



**DARBHANGA COLLEGE OF ENGINEERING
DARBHANGA**

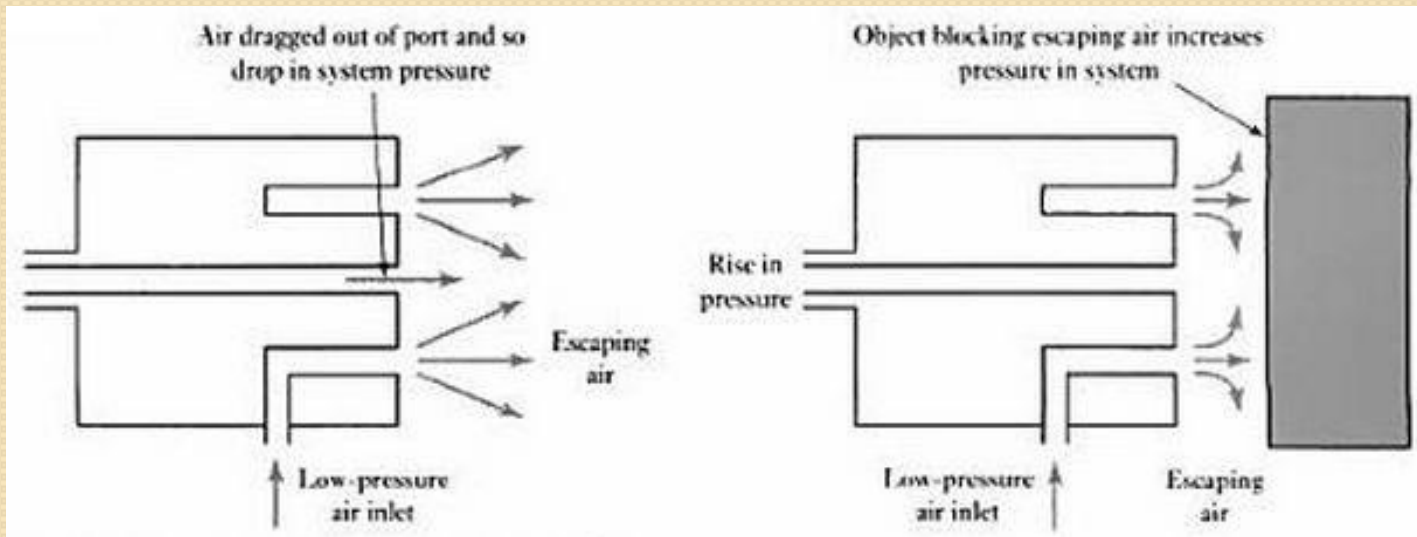
**INSTRUMENTATION AND
CONTROL
(SEM-IV:ME)**

