

# Single Point Temperature Measurement for tank gauging systems



- Optimize tank plant efficiency with flexible sensor and thermowell selection for various installation requirements
- Improve measurement reliability with state-of-the-art sensor design, element packaging, and manufacturing procedures
- Benefit from convenient and safe installation with 2-wire IS bus power supply
- Enable integral transmitter mounting configuration with terminal block and flying leads sensor styles
- Improve your local operation overview with an integrated display option

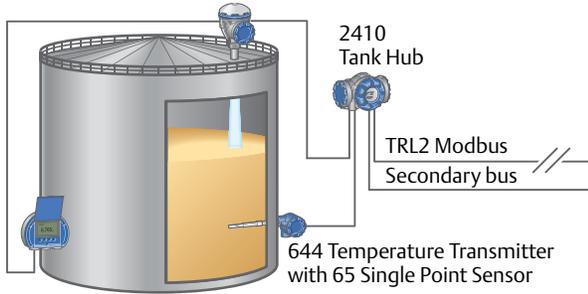
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## Note

For the general 644/65/68 Product Data Sheets, see document number 00813-0100-4728, 00813-0200-2654, and 00813-0100-2654.

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# Get reliable single point temperature measurement with reduced complexity



Single point temperature sensors are used in tank gauging applications with medium accuracy requirements on volume measurements, or when it is not possible to use a multiple spot temperature sensor due to installation restrictions (e.g. an LPG tank with thermowell).

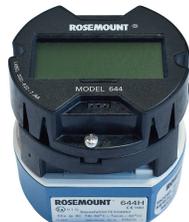
## Rosemount 644 Single Point Temperature Transmitter

The Rosemount 644 Temperature Transmitter utilizes the FOUNDATION™ fieldbus communication protocol to distribute measured temperature data to TankMaster or a DCS/host system via the 2410 Tank Hub.

The 644 Temperature Transmitter can be ordered with Rosemount 65 or 68 Single Point Temperature Sensors assembled to the transmitter.



644 Temperature Transmitter



644 Temperature Transmitter with display option

## Rosemount 65 and 68 Single Point Temperature Sensors

The 65 and 68 Series Platinum RTD (Resistance Temperature Detector) Single Point Temperature Sensors are delivered with Class B tolerance as standard according to EN 60751.

- The temperature sensor can be connected with a flange or a thread.
- An extension can be used to have transmitter electronics installed away from a heated tank.
- The temperature sensor can be ordered pre-installed in a thermowell.



The Rosemount 644 Single Point Temperature Transmitter connected to a sensor mounted in thermowell

### Stainless steel thermowell

Single point temperature sensors in thermowells are used for pressurized tanks or when there is a requirement to be able to replace a sensor without having to drain or evacuate the process.

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# Ordering Information

## Rosemount 644 Single Point Temperature Transmitter



Below are the model code selection for Tank Gauging systems.

**Additional information**

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**Table 1. Rosemount 644 Single Point Temperature Transmitter ordering information**

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

Model	Product Description	
644 <sup>(1)</sup>	Single Point Temperature Transmitter	
<b>Transmitter Type</b>		
H	DIN A head mount – single sensor input	★
<b>Output</b>		
F	Bus powered 2-wire FOUNDATION fieldbus (IEC 61158)	★
<b>Hazard Location Certification</b>		
I1 <sup>(2)</sup>	ATEX Intrinsic Safety	★
I2 <sup>(2)</sup>	INMETRO Intrinsic safety	★
I3 <sup>(2)</sup>	China Intrinsic Safety	★
I5 <sup>(2)</sup>	FM Intrinsic Safety	★
I6 <sup>(2)</sup>	CSA Intrinsic Safety	★
I7 <sup>(2)</sup>	IECEX Intrinsic Safety	★
NA <sup>(2)</sup>	No hazardous location certification	★
<b>Options</b>		
XA <sup>(3)</sup>	Rosemount 65 or 68 Single Point Temperature Sensor assembled to the transmitter. The sensor is specified separately	★
M5 <sup>(4)</sup>	LCD display	★
GE	M12, 4-pin male connector (Eurofast)	★
GM	A size Mini, 4-pin male connector (Minifast)	★
J6 <sup>(5)(6)</sup>	Universal Junction Box enclosure	★
R2 <sup>(6)(7)</sup>	Rosemount Connection Head enclosure	★
Q4	Calibration certificate (3 point calibration)	★
<b>Typical Model Number: 644 H F I1 – XA M5 Q4</b>		

(1) If integrated with the Rosemount 65 sensor, the enclosure (connection head) is ordered with the 65 sensor. If integrated with the Rosemount 68 sensor, or stand-alone usage of the 644 transmitter, the enclosure (connection head) is ordered with Options code J6 or R2.

- (2) Best practice is to install the associated single point temperature sensor in a thermowell, and for ATEX and IECEx certification it is a requirement when connecting Rosemount 644 Transmitter to the Rosemount 2410 Tank Hub.
- (3) If ordering option XA (pre-assembly), specify XA for both the 644 transmitter and 65/68 sensor.
- (4) Requires Enclosure (connection head) code 1 or 2 for Rosemount 65 Single Point Temperature Sensor.
- (5) Universal head with 2 in. SST pipe bracket. For stand-alone 644 usage, or when the 644 is integrated with the 68 sensor. Either of J6 or R2 enclosure is required for integration of the 68 sensor.
- (6) 2 entries  
Material: Aluminum  
Entry Size: ½-14 NPT  
Diameter: 3 in. (76 mm)
- (7) Used when the 644 is integrated with the 68 sensor. Either of J6 or R2 enclosure is required for integration of the 68 sensor.

## Rosemount 65 Single Point Temperature Sensor, without thermowell



The 65 Series Sensors may be ordered as complete assemblies, by specifying type of sensing element, length, extension and enclosure (connection head). They can be ordered with flying leads, or a terminal block.

