Duct Averaging Transmitters in the BAPI-Box Crossover Enclosure

Installation & Operations

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Overview and Identification

BAPI's Temperature Transmitters in the BAPI-Box Crossover enclosure (BBX) can be ordered with a 1KΩ (385) RTD that has a field adjustable 0 to 5, 1 to 5, 0 to 10, 2 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.

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 BAPI-Box Crossover enclosure has a hinged cover for easy termination and comes with an IP10 rating (or IP44 rating with a pierceable knockout plug installed in the open port).

The BAPI Flexible Probe Bracket (Fig. 6) is used to mount averaging sensors. It makes a smooth arc at direction changes to eliminate the risk of kinking.

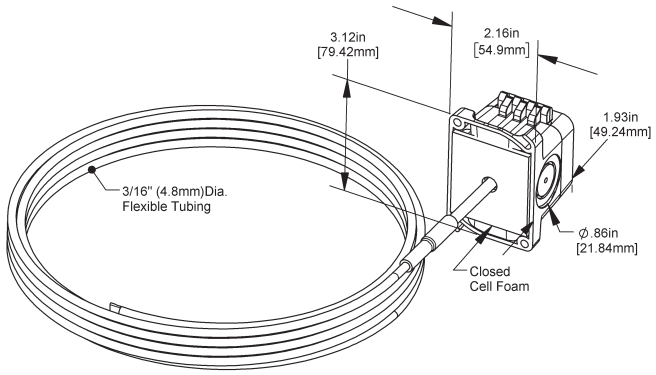


Fig. 1: Duct Averaging Transmitter with BAPI-Box Crossover Enclosure

Specifications

RTD Transmitter

Power Required:	12 to 40VDC
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. 30°F (17°C), Max 1,000°F, (555°C)
Zero:	Min. -148°F (-100°C), Max 900°F (482°C)
Zero & Span Adjust:	10% of span
Accuracy:	±0.065% of span
Linearity:	(0.125 x T-20°C)/100
RTD Sensor:	2 wire Platinum (Pt), 385 curve
Transmitter Ambient:	-4 to 158°F(-20 to 70°C) 0 to 95% RH, Non-condensing)

RTD Sensor: Resistance Temp Device (Bare Sensor)

Platinum (Pt):	1KΩ @0°C, 385 curve
Pt Accuracy (Std):	0.12% @Ref, or ±0.55°F, (±0.3°C)
Pt Accuracy (High):	0.06% @Ref, or ±0.277°F, (±0.15°C)
Pt Stability:	±0.25°F, (±0.14°C)
Pt Self Heating:	0.4 °C/mW @0°C
Pt Probe Range:	-40° to 221°F, (-40 to 105°C)

Environmental Operating Range:
-40 to 185°F (-40 to 85°C)
0 to 100% RH, Non-condensing

Lead Wire:
22awg stranded

Wire 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

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

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

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.

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 6) 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.

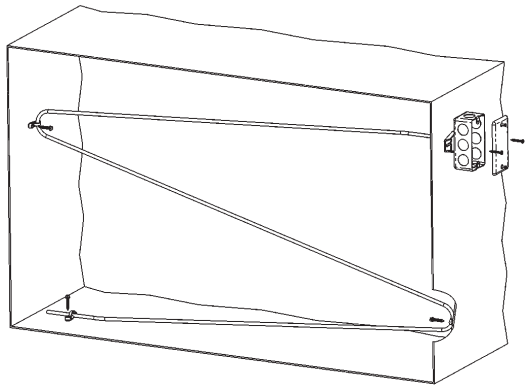


Fig. 2: Flexible Sensor Horizontal Mount (Best for Vertical Stratification)

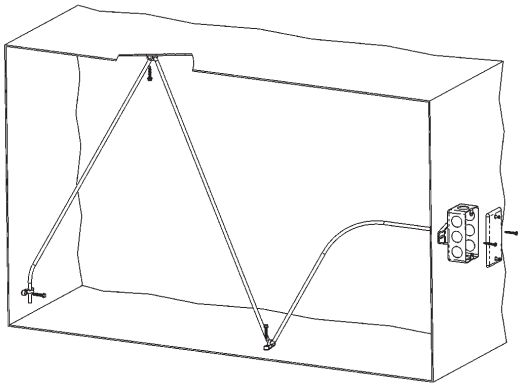


Fig. 3: Flexible Sensor Vertical Mount (Best for Horizontal Stratification)

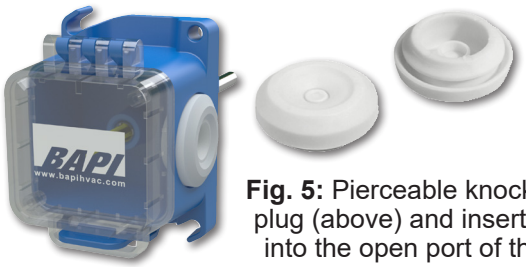


Fig. 5: Pierceable knockout plug (above) and inserted into the open port of the BAPI-Box Crossover.

