Discrete Input – Devices

Circuit Breakers, Motor Contactors etc.

Proximity Switches, Photoelectric Sensors

Limit Switches.

Level/Pressure/Temperature/Flow Switches

Push Buttons
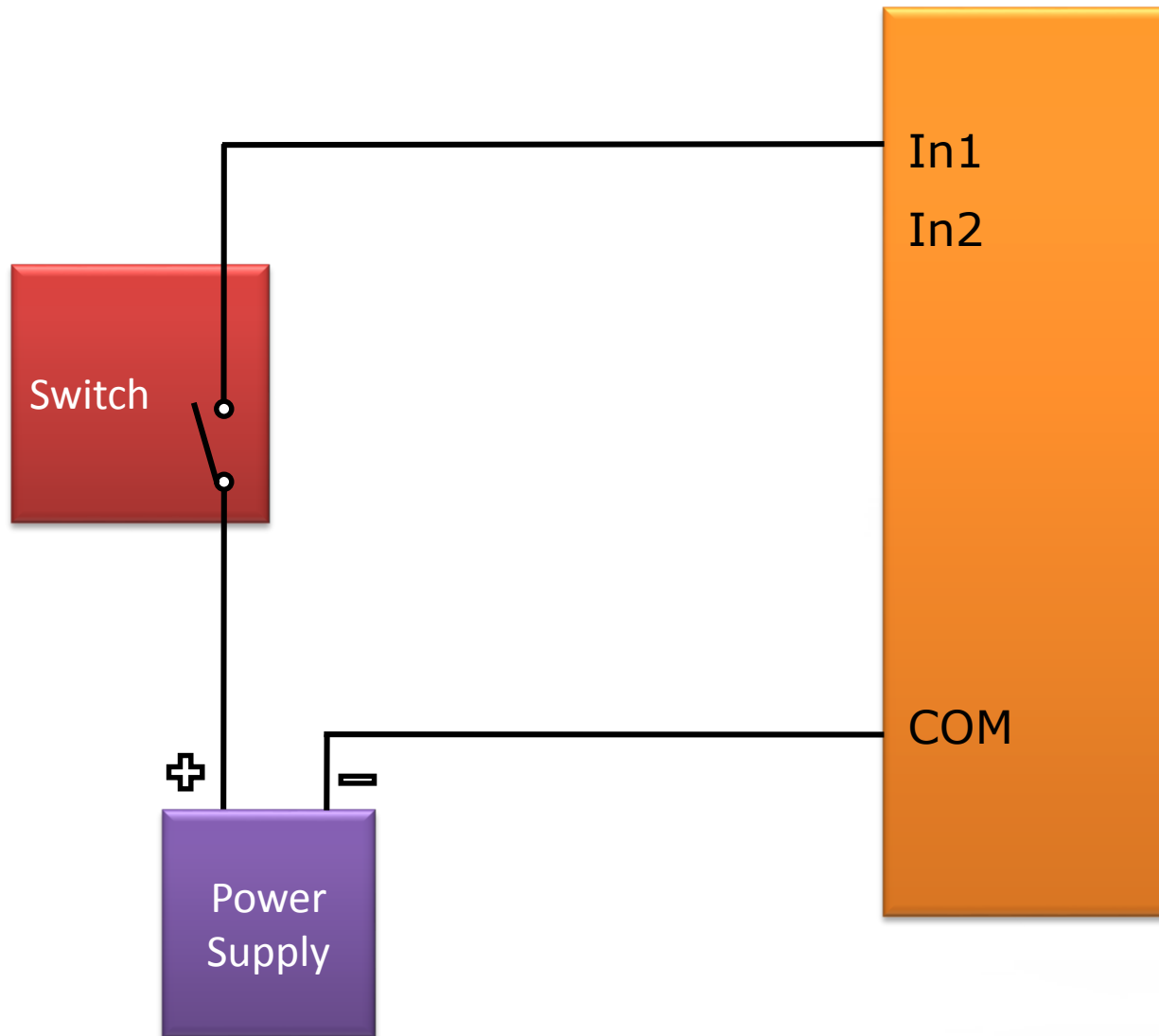
Selector Switches

Relay Contacts

Discrete Input – Devices

Circuit Breakers, Motor Contactors, Limit Switch, Push Buttons, Selector Switch, Flow Switch, Level Switch, Temperature Switch etc. behaves like a contact for Input to PLC

