SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE NAME :19EE603 IoT for Electrical Engineers
III YEAR /VI SEMESTER

Unit 2-Sensors

Inductive Sensors

Applications of Inductive Sensor

- Industrial Automation
- Machine Tooling and Machining
- Automotive Applications
- Material Handling
- Packaging Machinery
- Door and Gate Automation
- Proximity Switches
- HVAC Systems
- Security Systems
- Railway and Transportation

What is Inductive Sensors???

Inductive Sensors

- An inductive sensor is a device whose action is based on a changing magnetic field in an inductive coil. When an object made of metal enters its field of action, it is captured and recognized.

- A circuit built into the device produces electromagnetic radiation. When an induced voltage appears in it, the oscillations decrease. Inductive sensors read this immediately.

- An inductive sensor is a proximity switch that got its name because of the principle of operation. The sensor has a sensor element with a magnetic circuit open towards the working surface of the sensor.

Sensitivity of Sensor

- The sensitivity of a sensor refers to its ability to detect and respond to changes in the input stimulus or parameter it is designed to measure.

- It quantifies how effectively the sensor can convert the measured physical quantity into a proportional output signal.

- Sensitivity is typically expressed as the ratio of the change in output signal to the change in input stimulus, often represented in units such as volts per unit of measurement (e.g., volts per degree Celsius for a temperature sensor).

Sensitivity = $\Delta S / \Delta x$
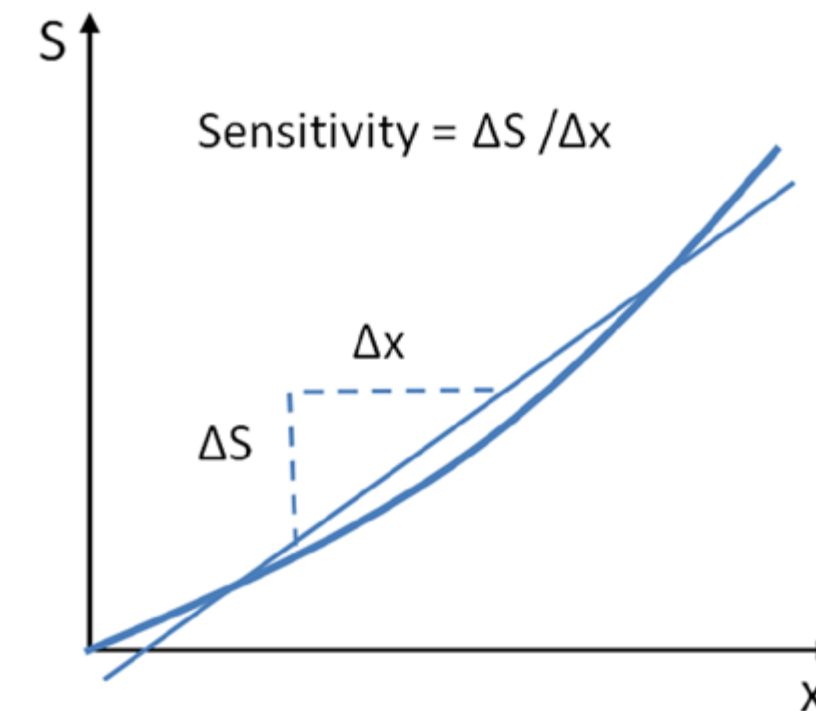
Linearity of Sensor

- The linearity of a sensor refers to the relationship between the input stimulus or parameter being measured and the sensor's output signal.
- A sensor is said to be linear if its output response is directly proportional to changes in the input stimulus over its operating range.
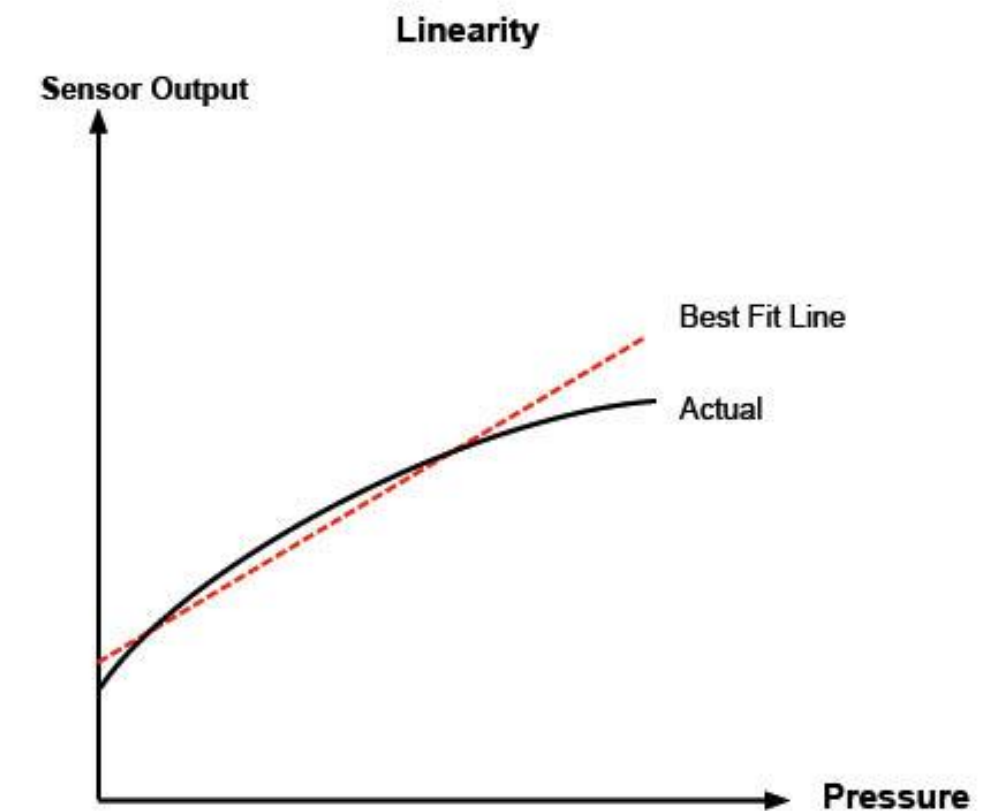
Advantages

