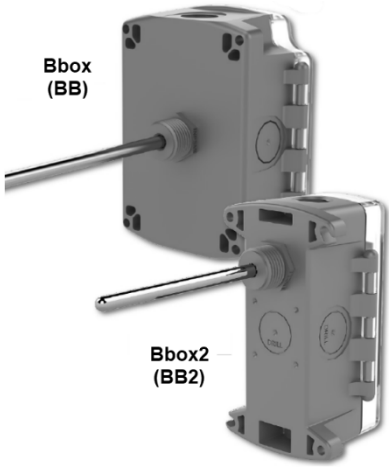
Identification and Overview

Immersion Temperature Transmitters

The Immersion Sensor is made for thermowell mounting and temperature measurement in water pipes, water tanks or cooling tower sump applications. Immersion Temperature Transmitter can be ordered with a 1KΩ (385) RTD that has a field adjustable 1-5, 0-5, 2-10, 0-10VDC or 4 to 20 mA output over a selected temperature range. (see min and max temperature ranges below). These adjustable outputs can be set at the factory to order or default set to 4 to 20mA.

This transmitter can also be ordered in a variety of probe lengths and three mounting enclosures.



Part #s:

N1-T1K[0 TO 100F]-I-2-BB2-A
N1-T1K[0 TO 100F]-I-4-BB-A
N1-T1K[20 TO 120F]-I-2-BB2-A
N1-T1K[32 TO 212F]-I-2-BB2-A
N1-T1K20-120F-I-2-BB2-M304-A
N1-T1K20-120F-I-8-BB2-M304-A
N1-T1K32-212F-I-4-BB2-M304-A
N1-T1K32-212F-I-8-BB-M304-A
N1-T1K[0 TO 100F]-I-4-BB2-A
N1-T1K[0 TO 100F]-I-8-BB2-A
N1-T1K[20 TO 120F]-I-4-BB2-A
N1-T1K[32 TO 212F]-I-8-BB-A
N1-T1K20-120F-I-4-BB2-M304-A
N1-T1K32-212F-I-2-BB2-M304-A
N1-T1K32-212F-I-8-BB2-M304-A

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 for 1KΩ RTD, Approximate @ 32ºF (0ºC)
Lead Wire: 22awg stranded
Insulation: Etched Teflon, Plenum rated
Probe: Rigid, 304 Stainless Steel, 0.25" OD
Probe Length: 2", 4" or 8" or per order
Duct Gasket: 1/4" Closed cell foam (impervious to mold)
Enclosure Types:
BBox: .....BB, w/ four ½" NPSM & one ½" drill-out
BBox2: .....BB2, w/ three ½" NPSM & three ½" drill-outs
Enclosure Ratings:
BBox .....BB, NEMA 4, IP66, UV Rated
BBox2 .....BB2, NEMA 4, IP66, UV Rated
Enclosure Material:
BBox .....BB, Polycarbonate, UL94V-0, UV rated
BBox2 .....BB2, Polycarbonate, UL94V-0, UV rated
Ambient (Enclosure): 0 to 100% RH, Non-condensing
BBox .....BB, -40ºF to 185ºF, (-40º to 85ºC)
BBox2 .....BB2, -40ºF to 185ºF, (-40º to 85ºC)
Agency
RoHS
PT=DIN43760, IEC Pub 751-1983, JIS C1604-1989

