SNS COLLEGE OF ENGINEERING

Coimbatore

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC
with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna
University, Chennai

DEPARTMENT OF ELECTRONICS & ELECTRONICS ENGINEERING

ELECTRICAL ENGINEERING & INSTRUMENTATION

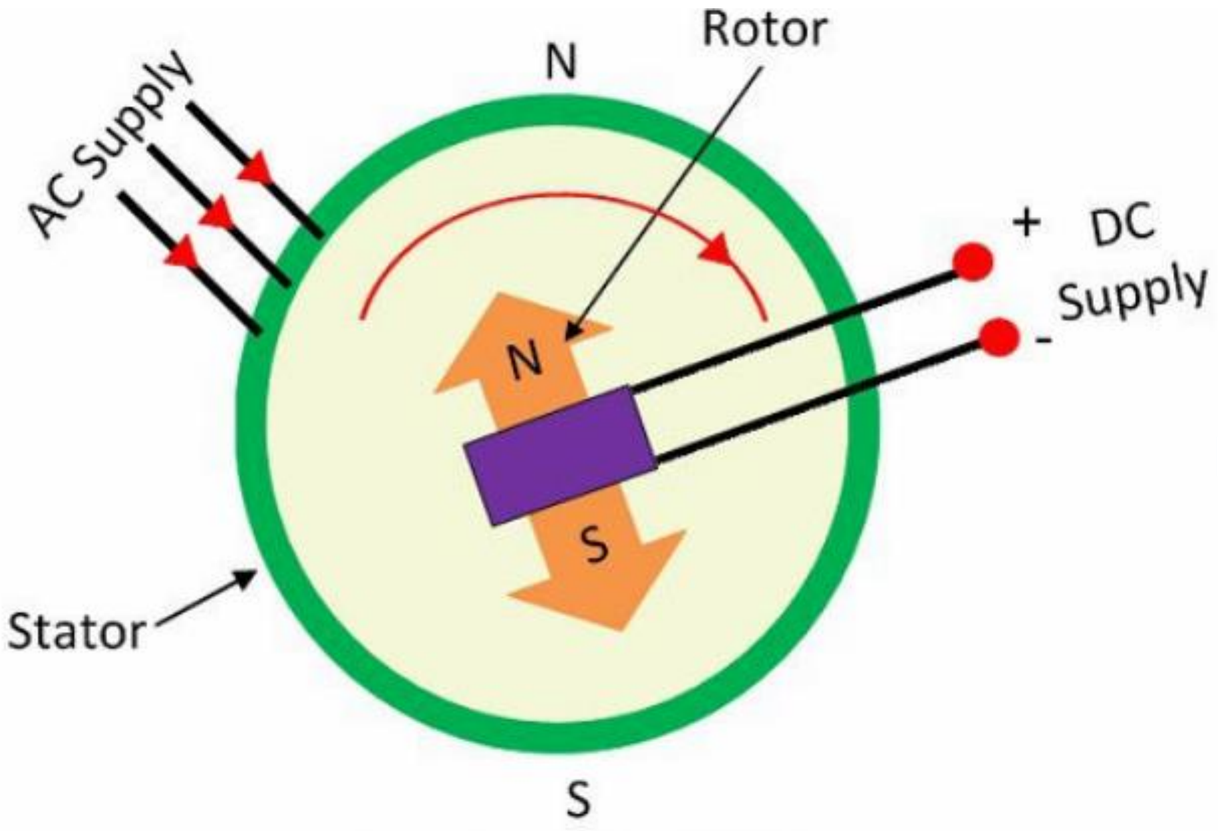
II YEAR/ III SEMESTER

UNIT 3 – INDUCTION MACHINES

SYNCHRONOUS MOTOR

SYNCHRONOUS MOTOR

SYNCHRONOUS MOTOR

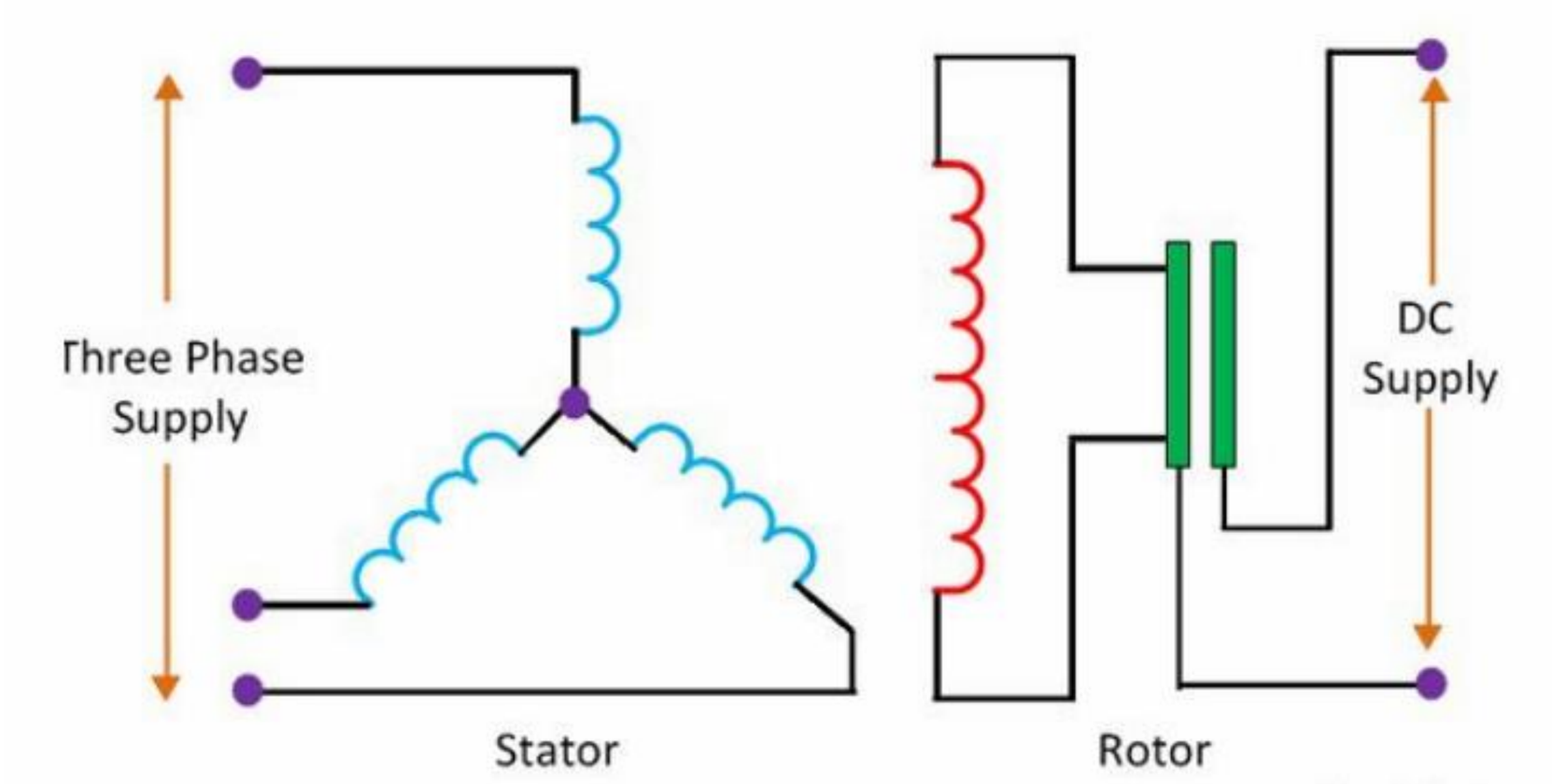


EXCITATION:

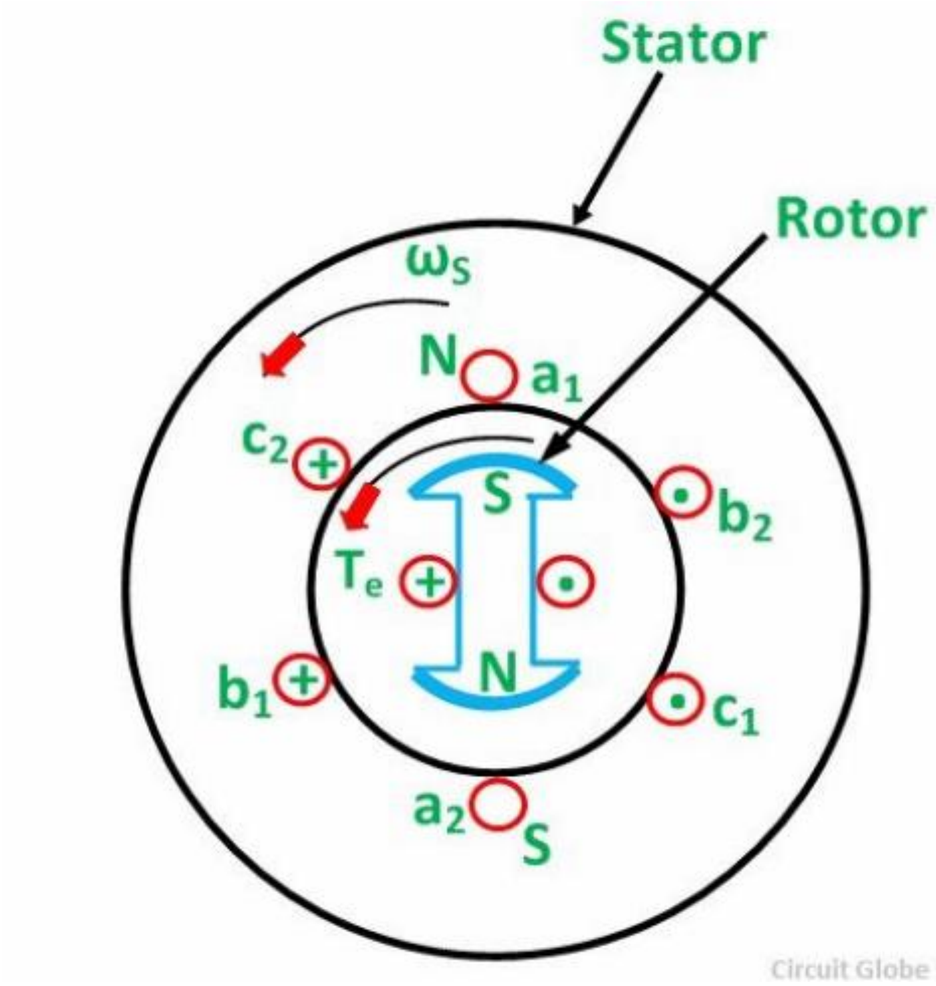
is the process of inducing the magnetic field on the parts of the motor with the help of an electric current.