- The design of these units is quite simple, it does not contain any complex elements that require special settings. Due to this, the sensors are highly durable and reliable, break down infrequently, and can be constantly used in production. It is also convenient that they do not have sliding contacts.

- The features of the device allow you to connect devices to an industrial voltage system without any problems.

- They have good sensitivity, so they can be used when working with various metal objects.

Disadvantages

- The disadvantages include the fact that during operation, the sensors can produce errors due to the presence of various factors.

- They can be affected by temperature, as well as exposure to other fields of a similar type.

- Therefore, for high-quality work, it is necessary to provide suitable conditions that would not prevent the sensors from functioning correctly.

Where Inductive Sensors are Used?

- Inductive sensors are known for their reliability and safety in harsh environments.
- This makes them the best choice for the military, aerospace, railroad, and heavy industries. Inductive sensors are also used in machine tools, machines for the textile industry, the automotive industry, assembly lines, etc.
- They are used to detect metal parts in difficult environments and where fast moving parts need to be inspected.
- An inductive type sensor is designed to control the movement of the working body without direct contact with it. This sensor creates an electromagnetic field in the area of sensitivity and has a semiconductor switch.

Working Principle of Inductive Sensor

- When an object consisting of a metallic or ferromagnetic material enters the field of action of the unit, the vibrations begin to change, which indicates the presence of an object.

- When starting work, the limit switch is energized, which contributes to the formation of a magnetic field.

- The result of all these transformations is an output signal, which can vary depending on the distance between the working sensor and the object under study.

DC Supply

Oscillator

Current Sensor

DC output (NO or NC avail.)

Magnetic field (Metal sensing region)
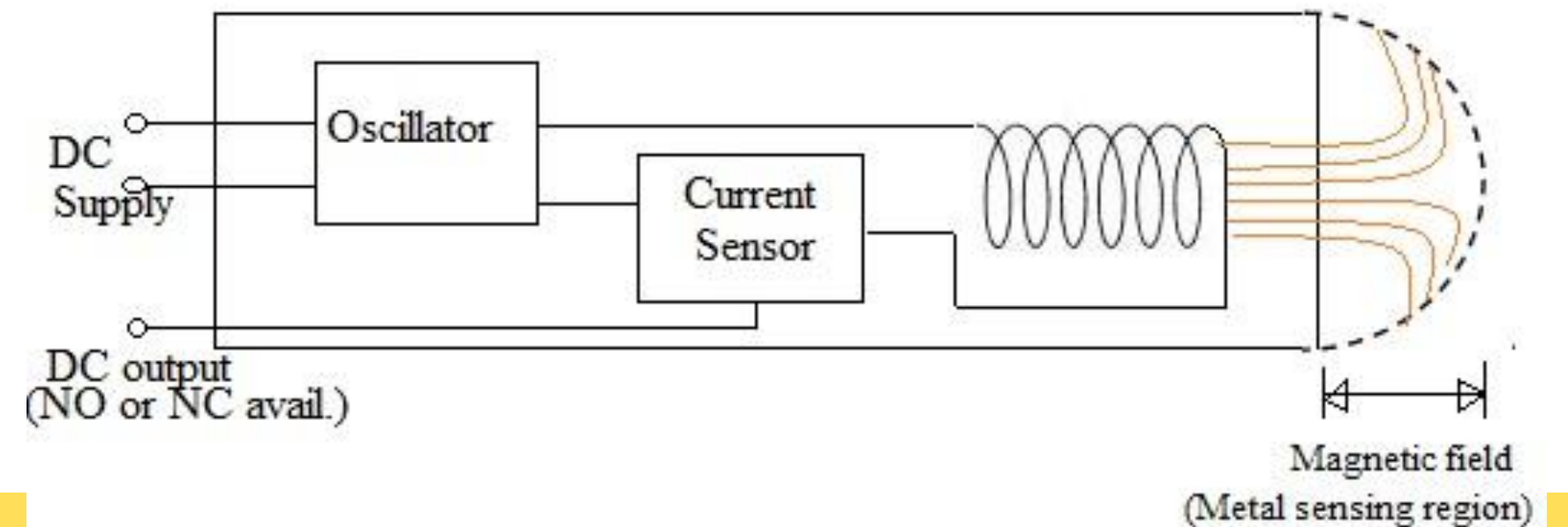
Examples of analog and digital sensors??

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