



# EM-S

## Superior Stepper Drive

### Leadshine Technology Co., Ltd.

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- ▶ Performance Improved by 10% - 25%
- ▶ Ten More Functions Added
- ▶ Enhanced Anti-interference Ability
- ▶ No Tuning

## EM-S Series

The EM-S series is a superior stepper drive product developed by Leadshine Technology Co., Ltd. with ten years accumulation of application and production experiences of DM series. EM-S series not only retain DM series' features such as stability, reliability, low noise, low heat, and low vibration, but also improve the motion performance with more than ten new functions, and better anti-interference capability. The EM-S series can drive all step motors with NEMA8/11/14/17/23/24/34, which makes it ideal for leading equipment manufacturers that require stable, reliable, and high-performance step drives!

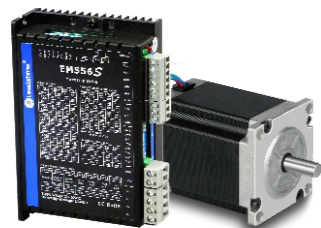


## EM-S Series Advantages



- Increased motor torque and running speed by 10% - 25%.
- Ten more new functions such as alarm and brake output, Positional command filter, pulse type, self test, 5V or 24V control signals, etc.
- Greatly improved the anti-interference performance.
- No tuning.

## Customer Benefits

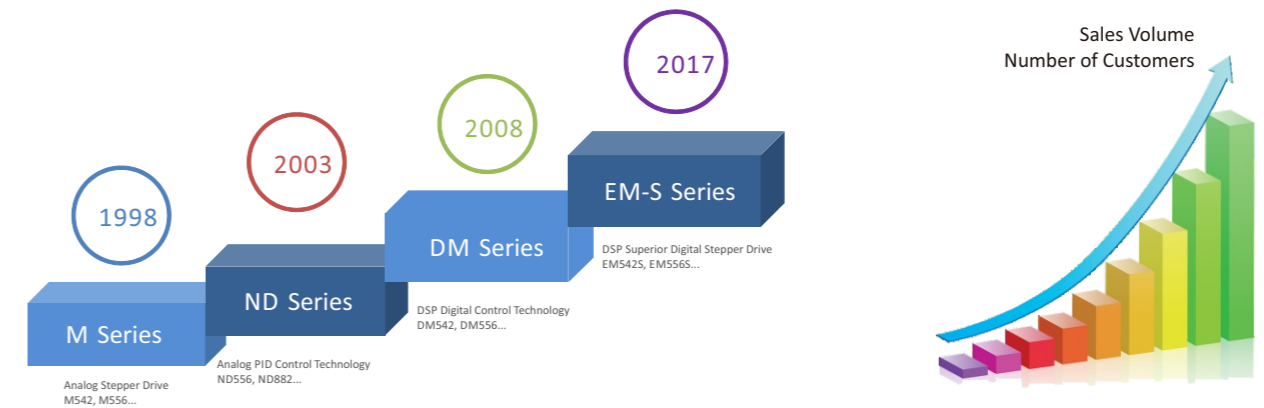


- **Increased equipment price:**  
Increase of the motor speed helps raise the equipment efficiency and price.
- **Increased equipment stability**  
Increase of the motor torque helps reduce the risks of pulse losing and breakdown.
- **Ensured returning of investment**  
Improvement of the equipment stability helps to decrease the risk of investment returning.

## Why Leadshine EM-S Series ?

- Leadshine stepper drive has been ranked No. 1 in Chinese market for 10 consecutive years by authoritative research institutions.
- Ten years accumulation of application and production experiences and 5 million+ drives in field globally.
- The EM-S series further improve motor torque, functions, and anti-interference performance.
- The EM-S Series with the same connector and installation size as previous M /ND Series, DM Series and EM series.

## 20 years continuous innovation, promoting the upgrading of industrial automation



## Contents

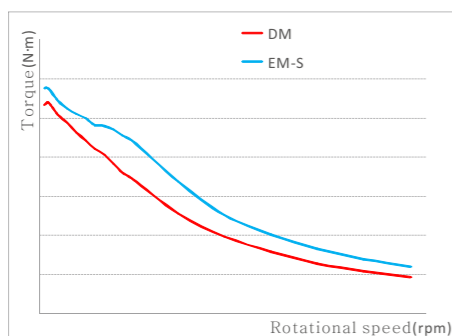
1. EM-S Series Overview
2. EM-S Series Drives
3. Matching Stepper Motor - CM Series
4. Cables and Power Supplies
5. Ordering Information

# 01 EM-S Series Overview

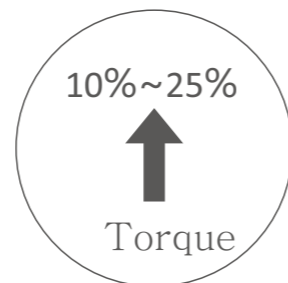
## 1.1 Features

### 1 Dramatically Improved Performance

- The acceleration performance and high-speed performance of the motor are significantly improved. The motor output torque increases by approximately 10%-25% compared with the DM series, and the acceleration and maximum speed also increase correspondingly.



Torque comparison between the EM-S series stepper drive and DM series stepper drive matching the same motor (same condition)



### 2 Command Smoothing Setting

- You can easily select the control command smoothing time via the DIP switch.

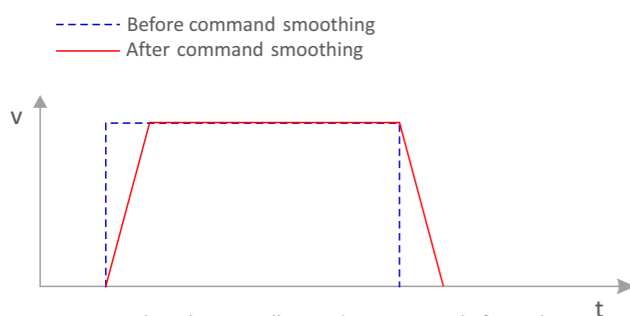


Figure A: When the controller sends a step signal of speed command, the stepper drive automatically smooths to a trapezoidal signal.

