



# OUTSIDE AIR SERIES TEMPERATURE TRANSMITTER

Phone: 1-888-967-5224  
Website: workaci.com

Installation & Operation Instructions

## GENERAL INFORMATION

The ACI Outside Air Series sensors and transmitters are single point sensors that output 4-20 mA with an optional voltage signal output of 1-5VDC or 2-10VDC signal to BAS or controller. All ACI/TT and TTM temperature transmitters can be powered from either an unregulated or regulated 8.5 to 32 VDC power supply.

## MOUNTING INSTRUCTIONS

For optimal temperature measurement, follow these tips:

- Avoid mounting to chimney walls, above windows, above vents, near doors, or dampers.
- Mount at least 1'-2' (0.3-0.6 m) below eave to prevent thermal radiation from affecting performance – see **FIGURE 2** (p. 2).
- Mount at least 4' (1.22 m) above ground to prevent thermal radiation rising up affecting performance.
- Mount in shade on North side of the structure to minimize sun exposure. In the Southern hemisphere the South side of the building is where the sensor should be mounted.
- The plastic tube that houses the sensor must be pointed down to avoid debris, water, or ice potentially affecting sensor performance.

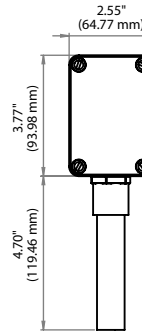
Attach the base directly to the wall. Mounting holes are located at the corners of the housing – see **FIGURE 1** (right). Drill pilot holes for the mounting screws. Use the enclosure mounting holes as a guide, or use the dimensions listed below to measure out. Install the PG11 watertight fitting supplied with the sensor if not using conduit. The outer knockout ring (PG 11/16) on housing should not be removed when using a 1/2" NPT conduit fitting.

Take care when mounting. Sensors should not be placed in direct sunlight, or any other potential heating or cooling sources that could affect temperature being sensed.

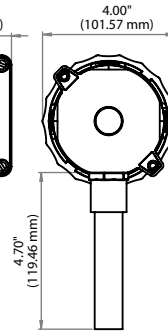
## FIGURE 1: ENCLOSURE DIMENSIONS

### FRONT VIEW

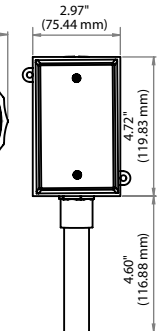
#### NEMA -4X (-4X)



#### EURO (-EH)

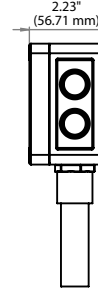


#### BELL BOX (-BB)

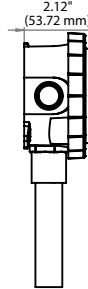


### SIDE VIEW

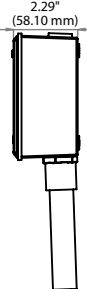
#### -4X



#### -EH

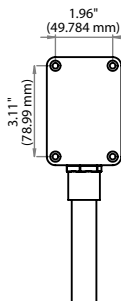


#### -BB

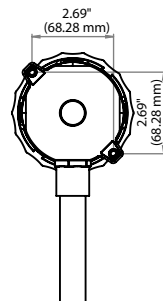


### MOUNTING HOLE LOCATIONS

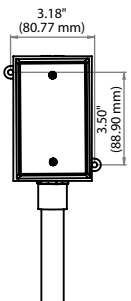
#### -4X



#### -EH



#### -BB



# WIRING INSTRUCTIONS



## PRECAUTIONS

- Transmitter is powered by 24 VDC only.
- Remove power before wiring. NEVER connect or disconnect wiring with power applied.
- When removing the shield from the sensor end, make sure to properly trim the shield to prevent any chance of shorting.
- When using a shielded cable, ground the shield ONLY at the controller end. Grounding both ends can cause a ground loop.
- If the 24 VDC power is shared with devices that have coils such as relays, solenoids, or other inductors, each coil must have an MOV, DC Transorb, Transient Voltage Suppressor (ACIPart: 142583), or diode placed across the coil or inductor. The cathode, or banded side of the DC Transorb or diode, connects to the positive side of the power supply. Without these snubbers, coils produce very large voltage spikes when de-energizing that can cause malfunction or destruction of electronic circuits.

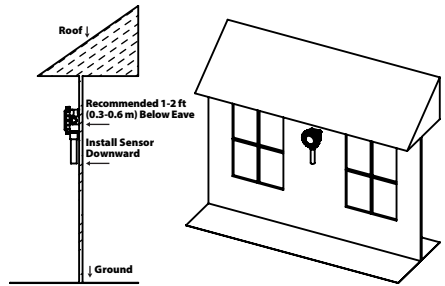
Open the cover of the enclosure. ACI recommends 16 to 26 AWG twisted pair wires or shielded cable for all transmitters. Twisted pair may be used for 2-wire current output transmitters or 3-wire for voltage output. Refer to **FIGURE 3** (right) for wiring diagrams. All wiring must comply with local and National Electric Codes. All ACITT and TTM temperature transmitters can be powered from either an unregulated or regulated 8.5 to 32VDC power supply. The TT and TTM DO NOT support an AC input. All TT and TTM temperature transmitters are reverse polarity protected. After wiring, attach the cover to the enclosure.

The minimum voltage at the transmitter power terminal is 8.5V after load resistor voltage drop.

- 249Ω load resistor (1-5 VDC output) = 13.5 V min supply voltage
- 499 Ω load resistor (2-10 VDC output) = 18.5 V min supply voltage

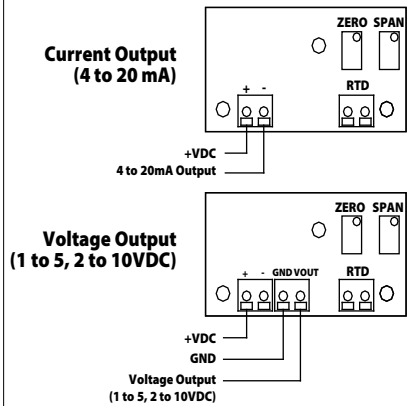
**Note:** Adding extra wire length between the sensor and transmitter board may affect accuracy.

## FIGURE 2: OUTSIDE MOUNTING

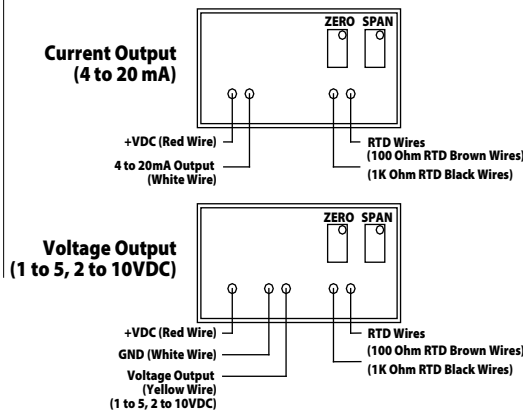


## FIGURE 3: WIRING DIAGRAMS

### STANDARD UNITS



### POTTED UNITS



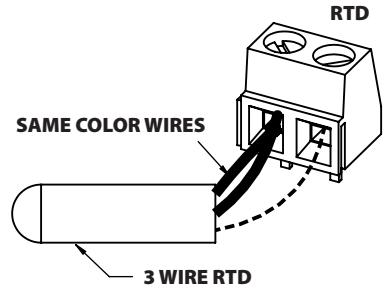
## WIRING INSTRUCTIONS (Continued)

**Note:** All RTD's are supplied with (2) or (3) flying lead wires. ACI's transmitters are supplied with a 2 pole terminal block for RTD sensor connections. When wiring a 3 wire RTD, connect the (2) common wires (same color) together into the same terminal block - see **FIGURE 4** (right).

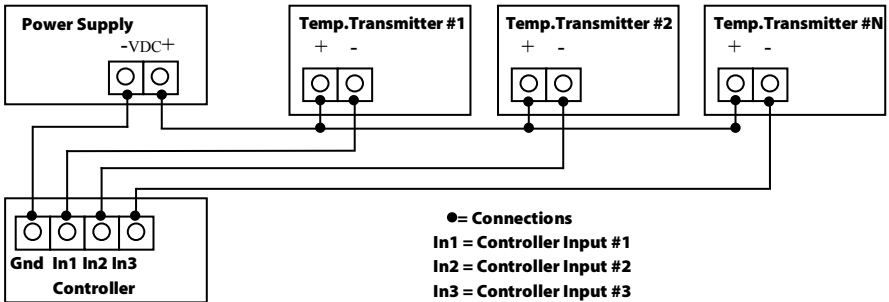
### Formula for Number of Transmitters

Several transmitters may be powered from the same supply as shown in **FIGURE 5** (below). Each transmitter draws 25mA; refer to the following equation to obtain the number of permissible transmitters:  $[\# \text{ Transmitters}] = [\text{Current}] / (25 \text{ mA})$ .

**FIGURE 4: 3 WIRE RTD**



**FIGURE 5: MULTIPLE TRANSMITTER CONNECTIONS**



## TROUBLESHOOTING

### TEMPERATURE PROBLEM

#### No Reading

- No power to board - check voltage at power terminal - should be between +8.5 and 32 VDC.

#### Reading too Low

- RTD wires shorted. Disconnect wires from terminal block and check with ohmmeter. Reading should be close to 100 Ω or 1 KΩ.
- RTD Improper range of transmitter (too low). Check current or voltage - should be between 4-20 mA, 1-5 V, or 2-10 V.

#### Reading too High

- RTD opened. Disconnect sensor wires from terminal block and check with ohmmeter. Reading should be close to 100 Ω or 1 KΩ.
- Improper range of transmitter (too high). Check current or voltage - should be between 4-20 mA, 1-5 V, or 2-10 V.