Switch is actuated thru external force i.e. mechanical or electromechanical.
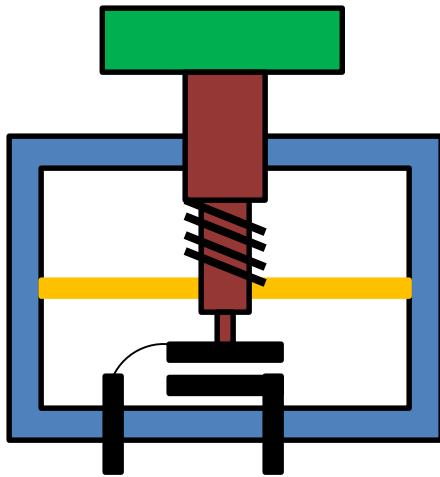
Discrete Input – Devices

Switch

Power Supply

In1

In2

COM

Discrete I/P Device - Pushbutton

Pushbutton are intended purely for signal uses.

Basic type of pushbutton are momentary-action and alternate-action.

Pushbutton has two parts actuator and switch.

Switch has contact either NO(Normally Open) or NC (Normally Close).

Actuator is used to activate the switch.

Discrete I/P Device - Pushbutton

Guarded or Shrouded actuators Pushbutton is recessed inside the sleeve and can only be depressed by an object smaller than the sleeve

It provides protection against the button being accidentally pressed, avoiding situations where pressing the switch causes something potentially dangerous to happen
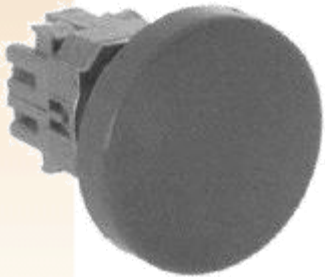

Flush type actuator is aligned with the sleeve.

Discrete I/P Device - Pushbutton

Extended actuators Pushbutton, have actuator extends beyond the sleeve which makes the button easy to depress by finger, palm of the hand, or any object.

Mushroom head pushbutton are used where emergency operation or more number of operation is required.

Detent pushbutton are known as Emergency Stop of E-Stop
When pressed in it remains in, and then to return it to its original position, it must be pulled out

Discrete I/P Device – Selector Switch

Extended actuators Pushbutton, have actuator extends beyond the sleeve which makes the button easy to depress by finger, palm of the hand, or any object.

Discrete I/P Device – Limit Switch

Limit switches are activated by moving parts on the machine.

Sometimes called cam switches because many are operated by a cam action when a moving part passes by the switch.

NO limit Switch

NC limit Switch

Proximity Sensor

Proximity sensors are discrete sensors that sense when an object has come near to the sensor face.

There are four fundamental types of proximity sensors,

Inductive proximity sensor.
Capacitive proximity sensor.
Ultrasonic proximity sensor.
Optical proximity sensor.

Inductive Proximity Sensor

Inductive proximity sensors operate on the principle that the inductance of a coil vary as a metallic (or conductive) object is passed near to it

Because of this operating principle, inductive proximity sensors are only used for sensing metal objects.

Inductive proximity sensors are available in both DC and AC powered models.

