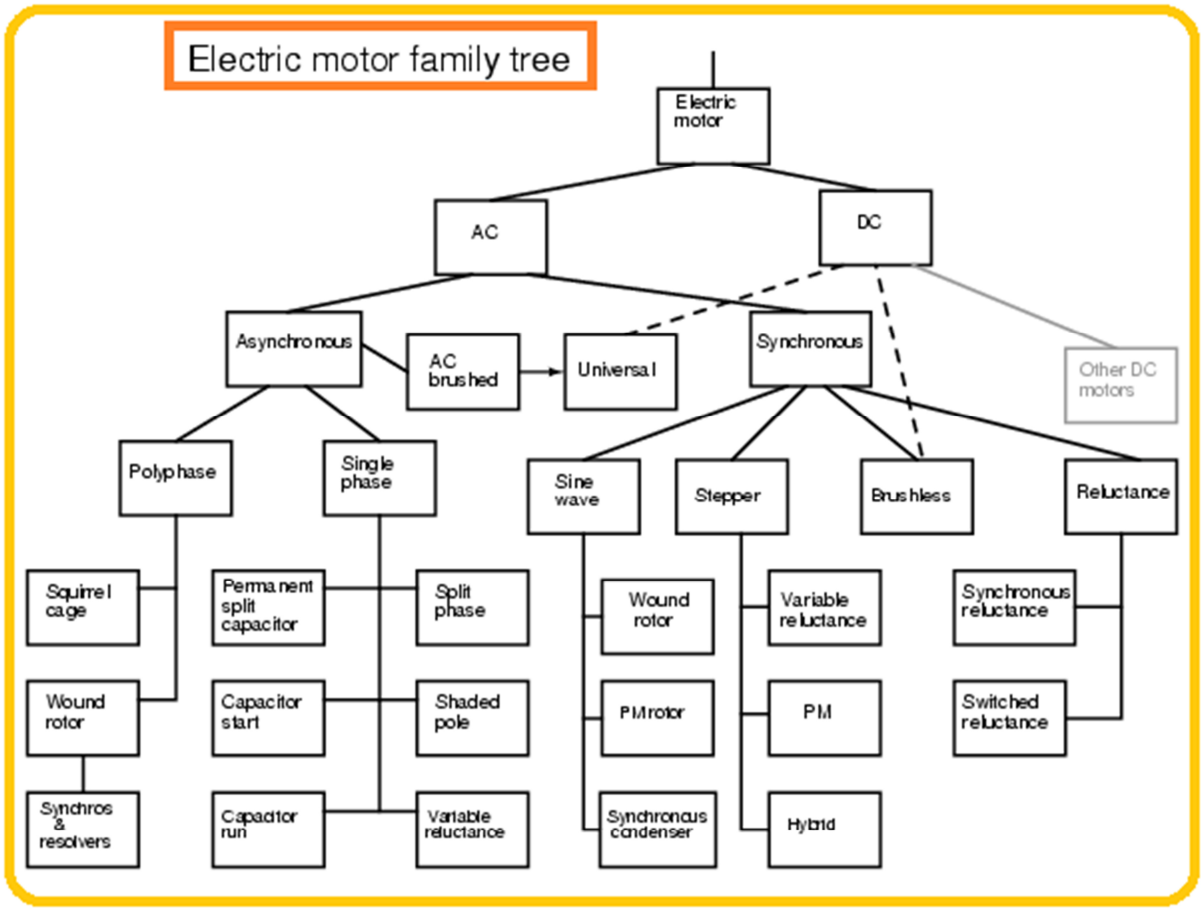
Electrical Motor

The **motor** or an **electrical motor** is a device that has brought about one of the biggest advancements in the fields of engineering and technology ever since the invention of electricity. A **motor** is nothing but an electro-mechanical device that converts electrical energy to mechanical energy. It's because of motors, life is what it is today in the 21st century. Without motor we had still been living in Sir Thomas Edison's Era where the only purpose of electricity would have been to glow bulbs. There are different **types of motor** have been developed for different specific purposes.

