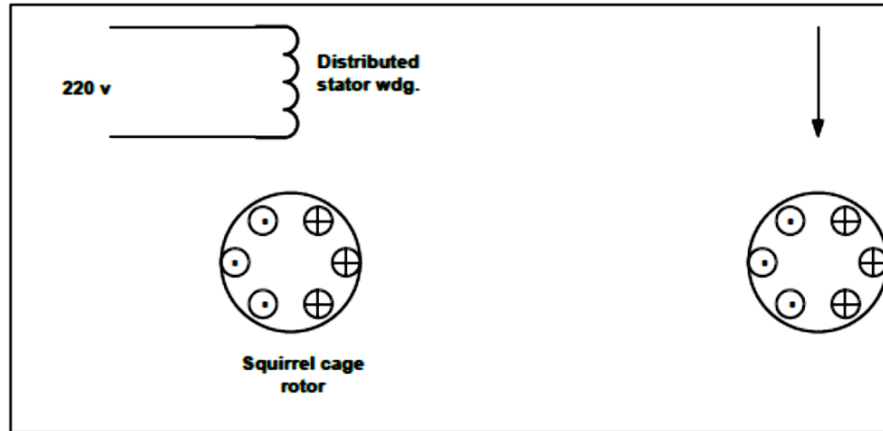


## Single Phase Induction Motor

The majority of fractional horsepower motors are of the induction type. Induction motor has cage rotor and a single phase distributed stator winding as shown in figure below.

This motor does not develop any starting torque .



When the rotor is stationary , the stator winding is connected to a single phase supply . A pulsating flux (  $\phi_s$  ) is established in the machine along the axis of stator winding . The pulsating stator flux induced current in the rotor circuit which produced a pulsating flux (  $\phi_r$  ) acting along the same axis as the stator flux (  $\phi_s$  ) . By Lenz law , these two fluxes tend to appose each other . Therefore no starting torque is developed . Simplest method of starting a single phase induction motor is to provide an auxiliary winding on the stator in addition to the main winding . The two windings are placed in the stator with their axis displaced 90 electrical degrees in space.

P

Note : Electrical angle = ----- x mechanical angle

2

Where P is the number of poles .

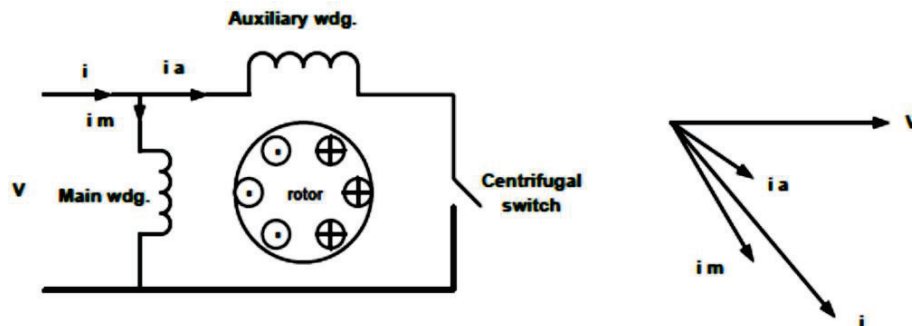
## Classification of a single phase induction motor

Single phase induction motors are known by various names . The names are descriptive of the methods used to produced stating torque.

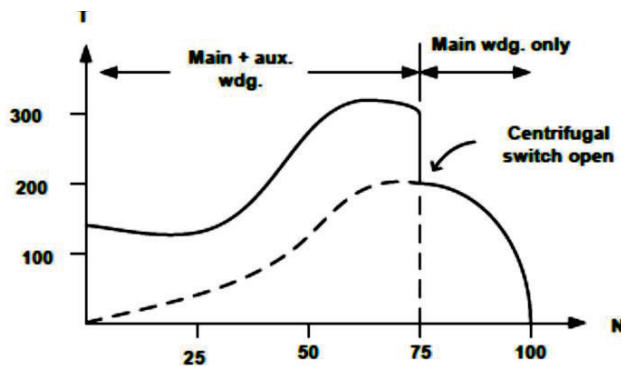
### 1. split – phase motor:

A schematic diagram of a split – phase induction motor is shown in figure below .The auxiliary winding has a higher resistance to reactance ratio than the main winding , so the two currents are out of phase as shown in figure below.

The higher resistance to reactance ratio is usually obtained by using finer wire for the auxiliary winding . The centrifugal switch cuts the auxiliary circuit when the speed of the motor reached about 75% of rated speed .

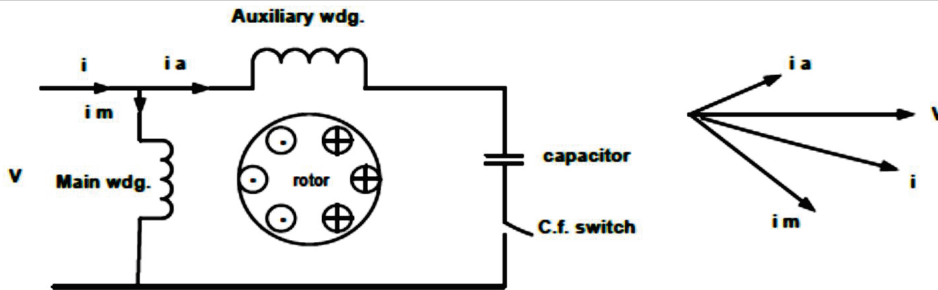


The typical torque – speed characteristic of this motor is shown in figure below. motor has low starting torque which depends on the two currents and the phase angle between them .

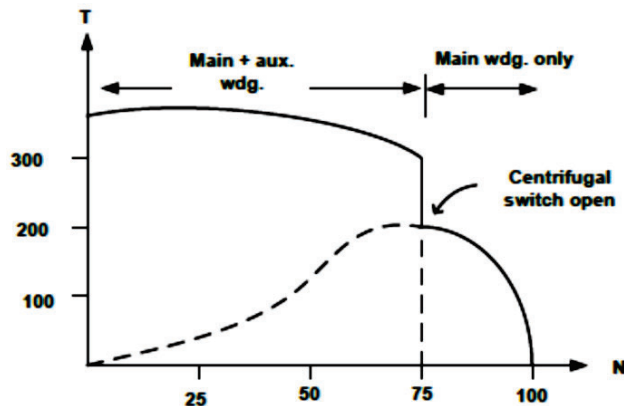


## 2. Capacitor – start motor:

Higher starting torque can be obtained if a capacitor is connected in series with the auxiliary winding as shown in figure below. This increase in phase angle between the two currents as shown in figure below .



The typical torque – speed characteristic of this motor is shown in figure below .



## 3. Shaded - pole induction motor:

These motors have a salient pole construction .A shaded band consisting of a short circuited copper turn known as a shading coil , is used on one portion of each pole . The main single phase winding is wound on the salient pole . The result is that the current induced in the shading coil causes the flux in the shades portion of the pole to lag the flux in the un shaded portion of the pole . Therefore , the flux in the shaded portion reaches its maximum after the flux in the un shaded portion reaches its maximum. It is similar to a rotating field moving from the un shaded to the shaded portion of the pole . As a result the motor produces a starting torque .



The typical torque – speed characteristic is shown in figure below . This motor is used for the low horsepower rating up to about 1/20 h.p .

