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Temperature

The Rosemount Temperature portfolio provides reliable solutions for a variety of temperature applications across your plant. Our integrated approach to the design and manufacturing of sensors, thermowells and transmitters ensures the most reliable and durable temperature measurement in every installation.

Single Point Temperature Transmitters

Rosemount Single Point temperature transmitters deliver exceptional results by utilizing innovative designs and advanced diagnostics. A comprehensive and versatile portfolio provides solutions for every single point temperature measurement need.

- Advanced diagnostics: Hot Backup, Sensor Drift Alert, and Thermocouple Degradation Diagnostics
- Reliable dual compartment housings for harsh process and environmental conditions
- Unmatched measurement system accuracy with Transmitter-Sensor Matching

High Density Temperature Transmitters

Multiple temperature measurements within close proximity require an innovative solution with proven technology. Rosemount high density products provide a reliable and cost-effective way to solve your temperature-intensive application.

General Use Temperature Sensors

Rosemount General Use Sensors and Thermowells can provide a complete solution for your temperature measurement needs. Our sensors and thermowells deliver superior durability to complement Rosemount transmitters.

Application and Industry Solution (AIS) Temperature Sensors

The most difficult temperature applications require advanced sensor designs. Rosemount AIS sensors offer the best performance for challenging process environments and unique installations.

Table 1. Temperature Transmitter Product Selection Chart

Models	Application		Functionality									Housing				Available Outputs			
	Single Point	High Density	Sensor Inputs	RTD Inputs	Thermocouple Inputs	LCD Display	Hot Backup®	Sensor Drift Alert	Safety Certified	Transmitter Sensor Matching	Integral Transient	Dual-Compartment	Head Mount	Rail Mount	Other	HART	FOUNDATION fieldbus	Wireless	PC-Programmable
3144P			2	X	X	X	X	X	X	X	X	X	–	–	–	X	X	–	–
648			1	X	X	X	–	–	–	X		X	–	–	–	X	–	X	–
644			1	X	X	X	–	–	–	X	X	–	X	X	–	X	X	–	–
248			1	X	X	–	–	–	–	–	–	–	X	X	–	X	–	–	–
148			1	X	X	–	–	–	–	–	–	–	X	–	–	–	–	–	X
848T			8	X	X	–	–	–	–	–	X	–	–	X	–	–	X	–	X
848T Wireless			4	X	X	–	–	–	–	–	–	–	–	–	X	X	–	X	–

= Recommended X = Available – = Not Available NA Not Applicable

Table 2. Temperature Sensor Selection Chart

Models	Style		Technology		Specifications			
	U.S.	European DIN / Metric	RTD	Thermocouple	Temperature Range °C (°F)	Use with Transmitter-Sensor Matching	Measurement Points	Comments
68	X	–	X	–	–50 to 400 (–58 to 752)	X	1	Thin-film RTD
78	X	–	X	–	–200 to 600 (–328 to 1112)	X	1 or 2	Wire-wound RTD
68Q	X	–	X	–	–50 to 200 (–58 to 392)	X	1 or 2	Sanitary RTD
183	X	–	–	X	–180 to 1150 (–292 to 2102)	–	1 or 2	U.S. Style Thermocouple
1080/ 1082	NA	NA	X	X	–40 to 800 (–40 to 1472)	X	2 to 60	Multipoint sensor for temperature profiling
65	–	X	X	–	–196 to 600 (–321 to 1112)	X	1 or 2	DIN style RTD
65Q	–	X	X	–	–50 to 250 (–58 to 482)	X	1 or 2	Sanitary RTD
65B	–	X	X	–	–50 to 250 (–58 to 482)	X	1 or 2	Sanitary RTD
185	–	X	–	X	–40 to 1000 (–40 to 1832)	–	1 or 2	DIN style thermocouple
1075	–	X	–	X	0 to 1700 (32 to 3092)	–	1	High Temperature Thermocouple

X = Available – = Not Available NA Not Applicable

Product Data Sheet
00813-0100-4021, Rev KB
April 2010

Rosemount 3144P Temperature Transmitter

- *Sensor Drift Alert and Hot Backup® features improve measurement reliability while the Transmitter-Sensor Matching feature improves temperature measurement accuracy*
- *Statistical Process Monitoring (SPM) and Thermocouple Diagnostics provide improved visibility into process conditions and sensor loops.*
- *Communicate using either 4-20 mA/HART® or FOUNDATION™ fieldbus protocol*
- *The integral LCD Display (optional) conveniently displays sensor values and transmitter diagnostics information*
- *Capable of single-sensor and dual-sensor inputs. Differential and average temperature measurement increases system flexibility*
- *Dual-compartment housing provides the highest reliability in harsh industrial environments*
- *Safety certified to IEC 61508*

Content

The Ultimate Temperature Transmitter for Critical Control and Safety Applications

The Rosemount 3144P Temperature Transmitter provides superior accuracy, stability, and reliability – making it the industry-leading temperature transmitter used in critical control and safety applications. The 3144P can be ordered with either 4–20 mA/HART or a completely digital FOUNDATION fieldbus protocol. It has the capability to accept either single-sensor or dual-sensor inputs. This dual-sensor input capability allows the transmitter to accept simultaneous input from two independent sensors, enabling measurement of differential temperatures, averaging temperature, or redundant temperature measurement. The transmitter can be configured for a variety of sensor inputs: RTD, thermocouple, millivolt, or ohm. The 3144P (HART) is approved for use in Safety Instrumented Systems (third party validated metrics are available for the 3144P. Testing done per IEC 61508 for Safety Instrumented Systems).

Best in Class Accuracy and Reliability

The transmitter provides industry-leading five-year stability, which reduces maintenance costs. The Transmitter-Sensor Matching feature eliminates interchangeability error, which improves accuracy by 75%. Sensor Drift Alert enables continuous monitoring of the differential temperature for two sensors. When one sensor drifts, the differential of the sensors will increase. If this difference exceeds defined limits, the user is alerted of an unreliable measurement. The Hot Backup feature can reduce the risk of losing important temperature measurements by 80% when the measurement automatically switches to the backup sensor if the primary sensor fails.

Reliable Transmitter Performance

Meeting the NAMUR NE 21 recommendations, the 3144P ensures top transmitter performance in harsh EMC environments. In addition, the 3144P HART transmitter meets NAMUR NE 43 and NE 89 recommendations.

FOUNDATION Fieldbus and HART Protocols

High performance and advanced diagnostics are available with HART or FOUNDATION fieldbus communication. These transmitters offer diagnostics that provide continuous measurement status (good, bad, or uncertain), as well as sensor failure indication. Both transmitters provide performance information to AMS.

Integral LCD Display

Local indication of temperature measurement and diagnostics provides immediate and accurate verification of process conditions.

Measurement Flexibility

The 3144P is capable of single-sensor or dual-sensor input. This also allows for configuration of differential or average temperature measurements.

Designed for Harsh Environments

The 3144P is designed with a dual-compartment housing that provides the highest reliability in harsh environments. The dual-compartment housing provides isolation between the electronics and terminal compartments. The large terminal block allows for easier wire installation. Enhanced EMI rejection and filtering result in unmatched stability in process measurement.

Certified for use in SIS Applications

The 3144P is certified to IEC61508 for non-redundant use in SIL 1 and 2 Safety Instrumented Systems and redundant use in SIL 3 Safety Instrumented Systems. In allowable installations, the 3144P HART electronics can be upgraded to safety certified electronics.

Advanced Temperature Diagnostics

The advanced 3144P powers PlantWeb® by communicating important temperature diagnostics and PlantWeb alerts to ensure process health and enable multi-sensor architecture.

Diagnostic Logging

The 3144P Temperature Transmitter keeps a record of any diagnostic information and logs the item to the database. The log is retained as long as the device has power or can be reset by the user via the Field Communicator or AMS.

Statistical Process Monitoring (SPM)

Detect abnormal process situations with a means and standard deviation calculation by the transmitter.

Thermocouple Diagnostic

Use the transmitter to monitor the resistance of thermocouple loops in order to detect drift conditions or changing wiring conditions.

Rosemount Temperature Solutions

Rosemount 644 Temperature Transmitter
Head mount styles available with HART or FOUNDATION fieldbus protocol. Rail mount style available for HART protocol.

Rosemount 848T Eight Input Temperature Transmitter
Eight input transmitter available with FOUNDATION fieldbus protocol.

Rosemount 3420 Fieldbus Interface Module
Provides an interface between FOUNDATION fieldbus instruments and systems without fieldbus capability using standard interface protocols.

Rosemount 248 Temperature Transmitter
Head mount style (DIN B) and Rail mount style with HART protocol and complete temperature assembly.

Rosemount sensors, thermowells, and extensions
Rosemount has a broad offering of RTD and thermocouples that are designed to meet plant requirements.

Rosemount 148 Temperature Transmitter
Head mount style (DIN B) PC-programmable transmitter

Specifications

HART® AND FOUNDATION™ FIELDBUS

Functional Specifications

Inputs
User-selectable. See “Accuracy” on page 4 for sensor options.

Output
2-wire device with either 4–20 mA/HART, linear with temperature or input, or completely digital output with FOUNDATION fieldbus communication (ITK 5.0.1 compliant).

Isolation
Input/output isolation tested up to 500 V ac (707 V dc) at 50/60 Hz.

Humidity Limits
0–99% relative humidity.

Update Time
Approximately 0.5 seconds for a single sensor (1 second for dual sensors).

Physical Specifications

Conduit Connections
The standard field mount housing has ½–14 NPT conduit entries. Additional conduit entry type are available, including PG13.5 (PG11), M20 X 1.5 (CM20), or JIS G ½. When any of these additional entry types are ordered, adapters are placed in the standard field housing so these alternative conduit types fit correctly. See “Dimensional Drawings” on page 17 for dimensions.

Materials of Construction
Electronics Housing

- Low-copper aluminum or CF-8M (cast version of 316 Stainless Steel)

Paint

- Polyurethane

Cover O-rings
Buna-N

Mounting
Transmitters may be attached directly to the sensor. Optional mounting brackets (codes B4 and B5) allow for remote mounting. See “Optional Transmitter Mounting Brackets” on page 18.

Weight

Aluminum[1]	Stainless Steel[1]
3.1 lb (1.4 kg)	7.8 lb (3.5 kg)

(1) Add 0.5 lb (0.2 kg) for meter or 1.0 lb (0.5 kg) for bracket options.

Enclosure Ratings
NEMA 4X, CSA Enclosure Type 4X, IP66, and IP68.

Stability
- RTDs - ±0.1% of reading or 0.1 °C, whichever is greater, for 24 months.
- Thermocouples - ±0.1% of reading or 0.1 °C, whichever is greater, for 12 months.

5 Year Stability
- RTDs - ±0.25% of reading or 0.25 °C, whichever is greater, for 5 years.
- Thermocouples - ±0.5% of reading or 0.5 °C, whichever is greater, for 5 years.

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

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

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.

RFI Effect
Worst case RFI effect is equivalent to the transmitter’s nominal accuracy specification, according to Table on page 4, when tested in accordance with IEC 61000-4-3, 30 V/m (HART) / 20 V/m (HART T/C) /10 V/m (FOUNDATION fieldbus), 80 to 1000 MHz, with unshielded cable.

CE Electromagnetic Compatibility Compliance Testing
The 3144P meets or exceeds all requirements listed under IEC 61326: 2006.

External Ground Screw Assembly
The external ground screw assembly can be ordered by specifying code G1. However, some approvals include the ground screw assembly in the transmitter shipment, hence it is not necessary to order code G1. The table below identifies which approval options include the external ground screw assembly.

Approval Type	External Ground Screw Assembly Included?[1]
E5, I1, I2, I5, I6, I7, K5, K6, KB, NA	No–Order option code G1
E1, E2, E3, E4, E7, K1, K7, KA, N1, N7, ND, NF	Yes

(1) The parts contained with the G1 option are included with the Integral Protector option code T1. When ordering T1, the G1 option code does not need to be ordered separately.

Hardware Tag

- No charge
- 2 lines of 28 characters (56 characters total)
- Tags are stainless steel
- Permanently attached to transmitter
- Character height is $^{1}/_{16}$-in. (1.6mm)
- A wire-on tag is available upon request. 5 lines of 12 characters (60 characters total)

Software Tag

- HART transmitter can store up to 8 characters. FOUNDATION fieldbus transmitters can store up to 32 characters.
- Can be ordered with different software and hardware tags.
- If no software tag characters are specified, the first 8 characters of the hardware tag are the default.

Accuracy

Sensor Options	Sensor Reference	Input Ranges		Recommended Min. Span[1]		Digital Accuracy[2]		D/A Accuracy[3][4]
2-, 3-, 4-wire RTDs		°C	°F	°C	°F	°C	°F	
Pt 100	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	10	18	± 0.10	± 0.18	±0.02% of span
Pt 100	JIS 1604, 1981 (α = 0.003916)	–200 to 645	–328 to 1193	10	18	± 0.10	± 0.18	±0.02% of span
Pt 200	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	10	18	± 0.22	± 0.40	±0.02% of span
Pt 200	JIS 1604, 1981 (α = 0.003916)	–200 to 645	–328 to 1193	10	18	± 0.22	± 0.40	±0.02% of span
Pt 500	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	10	18	± 0.14	± 0.25	±0.02% of span
Pt 1000	IEC 751, 1995 (α = 0.00385)	–200 to 300	–328 to 572	10	18	± 0.10	± 0.18	±0.02% of span
Ni 120	Edison Curve No. 7	–70 to 300	–94 to 572	10	18	± 0.08	± 0.14	±0.02% of span
Cu 10	Edison Copper Winding No. 15	–50 to 250	–58 to 482	10	18	±1.00	± 1.80	±0.02% of span
Pt 50 (α=0.00391)	GOST 6651-94	-200 to 550	-328 to 1022	10	18	±0.20	±0.36	±0.02% of span
Pt 100 (α=0.00391)	GOST 6651-94	-200 to 550	-328 to 1022	10	18	±0.10	±0.18	±0.02% of span
Cu 100 (α=0.00428)	GOST 6651-94	-185 to 200	-365 to 392	10	18	±0.17	±0.31	±0.02% of span
Cu 50 (α=0.00428)	GOST 6651-94	-185 to 200	-365 to 392	10	18	±0.34	±0.61	±0.02% of span
Cu 100 (α=0.00426)	GOST 6651-94	-50 to 200	-122 to 392	10	18	±0.17	±0.31	±0.02% of span
Cu 50 (α=0.00426)	GOST 6651-94	-50 to 200	-122 to 392	10	18	±0.34	±0.61	±0.02% of span
Thermocouples[5]								
Type B[6]	NIST Monograph 175, IEC 584	100 to 1820	212 to 3308	25	45	± 0.75	± 1.35	±0.02% of span
Type E	NIST Monograph 175, IEC 584	–50 to 1000	–58 to 1832	25	45	± 0.20	± 0.36	±0.02% of span
Type J	NIST Monograph 175, IEC 584	–180 to 760	–292 to 1400	25	45	± 0.25	± 0.45	±0.02% of span
Type K[7]	NIST Monograph 175, IEC 584	–180 to 1372	–292 to 2502	25	45	± 0.25	± 0.45	±0.02% of span
Type N	NIST Monograph 175, IEC 584	–200 to 1300	–328 to 2372	25	45	± 0.40	± 0.72	±0.02% of span
Type R	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	25	45	± 0.60	± 1.08	±0.02% of span
Type S	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	25	45	± 0.50	± 0.90	±0.02% of span
Type T	NIST Monograph 175, IEC 584	–200 to 400	–328 to 752	25	45	± 0.25	± 0.45	±0.02% of span
DIN Type L	DIN 43710	–200 to 900	–328 to 1652	25	45	± 0.35	± 0.63	±0.02% of span
DIN Type U	DIN 43710	–200 to 600	–328 to 1112	25	45	± 0.35	± 0.63	±0.02% of span
Type W5Re/ W26Re	ASTM E 988-96	0 to 2000	32 to 3632	25	45	± 0.70	± 1.26	±0.02% of span
GOST Type L	GOST R 8.585-2001	-200 to 800	-392 to 1472	25	45	± 0.25	± 0.45	±0.02% of span
Millivolt Input		–10 to 100 mV		3 mV		±0.015 mV		±0.02% of span
2-, 3-, 4-wire Ohm Input		0 to 2000 ohms		20 ohm		±0.35 ohm		±0.02% of span

(1) No minimum or maximum span restrictions within the input ranges. Recommended minimum span will hold noise within accuracy specification with damping at zero seconds.

(2) Digital accuracy: Digital output can be accessed by the Field Communicator.
(3) Total Analog accuracy is the sum of digital and D/A accuracies.
(4) Applies to HART / 4-20 mA devices.
(5) Total digital accuracy for thermocouple measurement: sum of digital accuracy +0.25 °C (0.45 °F) (cold junction accuracy).
(6) Digital accuracy for NIST Type B is ±3.0 °C (±5.4 °F) from 100 to 300 °C (212 to 572 °F).
(7) Digital accuracy for NIST Type K is ±0.50 °C (±0.9 °F) from –180 to –90 °C (–292 to –130 °F).

Reference Accuracy Example (HART only)

When using a Pt 100 (α = 0.00385) sensor input with a 0 to 100 °C span: Digital Accuracy would be ±0.10 °C, D/A accuracy would be ±0.02% of 100 °C or ±0.02 °C, Total = ±0.12 °C.

Differential Capability Exists Between Any Two Sensor Types (dual-sensor option)

For all differential configurations, the input range is X to Y where:

- X = Sensor 1 minimum – Sensor 2 maximum *and*
- Y = Sensor 1 maximum – Sensor 2 minimum.

Ambient Temperature Effect

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

Digital Accuracy for Differential Configurations (dual-sensor option, HART only)

- Sensor types are similar (e.g., both RTDs or both T/Cs): Digital Accuracy = 1.5 times worst case accuracy of either sensor type.
- Sensor types are dissimilar (e.g., one RTD, one T/C): Digital Accuracy = Sensor 1 Accuracy + Sensor 2 Accuracy.

Table 1. Ambient Temperature Effect

Sensor Options	Digital Accuracy per 1.8 °F (1.0 °C) Change in Ambient[1]	Range	D/A Effect[2]
2-, 3-, or 4- Wire RTDs			
Pt 100 (α = 0.00385)	0.0015 °C	Entire Sensor Input Range	0.001% of span
Pt 100 (α = 0.003916)	0.0015 °C	Entire Sensor Input Range	0.001% of span
Pt 200 (α = 0.00385)	0.0023 °C	Entire Sensor Input Range	0.001% of span
Pt 200 (α = 0.003916)	0.0023 °C	Entire Sensor Input Range	0.001% of span
Pt 500	0.0015 °C	Entire Sensor Input Range	0.001% of span
Pt 1000	0.0015 °C	Entire Sensor Input Range	0.001% of span
Ni 120	0.0010 °C	Entire Sensor Input Range	0.001% of span
Cu 10	0.015 °C	Entire Sensor Input Range	0.001% of span
Pt 50 (α = 0.00391)	0.003 °C	Entire Sensor Input Range	0.001% of span
Pt 100 (α = 0.00391)	0.0015 °C	Entire Sensor Input Range	0.001% of span
Cu 100 (α =0.00428)	0.0015 °C	Entire Sensor Input Range	0.001% of span
Cu 50 (α =0.00428)	0.003 °C	Entire Sensor Input Range	0.001% of span
Cu 100 (α =0.00426)	0.0015 °C	Entire Sensor Input Range	0.001% of span
Cu 50 (α =0.00426)	0.003 °C	Entire Sensor Input Range	0.001% of span
Thermocouples			
Type B	0.014 °C 0.029 °C – 0.0021% of (R – 300) 0.046 °C – 0.0086% of (R – 100)	R ≥ 1000 °C 300 °C ≤ R < 1000 °C 100 °C ≤ R < 300 °C	0.001% of span
Type E	0.004 °C + 0.00043% of R		0.001% of span
Type J	0.004 °C + 0.00029% of R 0.004 °C + 0.0020% of abs. val. R	R ≥ 0 °C R< 0 °C	0.001% of span
Type K	0.005 °C + 0.00054% of R 0.005 °C + 0.0020% of abs. val. R	R ≥ 0 °C R < 0 °C	0.001% of span
Type N	0.005 °C + 0.00036% of R	All	0.001% of span
Types R and S	0.015 °C 0.021 °C – 0.0032% of R	R ≥ 200 °C R < 200 °C	0.001% of span
Type T	0.005 °C 0.005 °C + 0.0036% of abs. val. R	R ≥ 0 °C R < 0 °C	0.001% of span
DIN Type L	0.0054 °C + 0.00029% of R 0.0054 °C + 0.0025% of abs. val. R	R ≥ 0 °C R < 0 °C	0.001% of span
DIN Type U	0.0064 °C 0.0064 °C + 0.0043% of abs. val. R	R ≥ 0 °C R < 0 °C	0.001% of span
Type W5Re/W26Re	0.016 °C 0.023 °C + 0.0036% of R	R ≥ 200 °C R < 200 °C	0.001% of span
GOST Type L	0.005 > 0 °C 0.005 - 0.003% < 0 °C		0.001% of span
Millivolt Input	0.00025 mV	Entire Sensor Input Range	0.001% of span
2-, 3-, 4-wire Ohm Input	0.007 Ω	Entire Sensor Input Range	0.001% of span

(1) Change in ambient is in reference to the calibration temperature of the transmitter (20° C [68° F])
(2) Applies to HART / 4-20 mA devices.

Temperature Effects Example

When using a Pt 100 (α = 0.00385) sensor input with a 0 to 100 °C span at 30 °C ambient temperature, the following statements would be true:

Digital Temp Effects

- $0.0015° \frac{C}{°C} \times (30° - 20°) = 0.015°C$

D/A Effects (HART / 4–20 mA only)%

- [0.01% / °C of span] x |(Ambient temp - Calibrated temp)| = D/A Effects
- [0.01% / °C x 100] x |(30 - 20)| = 0.01 °C

Worst Case Error

- Digital + D/A + Digital Temp Effects + D/A Effects = 0.10 °C + 0.02 °C + 0.015 °C + 0.01 °C = 0.145 °C

Total Probable Error

$$\sqrt{0.10^2 + 0.02^2 + 0.015^2 + 0.01^2} = 0.10°C$$

HART / 4–20 MA SPECIFICATIONS

Power Supply

External power supply required. Transmitters operate on 12.0 to 42.4 V dc transmitter terminal voltage (with 250 ohm load, 18.1 V dc power supply voltage is required). Transmitter power terminals rated to 42.4 V dc.

Wiring Diagram

See Figure 1 on page 19.

Alarms

Custom factory configurations of alarm and saturation levels are available for valid values with option code C1. These values can also be configured in the field using a Field Communicator.

Transient Protection (option code T1)

The transient protector helps to prevent damage to the transmitter from transients induced on the loop wiring by lightning, welding, heavy electrical equipment or switch gears. The transient protection electronics are contained in an add-on assembly that attaches to the standard transmitter terminal block. The external ground lug assembly (code G1) is included with the Transient Protector.The transient protector has been tested per the following standard:

- IEEE C62.41-1991 (IEEE 587)/ Location Categories B3.
  6kV/3kA peak (1.2 × 50 μS Wave 8 × 20 μS Combination Wave)
  6kV/0.5kA peak (100 kHz Ring Wave)
  EFT, 4kVpeak, 2.5kHz, 5*50nS
- Loop resistance added by protector: 22 ohms max.
- Nominal clamping voltages: 90 V (common mode), 77 V (normal mode)

Local Display

Optional five-digit LCD display includes 0–100% bar graph. Digits are 0.4 inches (8 mm) high. Display options include engineering units (°F, °C, °R, K, ohms, and millivolts), percent, and milliamperes. The display can also be set to alternate between engineering units/milliamperes, Sensor 1/Sensor 2, Sensor 1/Sensor 2/Differential Temperature, and Sensor 1/Sensor2/Average Temperature. All display options, including the decimal point, may be reconfigured in the field using a Field Communicator or AMS.

Turn-on Time

Performance within specifications is achieved less than 6 seconds after power is applied to the transmitter when the damping value is set to 0 seconds.

Power Supply Effect

Less than ±0.005% of span per volt.

SIS Safety Transmitter Failure Values

IEC 61508 Safety Certified SIL 2 and SIL 3 Claim Limit

- Safety accuracy: 2.0%(1) or 2 °C (3.6 °F), whichever is greater
- Safety response time: 5 seconds
- Safety specifications and FMEDA Report available at www. rosemount.com/safety
- Software suitable for SIL3 Applications

(1) Trip values in the DCS or safety logic solver should be derated by 2%. A 2% variation of the transmitter mA output is allowed before a safety trip.

Temperature Limits

Description	Operating Limit	Storage Limit
Without LCD	–40 to 185 °F –40 to 85 °C	–60 to 250 °F –50 to 120 °C
With LCD(1)	–40 to 185 °F –40 to 85 °C	–40 to 185 °F –40 to 85 °C

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

HART Communicator Connections

Field Communicator connections are permanently fixed to power/signal block.

Failure Mode

The 3144P features software and hardware failure mode detection. An independent circuit is designed to provide backup alarm output if the microprocessor hardware or software fails. The alarm level is user-selectable using the failure mode switch. If failure occurs, the position of the hardware switch determines the direction in which the output is driven (HIGH or LOW). The switch feeds into the digital-to-analog (D/A) converter, which drives the proper alarm output even if the microprocessor fails. The values at which the transmitter drives its output in failure mode depends on whether it is configured to standard, or NAMUR-compliant (NAMUR recommendation NE 43) operation. The values for standard and NAMUR-compliant operation are as follows:

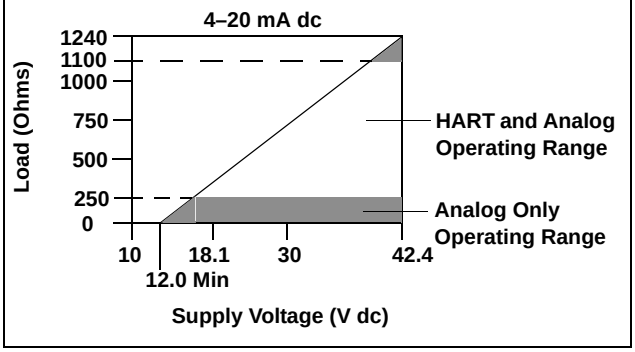
Table 2. Operation Parameters

	Standard [1]	NAMUR-Compliant[1]
Linear Output:	3.9 ≤ I ≤ 20.5	3.8 ≤ I ≤ 20.5
Fail HIGH:	21.75 ≤ I ≤ 23 (default)	21.5 ≤ I ≤ 23 (default)
Fail Low:	I ≤ 3.75	I ≤ 3.6

(1) Measured in milliamperes

Load Limitations

Maximum Load = 40.8 X (Supply Voltage - 12.0)[1]



(1) Without transient protection (optional).

NOTE
HART Communication requires a loop resistance between 250 and 1100 ohms. Do not communicate with the transmitter when power is below 12 V dc at the transmitter terminals.

HART
4–20 mA

FOUNDATION FIELDBUS SPECIFICATIONS

Power Supply

Powered over FOUNDATION fieldbus with standard fieldbus power supplies. Transmitters operate on 9.0 to 32.0 V dc, 12 mA maximum. Transmitter power terminals are rated to 42.4 V dc.

Wiring Diagram

See Figure 2 on page 19.

Alarms

The AI function block allows the user to configure the alarms to HIGH-HIGH, HIGH, LOW, or LOW-LOW with a variety of priority levels and hysteresis settings

Transient Protection (option code T1)

The transient protector helps to prevent damage to the transmitter from transients induced on the loop wiring by lightning, welding, heavy electrical equipment, or switch gears. The transient protection electronics are contained in an add-on assembly that attaches to the standard transmitter terminal block. The transient terminal block is not polarity insensitive. The transient protector has been tested to the following standard:

- IEEE C62.41-1991 (IEEE 587)/ Location Categories B3.
  6kV/3kA peak (1.2 × 50 μS Wave 8 × 20 μS Combination Wave)
  6kV/0.5kA peak (100 kHz Ring Wave)
  EFT, 4kVpeak, 2.5kHz, 5*50nS
- Loop resistance added by protector: 22 ohms maximum
- Nominal clamping voltages: 90 V (common mode), 77 V (normal mode)

Diagnostics Suite for FOUNDATION fieldbus (Option Code D01)

The 3144P Diagnostics Suite for FOUNDATION fieldbus provides advanced functionality in the form of Statistical Process Monitoring (SPM), a thermocouple Diagnostic, and Sensor Drift Alert. SPM technology calculates the mean and standard deviation of the process variable and makes them available to the user. This may be used to detect abnormal process situations.

The Thermocouple Diagnostic enables the 3144P to measure and monitor the resistance of thermocouple loops in order to detect drift or changing wiring connections.

Sensor Drift Alert allows the user to monitor the difference in measurement between two sensors installed in one process point. A change in this differential value may indicate drifting sensors.

Local Display

Displays all DS_65 measurements in the Transducer and Function Blocks including Sensor 1, Sensor 2, differential and terminal temperatures. The display alternates up to four selected items. The meter can display up to five digits in engineering units (°F, °C, °R, K, Ω, and millivolts). Display settings are configured at the factory according to the transmitter configuration (standard or custom). These settings can be reconfigured in the field using a Field Communicator or DeltaV. In addition, the LCD provides the ability to display DS_65 parameters from other devices. In addition to the configuration of the meter, sensor diagnostic data is displayed. If the measurement status is Good, the measured value is shown. If the measurement status is Uncertain, the status indicating uncertain is shown in addition to the measured value.If the measurement status is Bad, the reason for the bad measurement is shown.

Note: When ordering a spare electronics module assembly, the LCD transducer block will display the default parameter.

Turn-on Time

Performance within specifications is achieved less than 20 seconds after power is applied to the transmitter when the damping value is set to 0 seconds.

Status

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

FOUNDATION Fieldbus Parameters

Schedule Entries	25 (max.)
Links	30 (max.)
Virtual Communications Relationships (VCR)	20 (max.)

Backup Link Active Scheduler (LAS)

The transmitter is classified as a device link master, which means it can function as a Link Active Scheduler (LAS) if the current link master device fails or is removed from the segment. The host or other configuration tool is used to download the schedule for the application to the link master device. In the absence of a primary link master, the transmitter will claim the LAS and provide permanent control for the H1 segment.

Function Blocks

Resource Block

- Contains physical transmitter information including available memory, manufacture identification, device type, software tag, and unique identification.
- PlantWeb Alerts enable the full power of the PW digital architecture by diagnosing instrumentation issues, communicating the details, and recommending a solution.

Transducer Block

- Contains the actual temperature measurement data, including sensor 1, sensor 2, and terminal temperature.
- Includes information about sensor type and configuration, engineering units, linearization, range, damping, and diagnostics.

LCD Block (when an LCD display is used)

- Configures the local display.

Analog Input (AI)

- Processes the measurement and makes it available on the fieldbus segment.
- Allows filtering, engineering unit, and alarm changes.

PID Block (provides control functionality)

- Performs single loop, cascade, or feedforward control in the field.

Block	Execution Time
Resource	–
Transducer	–
LCD Block	–
Advanced Diagnostics	–
Analog Input 1, 2, 3	60 milliseconds
PID 1 and 2 with Autotune	90 milliseconds
Input Selector	65 milliseconds
Signal Characterizer	45 milliseconds
Arithmetic	60 milliseconds
Output Splitter	60 milliseconds

Product Certifications

ROSEMOUNT 3144P WITH HART / 4–20 MA

Approved Manufacturing Locations

Rosemount Inc. – Chanhassen, Minnesota, USA

Rosemount Temperature GmbH – Germany

Emerson Process Management Asia Pacific – Singapore

European Union Directive Information

The most recent revision of the European Union Declaration of Conformity can be found at www.emersonprocess.com.

ATEX Directive (94/9/EC)

Rosemount Inc. complies with the ATEX Directive.

Electro Magnetic Compatibility (EMC) (2004/108/EC)

EN 61326-2-3:2006 and EN 61326-1:2006

Hazardous Locations Installations

North American Certifications

Factory Mutual (FM) Approvals

I5 FM Intrinsically Safe and Non-incendive:
Certificate Number: 3012752

Intrinsically Safe for Class I/II/III, Division 1, Groups A, B, C, D, E, F, and G.
Temperature codes: T4A (T_{amb} = – 60 to 60 °C)
T5 (T_{amb} = – 60 to 50°C)
Zone Marking: Class I, Zone 0, AEx ia IIC
T4 (T_{amb} = – 50 to 60 °C)
Intrinsically Safe when installed in accordance with control drawing 03144-0321.
Non-incendive for use in Class I, Division 2, Groups A, B, C, and D. Suitable for use in Class II / III, Division 2, Groups F and G.
Non-incendive when installed in accordance with Rosemount drawings 03144-0321.

Temperature codes: T6 (T_{amb} = – 60 to 60 °C),
T5 (T_{amb} = – 60 to 85°C)

E5 Explosion-proof for Class I, Division 1, Groups A, B, C, D. Dust Ignition-Proof for use in Class II/III, Division 1, Groups E, F, and G.

Certificate Number: 3012752

Explosion-proof and Dust Ignition-Proof when installed in accordance with Rosemount drawing 03144-0320. Indoor and outdoor use. Type 4X.

Temperature code: T5 (T_{amb} = – 50 to 85 °C)

NOTE
For Group A, seal all conduits within 18 inches of enclosure; otherwise, conduit seal not required for compliance with NEC 501-15(A)(1).

Non-incendive for use in Class I, Division 2, Groups A, B, C, and D. Suitable for use in Class II/III, Division 2, Groups F and G. Non-incendive when installed in accordance with Rosemount drawing 03144-0321.

Temperature codes: T5 (T_{amb} = – 60 to 85 °C),
T6 (T_{amb} = – 60 to 60 °C)

Canadian Standards Association (CSA) Approvals

I6 CSA Intrinsically Safe and Division 2

Certificate Number: 1242650

Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1; Suitable for Class I, Division 2, Groups A, B, C, and D. Intrinsically Safe and Division 2 when installed per Rosemount drawing 03144–0322.

K6 Combination of I6 and the following:
Explosion-proof for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 hazardous locations. Factory sealed.

European Certifications

E1 ATEX Flameproof Approval (Zone 1)
Certificate Number: KEMA01ATEX2181X
ATEX Category Marking ⟨Ex⟩ II 2 G
Ex d IIC T6 (T_{amb} = –40 to 70 °C)
Ex d IIC T5 (T_{amb} = –40 to 80 °C)
Max supply voltage: 55 Vdc

Special Conditions for Safe Use (X):

For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

ND ATEX Dust Ignition-Proof Approval
Certificate Number: KEMA01ATEX2205
ATEX Category Marking ⟨Ex⟩ II 1 D
Ex tD A20 IP66 T95 °C (T_{amb} = –40 to 80 °C)
Max supply voltage: 55 Vdc

N1 ATEX Type n Approval (Zone 2)
Certificate Number: BAS01ATEX3432X
ATEX Category Marking ⟨Ex⟩ II 3 G
Ex nL IIC T6 (T_{amb} = –40 to 50 °C)
Ex nL IIC T5 (T_{amb} = –40 to 75 °C)
U_i = 55V

Special Conditions for Safe Use (X):

The transmitter is not capable of withstanding the 500 v insulating test required by Clause 9.1 of EN50021:1999. This condition must be taken into account during installation.

I1 ATEX Intrinsic Safety Approval (Zone 0)
Certificate Number: BAS01ATEX1431X
ATEX Category Marking ⟨Ex⟩ II 1 G
Ex ia IIC T6 (T_{amb} = –60 to 50 °C)
Ex ia IIC T5 (T_{amb} = –60 to 75 °C)

Table 3. Input Entity Parameters

Power/Loop		Sensor	
U_i = 30 V dc	C_i = 5 nF	U_o = 13.6 V	C_i = 78 nF
I_i = 300 mA	L_i = 0	I_o = 56 mA	L_i = 0
P_i = 1.0 W		P_o =190 mW	

Special Conditions for Safe Use (x):

The transmitter is not capable of withstanding the 500V insulation test as defined in Clause 6.4.12 of EN50 020. This condition must be taken into account during installation.

International Certifications

IECEx Certifications

E7 IECEx Flameproof Approval
Certificate Number: IECEx KEM 09.0035X
Ex d IIC T6 (T_{amb} = -40 to 70 °C)
Ex d IIC T5 (T_{amb} = -40 to 80 °C)
Max supply voltage: 55 V

Special Conditions for Safe Use (X):

For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

NF IECEx Dust Ignition-Proof Approval
Certificate Number: IECEx KEM 09.0036
Ex tD A20 IP66 T95 °C (T_{amb} = -40 to 80 °C)
Max supply voltage: 55 Vdc
Consult factory for NF availability

N7 Type N Approval
Certificate Number: IECEx BAS 07.0003X
Ex nA nL IIC T6 (T_{amb} = –40 to 50 °C)
Ex nA nL IIC T5 (T_{amb} = –40 to 75 °C)
U_i = 55 V

Special Conditions for Safe Use (x):

When fitted with the transient terminal options, the apparatus is not capable of withstanding the 500V electrical strength test as defined in Clause 6.8.1 of IEC 60079-15: 2005. This must be taken into account during installation.

I7 Intrinsic Safety Approval
Certificate Number: IECEx BAS 07.0002X
Ex ia IIC T6 (T_{amb} = –60 to 50 °C)
Ex ia IIC T5 (T_{amb} = –60 to 75 °C)

Table 4. Input Entity Parameters

Power/Loop		Sensor	
U_i = 30 V	C_i = 5 nF	U_o = 13.6 V	C_i = 78 nF
I_i = 300 mA	L_i = 0	I_o = 56 mA	L_i = 0
P_i = 1.0 W		P_o = 190 mW	

Special Conditions for Safe Use (x):

When fitted with the transient terminal options, the apparatus is not capable of withstanding the 500V electrical strength test as defined in Clause 6.4.12 of IEC 60079-11: 1999. This must be taken into account during installation.

Brazilian Certifications

Centro de Pesquisas de Energia Eletrica (CEPEL) Approval

I2 INMETRO Intrinsic Safety
Certificate Number: CEPEL-Ex-0723/05X
BR-Ex ia IIC T6 (T_{amb}= -60 to 50 °C)
BR-Ex ia IIC T5 (T_{amb}= -60 to 75 °C)
IP66W

Special Conditions for Safe Use (x):

1. The apparatus enclosure may contain light metals. The apparatus must be installed in such a manner as to minimize the risk of impact or friction with other metal surfaces.
2. A transient protection device can be fitted as an option, in which the equipment will not pass the 500V test.

E2 INMETRO Flameproof
Certificate Number: CEPEL-EX-0307/2004X
BR-Ex d IIC T6 (T_{amb}= -40 to 65 °C)
BR-Ex d IIC T5 (T_{amb}= -40 to 80 °C)

Special Conditions for Safe Use (x):

1. The accessory of cable entries or conduit must be certified as flameproof and needs to be suitable for use conditions.
2. For ambient temperature above 60 ºC, cable wiring must have minimum isolation temperature 90 ºC, to be in accordance to equipment operation temperature.
3. Where electrical entry is via conduit, the required sealing device must be assembly immediately close to enclosure.

Japanese Certifications

E4 TIIS Flameproof
Various configurations available. Consult factory for certified assemblies.

HART 4–20 mA

China (NEPSI) Certifications

I3 China Intrinsic Safety

Ex ia IIC T4

Certificate Number: GYJ06586/GYJ06587

Special Conditions for Safe Use (x):

1. The temperature of the process medium must be less than +121 ° C.
2. The ambient temperature range is from -40 °C to + 60 ° C.
3. Safety Parameters:

Table 5. NEPSI Input Entity Parameters HART Protocol, including SIS

Input Parameters		RTD Terminals
U_i = 30 V		U_o = 14.1 V
I_i = 300 mA		I_o = 18.6 mA
P_i = 1.0 W		P_o = 65.7 W
C_i = 0.023 μ F		C_o = 0.63 μ F
L_i = 0 mH		L_o = 93.3 mH

4. The cable entry of the temperature transmitter must be protected to ensure the degree of protection of the enclosure to IP 20(GB4208-1993) at least.
5. The terminals for connection to power supply of the temperature transmitter must be connected to an associated apparatus certified by NEPSI in accordance with GB 3836.1-2000 and GB 3836.4-2000 to establish an intrinsic safety system. The following requirements must be fulfilled:

$U_o \le U_i$	$C_o \ge C_i + C_c$
$I_o \le I_i$	$L_o \ge L_c + L_i$
$P_o \le P_i$	

Where:

C_c, L_c the distributed capacitance and inductance of the cables

U_o, I_o, P_o maximum output parameters of the associated apparatus

C_o, L_o maximum external parameters of the associated apparatus

6. The terminals for connection to sensor of temperature transmitter must be connected to an intrinsic safety sensor certified by NEPSI in accordance with GB 3836.1-2000 and GB 3836.4-2000 to establish an intrinsically safe system. The following requirements must be fulfilled:

$U_i \ge U_o$	$C_i \le C_o - C_c$
$I_i \ge I_o$	$L_i \ge L_c - L_o$
$P_o \ge P_i$	

Where:

C_c, L_c the distributed capacitance and inductance of the cables

U_i, I_i, P_i maximum input parameters of intrinsically safe sensor

C_i, L_i maximum internal parameters of intrinsically safe sensor

7. The cables between temperature transmitter, associated apparatus and sensor are 2-core shielded cables (the cables must have insulated shield). The cable core section area should be much than 0.5 mm^2. The shielded has to be grounded in non-hazardous area and isolated from the housing. The wiring has to not be affected by electromagnetic disturbance.
8. Associated apparatus should be installed in a safe location, and during installation, operation and maintenance, the regulations of the instruction manual have to be strictly observed.
9. End users are not permitted to change the internal components or hardware of the device.
10. During installation, operation, and maintenance of the temperature transmitter, observe the following standards:
    a. GB3836.13-1997 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”
    b. GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”
    c. GB50257-1996 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering.”

E3 China Flameproof

Ex d IIC T6

Certificate Number: GYJ06583/GYJ06584

Special Conditions for Safe Use (x):

1. Device must only be subjected to the ambient temperature range from -40 °C to + 70 °C.
2. The temperature of the process medium must be less than + 80 °C.
3. The ground connection must be properly and reliably connected within the enclosure of the device.
4. During installation, use and maintenance of the temperature transmitter, observe the warning “Don’t open the cover when the circuit is live.”
5. During installation, there should be no mixture harm to the flameproof housing.
6. When installing in hazardous locations, the cable entry must be certified by NEPSI with protection type Ex d II C, in accordance with GB3836.1-2000 and GB3836.2-2000. Five full threads must be engaged when the cable entry is assembled to the temperature transmitters.
7. The diameter of the cable must observe the instruction manual of cable entry. The compressing nut should be fastened. The aging of seal ring should be changed in time.
8. Maintenance must be performed in a non-hazardous location.
9. The end user is not permitted to change any of the internal components or hardware of the device.

10. During installation, operation, and maintenance of the temperature transmitter, observe the following standards:
    a. GB3836.13-1997 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”
    b. GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”
    c. GB50257-1996 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering.”

Combination Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

KA Combination of K1 and K6
KB Combination of K5 and K6
K1 Combination of E1, N1, I1 and ND
K7 Combination of E7, N7, and I7
K5 Combination of I5 and E5
K6 CSA Combination

Additional Certifications

American Bureau of Shipping (ABS) Type Approval

ABS Type Approval for temperature measurements in hazardous locations on ABS Classed Vessels, Marine and Offshore Installations. Type Approval is based on Factory Mutual (FM) Approvals; therefore, specify order code K5. Please contact your Emerson Process Management representative if a copy of the certification is required. Consult factory for availability.

Bureau Veritas (BV) Type Approval Shipboard

Consult factory for availability.

Det Norske Veritas (DNV) Type Approval for Shipboard and Offshore Installations

DNV rules for classifications of ships and mobile offshore units for temperature measurements in the following locations:

Table 6. Applications / Limitations

Location	Class
Temperature	D
Humidity	B
Vibration	B/C
Enclosure	D

NOTE
The transient protector (option code T1) is required when requesting DNV Type Approval. Additionally, hazardous locations approvals may be required (based on shipboard location) and will need to be specified by the Hazardous Locations option code.

Please contact your Emerson Process Management representative if a copy of the certification is required.

GOSTANDART

Tested and approved by Russian Metrological Institute.

ROSEMOUNT 3144P WITH FOUNDATION FIELDBUS

Approved Manufacturing Locations

Rosemount Inc. – Chanhassen, Minnesota, USA
Rosemount Temperature GmbH – Germany
Emerson Process Management Asia Pacific – Singapore

European Union Directive Information

The most recent revision of the European Union Declaration of Conformity can be found at www.emersonprocess.com.

ATEX Directive (94/9/EC)

Rosemount Inc. complies with the ATEX Directive.

Electro Magnetic Compatibility (EMC) (2004/108/EC)

EN 61326-1:2006 / EN 61326-2-3:2006

Hazardous Locations Installations

North American Certifications

Factory Mutual (FM) Approvals

I5 FM Intrinsically Safe / FISCO and Non-incendive
Certificate Number: 3012752
Intrinsically Safe / FISCO for use in Class I, II, III, Division 1, Groups A, B, C, D, E, F, and G;
Temperature code: T4 (T_{amb} = – 60 °C to 60 °C)
Zone marking: Class I, Zone 0, AEx ia IIC T4 (T_{amb} = – 50 °C to 60 °C)
Intrinsically safe when installed in accordance with control drawing 003144-5075.
Non-incendive for use in Class, Division 2, Groups A,B,C and D; Suitable for use in Class II/III, Division 2, Groups F and G. Non-incendive when installed in accordance with Rosemount drawing 03144-5075.
Temperature Class: T6 (T_{amb} = – 60 °C to 50 °C);
T5 (T_{amb} = – 60 °C to 75 °C)

E5 Explosion-proof for Class I, Division 1, Groups A, B, C, and D.
Dust Ignition-Proof for use in Class II/III, Division 1, Groups E, F, and G.
Certificate Number: 3012752
Explosion-proof and Dust Ignition-Proof when installed in accordance with Rosemount drawing 03144-0320. Indoor and outdoor use. Type 4X.
Temperature code: T5 (T_{amb} = – 50 to 85 °C)

NOTE
For Group A, seal all conduits within 18 inches of enclosure; otherwise, conduit seal not required for compliance with NEC 501-15(A)(1).

Non-incendive for use in Class I, Division 2, Groups A, B, C, and D. Suitable for use in Class II/III, Division 2, Groups F and G. Non-incendive when installed in accordance with Rosemount drawing 03144-5075.

Temperature codes: T5 (T_{amb} = – 60 to 75 °C),
T6 (T_{amb} = – 60 to 50°C)

Canadian Standards Association (CSA) Approvals

I6 CSA Intrinsically Safe / FISCO and Division 2
Certificate Number: 1242650
Intrinsically Safe / FISCO for use in Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1.
Temperature Class: T4 (T_{amb} = – 50 °C to 60 °C)
Suitable for Class I, Division 2, Groups A, B, C, and D.
Temperature Class: T5 (T_{amb} = – 60 °C to 85 °C);
T6 (T_{amb} = – 60 °C to 60 °C)
Intrinsically Safe / FISCO and Division 2 when installed per Rosemount drawing 03144-5076.

K6 Combination of I6 and the following:
Explosion-proof for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 hazardous locations. Factory sealed.

European Certifications

E1 ATEX Flameproof Approval (Zone 1)
Certificate Number: KEMA01ATEX2181X
ATEX Category Marking ⟨Ex⟩ II 2 G
Ex d IIC T6 (T_{amb} = –40 to 70 °C)
Ex d IIC T5 (T_{amb} = –40 to 80 °C)
Max supply voltage: 55 Vdc

Special Condition for Safe Use (X):
For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

ND ATEX Dust Ignition-Proof Approval
Certificate Number: KEMA01ATEX2205
ATEX Category Marking ⟨Ex⟩ II 1 D
Ex tD A20 IP66 T95 °C (T_{amb} = –40 to 80 °C)
Max supply voltage: 55 Vdc

N1 ATEX Type n Approval (Zone 2)
Certificate Number: Baseefa03ATEX0709
ATEX Category Marking ⟨Ex⟩ II 3 G
Ex nA nL IIC T5 (T_{amb} = –40 to 75 °C)
U_i = 42.4 V maximum

I1 ATEX Intrinsic Safety / FISCO Approval (Zone 0)
Certificate Number: Baseefa03ATEX0708X
ATEX Category Marking ⟨Ex⟩ II 1 G
Ex ia IIC T4 (T_{amb} = –60 to 60 °C)

Table 7. Input Entity Parameters

Power/Loop	FISCO Power/Loop	Sensor
U_i = 30 V	U_i = 17.5 V	U_o = 13.9 V
I_i = 300 mA	I_i = 380 mA	I_o = 23 mA
P_i = 1.3 W	P_i = 5.32 W	P_o =79 mW
C_i = 2.1 nF	C_i = 2.1 nF	C_i = 7.7 nF
L_i = 0	L_i = 0	L_i = 0

Special Conditions for Safe Use (x):
1. The apparatus enclosure may contain light metals. The apparatus must be installed in such a manner as to minimize the risk of impact or friction with other metal surfaces.
2. A Transient protection device can be fitted as an option, in which the equipment will not pass the 500V test.

International Certifications

IECEx Certifications

E7 IECEx Flameproof Approval (Zone 1)
Certificate Number: IECEx KEM 09.0035X
Ex d IIC T6 (T_{amb} = -40 to 70 °C)
Ex d IIC T5 (T_{amb} = -40 to 80 °C)
Max supply voltage: 55 Vdc

Special Condition for Safe Use (X):
For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

NF IECEx Dust Ignition-Proof Approval
Certificate Number: IECEx KEM 09.0036
Ex tD A20 IP66 T95 °C (T_{amb} = -40 to 80 °C)
Max supply voltage: 55 Vdc
Consult factory for NF availability

N7 Type n Approval (Zone 2)
Certificate Number: IECEx BAS 07.0005X
Ex ia IIC T4 (T_{amb} = –40 to 75 °C)
42.4 V
IP66

I7 Intrinsic Safety Approval
Certificate Number: IECEx BAS 07.0004X
Ex ia IIC T4 (T_{amb} = –60 to 60 °C)

Power/Loop	FISCO Power/Loop	Sensor
U_i = 30 V dc	U_i = 17.5 V dc	U_o = 13.9 V dc
I_i = 300 mA	I_i = 380 mA	I_o = 23 mA
P_i = 1.3 W	P_i = 5.32 W	P_o =79 mW
C_i = 2.1 nF	C_i = 2.1 nF	C_i = 7.7 nF
L_i = 0	L_i = 0	L_i = 0

Special Conditions for Safe Use (x):
When fitted with the transient terminal options, the apparatus is not capable of withstanding the 500V electrical strength test as defined in Clause 6.8.1 of IEC 60079-15: 2005. This must be taken into account during installation.

Brazilian Certifications

Centro de Pesquisas de Energia Eletrica (CEPEL) Approval

I2 INMETRO Intrinsic Safety
Certificate Number: CEPEL-Ex-0723/05X
BR-Ex ia IIC T6 (T_{amb}= -60 to 50 °C)
BR-Ex ia IIC T5 (T_{amb}= -60 to 75 °C)
IP66W

Special Conditions for Safe Use (x):
1. The apparatus enclosure may contain light metals. The apparatus must be installed in such a manner as to minimize the risk of impact or friction with other metal surfaces.
2. A transient protection device can be fitted as an option, in which the equipment will not pass the 500V test.

E2 INMETRO Flameproof
Certificate Number: CEPEL-EX-0307/2004X
BR-Ex d IIC T6 (T_{amb}= -40 to 65 °C)
BR-Ex d IIC T5 (T_{amb}= -40 to 80 °C)

Special Conditions for Safe Use (x):
1. The accessory of cable entries or conduit must be certified as flameproof and needs to be suitable for use conditions.
2. For ambient temperature above 60ºC, cable wiring must have minimum isolation temperature 90ºC, to be in accordance to equipment operation temperature.
3. Where electrical entry is via conduit, the required sealing device must be assembly immediately close to enclosure.

Japanese Certifications

E4 TIIS Flameproof
Various configurations available. Consult factory for certified assemblies.

China (NEPSI) Certifications

I3 China Intrinsic Safety
Ex ia IIC T4
Certificate Number: GYJ06586/GYJ06587

Special Conditions for Safe Use (x):
1. The temperature of the process medium must be less than + 121 ° C.
2. The ambient temperature range is from -40 °C to + 60 °C.
3. Safety Parameters:

Table 8. Fieldbus Protocol Safety Parameters

Input Parameters		RTD Terminals
U_i = 30 V		U_o = 13.9 V
I_i = 300 mA		I_o = 23 mA
P_i = 1.3 W		P_o = 79 mW
C_i = 0.022 µ F		C_o = 7.7 nF
L_i = 0 mH		L_o = 0 mH

4. This temperature transmitters with FOUNDATION Fieldbus protocol is suitable for FISCO (IEC 60079-25:2005) with the following safe parameters:

Table 9. FISCO Parameters

Parameters
U_i = 17.5 V
I_i = 380 mA
P_i = 1 W
C_i = 0.022 µ F
L_i = 0 mH

5. The cable entry of the temperature transmitter must be protected to ensure the degree of protection of the enclosure to IP 20(GB4208-1993) at least.

FOUNDATION Fieldbus

6. The terminals for connection to power supply of the temperature transmitter must be connected to an associated apparatus certified by NEPSI in accordance with GB 3836.1-2000 and GB 3836.4-2000 to establish an intrinsic safety system. The following requirements must be fulfilled:

$U_o \leq U_i$	$C_o \geq C_i + C_c$
$I_o \leq I_i$	$L_o \geq L_c + L_i$
$P_o \leq P_i$	

Where:

C_c, L_c the distributed capacitance and inductance of the cables

U_o, I_o, P_o maximum output parameters of the associated apparatus

C_o, L_o maximum external parameters of the associated apparatus

7. The terminals for connection to sensor of temperature transmitters must be connected to an intrinsically safe sensor certified by NEPSI in accordance with GB 3836.1-2000 and GB 3836.4-2000 to establish an intrinsically safe system. The following requirements must be fulfilled:

$U_i \geq U_o$	$C_i \leq C_o - C_c$
$I_i \geq I_o$	$L_i \geq L_c - L_o$
$P_o \geq P_i$	

Where:

C_c, L_c the distributed capacitance and inductance of the cables

U_i, I_i, P_i maximum input parameters of intrinsically safe sensor

C_i, L_i maximum internal parameters of intrinsically safe sensor

8. The cables between temperature transmitter, associated apparatus and sensor are 2-core shielded cables (the cables must have insulated shield). The cable core section area should be much than 0.5 mm^2. The shielded has to be grounded in non-hazardous area and isolated from the housing. The wiring has to not be affected by electromagnetic disturbance.
9. Associated apparatus should be installed in a safe location, and during installation, operation and maintenance, the regulations of the instruction manual have to be strictly observed.
10. End users are not permitted to change the internal components or hardware of the device.
11. During installation, operation, and maintenance of the temperature transmitter, observe the following standards:
    a. GB3836.13-1997 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”
    b. GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”
    c. GB50257-1996 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering.”

E3 China Flameproof

Ex d IIC T6

Certificate Number: GYJ06583/GYJ06584

Special Conditions for Safe Use (x):

1. Device must only be subjected to the ambient temperature range from -40 °C to + 70 °C.
2. The temperature of the process medium must be less than + 80 °C.
3. The ground connection must be properly and reliably connected within the enclosure of the device.
4. During installation, use and maintenance of the temperature transmitter, observe the warning “Don’t open the cover when the circuit is live.”
5. During installation, there should be no mixture harm to the flameproof housing.
6. When installing in hazardous locations, the cable entry must be certified by NEPSI with protection type Ex d II C, in accordance with GB3836.1-2000 and GB3836.2-2000. Five full threads must be engaged when the cable entry is assembled to the temperature transmitters.
7. The diameter of the cable must observe the instruction manual of cable entry. The compressing nut should be fastened. The aging of seal ring should be changed in time.
8. Maintenance must be performed in a non-hazardous location.
9. The end user is not permitted to change any of the internal components or hardware of the device.
10. During installation, operation, and maintenance of the temperature transmitter, observe the following standards:
    a. GB3836.13-1997 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”
    b. GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”
    c. GB50257-1996 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering.”

Combination Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

KA Combination of K1 and K6

KB Combination of K5 and K6

K1 Combination of E1, N1, I1, and ND

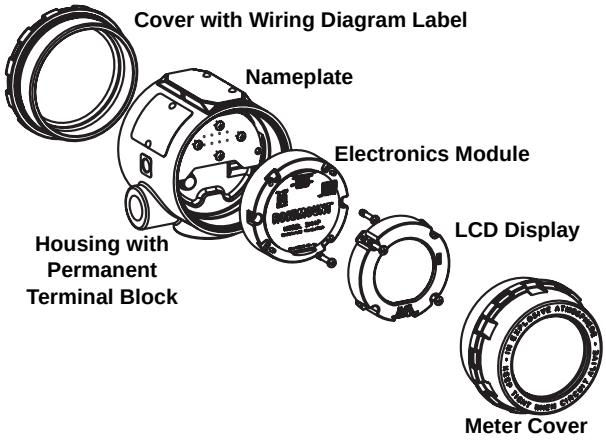
K7 Combination of E7, N7, I7 and NF

K5 Combination of I5 and E5

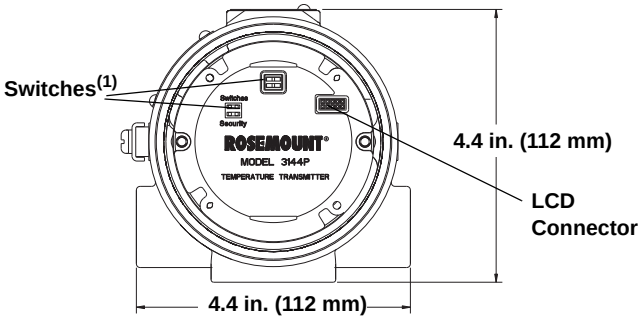
K6 CSA Combination

Dimensional Drawings

Transmitter Exploded View



Switch Location

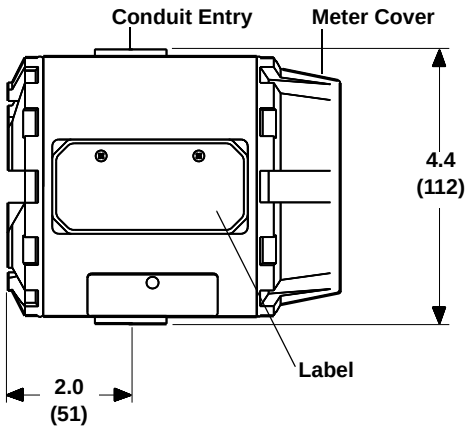


(1) Alarm and Write Protect (HART), Simulate and Write Protect (FOUNDATION Fieldbus)

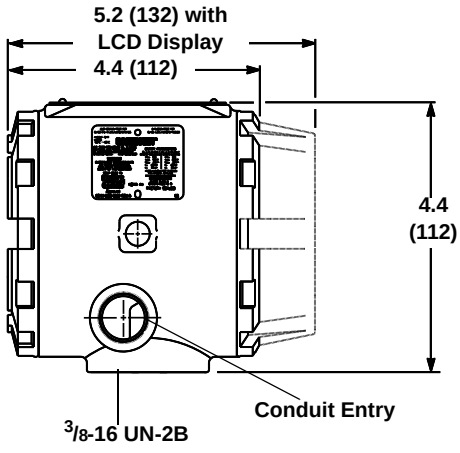
LCD Display Faceplate

Transmitter Dimensional Drawing

Top View



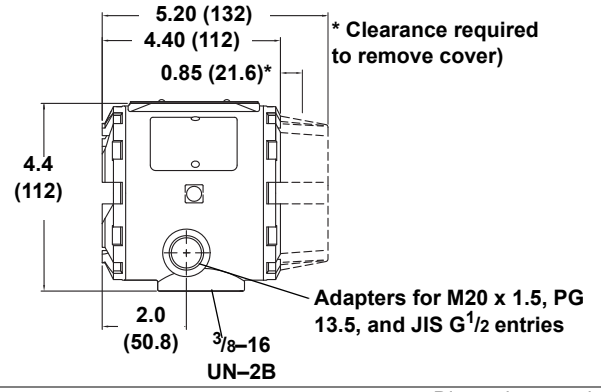
Side View



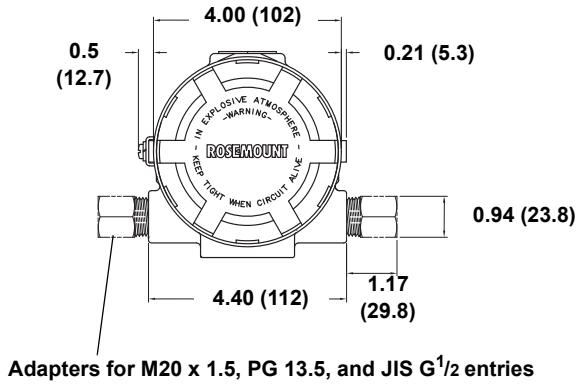
Dimensions are in inches (millimeters)

Transmitter Dimensional Drawing for Conduits with M20 x 1.5, PG 13.5, and JIS G1/2 Entries

Top View



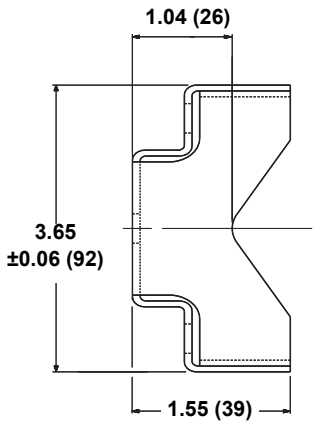
Front View

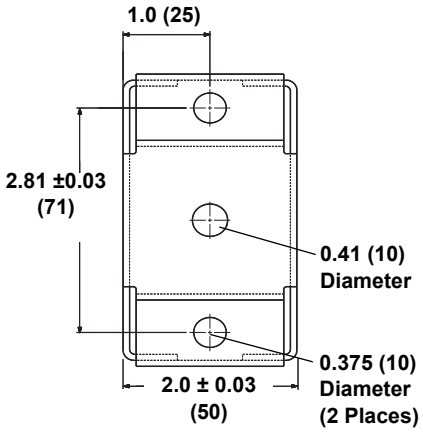


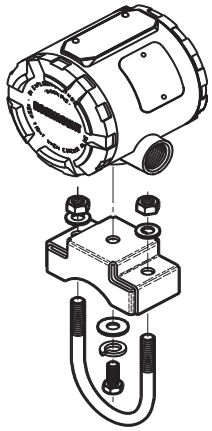
Dimensions are in inches (millimeters)

Optional Transmitter Mounting Brackets

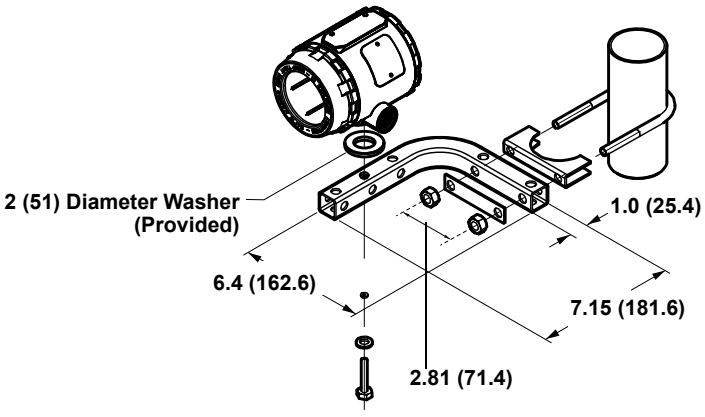
Option Code B4 Bracket







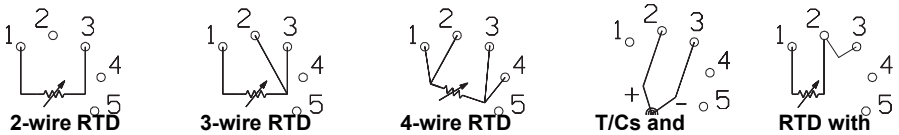
Option Code B5 Bracket



Dimensions are in inches (millimeters)

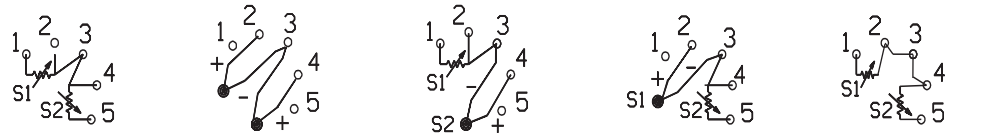
Figure 1. HART / 4–20 mA

3144P Single-Sensor Connections Diagram



2-wire RTD and Ohms | **3-wire RTD and Ohms**** | **4-wire RTD and Ohms** | **T/Cs and Millivolts** | **RTD with Compensation Loop***

3144P Dual-Sensor Connections Diagram

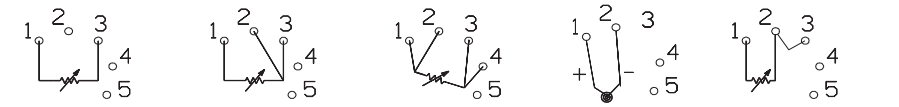


ΔT/Hot Backup/Dual Sensor with 2 RTDs | **ΔT/Hot Backup/Dual Sensor with 2 Thermocouples** | **ΔT/Hot Backup/Dual Sensor with RTDs/ Thermocouples**** | **ΔT/Hot Backup/Dual Sensor with RTDs/ Thermocouples**** | **ΔT/Hot Backup/Dual Sensor with 2 RTDs with Compensation Loop****

* *Transmitter must be configured for a 3-wire RTD in order to recognize an RTD with a compensation loop.*
** *Emerson Process Management provides 4-wire sensors for all single-element RTDs. Use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.*

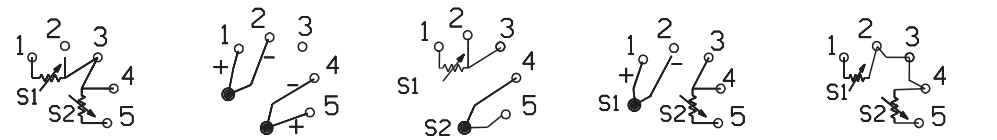
Figure 2. FOUNDATION fieldbus

3144P Single-Sensor Connections Diagram



2-wire RTD and Ohms | **3-wire RTD and Ohms**** | **4-wire RTD and Ohms** | **T/Cs and Millivolts** | **RTD with Compensation Loop***

3144P Dual-Sensor Connections Diagram



ΔT/Hot Backup/Dual Sensor with 2 RTDs | **ΔT/Hot Backup/Dual Sensor with 2 Thermocouples** | **ΔT/Hot Backup/Dual Sensor with RTDs/ Thermocouples**** | **ΔT/Hot Backup/Dual Sensor with RTDs/ Thermocouples**** | **ΔT/Hot Backup/Dual Sensor with 2 RTDs with Compensation Loop****

* *Transmitter must be configured for a 3-wire RTD in order to recognize an RTD with a compensation loop.*

** *Emerson Process Management provides 4-wire sensors for all single-element RTDs. Use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.*

Ordering Information

Table 10. Rosemount 3144P 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			
3144P	Temperature Transmitter			
Housing Style		**Material**	**Conduit Entry Size**	
Standard				**Standard**
D1	Field Mount Housing, Dual-Compartment Housing	Aluminum	1/2–14 NPT	★
D2	Field Mount Housing, Dual-Compartment Housing	Aluminum	M20 x 1.5 (CM20)	★
D3	Field Mount Housing, Dual-Compartment Housing	Aluminum	PG 13.5 (PG11)	★
D4	Field Mount Housing, Dual-Compartment Housing	Aluminum	JIS G 1/2	★
D5	Field Mount Housing, Dual-Compartment Housing	Stainless Steel	1/2–14 NPT	★
D6	Field Mount Housing, Dual-Compartment Housing	Stainless Steel	M20 x 1.5 (CM20)	★
D7	Field Mount Housing, Dual-Compartment Housing	Stainless Steel	PG 13.5 (PG11)	★
D8	Field Mount Housing, Dual-Compartment Housing	Stainless Steel	JIS G 1/2	★
Transmitter Output				
Standard				**Standard**
A	4-20 mA with digital signal based on HART protocol			★
F	FOUNDATION fieldbus digital signal (includes 3 AI function block and Backup Link Active Scheduler)			★
Measurement Configuration				
Standard				**Standard**
1	Single-Sensor Input			★
2	Dual-Sensor Input			★
Product Certifications				
Standard				**Standard**
NA	No Approval			★
E5	FM Explosion-proof, Dust Ignition-Proof and Non-incendive approval			★
I5(1)	FM Intrinsically Safe and Non-incendive (includes standard IS and FISCO for fieldbus units)			★
K5(1)	FM IS, Non-incendive & Explosion-proof combo (includes standard IS and FISCO for fieldbus units)			★
KB(1)	FM and CSA IS, Explosion-proof, and Non-incendive combo (includes standard IS and FISCO for FF units)			★
I6(1)	CSA Intrinsically Safe/FISCO and Division 2 (includes standard IS and FISCO for fieldbus units)			★
K6(1)	CSA IS, FISCO Division 2 and Explosion-proof combo (includes standard IS, FISCO for fieldbus units)			★
E1	ATEX Flameproof approval			★
N1	ATEX type n approval			★
I1(1)	ATEX intrinsic safety approval (includes standard IS and FISCO for fieldbus units)			★
K1(1)	ATEX IS, Flameproof, Dust Ignition-Proof and type n combo (includes standard IS and FISCO for fieldbus units)			★
ND	ATEX Dust Ignition-Proof approval			★
KA(1)	ATEX/CSA intrinsic safety, Explosion-proof combo (includes standard IS and FISCO for fieldbus units)			★
E7	IECEx Flameproof approval			★
N7	IECEx Type 'n' approval			★
I7(1)(2)	IECEx Intrinsic Safety			★
K7(1)(2)	IECEx Intrinsic Safety, Flameproof, Dust Ignition-Proof and Type n combination			★
E2(2)	INMETRO Flameproof			★
I2(2)(5)	INMETRO Intrinsic safety			★
E4(2)	TIIS Flameproof approval			★
E3(2)	NEPSI Flameproof approval			★
I3(1)(2)	NEPSI Intrinsic safety			★

Table 10. Rosemount 3144P 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.

Options (Include with selected model number)

PlantWeb Control Functionality		
Standard		**Standard**
A01	FOUNDATION fieldbus Advanced Control Function Block Suite	★
PlantWeb Advanced Diagnostic Functionality		
Standard		**Standard**
D01	Diagnostics Suite: Statistical Process Monitoring (SPM), Thermocouple Diagnostic, Min/Max Tracking – FOUNDATION fieldbus only	★
Mounting Bracket		
Standard		**Standard**
B4	Universal Mounting Bracket for 2-inch pipe and panel mounting—SST bracket and bolts	★
B5	Universal “L” Mounting Bracket for 2-inch pipe mounting—SST bracket and bolts	★
Display		
Standard		**Standard**
M5	LCD Display	★
External Ground		
Standard		**Standard**
G1	External Ground Lug Assembly (See “External Ground Screw Assembly” on page 3.)	★
Transient Protector		
Standard		**Standard**
T1	Integral Transient Protector	★
Software Configuration		
Standard		**Standard**
C1[3]	Custom Configuration of Date, Descriptor and Message (Requires CDS with order)	★
Line Filter		
Standard		**Standard**
F5	50 Hz Line Voltage Filter	★
Alarm Level Configuration		
Standard		**Standard**
A1	NAMUR alarm and saturation levels, high alarm	★
CN	NAMUR alarm and saturation levels, low alarm	★
Low Alarm		
Standard		**Standard**
C8	Low Alarm (Standard Rosemount Alarm and Saturation Values)	★
Sensor Trim		
Standard		**Standard**
C2	Transmitter-Sensor Matching – Trim to Specific Rosemount RTD Calibration Schedule (CVD constants)	★
Expanded		
C7	Trim to Non-Standard Sensor (Special Sensor–Customer must provide sensor information)	
5-Point Calibration		
Standard		**Standard**
C4	5-Point Calibration (Requires the Q4 option code to generate a Calibration Certificate)	★
Calibration Certification		
Standard		**Standard**
Q4	Calibration Certificate (3-Point Calibration)	★
QP	Calibration Certificate and Tamper Evident Seal	★
Dual-Input Custom Configuration (only with measurement type option code 2)		
Standard		**Standard**
U1[4]	Hot Backup	★
U2[5]	Average temperature with Hot Backup and Sensor Drift Alert – warning mode	★
U3[5]	Average temperature with Hot Backup and Sensor Drift Alert – alarm mode	★
U5	Differential temperature	★
U6[4]	Average temperature	★
U7[4]	First good temperature	★

Table 10. Rosemount 3144P 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.

Expanded		
U4	Two independent sensors	
Quality Certification for Safety		
Standard		**Standard**
QS	Prior-use certificate of FMEDA data (HART Only)	★
QT	Safety-certified to IEC 61508 with certificate of FMEDA data (HART only)	★
Conduit Electrical Connector		
Standard		**Standard**
GE[6]	M12, 4-pin, Male Connector (*eurofast*®)	★
GM[6]	A size Mini, 4-pin, Male Connector (*minifast*®)	★
Assemble To Options		
Standard		**Standard**
XA	Sensor Specified Separately and Assembled to Transmitter	★
Typical Model Number: 3144P D1 A 1 E5 B4 M5		

(1) When IS approval is ordered on a FOUNDATION fieldbus, both standard IS and FISCO IS approvals apply. The device label is marked appropriately.

(2) Consult factory for availability when ordering with HART or FOUNDATION fieldbus models.

(3) Consult factory for availability when ordering with FOUNDATION fieldbus models.

(4) Codes U1 and U6 for HART transmitters will not have drift alert enabled; option codes U1, U6, U7, U8, and U9 for FOUNDATION fieldbus transmitters will have drift alert enabled.

(5) Not available for FOUNDATION Fieldbus.

(6) Available with Intrinsically Safe approvals only. For FM Intrinsically Safe or non-incendive approval (option code I5), install in accordance with Rosemount drawing 03151-1009 to maintain 4X rating.

Standard Configuration

Both standard and custom configuration settings may be changed. Unless specified, the transmitter will be shipped as follows:

Standard Configuration	
4 mA value / Lower Range (HART / 4–20 mA) Measurement Point LO (FOUNDATION Fieldbus)	0 °C
20 mA value / Upper Range (HART / 4–20 mA) Measurement Point HI (FOUNDATION Fieldbus)	100 °C
Damping	5 seconds
Output	Linear with temperature
Failure Mode (HART / 4–20 mA)	High
Line Voltage Filter	60 Hz
Software Tag	See “Tagging”
Optional Integral Meter	Units and mA / Sensor 1 units
Single Sensor option	
Sensor Type	4-wire Pt 100 α = 0.00385 RTD
Primary Variable (HART / 4–20 mA) AI 1400 (FOUNDATION Fieldbus)	Sensor 1
Secondary Variable AI 1600 (FOUNDATION Fieldbus)	Terminal Temperature
Tertiary Variable	Not Used
Quaternary Variable	Not Used
Dual-Sensor option	
Sensor Type	Two 3-wire Pt 100 α = 0.00385 RTD
Primary Variable (HART / 4–20 mA) AI 1400 (FOUNDATION Fieldbus)	Sensor 1
Secondary Variable AI 1500 (FOUNDATION Fieldbus)	Sensor 2
Tertiary Variable AI 1600 (FOUNDATION Fieldbus)	Terminal Temperature
Quaternary Variable	Not Used

Custom Configuration

The 3144P transmitter can be ordered with custom configuration. The table below lists the requirements necessary to specify a custom configuration.

Option Code	Requirements/Specification
C1: Factory Data(1)	Date: day/month/year Descriptor: 16 alphanumeric character Message: 32 alphanumeric character Custom Alarm Levels can be specified for configuration at the factory.
C2: Transmitter Sensor Matching	The transmitters are designed to accept Callendar-van Dusen constants from a calibrated RTD schedule and generate a custom curve to match any specific sensor curve. Specify a Series 68, 65, or 78 RTD sensor on the order with a special characterization curve (V or X8Q4 option). These constants will be programmed into the transmitter with this option.
C4: Five Point Calibration	Will include five-point calibration at 0, 25, 50, 75, and 100% analog and digital output points. Use with option code Q4 to obtain a Calibration Certificate.
C7: Special Sensor	Used for non-standard sensor, adding a special sensor or expanding input. Customer must supply the non-standard sensor information.Additional special curve will be added to sensor curve input choices.
A1: NAMUR- Compliant, high alarm	Analog output levels compliant with NAMUR. Alarm is set to fail high.
CN: NAMUR- Compliant, low alarm	Analog output levels compliant with NAMUR. Alarm is set to fail low.
C8: Low Alarm	Analog output levels compliant with Rosemount standard. Alarm is set to fail low
F5: 50 Hz Line Filter	Calibrated to 50 Hz line voltage filter.

(1) CDS required.

To custom configure the 3144P with the dual-sensor option transmitter for one of the applications described below, indicate the appropriate option code in the model number. If a sensor type is not specified, the transmitter will be configured for two 3-wire Pt 100 (α = 0.00385) RTDs if any of the following option codes are selected.

Option Code U1: Hot Backup	
Primary Usage	Primary usage sets the transmitter to automatically use sensor 2 as the primary input if sensor 1 fails. Switching from sensor 1 to sensor 2 is accomplished without any effect on the analog signal. A digital alert will be sent in the event of a failed sensor.
Primary Variable	1st good
Secondary Variable	Sensor 1
Tertiary Variable	Sensor 2
Quaternary Variable	Terminal Temperature

Option Code U2: Average Temperature with Hot Backup and Sensor Drift Alert – Warning Mode	
Primary Usage	Critical applications, such as safety interlocks and control loops. Outputs the average of two measurements and sends a digital alert if temperature difference exceeds the set maximum differential (Sensor Drift Alert – warning mode). If a sensor fails, an alert will be sent digitally and the primary variable will be reported as the remaining good sensor value.
Primary Variable	Sensor Average
Secondary Variable	Sensor 1
Tertiary Variable	Sensor 2
Quaternary Variable	Terminal Temperature

Option Code U3: Average temperature with Hot Backup and Sensor Drift Alert – Alarm Mode	
Primary Usage	Critical applications, such as safety interlocks and control loops. Outputs the average of two measurements and sets the analog output into alarm if temperature difference exceeds the set maximum differential (Sensor Drift Alert – alarm mode). If a sensor fails, an alert will be sent digitally and the primary variable will be reported as the remaining good sensor value.
Primary Variable	Sensor Average
Secondary Variable	Sensor 1
Tertiary Variable	Sensor 2
Quaternary Variable	Terminal Temperature

Option Code U4: Two Independent Sensors	
Primary Usage	Used in non-critical applications where the digital output is used to measure two separate process temperatures.
Primary Variable	Sensor 1
Secondary Variable	Sensor 2
Tertiary Variable	Terminal Temperature
Quaternary Variable	Not Used

Option Code U5 Differential Temperature	
Primary Usage	The differential temperature of two process temperatures is configured as the primary variable. If the temperature difference exceeds the maximum differential, the analog output will go into alarm. Primary Variable will be reported as a bad sensor value.
Primary Variable	Differential Temperature
Secondary Variable	Sensor 1
Tertiary Variable	Sensor 2
Quaternary Variable	Terminal Temperature

Option Code U6: Average Temperature	
Primary Usage	When average measurement of two different process temperatures is required.If a sensor fails, the analog output will go into alarm and the primary variable will report the measurement of the remaining good sensor.
Primary Variable	Sensor Average
Secondary Variable	Sensor 1
Tertiary Variable	Sensor 2
Quaternary Variable	Terminal Temperature

Rosemount 3144P

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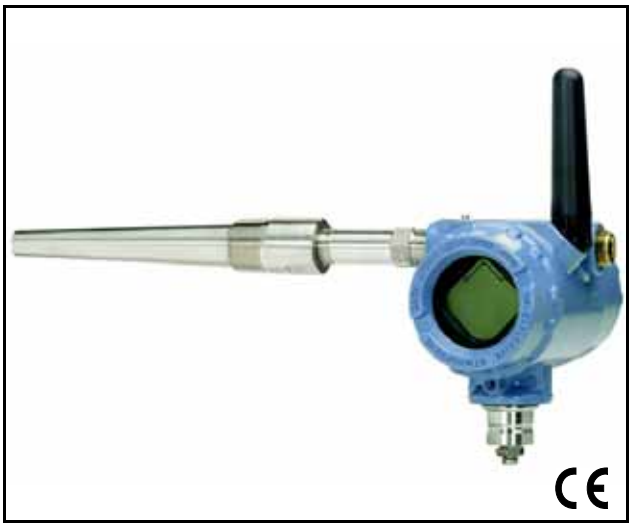
Email : Enquiries@AP.EmersonProcess.com

EMERSON™
Process Management

Product Data Sheet
00813-0100-4648, Rev DB
April 2010

Rosemount 648 Wireless Temperature Transmitter

- *Installation-ready single point measurement solution*
- *Transmitter-Sensor Matching improves measurement accuracy by 75%*
- *Integral LCD displays primary sensor and diagnostic information*
- *Self-organizing network delivers information rich data with >99% data reliability*
- *WirelessHART™ capabilities extend the full benefits of PlantWeb® to previously inaccessible locations*



WirelessHART

Contents

Success With Smart Wireless

Self-Organizing Networks

The self-forming, intelligent devices provide exceptional data reliability and network stability. The Rosemount 648 works the same as wired devices, allowing you to leverage existing practices, training and maintenance procedures, but without the added wiring costs.

SmartPower™

Emerson is the only provider of a power optimized solution for both user and process safety. An intrinsically safe power module allows field replacements without removing the transmitter from the process to keep personnel safe and reduce maintenance costs. Power module installation requires no special training. Keyed connections eliminate the risk of incorrect installation. This reliable solution provides long lasting power technology life that delivers rich WirelessHART data.

Layered Security Keeps Your Network Safe

Emerson Process Management's layered approach to wireless network security ensures that your network stays protected. The network devices implement Encryption, Authentication, Verification, Anti-Jamming and Key Management methods to ensure that data transmissions are secure.

Reliable Transmitter Performance

The 648 can be configured for a variety of sensor inputs: RTD, thermocouple, millivolt, or ohm, and it ensures top transmitter performance in harsh and/or noisy EMI/RFI environments.

Transmitter-Sensor Matching

Entering the temperature-resistance profile specific to the RTD sensor into the 648 transmitter results in Transmitter-Sensor Matching. This eliminates the sensor interchangeability error, which can improve accuracy.

Integral LCD Display

Local indication of temperature measurement and diagnostics provides real time and accurate verification of process conditions.

Digital Field Devices that Power PlantWeb

The Rosemount 648 powers *PlantWeb*® by communicating important temperature diagnostics and *PlantWeb* alerts to ensure process health and enable economical single-sensor architecture.

Mounting Flexibility

Field mount transmitters to be direct mounted via a sensor or thermocouple, or remote mounted, allowing the flexibility needed to reach any measurement point. The LCD offers clear visibility to process and device variables.

SMART WIRELESS SOLUTIONS

Smart Wireless Gateway

The Emerson Smart Wireless Gateway integrates the self-organizing network into the host system, providing industry leading security and data reliability.

Rosemount 3051S Wireless Series of Instrumentation

The scalable 3051S enables fully integrated pressure, flow and level self-organizing network solutions to optimize plant performance and reduce risk.

Rosemount 702 Wireless Discrete Transmitter

The Rosemount 702 integrates discrete input state into a self-organizing network to optimize plant performance and extend asset life.

Rosemount 848T Wireless Temperature Transmitter

The 848T Wireless temperature transmitter integrates four temperature measurements into a self-organizing network. It provides a reliable and cost effective solution for high density applications.

WirelessHART... The Industry Standard

Self-Organizing, Adaptive Mesh Routing

- No wireless expertise required, devices automatically find the best communication paths
- Network continuously monitors paths for degradation and repairs itself
- Adaptive behavior provides reliable, hands-off operation and simplifies network deployments, expansion and reconfiguration
- Supports both star and mesh topologies

Industry Standard Radio with Channel Hopping

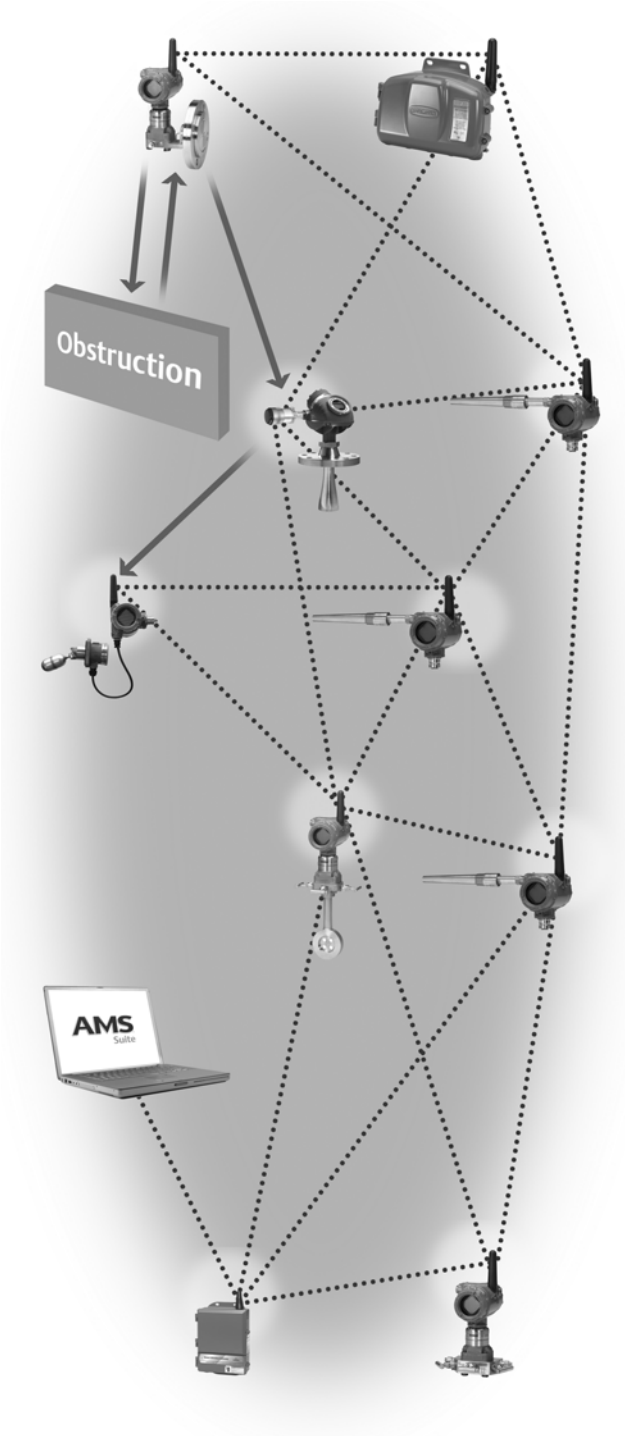
- Standard IEEE 802.15.4 radios
- 2.4 GHz ISM band sliced into 16 radio-channels
- Continually “hop” across channels to avoid interference and increase reliability
- Frequency hopping spread spectrum (FHSS) technology delivers high reliability in challenging radio environment

Self-Healing Network

- If an obstruction is introduced into the mesh network, devices will automatically find the best alternate communication path. This alternate path will be created and the information will continue to flow.

Seamless Integration to Existing Hosts

- Transparent and seamless integration
- Same control system applications
- Gateways connect using industry protocols



Specifications

Functional Specifications

Input

Supports Thermocouple, RTD, millivolt, and ohm input types. See “Accuracy” on page 6 for sensor options.

Output

WirelessHART 2.4 GHz DSSS.
Wireless 2.4 GHz DSSS, or 900 MHz FHSS.

Local Display

The optional five-digit integral LCD Display can display engineering units (°F, °C, °R, K, Ω, and millivolts). Display update rate up to once per minute.

Humidity Limits

0–100% relative humidity

Update Rate

WirelessHART, user selectable 8 sec. to 60 min.
Wireless, user selectable 15 sec. to 60 min.

Accuracy (Pt 100 @ reference condition: 20 °C)
±0.225 °C (±0.405 °F)

Physical Specifications

Electrical Connections

Power Module

Field replaceable, keyed connection eliminates the risk of incorrect installation. Intrinsically Safe Lithium-thionyl chloride Power Module with polybutadine terephthalate (PBT) enclosure. Eight-year life at one minute update rate.(1)

Sensor Terminals

Sensor terminals permanently fixed to terminal block

HART Communicator Connections

Communication Terminals

Clips permanently fixed to terminal block

Materials of Construction

Enclosure

Housing - Low-copper aluminum or stainless steel

Paint - Polyurethane

Cover O-ring - Buna-N

Terminal Block and Power Module

PBT

Antenna

PBT/Polycarbonate (PC) integrated omnidirectional antenna

Mounting

Transmitters may be attached directly to the sensor. Mounting brackets also permit remote mounting. See “Dimensional Drawings” on page 10.

Weight

Low-copper Aluminum:
648 without LCD - 4.6 lbs. (2.0 kg)
648 with M5 LCD - 4.7 lbs (2.1 kg)

Stainless Steel:
648 without LCD - 8.0 lbs. (3.6 kg)
648 with M5 LCD - 8.1 lbs (3.7 kg)

Enclosure Ratings (648)

Housing option code D and E are NEMA 4X, and IP66.

Performance Specifications

ElectroMagnetic Compatibility (EMC)

All Models:

Meets all relevant requirements of EN 61326-1; 2006; EN 61326-2-3; 2006.

Transmitter Stability

The 648 has a stability of ±0.225% of output reading or 0.225 °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

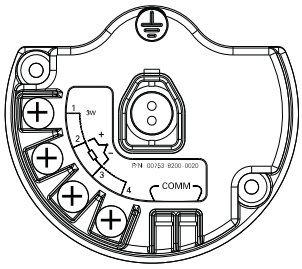
No effect when tested per the requirements of IEC60770-1:

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

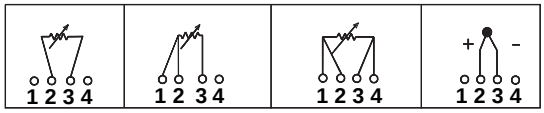
---

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

Sensor Connections



648 Sensor Connections Diagram



2-wire RTD and Ω | **3-wire RTD and Ω** * | **4-wire RTD and Ω** | **T/C and mV**

* *Rosemount Inc. provides 4-wire sensors for all single element RTDs. You can use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.*

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

Accuracy

TABLE 1. Rosemount 648 Input Options and Accuracy.

Sensor Options	Sensor Reference	Input Ranges		Digital Accuracy(1)	
2-, 3-, 4-wire RTDs		°C	°F	°C	°F
Pt 50 (α = 0.003910)	GOST 6651-94	-200 to 550	-328 to 990	± 0.45	± 0.81
Pt 100 (α = 0.00385)	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	± 0.225	± 0.405
Pt 100 (α = 0.003910)	GOST 6651-94	-200 to 550	-328 to 990	± 0.225	± 0.405
Pt 100 (α = 0.003916)	JIS 1604, 1981 (α = 0.003916)	–200 to 645	–328 to 1193	± 0.225	± 0.405
Pt 200	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	± 0.405	± 0.729
Pt 200 (α = 0.003916)	JIS 1604, 1981 (α = 0.003916)	–200 to 645	–328 to 1193	± 0.405	± 0.729
Pt 500	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	± 0.285	± 0.513
Pt 1000	IEC 751, 1995 (α = 0.00385)	–200 to 300	–328 to 572	± 0.285	± 0.513
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
Cu 50 (α = 426)	GOST 6651-94	-50 to 200	-122 to 392	±0.72	± 1.296
Cu 50 (α = 428)	GOST 6651-94	-185 to 200	-365 to 392	±0.72	± 1.296
Cu 100 (α = 426)	GOST 6651-94	-50 to 200	-122 to 392	±0.36	± 0.648
Cu 100 (α = 428)	GOST 6651-94	-185 to 200	-365 to 392	±0.36	± 0.648
Thermocouples(2)					
Type B(3)	NIST Monograph 175, IEC 584	100 to 1820	212 to 3308	± 1.155	± 2.079
Type E	NIST Monograph 175, IEC 584	–50 to 1000	–58 to 1832	± 0.30	± 0.54
Type J	NIST Monograph 175, IEC 584	–180 to 760	–292 to 1400	± 0.525	± 0.945
Type K(4)	NIST Monograph 175, IEC 584	–180 to 1372	–292 to 2502	± 0.75	± 1.35
Type N	NIST Monograph 175, IEC 584	–200 to 1300	–328 to 2372	± 0.75	± 1.35
Type R	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	± 1.125	± 2.025
Type S	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	± 1.05	± 1.89
Type T	NIST Monograph 175, IEC 584	–200 to 400	–328 to 752	± 0.525	± 0.945
GOST L	GOST R 8.585-2001	-200 to 800	-392 to 1472	± 0.525	± 0.945
DIN Type L	DIN 43710	–200 to 900	–328 to 1652	± 0.525	± 0.945
DIN Type U	DIN 43710	–200 to 600	–328 to 1112	± 0.525	± 0.945
Type W5Re/W26Re	ASTM E 988-96	0 to 2000	32 to 3632	± 1.05	± 1.89
Millivolt Input		–10 to 100 mV		± 0.0225 mV	
2-, 3-, 4-wire Ohm Input		0 to 2000 ohms		± 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 ±4.5 °C (±8.1 °F) from 100 to 300 °C (212 to 572 °F).

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

Ambient Temperature Effect

TABLE 2. Ambient Temperature Effect

Sensor Options	Temperature Effects per 1.0 °C (1.8 °F) Change in Ambient Temperature(1)	Range
2-, 3-, 4-wire RTDs		
Pt 50 (α = 0.003910)	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Pt 100 (α = 0.00385)	0.0045 °C (0.0081 °F)	Entire Sensor Input Range
Pt 100 (α = 0.003910)	0.0045 °C (0.0081 °F)	Entire Sensor Input Range
Pt 100 (α = 0.003916)	0.0045 °C (0.0108 °F)	Entire Sensor Input Range
Pt 200	0.006 °C (0.0108 °F)	Entire Sensor Input Range
Pt 200 (α = 0.003916)	0.006 °C (0.0108 °F)	Entire Sensor Input Range
Pt 500	0.0045 °C (0.0081 °F)	Entire Sensor Input Range
Pt 1000	0.0045 °C (0.0081 °F)	Entire Sensor Input Range
Ni 120	0.0045 °C (0.0081 °F)	Entire Sensor Input Range
Cu 10	0.045 °C (0.081 °F)	Entire Sensor Input Range
Cu 50 (α = 426)	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Cu 50 (α = 428)	0.009 °C (0.0162 °F)	Entire Sensor Input Range
Cu 100 (α = 426)	0.0045 °C (0.0081 °F)	Entire Sensor Input Range
Cu 100 (α = 428)	0.0045 °C (0.0081 °F)	Entire Sensor Input Range
Thermocouples		
Type B	0.021 °C	R ≥ 1000°C
	0.048 °C – (0.00375% of (R – 300))	300 °C ≤ R < 1000 °C
	0.081 °C – (0.0165% of (R – 100))	100 °C ≤ R< 300 °C
Type E	0.0075 °C +(0.000645% of R)	All
Type J	0.0081 °C +(0.000435%of R)	R ≥ 0 °C
	0.0081 °C + (0.00375% of absolute value R)	R < 0 °C
Type K	0.0092 °C +(0.00081% of R)	R ≥ 0 °C
	0.0092 °C + (0.00375% of absolute value R)	R < 0 °C
Type N	0.0102 °C +(0.00054% of R)	All
Type R, S, W5Re/W26Re	0.024 °C	R ≥ 200°C
	0.0345 °C – (0.0108% of R)	R < 200 °C
Type T	0.0096 °C	R ≥ 0 °C
	0.0096 °C +(0.00645% of absolute value R)	R < 0 °C
GOST L	0.0105 °C	R ≥ 0 °C
	0.00105°C + (0.0045% of absolute value R)	R < 0 °C
DIN Type L	0.0081 °C + (0.000435% of R)	R ≥ 0 °C
	0.0081 °C +(0.00375% of absolute value R)	R < 0 °C
DIN Type U	0.0096 °C	R ≥ 0 °C
	0.0096 °C +(0.00645% of absolute value R)	R < 0 °C
Millivolt Input	0.0008 mV	Entire Sensor Input Range
2-, 3-, 4-wire Ohm	0.0126 Ω	Entire Sensor Input Range

(1) 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 85 °C (–40 and 185 °F). In order to maintain excellent accuracy performance, each transmitter is individually characterized over this ambient temperature range at the factory.

Temperature Effects Example

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

- Digital Temperature Effects: 0.0045 °C x (30 - 20) = 0.045 °C
- Worst Case Error: Digital + Digital Temperature Effects = 0.225 °C + 0.045 °C = 0.27 °C
- Total Probable Error: $\sqrt{0.225^2 + 0.045^2} = 0.23$

Product Certifications

Approved Manufacturing Locations

Rosemount Inc. – Chanhassen, Minnesota, USA
Emerson Process Management GmbH & Co. - Karlstein, Germany
Emerson Process Management Asia Pacific Private Limited - Singapore

European Union Directive Information

The current Declaration of Conformity is located at the end of this document. The most recent revision of the European Union Declaration of Conformity can be found at www.emersonprocess.com.

ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

Electro Magnetic Compatibility (EMC) (2004/108/EC)

Emerson Process Management complies with EMC Directive.

Radio and Telecommunications Terminal Equipment Directive (R&TTE)(1999/5/EC)

Emerson Process Management complies with the R&TTE Directive.

Telecommunication Compliance

All wireless devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. Emerson is working with governmental agencies around the world to supply fully compliant products and remove the risk of violating country directives or laws governing wireless device usage.

FCC and IC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation.

This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

Ordinary Location Certification for FM

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

Hazardous Locations Certificates

North American Certifications

Factory Mutual (FM) Approvals

I5 FM Intrinsically Safe, Non-incendive and Dust Ignition-proof
Certificate Number: 3027705
Intrinsically Safe for Class I/II/III, Division 1, Groups A, B, C, D, E, F, and G.
Zone Marking: Class I, Zone 0, AEx ia IIC
Temperature Codes: T4 (T_{amb} = -50 to 70 °C)
T5 (T_{amb} = -50 to 40 °C)
Non-incendive for Class I, Division 2, Groups A, B, C, and D.
Temperature Codes: T4 (T_{amb} = -50 to 70 °C)
T5 (T_{amb} = -50 to 40 °C)
Dust Ignition-Proof for Class II/III, Division 1, Groups E, F, and G.
Ambient temperature limits: -50 to 85 °C

Enclosure: Type 4X/IP66/IP67
Intrinsically Safe and Non-incendive when installed in accordance with Rosemount drawing 00648-1000.
For use with Rosemount Power Module P/N 753-9220-XXXX only.

N5 FM Non-incendive and Dust Ignition-proof
Certificate Number: 3027705
Non-incendive for Class I, Division 2, Groups A, B, C, and D.
Temperature Codes: T4 (T_{amb} = -50 to 70 °C)
T5 (T_{amb} = -50 to 40 °C)
Dust Ignition-proof for Class II/III, Division 1, Groups E, F, and G.
Ambient temperature limits: -50 to 85 °C

Enclosure: Type 4X/IP66/IP67
For use with Rosemount Power Module P/N 753-9220-XXXX only.

Canadian Standards Association (CSA)

I6 CSA Intrinsically Safe
Certificate Number: 1143113
Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D.
Temp Code T3C

Enclosure: Type 4X/IP66/IP67
Intrinsically Safe when installed per Rosemount drawing 00648-1020.
For use with Rosemount Power Module P/N 753-9220-XXXX only.

European Certifications

I1 ATEX Intrinsic Safety
Certificate Number: Baseefa07ATEX0011 ⟨Ex⟩ II 1G
Ex ia IIC T4 (T_{amb} = -60 °C to 70 °C)
Ex ia IIC T5 (T_{amb} = -60 °C to 40 °C)
Enclosure: IP66/IP67
CE 1180

TABLE 3. Sensor Parameters

Sensor
U_o = 6.6 V
I_o = 26.2 mA
P_o = 42.6 mW
C_o = 23.8 uF
L_o = 25 mH

Intrinsically Safe when installed per Rosemount drawing 00648-1025.
For use with Rosemount Power Module P/N 753-9220-XXXX only.

Special Conditions for Safe Use

The surface resistivity of the antenna is greater than one gigaohm. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth.

International Certifications

I7 IECEx Intrinsic Safety
Certificate Number: IECEx BAS 07.0007
Ex ia IIC T4 (T_{amb} = -60 °C to 70 °C)
Ex ia IIC T5 (T_{amb} = -60 °C to 40 °C)
Enclosure: IP66/IP67

TABLE 4. Sensor Parameters

Sensor
U_o = 6.6 V
I_o = 26.2 mA
P_o = 42.6 mW
C_o = 23.8 uF
L_o = 25 mH

Intrinsically Safe when installed per Rosemount drawing 00648-1025.
For use with Rosemount Power Module P/N 753-9220-XXXX only.

Special Conditions for Safe Use

The surface resistivity of the antenna is greater than one gigaohm. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth.

Japanese Certifications

I4 TIIS Intrinsic Safety
Certificate Number: TC18638
Ex ia IIC T4 (T_{amb} = -20 °C to 60 °C)
Various configurations available. Consult factory for certified assemblies.

China (NEPSI) Certifications

I3 China Intrinsic Safety
Certificate Number: GYJ071412
Ex ia IIC T4/T5

Special Conditions for Safe Use:

1. The temperature class depends on ambient temperature range as following:

Temperature Class	Ambient Temperature Range
T4	(-55 to 70) °C
T5	(-55 to 40) °C

2. Safety Parameters:

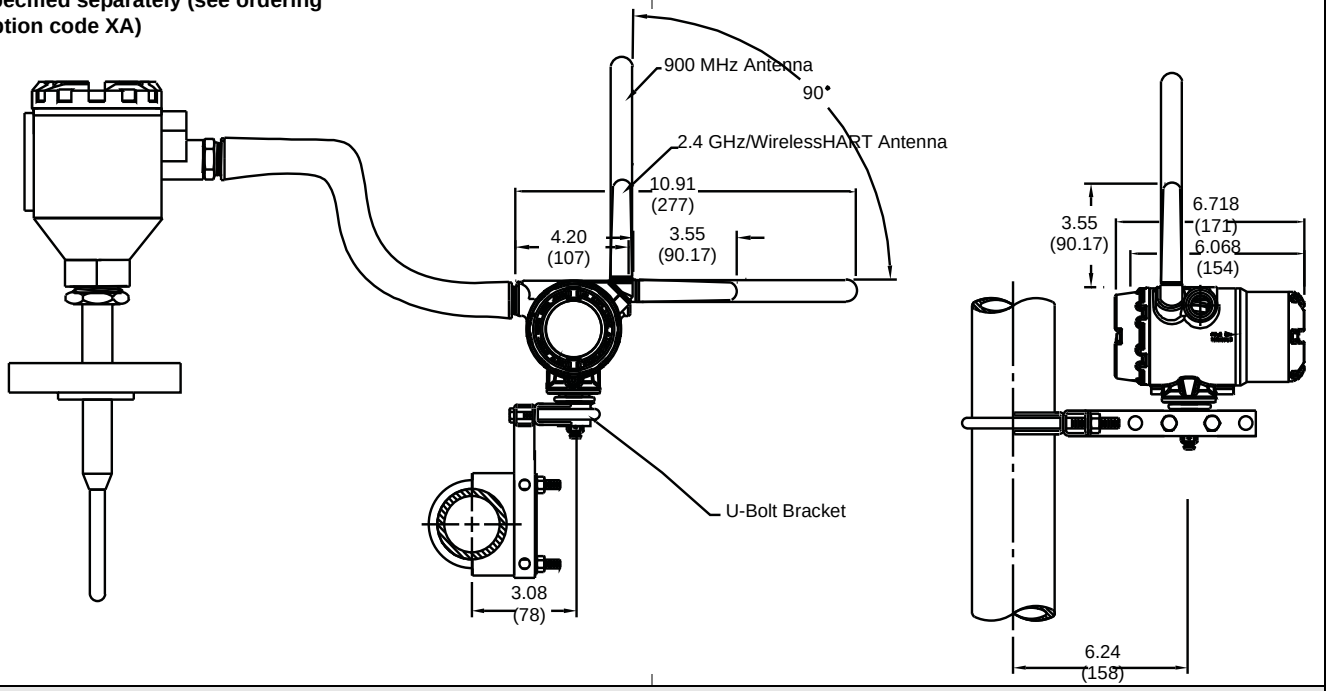
   U_o = 6.6 V
   I_o = 26 mA
   P_o = 42.6 mW
   C_o = 11 uF
   L_o = 25 uH

3. The cable entry of wireless temperature transmitter should be protected to ensure the degree of protection of the enclosure IP 20 (GB4208-1993) at least,
4. Associated apparatus should be installed in a safe location, and during installation, operation and maintenance, the regulations of the instruction manual have to be strictly observed.
5. End users are not permitted to change any components insides.
6. During installation, use, and maintenance of the wireless temperature transmitter, observe the following standards:
   a. GB3836.13-1997 “Electrical apparatus for explosive gas atmospheres Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres”
   b. GB3836.15-2000 “Electrical apparatus for explosive gas atmospheres Part 15: Electrical installations in hazardous area (other than mines)”
   c. GB3836.16-2006 “Electrical apparatus for explosive gas atmospheres Part 16: Inspection and maintenance of electrical installation (other than mines)”
   d. GB50257-1996 “Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering”

Dimensional Drawings

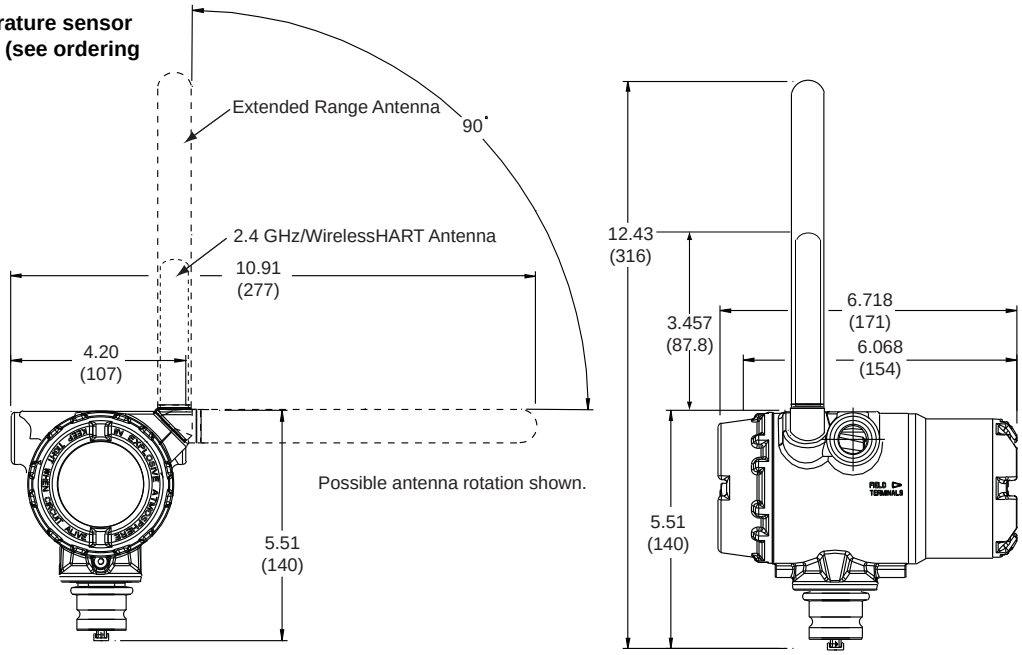
648 Remote Mount

Remote mount temperature sensor specified separately (see ordering option code XA)



648 Direct Mount

Direct mount temperature sensor specified separately (see ordering option code XA)



Dimensions are in inches (millimeters)

Ordering Information

TABLE 5. Rosemount 648 Temperature Transmitter

★ 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		
648	Temperature Transmitter		
Transmitter Type			
Standard			**Standard**
D	Wireless Field Mount		★
Transmitter Output			
Standard			**Standard**
X	Wireless		★
Measurement Configuration			
1	Single-Sensor Input		★
Housing Style		**Material**	
Standard			**Standard**
D	Dual Compartment Housing	Aluminum	★
E	Dual Compartment Housing	SST	★
Conduit Entry Size			
Standard			**Standard**
1	1/2-14 NPT		★
Product Certifications			
Standard			**Standard**
NA	No Approval		★
I5	FM Intrinsically Safe, Non-incendive, and Dust Ignition-proof		★
N5	FM Nonincendive and Dust Ignition-proof		★
I6	CSA Intrinsically Safe		★
I1	ATEX Intrinsic Safety		★
I7	IECEx Intrinsic Safety		★
I4	TIIS Intrinsic Safety		★
I3	China Intrinsic Safety		★

Wireless Options (Include with selected model number)

Wireless Update Rate, Operating Frequency and Protocol		
Standard		**Standard**
WA3	User Configurable Update Rate, 2.4 GHz DSSS, Wireless HART™	★
Omnidirectional Wireless Antenna and SmartPower™		
Standard		**Standard**
WK1	Long range, Integral Antenna, Power Module Adapter, Intrinsically Safe (Power Module separate)	★
WM1	Extended range, Integral Antenna, Power Module Adapter, Intrinsically Safe (Power Module separate)	★
	NOTE: Long Life Power Module must be shipped separately, order Part #00753-9220-0001.	
Display		
Standard		**Standard**
M5	LCD Display	★
Software Configuration		
Standard		**Standard**
C1	Custom Configuration of Date, Descriptor, Message and Wireless Paramaters (Requires CDS with order)	★
Line Filter		
Standard		**Standard**
F5	50 Hz Line Voltage Filter	★
F6	60 Hz Line Voltage Filter	★
Sensor Trim		
Standard		**Standard**
C2	Transmitter-Sensor Matching - Trim to Specific Rosemount RTD Calibration Schedule (CVD Constants)	★

TABLE 5. Rosemount 648 Temperature Transmitter

★ 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.

5-Point Calibration		
Standard		**Standard**
C4	5-Point Calibration (Requires Q4 option code to generate a Calibration Certificate)	★
Calibration Certificate		
Standard		**Standard**
Q4	Calibration Certificate (3-Point Calibration with Certificate)	★
Cable Gland Option		
Standard		**Standard**
G2	Cable Gland (7.5 mm - 11.9 mm)	★
G4	Thin Wire Cable Gland (3 mm - 8 mm)	★
Assemble To Options		
Standard		**Standard**
XA	Sensor Specified Separately and Assembled to Transmitter	★
Typical Model Number: 648 D X 1 D 1 NA WA 3 WK 1 M5 C1 F6		

Emerson Process Management
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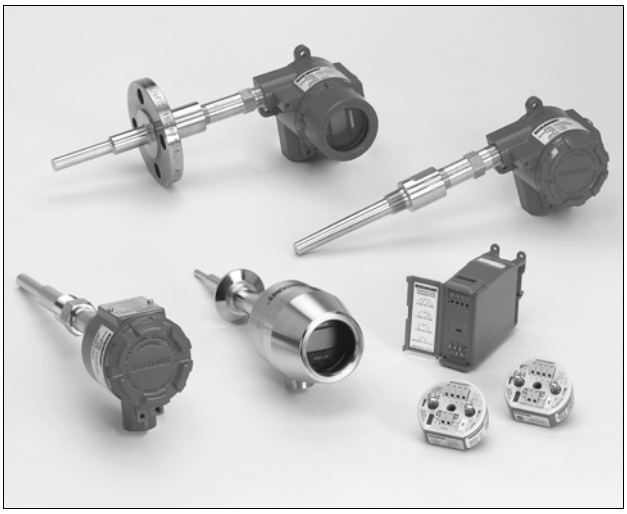
EMERSON™
Process Management

Product Data Sheet
00813-0100-4728, Rev NA
April 2010

Rosemount 644 Temperature Transmitter

- *Communicates easily using either 4-20 mA/HART® or FOUNDATION™ fieldbus protocol*
- *Meets NAMUR NE 21 recommendation ensuring reliable transmitter performance for head mount products*
- *The Transmitter-Sensor Matching feature improves temperature measurement accuracy by up to 75% when compared to unmatched assemblies*
- *The integral LCD Display conveniently displays the primary sensor input, and diagnostics of the transmitter*
- *An installation-ready solution that provides a variety of mounting options, transmitter configurations, and sensors/thermowells*



Contents

High Accuracy and Reliability for Control Applications

The Rosemount 644 temperature transmitter is ideal for critical applications (in many types of process environments). It provides reliability with advanced accuracy for all installations.

The Rosemount 644 can be ordered with either 4–20 mA/*HART* or a completely digital *FOUNDATION* fieldbus protocol. Each unit can be configured for a variety of sensor inputs: RTD, thermocouple, millivolt, or ohm.

DIGITAL FIELD DEVICES THAT POWER PLANTWEB

The advanced 644 powers *PlantWeb*® by communicating important temperature diagnostics and *PlantWeb* alerts to ensure process health and enable economical single-sensor architecture.

TRANSMITTER-SENSOR MATCHING

Entering the temperature-resistance profile specific to the RTD sensor into the 644 transmitter results in transmitter-sensor matching. This eliminates the sensor interchangeability error, which can improve accuracy by up to 75%.

INTEGRAL LCD DISPLAY

Local indication of temperature measurement and diagnostics provides immediate and accurate verification of process conditions.

RELIABLE TRANSMITTER PERFORMANCE

Meeting the NAMUR NE 21 recommendations, the 644 ensures top transmitter performance in harsh EMC environments. In addition, the 644 *HART* transmitter meets NAMUR NE 43 and NE 89 recommendations.

MOUNTING FLEXIBILITY

DIN A style head mount transmitters fits a variety of housings for remote transmitter mounting and can be integral or remote mounted to a sensor. The compact rail mount style is great for DIN rail mounting in the tight spaces of a crowded control room.

Rosemount Temperature Solutions

Rosemount 644 Temperature Transmitter
Head mount styles available with *HART* or *FOUNDATION* fieldbus protocol. Rail mount style available for *HART* protocol.

Rosemount 848T High Density Temperature Measurement Family
Rail mount 8-input style available with Foundation Fieldbus and a Fieldmount 4-input style available with Wireless HART protocol.

Rosemount 3420 Fieldbus Interface Module
Provides an interface between *FOUNDATION* fieldbus instruments and systems without fieldbus capability using standard interface protocols.

Rosemount 248 Temperature Transmitter
Head mount style (DIN B) and Rail mount style with *HART* protocol.

Rosemount 148 Temperature Transmitter
Head mount style (DIN B) PC-programmable transmitter.

Rosemount sensors, thermowells, and extensions
Rosemount has a broad offering of RTD and thermocouples that are designed to meet plant requirements.

Specifications

HART AND *FOUNDATION* FIELDBUS

Functional Specifications

Inputs

User-selectable; sensor terminals rated to 42.4 V dc. See “Accuracy” on page 7 for sensor options.

Output

Single 2-wire device with either 4–20 mA/*HART*, linear with temperature or input; or a completely digital output with *FOUNDATION* fieldbus communication (ITK 5.01 compliant).

Isolation

Input/output isolation tested to 500 V ac rms (707 V dc) at 50/60 Hz

Local Display

The optional five-digit integral LCD Display includes a floating or fixed decimal point. It can also display engineering units (°F, °C, °R, K, Ω, and millivolts), milliampere, and percent of span. The display can be configured to alternate between selected display options. Display settings are preconfigured at the factory according to the standard transmitter configuration. They can be reconfigured in the field using either *HART* or *FOUNDATION* fieldbus communications.

Humidity Limits

0–99% relative humidity

Update Time

≤ 0.5 seconds

Accuracy (default configuration) PT 100

HART (0-100 °C): ±0.18 °C

FOUNDATION Fieldbus: ±0.15 °C

Physical Specifications

Electrical Connections

Model	Power and Sensor Terminals
644H	Compression screws permanently fixed to terminal block
644R	Compression screw permanently fixed to front panel
WAGO® Spring clamp terminals are optional (option code G5)	

HART Communicator Connections

Communication Terminals	
644H	Clips permanently fixed to terminal block
644R	Clips permanently fixed to front panel

Materials of Construction

Electronics Housing and Terminal Block	
644H	*Noryl*® glass reinforced
644R	*Lexan*® polycarbonate
Enclosure (Option code J5 or J6)	
Housing	Low-copper aluminum
Paint	Polyurethane
Cover O-ring	Buna-N

Mounting

The 644R attaches directly to a wall or a DIN rail. The 644H installs in a connection head or universal head mounted directly on a sensor assembly, apart from a sensor assembly using a universal head, or to a DIN rail using an optional mounting clip.

Weight

Code	Options	Weight
644H	*HART*, Head Mount Transmitter	96 g (3.39 oz)
644H	*FOUNDATION* fieldbus, Head Mount Transmitter	92 g (3.25 oz)
644R	*HART*, Rail Mount Transmitter	174 g (6.14 oz)
M5	LCD Display	38 g (1.34 oz)
J5, J6	Universal Head, Standard Cover	577 g (20.35 oz)
J5, J6	Universal Head, Meter Cover	667 g (23.53 oz)

Enclosure Ratings (644H)

All option codes (S1, S2, S3, S4, J5, J6, J7, J8, R1, R2, R3 and R4) are NEMA 4X, IP66, and IP68. Option code J6 is CSA Enclosure Type 4X.

Performance Specifications

EMC (ElectroMagnetic Compatibility) NAMUR NE 21 Standard

The 644H *HART* meets the requirements for NAMUR NE 21 Rating. (Hardware Rev 26 and later for *HART* devices.)

Susceptibility	Parameter	Influence
		HART
ESD	• 6 kV contact discharge • 8 kV air discharge	None
Radiated	• 80 – 1000 MHz at 10 V/m AM	< 0.5%
Burst	• 1 kV for I.O.	None
Surge	• 0.5 kV line–line • 1 kV line–ground (I.O. tool)	None
Conducted	• 150 kHz to 80 MHz at 10 V	< 0.5%

CE Mark

The 644 meets all requirements listed under IEC 61326, 2006 and 61326-2-3.

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

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.

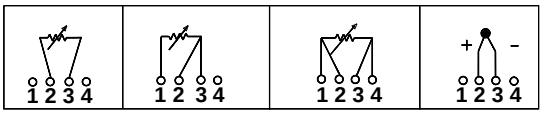
Vibration Effect

The 644 is tested to the following specifications with no effect on performance:

Frequency	Vibration
10 to 60 Hz	0.21 mm displacement
60 to 500 Hz	3 g peak acceleration

Sensor Connections

644 Sensor Connections Diagram



2-wire RTD and Ω | **3-wire RTD and Ω*** | **4-wire RTD and Ω** | **T/C and mV**

644-000B01A

* *Rosemount Inc. provides 4-wire sensors for all single element RTDs. You can use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.*

FOUNDATION FIELDBUS SPECIFICATIONS

Function Blocks

Resource Block

- The resource block contains physical transmitter information including available memory, manufacture identification, device type, software tag, and unique identification.

Transducer Block

- The transducer block contains the actual temperature measurement data, including sensor 1 and terminal temperature. It includes information about sensor type and configuration, engineering units, linearization, reranging, damping, temperature correction, and diagnostics.

LCD Block

- The LCD block is used to configure the local display, if a LCD Display is being used.

Analog Input (AI)

- Processes the measurement and makes it available on the fieldbus segment
- Allows filtering, alarming, and engineering unit changes.

PID Block

- The transmitter provides control functionality with one PID function block in the transmitter. The PID block can be used to perform single loop, cascade, or feedforward control in the field.

Block	Execution Time (milliseconds)
Resource	–
Transducer	–
LCD Block	–
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 detect a sensor burnout or a transmitter failure, the status of the measurement will be updated accordingly. Status may also send the PID output to a safe value.

Power Supply

Powered over *FOUNDATION* Fieldbus with standard fieldbus power supplies. The transmitter operates between 9.0 and 32.0 VDC, 12 mA maximum. The power terminals are rated to 42.4 VDC (max.).