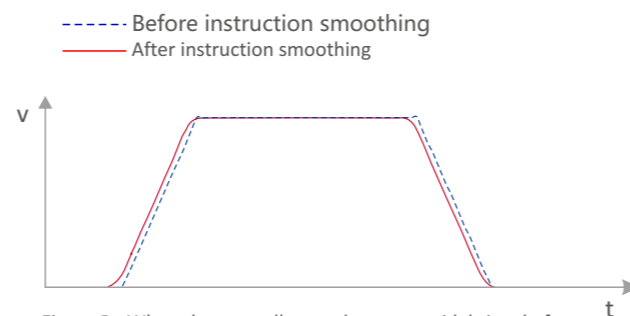
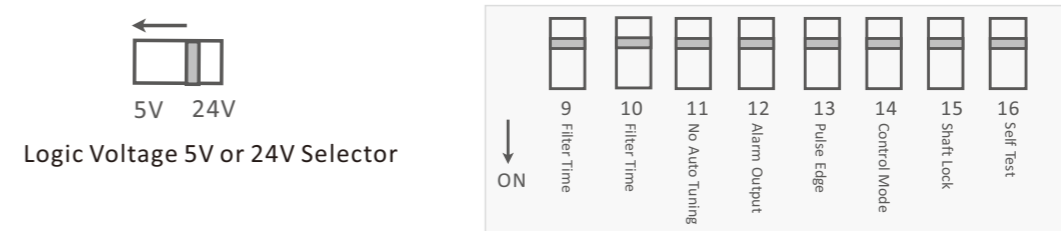


Figure B: When the controller sends a trapezoidal signal of speed command, the stepper drive automatically smooths to a s-shaped signal.

### 3 Second Functions of Second DIP Switch

- In addition to the conventional microstep and current setting, the stepper drive also adds a second DIP switch to perform more optional functions: Control command smoothing time, motor auto-configuration, fault output impedance, pulse active edge, control mode, lock shaft and self-test.



### 4 Significantly Enhanced Anti-interference Performance

- The anti-interference performance of the stepper drive is greatly enhanced by optimizing the shell and improving the circuit. The product becomes more elegant and reliable.



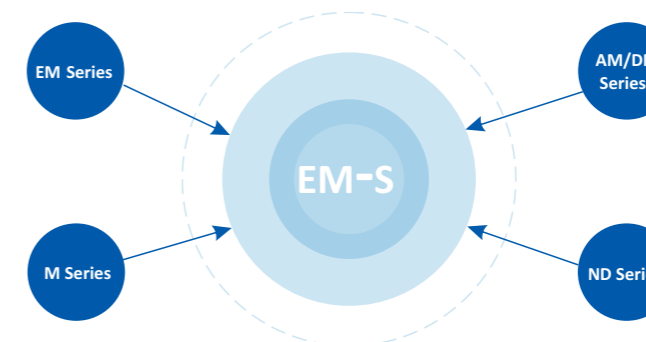
### 5 Fault and Brake Outputs

- The EM-S series stepper drive signals for common faults such as overcurrent and overvoltage to the Controller/PLC or Relay or LED to ensure its security and reliability.

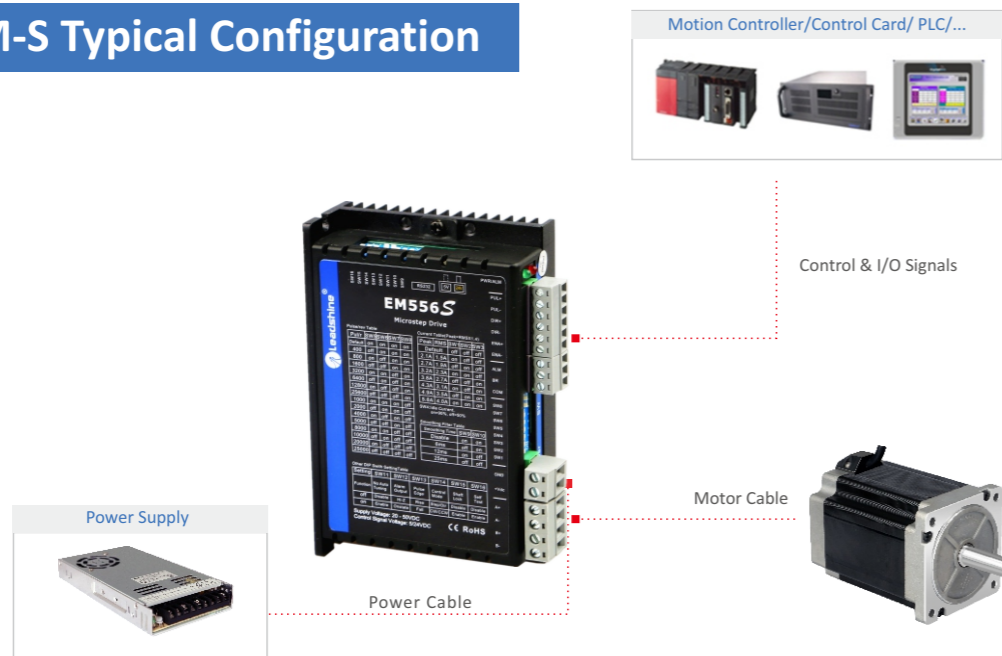


### 6 Compatible with Traditional DM/ND/M/AM Series

- The totally compatible plugs and ports and inherited microstep and current features make the EM-S series a secure and reliable superior substitute with better performance and functions.



## 1.2 EM-S Typical Configuration



## 1.3 Typical Applications

Leadshine EM-S series stepper drive system are widely used in a variety of automated production equipment in the fields of sculpture, laser, textiles, logistics, medical equipment, electronic equipment, and automated production lines.



