Actuators

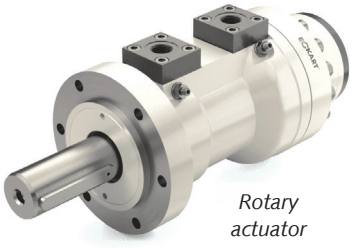
What is an actuator?

An **actuator** is a device that converts energy, which may be electric, hydraulic, pneumatic, etc., into mechanical energy in such a way that it can be controlled. The quantity and the nature of the input depend on the kind of energy to be converted and the function of the actuator. Electric actuators, for instance, work on the input of electric current or voltage, for hydraulic actuators the input is incompressible liquid, and for pneumatic actuators the input is air. The output is always mechanical energy.

In industrial mechatronics systems, actuators are responsible for making a device such as a robotic arm move when an electric input is provided.

Parts of an actuator

The functioning of an actuator depends on these components:



Rotary actuator

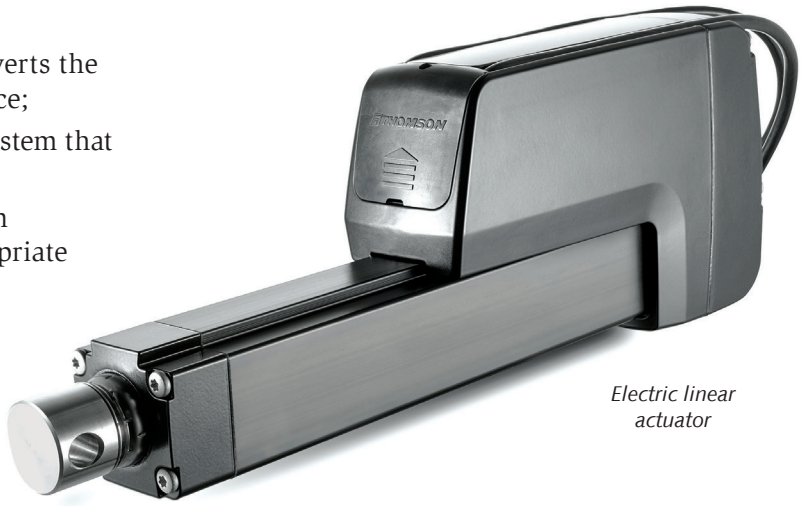
- **power source**: it provides the energy input that is necessary to drive the actuator;
- **power converter:** it supplies power from the source to the actuator in accordance with the measurements set by the controller. Hydraulic proportional valves and electrical inverters are examples of power converters in industrial systems;
- **actuator**: the actual device that converts the supplied energy into mechanical force;
- **mechanical load**: the mechanical system that is driven by the actuator;
- **controller**: it ensures that the system functions seamlessly with the appropriate input quantities and other setpoints decided by an operator.

Types of actuators

To distinguish different types of actuators, we can sort them according to the power source or system they use to move. The most common actuators according to energy source are:

- **hydraulic actuators**, which operate by the use of a fluid-filled cylinder with a piston suspended at the centre. They usually produce linear movements;
- **pneumatic actuators**, which use pressurised gases to create mechanical movement. They are one of the most reliable options for machine motion;
- **electric actuators,** which require electricity to work. Well-known examples include electric cars, manufacturing machinery, and robotics equipment. Similar to pneumatic actuators, they also create precise motion as the flow of electrical power is constant;
- **mechanical actuators**, which are used as a mechanism to translate mechanical motion (often rotary) into linear motion.

seamlessly: *facilmente*
setpoint: *valore di impostazione*
to sort: *dividere*



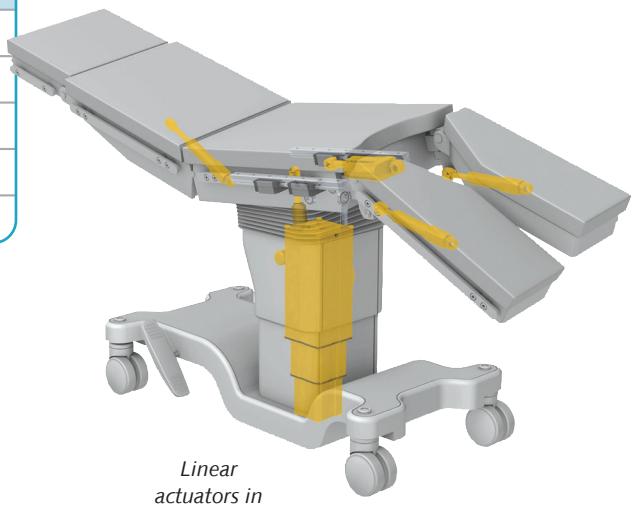
Electric linear actuator

1 Find the English words for these Italian terms.

1. Tensione .....
2. Azionare .....
3. Convertitore .....
4. Fornire .....
5. Valvola .....
6. Carico .....
7. Fonte di energia .....
8. Flusso .....

2 Complete a similar the table with the missing information.

Component	Function
Power source	
Power converter	
Actuator	
Mechanical load	
Controller	



Linear actuators in patient lifts

3 Answer the questions.

1. What is an actuator?
2. What type of output is obtained?
3. How do hydraulic actuators operate?
4. How do pneumatic actuators work?
5. What do electric actuators need to work?
6. How are mechanical actuators used?