

# Rosemount™ 648 Wireless Temperature Transmitter

## with Rosemount X-well™ Technology



- Rosemount X-well Technology provides accurate process temperature without the requirement of a thermowell or process penetration.
- Industry-leading temperature transmitter delivers field reliability as a wireless measurement solution.
- Achieve optimal efficiency with best-in-class product specifications and capabilities.
- Wireless delivers innovative wireless solutions for temperature measurement and overall transmitter performance.

# Rosemount 648 Wireless Temperature Transmitter

Rosemount X-well Technology provides a Complete Point Solution™ for accurately measuring process temperature without the requirement of a thermowell or process penetration.



- Simplifies temperature measurement point specification, installation, maintenance, and eliminates possible leak points
- Calculates a repeatable and accurate process temperature measurement via an in-transmitter thermal conductivity algorithm
- Measures pipe surface and ambient temperature and utilizes the thermal conductivity properties of the installation and process piping to provide an accurate process measurement

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**Industry-leading temperature transmitter delivers field reliability as a wireless measurement solution**



- Superior accuracy and stability
- Single sensor capability with universal sensor inputs (RTD, T/C, mV, ohms)
- Transmitter-Sensor Matching with Callendar-Van Dusen
- IEC-approved *WirelessHART®* Protocol
- Dual-compartment housing, available in aluminum or stainless steel
- Large LCD display
- Extended range antenna options available

**Achieve optimal efficiency with best-in-class product specifications and capabilities**

- Two-year stability rating reduces maintenance costs
- Transmitter-sensor matching eliminates the interchangeability error of sensors, improving measurement point accuracy by 75 percent
- User-centric Device Dashboards communicate important diagnostics and ensure process health
- Dual-compartment housing provides the highest reliability in harsh industrial environments

**A standard diagnostic offering increases measurement reliability and provides visibility into process conditions**



- Four user-configurable alerts provide increased process information and measurement point insight.
- Open/short sensor diagnostics assist with detecting issues in sensor loops.
- Terminal temperature feature verifies installation location temperature conditions to ensure optimal transmitter operation.

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



- Self-organizing network delivers information-rich data with 99 percent data reliability and establishes a highly stable network.
- Smart Wireless capabilities extend the full benefits of Plantweb™ to previously inaccessible temperature measurement locations.
- 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's layered approach to wireless network security ensures that data transmissions are secure.

**Explore the benefits of a Complete Point Solution from Emerson**



- An "Assemble To Sensor" option enables Emerson to provide a complete point temperature solution, delivering an installation-ready transmitter and sensor assembly.
- Emerson offers a selection of RTDs, thermocouples, and thermowells that bring superior durability and Rosemount reliability to temperature sensing, complementing the Rosemount Transmitter portfolio.

**Experience global consistency and local support from numerous worldwide Emerson manufacturing sites**



- World-class manufacturing provides globally consistent product from every factory and the capacity to fulfill the needs of any project, large or small.
- Experienced instrumentation consultants help select the right product for any temperature application and advise on best installation practices.
- An extensive global network of Emerson service and support personnel can be on-site when and where they are needed.
- Make wireless installation and configuration easy with the Wireless Gateway.
- For installations that have a high number of temperature measurements in close proximity, consider the Rosemount 848T High Density Temperature Transmitter.
- Explore how Emerson's intrinsically safe SmartPower Solutions reduce maintenance costs.

# Ordering information



The Rosemount 648 Wireless delivers industry-leading temperature field reliability as a wireless process measurement with best-in-class specifications and capabilities.

Transmitter features include:

- Temperature Measurement Assembly with Rosemount X-well Technology (option code PT)
- IEC-approved *WirelessHART* Protocol (option code WA3)
- External antenna (option code WK1)
- Extended range, external antenna (option code WM1)
- Large LCD display (option code M5)
- Transmitter-sensor matching (option code C2)
- 3-point calibration certificate (option code Q4)
- Assemble to sensor (option code XA)

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## Online product configurator

Many products are configurable online using our product configurator.

Select the **Configure** button or visit [Emerson.com/global](https://Emerson.com/global) to start. With this tool's built-in logic and continuous validation, you can configure your products more quickly and accurately.

## 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**

**3144P D1 A 1 NA M5 DA1 Q4**

**1**

**2**

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

## Specifications and options

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.

When ordering Rosemount X-well Technology, specific option codes are required. See [How to order Rosemount X-well Technology](#) for more information.