Ordered with flying leads, the sensor is designed to be used with the 644 Temperature Transmitter attached directly to the sensor. The flying lead configuration allows removal of the sensor and transmitter as one assembly.

Below are the model code selection for Tank Gauging systems.

### Additional information

Specifications: [page 15](#)

Dimensional Drawings: [page 22](#)

**Table 2. Rosemount 65 Single Point Temperature Sensor without thermowell ordering information**

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

Model	Product Description	
0065 <sup>(1)</sup>	Single Point Temperature Sensor, Pt-100 RTD (IEC 751), without thermowell	
<b>Enclosure (Connection Head)</b>		
C <sup>(2)</sup>	Aluminum, M20 x 1.5 cable entry, IP 66/68	★
D <sup>(2)</sup>	Aluminum, ½-in. ANPT cable entry, IP 66/68	★
1 <sup>(2)</sup>	Aluminum with LCD display meter cover, M20 x 1.5 cable entry, IP 66/68	★
2 <sup>(2)</sup>	Aluminum with LCD display meter cover, ½-in. ANPT cable entry, IP 66/68	★
<b>Sensor Lead Wire Termination</b>		
0	Flying leads – No springs on DIN plate. Use when ordering with Rosemount 644	★
2	Terminal block – DIN 43762. Use when ordering with Rosemount 2240S or as a stand-alone sensor	★
<b>Sensor Type</b>		
1	RTD, single element, 4-wire (Class B), -50 to 450 °C (-58 to 842 °F)	★
3	RTD, single element, 4-wire (Class B), -196 to 600 °C (-321 to 1112 °F)	★
<b>Extension Type</b>		
D <sup>(3)</sup>	DIN – standard, 12 x 1.5	★
X	Special	
<b>Extension Length (N)</b>		
0135	135 mm (5.3 in.)	★
XXXX <sup>(4)</sup>	Customized length in mm (minimum 35 mm)	
<b>Thermowell Material</b>		
N	No thermowell	★
<b>Sensor/Immersion Length (L)</b>		
0500	500 mm (19.7 in.)	★
0600	600 mm (23.6 in.)	★

**Table 2. Rosemount 65 Single Point Temperature Sensor without thermowell ordering information**

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

0700	700 mm (27.6 in.)	★
0800	800 mm (31.5 in.)	★
0900	900 mm (35.4 in.)	★
1000	1000 mm (39.4 in.)	★
<b>Options – none or multiple selections are possible</b>		
XA <sup>(5)</sup>	Assemble sensor to Rosemount 644 temperature transmitter	★
<b>Typical Model Number: 0065 C 0 1 D 0135 N 1000 XA</b>		

- (1) To be installed in existing thermowell.
- (2) To maintain IP rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.
- (3) Head Connection: M24 x 1.5  
Instrument Connection: ½-in ANPT  
300 Series Stainless Steel (minimum length N = 35 mm)
- (4) Enter your own four digits to specify custom length.
- (5) If ordering option XA (pre-assembly), specify XA for both the 644 transmitter and 65 sensor.

## Rosemount 65 Single Point Temperature Sensor, with barstock thermowell



The 65 Series Sensors may be ordered as complete assemblies, by specifying type of sensing element, length, extension, enclosure (connection head) and thermowell. They can be ordered with flying leads, or a terminal block.

Ordered with flying leads, the sensor is designed to be used with the 644 Temperature Transmitter attached directly to the sensor. The flying lead configuration allows removal of the sensor and transmitter as one assembly.

Below are the model code selection for Tank Gauging systems.

### Additional information

Specifications: [page 15](#)

Dimensional Drawings: [page 22](#)

**Table 3. Rosemount 65 Single Point Temperature Sensor with barstock thermowell ordering information**

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Model	Product Description	
0065	Single Point Temperature Sensor, Pt-100 RTD (IEC 751), with barstock thermowell	
<b>Enclosure (Connection Head)</b>		
C <sup>(1)</sup>	Aluminum, M20 x 1.5 cable entry, IP 66/68	★
D <sup>(1)</sup>	Aluminum, ½-in. ANPT cable entry, IP 66/68	★
1 <sup>(1)</sup>	Aluminum with LCD meter cover, M20 x 1.5 cable entry, IP 66/68	★
2 <sup>(1)</sup>	Aluminum with LCD meter cover, ½-in. ANPT cable entry, IP 66/68	★
<b>Sensor Lead Wire Termination</b>		
0	Flying leads – No springs on DIN plate. Use when ordering with Rosemount 644	★
2	Terminal block – DIN 43762. Use when ordering with Rosemount 2240S or as a stand-alone sensor	★
<b>Sensor Type</b>		
1	RTD, single element, 4-wire (Class B), -50 to 450 °C (-58 to 842 °F)	★
3	RTD, single element, 4-wire (Class B), -196 to 600 °C (-321 to 1112 °F)	★
<b>Extension Type</b>		
D <sup>(2)</sup>	DIN – standard, 12 x 1.5	★
<b>Extension Length (N)</b>		
0135	135 mm (5.3 in.)	★
XXXX <sup>(3)</sup>	Customized length in mm (minimum 35 mm)	
<b>Thermowell Material</b>		
D	1.4404 (316L SST)	★
<b>Sensor/Immersion Length (U)</b>		
0450	450 mm (17.7 in.)	★
0500	500 mm (19.7 in.)	★
0600	600 mm (23.6 in.)	★