# 02 EM-S Series Drives

## 2.1 Part Number



- ① **Phase**  
Blank: 2 phase  
3: 3 phase
- ② **Series Name**  
EM: EM series stepper drive
- ③ **Type of Power Input**  
Blank: DC Input  
A: Compatible with AC and DC Input
- ④ **Maximum Power Voltage**  
5: 50V
- ⑤ **Maximum Peak Current**  
56: Maximum Peak Current = 5.6A
- ⑥ **Version**  
S: Superior
- ⑦ **Customized**

## 2.2 Specifications

Universal Specifications	
Operation Temperature	0 - 40°C
Humidity	40 - 90%RH
Cooling Method	Natural cooling or forced cooling
Environment	Avoid dust, oil fog and corrosive gases
Vibration	10 - 55Hz / 0.15mm
Weight	EM415S/EM422S:100g; EM542S/EM556S/EM870S/3EM580S:230g; EM882S: 570g
Speed Range	0-3000 r/min without load

## 2.3 Electrical Specifications

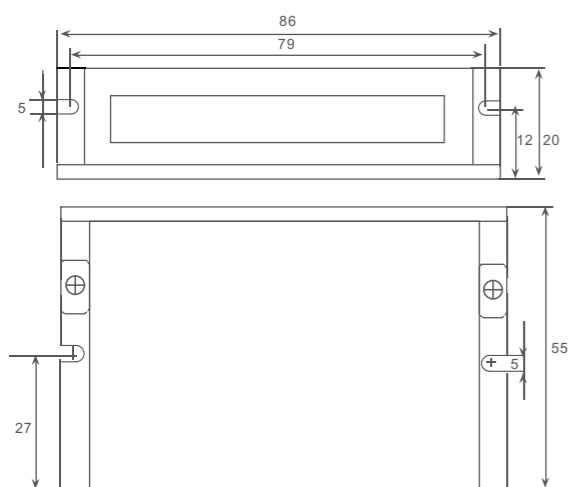
Drive Model	Working Voltage <sup>(1)</sup> (Vdc)			Output Current Peak(A)		Logic Current(mA)		Logic Voltage <sup>(2)</sup> (Vdc)
	Min.	Typical	Max.	Min.	Max.	Min.	Max.	
EM415S	18	24	36	0.3	1.5	7	16	5V / 24V <sup>(2)</sup>
EM422S	18	24	36	0.3	2.2	7	16	5V / 24V <sup>(2)</sup>
EM542S	20	36	50	1.0	4.2	7	16	5V / 24V
EM556S	20	36	50	1.8	5.6	7	16	5V / 24V
EM870S	20	68	80	2.6	7.0	7	16	5V / 24V
3EM580S	20	36	50	2.5	8.0	7	16	5V / 24V
EM882S	20	70	80	2.7	8.2	7	16	5V / 24V

Note: (1) If the stepper motor is required to work at a high speed, the working voltage of stepper drive need to be properly increased; (2) The logic voltage of control signals can be 5V or 24V. When the logic voltage is 24V, the standard model of EM542S, EM556S, EM870S, EM882S can work well, while EM415S and EM422S need to connect a 2KΩ resistor, or order a customized model.

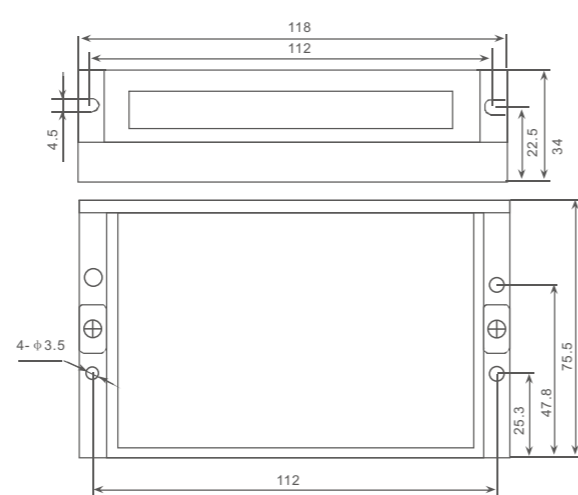
## 2.3 Mechanical Specifications

Unit: mm [1inch=25.4mm]

