

# Project 07 Servo



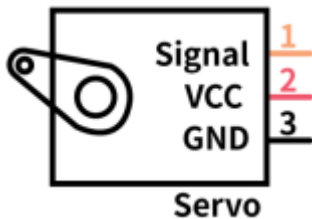
## 1. Description

Servo can control doors and windows. In this course, we'll introduce its principle and demonstrate how to use it.

Servo motor is a position control rotary actuator. It mainly consists of housing, circuit board, core-less motor, gear and position sensor.

Its working principle is that the servo receives the signal sent by MCU or receiver, and produces a reference signal with a period of 20ms and width of 1.5ms, then compares the acquired DC bias voltage to the voltage of the potentiometer and obtains the voltage difference output.

Generally, Servo reserves three external wires distinguished by colors of brown(GND), red(VCC, the positive pole of power supply) and orange(signal). But the colors vary from different brands of Servo.

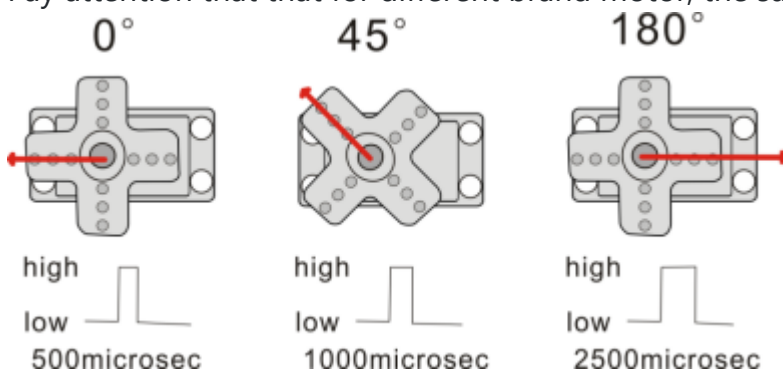


When the motor speed is constant, the potentiometer is driven to rotate through the cascade reduction gear, which leads 0 voltage difference, and the motor stops rotating.

Commonly, the angle range of servo rotation is  $0^\circ$  --  $180^\circ$ , which is controlled by regulating the duty cycle of PWM (Pulse-Width Modulation) signal.

The standard cycle of PWM signal is 20ms (50Hz). Theoretically, the width is distributed between 1ms-2ms, but in fact, it's between 0.5ms-2.5ms, and its width corresponds to the rotation angle from  $0^\circ$  to  $180^\circ$ .

Pay attention that that for different brand motor, the same signal may have different rotation angle.



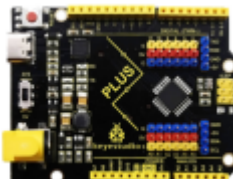
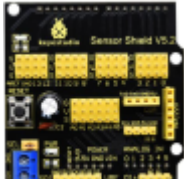


The corresponding servo Angle:

High level time	Servo angle
0.5ms	0 degree
1ms	45 degree
1.5ms	90 degree
2ms	135 degree
2.5ms	180 degree

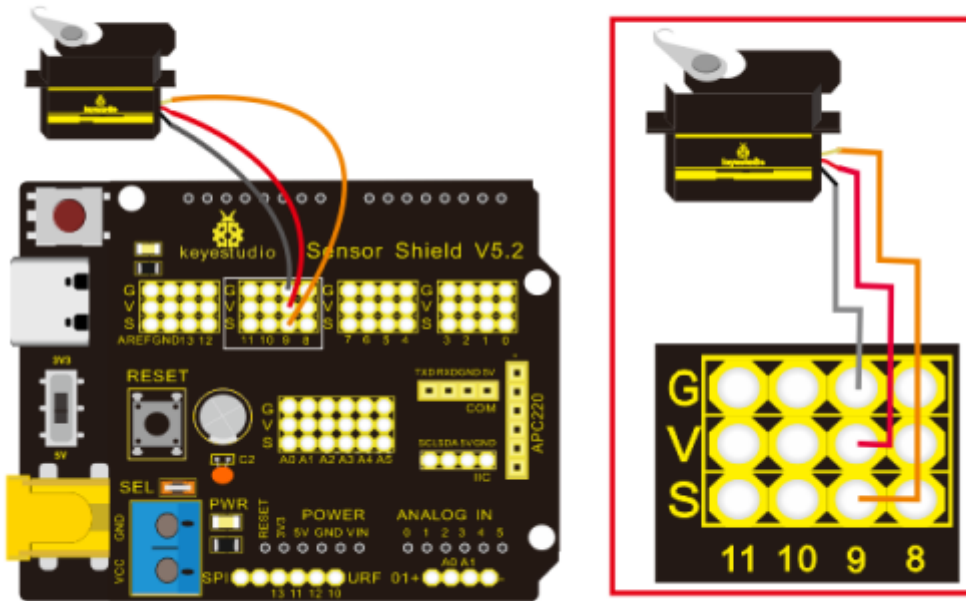
## 2. Parameters

- Working voltage: DC 4.8V~6V
- perating angle range: About 180°(at 500→2500 μsec)
- Pulse width range: 500→2500 μsec
- No-load speed: 0.12±0.01 sec/60(DC 4.8V) 0.1±0.01 sec/60(DC 6V)
- No-load current: 200±20mA(DC 4.8V) 220±20mA(DC 6V)
- Stopping torque: 1.3±0.01kg·cm(DC 4.8V) 1.5±0.1kg·cm(DC 6V)
- Stop current: ≤850mA(DC 4.8V) ≤1000mA(DC 6V)
- Standby current: 3±1mA(DC 4.8V) 4±1mA(DC 6V)
- Lead length: 250±5mm
- Appearance dimensions: 22.9 \* 12.2 \* 30mm
- Weight: 9±1g(without servo horn)

