#20920 – 9/8/23

## Identification and Overview

### Outside Air Temperature Transmitters

The outside air temperature transmitter is designed to handle the harshest outside environments. The probe and enclosure are made to protect the sensor from impediments such as rain, sleet, snow or bird droppings.

The Temperature Transmitter can be ordered with a 1KΩ (385) RTD that has a field adjustable 1 to 5, 0 to 5, 2 to 10, 0 to 10VDC or 4 to 20 mA output over a selected temperature range. These adjustable outputs can be set at the factory to order or default set to 4 to 20mA.

Special high accuracy RTD matched transmitters (M) are available which match the sensor to the transmitter for improved accuracy. Enclosure mounting styles come in plastic or metal for both NEMA 3R and NEMA 4 applications and are all UV rated.

**Part #s: N1-T1K[-20 TO 120F]-O-BB2-C**

## Specifications

**Transmitter Circuit**

- Power Required: ..... 12 to 40VDC
- Transmitter Output:.. 4 to 20mA, 0 to 5, 1 to 5, 0 to 10 or 2 to 10VDC, 850Ω@24VDC
- Output Wiring: ..... 2 wire loop
- Output Limits: ..... <1mA (short), <22.35mA (open)
- Span: ..... Min 30ºF (17ºC), Max 1000ºF, (555ºC)
- Zero: ..... Min -148°F (-100°C), Max 900ºF (482ºC)
- System Accuracy: ... ±0.065% of span
- Linearity: .....±(0.125 * T-20ºC)/100
- RTD Sensor:..... 2 wire Platinum (Pt), 385 curve
- Transmitter Ambient .-4 to 158ºF(-20 to 70ºC) 0 to 95% RH, Non-condensing

**RTD** Sensor**:** Resistance Temp Device (Bare Sensor)

- Platinum (Pt): ..... 1KΩ @0ºC, 385 curve,
- Pt Accuracy (Std): ... 0.12% @Ref, or ±0.55ºF, (±0.3ºC)
- Pt Accuracy (High): 0.06% @Ref, or ±0.277ºF, (±0.15ºC), **[A]**option
- Pt Stability: ..... ±0.25ºF, (±0.14ºC)
- Pt Self Heating: ..... 0.4 ºC/mW @0ºC
- Pt Probe Range:..... -40 to 221ºF, (-40 to 105ºC)
- Wire Colors:..... General color code (other colors possible)
  - 1KΩ, Class B..... Orange/Orange (no polarity)
  - 1KΩ, Class A..... Orange/White (no polarity)

**RTD Sensitivity:** 3.85Ω/ºC, Approximate @ 32ºF (0ºC)

**Lead Wire:** 22awg stranded

**Insulation:** Etched Teflon, Plenum rated **Probe:** Vented polycarbonate shield, ½" OD

**Probe Length:** 1.2" with ½" NPT threads

**Wall Gasket:** 1/4" Closed cell foam (impervious to mold)

**Enclosure Types:**

- Bbox2 ..... .**BB2**, w/ three ½" NPSM & three ½" drill-outs

**Enclosure Ratings:** (Part number designator in bold)

- BBox2.....**BB2,** NEMA 4, IP66, UV Rated

**Enclosure Material:**

- BBox2 ..... **BB2** Polycarb., UL94V-0, UV rated

**Ambient (Enclosure):** 0 to 100% RH, Non-condensing

- BBox2 ..... **BB2,** -40ºF to 185ºF, (-40º to 85ºC)