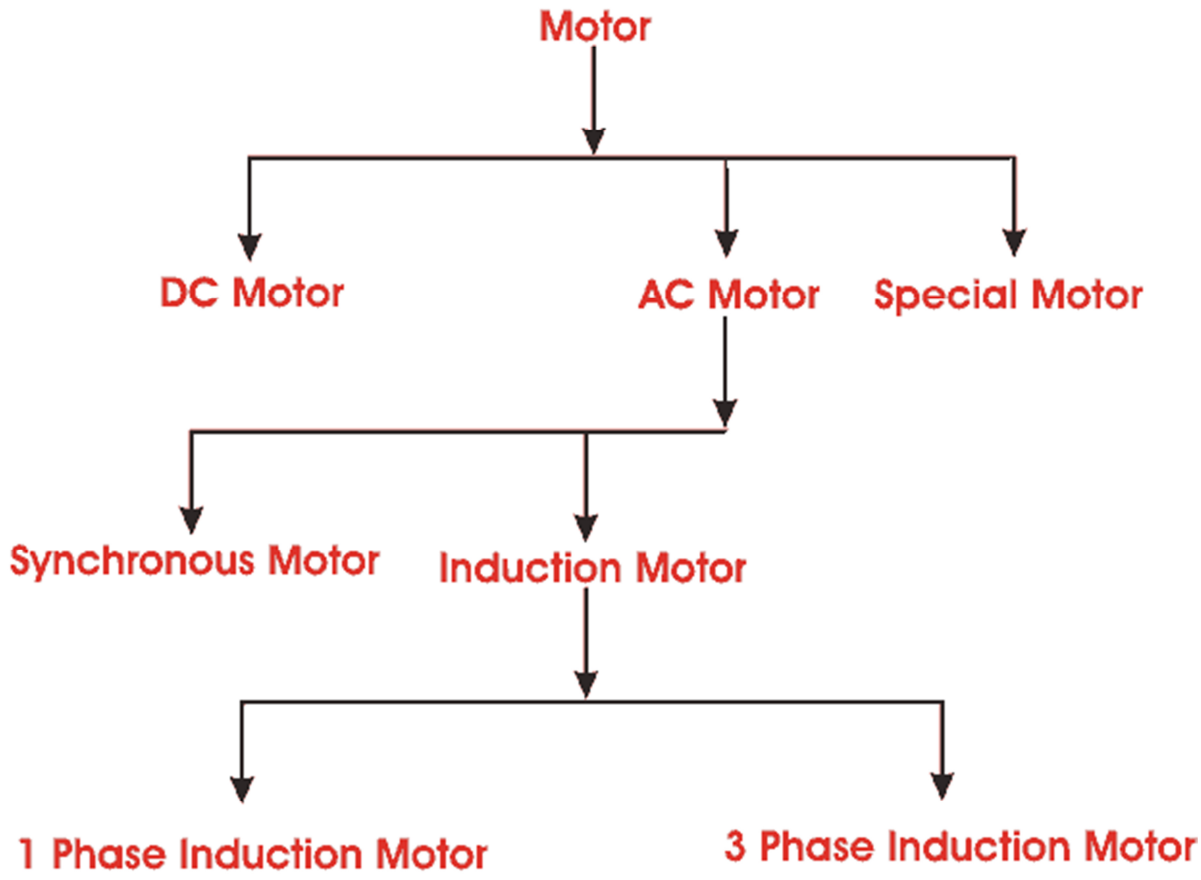


In simple words we can say a device that produces rotational force is a motor. The very basic principal of functioning of an **electrical motor** lies on the fact that force is experienced in the direction perpendicular to magnetic field and the current, when field and current are made to interact with each other. Ever since the invention of motors, a lot of advancements has taken place in this field of engineering and it has become a subject of extreme importance for modern engineers. This particular webpage takes into consideration, the above mentioned fact and provides a detailed

description on all major electrical motors and motoring parts being used in the present era.

Classification or Types of Motor

The primary **classification of motor** or **types of motor** can be tabulated as shown below,



CONSTRUCTION OF AC INDUCTION MOTORS

The three phase induction motor is the most widely used electrical motor. Almost 80% of the mechanical power used by industries is provided by three phase induction motors because of its simple and rugged construction, low cost, good operating characteristics, absence of commutator and good speed regulation. In three phase induction motor the power is transferred from stator to rotor winding through induction. The Induction motor is also called asynchronous motor as it runs at a speed other than the synchronous speed.

Like any other electrical motor induction motor also have two main parts namely rotor and stator

1. Stator: As its name indicates stator is a stationary part of induction motor. A stator winding is placed in the stator of induction motor and the three phase supply is given to it.
2. Rotor: The rotor is a rotating part of induction motor. The rotor is connected to the mechanical load through the shaft.

The rotor of the three phase induction motor are further classified as

1. Squirrel cage rotor,
2. Slip ring rotor or wound rotor or phase wound rotor.

Depending upon the type of rotor construction used the three phase induction motor are classified as:

1. Squirrel cage induction motor,
2. Slip ring induction motor or wound induction motor or phase wound induction motor.

The construction of stator for both the kinds of three phase induction motor remains the same and is discussed in brief in next paragraph. The other parts, which are required to complete the induction motor, are:

