU INSTALL

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 Rosemount 3308 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.

Software write protect

Security write protection prevents unauthorized access to configuration data through a Field Communicator or AMS Suite software.

MOUNTING CONSIDERATIONS

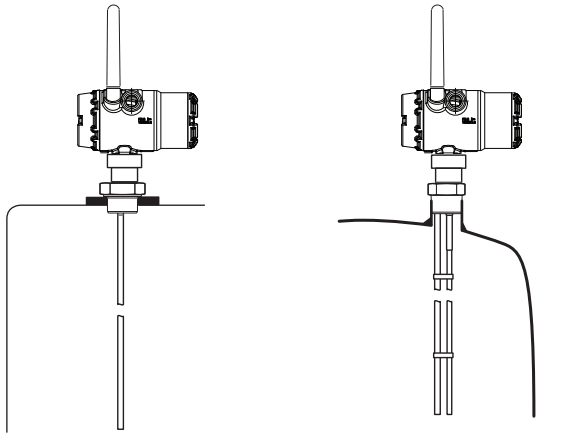
Before installing the Rosemount 3308 transmitter, consider specific mounting requirements, vessel characteristics and process characteristics.

Process Connection

The Rosemount 3308 transmitter 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

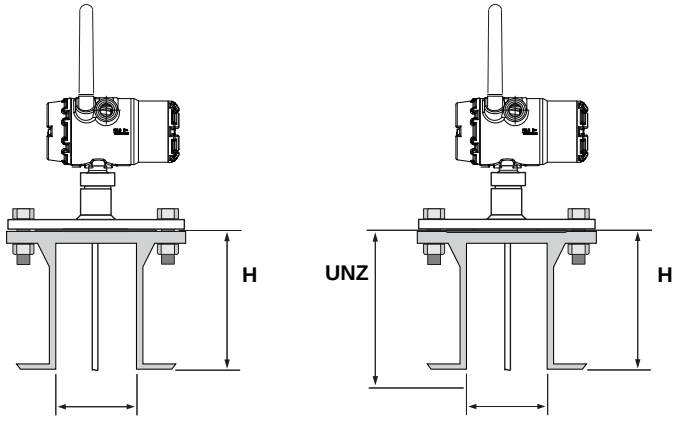
Figure 4-1. Mounting on tank roof using threaded connection



Mounting on tank roof **Mounting in threaded pipe**

Flange Connection on Nozzles

Figure 4-2. Mounting in nozzles



D1 = min. diameter

D2 = min. diameter with Upper Null Zone adjustment

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 4-1*. 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 7-10*. 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 4-1. Minimum nozzle diameter D1/D2 and maximum nozzle height H (inch/mm).

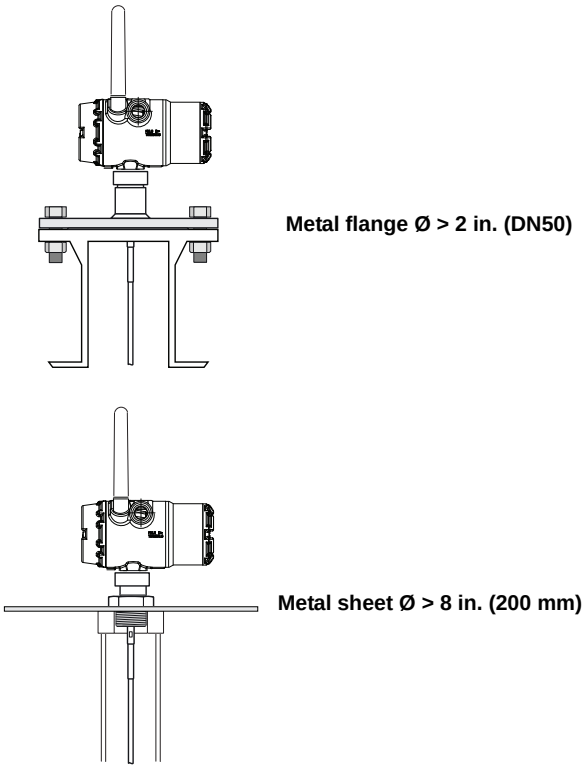
	Rigid Twin Lead	Flexible Twin Lead	Coaxial	Single Lead	Flexible Single
D1(1)	4/100	4/100	> Probe diameter	6/150	6/150
D2(2)	2/50	2/50	> Probe diameter	2/50(3) 1.5/38(4)	2/50
H(5)	4/100 + D(6)	4/100 + D(6)	-	4/100 + D(6)	4/100 + D(6) (7)

(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).

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 4-3. Mounting in non-metallic tanks.

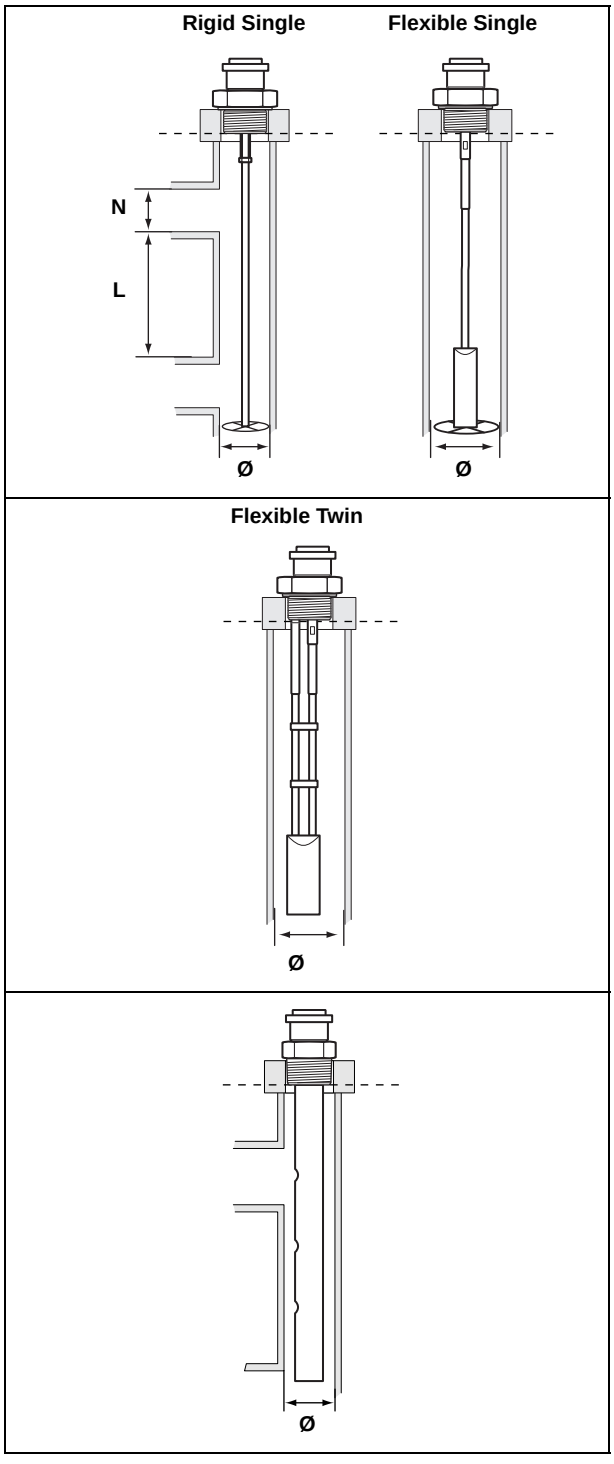


Avoid introducing EMI environment near the tank. Installation in metallic tank is recommended.

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 PTFE. See also *"Mounting a Centering Disc for Pipe Installations" on page 4-17*.

Figure 4-4. Mounting in Still Pipes.



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

Rigid Single Lead.
Pipe diameter Ø≥2 in. (50 mm).
Inlet pipe diameter N<Ø.
L≥12 in. (300 mm).

Flexible Single Lead.
Pipe diameter Ø≥4 in. (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.

Flexible Twin Lead.
Pipe diameter Ø≥4 in. (100 mm).
Note! For smaller pipes please consult factory.

The center rod must be placed more than 0.6 in. (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 Ø≥1.5 in. (38 mm).

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 4-5. Free Space Requirement

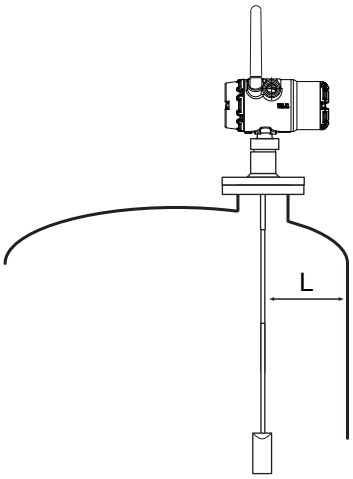


Table 4-2. Recommended minimum free space **L** to tank wall or other objects in the tank.

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

Table 4-3. Recommended minimum free space **L** to tank wall or other objects in the tank for Single Lead probes.

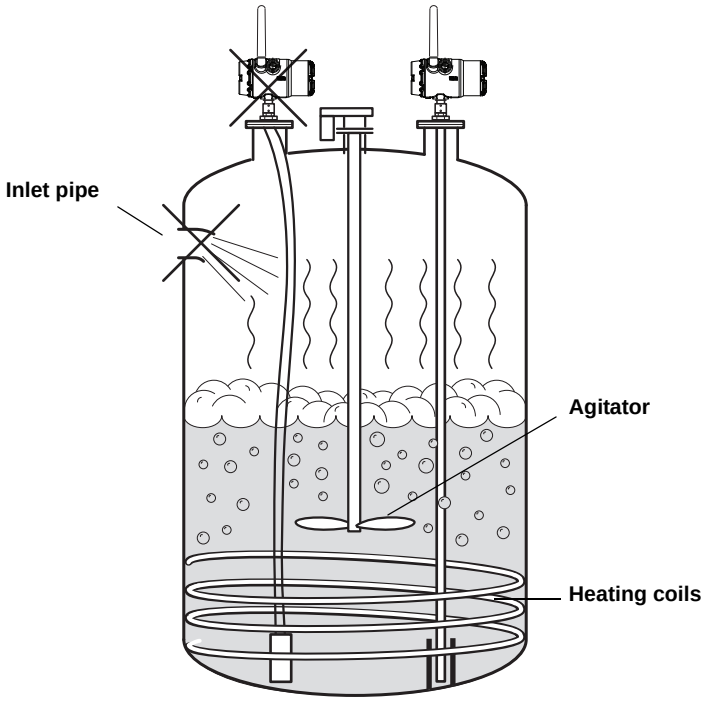
Rigid Single/Flexible Single	
4 in. (100 mm)	Smooth metal wall.
12 in. (300 mm)	Disturbing objects such as pipes and beams, concrete or plastic tank walls, rugged metal tank walls.

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 4-11* for more information.

Figure 4-6. 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 12 in. (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.

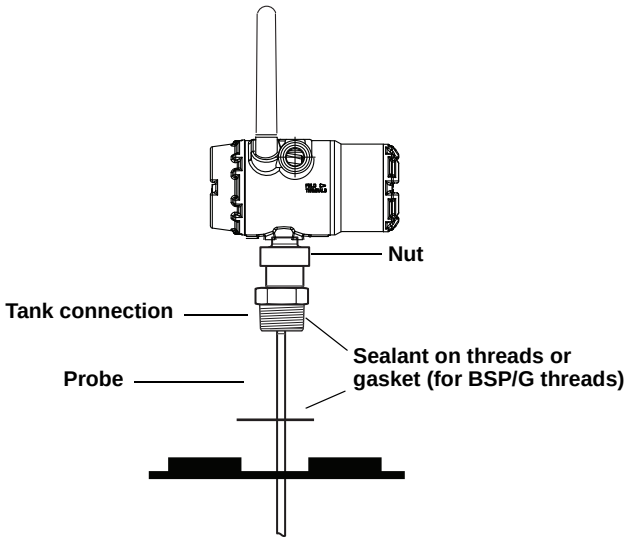
NOTE!
Violent fluid movements causing high sideway forces may break rigid probes.

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 7-9* for further information.

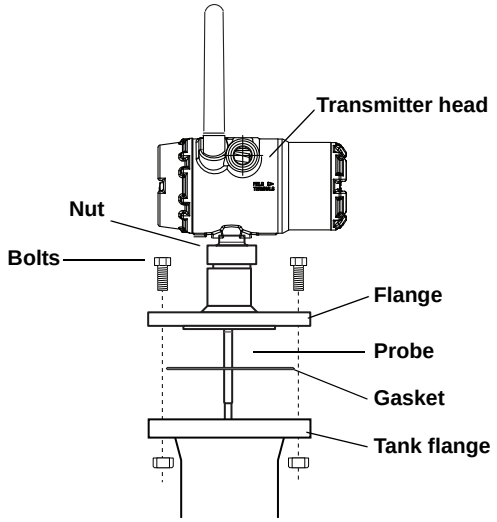
Figure 4-7. Threaded tank connection.



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.
7. Continue with the Power Module Installation.

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

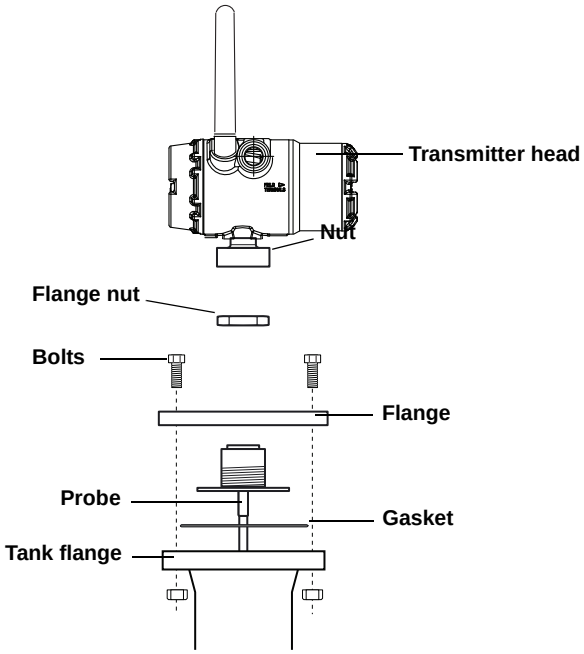
Figure 4-8. Tank connection with flange.



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.
7. Continue with the Power Module Installation.

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

Figure 4-9. Tank connection with loose flange (“plate design”).

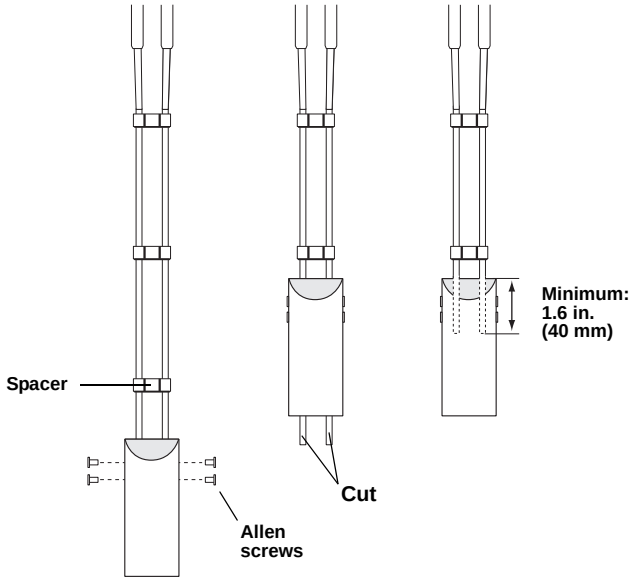


The transmitter is delivered with head, flange and probe assembled into one unit. If, for some reason, these parts have been disassembled mount the transmitter as described below:

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.
9. Continue with the Power Module Installation.

Shortening the Probe

Flexible Twin/Single Lead



1. Mark off the required probe length. Add at least 1.6 in. (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. The minimum probe length is 3.33 ft (1 m). 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 5-9.

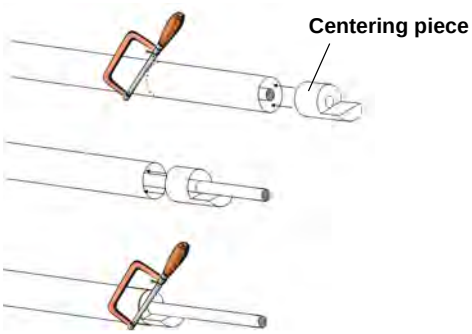
If the weight was removed from the cables when cutting, make sure that at least 1.6 in. (40 mm) of the cable is inserted when the weight is replaced.

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 5-9.

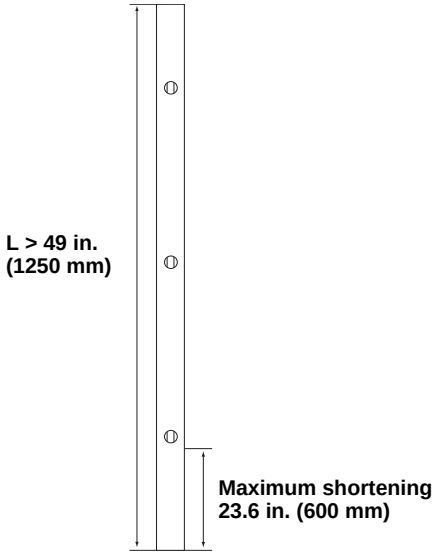
NOTE!
The PTFE covered probes must not be cut in field.

Coaxial

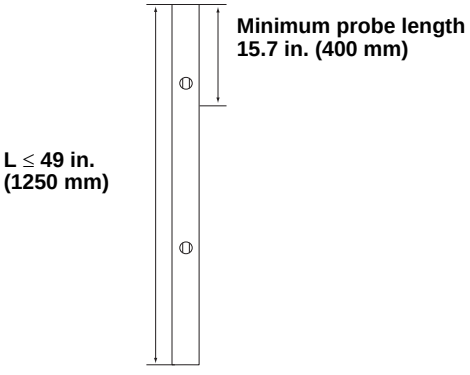


To cut a coaxial probe do the following:

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.



