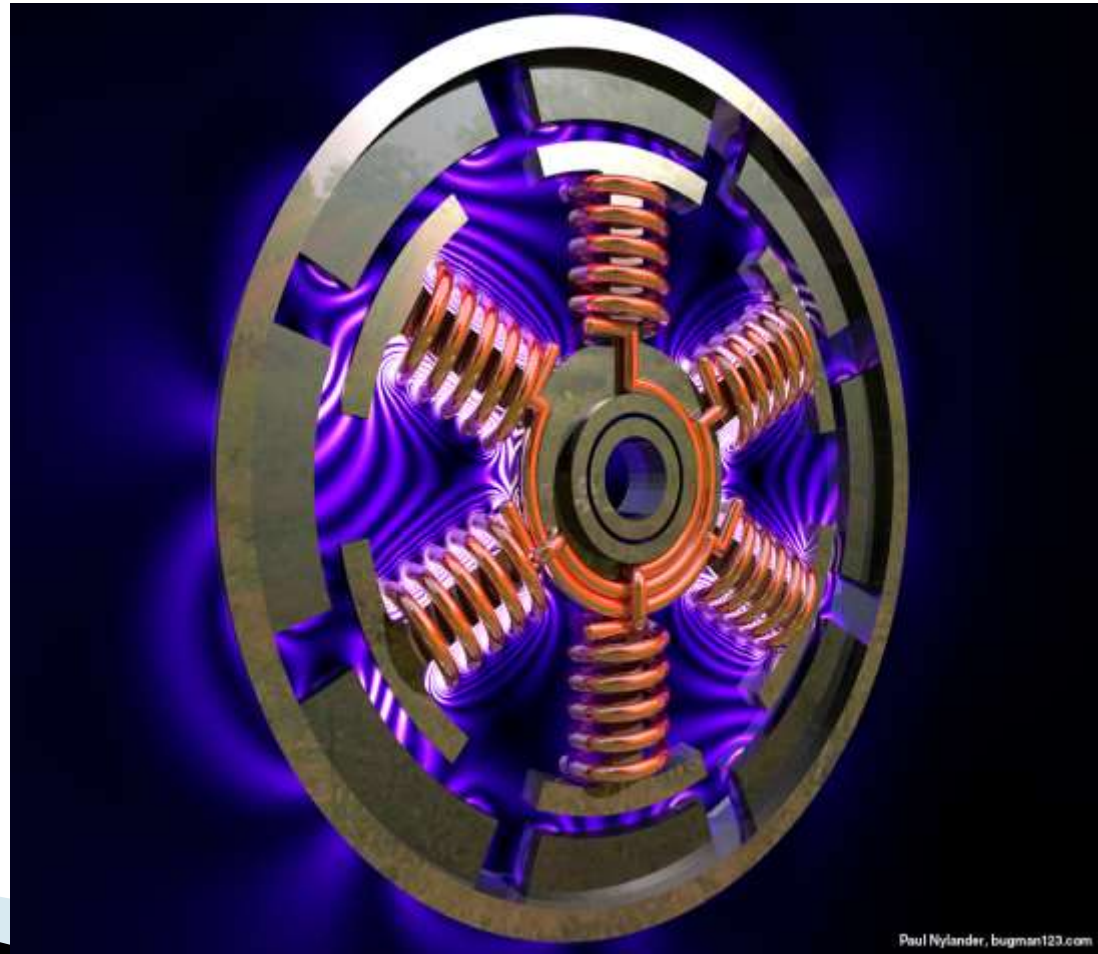


Synchronous machines



Construction of synchronous machines

Synchronous machines are AC machines that have a field circuit supplied by an external DC source.

In a synchronous generator, a DC current is applied to the rotor winding producing a rotor magnetic field. The rotor is then turned by external means producing a rotating magnetic field, which induces a 3-phase voltage within the stator winding.

