



BAPI Averaging Duct Sensors Installation Guide

[Home](#) » [BAPI](#) » BAPI Averaging Duct Sensors Installation Guide 



Contents

- [1 Overview and Identification](#)
- [2 Mounting](#)
- [3 Wiring & Termination](#)
- [4 Diagnostics](#)
- [5 Specifications](#)
- [6 Documents / Resources](#)
- [7 Related Posts](#)

Overview and Identification

The Averaging Duct Sensor measures stratified air to give the average temperature along the length of the sensor. The probe is made of flexible aluminum and is available in multiple thermistors or RTD options and multiple enclosure styles. RTDs have continuous wire strands that measure an average temperature along their entire length. Averaging probes with an RTD will measure an average temperature along their entire length without gaps between the sensing elements. Thermistors are multi-point discrete sensing elements. Averaging units with thermistors will have 4 or 9 individual thermistors spread evenly throughout the tube. Coils less than 24' (7.3m) have 4 sensors, and coils 24' and greater have 9 sensors (see Fig 10).

Fig. 1: Duct Unit with No Box (NB)

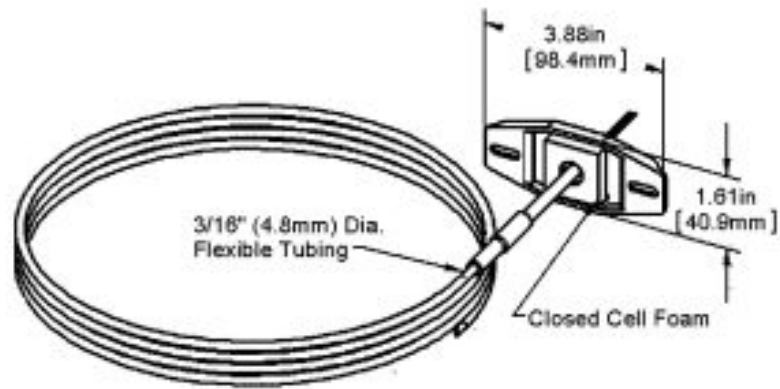


Fig 2: Duct Unit with J-Box (Standard)