## 3. Needed Components

PLUS control board*1	Expansion board*1	Servo*1	USB cable*1
			

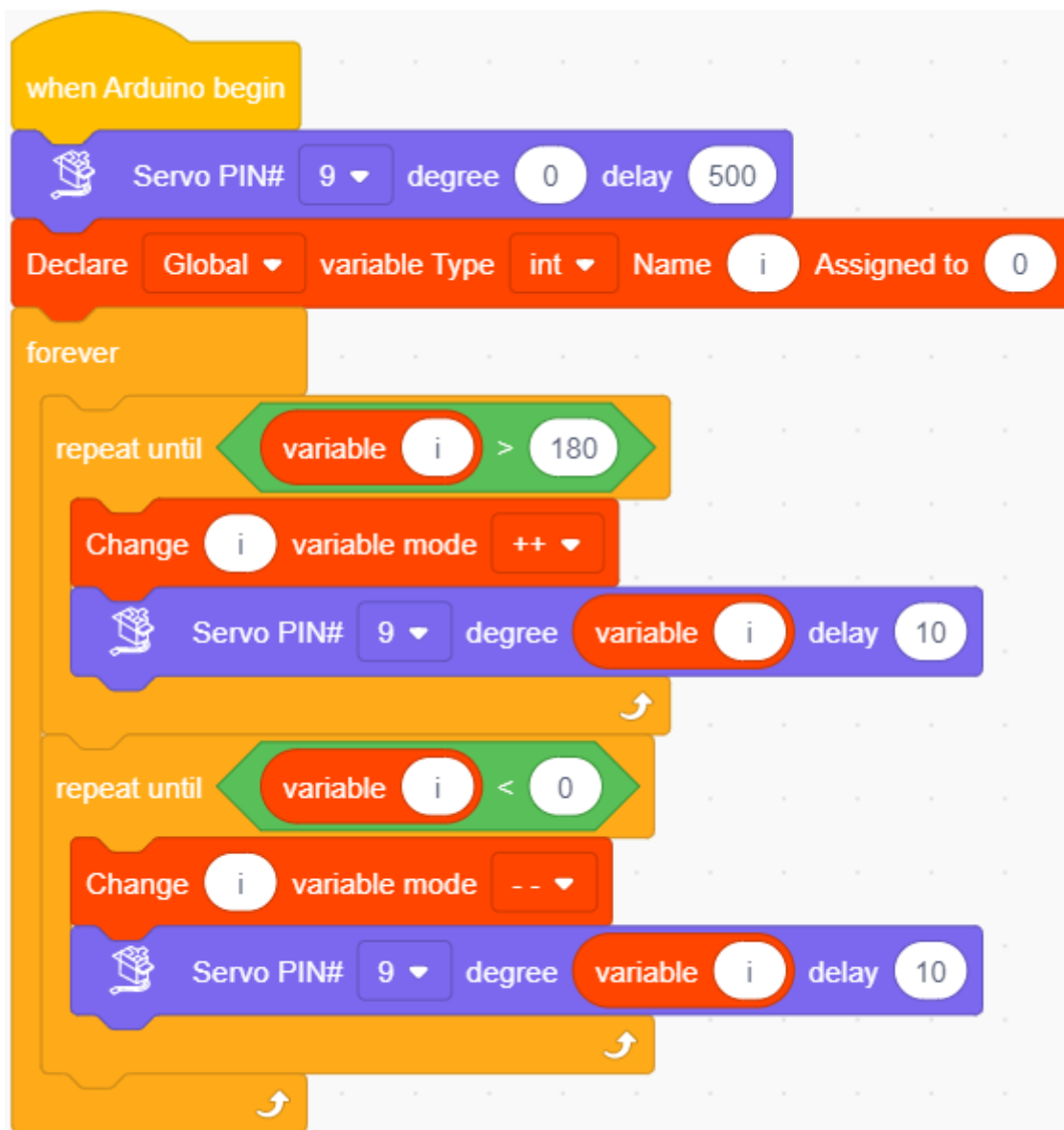
## 4. Wiring Diagram



Note: On the expansion board, the brown wire of the servo is connected to Gnd (G), the red wire is linked with 5v (V), and the orange wire is connected to digital pin 9.

## 5. Test Code

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## 6. Test Result

Upload code, wire up components according to connection diagram, and power on. The servo rotates from 0° to 180° then from 180°~0° in loop.

