Duct & Outside Air Humidity Units with RTD Temperature Transmitter

Humidity Output (4 to 20mA, 0 to 5V, 0/2 to 10V), Temperature Output (4 to 20mA)

Installation and Operating Instructions

26415_ins_hum_RTD_temp_trans_duct_out rev. 01/12/16

Overview

The BA/T1x-(H2xx, H3xx) is a humidity transmitter which comes in 2% or 3% accuracies and an RTD temperature transmitter. It can be ordered for either Duct or Outside Air applications with a doublegang Weatherproof Enclosure (NEMA 3R) or a BAPI-Box Enclosure (NEMA 4, IP66). The humidity transmitter can be ordered with 4 to 20 mA, 0 to 5VDC, 0 to 10V or 2 to 10V output while the temperature transmitter has a 4 to 20mA output.

Duct Unit Mounting

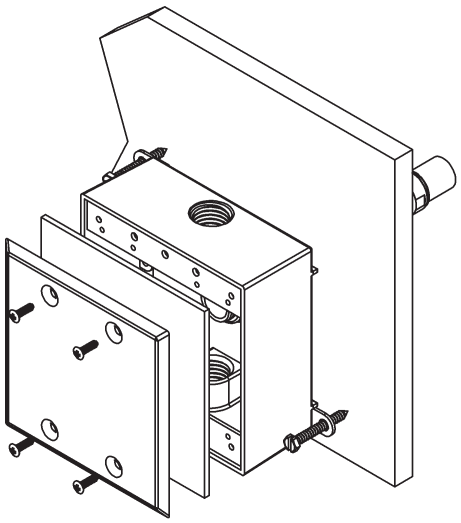

Fig. 1: Duct Humidity Unit in a Weatherproof (WP) Enclosure

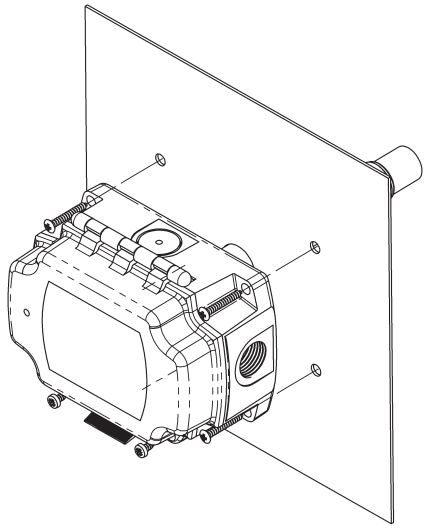

Fig. 2: Duct Humidity Unit in a BAPI-Box (BB) Enclosure

Mount in the center of the duct wall at least 3 duct diameters from humidifiers. Drill a 1 inch hole in the duct for the probe 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, but do not over tighten the screws.

Outside Air Mounting

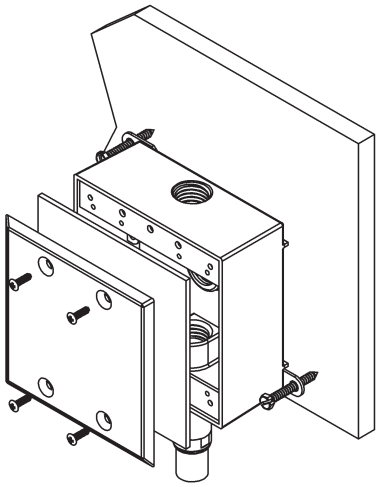

Fig. 3: Outside Air Humidity in a Weatherproof (WP) Enclosure

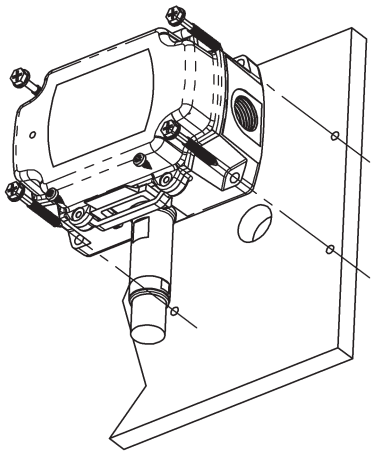

Fig. 4: Outside Humidity Unit in a BAPI-Box (BB) Enclosure

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.

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

Termination

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: Humidity Transmitter with 0 to 10VDC Output		
Wire Color	**Purpose**	**Note**
Green	Humidity Output	0 to 10VDC, To Analog Input of Controller
Black	GND (Common)	Ground for Power and Humidity Output
Red	Power	15 to 35VDC or 15 to 27VAC

Table 4: Humidity Transmitter with 2 to 10VDC Output		
Wire Color	**Purpose**	**Note**
Brown	Humidity Output	2 to 10VDC, To Analog Input of Controller
Black	GND (Common)	Ground for Power and Humidity Output
Red	Power	15 to 35VDC or 15 to 27VAC

Table 5: Temperature Transmitter with 4 to 20mA Output		
Wire Color	**Purpose**	**Note**
Black	Temperature Output	4 to 20mA, To Analog Input of Controller
Red	Power	7 to 40VDC

