Displacement Measurements - LVDT

Linear Variable Differential Transformer
A “transducer” is a device that converts some mechanical quantity into some measurable electrical quantity.

Through a calibration procedure, the “sensitivity” of the transducer can be obtained.

**INPUT**

- Physical Phenomenon
  - Pressure, Temperature, Strain, Displacement, Velocity, Acceleration, etc

**OUTPUT**

- Electrical Signal related to Physical Phenomenon
  - DC voltage, AC voltage, current, resistance, etc

- Volts per Engineering Unit
  - V/EU
There are a wide variety of devices used to measure displacement

Potentiometer

Linear and Rotary Variable Differential Transformers

Capacitive Displacement Sensors

Linear Velocity Transducers

Angular Displacement and Velocity Devices

Only the LVDT will be considered here
An LVDT works on the principle of modifying the spatial distribution of an alternating magnetic field. The LVDT consists of a primary coil and two secondary coils.

The primary core tends to concentrate the field in its vicinity.

This induces alternating currents in the secondary coils.

As the primary is displaced, the voltage in the closest secondary increases.

The difference in the two secondary coils is proportional to the displacement of the primary coil. The direction of the motion is obtained from the phase of the secondary coil AC voltages.
LVDTs can be obtained to measure thousands of an inch up to several inches.

However, their frequency response characteristics are limited. They can be used up to 100 to 200 Hz depending on the excitation frequency for the coil. (They are "self" filtering low pass filters.)

They are also very linear over their designed linear range and then become highly non-linear.