Inductive Proximity Sensor

Coil → Oscillator → Trigger Circuit → Output Switching Device
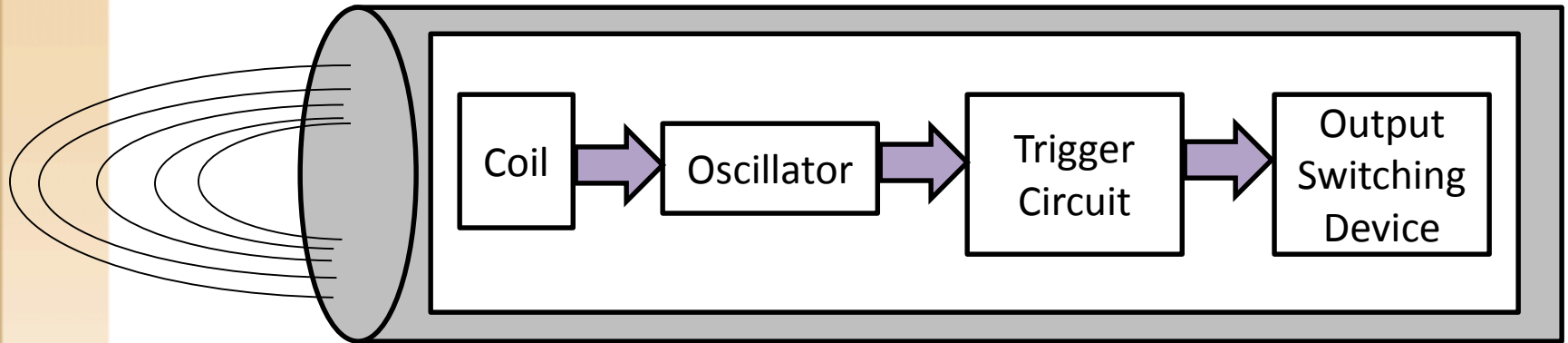
Oscillator Combined with Coil will generate Alternating Magnetic Field (Sensing Area).

Oscillator is tuned with no magnetic material present in Sensing Area.

As soon as there is any magnetic material in sensing area eddy current are induced in the coil making oscillator unstable.

If the level of Eddy current is more than threshold level set in trigger circuit it will generate output.

Inductive Proximity Sensor

The sensing range of a proximity sensor is the maximum distance the target object may be from the face of the sensor in order for the sensor to detect it.
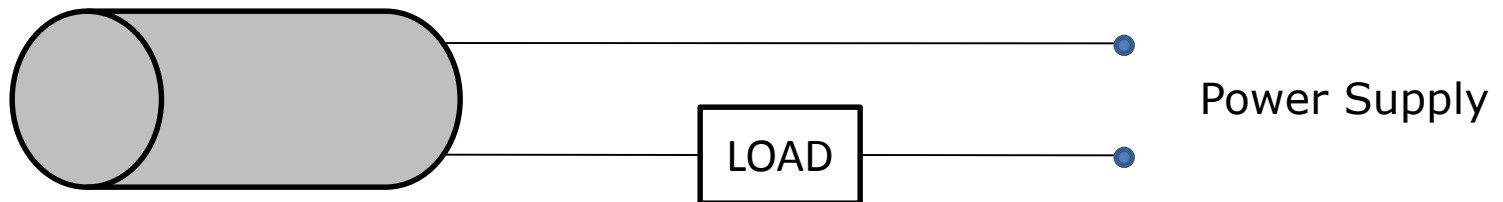
Parameter affecting the sensing range are,

- The size (diameter) of the sensing coil in the sensor
- Target Material as different metals have different values of resistivity and permeability.
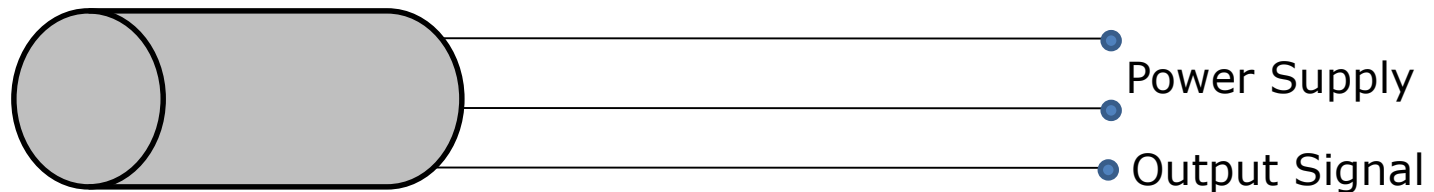
Inductive Proximity Sensor