Dimensional Drawing

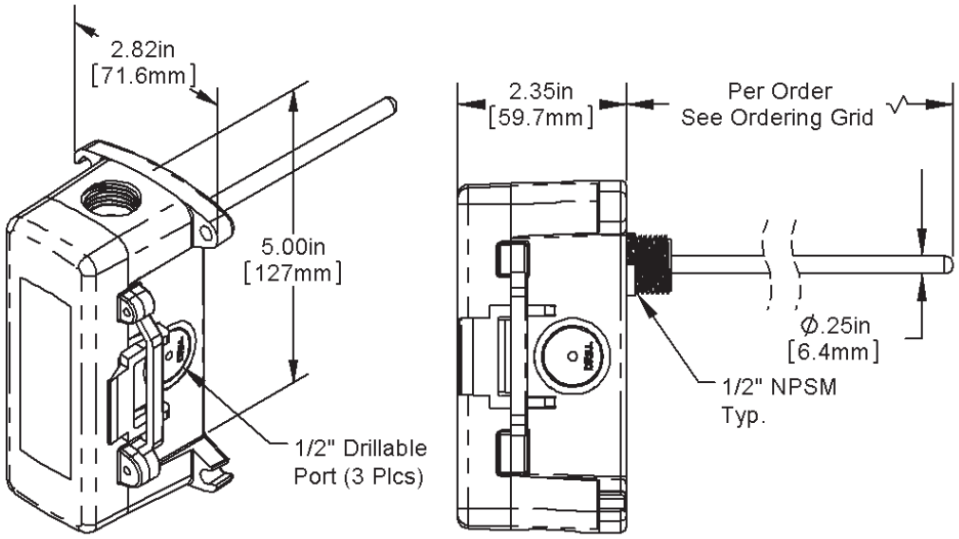


Figure 1: BBox2 (BB2) Immersion

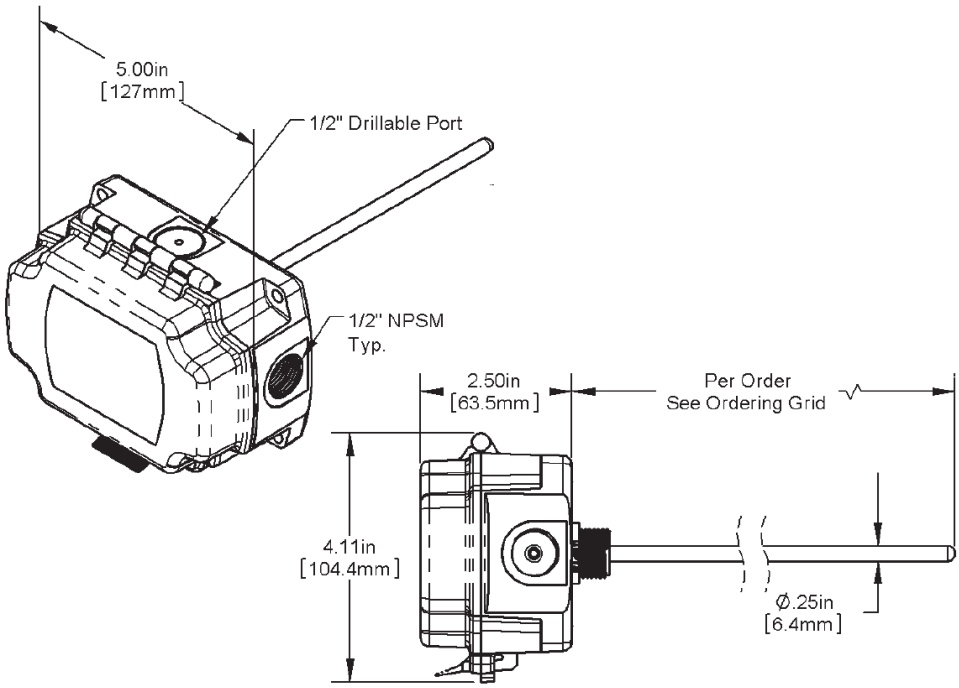


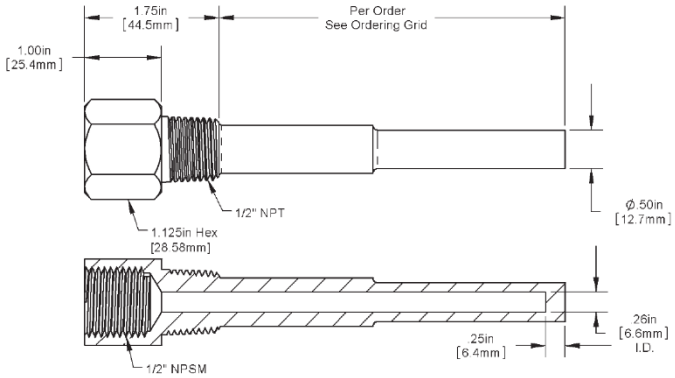
Figure 2: BBox (BB) Immersion

Mounting

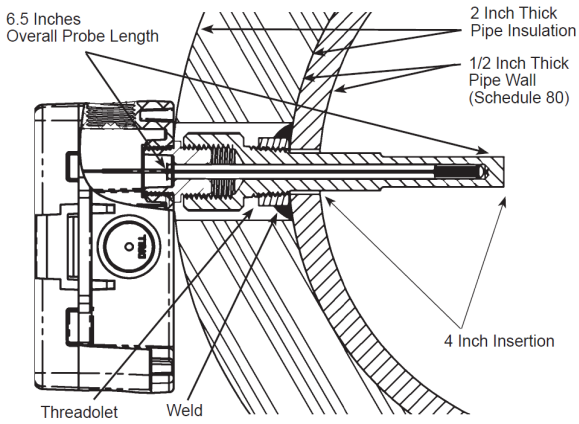
Application: The Typical Corner Mount figure shows a typical four-inch thermowell and four-inch immersion probe installed into an eight inch pipe. In a properly insulated pipe with liquid or steam, the temperature is essentially the same across the entire cross section of the pipe. Usually thermowells are sized to extend to the center of the pipe; however, shorter thermowells will give proper temperature readings if properly insulated. The shorter thermowells are used in pipes with high flow velocities.

