



# HAZARDOUS IMMERSION SERIES

Installation & Operation Instructions

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## PRECAUTIONS

**•DO NOT RUN THE WIRING IN ANY CONDUIT WITH LINE VOLTAGE (24/120/230 VAC).**

## GENERAL INFORMATION

The ACI Hazardous Immersion Sensor 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 multiple thermistor or RTD options. Hazardous Immersion 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:**

- Apply thermal grease to the end of the probe before installation into thermowell (ACI Item #102595).
- The tip of the thermowell should be located in the middle of the pipe.
- The sensor thermowell should be installed against the flow of the water, where water temperature is well mixed (no stratification).
- Make sure the entire thermowell is immersed. If the thermowell is longer than the pipe diameter, the thermowell should be installed in an elbow or Tee.

## ASSEMBLY INSTRUCTIONS

The enclosure and probe assembly are shipped separately. Insert the lead wires through the threaded hole on the explosion proof enclosure.

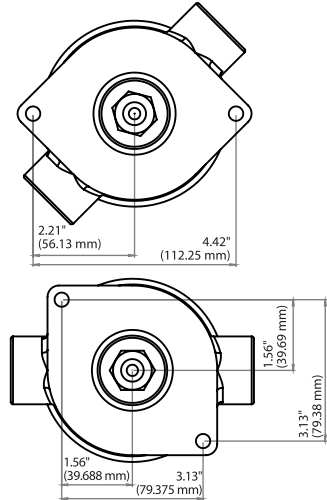
Thread the probe fitting into the hole and fasten tightly with channel lock pliers/wrench.

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

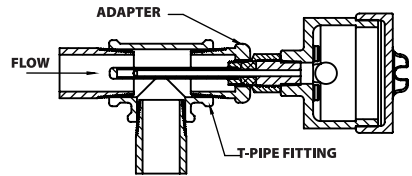
## THERMOWELL INSTALLATION

ACI's Hazardous Immersion sensors are made to install into a 1/2" NPT female thread. Typically a Threadolet or Tee is installed into the pipe, but a hole can also be drilled and tapped.

**FIGURE 1: MOUNTED ASSEMBLY**



**FIGURE 2: T-PIECE ASSEMBLY**



The pipe/system will need to be drained, unless a Hot Tap is being used. The recommend drill size is 23/32 in. (18 mm). Drill the hole, and tap the hole with 1/2"-14NPT.

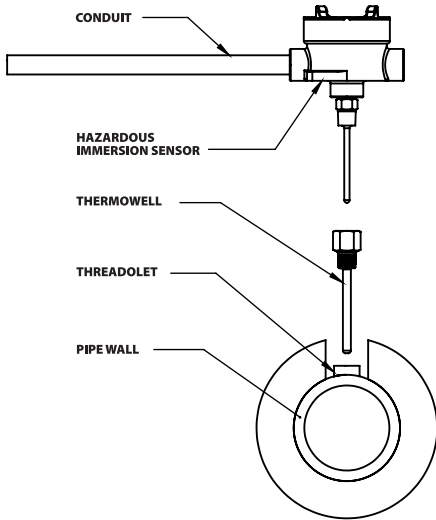
Always use proper thread sealants on tapered pipe threads of the thermowell. Screw the thermowell into the Threadolet, Tee, or tapped hole, using a wrench to tighten it firmly.

Refill the system and check for leaks.

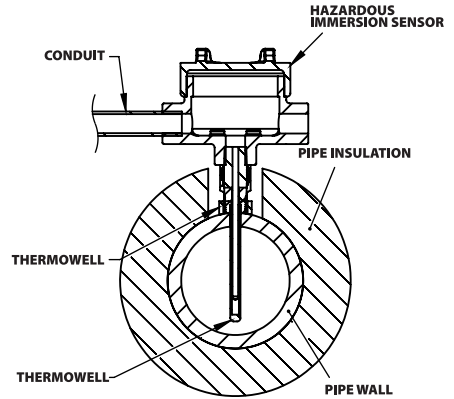
Best practice is to apply thermal grease to the end of the probe, but not required. Insert and push the sensor probe into the thermowell. Turn the sensor probe assembly clockwise to tighten down completely. Refer to the **Wiring Instructions** (p. 3) to make necessary connections.



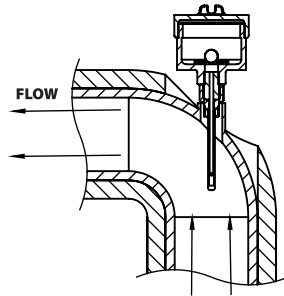
**FIGURE 3: ASSEMBLY**



**FIGURE 4: THREADOLET ASSEMBLY**



**FIGURE 5: ELBOW ASSEMBLY**



## PROBE AND INSERTION LENGTH

The immersion sensors “-I” include a welded thermowell but can be ordered without the thermowell “-INW” version. The “-INW” includes a standard 1/2” NPS process thread to be used with a machined thermowell or existing thermowell application. Verify the existing thermowell insertion length of the pipe is suitable for your selected Immersion. The Hazardous Immersion Sensors are available in 2.5”, 4”, and 6” insertion lengths. 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**.

