

Radar Level Gauge

Quick Installation Guide

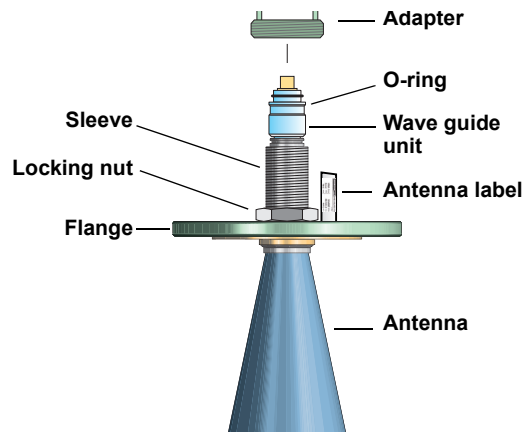


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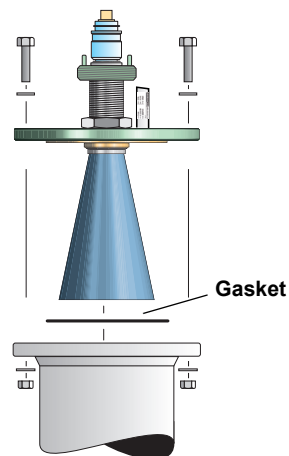
MECHANICAL INSTALLATION

Cone Antenna

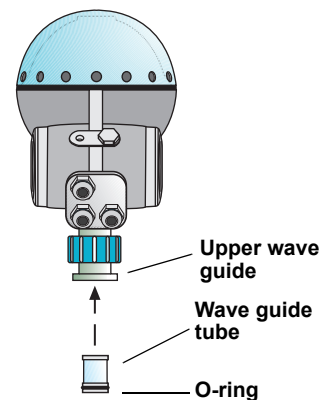
Step 1 Mount the Cone Antenna



Step 2 Mount Antenna on Tank Nozzle



Step 3 Mount the Wave Guide Tube

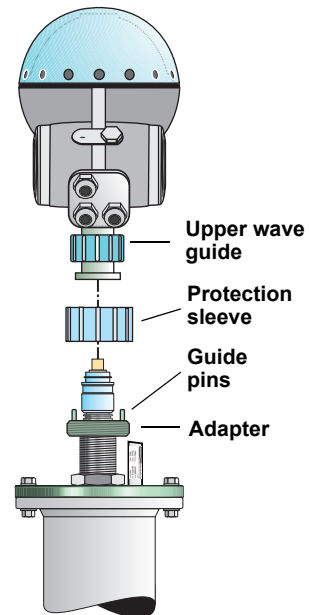


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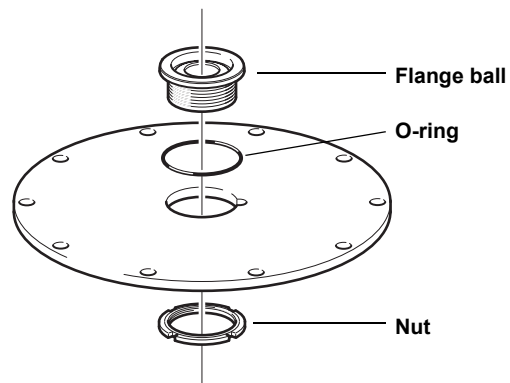
TankRadar Pro

