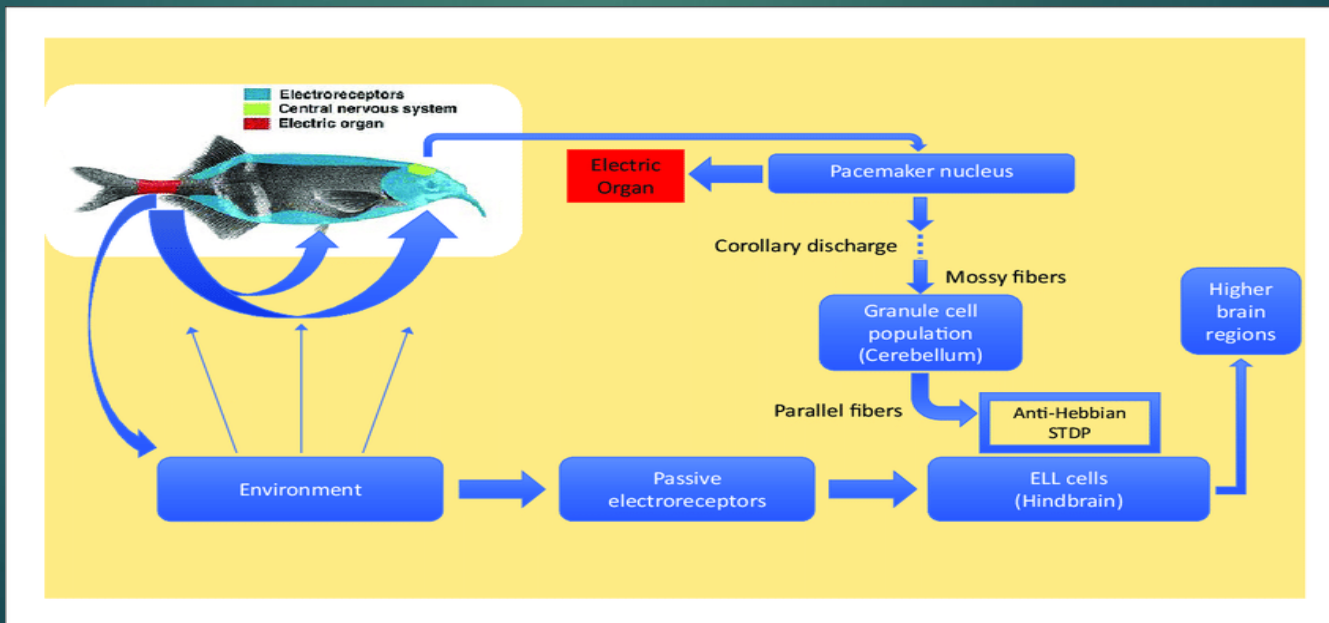


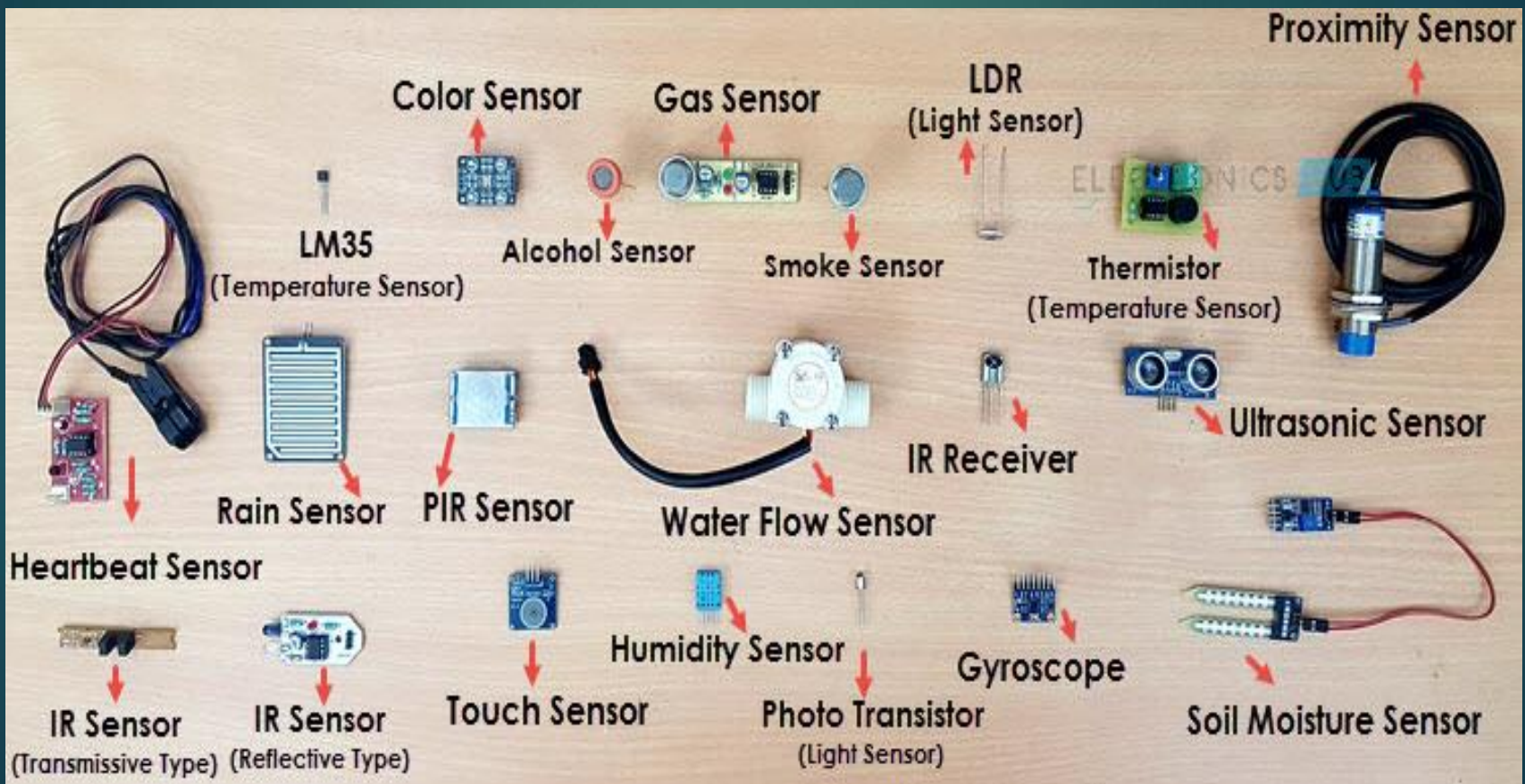


# Measurement techniques

## Sensors



# Type of sensor



# MEANING AND DEFINITION

*sensor*

*'sɛnsə/*

*noun*

**sensor**; plural noun: **sensors**

*A device which detects or measures a physical property and records, indicates, or otherwise responds to it.*

