

INTRODUCTION

- ▶ A sensor is a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument
- ▶ Example: You can say that our skin, ears, eyes and nose are also a sensor because they can sense touch, heat, cold, light, noise and smell.
- ▶ For accuracy, most of the sensors are calibrated against some known standards..

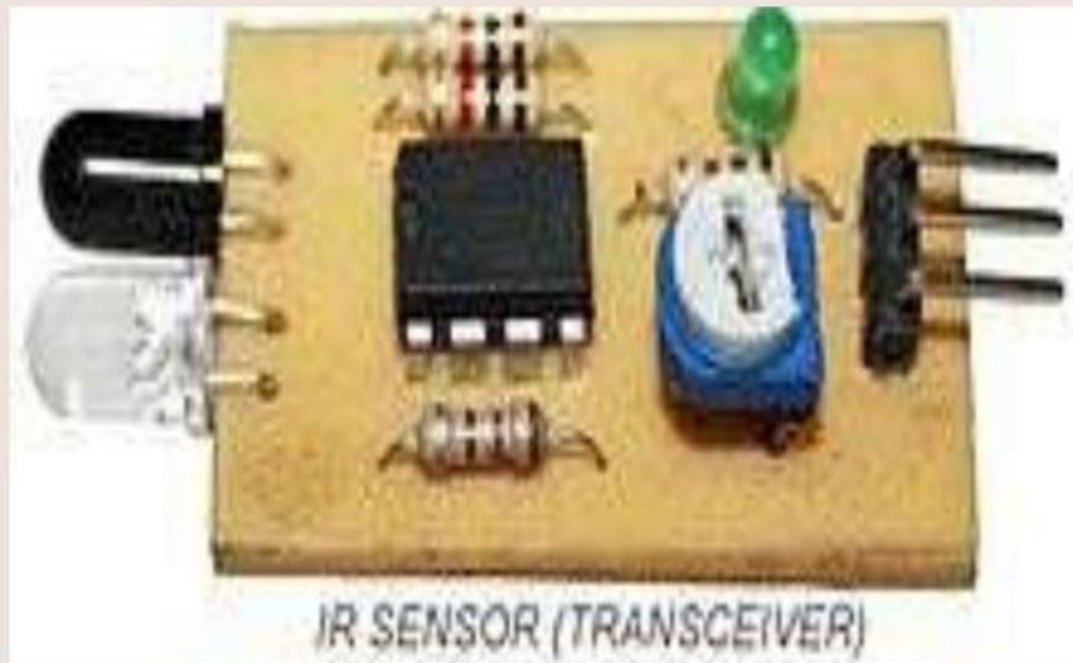
What is a sensor??

- ▶ A sensor is a device that receives and responds to a signal. A sensor's sensitivity indicates how much the sensor's output changes when the measured quantity changes.
- ▶ Sensors are a new solution for measuring currents and voltages in medium voltage power systems.
- ▶ A typical example is a mercury thermometer used in a glass thermometer that measures the temperature and converts it into the expansion of a liquid.

USES

- ▶ Sensors are used in every day objects such as touch-sensitive elevator buttons and lamps which dim or brighten by touching the base.
- ▶ There are innumerable applications of this technology of which most of people are not aware .
- ▶ Its applications include Cars, Machines, Aerospace, Medicines, Manufacturing and Robotics... And many more.

INFRARED SENSOR:- THESE ARE USED IN HOUSES AND IN HOTELS AT AUTOMATIC LIGHTS AND WATER TAPS



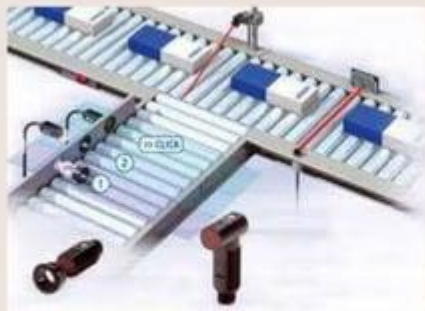
THESE **INFRARED SENSORS** ARE USED IN TAPS ALSO



PHOTOELECTRIC SENSOR

A photoelectric sensor, or photo eye, is a device used to detect the distance, absence, or presence of an object by using a light transmitter and a photoelectric receiver.

They are used extensively in industrial manufacturing.



STREET LIGHTS

- ✘ The street lights automatically turns on and off as the sun rises and sun sets.
- ✘ This is implemented by using photo electric effect.
- ✘ The street lights automatically turns on and off on the basis of darkness measured by a sensor.

AUTOMATIC STAIRS

- ✘ It starts running and stops automatically as it senses the presence or absence of a person.

SENSOR'S NATURE

A good sensor obeys the following rules:

- It is sensitive to the measured property
 - It is insensitive to any other property
 - It does not influence the measured property
- ▶ A Bad sensor has following Characteristics
- ▶ If the sensor is not ideal, several types of deviations can be observed:
- ▶ The sensitivity may differ from the value specified. This is called a sensitivity error, but the sensor is still linear.

Rules for good sensor

- ▶ It is sensitive to the measured property only.
- ▶ It is insensitive to any other property likely to be encountered in its applications..
- ▶ It does not influence the measured property
- ▶ Ideal sensors are designed to be linear.

Some other attributes

- ▶ The output signal of a good sensor is linearly proportional to the value of the measured property
- ▶ The sensitivity is then defined as the ratio between output signal and measured property..
- ▶ Ex: If a sensor measures temperature and has a voltage output, the sensitivity is a constant.
- ▶ Sensor is linear because the ratio is constant at all points of measurement..

Resolution

- ▶ The resolution of a sensor is the smallest change that it can detect in the quantity that it is measuring..
- ▶ In a digital display, the least significant digit will fluctuate, indicating the changes of its magnitude.
- ▶ And Resolution is related to precision.
- ▶ Ex: A scanning tunnelling probe resolves into atoms and molecules.

Types of sensors

- ▶ **Optical sensor**
- ▶ **Microwave sensor**
- ▶ **Bio sensor**
- ▶ **Non-biological sensor**

Optical Sensor

- ▶ **Optical sensors observe visible lights and infrared rays.**
- **There are two kinds of observation methods using optical sensors:**
 - **Visible/near infrared remote sensing**
 - **Thermal infrared remote sensing.**

Microwave Sensor

- ❖ Microwave sensors receive microwaves, which is longer wavelength than visible light and infrared rays, and observation is not affected by day, night or weather.
- There are two types of observation methods using microwave sensor: active and passive.
 - **Active type**
 - **Passive type**

Bio-sensor

- ▶ In bio medicine, and bio technology, sensors which can detect analyses thanks to a biological component, such as cells, proteins, nucleic acid or biometric polymers, are called bio sensors.

Non-biological sensors

- ▶ A non biological for both sensor, even organic=carbon chemistry, for biological analyses is referred to as sensor or nano sensor.
- ▶ This terminology applies for both in vitro and in vivo applications.
- ▶ The encapsulation of the biological component in bio sensors, presents with a slightly different problem that ordinary sensors.

- ▶ This can be done by means of a semi permeable barrier, such as a dialysis membrane or a hydrogel, a 3d polymer matrix which either physically constrains the sensing macro molecule or chemically.

Properties

- ▶ The natural properties of the soft iron core, as maximal flux density and lack of linearity in the excitation curve, have sets limits for the possibilities to reduce the transformer size and to use the transformer in a wider range of applications
- ▶ These principles are far from new, they are generally as old as the principles of conventional inductive instrument transformers.