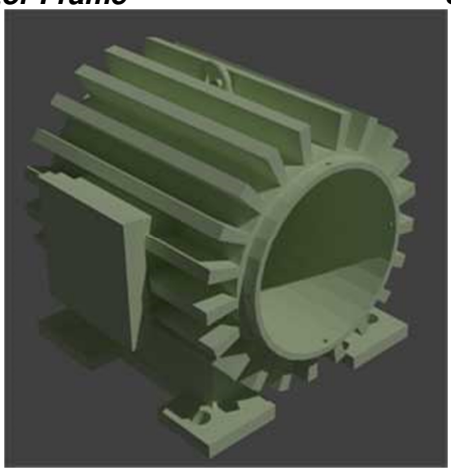
1. Shaft for transmitting the torque to the load. This shaft is made up of steel.
2. Bearings for supporting the rotating shaft.
3. One of the problems with electrical motor is the production of heat during its rotation. In order to overcome this problem we need fan for cooling.
4. For receiving external electrical connection Terminal box is needed.
5. There is a small distance between rotor and stator which usually varies from 0.4 mm to 4 mm. Such a distance is called air gap.

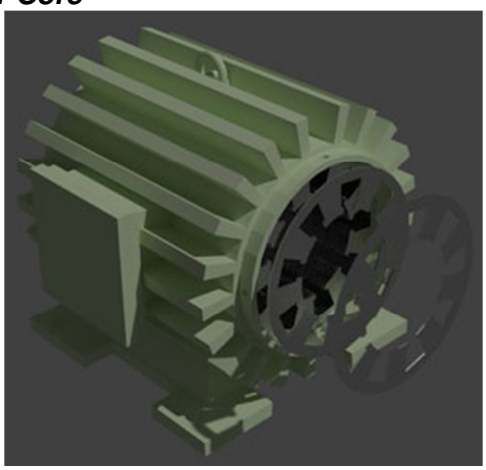
Stator of Three Phase Induction Motor

The stator of the three phase induction motor consists of three main parts :

1. Stator frame,
2. Stator core,
3. Stator winding or field winding.

Stator Frame ***Stator Core***





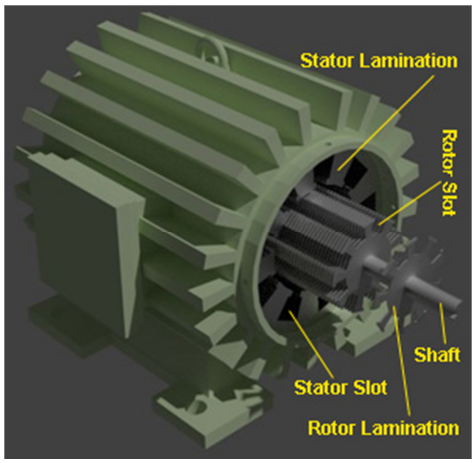
It is the outer most part of the three phase induction motor. Its main function is to support the stator core and the field winding. It acts as a covering and it provide protection and mechanical strength to all the inner parts of the induction motor. The frame is either made up of die cast or fabricated steel. The frame of three phase induction motor should be very strong and rigid as the air gap length of three phase induction motoris very small, otherwise rotor will not remain concentric with stator, which will give rise to unbalanced magnetic pull.

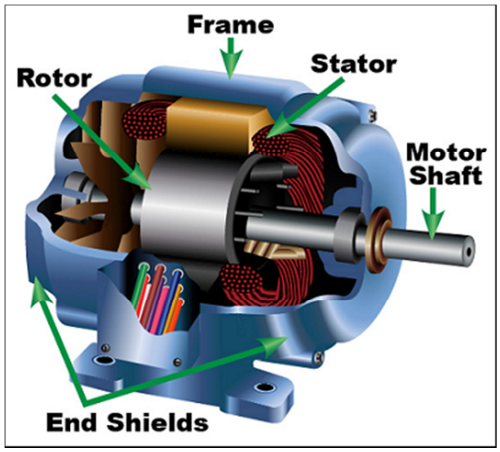
Stator Core

The main function of the stator core is to carry the alternating flux. In order to reduce the eddy currentloss, the stator core is laminated. These laminated types of structure are made up of stamping which is about 0.4 to 0.5 mm thick. All the stamping are stamped together to form stator core, which is then housed in stator frame. The stamping is generally made up of silicon steel, which helps to reduce the hysteresis lossoccurring in motor.

Stator Winding or Field Winding

The slots on the periphery of stator core of the three phase induction motor carries three phase windings. This three phase winding is supplied by three phase ac supply. The three phases of the winding are connected either in star or delta depending upon which type of starting method is used. The squirrel cage motor is mostly started by star – delta stater and hence the stator of squirrel cage motor is delta connected. The slip ring three phase induction motor are started by inserting resistances so, the stator winding of slip ring induction motor can be connected either in star or delta. The winding wound on the stator of three phase induction motor is also called field winding and when this winding is excited by three phase ac supply it produces a rotating magnetic field.





Following shows working of motor: