

# Rosemount™ 2160 Wireless Level Detector

## Vibrating Fork



- World's first wireless liquid level detector for reliable point level detection
- Wireless capabilities extend the full benefits of Plantweb™ to previously inaccessible locations
- Self-organizing network delivers information rich data with >99% data reliability
- Designed for operation in temperature extremes of -94 to 500 °F (-70 to 260 °C)
- TÜV tested and approved for overfill protection according to DiBt/WHG regulations

# Introduction

## Measurement principle

The Rosemount 2160 is the world's first *WirelessHART*<sup>®</sup> level detector using Emerson's vibrating fork technology.

Using the principle of a tuning fork, a piezo-electric crystal oscillates the forks at their natural frequency. Changes to the oscillation frequency are continuously monitored by electronics as it varies depending on the liquid medium in which the forks are immersed. The denser the liquid, the lower the oscillation frequency.

Whenever a liquid medium in a vessel (tank) or pipe drains down past the forks, it causes a distinct frequency change. This change is detected by the electronics and a dry condition is indicated.

Whenever a liquid medium in a vessel (tank) or pipe rises and contacts the forks, again a distinct frequency change is detected. This time, the electronics will indicate a wet condition.

The wet and dry conditions, along with other parameters, are regularly transmitted over a secure wireless connection to a wireless gateway.

## Key features and benefits

- Virtually unaffected by turbulence, foam, vibration, solids content, coating products, or liquid properties.
- The mid-range temperature version of the Rosemount 2160 operates in process temperatures of –40 to 356 °F (–40 to 180 °C).
- The high temperature version of the Rosemount 2160 is operates in process temperatures of –94 to 500 °F (–70 to 260 °C). It has a stainless steel thermal tube to move the electronics away from the process.
- Electronic self-checking and condition monitoring, and alerts using a handheld communicator or AMS Device Manager.
- Software adjustable switching delay prevents false switching in turbulent or splashing applications.
- Wireless and encrypted digital communication of the switch output state and other variables.
- Optional integral LCD display for indicating the switch output state and diagnostics.
- 'Fast drip' fork design gives quicker response time, especially with viscous liquids.
- Rapid wet-to-dry time for highly responsive switching.
- Fork shape is optimized for hand polishing to meet hygienic requirements.
- No moving parts or crevices for virtually no maintenance.

---

## Contents

Introduction.....	2
Ordering information.....	6
Specifications.....	12
Product certifications.....	16
Dimensional drawings.....	17

## Built-in diagnostics

- Built-in diagnostics continuously check electronic and mechanical health.
- Fork conditions detected including internal and external damage, coated or blocked, and extreme corrosion.
- Ideal for critical alarm duties.

## Fit and forget

- Once installed, the Rosemount 2160 is ready to go. It needs no calibration and requires minimum installation.
- You can install, and forget it.

## Wireless power module

- The Rosemount 2160 is powered by a replaceable wireless power module.
- The fork sensor requires very little power, and the power module life remains long even with fast update rates.
- The Rosemount 2160 can be powered with standard life Black Power Module (WK1) or extended life Blue Power Module (WK2).

## Power module life estimator

To better estimate power module life for a wireless transmitter in your network, visit the on-line [Power Module Life Estimator](#).

## Extended high and low temperature performance

The high temperature version of the Rosemount 2160 enables standardization of Emerson's vibrating fork switches and detectors across a wide range of process environments, and is ideally suited for harsh conditions where high reliability is essential.

## Wireless capability

- The Rosemount 2160 is the world's first wireless liquid level detector.
- Includes all the features of our wired level switches, but without the complications and cost of wiring.
- Ideal for point level detection in locations previously inaccessible, or too costly for wired devices.

## Application examples

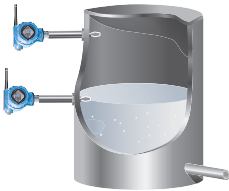
### Overfill prevention

Spillage caused by overfilling can be hazardous to people and the environment, resulting in lost product and potentially high clean-up costs. The Rosemount 2160 is an overfill prevention product from Emerson that can be used as one of multiple layers of protection.



### High and low level point alarms

Maximum and minimum level detection in tanks containing different types of liquids are ideal applications. It is common practice to have an independent high level alarm switch or detector as a backup to an installed level device in case of primary failure.



### Pump control or limit detection

Batch processing tanks often contain stirrers and agitators to ensure mixing and product 'fluidity'. The Rosemount 2160 has a software-configurable time delay, from 0 to 3600 seconds, that virtually eliminates the risk of false detection from splashing.



### Pump protection or empty pipe detection

With the fork projecting only 2 in. (50 mm) (dependent on connection type), the Rosemount 2160 can be installed in small diameter pipes. Short forks mean minimum intrusion on the wet side and allow for simple, low cost installation at any angle into pipes or tanks. The Rosemount 2160 is ideal for reliable pump control and can be used to protect against pumps running dry.



### High temperature applications

The high temperature version of the Rosemount 2160 is designed for continuous operation within the temperature range of -94 to 500 °F (-70 to 260 °C).



