

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.

They are made for thermowell mounting and temperature measurement in water pipes, water tanks or cooling tower sump applications. Direct probe insertion into a Threadolet is possible without a thermowell. However, this is not recommended as it cannot be removed after the pipe is pressurized. The probe and threads are made of Stainless Steel and made in different lengths for a custom thermowell fit. The unit is available with a variety of thermistor or RTD sensing elements.

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).

This instruction sheet is specific to the sensors and probes with the BAPI-Box Crossover Enclosure. For other enclosures, please refer to instruction sheet "20919_ins_ImrsnDbIThread_Active.pdf" which is available on the BAPI website or by contacting BAPI.

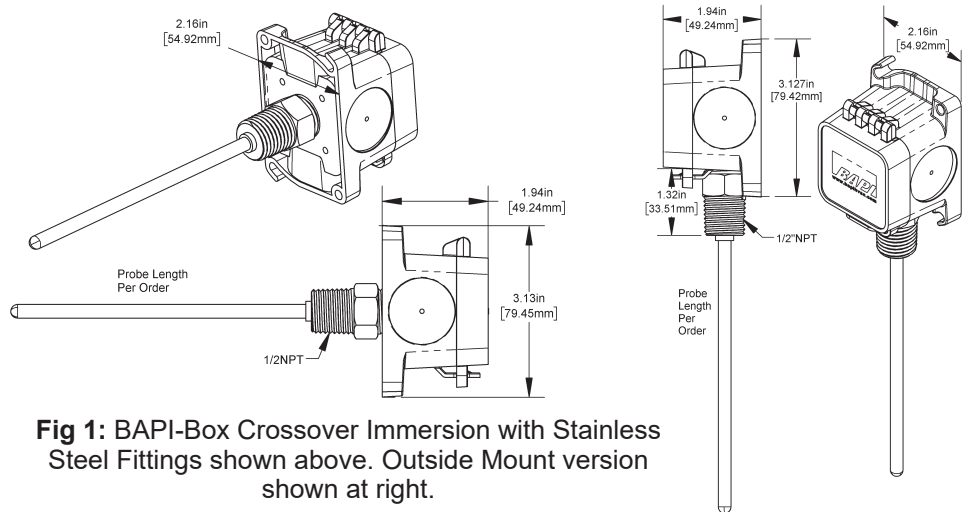


Fig 1: BAPI-Box Crossover Immersion with Stainless Steel Fittings shown above. Outside Mount version shown at right.

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. 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. Do not mount the two-part thermowells close to the inlet or outlet pipe of the tank.

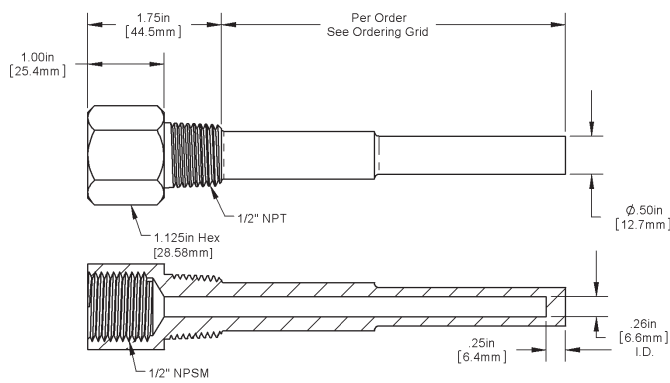


Fig 2: Machined Thermowell

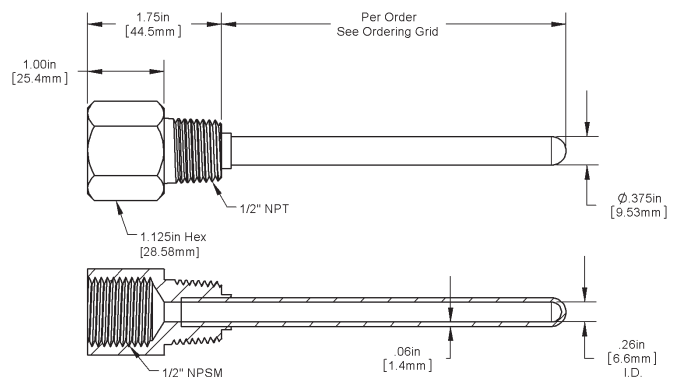


Fig 3: Two-Part Welded Thermowell

Thermowells and Immersion Sensors continued...

