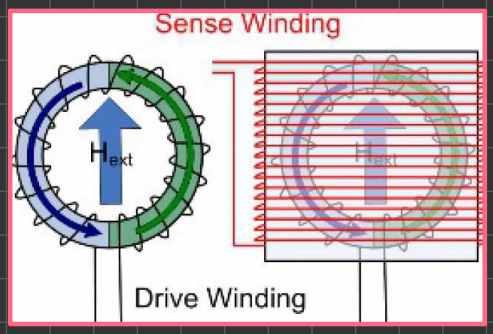
Magnetic Sensors

Classification :

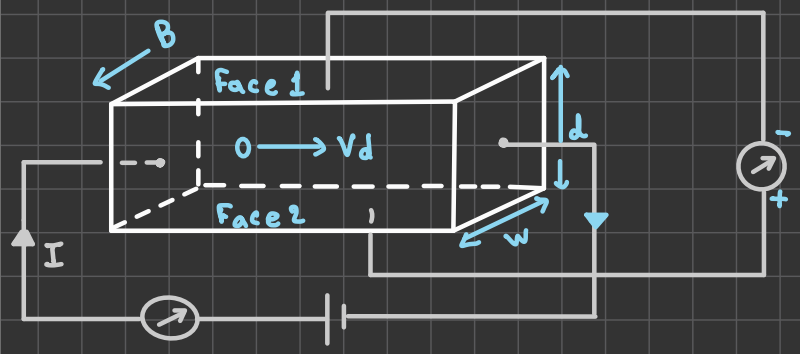
Vector Magnetometer	Scalar Megnetometer
1. Search coil	1 Optically Pumped
2. Flux gate	2. Nuclear Precession
3. Squids	3. Over Hauser Magnetometer
4. Hall probe	
5. MEMS	

Fluxgate Magnetometer :

- Works on the principle of electromagnetic induction
- It works by detecting changes in magnetic flux through the ferromagnetic core.
- A primary and a secondary coil are wound around the core.
- The change in flux is measured by the secondary coil and is then converte to electrical signal.



Hall Effect Sensors :



$$V_H = R_H \times \frac{I B d}{A}$$

- V_H → Hall voltage
- R_H → Hall coefficient
- B → Magnetic field
- A → Area
- I → Current

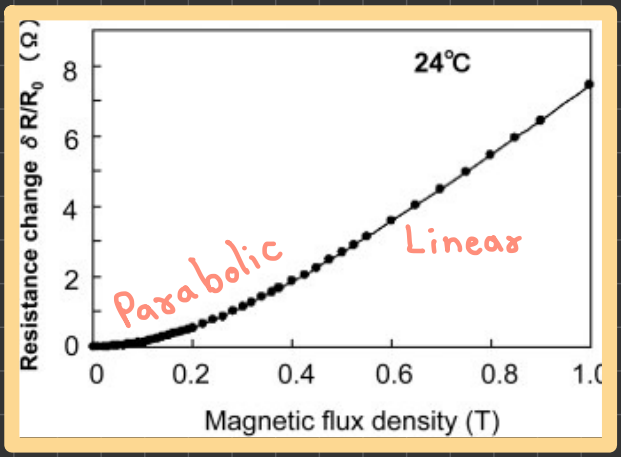
$$R_H = \frac{1}{q_p} \text{ or } \frac{1}{q_n}$$

q_n → number of electron

- This sensor is a magnetic sensor that works by measuring voltage generated by the interaction of magnetic field with the flow of conductor.
- The voltage generated (Hall voltage) is proportional to the strength of magnetic field.
- Based on Lorentz force.

↳ Magnetoresistance :

- Magnetoresistance is the change in resistance of a material in response to an Applied magnetic field.
- Materials that exhibit this property are known as Magnetoresistors
- The resistance increases with a increase in magnetic field strength due to interaction of electrons with magnetic field , causing collision among them and restricting the flow of electrons.



$$R = R_0\left(1 + \frac{\Delta R}{R}\cos^2\alpha\right)$$