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English
Rev. AB

ROSEMOUNT SPECIFICATIONS

Models 244EH and 244ER PC Programmable Temperature Transmitters

1. EQUIPMENT DESCRIPTION

- Two-wire, microprocessor-based, pc programmable, head or rail mount temperature transmitter that accepts platinum and nickel RTD, ohms, millivolt, and thermocouple inputs.

2. GENERAL SPECIFICATIONS

- Material supplied under this specification shall be in conformance with:
  - Hazardous locations certifications:
    FM and CSA explosionproof(1) and intrinsic safety
    CENELEC flameproof(1) and intrinsic safety
    BASEEFA type N(1)
    SAA flameproof,(1) intrinsic safety, and type n.(1)
  - Other certifications:
    GOSTANDART Russian Metrological Institute approval
  - 3 sigma (σ) conformance to specifications.
  - Connection head and junction box enclosure ratings:
    NEMA 4X, CSA Enclosure Type 4X, IP 66, or IP 68.
- Electronics shall be completely encapsulated with epoxy to make the transmitter extremely sturdy and to ensure long-term stability and accuracy.
- Transmitter shall be provided with a portable, self-contained communications interface for use between the transmitter and a PC. The interface shall be approved for FM and CSA ordinary locations.
- Manufacturer must be certified as meeting the requirements of ISO 9001.

3. ENVIRONMENTAL CONDITIONS

- The instrument selected shall be suitable for the following conditions:
  - Humidity: 0–99% relative humidity, non-condensing.
  - Ambient temperature limits: –40 to 85 °C (–40 to 185 °F).
  - Storage temperature limits: –50 to 120 °C (–58 to 248 °F).

4. SENSOR INPUTS

- Inputs shall include choice of the following:
  - 2-, 3-, or 4-wire RTDs:
    Pt 100 α=0.00385
    Pt 200 α=0.00385
    Pt 500 α=0.00385
    Pt 100 α=0.003916
    Ni 120
    Cu 10
    Pt 1000 α=0.00385
  - Ohms:
    0 to 2000 ohms.
  - Millivolts:
    –10 to 80 millivolts.
  - Thermocouples:
    IEC/NIST/DIN Types B, E, J, K, N, R, S, T
    DIN types L, U.
    W5Re26

5. INPUT ISOLATION

- Transmitter shall be galvanically isolated from the output and ground, up to 500 V RMS (707 V dc), thus it is capable of accepting grounded or ungrounded sensors.

6. ELECTRICAL

- Transmitter shall be provided with an independent and parallel circuit designed to provide separate backup alarm output in case of electronic or software failure.
- Transmitter shall be provided with a 50/60 Hz line frequency noise filtering feature.

7. POWER SUPPLY

- Transmitter shall operate between 12.0 to 42.4 V dc transmitter terminal voltage with load.

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(1) Only Available when used with a suitable Rosemount connection head or junction box.

8. OUTPUTS

- Outputs shall be a two-wire, 4–20 mA analog signal, linear with temperature for RTDs and thermocouples, and linear with input for millivolts and ohms.
- Analog output shall be linearized with temperature (°C, °F, °R, or K) and linear with input (ohm or mV).

9. CONFIGURATION SOFTWARE

- The configuration capabilities of the software shall allow the user the ability to input and store information including:
  - sensor type
  - number of wires
  - electronic filter setting
  - engineering units
  - upper and lower range values
  - damping value
  - transmitter electronic tag
- Configuration software shall allow the user the ability to view the process variable.
- Configuration software shall be available in English, French, German, Italian, Spanish, Chinese, Japanese, and Korean language versions.
- A label printing spreadsheet shall be included in the software along with one sheet of labels.

10. PERFORMANCE

- The transmitter shall meet the following performance criteria as a minimum:
  - Stability: ±0.1% of span or 0.1 °C, whichever is greater for 12 months for RTDs and thermocouples.
  - Vibration effect without output error:

Head Mount

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

Rail Mount

Frequency	Acceleration
10–60 Hz	0.07 mm peak displacement
60–150 Hz	1 g peak acceleration

  - RFI effect:

Head Mount

Worst case RFI effect is equivalent to the transmitter's nominal accuracy specification per the accuracy table below when tested in accordance with ENV 50140, 10 V/m, 80 to 1000 MHz, with unshielded cable.

Rail Mount

Worst case RFI effect is equivalent to 1.5 times the transmitter's nominal accuracy specification per the accuracy table below when tested in accordance with ENV 50140, 10 V/m, 80 to 1000 MHz, with unshielded cable.

  - Accuracy:

