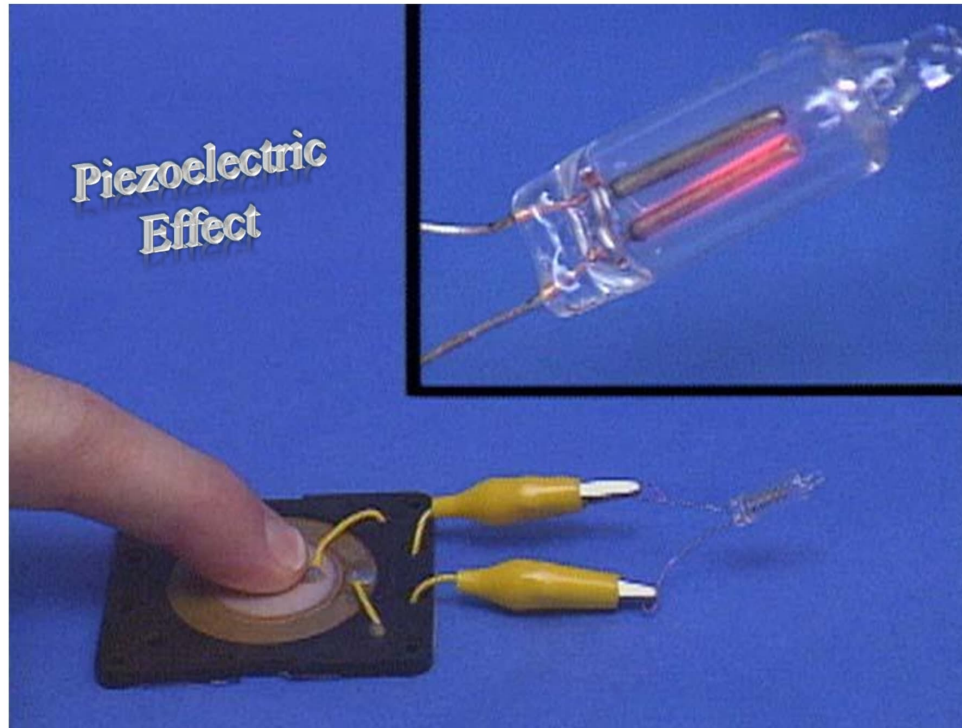




Piezoelectric Pressure Sensor

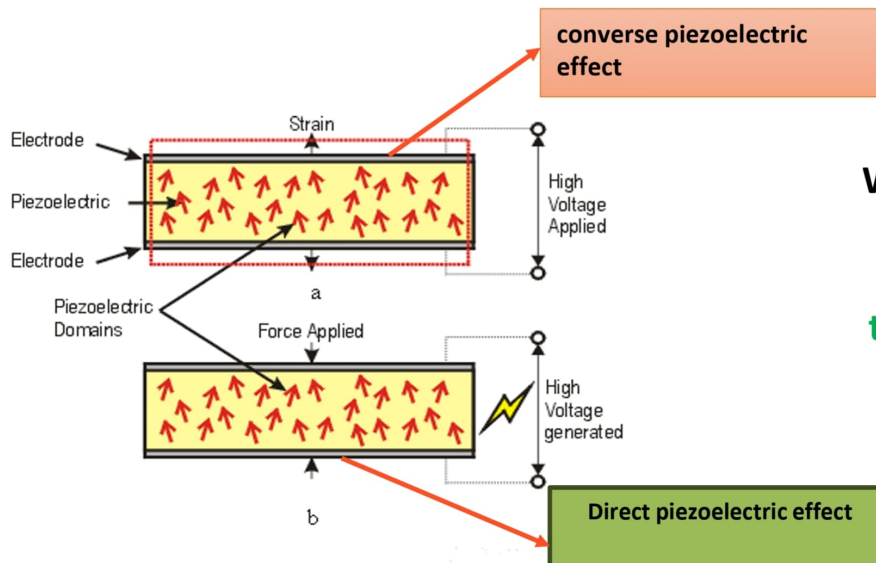
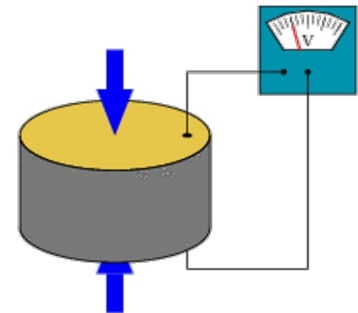