Course Code- PCC-ME 207

Lecture 5
SENSOR AND
TRANSDUCERS

1.5 Pneumatic Sensor

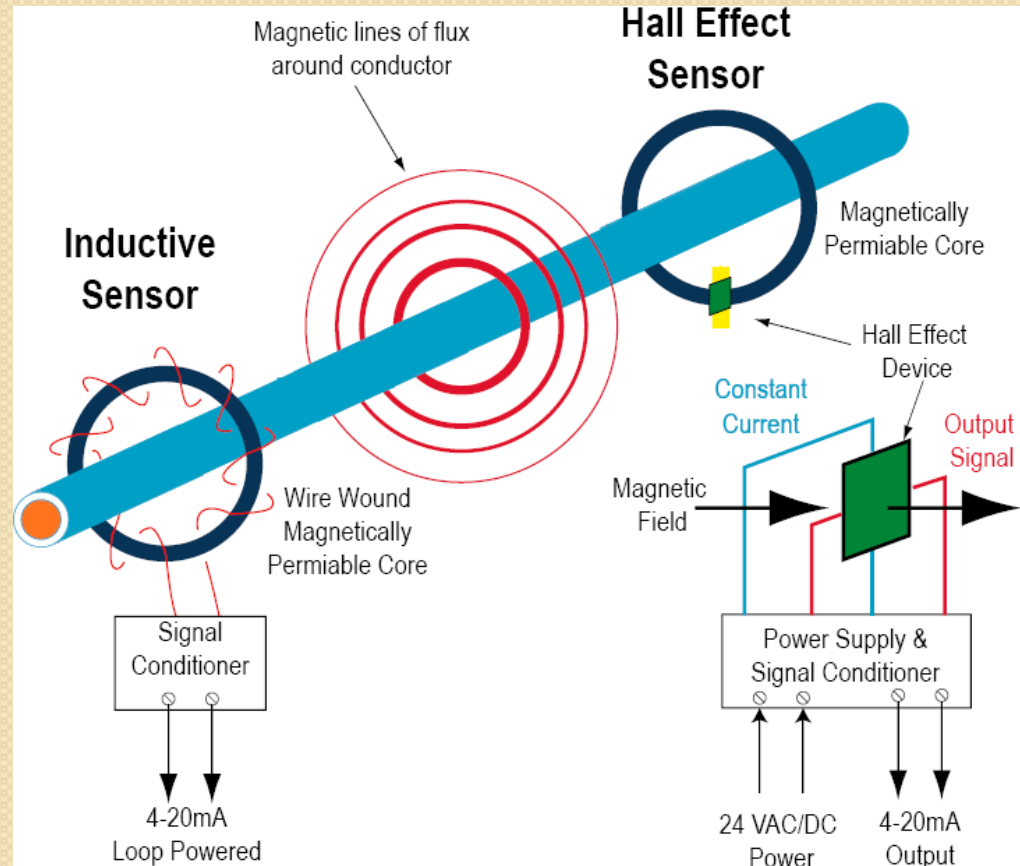
- Pneumatic sensors are displacement sensors and use compressed air to measure the displacement of objects. Whenever the body whose displacement we want to measure changes its position will result in the change in air pressure.
- If we look at the working of pneumatic sensor, we have low pressure air escape from the port in front of sensor. If we don't have any object in front of sensor, this air will escape and reduce air pressure in the nearby output port. But if we have an object in the path of compressed air then air will escape and increase air pressure at sensor output port. The rise in output pressure depends upon the closeness of the



These sensors are used to work for short range applications ranging from 3 mm to 12 mm.

