Duct Temperature Transmitters

Installation & Operations

20913_ins_Duct_Active

rev. 09/11/20

Overview and Identification

The Duct Temperature Transmitter comes in a variety of probe lengths and optional mounting enclosures as shown below.

The 4 to 20mA output transmitter can be ordered with a 1KΩ (385) RTD or a 10K-2 thermistor sensor. A 0 to 5VDC or 0 to 10VDC output is also available with the 10K-2 thermistor.

Special high accuracy RTD matched transmitters (**M**) are available which match the sensor to the transmitter for improved accuracy.

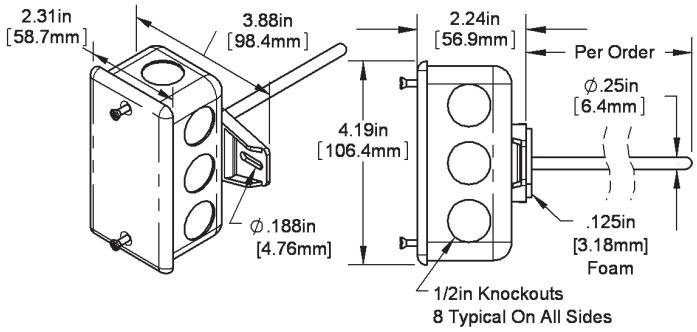

Fig. 1: Duct Unit with J-Box (Standard)

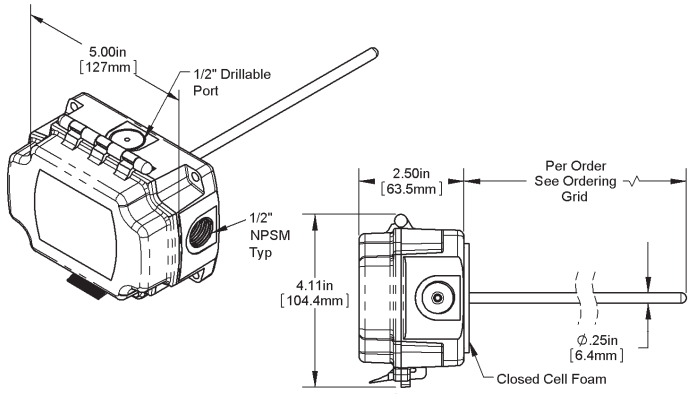

Fig. 2: Duct Unit with BAPI-Box **(BB)** Enclosure

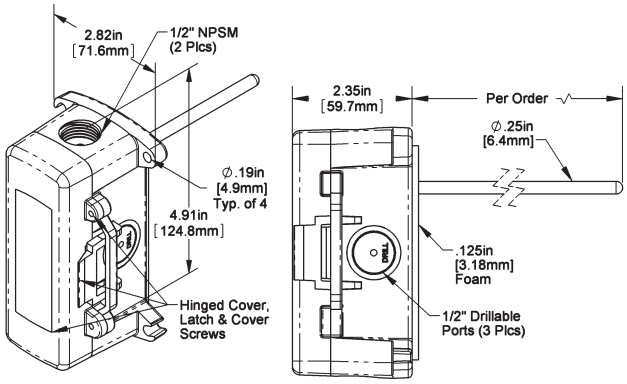

Fig. 3: Duct Unit with BAPI-Box 2 **(BB2)** Enclosure

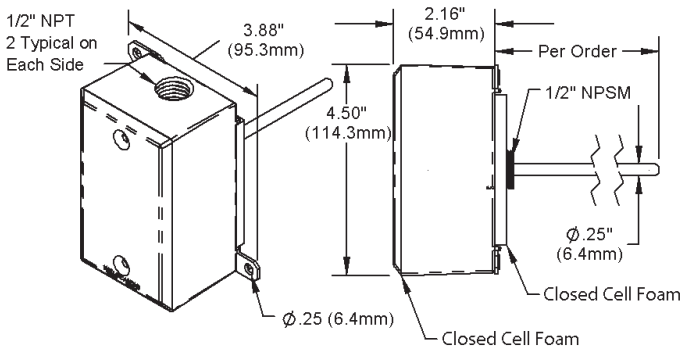

Fig. 4: Duct Unit with Weatherproof **(WP)** Enclosure

Specifications subject to change without notice.