### Hygienic applications

With the highly polished forks option providing a surface finish (Ra) better than 0.4 µm, the Rosemount 2160 meets the most stringent hygienic requirements used in food and beverage, and pharmaceutical applications.



## Access information when you need it with asset tags

Newly shipped devices include a unique QR code asset tag that enables you to access serialized information directly from the device. With this capability, you can:

- Access device drawings, diagrams, technical documentation, and troubleshooting information in your MyEmerson account
- Improve mean time to repair and maintain efficiency
- Ensure confidence that you have located the correct device
- Eliminate the time-consuming process of locating and transcribing nameplates to view asset information

# Ordering information

## Online product configurator

Many products are configurable online using our Product Configurator. Select the **Configure** button or visit our [website](#) to start. With this tool's built-in logic and continuous validation, you can configure your products more quickly and accurately.

## Specifications and options

See the Specifications and options section for more details on each configuration. Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See the Material selection section for more information.

### Related information

[Specifications](#)

[Material selection](#)

## Model codes

Model codes contain the details related to each product. Exact model codes will vary; an example of a typical model code is shown in [Figure 1](#).

### Figure 1: Model Code Example

2160 XD 8 S S 1 NN N A0000 1 I5 WA3 WK1	M5 Q8
1	2

1. Required model components (choices available on most)
2. Additional options (variety of features and functions that may be added to products)

## Optimizing lead time

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.

## Rosemount 2160 Wireless Level Detector ordering information



The Rosemount 2160 Wireless Level Detector is ideal for hard to reach locations. It is suitable for high and low level alarms, overfill prevention systems, and pump control with self-checking features. The Rosemount 2160 is designed for energy efficiency and uses a high quality battery for a long battery life. With a one minute update rate, the battery can last up to ten years.

CONFIGURE >	VIEW PRODUCT >
-------------	----------------

### Required model components

#### Model

Code	Description	
2160	Wireless vibrating fork liquid level detector	★

#### Output

Code	Description	
X	Wireless	★

#### Housing material

Code	Description	
D	Dual compartment housing – Aluminum (Aluminium)	★

#### Conduit entry and cable threads

Code	Description	
8	½-in. NPT thread	★

#### Operating temperature

Code	Description	
S	Standard: -40 °F (-40 °C)...302 °F (150 °C)	★
E <sup>(1)</sup>	High: -94 °F (-70 °C)...500 °F (260 °C)	★

(1) Not available with option code WK2 (Blue Power Module).

#### Material of construction: process connection and fork

Code	Description	
S <sup>(1)</sup>	316/316L Stainless Steel (1.4401/1.4404)	★
H <sup>(2)</sup>	Alloy C (UNS N10002), Alloy C-276 (UNS N10276)	

(1) Flanges are dual certified 316 and 316L Stainless Steel (1.4401 and 1.4404).

(2) Only available for BSPT and NPT threaded process connection types as standard, other upon request.

**Process connection size**

Code	Description	
9	¾-in. / 19 mm	★
1	1-in. / 25 mm (DN25)	★
5	1½-in. / 40 mm (DN40)	★
2	2-in. / 50 mm (DN50)	★
7	2½-in. / 65 mm (DN65)	★
3	3-in. / 80 mm (DN80)	★
4	4-in. / 100 mm (DN100)	★
6	6-in. / 150mm (DN150)	★
8	8-in. / 200mm (DN200)	★
X <sup>(1)</sup>	Customer specific	

(1) Other process connections available upon request.

**Process connection rating**

Code	Description	
AA	ASME B16.5 Class 150 flange	★
AB	ASME B16.5 Class 300 flange	★
AC	ASME B16.5 Class 600 flange	
DA	EN1092-1 PN10/16 flange	
DB	EN1092-1 PN25/40 flange	★
DC	EN1092-1 PN63 flange	
DD	EN1092-1 PN100 flange	
NN	For use with non-flange process connection type	★
XX <sup>(1)</sup>	Customer specific	

(1) Other process connections available upon request.

**Process connection type**

Code	Description	
R	Raised Face (RF) flange	★
B	BSPT (R) thread	★
G	BSPP (G) thread	★
N	NPT thread	★
P	BSPP (G) O-ring	★
C	Tri Clamp	★
XX <sup>(1)</sup>	Customer specific	

(1) Other process connections available upon request.



**Fork length**

Code	Description	
A	Standard length 1.7 in. (44 mm)	★
H	Standard length flange 4.0 in. (102 mm)	★
E	Extended, customer specified length in tenths of inches	★
M	Extended, customer specified length in millimeters	★

**Related information**

[Customer specified fork length](#)

**Specific extended fork length**

Code	Description	
0000	Factory default length (only if fork length A or H is selected)	★
xxxx <sup>(1)</sup>	Specific customer specified length in tenths of inches or millimeters (xxx.x inches or xxxx mm)	★

(1) Examples: Code E1181 is 118.1 inches. Code M3000 is 3000 millimeters.

**Related information**

[Customer specified fork length](#)

**Surface finish**

Code	Description	
1	Standard surface finish	★
2 <sup>(1)(2)</sup>	Hand polished (Ra < 0.4 μm)	★

(1) Not available with Material of Construction Process / Fork option code H.

