

SERVOMOTORS

SERVOMOTORS



WHAT IS SERVO MOTOR ?

- It is a special type of motor.
- Automatically operated up to certain limit for a given command.
- It uses error sensing feedback to correct the performance.



TYPES OF SERVO MOTORS

● AC SERVOMOTORS

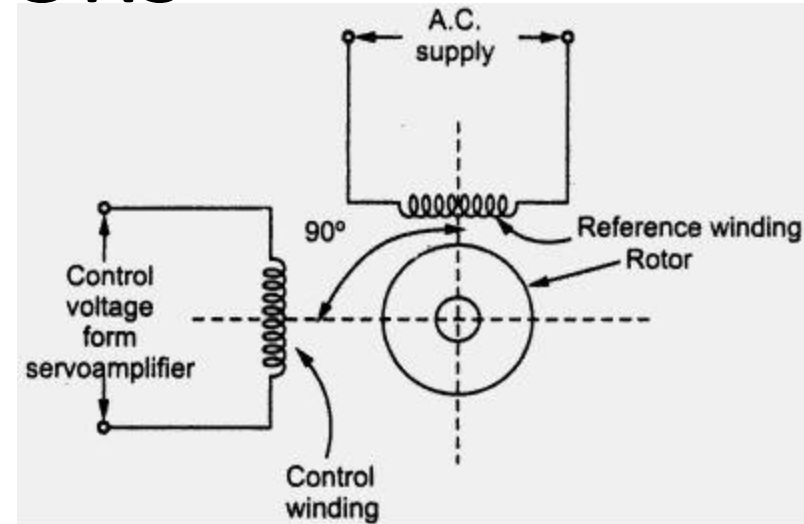
● DC SERVOMOTORS

AC SERVOMOTORS

- Induction motor with low (X/R) ratio.
- Consists of two main parts as follows,

STATOR

- Two windings displaced by 90 degree.
 - Reference winding → constant AC supply.
 - Control winding → control voltage from servo amplifier.



ROTOR

- ✓ It is classified into two types as follows

SQUIRREL CAGE ROTOR

- ✓ Use of aluminium reduces weight.
- ✓ Low inertia.
- ✓ Air gap is small.
- ✓ High resistance.

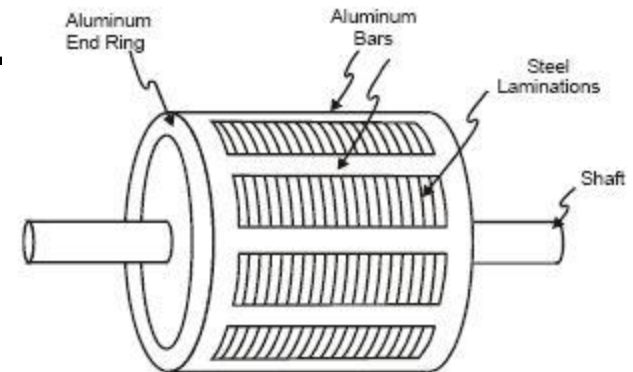
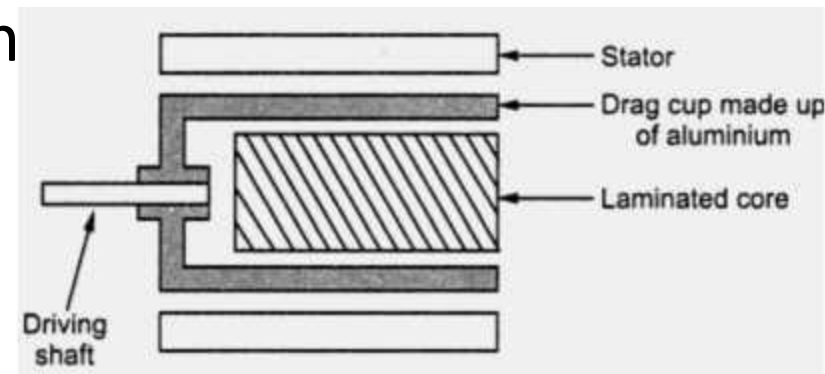


Figure 3-23. Squirrel cage induction motor rotor


DRAG CUP ROTOR

- ✓ Two air gaps.
- ✓ Used in low power application
- ✓ Made up of aluminium.





