Duct Averaging Sensors in the BAPI-Box Crossover Enclosure

Installation & Operations

37707_ins_ductavg_passive_bbx rev. 12/01/20

Overview and Identification

The Duct Averaging sensor is for temperature measurement of stratified air and provides an average temperature along its length. The flexible probe is made of bendable aluminum. The Averaging Sensor is available in multiple thermistor or RTD sensor options. The BAPI-Box Crossover enclosure has a hinged cover for easy termination and comes with an IP10 rating (or IP44 with a pierceable knockout plug installed in the open port).

The BAPI Flexible Probe Bracket (Fig. 7) is used to mount averaging sensors. It makes a smooth arc at direction changes to eliminate the risk of kinking.

RTDs are available in long wire strands that measure an average temperature along their entire length. Therefore averaging units with RTD sensors will measure an average temperature along their entire length without gaps between the sensing elements.

Thermistors only come in single point sensing elements. Therefore an averaging unit with thermistor sensors 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 6).

This instruction sheet is specific to units with the BAPI-Box Crossover Enclosure. For other enclosures, please refer to instruction sheet "20903_ins_duct_avg_passive.pdf" which is available on the BAPI website or by contacting BAPI.

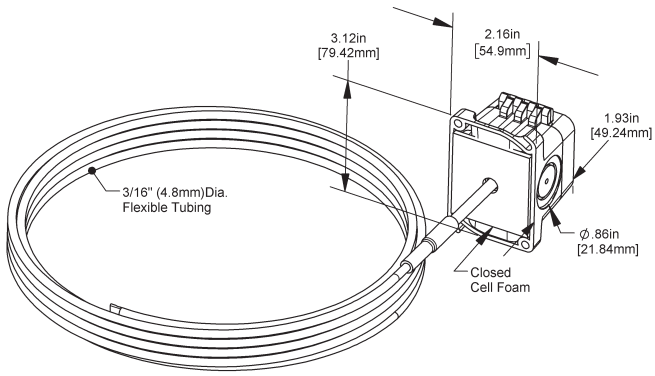

Fig. 1: Duct Averaging Unit with BAPI-Box Crossover Enclosure

Specifications

Sensor: Passive
- Thermistor .....4 sensors in 8' and 12' probes
  9 sensors in 24' or longer probes
- RTD .....Continuous sensor, 2 or 3 wire

Thermistor: Thermal resistor
- Temp. Output..... Resistance
- 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
- Temp. Drift..... <0.02ºC per year
- Probe Range ..... -40º to 221ºF (-40º to 105ºC)

RTD: Resistance Temperature Device
- Platinum (Pt) ..... 1KΩ @0ºC, 385 curve,
- Platinum (Pt) ..... 1KΩ @0ºC, 375 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 ..... -40º to 221ºF, (-40 to 105ºC)
- Nickel (Ni) ..... 1000Ω @70ºF, JCI curve
- Ni Probe Range ..... -40º to 221ºF (-40 to 105ºC)

Sensitivity: Approximate @ 32ºF (0ºC)
- Thermistor ..... See bapihvac.com "Sensor Specs"
- 1KΩ RTD (Pt) ... 3.85Ω/ºC
- Nickel (Ni) ..... 2.95Ω/ºF for the JCI RTD

BAPI-Box Crossover Enclosure Ratings:
IP10, NEMA 1
IP44 with knockout plug installed in the open port

BAPI-Box Crossover Enclosure Material:
UV-resistant polycarbonate & Nylon, UL94V-0

Environmental Operating Range:
-40 to 185ºF (-40 to 85ºC)
0 to 100% RH, Non-condensing

Lead Wire: 22awg stranded

Wire Insulation: 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)

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

Specifications subject to change without notice.

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Mounting

1. Place the sensor in the middle or top of the duct as shown in Figs 2 or 3 and drill the probe and mounting holes as shown in Fig 4.
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.
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.
5. A pierceable knockout plug is available for the open port in the BAPI-Box Crossover enclosure (see Fig. 5). The plug increases the enclosure rating from IP10 to IP44.

