

Rosemount™ 3101, 3102, and 3105 Level Transmitters

Ultrasonic



- Non-contacting measurement with no moving parts
- Integral LCD and buttons as standard for on-site programming
- Continuous measurement of level
- Volume or open channel flow calculations for the Rosemount 3102 and Rosemount 3105
- Two wire loop powered. Rosemount 3102 and 3105 have digital HART® communications
- Two integral signal relays on the Rosemount 3102
- Easy to install and configure
- Rugged metal or plastic housing. PVDF wetted material

Introduction

Measurement principle

The Rosemount 3100 Series is a liquid level transmitter based on ultrasonic technology that is suitable for many liquid applications. Ultrasonic pulse signals are transmitted and reflected from the liquid surface. The transmitter 'listens' for reflected signals (echoes) and measures the time-delay between transmitting and receiving. The distance to the liquid surface is automatically calculated using the computed time-delay.

The transmitter then calculates the liquid depth (level) and outputs the level as a 4–20 mA signal (and a digital HART® signal on the Rosemount 3102 and 3105).

The Rosemount 3102 is used for measuring the level only. The Rosemount 3102 and 3105 can calculate distance-to-surface, contents (volume), or open channel flow, and then output the result as a 4–20 mA signal and a digital HART signal.

An integral temperature sensor continuously measures the air temperature around the transmitter. It then computes the speed of sound in air, automatically compensating the calculated distance for temperature effects. The Rosemount 3102 and 3105 have a remote temperature sensor option.

Figure 1: Rosemount™ 3100 Series Ultrasonic Level Transmitters



- A. Metal housing material (½-14 NPT conduit entries)
- B. Glass-filled nylon housing material
- C. Remote temperature sensor option (for the Rosemount 3102 and 3105)

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Features and benefits

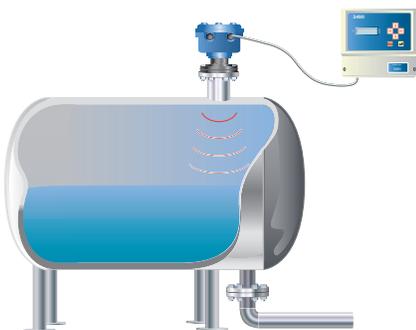
- Measures liquid height, distance to liquid, volume, or flow in open channels
- Eliminates problems experienced with contacting instrumentation
- Simple set-up and operation with an integral LCD display and buttons



- Low cost of installation and commissioning. Minimal maintenance after installed
- Process downtime minimized
- Non-contacting measurement with no moving parts
- Two integral signal relays (on the 3102 only)
- Corrosion resistant PVDF wetted material
- Two-wire 24 V direct current loop-powered
- Operating range up to 36 ft. (11 m)
- Automatic temperature compensation

Applications

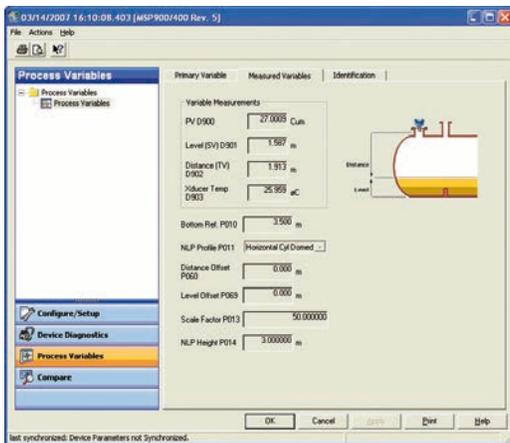
- Storage tank levels
- Open channel flow
- Effluent pits
- Reservoir level
- Buffer tanks



Special features

Advanced software features on the HART transmitters (Rosemount 3102 and 3105 only)

- Learn routine (false echo registration)
 - The transmitter can learn to ignore up to four false echoes, caused by the pulse signal reflecting off obstructions.
- Empty tank mapping
 - When a tank is empty, the transmitter can learn to ignore up to four false echoes, without the need for user interaction.
- Present depth
 - The bottom reference can be automatically set using a known user-entered depth.
- Set as empty
 - When the tank is empty, the bottom reference can be automatically reset to the measured distance.
- Distance offset
 - The distance to the surface can be adjusted by a user-entered positive or negative offset value.
- Level offset
 - The level can be adjusted by a user-entered positive or negative offset value.
- Bottom blanking
 - The transmitter can be set to ignore an area of the tank bottom to avoid false echoes from obstructions.



