

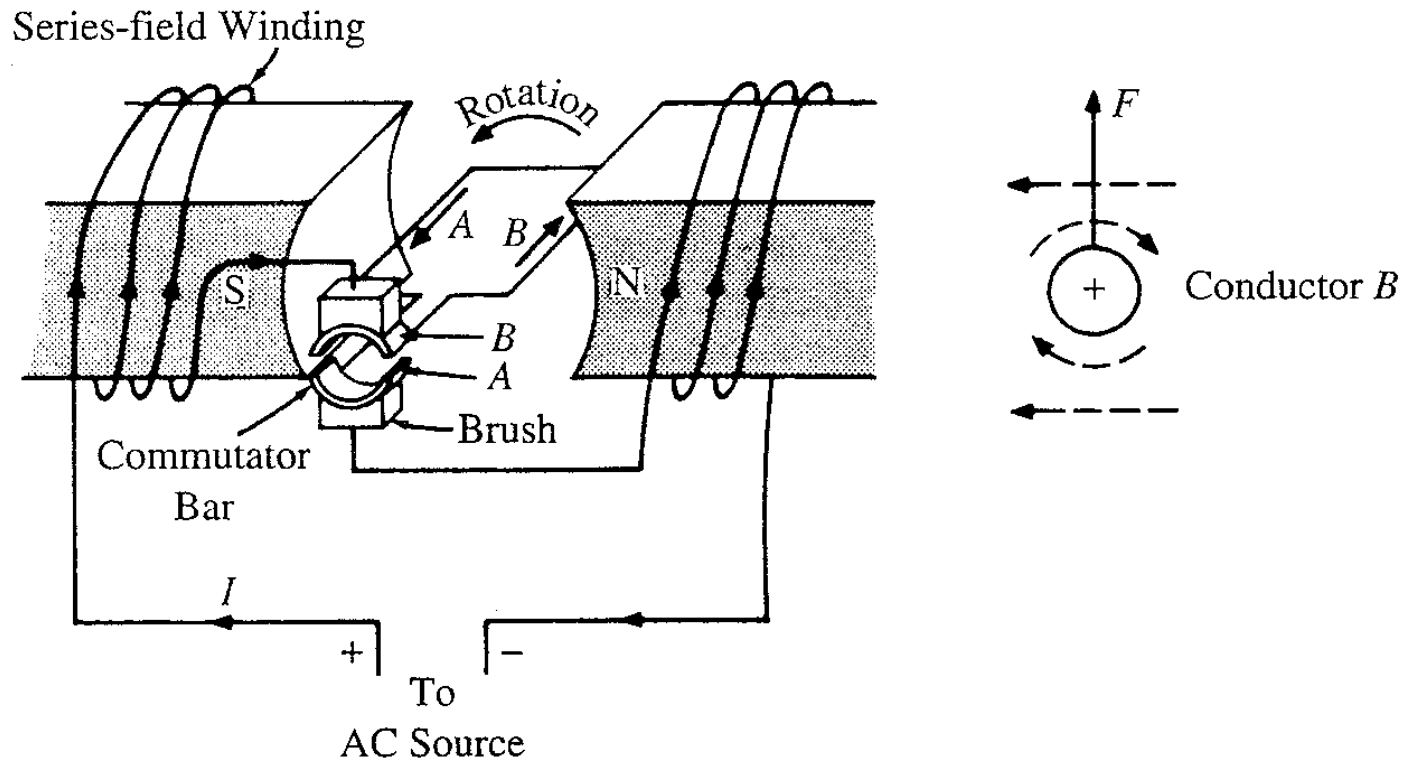
# **Special Electrical Machines**

# UNIT-V

## Single Phase Commutator Motors

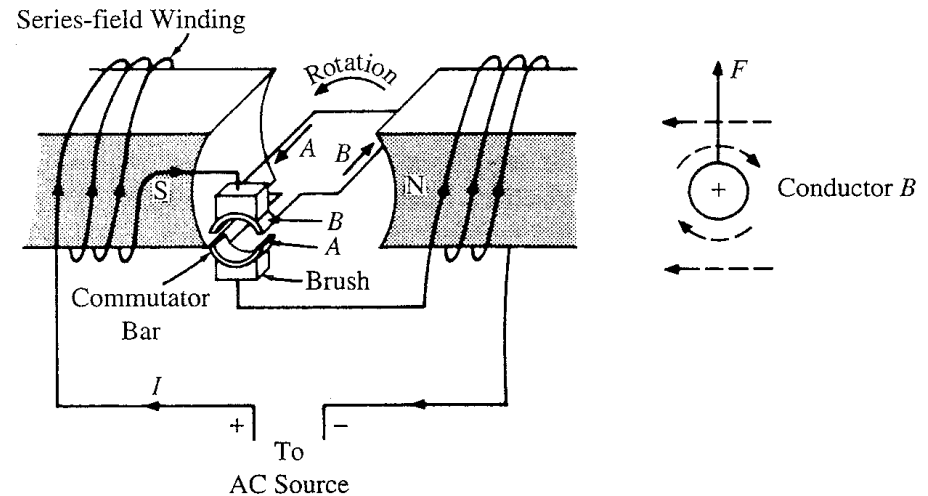
- Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors.  
Construction, principle of operation, Linear force, and applications.