Alarms

The AI function block allows the user to configure the alarms to HI-HI, HI, LO, or LO-LO with a variety of priority levels and hysteresis settings.

Backup Link Active Scheduler (LAS)

The transmitter is classified as a device link master, which means it can function as a Link Active Scheduler (LAS) if the current link master device fails or is removed from the segment.

The host or other configuration tool is used to download the schedule for the application to the link master device. In the absence of a primary link master, the transmitter will claim the LAS and provide permanent control for the H1 segment.

FOUNDATION Fieldbus Parameters

Schedule Entries	25
Links	16
Virtual Communications Relationships (VCR)	12

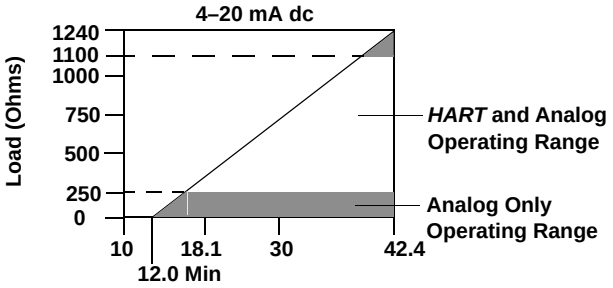
4–20 mA / *HART* SPECIFICATIONS

Power Supply

External power supply required. Transmitters operate on 12.0 to 42.4 V dc transmitter terminal voltage (with 250 ohm load, 18.1 V dc power supply voltage is required). Transmitter power terminals rated to 42.4 V dc.

Load Limitations

Maximum Load = 40.8 X (Supply Voltage - 12.0)(1)



(1) Without transient protection (optional).

NOTE
HART Communication requires a loop resistance between 250 and 1100 ohms. Do not communicate with the transmitter when power is below 12 V dc at the transmitter terminals.

Temperature Limits

	Operating Limit	Storage Limit
With LCD Display(1)	–4 to 185 °F –20 to 85 °C	–50 to 185 °F –45 to 85 °C
Without LCD Display	–40 to 185 °F –40 to 85 °C	–58 to 248 °F –50 to 120 °C

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

Hardware and Software Failure Mode

The 644 features software driven alarm diagnostics and an independent circuit which is designed to provide backup alarm output if the microprocessor software fails. The alarm direction (HI/LO) is user-selectable using the failure mode switch. If failure occurs, the position of the switch determines the direction in which the output is driven (HI or LO). The switch feeds into the digital-to-analog (D/A) converter, which drives the proper alarm output even if the microprocessor fails. The values at which the transmitter software drives its output in failure mode depends on whether it is configured to standard, custom, or NAMUR-compliant (NAMUR recommendation NE 43, June 1997) operation. Table 1 shows the configuration alarm ranges.

TABLE 1. Available Alarm Range(1)

	Standard	NAMUR- NE 43 Compliant
Linear Output:	$3.9 \leq I^{(2)} \leq 20.5$	$3.8 \leq I \leq 20.5$
Fail High:	$21.75 \leq I \leq 23$	$21.5 \leq I \leq 23$
Fail Low:	$3.5 \leq I \leq 3.75$	$3.5 \leq I \leq 3.6$

(1) Measured in milliamperes.

(2) I = Process Variable (current output).

Custom Alarm and Saturation Level

Custom factory configuration of alarm and saturation level is available with option code C1 for valid values. These values can also be configured in the field using a *HART* Communicator.

Turn-on Time

Performance within specifications in less than 5.0 seconds after power is applied, when damping value is set to 0 seconds.

Transient Protection

The Rosemount 470 prevents damage from transients induced by lightning, welding, or heavy electrical equipment. For more information, refer to the 470 Product Data Sheet (document number 00813-0100-4191).

Accuracy

TABLE 2. Rosemount 644 Input Options and Accuracy.

Sensor Options	Sensor Reference	Input Ranges		Recommended Min. Span[1]		Digital Accuracy[2]		D/A Accuracy[3]
2-, 3-, 4-wire RTDs		°C	°F	°C	°F	°C	°F	
Pt 100	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	10	18	± 0.15	± 0.27	±0.03% of span
Pt 100	JIS 1604, 1981 (α = 0.003916)	–200 to 645	–328 to 1193	10	18	± 0.15	± 0.27	±0.03% of span
Pt 200	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	10	18	± 0.27	± 0.49	±0.03% of span
Pt 500	IEC 751, 1995 (α = 0.00385)	–200 to 850	–328 to 1562	10	18	± 0.19	± 0.34	±0.03% of span
Pt 1000	IEC 751, 1995 (α = 0.00385)	–200 to 300	–328 to 572	10	18	± 0.19	± 0.34	±0.03% of span
Ni 120	Edison Curve No. 7	–70 to 300	–94 to 572	10	18	± 0.15	± 0.27	±0.03% of span
Cu 10	Edison Copper Winding No. 15	–50 to 250	–58 to 482	10	18	±1.40	± 2.52	±0.03% of span
Thermocouples[4]								
Type B[5]	NIST Monograph 175	100 to 1820	212 to 3308	25	45	± 0.77	± 1.39	±0.03% of span
Type E	NIST Monograph 175	–50 to 1000	–58 to 1832	25	45	± 0.20	± 0.36	±0.03% of span
Type J	NIST Monograph 175	–180 to 760	–292 to 1400	25	45	± 0.35	± 0.63	±0.03% of span
Type K[6]	NIST Monograph 175	–180 to 1372	–292 to 2502	25	45	± 0.50	± 0.90	±0.03% of span
Type N	NIST Monograph 175	–200 to 1300	–328 to 2372	25	45	± 0.50	± 0.90	±0.03% of span
Type R	NIST Monograph 175	0 to 1768	32 to 3214	25	45	± 0.75	± 1.35	±0.03% of span
Type S	NIST Monograph 175	0 to 1768	32 to 3214	25	45	± 0.70	± 1.26	±0.03% of span
Type T	NIST Monograph 175	–200 to 400	–328 to 752	25	45	± 0.35	± 0.63	±0.03% of span
DIN Type L	DIN 43710	–200 to 900	–328 to 1652	25	45	± 0.35	± 0.63	±0.03% of span
DIN Type U	DIN 43710	–200 to 600	–328 to 1112	25	45	± 0.35	± 0.63	±0.03% of span
Type W5Re/W26Re	ASTM E 988-96	0 to 2000	32 to 3632	25	45	± 0.70	± 1.26	±0.03% of span
Millivolt Input		–10 to 100 mV		3 mV		±0.015 mV		±0.03% of span
2-, 3-, 4-wire Ohm Input		0 to 2000 ohms		20 ohm		±0.45 ohm		±0.03% of span

(1) No minimum or maximum span restrictions within the input ranges. Recommended minimum span will hold noise within accuracy specification with damping at zero seconds.

(2) The published digital accuracy applies over the entire sensor input range. Digital output can be accessed by HART or FOUNDATION fieldbus Communications or Rosemount control system.

(3) Total Analog accuracy is the sum of digital and D/A accuracies. This is not applicable for FOUNDATION Fieldbus

(4) Total digital accuracy for thermocouple measurement: sum of digital accuracy +0.5 °C. (cold junction accuracy)

(5) Digital accuracy for NIST Type B T/C is ±3.0 °C (±5.4 °F) from 100 to 300 °C (212 to 572 °F).

(6) Digital accuracy for NIST Type K T/C is ±0.70 °C (±1.26 °F) from –180 to –90 °C (–292 to –130 °F).

Accuracy Example (*HART* devices)

When using a Pt 100 (α = 0.00385) sensor input with a 0 to 100 °C span:

- Digital accuracy = ±0.15 °C
- D/A accuracy = ±0.03% of 100 °C or ±0.03 °C
- Total accuracy = ±0.18 °C.

Accuracy Example (*Foundation* fieldbus devices)

When using a Pt 100 (α = 0.00385) sensor input:

- Total accuracy = ±0.15 °C.
- No D/A accuracy effects apply

Ambient Temperature Effect

TABLE 3. Ambient Temperature Effect

Sensor Options	Temperature Effects per 1.0 °C (1.8 °F) Change in Ambient Temperature[1]	Range	D/A Effect[2]
2-, 3-, 4-wire RTDs			
Pt 100 ((α = 0.00385)	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Pt 100 (α = 0.003916)	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Pt 200	0.004 °C (0.0072 °F)	Entire Sensor Input Range	0.001% of span
Pt 500	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Pt 1000	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Ni 120	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Cu 10	0.03 °C (0.054 °F)	Entire Sensor Input Range	0.001% of span
Thermocouples			
Type B	0.014 °C	R ≥ 1000°C	0.001% of span
	0.032 °C – (0.0025% of (R – 300))	300 °C ≤ R < 1000 °C	0.001% of span
	0.054 °C – (0.011% of (R – 100))	100 °C ≤ R< 300 °C	0.001% of span
Type E	0.005 °C +(0.00043% of R)	All	0.001% of span
Type J	0.0054 °C +(0.00029%of R)	R ≥ 0 °C	0.001% of span
	0.0054 °C + (0.0025% of absolute value R)	R < 0 °C	0.001% of span
Type K	0.0061 °C +(0.00054% of R)	R ≥ 0 °C	0.001% of span
	0.0061 °C + (0.0025% of absolute value R)	R < 0 °C	0.001% of span
Type N	0.0068 °C +(0.00036% of R)	All	0.001% of span
Type R, S, W5Re/W26Re	0.016 °C	R ≥ 200°C	0.001% of span
	0.023 °C – (0.0036% of R)	R < 200 °C	0.001% of span
Type T	0.0064 °C	R ≥ 0 °C	0.001% of span
	0.0064 °C +(0.0043% of absolute value R)	R < 0 °C	0.001% of span
DIN Type L	0.0054 °C + (0.00029% of R)	R ≥ 0 °C	0.001% of span
	0.0054 °C +(0.0025% of absolute value R)	R < 0 °C	0.001% of span
DIN Type U	0.0064 °C	R ≥ 0 °C	0.001% of span
	0.0064 °C +(0.0043% of absolute value R)	R < 0 °C	0.001% of span
Millivolt Input	0.0005 mV	Entire Sensor Input Range	0.001% of span
2-, 3-, 4-wire Ohm	0.0084 Ω	Entire Sensor Input Range	0.001% of span

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

(2) Does not apply to FOUNDATION Fieldbus.

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

Temperature Effects Example (*HART* devices)

When using a Pt 100 (α = 0.00385) sensor input with a 0–100 °C span at 30 °C ambient temperature:

- Digital Temperature Effects: 0.003 °C x (30 - 20) = 0.03 °C
- D/A Effects: [0.001% of 100] x (30 - 20) = 0.01 °C
- Worst Case Error: Digital + D/A + Digital Temperature Effects + D/A Effects = 0.15 °C + 0.03 °C + 0.03 °C + 0.01 °C = 0.22 °C
- Total Probable Error: $\sqrt{0.15^2 + 0.03^2 + 0.03^2 + 0.01^2} = 0.16°C$

Temperature Effects Examples (*Foundation* fieldbus devices)

When using a Pt 100 (α = 0.00385) sensor input at 30 °C span at 30 °C ambient temperature:

- Digital Temperature Effects: 0.003 °C x (30 - 20) = 0.03 °C
- D/A Effects: No D/A effects apply
- Worst Case Error: Digital + Digital Temperature Effects = 0.15 °C + 0.03 °C = 0.18 °C
- Total Probable Error: $\sqrt{0.15^2 + 0.03^2} = 0.153°C$

Product Certifications

ROSEMOUNT 644 WITH *FOUNDATION* FIELDBUS

Approved Manufacturing Locations

Emerson Process Management Rosemount Division. – Chanhassen, Minnesota, USA

Rosemount Temperature GmbH – Germany

Emerson Process Management Asia Pacific – Singapore

European Union Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales representative.

ATEX Directive (94/9/EC)

Rosemount Inc. complies with the ATEX Directive.

Electro Magnetic Compatibility (EMC) (89/336/EEC)

644H and 644R – EN 50081-1: 1992; EN 50082-2:1995; EN 61326-1:1997 +AI

Hazardous Locations Certificates

The product certifications for the Rosemount 644 with *FOUNDATION* fieldbus are pending. Consult the factory for additional information.

North American Certifications

Factory Mutual (FM) Approvals

I5 FM Intrinsic Safety
Intrinsically Safe (Entity) / FISCO for use in Class I, II, III, Division 1, Groups A, B, C, D, E, F, and G; when installed per control drawing 00644-2075.
Temperature Code: T4A (T_{amb} = – 50 °C to 40 °C).

Nonincendive for use in Class I, Division 2, Groups A, B, C, and D.
Temperature Code: T4 (T_{amb} = – 50 °C to 85 °C);
T5 (T_{amb} = – 50 °C to 70 °C)

E5 FM Explosion Proof
Explosion Proof for Class I, Division 1, Groups B, C, and D.
Dust Ignition Proof for Class II/III, Division 1, Groups E, F, G.
T5 (T_a = – 50 °C to 85 °C)
when installed per Rosemount drawing 00644-1049.
(J5 and J6 options only.)

Canadian Standards Association (CSA) Approvals

I6 CSA Intrinsic Safety
Intrinsically Safe and FISCO for Class I, Division 1, groups A, B, C, and D when connected per Rosemount drawing 00644-2076.

Temperature code: T4 (T_{amb} = – 50 °C to 60 °C);

Suitable for Class I, Division 2, groups A, B, C, and D (must be installed in a suitable enclosure)

Temperature Code: T4 (T_{amb} = – 50 °C to 60 °C);
T5 (T_{amb} = – 50 °C to 85°C)

K6 CSA Intrinsic Safety, Explosion-proof
Includes Intrinsically Safe "I6" and Explosion-Proof for Class I, Division 1, groups B, C, and D.
Dust-Ignition Proof for Class II, Division 1, Groups E, G, and G.
Dust-Ignition Proof for Class III, Division 1
Seal not required.
CSA Enclosure Type 4X

European Certifications

E1 ATEX Explosion-proof Approval
Certificate Number: KEMA99ATEX8715X
ATEX Marking: ⟨Ex⟩ II 2 G
CE 1180
Ex d IIC T6 (–40 °C ≤ T_{amb} ≤ 65 °C)
U_i = 55 Vdc

Special Conditions for Safe Use (X):
For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

I1 ATEX Intrinsic Safety
Certificate Number: Baseefa03ATEX0499X
ATEX Marking: ⟨Ex⟩ II 1 G
CE 1180
Ex ia IIC T4 (-50 °C ≤ T_{amb} ≤ 60 °C)

TABLE 4. Entity Parameters

I.S. Loop/Power Terminals
U_i = 30 V
I_i = 300 mA
P_i = 1.3 W
C_i = 2.1 nF
L_i = 0
FISCO Loop/Power Terminals
U_i = 17.5 V
I_i = 380 mA
P_i = 5.32 W
C_i = 2.1 nF
L_i = 0
Sensor Terminals
U_o = 13.9 V
I_o = 23 mA
P_o = 79 mW
C_i = 7.7 nF
L_i = 0

Special Conditions for Safe Use (X):
The apparatus must be installed in an enclosure which affords it a degree of protection of at least IP20. Non-metallic enclosures must have a surface resistance of less than 1GΩ, light alloy or zirconium enclosures must be protected from impact and friction when installed.

N1 ATEX Type n
Certificate Number: BAS00ATEX3145
ATEX Marking: ⟨Ex⟩ II 3 G
Ex n IIC T5 (-40 °C ≤ T_{amb} ≤ 70 °C)
U_i = 45 V

NC ATEX Type n Component
Certificate Number: BAS99ATEX3084U
ATEX Marking: ⟨Ex⟩ II 3 G
Ex n IIC T5 (-40 °C ≤ T_{amb} ≤ 70 °C)
U_i = 45 V

ND ATEX Dust Ignition-Proof
Certificate Number: KEMA99ATEX8715X
ATEX Marking: ⟨Ex⟩ II 1 D
T95°C (-40 °C ≤ T_{amb} ≤ 85 °C)
CE 1180
IP66

Special Conditions for Safe Use (X):
For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

IECEx Certifications

I7 IECEx Intrinsic Safety (FISCO)
Certificate Number: IECEx BAS 07.0053X
Ex ia IIC T4/T5/T6

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. 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.

N7 IECEx Type n
Certificate Number: IECEx BAS 07.0055
Ex nA nL IIC T5 (-40 °C ≤ T_a ≤ 70 °C)

NG IECEx Type n Component
Certificate Number: IECEx BAS 07.0054U
IECEx BAS 07.0054U
Ex nA nL IIC T5 (-40 °C ≤ T_{amb} ≤ 75 °C)

E7 IECEx Explosionproof (Flameproof)
Certificate No.: IECExKEM09.0015X
Ex d IIC T6 (-50 °C ≤ T_{amb} ≤ 65 °C)
Ex d IIC T5 (-50 °C ≤ T_{amb} ≤ 80 °C)
Vmax = 42.4V

Special Conditions for Safe Use (X):

1. A thermowell must be utilized on installations incorporating a DIN style or a spring loaded sensor assembly, with all threaded connections sealed with sealing tape to maintain the IP rating of IP66/IP68 (3 meters).
2. When a gland is utilized on installation, the gland must be IECEx certified and must be capable of maintaining the IP rating. This also requires the use of thread sealing tape on all gland entries.

Japanese Certifications

Japanese Industrial Standard (JIS) Approvals

I4 JIS Intrinsic Safety

E4 JIS Explosion Proof

TABLE 5. Certificate and Description

Certificate	Description	Approval Group	Temp Code
C15744	644H with meter and no sensor	Ex d II C	T6
C15745	644H without meter and no sensor	Ex d II C	T6
C15749	644H without meter and with RTD	Ex d II B	T4
C15750	644H without meter and with thermocouple	Ex d II B	T4
C15751	644H with meter and thermocouple	Ex d II B	T4
C15752	644H with meter and RTD	Ex d II B	T4
C15910	644H without meter and with thermocouple	Ex d II B + H2	T4
C15911	644H with meter and thermocouple	Ex d II B + H2	T4
C15912	644H without meter and with RTD	Ex d II B + H2	T4
C15913	644H with meter and RTD	Ex d II B + H2	T4

Combination Approvals

K5 Combination of I5 and E5.

Russian GOST Certifications

PPC BA-13006:

0 Ex ia IIC T4/T5/T6

Kazakhstan GOST

Pattern approval Certificate for Measuring Instruments

See Certificate

Ukraine GOST

Pattern Approval for Measuring Instruments

See Certificate

ROSEMOUNT 644 WITH *HART*

Approved Manufacturing Locations

Emerson Process Management Rosemount Division. – Chanhassen, Minnesota, USA

Rosemount Temperature GmbH – Germany

Emerson Process Management Asia Pacific – Singapore

European Union Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales representative.

ATEX Directive (94/9/EC)

Rosemount Inc. complies with the ATEX Directive.

Electro Magnetic Compatibility (EMC) (89/336/EEC)

644H and 644R – EN 50081-1: 1992; EN 50082-2:1995; EN 61326-1:1997 +AI

Hazardous Locations Certificates

North American Certifications

Factory Mutual (FM) Approvals

I5 FM Intrinsic Safety and Non-incendive
Intrinsically Safe for Class I/II/III, Division 1, Groups A, B, C, D, E, F, and G.
Non-incendive for Class I, Division 2, Groups A, B, C, and D.
Intrinsically Safe and non-incendive when installed in accordance with Rosemount drawing 00644-0009.

TABLE 6. Temperature Code

Pi	Temperature Code
0.67 W	T5 (T_{amb} = – 50 °C to 50 °C)
0.67 W	T6 (T_{amb} = – 50 °C to 40 °C)
1.0 W	T4 (T_{amb} = – 50 °C to 80 °C)
1.0 W	T5 (T_{amb} = – 50 °C to 40 °C)

E5 FM Explosion-Proof and Non-incendive
Explosion-Proof for Class I, Division 1, Groups B, C, and D.
Dust Ignition Proof for Class II/III, Division 1, Groups E, F, G when installed per Rosemount Drawing 00644-1049.
Non-incendive for Class 1, Division 2, Groups A, B, C, and D.
Temperature Code: T5 (T_{amb}= –50°C to 85°C)
Conduit seal not required for compliance with NEC501–5a(1).

NOTE
Approval E5 is only available with 644H option codes J5 and J6.

K5 Combination of I5 and E5.

NOTE
K5 is only available with 644H option code J6.

Canadian Standards Association (CSA) Approvals

I6 CSA Intrinsic Safety
Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D when installed in accordance with Rosemount drawing 00644–1064.

TABLE 7. Temperature Code

Pi	Temperature Code
0.67 W	T6 (T_{amb} = – 50 °C to 40 °C)
0.67 W	T5 (T_{amb} = – 50 °C to 60 °C)
1.0 W	T4 (T_{amb} = – 50 °C to 80 °C)

K6 CSA Intrinsic Safety, Explosion–Proof, and Non-incendive
Combination of I6 and Explosion–proof for Class I, Division 1, Groups B, C, and D; Dust-ignition proof for Class II, Division 1, Groups E, F, and G; Class III, Division 1 hazardous locations, when installed in accordance with Rosemount drawing 00644–1059.
Suitable for Class I, Division 2, Groups B, C, and D when installed in a suitable enclosure.
Temperature Code: Ambient Limits –50°C to 85°C.

NOTE
K6 is only available with 644H option code J6.

European Certifications

I1 ATEX Intrinsic Safety
Certificate Number: BAS00ATEX1033X
ATEX Marking: ⟨Ex⟩ II 1 G Ex ia IIC T4/T5/T6
CE 1180

TABLE 8. Temperature Code

Pi	Temperature Code
0.67 W	T6 (– 60 °C ≤ T_{amb} ≤ 40 °C)
0.67 W	T5 (– 60 °C ≤ T_{amb} ≤ 50 °C)
1.0 W	T5 (– 60 °C ≤ T_{amb} ≤ 40 °C)
1.0 W	T4 (– 60 °C ≤ T_{amb} ≤ 80 °C)

TABLE 9. Entity Parameters

Loop/Power	Sensor
U_i = 30 V	U_o = 13.6 V
I_i = 200 mA	I_o = 80 mA
P_i = 0.67 W or 1.0 W	P_o = 80 mW
C_i = 10 nF	C_i = 75 nF
L_i = 0	L_i = 0

Special Conditions for Safe Use (X):
The transmitter must be installed so that its external terminals and communication pins are protected to at least IP20.
Non-metallic enclosures must have a surface resistance of less than 1GΩ. Light alloy or zirconium enclosures must be protected from impact and friction when installed.

E1 ATEX Flame-Proof
Certificate Number: KEMA99ATEX8715X
ATEX Marking: ⟨Ex⟩ II 2 G Ex d IIC T6
CE 1180
Temperature Code: T6 (–40°C ≤ T_{amb} ≤ 65°C)
Max Input Voltage: U_i = 55Vdc

Special Conditions for Safe Use (X):
For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

N1 ATEX Type n
Certificate Number: BAS00ATEX3145
ATEX Marking: ⟨Ex⟩ II 3 G EEx nL IIC T5
Temperature Code: T5 (–40°C ≤ T_{amb} ≤ 70°C)
Max Input Voltage: U_i=45Vdc

NC ATEX Type n Component
Certificate Number: BAS99ATEX3084U
ATEX Marking: ⟨Ex⟩ II 3 G EEx nL IIC T5
Temperature Code: T5 (–40°C ≤ T_{amb} ≤ 70°C)
Max Input Voltage: U_i=45Vdc

NOTE
The equipment must be installed in an enclosure meeting the requirements of IP54 and the requirements of the impact tests described in EN50021.

ND ATEX Dust Ignition-Proof
Certificate Number: KEMA99ATEX8715X
ATEX Marking: II 1 D
T95 C (-40 C = T_{amb} = +85 C
IP 66

IECEx Certifications

I7 IECEx Intrinsic Safety (FISCO)
Certificate Number: IECEx BAS 07.0053X
Ex ia IIC T4/T5/T6

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. 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.

E7 IECEx Explosionproof (Flameproof)
Certificate No.: IECExKEM09.0015X
Ex d IIC T6 (-50 °C ≤ T_{amb} ≤ 65 °C)
Ex d IIC T5 (-50 °C ≤ T_{amb} ≤ 80 °C)
Vmax = 42.4V

Special Conditions for Safe Use (X):

1. A thermowell must be utilized on installations incorporating a DIN style or a spring loaded sensor assembly, with all threaded connections sealed with sealing tape to maintain the IP rating of IP66/IP68 (3 meters).
2. When a gland is utilized on installation, the gland must be IECEx certified and must be capable of maintaining the IP rating. This also requires the use of thread sealing tape on all gland entries.

N7 IECEx Type n
Certificate Number: IECEx BAS 07.0055
Ex nA nL IIC T5 (-40 °C ≤ T_a ≤ 70 °C)

NG IECEx Type n Component
Certificate Number: IECEx BAS 07.0054U
IECEx BAS 07.0054U
Ex nA nL IIC T5 (-40 °C ≤ T_{amb} ≤ 75 °C);

Brazilian Certifications

Centro de Pesquisas de Energia Eletrica (CEPEL) Approval

I2 CEPEL Intrinsic Safety. Not available, consult factory

Russian Certifications

Gostandart

Tested and approved by the Russian Metrological Institute GOSTANDART.

Japanese Certifications

Japanese Industrial Standard (JIS) Approvals

E4 JIS Explosion-Proof

TABLE 10. Certificate and Description

Certificate	Description	Approval Group	Temp Code
C15744	644H with meter and no sensor	Ex d II C	T6
C15745	644H without meter and no sensor	Ex d II C	T6
C15749	644H without meter and with RTD	Ex d II B	T4
C15750	644H without meter and with thermocouple	Ex d II B	T4
C15751	644H with meter and thermocouple	Ex d II B	T4
C15752	644H with meter and RTD	Ex d II B	T4
C15910	644H without meter and with thermocouple	Ex d II B + H2	T4
C15911	644H with meter and thermocouple	Ex d II B + H2	T4
C15912	644H without meter and with RTD	Ex d II B + H2	T4
C15913	644H with meter and RTD	Ex d II B + H2	T4

NOTE
Explosion Proof certification is only available as a complete assembly with Rosemount universal head – option codes J5, J6, J7 and J8.

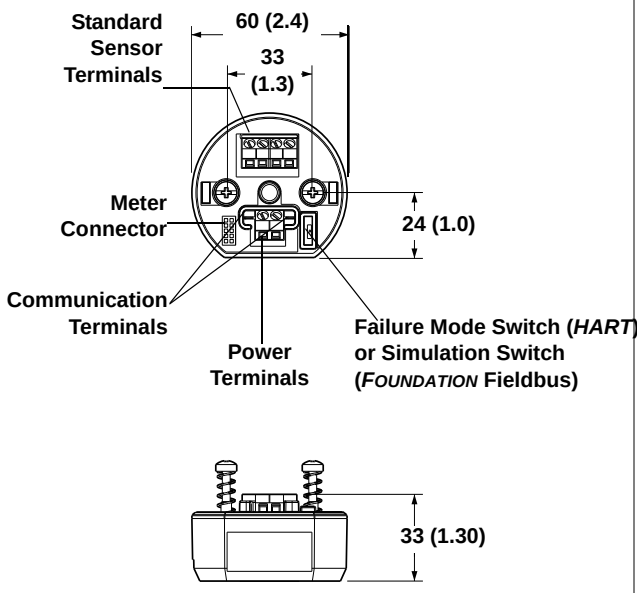
Slovak Republic Certification

Ex ia IIC T4 & T5
See Intrinsic Safety Certificate

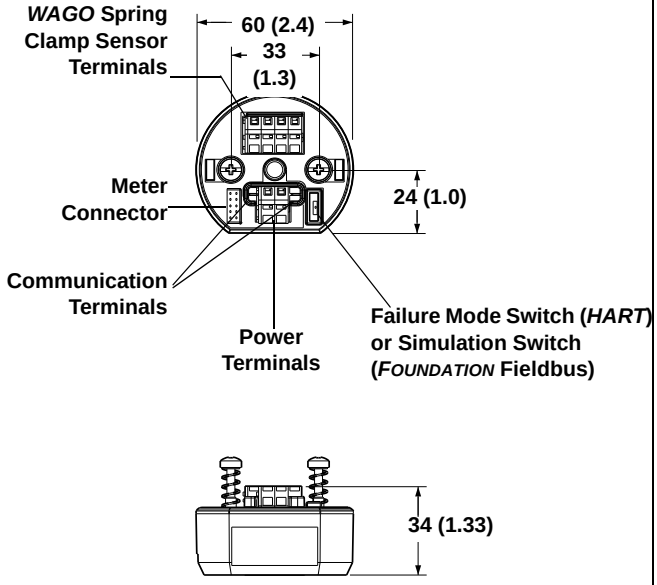
Dimensional Drawings

644H (DIN A Head Mount)

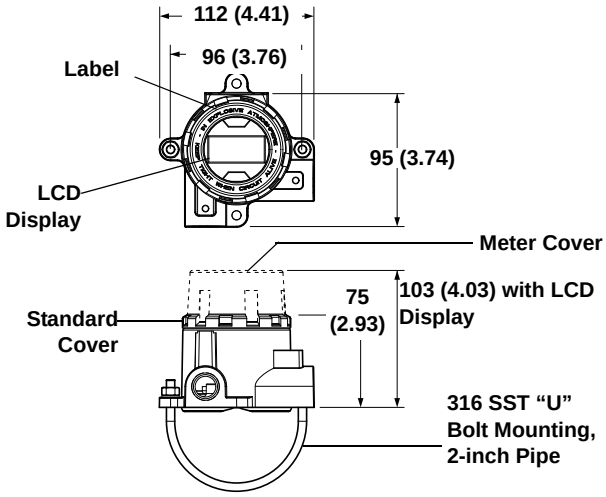
Shown with Standard Compression Screw Terminals



Shown with WAGO® Spring Clamp Terminals

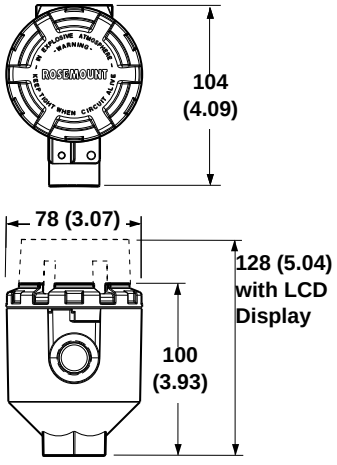


Threaded-Sensor Universal Head (Option code J5, J6, J7 or J8)



Note: A "U" Bolt is shipped with each universal head unless assembly option XA is ordered. Since the head is integrally mounted to the sensor, it may not need to be used.

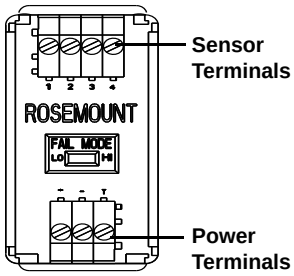
Integral DIN Style Sensor Connection Head

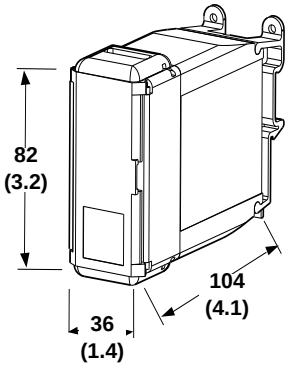


Note: If ordering the transmitter with a DIN style sensor, it is recommended that the enclosure be ordered within the Sensor Model (Product Data Sheet doc # 00813-0200-2654) rather than within the transmitter model, this is in order to drive necessary parts.

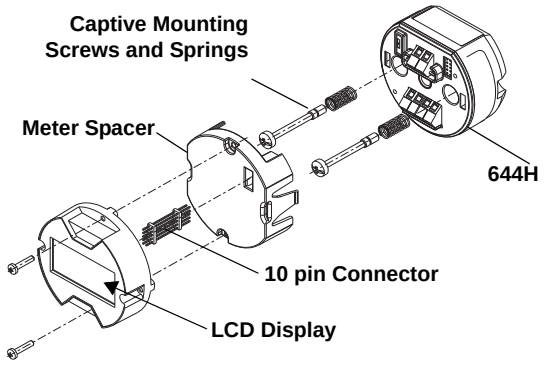
Dimensions are in millimeters (inches)

644 Rail Mount
HART Protocol Only



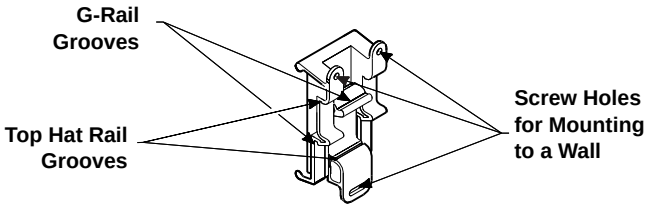


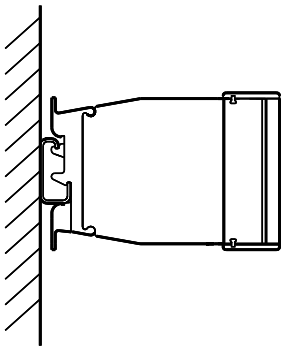
LCD Display
Head Mount Transmitter

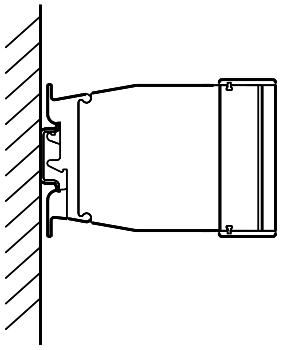


Mounting

Universal Clip for Mounting to a Wall or a Rail
(part number 03044-4103-0001)

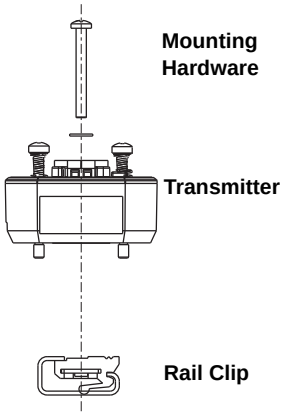




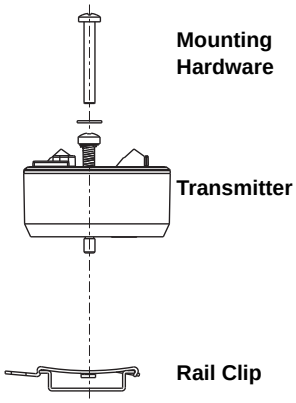


Head Mount

G-Rail (asymmetric)

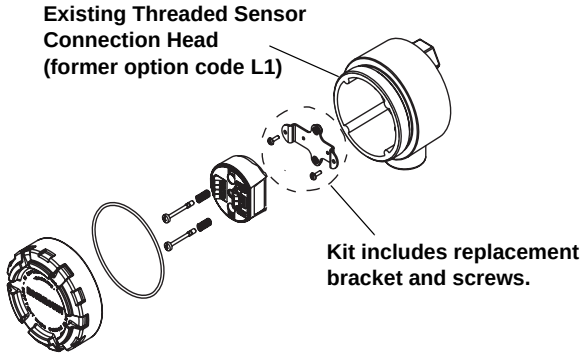


Top Hat Rail (symmetric)



Note: Kit (part number 00644-5301-0010) includes mounting hardware and both types of rail kits.

644H Retrofit Kit



Note: Kit (part number 00644-5321-0010) includes a new mounting bracket and the hardware necessary to facilitate the installation.

Ordering Information

TABLE 11. Rosemount 644 Smart Temperature Transmitter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.
The Expanded offering is manufactured after receipt of order and is subject to additional delivery lead time.

● = Available
– = Not Available

Model	Product Description							
644	Smart Temperature Transmitter							
Transmitter Type								
Standard								**Standard**
H	Head Mount (suitable for mounting in the field with enclosure options below)							★
R	Rail Mount							★
Output		**Head**			**Rail**			
Standard								**Standard**
A	4–20 mA with Digital Signal based on *HART* protocol	●			●			★
F	*Foundation* fieldbus digital signal (includes 2 AI function blocks and Backup Link Active Scheduler)	●			–			★
W	Profibus PA digital signal	●			–			★
Product Certifications								
Hazardous Locations Certificates (consult factory for availability)		**A**	**F**	**W**	**A**	**F**	**W**	
Standard								**Standard**
E5(1)	FM Explosion–Proof	●	●	●	–	–	–	★
I5(2)	FM Intrinsic Safety (includes standard I.S. and FISCO for Fieldbus units)	●	●	●	●	–	–	★
K5(2)	FM Intrinsic Safety and Explosion–Proof combination (includes standard I.S. and FISCO for Fieldbus units)	●	●	●	–	–	–	★
KC	FM/CSA Intrinsic Safety and Non-incendive Approval	●	●	●	–	–	–	★
I6(2)	CSA Intrinsic Safety (includes standard I.S. and FISCO for Fieldbus units)	●	●	●	–	–	–	★
K6(1)(3)	CSA Intrinsic Safety and Explosion–Proof combination (includes standard I.S. and FISCO for Fieldbus units)	●	●	●	–	–	–	★
I3	NEPSI Intrinsic Safety	●	●	●	–	–	–	★
E3	NEPSI Flame-Proof	●	●	●	–	–	–	★
E1(1)	ATEX Flame–Proof	●	●	●	–	–	–	★
N1(1)	ATEX Type n	●	●	●	–	–	–	★
NC	ATEX Type n Component	●	●	●	●	–	–	★
ND(1)	ATEX Dust Ignition–Proof	●	●	●	–	–	–	★
I1(2)	ATEX Intrinsic Safety (includes standard I.S. and FISCO for Fieldbus units)	●	●	●	●	–	–	★
E7(1)	SAA Flame–Proof	●	●	●	–	–	–	★
I7(3)(2)	IECEx Intrinsic Safety (includes standard I.S. and FISCO for Fieldbus units)	●	●	●	●	–	–	★
N7(1)(3)	IECEx Type n	●	●	●	–	–	–	★
NG	IECEx Type n Component	●	●	●	●	–	–	★
E4(1)(3)	TIIS Explosion–Proof	●	●	●	●	–	–	★
E2	INMETRO Flameproof	●	●	●	–	–	–	★
NA	No approval	●	●	●	●	–	–	★
OPTIONS		**A**	**F**	**W**	**A**	**F**	**W**	
Plant Web Software Functionality								
Standard								**Standard**
A01	Regulatory Control Suite – 1 PID Block	–	●	–	–	–	–	★
Assembly								
Standard								**Standard**
XA	Sensor specified separately and assembled to transmitter	●	●	●	–	–	–	★

TABLE 11. Rosemount 644 Smart Temperature Transmitter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.
The Expanded offering is manufactured after receipt of order and is subject to additional delivery lead time.

● = Available
– = Not Available

		Head			Rail			
		A	F	W	A	F	W	
Enclosure								
Standard								**Standard**
J5[4][5]	Universal Head (junction box), aluminum alloy with 50.8 mm (2-in.) SST pipe bracket (M20 entries)	●	●	●	–	–	–	★
J6[3]	Universal Head (junction box), aluminum alloy with 50.8 mm (2-in.) SST pipe bracket ($^1/_2$–14 NPT entries)	●	●	●	–	–	–	★
J7[3][5]	Universal Head (junction box), cast SST with 50.8 mm (2-in.) SST pipe bracket (M20 entries)	●	●	●	–	–	–	★
J8[3]	Universal Head (junction box), cast SST with 50.8 mm (2-in.) SST pipe bracket ($^1/_2$–14 NPT entries)	●	●	●	–	–	–	★
Expanded								
S1	Connection Head, Polished Stainless Steel ($^1/_2$–14 NPT entries)	●	●	●	–	–	–	
S2	Connection Head, Polished Stainless Steel ($^1/_2$–14 NPSM entries)	●	●	●	–	–	–	
S3	Connection Head, Polished Stainless Steel (M20 x 1.5 conduit and entries)	●	●	●	–	–	–	
S4	Connection Head, Polished Stainless Steel (M20 x 1.5 conduit entries, M24 x 1.5 head entry)	●	●	●	–	–	–	
Local Display (644H only)								
Standard								**Standard**
M5	LCD Display	●	●	●	–	–	–	★
Expanded								
M6	LCD Display with Polycarbonate Meter Face	●	●	●	–	–	–	
Configuration								
Standard								**Standard**
C1	Factory configuration date, descriptor, and message fields (CDS, document number 00806-0100-4728 required).	●	●	●	●	–	–	★
Analog Output								
Standard								**Standard**
A1	Analog output levels compliant with NAMUR-recommendations NE 43: June 1997: high alarm configuration	●	–	–	●	–	–	★
CN	Analog output levels compliant with NAMUR-recommendations NE 43: June 1997: low alarm configuration	●	–	–	●	–	–	★
C8	Low Alarm (standard Rosemount alarm and saturation values)	●	–	–	●	–	–	★
Filter								
Standard								**Standard**
F6	60 Hz line voltage filter	●	●	●	●	–	–	★
Trim								
Standard								**Standard**
C2	Transmitter-sensor matching, trim to specific Rosemount RTD calibration schedule (CVD constants)	●	●	●	●	–	–	★
Calibration Option								
Standard								**Standard**
C4	5-point calibration. *Use option code Q4 to generate a calibration certificate*	●	●	●	●	–	–	★
Q4	Calibration certificate. *3-Point calibration with certificate*	●	●	●	●	–	–	★

TABLE 11. Rosemount 644 Smart Temperature Transmitter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.
The Expanded offering is manufactured after receipt of order and is subject to additional delivery lead time.

● = Available
– = Not Available

		Head			Rail			
		A	**F**	**W**	**A**	**F**	**W**	
Accessory Options								
Standard								**Standard**
G1	External ground lug assembly(6) (see “External Ground Screw Assembly” on page 19)	●	●	●	–	–	–	★
G2	Cable gland(7), EEx d, Brass, 7.5 mm - 11.99 mm	●	●	●	–	–	–	★
G7	Cable gland, M20x1.5, EEx e, Blue, Polyamide, Diam 5-9mm	●	●	●	–	–	–	★
G3	Cover chain. *Only available with enclosure option codes J5 or J6. Not available with LCD Display option code M5.*	●	●	●	–	–	–	★
G5	*WAGO* spring clamp terminals	●	●	●	–	–	–	★
Interlinkbt Connector								
Standard								**Standard**
GE(8)	Eurofast® Interlinkbt Connector	●	●	●	–	–	–	★
GM(8)	Minifast® Interlinkbt Connector	●	●	●	–	–	–	★
External Label								
Standard								**Standard**
EL	External label for ATEX Intrinsic Safety	●	●	●	–	–	–	★
Typical Rail Mount Model Number: 644 R A I5 **Typical Head Mount Model Number: 644 H F I5 A01**								

(1) Requires enclosure option J5, J6, J7 or J8.

(2) When IS approval is ordered on a Foundation fieldbus, both standard IS and FISCO IS approvals apply. The device label is marked appropriately.

(3) Consult factory for availability.

(4) Suitable for remote mount configuration.

(5) When ordered with XA, 1/2" NPT enclosure will come equipped with an M20 adapter with the sensor installed as process ready.

(6) Only available with Enclosure option code J5 or J6. For ATEX approved units the Ground Lug Assembly is included. It is not necessary to include code G1 for units with ATEX approvals.

(7) Only available with Enclosure option code J5.

(8) Available with Intrinsically Safe approvals only. For FM Intrinsically Safe or non-incendive approval (option code I5), install in accordance with Rosemount drawing 03151-1009 to maintain NEMA 4X rating.

NOTE
For additional options (e.g. “K” codes), please contact your local Emerson Process Management representative.

Tagging

Hardware

- No charge
- 2 lines of 28 characters (56 characters total)
- Tags are adhesive labels
- Permanently attached to transmitter
- Character height is 1/16-in (1.6 mm)

Software

- No charge
- The transmitter can store up to 30 characters for *Foundation* Fieldbus or 8 for *HART* protocol. If no characters are specified, the first 8 characters of the hardware tag are the default.

Considerations

Special Mounting Considerations

See “Mounting” on page 15 for the special hardware that is available to:

- Mount a 644H to a DIN rail. (see Table 12 on page 19)
- Retrofit a new 644H to replace an existing 644H transmitter in an existing threaded sensor connection head.(see Table 12 on page 19)

External Ground Screw Assembly

The external ground screw assembly can be ordered by specifying code G1 when an enclosure is specified. However, some approvals include the ground screw assembly in the transmitter shipment, hence it is not necessary to order code G1. The table below identifies which approval options include the external ground screw assembly and which do not.

Approval Type	External Ground Screw Assembly Included?
E5, I1, I2, I5, I6, I7, K5, K6, NA, I4	No–Order option code G1
E1, E2, E3, E4, E7, K7, N1, N7, ND	Yes

TABLE 12. Transmitter Accessories

Part Description	Part Number
Aluminum alloy Universal Head, standard cover—M20 entries	00644-4420-0002
Aluminum alloy Universal Head, meter cover—M20 entries	00644-4420-0102
Aluminum alloy Universal Head, standard cover—1/2-14 NPT entries	00644-4420-0001
Aluminum alloy Universal Head, meter cover—1/2-14 NPT entries	00644-4420-0101
LCD Display (includes meter and meter spacer assembly)	00644-4430-0002
LCD Display kit (includes meter and meter spacer assembly, and meter cover)	00644-4430-0001
Ground screw assembly kit	00644-4431-0001
Kit, Hardware for mounting a 644H to a DIN rail (includes clips for symmetrical and asymmetrical rails)	00644-5301-0010
Kit, Hardware for retrofitting a 644H in an existing threaded sensor connection head (former option code L1)	00644-5321-0010
Kit, 316 U-Bolt for Universal Housing	00644-4423-0001
Universal clip for rail or wall mount	03044-4103-0001
24 Inches of symmetric (top hat) rail	03044-4200-0001
24 Inches of asymmetric (G) Rail	03044-4201-0001
Ground clamp for symmetric or asymmetric rail	03044-4202-0001
End clamp for symmetric or asymmetric rail	03044-4203-0001
Snap rings kit (used for assembly to a DIN sensor – quantity 12)	00644-4432-0001
SST Universal Head, standard cover—M20 entries	00644-4433-0002
SST Universal Head, meter cover—M20 entries	00644-4433-0102
SST Universal Head, standard cover—1/2-14 NPT entries	00644-4433-0001
SST Universal Head, meter cover—1/2-14 NPT entries	00644-4433-0101
Polished SST Connection Head, standard cover—1/2-14 NPT entries	00079-0312-0011
Polished SST Connection Head, meter cover—1/2-14 NPT entries	00079-0312-0111
Polished SST Connection Head, standard cover—1/2-14 NPSM entries	00079-0312-0022
Polished SST Connection Head, meter cover—1/2-14 NPSM entries	00079-0312-0122
Polished SST Connection Head, standard cover—M20 x 1.5 entries	00079-0312-0033
Polished SST Connection Head, meter cover—M20 x 1.5 entries	00079-0312-0133
Polished SST Connection Head, standard cover—M20 x 1.5 / M24 x 1.5 entries	00079-0312-0034
Polished SST Connection Head, meter cover—M20 x 1.5 / M24 x 1.5 entries	00079-0312-0134

Configuration

Transmitter Configuration

The transmitter is available with standard configuration setting for either *HART* (see Standard HART Configuration)or *FOUNDATION* fieldbus (see Standard Foundation Fieldbus Configuration). The configuration settings and block configuration may be changed in the field with Emerson's DeltaV®, AMS™ Suite, or other *FOUNDATION* fieldbus host or configuration tool.

Custom Configuration

Custom configurations are to be specified when ordering. The following table lists the necessary requirements to specify a custom configuration.

	Option Code	Requirements/ Specification
	C1: Factory Configuration Data (CDS required)	Date: day/month/year Descriptor: 16 alphanumeric characters Message: 32 alphanumeric character Analog Output: Alarm and saturation levels
	C2:Transmitter – Sensor Matching	The transmitters are designed to accept Callendar-Van Dusen constants from a calibrated RTD. Using these constants, the transmitter generates a custom curve to match the sensor-specific curve. Specify a Series 65, 65, or 78 RTD sensor on the order with a special characterization curve (V or X8Q4 option). These constants will be programmed into the transmitter with this option
***HART* only**	A1: NAMUR-Compliant, High Alarm	High Alarm = 21.5 mA Upscale Saturation = 20.5 mA
	CN: NAMUR-Compliant, Low Alarm	Low Alarm = 3.6 mA Downscale Saturation = 3.8 mA
	C4: Five Point Calibration	Will include 5-point calibration at 0, 25, 50, 75, and 100% analog and digital output points. Use with Calibration Certificate Q4.
	F6: 60 Hz Line Filter	Calibrated to a 60 Hz line voltage filter instead of 50 Hz filter

Standard *HART* Configuration

Unless specified, the transmitter will be shipped as follows:

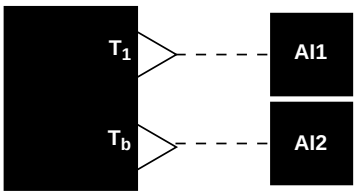
Sensor Type	RTD, Pt 100 (α=0.00385, 4-wire)
4 mA Value	0 °C
20 mA Value	100 °C
Damping	5 seconds
Output	Linear with temperature
Alarm	High (21.75 mA)
Saturation Levels	3.9 / 20.5 mA
LCD (when installed)	Engineering Units and mA
Line Voltage Filter	50 Hz
Tag	See "Tagging" on page 19

Standard *FOUNDATION* Fieldbus Configuration

Unless otherwise specified, the transmitter will be shipped as follows:

Sensor Type: RTD, Pt 100 (α=0.00385, 4-wire)
Damping: 5 seconds
Units of Measurement: °C
Line Voltage Filter: 50 Hz
Software Tag: See Tagging
Function Blocks Tags: • Resource Block: Resource • Transducer Block: Transducer • LCD Block: Display • Analog Input Blocks: AI1, AI2
Alarm Limits of AI1 and AI2: • HI-HI: Infinity • HI: Infinity • LO: Infinity • LO-LO: Infinity
Local Display (when installed): Engineering Units of Temperature

Standard Block Configuration



Note:
T_1 = Sensor Temperature
T_b = Terminal Temperature

Final Station

AI Blocks are scheduled for 1 second. AI Blocks are linked as shown above.

STAINLESS STEEL HOUSING FOR BIOTECHNOLOGY, PHARMACEUTICAL INDUSTRIES, AND SANITARY APPLICATIONS

Weight

Option Code	Standard Cover	Meter Cover
S1	840 g (27 oz)	995 g (32 oz)
S2	840 g (27 oz)	995 g (32 oz)
S3	840 g (27 oz)	995 g (32 oz)
S4	840 g (27 oz)	995 g (32 oz)

Enclosure Rating

NEMA 4X, IP66, and IP68

Materials of Construction

Housing and Standard Meter Cover

- 316L SST

Cover O-Ring

- Buna-N

LCD Display Cover

- 316L SST
- Glass

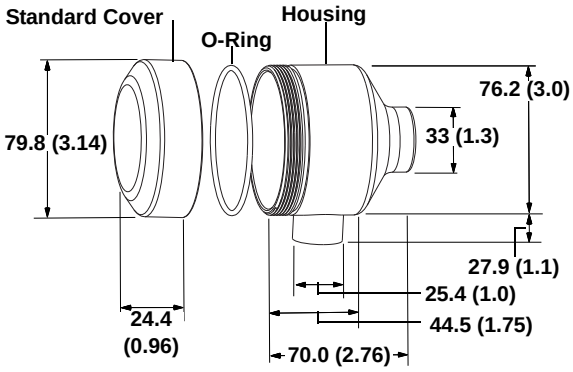
Surface

Surface finish is polished to 32 RMA. Laser etched product marking on housing and standard covers.

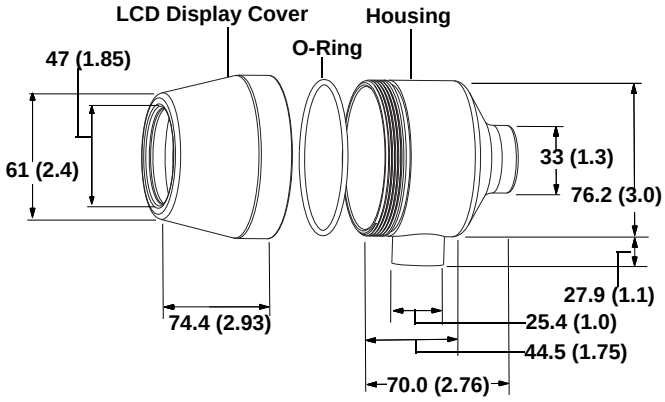
Dimensional Drawings

Sanitary Housing Covers

Standard Cover



LCD Display Cover



Dimensions are in millimeters (inches)

Rosemount 644

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Rosemount Measurement
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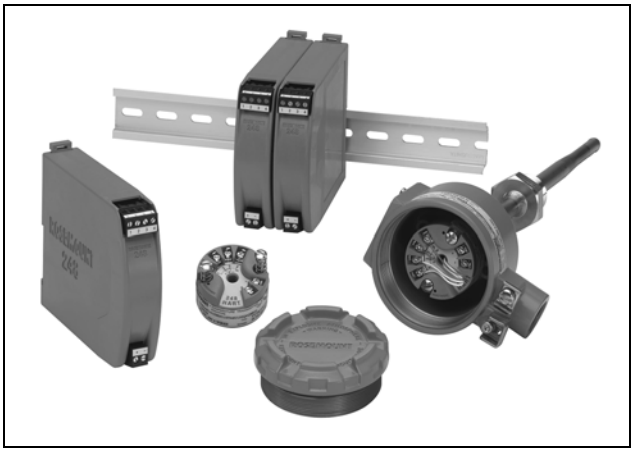
Email : Enquiries@AP.EmersonProcess.com

EMERSON™
Process Management

Product Data Sheet
00813-0100-4825, Rev HB
April 2010

Rosemount 248 Temperature Transmitter

- *"Ready-to-install" out of the box*
- *Unsurpassed performance for temperature monitoring points*
- *Industry standard DIN Form B headmount transmitter size enables mounting in any connection head*
- *New compact DIN railmount style*
- *Reliable EMC performance meets NAMUR NE21 recommendation*
- *Communicates using open 4–20 mA/HART® Protocol*
- *A 248C PC-based HART configuration interface is available*



Contents

The Rosemount 248 Temperature Transmitter

The Rosemount 248 is an entry-level HART® transmitter that accepts industry standard sensor inputs, conforms to head and rail mount form factors, and offers a cost-effective solution in any temperature measurement application.

Installation Ready Solutions

The Rosemount 248 uses HART protocol to communicate rich data and diagnostics usually not found on a traditional 4–20 mA signal.

The Rosemount 248 offers a complete point solution that guarantees the transmitter, housing, sensor, extension, and thermowell are shipped from the factory as an installation-ready assembly.

Increased Performance

The Rosemount 248 offers improved measurement accuracy and reliability than wiring a temperature sensor directly to the DCS, at an affordable cost.

Flexibility

The Rosemount 248 is compatible with 2-, 3-, and 4-wire nickel and platinum RTDs, a variety of thermocouple sensors, mV, and ohm/inputs.

Low Installation Cost

The Rosemount 248 offers lower overall installation costs when compared to wiring sensors directly. In addition, it can eliminate using expensive extension wires and multiplexers.

Programmable

The Rosemount 248C Configuration Interface comes with a programmer, cables, and configuration software. This provides the tools needed to select may options including the sensor type, range and error action.

ROSEMOUNT TEMPERATURE SOLUTIONS

Rosemount 3144P

Field mount style HART® or FOUNDATION™ fieldbus protocol. Dual sensor input with advanced diagnostics.

Rosemount 644 Smart Temperature Transmitter

Head mount styles available with HART® or FOUNDATION fieldbus protocol. Rail mount style available for *HART* protocol.

Rosemount 848THigh Density Temperature Measurement Family

Measure temperature points in close proximity with the 848T architecture, with WirelessHART™ or FOUNDATION fieldbus protocols.

Rosemount 3420 Fieldbus Interface Module

Provides an interface between FOUNDATION™ fieldbus instruments and systems without fieldbus capability using standard interface protocols.

Rosemount 248 Temperature Transmitter

Head mount (DIN B) and Rail mount style with HART® protocol and complete temperature assembly.

Rosemount sensors, thermowells, and extensions

Rosemount has a broad offering of RTD and thermocouples that are designed to meet plant requirements.

Temperature Solutions

SINGLE POINT MEASUREMENT

Real Results

Rosemount single point transmitters deliver exceptional results by utilizing innovative designs and advance diagnostics. A comprehensive and versatile portfolio provides solutions for single point measurement needs.

Single Point. Single Provider.

Every one of the 200,000+ temperature transmitters Emerson delivers each year possesses the quality and reliability that you expect from Rosemount instrumentation.

- Simplify installation with complete assemblies that are configured and calibrated to your specifications
- Maximize process efficiency with industry-leading accuracy and stability
- Optimize your limited resources with preventative maintenance diagnostics
- Simplify safety compliance with SIS certified transmitters and prior-use safety documentation

GLOBAL REACH. LOCAL SUPPORT.

Worldwide Manufacturing

With numerous Rosemount Temperature manufacturing sites located worldwide and continued expansion of our operations, Emerson is ready to respond to all your project and daily needs. Our world-class manufacturing provides:

- Globally consistent product from every factory
- A single provider for transmitters, sensors and thermowells
- Capacity to fulfill the needs of your largest projects
- Overnight deliveries for emergency needs

Local Expertise

When you need a temperature expert, Emerson is there. Our experienced Instrumentation Consultants help you find the right product for your temperature application and advise you on best installation practices to ensure you see real results. With our extensive global network of service and support personnel, we can be on site to help when and where you need us.

Transmitter Specifications

FUNCTIONAL SPECIFICATIONS

Inputs

User-selectable; sensor terminals rates to 42.4 V dc. See "Transmitter Accuracy and Ambient Temperature Effects" on page 6 for sensor options.

Output

2-wire 4–20 mA, linear with temperature or input; digital output signal superimposed on 4–20 mA signal, available for a *HART* communicator or control system interface.

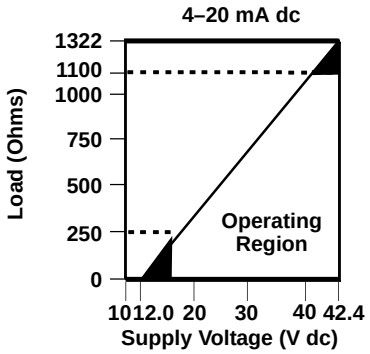
Isolation

Input/output isolation tested to 500 V ac rms (707 V dc) at 50/60 Hz.

Power Supply

An external power supply is required for *HART* devices. The transmitter operates on 12.0 to 42.4 VDC transmitter terminal voltage with load resistance between 250 and 1100 ohms. A minimum of 17.75 VDC power supply is required with a load of 250 ohms. Transmitter power terminals are rated to 42.4 V DC.

Maximum Load = 40.8 x (Supply Voltage – 12.0)



Humidity Limits

0–99% relative humidity, non-condensing

NAMUR Recommendations

The 248 meets the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility (EMC) for Process and Laboratory Apparatus
- NE 43 – Standard of the signal level breakdown information of digital transmitters
- NE 89 – Standard of temperature transmitters with digital signal processing

Transient Protection

The optional Rosemount 470 Transient Protector prevents damage from transients induced by lightning, welding, heavy electrical equipment, or switch gears. Refer to the 470 Product Data Sheet (document number 00813-0100-4191) for more information.

Temperature Limits

Operating Limit

- –40 to 85 °C (–40 to 185 °F)

Storage Limit

- –50 to 120 °C (–58 to 248 °F)

Turn-on Time

Performance within specifications in less than 5.0 seconds after power is applied to transmitter, when damping value is set to zero seconds.

Update Rate

Less than 0.5 seconds

Damping

32 seconds maximum. 5 seconds default

Custom Alarm and Saturation Levels

Custom factory configuration of alarm and saturation levels is available with option code C1 for valid values. These values can also be configured in the field using a *HART* Communicator.

Recommended Minimum Measuring Span

10 K

Software Detected Failure Mode

The values at which the transmitter drives its output in failure mode depends on whether it is configured to standard, custom, or NAMUR-compliant (NAMUR recommendation NE 43) operation. The values for standard and NAMUR-compliant operation are as follows:

FIGURE 1. Operation Parameters

	Standard (1)	**NAMUR NE43-Compliant(1)**
Linear Output:	$3.9 \leq I \leq 20.5$	$3.8 \leq I \leq 20.5$
Fail High:	$21 \leq I \leq 23$ (default)	$21 \leq I \leq 23$ (default)
Fail Low:	$I \leq 3.75$	$I \leq 3.6$

(1) Measured in milliamperes

Certain hardware failures, such as microprocessor failures, will always drive the output to greater than 23 mA.

PHYSICAL SPECIFICATIONS

HART Communicator Connections

Communication Terminal: Clips permanently fixed to the terminals

Materials of Construction

Electronics Housing

- *Noryl*® glass reinforced

Universal (option code U and H) and Rosemount® Connection (option code A and G) Heads

- Housing: Low-copper aluminum (option codes U and A)
  Stainless Steel (option codes G and H)
- Paint: Polyurethane
- Cover O-Ring: Buna–N

BUZ Head (option code B)

- Housing: Aluminum
- Paint: Aluminum lacquer
- O-Ring Seal: Rubber

Mounting

The 248R attaches directly to a wall or a DIN rail. The 248H installs in a connection head or universal head mounted directly on a sensor assembly or apart from a sensor assembly using a universal head. The 248H can also mount to a DIN rail using an optional mounting clip (see Table 15).

Weight

Code	Options	Weight
248H	Headmount Transmitter	42 g (1.5 oz)
248R	Railmount Transmitter	250 g (8.8 oz)
U	Universal Head	520 g (18.4 oz)
B	BUZ Head	240 g (8.5 oz)
C	Polypropylene Head	90 g (3.2 oz.)
A	Rosemount Connection Head	524 g (18.5 oz)
S	Polished Stainless Steel (SST) Head	537 g (18.9 oz)
G	Rosemount Connection Head (SST)	1700 g (60 oz)
H	Universal Head (SST)	1700 g (60 oz)

Enclosure Ratings

The Universal (option code U) and Rosemount Connection (option code A) Heads are NEMA 4X, IP66, and IP68. The Universal Head with $^1/_2$ NPT threads is CSA Enclosure Type 4X. The BUZ head (option code B) is NEMA 4 and IP65.

PERFORMANCE SPECIFICATIONS

EMC (ElectroMagnetic Compatibility) NAMUR NE21 Standard

The 248 meets the requirements for NAMUR NE21 Rating

Susceptibility	Parameter	Influence
ESD	• 6 kV contact discharge • 8 kV air discharge	None
Radiated	• 80 – 1000 MHz at 10 V/m AM	None
Burst	• 1 kV for I.O.	None
Surge	• 0.5 kV line–line • 1 kV line–ground (I.O. tool)	None
Conducted	• 150 kHz to 80 MHz at 10 V	None

CE Mark

The 248 meets all requirements listed under IEC 61326: Amendment 1, 2006.

Power Supply Effect

Less than ±0.005% of span per volt

Vibration Effect

The 248 is tested to the following specifications with no effect on performance:

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

Stability

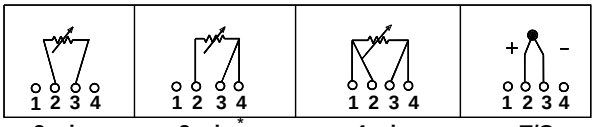
For RTD and thermocouple inputs the transmitter will have a stability of ±0.1% of reading or 0.1 °C (whichever is greater) for twelve months

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.

Sensor Connections

248 Sensor Connections Diagram



2-wire RTD and Ω | **3-wire* RTD and Ω** | **4-wire RTD and Ω** | **T/C and mV**

* *Rosemount Inc. provides 4-wire sensors for all single element RTDs. You can use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.*

Transmitter Accuracy and Ambient Temperature Effects

NOTE
The accuracy and ambient temperature effect is the greater of the fixed and percent of span values (see example below).

TABLE 1. 248 Transmitter Input Options, Accuracy, and Ambient Temperature Effects

Sensor	Transmitter Input Ranges[1]		Accuracy[13]		Temperature Effects per 1.0 °C (1.8 °F) Change in Ambient Temperature[2][12]	
	°C	°F	Fixed	% of Span	Fixed	% of Span
2-, 3-, 4-wire RTDs						
Pt 100[3] (α = 0.00385)	–200 to 850	–328 to 1562	0.2 °C (0.36 °F)	±0.1	0.006 °C (0.011 °F)	±0.004
Pt 100[4] (α = 0.003916)	–200 to 645	–328 to 1193	0.2 °C (0.36 °F)	±0.1	0.006 °C (0.011 °F)	±0.004
Pt 200[3]	–200 to 850	–328 to 1562	1.17 °C (2.11 °F)	±0.1	0.018 °C (0.032 °F)	±0.004
Pt 500[3]	–200 to 850	–328 to 1562	0.47 °C (0.85 °F)	±0.1	0.018 °C (0.032 °F)	±0.004
Pt 1000[3]	–200 to 300	–328 to 572	0.23 °C (0.41 °F)	±0.1	0.010 °C (0.018 °F)	±0.004
Ni 120[5]	–70 to 300	–94 to 572	0.16 °C (0.29 °F)	±0.1	0.004 °C (0.007 °F)	±0.004
Cu 10[6]	–50 to 250	–58 to 482	2 °C (3.60 °F)	±0.1	0.06 °C (0.108 °F)	±0.004
Cu 50 (α = 0.00428)	-185 to 200	-365 to 392	0.68 °C (1.22 °F)	±0.1	0.012 °C (0.022 °F)	±0.004
Cu 100 (α = 0.00428)	-185 to 200	-365 to 392	0.34 °C (0.61 °F)	±0.1	0.006 °C (0.011 °F)	±0.004
Cu 50 (α = 0.00426)	-50 to 200	-122 to 392	0.68 °C (1.22 °F)	±0.1	0.012 °C (0.022 °F)	±0.004
Cu 100 (α = 0.00426)	-50 to 200	-122 to 392	0.34 °C (0.61 °F)	±0.1	0.006 °C (0.011 °F)	±0.004
PT 50 (α = 0.00391)	-200 to 550	-392 to 1022	0.40 °C (0.72 °F)	±0.1	0.012 °C (0.022 °F)	±0.004
PT 100 (α = 0.00391)	-200 to 550	-392 to 1022	0.20 °C (0.36 °F)	±0.1	0.006 °C (0.011 °F)	±0.004
Thermocouples[7]						
Type B[8] [9]	100 to 1820	212 to 3308	1.5 °C (2.70 °F)	±0.1	0.056 °C (0.101 °F)	±0.004
Type E[8]	–50 to 1000	–58 to 1832	0.4 °C (0.72 °F)	±0.1	0.016 °C (0.029 °F)	±0.004
Type J[8]	–180 to 760	–292 to 1400	0.5 °C (0.90 °F)	±0.1	0.016 °C (0.029 °F)	±0.004
Type K[8] [10]	–180 to 1372	–292 to 2502	0.5 °C (0.90 °F)	±0.1	0.02 °C (0.036 °F)	±0.004
Type N[8]	–200 to 1300	–328 to 2372	0.8 °C (1.44 °F)	±0.1	0.02 °C (0.036 °F)	±0.004
Type R[8]	0 to 1768	32 to 3214	1.2 °C (2.16 °F)	±0.1	0.06 °C (0.108 °F)	±0.004
Type S[8]	0 to 1768	32 to 3214	1 °C (1.80 °F)	±0.1	0.06 °C (0.108 °F)	±0.004
Type T[8]	–200 to 400	–328 to 752	0.5 °C (0.90 °F)	±0.1	0.02 °C (0.036 °F)	±0.004
DIN Type L[11]	–200 to 900	–328 to 1652	0.7 °C (1.26 °F)	±0.1	0.022 °C (0.040 °F)	±0.004
DIN Type U[11]	–200 to 600	–328 to 1112	0.7 °C (1.26 °F)	±0.1	0.026 °C (0.047 °F)	±0.004
Type W5Re/W26Re[12]	0 to 2000	32 to 3632	1.4 °C (2.52 °F)	±0.1	0.064°C (0.115°F)	±0.004
GOST Type L	-200 to 800	-392 to 1472	0.50 °C (0.90 °F)	±0.1	0.003 °C (0.005 °F)	±0.004
Millivolt Input	–10 to 100 mV		0.03 mV	±0.1	0.001 mV	±0.004
2-, 3-, 4-wire Ohm Input	0 to 2000 ohms		0.7 ohm	±0.1	0.028 ohm	±0.004

(1) Input ranges are for transmitter only. Actual sensor (RTD or Thermocouple) operating ranges may be more limited. See "Product Certifications" on page 8 for temperature ranges.

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

(3) IEC 751, 1995

(4) JIS 1604, 1981

(5) Edison Curve No. 7

(6) Edison Copper Winding No. 15

(7) Total CJC accuracy for thermocouple measurement: ±0.5 °C.

(8) NIST Monograph 175, IEC 584

(9) Fixed accuracy for NIST Type B is ±5.4 °F (±3.0 °C) from 212 to 572 °F (100 to 300 °C).

(10) Fixed accuracy for NIST Type K is ±1.3 °F (±0.7 °C) from -292 to -130 °F (-130 to -90 °C).

(11) DIN 43710

(12) ASTME 988-96

(13) Accuracy and Ambient Temperature Effects are tested and verified down to -51° C (-60° F) for LT option.

Transmitter Accuracy Example

When using a Pt 100 (a = 0.00385) sensor input with a 0 to 100 °C span, use the greater of the two calculated values. In this case the accuracy would be +/-0.2 °C.

Transmitter Temperature Effects Example

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

When using a Pt 100 (a = 0.00385) sensor input with a 0–100 °C span at 30 °C ambient temperature:

- Temperature Effects: 0.006 °C x (30 - 20) = 0.06 °C

Total Transmitter Error

Worst Case Transmitter Error: Accuracy + Temperature Effects = 0.2 °C + 0.06 °C = 0.26 °C

Total Probable Transmitter Error: $\sqrt{0.2^2 + 0.06^2} = 0.21°C$

Product Certifications

APPROVED MANUFACTURING LOCATIONS

Rosemount Inc. – Chanhassen, Minnesota, USA

Emerson Process Management Temperature GmbH – Germany

Emerson Process Management Asia Pacific – Singapore

EUROPEAN UNION DIRECTIVE INFORMATION

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting your local sales representative.

ATEX Directive (94/9/EC)

Rosemount Inc. complies with the ATEX Directive.

Electro Magnetic Compatibility (EMC) (89/336/EEC)

All Models: EN 50081-1: 1992; EN 50082-2:1995; EN 61326-1. 2006

CE Mark

The 248 meets all requirements listed under IEC 61326:Amendment 1,2006

HAZARDOUS LOCATIONS CERTIFICATIONS(1)

North American Certifications

Factory Mutual (FM)

I5 FM Intrinsic Safety and Non-incendive
Intrinsically Safe for Class I/II/III, Division 1, Groups A, B, C, D, E, F, and G. Non-incendive Field Circuit for Class I, Division 2, Groups A, B, C, and D. Intrinsically Safe and non-incendive when installed in accordance with Rosemount drawing 00248-1055.

Temperature Codes:
T5 (T_{amb} = –50 to 75 °C)
T6 (T_{amb} = –50 to 40 °C)

TABLE 2. Entity Parameters

Loop/Power	Sensor
U_i = 30 Vdc	U_o = 45 Vdc
I_i = 130 mA	I_o = 26 mA
P_i = 1.0 W	P_o = 290 mW
C_i = 3.6 nF	C_o = 0.4 nF
L_i = 13.8 µH	L_o = 49.2 mH

E5 FM Explosion-Proof
Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust Ignition-Proof for Class II/III, Division 1, Groups E, F, G when installed in accordance with Rosemount drawing 00248-1065.

Temperature Code:
T5 (T_{amb} = –40 to 85 °C)

Combination Certifications

K5 Combination of I5 and E5.

Canadian Standards Association (CSA) Approvals

I6 CSA Intrinsically Safe and Class I, Division 2
Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D when installed in accordance with Rosemount drawing 00248-1056.

Temperature Codes:
T5 (T_{amb} = –50 to 60 °C)
T6 (T_{amb} = –50 to 40 °C)

Suitable for use in Class I, Division 2, Groups A, B, C, and D.

K6 CSA Intrinsically Safe, Explosion-Proof, and Class I, Division 2.
Combination of I6 and Explosion-Proof for Class I, Division 1, Groups B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 hazardous locations, when installed in accordance with Rosemount drawing 00644-1059.

Suitable for Class I, Division 2, Groups A,B, C, and D.
Ambient Temperature Limit: –50 to 85°C

European Certifications

I1 ATEX Intrinsic Safety
Certificate Number: Baseefa03ATEX0030X
ATEX Marking: ⟨Ex⟩ II 1 G
CE 1180
Ex ia IIC

Temperature Codes:
T5 (–60 ≤ T_{amb} ≤ 80 °C)
T6 (–60 ≤ T_{amb} ≤ 60 °C)

TABLE 3. Entity Parameters

Loop/Power	Sensor
U_i = 30 Vdc	U_o = 45 Vdc
I_i = 130 mA	I_o = 26 mA
P_i = 1.0 W	P_o = 290 mW
C_i = 3.6 nF	C_i = 2.1 nF
L_i = 0	L_i = 0

Special Conditions for Safe Use (X):
The apparatus must be installed in an enclosure which affords it a degree of protection of at least IP20.
Non-metallic enclosures must have a surface resistance of less than 1 GOHM; light alloy or zirconium enclosures must be protected from impact and friction when installed.

(1) Consult factory for availability.

E1 ATEX Flame-Proof
Certificate Number: KEMA99ATEX8715X
ATEX Marking: ⟨Ex⟩ II 2 G
CE 1180
Ex d IIC T6

Special Conditions for Safe Use (X):

For information on the dimensions of the flameproof joints the manufacturer should be contacted.

TABLE 4. Entity Parameters

Sensor	Transmitter
U_{max} = 5 V	U_{max} = 55 Vdc
I_{max} = 2.0 mA	I_{max} = 40 mA

Temperature Codes:
T6 (–40 ≤ T_{amb} ≤ 65 °C)

N1 ATEX Type n
Certificate Number: BAS00ATEX3145
ATEX Marking: ⟨Ex⟩ II 3
Ex nL IIC

TABLE 5. Input Parameters

Transmitter U_i = 45 V
Resistance Element Terminal Block U_i = 5 V
Thermocouple Terminal Block U_i = 0 V

Temperature Codes:
T5 (–40 ≤ T_{amb} ≤ 70 °C)

NC ATEX Type n Component
Certificate Number: Baseefa03ATEX0032U
ATEX Marking: ⟨Ex⟩ II 3G
Ex nA IIC

TABLE 6. Input Parameters

U_i = 42.4 V

Temperature Codes:
T5 (–60 ≤ T_{amb} ≤ 80°C)
T6 (–60 ≤ T_{amb} ≤ 60°C)

ND ATEX Dust
Certificate Number: KEMA99ATEX8715X
ATEX Marking: II 1 D
CE 1180
T95 C (-40 ≤ T_{amb} ≤ 85 °C)
Ex tD A20 IP66

TABLE 7. Input Parameters

Sensor	Transmitter
U_{max} = 5 V	U_{max} = 55 Vdc
I_{max} = 2.0 mA	I_{max} = 40 mA

Brazilian Certifications

Centro de Pesquisas de Energia Eletrica (CEPEL) Approval

I2 CEPEL Intrinsic Safety

IECEx Certifications

E7 IECEx Explosion-proof (Flameproof)
Certificate No.: IECExKEM09.0015X
Ex d IIC T6

Special Conditions for Safe Use (X):

For information on the dimensions of the flameproof joints the manufacturer should be contacted.

TABLE 8. Entity Parameters

Sensor	Transmitter
U_{max} = 5 V	U_{max} = 55 Vdc
I_{max} = 2.0 mA	I_{max} = 40 mA

Temperature Codes:
T6 (–40 ≤ T_{amb} ≤ 65 °C)

NF IECEx Dust Ignition-Proof
Certificate Number: IECEx KEM09.0015X
Ex tD A20 IP66
T95 C (-40 ≤ T_{amb} ≤ 85 °C)

TABLE 9. Input Parameters

Sensor	Transmitter
U_{max} = 5 V	U_{max} = 55 Vdc
I_{max} = 2.0 mA	I_{max} = 40 mA

I7 IECEx Intrinsic Safety (Zone 0)
Certificate Number: TSA IECEx 04.0004X
Ex ia IIC

Temperature Codes:
T5 (T_{amb} = -60 °C to 80 °C)
T6 (T_{amb} = -60 °C to 60 °C)

TABLE 10. Entity Parameters

Ex ia Terminals ±	Sensor
U_i = 30 Vdc	U_o = 45 Vdc
I_i = 130 mA	I_o = 26 mA
P_i = 1.0 W	P_o = 290 mW
C_i = 3.63 nF	C_i = 10 nF
L_i = 0 mH	L_i = 26 mH

Conditions of Certification:

1. It is a condition of safe use that the input entity parameters must be taken into account when connecting to a supply. For sensor output terminals, the sensor entity parameters shall be taken into account during installation.
2. It is a condition of safe use that the apparatus shall only be supplied from a galvanically isolated safety barrier with output current limited by a minimum 225 Ohms resistor.
3. It is a condition of safe use that the transmitter must be mounted in an enclosure that suits Group IIC application and affords a degree of protection of at least IP20 for Ex ia version, and of at least IP54 for Ex n version.
4. It is a condition of safe use that the apparatus shall be installed according to the installation drawing 00248-1057.

N7 IECEx Type n (Zone 2)
Certificate Number: TSA IECEx 04.0004X
Ex n IIC

Temperature Codes:
T5 (T_{amb} = -60 °C to 70 °C)
T6 (T_{amb} = -60 °C to 50 °C)

TABLE 11. Ex n Input Parameters

Ex n Terminals ±
U_i = 45 V

GOST Certifications

Russian GOST

PPC 04-9788: (EP Only)

1 Ex d IIC T6

PPC BA-13006:

0 Ex ia IIC T5/T6

Kazakhstan GOST

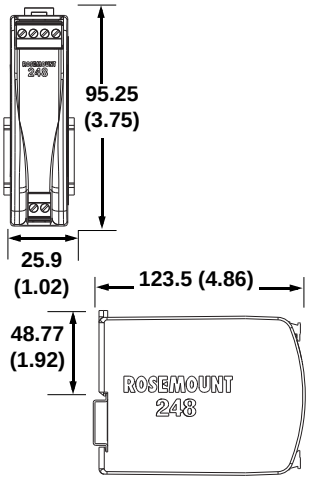
See Certificate

Ukraine GOST

See Certificate

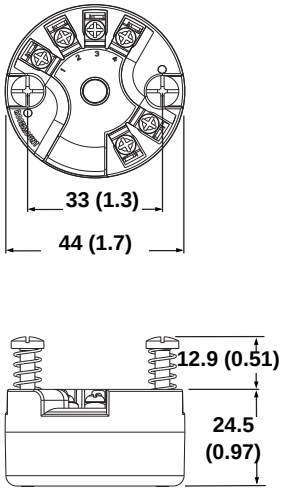
Dimensional Drawings

248R Railmount Transmitter



248H Headmount Transmitter

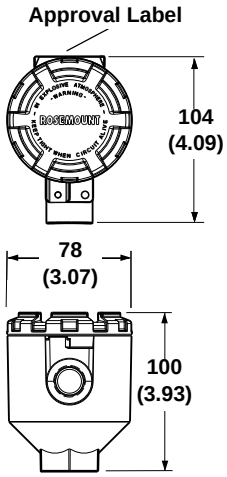
(enlarged)



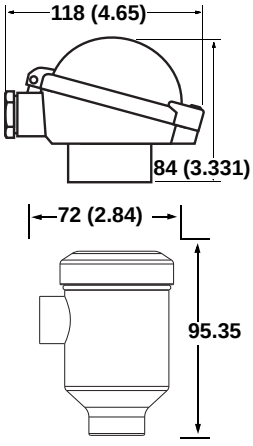
Dimensions are in millimeters (inches)

Enclosures

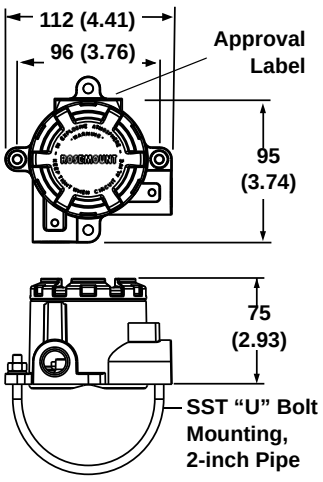
Connection Head[1]



BUZ and Polypropylene Heads (option codes B and C) and Mini SST Head (option code S)



Universal Head[2] (option codes H and U)

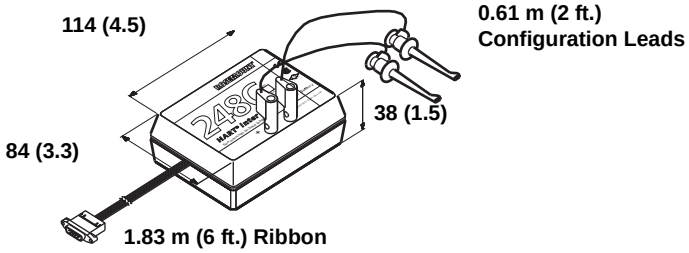


(1) If ordering the transmitter with a DIN style sensor, it is recommended that the enclosure be ordered within the sensor model (Product Data Sheet doc # 00813-0200-2654) rather than within the transmitter model, in order to drive necessary parts.

(2) A "U" Bolt is shipped with each universal head unless a sensor is ordered assembled to the enclosure. However, since the head can be integrally mounted to the sensor it may not need to be used.

248C Configuration Interface

Option 1: HART Interface Box



Ordering Information

TABLE 12. 248 Headmount Temperature Transmitter

★ 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			
248	Temperature Transmitter			
Transmitter Type				
Standard				**Standard**
H	DIN B Head Mount			★
Transmitter Output				
Standard				**Standard**
A	4–20 mA with Digital Signal based on *HART* Protocol			★
Product Certifications		**Enclosure Options Codes Permitted**		
Standard				**Standard**
E5	FM Explosion-Proof	A, U, G, H		★
I5	FM Intrinsic Safety and Class I, Division 2	A, B, U, N, C, G, S, H		★
K5	FM Intrinsic Safety, Explosion-Proof, and Class I, Division 2	A, U, G, H		★
I6	CSA Intrinsic Safety and Class I, Division 2	A, B, U, N, C, G, H		★
K6	CSA Intrinsic Safety, Explosion-Proof, and Class I, Division 2	A, U, G, H		★
E1	ATEX Flameproof	A, U, G, H		★
I1	ATEX Intrinsic Safety	A, B, U, N,C, G, S, H		★
ND	ATEX Dust	A, U, G, H		★
N1	ATEX Type n	A, U, G, H		★
NC(1)	ATEX Type n Component	N		★
E7	IECEx Flameproof	A, U, G, H		★
I7	IECEx Intrinsic Safety	A, B, U, N, C, G, S, H		★
N7	IECEx Type n	A, U, G, H		★
NG	IECEx Type n Component	N		★
NA	No Approvals	All Options		★
Enclosures		**Material**	**IP Rating**	
Standard				**Standard**
A	Connection Head	Aluminum	IP66/68	★
B	BUZ Head	Aluminum	IP65	★
C	BUZ Head	Polypropylene	IP65	★
G	Connection Head	SST	IP66/IP68	★
H	Universal Head (Junction Box)	SST	IP66/IP68	★
U	Universal Head (Junction Box)	Aluminum	IP66/IP68	★
N	No Enclosure			
Expanded				
F	Sanitary Connection Head, DIN A	Polished SST	IP66/IP68	
S	Sanitary Connection Head, Din B	Polished SST	IP66/IP68	
Conduit Entry Size(2)				
Standard				**Standard**
1(3)	M20 x 1.5 (CM20)			★
2	1/2-inch NPT			★
0	No Enclosure			★
Assemble to Options				
Standard				**Standard**
XA	Sensor Specified Separately and Assembled to Transmitter			★
NS	No Sensor			★

TABLE 12. 248 Headmount Temperature Transmitter

★ 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.

Options (Include with selected model number)

Alarm Level Configuration		
Standard		**Standard**
A1	NAMUR alarm and saturation levels, high alarm	★
CN	NAMUR alarm and saturation levels, low alarm	★
5-Point Calibration		
Standard		**Standard**
C4	5-Point Calibration (Requires the Q4 option code to generate a Calibration Certificate)	★
Calibration Certificate		
Standard		**Standard**
Q4	Calibration Certificate (3-Point standard)	★
External Ground		
Standard		**Standard**
G1	External Ground Lug Assembly	★
Line Filter		
Standard		**Standard**
F6	60 Hz line Voltage Filter	★
Conduit Electrical Connector		
Standard		**Standard**
GE(4)(2)	M12, 4 pin, Male Connector (eurofast®)	★
GM(2)	A-size Mini, 4 pin, Male Connector (minifast®)	★
External Label		
Standard		**Standard**
EL	External Label for ATEX Intrinsic Safety	★
Cover Chain Option		
Standard		**Standard**
G3	Cover Chain	★
Software Configuration		
Standard		**Standard**
C1	Custom Configuration of Date, Descriptor, Message and Wireless Paramaters (Requires CDS with order)	★
Typical Model Number: 248H A I1 A 1 DR N080 T08 EL U250 CN		

(1) The 248H with ATEX Type n Component Approval is not approved as a stand alone unit, additional system certification is required. Transmitter must be installed so it is protected to at least the requirements of IP54.

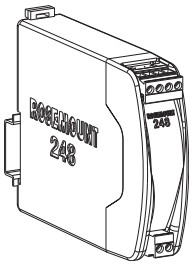
(2) All process connection threads are 1/2 in. NPT, except for Enclosure Codes H and U with Conduit Entry Code 1 and Sensor Type Code NS

(3) For enclosures H and U with the XA option specified, a 1/2-in. NPT to M20 x 1.5 thread adapter is used.

(4) Available with Intrinsically Safe approvals only for FM Intrinsically Safe or Non-Incendive approval (Option Code I5). To maintain NEMA 4X rating, it must be installed according to Rosemount Drawing 03151-1009.

TABLE 13. 248R Railmount Transmitter

★ 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		
248R	Smart DIN Rail Mount Temperature Transmitter		
Output Protocol			
Standard			**Standard**
A	HART		★
Product Certifications			
Standard			**Standard**
I5	FM Intrinsically Safe and Class I, Division 2		★
I6	CSA Intrinsically Safe and Class I, Division 2		★
I1	ATEX Intrinsic Safety		★
NC	ATEX Type n Component		★
I7(1)	IECEx Intrinsic Safety		★
NA	No Approvals		★
Options (Include with selected model number)			
Software Configuration			
Standard			**Standard**
C1	Factory enters date, descriptor, and message fields (CDS required with order)		★
Alarm Level Configuration			
Standard			**Standard**
A1	NAMUR alarm and saturation levels, high alarms		★
CN	NAMUR alarm and saturation levels, low alarms		★
5-Point Calibration			
Standard			**Standard**
C4	5-Point Calibration (Requires the Q4 option to generate a Calibration Certificate)		★
Calibration Certificate			
Standard			**Standard**
Q4	Calibration Certificate (3-Point standard; use option codes C4 with Q4 for a 5-Point Calibration Certificate)		★
Calibration Certificate			
Standard			**Standard**
F6	60 Hz Line Voltage Filter		★
Mounting Style			
Standard			**Standard**
GR	G-Rail Mounting		★
Typical Model Number: 248R A I1 Q4			

(1) Consult Factory for availability

248C Configuration Interface Specifications

CONFIGURATION SOFTWARE

The 248C PC-based configuration software for the Rosemount 248 allows comprehensive configuration of the transmitters. Used in conjunction with various Rosemount or user-supplied hardware modems, the software provides the tools necessary to configure the 248 transmitters including the following parameters:

- Process Variable
- Sensor Type
- Number of Wires
- Engineering Units
- Transmitter Tag Information
- Damping
- Alarming Parameters

CONFIGURATION HARDWARE

The 248C Configuration Interface has 4 hardware options as follows:

Option “0”: Software Only

Customer must provide appropriate communications hardware (modem, power supply, etc.).

Option “1”: HART Interface Box

HART interface box including an integrated serial modem and battery-powered transmitter power supply. Only suitable for off-line transmitter configuration. Requires PC serial port. *Will not work with powered loops.*

Option “2”: Serial HART Modem

Serial HART modem. Customer must provide separate loop power supply and resistor. Requires PC serial port. *Suitable for use with powered loops.*

Option “3”: USB HART Modem

USB (Universal Serial Bus) HART modem. Customer must provide separate loop power supply and resistor. Requires PC with USB port. *Suitable for use with powered loops.*

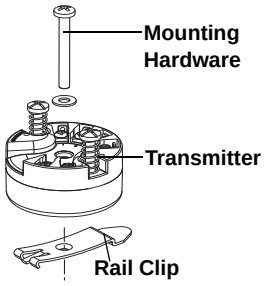
TABLE 14. 248C Configuration Interface

★ 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	
248C(1)	PC-based 248 HART Configuration Software	
Communications Hardware Options		
Standard		**Standard**
0	Software Only (no Modem))	★
1	Software with 248C HART Interface Box (Serial Interface with Transmitter Power Supply)	★
2	Software with Serial HART Modem	★
3	Software with USB HART Modem	★
Typical Model Number: 248C 1		

(1) Consult Factory for availability

TABLE 15. 248 Transmitter Accessories



Part Description	Part Number
Aluminum Alloy Universal Head – M20 Entries	00644-4420-0002
Aluminum Alloy Universal Head – 1/2 NPT Entries	00644-4420-0001
Aluminum Alloy Rosemount Connection Head – M20 Conduit Entry, M24 Instrument Entry	00644-4410-0023
Aluminum Alloy Rosemount Connection Head – 1/2 NPT Conduit Entry and M24 Instrument Entry	00644-4410-0013
Aluminum Alloy BUZ Head – M20 Conduit Entry, M24 Instrument Entry	00644-4196-0023
Aluminum Alloy BUZ Head – M20 Conduit Entry and 1/2 NPT Instrument Entry	00644-4196-0021
Aluminum Alloy BUZ Head – 1/2 NPT Conduit Entry	00644-4196-0011
External Ground Screw Assembly Kit	00644-4431-0001
Kit, Hardware for Mounting a 248 to a DIN Rail (see left picture-top hat rail, symmetric)	00248-1601-0001
Standard Cover for Universal or Rosemount Connection Heads	03031-0292-0001
Snap Rings Kit (used for assembly to DIN Plate Style sensor)	00644-4432-0001

Hardware Tag

- no charge
- 20 characters maximum
- transmitter enclosure, sensor, and thermowell if applicable will be tagged in accordance with customer requirements

Software Tag

- no charge
- the transmitter can store up to 8 characters. If no characters are specified, the first 8 characters of the hardware tag are the default.

Configuration

When ordering a transmitter and sensor assembly in one model number, the transmitter will be configured for the sensor that is ordered.

When a transmitter is ordered alone, the transmitter will be shipped as follows (unless specified):

Sensor Type	RTD, Pt 100 (α=0.00385, 4-wire)
4 mA Value	0 °C
20 mA Value	100 °C
Damping	5 seconds
Output	Linear with temperature
Failure Mode	High/Upscale
Line Voltage Filter	50 Hz
Tag	See Hardware Tag

Options

The following table lists the requirements necessary to specify a custom configuration.

Option Code	Requirements/ Specification
C1: Factory Configuration Data (CDS required)	Date: day/month/year Descriptor: 16 alphanumeric characters Message: 32 alphanumeric character Analog Output: Alarm and saturation levels
A1: NAMUR-Compliant, High Alarm	See Table 1 on page 4
CN: NAMUR-Compliant, Low Alarm	See Table 1 on page 4
Q4: Calibration Certificate	Will include 3-Point calibration at 0, 50, and 100% analog and digital output points
C4: Five Point Calibration	Will include 5-point calibration at 0, 25, 50, 75, and 100% analog and digital output points. Use with Calibration Certificate Q4.
F6: 60 Hz Line Filter	Calibrated to a 60 Hz line voltage filter instead of 50 Hz filter

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EMERSON™
Process Management

Rosemount 148 Temperature Transmitter

- *"Ready-to-install" solution for temperature monitoring applications*
- *Increased measurement accuracy and reliability*
- *Accepts 2-, 3-, and 4-wire RTD, thermocouple, and ohm sensor inputs*
- *Configurable using the Rosemount PC Programmer interface device*
- *Decreased installation costs over direct wired sensors*

Content

The Rosemount 148 Temperature Transmitter

The Rosemount 148 is a low cost temperature transmitter used with multiple sensor type inputs in monitoring applications. The Rosemount 148 saves money in cabling and installation costs over wiring directly and delivers superior measurement accuracy and reliability.

INSTALLATION READY SOLUTIONS

The Rosemount 148 offers a complete point solution that guarantees the transmitter, housing, sensor, extension, and thermowell can be shipped from the factory as an installation-ready assembly.

INCREASED PERFORMANCE

The Rosemount 148 offers better measurement accuracy and improved reliability over wiring a temperature sensor directly back to the DCS.

FLEXIBILITY

The Rosemount 148 is compatible with 2-, 3-, and 4-wire nickel and platinum RTDs, a variety of thermocouple sensors, and ohm inputs.

LOW INSTALLED COST

The Rosemount 148 reduces overall installation costs when compared to wiring sensors direct. In addition, the 148 can eliminate the use of expensive extension wires and multiplexers.

PROGRAMMABLE

The Rosemount 148 PC Programmer interface consists of a programmer, cables, and configuration software. The configuration software, when used in conjunction with the interface, provides the tools necessary to select the sensor type, sensor range, and sensor error action in addition to many other options.

ROSEMOUNT TEMPERATURE SOLUTIONS

Rosemount 3144P

Field mount style HART® or FOUNDATION™ fieldbus protocol. Dual sensor input with advanced diagnostics.

Rosemount 644 Smart Temperature Transmitter

Head mount styles available with HART® or FOUNDATION™ fieldbus protocol. Rail mount style available for *HART* protocol.

Rosemount 848T High Density Temperature Measurement Family

Measure temperature points in close proximity with the 848T architecture, with WirelessHART™ or FOUNDATION fieldbus protocols.

Rosemount 3420 Fieldbus Interface Module

Provides an interface between FOUNDATION™ fieldbus instruments and systems without fieldbus capability using standard interface protocols.

Rosemount 248 Temperature Transmitter

Head mount (DIN B) and Rail mount style with HART® protocol.

Rosemount sensors, thermowells, and extensions

Rosemount has a broad offering of RTD and thermocouples that are designed to meet plant requirements.

Temperature Solutions

SINGLE POINT MEASUREMENT

Real Results

Rosemount single point transmitters deliver exceptional results by utilizing innovative designs and advance diagnostics. A comprehensive and versatile portfolio provides solutions for single point measurement needs.

Single Point. Single Provider.

Every one of the 200,000+ temperature transmitters Emerson delivers each year possesses the quality and reliability that you expect from Rosemount instrumentation.

- Simplify installation with complete assemblies that are configured and calibrated to your specifications
- Maximize process efficiency with industry-leading accuracy and stability
- Optimize your limited resources with preventative maintenance diagnostics
- Simplify safety compliance with SIS certified transmitters and prior-use safety documentation

GLOBAL REACH. LOCAL SUPPORT.

Worldwide Manufacturing

With numerous Rosemount Temperature manufacturing sites located worldwide and continued expansion of our operations, Emerson is ready to respond to all your project and daily needs. Our world-class manufacturing provides:

- Globally consistent product from every factory
- A single provider for transmitters, sensors and thermowells
- Capacity to fulfill the needs of your largest projects
- Overnight deliveries for emergency needs

Local Expertise

When you need a temperature expert, Emerson is there. Our experienced Instrumentation Consultants help you find the right product for your temperature application and advise you on best installation practices to ensure you see real results. With our extensive global network of service and support personnel, we can be on site to help when and where you need us.

Transmitter Specifications

FUNCTIONAL SPECIFICATIONS

Inputs

User-selectable; sensor terminals rates to 42.4 V dc. See “Transmitter Accuracy and Ambient Temperature Effects” on page 4 for sensor options.

Output

2-wire 4–20 mA, linear with temperature or input.

Isolation

Input/Output isolation tested to 500V ac rms (707 V dc) at 50/60 Hz.

Supply Voltage DC

Standard: 12 to 35 V

Intrinsic Safety: 12 to 28 V

Minimum Voltage Across Terminals

12 V dc

Humidity Limits

0 - 95% relative humidity, non-condensing

NAMUR Recommendations

The 148 meets the following NAMUR recommendations:

- NE 21 - Electromagnetic compatibility (EMC) for Process and Laboratory Apparatus
- NE 43 - Standard of the signal level breakdown information of digital transmitters

Transient Protection

The optional rosemount 470 Transient Protector prevents damage from transients induced by lightning, welding, heavy electrical equipment, or switch gears. Refer to the 470 Product Data Sheet (document number 00813-0100-4191) for more information.

Temperature Limits

Operating Limit

- -40 to 185 °F (-40 to 85 °C)

Storage Limit

- -58 to 248 °F (-50 to 120 °C)

Turn-on Time

Performance within specifications is less than 5.0 seconds after power is applied to the transmitter, when damping value is set to zero seconds.

Update Rate

Less than 0.5 seconds

Damping

32 seconds maximum, 5 seconds default.

Recommended Minimum Measuring Span

18 °F (10 °C)

Software Detected Failure Mode

The values at which the transmitter drives its output in failure mode depends on device configuration. The device can be configured to meet NAMUR-compliant (NAMUR recommendation NE 43) operation. The values for standard and NAMUR-compliant operation are as follows:

TABLE 1. Operation Parameters

	Standard(1)	NAMUR NE43-Complaint(1)
Linear Output:	3.9 ≤ I ≤ 20.5	3.8 ≤ I ≤ 20.5
Fail High:	21 ≤ I ≤ 23 (default)	21 ≤ I ≤ 23 (default)
Fail Low:	I ≤ 3.75	I ≤ 3.6

(1) Measured in milliamperes

Certain hardware failures, such as microprocessor failures, will always drive the output to greater than 23 mA.

PERFORMANCE SPECIFICATIONS

EMC (ElectroMagnetic Compatibility) NAMUR NE21 Standard

The 148 meets the requirements for NAMUR NE21 Rating

Susceptibility	Parameter	Influence
ESD	• 6 kV contact discharge • 8 kV air discharge	None
Radiated	• 80 – 1000 MHz at 10 V/m AM	None
Burst	• 1 kV for I.O.	None
Surge	• 0.5 kV line–line • 1 kV line–ground (I.O. tool)	None
Conducted	• 150 kHz to 80 MHz at 10 V	None

CE Mark

The 148 meets all of the requirements listed under IEC 61326: Amendment 1, 2006.

Power Supply Effect

Less than ±0.0055 of span per volt.

Vibration Effect

The 148 is tested to the following specifications with no effect on performance:

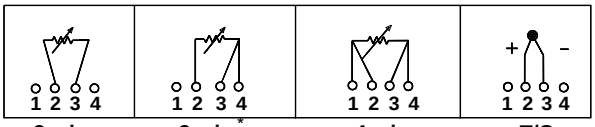
Frequency	Vibration
10 to 60 Hz	0.21 mm displacement
60 to 2000 Hz	3 g peak acceleration

Stability

For RTD and thermocouple inputs, the transmitter will have a stability of ±0.15% of reading or 0.15 °C (whichever is greater) for twelve months.

Sensor Connections

148 Sensor Connections Diagram



2-wire RTD and Ω | **3-wire* RTD and Ω** | **4-wire RTD and Ω** | **T/C**

** Rosemount Inc. provides 4-wire sensors for all single element RTDs. You can use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.*

Transmitter Accuracy and Ambient Temperature Effects

NOTE
The accuracy and ambient temperature effect is the greater of the fixed and percent of span values (see example below).

TABLE 2. 148 Transmitter Input Options, Accuracy, and Ambient Temperature Effects

Sensor	Transmitter Input Ranges(1)		Accuracy		Temperature Effects per 1.0 °C (1.8 °F) Change in Ambient Temperature(2)()	
	°C	°F	Fixed	% of Span	Fixed	% of Span
2-, 3-, 4-wire RTDs						
Pt 100(3) (α = 0.00385)	–200 to 850	–328 to 1562	0.3 °C (0.54 °F)	±0.15	0.009 °C (0.016 °F)	±0.006
Pt 100(4) (α = 0.003916)	–200 to 645	–328 to 1193	0.3 °C (0.54 °F)	±0.15	0.009 °C (0.016 °F)	±0.006
Ni 120(5)	–70 to 300	–94 to 572	0.2 °C (0.36 °F)	±0.15	0.006 °C (0.011 °F)	±0.006
Cu 10(6)	–50 to 250	–58 to 482	3 °C (5.40 °F)	±0.15	0.09 °C (0.16 °F)	±0.006
Thermocouples(7)						
Type B(8) (9)	100 to 1820	212 to 3308	2.3 °C (4.05 °F)	±0.15	0.084 °C (0.150 °F)	±0.006
Type J(8)	–180 to 760	–292 to 1400	0.8 °C (1.35 °F)	±0.15	0.03 °C (0.054 °F)	±0.006
Type K(8) (10)	–180 to 1372	–292 to 2502	0.8 °C (1.35 °F)	±0.15	0.03 °C (0.054 °F)	±0.006
Type N(8)	–200 to 1300	–328 to 2372	1.2 °C (2.16 °F)	±0.15	0.03 °C (0.054 °F)	±0.006
Type R(8)	0 to 1768	32 to 3214	1.8 °C (3.24 °F)	±0.15	0.09 °C (0.16 °F)	±0.006
Type S(8)	0 to 1768	32 to 3214	1.5 °C (2.70 °F)	±0.15	0.09 °C (0.16 °F)	±0.006
2-, 3-, 4-wire Ohm Input	0 to 2000 ohms		1.1 ohm	±0.15	0.042 ohm	±0.009

(1) Input ranges are for transmitter only. Actual sensor (RTD or Thermocouple) operating ranges may be more limited. See "Sensor Specifications" on page 84 for temperature ranges.

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

(3) IEC 751, 1995

(4) JIS 1604, 1981

(5) Edison Curve No. 7

(6) Edison Copper Winding No. 15

(7) Total accuracy for thermocouple measurement: sum of accuracy +0.5 °C.

(8) NIST Monograph 175, IEC 584

(9) Fixed accuracy for NIST Type B is ±5.4 °F (±3.0 °C) from 212 to 572 °F (100 to 300 °C).

(10) Fixed accuracy for NIST Type K is ±1.3 °F (±0.7 °C) from -292 to -130 °F (-130 to -90 °C).

Transmitter Accuracy Example

When using a Pt 100 (a = 0.00385) sensor input with a 0 to 100 °C span, use the greater of the two calculated values. In this case the accuracy would be +/-0.3 °C.

Transmitter Temperature Effects Example

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

When using a Pt 100 (a = 0.00385) sensor input with a 0–100 °C span at 30 °C ambient temperature:

- Temperature Effects: 0.009 °C x (30 - 20) = 0.09 °C

Total Transmitter Error

Worst Case Transmitter Error: Accuracy + Temperature Effects = 0.3 °C + 0.09 °C = 0.39 °C

Total Probable Transmitter Error: $\sqrt{0.3^2 + 0.09^2} = 0.31°C$

Product Certifications

APPROVED MANUFACTURING LOCATIONS

Rosemount Inc. – Chanhassen, Minnesota, USA

Emerson Process Management Temperature GmbH – Karlstein, Germany

Emerson Process Management Asia Pacific – Singapore

EUROPEAN UNION DIRECTIVE INFORMATION

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting your local sales representative.

ATEX Directive (94/9/EC)

Rosemount Inc. complies with the ATEX Directive.

Electro Magnetic Compatibility (EMC) (89/336/EEC)

All Models: EN 50081-1: 1992; EN 50082-2:1995; EN 61326-1. 2006

CE Mark

The 148 meets all requirements listed under IEC 61326:Amendment 1,2006

HAZARDOUS LOCATIONS CERTIFICATIONS(1)

North American Certifications

Factory Mutual (FM)

I5 FM Intrinsic Safety and Non-incendive
Intrinsically Safe for Class I/II/III, Division 1, Groups A, B, C, D, E, F, and G. Non-incendive Field Circuit for Class I, Division 2, Groups A, B, C, and D. Intrinsically Safe and non-incendive when installed in accordance with Rosemount drawing 00148-1055.

Temperature Codes:
T5 (T_{amb} = –50 to 75 °C)
T6 (T_{amb} = –50 to 40 °C)

TABLE 3. Entity Parameters

Loop/Power	Sensor
U_i = 30 Vdc	U_o = 45 Vdc
I_i = 130 mA	I_o = 26 mA
P_i = 1.0 W	P_o = 290 mW
C_i = 3.6 nF	C_o = 0.4 nF
L_i = 13.8 μH	L_o = 49.2 mH

E5 FM Explosion-Proof
Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust Ignition Proof for Class II/III, Division 1, Groups E, F, G when installed in accordance with Rosemount drawing 00148-1065.

Temperature Code:
T5 (T_{amb} = –40 to 85 °C)

Combination Certifications

K5 Combination of I5 and E5.

Canadian Standards Association (CSA) Approvals

I6 CSA Intrinsically Safe and Class I, Division 2
Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D when installed in accordance with Rosemount drawing 00148-1056.

Temperature Codes:
T5 (T_{amb} = –50 to 60 °C)
T6 (T_{amb} = –50 to 40 °C)

Suitable for use in Class I, Division 2, Groups A, B, C, and D.

K6 CSA Intrinsically Safe, Explosion-Proof, and Class I, Division 2.
Combination of I6 and Explosion-Proof for Class I, Division 1, Groups B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 hazardous locations, when installed in accordance with Rosemount drawing 00644-1059.

Suitable for Class I, Division 2, Groups A,B, C, and D.
Ambient Temperature Limit: –50 to 85°C

European Certifications

I1 ATEX Intrinsic Safety
Certificate Number: Baseefa080ATEX0030X
ATEX Marking: ⟨Ex⟩ II 1 G
CE 1180
EEx ia IIC

Temperature Codes:
T5 (–60 ≤ T_{amb} ≤ 80 °C)
T6 (–60 ≤ T_{amb} ≤ 60 °C)

TABLE 4. Entity Parameters

Loop/Power	Sensor
U_i = 30 Vdc	U_o = 45 Vdc
I_i = 130 mA	I_o = 26 mA
P_i = 1.0 W	P_o = 290 mW
C_i = 3.6 nF	C_i = 2.1 nF
L_i = 0	L_i = 0

Special Conditions for Safe Use (X):
The apparatus must be installed in an enclosure which affords it a degree of protection of at least IP20.
Non-metallic enclosures must have a surface resistance of less than 1 GOHM; light alloy or zirconium enclosures must be protected from impact and friction when installed.

(1) Consult factory for availability.

E1 ATEX Flame-Proof
Certificate Number: KEMA99ATEX8715
ATEX Marking: II 2 G
CE 1180
EEx d IIC
TABLE 5. Input Parameters

U_{max} = 42.4 Vdc
I_{max} = 24 mA

Temperature Codes:
T6 (–40 ≤ T_{amb} ≤ 65 °C)

N1 ATEX Type n
Certificate Number: BAS00ATEX3145
ATEX Marking: II 3
EEx nL IIC
TABLE 6. Input Parameters

U_{max} = 45 V

Temperature Codes:
T5 (–40 ≤ T_{amb} ≤ 70 °C)

NC ATEX Type n Component
Certificate Number: Baseefa08ATEX0031U
ATEX Marking: II 3G
EEx nA IIC
TABLE 7. Input Parameters

U_i = 42.4 V
C_i = 3.6nF
L_i = 0

Temperature Codes:
T5 (–60 ≤ T_{amb} ≤ 80°C)
T6 (–60 ≤ T_{amb} ≤ 60°C)

ND ATEX Dust Ignition Proof
Certificate Number: KEMA99ATEX8715
ATEX Marking: II 1 D
CE 1180
T95 C (-40 ≤ T_{amb} ≤ 85 °C)
IP66
TABLE 8. Input Parameters

U_{max} = 42.4 Vdc
I_{max} = 24 mA

Australian Certifications

Standard Australia Quality Assurance Service (SAA) Approvals

E7 SAA Explosion-Proof
Certificate Number: AUSEx3716X
Ex d IIC
Temperature Codes:
T6 (–40 ≤ T_{amb} ≤ 65 °C)

Special Conditions for Safe Use (X):

1. A thermowell must be utilized on installations incorporating a DIN style or a spring loaded sensor assembly, with all threaded connections sealed with sealing tape to maintain the IP rating of IP66/IP68 (3 meters).
2. When a gland is utilized on installation, the gland must be Standards Australia certified and must be capable of maintaining the IP rating. This also requires the use of thread sealing tape on all gland entries.

Brazilian Certifications

Centro de Pesquisas de Energia Eletrica (CEPEL) Approval

I2 CEPEL Intrinsic Safety

IECEx Certifications

I7 IECEx Intrinsic Safety (Zone 0)
Certificate Number: IECExBAS08.0011X
EEx ia nL IIC|

Temperature Codes:
T5 (-60 °C to 80°C)
T6 (-60 °C to 60°C)(
TABLE 9. Entity Parameters

Ex ia Terminals ±	**Sensor**
U_i = 30 Vdc	U_o = 45 Vdc
I_i = 130 mA	I_o = 26 mA
P_i = 1.0 W	P_o = 290 mW
C_i = 3.63 nF	C_i = 2.1 nF
L_i = 0 mH	L_i = 0 mH

Conditions of Certification:

1. It is a condition of safe use that the input entity parameters must be taken into account when connecting to a supply. For sensor output terminals, the sensor entity parameters shall be taken into account during installation.
2. It is a condition of safe use that the apparatus shall only be supplied from a galvanically isolated safety barrier with output current limited by a minimum 225 Ohms resistor.
3. It is a condition of safe use that the transmitter must be mounted in an enclosure that suits Group IIC application and affords a degree of protection of at least IP20 for Ex ia version, and of at least IP54 for Ex n version.
4. It is a condition of safe use that the apparatus shall be installed according to the installation drawing 00148-1057.

N7 IECEx Type n (Zone 2)
Certificate Number: IECExBAS07.0055
Ex nA NL IIC

Temperature Codes:
T5 (T_{amb} = -40 °C to 75 °C))
TABLE 10. Ex n Input Parameters

Ex n Terminals ±
U_i = 45 V

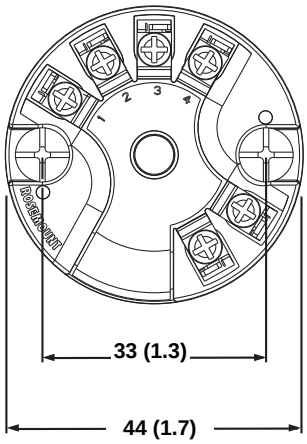
NG IECEx Type n Component
Certificate number: IECExBAS08.0012U
Ex na IIC

Temperature Codes
T5 (T_{amb} = -60 °C to 75 °C)
T6(T_{amb} = -60 °C to 60 °C)
TABLE 11. Input Parameters

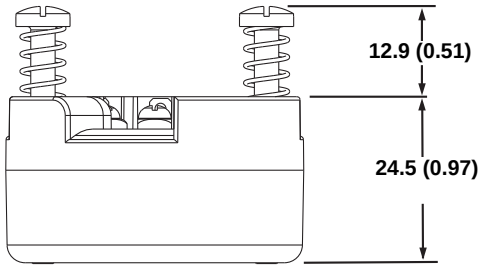
U_i = 42.4 V
C_i = 3.6nF (4–20 mA loop)
C_i = 2.1nF (Temperature Sensor Input)
L_i = 0

Dimensional Drawings

Rosemount 148 Top View



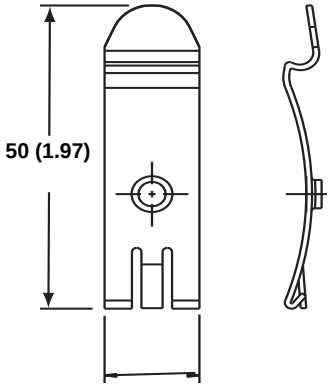
Rosemount 148 Side View



Dimensions are in millimeters (inches)

DIN Rail Mounting Kit

Dimensions



Dimensions are in millimeters (inches)

Ordering Information

TABLE 12. Rosemount 148 PC-Programmable Temperature Transmitter

★ 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			
148	PC Programmable Temperature Transmitter			
Transmitter Type				
Standard				**Standard**
H	DIN B Head Mount			★
Transmitter Output				
Standard				**Standard**
N	Analog Output			★
Product Certifications				
Standard				**Standard**
I5	FM Intrinsic Safety and Class 1, Division 2			★
E5(1)	FM Explosion-Proof			★
K5(1)	FM Intrinsic Safety, Explosion-Proof, and Class 1, Division 2			★
I6	CSA Intrinsic Safety and Class 1, Division 2			★
K6(1)	CSA Intrinsic Safety, Explosion-Proof, and Class 1, Division 2			★
I1	ATEX Intrinsic Safety			★
E1(1)	ATEX Flameproof			★
N1(1)	ATEX Type n			★
NC	ATEX Type n Component			★
ND(1)	ATEX Dust Ignition-Proof			★
I7	IECEx Intrinsic Safety			★
E7(1)	IECEx Flameproof			★
N7(1)	IECEx Type N			★
NG	IECEx Type n Component			★
NA	No approvals			★
Enclosure Options		**Material**	**IP Rating**	
Standard				**Standard**
A	Connection Head	Aluminum	IP68	★
U	Universal Head (Junction Box)	Aluminum	IP68	★
B	BUZ Head	Aluminum	IP65	★
C	BUZ Head	Polypropylene	IP65	★
N	No Enclosure			★
Expanded				
G	Connection Head	SST	IP68	
H	Universal Head (Junction Box)	SST	IP68	
S	Sanitary Connection Head, DIN B	Polished SST	IP66	
F	Sanitary Connection Head, DIN A	Polished SST	IP66/IP68	
Conduit Entry Size				
Standard				**Standard**
1	M20 x 1.5 (CM20)			★
2	1/2-14 in. NPT			★
0	No Enclosure			★

Options (Include with selected model number)

Alarm Level Configuration		
Standard		**Standard**
A1	NAMUR alarm and saturation levels, high alarm	★
CN	NAMUR alarm and saturation levels, low alarm	★

TABLE 12. Rosemount 148 PC-Programmable Temperature Transmitter

★ 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.

Calibration Certificate		
Standard		**Standard**
Q4	Calibration Certificate (3-point Calibration)	★
Line Filter		
Standard		**Standard**
F6	60 Hz Line Voltage Filter	★
External Ground Option (Available w/Enclosures U, H)		
Standard		**Standard**
G1	External Ground Lug Assembly	★
Cover Chain Option (Available w/Enclosures U, H)		
Standard		**Standard**
G3	Cover Chain	★
Cable Glande Option		
Standard		**Standard**
G2	Cable Gland–Explosion Proof–7.5 mm - 11.9 mm	★
G4	Cable Gland–Explosion Proof, Thin Wire - 3.0 mm - 8.0 mm	★
Conduit Electrical Connector		
Standard		**Standard**
GE	M12, 4-pin, Male Connector (eurofast®)	★
GM	A size Mini, 4-pin, Male Connector (minifast®)	★
Assemble To Options		
Standard		**Standard**
XA	Sensor Specified Separately and Assembled to Transmitter	★
Typical Model Number: 148 H N I5 U1 A1 XA		

(1) Approval Codes E1, N1, N7, ND, E5, K5, K6, and E7 require an enclosure

Rosemount 148 PC Programmer

The Rosemount 148 PC Programmer is a portable, self-contained communication link between your PC and the 148 transmitter for use in non-hazardous environments. The 148 PC Programmer contains the following items:

- PC Programmer Unit
- Programming Software (CD-ROM)
- 9V Battery
- Transmitter Connectors

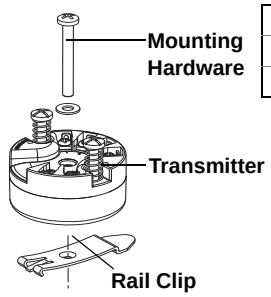
Rosemount 148 PC Programmer Software

The software makes the following parameters available:

- Process Variable
- Sensor Type
- Number of Wires
- Engineering Units
- Transmitter Tag Information)
- Damping
- Alarming Parameters

To order the 148 PC Programmer, use Part Number 00148-1601-0001.

TABLE 13. Rosemount 148 Transmitter Accessories



External Ground Screw Assembly Kit	00644-4431-0001
Kit, Hardware for Mounting a 148 to a DIN Rail (see left picture-top hat rail, symmetric)	00248-1601-0001
Snap Rings Kit (used for assembly to DIN Plate Style sensor)	00644-4432-0001

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EMERSON™
Process Management

Product Data Sheet
00813-0100-4697, Rev JA
April 2010

Rosemount 848T High Density Temperature Measurement Family

- *Innovative temperature measurement for high density applications that provide installation and operational savings*
- *Independently configurable inputs that support RTD, thermocouple, ohm, mV, and 4–20 mA signals*
- *Enclosure options and intrinsically safe design allows for installation close to any process, including hazardous areas*
- *WirelessHART™ capabilities extends the full benefits of PlantWeb® to previously inaccessible locations*

WirelessHART FOUNDATION CE

Contents

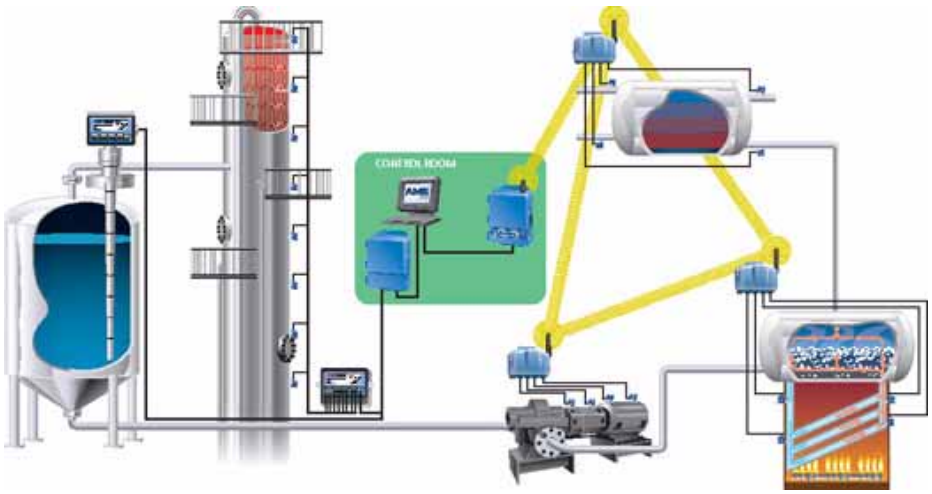
High Density Temperature Measurement

High Density Measurement Applications
Ideal for situations with multiple temperature measurements within close proximity to each other. Examples include bearing temperature on motors, heat exchanger efficiency, boiler tube monitoring, distillation columns, tanks, finished goods storage, furnaces, reactors, compressor stations, and kilns.

Economical Solution
Reduces installation and operational costs by as much as 70 percent compared to traditional methods such as wired direct sensors, low cost single input transmitters, and multiplexers. Traditional methods add significant infrastructure requirements making installations costly and time consuming.

Mounts Practically Anywhere
Provides optimum mounting flexibility with robust housings and junction box options, ambient temperature limits, RFI immunity compliance, and Intrinsic Safety approvals for installation in hazardous areas. To reduce installation costs, it should be mounted right next to the process.

PlantWeb Benefits
The information PlantWeb delivers - whether wired or wireless - will empower your staff to work predictively, instead of reactively. Maintenance can focus on the repairs that are needed, instead of fixing things that aren't broken. Operations can run production with greater confidence in automation, tuning the process for optimal throughput, quality and availability while reducing overall cost of operations.



Rosemount High Density Temperature Measurement Solutions

Rosemount 848T FOUNDATION™ fieldbus Temperature Transmitter: Simplifies and reduces the cost of temperature measurements by eliminating traditional and costly measurement methods (wiring direct, low cost single input transmitters, and multiplexers). This eight input transmitter can be mounted next to the process and provides a robust solution for the process industry, eliminating installation and maintenance costs associated with traditional methods.