How to choose the right transmitter version

Each transmitter version has been designed for a specific purpose (see [Table 1](#)).

Table 1: Choosing Rosemount™ 3100 Series Ultrasonic Level Transmitters

Application	Version	Range
Simple level measurement	3101	26-ft. (8 m) range
	3102	36-ft. (11 m) range
Level measurement and local relays	3102	36-ft. (11 m) range
Level measurement in hazardous areas	3105	36-ft. (11 m) range
Open channel flow or volume measurement	3102	Non-hazardous area
	3105	Hazardous area

Ordering information

Rosemount 3101 Level Transmitter

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See [Materials selection](#) for more information on Material Selections.

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Table 2: Rosemount 3101 Level Transmitter Ordering Information

Model	Product description	
3101	Ultrasonic Level Transmitter, 1 to 26 ft.(0,3 to 8 m) range	
Signal output		
L	4–20 mA	★
Housing material		
A	Polyurethane-covered Aluminum	★
P	Glass Filled Nylon	★
Conduit/cable thread		
1	½ –14 NPT	★
2	M20 x 1.5 adaptor	★
3	M20 x 1.5 supplied with nylon cable glands (Plastic Housing only)	★
Wetted material		
F	PVDF	★
Process connection		
RC (1)	2-in. NPT thread	★
SC (2)	2-in. BSPT thread	★
Product certificates		
NA	No certification	★
G5	FM Ordinary Location	★
G6	CSA Ordinary Location	★
Typical model number: 3101 LA 1 F RC G5		

(1) Choosing this option implies US (Imperial) units of measurement in feet are required for the default configuration. The configuration can be changed on-site.

(2) Choosing this option implies Metric units of measurement in meters are required for the default configuration. The configuration can be changed on-site.

Rosemount 3102 Level Transmitter

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See [Materials selection](#) for more information on Material Selections.

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Table 3: Rosemount 3102 Ordering Information

Model	Product description	
3102	Ultrasonic Level Transmitter with 2 integral relays, 1 to 36 ft. (0,3 to 11 m) range	
Signal output		
H	4–20 mA with HART communication	★
Housing material		
A	Polyurethane-covered Aluminum	★
P	Glass Filled Nylon	★
Conduit/cable thread		
1	½ –14 NPT	★
2	M20 x 1.5 adaptor	★
3	M20 x 1.5 supplied with nylon glands (Plastic Housing only)	★
Wetted material		
F	PVDF	★
Process connection		
RC ⁽¹⁾	2-in. NPT thread	★
SC ⁽²⁾	2-in. BSPT thread	★
Product certificates		
NA	No certification	★
G5	FM Ordinary Location	★
G6	CSA Ordinary Location	★
Options (include with selected model number)		
Special alarm options ⁽³⁾		
C4	Namur NE43 alarm and saturation levels, high alarm	★
C5	Namur NE43 alarm and saturation levels, low alarm	★
C8	Standard Rosemount alarm and saturation levels, low alarm	★
Special certification option		
Q4	Certificate of functional test	★
Typical model number: 3102 H A 1 F RC G5 C4		

(1) Choosing this option implies US (Imperial) units of measurement of feet are required for the default configuration. The configuration can be changed on-site.

(2) Choosing this option implies Metric units of measurement of meters are required for the default configuration. The configuration can be changed on-site.

(3) When no Special Alarm option code is selected, the configuration is pre-set for a high-signal alarm indication, and standard Rosemount alarm and saturation levels (see [Electrical](#) for details).

Rosemount 3105 Level Transmitter

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See [Materials selection](#) for more information on Material Selections.

