Electrical Machine- II

UNIT – II
Starting of Three Phase Induction Motor

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Source & References:

The materials presented in this lecture has been taken from internet sites and books. This can be used only for academic purpose only.

STARTING OF THREE PHASE INDUCTION MOTOR

Let us consider the case of starting of a Three phase Induction Motor. Here, we apply a three-phase supply across the motor having three-phase stator winding. We arrange the stator winding in such a way that each phase is 120^{o} separate from each other. This arrangement produces a revolving magnetic field in the stator due to applied three phase supply. The rotor remains stationary just after switching ON the supply. The change in flux linkage to the rotor is maximum therefore emf will be induced in rotor conductor causing large current to flow through it. This current is called starting current which is multiple times of full load current.

Hence now the rotor is acting like current carrying conductor placed in revolving magnetic field . Hence, the rotor conductors now experience mechanical force in the direction same as direction of the revolving magnetic field, and hence the rotor starts rotating and attends a speed given as

Slip Speed = N_s – N

Where N_s is the synchronous speed that is the speed of revolving magnetic field present at stator winding and N is Rotor speed.

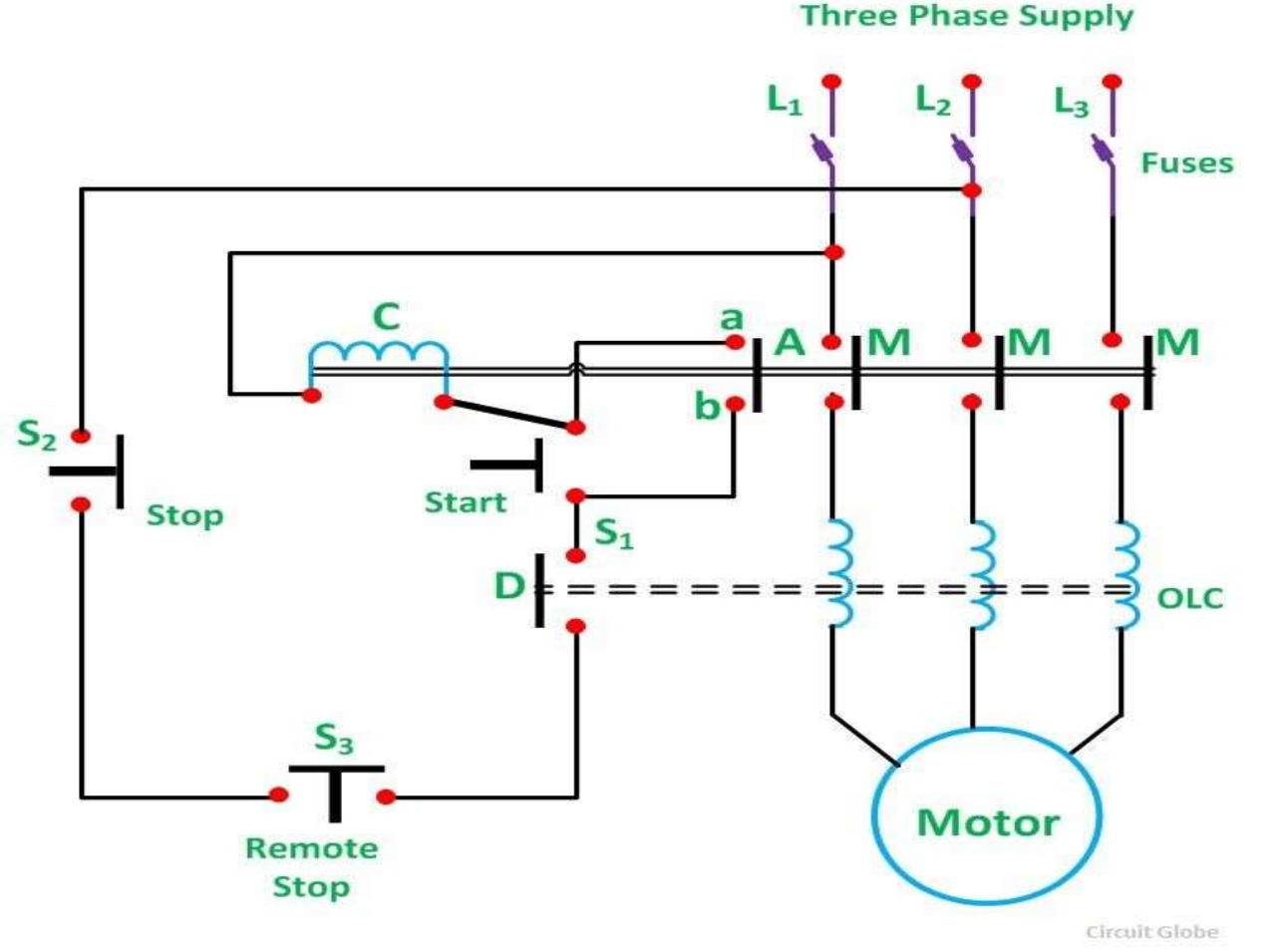
At the time of starting, induction motor takes 5-6 times of full load current that's why we are using starting methods.

