

# SR4-Plus

## 2 Phase Step Motor Drive



User Manual  
Rev. 1.1

AMP & MOONS' Automation

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## 1 Introduction

Thank you for selecting the MOONS' SR4-Plus Motor Drive. We hope our commitment to performance, quality and economy will make a successful motion control project.

### 1.1 Overview

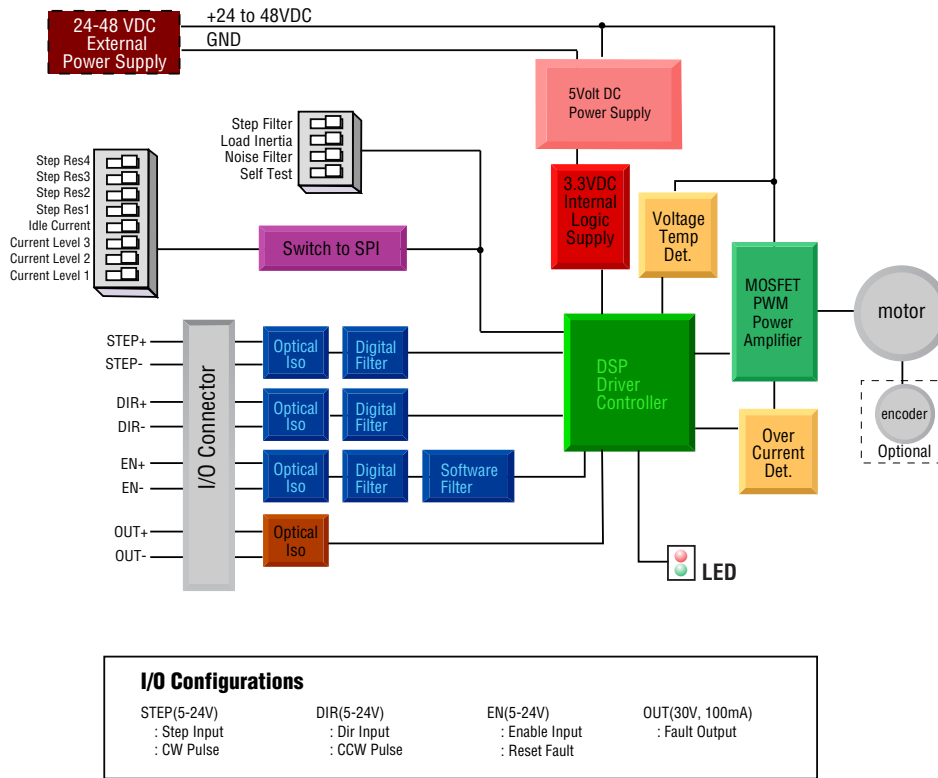
The SR series drives are cost-effective, high performance 2 phase step drives. The design is based on advanced digital current control technology, and features high torque, low noise, and low vibration. The running current and microstep resolution are switch selectable.

### 1.2 Features

- Power Supply - operates from a 24 to 48 volt DC power supply
- Output Power - position switch selectable, 8 settings, max 4.5 amps peak
- Current Control - advanced digital current control provides excellent high speed torque
- Microstep Resolution - position switch selectable, 16 settings: 200, 400, 800, 1600, 3200, 6400, 12800, 25600, 1000, 2000, 4000, 5000, 8000, 10000, 20000, 25000 step/rev
- Speed Range - speeds up to 3000 rpm
- Anti Resonance - raises the system-damping ratio to eliminate midrange instability and allow stable operation throughout the speed range of the motor.
- Auto Setup - measures motor parameters and configures motor current control and anti-resonance gain settings
- Microstep Emulation - performs high resolution stepping by synthesizing coarse steps into fine micro-steps
- Control Modes - Step & Direction or CW/CCW pulse
- Input Digital Filters - 2 MHz digital filter for high speed inputs
- Motor Type Select - a 16 bit rotary switch is used to select the desired motor database which is pre-loaded at the Factory
- Load Inertia Select - as part of the motor database each motor can be selected for use with low or high load inertia.
- Idle Current - switch selectable for 50% or 90% idle running current reduction 1 second after the motor stops
- Self Test - switch selectable, the drive will perform a 2 rev, 1 rps, CW/CCW move test

### 1.3 Block diagram

**SR4-Plus**  
Block Diagram



## 2 Mounting the Drive

The SR4-Plus Step Drive can be mounted on the wide or the narrow side of the chassis. If it is mounted on the wide side, M3 screws should be used through the four corner holes. For narrow side mounting applications, M3 screws can be used in the two side holes.

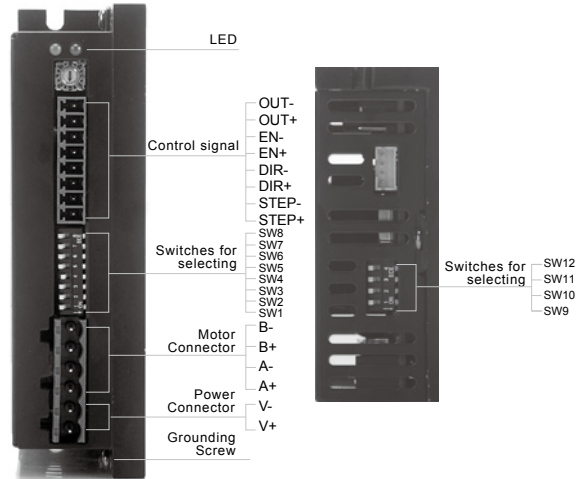
The amplifiers in the drive generate heat. To operate the drive continuously at maximum power forced air cooling, as from a fan, should be provided.

Never use the drive in a space where there is no air flow or where other devices can cause the surrounding air to be more than 40 °C. Never put the drive where it can get wet or where metal particles can fall into it.