WORKING

- The voltage applied to stator creates RMF which makes rotor shaft to rotate.
 - Torque-Speed characteristics.
 - ✓ Linear for low (X/R) ratio.
 - ✓ Non-linear for high (X/R) ratio.
 - Linear characteristics depends on control voltage.
 - It is operated in low speed range.
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AC SERVO MOTOR FEATURES

- Small (X/R) ratio & high efficiency.
- Smooth, Less weight & low cost.
- Robust construction & noise free working.

APPLICATIONS OF AC SERVO MOTORS

- Recorders, Computers and Robotics.

DC SERVOMOTORS

- It is classified as ,
- Electromagnetic field motor.
- Permanent motor.

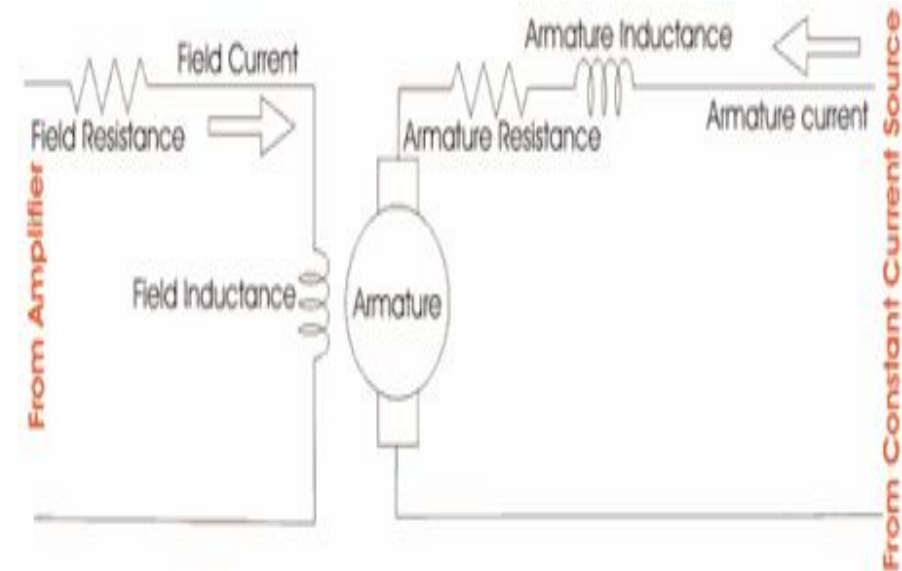
ELECTROMAGNETIC FIELD MOTORS

FIELD CONTROLLED MOTORS:-

- Field winding \longrightarrow control signal.
- Armature winding \longrightarrow constant current.

FEATURES

- Large time constant.
- Open loop system.
- Preferred for smaller rate motors.