#### Reading is Inaccurate

- **Sensor check:** Disconnect sensor wires from terminal block and check with ohmmeter. Compare the resistance reading to the Temperature vs Resistance curves located on ACI's website.
- **Transmitter check:** Make sure sensor wires are connected to terminal block. Determine that the proper output is being transmitted based on predetermined span:
  1. Go to ACI Website, Span to Output Page: <http://www.workaci.com/content/span-output>
  2. Enter the low end of the span
  3. Enter the high end of the span
  4. Click on the output of the transmitter. This will generate a span to output chart.
  5. Measure output of transmitter.
  6. Compare measured output to calculated output

# PRODUCT SPECIFICATIONS

SENSOR NON-SPECIFIC	
<b>Storage Temperature Range:</b>	-40 to 71 °C (-40 to 160 °F)
<b>Lead Length   Conductor Size:</b>	14" (35.6cm)   22 AWG (0.65mm)
<b>Lead Wire Insulation   Wire Rating:</b>	Etched (PTFE) Teflon Colored Leads   MIL-W-16878/4 (Type E)
<b>Conductor Material:</b>	Silver Plated Copper
<b>Enclosure Specifications: (Operating Temperature, Material, Flammability, NEMA/IP Ratings):</b>	"-EH": PC/ASA Plastic w/ UV Protectant; -40 to 88 °C (-40 to 190 °F); UL94-V0 "-4X": Polystyrene Plastic, -40 to 70 °C (-40 to 158 °F), UL94-V2, NEMA 4X (IP 66) "-BB": Aluminum, -40 to 121 °C (-40 to 250 °F), NEMA 3R, UL94-V2, NEMA 4X (IP 66)
SENSOR	
<b>Sensor Type   Sensor Curve   Sensing Points:</b>	Platinum RTD   PTC (Positive Temperature Coefficient)   One
<b>Sensor Output at 0°C (32°F):</b>	<b>A/TT100/TTM100:</b> 100 Ω (Brown/Brown)   <b>A/TT1K/TTM1K:</b> 1 KΩ (Black/Black)
<b>RTD Tolerance Class   Accuracy:</b>	+/- 0.06% Class A   (Tolerance Formula: +/- °C = (0.15 °C + (0.002 *  t )) where  t  is the absolute value of temperature above or below 0 °C in °C)
<b>Din Standard   Temperature Coefficient:</b>	DIN EN 60751 (IEC 751)   3850 ppm / °C
<b>Sensor Stability:</b>	+/- 0.03% after 1000 Hours @ 300 °C (572 °F)
<b>Response Time (63% Step Change):</b>	8 Seconds nominal
<b>Sensor Operating Temperature Range:</b>	-40 to 71 °C (-40 to 160 °F)
TRANSMITTER	
<b>Transmitter Supply Voltage   Supply Current:</b>	+8.5 to 32 VDC (Reverse Polarity Protected)   25 mA minimum <b>250 Ω Load:</b> +13.5 to 32 VDC   <b>500 Ω Load:</b> +18.5 to 32 VDC
<b>Maximum Load Resistance:</b>	(Terminal Voltage - 8.5 V)   0.020 A
<b>Output Signals:</b>	<b>Current:</b> 4-20 mA (2-Wire)   <b>Voltage:</b> 1-5 VDC or 2-10 VDC (3-Wires)
<b>Calibrated Accuracy   Linearity<sup>1</sup>:</b>	<b>T. Spans &lt; 500 °F (260 °C):</b> +/- 0.2%
<b>Thermal Drift<sup>2</sup>:</b>	<b>T. Spans &lt; 100 °F (38 °C):</b> +/- 0.04%/°F   <b>T. Spans &gt; 100 °F (38 °C):</b> +/- 0.02%
<b>Min./Max. Calibrated Temperature Spans:</b>	<b>Min. T. Span:</b> 50 °F (28 °C)   <b>Max T. Span:</b> 400 °F (204 °C)
<b>TTM100/TTM1K Certification Points:</b>	<b>3 Pt. NIST:</b> 20, 50, & 80% of span   <b>5 Pt. NIST:</b> 20, 35, 50, 65, & 80% of span
<b>Warm Up Time   Warm Up Drift:</b>	10 Minutes   +/- 0.1%
<b>Transmitter Operating Temperature Range:</b>	-40 to 185 °F (-40 to 85 °C)
<b>Transmitter Operating Humidity Range:</b>	0 to 90%, non-condensing
<b>Connections   Wire Size:</b>	Screw Terminal Blocks   16 AWG (1.31 mm <sup>2</sup> ) to 26 AWG (0.129 mm <sup>2</sup> )
<b>Terminal Block Torque Rating:</b>	0.37 ft-lb (0.5 Nm) nominal

**Note<sup>1</sup>:** Transmitter's calibrated at 71 °F (22 °C) nominal | **Note<sup>2</sup>:** Thermal Drift is referenced to 71 °F (22 °C) nominal calibration temperature

## WARRANTY

The ACI Outside Air Series sensors and transmitters are covered by ACI's Five (5) Year Limited Warranty, which is located in the front of ACI'S SENSORS & TRANSMITTERS CATALOG or can be found on ACI's website: [www.workaci.com](http://www.workaci.com).

## W.E.E.E. DIRECTIVE

At the end of their useful life the packaging and product should be disposed of via a suitable recycling centre. Do not dispose of with household waste. Do not burn.

