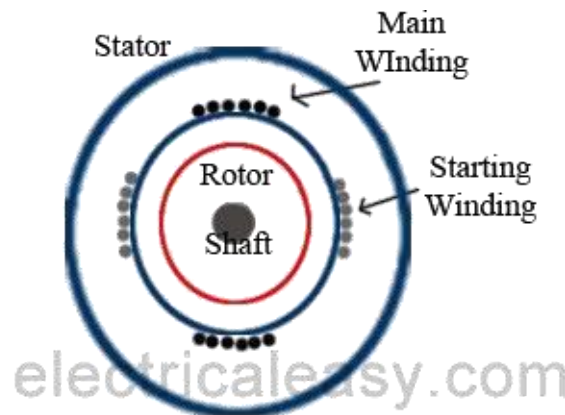


### 3.3 SINGLE PHASE INDUCTION MOTOR

Construction of a single phase induction motor is similar to the construction



of three phase induction motor having squirrel cage rotor, except that the stator is wound for single phase supply. Stator is also provided with a 'starting winding' which is used only for starting purpose. This can be understood from the **schematic of single phase induction motor** at the left.

#### Working Principle Of Single Phase Induction Motor

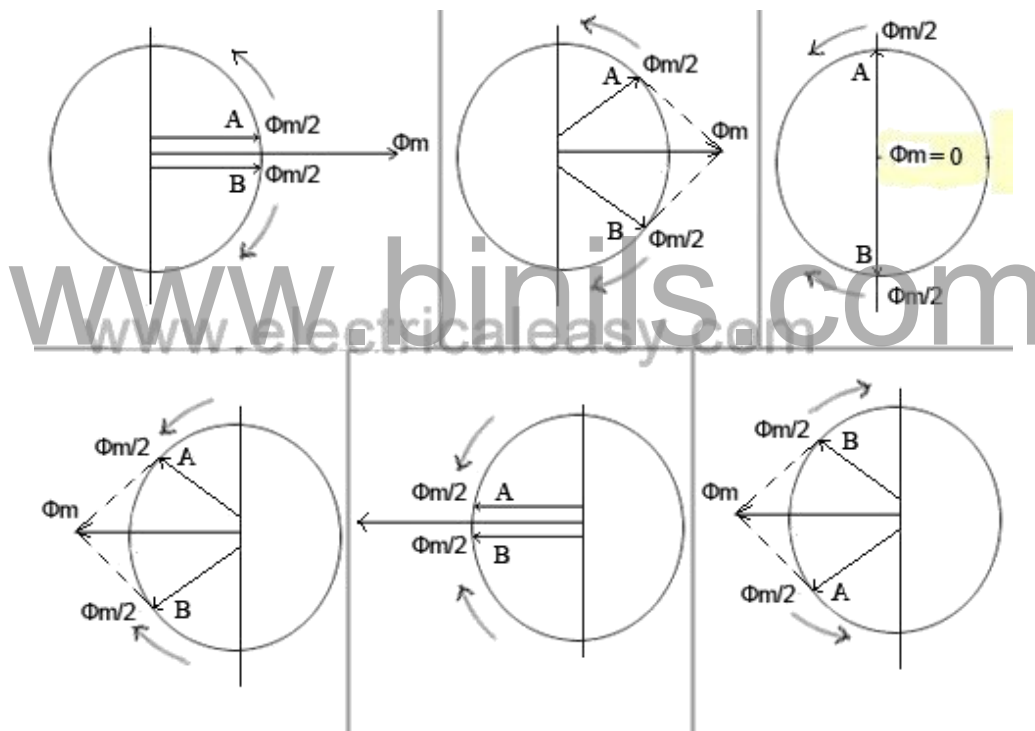
When the stator of a single phase motor is fed with single phase supply, it produces alternating flux in the stator winding. The alternating current flowing through stator winding causes induced current in the rotor bars (of the squirrel cage rotor ) according to Faraday's law of electromagnetic induction. This induced current in the rotor will also produce alternating flux. Even after both alternating fluxes

are set up, the motor fails to start (the reason is explained below). However, if the rotor is given a initial start by external force in either direction, then motor accelerates to its final speed and keeps running with its rated speed. This behavior of a single phase motor can be explained by double-field revolving theory.

### Double-Field Revolving Theory

The double-field revolving theory states that, any alternating quantity (here, alternating flux) can be resolved into two components having magnitude half of the maximum magnitude of the alternating quantity, and both these components rotating in opposite direction.

Following figures will help you understanding the double field revolving theory.



### Why Single Phase Induction Motor Is Not Self Starting?

The stator of a single phase induction motor is wound with single phase winding. When the stator is fed with a single phase supply, it produces alternating flux

(which alternates along one space axis only). Alternating flux acting on a squirrel cage rotor can not produce rotation, only revolving flux can. That is why a single phase induction motor is not self starting.

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*How To Make Single Phase Induction Motor Self Starting?*

- As explained above, **single phase induction motor is not self-starting**. To make it self- starting, it can be temporarily converted into a two-phase motor while starting. This can be achieved by introducing an additional 'starting winding' also called as auxillary winding.
- Hence, stator of a single phase motor has two windings: (i) Main winding and (ii) Starting winding (auxillary winding). These two windings are connected in parallel across a single phase supply and are spaced 90 electrical degrees apart. Phase difference of 90 degree can be achieved by connecting a capacitor in series with the starting winding.

Hence the motor behaves like a two-phase motor and the stator produces revolving magnetic field which causes rotor to run. Once motor gathers speed, say upto 80 or 90% of its normal speed, the starting winding gets disconnected form the circuit by means of a centrifugal switch, and the motor runs only on main winding.

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