### 3 Connections

To use the SR4-Plus Step Drive, the following items are needed:

- A power supply (24 - 48 VDC)
- Pulse & Direction signal
- A compatible step motor



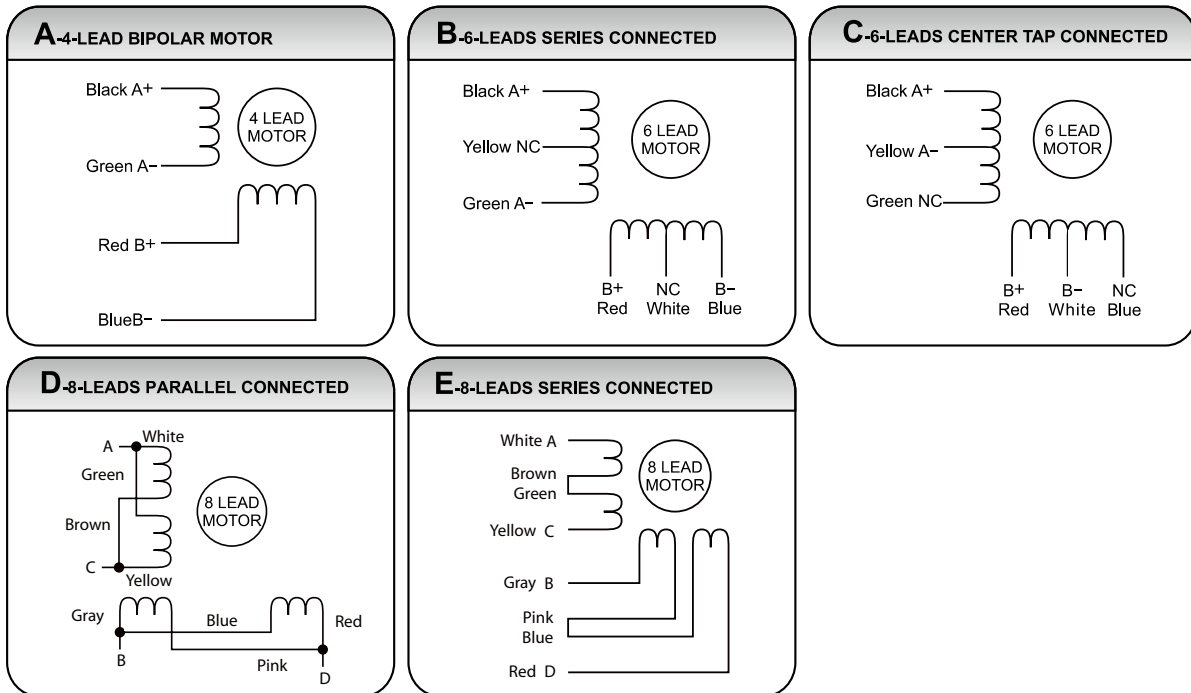
#### 3.1 Connecting to the Power Supply

If the power supply does not have a fuse on the output or some kind of short circuit current limiting device, a fast acting fuse is required. A 4 amp fast acting fuse should be installed in line with the “+” power supply lead.

Connect the motor power supply “+” terminal to the drive terminal labeled “V+”. Connect the power supply “-” to the drive terminal labeled “V-”.

**Be careful not to reverse the wires.**

#### 3.2 Connecting to a Motor

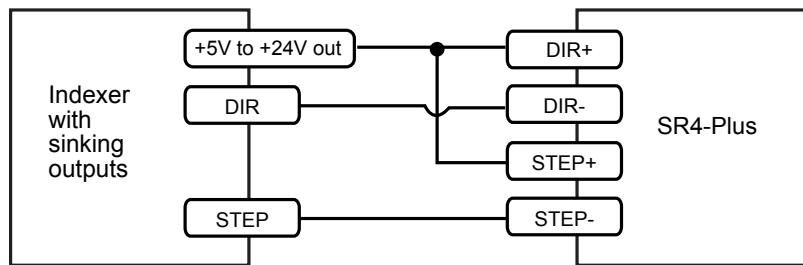


### 3.3 Connecting to the Inputs

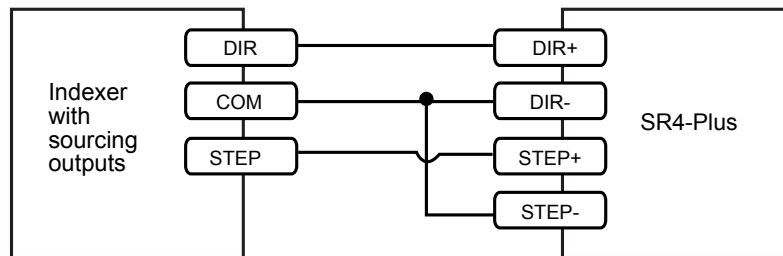
#### 3.3.1 High Speed Digital Inputs

The SR4-Plus drives include two high-speed inputs called STEP and DIR. They accept 5 to 24 volt single-ended or differential signals, up to 2 MHz. Typically these inputs connect to an external controller that provides step & direction command signals. You can also connect a master encoder to the high-speed inputs for “following” applications. Or you can use these inputs with Wait Input, If Input, Feed to Sensor, Seek Home and other such commands.

