TEMPERATURE LINECARD
The first product line ACI manufactured in 1991 was temperature sensors. This line has grown in scope every year since and has become a staple in the industry today. ACI goes the extra mile by double encapsulating and using high-quality etched teflon for probe-based sensors.
ACI’s thermistors and RTDs are resistive temperature sensors whose resistance outputs vary with changes in temperature. All of ACI’s standard thermistors have a non-linear NTC (Negative Temperature Coefficient) output and RTDs have a linearized PTC (Positive Temperature Coefficient) output. Thermistors differ from RTDs in that each thermistor is an interchangeable, high accuracy epoxy coated chip, while the RTD’s are manufactured using ceramic, semiconductors, and wire wound sensors using platinum and nickel elements. RTDs are useful over a larger range of temperatures and where long-term stability and accuracy are required, while thermistors typically achieve a high precision over a limited temperature range. Thermistors are less expensive and are the standard choice for most modern Building Management (DDC) Systems. Thermistors are affected less by lead wire resistance when compared to RTD’s due to their increased sensor resolution. Due to their linearity, accuracy and stability over wide operating temperature ranges, RTDs are typically the sensor used with Temperature Transmitters.

Temperature Transmitters take the resistance output of a Platinum RTD and convert it into an analog signal of 4-20 mA, 1-5 VDC, or 2-10 VDC. Temperature transmitters offer several advantages when using them versus resistive type sensors. A transmitter with a 4-20 mA signal is not affected by lead wire resistance and are much less susceptible to noise and other radiated interference. Most DDC controllers and PLCs include standard analog “universal” inputs and do not require programming for specific temperature resistance curves. Transmitters with NIST Certified Calibration are available for applications requiring high accuracy and traceability; and the ability to be recalibrated over time.

<table>
<thead>
<tr>
<th>SENSOR TYPE</th>
<th>OUTPUT</th>
<th>COE*</th>
<th>TEMP RATING</th>
<th>LINEAR OUTPUT</th>
<th>RES.</th>
<th>LEAD WIRE LENGTH IMPACTED</th>
<th>ACC. RATING</th>
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<tbody>
<tr>
<td>Thermistors</td>
<td>Resistive</td>
<td>NTC</td>
<td>-40 to 302°F</td>
<td>NO</td>
<td>High</td>
<td>NO</td>
<td>Good</td>
</tr>
<tr>
<td>RTDS</td>
<td>Resistive</td>
<td>PTC</td>
<td>-58 to 392°F</td>
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<tr>
<td>Semiconductors</td>
<td>Micro Amps</td>
<td>PTC</td>
<td>----</td>
<td>YES</td>
<td>----</td>
<td>NO</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Millivolts</td>
<td>PTC</td>
<td>----</td>
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<td>Good</td>
</tr>
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<td>NO</td>
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* NTC (Negative Temperature Coefficient) = As temperature increases, resistance decreases
* PTC (Positive Temperature Coefficient) = As temperature increases, resistance increases

COE = Temperature Coefficient  RES = Resolution  ACC = Accuracy

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COE = Temperature Coefficient  RES = Resolution  ACC = Accuracy
There are several types of thermistors available in the Building Automation Industry today. ACI’s nomenclature typically calls out the resistance reference at 25ºC (77ºF) in each part number. For instance, the A/20K prefix indicates a 20,000 ohm resistance value at 25ºC (77ºF). The two most common thermistors are A/AN (Type III) and A/CP (Type II) where both are referenced at 10,000 ohms but vary from each other when the temperatures changes from their initial reference point. The “AN” and “CP” are abbreviations from two OEMs that standardized on these common thermistor types back in the early 90’s.

ACI has a large selection of thermistor and RTD choices available and can provide sensor recommendations when provided with some general information such as the control manufacturer or the specific controller being used. Please contact our highly qualified staff for assistance if you have any further questions as to which sensor will work with your system or controller.