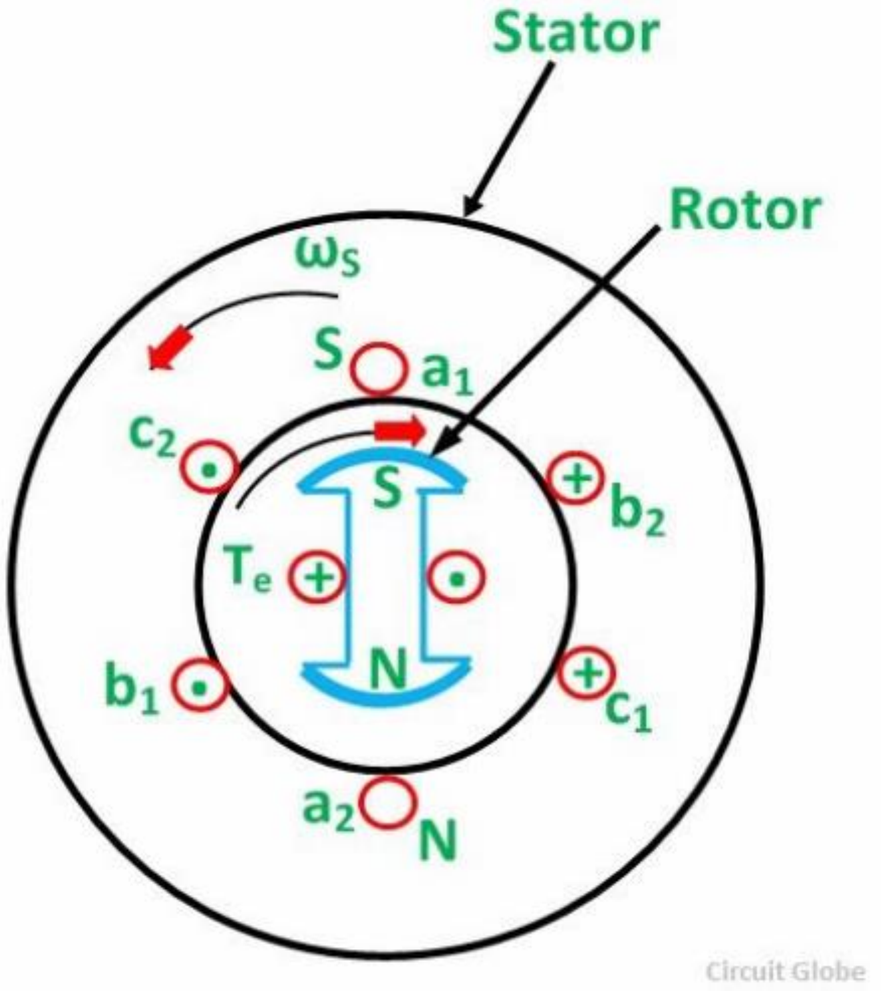
RMF: STATOR **CMF:** ROTOR

ELECTRICAL/CIRCUIT DIAGRAM SYNCHRONOUS MOTOR

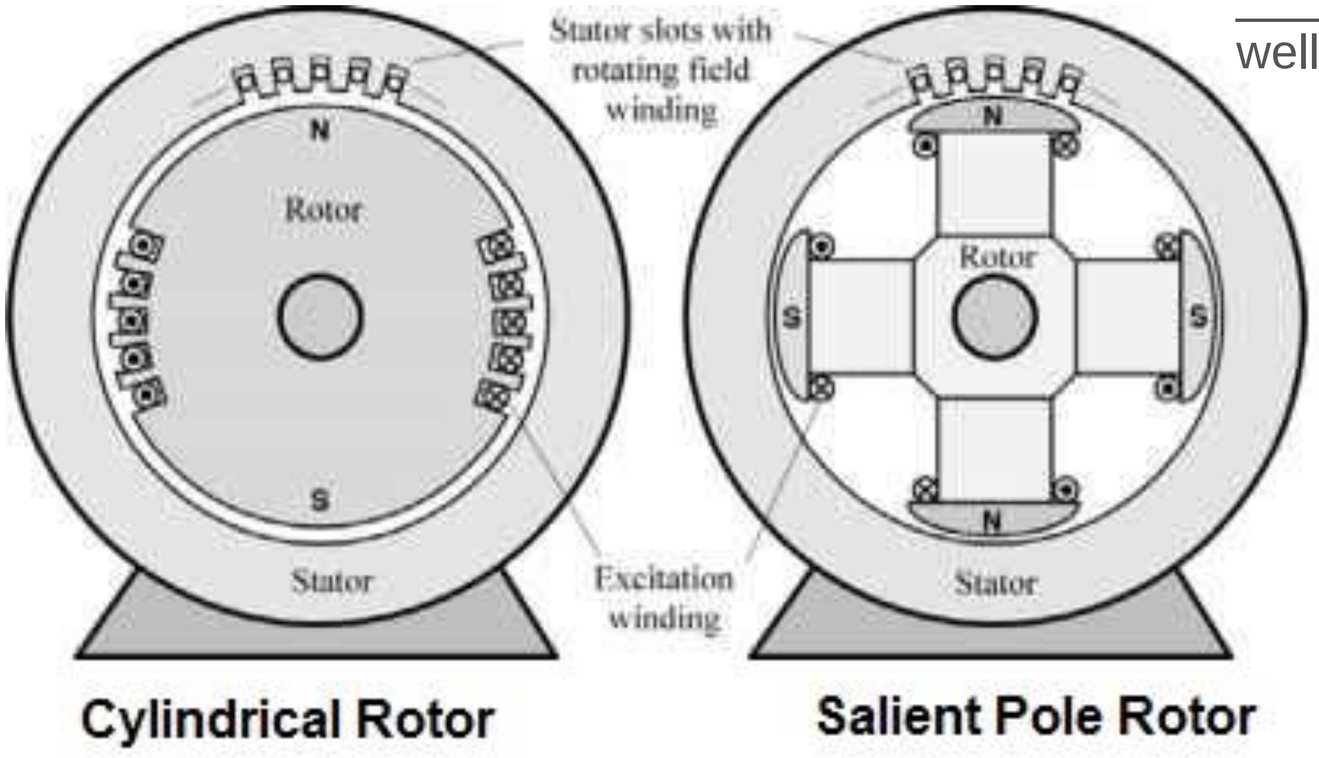


UNDERSTANDING SYNCHRONOUS MOTOR WORKING





CYLINDRIAL VS SALIENT POLE



2.For high speed prime mover _____CYLINDRICAL_____ construction is well suited

3.Why Salient pole is not used for high speed?

1.To accommodate larger number of poles, ____SALIENT_____ Pole construction is well suited.