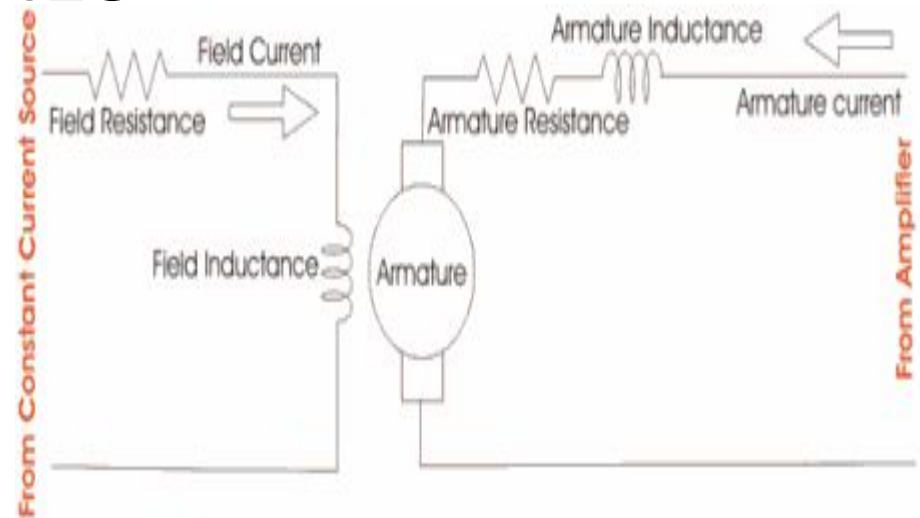


ARMATURE CONTROLLED DC SERVO MOTORS

- Armature winding → control signal.
- Field winding → constant current source.

FEATURES

- Small time constant.
- Closed loop system.
- Preferred for large rate motors.

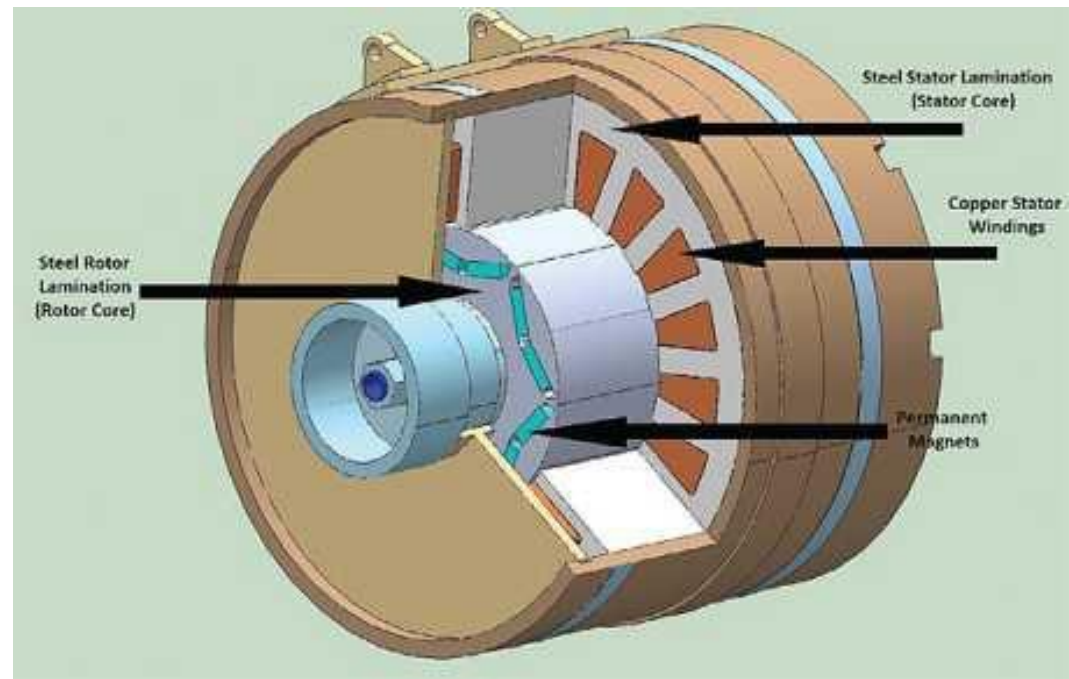


PERMANENT MAGNET MOTORS

- Field winding \longleftrightarrow Permanent magnet.
- Armature winding \longrightarrow voltage.

FEATURES

- No field supply is required.
- Highly efficient.
- Less affected by temperature rise.
- Less heating.