**Table 3. Rosemount 65 Single Point Temperature Sensor with barstock thermowell ordering information**

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

0700	700 mm (27.6 in.)	★
0800	800 mm (31.5 in.)	★
0900	900 mm (35.4 in.)	★
1000	1000 mm (39.4 in.)	★
<b>Thermowell Mounting Style (Tapered Stem Style)</b>		
<b>Threaded process connection</b>		
T44	½-in. ANPT, threaded	★
T46	¾-in. ANPT, threaded	★
T48	1-in. ANPT, threaded	★
T98	M20 x 1.5, threaded	★
<b>Flanged connection (raised face)</b>		
F04	ANSI 1 in. Class 150	★
F10	ANSI 1 ½-in. Class 150	★
F16	ANSI 2 in. Class 150	★
F22	ANSI 1 in. Class 300	★
F28	ANSI 1 ½-in. Class 300	★
F34	ANSI 2 in. Class 300	★
<b>Flanged connection (Form B1 according to EN 1092-1)</b>		
D16	EN DN40 PN 16	★
D22	EN DN40 PN25/40	★
<b>Options – none or multiple selections are possible</b>		
XA <sup>(4)</sup>	Assemble sensor to Rosemount 644 Temperature Transmitter	★
Q8	Thermowell material certification, DIN EN 10204 3.1	★
<b>Typical Model Number: 0065 C 0 1 D 0135 D 1000 T44 XA</b>		

(1) To maintain IP rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.

(2) Head Connection: M24 x 1.5,  
Instrument Connection: ½-in ANPT  
300 Series Stainless Steel (minimum length N = 35 mm)

(3) Enter your own four digits to specify custom length.

(4) If ordering option XA (pre-assembly), specify XA for both the 644 transmitter and 65 sensor.

## Rosemount 68 Single Point Temperature Sensor, without thermowell



The 68 series sensors may be ordered as complete assemblies, by specifying type of sensing element, length and extension. They can be ordered with flying leads, or an enclosure (connection head) with terminal block.

Ordered with flying leads, the sensor is designed to be used with the 644 Temperature Transmitter with enclosure (connection head), attached directly to the sensor

Below are the model code selection for Tank Gauging systems.

### Additional information

Specifications: [page 17](#)

Dimensional Drawings: [page 22](#)

**Table 4. Rosemount 68 Single Point Temperature Sensor without thermowell ordering information**

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Model	Product Description	
0068 <sup>(1)</sup>	Single Point Temperature Sensor, Pt-100 RTD, 4 wire, without thermowell	
<b>Sensor Lead Wire Termination</b>		
N	Sensor only with 6 in. PTFE insulated, 22-gauge lead wires. For use with Rosemount 644	★
P	Aluminum enclosure (connection head), 6 terminals, flat cover, painted. For use with Rosemount 2240S or as a stand-alone sensor	★
<b>Sensor Type</b>		
21	Spring-loaded style	★
<b>Extension Type</b>		
A	Nipple coupling	★
<b>Extension Length (E)</b>		
30	3 in. standard	★
60	6 in. optional	★
<b>Thermowell Material</b>		
N	No thermowell required	★
<b>Sensor/Immersion Length (L)</b>		
360	36 in.	★
100-480	10- 48 in.	★
<b>Options – none or multiple selections are possible</b>		
XA <sup>(2)</sup>	Assemble sensor to Rosemount 644 temperature transmitter	★
<b>Typical Model Number: 0068 N 21 A 30 N 360 XA</b>		

(1) To be installed in existing thermowell.

(2) If ordering option XA (pre-assembly), specify XA for both the 644 transmitter and 68 sensor.

## Rosemount 68 Single Point Temperature Sensor, with thermowell



The 68 Series Sensors may be ordered as complete assemblies, by specifying type of sensing element, length, extension, and thermowell. They can be ordered with flying leads, or an enclosure (connection head) with terminal block.

Ordered with flying leads, the sensor is designed to be used with the 644 Temperature Transmitter with enclosure (connection head), attached directly to the sensor

Below are the model code selection for Tank Gauging systems.

### Additional information

Specifications: [page 17](#)

Dimensional Drawings: [page 22](#)

**Table 5. Rosemount 68 Single Point Temperature sensor with thermowell ordering information**

★ The Standard offering represents the most common options. The starred options (★) should be selected for best delivery.

The Expanded offering is subject to additional delivery lead time.

Model	Product Description	
0068	Single Point Temperature Sensor, Pt 100 RTD, 4 wire, with thermowell	
<b>Sensor Lead Wire Termination</b>		
N	Sensor only with 6 in. PTFE insulated, 22 AWG lead wires. (for use with Rosemount 644)	★
P	Aluminum enclosure (connection head), 6 terminals, flat cover, painted. (for use with Rosemount 2240S or as a stand-alone sensor)	★
<b>Sensor Type</b>		
21	Spring loaded style	★
<b>Extension Type</b>		
A	Nipple coupling	★
<b>Extension Length (E)</b>		
30	3 in. standard	★
60	6 in. optional	★
<b>Thermowell Material</b>		
A	316 stainless steel	★
<b>Sensor/Immersion Length (U)</b>		
360	36 in.	★
100-480	10- 48 in.	★
<b>Thermowell Style</b>		
<b>Threaded Process Connection</b>		
T28	1-11.5 ANPT, tapered stem	★
T30	1 ½ -11 ANPT, tapered stem	★
<b>Flanged Process Connection</b>		
F58	1 in. Class 150, tapered stem	★
F60	1 ½ in. Class 150, tapered stem	★

**Table 5. Rosemount 68 Single Point Temperature sensor with thermowell ordering information**

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

F62	2 in. Class 150, tapered stem	★
F12	3 in. Class 150, straight stem	★
<b>Options – none or multiple selections are possible</b>		
XA <sup>(1)</sup>	Assemble sensor to Rosemount 644 Temperature Transmitter	★
Q8	Thermowell material certification	★
<b>Typical Model Number: 0068 N 21 A 30 A 360 T28 XA</b>		

(1) If ordering option XA (pre-assembly), specify XA for both the 644 transmitter and 68 sensor.

