Immersion Temperature Transmitters in BAPI-Box Crossover Enclosure

Installation & Operations

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 unit is made for thermowell mounting and temperature measurement in water pipes, water tanks or cooling tower sump applications. The probe is made of Stainless Steel or Brass and comes in three lengths.

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).

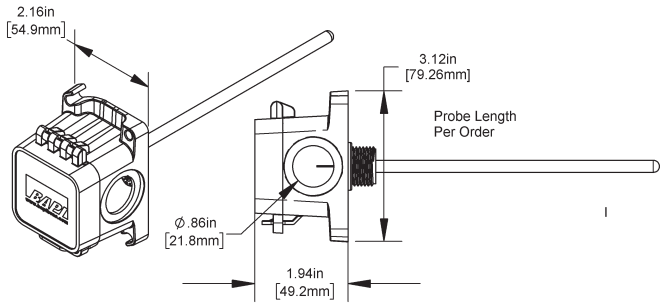


Fig. 1: BAPI-Box Crossover Immersion
(A Pierceable Knockout Plug is available from BAPI for the open port in the BAPI-Box Crossover enclosure.)

Thermowells and Immersion Sensors

Immersion Unit Probes are designed to be inserted into a Thermowell. Standard Thermowells from BAPI include machined 304 and 316 stainless steel and brass, and two-part welded 304 stainless steel. The Thermowell chosen for an installation is governed mainly by the corrosion conditions the well will face. The machined stainless steel wells all come with a mirror polish to provide maximum corrosion resistance.

Occasionally, the material consideration is one of strength rather than corrosion. For example, a machined stainless steel well may be required for high pressure water service where otherwise a brass or two-part stainless steel well would be satisfactory from a corrosion standpoint. The two-part welded stainless steel thermowells are not intended for service in moving water. They may be used in catch basins, sumps or large storage tanks with small inlet and outlet pipes. Do not mount the two-part thermowells close to the inlet or outlet pipe of the tank.