## Optimizing lead time

The starred offerings (★) represent the most common options and are recommended for the fastest delivery times. The non-starred offerings are subject to additional delivery lead time.

## Required model components

### Model

Code	Description	
648	Temperature transmitter	★

### Transmitter type

Code	Description	
D	Wireless field mount	★

### Transmitter output

Code	Description	
X	Wireless	★

### Measurement configuration

Code	Description	
1	Single-sensor input	★

### Housing style

Code	Description	Material	
D	Dual-compartment housing	Aluminum	★
E	Dual-compartment housing	SST	★

### Conduit entry size

Code	Description	
1	½-4 NPT	★

### Product certifications

Code	Description	
NA	No approval	★
I5	USA Intrinsically Safe, Non-Incendive, and Dust Ignition-proof	★
N5	USA Non-Incendive and Dust Ignition-proof	★

Code	Description	
I6	Canada Intrinsically Safe	★
I1	ATEX Intrinsic Safety	★
I7	IECEx Intrinsic Safety	★
I2	Brazil Intrinsic Safety	★
I4	Japan Intrinsic Safety	★
I3	China Intrinsic Safety	★
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety	★
KQ	USA, Canada, ATEX Intrinsic Safety Combination (combination of I1, I5, and I6)	★
IP	Korea Intrinsic Safety	★

## Wireless options

### Assemble to options

Code	Description	
XA <sup>(1)</sup>	Sensor specified separately and assembled to transmitter	★
XC	Hand tight assembly of a transmitter and sensor	★

(1) When ordering the XA option, a mounting bracket is not included. If a bracket is required, please order option code B5.

### Wireless update rate

Code	Description	
WA3	User configurable update rate, 2.4 GHz DSSS, IEC 62591 (WirelessHART)	★

### Wireless antenna and SmartPower

Black power module must be shipped separately; order Model 701PBKKF or Part #00753-9220-0001.

Code	Description	
WK1	External antenna, adapter for Black Power Module (I.S. Power Module sold separately)	★
WK2	External antenna, extra long life power module adapter, Intrinsically Safe	★
WM1	Extended range, external antenna, adapter for Black Power Module (I.S. Power Module sold separately)	
WM2	Extended range, external antenna, extra long life power module adapter, Intrinsically Safe	

### Mounting bracket

Code	Description	
B5	"L" mounting bracket for 2-in. pipe and panel mounting - All SST	★

### Display

Code	Description	
M5	LCD display	★

## Enhanced performance

When ordering the PT option code, the C1 and XA option codes are required.

Code	Description	
PT	Temperature measurement assembly with Rosemount X-well Technology	★

## Software configuration

Code	Description	
C1	Custom configuration of date, descriptor, message, and wireless parameters (requires CDS with order)	★

## Line filter

Code	Description	
F5	50 Hz line voltage filter	★
F6	60 Hz line voltage filter	★

## Sensor trim

Code	Description	
C2	Transmitter-sensor matching - trim to specific Rosemount RTD calibration schedule (CVD Constants)	★

## 5-Point calibration

Code	Description	
C4	5-point calibration (requires Q4 option code to generate a Calibration Certificate)	★

## Calibration certificate

Code	Description	
Q4	Calibration certificate (3-point calibration)	★

## Cable gland option

Code	Description	
G2	Cable gland (0.30 in. (7.5 mm) – 0.47 in. (11.9 mm))	★
G4	Thin wire cable gland (0.12 in. (3 mm) – 0.31 in. (8 mm))	★

## Extended product warranty

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

**Cold temperature**

Code	Description	
BR5	Cold temperature operation: -60 °F (-51 °C)	★

# How to order Rosemount X-well Technology

Rosemount X-well Technology is for temperature monitoring applications and is not intended for control or safety applications. It is available with the Rosemount 648 Temperature Transmitter in a factory assembled direct mount configuration with a Rosemount 0085 Pipe Clamp Sensor. It cannot be used in a remote mount configuration. Rosemount X-well Technology will only work as specified with factory supplied and assembled Rosemount 0085 Sensor silver tipped single element sensor with an 3.15-in. (80 mm) extension length. It will not work as specified if used with other sensors.