Building Automation Products, Inc., 750 North Royal Avenue, Gays Mills, WI 54631 USA
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Mounting

1. Place the sensor in the middle of the duct away from temperature stratified air, coils or humidifiers to achieve the best temperature reading.
2. Drill the probe hole as depicted on this page for the enclosure being used. Insert the probe into the duct.
3. Mount the enclosure to the duct using BAPI recommended #8 screws through a minimum of two opposing mounting tabs. Weatherproof **(WP)** enclosures require assembly of the mounting tabs on opposite corners. A 1/8 inch pilot screw hole in the duct makes mounting easier through the mounting tabs. Use the enclosure tabs to mark the pilot hole locations.
4. Snug up the sensors so that the foam backing is depressed to prevent air leakage but do not over-tighten or strip the screw threads.

Note 1:
Do not drill into the water tight enclosures **(BB, BB2, WP)** which will violate the NEMA and/or IP rating.

Note 2:
Use caulk or Teflon tape for your conduit entries to maintain the appropriate NEMA or IP rating for your application.

Note 3:
Conduit entry for outdoor or wet applications should be from the bottom of the enclosure.

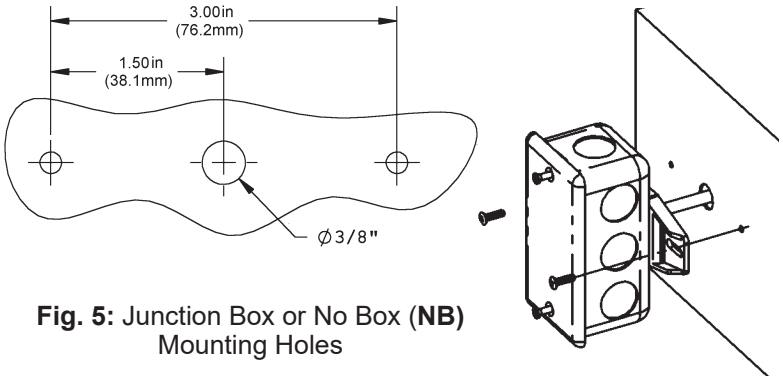

Fig. 5: Junction Box or No Box (**NB**) Mounting Holes