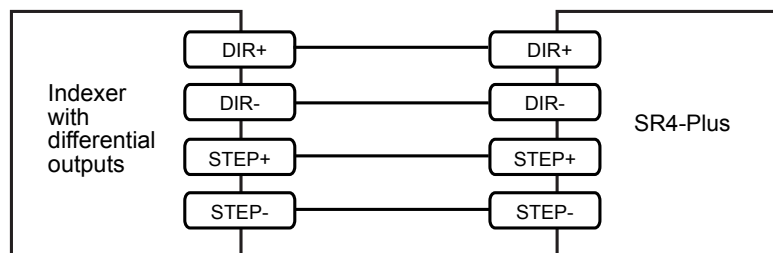
Connection diagrams follow:



Connecting to indexer with sinking outputs



Connecting to indexer with sourcing outputs



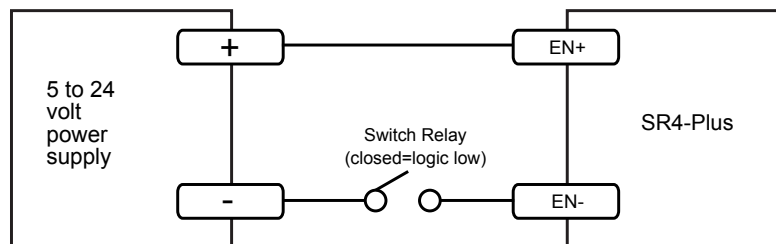
Connecting to indexer with differential outputs  
Many high speed indexers have differential outputs

### 3.3.2 The Enable (EN) Digital Input

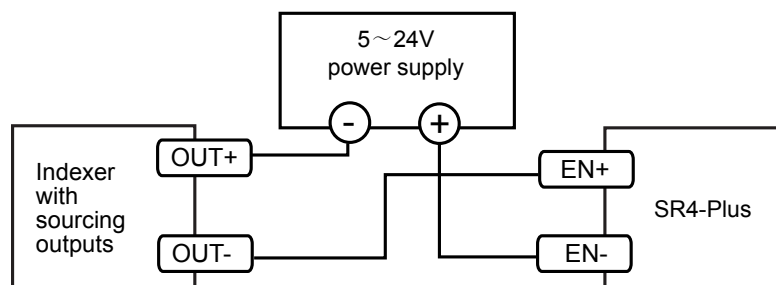
The EN input enables or disables the drive amplifier. It is an optically isolated input that accepts a 5 to 24 volt single-ended or differential signal. The maximum voltage that can be applied to the input is 28V.

When EN input is closed, the driver amplifier is deactivated, all the MOSFETs will shut down, and the motor will be free. When EN input is open, the drive is activated.

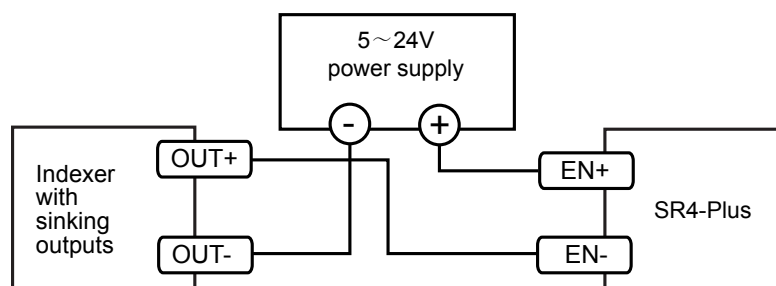
When the drive has encountered an error and the fault is removed from system, a falling signal into the EN input will reset the error status and activate the drive amplifier again.



Connecting the input to a switch or relay



Connecting the input to sourcing outputs

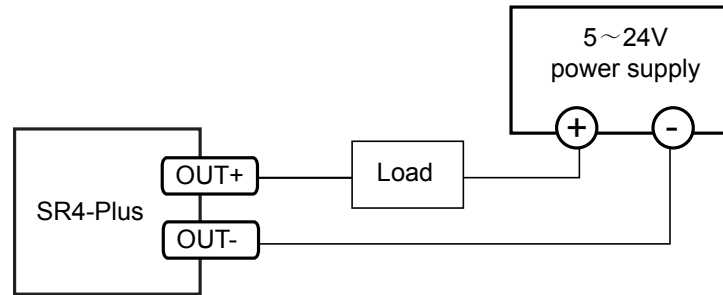


Connecting the input to sinking outputs

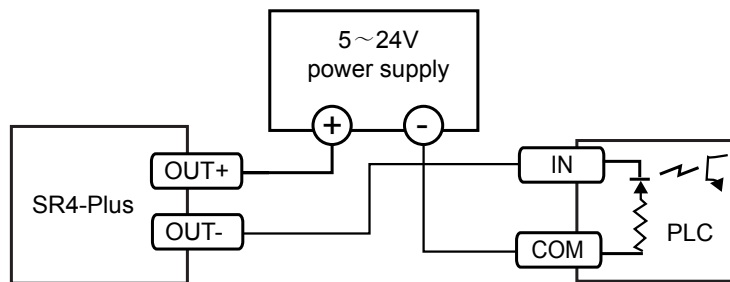
### 3.3.3 Programmable Output

The FAULT Output is optically isolated. The maximum collector current is 100mA, and the maximum collector to emitter voltage is 30 volts. The output can be wired to sink or source current.

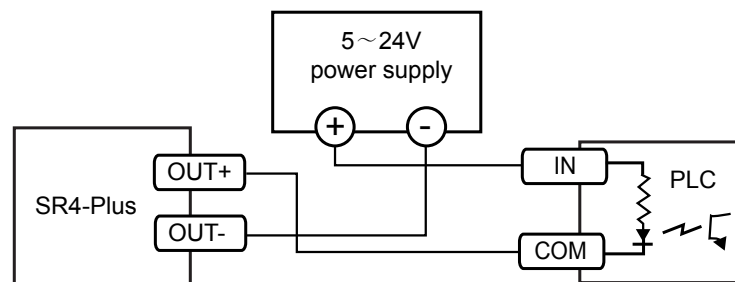
When drive is working normally, the output is open. When the drive encounters an error, the output closes.