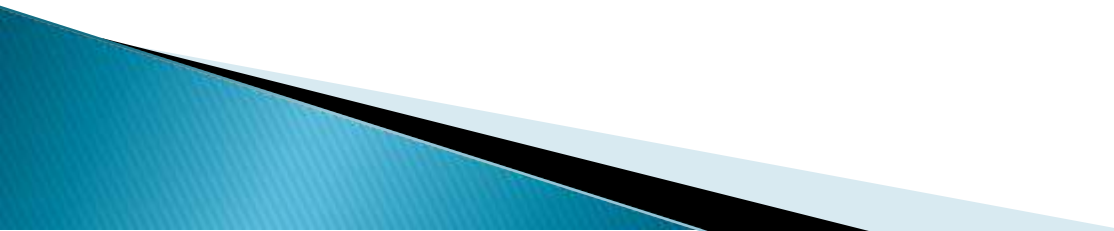
In a synchronous motor, a 3-phase set of stator currents produces a rotating magnetic field causing the rotor magnetic field to align with it. The rotor magnetic field is produced by a DC current applied to the rotor winding.

Field windings are the windings producing the main magnetic field (rotor windings for synchronous machines); armature windings are the windings where the main voltage is induced (stator windings for synchronous machines).

Construction of Synchronous motor

- Stator
- Rotor

Stator

- Field winding is provided in armature.
 - Armature winding is provided in stator.
 - Made by special magnetic iron or silicon steel.
 - Armature conductor is placed in slot of stator.
- 

Rotor

- Field system is just like that of dc generator
- Excitation is provided by small dc shunt or compound generator
- Types of Rotor
 - Cylindrical rotor type
 - Salient pole type

Cylindrical rotor type or non-salient pole type

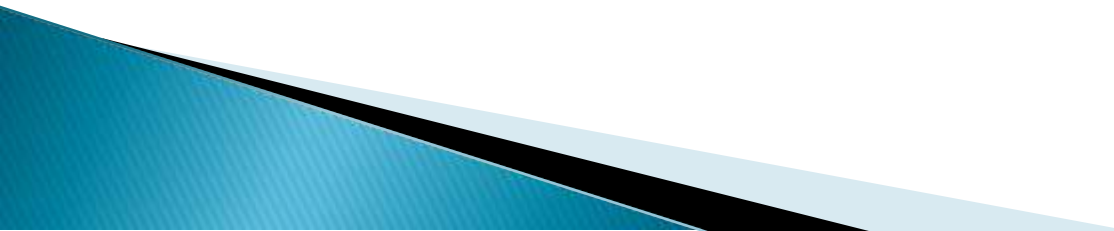
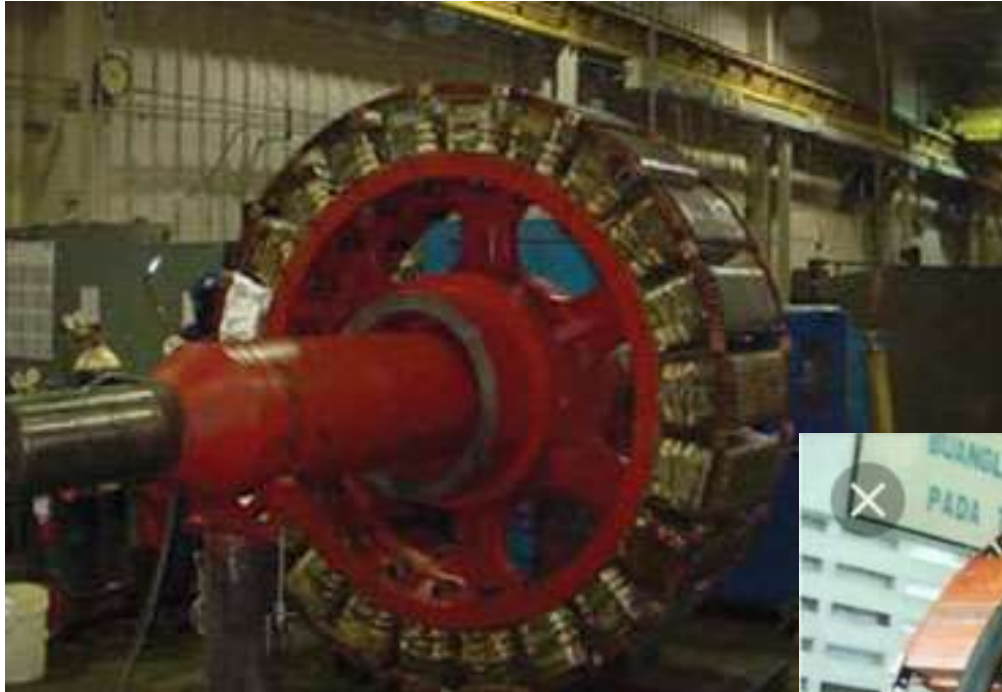
- Have smaller diameter
 - Axial length is large
 - Used in very high speed operation (3000 rpm)
 - Less windage loss
 - Noiseless operation
- 