Piezoelectric Pressure Sensor

Piezoelectric effect

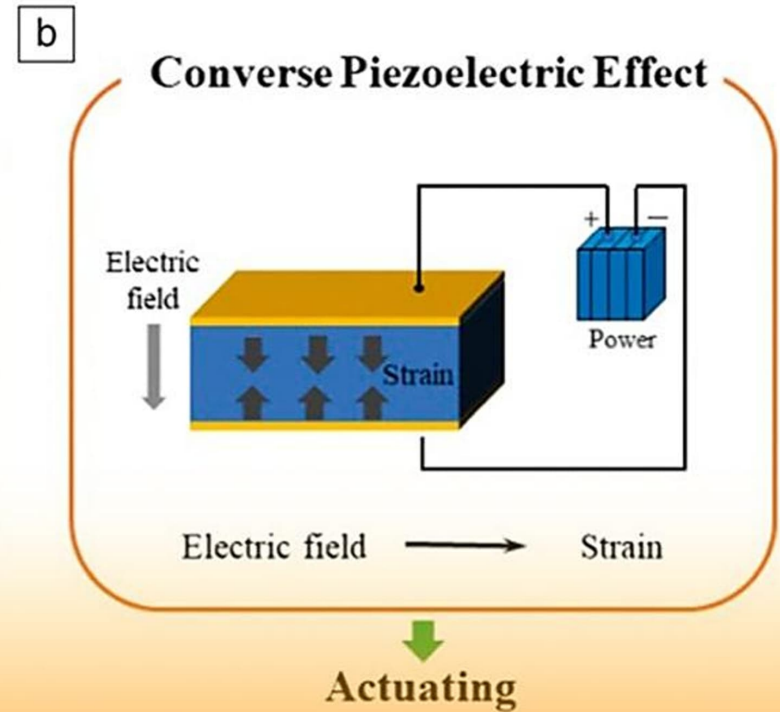
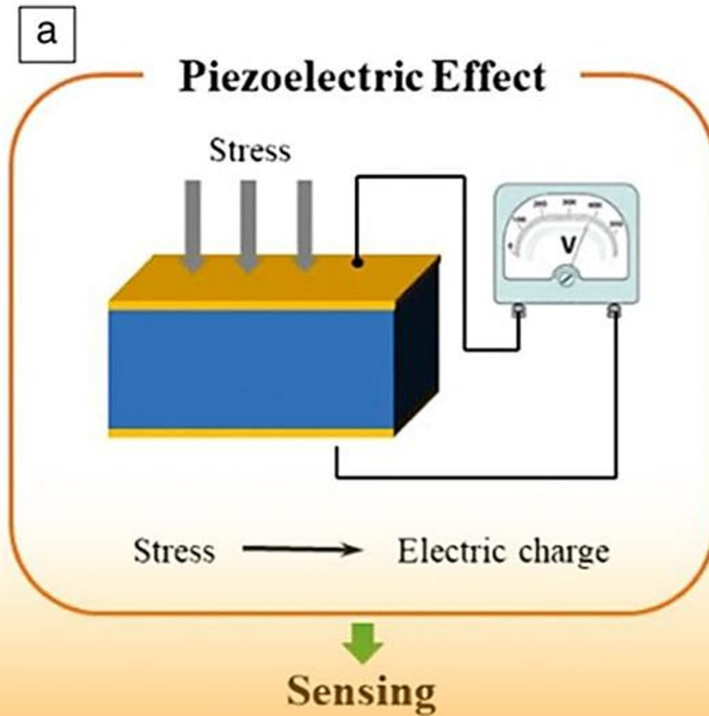
Piezoelectricity (from the Greek “piezin”, meaning to press) is a property of certain materials which show non-centre of symmetry



When **PRESSURE** is being applied to certain crystals they produce an electric output and vice-versa



Piezoelectric Pressure Sensor





Piezoelectric Sensor

Physical Phenomena

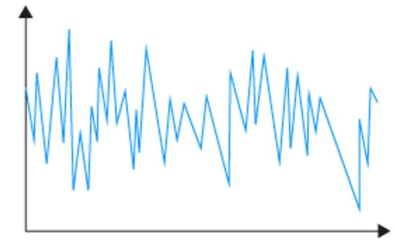
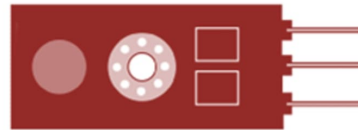
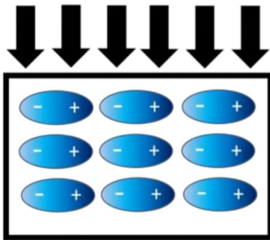


SENSOR



Electrical Signal

Pressure



Input

(Physical quantity)



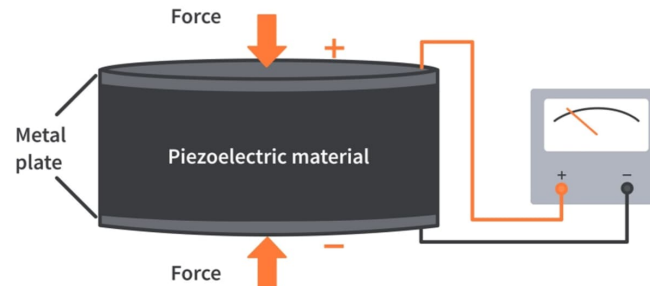
SENSOR

(or Detector)



Output

(Electrical Signal)