(2) Hand-polished for hygienic connections to better than 0.4 μm Ra such that there are no pits, folds, crevices or cracks discernible to the naked eye (i.e. no features larger than 75 micrometers based on resolving 1/60 degree at a distance of 250 mm).

**Product certifications**

Code	Description	
NA	No Hazardous Locations Certifications	★
GM	Technical Regulation Customs Union (EAC) Ordinary Locations	★
I1	ATEX Intrinsic Safety	★
I3	NEPSI Intrinsic Safety	★
I4	Japan Intrinsic Safety	★
I5	FM Intrinsic Safety	★
I6 <sup>(1)</sup>	CSA Intrinsic Safety	★
I7	IECEx Intrinsic Safety	★
IM	Technical Regulation Customs Union (EAC) Intrinsic Safety	★

(1) The requirements of CRN are met when a Rosemount 2160 is configured with a CSA approval, 316/316L stainless steel (1.4401/1.4404) wetted parts, and either NPT threaded or 2-in. to 4-in. ASME B16.5 flanged process connections.

**Related information**[Product certifications](#)**Wireless update rate, operating frequency, and protocol**

Code	Description	
WA3	User configurable update rate, 2.4 GHz DSSS, IEC 62591 ( <i>WirelessHART</i> ®)	★

**Omni-directional wireless antenna and SmartPower™**

I.S. Power Module sold separately.

Code	Description	
WK1 <sup>(1)</sup>	External antenna, adapter for standard life Black Power Module	★
WK2 <sup>(2)</sup>	External antenna, adapter for extended life Blue Power Module	★

(1) *Black Power Module must be shipped separately; order Model 701PBKKF. See the Emerson Wireless SmartPower Solutions [Product Data Sheet](#) for more information.*

(2) *Blue Power Module must be shipped separately; order Model MHM-89004. See the Emerson Wireless SmartPower Solutions [Product Data Sheet](#) for more information.*

**Additional options****Meter**

Code	Description	
M5	LCD display meter	★

**Factory configuration**If this option is selected, submit a completed Rosemount 2160 [Configuration Data Sheet](#) with the order.

Code	Description	
C1	Factory configured date, descriptor, message fields and wireless parameters	★

**Calibration data certification**

Code	Description	
Q4	Certificate of functional test	★

**Material traceability certification**

Code	Description	
Q8	Material traceability certification per EN 10204 3.1	★

**Material certification**

Code	Description	
Q15	NACE® MR0175 / ISO 15156	★
Q25	NACE MR0103	★

**Dye penetration test certificate**

Code	Description	
Q73	Certificate of liquid penetrant inspection	★

**Positive material identification certificate**

Code	Description	
Q76	Positive material identification certificate of conformance	★

**Special procedures**

This option is limited to units with extended lengths up to 59.1 in. (1500 mm).

Code	Description	
P1	Hydrostatic testing with certificate	★

**Extended product warranty**

Rosemount extended warranties have a limited warranty of three or five years from date of shipment.

Code	Description	
WR3	3-year limited warranty	★
WR5	5-year limited warranty	★

**Overfill approval option**

The Rosemount 2160 has been TÜV-tested and approved for overfill protection according to the German DIBt/WHG regulations. If required, add “R2259” to the end of the model number.

**Spare parts and accessories**

**Seal**

Part number	Description
02100-1000-0001	Seal for 1-in. BSPP (G1A) process connection. Material: Non-asbestos BS7531 grade X carbon fiber with rubber binder
02100-1040-0001	Seal for ¾-in. BSPP (G3/4A) process connection. Material: Non-asbestos BS7531 grade X carbon fiber with rubber binder

**Adaptor boss**

Part number	Description
02100-1010-0001	Adaptor boss, 1-in. BSPP to 1½-in. (38 mm) Tri Clamp Materials: 316 stainless steel fitting, FPM/FKM O-ring

## Tri Clamp kit

Part number	Description
02100-1020-0001	2-in. (51 mm) Tri Clamp kit (vessel fitting, clamp ring and seal) Materials: 316 stainless steel, NBR Nitrile

# Specifications

## General

### Measuring technology

Vibrating fork

### Applications

Point level detection in liquid process mediums, including coating liquids, aerated liquids, and slurries. Suitable for horizontal and vertical installation.

## Physical specifications

### Material selection

Emerson provides a variety of Rosemount products 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 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.

### Electronics housing

#### Enclosure

- Housing: Stainless steel or low-copper aluminum
- Paint: Polyurethane (aluminum housing only)
- Cover O-ring: Nitrile butadiene

#### Terminal block and power module pack

PBT

#### Antenna

PBT/PC integrated omni-directional antenna

#### Rotation

Rotatable housing allows correct alignment of both the forks and the omni-directional antenna for optimal signal and best viewing position of the LCD integral display.

### Ingress protection

Housing is NEMA 4X and IP66 compliant.

## Process wetted connections

### Connections

Threaded, Tri Clamp, and flanged process connection options.

