

Rosemount™ 248 Temperature Transmitter



- Basic temperature transmitter offers a reliable solution for temperature monitoring points.
- Standard transmitter design provides flexible and reliable performance in process environments.
- Experience lower over-all installation costs when compared to wiring sensor directly, reducing the need for expensive extension wires and multiplexers.
- Explore the benefits of a Complete Point Solution™ from Rosemount Temperature.

Rosemount 248 Temperature Transmitter

Basic temperature transmitter offers a cost effective solution for temperature monitoring points



- DIN B style head mount transmitter
- Variety of DIN B enclosure options
- Rail mount
- HART®/4–20 mA Protocol
- Single sensor capability with universal sensor inputs (RTD, T/C, mV, ohms)
- Transmitter-sensor matching with Callendar Van Dusen constants
- SIL2 Capable: IEC 61508 certified by an accredited 3rd party agency for use in safety instrumented systems up to SIL 2

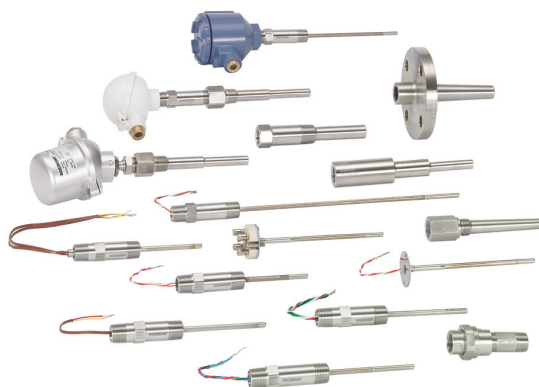
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Standard transmitter design provides flexible and reliable performance in process environments

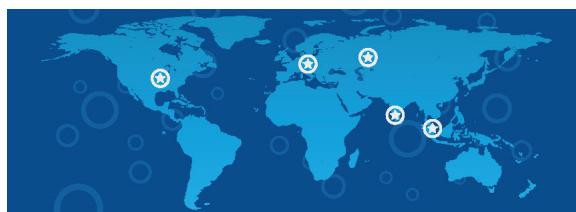
- Offers improved measurement accuracy and reliability over direct-wiring a sensor to the digital control system for a lower overall installation cost
- One-year stability rating reduces maintenance costs
- Open/short sensor diagnostics assist with detecting issues in the sensor loop
- Compensation for ambient temperatures enhances transmitter performance

Explore the benefits of a complete point solution from Rosemount Temperature Measurement



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

Experience global consistency and local support from numerous worldwide Rosemount Temperature manufacturing sites



- World-class manufacturing provides globally consistent product from every factory and the capacity to fulfill the needs of any project, large or small
- Experienced Instrumentation Consultants help select the right product for any temperature application and advise on best installation practices
- An extensive global network of Emerson service and support personnel can be on-site when and where they are needed

Rosemount 248 Temperature Transmitter Order Tables

Rosemount 248 Head Mount Temperature Transmitter



The Rosemount 248 has a standard transmitter design that provides flexible and reliable performance in process environments.

Transmitter features include:

- HART/4–20 mA Communication Protocol
- DIN B style head mount and rail mount transmitter types
- Variety of DIN B enclosure options
- Sanitary Connection Heads available (option code F and S)
- Three-Point Calibration Certificate (option code Q4)
- Assemble to Sensor options (option code XA)
- Transmitter-Sensor Matching (option code C2)
- SIS SIL 2 Safety Certification (option code QT)

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

Table 1: Rosemount 248 Head Mount Temperature Transmitter

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

Model	Product Description		
248	Temperature transmitter		
Transmitter Type			
H	DIN B Head Mount		★
Transmitter Output			
A	4–20 mA with digital signal based on HART Protocol		★
Product Certifications		Enclosure Option Codes Permitted	
E5	USA Explosion-Proof	A, G, H, J, K, U	★
I5	USA Intrinsic Safety and Class I, Division 2	A, B, G, H, J, K, N, U	★
K5	USA Intrinsic Safety, Explosion-Proof, and Class I, Division 2	A, G, H, J, K, U	★
I6	Canada Intrinsic Safety and Class I, Division 2	A, B, G, H, J, K, N, U	★

Table 1: Rosemount 248 Head Mount Temperature Transmitter (continued)

K6	Canada Intrinsic Safety, Explosion-Proof, and Class I, Division 2	A, G, H, J, K, U		★
E1	ATEX Flameproof	A, G, H, J, K, U		★
I1	ATEX Intrinsic Safety	All Options		★
ND	ATEX Dust	A, G, H, J, K, U		★
N1	ATEX Zone 2	A, G, H, J, K, U		★
NC ⁽¹⁾	ATEX Zone 2 without enclosure	N		★
E7	IECEx Flameproof and Dust	A, G, H, J, K, U		★
I7	IECEx Intrinsic Safety	All options		★
N7	IECEx Zone 2	A, G, H, J, K, U		★
NG	IECEx Zone 2 without enclosure	N		★
KM	Technical Regulations Customs Union (EAC) Flameproof, Intrinsic Safety	A, G, H, J, K, U		★
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety	All options		★
EM	Technical Regulations Customs Union (EAC) Flameproof	A, G, H, J, K, U		★
E3	China Flameproof	A, G, H, J, K, U		★
I3	China Intrinsic Safety	A, B, G, H, J, K, N, U		★
N3	China Type n	A, G, H, J, K, U		★
NA	No Approval	All options		★
Enclosure		Material	IP Rating	
A	Connection Head	Aluminum	IP66/68	★
B	BUZ Head	Aluminum	IP65	★
C	BUZ Head	Polypropylene	IP65	★
G	Connection Head	SST	IP66/IP68	★
J	Universal junction box, 3 entries	Aluminum	IP66/IP68	★
K	Universal Junction Box, 3 Entries	SST	IP66/IP68	★
H	Universal Head (Junction Box)	SST	IP66/IP68	★
U	Universal Head (Junction Box)	Aluminum	IP66/IP68	★
N	No Enclosure	N/A	N/A	★
F	Sanitary Connection Head, DIN A	Polished SST	IP66/IP68	
S	Sanitary Connection Head, DIN B	Polished SST	IP66/IP68	
Conduit Entry Size ⁽²⁾				
1 ⁽³⁾	M20 × 1.5 (CM20)			★
2	1/2-in. NPT			★
0	No Enclosure			★
Assemble To Options				
XA	Sensor Specified Separately and Assembled to Transmitter			★

Table 1: Rosemount 248 Head Mount Temperature Transmitter (continued)

NS	No Sensor	★
XC	Hand tight assembly of a transmitter and sensor	★

- (1) The Rosemount 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 × 1.5 thread adapter is used.

