

Overview and Identification

The Double Threaded Stainless Steel (SS) Immersion Transmitter is 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 rigid probe and threads are made of Stainless Steel and made in different lengths for a custom thermowell fit. BAPI's Temperature Transmitter can be ordered with a 1K Ω (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.

This transmitter can also be ordered in a variety of probe lengths and mounting enclosures as shown below.

These transmitters are available with a wired connection via flying leads or a pluggable terminal block (-TS). Special high accuracy

RTD matched transmitters (M) are available which match the sensor to the transmitter for improved accuracy. Enclosure mounting styles come in plastic or metal for both NEMA 3R and NEMA 4 applications and are all plenum rated.

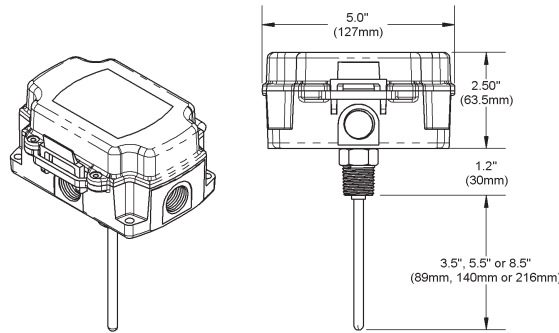


Fig. 1: BAPI-Box (BB) Enclosure

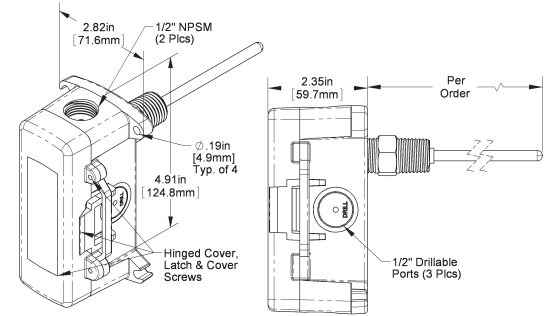


Fig. 2: BAPI-Box 2 (BB2) Enclosure

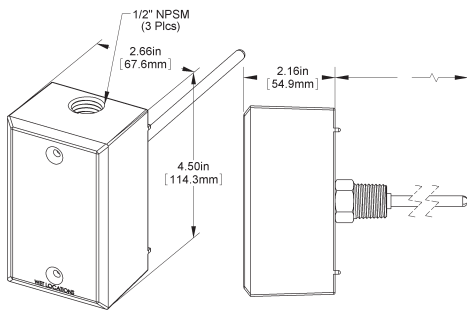


Fig. 3: Weatherproof (WP) Enclosure

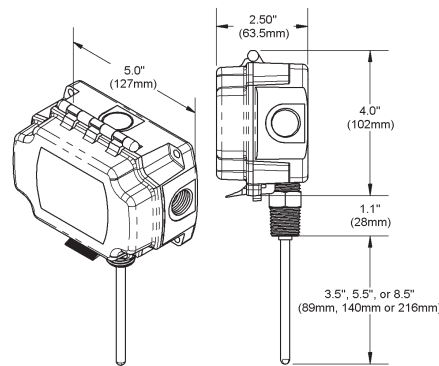


Fig. 4: BAPI-Box (BBO) Enclosure with "Outside Mount" Configuration

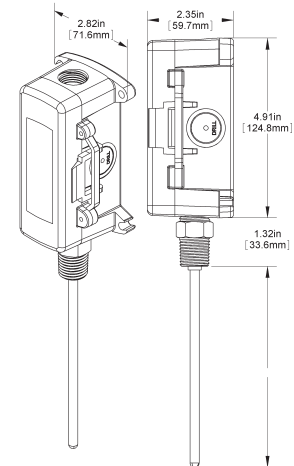


Fig. 5: BAPI-Box 2 (BB20) Enclosure with "Outside Mount" Config.

