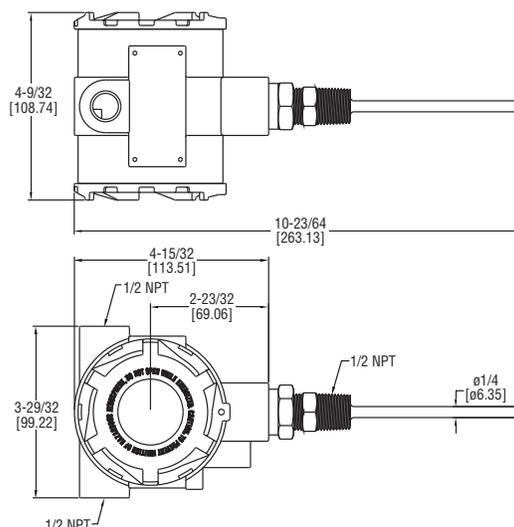




## Series TTE Explosion-Proof RTD Temperature Transmitter

## Installation and Operation Instructions



The Series TTE Explosion-Proof RTD Temperature Transmitter is the ideal product for hazardous temperature measurement applications. The TTE series has seven pre-programmed temperature ranges that are selectable via an internal dip switch. For those applications that need a custom range, the transmitter can be easily configured for any range between -30 to 250°F with a minimum span of 40°F. The span and zero can be quickly adjusted with a simple push button design. The compact housing allows for the transmitter to be mounted in virtually any application.

The Series TTE is ideally suited for refrigeration, building automation, commercial hot water heaters and boilers, and water chillers applications.

### SPECIFICATIONS

**Temperature Sensor:** Pt1000, 0.00385 DIN.

**Output Temperature Ranges:** User selectable – any range between -30 to 250°F with a minimum span of 40°F.

**Temperature Limits:** Ambient: 0 – 158°F (-18 to 70°C).  
Process: -30 to 250°F (-34.4 to 121.1°C).

**Accuracy:** Transmitter +/-0.1% F.S. Probe +/-0.3% F.S.

**Thermal Drift Effects:** +/-0.02%/°C max.

**Response Time:** 250 ms.

**Wetted Materials:** 316 stainless steel.

**Process Connection:** 1/2" male NPT.

**Conduit Connection:** 1/2" female NPT.

**Probe Length:** 2" to 18" (depending on model).

**Pressure Limits:** 2000 PSI.

**Power Requirements:** 10 to 35 VDC.

**Output Signal:** 4-20 mA (two wire loop powered).

**Optional Display:** 2 lines X 8 character LCD.

**Enclosure Rating:** NEMA 4X (IP66) and explosion-proof for Class I, Groups B, C, D; Class II, Groups E, F, G; Class III.

**Weight:** 2 lb 8 oz (1134 g).

**Agency Approvals:** FM, CE.

## INSTALLATION

- 1. Location:** Select a location where the temperature of the transmitter will be between 0 and 158°F. Distance from the receiver is limited only by total loop resistance.
- 2. Position:** The transmitter is not position sensitive. Units with the optional display should be mounted for ease of viewing the display.
- 3. Electrical Connection:**

**Wire Length** - The maximum length of wire connecting the transmitter and receiver is a function of wire size and receiver resistance. Wiring should not contribute more than 10% of the receiver resistance to total loop resistance. For extremely long runs (over 1000 feet), choose receivers with lower resistance to minimize the size and cost of connecting leads.

### Current (4-20 mA) Output Operation

An external power supply is required. See Fig. A for diagram of the connection of the power supply, transmitter and receiver. The range of appropriate receiver load resistance (RL) for the DC power supply voltage available is expressed by the formula:

$$R_L = \frac{V_{ps} - 10}{20\text{mA DC}}$$

Shielded cable is recommended for control loop wiring.