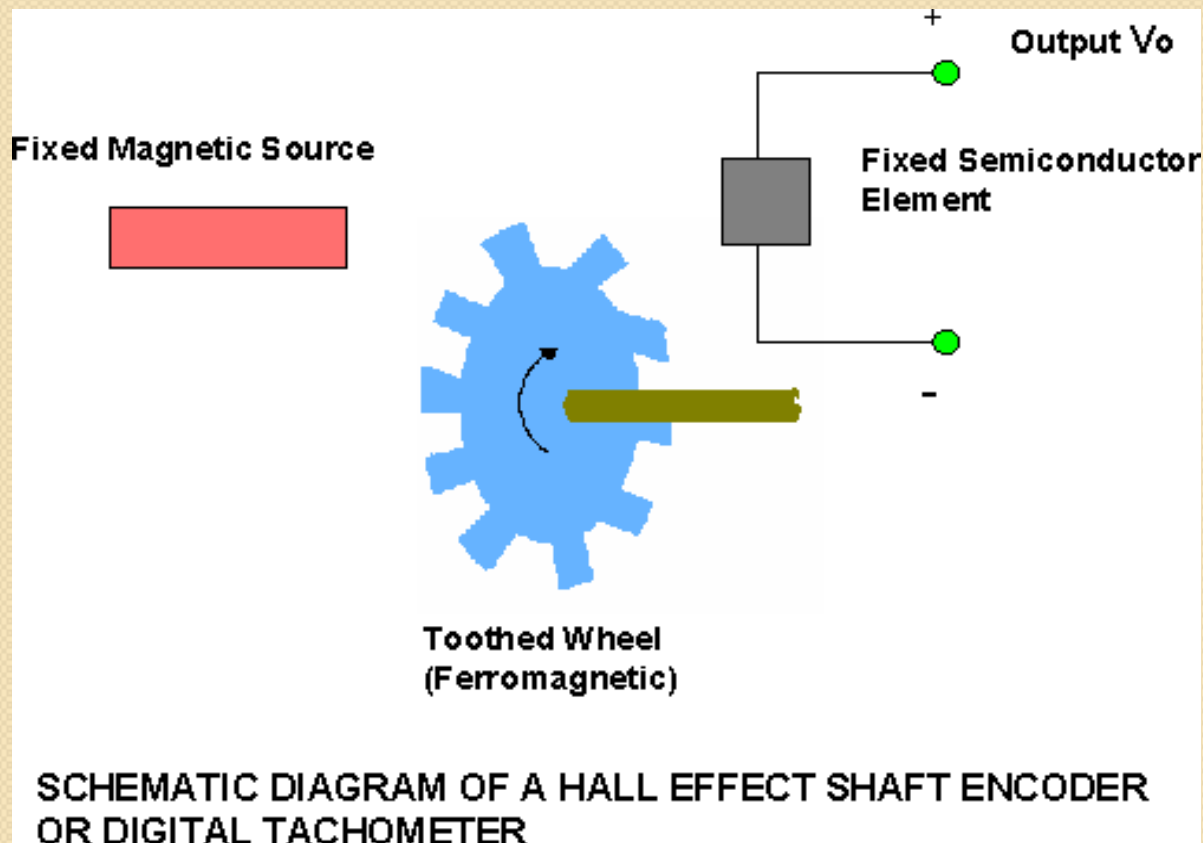
1.6 Hall Effect Sensor

- A Hall effect sensor is a transducer that varies its output voltage in response to a magnetic field. Hall effect sensors are used for proximity switching, positioning, speed detection, and current sensing applications.



2 Velocity sensors

2.1 Tachogenerator

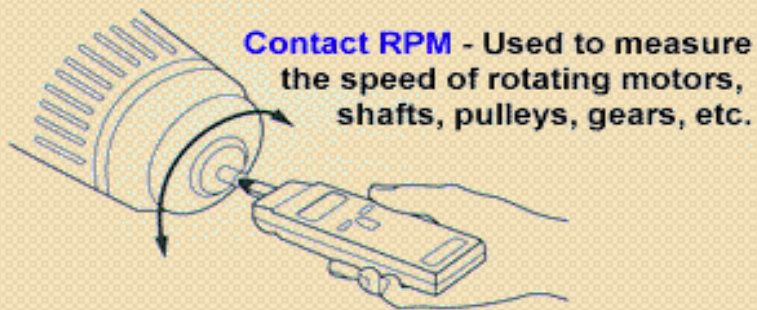


- The semiconductor element and the magnetic source are fixed relative to one another in a single package.
- By moving the ferromagnetic member into the air gap between the magnetic source and the semiconductor element, the flux linkage can be altered. This changes V_o .
- Suitable both as an analog proximity sensor and as a limit switch.
- The relationship between the output voltage V_o and the distance of a Hall effect sensor measured from the moving member is non linear. Linear Hall effect sensors use calibration to linearize their outputs.

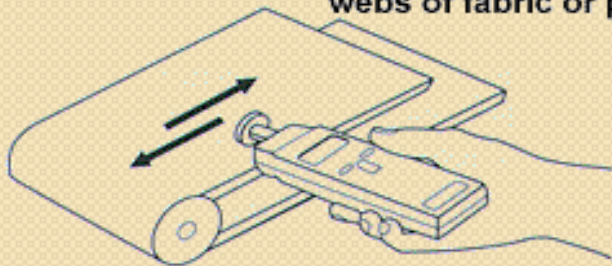


DIGITAL TACHOMETER

WHERE USED:



Linear Speed and Length - Used to measure the linear speed or length of moving surfaces, such as conveyor belts, printed materials, webs of fabric or paper, etc.