### Materials

- 316/316L stainless steel (1.4401/1.4404 dual-certified)  
Hand-polished to better than 0.4 µm option for Tri Clamp connections.
- Alloy C (UNS N10002) and Alloy C-276 (UNS N10276)  
Available for flanged, and selected threaded process connections (¾-in. and 1-in. BSPT (R), and ¾-in. and 1-in. NPT).
- Gasket material for ¾-in. and 1-in. BSPP (G) is non-asbestos BS7531 Grade X carbon fiber with rubber binder.  
Gaskets are not supplied with flanged process connections.

## Customer specified fork length

**Table 1: Extended Fork Lengths**

Process connection	Minimum	Maximum <sup>(1)</sup>
¾-in. threaded	3.8 in. (95 mm)	118.1 in. (3000 mm)
1-in. threaded	3.7 in. (94 mm)	118.1 in. (3000 mm)
Flanged	3.5 in. (89 mm)	118.1 in. (3000 mm)
Tri Clamp	4.1 in. (105 mm)	118.1 in. (3000 mm)

(1) Maximum extended length of fork with hand-polished option is 39.4 in. (1000 mm).

### Related information

[Dimensional drawings](#)

## Performance specifications

### Electromagnetic Compatibility (EMC)

All versions of the Rosemount 2160 meet all relevant requirements of EN 61326.

### Hysteresis (water)

0.1 in. (2.5 mm)

### Switching point (water)

0.5 in. (13 mm) from fork tip if mounted vertically.

0.5 in. (13 mm) from the fork edge if mounted horizontally.

The switching point varies with different liquid densities.

### Liquid density requirements

Minimum liquid density is 31.2 lb/ft<sup>3</sup> (500 kg/m<sup>3</sup>).

### Liquid viscosity range

0.2 to 10000 cP (centiPoise)

### Humidity limits

0 to 100% relative humidity.

### Solids content and coating

The maximum recommended diameter of solid particles in the liquid is 0.2 in. (5 mm). Avoid bridging of forks (fork-to-fork).

### Detection output delay

Optional output delay, programmable from 0 to 3600 seconds, to prevent false detection caused by splashing on the forks. Default delay is 1 second.

## Electrical specifications

### Wireless power module

Replaceable, intrinsically safe Lithium-Thionyl Chloride power module with PBT enclosure.

### Power module battery life

Ten year life at one minute update rate.

---

#### Note

Reference conditions are 70 °F (21 °C), and routing data for three additional network devices. Continuous exposure to ambient temperature limits -40 °F or 185 °F (-40 °C or 85 °C) may reduce specified power module life by 20 percent.

---

#### Related information

[Power module life estimator](#)

### Handheld communicator connections

Clips are permanently fixed to the terminal block.

## Functional specifications

### Outputs

IEC 62591 (*WirelessHART*<sup>®</sup>) 2.4 GHz DSSS

### Radio frequency power output from antenna

Maximum of 10 mW (10 dBm) EIRP

### Wireless update rate

User-selectable: from one second up to sixty minutes.

The optional integral LCD display updates at each wireless update.

### Local display

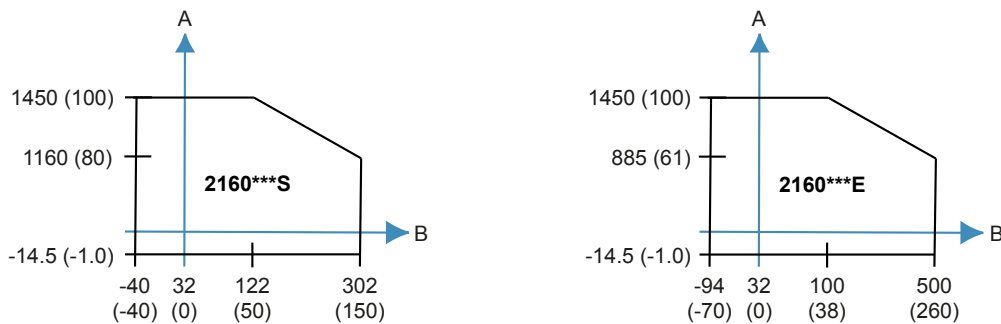
A 'locate device' function allows easy identification of instrument during commissioning inspection.

The optional five-digit integral LCD can indicate a sequence of up to four process variables (dry/wet, electronics temperature, frequency, and supply voltage) and diagnostic information.

## Environmental specifications

### Maximum operating pressures

Figure 2: Operating Pressures



- A. Process pressure, psig (barg)
- B. Process temperature, °F (°C)

The final rating depends on the process-wetted connection.

### Threaded process connection

See Figure 2.

### Hygienic process connection

435 psig (30 barg)

**Flanged process connection**

The maximum operating pressure is the lower of the process pressure (Figure 2) and flange pressure rating (see Table 2).