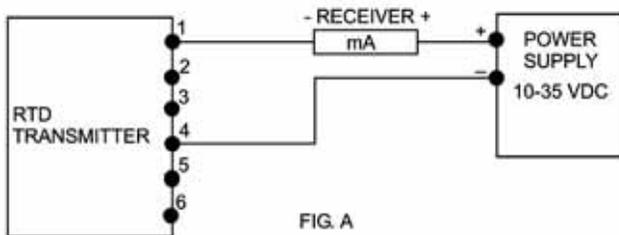


FIG. A



### Explosion-Proof Installation Notes:

1. Install in accordance with any applicable national electric code.
2. Plug unused conduit openings. Plug must engage a minimum of 5 threads.
3. Use a conduit seal within 18 inches of conduit entry.
4. Disconnect power before servicing.

Electrical connections to the RTD Transmitter are made to the terminal block located inside the housing. Unscrew and remove the cover. Wire as shown in FIG. B.

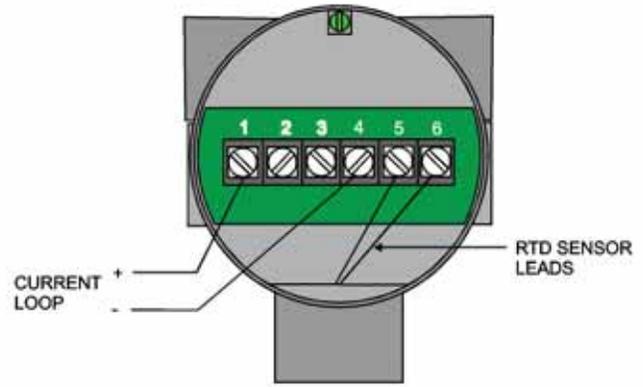


FIG. B

### Temperature Range Selection

The RTD Transmitter has 7 built in temperature ranges and a user settable range that are selectable by setting the Dip Switch located inside the housing (Fig C). Switches 2, 3, and 4 are used to set the range. To set the desired range, unscrew and remove the cover and set the Dip Switch according to the following table:

Selectable Ranges	DIP SWITCH		
	2	3	4
40 to 90°F (4.4 to 32.2°C)	OFF	OFF	OFF
-20 to 140°F (-28.9 to 60°C)	ON	OFF	OFF
0 to 100°F (-17.8 to 37.8°C)	OFF	ON	OFF
30 to 240°F (-1.1 to 115.6°C)	ON	ON	OFF
32 to 212°F (0 to 100°C)	OFF	OFF	ON
32 to 122°F (0 to 50°C)	ON	OFF	ON
-30 to 65°C (-1.1 to 18.3°C)	OFF	ON	ON
User Settable	ON	ON	ON

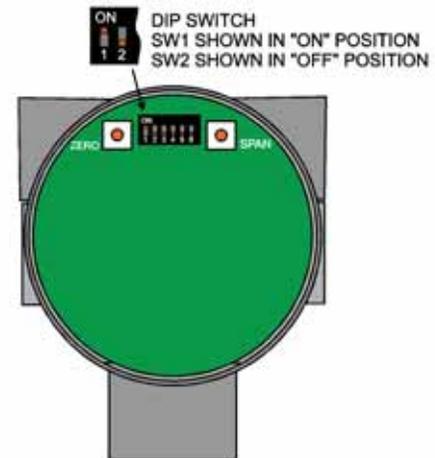


FIG. C

### Setting and Calibrating the User Settable Range

By setting SWITCH 2, 3, and 4 on, the RTD Transmitter may be adjusted to a custom user specified range. The range may be any values between  $-30^{\circ}\text{F}$  and  $+250^{\circ}\text{F}$  ( $-34$  to  $+121^{\circ}\text{C}$ ) with a MINIMUM SPAN of  $40^{\circ}\text{F}$  ( $22^{\circ}\text{C}$ ).

### Equipment Required

In order to calibrate the unit for a custom range, a precision RTD simulator that can simulate a 1000 OHM DIN type RTD or precision decade box is required. The device must be capable of generating the correct RTD resistance to 0.1% or better.

### Calibration Procedure

1. Set DIP SWITCHES 2, 3 and 4 ON.
2. Remove the RTD sensor leads from terminals 5 and 6 (Fig. B). Connect the precision RTD simulator or decade box to terminals 5 and 6.
3. Wire instrument as previously discussed. A current meter may be wired in series with the unit to verify the correct current output, but this is not necessary for calibration. Apply power to the unit.
4. If a precision RTD simulator is used, make sure it is set to simulate a 1000 OHM DIN 0.00385 RTD. Then set it to the desired minimum temperature. If a decade box is used refer to the table in Appendix A ( $^{\circ}\text{F}$ ) or Appendix B ( $^{\circ}\text{C}$ ) and set it to the resistance that represents the desired minimum temperature.
5. Press the ZERO button. If the unit has the optional LCD, the display will read ZERO OK momentarily. If a current meter is wired, it will read 4.00mA.
6. Repeat step 4 using the value for the maximum desired temperature.
7. Press the SPAN button. If the unit has the optional LCD, the display will read SPAN OK momentarily. If a current meter is wired, it will read 20.00mA.
8. Turn off power to the unit. Disconnect the RTD simulator or decade box and reconnect the RTD sensor to terminals 5 and 6. Calibration is complete.

Note: The calibration procedure does not effect the calibration of any of the built in ranges.

### $^{\circ}\text{F}$ and $^{\circ}\text{C}$ Selection

If the unit has the optional LCD display, DIP SWITCH 1 sets the display to read in  $^{\circ}\text{F}$  or  $^{\circ}\text{C}$ . SWITCH 1 "OFF" =  $^{\circ}\text{F}$   
SWITCH 1 "ON" =  $^{\circ}\text{C}$ .

### Output Current Display

If the unit has the optional LCD display, the lower display will show the output current if DIP SWITCH 5 is "ON". Setting DIP SWITCH 5 "OFF" causes the lower display to be blank.

### Open RTD Protection

Upon detecting an open RTD, the unit may be set to force the output to read 3.5mA or 21mA based upon the setting of DIP SWITCH 6.

SWITCH 6 "OFF", output forced to 3.5mA

SWITCH 6 "ON", output forced to 21mA

### Calibration

The unit requires no calibration. An internal precision resistor continually self calibrates the unit. Calibration may be verified by removing the sensor leads and testing the unit against a precision RTD simulator or a precision decade box. If the unit is found to out of calibration it must be returned to the factory for service.

### MAINTENANCE

Upon final installation of the Series TTE Explosion Proof RTD Temperature Transmitter, no routine maintenance is required. A periodic check of the system calibration is recommended. The Series TTE is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number for shipping.

**Appendix A - RTD Table, °F Pt 1000 DIN 0.00385**

Values are in ohms

TEMP, °F	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-30	864.7									
-20	886.6	884.4	882.2	880.0	877.8	875.6	873.5	871.3	869.1	866.9
-10	908.5	906.3	904.1	901.9	899.7	897.6	895.4	893.2	891.0	888.8
-0	930.3	928.2	926.0	923.8	921.6	919.4	917.2	915.0	912.9	910.7
TEMP, °F	0	1	2	3	4	5	6	7	8	9
0	930.3	932.5	934.7	936.9	939.1	941.2	943.4	945.6	947.8	950.0
10	952.1	954.3	956.5	958.7	960.9	963.0	965.2	967.4	969.6	971.7
20	973.9	976.1	978.3	980.4	982.6	984.8	987.0	989.1	991.3	993.5
30	995.7	997.8	1000.0	1002.2	1004.3	1006.5	1008.7	1010.9	1013.0	1015.2
40	1017.4	1019.5	1021.7	1023.9	1026.0	1028.2	1030.4	1032.5	1034.7	1036.9
50	1039.0	1041.2	1043.4	1045.5	1047.7	1049.9	1052.0	1054.2	1056.3	1058.5
60	1060.7	1062.8	1065.0	1067.1	1069.3	1071.5	1073.6	1075.8	1077.9	1080.1
70	1082.3	1084.4	1086.6	1088.7	1090.9	1093.0	1095.2	1097.4	1099.5	1101.6
80	1103.8	1106.0	1108.1	1110.3	1112.4	1114.6	1116.7	1118.9	1121.0	1123.2
90	1125.3	1127.5	1129.6	1131.8	1133.9	1136.1	1138.2	1040.4	1142.5	1144.7
TEMP, °F	0	1	2	3	4	5	6	7	8	9
100	1146.8	1149.0	1151.1	1153.3	1155.4	1157.6	1159.7	1161.8	1164.0	1166.1
110	1168.3	1170.4	1172.6	1174.7	1176.9	1179.0	1181.1	1183.3	1185.4	1187.6
120	1189.7	1191.8	1194.0	1196.1	1198.3	1200.4	1202.5	1204.7	1207.0	1208.9
130	1211.1	1213.2	1215.4	1217.5	1219.6	1221.8	1223.9	1226.0	1228.2	1230.3
140	1232.4	1234.6	1236.7	1238.8	1241.0	1243.1	1245.2	1247.3	1249.5	1251.6
150	1253.7	1255.9	1258.0	1260.1	1262.2	1264.4	1266.5	1268.6	1270.8	1272.9
160	1275.0	1277.1	1279.3	1281.4	1283.5	1285.6	1287.8	1289.9	1292.0	1294.1
170	1296.2	1298.4	1300.5	1302.6	1304.7	1306.9	1309.0	1311.1	1313.2	1315.3
180	1317.5	1319.6	1321.7	1323.8	1325.9	1328.0	1330.2	1332.3	1334.4	1336.5
190	1338.6	1340.7	1342.8	1345.0	1347.1	1349.2	1351.3	1353.4	1355.5	1357.6
TEMP, °F	0	1	2	3	4	5	6	7	8	9
200.0	1359.7	1361.9	1364.0	1366.1	1368.2	1370.3	1372.4	1374.5	1376.6	1378.7
210.0	1380.8	1383.0	1385.1	1387.2	1389.3	1391.4	1393.5	1395.6	1397.7	1399.8
220.0	1401.9	1404.0	1406.1	1408.2	1410.3	1412.4	1414.5	1416.6	1418.7	1420.8
230.0	1422.9	1425.0	1427.1	1429.2	1431.3	1433.4	1435.5	1437.6	1439.7	1441.8
240.0	1443.9	1446.0	1448.1	1450.2	1452.3	1454.4	1456.5	1458.6	1460.7	1462.8
250.0	1464.9									

**Appendix B - RTD Table, °C Pt 1000 DIN 0.00385**

Values are in ohms

TEMP, °C	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-30	888.2	878.3	874.3	870.4	866.4					
-20	921.6	917.7	913.7	909.8	905.9	901.9	898.0	894.0	890.1	886.2
-10	960.9	956.9	953.0	949.1	945.2	941.2	937.3	933.4	929.5	925.5
-0	1000.0	996.1	992.2	988.3	984.4	980.4	976.5	972.6	968.7	964.8
TEMP, °C	0	1	2	3	4	5	6	7	8	9
0	1000.0	1003.9	1007.8	1011.7	1015.6	1019.5	1023.4	1027.3	1031.2	1035.1
10	1039.0	1042.9	1046.8	1050.7	1054.6	1058.5	1062.4	1066.3	1070.2	1074.1
20	1077.9	1081.8	1085.7	1089.6	1093.5	1097.4	1101.2	1105.1	1109.0	1112.9
30	1116.7	1120.6	1124.5	1128.3	1132.2	1136.1	1140.0	1143.8	1147.7	1151.5
40	1155.4	1159.3	1163.1	1167.0	1170.9	1174.7	1178.6	1182.4	1186.3	1190.1
50	1194.0	1197.8	1201.7	1205.5	1209.4	1213.2	1217.1	1220.9	1224.7	1228.6
60	1232.4	1236.3	1240.1	1243.9	1247.8	1251.6	1255.4	1259.3	1263.1	1266.9
70	1270.8	1274.6	1278.4	1282.2	1286.1	1289.9	1293.7	1297.5	1301.3	1305.2
80	1309.0	1312.8	1316.6	1320.4	1324.2	1328.0	1331.8	1335.7	1339.5	1343.3
90	1347.1	1350.9	1354.7	1358.5	1362.3	1366.1	1369.9	1373.7	1377.5	1381.3
TEMP, °C	0	1	2	3	4	5	6	7	8	9
100	1385.1	1388.9	1392.6	1396.4	1400.2	1404.0	1407.8	1411.6	1415.4	1419.1
110	1422.9	1426.7	1430.5	1434.3	1438.0	1441.8	1445.6	1449.4	1453.1	1456.9
120	1460.7	1464.5								