Table 2: Options (include with selected model number)

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

Mounting bracket		
B4	Universal Mounting Bracket for 2-in. pipe and panel mounting - SST bracket and bolts	★
B5	Universal "L" mounting bracket for 2-in. pipe mounting - SST bracket and bolts	★
Alarm Level Configuration		
A1	NAMUR alarm and saturation levels, high alarm	★
CN	NAMUR alarm and saturation levels, low alarm	★
5-point Calibration		
C4	5-Point Calibration (requires the Q4 option code to generate a Calibration Certificate)	★
Calibration Certificate		
Q4	Calibration Certificate (3-point calibration)	★
External Ground		
G1	External Ground Lug Assembly	★
Line filter		
F6	60 Hz Line Voltage Filter	★
Sensor trim		
C2 ⁽¹⁾	Transmitter sensor matching - trim to specific Rosemount RTD calibration schedule (CVD constants)	★
Quality Certification for safety		
QT	Safety Certified to IEC 61508 with certificate of FMEDA data	★
Conduit Electrical Connector		
GE ⁽²⁾	M12, 4 pin, Male Connector (eurofast®)	★
GM ⁽²⁾	A-size Mini, 4 pin, Male Connector (minifast®)	★
External Label		
EL	External Label for ATEX Intrinsic Safety	★
Cover Chain Option		
G3	Cover Chain	★
Software Configuration		
C1	Custom Configuration of Date, Descriptor and Message (requires CDS with order)	★
HART revision configuration⁽³⁾		
HR5	Configured for HART Revision 5	★

Table 2: Options (include with selected model number) (continued)

HR7 ⁽⁴⁾	Configured for HART Revision 7	★
Extended product warranty		
WR3	3-year warranty	★
WR5	5-year warranty	★
Cold temperature option		
BR5	–60 °F (–51 °C) cold temperature option	
BR6	–76 °F (–60 °C) cold temperature option	
Typical Model Number: 248H A I1 A1		

(1) Requires HR7 (HART Revision 7).

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

(3) HART Revision 5 is the default HART output.

(4) Configures the HART output to HART Revision 7. The device can be field configured to HART Revision 5 if needed.

Rosemount 248R Rail Mount Transmitter



The Rosemount 248 has a standard transmitter design that provides flexible and reliable performance in process environments.

Transmitter features include:

- HART/4–20 mA communication protocol
- Rail mount transmitter type
- 3-Point Calibration Certificate (Option Code Q4)
- Custom Configuration of Software Parameters (Option Code C1)

Table 3: Rosemount 248R Rail Mount Transmitter

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

Model	Product description	
248R	Rail Mount Temperature Transmitter	
Output Protocol		
A	4–20 mA with digital signal based on HART Protocol	★

Table 3: Rosemount 248R Rail Mount Transmitter (continued)

Product Certifications		
I5	USA Intrinsically Safe and Class I, Division 2	★
I6	Canada Intrinsically Safe and Class I, Division 2	★
I1	ATEX Intrinsic Safety	★
NC	ATEX Type n Component	★
I7 ⁽¹⁾	IECEx Intrinsic Safety	★
IM	GOST (Russia) Intrinsically Safe	★
I3	China Intrinsic Safety	★
NA	No Approvals	★

(1) Consult factory for availability.

Table 4: Options (include with selected model number)

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

Software Configuration		
C1	Custom Configuration of enters date, descriptor, and message (CDS required with order)	★
Alarm Level Configuration		
A1	NAMUR alarm and saturation levels, high alarm	★
CN	NAMUR alarm and saturation levels, low alarm	★
5-point Calibration		
C4	5-Point Calibration (requires the Q4 option code to generate a Calibration Certificate)	★
Calibration Certificate		
Q4	Calibration Certificate (3-point calibration)	★
Line Filter		
F5	50 Hz Line Voltage Filter	★
F6	60 Hz Line Voltage Filter	★
Mounting Style		
GR	G-Rail Mounting	★
Extended Product Warranty		
WR3	3-year warranty	★
WR5	5-year warranty	★
Typical Model Number: 248R A I1 Q4		

Transmitter Specifications

Functional specifications

Inputs

User-selectable; sensor terminals rates to 42.4 Vdc. See [Transmitter accuracy and ambient temperature effects](#) for sensor options.

Output

Two-wire 4–20 mA, linear with temperature or input; digital output signal superimposed on 4–20 mA signal, available for a Field Communicator or control system interface.

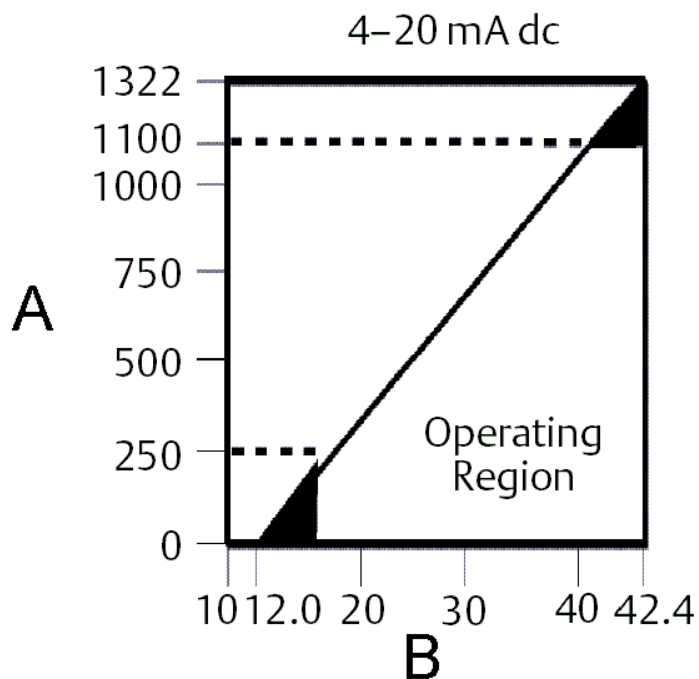
Isolation

Input/output isolation tested to 500 Vac rms (707 Vdc) 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 Vdc.

