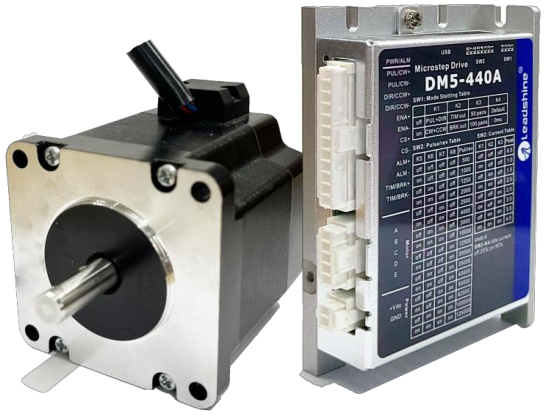
User Manual

5-phase Stepper Drive

Digital Microstep Drive



Revision 3.0

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Important Notice

Read this manual carefully before any assembling and using. Incorrect handling of products in this manual can result in injury and damage to persons and machinery. Strictly adhere to the technical information regarding installation requirements.

Record of Revisions

Revision	Date	Description of Release
V1.0	Dec 2023	Initial Release
V1.1	Oct 2024	Update the wiring diagram

Table of Contents

1. Introduction

Leadshine 5-phase stepper drive is a summary of more than 20 years of development experience in stepper drives. Compared with traditional two-phase stepper drives, it has high positioning accuracy, small speed fluctuations in each speed range. It also has a series of advantages including small torque ripple, fast acceleration, high maximum operating speed, and low vibration noise. It compensates for the shortcomings of traditional two-phase stepper drive and also fills a part of the application market of AC servo.

1.1 Features

- Able to match 5-phase stepper motor of NEMA 11/17/24
- Maximum pulse frequency up to 1MHz
- Step&direction and CW&CCW control
- 50 or 100 pairs of pole setting by DIP switch
- 8 current setting by DIP switch
- 16 microstep setting by DIP switch
- Alarm output, brake output, excitation origin output
- Over voltage, over current, over heat protections, etc.

2. Specifications

2.1 Electrical Specifications

Drive	DM5-422A	DM5-432A	DM5-440A
Matching Motor	Frame 28	Frame 42	Frame 60
Power Supply	24~36Vdc	24~36Vdc	24~36Vdc
Maximum Output Current (Peak)	2.2A	3.2A	4.0A
Pulse Signal Voltage	5Vdc		
Maximum Pulse Input Frequency	1MHz		
Input Signal Current	Typical10Ma (6~16mA)		
Input Signal Voltage	12V/24V		
Maximum OC Current	100mA		
Maximum OC Voltage	30Vdc		
Isolation Resistance	100 MΩ		

Motor	Frame 28 (NEMA11)	Frame 42 (NEMA17)	Frame 60 (NEMA42)
Step Angle	0.72°		
Accuracy of Step Angle	±0.036° (non-load/ full step)		

Temperature Rise	MAX 80K		
Operating Environment	Temperature: -10~+50℃; Humidity: 85% MAX		
Insulation Class	B		
Insulation Resistance	MIN 100 *MΩ*，500 VDC		
Dielectric Strength	500 VAC，1 min		
Radial Play	0.025 mm MAX (Load 5N）		
Axial Play	0.075 mm MAX (Load 10N）		
Maximum radial Load (N)	15	30	90
Maximum Axial Load (N)	Motor weight		

2.2 Environment

Cooling	**Natural Cooling or Forced cooling**	
Operating Environment	Environment	Avoid dust, oil fog and corrosive gases
	Ambient Temperature	0 — 65°C (32 - 149°F)
	Humidity	40 — 90%RH
	Operating Temperature	0 — 50°C (32 - 122°F)
	Vibration	10-50Hz / 0.15mm
Storage Temperature	-20°C — 65°C (-4°F - 149°F)	

2.3 Mechanical Specification

(Unit: mm [1inch=25.4mm])

