



Thermobuffer Temperature Transmitters

BA/T#- TB Temperature Transmitter

Installation and Operation Instructions

20898_ins_Thermobuffer_Active

rev. 03/11/24

Overview

The Thermobuffer Transmitter is designed to measure the temperature in walk-in-freezers or refrigerators with a wall or hanging bracket sensor. The buffer chambers come in different lengths and are made to be filled with food grade glycol to slow down the temperature response to more closely simulate the contents of the freezer or refrigerator. 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). The mounting enclosure styles come in NEMA 4 plastic or hanging bracket with the buffers available in stainless steel or aluminum to fit any application.

Identification

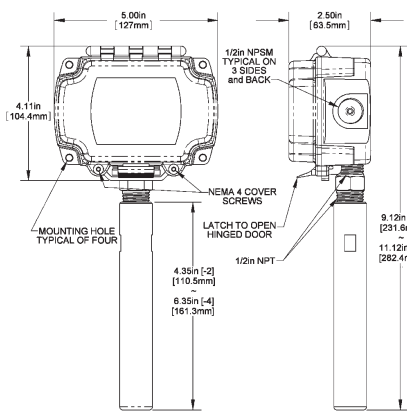


Fig 1: 2" & 4" Thermobuffer in a BAPI-Box (BB) Enclosure

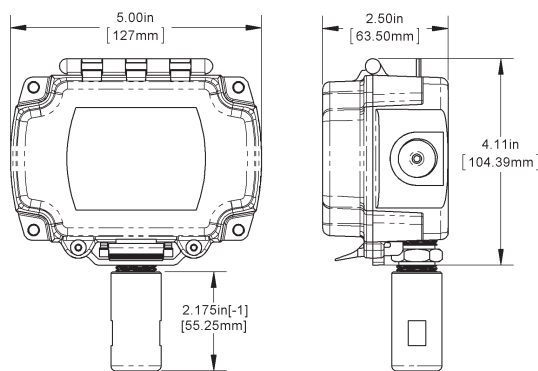


Fig 2: 1" Thermobuffer in a BAPI-Box (BB) Enclosure with Plastic Threaded Fitting

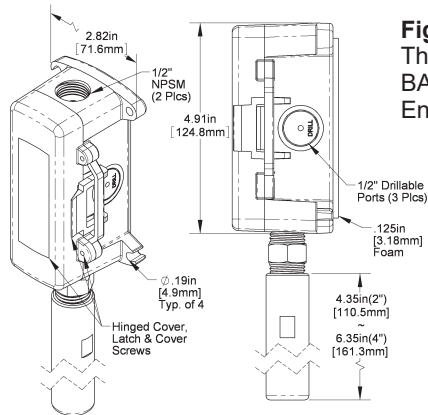


Fig 3: 2" & 4" Thermobuffer in a BAPI-Box 2 (BB2) Enclosure

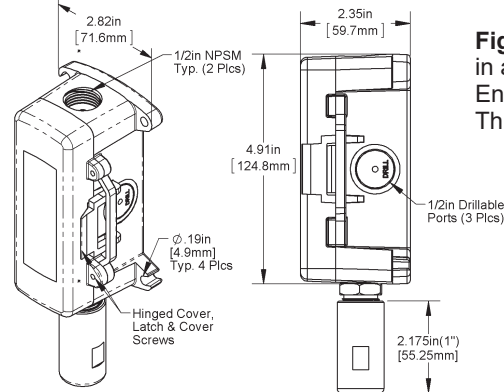


Fig 4: 1" Thermobuffer in a BAPI-Box 2 (BB2) Enclosure with Plastic Threaded Fitting

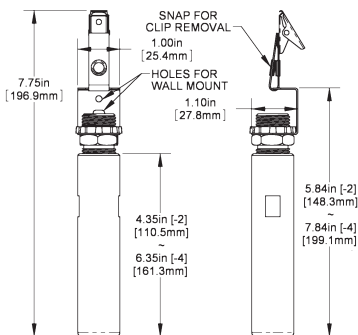


Fig 5: 2" & 4" Hanging Bracket Thermobuffer (Transmitter is ordered and mounted separately.)