# Specifications for Rosemount 644

## Performance specifications

### Measuring performance

#### Reference accuracy

± 0.15 °C (± 0.27 °F) over the whole temperature measuring range

± 0.03% of span with Rosemount 65 or 68 sensors

#### Ambient temperature effect

0.003 °C (0.0054 °F) per 1 °C (1.8 °F) change in ambient temperature<sup>(1)</sup>

#### Power supply effect

Less than ± 0.005% of span per volt

#### Stability

RTDs and thermocouples have a stability of ±0.15% of output reading or 0.15 °C (whichever is greater) for 24 months

#### Temperature measuring range

-50 to 450 °C (-58 to 842 °F) or -196 to 600 °C (-321 to 1112 °F) depending on option

#### Resolution

± 0.1 °C (± 0.1 °F) according to API chapter 7 and 12

#### Update time

≤ 0.5 seconds

## Functional specifications

### Power supply

Powered by Rosemount 2410 Tank Hub (9.0-17.5 VDC, polarity insensitive)

### Internal power consumption

Typical 70 mW

### Bus current draw

12 mA

### Built-in Tankbus termination

No

### Tankbus to sensor isolation

Tested to 500 VAC rms (707 VDC) at 50/60 Hz

### Metrology sealing possibility

No

### Write protection switch

No

### FOUNDATION fieldbus

#### Conforming FOUNDATION fieldbus

ITK 5.01

**Table 6. FOUNDATION fieldbus Parameters**

Backup Link Active Scheduler (LAS)	Link Master device
Schedule entries	25
Links	16
Virtual Communication Relationship (VCR)	12

#### Function blocks and execution

Block	Execution time (milliseconds)
Resource	N/A
Transducer	N/A
LCD Block	N/A
Analog Input 1	45
Analog Input 2	45
PID 1	60

### Turn-on time

Performance within specifications in less than 20 seconds after power is applied, when damping value is set to 0 seconds.

### Status

If self-diagnostics detects a sensor burnout or a transmitter failure, the status of the measurement will be updated accordingly. Status may also send the AI output to a safe value.

### Alarms

The AI function block allows the user to configure the alarms to HI-HI, HI, LO, or LO-LO with hysteresis settings.

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

### 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

The 644 Fieldbus is tested to the following specifications with no effect on performance per IEC 60770-1: 1999

Frequency	Vibration
10 to 60 Hz	0.21 mm displacement
60 to 2000 Hz	3 g peak acceleration

### EMC (Electromagnetic Compatibility)

NAMUR NE 21 Standard

### LCD display

An optional 11 digit, 2 line integral LCD display operates with a floating or fixed decimal point. It displays engineering units (°C, °F, °R, K, Ohms and mV), mA, and percent of range. The display can be configured to alternate between selected display options. Display settings are pre-configured at the factory according to the standard transmitter configuration. They can be re-configured in the field.

### Temperature limits

#### Ambient operating temperature

-40 to 85 °C (-40 to 185 °F)  
 With LCD display<sup>(1)</sup>: -20 to 85 °C (-4 to 185 °F)

#### Storage temperature

-50 to 120 °C (-58 to 248 °F)  
 With LCD display: -45 to 85 °C (-50 to 185 °F)

### Humidity limits

0-95% relative humidity

### Extension considerations

If the expected process temperature is near or beyond the transmitter specification limits, consider the use of additional thermowell extension length (ordered with the sensor), or a remote installation configuration to isolate the transmitter from these excessive temperatures.

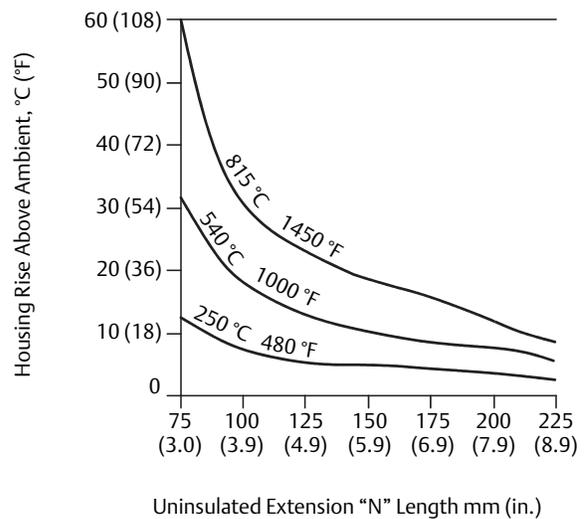
#### Example

The rated ambient temperature specification for the transmitter is 85 °C (185 °F). If the maximum ambient temperature is 40 °C (104 °F) and the temperature to be measured is 540 °C (1004 °F), the maximum allowable housing temperature rise is the rated temperature specification limit minus the existing ambient temperature (85 – 40), or 45 °C (81 °F).

As shown in Figure 1, an “N” dimension of 90 mm (3.5 in.) will result in a housing temperature rise of 22 °C (40 °F). An “N” dimension of 100 mm (3.9 in.) would therefore be the minimum recommended length, and would provide a safety factor of about 25 °C (40 °F).

A longer “N” dimension, such as 150 mm (5.9 in.), would be desirable, although in that case the transmitter may require extra support.

**Figure 1. Transmitter Housing Temperature and Uninsulated Extension Length.**



(1) The LCD display may not be readable and display updates will be slower at temperatures below -20 °C (-4 °F).

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## Physical specifications

### Wiring

644 with integrated 4-wire Rosemount 65 or 68 Single Point Temperature Sensor

### Cable entry (connection/glands)

M20 x 1.5 and ½-in. NPT entries for cable glands and conduits.

### Tankbus cabling

0.5-1.5 mm<sup>2</sup> (AWG 22-16), twisted shielded pairs.

### Enclosure material

There are two installation possibilities, one when the 644 transmitter is installed together with the 68 sensor and the other if the transmitter is ordered stand-alone. If the 644 transmitter is used with a Rosemount 65 sensor, the enclosure is ordered with the sensor.