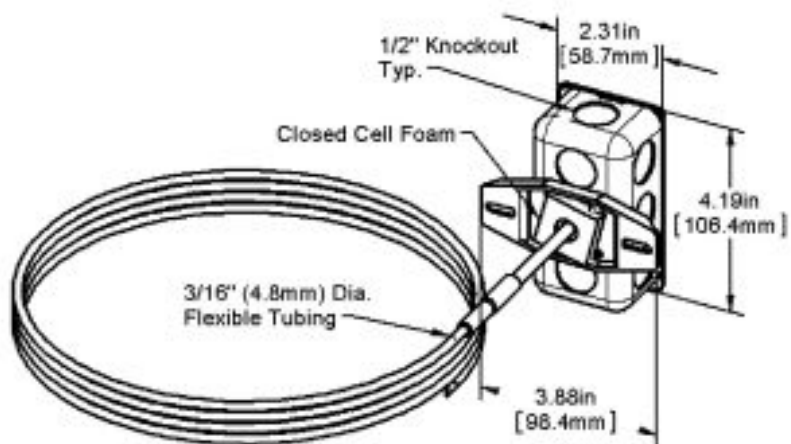


Fig. 3: Weatherproof (WP) Duct Unit

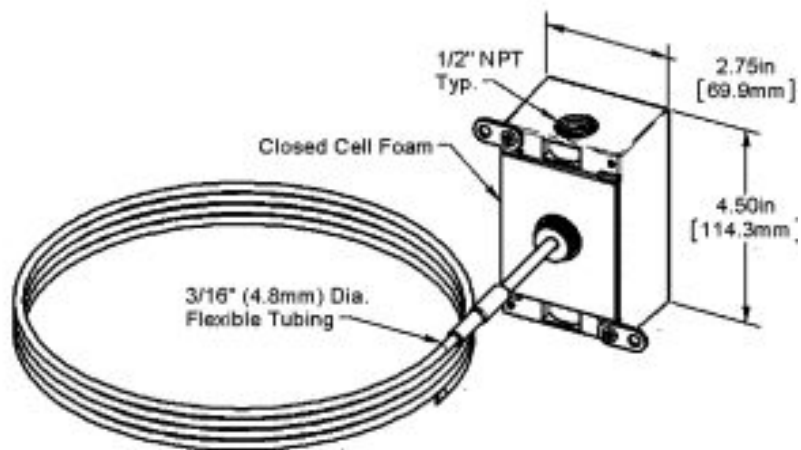


Fig. 4: BAPI-Box (BB) Duct Unit

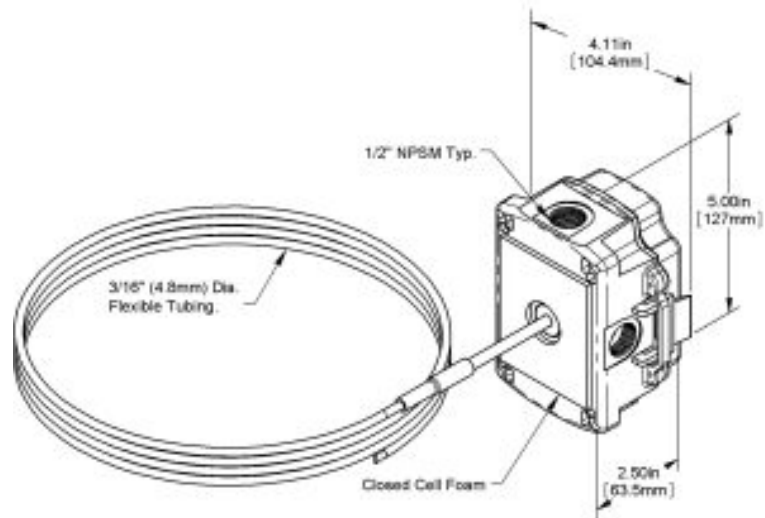


Fig. 5: BAPI-Box 2 (BB2) Duct

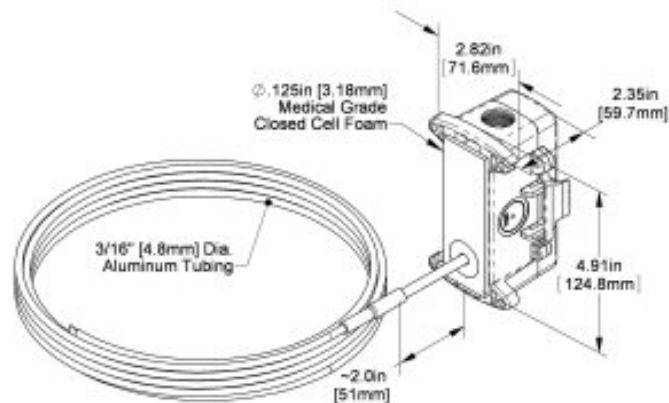


Fig. 6: BAPI-Box 4 (BB4) Duct Unit A Pierceable Knockout Plug is available for the open port in the BB4. (BA/PKP-100)

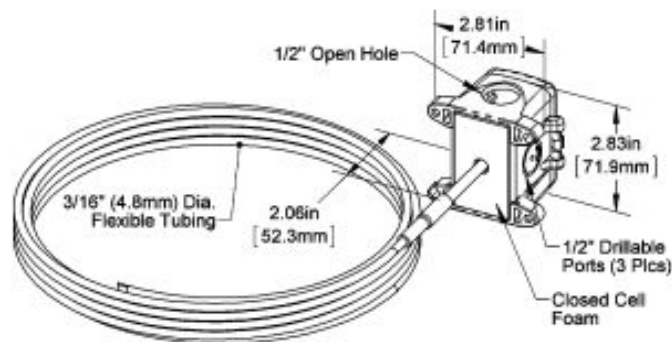
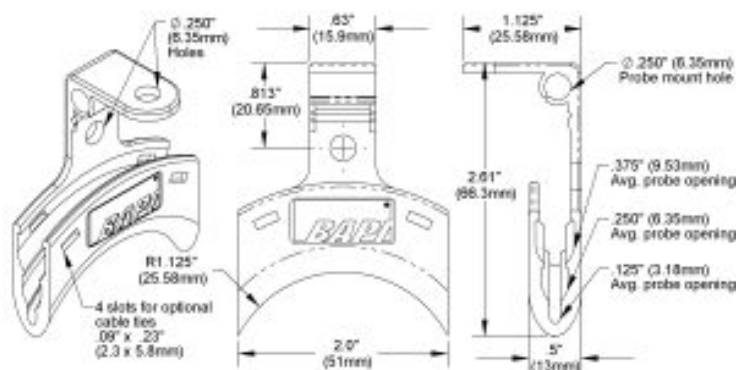


Fig. 7: Flexible Probe Bracket for mounting averaging sensors (Part #: BA/FPB)



Mounting

1. Place the sensor in the middle or top of the duct as shown in Figs 8 & 9 and drill the probe and mounting holes as depicted for the enclosure being used.
2. Insert the probe by unrolling it into the duct carefully to avoid kinking. Serpentine the probe at least twice across the stratified air in the duct to achieve the best average temperature reading. At the probe reversing points, a BAPI Flexible Probe Bracket (Fig 7) can be used to support the sensor, avoid kinking and provide isolation from the duct wall.
3. Mount the enclosure to the duct using BAPI recommended 5/16" self-tapping, self-drilling sheet metal screws through a minimum of two opposing mounting tabs. A 1/8" pilot screw hole in the duct makes mounting easier through the mounting tabs. Use the enclosure tabs to mark the pilot hole locations. Weatherproof (WP) enclosures require assembly of the mounting tabs on opposite corners.
4. Snug up the sensors so that the foam backing is depressed to prevent air leakage but do not over-tighten or strip the duct wall.

Note 1: Be sure not to drill into the weatherproof enclosures (BB, BB2, WP) which will violate the NEMA and/or the IP rating.