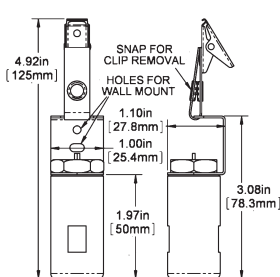


Fig 6: 1" Hanging Bracket Thermobuffer (Transmitter is ordered and mounted separately.)

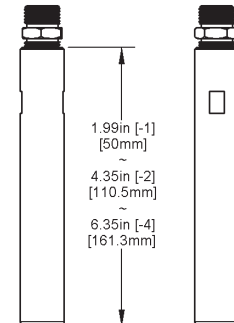


Fig 7: No Box (NB) Thermobuffer (Transmitter is ordered and mounted separately.)

Assembly & Installation

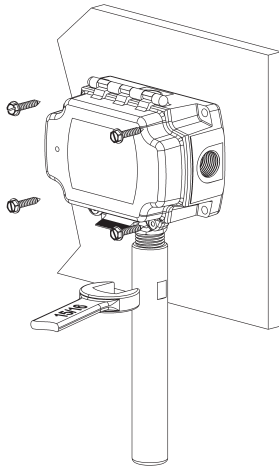


Fig 8: 2" & 4" Thermbuffer in a BAPI-Box (BB) Enclosure Installation

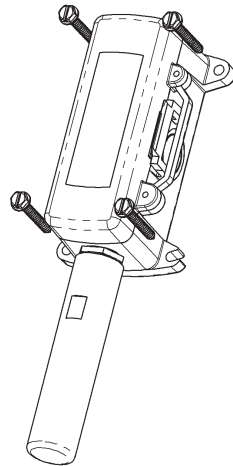


Fig 9: 2" & 4" Thermbuffer in a BAPI-Box 2 (BB2) Enclosure Installation

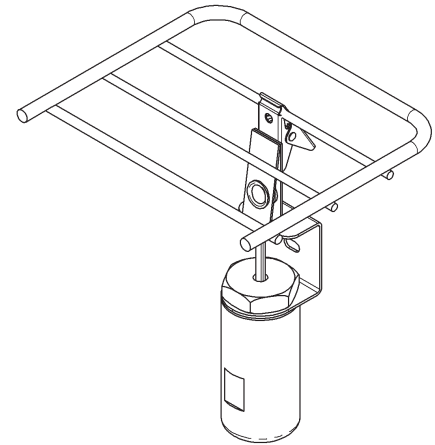


Fig 10: 1" Hanging Bracket Rack Installation

- 1 Fill the buffer with the appropriate amount of customer provided glycol to the amount as dictated by table 1.
- 2 Wrap the probe threads with Teflon tape with at least 4 wraps so a water tight seal is established.
- 3 Insert the probe into the buffer and screw in for a secure water tight fit.
- 4 Towel off excess fluid which may leak out during assembly and check for leaking. If the assembly leaks, a 15/16ths wrench may be used to snug up the probe to the buffer. More tape may also be needed. The use of food safe silicon may also be used.
- 5 Select a location on a wall or hanging from a wire rack near the contents you wish to monitor.
- 6 Mount the Thermo Buffer with the buffer facing down (Probe on top). Any other orientation is not recommended due to leaking concerns.
- 7 We recommend BAPI Box surface mounting be positioned over the refrigerator wire way hole using the rear BAPI Box knock out. Pull the wiring into the unit and terminate using sealant filled connectors. Best practice is to caulk the wiring hole after the wiring is installed. Secure with mounting screws and ensure that the foam backing compresses to about 50% of its thickness to make a gasket type seal against the surface.

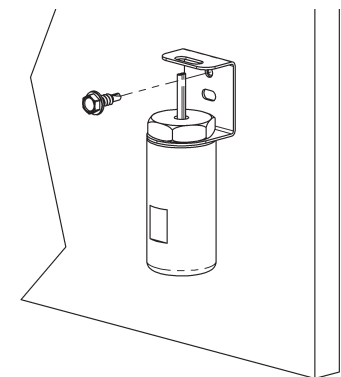


Fig 11: 1" Hanging Bracket Wall Installation (Transmitter Mounted Externally)
Note: Customer Provided Screws