Sensor Options	Input Ranges		Recommended Min. Span[1]		Accuracy
2-, 3-, 4-Wire RTDs	**°C**	**°F**	**°C**	**°F**	
Pt 100 (α = 0.00385)[2]	–200 to 850	–328 to 1562	10	18	0.05% of span + 0.15 °C or 0.2 °C whichever is greater
Pt 100 (α = 0.003916)[3]	–200 to 645	–328 to 1193	10	18	0.05% of span + 0.15 °C or 0.2 °C whichever is greater
Pt 200[2]	–200 to 850	–328 to 1562	10	18	0.1% of span or 0.4 °C whichever is greater
Pt 500[2]	–200 to 850	–328 to 1562	10	18	0.1% of span or 0.3° C whichever is greater
Ni 120[4]	–70 to 300	–94 to 572	10	18	0.1% of span or 0.2° C whichever is greater
Pt 1000 (α=0.00385)[2]	–200 to 300	–328 to 572	10	18	0.1% of span or 0.3° C whichever is greater
Cu 10[5]	–50 to 250	–58 to 482	10	18	0.5% of span or 1.5° C whichever is greater
Thermocouples	**°C**	**°F**	**°C**	**°F**	
Type B[6][7][8]	100 to 1820	212 to 3308	25	45	0.2% of span or 1.0 °C whichever is greater
Type E[6][8]	–50 to 1000	–58 to 1832	25	45	0.1% of span or 0.5 °C whichever is greater
Type J[6][8]	–180 to 760	–292 to 1400	25	45	0.1% of span or 0.5 °C whichever is greater
Type K[6][8]	–180 to 1372	–292 to 2502	25	45	0.1% of span or 1.0 °C whichever is greater
Type N[6][8]	0 to 1300	32 to 2372	25	45	0.1% of span or 1.0 °C whichever is greater
Type R[6][8]	0 to 1768	32 to 3214	25	45	0.2% of span or 1.0 °C whichever is greater
Type S[6][8]	0 to 1768	32 to 3214	25	45	0.2% of span or 1.0 °C whichever is greater
Type T[6][8]	–200 to 400	–328 to 752	25	45	0.1% of span or 0.5 °C whichever is greater
DIN Type L[8][9]	–200 to 900	–328 to 1652	25	45	0.1% of span or 0.5 °C whichever is greater
DIN Type U[8][9]	–200 to 600	–328 to 1112	25	45	0.1% of span or 0.5 °C whichever is greater
Type W5Re26[10]	0 to 2000	32 to 3632	25	45	0.1% of span or 1.0° C whichever is greater
Millivolt Input[11]	–10 to 80 mV		3 mV		0.025 mV + 0.03% of span
2-, 3-, 4-Wire Ohm Input	0 to 2000 ohms		20 ohm		0.75 Ω + 0.03% of span

Accuracy Example: When using a Pt 100 (α = 0.00385) sensor input with a 75 to 150 °C range, the accuracy will be 0.05% of span + 0.15 °C or 0.20 °C, whichever is greater. Sample Calculation: [0.0005 × (150-75) + 0.15] = 0.19 °C which is < 0.20 °C, so the accuracy equals 0.20 °C.

(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) IEC 751, 1995.
(3) JIS 1604, 1981.
(4) Edison Curve No. 7
(5) Edison Copper Winding No. 15
(6) NIST Monograph 175, IEC 584.
(7) Digital Accuracy for NIST Type B T/C is ±3.0 °C from 100 to 300 °C.
(8) Total accuracy for thermocouple measurement: sum of accuracy +0.5 °C (cold junction accuracy).
(9) DIN 43710
(10)ASTM E 988–96
(11)Millivolt inputs are not approved for use with CSA Option Code I6.

- Ambient Temperature Effect per 1 °C (1.8 °F) change in Ambient:

Sensor Option[1]	Fixed Value (a)	% of Reading (b) (if reading > 0)	% of Reading (b) (if Reading < 0)	% of Span (c)
2-, 3-, 4-Wire RTDs:				
Pt 100, Pt 500, Pt 1000, Ni 120	0.003 °C	—	—	+ 0.001
Pt 200	0.004 °C	—	—	+ 0.001
Cu 10	0.03 °C	—	—	+ 0.001
Thermocouples:				
Type B (100 °C ≤ reading < 300 °C)	0.064 °C	– 0.011	—	+ 0.001
(300 °C ≤ reading < 1000 °C)	0.040 °C	– 0.0025	—	+ 0.001
(reading ≥ 1000 °C)	0.014 °C	—	—	+ 0.001
Type E	0.005 °C	+ 0.00043	0.00043	+ 0.001
Types J, K, DIN L	0.006 °C	+ 0.00054	– 0.0025	+ 0.001
Type N	0.007 °C	+ 0.00036	—	+ 0.001
Type R, S(reading < 200 °C)	0.023 °C	– 0.0036	—	+ 0.001
(reading ≥ 200 °C)	0.016 °C	—	—	+ 0.001
Type T, DIN U	0.007 °C	—	– 0.043	+ 0.001
Type W5Re26	0.023 °C	– 0.0036	—	+ 0.001
	0.016 °C	—	—	+ 0.001
Millivolt Input	0.0005 mV	—	—	+ 0.001
2-, 3-, 4-Wire Ohm Input	0.0084 Ohms	—	—	+ 0.001

Ambient Temperature Effect Examples:

a. When using a Type J thermocouple with a –50 °C to 600 °C range at an ambient temperature of 60 °C and a reading of –25 °C, the ambient temperature effect per °C is: [fixed value (a) + (% of reading (b) × reading) + (% of span (c) × span)] = [0.006 + (– 0.000025 × (–25)) + (0.00001 × 650)] = 0.013 °C per °C.
With ambient temperature 40 °C above reference condition temperature[1], total ambient temperature effect is: 40 × 0.013 = 0.52 °C.

b. When using a Type J thermocouple with a –50 °C to 600 °C range at an ambient temperature of 60 °C and a reading of 525 °C, the ambient temperature effect per °C is: [fixed value (a) + (% of reading (b) × reading) + (% of span (c) × span)] = [0.006 + (0.0000054 × 525) + (0.00001 × 650)] = 0.015 °C per °C.
With ambient temperature 40 °C above reference condition temperature[1], total ambient temperature effect is: 40 × 0.015 = 0.6 °C.

c. Worst Case Error would be: Reference Accuracy + CJC Accuracy + Temp Effects = 0.65 °C + 0.5 °C + 0.52 °C = 1.67 °C
Total Probable Error = $\sqrt{(0.65^2 + 0.5^2 + 0.52^2)}$ = 0.97 °C

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

11. MOUNTING OPTIONS

- Assortment of connection heads and junction boxes.
- Rail clips available on head mount transmitter.
- Universal clip for mounting to a wall or a DIN rail available on rail mount transmitter.

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