

## Outdoor Temperature Sensors

## TO Series



## SPECIFICATIONS

5 Year  
Warranty

|                                       |                                                                                                                                                                        |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Wiring</b>                         | 22 AWG; 2-wire: RTD/Thermistor, 4-20mA; 3-wire: Voltage output models                                                                                                  |
| <b>Junction Box</b>                   | Weather resistant                                                                                                                                                      |
| <b>TEMPERATURE TRANSMITTER OPTION</b> |                                                                                                                                                                        |
| <b>Input Power</b>                    | 4-20mA version - Loop powered Class 2, 12-30VDC only, 30mA max;<br>0-5/0-10V versions - 12-30VDC/24VAC, 50/60Hz, 15mA max                                              |
| <b>Temp Output</b>                    | 2-wire, loop powered Class 2, 4-20mA;<br>3-wire, 0-5V/0-10VDC                                                                                                          |
| <b>Sensor Type</b>                    | Solid-state, integrated circuit (Transmitter)                                                                                                                          |
| <b>Accuracy</b>                       | ±0.5°C (±.9°F) typical                                                                                                                                                 |
| <b>Ranges</b>                         | 0° to 50°C (32° to 122°F), -40° to 50°C (-40° to 122°F)*                                                                                                               |
| <b>LINITEMP OPTION</b>                |                                                                                                                                                                        |
| <b>Input Power</b>                    | 5 to 30VDC                                                                                                                                                             |
| <b>Output</b>                         | 10mV/°C                                                                                                                                                                |
| <b>Operating Temp</b>                 | -25° to 105°C (-13° to 221°F)                                                                                                                                          |
| <b>Calibration Error</b>              | 1.5°C (2.7°F) typical; 2.5°C (4.5°F) max. at 25°C (77°F)                                                                                                               |
| <b>Error over Temp</b>                | 1.8°C (3.24°F) typical; 3.0°C (5.4°F) max. over 0° to 70°C (32° to 158°F) range;<br>2.0°C (3.6°F) typical, 3.5°C (6.3°F) max. over -25° to 105°C (-13° to 221°F) range |
| <b>RESISTIVE OPTION</b>               |                                                                                                                                                                        |
| <b>Operating Temp</b>                 | -25° to 105°C (-13° to 221°F)                                                                                                                                          |
| <b>RTD/Thermistor</b>                 | See table at right                                                                                                                                                     |

## Sleek Design, Reduces Solar Heating

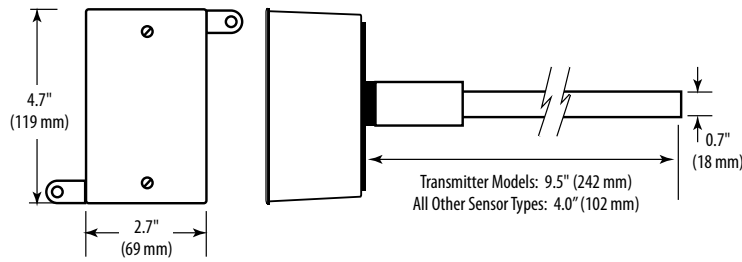
## FEATURES

- Sleek design reduces solar heating...reliable and accurate
- Available with transmitter, linitemp, RTDs, or thermistors

## DESCRIPTION

The **TO Series** outdoor temperature sensors feature a sleek, weather resistant design, and provide easy installation. The durable probe is encased in a radiation shield to reduce the effects of solar heating. Choose from a variety of RTD, thermistor, or transmitter outputs to suit any application.