Construction material if the 644 transmitter is ordered with either R2 or J6 option.

- Housing: Low-copper aluminum
- Paint: Polyurethane
- Cover O-ring: Buna-N

If not ordered with these options, the electronics housing and terminal block material is reinforced GE polyphenylene glass.

### Ingress protection

All available enclosures are Type 4X, IP 66 and IP 68.

### Weight

<0.8 kg (1.8 lbs), depending on options.

#### Transmitter

92 g (3.25 oz)

#### LCD display

35 g (1.34 oz)

#### J6 option

577 g (20.35 oz)

#### R2 option

523 g (18.45 oz)

# Specifications for Rosemount 65

## Performance specifications

### Measuring performance

#### Accuracy

DIN Class B (standard). 100  $\Omega$  RTD at 0 °C,  
 $\alpha = 0.00385 \text{ } ^\circ\text{C}^{-1}$  (Callendar-van Dusen equation)

#### Pressure range

According to flange/thermowell pressure rating

#### Temperature measuring range

Standard: -50 to 450 °C (-58 to 842 °F)

Optional: -196 to 600 °C (-321 to 1112 °F)

### Self heating

0.15 °C/mW when measured per method defined in  
 IEC 751:1983, Amendments 1 & 2

### Thermal response time

Nine seconds maximum required to reach 50% sensor response  
 when tested in flowing water according to IEC 751:1983,  
 Amendments 1 & 2

### Immersion error

60 mm minimum usable depth of immersion when tested  
 according to IEC 751:1983, Amendments 1 & 2

### Interchangeability

Standard Series 65 IEC-751 Class B	Temperature
±0.80 °C (±1.44 °F)	-100 °C (-148 °F)
±0.30 °C (±0.54 °F)	0 °C (32 °F)
±0.80 °C (±1.44 °F)	100 °C (212 °F)
±1.80 °C (±3.24 °F)	300 °C (572 °F)
±2.30 °C (±4.14 °F)	400 °C (752 °F)

## Functional specifications

### Element type

Pt-100 spot elements according to EN 60751. 4-wire, single  
 element design.

### Ambient operating temperature

Enclosure (connection head): -40 to 85 °C (-40 to 185 °F)

### Immersion length

500 mm (20 in.) to 1000 mm (40 in.)

### Extension length

An extension of 135 mm (5.3 in.) as standard can be used to  
 have the sensor housing and transmitter installed away from a  
 heated tank. The extension material is stainless steel.

## Physical specifications

### Tank connection

½-in, ¾-in., or 1-in. ANPT, M20 x 1.5, 1-in. 1.5-in. or 2-in.  
 150 or 300 lbs flanges, or EN DN40 PN16 or DN40 PN25/40  
 flanges.

### Materials of construction

#### Enclosure (connection head)

Aluminum

#### Thermowell material

Stainless steel 1.4404 (AISI 316L)

#### Sheath material

316 SST/321 SST with mineral-insulated cable construction

#### Lead wire

PTFE insulated, silver-coated copper wire.

### Ingress protection (IP) ratings

IP66/IP68 and NEMA 4X (for complete assemblies including  
 either a connection head with extension and thermowell or a  
 connection head with extension and sensor)

### Insulation resistance

1000 M $\Omega$  minimum insulation resistance when measured at  
 500 VDC and at room temperature.

## Wiring configuration

Figure 2. Series 65 RTD Flying Leads

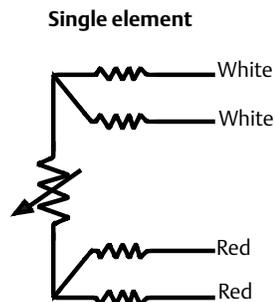
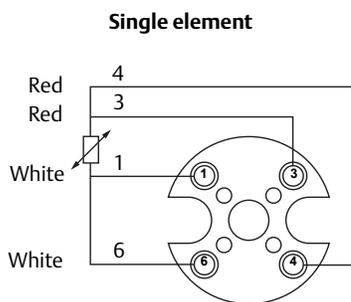


Figure 3. Series 65 RTD Terminal Block Termination



## Environmental specifications

### Humidity limits

Lead seal can withstand 100% relative humidity

### Vibrations limits

±0.05% maximum ice-point resistance shift due to 30 minutes of 14 g peak vibration from 5 to 350 Hz at 20 °C (68 °F) for unsupported stem length of less than 6 inches.

### Quality assurance

Each sensor is subjected to a resistance accuracy test at 0 °C (32 °F) and an insulation resistance test.

### Enclosure ratings

When installed properly, Rosemount Series 65 Sensors are suitable for indoor and outdoor NEMA 4X and CSA Enclosure Type 4X installations. See Hazardous Area Approvals for complete installation information.

# Specifications for Rosemount 68

## Performance specifications

### Measuring performance

#### Accuracy

DIN Class B (standard). 100  $\Omega$  RTD at 0 °C,  $\alpha = 0.00385 \text{ } ^\circ\text{C}^{-1}$

#### Pressure range

According to flange/thermowell pressure rating.

#### Temperature measuring range

-50 to 400 °C (-58 to 752 °F)

#### Effect of temperature cycling

$\pm 0.05\%$  (0.13 °C or 0.23 °F) maximum ice-point resistance shift following 10 cycles over the specified temperature range.

#### Stability

$\pm 0.11\%$  maximum ice-point resistance shift following 1,000 hours at maximum specified temperature (400 °C).

#### Maximum hysteresis

$\pm 0.1\%$  of operating temperature range.

#### Thermal response time

12 seconds maximum required to reach 63.2% sensor response in water flowing at 3 ft/s (0.91 m/s).