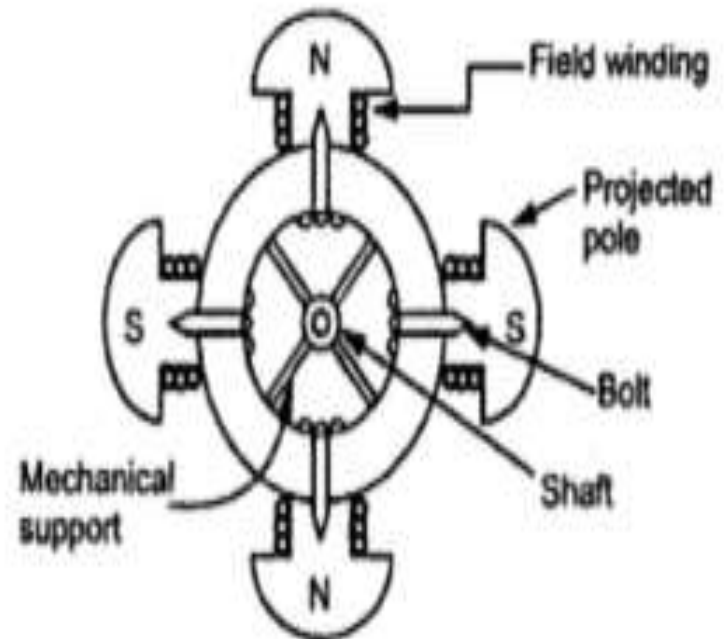


Fig: Cylindrical rotor with slotted rotor surface along axial length to house field windings

Salient pole type



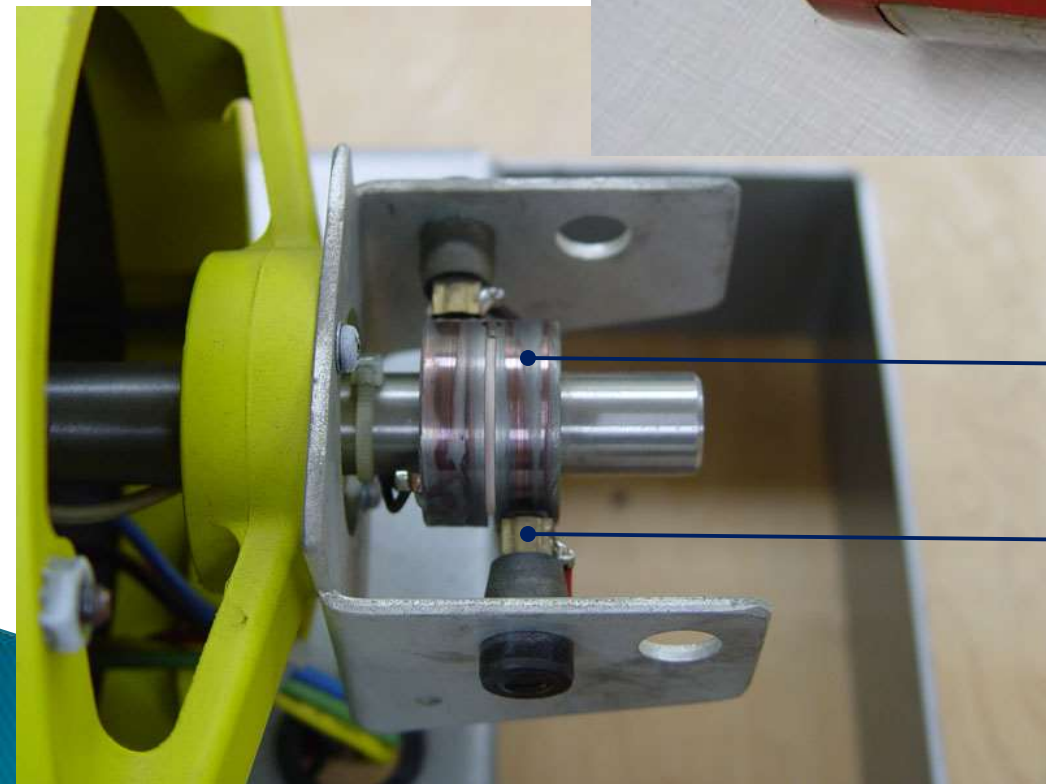
- Used in low and moderate speed
- Mechanical strength is poor
- Slot is provided for damper winding
- Damper winding reduces vibration
- Larger in diameter & short axial length