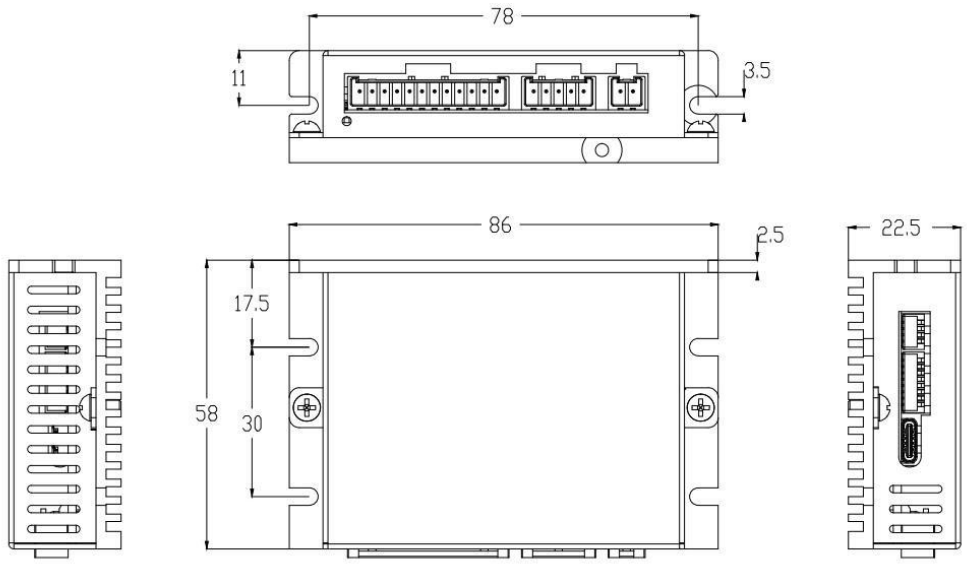
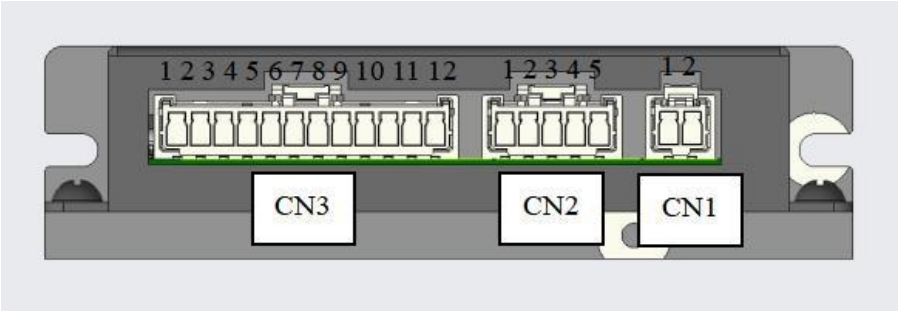


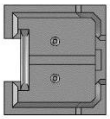
Figure 1 Mechanical Specification

3. Port Description and LED Indication



3.1 Port Description

- **Power port**

Port	Picture	Pin	Signal	Definition
CN1		1	VDC	Power 24～36VDC
		2	GND	Power GND

- **Motor port**

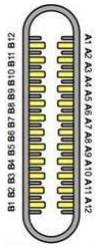
Port	Picture	Pin	Signal	Definition	Color
CN2		1	A	Motor cable A	Blue
		2	B	Motor cable B	Red
		3	C	Motor cable C	Orange
		4	D	Motor cable D	Green
		5	E	Motor cable E	Black

- **Control port**

Port	Picture	Pin	Signal	Definition
CN3		1	CW+（PUL+）	Pulse and direction signal 5V input, Maximum 1MHz
		2	CW-（PUL-）	
		3	CCW+（DIR+）	
		4	CCW-（DIR-）	
		5	ENA+	Enable signal 24V input
		6	ENA-	
		7	CS+	Microstep setting method High voltage: microstep setting by parameter Low voltage: microstep setting by DIP switch
		8	CS-	
		9	ALM+	Alarm output Maximum 30V/100mA output
		10	ALM-	

		11	TIM+/BRK	Origin point/ brake output (optional)
		12	TIM-/BRK	Maximum 30V/100mA output

- **Tuning port**

Port	Picture	Pin	Signal	Definition
USB Type-C		A4, B4,A9, B9	VCC 5V	Power 5V
		A12,B12,A1,B1	GND	Power 5V GND
		A6,B6	D+	USB data+
		A7,B7	D-	USB data-
		Ground	/	Ground

3.2 LED Indication

There are two LED lights for DM5. The GREEN one is the power indicator which should be always on in normal circumstance. The RED one is a drive status indication light, which will be OFF while working normally but ON and flash 1 or 2 times in a 3-second period in the case of enabled over-current or over-voltage protection.

4. Fault and Brake Output Connection

- **Fault Output**

When over voltage or over current protection happens, DM5 red status LED light will blink and the impedance state between ALM and COM- will change (from low to high or high to low depending on configuration) and can thus be detected. Fault output connection is optional, and it can be connected either in sinking or sourcing.

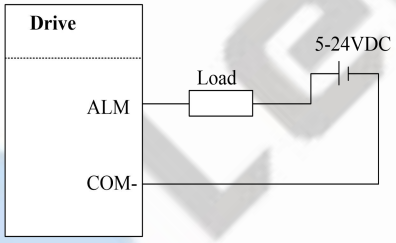


Figure 2 Sinking Output

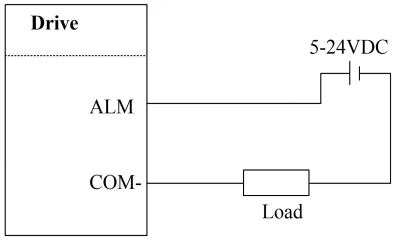


Figure 3 Sourcing Output

- **Brake Control**

It is recommended to connect a fly-wheel diode in parallel to a 24VDC relay and brake coil connection. Refer to the following figure for brake connection.

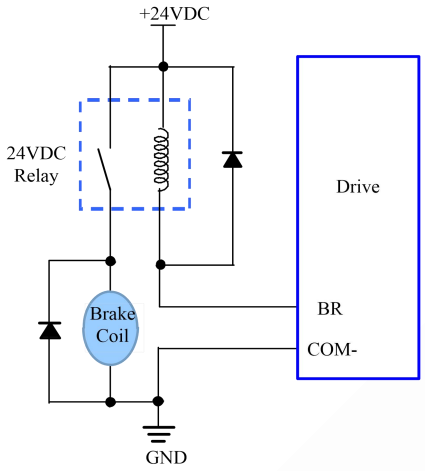
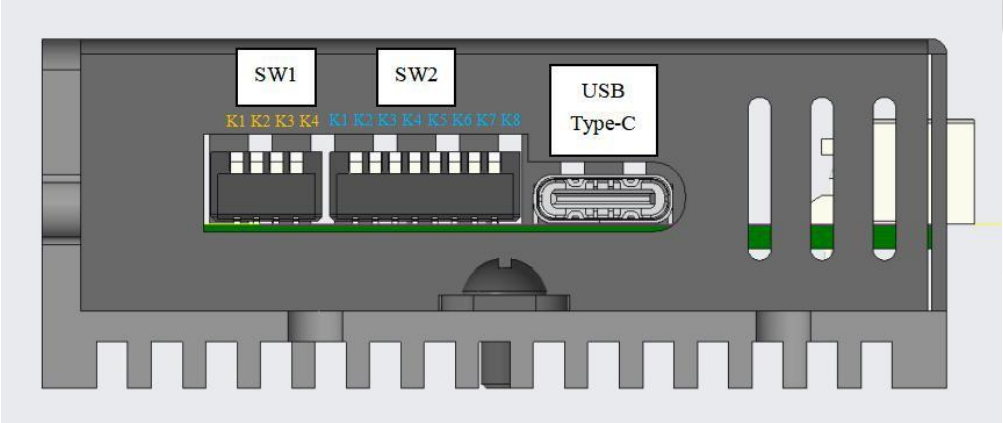


Figure 4 Brake Output Connection

5. DIP Switch Description



SW2-K1	SW2-K2	SW2-K3	Current (peak)Peak A
off	off	off	0.5 (default)
On	off	off	1.0
off	On	off	1.5
On	On	off	2
off	off	On	2.5
On	off	On	3
off	On	On	3.5
On	On	On	4.0

DIP Switch	Function	Definition
SW2-K4	Percent of standby current current	Off (default): 25% on: 50%

SW2-K5	SW2-K6	SW2-K7	SW2-K8	Microstep
Off	off	off	off	500
On	off	off	off	1000
Off	on	off	off	1250
On	on	on	off	2000
Off	off	on	off	2500
On	off	on	off	4000
Off	on	on	off	5000 (default)
On	on	on	off	10000
Off	off	on	off	12500
On	off	on	off	20000
Off	on	on	off	25000
On	on	on	off	40000
Off	off	on	on	50000
On	off	on	on	62500
Off	on	on	on	100000
On	on	on	on	125000

DIP Switch	Function	Definition
SW1-K1	Pulse mode	Off(default): pulse+direction On: double pulse
SW1-K2	TIM/BRK setting	Off(default): origin point output, output signal per 7.2° On: brake output
SW1-K3	Pair of poles setting	Off(default): 50 pairs of poles On: 100 pairs of poles
SW1-K4	Filtering time setting	Off(default): filtering time 5.5ms on，filtering time 0ms。

6. Typical Connection

A complete stepping system should include stepping motor, stepping drive, power supply and controller (pulse generator). A typical connection is shown as figure 4.

