HALL EFFECT TRANSDUCER

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What is Hall Sensor?

A **Hall 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.

Hall Effect

The Hall effect was discovered by Edwin H. Hall in 1879 while working on his doctoral degree at The Johns Hopkins University U.S.A.

- The hall effect sensor is a type of transducer which is used for measuring the magnetic field intensity.
- The direct measurement of the magnetic field intensity is not practicable.
- The hall effect transducer converts the magnetic field into an electric voltage and this voltage can be easily which is easily measured by the analogue measures by volt meters.

Principle of Hall Effect Transducer

- If the current carrying conductor is placed with in a magnetic field, then the EMF or voltage is developed on the edge of the conductor.
- The magnitude of such develop voltage depends on the magnetic flux density.
- This phenomenon of a conductor is called the Hall effect.
- VH =(K B I)/ t
  - K – Hall effect coefficient
  - B – Magnetic field intensity
  - I – current through the conductor
  - t- thickness of the conductor

- The Hall effect sensor is mainly used for magnetic intensity.
- It can be also used for measuring the current through a conductor with out breaking the conductor as in the conventional way of current measurement.

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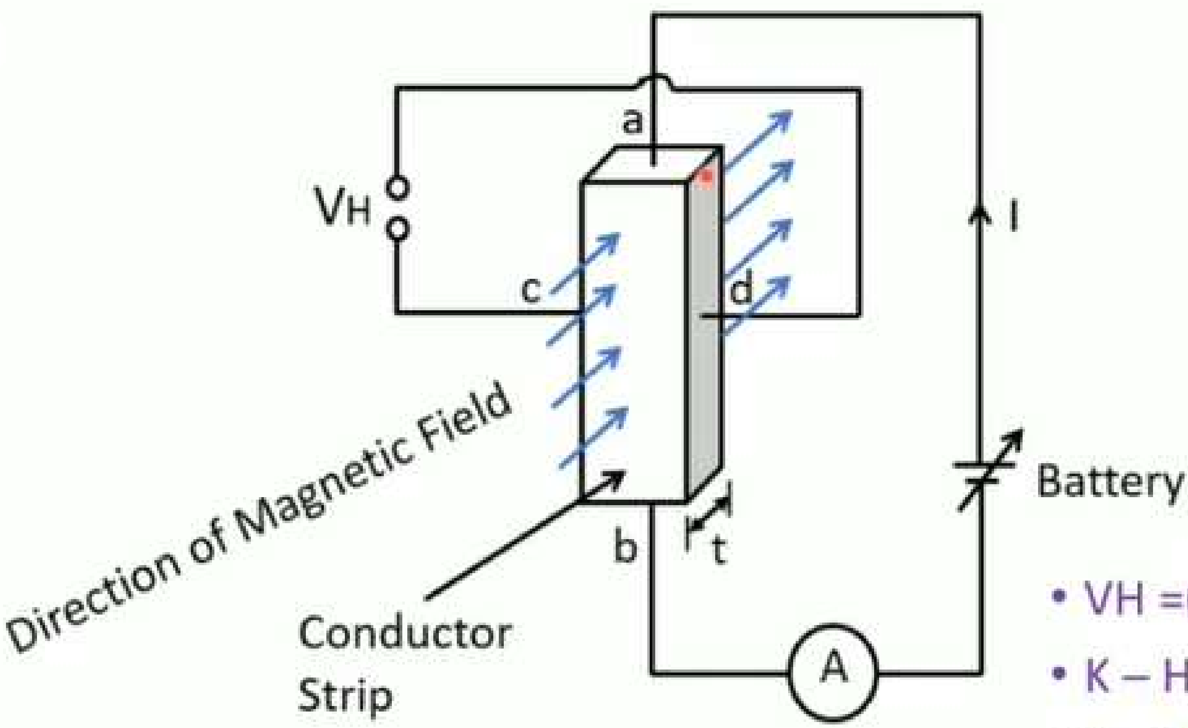

