

Resistance Temperature Detector (RTD)

Resistance temperature detectors, resistance thermometers, platinum resistance thermometers, or RTD's are sensors that measure temperature by means of resistance. RTD's are based on the principle that the electrical resistance of metals changes with temperature. The phenomena exists in all metals but some metals have a more repeatable resistance to temperature relationship. Platinum, nickel and copper are all used in RTD's but platinum has become the standard for RTD elements due to the almost linear resistance to temperature output. RTD elements are small in size and are most commonly constructed in a thin film or traditional wire wound style. The platinum thin film RTD element consists of platinum etched onto a substrate. The traditional wire wound is made by coiling the platinum wire inside a small ceramic cylinder.

RTD's are most commonly defined by their resistance at 0°C and a constant from the RTD equation. For example the 100 Ohm Platinum 0.00385 ohm/ohm/°C RTD element is the most common RTD element used by Aircom. This element is defined by the industry standard IEC 60751 (DIN EN 60751), which specifies the requirements, tolerance and temperature to resistance relationship for industrial platinum resistance temperature sensors. Table 1 outlines the class designation along with the tolerance definition that defines the allowable amount of variation at a given temperature per the standard for 100 ohm platinum 385 elements. Table 2 is an expansion of table 1 at various temperatures.

Tolerance

Tolerance Class	Tolerance Definition
Class A	$\pm(0.15 + 0.002 t)$
Class B	$\pm(0.3 + 0.005 t)$
1/10 Class B*	$\pm(0.03 + 0.0005 t)$
<i> t = absolute temperature</i>	

*Some applications call for a tighter tolerance. 1/10 DIN, 1/10 B or 1/10 Class B are common terms used in industry for identifying a higher tolerance element. These elements are not defined under IEC 60751. The tolerance however is specified as approximately one tenth of a class B element.

Temp °C	Limit Variations per IEC 60751			
	Class A		Class B	
	°C	Ohm	°C	Ohm
-200	±0.55	±0.24	±1.3	±0.56
-100	±0.35	±0.14	±0.8	±0.32
0	±0.15	±0.06	±0.3	±0.12
100	±0.35	±0.13	±0.8	±0.30
200	±0.55	±0.20	±1.3	±0.48
300	±0.75	±0.27	±1.8	±0.64
400	±0.95	±0.33	±2.3	±0.79
500	±1.15	±0.38	±2.8	±0.93
600	±1.35	±0.43	±3.3	±1.06
650	±1.45	±0.46	±3.6	±1.13
700	-	-	±3.8	±1.17
800	-	-	±4.3	±1.28
850	-	-	±4.6	±1.34

Aircom manufactures RTD elements into usable temperature devices such as sensor probes and assemblies. The construction of RTD temperature devices will vary depending on the temperature and type of process the RTD will be used in. Aircom has five RTD construction definitions:

- LT: Aircom's standard RTD construction, 316/L stainless steel sheath, suitable for -50 to 260°C temperature readings
- HT: High temperature RTD construction, 316/L stainless steel sheath, suitable for -50 to 650°C, 450°C continuous temperature
- ET: Extreme temperature RTD construction, 316/L stainless steel sheath, suitable for -50 to 850°C temperature readings
- VT: High vibration RTD construction, 316/L stainless steel sheath, suitable for -50 to 482°C temperature readings
- CT: Cryogenic temperature construction, 316/L stainless steel sheath suitable for -200 to 260°C temperature readings