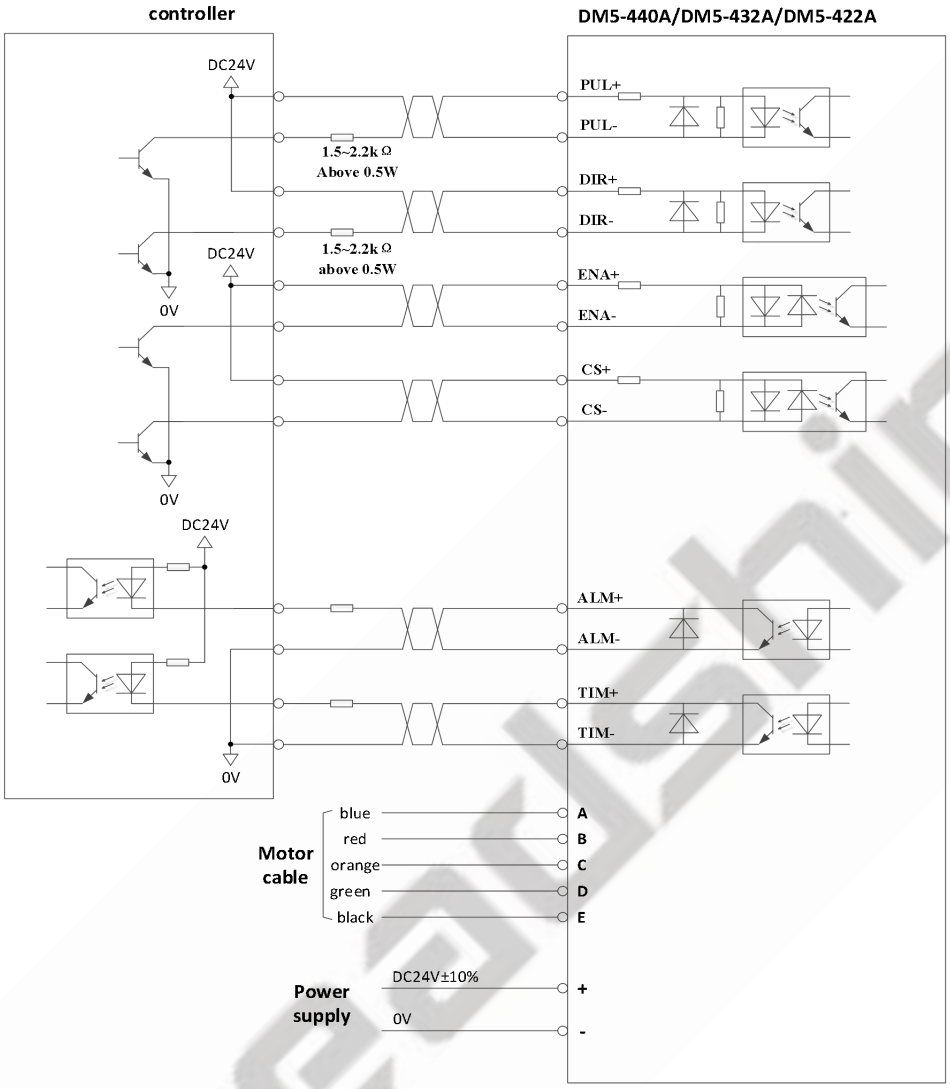


Figure 5 Typical Connection

7. Troubleshooting

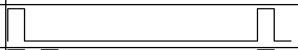
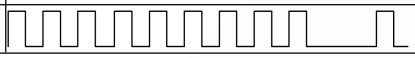
In the event that your drive doesn't operate properly, the first step is to identify whether the problem is electrical or mechanical in nature. The next step is to isolate the system component that is causing the problem. As part of this process you may have to disconnect the individual components that make up your system and verify that they operate independently. It is important to document each step in the troubleshooting process. You may need this documentation to refer back to at a later date, and these details will greatly assist our Technical Support staff in determining the problem should you need assistance.

LED status	Trouble	Solution
Green LED not on	Power not on	Check the drive power connection
Red LED blink once	Over current	Restart the drive; If the alarm remain, check if the motor wire is short circuit
Red LED blink twice	Over voltage	Restart the drive;

		If the alarm remain, check if the drive power supply is high
Red LED blink 4 times	Axi locking wrong/ motor wire disconnecting	Check if the motor is disconnecting or wrong connection
Red LED blink 6 times	Parameter identification wrong	Restart the drive; if the alarm remain, check if the motor wrong connection check if the motor is matched
Red LED blink 9 times	Over heat	Check if the Inadequate heat sinking / cooling Reduce the output current

Figure 6 Error Protections

When over-current and over-voltage protections are activated, the motor shaft will be free or the red LED blinks. Reset the drive by restart it to make it function properly after removing above problems.

Blink times	Blink form of red LED	Description
1		Over current
2		Over voltage
4		Axi locking wrong/ motor wire disconnecting
6		Parameter identification wrong
9		Over heat

8. Warranty

Twelve Month Warranty

Leadshine Technology Co., Ltd. warrants its products against defects in materials and workmanship for a period of 12 months from shipment out of factory. During the warranty period, Leadshine will either, at its option, repair or replace products which proved to be defective.

Exclusions

The above warranty does not extend to any product damaged by reasons of improper or inadequate handlings by customer, improper or inadequate customer wirings, unauthorized modification or misuse, or operation beyond the electrical specifications of the product and/or operation beyond environmental specifications for the product.

Obtaining Warranty Service

To obtain warranty service, please contact your seller to obtain a returned material authorization number (RMA) before returning product for service.

Shipping Failed Products

If your product fail during the warranty period, please contact your seller for how and where to ship the failed product for warranty or repair services first, you can also e-mail customer service at tech@leadshine.com to obtain a returned material authorization number (RMA) before returning product for service. Please include a written description of the problem along with contact name and address.