

ACTUATORS IN IOT

An actuator is a system or device that moves or controls a mechanism in response to a control signal. In IoT devices, sensors gather environmental data, and based on this data, actuators perform actions like moving, controlling, or adjusting the system's operation.

Example: Servo Motor

A servo motor is a type of actuator used in IoT, which can rotate to a specified angular position (e.g., 90°, 180°).

How Actuators Work in IoT Devices:

- **Controller:** Processes the sensor data.

- **Actuator:** Executes the necessary action based on the control signal from the controller (e.g., rotating a motor or adjusting a valve).

Types of Actuators:

1. Hydraulic Actuators:

- **How it works:** Uses hydraulic power (fluid pressure) to produce movement.
- **Example:** Construction equipment (e.g., excavators).
- **Advantages:** High force and speed.
- **Disadvantages:** Expensive, leaks can cause issues, requires maintenance.

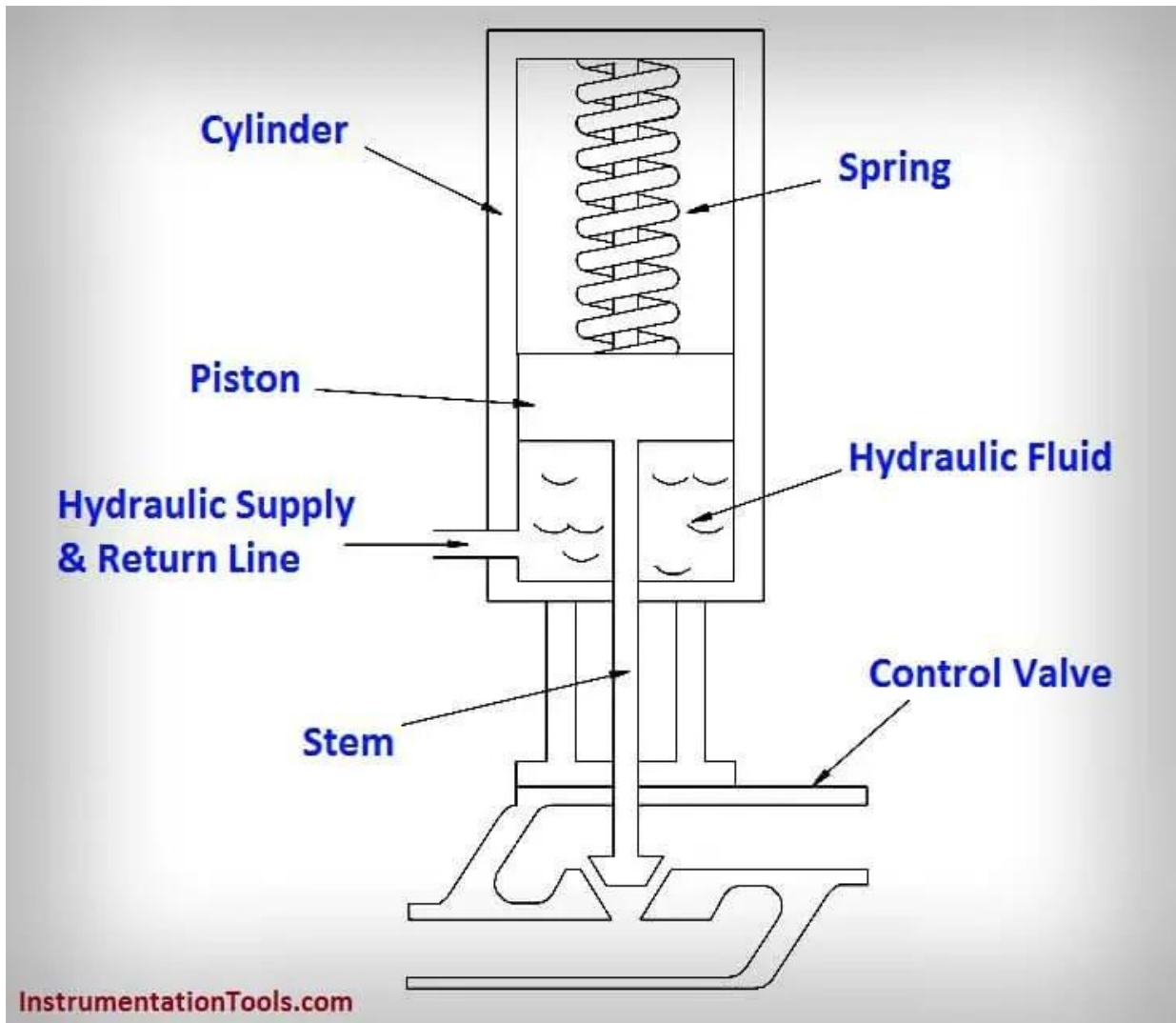


Fig: Hydraulic Actuator

2. Pneumatic Actuators:

- **How it works:** Uses compressed air to generate motion (linear or rotary).
- **Example:** Robotics, pneumatic fingers.

- **Advantages:** Low cost, durable, fast operation.
- **Disadvantages:** Loss of pressure affects efficiency, requires continuous air supply.