# Universal Motor

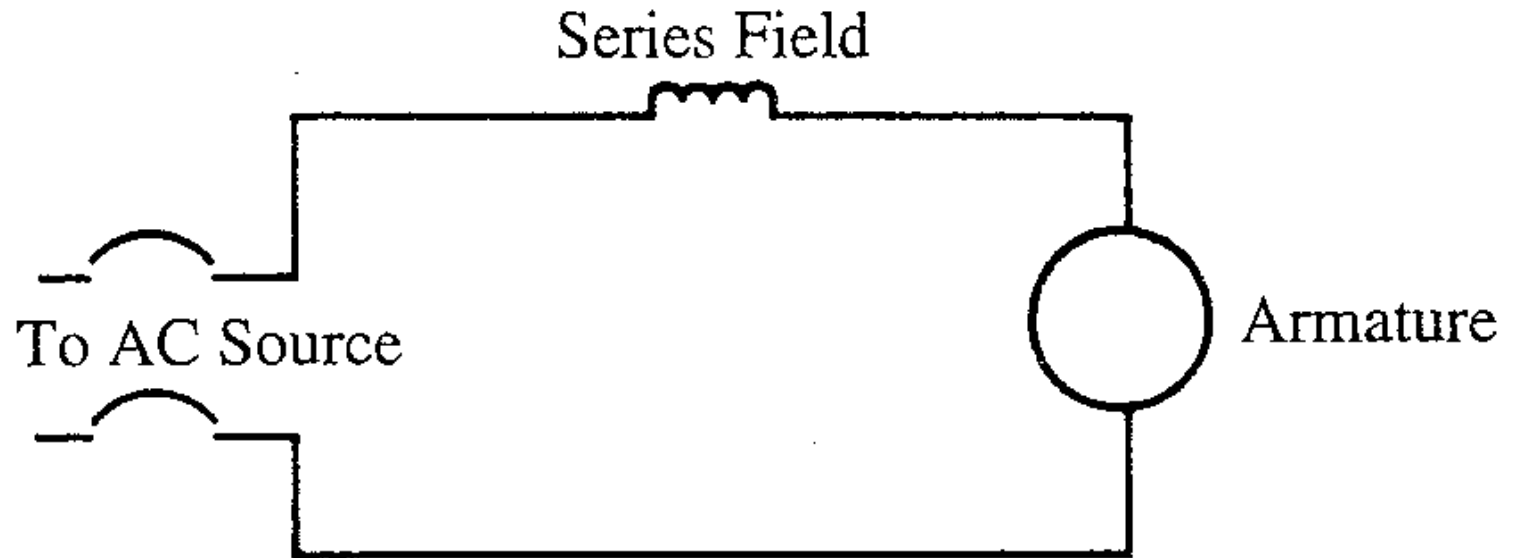


# Universal Motor

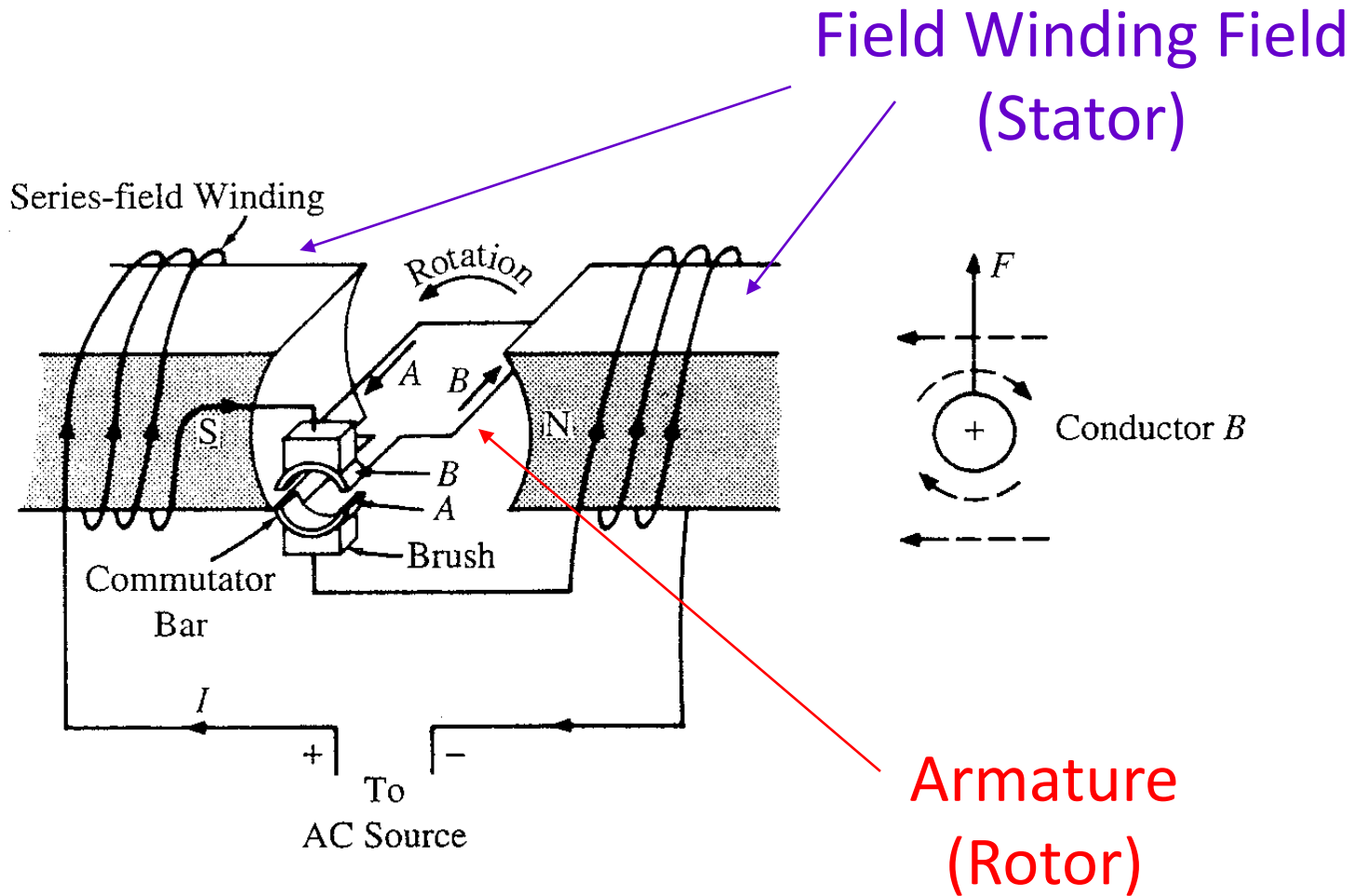
- Series-connected
  - Rotor and Stator are connected in series
- Operates on *either* ac or dc
- NEMA ratings
  - 0.01hp – 1.0hp @ 5000r/min or above