Fig 4 shows a typical four-inch thermowell and four-inch immersion probe installed into an eight-inch pipe.

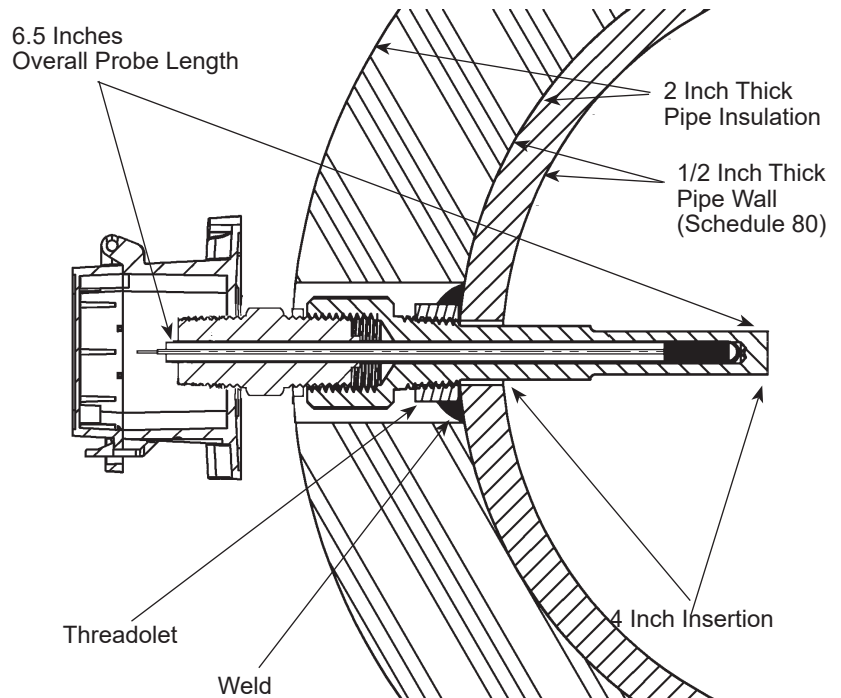


Fig 4: Typical Sensor and Thermowell Installation

Immersion Sensor Installation

SENSOR INSTALLATION WITH THERMOWELL:

Insert the immersion sensor into the well. Hand tighten the immersion sensor snugly without too much torque. The probe is tight fitting to the bottom and wall of the thermowell offering an accurate temperature reading.

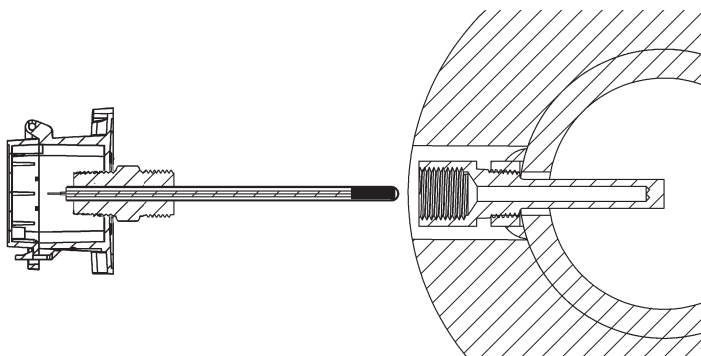


Fig 5: BAPI-Box Crossover Unit Before Insertion

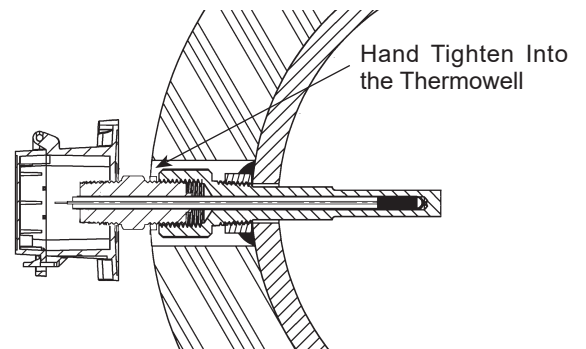


Fig 6: BAPI-Box Crossover Unit Inserted

SENSOR INSTALLATION WITHOUT A THERMOWELL:

Direct probe insertion into the pipe without a thermowell is possible. However, this is not recommended as it cannot be removed after the pipe is pressurized. Apply a minimum of five turns of Teflon tape to the SS probe side threads. Insert the SS probe and 1/2" NPT threads into the Threadolet and tighten with a wrench to achieve a water tight seal. The probe should not touch the far inside of the water pipe or probe failure may occur.

