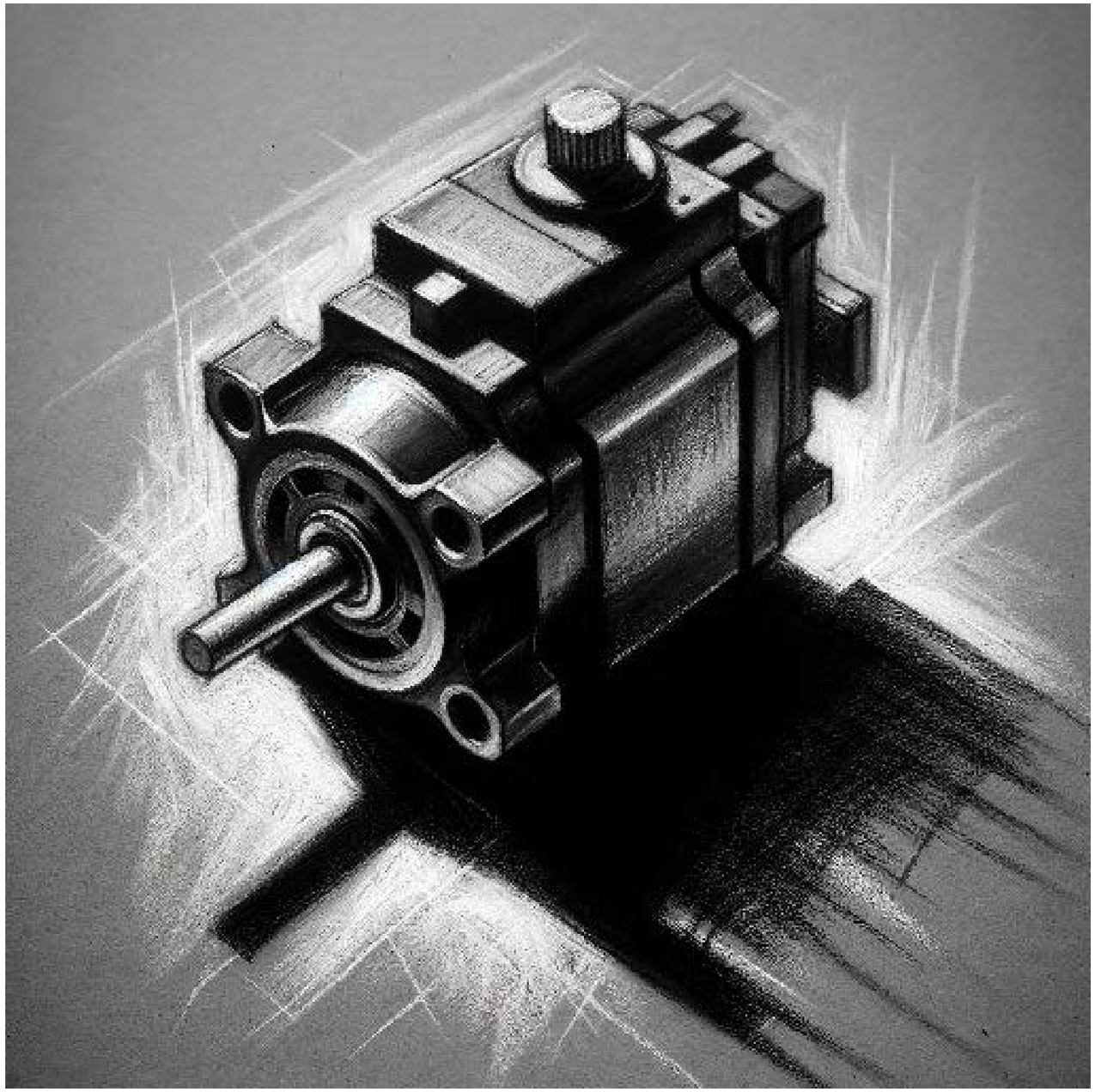