Note 2: Be sure to seal your conduit entries to maintain the appropriate NEMA or IP rating for your application if required.

THERMISTOR SENSOR ELEMENT LOCATIONS IN AVERAGING PROBES

8' (2.4m) – First element located about 8" (200mm) from the tip. Spacing between thermistors is 27-1/2" (700mm).

12' (3.7m) – First element located about 8" (200mm) from the tip. Spacing between thermistors is 42-1/2" (1080mm).

24' (7.3m) – First element located about 15-3/4" (400mm) from the tip. Spacing between thermistors is 31-1/2" (800mm).

50' (15.2m) – First element located about 15-3/4" (400mm) from the tip. Spacing between thermistors is 70-3/4" (1800mm).

Fig. 8: Flexible Sensor Horizontal Mount (Best for Vertical Stratification)

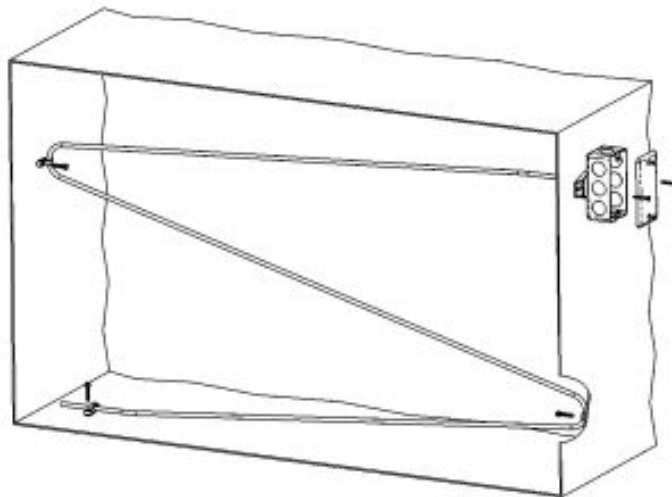


Fig. 9: Flexible Sensor Vertical Mount (Best for Horizontal Stratification)