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# CLASSIFICATION OF SENSORS

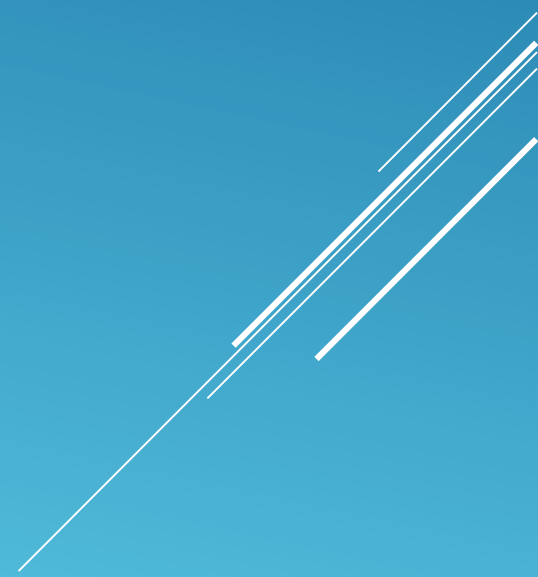


*According to power or energy supply requirement of the sensors.*

According to various measurement objective.

According to principle of operation.

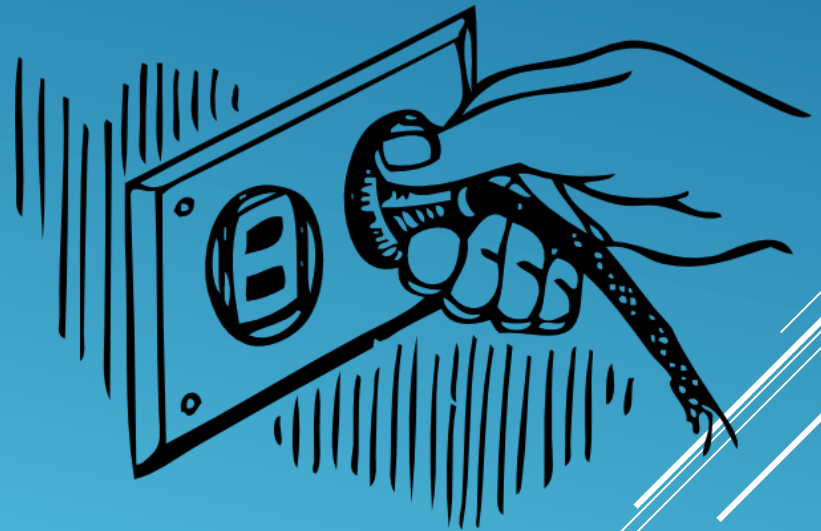
According to output signal.