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<tr>
<td>PREFIX</td>
<td>OHM</td>
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</tr>
<tr>
<td>A/CP</td>
<td>Type II 10,000Ω @ 77ºF</td>
<td>A/100</td>
</tr>
<tr>
<td>A/AN</td>
<td>Type III 10,000Ω @ 77ºF</td>
<td>A/1K</td>
</tr>
<tr>
<td>A/1.8</td>
<td>1,800Ω @ 77ºF</td>
<td>A/1K-NI</td>
</tr>
<tr>
<td>A/2252</td>
<td>2,252Ω @ 77ºF</td>
<td>A/100KS</td>
</tr>
<tr>
<td>A/3K</td>
<td>3,000Ω @ 77ºF</td>
<td>A/10KE</td>
</tr>
<tr>
<td>A/10KS</td>
<td>10,000Ω @ 77ºF</td>
<td>A/10KEI</td>
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<tr>
<td>A/10K</td>
<td>10,000Ω @ 77ºF</td>
<td>A/AN-BC</td>
</tr>
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ACI provides the specific curve chart characteristics at [www.workaci.com/content/thermistor-curves-0](http://www.workaci.com/content/thermistor-curves-0) for each standard thermistor sensor.
ROOM
The ACI R2 offers the most stylish and modern room enclosure appearance in the industry today. ACI’s R2 provides great airflow which allows the enclosure to be fitted with numerous options and limits self-heating errors. Options include setpoint, override, and communication jack. This attractive enclosure can be ordered with your custom logo as well.

DUCT
ACI’s standard plastic box has a hinged cover with a pressure latch closing mechanism, a mounting flange and a foam pad. Each sensing element is double encapsulated and is offered in numerous probe lengths. Ducts can also be ordered with a galvanized metal box, NEMA 3R, or NEMA 4X enclosure.

OUTSIDE
The ACI Outside Air Mount is based on a European style enclosure that locks out water with a gasketed cover and watertight fitting; and designed to be mounted flush to an exterior wall. A solar radiation/weather shield is offered when applications require additional protection from extreme weather conditions.

IMMERSION
The ACI Immersion configuration incorporates the same high quality standards as the ACI Duct configuration but adds a ½ inch NPSM fitting in place of the mounting flange and includes a two part 304 stainless steel thermowell. This product comes standard with a galvanized box and can also be ordered with an optional plastic enclosure, NEMA 3R or NEMA 4X enclosure.

STRAP
The ACI Strap-on comes with a sensor epoxied to the back side of a copper plate and with a foam pad, creates compression when the strap wormdrive is tightened. This creates a good thermal transfer around pipes 2” to 5” in diameter. Strap-ons come standard with a galvanized box and can be ordered with a plastic enclosure or a NEMA 4X enclosure.

Temperature
www.workaci.com
**COPPER AVERAGING**

ACI has several options for getting an average temperature reading. Our most common is the flexible copper tube type, which comes in lengths of 8’, 12’, and 24’. Copper is known to have an inhibiting effect on the growth of fungi’s and bacteria within the typical HVAC duct. Copper also has a thermal conductivity that is approximately 1.75 to 2 times higher than that of aluminum.

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**RIGID AVERAGING**

A foam pad to dampen vibrations. The stainless steel probe houses sensing elements which are wired in a series/parallel configuration to provide an averaged output.

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**FLEXIBLE AVERAGING**

The flexible averaging series incorporates sensing elements which are wired in a series/parallel configuration to provide an averaged output inside a flexible cable for ease of installation. Each sensing element is marked by adhesive shrink wrap.

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**BUTTON**

The ACI Button Sensor is designed to be aesthetically pleasing for higher profile applications. Due to the size and appearance of these products, any button sensor is a perfect choice for applications where room sensors want to remain un-noticed. Buttons are available in brass, stainless steel, and plastic for installation flexibility.

