

3.3 INDUCTION MOTOR DRIVES

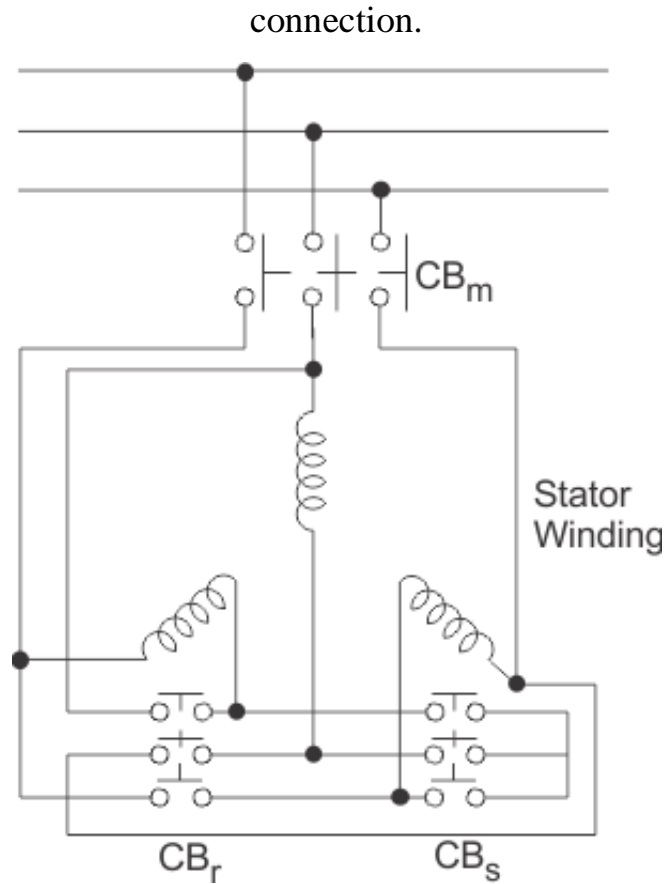
Though the cost of these drivers is more than DC driver, still the use of induction motors is increasing and they are replacing DC motors because of their advantages. While discussing this topic we will look through the starting, braking and speed control of induction motors.

Starting of Induction Motors

We know that the induction motor is self-starting i.e when the supply is given to the motor it starts to rotate without any external help. When an induction motor is started as there is no resistance initially (i.e, during starting), there is a tendency of huge current flow through the rotor circuit which may damage the circuit permanently. To overcome this problem various methods have been introduced to limit the starting current. Some of the methods are

1. Star delta starter
2. Auto-transformers starter
3. Reactor starter
4. Saturable reactor starter
5. Part winding starter
6. AC voltage controller starter
7. Rotor resistance starter is used for starting of wound rotor motor.

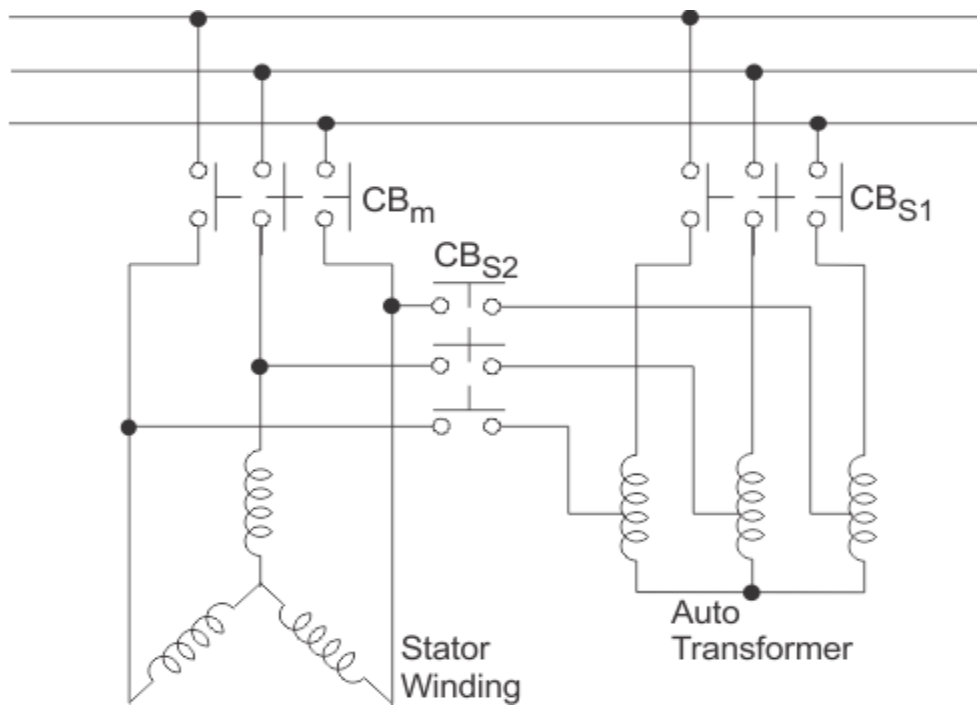
The **induction motor drives** are normally designed to run on delta connection, but during starting the supply is given from star connection because then the starter voltage and current reduces by $1/\sqrt{3}$ times than the delta connection. When the motor reaches a steady state speed the connection changes from star to delta



Another type of starting method of induction motors is the auto transformer starting. Since we know that the torque is proportional to square of the voltage. By auto transformers the starting voltage and current are reduced to overcome the problem of overheating due to very high current flow.

During starting the ratio of the transformer is set in a way that the starting current does not exceed the safe limit. Once the induction motor starts running and reaches a steady state value, the auto transformer is disconnected from the supply.

The circuit diagram is given here with



Another method of starting is softstart using saturable reactor drivers. In this method high reactance is introduced into the circuit so that the starting torque is closed to zero. Now the reactance is reduced smoothly during starting and the starting current increases and the torque also varies steplessly. In this method the motor starts without any jerk and the acceleration is smooth, that's why its called soft start also.

Unbalanced starting scheme for soft start is another type of starting method where the impedance is introduced only in one of the supply phases. During starting the impedance is kept very high so that the motor operates as a single phase motor, the speed torque characteristics at that time is similar to curve A in the graph. When the speed attains a steady state value the impedance is removed completely, at that time the curve is similar to B, which is the natural characteristics of the matine. This starting method is also without any jerk and the operation is very smooth.

Part winding starting method is special for squirrel-cage induction motors. In this method two or more starter winding are connected in parallel. When the motor starts, any one of the winding is connected as a result the starter impedance is increased and starting current is reduced. When the steady speed is acquired by the motor both the windings are connected.

