

# Displacement Transducer

- **Potentiometer**
- **LVDT(Linear Variable Differential Transducer)**
- **Capacitive Transducer**
- **Strain Gauge**

# Potentiometer

## Resistive Transducer

A potentiometer is a resistive-type [transducer](#) that converts either linear or angular displacement into an output voltage by moving a sliding contact along the surface of a [resistive element](#)

Linear [potentiometric transducers](#)

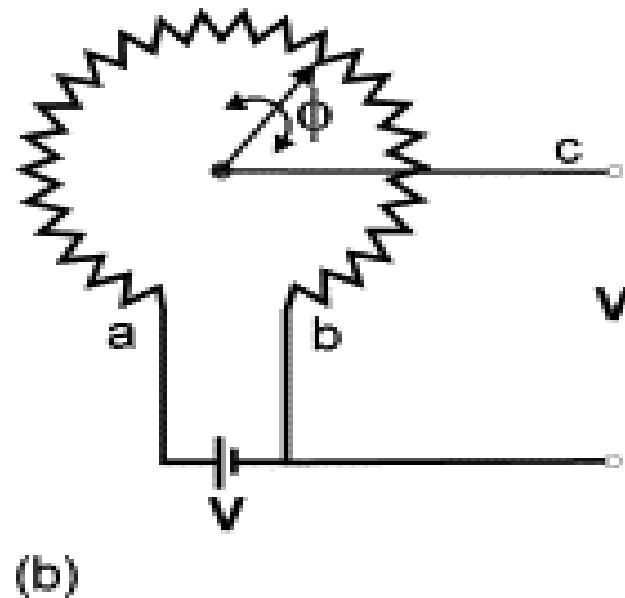
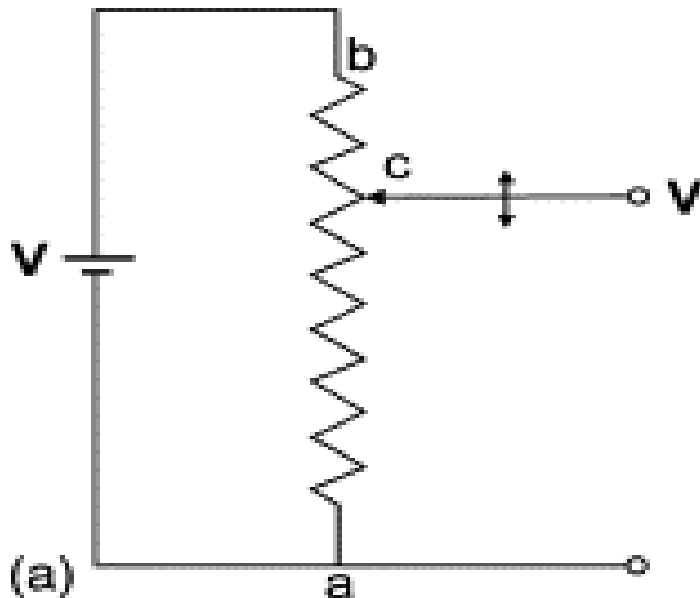
Angular [potentiometric transducers](#)

- Resistive potentiometers are one of the most widely used forms of position sensor.
- Can be angular or linear.
- Consists of a length of resistive material with a sliding contact onto the resistive track.
- When used as a position transducer a potential is placed across the two end terminals, the voltage on the sliding contact is then proportional to its position.
- An inexpensive and easy to use sensor

