Duct Averaging Temperature Transmitters

Installation & Operations

20914_ins_DuctAvgFlex_Active rev. 03/11/24

Overview and Identification

BAPI's Flexible Duct Averaging 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. They can also be ordered with a special high accuracy matched RTD transmitter which matches the sensor to the transmitter for improved accuracy.

This transmitter can also be ordered in a variety or probe lengths and mounting enclosures as shown below. They are available with a wired connection via flying leads or a pluggable terminal block (-TS).

The BAPI Flexible Probe Bracket (Fig. 9) is used to mount averaging sensors. It makes a smooth arc at direction changes to eliminate the risk of kinking.

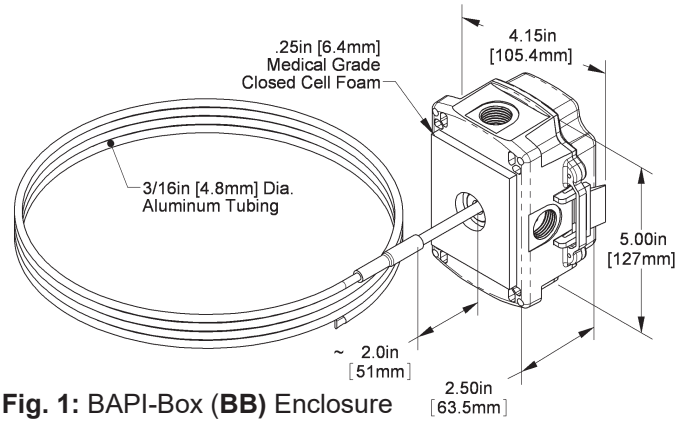


Fig. 1: BAPI-Box (**BB)** Enclosure

Fig. 2: Duct Averaging Unit with Weatherproof (**WP)** Enclosure

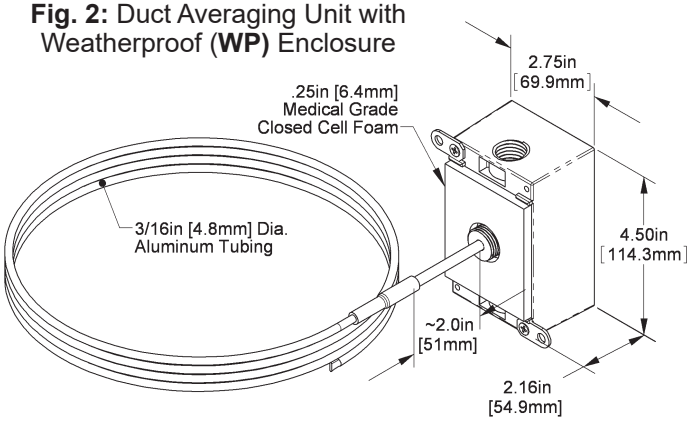
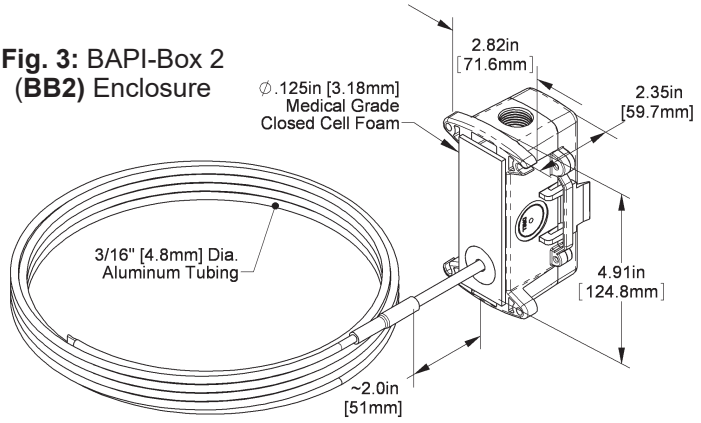


Fig. 3: BAPI-Box 2 (**BB2)** Enclosure



Mounting

1. Place the sensor in the middle or top of the duct as shown in Figs 4 & 5 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 9) 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