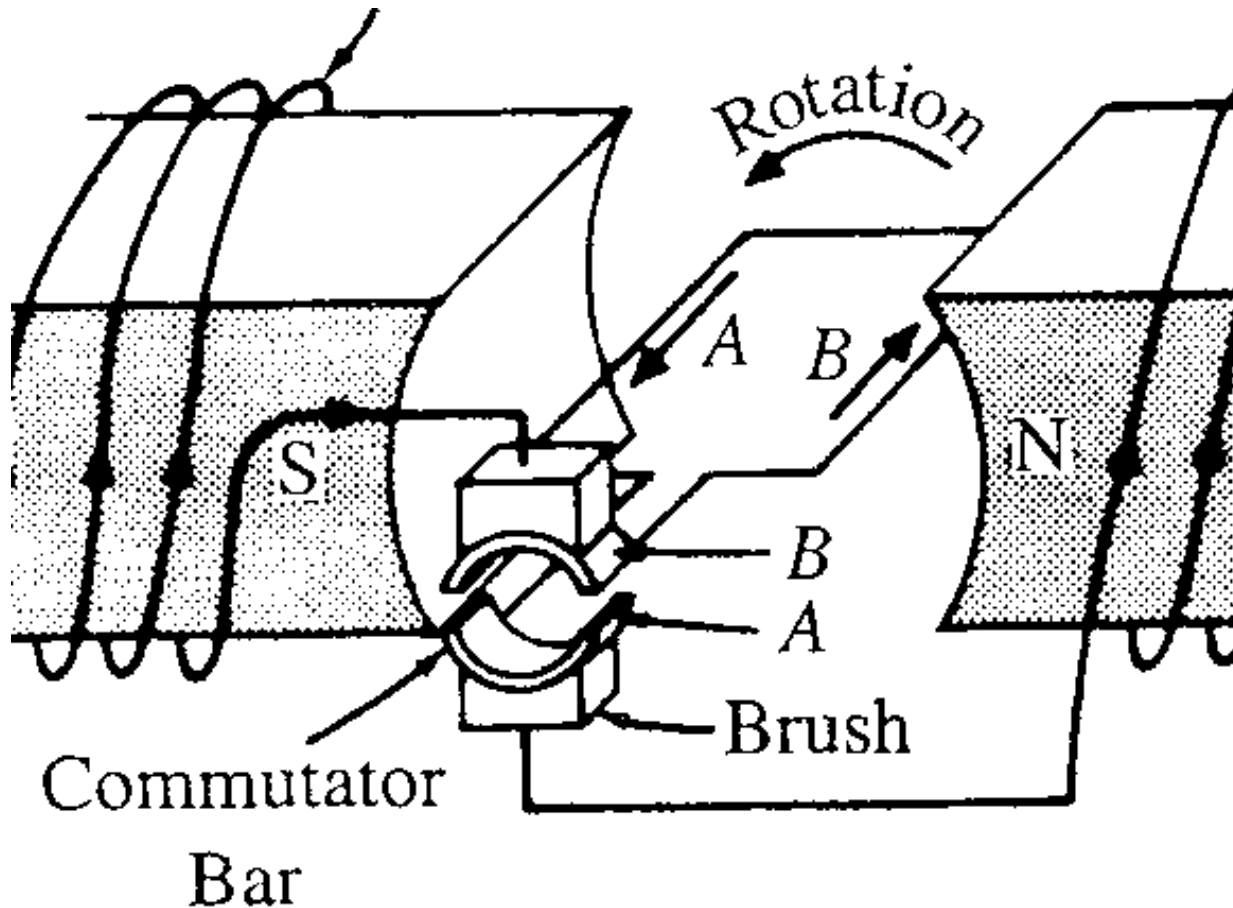


# Equivalent Circuit



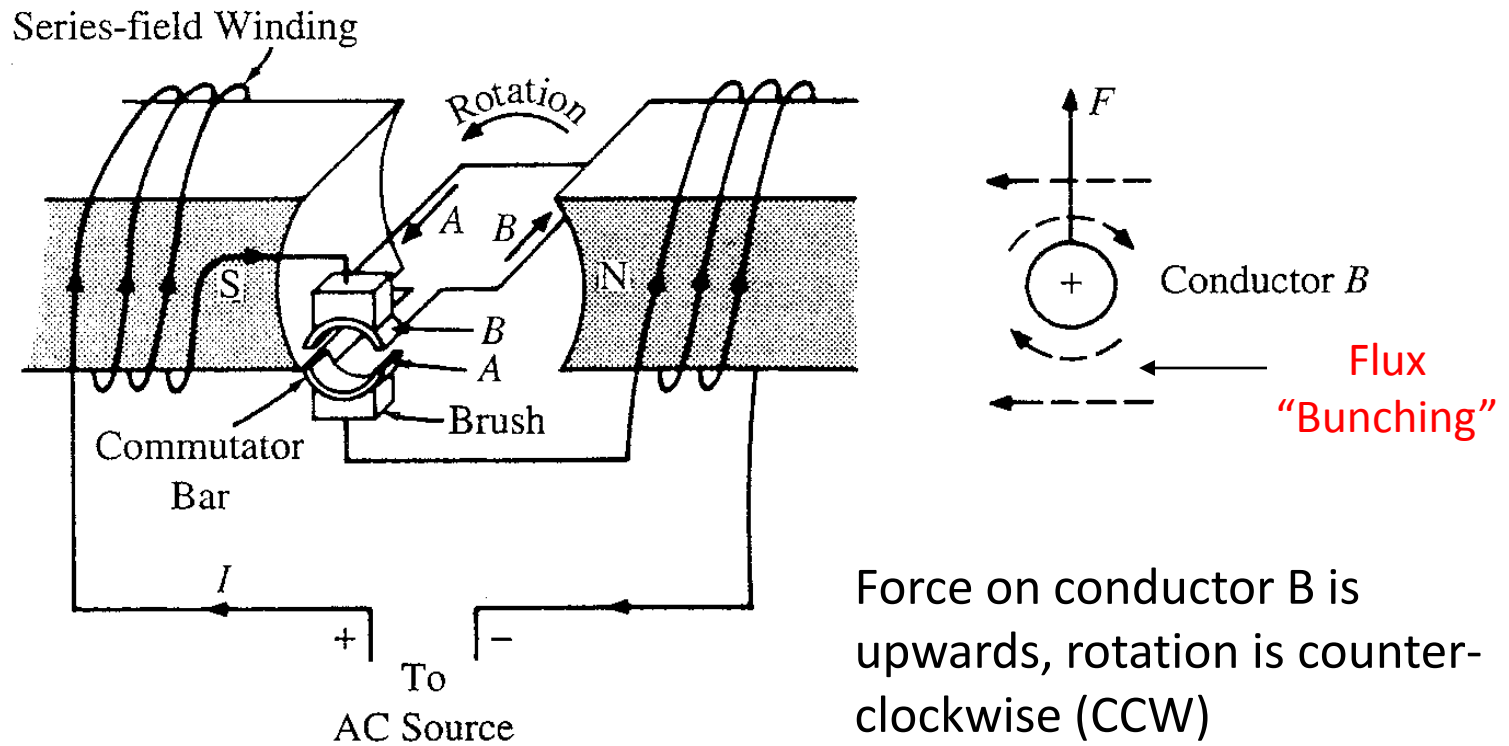
# A Closer Look





The Commutator Bar and Brushes are a switch that reverses the current in the armature coil as it rotates

