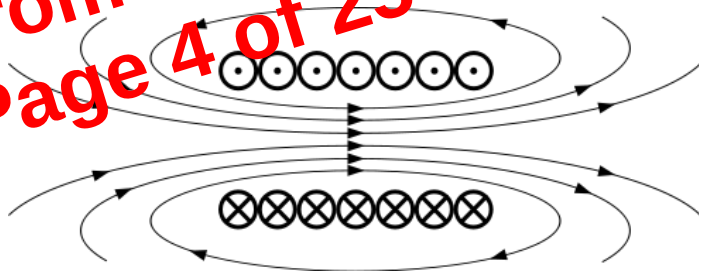
What is an Actuator?

- An actuator is a device that converts a signal variable into a physical variable
- Physical variables might be
  - Force
  - Displacement
  - Pressure (etc…)
- Signal variable might be
  - Voltage
  - Heat
  - Current (etc…)
- It is often called a transducer
- In Mechatronics we are mainly interested in electrically controlled actuators

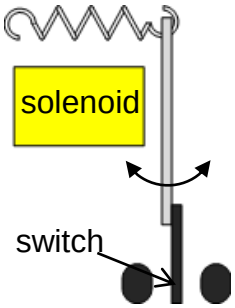
Solenoids / Relays

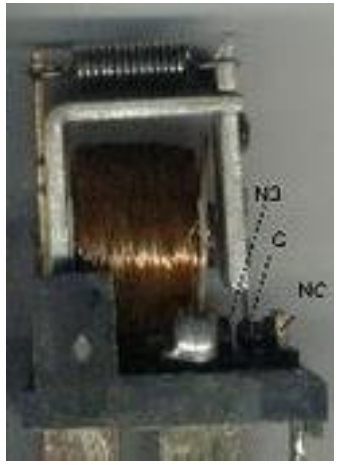
- The term solenoid refers specifically to a magnet designed to produce a uniform magnetic field in a volume of space



- Electromechanical solenoids consist of an electromagnetically inductive coil, wound around a movable steel slug. The armature is used to provide a mechanical force to some mechanism.

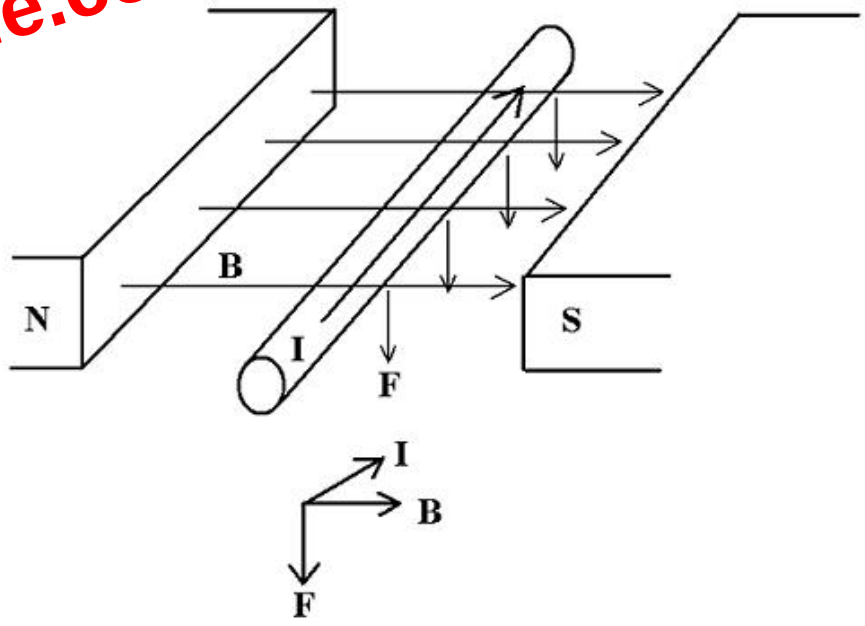
- A Relay is an electromechanical solenoid that turns an electrical switch on and off.



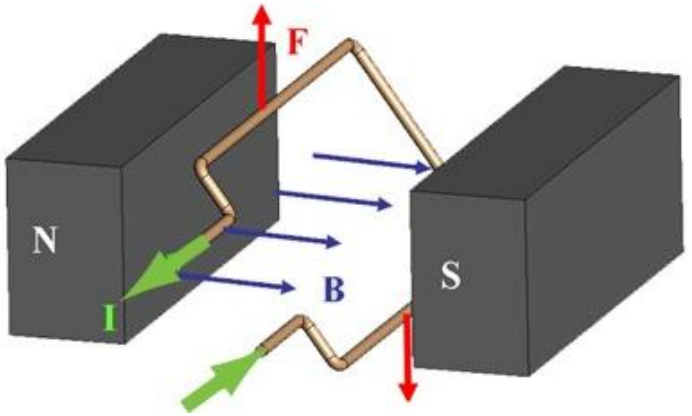


Lorentz Forces

- The forces inside a motor that cause the rotor to rotate are called *Lorentz Forces:*

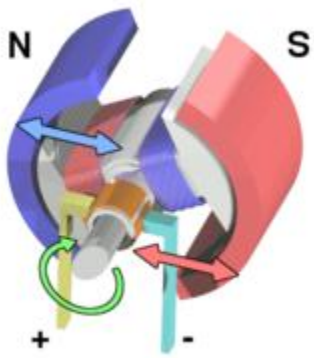


$$\vec{F} = \vec{I} \times \vec{B}$$



Thanks Wikipedia!

Brushed DC Motors



A simple DC electric motor. When the coil is powered, a magnetic field is generated around the armature. The left side of the armature is pushed away from the left magnet and drawn toward the right, causing rotation.

When the armature becomes horizontally aligned, the commutator reverses the direction of current through the coil, reversing the magnetic field. The process then repeats.

Thanks Wikipedia!