Figure 1: Maximum Load = 40.8 (Supply Voltage – 12.0)



A. Load (Ohms)

B. Supply Voltage (VDC)

Humidity limits

0–95 percent relative humidity, non-condensing

NAMUR recommendations

The Rosemount 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 53 – Revision controlled labeling for software and hardware changes
- NE 89 – Standard of temperature transmitters with digital signal processing
- NE 107 – Self-Monitoring and Diagnosis of Field Devices

Temperature limits

Operating limit

- –40 to 185 °F (–40 to 85 °C)
- –60 to 185 °F (–50 to 85 °C) available with BR5
- –76 to 185 °F (–60 to 85 °C) available with BR6

Storage limit

- –58 to 248 °F (–50 to 120 °C)

Turn-on time

Performance within specifications in less than five 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; five 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 Field Communicator.

Recommended minimum measuring span

See [Transmitter accuracy and ambient temperature effects](#)

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:

Table 5: 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 millimeters.

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

Physical specifications

Material selection

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

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

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

Field Communicator connections

Communication terminal: clips permanently fixed to the terminals

Materials of construction

Electronics housing

Polyphenylene ether and polystyrene blend. Glass reinforced.

Universal (option code G, H, J, and K) and Rosemount connection (option code A and G) heads

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

BUZ head (option code B)

- Housing: Aluminum
- Paint: Aluminum lacquer
- O-ring seal: Rubber

Mounting

The Rosemount 248R attaches directly to a wall or a DIN rail. The Rosemount 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 Rosemount 248H can also mount to a DIN rail using an optional mounting clip (see [Options](#)).

Weight

Code	Options	Weight
248H	Headmount transmitter	50 g (1.7 oz)
248R	Railmount transmitter	250 g (8.8 oz)
U	Universal head	567 g (20.0 oz)
J	Universal junction box, 3 entries aluminum	718 g (25.3 oz)
K	Universal junction box, 3 entries, SST	2073 g (73.1 oz)
B	BUZ head	277 g (9.8 oz)
C	Polypropylene head	90 g (3.2 oz.)
A	Rosemount connection head	526 g (18.5 oz)
S	Polished stainless steel (SST) head	740 g (26.1 oz)
G	Rosemount connection head (SST)	1613 g (56.9 oz)
H	Universal head (SST)	1673 g (59.0 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

Electromagnetic compatibility (EMC)

Meets all industrial environment requirements of EN61326 and NAMUR NE-21. Maximum deviation < 1% span during EMC disturbance.

Power supply effect

Less than ± 0.005 percent of span per volt

Vibration effect

Tested to the following with no effect on performance per IEC 60770-1, 2010:

Frequency	Vibration
10 to 60 Hz	0.35 mm displacement
60 to 2000 Hz	5 g peak acceleration

Table 6: Rosemount 248 Transmitter Accuracy Input Options, Accuracy, and Ambient Temperature Effects (continued)

Sensor Options	Sensor Reference	Input Ranges		Recommended Min. Span ⁽¹⁾		Digital Accuracy ⁽²⁾		D/A Accuracy ⁽³⁾
Cu 50 ($\alpha = 0.00426$)	GOST 6651-94	-50 to 200	-58 to 392	10	18	± 0.68	± 1.22	$\pm 0.10\%$ of span
Cu 50 ($\alpha = 0.00428$)	GOST 6651-94	-185 to 200	-301 to 392	10	18	± 0.68	± 1.22	$\pm 0.10\%$ of span
Cu 100 ($\alpha = 0.00426$)	GOST 6651-94	-50 to 200	-58 to 392	10	18	± 0.34	± 0.61	$\pm 0.10\%$ of span
Cu 100 ($\alpha = 0.00428$)	GOST 6651-94	-185 to 200	-301 to 392	10	18	± 0.34	± 0.61	$\pm 0.10\%$ of span
Thermocouples⁽⁵⁾								
Type B ⁽⁶⁾	NIST Monograph 175	100 to 1820	212 to 3308	25	45	± 1.50	± 2.70	$\pm 0.10\%$ of span
Type E	NIST Monograph 175	-200 to 1000	-328 to 1832	25	45	± 0.40	± 0.72	$\pm 0.10\%$ of span
Type J	NIST Monograph 175	-180 to 760	-292 to 1400	25	45	± 0.50	± 0.90	$\pm 0.10\%$ of span
Type K ⁽⁷⁾	NIST Monograph 175	-180 to 1372	-292 to 2501	25	45	± 0.50	± 0.90	$\pm 0.10\%$ of span
Type N	NIST Monograph 175	-200 to 1300	-328 to 2372	25	45	± 0.80	± 1.44	$\pm 0.10\%$ of span
Type R	NIST Monograph 175	0 to 1768	32 to 3214	25	45	± 1.20	± 2.16	$\pm 0.10\%$ of span
Type S	NIST Monograph 175	0 to 1768	32 to 3214	25	45	± 1.00	± 1.80	$\pm 0.10\%$ of span
Type T	NIST Monograph 175	-200 to 400	-328 to 752	25	45	± 0.50	± 0.90	$\pm 0.10\%$ of span
Type L	DIN 43710	-200 to 900	-328 to 1652	25	45	± 0.70	± 1.26	$\pm 0.10\%$ of span
Type U	DIN 43710	-200 to 600	-328 to 1112	25	45	± 0.70	± 1.26	$\pm 0.10\%$ of span
Type C	W5Re/W26Re ASTM E988-96	0 to 2000	32 to 3632	25	45	± 1.40	± 2.52	$\pm 0.10\%$ of span
Type L	GOST R 8.585-2001	-200 to 800	-328 to 1472	25	45	± 0.50	± 0.90	$\pm 0.10\%$ of span
Other input types								
Millivolt Input		-10 to 100 mV		3mV		± 0.03 mV		$\pm 0.10\%$ of span
2-, 3-, 4-wire Ohm Input		0 to 2000 ohms		20 ohms		± 0.70 ohm		$\pm 0.10\%$ 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 Communications or Rosemount control system.