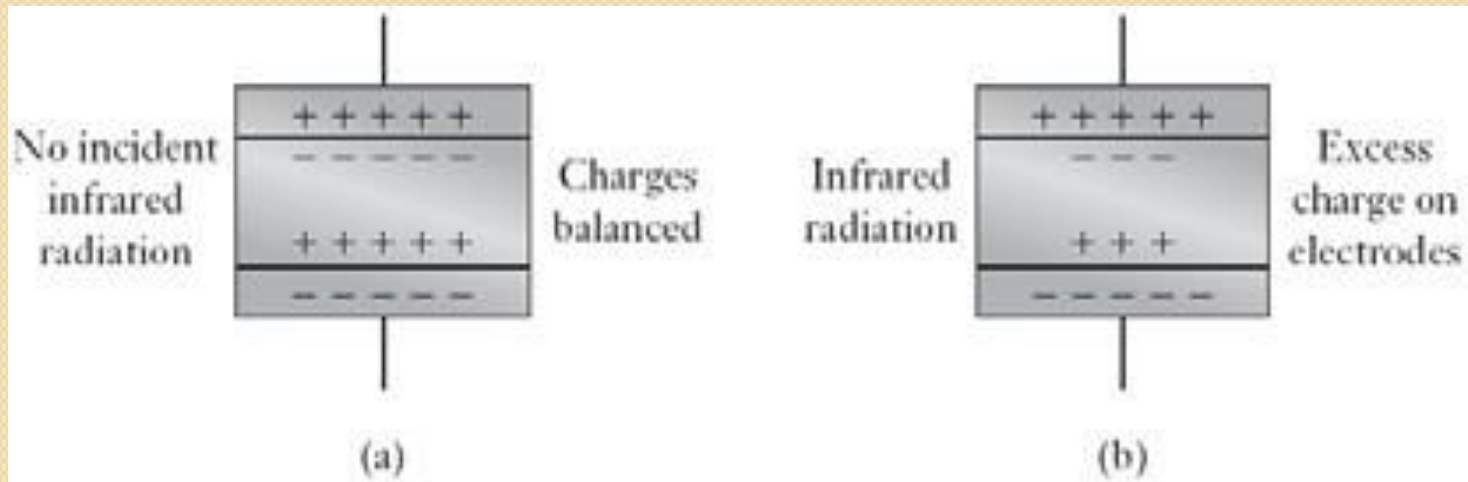




DIGITAL TACHOMETER AS A MEASUREMENT DEVICE

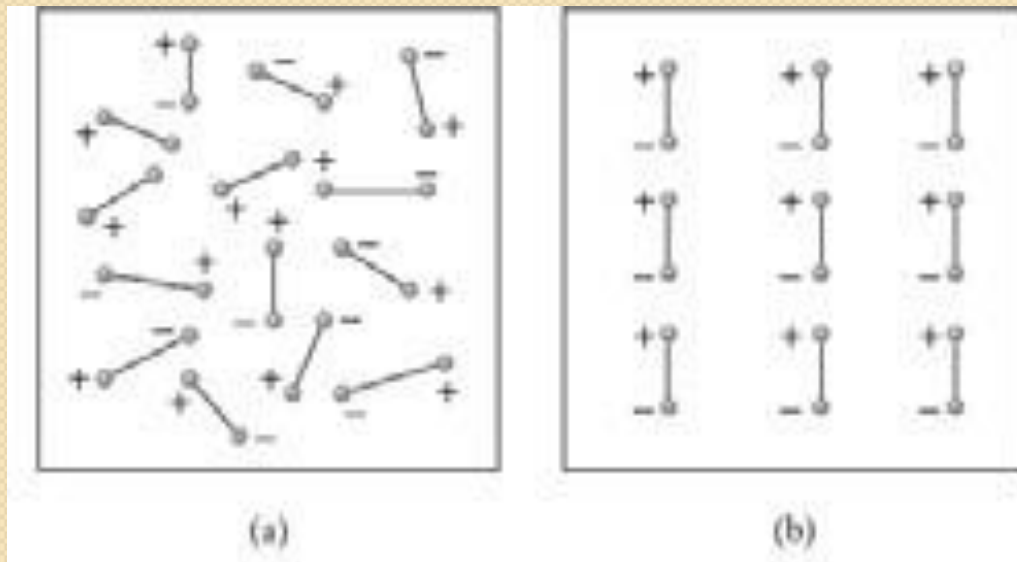
2.2 Pyroelectric Sensor

This charge leaks away through the measurement circuit until the charge on the crystal once again is balanced by the charge on the electrodes.

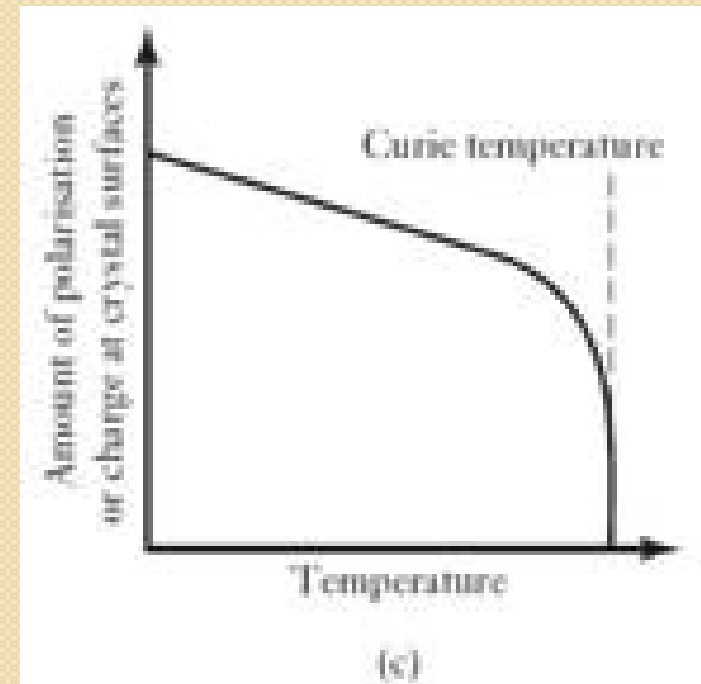


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Pyroelectric (from the Greek *pyr*, fire, and *electricity*) materials, e.g. lithium tantalate, are crystalline materials which generate charge in response to heat flow.



Polarising a pyroelectric material

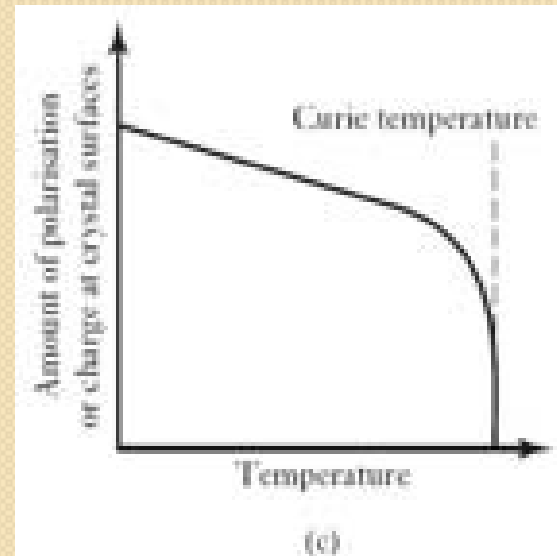


The effect of temperature on the amount of polarisation.