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Table 4: Rosemount 3105 Ordering Information

Model	Product description	
3105	Ultrasonic Level Transmitter for hazardous areas, 1 to 36 ft.(0,3 to 11 m) range	
Signal output		
H	4–20 mA with HART communication	★
Housing material		
A	Polyurethane-covered Aluminum	★
P	Glass Filled Nylon	★
Conduit/cable thread		
1	½ –14 NPT	★
2	M20 x 1.5 adaptor	★
3	M20 x 1.5 supplied with nylon glands (Plastic Housing only)	★
Wetted material		
F	PVDF	★
Process connection		
RC ⁽¹⁾	2-in. NPT thread	★
SC ⁽²⁾	2-in. BSPT thread	★
Product certificates		
I1	ATEX Intrinsically Safe	★
I3	NEPSI China Intrinsically Safe	★
I5	FM Intrinsically Safe and Non-Incendive	★
I6	CSA Intrinsically Safe and Non-Incendive	★
I7	IECEX Intrinsically Safe	★
Options (include with selected model number)		
Special alarm options ⁽³⁾		
C4	Namur NE43 alarm and saturation levels, high alarm	★
C5	Namur NE43 alarm and saturation levels, low alarm	★
C8	Standard Rosemount alarm and saturation levels, low alarm	★
Special certification option		
Q4	Certificate of functional test	★
Typical model number: 3105 H A 1 F RC I5		

(1) Choosing this option implies US (Imperial) units of measurement in feet are required for the default configuration. The configuration can be changed on-site.

- (2) Choosing this option implies Metric units of measurement in meters are required for the default configuration. The configuration can be changed on-site.
- (3) When no Special Alarm option code is selected, the configuration is pre-set for a high-signal alarm indication, and standard Rosemount alarm and saturation levels (see [Electrical](#) for details).

Spare Parts and Accessories

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See [Materials selection](#) for more information on Material Selections.

The starred offerings (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Table 5: Spare parts and accessories

Part number	Description	
03100-1001-0001	Flange Mounting, 2-in. NPT to 2-in. ASME B16.5 Class 150, PVC	★
03100-1001-0002	Flange Mounting, 2-in. NPT to 3-in. ASME B16.5 Class 150, PVC	★
03100-1001-0003	Flange Mounting, 2-in. NPT to 4-in. ASME B16.5 Class 150, PVC	★
03100-1001-0004	Flange Mounting, 2-in. NPT to 6-in. ASME B16.5 Class 150, PVC	★
03100-1002-0001	Flange Mounting, 2-in. BSPT to PN16 DN50, PVC	★
03100-1002-0003	Flange Mounting, 2-in. BSPT to PN16 DN80, PVC	★
03100-1002-0004	Flange Mounting, 2-in. BSPT to PN16 DN100, PVC	★
03100-1002-0005	Flange Mounting, 2-in. BSPT to PN16 DN150, PVC	★
03100-1003-0001 ⁽¹⁾	2-in. NPT Mounting Bracket	★
03100-1003-0002 ⁽¹⁾	2-in. BSPT Mounting Bracket	★
03100-0001-0001	Remote Temperature Sensor (Rosemount 3102 and 3105 only)	★
03100-0002-0002	1/2–14 NPT to M20 x 1.5 Conduit Adaptor (Pack of two)	★

(1) See [Dimensional Drawings](#).

Specifications

General

Product

Rosemount™ 3100 Series Ultrasonic Level Transmitters:

- Rosemount 3101: level measurement
- Rosemount 3102:
 - Level, distance, content (volume), and flow measurement, with two integral signal relays
- Rosemount 3105:
 - Level, distance, content (volume), and flow measurement for hazardous locations

Measurement principle

- Ultrasonic, time-of-flight

Measuring performance

Measurement range

- Rosemount 3101:
 - Range of 1 to 26 ft. (0,3 to 8 m)
- Rosemount 3102 and 3105:
 - Range of 1 to 36 ft. (0,3 to 11 m)

Level resolution

- Better than 0.04 in. (1 mm)

Accuracy under reference conditions

- Rosemount 3101 ⁽¹⁾:
 - ± 0.2 in. (5 mm) for < 3.3 ft. (1 m), $\pm 0.5\%$ of measured distance for > 3.3 ft. (1 m)
- Rosemount 3102 and 3105 ^{(1) (2)}:
 - ± 0.1 in. (2,5 mm) < 3.3 ft (1 m), $\pm 0.25\%$ of measured distance for > 3.3 ft. (1 m)

Blanking distance (dead zone)

- 12 in. (0,3 m)

Update interval

- Display: 500 ms
- Current Output: 200 ms

(1) Temperature: 68 °F (20 °C), Pressure: 1013 mbar (atmospheric pressure), and Relative Humidity: 50%.