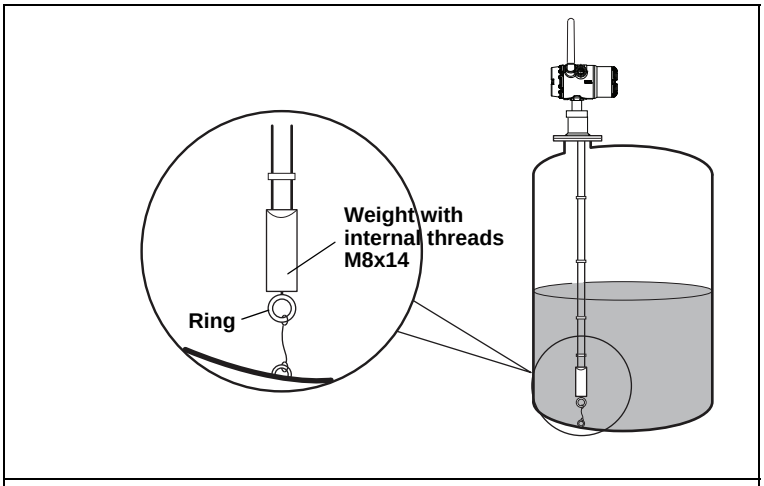
4. Cut the rod inside the tube. Make sure that the rod is fixed with the centering piece while cutting.
   - Pipes longer than 49 in. (1250 mm) can be shortened by as much as 23.6 in. (600 mm).
   - Pipes shorter than 49 in. (1250 mm) can be cut as long as the remaining length is not less than 15.7 in. (400 mm).



5. Update the transmitter configuration to the new probe length, see “Probe Length“ on page 5-9.

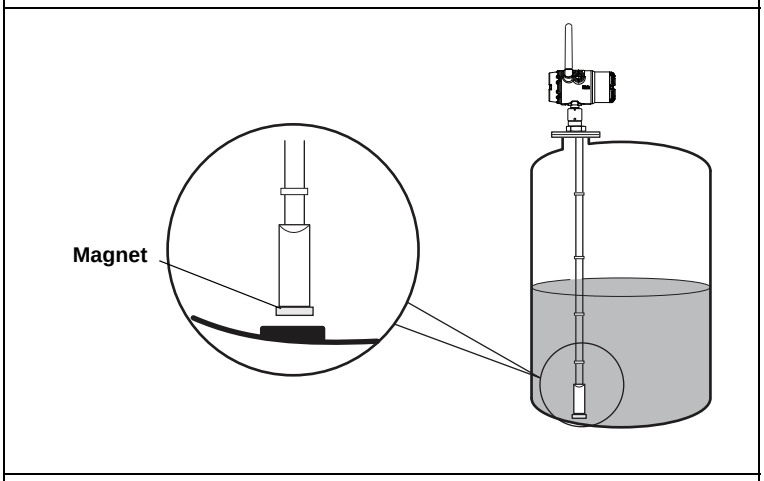
Anchoring

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.



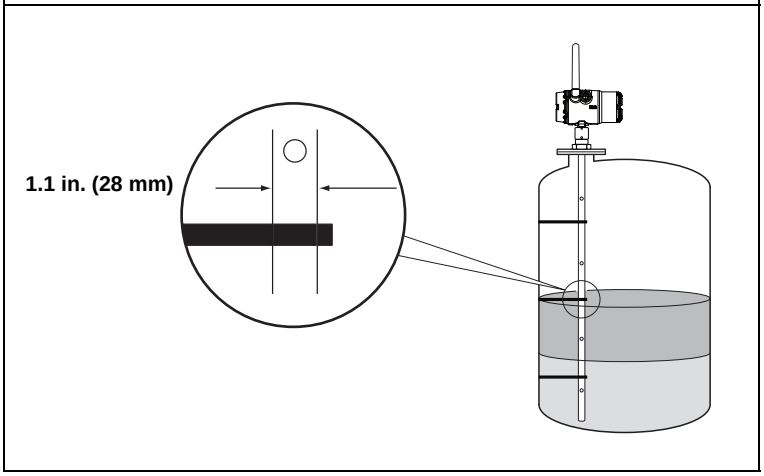
Flexible Twin/Single Lead probe with weight and ring.

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.



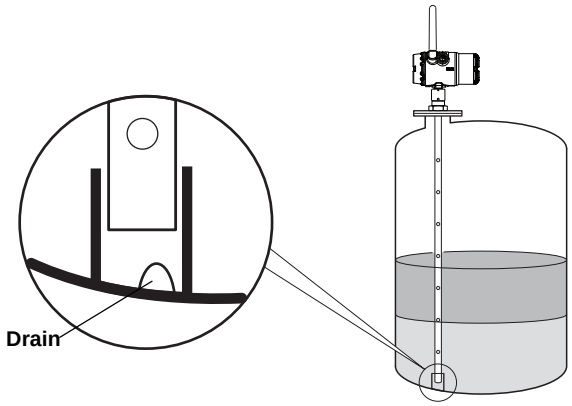
Flexible Twin/Single Lead probe with weight and magnet.

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.

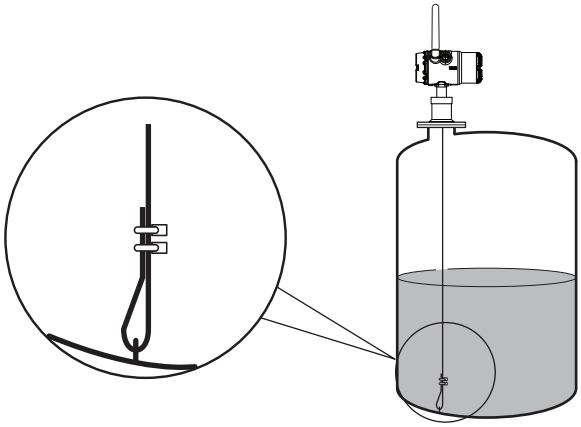


Coaxial probe.

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.

Flexible Single Lead probe with weight.

TO BE ADDED



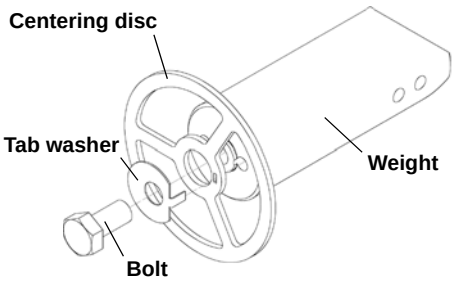
Flexible Single Lead probe.

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.

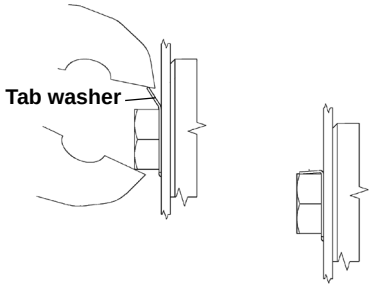
The length of the loop will add to the transition zone.The location of the clamps will determine the beginning of the transition zone. The probe length should be configured as the length from the underside of the flange to the top clamp. See section “Transition Zones“ on page 2-12 for further information on Transition Zones.

Mounting a Centering Disc for Pipe Installations

Flexible Single/Twin Lead probe

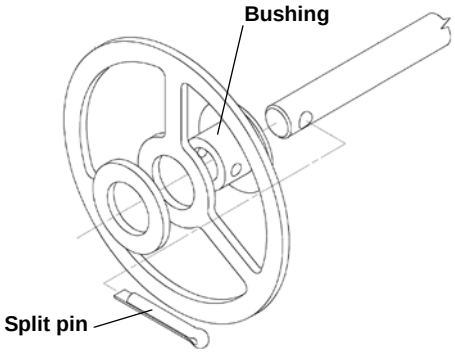


1. Mount the centering disc at the end of the weight.
2. Make sure that the tab washer is properly inserted in the centering disc.
3. Fasten the centering disc with the bolt.

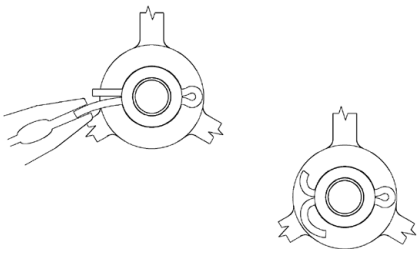


4. Secure the bolt by folding the tab washer.

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.

LCD DISPLAY

NOTE!
Do not remove the instrument cover in explosive environments when the circuit is live.

General

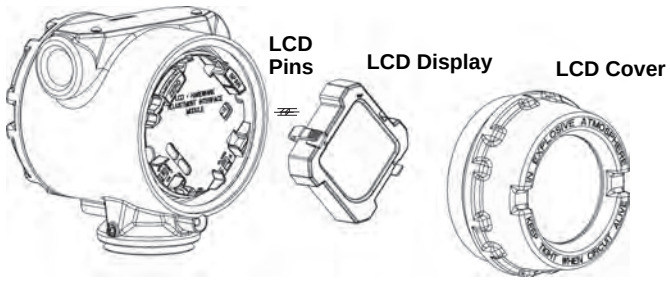
If the LCD display is ordered in the transmitter model number (option code M5), it will be shipped attached to the transmitter.

NOTE
If ordering spare parts for a replacement LCD, only use Rosemount Wireless LCD Part Number: 00753-9004-0002. This will provide a replacement LCD/electronics board, and LCD pin connector.

LCD Rotation

The optional LCD display can be rotated in 90-degree increments by squeezing the two black tabs on opposite sides of the display, gently pulling out the display, rotating to the desired orientation, and snapping back the display into place. Refer to Figure 4-10 for a graphical illustration.

Figure 4-10. LCD Rotation

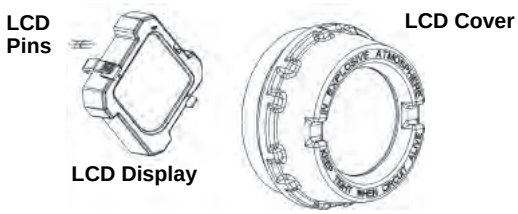


If the LCD pins are inadvertently removed from the interface board, carefully re-insert the pins before snapping the LCD display back into place.

Retrofitting

If an existing transmitter with no display (flat electronics cover) is to be retrofitted with a new display, order spare part number 00753-9004-0001. This kit contains an extended aluminum cover with an LCD viewing window, an LCD/electronics board, and an LCD pin connector. The contents of this kit are shown in Figure 4-11.

Figure 4-11. LCD Display Retrofit Kit



To install the LCD display, remove the electronics-side flat cover. Insert the four-pin connector into the LCD display, rotate the LCD to the desired orientation, and gently snap into place. Replace the flat cover with the LCD cover and tighten. Refer back to Figure 4-10 for a graphical illustration.

LCD Configuration

How to configure parameters displayed, update rate, always off, etc.

GROUND THE TRANSMITTER

The Rosemount 3308 Wireless Guided Wave Radar transmitter operates with the housing grounded or floating. Floating systems can cause extra noise that may affect many types of readout devices. If the signal appears noisy or erratic, grounding at a single point may solve the problem. Grounding of the electronics enclosure should be done in accordance with local and national installation codes. Grounding is accomplished through the process connection using the internal or external case grounding terminal.

How to Ground the Device

Procedure to be added.

NOTE
Always use facility recommended wiring practices.

Section 5 Start-Up/Commissioning

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

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.

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the Product Certifications section for any restrictions associated with a safe installation.

- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an Explosion-proof/Flameproof installation, do not remove the transmitter cover when power is applied to the unit.

Process leaks may cause harm or result in death:

- Do not remove the transmitter while in operation
- Install device prior to process start-up

Electrical shock could cause death or serious injury:

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

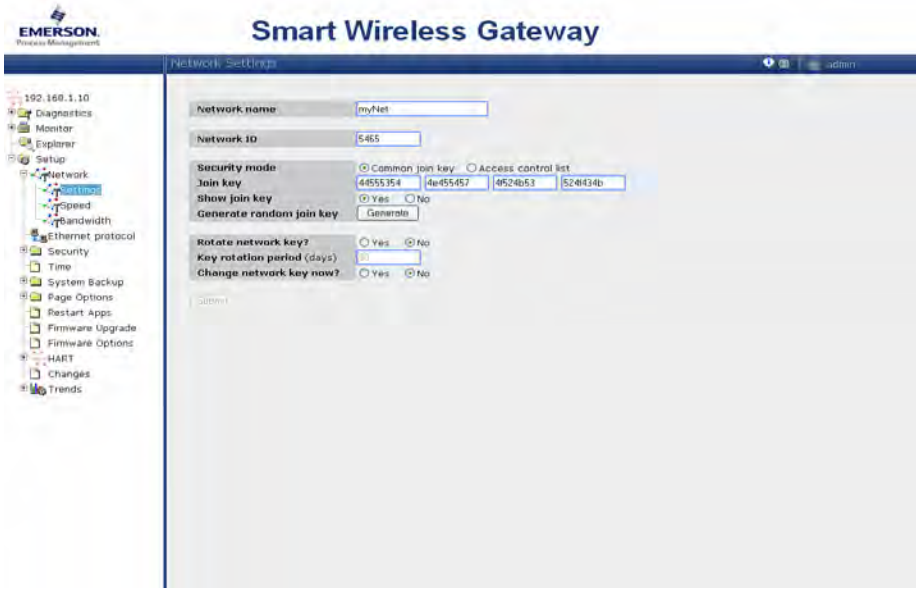
This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm (8 in.) from all persons.

DEVICE NETWORK CONFIGURATION

To communicate with the Gateway, and ultimately the host system, the transmitter must be configured to communicate with the wireless network.

Using a Field Communicator or AMS Wireless Configurator, enter the **Network ID and Join Key** so they match the Network ID and Join Key of the Gateway and the other devices in the network. If the Network ID and Join Key are the same as the Gateway, the transmitter will not communicate with the network. The Network ID and Join Key may be obtained from the Gateway on the **Setup>Network>Settings** page on the Gateway's integrated web server, shown in Figure 5-1.

Figure 5-1. Gateway Network Settings



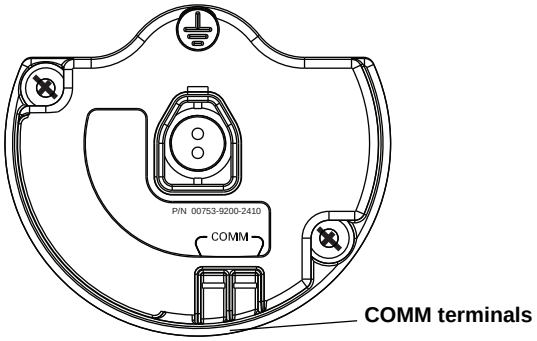
AMS

Right click on the Rosemount 3308 transmitter and select **Configure**. When the menu opens, select **Join Device to Network** and complete the method to enter the Network ID and Join Key.

Field Communicator

Connect the field communicator leads to the COMM terminals on the terminal block as shown in Figure 5-2.

Figure 5-2. Terminal Block with COMM terminals



The Network ID and Join Key may be changed in the wireless device on a Field Communicator by using the Fast Key Sequence shown in Table 5-1.

Table 5-1. Rosemount 3308 Fast Key Sequence

Function	Key Sequence	Menu Items
Join Device to Network	**2, 1, 2**	Network ID, Set Join Key

CONFIGURATION PARAMETERS

The Rosemount 3308 transmitter can be configured for level, volume, interface level, and interface distance measurements.
The Rosemount 3308 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 5-3. Tank Geometry

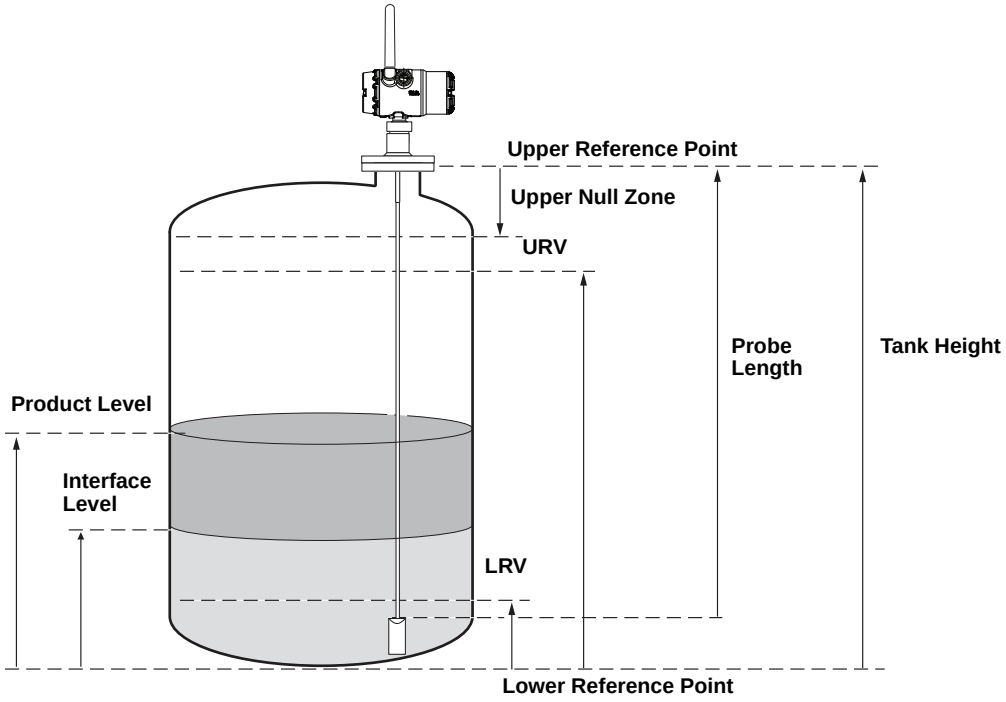
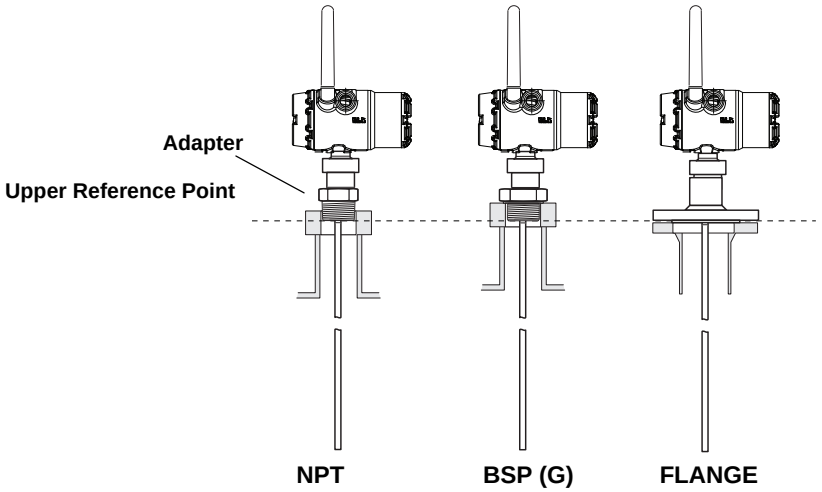


Figure 5-4. Upper Reference Point

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 5-4:



Tank Height

The Tank 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 Tank 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.

