SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

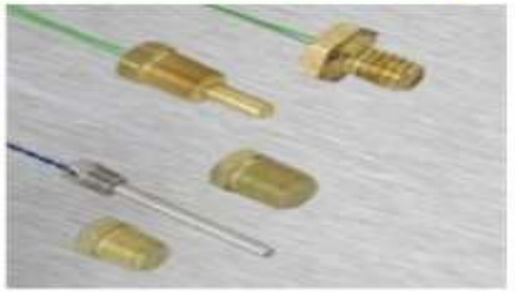
IIYEAR/ III SEMESTER

19ECT201 Electrical Engineering and Instrumentation

TOPIC – RTD

RESISTANCE TEMPERATURE DETECTOR-RTD

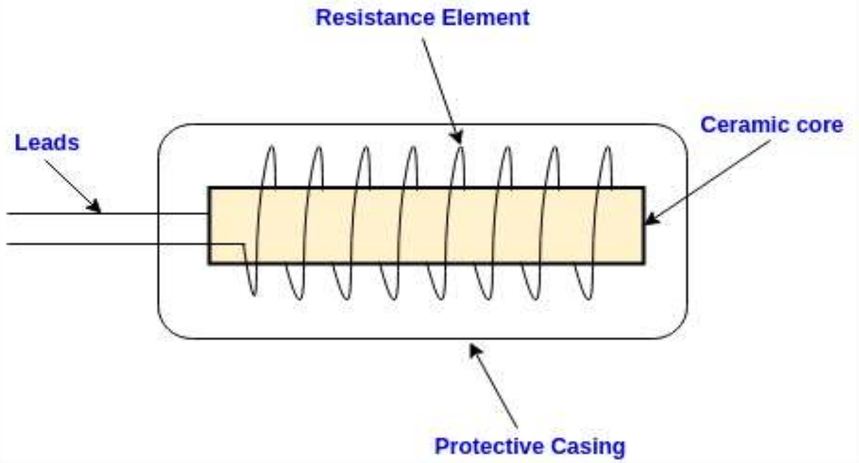
Resistance Temperature Detector- RTD



- RTD is a temperature sensitive resistor, It is a positive temperature coefficient device, which means that the resistance increases with temperature.
- This type of sensors is based on the observation that different materials can have different resistive profiles at different temperatures.
  - Properties are mainly electrical in nature.
- Industrial RTDs are very accurate: the accuracy can be as high as ±0.1°C.
- The ultra high accurate version of RTD is known as Standard Platinum Resistance Thermometers (SPRTs) having accuracy at **±0.0001°C.**

Construction of RTD

The resistance temperature detector is constructed by wounding the resistance wire on a mica base. The wire is wound like a helical coil on the support to reduce the inductance effect. The terminals(Leads) are brought out of the pipe. The coil is protected by a stainless steel case. The structural view of a wire wound RTD is shown in the figure.

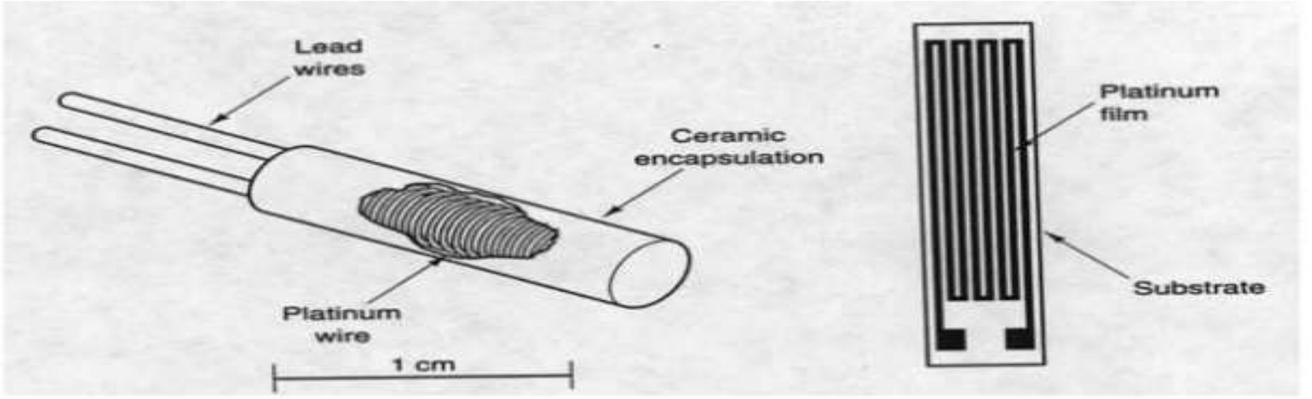


Copper, Nickel and Platinum are the most used RTD materials. These metals have positive temperature co-efficient and possess poor thermal sensitivity. Also, the resistance-temperature characteristics of these materials are approximately linear.

Another type of RTD is thin-film RTD that is constructed by depositing a thin layer of resistive material onto a ceramic substance.

Thin-Film RTDs

- Thin-film RTD design is a newer technology and is gaining favor due to lower cost.
- It is designed to minimize strain on the platinum due to thermal expansion since strain also cause changes in resistance, $R = \rho(L/A)$.



Working Principle of RTD

Resistance Temperature Detectors (RTD) operates on the principle that the resistance of a metal changes with changes in temperature.

The variation of resistance R with temperature t can be represented by the equation,

$$R_t = R_0(1 + \alpha\,\Delta t)$$

Where α is the temperature co-efficient at t_0 and R_0 is the resistance at t_0.

Advantages

- Can be operated in a wide temperature range.
- Good stability at high temperature.
- High accuracy.

Dis-advantages

- Low sensitivity.
- More Expensive.
- Affected by shock or vibration.

RTD Applications

- Air conditioning and refrigeration servicing
- Furnace servicing
- Foodservice processing
- Medical research
- Textile production