**Table 1: Rosemount 648 Wireless Option Code Requirements**

Code	Description
PT	Temperature measurement assembled with Rosemount X-well Technology
XA	Sensor specified separately and assembled to transmitter
C1	Custom configuration of date, descriptor, message, and wireless parameters (requires CDS with order)

**Table 2: Rosemount 0085 Pipe Clamp Sensor Option Code Requirements**

Code	Description
N	No connection head
3	Sensor connection
P1	Sensor type
J	Extension type
0080	Extension length
XA	Assemble sensor to specific temperature transmitter

Typical model number of the assembly: 648 D X 1 D 1 NA WA3 WK1 M5 PT C1 XA 0085 N 3 P1 J 0080 U 0169 N XA

## Specifications

### Physical specifications

#### Material selection

Emerson provides a variety of Rosemount products with various 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.

## Conformance to specifications ( $\pm 3\sigma$ [Sigma])

Technology leadership, advanced manufacturing techniques, and statistical process control ensure specification conformance to at least  $\pm 3\sigma$ .

## Electrical connections

### Power module

The Emerson SmartPower™ Power Module is field replaceable, featuring keyed connections that eliminate the risk of incorrect installation.

The power module is an Intrinsically Safe solution, containing Lithium-thionyl chloride with a Polybutadiene Terephthalate (PBT) enclosure.

The Rosemount 648 Wireless has power module life time rating of 10 years with a one-minute update rate at reference conditions.<sup>(1)</sup>

### Sensor terminals

Sensor terminals permanently fixed to terminal block.

### Field Communicator connections

Communication terminals

Clips permanently fixed to terminal block, designated by the text "COMM."

## Materials of construction

### Enclosure

Housing	Low-copper aluminum or stainless steel
Paint	Polyurethane
Cover O-ring	Buna-N

### Terminal block and power module

Polybutadiene terephthalate (PBT)

### Antenna

PBT/Polycarbonate (PC) integrated omni-directional antenna

### Mounting

Transmitters may be attached directly to the sensor. Mounting brackets also permit remote mounting. See [Dimensional drawings](#).

### Weight

#### ■ Low-copper aluminum

Rosemount 648 without LCD display - 4.1 lb (1.9 kg)  
Rosemount 648 with M5 LCD display - 4.2 lb (2.0 kg)

#### ■ Stainless steel

Rosemount 648 without LCD display - 8.0 lb (3.5 kg)  
Rosemount 648 with M5 LCD display - 8.1 lb (3.6 kg)

(1) Reference conditions are 70 °F (21 °C) and routing data for three additional network devices.

NOTE: Continuous exposure to ambient temperature limits (-40 or 185 °F; -40 or 85 °C) may reduce specified life by less than 20 percent.

### Enclosure ratings

Housing style option codes D and E are type 4X and IP66/67 rated dual-compartment housings.

## Functional specifications

### Input

Supports thermocouple, RTD, millivolt, and ohm input types. See [Table 4](#) for sensor options.

### Output

IEC 62591 (*WirelessHART*), 2.4 GHz DSSS

### Local display

The optional five-digit integral LCD display can display sensor temperature in engineering units (°F, °C, °R, K, Ω, and millivolts) and percent of range. The display updates based on the wireless update rate.

### Humidity limits

0–99% non-condensing relative humidity

### Update rate

*WirelessHART*, user-selectable one second to 60 minutes

### Accuracy

(Pt 100 at reference condition: 20 °C)  $\pm 0.225$  °C ( $\pm 0.405$  °F)

### Radio frequency power output from antenna

External antenna (WK1 option): Maximum of 10 mW (10 dBm) EIRP

## Performance specifications

### Electromagnetic compatibility (EMC)

All models meet all relevant requirements of EN 61326-1; 2006; EN 61326-2-3; 2006

### Transmitter stability

$\pm 0.15\%$  of output reading or 0.15 °C (whichever is greater) for 24 months.

### Self calibration

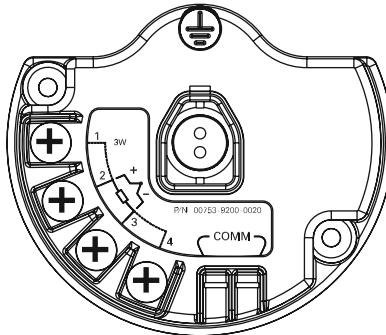
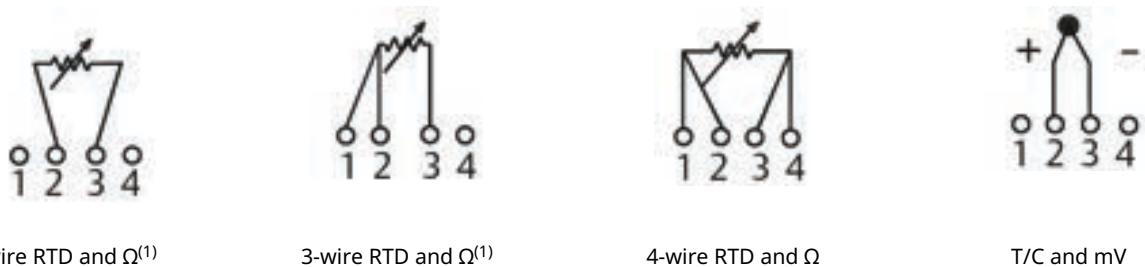
The analog-to-digital measurement circuitry automatically self-calibrates for each temperature update by comparing the dynamic measurement to extremely stable and accurate internal reference elements.