(2) GOST/Belarus-approved Rosemount 3102 and 3105: see the Russian Product Data Sheet 00813-0107-4840 (available upon request) for revised accuracy of ± 0.12 in. (± 3 mm) for measured distances less than 3.5 ft. (1.2 m).

Display and configuration

Integral display

- 4/5 digit display for live measurement, and for configuration purposes

Output variables

- Rosemount 3101: level
- Rosemount 3102 and 3105:
 - Level (or distance-to-surface), Content (Volume), and Flow

Output units

- For level or distance-to-surface: m, ft, in, or none
- For contents: l, m³, gal, ft³, or none
- For flow: l/s, l/m, m³/hr, gal/s, gal/m, ft³/m (cfm), ft³/hr, or none

Configuration tools

- Standard integral push-buttons with LCD
- DD-based handheld communicator⁽³⁾
- Rosemount™ 3490 Series Universal Control Unit⁽³⁾
- AMS Device Manager⁽³⁾

Electrical

Power supply

- Loop-powered (two-wire)
- Rosemount 3101: 12 to 30 Vdc
- Rosemount 3102: 12 to 40 Vdc
- Rosemount 3105: 12 to 40 Vdc (non-hazardous area), 12 to 30 Vdc (hazardous area)

Earthing

- None required.

Current output

- Rosemount 3101: Analog 4–20 mA
- Rosemount 3102: Analog 4–20 mA, HART
- Rosemount 3105: Analog 4–20 mA, HART

Signal on alarm

- Rosemount 3101: Low = 3.6 mA. High = 21 mA
- Rosemount 3102 and 3105:
 - Standard: Low = 3.6 mA. High = 21 mA
 - Namur NE43: Low = 3.6 mA. High = 22.5 mA

⁽³⁾ This configuration tool uses HART which is not supported on the Rosemount 3101.

Saturation levels

- Rosemount 3101: Low = 3.8 mA. High = 20.5 mA
- Rosemount 3102 and 3105:
 - Standard: Low = 3.9 mA. High = 20.8 mA
 - Namur NE43: Low = 3.8 mA. High = 20.5 mA

Relay output (Rosemount 3102)

Two integral signal relays, SPST rated 1A @ 30 Vdc (inductive) and 2A @ 30 Vdc (resistive)

Electrical parameters (for Rosemount 3105 hazardous area approvals)

$U_i = 30\text{ V}$, $I_i = 120\text{ mA}$, $P_i = 0,82\text{ W}$, $L_i = 108\text{ }\mu\text{H}$, $C_i = 0\text{ nF}$

Cable entry

- Aluminum housing:
 - Two ½-14 NPT conduit entries for cable glands.
 - Option: M20 x 1.5 conduit/cable adaptor.
- Glass-filled nylon housing:
 - Two M20 x 1.5 conduit entries for cable glands.

Output cabling

Single twisted-pair and shielded, min. 0,22 mm² (24 AWG), max. 1,5 mm² (15 AWG)

Materials selection

Emerson provides a variety of Rosemount product with various product options and configurations including materials of construction that can be expected to perform well in a wide range of applications. The Rosemount product information presented is intended as a guide for the purchaser to make an appropriate selection for the application. It is the purchaser's sole responsibility to make a careful analysis of all process parameters (such as all chemical components, temperature, pressure, flow rate, abrasives, contaminants, etc.), when specifying product, materials, options and components for the particular application. Emerson Process Management is not in a position to evaluate or guarantee the compatibility of the process fluid or other process parameters with the product, options, configuration or materials of construction selected.