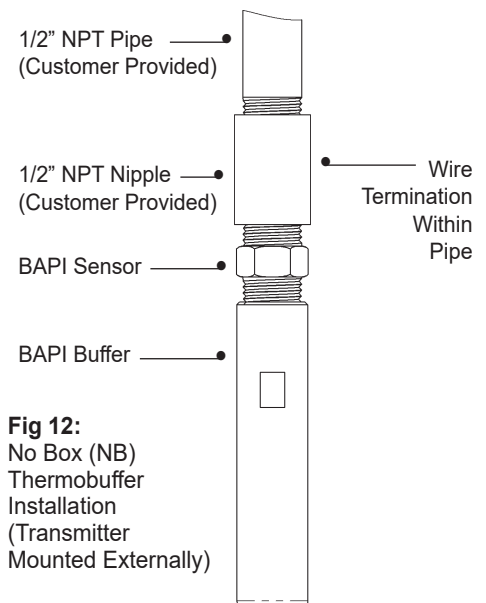


Fig 12: No Box (NB) Thermbuffer Installation (Transmitter Mounted Externally)

Table 1:	
Buffer Size	Recommended Fluid Fill
1" Buffer	0.17 Fluid oz (5mL)
2" Buffer	0.67 Fluid oz (20mL)
4" Buffer	1.00 Fluid oz (30mL)