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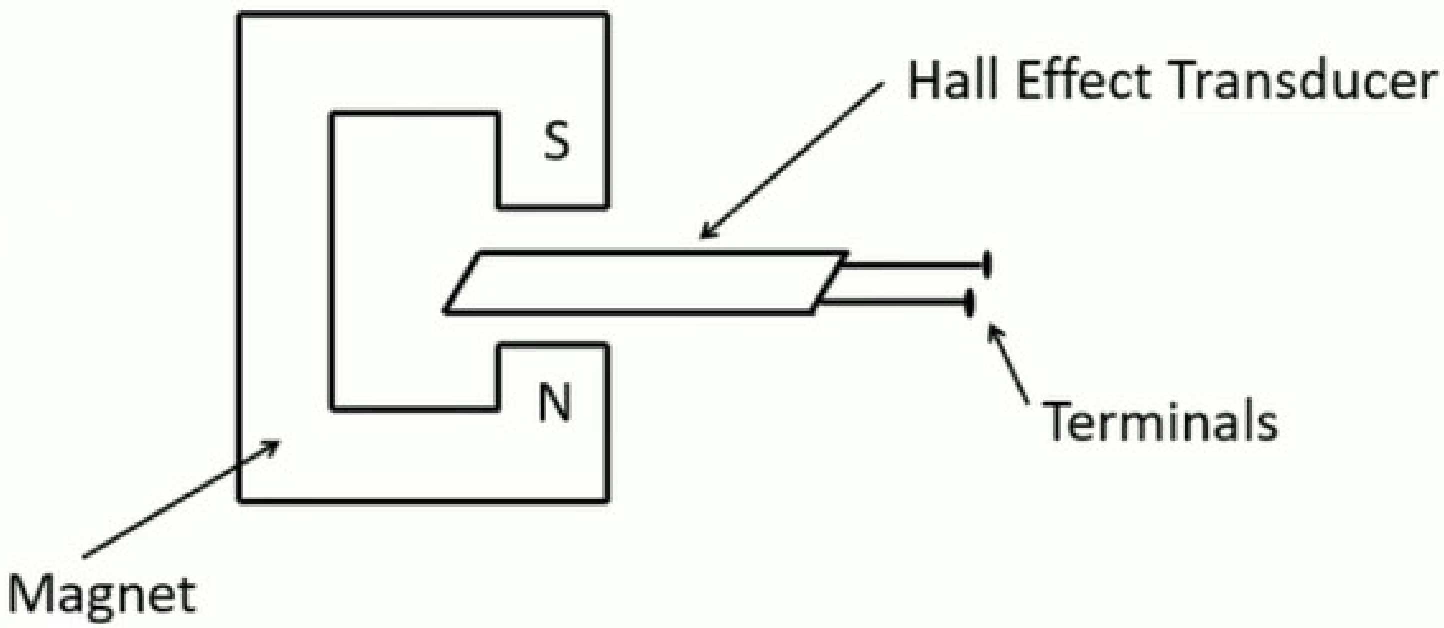
Working Principle

- **Hall Effect Sensors** consist basically of a thin piece of rectangular p-type semiconductor material such as gallium arsenide (GaAs), indium antimonide (InSb) or indium arsenide (InAs) passing a continuous current through itself. When the device is placed within a magnetic field, the magnetic flux lines exert a force on the semiconductor material which deflects the charge carriers, electrons and holes, to either side of the semiconductor slab. This movement of charge carriers is a result of the magnetic force they experience passing through the semiconductor material.
- As these electrons and holes move side wards a potential difference is produced between the two sides of the semiconductor material by the build-up of these charge carriers. Then the movement of electrons through the semiconductor material is affected by the presence of an external magnetic field which is at right angles to it and this effect is greater in a flat rectangular shaped material.
- The effect of generating a measurable voltage by using a magnetic field is called the **Hall Effect** after Edwin Hall who discovered it back in the 1870's with the basic physical principle underlying the Hall effect being Lorentz force. To generate a potential difference across the device the magnetic flux lines must be perpendicular, (90^o) to the flow of current and be of the correct polarity, generally a south pole.
- The Hall effect provides information regarding the type of magnetic pole and magnitude of the magnetic field. For example, a south pole would cause the device to produce a voltage output while a north pole would have no effect. Generally, Hall Effect sensors and switches are designed to be in the "OFF", (open


Hall Effect Transducer
S
N
Terminals
Magnet

Applications

- Magnetometer
- Direct current (DC) transformers
- Position sensing
- Automotive fuel level indicator