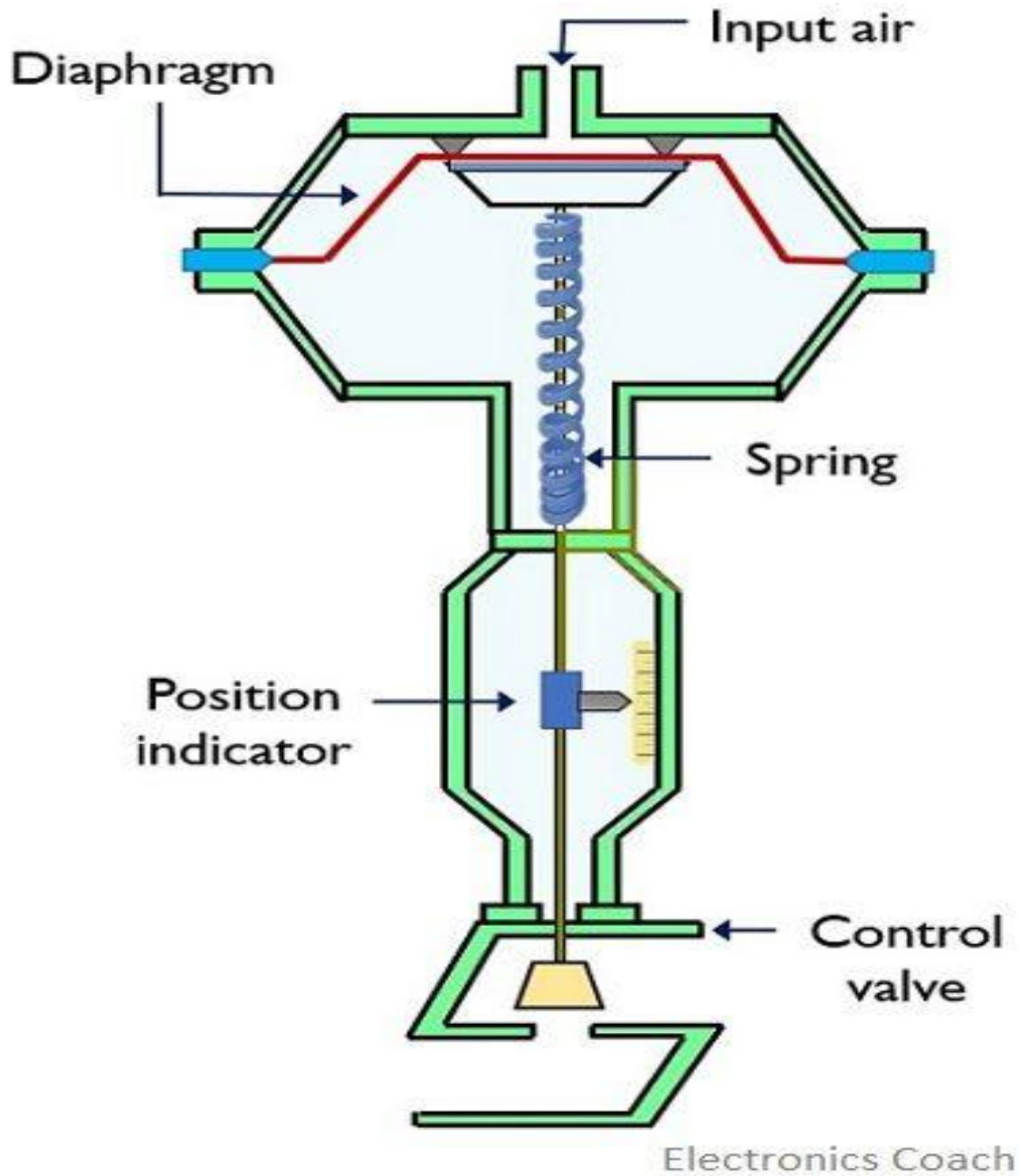


Fig: Pneumatic Actuator

3. Electrical Actuators:

- **How it works:** Uses electrical energy (via motors) to produce mechanical movement.
- **Example:** Solenoid-based electric bell.
- **Advantages:** High control precision, low noise, safe (no fluid leaks).
- **Disadvantages:** Expensive, sensitive to environmental conditions.

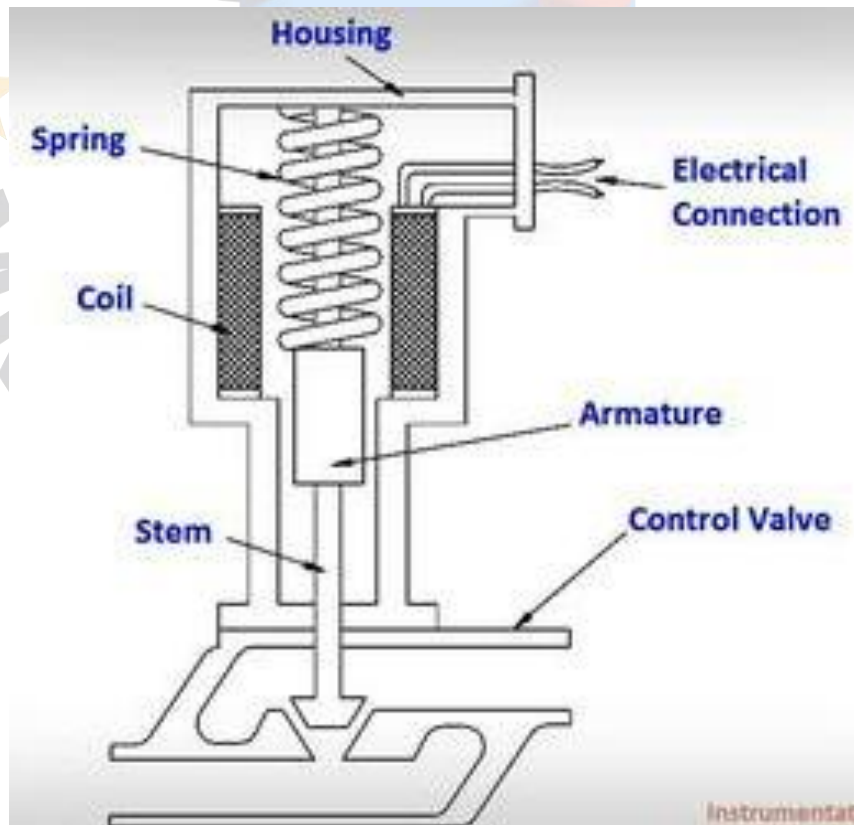


Fig: Electrical Actuators

4. Other Actuators:

- **Thermal/Magnetic Actuators:** Actuated by thermal or magnetic energy (e.g., Shape Memory Alloys, Piezo motors).
- **Mechanical Actuators:** Convert rotary to linear motion using gears, pulleys, etc. (e.g., crankshaft).
- **Soft Actuators:** Use soft materials to generate movement.
- **Shape Memory Polymers:** Materials that change shape when heated or cooled.
- **Light Activated Polymers:** Materials that change shape or properties when exposed to light.