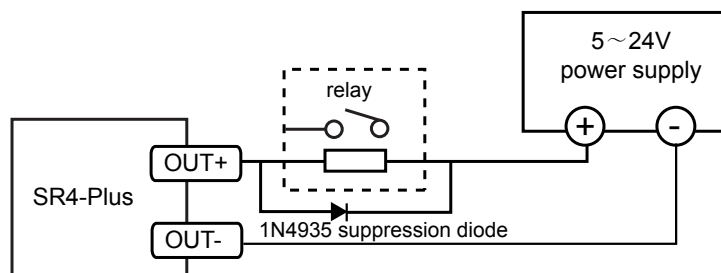
Connecting a sinking output



Connecting a sourcing output



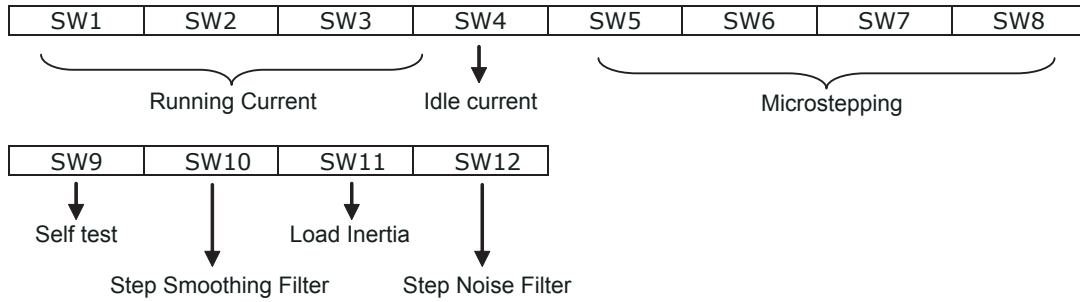
Connecting a sourcing output again



Driving a relay



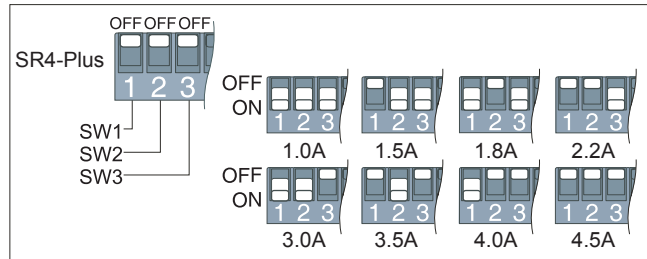
## 4 Switch Selection



### 4.1 Running Current

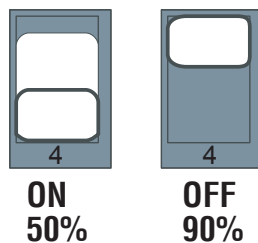
The output current of the SR4-Plus Step Drive is set by the **SW1**, **SW2**, and **SW3** switches and can be changed as necessary. There are 8 settings available according to the ON/OFF combination of the switches.

Peak	SW1	SW2	SW3
1A	ON	ON	ON
1.5A	OFF	ON	ON
1.8A	ON	OFF	ON
2.2A	OFF	OFF	ON
3.0A	ON	ON	OFF
3.5A	OFF	ON	OFF
4.0A	ON	OFF	OFF
4.5A	OFF	OFF	OFF



### 4.2 Idle Current

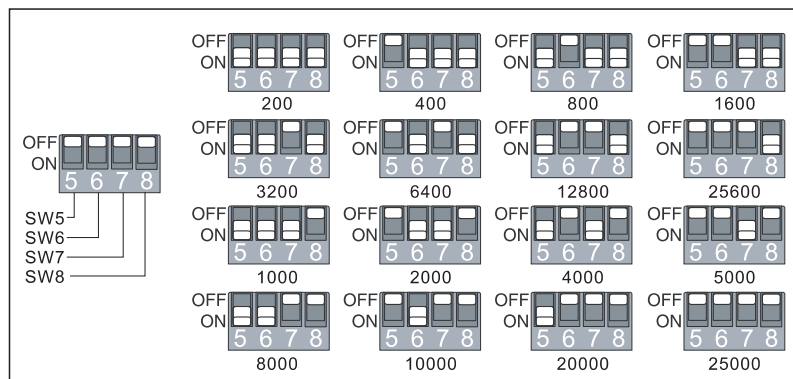
The running current of the SR4-Plus drive is automatically reduced anytime the motor isn't moving. Setting the **SW4** switch to ON reduces the current to 50% of its running value. Setting this switch to OFF maintains 90% of the running current. This 90% setting is useful when a high holding torque is required. To minimize motor and drive heating it is highly recommended that the idle current reduction feature be set to 50% unless the application requires the higher setting.



### 4.3 Microstepping

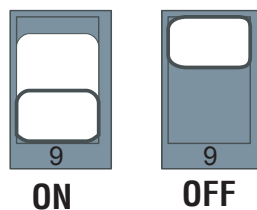
The microstep resolution is set by the **SW5**, **SW6**, **SW7** and **SW8** switches. There are 16 settings.

Microstep(steps/rev)	SW5	SW6	SW7	SW8
200	ON	ON	ON	ON
400	OFF	ON	ON	ON
800	ON	OFF	ON	ON
1600	OFF	OFF	ON	ON
3200	ON	ON	OFF	ON
6400	OFF	ON	OFF	ON
12800	ON	OFF	OFF	ON
25600	OFF	OFF	OFF	ON
1000	ON	ON	ON	OFF
2000	OFF	ON	ON	OFF
4000	ON	OFF	ON	OFF
5000	OFF	OFF	ON	OFF
8000	ON	ON	OFF	OFF
10000	OFF	ON	OFF	OFF
20000	ON	OFF	OFF	OFF
25000	OFF	OFF	OFF	OFF



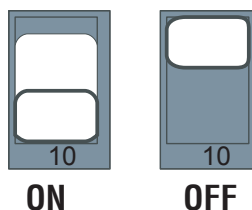
### 4.4 Self Test

Setting switch **SW9** to ON after the drive is powered up will cause the drive to perform a self test move of 2 revolutions both CW and CCW at 1rps. Setting switch SW9 to OFF disables this feature.



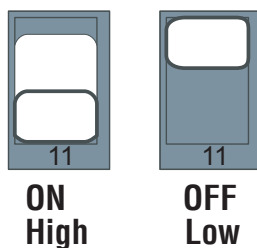
## 4.5 Step Smoothing Filter

Setting switch **SW10** to ON selects this function; setting it to OFF will disable it. Command signal smoothing can soften the effect of immediate changes in velocity and direction, making the motion of the motor less jerky. An added advantage is that it reduces wear on mechanical components. This function can cause a short delay in following the control signal, and should be used with that in mind.