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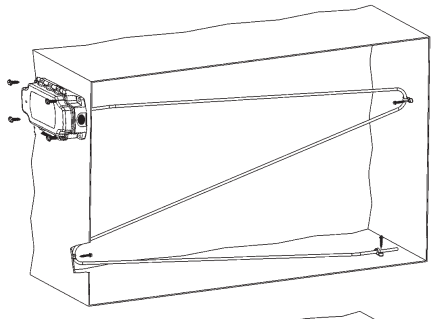


Fig. 4: Flexible Sensor Horizontal Mount (Best for Vertical Stratification)

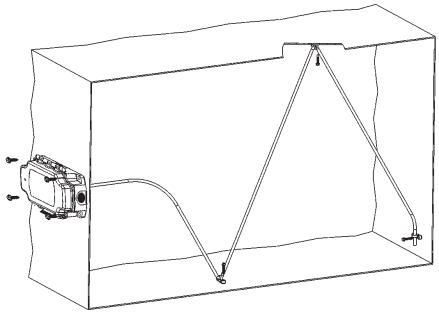


Fig. 5: Flexible Sensor Vertical Mount (Best for Horizontal Stratification)

Mounting continued...

opposite corners.

4. Snug up the sensors so that the foam backing is depressed to prevent air leakage but do not over-tighten.

Note 1: Do not to drill into the enclosures which will violate the NEMA and/or the IP rating.

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

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

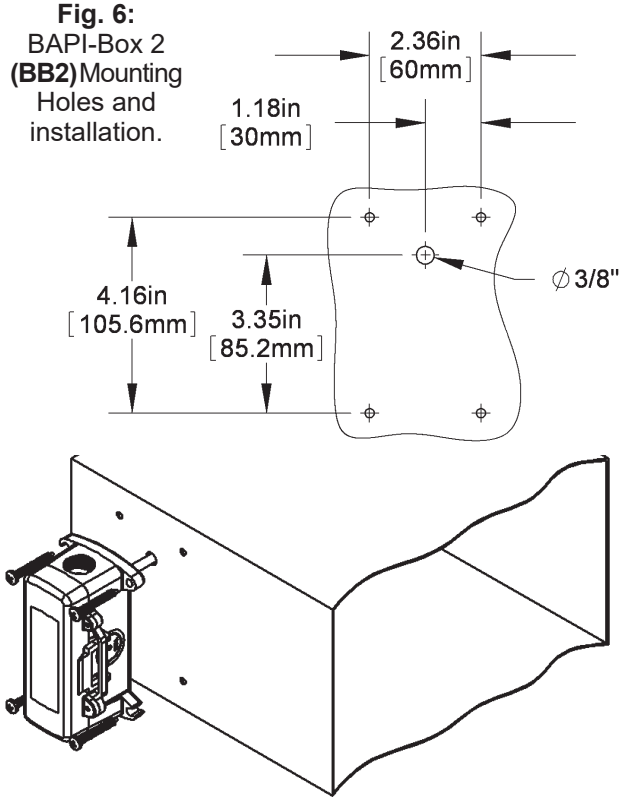
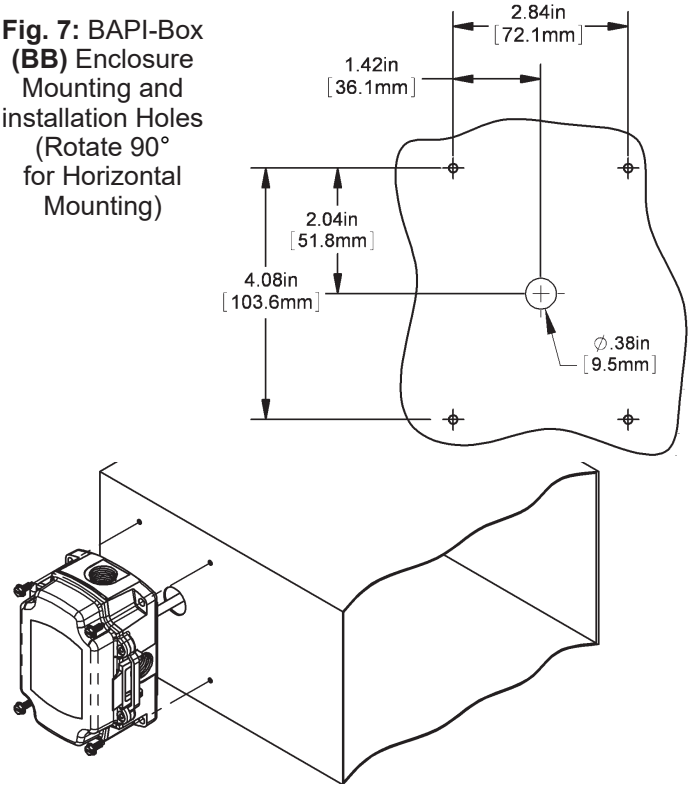