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.

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 2-7 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 7-5 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 7: Disturbances at the Top of the Tank* for further information.

NOTE
Measurements are not performed within the Upper Null Zone.

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

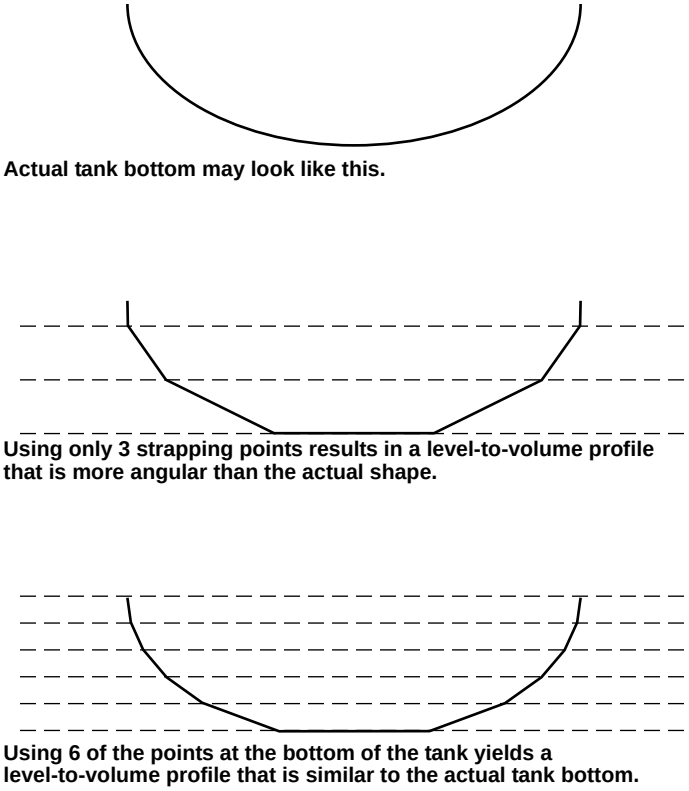
You can choose one of the following options:

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

Strapping Table

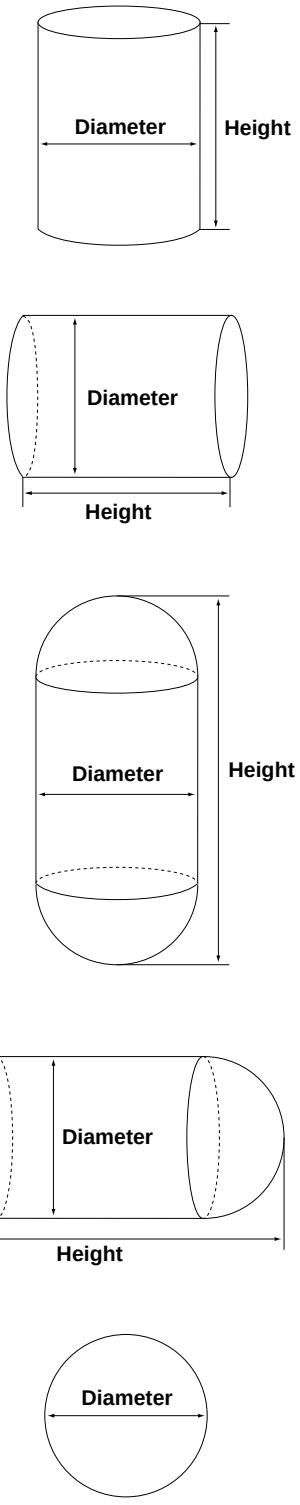
Use a strapping table if a standard tank type does not provide sufficient accuracy. Use most of the strapping points in regions where the tank shape is non-linear. A maximum of 10 points can be added to the strapping table.

Figure 5-5. Strapping points



Standard Tank Shapes

Figure 5-6. Standard tank shapes



Vertical Cylinder

Vertical Cylinder tanks are specified by Diameter and Height.

Horizontal Cylinder

Horizontal Cylinders are specified by Diameter and Height.

Vertical Bullet

Vertical Bullet tanks are specified by Diameter and Height. The volume calculation model for this tank type assumes that the radius of the bullet end is equal to the Diameter/2.

Horizontal Bullet

Horizontal Bullets are specified by Diameter and Height. The volume calculation model for this tank type assumes that the radius of the bullet end is equal to the Diameter/2.

Sphere

Spherical tanks are specified by Diameter.

CONFIGURATION USING A FIELD COMMUNICATOR

This section describes how to configure the Rosemount 3308 transmitter by using a Field Communicator. A HART Communicator may also be used.

For information on all the capabilities, refer to the Field Communicator Product Manual (Document No. 00809-0100-4276).

Figure 5-7. The Field Communicator.

Replace with 475

BASIC CONFIGURATION

This section describes the various HART commands used to configure the Rosemount 3308 transmitter for level measurements. The transmitter outputs a digital HART wireless signal.

Transmitter Variables

HART Comm	TO BE ADDED

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

Measurement Units

HART Comm	TO BE ADDED

Set transmitter units for level and temperature.

Tank Height

HART Comm	TO BE ADDED

The Tank Height is the distance from the Upper Reference Point to the bottom of the tank (see Figure 5-3 on page 5-3). When setting the Tank Height, keep in mind that this value is used for all level measurements performed by the Rosemount 3308 transmitter.

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

Probe Length

HART Comm	TO BE ADDED

The probe length is the distance from the Upper Reference Point to the end of the probe, see Figure 5-3. 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.

Probe Type

HART Comm	TO BE ADDED

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:

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

Product Dielectric

HART Comm	TO BE ADDED

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 7-5* for further information.The dielectric constant of the product is used for setting the appropriate signal amplitude thresholds, see *Section 7: 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 AMS Suite software includes a Dielectric Chart which lists the dielectric constants of a wide range of products. AMS also includes a tool which allows you to calculate dielectric constants based on measurements of the Upper Product Thickness.

Vapor Dielectric

HART Comm	TO BE ADDED

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	TO BE ADDED

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

Table 5-2. Measurement Mode

Model	Measurement Mode
3308	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 7: 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	TO BE ADDED

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	TO BE ADDED

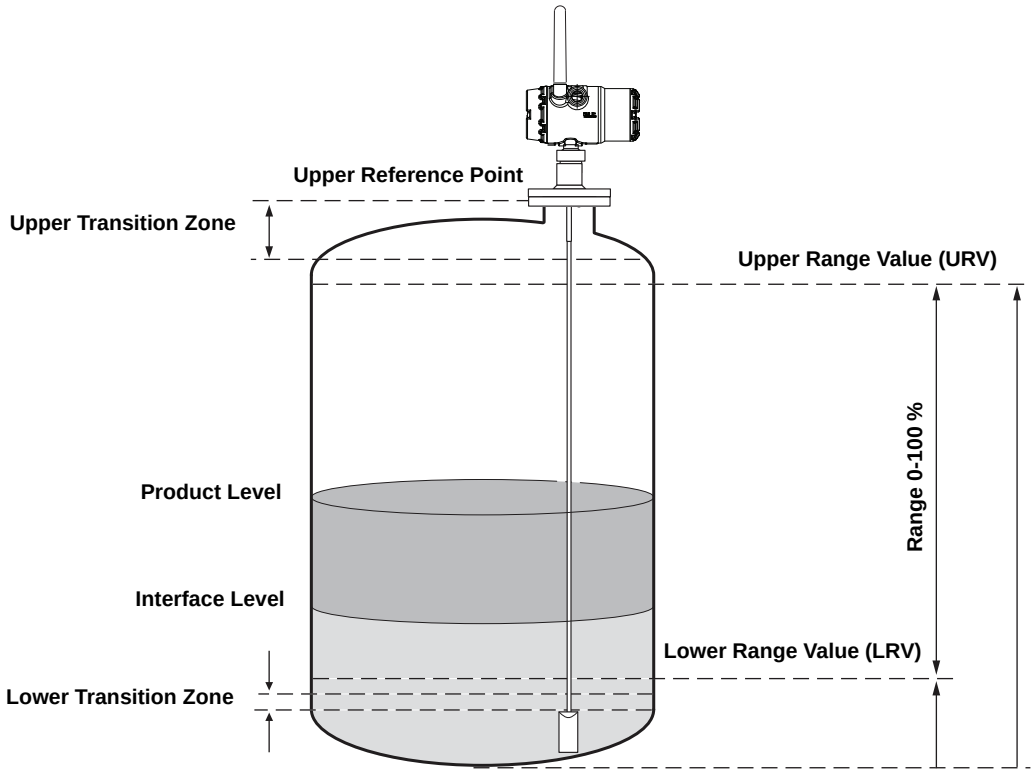
For interface measurements the Maximum Upper Product Thickness parameter may be used in special cases when the dielectric constant of the upper product is relatively high. By setting this parameter you can avoid that interface measurements are getting out of range.

Display

HART Comm	TO BE ADDED

Choose variabels to be displayed.

Figure 5-8. Range Values



VOLUME CONFIGURATION

Transmitter Variables

HART Comm	TO BE ADDED

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

Volume Units

HART Comm	TO BE ADDED

Choose one of the following units:

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

Tank Type

HART Comm	TO BE ADDED

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	TO BE ADDED

If a standard tank type was chosen, enter the diameter and height of the tank. See “Volume Configuration” on page 5-6 for information on how to specify tank dimensions.

Strapping Table

HART Comm	TO BE ADDED

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.

VERIFY OPERATION

Operation can be verified in four ways, further described in this section:

1. At the device with the local display
2. Using the Field Communicator
3. In the Smart Wireless Gateway's integrated web interface
4. Using the AMS® Suite Wireless Configurator or AMS Device Manager

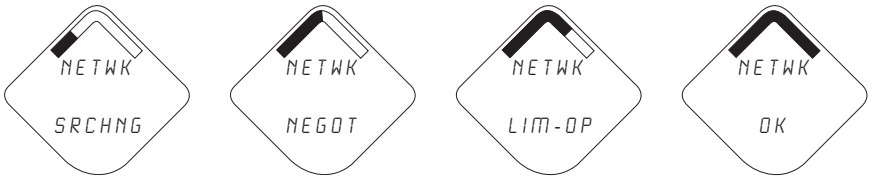
If the Rosemount 3308 was configured with the Network ID and Join Key, and sufficient time has passed, the transmitter will be connected to the network. If Network ID and Join Key were not configured, please see “Troubleshooting” on page 5-16.

Verification by LCD

To verify operation at the device with the local display, confirm that the display is showing a value. If the device is connected, the default LCD configuration displays the primary variable (PV) value at the configured update rate.

illustrates the display messages that may be shown in the various stages of the device's network connection. Refer to Section 6: Operation and Maintenance for a full listing of error codes and other LCD messages. Press the Diagnostic button to display the TAG, Device ID, Network ID, Network Join Status, and Device Status screens.

Figure 5-9. Network Connection LCD Display Messages



Searching for Network | **Joining Network** | **Connected with Limited Bandwidth** | **Connected**

Field Communicator Verification

For HART Wireless transmitter communication, a Rosemount 3308 DD is required. To obtain the latest DD, visit the Emerson Process Management Easy Upgrade site at: http://www2.emersonprocess.com/en-US/documentation/deviceinstallkits.

Connect the Field Communicator as shown on in Figure 5-2 on page 5-2 of this document. Do not remove the Power Module. Removing the Power Module may cause the device to drop off the network.

NOTE
In order to communicate with a Field Communicator, the device must be powered by connecting the Power Module.

Enter the Field Communicator menu and use the Fast Key Sequence in Table 5-3 to navigate to the Communications menu items. Select the **Communication Status** parameter to verify operation. The remaining Communications menu items provide additional network information.

Table 5-3. Rosemount 3308 Communications Fast Key Sequence

Function	Key Sequence	Menu Items
Communications	3, 3	Join Status, **Communication Status**, Join Mode, Number of Available Neighbors, Number of Advertisements Heard, Number of Join Attempts

Verification by Gateway

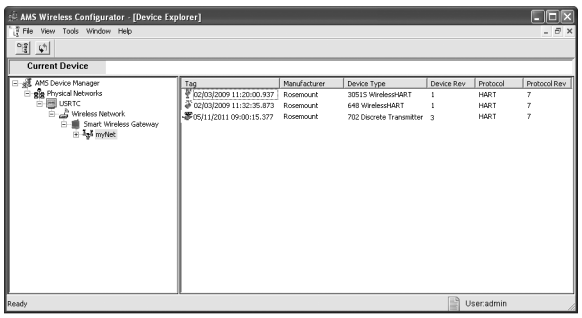
Using the Smart Wireless Gateway's integrated web interface, navigate to the **Explorer>Status** page as shown in Figure 5-10. This page shows whether the device has joined the network and if it is communicating properly. Locate the device in question and verify all status indicators are good (green). It may take several minutes for the device to join the network and be seen on the Gateway's integrated web interface.

Figure 5-10. Smart Wireless Gateway Explorer Status Page

Verification with AMS Wireless Configurator

When the device has joined the network, it will appear in the Wireless Configurator window as illustrated in Figure 5-11. For HART Wireless transmitter communication, a 3308A DD is required. To obtain the latest DD, visit the Emerson Process Management Easy Upgrade site at: http://www2.emersonprocess.com/en-US/documentation/deviceinstallkits.

Figure 5-11. AMS Wireless Configurator Screen



Troubleshooting

If the device is not joined to the network after power up, verify the correct configuration of the Network ID and Join Key, and that Active Advertising has been enabled on the Smart Wireless Gateway. The Network ID and Join Key in the device must match the Network ID and Join Key of the Gateway. Reference the instructions given on page 5-2 for information on configuring the Network ID and Join Key of the Rosemount 3308.

Section 6 Operation and Maintenance

SAFETY MESSAGES

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

⚠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.

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the Product Certifications section for any restrictions associated with a safe installation.

- Before connecting a Field Communicator in an explosive atmosphere, ensure the instruments are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an Explosion-proof/Flameproof installation, do not remove the transmitter cover when power is applied to the unit.

Process leaks may cause harm or result in death:

- Do not remove the transmitter while in operation
- Install device prior to process start-up

Electrical shock could cause death or serious injury:

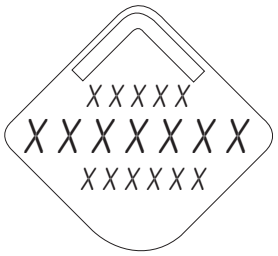
- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm (8 in.) from all persons.

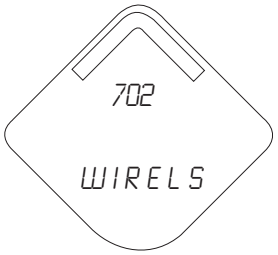
LCD SCREEN MESSAGES

Startup Screen Sequence

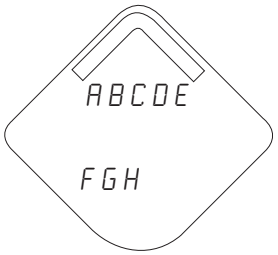
The following screens will display when the power module is first connected to the Rosemount 3308.



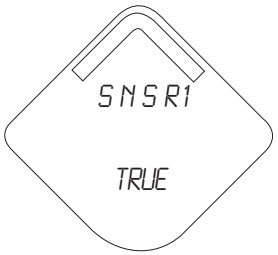
All Segments On: used to visually determine if there are any bad segments on the LCD



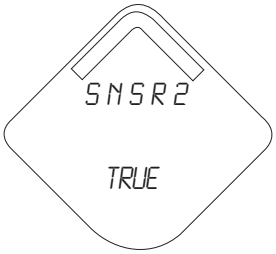
Device Identification: used to determine Device Type.



Device Information - Tag: user entered tag which is 8 characters long - will not display if all characters are blank

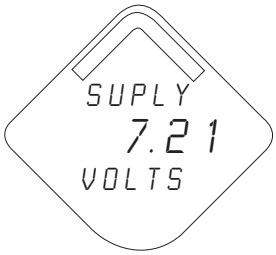


PV Screen - Measurement of mapped Primary Variable (default is XX)



SV Screen - Measurement of mapped Second Variable (default is XX)

Electronics Temperature



Supply Voltage

DISPLAY OPERATION

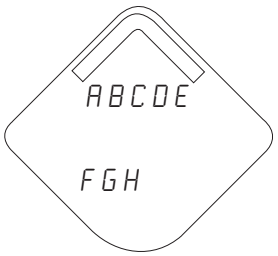
During steady state operation, the LCD gives a periodic display of user-chosen variables at the configured wireless update rate. These variables can be chosen from a list of XX: Level, ……

The LCD Display will display the variables at the configured update rate, but no faster than XXX. Refer to page XX for instructions on configuring the display.

