Duct and Outside Air Humidity (H200-H300)
4 to 20mA or 0 to 5V Humidity Output with Optional Temperature Sensor
Installation and Operating Instructions

9938_ins_hum_temp_duct_out_5_20

rev. 08/31/20

## Overview

Duct and Outside Air Humidity Transmitters come in ±2%RH or ±3%RH accuracies and an optional temperature sensor. The temperature sensor can be either a Thermistor or RTD. It can be ordered with a Weatherproof (WP), BAPI-Box (BB) or BAPI-Box 2 (BB2) Enclosure. The transmitter can be wired for either a 0 to 5VDC output or a loop powered 4 to 20mA output.

Duct Unit Mounting

Mount at least 3 duct diameters from humidifiers in the center of the duct wall. Drill a 1 inch hole for the probe in the duct and use two number 8 sheet metal screws to attach the sensor to the duct. Center the probe in its mounting hole. Be sure that the foam seals the hole, do not over tighten the screws.
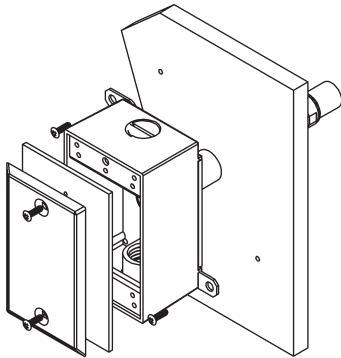
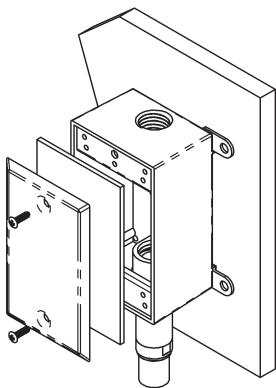**Fig. 1:** Duct Humidity in a Weatherproof (WP) Enclosure
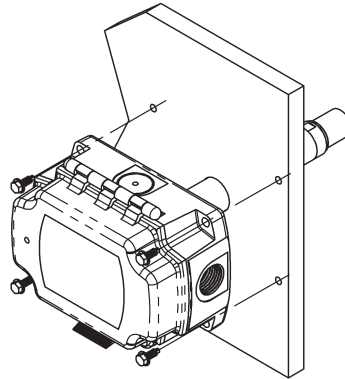
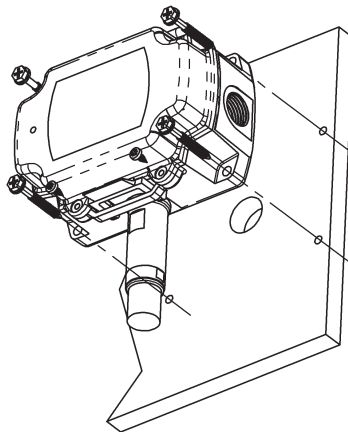**Fig. 2:** Duct Humidity in a BAPI-Box (BB) Enclosure
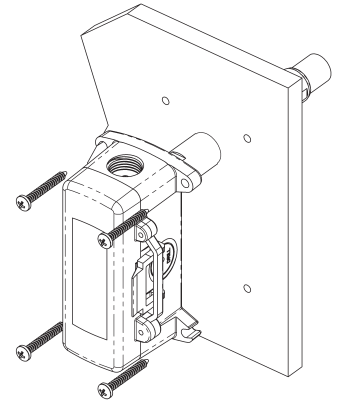
Fig. 3: Duct Humidity in a BAPI-Box 2 (BB2) Enclosure

Outside Air Mounting

Mount in a permanently shaded area away from windows and doors. Do not mount in direct sunlight. Mount with the sensor probe pointed down. Drill a hole large enough for your sensor cable through your mounting surface. Mount the unit to the surface with the wiring knock out centered over the wiring hole. Pull the wiring into the unit and terminate using sealant filled connectors. Best practice is to seal the wiring hole with caulk after the wiring is installed. Be sure that the foam on the back of the unit makes a good weather tight seal.

