SNS COLLEGE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

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DEPARTMENT OF FOOD TECHNOLOGY

COURSE CODE & NAME: 19FTT303 & APPLICATION OF COMPUTERS IN INSTRUMENTATION AND PROCESS CONTROL OF FOOD INDUSTRY

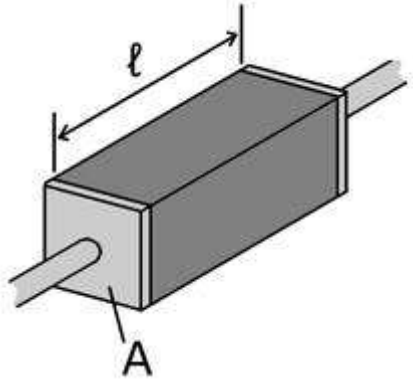
III YEAR / V SEMESTER

UNIT : I SENSORS AND TRANSDUCERS

TOPIC 2 : RESISTIVE TRANSDUCERS

INTRODUCTION

- The resistive transducers or resistive sensors are also called as variable resistance transducers.
- The variable resistance transducers are one of the most commonly used types of transducers.
- They can be used for measuring various physical quantities, such as, temperature, pressure, displacement, force, vibrations etc.
- These transducers are usually used as the secondary transducers, where the output from the primary mechanical transducer acts as the input for the variable resistance transducer.
- The output obtained from it is calibrated against the input quantity and it directly gives the value of the input.

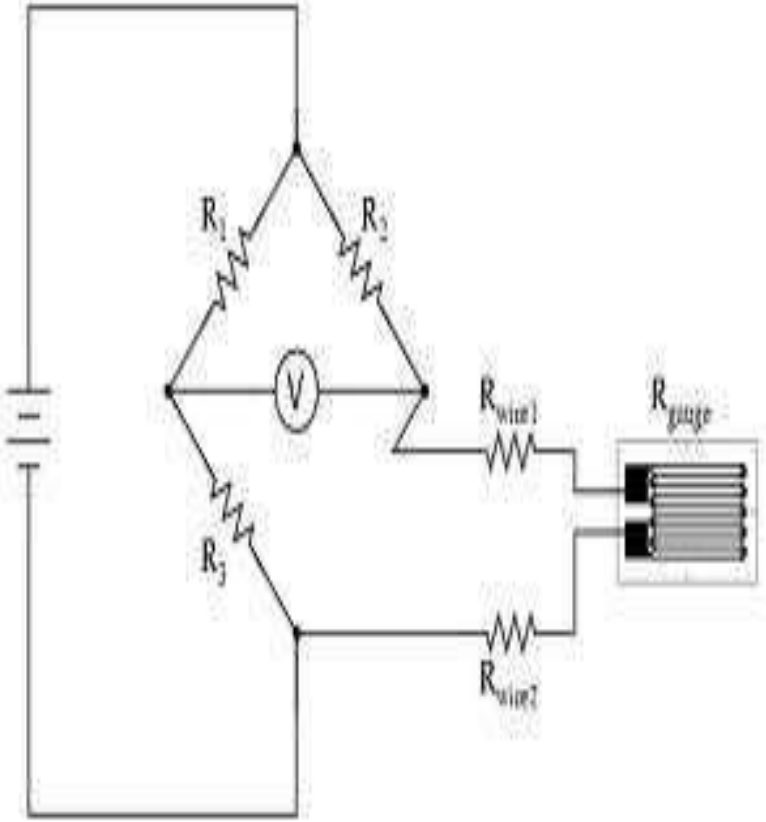


- L is the length of the conductor (m) and A is its area (m^2) then its resistance R(ohms) is given by:
- $R = \rho L/A$
- Where ρ is called as resistivity of the material measured in ohm-m and it is constant for the given material.

strain gauge

A strain gauge is an example of passive transducer that converts a mechanical displacement into a change of resistance.

• A strain gauge is a thin, wafer-like device that can be attached to a variety of materials to measure applied strain.