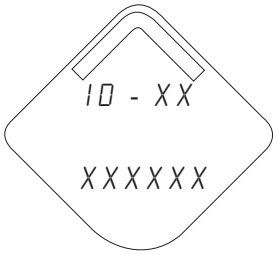
Diagnostic Button Screen Sequence

Detailed diagnostic information can be obtained by removing the display cover of the Rosemount 3308 transmitter, and momentarily depressing the "DIAG" button. The LCD will display the diagnostic screens as shown below. Press the **Diagnostic** button to display the **TAG**, **Device ID**, **Network ID**, **Network Join Status**, and **Device Status** screens.

The following five screens will display when the device is operating properly and the Diagnostic Button has been pressed.



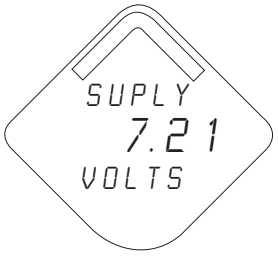
Diagnostic Button Screen 1: Tag



Diagnostic Button Screen 2: Device Identification - used to determine Device ID

Diagnostic Button Screen 3: Network ID

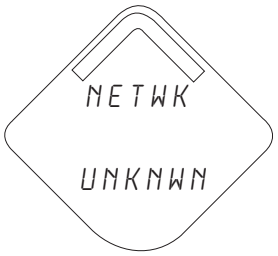
Diagnostic Button Screen 4: the device has joined a network and has been fully configured and has multiple parents. Also see “Network Connection Status Screens” on page 6-5.



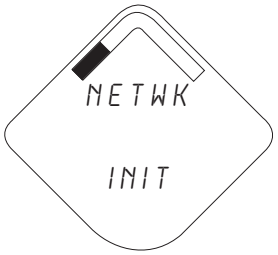
Diagnostic Button Screen 5: voltage reading at the Power Module terminals. Also see

Network Connection Status Screens

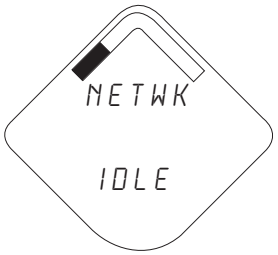
One of the following network diagnostic status screens will display in the fourth position of the Diagnostic Button Screen sequence. The screen displayed is dependent on the progress of the device in joining the wireless network.



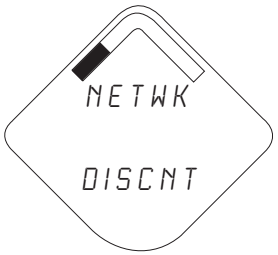
Diagnostic Button Screen 4.1: the device is still in the process of being activated



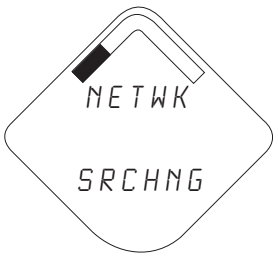
Diagnostic Button Screen 4.2: the device has just started



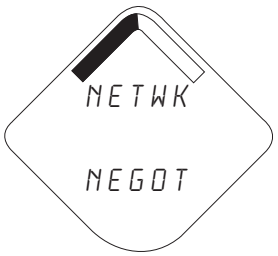
Diagnostic Button Screen 4.3: the device has just started to join the network



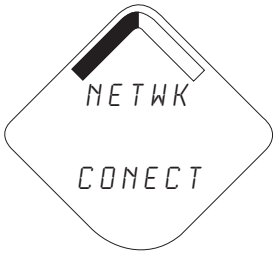
Diagnostic Button Screen 4.4: the device is in a disconnected state and requires a "Force Join" command to join the network



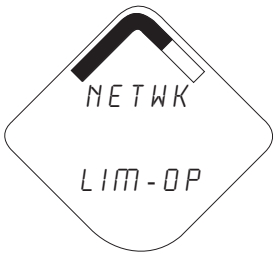
Diagnostic Button Screen 4.5: the device is searching for the network



Diagnostic Button Screen 4.6: the device is attempting to join a network



Diagnostic Button Screen 4.7: the device is connected to the network, but is in a “quarantined” state

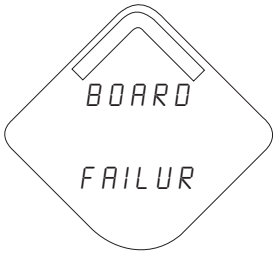


Diagnostic Button Screen 4.8: the device is joined and operational, but is running with limited bandwidth for sending periodic data

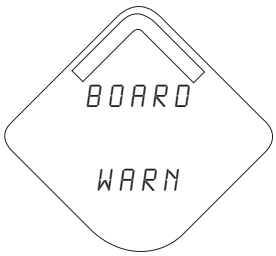
Diagnostic Button Screen 4.9: the device has joined a network and has been fully configured and has multiple parents

Diagnostic Button Screen Sequence (continued)

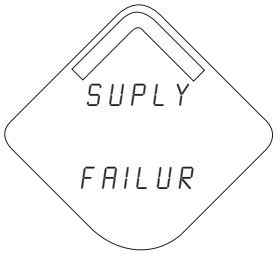
The following screens will show the device diagnostics depending on the state of the device, continuing after Diagnostic Button Screen 5.



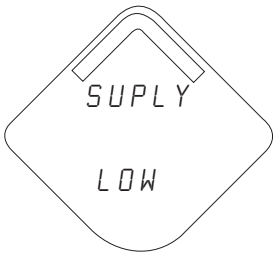
Diagnostic Button Screen 6.1: there is a critical error which may prevent the electronics board from operating correctly



Diagnostic Button Screen 6.2: there is a warning which should be addressed, but should not affect the device output.



Diagnostic Button Screen 7.1: the terminal voltage has dropped below level of operating limit. Replace the Black Power Module model number 701PBKKF
(Part Number: 00753-9220-0001)

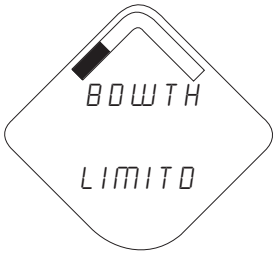


Diagnostic Button Screen 7.2: the terminal voltage is below the recommended operating range
- if this is a self-operated device, the power module should be replaced - for line powered devices, the supply voltage should be increased

Diagnostic Button Screen 8: the device cannot retrieve information from the radio in the device - the device may still be operational and publishing HART data

Diagnostic Button Screen 9: configuration of the transmitter is invalid such that critical operation of the device may be affected - check the extended configuration status to identify which configuration item(s) need to be corrected

Diagnostic Button Screen 10: a switch attached to the transmitter has failed, and valid readings from that probe are no longer possible - check the probe and probe wiring connections - check additional status for more detailed information of the failure source



Diagnostic Button Screen 11: the device has not yet received all of the requested wireless bandwidth needed to operate as configured

Diagnostic Button Screen 12: the device has not yet received all of the requested wireless bandwidth needed to operate as configured

Diagnostic Button Screen 13+: all of the periodic screens except Supply Voltage will now be displayed to conclude the Diagnostic Button Screen Sequence. These screens are:
PV Measurement
SV Measurement
Electronics Temperature

ALERTS

The Rosemount 3308 can be configured to report alerts based on the measured variables. The Rosemount 3308 also reports diagnostic alerts when there is a device malfunction. For information on these alerts, refer to Section 6: Troubleshooting. The following figures show how the AMS Suite Intelligent Device Manager overview screen looks for each of the alert conditions.

Figure 6-1. AMS Device Manager Overview Screen, Normal Conditions

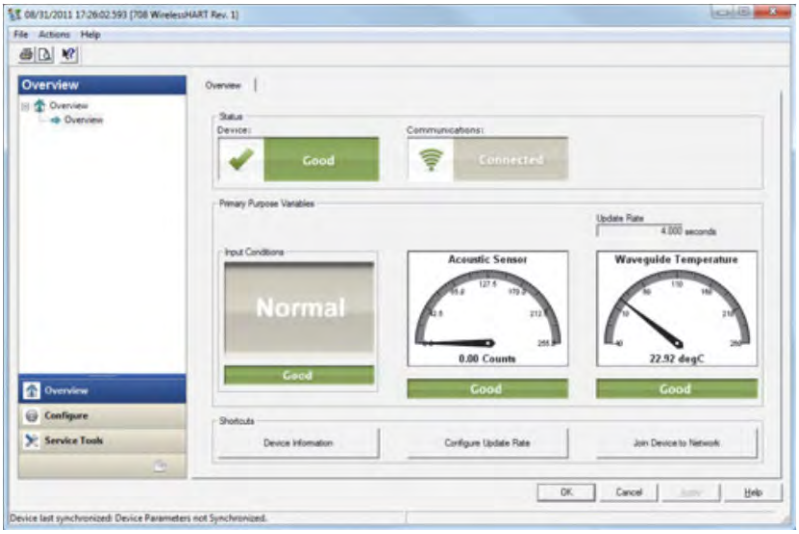
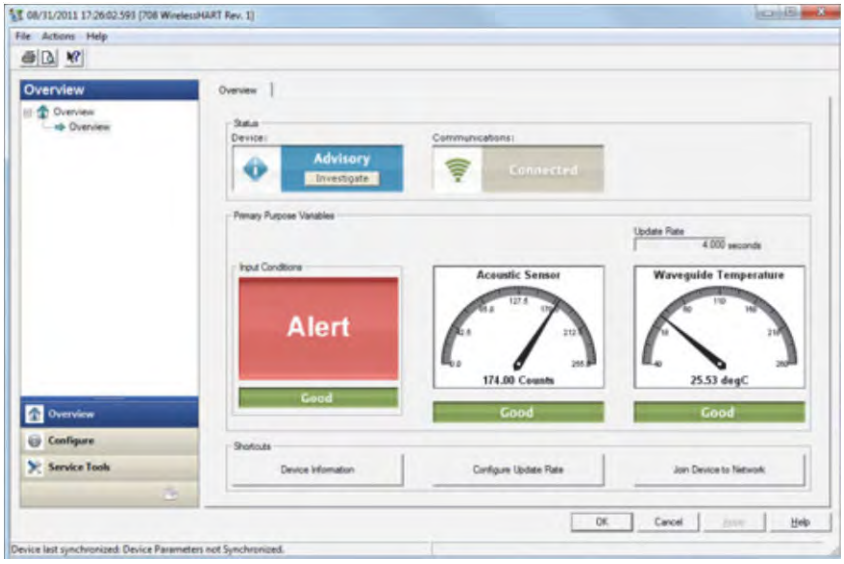


Figure 6-2. AMS Device Manager Overview Screen, Alert Conditions



Device Alert Configuration

Alert Levels

The Rosemount 3308 provides 4 user configurable alerts.

HI HI

HI

LO

LO LO explain all and add image.

Alert Setup

There are three methods that can be used to set up these alerts using AMS Wireless Configurator or a field communicator.

Add methods.

POWER MODULE REPLACEMENT

Expected Power Module life is XX years at reference conditions(1).

Add warnings

When the Power Module needs to be replaced, remove the Power Module cover and the depleted Power Module. Replace the power module with a new Black Power Module, SmartPower™ Solutions model number 701PBKKF. Replace the cover and ensure that the power module cover is fully tightened to prevent moisture ingress. The lip of the power module cover should be in contact with the metal enclosure to ensure a proper seal. Do not over tighten.

Handling Considerations

The Black Power Module with the wireless unit contains two "C" size primary lithium/thionyl chloride batteries. Each battery contains approximately 2.5 grams of lithium, for a total of 5 grams in each Power Module. Under normal conditions, the battery materials are self-contained and are not reactive as long as the batteries and the battery pack integrity are maintained. Care should be taken to prevent thermal, electrical or mechanical damage. Contacts should be protected to prevent premature discharge.

Use caution when handling the power module, it may be damaged if dropped from heights in excess of 20 ft (6 m).

⚠ Battery hazards remain when cells are discharged.

Environmental Considerations

As with any battery, local environmental rules and regulations should be consulted for proper management of spent batteries. If no specific requirements exist, recycling through a qualified recycler is encouraged. Consult the materials safety data sheet for battery specific information.

Shipping Considerations

The unit was shipped to you without the power module installed. Please remove the power module prior to shipping.

Each Black Power Module contains two "C" size primary lithium batteries. Primary lithium batteries are regulated in transportation by the U.S. Department of Transportation, and are also covered by International Air Transport Association (IATA), International Civil Aviation Organization (ICAO), and European Ground Transportation of Dangerous Goods (ARD). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Please consult current regulations and requirements before shipping.

(1) Reference conditions are 70° F (21° C), transmit rate of once per minute, and routing data for three additional network devices.

Section 7 Service and Troubleshooting

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.

In an Explosion-proof/Flameproof installation, do not remove the transmitter cover when power is applied to the unit.

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 3308 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.

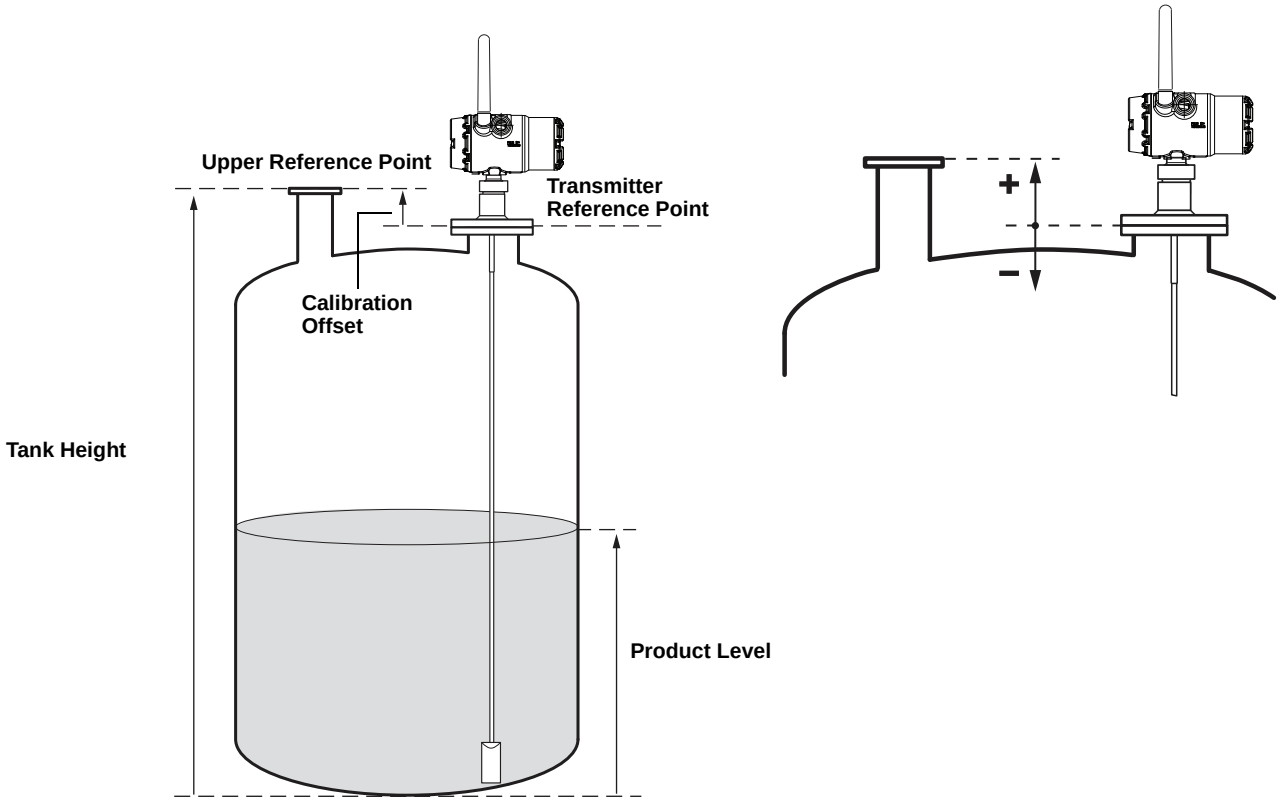
ADVANCED CONFIGURATION

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 7-1. Tank Geometry



To set the desired upper reference point do the following:

1. Adjust the **Tank 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.

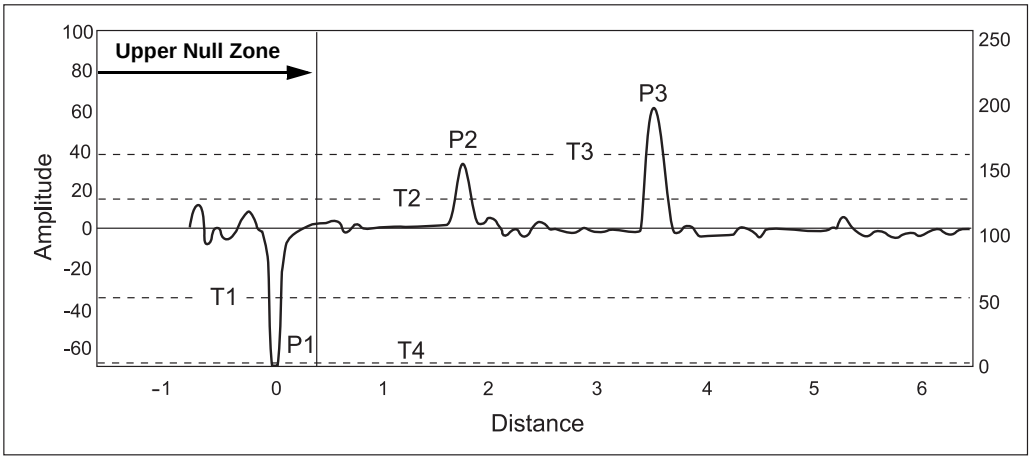
Plotting the Measurement Signal

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 7-2. 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 Rosemount 3308 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.

