Accuracy, Stability, and Repeatability.

Tolerance/Accuracy is calculated as:	
Class B	change in t=+/- (0.3+0.005|t|)
Class A	change in t=+/- (0.15+0.002|t|)
1/3 Class B	change in t=+/- 1/3 x (0.3+0.005|t|)
1/5 Class B	change in t=+/- 1/5 x (0.3+0.005|t|)
1/10 Class B	change in t=+/- 1/10 x (0.3+0.005|t|)
|t| = absolute temperature in °C. Where elements have a resistance of n x 100 Ohms then the basic values and tolerances also have to be multiplied by n	

These three terms are often confused, but it is important to understand the difference.

- Accuracy. IEC standard 751 sets two tolerance classes for the accuracy of RTDs: Class A and Class B:

Class A: $\Delta t = \pm(0.15 + 0.002 \cdot |t|)$

Class B: $\Delta t = \pm(0.30 + 0.005 \cdot |t|)$

where:

$|t|$ = absolute value of temperature in °C

Class A applies to temperatures from –200°C to 650°C, and only for RTDs with three- or four-wire configurations. Class B covers the entire range from –200°C to 850°C.

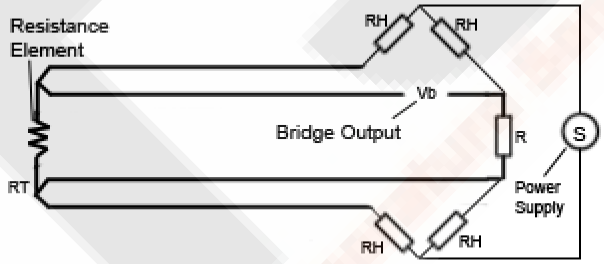

Figure 3. Lead wires have resistance that is a function of the material used, wire size, and lead length. This resistance can add to the measured RTD resistance, and improper wire compensation can result in significant errors. The common configurations of RTDs are two (A), three (B), or four wires (C).

- Stability. This is the sensor's ability to maintain a consistent output when a constant input is applied. Physical or chemical changes can cause calibration drift. The material that the platinum is adhered to, whether wound on a mandrel or on a substrate, can expand and contract, straining the wire. Drift rates conservatively specified by manufacturers are typically 0.05°C/yr.
- Repeatability. Repeatability is the sensor's ability to give the same output or reading under repeated identical conditions.

Absolute accuracy is not necessary in most applications. The focus should be on the stability and repeatability of the sensor. If an RTD in a 100.00°C bath consistently reads 100.06°C, the electronics can easily compensate for this error. The stability of RTDs is exceptional, with most experiencing drift rates of 0.05°C over a five-year period.

Response Time.

Response time varies according to the application. It is the sensor's ability to react to a change in temperature, and depends on the sensor's thermal mass and proximity to the material being tested. For instance, an RTD sensor in a thermowell will react more slowly than the same sensor immersed directly into a process. RTD specifications will list the sensor's time constant, which is the time it takes for an RTD to respond to a step change in temperature and come to 63% of its final equilibrium value. Response times are calculated in water flowing at 0.2 m/s and in air flowing at 1 m/s. This gives a useful comparison of RTD sensor configurations.