Materials of construction

Wet-side material

PVDF

Body and cover materials

- Body: polyurethane-covered aluminum, or glass-filled nylon
- Cover seal: silicone rubber
- Cover screws: 316 stainless steel
- Transducer body seal: EPDM

Mechanical

Mounting thread size

- 2-in. NPT, or 2-in. BSP.
- Optional flange accessories available

Weight of transmitter

- Rosemount 3101
 - with aluminum housing: 3.1 lb (1,4 kg)
 - with glass-filled nylon housing: 2.0 lb (0,9 kg)
- Rosemount 3102
 - with aluminum housing: 3.3 lb (1,5 kg)
 - with glass-filled nylon housing: 2.2 lb (1,0 kg)
- Rosemount 3105
 - with aluminum housing: 4.4 lb (2,0 kg)
 - with glass-filled nylon housing: 3.1 lb (1,4 kg)

Measuring

Temperature compensation ⁽⁴⁾

- Rosemount 3101:
 - Automatic Integral temperature compensation
- Rosemount 3101 and 3105:
 - Automatic Integral temperature compensation.
 - Optional remote temperature sensor for dynamic temperature compensation.

Environment

Ambient temperature

⁽⁵⁾

- Rosemount 3101:
 - Range of –4 to 158 °F (–20 to 70 °C)
- Rosemount 3102 and 3105:
 - Range of –40 to 158 °F (–40 to 70 °C)

Process temperature

- Rosemount 3101:
 - Range of –4 to 158 °F (–20 to 70 °C)
- Rosemount 3102 and 3105:
 - Range of –22 to 158 °F (–30 to 70 °C)

Process pressure

- –4 to 44 psi (–0,25 to 3,0 bar)

⁽⁴⁾ See [Spare Parts and Accessories](#) for optional accessories.

⁽⁵⁾ See [Product Certifications](#) for approval temperature ranges.

Ingress protection

- NEMA 4X, IP 66 for aluminum housing (requires a suitably rated cable gland/blanking plug--not supplied)
- IP 66/67 for glass-filled nylon housing (when using the supplied cable gland/blanking plug)

Electromagnetic compatibility

- EN61326 (Class B)

Certifications

- CE-mark, FM, CSA, NEPSI, ATEX, or IECEx (dependent on order code)

Load limitations

A handheld communicator requires a minimum load resistance of 250 Ohm within the loop in order to function properly. Communication with a Rosemount™ 3490 Universal Controller does not require additional resistance. The maximum load resistance can be determined from graphs in Figure 2 or Figure 3 .

Figure 2: Non-Intrinsically Safe Installations

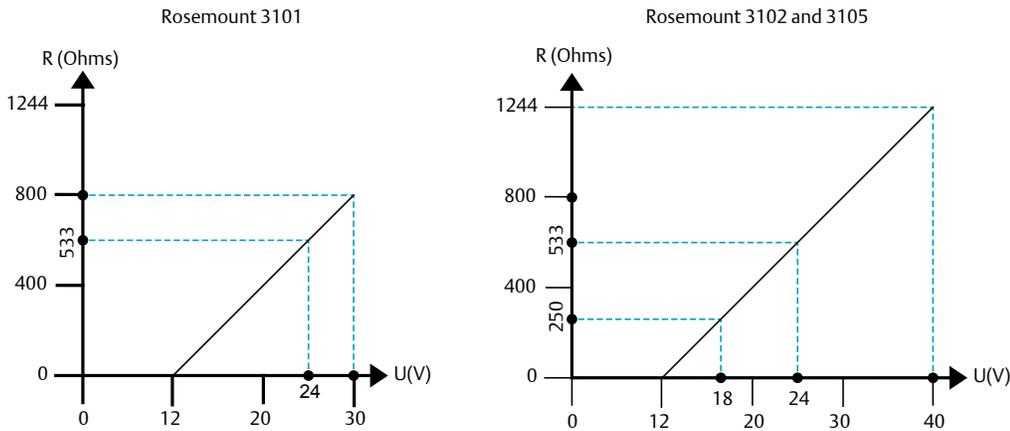
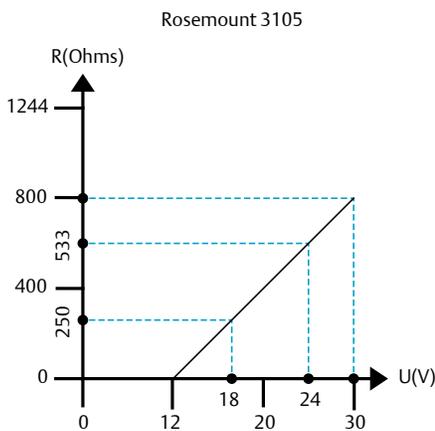