# ACTIVE SENSOR

**Sensors that require power supply are called as Active Sensors**

**Example:** LIDAR  
(Light detection and ranging),  
photoconductive cell.



# PASSIVE SENSOR

**Sensors that do not require power supply are called as Passive Sensors.**

**Example:** Hg  
thermometer etc.





# ANALOG SENSOR

*Analog sensor produce continuous signals that are proportional to the sensed parameter.*

**Example:**  
analog  
tachometer  
etc...



# DIGITAL SENSOR


*Digital sensor produce digital outputs that can be directly interfaced with the digital controller.*

**Example:**  
Digital  
tachometer  
etc...





# *ACCORDING TO VARIOUS MEASUREMENT OBJECTIVE*

- Temperature sensor
  - Pressure sensor
  - Level sensor
  - displacement  
sensor
  - Flow sensor
  - Speed sensor
  - Biosensors
- 
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# TEMPERATURE SENSOR

*A device which gives temperature measurement as an electrical signal is called as temperature sensor.*

**Example:** Thermistors, thermocouples etc.

**Application:** Digital thermometer, in boiler, furnaces, gas turbine etc..

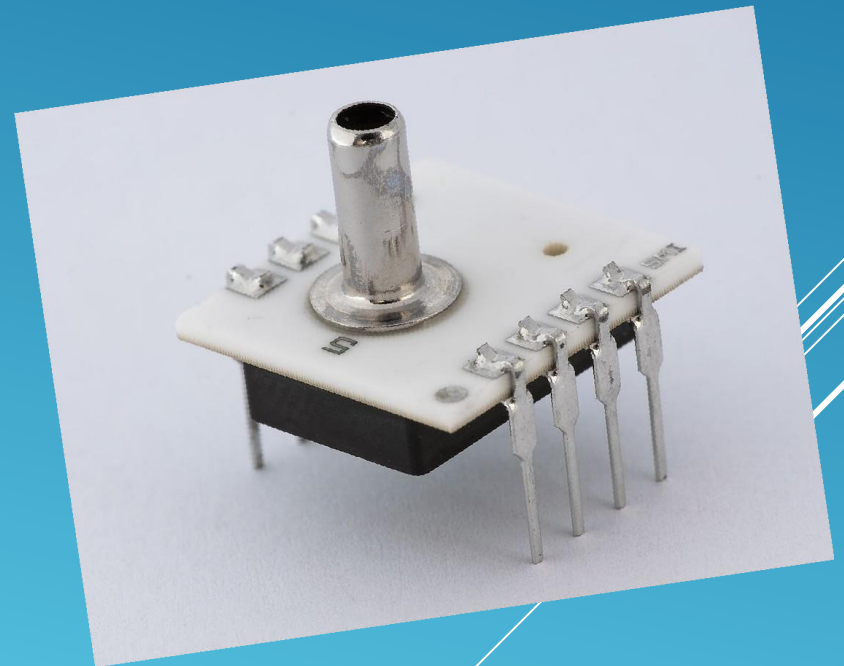


# PRESSURE SENSOR

*A **pressure sensor** measures pressure, typically of gases or liquids. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed. such a signal is electrical.*