(3) Total analog accuracy is the sum of digital and D/A accuracies.

- (4) Pt 200 ($\alpha = 0.003916$) is supported only in HART 7 mode and cannot be configured or used in HART 5 mode.
 (5) Total digital accuracy for thermocouple measurement: sum of digital accuracy $+0.5^{\circ}\text{C}$. (cold junction accuracy).
 (6) Digital accuracy for NIST Type B T/C is $\pm 3.0^{\circ}\text{C}$ ($\pm 5.4^{\circ}\text{F}$) from 100 to 300 $^{\circ}\text{C}$ (212 to 572 $^{\circ}\text{F}$).
 (7) Digital accuracy for NIST Type K T/C is $\pm 0.70^{\circ}\text{C}$ ($\pm 1.26^{\circ}\text{F}$) from -180 to -90°C (-292 to -130°F).

Accuracy example (HART devices)

When using a Pt 100 ($\alpha = 0.00385$) sensor input with a 0 to 100 $^{\circ}\text{C}$ span:

- Digital accuracy = $\pm 0.20^{\circ}\text{C}$
- D/A accuracy = $\pm 0.10\%$ of 100 $^{\circ}\text{C}$ or $\pm 0.10^{\circ}\text{C}$
- Total accuracy = $\pm 0.30^{\circ}\text{C}$

Table 7: Ambient Temperature Effect

Sensor Options	Sensor Reference	Input Ranges		Temperature effects per 1.0 $^{\circ}\text{C}$ (1.8 $^{\circ}\text{F}$) change in ambient temperature ^{(1) (2) (3)}		D/A Accuracy
2-, 3-, 4-wire RTDs		$^{\circ}\text{C}$	$^{\circ}\text{F}$	$^{\circ}\text{C}$	$^{\circ}\text{F}$	
Pt 100 ($\alpha = 0.00385$)	IEC 751	-200 to 850	-328 to 1562	0.006	0.011	0.004% of span
Pt 200 ($\alpha = 0.00385$)	IEC 751	-200 to 850	-328 to 1562	0.018	0.032	0.004% of span
Pt 500 ($\alpha = 0.00385$)	IEC 751	-200 to 850	-328 to 1562	0.018	0.032	0.004% of span
Pt 1000 ($\alpha = 0.00385$)	IEC 751	-200 to 300	-328 to 572	0.010	0.018	0.004% of span
Pt 100 ($\alpha = 0.003916$)	JIS 1604	-200 to 645	-328 to 1193	0.006	0.011	0.004% of span
Pt 200 ($\alpha = 0.003916$)	JIS 1604	-200 to 645	-328 to 1193	0.018	0.032	0.004% of span
Ni 120	Edison Curve No. 7	-70 to 300	-94 to 572	0.004	0.007	0.004% of span
Cu 10	Edison Copper Winding No. 15	-50 to 250	-58 to 482	0.060	0.108	0.004% of span
Pt 50 ($\alpha = 0.00391$)	GOST 6651-94	-200 to 550	-328 to 1022	0.012	0.022	0.004% of span
Pt 100 ($\alpha = 0.00391$)	GOST 6651-94	-200 to 550	-328 to 1022	0.006	0.011	0.004% of span
Cu 50 ($\alpha = 0.00426$)	GOST 6651-94	-50 to 200	-58 to 392	0.012	0.022	0.004% of span
Cu 50 ($\alpha = 0.00428$)	GOST 6651-94	-185 to 200	-301 to 392	0.012	0.022	0.004% of span
Cu 100 ($\alpha = 0.00426$)	GOST 6651-94	-50 to 200	-58 to 392	0.006	0.011	0.004% of span
Cu 100 ($\alpha = 0.00428$)	GOST 6651-94	-185 to 200	-301 to 392	0.006	0.011	0.004% of span
Thermocouples						
Type B	NIST Monograph 175	100 to 1820	212 to 3308	0.056	0.101	0.004% of span

Table 7: Ambient Temperature Effect (continued)

Sensor Options	Sensor Reference	Input Ranges		Temperature effects per 1.0 °C (1.8 °F) change in ambient temperature ^{(1) (2) (3)}		D/A Accuracy
Type E	NIST Monograph 175	–200 to 1000	–328 to 1832	0.016	0.029	0.004% of span
Type J	NIST Monograph 175	–180 to 760	–292 to 1400	0.016	0.029	0.004% of span
Type K	NIST Monograph 175	–180 to 1372	–292 to 2501	0.020	0.036	0.004% of span
Type N	NIST Monograph 175	–200 to 1300	–328 to 2372	0.020	0.036	0.004% of span
Type R	NIST Monograph 175	0 to 1768	32 to 3214	0.060	0.108	0.004% of span
Type S	NIST Monograph 175	0 to 1768	32 to 3214	0.060	0.108	0.004% of span
Type T	NIST Monograph 175	–200 to 400	–328 to 752	0.020	0.036	0.004% of span
Type L	DIN 43710	–200 to 900	–328 to 1652	0.022	0.040	0.004% of span
Type U	DIN 43710	–200 to 600	–328 to 1112	0.026	0.047	0.004% of span
Type C	W5Re/W26Re ASTM E988-96	0 to 2000	32 to 3632	0.064	0.115	0.004% of span
Type L	GOST R 8.585-2001	–200 to 800	–328 to 1472	0.026	0.047	0.004% of span
Other input types						
Millivolt Input		–10 to 100 mV		0.001mV		0.004% of span
2-, 3-, 4-wire Ohm Input		0 to 2000 ohms		0.028 ohms		0.004% of span

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

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

(3) Temperature effects (change / °C) are not intended to limit the change in errors in any one degree, but rather to serve in defining a "butterfly" error band over the full ambient temperature range and includes the errors defined by "Accuracy" at the narrowest point (room temp).