Rosemount 848T Wireless Temperature Transmitter: Achieve all of the benefits of a high density measurement transmitter with no signal wire leading back to the control system. Installation and maintenance costs of signal wire can make some applications and projects economically unfeasible. Break down the economic barriers and receive key insight to valuable assets and processes to improve availability, throughput, and product quality. The Rosemount 848T Wireless can be integrated into any host system with the Smart Wireless Gateway.

The Rosemount 848T FOUNDATION fieldbus Temperature Transmitter

Economical Solution
The Rosemount 848T offers a low cost solution for high density measurements (e.g. distillation columns, tanks, reactors, boilers, etc.). It can reduce installation costs by as much as 70 percent per point when compared to traditional sensor wire direct applications.

Reduces I.S. Barrier Costs
For I.S. installations, only one barrier is needed to safely power several Rosemount 848T transmitters. As a result, one barrier can support at least 24 temperature measurement points, resulting in significant savings. The Fieldbus Intrinsically Safe Concept (FISCO) certification on the Rosemount 848T allows even more measurements per I.S. segment.

Eight Independent Sensor Inputs
The Rosemount 848T accepts eight independently configurable sensor inputs (2- and 3-wire RTDs, thermocouples, mV, ohm, and 4–20 mA signals).

Rosemount 848T FOUNDATION fieldbus temperature transmitter

Diagnostics and MAI Function Blocks
FOUNDATION fieldbus offers inherent diagnostics that provide continuous measurement status (good, bad, or uncertain) as well as sensor failure indication. The Rosemount 848T also offers the Multiple Analog Input (MAI) function block, which allows all eight of the sensor inputs to communicate with one function block, resulting in greater network efficiency.

Converts Analog to Fieldbus
The Rosemount 848T can accept 4–20 mA inputs using an optional analog connector that allows for quick connection of the Field Communicator for local configuration.

The Rosemount 848T Transmitters power PlantWeb providing high density measurement devices with calculating capability using Input Selector function blocks.

Rosemount Temperature Solutions

Rosemount 644 Temperature Transmitter
Head mount styles available with HART or FOUNDATION fieldbus protocol. Rail mount style available for HART protocol.

Rosemount General Use Sensors and Thermowells
Rosemount has a broad offering of RTD and thermocouples that are designed to meet plant requirements.

Rosemount 248 Temperature Transmitter
Head mount (DIN B) and Rail mount style with HART protocol and complete temperature assembly.

Rosemount 3144P Temperature Transmitter
Dual-compartment housing, dual sensor design available with HART or FOUNDATION fieldbus fieldbus protocol.

Rosemount 148 Temperature Transmitter
Head mount style (DIN B) PC-programmable transmitter.

Specifications

FUNCTIONAL

Inputs

Eight independently configurable channels including combinations of 2- and 3-wire RTDs, thermocouples, mV, and ohm inputs.

4–20 mA inputs using optional connector(s).

Outputs

Manchester-encoded digital signal that conforms to IEC 1158-2 and ISA 50.02.

Status

If self-diagnostics detect a sensor burnout or a transmitter failure, the status of the measurement will be updated accordingly.

Ambient Temperature Limits

–40 to 185 °F (–40 to 85 °C)

Accuracy (Pt 100 @ reference condition: 20 °C)
±0.30 °C (±0.54 °F) For the complete list see “Accuracy” on page 6.

Isolation

- 600 Vdc channel to channel isolation(1).
- 10 Vdc channel to channel isolation for all operating conditions with maximum 150 meters (500 feet) of sensor lead length 18 AWG.

Power Supply

Powered over FOUNDATION fieldbus with standard fieldbus power supplies. The transmitter operates between 9.0 and 32.0 V dc, 22 mA maximum. (Transmitter power terminals are rated to 42.4 V dc.)

Transient Protection

The transient protector (option code T1) helps to prevent damage to the transmitter from transients induced on the loop wiring by lightning, welding, heavy electrical equipment, or switch gears. This option is installed at the factory for the Rosemount 848T and is not intended for field installation.

Update Time

Approximately less than 1.5 seconds to read all 8 inputs.

Humidity Limits

0–99% non-condensing relative humidity

Turn-on Time

Performance within specifications is achieved in less than 30 seconds after power is applied to the transmitter.

Alarms

The AI and ISEL function blocks allow the user to configure the alarms to HI-HI, HI, LO, or LO-LO with a variety of priority levels and hysteresis settings.

CE Electromagnetic Compatibility Compliance Testing

Meets the criteria under IEC 61326: 2006

Stability

- ±0.1% of reading or 0.1 °C (0.18 °F), whichever is greater, for 2 years for RTDs.
- ±0.1% of reading or 0.1 °C (0.18 °F), whichever is greater, for 1 year for thermocouples.

Self Calibration

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

Vibration Effect

Transmitters are tested to the following vibration conditions with no effect on performance:

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

Backup Link Active Scheduler (LAS)

The transmitter is classified as a device link master, which means it can function as a Link Active Scheduler (LAS) if the current link master device fails or is removed from the segment.

The host or other configuration tool is used to download the schedule for the application to the link master device. In the absence of a primary link master, the transmitter will claim the LAS and provide permanent control for the H1 segment.

Software Upgrade in the Field

Software for the Rosemount 848T with FOUNDATION fieldbus is easy to upgrade in the field using the FOUNDATION fieldbus Common Device Software Download procedure.

FOUNDATION fieldbus Parameters

Schedule Entries	20
Links	30
Virtual Communications Relationships (VCR)	20

PHYSICAL

Mounting

The Rosemount 848T can be mounted directly onto a DIN rail or it can be ordered with an optional junction box. When using the optional junction box, the transmitter can be mounted onto a panel or to a 2-in. pipe stand (with option code B6).

(1) Reference conditions are -40 to 60 °C (-40 to 140 °F) with 30 meters (100 feet) of sensor lead length 18 AWG wire.

Entries for Optional Junction Box

No Entry

- Used for custom fittings

Cable Gland

- 9 x M20 nickel-plated brass glands for 7.5–11.9 mm unarmored cable

Conduit

- 5 plugged 0.86-in. diameter holes suitable for installing $^{1}/_{2}$-in. NPT fittings

Materials of Construction for Optional Junction Box

Junction Box Type	Paint
Aluminum	Epoxy Resin
Plastic	NA
Stainless Steel	NA
Aluminum Explosion-proof	NA

Weight

Assembly	Weight		
	oz	lb	kg
Rosemount 848T only	7.5	.47	.208
Aluminum(1)	78.2	4.89	2.22
Plastic(1)	58.1	3.68	1.65
Stainless Steel (1)	77.0	4.81	2.18
Aluminum Explosion-proof	557	34.8	15.5

(1) Add 35.2 oz (2.2 lb, 0.998 kg) for nickel-plated brass glands.

Environmental Ratings

Type 4X, and CSA Enclosure Type 4X, and IP66 with optional junction box. JX3 Explosion-proof enclosure rated to -4 °F (-20 °C).

FUNCTION BLOCKS

Analog Input (AI)

- Processes the measurement and makes it available on the fieldbus segment.
- Allows filtering, alarming, and engineering unit changes.

Input Selector (ISEL)

- Used to select between inputs and generate an output using specific selection strategies such as minimum, maximum, midpoint, or average temperature.
- Since the temperature value always contains the measurement status, this block allows the selection to be restricted to the first “good” measurement.

Multiple Analog Input Block (MAI)

- The MAI block allows the eight AI blocks to be multiplexed together so they serve as one function block on the H1 segment, resulting in greater network efficiency.

ACCURACY

TABLE 1. Input Options/Accuracy

Sensor Option	Sensor Reference	Input Ranges		Accuracy Over Range(s)	
		°C	°F	°C	°F
2- and 3-Wire RTDs					
Pt 50 (α = 0.00391)	GOST 6651-94	–200 to 550	–328 to 1022	± 0.57	± 1.03
Pt 100 (α = 0.00391)	GOST 6651-94	–200 to 550	–328 to 1022	± 0.28	± 0.50
Pt 100 (α = 0.00385)	IEC 751; α = 0.00385, 1995	–200 to 850	–328 to 1562	± 0.30	± 0.54
Pt 100 (α = 0.003916)	JIS 1604, 1981	–200 to 645	–328 to 1193	± 0.30	± 0.54
Pt 200 (α = 0.00385)	IEC 751; α = 0.00385, 1995	–200 to 850	–328 to 1562	± 0.54	± 0.98
Pt 200 (α = 0.003916)	JIS 1604; α = 0.003916, 1981	–200 to 645	–328 to 1193	± 0.54	± 0.98
Pt 500	IEC 751; α = 0.00385, 1995	–200 to 850	–328 to 1562	± 0.38	± 0.68
Pt 1000	IEC 751; α = 0.00385, 1995	–200 to 300	–328 to 572	± 0.40	± 0.72
Ni 120	Edison Curve No. 7	–70 to 300	–94 to 572	± 0.30	± 0.54
Cu 10	Edison Copper Winding No. 15	–50 to 250	–58 to 482	± 3.20	± 5.76
Cu 100 (a=428)	GOST 6651-94	-185 to 200	-301 to 392	± 0.48	±0.86
Cu 50 (a=428)	GOST 6651-94	-185 to 200	-301 to 392	± 0.96	±1.73
Cu 100 (a=426)	GOST 6651-94	-50 to 200	-58 to 392	± 0.48	±0.86
Cu 50 (a=426)	GOST 6651-94	-50 to 200	-58 to 392	± 0.96	±1.73
Thermocouples—Cold Junction Adds + 0.5 °C to Listed Accuracy					
NIST Type B (Accuracy varies according to input range)	NIST Monograph 175	100 to 300 301 to 1820	212 to 572 573 to 3308	± 6.00 ± 1.54	± 10.80 ± 2.78
NIST Type E	NIST Monograph 175	–200 to 1000	–328 to 1832	± 0.40	± 0.72
NIST Type J	NIST Monograph 175	–180 to 760	–292 to 1400	± 0.70	± 1.26
NIST Type K	NIST Monograph 175	–180 to 1372	–292 to 2502	± 1.00	± 1.80
NIST Type N	NIST Monograph 175	–200 to 1300	–328 to 2372	± 1.00	± 1.80
NIST Type R	NIST Monograph 175	0 to 1768	32 to 3214	± 1.50	± 2.70
NIST Type S	NIST Monograph 175	0 to 1768	32 to 3214	± 1.40	± 2.52
NIST Type T	NIST Monograph 175	–200 to 400	–328 to 752	± 0.70	± 1.26
DIN L	DIN 43710	–200 to 900	–328 to 1652	± 0.70	± 1.26
DIN U	DIN 43710	–200 to 600	–328 to 1112	± 0.70	± 1.26
w5Re26/W26Re	ASTME 988-96	0 to 2000	32 to 3632	± 1.60	± 2.88
Type L	GOST R 8.585-2001	-200 to 800	-328 to 1472	± 0.71	±1.28
Body Temperature of Transmitter		-50 to 85	-58 to 185	±0.50	±0.90
Millivolt Input—Not approved for use with CSA Option Code I6		–10 to 100 mV		± 0.05 mV	
2- and 3-Wire Ohm Input		0 to 2000 ohms		± 0.90 ohm	
4–20 mA (Rosemount)(1)		4–20 mA		± 0.01 mA	
4–20 mA (NAMUR)(1)		4–20 mA		± 0.01 mA	

(1) Requires the S002 option code.

Accuracy Notes

Differential capability exists between any two sensor types:

For all differential configurations, the input range is X to +Y where

X = Sensor A minimum - Sensor B max.
Y = Sensor A maximum - Sensor B min.

Accuracy for differential configurations:

If sensor types are similar (for example, both RTDs or both thermocouples), the accuracy = 1.5 times worst case accuracy of either sensor type. If sensor types are dissimilar (for example, one RTD and one thermocouple), the accuracy = Sensor 1 Accuracy + Sensor 2 Accuracy.

Analog Sensors 4–20mA

Two types of 4–20 mA sensors are compatible with the Rosemount 848T. These types must be ordered with the S002 option code complete with an analog connector kit. The alarm levels, accuracy for each type are listed in Table 2.

TABLE 2. Analog Sensors

Sensor Option	Alarm Levels	Accuracy
4–20mA (Rosemount Standard)	3.9 to 20.8 mA	± 0.01mA
4–20mA (NAMUR)	3.8 to 20.5 mA	± 0.01mA

AMBIENT TEMPERATURE EFFECT

Transmitters may be installed in locations where the ambient temperature is between –40 and 85 °C (–40 and 185 °F).

TABLE 3. Ambient Temperature Effects

NIST Type	Accuracy per 1.0 °C (1.8 °F) Change in Ambient Temperature(1)	Temperature Range (°C)
RTD		
Pt 50 (α = 0.00391)	• 0.004 °C (0.0072 °F)	NA
Pt 100 (α = 0.00391)	• 0.002 °C (0.0036 °F)	NA
Pt 100 (α = 0.00385)	• 0.003 °C (0.0054 °F)	NA
Pt 100 (α = 0.003916)	• 0.003 °C (0.0054 °F)	NA
Pt 200 (α = 0.003916)	• 0.004 °C (0.0072 °F)	NA
Pt 200 (α = 0.00385)	• 0.004 °C (0.0072 °F)	NA
Pt 500	• 0.003 °C (0.0054 °F)	NA
Pt 1000	• 0.003 °C (0.0054 °F)	NA
Cu 10	• 0.03 °C (0.054 °F)	NA
Cu 100 (a=428)	• 0.002 °C (0.0036 °F)	NA
Cu 50 (a=428)	• 0.004 °C (.0072 °F)	NA
Cu 100 (a=426)	• 0.002 °C (0.0036 °F)	NA
Cu 50 (a=426)	• 0.004 °C (.0072 °F)	NA
Ni 120	• 0.003 °C (0.0054 °F)	NA
Thermocouple (R = the value of the reading)		
Type B	• 0.014 °C • 0.032 °C - (0.0025% of (R - 300)) • 0.054 °C - (0.011% of (R - 100))	• R ≥ 1000 • 300 ≤ R < 1000 • 100 ≤ R < 300
Type E	• 0.005 °C + (0.00043% of R)	• All
Type J, DIN Type L	• 0.0054 °C + (0.00029% of R) • 0.0054 °C + (0.0025% of |R|)	• R ≥ 0 • R < 0
Type K	• 0.0061 °C + (0.00054% of R) • 0.0061 °C + (0.0025% of |R|)	• R ≥ 0 • R < 0
Type N	• 0.0068 °C + (0.00036% of R)	• All
Type R, Type S	• 0.016 °C • 0.023 °C - (0.0036% of R)	• R ≥ 200 • R < 200
Type T, DIN Type U	• 0.0064 °C • 0.0064 °C - (0.0043% of |R|)	• R ≥ 0 • R < 0
GOST Type L	• 0.007 °C • 0.007 °C + (0.003% of IRI)	• R ≥ 0 • R < 0
Millivolt	• 0.0005 mV	NA
2- and 3-wire Ohm	• 0.0084 ohms	NA
4–20 mA (Rosemount)	• 0.0001 mA	NA
4-20 mA (NAMUR)	• 0.0001 mA	NA

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

Ambient Temperature Notes

Examples:

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

- Ambient Temperature Effects: 0.003 °C x (30 - 20) = 0.03 °C
- Worst Case Error: Sensor Accuracy + Ambient Temperature Effects = 0.30 °C + 0.03 °C = 0.33 °C
- Total Probable Error $\sqrt{0.30^2 + 0.03^2} = 0.30°C$

Analog to Fieldbus Performance

Accuracy: 0.0625% of span. **Note:** To obtain accuracy, the mV input must be calibrated while using the optional analog connector
Temperature Effect: [0.002% of reading + 0.000625% of span] per 1.0 °C change in Ambient Temperature.

FOUNDATION fieldbus

Product Certifications

HAZARDOUS LOCATIONS CERTIFICATION

North American Certificates

Factory Mutual (FM) Certifications

I5 Intrinsically Safe and Non-Incendive
Intrinsically Safe for use in Class I, Division 1, Groups A, B,C, D; when installed per Rosemount drawing 00848-4404.

Temperature Code:
T4 (T_{amb} = –40 to 60 °C)

Non-Incendive for use in Class I, Division 2, Groups A, B, C, D (suitable for use with Non-Incendive field wiring) when installed in accordance with Rosemount Drawing 00848-4404.

Temperature Code:
T4A (T_{amb} = -40 to 85 °C)
T5 (T_{amb} = -40 to 70 °C)
Rosemount Enclosure Required.
Indoor Hazardous (Classified) Locations.

IE FISCO (Fieldbus Intrinsically Safe Concept) Intrinsic Safety
Intrinsically safe for use in Class I, Division 1, Groups A, B,C, D; when installed in accordance with Rosemount Drawing 00848-4404.

Temperature Code:
T4 (T_{amb} = –40 to 60 °C)

Non-incendive for use in Class I, Division 2, Groups A, B, C, D (suitable for use with non-incendive field wiring); when installed in accordance with Rosemount Drawing 00848-4404.

Temperature Code:
T4A (T_{amb} = –40 to 85 °C)
T5 (T_{amb} = –40 to 70 °C)

TABLE 4. Entity Parameters

Power/Bus	Sensor(1)
U_i = 17.5 V	U_o = 12.5 V
I_i = 380 mA	I_o = 4.8 mA
P_i = 5.32 W	P_o = 15 mW
C_i = 2.1 nF	C_o= 1.2 µF
L_i = 0	L_o= 1 H

(1) Entity parameters apply to entire device, not individual sensor.

N5 Dust Ignition-proof
For use in Class II, III, Division 1, Groups E, F, G. Class I, Division 2, Groups A, B, C, D;
Non-incendive for Class 1, Division 2, Groups A, B, C, D when installed to Rosemount Control Drawing 00848-4404.
Rosemount Enclosure Required.
Valid with both S001 and S002 options.

Temperature Code:
T4A (T_{amb} = –40 to 85 °C)
T5 (T_{amb} = –40 to 70 °C)

NK Non-Incendive for use in Class I, Division 2, Groups A, B, C, D (suitable for use with Non-Incendive field wiring) when installed in accordance with Rosemount Drawing 00848-4404.

Temperature Code:
T4A (T_{amb} = -40 to 85 °C)
T5 (T_{amb} = -40 to 70 °C)
Rosemount Enclosure Required.
Indoor Hazardous (Classified) Locations.

TABLE 5. FM Approved Entity Parameters(1)

Power/Bus	Sensor
U_o = 3.01V	U_o = 12.02 V
I_o = 3.38mA	I_o = 13.5 mA
P_o = 0.01W	P_o = 0.04 W
C_a = 0.34 µF	C_a = 1.36 µF
L_a = 40 mH	L_a = 160 mH

(1) Intrinsically safe and non-incendive parameters.

Canadian Standards Association (CSA) Certifications

E6 Explosion-proof and Dust Ignition-proof
Class I, Division 1, Groups B, C, and D.

Class II, Division 1, Groups E, F, and G.
Class III

Must be installed in enclosure option JX3.
Install per drawing 00848-1041.
Conduit seal not required.

Suitable for use in Class I, Division 2, Groups A, B, C, D. when installed per Rosemount drawing 00848-4404.
Temperature Code:
T3C = (– 50 ≤ T_{amb} ≤ 60 °C)
Must be installed in a suitable enclosure as determined acceptable by the local inspection authority.

I6 Intrinsically Safe, Division 2
For use in Class I, Division 1, Groups A, B, C, D; when installed per Rosemount drawing 00848-4405.

Temperature Code:
T3C (T_{amb} = –50 to 60 °C)

Suitable for Class I, Division 2, Groups A, B, C, D. Rated 42.4 VDC max. Not valid with S002 option.

TABLE 6. CSA Approved Entity Parameters

Power/Bus	Sensor(1)
U_i = 30 V	U_o = 12.5 V
I_i = 300 mA	I_o = 4.8 mA
C_i = 2.1 nF	P_o = 15 mW
L_i = 0	C_o = 1.2 µF
	L_o = 1 H

(1) Entity parameters apply to entire device, not individual sensor.

IF FISCO (Intrinsically Safe)
For use in Class I, Division 1, Groups A, B, C, D; when installed per Rosemount drawing 00848-4405.
Temperature Code:
T3C (T_{amb} = –50 to 60 °C)
Suitable for Class I, Division 2, Groups A, B, C, D. Rated 42.4 VDC max. Not valid with S002 option.

TABLE 7. CSA Approved Entity Parameters

Power/Bus	Sensor(1)
U_i = 17.5 V	U_o = 12.02 V
I_i = 380 mA	I_o = 11.8 mA
C_i = 2.1 nF	C_a = 1.36 µF
L_i = 0	L_a = 225 mH

(1) Entity parameters apply to entire device, not individual sensor.

N6 Class I, Division 2
Suitable for use in Class I, Division 2, Groups A, B, C, D. when installed per Rosemount drawing 00848-4404.
Temperature Code:
T3C = (–50 ≤ T_a ≤ 60 °C)
Must be installed in a suitable enclosure as determined acceptable by the local inspection authority.

European Certifications

ATEX Certifications

I1 Intrinsic Safety
Certificate Number: BASEEFA09ATEX0093X
ATEX Marking ⟨Ex⟩ II 1 G
Ex ia IIC T4 (–50 ≤ T_{amb} ≤ 60 °C)
CE 1180

TABLE 8. ATEX Approved Entity Parameters

Power/Bus	Sensor(1)
U_i = 30 V	U_o = 12.5 V
I_i = 300 mA	I_o = 4.8 mA
P_i = 1.3 W	P_o = 15 mW
C_i = 0	C_o = 1.2 µF
L_i = 0	L_o = 1 H

(1) Entity parameters apply to entire device, not individual sensor

Special Conditions for Safe Use (x):
This apparatus must be installed in an enclosure offering protection of at least IP20. Non-metallic enclosures must have a surface resistance of less than 1G ohm, light alloy or zirconium enclosures must be protected from impact and friction when installed.

The apparatus will not meet the 500V rms isolation test required by Clause 6.4.12 on EN50 020:1994 when the optional transient protection (FISCO) board is fitted and should be taken into account when installing the apparatus.

IA FISCO (Fieldbus Intrinsically Safe Concept) Intrinsic Safety
Certificate Number: BASEEFA09ATEX0093X
ATEX Marking ⟨Ex⟩ II 1 G
EEx ia IIC T4 (T_{amb} = –50 to 60 °C)
CE 1180

TABLE 9. ATEX Approved Entity Parameters

Power/Bus	Sensor
U_i = 17.5 V	U_o = 12.5 V
I_i = 380 mA	I_o = 4.8 mA
P_i = 5.32 W	P_o = 15 mW
C_i = 0	C_i = 1.2 µF
L_i = 0	L_o = 1 H

Special Conditions for Safe Use (x):
This apparatus must be installed in an enclosure offering protection of at least IP20. Non-metallic enclosures must have a surface resistance of less than 1G ohm, light alloy or zirconium enclosures must be protected from impact and friction when installed.

The apparatus will not meet the 500V rms isolation test required by Clause 6.4.12 on EN50 020:1994 when the optional transient protection (FISCO) board is fitted and should be taken into account when installing the apparatus.

N1 ATEX Type n
Certificate Number: BASEFFA09ATEX0095X
ATEX Marking ⟨Ex⟩ II 3 G
Ex nL IIC T5 (–40 ≤ T_{amb} ≤ 65 °C)

TABLE 10. ATEX Approved Entity Parameters

Power/Bus	Sensor
U_i = 42.4 V	U_o = 12.5 V
C_i = 0	I_o = 4.8 mA
L_i = 0	P_o = 15 mW
	C_o = 1.2 µF
	L_o = 1 H

Special Conditions for Safe Use (x):

1. Provisions shall be made, external to the apparatus, to prevent the rated voltage (42.4 V dc) being exceeded by transient disturbances of more than 40%.
2. The ambient temperature range of use shall be the most restrictive of the apparatus, cable gland, or blanking plug.

NC ATEX Type n Component
Certificate Number: BASEEFA09ATEX0094U
ATEX Marking ⟨Ex⟩ II 3 G
Ex nL IIC T4 (–50 ≤ T_{amb} ≤ 85 °C)
Ex nL IIC T5 (–50 ≤ T_{amb} ≤ 70 °C)

Special Conditions for Safe Use (x):

1. The component must be housed in a suitably certified enclosure.
2. Provision shall be made, external to the component, to prevent the rated voltage (42.4V d.c.) being exceeded by transient disturbances of more than 40%.

ND ATEX Dust
Certification Number: BAS01ATEX1315X
ATEX Marking ⟨Ex⟩ II 1 D
T90C (–40 ≤ T_{amb} ≤ 65 °C) IP66

Special Conditions for Safe Use (x):

1. The user must ensure that the maximum rated voltage and current (42.2 volts, 22 mA, DC) are not exceeded. All connections to other apparatus or associated apparatus shall have control over this voltage and current equivalent to a category “ib” circuit according to EN50020.
2. Component approved Ex e cable entries must be used which maintain the ingress protection of the enclosure to at least IP66.
3. Any unused cable entry holes must be filled with component approved Ex e blanking plugs.
4. The ambient temperature range of use shall be the most restrictive of the apparatus, cable gland, or blanking plug.

NE ATEX TYPE ‘n’ APPROVAL
Certification Number: BASEEFA09ATEX00944 and BASEFFA09ATEX0095X
ATEX Marking ⟨Ex⟩ II 3 G
Ex nA nL IIC T5 (T_{amb} = –40 to 65 °C)
NE is valid with S001 Input Type ONLY)

TABLE 11. Baseefa Approved Entity Parameters

Power/Bus	Sensor
U_i = 42.4 V	U_o = 5V dc
C_i = 0	I_o = 2.5 mA
L_i = 0	C_o = 1000 µF
	L_o = 1000 mH

Special Conditions of Safe Use (x):

1. Provisions shall be made, external to the apparatus to prevent the rated voltage (42.4 Vdc) from being exceeded by transient disturbances of more than 40%.
2. The ambient temperature range of use shall be the most restrictive of the apparatus, cable gland, or blanking plug.

NF ATEX Type N Component Approval
Certificate Number BASEFFA09ATEX0095X
ATEX Marking ⟨Ex⟩ II 3 G
Ex nA nL IIC T4 (–50 ≤ T_{amb} ≤ 85 °C)
Ex nA nL IIC T5 (–50 ≤ T_{amb} ≤ 70 °C)
NF is valid with S001 Input Type ONLY

TABLE 12. Baseefa Approved Entity Parameters

Power/Bus	Sensor
U_i = 42.4 V	U_o = 5V dc
C_i = 0	I_o = 2.5 mA
L_i = 0	C_o = 1000 µF
	L_o = 1000 mH

Special Conditions of Safe Use (x):

1. The component must be housed in a suitable certified enclosure.
2. Same as condition 1 for Cert: BASEFFA09ATEX0095X

IECEx Certifications

I7 IECEx Intrinsic Safety
Certificate No.: IECExBAS09.0030X
Ex ia IIC T4 (–50 ≤ T_{amb} ≤ 60 °C)

TABLE 13. IECEx Approved Entity Parameters

Power/Bus	Sensor
U_i = 30 V	U_o = 12.5 V
I_i = 300 mA	I_o = 4.8 mA
P_i = 1.3 W	P_o = 15 mW
C_i = 0	C_o = 1.2 µF
L_i = 0	L_o = 1 H

IG IECEx FISCO
Certificate No.: IECExBAS09.0030X
Ex ia IIC T4 (–50 ≤ T_{amb} ≤ 60 °C)

TABLE 14. IECEx Approved Entity Parameters

Power/Bus	Sensor
U_i =17.5 V	U_o = 12.5 V
I_i = 380 mA	I_o = 4.8 mA
P_i = 5.32 W	P_o = 15 mW
C_i = 0	C_o = 1.2 µF
L_i = 0	L_o = 1 H

Special Conditions of Safe Use (x):

1. The 848T shall be used according to its input and output parameters.
2. For Ex ia applications, the equipment is to be DIN-rail mounted in an IP20 area, mounted in a Rosemount Junction Box Option Code JPx, JAx, or JSx, or mounted in any suitable enclosure rated to a minimum of IP20.
3. For Ex n applications, the equipment is to be mounted in a Rosemount Junction Box Option Code JPx, JAx, or JSx, or mounted in any suitable enclosure rated to a minimum of IP54.
4. When installed in an enclosure, cable glands and used should ensure a minimum rating of IP20 for Ex ia equipment or a minimum rating of IP54 for Ex n equipment. Unused cable glands or conduit entries are to be closed to ensure the required IP rating is maintained.
5. When the equipment is to be installed and used in accordance with the FISCO concept, the transient protection option is to be fitted.
6. The sensor terminals are used only with passive temperature sensors (resistance or thermocouple) classed as simple devices.

N7 IECEx Type n Approval
Certificate No.: IECExBAS09.0032X
Ex Na nL IIC T5 (–40 ≤ T_{amb} ≤ 65 °C)
NOTE: N7 is valid with S001 and S002 Input Types

TABLE 15. IECEx Approved Entity Parameters

Power/Bus	Sensor
U_i = 42.4 V	U_o = 5V dc
C_i = 0	I_o = 2.5 mA
L_i = 0	C_o = 1000 µF
	L_o = 1000 mH

Special Conditions for Safe Use (x):

1. Provisions shall be made, external to the apparatus, to prevent the rated voltage (42.2V dc) being exceeded by transient disturbances of more than 40%.
2. The ambient temperature range of use shall be the most restrictive of the apparatus, cable gland, or blanking plug.

NJ IECEx Type n COMPONENT Approval
Certification Number: IECExBAS09.00314
Ex nA nL IIC T4 ($-50 \leq T_{amb} \leq 85$ °C)
Ex nA nL IIC T5 ($-50 \leq T_{amb} \leq 70$ °C)
NOTE: NJ is valid with S001 and S002 Input Types

TABLE 16. IECEx Approved Entity Parameters

Power/Bus	Sensor
U_i = 42.4 V	U_o = 5V dc
C_i = 0	I_o = 2.5 mA
L_i = 0	C_o = 1000 μF
	L_o = 1000 mH

Special Conditions of Safe Use (x):

1. The component must be housed in a suitable certified enclosure.
2. Provisions shall be made, external to the apparatus, to prevent the rated voltage (42.2V dc) being exceeded by transient disturbances of more than 40%.

Brazilian Certifications

Brazilian Approval (INMETRO Approval)

Certification number: NCC3960.07X

BR-Ex nL IIC T5 Tamb: -40ºC a +65ºC

Special Conditions of Safe Use (x):

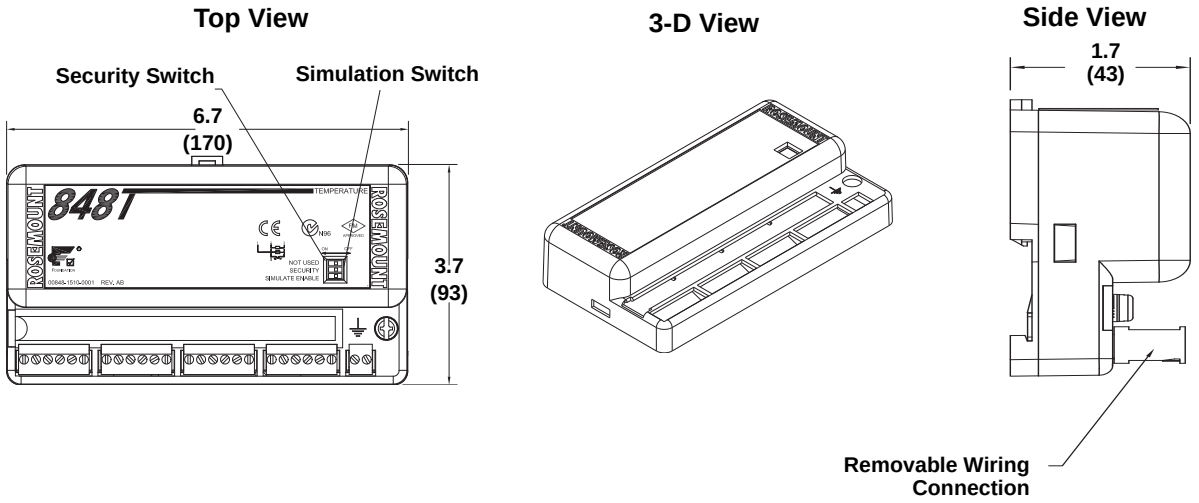
1. This apparatus must be installed in an enclosure which affords it a degree of protection of at least IP20. Non-metallic enclosures must have a surface resistance of less than 1G ohm, light alloy or zirconium enclosures must be protected from impact and friction when installed.
2. Provisions shall be made, external to the apparatus, to prevent the rated voltage (42,4V dc) being exceeded by transient disturbances of more than 40%.
3. The ambient temperature range of use shall be the most restrictive of the apparatus, cable gland, or blanking plug.

FOUNDATION fieldbus

Dimensional Drawings

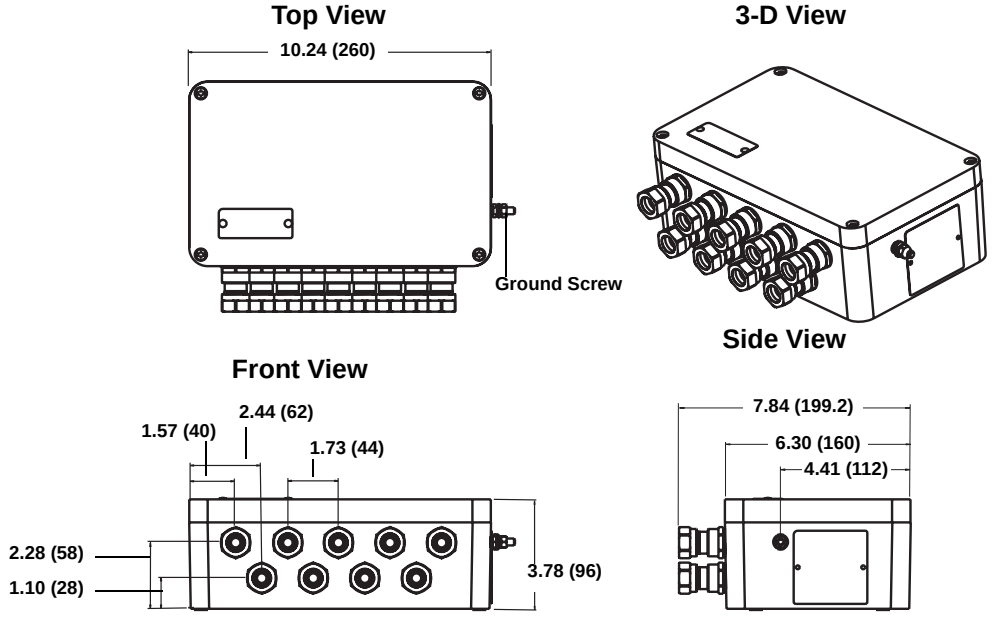
Junction Boxes with no entries (option codes JP1, JA1, and JS1)– external dimensions are the same as those outlined for the other junction box materials in this section.

Rosemount 848T



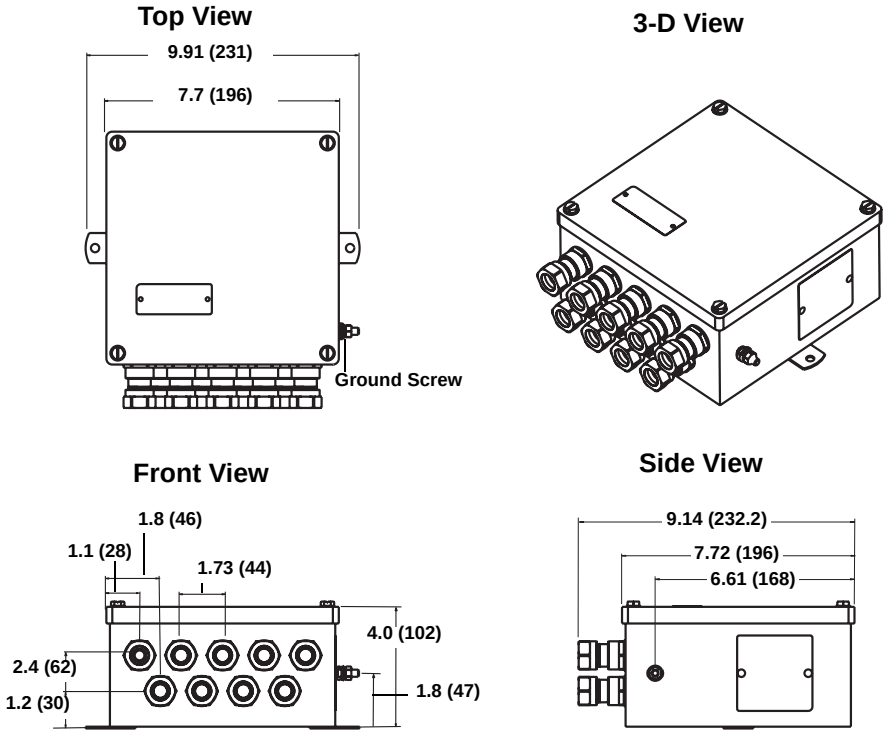
Dimensions are in inches (millimeters)

Aluminum/Plastic Junction Box—Cable Gland (option codes JA2 and JP2)



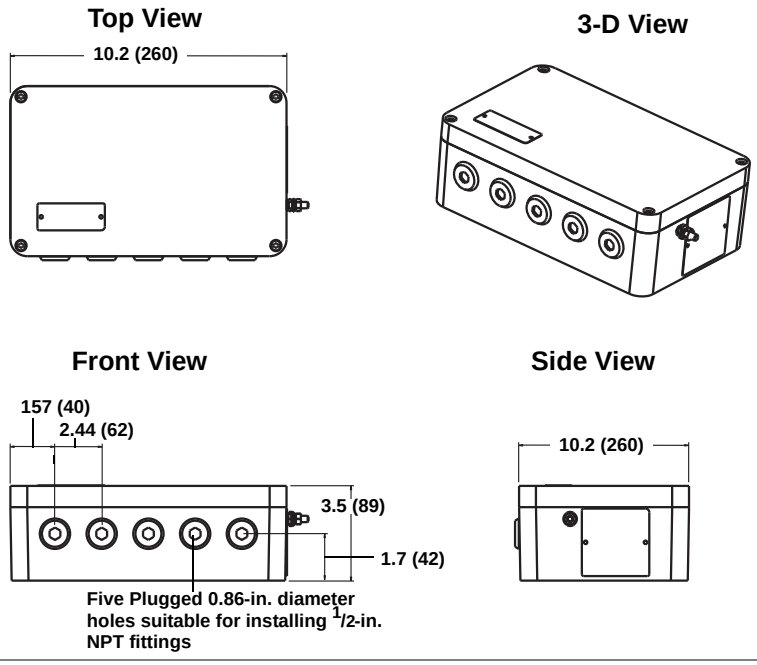
Dimensions are in inches (millimeters)

Stainless Steel Junction Box—Cable Gland (option code JS2)



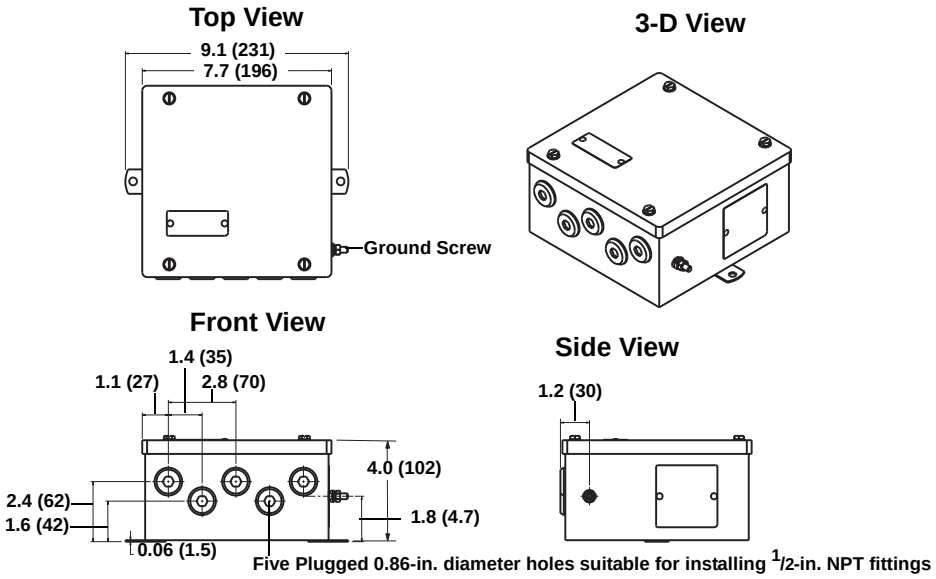
Dimensions are in inches (millimeters)

Aluminum/Plastic Junction Box—Conduit Entry (option codes JA3 and JP3)



Dimensions are in inches (millimeters)

Stainless Steel Junction Box—Conduit Entry (option code JS3)

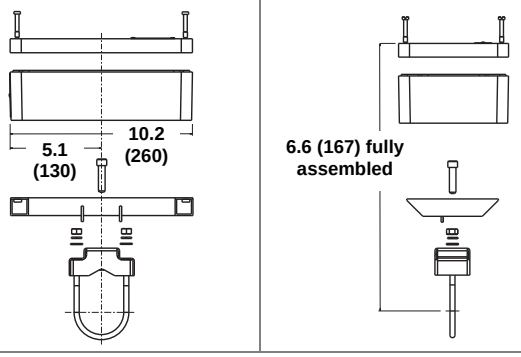


Dimensions are in inches (millimeters)

MOUNTING OPTIONS

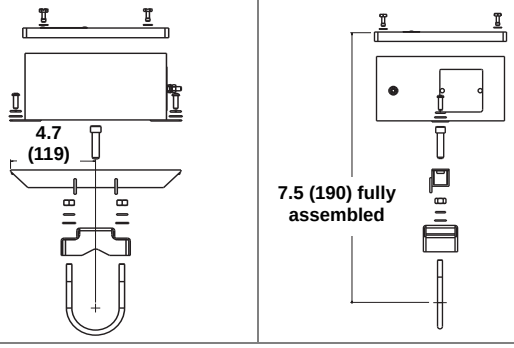
Aluminum/Plastic Junction Box (styles JA and JP)

Front View	Side View



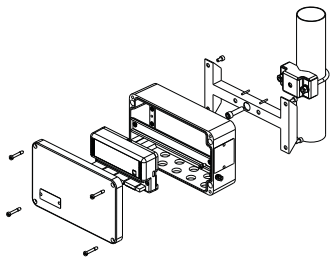
Stainless Steel Junction Box (style JS)

Front View	Side View

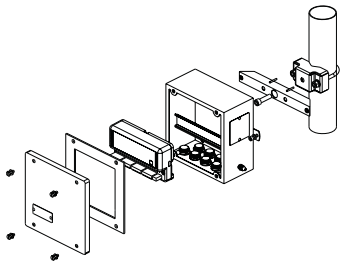


Dimensions are in inches (millimeters)

Aluminum/Plastic Junction Box Mounted on a Vertical Pipe



Stainless Steel Junction Box Mounted on a Vertical Pipe



Ordering Information

TABLE 17. Rosemount 848T High Density Temperature Family

★ 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		
848T	High Density Temperature Family		
Communications Protocol			
Standard			**Standard**
F	FOUNDATION fieldbus digital signal (includes AI, MAI, and ISEL function blocks, and Backup Link Active Scheduler)		★
Product Certifications(1)		**Rosemount Junction Box required?**	
Standard			**Standard**
I5(2)	FM Intrinsically Safe, Division 2	No	★
IE	FM FISCO Intrinsically Safe	No	★
N5	FM Class I, Division 2, and Dust Ignition-proof (enclosure required)	Yes	★
NK	FM Class 1, Division 2	No	★
I6(2)	CSA Intrinsically Safe, Division 2	No	★
IF(2)	CSA FISCO Intrinsically Safe, Division 2	No	★
N6	CSA Class I, Division 2	No	★
I1	ATEX Intrinsic Safety	No	★
IA	ATEX FISCO Intrinsic Safety	No	★
N1	ATEX Type n (enclosure required)	Yes	★
NC	ATEX Type n Component (EEx nL)	No(3)	★
ND	ATEX Dust (enclosure required)	Yes	★
I7	IECEx Intrinsic Safety	No	★
IG	IECEx FISCO (Intrinsically Safe)	No	★
N7	IECEx Type n (enclosure required)	Yes	★
NJ	IECEx Type n Component (Ex nA nL)	No(3)	★
I4	TIIS Intrinsically Safety	No	★
NA	No Approval	No	★
Expanded			
E6	CSA Explosion-proof, Dust Ignition-proof, Division 2 (JX3 enclosure required)	Yes(4)	
Input Types			
Standard			**Standard**
S001	Resistance Temperature Detectors and Thermocouples		★
S002(5)	RTDs, Thermocouples, and 4–20 mA		★
Transient Protection			
Standard			**Standard**
T1	Transient Protection		★
Mounting Kit Options			
B6	Mounting Bracket for 2-in. pipe mounting and for panel mounting – SST bracket and bolts		★
Enclosure Options			
Standard			**Standard**
JA2	Aluminum Cable Glands (9 x M20 nickel-plated brass glands for 7.5–11.9 mm unarmored cable)		★
JA3	Aluminum Conduit Entries (5 plugged holes, suitable for installing 1/2-in. NPT fittings)		★
Expanded			
JP1	Plastic Junction Box; No Entries		
JP2	Plastic Box, Cable Glands (9 x M20 nickel-plated brass glands for 7.5–11.9 mm unarmored cable)		

TABLE 17. Rosemount 848T High Density Temperature Family

★ 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		
JP3	Plastic Box, Conduit Entries (5 plugged holes, suitable for installing 1/2-in. NPT fittings)		
JA1	Aluminum Junction Box; No Entries		
JS1	Stainless Steel Junction Box; No Entries		
JS2	Stainless Steel Box, Cable Glands (9 x M20 nickel-plated brass glands for 7.5–11.9 mm unarmored cable)		
JS3	Stainless Steel Box, Conduit Entries (5 plugged holes, suitable for installing 1/2-in. NPT fittings)		
JX3(6)	Explosion-proof Box, Conduit Entries (4 plugged holes, suitable for installing 1/2-in. NPT fittings)		
Custom Software Configuration Request			
Standard			**Standard**
C1	Factory configuration of date, descriptor, and message fields (CDS required)		★
Configuration Options			
Standard			**Standard**
F5	50 Hz Line Voltage Filter		★
5-Point Calibration			
Standard			**Standard**
C4	5-Point Calibration (requires Q4 option code to generate a calibration certificate)		★
Calibration Certification			
Standard			**Standard**
Q4	3 Point Calibration Certificate Provided		★
Conduit Electrical Connector			
Standard			**Standard**
GE(7)	M12, 4-pin, Male Connector (eurofast®)		★
GM(7)	A size Mini, 4-pin, Male Connector (minifast®)		★
Typical Model Number: 848T F I5 S001 T1 B6 JA2			

(1) Consult factory for availability.

(2) Available only with S001 option.

(3) The Rosemount 848T ordered with component approval is not approved as a stand-alone unit. Additional system certification is required.

(4) Enclosure Option JX3 must be ordered with Product Certification Code E6. (O-ring for the JX3 enclosure rated to -20 °C).

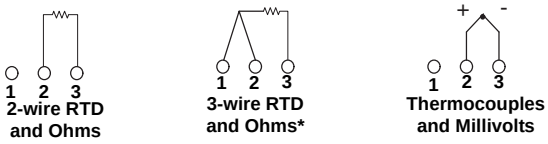
(5) S002 is only available with Product Certification N5, N6, N1, NC, NK, and NA.

(6) JX3 Explosion-proof enclosure rated to -4 °F (-20 °C).

(7) Available with no approval or Intrinsically Safe approvals only. For FM Intrinsically Safe (option code I5), install in accordance with Rosemount drawing 00848-4402.

Wiring

Rosemount 848T Sensor Wiring Diagram



** Rosemount provides 4-wire sensors for all single-element RTDs. Use these RTDs in 3-wire configurations by clipping the fourth lead or leaving it disconnected and insulated with electrical tape.*

Standard Configuration

Unless otherwise specified, the transmitter will be shipped as follows for all eight sensors:

Standard Configuration Settings	
Sensor Type(1)	Thermocouple Type J
Damping(1)	5 seconds
Measurement Units(1)	°C
Output(1)	Linear with Temperature
Line Voltage Filter(1)	60 Hz
Temperature Specific Blocks	• Sensor Transducer Block (1)
FOUNDATION™ fieldbus Function Blocks	• Analog Input (8) • Multiple Analog Input (1) • Input Selector (4)
Input Transient Filter(1)	• Enabled

(1) For all eight sensors.

The Rosemount 848T Wireless Temperature Transmitter

Self-Organizing Networks

The Rosemount 848T Wireless works the same as wired devices, allowing you to leverage existing practices, training and maintenance procedures, but without the added wiring costs. The self-forming, intelligent devices provide exceptional data reliability and network stability.

SmartPower™

Emerson is the only provider of a power optimized solution for both user and process safety. An intrinsically safe power module allows field replacements without removing the transmitter from the process to keep personnel safe and reduce maintenance costs. Power module installation requires no special training. Keyed connections eliminate the risk of incorrect installation. This reliable solution provides long lasting power module life that delivers rich WirelessHART data.

Layered Security Keeps Your Network Safe

Emerson Process Management's layered approach to wireless network security ensures that your network stays protected. The network devices implement Encryption, Authentication, Verification, Anti-Jamming and Key Management methods to ensure that data transmissions are secure.

Configurable High and Low Alerts

Experience enhanced performance with each sensor being user-configurable for high and low temperature points. When the temperature measurements rise above or falls below these points, an alert message is sent.

Rosemount 848T Wireless Temperature Transmitter

Reliable Transmitter Performance

The 848T Wireless can be configured for a variety of sensor inputs: RTD, thermocouple, millivolt, ohm, or milliamp signals and it ensures top transmitter performance in harsh and/or noisy EMI/RFI environments.

Digital Field Devices that Power PlantWeb

The Rosemount 848T Wireless powers PlantWeb by communicating temperature diagnostics and PlantWeb alerts that ensure process and asset health.

Smart Wireless Solutions

Rosemount 648 Wireless Temperature Transmitter

The Rosemount 648 integrates temperature measurement into a self-organizing network to optimize plant performance while minimizing maintenance.

Smart Wireless Gateway

The Emerson Smart Wireless Gateway integrates the self-organizing network into the host system, providing industry leading security and data reliability.

Rosemount 3051S Series of Instrumentation

The scalable 3051S enables fully integrated pressure, flow and level self-organizing network solutions to optimize plant performance and reduce risk.

Rosemount 702 Discrete Input Transmitter

The Rosemount 702 integrates discrete input state into a self-organizing network to optimize plant performance and extend asset life.

Smart Wireless THUM™ Adapter

The SmartWireless THUM Adapter integrates HART data from any wired HART device into the self-organizing network to optimize plant performance and extend asset life.

WirelessHART... The Industry Standard

Self-Organizing, Adaptive Mesh Routing

- No wireless expertise required, devices automatically find the best communication paths
- Network continuously monitors paths for degradation and repairs itself
- Adaptive behavior provides reliable, hands-off operation and simplifies network deployments, expansion and reconfiguration
- Supports both star and mesh topologies

Industry Standard Radio with Channel Hopping

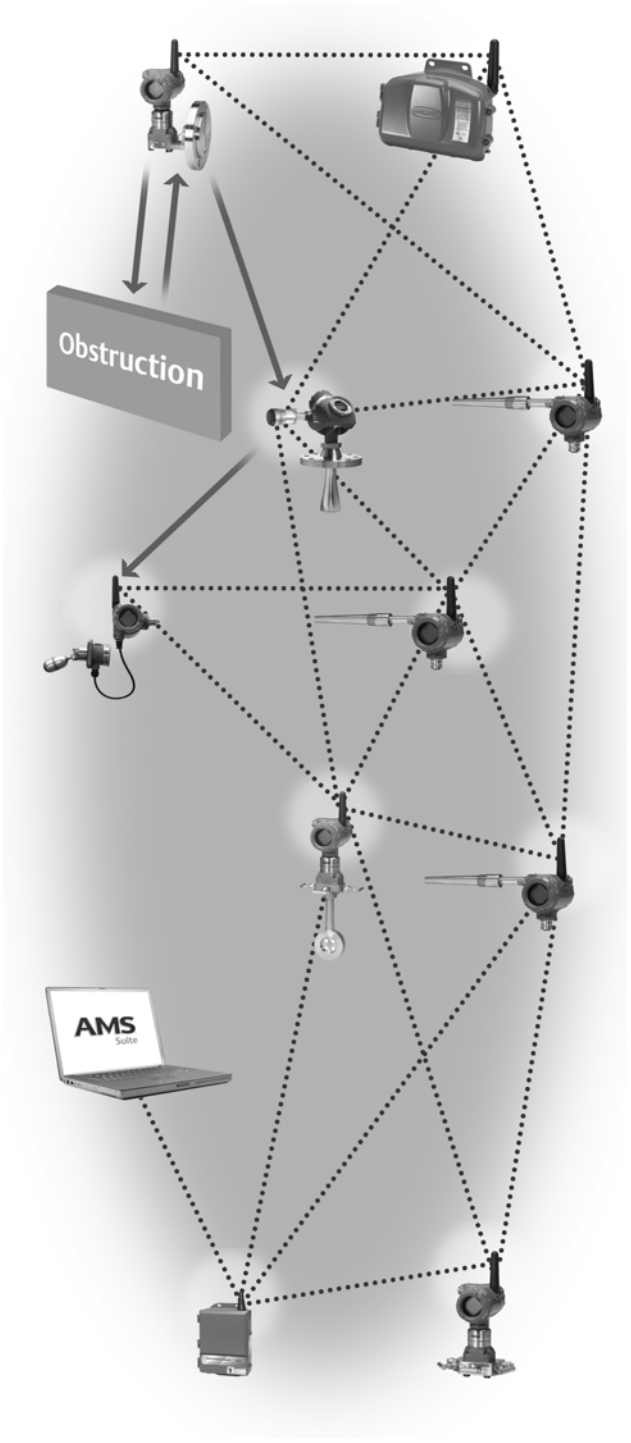
- Standard IEEE 802.15.4 radios
- 2.4 GHz ISM band sliced into 16 radio-channels
- Continually “hop” across channels to avoid interference and increase reliability
- Frequency hopping spread spectrum (FHSS) technology delivers high reliability in challenging radio environment

Self-Healing Network

- If an obstruction is introduced into the mesh network, devices will automatically find the best alternate communication path. This alternate path will be created and the information will continue to flow.

Seamless Integration to Existing Hosts

- Transparent and seamless integration
- Same control system applications
- Gateways connect using industry protocols



Specifications

Functional Specifications

Input

Four independently configurable input channels that supports Thermocouple, RTD, millivolt, ohm, and 4–20 mA input types. See “Accuracy” on page 20 for sensor options.

Output

WirelessHART 2.4 GHz DSSS.

Ambient Temperature Limits

–40 to 85 °C (–40 to 185 °F)

Humidity Limits

0–99% non-condensing relative humidity

Update Rate

User selectable, 4 sec to 60 min.

Accuracy (Pt 100 @ reference condition: 20 °C)

±0.30 °C (±0.54 °F) For the complete list see “Accuracy” on page 20.

Isolation

Isolation between all sensor channels is rated to 10Vdc over all operating conditions. No damage will occur to the device with up to 250 Vdc between any sensor channel.

Alerts

Message sent when open or short sensor is detected.

ElectroMagnetic Compatibility (EMC)

All Models:

Meets all relevant requirements of EN 61326.

Transmitter Stability

- ±0.15% of reading or 0.15 °C (0.27 °F), whichever is greater, for 2 years for RTDs.
- ±0.15% of reading or 0.15 °C (0.27 °F), whichever is greater, for 1 year for thermocouples.

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

Minimal effect when tested per the requirements of IEC60770-1:

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

Physical Specifications

Electrical Connections

Power Module

Field replaceable, keyed connection eliminates the risk of incorrect installation. Intrinsically Safe Lithium-thionyl chloride Power Module with polybutadine terephthalate (PBT) enclosure. Six-year life at one minute update rate.(1)

Sensor Terminals

Sensor terminals permanently fixed to terminal block

HART Communicator Connections

Communication Terminals

Clips permanently fixed to terminal block

Materials of Construction

Enclosure

Housing - Low-copper aluminum
Paint - Polyurethane
Cover O-ring - Silicone

Terminal Block and Power Module

PBT

Antenna

PBT/Polycarbonate (PC) integrated omnidirectional antenna

Mounting

Transmitter can be mounted onto a 2-in. pipe stand. Sensors must be remotely mounted.

Weight

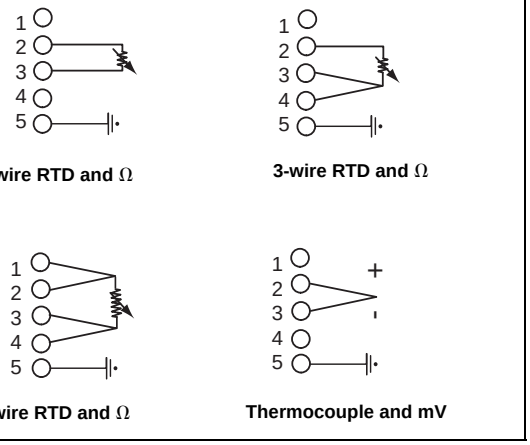
848T Wireless - 4.75 lbs. (2.15 kg)

Enclosure Ratings (848T Wireless)

Housing option codes HA1 or HA2 are Type 4x and IP66.

Sensor Connections

848T Wireless Sensor Connections Diagram



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

ACCURACY

TABLE 18. Input Options/Accuracy

Sensor Option	Sensor Reference	Input Ranges		Accuracy Over Range(s)	
		°C	°F	°C	°F
2-, 3-, and 4-Wire RTDs					
Pt50 (α = 0.00391)	GOST 6651-94	–200 to 550	–328 to 1022	± 0.57	± 1.03
Pt 100 (α = 0.00391)	GOST 6651-94	–200 to 550	–328 to 1022	± 0.28	± 0.50
Pt 100 (α = 0.00385)	IEC 751; α = 0.00385, 1995	–200 to 850	–328 to 1562	± 0.30	± 0.54
Pt 100 (α = 0.003916)	JIS 1604, 1981	–200 to 645	–328 to 1193	± 0.30	± 0.54
Pt 200 (α = 0.00385)	IEC 751; α = 0.00385, 1995	–200 to 850	–328 to 1562	± 0.54	± 0.98
PT 200 (α = 0.003916)	JIS 1604, 1981 (α = 0.003916)	–200 to 645	–328 to 1193	± 0.54	± 0.98
Pt 500 (α = 0.00385)	IEC 751; α = 0.00385, 1995	–200 to 850	–328 to 1562	± 0.38	± 0.68
Pt 1000 (α = 0.00385)	IEC 751; α = 0.00385, 1995	–200 to 300	–328 to 572	± 0.40	± 0.72
Ni 120	Edison Curve No. 7	–70 to 300	–94 to 572	± 0.30	± 0.54
Cu 10	Edison Copper Winding No. 15	–50 to 250	–58 to 482	± 3.20	± 5.76
Cu 100 (a=428)	GOST 6651-94	-185 to 200	-301 to 392	± 0.48	±0.86
Cu 50 (a=428)	GOST 6651-94	-185 to 200	-301 to 392	± 0.96	±1.73
Cu 100 (a=426)	GOST 6651-94	-50 to 200	-58 to 392	± 0.48	±0.86
Cu 50 (a=426)	GOST 6651-94	-50 to 200	-58 to 392	± 0.96	±1.73
Thermocouples—Cold Junction Adds + 0.5 °C to Listed Accuracy					
NIST Type B (Accuracy varies according to input range)	NIST Monograph 175	100 to 300 301 to 1820	212 to 572 573 to 3308	± 6.00 ± 1.54	± 10.80 ± 2.78
NIST Type E	NIST Monograph 175	–200 to 1000	–328 to 1832	± 0.40	± 0.72
NIST Type J	NIST Monograph 175	–180 to 760	–292 to 1400	± 0.70	± 1.26
NIST Type K	NIST Monograph 175	–180 to 1372	–292 to 2502	± 1.00	± 1.80
NIST Type N	NIST Monograph 175	–200 to 1300	–328 to 2372	± 1.00	± 1.80
NIST Type R	NIST Monograph 175	0 to 1768	32 to 3214	± 1.50	± 2.70
NIST Type S	NIST Monograph 175	0 to 1768	32 to 3214	± 1.40	± 2.52
NIST Type T	NIST Monograph 175	–200 to 400	–328 to 752	± 0.70	± 1.26
DIN L	DIN 43710	–200 to 900	–328 to 1652	± 0.70	± 1.26
DIN U	DIN 43710	–200 to 600	–328 to 1112	± 0.70	± 1.26
w5Re/W26Re	ASTME 988-96	0 to 2000	32 to 3632	± 1.60	± 2.88
Type L	GOST R.8.585-2001	–200 to 800	–328 to 1472	±0.71	±1.28
Body Temperature of Transmitter		-50 to 85	-58 to 185	±3.50	±6.30
Input Units					
Ohm Input		0 to 2000 ohms		±0.90 ohms	
Millivolt Input		-10 to 100 mV		±0.05 mV	
4–20 mA (Rosemount)(1)		4–20 mA		±0.01 mA	
4–20 mA (NAMUR)(1)		4–20 mA		±0.01 mA	

(1) Requires the S002 option code.

AMBIENT TEMPERATURE EFFECT

Transmitters may be installed in locations where the ambient temperature is between –40 and 85 °C (–40 and 185 °F).

TABLE 19. Ambient Temperature Effects

NIST Type	Accuracy per 1.0 °C (1.8 °F) Change in Ambient Temperature(1)	Temperature Range (°C)
RTD		
Pt 50 (α = 0.003910)	• 0.004 °C (0.0072 °F)	NA
Pt 100 (α = 0.00391)	• 0.002 °C (0.0036 °F)	NA
Pt 100 (α = 0.00385)	• 0.003 °C (0.0054 °F)	NA
Pt 100 (α = 0.003916)	• 0.003 °C (0.0054 °F)	NA
Pt 200 (α = 0.00385)	• 0.004 °C (0.0072 °F)	NA
PT 200 (α = 0.003916)	• 0.004 °C (0.0072 °F)	NA
Cu 10	• 0.03 °C (0.054 °F)	NA
Pt 500	• 0.003 °C (0.0054 °F)	NA
Pt 1000	• 0.003 °C (0.0054 °F)	NA
Cu 100 (a=428)	• 0.002 °C (0.0036 °F)	NA
Cu 50 (a=428)	• 0.004 °C (.0072 °F)	NA
Cu 100 (a=426)	• 0.002 °C (0.0036 °F)	NA
Cu 50 (a=426)	• 0.004 °C (.0072 °F)	NA
Ni 120	• 0.003 °C (0.0054 °F)	NA
Thermocouple (R = the value of the reading)		NA
Type B	• 0.014 °C • 0.032 °C - (0.0025% of (R - 300)) • 0.054 °C - (0.011% of (R - 100))	• R ≥ 1000 • 300 ≤ R < 1000 • 100 ≤ R < 300
Type E	• 0.005 °C + (0.00043% of R)	• All
Type J, Din Type L	• 0.0054 °C + (0.00029% of R) • 0.0054 °C + (0.0025% of |R|)	• R ≥ 0 • R < 0
Type K	• 0.0061 °C + (0.00054% of R) • 0.0061 °C + (0.0025% of |R|)	• R ≥ 0 • R < 0
Type N	• 0.0068 °C + (0.00036% of R)	• All
Type R, Type S	• 0.016 °C • 0.023 °C - (0.0036% of R)	• R ≥ 200 • R < 200
Type T, DIN Type U	• 0.0064 °C • 0.0064 °C - (0.0043% of |R|)	• R ≥ 0 • R < 0
GOST Type L	• 0.007 °C • 0.007 °C + (0.003% of IRI)	• R ≥ 0 • R < 0
Input Units		
Ohm input	• 0.0084 ohms	NA
Millivolt Input	• 0.0005 mV	NA
4–20 mA (Rosemount)	• 0.0001 mA	NA
4–20 mA (NAMUR)	• 0.0001 mA	NA

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

Ambient Temperature Notes

Examples:

When using a Pt 100 (α = 0.00385) sensor input at 40 °C ambient temperature, temperature effects would be:

- Ambient Temperature Effects: 0.003 °C x (30 - 20) = 0.03 °C
- Worst Case Error: Sensor Accuracy + Ambient Temperature Effects = 0.30 °C + 0.03 °C = 0.33 °C
- Total Probable Error $\sqrt{0.30^2 + 0.03^2} = 0.30°C$

Product Certifications

Approved Manufacturing Locations

Rosemount Inc. – Chanhassen, Minnesota, USA
Emerson Process Management GmbH & Co. - Karlstein, Germany
Emerson Process Management Asia Pacific Private Limited - Singapore

European Union Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found at www.rosemount.com. A hard copy may be obtained by contacting an Emerson Process Management representative.

*ATEX Directive (94/9/EC***)**

Emerson Process Management complies with the ATEX Directive.

Electro Magnetic Compatibility (EMC) (2004/108/EC)

EN 61326-1:2006
EN 61326-2-3:2006

Radio and Telecommunications Terminal Equipment Directive (R&TTE) (1999/5/EC)

Emerson Process Management complies with the R&TTE Directive.

Telecommunication Compliance

All wireless devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. Emerson is working with governmental agencies around the world to supply fully compliant products and remove the risk of violating country directives or laws governing wireless device usage.

FCC and IC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference, this device must accept any interference received, including interference that may cause undesired operation.

This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

Ordinary Location Certification for FM

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

Hazardous Locations Certificates

North American Certifications

Factory Mutual (FM) Approvals

I5 FM Intrinsic Safety and Non-incendive
Intrinsically Safe for Class I, Division 1, Groups A, B, and C.
Zone Marking: Class I, Zone 0, AEx ia llC
Temperature Codes T4 (T_{amb} = -50 to 70° C)
Non-incendive for Class I, Division 2, Groups A, B, C, and D.
Intrinsically Safe and non-incendive when installed in accordance with Rosemount drawing 00849-1000.
For use with Rosemount power module P/N 753-9220-0001 only.
Enclosure Type 4X / IP66

N5 FM Class 1, Division 2, and Dust
Non-Incendive for Class I, Division 2, Groups A, B, C, and D.
Dust Ignition-proof for Class II/III, Division 1, Groups E, F, and G.
Ambient Temperature Limits -50 to 85° C
Non-incendive when installed in accordance with Rosemount drawing 00849-1000.
For use with Rosemount power module P/N 753-9220-0001 only.
Enclosure Type 4X / IP66

CSA - Canadian Standards Association

I6 CSA Intrinsic Safety
Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D.
Temp Code T3C
Non-incendive for Class I, Division 2, Groups A, B, C, and D.
Enclosure Type 4X / IP66
For use with Rosemount power module P/N 753-9220-0001 only.
Intrinsically Safe and non-incendive when installed in accordance with Rosemount drawing 00849-1016.

N6 CSA Class 1, Division 2
Non-Incendive for Class I, Division 2, Groups A, B, C, and D.
Enclosure Type 4X / IP66.
For use with Rosemount power module P/N 753-9220-0001 only.
Non-incendive when installed per Rosemount drawing 00849-1016.

European Certifications

I1 ATEX Intrinsic Safety
Certificate No.: Baseefa09ATEX0022X ⟨Ex⟩ II 1G
Ex ia IIC T5 (T_a = -60 °C to 40 °C)
Ex ia IIC T4 (T_a = -60 °C to 70 °C)
IP66
For use with Rosemount power module P/N 753-9220-0001 only.
CE 1180

Special Conditions for safe use (X):

1. The surface resistivity of the antenna is greater than 1GΩ. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth.
2. The power module may be replaced in a hazardous area. The power module has surface resistivity greater than 1GΩ and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

TABLE 20. Sensor Parameters

Sensor
U_o = 6.6 V
I_o = 3.2 mA
P_o = 5.3 mW
C_o = 22 uF
L_o = 1 H

IECEx Certifications

I7 IECEx Intrinsic Safety
Certificate No.: IECEx BAS 09.0004X
Ex ia IIC T6 (T_{amb} = -60 °C to 50 °C)
Ex ia IIC T5 (T_{amb} = -60 °C to 75 °C)
IP66
For use with Rosemount power module P/N 753-9220-0001 only.
Dimensional Drawings

TABLE 21. Sensor Parameters

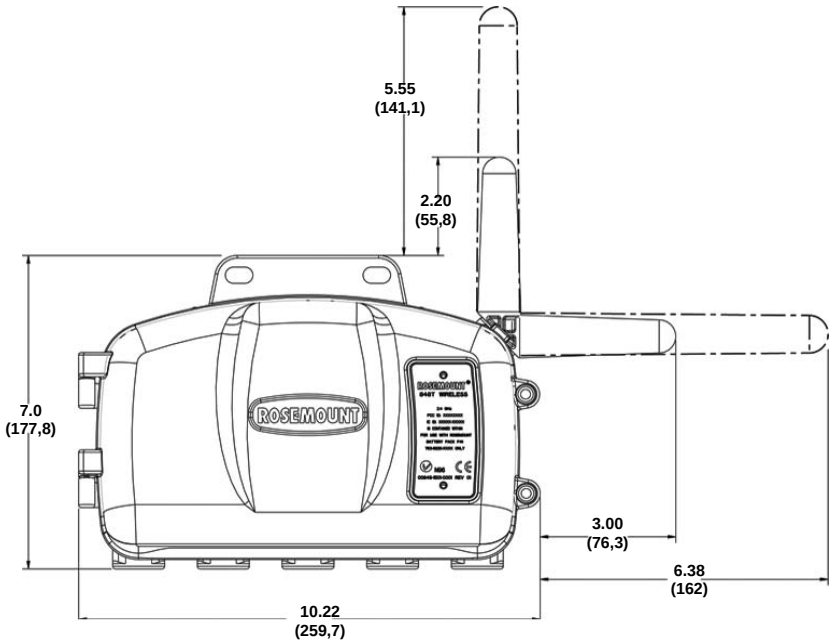
Sensor
U_o = 6.6 V
I_o = 3.2 mA
P_o = 5.3 mW
C_o = 22 uF
L_o = 1 H

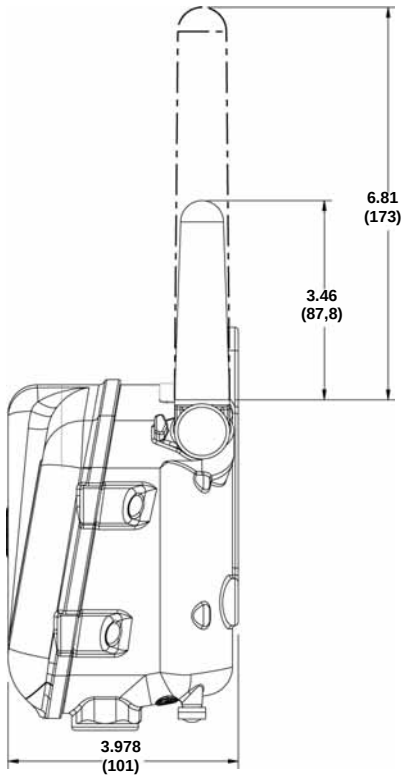
Special Conditions for safe use (X):

1. The surface resistivity of the antenna is greater than 1GΩ. To avoid electrostatic charge build-up, it must not be rubbed or cleaned with solvents or a dry cloth.
2. The power module may be replaced in a hazardous area. The power module has surface resistivity greater than 1GΩ and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

Dimensional Drawings

848T Wireless Dimensional Drawings





Dimensions are in inches (millimeters)

Ordering Information

TABLE 22. Rosemount 848T High Density Temperature Family

★ 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	
848T	High Density Temperature Measurement Family	
Communications Protocol		
Standard		**Standard**
X	Wireless	★
Certifications		
Standard		**Standard**
I5	FM Intrinsically Safe	★
N5	FM Class I, Division 2, and Dust Ignition-proof (enclosure required)	★
I6	CSA Intrinsically Safe	★
N6	CSA Class I, Division 2	★
I1	ATEX Intrinsic Safety	★
I7	IECEx Intrinsic Safety	★
NA	No Approval	★
Input Types		
Standard		**Standard**
S001	Resistance Temperature Detectors and Thermocouples	★
S002(1)	RTDs, Thermocouples, and 4–20 mA	★
Wireless Burst Rate		
Standard		**Standard**
WA3(2)	User Configurable Burst Rate, 2.4 GHz DSSS WirelessHART	★
Omnidirectional Wireless Antenna		
WK(2)	Long Range, Integral Antenna	★
WM	Extended Range, Integral Antenna	★
SmartPower™		
Standard		**Standard**
1(2)	Long Life Power Module Adapter, Intrinsically Safe	★
	Note: Long-Life Power Module must be shipped separately, order Part #00753-9220-0001	
Mounting Kit Options		
Standard		**Standard**
B6	Mounting Bracket for 2-in. pipe mount - SST brackets and bolts	★
Housing Options		
Standard		**Standard**
HA1(3)	Aluminum with Cable Glands (5 x 1/2 inch NPT for 7.5 - 11.9 mm)	★
HA2(3)	Aluminum with Conduit Entries (5 plugged holes, suitable for installing 1/2-inch NPT fittings)	★
Custom Software Configuration Request		
Standard		**Standard**
C1	Factory configuration of date, descriptor, and message fields (CDS required)	★
Configuration Options		
Standard		**Standard**
F5	50 Hz Line Voltage Filter	★
5-Point Calibration		
Standard		**Standard**
C4	5-Point Calibration (requires Q4 option code to generate a calibration certificate)	★
Calibration Certification		
Standard		**Standard**
Q4	3 Point Calibration Certificate Provided	★
Typical Model Number: 848T X I5 S001 WA3 WK1 B5 HA1		

(1) Only available with product certifications NA and N5. Stable resistors included.

(2) Required for wireless.

(3) HA1 or HA2 required for wireless.

Rosemount 848T Family

Product Data Sheet
00813-0100-4697, Rev JA
April 2010

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00813-0100-4697 Rev JA 4/10

EMERSON™
Process Management

Temperature Sensors and Accessories (English)

- *Standard Immersion Sensors*
- *Available with Many Standard Process Connections*
- *Calibration Capabilities*

Content

Introduction

OVERVIEW

Emerson Process Management offers a wide variety of RTD and thermocouple sensors that are available alone or as complete assemblies including connection heads, thermowells, and extension fittings. In addition to complete assemblies, Emerson Process Management offers heads, coupling/nipple and union/nipple extensions, compression fittings, and thermowells.

Using this Product Data Sheet (PDS)

Use this PDS to order complete temperature sensor assemblies, which include sensors, thermowells, extensions, and connection heads. These options can also be ordered separately. For example, you can order a thermowell, extension, or connection head for use with an existing sensor. In each case it is important to know and understand the sections of this PDS when specifying the items.

Threaded Sensors and Assemblies

- Includes descriptions, specifications, and ordering information for Series 58C, 68, 68Q, and 78 RTDs, and the Series 183 thermocouples.
- Includes information for ordering sensors, connection heads, extensions, and thermowells as complete assemblies.

Calibration

- Includes characterization schedules and information for ordering calibrated Series 68, 68Q, and 78 RTD Sensors.
- Includes information regarding the use of Callendar-Van Dusen constants to match specific Series 68, 68Q, and 78 RTDs to Rosemount Smart Temperature Transmitters.

Mounting Accessories

- Includes descriptions, specifications, and ordering information for temperature accessories such as thermowells, extensions, connection heads, mounting adapters, lead wire extensions, connectors, seals, and thermowells.

Hazardous Area Approvals

- Includes descriptions of the FM, CSA, SAA, and ATEX approvals for sensors and connection heads.

Configuration Data Sheet

- Provides a form used for thermowell application calculations.

Series 58C, 68, 68Q, and 78 platinum RTD temperature sensors are primarily used when high accuracy, durability, and long-term stability are required. These sensors conform to international standards: IEC-751, EN 60751, and BS EN 60751.(1)

Series 58C platinum RTD temperature sensors:

- Combine an economical thin-film design with a sheath that can be shortened to any length with tubing cutter.

Series 68Q Quick Response Sanitary RTD sensors:

- Conform to 3–A Sanitary Standards and feature product contact surfaces designed for CIP cleaning.

Series 68 platinum RTD temperature sensors:

- Provide high performance in an economical thin-film design.

Series 78 platinum RTDs temperature sensors:

- Use a wire-wound element which allows for a broader measurement range.

Thermocouples

Series 183 thermocouple temperature sensors conform to ASTM E-230, and are available in types J, K, E, and T.

Series 183 thermocouple temperature sensors are available:

- grounded or ungrounded
- isolated or unisolated
- with immersion lengths from 2 to 48 inches.

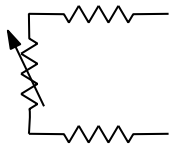
(1) 100 ohms at 0 °C, α = 0.00385 ohms/ohm/°C

The Use of 2-, 3-, and 4- wire RTDs

To help you attain the highest possible temperature measurement accuracy, Rosemount provides 4-wire sensors for all single element RTDs. You can use these RTDs in 2-, 3-, or 4-wire configurations by simply securing the unneeded leads with tape. To properly wire the 4-wire RTD for use in a 2-, 3-, or 4-wire configuration, refer to the following wiring diagrams:

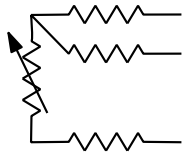
2-wire Configuration

2-wire RTDs provide one connection to each end of the sensor. In a 2-wire configuration, lead wires add resistance to the circuit which cannot be compensated. The 2-wire configuration is rarely used because the added lead wire resistance can cause substantial errors in the temperature reading.



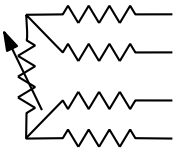
3-wire Configuration

3-wire RTDs provide one connection to one end of the sensor, and two connections to the other end. The 3-wire approach does not eliminate all lead wire effects. However, for sensors with lead wires of the same length, lead wire effects are slight, and the approach provides reasonable accuracy.



4-wire Configuration

The most effective way to eliminate lead wire effects is with two connections at each end of the sensor. 4-wire RTDs fully compensate for lead wire effects.



Benefits and Limitations of RTDs when compared to Thermocouples

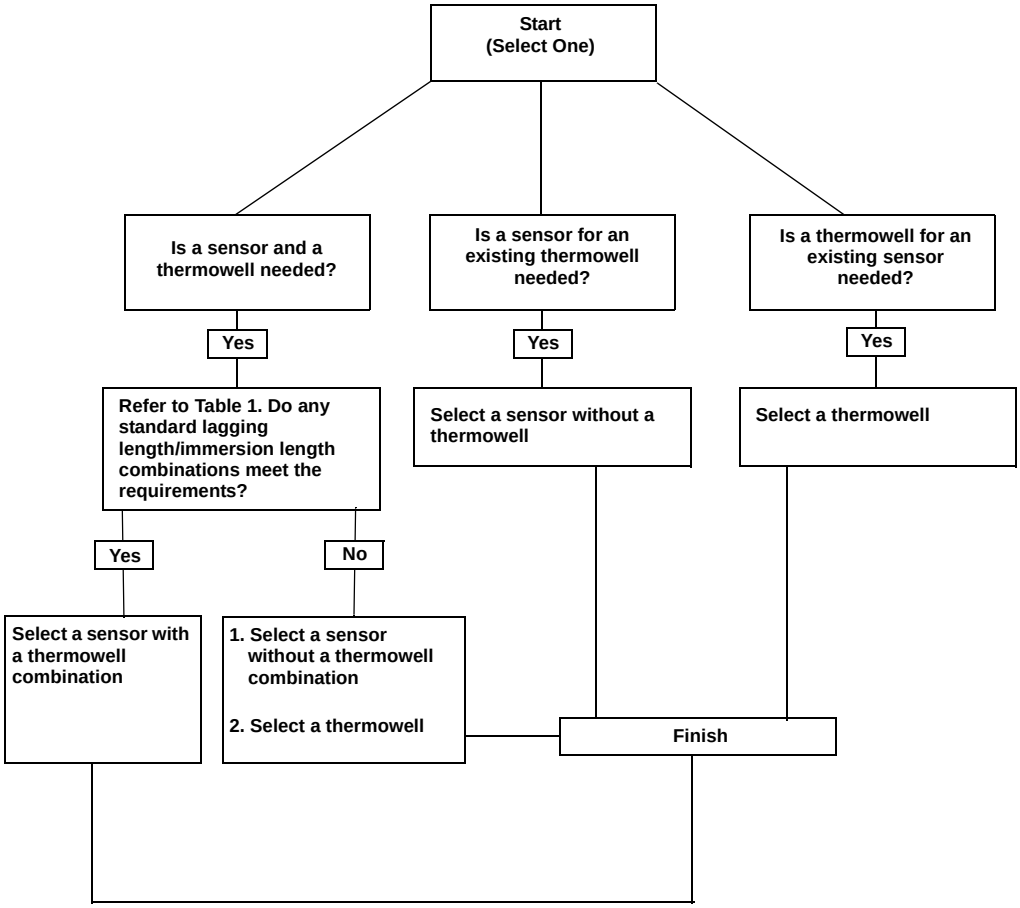
Benefits:

- Higher accuracy
- Better linearity and long-term stability
- Cold junction compensation not required
- Special extension lead wire not required
- Less susceptible to noise
- Can be “matched” to a Rosemount transmitter with transmitter sensor matching

Limitations

- Lower maximum temperature limit
- Slower response time in applications without a thermowell

HOW TO DECIDE WHAT TO ORDER



If Rosemount sensor and model code is visible on the Sensor:

1. If the thermowell is ordered separately (0078P23C30**N**060) 11th digit = 'N'
   a. Start with immersion length - digits 12-14; 060 = 6.0 in.
   b. Add extension length - digits 9 & 10; 30 = 3.0 in. (3 + 6 = 9)

Order the replacement sensor for the total length without connection heads (5th digit **N**) and extension (8th digit **N**) 0078N23N00N**090**

2. If the thermowell is ordered integral to sensor (0078P23C**30A060**W40) 11th digit = not 'N'
   a. Immersion length 'U' is defined by the 12-14th digits; 060 = 6.0 in.
   b. Look up 'L' length from the correct order chart for given 'U' length. This will be 4 inches for short sensors, or a whole number divisible by 3 for sensors longer than 4 inches (4, 6, 9, 12, 15, 18... inches);
   'U' 060 = 9 inches 'L'
   c. Add extension length as defined by 9th and 10th digits; 30 = 3.0 in. to the 'L' length found in table.
   (9" + 3" = 12", Length code 120)
   d. This will be the replacement sensor length 'X'.

Order sensor without connection head (5th digit **N**) or extension (8th digit **N**) 0078**N**23**N**00N**120**

If model code is NOT visible on the sensor, follow one of the three instructions below:

1. Measure the inside depth of the thermowell *preferred*
    a. Measure down the inside of the thermowell hole to the top-most face of the extension used, or the thermowell if no extension
    b. This will be the replacement sensor length if depth = 12.0 in., sensor length will be 12 in.

Order sensor without connection heads (5th digit **N**) or extension (8th digit **N**) 0078**N**23**N**00N**120**

2. Measure the overall outside length of the thermowell from end to end.
    a. Measure down the outside of the thermowell from the tip to the end face of the extension if used, or the thermowell if no extension.
    b. Subtract 1/4 in. to account for thickness of the thermowell at the tip.
    c. This will be the replacement sensor length. Overall length = 12.25 in., the replacement will be 12 in.

Order sensor without connection heads (5th digit **N**) or extension (8th digit **N**) 0078**N**23**N**00N**120**

3. Measure the old sensor length from tip to the flat face of the threaded process connection.
    a. Determine if the sensor is spring loaded or general purpose (welded) where the sensor sheath meets the threaded adaptor.
    b. For spring loaded sensors, the measurement of the exposed sheath from tip of the start of the threaded portion will be the same as the replacement sensor length.
        • Normal spring compression for a Rosemount sensor is assumed to be 1/2 in. and the normal thread engagement is also assumed to be 1/2 in.
        • Round to the nearest whole 1/4 in. increment as the spring will make up any small differences
        • Replacement sensor for a spring loaded sensor measuring 6.5 inches will be 6.5 in. length

Order sensor without connection heads (5th digit **N**) or extension (8th digit **N**) 0078N15N00N**065**

    c. For general purpose sensors with the distance from tip to threaded adapter:
        • Add 1/4 in. to allow clearance, preventing bottoming sensor during installation.
        • Add 1/2 in. for the thread engagement of the sensor in the thermowell.
        • The replacement sensor for a general purpose sensor measuring 5.75 in. from the tip to the threaded adaptor is 6.5 in. ($5\frac{3}{4} + \frac{1}{4} + \frac{1}{2} = 6\frac{1}{2}$ in).

Order sensor without connection heads (5th digit **N**) or extension (8th digit **N**) 0078N15N00N**065**

If model code is visible on the thermowell (0091A060W40T015P) follow the instructions below to determine sensor model number:

a. Start with immersion length digits 6-8, 060 = 6.0 in.
b. Add additional lagging length digits 13-15, 015 = 1.5 in.
c. To those lengths add 1.5 in. (this is the additional standard lagging length on all Rosemount thermowells) 1.75 in. minus (0.25 in. thermowell tip thickness) = 1.50 in.
d. 6.0 +1.5 +1.5 = 9 in.

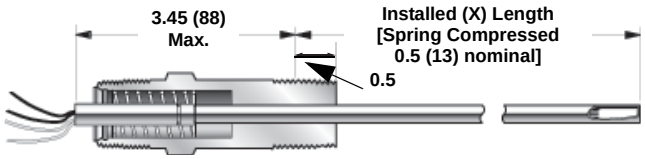
Order replacement sensor 0078N23N00N**090**

SPRING-LOADED SENSOR DIMENSIONS

When a spring-loaded sensor is used properly, the spring should be compressed approximately 1/2-inch. Therefore, all measurements of spring-loaded sensors are made with the spring compressed. If you measure an existing spring-loaded sensor while it is in a relaxed state, you must subtract 1/2-inch to arrive at the installed length (X) that must be ordered. See Figure 1.

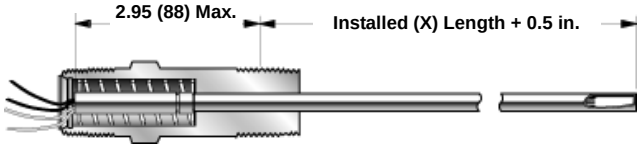
FIGURE 1. Spring Loaded Sensors Dimensions

Compressed Spring Loaded Sensor



Spring loaded sensor in a compressed state: The actual sensor length is measured when the spring is compressed approximately 1/2-in. shorter than the relaxed sensor.

Relaxed Spring Loaded Sensor



Spring loaded sensor in a relaxed state: Normally, when a spring loaded sensor is measured, it is in a relaxed state. You must subtract 1/2-in. from your measurement to order a replacement sensor. Rosemount Inc. assumes that the sensor length you specify is that of a compressed sensor.

Determining the Length (L) of a spring-loaded sensor to be used with an existing non-Rosemount Thermowell

See Figure 1, Figure 3, and Figure 4.

1. Remove the existing generic sensor from the installed thermowell.
2. Measure the sensor length with the spring in the relaxed state (as shown in Figure 1). Measure from the tip of the sensor to the maximum thread engagement point (0.53 in. into the threads).
3. Subtract 0.5 inches from your measurement. The resulting length is (X).
4. If the sensor is installed with an extension, measure the extension length (E), as shown in Figure 4. If the sensor is not installed with an extension, let (E) = 0.
5. Since (X) = (E) + (L), subtract (E) from (X) to find (L).

Use the resulting length (L) in the Section 2 ordering tables to choose the correct length of sensor.

Length Code Key	
L	Thermowell length minus 0.25 in.
U	Immersion length into process
T	Lagging length
E	Extension fitting length
X	Sensor length

Use the following equations to determine all lengths

L = U + T + 1.5
X = E + L
X = E + U + T + 1.5

FIGURE 2. Thermowell Dimensions (use with Table 1)

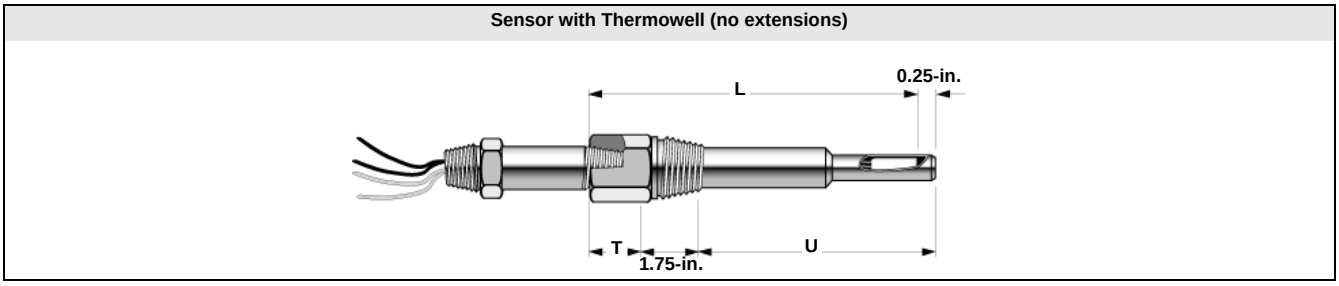


TABLE 1. Dimensions for thermowells when ordered with sensors (U), (L), and (T). Use with Figure 2.

Dimensions (in.)[1]													
Code	**(U)**	**(L)**	**(T)**		**Code**	**(U)**	**(L)**	**(T)**		**Code**	**(U)**	**(L)**	**(T)**
020	2.0	4.0	0.5		090	9.0	12.0	1.5		160	16.0	18.0	0.5
025	2.5	4.0	0.0		095	9.5	12.0	1.0		165	16.5	18.0	0.0
030	3.0	6.0	1.5		100	10.0	12.0	0.5		170	17.0	21.0	2.5
035	3.5	6.0	1.0		105	10.5	12.0	0.0		175	17.5	21.0	2.0
040	4.0	6.0	0.5		110	11.0	15.0	2.5		180	18.0	21.0	1.5
045	4.5	6.0	0.0		115	11.5	15.0	2.0		185	18.5	21.0	1.0
050	5.0	9.0	2.5		120	12.0	15.0	1.5		190	19.0	21.0	0.5
055	5.5	9.0	2.0		125	12.5	15.0	1.0		195	19.5	21.0	0.0
060	6.0	9.0	1.5		130	13.0	15	0.5		200	20.0	24.0	2.5
065	6.5	9.0	1.0		135	13.5	15.0	0.0		205	20.5	24.0	2.0
070	7.0	9.0	0.5		140	14.0	18.0	2.5		210	21.0	24.0	1.5
075	7.5	9.0	0.0		145	14.5	18.0	2.0		215	21.5	24.0	1.0
080	8.0	12.0	2.5		150	15.0	18.0	1.5		220	22.0	24.0	0.5
085	8.5	12.0	2.0		155	15.5	18.0	1.0		225	22.5	24.0	0.0

(1) L = U + T + 1.5

Ordering a Sensor and a Thermowell

See Figure 2 and Table 1 and Figure 3 and Figure 4. Use the following Procedure to determine if a standard lagging length can be use with the sensor and thermowell.

1. Determine the (U), (T), and (E) lengths necessary for your installation.
   If you do not need an extension, (E) = 0 (zero).
   Note: If your existing sensor/thermowell combination is different than Figure 3, refer to the drawings on the following pages.
2. Find your immersion length (U) on Table 1 above and compare the corresponding lagging length (T) to the lagging length that you previously determined.
3. If your lengths match the values on the line that corresponds to your required immersion length, order your sensor and thermowell together.

   If your lengths do not match the values on the line that corresponds to your measured immersion length, order your sensor and thermowell separately. Solve for (L) using the equation (L) = (U) + (T) + 1.5 (since (L) is required when ordering the sensor separately from the thermowell).

Length Code Key

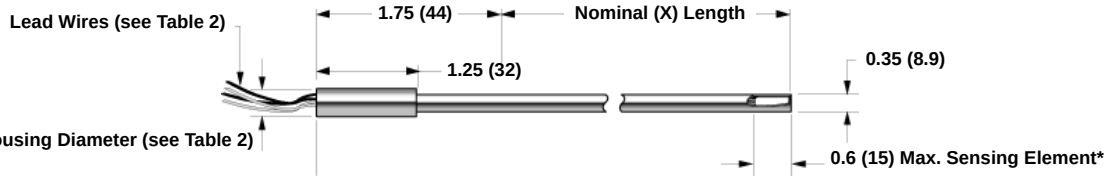
L	Thermowell length minus 0.25 in.
U	Immersion length into process
T	Lagging length
E	Extension fitting length
X	Sensor length

Use the following equations to determine all lengths

L = U + T + 1.5
X = E + L
X = E + U + T + 1.5

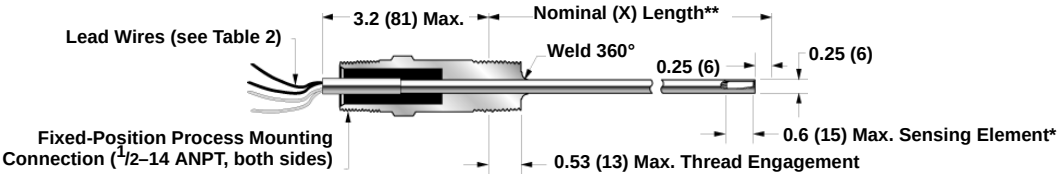
FIGURE 3. Series 68, 78, and 183 Sensor Assembly Dimensional Drawings

Capsule Sensor Only



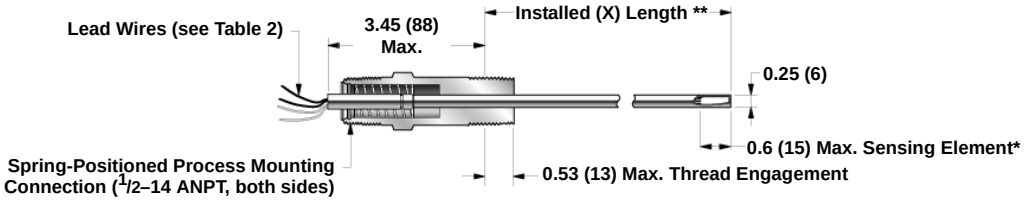
** Maximum sensing element length for Series 78 dual-element = 1-in. (25 mm)*

General Purpose Sensor Assembly



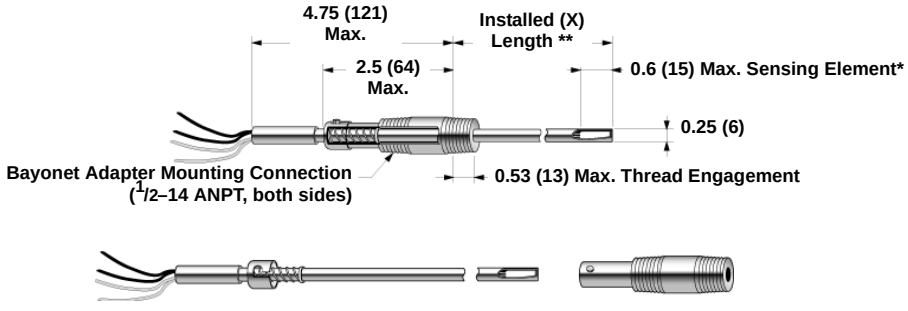
** Maximum sensing element length for Series 78 dual-element = 1-in. (25 mm)*
*** Actual length is 0.25 (6) less to avoid bottoming in thermowell*

Spring Loaded Sensor Assembly



** Maximum sensing element length for Series 78 dual-element = 1-in. (25 mm)*
*** Spring Compressed 0.5 (13)*

Bayonet Spring Loaded Sensor Assembly



** Spring is shown compressed 0.5 -in.(13 mm.) Do not adjust the equations in Table 2 when calculating X, L, U, and T lengths. The equation already accounts for spring compression.*

Dimensions are in inches (millimeters)

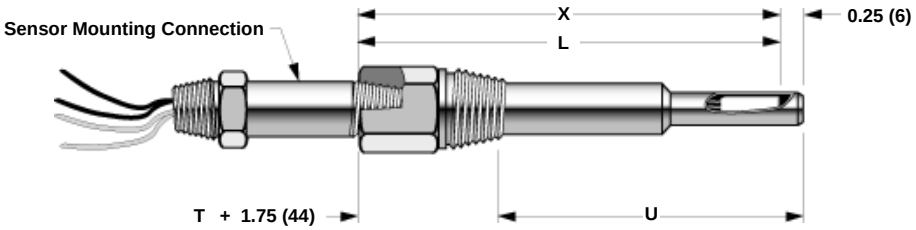
TABLE 2. Sensor Series and Dimensions

Series	Housing Diameter		Lead Wires	Lead Wire Length	
	in	mm		in	mm
68	0.350	8.0	4	6.0	152.4
78 single	0.350	8.0	4	6.0	152.4
78 dual	0.350	8.0	6	6.0	152.4

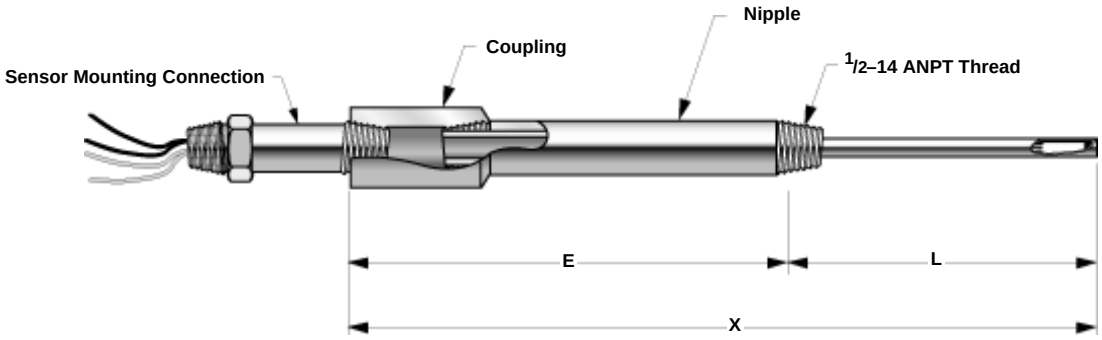
Series	Housing Diameter		Lead Wires	Lead Wire Length	
	in	mm		in	mm
183 single	0.375	9.53	2	6.0	152.4
183 dual	0.375	9.53	4	12.0	304.8

FIGURE 4. Series 68, 78, and 183 Sensor Assembly Length Code Drawings

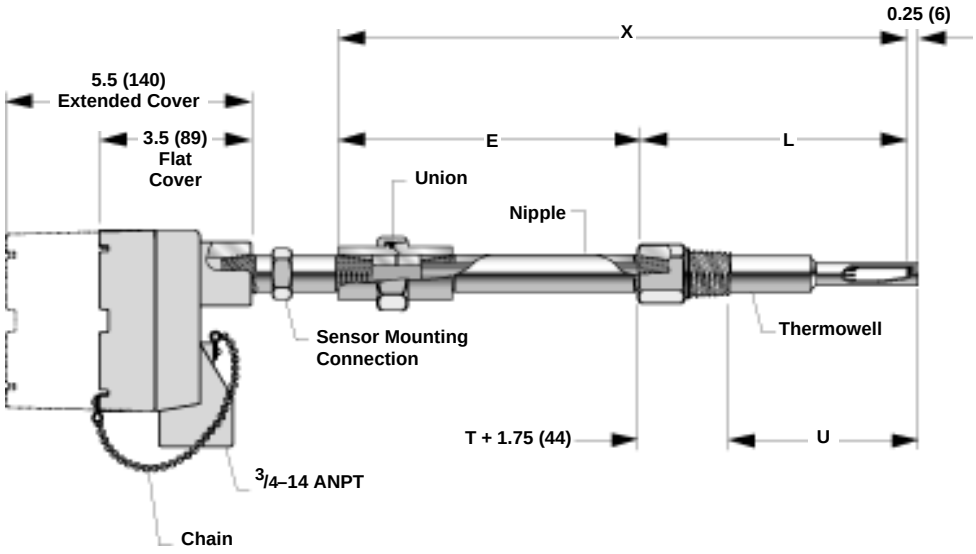
Sensor with Thermowell (No Extension)



Sensor with Extension (No Thermowell)



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



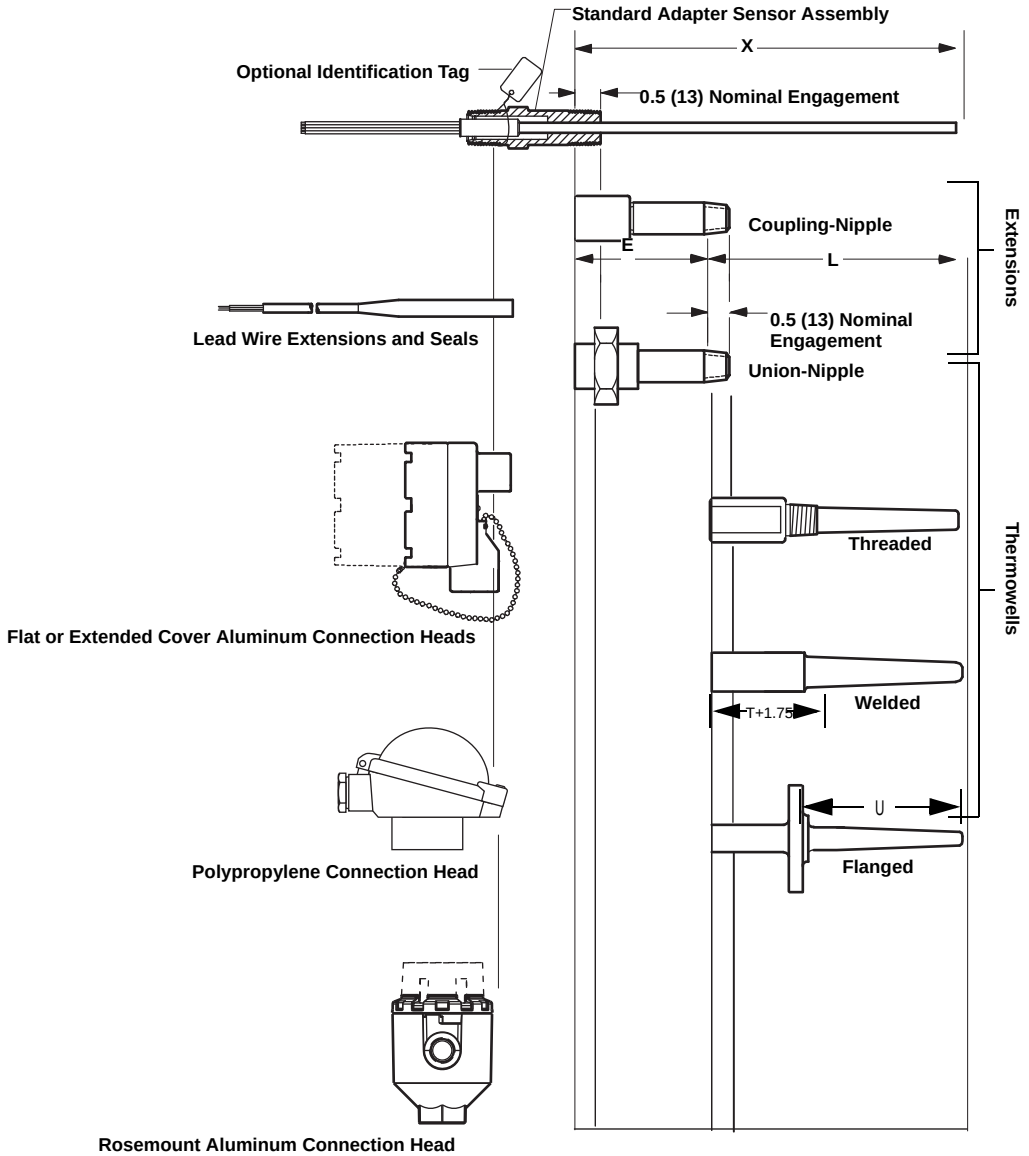
Dimensions are in inches (millimeters)

Threaded Sensors and Assemblies

Series 68, 68Q, and 78 RTD and Series 183 Thermocouple Sensors may be ordered as complete assemblies. These assemblies provide a complete, yet simple means of specifying the proper industrial hardware for most temperature measurements.

One assembly model number, derived from one ordering table, completely defines the type of sensing element, as well as the material, length, and style of both the extension fittings and thermowells. All sensor assemblies are sized and inspected by Rosemount Inc. to ensure complete component compatibility and performance.

FIGURE 5. Individual Components of a Complete Temperature Assembly



Dimensions are in inches (millimeters)

MOUNTING CONFIGURATIONS

Capsule

Capsules are designed for direct immersion without mounting fittings. Accessory compression fittings are available for adjustable mounting into a thermowell. See Mounting Adapters for Series 58, 68, 78, and 183.

General-Purpose Sensor Assemblies

Designed with a welded, fixed-position 1/2–14 ANPT process connection fitting for direct immersion or thermowell applications, this sensor design provides a moisture-proof and vapor-tight seal. The maximum static working pressure at 20 °C (68 °F) with no vibration or flow condition is 31.59 MPa (3,500 psig). The use of a thermowell is recommended for process pressure containment. Note that standard lengths are 1/4 inch less than nominal dimension to prevent bottoming of the sensor in a thermowell.

Spring-Loaded Sensor Assemblies

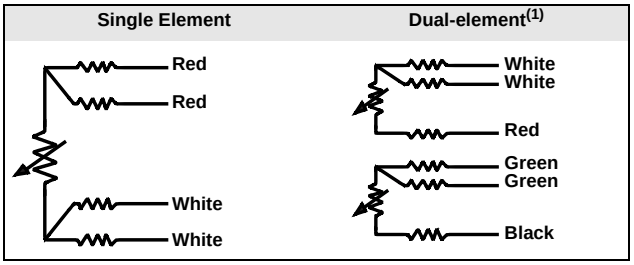
Spring-loaded sensors have a spring-positioned, 1/2–14 ANPT process connection fitting that ensures good surface contact in thermowells for faster time response and vibration resistance. Spring-loaded sensors are not intended to provide a process seal. They must be used in conjunction with a thermowell for this purpose.

NOTE
When a spring-loaded sensor is used properly, the spring should be compressed approximately 1/2-inch.

Bayonet Spring-Loaded Sensor Assemblies

Bayonet assemblies have the same advantages as the spring-loaded sensor. However, the bayonet connector permits the sensor to be easily removed from the process without tools.

FIGURE 6. Series 68, 68Q, 78, and 58C Lead Wire Configurations



(1) Dual-element sensors are only available on Series 68Q and 78 sensors.

SERIES 68 PLATINUM RTD

Rosemount Series 68 Platinum resistance temperature sensors measure from –50 to 400 °C (–58 to 752 °F). Series 68 Class B, Pt100-385 sensors are available in capsule, general purpose, and spring-loaded designs in sensor lengths from 1 to 48 inches.

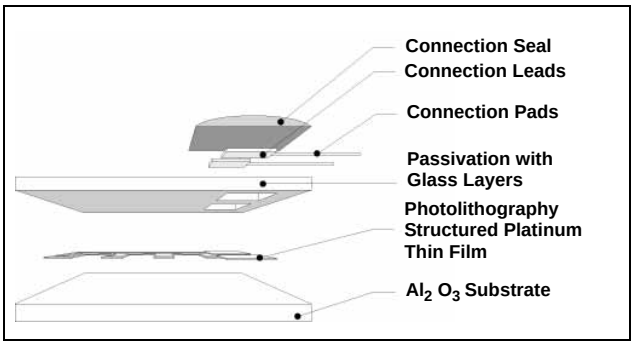
Table 3 shows the interchangeability of the Series 68 RTD. As an option, for maximum system accuracy, Rosemount Inc. can provide sensor calibration. See Sensor Characterization (Calibration) Schedules– Option Code V. In addition, Rosemount Inc. offers optional sensor-to-transmitter matching capability obtainable through the use of Callendar-Van Dusen Constants. See Option Code “V” Callendar-van Dusen Constants.

TABLE 3. Series 68 Interchangeability

• ±0.55 °C (±0.99 °F) at -50 °C (-58 °F)
• ±0.30 °C (±0.54 °F) at 0 °C (32 °F)
• ±0.80 °C (±1.44 °F) at 100 °C (212 °F)
• ±1.30 °C (±2.34 °F) at 200 °C (392 °F)
• ±1.60 °C (±2.88 °F) at 260 °C (500 °F)
• ±2.30 °C (±4.14 °F) at 400 °C (752 °F)

Construction

FIGURE 7. Construction of a Platinum Thin Film RTD



Design and construction of the Series 68 Platinum Sensors provides the optimum combination of accuracy and durability available for temperature measurements. The construction of the sensor allows for direct immersion in non-corrosive fluids at reasonable static pressures. For corrosive environments or many industrial applications, these sensors are widely used with standard thermowell assemblies.

Platinum Element and Lead Wire Configurations

Single-element temperature sensors have four lead wires and may be used in 2-, 3-, and 4-wire signal conditioning systems.

Specifications

Performance

Temperature Range

–50 to 400 °C (–58 to 752 °F)

Effect of Temperature Cycling

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

Stability

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

Maximum Hysteresis

±0.1% of operating temperature range.

Time Constant

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

Nominal R0 100 Ohm

Nominal alpha .00385 C-1

Physical Specifications

Sheath Material

316 SST. / 321 SST.

Lead Wire

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

Identification Data

The model, serial numbers, and up to six lines of permanent tagging information are etched on each sensor. Stainless steel tags are available upon request.

Weight

- Capsule sensors: 5 oz
- General-purpose and spring-loaded sensors: 9 oz

Environmental

Humidity Limits

- Lead seal can withstanding 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 a 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.

Insulation Resistance

1000×10^6 ohms minimum insulation resistance when measured at 500 Vdc at room temperature.

ORDERING INFORMATION

TABLE 4. Series 68 RTD Sensor Assemblies WITHOUT Thermowell

★ 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	Available Safety Approvals					
			FM	ATEX	CSA	SAA	
0068	Platinum Temperature Sensor WITHOUT thermowell						
Sensor Lead Wire Termination							
Standard							**Standard**
R	Aluminum Connection Head, Six Terminals, Flat Cover, Unpainted		Y	Y	Y	N	★
T	Aluminum Connection Head, Six Terminals, Extended Cover, Unpainted		Y	Y	Y	N	★
P	Aluminum Connection Head, Six Terminals, Flat Cover, Painted		Y	Y	Y	N	★
L	Aluminum Connection Head, Six Terminals, Extended Cover, Painted		Y	Y	Y	N	★
N	Sensor only with 6-in. Teflon® -insulated, 22-gauge lead wires		Y	Y	Y	N	★
D	Rosemount Aluminum Connection Head with 1/2-in. Entries		Y	Y	Y	Y	★
Expanded							
C	Polypropylene Connection Head		N	N	N	N	
G	Rosemount SST Connection Head with 1/2-in. Entries		Y	Y	Y	Y	
Sensor Type (single element -50 to 400 °C (-58 to 752 °F))							
Standard							**Standard**
01(1)(2)	Capsule Style						★
11(3)	General-purpose style						★
21(4)	Spring-loaded style						★
Expanded							
31(5)	Bayonet spring-loaded style (not available in (X) lengths over 21 inches)						
Extension Type							
Standard							**Standard**
A	Nipple Coupling						★
C	Nipple Union						★
N	None						★
Extension Length (E)							
Standard							**Standard**
00	0.0 in.						★
30	3.0 in.						★
60	6.0 in.						★
Thermowell Material							
Standard							**Standard**
N	No thermowell required						★
Immersion Length (L)							
Standard							**Standard**
010(1)(6)	1.0-in.						★
015	1.5-in.						★
020	2.0-in.						★
025	2.5-in.						★
030	3.0-in.						★
035	3.5-in.						★
040	4.0-in.						★
045	4.5-in.						★
050	5.0-in.						★
055	5.5-in.						★
060	6.0-in.						★
065	6.5-in.						★
070	7.0-in.						★
075	7.5-in.						★
080	8.0-in.						★
085	8.5-in.						★
090	9.0-in.						★

TABLE 4. Series 68 RTD Sensor Assemblies WITHOUT Thermowell

★ 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.

Standard		Standard
095	9.5-in.	★
100	10.0-in.	★
105	10.5-in.	★
110	11.0-in.	★
115	11.5-in.	★
120	12.0-in.	★
125	12.5-in.	★
130	13.0-in.	★
135	13.5-in.	★
140	14.0-in.	★
145	14.5-in.	★
150	15.0-in.	★
155	15.5-in.	★
160	16.0-in.	★
165	16.5-in.	★
170	17.0-in.	★
175	17.5-in.	★
180	18.0-in.	★
185	18.5-in.	★
190	19.0-in.	★
195	19.5-in.	★
200	20.0-in.	★
205	20.5-in.	★
210	21.0-in.	★
210	21.5-in.	★
220	22.0-in.	★
225	22.5-in.	★
230	23.0-in.	★
235	23.5-in.	★
240	24.0-in.	★
245	15.5-in.	★
250	25.0-in.	★
260	26.0-in.	★
270	27.0-in.	★
280	28.0-in.	★
290	29.0-in.	★
300	30.0-in.	★
310	31.0-in.	★
320	32.0-in.	★
330	33.0-in.	★
340	34.0-in.	★
350	35.0-in.	★
360	36.0-in.	★
370	37.0-in.	★
380	38.0-in.	★
390	39.0-in.	★
400	40.0-in.	★
410	41.0-in.	★

TABLE 4. Series 68 RTD Sensor Assemblies WITHOUT Thermowell
★ 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.

Standard		**Standard**
420	42.0-in.	★
430	43.0-in.	★
440	44.0-in.	★
450	45.0-in.	★
460	46.0-in.	★
470	47.0-in.	★
480	48.0-in.	★
OPTIONS		
Approval Options		
Standard		**Standard**
E5	FM Explosion-proof approval (See Figure 26)	★
E6	CSA Explosion-proof approval (See Figure 27)	★
E7(7)	SAA Flameproof approval (See Figure 30)	★
Callendar-Van Dussen Constants		
Standard		**Standard**
V1-V8	V-Callendar-van Dussen Constant (V4 not available with series 68 sensors)	★
Calibration Schedule		
Standard		**Standard**
X8	Customer-Specified Temperature Range Calibration	★
X9	Customer-Specified Single Temperature Point Calibration	★
Calibration Certification		
Standard		**Standard**
Q4	Calibration Certification, Customer-Specified Temperature	★
Mounting Adapters		
Standard		**Standard**
M5-M7	Mounting adapter: Sensor Compression Fitting: M5= 1/8 - 27 NPT, M6 = 1/4 - 18 NPT, M7 = 1/2 - 14 NPT	★
A Leadkit		
Standard		**Standard**
A1-A8	Twisted lead wire extension: A1 = 1.5 ft, A2 = 3.0 ft, A3 = 6.0 ft, A4 = 12 ft, A5 = 24 ft, A6 = 50 ft, A7 = 75 ft, A8 = 100 ft	★
B Leadkit		
Standard		**Standard**
B1-B8(8)	Shielded cable lead wire extension: B1 = 1.5 ft, B2 = 3.0 ft, B3 = 6.0 ft, B4 = 12 ft, B5 = 24 ft, B6 = 50 ft, B7 = 75 ft, B8 = 100 ft	★
C Leadkit		
Standard		**Standard**
C1-C8(8)	Armored cable lead wire extension: C1 = 1.5 ft, C2 = 3.0 ft, C3 = 6.0 ft, C4 = 12 ft, C5 = 24 ft, C6 = 50 ft, C7 = 75 ft, C8 = 100 ft	★
D Leadkit		
Standard		**Standard**
D1-D8(8)	Armored cable lead wire extensions with electrical plug: D1 = 1.5 ft, D2 = 3.0 ft, D3 = 6.0 ft, D4 = 12 ft, D5 = 24 ft, D6 = 50 ft, D7 = 75 ft, D8 = 100 ft	★
L Leadkit		
Standard		**Standard**
L1-L8	Armored cable mating plugs with lead wire extension: L1 = 1.5 ft, L2 = 3.0 ft, L3 = 6.0 ft, L4 = 12 ft, L5 = 24 ft, L6 = 50 ft, L7 = 75 ft, L8 = 100 ft	★
F Leadkit		
Standard		**Standard**
F1	4-pin bayonet connector	★
H Leadkit		
Standard		**Standard**
H1-H8	4-pin connector mating plugs with lead wire extension: H1 = 1.5 ft, H2 = 3.0 ft, H3 = 6.0 ft, H4 = 12 ft, H5 = 24 ft, H6 = 50 ft, H7 = 75 ft, H8 = 100 ft	★
J Leadkit		
Standard		**Standard**
J1	Moisture-proof seal assembly for armored cables	★

TABLE 4. Series 68 RTD Sensor Assemblies WITHOUT Thermowell

★ 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.

Assemble to Options		
Standard		**Standard**
XA[9]	Assemble connection head or transmitter to a sensor assembly	★

(1) Capsule style available in 1-in. increments only, starting at 1-in. (i.e. 1, 2, 3-inches, etc.) See "Mounting Adapters for Series 58, 68, 78, and 183" on page 66.

(2) This option must be used with Sensor Lead Wire Termination code N and is not available with assembly code XA or with Approval codes E1, E5, E6, and E7.

(3) General-purpose sensors are only available in (L) lengths of 2.5-in. or greater.

(4) Spring loaded sensors must be installed in a thermowell assembly to meet the requirements of explosion-proof approvals code E6.

(5) Not available with Sensor Lead Wire Termination codes R, P, or C or with approval codes E1, E5, E6, or E7.

(6) 1-in. length without extension is only available in capsule style.

(7) SAA Flame-proof Approval is only applicable if installed with Rosemount 248, 644, or 3144P transmitters.

(8) These options are not available with Sensor Lead Wire Termination codes R, P, or W.

(9) If ordering code XA with a transmitter, specify the same option on the transmitter model code.

Ordering Example

	Model	Lead Wire Termination	Sensor Type	Extension Type	Extension Length	Thermowell Material	Immersion Length	Additional Options
Typical Model Number	0068	N	11	N	00	N	045	E5

ORDERING INFORMATION

TABLE 5. Series 68 RTD Sensor Assemblies WITH Thermowell

★ 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	Available Safety Approvals						
			FM	ATEX	CSA	SAA		
0068	Platinum Temperature Sensors WITH Thermowell							
Sensor Lead Wire Termination								
Standard								**Standard**
R	Aluminum Connection Head, Six Terminals, Flat Cover, Unpainted		Y	Y	Y	N		★
T	Aluminum Connection Head, Six Terminals, Extended Cover, Unpainted		Y	Y	Y	N		★
P	Aluminum Connection Head, Six Terminals, Flat Cover, Painted		Y	Y	Y	N		★
L	Aluminum Connection Head, Six Terminals, extended Cover, Painted		Y	Y	Y	N		★
N	Sensor only with 6-in. Teflon® -insulated, 22-gauge lead wires		Y	Y	Y	N		★
D	Rosemount Aluminum Connection Head with 1/2-in. Entries		Y	Y	Y	Y		★
Expanded								
C	Polypropylene Connection Head		N	N	N	N		
G	Rosemount SST Connection Head with 1/2-in. Entries		Y	Y	Y	Y		
Sensor Type (single element -50 to 400 °C (-58 to 752 °F))								
Standard								**Standard**
11	General-purpose style							★
21	Spring-loaded style							★
Expanded								
31(1)(2)	Bayonet spring-loaded style (available in (X) lengths of 1 to 21-in., increments of 1-in.)							
Extension Type								
Standard								**Standard**
A(3)	Nipple Coupling							★
C(3)	Nipple Union							★
N	None							★
Extension Length (E)								
Standard								**Standard**
00	0.0 in.							★
30	3.0 in.							★
60	6.0 in.							★
Thermowell Material								
Standard								**Standard**
A	Type 316 SST(4)							★
B	Type 304 SST							★
C	Carbon Steel							★
D	316L SST							★
E	304L SST							★
Expanded								
F	Alloy 20							
G	Alloy 400							
H	Alloy 600							
J	Alloy C-276							
L	Alloy B							
M	304 SST with Teflon (PTFE) coating							
P	Chrome Molybdenum F22							
R	Nickel 200							
T	Titanium							
U(5)	316 SST with Tantalum Sheath							
V	310 SST							
W	321 SST							
Z	Chrome Molybdenum F11							

Sensor/Immersion Length (U(6) lenght in inches)		(L) Lenght in inches	(T(7)) Lenght in inches	
Standard				**Standard**
015	1.5-in.	4.0-in.	1.0-in.	★
020	2.0-in.	4.0-in.	0.5-in.	★
025	2.5-in.	4.0-in.	0.0-in.	★
030	3.0-in.	6.0-in.	1.5-in.	★
035	3.5-in.	6.0-in.	1.0-in.	★
040	4.0-in.	6.0-in.	0.5-in.	★

TABLE 5. Series 68 RTD Sensor Assemblies WITH Thermowell

★ 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.