SYNCHROS



Synchros

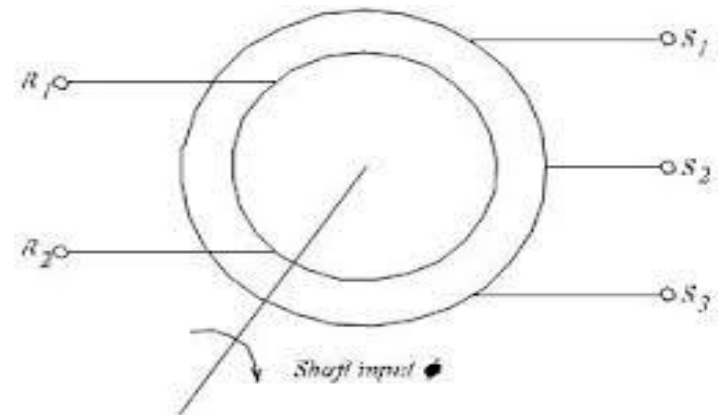
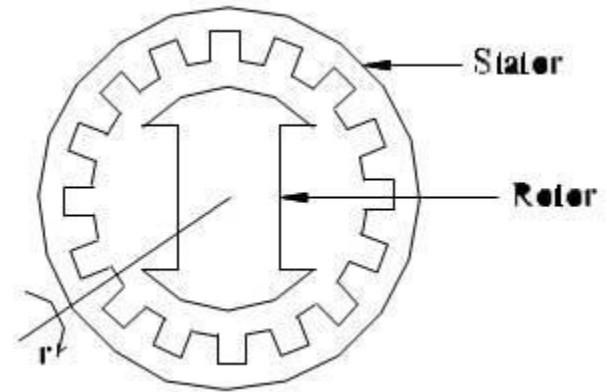
Synchros is a name for a family of inductive devices which works on the principle of a rotating transformer.