**DIMENSIONAL DRAWING**



*To compute Linitemp Temperature*  
 $mV \text{ reading} / 10 - 273.15 = \text{Temperature in } ^\circ C$

| Class           | Pt RTD                  |                         | Balco RTD | THERMISTOR       |                  |                     |                  |                    |                  |                  |                    |                    |                    | 10k Type 2                      | 10k Type 3       |
|-----------------|-------------------------|-------------------------|-----------|------------------|------------------|---------------------|------------------|--------------------|------------------|------------------|--------------------|--------------------|--------------------|---------------------------------|------------------|
| Type            | 100 Ohm                 | 1000 Ohm                | 1000 Ohm  | 2.2k             | 3k               | 10k Type 2          | 10k Type 3       | 10k Dale           | 10k 3A221        | 10k "G" US       | 20k                | 20k "D"            | 100k               | 10k Type 2                      | 10k Type 3       |
| Accuracy        | ±0.3°C<br>0.00385 curve | ±0.3°C<br>0.00385 curve | ±1% @70°C | ±0.2°C<br>0/70°C | ±0.2°C<br>0/70°C | ±1.0°C<br>-50/150°C | ±0.2°C<br>0/70°C | ±0.2°C<br>-20/70°C | ±1.1°C<br>0/70°C | ±0.2°C<br>0/70°C | Consult<br>Factory | Consult<br>Factory | Consult<br>Factory | ±0.1°C 20/70°C<br>±0.2°C 0/20°C | ±0.1°C<br>0/70°C |
| Temp. Response* | PTC                     | PTC                     | PTC       | NTC              | NTC              | NTC                 | NTC              | NTC                | NTC              | NTC              | NTC                | NTC                | NTC                | NTC                             | NTC              |

\*PTC: Positive Temperature Coefficient  
 \*NTC: Negative Temperature Coefficient

**STANDARD RTD AND THERMISTOR VALUES (Ohms Ω)**

| °C  | °F  | 100 Ohm | 1000 Ohm | 1000 Ohm | 2.2k    | 3k      | 10k Type 2 | 10k Type 3 | 10k Dale | 10k 3A221 | 10k "G" US | 20k NTC   | 20k "D" | 100k      | 10k Type 2 | 10k Type 3 |
|-----|-----|---------|----------|----------|---------|---------|------------|------------|----------|-----------|------------|-----------|---------|-----------|------------|------------|
| -50 | -58 | 80.306  | 803.06   | 740.46   | 154,464 | 205,800 | 692,700    | 454,910    | 672,300  | -         | 441,200    | 1,267,600 | -       | -         | 692,700    | 454,910    |
| -40 | -40 | 84.271  | 842.71   | 773.99   | 77,081  | 102,690 | 344,700    | 245,089    | 337,200  | 333,562   | 239,700    | 643,800   | 803,200 | 3,366,000 | 344,700    | 245,089    |
| -30 | -22 | 88.222  | 882.22   | 806.02   | 40,330  | 53,730  | 180,100    | 137,307    | 177,200  | 176,081   | 135,300    | 342,000   | 412,800 | 1,770,000 | 180,100    | 137,307    |
| -20 | -4  | 92.160  | 921.60   | 841.00   | 22,032  | 29,346  | 98,320     | 79,729     | 97,130   | 96,807    | 78,910     | 189,080   | 220,600 | 971,200   | 98,320     | 79,729     |
| -10 | 14  | 96.086  | 960.86   | 877.46   | 12,519  | 16,674  | 55,790     | 47,843     | 55,340   | 55,252    | 47,540     | 108,380   | 122,400 | 553,400   | 55,790     | 47,843     |
| 0   | 32  | 100.000 | 1,000.00 | 913.66   | 7,373   | 9,822   | 32,770     | 29,588     | 32,660   | 32,639    | 29,490     | 64,160    | 70,200  | 326,600   | 32,770     | 29,588     |
| 10  | 50  | 103.903 | 1,039.03 | 952.25   | 4,487   | 5,976   | 19,930     | 18,813     | 19,900   | 19,901    | 18,780     | 39,440    | 41,600  | 199,000   | 19,930     | 18,813     |
| 20  | 68  | 107.794 | 1,077.94 | 991.82   | 2,814   | 3,750   | 12,500     | 12,272     | 12,490   | 12,493    | 12,260     | 24,920    | 25,340  | 124,900   | 12,500     | 12,272     |
| 25  | 77  | 109.735 | 1,097.35 | 1,013.50 | 2,252   | 3,000   | 10,000     | 10,000     | 10,000   | 10,000    | 10,000     | 20,000    | 20,000  | 100,000   | 10,000     | 10,000     |
| 30  | 86  | 111.673 | 1,116.73 | 1,035.18 | 1,814   | 2,417   | 8,055      | 8,195      | 8,056    | 8,055     | 8,194      | 16,144    | 15,884  | 80,580    | 8,055      | 8,195      |
| 40  | 104 | 115.541 | 1,155.41 | 1,077.68 | 1,199   | 1,598   | 5,323      | 5,593      | 5,326    | 5,324     | 5,592      | 10,696    | 10,210  | 53,260    | 5,323      | 5,593      |
| 50  | 122 | 119.397 | 1,193.97 | 1,120.52 | 811.5   | 1,081   | 3,599      | 3,894      | 3,602    | 3,600     | 3,893      | 7,234     | 6,718   | 36,020    | 3,599      | 3,894      |
| 60  | 140 | 123.242 | 1,232.42 | 1,166.13 | 561.0   | 747     | 2,486      | 2,763      | 2,489    | 2,486     | 2,760      | 4,992     | 4,518   | 24,880    | 2,486      | 2,763      |
| 70  | 158 | 127.075 | 1,270.75 | 1,210.75 | 395.5   | 527     | 1,753      | 1,994      | 1,753    | 1,751     | 1,990      | 3,512     | 3,100   | 17,510    | 1,753      | 1,994      |
| 80  | 176 | 130.897 | 1,308.97 | 1,254.55 | 284.0   | 378     | 1,258      | 1,462      | 1,258    | 1,255     | 1,458      | 2,516     | 2,168   | 12,560    | 1,258      | 1,462      |
| 90  | 194 | 134.707 | 1,347.07 | 1,301.17 | 207.4   | -       | 919        | 1,088      | 917      | 915       | 1,084      | 1,833     | 1,542   | 9,164     | 919        | 1,088      |
| 100 | 212 | 138.506 | 1,385.06 | 1,348.38 | 153.8   | -       | 682        | 821        | 679      | 678       | 816.8      | 1,356     | 1,134   | 6,792     | 682        | 821        |
| 110 | 230 | 142.293 | 1,422.93 | 1,397.13 | 115.8   | -       | 513        | 628        | 511      | 509       | 623.6      | 1,016     | 816     | 5,108     | 513        | 628        |
| 120 | 248 | 146.068 | 1,460.68 | 1,447.44 | 88.3    | -       | 392        | 486        | 389      | 388       | 481.8      | 770       | 606     | 3,894     | 392        | 486        |
| 130 | 266 | 149.832 | 1,498.32 | 1,496.28 | 68.3    | -       | 303        | 380        | 301      | 299       | 376.4      | 591       | 456     | 3,006     | 303        | 380        |