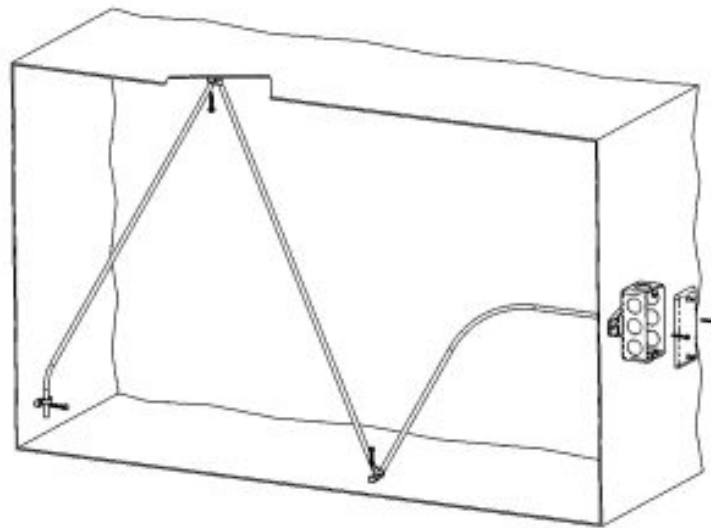


Fig. 10: Thermistor Sensor Element Location in Probes

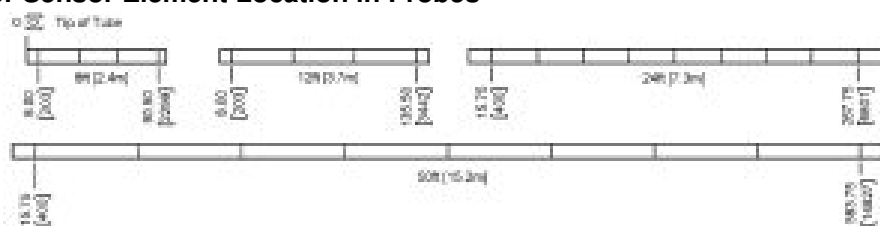


Fig. 11: Junction Box or No Box (NB) Mounting Holes and installation