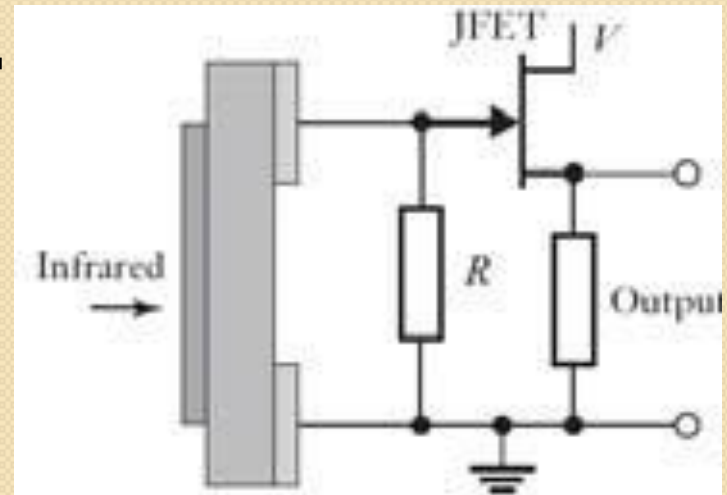
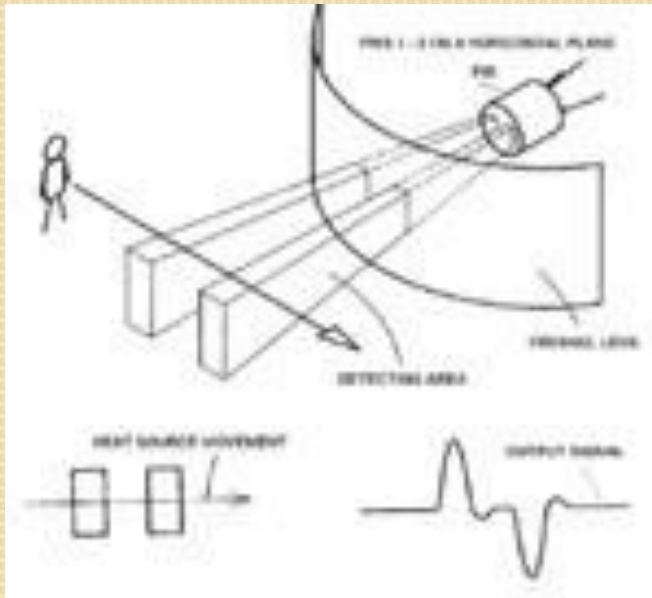
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The pyroelectric sensor thus behaves as a charge generator which generates charge when there is a change in its temperature as a result of the incidence of infrared radiation.

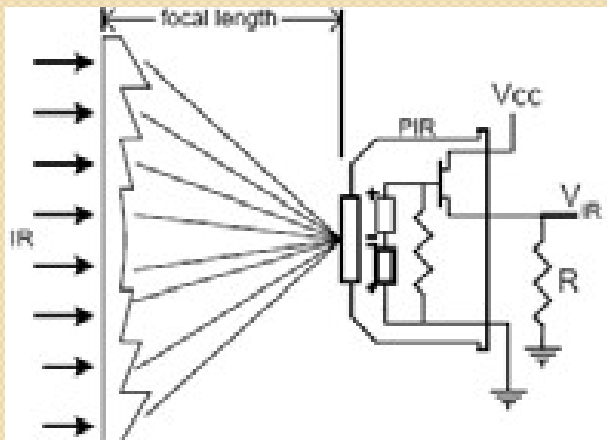
For the linear part of the graph shown below, when there is a temperature change the change in charge is proportional to the change in temperature.



Cont..



When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiant from the room or walls or outdoors. When a warm body like a human or animal pass by, it first intercepts one half of the sensor, which causes a *positive differential* change between t two halves. When the warm body leaves the sensing area, reverse happens, whereby the sensor generate negative differential change.



Dual pyroelectric sensor