**ORDERING INFORMATION**



**RTD/Thermistor Models**

**Sensor Type** TO

**Output** RØ  = Resistive Output

**Cal Certificate**

0 = None  
 1 = 1 point Cal validation  
 2 = 2 point Cal validation

**Example:**  
 TO C RØ 2

- B = 100R platinum, RTD
- C = 1k platinum, RTD
- D = 10k T2, Thermistor
- E = 2.2k, Thermistor
- F = 3k, Thermistor
- G = 10k CPC, Thermistor
- H = 10k T3, Thermistor
- I = 1k Balco (Nickel-Iron) RTD
- J = 10k Dale, Thermistor
- K = 10k w/11k shunt, Thermistor
- M = 20k NTC, Thermistor
- N = 1800 ohm, Thermistor
- P = 10mV/°C, Linitemp
- R = 10k US, Thermistor
- S = 10k 3A221, Thermistor
- T = 100k, Thermistor
- U = 20k "D", Thermistor
- W = 10k T2 high accuracy, Thermistor
- Y = 10k T3 high accuracy, Thermistor
- Z = 10k E1, Thermistor
- CC = 15k, Thermistor

**Temperature Transmitter Models**

**Output** TOA

**Range**

**Cal Certificate**

M = 4-20mA  
 V = 0-5/0-10VDC

1 = -40 to 50°C  
 (-40° to 122°F)  
 2 = 0° to 50°C  
 (32° to 122°F)

0 = None  
 1 = 1 point Cal validation  
 2 = 2 point Cal validation

**Example:**  
 TOA M 1 0