045	4.5-in.	6.0-in.	0.0-in.	★
050	5.0-in.	9.0-in.	2.5-in.	★
055	5.5-in.	9.0-in.	2.0-in.	★
060	6.0-in.	9.0-in.	1.5-in.	★
065	6.5-in.	9.0-in.	1.0-in.	★
070	7.0-in.	9.0-in.	0.5-in.	★
075	7.5-in.	9.0-in.	0.0-in.	★
080	8.0-in.	12.0-in.	2.5-in.	★
085	8.5-in.	12.0-in.	2.0-in.	★
090	9.0-in.	12.0	1.5-in.	★
095	9.5-in.	12.0-in.	1.0-in.	★
100	10.0-in.	12.0-in.	0.5-in.	★
105	10.5-in.	12.0-in.	0.0-in.	★
110	11.0-in.	15.0-in.	2.5-in.	★
115	11.5-in.	15.0-in.	2.0-in.	★
120	12.0-in.	15.0-in.	1.5-in.	★
125	12.5-in.	15.0-in.	1.0-in.	★
130	13.0-in.	15.0-in.	0.5-in.	★
135	13.5-in.	15.0-in.	0.0-in.	★
140	14.0-in.	18.0-in.	2.5-in.	★
145	14.5-in.	18.0-in.	2.0-in.	★
150	15.0-in.	18.0-in.	1.5-in.	★
155	15.5-in.	18.0-in.	1.0-in.	★
160	16.0-in.	18.0-in.	0.5-in.	★
165	16.5-in.	18.0-in.	0.0-in.	★
170	17.0-in.	21.0-in.	2.5-in.	★
175	17.5-in.	21.0-in.	2.0-in.	★
180	18.0-in.	21.0-in.	1.5-in.	★
185	18.5-in.	21.0-in.	1.0-in.	★
190	19.0-in.	21.0-in.	0.5-in.	★
195	19.5-in.	21.0-in.	0.0-in.	★
200	20.0-in.	24.0-in.	2.5-in.	★
205	20.5-in.	24.0-in.	2.0-in.	★
210	21.0-in.	24.0-in.	1.5-in.	★
215	21.5-in.	24.0-in.	1.0-in.	★
220	22.0-in.	24.0-in.	0.5-in.	★
225	22.5-in.	24.0-in.	0.0-in.	★
230	23.0-in.	27.0-in.	2.5-in.	★
240	24.0-in.	27.0-in.	1.5-in.	★
250	25.0-in.	27.0-in.	0.5-in.	★
260	26.0-in.	30.0-in.	2.5-in.	★
270	27.0-in.	30.0-in.	1.5-in.	★
280	28.0-in.	30.0-in.	0.5-in.	★
290	29.0-in.	33.0-in.	2.5-in.	★
300	30.0-in.	33.0-in.	1.5-in.	★
310	31.0-in.	33.0-in.	0.5-in.	★
320	32.0-in.	36.0-in.	2.5-in.	★
330	33.0-in.	36.0-in.	1.5-in.	★
340	34.0-in.	36.0-in.	0.5-in.	★
350	35.0-in.	39.0-in.	2.5-in.	★
360	36.0-in.	39.0-in.	1.5-in.	★
370	37.0-in.	39.0-in.	0.5-in.	★
380	38.0-in.	42.0-in.	2.5-in.	★
390	39.0-in.	42.0-in.	1.5-in.	★
400	40.0-in.	42.0-in.	0.5-in.	★
410	41.0-in.	45.0-in.	2.5-in.	★
420	42.0-in.	45.0-in.	1.5-in.	★

TABLE 5. Series 68 RTD Sensor Assemblies WITH Thermowell

★ 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.

430	43.0-in.		45.0-in.	0.5-in.	★
440	44.0-in.		48.0-in.	2.5-in.	★
450	45.0-in.		48.0-in.	1.5-in.	★
460	46.0-in.		48.0-in.	0.5-in.	★
470	47.0-in.		51.0-in.	2.5-in.	★
480	48.0-in.		51.0-in.	1.5-in.	★
Thermowell Style		**Mounting**	**Stem**		
Standard					**Standard**
T20[4]	Threaded	1/2-14 ANPT	Stepped		★
T22[4][10]	Threaded	3/4-14 ANPT	Stepped		★
T24[4][10]	Threaded	1-11.5 ANPT	Stepped		★
T26[10]	Threaded	3/4-14 ANPT	Tapered		★
T28[10]	Threaded	1-11.5 ANPT	Tapered		★
T30[10]	Threaded	1 1/2-11 ANPT	Tapered		★
T32[10]	Threaded	1/2-14 ANPT	Straight		★
T34[10][11]	Threaded	3/4-14 ANPT	Straight		★
T36[10][11]	Threaded	1-11.5 ANPT	Straight		★
T38[10][11]	Threaded	3/4-14 ANPT	Straight		★
T44[10]	Threaded	1/2-14 ANPT	Tapered		★
W38	Welded	3/4-in. pipe	Stepped		★
W40	Welded	1-in. pipe	Stepped		★
W42	Welded	3/4-in. pipe	Tapered		★
W44	Welded	1-in. pipe	Tapered		★
W46	Welded	1 1/4-in. pipe	Tapered		★
W48[10]	Welded	3/4-in. pipe	Straight		★
W50[10]	Welded	1-in. pipe	Straight		★
F10[10]	Flanged	2-in., Class 150	Straight		★
F12[10]	Flanged	3-in., Class 150	Straight		★
F52	Flanged	1-in., Class 150	Stepped		★
F54	Flanged	1 1/2-in., Class 150	Stepped		★
F56	Flanged	2-in., Class 150	Stepped		★
F58	Flanged	1-in., Class 150	Tapered		★
F60	Flanged	1 1/2-in., Class 150	Tapered		★
F62	Flanged	2-in. Class 150	Tapered		★
F64[10]	Flanged	1-in., Class 150	Straight		★
F66[10]	Flanged	1 1/2-in., Class 150	Straight		★
F70	Flanged	1-in., Class 300	Stepped		★
F72	Flanged	1 1/2-in., Class 300	Stepped		★
F74	Flanged	2-in., Class 300	Stepped		★
F76	Flanged	1-in., Class 300	Tapered		★
F78	Flanged	1 1/2-in., Class 300	Tapered		★
F80	Flanged	2-in., Class 300	Tapered		★
F82[10]	Flanged	1-in., Class 300	Straight		★
F84[10]	Flanged	1 1/2-in., Class 300	Straight		★
F86[10]	Flanged	2-in., Class 300	Straight		★
F88[8]	Flanged	1-in., Class 600	Stepped		★
F90[8]	Flanged	1 1/2-in., Class 600	Stepped		★
F92[8]	Flanged	2-in., Class 600	Stepped		★
F94[8]	Flanged	1-in., Class 600	Tapered		★
F96[8]	Flanged	1 1/2-in., Class 600	Tapered		★
F98[8]	Flanged	2-in., Class 600	Tapered		★
F02[10][8]	Flanged	1-in., Class 600	Straight		★
F04[10][8]	Flanged	1 1/2-in., Class 600	Straight		★
F06[10][8]	Flanged	2-in., Class 600	Straight		★
F16[8]	Flanged	1 1/2-in., Class 900	Tapered		★
F34[8]	Flanged	1 1/2-in., Class 1500	Tapered		★
F24[8]	Flanged	2-in., Class 1500	Tapered		★

TABLE 5. Series 68 RTD Sensor Assemblies WITH Thermowell

★ 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.

F08[8]	Flanged	1 1/2-in., Class 2500	Tapered	★
Q02[9]	Sanitary, Tri-Clamp	1-in., Tri-Clamp	Stepped	★
Q04[9]	Sanitary, Tri-Clamp	1 1/2-in., Tri-Clamp	Stepped	★
Q06[9]	Sanitary, Tri-Clamp	2-in., Tri-Clamp	Stepped	★
Q08[9]	Sanitary, Tri-Clamp	3-in., Tri-Clamp	Stepped	★
Q20[9]	Sanitary, Tri-Clamp	3/4-in., Tri-Clamp	Straight	★
Q22[9]	Sanitary, Tri-Clamp	1-in., Tri-Clamp	Straight	★
Q24[9]	Sanitary, Tri-Clamp	1 1/2-in., Tri-Clamp	Straight	★
Q26[9]	Sanitary, Tri-Clamp	2-in., Tri-Clamp	Straight	★
Q28[9]	Sanitary, Tri-Clamp	3-in., Tri-Clamp	Straight	★

Options (Include with selected model number)		
Product Certifications		
Standard		**Standard**
E5	FM Explosion-proof approval (See Figure 26)	★
E6	CSA Explosion-proof approval (See Figure 27)	★
E7[10]	SAA Flameproof approval (See Figure 30)	★
Callendar-Van Dusen Constants		
Standard		**Standard**
V1-V7	V-Callendar-van Dusen Constants (V4 not available with series 68 sensors)	★
Calibration Schedule		
Standard		**Standard**
X8	Customer-Specified Temperature Calibration	★
X9	Customer-Specified Single Temperature Point Calibration	★
Calibration Certification		
Standard		**Standard**
Q4	Calibration Certification, Customer-Specified Temperature	★
Mounting Adapters		
Standard		**Standard**
M5-M7	Mounting adapter; Sensor Compression Fitting: M5= 1/8-27 NPT, M6 = 1/4-18 NPT, M7 = 1/2-14 NPT	★
A Leadkit		
Standard		**Standard**
A1-A8	Twisted lead wire extension: A1 = 1.5 ft, A2 = 3.0 ft, A3 = 6.0 ft, A4 = 12 ft, A5 = 24 ft, A6 = 50 ft, A7 = 75 ft, A8 = 100 ft	★
B Leadkit		
Standard		**Standard**
B1-B8[1]	Shielded cable lead wire extension: B1 = 1.5 ft, B2 = 3.0 ft, B3 = 6.0 ft, B4 = 12 ft, B5 = 24 ft, B6 = 50 ft, B7 = 75 ft, B8 = 100 ft	★
C Leadkit		
Standard		**Standard**
C1-C8[1]	Armored cable lead wire extension: C1 = 1.5 ft, C2 = 3.0 ft, C3 = 6.0 ft, C4 = 12 ft, C5 = 24 ft, C6 = 50 ft, C7 = 75 ft, C8 = 100 ft	★
D Leadkit		
Standard		**Standard**
D1-D8[1]	Armored cable lead wire extensions with electrical plug: D1 = 1.5 ft, D2 = 3.0 ft, D3 = 6.0 ft, D4 = 12 ft, D5 = 24 ft, D6 = 50 ft, D7 = 75 ft, D8 = 100 ft	★
L Leadkit		
Standard		**Standard**
L1-L8	Armored cable mating plugs with lead wire extension: L1 = 1.5 ft, L2 = 3.0 ft, L3 = 6.0 ft, L4 = 12 ft, L5 = 24 ft, L6 = 50 ft, L7 = 75 ft, L8 = 100 ft	★
F Leadkit		
Standard		**Standard**
F1[1]	4-pin bayonet connector	★
H Leadkit		
Standard		**Standard**
H1-H8	4-pin connector mating plugs with lead wire extension: H1 = 1.5 ft, H2 = 3.0 ft, H3 = 6.0 ft, H4 = 12 ft, H5 = 24 ft, H6 = 50 ft, H7 = 75 ft, H8 = 100 ft	★
J Leadkit		
Standard		**Standard**
J1	Moisture-proof seal assembly for armored cables	★
Special External Pressure Test		
Standard		**Standard**
R01	Special External Pressure Test	★

TABLE 5. Series 68 RTD Sensor Assemblies WITH Thermowell

★ 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.

Material Certification		
Standard		**Standard**
Q8	Material Certification	★
Surface Finish Certification		
Standard		**Standard**
Q16	Surface Finish Certification	★
Dye Penetration Test		
Standard		**Standard**
R03	Dye Penetration Test	★
Thermowell Special Cleaning		
Standard		**Standard**
R04	Thermowell Special Cleaning	★
NACE Approval		
Standard		**Standard**
R05	NACE Approval	★
SST Plug and Chain		
Standard		**Standard**
R06	Stainless steel plug and chain	★
Full Penetration Weld		
Standard		**Standard**
R07(11)	Full penetration weld	★
Thermowell Concentric Serrations		
Standard		**Standard**
R09(11)(12)	Concentric serrations of thermowell flange face	★
Flat Faced Flange		
Standard		**Standard**
R10 (11)(12)	Flat Faced Flange	★
Vent Hole		
Standard		**Standard**
R11	Vent Hole	★
Thermowell Xray		
Standard		**Standard**
R12	Thermowell Xray	★
Special Surface Finish		
Standard		**Standard**
R14	Special Surface Finish (12 Ra Maximum “U” lenght = 22.5-in.)	★
Ring Joint Flange		
Standard		**Standard**
R16(11)(12)	Ring joint flange (Not available with 0-in. (T) length)	★
Electropolish		
Standard		**Standard**
R20	Electropolish	★
Wake Frequency		
Standard		**Standard**
R21	Wake Frequency-Thermowell Strength Calculation	★
Internal Pressure Test		
Standard		**Standard**
R22	Internal pressure test	★
Brass Plug & Chain		
Standard		**Standard**
R23	Brass plug & chain	★
Canadian Registration No.		
Expanded		
R24	CRN Marking for British Columbia	
R25	CRN Marking for Alberta	
R26	CRN Marking for Saskatchewan	
R27	CRN Marking for Manitoba	
R28	CRN Marking for Ontario	
R29	CRN Marking for Quebec	
R30	CRN Marking for New Brunswick	
R31	CRN Marking for Nova Scotia	
R32	CRN Marking for Prince Edward Island	
R33	CRN Marking for Yukon Territory	
R34	CRN Marking for Northwest Territory	

TABLE 5. Series 68 RTD Sensor Assemblies WITH Thermowell

★ 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.

R35	CRN Marking for Nunavut	
R36	CRN Marking for Newfoundland and Labrador	
Twell From Hex Stock		
Expanded		
R37	Thermowell from Hex stock	
Assemble to Options		
Standard		**Standard**
XA(13)	Assemble connection head or transmitter to a sensor assembly	★

(1) Not available with Sensor Lead Wire Termination codes R, P, or W.

(2) Not available with option codes E1, E5, E6, and E7.

(3) Codes A and C must be used with an extension length. Additional non-standard (E) lengths are available in 1/2-in. increments from 2.5 to 9-in.

(4) Standard configuration with best delivery.

(5) Available only with straight stem thermowells.

(6) Thermowells with an overall length ("U" + "T" + 1.75-in.) of 36-in. or less are machined from solid barstock. Thermowells with an overall length larger than 42-in. will be constructed using a welded 3-piece design and are available only with a stepped stem style.

(7) For additional (T) lengths, see Table 28 on page Temperature-71.

(8) F88 to F08 cannot be used with 0-in. (T) length. F08 cannot be used with 0- or 1/2-in. (T) length)

(9) Limited to 24" immersion length and 316 or 304 SST materials only.

(10) SAA flame-proof approval is only applicable if installed with a Rosemount 248, 644, or 3144P transmitter.

(11) Available on flanged thermowells only.

(12) Only one flange face option allowed.

(13) If ordering option code XA with a transmitter, specify the same option on the transmitter model code.

TABLE 6. Ordering Example

	Model	Lead Wire Termination	Sensor Type	Extension Type	Extension Length	Material Code	Immersion Length	Mounting Style	Additional Options
Typical Model Number	0068	N	21	A	30	A	075	T22	E5

SERIES 78 PLATINUM RTD

Series 78 sensors are intended for applications that require high accuracy, dual-elements, and/or are subjected to high temperatures. Rosemount Series 78 Platinum Resistance temperature sensors measure from –200 to 600 °C (–328 to 1112 °F). These sensors are available in capsule, general-purpose, spring-loaded, and bayonet spring-loaded designs in sensor (X) lengths from 1 to 68 inches.

Table 7 shows the interchangeability of the Series 78 Pt100-385 sensors. The performance of the standard Series 78 sensor conforms to the standard set by IEC 751 Class B. Additionally, IEC-751 Class A accuracy is available as an option. For maximum system accuracy, Rosemount Inc. can provide sensor calibration. See Sensor Characterization (Calibration) Schedules– Option Code V. Rosemount Inc. also offers optional sensor-to-transmitter matching capability obtainable through the use of Callendar-Van Dusen Constants. See Option Code “V” Callendar-van Dusen Constantsand Option X8Q4: Sensor Calibrated to a Customer-Specified Temperature Range.

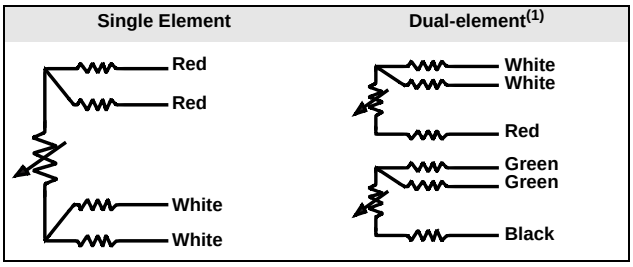
The wire-wound design and construction of the General-Purpose Series 78 sensor allows direct immersion in non-corrosive fluids at reasonable static pressures. For corrosive environments and in many industrial applications, these sensors are commonly used with standard thermowell assemblies.

Platinum Element and Lead Wire Configurations

Single-element high-temperature sensors have four lead wires and may be used in 2-, 3-, and 4-wire signal conditioning systems.

Dual-element sensors have redundant elements to provide separate readout and control signals from a single measurement point. Dual-element sensors have three lead wires for each element and may be used with 2- or 3-wire systems. Dual-element sensors can also be wired to be used as compensation loop sensors (see Figure 8).

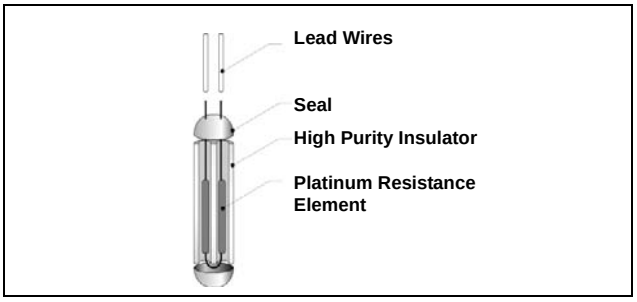
FIGURE 8. Wiring Configuration of a Dual-Element Sensor to Function as a Single Element Sensor with a Compensation Loop



(1) Dual-element sensors are only available on Series 68Q and 78 sensors.

Construction

FIGURE 9. Construction of a Platinum Wire-wound RTD



Specifications

Performance

Temperature Range

Series 78 single- and dual-element sensors may be used in temperatures from –200 to 500 °C (–328 to 932 °F). Series 78 single-element high-temperature sensors are provided for high-temperature service over the range of 0 to 600 °C (32 to 1112 °F).

Effect of Temperature Cycling

±0.04% (0.10 °C or 0.18 °F) maximum ice-point resistance shift following 10 cycles between –200 and 500 °C (–328 to 932 °F).

Stability

±0.05% maximum ice-point resistance shift following 1,000 hours at 400 °C (752 °F).

Accuracy

TABLE 7. Series 78 Interchangeability

Standard Series 78 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)
Series 78 with IEC-751 Class A Option	**Temperature**
±0.35 °C (±0.63 °F)	-100 °C (-148 °F)
±0.15 °C (±0.27 °F)	0 °C (32 °F)
±0.35 °C (±0.63 °F)	100 °C (212 °F)
±0.75 °C (±1.35 °F)	300 °C (572 °F)
±0.95 °C (±1.71 °F)	400 °C (752 °F)

Maximum Hysteresis

- Single- and dual-element, Nominal R0 100 Ohm Nominal alpha .00385 Ω/Ω °C.
- Single-element, high temperature: ±0.1% of range.

Time Constant

4 seconds maximum required to reach 63.2% sensor response in water flowing at 3 ft/s (0.91 m/s), 9.5 seconds for single-element high-temperature sensors.

Self Heating

18 mW minimum power dissipation required to cause a 1 °C (1.8 °F) temperature measurement error in water flowing at 3 ft/s, 25 mW for single-element high temperature sensors.

Insulation Resistance

500×10^6 ohms minimum insulation resistance when measured at 500 V dc at room temperature [20 °C (68 °F)]. Single element high-temperature sensors are measured at 100V dc.

Environmental

Humidity Limits

Lead seal is capable of withstanding 100% relative humidity.

Vibration Limits

Standard single- and dual-element sensors:

- ±0.03% maximum ice-point resistance shift due to 30 minutes of 21 g peak vibration from 5 to 350 Hz continuous sweep at 20 °C (68 °F) for unsupported stem length of less than 5.5 inches (140 mm).

Single-element high-temperature sensors:

- Meet ASTM E 1137-95. Cycling time is 3 hours per longitudinal axis, less the time spent at resonant dwells at the axis, from 5 to 500 Hz. The test level is 1.27 mm (0.05 in.) double amplitude displacement or peak g-level of 3, whichever is less.

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 78 sensors are suitable for indoor and outdoor NEMA 4X and CSA Enclosure Type 4X installations. See Hazardous Area Approvals for complete installation information.

Physical Specifications

Sheath Material

316 SST

Lead Wires

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

Identification Data

The model and serial numbers and up to six lines of permanent tagging information are etched on each sensor. Stainless steel tags are available upon request.

Weight

- Capsule sensors: 5 oz
  General purpose and spring-loaded sensors: 9 oz

Ordering Information

TABLE 8. Series 78 RTD Sensor Assemblies WITHOUT Thermowell

★ 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	Available Safety Approvals					
			FM	ATEX	CSA	SAA	
0078	Platinum Temperature Sensor WITHOUT Thermowell						
Sensor Lead Wire Termination							
Standard							**Standard**
R	Aluminum Connection Head, Six Terminals, Flat Cover, Unpainted		Y	Y	Y	N	★
T	Aluminum Connection Head, Six Terminals, Extended Cover, Unpainted		Y	Y	Y	N	★
P	Aluminum Connection Head, Six Terminals, Flat Cover, Painted		Y	Y	Y	N	★
L	Aluminum Connection Head, Six Terminals, Extended Cover, Painted		Y	Y	Y	N	★
N	Sensor only with 6-in. PTFE-insulated, 22-gauge lead wires		Y	Y	Y	N	★
D	Rosemount Aluminum Connection head		Y	Y	Y	Y	★
Expanded							
C	Polypropylene Connection Head		N	N	N	N	
G	Rosemount SST Connection Head with 1/2 in. Entries		Y	Y	Y	Y	

Sensor Type		**Range**	
Single Element Temperature Sensors		**-200 to 500 °C (-328 to 932 °F)**	
Standard			**Standard**
01[1][2]	Capsule style		★
11	General-purpose style		★
21[3]	Spring-loaded style		★
Expanded			
31[4]	Bayonet spring-loaded style (available in (X) lengths of 1 to 21-in, increments of 1-in.)		
Single Element High Temperature Sensors		**0 to 600 °C (32 to 1112 °F)**	
Standard			**Standard**
03[1]	Capsule style (available in (X) lengths of 3 to 48-in, increments of 1-in.)		★
13	General-purpose style (available in (X) lengths of 3 to 48-in, increments of 1/2-in.)		★
23[3]	Spring-loaded style (available in (X) lengths of 3 to 48-in, increments of 1/2-in.)		★
Expanded			
33[4]	Bayonet spring-loaded style (available in (X) lengths of 3 to 21-in, increments of 1-in.)		
Dual-element Temperature Sensors		**-200 to 500 °C (-328 to 932 °F)**	
Standard			**Standard**
05[1]	Capsule style		★
15	General-purpose style		★
25[3]	Spring-loaded style		★
Expanded			
35[4]	Bayonet spring-loaded style (available in (X) lengths of 1 to 21-in, increments of 1-in.)		

Extension Type		**Material**	
Standard			**Standard**
A[5]	Nipple Coupling	SST	★
C[5]	Nipple Union	SST	★
N	None (Use with extension length option code 00)		★
Extension Length (E)			
Standard			**Standard**
00	0.0 in.		★
30	3.0 in.		★
60	6.0 in.		★
Thermowell Material			
Standard			**Standard**
N	No thermowell required		★
Sensor/ Immersion Length (U length in inches)			
Standard			**Standard**
010	1.0-in.		★
015	1.5-in.		★
020	2.0-in.		★
025	2.5-in.		★
030	3.0-in.		★
035	3.5-in.		★

TABLE 8. Series 78 RTD Sensor Assemblies WITHOUT Thermowell

★ 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.

040	4.0-in.	★
045	4.5-in.	★
050	5.0-in.	★
055	5.5-in.	★
060	6.0-in.	★
065	6.5-in.	★
070	7.0-in.	★
075	7.5-in.	★
080	8.0-in.	★
085	8.5-in.	★
090	9.0-in.	★
095	9.5-in.	★
100	10.0-in.	★
105	10.5-in.	★
110	11.0-in.	★
115	11.5-in.	★
120	12.0-in.	★
125	12.5-in.	★
130	13.0-in.	★
135	13.5-in.	★
140	14.0-in.	★
145	14.5-in.	★
150	15.0-in.	★
155	15.5-in.	★
160	16.0-in.	★
165	16.5-in.	★
170	17.0-in.	★
175	17.5-in.	★
180	18.0-in.	★
185	18.5-in.	★
190	19.0-in.	★
195	19.5-in.	★
200	20.0-in.	★
205	20.5-in.	★
210	21.0-in.	★
215	21.5-in.	★
220	22.0-in.	★
225	22.5-in.	★
230	23.0-in.	★
235	23.5-in.	★
240	24.0-in.	★
245	24.5-in.	★
250	25.0-in.	★
260	26.0-in.	★
270	27.0-in.	★
280	28.0-in.	★
290	29.0-in.	★
300	30.0-in.	★
310	31.0-in.	★
320	32.0-in.	★
330	33.0-in.	★
340	34.0-in.	★
350	35.0-in.	★
360	36.0-in.	★
370	37.0-in.	★
380	38.0-in.	★
390	39.0-in.	★
400	40.0-in.	★

TABLE 8. Series 78 RTD Sensor Assemblies WITHOUT Thermowell

★ 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.

410	41.0-in.	★
420	42.0-in.	★
430	43.0-in.	★
440	44.0-in.	★
450	45.0-in.	★
460	46.0-in.	★
470	47.0-in.	★
480(6)	48.0-in.	★

Options (Include with selected model number)

Sensor		
Expanded		
A(7)	IEC – 751 Class A Sensor	
Approval Options		
Standard		**Standard**
E5	FM Explosion-proof approval (See Figure 26)	★
E6	CSA Explosion-proof approval (See Figure 27)	★
E7(8)	SAA Flameproof approval (See Figure 30)	★
Callendar-Van Dusen Constants		
Standard		**Standard**
V1-V7	V-Callendar-van Dusen Constants	★
Calibration Schedule		
Standard		**Standard**
X8	Customer-Specified Temperature Range Calibration	★
X9	Customer-Specified Single Temperature Point Calibration	★
Calibration Certification		
Standard		**Standard**
Q4	Calibration Certification, Customer-Specified Temperature	★
Mounting Adapters		
Standard		**Standard**
M5-M7	Mounting adapter; Sensor Compression Fitting: M5= 1/8-27 NPT, M6 = 1/4-18 NPT, M7 = 1/2-14 NPT	★
A Leadkit		
Standard		**Standard**
A1-A8	Twisted lead wire extension: A1 = 1.5 ft, A2 = 3.0 ft, A3 = 6.0 ft, A4 = 12 ft, A5 = 24 ft, A6 = 50 ft, A7 = 75 ft, A8 = 100 ft	★
B Leadkit		
Standard		**Standard**
B1-B8(9)	Shielded cable lead wire extension: B1 = 1.5 ft, B2 = 3.0 ft, B3 = 6.0 ft, B4 = 12 ft, B5 = 24 ft, B6 = 50 ft, B7 = 75 ft, B8 = 100 ft	★
C Leadkit		
Standard		**Standard**
C1-C8(9)	Armored cable lead wire extension: C1 = 1.5 ft, C2 = 3.0 ft, C3 = 6.0 ft, C4 = 12 ft, C5 = 24 ft, C6 = 50 ft, C7 = 75 ft, C8 = 100 ft	★
D Leadkit		
Standard		**Standard**
D1-D8(9)	Armored cable lead wire extensions with electrical plug: D1 = 1.5 ft, D2 = 3.0 ft, D3 = 6.0 ft, D4 = 12 ft, D5 = 24 ft, D6 = 50 ft, D7 = 75 ft, D8 = 100 ft	★
L Leadkit		
Standard		**Standard**
L1-L8	Armored cable mating plugs with lead wire extension: L1 = 1.5 ft, L2 = 3.0 ft, L3 = 6.0 ft, L4 = 12 ft, L5 = 24 ft, L6 = 50 ft, L7 = 75 ft, L8 = 100 ft	★
F Leadkit		
Standard		**Standard**
F1(9)	4-pin bayonet connector	★
H Leadkit		
Standard		**Standard**
H1-H8	4-pin connector mating plugs with lead wire extension: H1 = 1.5 ft, H2 = 3.0 ft, H3 = 6.0 ft, H4 = 12 ft, H5 = 24 ft, H6 = 50 ft, H7 = 75 ft, H8 = 100 ft	★
J Leadkit		
Standard		**Standard**
J1	Moisture-proof seal assembly for armored cables	★
Assemble to Options		
Standard		**Standard**
XA(10)	Assemble connection head or transmitter to a sensor assembly (PTFE paste where appropriate, fully wired.)	★

(1) Capsule style available in 1-in. increments only. See "Mounting Adapters for Series 58, 68, 78, and 183" on page Temperature-66.

(2) Must be used with Sensor Lead Wire Termination code N and is not available with assembly option XA or with approval option codes E1, E5, E6, or E7.

(3) Spring loaded sensors must be installed in a thermowell assembly to meet the requirements of explosion-proof approval option code E6.

(4) This option is not available with Sensor Lead Wire Termination codes R, P or C or approval code E1, E6, and E7.

(5) Codes A and C must be used with an extension length. Additional non-standard (E) lengths are available in 1/2-in. increments from 2.5 to 9-in.

(6) Additional lengths are available up to 68-in., increments of 1-in.

(7) The IEC 751 Class A option is not available with high-temperature sensors.

(8) SAA Flameproof approvals only applicable if installed with a Rosemount 248, 644, or 3144P transmitter.

(9) Requires Sensor lead wire termination code N

(10) If ordering option code XA with a transmitter, specify the same option on the transmitter model code.

TABLE 9. Ordering Example

Typical Model Number	Model	Lead Wire Termination	Sensor Type	Extension Type	Extension Length	Thermowell Material	Immersion Length	Additional Options
	0078	N	21	N	00	N	045	E5

Ordering Information

TABLE 10. Series 78 RTD Sensor Assemblies WITH Thermowell

★ 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	Available Safety Approvals					
0078	Platinum Temperature Sensor WITH Thermowell	FM	ATEX	CSA	SAA		
Sensor Lead Wire Termination							
Standard							**Standard**
R	Aluminum Connection Head, Six Terminals, Flat Cover, Unpainted	Y	Y	Y	N		★
T	Aluminum Connection Head, Six Terminals, Extended Cover, Unpainted	Y	Y	Y	N		★
P	Aluminum Connection Head, Six Terminals, Flat Cover, Painted	Y	Y	Y	N		★
L	Aluminum Connection Head, Six Terminals, Extended Cover, Painted	Y	Y	Y	N		★
N	Sensor only with 6-in. Teflon®-insulated, 22-gauge lead wires	Y	Y	Y	N		★
D	Rosemount Aluminum Connection head with 1/2- in. Entries	Y	Y	Y	Y		★
Expanded							
C	Polypropylene Connection Head	N	N	N	N		
G	Rosemount SST Connection Head with 1/2- in. Entries	Y	Y	Y	Y		
Sensor Type		**Temperature**					
Single Element Temperature Sensors		**-200 to 500 °C (-328 to 932 °F)**					
Standard							**Standard**
11	General-purpose style						★
21	Spring-loaded style						★
Expanded							
31(1)(2)	Bayonet spring-loaded style (available in (X) lengths over 21-in.)						
Single Element High Temperature Sensors		**0 to 500 °C (32 to 1112 °F)**					
Standard							**Standard**
13	General-purpose style (available in (X) lengths of 3 to 24-in., increments of 1/2-in.)						★
23	Spring-loaded style (available in (X) lengths of 3 to 24-in., increments of 1/2-in.)						★
Expanded							
33(1)(2)	Bayonet spring-loaded style (available in (X) lengths of 3 to 21-in., increments of 1-in.)						
Dual-element Temperature Sensors		**-200 to 500 °C (-328 to 932 °F)**					
Standard							**Standard**
15	General-purpose style						★
25	Spring-loaded style						★
Expanded							
35(1)(2)	Bayonet spring-loaded style (available in (X) lengths of 1 to 21-in., increments of 1-in.)						
Extension Type	**Material**						
Standard							**Standard**
A(3)	Nipple Coupling	SST					★
C(3)	Nipple Union	SST					★
N	None (Use with extension length option code 00)						★
Extension Length (E)							
Standard							**Standard**
00	0.0 in.						★
30	3.0 in.						★
60	6.0 in.						★
Thermowell Material							
Standard							**Standard**
A	Type 316 SST(4)						★
B	Type 304 SST						★
C	Carbon Steel						★
D	316L SST						★
E	304L SST						★
Expanded							
F	Alloy 20						
G	Alloy 400						
H	Alloy 600						
J	Alloy C-276						
L	Alloy B						
M	304 SST with Teflon (PTFE) coating						
P	Chrome Molybdenum F22						
R	Nickel 200						
T	Titanium						
U(5)	316 SST with Tantalum Sheath						

TABLE 10. Series 78 RTD Sensor Assemblies WITH Thermowell

★ 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.

V	310 SST			
W	321 SST			
Z	Chrome Molybdenum F11			
Sensor/Immersion Length (U) length in inches)		**(L) Length in inches**	**(T) Length in inches**	
Standard				**Standard**
015[6]	1.5-in.	4.0-in.	1.0-in.	★
020[6]	2.0-in.	4.0-in.	0.5-in.	★
025[6]	2.5-in.	4.0-in.	0.0-in.	★
030	3.0-in.	6.0-in.	1.5-in.	★
035	3.5-in.	6.0-in.	1.0-in.	★
040	4.0-in.	6.0-in.	0.5-in.	★
045	4.5-in.	6.0-in.	0.0-in.	★
050	5.0-in.	9.0-in.	2.5-in.	★
055	5.5-in.	9.0-in.	2.0-in.	★
060	6.0-in.	9.0-in.	1.5-in.	★
065	6.5-in.	9.0-in.	1.0-in.	★
070	7.0-in.	9.0-in.	0.5-in.	★
075	7.5-in.	9.0-in.	0.0-in.	★
080	8.0-in.	12.0-in.	2.5-in.	★
085	8.5-in.	12.0-in.	2.0-in.	★
090	9.0-in.	12.0-in.	1.5-in.	★
095	9.5-in.	12.0-in.	1.0-in.	★
100	10.0-in.	12.0-in.	0.5-in.	★
105	10.5-in.	12.0-in.	0.0-in.	★
110	11.0-in.	15.0-in.	2.5-in.	★
115	11.5-in.	15.0-in.	2.0-in.	★
120	12.0-in.	15.0-in.	1.5-in.	★
125	12.5-in.	15.0-in.	1.0-in.	★
130	13.0-in.	15.0-in.	0.5-in.	★
135	13.5-in.	15.0-in.	0.0-in.	★
140	14.0-in.	18.0-in.	2.5-in.	★
145	14.5-in.	18.0-in.	2.0-in.	★
150	15.0-in.	18.0-in.	1.5-in.	★
155	15.5-in.	18.0-in.	1.0-in.	★
160	16.0-in.	18.0-in.	0.5-in.	★
165	16.5-in.	18.0-in.	0.0-in.	★
170	17.0-in.	21.0-in.	2.5-in.	★
175	17.5-in.	21.0-in.	2.0-in.	★
180	18.0-in.	21.0-in.	1.5-in.	★
185	18.5-in.	21.0-in.	1.0-in.	★
190	19.0-in.	21.0-in.	0.5-in.	★
195	19.5-in.	21.0-in.	0.0-in.	★
200	20.0-in.	24.0-in.	2.5-in.	★
205	20.5-in.	24.0-in.	2.0-in.	★
210	21.0-in.	24.0-in.	1.5-in.	★
215	21.5-in.	24.0-in.	1.0-in.	★
220	22.0-in.	24.0-in.	0.5-in.	★
225	22.5-in.	24.0-in.	0.0-in.	★
230	23.0-in.	27.0-in.	2.5-in.	★
240	24.0-in.	27.0-in.	1.5-in.	★
250	25.0-in.	27.0-in.	0.5-in.	★
260	26.0-in.	30.0-in.	2.5-in.	★
270	27.0-in.	30.0-in.	1.5-in.	★
280	28.0-in.	30.0-in.	0.5-in.	★
290	29.0-in.	33.0-in.	2.5-in.	★
300	30.0-in.	33.0-in.	1.5-in.	★
310	31.0-in.	33.0-in.	0.5-in.	★
320	32.0-in.	36.0-in.	2.5-in.	★
330	33.0-in.	36.0-in.	1.5-in.	★
340	34.0-in.	36.0-in.	0.5-in.	★

TABLE 10. Series 78 RTD Sensor Assemblies WITH Thermowell

★ 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.

350	35.0-in.	39.0-in.	2.5-in.	★
360	36.0-in.	39.0-in.	1.5-in.	★
370	37.0-in.	39.0-in.	0.5-in.	★
380	38.0-in.	42.0-in.	2.5-in.	★
390	39.0-in.	42.0-in.	1.5-in.	★
400	40.0-in.	42.0-in.	0.5-in.	★
410	41.0-in.	45.0-in.	2.5-in.	★
420	42.0-in.	45.0-in.	1.5-in.	★
430	43.0-in.	45.0-in.	0.5-in.	★
440	44.0-in.	48.0-in.	2.5-in.	★
450	45.0-in.	48.0-in.	1.5-in.	★
460	46.0-in.	48.0-in.	0.5-in.	★
470	47.0-in.	51.0-in.	2.5-in.	★
480	48.0-in.	51.0-in.	1.5-in.	★
Thermowell Style		**Mounting**	**Stem**	
Standard				**Standard**
T20[4]	Threaded	1/2-14 ANPT	Stepped	★
T22[4]	Threaded	3/4-14 ANPT	Stepped	★
T24[4]	Threaded	1-11.5 ANPT	Stepped	★
T26	Threaded	3/4-14 ANPT	Tapered	★
T28	Threaded	1-11.5 ANPT	Tapered	★
T30	Threaded	1 1/2-11 ANPT	Tapered	★
T32	Threaded	1/2-14 ANPT	Straight	★
T34	Threaded	3/4-14 ANPT	Straight	★
T36	Threaded	1-11.5 ANPT	Straight	★
T38	Threaded	3/4-14 ANPT	Straight	★
T44	Threaded	1/2-14 ANPT	Tapered	★
W38	Welded	3/4-in. pipe	Stepped	★
W40	Welded	1-in. pipe	Stepped	★
W42	Welded	3/4-in. pipe	Tapered	★
W44	Welded	1-in. pipe	Tapered	★
W46	Welded	1 1/4-in. pipe	Tapered	★
W48	Welded	3/4-in. pipe	Straight	★
W50	Welded	1-in. pipe	Straight	★
F10	Flanged	2-in., Class 150	Straight	★
F12	Flanged	3-in., Class 150	Straight	★
F52	Flanged	1-in., Class 150	Stepped	★
F54	Flanged	1 1/2-in., Class 150	Stepped	★
F56	Flanged	2-in., Class 150	Stepped	★
F58	Flanged	1-in., Class 150	Tapered	★
F60	Flanged	1 1/2-in., Class 150	Tapered	★
F62	Flanged	2-in. Class 150	Tapered	★
F64	Flanged	1-in., Class 150	Straight	★
F66	Flanged	1 1/2-in., Class 150	Straight	★
F70	Flanged	1-in., Class 300	Stepped	★
F72	Flanged	1 1/2-in., Class 300	Stepped	★
F74	Flanged	2-in., Class 300	Stepped	★
F76	Flanged	1-in., Class 300	Tapered	★
F78	Flanged	1 1/2-in., Class 300	Tapered	★
F80	Flanged	2-in., Class 300	Tapered	★
F82	Flanged	1-in., Class 300	Straight	★
F84	Flanged	1 1/2-in., Class 300	Straight	★
F86	Flanged	2-in., Class 300	Straight	★
F88[7]	Flanged	1-in., Class 600	Stepped	★
F90[7]	Flanged	1 1/2-in., Class 600	Stepped	★
F92[7]	Flanged	2-in., Class 600	Stepped	★
F94[7]	Flanged	1-in., Class 600	Tapered	★
F96[7]	Flanged	1 1/2-in., Class 600	Tapered	★
F98[7]	Flanged	2-in., Class 600	Tapered	★

TABLE 10. Series 78 RTD Sensor Assemblies WITH Thermowell

★ 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.

F02(7)	Flanged	1-in., Class 600	Straight	★
F04(7)	Flanged	1 1/2-in., Class 600	Straight	★
F06(7)	Flanged	2-in., Class 600	Straight	★
F16(7)	Flanged	1 1/2-in., Class 900	Tapered	★
F34(7)	Flanged	1 1/2-in., Class 1500	Tapered	★
F24(7)	Flanged	2-in., Class 1500	Tapered	★
F08(7)	Flanged	1 1/2-in., Class 2500	Tapered	★
Q02(8)	Sanitary, Tri-Clamp	1-in., Tri-Clamp	Stepped	★
Q04(8)	Sanitary, Tri-Clamp	1 1/2-in., Tri-Clamp	Stepped	★
Q06(8)	Sanitary, Tri-Clamp	2-in., Tri-Clamp	Stepped	★
Q08(8)	Sanitary, Tri-Clamp	3-in., Tri-Clamp	Stepped	★
Q20(8)	Sanitary, Tri-Clamp	3/4-in., Tri-Clamp	Straight	★
Q22(8)	Sanitary, Tri-Clamp	1-in., Tri-Clamp	Straight	★
Q24(8)	Sanitary, Tri-Clamp	1 1/2-in., Tri-Clamp	Straight	★
Q26(8)	Sanitary, Tri-Clamp	2-in., Tri-Clamp	Straight	★
Q28(8)	Sanitary, Tri-Clamp	3-in., Tri-Clamp	Straight	★

Options (Include with selected model number)

Sensor		
Expanded		
A(9)	IEC 751 Class A sensor	
Approval Options		
Standard		**Standard**
E5	FM Explosion-proof approval (See Figure 26)	★
E6	CSA Explosion-proof approval (See Figure 27)	★
E7(10)	SAA Flameproof approval (See Figure 30)	★
Callendar-Van Dusen Constant		
Standard		**Standard**
V1-V7	V-Callendar-van Dusen Constants	★
Calibration Schedule		
Standard		**Standard**
X8	Customer-Specified Temperature Range Calibration	★
X9	Customer-Specified Single Temperature Point Calibration	★
Calibration Certification		
Standard		**Standard**
Q4	Calibration Certification, Customer-Specified Temperature	★
Mounting Adapters		
Standard		**Standard**
M5-M7	Mounting adapter; Sensor Compression Fitting: M5= 1/8-27 NPT, M6 = 1/4-18 NPT, M7 = 1/2-14 NPT	★
A Leadkit		
Standard		**Standard**
A1-A8	Twisted lead wire extension: A1 = 1.5 ft, A2 = 3.0 ft, A3 = 6.0 ft, A4 = 12 ft, A5 = 24 ft, A6 = 50 ft, A7 = 75 ft, A8 = 100 ft	★
B Leadkit		
Standard		**Standard**
B1-B8(11)	Shielded cable lead wire extension: B1 = 1.5 ft, B2 = 3.0 ft, B3 = 6.0 ft, B4 = 12 ft, B5 = 24 ft, B6 = 50 ft, B7 = 75 ft, B8 = 100 ft	★
C Leadkit		
Standard		**Standard**
C1-C8(11)	Armored cable lead wire extension: C1 = 1.5 ft, C2 = 3.0 ft, C3 = 6.0 ft, C4 = 12 ft, C5 = 24 ft, C6 = 50 ft, C7 = 75 ft, C8 = 100 ft	★
D Leadkit		
Standard		**Standard**
D1-D8(11)	Armored cable lead wire extensions with electrical plug: D1 = 1.5 ft, D2 = 3.0 ft, D3 = 6.0 ft, D4 = 12 ft, D5 = 24 ft, D6 = 50 ft, D7 = 75 ft, D8 = 100 ft	★
L Leadkit		
Standard		**Standard**
L1-L8	Armored cable mating plugs with lead wire extension: L1 = 1.5 ft, L2 = 3.0 ft, L3 = 6.0 ft, L4 = 12 ft, L5 = 24 ft, L6 = 50 ft, L7 = 75 ft, L8 = 100 ft	★
F Leadkit		
Standard		**Standard**
F1(11)	4-pin bayonet connector	★
H Leadkit		
Standard		**Standard**
H1-H8	4-pin connector mating plugs with lead wire extension: H1 = 1.5 ft, H2 = 3.0 ft, H3 = 6.0 ft, H4 = 12 ft, H5 = 24 ft, H6 = 50 ft,	★

TABLE 10. Series 78 RTD Sensor Assemblies WITH Thermowell

★ 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.

J Leadkit		
Standard		**Standard**
J1	Moisture-proof seal assembly for armored cables	★
Special External Pressure Test		
Standard		**Standard**
R01	Special External Pressure Test	★
Material Certifications		
Standard		**Standard**
Q8	Thermowell material certificate	★
Surface Finish Certification		
Standard		**Standard**
Q16	Surface Finish Certification	★
Dye Penetration Test		
Standard		**Standard**
R03	Dye Penetration Test	★
Thermowell Special Cleaning		
Standard		**Standard**
R04	Thermowell Special Cleaning	★
NACE Approval		
Standard		**Standard**
R05	NACE Approval	★
SST Plug and Chain		
Standard		**Standard**
R06	SST Plug and Chain	★
Full Penetration Weld		
Standard		**Standard**
R07[12]	Full Penetration Weld	★
Themowell Concentric Serrations		
Standard		**Standard**
R09[12][13]	Concentric Serrations of Thermowell Flange Face	★
Flat Faced Flange		
Standard		**Standard**
R10 [12][13]	Flat Faced Flange	★
Vent Hole		
Standard		**Standard**
R11	Vent Hole	★
Thermowell Xray		
Standard		**Standard**
R12	Thermowell Xray	★
Special Surface Finish		
Standard		**Standard**
R14	Special Surface Finish (12 RA Maximum “U” length = 22.5-in.)	★
Ring Joint Flange		
Standard		**Standard**
R16[12][13]	Ring Joint Flange (not available with 0-in. (T) length)	★
Electropolish		
Standard		**Standard**
R20	Electropolish	★
Wake Frequency		
Standard		**Standard**
R21	Wake Frequency - Thermowell Strength Calculation	★
Internal Pressure Test		
Standard		**Standard**
R22	Internal Pressure Test	★
Brass Plug & Chain		
Standard		**Standard**
R23	Brass Plug & Chain	★
Canadian Registration No.		
Expanded		
R24	CRN Marking for British Columbia	
R25	CRN Marking for Alberta	
R26	CRN Marking for Saskatchewan	
R27	CRN Marking for Manitoba	
R28	CRN Marking for Ontario	
R29	CRN Marking for Quebec	

TABLE 10. Series 78 RTD Sensor Assemblies WITH Thermowell

★ 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.

R30	CRN Marking for New Brunswick	
R31	CRN Marking for Nova Scotia	
R32	CRN Marking for Prince Edward Island	
R33	CRN Marking for Yukon Territory	
R34	CRN Marking for Northwest Territory	
R35	CRN Marking for Nunavut	
R36	CRN Marking for Newfoundland and Labrador	
Twell From Hex Stock		
Expanded		
R37	Thermowell From Hex Stock	
Assemble to Option		
Standard		**Standard**
XA(2)(14)	Assemble connection head or transmitter to a sensor assembly (PTFE paste where appropriate, fully wired.)	★

(1) Not available with Sensor Lead Wire Termination codes R, P or W.

(2) Not available with Approval codes E1, E6, or E7.

(3) Codes A and C must be used with an extension length. Additional non-standard (E) lengths are available in 1/2-in. increments from 2.5 to 9-in.

(4) Standard configuration with best delivery.

(5) Available only with straight stem flanged thermowells.

(6) Straight or Tapered stem only.

(7) F88 to F08 cannot be used with 0-in. (T) length. F08 cannot be used with 0- or 1/2-in. (T) length

(8) Limited to 24" immersion length and 316 or 304 SST materials only.

(9) The IEC 751 Class A option is not available with high-temperature sensors.

(10) SAA Flameproof approvals only applicable if installed with a Rosemount 248, 644, or 3144 transmitter.

(11) These options are not available with Sensor Lead Wire Termination codes R, P, or W.

(12) Available on flanged thermowells only.

(13) Only one flange face option allowed.

(14) If ordering option code XA with a transmitter, specify the same option on the transmitter model code.

TABLE 11. Ordering Example

Typical Model Number	Model	Lead Wire Termination	Sensor Type	Extension Type	Extension Length	Material Code	Immersion Length	Mounting Style	Additional Options
	0078	N	21	A	30	A	075	T22	E5

SERIES 68Q SANITARY PLATINUM RTD

Rosemount Series 68Q sanitary RTD temperature sensors measure from –50 to 200 °C (–58 to 392 °F). Series 68Q sensors are available in Tri-Clamp® endcap designs in immersion lengths from 1.0 to 9.5 inches. Table 12 shows the interchangeability of the Series 68Q sensor.

Accuracy

TABLE 12. Series 68Q Interchangeability (IEC 751 Class B)

±0.55 °C (±0.99 °F) at –50 °C (–58 °F)
±0.30 °C (±0.54 °F) at 0 °C (32 °F)
±0.80 °C (±1.44 °F) at 100 °C (212 °F)
±1.30 °C (±2.34 °F) at 200 °C (392 °F)

Construction

Series 68Q sensors conform to 3-A Sanitary Standards and feature product contact surfaces designed for CIP cleaning. The response times of Series 68Q sensors meet the Grade A Pasteurized Milk Ordinance (PMO) specification for thermometric response of an indicating thermometer on a pipeline.

Series 68Q sensors are offered in a Tri-Clamp sanitary endcap configuration. The sensor capsule is welded into the 316 SST sanitary endcap/stem assembly. The product contact of this assembly is polished to a finish that exceeds No. 4 minimum finish as required by the 3–A Sanitary Council Standard #74-02.

Platinum Element and Lead Wire Configurations

Single-element temperature sensors have four lead wires and may be used in 2-, 3-, and 4-wire signal conditioning systems. Dual-element sensors have six lead wires and may be used in 2- and 3-wire signal conditioning systems.

SPECIFICATIONS

Performance

Temperature Range

–50 to 200 °C (–58 to 392 °F)

Maximum Hysteresis

±0.09% of operating temperature range

Stability

Tri-clamp O.D. Tube Size 1-in. and greater:

±0.04% maximum ice-point resistance shift following 1,000 hours at maximum specified temperature 392 °F (200 °C).

Tri-clamp O.D. Tube Size $^1/_2$ - $^3/_4$-in.:

±0.08% maximum ice-point resistance shift following 1,000 hours at maximum specified temperature 392 °F (200 °C).

Response Time

Tri-clamp O.D. Tube Size 1-in. and greater

Less than 3.5 seconds required to reach 63.2% sensor response in water flowing at 3 ft/s (0.91 m/s). Meets PMO specification

Tri-clamp O.D. Tube Size $^1/_2$ - $^3/_4$-in.:

Less than 1.5 seconds required to reach 63.2% sensor response in water flowing at 3 ft/s (0.91 m/s).

Insulation Resistance

500×10^6 ohms minimum insulation resistance when measured at 100 V dc at room temperature

Surface Finish

$32R_A$ standard finish on product contact surfaces. Meets 3-A requirements

$15R_A$ high mechanical polish available with option code HP.

Environmental

Humidity Limits

Lead seal is capable of withstanding 100% relative humidity

Quality Assurance

Each sensor is subjected to a resistance accuracy test at 0 °C

Physical Specifications

Sheath Material

316 SST

Lead Wire

PTFE-insulated, nickel-coated, 24-gauge stranded copper wire

Identification Data

The model and serial numbers and up to six lines of permanent tagging information are etched on each sensor. Stainless steel tags are available upon request

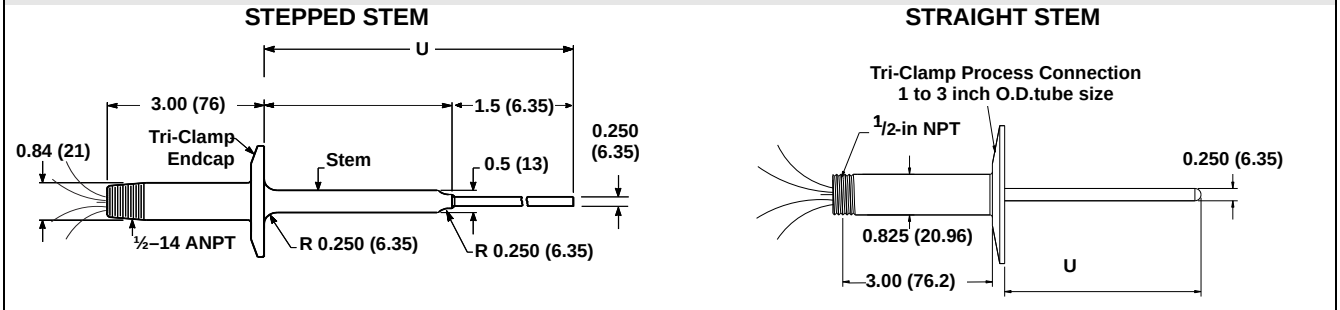
Weight

0.6 to 2.0 lb (0.3 to 0.9 kg)

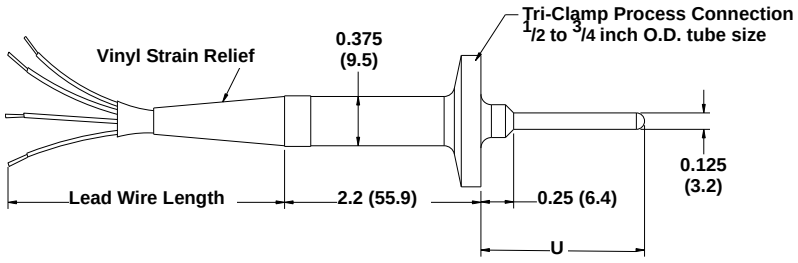
Dimensional Drawings

FIGURE 10. 68Q Sanitary Sensor and Polypropylene Connection Head Dimensional Drawings

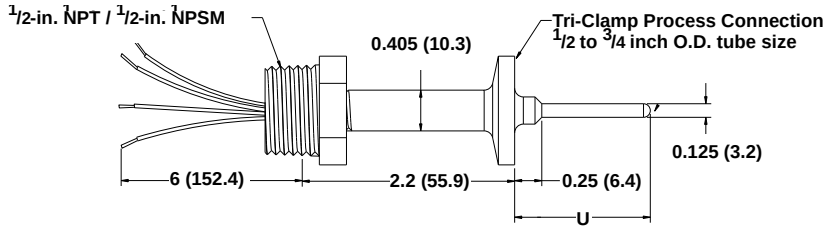
68Q Sanitary Sensor with Tri-Clamp® Endcap



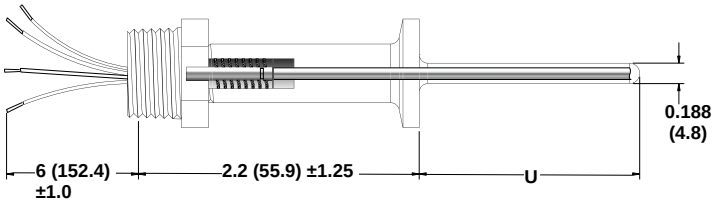
68Q Mini General Purpose Sensor with Cable and Strain Relief



68Q Mini General Purpose Sensor with 1/2-in. NPT Threaded Adapter



68Q Mini Spring Loaded Sensor with Thermowell and Replaceable Sensor



Dimensions are in inches (millimeters)

TABLE 13. Series 68Q Spare Parts List

Mini Spring-Loaded Sanitary Replacement Sensors and Thermowells		
Immersion Length (U)	**Replacement Sensor Part Number**	**Replacement Thermowell Part Number**
2.0	00068-4035-0020	00068-4035-1020
2.5	00068-4035-0025	00068-4035-1025
3.0	00068-4035-0030	00068-4035-1030

Ordering Information

TABLE 14. Series 68Q Sanitary Platinum RTD Sensor Assemblies

★ 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		
0068Q	Sanitary Platinum RTD Sensor Assembly		
Sensor Lead Wire Termination			
Standard			**Standard**
P	Aluminum Connection Head, Six Terminals, Flat Cover, Painted		★
L	Aluminum Connection Head, Six Terminals, Extended Cover, Painted		★
N	Sensor only		★
D	Rosemount Aluminum Connection Head with 1/2-in. Entries		★
Expanded			
C	Polypropylene Connection Head		
G	Rosemount SST Connection Head with 1/2-in. Entries		
Sensor Type		**Temperature**	
Standard			**Standard**
11	Single Stepped Stem	-50 to 200 °C (-58 to 392 °F)	★
15	Dual Stepped Stem	-50 to 200 °C (-58 to 392 °F)	★
21	Single Straight Stem	-50 to 200 °C (-58 to 392 °F)	★
25	Dual Straight Stem	-50 to 200 °C (-58 to 392 °F)	★
30(1) (2)	Mini General Purpose 6-in. lead with 1/2-in. NPT Threaded Adapter	-50 to 200 °C (-58 to 392 °F)	★
31(1)(2)(3)	Mini General Purpose 6-in. lead with 1/2-in. NPSM Threaded Adapter	-50 to 200 °C (-58 to 392 °F)	★
32(1)(2)(3)	Mini General Purpose 180-in. cable with strain relief	-50 to 200 °C (-58 to 392 °F)	★
33(1)(2)(3)	Mini General Purpose 300-in. cable with strain relief	-50 to 200 °C (-58 to 392 °F)	★
41(4)	Mini Spring Loaded with thermowell replacement sensor	-50 to 200 °C (-58 to 392 °F)	★
Sensor Immersion Length (L) (inches			
Standard			**Standard**
U010	1.00 in.		★
U011	1.10 in.		★
U012	1.20 in.		★
U013	1.25 in.		★
U014	1.40 in.		★
U015	1.50 in.		★
U016	1.60 in.		★
U017	1.70 in.		★
U018	1.80 in.		★
U019	1.90 in.		★
U020	2.00 in.		★
U025	2.50 in.		★
U030	3.00 in.		★
U035	3.50 in.		★
U040(5)	4.00 in.		★
U045	4.50 in.		★
U050(5)	5.00 in.		★
U055	5.50 in.		★
U060	6.00 in.		★
U065	6.50 in.		★
U070	7.00 in.		★
U075	7.50 in.		★
U080	8.00 in.		★
U085	8.50 in.		★
U090	9.00 in.		★
U095	9.50 in.		★
Endcap Type		**O.D. Tube Size (inches)**	
Standard			**Standard**
L050(6)	Tri-Clamp	1/2 to 3/4 in.	★
L100	Tri-Clamp	1.00 in.	★
L150(5)	Tri-Clamp	1.50 in.	★

TABLE 14. Series 68Q Sanitary Platinum RTD Sensor Assemblies

★ 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.

L200[5]	Tri-Clamp	2.00 in.	★
L250	Tri-Clamp	2.50 in.	★
L300	Tri-Clamp	3.00 in.	★
Options (Include with selected model number)			
Callendar-Van Dusen Constants			
Standard			**Standard**
V1-V7	V-Callendar-van Dusen Constants (V3, V4, V6 not available with 68Q)		★
Calibration Schedule			
Standard			**Standard**
X8	Customer-Specified Temperature Range Calibration		★
X9	Customer-Specified Single Temperature Point Calibration		★
Calibration Certification			
Standard			**Standard**
Q4	Calibration Certification, Customer-Specified Temperature		★
Special Surface Finish Electro Polish			
Standard			**Standard**
R20[7]	Electropolishing of wetted surfaces		★
Special Surface Finish High Mechanical Polish			
Standard			**Standard**
HP	High Mechanical Polish, 15R_a or better		★
Thermowell Material Certification			
Standard			**Standard**
Q8	Material Certification		★
Surface Finish Certification			
Standard			**Standard**
Q16	Surface Finish Certification		★
Assemble to Options			
Standard			**Standard**
XA[8]	Assemble connection head or transmitter to a sensor assembly (PTFE paste where appropriate, fully wired.)		★

(1) Only available in immersion lengths between 1-in. and 2-in.

(2) Only available with Tri-Clamp O.D. tube size 1/2 to 3/4-in. (Endcap type code L050).

(3) Only available with Sensor lead Wire Termination code N (sensor only).

(4) Only available in U lengths of 2.0, 2.5, or 3.0 inches.

(5) Standard configuration with best delivery.

(6) Only available in sensor type code 30, 31, 32, 33

(7) If ordering a Mini General Purpose or Mini Spring Loaded Sensor (Sensor Type codes 30, 31, 32, 33, or 41) with Electropolishing, High Mechanical Polish (Option code HP) is also required.

(8) If ordering option code XA with a transmitter, specify the same option on the transmitter model code.

Ordering Example

	Model	Lead Wire Termination	Sensor Type	Immersion Length	Endcap Type, Tube Size	Additional Options
Typical Model Number	0068Q	N	11	U050	L150	V2

SERIES 58C PLATINUM RTD

Rosemount Series 58C sensors are available in 12-, 24-, 36-, and 48-inch (X) lengths and may be shortened to any desired length with an ordinary tubing cutter. This cut-to-fit feature eliminates the need to stock a large selection of sensors in many specific lengths. Table 15 shows the interchangeability of the Series 58C Sensor.

TABLE 15. Series 58C Interchangeability (IEC 751 Class B)

±0.55 °C (±0.99 °F) at –50 °C (–58 °F)
±0.30 °C (±0.54 °F) at 0 °C (32 °F)
±0.80 °C (±1.44 °F) at 100 °C (212 °F)
±1.30 °C (±2.34 °F) at 200 °C (392 °F)

Specifications

Performance Specifications

Temperature Range

–50 to 200 °C (–58 to 392 °F)

Maximum Hysteresis

±0.09% of operating temperature range.

Stability

±0.035% maximum ice-point resistance shift following 1,000 hours at maximum specified temperature (200 °C).

Insulation Resistance

500×10^6 ohms minimum insulation resistance when measured at 50 V dc at room temperature.

Environmental Specifications

Humidity Limits

No permanent rear seal is installed

Quality Assurance

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

Physical Specifications

Sheath Material

316 SST

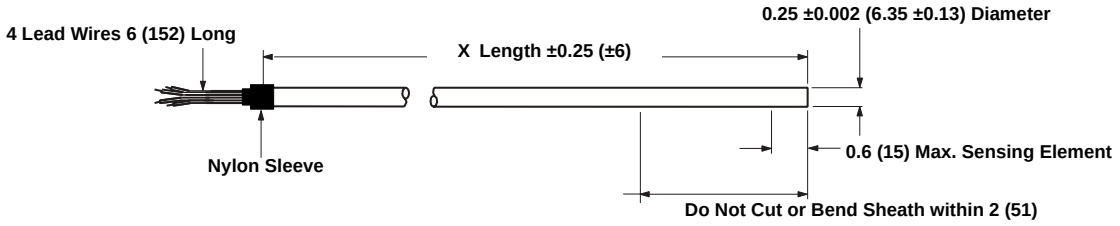
Lead Wires

PTFE-insulated, nickel-coated, 24-gauge stranded copper wire

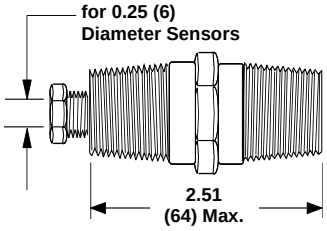
Dimensional Drawings

Series 58C Sensor

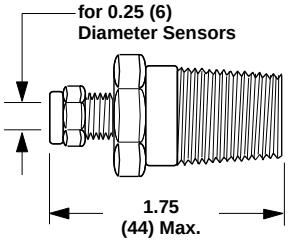
Do not cut all the way through the sensor sheath when cutting the sensor to length. Damage to the sensor wires could result. To prevent damage to the sensor wires, score the sheath considerably with a tubing cutter and gently break off the excess.



Option Code SNN Spring-Loaded Fitting
303 SST. 1/2–14 ANPT



Option Codes C01, C02, Swagelok Compression Fitting
316 SST. 1/2–14 ANPT



Dimensions are in inches (millimeters)

Ordering Information

TABLE 16. Series 58C Cut-to-Fit RTD Sensors

★ 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	
0058C	Platinum Resistance Temperature Sensor	
Sensor Lead Wire Termination		
Standard		**Standard**
D	Rosemount Aluminum Connection Head with 1/2-in. Entries	★
R	Aluminum Connection Head, Six Terminals, Flat Cover, Unpainted	★
T	Aluminum Connection Head, Six Terminals, Extended Cover, Unpainted	★
P	Aluminum Connection Head, Six Terminals, Flat Cover, Painted	★
L	Aluminum Connection Head, Six Terminals, Extended Cover, Painted	★
N	Sensor only with 6-in. Teflon® -insulated, 22-gauge lead wires	★
Expanded		
C	Polypropylene Connection Head	
G	Rosemount SST Connection with 1/2-in. Entries	
Sensor Immersion Length		
Standard		**Standard**
1200	12 in.	★
2400	24 in.	★
3600	36 in.	★
4800	48 in.	★
Mounting Adapter		
Standard		**Standard**
NNN	None	★
C01(1)	One-compression fitting 1/2–14 ANPT	★
C02(1)	Two-compression fittings 1/2–14 ANPT	★
SNN	Spring-loaded fitting 1/2–14 ANPT	★

(1) The only difference between C01 and C02 is that the C01 includes one fitting while the C02 option includes two fittings.

Ordering Example

Typical Model Number

Model	Lead Wire Termination	Sensor Length	Mounting Adapter
0058C	R	1200	SNN

TABLE 17. Series 58C Spare Parts List

(specify spare part number separately when ordering mounting adapters)

Mounting Adapters	Option Code	Spare Part Number
Compression fitting 1/2–14 ANPT	C01 and C02	C07961-0008
Spring loaded fitting 1/2–14 ANPT	SNN	00058-0010-0001

SERIES 183 THERMOCOUPLE

Rosemount Series 183 Thermocouple sensors measure from –180 to 1150 °C (–292 to 2102 °F).

Construction

The Series 183 Thermocouples are manufactured using ISA Type J, K, E, or T wire with “special limits of error” accuracy. The junction of these wires is fusion-welded to form a pure joint, to maintain the integrity of the circuit, and to ensure the highest accuracy. Grounded junctions are available for improved response time and good thermal contact with protection from the environment. The ungrounded and isolated junctions provide electrical isolation from the sensor sheath (see Figure 11).

Rosemount thermocouples are encased in a protective metal sheath. The sheath material is 304 SST for types J, E, and T, used at temperatures up to 871 °C and Inconel for type K, used at temperatures up to 1150 °C. Metallic oxide insulation is compacted into the sheath to mechanically support and electrically insulate the thermocouple wire. See Table 22 for more information on the different types of thermocouples.

FIGURE 11. Series 183 Junction Configurations

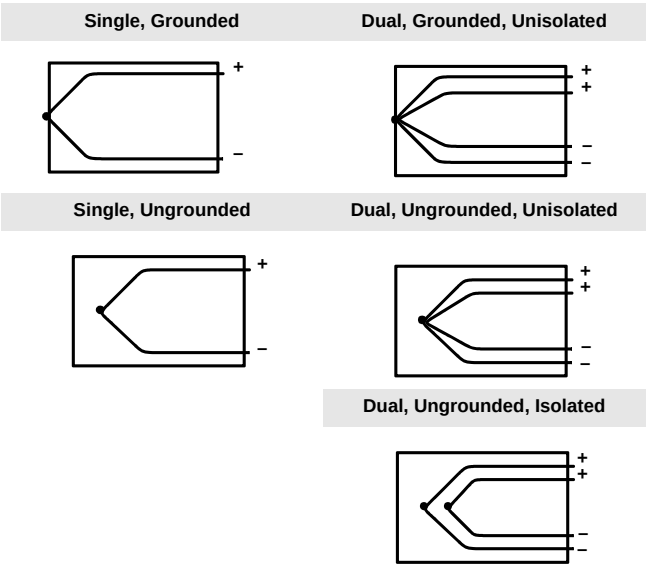
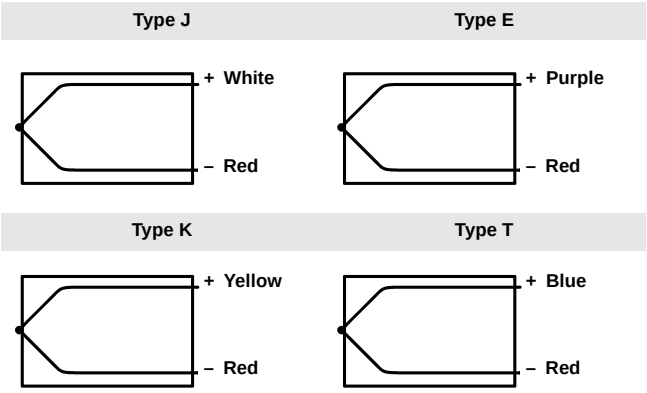


FIGURE 12. Series 183 Lead Wire Configurations



Specifications

Performance Specifications

The thermoelectric current relationship in a thermocouple is standardized and defined by ASTM E-230. All Series 183 Thermocouples conform to these standards with “special limits of error” accuracy. The particular characteristics of each ISA type thermocouple are outlined in Table 22.

Physical

Sheath Material

304 SST for types J, E, and T (used at temperatures up to 871 °C). Inconel for type K (used at temperatures up to 1150 °C).

Lead Wires

Thermocouple, internal—16 AWG solid wire (max), 18 AWG solid wire (min.). External lead wires—20 AWG wire, PTFE-insulated. Color coded per lead wire configuration schematic shown in Figure 12.

Identification Data

The model and serial numbers and up to six lines of permanent tagging information are etched on each sensor. Stainless steel tags are available upon request.

Weight

Capsule sensors: 5 ounces. General-purpose and spring-loaded sensors: 9 ounces.

Insulation Resistance

100×10^6 ohms minimum insulation resistance when measured at 100 V dc at room temperature.

Enclosure Ratings

When installed properly, Rosemount Series 183 sensors are suitable for indoor and outdoor
NEMA 4X and CSA Enclosure Type 4X installations. See Hazardous Area Approvals for complete installation information.

Ordering Information

TABLE 18. Series 183 Thermocouple Sensor Assemblies WITHOUT Thermowell

★ 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	Available Safety Approvals					
		FM	ATEX	CSA	SAA		
0183	Thermocouple Sensor WITHOUT Thermowell						
Sensor Lead Wire Termination							
Standard							**Standard**
R	Aluminum Connection Head, Six Terminals, Flat Cover, Unpainted	Y	Y	Y	N		★
T	Aluminum Connection Head, Six Terminals, Extended Cover, Unpainted	Y	Y	Y	N		★
P	Aluminum Connection Head, Six Terminals, Flat Cover, Painted	Y	Y	Y	N		★
L	Aluminum Connection Head, Six Terminals, Extended Cover, Painted	Y	Y	Y	N		★
N	Sensor only with 6-in. Teflon®-insulated, 20-gauge lead wires	Y	Y	Y	N		★
D	Rosemount Aluminum Connection Head with 1/2-in. Entries	Y	Y	Y	Y		★
Expanded							
C	Polypropylene Connection Head	N	N	N	N		
G	Rosemount SST Connection Head with 1/2-in. Entries	N	N	N	N		

Sensor Type		Junction	
Capsule Sensor(1)(2)			
Standard			**Standard**
01(1)	Single	Grounded	★
02	Dual	Grounded	★
03	Single	Ungrounded	★
04	Dual, Unisolated	Ungrounded	★
05	Dual, Isolated	Ungrounded	★
General Purpose Sensors			
Standard			**Standard**
11	Single	Grounded	★
12	Dual	Grounded	★
13	Single	Ungrounded	★
14	Dual, Unisolated	Ungrounded	★
15	Dual, Isolated	Ungrounded	★
Spring-Loaded Sensors(3)			
Standard			**Standard**
21	Single	Grounded	★
22	Dual	Grounded	★
23	Single	Ungrounded	★
24	Dual, Unisolated	Ungrounded	★
25	Dual, Isolated	Ungrounded	★
Bayonet Spring-Loaded Sensors(4)(5)			★
Expanded			
31	Single	Grounded	
32	Dual	Grounded	
33	Single	Ungrounded	
34	Dual, Unisolated	Ungrounded	
35	Dual, Isolated	Ungrounded	

Thermocouple Type		Temperature Range	
Standard			**Standard**
J2	J	0 to 760 °C (32 to 1400 °F)	★
K2	K	0 to 1150 °C (32 to 2102 °F)	★
E2	E	0 to 871 °C (32 to 1600°F)	★
T2	T	–180 to 371 °C (–292 to 700 °F)	★

Extension Type		Material	
Standard			**Standard**
A(6)	Nipple Coupling	SST	★
C(6)	Nipple Union	SST	★
N	None (Use with extension length option code 00)		★

TABLE 18. Series 183 Thermocouple Sensor Assemblies WITHOUT Thermowell

★ 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.

Extension Length (E)				
Standard				**Standard**
00	0.0 in.			★
30	3.0 in.	(X) sensor length = (E) extension length + (L) thermowell length minus 0.25 in. (see Figure 4.)		★
60	6.0 in.			★
Thermowell Material				
Standard				**Standard**
N	No thermowell required			★
Code	**Sensor/Immersion Length (U length in inches)**			
Standard				**Standard**
020	2.0-in.			★
025	2.5-in.			★
030	3.0-in.			★
035	3.5-in.			★
040	4.0-in.			★
045	4.5-in.			★
050	5.0-in.			★
055	5.5-in.			★
060	6.0-in.			★
065	6.5-in.			★
070	7.0-in.			★
075	7.5-in.			★
080	8.0-in.			★
085	8.5-in.			★
090	9.0-in.			★
095	9.5-in.			★
100	10.0-in.			★
105	10.5-in.			★
110	11.0-in.			★
115	11.5-in.			★
120	12.0-in.			★
125	12.5-in.			★
130	13.0-in.			★
135	13.5-in.			★
140	14.0-in.			★
145	14.5-in.			★
150	15.0-in.			★
155	15.5-in.			★
160	16.0-in.			★
165	16.5-in.			★
170	17.0-in.			★
175	17.5-in.			★
180	18.0-in.			★
185	18.5-in.			★
190	19.0-in.			★
195	19.5-in.			★
200	20.0-in.			★
205	20.5-in.			★
210	21.0-in.			★
215	21.5-in.			★
220	22.0-in.			★
225	22.5-in.			★
230	23.0-in.			★
235	23.5-in.			★

TABLE 18. Series 183 Thermocouple Sensor Assemblies WITHOUT Thermowell

★ 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.

240	24.0-in.	★
245	24.5-in.	★
250	25.0-in.	★
260	26.0-in.	★
270	27.0-in.	★
280	28.0-in.	★
290	29.0-in.	★
300	30.0-in.	★
310	31.0-in.	★
320	32.0-in.	★
330	33.0-in.	★
340	34.0-in.	★
350	35.0-in.	★
360	36.0-in.	★
370	37.0-in.	★
380	38.0-in.	★
390	39.0-in.	★
400	40.0-in.	★
410	41.0-in.	★
420	42.0-in.	★
430	43.0-in.	★
440	44.0-in.	★
450	45.0-in.	★
460	46.0-in.	★
470	47.0-in.	★
480	48.0-in.	★

Options (Include with selected model number)

Product Certifications		
Standard		**Standard**
E5	FM Explosion-proof approval (See Figure 26)	★
E6	CSA Explosion-proof approval (See Figure 27)	★
E7(7)	SAA Flameproof approval (See Figure 30)	★
E1(8)	ATEX Flameproof approval (See Figure 29)	★
Mounting Adapters, Lead Wire Extensions, Connectors, and Seals		
Standard		**Standard**
M5-M7	Mounting adapters	★
Assembly Options		
Standard		**Standard**
XA(9)	Assemble connection head or transmitter to a sensor assembly	★

(1) This option must be used with Sensor Lead Wire Termination code N and is not available with assembly options XA.

(2) Cannot be used with approval option codes E1, E5, E6, or E7. See "Mounting Adapters for Series 58, 68, 78, and 183" on page Temperature-66.

(3) Spring-loaded sensors must be installed in a thermowell assembly to meet the requirement option code E6.

(4) This option is not available with explosion-proof approval option code E6.

(5) Bayonet spring-loaded style is available to 45-inches but is not available with Sensor Lead Wire Termination codes R, P, or W.

(6) Codes A and C must be used with an extension length. Additional non-standard (E) lengths are available in 1/2-in. increments from 2.5 to 9-in.

(7) SAA Flameproof approvals only applicable if installed with a Rosemount 248, 644, or 3144 transmitter.

(8) ATEX Flameproof approval is only applicable if ordered with Sensor Lead Wire Terminator code D, R, P. T. or L (Rosemount connection head) or installed with Rosemount 248, 644, or 3144P transmitters.

(9) If ordering option code XA with a transmitter, specify the same option on the transmitter model code.

TABLE 19. Ordering Example

Typical Model Number	Model	Lead Wire Termination	Sensor Type	ISA Type	Extension Type	Extension Length	Thermowell Code	Immersion Length	Additional Options
	0183	N	11	J2	N	00	N	045	E5

Ordering Information

TABLE 20. Series 183 Thermocouple Sensor Assemblies WITH Thermowell

★ 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	Available Safety Approvals					
		FM	ATEX	CSA	SAA		
0183	Thermocouple Sensor WITH Thermowell						
Sensor Lead Wire Termination							
Standard							**Standard**
R	Aluminum Connection Head, Six Terminals, Flat Cover, Unpainted	Y	Y	Y	N		★
T	Aluminum Connection Head, Six Terminals, Extended Cover, Unpainted	Y	Y	Y	N		★
P	Aluminum Connection Head, Six Terminals, Flat Cover, Painted	Y	Y	Y	N		★
L	Aluminum Connection Head, Six Terminals, Extended Cover, Painted	Y	Y	Y	N		★
N	Sensor only with 6-in. Teflon®-insulated, 22-gauge lead wires	Y	Y	Y	N		★
D	Rosemount Aluminum Connection Head with 1/2-in. Entries	Y	Y	Y	Y		★
Expanded							
C	Polypropylene Connection Head	N	N	N	N		
G	Rosemount SST Connection Head with 1/2-in. Entries	N	N	N	N		

Sensor Type		**Junction**	
General-Purpose Sensors			
Standard			**Standard**
11	Single	Grounded	★
12	Dual	Grounded	★
13	Single	Ungrounded	★
14	Dual, Unisolated	Ungrounded	★
15	Dual, Isolated		★
Spring-Loaded Sensors			
Standard			**Standard**
21	Single	Grounded	★
22	Dual	Grounded	★
23	Single	Ungrounded	★
24	Dual, Unisolated	Ungrounded	★
25	Dual, Isolated	Ungrounded	★
Bayonet Spring-Loaded Sensors(1)(2)			
Expanded			
31	Single	Grounded	
32	Dual	Grounded	
33	Single	Ungrounded	
34	Dual, Unisolated	Ungrounded	
35	Dual, Isolated	Ungrounded	
Thermocouple Type		**Temperature Range**	
Standard			**Standard**
J2	J	0 to 760 °C (32 to 1400 °F)	★
K2	K	0 to 1150 °C (32 to 2102 °F)	★
E2	E	0 to 871 °C (32 to 1600°F)	★
T2	T	–180 to 371 °C (–292 to 700 °F)	★
Extension Type		**Material**	
Standard			**Standard**
A(3)	Nipple Coupling	SST	★
C(3)	Nipple Union	SST	★
N	None	(Use with extension length option code 00)	★
Extension Length (E)			
Standard			**Standard**
00	0.0 in.		★
30	3.0 in.		★
60	6.0 in.		★
Thermowell Material			
Standard			**Standard**
A	Type 316 SST(4)		★
B	Type 304 SST		★
C	Carbon Steel		★

TABLE 20. Series 183 Thermocouple Sensor Assemblies WITH Thermowell

★ 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.

D	316L SST			★
E	304L SST			
Expanded				
F	Alloy 20			
G	Alloy 400			
H	Alloy 600			
J	Alloy C-276			
L	Alloy B			
M	304 SST with Teflon (PTFE) coating			
P	Chrome Molybdenum F22			
R	Nickel 200			
T	Titanium			
U[5]	316 SST with Tantalum Sheath			
V	310 SST			
W	321 SST			
Z	Chrome Molybdenum F11			
Sensor/Immersion Length (U[6] length in inches)		**(L) Length in Inches**	**T[7] Length in Inches**	
Standard				**Standard**
015[8]	1.5-in.	4.0-in.	1.0-in.	★
020[6]	2.0-in.	4.0-in.	0.5-in.	★
025[6]	2.5-in.	4.0-in.	0.0-in.	★
030	3.0-in.	6.0-in.	1.5-in.	★
035	3.5-in.	6.0-in.	1.0-in.	★
040	4.0-in.	6.0-in.	0.5-in.	★
045	4.5-in.	6.0-in.	0.0-in.	★
050	5.0-in.	9.0-in.	2.5-in.	★
055	5.5-in.	9.0-in.	2.0-in.	★
060	6.0-in.	9.0-in.	1.5-in.	★
065	6.5-in.	9.0-in.	1.0-in.	★
070	7.0-in.	9.0-in.	0.5-in.	★
075	7.5-in.	9.0-in.	0.0-in.	★
080	8.0-in.	12.0-in.	2.5-in.	★
085	8.5-in.	12.0-in.	2.0-in.	★
090	9.0-in.	12.0-in.	1.5-in.	★
095	9.5-in.	12.0-in.	1.0-in.	★
100	10.0-in.	12.0-in.	0.5-in.	★
105	10.5-in.	12.0-in.	0.0-in.	★
110	11.0-in.	15.0-in.	2.5-in.	★
115	11.5-in.	15.0-in.	2.0-in.	★
120	12.0-in.	15.0-in.	1.5-in.	★
125	12.5-in.	15.0-in.	1.0-in.	★
130	13.0-in.	15.0-in.	0.5-in.	★
135	13.5-in.	15.0-in.	0.0-in.	★
140	14.0-in.	18.0-in.	2.5-in.	★
145	14.5-in.	18.0-in.	2.0-in.	★
150	15.0-in.	18.0-in.	1.5-in.	★
155	15.5-in.	18.0-in.	1.0-in.	★
160	16.0-in.	18.0-in.	0.5-in.	★
165	16.5-in.	18.0-in.	0.0-in.	★
170	17.0-in.	21.0-in.	2.5-in.	★
175	17.5-in.	21.0-in.	2.0-in.	★
180	18.0-in.	21.0-in.	1.5-in.	★
185	18.5-in.	21.0-in.	1.0-in.	★
190	19.0-in.	21.0-in.	0.5-in.	★
195	19.5-in.	21.0-in.	0.0-in.	★
200	20.0-in.	24.0-in.	2.5-in.	★
205	20.5-in.	24.0-in.	2.0-in.	★
210	21.0-in.	24.0-in.	1.5-in.	★
215	21.5-in.	24.0-in.	1.0-in.	★

TABLE 20. Series 183 Thermocouple Sensor Assemblies WITH Thermowell

★ 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.

220	22.0-in.	24.0-in.	0.5-in.	★
225	22.5-in.	24.0-in.	0.0-in.	★
Thermowell Style		**Mounting**	**Stem**	
Standard				**Standard**
T20[4]	Threaded	1/2-14 ANPT	Stepped	★
T22[4]	Threaded	3/4-14 ANPT	Stepped	★
T24[4]	Threaded	1-11.5 ANPT	Stepped	★
T26	Threaded	3/4-14 ANPT	Tapered	★
T28	Threaded	1-11.5 ANPT	Tapered	★
T30	Threaded	1 1/2-11 ANPT	Tapered	★
T32	Threaded	1/2-14 ANPT	Straight	★
T34	Threaded	3/4-14 ANPT	Straight	★
T36	Threaded	1-11.5 ANPT	Straight	★
T38	Threaded	3/4-14 ANPT	Straight	★
T44	Threaded	1/2-14 ANPT	Tapered	★
W38	Welded	3/4-in. pipe	Stepped	★
W40	Welded	1-in. pipe	Stepped	★
W42	Welded	3/4-in. pipe	Tapered	★
W44	Welded	1-in. pipe	Tapered	★
W46	Welded	1 1/4-in. pipe	Tapered	★
W48	Welded	3/4-in. pipe	Straight	★
W50	Welded	1-in. pipe	Straight	★
F10	Flanged	2-in., Class 150	Straight	★
F12	Flanged	3-in., Class 150	Straight	★
F52	Flanged	1-in., Class 150	Stepped	★
F54	Flanged	1 1/2-in., Class 150	Stepped	★
F56	Flanged	2-in., Class 150	Stepped	★
F58	Flanged	1-in., Class 150	Tapered	★
F60	Flanged	1 1/2-in., Class 150	Tapered	★
F62	Flanged	2-in. Class 150	Tapered	★
F64	Flanged	1-in., Class 150	Straight	★
F66	Flanged	1 1/2-in., Class 150	Straight	★
F70	Flanged	1-in., Class 300	Stepped	★
F72	Flanged	1 1/2-in., Class 300	Stepped	★
F74	Flanged	2-in., Class 300	Stepped	★
F76	Flanged	1-in., Class 300	Tapered	★
F78	Flanged	1 1/2-in., Class 300	Tapered	★
F80	Flanged	2-in., Class 300	Tapered	★
F82	Flanged	1-in., Class 300	Straight	★
F84	Flanged	1 1/2-in., Class 300	Straight	★
F86	Flanged	2-in., Class 300	Straight	★
F88[9]	Flanged	1-in., Class 600	Stepped	★
F90[9]	Flanged	1 1/2-in., Class 600	Stepped	★
F92[9]	Flanged	2-in., Class 600	Stepped	★
F94[9]	Flanged	1-in., Class 600	Tapered	★
F96[9]	Flanged	1 1/2-in., Class 600	Tapered	★
F98[9]	Flanged	2-in., Class 600	Tapered	★
F02[9]	Flanged	1-in., Class 600	Straight	★
F04[9]	Flanged	1 1/2-in., Class 600	Straight	★
F06[9]	Flanged	2-in., Class 600	Straight	★
F16[9]	Flanged	1 1/2-in., Class 900	Tapered	★
F34[9]	Flanged	1 1/2-in., Class 1500	Tapered	★
F24[9]	Flanged	2-in., Class 1500	Tapered	★
F08[9]	Flanged	1 1/2-in., Class 2500	Tapered	★
Q02[10]	Sanitary, Tri-Clamp	1-in., Tri-Clamp	Stepped	★
Q04c	Sanitary, Tri-Clamp	1 1/2-in., Tri-Clamp	Stepped	★
Q06[9]	Sanitary, Tri-Clamp	2-in., Tri-Clamp	Stepped	★
Q08[9]	Sanitary, Tri-Clamp	3-in., Tri-Clamp	Stepped	★

TABLE 20. Series 183 Thermocouple Sensor Assemblies WITH Thermowell

★ 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.

Q20[9]	Sanitary, Tri-Clamp	3/4-in., Tri-Clamp	Straight	★
Q22[9]	Sanitary, Tri-Clamp	1-in., Tri-Clamp	Straight	★
Q24[9]	Sanitary, Tri-Clamp	1 1/2-in., Tri-Clamp	Straight	★
Q26[9]	Sanitary, Tri-Clamp	2-in., Tri-Clamp	Straight	★
Q28[9]	Sanitary, Tri-Clamp	3-in., Tri-Clamp	Straight	★

Options (Include with selected model number)

Product Certifications		
Standard		**Standard**
E5	FM Explosion-proof approval (See Figure 26)	★
E6	CSA Explosion-proof approval (See Figure 27)	★
E7[11]	SAA Flameproof approval (See Figure 30)	★
Mounting Adapters		
Standard		**Standard**
M5-M7	Mounting adapter: Sensor Compression Fitting: M5 = 1/8-27 NPT, M6 = 1/4-18 NPT, M7 = 1/2-14 NPT	★
Special External Pressure Test		
Standard		**Standard**
R01	Special External Pressure Test	★
Material Certification		
Standard		**Standard**
Q8	Material Certification	★
Dye Penetration Test		
Standard		**Standard**
R03	Dye Penetration Test	★
Thermowell Special Cleaning		
Standard		**Standard**
R04	Thermowell Special Cleaning	★
NACE Approval		
Standard		**Standard**
R05	NACE Approval	★
SST Plug and Chain		
Standard		**Standard**
R06	SST Plug and Chain	★
Full Penetration Weld		
Standard		**Standard**
R07[12]	Full Penetration Weld	★
Thermowell Concentric Serrations		
Standard		**Standard**
R09[12][13]	Concentric Serrations of Thermowell Flange Face	★
Flat Faced Flange		
Standard		**Standard**
R10 [11][12]	Flat Faced Flange	★
Vent Hole		
Standard		**Standard**
R11	Vent Hole	★
Thermowell Xray		
Standard		**Standard**
R12	Thermowell Xray	★
Special Surface Finish		
Standard		**Standard**
R14	Special Surface Finish (12 Ra Maximum “U” length = 22.5-in.)	★
Ring Joint Flange		
Standard		**Standard**
R16[11][12]	Ring joint flange (Not available with 0-in. (T) length)	★
Electropolish		
Standard		**Standard**
R20	Electropolish	★
Wake Frequency		
Standard		**Standard**
R21	Wake Frequency-Thermowell Strength Calculation	★

TABLE 20. Series 183 Thermocouple Sensor Assemblies WITH Thermowell

★ 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.

Internal Pressure Test		
Standard		**Standard**
R22	Internal Pressure Test	★
Brass Plug & Chain		
Standard		**Standard**
R23	Brass Plug & Chain	★
Canadian Registration No.		
Expanded		
R24	CRN Marking for British Columbia	
R25	CRN Marking for Alberta	
R26	CRN Marking for Saskatchewan	
R27	CRN Marking for Manitoba	
R28	CRN Marking for Ontario	
R29	CRN Marking for Quebec	
R30	CRN Marking for New Brunswick	
R31	CRN Marking for Nova Scotia	
R32	CRN Marking for Prince Edward Island	
R33	CRN Marking for Yukon Territory	
R34	CRN Marking for Northwest Territory	
R35	CRN Marking for Nunavut	
R36	CRN Marking for Newfoundland and Labrador	
Twell From Hex Stock		
Expanded		
R37	Thermowell from Hex stock	
Assemble to Options		
Standard		**Standard**
XA(14)	Assemble connection head or transmitter to a sensor assembly	★

(1) This option is not available with explosion-proof approval option codes E1, E5, E6, or E7.

(2) Bayonet spring-loaded style available to 45 inches. Codes 31 - 35 are not available with Sensor Lead Wire Termination codes R or P.

(3) Codes A and C must be used with an extension length. Additional non-standard (E) lengths are available in 1/2-in. increments from 2.5 to 9-in.

(4) Standard configuration with best delivery.

(5) Available only with straight stem thermowells.

(6) Thermowells with an overall length ("U" + "T" + 1.75-in.) of 36-in. or less are machined from solid barstock. Thermowells with an overall length larger than 42-in. will be constructed using a welded 3-piece design and are available only with a stepped stem style.

(7) For additional (T) lengths, see Table 28 on page Temperature-71.

(8) Straight or Tapered stem thermowells only.

(9) Cannot be used with 0-in. (T) length. F08 cannot be used with 0- or 1/2-in. (T) length

(10) Limited to 24" immersion length and 316 or 304 SST materials only.

(11) SAA Flameproof approvals only applicable if installed with a Rosemount 248, 644, or 3144P transmitter.

(12) Available on flanged thermowells only.

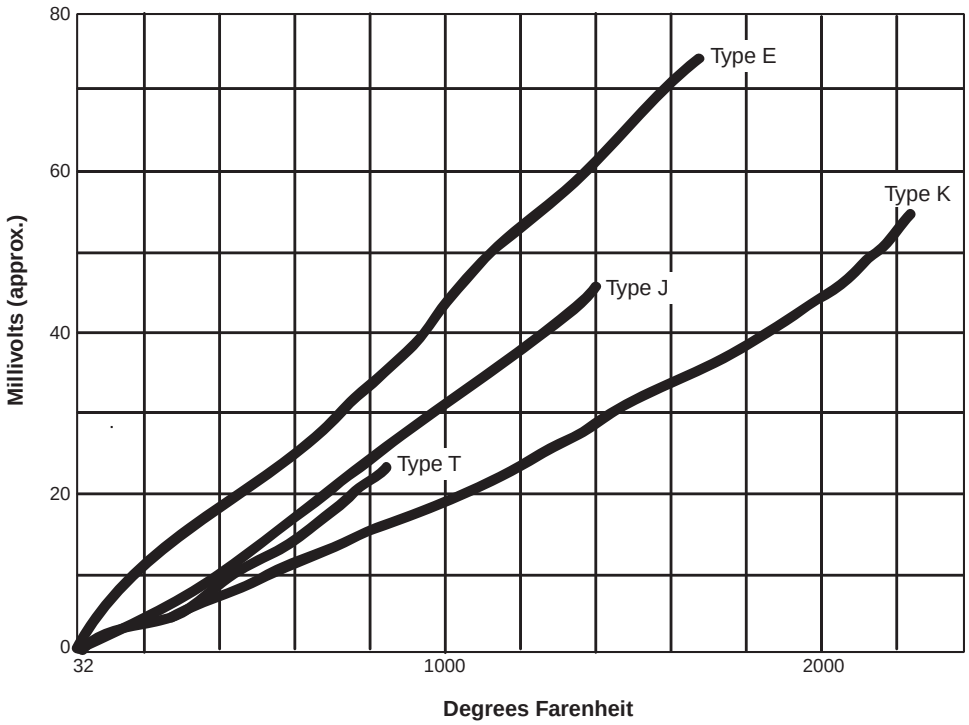
(13) Only one flange face option allowed.

(14) If ordering option code XA with a transmitter, specify the same option on the transmitter model code.

TABLE 21. Ordering Example

Typical Model Number	Model	Lead Wire Termination	Sensor Type	ISA Type	Extension Type	Extension Length	Material Code	Immersion Length	Mounting Style	Additional Options
	0183	N	21	J2	A	30	A	075	T22	E5

Comparison of Thermocouples



Thermocouple	Conditions for Use
Type J Iron / Constantan	Maximum operating temperature of 760 °C (1400 °F). Used with or without protective tubing where deficiency of free oxygen exists. Protective tube not essential, but desirable for cleanliness and longer service.
Type K Chromel / Alumel	Suitable for extended use in temperature reaching 1150 °C (2102 °F). Use of metal or ceramic protective tube desirable, especially in reducing atmospheres. in oxidizing atmospheres, protective tubing necessary only to promote cleanliness and longer service.
Type E Chromel / Constantan	Suitable for use at temperature p to 900 °C (1652 °F) in vacuum r inert, mildly oxidizing or reducing atmosphere. Not subject to corrosion at cryogenic temperatures. Has highest EMF output per degree of all commonly used thermocouples.
Type T Copper /Constantan	Operating temperature range of –180 to 371 °C (–292 to 700 °F). Use in either oxidizing or reducing atmospheres. Protective tubing necessary only to promote cleanliness and longer service. Stable at lower temperature. Superior for a wide variety of uses in cryogenic temperatures.

TABLE 22. Characteristics of Series 183 Thermocouple Types

ISA Thermocouple Types	Thermocouple Wire Alloys	Temperature Range		Limits of Error (Interchangeability)
		°C	°F	
J	Iron/Constantan	0 to 760	32 to 1400	±1.1 °C or ±0.4% of measured temperature, whichever is greater
K	Chromel/Alumel	0 to 1150	32 to 2102	±1.1 °C or ±0.4% of measured temperature, whichever is greater
E	Chromel/Constantan	0 to 871	32 to 1600	±1.0 °C or ±0.4% of measured temperature, whichever is greater
T	Copper/Constantan	–180 to 0	–292 to 32	±1.0 °C or ±1.5% of measured temperature, whichever is greater
		0 to 371	32 to 700	±0.5 °C or ±0.4% of measured temperature, whichever is greater

Calibration

CALIBRATION OPTIONS

Sensor calibration may be required for input to quality systems, or for control system enhancement. More frequently, it is used to improve the overall temperature measurement performance by matching the sensor to a temperature transmitter. Transmitter-Sensor matching is available for RTD sensors used with Rosemount 644, 3144P, and 3244MV temperature transmitters where the inherent stability and repeatability of the RTD technology is well established.

Transmitter-Sensor Matching Using Callendar-Van Dusen Constants

Significant temperature measurement accuracy improvement can be attained using a temperature sensor that is matched to a temperature transmitter. This matching process entails *teaching* the temperature transmitter the relationship between resistance and temperature for a specific RTD sensor. This relationship, approximated by the Callendar-Van Dusen equation, described as:

$R_t = R_o + R_o\alpha[t - \delta(0.01t - 1)(0.01t) - \beta(0.01t - 1)(0.01t)^3]$, where:

R_t = Resistance (ohms) at Temperature t (°C)

R_o = Sensor-Specific Constant (Resistance at t = 0 °C)

α =Sensor-Specific Constant

δ =Sensor-Specific Constant

β =Sensor-Specific Constant (0 at t > 0 °C, 0.11 at t < 0°C)

The exact values for R_0, α, δ, β, – known as Callendar-Van Dusen (CVD) constants – are specific to each RTD sensor, and are established by testing each individual sensor at various temperatures.

The calibration temperature values using the CVD equation are divided into two major temperature areas: above 0 °C and below 0 °C. The calibration for the temperature range between 0 and 660 °C is obtained from the following formula:

$$R_t = R_0\left\{1 + \alpha\left[t - \delta\left(\frac{t}{100}\right)\left(\frac{t}{100} - 1\right)\right]\right\}$$

Note that this is a modification of the fourth-order CVD equation where $\beta = 0$ for temperatures greater than 0 °C. Since this modified equation is a second-order degree equation, at least three distinct temperature values are needed in order to curve fit the behavior of the RTD. For the temperature range from 0 to 100 °C only these two end points are used, and an approximation is made to render the constants.

Once the sensor-specific constants are entered, the transmitter uses them to generate a custom curve to best describe the relationship between resistance and temperature for the particular sensor and transmitter system. Matching a Series 68 or 78 RTD sensor to a 644, 3144P, and 3244MV transmitter typically results in a 3- or 4-fold improvement in temperature measurement accuracy for the total system. This substantial system accuracy improvement is realized as a result of the transmitter's ability to use the sensor's ***actual*** resistance-vs.-temperature curve instead of an *ideal* curve.

An example of the benefits of using the sensor matching capability of a Rosemount 3144P Temperature transmitter along with a matched Series 68 RTD sensor are shown in Typical Transmitter-Sensor Matching Uncertainty Improvements.

Calibration Uncertainty

Calibration uncertainties of the lab are equal to or better than $^1/_{10}$ IEC 751 Class B interchangeability:

$$\textbf{Uncertainty} = \mathbf{0.03 + 0.0005 \times |}t\mathbf{|}$$

$|t|$ = *absolute value of temperature in °C*

TYPICAL TRANSMITTER-SENSOR MATCHING UNCERTAINTY IMPROVEMENTS

Transmitter: 3144 (has built-in sensor matching capabilities), span of 1 to 200 °C, accuracy = 0.1 °C)

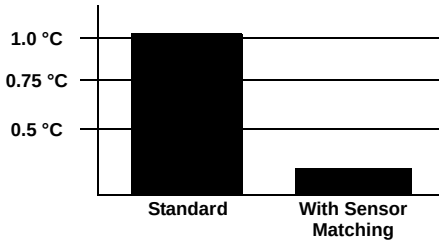
Sensor: Series 68 RTD

Callendar van Dusen Option: V2
Process Temperature: 150 °C

Temperature		Sensor Interchangeability Error		Total Calibrated Sensor Uncertainty[1]	
°C	°F	°C	°F	°C	°F
0	32	±0.30	±0.54	±0.10	±0.18
50	122	±0.55	±0.99	±0.17	±0.31
100	212	±0.80	±1.44	±0.22	±0.40
150	302	±1.05	±1.89	±0.18	±0.32
200	392	±1.30	±2.34	±0.16	±0.29

(1) Includes calibration uncertainties of the lab, hysteresis, and repeatability.

System Uncertainty Comparison at 150 °C:



Standard 68 Sensor	
Rosemount 3144:	± 0.10 °C
Standard Series 68 RTD:	± 1.05 °C
Total System[1]:	± 1.05 °C
68 Sensor with V2 Option	
Rosemount 3144:	± 0.10 °C
Standard Series 68 RTD:	± 0.18 °C
Total System[1]:	± 0.21 °C

(1) Calculated using RSS statistical method:

$$SystemAccuracy = \sqrt{(TransmitterAccuracy)^2 + (SensorAccuracy)^2}$$

ORDERING INFORMATION

Sensor Characterization (Calibration) Schedules– Option Code V

Series 68, 68Q, and 78 RTD sensors can be ordered with an option (V1, V2,...V7, see Option Code “V” Callendar-van Dusen Constants), that provides Callendar-Van Dusen constants that are shipped with the sensor. When you order this option, the values of all four sensor-specific constants are physically attached to each sensor with a wire-on tag. Rosemount 644, 3144P, and 3244MV have a unique, built-in sensor matching capability. To use this capability, the four sensor-specific constants are programmed into the 644, 3144P, and 3244MV at the factory by ordering a C2 option on the transmitter, or easily entered and changed in the field using a HART Communicator or AMS. When these values are entered into a Rosemount 644, 3144P, and 3244MV, the sensor and transmitter become *matched*.

Each “V” option is specific to a particular temperature range for a given sensor type (see Option Code “V” Callendar-van Dusen Constants). As with option code X8Q4, the accuracies associated with each option code represent worst-case conditions when the sensor is used over the entire temperature range.

For applications requiring the increased accuracy obtainable through a matched sensor and transmitter, order the appropriate “V” option (seeOption Code “V” Callendar-van Dusen Constants). To ensure optimal performance, select a “V” option such that the sensor’s range of actual operation is between the minimum and maximum calibration points.

The accuracy (uncertainty) of different calibration points varies because each calibration schedule has specific hysteresis and repeatability characteristics. For example, the accuracy of calibration points at 100 °C for options V1 and V2 differs because of the two different temperature ranges.

NOTE
An RTD ordered with the V option is shipped with CVD constants only; it does not include calibration tables.

OPTION CODE “V” CALLENDAR-VAN DUSEN CONSTANTS

Option Code	Temperature Range		Calibration Points		Uncertainty[1] of Calibration Lab		Total Uncertainty[2] of Calibrated Sensor					
							Series 68		Series 78 Standard		Series 78 High Temperature	
	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
V1[3]	0 to 100	32 to 212	0	32	±0.03	±0.05	±0.06	±0.11	±0.06	±0.11	±0.06	±0.11
			100	212	±0.08	±0.14	±0.10	±0.18	±0.10	±0.18	±0.10	±0.18
V2[3]	0 to 200	32 to 392	0	32	±0.03	±0.05	±0.10	±0.18	±0.09	±0.16	±0.10	±0.18
			100	212	±0.08	±0.14	±0.22	±0.40	±0.15	±0.27	±0.23	±0.41
			200	392	±0.13	±0.23	±0.16	±0.29	±0.15	±0.27	±0.16	±0.29
V3[3]	0 to 400	32 to 752	0	32	±0.03	±0.05	±0.20	±0.29	±0.16	±0.29	±0.20	±0.29
			200	392	±0.13	±0.23	±0.42	±0.76	±0.29	±0.52	±0.44	±0.79
			400	752	±0.23	±0.41	±0.30	±0.54	±0.28	±0.50	±0.30	±0.54
V4[3][4]	0 to 600	32 to 1112	0	32	±0.03	±0.05	NA	±NA	NA	NA	NA	NA
			200	392	±0.13	±0.23	NA	±NA	NA	NA	NA	NA
			400	752	±0.23	±0.41	NA	±NA	NA	NA	NA	NA
V5[3]	–50 to 100	–58 to 212	0	32	±0.03	±0.05	±0.08	±0.14	±0.06	±0.11	±0.09	±0.16
			100	212	±0.08	±0.14	±0.10	±0.18	±0.10	±0.18	±0.10	±0.18
V6[3]	–50 to 200	–58 to 392	–50	–58	±0.06	±0.10	±0.14	±0.25	±0.11	±0.20	±0.14	±0.25
			0	32	±0.03	±0.05	±0.20	±0.36	±0.14	v0.25	±0.21	±0.38
			100	212	±0.08	±0.14	±0.26	±0.47	±0.18	±0.32	±0.27	±0.49
			200	392	±0.13	±0.23	±0.18	±0.32	±0.16	±0.29	±0.17	±0.3
V7[3]	–50 to 400	–58 to 752	–50	–58	±0.06	±0.10	±0.23	±0.41	±0.19	±0.34	±0.23	±0.41
			0	32	±0.03	±0.05	±0.31	±0.56	±0.22	±0.40	±0.32	±0.58
			200	392	±0.13	±0.23	±0.46	±0.83	±0.31	±0.56	±0.48	±0.86
			400	752	±0.23	±0.41	±0.32	±0.58	±0.29	±0.52	±0.32	±0.58

(1) Includes only the uncertainly of the lab.

(2) Includes the uncertainty of the lab, hysteresis, and repeatability.

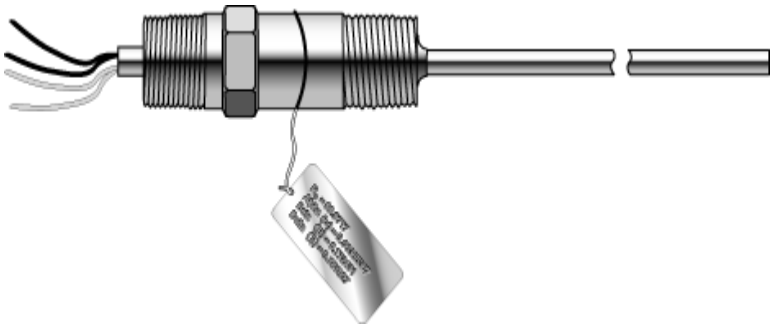
(3) Uncertainties are valid for option code X8Q4 when ordered with the corresponding temperature range. The largest error shown in each temperature range is the worst case error for all points not shown in that range.

(4) Only available with Series 78 High Temperature Sensors 10-in. or longer.

Ordering Information

Specify Sensor Model Number with “V” Option Example								
Sensor Model	0068	N	11	N	00	N	120	V2

FIGURE 13. Typical Sensor Ordered with Option Code V

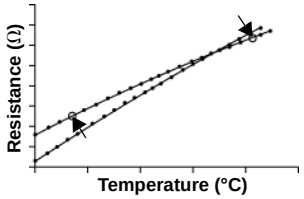


Option Code X8Q4

The X8Q4 option calibrates the sensor to a customer-specified temperature range. The X8Q4 report includes the Callendar-Van Dusen (CVD) constants (R_0, α, δ, β), a resistance-versus-temperature table in one-degree increments, and a graph which includes the maximum errors due to the uncertainty of the calibration equipment, hysteresis, and repeatability. The values in the tables are calculated using Callendar-Van Dusen methodology. Two of the values on this table could be used to perform a two-point trim. The X8Q4 option also provides the CVD constants on a stainless steel tag attached to the sensor.

See Figure 16.

FIGURE 14. Graph of a Typical Two-point Trim



A two-point trim shifts the ideal curve up or down, and changes the slop based on the two characterized points.

Option X8Q4: Sensor Calibrated to a Customer-Specified Temperature Range

When you order an RTD with the X8Q4 option, you must specify a temperature range over which the sensor is to be calibrated. Before specifying the range, take careful note of the sensor temperature limits.

Ordering Example:

Typical Model Number	Model	Lead Wire Termination	Sensor Type	Extension Type	Extension Length	Thermowell Material	Immersion Length	Additional Options
	0068	N	11	N	00	N	045	X8Q4 X8X9Q4

If X8Q4 and X9Q4 are both required, do not repeat the “Q4” code in the model string. Include the following instead:

Calibrate from –10 to 120 °C

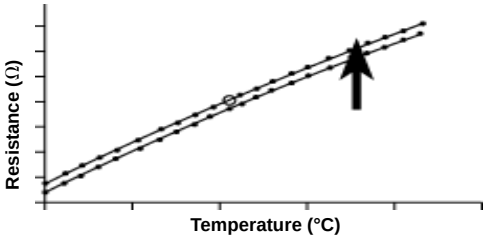
Option Code X9Q4

The X9Q4 option calibrates the sensor at a single customer-specified point. A calibration certificate with the resistance value at this point is supplied. This value could be used to perform a one-point trim on the transmitter.All characterizations are traceable to the National Institute of Standards and Technology (NIST). The calibration table is dated and marked with the sensor series and serial number.

See Figure 17.

NOTE
The X9Q4 option can be ordered and used in conjunction with the X8Q4 option.

FIGURE 15. Graph of a Typical One-point Trim



A one-point trim shifts the ideal curve up or down based on the single characterized point.

Option X9Q4: Sensor Calibrated to a Customer-Specified Single Point

When you order an RTD with theX9Q4 option, you must specify a single temperature point at which the sensor is to be calibrated. Before specifying the point, take careful note of the sensor temperature limits.

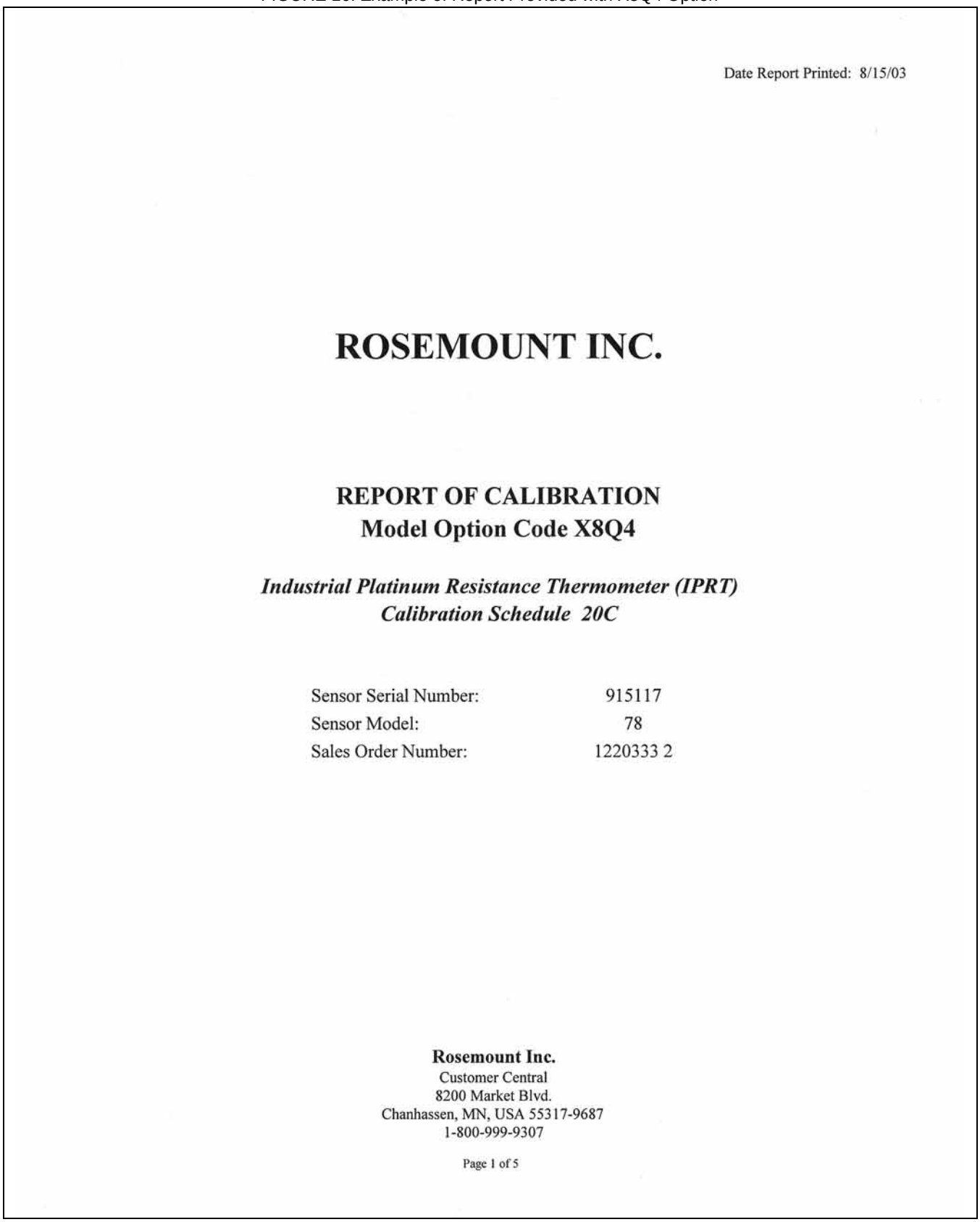
Ordering Example:

Typical Model Number	Model	Lead Wire Termination	Sensor Type	Extension Type	Extension Length	Thermowell Material	Immersion Length	Additional Options
	0068	N	11	N	00	N	045	X9Q4

If X8Q4 and X9Q4 are both required, do not repeat the “Q4” code in the model string. Include the following instead: X8X9Q4

Calibrate at 50 °C

FIGURE 16. Example of Report Provided with X8Q4 Option



Date Report Printed: 8/15/03

ROSEMOUNT INC.

REPORT OF CALIBRATION
Model Option Code X8Q4

Industrial Platinum Resistance Thermometer (IPRT)
Calibration Schedule 20C

Sensor Serial Number:	915117
Sensor Model:	78
Sales Order Number:	1220333 2

Rosemount Inc.
Customer Central
8200 Market Blvd.
Chanhassen, MN, USA 55317-9687
1-800-999-9307

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ROSEMOUNT INC.

Report of Calibration

Industrial Platinum Resistance Thermometer (IPRT)

Callendar – Van Dusen Method Of Temperature Interpolation

$$R_t = R_0\left\{1+\alpha\left[t-\delta\left(\frac{t}{100}\right)\left(\frac{t}{100}-1\right)-\beta\left(\frac{t}{100}-1\right)\left(\frac{t}{100}\right)^3\right]\right\}$$

Where:

R_t = Resistance at temperature t, Ω
R_0 = Resistance at temperature 0° C
t = Temperature, °C
α, β, and δ = Calibration Constants
β = 0 for t > 0° C

Alternate Form Of The Callendar – Van Dusen Interpolation Equation

$$R_t = R_0\left[1+At+Bt^2+Ct^3(t-100)\right]$$

Where:

R_t = Resistance at temperature t, Ω
R_0 = Resistance at temperature 0° C
t = Temperature, °C
A, B, and C = Calibration Constants
C = 0 for t > 0° C

The Callendar – Van Dusen method of temperature interpolation is the method utilized by the Rosemount Inc. 3144 and 3244 Temperature Transmitters.

Page 2 of 5

ROSEMOUNT INC.

Report of Calibration

Industrial Platinum Resistance Thermometer (IPRT)

Calibration Schedule: 20C
Interpolation Method: Callendar-Van Dusen
Sensor Model: 78
Sensor Serial Number: 915117

Calibration Test Points

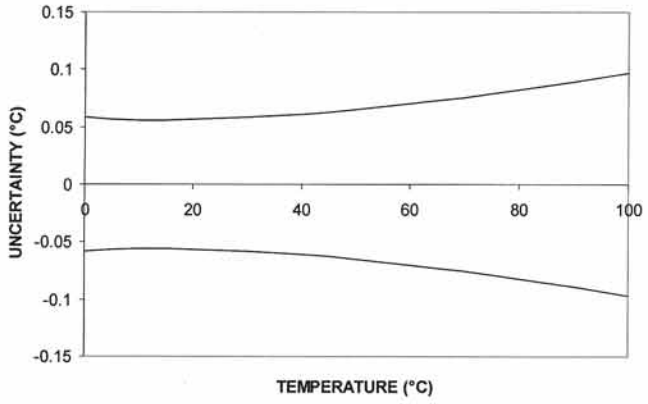
Temperature (°C)	Resistance (ohms)
0.008	99.981
99.976	138.437

Calibration Constants

Ro= 99.9776	
Alpha= 0.00384767	**A**= 0.00390542
Beta= 0.1110	**B**= -5.7750E-07
Delta= 1.5009	**C**= -4.27092E-12

The graph below displays the uncertainty for the supplied R vs T interpolation method for calibration schedule 20C

CALIBRATION ERROR CURVE 20C: 0°C TO 100°C



ROSEMOUNT INC.

Report of Calibration

Industrial Platinum Resistance Thermometer (IPRT)

Calibration Schedule: 20C
Interpolation Method: Callendar-Van Dusen
Sensor Model: 78
Sensor Serial Number: 915117

Temp. (°C)	Resistance (Ohms)	Temp. (°C)	Resistance (Ohms)	Temp. (°C)	Resistance (Ohms)	Temp. (°C)	Resistance (Ohms)	Temp. (°C)	Resistance (Ohms)
0	99.978	48	118.586	96	136.929				
1	100.368	49	118.971	97	137.308				
2	100.758	50	119.356	98	137.688				
3	101.148	51	119.741	99	138.067				
4	101.538	52	120.125	100	138.446				
5	101.928	53	120.509						
6	102.318	54	120.894						
7	102.708	55	121.278						
8	103.098	56	121.662						
9	103.487	57	122.046						
10	103.876	58	122.430						
11	104.266	59	122.813						
12	104.655	60	123.197						
13	105.044	61	123.580						
14	105.433	62	123.964						
15	105.821	63	124.347						
16	106.210	64	124.730						
17	106.599	65	125.113						
18	106.987	66	125.496						
19	107.375	67	125.879						
20	107.764	68	126.262						
21	108.152	69	126.644						
22	108.540	70	127.026						
23	108.927	71	127.409						
24	109.315	72	127.791						
25	109.703	73	128.173						
26	110.090	74	128.555						
27	110.478	75	128.937						
28	110.865	76	129.319						
29	111.252	77	129.700						
30	111.639	78	130.082						
31	112.026	79	130.463						
32	112.413	80	130.844						
33	112.800	81	131.226						
34	113.186	82	131.607						
35	113.573	83	131.988						
36	113.959	84	132.368						
37	114.345	85	132.749						
38	114.731	86	133.130						
39	115.117	87	133.510						
40	115.503	88	133.890						
41	115.889	89	134.271						
42	116.275	90	134.651						
43	116.660	91	135.031						
44	117.046	92	135.411						
45	117.431	93	135.790						
46	117.816	94	136.170						
47	118.201	95	136.550						

ROSEMOUNT INC.

Report of Calibration

Industrial Platinum Resistance Thermometer (IPRT)

Calibration Schedule: 20C
Interpolation Method: Callendar-Van Dusen
Sensor Model: 78
Sensor Serial Number: 915117

NIST TRACEABILITY

	Calibration Bath:			
Sensor:	**0°C Bath**	**100°C Bath**		
Primary Standard				
Manufacturer:	Rosemount Aerospace	Rosemount Aerospace		
Model Number:	162CE	162CE		
Serial Number:	4746	4004		
NIST Test Report Number:	836/264032-00	836/262003-99		
Calibration Date:	9-13-00	7/9/99		
Where Calibrated:	NIST	NIST		
Secondary Standard				
Manufacturer:	Rosemount Aerospace	Rosemount Aerospace		
Model Number:	162CE	162CE		
Serial Number:	4155	4173		
Calibration Date:	4/25/01	3/23/00		
Where Calibrated:	Rosemount Aerospace	Rosemount Aerospace		
Industrial PRT				
Manufacturer:	**Rosemount Inc.**			
Sensor Model:	78		**IPRT Calibrated By:**	
Serial Number:	915117		Employee Number: 11411	
Calibration Date:	7/24/03		Blong Lee	
Where Calibrated:	Rosemount Inc., Chanhassen, MN			

ITS-90 Temperature Scale values are utilized in this calibration process and report.