**Table 2: Maximum Flange Pressure Rating**

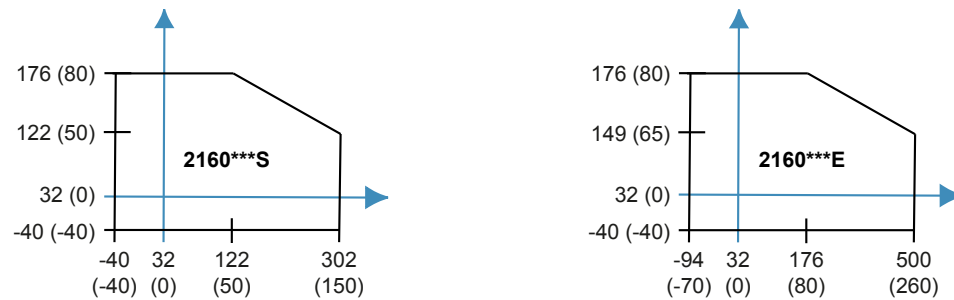
Flange standard	Stainless steel flanges <sup>(1)</sup>
ASME B16.5 Class 150	275 psig <sup>(2)</sup>
ASME B16.5 Class 300	720 psig <sup>(2)</sup>
ASME B16.5 Class 600	1440 psig <sup>(2)</sup>
EN1092-1 PN 10/16	16 barg <sup>(3)</sup>
EN1092-1 PN 25/40	40 barg <sup>(3)</sup>
EN1092-1 PN 63	63 barg <sup>(3)</sup>
EN1092-1 PN 100	100 barg <sup>(3)</sup>

- (1) ASTM stainless steel.
- (2) At 100 °F (38 °C), the pressure rating decreases with an increasing process temperature.
- (3) At 122 °F (50 °C), the pressure rating decreases with an increasing process temperature.

**Maximum and minimum operating temperatures**

See Figure 3 for the maximum and minimum operating temperatures.

**Figure 3: Operating Temperatures**



- A. Ambient Temperature, °F (°C)
- B. Process Temperature, °F (°C)

**Product certifications**

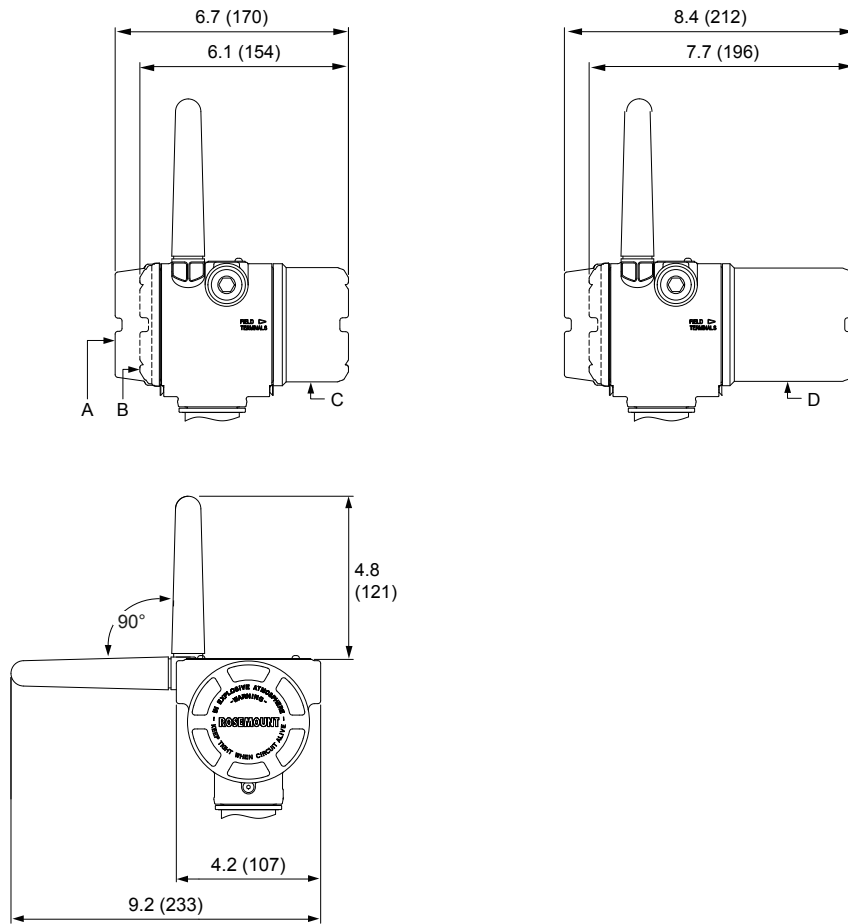
See the Rosemount 2160 [Product Certifications](#) document for detailed information on the existing approvals and certifications.