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

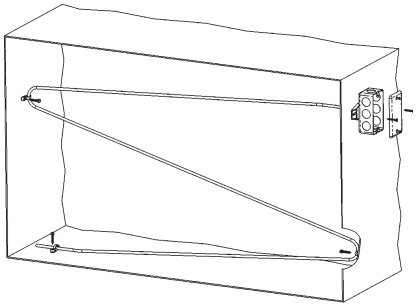

Fig. 2: Flexible Sensor Horizontal Mount (Best for Vertical Stratification)

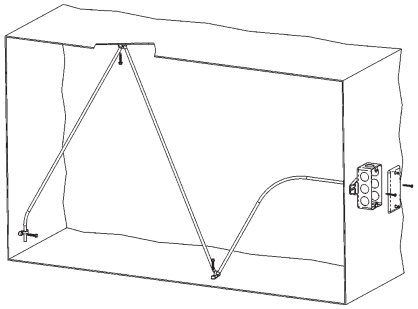

Fig. 3: Flexible Sensor Vertical Mount (Best for Horizontal Stratification)

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).

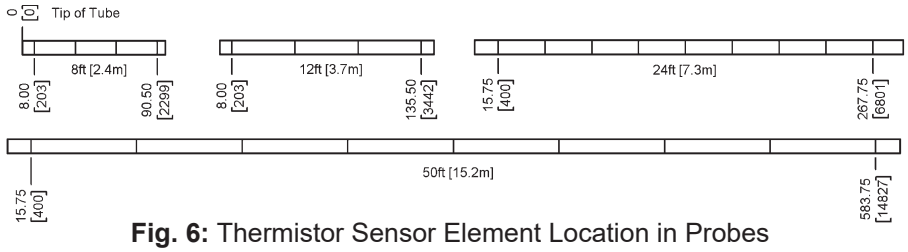

Fig. 6: Thermistor Sensor Element Location in Probes

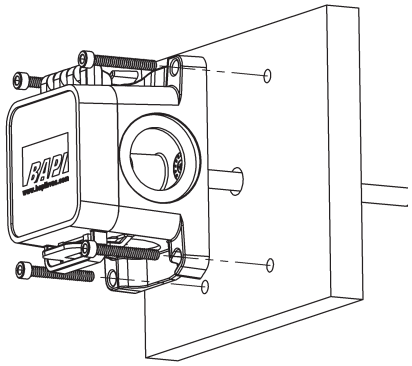

Fig. 4: BAPI-Box Crossover Mounting to the Duct

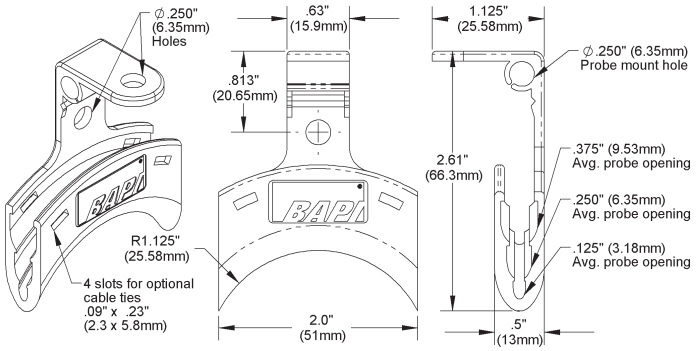

Fig. 7: Flexible Probe Bracket **(BA/FPB)** (Order Separately)

Fig. 5: Pierceable knockout plug (above) and inserted into the open port of the BAPI-Box Crossover.

Wiring & Termination

BAPI recommends using twisted pair of at least 16 to 22AWG stranded wire 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.