Definitions:

NIST - National Institute of Standards and Technology

ITS-90 - International Temperature Scale, 1990 revision.

Primary Standard - Standard PRT (SPRT) calibrated at NIST.

Secondary Standard - Rosemount Inc.'s Standard PRT (Secondary SPRT), calibrated against the primary standard.

Industrial PRT (IPRT) - The Rosemount model 58, 68, or 78 sensor that is the topic of this report, calibrated against the secondary standard(s) by comparison methodology.

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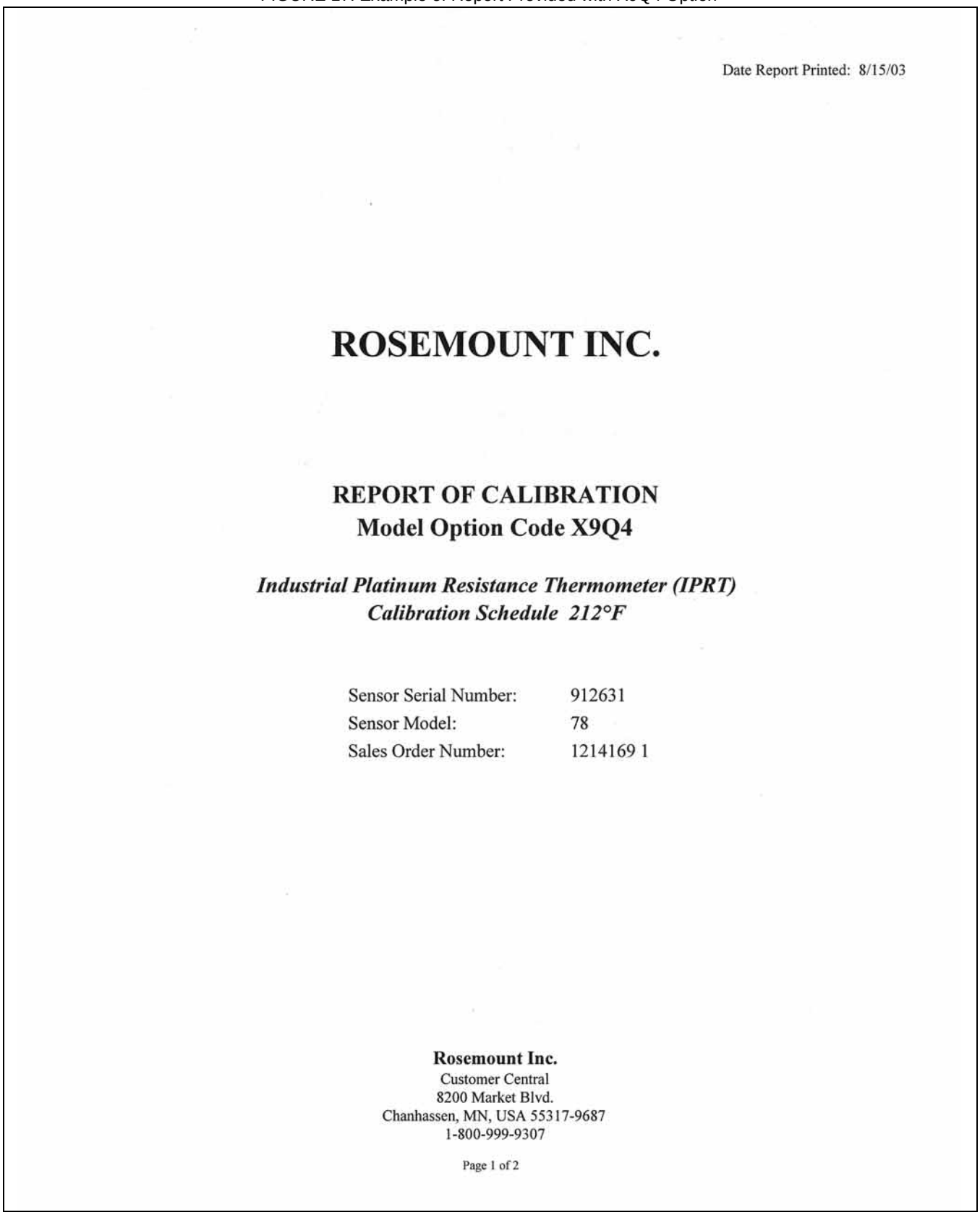
FIGURE 17. Example of Report Provided with X9Q4 Option



Date Report Printed: 8/15/03

ROSEMOUNT INC.

REPORT OF CALIBRATION
Model Option Code X9Q4

Industrial Platinum Resistance Thermometer (IPRT)
Calibration Schedule 212°F

Sensor Serial Number:	912631
Sensor Model:	78
Sales Order Number:	1214169 1

Rosemount Inc.
Customer Central
8200 Market Blvd.
Chanhassen, MN, USA 55317-9687
1-800-999-9307

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ROSEMOUNT INC.

Report of Calibration (X9Q4)

Industrial Platinum Resistance Thermometer (IPRT)

Calibration Schedule: 212°F
Sensor Serial Number: 912631

Calibration Test Points

Temperature (°F)	Resistance (ohms)
212.034	138.519

Corrected Results

Temperature	Resistance (ohms)
212.000 °F (100.000 °C)	138.512

NIST* TRACEABILITY

Primary Standard		***Industrial PRT***	
Manufacturer:	Rosemount Aerospace	**Manufacturer:**	**Rosemount Inc.**
Model Number:	162CE	**Sensor Model:**	78
Serial Number:	4004	**Serial Number:**	912631
NIST Test Report Number:	836/262003-99	**Calibration Date:**	7/8/03
Calibration Date:	7/9/99	**Where Calibrated:**	Rosemount Inc., Chanhassen, MN
Where Calibrated:	NIST		
Secondary Standard			
Manufacturer:	Rosemount Aerospace	**IPRT Calibrated By:**	
Model Number:	162CE	Employee Number: 11262	
Serial Number:	4173	Jonathon Vought	
Calibration Date:	3/23/00		
Where Calibrated:	Rosemount Aerospace		

ITS-90** Temperature Scale values are utilized in this calibration process and report.

* ***NIST*** - National Institute of Standards and Technology
** ***ITS-90*** - International Temperature Scale, 1990 revision.

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TABLE 23. Option Code X9Q4 Calibration Uncertainties for the Series 68 and 78 Standard and High Temperature

Temperature		Uncertainty of Calibration Lab[1]		Total Uncertainty of Calibrated Sensor[2]	
°C	°F	°C	°F	°C	°F
–50	–58	0.06	0.10	0.07	0.13
0	32	0.03	0.05	0.06	0.11
100	212	0.08	0.14	0.09	0.16
200	392	0.13	0.23	0.14	0.25
400	752	0.23	0.41	0.24	0.43

(1) Includes only the uncertainty of the lab.

(2) Includes uncertainty of the lab and repeatability.

TABLE 24. Resistance vs. Temperature

IEC 751 Platinum 100, α = 0.00385 RTD														
°F	Ohms		°F	Ohms		°F	Ohms		°C	Ohms		°C	Ohms		°C	Ohms
–330	18.04		210	138.08		690	235.15		–200	18.52		90	134.71		380	240.18
–320	20.44		220	140.19		700	237.09		–190	22.83		100	138.51		390	243.64
–310	22.83		230	142.29		710	239.02		–180	27.10		110	142.29		400	247.09
–300	25.20		240	144.39		720	240.95		–170	31.34		120	146.07		410	250.53
–290	27.57		250	146.49		730	242.87		–160	35.54		130	149.83		420	253.96
–280	29.93		260	148.58		740	244.79		–150	39.72		140	153.58		430	257.38
–270	32.27		270	150.67		750	246.71		–140	43.88		150	157.33		440	260.78
–260	34.61		280	152.75		760	248.62		–130	48.00		160	161.05		450	264.18
–250	36.94		290	154.83		770	250.53		–120	52.11		170	164.77		460	267.56
–240	39.26		300	156.91		780	252.44		–110	56.19		180	168.48		470	270.93
–230	41.57		310	158.98		790	254.34		–100	60.26		190	172.17		480	274.29
–220	43.88		320	161.05		800	256.24		–90	64.30		200	175.86		490	277.64
–210	46.17		330	163.12		810	258.14		–80	68.33		210	179.53		500	280.98
–200	48.46		340	165.18		820	260.03		–70	72.33		220	183.17		510	284.30
–190	50.74		350	167.24		840	263.80		–60	76.33		230	186.84		520	287.62
–180	53.02		360	169.30		850	265.68		–50	80.31		240	190.47		530	290.92
–170	55.29		370	171.35		860	267.56		–40	84.27		250	194.10		540	294.21
–160	57.55		380	173.40		870	269.44		–30	88.22		260	197.71		550	297.49
–150	59.81		390	175.45		880	271.31		–20	92.16		270	201.31		560	300.74
–140	62.06		400	177.49		890	273.17		–10	96.09		280	204.90		570	304.01
–130	64.30		410	179.53		900	275.04		0	100.00		290	208.48		580	307.25
–120	66.54		420	181.56		910	276.90		10	103.90		300	212.05		590	310.49
–110	68.77		430	183.59		920	278.75		20	107.79		310	215.61		600	313.71
–100	71.00		380	173.40		930	280.61		30	111.67		320	219.15		610	316.92
–90	73.22		390	175.45		940	282.46		40	115.54		330	222.68		620	320.12
–80	75.44		400	177.49		950	284.30		50	119.40		340	226.21		630	323.30
–70	77.66		410	179.53		960	286.14		60	123.24		350	229.72		640	326.48
–60	79.86		420	181.56		970	287.98		70	127.08		360	233.21		650	329.64
–50	82.07		430	183.59		980	289.82		80	130.90		370	236.70		660	332.79
–40	84.27		450	187.65		990	291.65									
–30	86.47		460	189.67		1000	293.48									
–20	88.66		470	191.68		1010	295.30									
–10	90.85		480	193.70		1020	297.12									
0	93.03		490	195.71		1030	298.94									
10	95.21		500	197.71		1040	300.75									
20	97.39		510	199.71		1050	302.56									
30	99.57		520	201.71		1060	304.37									
40	101.74		530	203.71		1070	306.17									
50	103.90		540	205.70		1080	307.97									
60	106.07		550	207.69		1090	309.77									
70	108.23		560	209.67		1100	311.56									
80	110.38		570	211.66		1110	313.35									
90	112.53		580	213.63		1120	315.14									
100	114.68		590	215.61		1130	316.92									
110	116.83		600	217.58		1140	318.70									
120	118.97		610	219.55		1150	320.47									
130	121.11		620	221.51		1160	322.24									
140	123.24		630	223.47		1170	324.01									
150	125.37		640	225.42		1180	325.77									
160	127.50		650	227.38		1190	327.53									
170	129.62		660	229.33		1200	329.29									
180	131.74		670	231.27		1210	331.04									
190	133.86		680	233.21												
200	135.97															

Note

To covert from °C to °F: {1.8 X (°C)] + 32 = °F
Example: (1.8 X 100) + 32 = 212 °F

To convert from °F to °C: 0.556 [(°F) – 32] = 100 °F
Example: 0.556 (212 – 32) = 100 °C

Mounting Accessories

ROSEMOUNT CONNECTION HEAD

The Rosemount Connection head is for general-purpose and spring-loaded sensors. The terminal block has six terminals for either single or dual element sensors. If the sensor assembly is ordered assembled to a Rosemount 248 or 644H head mount transmitter then the terminal block is replaced by the transmitters.

Specifications

Sensor Connection

- 1/2–14 NPT mounting thread. Screw terminals for lead wire connections.

Electrical Connection

- 1/2–14 NPT conduit

Materials of Construction

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

Weight

- 18.5 oz (524 g)

Enclosure Rating

- NEMA 4X, IP66, and IP68

POLYPROPYLENE CONNECTION HEAD

The polypropylene connection head (part number 00644-4198-0011) is designed for use with sanitary sensors. It is FDA-compliant, and is resistant to attack by acids, alkalies, and organic solvents.

Specifications

Sensor Connection

- 1/2–14 NPT mounting thread. Screw terminals for lead wire connections

Electrical Connection

- 1/2–14 NPT conduit

Materials of Construction

- Housing: White polypropylene polymer
- O-Ring Seal: Silicone rubber
- Terminals: Nickel-plated brass

Temperature Limits

- –73 to 104 °C (–100 to 220 °F)

Weight

- 0.5 lb

CONNECTION HEAD

The Extended Cover Connection Head (P/N 00079-0324-xxxx) provides the additional space required by sensors that have bayonet connectors. This model can also be used with general-purpose and spring-loaded sensors. The terminal block has six terminals for either single- or dual-element sensors.

The Flat Cover Connection Head (P/N 00079-0325-xxxx) is for general-purpose and spring-loaded sensors. The terminal block has six terminals for either single- or dual-element sensors.

Specifications

Sensor Connection

- 1/2–14 ANPT mounting thread. Screw terminals for lead wire connections

Electrical Connection

- 3/4–14 ANPT conduit

Materials of Construction

- Housing: Low-copper aluminum alloy
- O-Ring Seal: Silicone rubber
- Terminals: Nickel-plated brass

Temperature Limits

Head Type	Unapproved	E5 option	E6 option	E1 option
Painted	–100 to 100 °C –148 to 212 °F	–50 to 85 °C –58 to 185 °F	–50 to 85 °C –58 to 185 °F	–40 to 65 °C –40 to 149 °F
Unpainted	–100 to 200 °C –148 to 392 °F	–50 to 85 °C –58 to 185 °F	–50 to 200 °C –58 to 392 °	–40 to 65 °C –40 to 149 °F

Enclosure Ratings

- When installed properly, painted connection heads are suitable for indoor and outdoor NEMA 4X and CSA Enclosure Type 4X installations. When installed properly, unpainted connection heads are suitable for NEMA 4 and CSA Enclosure Type 4 installations. See Hazardous Area Approvals for complete installation information

Weight

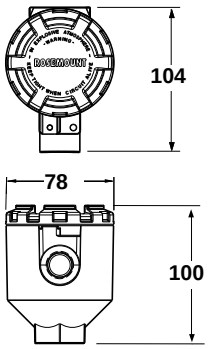
- 2 lb 8 oz (extended cover)
- 1 lb 9 oz (flat cover)

Connection Head Model Numbers

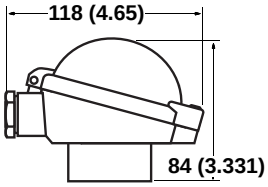
Model	Description
00644-4410-0011	Rosemount Connection Head, painted aluminum
007903252003	Six Terminals with Flat Cover, Unapproved, Unpainted
007903242003	Six Terminals with Extended Cover, Unapproved, Unpainted
007903250002	Six Terminals with Flat Cover, FM Approved, Unpainted
007903240002	Six Terminals with Extended Cover, FM Approved, Unpainted
007903250003	Six Terminals with Flat Cover, CSA Approved, Unpainted
007903240003	Six Terminals with Extended Cover, CSA Approved, Unpainted
007903252005	Six Terminals with Flat Cover, Unapproved, Painted
007903242005	Six Terminals with Extended Cover, Unapproved, Painted
007903250004	Six Terminals with Flat Cover, FM Approved, Painted
007903240004	Six Terminals with Extended Cover, FM Approved, Painted
007903250005	Six Terminals with Flat Cover, CSA Approved, Painted
007903240005	Six Terminals with Extended Cover, CSA Approved, Painted
00644-4198-0011	No Approval Options, White Polypropylene
00065-0305-0001	Round Terminal Block for Rosemount and Polypropylene heads
006444-4431-0001	External ground Screw Assembly for Rosemount Connection Head
00644-4435-0011	Polypropelyne Connection Head with Terminal Block $^{1}/_{2}$ in. NPT entries
00079-0329-0001	Kit of 12 Silicone Rubber O-rings for Flat/Extended Heads

Connection Head Dimensional Drawing

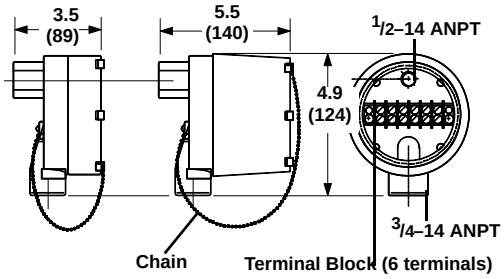
Rosemount Connection Head



Polypropylene



Flat Cover **Extended Cover** **Terminal View**



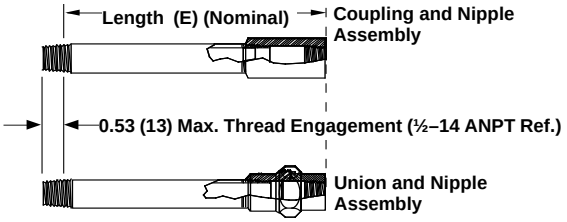
Dimensions are in inches (millimeters)

EXTENSION FITTING ASSEMBLIES

Extension fitting assemblies are available in

- a coupling and nipple assembly
- a union and nipple assembly

FIGURE 18. Extension Fitting



Dimensions are in inches (millimeters)

TABLE 25. Extension

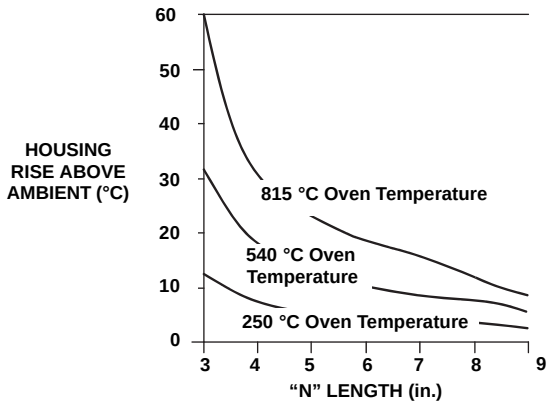
Coupling and Nipple, SST		Union and Nipple, SST	
Model Number	**Length (E)**	**Model Number**	**Length (E)**
007903540250	2.5-in.	007903550250	2.5-in.
007903540300	3.0-in.(1)	007903550300	3.0-in.(1)
007903540350	3.5-in.	007903550350	3.5-in.
007903540400	4.0-in.	007903550400	4.0-in.
007903540450	4.5-in.	007903550450	4.5-in.
007903540500	5.0-in.	007903550500	5.0-in.
007903540550	5.5-in.	007903550550	5.5-in.
007903540600	6.0-in.(1)	007903550600	6.0-in.(1)
007903540650	6.5-in.	007903550650	6.5-in.
007903540700	7.0-in.	007903550700	7.0-in.
007903540750	7.5-in.	007903550750	7.5-in.
007903540800	8.0-in.	007903550800	8.0-in.
007903540850	8.5-in.	007903550850	8.5-in.
007903540900	9.0-in.	007903550900	9.0-in.

(1) Standard configuration with best delivery. Also available for emergency requirements. Consult factory for information.

Choosing an Extension

Aside from ambient temperature variations, the heat from the process is transferred from the thermowell to the transmitter housing. If the process temperature is near or beyond specification limits, consider the use of additional thermowell lagging, an extension nipple, or a remote mounting configuration to isolate the transmitter from the excessive temperatures. Use Figure 19 and the example below to determine an adequate thermowell extension length.

FIGURE 19. 3144 Transmitter Housing Temperature Rise versus Extension Length for a Test Installation



Example

The rated ambient temperature specification is 85 °C. If the maximum ambient temperature is 40 °C and the process temperature to be measured is 540 °C, the maximum allowable housing temperature rise is the rated temperature specification limit minus the existing ambient temperature (85 – 40), or 45 °C.

As shown in Figure 19, an extension (E) dimension of 3.0-in (76 mm) will result in a housing temperature rise of 30 °C. An “E” dimension of 3-in. would therefore be the minimum recommended length, and would provide a safety factor of about 15 °C. A longer “E” dimension, such as 6-in. (152 mm), would be desirable in order to reduce errors caused by transmitter temperature effect, although in that case the transmitter would probably require extra support. If a thermowell with lagging is used, the “E” dimension may be reduced by the length of the lagging.

MOUNTING ADAPTERS FOR SERIES 58, 68, 78, AND 183

M5–M7, Sensor Compression Fittings, 316 SST

- For adjustable sensor length.
- For low pressure applications (100 psig maximum).
- Fits ¼-inch diameter sensors.
- Available with 1/8–27 (M5), ¼–18 (M6), and ½–14 (M7) ANPT process threads.
- Not available on spring-loaded sensors.

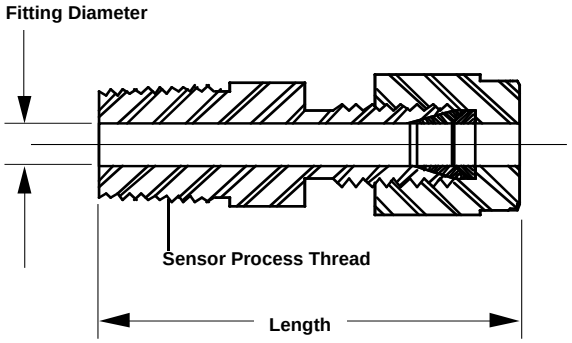


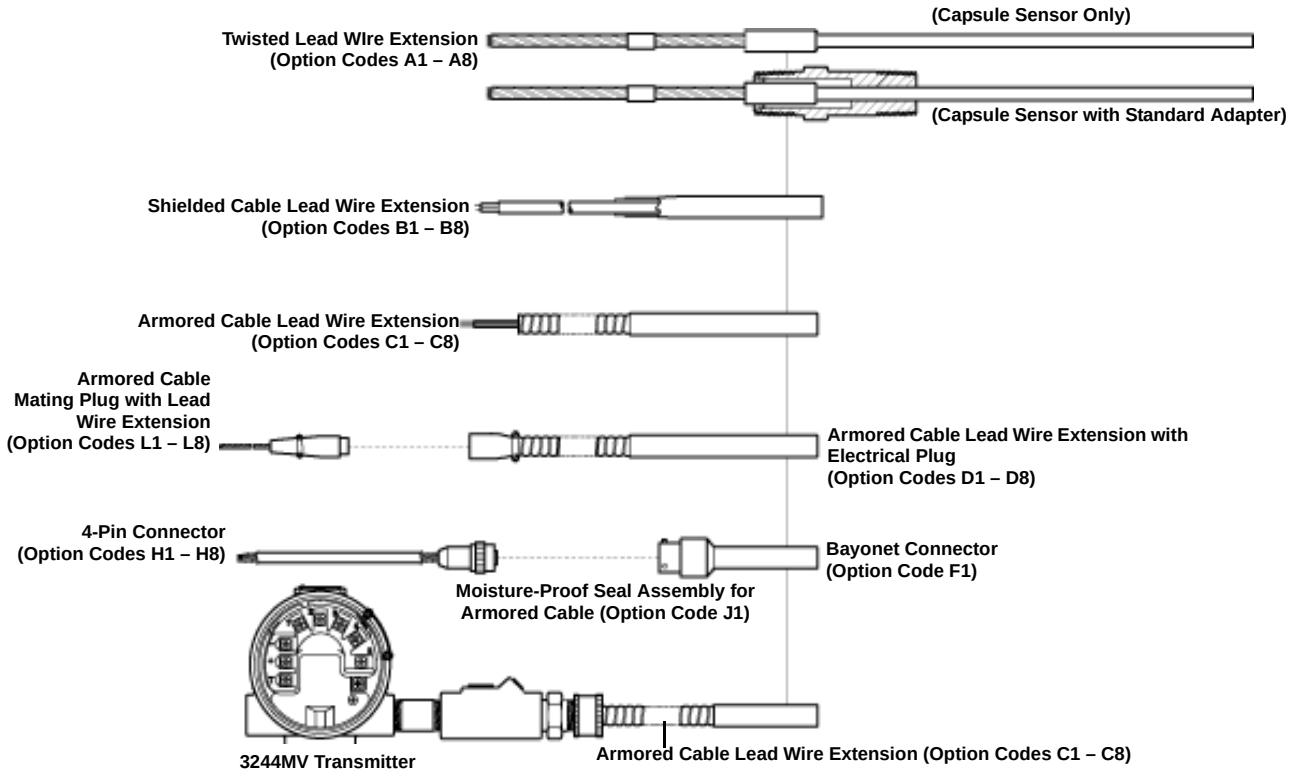
TABLE 26. Compression Fittings, 316 SST

(for attachment to the stem of the capsule)

Model Number	Option Code	Sensor Process Thread	Fitting Diameter		Length	
			in.	mm	in.	mm
C07961-0005	M5	1/8–27 ANPT	0.25	6.35	1.31	33.27
C07961-0006	M6	1/4–18 ANPT	0.25	6.35	1.5	38.1
C07961-0008	M7	1/2–14 ANPT	0.25	6.35	1.75	44.45

LEAD WIRE EXTENSIONS, CONNECTORS, AND SEALS

The following options are available on most Series 68 and 78 sensors. They are not available for use on Series 58C, 68Q, and 183 sensors or with SAA or ATEX/ISSeP Flameproof approval (Option Codes E7 or E1).

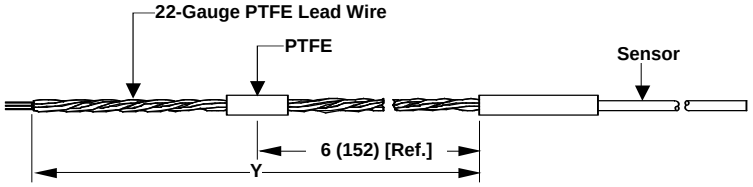


A1–A8, Twisted Lead Wire Extension

- Lead wire connections are silver brazed and individually insulated by shrinkable PTFE tubes
- Withstands 95 percent relative humidity
- 200° C (392° F) maximum temperature
- Available with single or dual-element sensors

Option Code	Y Length (ft)
A1	1 1/2
A2	3
A3	6
A4	12

Option Code	Y Length (ft)
A5	24
A6	50
A7	75
A8	100



Not available for use with Series 68Q Sanitary RTDs and 183 thermocouples or with SAA or ATEX/ISSeP flameproof approval (option codes E7 or E1)

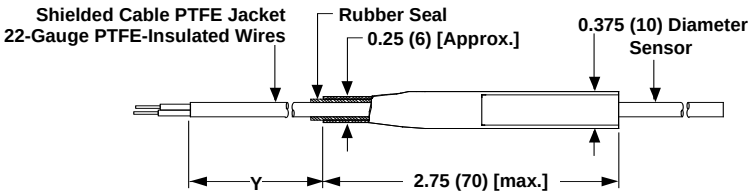
Dimensions are in inches (millimeters)

B1–B8, Shielded Cable Lead Wire Extension

- Copper shielded cable prevents electrical noise distortions to sensor signal output
- Withstands 95 percent relative humidity
- 200° C (392° F) maximum temperature

Option Code	Y Length (ft)
B1	1 1/2
B2	3
B3	6
B4	12

Option Code	Y Length (ft)
B5	24
B6	50
B7	75
B8	100



Not available for 58C, 68Q, and 183 sensors or with SAA or ATEX/ISSeP flameproof approval (option codes E7 or E1)

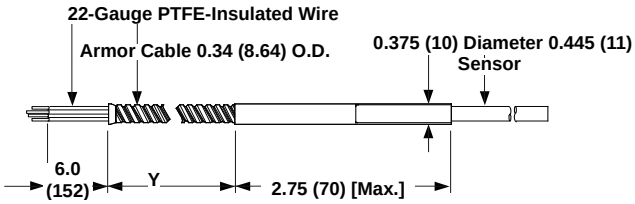
Dimensions are in inches (millimeters)

C1–C8, Armored Cable Lead Wire Extension

- Provides lead wire protection in heavy duty environments.
- Withstands 95 percent relative humidity
- 200° C (392° F) maximum temperature
- Available with single or dual-element sensors

Option Code	Y Length (ft)
C1	1 1/2
C2	3
C3	6
C4	12

Option Code	Y Length (ft)
C5	24
C6	50
C7	75
C8	100



Not available for 58C, 68Q, and 183 sensors or with SAA or ATEX/ISSeP flameproof approval (option codes E7 or E1)

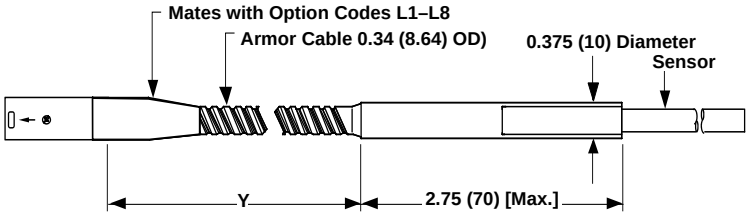
Dimensions are in inches (millimeters)

D1–D8, ARMORED CABLE LEAD WIRE EXTENSION WITH ELECTRICAL PLUG

- Provides lead wire protection in heavy-duty environments
- Provides quick-disconnect capability
- Withstands 95 percent relative humidity

Option Code	Y Length (ft)
D1	1 1/2
D2	3
D3	6
D4	12

Option Code	Y Length (ft)
D5	24
D6	50
D7	75
D8	100



Not available for 58C, 68Q, and 183 sensors or with SAA or ATEX/ISSeP flameproof approval (option codes E7 or E1)

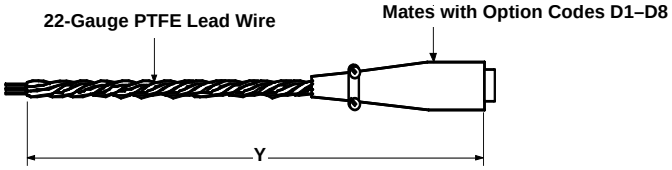
Dimensions are in inches (millimeters)

L1–L8, ARMORED CABLE MATING PLUG WITH LEAD WIRE EXTENSION

- Completes quick-disconnect capability for armored cable
- Withstands 95 percent relative humidity
- Twisted lead wire extension for lowest cost installation

Option Code	Y Length (ft)
L1	1 1/2
L2	3
L3	6
L4	12

Option Code	Y Length (ft)
L5	24
L6	50
L7	75
L8	100

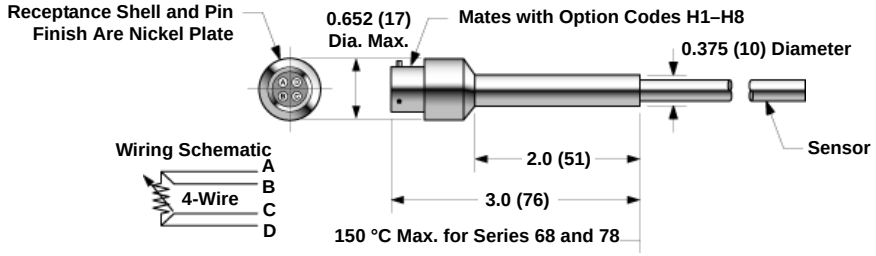


Not available for 58C, 68Q, and 183 sensors or with SAA or ATEX/ISSeP flameproof approval (option codes E7 or E1)

Dimensions are in inches (millimeters)

F1, 4-PIN BAYONET CONNECTOR

- Provides quick-disconnect capability
- Withstands 100 percent relative humidity with connector mate
- Available for capsule and general purpose with 4-wire lead wire configuration only



Not available for 58C, 68Q, and 183 sensors, or with FM or CSA explosion-proof, or with SAA or ATEX/ISSeP flameproof approval (option codes E5, E6, E7, or E1)

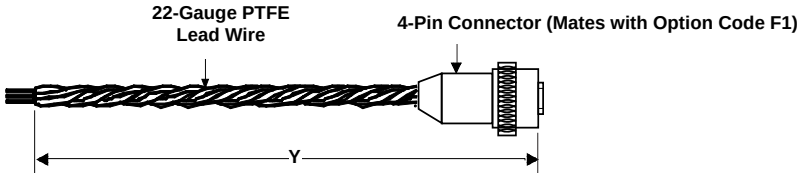
Dimensions are in inches (millimeters)

H1–H8, 4-PIN CONNECTOR MATING PLUG WITH LEAD WIRE EXTENSION

- Completes the quick-disconnect capability of connector
- Provides twisted lead wire extension for remote installations
- Withstands 100 percent relative humidity with connector mate
- F1 connector is required if H1–H8 lead wire extension is used

Option Code	Y Length (ft)
H1	1 1/2
H2	3
H3	6
H4	12

Option Code	Y Length (ft)
H5	24
H6	50
H7	75
H8	100

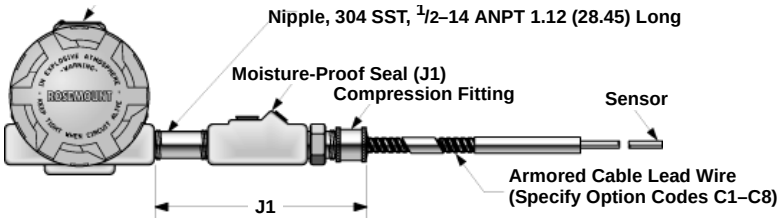


Not available for 58C, 68Q, and 183 sensors, or with FM or CSA explosion-proof, or with SAA or ATEX/ISSeP flameproof approval (option codes E5, E6, E7, or E1)

Dimensions are in inches (millimeters)

J1, MOISTURE-PROOF SEAL ASSEMBLY FOR ARMORED CABLE

- Prevents moisture migration through armored cable
- For use in humid environments but not for direct liquid immersion
- Non-disconnectable type assembly with armored cable and sensor



Not available for 58C, 68Q, and 183 sensors, or with FM or CSA explosion-proof, or with SAA or ATEX/ISSeP flameproof approval (option codes E5, E6, E7, or E1).
Moisture-proof seal assembly must be ordered with armored cable lead wire extension (option codes C1 – C8)

Dimensions are in inches (millimeters)

THERMOWELLS

To simplify ordering, the previous Series 79, 80, and 81 thermowell offerings are all included in the new Series 91 thermowell option.

Materials

Rosemount Thermowells are supplied in most materials required for industrial applications. Standard materials are 316 SST, 304 SST, and C1018 carbon steel. For corrosive environments, special materials such as Monel®, Hastelloy®, and Inconel 600 are available. Consult factory for other material availability.

Strength (Pressure and Flow Vibration)

The strength of a thermowell depends on several parameters that relate thermowell construction to the installation environment. For most industrial applications, standard Rosemount thermowells provide the necessary strength if the material, style, and length are correct for the application. The proper selection of a thermowell depends on fluid type, temperature, pressure, and fluid velocity. It is important to note that most thermowell failures are caused by vibration that is induced by fluid flow. If static pressure strength is a major consideration, refer to Table 27 for standard material ratings for a 1/2-inch tip. Tapered thermowells are offered for additional strength.

Strength Calculation

Rosemount Inc. has the ability to perform thermowell frequency calculations to verify that the thermowell dimensions you provide are appropriate for your specific application. To take advantage of this calculation, fill out and return the Configuration Data Sheet.

Construction

All thermowell bodies with an overall length less than 42-in. are machined from solid bar stock to ensure water-tightness. Flange mounts are welded to the thermowell body. Standard construction provides immersion lengths (U) from 2½ to 48 inches with overall lengths (L) from 4 to 59 inches respectively. Thermowells with overall lengths larger than 42-in. will be a 3-piece welded construction. Consult the factory for more information on welded 3-piece construction thermowells.

Identification Data

The part number is etched on each thermowell. Additional tagging for specific customer requirements is available.

Installation

For dimensional drawings of Thread Mounted, Weld Mounted, and Flange Mounted Thermowells, refer to Figure 20, 22, and 24.

TABLE 27. Thermowell Material Rating

		Process Rating(1) (psi) at Temperature (°F)						
Material	**Recommended Usage**	**0 °F**	**300 °F**	**500 °F**	**700 °F**	**900 °F**	**1100 °F**	**1300 °F**
304 SST	Good resistance to oxidation	5600	4800	4700	4600	3400	2400	780
316 SST	Good resistance to corrosion. Better resistance to chemical attack than 304 SST	5600	5400	5300	5200	4400	3200	1250
Carbon Steel	For non-corrosive service	3700	3700	3700	3650	2000	—	—

(1) In case of an explosion, the integrity of the thermowell is maintained to the specified pressures.

ORDERING INFORMATION

TABLE 28. Series 91 Thermowells

★ 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	Description	
0091	Thermowells	
Thermowell Material		
Standard		**Standard**
A	Type 316 SST	★
B	Type 304 SST	★
C	Carbon Steel	★
D	316L SST	★
E	304L SST	★
Expanded		
F	Alloy 20	
G	Alloy 400	
H	Alloy 600	
J	Alloy C-276	
L	Alloy B	
M	304 SST with Teflon (PTFE) coating	
P	Chrome Molybdenum F22	
R	Nickel 200	
T	Titanium	
U[(2)]	316 SST with tantalum sheath	
V	310 SST	
W	321 SST	
X	Special Material	
Y	316Ti SST	
Z	Chrome Molybdenum F11	
Sensor/Immersion Length (U) in inches[(1)]		
Standard		**Standard**
015[(2)]	1.5 in.	★
020	2.0 in.	★
025	2.5 in.	★
030	3.0 in.	★
035	3.5 in.	★
040	4.0 in.	★
045	4.5 in.	★
050	5.0 in.	★
055	5.5 in.	★
060	6.0 in.	★
065	6.5 in.	★
070	7.0 in.	★
075	7.5 in.	★
080	8.0 in.	★
085	8.5 in.	★
090	9.0 in.	★
095	9.5 in.	★
100	10.0 in.	★
105	10.5 in.	★
110	11.0 in.	★
115	11.5 in.	★
120	12.0 in.	★
125	12.5 in.	★
130	13.0 in.	★
135	13.5 in.	★

TABLE 28. Series 91 Thermowells

★ 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.

140	14.0 in.				★
145	14.5 in.				★
150	15.0 in.				★
155	15.5 in.				★
160	16.0 in.				★
165	16.5 in.				★
170	17.0 in.				★
175	17.5 in.				★
180	18.0 in.				★
185	18.5 in.				★
190	19.0 in.				★
195	19.5 in.				★
200	20.0 in.				★
205	20.5 in.				★
210	21.0 in.				★
215	21.5 in.				★
220	22.0 in.				★
225	22.5 in.				★
230	23.0 in.				★
240	24.0 in.				★
250	25.0 in.				★
260	26.0 in.				★
270	27.0 in.				★
280	28.0 in.				★
290	29.0 in.				★
300	30.0 in.				★
310	31.0 in.				★
320	32.0 in.				★
330	33.0 in.				★
340	34.0 in.				★
350	35.0 in.				★
360	36.0 in.				★
370	37.0 in.				★
380	38.0 in.				★
390	39.0 in.				★
400	40.0 in.				★
410	41.0 in.				★
420	42.0 in.				★
430	43.0 in.				★
440	44.0 in.				★
450	45.0 in.				★
460	46.0 in.				★
470	47.0 in.				★
480	48.0 in.				★
Thermowell Mounting Style		**Stem Style**	**Tip A (in.)**	**Root B (in.)**	
Standard					**Standard**
T20	Thread, 1/2–14 ANPT	Stepped	0.50	0.63	★
T22	Thread, 3/4–14 ANPT	Stepped	0.50	0.75	★
T24	Thread, 1–11.5 ANPT	Stepped	0.50	0.88	★
T26	Thread, 3/4–14 ANPT	Tapered	0.63	0.88	★
T28	Thread, 1–11.5 ANPT	Tapered	0.63	1.06	★
T30	Thread, 1 1/2–11.5 ANPT	Tapered	0.75	1.50	★
T32	Thread, 1/2–14 ANPT	Straight	0.50	0.50	★

TABLE 28. Series 91 Thermowells

★ 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.

T34	Thread, 3/4–14 ANPT	Straight	0.75	0.75	★
T36	Thread, 1–11.5 ANPT	Straight	0.75	0.75	★
T38	Thread, 3/4–14 ANPT	Straight	0.50	0.50	★
T44	Thread, 1/2–14 ANPT	Tapered	0.50	0.63	★
W38	Weld, 3/4-in. pipe	Stepped	0.50	0.75	★
W40	Weld, 1-in. pipe	Stepped	0.50	0.88	★
W42	Weld, 3/4-in. pipe	Tapered	0.63	0.88	★
W44	Weld, 1-inch Pipe,	Tapered	0.75	1.00	★
W46	Weld, 1 1/4-inch Pipe	Tapered	0.75	1.25	★
W48	Weld, 3/4-inch Pipe	Straight	0.75	0.75	★
W50	Weld, 1-inch Pipe	Straight	0.75	0.75	★
F10	Flange, F = 2-inch, Class 150	Straight	0.75	0.75	★
F12	Flange, F = 3-inch, Class 150	Straight	0.75	0.75	★
F52	Flange, F = 1-inch, Class 150	Stepped	0.50	0.75	★
F54	Flange, F = 1½-inch, Class 150	Stepped	0.50	0.75	★
F56	Flange, F = 2-inch, Class 150	Stepped	0.50	0.75	★
F58	Flange, F = 1-inch, Class 150	Tapered	0.75	1.00	★
F60	Flange, F = 1½-inch, Class 150	Tapered	0.75	1.00	★
F62	Flange, F = 2-inch, Class 150	Tapered	0.75	1.25	★
F64	Flange, F = 1-inch, Class 150	Straight	0.75	0.75	★
F66	Flange, F = 1½-inch, Class 150	Straight	0.75	0.75	★
F70	Flange, F = 1-inch, Class 300	Stepped	0.50	0.75	★
F72	Flange, F = 1½-inch, Class 300	Stepped	0.50	0.75	★
F74	Flange, F = 2-inch, Class 300	Stepped	0.50	0.75	★
F76	Flange, F = 1-inch, Class 300	Tapered	0.75	1.00	★
F78	Flange, F = 1½-inch, Class 300	Tapered	0.75	1.00	★
F80	Flange, F = 2-inch, Class 300	Tapered	0.75	1.25	★
F82	Flange, F = 1-inch, Class 300	Straight	0.75	0.75	★
F84	Flange, F = 1½-inch, Class 300	Straight	0.75	0.75	★
F86	Flange, F = 2-inch, Class 300	Straight	0.75	0.75	★
F88[3]	Flange, F = 1-inch, Class 600	Stepped	0.50	0.75	★
F90[3]	Flange, F = 1½-inch, Class 600	Stepped	0.50	0.75	★
F92[3]	Flange, F = 2-inch, Class 600	Stepped	0.50	0.75	★
F94[3]	Flange, F = 1-inch, Class 600	Tapered	0.75	1.00	★
F96[3]	Flange, F = 1½-inch, Class 600	Tapered	0.75	1.00	★
F98[3]	Flange, F = 2-inch, Class 600	Tapered	0.75	1.25	★
F02[3]	Flange, F = 1-inch, Class 600	Straight	0.75	0.75	★
F04[3]	Flange, F = 1½-inch, Class 600	Straight	0.75	0.75	★
F06[3]	Flange, F = 2-inch, Class 600	Straight	0.75	0.75	★
F16[3]	Flange, F = 1½-inch, Class 900	Tapered	0.75	1.00	★
F34[3]	Flange, F = 1½-inch, Class 1500	Tapered	0.75	1.00	★
F24[3]	Flange, F = 2-inch, Class 1500	Tapered	0.75	1.25	★
F08[4]	Flange, F = 1½-inch, Class 2500	Tapered	0.75	1.00	★
Q02[5]	Sanitary, 1-in.,Tri-Clamp	Stepped	0.50	0.75	★
Q04[6]	Sanitary, 1 1/2-in., Tri-Clamp	Stepped	0.50	0.75	★
Q06[6]	Sanitary, 2-in., Tri-Clamp	Stepped	0.50	0.75	★
Q08[6]	Sanitary, 3-in.,Tri-Clamp	Stepped	0.50	0.75	★
Q20[6]	Sanitary, 3/4-in., Tri-Clamp	Straight	0.44	0.44	★
Q22[6]	Sanitary, 1-in.,Tri-Clamp	Straight	0.50	0.50	★
Q24[6]	Sanitary, 1 1/2-in., Tri-Clamp	Straight	0.50	0.50	★
Q26[6]	Sanitary, 2-in., Tri-Clamp	Straight	0.50	0.50	★
Q28[6]	Sanitary, 3-in.,Tri-Clamp	Straight	0.50	0.50	★

TABLE 28. Series 91 Thermowells

★ 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.

Thermowell Lagging Length (T) in.		
Standard		**Standard**
T000	0.0 in.	★
T005	0.5 in.	★
T010	1.0 in.	★
T015	1.5 in.	★
T020	2.0 in.	★
T025	2.5 in.	★
T030	3.0 in.	★
T035	3.5 in.	★
T040	4.0 in.	★
T045	4.5 in.	★
T050	5.0 in.	★
T055	5.5 in.	★
T060	6.0 in.	★
T065	6.5 in.	★
T070	7.0 in.	★
T075	7.5 in.	★
T080	8.0 in.	★
T085	8.5 in.	★
T090	9.0 in.	★
T095	9.5 in.	★
Instrument Connection Thread		
Standard		**Standard**
P	1/2–14 NPSM	★
D	1/2–14 ANPT for CSA	★

Options (Include with selected model number)

Special External Pressure Test		
Standard		**Standard**
R01(6)	Special External Pressure Test	★
Material Certification		
Standard		**Standard**
Q8	Material Certification	★
Dye Penetration Test		
Standard		**Standard**
R03	Dye Penetration Test	★
Thermowell Special Cleaning		
Standard		**Standard**
R04	Thermowell Special Cleaning	★
NACE Approval		
Standard		**Standard**
R05	NACE Approval	★
SST Plug and Chain		
Standard		**Standard**
R06	SST Plug and Chain	★
Full Penetration Weld		
Standard		**Standard**
R07(7)	Full Penetration Weld	★
Thermowell Concentric Serrations		
Standard		**Standard**
R09(7)(8)	Concentric Serration of Thermowell Flange Face	★

TABLE 28. Series 91 Thermowells

★ 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.

Flat Faced Flange		
Standard		**Standard**
R10 (7)(8)	Flat Face Flange	★
Vent Hole		
Standard		**Standard**
R11	Vent Hole	★
Special Surface Finish		
Standard		**Standard**
R14(9)	Thermowell Special Surface Finish (12 R_a Max) (Maximum (U) length = 22.5 in.)	★
Ring Joint Flange		
Standard		**Standard**
R16(3)(7)(8)	Ring Joint Flange (Not available with 0-in. (T) length)	★
Electropolish		
Standard		**Standard**
R20(10)	Electropolish	★
Wake Frequency		
Standard		**Standard**
R21	Wake Frequency-Thermowell Strength Calculation	★
Internal Pressure Test		
Standard		**Standard**
R22	Internal Pressure Test	★
Brass Plug & Chain		
Standard		**Standard**
R23	Brass Plug & Chain	★
Canadian Registration No.		
Expanded		
R24	CRN Marking for British Columbia	
R25	CRN Marking for Alberta	
R26	CRN Marking for Saskatchewan	
R27	CRN Marking for Manitoba	
R28	CRN Marking for Ontario	
R29	CRN Marking for Quebec	
R30	CRN Marking for New Brunswick	
R31	CRN Marking for Nova Scotia	
R32	CRN Marking for Prince Edward Island	
R33	CRN Marking for Yukon Territory	
R34	CRN Marking for Northwest Territory	
R35	CRN Marking for Nunavut	
R36	CRN Marking for Newfoundland and Labrador	
Twell From Hex Stock		
Expanded		
R37	Thermowell From Hex stock	

(1) Thermowells with an overall lengths ("U" + "T" + 1.75-in.) of 36-in. or less are machined from solid bar stock. Thermowells with an overall length larger than 42-in. will be constructed using a welded 3-piece design and are available only with a stepped stem style.

(2) Available in straight stem only

(3) Not available with 0-in. (T) length.

(4) Not available with 0- or 1/2-in. (T) length.

(5) Limited to 24" immersion length and 316 or 304 SST materials only.

(6) Maximum (U) length = 42.0-in.

(7) Available on flanged thermowells only.

(8) Only one flange face option allowed.

(9) Maximum (U) length = 22.5 inches.

(10) Not available on flanged thermowells and L lengths longer than 24".

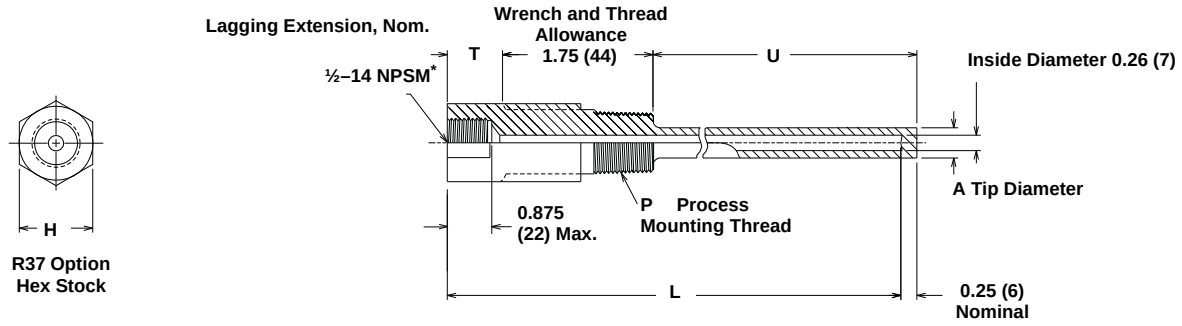
Ordering Example

Typical Model Number

Model	Material	Immersion Length	Mounting Style	Lagging Length	Connection Thread	Additional Options
0091	A	030	F52	T040	P	R01 R05 R07

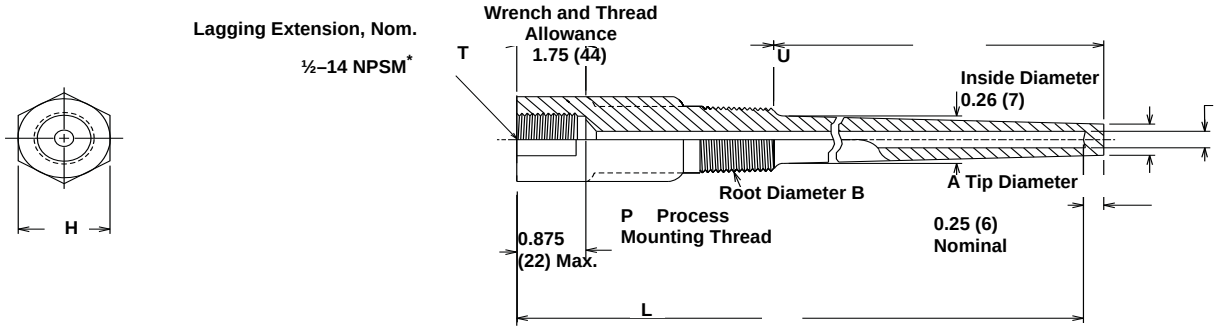
FIGURE 20. Thread Mounted Thermowells

Straight



Thread (P)	Hex Size Inches (H)
0.5 – 0.75 ANPT	1.125
1–11.5 ANPT	1.375

Tapered



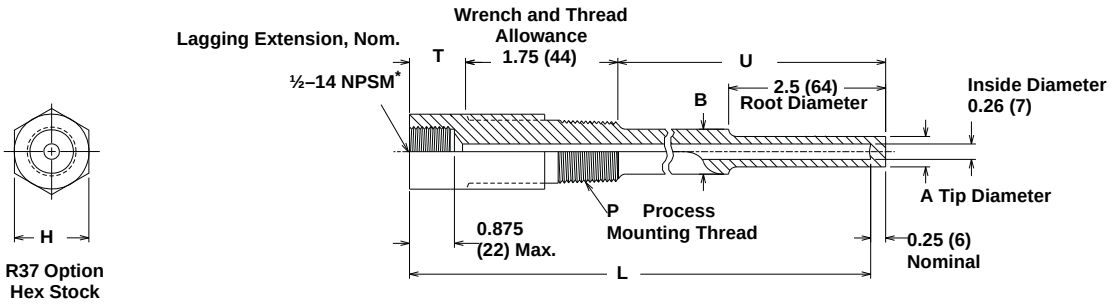
Thread (P)	Hex Size Inches (H)
0.5 – 0.75 ANPT	1.125
1–11.5 ANPT	1.375

** 1/2–14 ANPT threads are available*

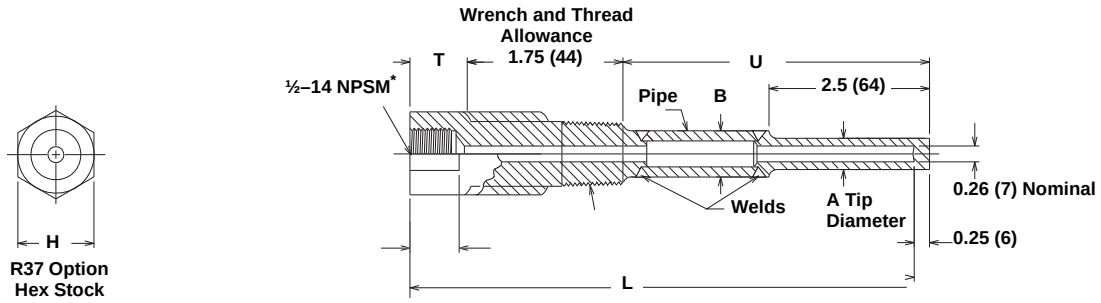
Dimensions are in inches (millimeters)

FIGURE 21. Thread Mounted Thermowells (continued)

Stepped



Stepped, For Thermowells with Overall Length Greater than 42-in. (3-Piece Construction)



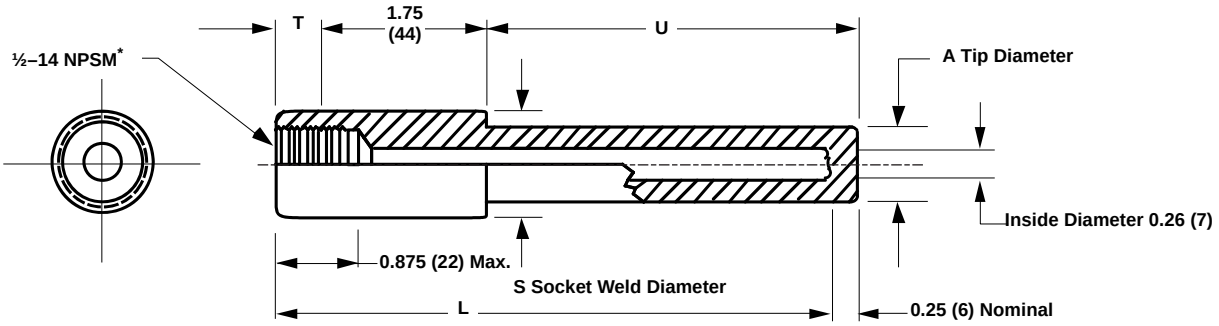
Thread (P)	Hex Size Inches (H)
0.5 – 0.75 ANPT	1.125
1–11.5 ANPT	1.375

** 1/2–14 ANPT threads are available*

Dimensions are in inches (millimeters)

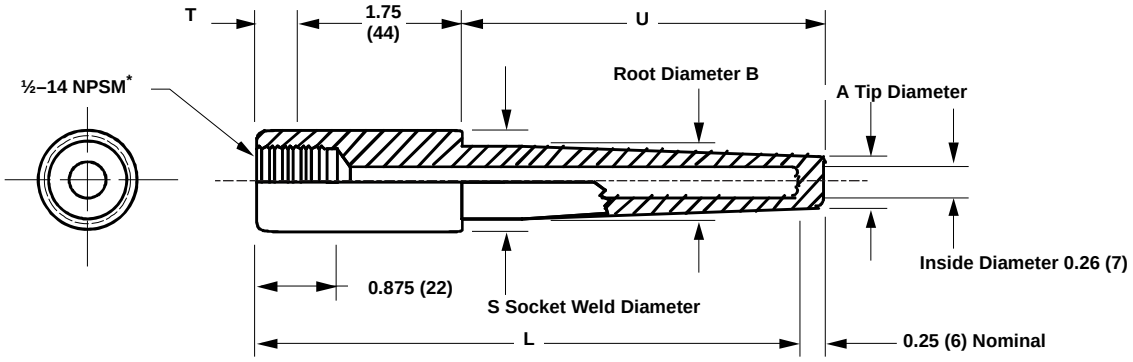
FIGURE 22. Weld Mounted Thermowells

Straight



Pipe Size	Socket Size (S) Diameter
0.75-in.	1.050 ±0.010
1-in.	1.315 ±0.010

Tapered



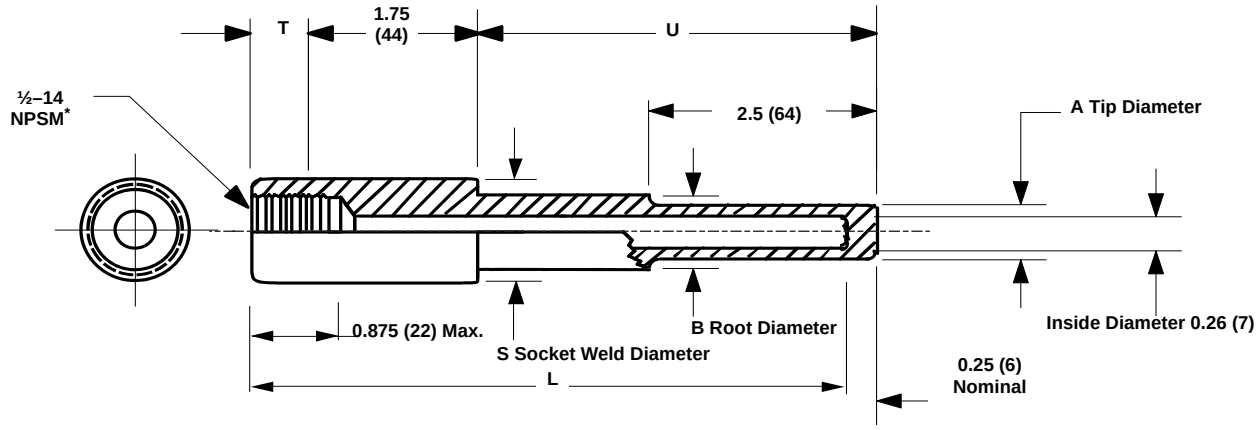
Pipe Size	Socket Size (S) Diameter
0.75-in.	1.050 ±0.010
1-in.	1.315 ±0.010

** 1/2–14 ANPT threads are available*

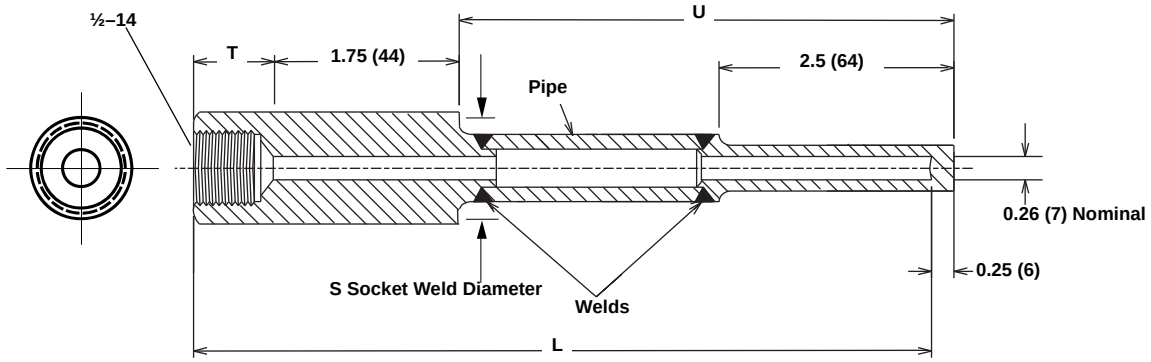
Dimensions are in inches (millimeters)

FIGURE 23. Weld Mounted Thermowells (continued)

Stepped



Stepped, For Thermowells with Overall Length Greater than 42-in. (3-Piece Construction)



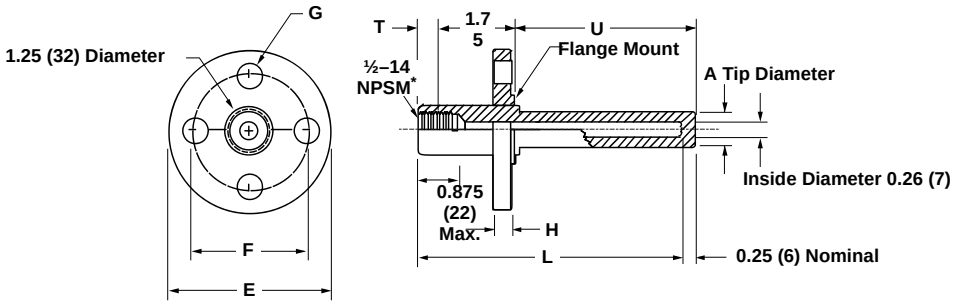
Pipe Size	Socket Size (S) Diameter
0.75-in.	1.050 ±0.010
1-in.	1.315 ±0.010

** 1/2–14 ANPT threads are available*

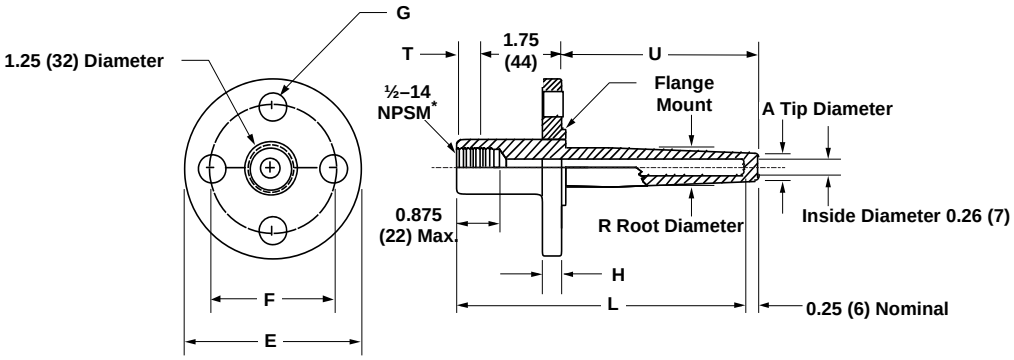
Dimensions are in inches (millimeters)

FIGURE 24. Flange Mounted Thermowells

Straight



Tapered



Class 150				
Size (in.)	O.D. (E)	Circle (F)	# of holes and dia. (G)	thickness (in.) (H)
1.0	4.25	3.12	four-0.625	0.5625
1.5	5.0	3.88	four-0.625	0.6875
2.0	6.0	4.75	four-0.75	0.75
3.0	7.5	6.00	four-0.75	0.94
Class 300				
1.0	4.88	3.5	four-0.75	0.69
1.5	6.12	4.5	four-0.88	0.81
2.0	6.5	5.0	eight-0.75	0.88

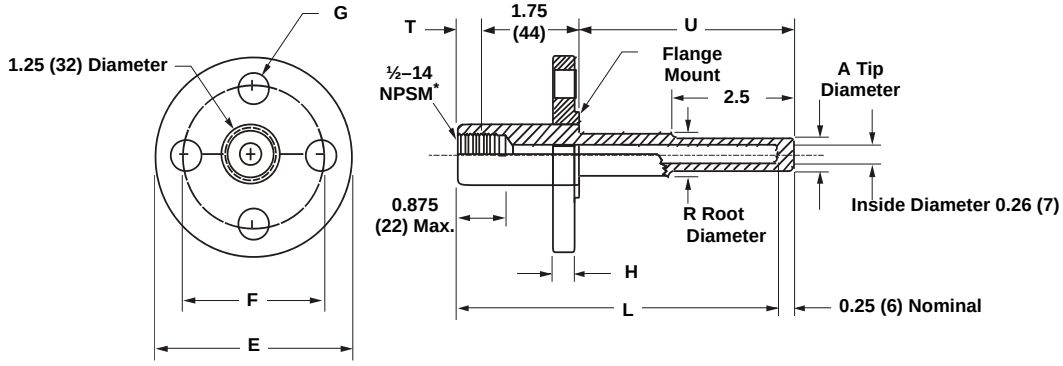
Class 600				
Size (in.)	O.D. (E)	Circle (F)	# of holes and dia. (G)	thickness (in.) (H)
1.0	4.88	3.5	four-0.75	0.94
1.5	6.12	4.5	four-0.88	1.13
2.0	6.5	5.0	eight-0.75	1.25
Class 900 and 1500				
1.5	7.0	4.88	four-1.12	1.5
Class 2500				
1.5	8.0	5.75	four-1.25	2.0

** 1/2–14 ANPT threads are available*

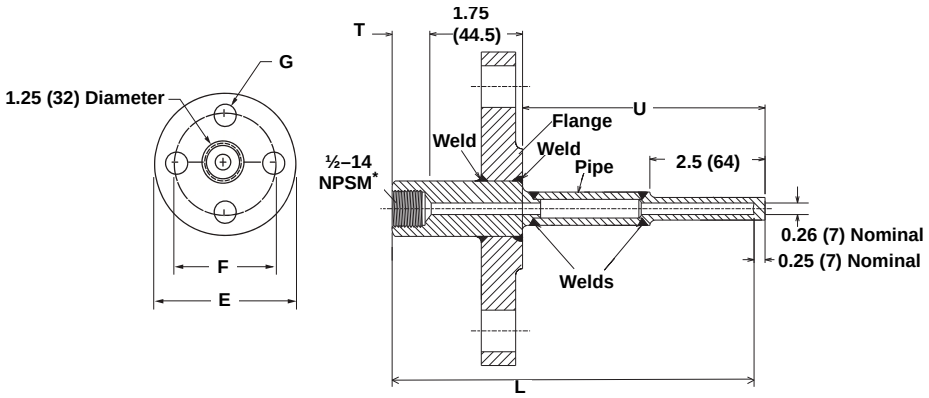
Dimensions are in inches (millimeters)

FIGURE 25. Flange Mounted Thermowells (continued)

Stepped



Stepped, For Thermowells with Overall Length Greater than 42-in. (3-Piece Construction)



Class 150				
Size (in.)	O.D. (E)	Circle (F)	# of holes and dia. (G)	thickness (in.) (H)
1.0	4.25	3.12	four-0.625	0.5625
1.5	5.0	3.88	four-0.625	0.6875
2.0	6.0	4.75	four-0.75	0.75
3.0	7.5	6.00	four-0.75	0.94
Class 300				
1.0	4.88	3.5	four-0.75	0.69
1.5	6.12	4.5	four-0.88	0.81
2.0	6.5	5.0	eight-0.75	0.88

Class 600				
Size (in.)	O.D. (E)	Circle (F)	# of holes and dia. (G)	thickness (in.) (H)
1.0	4.88	3.5	four-0.75	0.94
1.5	6.12	4.5	four-0.88	1.13
2.0	6.5	5.0	eight-0.75	1.25
Class 900 and 1500				
1.5	7.0	4.88	four-1.12	1.5
Class 2500				
1.5	8.0	5.75	four-1.25	2.0

** 1/2–14 ANPT threads are available*

Dimensions are in inches (millimeters)

Hazardous Area Approvals

SENSORS

Factory Mutual (FM) Approval

E5 Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II/III, Division 1, Groups E, F, and G. Suitable for indoor and outdoor (NEMA 4X) hazardous locations. Install in accordance with Rosemount drawing 00068-0013.

Canadian Standards Association (CSA) Approval

E6 Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II/III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2, Groups A, B, C, and D. Suitable for indoor and outdoor (CSA Enclosure Type 4X) hazardous locations. Install in accordance with Rosemount drawing 00068-0033.

To ensure approval compliance install sensors in exact accordance with the specified installation drawings (see Figure 27).

CONNECTION HEADS

Factory Mutual (FM) Approval

E5 Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II/III, Division 1, Groups E, F, and G. Painted models are suitable for indoor and outdoor (NEMA 4X) hazardous locations. Unpainted models are suitable for indoor and outdoor (NEMA 4) hazardous locations. When used with temperature sensors, connection heads must be installed in accordance with Rosemount drawing 00068-0013.

Canadian Standards Association (CSA) Approval

E6 Explosion Proof for Class I, Division 1, Groups C, and D. Dust-Ignition Proof for Class II/III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2, Groups A, B, C, and D.
Painted models are suitable for indoor and outdoor (CSA Enclosure Type 4X) hazardous locations. Unpainted models are suitable for indoor and outdoor (CSA Enclosure Type 4) hazardous locations. When used with temperature sensors, connection heads must be installed in accordance with Rosemount drawing 00068-0033.

To ensure approval compliance, install connection heads in exact accordance with the specified installation drawings (see Figure 27).

SENSOR AND TRANSMITTER ASSEMBLIES

ATEX Approval

E1 ATEX Explosion- proof
Certificate Number: KEMA99ATEX8715
ATEX Marking: ⟨Ex⟩ II 2 G
EEx d IIC T6 ($-40°C \leq T_{amb} \leq +65°C$)

Rosemount Series 68 and 78 RTD and Series 183 thermocouple temperature sensors with spring-loaded or general purpose style sensors are approved only for direct mount to the Rosemount 3144P, 3244MV, 644, 244E, 144H, and 248 or mounted to the Rosemount Connection Head.

To ensure approval compliance, specify the E1 option on both the sensor and the transmitter at the time of ordering.

NOTE
Rosemount series 68 and 78 RTD and Series 183 Thermocouple Temperature Sensors can be supplied as a replacement part with the E1 option for installation in an existing temperature measurement assembly.

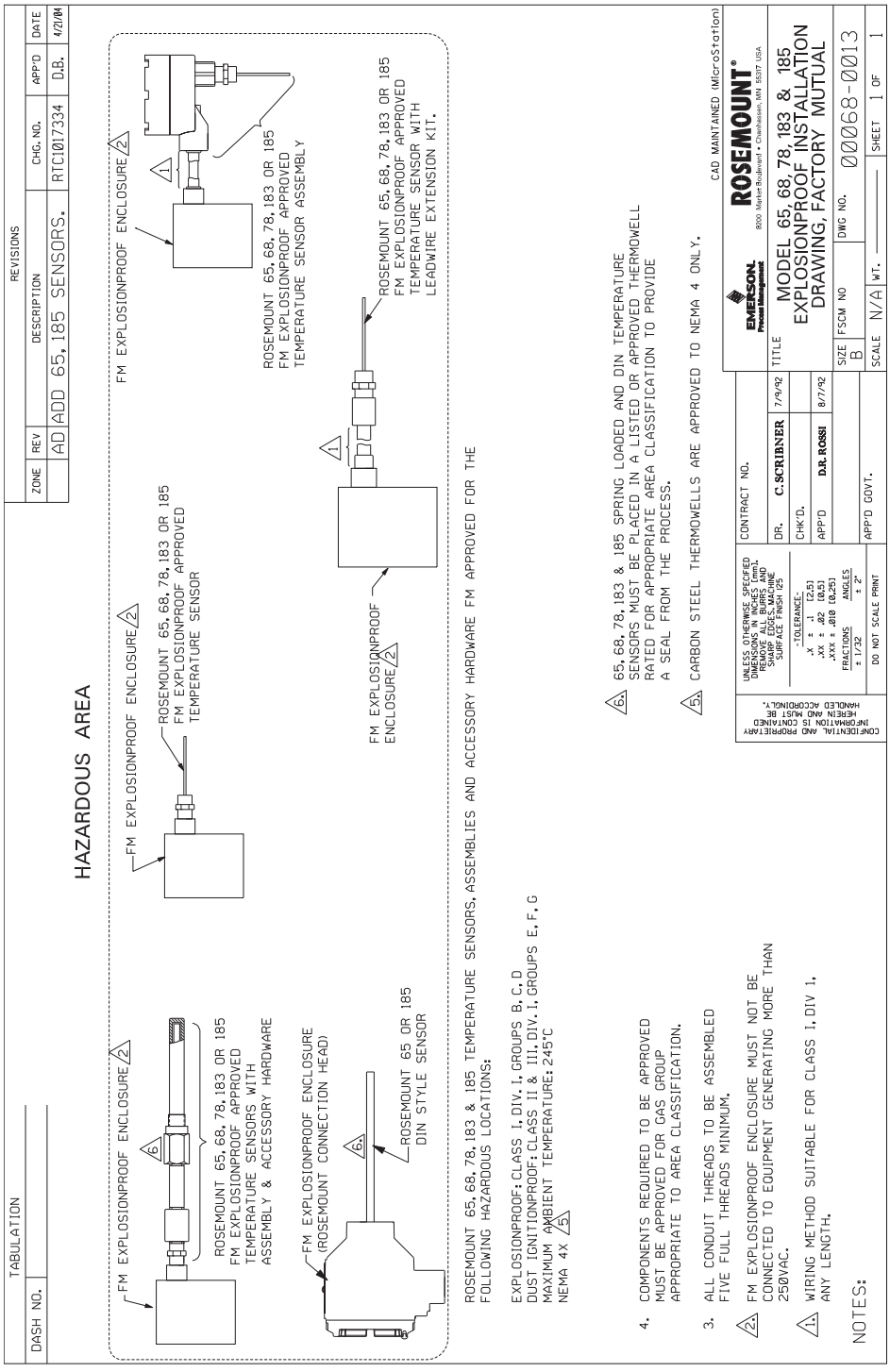
Standard Association of Australia (SAA) Flameproof Approval

E7 Ex d IIC T6 ($T_{amb} = -20$ to 60 °C)
Rosemount Series 68 and 78 RTD and Series 183 thermocouple temperature sensors with spring-loaded or general purpose style sensor adapters are approved for direct mount to the Rosemount 144, 244E, 644, 3144 and 3244MV Smart Temperature Transmitters or mounted to the Rosemount Connection Head.

To ensure approval compliance, specify the E7 option on both the sensor and the transmitter at the time of ordering, and install in exact accordance with Rosemount drawing 03144-0225 (see Figure 30).

Factory Mutual (FM) Explosion-Proof

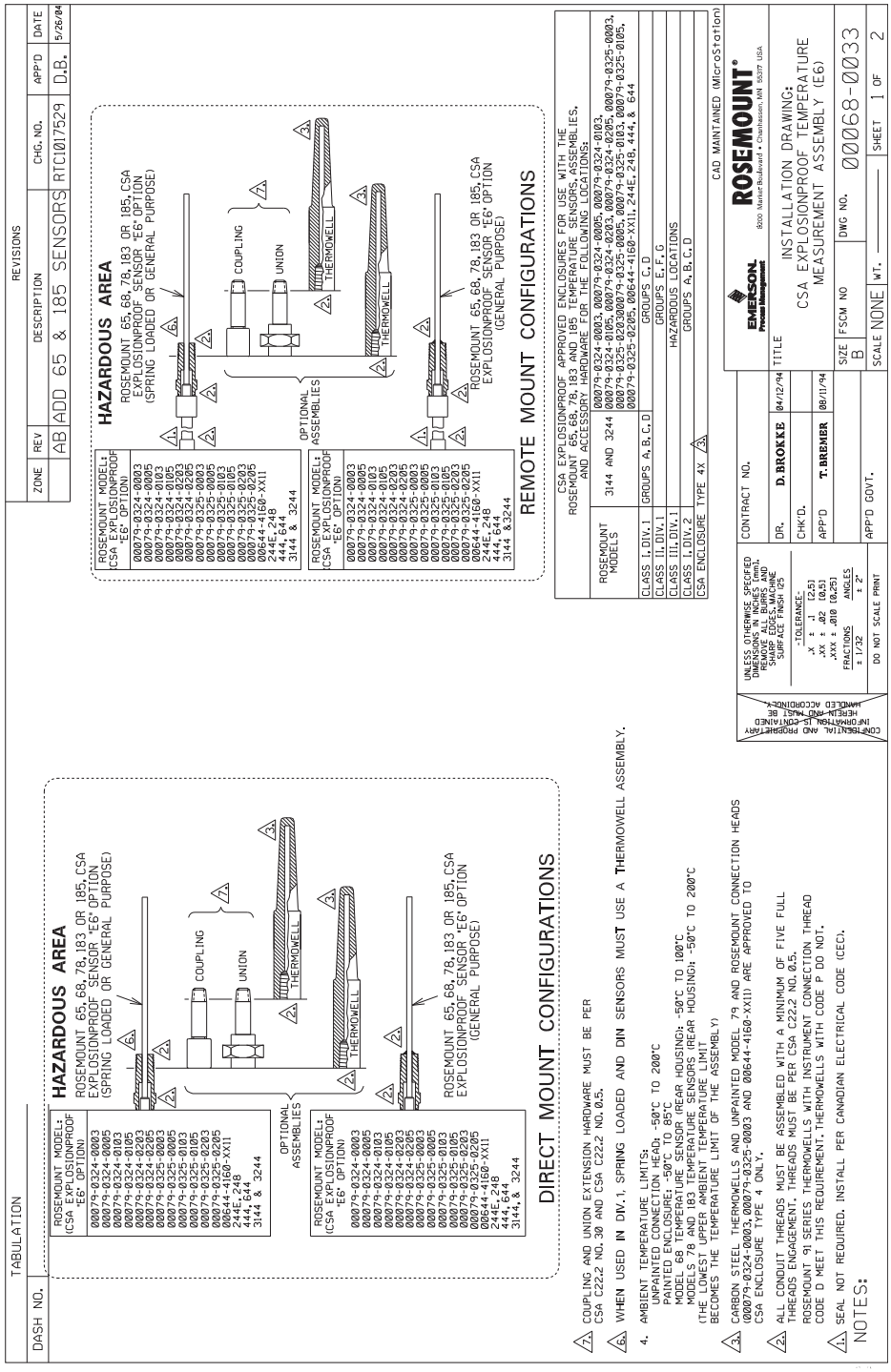
FIGURE 26. Installation Drawing 00068-0013, Rev. AD



NOTE
For Hand-Tight Assembly Option XA: End-User (installer) must unscrew threaded joints, then reassemble and tighten all joints per installation drawing 00068-0013.

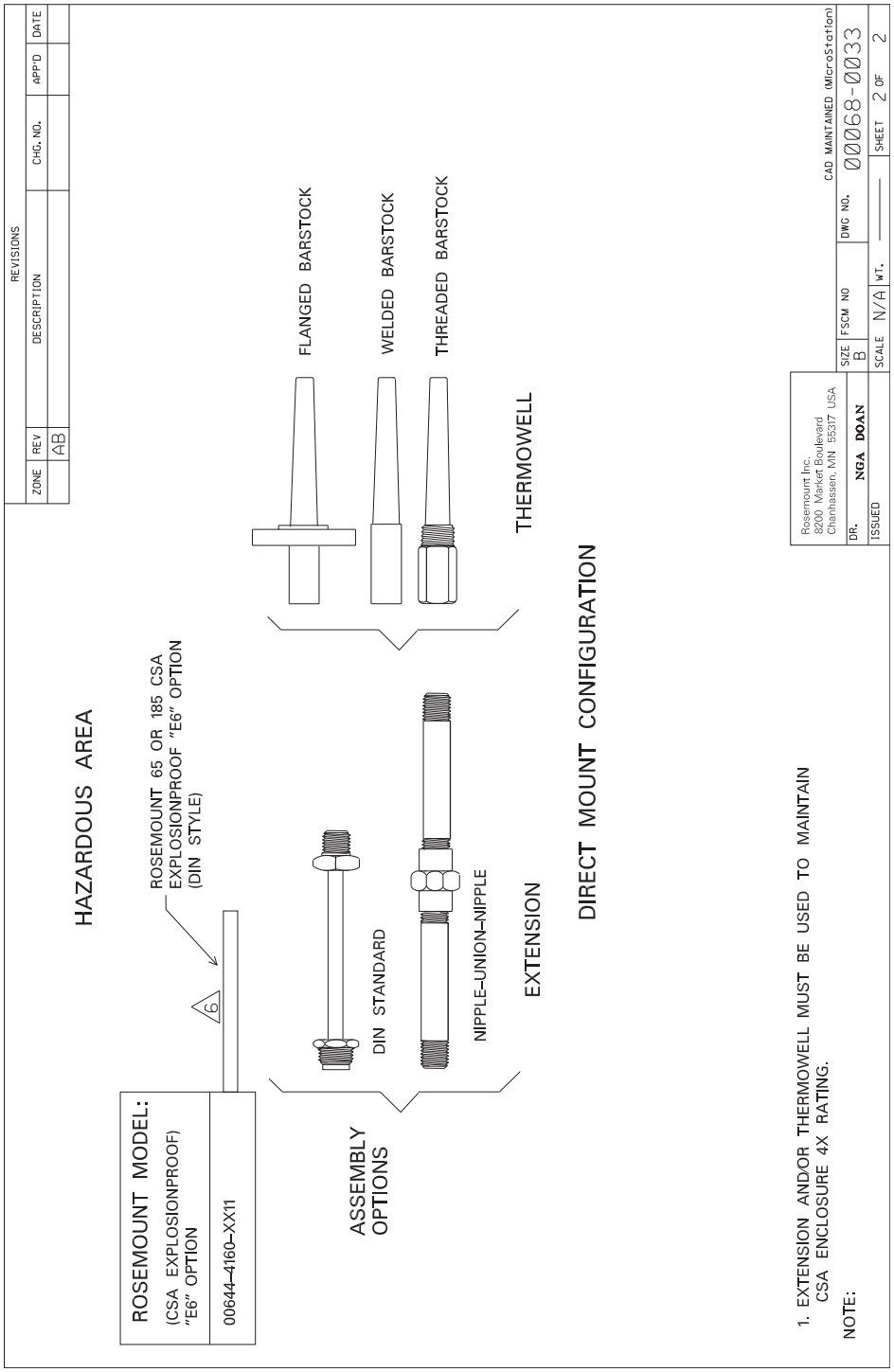
Canadian Standards Association (CSA) Explosion-Proof

FIGURE 27. Installation Drawing 00068-0033, Rev. AB Page 1 of 2



NOTE
For Hand-Tight Assembly Option XA: End-User (installer) must unscrew threaded joints, then reassemble and tighten all joints per installation drawing 00068-0033.

FIGURE 28. Installation Drawing 00068-0033, Rev. AB Page 2 of 2



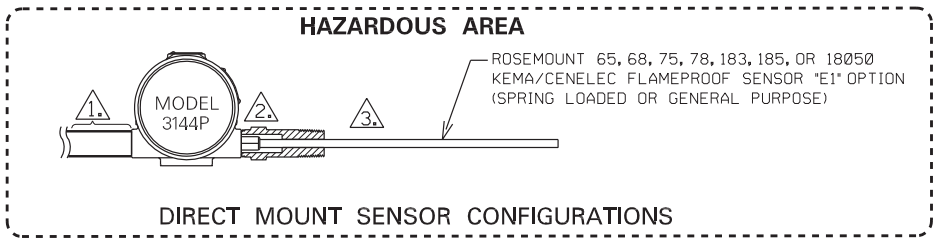
ATEX Flameproof

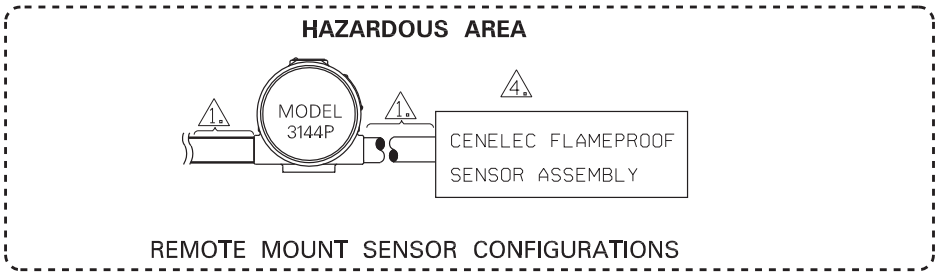
FIGURE 29. Installation Drawing 03144-0324, Rev. AB

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY

REVISIONS

REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AA	NEW RELEASE	RTC1Ø11243	D.B.	7/17/Ø1
AB	CHANGE ISSEP REFERENCES TO KEMA	RTC1Ø11874	D.B.	11/26/Ø1





7. WAIT 1Ø SECONDS AFTER DISCONNECTING POWER BEFORE REMOVING COVER.
6. A CONDUIT PLUG MUST BE INSTALLED INTO ANY UNUSED CONDUIT ENTRIES.
5. ROSEMOUNT MODELS 3144P KEMA/CENELEC FLAMEPROOF APPROVAL Ex II 2 G
DESCRIPTION: EEx d IIC T6 (Tamb= -40°C TO +70°C) T5 (-40°C TO +80°C).
IP66

△4. TEMPERATURE SENSOR ASSEMBLY MUST BE CENELEC APPROVED FOR APPROPRIATE AREA CLASSIFICATION.

△3. SPRING LOADED SENSORS MUST USE A THERMOWELL ASSEMBLY.

△2. THREADS MUST BE ASSEMBLED WITH LOCTITE THREAD SEALANT AND HAVE A MINIMUM OF FIVE FULL THREADS ENGAGEMENT AND 8 mm AXIAL LENGTH ENGAGEMENT.

△1. INSTALL PER LOCAL INSTALLATION CODES.
CENELEC APPROVED CABLE ENTRY OR STOPPING BOX REQUIRED.

CAD MAINTAINED (MicroStation)

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCE-
.X ± .1 [2,5]
.XX ± .Ø2 [Ø,5]
.XXX ± .Ø1Ø [Ø,25]
FRACTIONS ± 1/32
ANGLES ± 2°

DO NOT SCALE PRINT

CONTRACT NO.

DR. NGA DOAN 6/29/Ø1
CHK'D
APP'D. DIRK BAUSCHKE 7/17/Ø1
APP'D. GOVT.

EMERSON. Process Management
ROSEMOUNT®
8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE INSTALLATION DRAWING:
KEMA/CENELEC FLAMEPROOF TEMPERATURE MEASUREMENT ASSEMBLY (EI)

SIZE A | FSCM NO | DWG NO. Ø3144-Ø324

SCALE NONE | WT. | SHEET 1 OF 1

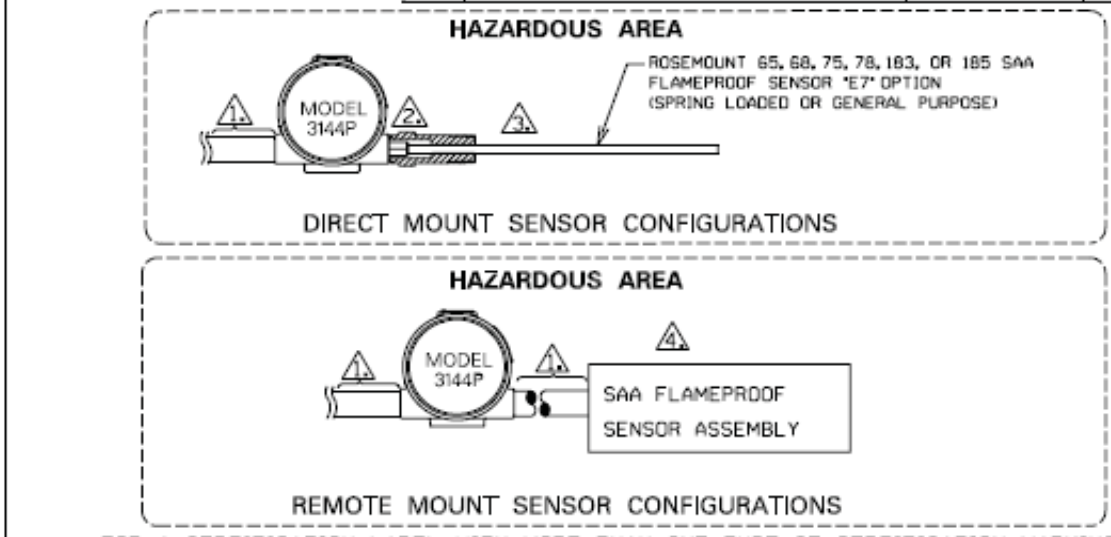
Standard Association of Australia (SAA) Flameproof

FIGURE 30. Drawing 03144-0325, Rev. AD

CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY

REVISIONS

REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AC	ADD NOTES 8 & 9. CHANGE AMBIENT TEMPS IN NOTE 5. ADD TEFLON TAPE TO NOTE 2.	RTC1013713	D.B.	9/4/02
AD	CHANGE IP RATING IN NOTE 5	RTC1013808	D.B.	9/23/02



9. FOR A CERTIFICATION LABEL WITH MORE THAN ONE TYPE OF CERTIFICATION MARKING ON IT, ON COMPLETION OF COMMISSIONING THE APPARATUS, THE IRRELEVANT MARKING CODE(S) SHALL BE PERMANENTLY SCRIBED OFF.
8. COVERS ARE TIGHTENED TO METAL-TO-METAL SEAL WITH A TOOL.
7. WAIT 10 SECONDS AFTER DISCONNECTING POWER BEFORE REMOVING COVER.
6. A CONDUIT PLUG MUST BE INSTALLED INTO ANY UNUSED CONDUIT ENTRIES.
5. ROSEMOUNT MODELS 3144P SAA FLAMEPROOF
   APPROVAL DESCRIPTION: Ex d IIC T6 (Tamb= -20°C TO +60°C)
   IP66
4. TEMPERATURE SENSOR ASSEMBLY MUST BE SAA APPROVED FOR APPROPRIATE AREA CLASSIFICATION.
3. SPRING LOADED SENSORS MUST USE A THERMOWELL ASSEMBLY.
2. THREADS MUST BE ASSEMBLED WITH LOCTITE THREAD SEALANT OR TEFLON TAPE (PTFE) AND HAVE A MINIMUM OF FIVE FULL THREADS ENGAGEMENT AND 8 mm AXIAL LENGTH ENGAGEMENT.
1. INSTALL PER LOCAL INSTALLATION CODES.
   SAA APPROVED CABLE ENTRY OR STOPPING BOX REQUIRED.

CAD MAINTAINED (MicroStation)

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES. MACHINE SURFACE FINISH 125

-TOLERANCE-
.X ± .1 [2,5]
.XX ± .02 [0,5]
.XXX ± .010 [0,25]
FRACTIONS ± 1/32
ANGLES ± 2°

DO NOT SCALE PRINT

CONTRACT NO.

DR. NGA DOAN 8/7/01
CHK'D
APP'D DIRK BAUSCHKE 8/17/01
APP'D. GOVT.

EMERSON Process Management

ROSEMOUNT®
8200 Market Boulevard • Chanhassen, MN 55317 USA

TITLE INSTALLATION DRAWING: SAA FLAMEPROOF TEMPERATURE MEASUREMENT ASSEMBLY (E7)

SIZE A | FSCM NO | DWG NO. 03144-0325

SCALE N/A | WT. ——— | SHEET 1 OF 1

Product Data Sheet
00813-0100-2654, Rev GB
April 2010

Sensors and Accessories (English)

Emerson Process Management

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1 Pandan Crescent
Singapore 128461
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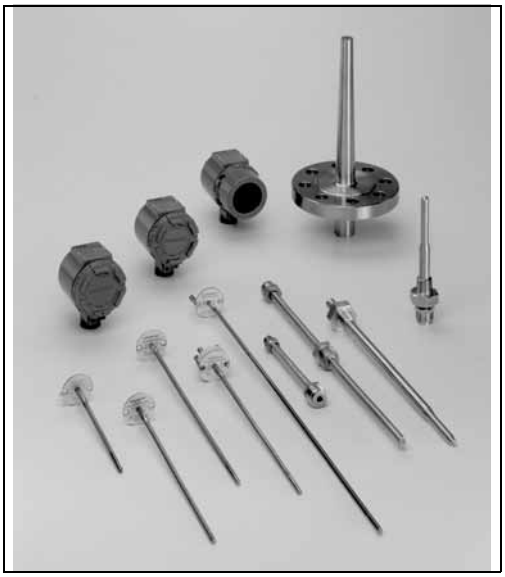
F (65) 6777 0947
Enquiries@AP.EmersonProcess.com

00813-0100-2654 Rev GB 4/10

EMERSON™
Process Management

Product Data Sheet
00813-0200-2654, Rev HB
April 2010

Temperature Sensors and Accessories (Metric)



Content

Introduction

Overview

Rosemount integral mount temperature sensors, accessory hardware, and assemblies constitute a complete line of industrial temperature-sensing instruments. A variety of RTD and thermocouple sensors are available alone, or as complete assemblies including connection heads, thermowells, and extension fittings. Emerson Process Management (“Emerson”) offers s complete temperature measurement assemblies including Rosemount Smart and Programmable Temperature Transmitters. Please ask your Emerson representative for details.

Series 65 Platinum RTD Temperature Sensors are highly linear and have a stable resistance versus temperature relationship. These sensors are used primarily in industrial environments where high accuracy, durability, and long-term stability are required. Series 65 sensors are designed to meet the most critical parameters of international standards: DIN EN 60751 incorporating Amendments 1 and 2, DIN 43760, and BS 1904.(1) This standardization provides sensor interchangeability without the need for transmitter circuitry adjustment.

Enhanced performance and optimal temperature measurement accuracy is available for Series 65 sensors coupled with a range of smart temperature transmitters through calibration schedules and Callendar van Dusen constants.

Series 185 Thermocouple Temperature Sensors conform to IEC 584 and are available in types J, K and N. Series 185 sensors are available single ungrounded, or dual ungrounded, isolated.

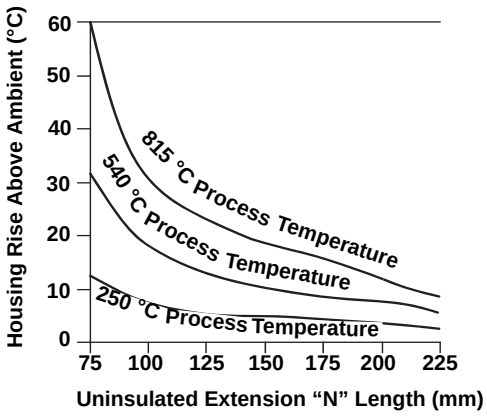
All sensors are available in a variety of lengths(2) and ranges with flying lead, terminal block, or 1/2-inch ANPT spring-loaded adapter lead wire terminations.

In addition to complete assemblies, Emerson offers a selection of separate accessory hardware including connection heads and thermowells.

Choosing an Extension and Thermowell

Aside from ambient temperature variations, heat from the process, in a direct mounting configuration, is transferred from the thermowell to the transmitter housing. If the expected process temperature is near or beyond the transmitter specification limits, consider the use of additional thermowell extension length, an extension nipple, or a remote mounting configuration to isolate the transmitter from these excessive temperatures. Figure 1 provides an example of the relationship between transmitter housing temperature rise and extension length. Use Figure 1 and the accompanying example as a guide for determining adequate thermowell extension length.

FIGURE 1. Transmitter Housing Temperature Rise vs. Uninsulated Extension Length



Example

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

As shown in Figure 1, an “N” dimension of 90 mm will result in a housing temperature rise of 22 °C. An “N” dimension of 100 mm would therefore be the minimum recommended length, and would provide a safety factor of about 25 °C. A longer “N” dimension, such as 150 mm, would be desirable in order to reduce errors caused by transmitter temperature effect, although in that case the transmitter may require extra support.

(1) 100 Ω at 0 °C, α = 0.00385 Ω x °C/Ω

(2) Sensors over two meters long will be supplied coiled unless otherwise requested.

INTEGRAL MOUNT SENSORS AND ASSEMBLIES

Series 65 RTD and Series 185 Thermocouple Temperature Sensors may be ordered as complete assemblies, which provide a complete, yet simple, means of specifying the proper industrial hardware for most temperature measurements. One assembly model number, derived from one ordering table, completely defines the type of sensing element, as well as the material, length, and style of extension fittings and thermowells.

All sensor assemblies are sized and inspected by Emerson to ensure complete component compatibility and performance.

MOUNTING CONFIGURATIONS

Series 65 Platinum RTDs and Series 185 Thermocouples

You may order the Series 65 RTDs and the Series 185 Thermocouples with flying leads, a terminal block, or a 1/2-inch ANPT spring-loaded adapter.

Ordered with flying leads, the sensors are designed to be used with a head-mount temperature transmitter attached directly to the sensor. The flying lead configuration allows the removal of the sensor and transmitter as one assembly.

The BUZH connection head allows terminal block style sensors and transmitters to be mounted together. The transmitters in these assemblies will be mounted in the cover of the BUZH connection head.

The sensors with a 1/2-inch ANPT spring-loaded adapter are used with directly mounted 3144P field-mount temperature transmitters or through the use of Rosemount connection heads. This assembly requires a terminal block to be mounted inside the head.

Hazardous area approvals are available with all three types of sensors, but they are dependent on the configuration of the entire temperature measurement assembly (see “Hazardous Locations Certification” on page 5).

Temperature Considerations

Ambient temperature limits for the connection head are -40° C to +85° C. The LT Option may be extended down to a range of -51° C to +85° C.

Ambient temperature range addresses the connection head only, and requires suitable cable glands and field wiring provisions to meet the temperature requirements below -40° C.

FIGURE 2. Series 65 RTD Lead Wire Configuration

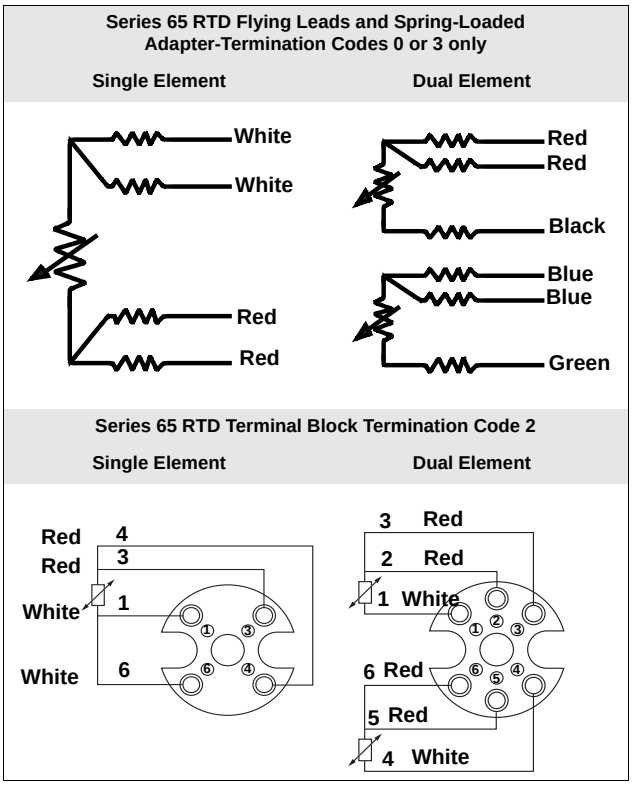
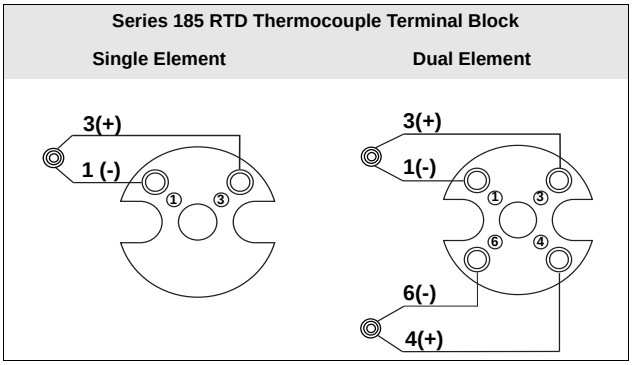


FIGURE 3. Series 185 Lead Wire Configuration



SPECIFICATIONS

Series 65 Platinum RTD

100 Ω RTD at 0 °C,
α = 0.00385 Ω x °C/Ω.

Temperature Range

–50 to 450 °C or –196 to 600 °C depending on type

Self Heating

0.15 K/mW when measured per method defined in DIN EN 60751:1996

Thermal Response Time

9 seconds maximum required to reach 50% sensor response when tested in flowing water according to IEC 751

Immersion Error

60 mm minimum usable depth of immersion when tested according to IEC 751

Insulation Resistance

1,000 MΩ minimum insulation resistance when measured at 500 Vdc and at room temperature

Sheath Material

316 SST / 321 SST with mineral-insulated cable construction

Lead Wire

PTFE insulated, silver-coated copper wire. See Figure 3 for wire configuration

Identification Data

The model and serial numbers are marked on each sensor

Ingress Protection (IP) Ratings

Rosemount Series 65 sensor assemblies are IP65 / IP68 and NEMA 4X. This rating is applicable only for complete assemblies including either:

- a connection head, extension, and barstock thermowell
- a connection head and tubular thermowell
- a connection head, extension, and sensor

Series 185 Thermocouple

Construction

A thermocouple consists of a junction between two dissimilar metals that produces a change in thermoelectric emf in relationship to a change in temperature. Rosemount Series 185 thermocouple sensors are manufactured from selected materials to meet IEC 584 Tolerance Class 1. The junction of these wires is welded to form a pure joint, maintaining the integrity of the circuit and ensuring the highest accuracy. Ungrounded junctions are protected from the environment by the sensor sheath. The ungrounded and isolated junctions provide electrical isolation from the sensor sheath.

Sheath Material

Rosemount thermocouples are made of a mineral insulated cable design with a variety of sheath materials available to suit both the temperature and the environment. For temperature up to 800 °C in air, AISI 321 is standard. For temperatures from 800 to 1100 °C in air, Inconel 600 is standard. For temperatures above 1100 °C, precious metal or ceramic protective sheaths are available upon request. For strongly oxidising or reducing atmospheres, please consult your local Emerson representative.

Lead Wires

Thermocouple, internal – 18 SWG (16 AWG) solid wire (max), 19 SWG (18 AWG) solid wire (min.). External extension leads, Type J and K – 0.8 mm minimum stranded wire, PTFE insulated. Color coded per IEC 584. See Figure 3 for wire configuration.

Identification Data

The model and serial numbers are marked on each sensor.

Insulation Resistance

1 000 MΩ minimum insulation resistance when measured at 500 Vdc and at room temperature.

Ingress Protection (IP) Ratings

Rosemount Series 65 sensor assemblies are IP65 / IP68 and NEMA 4X. This rating is applicable only for complete assemblies including either:

- a connection head, extension, and barstock thermowell
- a connection head and tubular thermowell
- a connection head, extension, and sensor

TABLE 1. Characteristics of Series 185 Thermocouples

Type	Alloys (wire colour)	Sheath Material	Temp. Range (°C)	Limits of Error Interchangeability DIN EN 60584-2	Tolerance Class
J	Fe (+ black), CuNi (– white)	1.4541 (AISI 321)	– 40 to 375, 375 to 750	1.5 °C, 0.004 t	1
K	NiCr (+ green), NiAl (– white)	Inconel 600	– 40 to 375, 375 to 1000	1.5 °C, 0.004 t	1
N	NiCrSi (+ rose), NiSi (- white)	Nicrobell B	– 40 to 375, 375 to 1000	1.5 °C, 0.004 t	1

HAZARDOUS LOCATIONS CERTIFICATION

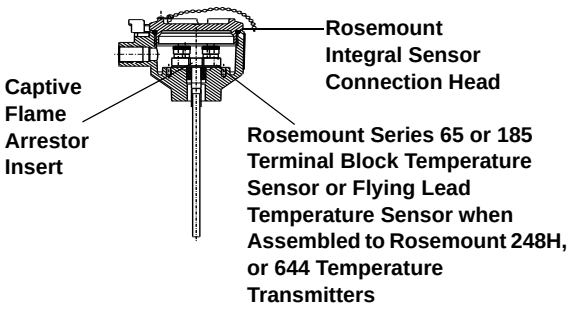
E1 ATEX/CENELEC Flameproof Approval
ATEX Marking ⟨Ex⟩ II 2 G
Certification Number. KEMA99ATEX8715
EEx d IIC T6 (T_{amb} = –40 to 65 °C).

The ATEX/CENELEC Flameproof approval is dependent on the Rosemount Integral Sensor Connection Head assembled with a Rosemount RTD or thermocouple temperature sensor (see Figure 4). The captive flame arrestor insert must be fully engaged into the connection head for compliance with this approval.

ATEX Flameproof Approval
ATEX Marking ⟨Ex⟩ II 2 G
Certification Number. KEMA01ATEX2181.
EEx d IIC T5 (–40 ≤ T_{amb} ≤ 80 °C)
EEx d IIC T6 (–40 ≤ T_{amb} ≤ 70 °C)

The Rosemount Series 65 RTD and 185 Thermocouple Temperature Sensors with $^1/_2$-inch ANPT Spring Loaded Adapters are approved for direct mount to the Rosemount 3144P Smart Temperature Transmitters. Refer to the Rosemount Temperature Transmitter Reference Manuals for installation details.

FIGURE 4. ATEX/CENELEC Flameproof Configuration.



ND ATEX / CENELEC Dust Ignition-Proof
Certification Number: KEMA99ATEX8715
ATEX Marking: ⟨Ex⟩ II 1 D
CE 1180
T95 °C (-40 °C ≤ T_{amb} ≤ 85 °C)
IP66
The ATEX/CENELEC Dust Ignition-Proof approval is dependent on the Rosemount Integral Sensor Connection Head assembled with a Rosemount RTD or thermocouple temperature sensor (see Figure 4). The captive flame arrestor insert must be fully engaged into the connection head for compliance with this approval.

N1 ATEX/CENELEC Type “n” Approval
ATEX Marking ⟨Ex⟩ II 3 G
Certification Number BAS00ATEX3145
[EEx nL II T5 (T_{amb} = – 40 to 70 °C)]
The ATEX/CENELEC EExn Approval allows equipment, which under normal conditions does not emit sparks or produce hot surfaces, to be installed in Zone 2 areas. The EEx n integrity is achieved by the design and construction that maintains a minimum of IP 54 protection. Individual items are not approved. The Rosemount type n approval applies to complete assemblies only. This approval applies to every combination of thermowell, connection head, extension, and sensor detailed in this Product Data Sheet, except the $^1/_2$-inch ANPT spring-loaded style. In addition, certain thermowells, not designed by Rosemount Inc., are acceptable for the EEx n assembly provided they conform exactly to Rosemount specifications.

I1 ATEX/IBExU Intrinsic Safety Approval
ATEX Marking ⟨Ex⟩ II 2 G
EEx ia IIC T6 (T_{amb} = – 51 to 60 °C)
The Intrinsically Safety Approval is valid for Series 65 RTD Sensors and Series 185 thermocouples.
These certified sensors can only be applied in Zone 1. The marking of intrinsically safe circuits is effected by color codes or print, Ex i. A mounted-on connection head is provided with a ground screw for earth connection and a blue painted cable gland.

E5 FM Explosion-Proof
Explosion-Proof for Class I, Division 1, Groups B, C, D.
Dust-Ignition Proof for Class I, III, Division 1, Groups E, F, G.
Ambient temperature Limits: -40 to 245 °C
When installed per Rosemount Drawing 000068-0013
NEMA Enclosure Type 4X.

E7 Standard Association of Australia (SAA) Flameproof Approval
(EEx d IIC T6 (T_{amb} = –40 to 65 °C)
The Rosemount Series 65 RTD and Series 185 Thermocouple Temperature Sensors are approved for direct mount to the Rosemount 248H, 644, and 3144P Smart Temperature Transmitters. To ensure approval compliance, specify the E7 option of both the sensor and the transmitter at the time of ordering.

SENSOR-TO-TRANSMITTER MATCHING

Significant measurement accuracy improvements can be attained using a temperature sensor that is matched to a temperature transmitter. This process involves identifying the relationship between resistance and temperature for a specific RTD sensor. This relationship, approximated by the Callendar-van Dusen equation, is described as:

$R_t = R_o + R_o\alpha[t - \delta(0.01t - 1)(0.01t) - \beta(0.01t - 1)(0.01t)^3]$,

where:

R_t = Resistance (ohms) at Temperature t (°C)

R_o = Sensor-Specific Constant (Resistance at t = 0 °C)

α =Sensor-Specific Constant

δ =Sensor-Specific Constant

β =Sensor-Specific Constant (0 at t > 0 °C)

The exact values for the Callendar-van Dusen constants (Ro, α, δ, β) are specific to each RTD sensor and are established by testing each individual sensor at various temperatures.

Series 65 RTD sensors can be ordered with the Calibration Option codes V10 or V11, where the values of all four sensor-specific constants are supplied with each sensor. To utilize the unique, built-in sensor-matching capability of the Rosemount 644, and 3144P transmitters, the Callendar-van Dusen constants can be programmed into the transmitter at the factory or in the field using a HART Communicator.

The transmitter uses the Callendar-van Dusen constants to generate a sensor curve that describes the relationship between resistance and temperature for this particular sensor and transmitter assembly. By using the sensors actual resistance-vs.-temperature curve, there is a 3- or 4-fold improvement in temperature measurement accuracy for the total system.

Options V10 and V11 are specific to a particular temperature range. As with Calibration Schedules, the accuracies associated with each option code represent worst-case conditions when the sensor is used over the entire temperature range. The accuracy of Series 65 sensors with the “V” option will vary because they have different hysteresis and repeatability characteristics. To ensure optimal performance, select a “V” option where the sensor’s range of actual operation is between the minimum and maximum calibration points. For applications requiring the use of a Resistance vs. Temperature Table, order a temperature range-specific characterization schedule.

IEC 751 Interpretation

The Callendar-van Dusen equation is one method of describing the resistance versus temperature (R vs.T) relationship for platinum RTDs. International standard IEC 751 interprets the R vs. T relationship using an approach similar to the Callendar-van Dusen methodology. The IEC 751 R vs.T relationship standard uses the following equation:

$R_t = R_o[1 + At + Bt^2 + C\ (t-100)t^3]$

As in the Callendar-van Dusen method, R_o, A, B, C are specific to each RTD and are established by testing each sensor at various temperatures. The actual values for A, B, and C differ in magnitude from the Callendar-van Dusen constants (R_o, α, β, δ), while R_o is the same in both equations. Either methodology yields the same result in any sensor-to-transmitter matching scenario, since one equation is a simple mathematical interpretation of the other.

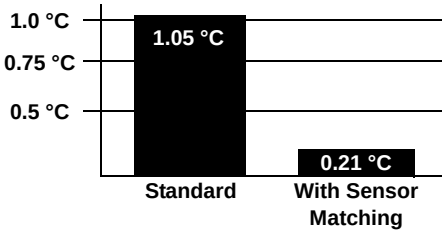
TABLE 2. Series 65 Interchangeability

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)
Series 65 with IEC-751 Class A Option	**Temperature**
±0.35 °C (±0.63 °F)	-100 °C (-148 °F)
±0.15 °C (±0.27 °F)	0 °C (32 °F)
±0.35 °C (±0.63 °F)	100 °C (212 °F)
±0.75 °C (±1.35 °F)	300 °C (572 °F)
±0.95 °C (±1.71 °F)	400 °C (752 °F)

Typical Sensor–to–Transmitter Matching Accuracy Improvements

Transmitter: Rosemount 3144 (has built-in sensor matching capabilities), span of 0 to 200 °C, accuracy = 0.1 °C)
Sensor: Series 65 RTD
Callendar van Dusen Option: V10
Process Temperature: 150 °C

System Uncertainty Comparison at 150 °C:



Standard 65 Sensor	
Rosemount 3144P:	± 0.10 °C
Standard Series 65 RTD:	± 1.05 °C
Total System(1):	± 1.05 °C
65 Sensor with V10 Option	
Rosemount 3144P:	± 0.10 °C
Calibrated Sensor Series 65 RTD:	± 0.18°C
Total System(1):	± 0.21 °C

(1) Calculated using RSS statistical method:

System accuracy = $\sqrt{(\text{Transmitter accuracy})^2 + (\text{Sensor accuracy})^2}$

CALIBRATION

Sensor calibration may be required for input to quality systems, or for control system enhancement. More frequently, it is used to improve the overall temperature measurement performance by matching the sensor to a temperature transmitter. Sensor matching is available for RTD sensors used with Rosemount Smart transmitters where the inherent stability and repeatability of the RTD technology is well established.

Ordering Information

Use the formats presented below to order a calibrated Series 65 RTD. If you fail to specify all of the necessary calibration-related information when you place your order, Emerson will contact you for the information and your order may be delayed slightly.

Calibration Options

The X8 option calibrates the sensor to a customer-specific temperature range. The Callendar van Dusen, and A, B, and C-constants are supplied with a works certificate.

Option X8: Sensor Calibrated to a Customer-Specified Temperature Range (see Temperature Range)
When you order an RTD with the X8 option, the temperature range the sensor needs to be calibrated must be specified. Take note of the sensor temperature limits as shown below.

Typical Model Number

Model	Connection Head	Lead Wire Termination	Sensor Type	Extension Type	Extension Length	Thermowell Material	Immersion Length	Mounting Style	Additional Options
0065	C	2	1	D	0135	D	0225	T12	X8

Calibrate from –10 to 120 °C

Option V: Sensor Calibration with Works Certificate

	Code	
	V10	V11
Temperature Range (°C)	– 50 to 450	0 to 100
Calibration Points (°C)	–50 0 100 450	0 50 100

Sensors and Accessories (Metric)

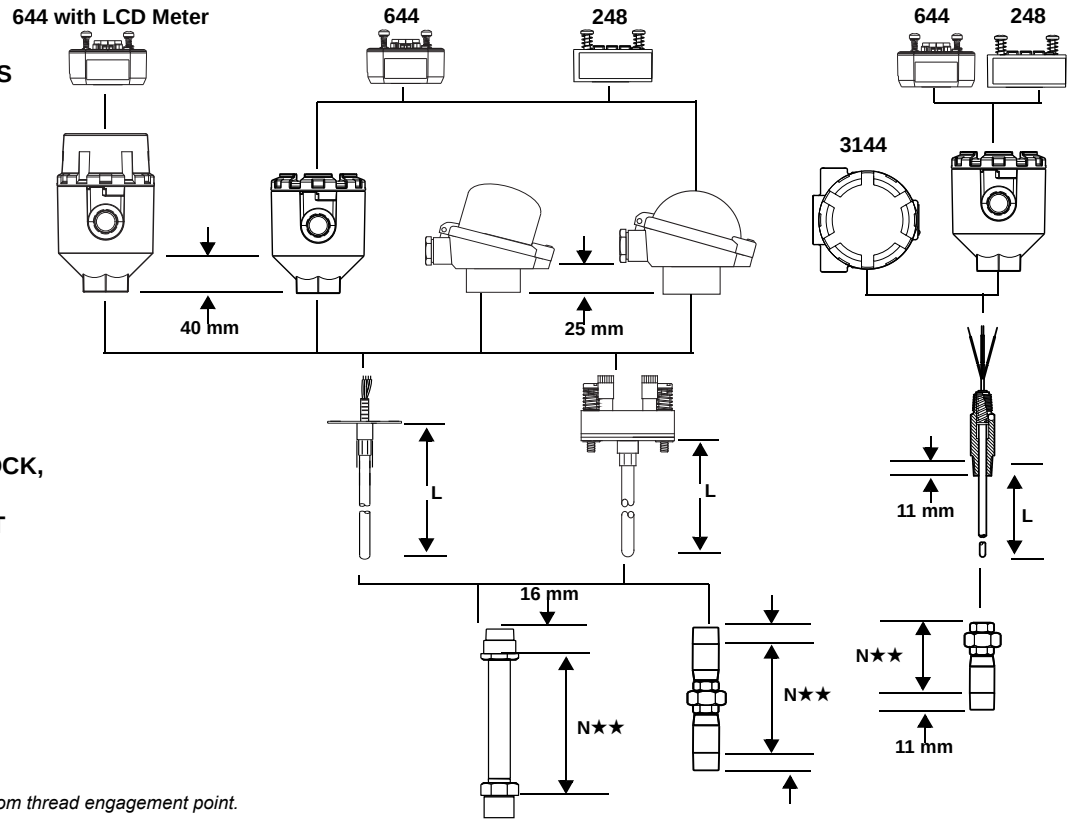
Sensor Assembly without Thermowell

HEAD OR FIELD MOUNT TRANSMITTERS

IP68 OR IP65 CONNECTION HEADS

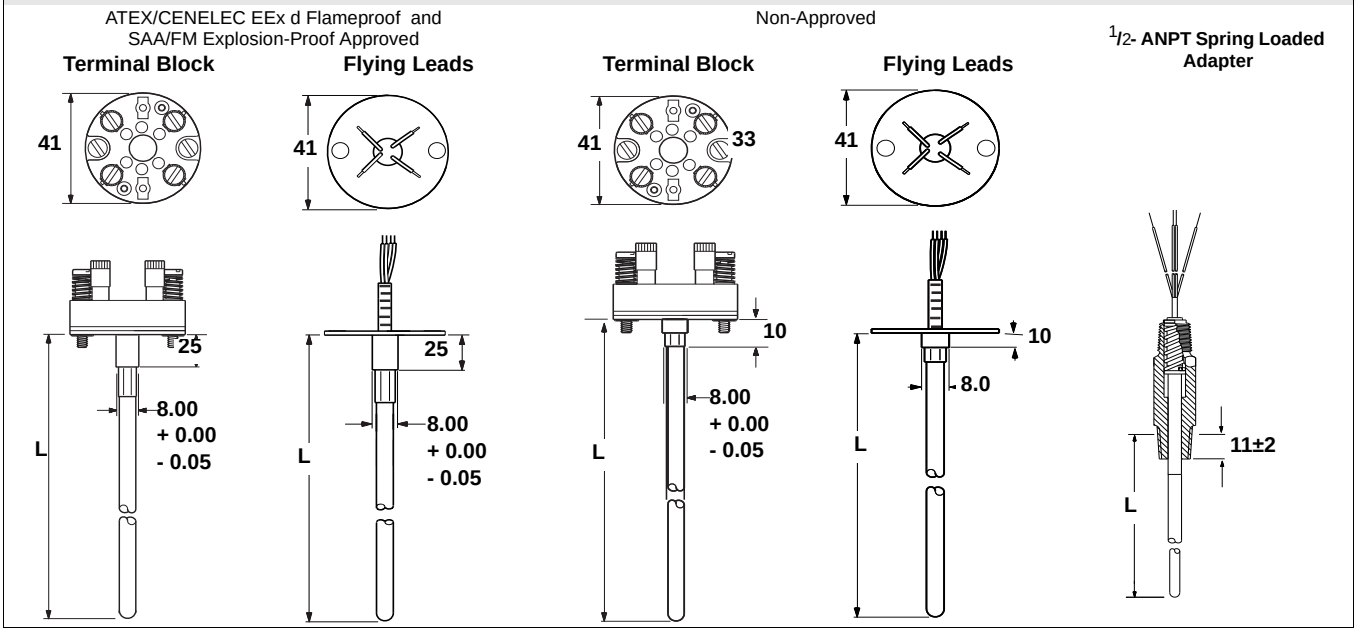
SENSOR WITH FLYING LEADS, TERMINAL BLOCK, OR SPRING-LOADED ADAPTER 2 x 1/2-in. NPT

EXTENSIONS



★★ *N dimension measures from thread engagement point.*

Series 65 RTD and Series 185 Thermocouple Dimensional Drawings



Series	Sensor Diameter	Number of Leads	Lead Wire Length (Flying Leads)		Lead Wire Length (Spring Loaded)	
			Element 1	Element 2	Element 1	Element 2
65 Single Element	6.0	4	100	—	150	—
65 Dual Element	6.0	6	100	200	150	200
185 Single Element	6.0	2	100	—	150	—
185 Dual Element	6.0	4	100	200	150	200

ORDERING TABLES

TABLE 3. Series 65 Platinum RTD and 185 Thermocouple Without Thermowell

★ 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	Resistance Thermometer, Pt 100 Ohm RTD Standard without Thermowell			
0185	Thermocouples, DIN EN 60584 (IEC 584), Class 1, suitable for transmitter mounting			
Connection Head		**IP Rating(1)**	**Connection Thread**	
Standard				**Standard**
C	Rosemount Aluminum	68	M20 x 1.5	★
D	Rosemount Aluminum	68	1/2-in. NPT	★
1	Rosemount Aluminum with LCD Meter cover	68	M20 x 1.5	★
2	Rosemount Aluminum with LCD Meter cover	68	1/2-in. NPT	★
N	No Connection head)			★
Expanded				
G	Rosemount Stainless steel	68	M20 x 1.5	
H	Rosemount Stainless steel	68	1/2-in. NPT	
J	GR–A/BL (BUZ) Aluminum w/ Cble Gland	65	M20 x 1.5 (with cable gland)	
L	TZ–A/BL (BUZH) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
Sensor Lead Wire Termination				
Standard				**Standard**
0	Flying leads – No springs on DIN plate			★
2	Terminal block – DIN 43762			★
3	Spring loaded adapter – 1/2-in. NPT			★

	Sensor Type		Temperature Range	
Standard				**Standard**
65 Only	1	RTD, Single Element, 4-wire	– 50 to 450 °C (–58 to 842 °F)	★
	2	RTD, Dual Element, 3-wire	– 50 to 450 °C (–58 to 842 °F)	★
	3	RTD, Single Element, 4-wire	–196 to 600 °C (–321 to 1112 °F)	★
	4	RTD, Dual Element, 3-wire	–196 to 600 °C (–321 to 1112 °F)	★
185 Only	03J1	Thermocouple, Type J, Single Element, Ungrounded	– 40 to 750 °C (–40 to 1382 °F)	★
	03K1	Thermocouple, Type K, Single Element, Ungrounded	– 40 to 1000 °C (–40 to 1832 °F)	★
	05J1	Thermocouple, Type J, Dual Element, Isolated, Ungrounded	– 40 to 750 °C (–40 to 1382 °F)	★
	05K1	Thermocouple, Type K, Dual Element, Isolated, Ungrounded	– 40 to 1000 °C (–40 to 1832 °F)	★
Expanded				
	03N1	Thermocouple, Type N, Single Element, Ungrounded	– 40 to 1000 °C (–40 to 1832 °F)	
	05N1	Thermocouple, Type N, Dual Element, Isolated, Ungrounded	– 40 to 1000 °C (–40 to 1832 °F)	

Extension		Head Connection	Instrument Connection	Material	
Standard					**Standard**
D	DIN Standard 12 x 1.5	M24 x 1.5	1/2-in NPT	Stainless Steel	★
T	DIN Standard 12 x 1.5	M24 x 1.5	M18 x 1.5	Stainless Steel	★
F	Nipple Union Nipple	1/2-in NPT	1/2-in NPT	Stainless Steel	★
J	Nipple Union (M/F)	no head	1/2-in NPT	Stainless Steel	★
N	No Extension (use when ordering the sensor alone, only available with Extension Length (N) code 0000)				★
W	No Extension Head Connection M24 x 1.5				★
L	No Extension Head Connection 1/2-in. NPT				★
Extension Length (N) in Millimeters					
Standard					**Standard**
0000	No extension – use with Extension Type code N				★
0035	35 mm				★
0080	80 mm – standard for Extension Type code J				★
0110	110 mm – standard for Extension Type codes F and J				★
0135	135 mm – standard for DIN Extension used with Rosemount Connection Head Material codes C, D, G, H, 1, and 2				★
0150	150 mm – standard for DIN Extension used with Form B Connection Head Material codes J and L				★
Expanded					
XXXX	Non-standard extension length – available from 35 to 500 mm				
Thermowell Material					
Standard					**Standard**
N	No thermowell				★
Sensor Length (L) in Millimeters					
Standard					**Standard**
0145	145 mm				★
0205	205 mm				★
0275	275 mm				★
0315	315 mm				★

TABLE 3. Series 65 Platinum RTD and 185 Thermocouple Without Thermowell

★ 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.