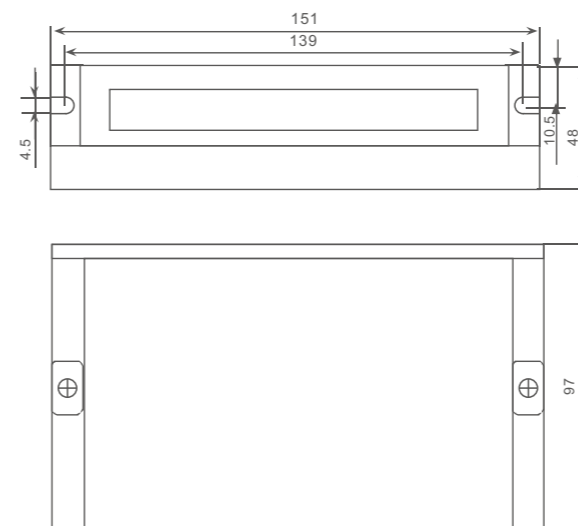
### EM415S, EM422S



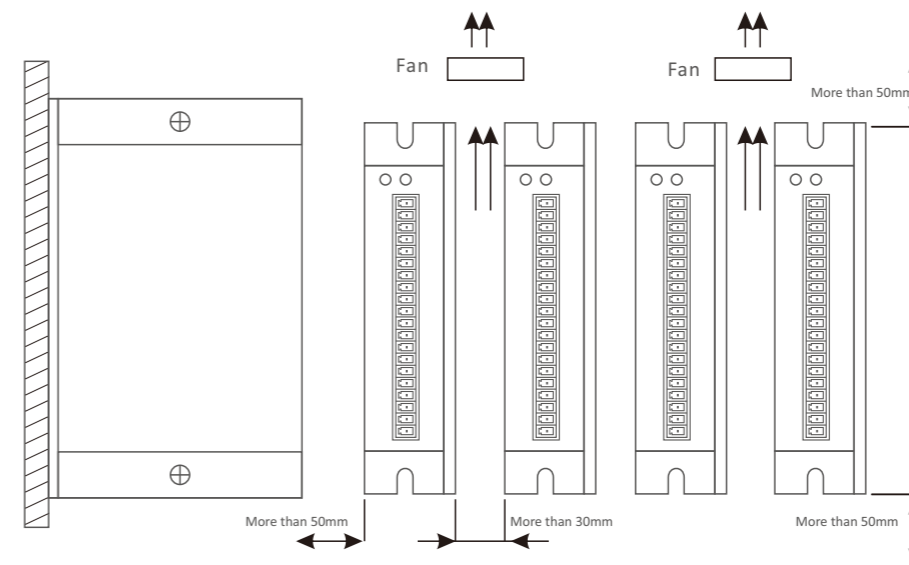
### EM542S, EM556S, EM870S, 3EM580S



### EM882S



### Drives Installation Instructions



## 1 DIP Switch Setting

SW1 - SW3		SW4		SW5 - SW8		
Output Current		Idle Current		Micro step		
SW9 - SW10	SW11	SW12	SW13	SW14	SW15	SW16
Filter Time	Auto Tuning	Alarm Output	Pulse edge	Control mode	Shaft Lock	Self Test

Filter Time	It indicates filtering time with both SW9 and SW10 off (by default). You can set the instruction filtering time to 6 ms, 12 ms, or 25 ms.
Auto Tuning	It indicates power-on auto-tuning with SW11 off (by default), and indicates no auto-tuning with SW11 on.
Alarm Output	The alarm output is high impedance with SW12 off (by default). The alarm output is low impedance with SW12 on.
Pulse edge	The rising edge is valid with SW13 off (by default). The falling edge is valid with SW13 on.
Control mode	It indicates the mode with SW14 off (by default), and the mode with SW14 on.
Shaft Lock	If SW15 is off, the motor is not locked when (by default). If SW15 is on, the motor is locked when.
Self Test	Turned off with SW16 off (by default) and turned on with SW16 on.

## 2 Input Signals

Name	Details
PUL+	PUL+ Pulse Connection: Required. (1) 5-24V, optically isolated, differential. (2) Maximum 200 KHz input frequency. (3) Pulse width of 2.5µs or longer. (4) In single pulse (step & direction) control mode, this input signal represents a pulse which is active at the rising or falling voltage edge (set by DIP switch SW13); in double pulse (CW/CCW) control mode, this input signal represents clockwise (CW) pulse which is active at both high voltage level and low voltage level.
PUL-	
DIR+	Direction Connection: Required. (1) 5-24V, optically isolated, differential. (2) Maximum 200 KHz input frequency. (3) Pulse width of 2.5µs or longer. (4) Minimal DIR signal setup time should be at least 5µs. (5) In single pulse (step & direction) control mode, this signal represents controls motion rotation direction; in double pulse (CW/CCW) control mode, this input signal controls counterclockwise (CCW) rotation direction and is active at both voltage high level and low level.
DIR-	
ENA+	Enable Connection: Optional. (1) Optically isolated, differential. (2) Disable the drive by 5-24V input connection; enable the drive by 0-0.5 VDC connection. (3) This connection is optional (defaulted to unconnected) with drive enabled. (4) By default, motor shaft is unlocked when drive disabled but can be configured to shaft locked by DIP switch SW15.
ENA-	

## 3 Output Signals

Name	Details
ALM	Fault Output Connection: Optional. (1) Maximum 30V/100mA output. (2) Sinking or sourcing. (3) The resistance between ALM and COM - is low impedance as default (configurable by DIP switch SW12), and will change to high when the drive goes into error protection.
BR	
COM	

## 4 Power Input Interface

DC Input	
+Vdc	Power
GND	Power Ground

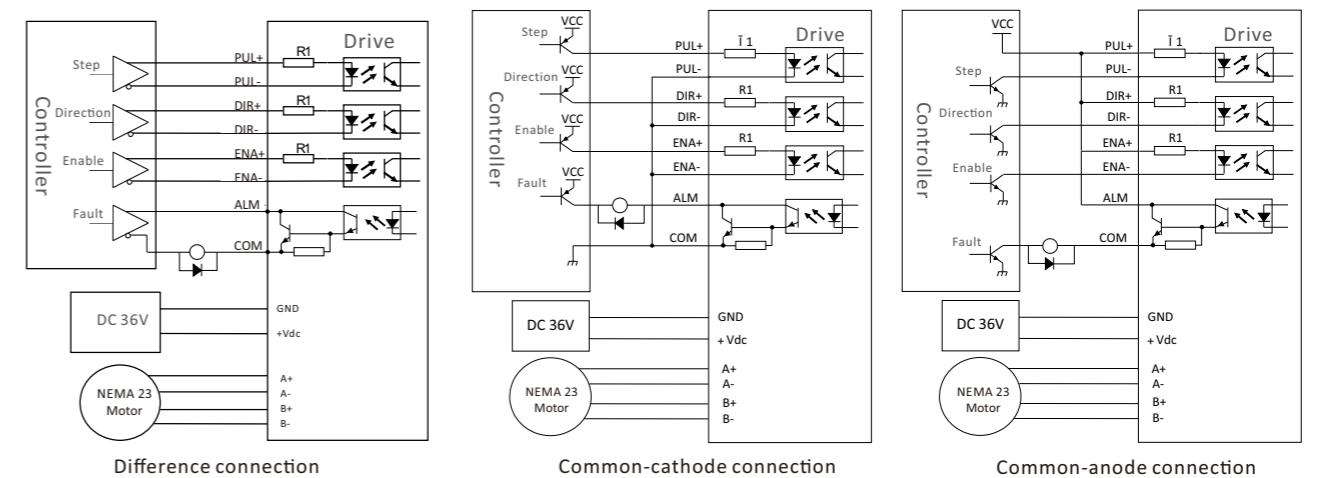
## 4 Motor Winding Input Interface

Name	Description
A+	Motor Winding A+
A-	Motor Winding A-
B+	Motor Winding B+
B-	Motor Winding B-