# Dimensional drawings

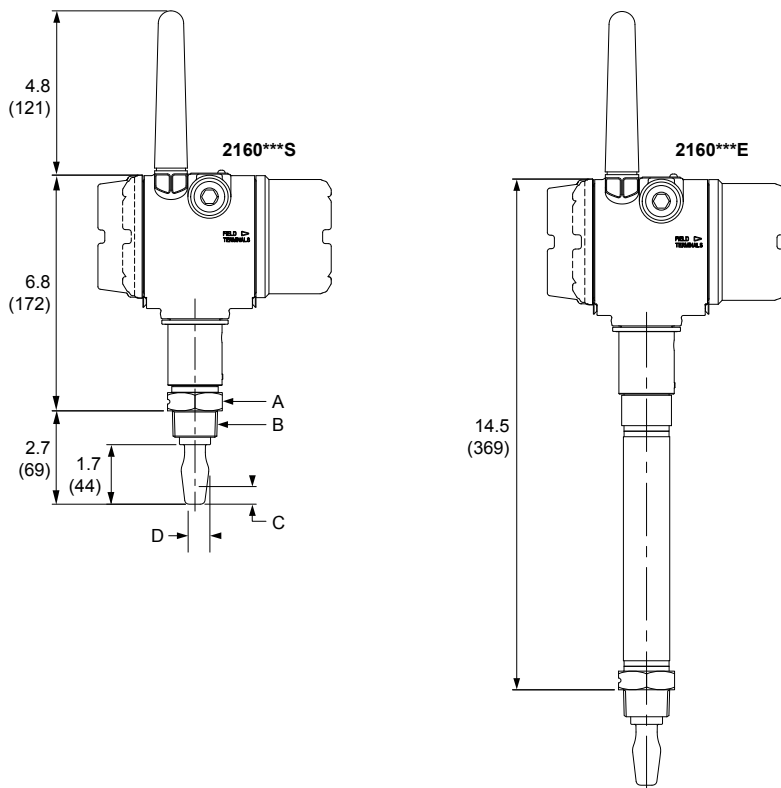
Refer to the [Type 1 Drawing](#) on the Rosemount 2160 [web page](#) for dimensions of the O-ring seal (BSPP) versions.

**Figure 4: Housing and Antenna**



- A. LCD display (option M5)
- B. No LCD display
- C. Black Power Module cover (option WK1)
- D. Blue Power Module cover (option WK2)

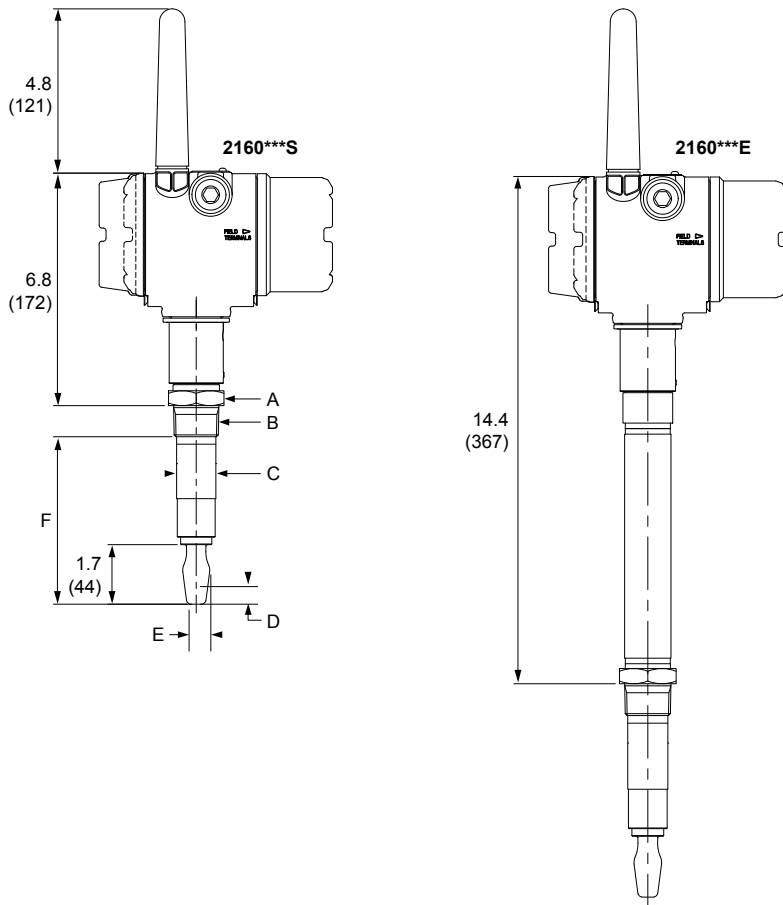
**Figure 5: Threaded Process Connections (Standard Fork Length)**



- A. 1.6 (40) A/F hexagon
- B. 3/4- or 1-in. thread
- C. 0.5 (13) switchpoint (when mounted vertically)
- D. 0.5 (13) switchpoint (when mounted horizontally)

Dimensions are in inches (millimeters).