0375	375 mm	★
0405	405 mm	★
0435	435 mm	★
0555	555 mm	★
Expanded		
XXXX	Non-standard sensor length – available from min. 100 mm, max. 9999 mm	

Options (Include with selected model number)

Sensor Options (available with 65 only)		
Standard		**Standard**
A1	Single Element Class A sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7,9,0)	★
A2	Dual element Class A sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7,9,0)	★
Product Certifications		
Standard		**Standard**
I1	EEx ia – ATEX/IBExU Intrinsic Safety Approval	★
N1[(2)(3)]	EEx n – ATEX/CENELEC Type n Approval	★
E1[(3)]	EEx d – ATEX/CENELEC Flameproof Approval	★
ND[(3)]	ATEX Dust Ignition-proof Approval	★
E7[(3)]	SAA Flameproof Approval	★
E5[(3)]	FM Explosion-proof Approval	★
Ground Screw		
Standard		**Standard**
G1	External ground screw – only available with Rosemount Connection Head Material codes C, D, G, H, 1, and 2	★
Cover Chain Option		
Standard		**Standard**
G3	Cover Chain – only available with Rosemount Connection Head Material codes C, D, G, and H,	★
Extension Ring		
Standard		**Standard**
G6[(4)]	Aluminum Extension Ring for Dual Transmitter Mounting – use with Rosemount Connection Head Material Codes C and D.	★
Termination		
Standard		**Standard**
TB	Terminal Block for use with sensor termination code 3 and Rosemount Heads C, D, G, and H	★
Assemble To Option		
Standard		**Standard**
XA[(5)]	Assemble Sensor to Specific Temperature Transmitter (Teflon paste)	★
V Options (available with 65 only)		
Standard		**Standard**
V10	Works Certificate – Sensor Calibration from –50 to 450 °C (–58 to 842 °F) with A, B, C, and Callendar-Van Dusen Constants	★
V11	Works Certificate – Sensor Calibration from 0 to 100 °C (–32 to 212 °F) with A, B, C, and Callendar-Van Dusen Constants	★
Temperature Range (available with 65 only)		
Standard		**Standard**
X8	Works Certificate – Sensor Calibration Over Specified Temperature Range with A, B, C, and Callendar-Van Dusen Constants	★
Temperature Range Option		
Standard		**Standard**
LT	Special materials to meet extended temperature range of -51° C	★
Typical Model Number: 0065 C 2 3 D 0150 N 0315 A1		

(1) To maintain IP 68 rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.

(2) For complete assemblies or as replacement sensor for N-series, component parts are not approved. If the transmitter is mounted in a connection head, the Sensor Lead Wire Termination code 0 (flying leads) is required.

(3) Not available with Connection Head Material Codes J and L.

(4) Not valid with E5, E7, ND or E1 Approval.

(5) If ordering Assemble To Option XA with a transmitter, specify the same option on the transmitter model number.

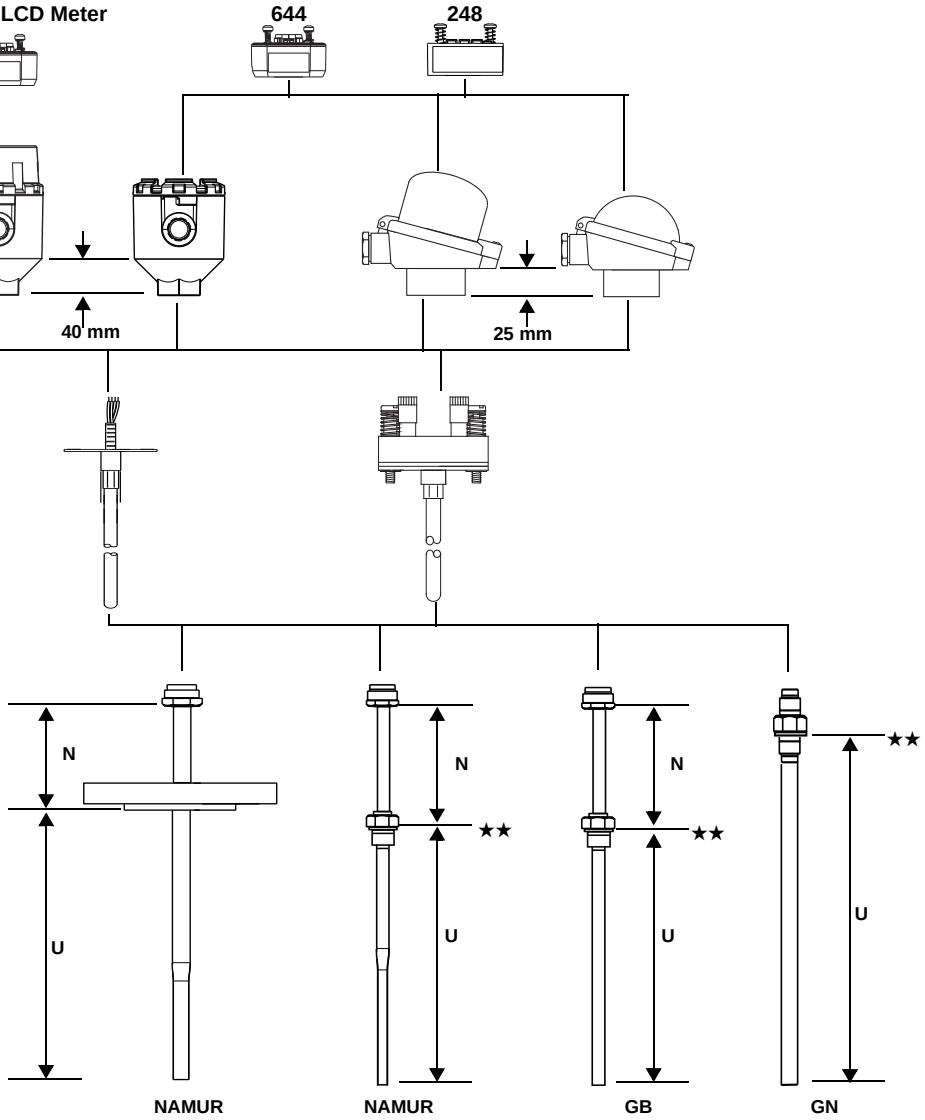
Tubular Thermowell Sensor Assemblies

HEAD OR FIELD MOUNT TRANSMITTERS

IP68 OR IP65, CONNECTION HEADS

SENSOR WITH FLYING LEADS OR TERMINAL BLOCK

THREADED AND FLANGED TUBULAR THERMOWELLS



★★ *For straight threading, N dimension references bottom of hex. For tapered threading, N dimension references thread engagement point (bottom of thread)*

TABLE 4. Tubular Thermowell Ratings

Type	Dimensions	Process Connection	Max. Flow Velocity (m/s)		Immersion length (mm)	Max. Pressure (bar)(1)	At Temperature (°C)			
			Air	Water		0	100	200	300	400
GN, GB	9 x 1 mm 1.4571 (316 Ti)	Screw Socket G1/2	25	3	160	50	48	44	40	36
					250	40	40	40	40	36
					400	18	18	18	18	18
GN,	11 x 2 mm 1.4571 (316 Ti)	Screw Socket G1	40	5	160	100	95	92	88	80
					250	50	50	50	50	50
					400	18	18	18	18	18
NAMUR	12 x 2.5 mm 1.4571 (316 Ti)	Screw Socket G1	40	5	160	100	100	100	100	100
					220	100	100	100	78	78
					280	100	100	100	55	55

(1) For immersion "U" length (mm)

TABLE 5. Series 65 Platinum RTD and 185 Thermocouple With Tubular Thermowell

★ 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	Resistance Thermometer, Pt 100 Ohm RTD Standard with Tubural Thermowell			
0185	Thermocouples, DIN EN 60584 (IEC 584) Class 1 with Tubular Thermowell			
Connection Head		**IP Rating(1)**	**Conduit / Cable Entry**	
Standard				**Standard**
C	Rosemount Aluminum	68	M20 x 1.5	★
D	Rosemount Aluminum	68	1/2-in. NPT	★
1	Rosemount Aluminum with LCD Meter Cover	68	M20 x 1.5	★
2	Rosemount Aluminum with LCD Meter Cover	68	1/2-in. NPT	★
N	No Connection Head			
Expanded				
G	Rosemount Stainless Steel	68	M20 x 1.5	
H	Rosemount Stainless Steel	68	1/2-in. NPT	
J	GR –A/BL (BUZ) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
L	TZ–A/BL (BUZH) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
Sensor Lead Wire Termination				
Standard				**Standard**
0	Flying Leads – No Springs on DIN plate			★
2	Terminal block – DIN 43762			★
3	Spring Loaded Adapter - 1/2-in. NPT (available with 185 only)			★
Sensor Type			**Temperature Range –valid for tolerance Class B Pt 100 only**	
Standard				**Standard**
65 Only 1	RTD, Single Element, 4-wire		– 50 to 450 °C (–58 to 842 °F)	★
65 Only 2	RTD, Dual Element, 3-wire		– 50 to 450 °C (–58 to 842 °F)	★
65 Only 3	RTD, Single Element, 4-wire		–196 to 600 °C (–321 to 1112 °F)	★
65 Only 4	RTD, Dual Element, 3-wire		–196 to 600 °C (–321 to 1112 °F)	★
185 Only 03J1	Thermocouple, Type J, Single Element, Ungrounded		– 40 to 750 °C (–40 to 1382 °F)	★
185 Only 03K1	Thermocouple, Type K, Single Element, Ungrounded		– 40 to 1000 °C (–40 to 1832 °F)	★
185 Only 05J1	Thermocouple, Type J, Dual Element, Isolated, Ungrounded		– 40 to 750 °C (–40 to 1382 °F)	★
185 Only 05K1	Thermocouple, Type K, Dual Element, Isolated, Ungrounded		– 40 to 1000 °C (–40 to 1832 °F)	★
Expanded				
03N1	Thermocouple, Type N, Single Element, Ungrounded		– 40 to 1000 °C (–40 to 1832 °F)	
05N1	Thermocouple, Type N, Dual Element, Isolated, Ungrounded		– 40 to 1000 °C (–40 to 1832 °F)	
Extension				
Standard				**Standard**
Y	Tubular, no Extension – form GN			★
Z	Tubular, with Extension – form GB, NAMUR, GC, FC			★
Extension Length (N) in MIllimeters				
Standard				**Standard**
0000	No extension – use with Extension Type code Y			★
0050	50 mm			★
0065	65 mm			★
0105	105 mm			★
0115	115 mm			★
0130	130 mm			★
0200	200 mm			★
0250	250 mm			★
Expanded				
XXXX	Non-standard extension length – available from 35 to 500 mm			
Thermowell Material				
Standard				**Standard**
D(2)	1.4404 (AISI 316L)			★
Y	1.4571 (AISI 316Ti)			★
Immersion Length (U) in Millimeters				
Standard				**Standard**
0050	50 mm			★
0075	75 mm			★
0100	100 mm			★
0115	115 mm			★
0130	130 mm			★
0150	150 mm			★
0160	160 mm			★
0200	200 mm			★

TABLE 5. Series 65 Platinum RTD and 185 Thermocouple With Tubular Thermowell

★ 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.

0220	220 mm			★
0225	225 mm			★
0250	250 mm			★
0280	280 mm			★
0300	300 mm			★
0345	345 mm			★
0400	400 mm			★
Expanded				
XXXX	Non-standard Immersion Length – available from 50 to 2500 mm			
Mounting Style		**Process Connections**	**Stem Style**	
Standard				**Standard**
G02	Thread, Tapered	R 1/2-in. (1/2-in. BSPT)	Stepped, NAMUR(3)	★
G04	Thread, Tapered	R 3/4-in. (3/4-in.BSPT)	Stepped, NAMUR(3)	★
G06	Thread, Tapered	R 1-in. (1-in. BSPT)	Stepped, NAMUR(3)	★
G13	Thread, Parallel	M27 x 2	Stepped, NAMUR(3)	★
G20	Thread, Parallel	G 1/2-in. (1/2-in. BSPF)	Stepped, NAMUR(3)	★
G22	Thread, Parallel	G 3/4-in. (3/4-in.BSPF)	Stepped, NAMUR(3)	★
G24	Thread, Parallel	G 1-in. (1-in. BSPF)	Stepped, NAMUR(3)	★
G91	Thread, Parallel	M20 x 1.5	Stepped, NAMUR(3)	★
G31	Thread, Parallel	M33 x 2	Stepped, NAMUR(3)	★
G38	Thread, Tapered	1/2-in. NPT	Stepped, NAMUR(3)	★
G40	Thread, Tapered	3/4-in. NPT	Stepped, NAMUR(3)	★
G42	Thread, Tapered	1-in. NPT	Stepped, NAMUR(3)	★
G52	Thread, Parallel	G 1/2-in. (1/2-in. BSPF)	Straight, GN, D. 9 x 1 mm(4)	★
G92	Thread, Parallel	M20 x 1.5	Straight, GN, D. 9 x 1 mm(4)	★
G63	Thread, Parallel	G 1/2-in. (1/2-in. BSPF)	Straight, GN, D. 11 x 2 mm(4)	★
G94	Thread, Parallel	M20 x 1.5	Straight, GN, D. 11 x 2 mm(4)	★
G72	Thread, Parallel	G 1/2-in. (1/2-in. BSPF)	Straight, GB, D. 9 x 1 mm(4)	★
G95	Thread, Parallel	M20 x 1.5	Straight, GB, D. 9 x 1 mm(4)	★
L02	Flange, RF	1-in. 150 lbs	Stepped, NAMUR(3)	★
L08	Flange, RF	1.5-in. 150 lbs	Stepped, NAMUR(3)	★
L14	Flange, RF	2-in. 150 lbs	Stepped, NAMUR(3)	★
L20	Flange, RF	1-in. 300 lbs	Stepped, NAMUR(3)	★
L26	Flange, RF	1.5-in. 300 lbs	Stepped, NAMUR(3)	★
L32	Flange, RF	2-in. 300 lbs	Stepped, NAMUR(3)	★
H02	Flange, Form B1 according to EN 1092-1	DN 25 PN 16	Stepped, NAMUR(3)	★
H08	Flange, Form B1 according to EN 1092-1	DN 25 PN 25/40	Stepped, NAMUR(3)	★
H14	Flange, Form B1 according to EN 1092-1	DN 40 PN 16	Stepped, NAMUR(3)	★
H20	Flange, Form B1 according to EN 1092-1	DN 40 PN 25/40	Stepped, NAMUR(3)	★
H26	Flange, Form B1 according to EN 1092-1	DN 50 PN 40	Stepped, NAMUR(3)	★

Options (Include with selected model number)

Sensor Options (available with 65 only)		
Standard		**Standard**
A1	Single Element Class A Sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7, 9, 0)	★
A2	Dual Element Class A Sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7, 9, 0)	★
Product Certifications		
Standard		**Standard**
I1	EEx ia – ATEX / IBExU Intrinsic Safety Approval	★
N1(5)(6)	EEx n – ATEX/CENELEC Type n Approval	★
E1(6)	EEx d – ATEX/CENELEC Flameproof Approval	★
ND(6)	ATEX Dust Ignition-proof	★
E7(6)	SAA Flameproof Approval	★
E5(6)	FM Explosion-proof Approval (consult factory for availability)	★
Ground Screw		
Standard		**Standard**
G1	External ground screws – only available with Rosemount Connection Head Material codes C, D, G, H, 1, and 2	★
Cover Chain Option		
Standard		**Standard**
G3	Cover Chain – only available with Rosemount Connection Head Material codes C, D, G, and H,	★

TABLE 5. Series 65 Platinum RTD and 185 Thermocouple With Tubular Thermowell

★ 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.

Extension Ring		
Standard		**Standard**
G6[7]	Aluminum Extension Ring for Dual Transmitter Mounting – use with Rosemount Connection Head Material Codes C and D.	★
Material Certification		
Standard		**Standard**
Q8	Thermowell Material Certification	★
External Pressure Test		
Standard		**Standard**
R01[8]	Thermowell External Pressure Testing	★
Dye Test		
Standard		**Standard**
R03	Thermowell Dye Penetration Testing	★
Special Cleaning		
Standard		**Standard**
R04	Thermowell Special Cleaning	★
Assemble To Options		
Standard		**Standard**
XA[9]	Assemble Sensor to Specific Temperature Transmitter (Teflon paste)	★
V Options (available with 65 only)		
Standard		**Standard**
V10	Works Certificate – Sensor Calibration from –50 to 450 °C (–58 to 842 °F) with A, B, C, and Callendar-Van Dusen Constants	★
V11	Works Certificate – Sensor Calibration from 0 to 100 °C (–32 to 212 °F) with A, B, C, and Callendar-Van Dusen Constants	★
Temperature Range (available with 65 only)		
Standard		**Standard**
X8	Works Certificate – Sensor Calibration Over Specified Temperature Range with A, B, C, and Callendar-Van Dusen Constants	★
Temperature Range Option		
Standard		**Standard**
LT	Special Materials to meet extended Temperature range of -51 °C	★
Typical Model Number: 0065 L 2 1 Z 0115 Y 0375 G20 XA		

(1) To maintain IP 68 rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.

(2) Process thread or process flange to be 316L material with a stem material of 316Ti. Not NAMUR compliant.

(3) NAMUR compliance only applicable with 316Ti material code "Y". Minimum immersion length of 115 mm. For u < 115 mm, use straight thermowell, 8 mm Diameter.

(4) Not available with Thermowell Material code D.

(5) For complete assemblies or as replacement sensor for type N-series, component parts are not approved. If the transmitter is mounted in a connection head, the Sensor Lead Wire Termination code 0 (flying leads) is requested.

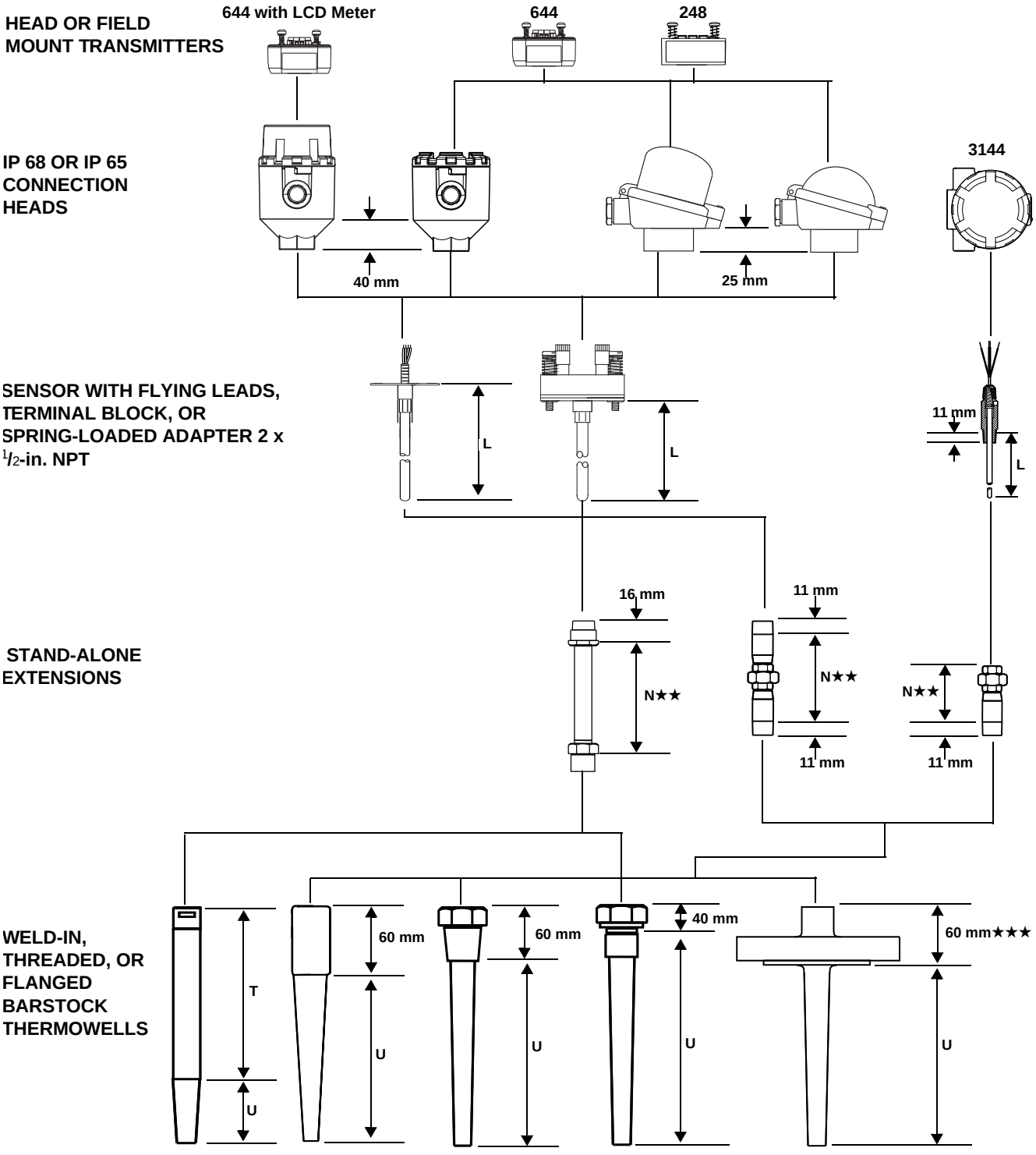
(6) Not available with Connection Head Material codes J and L.

(7) Not valid with E5, E7, ND, or E1 Approval.

(8) Not available with welded connection.

(9) If ordering Assemble To Option XA with a transmitter, specify the same option on the transmitter model number.

Barstock Thermowell Sensor Assemblies



★★ *N dimension measures from thread engagement point.*
★★★ *This dimension is 80 mm for 1500# and 2500# flanges.*

Sensors and Accessories (Metric)

TABLE 6. Series 65 Platinum RTD and 185 Thermocouple With Barstock Thermowell

★ 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	Resistance Thermometer, Pt 100 Ohm Standard with Barstock Thermowell			
0185	Thermocouples, DIN EN 60584 (IEC 584) Class 1 with Barstock Thermowell			
Connection Head Material		**IP Rating(1)**	**Conduit / Cable Entry**	
Standard				**Standard**
C	Rosemount Aluminum	68	M20 x 1.5	★
D	Rosemount Aluminum	68	1/2-in. NPT (cable entry)	★
1	Rosemount Aluminum with LCD Meter Cover	68	M20 x 1.5	★
2	Rosemount Aluminum with LCD Meter Cover	68	1/2-in. NPT	★
N	No Connection head			★
Expanded				
G	Rosemount Stainless Steel	68	M20 x 1.5 (cable entry)	
H	Rosemount Stainless steel	68	1/2-in. NPT (cable entry)	
J	GR –A/BL (BUZ) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
L	TZ–A/BL (BUZH) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
Sensor Lead Wire Termination				
Standard				**Standard**
0	Flying Leads – No Springs on DIN plate			★
2	Terminal Block – DIN 43762			★
3	Spring Loaded Adapter – 1/2-in. NPT – use with Extension Type codes J and N			★
Sensor Type			**Temperature Range –valid for tolerance Class B Pt 100 only**	
Standard				**Standard**
65 Only 1	RTD, Single Element, 4-wire		– 50 to 450 °C (–58 to 842 °F)	★
65 Only 2	RTD, Dual Element, 3-wire		– 50 to 450 °C (–58 to 842 °F)	★
65 Only 3	RTD, Single Element, 4-wire		–196 to 600 °C (–321 to 1112 °F)	★
65 Only 4	RTD, Dual Element, 3-wire		–196 to 600 °C (–321 to 1112 °F)	★
185 Only 03J1	Thermocouple, Type J, Single Element, Ungrounded		– 40 to 750 °C (–40 to 1382 °F)	★
185 Only 03K1	Thermocouple, Type K, Single Element, Ungrounded		– 40 to 1000 °C (–40 to 1832 °F)	★
185 Only 05J1	Thermocouple, Type J, Dual Element, Isolated, Ungrounded		– 40 to 750 °C (–40 to 1382 °F)	★
185 Only 05K1	Thermocouple, Type K, Dual Element, Isolated, Ungrounded		– 40 to 1000 °C (–40 to 1832 °F)	★
Expanded				
03N1	Thermocouple, Type N, Single Element, Ungrounded		– 40 to 1000 °C (–40 to 1832 °F)	
05N1	Thermocouple, Type N, Dual Element, Isolated, Ungrounded		– 40 to 1000 °C (–40 to 1832 °F)	
Extension		**Head Connection**	**Instrument Connection**	**Materials**	
Standard					**Standard**
D	DIN Standard 12 x 1.5	M24 x 1.5	1/2-in NPT	Stainless Steel	★
T(2)	DIN Standard 12 x 1.5	M24 x 1.5	M18 x 1.5	Stainless Steel	★
F	Nipple Union Nipple	1/2-in NPT	1/2-in NPT	Stainless Steel	★
J	Nipple Union (MF)	(No Head)	1/2-in NPT	Stainless Steel	★
N	No Extension (only available with Extension length (N) code 0000)				★
Extension Length (N) in Millimeters					
Standard					**Standard**
0000	No extension – use with Extension Type code N				★
0035	35 mm				★
0080	80 mm– standard for Extension Type code J				★
0110	110 mm – standard for Extension Type codes F and J				★
0135	135 mm – standard for DIN Extension used with Rosemount Connection Head Material codes C, D, G, H, 1, and 2				★
0150	150 mm – standard for DIN Extension used with Form B Connection Head Material codes J and L				★
Expanded					
XXXX	Non-standard extension length – available from 35 to 500 mm				
Thermowell Material					
Standard					**Standard**
D	1.4404 (AISI 316L)				★
Y	1.4571 (AISI 316Ti)				★
Code	**Immersion Length (U)**				
Standard					**Standard**
0065	65 mm				★
0075	75 mm				★
0115	115 mm				★
0125	125 mm				★
0150	150 mm				★

TABLE 6. Series 65 Platinum RTD and 185 Thermocouple With Barstock Thermowell

★ 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.

0225	225 mm			★
0300	300 mm			★
0450	450 mm			★
Expanded				
XXXX	Non-standard immersion length – available from 80 to 1000 mm in 5mm increments			
Code	**Thermowell Mounting Style**	**Process Connections**	**Stem Style**	
Standard				**Standard**
T08	Threaded	R 1/2-in. (1/2-in. BSPT)	Tapered	★
T10	Threaded	R 3/4-in. (3/4-in.BSPT)	Tapered	★
T12	Threaded	R 1-in. (1-in. BSPT)	Tapered	★
T26	Threaded	G 1/2-in. (1/2-in. BSPF)	Tapered	★
T28	Threaded	G 3/4-in. (3/4-in.BSPF)	Tapered	★
T30	Threaded	G 1-in. (1-in. BSPF)	Tapered	★
T44	Threaded	1/2-in. NPT	Tapered	★
T46	Threaded	3/4-in. NPT	Tapered	★
T48	Threaded	1-in. NPT	Tapered	★
T93	Threaded	M27 x 2	Tapered	★
T95	Threaded	M33 x 2	Tapered	★
T98	Threaded	M20 x 1.5	Tapered	★
F04	Flanged, RF	1-in. 150 lbs	Tapered	★
F10	Flanged, RF	1.5-in. 150 lbs	Tapered	★
F16	Flanged, RF	2-in. 150 lbs	Tapered	★
F22	Flanged, RF	1-in. 300 lbs	Tapered	★
F28	Flanged, RF	1.5-in. 300 lbs	Tapered	★
F34	Flanged, RF	2-in. 300 lbs	Tapered	★
F40	Flanged, RF	1-in. 600 lbs	Tapered	★
F46	Flanged, RF	1.5-in. 600 lbs	Tapered	★
F52	Flanged, RF	2-in. 600 lbs	Tapered	★
F58(3)	Flanged, RF	1-in. 900/1500 lbs	Tapered	★
F64(3)	Flanged, RF	1.5-in. 900/1500 lbs	Tapered	★
F70(3)	Flanged, RF	2-in. 900/1500 lbs	Tapered	★
F82	Flanged, RF	1.5 in., 2500 lbs.	Tapered	★
F88	Flanged, RF	2 in. 2500 lbs.	Tapered	★
D04	Flange, Form B1 according to EN 1092-1	DN 25 PN 16	Tapered	★
D10	Flange, Form B1 according to EN 1092-1	DN 25 PN 25/40	Tapered	★
D16	Flange, Form B1 according to EN 1092-1	DN 40 PN 16	Tapered	★
D22	Flange, Form B1 according to EN 1092-1	DN 40 PN 25/40	Tapered	★
D28	Flange, Form B1 according to EN 1092-1	DN 50 PN 40	Tapered	★
W10	Welded	3/4-in. pipe	Tapered	★
W12	Welded	1-in. pipe	Tapered	★
W14	Welded	1 1/4-in. pipe	Tapered	★
W16	Welded	1 1/2-in. pipe	Tapered	★
E01	D1 welded	24h7	Tapered	★
E02	D2 welded	24h7	Tapered	★
E04	D4 welded	24h7	Tapered	★
E05	D5 welded	24h7	Tapered	★

Options (Include with selected model number)

Sensor Options (available with 65 only)		
Standard		**Standard**
A1	Single Element Class A sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7, 9, 0)	★
A2	Dual element Class A sensor from –50 to 450 °C (–58 to 842 °F) (0 °C to 350 °C for Sensor Types 7, 9, 0)	★
Product Certifications		
Standard		**Standard**
I1	EEx ia – ATEX/IBExU Intrinsic Safety Approval	★
N1(4)(5)	EEx n – ATEX/CENELEC Type n Approval	★
E1(5)	EEx d – ATEX/CENELEC Flameproof Approval	★
ND(5)	ATEX Dust Ignition-proof Approval	★
E7(5)	SAA Flameproof Approval	★
E5(5)	FM Explosion-proof Approval (consult factory for availability)	★
Ground Screw		
Standard		**Standard**
G1	External Ground Screw – only available with Rosemount Connection Head Material codes C, D, G, H, 1, and 2	★
Cover Chain Option		
Standard		**Standard**
G3	Cover Chain – only available with Rosemount Connection Head Material codes C, D, G, and H,	★

TABLE 6. Series 65 Platinum RTD and 185 Thermocouple With Barstock Thermowell

★ 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.

Extension Ring		
Standard		**Standard**
G6[6]	Aluminum Extension Ring for Dual Transmitter Mounting – use with Rosemount Connection Head Material Codes C and D.	★
Termination		
Standard		**Standard**
TB	Terminal Block for use with sensor termination code 3 and Connection Heads C, D, G, and H	★
Material Certification		
Standard		**Standard**
Q8	Thermowell material certification, DIN EN 10204 3.1	★
External Pressure Test		
Standard		**Standard**
R01	Thermowell External Pressure Testing	★
Internal Pressure Test		
Standard		**Standard**
R22	Thermowell Internal Pressure Testing	★
Dye Test		
Standard		**Standard**
R03	Thermowell Dye Penetration Testing	★
Special Cleaning		
Standard		**Standard**
R04	Thermowell Special Cleaning	★
NACE Approval		
Standard		**Standard**
R05[7]	Thermowell NACE Approval	★
Plug/Chain		
Standard		**Standard**
R06	Stainless Steel Plug and Chain	★
Weld Options		
Standard		**Standard**
R07	Full Penetration Weld - for flanged thermowells only	★
Wake Frequency		
Standard		**Standard**
R21	Wake Frequency – Thermowell Strength Calculation	★
Assemble To Options		
Standard		**Standard**
XA[8]	Assemble Sensor to Specific Temperature Transmitter (Teflon paste)	★
Temperature Range Option		
Standard		**Standard**
LT	Special Material to meet extended Temperature range of -51° C	★
Typical Model Number: 0065 G 2 2 D 0135 D 0225 F70 Q8 R01 R07		

(1) To maintain IP 68 rating, use a suitable cable gland on the conduit connection thread. All threads must be sealed with a suitable sealing tape.

(2) Only available with Thermowell Mounting Style codes E01, E02, E04, and E05.

(3) Standard T-length is 80 mm, full penetration option R07 must be ordered.

(4) For complete assemblies or as replacement sensor for type N-series, component parts are not approved. If the transmitter is mounted in a connection head, the Sensor Lead Wire Termination code 0 (flying leads) is requested.

(5) Not available with Connection Head Material codes J and L.

(6) Not valid with E5, E7, ND, or E1 Approval

(7) Valid for thermowell material code D AISI 316L (1.4404) only.

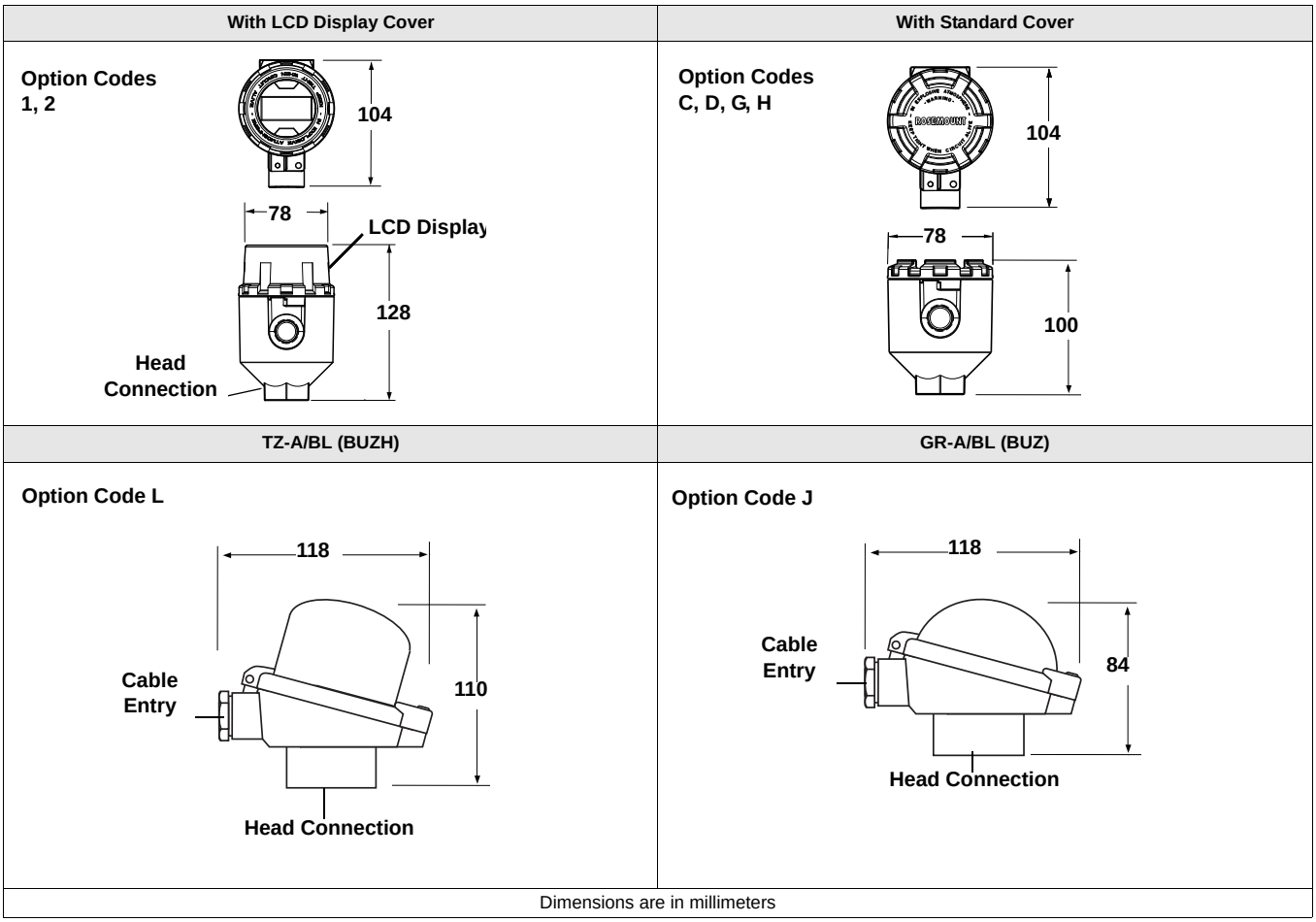
(8) If ordering Assemble To Option XA with a transmitter, specify the same option on the transmitter model number.

Accessories

TABLE 7. Connection Head

Part Number	Model/Material	IP Rating	Conduit Connection	Process Connection
00644-4410-0011	Rosemount, Aluminium	68	1/2-inch NPT	1/2-inch NPT
00644-4410-0013	Rosemount, Aluminium	68	1/2-inch NPT	M24 x 1.5
00644-4410-0021	Rosemount, Aluminium	68	M20 x 1.5	1/2-inch NPT
00644-4410-0023	Rosemount, Aluminium	68	M20 x 1.5	M24 x 1.5
00644-4410-0111	Rosemount, Aluminium with LCD Display Cover	68	1/2-inch NPT	1/2-inch NPT
00644-4410-0113	Rosemount, Aluminium with LCD Display Cover	68	1/2-inch NPT	M24 x 1.5
00644-4410-0121	Rosemount, Aluminium with LCD Display Cover	68	M20 x 1.5	1/2-inch NPT
00644-4410-0123	Rosemount, Aluminium with LCD Display Cover	68	M20 x 1.5	M24 x 1.5
00644-4411-0011	Rosemount, Stainless Steel	68	1/2-inch NPT	1/2-inch NPT
00644-4411-0013	Rosemount, Stainless Steel	68	1/2-inch NPT	M24 x 1.5
00644-4411-0021	Rosemount, Stainless Steel	68	M20 x 1.5	1/2-inch NPT
00644-4411-0023	Rosemount, Stainless Steel	68	M20 x 1.5	M24 x 1.5
00644-4196-0023	GR–A/BL (BUZ), Aluminum	65	M20 x 1.5	M24 x 1.5
00644-4197-0023	TZ–A/BL (BUZH), Aluminum	65	M20 x 1.5	M24 x 1.5

FIGURE 5. Connection Head Dimensional Drawing

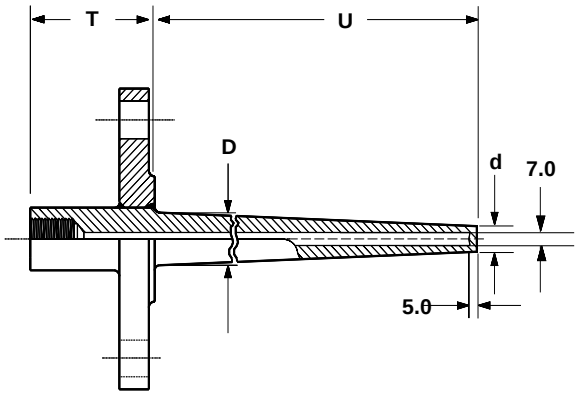


Series 96 Barstock Thermowells

U = Immersion Length D = Stem Diameter TL = Total Length T = Lagging Length

Dimensions in millimeters

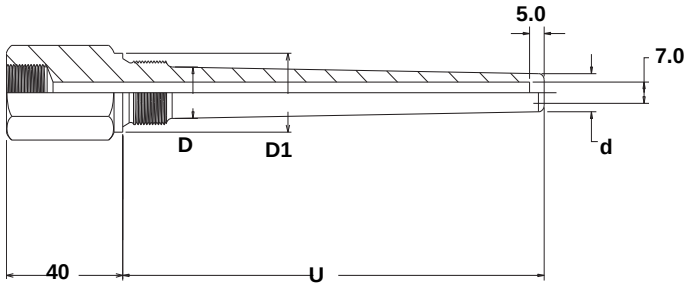
Flanged Barstock Thermowell – Tapered



Flange Size	D	d	T
1-in. 150 – 1500 lbs, DN 25	19	12.5	60
1 1/2 to 2-in. 150 – 600 lbs, DN40 - 50	26.5	18	60
1.5 to 2-in. 900/1500	26.5	18	80

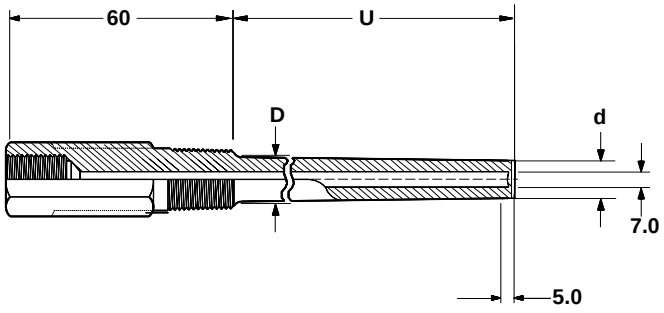
Note: Flanged thermowells generally conform to the specifications of ASME B 16.5 (ANSI) and DIN EN 1092-1.

Threaded Barstock Thermowell – Parallel Thread



Parallel Thread Size	D	D1	d
1/2-in. BSPF (G1/2); M20 x 1.5	17	26	12.5
3/4-in. BSPF (G3/4)	19	32	12.5
1-in. BSPF (G1)	26.5	39	18
M24 x 1.5	19	29	12.5

Threaded Barstock Thermowell – Tapered Thread



Tapered Thread Size	D	d
1/2-in. NPT ; M20 x 1.5	17	12.5
3/4-in. NPT	19	12.5
1-in. NPT	26.5	18

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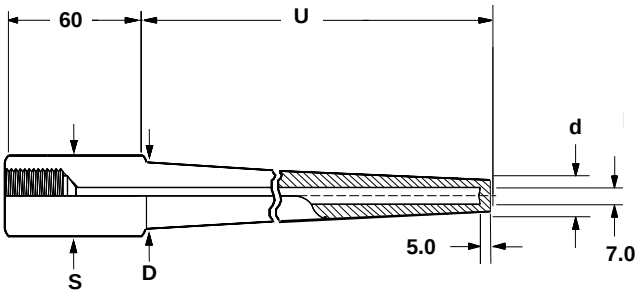
U = Immersion Length D = Stem Diameter TL = Total Length T = Lagging Length

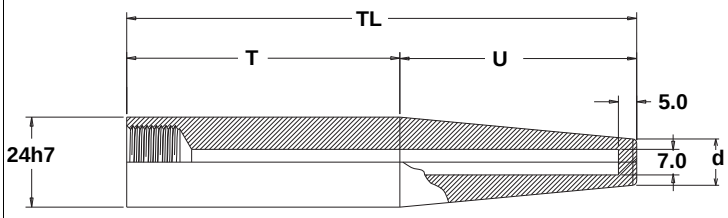
Dimensions in millimeters

Weld-in Barstock Thermowell (codes W10, W12, W14, W16)



Socket Size	S	D	d
3/4-in.	26.7	19.0	12.5
1-in.	33.4	19.0	12.5
1 1/4-in.	42.2	19.0	12.5
1 1/2-in.	48.3	19.0	12.5

Weld-in Barstock Thermowell (codes E01, E02, E04, E05)



Previous DIN Form	D1	D2	D4	D5	d
TL	140	200	200	260	12.5
U	65	125	65	125	12.5
T	75	75	135	135	12.5

TABLE 8. Series 96 Barstock Thermowell

★ 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			
0096	Barstock Thermowell			
Thermowell Material[(1)]				
Standard				**Standard**
D	1.4404 (AISI 316L)			★
Y	1.4571 (AISI 316Ti)			★
Immersion Length (L) in Millimeters				
Standard				**Standard**
0065	65 mm – standard length for weld-in thermowells, E01 and E04			★
0075	75 mm			★
0115	115 mm			★
0125	125 mm – standard length for weld-in thermowells, E02 and E05			★
0150	150 mm			★
0225	225 mm			★
0300	300 mm			★
0450	450 mm			★
Expanded				
XXXX	Non-standard immersion length			
Thermowell Mounting Style		**Process Connections**	**Stem Style**	
Standard				**Standard**
T08	Thread	R 1/2-in. (1/2-in. BSPT)	Tapered	★
T10	Thread	R 3/4-in. (3/4-in.BSPT)	Tapered	★
T12	Thread	R 1-in. (1-in. BSPT)	Tapered	★
T26	Thread	G 1/2-in. (1/2-in. BSPF)	Tapered	★
T28	Thread	G 3/4-in. (3/4-in.BSPF)	Tapered	★
T30	Thread	G 1-in. (1-in. BSPF)	Tapered	★
T44	Thread	1/2-in. NPT	Tapered	★
T46	Thread	3/4-in. NPT	Tapered	★
T48	Thread	1-in. NPT	Tapered	★
T93	Thread	M27 x 2	Tapered	★
T95	Thread	M33 x 2	Tapered	★
T98	Thread	M20 x 1.5	Tapered	★
F04	Flange, RF	1-in. 150 lbs	Tapered	★
F10	Flange, RF	1.5-in. 150 lbs	Tapered	★
F16	Flange, RF	2-in. 150 lbs	Tapered	★
F22	Flange, RF	1-in. 300 lbs	Tapered	★
F28	Flange, RF	1.5-in. 300 lbs	Tapered	★
F34	Flange, RF	2-in. 300 lbs	Tapered	★
F40	Flange, RF	1-in. 600 lbs	Tapered	★
F46	Flange, RF	1.5-in. 600 lbs	Tapered	★
F52	Flange, RF	2-in. 600 lbs	Tapered	★
F58[(2)]	Flanged, RF	1-in. 900/1500 lbs	Tapered	★
F64[(2)]	Flanged, RF	1.5-in. 900/1500 lbs	Tapered	★
F70[(2)]	Flanged, RF	2-in. 900/1500 lbs	Tapered	★
F82	Flanged, RF	1.5 in 2500 lbs	Tapered	★
F88	Flanged, RF	2 in. 2500 lbs	Tapered	★
D04	Flange, Form B1 according to EN 1092-1	DN 25 PN 16	Tapered	★
D10	Flange, Form B1 according to EN 1092-1	DN 25 PN 25/40	Tapered	★
D16	Flange, Form B1 according to EN 1092-1	DN 40 PN 16	Tapered	★
D22	Flange, Form B1 according to EN 1092-1	DN 40 PN 25/40	Tapered	★
D28	Flange, Form B1 according to EN 1092-1	DN 50 PN 40	Tapered	★
W10	Welded	3/4-in. pipe	Tapered	★
W12	Welded	1-in. pipe	Tapered	★
W14	Welded	1 1/4-in. pipe	Tapered	★
W16	Welded	1 1/2-in. pipe	Tapered	★
E01	D1 welded, DIN	24h7	Tapered	★
E02	D2 welded, DIN	24h7	Tapered	★
E04	D4 welded, DIN	24h7	Tapered	★
E05	D5 welded, DIN	24h7	Tapered	★
Lagging Length				
Standard				**Standard**
T040	40 mm – valid for Mounting style codes T26, T28, T30, T93, T95, and T98			★
T060	60 mm			★
T075	75 mm – valid for weld-in thermowells codes E01 and E02			★
T080	80 mm – valid for flanged thermowells codes F58, F64, F70			★
T135	135 mm – valid for weld-in thermowells codes E04 and E05			★

TABLE 8. Series 96 Barstock Thermowell

★ 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.

Expanded		
TXXX	Non Standard Lagging Length	
Instrument Connection Thread Type		
Standard		**Standard**
A	M24 x 1.5	★
D	1/2-in. NPT	★
T	M18 x 1.5 – valid for weld-in thermowells codes E01, E02, E04, and E05	★

Options (Include with selected model number)

Material Certification		
Standard		**Standard**
Q8	Thermowell Material Certification	★
External Pressure Test		
Standard		**Standard**
R01	Thermowell External Pressure Testing (flanged thermowells only)	★
Internal Pressure Test		
Standard		**Standard**
R22	Thermowell Internal Pressure Test	★
Dye Test		
Standard		**Standard**
R03	Thermowell Dye Penetration Testing	★
Special Cleaning		
Standard		**Standard**
R04	Thermowell Special Cleaning	★
NACE Approval		
Standard		**Standard**
R05(3)	Thermowell NACE Approval	★
Plug/Chain		
Standard		**Standard**
R06	Stainless Steel Plug and Chain	★
Weld Options		
Standard		**Standard**
R07	Full Penetration Weld - for flanged thermowells only	★
Flange Type		
Standard		**Standard**
R16	Ring Joint Flange Face	★
Wake Frequency		
Standard		**Standard**
R21	Wake Frequency – Thermowell Strength Calculation	★
Typical Model Number: 0096 D 0300 F04 T060 D Q8 R01		

(1) Additional materials are available upon request.
(2) Standard T-length is 80 mm, full penetration option R07 must be ordered.
(3) Not available with Thermowell Material code Y.

Thermowell Strength Calculation

Pressure and Flow Vibration

The strength of a thermowell depends on several parameters relating thermowell construction to the installation environment. For most industrial applications, standard Rosemount thermowells provide the necessary strength if the material, style, and length are correct for the application. The proper selection of a thermowell depends on fluid type, temperature, pressure, and fluid velocity. Most thermowell failures are caused by vibration that is induced by fluid flow.

Emerson has a design system for the correct selection of thermowells. This selection service is available for a nominal charge, and to take advantage of this service, complete and return the Thermowell Strength Calculation to your local Emerson Process Management representative.

Emerson includes three possible failure modes in conjunction with thermowell analysis:

Flow-Induced Vibration

Fluid flow past a thermowell causes vortices to be shed from the well at a wake frequency proportional to the flow velocity. If the wake frequency is at or near the natural frequency of a given thermowell, a resonance condition may cause massive amounts of energy to be absorbed by the thermowell. This results in very high stresses and possible failures. Even if the thermowell does not fail, the sensor capsule may be subjected to severe levels of shock and vibration, resulting in erroneous readings or total sensor failure.

The ASME technique requires that the ratio of wake frequency to the natural frequency of a thermowell be less than 0.8. If the ratio is greater than 0.8, a user has two options:

1. Reducing the flow velocity or use a larger diameter thermowell; or
2. Use a stronger thermowell configuration (a different thermowell type or material, or a shorter length thermowell).

Flow-Induced Stress

Fluid flow, a function of flow velocity and density, causes force to be exerted on the thermowell. The flow-induced stress is calculated and compared with the material strength of the thermowell.

Process Pressure

The maximum static pressure that a thermowell stem can undergo is calculated.

NOTE
The thermowell analysis process is an aid in choosing thermowells for specific applications. It is based upon accepted theoretical methods and not meant to be a guarantee against thermowell failure.

Application Data Sheet

Calculations conducted per ASME/ANSI PTC 19.3 but with Strouhal number varying with Reynolds number. Please complete and fax to appropriate locations at the bottom of this form.

Company Information

Requesting Company:	Phone:	Fax:
Contact	Tag Number	
End Customer	Date of Request:	

Thermowell Information (Information for either (a), (b), (c), or (d) required)

a) Rosemount Thermowell Part Number (example 0096D0300F04T060DQ8R01):

b) Rosemount Sensor Model Number (example 0065C21D0135D0300T12):

c) Customer Drawing Number

d) Generic Thermowell Information:

Thermowell Material:

Stem Style: ❒ Straight ❒ Stepped ❒ Tapered

Mounting Style: ❒ Threaded ❒ Welded ❒ Flanged

If flanged, specify: ❒ ANSI/ASME ❒ DIN

Size: Class:

Thermowell Immersion Length (U):

Thermowell Bore Diameter (D):

Thermowell Lagging Length (T):

Tip Diameter (A):

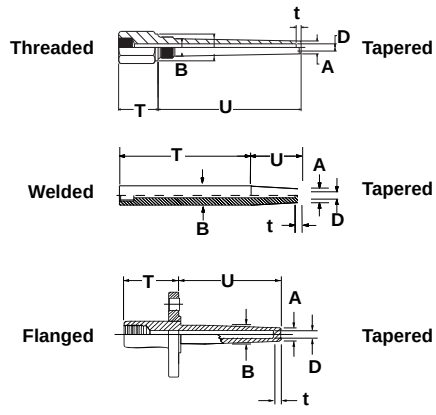
Tip Thickness (t):

Length from Tip to Support (U):

Root Diameter (B)(1):

Length of Tip Diameter (Z):

Mounting Style **Stem Style**



Service: ❒ Liquid	❒ Gas	❒ Steam	Fluid Description:				
Operating Fluid Flow Rate: Maximum							
Operating Fluid Flow Rate Units:							
❒ gal/s	❒ gal/min	❒ gal/hr	❒ l/s	❒ l/min	❒ l/hr	❒ ft/s	❒ ft^3/min
❒ ft^3/hr	❒ bbl/hr	❒ impgal/s	❒ impgal/min	❒ impgal/hr	❒ m/s	❒ m^3/min	❒ m^3/hr
❒ shton/hr	❒ lb/hr	❒ kg/s	❒ kg/hr	❒ other:			

Operating Max. Fluid Pressure:	❒Gauge ❒Absolute	Operating Min. Fluid Pressure:	❒Gauge ❒Absolute
Pressure Units:		Pressure Units:	
Operating Fluid Temperature:	❒°F ❒°C	**Viscosity:**	❒kg/m•s (Pa•s) ❒Centipoise
Operating Fluid Density:	❒ kg/m^3 ❒ lbm/ft^3	**or Specific Volume/Density:**	❒at process conditions ❒at standard conditions (STP)

Process Pipe Size:		Pipe Standoff Height:	
Process Pipe Size:		Standoff Schedule:	
		or Standoff Internal Diameter:	

For Rosemount Internal Use Only

Rosemount Order/Quotation #	Line Item #	Ship Set #	ID #
Customer Order/Item #	Salesperson:		
Cont. Admin.	Tech. Specialist:		

(1) Same as A for straight thermowells.

Product Data Sheet
00813-0200-2654, Rev HA
April 2010

Sensors and Accessories (Metric)

Emerson Process Management

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Singapore 128461
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0081-0200-2654 Rev HB 4/10

EMERSON™
Process Management

Product Data Sheet
00813-0100-4951, Rev AB
April 2010

Rosemount 1067 Compact Sensor and 1097 Thermowell

- *RTD and Thermocouple single and dual sensor models (1067 Model)*
- *Wide selection of materials available for thermowells (1097 Model)*
- *Integrated temperature assembly is available with Rosemount 248 and 644 Temperature Transmitters*

Content

Reliable and Superior Performance

The Rosemount 1067 sensor and 1097 thermowell provide a reliable solution for your temperature measurement needs. These products are high quality, deliver superior performance, and can be used in a wide variety of applications.

Globally Available, Locally Supported

The Rosemount 1067 sensors and 1097 thermowells are manufactured worldwide to provide the best delivery and support system. An extensive network provides for timely and local support and service capabilities at key locations.

Increased Performance

The Rosemount 1067 is a DIN style sensor that is available in a wide variety of sensing technologies (RTDs and various thermocouples). All sensor styles and lengths are available in 6 mm (standard) and 3 mm diameters which allows for a quicker response time.

A standard feature on all 1097 flanged thermowells is the full penetration weld. Tapered tips allow for a faster response time, and integral thermowell extensions eliminate components to provide a simplified configuration.

Streamlined Operations and Maintenance

The DIN style sensor uses internal connection head mounting for quick replacement while maintaining environmental integrity. With simplified sensor replacement and maintenance, the DIN style Rosemount 1067 sensor saves your company time and money.

Complete Temperature Assemblies Reduce Costs

Installing a complete temperature assembly reduces engineering, procurement, and installation costs with just one integrated solution. The transmitter, sensor, and thermowell arrive fully assembled, calibrated and tested for immediate installation into your process. Additionally, pairing the Rosemount sensor and transmitter allows you to take advantage of performance enhancing features, such as Transmitter-Sensor Matching and other sensor diagnostics.

TEMPERATURE SOLUTIONS

Rosemount 644 Temperature Transmitter

Head mount styles available with HART® or FOUNDATION™ fieldbus protocol. Rail mount style available for HART protocol.

Rosemount 848T Temperature Transmitter

Eight input transmitter available with FOUNDATION fieldbus protocol.

Rosemount 248 Temperature Transmitter

Head mount (DIN B) and rail mount style with HART protocol and complete temperature assembly.

Rosemount 648 Wireless Temperature Transmitter

The Rosemount 648 integrates temperature measurement into a self-organizing wireless network, providing best in class security, reliability, SmartPower™ capabilities, and network scalability, optimizing plant performance while minimizing maintenance.

Rosemount 3144P

Field mount style HART® or FOUNDATION fieldbus protocol. Dual sensor input with advanced diagnostics.

Overview

Rosemount 1067 Overview

Emerson offers a wide range of RTDs and thermocouples alone, or as complete point solutions including Rosemount Temperature Transmitters, connection heads, and thermowells.

Rosemount 1067 Platinum RTD Temperature Sensors are highly linear and have a stable resistance versus temperature relationship. They are used primarily in industrial environments where high accuracy, durability, and long-term stability are required, and are designed to meet the most critical parameters of international standards: IEC 751 1983/DIN EN 60751 incorporating Amendments 1 and 2.(1) Standardization provides sensor interchangeability with no transmitter circuitry adjustment required. Rosemount 1067 RTD sensors offer enhanced performance and optimal temperature measurement accuracy when coupled with temperature transmitters using Callendar-van Dusen constants.

A thermocouple is a junction between two dissimilar metals that produces a change in thermoelectric emf in relationship to a temperature change. Rosemount 1067 Thermocouple sensors are manufactured from selected materials to meet IEC 60584 Tolerance Class 1 and ISA MC96.1 Special Limits. The junction is laser welded to form a pure joint that maintains the integrity of the circuit and ensures accuracy. A sensor sheath protects ungrounded junctions from the environment. The ungrounded and isolated junctions provide electrical isolation from the sensor sheath.

Rosemount 1067 Thermocouples conform to IEC 60584 or ISA MC96.1 and are available in types E, J, K, N, R, S and T. They are available in two configurations: single sensor ungrounded, or dual sensor ungrounded and isolated.

All of the sensors are available in a variety of lengths and ranges with flying lead or terminal block lead wire terminations.

Rosemount 1097 Overview

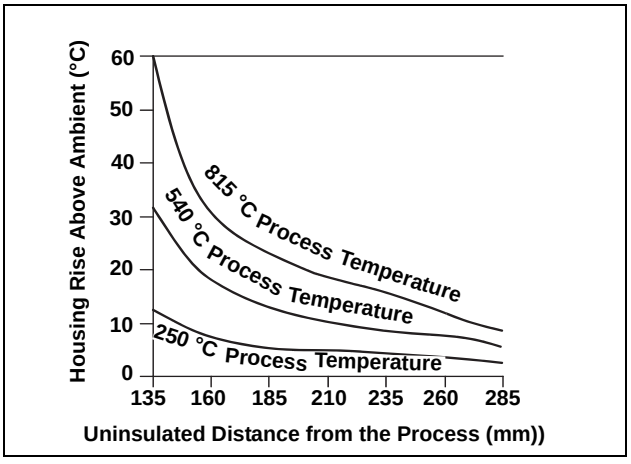
Emerson offers thermowells in a wide range of materials, styles, and lengths for most industrial applications. Standard materials include SST 316L and SST 304L, but other materials are available for corrosive environments. Please consult with your Emerson representative for information on additional material availability.

Emerson also provides engineering services and reports to ensure the proper thermowell is used for your application.

Selecting the Lagging Length for a Thermowell

A direct mounting configuration allows heat from the process, aside from ambient temperature variations, to transfer from the thermowell to the transmitter housing. If the expected process temperature is near or above the transmitter specification limits, consider using additional thermowell lagging length or a remote mounting configuration to isolate the transmitter. Figure 1 provides an example of the relationship between transmitter housing temperature rise and distance from the process. The following example and Figure 1 can be used as a guide to determine adequate thermowell lagging length.

FIGURE 1. Transmitter Housing Temperature Rise vs. Uninsulated Distance from the Process



(1) 100 Ω at 0 °C, α = 0.00385 Ω x °C/Ω

Example

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

As shown in Figure 1, an uninsulated distance from the process of 90 mm will result in a housing temperature rise of 22 °C. Therefore, 100 mm would be the minimum recommended distance from the process providing a safety factor of about 25 °C. A longer length, such as 150 mm, is desired to reduce errors caused by transmitter temperature effect, although in that case the transmitter may require extra support.

THERMOWELL STRENGTH CALCULATION

Pressure and Flow Vibration

Best engineering practices recommend performing an analysis of the thermowell strength for a specific application to prevent thermowell and sensor breakage. Proper selection of a thermowell depends on fluid type, temperature, pressure and fluid velocity.

To select the correct thermowell, Emerson Process Management has a design system available for a nominal fee. Simply complete the “Welded Barstock Thermowell (3 mm)” on page 24 and return it to your local Emerson representative.

There are three possible failure modes considered in an Emerson thermowell analysis:

Flow-Induced Vibration

Fluid flow past a thermowell can cause vortices to be shed from the thermowell as a wake frequency proportional to the flow velocity. If the wake frequency is at, or near, the natural frequency of a given thermowell, a resonance condition may cause large amounts of energy to be absorbed by the thermowell resulting in very high stress and possible failure. If the thermowell does not fail, the sensor capsule may be subjected to high levels of shock and vibration resulting in erroneous readings, or in total sensor failure.

The ASME technique requires the ratio of wake frequency to natural frequency of a thermowell to be less than 0.8. For a ratio greater than 0.8, two options are available:

1. Shorten the immersion length; or
2. Change the thermowell material.

Flow-Induced Stress

Fluid flow is a function of flow velocity and density, and can cause force to be exerted on the thermowell. The flow-induced stress is calculated and compared with the material strength of the thermowell.

Process Pressure

The maximum static pressure a thermowell stem can undergo is calculated.

NOTE
The thermowell analysis process helps to choose thermowells for specific applications. It is based on accepted theoretical methods and is not a guarantee against thermowell failure.

Specifications

Rosemount 1067 Platinum RTD

100 Ω RTD at 0 °C,
α = 0.00385 Ω x °C/Ω.

Temperature Range

–196 to 600 °C (-320.8 to 1112 °F)

Insulation Resistance

1,000 MΩ minimum insulation resistance when measured at 500 Vdc and at room temperature

Sheath Material

316 SST / 321 SST with mineral-insulated cable construction

Lead Wire

PTFE insulated, 24 AWG, silver-plated copper wire. See Figure 2 for wire configuration

Ingress Protection (IP) Ratings

For information see Table 8 on page 22

Self Heating

0.15 K/mW when measured per method defined in DIN EN 60751:1996

Thermal Response Time

9 seconds maximum required to reach 50% sensor response when tested in flowing water according to IEC 751

Rosemount 1067 Thermocouple

Temperature Range

See Table 1 and Table 2.

Insulation Resistance

1 000 MΩ minimum insulation resistance when measured at 500 Vdc and at room temperature.

Sheath Material

Rosemount thermocouples are made of a mineral insulated cable design with a variety of sheath materials available to suit both the temperature and the environment. For temperature up to 800 °C (1472 °F) in air, the sheath is made from 321 SST. For temperatures above 800 °C (1472 °F) in air, the sheath is made from Alloy 600. For strongly oxidizing or reducing atmospheres, consult your local Emerson representative for information.

Lead Wires

Thermocouple, internal – 19 AWG solid wire (max) and 21 AWG solid wire (min.). External extension leads, Type E, J, K, N, R, S and T. PTFE insulated. 20 AWG (max.) and 24 AWG (min.) Color coded per IEC 60584 or ISA MC96.1. Figure 3 shows the wire configuration.

Ingress Protection (IP) Ratings

For information see Table 8 on page 22.

TABLE 1. Characteristics of 1067 IEC Thermocouples (IEC Standards are typically used in European applications)

Type	Wire Alloys	Sheath Material	Temp. Range	Interchangeability Error IEC 60584-2(1)	Accuracy
E	Chromel/Constantan	321 SST	-40 to 800 °C (-40 to 1472 °F)	±1.5 °C (±2.7 °F) or ±0.4%	Class 1
J	Iron/Constantan	321 SST	-40 to 750 °C (-40 to 1382 °F)	±1.5 °C (±2.7 °F) or ±0.4%	Class 1
K	Chromel/Alumel	Alloy 600	-40 to 1000 °C (-40 to 1832 °F)	±1.5 °C (±2.7 °F) or ±0.4%	Class 1
N	Nicrosil/Nisil	Alloy 600	-40 to 1000 °C (-40 to 1832 °F)	±1.5 °C (±2.7 °F) or ±0.4%	Class 1
R	Platinum-13% Rhodium/Platinum	Alloy 600	0 to 1000 °C (32 to 1832 °F)	±1.0 °C (±1.8 °F) or ±[1+0.3% x (t-1100)] °C	Class 1
S	Platinum-10% Rhodium/Platinum	Alloy 600	0 to 1000 °C (32 to 1832°F)	±1.0 °C (±1.8 °F) or ±[1+0.3% x (t-1100)] °C	Class 1
T	Copper/Constantan	321 SST	-40 to 350 °C (-40 to 662 °F)	±0.5 °C (±1.0 °F) or ±0.4%	Class 1

(1) Whichever is greater

TABLE 2. Characteristics of 1067 ISA Thermocouples (ISA Standards are typically used in North American applications)

Type	Wire Alloys	Sheath Material	Temp. Range (°C)	Interchangeability Error ISA MC 96.1(1)	Accuracy
E	Chromel/Constantan	321 SST	0 to 900 °C (32 to 1652 °F)	±1.0 °C (±1.8 °F) or ±0.4%	Special Limits
J	Iron/Constantan	321 SST	0 to 750 °C (32 to 1382 °F)	±1.1 °C (±2.0 °F) or ±0.4%	Special Limits
K	Chromel/Alumel	Alloy 600	0 to 1000 °C (32 to 1832°F)	±1.1 °C (±2.0 °F) or ±0.4%	Special Limits
N	Nicrosil/Nisil	Alloy 600	0 to 1000 °C (32 to 1832°F)	±1.1 °C (±2.0 °F) or ±0.4%	Special Limits
R	Platinum-13% Rhodium/Platinum	Alloy 600	0 to 1000 °C (32 to 1832 °F)	±0.6 °C (±1.0 °F) or ±0.1%	Special Limits
S	Platinum-10% Rhodium/Platinum	Alloy 600	0 to 1000 °C (32 to 1832 °F)	±0.6 °C (±1.0 °F) or ±0.1%	Special Limits
T	Copper/Constantan	321 SST	0 to 350 °C (32 to 662 °F)	±0.5 °C (±1.0 °F) or ±0.4%	Special Limits

(1) Whichever is greater

WIRING DIAGRAMS

FIGURE 2. 1067 RTD Lead Wire Configuration

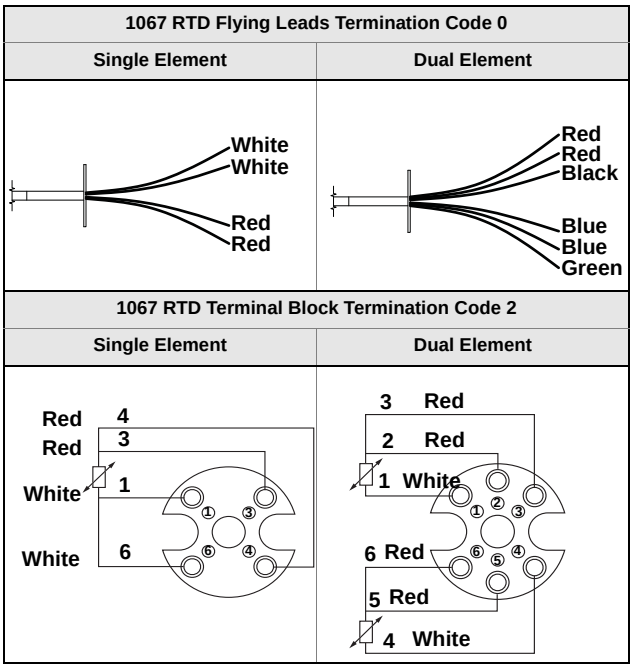


FIGURE 3. 1067 Thermocouple Lead Wire Configuration

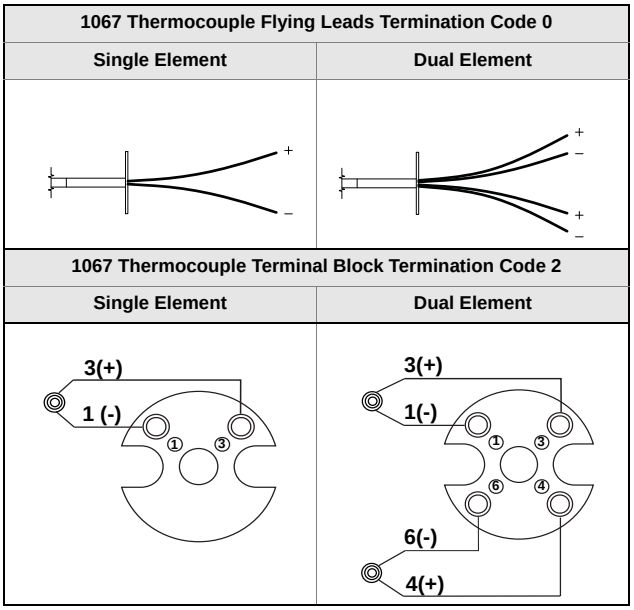


TABLE 3. 1067 Thermocouple Wire Color

	IEC Wire Color		ISA Wire Color	
Type	**Positive (+)**	**Negative (-)**	**Positive (+)**	**Negative (-)**
E	Violet	White	Violet	Red
J	Black	White	White	Red
K	Green	White	Yellow	Red
N	Rose	White	Orange	Red
R	Orange	White	Black	Red
S	Orange	White	Black	Red
T	Brown	White	Blue	Red

INTEGRAL MOUNT SENSORS AND ASSEMBLIES

Rosemount 1067 RTD and Thermocouple Temperature Sensors can be ordered as assemblies that provide a complete, yet simple, means of specifying the proper industrial hardware for most temperature measurements. An assembly model number is derived from the ordering table and defines the type of sensing element, the material length, and thermowell style.

Emerson Process Management sizes and inspects all sensor assemblies to ensure complete component compatibility and performance.

MOUNTING CONFIGURATIONS

The 1067 RTDs and Thermocouples may be ordered with flying leads or a terminal block.

The flying lead configuration has sensors designed to be used with a head mount temperature transmitter attached directly to the sensor inside the connection head, allowing the removal of the sensor and transmitter as one assembly.

A terminal block configuration has sensors designed to be used with Rosemount 248, 644, 848T, 648, and 3144P in a remote mounting.

Hazardous area approvals are available with the 1067 sensor types, but depend on the entire temperature measurement assembly configuration. See “Hazardous Locations Certification” on page 11.

FIGURE 4. Sensor Assembly Without Thermowelll

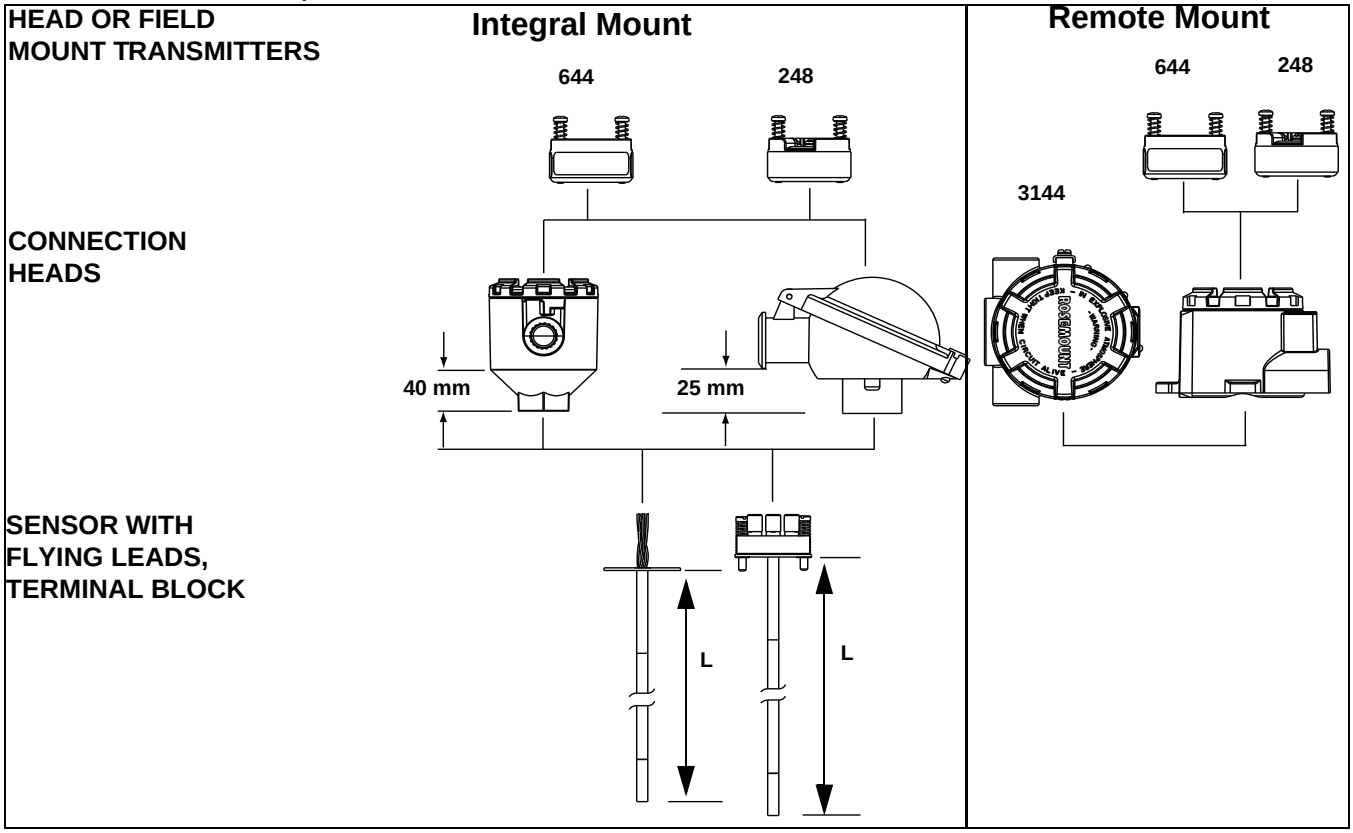


FIGURE 5. Rosemount 1067 RTD and Thermocouple Dimensional Drawings (All dimensions in mm)

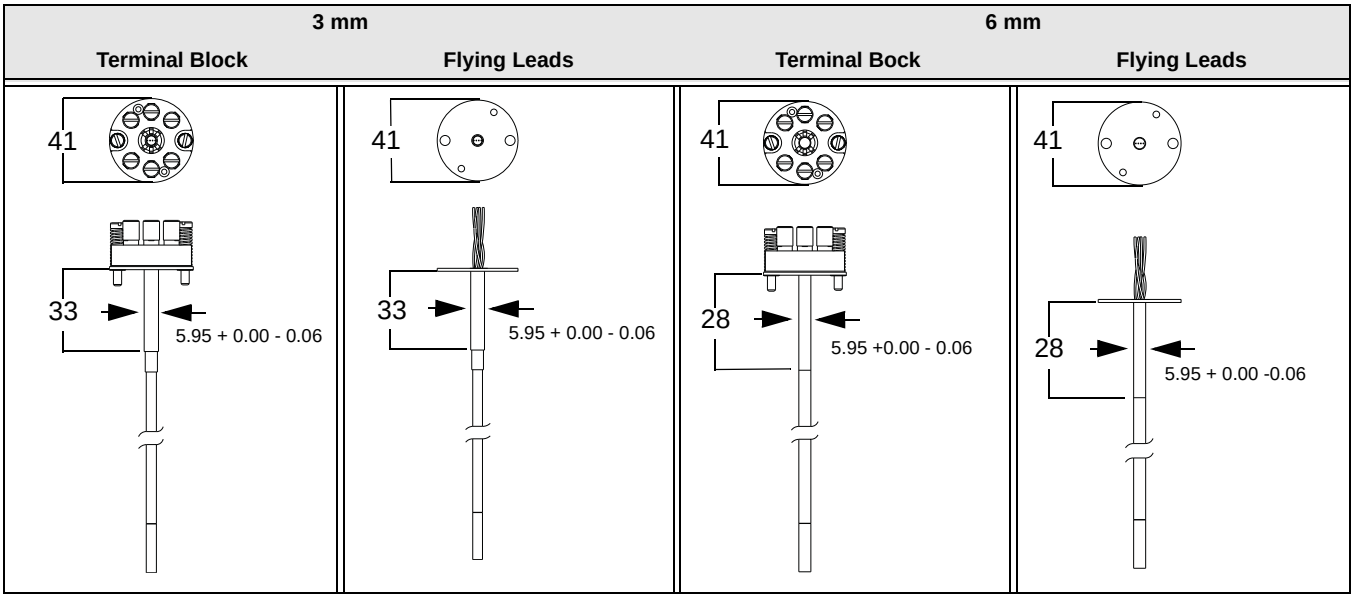


TABLE 4. Lead Wire Specifications

Rosemount 1067	Sensor Diameter (mm)	Number of Leads	Approximate Lead Wire Length (Flying Leads)	
			Element 1 (mm)	Element 2 (mm)
RTD Single Element	3/6	4	140	---
RTD Dual Element	3/6	6	140	190
Thermocouple Single Element	3/6	2	140	---
Thermocouple Dual Element	3/6	4	140	190

TRANSMITTER-SENSOR MATCHING

By using a temperature sensor matched to a temperature transmitter, significant measurement accuracy improvement can be attained. This involves identifying the relationship between resistance and temperature for a specific RTD sensor. This relationship is approximated by the Callendar-van Dusen equation:

$R_t = R_o + R_o\alpha[t - \delta(0.01t - 1)(0.01t) - \beta(0.01t - 1)(0.01t)^3]$,

where:

R_t = Resistance (ohms) at Temperature t (°C)
R_o = Sensor-Specific Constant (Resistance at t = 0 °C)
α =Sensor-Specific Constant
δ =Sensor-Specific Constant
β =Sensor-Specific Constant (0 at t > 0 °C)

The exact values for the Callendar-van Dusen constants (R_o, α, δ, β) are specific to each RTD sensor and are established by testing each individual sensor at various temperatures.

The transmitter uses the Callendar-van Dusen constants to generate a sensor curve describing the relationship between resistance and temperature for this particular sensor and transmitter assembly. There is a 3- or 4-fold improvement in temperature measurement accuracy for the total system by using the sensor's actual resistance vs. temperature curve.

Rosemount 1067 RTD sensors can be ordered with Calibration Option code V10, where the values of all four sensor-specific constants are supplied with each sensor. To utilize the unique, built-in sensor-matching capability of the Rosemount 644 and 3144P transmitters, the Callendar-van Dusen constants can be programmed into the transmitter at the factory, or in the field using a HART Communicator.

Option V10 is specific to a particular temperature range and, as with calibration schedules, the accuracies associated with this option represent worst case conditions when the sensor is used over the entire temperature range. Accuracy of the Rosemount 1067 sensor with the V10 option varies since they have different hysteresis and repeatability characteristics.

IEC 751 Interpretation

The Callendar-van Dusen equation is one method used to describe the resistance versus temperature (R vs.T) relationship for platinum RTDs. International standard IEC 751 interprets the R vs. T relationship using an approach similar to the Callendar-van Dusen methodology. The IEC 751 R vs.T relationship standard uses the following equation:

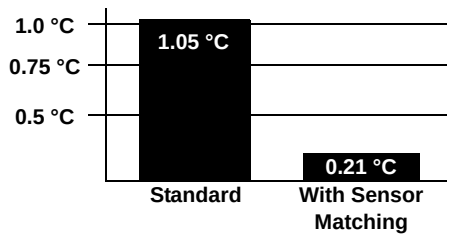
$R_t = R_o[1 + At + Bt^2 + C(t-100)t^3]$

As in the Callendar-van Dusen method, R_o, A, B, C are specific for each RTD and are established by testing each sensor at various temperatures. The actual values for A, B, and C differ in magnitude from the Callendar-van Dusen constants (R_o, α, β, δ), while R_o is the same for both equations. Either methodology produces the same result in any Transmitter-Sensor Matching scenario, since one equation is a simple mathematical interpretation of the other.

Typical Transmitter-Sensor Matching Accuracy Improvements

Transmitter: Rosemount 3144P (built-in sensor matching capabilities), span of 0 to 200 °C, accuracy = 0.1 °C)
Sensor: 1067 RTD
Callendar-van Dusen Option: V10
Process Temperature: 150 °C

System Uncertainty Comparison at 150 °C:



Standard 1067 Sensor		
Rosemount 3144P:	± 0.10 °C	
Standard 1067 RTD:	± 1.05 °C	
Total System(1):	± 1.05 °C	
1067 Sensor with V10 Option		
Rosemount 3144P:	± 0.10 °C	
Calibrated Sensor 1067 RTD:	± 0.18°C	
Total System(1):	± 0.21 °C	

(1) Calculated using RSS statistical method:

System accuracy = $\sqrt{(\text{Transmitter accuracy})^2 + (\text{Sensor accuracy})^2}$

CALIBRATION

Sensor calibration may be needed for input to quality systems, or for control system enhancement. It is used mainly to improve the overall temperature measurement performance by matching the sensor to a temperature transmitter. Sensor matching is available for RTD sensors used with Rosemount transmitters where the inherent stability and repeatability of the RTD technology is well established.

Calibration Options

The Callendar-van Dusen, and A, B, and C-constants are supplied with a calibration certificate.

TABLE 5. Option V10: Sensor Calibration with Works Certificate

	Code
	V10
Temperature Range (°C)	– 50 to 450
Calibration Points (°C)	–50 0 100 450

Temperature Considerations

Ambient temperature limits for the connection head are -40° C to +85° C.

Product Certifications

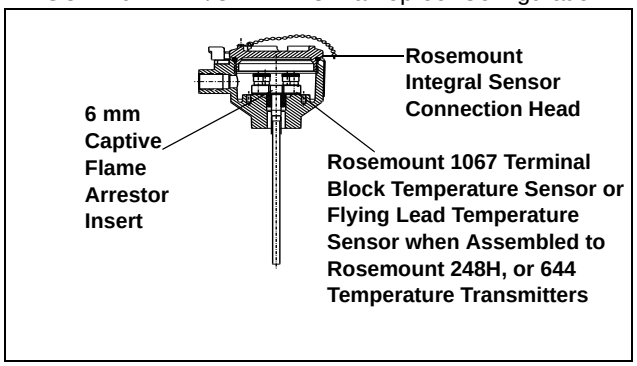
HAZARDOUS LOCATIONS CERTIFICATION

E1 ATEX/CENELEC Flameproof Approval
ATEX Marking ⟨Ex⟩ II 2 G
Certification Number. KEMA99ATEX8715
EEx d IIC T6 (T_{amb} = –40 to 70 °C).

The ATEX/CENELEC Flameproof approval is dependent on the Rosemount Connection Head assembled with a Rosemount RTD or thermocouple temperature sensor (see Figure 6). The captive flame arrestor insert must be fully engaged into the connection head for compliance with this approval.

ATEX Flameproof Approval
ATEX Marking ⟨Ex⟩ II 2 G
Certification Number. KEMA01ATEX2181.
EEx d IIC T5 (–40 ≤ T_{amb} ≤ 80 °C)
EEx d IIC T6 (–40 ≤ T_{amb} ≤ 70 °C)

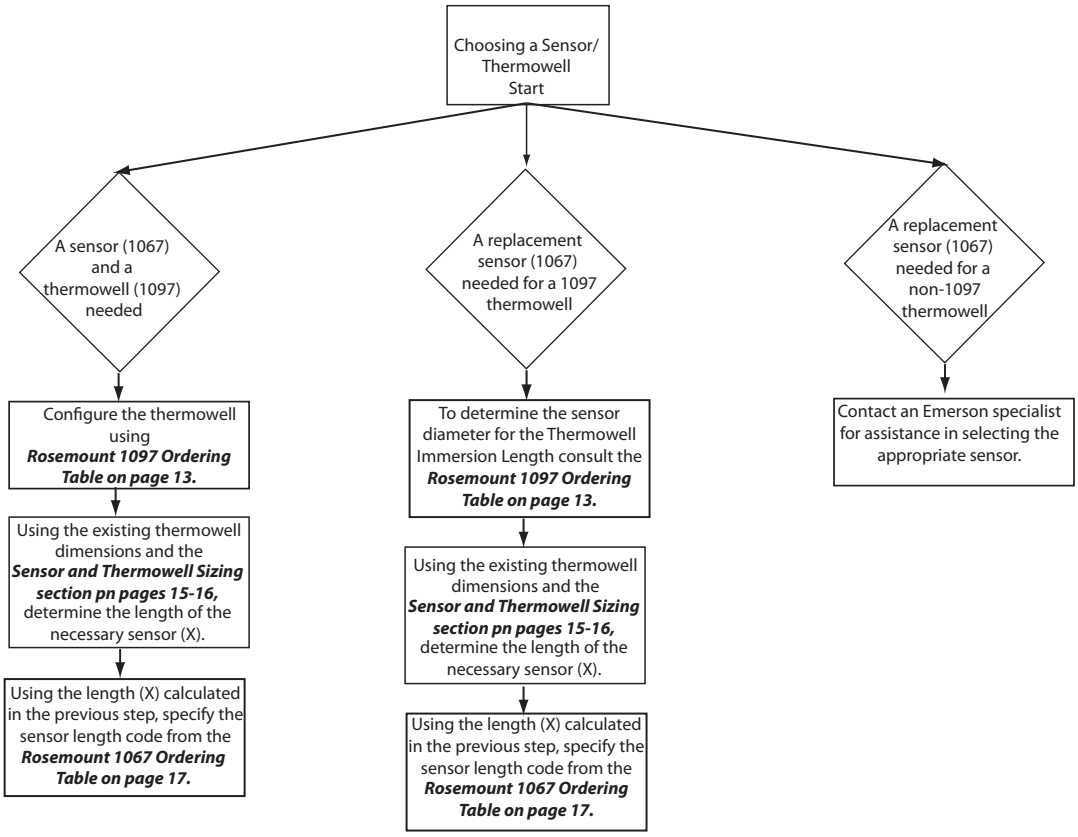
FIGURE 6. ATEX/CENELEC Flameproof Configuration.



E5 FM Explosion-Proof
Explosion-Proof for Class I, Division 1, Groups B, C, D.
Dust-Ignition Proof for Class I, III, Division 1, Groups E, F, G.
Ambient temperature Limits: -40 to 85 °C
When installed per Rosemount Drawing 00068-0013
NEMA Enclosure Type 4X.

E6 CSA Explosion-Proof
Explosion-Proof for Class I, Division 1, Groups B, C, D.
Dust Ignition-Proof for Class II, Division 1, Groups E, F, G.
Dust Ignition-Proof for Class III, Division 1.
Suitable for Class I, Division 2, Groups A, B, C, D.
Must be installed per Rosemount Drawing 00068-0033.
CSA Enclosure Type 4X.

Selection of Thermowells and Sensors



Examples:

1. Rosemount 1067 Sensor and 1097 Thermowell are needed:

   The user needs a thermowell with a 150 mm Immersion Length and a Flanged mounting style.

   Step 1: Configure Thermowell from Table 6 on page 14.

   1097 A2 **0150** F01 **T000**

   Option 0150 indicates the Thermowell Immersion Length of 150 mm with a sensor diameter of 6 mm (specified in the table). Option T000 represents the Flanged mounting style.

   Step 2: Sensor and Thermowell Sizing.

   Select the figure and formula for the 6 mm flange (as determined in Step 1). For a Rosemount connection head, the Throat Length is 20 mm.

   Formula: Length (X) = 150 + 155 + 20 = 325 (mm).

   Step 3: Select the 1067 Sensor options from Table 7 on page 20.

   1067 D 0 E1 6 **0325**

   Option D represents the Rosemount connection head (Step 2). Option 6 is determined from Step 1. Option 0325 is the length calculated in Step 2.

2. Rosemount 1067 Sensor is needed for a 1097 Thermowell

   The user has a 1097 thermowell with a 300 mm Immersion Length, a Welded mounting style, and a Lagging Length of 45.

   Step 1: Consult Thermowell Table 6 on page 14.

   For a Thermowell Immersion Length of 300, a sensor with a diameter of 6 mm is required.

   Step 2: Sensor and Thermowell Sizing.

   Select the figure and formula for the 6 mm welded style (as determined in Step 1). For a polypropylene connection head, the Throat Length is 10 mm.

   Formula: Length (X) = 300 + 45 + 105 + 10 = 460 (mm).

   Step 3: Select the 1067 Sensor options from Table 7 on page 20.

   1067 C 0 E1 6 **0460**

   Option C represents the polypropylene connection head (Step 2). Option 6 is determined from Step 1. Option 0460 is the length calculated in Step 2.

3. Replacement 1067 Sensor is needed for a non-1097 Thermowell

   For this case, please contact an Emerson specialist for assistance in selecting the appropriate sensor.

REORDERING

When reordering just the 1067 sensor, specify the model number of the sensor being replaced and connection head code “N”. See “Rosemount 1067 Compact Sensor H The Standard offering represents the most common options. The starred options (H) should be selected for best delivery. __The Expanded offering is subject to additional delivery lead time.” on page 20 for more information.

When reordering only the 1097 thermowell, specify the model number of the thermowell being replaced.

Rosemount 1097 Ordering Table

TABLE 6. Rosemount 1097 Compact Barstock Thermowell

★ 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		
1097	Compact Barstock Thermowell		
Material			
Standard			**Standard**
A2	316L Stainless steel		★
A5	304L Stainless steel		★
C1	Carbon steel		★
Expanded			
A6	304L Stainless steel with carbon steel flange		
B2	Tantalum sheath over 316L Stainless steel		
B3	316L Stainless steel with Tantalum sheath with Platinum beads		
B4	316L Stainless steel with PFA coating		
D1	Alloy 20		
D2	Alloy C276		
D4	Nickel 200		
D8	Alloy 825		
F3	Duplex 2205 F51		
G1	Alloy 400		
H1	Alloy 600		
K1	Titanium Gr 2		
L1	13 Cr Mo 44		
Immersion Length (U) in Millimeters		**Suitable for Sensor Diameter**	
Standard			**Standard**
0025	25 mm	3 mm. see Figure 12and Figure 14	★
0050	50 mm	3 mm. see Figure 12and Figure 14	★
0070	70 mm	3 mm. see Figure 12and Figure 14	★
0130	130 mm	3 mm. see Figure 12and Figure 14	★
0150	150 mm	6 mm. see Figure 11 and Figure 13	★
0225	225 mm	6 mm. see Figure 11 and Figure 13	★
0250	250 mm	6 mm. see Figure 11 and Figure 13	★
0300	300 mm	6 mm. see Figure 11 and Figure 13	★
0325	325 mm	6 mm. see Figure 11 and Figure 13	★
0375	375 mm	6 mm. see Figure 11 and Figure 13	★
Expanded			
XXXX	Non-standard Immersion Length (in 1 mm increments up to 500 mm). Lengths greater than 130 mm = 6 mm diameter.		
Thermowell Mounting Style(1)			
Standard			**Standard**
F01	Flanged, RF, 3/4 inch 150 lb.		★
F04	Flanged, RF, 1 inch 150 lb.		★
F10	Flanged, RF, 1 1/2 inch 150 lb.		★
F16	Flanged, RF, 2 inch 150 lb.		★
F17	Flanged, RF, 3 inch 150 lb.		★
F22	Flanged, RF, 1 inch 300 lb.		★
F23	Flanged, RF, 3/4 inch 300 lb.		★
F28	Flanged, RF, 1 1/2 inch 300 lb.		★
F34	Flanged, RF, 2 inch 300 lb.		★
F37	Flanged, RF, 3 inch 300 lb.		★
F39	Flanged, RF, 3/4 inch 600 lb.		★

TABLE 6. Rosemount 1097 Compact Barstock Thermowell

★ 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.

F40	Flanged, RF, 1 inch 600 lb.	★
F46	Flanged, RF, 1 1/2 inch 600 lb.	★
F52	Flanged, RF, 2 inch 600 lb.	★
F55	Flanged, RF, 3 inch 600 lb.	★
F57	Flanged, RF, 3/4 inch 900 lb.	★
F58	Flanged, RF, 1 inch 900 lb.	★
F64	Flanged, RF, 1 1/2 inch 900 lb.	★
F70	Flanged, RF, 2 inch 900 lb.	★
F73	Flanged, RF, 3 inch 900 lb.	★
W10	Welded, 3/4 inch Pipe (only available with Immersion Lengths 50-130 mm)	★
W12	Welded, 1 inch Pipe	★
Lagging Length		
Standard		**Standard**
T025	25 mm	★
T030	30 mm	★
T035	35 mm	★
T040	40 mm	★
T045	45 mm	★
T050	50 mm	★
T100	100 mm	★
T125	125 mm	★
T000	Flanged Thermowells	★
Expanded		
TXXX	Non-standard Lagging Length (in 1 mm increments from 25 to 250 mm)	

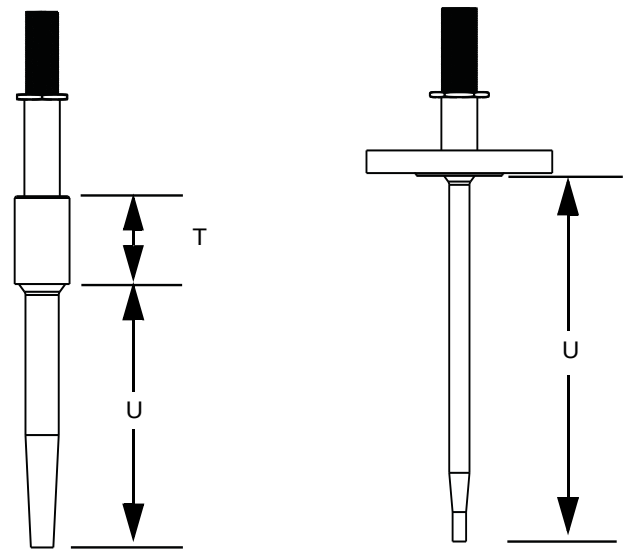
Options (Include with selected model number)

Material Certification		
Standard		**Standard**
Q8	Thermowell material Certification, DIN EN 10204 3.1	★
Flange Type		
Standard		**Standard**
R10	Flat Flanged Face	★
R16	Ring Joint Flange Face	★
Wake Frequency		
Standard		**Standard**
R21	Wake Frequency - Thermowell Strength Calculation	★
Typical Model Number: 1097 A2 0250 F01 T00 Q8 R10 R21		

(1) All flanges are full penetration weld

FIGURE 7. Welded or Flanged Thermowells

U = Immersion Length
T = Tagging Length



Sensor and Thermowell Sizing

To ensure compatibility, specify the thermowell first, The mounting style (flanged or welded) and the sensor diameter (3 mm or 6mm) will determine the formula used to calculate the sensor length.

Formulae for Flange Mount:

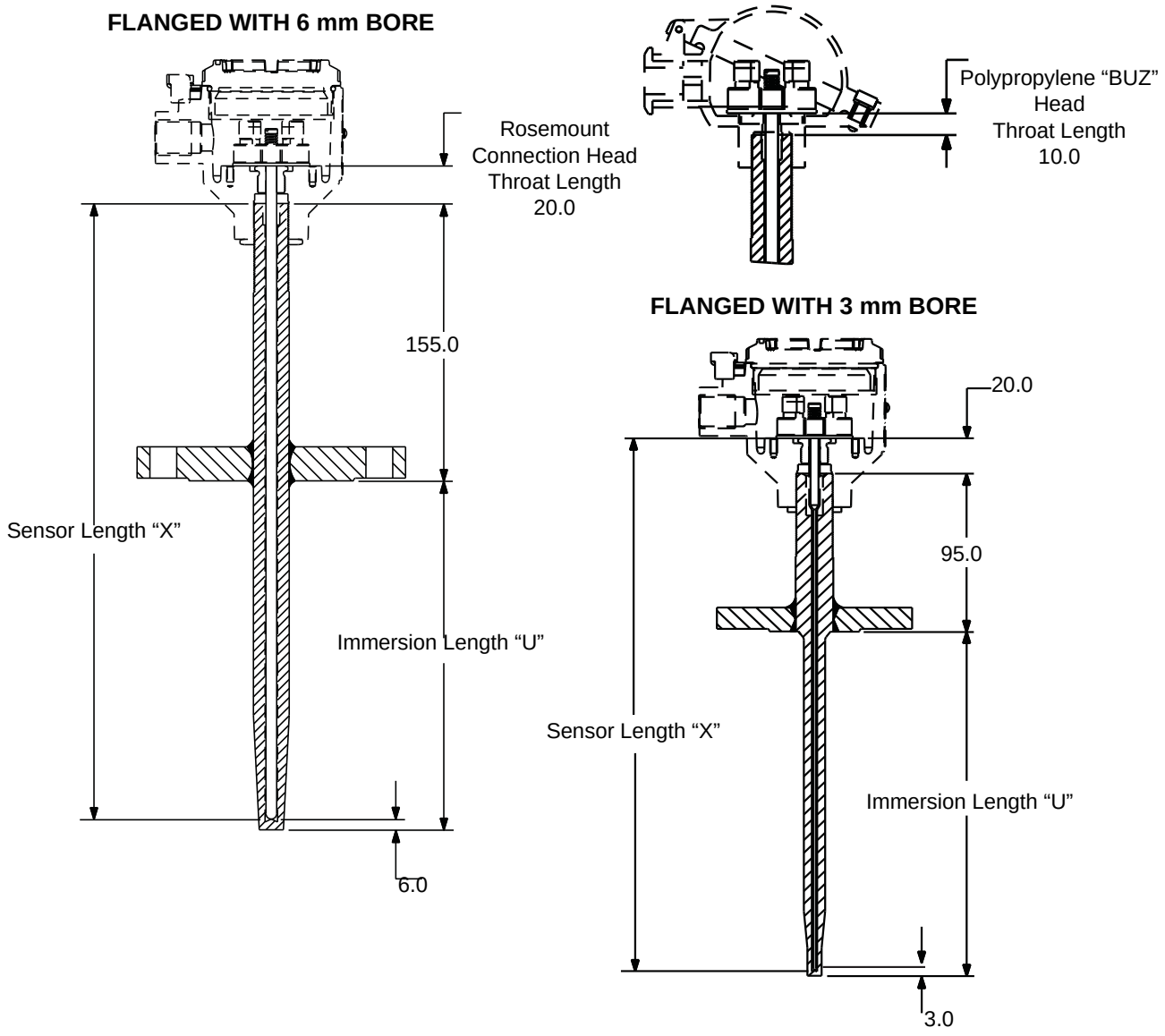
X: Sensor Length (See Figure 8)
U: Immersion Length (See Figure 8)

Throat Length:
Use 20 mm for Rosemount Connection Head
Use 10 mm for polypropylene head

3 mm: X = U + 95 mm + Throat Length

6 mm: X = U + 155 mm + Throat Length

FIGURE 8. 1097 Flange Mounted Diagram



Formula for Weld Mount:

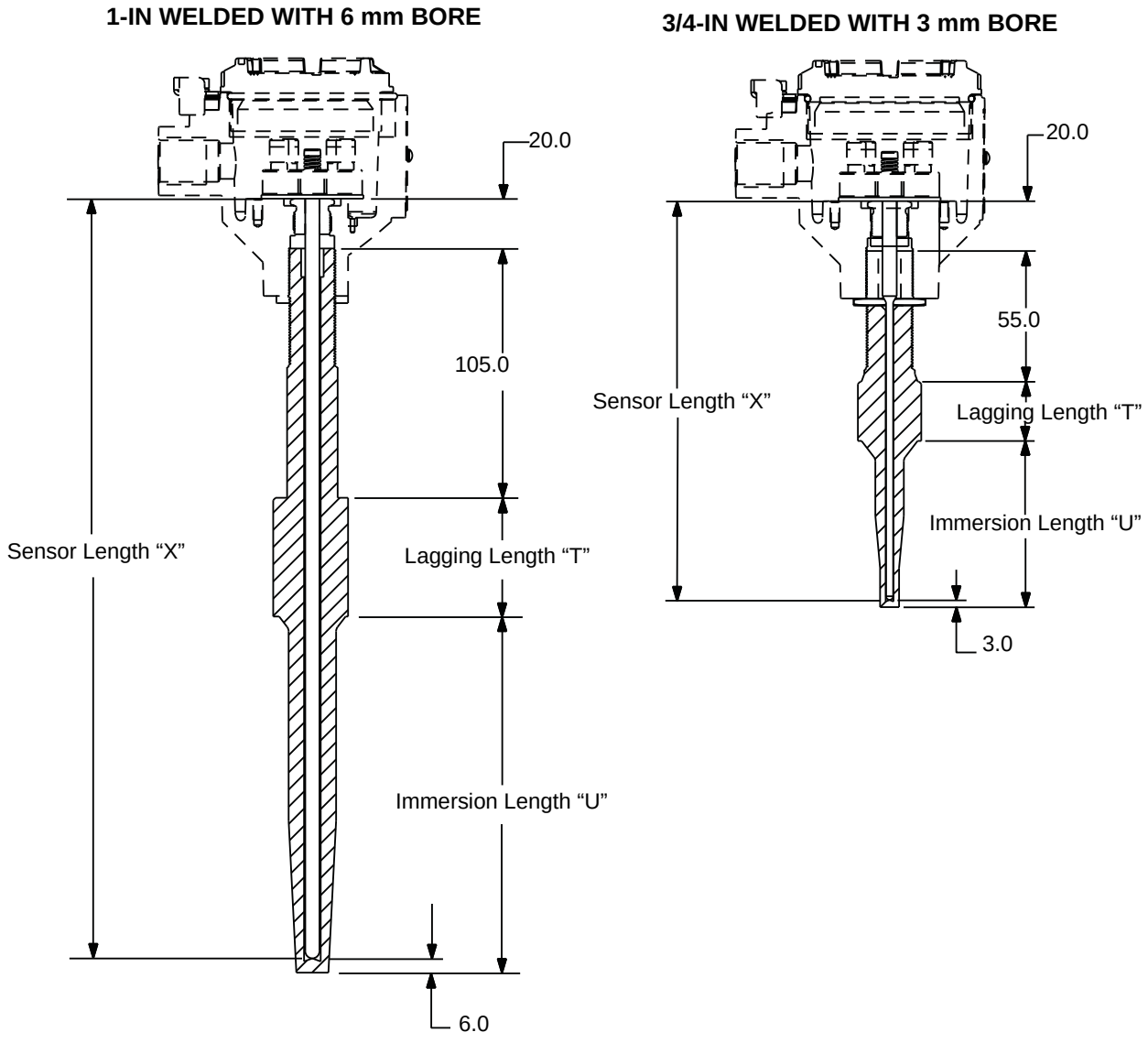
X: Sensor Length (See Figure 9)
U: Immersion Length (See Figure 9)
T: Tagging Length (See Figure 9))

Throat Length:
Use 20 mm for Rosemount Connection Head
Use 10 mm for polypropylene head

3 mm: X = U + T + 55 mm + Throat Length

6 mm: X = U + T + 105 mm + Throat Length

FIGURE 9. 1067 Weld Mounted Diagram



Rosemount 1067 Ordering Tables

TABLE 7. Rosemount 1067 Compact Sensor

★ 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				
1067	Compact Sensor				
Connection Head		**IP Rating**	**Process Thread**	**Conduit Thread(1)**	
Standard					**Standard**
D	Rosemount Aluminum	68	M20x1.5	1/2 inch NPT	★
N	No Connection Head				★
Expanded					
C	Polypropylene (BUZ)	65	M20x1.5	1/2 inch NPT	
Sensor Lead Wire Termination					
Standard					**Standard**
0	Flying Lead - No Springs on DIN plate				★
2	Terminal Block - DIN 43762				★
Sensor Type					
Standard					**Standard**
P1	RTD, PT-100, Single Element, 4 Wire				★
P2	RTD, PT-100, Dual Element, 3 Wire				★
E1	Thermocouple, Type E Single Element, Ungrounded				★
E2	Thermocouple, Type E Dual Element, Isolated, Ungrounded				★
K1	Thermocouple, Type K, Single Element, Ungrounded				★
K2	Thermocouple, Type K Dual Element, Isolated, Ungrounded				★
J1	Thermocouple, Type J, Single Element, Ungrounded				★
J2	Thermocouple, Type J Dual Element, Isolated, Ungrounded				★
T1	Thermocouple, Type T, Single Element, Ungrounded				★
T2	Thermocouple, Type T Dual Element, Isolated, Ungrounded				★
Expanded					
N1	Thermocouple, Type N, Single Element, Ungrounded				
N2	Thermocouple, Type N Dual Element, Isolated, Ungrounded				
R1	Thermocouple, Type R, Single Element, Ungrounded				
R2	Thermocouple, Type R Dual Element, Isolated, Ungrounded				
S1	Thermocouple, Type S, Single Element, Ungrounded				
S2	Thermocouple, Type S Dual Element, Isolated, Ungrounded				
Sheath Diameter					
Standard					**Standard**
3	3 mm				★
6	6 mm				★
Sensor Length (X) in Millimeters					
Standard					**Standard**
0170	170 mm				★
0245	245 mm				★
0325	325 mm				★
0400	400 mm				★
0425	425 mm				★
0475	475 mm				★
0500	500 mm				★
0550	550 mm				★
Expanded					
XXXX	Non-standard Sensor Length (in 1 mm increments from 100 to 875 mm)				
NOTE: The sheath diameter and the sensor length must match the thermowell bore. See "Sensor and Thermowell Sizing" on page 17					

TABLE 7. Rosemount 1067 Compact Sensor

★ 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.

Options (Include with selected model number)

Thermocouple Wire Color Code		
Standard		**Standard**
U1	Wire Color per ISA MC96.1	★
U2	Wire Color per IEC 60584-3	★
RTD Options		
Standard		**Standard**
A1	Class A Sensor from -50 °C to 450 °C (-58 to 842 °F)	★
Product Certifications(3)		
Standard		**Standard**
E1	EExd - ATEX/CENELEC Flameproof Approval	★
E5	FM Explosion-Proof Approval	★
E6	CSA Explosion-Proof	★
Assemble To Options		
Standard		**Standard**
XA(2)	Assemble sensor to specific temperature transmitter	★
Callendar-van Dusen Constants		
Standard		**Standard**
V10	Works Cert - sensor calibration from -50 °C to 450 °C (-58 to 848 °F) with A, B, C, and Callendar-van Dusen constants	★
Exernal Ground Screw(3)		
Standard		**Standard**
G1	External Ground Screw	★
Cover Chain(3)		
Standard		**Standard**
G3	Cover Chain	★

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

(2) If ordering Assemble to Option XA with a transmitter, specify the same option on the transmitter model number. Connection head must be ordered with the 1067 model.

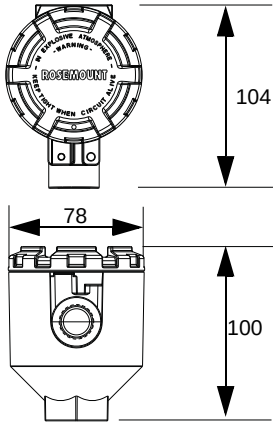
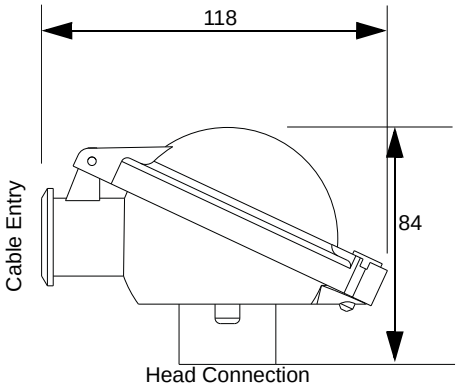
(3) Not available with polypropylene connection head.

Accessories

TABLE 8. Connection Head

Part Number	Model/Material	IP Rating	Conduit Connection	Process Connection
00644-4190-0014	Rosemount, Aluminum	66/68	1/2 inch ANPT	M20 x 1.5
00644-4198-0014	BUZ, White Polypropylene	65	1/2 inch ANPT	M20 x 1.5

FIGURE 10. Connection Head Dimensional Drawing

With Standard Cover	Polypropylene (BUZ)
Option Code D	**Option Code C**
	
Dimensions are in millimeters	

Rosemount 1097 Thermowells

FIGURE 11. Flanged Barstock Thermowell (6 mm)

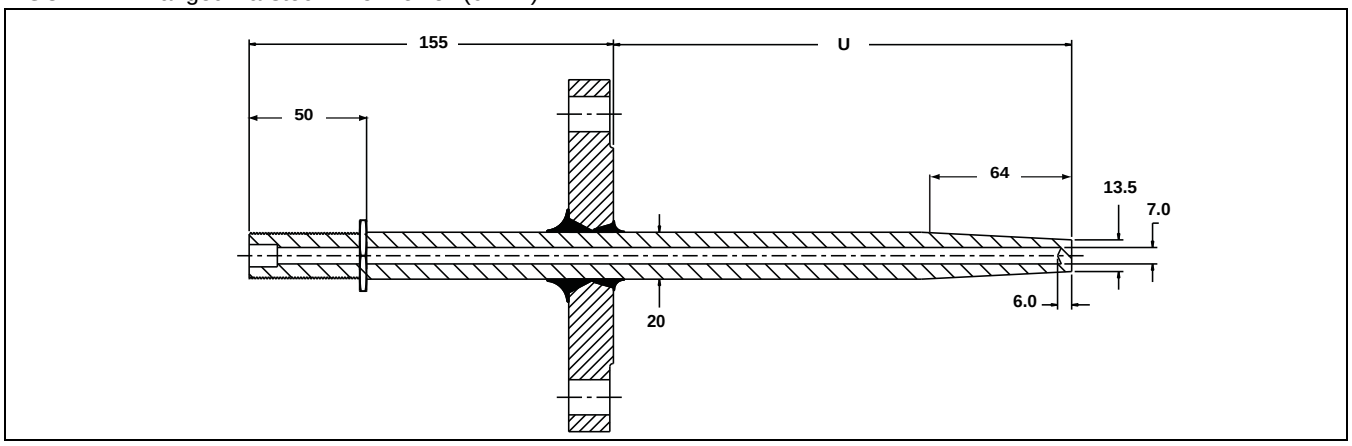


FIGURE 12. Flanged Barstock Thermowell (3 mm)

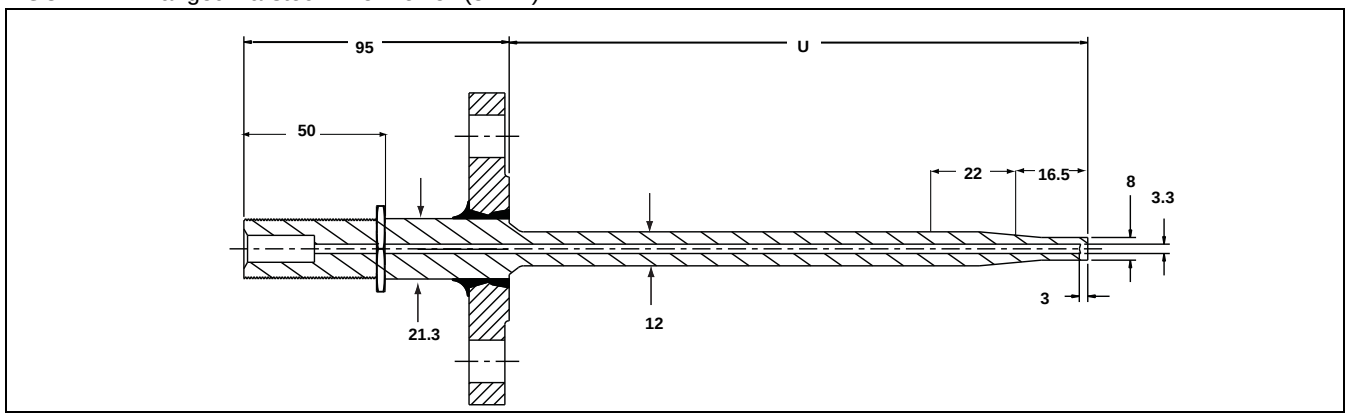
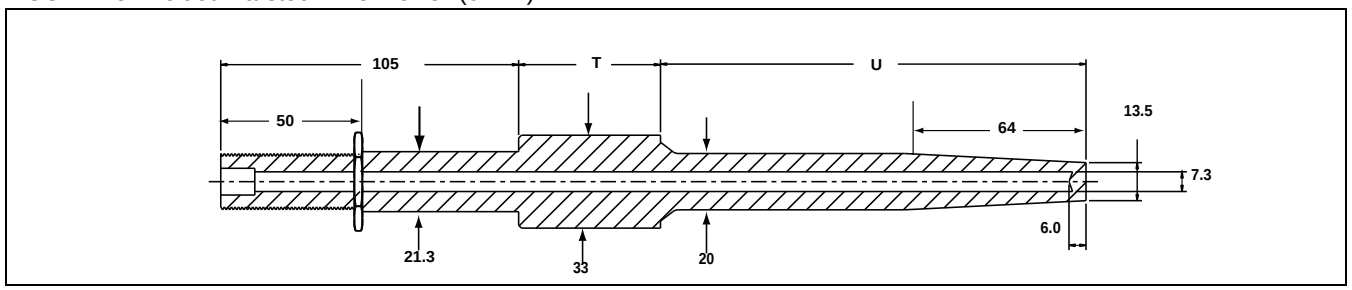
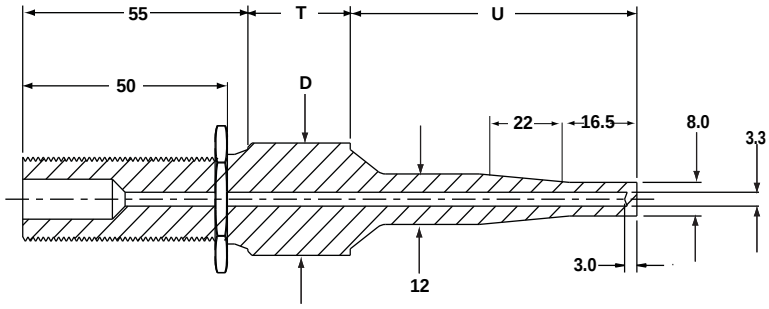


FIGURE 13. Welded Barstock Thermowell (6 mm)



Rosemount 1067 and 1097

FIGURE 14. Welded Barstock Thermowell (3 mm)



Socket Size	D
3/4 inch	26.7
1 inch	33.4

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Rosemount 1075 and 1099 Series High Temperature Thermocouples

- *Accurate and reliable measurements in high temperature applications such as heat treatment and combustion processes*
- *Ceramic protection tube materials available for use up to 1800 °C (3272 °F)*
- *Metal protection tube materials for use up to 1200 °C (2192 °F)*
- *Reaction sintered, silicon infiltrated silicon carbide protection tube for use up to 1700 °C (3092 °F)*
- *Wide range of Precious Metal and Base Metal thermocouples*
- *Maximum measurement reliability obtained through calibration services*
- *Integrated temperature assemblies provide time and cost savings*

Contents

Success with High-Temperature Measurement

The Rosemount 1075 and 1099 Series High Temperature Thermocouples provide a reliable solution for your high temperature measurement needs. These products are high quality, deliver superior performance, and can be used in a wide variety of high temperature applications.

Overview

The Rosemount 1075 Series thermocouples conform to the requirements of the DIN EN 60584-1/2 (IEC 584) standards and are manufactured from premium materials. The DIN EN 50446 standard defines all protection tube designs. By using a state-of-the-art manufacturing process, the thermocouples can be used in many different applications including the monitoring and control of process temperatures of up to 1800 °C (3272 °F).

Our German Calibration Service (DKD) certified calibration laboratory performs thermocouple and resistance thermometer (RTD) calibration for comparative and fixed point measurements for every customer sensor. As the equipment traceability requirements of DIN EN/ISO 9000 become more stringent, Emerson Process Management keeps our customers internationally competitive by providing certificates and documents for quality assurance systems.

Flexible Installation

The Rosemount 1075 and 1099 Series High Temperature Thermocouples offer industry standard process connections to ensure compatibility with your current process. Adjustable flanges and fittings are offered to reduces engineering, procurement, maintenance, and inventory costs.

Complete Assemblies

Emerson makes it easy for you to order and install complete assemblies to accomplish your measurement needs. The Rosemount 1075 and 1099 Series are available with an in-head HART or FOUNDATION™ fieldbus transmitter (Rosemount 248 or Rosemount 644 Temperature Transmitters).

Long Term Stability

The Rosemount 1075 and 1099 Series High Temperature Thermocouples encounter extremely harsh process conditions, yet are able to output a stable, reliable temperature over long periods of time. This is accomplished by the resistance of the available protection tube materials against various process conditions and the quality construction of the thermocouple elements.

Multiple Applications

The Rosemount 1075 and 1099 Series offers a wide variety of protection tube materials and combinations of inner and outer protection tubes to meet most high-temperature application requirements.

TEMPERATURE SOLUTIONS

Rosemount 248 Temperature Transmitter

Head mount (DIN B) and rail mount style with HART® protocol and complete temperature assembly.

Rosemount 644 Temperature Transmitter

Head mount styles available with HART or FOUNDATION fieldbus protocol. Rail mount style available for HART protocol.

Rosemount 3144P

Field mount style HART or FOUNDATION fieldbus protocol. Dual sensor input with advanced diagnostics.

Rosemount 648 Wireless Temperature Transmitter

The Rosemount 648 integrates temperature measurement into a self-organizing wireless network, providing best in class security, reliability, SmartPower™ capabilities, and network scalability, optimizing plant performance while minimizing maintenance.