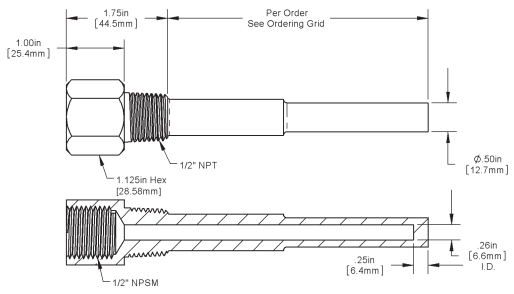


Fig. 2: Machined Thermowell

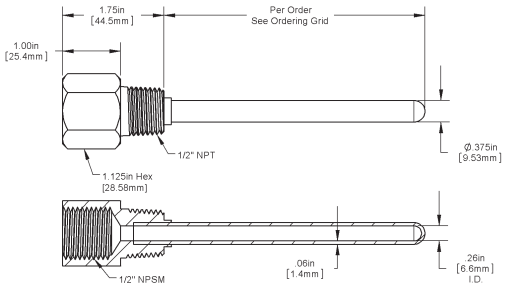


Fig. 3: Two-Part Welded Thermowell

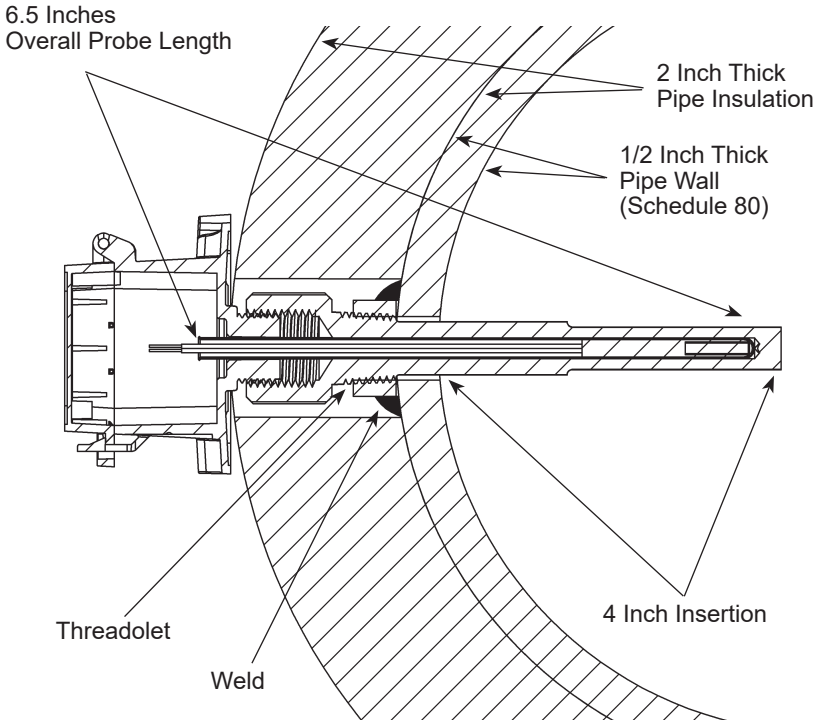


Fig. 4: Typical Sensor and Thermowell Installation

Immersion Sensor Installation

Immersion probes come with a plastic fitting that screws into the threads at the top of the thermowell. Pull the probe away from the plastic fitting until the probe is fully extended. Insert the immersion probe into the thermowell until the plastic fittings come into contact with the threads in the thermowell. Hand tighten the immersion sensor snugly into the thermowell without too much torque. The unit is designed so that the temperature probe slides back into the enclosure as the sensor contacts the bottom of the thermowell. Make sure that the tip of the immersion sensor probe is in good contact with the bottom of the thermowell by pushing on the flaired end of the probe until the tip bottoms out in the thermowell.

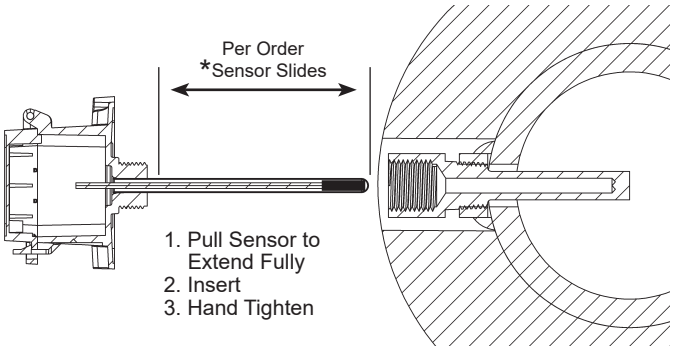


Fig. 5: BAPI-Box Crossover Unit Before Insertion

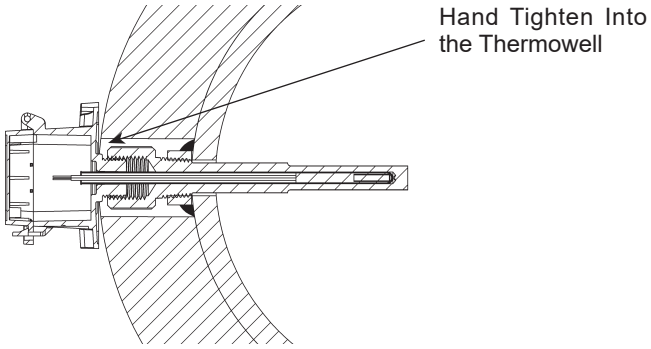


Fig. 6: BAPI-Box Crossover Unit Inserted

Note on Figs 5 & 6: As the immersion sensor is hand threaded into the thermowell, the flair end of the probe will be pushed back into the enclosure as the probe tip bottoms out in the thermowell. The probe can slide up to 1.6". The Junction Box enclosure is shown above but the process is the same for the other enclosure styles.

Installation in Pipes Less than 3" in Diameter

T- Mount

Figure 9 shows how a 2" Tee and a 1/2" to 2" bushing allows a 2" thermowell to measure the temperature of the contents of a 2" water pipe. Be sure to use a thread sealant on the outside threads of the thermowell.

Corner Mount

Figure 5 shows how a pipe Tee can be used in an elbow application. A 2" tee and a 1/2" to 2" bushing allows a 4" thermowell to measure the temperature of the contents of a 2" water pipe.

Note: Temperatures in pipes as small as 1-1/4" may be measured by this method. In small pipes, the diameter of the thermowell may become a significant obstruction, so be sure to check for proper flow rates after installation is complete.

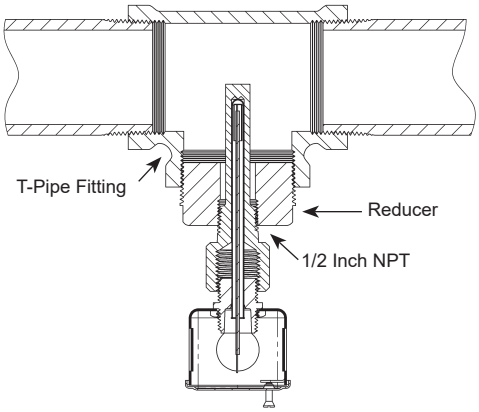


Fig. 7: Typical T-Mount
(shown with Junction Box enclosure)