#### Interchangeability

Series 68 Platinum RTD	Temperature
$\pm 0.55 \text{ } ^\circ\text{C}$ ( $\pm 0.99 \text{ } ^\circ\text{F}$ )	-50 °C (-58 °F)
$\pm 0.30 \text{ } ^\circ\text{C}$ ( $\pm 0.54 \text{ } ^\circ\text{F}$ )	0 °C (32 °F)
$\pm 0.80 \text{ } ^\circ\text{C}$ ( $\pm 1.44 \text{ } ^\circ\text{F}$ )	100 °C (212 °F)
$\pm 1.30 \text{ } ^\circ\text{C}$ ( $\pm 2.44 \text{ } ^\circ\text{F}$ )	200 °C (392 °F)
$\pm 1.60 \text{ } ^\circ\text{C}$ ( $\pm 2.88 \text{ } ^\circ\text{F}$ )	260 °C (500 °F)
$\pm 2.30 \text{ } ^\circ\text{C}$ ( $\pm 4.14 \text{ } ^\circ\text{F}$ )	400 °C (752 °F)

## Functional specifications

### Element type

Pt-100 spot elements according to EN 60751. 4-wire, single element design.

### Immersion length

1 to 48 in. (36 in. is standard for Raptor).

### Extension length

3 in. standard for a Rosemount Tank Gauging system. Extension material is stainless steel.

## Physical specifications

### Tank connection

1-in. or 1 ½-in. NPT, 1-in. 1 ½-in. 2-in. or 3-in. 150 lbs flanges

### Materials of construction

#### Thermowell material

316 stainless steel

#### Sheath material

316 SST

#### Lead wire

PTFE insulated, nickel-coated, 22-gauge stranded copper wire.

### Weight

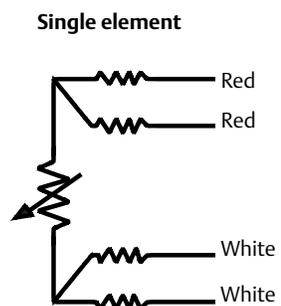
255 g (9 oz)

### Insulation resistance

1000 x 10<sup>6</sup>  $\Omega$  minimum insulation resistance when measured at 500 VDC at room temperature.

## Wiring configuration

Figure 4. Series 68 Lead Wire Configuration



## Environmental specifications

### Humidity limits

Lead seal can withstand 100% relative humidity.

### Vibration limits

± 0.05% maximum ice-point resistance shift due to 30 minutes of 14 g peak vibration from 5 to 350 Hz at 20 °C (68 °F) for unsupported stem length of less than 6 inches.

### Quality assurance

Each sensor is subjected to a resistance accuracy test at 0 °C and an insulation resistance test.

### Enclosure ratings

When installed properly, Rosemount Series 68 Sensors are suitable for indoor and outdoor NEMA 4X and CSA Enclosure Type 4X installations. See Hazardous Area Approvals for complete installation information.

# Product Certifications

## Certifications for Rosemount 644

For complete information, see the Rosemount 644 Product Data Sheet (00813-0100-4728).

### European Directive Information

A copy of the EC Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EC Declaration of Conformity can be found at [www.rosemount.com](http://www.rosemount.com).

### Ordinary Location Certification from FM

#### Approvals

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

### North America

**I5** FM Intrinsic Safety and Nonincendive  
Certificate: 3008880  
Standards Used: FM Class 3600: 1998, FM Class 3610: 2010, FM Class 3611: 2004, FM Class 3810: 2005, NEMA - 250: 1991  
Markings: **IS** CL I/ II / III, DIV I, GP A, B, C, D, E, F, G; T4A(-50 °C ≤ T<sub>a</sub> ≤ +60 °C); **NI** CL I, DIV 2, GP A, B, C, D; T6(-50 °C ≤ T<sub>a</sub> ≤ +70 °C), T5(-50 °C ≤ T<sub>a</sub> ≤ +85 °C); when installed per Rosemount drawing 00644-2075;

#### Special conditions for safe use (x):

1. When no enclosure option is selected, the Model 644 Temperature Transmitter shall be installed in an enclosure meeting the requirements of ANSI/ISA S82.01 and S82.03 or other applicable ordinary location standards.
2. Enclosure option has to be selected to maintain a Type 4X rating.

**I6** CSA Intrinsic Safety and Division 2  
Certificate: 1091070  
Standards Used: CAN/CSA C22.2 No. 0-M10, CSA Std C22.2 No 25-1966, CAN/CSA-C22.2 No. 94-M91, CSA Std C22.2 No. 142-M1987, CAN/CSA-C22.2 No. 157-92, CSA Std C22.2 No. 213-M1987, C22.2 No 60529-05  
Markings:**IS** CL I DIV 1, GP A, B, C, D; T4(-50 °C ≤ T<sub>a</sub> ≤ +60 °C), (-50 °C ≤ T<sub>a</sub> ≤ +80 °C); when installed per Rosemount drawing 00644-2076; **CL I DIV 2** GP A, B, C, D; T5(-50 °C ≤ T<sub>a</sub> ≤ +85 °C)

### Europe

**I1** ATEX Intrinsic Safety  
Certificate: Baseefa03ATEX0499X;  
Standards Used: EN 60079-0: 2012;  
EN 60079-11:2012;  
Markings:  II 1 G Ex ia IIC T4 Ga

See [Table 7](#) at the end of the Product Certifications section for Entity Parameters and Temperature Classifications.

#### Special conditions for safe use (x):

1. The equipment must be installed in an enclosure which affords it a degree of protection of at least IP20 in accordance with the requirements of IEC 60529. Non-metallic enclosures must have a surface resistance of less than 1 GΩ; light alloy or zirconium enclosures must be protected from impact and friction when installed in a Zone 0 environment.