## 5 LED Indicator Description

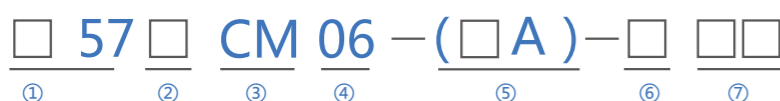
Color	Function	Description								
Green	Power Indicator PWR	When Power is on, the green indicator will be on constantly								
Red	Fault Indicator ALM	When any fault occurs, the red indicator will blink with different periods indicating different faults. The fault will not be removed until the drive is restarted. The fault indications are as the followings, <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Time(s) of ON</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Over-current Protection activated when peak current exceeds the limit</td> </tr> <tr> <td>2</td> <td>Over-current Protection activated when drive working voltage is greater than 60VDC</td> </tr> <tr> <td>4</td> <td>Motor cable error or not connected to the motor</td> </tr> </tbody> </table>	Time(s) of ON	Description	1	Over-current Protection activated when peak current exceeds the limit	2	Over-current Protection activated when drive working voltage is greater than 60VDC	4	Motor cable error or not connected to the motor
Time(s) of ON	Description									
1	Over-current Protection activated when peak current exceeds the limit									
2	Over-current Protection activated when drive working voltage is greater than 60VDC									
4	Motor cable error or not connected to the motor									

## 2.5 Typical Connection



# 03 Matching Stepper Motor — CM Series

## 3.1 Part Number



### ① Motor Frame Size

- 42: NEMA 17 motor
- 57: NEMA 23 motor
- D57: NEMA 23 motor with larger body
- 60: NEMA 24 motor
- 86: NEMA 34 motor

### ② Motor Phase

- Blank: 2 phase motor
- 3 : 3 phase motor

### ④ Holding Torque

- For NEMA 8/11/14 motor:  
Divide the value by 100  
044 : 0.44N.m
- For NEMA 17/23/24/34 motor:  
Divide the value by 10  
06: 0.6N.m

### ⑤ Motor Rate Current

- Blank: Standard rate current
- 4A : Rate current 4A

### ⑥ Standard Customized Specification

- SZ : Double shaft motor
- BZ : Brake motor
- FS : Waterproof motor

### ⑦ Customized model

## 3.2 List of Step Motor Models

- CM series step motors also include multiple customized models with band brakes, waterproof systems, and double shafts.
- The motor models not marked "X" use Japanese core component, whereas the motor models marked "X" use qualified Chinese components.
- For more information about motors, access [www.leadshine.com](http://www.leadshine.com).

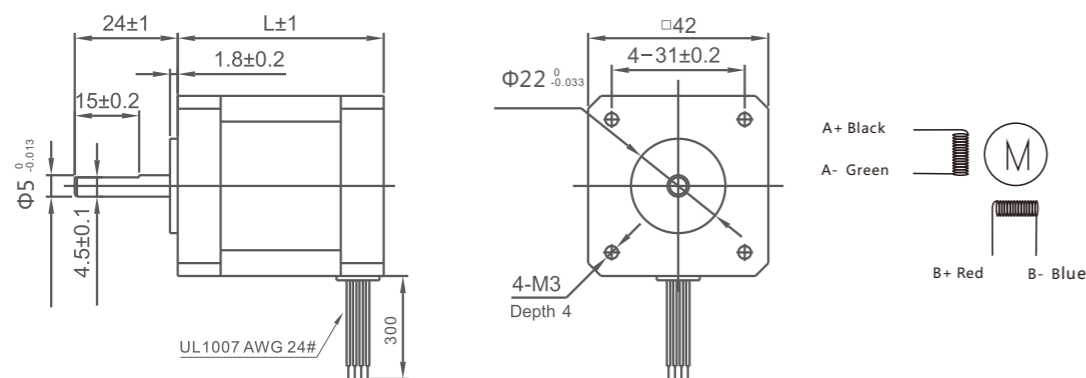
Motor Size	Model	Holding Torque (N.m)	Standard Type Length(mm)	Rate Current (A)	Matched Drive
NEMA 8	20CM003	0.03	33	0.6	EM415S/EM422S
	20CM005	0.05	45	0.6	EM415S/EM422S
	20CM005-SZ	0.05	45	0.6	EM415S/EM422S
NEMA 11	28CM006	0.06	32	1.2	EM415S/EM422S
	28CM010	0.10	41	1.2	EM415S/EM422S
	28CM010-SZ	0.10	41	1.2	EM415S/EM422S
	28CM013-SZ	0.13	51	1.2	EM415S/EM422S
	28CM013	0.13	51	1.2	EM415S/EM422S

NEMA 14	35CM015	0.15	31	2.0	EM415S/EM422S
	35CM04	0.36	47	2.0	EM415S/EM422S
	35CM04-SZ	0.36	47	2.0	EM415S/EM422S
NEMA 17	42CM02	0.2	33	1.5	EM422S
	42CM04	0.4	40	1.5	EM422S
	42CM02-1A	0.2	33	1.0	EM415S/EM422S
	42CM04-1A	0.4	40	1.0	EM415S/EM422S
	42CM06	0.6	47	2.5	EM432S/EM542S
	42CM08	0.8	60	2.5	EM432S/EM542S
	42CM06-1A	0.6	47	1.5	EM422S
	42CM08-1A	0.8	60	1.5	EM422S
	42CM06-SZ	0.6	47	2.5	EM432S/EM542S
	42CM08-SZ	0.8	60	2.5	EM432S/EM542S
NEAM 23	57CM06	0.6	41	3	EM542S
	57CM13	1.3	56	4	EM542S/EM556S
	57CM13-3A	1.3	56	3	EM542S
	57CM23	2.3	76	5	EM542S/EM556S
	57CM23-3A	2.3	76	3	EM542S
	57CM23-4A	2.3	76	4	EM542S/EM556S
	57CM26	2.6	84	5	EM542S/EM556S
	57CM26-4A	2.6	84	4	EM542S/EM556S
	57CM13-SZ	1.3	56	4	EM542S/EM556S
	57CM23-SZ	2.3	76	5	EM542S/EM556S
	57CM26-SZ	2.6	84	5	EM542S/EM556S
	D57CM21-4A	2.1	67	4	EM556S
	D57CM31-4A	3.1	88	4	EM556S
	D57CM21	2.1	67	5	EM556S/EM870S
	D57CM31	3.1	88	5	EM556S/EM870S
	D57CM21-SZ	2.1	67	5	EM556S/EM870S
D57CM31-SZ	3.1	88	5	EM556S/EM870S	
NEMA 24X	60CM22X	2.2	67	5	EM556S/EM870S
	60CM30X	3.0	85	5	EM556S/EM870S
NEMA 34	86CM35	3.5	66	4	EM870S /EM882S
	86CM45	4.5	80	6	EM870S /EM882S
	86CM80	8.0	98	6	EM882S
	86CM85	8.5	118	6	EM882S
	86CM120	12	129	6	EM882S
	86CM45-SZ	4.5	80	6	EM870S/EM882S
	86CM85-SZ	8.5	118	6	EM882S

