THERMISTORS

The thermistor is a thermally sensitive resistor, but unlike the RTD, it exhibits a correspondingly large change in resistance. Its resistance, in general, decreases as the temperature increases. Thermistors are made by sintering a combination of oxides into plain beads or beads in a glass rod.27 Oxides of manganese, nickel, cobalt, copper, iron, and titanium are commonly used.

The resistance vs. temperature relationship for a thermistor can be represented by a third-degree polynomial, as shown below.

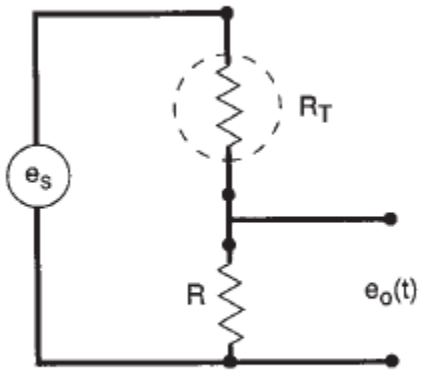

Figure 5.13 A voltage-divider circuit for a thermistor.

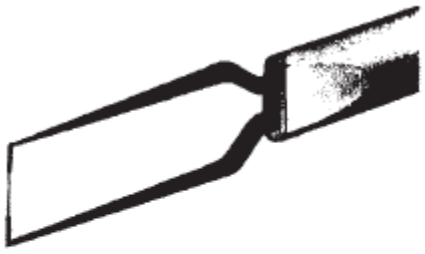

Figure 5.14 Hot-wire anemometer. *(Courtesy of Dantec Electronics, Inc., Mahwah, N.J.)*

$$\log_e R_T = a_0 + \frac{a_1}{T} + \frac{a_2}{T^2} + \frac{a_3}{T^3} \qquad (5.14)$$

where R_T=resistance, Ω, at T/K
a_0, a_1, a_2, and a_3=unique numerical constants
T=(°C+273.15)K

Since there are four unknowns, at least four calibration points are required to solve four simultaneous equations to obtain the values of the constants.

The Wheatstone bridge circuit configurations used with strain gages and RTDs are also used with thermistors. In many cases, a single voltage-divider circuit is also used as shown in Fig. 5.13. This circuit has the advantage of providing an output voltage eo(t) that increases as the temperature increases,

$$e_o(t) = e_s\left(\frac{R}{R + R_T}\right) \qquad (5.15)$$

By selecting an appropriate value of R, it is possible to operate in the quasilinear region.

Source: http://mediatoget.blogspot.in/2012/05/thermistors.html