Temperature effects example (HART devices)

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

- Digital temperature effects: $0.006\text{ °C} \times (30 - 20) = 0.06\text{ °C}$
- D/A effects: $[0.004\% \text{ of } 100] \times (30 - 20) = 0.04\text{ °C}$
- Worst case error: Digital + D/A + Digital temperature effects + D/A effects = $0.20\text{ °C} + 0.10\text{ °C} + 0.06\text{ °C} + 0.04\text{ °C} = 0.40\text{ °C}$
- Total Probable Transmitter Error: $\sqrt{0.15^2 + 0.10^2 + 0.06^2 + 0.04^2} = 0.194\text{ °C}$

Note

For additional information regarding TPE , refer to TPE white paper.

Product Certifications

Rev 0.1

European Directive Information

A copy of the EU Declaration of Conformity can be found at the end of the Quick Start Guide. The most recent revision of the EU Declaration of Conformity can be found at Emerson.com/Rosemount.

Ordinary Location Certification

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

North America

The US National Electrical Code® (NEC) and the Canadian Electrical Code (CEC) permit the use of Division marked equipment in Zones and Zone marked equipment in Divisions. The markings must be suitable for the area classification, gas, and temperature class. This information is clearly defined in the respective codes.

USA

E5 USA Explosionproof and Dust-Ignitionproof

Certificate: 1091070

Standards: FM Class 3600-2011, FM Class 3611-2004, FM Class 3615-2006, FM 3616-2011, UL Std. No. 60079-0: Ed.6, UL Std. No. 50E

Markings: CL I/II/III, DIV 1, GP B, C, D, E, F, G; when installed per Rosemount drawing 00644-1059; Type 4X; IP66/68

I5 USA Intrinsic Safety and Nonincendive

Certificate: 1091070

Standards: FM Class 3600-2011, FM Class 3610-2010, FM Class 3611-2004, UL Std. No. 60079-0: Ed.6, UL Std. No. 60079-11: Ed.6, UL Std. No. 50E

Markings: CL I/II/III, DIV 1, GP A, B, C, D, E, F, G; NI CL1, DIV 2, GP A, B, C, D when installed per Rosemount drawing 00248-1056; Type 4X; IP66/68

Canada

I6 Canada Intrinsically Safe

Certificate: 1091070

Standards: CAN/CSA C22.2 No. 0-10, CSA Std. C22.2 No. 25-1966, CAN/CSA C22.2 No. 94-M91, CAN/CSA C22.2 No. 157-92, CSA C22.2 No. 213-M1987, CAN/CSA C22.2 No. 60079-11:14, C22.2 No 60529-05

Markings: IS CL I, DIV 1 GP A, B, C, D when installed per Rosemount drawing 00248-1056; CL I DIV 2 GP A, B, C, D; Type 4X, IP66/68

K6 Canada Intrinsically Safe, Explosionproof, and Division 2

Certificate: 1091070

Standards: CAN/CSA C22.2 No. 0-10, CSA Std. C22.2 No. 25-1966, CSA Std. C22.2 No. 30-M1986, CAN/CSA C22.2 No. 94-M91, CSA Std. C22.2 No. 142-M1987, CAN/CSA C22.2 No. 157-92, CSA C22.2 No. 213-M1987, CAN/CSA C22.2 No. 60079-11:14, C22.2 No 60529-05

Markings: XP CL I/II/III, DIV 1, GP B, C, D, E, F, G when installed per Rosemount drawing 00644-1059; IS CL I, DIV 1 GP A, B, C, D when installed per Rosemount drawing 00248-1056; CL I DIV 2 GP A, B, C, D; Type 4X, IP66/68; Conduit Seal not required

Europe

E1 ATEX Flameproof

Certificate: FM12ATEX0065X

Standards: EN 60079-0: 2012+A11:2013, EN 60079-1: 2014, EN 60529:1991+A1:2000 + A2:2013

Markings: ⚡ II 2 G Ex db IIC T6...T1 Gb, T6(-50 °C ≤ T_a ≤ +40 °C), T5...T1(-50 °C ≤ T_a ≤ +60 °C); See [Table 9](#) at the end of the Product Certifications section for Process Temperatures

Specific Conditions of Use (X):

1. See certificate for ambient temperature range.
2. The non-metallic label may store an electrostatic charge and become a source of ignition in Group III environments.
3. Guard the LCD display cover against impact energies greater than 4 joules.
4. Flameproof joints are not intended for repair.
5. A suitable certified Ex d or Ex tb enclosure is required to be connected to temperature probes with Enclosure option "N".
6. Care shall be taken by the end user to ensure that the external surface temperature on the equipment and the neck of DIN Style Sensor probe does not exceed 130 °C.
7. Non-Standard Paint options may cause risk from electrostatic discharge. Avoid installations that cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.

I1 ATEX Intrinsic Safety

Certificate: Baseefa18ATEX0090X

Standards: EN IEC 60079-0: 2018, EN 60079-11: 2012

Markings: ⚡ II 1 G Ex ia IIC T5/T6 Ga, T5(-60 °C ≤ T_a ≤ +80 °C), T6(-60 °C ≤ T_a ≤ +60 °C)

See [Table 10](#) at the end of the Product Certifications section for entity parameters.

Special Condition for Safe Use (X):

1. The equipment, if supplied without an enclosure, 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 GΩ; light alloy or zirconium enclosures must be protected from impact and friction if located in a Zone 0 environment.

N1 ATEX Zone 2 with enclosure

Certificate: Baseefa18ATEX0091X

Standards: EN IEC 60079-0:2018, EN 60079-15:2010

Markings: ⒺII 3 G Ex nA IIC T5/T6 Gc, T5(-60 °C ≤ T_a ≤ +80 °C), T6(-60 °C ≤ T_a ≤ +60 °C)

NC ATEX Zone 2 without enclosure

Certificate: Baseefa18ATEX0091X

Standards: EN IEC 60079-0:2018, EN 60079-15:2010

Markings: ⒺII 3 G Ex nA IIC T5/T6 Gc, T5(-60 °C ≤ T_a ≤ +80 °C), T6(-60 °C ≤ T_a ≤ +60 °C)

Special Condition for Safe Use (X):

1. The equipment, if supplied without an enclosure, must be installed in a suitably certified enclosure such that it is afforded a degree of protection of at least IP54 in accordance with IEC 60529 and EN 60079-15 and be located in an area of pollution degree 2 or better as defined in IEC 60664-1.