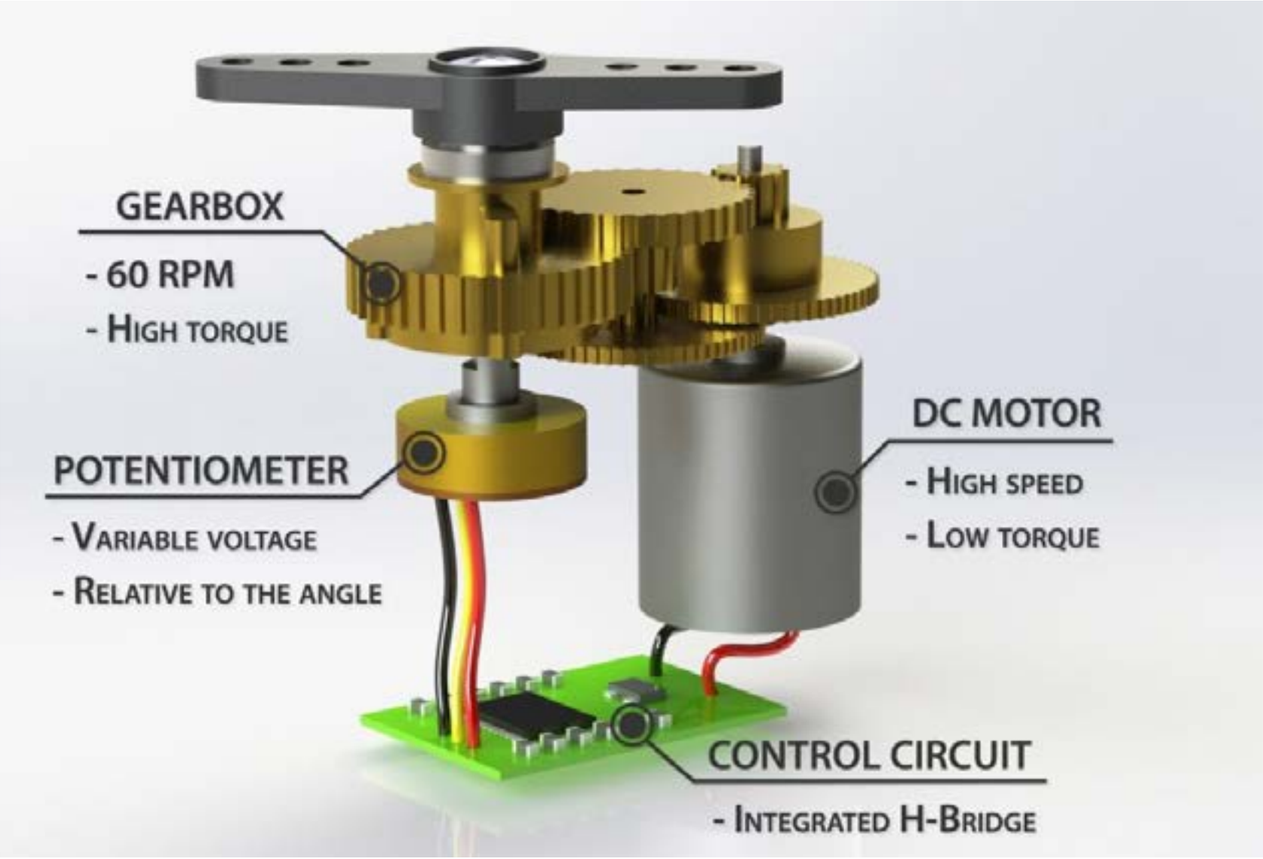
Physical Computing
Servos



