# BUILT-IN MOTOR SENSOR ENCODER

To have a better speed controlling, we can monitor speed of the motor RPM. Revolutions per minute (abbreviated rpm, RPM, rev/min, r/min). Thus, we need to have a feedback or sensor to sense shaft rotation

A motor encoder is a rotary encoder mounted to an electric motor that provides closed loop feedback signals by tracking the speed and/or position of a motor shaft. There are many types of motor encoder, this Incremental Encoders where the output is used to control the speed of a motor shaft.
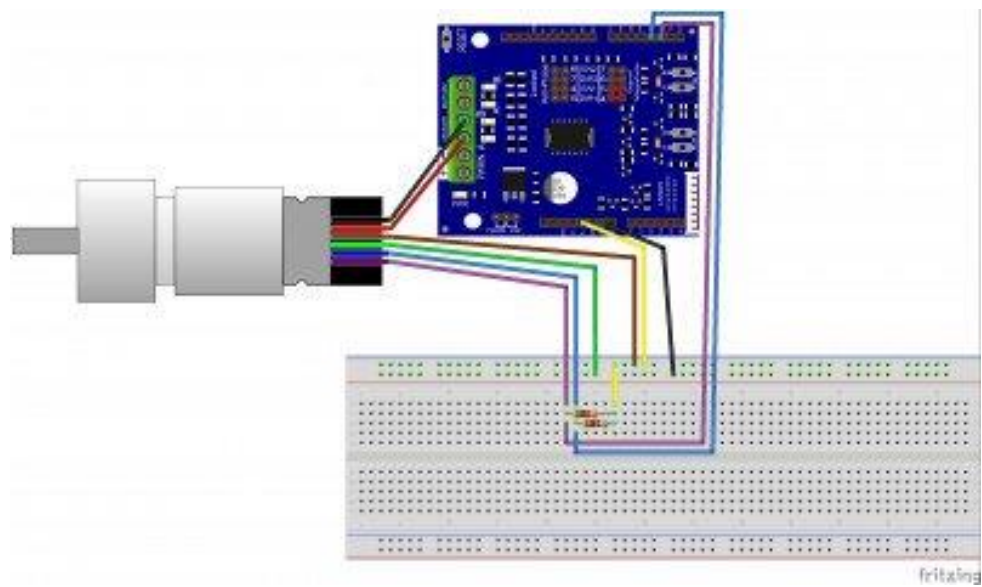
How rotary encoder works?
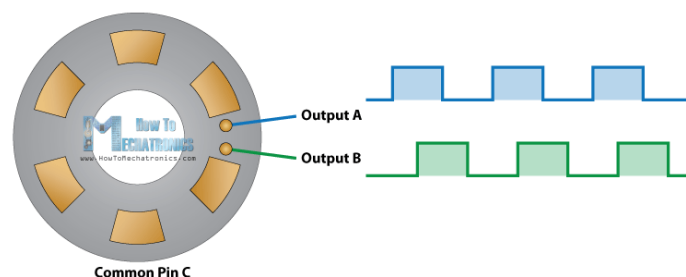
When the motor rotates the common Pin C part (the gold part) will intersect with output A and B sensor. So, when the sensors detect it will generate pulse. It can detect the speed by counting the number of pulse generate in a time. When pulse from sensor A generates first, it reflects that the motor is moving in clockwise, while if pulse from sensor B generates first, the motor is rotate in counter clockwise.

