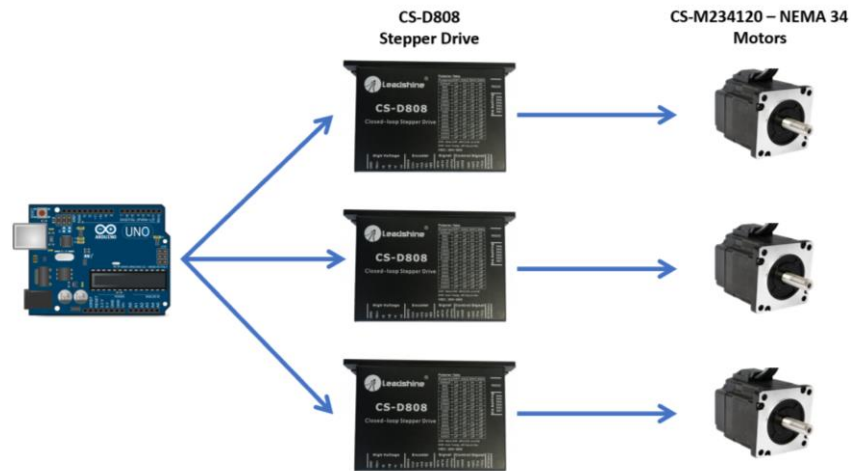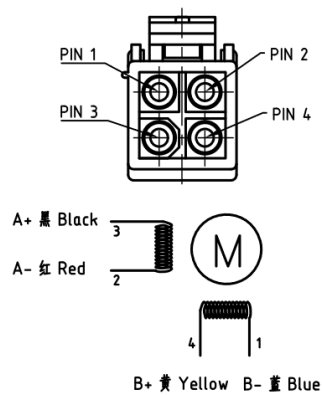## Motors and Drivers Connections

In order to use three industrial stepper motor (CS-M234120 – NEMA 34) in a robotic arm, three stepper drivers (CS-D808) have to be used and connected to the controller as shown below:
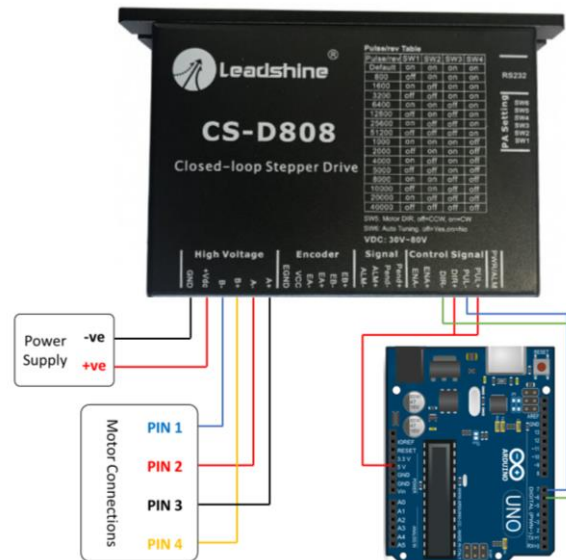

In each motor, there are 4 pins for the power connection as shown below:

So, the following figure shows how to connect each motor with its driver and to the controller:

The encoder part is optional depends on the complexity of the project and if the position or the speed is necessary to be determined. CS-M234120 – NEMA 34 stepper motor has an attached encoder with 6 pins that can be connected to the driver as following:

Encoder Signals
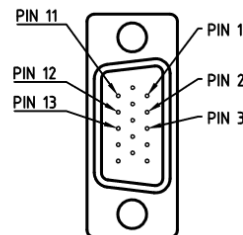
PIN	1	2	3	11	12	13
Color	BLK	RED	WHT	YEL	GRN	BLU
Define	A+	VCC	GND	B+	B–	A–

Selecting Supply Voltage

Higher supply voltage will allow higher motor speed to be achieved, at the price of more noise and heating. If the motion speed requirement is low, it's better to use lower supply voltage to decrease noise, heating and improve reliability. The CS-D808 is designed to operate within 30-80VDC voltage input. On this report the used voltage source is **48 VDC**, which is the typical value for the CS-D808 driver.

DIP Switch Configurations

The CS-D808 has a built-in 8-bit DIP switch to set microstep resolution, motor direction, auto tuning switch and so on. In order to set the configuration of the DIP switch, the PA setting on the driver has to be changed depends on the following standards.
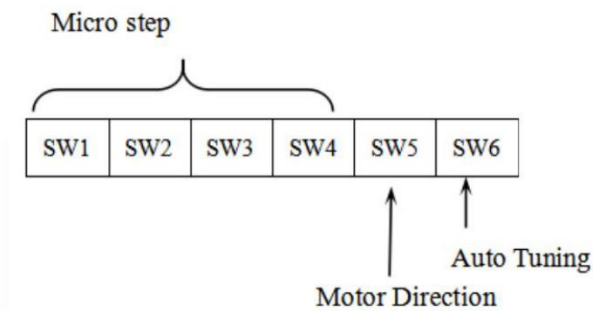
The number of steps by revolution is set by SW1, 2, 3, 4. For example, as shown in the following table:

Steps/Revolution	SW1	SW2	SW3	SW4
800	off	on	on	on
1600	on	off	on	on
3200	off	off	on	on
6400	on	on	off	on
12800	off	on	off	on

The rest of the table is available in the datasheet (Page 9).

For the other DIP switch settings. **SW5** is used for setting the default direction of the motor, On for CW (clockwise), and Off for CCW (counterclockwise). On the other hand, **SW6** is used to enable the Auto Tuning, On for No, Off for Yes.

On this report, 800 steps per revolution, clockwise is the default direction, with enabling the auto tuning feature. So, the PA setting is: 011110 or (off-on-on-on-on-on-off).

Robotic Arm Algorithm

One stepper test:

```
// Defin pins

int driverPUL = 7;   // PUL- pin
int driverDIR = 6;   // DIR- pin

// Variables

int pd = 500;      // Pulse Delay period
boolean setdir = LOW; // Set Direction


void setup() {

 pinMode (driverPUL, OUTPUT);
 pinMode (driverDIR, OUTPUT);

}

void loop() {

  digitalWrite(driverDIR,setdir);
  digitalWrite(driverPUL,HIGH);
  delayMicroseconds(pd);
  digitalWrite(driverPUL,LOW);
  delayMicroseconds(pd);
  setdir = !setdir;  //reverse the direction

}
```

Sources

http://www.leadshineusa.com/UploadFile/Down/CS-D808%20&%20CS-D1008_m_v3.1.pdf

https://www.youtube.com/watch?v=iY_4YOlpqyI&feature=youtu.be