Piezoelectric Pressure Sensor

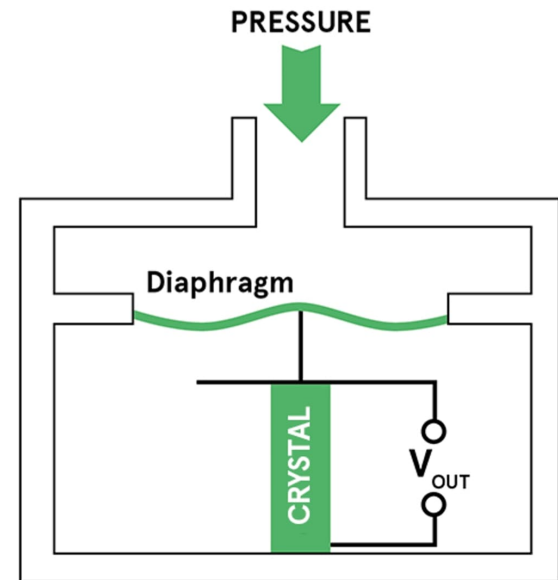
Introduction

- Piezoelectric pressure sensors are a unique class of devices that convert mechanical pressure into electrical signals.
- These sensors are increasingly popular due to their diverse applications, high sensitivity, and ability to operate in harsh environments.

Principle

Piezoelectric effect

- When pressure is applied to the sensor, the piezoelectric material deforms, causing a voltage difference across the electrodes.
- This voltage can then be measured and correlated to the applied pressure.

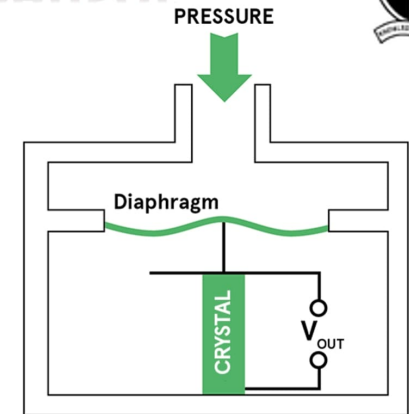




Piezoelectric Pressure Sensor

Advantages

- ✓ **High sensitivity**
- ✓ **Wide dynamic range**
- ✓ **Fast response time**
- ✓ **Excellent stability**
- ✓ **Resistance to harsh environments**



Applications

- Automotive:** They are used in monitoring engine performance, tire pressure, and fluid pressure in braking systems.
- Aerospace:** Measuring air pressure, cabin pressure, and fuel pressure in aircraft systems.
- Industrial processes:** To monitor fluid pressure in pipes, tanks, and reactors,
- Medical:** Blood pressure monitoring, respiratory therapy devices, and intracranial pressure monitoring.
- Environmental monitoring:** They are employed in measuring atmospheric pressure, ocean depth, and groundwater pressure for various research and monitoring purposes.

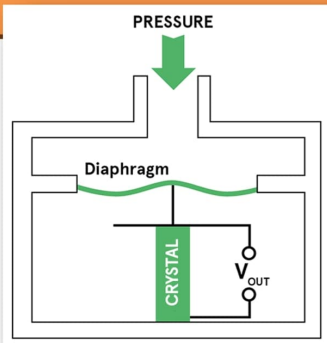


Piezoelectric Pressure Sensor

Types of Piezoelectric Pressure Sensors

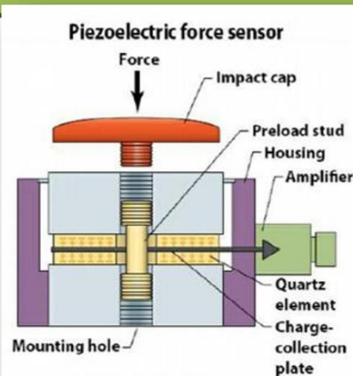
Piezoelectric diaphragm sensors

- ❑ A thin diaphragm to transfer pressure-induced mechanical stress to the piezoelectric material.
- ❑ Widely used for low-pressure measurements particularly suitable for dynamic and transient pressure applications.



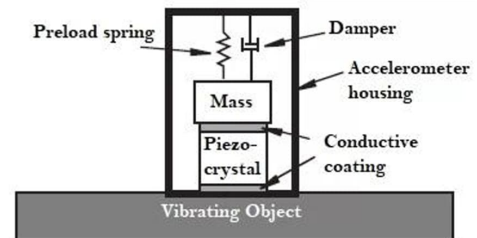
Piezoelectric force sensors

- ❑ These sensors measure pressure by converting the force applied to a rigid body into an electrical signal.
- ❑ They are commonly used in industrial applications where high accuracy and durability are required.



Piezoelectric accelerometer sensors

- ❑ These sensors detect changes in pressure by measuring the acceleration of a mass attached to the piezoelectric material.
- ❑ They are primarily used for vibration measurements and dynamic pressure applications.





Piezoelectric Pressure Sensor