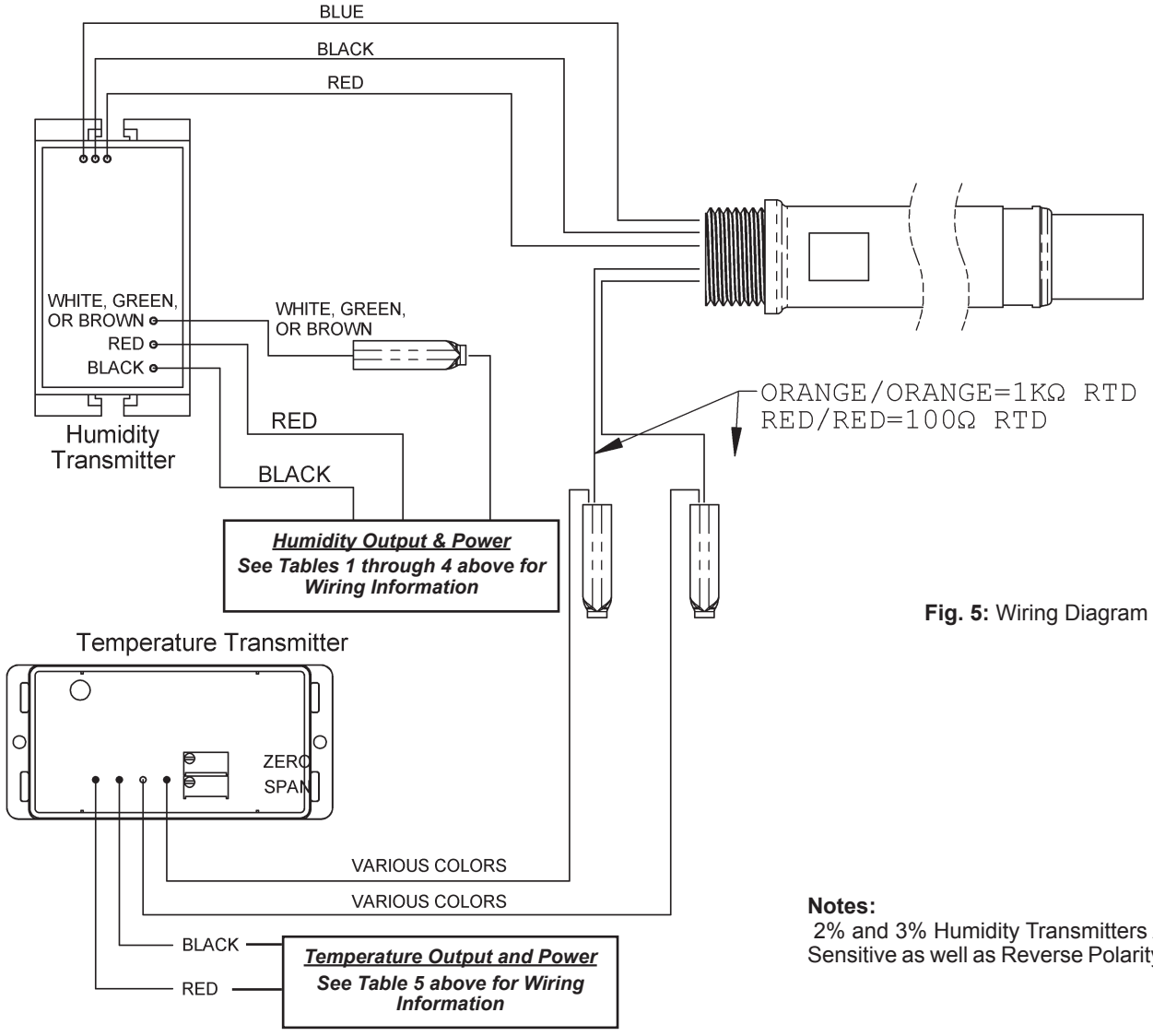

Fig. 5: Wiring Diagram

Notes:
2% and 3% Humidity Transmitters Are Polarity Sensitive as well as Reverse Polarity Protected.

Specifications

Power:

Units with RH Output of 4 to 20mA or 0 to 5VDC:	10 to 35VDC, 22mA max
Units with RH Output of 0 to 5VDC:	12 to 27VAC, 0.53VA max
Units with RH Output of 0 to 10VDC or 2 to 10VDC:	15 to 35VDC, 6mA max or 15 to 27VAC, 0.14VA max
Units with Temperature Output of 4 to 20mA:	7 to 40VDC, 22mA max

Humidity 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 linier from 10 to 90%
RH Hysteresis	Factory corrected to <1%

Humidity Filter: 80 micron sintered stainless steel filter

Humidity Transmitter Output

Transmitter Output	0 to 100%
H200, H300	4 to 20mA output, 700Ω@24VDC, Voltage drop is 10VDC
H200, H300	0 to 5VDC output, 10kΩ
H210, H310	0 to 10VDC output, 10kΩ
H212, H312	2 to 10VDC output, 10kΩ

Humidity Sensor 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

Output Wiring 2 wire current loop, or 3 wire voltage

Transmitter Ambient

Temperature	-4 to 158ºF (-20 to 70ºC)
Humidity	0 to 100% RH, condensing

Probe Ambient:

Temperature	-40º to 158ºF, (-40º to 70ºC)
Humidity	0 to 100% RH, condensing

Probe Length:

Duct	5.3” (13.5cm) Duct Insertion, 1” dia.
Outside Air	2.4” (6.1cm) Below Enclosure, 1” dia.