### 3.3 Motor Specifications

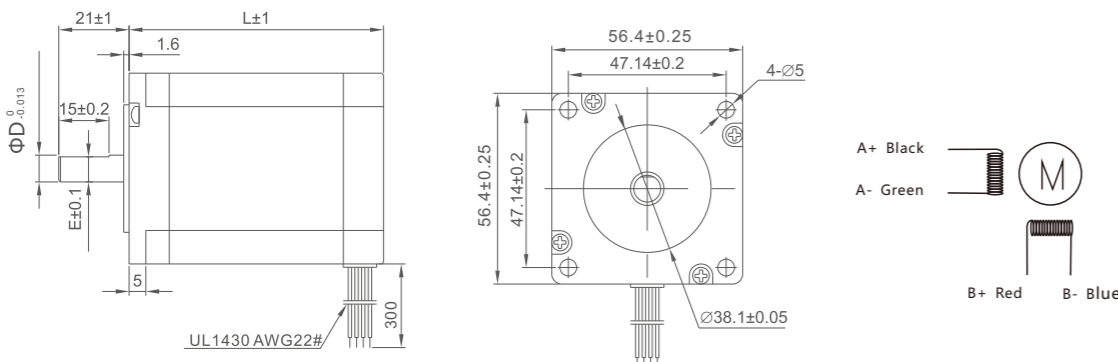
#### ■ NEMA 17

Model	Standard Type Length(mm)	Holding Torque (N.m)	Rate Current (A)	Resistance/Phase(Ω)	Inductance / Phase (mH)	Inertia (Kg.cm <sup>2</sup> )
42CM02	33	0.2	1.5	1.4	1.4	0.035
42CM04	39	0.4	1.5	2.4	4.3	0.054
42CM06	47	0.6	2.5	0.9	1.6	0.072
42CM08	60	0.8	2.5	1.0	2.4	0.11
42CM02-1A	33	0.2	1.0	3.5	3.0	0.035
42CM04-1A	39	0.4	1.0	4.6	4.0	0.054
42CM06-1A	47	0.6	1.5	2.2	4.5	0.072
42CM08-1A	60	0.8	1.5	3.0	6.9	0.11



#### ■ NEMA 23

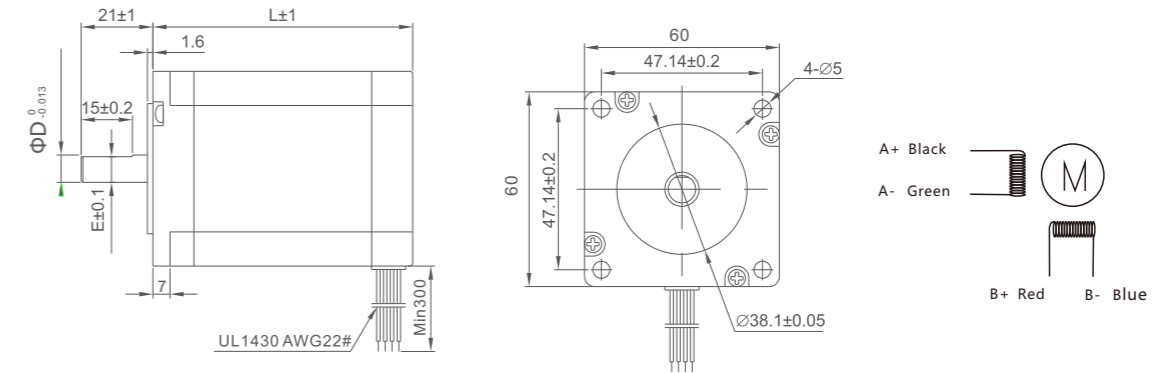
Model	Standard Type Length(mm)	Holding Torque (N.m)	Rate Current (A)	Resistance/Phase(Ω)	Inductance / Phase (mH)	Inertia (Kg.cm <sup>2</sup> )
57CM06	41	0.6	3	0.7	1.4	0.12
57CM13	56	1.3	4	0.42	1.4	0.3
57CM23	76	2.3	5	0.38	1.75	0.48
57CM26	84	2.6	5	0.44	2.0	0.52



Model	L(mm)	D(mm)	E(mm)
57CM06	41	6.35	5.8
57CM13	56	6.35	5.8
57CM23	76	8	7.5
57CM26	84	8	7.5