**Figure 6: Threaded Process Connections (Extended Fork Length)**



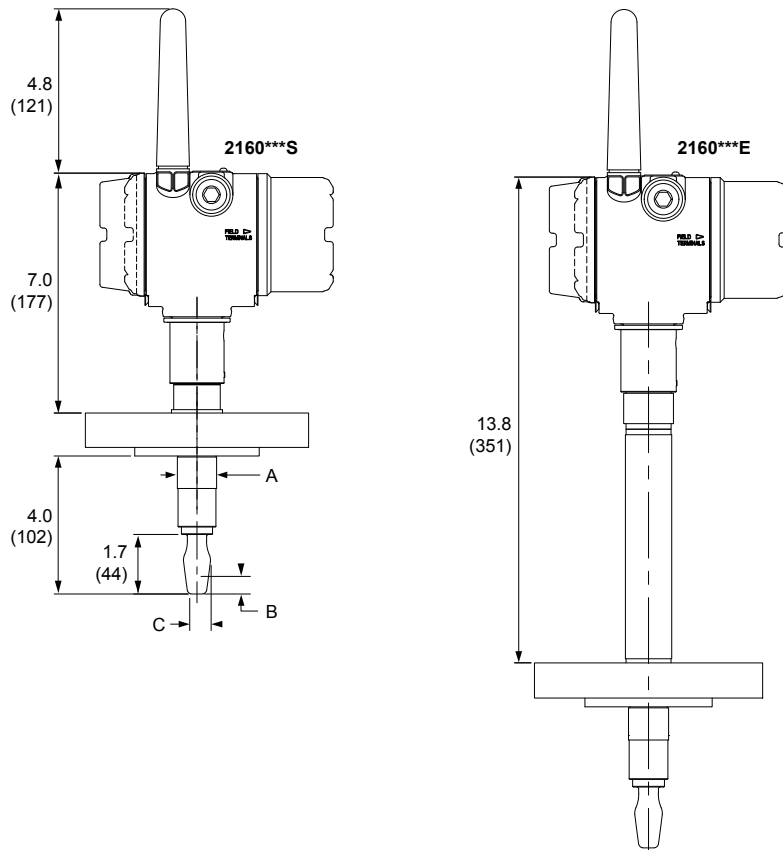
- A. 1.6 (40) A/F hexagon
- B. ¾- or 1-in. thread
- C. See [Table 3](#) for dimensions
- D. 0.5 (13) switchpoint (when mounted vertically)
- E. 0.5 (13) switchpoint (when mounted horizontally)
- F. Customer specified fork length (see [Table 1](#))

Dimensions are in inches (millimeters).

**Table 3: Tube Diameters**

Tube material	Size	Tube diameter in inches (mm)
316/316L	¾-in.	0.9 (22.9)
	1-in.	1.125 (28.6)
Alloy C/C-276	¾-in.	0.84 (21.4)
	1-in.	1.050 (26.7)

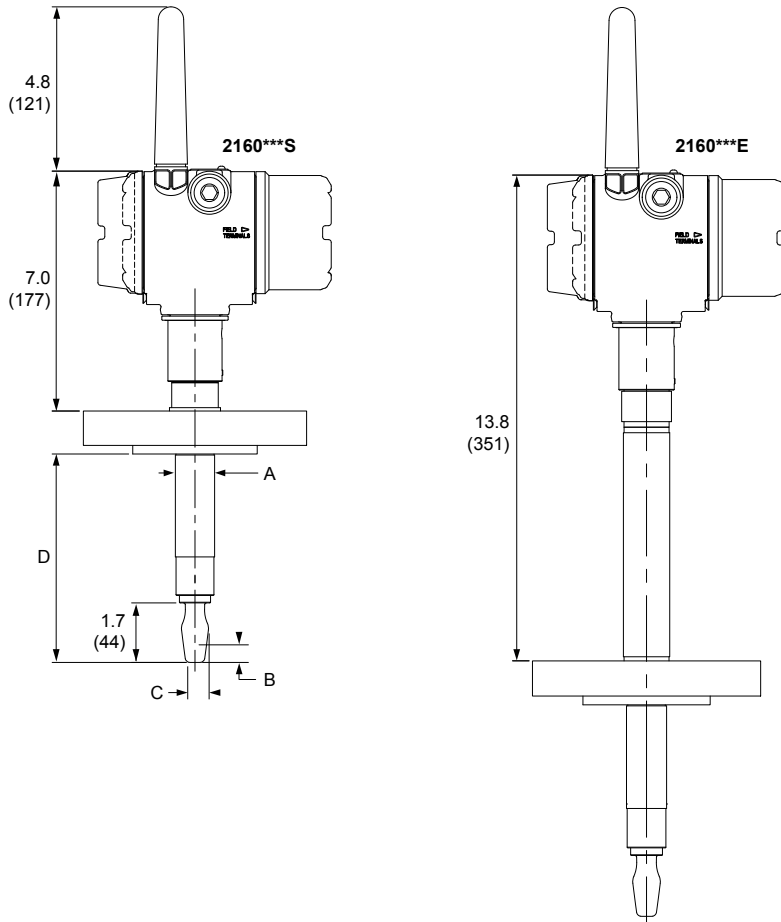
**Figure 7: Flanged Process Connections (Standard Fork Length)**



- A.  $\varnothing 0.9$  (23) for 1-in. flange;  $\varnothing 1.14$  (29) for 1½-in. or larger flange
- B. 0.5 (13) switchpoint (when mounted vertically)
- C. 0.5 (13) switchpoint (when mounted horizontally)

Dimensions are in inches (millimeters).