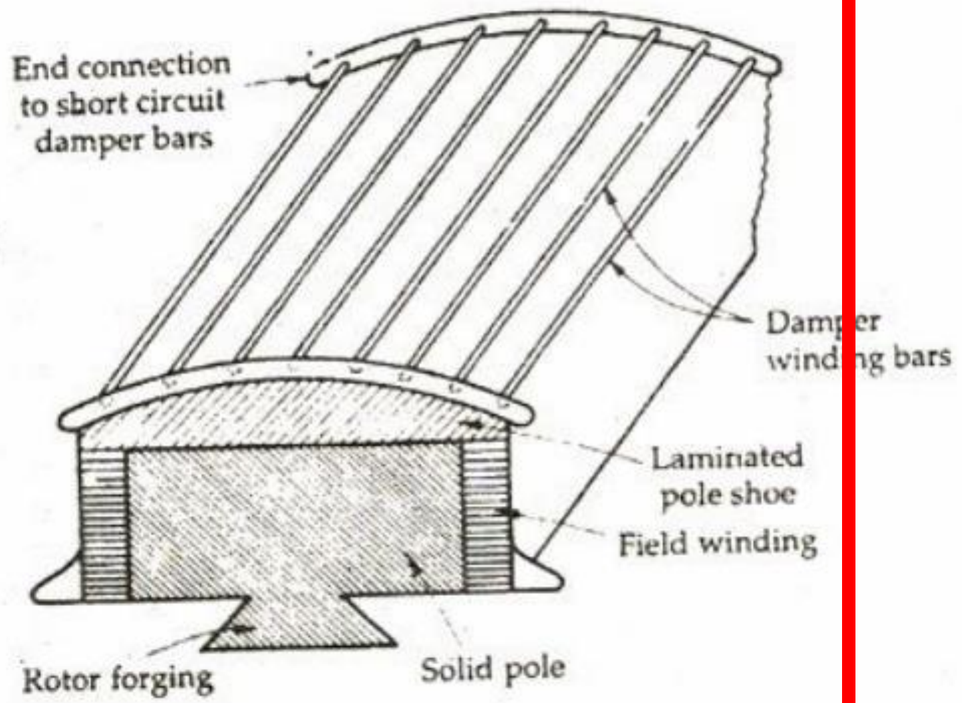
N=120F/P

Main Features of Synchronous Motor

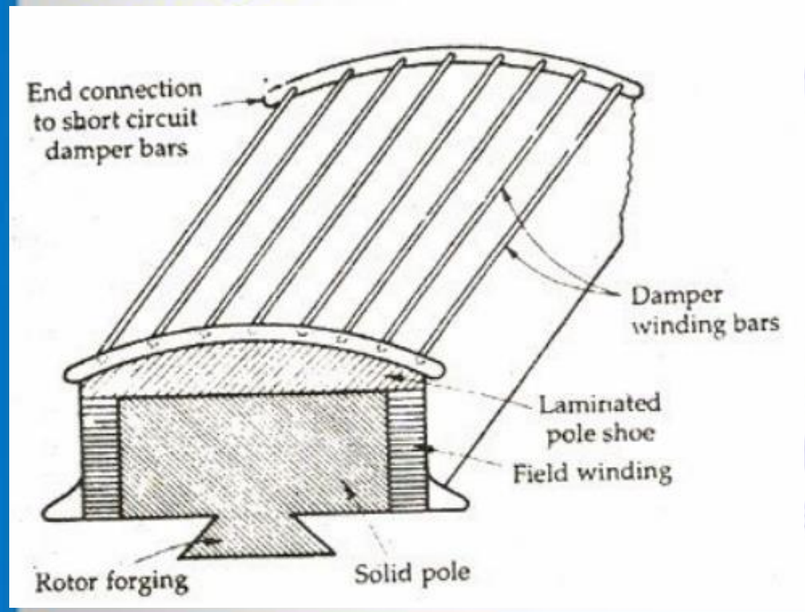
- ✔ The speed of the synchronous motor is independent of the load, i.e., the variation of the load does not affect the speed of the motor.
- ✔ The synchronous motor is not self-starting. The prime mover is used for rotating the motor at their synchronous speed.

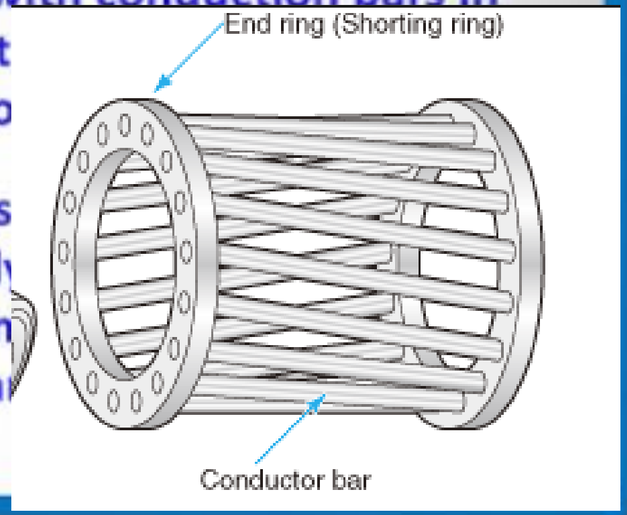
Starting Method of Synchronous Motor

- External Prime Mover
- Damper Windings



Synchronous Motor	Induction Motor
1. Synchronous motors require DC excitation to be supplied to the rotor windings.	1. Induction Motors don't require DC excitation to be supplied to the rotor windings.
tor	2. Induction motors are most often constructed with conduction bars in the rotor that at the ends to
ffect ed.	3. Three phas start by simpl single phase n additional sta





EMF EQUATION OF ALTERNATOR

EMF INDUCED BY THE GENERATOR:

$$Eg = \frac{\phi PN}{60} \quad (1)$$

SPEED N(rpm):

$$N = \frac{120F}{P} \quad (2)$$