Dimensions: W x H x D

Weatherproof (WP)	4.5” x 4.5” x 2.2”, (114 x 114 x 55 mm) (doublegang)
BAPI-Box (BB)	4.15” x 5” x 2.5”, (105.4 x 127 x 63.5mm)

Enclosure Material:

Weatherproof (WP)	Cast Aluminum (doublegang)
BAPI-Box (BB)	Polycarbonate, UV resistant

Temperature Sensor:

T1K	Platinum 1KΩ RTD
T100	Platinum 100Ω RTD (discontinued)

RTD Transmitter Output

Transmitter Output	4 to 20mA, 850Ω@24VDC
Output Wiring	2 wire loop
Output Limits	<1mA (short), <22.35mA (open)
Span Min.	30ºF (17ºC), Max 1000ºF, (555ºC)
Zero Min.	Min -130°F (-90°C)
Zero Max	Max 900ºF (482ºC)
Accuracy	±0.065% of span
Linearity	±0.125% of span
Power Output Shift	±0.009% of span
RTD Sensor	2 wire Platinum (Pt), 385 curve
Transmitter Ambient	-4 to 158ºF (-20 to 70ºC) 0 to 100% RH, condensing

Enclosures Ratings:

Weatherproof (WP)	NEMA-3R (doublegang)
BAPI-Box (BB)	NEMA-4, IP66, UL94V-0

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)

Approvals: RoHs

Specifications subject to change without notice.

Filter Care

A filter protects the humidity sensor from various airborne particles that might reduce the sensor's accuracy. Depending on the sensor's location and environment, this filter may need periodic cleaning. To do this, gently unscrew the filter from the probe. Rinse the filter under warm water until clean. Warm soapy water 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 or replacement probe is needed, call BAPI.

BA/HDOFS3 Stainless Steel Sintered Filter Replacement

Diagnostics - Humidity

Possible Problems:	**Possible Solutions:**
Unit will not operate	- Check for proper supply power. (See the wiring diagram and power specifications)
Humidity output is at its maximum or minumum value	- Make sure the humidity sensor is wired properly.
Humidity reading in controller's software appears to be off by more than the specified accuracy	- Check all software parameters - Determine if the sensor is exposed to an external air source different from the measured environment, such as air infiltration through the wiring conduit. - 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 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.

Output	Humidity Formula
4 to 20mA	%RH =(mA-4)/0.16
0 to 5VDC	%RH = V/0.05
0 to 10VDC	%RH = V/0.1
2 to 10VDC	%RH = (V-2)/0.08

Diagnostics - Temperature

Possible Problems:	**Possible Solutions:**
Unit will not operate	- Check for proper supply power (7 to 40VDC) to the temperature transmitter. (See pages 2 for wiring diagram and power specifications.)
Temperature sensor reading is inaccurate at the controller software	- Determine if the input is set up correctly in the controller's front end software. - Check if the RTD sensor wires are physically open or shorted. - Determine if the sensor is exposed to an external air source different from the measured environment, such as air infiltration through the wiring conduit. - Check the resistance of the temperature sensor (located inside the unit's probe) against an accurate temperature standard. Measure the temperature at the sensor's location using a reference meter. Disconnect the temperature sensor wires (2 Red Wires for a 100 Ohm Platinum RTD sensor or 2 Orange Wires for a 1,000 Ohm Platinum RTD sensor) and measure the temperature sensor's resistance with an ohmmeter. Compare this resistance to the appropriate temperature sensor's Output Table on the BAPI website. (Go to www.bapihvac.com; click on "Resource Library" and "Sensor Specs" and then on the 100 Ohm Plat. RTD or the 1,000 Ohm Plat. RTD.) If the measured resistance is different from the Output Table by more than 5%, contact BAPI technical support. - Check the output current of the temperature transmitter (located inside the unit's enclosure) against an accurate temperature standard. Measure the temperature at the sensor's location using a reference meter. Measure the transmitter current by placing an ammeter in series with the controller input (the black wire on the temperature transmitter). The current should read according to the equation at left. If the measured output is different from the calculated output, call BAPI technical support. If the measured output is the same as the calculated output, then check the wiring between the unit and the controller.

Temperature Equation

$$T = T_{low} + \frac{(A-4)x(T_{span})}{16}$$

T = Temperature at sensor
T_{low} = Low temperature of span
T_{high} = High temperature of span
$T_{span} = T_{high} - T_{low}$
A = Ammeter reading in mA

Note:
The temperature surrounding the transmitter must be between -4 and 158°F (-20 and 70°C).

Specifications subject to change without notice.