Installation in Pipes Less than 3" in Diameter

Corner Mount

Fig 7 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.

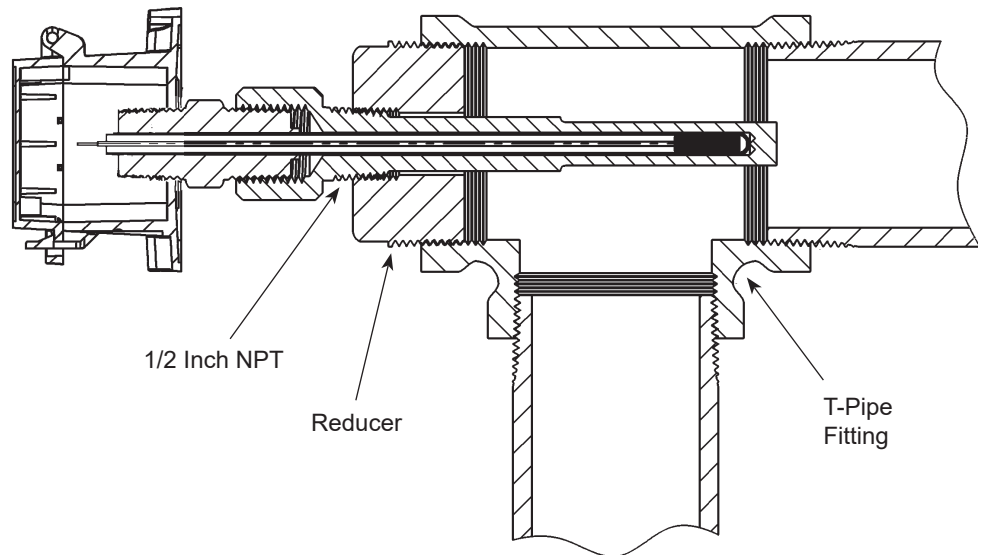


Fig 7: Typical Corner Mount
(shown with Junction Box enclosure)

T-Mount

Fig 8 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.

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.

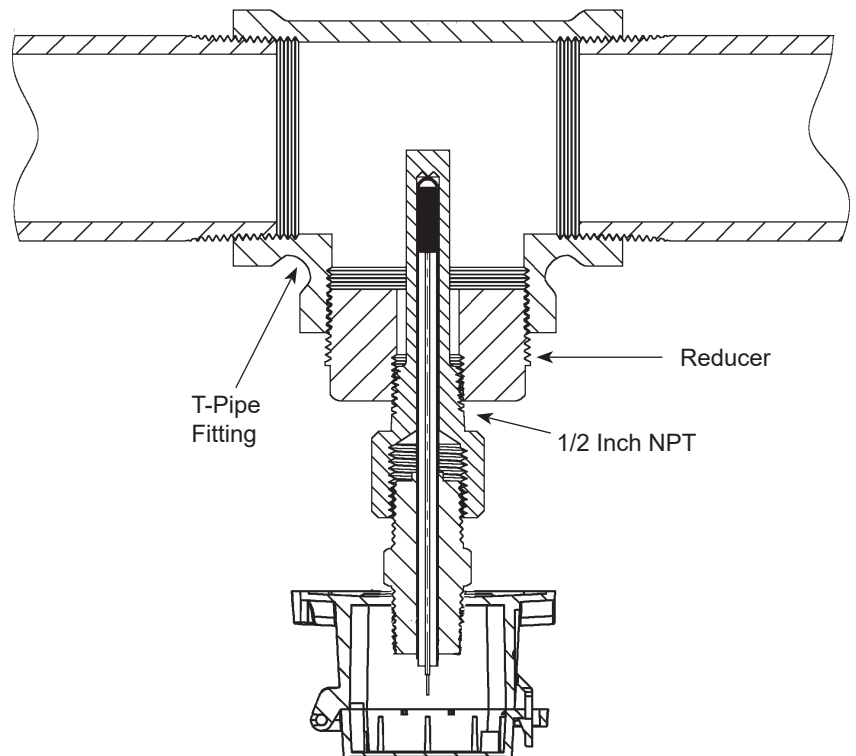


Fig 8: Typical T-Mount
(shown with Junction Box enclosure)

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.



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.