### International

**I7** IECEx Intrinsic Safety  
Certificate: IECEx BAS 07.0053X  
Standards Used: IEC 60079-0: 2011; IEC 60079-11:2011;  
Standards Used: IEC 60079-0: 2011; IEC 60079-11:2011;  
Markings: Ex ia IIC T6... T4 Ga  
See [Table 7](#) at the end of the Product Certifications section for Entity Parameters and Temperature Classifications.

#### Special conditions for safe use (x):

1. The equipment must be installed in an enclosure which affords it a degree of protection of at least IP20 in accordance with the requirements of IEC 60529. Non-metallic enclosures must have a surface resistance of less than 1 GΩ; light alloy or zirconium enclosures must be protected from impact and friction when installed in a Zone 0 environment.

**Brazil**

**I2** INMETRO Intrinsic Safety  
 Certificate: CEPEL 02.0096X  
 Standards Used: ABNT NBR IEC 60079-0:2008, ABNT NBR IEC 60079-11:2009, ABNT NBR IEC 60079-26:2008, ABNT NBR IEC 60529:2009  
 Markings: Ex ia IIC T\* Ga IP66W  
 See [Table 7](#) at the end of the Product Certifications section for entity parameters and temperature classifications.

**Special conditions for safe use (x):**

1. The apparatus must be installed in an enclosure which affords it a degree of protection of at least IP20.
2. Light allow or zirconium enclosures must be protected from impact and friction when installed.
3. When the maximum ambient temperature at the place of installation is greater than 50 °C, the equipment shall be installed with adequate insulation cables the minimum temperature of 90 °C.

**China**

**I3** China Intrinsic Safety  
 Certificate: GYJ111384X  
 Standard Used: GB3836.1-2000, GB3836.4-2000  
 Markings: Ex ia IIC T4/T5/T6

**Special conditions for safe use (x):**

1. The ambient temperature range is:

When Options do not select Enhance Performance:

Transmitter output	Maximum input power: (W)	T code	Ambient temperature
F	1.3	T4	-50 °C ≤ T <sub>a</sub> ≤ +60 °C
	5.32	T4	-50 °C ≤ T <sub>a</sub> ≤ +60 °C

When Options select Enhance Performance:

Maximum input power: (W)	T code	Ambient temperature
0.67	T6	-60 °C ≤ T <sub>a</sub> ≤ +40 °C
0.67	T5	-60 °C ≤ T <sub>a</sub> ≤ +50 °C
0.80	T5	-60 °C ≤ T <sub>a</sub> ≤ +40 °C
0.80	T4	-60 °C ≤ T <sub>a</sub> ≤ +80 °C

2. Parameters:

**When Options do not select Enhanced Performance**

Terminals of power supply (+, -)

Transmitter output	Maximum input voltage: U <sub>i</sub> (V)	Maximum input current: I <sub>i</sub> (mA)	Maximum input power: P <sub>i</sub> (W)	Maximum internal parameters:	
				C <sub>i</sub> (nF)	L <sub>i</sub> (mH)
F	30	300	1.3	2.1	0
F (FISCO)	17.5	380	5.32	2.1	0

Terminals of sensor (1,2,3,4)

Transmitter output	Maximum output voltage: U <sub>o</sub> (V)	Maximum output current: I <sub>o</sub> (mA)	Maximum output power: P <sub>o</sub> (W)	Maximum internal parameters:	
				C <sub>o</sub> (nF)	L <sub>o</sub> (mH)
F	13.9	23	0.079	7.7	0

**When Options select Enhanced Performance**

Terminals of power supply (+, -)

Maximum input voltage: U <sub>i</sub> (V)	Maximum input current: I <sub>i</sub> (mA)	Maximum input power: P <sub>i</sub> (W)	Maximum internal parameters:	
			C <sub>i</sub> (nF)	L <sub>i</sub> (mH)
30	150 (T <sub>a</sub> ≤ +80 °C)	0.67/0.8	3.3	0
	170 (T <sub>a</sub> ≤ +70 °C)			
	190 (T <sub>a</sub> ≤ +60 °C)			

Terminals of sensor (1,2,3,4)

Maximum output voltage: U <sub>o</sub> (V)	Maximum output current: I <sub>o</sub> (mA)	Maximum output power: P <sub>o</sub> (W)	Gas group	Maximum internal parameters:	
				C <sub>o</sub> (nF)	L <sub>o</sub> (mH)
13.6	80	0.08	IIC	0.816	5.79
			IIB	5.196	23.4
			IIA	18.596	48.06

3. This product complies to the requirements for FISCO field devices specified in IEC60079-27: 2008. For the connection of an intrinsically safe circuit in accordance FISCO model, FISCO parameters of this product are as above.
4. The product should be used with Ex-certified associated apparatus to establish explosion protection system that can be used in explosive gas atmospheres. Wiring and terminals should comply with the instruction manual of the product and associated apparatus.
5. The cables between this product and associated apparatus should be shielded cables (the cables must have insulated shield). The shielded has to be grounded reliably in non-hazardous area.
6. End users are not permitted to change any components insides, but to settle the problem in conjunction with manufacturer to avoid damage to the product.
7. During installation, use and maintenance of this product, observe the following standards:  
 GB3836.13-1997 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”  
 GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”  
 GB3836.16-2006 “Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)”  
 GB50257-1996 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering”.

**Tables**

**Table 7. Entity Parameters**

Parameter	Fieldbus
Voltage $U_i$ (V)	30
Current $I_i$ (mA)	300
Power $P_i$ (W)	1.3@T4(-50 °C ≤ T <sub>a</sub> ≤ +60 °C)
Capacitance $C_i$ (nF)	2.1
Inductance $L_i$ (mH)	0

**Certifications for Rosemount 65**

Considered as “simple apparatus” when used with Rosemount 644 or Rosemount 2240S in a Rosemount Tank Gauging system.

For complete information, see the Rosemount 65 Product Data Sheet (00813-0200-2654).