Step 4 Mount the Transmitter Head

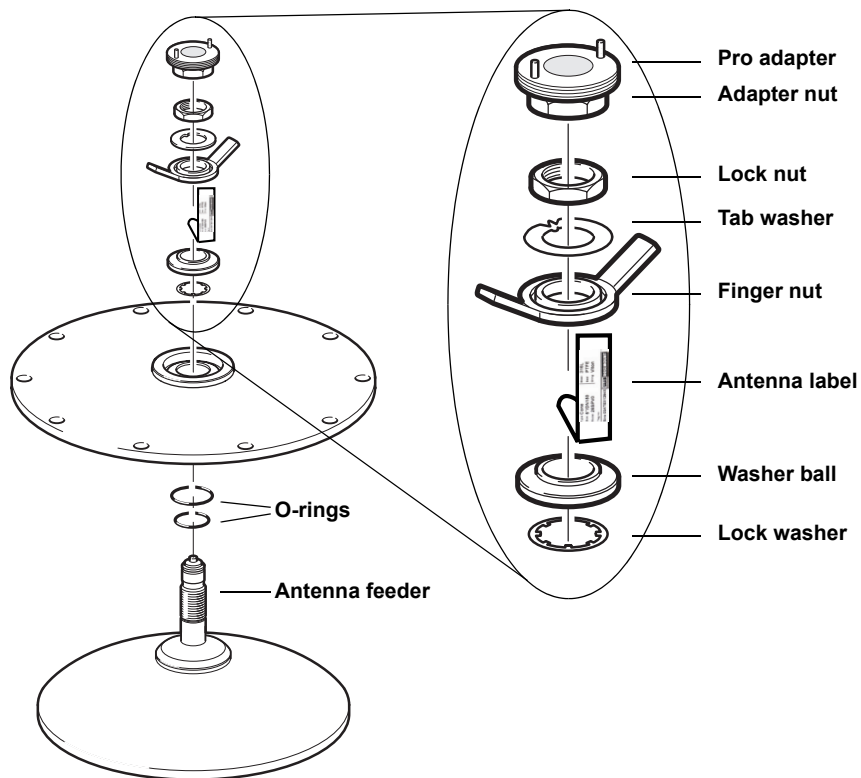


Parabolic Antenna

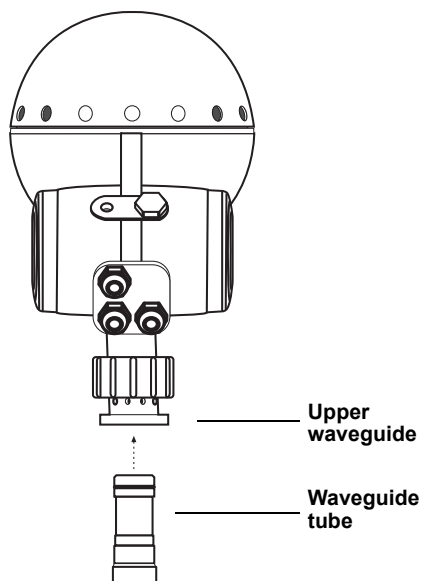
Step 1 Mount the Flange Ball



Step 2 Mount the Antenna Feeder and Pro Adapter



Step 3 Mount the Wave Guide Tube

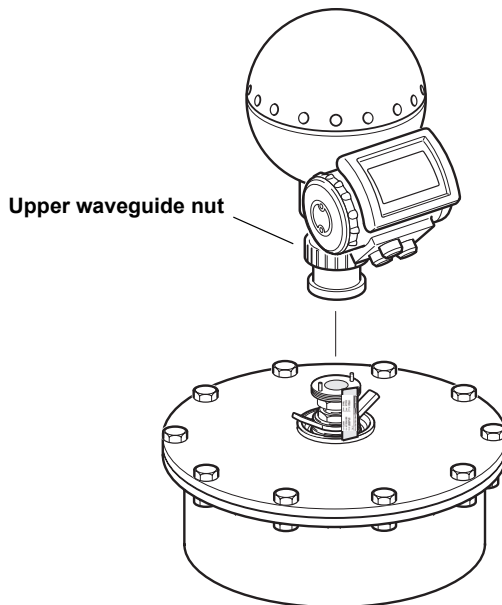


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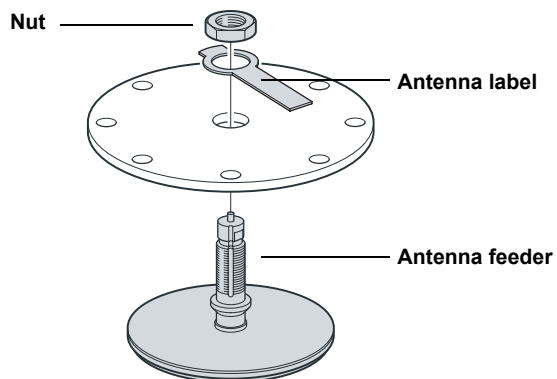
TankRadar Pro

Step 4 Mount the Transmitter Head

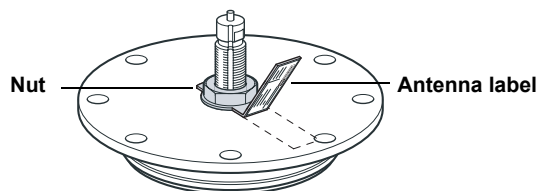


Still-pipe Array Antenna

Step 1 Insert the Antenna Feeder

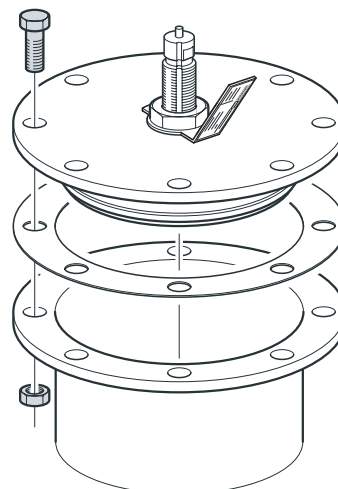


Step 2 Tighten the Nut and bend the Antenna Label

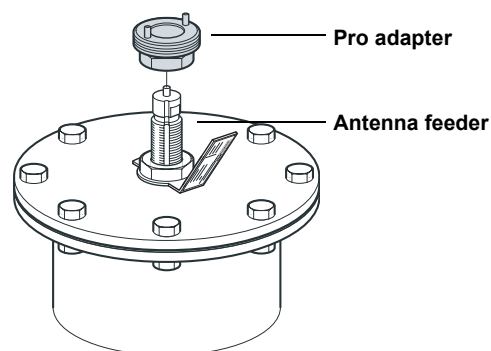


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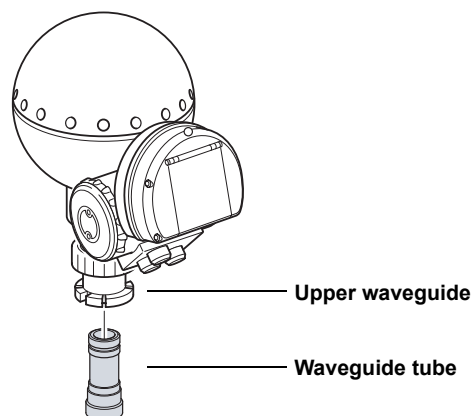
Step 3 Mount the antenna and Flange assembly



Step 4 Mount the Pro Adapter



Step 5 Insert the Waveguide Tube

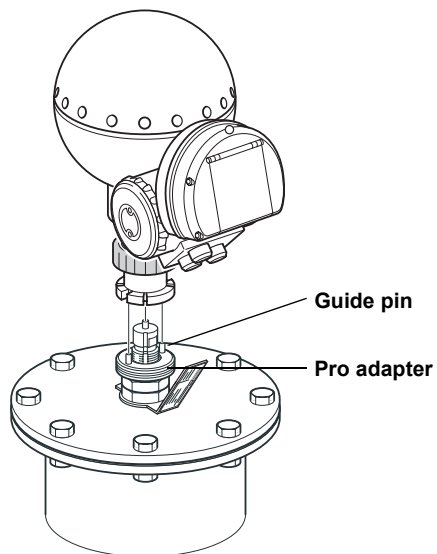


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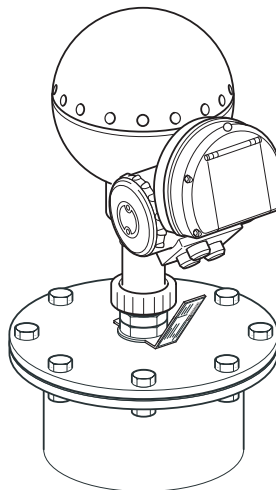
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Step 6 Mount the Transmitter Head onto the Pro Adapter