#### ■ NEMA 23(Continuous)

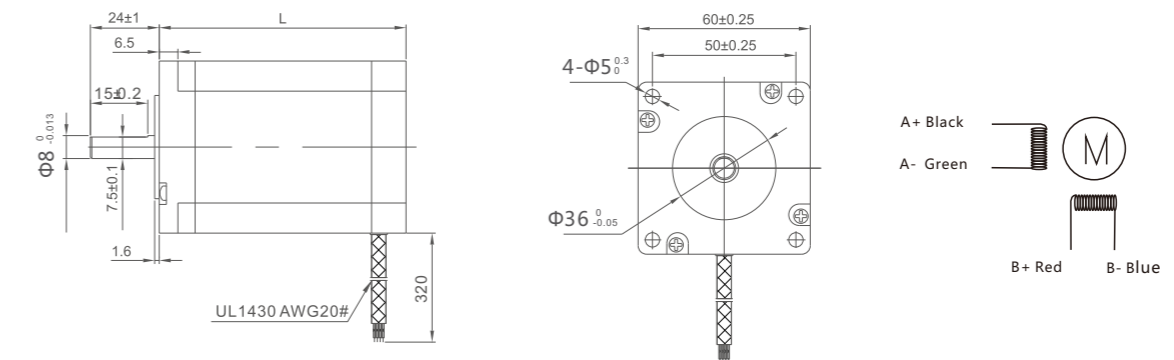
Model	Standard Type Length(mm)	Holding Torque (N.m)	Rate Current (A)	Resistance/Phase(Ω)	Inductance / Phase (mH)	Inertia (Kg.cm <sup>2</sup> )
D57CM21	67	2.1	5	0.21	0.75	0.57
D57CM31	88	3.1	5	0.26	1.18	0.84



Model	L(mm)	D(mm)	E(mm)
D57CM21	67	8	7.5
D57CM31	88	8	7.5

#### ■ NEMA 24

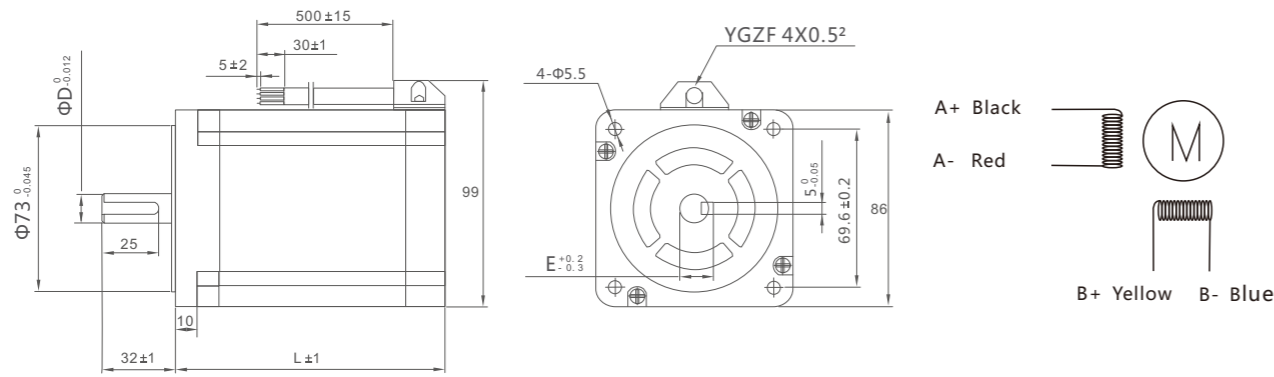
Model	Standard Type Length(mm)	Holding Torque (N.m)	Rate Current (A)	Resistance/Phase(Ω)	Inductance / Phase (mH)	Inertia (Kg.cm <sup>2</sup> )
60CM22X	67	2.2	5	0.33	1.05	0.49
60CM30X	85	3.0	5	0.46	2.0	0.69