Fig. 4: Outside Humidity in a Weatherproof (WP) Enclosure

Fig. 5: Outside Humidity in a BAPI-Box (BB) Enclosure
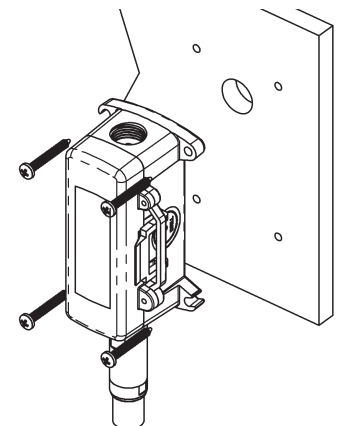
Fig. 6: Outside Humidity in a BAPI-Box 2 (BB2) Enclosure

Specifications subject to change without notice.

Building Automation Products, Inc., 750 North Royal Avenue, Gays Mills, WI 54631 USA
Tel:+1-608-735-4800 • Fax+1-608-735-4804 • E-mail:sales@bapihvac.com • Web:www.bapihvac.com

1 of 4

BAPI®

9938_ins_hum_temp_duct_out_5_20

Wiring and 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, 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. If you are experiencing any of these difficulties, please contact your BAPI representative.
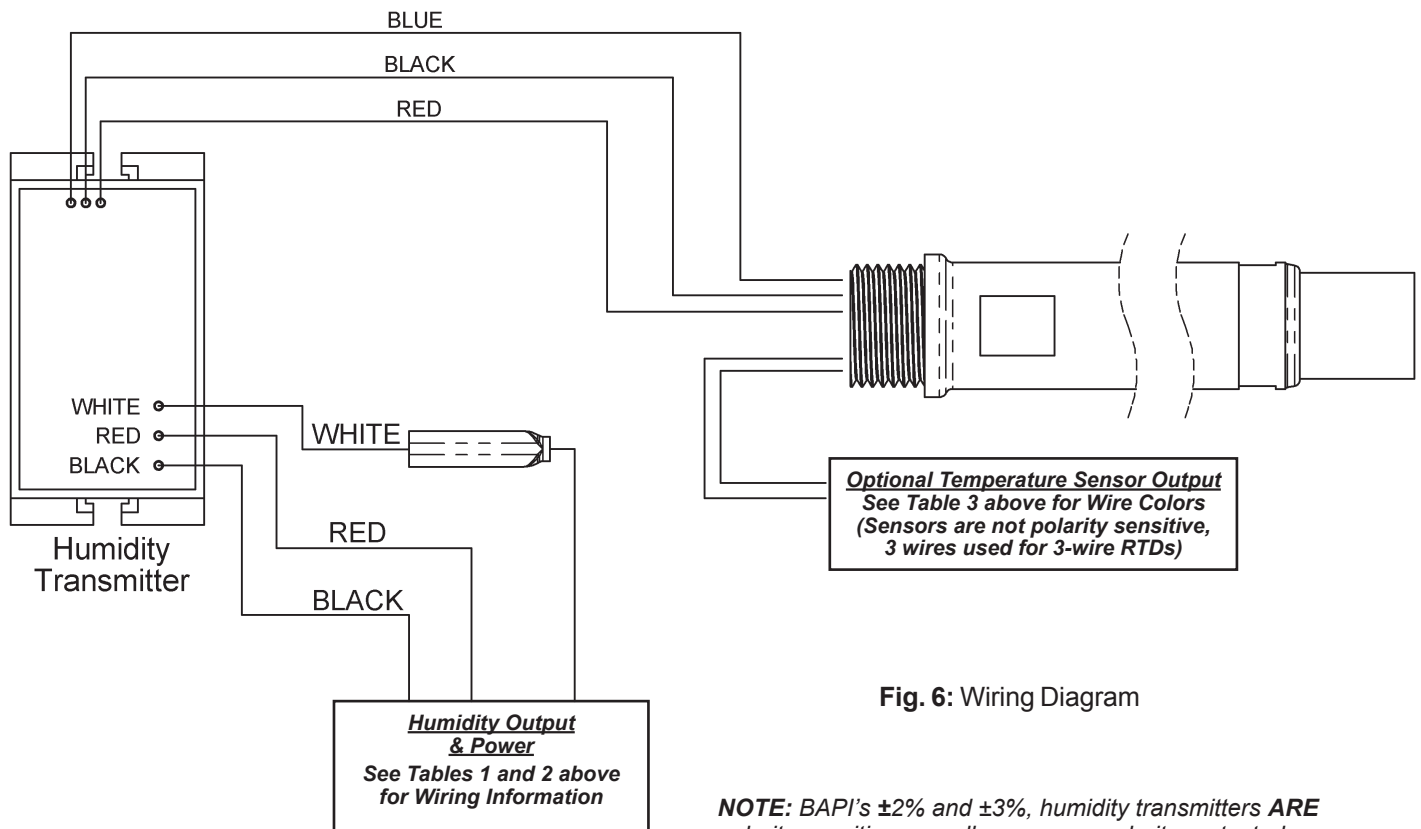
STOP BAPI recommends wiring the product with power disconnected. Proper supply voltage, polarity, and wiring connections are important to a successful installation. Not observing these recommendations may damage the product and will void the warranty.