Based on principle of working :

- Mechanical
- Electrical
- Piezoelectric

Based on mounting :

- Bonded strain gauge
- Unbonded strain gauge

Based on construction :

- Foil strain gauge
- Semiconductor strain gauge
- Photoelectric Strain gauge

STRAIN GAUGE SELECTION CRITERIA:

- Gauge Length
- Number of Gauges in Gauge Pattern
- Arrangement of Gauges in Gauge Pattern
- Grid Resistance
- temperature sensitivity
- Carrier Material
- Gauge Width
- Availability
- low cost

Advantages and Disadvantages

Advantages
- There is no moving part.
- It is small and inexpensive.

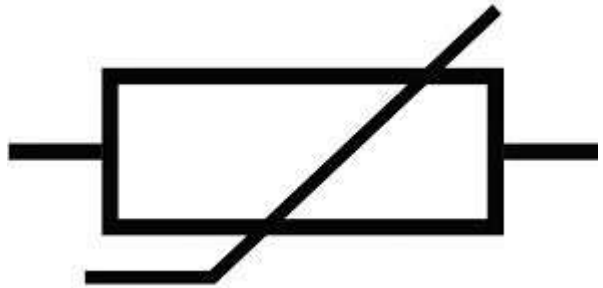
Disadvantages
- It is non-linear.
- It needs to be calibrated.

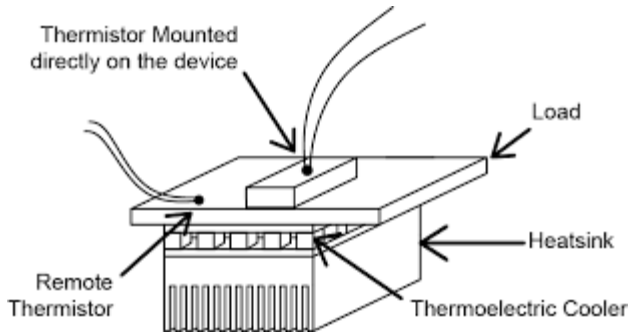
APPLICATIONS

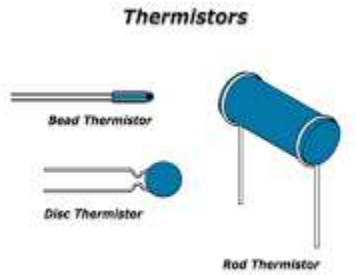
- Residual stress
- Vibration measurement
- Torque measurement
- Bending and deflection measurement
- Compression and tension measurement
- Strain measurement

Thermistor

•Thermistor is the short form for ‘Thermal Resistor’.
• The device consists of a bulk semiconductor device that acts as a resistor with a high and negative temperature co-efficient of resistance, sometimes as high as -6% per degree Celsius rise in temperature.
•Due to this property of high sensitivity (that is, huge resistance change for a small change in temperature).
• The thermistor is mainly applicable in precision temperature measurement, temperature control, and temperature compensation, especially in a lower temperature range of -100 degree Celsius to +300 degree Celsius







Construction of Thermistors

•Thermistor are composed of sintered mixture of metallic oxides such as manganese, nickel cobalt, copper, iron and uranium.

• They are available in variety of sizes and shapes.

•Thermistors may be in the form of beads, probes, rods and discs.

To be continu....

- dR = k.dT
- where, dR – Change in Resistance.
- k – Order Temperature Coefficient of Resistance.
- dT – Change in Temperature.

Thermistors are broadly divided in two types

- Positive temperature co –efficient thermistor
- Negative temperature co –efficient thermistor

•If the value of temperature coefficient of resistance (k) is positive, an increase in temperature increases the resistance. Such a device can be called a Posistor or **Positive Temperature Coefficient Thermistor (PTC)**

• If the value of k is negative, an increase in temperature will decrease the resistance value. Such a device is called a **Negative Temperature Coefficient Thermistor (NTC).**

ASSESSMENT

- Thermistor is the short form

a) Temperature sensor

b) Pressure sensor

c) Thermal resistor

- R = ρL/A,where “ρ” it stands for

a) Resistivity of the material

b) Resistivity of thermistance

c) Both a and b

THANK YOU...