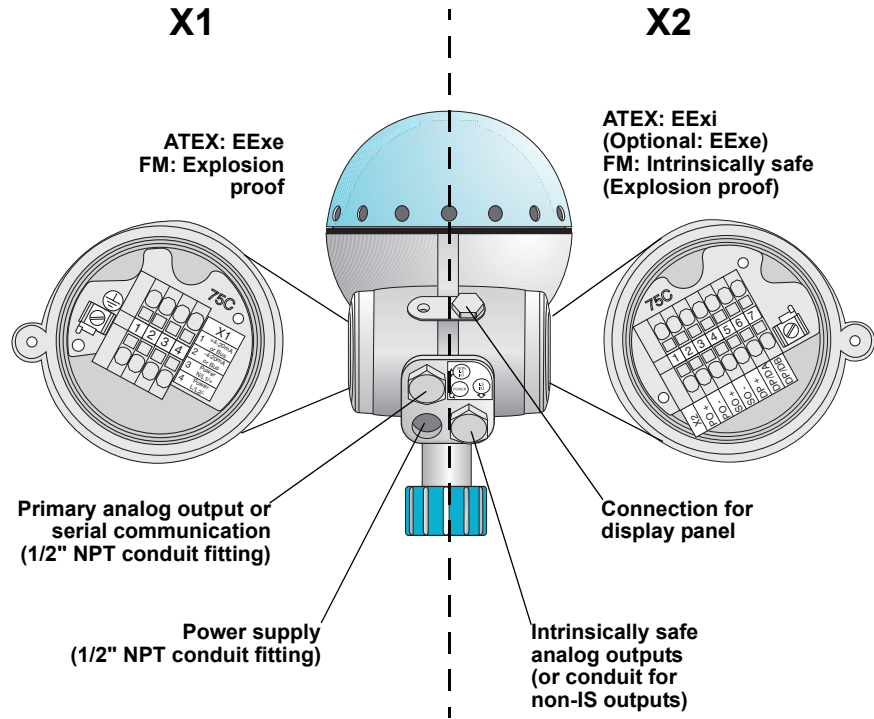


Step 7 Connect the Electrical Cabling and configure the gauge



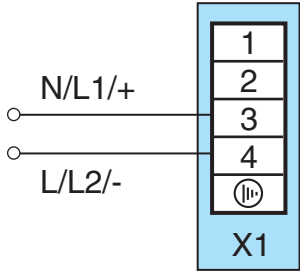
ELECTRICAL INSTALLATION

Junction Box Identification



Power Supply

Ultra wide 24-240 V DC or AC 0-60 Hz



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Options Identification

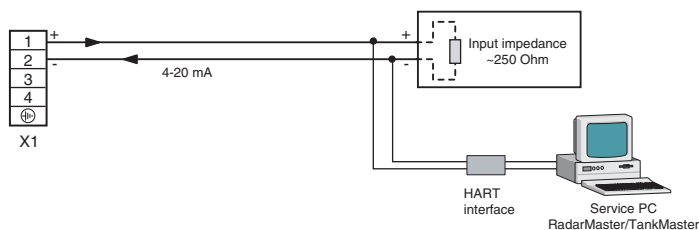
For identification of installed options, see label on the transmitter head. Find the Type TH 43 xxZZxx where ZZ is the primary output identification, see table.

TankRadar™ Pro		
RTG 40B		Transmitter Head Type TH 43 CP2ARB
EEx de[ib/ia] IIC T6 (Tamb - 40°C, +70°C)		Sira 03ATEX 1294X
IS (X2):	Display Panel Remote Extra Analog Out Active	
Non-IS(X1):	MODBUS	
Mains: 24-240V DC/AC, 0-60 Hz 15VA, 10W		
Serial No: 200516877	MODBUS UI: 26049	Tag No:
Manufactured by: Rosemount Tank Radar AB S-402 51 Göteborg Sweden		ROSEMOUNT® Tank Gauging

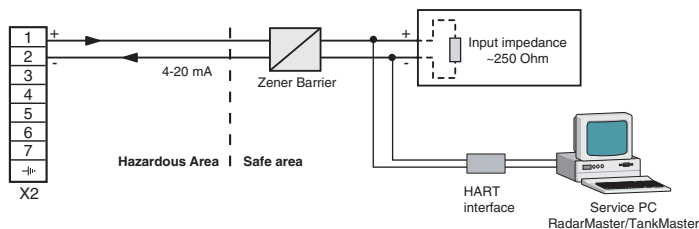
- | | | | |
|----|------------------------------|----|------------------------------|
| 1A | Non-IS HART/4-20 mA, active | 2A | TRL/2 Bus |
| 1C | Non-IS HART/4-20 mA, passive | 3A | Profibus DP |
| 1B | IS HART/4-20 mA, active | 4A | FOUNDATION™ fieldbus, non-IS |
| 1D | IS HART/4-20 mA, passive | 4B | FOUNDATION™ fieldbus, IS |

Cable Connections

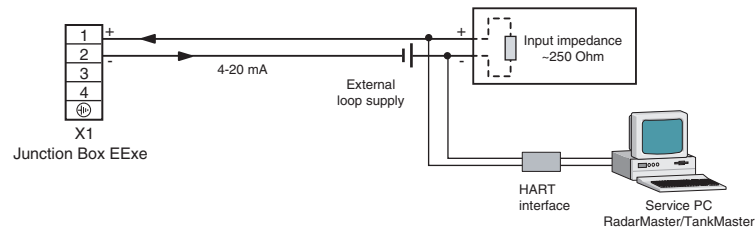
Option 1A



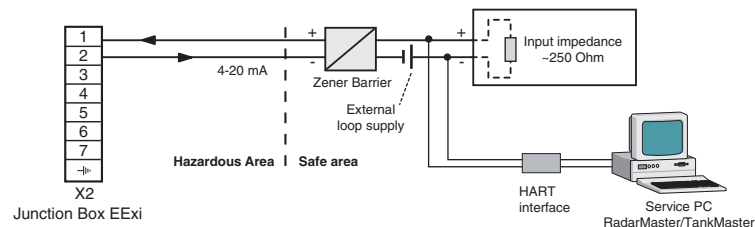
Option 1B



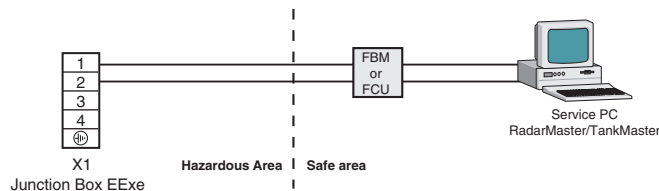
Option 1C



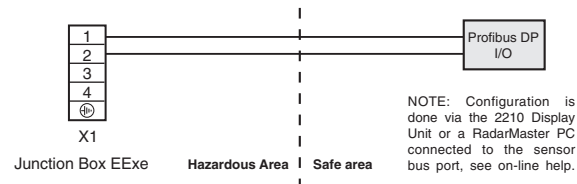
Option 1D



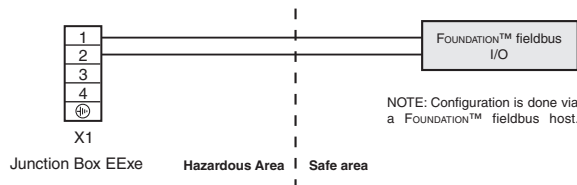
Option 2A



Option 3A



Option 4A

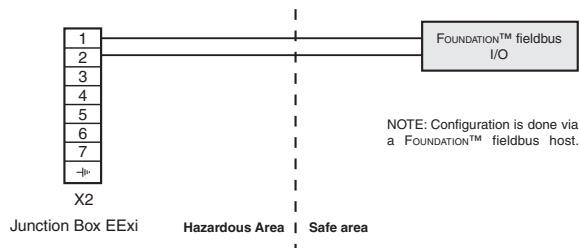


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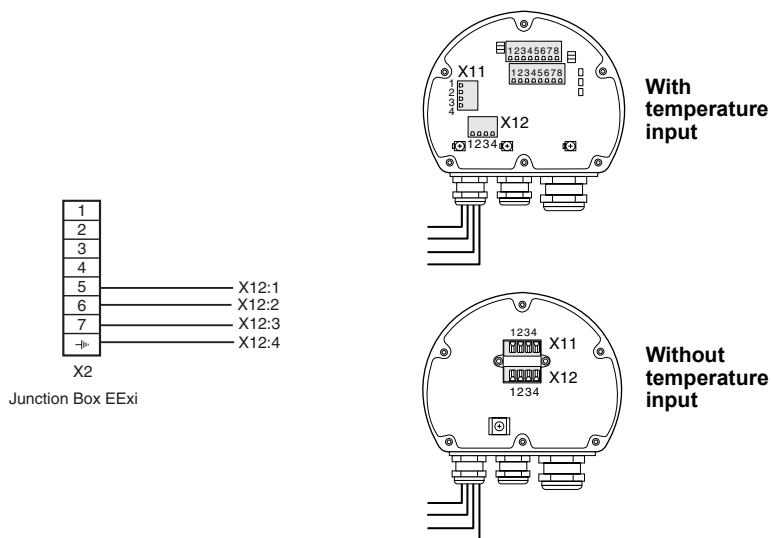
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Option 4B



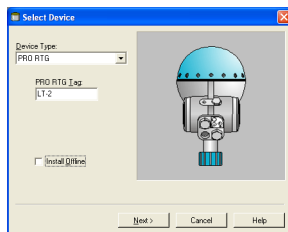
2210 Display Unit



For more information, see the Pro Reference Manual.

