



# HAZARDOUS DUCT SERIES TEMPERATURE TRANSMITTER

Installation & Operation Instructions

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## GENERAL INFORMATION

The ACI Hazardous Duct Sensor Transmitter is a single point temperature sensor that is designed for use with electronic controllers in commercial and industrial heating and cooling building management systems. It is available with 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. Hazardous Duct sensors come standard with a heavy-duty Feraloy® Iron Alloy Connection Head that meets Class I, Division 1 & 2, Group A, B, C, D; Class II, Division 1, Groups E, F, G; Class II, Division 2, Group F & G; class III standards.

**For optimal temperature measurement, follow these tips:**

- The sensor should be mounted in the middle of the duct where air circulation is well mixed (no stratification), and not blocked by obstructions. Stratification and obstructions can cause sensing errors. An example is downstream from a heating or cooling coil.
- The Duct probe should be placed (3) to (4) duct segments down from any bend or obstructions and away from 90° bends.
- Mount the sensor on the top or sides of duct work; mounting on the bottom risks damage due to moisture.

## ASSEMBLY INSTRUCTIONS

The enclosure and probe assembly are shipped separately. Insert the lead wires through the threaded hole on the explosion proof enclosure. Thread the probe fitting into the hole and fasten tightly with channel lock pliers/wrench.

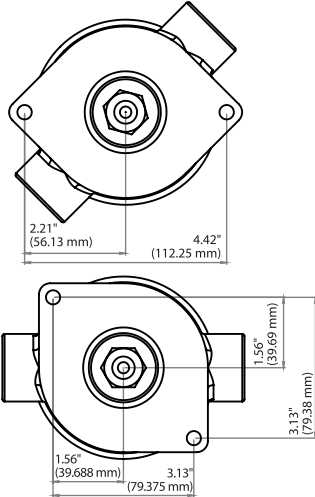
**Note:** If a NIST certified sensor is ordered, the sensor probe serial number must be paired with the enclosure serial number.

## MOUNTING INSTRUCTIONS

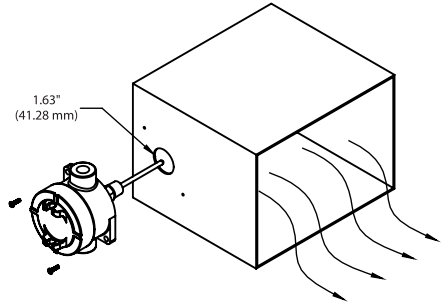
This product must be installed by a trained professional with knowledge of local codes and regulations. Before carrying out any work, ensure local regulations and site procedures are followed to maintain overall certification of the sensor.

Drill a hole approximately 1.63" (41.28 mm) in the duct and insert the probe through the hole until the housing is tightly seated to the duct work - see **FIGURE 2** (bottom). Drill pilot holes for (2) mounting screw (not provided). Use the enclosure flange as a guide, or use the dimensions listed in **FIGURE 1** (top). There are 1/2" NPT tappings located at the top and bottom of the enclosure. Seal fittings, intrinsically safe barriers, and explosion proof flex fittings **are not provided by ACI**.

**FIGURE 1: ENCLOSURE DIMENSIONS**



**FIGURE 2: MOUNTED ASSEMBLY**



Refer to the **Wiring Instructions** to make necessary connections. Remove the cover from housing by twisting off the cover. The housing is provided with Green ground screw if the housing requires an earth ground. After wiring, attach the cover to the base.

## 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 (ACI Part: 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** for wiring connections. The number of wires needed depends on the application. All wiring must comply with all local and National Electric Codes.

**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.

All ACI TT 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.

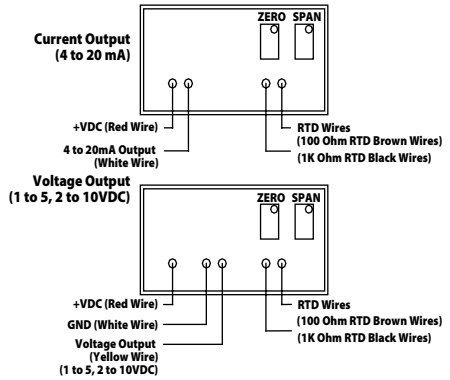
**Note:** The minimum voltage at the transmitter power terminal is 8.5V after load resistor voltage drop.

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

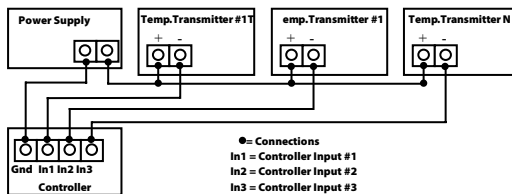
### Formula for Number of Transmitters

Several transmitters may be powered from the same supply as shown in **FIGURE 4**. Each transmitter draws 25mA; refer to the following equation to obtain the number of permissible transmitters:  $[# \text{ Transmitters}] = [\text{Current}] / (25\text{mA})$ .