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

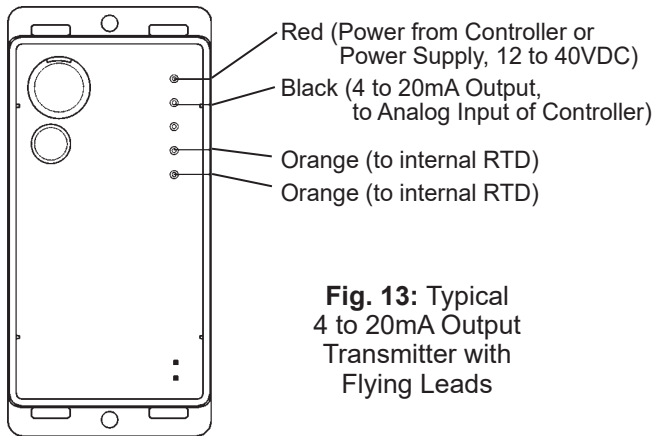


Fig. 13: Typical 4 to 20mA Output Transmitter with Flying Leads

4 to 20mA Output with Terminals

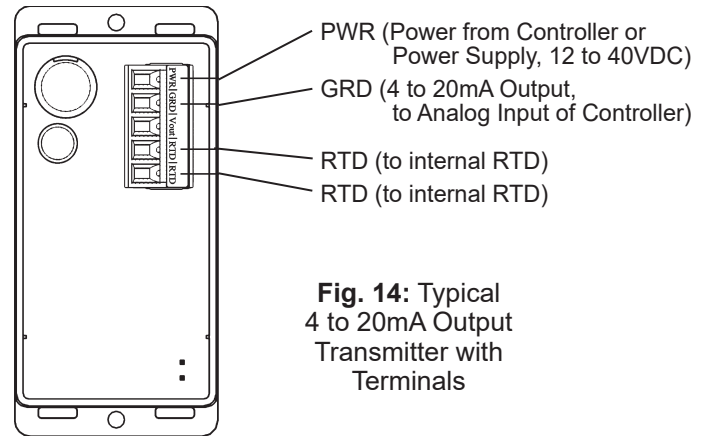


Fig. 14: Typical 4 to 20mA Output Transmitter with Terminals

Voltage Output with Flying Leads

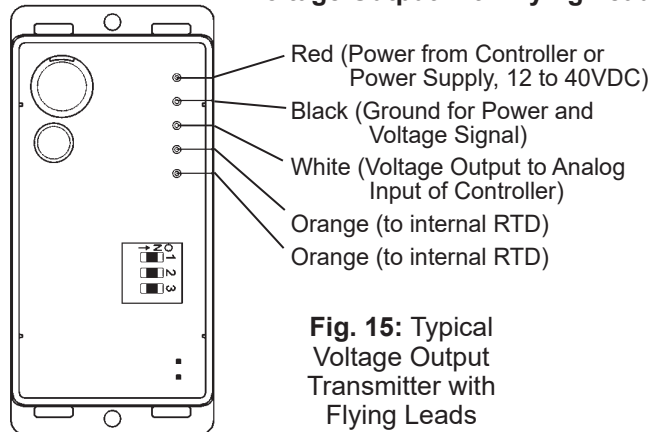


Fig. 15: Typical Voltage Output Transmitter with Flying Leads

Voltage Output with Terminals

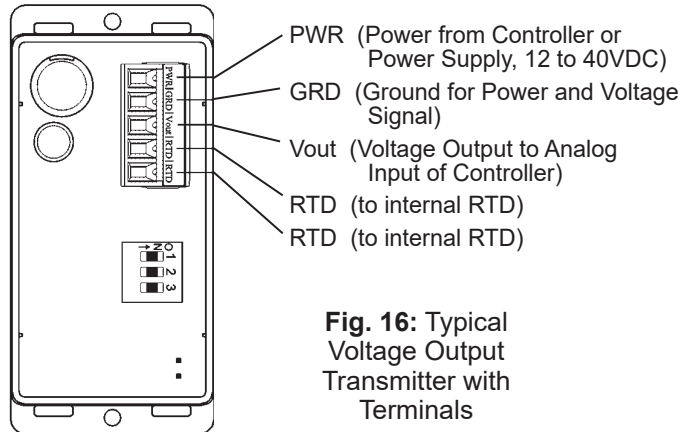
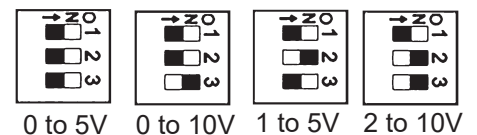


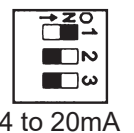
Fig. 16: Typical Voltage Output Transmitter with Terminals

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 13 and 14 above.





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Diagnosics

Problems:

Unit will not operate.

Possible Solutions:

- Verify that the power supply voltage across the transmitter's (+) and (-) terminal matches the power requirements in the specifications.
- Check that RTD wires are terminated correctly 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.

Reading is incorrect in the controller.

- Determine if the input is set up correctly in the controller and BAS software.
- For a 4 to 20mA current output, measure the transmitter current by placing an ammeter in series with the controller input. The current should read according to the "4 to 20mA Temp Equation" shown below.
- For a voltage output, measure the signal with a volt meter (Orange or Orange/Black to Black). The signal should read according to the "Voltage Temp 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 to 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, Etched Teflon, Plenum rated

Probe (inside buffer): 304 Stainless Steel (SS), 0.25" OD

Probe Length: Probe (inside buffer) tip to thread start
1" Buffer: 0.75" / 2" Buffer: 3.5" / 4" Buffer: 5.5"

Probe Process Connection (-TB):
304 SS Double threaded ½" NPT

Buffer Chamber Size: 1" dia., see pg 1 for lengths.

Mounting:

BAPI-Boxes 4 extension tabs (ears), 7/16" hole,
 Hanging Bracket.... SS bracket w/ 1/8" holes or 3/8" spring clip

Enclosure Types:

No Box **-NB**, intended for direct ½" NPT pipe mount
 BAPI-Box: **-BB**, w/ four ½" NPSM & one ½" drill-out
 BAPI-Box 2: **-BB2**, with 3 ½" NPSM and 3 ½" drill-outs
 Hanging Bracket.... **-HB**, Intended to hang from shelving

Enclosure Ratings:

No Box **-NB**, No Rating
 BAPI-Boxes **-BB, BB2**, NEMA 4, IP66
 Hanging Bracket.... **-HB**, No rating

Enclosure Materials:

BAPI-Boxes **-BB, BB2**, UV-rated Polycarb., UL94V-0
 Hanging Bracket.... **-HB**, 304 Satinless Steel bracket & clip

Buffer Chamber Construction:

M-304 Machined 304 Stainless Steel, 0.7" core
 MAL Machined Aluminum, 0.7" core

Liquid Fill:

..... Food Grade Glycol (Customer provided)

1" Buffer: 5 mL / 2" Buffer: 20 mL / 4" Buffer: 30 mL

Ambient (Enclosure): 0 to 100% RH, Non-condensing
 BAPI-Boxes **-BB, BB2**, -40 to 185°F (-40 to 85°C)
 NB, w/ TB sensor..... **-NB**, -40 to 212°F (-40 to 100°C)
 Hanging Bracket..... **-HB**, -40 to 122°F (-40 to 50°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.