Types of Starting Methods

- Direct online Starter
- Star Delta Starter
- Autotransformer Starter

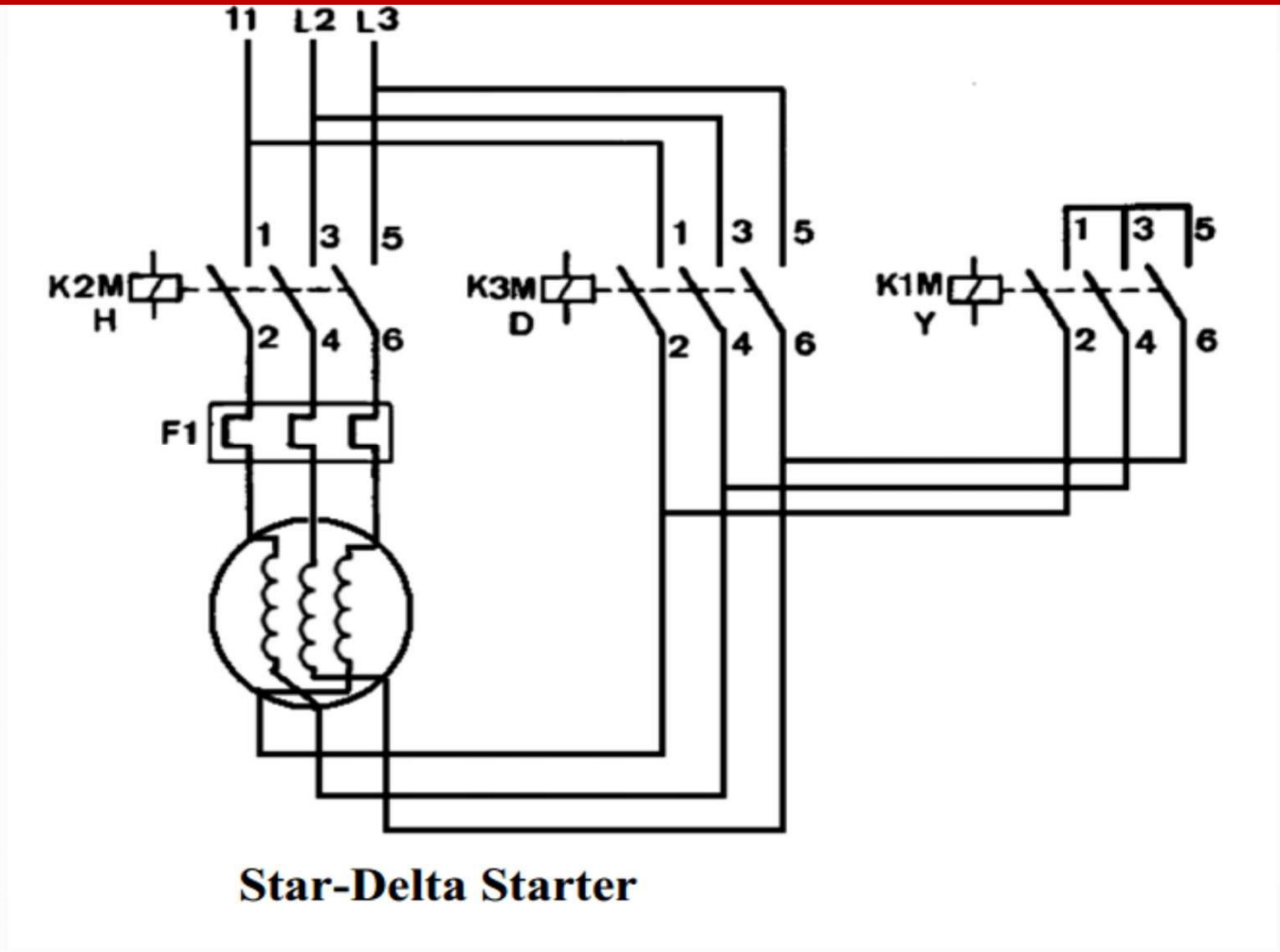
DOL Starter

It is a direct online starter consists of one-way switch simultaneously operates on each phase of the three-phase stator winding. The overload release of this switch protects the motor against overcurrent and No-volt release of this switch protects the motor from sudden three phase supply failure. DOL starters can be used to start motors up to 5 H.P.