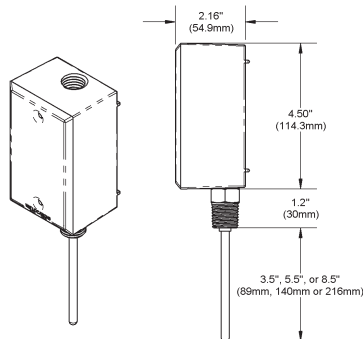


Fig. 6: Weatherproof (WPO) Enclosure with "Outside Mount" Configuration

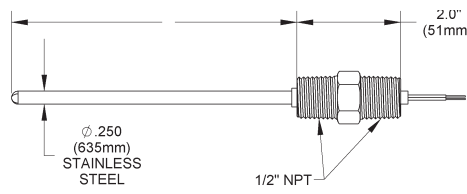


Fig. 7: Double Threaded Stainless Steel Immersion Probe Only

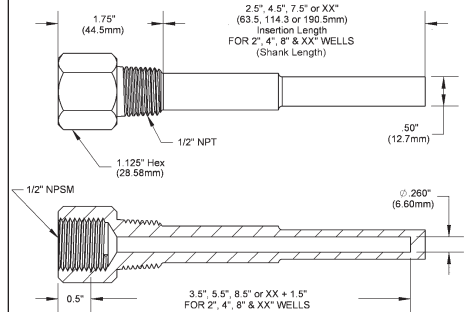


Fig. 8: Machined Bar Stock Thermowell

Mounting

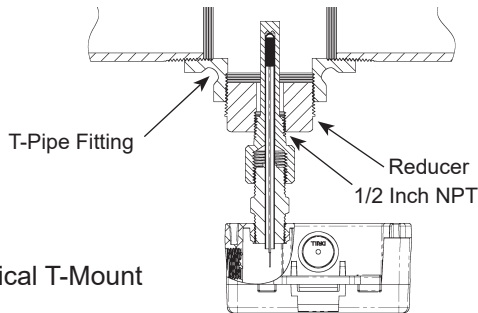


Fig. 9: Typical T-Mount

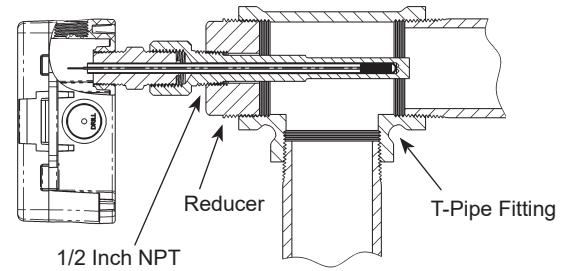


Fig. 10: Typical Corner Mount

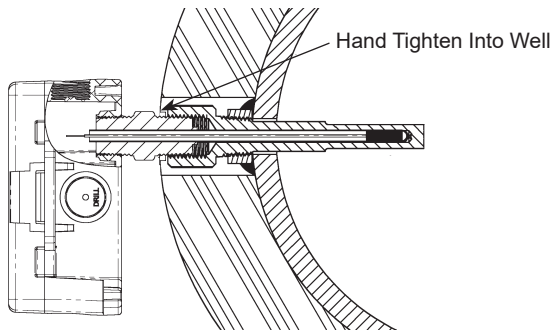


Fig. 11: Typical Sensor Inserted

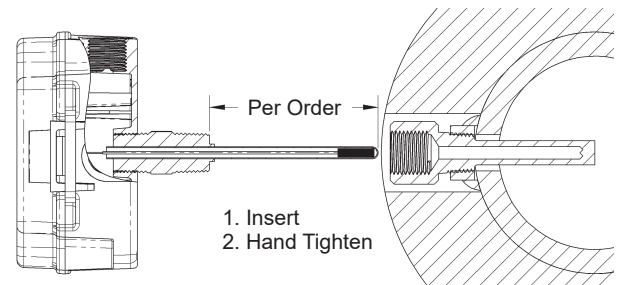


Fig. 12: BAPI-Box (BB) Model Before Insertion

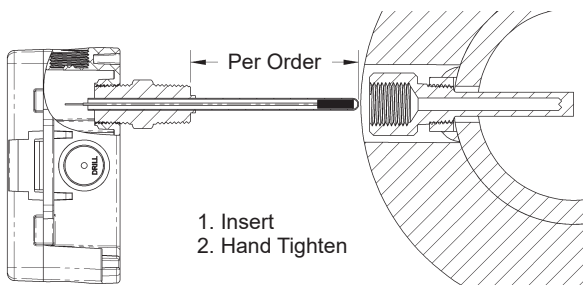


Fig. 13: BAPI-Box 2 (BB2) Model Before Insertion

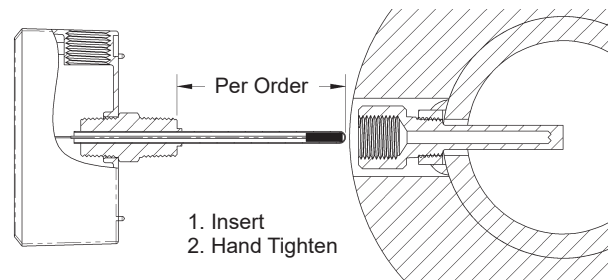


Fig. 14: Weatherproof (WP) Sensor Before Insertion

Application: Figure 11 shows a typical thermowell and immersion probe installed into a pipe. In a properly insulated pipe with liquid or steam, the temperature is essentially the same across the entire cross section of the pipe. Usually thermowells are sized to extend to the center of the pipe; however, shorter thermowells will give proper temperature readings if properly insulated. The shorter thermowells are used in pipes with high flow velocities. See Application notes "Thermowells Explained" on our web site BAPIHVAC.com.

Thermowell Installer: Typically a Pipe Fitter drills a 3/4-inch hole into the pipe where the thermowell is needed. A customer provided fitting, called a Threadolet or Weldolet, is welded to the pipe over the hole. The Threadolet has a 1/2" NPT thread in the center. Thread sealant such as Teflon tape or pipe dope is applied to the 1/2" NPT threads of the thermowell. The thermowell is then inserted into the Threadolet and tightened. Estimates on insertion depths can be seen in our Application note "Thermowells Explained" on our web site BAPIHVAC.com

Sensor Installation: 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.

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 tap 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.



Double Threaded Stainless Steel Immersion Transmitters

Installation & Operating Instructions

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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 class 1 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.*