**Note:** \*Fabricated (welded) thermowells are not intended for moving water or high pressure service. Fluid velocity and wake frequency are primary factors in well failure. Machined thermowells should be used in these types of applications. Fabricated thermowells are intended for tank, or low to no flow, applications.

## WIRING INSTRUCTIONS

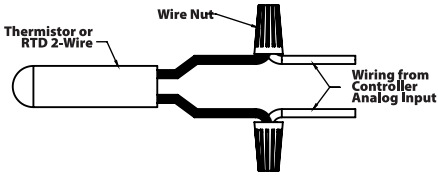
All thermistor type units are supplied with (2) flying lead wires, and all RTD's are supplied with (2) or (3) flying lead wires – see **FIGURES 6 and 7** (p. 3). The number of wires needed depends on the application.

Connect thermistor/RTD wire leads to controller analog input wires using wire nuts, terminal blocks, crimp connectors, or soldering. If the controller requires a (2) wire input for a RTD, connect the (2) common wires (same color) together. All wiring must comply with local codes and National Electric Code.

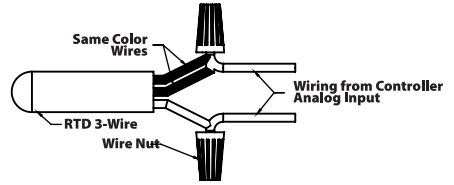
**Note:** When using a shielded cable, be sure to connect only (1) end of the shield to ground at the controller. Connecting both ends of the shield to ground may cause a ground loop. When removing the shield from the sensor end, make sure to properly trim the shield to prevent any chance of shorting.

**Note:** If the controller requires a (2) wire input for a RTD, connect the (2) common wires (same color) together. If the controller requires (3) wires, use (3) individual wires.

**FIGURE 6: 2-WIRE THERMISTOR or RTD WIRING**



**FIGURE 7: 3-WIRE RTD WIRING**



## TROUBLESHOOTING

PROBLEM	SOLUTION(S)
<b>Sensor reading is incorrect</b>	<ul style="list-style-type: none"> <li>• Verify sensor wiring to controller is not damaged and has continuity.</li> <li>• Verify sensor or wires are not shorted together.</li> <li>• Verify controller is setup for correct sensor curve.</li> <li>• Disconnect sensor wires, and take a resistance reading with a multimeter.</li> <li>• Compare the resistance reading to the Temperature Vs Resistance Curves online: <a href="http://www.workaci.com/content/thermistor-curves-0">http://www.workaci.com/content/thermistor-curves-0</a></li> <li>• Verify proper mounting location to confirm no external factors are affecting reading.</li> </ul>
<b>Sensor reads infinity/very high resistance</b>	<ul style="list-style-type: none"> <li>• Sensor or wires are open</li> </ul>
<b>Sensor reads low resistance</b>	<ul style="list-style-type: none"> <li>• Sensor or wires are shorted together</li> </ul>
<b>Erratic readings</b>	<ul style="list-style-type: none"> <li>• Bad wire connections</li> </ul>

# 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)	"-I" or "-INW" Enclosure: Feraloy® Iron Alloy, -50 to 60 °C (-58 to 140 °F), NEMA 3, 4, 7ABCD, 9EFG
<b>Sensor Operating Temperature Range:</b>	<b>Thermistor:</b> -40 to 150°C (-40 to 302°F)   <b>A/CP-HT and RTD:</b> -40 to 200°C (-40 to 392°F)
<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>	"-I" or "-INW" 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
<b>Thermowell Material   Bore Diameter:</b>	304 Stainless Steel   0.260"
<b>Thermowell Instrument Thread   Process Thread:</b>	1/2" NPS Female Thread   1/2" NPT Male Thread

## THERMISTOR

<b>Sensor Output @ 25°C (77°F):</b> (Lead Wire Colors)	<b>A/AN (Type III):</b> 10 KΩ nominal (White/White) <b>A/CP (Type II):</b> 10 KΩ nominal (White/Green) <b>A/CP-HT (Type II):</b> 10 KΩ nominal (White/Green) <b>A/10K-E1:</b> 10 KΩ nominal (Orange/Gray)	<b>A/1.8K:</b> 1.8 KΩ nominal (Red/Yellow) <b>A/3K:</b> 3 KΩ nominal (White/Brown) <b>A/20K:</b> 20 KΩ nominal (Brown/Blue) <b>A/100KS:</b> 100 KΩ nominal (Black/Yellow)
<b>Accuracy 0-70°C (32-158°F):</b>	<b>A/1.8K Series:</b> +/- 0.5 °C @ 25 °C (77 °F) and (+/-1.0 °C) (+/-1.8 °F)	<b>A/10K-E1 Series:</b> +/- 0.3 °C (+/- 0.54 °F) <b>All Else:</b> +/- 0.2 °C (+/- 0.36 °F)

## PLATINUM

<b>Sensor Output @ 0°C (32°F):</b>	<b>A/100:</b> 100 Ω nominal	<b>A/1K:</b> 1 KΩ nominal
<b>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>@ -40 °C (-40 °F):</b> +/- 0.23°C (+/- 0.414 °F) <b>@ 0 °C (32 °F):</b> +/- 0.15°C (+/- 0.27 °F)	<b>@ 200 °C 392 °F):</b> +/- 0.55 °C (+/- 0.99 °F)

## WARRANTY

The ACI Hazardous Immersion 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.

