



## Temperature Transmitter Description

BAPI's temperature transmitters incorporate a 1K $\Omega$  RTD sensor and an amplifier. These devices provide an accurate two-wire, 4 to 20mA output over a specified range. They are specifically designed for temperature sensing and transmission over long distances without degradation of the 4 to 20mA signal. BAPI also offers outputs of 0 to 5, 0 to 10, 1 to 5 and 2 to 10 Volts. All outputs can be ordered as field selectable by choosing the TXS option on the ordering grid.

Each temperature transmitter is first calibrated with simulated RTD resistances for the specified range. Then an RTD is connected to the transmitter and the output is verified at one temperature.

BAPI has verified over 200 temperature ranges for the transmitters. If we don't offer the exact range you're looking for, call your BAPI representative to see if we can create a special range.

Additionally, BAPI can provide matched RTD-based units. Matched (sensor-transmitter pair) units utilize the tight tolerance of Class A RTDs to improve overall accuracy. The matched unit is tested in an environmental chamber against an NIST traceable reference thermometer. Each matched pair is provided with a "Certificate of Calibration" which lists the tested and calculated offset values, and identifies the equipment, products and people involved in the calibration process. The overall accuracy of the matched pair now becomes a function of the transmitter linearity, RTD linearity and reference thermometer uncertainty.

Matched errors are

$$\pm((\text{Span} * \text{Linearity Error}) + (\text{Reference Thermometer uncertainty}))$$

Where Linearity Error = Square Root((Transmitter Linearity)<sup>2</sup> + (RTD Linearity)<sup>2</sup>) =  
 Square Root((0.125%)<sup>2</sup> + (0.2%)<sup>2</sup>) = 0.234%

### Examples:

BA/T1K(-30 to 130F)

Span = 130 - (-30) = 160

Matched error =  $\pm((160 * 0.234\%) + (0.05^\circ\text{F})) = \pm 0.42^\circ\text{F}$

BA/T1K(45 to 95F)

Span = 95 - 45 = 50

Matched error =  $\pm((50 * 0.234\%) + (0.05^\circ\text{F})) = \pm 0.17^\circ\text{F}$

These accuracies are for the entire range of the sensor, although the accuracies in the midband of the sensor will be tighter than those near the endpoints of the specified range. Other matching and/or certification options may be available, please contact your BAPI representative for details.

BAPI temperature transmitters come in a ruggedized package for all configurations where moisture or condensation may be a problem. The potting material used to ruggedize the transmitters has high thermal conductivity to eliminate circuit overheating and low thermal expansion to minimize the stress on the circuit components. Due to the extremely low moisture absorption properties of the potting material, a ruggedized transmitter will remain operational even if temporarily immersed in water.

## T1K Transmitter Specifications

**Sensor:** 1K $\Omega$  Platinum RTD

**Supply Voltage:** 12 to 40 VDC

**Output:** 4 to 20 mA, 0 to 5V, 1 to 5V, 0 to 10V, 2 to 10V

**Max. Loop Resistance:** 850 $\Omega$  at 24VDC

**Span:** Min 16.6 $^\circ\text{C}$  (30 $^\circ\text{F}$ ), Max 555 $^\circ\text{C}$  (1000 $^\circ\text{F}$ )

**Zero:** Min -100 $^\circ\text{C}$  (-148 $^\circ\text{F}$ ), Max 482 $^\circ\text{C}$  (900 $^\circ\text{F}$ )

**Field Adjustments:** Each transmitter is calibrated to the specified temperature range that is ordered and is not field adjustable.

**System Accuracy:**  $\pm 0.065\%$  of Span

**Linearity:**  $\pm(0.125 \times T - 20^\circ\text{C})/100$

**Operational Humidity:**

0 to 95%, non-condensing

**Output Current limits:**

Less than 1mA and 22.35  $\pm$  0.15 mA

**Power Output Shift:**

$\pm 0.009\%$  of Span to 40VDC

**Connections:** Four 22-gauge etched Teflon leads or terminal blocks

**Operating Temperature:**

Transmitter: -20 to 70 $^\circ\text{C}$

Sensor: -65 to 105 $^\circ\text{C}$  (standard)

-200 to 600 $^\circ\text{C}$  (available)





## 0-100 °F Temp. Transmitter Output Table

°F	°C	mA
0	-17.78	4.000
1	-17.22	4.160
2	-16.67	4.320
3	-16.11	4.480
4	-15.56	4.640
5	-15.00	4.800
6	-14.44	4.960
7	-13.89	5.120
8	-13.33	5.280
9	-12.78	5.440
10	-12.22	5.600
11	-11.67	5.760
12	-11.11	5.920
13	-10.56	6.080
14	-10.00	6.240
15	-9.44	6.400
16	-8.89	6.560
17	-8.33	6.720
18	-7.78	6.880
19	-7.22	7.040
20	-6.67	7.200
21	-6.11	7.360
22	-5.56	7.520
23	-5.00	7.680
24	-4.44	7.840
25	-3.89	8.000
26	-3.33	8.160
27	-2.78	8.320
28	-2.22	8.480
29	-1.67	8.640
30	-1.11	8.800
31	-0.56	8.960
32	0.00	9.120
33	0.56	9.280
34	1.11	9.440
35	1.67	9.600
36	2.22	9.760
37	2.78	9.920
38	3.33	10.080
39	3.89	10.240
40	4.44	10.400
41	5.00	10.560
42	5.56	10.720
43	6.11	10.880
44	6.67	11.040
45	7.22	11.200
46	7.78	11.360
47	8.33	11.520
48	8.89	11.680
49	9.44	11.840

°F	°C	mA
50	10.00	12.000
51	10.56	12.160
52	11.11	12.320
53	11.67	12.480
54	12.22	12.640
55	12.78	12.800
56	13.33	12.960
57	13.89	13.120
58	14.44	13.280
59	15.00	13.440
60	15.56	13.600
61	16.11	13.760
62	16.67	13.920
63	17.22	14.080
64	17.78	14.240
65	18.33	14.400
66	18.89	14.560
67	19.44	14.720
68	20.00	14.880
69	20.56	15.040
70	21.11	15.200
71	21.67	15.360
72	22.22	15.520
73	22.78	15.680
74	23.33	15.840
75	23.89	16.000
76	24.44	16.160
77	25.00	16.320
78	25.56	16.480
79	26.11	16.640
80	26.67	16.800
81	27.22	16.960
82	27.78	17.120
83	28.33	17.280
84	28.89	17.440
85	29.44	17.600
86	30.00	17.760
87	30.56	17.920
88	31.11	18.080
89	31.67	18.240
90	32.22	18.400
91	32.78	18.560
92	33.33	18.720
93	33.89	18.880
94	34.44	19.040
95	35.00	19.200
96	35.56	19.360
97	36.11	19.520
98	36.67	19.680
99	37.22	19.840
100	37.78	20.000