Three Phase Supply
L1
L2
L3
Fuses
C
a
A
M
M
M
b
S2
Stop
Start
S1
D
OLC
S3
Remote
Stop
Motor
Circuit Globe

Star Delta Starter

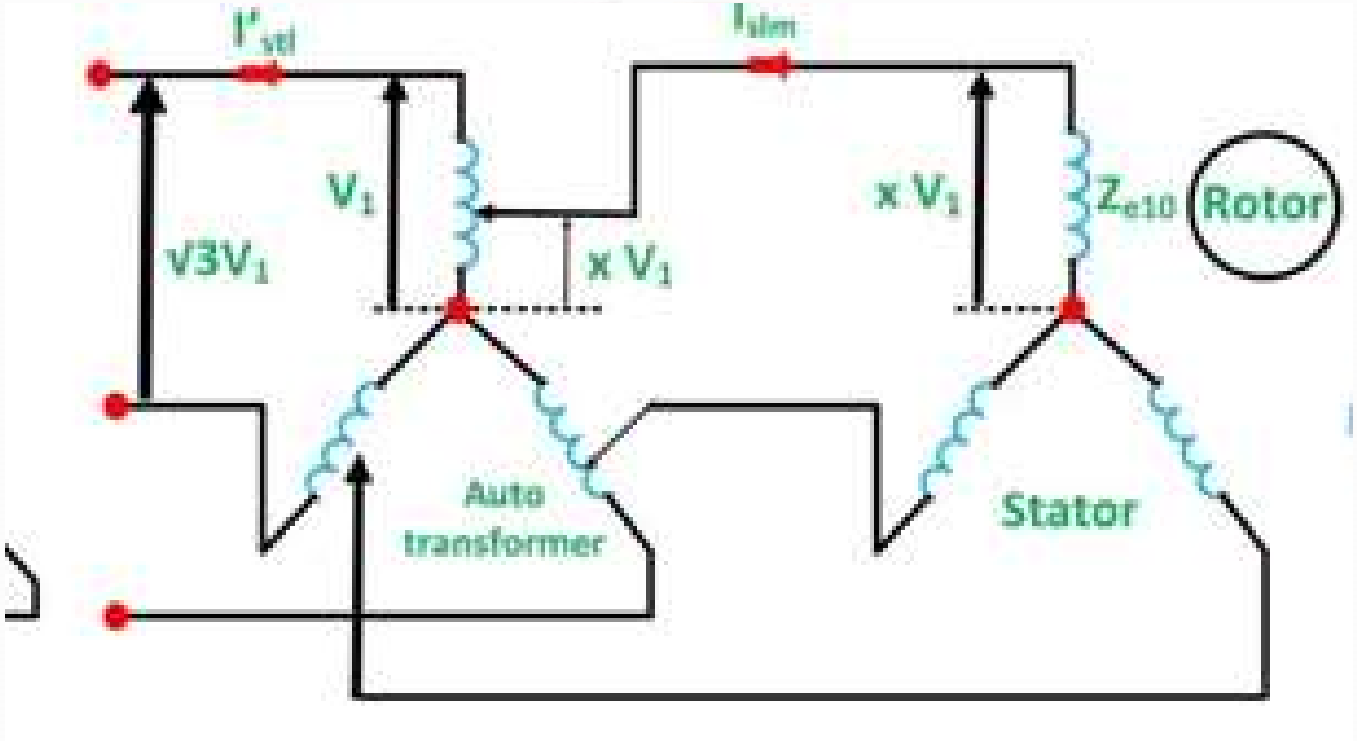
The stator winding is connected in star fashion. Therefore voltage is reduced at each phase at starting and hence current is reduced. As soon as motor achieves certain speed, motor winding is connected in delta fashion such that line voltage is equal to phase voltage with the help of two way switch. The star delta starter is used for starting of induction motor above 5 H.P.



Star-Delta Starter

Auto Transformer

The necessity of reduction of starting current to avoid failure of motor can be effectively done by auto transformer which consists of a single winding. The number of turns of the winding can be varied manually by moving the circular slider provided on it such that limited current will flow through the stator winding for an initial duration of time.



Auto Transformer starting