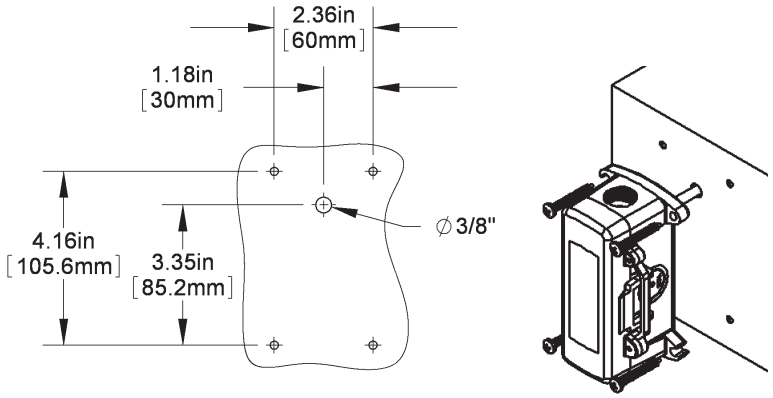

Fig. 6: BAPI-Box 2 **(BB2)** Enclosure Mounting Holes

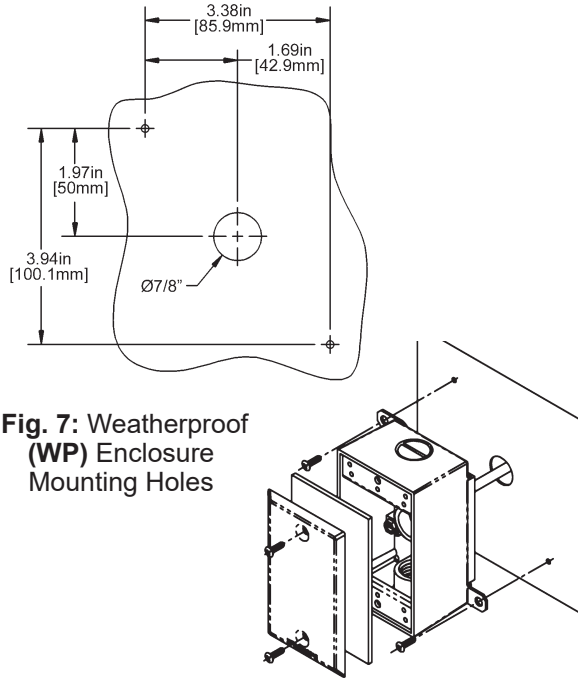

Fig. 7: Weatherproof **(WP)** Enclosure Mounting Holes

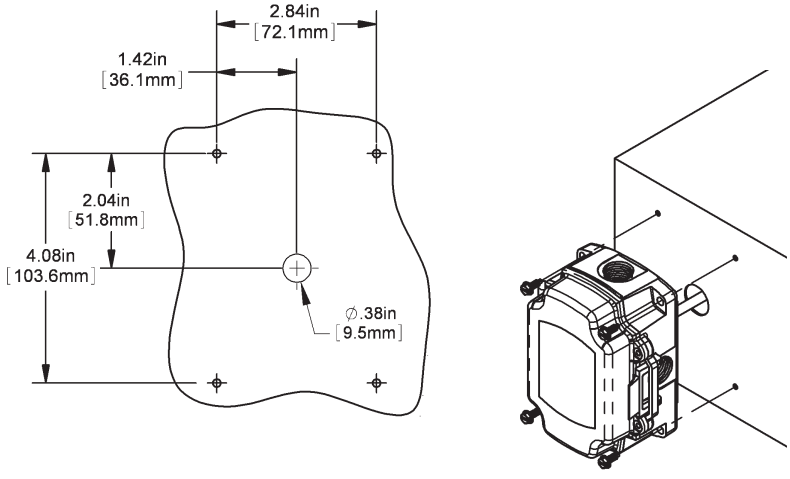

Fig. 8: BAPI-Box (**BB**) Enclosure Mounting Holes, Rotate 90° for Horizontal Mounting

Specifications subject to change without notice.

Wiring & Termination

BAPI recommends using twisted pair of at least 22AWG and sealant filled connectors for all wire connections. Larger gauge wire may be required for long runs. All wiring must comply with the National Electric Code (NEC) and local codes. Do NOT run this device's wiring in the same conduit as high or low voltage AC power wiring. BAPI's tests show that inaccurate signal levels are possible when AC power wiring is present in the same conduit as the sensor wires.

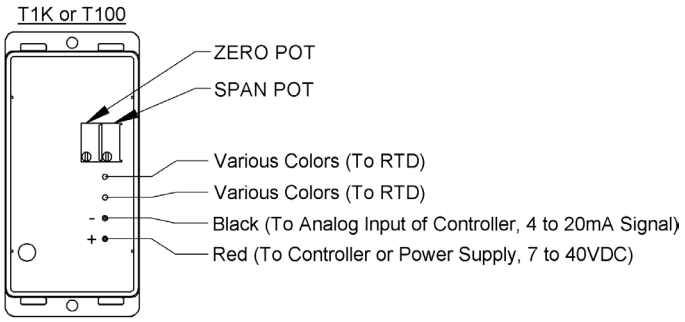

Fig. 9: Typical RTD 4 to 20mA Transmitter with Flying Leads

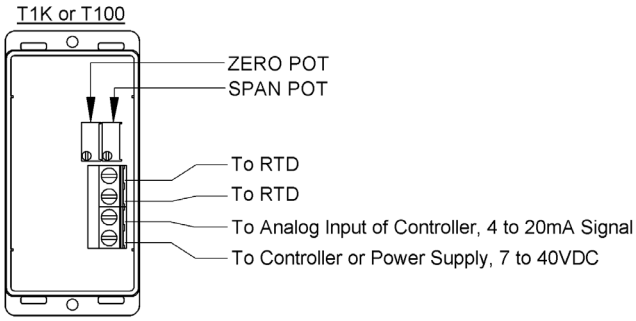

Fig. 10: Typical RTD 4 to 20mA Transmitter with Terminals

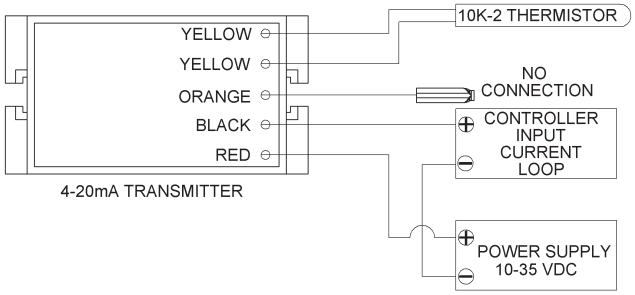

Fig. 11: Typical Thermistor 4 to 20mA Transmitter

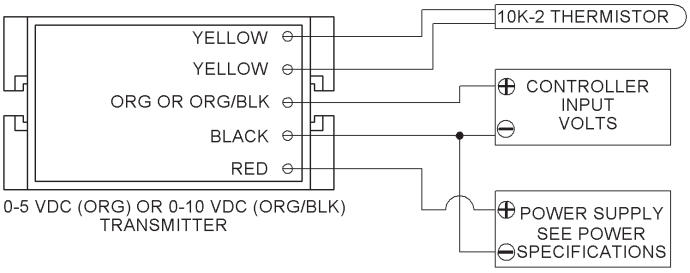

Fig. 12: Typical Thermistor Voltage Transmitter

Diagnostics

Possible Problems:

• Unit will not operate.