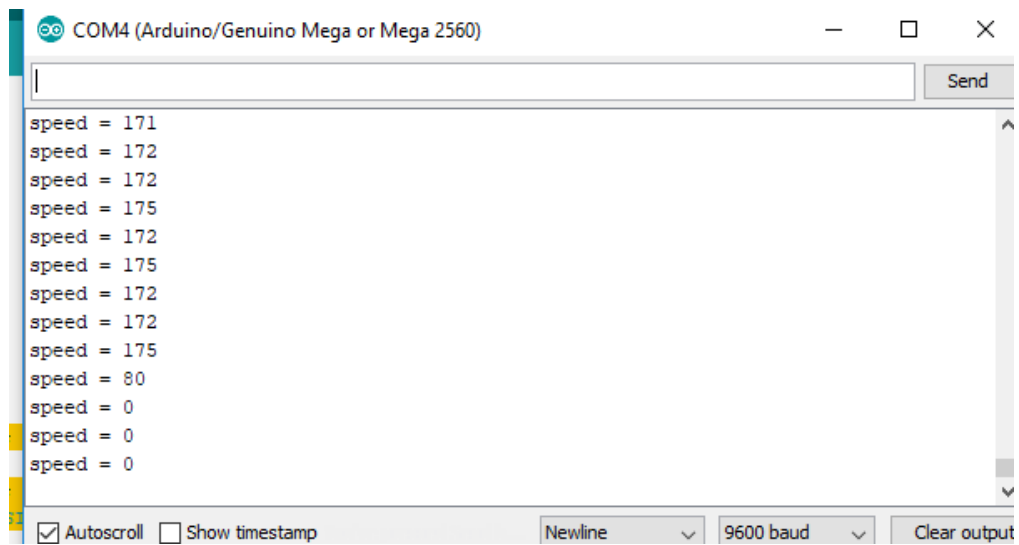**Pinout diagram**
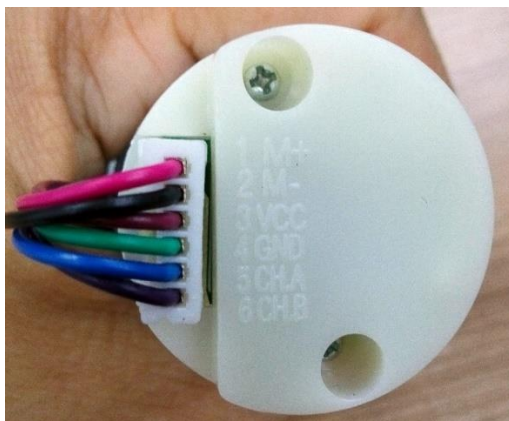
Pin	Name	Description
1	Motor -	Output of motor driver
2	Motor +	Output of motor driver
3	Hall effect sensor Vcc	Supply voltage for sensor circuit (4.5V-5.5V)
4	Hall effect sensor GND	Ground
5	Channel A	Output of the encoder
6	Channel B	Output of the encoder

Connection diagram

Sample output


```
COM4 (Arduino/Genuino Mega or Mega 2560)                    —    □    ✕

|                                                              [ Send ]

speed = 171
speed = 172
speed = 172
speed = 175
speed = 172
speed = 175
speed = 172
speed = 172
speed = 175
speed = 80
speed = 0
speed = 0
speed = 0

☑ Autoscroll  ☐ Show timestamp        Newline ∨   9600 baud ∨   Clear output
```

Coding sample

```
#define encoder0PinA  2
#define encoder0PinB  3
volatile long encoder0Pos=0;
long newposition;
long oldposition = 0;
unsigned long newtime;
unsigned long oldtime = 0;
long vel;
void setup()
{
  pinMode(encoder0PinA, INPUT);
  digitalWrite(encoder0PinA, HIGH);       // turn on pullup resistor
  pinMode(encoder0PinB, INPUT);
  digitalWrite(encoder0PinB, HIGH);       // turn on pullup resistor
  attachInterrupt(0, doEncoder, RISING);  // encoDER ON PIN 2
  Serial.begin (9600);
  Serial.println("start");             // a personal quirk
}
void loop()
{
newposition = encoder0Pos;
newtime = millis();
vel = (newposition-oldposition) * 1000 /(newtime-oldtime);
Serial.print ("speed = ");
Serial.println (vel);
oldposition = newposition;
oldtime = newtime;
delay(250);
}
void doEncoder()
{
  if (digitalRead(encoder0PinA) == digitalRead(encoder0PinB)) {
    encoder0Pos++;
  } else {
    encoder0Pos--;
  }
}
```