2-Wire Proximity

LOAD

Power Supply

Also called as NAMUR Proximity

3-Wire Proximity

Power Supply

Output Signal

Inductive Proximity Sensor

4-Wire Proximity

Power Supply

Output
(Potential
Free Contact)

4-Wire Proximity

Power Supply

PNP

NPN
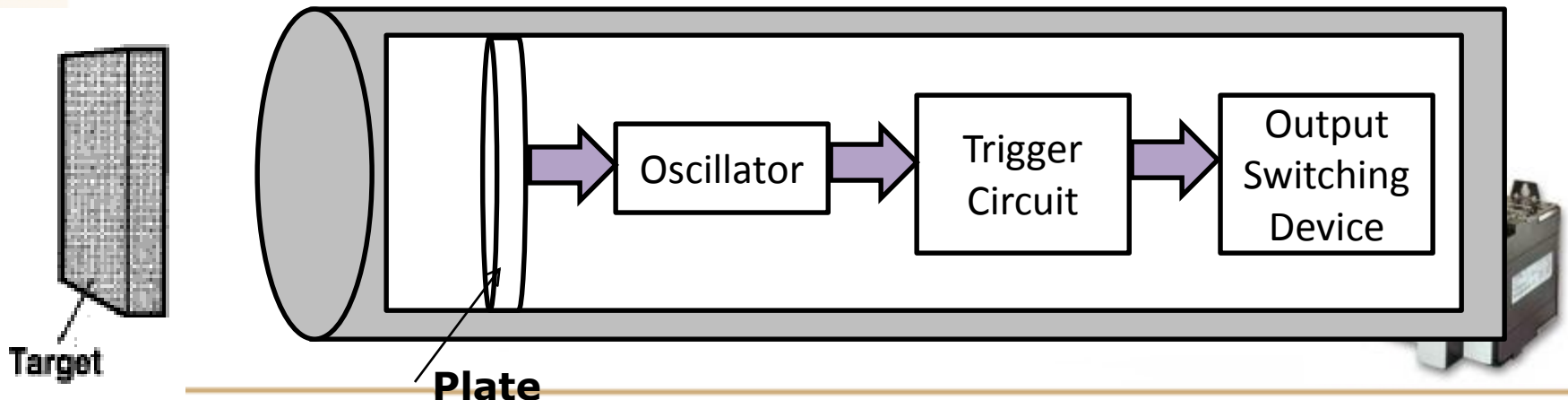
Capacitive Proximity Sensor

Principle is same as Inductive Proximity. Here instead of Inductance, Capacitance of the circuit changes whenever object moves near the proximity.

The principle of operation of the sensor is that an internal oscillator will not oscillate until a target material is moved close to the sensor face.

Oscillator

Trigger Circuit

Output Switching Device

Target

Plate

Capacitive Proximity Sensor

There are two type of Capacitive Proximity,

Dielectric : In which material to be sensed acts as a Dielectric for the capacitor.

Conductive : In which material to be sensed acts as a Second plate of capacitor.

In order for the Dielectric Sensor to work properly, it is best if the material being sensed has a high density.

Conductive type capacitive proximity sensors require that the material being sensed be an electrical conductor.

Ultrasonic Proximity Sensor

Target

Transducer

In order for the Dielectric Sensor to work properly, it is best if the material being sensed has a high density.

Conductive type capacitive proximity sensors require that the material being sensed be an electrical conductor.