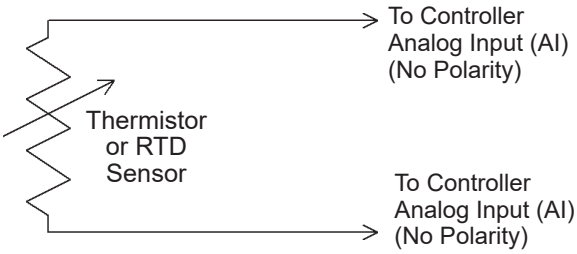

Fig. 8: 2-Wire Termination for Thermistor or RTDs

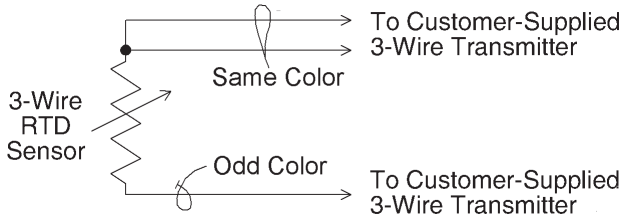

Fig. 9: 3-Wire Termination for RTDs

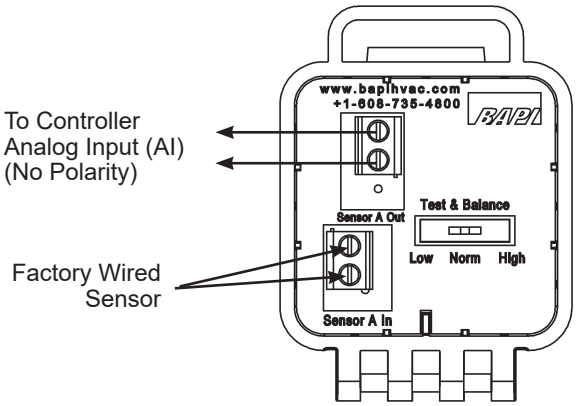

Fig. 10: Terminal Strip (-TS) or Test and Balance (-TB) Option for 2 Wire Sensors

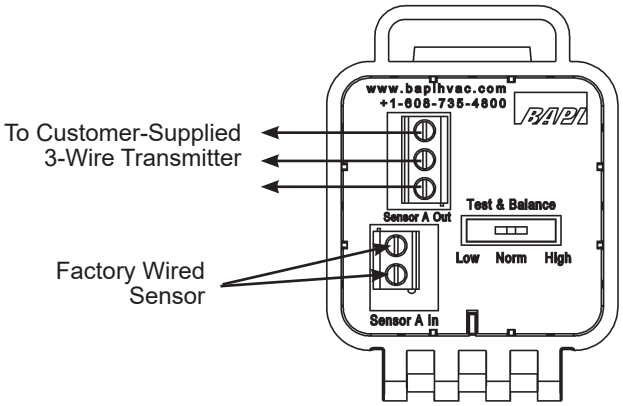

Fig. 11: Terminal Strip (-TS) or Test and Balance (-TB) Option for 3 Wire Sensors

Test and Balance Switch:
For units with a Test and Balance Switch, the Norm position allows the real sensor at be monitored at "Sensor A Out". The High position forces the "Sensor A Out" to a very hot reading and the Low position forces "Sensor A Out" to a very cold reading (see Table below).

Sensor Type	Low Temp (40° F) Resistance Value	High Temp (105°F) Resistance Value
1000Ω RTD	1.02KΩ (41.20°F)	1.15KΩ (101.5°F)
3000Ω Thermistor	7.87KΩ (39.8°F)	1.5KΩ (106.8°F)
10K-2 Thermistor	30.1KΩ (34.9°F)	4.75Ω (109.1°F)
10K-3 Thermistor	26.7KΩ (35.9°F)	5.11KΩ (108.4°F)
10K-3(11K) Thermistor	7.32KΩ (43.7°F)	3.65Ω (105.2°F)

Diagnostics

Possible Problems:

Controller reports higher or lower than actual temperature

Possible Solutions:

- Confirm the input is set up correctly in the front end software.
- Check wiring for proper termination and continuity (shorted or open wires).
- If the unit has a Test and Balance switch, make sure that the switch is in the center “Norm” position.
- Measure the physical temperature at the temperature sensor’s location using an accurate temperature standard. Disconnect the temperature sensor wires and measure the temperature sensor’s resistance across the sensor output pins with an ohmmeter. Compare the temperature sensor’s resistance to the appropriate temperature sensor table on the BAPI website. If the measured resistance is different from the temperature table by more than 5%, call BAPI technical support. Find BAPI’s website at www.bapihvac.com; click on “Resource Library” and “Sensor Specs” then click on the type of sensor you have.