Thermowell Installer: Typically a Pipe Fitter drills a ¾-inch hole into the pipe where the thermowell is needed. A customer provided fitting, called a Threadolet or Weldolet, is welded to the pipe over the hole. The Threadolet has a ½" NPT thread in the center. Thread sealant such as Teflon tape or pipe dope is applied to the ½" NPT threads of the thermowell. The thermowell is then inserted into the Threadolet and tightened. Estimates on insertion depths can be seen in our Application note "Thermowells

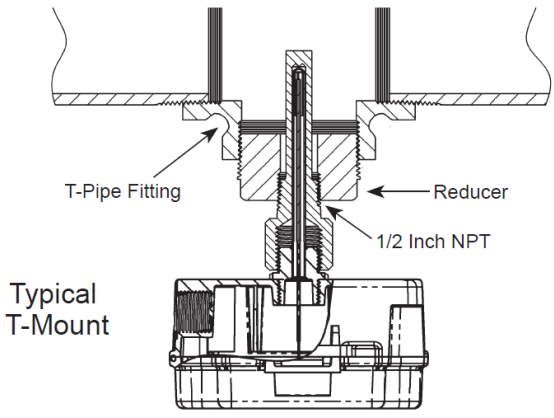
Sensor Installation: Insert the immersion sensor into the well with the plastic screw fitting into the opening on the well. Hand tighten the immersion sensor snugly without too much torque. Make sure that the tip of the immersion sensor is in contact with the bottom of the well by pushing on the top of the probe, without damaging the wires, to bottom out the probe in the thermowell. The unit is designed so that the temperature probe slides in the junction box as the sensor hits the bottom of the thermowell.



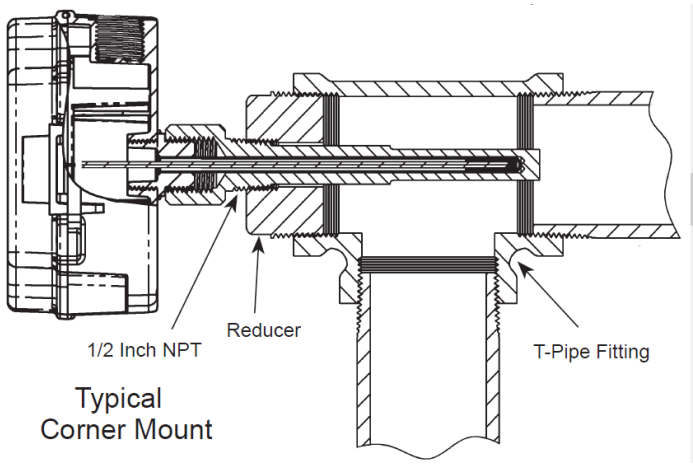
Machined Bar Stock Thermowell



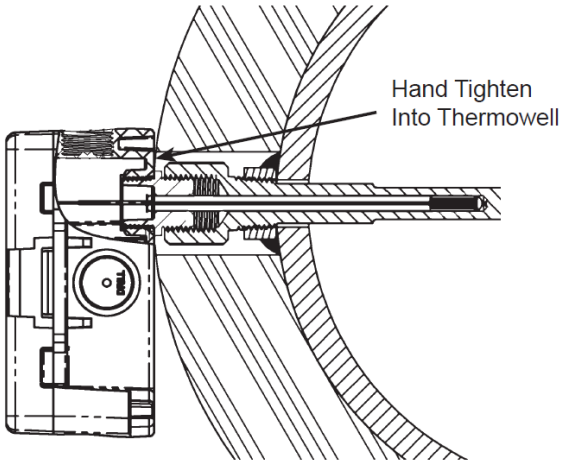
Typical Installation Identification and Dimensions