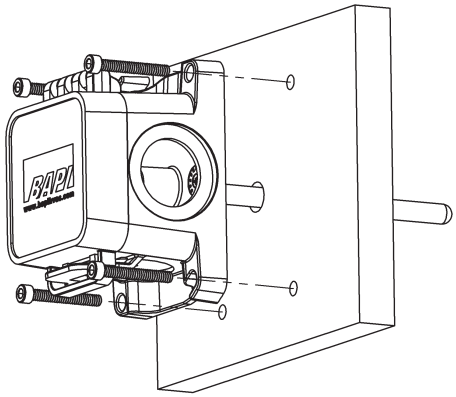


Fig. 4: BAPI-Box Crossover Mounting to the Duct

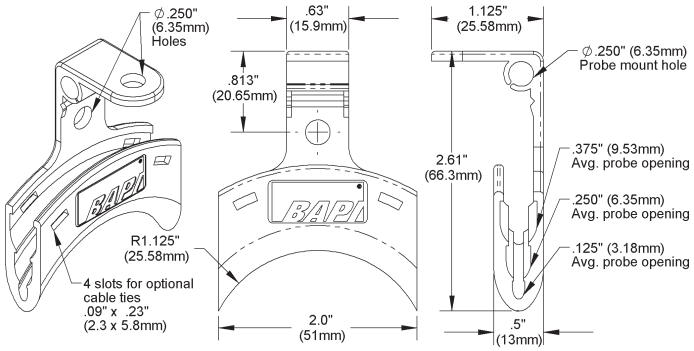


Fig. 6: Flexible Probe Bracket **(BA/FPB)** (Order Separately)

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. *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.*

A green LED on cover face will light when power is applied.

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

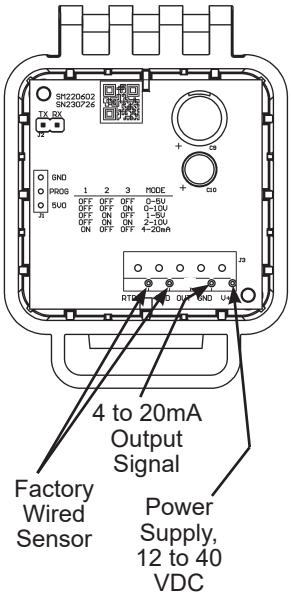


Fig. 7: Typical 4 to 20mA Output Transmitter with Flying Leads

4 to 20mA Output with Terminals

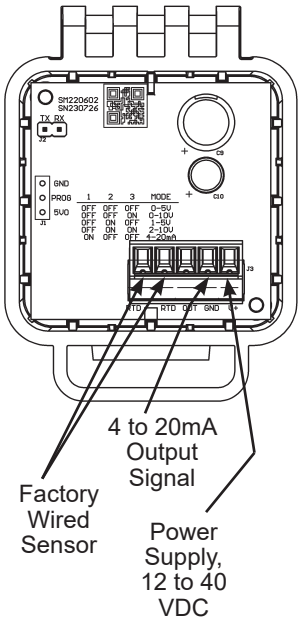


Fig. 8: Typical 4 to 20mA Output Transmitter with Terminals

Voltage Output with Flying Leads

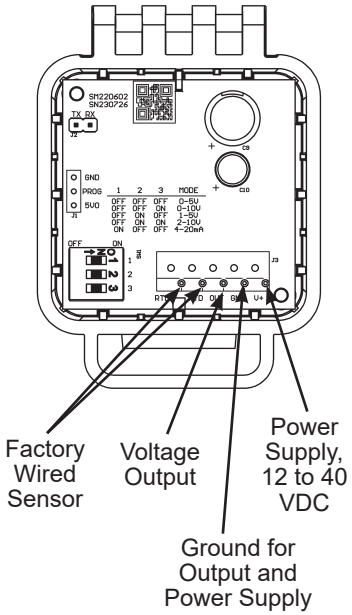


Fig. 9: Typical Voltage Output Transmitter with Flying Leads

Voltage Output with Terminals

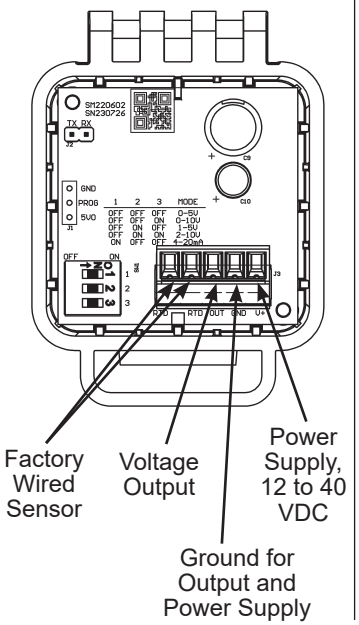
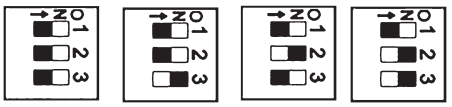


Fig. 10: Typical Voltage Output Transmitter with Terminals

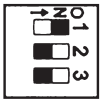
DIP Switch Settings for Field-Selectable Voltage Output Units

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 7 and 8 above.



4 to 20mA

Diagnostics

Possible Problems:	**Possible Solutions:**
Green power LED is not on.	- Measure the power supply voltage by placing a multi-meter across the transmitter's "V+" and "GND" leads or terminals. Make sure that the power is 12 to 40 VDC. - Make sure that the "V+" and "GND" wires are not open or shorted together and are terminated correctly to the controller.
The reading is incorrect in the controller.	- Determine if the input is set up correctly in the BAS and controller's software. - Compare the transmitted current or voltage to the actual temperature measurement at the sensor location. Measure the physical temperature at the temperature sensor's location using an accurate temperature standard. Measure the current or voltage output from the sensor and compare it to the appropriate equation below. If the output differs from the equation by more than 5%, call BAPI technical support.

4 to 20mA Temperature Equation

$$T = \frac{TLow + (A - 4) \times (TSpan)}{16}$$

T = Temperature at sensor
TLow = Low temperature of span
THigh = High temperature of span
TSpan = THigh - TLow
A = Signal reading in mA

Voltage Temperature Equation

$$T = T_{Low} + \left(\frac{V \times T_{Span}}{V_{Span}}\right)$$

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