GAUGE CONFIGURATION

TankRadar Pro is configured using a wide range of tools such as Rosemount RadarMaster, WinSetup, Handheld HART 375, AMS, and DeltaV.



For information on how to configure the TankRadar Pro using TankMaster, see the WinSetup User's Guide (ref.nr. 303027 En).

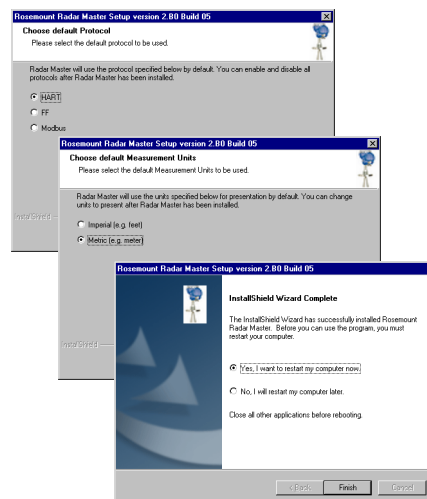
For 4-20 mA HART gauges, the preferred tool is Rosemount RadarMaster. It is the most powerful and it includes all required functions. The instructions below show the straightforward gauge configuration via Rosemount RadarMaster.

Software Installation

Install the Rosemount RadarMaster software from the enclosed CD by running RMTInstall.exe. Follow the Installation Wizard.

Communication Protocol and Units

- Choose default communication protocol.
- Choose default unit system.
- Finish the installation.



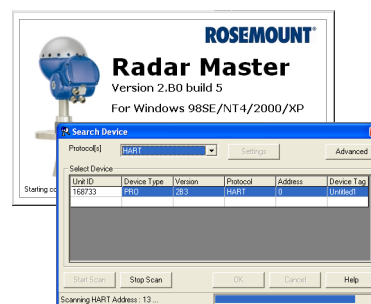
Run Rosemount RadarMaster

The first time Rosemount RadarMaster is launched a dialog On-line or Off-line will appear:

- Select On-line

A scan for a device connected to the bus will start; once found it will appear in the search device list:

- Select the device and press OK.



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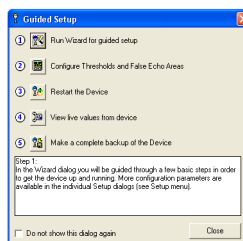
TankRadar Pro

Guided Setup

The guided setup contains seven steps and guides you through the basic setup procedure.

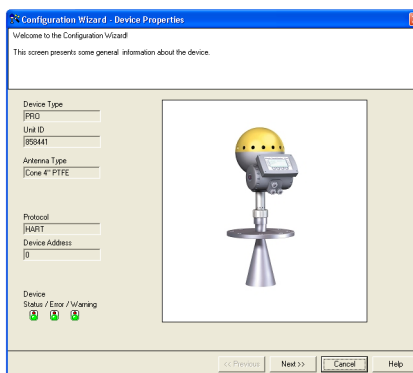
Step 1 Start the Guided Setup

Run the Wizard for Guided setup.



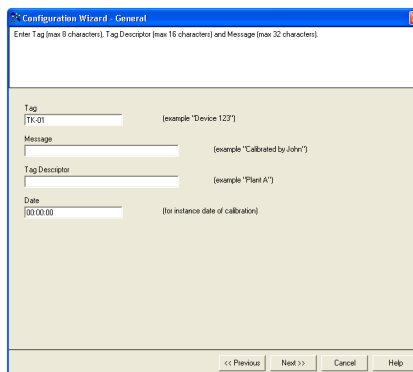
Step 2 Device Properties

Displays some general information about the device.



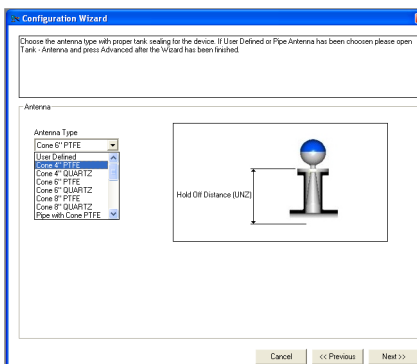
Step 3 Device Tag

Enter Tag, Message, Tag Descriptor, and Date. This information will be written to the device and used as digital identification via the digital bus. If not applicable for your application press NEXT.



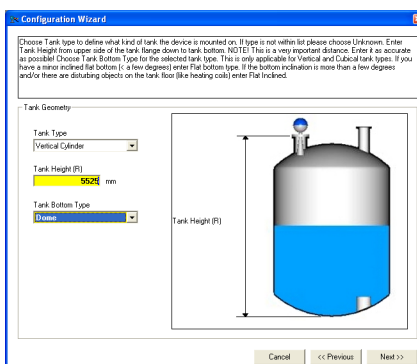
Step 4 Antenna

Choose antenna type with proper tank sealing for the device. The antenna type can be identified by the model code and is also shown on the antenna label.



Step 5 Tank Geometry

Set Tank Type, Tank Height and Tank Bottom Type.



Note! To ensure reliable measurements close to the tank bottom, make sure the distance between the upper reference point and the tank bottom equals the tank height. Selection of tank type and bottom type will optimize the gauge operation for such tanks.

Step 6 Tank Environment

Define the Tank Environment for your application.

Foam

Mark if a layer of foam normally or occasionally covers the product surface (in order to compensate for radar echo attenuation by the foam).

Turbulent Surface

Mark if the product surface is turbulent caused by mixers or other process conditions (in order to consider weak echoes from the surface).

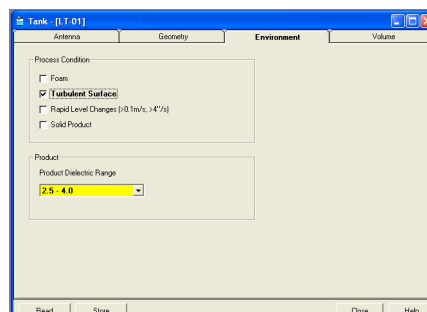
Rapid Level Changes

Mark if the product level rate is more than 0.1 m/s (4 in./s). A wider search window will then be selected.