### Vibration effect

Tested to the following with no effect on performance per IEC 60770-1, 1999:

High vibration level - field or pipeline (10–60 Hz 0.21 mm displacement peak amplitude/60–2000 Hz 3 g).

Frequency	Acceleration
10-60 Hz	0.21 mm peak displacement
60-2000 Hz	3 g

**Figure 2: Sensor Connections****Figure 3: Rosemount 648 Wireless Sensor Connections**2-wire RTD and  $\Omega^{(1)}$ 3-wire RTD and  $\Omega^{(1)}$ 4-wire RTD and  $\Omega$ 

T/C and mV

(1) Emerson provides 4-wire sensors for all single element RTDs. You can use these RTDs in 3- or 2-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.

**Table 3: Temperature Limits**

Description	Operating limit	Storage limit
Without LCD display	-40 to 185 °F -40 to 85 °C	-40 to 185 °F -40 to 85 °C
With LCD display	-4 to 175 °F -20 to 80 °C	-40 to 185 °F -40 to 85 °C

**Table 4: Rosemount 648 Wireless Input Options and Accuracy**

Sensor options	Sensor reference	Input ranges		Digital accuracy <sup>(1)</sup>	
2-, 3-, 4-wire RTDs		°C	°F	°C	°F
Pt 100 ( $\alpha = 0.00385$ )	IEC 751	-200 to 850	-328 to 1562	±0.225	±0.405
Rosemount X-well Pt 100 ( $\alpha = 0.00385$ )	IEC 751	-50 to 300	-58 to 572	±0.29	±0.52
Pt 200 ( $\alpha = 0.00385$ )	IEC 751	-200 to 850	-328 to 1562	±0.405	±0.729
Pt 500 ( $\alpha = 0.00385$ )	IEC 751	-200 to 850	-328 to 1562	±0.285	±0.513
Pt 1000 ( $\alpha = 0.00385$ )	IEC 751	-200 to 300	-328 to 572	±0.285	±0.513
Pt 100 ( $\alpha = 0.003916$ )	JIS 1604	-200 to 645	-328 to 1193	±0.225	±0.405
Pt 200 ( $\alpha = 0.003916$ )	JIS 1604	-200 to 645	-328 to 1193	±0.405	±0.729
Ni 120	Edison Curve No. 7	-70 to 300	-94 to 572	±0.225	±0.405
Cu 10	Edison Copper Winding No. 15	-50 to 250	-58 to 482	±2.1	±3.78
Pt 50 ( $\alpha = 0.00391$ )	GOST 6651-94	-200 to 550	-328 to 1022	±0.45	±0.81