Rosemount 848T High Density Temperature Measurement Family

Measure temperature points in close proximity with the 848T architecture, with WirelessHART™ or FOUNDATION fieldbus protocols.

Overview

Introduction

The Rosemount 1075 Series thermocouples conform to the DIN EN 50446 standard with an extended process connection offering, and can be ordered as complete thermocouple assemblies. High temperature thermocouples are used for temperature measurements in heat treatment and combustion processes. They are also suitable for hot gas environments including the glass, ceramic, and metal industries. The most frequent applications are temperature monitoring and control of incinerators, industrial furnaces, and reactors.

Design Overview

The Rosemount 1075 Series thermocouples are offered in 6 different designs with a wide variety of protection tube material combinations. The different forms reflect the variety of the different designs described in DIN EN 50446 and are divided in two major designs differing in the outer protection tube material and connection head form. DIN A connection heads are higher, have bigger terminal blocks and allow wire diameters up to 3mm, while DIN B connection heads only allow wire diameters up to 2mm. Rosemount offers three designs with metal outer protection tubes and three designs with ceramic outer protection tubes. See Table 1.

TABLE 1. Rosemount 1075 and 1099 Series High Temperature Thermocouples

DIN EN 50446 Design	Connection Head Form	Outer Protection Tube	Inner Protection Tube	Description
BM	B	Metal	None	This design consists of a base metal thermocouple Type K and a housing with a protection tube design BM, according to DIN EN 50446. The Type K thermocouple legs are insulated with ceramic elements. Standard materials for protection tubes are heat resistance steel 1.4762 (ASTM 446) and 1.4841 (ASTM 314).
AM	A	Metal	None	This design consists of a base metal thermocouple Type K and a housing with a protection tube design AM, according to DIN EN 50446. The Type K thermocouple legs are insulated with ceramic elements. Standard materials for protection tubes are heat resistant steel 1.4762 (ASTM 446) and 1.4841 (ASTM 314).
AMK	A	Metal	Ceramic	The design consists of a precious metal thermocouples Type R, S, or B and a housing with a protection tube design AMK, according to DIN EN 50446. Precious metal thermocouples are insulated with a ceramic insulating rod and have a gas tight inner tube of ceramic Type C610.
BK	B	Ceramic	None	This design consists of a base metal thermocouple Type K or precious metal thermocouples Type R, S, or B and a housing with a protection tube design BK, according to DIN EN 50446. The Type K thermocouple legs are insulated with ceramic elements. Precious metal thermocouples are insulated with a ceramic insulating rod. Standard materials for the protection tubes are ceramic Types C610 and C799 and the holding tube is made of 1.4762 (ASTM 466), 1.4841 (ASTM 314), or 1.0305 (A106-A.)
AK	A	Ceramic	None	This design consists of a base metal thermocouple Type K or precious metal thermocouples Type R, S, or B and a housing with a protection tube design AK, according to DIN EN 50446. The Type K thermocouple legs are insulated with ceramic elements. Precious metal thermocouples are insulated with a ceramic insulating rod. Standard materials for the protection tubes are ceramic Types C610 and C799 and the holding tube is made of 1.4762 (ASTM 466), 1.4841 (ASTM 314), or 1.0305 (A106-A)
AKK	A	Ceramic	Ceramic	This design consists of a base metal thermocouple Type K or precious metal thermocouples Type R, S, or B and a housing with a protection tube design AKK, according to DIN EN 50446. The Type K thermocouple legs are insulated with ceramic elements. Precious metal thermocouples are insulated with a 4-hole insulating rod and have a gas tight inner tube. Standard materials for the protection tubes are ceramic Types C530, C610 and C799. Standard materials for inner tubes are ceramic Types C610 or C799.The holding tube is made of 1.4762 (ASTM 466), 1.4841 (ASTM 314), or 1.0305 (A106-A).

Metal Protection Tube design

The Rosemount 1075 Series thermocouple designs BM, AM and AMK are designed with an outer protection tube made out of heat resistance stainless steel. This design is laid out for temperature up to 1350 °C and allows a direct mount of the process connection to the protection tube. The outer protection tube is clamped directly into the head by two screws.

Ceramic Protection Tube design

The Rosemount 1075 Series thermocouple designs BK, AK and AKK are designed with an outer protection tube made out of high heat resistance ceramic. This design is ideal for temperatures up to 1800 °C. A metal holding tube is required to mount the connection head to the ceramic protection tube due to the brittle nature of ceramic.

FIGURE 1. Metal Protection Tube Design

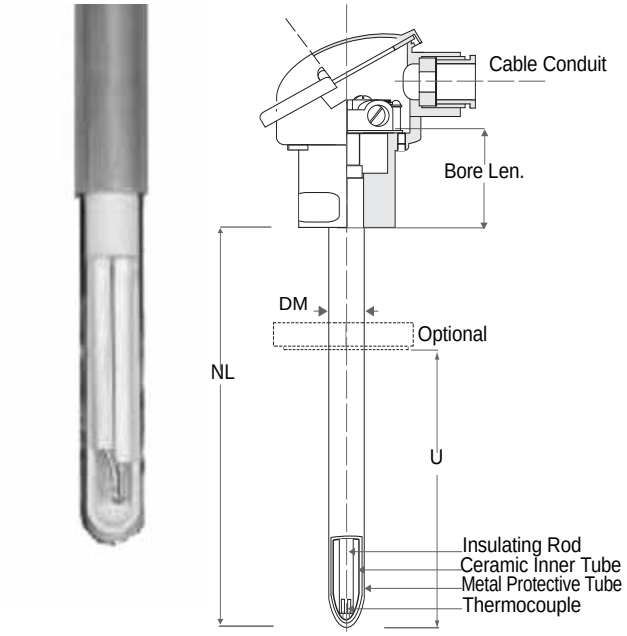
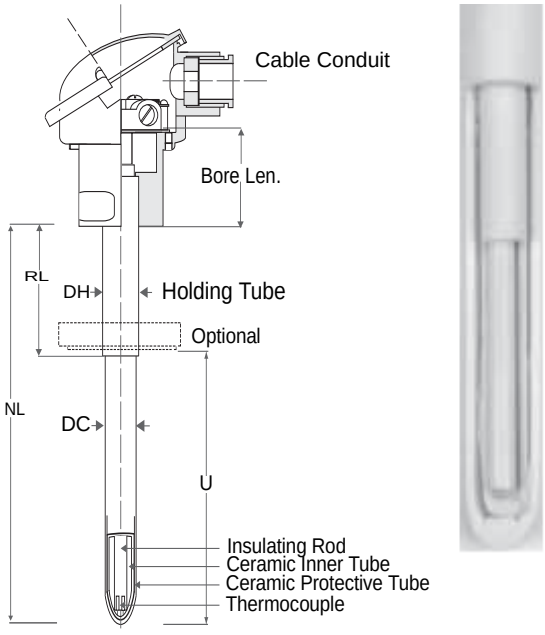


FIGURE 2. Ceramic Protection Tube Design



Connection Heads

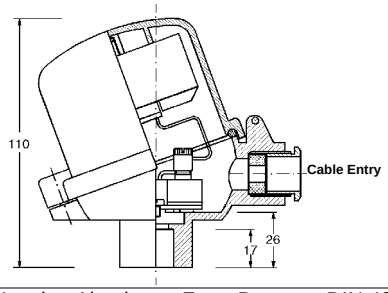
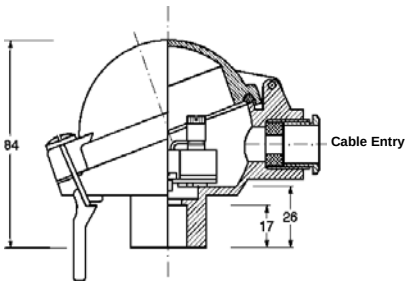
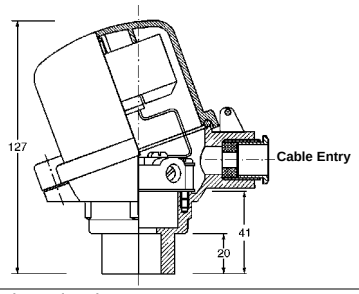
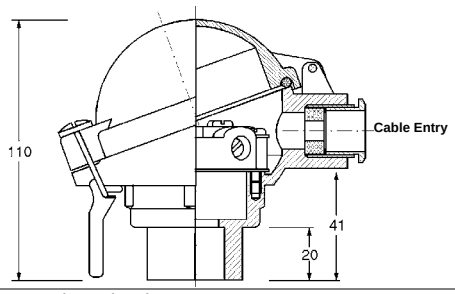
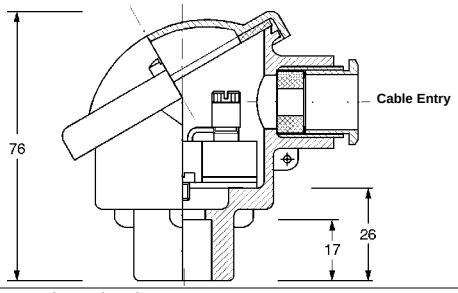
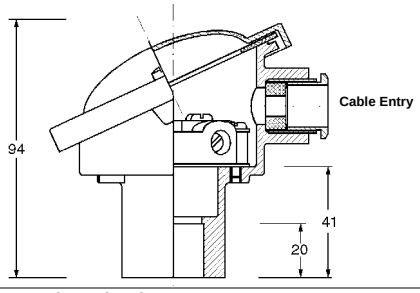
DIN A and B

Rosemount offers Connection heads in forms DIN A and DIN B see Figure 3 on page 5. DIN A connection heads allow connection of thermocouple wire diameters up to 3 mm while DIN B connections heads allow thermocouple wire diameters of up to 2 mm due to a smaller hole diameter. DIN A and B connection heads need different terminal blocks to accommodate different mounting screw spacing. The distance from the bottom of the terminal block to the bottom of the connection is 41 mm for DIN A and 26 mm for DIN B connection heads.

Transmitter Mounting

Each form of the Rosemount 1075 Series standard thermocouple has one connection head that allows mounting a transmitter in the head. Only connection heads TZ-AL (AUZH) DIN A (Option G or F for design AM, AMK, AK, AKK) and TZ-A/BL (BUZH) DIN B (Option L or A for design BM and BK) provide enough space to mount a transmitter directly in the connection head Figure 3 on page 5.

FIGURE 3. Connection Head Dimensional Drawings and Information (All Temperature Limits -40 to 80 °C [-40 to 176 °F])

TZ-A/BL (BUZH) (Option L and A)	HR-A/BL (BUS) (Option Y and Z)
	
Materials: Housing Aluminum; Form B acc. to DIN 43729; Finish Aluminum lacquer; O-Ring Seal Rubber **Weight:** 0.20 kg **Protection Class:** IP 40 **Cable entry:** M20 x1.5 (L) or $^1/_2$ - in. NPT (A) **Cover:** Hinged lid, screw **Transmitter Inst.:** Within cover	**Materials:** Housing Aluminum; Form B acc. to DIN 43729; Finish Aluminum lacquer; O-Ring Seal Rubber **Weight:** 0.24 kg **Protection Class:** IP 40 **Cable entry:** M20 x1.5 (Y) or $^1/_2$ - in. NPT (Z) **Cover:** Hinged lid, with lever lock **Transmitter Inst.:** Not Available
TZ-AL (AUZH) (Option G and F)	**HR-AL (AUS) (Option E and B)**
	
Materials: Housing Aluminum; Form A acc. to DIN 43729; Finish Aluminum lacquer; O-Ring Seal Rubber O-Ring-Seal Rubber **Weight:** 0.22 kg **Protection Class:** IP 40 **Cable entry:** M20 x1.5 (G) or $^1/_2$ - in. NPT (F) **Cover:** Hinged lid, screw **Transmitter Inst.:** Within cover	**Materials:** Housing Aluminum; Form A acc. to DIN 43729; Finish Aluminum lacquer; O-Ring Seal Rubber **Weight:** 0.24 kg **Protection Class:** IP 40 **Cable entry:** M20 x1.5 (E) or $^1/_2$ - in. NPT (B) **Cover:** Hinged lid, with lever lock **Transmitter Inst.:** Not Available
GN-BL (B) (Option U and R)	**GN-AL (A) (Option P and T)**
	
Materials: Housing Aluminum; Form B acc. to DIN 43729; Finish Aluminum lacquer; O-Ring Seal Rubber **Weight:** 0.18 kg **Protection Class:** IP 40 **Cable entry:** M20 x1.5 (U) or $^1/_2$ - in. NPT (R) **Cover:** Loose or removable lid, with 2 screws **Transmitter Inst.:** Not Available	**Materials:** Housing Aluminum; Form A acc. to DIN 43729; Finish Aluminum lacquer; O-Ring Seal Rubber **Weight:** 0.20 kg **Protection Class:** IP 40 **Cable entry:** M20 x1.5 (P) or $^1/_2$ - in. NPT (T) **Cover:** Loose or removable lid, with 2 screws **Transmitter Inst.:** Not Available
Dimensions are in millimeters	

Rosemount 1075 and 1099 Series

Dimensions

The two basic designs of the Rosemount 1075 Series thermocouples have different dimensions that must be considered when choosing a proper model for the various high temperature applications. Figure 4 and Table 2 are giving an overview and definition of the different dimensions for the designs that are used in the above and following chapters for various calculations.

FIGURE 4. Technical Information

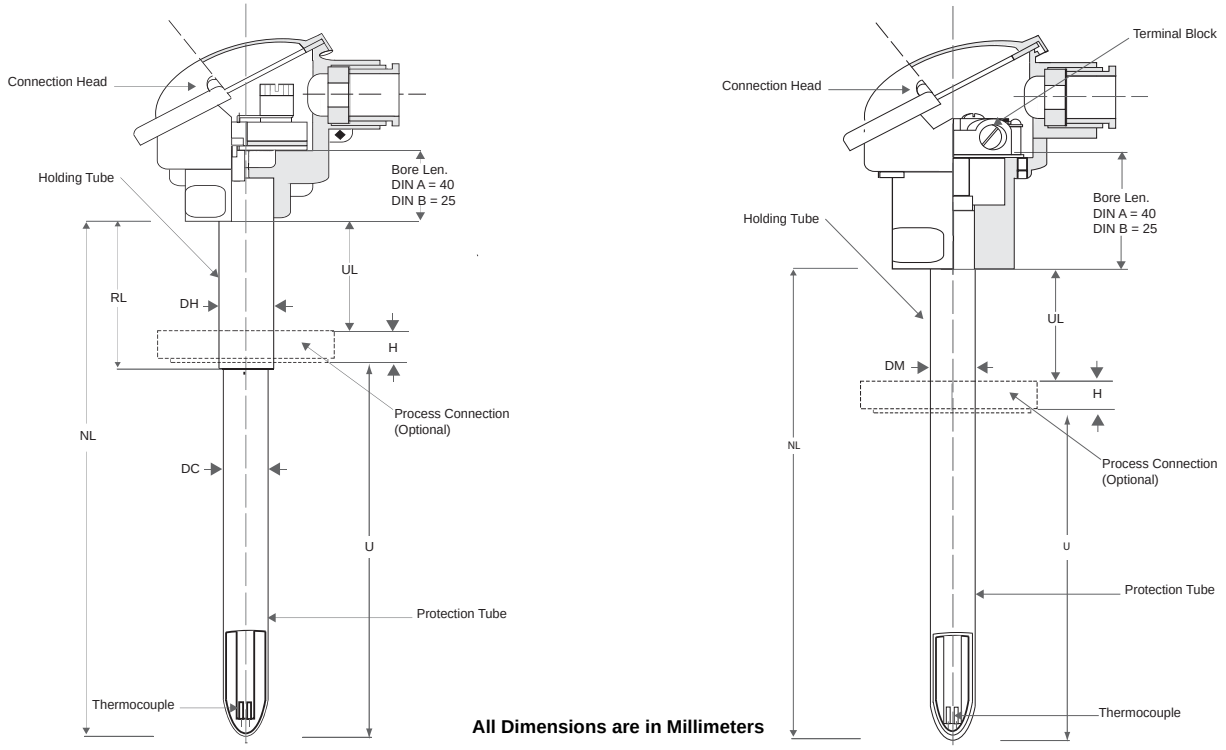


TABLE 2. Design Overview

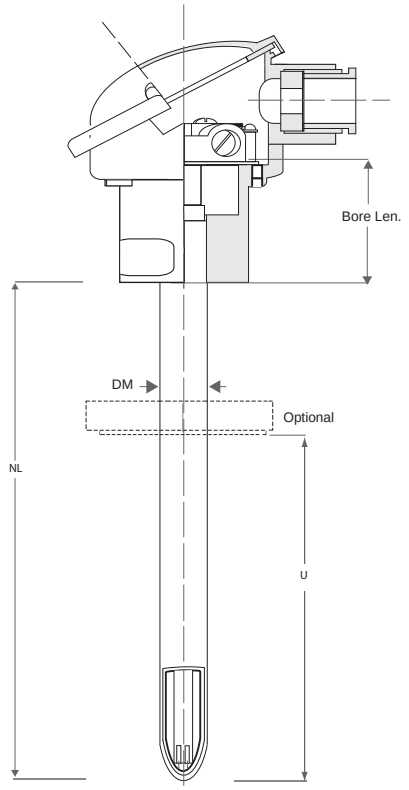
Code	Dimension	Description
NL	Nominal length	Total length of the sensor (from tip of sensor to bottom of connection head) NL = U + H + UL
U	Immersion length	Length of sensor immersed into the process (from tip of sensor to bottom of process connection) (1)
H	Process connection thickness	Used to calculate NL. Accounts for the thickness of the adjustable or welded flange, adjustable stop flange or threaded fitting. See drawings of process connections for more information on page 12.
UL	Uninsulated length	Used to calculate NL. Additional length, specified by customer, to allow the adjustable connections have room to move (for adjustment) and any additional length desired outside the process, between the process connection and connection head.
RL	Holding tube length	Required on 1075 Forms 4, 5, and 6. Min. length = 95 mm. When specifying holding tube length also consider that the process connection must be located on the holding tube, so make sure the lengths overlap.
DM	Diameter metal protection tube	Used to calculate adjustable threaded fitting thread and suitable standoff inner diameters.
DH	Diameter holding tube	Used to calculate adjustable threaded fitting thread and suitable standoff inner diameters
DC	Diameter ceramic protection tube	Used to calculate holding tube diameter.
Bore len	Bore length	Bore length of connection head. 40 mm for DIN A head and 25 mm for DIN B head. Automatically added to NL and RL to account for lengths used in connection head.

(1) This value needs to be specified in the Flange Immersion Length Code if a "Welded Flange" process connection is used. U = Uxxxx where the length = xxxx e.g. Immersion length of 750 = U0750. For more information see Figure C.

Metal Protection Tube Dimensions

For Rosemount 1075 Series thermocouples with metal outer protection tube, design BM, AM and AMK only one dimension has to be considered when selecting the proper model without a welded flange process connection. To select the correct nominal length (NL) for the application consider enough space for process connection (see Process Connection section) and a sufficient uninsulated length (see Uninsulated Length section). When a welded flange is needed for the application the Immersion Length U needs to be added to define the position of the flange. The maximum allowed immersion length U can be calculated by subtracting the welded flange height H stated in Process Connection section from the Nominal Length NL.

FIGURE 5. Metal Protection Tube Dimensions



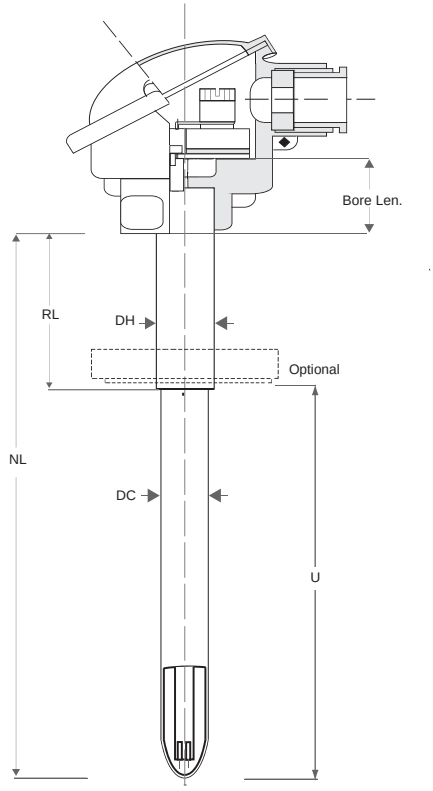
All dimensions are in millimeters

Ceramic Protection Tube Dimensions

For Rosemount 1075 Series thermocouples with ceramic outer protection tube, designs BK, AK and AKK, the Holding tube length RL and the nominal length NL, must be considered when selecting the proper model without a welded flange process connection. As described in the Holding Tube section, a metal holding tube is needed to connect the ceramic protection tube to the connection head. To select the correct holding tube length for the application consider enough space for process connection (see Process Connection section) and a sufficient uninsulated length (see Uninsulated Length section). The minimum length of the holding tube RL is restricted to 95 mm and the maximum length is restricted to 999 mm or nominal length NL – 50 mm.

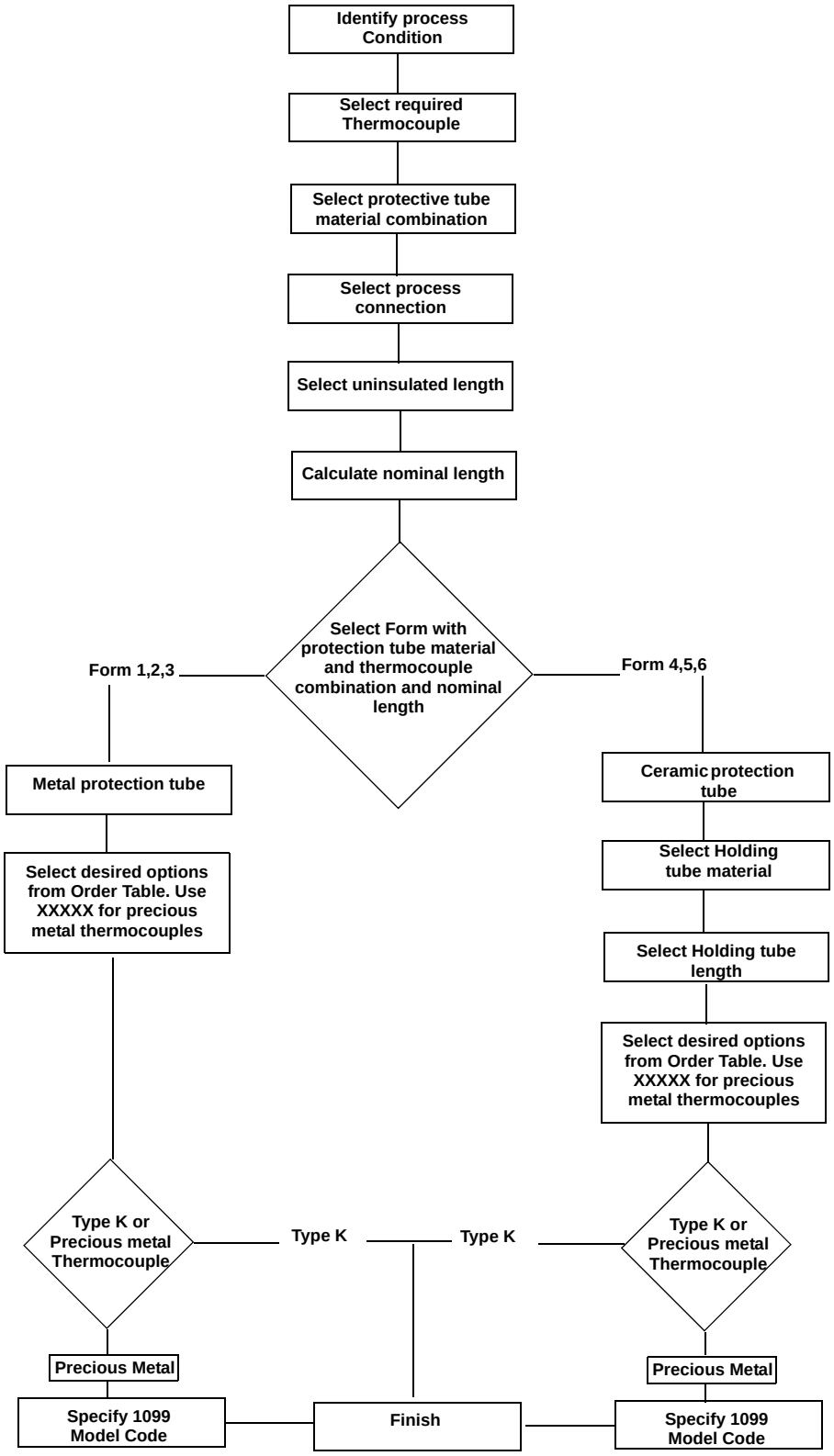
When a welded flange is needed for the application the Immersion Length U needs to be added to define the position of the flange on the holding tube. The maximum allowed immersion length U can be calculated by subtracting the holding tube length RL from the nominal length NL.

FIGURE 6. Ceramic Protection Tube Dimension



All dimensions are in millimeters

HOW TO DECIDE WHAT TO ORDER



How to decide what to order

Step 1: Know your process conditions

- Maximum process temperature
- Maximum process pressure
- Danger of thermal shocks (rapid temperature changes)
- Abrasive process medium
- Sulphurous gases in process
- Nitrogenous gases in process
- Required process connection size/type

Step 2: Select the right thermocouple type

- Check maximum temperature
- Consider proper wire diameter for 1099 model code

Step 3: Select protective tube material

- Use process parameters to find best suitable protection tube material
- Combinations of materials possible
- Check column protective tube material code for inner and outer protection tube combinations

Step 4: Select process connection

- Check maximum pressure
- Select proper process connection for application and pressure
- Look up model code and length L1 from appropriate table - if there are more than one L1 available keep all in mind for Step 6

Step 5: Select uninsulated length

- Ensure proper ambient temperature at connection head/transmitter position

Step 6: Calculate nominal length

- Calculate nominal length: Immersion length + process connection height (Step 4) + uninsulated length (Step 5)
- Make two calculations if you have different process connection heights

Step 7: Select 1075 Form

- Use Table 10
- Use protective tube material codes from Step 3 to select possible types
- Use chosen thermocouple type from Step 2 to check if suitable to type
- Check maximum temperature of protection tube/thermocouple combination
- Check maximum length of 1075 design by using the lengths calculated in Step 6
- Check ordering table from information column

Step 8: Select Holding tube material (only for Design BK, AK and AKK)

- Use Table 11
- Choose proper material for process conditions (Step 1)

Step 9: Select Holding tube length (only for Design BK, AK and AKK)

- See Dimensions
- Minimum holding tube length 95 mm

Step 10: Select desired options from 1075 ordering tables

- Use ordering table selected in Step 7

Step 11: Select desired options from 1099 ordering table (only for Design AMK, BK, AK and AKK)

Specification Guide

THERMOCOUPLES

Thermoelectric Effect

A thermocouple is a connection between two different metals that produces a change in Electromagnetic Force (EMF) in comparison to the temperature change that is applied. It provides a thermoelectric voltage in millivolts DC depending on the difference in temperature between the hot (exposed to the measurement temperature) and cold (known temperature) junctions. A thermocouple has two different connected leads (positive and negative). These leads are connected to extension or compensating cables, or directly to the transmitter in a local or remote connection head. The simplest thermocouple consists of two wires welded together at one end which form the measuring tip.

Thermocouple Materials

The IEC 584 (DIN EN 60584) standard defines the basic values and tolerances of the thermocouple types at a temperature range between 0 °C (32 °F) and 1800 °C (3272 °F). For high temperature measurements from 1200 °C (2192 °F) to 1800 °C (3272 °F), a precious-metal thermocouple must be used. Generally, precious-metal (platinum) thermocouples are stable and can be used up to 1800 °C (3272 °F), See Table 3.The most commonly used base metal thermocouple, Type K, covers most industrial applications.

TABLE 3. Characteristics of Standard Thermocouples

Thermocouple Type	Alloy of Leads + / -	Temperature Range	Output [mV d.c.]
K	NiCr-Ni	0 to 1200 °C (32 to 2192 °F)	0 to 48.828
R	PtRh87/13%-Pt	0 to 1600 °C (32 to 2912 °F)	0 to 18.842
S	PtRh90/10%-Pt	0 to 1600 °C (32 to 2912 °F)	0 to 16.771
B	PtRh70/30%-Pt Rh94/6%	0 to 1800 °C (32 to 3272 °F)	0 to 13.585

NOTE
Rosemount 1099 Series precious metal thermocouples (Type B, R, and S) need to be ordered using the model code. For more information, see Table 15 on page 29; Table 17 on page 34; Table 19 on page 39; and Table 21 on page 44.

Tolerances

All thermocouples manufactured and supplied by Emerson are in accordance with IEC 584-2 (DIN EN60584-2) limit tolerances. Thermocouples type K, R and S are supplied in Class1, but thermocouple Type B is supplied in class 2. Calibration of one or more customer-specified measuring points can be provided on request with a DKD-certificate up to 1200 °C (2192 °F) and a works certificate (WERKSZERTIFIKAT from Germany) up to 1300 °C (2372 °F).

TABLE 4. Tolerances of Thermocouples According to DIN EN 60584-2

Type	Alloy	Temperature Range	Tolerance DIN EN 60584-2	Tolerance Class
Base Metal Thermocouples				
K	NiCr-Ni	-40 to 375 °C (-40 to 707 °F) 375 to 1000 °C (707 to 1832 °F)	1.5 °C 0.004 x (t)	1
		-40 to 333 °C (-40 to 631 °F) 333 to 1200 °C (631 to 2192 °F)	2.5 °C 0.0075 x (t)	2
Precious Metal Thermocouples				
R	PtRh87/13%-Pt	0 to 1100 °C (32 to 2012 °F) 1100 to 1600 °C (2012 to 2912 °F)	1.0 °C 1 + 0.003 x (t - 1100 °C)	1
		0 to 600 °C (32 to 1112 °F) 600 to 1600 °C (1112 to 2912 °F)	1.5 °C 0.0025 x (t)	2
S	PtRh90/10%-Pt	0 to 1100 °C (32 to 2012 °F) 1100 to 1600 °C (2012 to 2912 °F)	1.0 °C 1 + 0.003 x (t - 1100 °C)	1
		0 to 600 °C (32 to 1112 °F) 600 to 1600 °C (1112 to 2912 °F)	1.5 °C 0.0025 x (t)	2
B	PtRh70/30%-Pt Rh94/6%	600 to 1700 °C (1112 to 3092 °F)	0.0025 x (t)	2

Precious metal thermocouples

The Rosemount 1075 and 1099 Series High Temperature Thermocouples offers precious metal thermocouples type B, R and S. The thermocouple wires of these thermocouples types consist of platinum with various contents of rhodium. These thermocouples are only available for Forms 3, 4, 5 and 6, where a ceramic protection tubes are used.

Rosemount 1099 Series Precious Metal Thermocouple Model code

The Rosemount 1099 series precious metal thermocouple have to be assembled and cannot be ordered as a stand-alone model.

Thermocouple wire diameter

The thermocouple wire diameter varies with the design of the thermocouple. The standard diameter is 0.5 mm (0.02 in.) and is recommended for long-term stability. However, a wire diameter of 0.35 mm (0.01 in.) is also available.

Protection Tube Design

A protection tube shields thermocouples from pressure, flow, corrosion, mechanical and chemical influences. Multiple designs using different materials and alloys were standardized for the use of our thermocouple assemblies. The Rosemount 1075 and 1099 Series offer a wide range of application specific protection tubes dependent on the process conditions.

Outer Protection Tube

Outer protection tubes are exposed directly to all flow, corrosion, mechanical and chemical influences from the process and are working as a barrier between the thermocouple and the process. Outer protection tubes must be selected for each Form of the Rosemount 1075 Series.

Inner Protection Tube

Inner protections are only available for Form 3 and 6 and are used to increase the lifetime of the thermocouple if the outer protection tube gets damaged or if the outer protection tube can not withstand all the mechanical, corrosive or chemical influences from the process. In some cases for the 1075 Type AMK the metal protection tube protects the inner protection from mechanical damage.

FIGURE 7. Ceramic Protection Tube Design

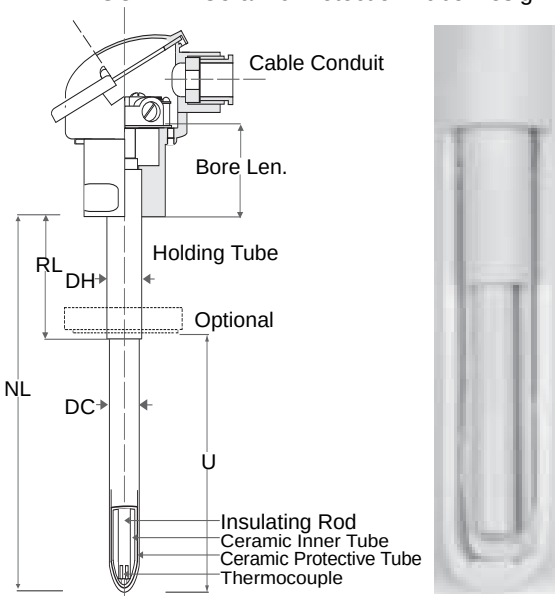


TABLE 5. Protection tube material guide

				Protective Tube Material's Resistance to:					
Protective Tube Material	**Protection Tube material codes outer tube/inner tube**	**Maximum Temperature**	**Suitable for High Pressure (≥ 1 bar)**	**Physical Gas Permeation**	**Thermal shock**	**Chemical Sulfurous Gases**	**Chemical Nitrogenous Gases**	**Abrasion**	**Application Example**
Metal Protective Tubes									
1.4762 ASTM 446	A, C, E	1200 °C	Yes	No	High	High	Low	Low	Combustion exhausts, cement and ceramic furnaces, thermal treatment processes, annealing furnaces
1.4767 Kathal AF™	G	1350 °C	Yes	No	High	High	Low	High	Industrial furnaces, glass, ceramic, and cement industry, refuse incinerators
1.4841 ASTM 314	B, D, F	1200 °C	Yes	No	High	Low	High	Low	Combustion chambers, industrial furnaces, cyanide baths, petrochemical industry, nitrogenous blast heaters
Ceramic Protection Tube (DIN EN 60672)									
Type C530 (AL_2O^3)	T, V	1600 °C	No	Yes	Mediu m	High	High	High	Electrically heated furnaces up to 1300 °C and other industrial furnaces
Type C610 (60% Al_2O_3)	J, P / T, E, F, G	1400 °C	No	Yes	Low	High	High	High	Gas tight furnaces, diffusion furnaces
Type C799 (99,7% Al^2O_3)	L, R, W / V, W, Y	1800 °C	No	No	Low	High	High	High	Protective gas furnaces as well as gas tight and electrically heated furnaces up to 1700 °C (glass tank furnaces), flue gas desulphurization, chemical industry, cement production
Silicon Carbide Protective Tube (DIN EN 12212)									
Reaction sintered, silicon infiltrated	Y	1700 °C	No	Yes	High	HIgh	High	High	Flue gas desulphurization, coal mill firing rooms

Selecting a suitable protection tube is crucial to the service life of the thermocouple assembly. Heat resistant metal protection tubes, such as Inconel or CrNi-steel, provide high mechanical stress protection and can be used with temperatures up to 1200 °C (2192 °F). Emerson offers, as standard design, protection tubes of the following materials: ASTM 446 (1.4762) and ASTM 314 (1.4841). Protection tubes of Kanthal AF available for temperatures up to1350 °C (2463 °F) e.g. in corrosive furnace atmospheres. Kanthal protection tubes can be used for multiple applications in refuse incinerators. Ceramic protection tubes are used for high temperature ranges. Table 5 identifies the characteristics and fields of application for standard materials and Ceramic Types C530, C610, and C799. Gas tight protective tube, made of silicon carbide for use in high dust loads and corrosive environments up to 1700 °C (3092 °F) guarantee a high service live under these conditions.

Process Connections

Rosemount offers a wide variety of adjustable and welded mounting elements. The mounting elements, like flanges, thread fittings and stop flanges are available in different sizes. All flanges are delivered with raised face sealing surface. The adjustable stop flange has no seal. The adjustable and removable flanges and threaded fittings are sealed with a fiber washer that can withstand up to 1 bar of pressure, while the welded-on flange connections are limited to 3 bar process pressure.

The process connection on the metal protective tubes can be moved. The mounting element on ceramic protective tubes with stop and counter flange is situated at the end of the holding tube with a seal on the protective tube. The position of the threaded fitting or welded-on flange on the holding tube can be selected as desired.

Allow enough space for the process connection, by using below tables, when choosing the nominal length (NL) of the Rosemount 1075 Series standard thermocouple.

FIGURE 8. Adjustable Stop Flanges

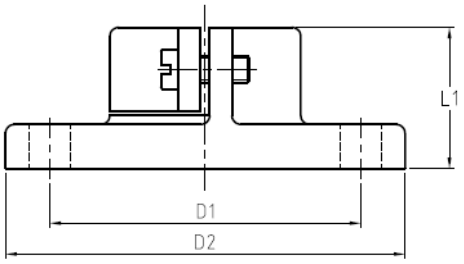


TABLE 6. Adjustable Stop Flanges acc to DIN 43734

Protective or Holding Tube dia. in mm	Option Code	L1 in mm	D1 in mm	D2 in mm
15	A1	32	55	75
22	A2	32	70	90
32	A3	32	70	90

FIGURE 9. Adjustable Gas Tight Threaded Fittings

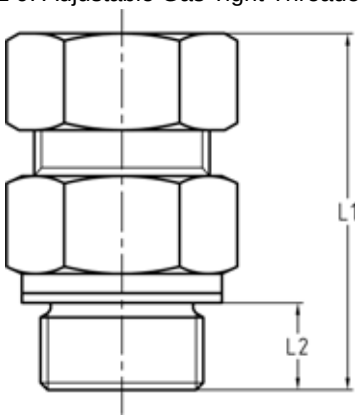


TABLE 7. Adjustable Gas Tight Threaded Fittings (up to 1 bar (14 psi))

Thread	Option Code	L1 in mm	L2 in mm
G 3/4	B1	65	20
G1	B2	75	20
G 1 1/4	B3	85	25
3/4-in. NPT	B4	65	20
1-in.NPT	B5	76	25
1 1/4 - in. NPT	B6	85	26

FIGURE 10. Welded-on Flanges

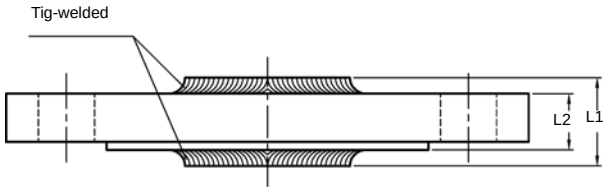


TABLE 8. Welded-on Flanges (up to 3 bar (43 psi))

Flange Size	Option Code	L1 in mm	L2 in mm
1-in. 150 lbs	F4	20	14
1-in. 300 lbs	F5	24	18
1-in. 600 lbs	F6	24	18
1 1/2-in. 150 lbs	G4	24	18
1 1/2-in. 300 lbs	G5	27	21
1 1/2-in. 600 lbs	G6	28	22
2-in. 150 lbs	H4	25	19
2-in. 300 lbs	H5	28	22
2-in. 600 lbs	H6	31	25

FIGURE 11. Adjustable Flanges

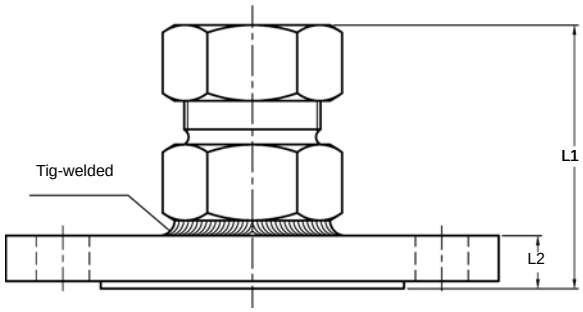


TABLE 9. Adjustable Flanges (up to 1 bar (14 psi))

		L1 in mm						L2 in mm
Flange Size	**Option Code**	**Type BM**	**Type AM**	**Type AMK**	**Type BK**	**Type AK**	**Type AKK**	
1-in. 150 lbs RF	C4	54	64	64	54	64	-	14
1-in. 300 lbs RF	C5	58	68	68	58	68	-	18
1-in. 600 lbs RF	C6	58	68	68	58	68	-	18
1 1/2-in. 150 lbs RF	D4	58	68	68	58	68	83	18
1 1/2-in. 300 lbs RF	D5	61	71	71	61	71	86	21
1 1/2-in. 600 lbs RF	D6	62	72	72	62	72	87	22
2-in. 150 lbs RF	E4	59	69	69	59	69	84	19
2-in. 300 lbs RF	E5	62	72	72	62	72	87	22
2-in. 600 lbs RF	E6	65	75	75	65	75	90	25

Uninsulated Length

In a direct mounting configuration, heat from the process, is transferred through the protection tube to the transmitter housing. The uninsulated length is the part of the metal protection or holding tube with no insulation, so the temperature from the process can transfer to the environment. This helps to ensure the temperature limits of the connection head are not exceeded. The connection heads and transmitters of the Rosemount 1075 Series are limited to temperatures of 80 °C (176 °F). If the expected process temperature is near or beyond the transmitter specification limits, consider the use of additional uninsulated length or a remote mounting configuration to isolate the transmitter from these excessive temperatures.

1075 Form Selector

The Rosemount 1075 and 1099 Series High Temperature Thermocouples are divided in 6 different types with different protection tube materials, diameters and thermocouple types. Please refer to Table 10 to chose the correct from for the application. The maximum temperature in Table 10 results in the maximum allowed temperature for either the thermocouple type or the protection tube.

TABLE 10. Form Selector

Protection Tube Material	Protection Tube Material Code	Maximum Length	Diameter (Outer Dia. x Wall Thickness)	Suitable Thermocouple	Maximum Temperature	Inner Tube	Type	Information Table
1.4762 / ASTM 446	A	2000 mm (78.4-in.)	15 x 2 mm (0.59 x 0.08-in.)	Type K	1200 °C (2192 °F)	Without	BM DIN B with Metal Protection Tube	Table 12 on page 18
1.4841 / ASTM 314	B		15 x 2 mm (0.59 x 0.08-in.)	Type K	1200 °C (2192 °F)			
1.4762 / ASTM 446	C	6000 mm (236.22-in.)	22 x 2 mm (0.87 x 0.08-in.)	Type K	1200 °C (2192 °F)	Without	AM DIN A with Metal Protection Tube	Table 13 on page 22
1.4841 / ASTM 314	D		22 x 2 mm (0.87 x 0.08-in.)	Type K	1200 °C (2192 °F)			
1.4762 / ASTM 446	E	4000 mm (157.48-in.)	22 x 2 mm (0.87 x 0.08-in.)	Type R, S, B	1200 °C (2192 °F)	C610	AMK DIN A with Metal Protection Tube and Ceramic Inner Tube	Table 14 on page 26
1.4841 / ASTM 314	F		22 x 2 mm (0.87 x 0.08-in.)	Type R, S, B	1200 °C (2192 °F)			
1.4767 (Kanthal AF™)	G		22 x 1.38 mm (0.87 x 0.06-in.)	Type R, S, B	1350 °C (2462 °F)			
Type C610	J	1000 mm (39.37-in.)	10 x 1.5 mm (0.39 x 0.06-in.)	Type K	1200 °C (2192 °F)	Without	BK DIN B with Ceramic Protection Tube	Table 16 on page 31
				Type R, S, B	1400 °C (2552 °F)			
Type C799	L		10 x 1.5 mm (0.39 x 0.06-in.)	Type R and S	1600 °C (2912 °F)			
				Type B	1800 °C (3272 °F)			
Type C610	P	2000 mm (78.4-in.)	15 x 2 mm (0.59 x 0.08-in.)	Type K	1200 °C (2192 °F)	Without	AK DIN A with Ceramic Protection Tube	Table 18 on page 36
				Type R, S, B	1400 °C (2552 °F)			
Type C799	R		15 x 2.5 mm (0.59 x 0.10-in.)	Type R and S	1600 °C (2912 °F)			
				Type B	1800 °C (3272 °F)			
Reaction sintered, silicon infiltrated, silicon carbide	Y	2000 mm (78.4-in.)	25 x 3,5 mm (0.98 x 0.14-in.)	Type B	1700 °C (3092 °F)	C799	AKK DIN A with Ceramic Protection Tube and Inner Tube	Table 20 on page 41
				Type R and S	1600 °C (2912 °F)			
Type C530	T		26 x 4 mm (1.02 x 0.16-in.)	Type K	1200 °C (2192 °F)	C610		
				Type R, S, B	1400 °C (2552 °F)			
Type C530	V	2000 mm (78.4-in.)	26 x 4 mm (1.02 x 0.16-in.)	Type R, S, B	1600 °C (2912 °F)	C799		
Type C799	W		24 x 3 mm (0.95 x 0.12-in.)	Type R and S	1600 °C (2912 °F)			
				Type B	1800 °C (3272 °F)			

Holding Tube

The Rosemount 1075 Series standard thermocouples Types BK, AK and AKK are designed with a ceramic outer protection tube (see Design with ceramic protection tube). The holding tube is used to connect the ceramic outer protection tube to the connection head and to mount the process connection. It is also used to ensure the proper uninsulated length to keep the connection head or transmitter cooler and to give some mechanical strength for the thermocouple in the refractory. Rosemount offers the holding tubes in three different steels. See Table 11.

Holding tubes are normally inside the refractory and are not exposed to the higher process temperatures. Because the temperature above the fitting is generally lower, unalloyed steel is acceptable for use. However, if a holding tube is exposed to the surface heat and the process medium, then heat resistant steel is required and resistance to the process medium must be considered to avoid damage. See Table 11 for the material properties.

TABLE 11. Holding Tube Material Information

Holding Tube Material	Maximum Temperature	Holding Tube Material's Resistance To:				
		Physical Gas Permeation	Thermal Shock	Chemical Sulfurous Gases	Chemical Nitrogenous Gases	Abrasion
1.4762 ASTM 446	1200 °C	No	High	High	Low	Low
1.4841 ASTM 314	1200 °C	No	High	Low	High	Low
1.0305 ASTM A106-A	550 °C	No	High	Low	Medium	Low

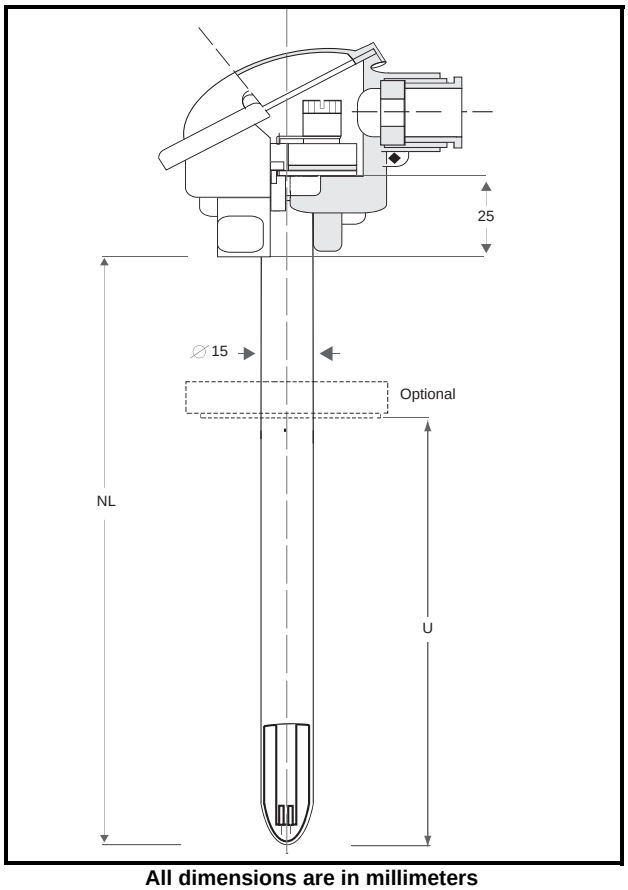
1075 Series Immersion Thermocouples with Metal Protection Tube (Design BM)

This design consists of a ceramic insulated base metal thermocouple Type K with a protection tube design Type BM, according to DIN EN 50446.

The thermocouple legs are insulated with ceramic elements. Oxidation can occur in Type K thermocouples operating between 800 and 1000 °C (1472 and 1832 °F) particularly in low-oxygen, and reducing atmospheres so minimally insulated thermocouple are recommended for these temperatures.

Protection tubes are available in standard heat resistance steel 1.4762 (ASTM 446) and 1.4841 (ASTM 314).

FIGURE 12. 1075 Series Immersion Thermocouples with Metal Protection Tube (Desing BM)



All dimensions are in millimeters

TABLE 12. Rosemount 1075 Series Immersion Thermocouples with Metal Protection Tube (Design BM) 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			
1075	High Temperature Thermocouple			
Design				
Standard				**Standard**
1	BM - DIN Form B Style with Metal Protection Tube (Max Temp 1200 °C, Max length 2000 mm)			★
Connection Head (DIN Form B Style) (More info on Figure 3 on page 5)		**IP Rating**	**Conduit Entry**	
Standard				**Standard**
L(1)	TZ-A/BL (BUZH), Aluminum	40	M20 x 1.5	★
U	GN-BL, Aluminum, DIN 43729	40	M20 x 1.5	★
Y	HR-A/BL (BUS), Aluminum	40	M20 x 1.5	★
A(1)	TZ-A/BL (BUZH), Aluminum	40	1/2 in. NPT	★
R	GN-BL, Aluminum, DIN 43729	40	1/2 in. NPT	★
Z	HR-A/BL (BUS), Aluminum	40	1/2 in. NPT	★
Sensor Connection				
Standard				**Standard**
2	Terminal Block DIN Form B Style			★
Number of Elements				
Standard				**Standard**
01	Single			★
02	Dual			★
Thermocouple Type (More info on Table 3 on page 10)		**Tolerance class acc. to IEC 584 (DIN EN 60584-2)**		
Standard				**Standard**
K	K	Class 1		★
Wire Diameter in Millimeters		**Thermocouple Type**	**Max. Temperature (°C)(2)**	
Standard				**Standard**
13	1.38 mm (Use with Dual Element)	K	1200	★
20	2 mm (Use with Single Element)	K	1200	★
Protection Tube Material (More info on Table 5 on page 12)		**Inner Tube Material**	**Max. Temperature (°C)(3)**	
Standard				**Standard**
A	1.4762 (AISI 446), 15 x 2	Not Required	1200 (K)	★
B	1.4841 (AISI 314), 15 x 2	Not Required	1200 (K)	★
Nominal Length (NL) In Millimeters (More info on Figure 4 on page 6)				
Standard				**Standard**
0250	250			★
0500	500			★
0710	710			★
1000	1000			★
XXXX	Other lengths (in 5 mm increments available from 150 to 2000 mm)			★
Process Connection (More info on Table 8 and Table 9 on page 14)		**Material**		
Standard				**Standard**
NN	No Fitting			★
A1	Adjustable stop flange (15 mm)	GTW-35 (cast iron)		★
B1	Adjustable threaded fitting with G 3/4	1.0718 (steel)		★
B4	Adjustable threaded fitting with 3/4 inch NPT	1.0718 (steel)		★

TABLE 12. Rosemount 1075 Series Immersion Thermocouples with Metal Protection Tube (Design BM) 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.

Expanded			
C4	Adjustable Flange 1 inch Class 150 RF	1.4571 (SS316Ti) Flange / 300 series SST fitting	
C5	Adjustable Flange 1 inch Class 300 RF	1.4571 (SS316Ti) Flange / 300 series SST fitting	
C6	Adjustable Flange 1 inch Class 600 RF	1.4571 (SS316Ti) Flange / 300 series SST fitting	
D4	Adjustable Flange 1 1/2 inch Class 150 RF	1.4571 (SS316Ti) Flange / 300 series SST fitting	
D5	Adjustable Flange 1 1/2 inch Class 300 RF	1.4571 (SS316Ti) Flange / 300 series SST fitting	
D6	Adjustable Flange 1 1/2 inch Class 600 RF	1.4571 (SS316Ti) Flange / 300 series SST fitting	
E4	Adjustable Flange 2 inch Class 150 RF	1.4571 (SS316Ti) Flange / 300 series SST fitting	
E5	Adjustable Flange 2 inch Class 300 RF	1.4571 (SS316Ti) Flange / 300 series SST fitting	
E6	Adjustable Flange 2 inch Class 600 RF	1.4571 (SS316Ti) Flange / 300 series SST fitting	
F4(4)	Welded Flange 1 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
F5(4)	Welded Flange 1 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
F6(4)	Welded Flange 1 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G4(4)	Welded Flange 1 1/2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G5(4)	Welded Flange 1 1/2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G6(4)	Welded Flange 1 1/2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H4(4)	Welded Flange 2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H5(4)	Welded Flange 2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H6(4)	Welded Flange 2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
Holding Tube Material			
Standard			**Standard**
N	No Holding Tube Required		★
Holding Tube Length (RL) in Millimeters			
Standard			**Standard**
000	No Holding Tube Length		★

Options (Include with selected model number)

Flange Immersion Length		
Standard		**Standard**
U1500	Length from Welded flange face to sensor tip (1500 mm)	★
UXXXX	Non-standard length form Welded flange face to sensor (xxxx mm)	★
Drawing		
Standard		**Standard**
M99	Order specific drawing	★
Assemble to Options		
Standard		**Standard**
XA	Fit sensor to temperature transmitter	★

TABLE 12. Rosemount 1075 Series Immersion Thermocouples with Metal Protection Tube (Design BM) 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.

Work Certificates		
Standard		**Standard**
W02	Works Cert: Comparison measurement at 2 temperature points (WERKSZERTIFIKAT)	★
W05	Works Cert: Comparison measurement at 5 temperature points (WERKSZERTIFIKAT)	★
Calibration Certificate		
Standard		**Standard**
K02	DKD Calibration Cert: DKD Cert for 2 temperature points specified by customer	★
K05	DKD Calibration Cert: DKD Cert for 5 temperature points specified by customer	★

(1) Connection head suitable for mounting a transmitter inside (Rosemount 248 and 644)

(2) Maximum allowable temperature for the protection tube material and thermocouple type combination.

(3) Maximum temperature for Class 1: 1000 °C (1832 °F). Higher temperatures Class 2

(4) Welded-on flange immersion length (U) must be less than the nominal length (NL) minus 50 mm.

1075 Series Immersion Thermocouples with Metal Protection Tube (Design AM)

This design consists of a base metal thermocouple Type K, and a housing with a protective tube design Type AM, according to DIN EN 50446. The thermocouple legs are insulated with ceramic elements.

A gas tight threaded fitting is needed for gas tight installation of the protection tube (pressure of up to 1 bar). Our standard heat resistant materials for protection tubes are 1.4762 (ASTM 446) and 1.4841 (ASTM 314).

FIGURE 13. 1075 Series Immersion Thermocouples with Metal Protectin Tube (Design AM)

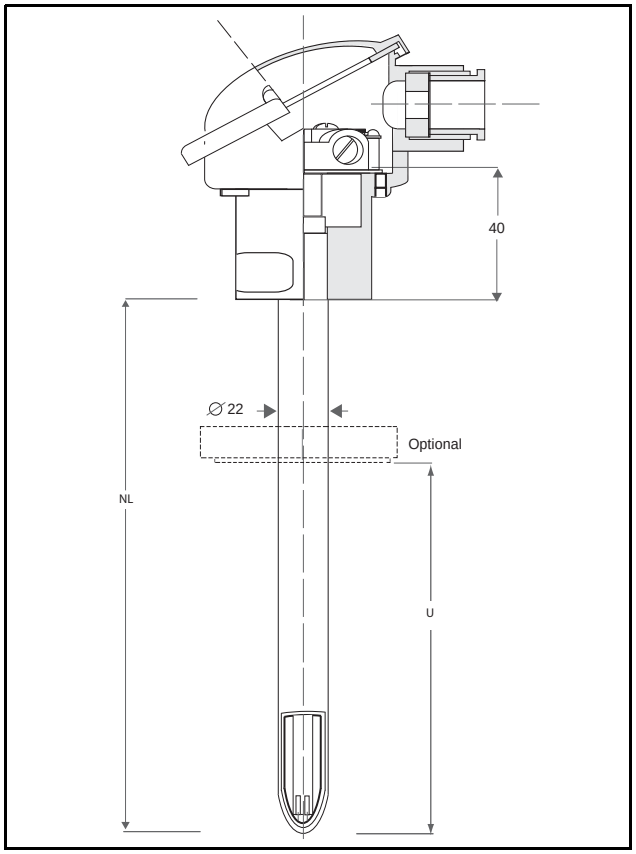


TABLE 13. Rosemount 1075 Series Immersion Thermocouples with Metal Protection Tube (Design AM) Ordering Information

★ 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**			
1075	High Temperature Thermocouple			
Model	**Design**			
Standard				**Standard**
2	AM - DIN A with Metal Protection Tube (Max Temp 1200 °C, Max length 6000 mm)			★
Connection Head (DIN Form A Style) (More info on Figure 3 on page 5)		**IP Rating**	**Conduit Entry**	
E	HR-AL (AUS), Aluminum	40	M20 x 1.5	★
G(1)	TZ-AL (AUZH), Aluminum	40	M20 x 1.5	★
P	GN-AL, Aluminum, DIN 43729	40	M20 x 1.5	★
B	HR-AL (AUS), Aluminum	40	1/2 in. NPT	★
F(1)	TZ-AL (AUZH), Aluminum	40	1/2 in. NPT	★
T	GN-AL, Aluminum, DIN 43729	40	1/2 in. NPT	★
Sensor Connection				
Standard				**Standard**
3	Terminal Block DIN Form A Style			★
Number of Elements				
Standard				**Standard**
01	Single			★
02	Dual			★
Thermocouple Type (More info on Table 3 on page 10)		**Tolerance class acc. to IEC 584 (DIN EN 60584-2)**		
Standard				**Standard**
K	K	Class 1		★
Wire Diameter in Millimeters		**Thermocouple Type**	**Max. Temperature (°C)(2)**	
Standard				**Standard**
20	2 mm (Use with Dual Element)	K	1200	★
30	3 mm (Use with Single Element)	K	1200	★
Code	**Protection Tube Material (More info on Table 5 on page 12)**	**Inner Tube Material**	**Max. Temperature (°C)(3)**	
Standard				**Standard**
C	1.4762 (AISI 446), 22 x 2	Not Required	1200 (K)	★
D	1.4841 (AISI 314), 22 x 2	Not Required	1200 (K)	★
Code	**Nominal Length (NL) in Millimeters (More info on Figure 4 on page 6)**			
Standard				**Standard**
0500	500 mm			★
0710	710 mm			★
1000	1000 mm			★
1400	1400 mm			★
XXXX	Other lengths (in 5mm increments available from 250 to 6000 mm)			★
Code	**Process Connection (More info on Table 8 and Table 9 on page 14)**	**Material**		
Standard				**Standard**
NN	No Fitting			★
A2	Adjustable stop flange (22 mm)	GTW-35 (cast iron)		★
B2	Adjustable threaded fitting with G 1	1.0718 (steel)		★
B5	Adjustable threaded fitting with 1 in. NPT	1.0718 (steel)		★

TABLE 13. Rosemount 1075 Series Immersion Thermocouples with Metal Protection Tube (Design AM) 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.

Expanded			
C4[4]	Adjustable Flange 1 inch Class 150 RF	1.4571 (SS316Ti) Flange/300 series SST fitting	
C5[4]	Adjustable Flange 1 inch Class 300 RF	1.4571 (SS316Ti) Flange/300 series SST fitting	
C6[4]	Adjustable Flange 1 inch Class 600 RF	1.4571 (SS316Ti) Flange/300 series SST fitting	
D4	Adjustable Flange 1 1/2 inch Class 150 RF	1.4571 (SS316Ti) Flange/300 series SST fitting	
D5	Adjustable Flange 1 1/2 inch Class 300 RF	1.4571 (SS316Ti) Flange/300 series SST fitting	
D6	Adjustable Flange 1 1/2 inch Class 600 RF	1.4571 (SS316Ti) Flange/300 series SST fitting	
E4	Adjustable Flange 2 inch Class 150 RF	1.4571 (SS316Ti) Flange/300 series SST fitting	
E5	Adjustable Flange 2 inch Class 300RF	1.4571 (SS316Ti) Flange/300 series SST fitting	
E6	Adjustable Flange 2 inch Class 600 RF	1.4571 (SS316Ti) Flange/300 series SST fitting	
F4[4][5]	Welded Flange 1 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
F5[4][5]	Welded Flange 1 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
F6[4][5]	Welded Flange 1 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G4[5]	Welded Flange 1 1/2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G5[5]	Welded Flange 1 1/2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G6[5]	Welded Flange 1 1/2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H4[5]	Welded Flange 2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H5[5]	Welded Flange 2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H6[5]	Welded Flange 2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
Holding Tube Material			
Standard			**Standard**
N	No Holding Tube		★
Holding Tube Length (RL) in Millimeters			
Standard			**Standard**
000	No Holding Tube Length		★

Options (Include with selected model number)

Flange Immersion Length		
Standard		**Standard**
U1500	Length from Welded flange face to sensor tip (1500 mm)	★
UXXXX	Non standard length from Welded flange face to sensor tip (xxxx mm)	★
Other		
Standard		**Standard**
M99	Order Specific Drawing	★
Assemble to Options		
Standard		**Standard**
XA	Fit sensor to temperature transmitter	★

TABLE 13. Rosemount 1075 Series Immersion Thermocouples with Metal Protection Tube (Design AM) 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.

Work Certificates		
Standard		**Standard**
W02	Works Cert: Comparison measurement at t 2 measurement points (WERKSZERTIFIKAT)	★
W05	Works Cert: Comparison measurement at with 5 measurement points (WERKSZERTIFIKAT)	★
Calibration Certificates		
Standard		**Standard**
K02	DKD Calibration Cert: DKD Cert for 2 temperature points specified by customer	★
K05	DKD Calibration Cert: DKD Cert for 5 temperature points specified by customer	★

(1) Connection head suitable for mounting a transmitter inside (Rosemount 248 and 644)

(2) Maximum temperature for Class 1: 1000 °C (1832 °F). Higher temperatures Class 2

(3) Maximum allowable temperature for the protection tube material and thermocouple type combination.

(4) Inner diameter of mating flange (standoff) must be greater then 23mm.

(5) Welded-on flange immersion length (U) must not be greater than nominal length (NL) minus 50 mm.

1075 Series Immersion Thermocouples with Metal Protection Tube and with Ceramic Inner Tube (Design AMK)

This design consists of precious metal thermocouples Types R, S, or B, and a housing with a protection tube design Type AMK, according to DIN EN 50446. Precious metal thermocouples are insulated with a Ceramic insulating rod and have a inner tube of 15 x 2 mm (0.59 x 0.08 in.).

A gas tight threaded fitting is needed for gas tight installation of the protection tube (pressure of up to 1 bar). Our standard heat resistant materials for protection tubes are 1.4762 (ASTM 446) and 1.4841 (ASTM 314). We also have a protection tube type made of heat resistant Kanthal with an outer diameter of 22 mm (0.67 in.).

Protection tubes of Kanthal AF offer the following advantages:

- Temperature resistance to 1350 °C (2462 °F)
- Longer service life with a wall thickness of 2.0 mm (0.08 in.)
- Greater heat transfer because low wall thickness leads to a better response time
- Greater temperatures create a form fitting alumina film that blocks impurities
- Resistance to oxidation that is superior to most iron and nickel-base alloys

FIGURE 14. 1075 Series Immersion Thermocouples with Metal Protection Tube and with Ceramic Inner Tube (Design AMK)

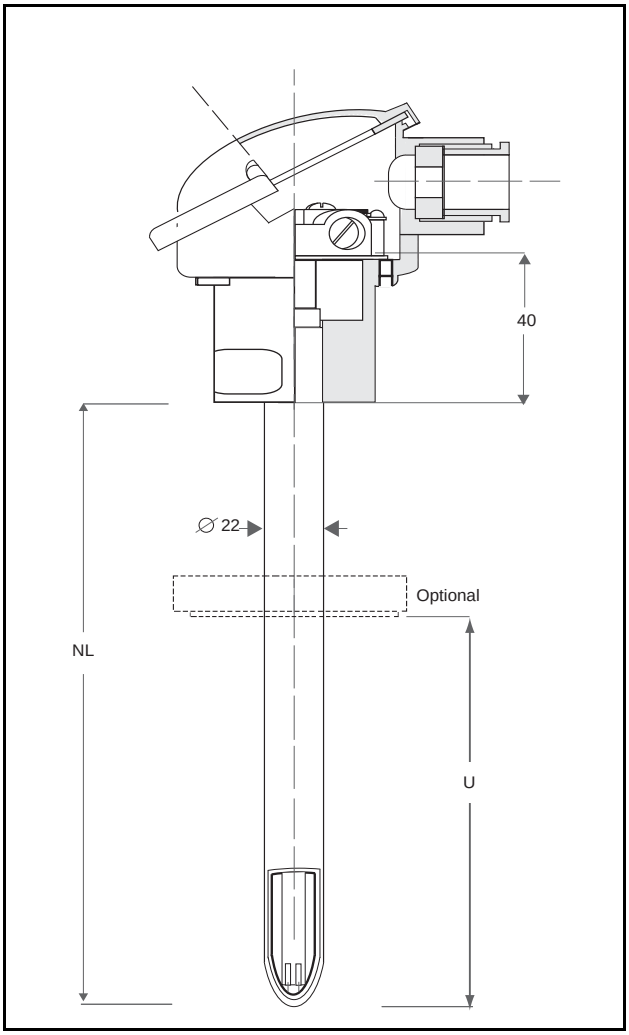


TABLE 14. Rosemount 1075 Series Immersion Thermocouples with Metal Protection Tube and with Ceramic Inner Tube (Design AMK) Ordering Information

★ 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			
1075	High Temperature Thermocouple			
Design				
Standard				**Standard**
3	AMK - DIN A with Metal Protection Tube and Ceramic Inner Tube (Max Temp 1350 °C, Max length 4000 mm)			★
Connection Head (DIN Form A Style) (More info on Figure 3 on page 5)		**IP Rating**	**Conduit Entry**	
Standard				**Standard**
E	HR-AL (AUS), Aluminum	40	M20 x 1.5	★
G(1)	TZ-AL (AUZH), aluminum	40	M20 x 1.5	★
P	GN-AL, Aluminum, DIN 43729	40	M20 x 1.5	★
B	HR-AL (AUS), Aluminum	40	1/2 in. NPT	★
F(1)	TZ-AL (AUZH), aluminum	40	1/2 in. NPT	★
T	GN-AL, Aluminum, DIN 43729	40	1/2 in. NPT	★
Sensor Connection				
Standard				**Standard**
3	Terminal Block DIN Form A Style			★
Number of Elements				
Standard				**Standard**
XX	Specify “XX” here. Choose Number of Elements in 1099 model			★
Thermocouple Type (More info on Table 3 on page 10)				
Standard				**Standard**
X	Specify “X” here. Choose Thermocouple Type in 1099 model			★
Wire Diameter (mm)		**Thermocouple Type**	**Max. Temperature (°C)**	
Standard				**Standard**
XX	Specify “XX” here. Choose Wire Diameter in 1099 model	B, R, S	1600 / R, S; 1800 / B	★
Protection Tube Material (More info on Table 5 on page 12)		**Inner Tube Material**	**Max. Temperature (°C)(2)**	
Standard				**Standard**
E	1.4762 (AISI 446), 22 x 2	Type C610, 15 x 2	1200 (B, R,S)	★
F	1.4841 (AISI 314), 22 x 2	Type C610, 15 x 2	1200 (B, R, S)	★
G	1.4767 (Kanthal AF), 22 x 2	Type C610, 15 x 2	1350 (B, R, S)	★
Nominal Length (NL) in Millimeters (More info on Figure 4 on page 6)				
Standard				**Standard**
0500	500 mm			★
0710	710 mm			★
1000	1000 mm			★
1400	1400 mm			★
XXXX	Other lengths (in 5 mm increments available from 250 to 4000)			★
Process Connection (More info on Table 8 and Table 9 on page 14)		**Material**		
Standard				**Standard**
NN	No Fitting			★
A2	Adjustable stop flange (22 mm)	GTW-35 (cast iron)		★
B2	Adjustable threaded fitting with G1	1.0718 (steel)		★
B5	Adjustable threaded fitting with 1 inch NPT	1.0718 (steel)		★

TABLE 14. Rosemount 1075 Series Immersion Thermocouples with Metal Protection Tube and with Ceramic Inner Tube (Design AMK) 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.

Expanded			
C4[3]	Adjustable Flange 1 inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
C5[3]	Adjustable Flange 1 inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
C6[3]	Adjustable Flange 1 inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
D4	Adjustable Flange 1 1/2 inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
D5	Adjustable Flange 1 1/2 inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
D6	Adjustable Flange 1 1/2 inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
E4	Adjustable Flange 2 inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
E5	Adjustable Flange 2 inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
E6	Adjustable Flange 2 inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
F4[4]	Welded Flange 1 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
F5[3][4]	Welded Flange 1 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
F6[3][4]	Welded Flange 1 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
G4[3]	Welded Flange 1 1/2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
G5[3]	Welded Flange 1 1/2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
G6[3]	Welded Flange 1 1/2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
H4[3]	Welded Flange 2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
H5[3]	Welded Flange 2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
H6[3]	Welded Flange 2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
Holding Tube Material			
Standard			**Standard**
N	No Holding Tube		★
Holding Tube Length (RL) in MIllimeters			
Standard			**Standard**
000	No Holding Tube Length		★

Options (Include with selected model number)

Flange Immersion Length		
Standard		**Standard**
U1500	Length from Welded flange face to sensor tip (1500 mm)	★
UXXXX	Length from Welded flange face to sensor tip Non-standard length (xxxx mm)	★
Drawing		
Standard		**Standard**
M99	Order Specific Drawing	★

TABLE 14. Rosemount 1075 Series Immersion Thermocouples with Metal Protection Tube and with Ceramic Inner Tube (Design AMK) 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.

Assemble to Options		
Standard		**Standard**
XA[5]	Fit sensor to temperature transmitter	★
Assemble to Precious Metal Thermocouple Wire		
Standard		**Standard**
XB[6]	Assemble to precious-metal thermocouple wire (B,R,S) Model 1099 on Table 15	★
Work Certificate		
Standard		**Standard**
W02	Works Cert: Comparison measurement at t 2 measurement points (WERKSZERTIFIKAT)	★
W05	Works Cert: Comparison measurement at 5 measurement points (WERKSZERTIFIKAT)	★
Calibration Certificate		
Standard		**Standard**
K02	DKD Calibration Cert: DKD Cert for 2 temperature points specified by customer	★
K05	DKD Calibration Cert: DKD Cert for 5 temperature points specified by customer	★

(1) Connection head suitable for mounting a transmitter inside (Rosemount 248 and 644).

(2) Maximum allowable temperature for the protection tube material and thermocouple type combination.

(3) Inner diameter of mating flange (standoff) must be greater then 23mm.

(4) Welded-on flange immersion length (U) must be less than nominal length (NL) minus 50 mm.

(5) Code "XA" must be specified in the 1075, 1099 and Transmitter model code.

(6) Code "XB" must be specified in both 1075 and 1099 model for proper assembly.

TABLE 15. Rosemount 1099 Series 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			
1099	High Temperature Themocouple Wire			
Product Form				
Standard				**Standard**
A3	Assembled to 1075 Design AMK			★
Number of Elements				
Standard				**Standard**
01	Single			★
02	Dual			★
Thermocouple Type (More info on Table 3 on page 10)		**Tolerance class acc. to IEC 584 (DIN EN 60584-2)**		
Standard				**Standard**
B	B	Class 2		★
R	R	Class 1		★
S	S	Class 1		★
Wire Diameter (in Millimeters)		**Thermocouple Type**	**Maximum Temperature (°C)**	
Standard				**Standard**
05[1]	0.5	B, R, S	1600 / R,S ; 1800 / B[2]	★
03	0.35	B, R, S	1400 / R,S ; 1600 / B	★
Nominal Length (NL) in Millimeters (Must match 1075 nominal length)				
Standard				**Standard**
0250	200 mm			★
0500	500 mm			★
0710	710 mm			★
1000	1000 mm			★
1400	1400 mm			★
XXXX	Specify same length as 1075 nominal length (NL)			★

Options (Include with selected model number)

Assemble to Options		
Standard		**Standard**
XA[3]	Assemble to Transmitter	★
Assemble to Precious Metal Thermocouple Wire		
Standard		**Standard**
XB[4]	Assemble to Precious Metal Thermocouple Wire	★

(1) Recommended wire diameter is 0.5 mm (0.02 in.) Larger diameter wire allows higher temperatures and is recommended for long-term stability.

(2) Tolerance class for type B thermocouples undefined above 1700 °C (3092 °F).

(3) Code "XA" must be specified in the 1075, 1099 and Transmitter model code.

(4) Code "XB" must be specified in both 1075 and 1099 model for proper assembly.

1075 Series Immersion Thermocouples with Ceramic Protection Tube (Design BK)

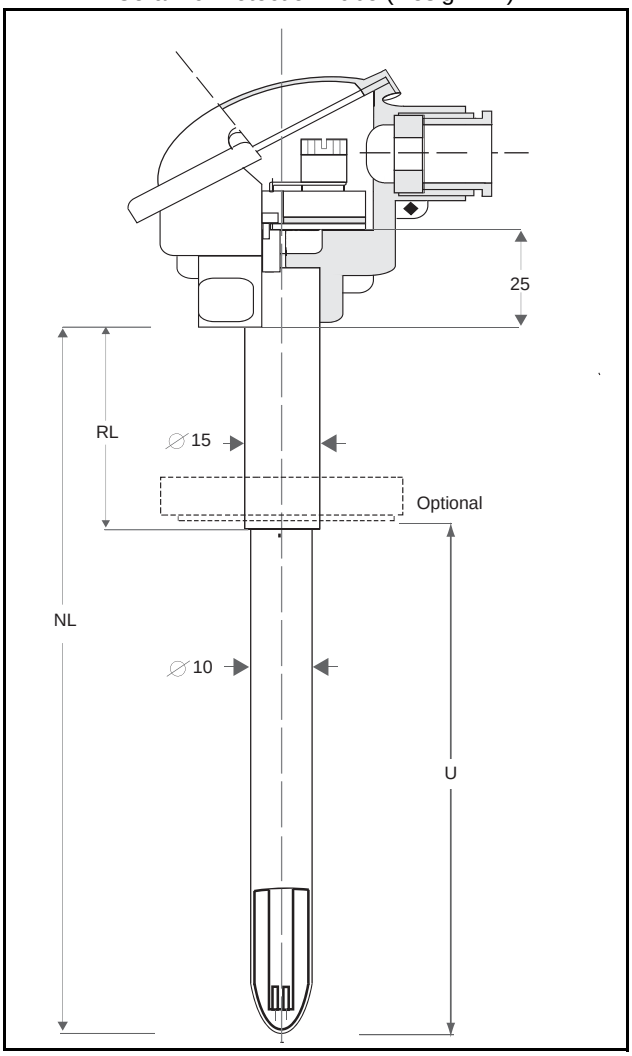
This design consists of a base metal thermocouple Type K or precious metal thermocouples Type R, S, or B and a housing with a protection tube design Type BK, according to DIN EN 50446.

The Single or Dual Type K thermocouple legs are insulated with ceramic elements.

Precious metal thermocouples are insulated with a ceramic insulating rod.

Installation requires adjustable stop flanges and threaded fittings. Standard materials for the protection tubes are Ceramic Types C610 and C799, and the holding tube is made of materials 1.4841(ASTM 314), 1.4762 (ASTM 446) or 1.0305 (A106-A).

FIGURE 15. 1075 Series Immersion Thermocouples with Ceramic Protection Tube (Design BK)



All dimensions are in millimeters

TABLE 16. Rosemount 1075 Series Immersion Thermocouples with Ceramic Protection Tube (Design BK) 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			
Standard				**Standard**
1075	High Temperature Thermocouple			★
Product Form				
Standard				**Standard**
4	BK - DIN Form B with Ceramic Protection Tube (Max Temp 1800 °C, Max length 1000 mm)			★
Connection Head (DIN Form B Style) (More info on Figure 3 on page 5)		**IP Rating**	**Conduit Entry**	
Standard				**Standard**
L(1)	TZ-A/BL (BUZH), Aluminum	40	M20 x 1.5	★
U	GN-BL, Aluminum, DIN 43729	40	M20 x 1.5	★
Y	HR-A/BL (BUS), Aluminum	40	M20 x 1.5	★
A(1)	TZ-A/BL (BUZH), Aluminum	40	1/2 in. NPT	★
R	GN-BL, Aluminum, DIN 43729	40	1/2 in. NPT	★
Z	HR-A/BL (BUS), Aluminum	40	1/2 in. NPT	★
Sensor Connection				
Standard				**Standard**
2	Terminal Block DIN Form B Style			★
Number of Elements				
Standard				**Standard**
01	Single (Type K thermocouple only)			★
02	Dual (Type K thermocouple only)			★
XX	Specify “XX” here for Type B, R, S thermocouples. Choose Number of Elements in 1099 model.			★
Thermocouple Type (More info on Table 3 on page 10)		**Tolerance Class acc. to IEC 584 (DIN EN 60584-2)**		
Standard				**Standard**
K	K	Class 1		★
X	Specify “X” here for Type B, R, S thermocouples. Choose Thermocouple Type in 1099 model. See model 1099 Table 17.			★
Wire Diameter (mm)		**Thermocouple Type**	**Max. Temperature (°C)**	
Standard				**Standard**
13	1.38	K	1200(2)	★
XX	Specify “XX” here for Type B, R, S thermocouples. Choose Wire Diameter in 1099 model	B, R, S	See model 1099 on Table 17	★
Protection Tube Material (More info on Table 5 on page 12)		**Inner Tube Material**	**Max. Temperature (°C)(3)**	
Standard				**Standard**
J	Type C610 / 10 x 1.5	Not Required	1200 (K); 1400 (R,B, S)	★
L	Type C799 / 10 x 1.5	Not Required	1600 (R,S)(4); 1800 (B)(4)	★
Nominal Length (NL) (mm) (More info on Figure 4 on page 6)				
Standard				**Standard**
0250	250			★
0500	500			★
0710	710			★
XXXX	Other lengths (in 5 mm increments available from 150 to 1000 mm)			★

TABLE 16. Rosemount 1075 Series Immersion Thermocouples with Ceramic Protection Tube (Design BK) 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.

Process Connection (More info on Table 8 and Table 9 on page 14)		**Material**	
Standard			**Standard**
NN	No Fitting		★
A1	Adjustable stop flange (15 mm)	GTW-35 (cast iron)	★
B1	Adjustable threaded fitting with G $^{3}/_{4}$	1.0718 (steel)	★
B4	Adjustable threaded fitting with $^{3}/_{4}$ inch NPT	1.0718 (steel)	★
Expanded			
C4	Adjustable Flange 1 inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
C5	Adjustable Flange 1 inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
C6	Adjustable Flange 1 inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
D4	Adjustable Flange 1 $^{1}/_{2}$ inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
D5	Adjustable Flange 1 $^{1}/_{2}$ inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
D6	Adjustable Flange 1 $^{1}/_{2}$ inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
E4	Adjustable Flange 2 inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
E5	Adjustable Flange 2 inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
E6	Adjustable Flange 2 inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
F4[5]	Welded Flange 1 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
F5[5]	Welded Flange 1 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
F6[5]	Welded Flange 1 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G4[5]	Welded Flange 1 $^{1}/_{2}$ inch Class RF 150 Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G5[5]	Welded Flange 1 $^{1}/_{2}$ inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G6[5]	Welded Flange 1 $^{1}/_{2}$ inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H4[5]	Welded Flange 2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H5[5]	Welded Flange 2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H6[5]	Welded Flange 2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
Holding Tube Material			
Standard			**Standard**
A	1.4762 (AISI 446), 15 x 2		★
B	1.4841 (AISI 314), 15 x 2		★
C	1.0305 (AISI A106-A), 15 x 2		★
Holding Tube Length (RL) in Millimeters			
Standard			**Standard**
095	95		★
Expanded			
XXX	Other length (in 5 mm increments, min. length 95 mm)		

TABLE 16. Rosemount 1075 Series Immersion Thermocouples with Ceramic Protection Tube (Design BK) 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.

Options (Include with selected model number)

Flange Immersion Length		
Standard		**Standard**
U1500	Length from Welded flange face to sensor tip (1500 mm).	★
UXXXX	Length from Welded flange face to sensor tip Non-Standard length (xxxx mm) must be welded to Holding tube	★
Drawing		
Standard		**Standard**
M99	Order Specific Drawing	★
Assemble to Options		
Standard		**Standard**
XA(6)	Assemble sensor to temperature transmitter	★
Assemble to Precious Metal Thermocouple Wire		
Standard		**Standard**
XB(7)	Assemble to precious-metal thermocouple wire (B, R, S) Model 1099 on Table 17	★
Work Certificate		
Standard		**Standard**
W02	Works Cert: Comparison measurement at 2 measurement points (WERKSZERTIFIKAT)	★
W05	Works Cert: Comparison measurement at 5 measurement points (WERKSZERTIFIKATE)	★
Calibration Certificate		
Standard		**Standard**
K02	DKD Calibration Cert: DKD Cert for 2 temperature points specified by customer	★
K05	DKD Calibration Cert: DKD Cert for 5 temperature points specified by customer	★

(1) Connection head suitable for mounting a transmitter inside (Rosemount 248 and 644)

(2) Maximum temperature for Class 1: 1000 °C (1832 °F). Higher temperatures Class 2

(3) Maximum allowable temperature for the protection tube material and thermocouple type combination.

(4) Temperature limit for wire diameter 0.5 mm, wire diameter 0.35 mm has lower limits. See 1099 model.

(5) Welded-on flange immersion length (U) must be less than Nominal length (NL) minus 50 mm. Immersion length (U) must also be greater than Nominal length minus Holding tube length (NL - RL).

(6) Code "XA" must be specified in the 1075, 1099 and Transmitter model code.

(7) Code "XB" must be specified in both 1075 and 1099 model for proper assembly

TABLE 17. Rosemount 1099 Series 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			
Standard				**Standard**
1099	High Temperature Thermocouple Wire			★
Product Form				
Standard				**Standard**
A4	Assembled to 1075 Design BK			★
Number of Elements				
Standard				**Standard**
01	Single			★
02	Dual			★
Thermocouple Type (More info on Table 3 on page 10)		**Tolerance Class acc. to IEC 584 (DIN EN 60584-2)**		
Standard				**Standard**
B	B	Class 2		★
R	R	Class 1		★
S	S	Class 1		★
Wire Diameter (in Millimeters)		**Thermocouple Type**	**Maximum Temperature (°C)**	
Standard				**Standard**
05[2]	0.5 mm	B, R, S	1600 (R, S); 1800 (B)[1]	★
03[2]	0.35 mm	B, R, S	1400 (R, S); 1600 (B)	★
Nominal Length (NL) in Millimeters (Must match 1075 nominal length)				
Standard				**Standard**
0250	250 mm			★
0500	500 mm			★
0710	710 mm			★
XXXX	Specify same length as 1075 nominal length (NL)			★

Options (Include with selected model number)

Assemble to Options		
Standard		**Standard**
XA[3]	Assemble to Transmitter	★
Assemble to Precious Metal Thermocouple Wire		
Standard		**Standard**
XB[4]	Assemble to Precious Metal Thermocouple Wire	★

(1) Tolerance class for type B thermocouples undefined above 1700 °C (3092 °F).

(2) Recommended wire diameter is 0.5 mm (0.02 in.) Larger diameter wire allows higher temperatures and is recommended for long-term stability.

(3) Code "XA" must be specified in the 1075, 1099 and Transmitter model code.

(4) Code "XB" must be specified in both 1075 and 1099 model for proper assembly.

1075 Series Immersion Thermocouple with Ceramic Protection Tube (Design AK)

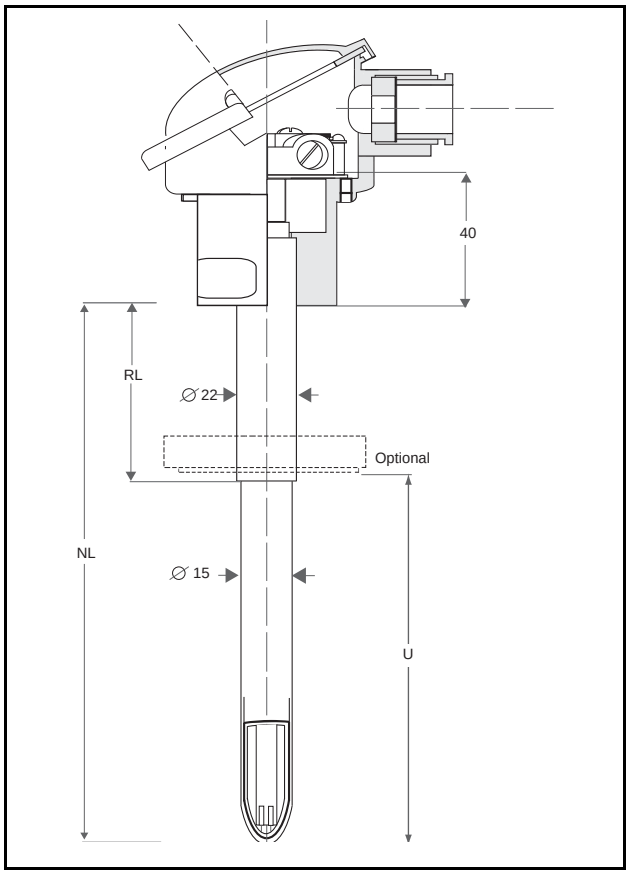
This design consists of a base metal thermocouple Type K or precious metal thermocouples Type R, S, or B and a housing with a protection tube design Type AK, according to DIN EN 50446.

The Single or Dual Type K thermocouple legs are insulated with ceramic elements.

Precious metal thermocouples are insulated with a ceramic insulating rod.

Installation requires adjustable stop flanges and threaded fittings with standard materials for the protection tubes are Ceramic Types C610 and C799 and the holding tube is made of materials 1.4841 (ASTM 314), 1.4762 (ASTM 446), or 1.0305 (A106-A).

FIGURE 16. 1075 Series Immersion Thermocouple with Ceramic Protection Tube (Design AK)



All dimensions are in millimeters

TABLE 18. Rosemount 1075 Series Immersion Thermocouple with Ceramic Protection Tube (Design AK) 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			
1075	High Temperature Thermocouple			
Product Design				
Standard				**Standard**
5	AK - DIN A with Ceramic Protection Tube (Max Temp 1800 °C, Max length 2000 mm)			★
Connection Head (DIN Form A Style) More info on Figure 3 on page 5)		**IP Rating**	**Conduit Entry**	
Standard				**Standard**
E	HR-AL (AUS), Aluminum	40	M20 x 1.5	★
G(1)	TZ-AL (AUZH), Aluminum	40	M20 x 1.5	★
P	GN-AL, Aluminum, DIN 43729	40	M20 x 1.5	★
B	HR-AL (AUS), Aluminum	40	1/2 in. NPT	★
F(1)	TZ-AL (AUZH), Aluminum	40	1/2 in. NPT	★
T	GN-AL, Aluminum, DIN 43729	40	1/2 in. NPT	★
Sensor Connection				
Standard				**Standard**
3	Terminal Block, DIN Form A Style			★
Number of Elements				
Standard				**Standard**
01	Single (Type K thermocouple only)			★
02	Dual (Type K thermocouple only)			★
XX	Specify “XX” here for Type B, R, S thermocouples. Choose Number of Elements in 1099 model.			★
Thermocouple Type (More info on Table 3 on page 10)		**Tolerance Class acc. to IEC 584 (DIN EN 60584-2)**		
Standard				**Standard**
K	K	Class 1		★
X	Specify “X” here for Type B, R, S thermocouples. Choose Thermocouple Type in 1099 model on Table 19			★
Wire Diameter (in Millimeters)		**Thermocouple Type**	**Max. Temperature (°C)**	
Standard				**Standard**
13	1.38 (Use with Dual Element)	K	1200(2)	★
30	3.0 (Use with Single Element)	K	1200(2)	★
XX	Specify “XX” here for Type B, R, S thermocouples. Choose Wire Diameter in 1099 Model	B, R, S	See model 1099 on Table 19	★
Protection Tube Material (More info on Table 5 on page 12)		**Inner Tube Material**	**Max. Temperature (°C)(3)**	
Standard				**Standard**
P	Type C610, 15 x 2	Not Required	1200 (K) ; 1400 (R,S,B)	★
R	Type C799, 15 x 2	Not Required	1600 (R,S)(4); 1800 (B)(4)	★
Nominal Length (NL) in Millimeters (More info on Figure 4 on page 6)				
Standard				**Standard**
0500	500 mm			★
0710	710 mm			★
1000	1000 mm			★
1400	1400 mm			★
XXXX	Other lengths (in 5 mm increments available from 250 to 2000 mm)			★

TABLE 18. Rosemount 1075 Series Immersion Thermocouple with Ceramic Protection Tube (Design AK) 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.

Process Connection (More info on Table 9 on page 14)		**Material**	
Standard			**Standard**
NN	No fitting		★
A2	Adjustable stop flange (22 mm)	GTW-35 (cast iron)	★
B2	Adjustable threaded fitting with G 1	1.0718 (steel)	★
B5	Adjustable threaded fitting with 1 inch NPT	1.0718 (steel)	★
Expanded			
C4[5]	Adjustable Flange 1 inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
C5[5]	Adjustable Flange 1 inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
C6[5]	Adjustable Flange 1 inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
D4	Adjustable Flange 1 1/2 inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
D5	Adjustable Flange 1 1/2 inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
D6	Adjustable Flange 1 1/2 inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
E4	Adjustable Flange 2 inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
E5	Adjustable Flange 2 inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
E6	Adjustable Flange 2 inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	
F4[5][6]	Welded Flange 1 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
F5[5][6]	Welded Flange 1 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
F6[5][6]	Welded Flange 1 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G4[5]	Welded Flange 1 1/2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G5[5]	Welded Flange 1 1/2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
G6[5]	Welded Flange 1 1/2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H4[5]	Welded Flange 2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H5[5]	Welded Flange 2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
H6[5]	Welded Flange 2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	
Holding Tube Material			
Standard			**Standard**
D	1.4762 (AISI 446), 22 x 2		★
E	1.4841 (AISI 316), 22 x 2		★
F	1.0305 (ASTM A106-A) 22 x 2		★
Holding Tube Length (RL) in Millimeters			
Standard			**Standard**
095	95		★
Expanded			
XXX	Other length (in 5 mm increments, min. length 95 mm)		

TABLE 18. Rosemount 1075 Series Immersion Thermocouple with Ceramic Protection Tube (Design AK) 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.

Options (Include with selected model number)

Flange Immersion Length		
Standard		**Standard**
U1500	Length from Welded flange face to sensor tip (1500 mm). Must be welded to Holding tube	★
UXXXX	Non standard length from Welded flange face to sensor tip (xxxx mm). Must be welded to Holding tube	★
Drawing		
Standard		**Standard**
M99	Order Specific Drawing	★
Assemble to Options		
Standard		**Standard**
XA(7)	Assemble sensor to temperature transmitter	★
Assemble to Options		
Standard		**Standard**
XB(8)	Assembles to precious metal thermocouple wire (B, R, S) Model 1099 Table 19	★
Work Certificate		
Standard		**Standard**
W02	Works Cert: Comparison measurement at 2 measurement points (WERKSZERTIFIKAT)	★
W05	Works Cert: Comparison measurement at 5 measurement points (WERKSZERTIFIKAT)	★
Calibration Certificate		
Standard		**Standard**
K02	DKD Calibration Cert: DKD Cert for 2 temperature points specified by customer	★
K05	DKD Calibration Cert: DKD Cert for 5 temperature points specified by customer	★

(1) Connection head suitable for mounting a transmitter inside (Rosemount 248 and 644)

(2) Maximum temperature for Class 1: 1000 °C (1832 °F). Higher temperatures Class 2

(3) Maximum allowable temperature for the protection tube material and thermocouple type combination.

(4) Temperature limit for wire diameter 0.5 mm, wire diameter 0.35 mm has lower limits. See 1099 model.

(5) Inner diameter of mating flange (standoff) must be greater then 23mm.

(6) Welded-on flange immersion length (U) must be less than Nominal Length (NL) minus 50 mm. Immersion length (UL) must also be greater than Nominal length minus Holding tube length (NL - RL).

(7) Code "XA" must be specified in the 1075, 1099 and Transmitter model code.

(8) Code "XB" must be specified in both 1075 and 1099 model for proper assembly.

TABLE 19. Rosemount 1099 Series 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			
1099	High Temperature Thermocouple Wire			
Product Form				
Standard				**Standard**
A5	Assembled to 1075 Design AK			★
Number of Elements				
Standard				**Standard**
01	Single			★
02	Dual			★
Thermocouple Type (More info on Table 3 on page 10)		**Tolerance Class acc. to IEC 584 (DIN EN 60584-2)**		
Standard				**Standard**
B	B	Class 2		★
R	R	Class 1		★
S	S	Class 1		★
Wire Diameter (mm)		**Thermocouple Type**	**Maximum Temperature (°C)**	
Standard				**Standard**
05[2]	0.5	B, R, S	1600 (R, S); 1800 (B)[1]	★
03[2]	0.35	B, R, S	1400 (R, S); 1600 (B)	★
Nominal Length (NL) in Millimeters (Must match 1075 nominal length)				
Standard				**Standard**
0500	500 mm			★
0710	710 mm			★
1000	1000 mm			★
1400	1400 mm			★
XXXX	Specify same length as 1075 nominal length (NL)			★

Options (Include with selected model number)

Assemble to Options		
Standard		**Standard**
XA[3]	Assemble to Transmitter	★
Assemble to Precious Metal Thermocouple Wire		
Standard		**Standard**
XB[4]	Assemble to Precious Metal Thermocouple Wire	★

(1) Code "XB" must be specified in both 1075 and 1099 model for proper assembly.

(2) Recommended wire diameter is 0.5 mm (0.02 in.) Larger diameter wire allows higher temperatures and is recommended for long-term stability.

(3) Code "XA" must be specified in the 1075, 1099 and Transmitter model code.

(4) Tolerance class for type B thermocouples undefined above 1700 °C (3092 °F).

1075 Series Immersion Thermocouple with Ceramic Protection Tube and Ceramic Inner Tube (Design AKK)

This design consists of a base metal thermocouple Type K or precious metal thermocouples Type R, S or B and a housing with a protection tube design Type AKK, according to DIN EN 50446.

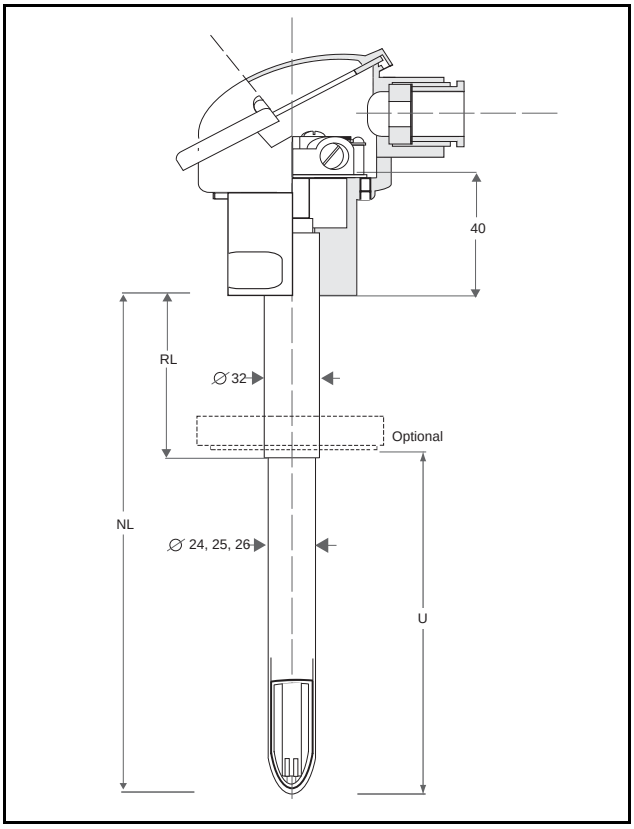
The Single or Dual Type K thermocouple legs are insulated with ceramic elements.

Precious-metal thermocouples are insulated with a 4-hole insulating rod and provided a gas tight inner tube made of Ceramic Type C610 or C799.

Installation requires stop flanges or threaded fittings. Standard materials for the protection tubes are Ceramic Types C530, C610, C799 and silicon carbide tubes.

Gas-tight ceramic materials are sensitive to thermal shock and stress impact with a tolerance level that can be optimized by selecting the proper materials for protection and inner tubes.

FIGURE 17. 1075 Series Immersion Thermocouple with Ceramic Protection Tube and Ceramic Inner Tube (Design AKK)



All dimensions in millimeters

For recommended combinations of ceramic protection and inner tube combinations, consult with your Emerson representative.

The standard holding tube is made of material 1.0305 (A106-A) and is recommended for temperatures to 200 °C (392 °F). For temperatures exceeding 200 °C (392 °F), The Rosemount 1075 Series offers holding tubes made of heat resistant materials 1.4762 (ASTM 446) or 1.4841 (ASTM 314).

Silicon carbide protection tubes consist of sintered material and have the following properties:

- Temperature resistant to 1700 °C (3092 °F)
- Not as porous or brittle, and can be used in higher temperatures and in corrosive furnace atmospheres

TABLE 20. Rosemount 1075 Series Immersion Thermocouple with Ceramic Protection Tube and Ceramic Inner Tube (Design AKK) 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			
1075	High Temperature Thermocouple			
Design				
Standard				**Standard**
6	AKK - DIN Form A with Ceramic Protection Tube and Inner Tube (Max Temp 1800 °C, Max length 2000 mm)			★
Connection Head (DIN Form A Style) More info on Figure 3 on page 5)		**IP Rating**	**Conduit Entry**	
Standard				**Standard**
E	HR-AL (AUS), Aluminum	40	M20 x 1.5	★
G(1)	TZ-AL (AUZH), aluminum	40	M20 x 1.5	★
P	GN-AL, Aluminum, DIN 43729	40	M20 x 1.5	★
B	HR-AL (AUS), Aluminum	40	1/2 in. NPT	★
F(1)	TZ-AL (AUZH), aluminum	40	1/2 in. NPT	★
T	GN-AL, Aluminum, DIN 43729	40	1/2 in. NPT	★
Sensor Connection				
Standard				**Standard**
3	Terminal Block DIN Form A Style			★
Number of Elements				
Standard				**Standard**
01	Single (Type K thermocouple only)			★
02	Dual (Type K thermocouple only)			★
XX	Specify “XX” here for Type B, R, S thermocouples. Choose Number of Elements in 1099. See model 1099 on Table 21			★
Thermocouple Type (More info on Table 3 on page 10)		**Tolerance Class acc. to IEC 584 (DIN EN 60584-2)**		
Standard				**Standard**
K	K	Class 1		★
X	Specify “X” here for Type B, R, S thermocouples. Choose Thermocouple Type in 1099 model. See model 1099 on Table 21			★
Wire Diameter (in Millimeters)		**Thermocouple Type**	**Max. Temperature (°C)**	
Standard				**Standard**
20	2 mm (Use with Dual Element)	K	1200(2)	★
30	3 mm (Use with Sing Element)	K	1200(2)	★
XX	Specify “XX” here for Type R, B, S thermocouples. Choose Wire Diameter in 1099 Model. See model 1099 on Table 21			★
Protection Tube Material (More info on Table 5 on page 12)		**Inner Tube Material**	**Max. Temperature (°C)(3)**	
Standard				**Standard**
T	Type C530, 26 x 4	Type C610, 15 x 2	1200 (K) 1400 (R, S)	★
V	Type C530, 26 x 4	Type 799, 15 x 2,5	1600 (R, S, B)(4)	★
W	Type C799, 24 x 3	Type 799, 15 x 2,5	1600 (R,S)(4); 1800 (B)(4)	★
Expanded				
Y	Protec, 25 x 3.5	Type C799, 15 x 2.5	1600 (R,S)(4); 1700 (B)(4)	

TABLE 20. Rosemount 1075 Series Immersion Thermocouple with Ceramic Protection Tube and Ceramic Inner Tube (Design AKK) 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.

Nominal Length (NL) in Milimeters (More info on Figure 4 on page 6)			
Standard			**Standard**
0500	500 mm		★
0710	710 mm		★
1000	1000 mm		★
1400	1400 mm		★
2000	2000 mm		★
XXXX	Other lengths (in 5 mm increments available from 250 to 2000 mm)		★
Process Connection (More info on Table 8 and Table 9 on page 14)		**Material**	
Standard			**Standard**
NN	No fitting		★
A3	Adjustable stop flange (32 mm)	GTW-35 (cast iron)	★
B3	Adjustable threaded fitting with G 1 1/4	1.0711 (steel)	★
B6	Adjustable threaded fitting with 1 1/4 inch NPT	1.0718 (steel)	★
D4	Adjustable Flange 1 1/2 inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
D5	Adjustable Flange 1 1/2 inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
D6	Adjustable Flange 1 1/2 inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
E4	Adjustable Flange 2 inch Class 150 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
E5	Adjustable Flange 2 inch Class 300 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
E6	Adjustable Flange 2 inch Class 600 RF	1.4571 (SS316Ti) Flange/ 300 series SST fitting	★
G4(5)	Welded Flange 1 1/2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
G5(5)	Welded Flange 1 1/2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
G6(5)	Welded Flange 1 1/2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
H4(5)	Welded Flange 2 inch Class 150 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
H5(5)	Welded Flange 2 inch Class 300 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
H6	Welded Flange 2 inch Class 600 RF Requires Flange immersion length (UXXXX)	1.4571 (SS316Ti) Flange	★
Holding Tube Material			
Standard			**Standard**
G	1.4762 (AISI 446), 32 x 2		★
H	1.4841 (AISI 316), 32 x 2		★
J	1.0305 (AISI A106-A), 32 x 2		★
Holding Tube Length (RL) in Millimeters			
Standard			**Standard**
095	95		★
Expanded			
XXX	Other length (in 5 mm increments, min. length 95 mm)		

TABLE 20. Rosemount 1075 Series Immersion Thermocouple with Ceramic Protection Tube and Ceramic Inner Tube (Design AKK) 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.

Options (Include with selected model number)

Flange Immersion Length		
Standard		**Standard**
U1500	Length from Welded flange face to sensor tip (1500 mm). Must be welded to Holding tube	★
UXXXX	Non Standard length from Welded flange face to sensor tip (xxxx mm). Must be welded to Holding tube	★
Drawing		
Standard		**Standard**
M99	Order specific drawing	★
Assemble to Option		
Standard		**Standard**
XA(6)	Assemble sensor to temperature transmitter	★
Assemble to Precious Metal Thermocouple Wire		
Standard		**Standard**
XB(7)	Assemble to precious metal thermocouple wire (B, R, S) Model 1099 on Table 21	★
Work Certificate		
Standard		**Standard**
W02	Works Cert: Comparison measurement at 2 measurement points (WERKSZERTIFIKAT)	★
W05	Works Cert: Comparison measurement at 5 measurement points (WERKSZERTIFIKAT)	★
Calibration Options		
Standard		**Standard**
K02	DKD Calibration Cert: DKD Cert for 2 temperature points specified by customer	★
K05	DKD Calibration Cert: DKD Cert for 5 temperature points specified by customer	★

(1) Connection head suitable for mounting a transmitter inside (Rosemount 248 and 644).

(2) Code "XB" must be specified in both 1075 and 1099 model for proper assembly.

(3) Maximum allowable temperature for the protection tube material and thermocouple type combination.

(4) Temperature limit for wire diameter 0.5 mm, wire diameter 0.35 mm has lower limits. See 1099 model.

(5) Welded-on flange immersion length (U) must be less than Nominal length (NL) minus 50 mm. Immersion length (U) must also be greater than Nominal length minus Holding tube length (NL - RL).

(6) Code "XA" must be specified in the 1075, 1099 and Transmitter model code.

(7) Code "XB" must be specified in both 1075 and 1099 model for proper assembly

TABLE 21. Rosemount 1099 Series 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			
1099	High Temperature Thermocouple Wire			
Product Form				
Standard				**Standard**
A6	Assembled to 1075 Design AKK			★
Number of Elements				
Standard				**Standard**
01	Single			★
02	Dual			★
Thermocouple Type (More info on Table 3 on page 10)		**Tolerance Class acc. to IEC 584 (DIN EN 60584-2)**		
Standard				**Standard**
B	B	Class 2		★
R	R	Class 1		★
S	S	Class 1		★
Wire Diameter (mm)		**Thermocouple Type**	**Maximum Temperature (°C)**	
Standard				**Standard**
05[2]	0.5	B, R, S	1600 / R, S; 1800 (B)[1]	★
03[2]	0.35	B, R, S	1600 / R, S; 1600 (B)	★
Nominal Length (NL) in Millimeter (Must match 1075 nominal length)				
Standard				**Standard**
0500	500			★
0710	710			★
1000	1000			★
1400	1400			★
2000	2000			★
XXXX	Specify same length as 1075 nominal length (NL)			★

Options (Include with selected model number)

Assemble to Options		
Standard		**Standard**
XA[3]	Assemble to Transmitter	★
Assemble to Precious Metal Thermocouple		
Standard		**Standard**
XB[4]	Assemble to Precious Metal Thermocouple Wire	★

(1) Tolerance class for type B thermocouples undefined above 1700 °C (3092 °F).

(2) Recommended wire diameter is 0.5 mm (0.02 in.) Larger diameter wire allows higher temperatures and is recommended for long-term stability.

(3) Code "XA" must be specified in the 1075, 1099 and Transmitter model code.

(4) Code "XB" must be specified in both 1075 and 1099 model for proper assembly.

Calibration and Certificates

Calibration with DKD-Certificate

The calibration of temperature sensors is done in our DKD calibration laboratory accredited according to DIN EN ISO/IEC 17025: 2005.

The Deutscher Kalibrierdienst (DKD) is an association of calibration laboratories including industrial firms research institutes, technical authorities, inspection and testing institutes.

The DKD calibration certificates provide traceability to national standards as required in the standard's family ISO 9000 and the ISO/IEC 17025 which allow the user to trust the reliability of the measurement results.

While compiling a DKD or works certificate, the thermocouple or measuring system is checked using comparison standards regarding measurement accuracy.

Our laboratory is authorized to issue DKD calibration certificates for temperature in the measurement ranges shown in Table 22 on page 45. The measurement uncertainties are defined in the various calibration points and based on the Dual standard deviation (k = 2), (probable coincidence approximately 95%).

The calibrations carried out by our laboratory are services provided to the customer. Our intention is to meet the quality requirements of the customer in relation to thermocouple calibration, including traceability to national standards and accomplishing the contract commitments with the accreditation authority - DAR (German Accreditation Council). The thermocouple, which provides the measurement result on its own or as a measuring chain, is compared with the national standards. This comparison measurement produces quantitative verification of traceability.

A report is issued in the form of a calibration certificate according to DKD specifications (Figure 19 on page 47).

TABLE 22. DKD Laboratory Accreditation Ranges for Thermocouple Calibration

Subject of Calibration	Temperature Range	Measurement Conditions	Measurement Uncertainty	Remarks
Thermocouples	0 to 1200 °C (32 to 2192 °F)	Comparison with standard thermocouples in tube furnaces	1.5K	
Thermocouples Type S and R	0 to 1100 °C (32 to 2012 °F)		1K	Comparison without protection tube in a PT cap
Transmitter with connected thermocouples	same as for thermocouples	same as for thermocouples	U(TE) + 500mK	U(TE) is the measurement uncertainty of calibrating the thermocouple by itself.

Works Certificates (WERKSZERTIFIKAT)

Thermocouples with a works certificate show documentation of measurements in the service and quality assurance department.

Using the comparison method, the calibrated values are certified on a works certificate. The maximum test temperature is 1300 °C (2372 °F).

The customer must specify the number and values of the calibrated test variables.

NOTE
Before specifying a temperature value, consider the temperature limits of the thermocouple. For individual order options see the Ordering Tables.

FIGURE 18. DAR Accreditation Certificate

Deutscher Kalibrierdienst (DKD)
Accreditation Body
represented in

Deutscher AkkreditierungsRat

Accreditation

The Accreditation Body of **Deutscher Kalibrierdienst** hereby accredits
Emerson Process Management GmbH & Co. OHG
Frankenstraße 21
63791 Karlstein-Dettingen

according to DIN EN ISO/IEC 17025:2005 for calibrations in the field / fields:

Temperature

Part of the certificate is: Annex 11 (1 page), 2005-03-02

DAR registration number: DKD-K-05601
DKD accredited since: 1987-03-24

Braunschweig, 2007-05-25

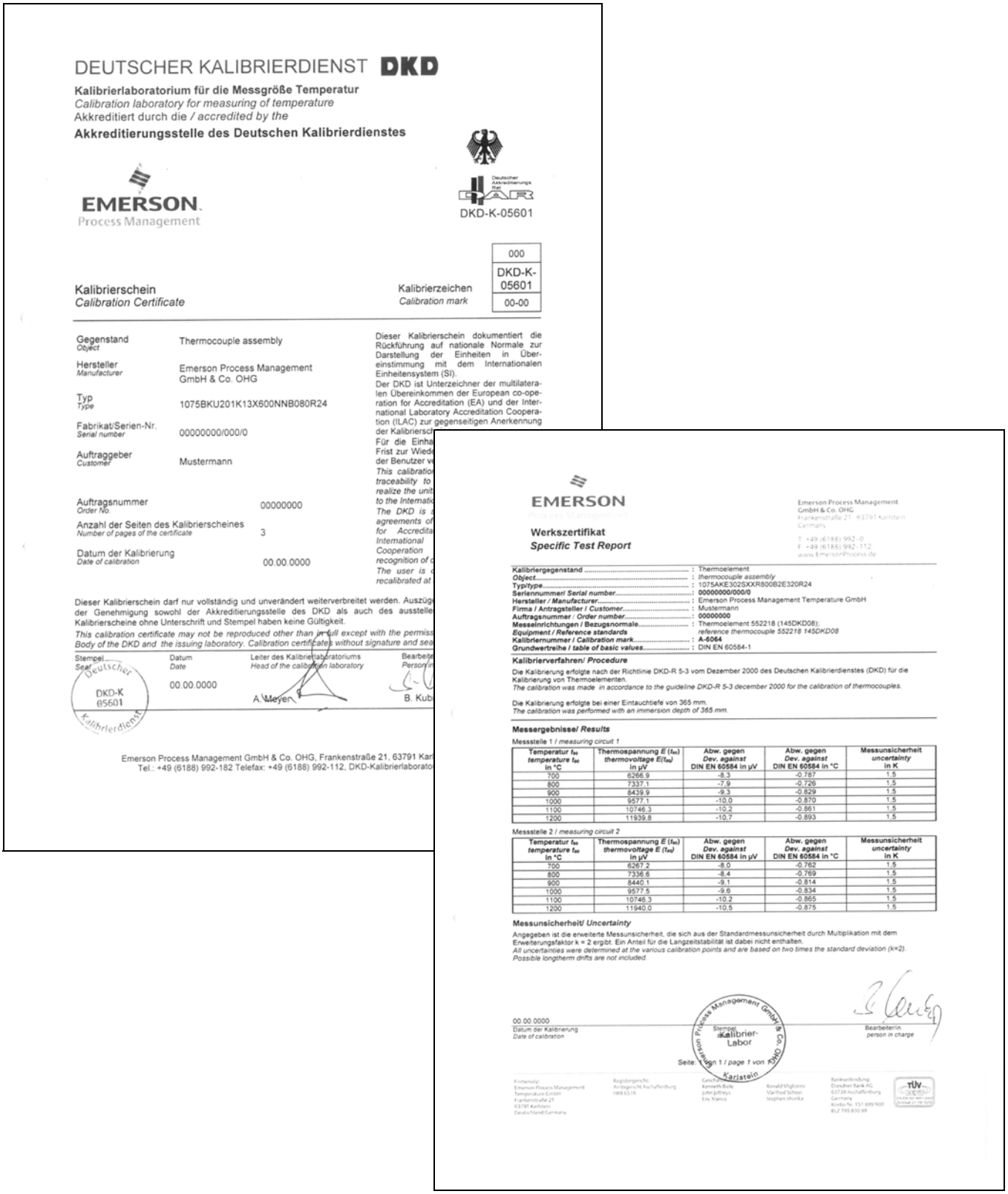
Head of Accreditation Body
by proxy

Dipl.-Ing. Michael Schaller

DEUTSCHER KALIBRIERDIENST · AKKREDITIERUNGSSTELLE · 2

See overleaf

FIGURE 19. DKD Certificate and Test Report Example



DEUTSCHER KALIBRIERDIENST DKD

Kalibrierlaboratorium für die Messgröße Temperatur
Calibration laboratory for measuring of temperature
Akkreditiert durch die / *accredited by the*
Akkreditierungsstelle des Deutschen Kalibrierdienstes

EMERSON
Process Management

DKD-K-05601

Kalibrierschein
Calibration Certificate

Kalibrierzeichen
Calibration mark
000 / DKD-K-05601 / 00-00

Gegenstand *Object*	Thermocouple assembly
Hersteller *Manufacturer*	Emerson Process Management GmbH & Co. OHG
Typ *Type*	1075BKU201K13X600NNB080R24
Fabrikat/Serien-Nr. *Serial number*	00000000/000/0
Auftraggeber *Customer*	Mustermann
Auftragsnummer *Order No.*	00000000
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	3
Datum der Kalibrierung *Date of calibration*	00.00.0000

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Der DKD ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DKD is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is responsible for the recalibration at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung sowohl der Akkreditierungsstelle des DKD als auch des ausstellenden Kalibrierlabors. Kalibrierscheine ohne Unterschrift und Stempel haben keine Gültigkeit.
This calibration certificate may not be reproduced other than in full except with the permission of the Accreditation Body of the DKD and the issuing laboratory. Calibration certificates without signature and seal are not valid.

Stempel *Seal*	Datum *Date*	Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Bearbeiter *Person in charge*
Deutscher DKD-K 05601 Kalibrierdienst	00.00.0000	A. Meyer	B. Kub

Emerson Process Management GmbH & Co. OHG, Frankenstraße 21, 63791 Karl
Tel.: +49 (6188) 992-182 Telefax: +49 (6188) 992-112, DKD-Kalibrierlaborato

EMERSON

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Werkszertifikat
Specific Test Report

Kalibriergegenstand / ***Object***	Thermoelement / *thermocouple assembly*
Typ/*type*	1075AKE302SXXR80OB2E320R24
Seriennummer/ *Serial number*	**00000000/000/0**
Hersteller / *Manufacturer*	Emerson Process Management Temperature GmbH
Firma / Antragsteller / *Customer*	Mustermann
Auftragsnummer / *Order number*	**00000000**
Messeinrichtungen / Bezugsnormale / ***Equipment / Reference standards***	Thermoelement 552218 (145DKD08); *reference thermocouple 552218 145DKD08*
Kalibriernummer / *Calibration mark*	**A-6064**
Grundwertreihe / *table of basic values*	DIN EN 60584-1

Kalibrierverfahren/ *Procedure*

Die Kalibrierung erfolgte nach der Richtlinie DKD-R 5-3 vom Dezember 2000 des Deutschen Kalibrierdienstes (DKD) für die Kalibrierung von Thermoelementen.
The calibration was made in accordance to the guideline DKD-R 5-3 december 2000 for the calibration of thermocouples.

Die Kalibrierung erfolgte bei einer Eintauchtiefe von 365 mm.
The calibration was performed with an immersion depth of 365 mm.

Messergebnisse/ *Results*

Messstelle 1 / *measuring circuit 1*

Temperatur t_{90} / *temperature* t_{90} in °C	Thermospannung E (t_{90}) / *thermovoltage* $E(t_{90})$ in µV	Abw. gegen *Dev. against* DIN EN 60584 in µV	Abw. gegen *Dev. against* DIN EN 60584 in °C	Messunsicherheit *uncertainty* in K
700	6266.9	-8.3	-0.787	1.5
800	7337.1	-7.9	-0.726	1.5
900	8439.9	-9.3	-0.829	1.5
1000	9577.1	-10.0	-0.870	1.5
1100	10746.3	-10.2	-0.861	1.5
1200	11939.8	-10.7	-0.893	1.5

Messstelle 2 / *measuring circuit 2*

Temperatur t_{90} / *temperature* t_{90} in °C	Thermospannung E (t_{90}) / *thermovoltage* E (t_{90}) in µV	Abw. gegen *Dev. against* DIN EN 60584 in µV	Abw. gegen *Dev. against* DIN EN 60584 in °C	Messunsicherheit *uncertainty* in K
700	6267.2	-8.0	-0.762	1.5
800	7336.6	-8.4	-0.769	1.5
900	8440.1	-9.1	-0.814	1.5
1000	9577.5	-9.6	-0.834	1.5
1100	10746.3	-10.2	-0.865	1.5
1200	11940.0	-10.5	-0.875	1.5

Messunsicherheit/ *Uncertainty*

Angegeben ist die erweiterte Messunsicherheit, die sich aus der Standardmessunsicherheit durch Multiplikation mit dem Erweiterungsfaktor k = 2 ergibt. Ein Anteil für die Langzeitstabilität ist dabei nicht enthalten.
All uncertainties were determined at the various calibration points and are based on two times the standard deviation (k=2). Possible longterm drifts are not included.

00.00.0000
Datum der Kalibrierung / *Date of calibration*

Stempel: Emerson Process Management GmbH & Co. OHG Kalibrier-Labor Karlstein

Bearbeiter/in / *person in charge*

Seite 1 / *page 1 von 3*

Temperature Transmitters

Rosemount head-mounted transmitters 248H and 644H can be assembled to the extended cover of the connection head Types TZ-A/BL (BUZH) or TZ-AL (AUZH). These transmitters have the following common properties:

- Complete installation ready assembly
- Improved accuracy with cold junction, and ambient temperature compensation
- Micro Processor controlled, with user selectable inputs and 4–20 mA/HART or FOUNDATION fieldbus communication protocols
- Meets NAMUR NE21, and is resistant to Radio Frequency and Electro Magnetic Interference
- Epoxy sealed electronics ensure reliable performance

The Rosemount 3144P transmitter can be ordered for remote mounting to the 1075 thermocouple. The 3144P features a sealed dual-compartment housing, an LCD meter display, Hot Backup sensor redundancy, and a Thermocouple Diagnostic function to detect drifting thermocouple conditions.

The Rosemount 848T and 848TX Wireless Temperature Transmitters are capable of accepting up to 8 and 4 (respectively) thermocouple inputs into one transmitter. The 848T is ideally suited for high density temperature measurement applications.