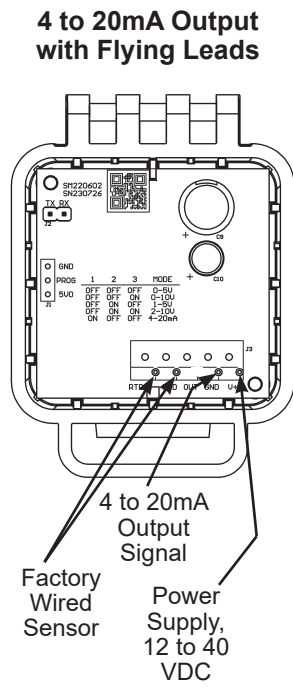


Fig. 9: Typical 4 to 20mA Output Transmitter with Flying Leads

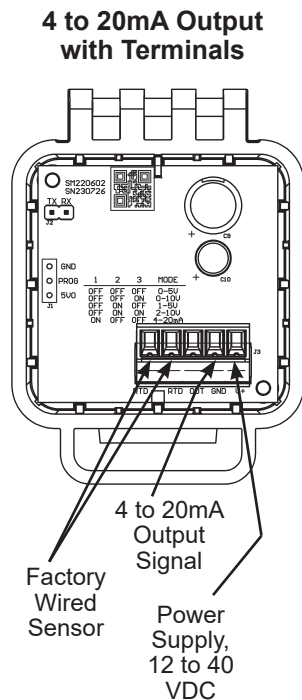


Fig. 10: Typical 4 to 20mA Output Transmitter with Terminals

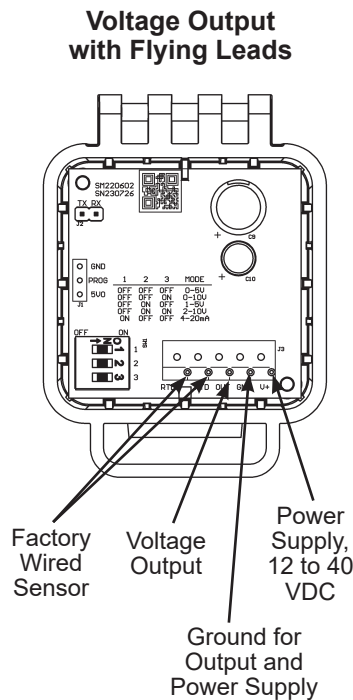


Fig. 11: Typical Voltage Output Transmitter with Flying Leads

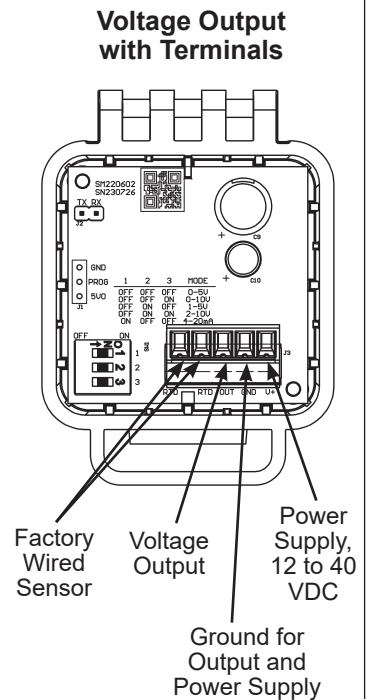
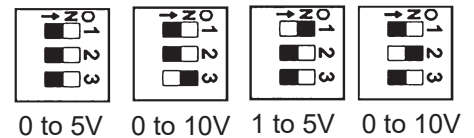


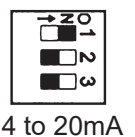
Fig. 12: Typical Voltage Output Transmitter with Terminals

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.



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.





Double Threaded Immersion Transmitters with Stainless Steel Fittings and BAPI-Box Crossover Enclosure

Installation & Operations

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rev. 10/05/23

Diagnostics

Possible Problems:

Green power LED is not on.

The reading is incorrect in the controller.

Possible Solutions:

- 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.

- 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

$$T = \frac{T_{Low} + (A - 4) \times (T_{Span})}{16}$$

- 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

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 × 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), [A]option
- 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)

- Lead Wire:22AWG stranded
- Wire Insulation:.....Etched Teflon, Plenum rated
- ProbeRigid, 316 St. Steel, 0.25" OD
- Probe Length:2", 4", 8" or custom per order
- Mounting:Extension tabs, 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:

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

Specifications subject to change without notice.