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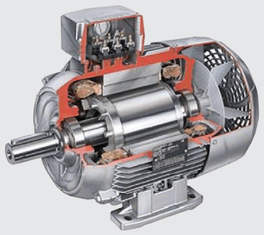
Tesca Technologies Pvt. Ltd.

Understanding DC Machines

Defination of DC Machine

A machine which converts mechanical power into electrical power is called a DC generator. A machine which converts DC electrical power into mechanical power is known as DC motor. From construction point of view there is no difference between DC generator and motor.

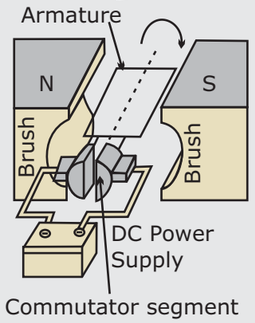


Operating Principle of Machine

When a current carrying conductor is placed in a magnetic field a mechanical force is experienced by it the direction of this force is determined by Fleming left hand rule and its magnitude is given by the relation.

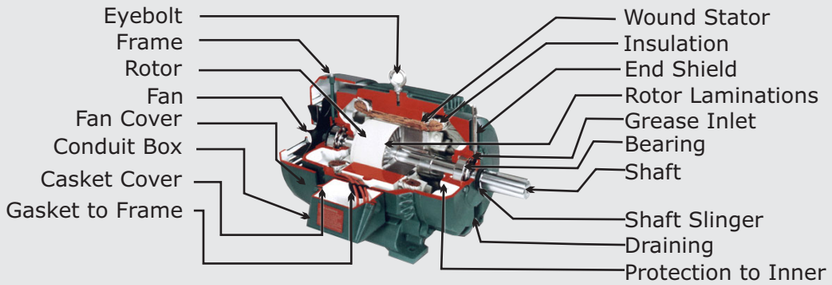
F = BILNEWTONS

Where,
B = magnetic field in TESLAS
I = current flowing through the conductor in Amps
L = length of the conductors in METRES



Cut set view of DC Machine

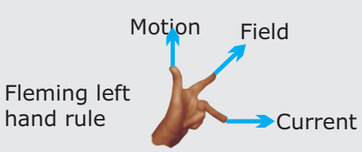
1. Bearings
2. Lifting eyebolt
3. Bearings
4. Shaft support flange
5. Ventilation turbine
6. Armature
7. Collector
8. Stator
9. Brushes and brush holder
10. Collector support flange
11. Cover



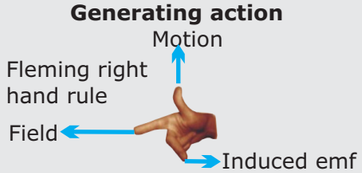
E.M.F Equation of DC Machine

EMF induced in the machine is the fundamental phenomenon of all DC machines whether they are working as generator or motor.