ND ATEX Dust-Ignitionproof

Certificate: FM12ATEX0065X

Standards: EN 60079-0: 2012+A11:2013, EN 60079-31:2014, EN 60529:1991+A1:2000+A2:2013

Markings: Ⓔ II 2 D Ex tb IIIC T130 °C Db, (-40 °C ≤ T_a ≤ +70 °C); IP66

See [Table 9](#) at the end of the Product Certifications section for process temperatures.

Specific Conditions of Use (X):

1. See certificate for ambient temperature range.
2. The non-metallic label may store an electrostatic charge and become a source of ignition in Group III environments.
3. Guard the LCD display cover against impact energies greater than 4 joules.
4. Flameproof joints are not intended for repair.
5. A suitable certified Ex d or Ex tb enclosure is required to be connected to temperature probes with Enclosure option “N”.
6. Care shall be taken by the end user to ensure that the external surface temperature on the equipment and the neck of DIN Style Sensor probe does not exceed 130 °C.
7. Non-Standard Paint options may cause risk from electrostatic discharge. Avoid installations that cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.

International**E7 IECEx Flameproof**

Certificate: IECEx FMG 12.0022X

Standards: IEC 60079-0:2011, IEC 60079-1:2014-06, 60079-31:2013

Markings: Ex db IIC T6...T1 Gb, T6($-50^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$), T5...T1($-50^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$); Ex tb IIIC T130 $^{\circ}\text{C}$ Db $T_a = -40^{\circ}\text{C}$ to $+70^{\circ}\text{C}$; IP66

See [Table 9](#) at the end of the Product Certifications section for process temperatures.

Specific Conditions of Use (X):

1. See certificate for ambient temperature range.
2. The non-metallic label may store an electrostatic charge and become a source of ignition in Group III environments.
3. Guard the LCD display cover against impact energies greater than 4 joules.
4. Flameproof joints are not intended for repair.
5. A suitable certified Ex d or Ex tb enclosure is required to be connected to temperature probes with Enclosure option "N".
6. Care shall be taken by the end user to ensure that the external surface temperature on the equipment and the neck of DIN Style Sensor probe does not exceed 130°C .
7. Non-Standard Paint options may cause risk from electrostatic discharge. Avoid installations that cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.

I7 IECEx Intrinsic Safety

Certificate: IECEx BAS 18.0062X

Standards: IEC 60079-0:2017, IEC 60079-11:2011

Markings: Ex ia IIC T5/T6 Ga, T5($-60^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$), T6($-60^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$)

See [Table 10](#) at the end of the Product Certifications section for entity parameters.

Special Condition for Safe Use (X):

1. The equipment, if supplied with an enclosure, 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 $1\text{ G}\Omega$; light alloy or zirconium enclosures must be protected from impact and friction if located in a Zone 0 environment.

N7 IECEx Zone 2 with enclosure

Certificate: IECEx BAS 18.0063X

Standards: IEC 60079-0:2017, IEC 60079-15:2010

Markings: Ex nA IIC T5/T6 Gc; T5($-60^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$), T6($-60^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$)

NG IECEx Zone 2 without enclosure

Certificate: IECEx BAS 18.0063X

Standards: IEC 60079-0:2017, IEC 60079-15:2010

Markings: Ex nA IIC T5/T6 Gc; T5($-60^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$), T6($-60^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$)

Special Condition for Safe Use (X):

1. The equipment, if supplied without an enclosure, must be installed in a suitably certified enclosure such that it is afforded a degree of protection of at least IP54 in accordance with IEC 60529 and IEC 60079-15 and be located in an area of pollution degree 2 or better as defined in IEC 60664-1.

Brazil

E2 Brazil Flameproof and Dust-Ignitionproof

Certificate: UL-BR 13.0535X

Standards: ABNT NBR IEC 60079-0:2013, ABNT NBR IEC 60079-1:2016, ABNT NBR IEC 60079-31:2014

Markings: Ex db IIC T6...T1 Gb, T6($-50^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$), T5...T1($-50^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$); Ex tb IIIC T130 $^{\circ}\text{C}$ Db $T_a = -40^{\circ}\text{C}$ to $+70^{\circ}\text{C}$; IP66

Specific Conditions of Use (X):

1. See product description for ambient temperature limits and process temperature limits.
2. The non-metallic label may store an electrostatic charge and become a source of ignition in Group III environments.
3. Guard the LCD cover against impact energies greater than 4 joules.
4. Consult the manufacturer if dimensional information on the flameproof joints is necessary.
5. A suitable certified Ex “d” or Ex “tb” enclosure is required to be connected to temperature sensors with Enclosure option “N”.
6. Care shall be taken by the end user to ensure that the external surface temperature on the equipment and the neck of the DIN Style Sensor does not exceed 130°C .
7. For all equipment, non-standard paint options may cause risk from electrostatic discharge. Avoid installation that cause electrostatic build-up on painted surfaces, and only clean the painted surfaces with a damp cloth. If paint is ordered through a special option code, contact the manufacturer for more information.

I2 Brazil Intrinsic Safety

Certificate: UL-BR 19.0202X

Standards: ABNT NBR IEC 60079-0:2013, ABNT NBR IEC 60079-11:2013

Markings: Ex ia IIC T5 Ga($-60^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$), Ex ia IIC T6 Ga($-60^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$)

See [Table 9](#) and [Table 10](#).

Specific Conditions of Use (X):

1. The equipment, if supplied without an enclosure, 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 $1\text{G}\Omega$; light alloy or zirconium enclosures must be protected from impact and friction when installed if located in a Zone 0 environment (areas that required EPL Ga).