Smart Servos Overview

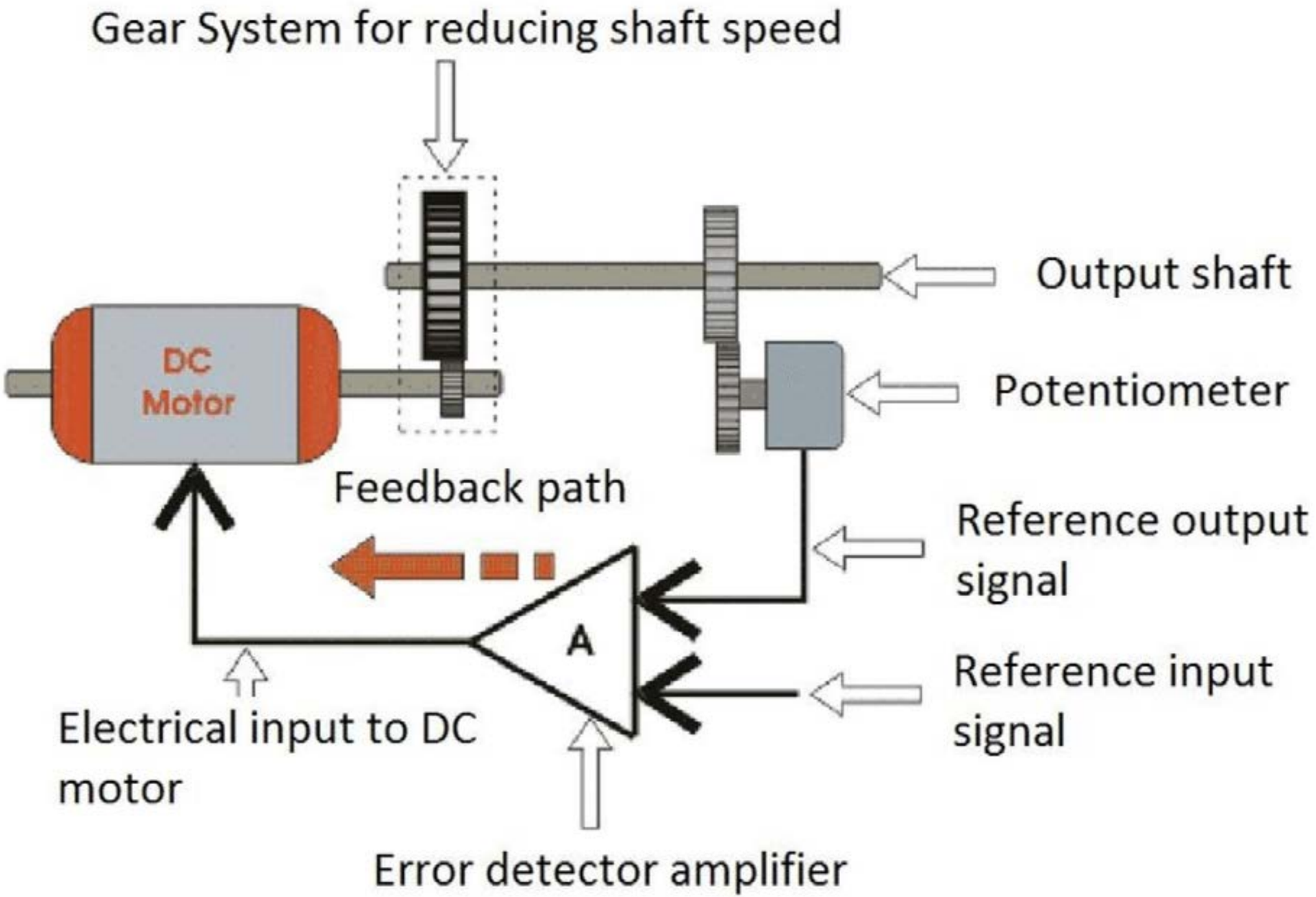
What are Servo Motors?