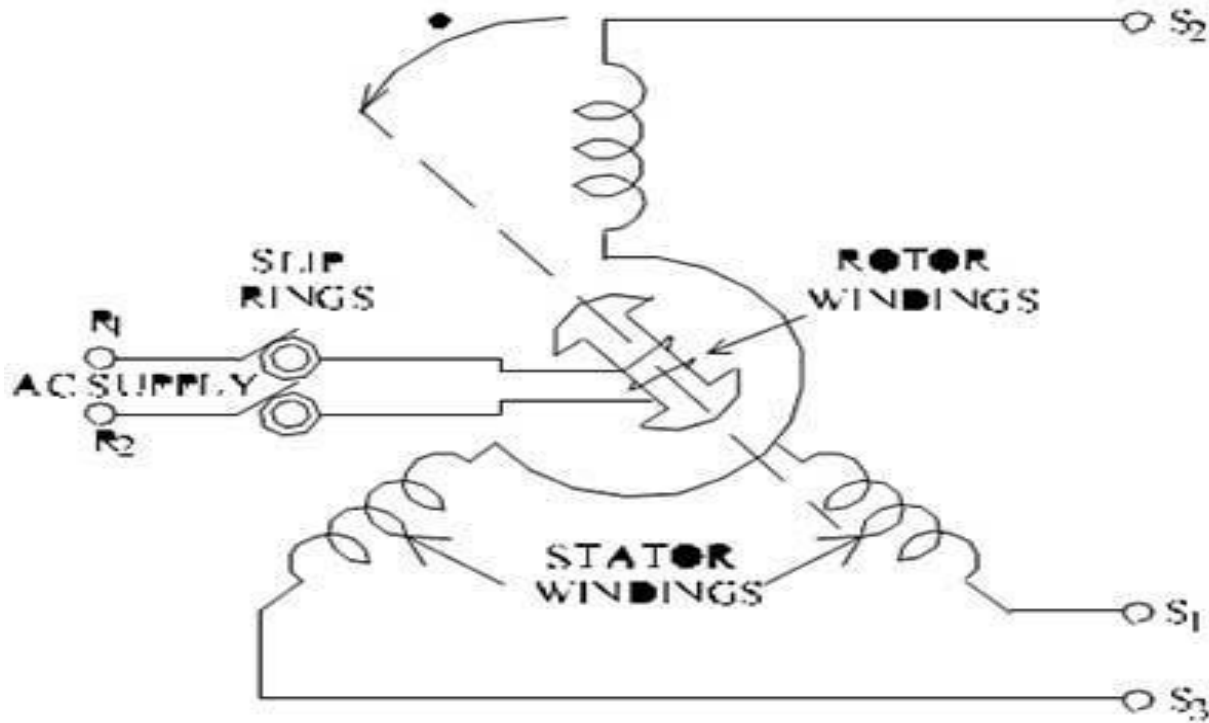
They can be used in following two ways

1. To control the angular position of load from a remote place.
 2. For automatic correction of changes due to disturbance in the angular position of the load.
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Synchro Transmitter

- ❑ When the rotor is excited by ac voltage, the rotor current flows, and a magnetic field is produced.
- ❑ The rotor magnetic field induces an emf in the stator coils by transformer action.

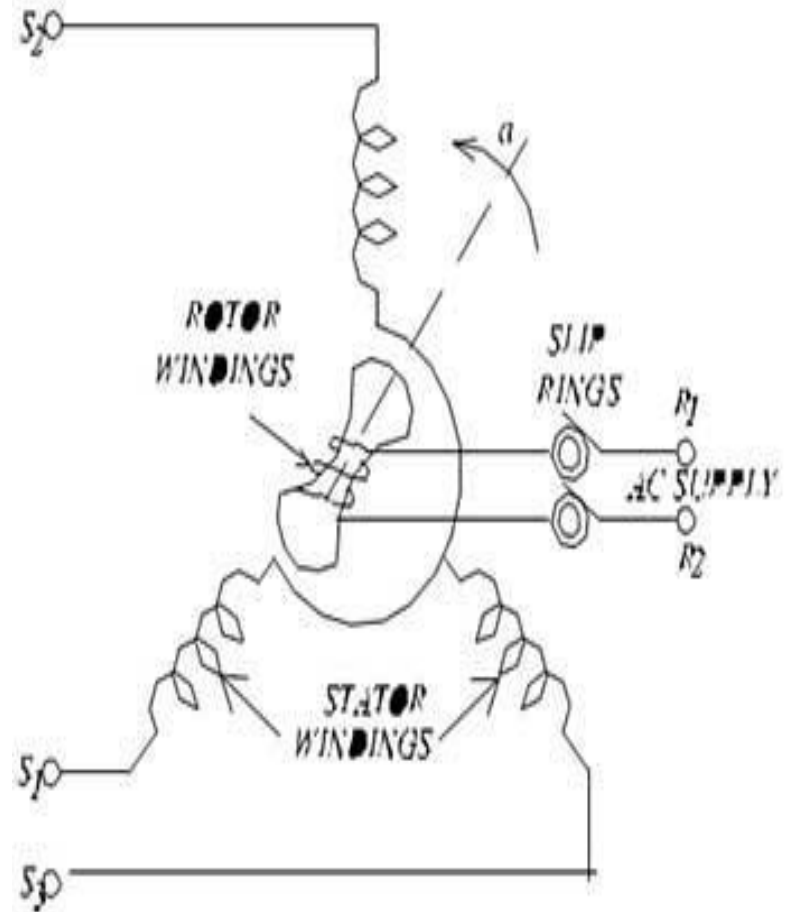




- ❖ The input to the synchro transmitter is the angular position of its rotor shaft.
- ❖ By measuring and identifying the set of voltages at the stator terminal


|| Synchro control Transformer

- The generated emf of the synchro is applied as input to the stator coils of control transformer.
- This emf can be measured used to drive a motor so that the position of the load is corrected.





Synchro as Error Detector

- The synchro error detector is formed by interconnection of a synchro transmitter and synchro control transformer.
 - Initially the shafts of transmitter and control transformer are assumed to be in aligned position.
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Synchro control transformer

- The null position of a control transformer in a servo system is that position of its rotor for which the output voltage on the rotor winding is zero