Figure 3: Intrinsically Safe Installations



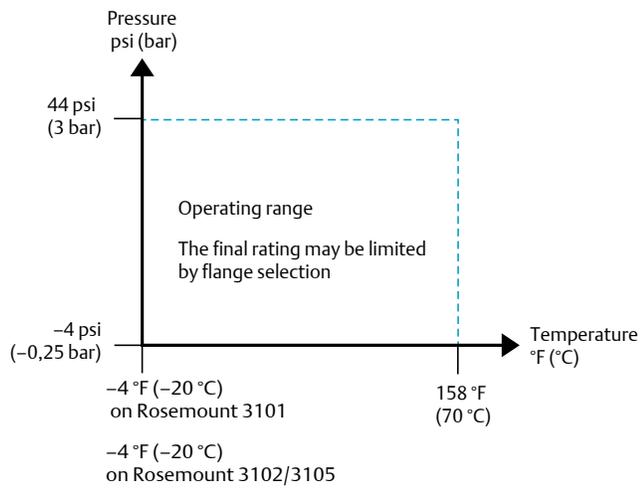
Note

R = Maximum load resistance. U = External power supply voltage.

Temperature and pressure ratings

The process temperature/pressure rating depends on the design of the transmitter in combination with the flange materials.

Figure 4: Process Temperature and Pressure Diagram for Rosemount 3101, 3102, and 3105



Product Certifications

European directive information

The most recent revision of the EU Declaration of Conformity can be found at Emerson.com/Rosemount.

Non-hazardous locations certifications

Ordinary location certification for FM (Rosemount 3101 and 3102 only)

G5 Project ID: 3024095

The transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

Ordinary location certification for CSA (Rosemount 3101 and 3102 only)

G6 Project ID: 02 CSA 1871624

The transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by CSA, a nationally recognized testing laboratory as accredited by the Standards Council of Canada (SCC).

Special condition for safe use:

For this CSA approval, the power for the Rosemount 3100 Series must be supplied from a Rosemount 3490 Series Control Unit, or from a class 2 or SELV source.

Hazardous locations certifications (Rosemount 3105 only)

Special conditions for intrinsically safe use (I1, I3, I5, I6, and I7):

1. All transmitter models have external plastic parts, which could present a risk of ignition due to electrostatic charge build-up. They shall not be directly installed in any process where its enclosure might be charged by the rapid flow of non-conductive media.
2. All transmitter models shall only be cleaned with a damp cloth.
3. When the transmitter housing uses aluminum alloy in its construction, this presents a risk of ignition due to impact and shall be taken into consideration on installation and use.

American and Canadian certifications

Factory Mutual (FM) intrinsically safe approval (Rosemount 3105 only)

I5

Project ID: 3024095
Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D

Zone marking: Class I, Zone 0, AEx ia IIC

Temperature code: T6 (T_a = 55 °C)

I5

Temperature code: T4 ($T_a = 60\text{ }^\circ\text{C}$)
Control drawing: 71097/1216
 $U_i = 30\text{ V}$, $I_i = 120\text{ mA}$, $P_i = 0.82\text{ W}$, $L_i = 108\text{ }\mu\text{H}$, $C_i = 0\text{ nF}$

Factory Mutual (FM) non-incendive approval (Rosemount 3105 only)**I5**

Project ID: 3024095
 Non-Incendive for Class I, Division 2, Groups A, B, C, and D
Zone marking: Class I, Zone 2, AEx nA IIC
Temperature code: T6 ($T_a = 55\text{ }^\circ\text{C}$)
Temperature code: T4 ($T_a = 60\text{ }^\circ\text{C}$)
Control drawing: 71097/1216
 $U_i = 30\text{ V}$, $I_i = 120\text{ mA}$, $P_i = 0.82\text{ W}$, $L_i = 108\text{ }\mu\text{H}$, $C_i = 0\text{ nF}$

Canadian Standards Association (CSA) intrinsically safe approval (on the Rosemount 3105 only)**I6**