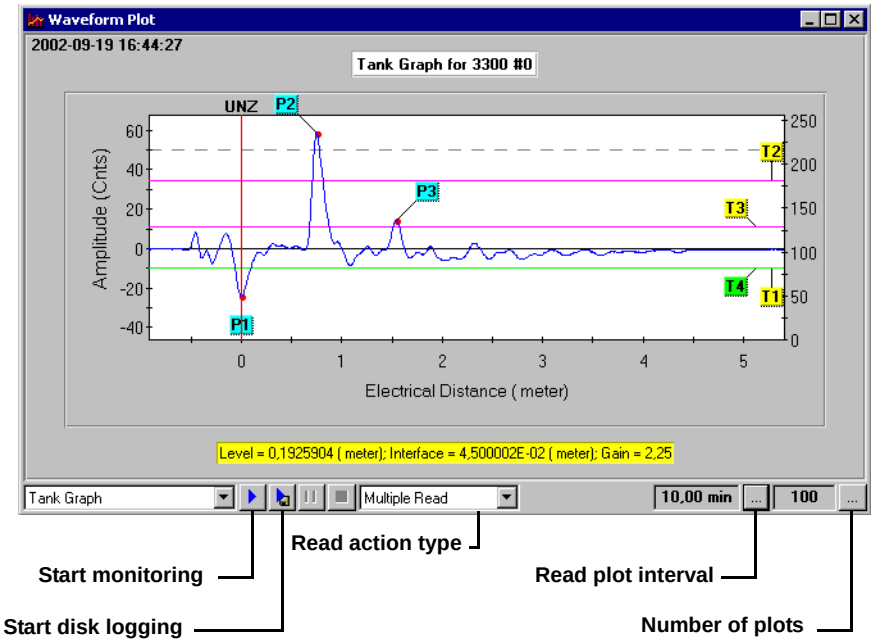
T4 - amplitude threshold that is used to detect whether the probe is fully immersed in the upper product or not.

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 7-3. 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 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 7-12.

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 7-4. Waveform plot indicating that the amplitude threshold for the interface peak is too high.

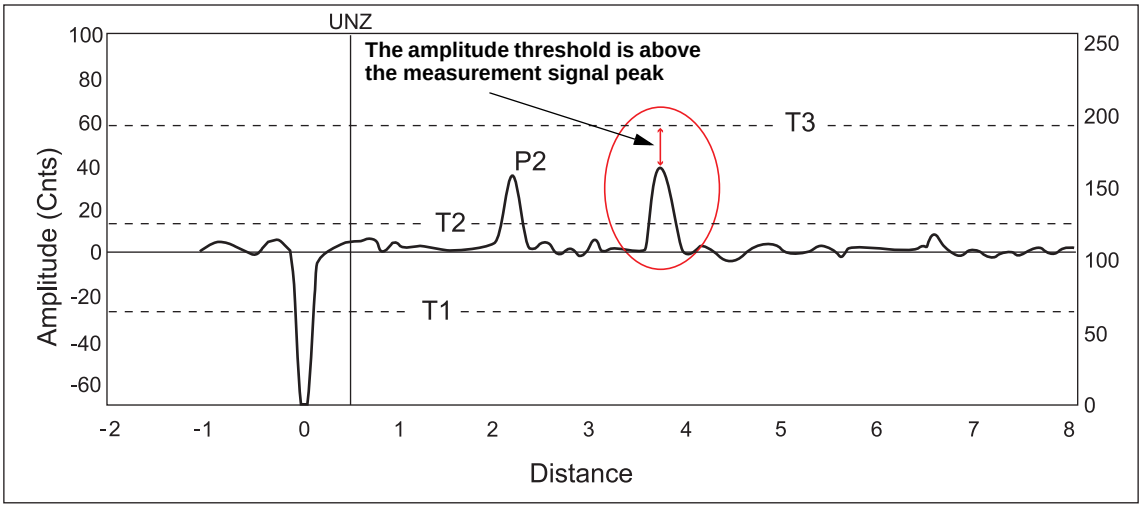
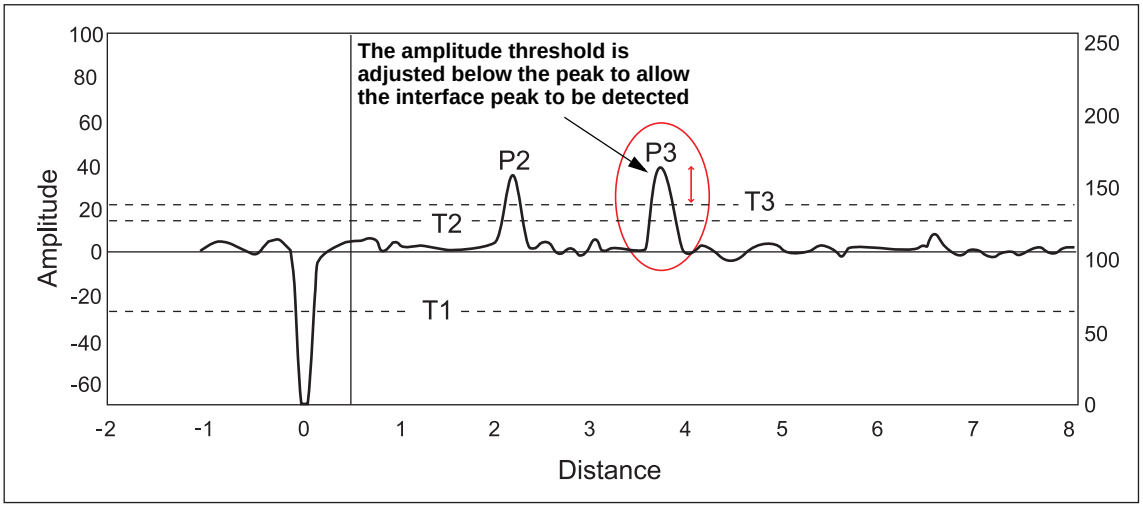


Figure 7-4 illustrates a situation where amplitude threshold T3 is too high. The signal amplitude peak at the interface between the upper and lower products is not detected in this case. By adjusting amplitude threshold T3, the peak at the interface between the upper and lower products is detected as illustrated in Figure 7-5:

Figure 7-5. After changing the amplitude threshold the transmitter detects the interface

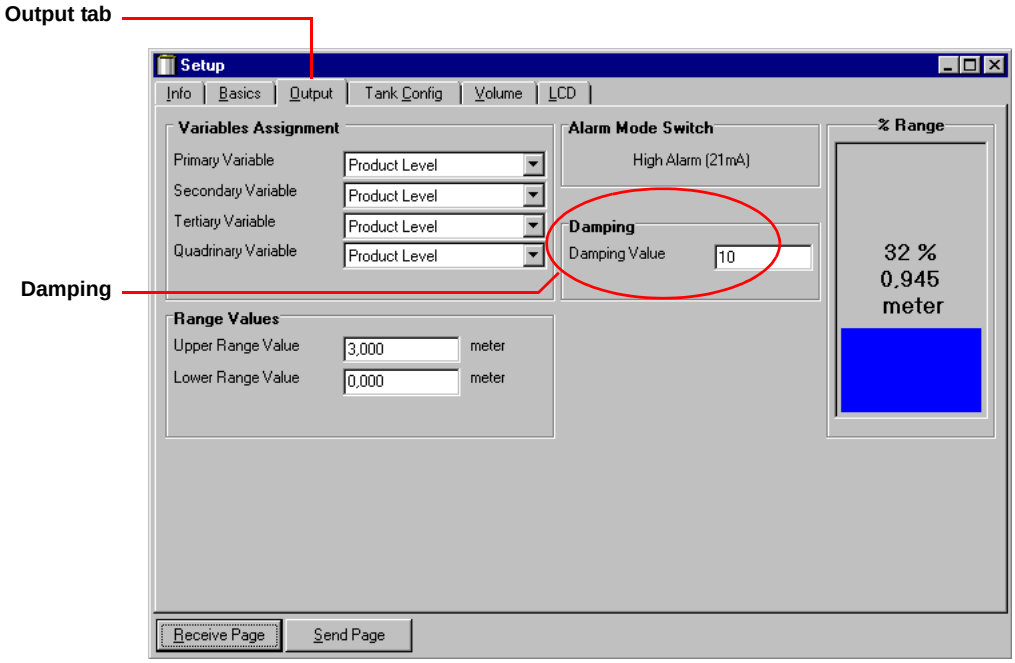


High Level Rates

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 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.

Interface Measurements with Fully Immersed Probes

The Rosemount 3308 transmitter 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 7-6. 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.

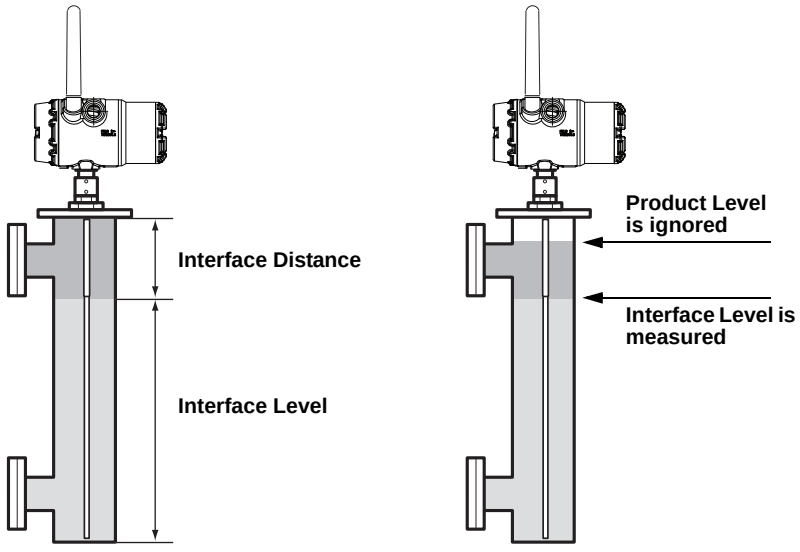
Measurement mode *Interface when Immersed Probe* can also be activated in the RCT software:

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 7-6. Interface Level measurements in a full bridle pipe.



NOTE!
Adjust Threshold T2 if the level pulse is not detected.

SERVICE

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 Tank Height.

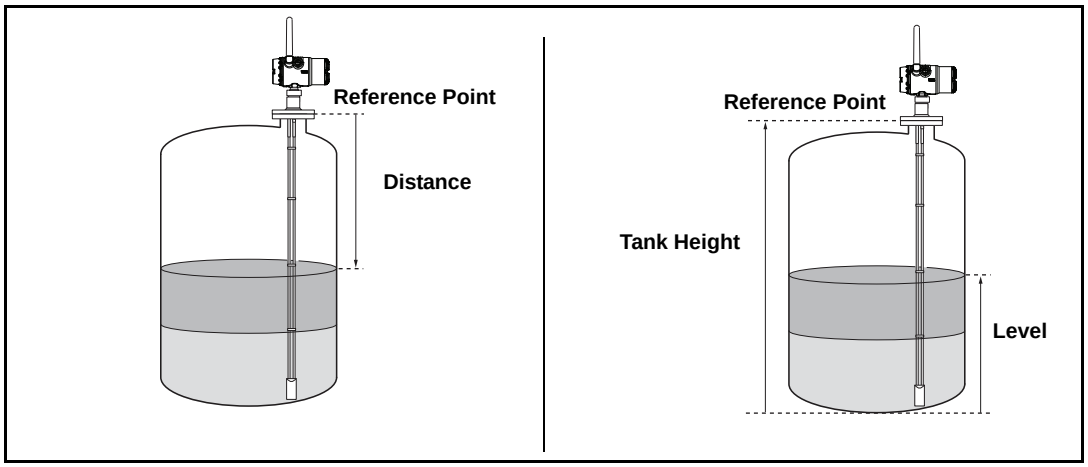
Distance calibration

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 Tank Height so that the measured Product Level corresponds with the actual level.

Figure 7-7. 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 Rosemount 3308 transmitter is equipped with software functionality that minimizes the Upper Transition 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 7-8. Upper Null Zone

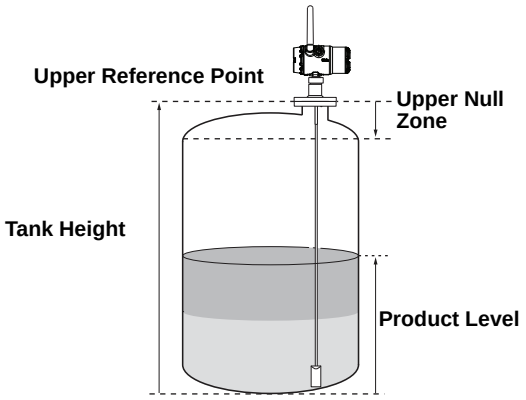
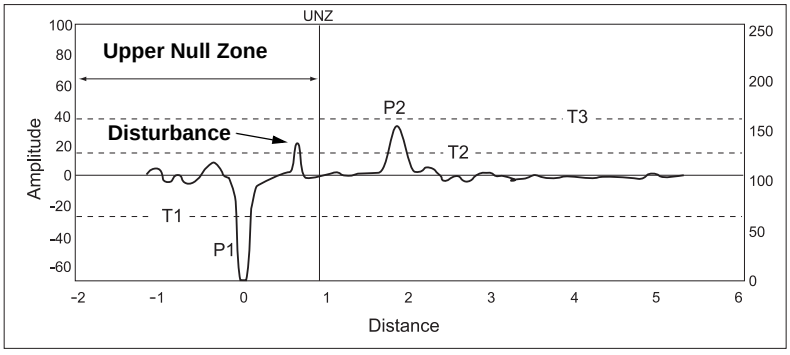


Figure 7-9. Identifying the Upper Null Zone in the RCT Waveform Plot



Amplitude Threshold Settings

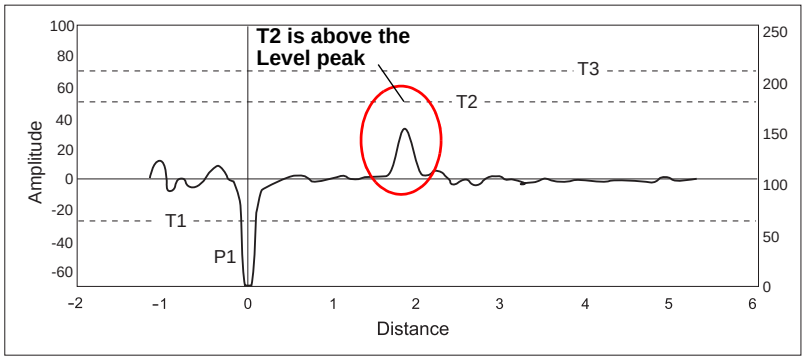
The amplitude thresholds are automatically adjusted to appropriate values in order to filter out noise and other non-valid measurements from the measurement signal.

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 5: 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.

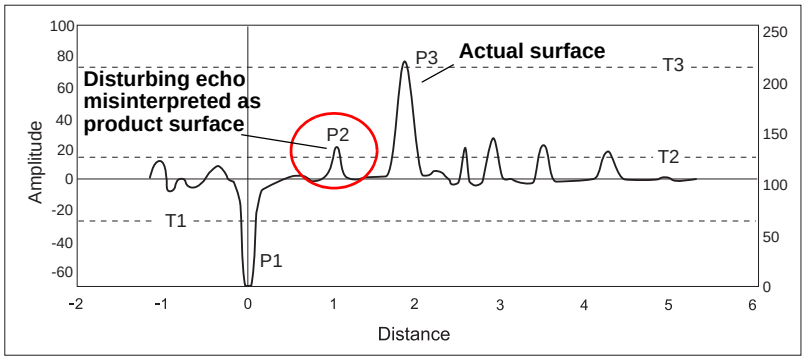
If the amplitude threshold is too high the product level is not detected as illustrated in Figure 7-10.

Figure 7-10. Example 1: amplitude threshold T2 is too high.



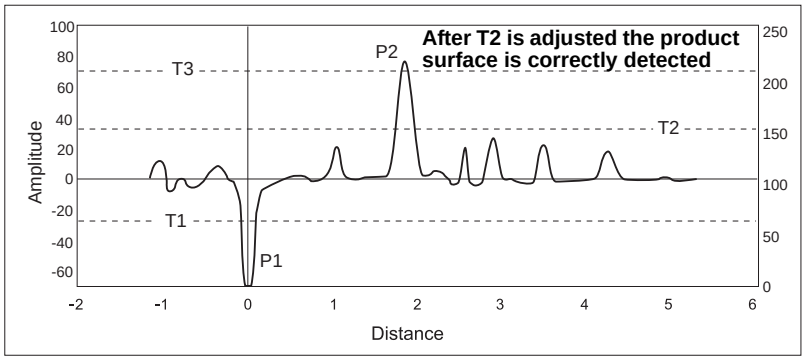
If there are disturbing objects in the tank the threshold must be carefully set in order to avoid locking on the wrong amplitude peak. In Figure 7-11 the transmitter has locked on a peak above the actual product surface, i.e. a disturbance was interpreted as the product surface, whereas the actual product surface was interpreted as an interface or the probe end.

Figure 7-11. Example 2: amplitude threshold T2 is too low.



By adjusting the amplitude threshold T2 the product surface is detected correctly as illustrated in Figure 7-12.

Figure 7-12. Waveform plot after threshold T2 was 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.