Table 1: Humidty Transmitter with 4 to 20mA Output

Wire Color	Purpose	Note
White	Not Used	Not Used (Cap Wires)
Black	Humidity Output	4 to 20 mA, To Analog Input of Controller
Red	Power	10 to 35VDC

Table 2: HumidityTransmitter with 0 to 5VDC Output

Wire Color	Purpose	Note
White	Humidity Output	0 to 5VDC, To Analog Input of Controller
Black	GND (Common)	Ground for Power and Humidity Output
Red	Power	10 to 35VDC or 12 to 27 VAC

Table 3: Temperature Sensor Lead Wire Colors

Thermistors		Platinum RTDs - 2 Wire	
1.8KΩ	Orange/Red	100Ω	Red/Red
2.2KΩ	Brown/White	1KΩ	Orange/Orange
3KΩ	Yellow/Black	**Nickel RTD**	
3.25KΩ	Brown/Green	1KΩ	Green/Green
3.3KΩ	Yellow/Brown	**Silicon RTD**	
10K-2Ω	Yellow/Yellow	2KΩ	Brown/Blue
10K-3Ω	Yellow/Red	**Platinum RTDs - 3 Wire**	
10K-3(11K)Ω	Yellow/Blue	100Ω	Red/Red/Black*
20KΩ	White/White	1KΩ	Orange/Orange/Black*
47KΩ	Yellow/Orange	*In the 3-Wire RTD sensors listed above, the two wires of similar color are connected together.	
50KΩ	White/Blue		
100KΩ	Yellow/White		

Additional sensors are available so your sensor may not be listed on this table.

BLUE

BLACK

RED

WHITE
RED
BLACK

Humidity
Transmitter

WHITE

RED

BLACK

Optional Temperature Sensor Output
See Table 3 above for Wire Colors
(Sensors are not polarity sensitive,
3 wires used for 3-wire RTDs)

Humidity Output
& Power
See Tables 1 and 2 above
for Wiring Information

Fig. 6: Wiring Diagram

NOTE: BAPI's ±2% and ±3%, humidity transmitters **ARE** polarity sensitive as well as reverse polarity protected.

Specifications subject to change without notice.

Duct and Outside Air Humidity (H200-H300)
4 to 20mA or 0 to 5V Humidity Output with Optional Temperature Sensor
Installation and Operating Instructions

9938_ins_hum_temp_duct_out_5_20

rev. 08/31/20

Specifications

Power:
  10 to 35 VDC .... For 0 to 5 VDC or 4 to 20 mA Humidity Outputs
  12 to 27 VAC .... For 0 to 5 VDC Humidity Output

Power Consumption:
  22 mA max. DC .... For 0 to 5 VDC or 4 to 20 mA Humidity Outputs
  0.53 VA max. AC .... For 0 to 5 VDC Humidity Output

Sensor: .... Factory corrected @17 RH points (10 to 90% RH)
  Humidity............................ Capacitive Polymer
  RH Accuracy .... ±2% @ 73°F (23°C) from 10 to 90%
  Drift .... 0.5% per year
  Response time.................. < 5 seconds in moving air
  RH Linearity...................... Negligible, factory corrected linear from 10 to 90%
  RH Hysteresis .... Factory corrected to <1%
  Opt. Temp. .... Passive RTD or Thermistor

Filter: 80 micron sintered stainless steel filter

Calibrated Accuracy: Calibration @17 RH points, (10% to 90%)
  RH 2% .... 2% from 10 to 90% @ 73°F (23°C), Non-condensing
  RH 3% .... 3% from 10 to 95% @ 73°F (23°C), Non-condensing
  Thermistor .... ±0.36°F (0.2°C) from 32 to 158°F (0 to 70°C) - High accuracy units are available
  RTD .... ±0.55°F (0.31°C) @ 32°F (0°C) - High accuracy units are available