**Table 4: Rosemount 648 Wireless Input Options and Accuracy (continued)**

<b>Sensor options</b>	<b>Sensor reference</b>	<b>Input ranges</b>		<b>Digital accuracy<sup>(1)</sup></b>	
Pt 100 ( $\alpha = 0.00391$ )	GOST 6651-94	-200 to 550	-328 to 1022	$\pm 0.225$	$\pm 0.405$
Cu 50 ( $\alpha = 0.00426$ )	GOST 6651-94	-50 to 200	-58 to 392	$\pm 0.72$	$\pm 1.296$
Cu 50 ( $\alpha = 0.00428$ )	GOST 6651-94	-185 to 200	-301 to 392	$\pm 0.72$	$\pm 1.296$
Cu 100 ( $\alpha = 0.00426$ )	GOST 6651-94	-50 to 200	-58 to 392	$\pm 0.36$	$\pm 0.648$
Cu 100 ( $\alpha = 0.00428$ )	GOST 6651-94	-185 to 200	-301 to 392	$\pm 0.36$	$\pm 0.648$
<b>Thermocouples<sup>(2)</sup></b>					
Type B <sup>(3)</sup>	NIST Monograph 175, IEC 584	100 to 1820	212 to 3308	$\pm 1.155$	$\pm 2.079$
Type E	NIST Monograph 175, IEC 584	-200 to 1000	-328 to 1832	$\pm 0.30$	$\pm 0.54$
Type J	NIST Monograph 175, IEC 584	-180 to 760	-292 to 1400	$\pm 0.525$	$\pm 0.945$
Type K <sup>(4)</sup>	NIST Monograph 175, IEC 584	-180 to 1372	-292 to 2501	$\pm 0.75$	$\pm 1.35$
Type N	NIST Monograph 175, IEC 584	-200 to 1300	-328 to 2372	$\pm 0.75$	$\pm 1.35$
Type R	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	$\pm 1.125$	$\pm 2.025$
Type S	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	$\pm 1.05$	$\pm 1.89$
Type T	NIST Monograph 175, IEC 584	-200 to 400	-328 to 752	$\pm 0.525$	$\pm 0.945$
DIN type L	DIN 43710	-200 to 900	-328 to 1652	$\pm 0.525$	$\pm 0.945$
DIN type U	DIN 43710	-200 to 600	-328 to 1112	$\pm 0.525$	$\pm 0.945$
Type W5Re/W26Re	ASTM E 988-96	0 to 2000	32 to 3632	$\pm 1.05$	$\pm 1.89$
GOST L	GOST R 8.585-2001	-200 to 800	-328 to 1472	$\pm 0.525$	$\pm 0.945$
<b>Other input types</b>					
Millivolt input		-10 to 100 mV		$\pm 0.0225$ mV	
2-, 3-, 4-wire Ohm input		0 to 2000 ohms		$\pm 0.675$ ohm	

(1) The published digital accuracy applies over the entire sensor input range. Digital output can be accessed by HART® Communications or WirelessHART.

(2) Total digital accuracy for thermocouple measurement: sum of digital accuracy  $+0.8$  °C. (cold junction accuracy).

(3) Digital accuracy for NIST Type B T/C is  $\pm 4.5$  °C ( $\pm 8.1$  °F) from 100 to 300 °C (212 to 572 °F).

(4) Digital accuracy for NIST Type K T/C is  $\pm 1.05$  °C ( $\pm 1.895$  °F) from -180 to -90 °C (-292 to -130 °F).

**Table 5: Ambient Temperature Effect on Digital Accuracy**

<b>Sensor options</b>	<b>Sensor reference</b>	<b>Effects per 1.8 °F (1.0 °C) change in ambient temperature<sup>(1)(2)</sup></b>	<b>Input temperature (T)</b>
<b>2-, 3-, 4-wire RTDs</b>			
Pt 100 ( $\alpha = 0.00385$ )	IEC 751	0.0081 °F (0.0045 °C)	Entire sensor input range
Rosemount X-well Pt 100 ( $\alpha = 0.00385$ )	IEC 751	0.0104 °F (0.0058 °C)	Entire sensor input range
Pt 200 ( $\alpha = 0.00385$ )	IEC 751	0.0108 °F (0.006 °C)	Entire sensor input range
Pt 500 ( $\alpha = 0.00385$ )	IEC 751	0.0081 °F (0.0045 °C)	Entire sensor input range
Pt 1000 ( $\alpha = 0.00385$ )	IEC 751	0.0081 °F (0.0045 °C)	Entire sensor input range
Pt 100 ( $\alpha = 0.003916$ )	JIS 1604	0.0108 °F (0.006 °C)	Entire sensor input range
Pt 200 ( $\alpha = 0.003916$ )	JIS 1604	0.0108 °F (0.006 °C)	Entire sensor input range
Ni 120	Edison Curve No. 7	0.0081 °F (0.0045 °C)	Entire sensor input range
Cu 10	Edison Copper Winding No. 15	0.081 °F (0.045 °C)	Entire sensor input range