**Example:** barometric, piezo resistive pressure sensor etc.

**Application:** in boiler, in gas turbine etc.



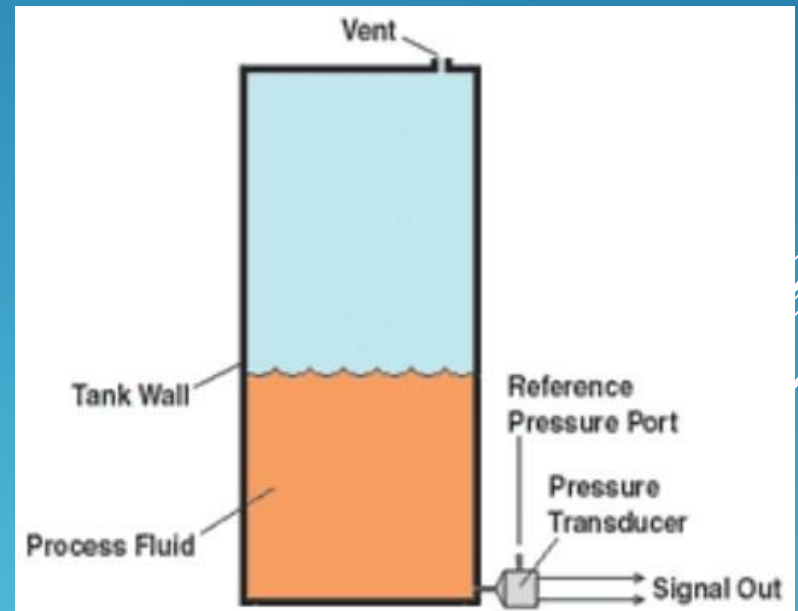
# LEVEL SENSOR

**Level sensors** *detect the level of liquids In the tank or container.*

**Example:** Magnetic and mechanical float, pressure transducer, Pneumatic, Capacitance, load cell etc.

**Application:** oil-water tank, boiler, etc...

## Pressure transducer



# *DISPLACEMENT SENSOR*

**Displacement sensor is used to measure the distance and position.**

**Example:** capacitive sensor, Eddy current sensor, Inductive sensor(LVDT) and etc..

**Application:** various industrial application, robotics, and etc...

capacitive sensor



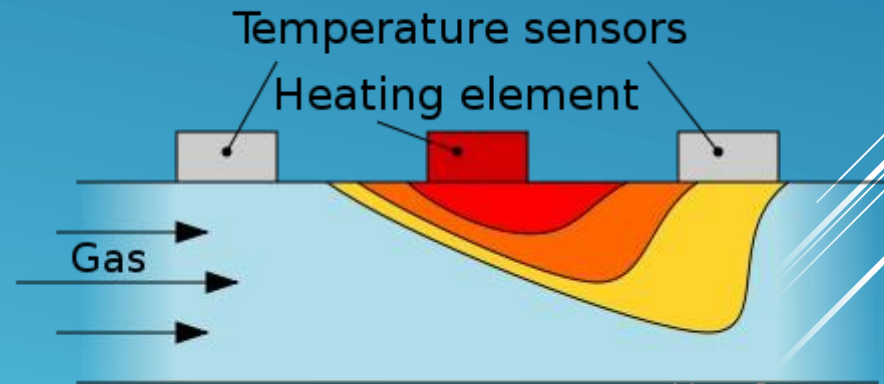
# *FLOW SENSOR*

*A **flow sensor** is a device for sensing the rate of fluid flow. Typically a flow sensor is the sensing element used in a flow meter.*

**Example:** velocimeters, Laser-based sensor, Hall effect sensors, Thermal mass flow meter and etc...

**Application:** In industrial used for measuring the flow rate.

## **Thermal mass flow meter**



# *SPEED SENSOR*

*Sensors used for detecting speed of an object or vehicle is called as Speed sensor.*

Example: Wheel speed sensors, speedometers, LIDAR, ground speed radar, radar etc...

Application: in bike, car, Tachometer and etc...






# *BIOSENSORS*

*A **biosensor** is an analytical device, used for the detection of an analyte, that combines a biological component with a physicochemical detector.*

**Application:** blood glucose biosensor, etc...

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# *ACCORDING TO PRINCIPLE OF OPERATION*

- **Resistive sensor**
  - **Capacitive sensor**
  - **Inductive sensor**
  - **Ultrasonic sensor**
- 
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# RESISTIVE SENSOR

*A resistive sensor is a transducer or electromechanical device that converts a mechanical change such as displacement into an electrical signal that can be monitored after conditioning. Resistive sensors are among the most common in instrumentation.*

**Example** : potentiometer, strain gages, Thermistor and etc..

## Thermistor



# CAPACITIVE SENSOR

*A capacitive sensor which generate a electrical signal according to the input.*

*Capacitive sensors can directly sense a variety of things motion, chemical composition, electric field and, indirectly, sense many other variables which can be converted into motion or dielectric constant, such as pressure, acceleration, fluid level, and fluid composition*

# INDUCTIVE SENSOR

*An **proximity(inductive) sensor** is an electronic proximity sensor, which detects metallic objects or any things without touching them.*

**Application:** metal detector, traffic lights, car washes and etc.



# ULTRASONIC SENSOR

**Ultrasonic sensors** work on a principle similar to radar or sonar, which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively.

## **Application:**

Industrial used (NDT),  
In ship and etc...



# LIGHT SENSOR

A **Light Sensor** is something that a robot can use to detect the current ambient **light** level i.e. how bright/dark it is.

## Example:

Photoresistors,  
Photodiodes,  
Phototransistors

**Application:** CRO,  
Cameras and Mobile  
Phones, etc...

