



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

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UNIT 1

SENSORS AND TRANSDUCERS

An **inductive transducer** is a type of sensor that converts physical quantities like displacement, pressure, or humidity into a change in inductance, which can then be measured electronically. However, inductive transducers are not typically used as humidity sensors.

Humidity Sensors

Humidity sensors, also known as hygrometers, measure the amount of moisture in the air. They typically work by sensing changes in electrical properties (such as capacitance or resistance) of a hygroscopic material, which changes as it absorbs or desorbs moisture from the air.

Inductive Transducer Overview

An inductive transducer works based on the principle of inductance, where the inductance of a coil changes due to the movement or presence of a magnetic material or due to the displacement of the coil itself. The inductance varies with the position of a magnetic core or the distance between the coils and the core.

Potential Use in Humidity Measurement

While inductive transducers are more common in measuring physical displacements or position, in theory, they could be part of a more complex system where humidity affects a material's properties (like expansion/contraction), leading to a measurable change in inductance. However, this would be an indirect method and is not standard in humidity sensing.



LVDT (Linear Variable Differential Transformer)

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Principle of Operation: An LVDT is an inductive transducer that works on the principle of mutual induction. It consists of a primary winding and two secondary windings, with a movable ferromagnetic core placed inside these windings. When an AC voltage is applied to the primary winding, it induces voltages in the secondary windings. The core's position affects the magnitude of these induced voltages, and the difference between them (differential voltage) is used to determine the displacement.

Key Features:

- **High Accuracy:** LVDTs are known for their high precision in measuring linear displacement.
- **Infinite Resolution:** They offer smooth and continuous measurement without any quantization error.
- **Rugged Construction:** LVDTs are robust and can operate in harsh environments, making them suitable for industrial applications.
- **Frictionless Operation:** Since there is no physical contact between the moving parts and the windings, LVDTs have a long operational life.



Applications:

- Position feedback in hydraulic systems.
- Measurement of displacement in materials testing machines.
- Servo mechanisms and control systems.

2. Induction Potentiometer

Principle of Operation: An induction potentiometer operates on the principle of variable inductance or mutual inductance, depending on its design. It typically consists of a coil and a movable element (such as a core or a slider) that changes the inductance as it moves. The change in inductance is converted into an electrical signal proportional to the displacement.

Key Features:

- **Moderate Accuracy:** Induction potentiometers are generally less accurate than LVDTs but still provide reliable measurements.
- **Compact Design:** They are often more compact and simpler in construction compared to LVDTs.
- **Electromagnetic Compatibility:** These devices are more susceptible to electromagnetic interference, which can affect their accuracy.
- **Mechanical Wear:** The moving parts in some designs can lead to mechanical wear, reducing the sensor's lifespan.

Applications:

- Simple displacement measurements where high precision is not critical.
- Control systems in automotive applications.
- Consumer electronics for position sensing.