Output: Selectable via wiring detail
  Humidity............................ 0 to 5VDC or 4 to 20mA at 0 to 100% RH
  Opt. Temp. .... Resistance RTD or Thermistor

Humidity Output Impedance:
  Current .... 700Ω@ 24VDC, Voltage drop is 10VDC
                                       (Supply Voltage DC – Transmitter voltage drop 10VDC) / 0.02 Amps = Max load Impedance
  Voltage.............................. 10KΩ

Probe Length:
  Duct .... 5.3" (13.5cm) Duct Insertion, 1" diameter
  Outside Air......................... 2.4" (6.1cm) Below Enclosure, 1" diameter

Dimensions: W x H x D
  Weatherproof (WP) .... 2.75" x 4.5" x 2.2", (70 x 114 x 55 mm)
  BAPI-Box (BB) .... 4.15" x 5" x 2.5", (105.4 x 127 x 63.5mm)
  BAPI-Box 2 (BB2) .... 4.9" x 2.8" x 2.35", (124.8 x 71.6 x 59.7mm)

Termination: Open wire
  Crimp .... 18 to 26 AWG with Sealant Filled Crimp Connector (BA/SFC1000-x00)
  Wire Nut............................ 26 to 16 AWG with Sealant Filled Wire Nut (BA/SFC2000-x00)

Enclosure Material:
  Weatherproof (WP)........... Cast Aluminum
  BAPI-Boxes (BB, BB2)...... Polycarbonate, UV resistant

Enclosures Ratings:
  Weatherproof (WP)........... NEMA-3R
  BAPI-Boxes (BB, BB2)...... NEMA-4, IP66, UL94V-0

Environmental Operation Range: -40° to 158°F (-40° to 70°C) • 0% to 100% RH

Approvals: RoHS

Specifications subject to change without notice.

Duct and Outside Air Humidity (H200-H300)
4 to 20mA or 0 to 5V Humidity Output with Optional Temperature Sensor
Installation and Operating Instructions

9938_ins_hum_temp_duct_out_5_20   rev. 08/31/20

Filter Care

A sintered filter protects the humidity sensor from various airborne particles and may need periodic cleaning. To do this, gently unscrew the filter from the probe. Rinse the filter in warm soapy water and rinse until clean. A nylon brush may be used if necessary. Gently replace the filter by screwing it back into the probe. The filter should screw all the way into the probe. Hand tighten only. If a replacement filter is needed, call BAPI.

BA/HDOFS3   Stainless Steel Sintered Filter Replacement for Outside Air Units

Humidity Diagnostics

Possible Problems:

Unit will not operate

Humidity output is at its maximum value of 5V or 20mA

Humidity output is at its minimum value of 0V or 4mA

Humidity reading in controller's software appears to be off by more than the specified accuracy

Output	Humidity Formula
4 to 20mA	%RH =(mA-4)/0.16
0 to 5VDC	%RH = V/0.05

Possible Solutions:

- Check for proper supply power. (See page 2 for wiring diagram and power specifications)

- Make sure the humidity sensor is wired properly.

- Make sure the humidity sensor is wired properly.

- Check all software parameters

- Determine if the sensor is exposed to an external air source different from the intended measured environment or reference device.

- Check the Humidity transmitter output against a calibrated reference such as a 2% accurate hygrometer. Measure the humidity at the sensor's location using the reference meter, then calculate the humidity transmitter output using the humidity formula at left. Compare the calculated output to the actual humidity transmitter output (see the wiring diagram on page 2 for the humidity transmitter output wire colors). If the calculated output differs from the humidity transmitter output by more than 5%, contact BAPI technical support.

Temperature Diagnostics

Possible Problems:

Controller reports Incorrect temperature

Possible Solutions:

- Confirm the input is set up correctly in the controller's software

- Verify that the sensor wires are not physically shorted or open

- Check wiring for proper termination

- Measure the 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. If the measured resistance is different from the temperature table by more than 5%, call BAPI technical support. BAPI's web site is found at www.bapihvac.com; click on "Resource Library" and "Sensor Specs" then click on the type of sensor you have.

Specifications subject to change without notice.