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

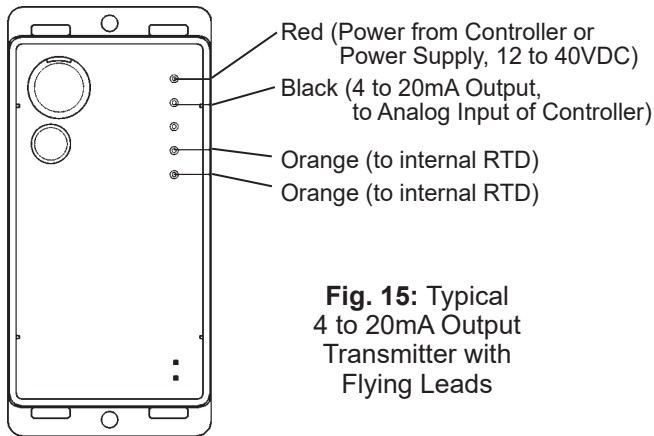


Fig. 15: Typical 4 to 20mA Output Transmitter with Flying Leads

4 to 20mA Output with Terminals

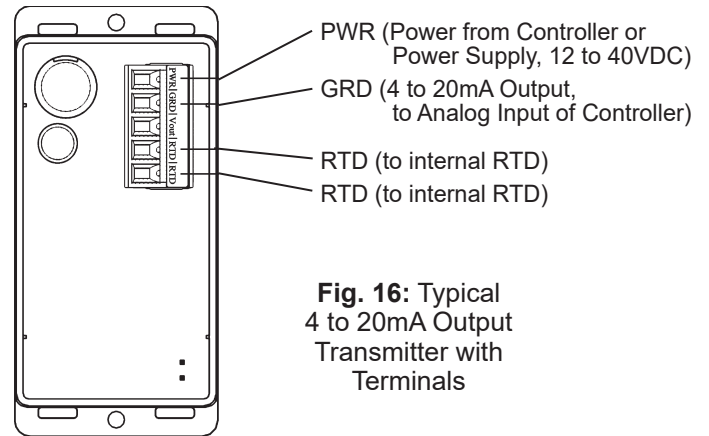


Fig. 16: Typical 4 to 20mA Output Transmitter with Terminals

Voltage Output with Flying Leads

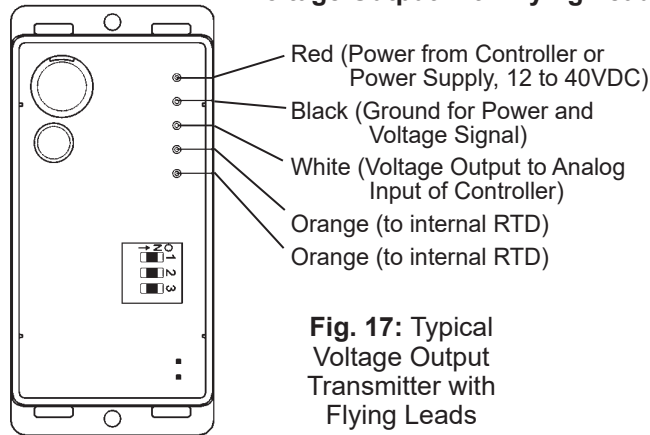


Fig. 17: Typical Voltage Output Transmitter with Flying Leads

Voltage Output with Terminals

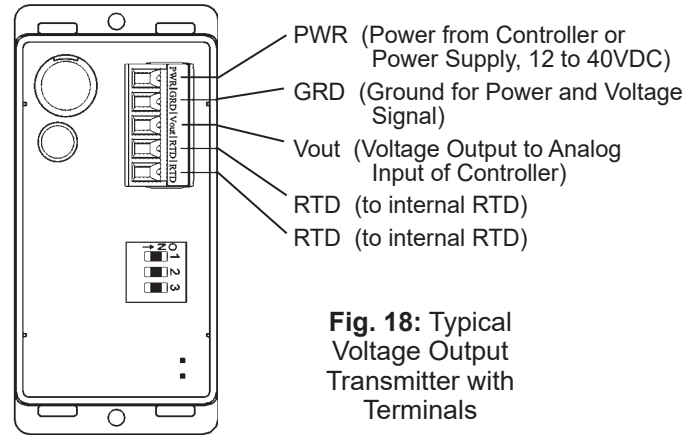
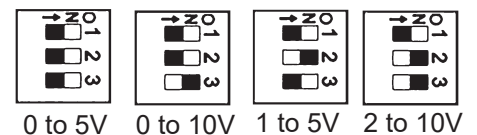


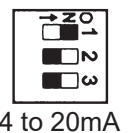
Fig. 18: Typical Voltage Output Transmitter with Terminals

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 15 and 16 above.





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Diagnostics

Possible Problems:

Unit will not operate.

Possible Solutions:

- 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.
- 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 with an ohmmeter. Compare the temperature sensor's resistance to the appropriate temperature sensor table on the BAPI website.

The reading is incorrect in the controller.

- Determine if the input is set up correctly in the controllers and BAS software.
- For a 4-20mA current transmitter measure the transmitter current by placing an ammeter in series with the controller input. The current should read according to the "4-20mA 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 below.