N2 Brazil Zone 2

Certificate: UL-BR 19.0203X

Standards: ABNT NBR IEC 60079-0:2013, ABNT NBR IEC 60079-15:2012

Markings: Ex na IIC T5 Gc($-60^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$), Ex na IIC T6 Gc($-60^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$)

Specific Conditions of Use (X):

1. The equipment, if supplied without an enclosure, must be installed in a suitably certified enclosure such that it is afforded a degree of protection of at least IP54 in accordance with ABNT NBR IEC 60529 and ABNT NBR IEC 60079-15 and be located in an area of pollution degree 2 or better as defined in IEC 60664-1.

China

E3 NEPSI Flameproof

Certificate: GYJ16.1335X
Standards: GB3836.1-2010, GB3836.2-2010
Markings: Ex d IIC T6~ T1 Gb: T6...T1 ($-50^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$) T5...T1 ($-50^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$)

产品安全使用特殊条件

证书编号后缀“X”表明产品具有安全使用特殊条件：涉及隔爆接合面的维修须联系产品制造商。

产品使用注意事项

1. 产品使用环境温度与温度组别的关系为：

表 8:

温度组别	环境温度
T6 ~ T1	$-50^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$
T5 ~ T1	$-50^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$

2. 产品外壳设有接地端子，用户在使用时应可靠接地。
3. 安装现场应不存在对产品外壳有腐蚀作用的有害气体。
4. 现场安装时，电缆引入口须选用国家指定的防爆检验机构按检验认可、具有 Ex d IIC 防爆等级的电缆引入装置或堵封件，冗余电缆引入口须用堵封件有效密封。
5. 现场安装、使用和维护必须严格遵守“断电后开盖！”的警告语。用户不得自行更换该产品的零部件，应会同产品制造商共同解决运行中出现的故障，以杜绝损坏现象的发生。产品的安装、使用和维护应同时遵守产品使用说明书、GB3836.13-2013“爆炸性环境 第 13 部分：设备的修理、检修、修复和改造”、GB3836.15-2000“爆炸性气体环境用电气设备 第 15 部分：危险场所电气安装（煤矿除外）”、GB3836.16-2006“爆炸性气体环境用电气设备 第 16 部分：电气装置的检查和维护（煤矿除外）”和 GB50257-2014“电气装置安装工程爆炸和火灾危险环境电力装置施工及验收规范”的有关规定。

EAC

EM Technical Regulation Customs Union (EAC) Flameproof

Markings: 1Ex d IIC T6...T1 Gb X, T6 ($-50^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$), T5...T1 ($-50^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$); IP66/IP67

Special Condition for Safe Use (X):

1. See certificate for special conditions.

Korea

EP Korea Explosionproof/Flameproof

Certificate: 13-KB4BO-0208X
Markings: Ex d IIC T6; T6 ($-40^{\circ}\text{C} \leq T_{amb} \leq +65^{\circ}\text{C}$)

Special Condition for Safe Use (X):

1. See certificate for special conditions.

Combinations**K5 Combination of E5 and I5****Table 9: Process Temperatures**

Temperature class	Ambient temperature	Process temperature without LCD display cover (°C)			
		No ext.	3-in.	6-in.	9-in.
T6	–50 °C to +40 °C	55	55	60	65
T5	–50 °C to +60 °C	70	70	70	75
T4	–50 °C to +60 °C	100	110	120	130
T3	–50 °C to +60 °C	170	190	200	200
T2	–50 °C to +60 °C	280	300	300	300
T1	–50 °C to +60 °C	440	450	450	450
T130 °C	–40 °C to +70 °C	100	110	110	120

Table 10: Entity Parameters

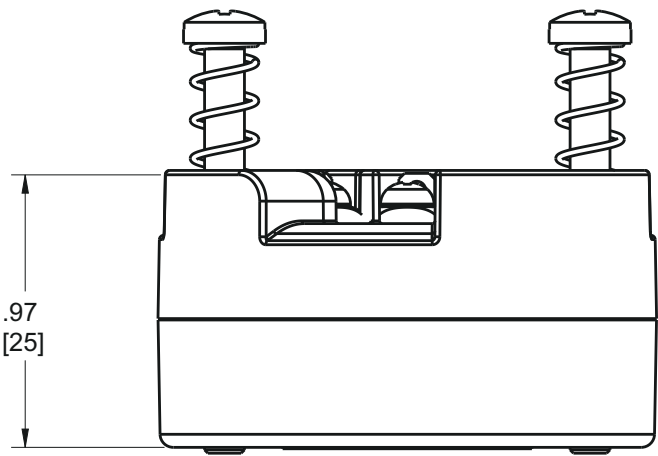
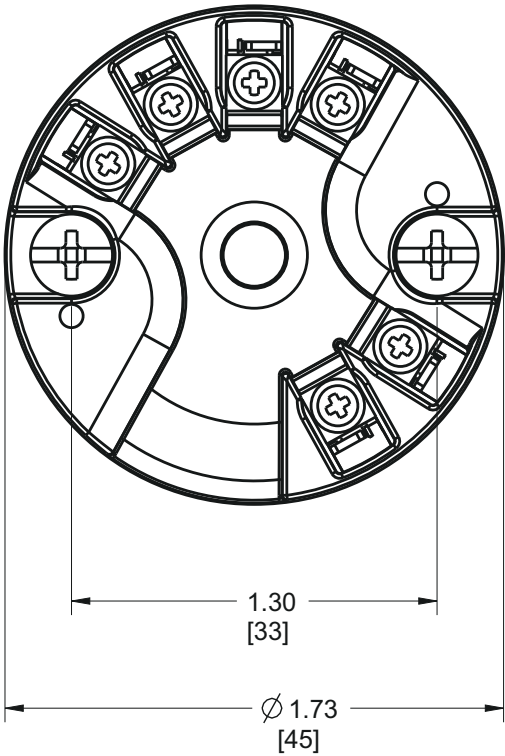
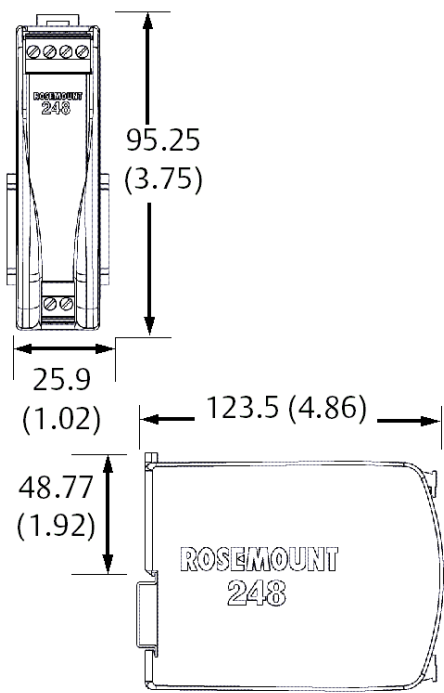
Parameters	HART loop terminals + and –	Sensor terminals 1 to 4
Voltage U_i	30 V	30 V
Current I_i	266 mA	26 mA
Power P_i	1 W	191 mW
Capacitance C_i	0 nF	1.54 nF
Inductance L_i	0 mH	0 μ H