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**HAZARDOUS**

ACI’s Hazardous Sensor Series is offered with an explosion proof head, which includes an O-ring, gasket, ground screw, (2) 1/2” NPT female openings, and mounting holes in the base of the housing for ease of installation. The conduit enclosure has a UL Listing of 886 and meets the following: CL. I, DIV. 1 & 2, GR. A, B, C, D; CL. II, DIV. 1, GR. E, F, G; CL.II, DIV. 2, GR. F, G; CL. III; NEMA 3, 4, 7ABCD, 9EFG.
**FREEZER**

The ACI Freezer Sensor Series is designed to be placed in glycol to buffer freezer fluctuation response times. Available sizes include: 6', 10', 30', 50' and 100' lengths for platinum RTDs and 30' for various thermistor sensor types. Freezer sensors may be purchased with a glycol bottle and mounting bracket if desired.

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**TUC2**

TUC2 can indicate room temperature, setpoint, fan speed, and occupied, unoccupied status with corresponding signals sent to your Direct Digital Control System (DDC System). This unit supports single sensor operation for several common sensor types and it provides the flexibility to indicate several options. Additionally, many options are field adjustable via the key-pad menu. The A/TUC2 is highly configurable as a standard offering but can also be engineered to meet special OEM requirements.

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**STAINLESS PLATE**

The ACI Stainless Plate has a sensor epoxied to its backside and is thermally shielded from temperatures inside the wall by an insulated foam pad. Options include an override and RS232 communication port.

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**HIGH & LOW**

ACI High Temperature (HT) and Low Temperature (LT) sensors are air encapsulated. This allows the sensor to have a more stable output since the sensing element isn’t subjected to the constant expansion and contraction of the encapsulation materials. Sensors are mounted in a 1/4” diameter stainless steel probe and have nickel plated fiberglass (HT) or teflon (LT) lead wires.

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**BULLET PROBE**

A stainless steel probe encases a double encapsulated sensing element for durability and ease of installation. The wire leads are etched Teflon and are color coded to identify the sensing element involved. Additional types of wire and cable are available for probe related sensors.
**POTTED SENSOR**

The raw sensor series is a double encapsulated sensing element for durability. The wire leads are etched Teflon and are color coded to identify the sensing element involved. Additional types of wire and cable are available.

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**LCD**

ACI offers a digital display to be used in conjunction with its full line of temperature sensors. These devices can be configured with a setpoint, override, and communication jack.

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**INFINITY**

The Infinity Enclosure has 4-way airflow and has been ACI’s standard enclosure for several years. It can support multiple options such as LCD, setpoint, override, and communication jacks. Recently, ACI introduced a modern update to the Infinity Enclosure, the R2 (Aries Enclosure).

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**THERMOWELLS**

ACI offers a full line of thermowells that cover a wide range of applications. A two-piece welded well comes standard with our thermowell sensor line. A machined well is available for moving water or high pressure applications. Also available are monel wells; which are well suited for marine and salt water applications.

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**MOUNTING PLATES**

The ACI Mounting Plate may be used to mount devices over a larger electrical enclosure or hole in the wall. It is made up of a plastic material and contains numerous mounting holes to match most of the standard electrical boxes used in the industry today. It may be mounted either vertically or horizontally. ACI also offers a slightly larger plate made from 20 Gauge Commercial Steel.
NEMA 4X
Type 4X enclosures are intended for indoor and outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose directed water; and to be undamaged by the formation of ice on the enclosure.

NEMA 3R
Type 3R enclosures are intended for outdoor use primarily to provide a degree of protection against falling rain; and to be undamaged by the formation of ice on the enclosure (Not available with the ACI Strap-on Sensor Series).

GALVANIZED
The ACI galvanized enclosures are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment or locations where unusual service conditions do not exist. Galvanized enclosures are typically fitted with mounting flanges and foam pads for duct mounted applications.

EURO, OUTSIDE
The Euro Housing is ACI’s standard enclosure for all outdoor resistive temperature sensors. This weather proof enclosure has a gasketed cover and a water tight gland for wiring.

PLASTIC BOX
The innovative plastic box from ACI features a hinged cover with no screws to mess with, only a quick snap latch for ease of installation. This sleek, yet robust, enclosure also features a built-in mounting flange and weighs much less than its metal counterparts.