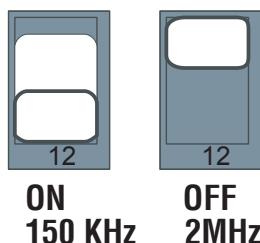
## 4.6 Load Inertia

Switch **SW11** selects the load inertia. Set it to ON for high inertia applications and to OFF for low inertia applications. The load inertia selection can help the SR4-Plus drive to calculate the current control parameter, which is used in Anti-Resonance. If the load inertia is close to that of the motor rotor, select the low (OFF) setting. If the load inertia is higher than that of the motor rotor, select the high (ON) setting.



## 4.7 Step Noise Filter

Switch **SW12** sets the digital signal filter. The STEP and DIR signal inputs have built-in digital filters and this setting will reduce external noise. If the system works on the low microstep, select the 150 KHz (ON) setting. If the system works on the high microstep, select the 2 MHz (OFF) setting.



## 5 Motor Selection

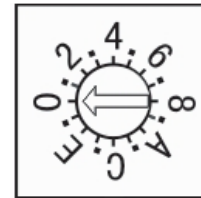
Each position of the 16-bit rotary switch selects a different motor, and automatically sets the configuration parameters in the drive. The SR4-Plus drive comes programmed with up to 8 typical motors as factory defaults. Drives can be customized with specially selected motors when required.

The rotary switch also selects a low or high inertia for each motor to allow for various load conditions. The low setting is 1:1, and the high setting is 10:1. Each motor in the loaded database has unique settings to optimize the anti-resonance. See the table below.

**When the motor selection is changed, the drive power supply will need to be cycled.**

**Motor selections ending in L are for low inertia and those ending in H are for high inertia.**

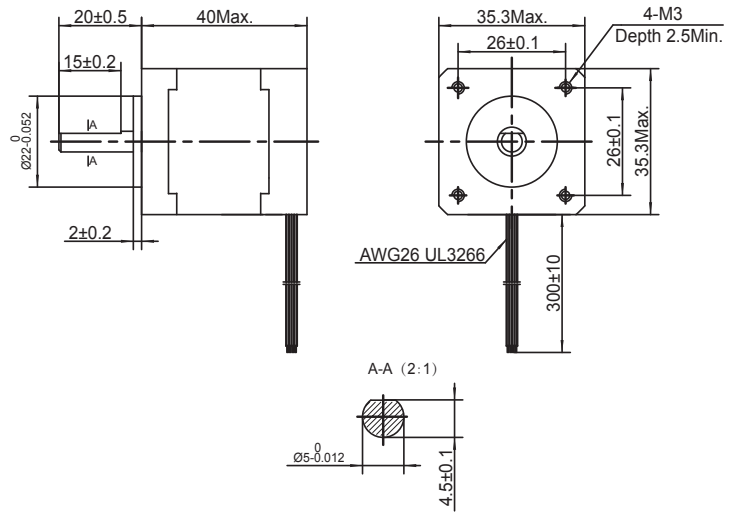
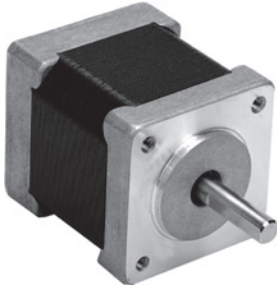
Switch Bit	SR4-Plus
0	NC
1	14HYB401
2	17HD4452
3	17HD2438
4	17HD6426
5	17HDB401
6	23HS0421
7	23HS2450
8	23HS3455
9	24HS2402
A	24HS5401
B	34HD0403
C	34HD4405
D	NC
E	NC
F	NC



### 5.1 Recommended motors

#### 14HY Series 1.8°

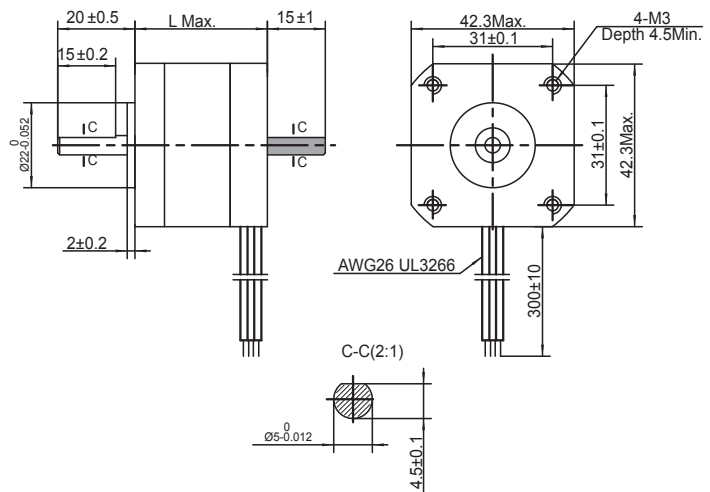
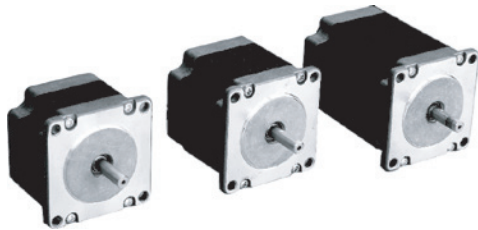
##### Parameters



##### Parameters

PART#	SHAFT	WIRING DIAG	#OF LEADS	LENGTH	HOLDING TORQUE	CURRENT	OHMS	ROTOR INERTIA	MOTOR WEIGHT
				mm	N·m	A/PHASE	Ω/PHASE	g·cm <sup>2</sup>	Kg
14HYB401-03	Single Shaft	A	4	40.0	0.2	1.0	4.3	20.0	0.21

