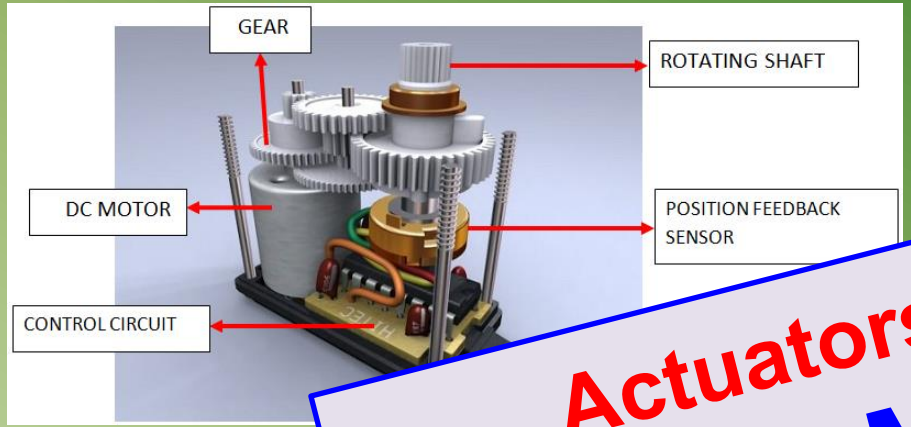
Vishwakarma Institute of Technology

FY - Department of Engineering, Sciences and Humanities



Actuators – 3.6

Servo Motors

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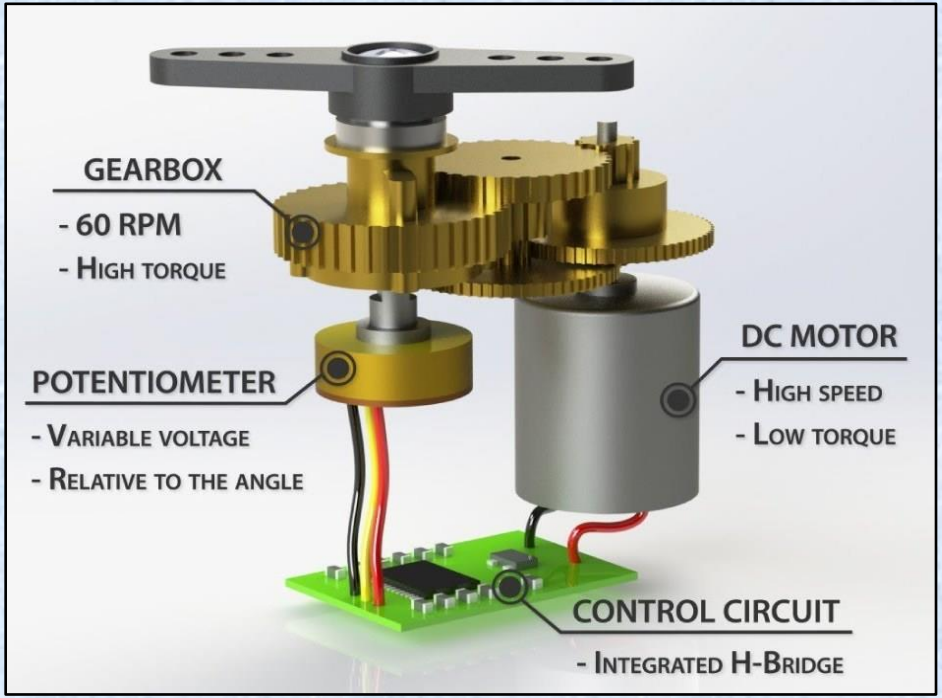
What is a Servo Motor ?

✓ A Servo motor is essentially a combination of a DC/AC motor, a Gearing mechanism, Position sensor, Feedback circuit, Control circuit etc. housed together.

✓ The main feature of a Servo motor is that it can rotate through a few specific degrees in addition to its capability to rotate continuously.

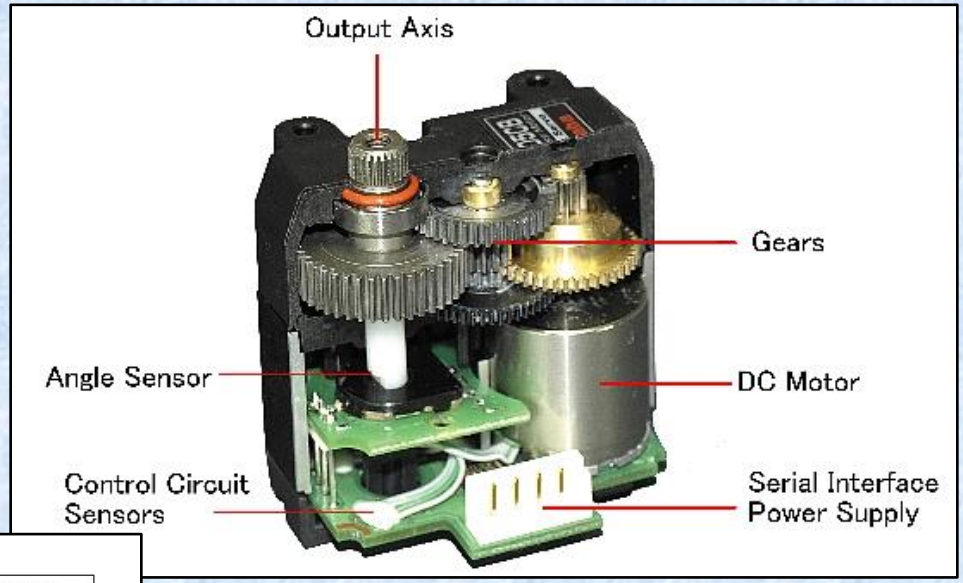


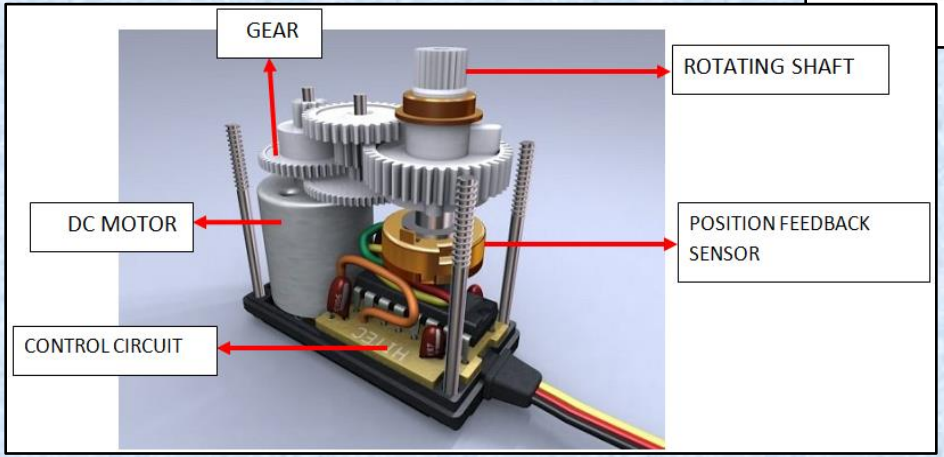
✓ This feature makes the servo motor a best choice for position control in Robotics and CNC machines.

Servo Motor –

✓ **Gearing mechanism –**

A train of gears reduces the speed of the motor and consequently increases the Torque at the output shaft. The speed is dropped to a very low value e.g. 30 – 40 rpm using suitable gear ratio.