**Table 5: Ambient Temperature Effect on Digital Accuracy (continued)**

Sensor options	Sensor reference	Effects per 1.8 °F (1.0 °C) change in ambient temperature <sup>(1)(2)</sup>	Input temperature (T)
Pt 50 ( $\alpha = 0.003910$ )	GOST 6651-94	0.0162 °F (0.009 °C)	Entire sensor input range
Pt 100 ( $\alpha = 0.003910$ )	GOST 6651-94	0.0081 °F (0.0045 °C)	Entire sensor input range
Cu 50 ( $\alpha = 0.00426$ )	GOST 6651-94	0.0162 °F (0.009 °C)	Entire sensor input range
Cu 50 ( $\alpha = 0.00428$ )	GOST 6651-94	0.0162 °F (0.009 °C)	Entire sensor input range
Cu 100 ( $\alpha = 0.00426$ )	GOST 6651-94	0.0081 °F (0.0045 °C)	Entire sensor input range
Cu 100 ( $\alpha = 0.00428$ )	GOST 6651-94	0.0081 °F (0.0045 °C)	Entire sensor input range
<b>Thermocouples</b>			
Type B	NIST Monograph 175, IEC 584	0.021 °C	$T \geq 1000$ °C
		0.048 °C - [0.00375% of (T - 300)]	$300$ °C $\leq T < 1000$ °C
		0.081 °C - [0.0165% of (T - 100)]	$100$ °C $\leq T < 300$ °C
Type E	NIST Monograph 175, IEC 584	0.0075 °C + (0.000645% of T)	All
Type J	NIST Monograph 175, IEC 584	0.0081 °C + (0.000435% of T)	$T \geq 0$ °C
		0.0081 °C + (0.00375% of absolute value T)	$T < 0$ °C
Type K	NIST Monograph 175, IEC 584	0.0092 °C + (0.00081% of T)	$T \geq 0$ °C
		0.0092 °C + (0.00375% of absolute value T)	$T < 0$ °C
Type N	NIST Monograph 175, IEC 584	0.0102 °C + (0.00054% of T)	All
Type R	NIST Monograph 175, IEC 584	0.024 °C	$T \geq 200$ °C
		0.0345 °C - (0.0108% of T)	$T < 200$ °C
Type S	NIST Monograph 175, IEC 584	0.024 °C	$T \geq 200$ °C
		0.0345 °C - (0.0108% of T)	$T < 200$ °C
Type T	NIST Monograph 175, IEC 584	0.0096 °C	$T \geq 0$ °C
		0.0096 °C + (0.00645% of absolute value T)	$T < 0$ °C
DIN type L	DIN 43710	0.0081 °C + (0.000435% of T)	$T \geq 0$ °C
		0.0081 °C + (0.00375% of absolute value T)	$T < 0$ °C
DIN type U	DIN 43710	0.0096 °C	$T \geq 0$ °C
		0.0096 °C + (0.00645% of absolute value T)	$T < 0$ °C
Type W5Re/W26Re	ASTM E 988-96	0.024 °C	$T \geq 200$ °C
		0.0345 °C - (0.0108% of T)	$T < 200$ °C
GOST L	GOST R. 8.585-2001	0.0105 °C	$T \geq 0$ °C
		0.0105 °C + (0.0045% of absolute value T)	$T < 0$ °C
<b>Other input types</b>			
Millivolt input		0.0008 mV	Entire sensor input range
2-, 3-, 4-wire Ohm input		0.0126 Ω	Entire sensor input range

(1) Ambient temperature effect specification valid over minimum temperature span of 50 °F (28 °C).

(2) Change in ambient is with reference to the calibration temperature of the transmitter 68 °F (20 °C) from factory.

Transmitters can be installed in locations where the ambient temperature is between -40 and 185 °F (-40 and 85 °C). In order to maintain excellent accuracy performance, each transmitter is individually characterized over this ambient temperature range at the factory.

**Table 6: Ambient and Process Temperature Difference Effect on Digital Accuracy**

Sensor option	Sensor reference	Effects per 1.0 °C (1.8 °F) difference in ambient and process temperature	Input temperature (T)
Rosemount X-well Pt 100 ( $\alpha = 0.00385$ )	IEC 751	$\pm 0.01 \text{ }^{\circ}\text{C}$ ( $0.018 \text{ }^{\circ}\text{F}$ )	Entire sensor input range

**Temperature effects example**

When using a Pt 100 ( $\alpha = 0.00385$ ) sensor input at 30 °C ambient temperature:

- Digital temperature effects:  $0.0045 \text{ }^{\circ}\text{C} \times (30 - 20) = 0.045 \text{ }^{\circ}\text{C}$
- Worst case error: Digital + Digital temperature effects =  $0.225 \text{ }^{\circ}\text{C} + 0.045 \text{ }^{\circ}\text{C} = 0.27 \text{ }^{\circ}\text{C}$
- Total probable error:  $\sqrt{0.225^2 + 0.045^2} = 0.23 \text{ }^{\circ}\text{C}$

**Rosemount X-well temperature effects example**

When using Rosemount X-well Technology at 30 °C ambient temperature and process temperature of 100 °C:

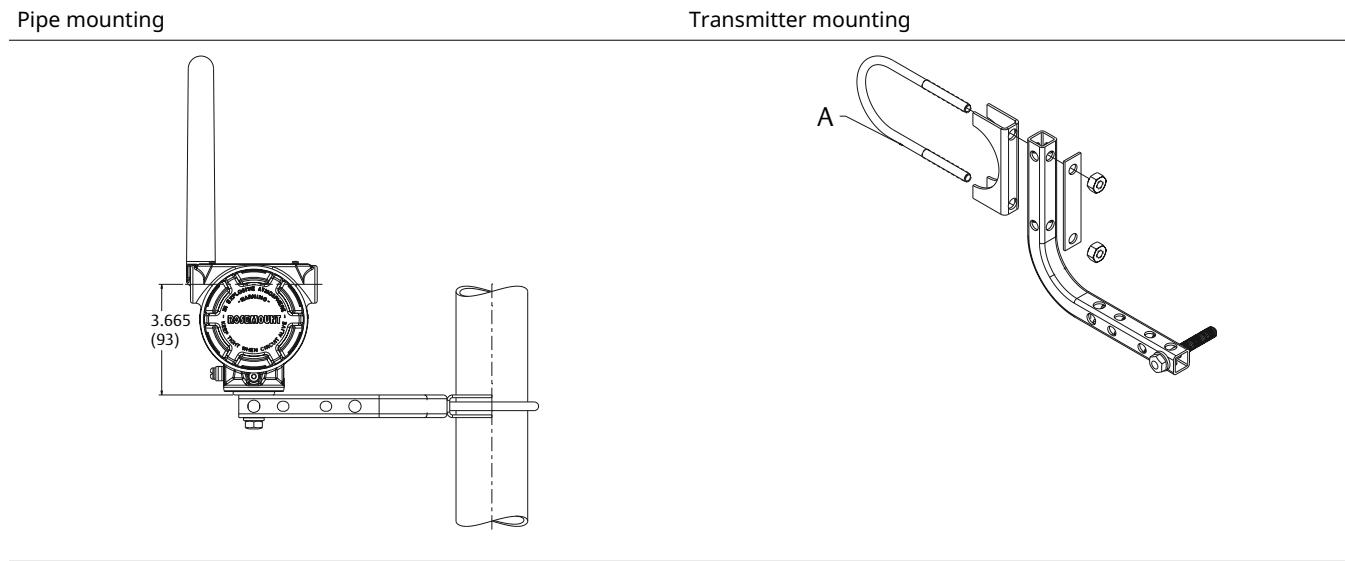
- Digital ambient temperature effects:  $0.0058 \text{ }^{\circ}\text{C} \times (30 - 20) = .058 \text{ }^{\circ}\text{C}$
- Process temperature effects:  $0.01 \text{ }^{\circ}\text{C} \times (100 - 30) = .70 \text{ }^{\circ}\text{C}$
- Worst case error: Digital Accuracy + Digital ambient temperature effects + Process temperature effects =  $0.29 \text{ }^{\circ}\text{C} + 0.058 \text{ }^{\circ}\text{C} + 0.70 \text{ }^{\circ}\text{C} = 1.05 \text{ }^{\circ}\text{C}$
- Total probable error:  $\sqrt{0.29^2 + 0.058^2 + 0.70^2} = 0.76 \text{ }^{\circ}\text{C}$

## Product certifications

For Rosemount 648 Wireless product certifications, see the [Rosemount 648 Wireless Temperature Transmitter Quick Start Guide](#).