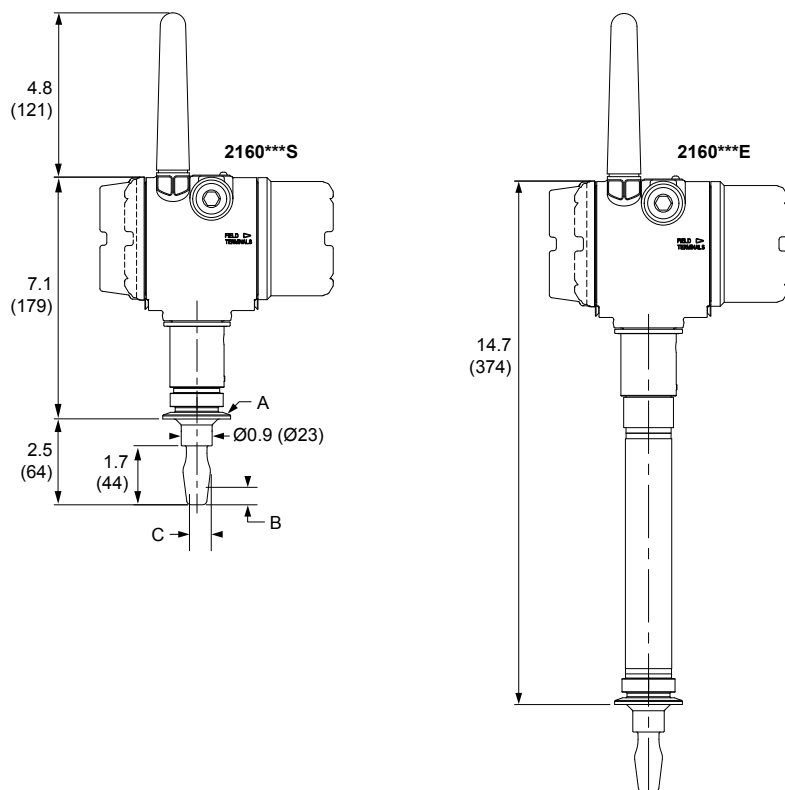
**Figure 8: Flanged Process Connections (Extended Fork Length)**



- A.  $\varnothing 0.9$  (23) for 1-in. flange;  $\varnothing 1.14$  (29) for 1½-in. or larger flange
- B. 0.5 (13) switchpoint (when mounted vertically)
- C. 0.5 (13) switchpoint (when mounted horizontally)
- D. Customer specified fork length (see [Table 1](#))

Dimensions are in inches (millimeters).

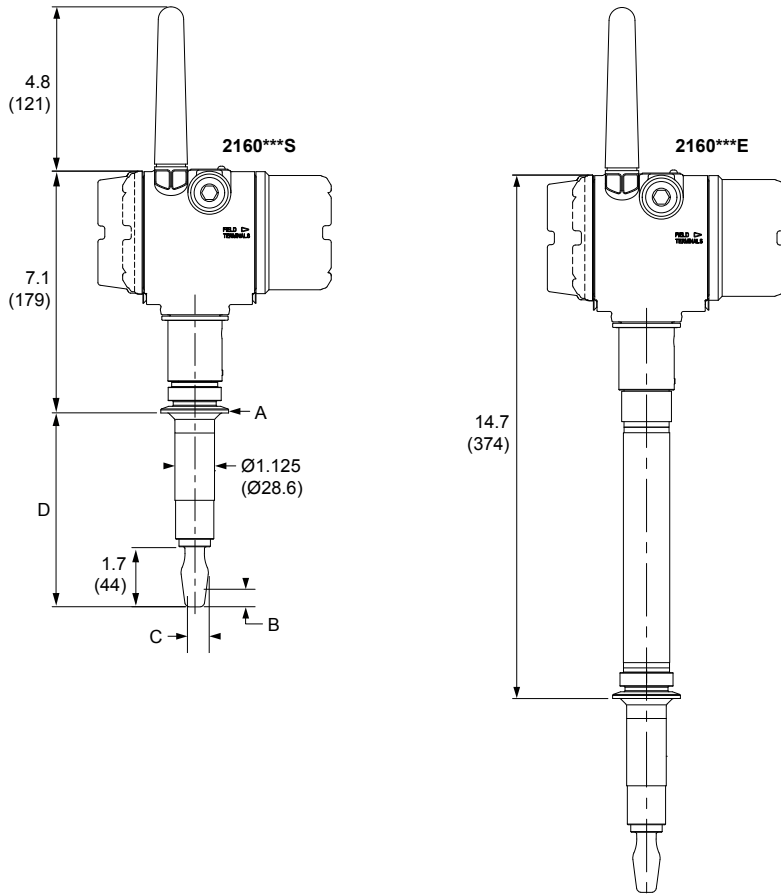
**Figure 9: Tri Clamp Process Connections (Standard Fork Length)**



- A. ½-in. (38) or 2-in. (52) Tri Clamp
- B. 0.5 (13) switchpoint (when mounted vertically)
- C. 0.5 (13) switchpoint (when mounted horizontally)

Dimensions are in inches (millimeters).

Figure 10: Tri Clamp Process Connections (Extended Fork Length)



- A. ½-in. (38) or 2-in. (52) Tri Clamp
- B. 0.5 (13) switchpoint (when mounted vertically)
- C. 0.5 (13) switchpoint (when mounted horizontally)
- D. Customer specified fork length (see [Table 1](#))

Dimensions are in inches (millimeters).

For more information: [Emerson.com](https://www.emerson.com)

©2022 Emerson. All rights reserved.

Emerson Terms and Conditions of Sale are available upon request. The Emerson logo is a trademark and service mark of Emerson Electric Co. Rosemount is a mark of one of the Emerson family of companies. All other marks are the property of their respective owners.

**ROSEMOUNT™**