**FIGURE 3: WIRING DIAGRAMS**



**FIGURE 4: MULTIPLE TRANSMITTER CONNECTIONS**



# PRODUCT SPECIFICATIONS

## SENSOR NON-SPECIFIC

<b>Number Sensing Points:</b>	One
<b>Storage Temperature Range:</b>	-40 to 85 °C (-40 to 185 °F)
<b>Operating Humidity Range:</b>	10 to 95% RH, non-condensing
<b>Enclosure Specifications:</b> (Temperature, NEMA Ratings)	"-D" Enclosure: Feraloy® Iron Alloy, -50 to 60 °C (-58 to 140 °F), NEMA 3, 4, 7ABCD, 9EFG
<b>Enclosure Explosion Proof Rating:</b>	CL. I, Div. 1 & 2, Groups A, B, C, D
<b>Enclosure Dust-Ignition Proof Rating:</b>	CL. II, Div. 1, Groups E, F, G
<b>Enclosure Raintight Rating:</b>	CL. II, Div. 2, Groups F, G
<b>Enclosure Wet Locations Rating:</b>	CL. III
<b>Enclosure UL Standards:</b>	"-D" Enclosure: UL 886
<b>Enclosure CSA Standards:</b>	C22.2 No. 30
<b>Enclosure Hubs   Hub Size:</b>	Two   1/2" NPT (National Pipe Tapered) Female Hubs
<b>Probe Diameter   Sensor Threads:</b>	0.250" (6.35mm)   1/2" NPT Thread
<b>Probe Material:</b>	304 Stainless Steel

## SENSOR

<b>Sensor Type   Sensor Curve:</b>	Platinum RTD   PTC (Positive Temperature Coefficient)
<b>Number Sensor Wires   Wire Colors:</b>	Two   A/TT100/TTM100-EXPL: Brown/Brown   A/TT1K/TTM1K-EXPL: (Black/Black)
<b>Nominal Sensor Output @ 0°C (32°F):</b>	A/TT100/TTM100-EXPL: 100 Ohms   A/TT1K/TTM1K-EXPL: 1000 Ohms
<b>Sensor 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>Sensor Operating   Storage Temperature Ranges:</b>	-40 to 200°C (-40 to 392°F)   -40 to 85°C (-40 to 185°F)

## TRANSMITTER

<b>Transmitter Supply Voltage   Supply Current:</b>	+8.5 to 32 VDC (Reverse Polarity Protected)   25 mA minimum 250 Ohm Load (1-5 VDC): +13.5 to 32 VDC   500 Ohm Load (2-10 VDC): +18.5 to 32 VDC
<b>Operating   Storage Temperature Range:</b>	-40°F to 185°F (-40°C to 85°C)
<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; Loop Powered)   <b>Voltage:</b> 1-5 VDC or 2-10 VDC (3-Wires)
<b>Calibrated Transmitter Accuracy   Linearity:</b>	<b>Temp. Spans &lt; 500°F (260°C):</b> +/- 0.2%   <b>Temp. Spans &gt; 500°F (260°C):</b> +/- 0.5%
<b>Temperature Drift:</b>	<b>Temp. Spans &lt; 100°F (38°C):</b> +/- 0.04%/°F   <b>Temp. Spans &gt; 100°F (38°C):</b> +/- 0.02%
<b>Warm Up Time   Warm Up Drift:</b>	10 Minutes   +/- 0.1%
<b>Calibrated Temperature Spans1:</b>	<b>Minimum Temp. Span:</b> 50°F (28°C)   <b>Maximum Temp. Span:</b> 500°F (260°C)

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



# TROUBLESHOOTING

PROBLEM	SOLUTION(S)
<b>No Reading</b>	<ul style="list-style-type: none"> <li>No power to board - check voltage at power terminal - should be between +8.5 and 32 VDC.</li> </ul>
<b>Reading too Low</b>	<ul style="list-style-type: none"> <li>RTD shorted. Measure the resistance of RTD with an ohmmeter. Reading should be close to 100 <math>\Omega</math> or 1 K<math>\Omega</math>.</li> <li>RTD Improper range of transmitter (too low). Check current or voltage - should be between 4-20 mA, 1-5 V, or 2-10 V.</li> </ul>
<b>Reading too High</b>	<ul style="list-style-type: none"> <li>RTD opened. Measure the resistance of RTD with an ohmmeter. Reading should be close to 100 <math>\Omega</math> or 1 K<math>\Omega</math>.</li> <li>Improper range of transmitter (too high). Check current or voltage - should be between 4-20 mA, 1-5 V, or 2-10 V.</li> </ul>
<b>Reading is Inaccurate</b>	<ul style="list-style-type: none"> <li><b>Sensor check:</b> Measure the resistance of RTD with an ohmmeter. Compare the resistance reading to the Temperature vs Resistance curves located on ACI's website.</li> <li><b>Transmitter check:</b> Determine that the proper output is being transmitted based on predetermined span:               <ol style="list-style-type: none"> <li>Go to ACI Website, Span to Output Page: <a href="http://www.workaci.com/content/span-output">http://www.workaci.com/content/span-output</a></li> <li>Enter the low end of the span</li> <li>Enter the high end of the span</li> <li>Click on the output of the transmitter. This will generate a span to output chart.</li> <li>Measure output of transmitter.</li> <li>Compare measured output to calculated output</li> </ol> </li> </ul>

## WARRANTY

The ACI Hazardous Duct Series temperature sensors is 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.

