

# What Industries are Servo Motors used in?



Servo motors are seen in applications such as factory automation, robotics, CNC machinery, and packaging. The feedback lets the drive know its position, speed, and torque to detect unwanted motion. Pharmaceutical industries are driven by the need to create smaller devices; ones that are easier to operate and function more efficiently.

12

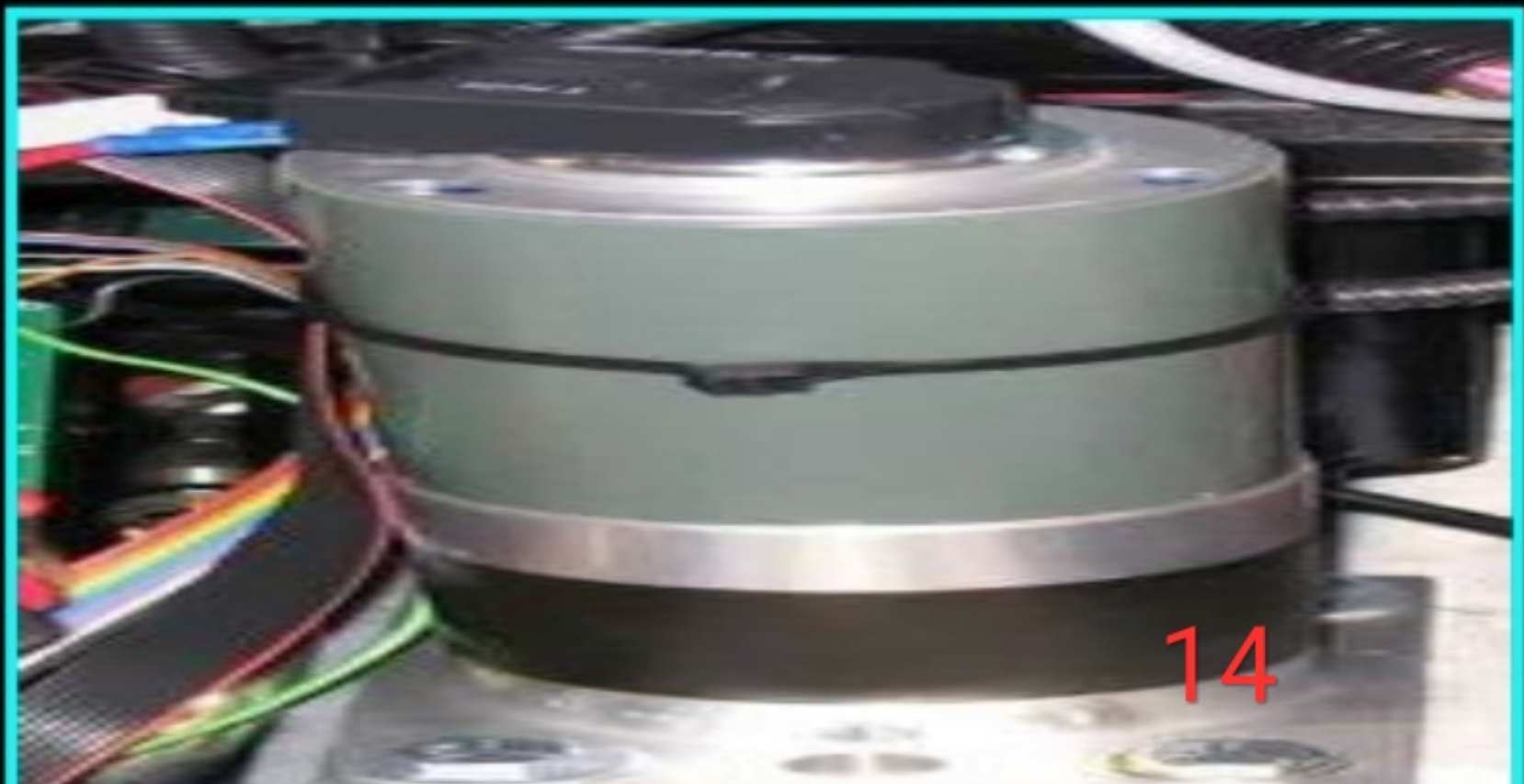
# Industrial Servo Motor



The grey/green cylinder is the brush-type DC motor. The black section at the bottom contains the planetary reduction gear, and the black object on top of the motor is the optical rotary encoder for position feedback. This is the steering actuator of a large robot vehicle.

13

# Industrial Servo Motor



14

# How Does a Servo Motor Work?



Typical servo motor mechanism is not complex. The servo motor has control circuits and a potentiometer that is connected to the output shaft. The shaft, which is the output device, links to a potentiometer and control circuits that are located inside the servo.

15

# How Does a Servo Motor Work?



The potentiometer, coupled with signals from the control circuits, control the angle of the shaft – anywhere from 0 to 180 degrees, sometimes further. The potentiometer allows the control circuitry to monitor the current angle of the servo motor.

16

# How Does a Servo Motor Work?



If the shaft is at the correct angle, the servo motor idles until next positioning signal is received. The servo motor will rotate the correct direction until the angle is correct. Each servo motor works off of modulation known as Pulse Coded Modulation, or PCM. The motor has a control wire that is given a pulse application for a certain length of time.

17

# How are Servo Motors controlled?



Servo motors operate on negative feedback, meaning that the control input is closely compared to the actual position via a transducer. If there is any variance between physical and wanted values, an error signal is amplified, converted, and used to drive the system in the direction necessary to reduce or eliminate error.

18

## How are Servo Motors controlled?



Servo motors are controlled by a pulse of variable width that is sent from a micro-controller output pin to the servo motor's control wire. The shaft angle is determined by the duration of the pulse, also known as pulse width modulation (pwm). This pulse has to have specific parameters such as; minimum pulse, a maximum pulse, and a repetition rate.

19



# Servo Motor Types



## 1. Rotary Servo Motor

A rotary Servo Motor is what most people think of when they think of a Servo Motor. The three types of Rotary Servo Motors are: AC Servo Motor, Brush DC Servo Motor, and Brushless DC Servo Motor. The motion of a rotary Servo Motor is often converted into linear motion by the use of a screw thread (ball screw or lead screw), or with the use of belts and pulleys.

20

# Servo Motor Types



## 1. Rotary Servo Motor

A Rotary AC Servo Motor is an AC type motor that is used with a feedback device. These are typically used in smaller applications, because a large AC Servo Motor is typically inefficient when compared to its DC or Brushless counterparts.

21