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. 30°F (17°C), Max 1000°F, (555°C)
 Zero: Min. -148°F (-100°C), Max 900°F (482°C)
 System 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 RTD: 1KΩ @ 0°C, 385 curve
 Sensitivity: 3.85Ω/°C, Approximate @ 32°F (0°C)
 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 Rigid: 316 Stainless Steel, 0.25" OD
Probe Length: 2', 4', 8' or custom per order
Mounting: 1/2" NPT, 316 SS Double Threaded Fitting
Enclosure Types: (Part number designator in bold)
 Weatherproof...-**WP**, w/ two 1/2" FNPT entries, (Bell box)
 BAPI-Box.....-**BB**, w/ four 1/2" NPSM & one 1/2" drill-out
 BAPI-Box 2.....-**BB2**, w/ three 1/2" NPSM & three 1/2" drill-outs
Enclosure Ratings: (Part number designator in bold)
 No Box.....-**NB**, No Rating, (Probe Only)
 Weatherproof...-**WP**, NEMA 3R, IP14
 BAPI-Boxes.....-**BB**, **BB2**, NEMA 4, IP66, UV Rated
Enclosure Material: (Part number designator in bold)
 Weatherproof:..-**WP**, Cast Aluminum, UV rated
 BAPI-Boxes.....-**BB**, **BB2**, Polycarb., UL94V-0, UV rated
Ambient (Enclosure): 0 to 100% RH, Non-condensing
 Weatherproof...-**WP**, -40°F to 212°F, (-40° to 100°C)
 BAPI-Boxes.....-**BB**,**BB2**, -40°F to 185°F, (-40° to 85°C)
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.