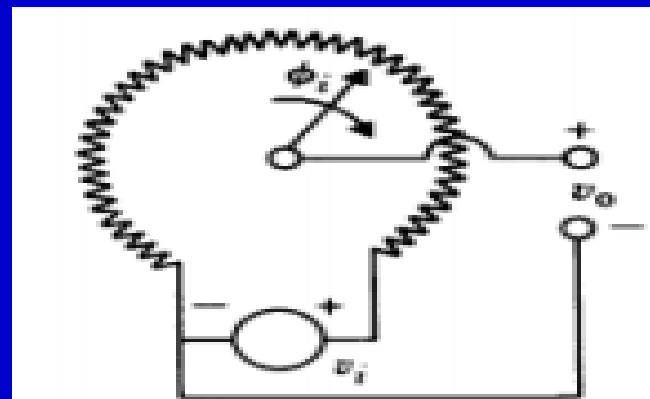
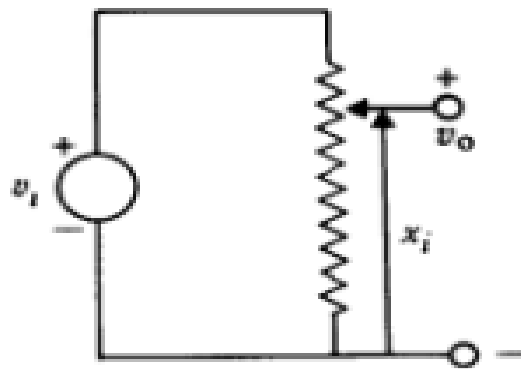
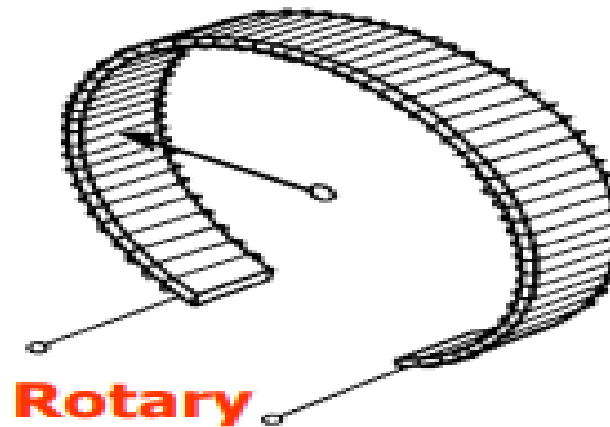
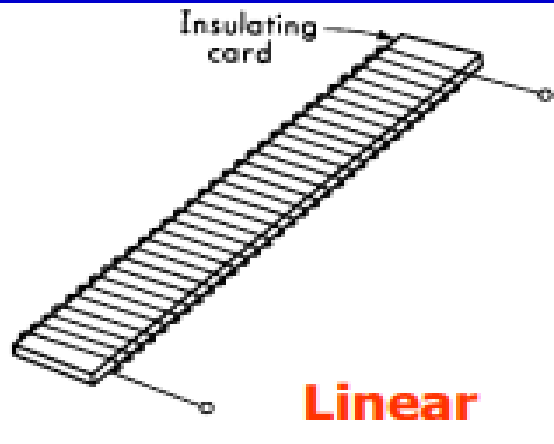
# Working Principle

- The potentiometer is the electrical type of transducer or sensor works on the principle of change of resistance of the wire with its length.
- The resistance of the wire is directly proportional to the length of the wire, thus as the length of the wire changes the resistance of the wire also changes.

- A voltage,  $V_i$ , is applied across the resistor,  $R$ . The output voltage,  $V_o$ , between the sliding contact and one terminal of the resistor is linearly proportional to the displacement.
- A [constant current source](#) is passed through the variable resistor, and the small change in output voltage is measured by a sensitive voltmeter using [Ohm's law](#) (i.e.,  $I = V/R$ ).