Typical
T-Mount



Typical
Corner Mount



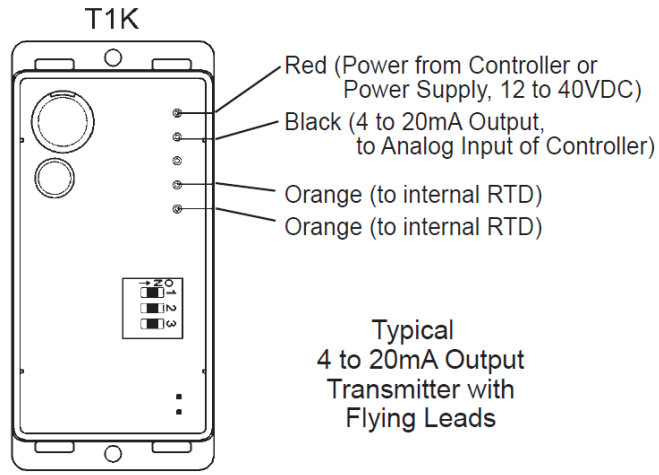
Typical Sensor Inserted

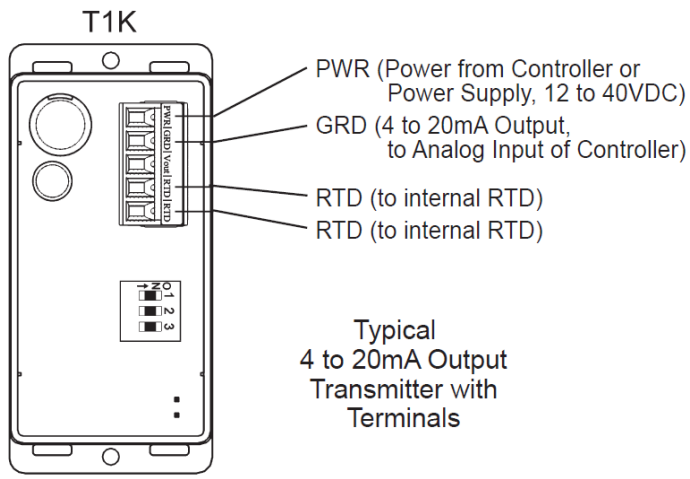
Termination

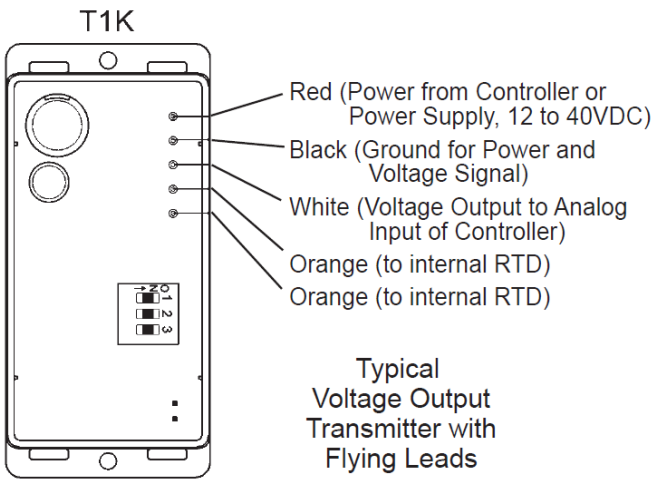
Warning	Wire the product with power disconnected. Proper supply voltage, polarity, and wiring connections are important to a successful installation. Not observing these recommendations may damage the product and will void the warranty.

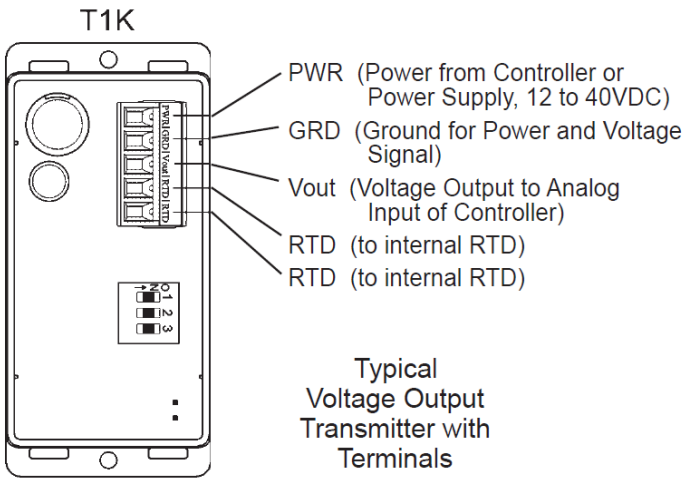
Caution	• Do NOT run this device's wiring in the same conduit as AC power wiring of NEC class1 or NEC class 2, NEC class 3 or with wiring used to supply highly inductive loads such as motors, contactors and relays. Tests show that fluctuating and inaccurate signal levels are possible when AC power wiring is present in the same conduit as the signal lines. 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 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.



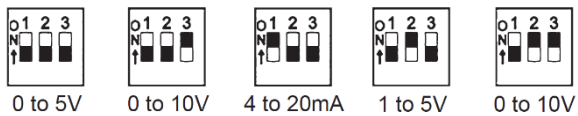






DIP Switch Settings for Field-Selectable Output

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. • 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. • 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. • 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

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.