Working Principle

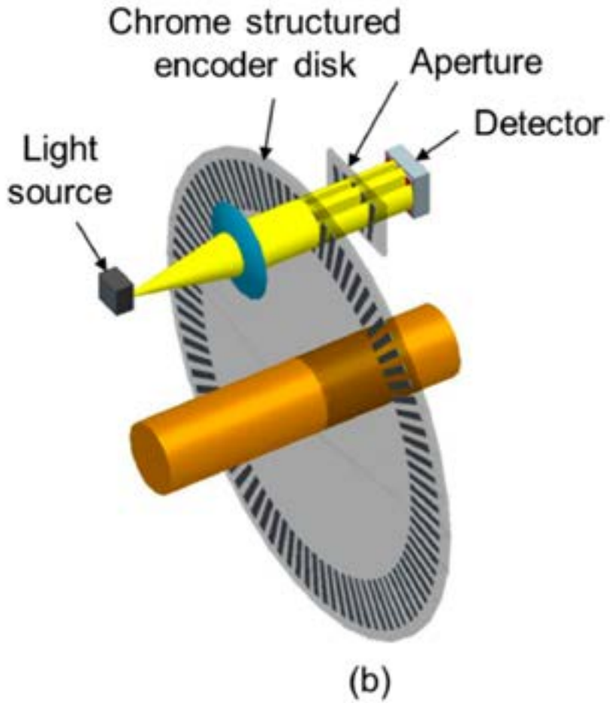


Motor with **closed loop** position controler

Required Connections:
+ Voltage
GND
Signal


Gear System for reducing shaft speed
Output shaft
DC Motor
Potentiometer
Feedback path
Reference output signal
A
Reference input signal
Electrical input to DC motor
Error detector amplifier

