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FACULTY OF ENGINEERING & TECHNOLOGY

Electrical Machine-ii

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CAPACITOR START CAPACITOR RUN MOTOR

- The Capacitor Start Capacitor Run Motor has a cage rotor, and its stator has two windings known as Main and Auxiliary Windings. The two windings are displaced 90 degrees in space.
- There are two capacitors in this method one is used at the time of the starting and is known as starting capacitor. The other one is used for continuous running of the motor and is known as RUN capacitor. So this motor is named as Capacitor Start Capacitor Run Motor. This motor is also known as Two Value Capacitor Motor.
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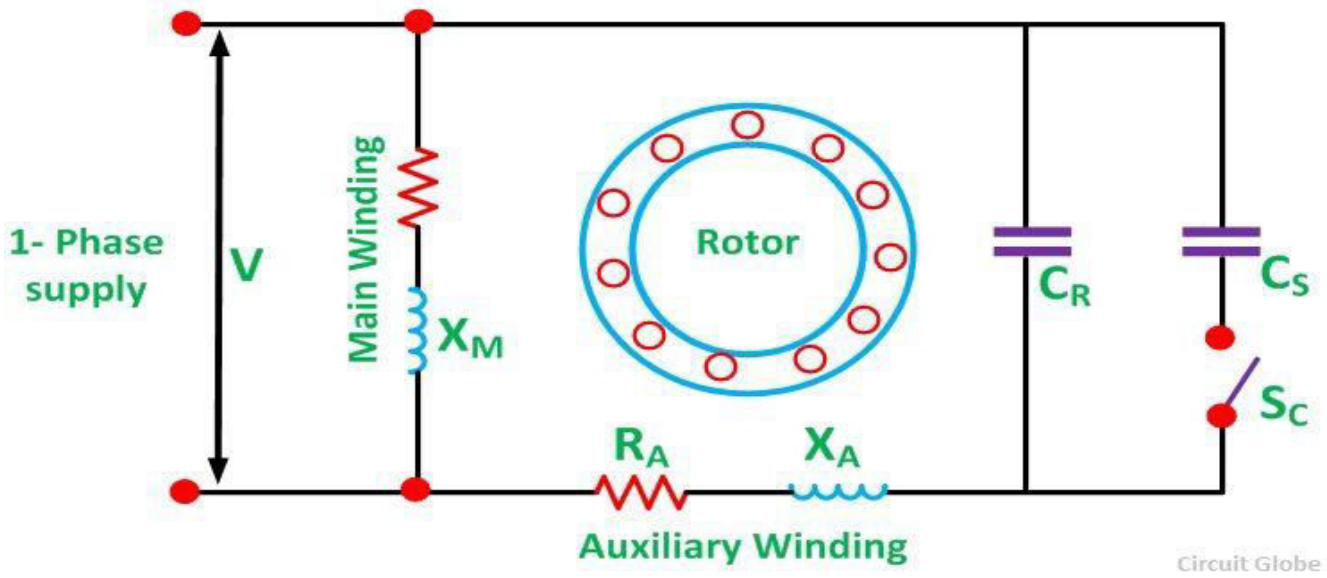


Application of Capacitor Start Capacitor Run IM

These motors have high starting torque hence they are used in conveyors, grinder, air conditioners, compressor, etc. They are available up to 6 KW.

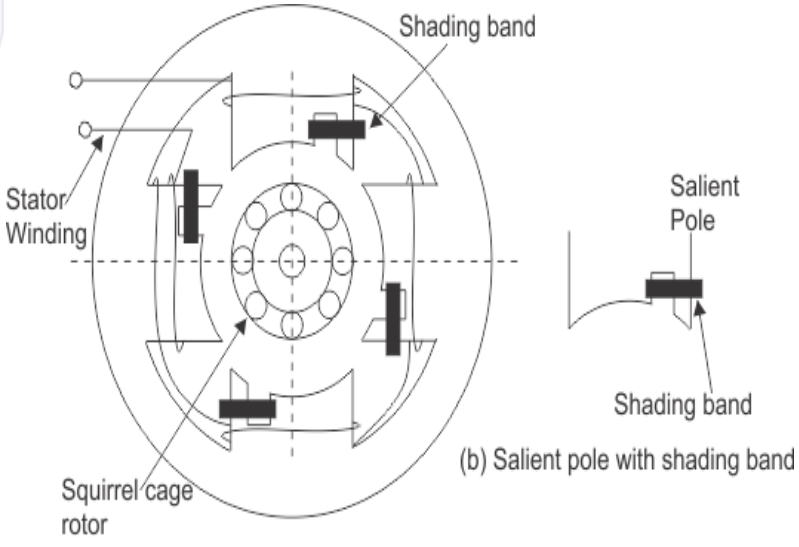
SHADED POLE SINGLE PHASE INDUCTION MOTORS