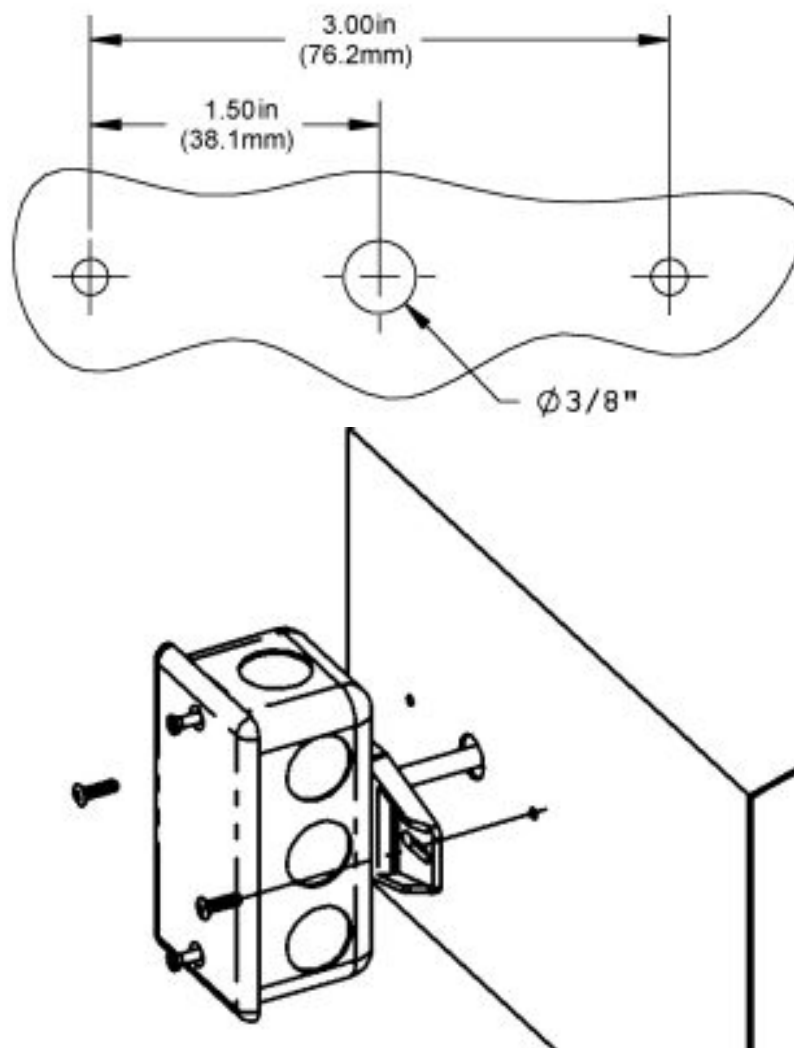


Fig. 12: BAPI-Box 2 (BB2) Mounting Holes and installation.

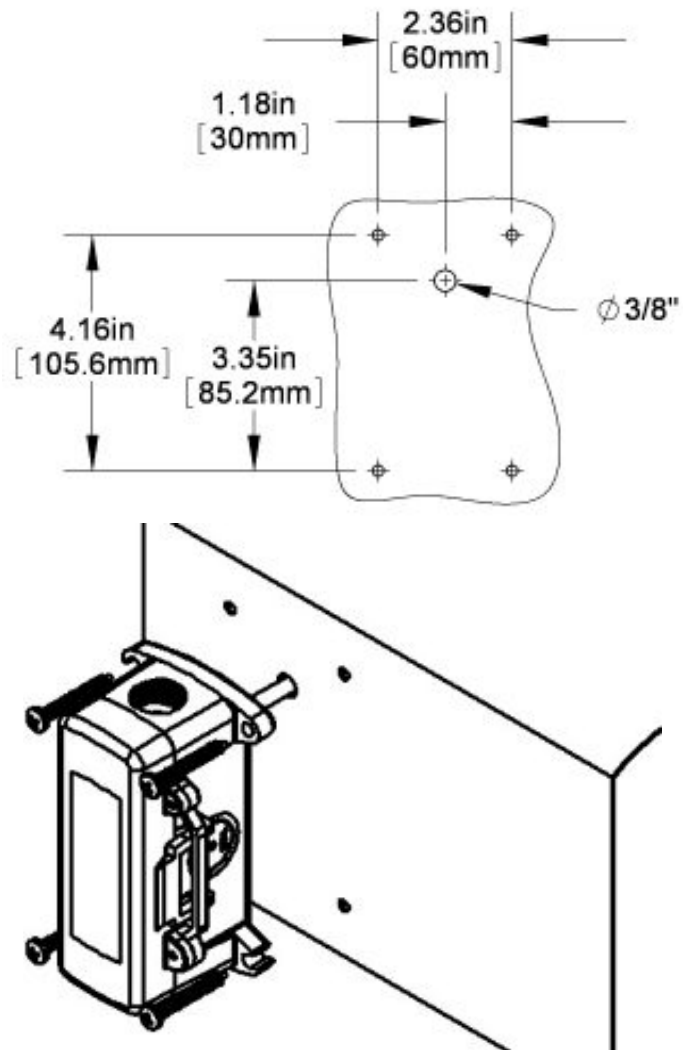
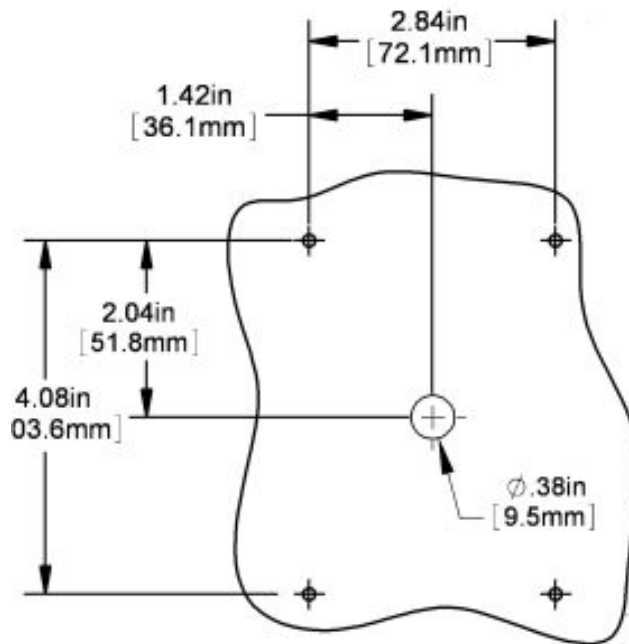


Fig. 13: BAPI-Box (BB) Enclosure Mounting and installation Holes (Rotate 90° for Horizontal Mounting)



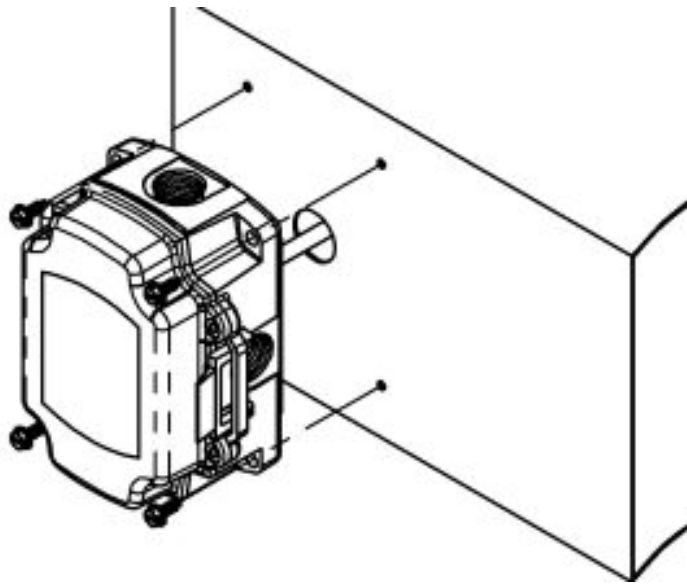


Fig. 14: Weatherproof Box (WP) Mounting Holes and Installation

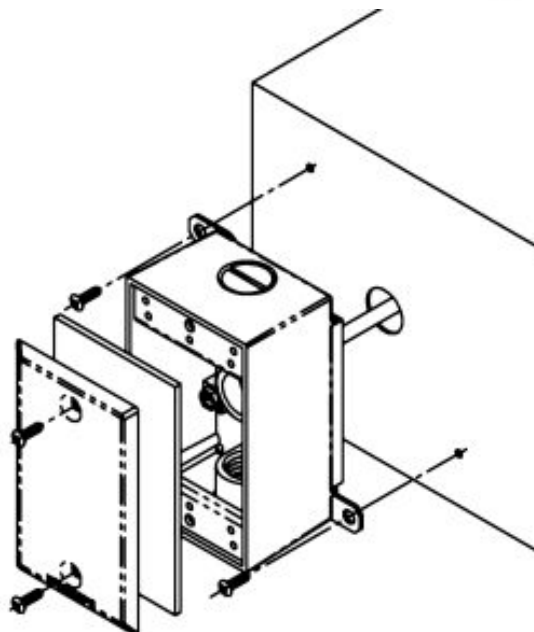
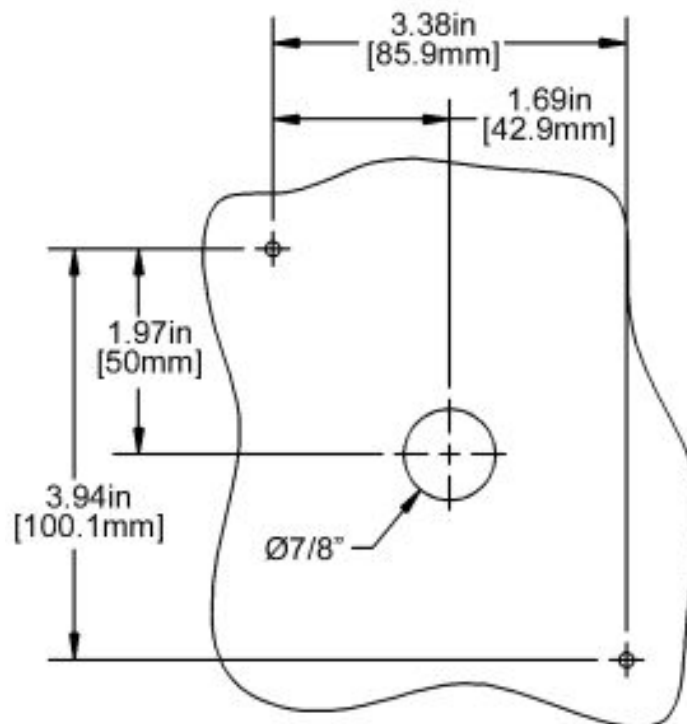
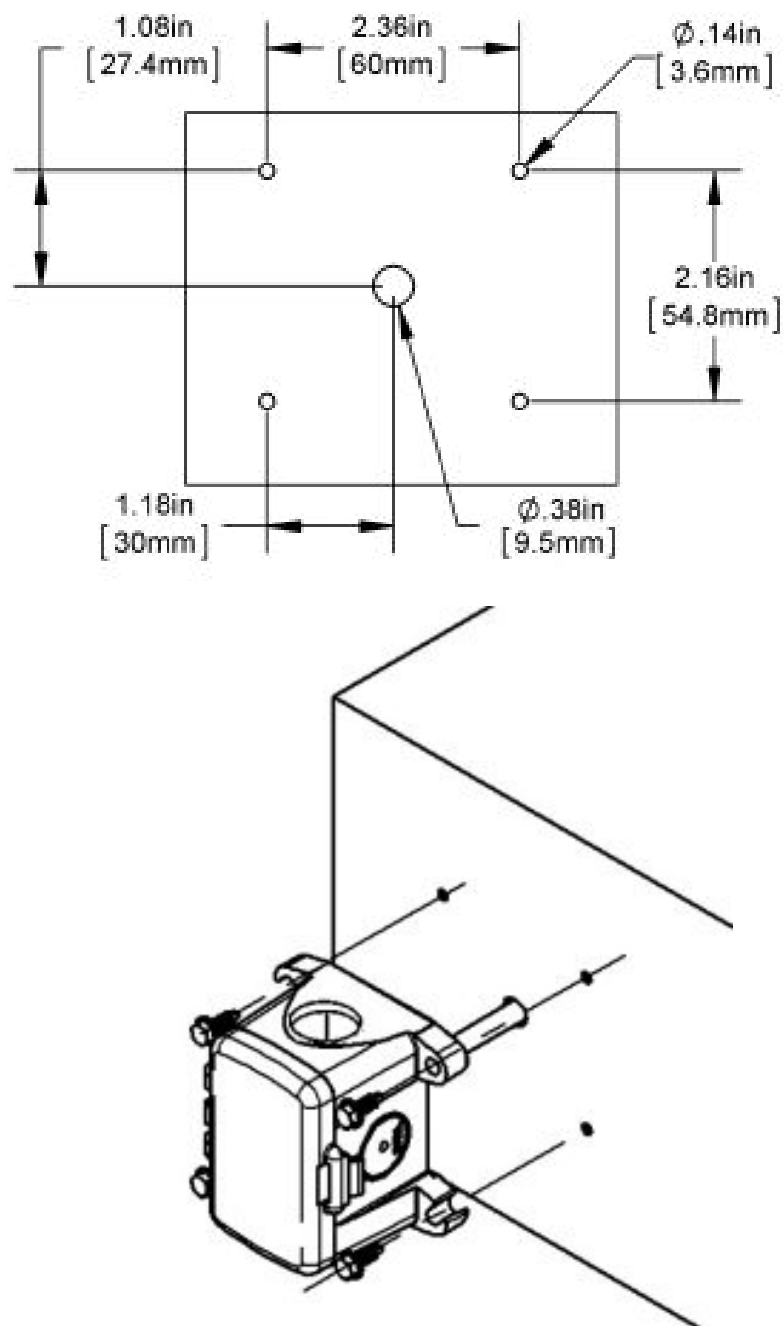


Fig. 15: BAPI-Box 4 (BB4) Enclosure Mounting Holes and Installation



Wiring & Termination

BAPI recommends using twisted pair of at least 16 to 22AWG stranded wire and sealant-filled connectors for all wire connections. A 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. 16: 2 Wire Termination for Thermistor or RTD