Fig. 7: BAPI-Box **(BB)** Enclosure Mounting and installation Holes (Rotate 90° for Horizontal Mounting)



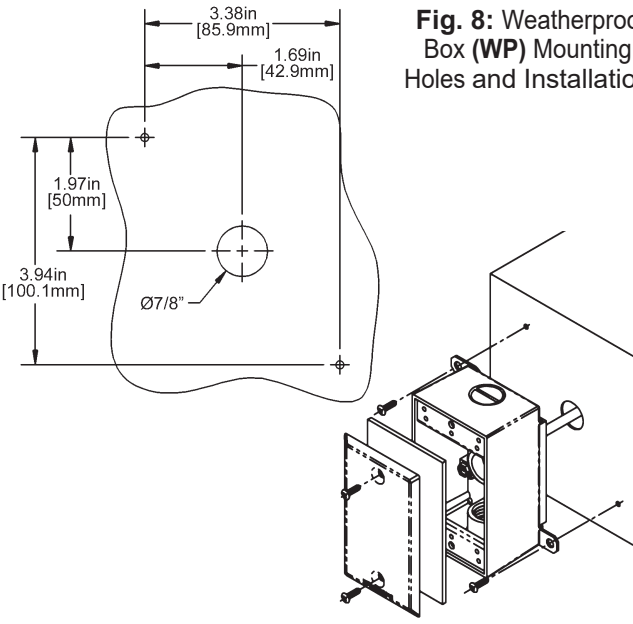


Fig. 8: Weatherproof Box **(WP)** Mounting Holes and Installation

Flexible Probe Bracket

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

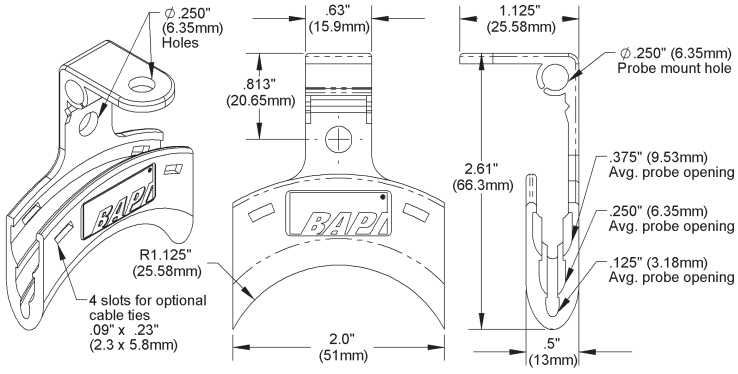


Fig. 9: Flexible Probe Bracket for mounting averaging sensors (Part #: BA/FPB)

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 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. BAPI's tests show that fluctuating and inaccurate signal levels are possible when AC power wiring is present in the same conduit as the signal lines. *Note: Keep transmitter at least 5 feet from any radio wave-emitting device (ie: 2 way radio). Transmitters that are less than 5 feet from a radio wave-emitting device can cause unwanted interference*.

STOP BAPI recommends wiring 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.