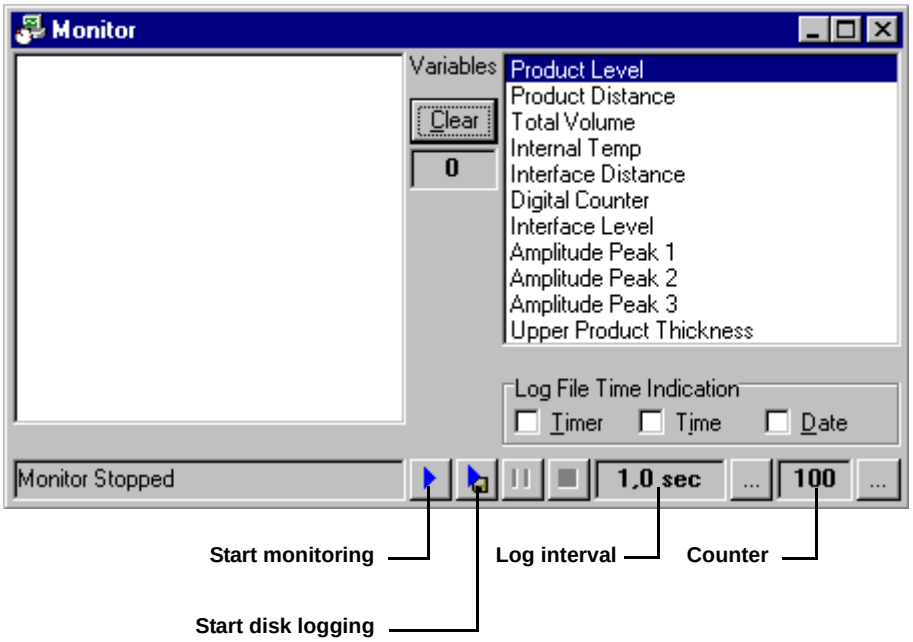
NOTE
Check that the dielectric constant parameter setting is reasonably close to the actual dielectric constant value of the upper product before changing the amplitude thresholds.

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

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

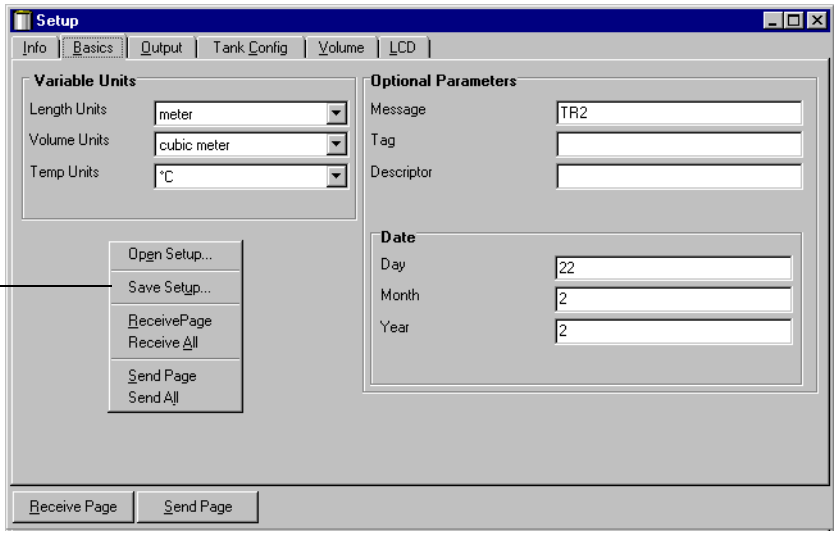
The Radar Configuration Tool offers different methods to save the current transmitter configuration:

- 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:

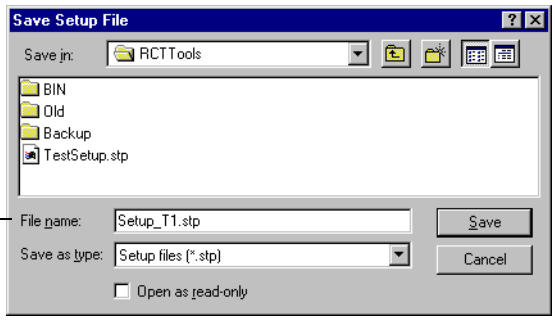
1. Click the Setup icon in the RCT workspace or choose the *Setup* option from the *View* menu to open the Setup window.



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.

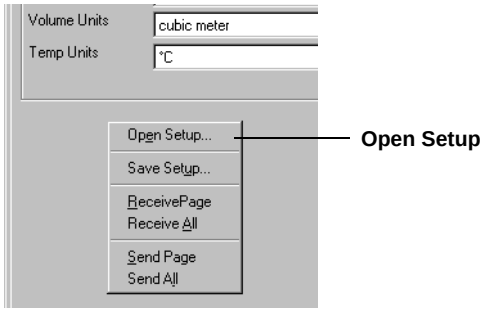
3. Click the right mouse button and choose the **Save Setup** option.



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.

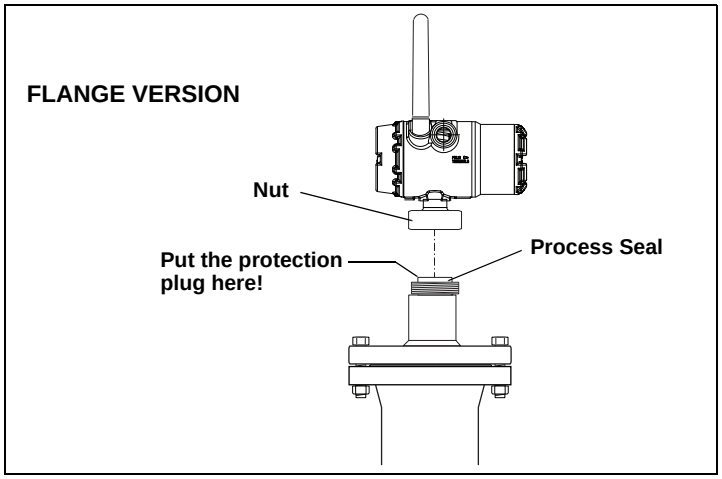
Memory Map

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:

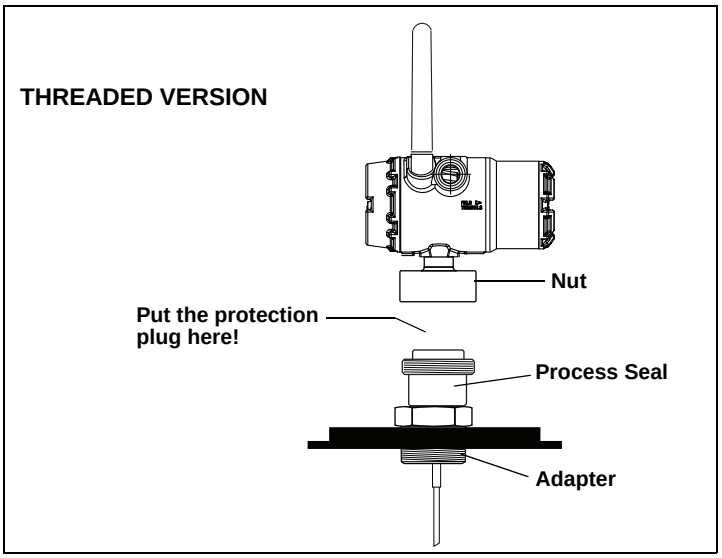
1. Start the RCT program.
2. Choose the **View>Memory** option, or click the **Memory Map** icon in the RCT workspace (Advanced section at the left side of the workspace window).
3. Choose the All EE option from the drop-down list.
4. Click the Receive button. (It may take a few minutes to read the database).
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

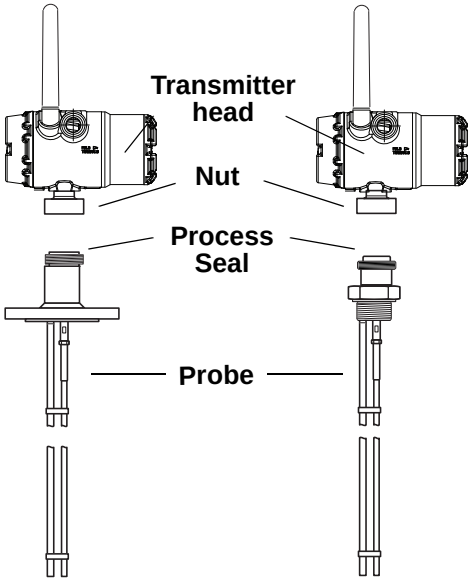


1. Loosen the nut that connects the transmitter housing to the Process Seal.
2. Carefully lift the transmitter head.
3. Make sure that the upper surface of the Process Seal is clean and the spring-loaded pin at the center of the Process Seal is properly inserted (the pin should move back when pushed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



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.

DIAGNOSTIC MESSAGES

Troubleshooting

If there is a malfunction despite the absence of diagnostic messages, see Table 7-1 for information on possible causes.

Table 7-1. Troubleshooting chart

Symptom	Possible cause	Action
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 5-9).
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.	• P3 is identified as a double bounce. • P2 and P3 are very close.	Adjust thresholds T2 and T3, see “Amplitude Threshold Settings” on page 7-12 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: • 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.	• The tank is full. • The transmitter is configured with wrong probe type. • Amplitude Threshold T1 is not correct.	• Check the product level. • Check that correct probe type is configured. • Check Amplitude Threshold T1.
Level accuracy seems off.	• Configuration error.	• Check the Tank Height parameter. • Check status information and diagnostic information.
Integral display does not work.		• Check the display configuration. • Check Display connection.

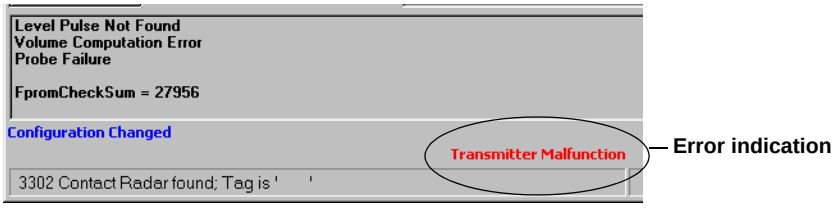
Table 7-2. Maintenance and Troubleshooting Suggestions

Symptom	Corrective Actions
Wireless Troubleshooting	
Poor wireless connectivity	1. Verify device oriented for optimal connections (See Section 2: Transmitter Overview of this document) 2. Verify wireless network best practices are followed (See Appendix C for more information)
Acoustic Transmitter not joining network	1. Verify the device has power 2. Verify the device is within effective communications range 3. Verify the proper Network ID has been entered into the device 4. See troubleshooting section of the Smart Wireless Gateway for more information (Document No. 00808-0200-4420)
Limited Bandwidth Error	1. Use the slowest acceptable update Rate 2. Increase communication paths by adding more wireless points 3. Check that the device has been online for at least an hour 4. Create a new network with an additional Smart Wireless Gateway

Errors

Table 7-3 is a list of diagnostic messages that may be displayed on the Integral Display, on the 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 7-3. 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.	• Load default database and restart the transmitter. • Contact Emerson customer service 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.
FPROM 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	• Load default database and restart the transmitter. • Contact Emerson customer service 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 7-18).

Warnings

Table 7-4 is a list of diagnostic messages that may be displayed on the Integral Display, on the 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 7-4. Warning messages.

Message	Description	Action
Reference pulse not found.	Possible cause: • Reference pulse immersed in high dielectric liquid. • Wrong threshold level T1. • Hardware error.	• View the waveform plot and check amplitude threshold T1. • Check that the tank is not overfull.
No level pulse is found.	Possible cause: • Wrong threshold level T2. • Liquid level in Transition Zone or below probe end.	• View the waveform plot and check amplitude threshold T2.
Interface pulse not found.	Possible cause: • Wrong threshold level T3. • Interface level too close to the upper product level. • No level pulse detected.	• View the waveform plot and check amplitude threshold T3.
Internal temperature out of range.	-40 ºC<Internal Temperature<85 ºC.	Contact Rosemount service department.
Volume computation warning.	• Volume configuration error. • Strapping table error.	• 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.	• Wrong threshold level T4. • Reference pulse immersed in liquid.	• View the waveform plot and check amplitude threshold T4.

Appendix A Reference Data

FUNCTIONAL SPECIFICATION

General	
Field of Application	Liquids and semi-liquids level or liquid/liquid interfaces
Measurement Principle	Time Domain Reflectometry (TDR). (See Figure 2-1 on page 2-3 for a description of how it works)
Microwave Output Power	
Telecommunication (FCC and R&TTE)	
Humidity	0 to 100% relative humidity
Start-up time	
Wireless	
Sensor Input	Add types of sensor inputs.
Output	IEC 62591 (*Wireless*HART) 2.4 GHz DSSS
Radio Frequency Power Output from Antenna	External (WK option) antenna: Maximum of 10 mW (10 dBm) EIRP Extended Range, External (WM option) antenna: Maximum of 18 mW (12.5 dBm) EIRP
Humidity Limits	0-100% relative humidity
Wireless Update Rate	User selectable, X sec. to 60 min.
IS Electrical Parameters	
Display and Configuration	
Integral Display	The optional integral LCD can display discrete state and diagnostic information. Display updates at each wireless update
Remote Display	Data can be read remotely by using the four-digit Rosemount 751 Field Signal Indicator. For further information, see the Rosemount 751 Product Data Sheet (Document Number 00813-0100-4378)
Configuration Tools (See earlier “Output” diagrams)	Emerson Field Communicator (e.g. 375/475 Field Communicator), Radar Configuration Tools (RCT) software package for PC (included with delivery of transmitter), or Emerson AMS™ Device Manager for PC (visit www.emersonprocess.com/AMS for further information), or or DeltaV or any other DD (Device Description) compatible host systems
	Notes: • DTM (compliant with version 1.2 of the FDT/DTM specification) is also available supporting configuration in for instance Yokogawa Fieldmate/PRM, E+H™ FieldCare, and PactWare™ • To communicate using RCT or AMS Device Manager, a HART modem is required. The HART modem is available as an RS232 or USB version (see “Accessories Rosemount 3308” on page A-20) • The transmitter can be pre-configured by selecting Options code C1 (page page A-18) and sending a completed Configuration Data Sheet (CDS). The CDS is available from www.rosemount.com
Output Units	For Level, Interface, and Distance: ft, inch, m, cm, or mm For Volume: ft^3, $inch^3$, Gallons, Imp gals, barrels, m^3, or liters
Output Variables	
Temperature Limits	
Ambient Temperature	The maximum and minimum ambient temperature for the electronics depends on the process temperature *and* on the approval (see “Product Certifications” on page B-1). • The temperature range for the optional Integral Display is –40 °F (–40 °C) to 185 °F (85 °C) • To lower the temperature around the electronics, a Remote Mounting Connection can be used. The maximum temperature for the Remote Housing Connection at the vessel connection point is 302 °F (150 °C).
Temperature Limits	Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

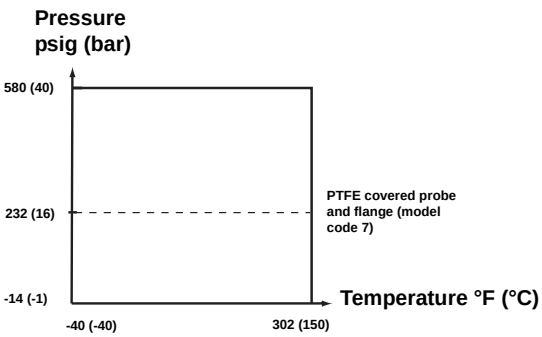
	Operating Limit	**Storage Limit**
With LCD Display	-4 to 175 °F (-20 to 80° C)	-40 to 185 °F (-40 to 85 °C)
Without LCD Display	-40 to 185 °F (-40 to 85° C)	-40 to 185 °F (-40 to 85 °C)

Storage Temperature	–40 to 176 °F (–40 to 80 °C)

Process Temperature and Pressure Rating

Process Temperature

Max. Rating, Standard Tank Connections



Final rating depends on flange and O-ring selection. Table A-1 on page A-4 gives the temperature ranges for standard tank seals with different O-ring materials.