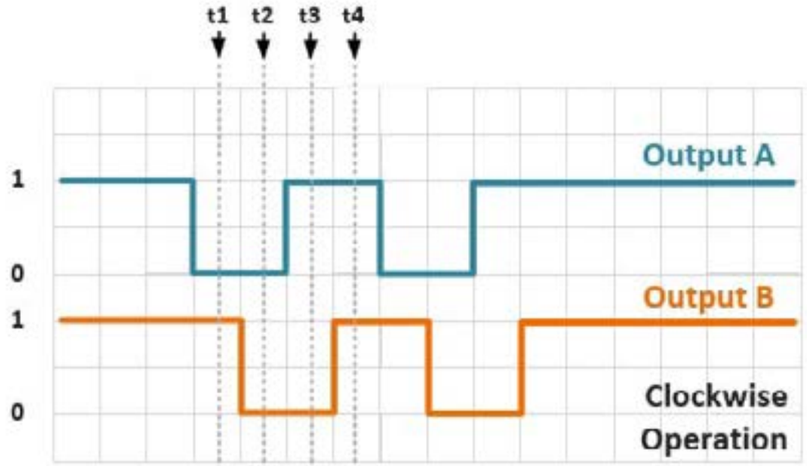
Working Principle



Feedback Sources

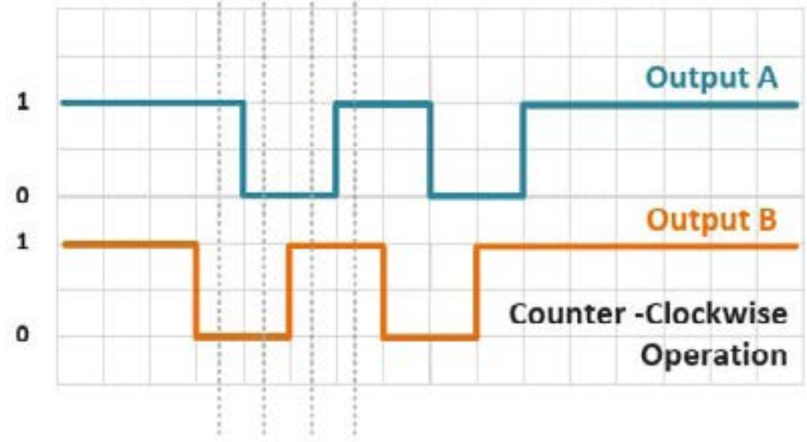
Working Principle

Encoder Signal



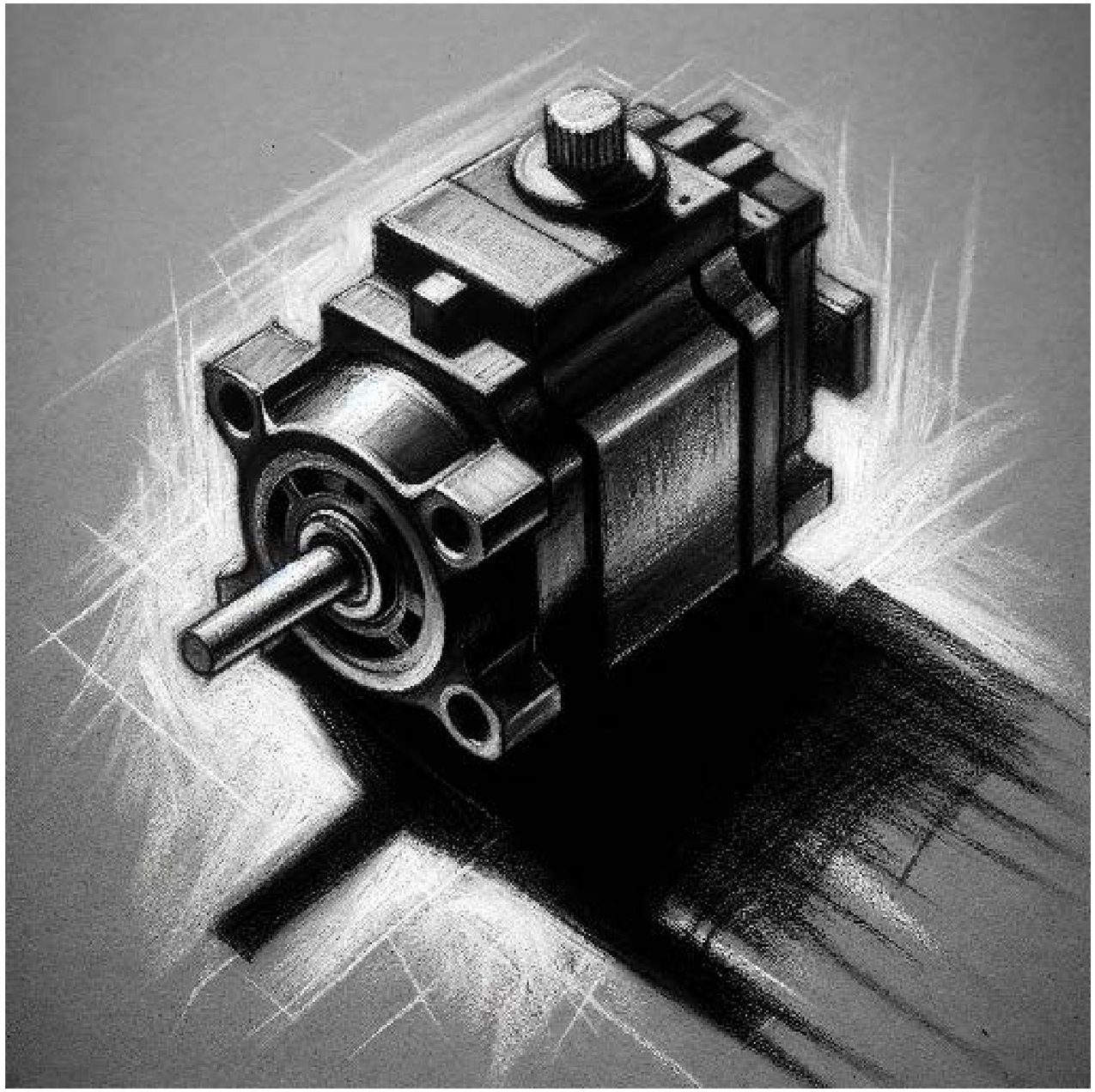
Clockwise Sequence

	A	B
t1	0	1
t2	0	0
t3	1	0
t4	1	1



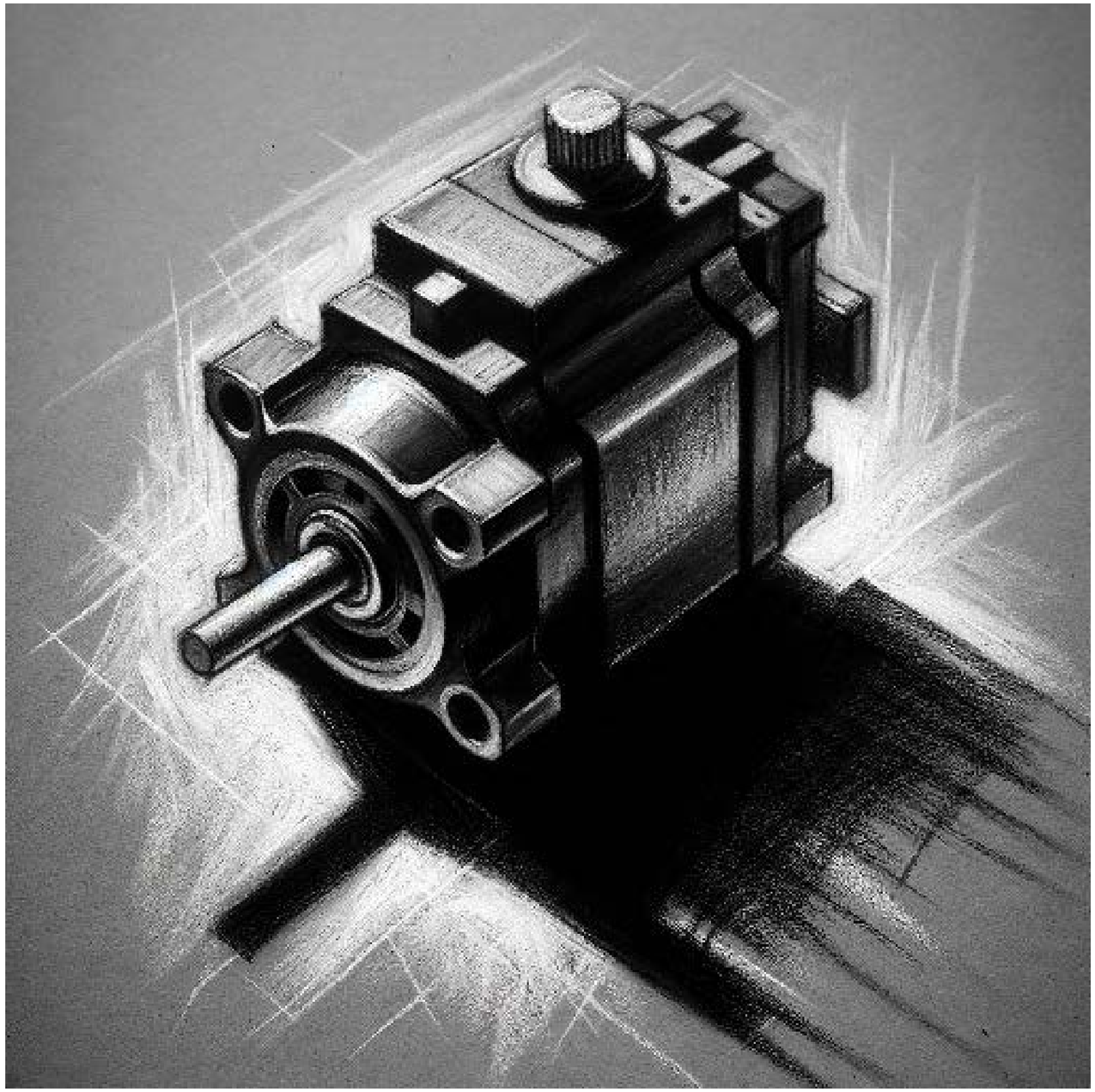
Counter-Clockwise Sequence

	A	B
t1	1	0
t2	0	0
t3	0	1
t4	1	1



Exercise 1

Make the servo sweep back and forth.



Hobby Servos

Reduced movement based on potentiometer as feedback source

RC-Vehicles
Small / Precise Movement

Exercise 1

```
1  //Basic Servo
2
3  #include <Servo.h>
4
5  Servo myservo;  // create servo object
6  int pos = 0;    // variable to store the servo position
7
8  void setup() {
9    myservo.attach(9);  // attaches the servo on pin 9 to the servo object
10 }
11
12 void loop() {
13   for (pos = 0; pos <= 180; pos += 1) { // goes from 0 degrees to 180 degrees
14     // in steps of 1 degree
15     myservo.write(pos);              // tell servo to go to position in variable 'pos'
16     delay(15);                       // waits 15ms for the servo to reach the position
17   }
18   for (pos = 180; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees
19     myservo.write(pos);              // tell servo to go to position in variable 'pos'
20     delay(15);                       // waits 15ms for the servo to reach the position
21   }
22 }
```