Dimensional Drawings

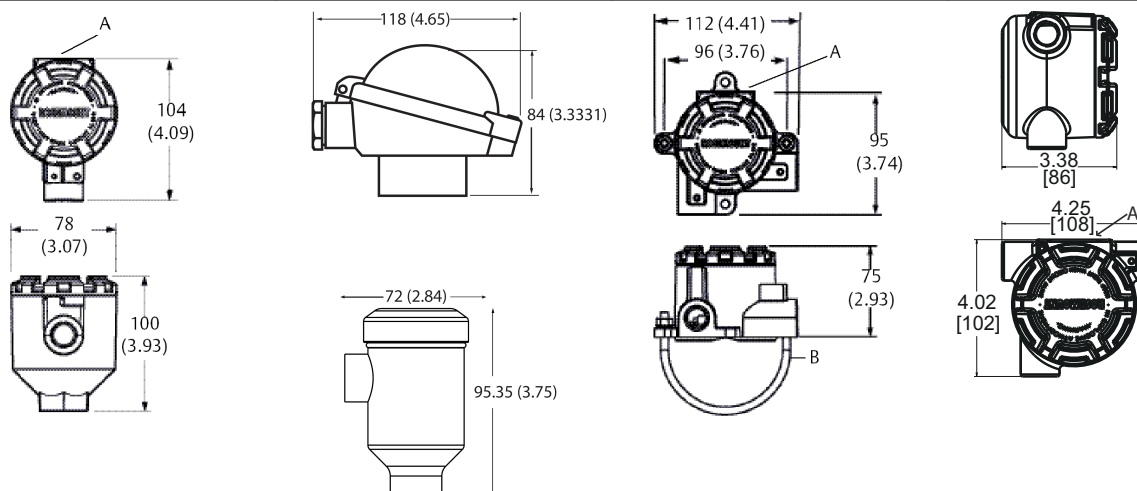
Figure 3: Transmitters

Rosemount 248R Railmount

Rosemount 248H Headmount (enlarged)



Dimensions are in millimeters (inches).

Figure 4: EnclosuresConnection 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)J universal connection head, 3-
conduit

A. Approval label

B. SST "U" bolt mounting, 2-in. pipe

Dimensions are in millimeters (inches).

- (1) If ordering the transmitter with a DIN style sensor, it is recommended the enclosure be ordered within the sensor model (see [Rosemount DIN-Style Product Data Sheet](#)) 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.

Configuration Interface Specifications

Configuration software

Note

The Rosemount configuration software is compatible with Windows™ XP, Windows 7 32-bit and Windows 7 64-bit. It is not compatible with Windows NT and Windows 2000. The PC-based configuration software is only available for HART Revision 5 output.

The Rosemount 248 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 Rosemount 248 Transmitters including the following parameters:

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

- Alarming Parameters

Configuration hardware (HART 5 only)

The Rosemount 248 Configuration Interface has three hardware options as follows:

Software only

Part number: 00248-1603-0002

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

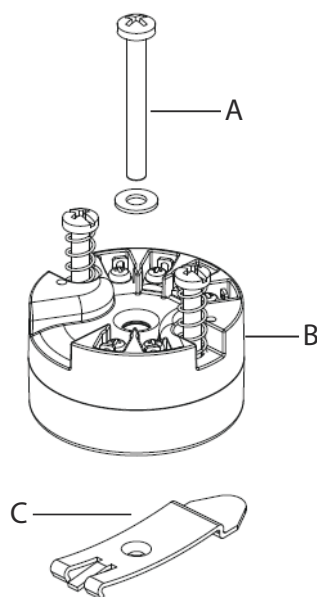
Serial HART modem and software

- Part number: 00248-1603-0004
- Serial HART modem
- Customer must provide separate loop power supply and resistor.
- Requires PC serial port
- Suitable for use with powered loops

USB HART modem and software

- Part number: 00248-1603-0003
- 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

Transmitter Accessories



- A. Mounting hardware
- B. Transmitter
- C. Rail clip

Table 11: 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
Universal Head, Aluminum, Standard cover, 3-Conduit - M20 Entries	00644-4439-0001
Universal Head, Aluminum, Standard cover, 3-Conduit - 1/2 - 14 NPT Entries	00644-4439-0002
External Ground Screw Assembly Kit	00644-4431-0001
Kit, Hardware for Mounting a Rosemount 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
Rosemount 248 Programming Software (CD)	00248-1603-0002
Rosemount 248 Programming Kit - Serial connection	00248-1603-0004
Rosemount 248 Programming Kit - USB connection	00248-1603-0003

Hardware tag

- 20 characters maximum
- Transmitter enclosure, sensor, and thermowell if applicable will be tagged in accordance with customer requirements

Software tag

- The transmitter can store up to eight characters. If no characters are specified, the first eight characters of the hardware tag are the default.
- Long software tag available with HR7 (HART 7) up to 32 characters.

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 ($\alpha=0.00385$, 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 NAMUR recommendations .
CN: NAMUR-Compliant, Low Alarm	See NAMUR recommendations .
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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