## Dimensional drawings

**Figure 4: Rosemount 648 Wireless Remote Mount**



*A. 2-in. U-bolt for pipe mounting*

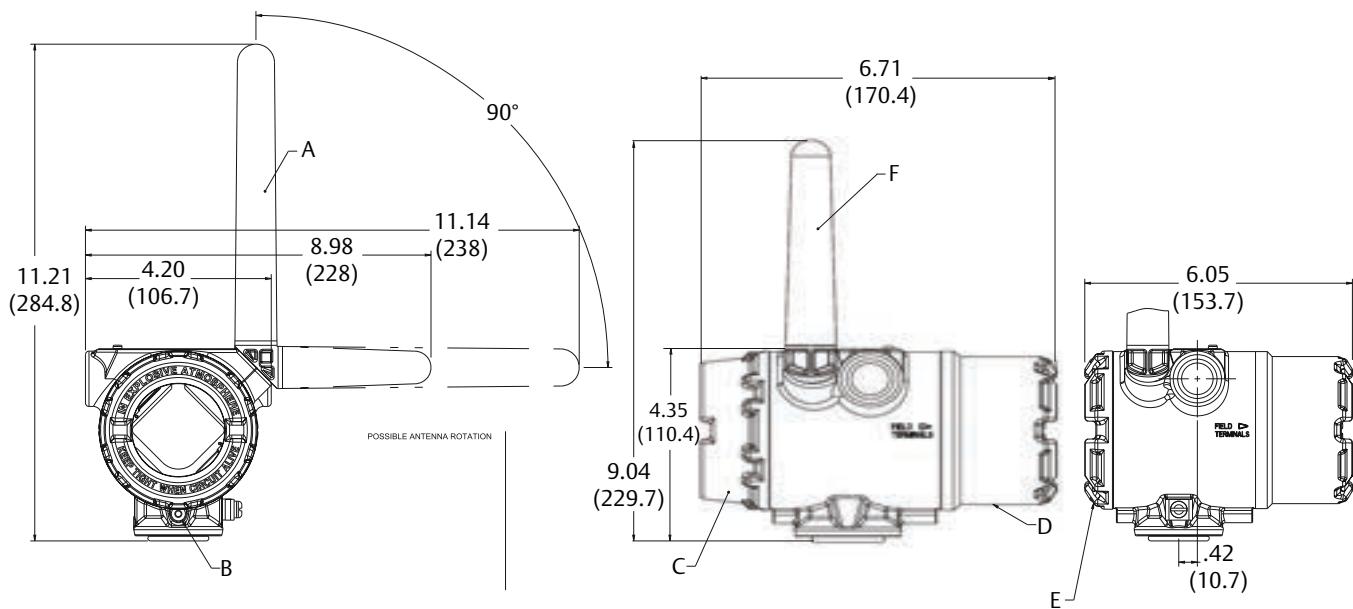
Dimensions are in inches (millimeters).

**Figure 5: Rosemount 648 Wireless Direct Mount**

Shown with 2.4 GHz extended range antenna

Shown with optional digital display and 2.4 GHz antenna

Shown without optional digital display



A. 2.4 GHz extended range antenna

B. Ground screw assembly

C. Digital display cover

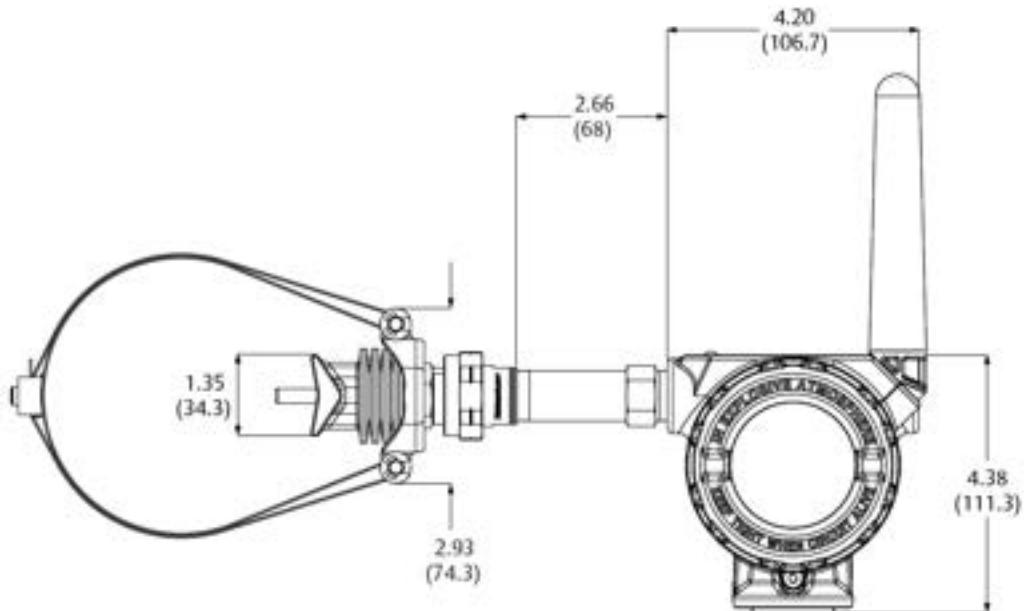
D. Field terminal (this side)

E. Transmitter electronics (this side)

F. 2.4 GHz antenna

Dimensions are in inches (millimeters).

**Figure 6: Rosemount 648 with Option Code PT**



Dimensions are in inches (millimeters).

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