Notes:

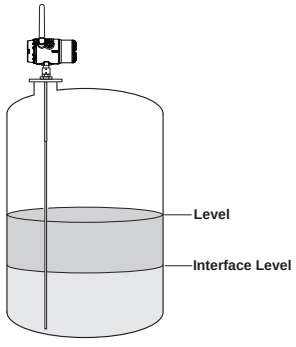
- The maximum product temperature is at the lower part of the flange
- The maximum temperature for the Remote Housing Connection at the vessel connection point is 302 °F(150 °C)

ASME / ANSI Flange Rating	316L SST Flanges according to ASME B16.5 Table 2-2.3. Max. 302 °F/580 psig (150 °C/40 bar)
EN Flange Rating	1.4404 according to EN 1092-1 material group 13E0. Max. 302 °F/580 psig (150 °C/40 bar)
Fisher & Masoneilan Flange Rating	316L SST Flanges according to ASME B16.5 Table 2-2.3. Max. 302 °F/580 psig (150 °C/40 bar)
JIS Flange Rating	316L SST Flanges according to JIS B2220 material group 2.3. Max. 302 °F/580 psig (150 °C/40 bar)
Tri-Clamps Rating	Maximum pressure is 16 bar for 1.5 in. (37.5 mm) and 2 in. (50 mm) housing; and 10 bar for 3 in. (75 mm) and 4 in. (100 mm) housing. The final rating depends on the clamp and gasket.
Plate Design	Certain models of flanged Alloy and PTFE covered probes have a tank connection design with a protective flange plate of the same material as the probe and with a backing flange in 316L / EN 1.4404. The protective flange plate prevents the backing flange from being exposed to the tank atmosphere For Alloy C-276 and Alloy 400, probes with flange plate design is available up to Class 300/PN 40. For PTFE, probes with flange plate design is available up to Class 150/PN 16
Flange Connection Rating	See Table A-2 for the conditions used for flange strength calculations

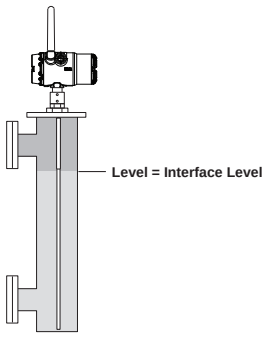
Interface Measurements

Considerations

The Rosemount 3308 is a good choice for measuring the interface of oil and water, or other liquids with significant dielectric differences. It is also possible to measure interfaces with a Rosemount 3308 in applications where the probe is fully submerged in the liquid. If interface is to be measured, follow these criteria:



Interface Measurement



Interface Measurement with fully submerged probe

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

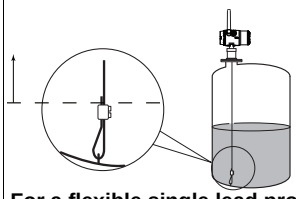
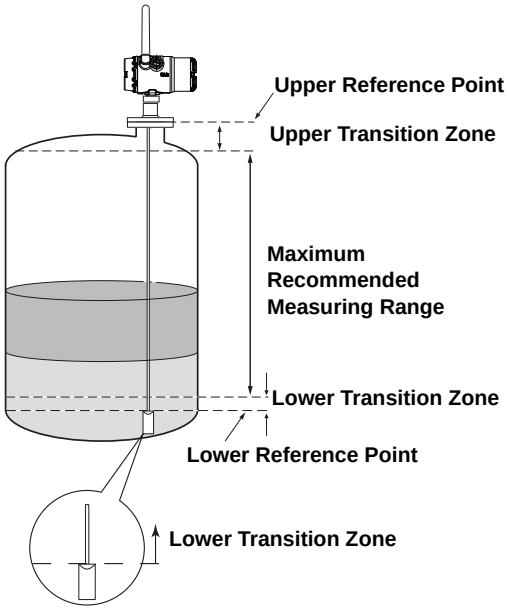
Table A-1. Temperature ranges for standard tank seals with different O-ring materials

Tank seal with different O-ring material	Min. Temperature °F (°C) in air	Max. Temperature °F (°C) in air
Fluoroelastomer (FKM)	5 (-15)	302 (150)
Ethylene Propylene (EPDM)	-40 (-40)	266 (130)
Perfluoroelastomer (FFKM)	14 (-10)	302 (150)
Nitrile butadiene	-31 (-35)	230 (110)

Table A-2. Conditions used for flange strength calculations

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

PERFORMANCE SPECIFICATION

General	
Reference Conditions	Rigid Single Lead probe, 77 °F (25 °C) water
Reference Accuracy	
Repeatability	± 0.04 in. (1 mm)
Ambient Temperature Effect	Less than 0.01% of measured distance per °C
Measuring Range	
Transition Zones	These zones are areas where measurements are non-linear or have reduced accuracy. If measurements are desired at the very top of a tank, it is possible to mechanically extend the nozzle and use a coaxial probe. The upper transition zone is then moved into the extension. See Table A-3 on page A-7. **Lower Transition Zone**  **For a flexible single lead probe with chuck, the lower transition zone is measured upwards from the upper part of the clamp.** 
Measuring Range and Minimum Dielectric Constant	16 in. (0.4 m) to 77 ft. (23.5 m)
	See Table A-4 on page A-7 for each probe's measuring range and minimum dielectric constant. Due to the measuring range depending on the application and factors described below, the values are a guideline for clean liquids. For more information, ask your local Emerson Process Management representative.
	Different parameters (factors) affect the echo and therefore the maximum measuring range differs depending on application according to: • Disturbing objects close to the probe • Media with higher dielectric constants (ε_r) give better reflection and allow a longer measuring range • Surface foam and particles in the tank atmosphere may affect measuring performance • Heavy coating or contamination on the probe should be avoided since it can reduce measuring range and might cause erroneous level readings
	Note: See Table A-5 on page A-7 for the measuring range when using the Remote Housing.
Interface Measuring Range	Target applications include interfaces between oil; oil-like and water; and water-like liquids with a low (<3) upper product dielectric constant and a high (>20) lower product dielectric constant. For such applications, the max measuring range is only limited by the length of the coaxial, rigid twin and rigid single lead probes.
	Note: For other product combinations, consult your local Emerson Process Management representative.
Environment	
Vibration Effect	Wireless output unaffected when tested per the requirements of IEC60770-1 field or pipeline with high vibration level (10-60 Hz 0.21 mm displacement peak amplitude / 60-2000 Hz 3g). Wireless output unaffected when tested per the requirements of IEC60770-1 field with general application or pipeline with low vibration level (10-60 Hz 0.15 mm displacement peak amplitude / 60-500 Hz 2g).
Electromagnetic Compatibility (EMC)	Meets all relevant requirements of EN 61326-2-3:2006
Built-in Lightning Protection	Meets EN 61000-4-4 Severity Level 4 and EN 61000-4-5 Severity Level 4

Coating	The Rosemount 3308 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. • Single lead probes are preferred when there is a risk for contamination (because coating can result in product bridging across the two leads for twin versions; between the inner lead and outer pipe for the coaxial probe) • PTFE probes are recommended for viscous or sticky applications. Periodic cleaning might be required • Maximum error due to coating is 1 to 10% depending on probe type, dielectric constant, coating thickness, and coating height above product surface 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 (see Table A-6 on page A-7).
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 3308 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 3308 transmitter can be configured to compensate for the influence of vapor.
CE-mark	

Table A-3. Transition Zones

	Dielectric Constant	Rigid Single Lead	Flexible Single Lead	Coaxial	Flexible Twin Lead
Upper[1] Transition Zone	**TO BE ADDED**				
Lower[2] Transition Zone					
	Note: The 4–20 mA set points are recommended to be configured between the transition zones, within the measuring range.				

(1) The distance from the upper reference point where measurements have reduced accuracy.
(2) The distance from the lower reference point where measurements have reduced accuracy.

Table A-4. Measuring Range and Minimum Dielectric Constant

Rigid Single Lead	Flexible Single Lead	Coaxial	Rigid Twin Lead	Flexible Twin Lead
Maximum Measuring Range				
TO BE ADDED				
Minimum Dielectric Constant				

Table A-5. Measuring Range When Using Remote Housing

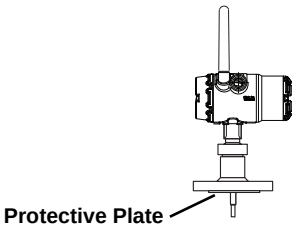
Rigid Single Lead	Flexible Single Lead	Coaxial	Rigid Twin Lead	Flexible Twin Lead
Maximum Measuring Range				
TO BE ADDED				
Minimum Dielectric Constant with 1 m Remote Housing				
Maximum Measuring Range with 2 m Remote Housing				
Maximum Measuring Range with 3 m Remote Housing				

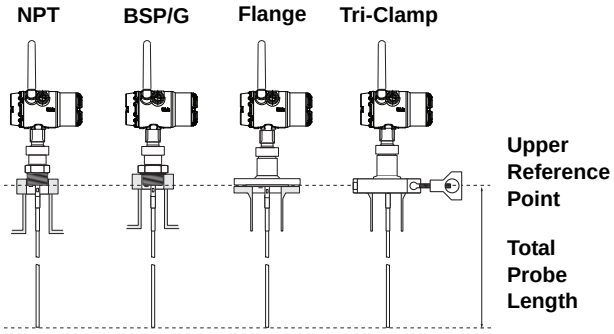
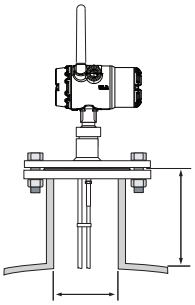
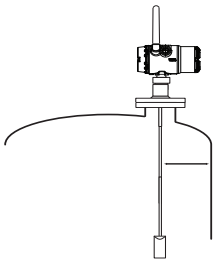
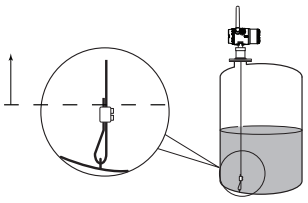
Table A-6. Maximum recommended Viscosity and Coating / Build-up

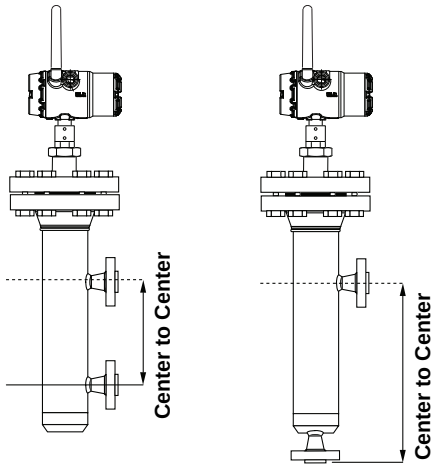
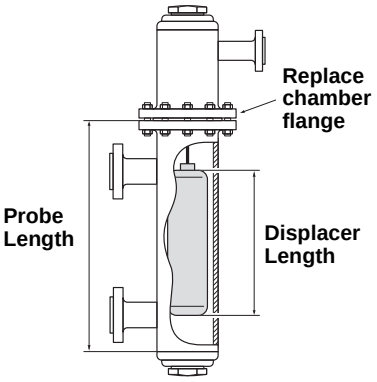
Coaxial	Twin Lead	Single Lead
Maximum Viscosity		
500 cP	1500 cP	8000 cP [1]
Coating / Build-up		
Coating not recommended	Thin coating allowed, but no bridging	Coating allowed

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

PHYSICAL SPECIFICATION

Housing and Enclosure	
Type	Dual compartment (removable without opening the tank). Electronics and cabling are separated. Two entries for conduit or cable connections. The transmitter housing can be rotated in any direction.
Electrical Connection	Wireless Black Power Module Replaceable, Intrinsically Safe Lithium-Thionyl Chloride power module with PBT polymer enclosure. XX year life at one minute update rate. Reference conditions are 70° F (21° C), and routing data for three additional network devices.
	Note: Continuous exposure to ambient temperature limits (-40 °F or 185 °F) (-40 °C or 85 °C) may reduce specified power module life by less than 20 %
Field Communicator Connections	Communication Terminal clips permanently fixed to terminal block
Materials of Construction	**Enclosure** Housing - Low-copper aluminum or stainless steel Paint - Polyurethane Cover O-ring - Nitrile butadiene **Terminal Block and Power Module Pack** PBT **Antenna** PBT/PC integrated omnidirectional antenna
Ingress Protection	NEMA 4X, IP 66, IP 67
Factory Sealed	Yes
Weight Transmitter Head	**Low-copper Aluminum** 3308 without LCD - XX lbs (XX kg) 3308 with M5 LCD - XX lbs (XX kg) **Stainless Steel** 3308 without LCD - XX lbs (XX kg) 3308 with M5 LCD - XX lbs (XX kg)
Remote Housing Mounting	Kit that includes a flexible armored extension cable and a bracket for wall or pipe mounting.
Tank Connection and Probe	
Tank Connection	The tank connection consists of a tank seal, a flange, Tri-Clamp, or NPT or BSP/G threads. Certain models of flanged Alloy and PTFE covered probes have a tank connection design with a protective flange plate of the same material as the probe and with a backing flange in 316L / EN 1.4404. The protective flange plate prevents the backing flange from being exposed to the tank atmosphere. See “Dimensional Drawings” on page 13.  **Protective Plate** **Tank Seal with Plate Design**
Flange Dimensions	Follows ASME B 16.5, JIS B2220, and EN 1092-1 standards for blind flanges. For Proprietary Fisher® and Masoneilan® flanges, see “Proprietary Flanges” on page A-13
Vented Flanges	Available with Masoneilan and Fisher vented flanges. Vented flanges must be ordered as accessories with a 1½-in. NPT threaded process connection (code RA); see Table on page A-20. As an alternative to a vented flange, it is possible to use a flushing connection ring on top of the standard nozzle.
Probe Versions	Coaxial, Rigid Twin and Rigid Single Lead, Flexible Twin and Flexible Single Lead.
	For guidelines on which probe to select depending on application, see the Technical Note Guided Wave Radar Application Guidelines (Document No. 00840-2600-4811)
	For interface measurements Rigid Single probe is the best choice for chamber mounting. The Twin or Coaxial probe is the preferred choice for clean, low dielectric constant liquids
Material Exposed To Tank Atmosphere	• Material model code 1: 316L SST (EN 1.4404), PTFE, PFA, and O-ring materials • Material model code 2: Alloy C-276 (UNS N10276), PTFE, PFA, and O-ring materials • Material model code 3: Alloy 400 (UNS N04400), PTFE, PFA, and O-ring materials • Material model code 7: PTFE • Material model code 8: PTFE, 316L SST (EN 1.4404), and O-ring materials
Pressure Equipment Directive (PED)	Complies with 97/23/EC article 3.3

Total Probe Length	This is defined from the upper reference point to the end of the probe (weight included, if applicable).  Select the probe length according to the required measuring range (the probe must be hung and fully extended through the entire distance where level readings are desired).
Cut-to-fit probes	Most of the probes can be cut in field. However, there are some restrictions for the standard coaxial probes: these can be cut up to 2 ft. (0.6 m). Probes shorter than 4.1 ft. (1.25 m) can be cut to the minimum length of 1.3 ft. (0.4 m). The PTFE covered probes cannot be cut in the field.
Minimum and Maximum Probe Length	TO BE ADDED
Probe Angle	0 to 90 degrees from vertical axis
Tensile Strength	Flexible Single Lead probe: 2698 lb (12 kN). Flexible Twin Lead probe: 2023 lb (9 kN)
Collapse Load	Flexible Single Lead probe: 3597 lb (16 kN)
Sideway Capacity	Coaxial probe: 73.7 ft. lbf, 3.7 lb at 19.7 ft. (100 Nm, 1.67 kg at 6 m) Rigid Twin Lead: 2.2 ft. lbf, 0.22 lb at 9.8 ft. (3 Nm, 0.1 kg at 3 m) Rigid Single Lead: 4.4 ft. lbf, 0.44 lb at 9.8 ft. (6 Nm, 0.2 kg at 3 m)
Maximum Recommended Nozzle Height	4 in. (10 cm) + nozzle diameter For coaxial probes, there are no restrictions
Minimum Clearance (See Table A-7 on page A-11)	 **Nozzle Diameter**  **Clearance to tank wall**
Other Mechanical Considerations	To get best possible performance, the following must be considered before installing the transmitter: • Inlets should be kept at a distance in order to avoid product filling on the probe • Avoid physical contact between probes and agitators, as well as applications with strong fluid movement unless the probe is anchored • Probe tie-down is recommended if the probe can move to within 1 ft. (30 cm) of any object during operations • In order to stabilize the probe for side forces, it is possible to fix or guide the probe to the tank bottom • For optimal single lead probe performance in non-metallic vessels, the probe must either be mounted with a 2-in. / DN 50 or larger metallic flange, or a metal sheet with an 8-in. diameter (200 mm) or larger must be used (see the Reference Manual for placement)  **Flexible single lead probe with chuck.**

Weight	Flange: depends on flange size Coaxial probe: 0.67 lb/ft. (1 kg/m) Rigid Single Lead probe (0.3 in./8 mm): 0.27 lb/ft. (0.4 kg/m) Rigid Single Lead probe (0.5 in./13 mm): 0.71 lb/ft. (1.06 kg/m) Rigid Twin Lead probe: 0.40 lb/ft. (0.6 kg/m) Flexible Single Lead probe: 0.05 lb/ft. (0.07 kg/m) Flexible Twin Lead probe: 0.09 lb/ft. (0.14 kg/m) End weight: 0.88 lb (0.40 kg) for single probes, 1.3 lb (0.60 kg) for twin probes
Chamber / Pipe Installations	
Rosemount 9901 Chamber	Rosemount 9901 allows external mounting of process level instrumentation. It supports a variety of process connections, and optional drain and vent connections. The Rosemount 9901 chamber is designed to the ASME B31.3 standard, and is Pressure Equipment Directive (PED) compliant. Use option code XC to order together with the 3308 transmitter. The probe length to use for a Rosemount 9901 chamber can be calculated with this formula: **Side-and-Side dimension:** Probe length=Centre-to-Centre dimension+19 in. (48 cm) **Side-and-Bottom dimension:** Probe length=Centre-to-Centre dimension+4 in. (10 cm) Use a centering disc the same diameter as the chamber if the probe length >3.3 ft. (1 m). See “Probe Type in Chamber Considerations” on page A-11 and “Centering Discs” on page A-11 for which probe and disc to use. **Side-and-Side dimension** **Side-and-Bottom dimension** 
	For additional information, see the Rosemount 9901 Chamber for Process Level Instrumentation Product Data Sheet (Document Number 00813-0100-4601)
Existing Chamber	A Rosemount 3308 transmitter is the perfect replacement in an existing displacer chamber. Proprietary flanges are offered, enabling use of existing chambers to make installation easy. **Considerations when changing to the Rosemount 3308 transmitter:** The Rosemount 3308 transmitter flange choice and probe length must be correctly matched to the chamber. Both standard ANSI and EN (DIN), as well as proprietary chamber flanges, are available. See “Proprietary Flanges” on page A-13 to identify the proprietary flanges. See “Probe Type in Chamber Considerations” on page A-11 and “Centering Discs” on page A-11 for which probe and disc to use. See Table A-8 on page A-12 for guidelines on the required probe length. 
	For additional information, see the Replacing Displacers with Guided Wave Radar Technical Note (Document Number 00840-2200-4811)

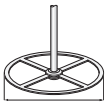
Probe Type in Chamber Considerations	When installing a Rosemount 3308 transmitter in a chamber, the single lead probe is recommended.
	The recommended minimum chamber diameter is 4 in. (100 mm) for Single Flexible probe and 3 in. (75 mm) for the Single Rigid probe. The probe should be centered to prevent it touching the sides of the well.
	The probe length determines if a Single Rigid or Single Flexible probe should be used: • Less than 19.7 ft. (6.0 m): Rigid Single Probe is recommended. Use a centering disc for probe > 3.3 ft. (1 m). If installation requires less head-space, use a Flexible Single Probe with a weight and centering disc. • More than 19.7 ft. (6.0 m): Use Flexible Single Probe with a weight and centering disc.
	A short weight is available for the single flexible SST probe. It is used for measuring close to the probe end and shall be used where the measuring range must be maximized. The height is 2 in. (50 mm) and the diameter is 1.5 in. (37.5 mm). The option code is W2. If a heavier weight is needed, option code W3 can be used (height is 5.5 in. (140 mm) and the diameter is 1.5 in. (37.5 mm).
Centering Discs	To prevent the probe from contacting the chamber or pipe wall, centering discs are available for rigid single, flexible single, and flexible twin lead probes. The disc is attached to the end of the probe. Discs are made of stainless steel, Alloy C-276, Alloy 400, or PTFE. See Table A-9 for Dimension D. Table A-10 shows which centering disc diameter to choose for a particular pipe.  **D**

Table A-7. Minimum Clearance

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

(1) Probe diameter is 1.1 in. (28 mm) for standard probe.
(2) Requires special configuration and setting of Upper Null Zone.
(3) Minimum clearance from tank bottom for the coaxial and rigid single probes is 0.2 in. (5 mm).
(4) The center-most lead must be at least 0.6 in. (15 mm) away from the pipe/bypass wall.
(5) The probe must be centered in the pipe/bypass.

Table A-8. Required probe length in chambers

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

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

Table A-9. Centering Discs Dimensions

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

Table A-10. Centering disc size recommendation for different pipe schedules

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

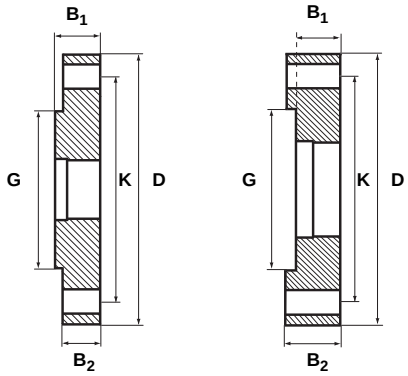
(1) Schedule is not available for pipe size.
(2) No centering disc is available.

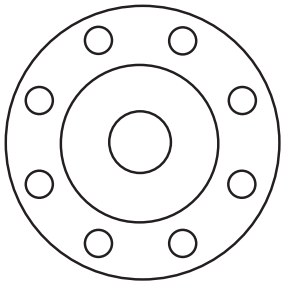
DIMENSIONAL DRAWINGS

TO BE ADDED

Proprietary Flanges

Raised Face **Recessed Face**





Dimensions are in inches (millimeter).

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

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

Table A-11. Dimensions of proprietary flanges

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

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

ORDERING INFORMATION

3308 Wireless Guided Wave Radar Level Transmitter Ordering Information

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

Model	**Product Description**		
3308A	Guided Wave Radar Level Transmitter		
Code	**Profile**		
Standard			**Standard**
S	Standard		★
O	Upstream Oil & Gas, Transmitter optimized for upstream oil and gas		★
R	Refining		★
C	Chemical		★
T	Tank Gauging		★
M	Marine		★
Signal Output			
Standard			**Standard**
X	WirelessHART		★
Special			
N	None(1)		
Measurement Type			
Standard			**Standard**
2	Level and Interface Transmitter		★
Expanded			
1	Level or Interface Transmitter (interface available for fully submerged probe)		
Special			
9	Spare Process Seal & Probe		
Housing Material			
Standard			**Standard**
D	Wireless PlantWeb housing, Aluminum		★
Expanded			
E	Wireless PlantWeb housing, Stainless Steel		
Special			
N	E(1)		
Conduit Threads			
Standard			**Standard**
1	½–14 NPT		★
Special			
0	None(1)		
Operating Temperature and Pressure		**Probe Type**	
Standard			**Standard**
S	- 15 psi (-1bar) to 580 psi (40 bar) @ 302 °F (150 °C)		★
Expanded			
P	High Pressure		
M	Medium Temperature and Pressure		
H	High Temperature and Pressure		
Special			
X	Special Temperature and Pressure Rating		
N	None(2)		

Material of Construction: Process Connection / Probe			**Probe Type**	
Standard				**Standard**
1	316L SST (EN 1.4404)			★
Expanded				
2	Alloy C-276 (UNS N10276). With plate design if flanged version. Up to class 600, PN 63.			
3	Alloy 400 (UNS N04400). With plate design if flanged version. Up to class 600, PN 63.			
7	PTFE covered probe and flange. With plate design.			
8	PTFE covered probe			
L	Alloy 625 (UNS N06625) process connection, flange, and probe.			
H	Alloy C-276 (UNS N10276) process connection, flange, and probe.			
M	Alloy 400 (UNS N04400) process connection, flange, and probe.			
D	Alloy 2205 (UNS S32205/S38103) process connection, flange, and probe.			
Special				
X	Special material of construction			
0	None[2]			
Sealing, O-ring Material				
Standard				**Standard**
V	Fluoroelastomer (FKM)			★
E	Ethylene Propylene			★
K	Perfluoroelastomer (FFKM)			★
B	Nitrile butadiene			★
Expanded				
F	FVMQ (Fluorosilicon)			
Special				
X	Special O-ring			
N	None[3]			
Probe Type		**Process Connection**	**Probe Lengths**	
Standard				**Standard**
1A	Rigid Twin Lead		Min.: 1 ft. 4 in. (0.4 m) Max: 9 ft. 10 in. (3 m)	
2A	Flexible Twin Lead with weight		Min.: 1 ft. 4 in. (0.4 m) Max: 32 ft. 10 in. (10 m)	★
5A	Flexible Single Lead (Ø 0.16 in./4 mm)		Min.: 1 ft. 4 in. (0.4 m) Max: 32 ft. 10 in. (10 m)	★
Expanded				
3A	Coaxial		Min.: 1 ft. 4 in. (0.4 m) Max: 19 ft. 8 in. (6 m)	
3B	Perforated Coaxial Probe		Min.: 1 ft. 4 in. (0.4 m) Max: 19 ft. 8 in. (6 m)	
4A	Rigid Single Lead 0.3 in. (8 mm)		Min.: 1 ft. 4 in. (0.4 m) Max: 9 ft. 10 in. (3 m)	
4B	Rigid Single Lead 0.5 in. (13 mm)		Min.: 1 ft. 4 in. (0.4 m) Max: 19 ft. 8 in. (6 m)	
4E	Rigid Single Lead with Integrated Pipe		Min.: 1 ft. 4 in. (0.4 m) Max: 19 ft. 8 in. (6 m)	
6A	Flexible Single Lead, standard weight (Ø 0.24 in./6 mm)		Min.: 1 ft. 4 in. (0.4 m) Max: 32 ft. 10 in. (10 m)	
6B	Flexible Single Lead with chuck (Ø 0.24 in./6 mm)		Min.: 1 ft. 4 in. (0.4 m) Max: 32 ft. 10 in. (10 m)	

Special				
XX	Special Probe			
0N	Use when ordering a Spare Transmitter Head			
Probe Length Units				
Standard				**Standard**
E	English (feet, inch)			★
M	Metric (meters, centimeters)			★
Special				
N	Not applicable(2)			
Probe Length (feet / meters)				
Standard				**Standard**
XXX	0-30 feet or 0-10 meters			★
Special				
000	Not applicable(2)			
Probe Length (inches / centimeters)				
Standard				**Standard**
XX	0-11 inches or 0-99 centimeters			★
Special				
00	Not applicable(2)			
Process Connection Size (ANSI / EN / JIS)				
Standard				**Standard**
5	1 ½ in., Threaded connections and Tri-Clamp only			★
2	2 in. / DN50 / 50A			★
3	3 in. / DN80 / 80A			★
4	4 in. / DN100 / 100A			★
Expanded				
1	1 in., Threaded connections only			
6	6 in. / DN150 / 150A			
8	8 in. / DN200 / 200A			
P	Proprietary flanges			
Special				
X	Special			
N	None(2)			
Process Connection Rating				
Standard				**Standard**
NN	For use with non-flange process connection type(2)			★
ANSI Ratings				
AA	ASME B16.5 Class 150 Flange			★
AB	ASME B16.5 Class 300 Flange			★
AC	ASME B16.5 Class 600 Flange			★
AD	ASME B16.5 Class 900 Flange			★
AE	ASME B16.5 Class 1500 Flange			★
EN Ratings				
DA	EN1092-1 PN16 Flange			★
DB	EN1092-1 PN40 Flange			★
DC	EN1092-1 PN63 Flange			★
DD	EN1092-1 PN100 Flange			★
DE	EN1092-1 PN160 Flange			★
JIS Ratings				
JA	JIS 10K Flange			★

JB	JIS 20K Flange	★
PF	Proprietary Flange, for use with proprietary flange process connection type	★
Expanded		
ANSI Ratings		
AF	ASME B16.5 Class 2500 Flange	
EN Ratings		
DF	EN1092-1 PN250 Flange	
DG	EN1092-1 PN320 Flange	
JIS Ratings		
JC	JIS 30K Flange	
JD	JIS 40K Flange	
Special		
XX	Special	
Process Connection Type		
Standard		**Standard**
Threads		
N	NPT Thread	★
G	BSPP (G) Thread	★
Flange Faces		
F	Flat Face (FF) Flange, standard face for EN flanges	★
R	Raised Face (RF) Flange, standard face for ANSI / JIS flanges	★
Proprietary Flanges		
M	Masoneilan-Proprietary, 316 SST Torque Tube Flange	★
P	Fisher-Proprietary, 316 SST, (for 249B cages) Torque Tube Flange	★
Q	Fisher-Proprietary, 316 SST, (for 249C cages) Torque Tube Flange	★
C	Tri-Clamp	
X	Special	★
0	None[(2)]	★
Expanded (Flange Faces)		
T	Ring Type Joint (RTJ) Flange	
V	DIN 2513 Form V13 Flange	
I	DIN 2513 Form R13 Flange	
D	DIN 2512 Form F Flange	
Product Certifications		
Standard		**Standard**
I1	ATEX Intrinsic Safety	★
I2	INMETRO Intrinsic Safety	★
I3	NEPSI Intrinsic Safety	★
I4	TIIS Intrinsic Safety	★
I5	FM Intrinsic Safety and Non-Incendive	★
I6	CSA Intrinsic Safety and Non-Incendive	★
I7	IECEx Intrinsic Safety	★
Expanded		
KD	ATEX and CSA Intrinsic Safety	
KE	FM and CSA Intrinsic Safety	
KF	ATEX and FM Intrinsic Safety	
NA	No Hazardous Locations Certifications	

Wireless Options		
Update Rate, Operating Frequency and Protocol		
Standard		**Standard**
WA3	User Configurable Update Rate, 2.4 GHz DSSS, IEC 62591 (WirelessHART)	★
Omnidirectional Wireless Antenna and SmartPower Solutions		
Standard		**Standard**
WK1	External Antenna, Adapter for Black Power Module (I.S. Power Module Sold Separately)	★
WM1	Extended Range, External Antenna, Adapter for Black Power Module	★
Expanded		
WN1	High Gain, Remote Antenna, Adapter for Black Power Module (I.S. Power Module Sold Separately)	

Options		
Display Type		
Standard		**Standard**
M5	PlantWeb LCD Display	★
Hydrostatic Testing		
Standard		**Standard**
P1	Hydrostatic Testing, including certificate	★
Factory Configuration		
Standard		**Standard**
C1	Factory Configuration per CDS	★
Special Quality Assurance		
Standard		**Standard**
Q4	Calibration Data Certificate	★
Quality Traceability Certification		
Standard		**Standard**
Q8	Material Traceability Certification per EN 10204 3.1	★
Welding Procedure Qualification		
Expanded		
Q66	Welding Procedure Qualification Record Documentation	
Special Certifications		
Expanded		
QG	GOST Certification	
Materials Certification MR0175		
Standard		**Standard**
Q15	NACE Material Recommendation per MR0175	★
Materials Certification MR0103		
Standard		**Standard**
Q25	NACE Material Recommendation per MR0103	★
Installation Options		
Standard		**Standard**
LS	Long Stud for Flexible Single Lead Probes, 10 in. (25 cm)	★
Expanded		
BR	Mounting Bracket for 1.5 in. NPT Process Connection (RA)	
Weight and Anchoring Options for Flexible Single Probes		
Standard		**Standard**
W1	Small weight, Length: 5.5 in. (140 mm), Diameter: 0.86 in. (22 mm). For narrow process connections.	★
W3	Heavy weight, Length: 5.5 in. (140 mm), Diameter: 1.5 in. (37.5 mm). Use for liquid applications.	★
W4	Chuck, for anchoring of probe in tank bottom	★

Expanded		
W2	Short weight, Length: 2 in. (50 mm), Diameter: 1.5 in. (37.5 mm). For limited space below measuring range.	
Weight Assembly Options for Flexible Single Probes		
Standard		**Standard**
WU	Weight not mounted on probe. Recommended for cutting probe in field.	★
Guaranteed Startup		
Expanded		
GS	Guaranteed Startup at -50 °C (Unpublished)	
Conduit Plug		
Expanded		
DO	316 SST Conduit Plug	
PlantWeb Diagnostic Functionality		
Standard		**Standard**
DA1	HART Diagnostics Suite	★
Centering Disc		
Standard		**Standard**
S2	2 in. Centering Disc	★
S3	3 in. Centering Disc	★
S4	4 in. Centering Disc	★
P2	2 in. Centering Disc PTFE	★
P3	3 in. Centering Disc PTFE	★
P4	4 in. Centering Disc PTFE	★
Expanded		
S6	6 in. Centering Disc	
S8	8 in. Centering Disc	
P6	6 in. Centering Disc PTFE	
P8	8 in. Centering Disc PTFE	
Remote Housing Mounting		
Expanded		
B1	3.2 ft. (1 m) Remote Housing Mounting Cable and Bracket	
B2	6.5 ft. (2 m) Remote Housing Mounting Cable and Bracket	
B3	9.8 ft. (3 m) Remote Housing Mounting Cable and Bracket	
Assemble / Consolidate to Chamber		
Standard		**Standard**
XC	Consolidate to Chamber	★
Expanded		
XA	Assemble to Chamber	
Specials		
RXXXX	Special TBD (Unpublished)	

(1) Use when ordering a Spare Probe.
(2) Use when ordering a Spare Transmitter Head.
(3) Use when ordering a Spare Transmitter Head.

Accessories Rosemount 3308

Code	Process Connection - Size/Type (consult factory for other process connections)		
Centering discs[1] [2]		**Outer Diameter**	
Standard			**Standard**
03300-1655-0001	Kit, 2-in. Centering Disc, SST, Rigid Single	1.8 in. (45 mm)	★
03300-1655-0002	Kit, 3-in. Centering Disc, SST, Rigid Single	2.7 in. (68 mm)	★
03300-1655-0003	Kit, 4-in. Centering Disc, SST, Rigid Single	3.6 in. (92 mm)	★
03300-1655-0006	Kit, 2-in. Centering Disc, PTFE, Rigid Single	1.8 in. (45 mm)	★
03300-1655-0007	Kit, 3-in. Centering Disc, PTFE, Rigid Single	2.7 in. (68 mm)	★
03300-1655-0008	Kit, 4-in. Centering Disc, PTFE, Rigid Single	3.6 in. (92 mm)	★
03300-1655-1001	Kit, 2-in. Centering Disc, SST, Single / Twin Flex Lead	1.8 in. (45 mm)	★
03300-1655-1002	Kit, 3-in. Centering Disc, SST, Single / Twin Flex Lead	2.7 in. (68 mm)	★
03300-1655-1003	Kit, 4-in. Centering Disc, SST, Single / Twin Flex Lead	3.6 in. (92 mm)	★
03300-1655-1006	Kit, 2-in. Centering Disc, PTFE, Single / Twin Flex Lead	1.8 in. (45 mm)	★
03300-1655-1007	Kit, 3-in. Centering Disc, PTFE, Single / Twin Flex Lead	2.7 in. (68 mm)	★
03300-1655-1008	Kit, 4-in. Centering Disc, PTFE, Single / Twin Flex Lead	3.6 in. (92 mm)	★
Expanded			
03300-1655-0004	Kit, 6-in. Centering Disc, SST, Rigid Single	5.55 in. (141 mm)	
03300-1655-0005	Kit, 8-in. Centering Disc, SST, Rigid Single	7.40 in. (188 mm)	
03300-1655-0009	Kit, 6-in. Centering Disc, PTFE, Rigid Single	5.55 in. (141 mm)	
03300-1655-0010	Kit, 8-in. Centering Disc, PTFE, Rigid Single	7.40 in. (188 mm)	
03300-1655-1004	Kit, 6-in. Centering Disc, SST, Single / Twin Flex Lead	5.55 in. (141 mm)	
03300-1655-1005	Kit, 8-in. Centering Disc, SST, Single / Twin Flex Lead	7.40 in. (188 mm)	
03300-1655-1009	Kit, 6-in. Centering Disc, PTFE, Single / Twin Flex Lead	5.55 in. (141 mm)	
03300-1655-1010	Kit, 8-in. Centering Disc, PTFE, Single / Twin Flex Lead	7.40 in. (188 mm)	
Vented Flanges[3]			
Expanded			
03300-1812-0092	Fisher 249B/259B[4]		
03300-1812-9002	Fisher 249C[4]		
03300-1812-9003	Masoneilan[4]		
Other			
Standard			**Standard**
03300-7004-0001	Viator HART Modem and cables (RS232 connection)		★
03300-7004-0002	Viator HART Modem and cables (USB connection)		★

(1) If a centering disc is required for a flanged probe, the centering disc can be ordered with options Sx or Px on page A-19 in the model code. If a centering disc is required for a threaded connection or as a spare part, it should be ordered using the item numbers listed below.
(2) To order a centering disc in a different material, consult the factory.
(3) 1½ in. NPT threaded connection (RA) is required.
(4) For pressure and temperature rating, see "Fisher & Masoneilan Flange Rating" on page A-3.

Appendix B Product Certifications

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.

In an Explosion-proof/Flameproof installation, do not remove the transmitter cover when power is applied to the unit.

⚠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 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.

PLACEHOLDER FOR APPROVALS INFORMATION

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