SUB 2 in 1:

$$Eg = \frac{\phi \cancel{P}^{2}\cancel{120}F}{\cancel{60P}} \quad (3)$$

$$Eg = 2\phi F \text{ volts} \quad (4)$$

If there are **Z** conductors in series per phase:

$$Eg = 2\phi FZ \text{ volts} \quad (5)$$

Z = No. of Conductors or Coil sides in series/phase i.e. **Z = 2T**…Where T is the number of coils or turns per phase (Note that one turn or coil has two ends or sides)

$$Eg = 4\phi FZT \text{ volts} \quad (6)$$

Also we know that;

Form Factor= RMS Value / Average Value

= RMS value= Form factor x Average Value,

= 1.11 x 4*f*ΦT = 4.44*f*ΦT Volts.

VOLTAGE REGULATION OF SYNCHRONOUS GENERATOR/ALTERNATOR

The voltage regulation is given by the equation shown below.

$$\text{Per Unit Voltage Regulation} \triangleq \frac{|E_a| - |V|}{|V|} \quad \ldots\ldots\ldots(1)$$

$$\text{Percentage Voltage Regulation} \triangleq \frac{|E_a| - |V|}{|V|} \quad \ldots\ldots\ldots(2)$$

Where,

- $|E_a|$ is the magnitude of a generated voltage per phase
- $|V|$ is the magnitude of rated terminal voltage per phase


Thank
You