**Agency**

RoHS / PT=DIN43760, IEC Pub 751-1983 / JIS C1604-1989

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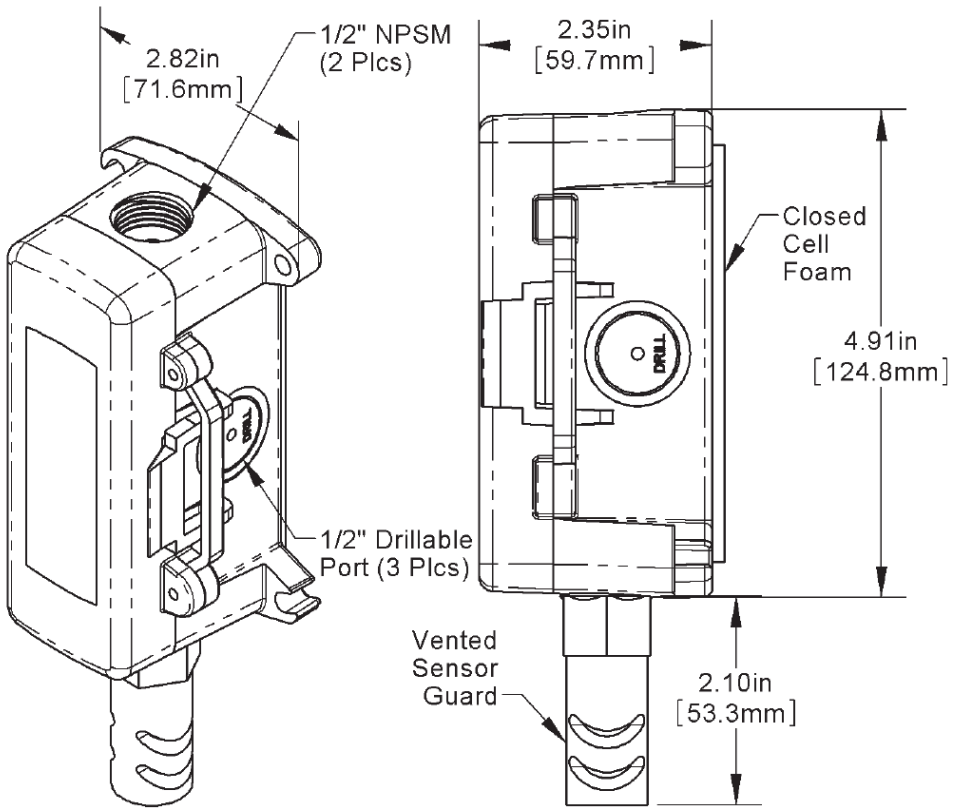
## Dimensional Drawing



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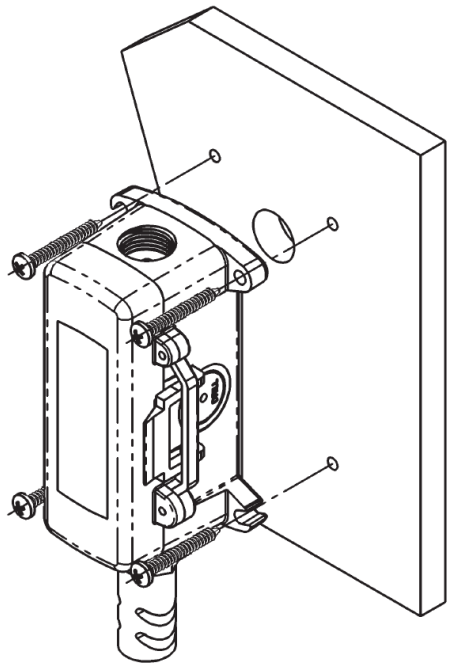
## Mounting

Outside Air (OSA) sensor placement is critical to good performance. The OSA sensor must be mounted in the shade away from building windows, doors or vents. They should never be in direct sunlight or you will have higher than expected temperature readings by as much as +30%. The ideal shaded location in the Northern hemisphere is on the North side of the building. In the Southern hemisphere the South side of the building is ideal.

The sensor shield and probe should always point down and mounted between four feet above the ground/roof and one foot minimum below the eave. (Note: Four feet keeps the sensor above the ground or roof top radiation and one foot under the eave prevents measurement of trapped heat from under the eave.)

1. Drill the mounting holes and mount as shown in the figures shown here.
2. Snug up the mounting screws to ensure that the foam backing compresses to about 50% of its thickness to make a gasket type seal against the wall surface.
3. Route the wires into the box and terminate with sealant filled connectors to prevent water from attacking the connection, thereby preventing costly callbacks.



| | |
|---|---|
| **Tip** | Caulk the wiring hole after the wiring is installed. Close the cover of the enclosures and secure with provided cover security screws. |

## Termination

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|---|---|
| **Warning** | Wire the product with power disconnected. Proper supply voltage, polarity, and wiring connections are important to a successful installation. Not observing these recommendations may damage the product and will void the warranty. |

| | |
|---|---|
| **Caution** | • Do NOT run this device's wiring in the same conduit as AC power wiring of NEC class1 or NEC class 2, NEC class 3 or with wiring used to supply highly inductive loads such as motors, contactors and relays. T ests show that fluctuating and inaccurate signal levels are possible when AC power wiring is present in the same conduit as the signal lines.<br>• All wiring must comply with the National Electric Code (NEC) and local codes. |

| | |
|---|---|
| **Tip** | • We recommend using twisted pair of at least 22AWG and sealant filled connectors for all wire connections. Larger gauge wire may be required for long runs.<br>• Keep transmitter at least 5 feet from any radio wave-emitting device (i.e.: 2 way radio). Transmitters that are less than 5 feet from a radio wave-emitting device can cause unwanted interference. |

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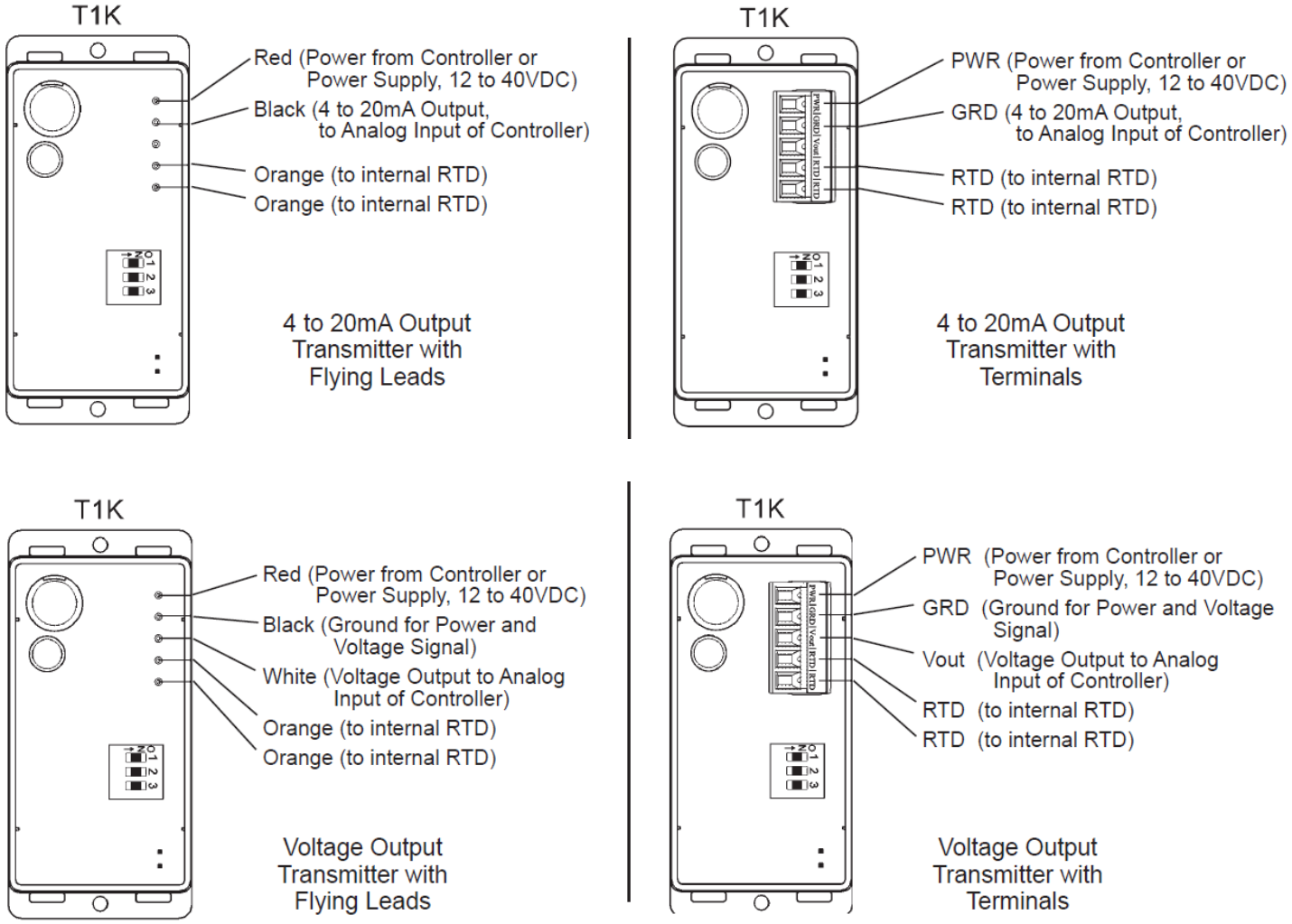
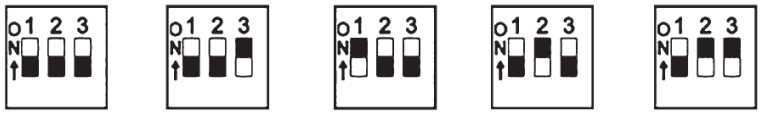
### Typical Configurations




## DIP Switch Settings for Field-Selectable Output

The transmitter circuit board has a three-position DIP switch that controls the temperature output value. This switch is set at the factory at the time of the order. The settings of the switch are shown below in case you want to change them in the field. Be aware that the power requirements for the unit change depending on the temperature output value. See the specifications section for power requirements.



## Diagnostics

| Possible Problems: | Possible Solutions: |
|---|---|
| Unit will not operate. | • Measure the power supply voltage by placing a voltmeter across the transmitter's (+) and (-) terminal. Make sure that it matches the drawings above and power requirements in the specifications.<br>• Check if the RTD wires are physically open or shorted together and are terminated to the transmitter. |
| The reading is incorrect in the controller | • Determine if the input is set up correctly in the controllers and BAS software.<br>• For a 4 to 20mA current transmitter measure the transmitter current by placing an ammeter in series with the controller input. The current should read according to the "4 to 20mA Temperature Equation" shown below.<br>• For a voltage transmitter, measure the signal with a volt meter (Orange or Orange/ Black to Black). The signal should read according to the "Voltage Temperature Equation" shown below. |

**Voltage Temperature Equation**

$$T = T_{Low} + \frac{(V \times T_{Span})}{V_{Span}}$$

| | |
|---|---|
| $T$ | = Temperature at sensor |
| $T_{Low}$ | = Low temperature of span |
| $T_{High}$ | = High temperature of span |
| $T_{Span}$ | = $T_{High} - T_{Low}$ |
| $V_{Low}$ | = Low transmitter voltage usually=(0, 1 or 2v) |
| $V_{High}$ | = High transmitter voltage usually=(5 or 10v) |
| $V_{Span}$ | = $V_{High} - V_{Low}$ |
| $V$ | = Signal reading in volts |

**4 to 20mA Temperature Equation**

$$T = T_{Low} + \frac{(A - 4) \times (T_{Span})}{16}$$

| | |
|---|---|
| $T$ | = Temperature at sensor |
| $T_{Low}$ | = Low temperature of span |
| $T_{High}$ | = High temperature of span |
| $T_{Span}$ | = $T_{High} - T_{Low}$ |
| $A$ | = Signal reading in mA |

## Appendix – Symbols Key

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|---|---|
| **Warning** | Potential for death, serious injury, or permanent damage to a system. |
| **Caution** | Potential for injury, damage to a system, or system failure. |
| **Tip** | Useful information not related to injury or system damage. |