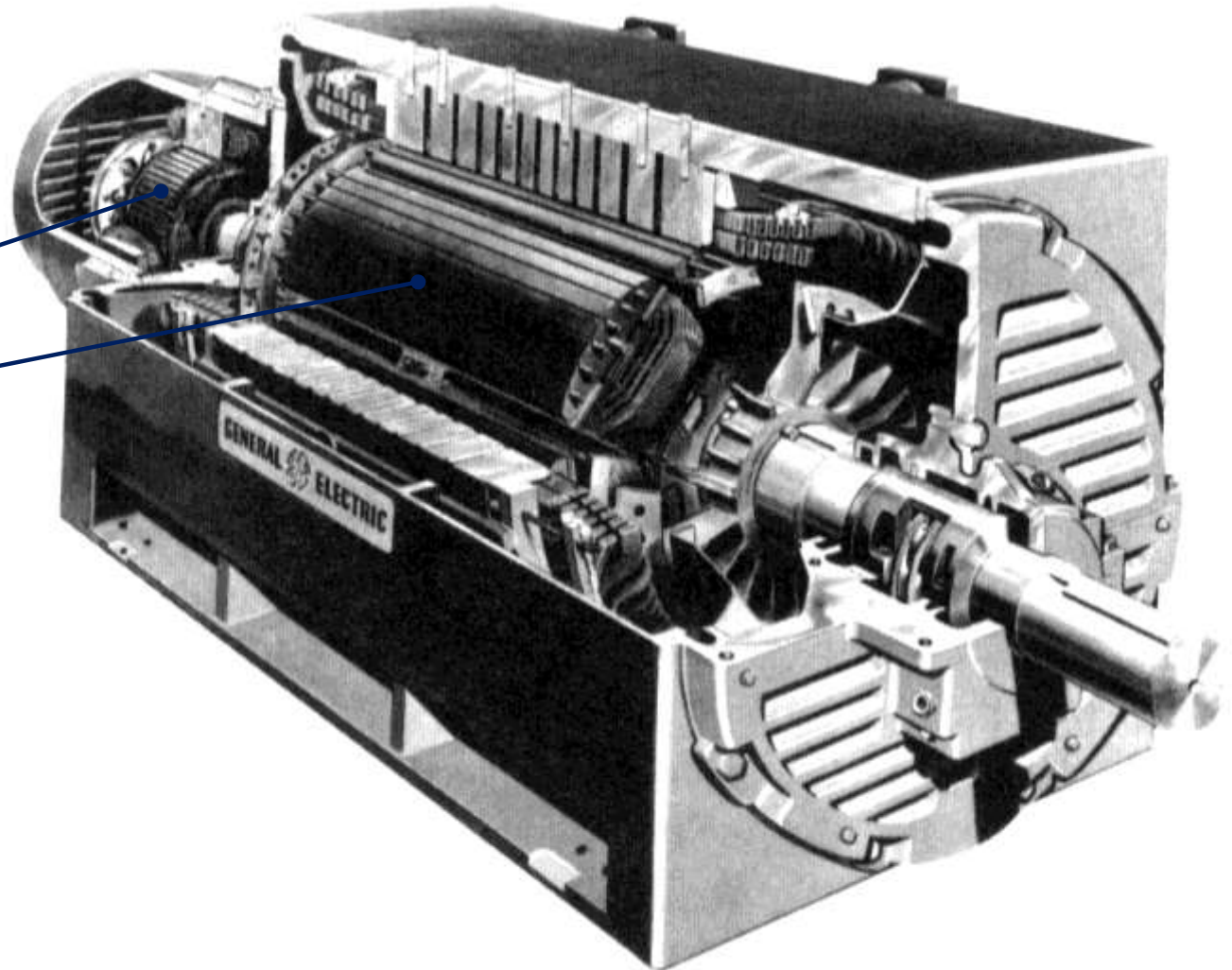
Slip rings

Brush



Construction of synchronous machines

A large synchronous machine with the exciter and salient poles.



U Phase

V Phase

W Phase

Common
Point (0V)