#### 17HD Series 1.8°

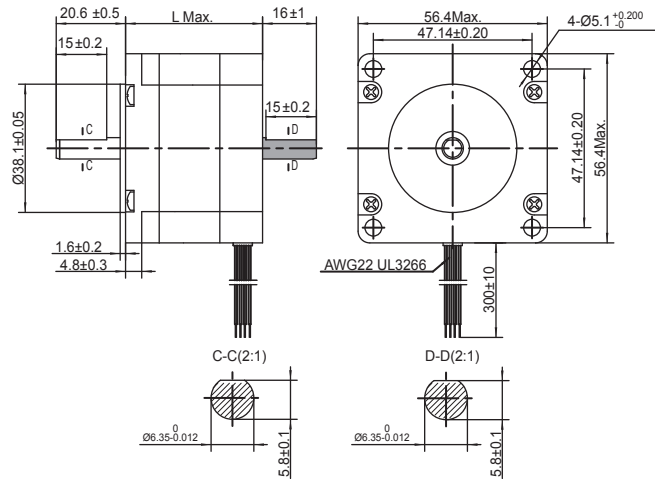
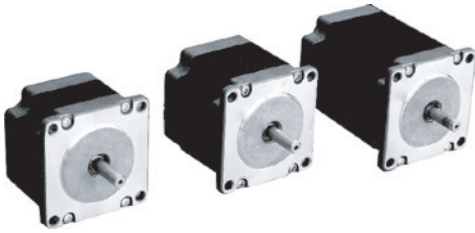


■ These dimensions are for the double shaft models. For the single shaft models, ignore the shadow (■) area.

##### Parameters

PART#	SHAFT	WIRING DIAG	#OF LEADS	LENGTH	HOLDING TORQUE	CURRENT	OHMS	ROTOR INERTIA	MOTOR WEIGHT
				mm	N·m	A/PHASE	Ω/PHASE	g·cm <sup>2</sup>	Kg
17HD4452-02N	Single Shaft	A	4	34.3	0.25	1.8	1.5	38.0	0.23
17HD4452-01N	Double Shaft								
17HD2438-02N	Single Shaft			39.8	0.4	1.8	1.9	57.0	0.28
17HD2438-01N	Double Shaft								
17HD6426-06N	Single Shaft			48.3	0.5	1.8	2.3	82.0	0.36
17HD6426-05N	Double Shaft								

**23HS Series 1.8°**

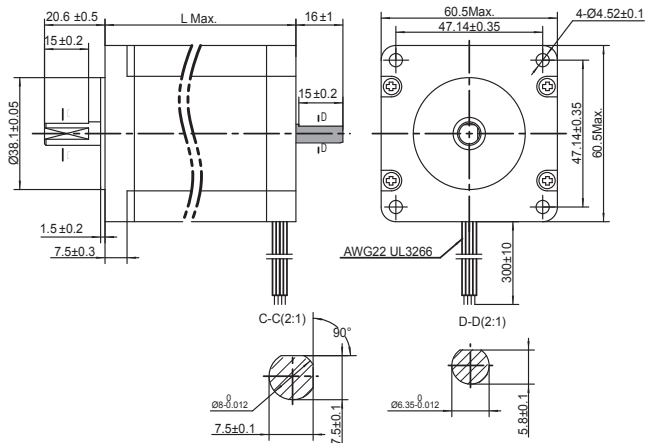
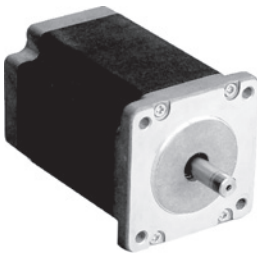


■ These dimensions are for the double shaft models. For the single shaft models, ignore the shadow ( ) area.

**Parameters**

PART#	SHAFT	WIRING DIAG	#OF LEADS	LENGTH	HOLDING TORQUE	CURRENT	OHMS	ROTOR INERTIA	MOTOR WEIGHT
				mm	N·m	A/PHASE	Ω/PHASE	g·cm <sup>2</sup>	Kg
23HS0421-01	Single Shaft	A	4	41.0	0.6	2.2	1.8	135.0	0.42
23HS0421-02	Double Shaft			54.0	1.2	2.2	2.4	260.0	0.6
23HS2450-01	Single Shaft			76.0	1.8	2.2	2.9	460.0	1.0
23HS2450-02	Double Shaft			41.0	0.6	4.5	0.48	135.0	0.42
23HS3455-01	Single Shaft			54.0	1.2	4.5	0.63	260.0	0.6
23HS3455-02	Double Shaft			76.0	1.8	4.5	0.75	460.0	1.0

**24HS Series 1.8°**



■ These dimensions are for the double shaft models. For the single shaft models, ignore the shadow ( ) area.

**Parameters**

PART#	SHAFT	WIRING DIAG	#OF LEADS	LENGTH	HOLDING TORQUE	CURRENT	OHMS	ROTOR INERTIA	MOTOR WEIGHT
				mm	N·m	A/PHASE	Ω/PHASE	g·cm <sup>2</sup>	Kg
24HS2402-08N	Single Shaft	A	4	54.0	1.2	4.5	0.43	450.0	0.83
24HS5401-10N	Single Shaft			85.0	2.5	4.5	0.65	900.0	1.4
24HS5401-24N	Double Shaft								