Solid Product

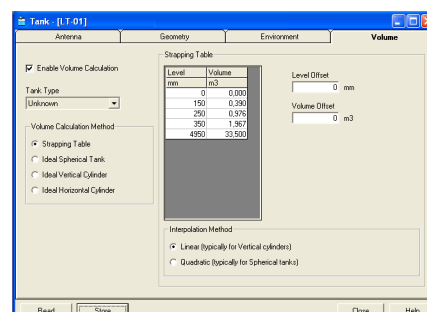
Mark if the product is solid such as powder, granules, pellets, etc. (e.g. to compensate for product pile-up).

Note! Use one or maximum two options for best performance. Select no option if the surface is calm inside the storage tank.



Step 7 Volume Calculation

The device can calculate tank volume by either a strapping table or by formulas for ideal shaped tanks.

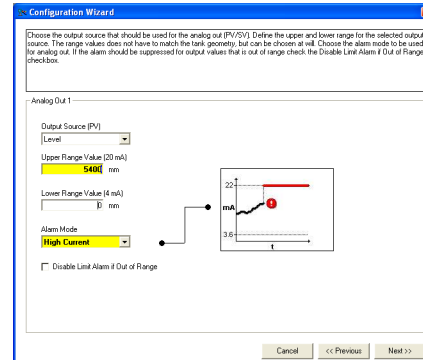


Note! This function is optional for some models.

Step 8 Analog Out Configuration

This information applies to both primary and secondary analog outputs. The primary and secondary analog outputs can be individually configured.

- Set source for analog output.
- Set upper and lower range for 4 and 20 mA.
- Set alarm mode:
 High current = 22 mA
 Low current = 3,8 mA
 Freeze = last current value is kept at 22 mA during error or alarm
 Binary = the output will work binary showing 4 or 20 mA switching when level is outside upper or lower range, useful as indication or relay control for e.g. High alarm.

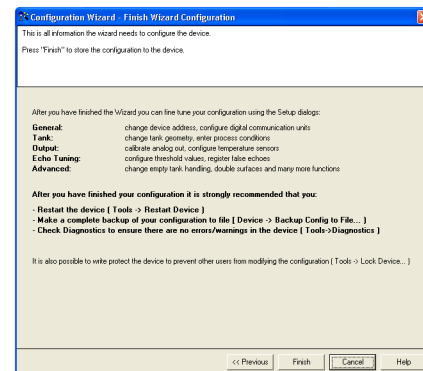


Note! Selected source will be assigned as primary variable (PV) in digital HART communication.

Note! A secondary analog output is optional, if not available press NEXT.

Step 9 Finish the Guided Setup

Carefully read the instructions on how to find the configuration dialogs after the wizard is closed.



Advanced Settings

For some installations special settings for Tank Geometry is required. This includes definition of Minimum Level Offset (C) and Distance Offset (G). To access these parameters enter the dialog Device config \ Tank \ Geometry \ Advanced.

If the measurement is difficult due to turbulence, foam, or mixers it's advisable to continue the setup through the dialog Device config \ Tank \ Environment to set up the tank conditions and the Device config \ Echo tuning dialog to show the tank spectrum, register any false echoes and fine tune the thresholds.

Tank Geometry

Distance Offset (G)

Set Distance Offset (G):

If the radar flange is used as upper reference point, set G = 0. If not, set G = distance between upper reference point and radar flange.

Tank Height (R)

Set Tank Height (R):

Set R = distance between upper and lower reference point.

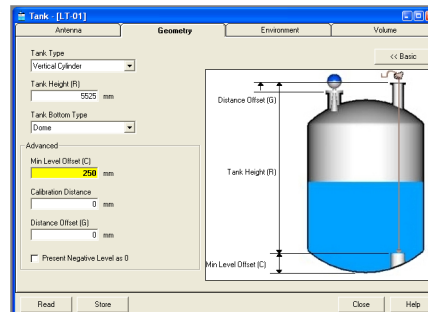
Minimum Level Offset (C)

Set Minimum Level Offset (C):

If the tank bottom is used as lower reference point (level zero), set $C = 0$. If not, set C = distance between lower reference point and physical tank bottom.

Note! To ensure reliable measurement close to the tank bottom, make sure the distance between the upper reference point and the tank bottom = $R + C$.

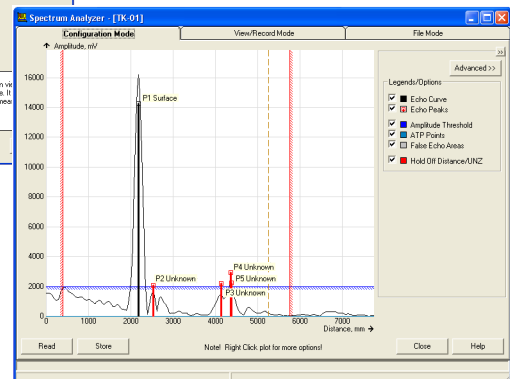
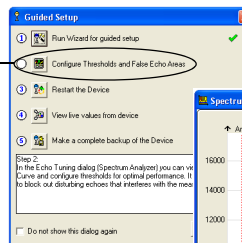
For more information on tank distances, see Pro Reference Manual.



Echo tuning

The spectrum graph shows the signal pattern from inside the tank. For a guide on how to register false echoes and adjust the thresholds, see the on-line manual. To start the spectrum analyzer, select Step 2 in the Guided Setup wizard.

Select Step 2



TANKRADAR PRO EUROPEAN ATEX DIRECTIVE INFORMATION

This chapter lists specific requirements which have to be fulfilled to secure a safe installation and use of TankRadar Pro in a hazardous area. Omission may jeopardize safety, and Rosemount Tank Radar AB will not take any responsibility if requirements as listed below are not fulfilled.

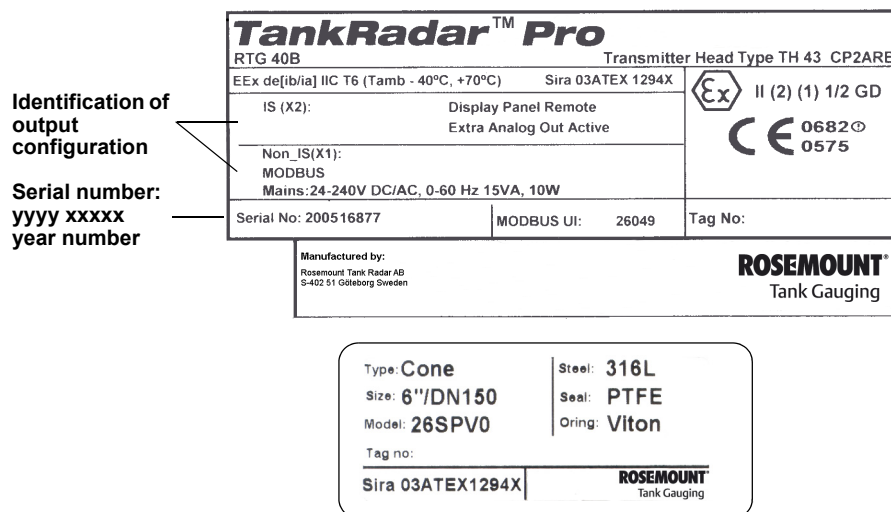


Figure 1. Approval labels for the TankRadar Pro Radar Unit and antenna.