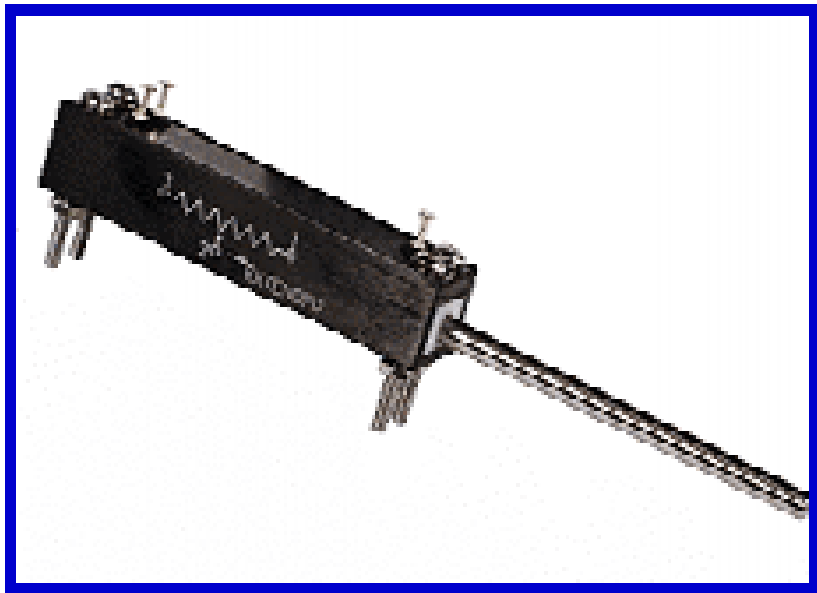


# CONSTRUCTION PRINCIPLES OF POTENTIOMETERS



# POTENTIOMETERS TYPES

Linear



Rotary

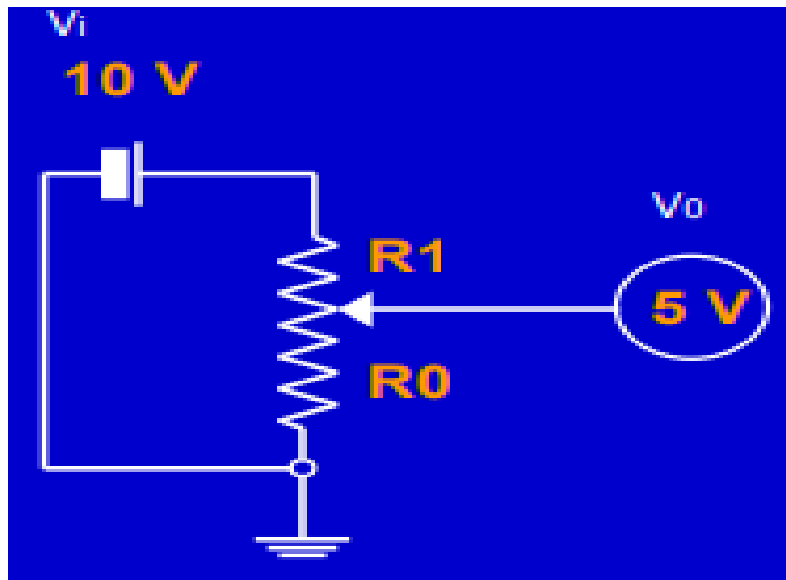


## How Potentiometer is used as the Transducer

- To measure the displacement of the body, this body, which is moving, is connected to the sliding element of the potentiometer.
- As the body moves, the position of the slider located on the potentiometer also changes so the resistance between the fixed point and the slider changes.
- Due to this the voltage  $V_o$  across these points also changes.
- The change in voltage or the resistance is proportional to the change in the displacement of the body.
- Thus the voltage change indicates the displacement of the body.
- The potentiometer can be used for the measurement of translational as well as well rotational displacement.
- These potentiometers work on the principle of resistance, they are also called as the resistive potentiometers.



## Connecting a potentiometer as a potential divider



$$V_o = V_i \left( \frac{R_0}{R_1 + R_0} \right)$$

## Advantages

- Cost-effective
- Simple design and simple working
- Can be used for measuring even large displacements.
- The device produces a large output and hence can be used for control purposes without further amplification steps.
- Can produce a high electrical efficiency.

## Disadvantages

- A huge force may be required for the slider movement.
- Can produce unwanted noise due to alignment problems, wear and tear of the sliding contact. This may also affect the total life of the device.