4 to 20mA Output with Flying Leads

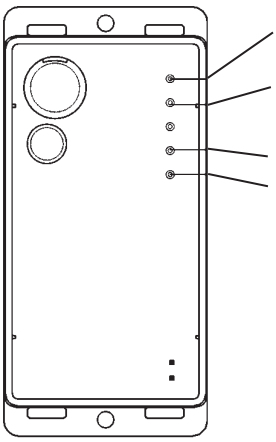


Fig. 10: Typical 4 to 20mA Output Transmitter with Flying Leads

4 to 20mA Output with Terminals

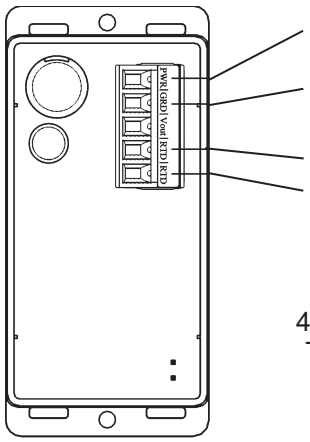


Fig. 11: Typical 4 to 20mA Output Transmitter with Terminals

Voltage Output with Flying Leads

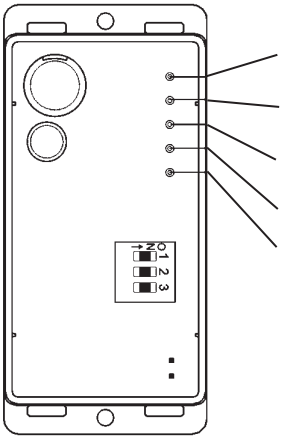


Fig. 12: Typical Voltage Output Transmitter with Flying Leads

Voltage Output with Terminals

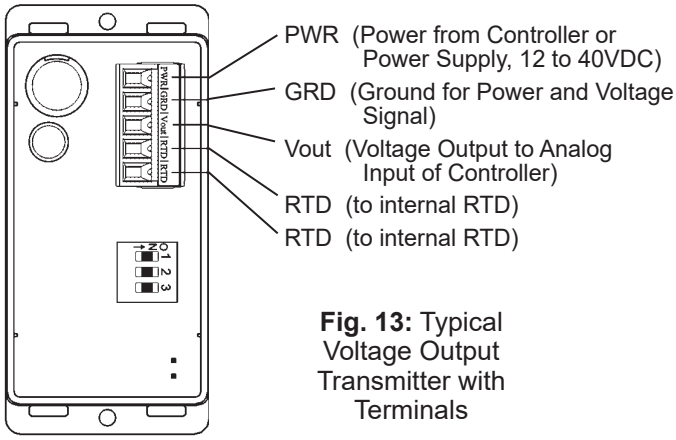
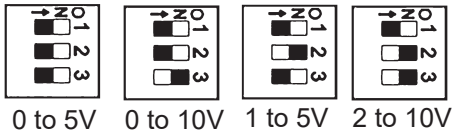


Fig. 13: Typical Voltage Output Transmitter with Terminals

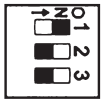
DIP Switch Settings for Field-Selectable Voltage Output Units

The circuit board for voltage output units has a 3-position DIP switch that controls the output value. This switch is set at the factory at the time of the order but may be changed in the field.



0 to 5V 0 to 10V 1 to 5V 2 to 10V

Note: Units ordered with Voltage Output can be switched to 4 to 20mA output with the DIP switch setting shown at right. The middle flying lead or middle terminal would not be used in that case and the unit would be wired similar to Figs 10 and 11 above.



4 to 20mA

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 at left.

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

4-20mA 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

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 RTD: .....1KΩ @ 0ºC, 385 curve
Sensitivity: .....3.85Ω/ºC, Approximate @ 32ºF (0ºC)
Accuracy (Standard):..0.12% @Ref, or ±0.55ºF, (±0.3ºC)
Accuracy (High):.....0.06% @Ref, or ±0.277ºF, (±0.15ºC), **[A]**option
Stability:.....±0.25ºF, (±0.14ºC)
Self Heating:.....0.4 ºC/mW @0ºC
Probe Range: .....-40 to 221ºF, (-40 to 105ºC)

Lead Wire: 22awg stranded

Insulation: Etched Teflon, Plenum rated

Probe: Flexible aluminum tube, 3/16" (4.8mm) O*D*

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

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

Enclosure Types: (Part number designator in bold)
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)
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)
Weatherproof..**-WP,** Cast Aluminum, UV rated
BAPI-Box.....**-BB,** Polycarbonate, UL94V-0, UV rated
BAPI-Box 2.....**-BB2,** Polycarb, UL94V-0, UV rated

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

Agency
CE EN 61326-1:2013 EMC (Industrial Electromagnetic Environment) / RoHS /
PT=DIN43760, IEC Pub 751-1983 / JIS C1604-1989

Specifications subject to change without notice.