FIGURE 20. Rosemount Temperature Transmitters

Rosemount 1075 and 1099 Series

Product Data Sheet
00813-0400-2654, Rev CB
April 2010

Emerson Process Management
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EMERSON
Process Management

00813-0400-2654 Rev CB 4/10

Product Data Sheet
00813-0100-4019, Rev BA
April 2010

Rosemount 1080 and 1082 Multipoint Thermocouple and RTD Profiling Sensors

BEST INSTALLATION PRACTICES

- *Efficient way of monitoring a temperature profile for a wide range of applications, especially hot-spot detection*
- *Compact design of independent measurement points. Up to 60 points within an insert tube diameter of 8 mm (0.32 inch)*
- *Low cost per measurement point*
- *Onsite replacement of individual elements*
- *Only one process connection for up to 60 independent measurement points*
- *A complete temperature measurement solution. The transmitter, enclosure, sensor and thermowell can be ordered as a complete assembly using one model number*

Contents

CE

ROSEMOUNT®

www.rosemount.com

EMERSON™
Process Management

Introduction

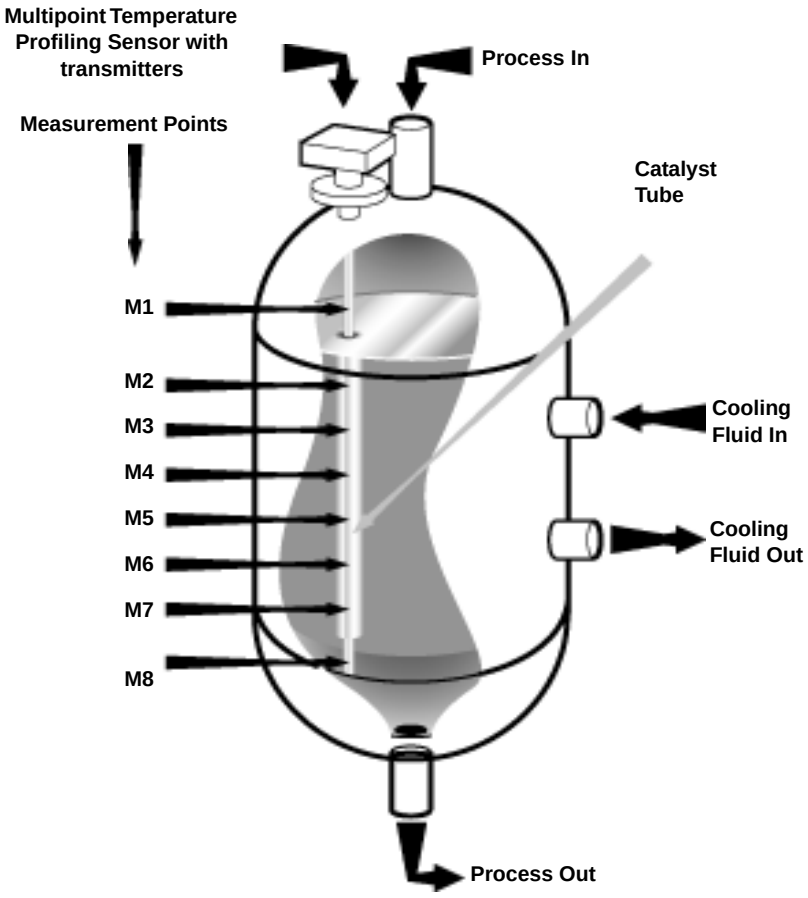
Multipoint Temperature Profiling Sensors measure the temperature at different points along its length. These sensors are frequently used in chemical and petrochemical industries because they provide an excellent temperature profile for chemical reactors, catalytic crackers, and fractionation towers. For these applications, Multipoint Temperature Profiling Sensors are the most efficient cost, maintenance, and data acquisition solution. Multipoint Temperature Profiling Sensors allow, with a single pipe penetration, the reading of up to 60 points that can be evaluated to provide a complete temperature profile of the column, tank, or reactor.

TYPICAL APPLICATIONS

Reactors

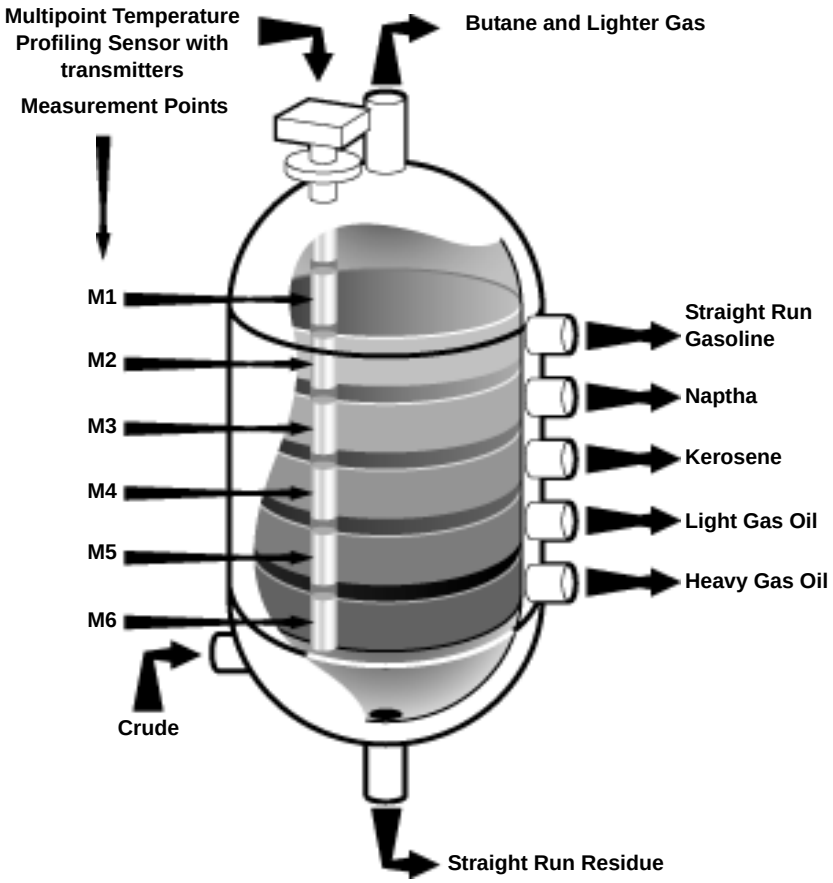
Multipoint Temperature Profiling Sensors improve monitoring and control of the reaction process within chemical reactors.

One example of how Multipoint Temperature Profiling Sensors are used is in the production of organic acid. Many organic acids are produced through an exothermal oxidation process. This chemical reaction takes place in multiple tubes filled with catalyst. The reaction components flow into the tubes (process in), react together (due to the catalyst), and then flow out as an acid (process out). The tubes are cooled by a cooling fluid flowing around the tubes. A critical process parameter is the process temperature. A Multipoint Temperature Profiling Sensor, such as the compact design of the Rosemount 1080C, measures the temperature profile inside a reaction tube. This temperature profile represents the profile of the other reaction tubes. Through monitoring the temperature profile the flow of reaction components and cooling fluid can be controlled to maximize the process output and reaction efficiency. A high local resolution of the temperature profile is required to ensure that the hot-spot (maximum measured temperature) does not reach the maximum allowable process temperature.



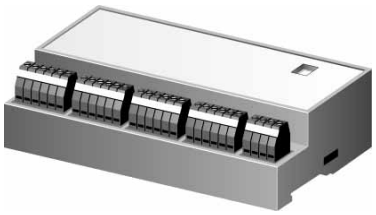
Distillation Columns / Fractionators

In a crude oil distillation process, crude oil is heated and run into a distillation column or fractionator, where a significant temperature profile can be measured (hot at the bottom, cooler at the top). Inside the column crude oil is separated into components or fractions according to weight and boiling point. As these component vapors travel up, they condense into liquid. The condensed components are captured by strategically mounted trays or “decks”. The trays are located at a height where the column temperature matches a components condensation point. The tray locations, or cut-points, are where products are then drawn from the column. Multipoint Temperature Profiling Sensors can be used to monitor the temperature at these cut-points and then control the temperature profile of the distillation column.



An Integrated Complete Solution

Each Multipoint Temperature Profiling Sensor can be used with integral mount temperature transmitters, allowing for a complete package solution for the monitoring of a temperature profile. Up to six Rosemount 848T Temperature Transmitters with FOUNDATION™ fieldbus (8 independent measurement channels per Rosemount 848T transmitter) or twenty-four head mount Rosemount 644H Smart Temperature Transmitters (HART) or head mount Rosemount 244EH PC-Programmable Temperature Transmitters can be mounted into one enclosure. This enclosure is then mounted on the top of the Multipoint Temperature Profiling Sensor. The transmitters can be configured by the factory to minimize start-up costs.

Rosemount 848T	Rosemount 644H	Rosemount 244EH
		
For product specifications see the Rosemount 848T Product Data Sheet (document number 00813-0100-4697)	For product specifications see the Rosemount 644 Product Data Sheet (document number 00813-0100-4728)	For product specifications see the Rosemount 244E Product Data Sheet (document number 00813-0100-4737)

PRODUCT OVERVIEW

Multipoint Temperature Profiling Sensors can be used in almost any temperature profile application. The Models 1080 and 1082 sensors are constructed using durable mineral insulated (MI) cable and can be provided with thermocouples (type E, J, K, or N) or with Pt100 resistance elements (RTDs). Rosemount Inc. has provided model structures for each multipoint sensor base design. These model numbers are developed to make it easy to order a Rosemount® Multipoint Temperature Profiling Sensor. The model structures are constructed with flexibility; If a mounting option or thermowell material is not available in the ordering tables, this does not mean that Rosemount Inc. can not provide it. Consult the factory and use the Configuration Data Sheet (CDS) provided for each Multipoint Temperature Profiling Sensors model, and Rosemount Inc. will provide the sensor which will accommodate the process application.

The tables below provide a quick reference for the performance and physical aspects of the three base Multipoint Temperature Profiling Sensors designs, the Rosemount 1080C (Compact), Rosemount 1080F (Contacting Fixture), and Rosemount 1082R (Contacting Fixture RTD).

TABLE 1. Performance Considerations

	Rosemount 1080C	Rosemount 1080F	Rosemount 1082R
Measuring Element Type	E, J, K, or N Thermocouple	E, J, K, or N Thermocouple	Pt100 RTD
Number of Measurement Points	2 minimum, 60 maximum Highest local resolution	2 minimum, 20 maximum	2 minimum, 12 maximum
Temperature Range	–40 to 750 °C (–40 to 1382 °F)	–40 to 800 °C (–40 to 1472 °F)	–40 to 450 °C (–40 to 842 °F)
Response Time	• Moderate, but depends on thermowell design used by the application	• Moderate, for Individual Guide Tube design • Fast, for Laminated Spring design • Fast, for Radial Spring design	• Moderate
Life Expectancy	Standard	High	High
Local High Resolution Temperature Profiling(1)	Yes	No	No
Durability	Standard	High	High
Replaceable individual Elements?	No	• Yes, for Individual Guide Tube design • No, for Laminated and Radial Spring design	No

(1) For identifying process fluid hot-spots

TABLE 2. Physical Considerations

	Rosemount 1080C	Rosemount 1080F	Rosemount 1082R
Required Inner Diameter of Existing Process Thermowells(1)	4 - 10 mm	≥ 25 mm	≥ 30 mm
Maximum Insertion Length	10m (33 ft) [30 m (99 ft) bundled version]	10m (33 ft) with thermowell [30 m (99 ft) without thermowell for Radial Spring and Laminated Spring designs only]	10m (33 ft) with thermowell [30 m (99 ft) without thermowell for Radial Spring design only]

(1) Depends on the number of measurement points

Rosemount 1080C Thermocouple Multipoint Sensor - Compact Design

The Rosemount 1080C is a compact Multipoint Sensor. The sensing elements are single ungrounded thermocouples. The high number of measurement points allow the monitoring of temperature profiles with a very good local resolution. The Rosemount 1080C is often used

for

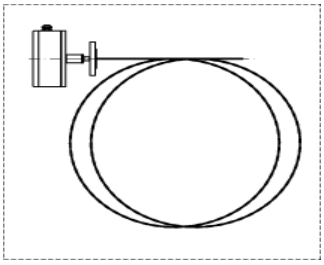
- hot-spot detection
- temperature profile monitoring

in

- tall reactors
- distillation columns.

The Rosemount 1080C is delivered without a thermowell because the thermowell typically already exists at the installation site. If a thermowell is required, please contact Rosemount Inc. The Rosemount 1080C is delivered either with an insert tube or in the bundled version (see Figure 2). The function of the insert tube is to fix the sensing elements and give mechanical stability to the sensor. The Rosemount 1080C, with an insert tube, can be shipped up to a length of 10m (33ft) and cannot be coiled for shipping. The 1080C in the bundled version can be delivered up to a length of 30m (99 ft) and is shipped as a coil (see Figure 1).

FIGURE 1. Bundled Multipoint Sensor Coiled for Shipping



SPECIFICATIONS

Functional

Number of Measurement Points

2 to 60

Temperature Limits

-40 to 750 °C (-40 to 1382 °F)

Physical

Physical Dimensions

TABLE 3. Available Insert Tube Outer Diameters

Diameter		Maximum Measurement Points
mm	inch	
3.5	0.14	25
4.5	0.18	30
5.0	0.20	40
6.0	0.24	60
8.0	0.32	60

TABLE 4. Length Limits

With Insert Tube		Bundled Version	
m	ft	m	ft
10	33	30	99

Performance

Ambient Temperature Limits

For enclosures and transmitters is –40 to 80 °C (–40 to 176 °F)

Insulation Resistance

Greater than 1000 MOhm at room temperature. See Table 5 for applied voltage.

TABLE 5. Applied Voltage for Insulation Resistance Measurement, based upon minearally insulated cable outside diameter

Outer Diameter		Test Voltage
mm	inch	
0.34	0.013	75 VDC
0.50	0.020	100 VDC
1.00	0.039	250 VDC

Accuracy

TABLE 6. Limits of Error Interchangeability for Class I Thermocouples

Type	
E	1.5 °C or 0.004 |t|[(1)], -40 to 750 °C
J	1.5 °C or 0.004 |t|[(1)], -40 to 750 °C
K	1.5 °C or 0.004 |t|[(1)], -40 to 750 °C
N	1.5 °C or 0.004 |t|[(1)], -40 to 750 °C

(1) Whichever is greater. "t" is in degrees Celsius

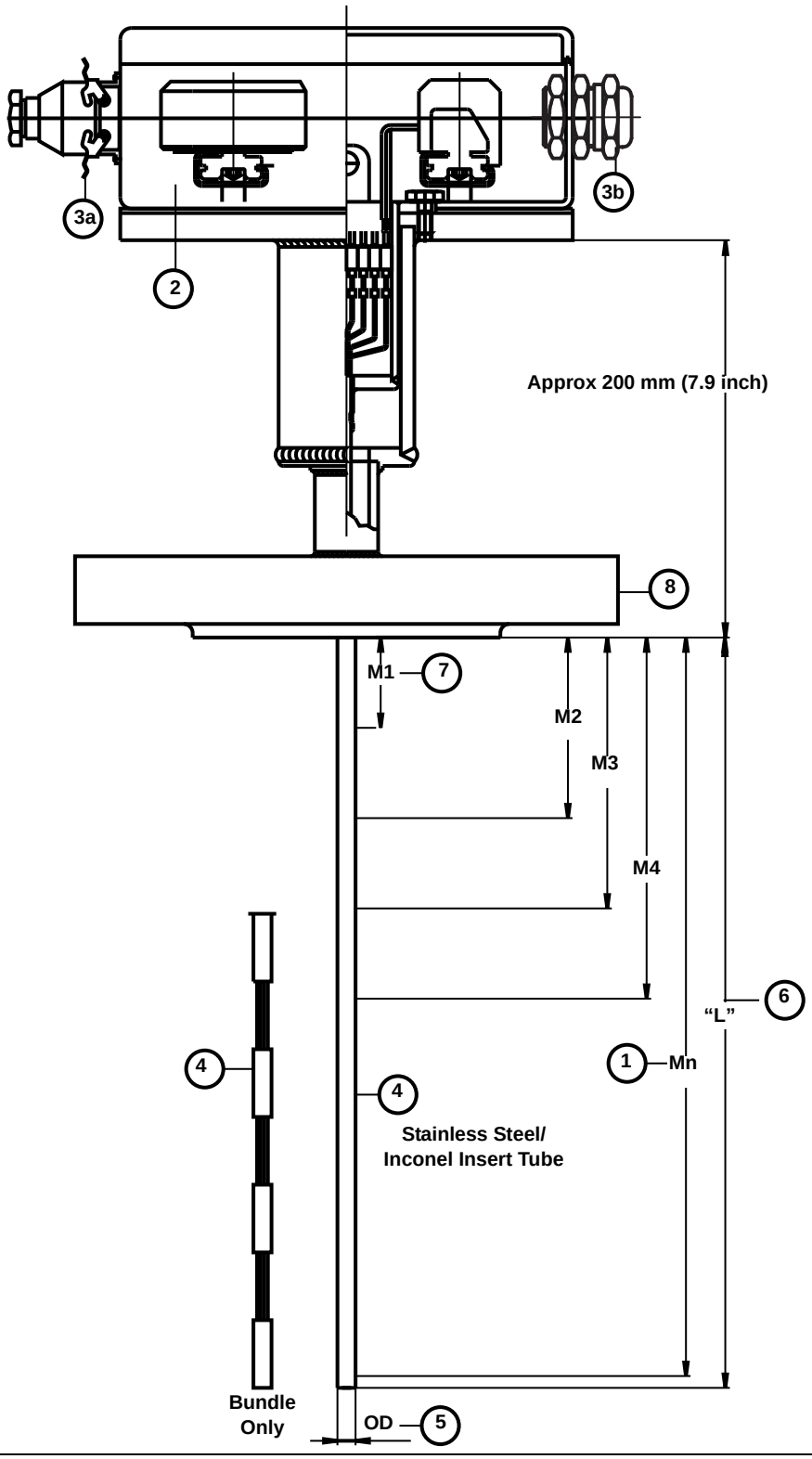
Enclosures

The enclosures are described in "Multipoint Sensor Enclosures" on page Temperature-18 and Temperature-20.

Individual Sensor Identification Data

By default, sensor 1 is closest to the flange. Remaining points are numbered incrementally. Use the C1 option and the CDS if a different numbering system is desired.

FIGURE 2. Multipoint Sensor Rosemount 1080C Compact Design

Description	Rosemount 1080C
1 Number of measurement points 2 Enclosure type (see “Multipoint Sensor Enclosures” on page Temperature-18 and Temperature-20.) 3 Enclosure entry (either 3a or 3b) 3a Han®-Plug Connection 3b Cable glands 4 Insert tube material 5 Insert tube outer diameter 6 Insertion length “L” 7 First measurement point location 8 Mounting style	

ORDERING INFORMATION– ROSEMOUNT 1080C

Model	Product Description
1080C	Series 1080C Thermocouple Multipoint Profiling Sensor - Compact Design - Tolerance Class 1

Code	Thermocouple Type	Operating Temperature Range	
		°C	°F
E1	E	-40 to 750	-40 to 1382
J1	J	-40 to 750	-40 to 1382
K1	K	-40 to 750	-40 to 1382
N1	N	-40 to 750	-40 to 1382

Code	Number of Measurement Points
08	8
16	16
24	24
32	32
40	40
48	48
XX	Other Quantities (minimum. 02; maximum. 60)

Code	Transmitter Type	Maximum Measurement Points
A	Rosemount 848T Temperature Transmitter–FOUNDATION™ fieldbus	48
B	Rosemount 644H Temperature Transmitter–HART®	24
C	Rosemount 244EH Temperature Transmitter–PC-Programmable	24
N	No transmitter–Terminal strip only	60

Code	Enclosure Type	Material	IP Rating	NEMA Rating
A	EEx d CENELEC Flameproof Approval (consult factory for availability)	Aluminum	65	NEMA 4
B	EEx e CENELEC Increased Safety Approval (consult factory for availability)	Aluminum	65	NEMA 4
C	EEx i Intrinsically Safety acc. EN 50014 and EN 50020 with manufacturer declaration for Ex i use in Zone 1	Aluminum	65	NEMA 4
D	Standard Aluminum	Aluminum	65	NEMA 4
E	Standard Polyester	Polyester	65	NEMA 4
S	Special Enclosure Type - Configuration Data Sheet Required			

Code	Enclosure Entry
1	Single Multi-core Cable Gland
2	Multiple Cable Glands M20x1,5, one per measurement point
3	Han®-Plug Connection IP65
4	Customer Specified - Configuration Data Sheet Required

Code	Insert Tube Material	Maximum Temperature	
		°C	°F
D	Stainless Steel - DIN 1.4404 (ANSI 316L)	450	842
P	Inconel®	750	1382
B	Bundle Only - DIN 1.4404 (ANSI 316L) - No Insertion Tube	450	842
C	Bundle Only - Inconel - No Insertion Tube	750	1382
S	Special Tube Material - Customer Specified - Configuration Data Sheet required		

Code	Insert Tube Outer Diameter	Maximum Measuring Points
00	No Insert Tube (used with Insert Tube Material codes B and C)	
35	3.5 mm (0.14 inch)	25
45	4.5 mm (0.18 inch)	30
50	5.0 mm (0.20 inch)	40
60	6.0 mm (0.24 inch)	60
80	8.0 mm (0.32 inch)	60

Code	Insertion Length “L”
01000	1000 mm (39 inch)
02000	2000 mm (79 inch)
03000	3000 mm (118 inch)
05000	5000 mm (197 inch)
07000	7000 mm (276 inch)
10000	10000 mm (394 inch)
XXXXX	Other lengths {maximum 10000mm (394 inch) with Insert Tube) (maximum 30000 mm (1181 inch) bundle only)

Note:
Length code is in mm. To convert to mm multiply the length in inches by 25.4.

Code	Measurement Point Distribution	
A	Equally Distributed Points	
C	Customer Specified–Configuration Data Sheet required	
Code	**First Measurement Point Location–Distance from base of mounting flange**	
00500	500 mm (20 inch)	
01000	1000 mm (39 inch)	
02000	2000 mm (79 inch)	
03000	3000 mm (118 inch)	
04000	4000 mm (158 inch)	
XXXXX	Other Lengths	
Code	**Mounting Style–Flange Material=DIN 1.4571 (ANSI 316Ti)**	**Process Connection**
F06	Flanged, ANSI	1 inch 150# RF
F12	Flanged, ANSI	1.5 inch 150# RF
F18	Flanged, ANSI	2 inch 150#RF
F24	Flanged, ANSI	1 inch 300# RF
F30	Flanged, ANSI	1.5 inch 300# RF
F36	Flanged, ANSI	2 inch 300# RF
F42	Flanged, ANSI	1 inch 600# RF
F48	Flanged, ANSI	1.5 inch 600# RF
F54	Flanged, ANSI	2 inch 600# RF
F66	Flanged, ANSI	1.5 inch 900# RF
F72	Flanged, ANSI	2 inch 900# RF
D06	Flanged, DIN	DN 25 PN 16
D12	Flanged, DIN	DN 25 PN 40
D18	Flanged, DIN	DN 40 PN16
D24	Flanged, DIN	DN 40 PN40
D28	Flanged, DIN	DN 50 PN 40
CDS	Customer Specified–Configuration Data Sheet Required	
Code	**Transmitter Options**	
	Approval Options (consult factory for availability)	
I5	FM Intrinsic Safety and Non-Incendive Approval	
I6	CSA Intrinsic Safety and Non-Incendive Approval	
I7	SAA Intrinsic Safety Approval	
I1	BASEEFA/CENELEC Intrinsic Safety	
	Frequency Options	
F5	50 Hz Line Voltage Filter (select this option only if 50 Hz is needed for the Rosemount 848T transmitter. 60 Hz is standard for Rosemount 848T transmitters)	
F6	60 Hz Line Voltage Filter (select this option only if 60 Hz is needed for the Rosemount 644 and 244E transmitters. 50 Hz is standard for Rosemount 644 and 244E transmitters)	
	NAMUR Options	
A1	NAMUR Alarm Levels Compliant to NE43	
CN	NAMUR Alarm Levels Compliant to NE43, Set Low	
Code	**Additional Options**	
	Special Tagging and Configuration Options	
C1(1)	Customer specified tagging and transmitter configuration–Configuration Data Sheet Required	
	Thermowell Options	
R16	Ring Joint Flange (ASME B16.5 ANSI flanged thermowells only)	
Typical Model Number: 1080C J1 08 A D 1 D 35 01000 A 00500 F36		

(1) Shipped with default transmitter configuration = 0 to 400 °C and default tagging of 1 through the number of measurement points. The first measurement point (closest to the enclosure) is tag "1." If other configuration is required, order option code C1.

Rosemount 1080F Thermocouple Multipoint Sensor – Contacting Fixture Design

The Rosemount 1080F Multipoint Sensor is versatile, robust, and designed for exceptional reliability with a long life expectancy. The individual measurement elements are ungrounded single thermocouples and the number of measurement points is limited to 20. These sensors are to be used for measurement of temperature profiles where a high local resolution is not required. The Rosemount 1080F can be ordered with or without a thermowell and is available in three different sensor configurations: Individual Guide Tube design, Radial Spring design, and Laminated Spring design.

Individual Guide Tube Design

The individual guide tube design offers the advantage of replaceable individual elements (see Figure 3). Mineral insulated thermocouple elements are inserted into each guide tube and guided to the specified measurement point. When ordered with spring loaded fittings, good thermal contact (fast response time) is achieved but the inside of the thermowell is not sealed from the atmosphere. When ordered with compression fittings, the thermowell is sealed from the atmosphere but the thermal contact isn't as good. The guide tube design, with or without a thermowell, cannot be coiled– which should be considered when shipping.

Radial Spring Design

This design provides good thermal contact between the thermocouple and thermowell. In this design, a radial spring presses the thermocouple against the inner wall of the thermowell. The flattened MI cable has full thermal contact with the thermowell. This design ensures the best possible response time. If ordered without a thermowell, it will be shipped as a coil. The individual thermocouples cannot be replaced.

Laminated Spring Design

This design provides good thermal contact between the thermocouple and the thermowell, facilitating a fast-time response. The laminated spring presses the thermocouple against the inner wall of the thermowell (see Figure 3) and is appropriate if the mounting flange is angled to the thermowell. The advantage of this design is the flexibility of the insert, which is similar to the flexibility of an oil dipstick. This design allows the sensor to follow the contour of the thermowell. If the laminated spring multipoint sensor is ordered without thermowell, it will be shipped as a coil. The individual thermocouples cannot be replaced.

Thermowell

Every Rosemount 1080F requires a thermowell for operation. When the Rosemount 1080F is ordered without thermowell, check the inner diameter of the existing thermowell. The inner wall of the thermowell must be smooth, especially at the welding joints, to insure that the multipoint sensor will not be damaged during insertion.

SPECIFICATIONS

Functional

Number of Measuring Points

2 to 20

Temperature Limits

- Type E and J: -40 to 750 °C (-40 to 1382 °F)
- Type K and N: -40 to 800 °C (-40 to 1472 °F)

Physical

Length Limits

10 m (33 ft) with thermowell– all designs
30 m (99 ft) without thermowell– Radial and Laminated designs only

Physical Dimensions

TABLE 7. Thermowell Diameter for Guide Tube and Laminated Spring Design

Number of Measurement Points	O.D.		I.D.	
	mm	inch	mm	inch
2-inch schedule 80				
2 to 5	60.33	2.34	49.25	1.94
$2^1/_2$-inch schedule 80				
6 to 8	73	2.9	59	2.3
3-inch schedule 80				
9 to 20	88.9	3.5	73.7	2.9

TABLE 8. Thermowell Diameter for Radial Spring Design

Number of Measurement Points	O.D.		I.D.	
	mm	inch	mm	inch
2 to 8	73.0	2.9	59.0	2.3
9 to 20	88.9	3.5	73.7	2.9

Performance

Ambient Temperature Limits

For the enclosures and transmitters is –40 to 80 °C (–40 to 176 °F)

Insulation Resistance

Greater than 1000 MOhm at room temperature, test voltage is 500 VDC.

Accuracy

TABLE 9. Limits of Error Interchangeability for Class I Thermocouples

Type	
E	1.5 °C or 0.004 $\|t\|^{(1)}$, -40 to 750 °C
J	1.5 °C or 0.004 $\|t\|^{(1)}$, -40 to 750 °C
K	1.5 °C or 0.004 $\|t\|^{(1)}$, -40 to 800 °C
N	1.5 °C or 0.004 $\|t\|^{(1)}$, -40 to 800 °C

(1) Whichever is greater. "t" is in degrees Celsius.

Enclosures

The enclosures are described in "Multipoint Sensor Enclosures" on page Temperature-18 and Temperature-20.

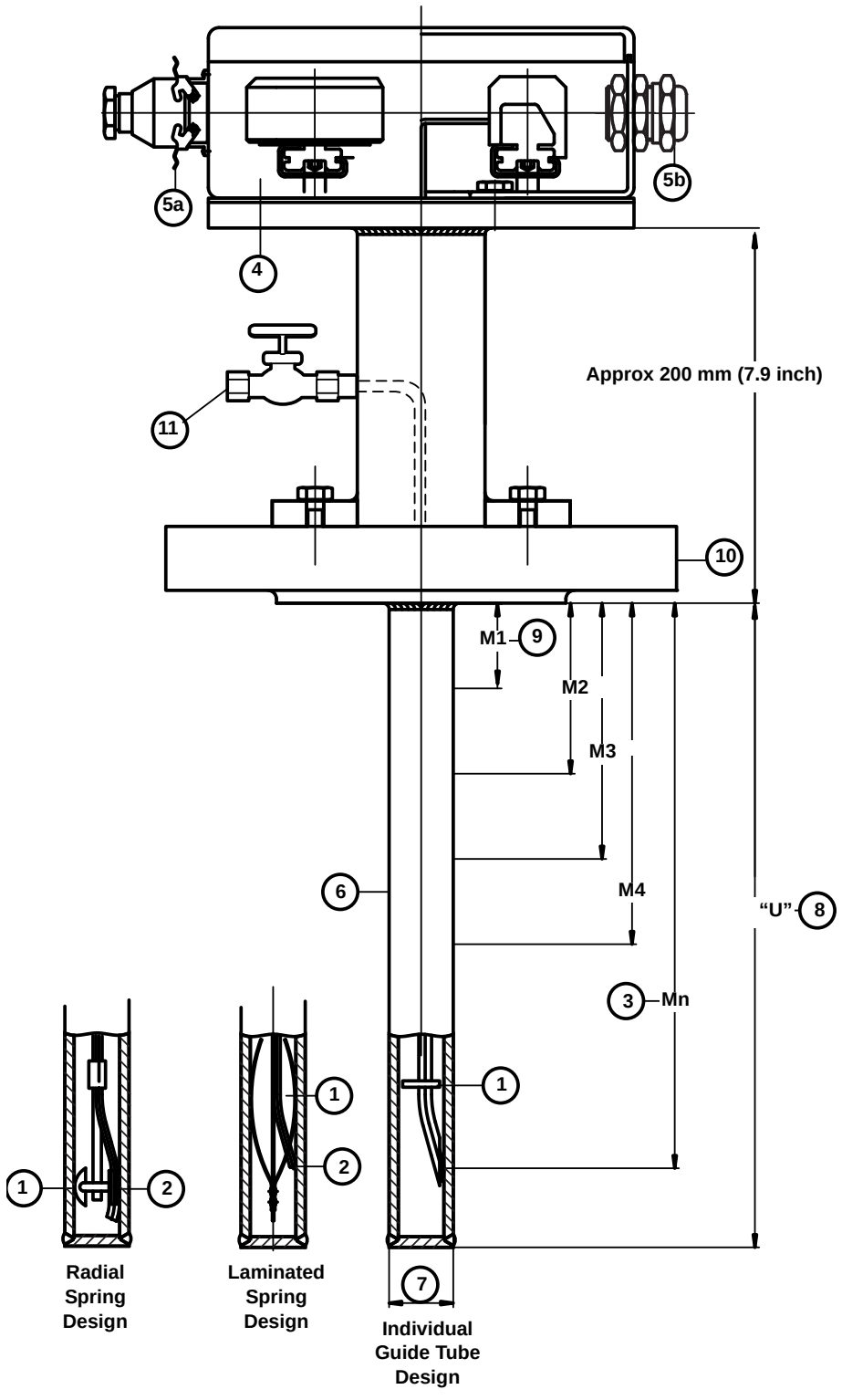
Individual Sensor Identification Data

By default, sensor 1 is closest to the flange. Remaining points are numbered incrementally. Use the C1 option and the CDS if a different numbering system is desired.

FIGURE 3. Multipoint Sensor Rosemount 1080F Thermocouple Multipoint Sensor–Contacting Fixture Design

Description

1 Element of fixation method
2 Thermocouple type
3 Number of measurement points
4 Enclosure type (see “Multipoint Sensor Enclosures” on page Temperature-18 and Temperature-20.)
5 Enclosure entry (either 5a or 5b)
5a Han-Plug Connection
5b Cable glands
6 Thermowell material
7 Thermowell diameter
8 Immersion length “U”
9 First measurement point location
10 Mounting style
11 Leak Check Valve (optional)



ORDERING INFORMATION

Model	Product Description
1080F	Series 1080F Thermocouple Multipoint Profiling Sensor– Contacting Fixture Design, Tolerance Class 1

Code	Element Fixation Method
1	Individual Guide Tubes, Compression Fittings, Replaceable Elements
2	Individual Guide Tubes, Spring Loaded Fittings, Replaceable Elements
3	Laminated Spring Design, Compression Fittings, Fixed Elements
4	Radial Spring Design, Fixed Elements

Code	Thermocouple Type	Operating Temperature Range	
		°C	°F
E1	E	-40 to 750	-40 to 1382
J1	J	-40 to 750	-40 to 1382
K1	K	-40 to 800	-40 to 1472
N1	N	-40 to 800	-40 to 1472

Code	Number of Measurement Points
03	3
08	8
12	12
16	16
20	20
XX	Other Quantities (minimum. 02; maximum. 20)

Code	Transmitter Type	Maximum Measurement Points
A	Rosemount 848T Temperature Transmitter–FOUNDATION™ fieldbus	20
B	Rosemount 644H Temperature Transmitter–HART®	20
C	Rosemount 244EH Temperature Transmitter–PC-Programmable	20
N	No Transmitter–Terminal Strip Only	20

Code	Enclosure Type	Material	IP Rating	NEMA Rating
A	EEx d CENELEC Flameproof Approved (consult factory for availability)	Aluminum	65	NEMA 4
B	EEx e CENELEC Increased Safety Approval (consult factory for availability)	Aluminum	65	NEMA 4
C	EEx i Intrinsically Safety acc. EN 50014 and EN 50020 with manufacturer declaration for Ex i use in Zone 1	Aluminum	65	NEMA 4
D	Standard Aluminum	Aluminum	65	NEMA 4
E	Standard Polyester	Polyester	65	NEMA 4
S	Special Enclosure Type - Configuration Data Sheet Required			

Code	Enclosure Entry
1	Single Multi-core Cable Gland
2	Multiple Cable Glands M20x1,5, one per measurement point
3	Han®-Plug Connection IP65
4	Customer Specified - Configuration Data Sheet Required

Code	Thermowell Material	Maximum Temperature	
		°C	°F
D	Stainless Steel - DIN 1.4404 (ANSI 316L)	450	842
P	Heat Resistant Steel–DIN 1.7380 (ANSI 182-F22)	800	1472
S	Special Tube Material - Customer Specified - Configuration Data Sheet Required	Consult factory	
N	No thermowell		

Code	Thermowell Diameter
A	Standard–see Table 7 and Table 8
C	Customer specified–Configuration Data Sheet Required

Code	Immersion Length “U”
01000	1000 mm (39 inch)
02000	2000 mm (79 inch)
03000	3000 mm (118 inch)
05000	5000 mm (197 inch)
07000	7000 mm (276 inch)
10000	10000 mm (394 inch)
XXXXX	Other Length {maximum 10000mm (394 inch with thermowell) (maximum 30000 mm (1181 inch) without thermowell– Laminated and Radial Spring designs only)

Note:
Length code is in mm. To convert to mm multiply the length in inches by 25.4.

Code	Measurement Point Distribution	
A	Equally Distributed Points (last point placed approx 50 mm from the bottom of the thermowell)	
C	Customer Specified–Configuration Data Sheet Required	
Code	**First Measurement Point Location–Distance from base of mounting flange**	
00500	500 mm (20 in)	
01000	1000 mm (39 in)	
02000	2000 mm (79 in)	
03000	3000 mm (118 in)	
04000	4000 mm (158 in)	
XXXXX	Other Lengths	
Code	**Mounting Style–Flange Material= DIN 1.4404 (ANSI 316L)**	**Process Connection**
F36	Flanged, ANSI	2 inch 300# RF
F74	Flanged, ANSI	$2^1/_2$ inch 300# RF
F76	Flanged, ANSI	3 inch 300# RF
F54	Flanged, ANSI	2 inch 600# RF
F78	Flanged, ANSI	$2^1/_2$ inch 600# RF
F80	Flanged, ANSI	3 inch 600# RF
F72	Flanged, ANSI	2 inch 900# RF
F82	Flanged, ANSI	$2^1/_2$ inch 900# RF
F84	Flanged, ANSI	3 inch 900# RF
D26	Flanged, DIN	DN 50 PN 25/40
CDS	Customer Specified–Configuration Data Sheet required	
Code	**Transmitter Options**	
	Approval Options (consult factory for availability)	
I5	FM Intrinsic Safety and Non-Incendive Approval	
I6	CSA Intrinsic Safety and Non-Incendive Approval	
I7	SAA Intrinsic Safety Approval	
I1	BASEEFA/CENELEC Intrinsic Safety	
	Frequency Options	
F5	50 Hz Line Voltage Filter (select this option only if 50 Hz is needed for the Rosemount 848T transmitter. 60 Hz is standard for Rosemount 848T transmitters)	
F6	60 Hz Line Voltage Filter (select this option only if 60 Hz is needed for the Rosemount 644 and 244E transmitters. 50 Hz is standard for Rosemount 644 and 244E transmitters)	
	NAMUR Options	
A1	NAMUR Alarm Levels Compliant to NE43	
CN	NAMUR Alarm Levels Compliant to NE43, Set Low	
Code	**Additional Options**	
	Special Tagging and Configuration Options	
C1(1)	Customer Specified Tagging and Transmitter Configuration–Configuration Data Sheet required	
	Thermowell Options	
Q8	Thermowell Material Certification, DIN EN 10204 3.1.B	
R01	Thermowell Pressure Testing	
R03	Thermowell Dye Penetration Testing	
R07	Full Penetration Weld	
R16	Ring Joint Flange (ASME B16.5 ANSI flanged thermowells only)	
	Process Connection Options	
P01	Leak Check Valve	

Typical Model Number: 1080F 2 J1 08 A D 1 D A 01000 A 00500 F36 R01 P01

(1) Shipped with default transmitter configuration = 0 to 400 °C and default tagging of 1 through the number of measurement points. The first measurement point (closest to the enclosure) is tag "1." If other configuration is required, order option code C1.

Rosemount 1082R RTD Multipoint Sensor– Contacting Fixture Design

The Rosemount 1082R Multipoint Sensor is a robust sensor with a long life expectancy. The individual measurement elements are resistance elements. The standard is a 4-wire RTD, except when the Rosemount 1082R is ordered with Rosemount 848T transmitter (in which case a 3-wire configuration is provided). The number of measurement points is restricted to 12. The Rosemount 1082R is used when a high local resolution is not required. These multipoint sensors can be ordered with or without thermowells.

The Rosemount 1082R is the best solution when data acquisition equipment requires an RTD output signal. However, a thermocouple multipoint sensor (such as the Rosemount 1080F) may be the optimal solution if transmitters are used (higher temperature range, more measurement points, same output). The Rosemount 1082R offers two different element fixation methods the Radial Spring design and the Spacer Design.

Radial Spring Design:

This design provides very good thermal contact between the RTD and the thermowell. A radial spring presses the RTD element against the inner wall of the thermowell ensuring the best possible response time (see Figure 4). If ordered without a thermowell it will be shipped as a coil. The individual RTD elements cannot be replaced.

Spacer Design:

This design (see Figure 4) uses spacer disks to guide the resistance elements into position. The individual RTD elements are not replaceable. For shipping purposes, the spacer design, with or without a thermowell, cannot be coiled.

Thermowell

Every Rosemount 1082R requires a thermowell for operation. When the Rosemount 1082R is ordered without a thermowell, check the inner diameter of the existing thermowell. The inner wall of the thermowell must be smooth, especially at the welding joints, to insure that the multipoint sensor will not be damaged by insertion.

SPECIFICATIONS

Functional

Number of Measurement Points

2 to 12

Temperature Limits

-40 to 450 °C (-40 to 842 °F)

Physical

Physical Dimensions

TABLE 10. Thermowell Required Diameters for the Radial Spring and Spacer Design

Number of Measurement Points	O.D.		I.D.	
	mm	inch	mm	inch
2 to 8	73	2.9	59	2.3
9 to 12	88.9	3.5	73.7	2.9

Length Limits

10 m (33 ft) with thermowell
30 m (99 ft) without thermowell– Radial Spring design only

Performance

Ambient Temperature Limits

For the enclosures and transmitters is –40 to 80 °C (–40 to 176 °F)

Insulation Resistance:

Greater than 1000 MOhms at room temperature, test voltage is 500 VDC.

Accuracy

TABLE 11. Accuracy in Accordance to DIN EN 60751

Class	
A	±(0.15K+0.0020*|t|)
B	±(0.30K+0.0050*|t|)
"t" is the temperature in °C.	

Enclosures

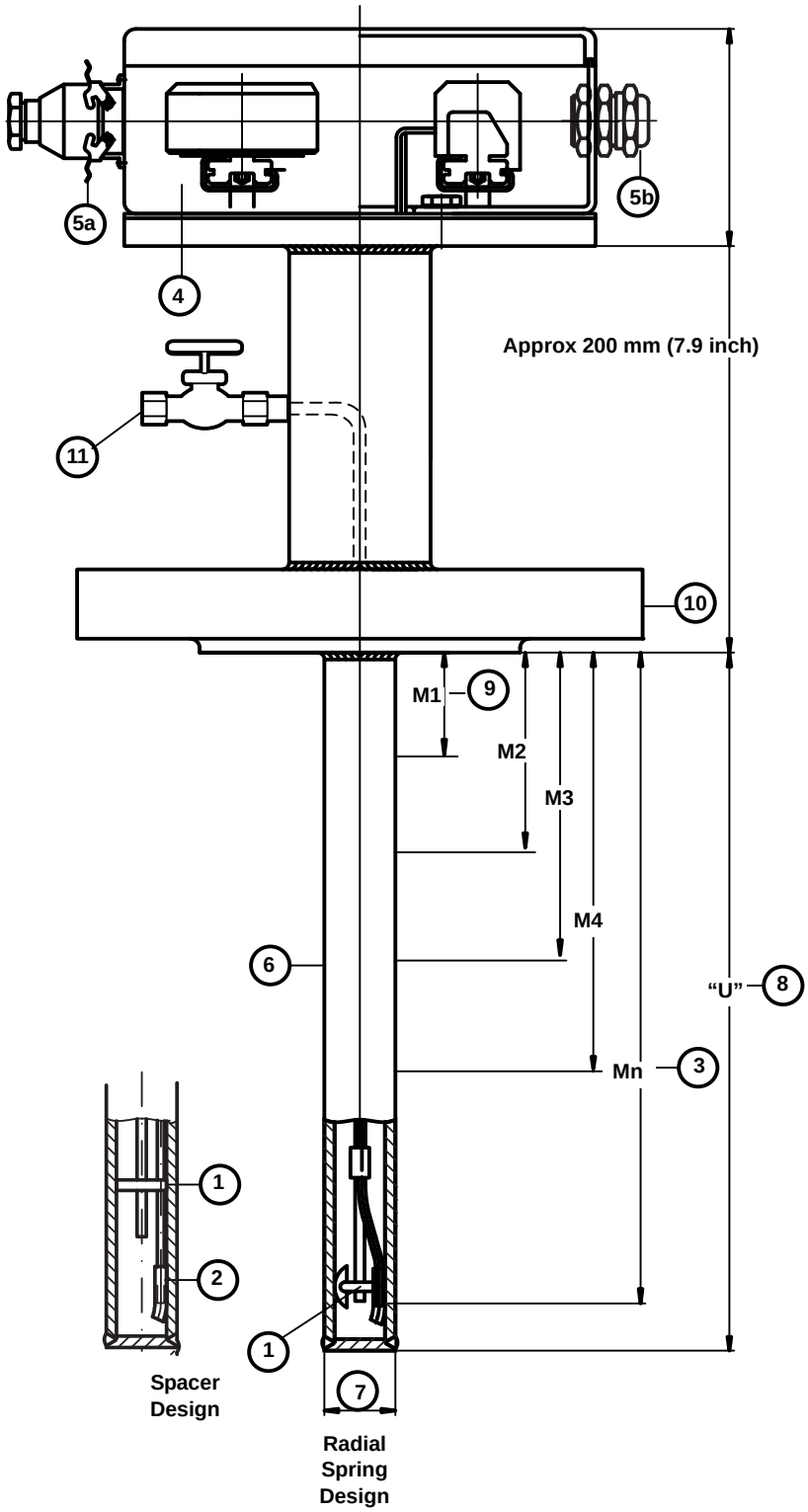
The enclosures are described in "Multipoint Sensor Enclosures" on page Temperature-18 and Temperature-20.

Individual Sensor Identification Data

By default, sensor 1 is closest to the flange. Remaining points are numbered incrementally. Use the C1 option and the CDS if a different numbering system is desired.

FIGURE 4. Multipoint Sensor Rosemount 1082R, Radial Spring and Spacer Design (Pt 100 RTD)

Description	
1	Element fixation method
2	Pt100 RTD
3	Number of measurement points
4	Enclosure type (see “Multipoint Sensor Enclosures” on page Temperature-18 and Temperature-20.)
5	Enclosure entry (either 5a or 5b)
	5a Han-Plug Connection
	5b Cable glands
6	Thermowell material
7	Thermowell outside diameter
8	Immersion length “U”
9	First measurement point location
10	Mounting style
11	Leak Check Valve (optional)



ORDERING INFORMATION

Model	Product Description
1082R	Series 1082R RTD Multipoint Profiling Sensor–Contacting Fixture Design

Code	Element Fixation Method
1	Radial Springs Design
2	Spacer Design

Code	Sensor Type	Operating Temperature Range °C	Operating Temperature Range °F
A	Pt100 Class A	–40 to 450	–40 to 842
B	Pt100, Class B	–40 to 450	–40 to 842

Code	Number of Measurement Points
05	5
08	8
12	12
XX	Other Quantities (minimum. 02; maximum. 12)

Code	Transmitter Type	Maximum Measurement Points
A	Rosemount 848T Temperature Transmitter–FOUNDATION™ fieldbus	12
B	Rosemount 644H Temperature Transmitter–HART®	12
C	Rosemount 244EH Temperature Transmitter–PC-Programmable	12
N	No transmitter–Terminal strip only	12

Code	Enclosure Type	Material	IP Rating	NEMA Rating
A	EEx d CENELEC Flameproof Approved (consult factory for availability)	Aluminum	65	NEMA 4
B	EEx e CENELEC Increased Safety Approval (consult factory for availability)	Aluminum	65	NEMA 4
C	EEx i Intrinsically Safety acc. EN 50014 and EN 50020 with manufacturer declaration for Ex i use in Zone 1	Aluminum	65	NEMA 4
D	Standard Aluminum	Aluminum	65	NEMA 4
E	Standard Polyester	Polyester	65	NEMA 4
S	Special Enclosure Type - Configuration Data Sheet Required			

Code	Enclosure Entry
1	Single Multi-core Cable Gland
2	Multiple Cable Glands M20x1,5, one per measurement point
3	Han®-Plug Connection IP65
4	Customer Specified - CDS required, consult factory

Code	Thermowell Material	Maximum Temperature °C	Maximum Temperature °F
D	Stainless Steel - DIN 1.4404 (ANSI 316L)	450	842
P	Heat Resistant Steel–DIN 1.7380 (ANSI 182-F22)	750	1382
S	Special Tube Material - Customer Specified - Configuration Data Sheet Required	Consult factory	
N	No thermowell		

Code	Thermowell Diameter
A	Standard–see Table 7 and Table 8
C	Customer Specified–CDS required

Code	Immersion Length “U”
01000	1000 mm (39 inch)
02000	2000 mm (79 inch)
03000	3000 mm (118 inch)
05000	5000 mm (197 inch)
07000	7000 mm (276 inch)
10000	10000 mm (394 inch)
XXXXX	Other Lengths {maximum 10000mm (394 in) with thermowell) (maximum 30000 without thermowell–Radial Spring design only)

Note:
Length code is in mm. To convert to mm multiply the length in inches by 25.4.

Code	Measurement Point Distribution	
A	Equally Distributed Points (last point placed approx 50 mm from the bottom of the thermowell)	
C	Customer Specified–Customer Data Sheet required	
Code	**First Measurement Point Location–Distance from base of mounting flange**	
00500	500 mm (20 inch)	
01000	1000 mm (39 inch)	
02000	2000 mm (79 inch)	
03000	3000 mm (118 inch)	
04000	4000 mm (158 inch)	
XXXXX	Other Lengths	
Code	**Mounting Style–Flange Material= DIN 1.4404 (ANSI 316L)**	**Process Connection**
F36	Flanged, ANSI	2 inch 300# RF
F74	Flanged, ANSI	$2^1/_2$ inch 300# RF
F76	Flanged, ANSI	3 inch 300# RF
F54	Flanged, ANSI	2 inch 600# RF
F78	Flanged, ANSI	$2^1/_2$ inch 600# RF
F80	Flanged, ANSI	3 inch 600# RF
F72	Flanged, ANSI	2 inch 900# RF
F82	Flanged, ANSI	$2^1/_2$ inch 900# RF
F84	Flanged, ANSI	3 inch 900# RF
D26	Flanged, DIN	DN 50 PN 25/40
CDS	Customer Specified–Customer Data Sheet Required	
Code	**Transmitter Options**	
	Approval Options (consult factory for availability)	
I5	FM Intrinsic Safety and Non-Incendive Approval	
I6	CSA Intrinsic Safety and Non-Incendive Approval	
I7	SAA Intrinsic Safety Approval	
I1	BASEEFA/CENELEC Intrinsic Safety	
	Frequency Options	
F5	50 Hz Line Voltage Filter (select this option only if 50 Hz is needed for the Rosemount 848T transmitter. 60 Hz is standard for Rosemount 848T transmitters)	
F6	60 Hz Line Voltage Filter (select this option only if 60 Hz is needed for the Rosemount 644 and 244E transmitters. 50 Hz is standard for Rosemount 644 and 244E transmitters)	
	NAMUR Options	
A1	NAMUR Alarm Levels Compliant to NE43	
CN	NAMUR Alarm Levels Compliant to NE43, Set Low	
Code	**Additional Options**	
	Special Tagging and Configuration Options	
C1[(1)]	Customer Specified Tagging and Transmitter Configuration–Configuration Data Sheet required	
	Thermowell Options	
Q8	Thermowell Material Certification, DIN EN 10204 3.1.B	
R01	Thermowell Pressure Testing	
R03	Thermowell Dye Penetration Testing	
R07	Full Penetration Weld	
R16	Ring Joint Flange (ASME B16.5 ANSI flanged thermowells only)	
	Process Connection Options	
P01	Leak Check Valve	

Typical Model Number: 1082R 1 A 08 A D 1 D A 01000 A 00500 F36 R01

(1) Shipped with default transmitter configuration = 0 to 400 °C and default tagging of 1 through the number of measurement points. The first measurement point (closest to the enclosure) is tag "1." If other configuration is required, order option code C1.

Multipoint Sensor Enclosures

Rosemount multipoint sensors are offered in three general enclosure types:

- Aluminum (A)
- Flameproof Aluminum (FPA)
- Polyester (P).

The enclosure size used with a multipoint sensor is determined by three factors, as shown in the tables:

- Multipoint sensors base model
- Number of measurement points
- Type of transmitter

See Table 12 on page Temperature-19 to determine the enclosure dimensions.

No Transmitter (enclosure and terminal strip only)

Measurement Points	Number of terminals			Enclosure Size		
	Rosemount 1080C	Rosemount 1080F	Rosemount 1082R	Rosemount 1080C	Rosemount 1080F	Rosemount 1082R
2 – 12	4 – 24	4 – 24	8 – 24	Size 1 (A, P) Size 5 (FPA	Size 1 (A, P) Size 5 (FPA	Size 1 (A, P) Size 5 (FPA
13 – 20	26 – 40	26 – 40	N/A(1)	Size 1 (A, P) Size 5 (FPA	Size 1 (A, P) Size 5 (FPA	N/A(1)
21 – 24	42 – 48	N/A(1)	N/A(1)	Size 1 (A, P) Size 5 (FPA	N/A(1)	N/A(1)
25 – 40	50 – 80	N/A(1)	N/A(1)	Size 2 (A, P) Size 6 (FPA	N/A(1)	N/A(1)
41 – 60	82 – 120	N/A(1)	N/A(1)	Size 3 (A) Size 4 (F) Size 7 (FPA)	N/A(1)	N/A(1)

(1) Not Applicable

With Rosemount 848T transmitters

Measurement Points	Number of Transmitters	Enclosure Size		
		Rosemount 1080C	Rosemount 1080F	Rosemount 1082R
2 –8	1	Size 1 (A, P) Size 5 (FPA	Size 1 (A, P) Size 5 (FPA	Size 1 (A, P) Size 5 (FPA
9 – 12	2	Size 3 (A) Size 4 (F) Size 7 (FPA)	Size 3 (A) Size 4 (F) Size 7 (FPA)	Size 3 (A) Size 4 (F) Size 7 (FPA)
14 – 16	2	Size 3 (A) Size 4 (F) Size 7 (FPA)	Size 3 (A) Size 4 (F) Size 7 (FPA)	N/A(1)
17 – 20	3	Size 3 (A) Size 4 (F) Size 7 (FPA)	Size 3 (A) Size 4 (F) Size 7 (FPA)	N/A(1)
21 – 24	3	Size 3 (A) Size 4 (F) Size 7 (FPA)	N/A(1)	N/A(1)

Measurement Points	Number of Transmitters	Enclosure Size		
		Rosemount 1080C	Rosemount 1080F	Rosemount 1082R
25 – 32	4	Size 3 (A) Size 4 (F) Size 7 (FPA)	N/A(1)	N/A(1)
33 – 40	5	Size 3 (A) Size 4 (F) Size 8 (FPA)	N/A(1)	N/A(1)
41 – 48	6	Size 3 (A) Size 4 (F) Size 8 (FPA)	N/A(1)	N/A(1)

(1) Not Applicable

With Rosemount 644H or 244EH transmitters

Measurement Point	Number of Transmitters	Enclosure Size		
		Rosemount 1080C	Rosemount 1080F	Rosemount 1082R
2 – 8	2 – 8	Size 1 (A, P) Size 5 (FPA	Size 1 (A, P) Size 5 (FPA	Size 1 (A, P) Size 5 (FPA
9 – 10	9 – 10	Size 2 (A, P) Size 6 (FPA	Size 2 (A, P) Size 6 (FPA	Size 2 (A, P) Size 6 (FPA
11 – 12	11 – 12	Size 3 (A) Size 4 (F) Size 7 (FPA)	Size 3 (A) Size 4 (F) Size 7 (FPA)	Size 3 (A) Size 4 (F) Size 7 (FPA)
13 – 20	13 – 20	Size 3 (A) Size 4 (F) Size 8 (FPA)	Size 3 (A) Size 4 (F) Size 8 (FPA)	N/A(1)
21 – 24	21 – 24	Size 3 (A) Size 4 (F) Size 8 (FPA)	N/A(1)	N/A(1)

(1) Not Applicable

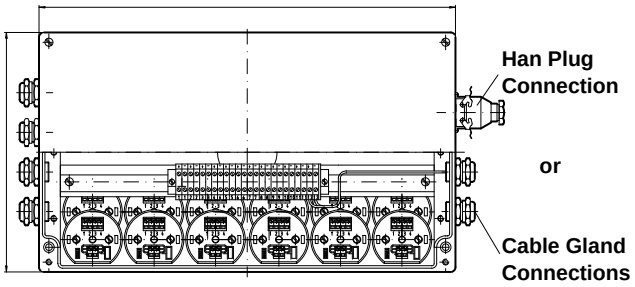
TABLE 12. Enclosure dimensions

Size	Length X Width x Depth (mm)	Length X Width x Depth (inch)
1	260 x 160 x 90	10.2 x 6.3 x 3.5
2	360 x 160 x 90	14.2 x 6.3 x 3.5
3	420 x 240 x 210	16.5 x 9.4 x 8.3
4	400 x 405 x 210	15.7 x 15.9 x 8.3
5	298 x 198 x 212	11.7 x 7.8 x 8.3
6	418 x 218 x 212	16.4 x 8.6 x 8.3
7	432 x 332 x 223	17.0 x 13.1 x 8.8
8	632 x 432 x 265	24.9 x 17.0 x 10.4

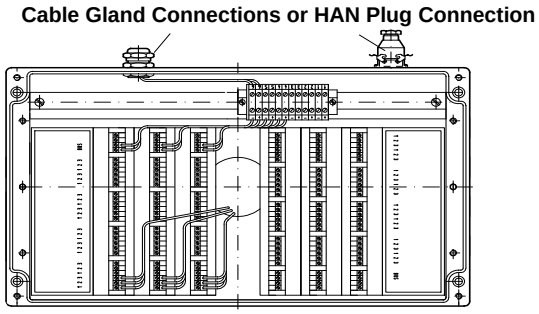
ENCLOSURES WITH TRANSMITTERS

The drawings below show the maximum number of transmitters that are permitted in the largest enclosure. If a Han plug connection is ordered, only one is required (and is included) with the enclosure.

For use with Rosemount 644H or 244EH
24 transmitters (24 measurement points)



For use with the Rosemount 848T
6 transmitters (48 measurement points)



Rosemount 1080 and 1082

Product Data Sheet
00813-0100-4019, Rev BA
April 2010

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00813-0100-4019 Rev BA, 4/10

EMERSON™
Process Management

Product Data Sheet
00813-0100-4827, Rev BB
April 2010

Resistance Temperature Sensors for Hygienic and Sanitary Applications

- *Resistance temperature sensors for applications in the food and beverage, pharmaceutical and life-science industries*
- *Aseptic process connections suitable for CIP and SIP dead-pocked free measurement applications*
- *Exchangeable measuring insert to ensure process integrity*
- *Enhanced system accuracy with transmitter-sensor matching, meets pharmaceutical industry requirements*
- *Reliable temperature measurement with Hot-Backup and Sensor Drift Alert*

Content

Introduction

Rosemount Series 65Q and 65B RTD temperature sensors are designed for use in hygienic and aseptic applications exclusively to meet the stringent quality requirements in the Food and Beverage, and Pharmaceutical industries. Series 65Q sensors represent a hygienic portfolio for applications in Food and Beverage, and low-end Pharmaceutical. Series 65B sterile and aseptic sensor assemblies instead are designed for use in Pharmaceutical and BioTech applications. Quality requirements, that relate to different properties of a measuring instrument. The hygienic design of production plant and thus of the measuring devices as well is a basic requirement of users in food processing, pharmaceuticals, and bio-technology for the production of faultless products. Rosemount temperature products are manufactured according to Good Manufacturing Practice (GMP) guidelines and comply with the standards of the European Hygienic Equipment Design Group (EHNEDG) as well as 3A standards.

NATIONAL AND INTERNATIONAL GUIDELINES

Products that may have a direct or indirect impact on public health, must be produced according to national and international guidelines. The guidelines contain rules for the implementation and organization of methods, production, production environments, and inspections.

The European Hygienic Equipment Design Group (EHEDG) is a foundation in which mainly users and manufacturers or hygienic equipment are represented. EHEDG provides guidance of the hygienic engineering aspects of manufacturing of safe and wholesome food, e.g. through production, publication, and updating of guidelines, equipment approval through certification to assist equipment suppliers and food manufacturers and advisory function to legislators and standards groups.

EHEDG Cooperation with 3-A

EHEDG cooperates with 3-A Sanitary Standards, Inc. in the development of hygienic construction material selection and design standards for food and dairy processing equipment. 3-A Sanitary Standards and Practices have been developed for use by the dairy industry, dairy equipment manufacturers, and milk regulatory agencies as voluntary guidelines. These voluntary guidelines are used as a benchmark for product performance, hygienic quality, and ultimately food safety. 3-A Sanitary Standards and Practices are generally accepted by federal, state, and local public health authorities in the United States and other public health authorities around the world.

While 3-A Sanitary Standards have been in development and use since the late 1920’s. EHEDG is a fairly recent development that applies test criteria and laboratory test data for determining cleanability and acceptance for equipment use in the processing of foods or comestibles. Both EHEDG and 3-A Sanitary Standards may be applied not only to Food and Beverage processing equipment, but can also be applied to Biotech and Bio-pharm equipment to ensure product acceptance and safety.

MOUNTING CONFIGURATIONS

Series 65Q and 65B RTDs

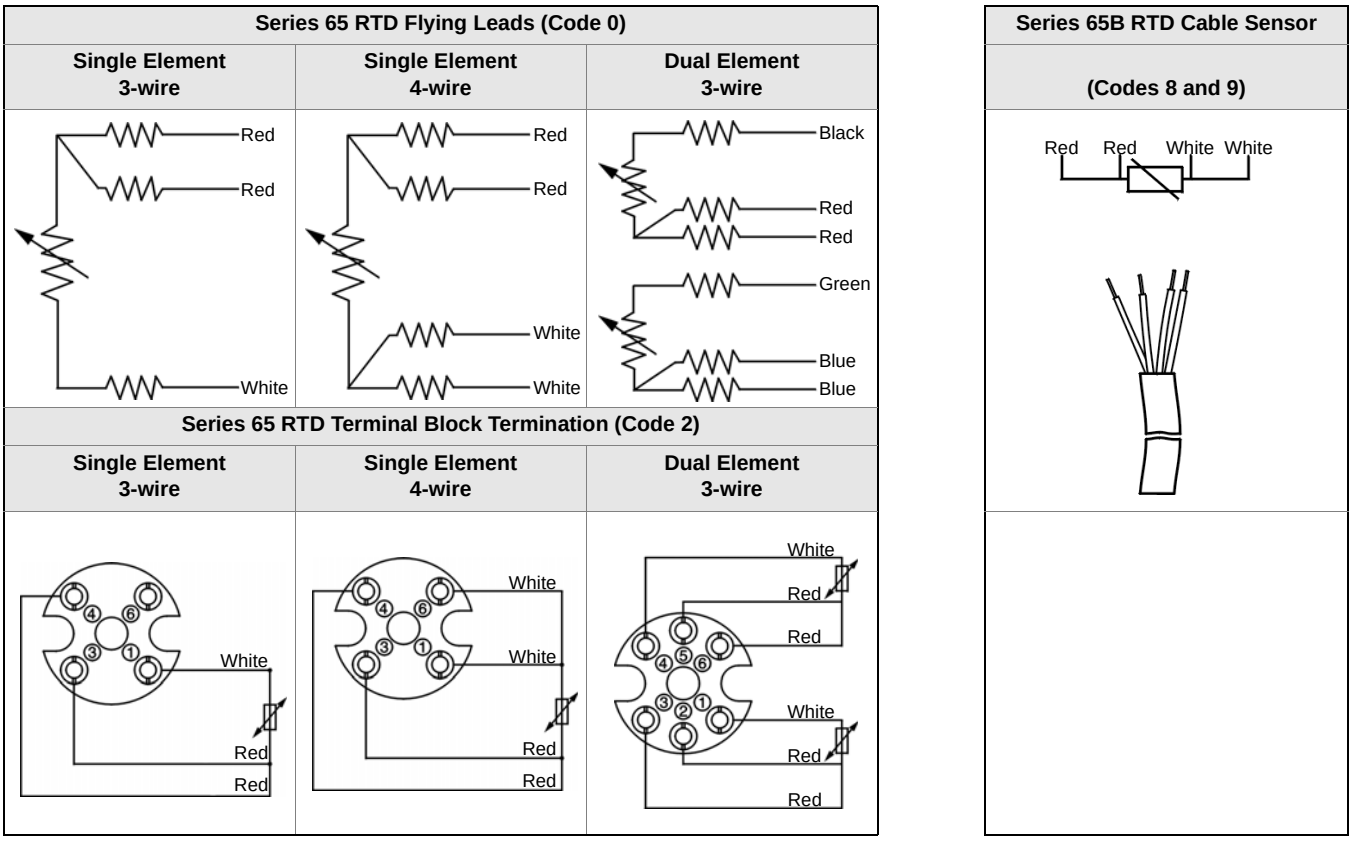
You may order the Series 65Q and 65B RTDs with flying leads or terminal block. Ordered with flying leads, the sensors are designed with an integral mounting plate, and are for use with a head-mount transmitter attached directly to the sensor. The flying lead configuration facilitates removal of the sensor and transmitter as one assembly. The configuration with terminal block allows only the mounting of transmitter into the cover of several DIN size connection heads or requires the use of field mount transmitter. 65B RTDs may also be ordered with a cable attached to the sensor. This assembly requires the use of field mount transmitters.

Rosemount 65Q and 65B Sensors

TABLE 1. Differentiation criteria between 65Q and 65B

Design Criteria	Series 65Q	Series 65B
Hygienic Design for Food and beverage Applications	Yes	Yes
Aseptic Design for Pharmaceutical/Biotech Applications	No	Yes
Sensor Lead Wire termination	• Flying leads • Terminal block	• Flying leads • Terminal block • Cable
Connection Head Material	• SST • Aluminum • Polyamide	• SST • Aluminum • Polyamide
Thermowell Material	1.4404 (316 L)	In-Line System with thermowell 1.4435 (316 L)
Thermowell Diameter	• 6 mm straight • 10 mm reduced to 6 mm	• No thermowell • 4.3 mm weld-in pocket as part of In-Line System
Process Connection	• Tri-Clamp • Tapered Union with Coupling Nut according to DIN 11851 (Dairy Connection) • Weld-in ball, adjustable • Threaded Connection • Varivent	• Hygienic In-Line System
Certificates	No	EHEDG
		3-A

FIGURE 1. Series 65Q and 65B Lead Wire Termination



Series 65Q RTD – Sanitary Applications

Rosemount Series 65Q integral mount temperature sensors are designed for use in hygienic, food and beverage applications when fitted with the TriClamp, adjustable Weld-in Ball or Tapered Union with Coupling Nut according to DIN 11851 (Dairy Connection) process connections which do not need to meet as harsh aseptic requirements as requested for BioPharm applications. Alternatively for direct insertion into non-hygienic processes the Series 65Q temperature sensor can be ordered optional with G½-in. (½-in. BSPF) or ½-in. NPT thread mounting.

Those RTD sensors are available alone or as complete assemblies including connection heads, thermowells with weld-on process connections. This offering is designed to be used in complete temperature assemblies including Rosemount Temperature Transmitters. The RTD sensors meet most critical parameters of international standards - DIN EN 60751 incorporating Amendments 1 and 2. All sensors are available in a variety of lengths and ranges with terminal block or flying leads.

SPECIFICATIONS

Nominal Resistance

In accordance with DIN EN 60751, the nominal resistance is defined as follows:

- 100 Ω RTD at 0 °C
- Temperature coefficient α = 0.00385 Ω x °C/Ω), averaged between 0 and 100 °C

Limit Deviations

Tolerance Class A as standard: t = ± (0.15 + 0.002 x t);
valid for the temperature range from 0 to +350 °C

Lead Wire Configuration

As single element (1Pt 100) with 3 or 4 lead wires or dual element (2Pt 100) with 3 lead wires

Response Time

Less than 12 seconds to reach 63% step change in water flowing at 0.4 m/s

Process Temperature Range

-50 to +450 °C
The measurement range can be limited by the gasket in the process connection.

Ambient Temperature

Housing without head-mounted transmitter

- Metal housings: -40 to +130 °C
- Plastic housings: -40 to +85°C

Housing with head-mounted transmitter

- -40 to +85°C

Maximum Process Pressure

Lower maximum pressure can be due to the process connection
Pressure ratings at 20 °C:

- Tri-Clamp: 10 bar
- Weld-in Ball with PEEK-Seal: 6 bar
- Weld-in Ball with SST-Seal: 40 bar
- Threaded: 40 bar
- Tapered Union with Coupling Nut: 10 bar
- Varivent: 10 bar

Shock and Vibration Resistance

According to DIN EN 60751: 2.8 g peak / 10…500 Hz

Self Heating

0.15 °K/mW when measured per method defined in DIN EN 60751

Insulation Resistance

1,000 MΩ minimum insulation resistance when measured at 500 Vdc and at room temperature

Sheath Material

321 Stainless Steel with mineral-insulated cable construction

Lead Wire

PTFE insulated, silver coated copper wire

Identification Data

The model and serial numbers are marked on each sensor

Ingress Protection (IP) Ratings

The particular rating is applicable only for complete assemblies including a connection head and tubular thermowell. IP varies from 65 to 68 due to a wide selection on different connection heads, DIN A and B size, made of different materials such as aluminium, polyamide and stainless steel

Rosemount 65Q and 65B Sensors

SYSTEM COMPONENTS

Sensor

The 65Q sensor consists of an exchangeable mineral-insulated measuring insert, wherein a small, drop-form thin film RTD element is encapsulated. This design protects the relatively strain-free element, thereby maintaining accuracy and long-term stability. The sensor is mounted into a swaged or straight stainless steel sheath. The sensor outer diameter is 3.2 mm. The minimum sensor length for an exchangeable sensor is 100 mm. The RTD sensor is fitted into a housing with connection head and welded thermowell.

Extension

- Standard material Stainless Steel 1.4404 (316 L)
- Standard diameter of 10 mm
- Preferred standard lengths; 50, 65, and 130 mm

Thermowell

Thermowell stem styles:

- Straight thermowell with an outer diameter of 6 mm diameter must be used for immersion lengths less than 50 mm
- More stable Stepped Thermowell with an outer diameter of 10mm reduced to 6 mm must be used for immersion lengths greater than 50 mm (65 mm on parallel thread G$^1/_2$-in. ($^1/_2$-in. BSPF))

Thermowell materials:

- Stainless Steel 1.4404 (316L) for hygienic applications

· Thermowell surface qualities:

- R_a < 0,8 µm as standard, electropolishing
- R_a < 0,4 µm optional, electropolishing

Connection Heads (see Table 2)

The connection heads can be of different types (size DIN A and B) and materials (plastic, aluminium, stainless steel). Its fitting to the rest of the probe and the gland for the cable entry, assure an IP grade of 65 at minimum. All supplied heads have a process connection M24x1.5.

Polished Stainless Steel DIN A (sanitary applications)

- Smoothly contoured design which minimizes crevices for easy wipe-down
- Sanitary Stainless Steel housing for easy-to-clean applications
- Mounting of one DIN A or B sized transmitter on DIN plate
- Local indication with integral LCD Meter

Polished Stainless Steel DIN B (sanitary applications)

- Smoothly contoured design which minimizes crevices for easy wipe-down
- Sanitary Stainless Steel housing for easy-to-clean applications
- Mounting of one DIN B sized transmitter on DIN plate

Rosemount Aluminium DIN A

- Rosemount design
- Mounting of one or two transmitters on DIN plate and for second one optional by the use of extension ring

TZ-A/BL (BUZH)

- DIN B head with enlarger space for mounting a DIN A size (644H) or DIN B size transmitter into the cover by the use of terminal block or two transmitters with flying lead sensors

GR-A/BL (BUZ)

- DIN B head with enlarger space for mounting a DIN A size (644H) or DIN B size transmitter on DIN plates

TZ-A/BK

- DIN B head with enlarger space for mounting a DIN A size (644H) or DIN B size transmitter into the cover by the use of terminal block or two transmitters (248H) with flying lead sensors
- Suggested for use in high humidity environments and at low temperatures to avoid problems due to condensation

TABLE 2. Connection Head Features

Type	Material	IP Rating	Lid Version	Transmitter Mounting	Conduit Connection	LCD Meter Cover
Polished DIN A	SST	68	Threaded	DIN plate, 644, 248	M20 x 1.5, $^1/_2$-in. NPT	Yes
Polished DIN B	SST	66	Threaded	DIN plate, 248	M20 x 1.5, $^1/_2$-in. NPT	No
Rosemount	Aluminum	68	Threaded	DIN plate, 644, 248	M20 x 1.5, $^1/_2$-in. NPT	Yes
TZ-A/BK	Polyamide	65	Screw-on cap	On cover, terminal block 644, 248	M20 x 1.5	No
TZ-A/BL	Aluminum	65	Screw-on camp	On cover, terminal block 644, 248	M20 x 1.5	No
GR-A/BL	Aluminum	65	Screw-on camp	DIN plate, 644, 248	M20 x 1.5	No

Rosemount 65Q and 65B Sensors

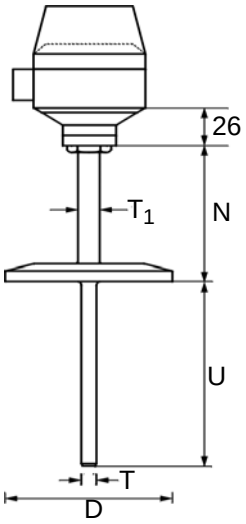
MOUNTING STYLE AND PROCESS CONNECTION

Achieving absolute control through every step of the manufacturing process is essential in order for the production of sanitary fittings to be successful. By achieving such control, each fitting will perform more satisfactorily when incorporated into the process installation, reducing installation time, and ensuring process integrity.

- Process connections are available in several sizes
- Process connection is continuously welded on the thermowell in such a way to obtain a welding radius of 3.2 mm at minimum, between the lower surface of the connection and the sensor stem according to 3A standards
- All process connections are available in material 1.4404 (316L)
- Surface roughness on wetted parts: R_a of ≤ 0.8 µm is available as standard, optional with R_a ≤ 0.4 µm, both electropolishing

Tri-Clamp

- Welded on the thermowell it allows immersion lengths from 25 to 500 mm, they depend on pipe nominal size used; see details on dimension table
- Available in 1/2 -to-4 in. (19 to 10.16 mm) tube OD sizes, larger sizes than 4-in. are available upon request
- available in material 1.4404 (316L), surface finish R_a of ≤ 0.8 µm is available as standard, optional with R_a of ≤ 0.4 µm, both electropolishing
- Can be cleaned in place, fast and easy to take down, provide lead-tight connections and readily adaptable to other forms of piping, allow in-line temperature measurement by the use of counter part and suitable seal o-ring on customer site
- Meet the 3-A Sanitary Standard
- Meets ASME BPE 2002 standards



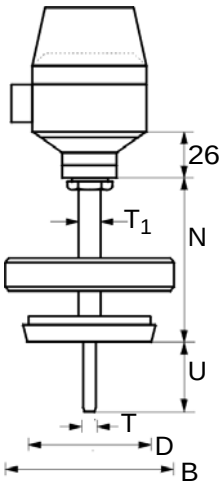
Dimensions (mm)			
Nominal Size	**D**	**T**	**T1**
1/2-in. (12.7 mm)	24.9	6(1)	10
3/4-in. (19 mm)	24.9	6(1)	10
1-in. (25.4 mm)	50.4	6(1)	10
1.5-in. (38 mm).	50.4	6(1)	10
2-in. (50.8 mm)	63.9	6(1)	10
2.5-in. (63.5 mm)	77.4	6(1)	10
3-in. (76.2 mm)	90.9	6(1)	10
4-in. (101.6 mm)	119.1	6(1)	10

(1) Diameter 6 mm as standard for immersion length U ≤ 50 mm. For U ≥ 50 mm Stepped thermowell diameter 10 mm with reduced measuring tip of 6 mm.

D = Process Connection Diameter
T1 = Extension Outer Diameter
T = Thermowell Outer Diameter
U = Immersion Length
N = Extension Length

Tapered Union with Coupling Nut according to DIN 11851 (Dairy Connection)

- Immersion lengths from 25 to 500 mm
- Available in DN10 - DN50 tube OD sizes, larger sizes than 50 DN are available upon request
- Available in material 1.4404 (316L), surface finish R_a of ≤ 0.8 µm is available as standard, optional with R_a of ≤ 0.4 µm, both electropolishing
- Self-centering, external coupling nut can be easily cleaned



Dimensions (mm)				
Nominal Size	**D**	**B**	**T**	**T_1**
DN 10	22.5	38	6(1)	10
DN 25	44	63	6(1)	10
DN 32	50	70	6(1)	10
DN 40	56	78	6(1)	10
DN 50	68.5	92	6(1)	10

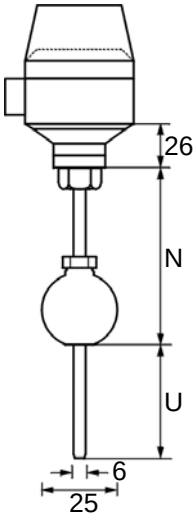
(1) Diameter 6 mm as standard for immersion length U ≤ 50 mm. For U ≥ 50 mm Stepped thermowell diameter 10 mm with reduced measuring tip of 6 mm.

D = Process Connection Diameter
T1 = Extension Outer Diameter
T = Thermowell Outer Diameter
U = Immersion Length
N = Extension Length
B = Coupling Nut Diameter

Rosemount 65Q and 65B Sensors

Weld-in Ball Connection

- Immersion lengths from 25 to 500 mm, mostly used for temperature measurement in vessels
- Available in material 1.4404 (316L), surface finish R_a of ≤ 0.8 µm is available as standard, optional with R_a of ≤ 0.4 µm, both electropolishing
- Used for Food and Beverage applications
- Available with PEEK or SST seal

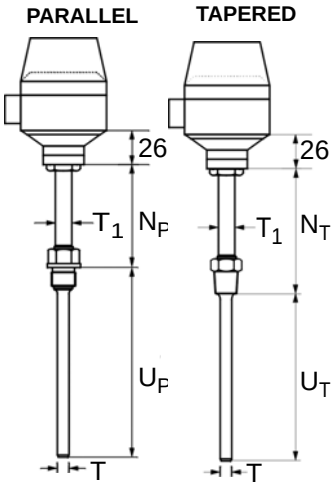


U = Immersion Length (adjustable)

N = Extension Length (adjustable)

Threaded Process Connection

- Immersion lengths from 25 mm (tapered threads) and 40 mm (parallel threads) to 500 mm
- Available in material 1.4404 (316L)
- Used for temperature measurement in non-hygienic processes



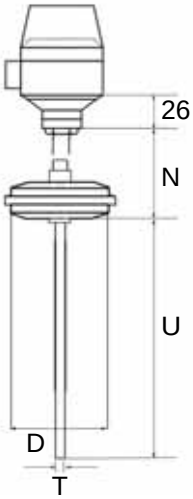
Dimensions (mm)	
T	**T_1**
6(1)	10

(1) Diameter 6 mm as standard for immersion length $U_T \leq 50$ mm or $U_p \leq 65$ mm. For $U_T \geq 50$ mmor $U_p \geq 65$ mm Stepped thermowell diameter 10 mm with reduced measuring tip of 6 mm.

D = Process Connection Diameter
T = Thermowell Outer Diameter
T_1 = Extension Outer Diameter
U_P = Immersion Length (parallel)
U_T = Immersion Length (tapered)
N_P = Extension Length (parallel)
N_T = Extension Length (tapered)

Varivent Process Connection

- Immersion lengths from 35 to 500 mm
- Available in D = 68 mm
- Suitable for hygienic and aseptic applications



Dimensions (mm)	
Nominal Size	**D**
DN 32 - 125	68

D = Process Connection Diameter
T = Thermowell Outer Diameter
U = Immersion Length
N = Extension Length

INSTALLATION

Series 65Q temperature sensors can be mounted on the wall of pipes or vessels. The counterparts for the process connections and the respective gaskets or sealing rings are generally not supplied with the sensors, and are on the customer's responsibility (FDA material certification, EHEDG and 3A requirements shall be observed).

As a general rule, the sensors should be installed in a manner which does not adversely affect their ability to be cleaned.

The immersion length may have an influence on the accuracy of the sensors, If it is too short, an error might be generated in the measured temperature, due to the lower temperatures of the process medium near the walls and the heat transfer which occurs through the sensor stem. To avoid this effect of inaccuracy, the immersion length should be, if possible, at least 90 to 120 mm. In pipes with smaller diameter, the axis line of the duct must be reached, and even slightly exceeded by the sensor tip.

In hygienic applications a strict installation rule exists so as not to leave any dead spaces along the run of process fluid.

In case of disassembling of the sensor, new gaskets equal to the originals and specific torques must be employed for the reassembly procedure, to assure the stated IP grade of the connection heads.

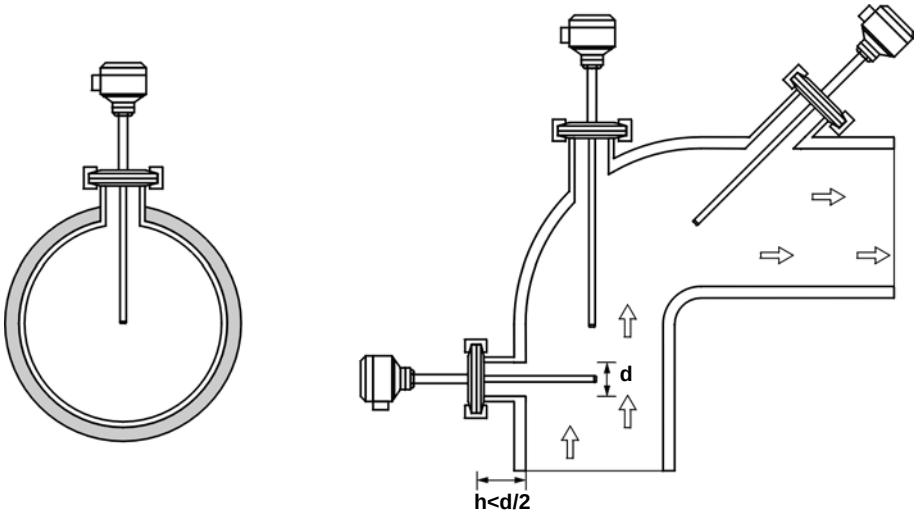
TriClamp Flange fulfills partly this requirement.

For **Weld-in Ball Connection** care should be taken by the user in the execution of the welding on the process side; e.g. suitable weld material, welding radius > 3 mm, absence of pits, crevices etc.)

Tapered Union with Coupling nut according to DIN 11581 (Dairy Process Connection) process connection doesn't meet as harsh aseptic requirements as requested for BioPharm applications.

Alternatively for direct insertion into non-hygienic processes the Series 65Q temperature sensor can be ordered optional with $G^1/_2$-in. **($^1/_2$-in. BSPF) or NPT thread mounting**.

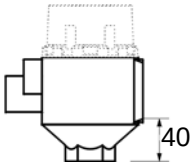
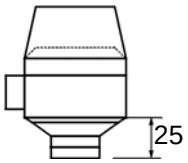
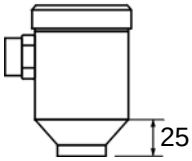
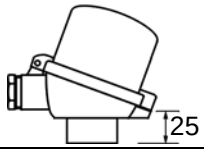
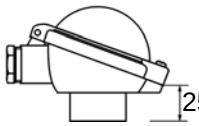
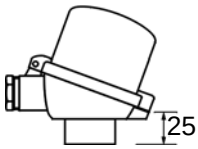
FIGURE 2. Installation Drawings



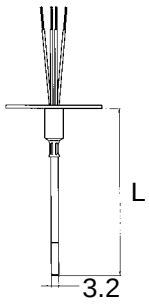
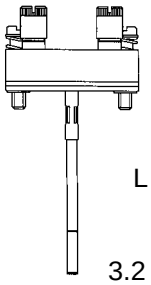
Rosemount 65Q and 65B Sensors

DIMENSIONAL DRAWINGS

Connection Heads

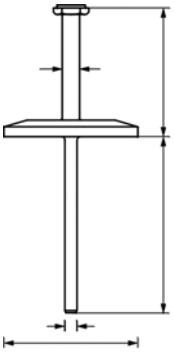
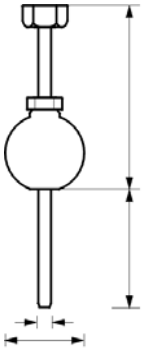
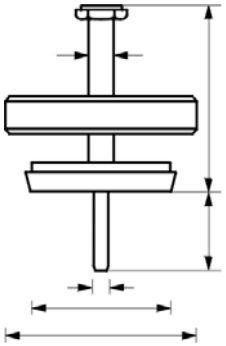
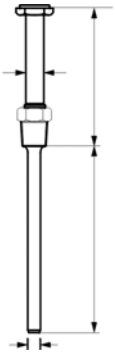
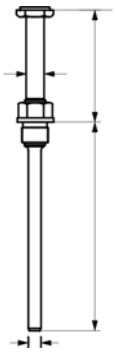
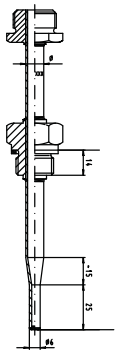
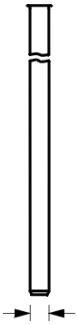
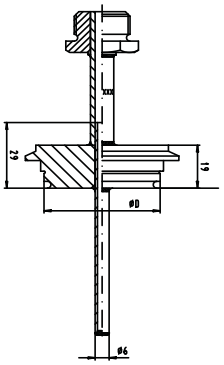
Rosemount Aluminum Codes C, D, 1, 2	DIN A SST Codes, E, F, 5, 6	DIN B Polished SST Codes R, S	TZ-A/BL Aluminum Code L	FR-A/BL Aluminum Code J	TZ-A/BK Polyamide Code T
					

Sensor Lead Wire Terminations

Flying Leads Code 0	Terminal Block Code 2
	

L = Sensor Length
N = Extension Length
N_P = Extension Length (parallel)
N_T = Extension Length (tapered)
U = Immersion Length
U_P = Immersion Length (parallel)
U_T = Immersion Length (tapered)
T = Thermowell Outer Diameter
T_1 = Extension Outer Diameter
D = Process Connection Diameter
B = Coupling Nut Diameter

Thermowells and Process Connections

Tri-Clamp	Weld-in Ball (adjustable)	Tapered Union with Coupling Nut	Threaded Tapered
			
Threaded Parallel	**Stepped Thermowell**	**Straight Thermowell**	**Varivent**
			

All dimensions are in millimeters

ORDERING INFORMATION

TABLE 3. 65Q RTD Assembly (Pt 100) for Hygienic and Food and Beverage Applications

★ 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			
0065Q	65Q RTD Sensor with Twell for Sanitary Applications			
Connection Head		**IP Rating(1)**	**Connection Thread**	
Standard				**Standard**
C	Rosemount Aluminum	68	M20 x 1.5	★
D	Rosemount Aluminum	68	1/2-in. NPT	★
1	Rosemount, Aluminum with LCD Display Cover	68	M20 x 1.5	★
2	Rosemount, Aluminum with LCD Display Cover	68	1/2-in. NPT	★
5	Connection Head DIN A Polished Stainless Steel with LCD Display Cover	68	M20 x 1.5	★
6	Connection Head DIN A Polished Stainless Steel with LCD Display Cover	68	1/2-in. NPT	★
E	Connection Head DIN A Polished Stainless Steel	68	M20 x 1.5	★
F	Connection Head DIN A Polished Stainless Steel	68	1/2-in. NPT	★
R	Connection Head DIN B Polished Stainless Steel	66	M20 x 1.5	★
S	Connection Head DIN B Polished Stainless Steel	66	1/2-in. NPT	★
Expanded				
J	GR-A/BL (BUZ), Aluminum	65	M20 x 1.5 (with cable gland)	
L	TZ-A/BL (BUZH) Aluminum	65	M20 x 1.5 (with cable gland)	
T	TZ-A/BK, Polyamide, Black	65	M20 x 1.5 (with cable gland)	
Sensor Lead Wire Termination				
Standard				**Standard**
0	Flying Leads – No Springs on DIN plate			★
2	Terminal Block – DIN 43762			★
Sensor Type		**Temperature Range**		
Standard				**Standard**
1	RTD, Single Element, 4-wire	– 50 to 450 °C		★
2	RTD, Dual Element, 3-wire	– 50 to 450 °C		★
5	RTD, Single Element, 3-wire	– 50 to 450 °C		★
Extension				
S	Tubular with Extension, Welded Screw Bush M24 x 1.5			★
Z	Tubular with Extension, Head Connection Adjustable Loose Screw Nut M24 x 1.5			★
Extension Length (N) in Millilmeters				
Standard				**Standard**
0050 (2)	50 mm			★
0065(3)	65 mm			★
0130	130 mm			★
Expanded				★
XXXX	Non-standard extension length – non-standard lengths are available from 50 to 990 mm			★
Thermowell Material				
Standard				**Standard**
D	1.4404 (AISI 316L) Stainless Steel, ≤ 0.8 µm electropolishing			★
Immersion Length (L) in MIllimeters				
Standard				**Standard**
0025	25 mm – not available for Mounting Style code T02			★
0050	50 mm			★
0065	65 mm			★
0100	100 mm			★

TABLE 3. 65Q RTD Assembly (Pt 100) for Hygienic and Food and Beverage Applications

★ 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.

0150	150 mm			★
0200	200 mm			★
0250	250 mm			★
Expanded				
XXXX	Non-standard immersion length – non-standard lengths are available from 25 to 2500 mm			
Thermowell Mounting Style		**Process Connection**	**Stem Style**	
Standard				**Standard**
C02	Flanged	1-in. Tri-Clamp (Diameter 50.4 mm)	Stepped, 10/6 mm(4)	★
C04	Flanged	1 1/2-in. Tri-Clamp (Diameter 50.4 mm)	Stepped, 10/6 mm(4)	★
C06	Flanged	2-in. Tri-Clamp (Diameter 64 mm)	Stepped, 10/6 mm(4)	★
C08	Flanged	2 1/2-in. Tri-Clamp (Diameter 77.4 mm)	Stepped, 10/6 mm(4)	★
C10	Flanged	3-in. Tri-Clamp (Diameter 91 mm)	Stepped, 10/6 mm(4)	★
C12	Flanged	4-in. Tri-Clamp (Diameter 119 mm)	Stepped, 10/6 mm(4)	★
C14	Flanged	1/2-in. Tri-Clamp (Diameter 24.9 mm)	Stepped, 10/6 mm(4)	★
C16	Flanged	3/4-in. Tri-Clamp (Diameter 37.4 mm)	Stepped, 10/6 mm(4)	★
K02	Weld-in	Ball (adjustable), diameter 25 mm, PEEK Seal	Straight, 6 mm(5)	★
K04	Weld-in	Ball (adjustable), diameter 25 mm, SST Seal	Straight, 6 mm(5)	★
M10	Tapered with Coupling Nut(6)	Suitable connection for tube nominal size DN 10	Stepped, 10/6 mm(4)	★
M25	Tapered Union with Coupling Nut(6)	Suitable connection for tube nominal size DN 25	Stepped, 10/6 mm(4)	★
M32	Tapered Union with Coupling Nut(6)	Suitable connection for tube nominal size DN 32	Stepped, 10/6 mm(4)	★
M40	Tapered Union with Coupling Nut(6)	Suitable connection for tube nominal size DN 40	Stepped, 10/6 mm(4)	★
M50	Tapered Union with Coupling Nut(6)	Suitable connection for tube nominal size DN 50	Stepped, 10/6 mm(4)	★
T02	Threaded Parallel	1/2-in. (1/2-in. BSPF) (G1/2)	Stepped, 10/6 mm(7)	★
T12	Threaded Tapered	1/2-in. NPT	Stepped, 10/6 mm(4)	★
V04	Varivent DN 1 1/2 - 3 inch (Dim. 68 mm) Standard			★

Options (Include with selected model number)

Sensor Options			
Expanded			
A3	Single Element Class 1/3 DIN B Sensor	0 to 100 °C (–32 to 212 °F)	
A4	Dual Element Class 1/3 DIN B Sensor	0 to 100 °C (–32 to 212 °F)	
Product Certifications			
Standard			**Standard**
I1	EEx ia ATEX/IBExU Intrinsic Safety Approval		★
Cable Gland Option			
Standard			**Standard**
G2	Cable Gland, EEx d, Brass 7.5 mm - 11.9 mm		★
Cover Chain Option			
Standard			**Standard**
G3	Cover Chain – only available with Connection Head Material codes C and D		★

TABLE 3. 65Q RTD Assembly (Pt 100) for Hygienic and Food and Beverage Applications

★ 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.

Extension Ring		
Standard		**Standard**
G6	Aluminum Extension Ring for Dual Transmitter Mounting – only available with Connection Head Material codes C and D)	★
Material Certification		
Standard		**Standard**
Q8	Thermowell Material Certification	★
Extension Ring		
Standard		**Standard**
R20	Electropolishing Surface Finish of wetted parts, R_a = 0.4 μm	
Assemble to Options		
Standard		**Standard**
XA(8)	Assemble Sensor to Specific Temperature Transmitter	★
Standard Calibration (with A, B, C and Callendar-van Dusen constants)		
Standard		**Standard**
V10	Works Certificate – Sensor Calibration from –50 to 450 °C (-58 to 842 F°)	★
V11	Works Certificate – Sensor Calibration from 0 to 100 °C (-32 to 212 °F)	★
Temperature Range		
Standard		**Standard**
X8	Works Certificate – Sensor Calibration Over Specified Temperature Range with A, B, C, and Callendar-van Dusen constants	★
Typical Model Number: 0065Q C 0 1 S 0050 D 0200 C04 XA		

(1) IP 68 rating requires a suitable cable gland on the conduit connection thread. All threads must be sealed.

(2) Standard length for use with Connection Head codes C, D, 1, and 2.

(3) Standard length for use with Connection Head codes E, F, J, L, R, S, T, 5,and 6.

(4) For U < 50 mm, outer diameter 6 mm straight, below part of process connection.

(5) Valid for DIN B connection heads only.

(6) According to DIN 11851.

(7) For $U_p \leq 65$ mm, the outer diameter is 6 mm for straight stem styles.

(8) If ordering XA with a transmitter, specify the same option on the transmitter model number.

TABLE 4. 65Q RTD Sensor without Thermowell (Pt 100) for Hygienic and Food and Beverage Applications

★ 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			
0065Q	65Q RTD Temperature Sensor without Thermowell for Sanitary Applications			
Connection Head		**IP Rating(1)**	**Conduit / Cable Entry**	
Standard				**Standard**
C	Rosemount Aluminum	68	M20 x 1.5	★
D	Rosemount Aluminum	68	1/2-in. NPT	★
1	Rosemount, Aluminum with LCD Display Cover	68	M20 x 1.5	★
2	Rosemount, Aluminum with LCD Display Cover	68	1/2-in. NPT	★
5	Connection Head DIN A Polished Stainless Steel with LCD Display Cover	68	M20 x 1.5	★
6	Connection Head DIN A Polished Stainless Steel with LCD Display Cover	68	1/2-in. NPT	★
E	Connection Head DIN A Polished Stainless Steel	68	M20 x 1.5	★
F	Connection Head DIN A Polished Stainless Steel	68	1/2-in. NPT	★
R	Connection Head DIN B Polished Stainless Steel	68	M20 x 1.5	★
S	Connection Head DIN B Polished Stainless Steel	68	1/2-in. NPT	★
N	No Connection Head – use when ordering the sensor alone			★
Expanded				
J	GR-A/BL (BUZ), Aluminum	65	M20 x 1.5 (with cable gland)	
L	TZ-A/BL (BUZH) Aluminum	65	M20 x 1.5 (with cable gland)	
T	TZ-A/BK, Polyamide, Black	65	M20 x 1.5 (with cable gland)	
Sensor Lead Wire Termination				
Standard				**Standard**
0	Flying Leads – No Springs on DIN plate			★
2	Terminal Block – DIN 43762			★
Sensor Type		**Temperature Range**		
Standard				**Standard**
1	RTD, Single Element, 4-wire	– 50 to 450 °C		★
2	RTD, Dual Element, 3-wire	– 50 to 450 °C		★
5	RTD, Single Element, 3-wire	– 50 to 450 °C		★
Extension				
Standard				**Standard**
N	No Extension			★
W	No Extension – use when ordering a sensor head and connection head assembly			★
Extension Length (N)				
Standard				**Standard**
0000	No Extension			★
Thermowell Material				
Standard				**Standard**
N	No Thermowell			★
Immersion Length (L) in MIllimeters				
Standard				**Standard**
0100	100 mm			★
0125	125 mm			★
0150	150 mm			★
0175	175 mm			★
0200	200 mm			★
0250	250 mm			★
0275	275 mm			★

TABLE 4. 65Q RTD Sensor without Thermowell (Pt 100) for Hygienic and Food and Beverage Applications

★ 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.

0315	315 mm	★
0375	375 mm	★
0435	435 mm	★
Expanded		
XXXX	Non-standard immersion length – non-standard lengths are available from 100 to 2000 mm	

Options (Include with selected model number)

Sensor Options			
Expanded			
A3	Single element Class 1/3 DIN B Sensor	0 to 100 °C (–32 to 212 °F)	
A4	Dual element Class 1/3 DIN B Sensor	0 to 100 °C (–32 to 212 °F)	
Product Certifications			
Standard			**Standard**
I1	EEx ia - ATEX/IBExU Intrinsic Safety Approval		★
Cable Gland Option			
Standard			**Standard**
G2	Cable Gland, EEx d, Brass, 7.5mm - 11.9 mm. – only for use with Connection Head Material codes C, E, R, 1, and 5)		★
Cover Chain Option			
Standard			**Standard**
G3	Cover Chain – only available with Connection Head Material codes C and D		★
Extension Ring			
Standard			**Standard**
G6	Aluminum Extension Ring for Dual Transmitter Mounting – only available with Connection Head Material codes C and D		★
Assemble to Options			
Standard			**Standard**
XA(2)	Assemble Sensor to Specific Temperature Transmitter		★
Standard Calibration (with A, B, C, and Callendar-van Dusen constants)			
Standard			**Standard**
V10	Works Certificate – sensor calibration from –50 to 450 °C (-58 to 842 °F)		★
V11	Works Certificate – sensor calibration from 0 to 100 °C (-32 to 212 °F)		★
Temperature Range			
Standard			**Standard**
X8	Works Certificate – Sensor Calibration Over Specified Temperature Range with A, B, C, and Callendar-van Dusen constants		★
Typical Model Number: 0065Q N 0 1 N 0000 N 0200 V18			

(1) IP 68 rating requires a suitable cable gland on the conduit connection thread. All threads must be sealed.

(2) If ordering XA with a transmitter, specify the same option on the transmitter model number.

Series 65B RTD — Biopharm, Hygienic and Food & Beverage Applications

Rosemount Series 65B integral mount temperature sensors are designed for use in BioPharm and Hygienic applications when fitted with Hygienic In-Line Systems which does meet sterile/aseptic requirements according to EHEDG and 3A guidelines. This Hygienic In-Line System is particularly suitable for temperature measurement in small pipes beginning with DN 10 to DN 15. Larger In-Line housings are also available as standard up to DN 80. The compact and dead-pocket free sensor design is easy to install and allows to maintain process integrity during exchange of sensor for calibration or replacement purposes. The close dimension tolerance of sensor to weld-in pocket inside the In-Line housing reduces the response time obviously.Those RTD sensors are available as complete assemblies including connection heads or extension cable and process connection thread $G^1/_2$-in. (1/2-in. BSPF), thermowells and mounting fittings. All components are made of Stainless Steel for easy-to-clean ability in CIP/SIP applications. The In-Line system housing is electropolished as standard and available with material certificate 3.1B upon request. The use of In-Line system allows a quick mounting by the use orbital welding device. Especially with small pipes or later installations the In-Line System offers important advantages to hygienic mounting in comparison with conventional installation with standard sleeves.

This offering is designed to be used in complete temperature assemblies that include Rosemount 248 and 644 Head Mount Temperature Transmitters built in wide range of connection heads. In addition the sensor can be ordered as a compact, complete assembly with cable as cold end termination. The RTD sensors meet most critical parameters of international standards - DIN EN 60751 incorporating Amendments 1 and 2. All sensors are available in a variety of lengths and ranges with terminal block or flying leads.

SPECIFICATIONS

Nominal Resistance

In accordance with DIN EN 60751, the nominal resistance is defined as follows:

- 100 Ω RTD at 0 °C
- Temperature coefficient α = 0.00385 Ω (°C/Ω), averaged between 0 and 100 °C

Limit Deviations

Tolerance Class A as standard: t = ± (0.15 + 0.002 x t); valid for the temperature range from 0 to +250 °C

Lead Wire Configuration

As single element (1Pt 100) with 4 lead wires

Response Time

Less than 12 seconds to reach 63% step change in water flowing at 0.4 m/s

Process Temperature Range

-50 to +250 °C

Ambient Temperature

Housing without head-mounted transmitter

- Metal housings: -40 to +130 °C

Housing with head-mounted transmitter

- -40 to +85°C

Maximum Process Pressure

16 bar at 0 °C

Shock and Vibration Resistance

According to DIN EN 60751: 2.8 g peak / 10…500 Hz

Self Heating

0.15 °K/mW when measured per method defined in DIN EN 60751

Insulation Resistance

1,000 MΩ minimum insulation resistance when measured at 500 Vdc and at room temperature

Sheath Material

321 SST with mineral-insulated cable construction

Lead Wire

PTFE insulated, silver coated copper wire

Identification Data

The model and serial number are marked on each sensor

Ingress Protection (IP) Ratings

The particular rating is applicable only for complete assemblies including a connection head and tubular thermowell. IP varies from 65 to 68 due to a wide selection on different connection heads, DIN A and DIN B size, made of different materials such as aluminum, polyamide, and stainless steel.

65B SENSOR DESIGN WITH CONNECTION HEAD

System Components

Sensor

The 65B sensor consists of a 3.2 mm exchangeable measuring insert, wherein a small, drop-form thin film RTD element is encapsulated. The single Class A platinum element is firmly secured within the sheath by compacted magnesium oxide. This design protects the relatively strain-free element, thereby maintaining accuracy and long-term stability. The sensor is mounted into a weld-in pocket inside the In-Line system by the use of the G$^{1}/_{2}$-in. ($^{1}/_{2}$-in. BSPF) threaded bush as process connection.

Connection Heads (see Table 5)

The connection heads can be of different types (size DIN A and B) and materials (plastic, aluminium, stainless steel). Its fitting to the rest of the probe and the gland for the cable entry, assure an IP grade of 65 at minimum. All supplied heads have a process connection M24x1.5. Preferred connection head material for the use in hygienic applications due to improved corrosion resistance is stainless steel which is available in both DIN A and DIN B size.

Polished Stainless Steel DIN A (sanitary applications)

- Rosemount design
- Smoothly contoured design which minimizes crevices for easy wipe-down
- Sanitary Stainless Steel housing for easy-to-clean applications
- Mounting of one DIN A or B sized transmitter on DIN plate
- Local indication with integral LCD Meter

Polished Stainless Steel DIN B (sanitary applications)

- Rosemount design
- Smoothly contoured design which minimizes crevices for easy wipe-down
- Sanitary Stainless Steel housing for easy-to-clean applications
- Mounting of one DIN B sized transmitter on DIN plate

Connection head styles in other materials than stainless steel can be used in environments where lower hygienic criteria are present.

Rosemount Aluminium DIN A

- Rosemount design
- Mounting of one or two transmitters on DIN plate and for second one optional by the use of extension ring

TZ-A/BL (BUZH)

- DIN B head with enlarger space for mounting a DIN A size (644H) or DIN B size transmitter into the cover by the use of terminal block or two transmitters with flying lead sensors

GR-A/BL (BUZ)

- DIN B head with enlarger space for mounting a DIN A size (644H) or DIN B size transmitter on DIN plates

TZ-A/BK

- DIN B head with enlarger space for mounting a DIN A size (644H) or DIN B size transmitter into the cover by the use of terminal block or two transmitters (248H) with flying lead sensors
- Suggested for use in high humidity environments and at low temperatures to avoid problems due to condensation

TABLE 5. Connection Head Features

Type	Material	IP Rating	Lid Version	Transmitter Mounting	Conduit Connection	LCD Meter Cover
Polished DIN A	SST	68	Threaded	DIN plate, 644, 248	M20 x 1.5, $^{1}/_{2}$-in. NPT	Yes
Polished DIN B	SST	66	Threaded	DIN plate, 248	M20 x 1.5, $^{1}/_{2}$-in. NPT	No
Rosemount	Aluminium	68	Threaded	DIN plate, 644, 248	M20 x 1.5, $^{1}/_{2}$-in. NPT	Yes
TZ–A/BK	Polyamide	65	Screw-on cap	On cover, terminal block 644, 248	M20 x 1.5	No
TZ–A/BL	Aluminium	65	Screw-on cap	On cover, terminal block 644, 248	M20 x 1.5	No
GR–A/BL	Aluminium	65	Screw-on cap	DIN plate, 644, 248	M20 x 1.5	No

Extension

Standard material: SST

Standard diameter: 12 mm

Standard length: 30 mm

Welded screw bush: M24 x 1.5 for easy to clean applications

Applications

- Monitoring of CIP / SIP processes
- If local indication of process variable and diagnostics required by the use of LCD meter on the transmitter
- Enhanced system accuracy with transmitter-sensor matching with HART and FOUNDATION fieldbus protocol for critical control applications involving temperature measurements fermentation and bio-reactors.

Rosemount 65Q and 65B Sensors

65B CABLE SENSOR

System Components

Sensor

The 65B sensor consists of a 3.2 mm measuring insert, wherein a small, drop-form thin film RTD element is encapsulated. The single, class A platinum element is firmly secured within the sheath by compacted magnesium oxide. This design protects the relatively strain-free element, thereby maintaining accuracy and long-term stability. The sensor is mounted into a weld-in pocket inside the In-Line system by the use of the G$^1/_2$-in. (1/2-in. BSPF) threaded bush as process connection. The cold end termination is provided with an extension cable.

Cable

- Isolation material PTFE/Wire/PTFE
- Standard cable length: 3 or 5 m
- Cable mounting provided by the use of M12 cable gland made from PVDF (Polyvinylidenfluorid), FDA conform

In-Line System (available for both sensor designs)

The In-Line System housings have a straight or elbow design to meet different installation requirements on site.

- Pipes according DIN 11850 Series 2 available as standard; DN10 to DN80 / $^1/_2$-in. to 3-in.
- Thread connection to the sensor: G$^1/_2$-in. ($^1/_2$-in. BSPF): loose screw bush allows the connection head mounting in any direction
- Housing material: 1.4435 (316L), optional with material certificate 3.1B
- Weld-in pocket immersion length depends on housing size.
- Electropolishing inner and outer the housing with a surface roughness $R_a \leq 0.8$ µm is available as standard
- Sealing method: weld-in pocket without the use of additional seal components
- EHEDG and 3A compliant housing design (pending)

Extension

- Standard material Stainless Steel
- Standard diameter: 12 mm
- Standard length: 30 mm

Applications

- For use in skid environments connected to 848T Eight Sensor Input Transmitter with Foundation Fieldbus protocol
- For use in fermentors or reactors connected to 3144P Dual Input Transmitter with HART or Foundation Fieldbus protocol

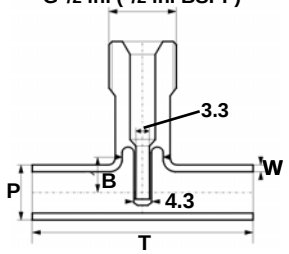
Installation

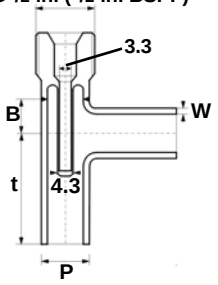
65B temperature sensors with In-Line system housings can be mounted on pipes according to DIN and ISO standards. As a general rule, the In-line systems should be installed in a manner which does not adversely affect their ability to be cleaned. In hygienic applications a strict installation rule consists in not to leave any dead spaces along the run of process fluid.

Care should be taken by the user in the execution of the welding on the process side e.g. between pipe and weld-in pocket; e.g. suitable weld material, welding radius > 3 mm, absence of pits, crevices etc.

Two installation variants are shown on following drawings:

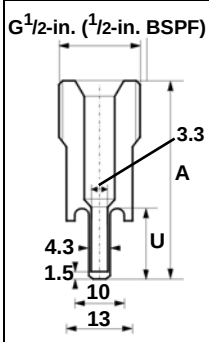
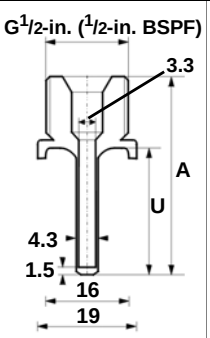
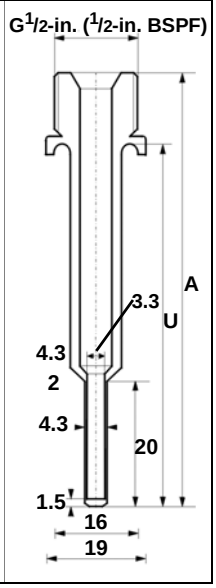
Straight Pipe Design	Elbow Pipe Design
G$^1/_2$-in. ($^1/_2$-in. BSPF)	G$^1/_2$-in. ($^1/_2$-in. BSPF)



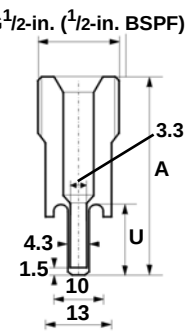
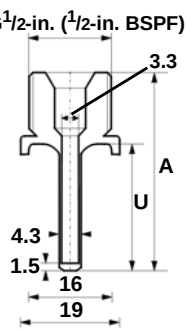
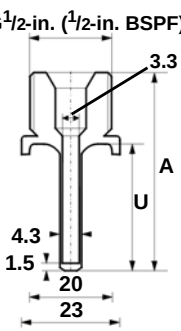


Drawings continued on page 18

Weld-in Pockets for Straight Pipe Design

U = 16 mm	U = 25 mm	U = 40 mm
		

Weld-in Pockets for Elbow Pipe Design

U = 27 mm	U = 33 mm	U = 37 mm
		

Dimensional Table

TABLE 6. Immersion Length according to. Standard (dimensions are in millimeters)

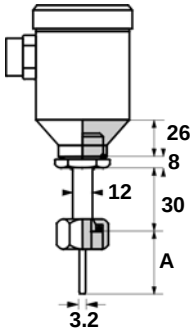
	Nominal Size	Pipe Length (T)	Dimensions (B)	Pipe Outer Diameter (P) x Wall Thickness (W)	Immersion Length (U)	Pocket Length (A)
Straight Design	**DIN 11852 in Metric**			**DIN 11850 in Metric, Row 2**		
	DN 15	70	11	19 x 1.5	16	39
	DN 20	80	13	23 x 1.5	16	39
	DN 25	100	16	29 x 1.5	16	39
	DN 32	110	19.5	35 x 1.5	25	43
	DN 40	120	23	41 x 1.5	25	43
	DN 50	160	30	53 x 1.5	25	43
	DN 65	210	40	70 x 2.0	40	60
	DN 80	260	47.5	85 x 2.0	40	60
	DIN 11866 in Inches			**DIN 11866**		
	DN 1	108	14.2	25.4 x 1.65	16	39
	DN 1 1/2	120.6	21.1	38.1 x 1.65	25	43
	DN 2	146	28.9	50.8 x 1.65	25	43
	DN 2 1/2	158.8	35.3	63.5 x 1.65	25	43
	DN 3	171.4	43.1	76.2 x 1.65	40	60
Elbow Design	**DIN 11865 in Metric**			**DIN 11866**		
	DN 10	35	11	13 x 1.5	30	50
	DN 15	35	11	19 x 1.5	33	51
	DN 20	40	13	23 x 1.5	37	55
	DIN 11865 in Inches			**DIN 11866**		
	DN 1/2	47.6	7.7	12.7 x 1.65	27	50
	DN 3/4	50.8	11	19.05 x 1.65	33	51

Rosemount 65Q and 65B Sensors

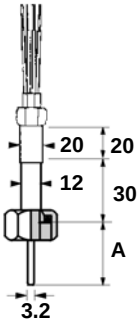
DIMENSIONAL DRAWINGS

Dimensions are in millimeters

Sensor Design with Connection Head

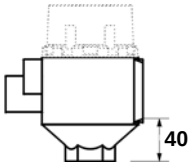


Cable Sensor Design

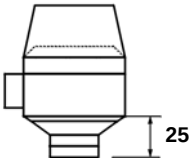


Connection Heads

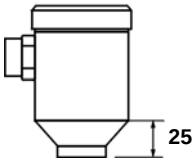
Rosemount
Aluminum
Codes C, D, 1, 2



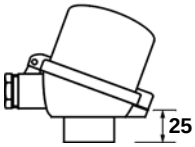
DIN A
SST
Codes E, F, 5, and 6



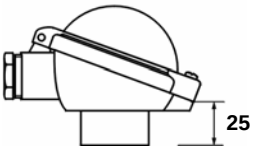
DIN B
Polished SST
Codes R, S



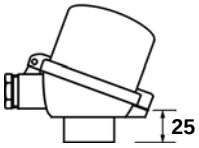
TZ-A/BL
Aluminum
Code L



GR-A/BL
Aluminum
Code J

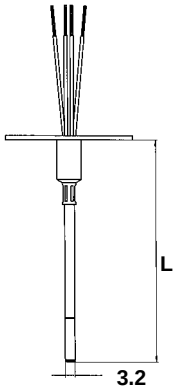


TZ-A/BK
Polyamide
Code T

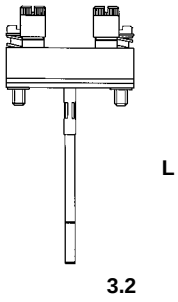


Sensor Lead Wire Terminations

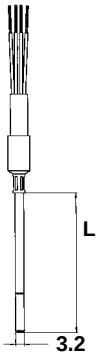
Flying Leads
Code 0



Terminal Block
Code 2

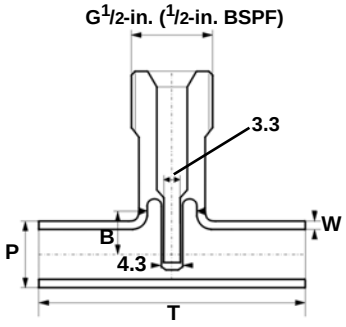


Cable Sensor
Codes 8 and 9

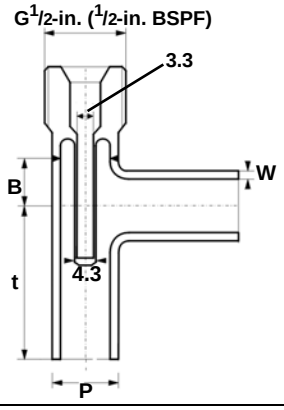


In-Line System

Straight



Elbow



A = Pocket Length
L = Sensor Length
B = Dimension "B"
P = Pipe Outer Diameter
T = Pipe Length
W = Wall Thickness
t = PIpe Length (1/2 T)

ORDERING INFORMATION

TABLE 7. 65B RTD Assembly (Pt 100) for BioPharm, Hygienic, and Food and Beverage Applications

★ 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**			
0065B	RTD Sensor for Biopharm, Hygenic and Food & Beverage Applications			
Code	**Connection Head Material**	**IP Rating(1)**	**Conduit / Cable Entry**	
Standard				**Standard**
C	Rosemount Aluminum	68	M20 x 1.5	★
D	Rosemount Aluminum	68	1/2-in. NPT	★
1	Rosemount, Aluminum with LCD Display Cover	68	M20 x 1.5	★
2	Rosemount, Aluminum with LCD Display Cover	68	1/2-in. NPT	★
5	Connection Head DIN A Polished Stainless Steel with LCD Display Cover	68	M20 x 1.5	★
6	Connection Head DIN A Polished Stainless Steel with LCD Display Cover	68	1/2-in. NPT	★
E	Connection Head DIN A Polished Stainless Steel	68	M20 x 1.5	★
F	Connection Head DIN A Polished Stainless Steel	68	1/2-in. NPT	★
R	Connection Head DIN B Polished Stainless Steel	66	M20 x 1.5	★
S	Connection Head DIN B Polished Stainless Steel	66	1/2-in. NPT	★
N	No Connection Head – use with Cable Sensor, Sensor Lead Wire Termination codes 8 and 9			★
Expanded				
J	GR-A/BL (BUZ), Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
L	TZ-A/BL (BUZH) Aluminum w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
T	TZ-A/BK, Polyamide w/ Cable Gland	65	M20 x 1.5 (with cable gland)	
Sensor Lead Wire Termination				
Standard				**Standard**
0	Flying leads – No Springs on DIN plate – use with Connection Heads only			★
2	Terminal Block, Form B – DIN 43762 – use with Connection Heads only			★
8	Cable Sensor with 3 m Extension Cable			★
9	Cable Sensor with 5 m Extension Cable			★
Sensor Type		**Temperature Range**		
Standard				**Standard**
1	RTD, Single Element, 4-wire	– 50 to 250 °C		★
Extension				
S	Extension, welded screw bush M24 x 1.5 – use with Connection Heads and Sensor Lead Wire Termination codes 0 and 2 only			
C	Extension, cable gland – use with Cable Sensors and Sensor Lead Wire Termination codes 8 and 9 only			
Extension Length (N) in Millimeters				
Standard				**Standard**
0030	30 mm			★
Thermowell Material				
Standard				**Standard**
N	No Thermowell			★
Immersion Length (L) in MIllimeters				
Standard				**Standard**
0016	16 mm			★
0025	25 mm			★
0030	30 mm			★
0033	33 mm			★
0037	37 mm			★
0040	40 mm			★

TABLE 7. 65B RTD Assembly (Pt 100) for BioPharm, Hygienic, and Food and Beverage Applications

★ 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.

Mounting Style		**Process Connection**	**Stem Style**	
Standard				**Standard**
H02	Hygienic In-Line System, electropolishing $R_a \leq 0.8$ µm	G1/2-in. (1/2-in. BSPF)	Straight	★
H04	Hygienic In-Line System, electropolishing $R_a \leq 0.8$ µm	G1/2-in. (1/2-in. BSPF)	Elbow	★
Nominal Size of Process Pipe		**Size**		
Standard				**Standard**
DN010	DN10, metric, DIN 11850 Row 2	13 x 1.5 – for use with elbow stem style only		★
DN015	DN15, metric, DIN 11850 Row 2	19 x 1.5		★
DN020	DN20, metric, DIN 11850 Row 2	23 x 1.5		★
DN025	DN25, metric, DIN 11850 Row 2	29 x 1.5 – for use with straight stem style only		★
DN032	DN32, metric, DIN 11850 Row 2	35 x 1.5 – for use with straight stem style only		★
DN040	DN40, metric, DIN 11850 Row 2	41 x 1.5 – for use with straight stem style only		★
DN050	DN50, metric, DIN 11850 Row 2	53 x 1.5 – for use with straight stem style only		★
DN065	DN65, metric, DIN 11850 Row 2	70 x 2.0 – for use with straight stem style only		★
DN080	DN80, metric, DIN 11850 Row 2	85 x 2.0 – for use with straight stem style only		★
IN050	DN 1/2-in., DIN 11866	12.7 x 1.65 – for use with elbow stem style only		★
IN075	DN 3/4-in., DIN 11866	19.05 x 1.65 – for use with elbow stem style only		★
IN100	DN 1-in., DIN 11866	25.4 x 1.65 – for use with straight stem style only		★
IN150	DN 1 1/2-in., DIN 11866	38.1 x 1.65 – for use with straight stem style only		★
IN200	DN 2-in., DIN 11866	50.8 x 1.65 – for use with straight stem style only		★
IN250	DN 2 1/2-in., DIN 11866	63.5 x 1.65 – for use with straight stem style only		★
IN300	DN 3-in., DIN 11866	76.2 x 1.65 – for use with straight stem style only		★
Seal Material				
Standard				**Standard**
N	Without Seal			★

Options (Include with selected model number)

Sensor Options			
Standard			**Standard**
A3	Single Element Class 1/3 DIN B sensor	0 to 100 °C (–32 to 212 °F)	★
Product Certifications			
Standard			**Standard**
I1	EEx ia - ATEX/IBExU Intrinsic Safety Approval		★
Ground Screw			
Standard			**Standard**
G1	External Ground Screw		★
Cable Gland Option			
Standard			**Standard**
G2	Cable Gland, EEx d, Brass 7.5 mm - 11.9 mm – only available with Connection Head Material codes C, E, R, 1, and 5)		★
G7	Cable Gland, M20 x 1.5, EEx e, Blue, Polyamide, Diameter 5 - 9 mm		★
Cover Chain Option			
Standard			**Standard**
G3	Cover Chain – only available with Connection Head Material codes C and D		★
Material Certification			
Standard			**Standard**
Q8	Thermowell Material Certification		★

Rosemount 65Q and 65B Sensors

TABLE 7. 65B RTD Assembly (Pt 100) for BioPharm, Hygienic, and Food and Beverage Applications

★ 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.

Assemble to Option		
Standard		**Standard**
XA[2]	Assemble Sensor to Specific Temperature Transmitter	★
Standard Calibration (with A, B, C, and Callendar-van Dusen constants)		
Standard		**Standard**
V11	Works Certificate for sensor calibration from 0 to 100 °C (32 to 212 °F)	★
Temperature Range		
Standard		**Standard**
X8	Works Certificate – Sensor Calibration Over Specified Temperature Range with A, B, C, and Callendar-van Dusen constants	★
Typical Model Number: 0065B E 0 1 S 0030 N 0025 H02 DN050 N Q8 XA		

(1) IP 68 rating requires a suitable cable gland on the conduit connection thread. All threads must be sealed.

(2) If ordering XA with a transmitter, specify the same option on the transmitter model number.

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