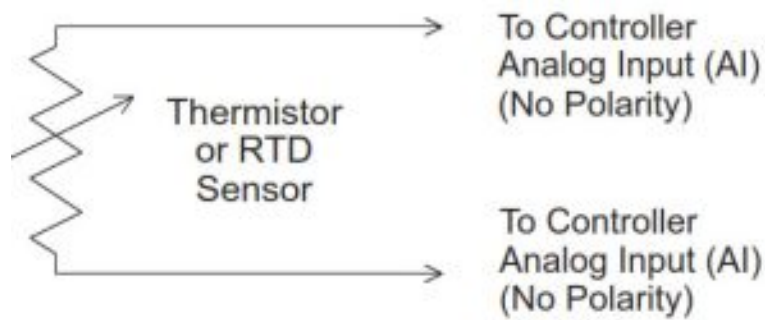


Fig. 17: 3 Wire Termination for RTD

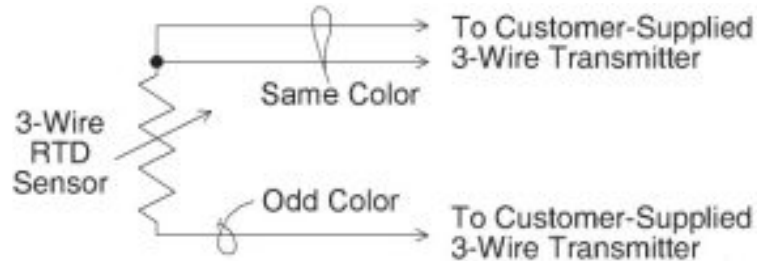


Fig. 18: Terminal Strip (-TS) Option for 2 Wire Sensors Termination

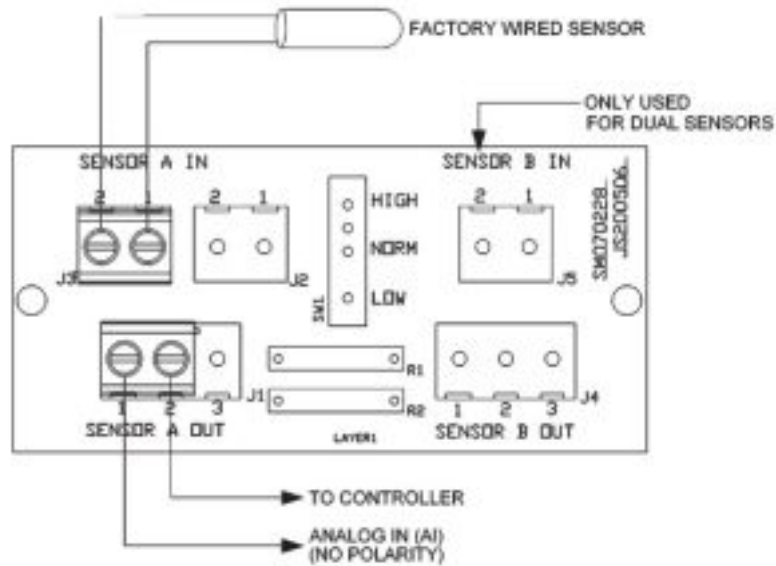


Fig. 19: Terminal Strip (-TS) Option for 3 Wire Sensors Termination

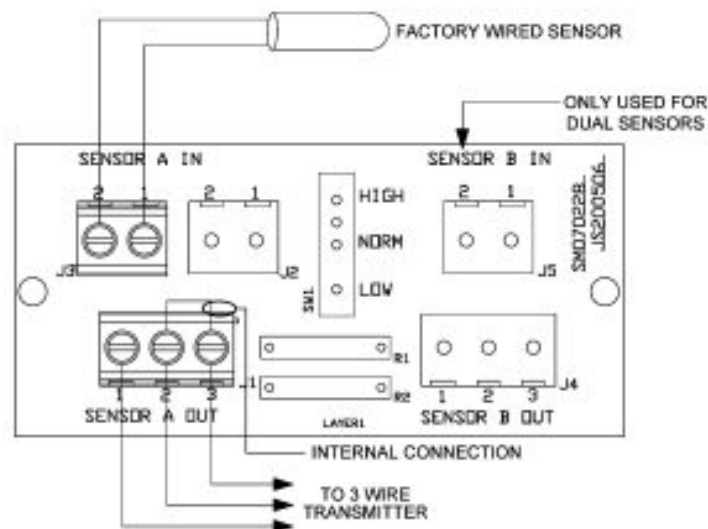


Fig. 20: Test & Balance (-TB) Option for 2 Wire Sensors Termination

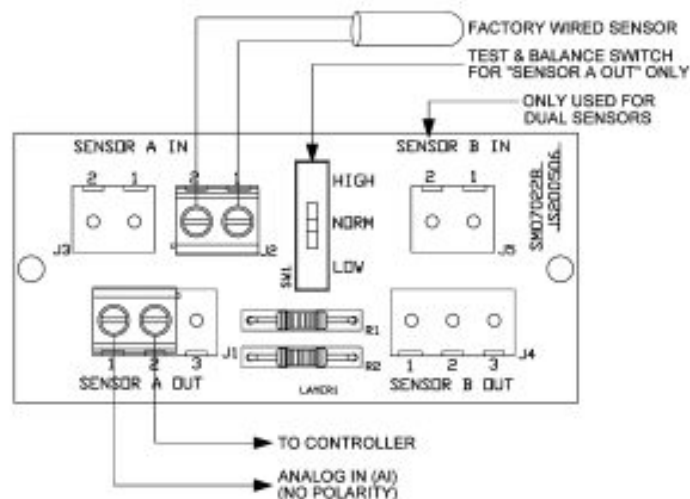
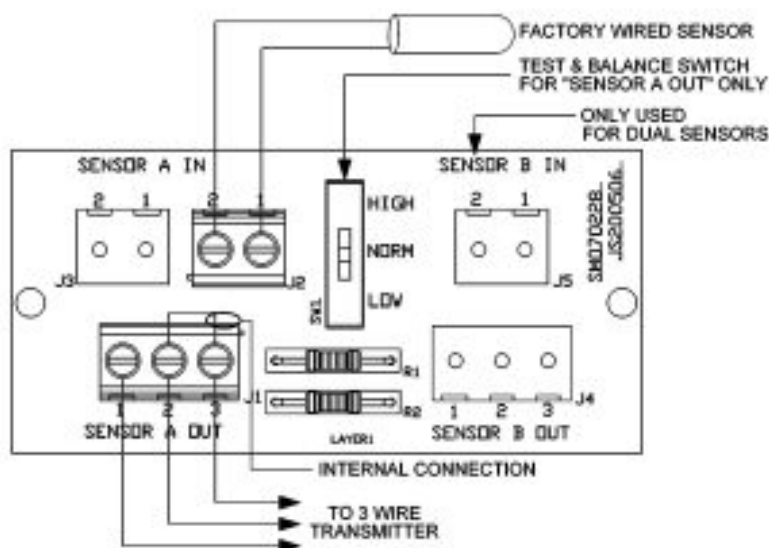