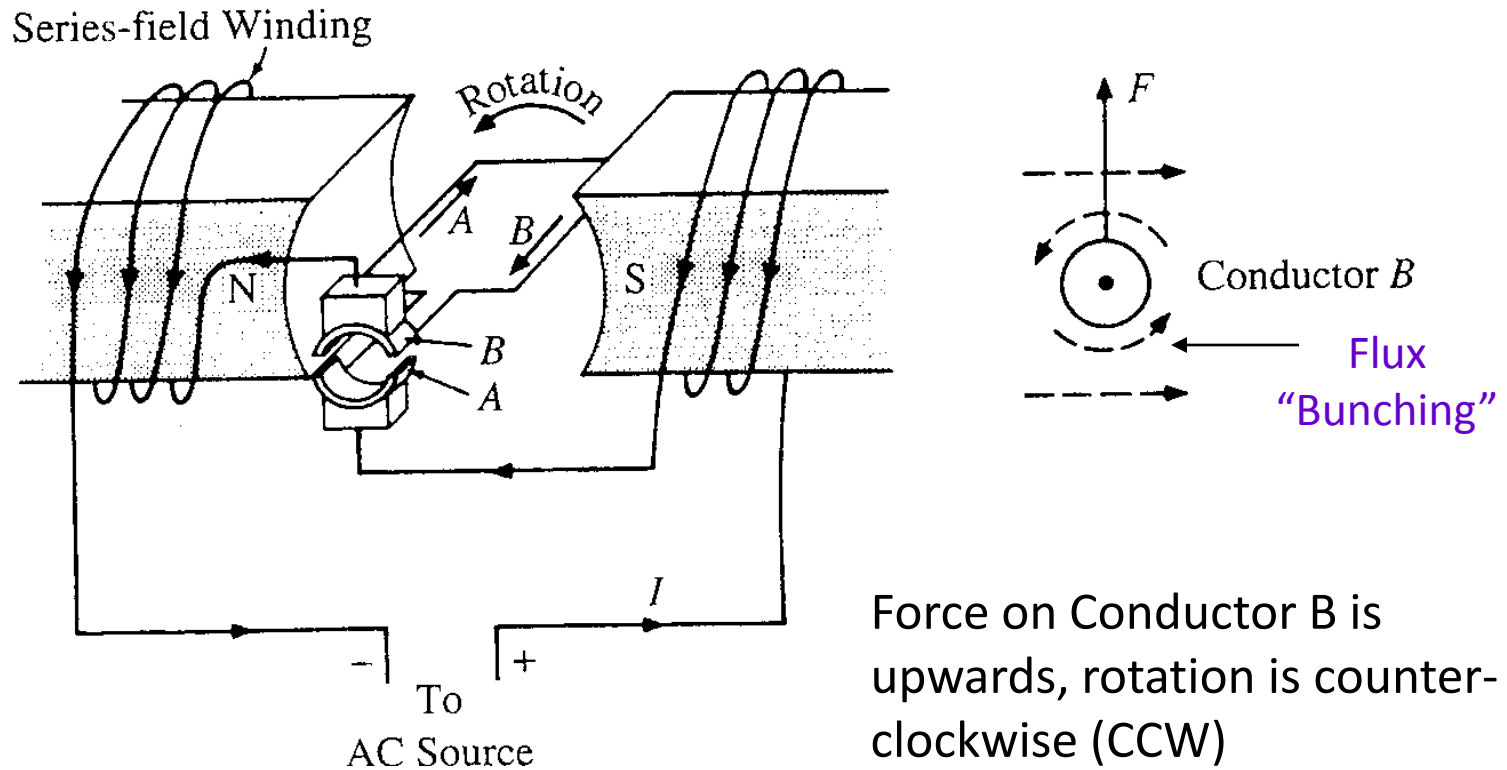
# Check the Direction of Rotation



+Positive Half-Cycle+



# Opposite Half-Cycle



-Negative Half-Cycle-

# Conclusions

- The direction of rotation (and Torque) is independent of the polarity of the AC source!

$$T_D \propto B_p I_a$$

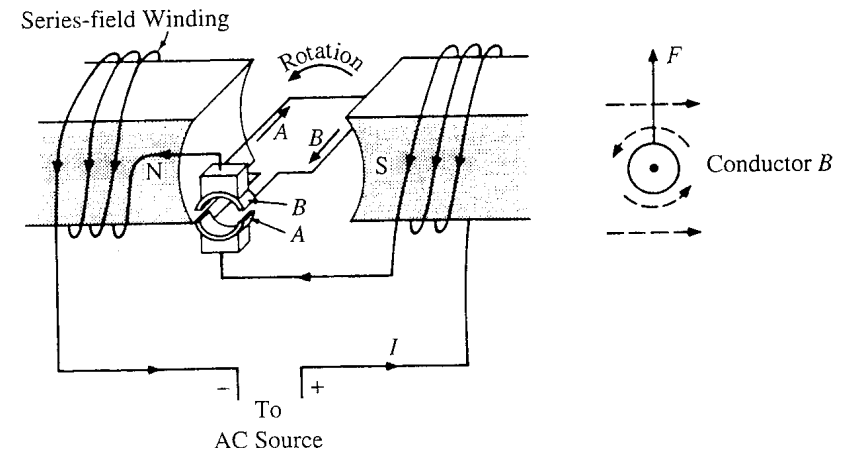
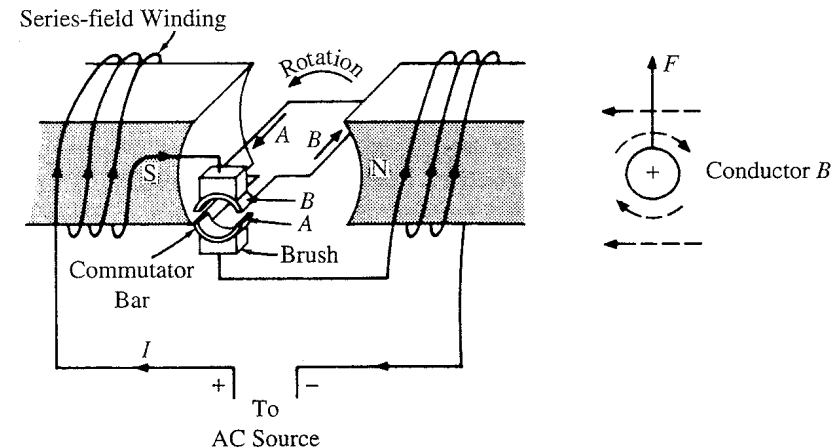
$$B_p \propto I_a$$

$$T_D \propto I_a^2$$

$T_D$  = Developed Torque

$B_p$  = flux density due to current in field

$I_a$  = armature current



# Other Considerations

- How do you reverse the direction of rotation?
  - Reverse the direction of the current in *either* the field *or* in the armature, ***but not both!***
- How do you control the speed of the motor?
  - Reduce the voltage applied to the motor
    - Use an autotransformer or SCR/Triac
    - This reduces the armature current, reducing the torque, reducing the speed
- Applications
  - Portable power tools
  - Small appliances

**THANKS....**

Queries Please...