Project ID: 02 CSA 1352094
 Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D
Zone marking: Class 1, Zone 0, Ex ia IIC
Temperature code: T4 ($T_a = -40\text{ to }60\text{ }^\circ\text{C}$)
Temperature code: T6 ($T_a = -40\text{ to }55\text{ }^\circ\text{C}$)
Control drawing: 71097/1218
 $U_i = 30\text{ V}$, $I_i = 120\text{ mA}$, $P_i = 0.82\text{ W}$, $L_i = 108\text{ }\mu\text{H}$, $C_i = 0\text{ nF}$

Canadian Standards Association (CSA) non-incendive approval (on the Rosemount 3105 only)**I6**

Project ID: 02 CSA 1352094
 Non-Incendive for Class I, Division 2, Groups A, B, C, and D
Zone marking: Class I, Zone 2, Ex nL IIC
Temperature code: T4 ($T_a = -40\text{ to }60\text{ }^\circ\text{C}$)
Temperature code: T6 ($T_a = -40\text{ to }55\text{ }^\circ\text{C}$)
Control drawing: 71097/1218
 $U_i = 30\text{ V}$, $I_i = 120\text{ mA}$, $P_i = 0.82\text{ W}$, $L_i = 108\text{ }\mu\text{H}$, $C_i = 0\text{ nF}$

European certifications**ATEX intrinsically safe approval (on the Rosemount 3105 only)****I1**

Certificate: Sira 06ATEX2260X
 ATEX Intrinsic Safety
Marking: II 1 G, Ex ia IIC T6 Ga ($T_a = -40\text{ to }55\text{ }^\circ\text{C}$)

I1

II 1 G, Ex ia IIC T4 Ga (Ta = -40 to 60 °C)
Ui = 30 V, li = 120 mA, Pi = 0.82 W, Li = 108µH, Ci = 0 nF

Rest of the world certifications**IECEX intrinsically safe approval (Rosemount 3105 only)****I7**

Certificate: IECEx SIR 06.0068X IECEx
IECEX Intrinsic Safety

Marking: Zone 0, Ex ia IIC T6 Ga (Ta = -40 to 55 °C)
Zone 0, Ex ia IIC T4 Ga (Ta = -40 to 60 °C)
Ui = 30 V, li = 120 mA, Pi = 0.82 W, Li = 108µH, Ci = 0 nF

NEPSI China intrinsically safe approval (on the Rosemount 3105 only)**I3**

Certificate: GYJ081008X
NEPSI Intrinsic Safety

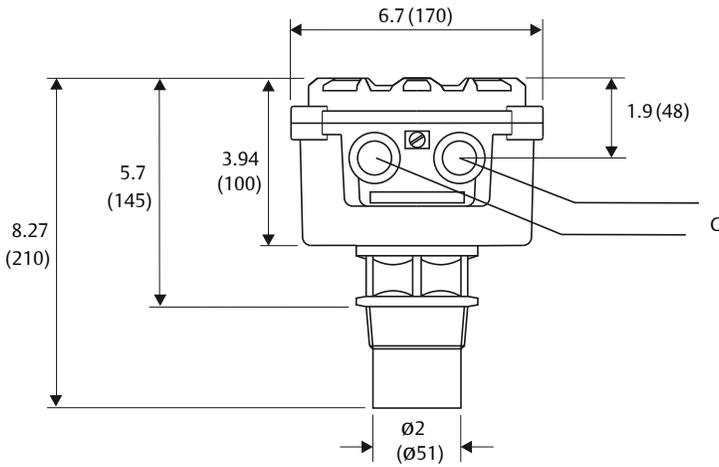
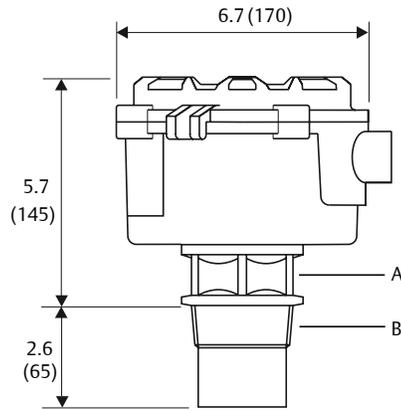
Marking: Ex ia IIC T6 (Ta = -40 to 55 °C)
Ex ia IIC T4 (Ta = -40 to 60 °C)
Ui = 30 V, li = 120 mA, Pi = 0.82 W, Li = 108µH, Ci = 0 nF

Dimensional Drawings

Aluminum housing

Note

Dimensions are in inches (mm). ½-14NPT to M20 x 1.5 adaptors are available when ordering the transmitter.