**Certifications for Rosemount 68**

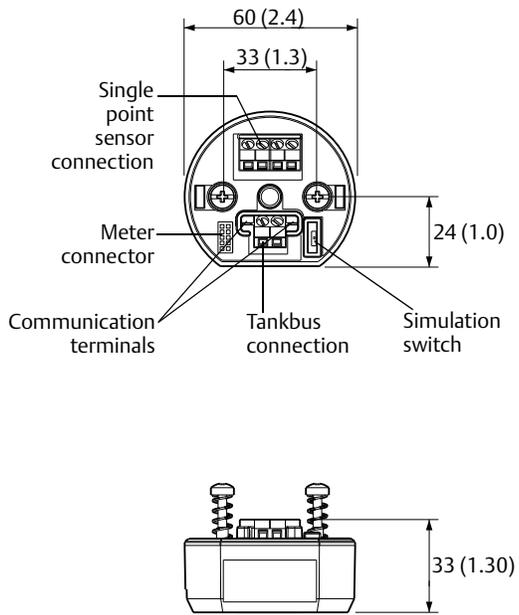
Considered as “simple apparatus” when used with Rosemount 644 or Rosemount 2240S in a Rosemount Tank Gauging system.

For complete information, see the Rosemount 68 Product Data Sheet (00813-0100-2654).

# Dimensional Drawings

## Rosemount 644 Temperature Transmitter

Figure 5. Rosemount 644 dimensions



Dimensions are in millimeters (inches)

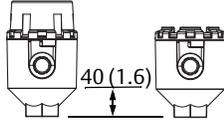
## Rosemount 65

Figure 6. Rosemount 65 dimensions

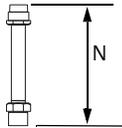
644 with  
LCD display



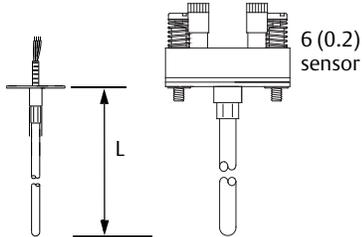
IP 68  
connection  
head



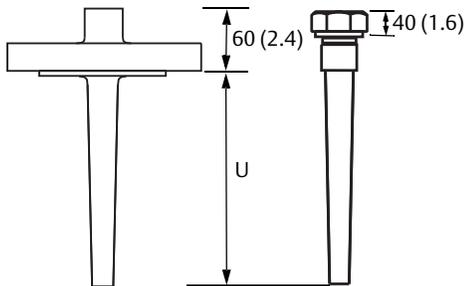
Extension



Sensor  
with flying  
leads or  
terminal  
block



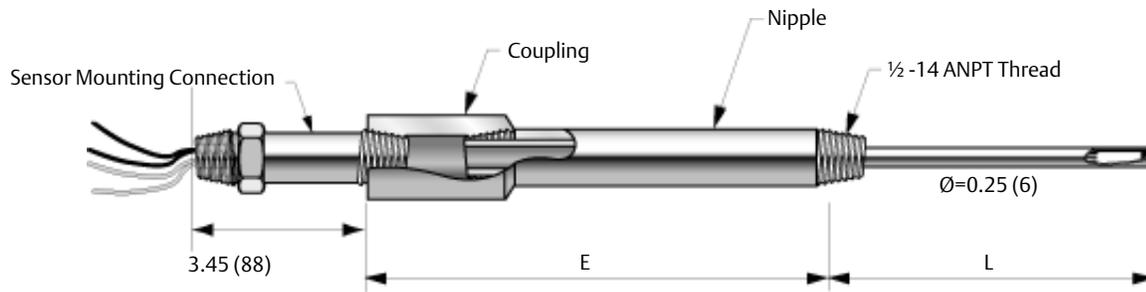
Barstock  
thermowell



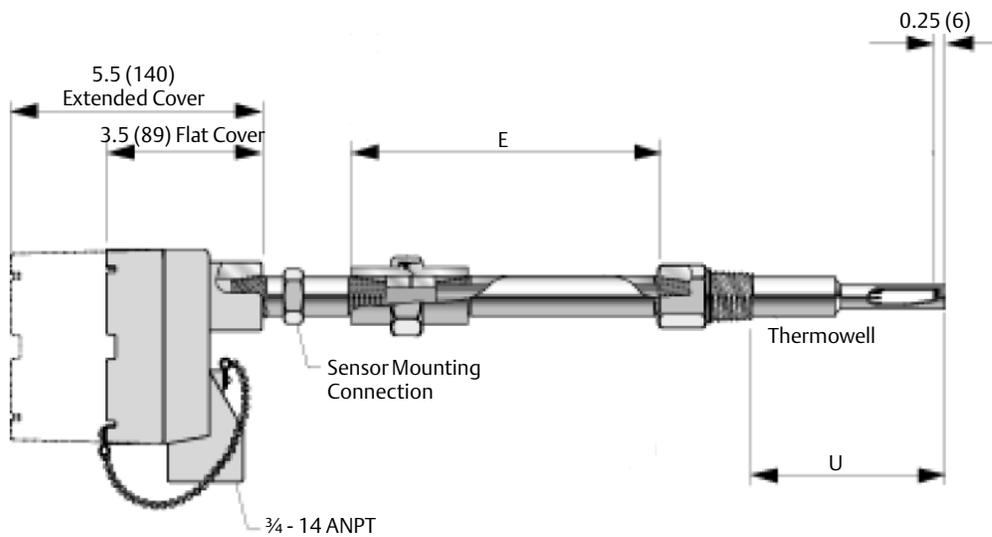
Dimensions are in millimeters (inches)

## Rosemount 68

Figure 7. Rosemount 68 dimensions



### Sensor with Extension (No Thermowell)



### Sensor installed in Connection Head (Flat Cover) with Union and Nipple Extensions and Thermowell

Dimensions are in millimeters (inches)



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