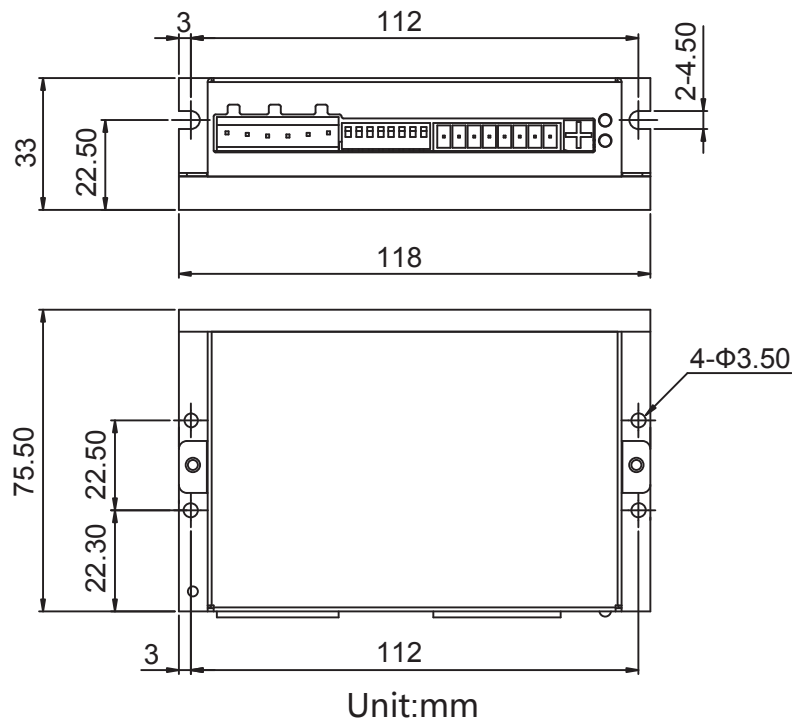
## 6 Error Codes

The SR4-Plus Step Drive has one bicolor (red/green) LED to indicate status. When the motor is enabled, the green LED flashes slowly. When the green LED is solid, the motor is disabled. If the red LED flashes, an error has occurred. Errors are indicated by a combination of red and green flashes as follows:

	Code	Error
●	Solid green	no alarm, motor disabled
● ●	Flashing green	no alarm, motor enabled
● ● ● ● ●	3 red, 1 green	drive over heating
● ● ● ● ● ● ●	3 red, 2 green	internal voltage out of range
● ● ● ● ● ● ● ● ●	4 red, 1 green	power supply over voltage
● ● ● ● ● ● ● ● ● ● ●	4 red, 2 green	power supply under voltage
● ● ● ● ● ● ● ● ● ● ● ● ●	5 red, 1 green	Over current/short circuit
● ● ● ● ● ● ● ● ● ● ● ● ● ● ●	6 red, 1 green	Open motor winding