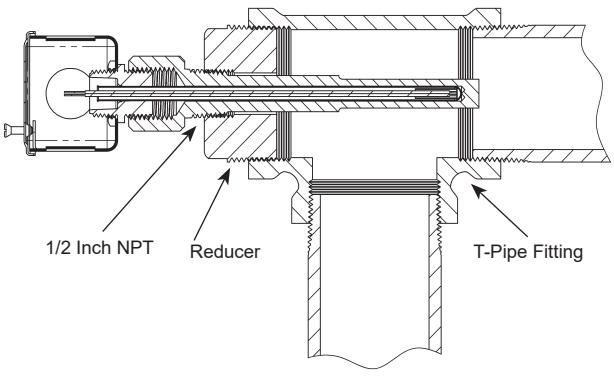


Fig. 8: Typical Corner Mount
(shown with Junction Box enclosure)

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

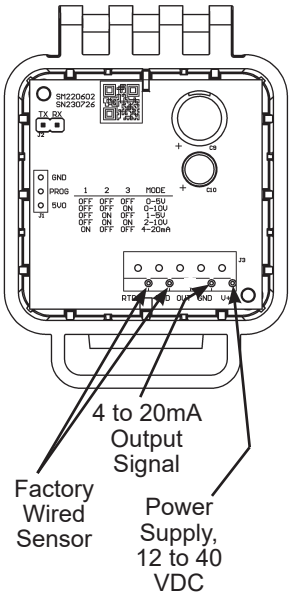


Fig. 9: Typical 4 to 20mA Output Transmitter with Flying Leads

4 to 20mA Output with Terminals

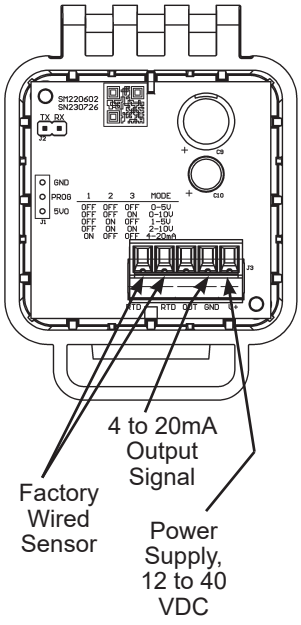


Fig. 10: Typical 4 to 20mA Output Transmitter with Terminals

Voltage Output with Flying Leads

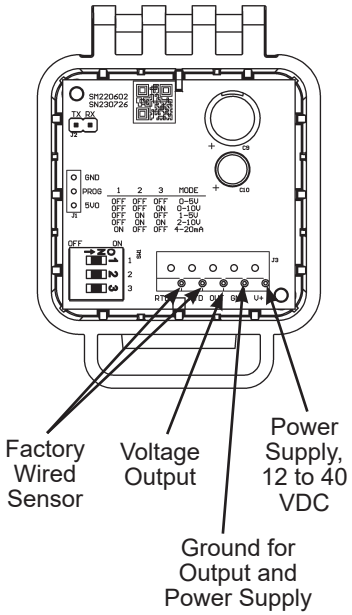


Fig. 11: Typical Voltage Output Transmitter with Flying Leads

Voltage Output with Terminals

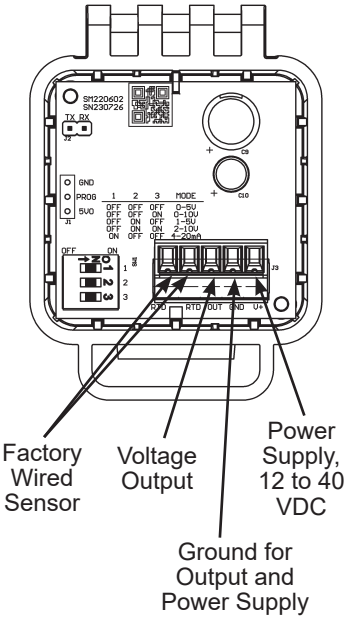
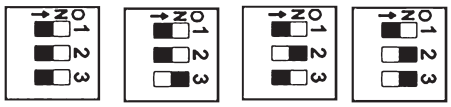


Fig. 12: Typical Voltage Output Transmitter with Terminals

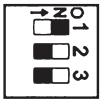
DIP Switch Settings for Field-Selectable Voltage Output Units

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 9 and 10 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

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

Lead Wire: 22AWG stranded

Insulation: Etched Teflon, Plenum rated

Probe:
304 or 316 Stainless Steel or Brass, 0.25" OD

Probe Length: 2", 4", 8" per order

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

Mounting: Extension tabs (ears), 3/16" holes

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

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.