Fig. 21: Test & Balance (-TB) Option for 3 Wire Sensors Termination



Diagnostics

Problems: The controller reports higher or lower than the actual temperature.

Possible Solutions:

- Confirm the input is set up correctly in the front-end software.
- Check to wire for proper termination & continuity (shorted or open wires).
- Measure the temperature at the temperature sensor's location using an accurate temperature standard. Disconnect the temperature sensor wires and measure the temperature sensor's resistance with an ohmmeter. Compare the temperature sensor's resistance to the appropriate temperature sensor table on the BAPI website. If the measured resistance varies from the table by more than 5%, call BAPI technical support. BAPI's website is found at www.bapihvac.com; click on the "Resources" then "BAPI Sensors Overview" and then click on the type of sensor you have.

Specifications

Sensor: Passive

Thermistor4 sensors in < 24' probes

9 sensors in > 24' probes

RTDContinuous sensor, 2 or 3 wire

Thermistor: Thermal resistor (NTC)

Temp. OutputResistance per order

Accuracy(std) $\pm 0.36^{\circ}\text{F}$, ($\pm 0.2^{\circ}\text{C}$)

Accuracy(High) $\pm 0.18^{\circ}\text{F}$, ($\pm 0.1^{\circ}\text{C}$), [XP] option

Stability< 0.036°F/Year, (<0.02°C/Year)

Heat dissipation2.7 mW/°C

Temp. Drift<0.02°C per year

Probe range-40° to 221°F (-40° to 105°C)

RTD: Resistance Temp Device (PTC)

Platinum (Pt)100Ω and 1KΩ @0°C, 385 curve

Platinum (Pt)1KΩ @0°C, 375 curve

Pt Accuracy (std) 0.12% @Ref or ±0.55°F, (±0.3°C)

Pt Stability±0.25°F, (±0.14°C)

Pt Self Heating0.4 °C/mW @0°C

Pt Probe Range-40° to 221°F, (-40 to 105°C)

Nickel (Ni)1000Ω @70°F, JCI curve

Ni Probe Range-40° to 221°F (-40 to 105°C)

Sensitivity: Approximate

Thermistor Non-linear – Go to bapihvac.com

click “Resources” and “BAPI

Sensors Overview”

Plat. RTD3.85Ω/°C for 1KΩ RTD

0.385Ω/°C for 100Ω RTD

Nickel RTD2.95Ω/°F for the JCI RTD

Lead Wire: 22AWG stranded, etched Teflon, plenum-rated

Probe: Flexible aluminum tube, 3/16” (4.8mm) OD

Probe Length: 8’, 12’ & 24’ (2.4m, 3.7m, 7.3m) per order

Duct Gasket: 1/4” (6.4mm) closed cell foam (impervious to mold)

Enclosure Ratings

J-Box -JB, NEMA 1

No Box -NB, No rating

Weather Proof -WP, NEMA 3R, IP14

BAPI-Box -BB, NEMA 4X, IP66

BAPI-Box 2 -BB2, NEMA 4X, IP66

BAPI-Box 4: -BB4, IP10 (IP44 with Knockout Plug installed)

Enclosure Materials

J-Box -JB, Galvanized steel, UL94H-B

No Box -NB, Nylon 66, UL94H-B

Weather Proof -WP, Cast Aluminum, UV rated

BAPI-Box -BB, Polycarbonate, UL94V-0, UV rated

BAPI-Box 2 -BB2, Polycarbonate, UL94V-0, UV rated

BAPI-Box 4: -BB4, Polycarbonate & Nylon, UL94V-0

Ambient (Encl.) 0 to 100% RH, Non-condensing

All BAPI-Boxes -BB, BB2, BB4, -40°F to 185°F, (-40° to 85°C)

J-Box & No Box -JB, NB, -40°F to 212°F, (-40° to 100°C)

Weatherproof -WP, -40°F to 212°F, (-40° to 100°C)

Agency

RoHS, *CE

PT=DIN43760, IEC Pub 751-1983,

JIS C1604-1989

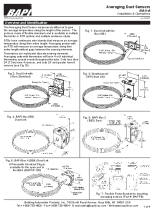
*Passive Thermistors 20KΩ and smaller are CE

Specifications are subject to change without notice.

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Documents / Resources



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