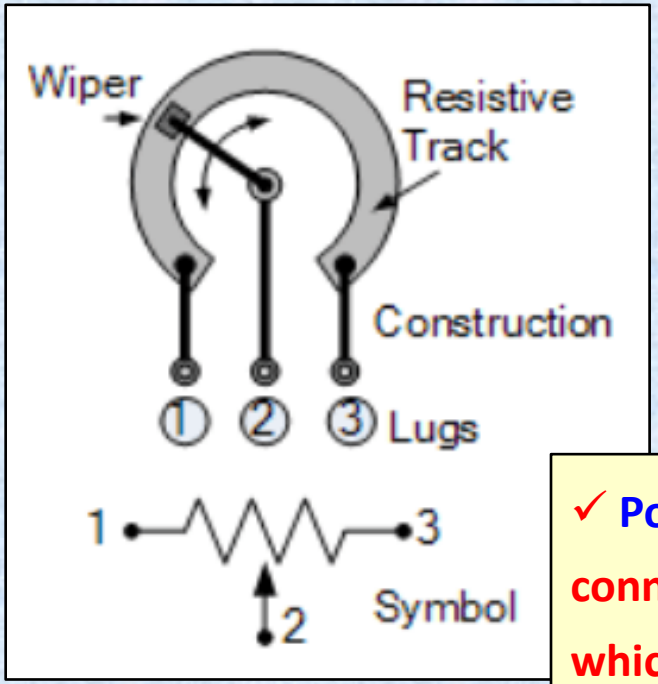
Why the Torque increases ?

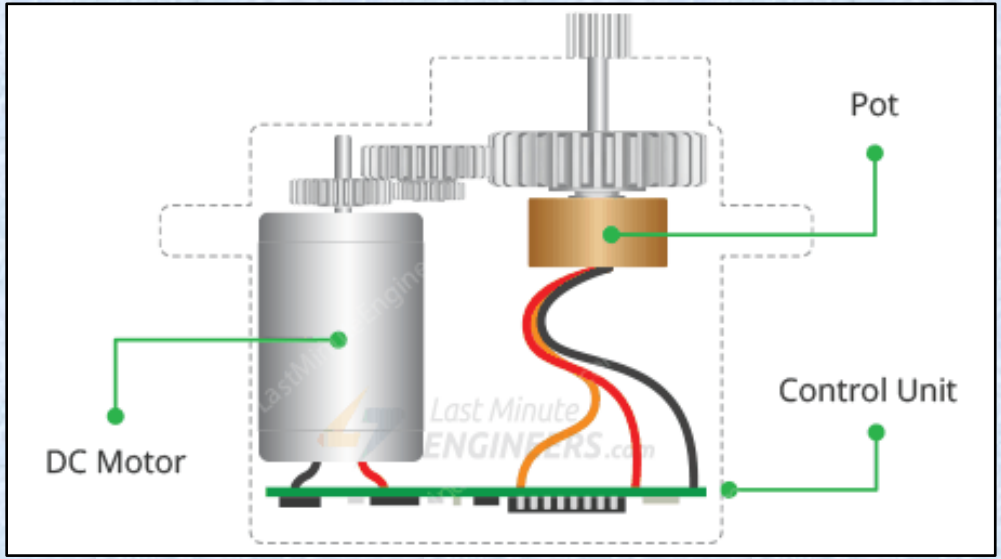
$P = T \times \omega$

But, $\omega = 2\pi N / 60$

For the same $P = T \uparrow \times \omega \downarrow$

Servo Motor –

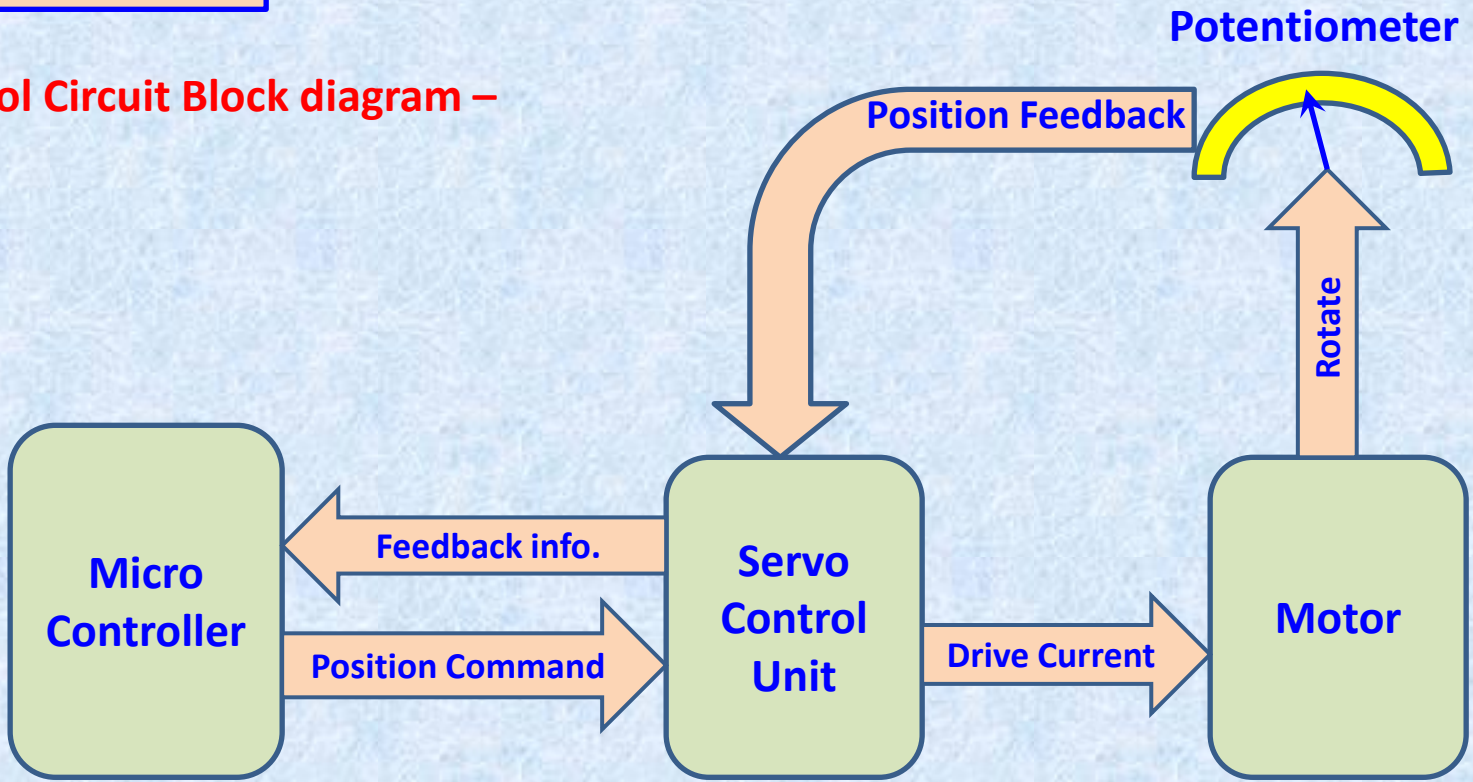




✓ **Position sensor – A Potentiometer is connected to the end of the gear train which turns through the same angle as that of the last gear. The resistance is measured and position is calculated.**

Servo Motor –

Control Circuit Block diagram –

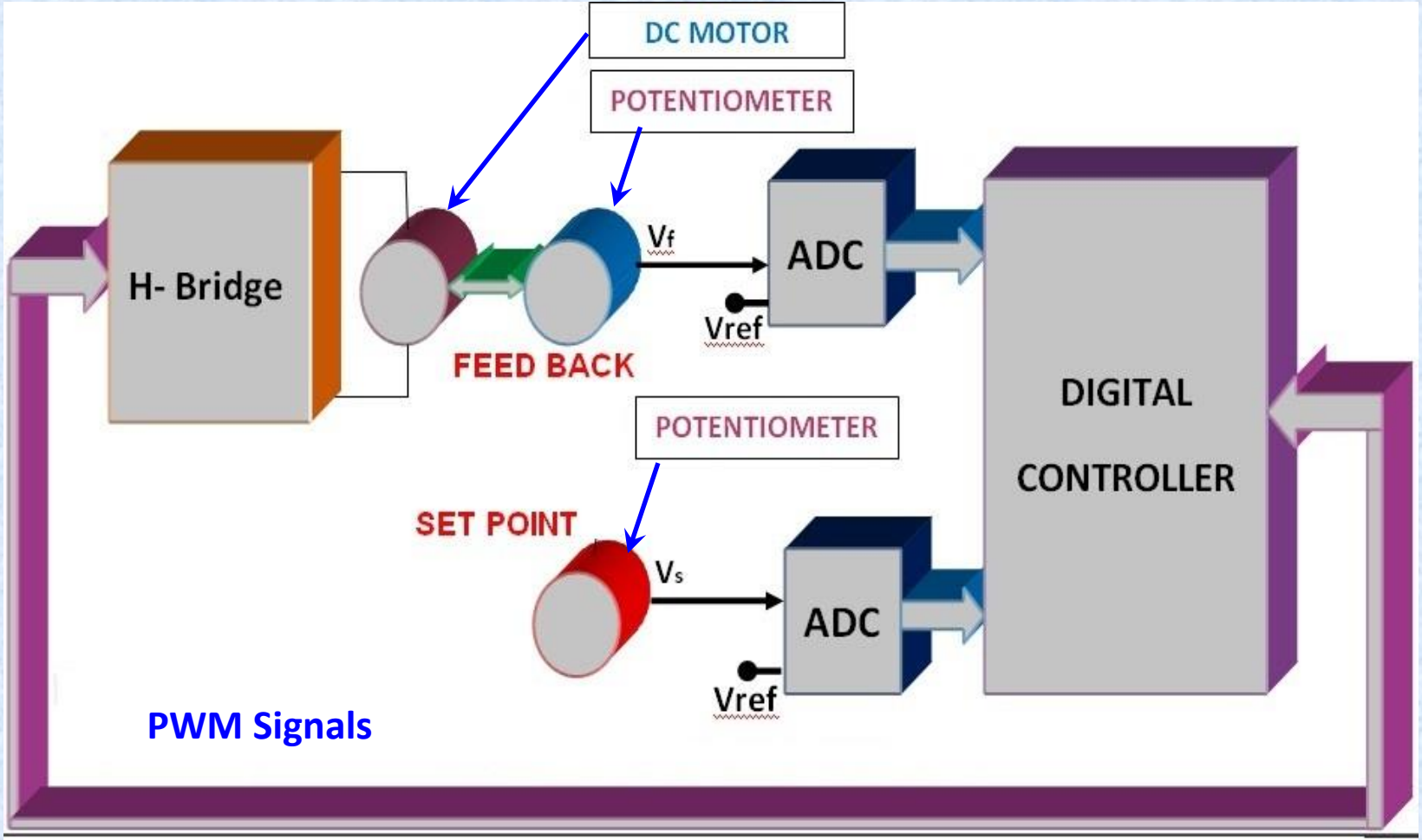


Servo Motor – types

$$N \propto \frac{Eb}{\varphi} = \frac{V - Ia\,Ra}{\varphi}$$

Speed control of Servo motor can be done in following way ….

1) Armature voltage controlled motor – The voltage given to the armature of the motor comes from the servo system of the motor.
2) Field (Flux) controlled motor – The voltage given to the field winding of the motor controls the flux and thus the speed.


DC MOTOR
POTENTIOMETER
H- Bridge
Vf
ADC
Vref
FEED BACK
POTENTIOMETER
DIGITAL
CONTROLLER
SET POINT
Vs
ADC
Vref
PWM Signals

Applications of Servo motor –

1) Position control systems
2) Robotics
3) CNC machines
4) Automation conveyors

5) Navigation systems
6) Solar tracking systems
7) Radio Antennas & Observatory
8) Auto focus cameras
9) Textile and Printing machinery

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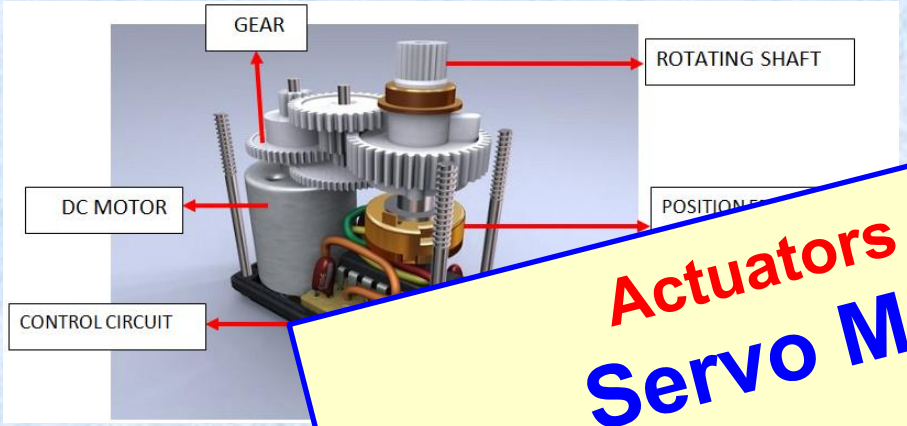

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Servo Motors

Thanks !

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Servo Motor –

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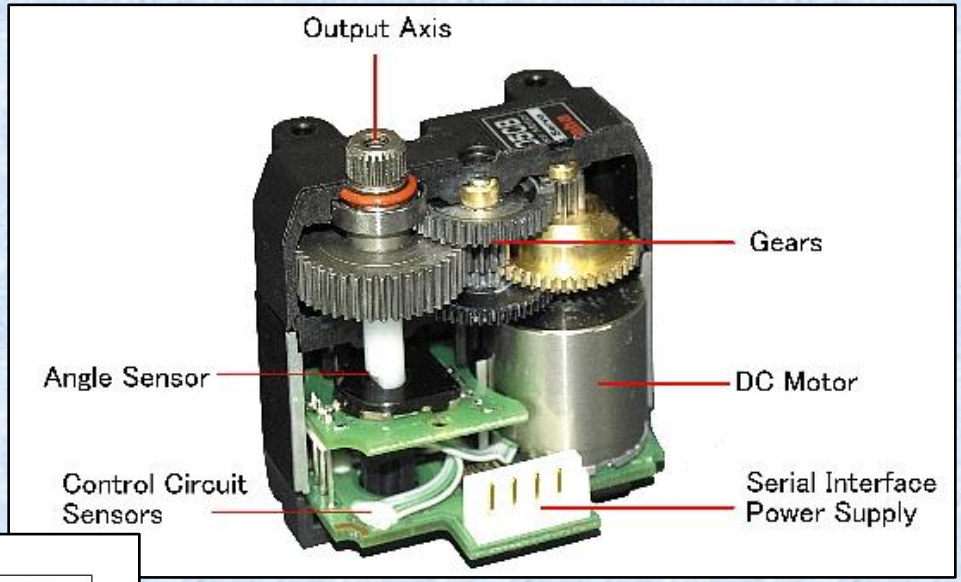

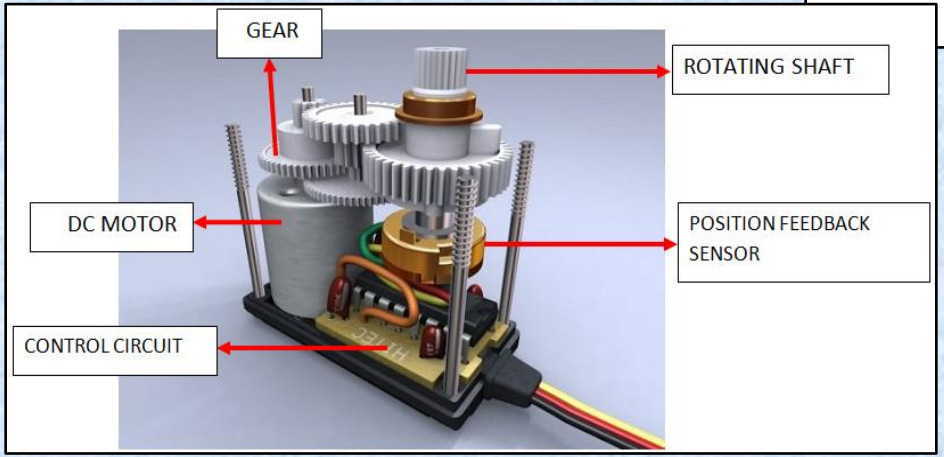

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