Possible Solutions:

- 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

Specifications subject to change without notice.

Specifications

RTD Transmitter

Power Required: .....7 to 40VDC
Transmitter Output: ..4 to 20mA, 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)
Zero & Span Adjust:..10% of span
Accuracy: .....±0.065% of span
Linearity: .....±0.125% of span
Power Output Shift: .±0.009% of span
RTD Sensor: .....2 wire Platinum (Pt), 385 curve
Transmitter Ambient..-4 to 158ºF(-20 to 70ºC)
0 to 95% RH, Non-condensing

Thermistor Transmitter

Supply Voltage:
10 to 35 VDC (0 to 5 VDC or 4 to 20 mA Outputs)
15 to 35 VDC (0 to 10 VDC Output)
12 to 24 VAC (0 to 5 VDC Outputs)
15 to 24 VAC (0 to 10 VDC Output)

Transmitter Output:...4 to 20mA, 700Ω@24VDC
0 to 5 & 0 to 10VDC, 10KΩ min

Output Wiring: .....2 & 3 wire (See wiring detail on pg. 3)
Transmitter Limits: ...-40 to 185ºF, (-40 to 85ºC)
Accuracy: .....±1.015ºC, from (0 to 65ºC)
Linearity: .....±0.065ºC, from (0 to 65ºC)
Resolution: Span/1024
Thermistor Sensor: ..10K-2 Thermistor, 10KΩ @77ºF
Transmitter Ambient: 32 to 158ºF, (0º to 70ºC)
0 to 95% RH, Noncondensing

Thermistor: 10K-2**,**Thermal Resistor (Bare Sensor)
Accuracy (Std): .....±0.36ºF, (±0.2ºC)
Accuracy (High): .....±0.18ºF, (±0.1ºC), **[XP]** option
Stability: .....< 0.036ºF/Year, (<0.02ºC/Year)
Heat Dissipation: .....2.7 mW/ºC
Probe Range: .....-40 to 221ºF (-40 to 105ºC)
Wire Colors:
Standard: .....Yellow/Yellow (no polarity)
High Acc. [XP]: .....Yellow/Yellow (no polarity)

RTD: Resistance Temp Device (Bare Sensor)
Platinum (Pt): .....100Ω and 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)
100Ω, Class B .....Red/Red (no polarity)
100Ω, Class A.....Red/Red-w/black stripe (no polarity)

Sensitivity: Approximate @ 32ºF (0ºC)
Thermistor .....Non-linier – Go to bapihvac.com
click “Resources” and “BAPI
Sensors Overview”

RTD (Pt): .....3.85Ω/ºC for 1KΩ RTD
0.385Ω/ºC for 100Ω RTD

Lead Wire: 22awg stranded

Insulation: Etched Teflon, Plenum rated

Probe: 304 Stainless steel, 0.25” OD

Probe Length: 2”, 4”, 8”, 12” or 18” or per order

Duct Gasket: 1/4” Closed cell foam (impervious to mold)

Enclosure Types: (Part number designator in bold)
J-Box: ..... **-JB,** w/ eight ½” knock-outs
Weatherproof: ... **-WP,** w/ two ½” FNPT entries, (Bell box)
BAPI-Box: ..... **-BB,** w/ four ½” NPSM & one ½” drill-out
BAPI-Box 2: ..... **-BB2,** w/ three ½” NPSM & three ½” drill-outs

Enclosure Ratings: (Part number designator in bold)
J-Box: ..... **-JB,** NEMA 1
Weatherproof: ... **-WP,** NEMA 3R, IP14
BAPI-Box: ..... **-BB,** NEMA 4, IP66, UV Rated
BAPI-Box 2: ..... **-BB2,** NEMA 4, IP66, UV Rated

Enclosure Material: (Part number designator in bold)
J-Box: ..... **-JB,** Galvanized steel, UL94H-B
Weatherproof:.... **-WP,** Cast Aluminum, UV rated
BAPI-Box:..... **-BB,** Polycarbonate, UL94V-0, UV rated
BAPI-Box 2: ..... **-BB2,** Polycarbonate, UL94V-0, UV rated

Ambient (Encl.) .. 0 to 100% RH, Non-condensing
BAPI-Box..... **-BB,** -40ºF to 185ºF, (-40º to 85ºC)
BAPI-Box 2..... **-BB2,** -40ºF to 185ºF, (-40º to 85ºC)
Weatherproof .... **-WP,** -40ºF to 212ºF, (-40º to 100ºC)
J-Box ..... **-JB,** -40ºF to 212ºF, (-40º to 100ºC)

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

Specifications subject to change without notice.