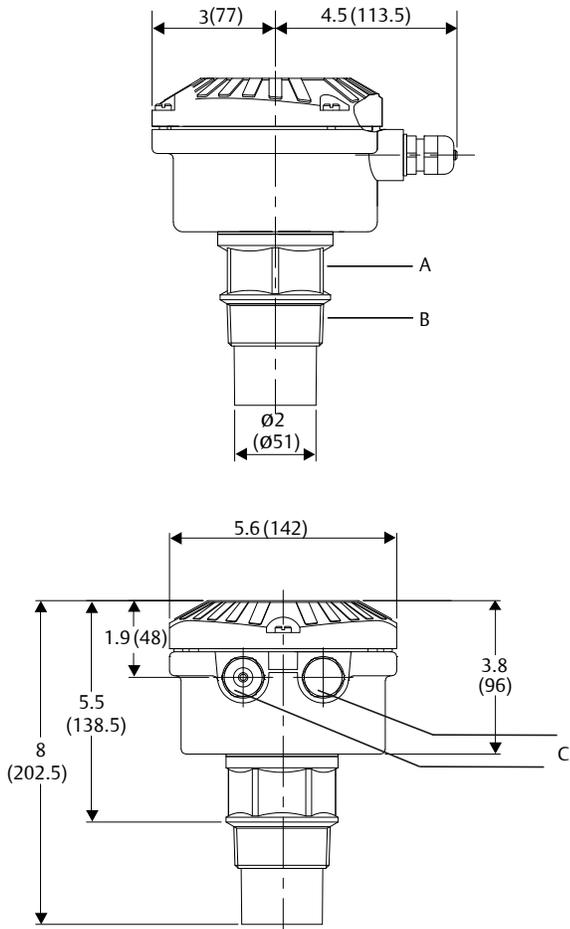


- A. 2.36(60) A/F hexagon
- B. 2-in. NPT/BSPT thread
- C. ½-14 NPT cable entries

Plastic housing

Note

Dimensions are in inches (mm).

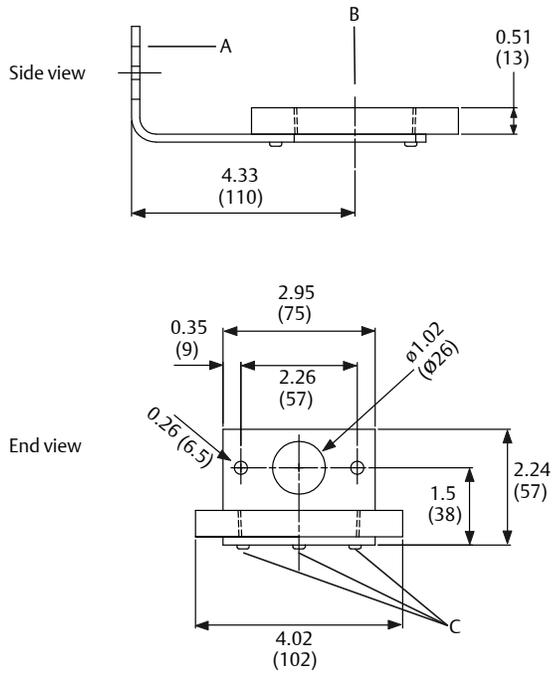


- A. 2.36 (60) A/F hexagon
- B. 2-in. NPT/BSPT thread
- C. Two M20 x 1.5 cable entries, one fitted with cable gland; the other plugged

2-in. NPT/BSPT bracket kits

Note

Dimensions are in inches (millimeters). The combined weight of bracket and disc is 16 oz.(0,5 kg).



Actual views with mounted transmitter



- A. *Stainless steel bracket*
- B. *2-in. NPT/BSPT threaded PVC disc*
- C. *No. 4x13 long self-tap screw(3 positions), carbon steel (zinc plated)*

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