## 7 Reference Materials

### 7.1 Mechanical Outline



## 7.2 Specifications

### 7.2.1 Electrical Specifications

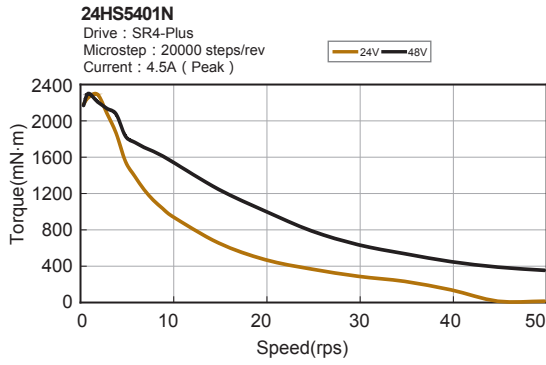
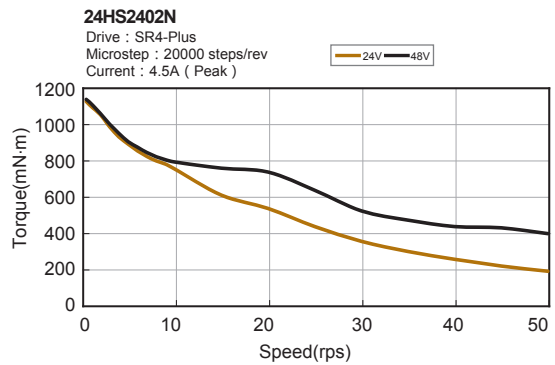
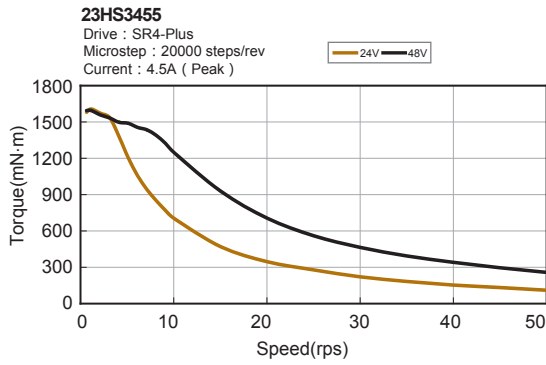
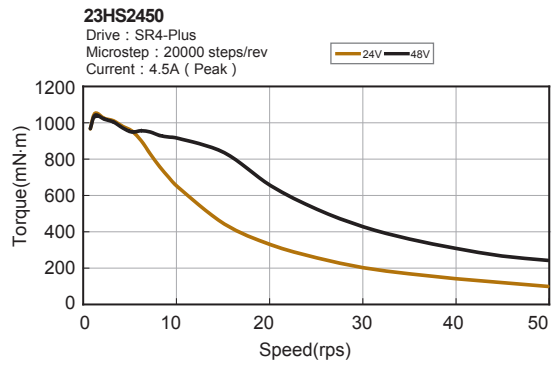
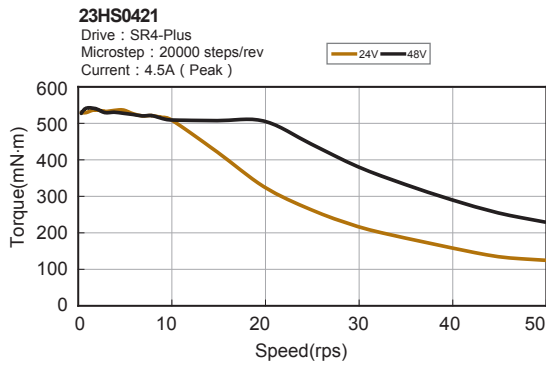
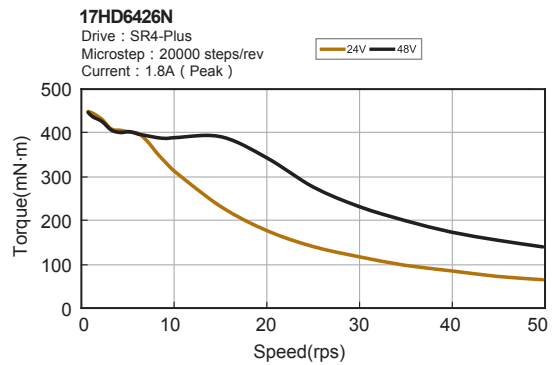
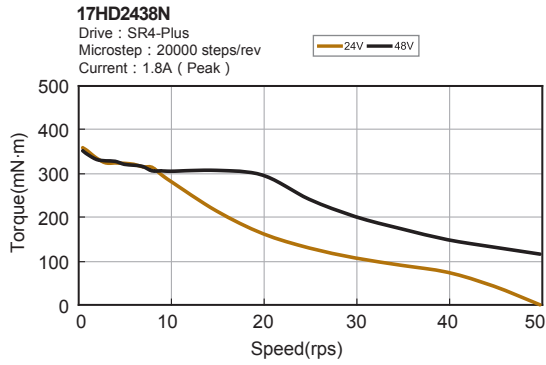
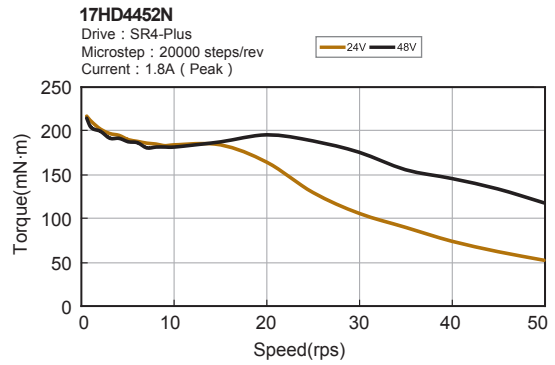
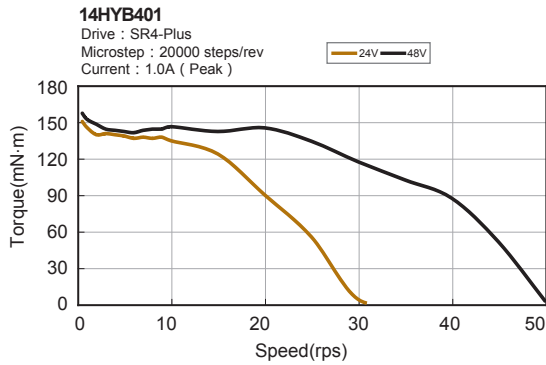
Parameter	Min.	Typ.	Max.	Unit
Power Supply	24	-	48	VDC
Output Current (Peak)	1.0	-	4.5	amps
Step Frequency	2	-	2M	Hz
STEP Minimum Pulse Width Hi and Low	250	-	-	ns
DIR Minimum Pulse Width	62.5	-	-	us
Under Voltage Protection	-	20	-	VDC
Over Voltage Protection	-	60	-	VDC
STEP/DIR Input Signal Voltage	4.0	-	28	VDC
OUT mximum output current	-	-	100	mA
OUT maximum voltage	-	-	30	V

### 7.2.2 Environmental Specifications

Heat Sinking Method	Natural cooling or fan-forced cooling
Surrounding Air Conditions	Avoid dust, oily mist and corrosive air
Operating Temperature	0 - 40°C (32 - 104°F)
Maximum Ambient Humidity	90% non-condensing
Shock	5.9m/s <sup>2</sup> maximum
Storage Temperature	-10 - 70°C (14 - 158°F)



### 7.3 Torque Curves



## 8 Contacting MOONS'



### ■ Headquarters

No. 168 Mingjia Road Industrial Park North Minhang District Shanghai 201107, P.R. China  
Tel: +86(0)21-52634688  
Fax: +86(0)21-62968682  
E-mail: info@moons.com.cn

### ■ MOONS' Industries (Europe) S.r.l.

Via Torri Bianche n.1 20059 Vimercate(MB) Italy  
Tel: +39 039 62 60 521  
Fax: +39 039 96 31 409

### ■ MOONS' Industries (South-East Asia) Pte Ltd.

33 Ubi Avenue 3 #08-23 Vertex Singapore 408868  
Tel: +65 6634 1198  
Fax: +65 6634 1138

### ■ Shenzhen Branch Office

Room 2209, 22/F, Kerry Center, No. 2008 Renminnan Road Shenzhen 518001 P. R.China  
Tel: +86 (0)755 25472080  
Fax: +86 (0)755 25472081

### ■ Beijing Branch Office

Room 202, Unit 2, 7th Building, Huilongsen International Science & Technology Industry Park,  
No.99, Kechuang 14th  
Street, Beijing 101111 P. R.China  
Tel: +86 (0)10 59755578  
Fax: +86 (0)10 59755579

### ■ Qingdao Branch Office

Room 10E, No.73 Wangjiao Mansion, mid. Hongkong Road Qingdao 266071 P. R.China  
Tel: +86 (0)532 85879625  
Fax: +86 (0)532 85879512

### ■ Wuhan Branch Office

Room 3001, World Trade Tower, No.686 Jiefang Avenue, Jiangnan District, Wuhan 430022 P.R.China  
Tel: +86 (0)27-85448742  
Fax: +86 (0)27-85448355

### ■ Nanjing Branch Office

Room 302, Building A, Tengfei Creation Center, 55 Jiangjun Avenue, Jiangning District, Nanjing  
211100 P. R.China  
Tel: +86 (0)25 52785841  
Fax: +86 (0)25 52785485