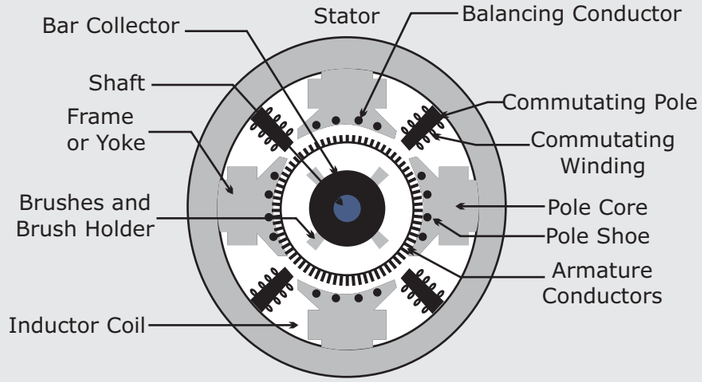
Motoring action



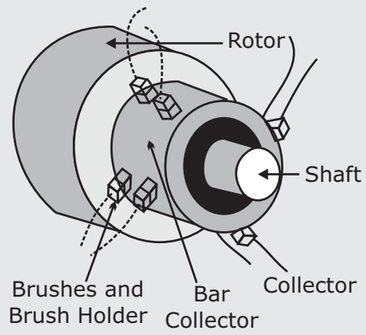
Generating action



Construction of DC Motor

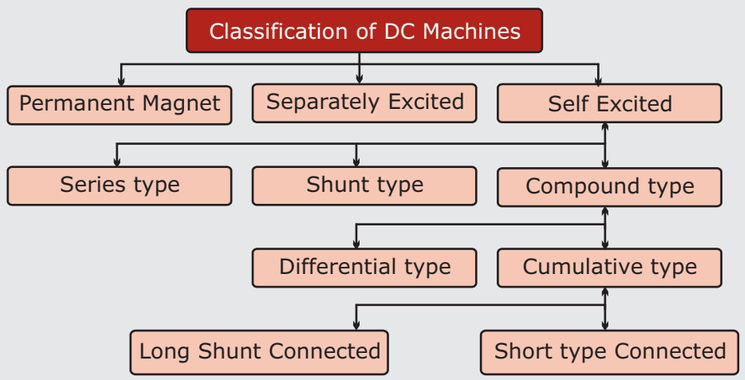


A typical DC generator or motor usually consists of An stator (The stationary part of the machine) and rotor (The rotating part of the machine) forms the mechanical circuit. An armature winding, filed winding, brushes and a commutator forms the electric circuit, An armature core, air gap, poles, and yoke forms the magnetic circuit. And a frame, end bells, bearings, brush supports and a shaft which provide the mechanical support.

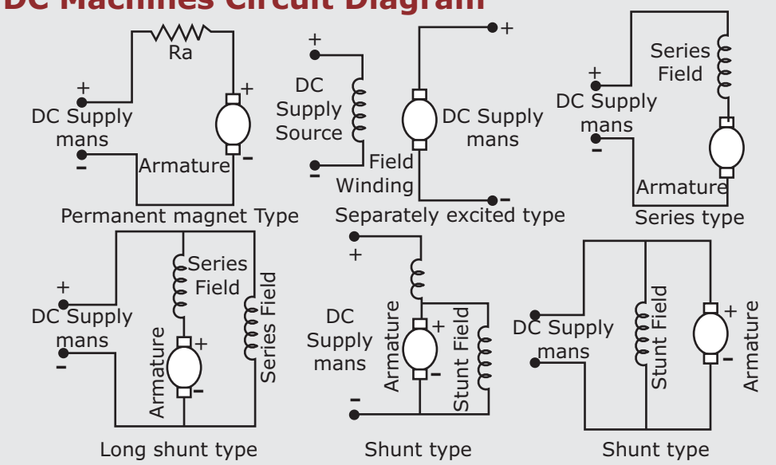


Classification DC Machine

DC Motor on the basis of their field excitation can be classified as

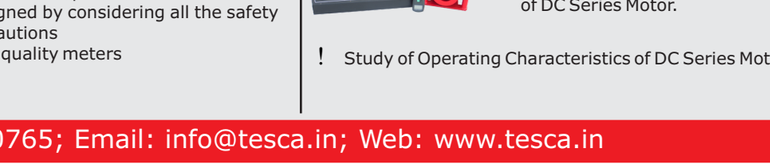


DC Machines Circuit Diagram



Speed Control of DC Machine:

Speed control of DC motor is given by the relation : N α V - Ia Ra /ϕ



Losses of DC Machine:

Efficiency of DC Machine

$$\text{Efficiency (in percentage)} = \frac{\text{Output}}{\text{Input}} = \frac{(\text{Input - Losses})}{\text{Input}} \times 100 = \frac{\text{Output}}{(\text{Output + Losses})} \times 100$$

Advantage of DC Over AC

- DC motor can control speed even with load but AC motor need special drives to control speeds.
- DC motor can operate directly from a battery.
- DC motors are also used where controlling speed and torque are important.
- DC have a higher degree of efficiency compared to some AC motors.

Order Code-46508 DC Machine Lab-I

Scope of Learning

- Study of No load characteristics (OCC) of DC Shunt Generator
- Study of Load Characteristics of DC Shunt Generator
- Speed of Load Characteristics of DC Shunt Generator
- Speed Control of DC Shunt Motor by Field and Armature current variation
- Load Characteristics of DC Shunt Motor
- Study of self excited DV Shunt Motor

Order Code-46509 DC Machine Lab-II

Scope of Learning

- Speed Control of DC Shunt Motor by Field and Armature current variation.
- Load Characteristics of DC Shunt Motor.
- N-I Characteristics of DC Shunt Motor.
- N-V Characteristics of DC Shunt Motor.
- Study of self excited DC Shunt Motor.

Order Code-46501 DC Supply

Scope of Learning

- Exclusive and rugged designed panel
- Stand alone operation
- Designed by considering all the safety precautions
- High quality meters

Order Code-46513 DC Series Motor

Scope of Learning

- Study of Speed Control of DC Series Motor by Field and Armature current variation
- Study of Load Characteristics of DC Series Motor.
- Study of Operating Characteristics of DC Series Motor

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