The stator of the shaded pole single phase induction motor has salient or projected poles. These poles are shaded by copper band or ring which is inductive in nature. The poles are divided into two unequal halves. The smaller portion carries the copper band and is called as shaded portion of the pole.

ACTION: When a single phase supply is given to the stator of shaded pole induction motor an alternating flux is produced. This change of flux induces emf in the shaded coil. Since this shaded portion is short circuited, the current is produced in it in such a direction to oppose the main flux. The flux in shaded pole lags behind the flux in the unshaded pole. The phase difference between these two fluxes produces resultant rotating flux. We know that the stator winding current is alternating in nature and so is the flux produced by the stator current. In order to clearly understand the working of shaded pole induction motor consider three regions-

1.When the flux changes its value from zero to nearly maximum positive value.
2.When the flux remains almost constant at its maximum value.
3.When the flux decreases from maximum positive value to zero.

REGION 1: When the flux changes its value from zero to nearly maximum positive value – In this region the rate of rise of flux and hence current is very high. According to Faraday's law whenever there is change in flux emf gets induced. Since the copper band is short circuit the current starts flowing in the copper band due to this induced emf. This current in copper band produces its own flux. Now according to Lenz's law the direction of this current in copper band is such that it opposes its own cause i.e rise in current. So the shaded ring flux opposes the main flux, which leads to the crowding of flux in non shaded part of stator and the flux weaken in shaded part. This non uniform distribution of flux causes magnetic axis to shift in the middle of the non shaded part.



(a) 4-pole shaded pole construction

SHADED POLE SINGLE PHASE INDUCTION MOTORS (CONTI..)

REGION 2: When the flux remains almost constant at its maximum value- In this region the rate of rise of current and hence flux remains almost constant. Hence there is very little induced emf in the shaded portion. The flux produced by this induced emf has no effect on the main flux and hence distribution of flux remains uniform and the magnetic axis lies at the center of the pole.

REGION 3: When the flux decreases from maximum positive value to zero - In this region the rate of decrease in the flux and hence current is very high. According to Faraday's law whenever there is change in flux emf gets induced. Since the copper band is short circuit the current starts flowing in the copper band due to this induced emf. This current in copper band produces its own flux. Now according to Lenz's law the direction of the current in copper band is such that it opposes its own cause i.e decrease in current. So the shaded ring flux aids the main flux, which leads to the crowding of flux in shaded part of stator and the flux weaken in non shaded part. This non uniform distribution of flux causes magnetic axis to shift in the middle of the shaded part of the pole. This shifting of magnetic axis continues for negative cycle also and leads to the production of rotating magnetic field. The direction of this field is from non shaded part of the pole to the shaded part of the pole.

Advantages and Disadvantages of Shaded Pole Motor

The advantages of shaded pole induction motor are

1. Very economical and reliable.
2. Construction is simple and robust because there is no centrifugal switch.

The disadvantages of shaded pole induction motor are

1. Low power factor.
2. The starting torque is very poor.
3. The efficiency is very low as, the copper losses are high due to presence of copper band.
4. The speed reversal is also difficult and expensive as it requires another set of copper rings.

Applications of Shaded Pole Motor

Applications of Shaded pole motors induction motor are- Due to their low starting torques and reasonable cost these motors are mostly employed in small instruments, hair dryers, toys, record players, small fans, electric clocks etc. These motors are usually available in a range of 1/300 to 1/20 KW.