ATEX marking and Ex Certification code

Table 1. ATEX marking and Ex Certification code

ATEX marking	Safety coding	Outputs
II 1/2 GD	EEx de IIC T6 (-40° to +70°C)	Non-Intrinsically Safe (Non-IS) Primary and/or Secondary outputs
II (2) (1) 1/2 GD	EEx de [ib] [ia] IIC T6 (-40° to +70°C)	IS Display output. IS Primary output, and/or IS Secondary output
II (1) 1/2 GD	EEx de [ia] IIC T6 (-40° to +70°C)	IS Display output. Non-IS Primary output

Intrinsically safe (IS) entity parameters

The unit can be equipped with various types of outputs, each type of IS configuration has specific entity parameters. The output configuration is shown on the main label of each unit.

- Passive analog output 4-20 mA, Label identification = HART passive
Voltage compliance 7-30 V, $U_i < 30$ V, $I_i < 200$ mA, $P_i < 1.3$ W, $C_i = 0$ μ F, $L_i = 0$ mH
- Active analog output 4-20 mA, Label identification = HART active
Max load 300 Ω , $U_o = 23.1$ V, $I_o = 125.7$ mA, $P_o = 0.726$ W,
 $C_{ext} < 0.14$ μ F, $L_{ext} < 2.2$ mH
- Foundation Fieldbus, Label identification = Foundation Fieldbus
 $U_i < 30$ V, $I_i < 300$ mA, $P_i < 1.3$ W, $C_i = 0$ μ F, $L_i = 0$ mH

Instructions specific to hazardous area installations

The TankRadar Pro has been certified to comply with Directive 94/9/EC of the European Parliament and the Council as published in the Official Journal of the European Communities No. L 100/1.

The following instructions apply to equipment covered by certificate numbers Sira03ATEX1294X:

1. The equipment may be used with flammable gases and vapours with apparatus Group IIC.
2. The Transmitter Head is certified for installation in a category 1 (cat 1) area and for use in ambient temperatures in the range of -40°C to +70°C and should not be used outside this temperature range.
3. The antenna including tank seal is designed to be mounted across the boundary between a cat 1 and cat 2 area. There are various cat 1 areas within the range from -40°C to +400°C, -1 to 55 bar that can be considered. It is the responsibility of the user to select the appropriate antenna including tank seal to match the tank process conditions, see table below. Antenna type, size and tank seal material can be found on the antenna label.

Table 2. Antenna process conditions

Antenna Type	Size	Tank Seal Material	Temperature range	Pressure range (linear interpolation between breakpoints)
Cone Pipe Pipe ITG	All	PTFE	-40 to +200°C	-1 to 10 bar @ -40°C -1 to 10 bar @ 100°C -1 to 5 bar @ 200°C
Cone Pipe Pipe ITG	All	Quartz	-40 to +400°C	-1 to 55 bar
Cone/purging	All	PTFE	-40 to +200°C	-1 to 10 bar
Cone/purging	All	Quartz	-40 to +400°C	-1 to 10 bar
Still-pipe array Flanged	4-12" / DN100-300	PTFE	-40 to +160°C	-0.5 to 2 bar
Still-pipe array Hatch	4-8" / DN100-200	PTFE	-40 to +160°C	-0.5 to 0.5 bar
Still-pipe array Hatch	10-12" / DN250-300	PTFE	-40 to +160°C	-0.25 to 0.25 bar
Process seal	4" / DN100	PTFE	-40 to +150°C	-1 to 5 bar @ -40°C 0 bar @ +150°C
Process seal	6" / DN150	PTFE	-40 to +150°C	-1 to 2 bar @ -40°C 0 bar @ +150°C
Process seal	4" / DN100	Ceramic	-40 to +400°C	-1 to 16 bar
Process seal	6" / DN150	Ceramic	-40 to +400°C	-1 to 6 bar
Rod	All	PTFE	-40 to +200°C	-1 to 35 bar @ -40°C -1 to 35 bar @ 100°C -1 to 25 bar @ 101°C -1 to 25 bar @ 200°C
Rod100 Rod250	All	PTFE	-40 to +200°C	25 bar @ -40°C 25 bar @ 100°C 16 bar @ 200°C
Parabolic	18" / Welded	PTFE	-40 to +230°C	-1 to 10 bar
Parabolic	18" / Clamped	PTFE	-40 to +230°C	-0.5 to 0.5 bar

4. The product must be installed by suitably trained personnel and carried out in accordance with all appropriate international, national and local standard codes of practice and site regulations for intrinsically safe apparatus and in accordance with the instructions contained within this manual.
5. Repair of this equipment shall be carried out by the manufacturer or in accordance with the applicable code of practice.
6. All externally connected intrinsically safe apparatus must comply with the specified IS entity parameters.
7. The Flameproof/Explosion proof enclosure may not be opened while energized.
8. The certificate marking is detailed on drawing numbers 9150076-931 and 9150076-932.
9. The certificate has special conditions for safe use associated with it, denoted by the X on the end of the certificate no., which must be observed when the equipment is installed.
10. The certification of this equipment relies on the following materials used in its construction:

If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

Aggressive substances - e.g. solvents that may affect polymeric materials

Suitable precautions - e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals

Special Conditions for Safe Use (X)

1. As alloys may be used as the enclosure (or other parts) material and be at the accessible surface of this equipment, in the event of rare incidents, ignition sources due to impact and friction sparks could occur. This shall be considered when the equipment is being installed in locations that specifically require group II, category 1G equipment.
2. Under certain extreme circumstances, the non-metallic parts of the equipment may be capable of generating an ignition-capable level of electrostatic charge. Therefore, when used for applications that specifically require group II, category 1 equipment, the equipment shall not be installed in a location where the external conditions are conducive to the build-up of electrostatic charge on such surfaces. Additionally, the equipment non-metallic parts shall only be cleaned with a damp cloth.

2210 DISPLAY UNIT EUROPEAN ATEX DIRECTIVE INFORMATION

The 2210 Display Unit can be installed as a remote mounted local readout unit for Rosemount TankRadar Pro or be factory mounted attached directly to the Radar Transmitter Head enclosure. The remote version has an optional I/O terminal card TP40 for temperature measurement.

The 2210 Display Unit is certified to comply with Directive 94/9/EC of the European Parliament and the Council as published in the Official Journal of the European Communities No. L 100/1.

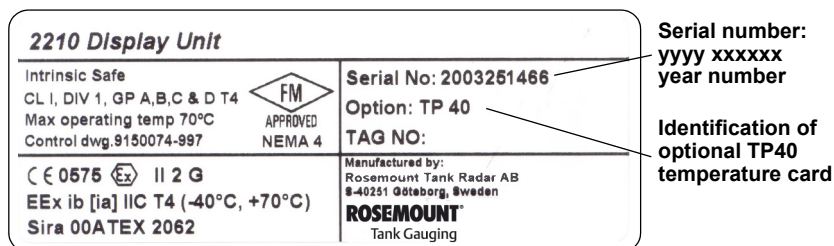


Figure 2. Approval label for the 2210 Display Unit.

ATEX marking and Ex Certification code

Table 3. 2210 Display Unit (2210 DU) ATEX marking and Ex Certification Code

Product	ATEX marking	Safety Coding
2210 DU without TP40	II 2 G	EEx ib IIC T4 (Ta = -40°C to +70°C)
2210 DU including TP40	II 2 (1) G	EEx ib ia IIC T4 (Ta = -40°C to +70°C)

Intrinsically safe (IS) entity parameters

- Connector X2: $U_i = 12\text{ V}$, $I_i = 400\text{ mA}$, $P_i = 0.7\text{ W}$
- Optional TP40, connector X17 and X18: $U_o = 5.88\text{ V}$, $I_o = 172.4\text{ mA}$, $P_o = 0.253\text{ W}$
The capacitance or either the inductance or the inductance to resistance (L/R) ratio of the cable connected to the connectors X17 and X18 must not exceed the following values:

Table 4. Maximum allowed Capacitance and Inductance

Gas group	Capacitance μF	Inductance μH	or	L/R ratio $\mu\text{H}/\text{Ohm}$
IIC	43	0.7		140
IIB	1000	5.2		560
IIA	1000	10		1120

Instructions specific to hazardous area installations

The following instructions apply to equipment covered by certificate number Sira 00ATEX2062:

1. The equipment may be used with flammable gases and vapours with apparatus groups IIC, IIB and IIA and with temperature classes T1, T2, T3 and T4.
2. The equipment is only certified for use in ambient temperatures in the range -40°C to +70°C and should not be used outside this range.
3. Installation shall be carried out in accordance with the applicable code of practice.
4. Repair of this equipment shall be carried out in accordance with the applicable code of practice.
5. Certification marking as detailed in drawing numbers 9150 074-980 and 9150 074-981.

TANKRADAR PRO FACTORY MUTUAL (FM) APPROVALS

This chapter lists specific requirements which have to be fulfilled to secure a safe installation and use of TankRadar Pro in a hazardous area. Omission may jeopardize safety, and Rosemount Tank Radar AB will not take any responsibility if requirements as listed below are not fulfilled.

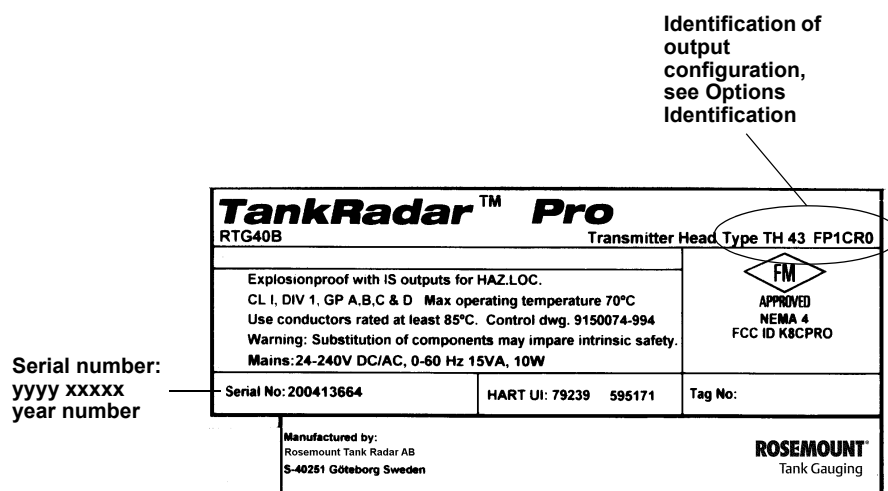


Figure 3. FM approval label for the TankRadar Pro Radar Unit

FM Marking and Certification Code

TankRadar Pro is FM certified for use in Hazardous locations, haz loc.

Table 5. FM marking for TankRadar Pro

FM marking	Control drawing nr	Outputs
Explosion proof Cl 1, Div 1, Group A, B, C and D	9150074-994	Non-Intrinsically Safe (Non-IS) Primary and/or Secondary outputs
Explosion proof with IS outputs Cl 1, Div 1, Group A, B, C and D	9150074-994	IS Display output. IS Primary and/or Secondary outputs (optional)

Intrinsically safe (IS) entity parameters

The unit can be equipped with various types of outputs, each type of IS configuration has specific entity parameters. The output configuration is shown on the main label of each unit.

- Passive analog output 4-20 mA, Label identification = HART passive
Voltage compliance 7-30 V, $U_i < 30$ V, $I_i < 200$ mA, $P_i < 1.3$ W, $C_i = 0$ μ F, $L_i = 0$ mH
- Active analog output 4-20 mA, Label identification = HART active
Max load 300 Ω , $U_o = 23.1$ V, $I_o = 125.7$ mA, $P_o = 0.726$ W,
 $C_{ext} < 0.14$ μ F, $L_{ext} < 2.2$ mH
- Foundation Fieldbus, Label identification = Foundation Fieldbus
 $U_i < 30$ V, $I_i < 300$ mA, $P_i < 1.3$ W, $C_i = 0$ μ F, $L_i = 0$ mH

Instructions specific to hazardous area installations

The equipment must be installed according to requirements shown in the "SYSTEM CONTROL DRAWING" listed above.

The main label on the enclosure indicates installed options.

Warning: Omission may jeopardize safety, Rosemount Tank Radar AB will not take any responsibility if requirements in this document and the system control drawing are not fulfilled.

2210 DISPLAY UNIT FACTORY MUTUAL (FM) APPROVALS

The 2210 Display Unit can be installed as a remote mounted local readout unit for Rosemount TankRadar Pro or be factory mounted attached directly to the Radar Transmitter Head enclosure. The remote version has an optional I/O terminal card TP40 for temperature measurement.

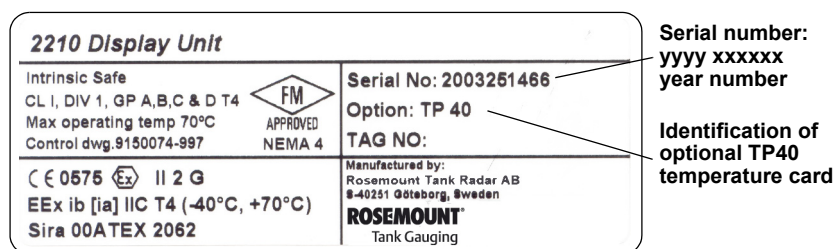


Figure 4. Approval label for the 2210 Display Unit.

FM Marking and Certification Code

Table 6. FM marking for 2210 Display Unit

FM marking	Control drawing nr	Outputs
Intrinsically safe CL 1, Div 1, Group A, B, C and D, T4	9150074-994	Non-Intrinsically Safe (Non-IS) Temperature input (optional)

Intrinsically safe (IS) entity parameters

- Connector X2: $U_i = 12 \text{ V}$, $I_i = 400 \text{ mA}$, $P_i = 0.7 \text{ W}$
- Optional TP40, connector X17 and X18: $U_o = 5.88 \text{ V}$, $I_o = 172.4 \text{ mA}$, $P_o = 0.253 \text{ W}$
The capacitance or either the inductance or the inductance to resistance (L/R) ratio of the cable connected to the connectors X17 and X18 must not exceed the following values:

Table 7. Maximum allowed Capacitance and Inductance

Gas group	Capacitance μF	Inductance μH	or	L/R ratio $\mu\text{H}/\text{Ohm}$
IIC	43	0.7		140
IIB	1000	5.2		560
IIA	1000	10		1120

TANKRADAR PRO CANADIAN STANDARDS ASSOCIATION (CSA) APPROVALS

This chapter list the specific requirements which have to be fulfilled to secure a safe installation of a CSA approved TankRadar Pro.

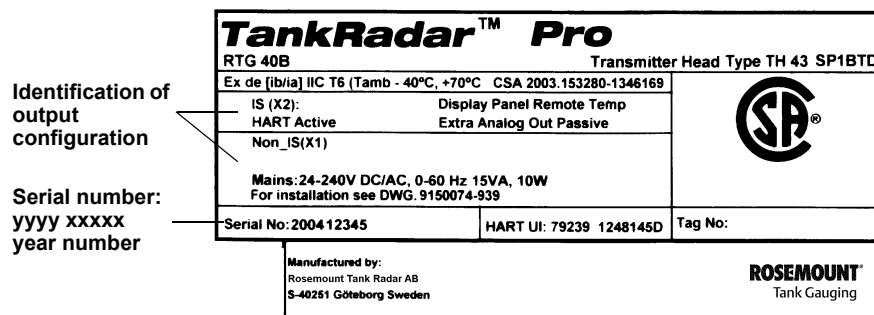


Figure 5. CSA approval label for the TankRadar Pro Radar Unit

CSA Marking and Certification Code

Table 8. CSA marking for TankRadar Pro

CSA marking	Installation drawing nr	Outputs
Ex de IIC T6	9150074-937	Non-Intrinsically Safe (Non-IS) Primary and/or Secondary outputs
Ex de [ib/ia] IIC T6	9150074-939	IS Display output. IS Primary and/or Secondary outputs (optional)

Intrinsically safe (IS) entity parameters

The unit can be equipped with various types of outputs, each type of IS configuration has specific entity parameters. The output configuration is shown on the main label of each unit.

- Passive analog output 4-20 mA, Label identification = HART passive
Voltage compliance 7-30 V, $U_i < 30$ V, $I_i < 200$ mA, $P_i < 1.3$ W, $C_i = 0$ μ F, $L_i = 0$ mH
- Active analog output 4-20 mA, Label identification = HART active
Max load 300 Ω , $U_o = 23.1$ V, $I_o = 125.7$ mA, $P_o = 0.726$ W,
 $C_{ext} < 0.14$ μ F, $L_{ext} < 2.2$ mH

Foundation Fieldbus, Label identification = Foundation Fieldbus
 $U_i < 30$ V, $I_i < 300$ mA, $P_i < 1.3$ W, $C_i = 0$ μ F, $L_i = 0$ mH

Instructions specific to hazardous area installations

The equipment must be installed according to requirements shown in the CSA installation drawing listed above.

The main label on the enclosure indicates installed options.

Warning: Omission may jeopardize safety, Rosemount Tank Radar AB will not take any responsibility if requirements in this document and the system control drawings are not fulfilled.

TankRadar Pro

2210 DISPLAY UNIT CANADIAN STANDARDS ASSOCIATION (CSA) APPROVALS

The 2210 Display Unit can be installed as a remote mounted local readout unit for Rosemount TankRadar Pro or be factory mounted attached directly to the Radar Transmitter Head enclosure. The remote version has an optional I/O terminal card TP40 for temperature measurement.

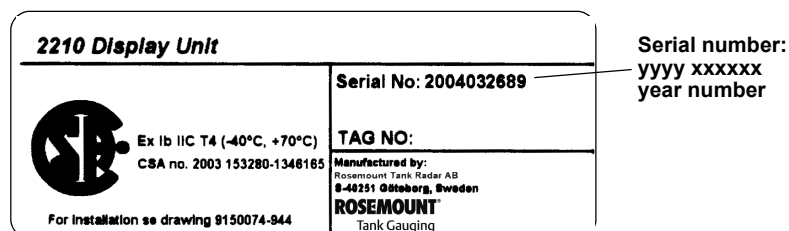


Figure 6. CSA approval label for the 2210 Display Unit.

CSA Marking and Certification Code

Table 9. CSA marking for 2210 Display Unit

CSA marking	Installation drawing nr	Outputs/Inputs
Ex ib IIC T4	9150074-944	IS display bus communication
Ex ib [ia] IIC T4	9150074-944	IS display bus communication Temperature inputs

Intrinsically safe (IS) entity parameters

- Connector X2: $U_i = 12 \text{ V}$, $I_i = 400 \text{ mA}$, $P_i = 0.7 \text{ W}$
- Optional TP40, connector X17 and X18: $U_o = 5.88 \text{ V}$, $I_o = 172.4 \text{ mA}$, $P_o = 0.253 \text{ W}$
The capacitance or either the inductance or the inductance to resistance (L/R) ratio of the cable connected to the connectors X17 and X18 must not exceed the following values:

Table 10. Maximum allowed Capacitance and Inductance

Gas group	Capacitance μF	Inductance μH	or	L/R ratio $\mu\text{H}/\Omega$
IIC	43	0.7		140
IIB	1000	5.2		560
IIA	1000	10		1120

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SYMBOLS

The following symbols can be found on the TankRadar Pro and 2210 Display Unit.



The CE marking symbolizes the conformity of the product with the applicable Community requirements.



The device uses non-harmonized radio frequencies.



Protective Earth



The Ex Certificate is a statement of an independent Certification Body declaring that this product meets the requirement of the applicable European Intrinsic Safety directives.



Ground



Power Supply



The FM symbol indicates that the marked equipment is certified by FM - Factory Mutual Research Corporation according to FMRC standards and are applicable for installation in hazardous locations.

75°C

External cabling must be approved for use in min. 75°C.

TankRadar Pro

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