■ NEMA 34

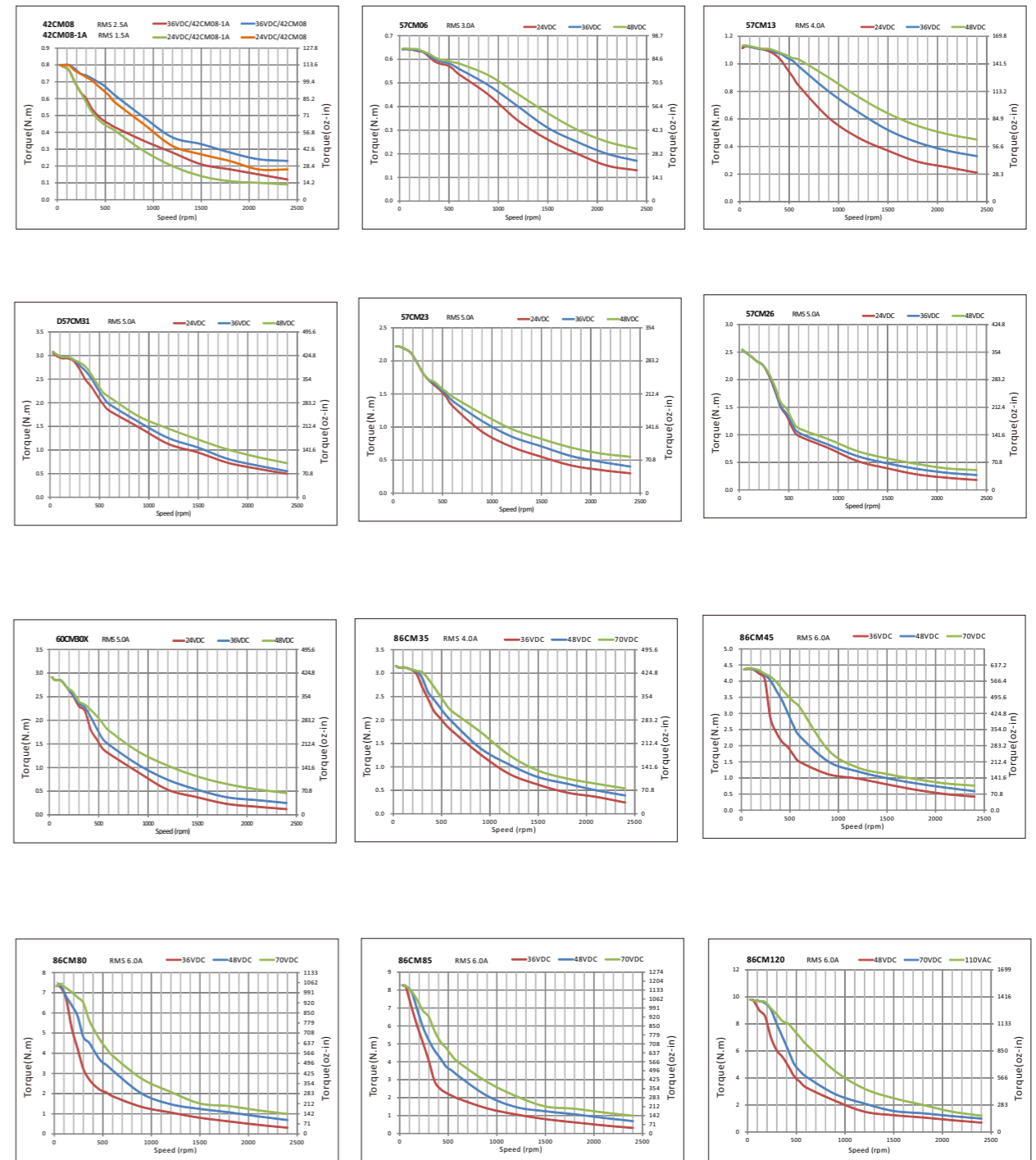
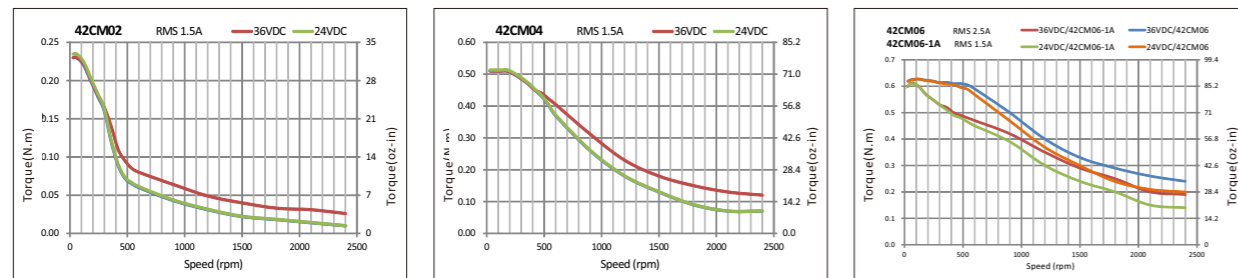
Model	Standard Type Length(mm)	Holding Torque (N.m)	Rate Current (A)	Resistance/Phase(Ω)	Inductance /Phase (mH)	Inertia (Kg.cm <sup>2</sup> )
86CM35	66	3.5	4	0.42	2.67	1.0
86CM45	80	4.5	6	0.43	2.95	1.4
86CM80	98	8	6	0.63	4.0	2.5
86CM85	118	8.5	6	0.53	4.25	2.7
86CM120	129	12	6	0.75	5.3	2.94



Model	L(mm)	D(mm)	E(mm)
86CM35	66	12.7	14.7
86CM45	80	12.7	14.7
86CM80	98	12.7	14.7
86CM85	118	12.7	14.7
86CM120	129	14	16

Note: For more information about NEMA8/NEMA11/NEMA14 motors, access [www.leadshine.com](http://www.leadshine.com).

3.4 Speed - Torque Curves



# 04 Cables and Power Supplies

## 4.1 Power Supplies

### 1 SPS Series Power Supplies

#### ■ Features

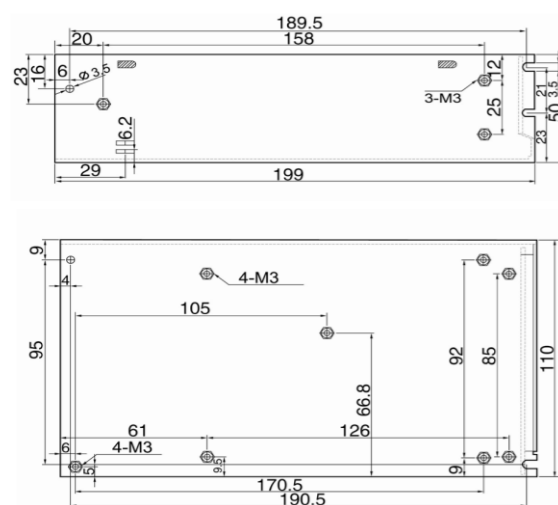
- Specially Designed Power Supplies for Stepper and Servo Controls
- Compact Size, Light in Weight
- Wide Input Voltage Range, 220VAC ± 10% or 110 VAC ± 10%
- Shortcut, Over-current, Over-voltage, Low-voltage Protections
- High Efficiency
- Easy to Use



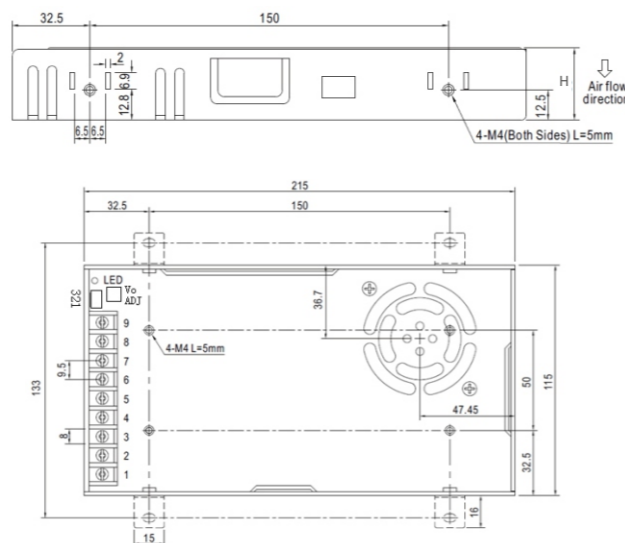
#### ■ Electrical Specifications

Model	Output Voltage (VDC)	Continuous Current (A)	Peak Current (A)	Input Voltage	Dimensions	Weight(Kg)
SPS2410(V2.0)	24	10	30	220VAC± 10% or 110 VAC ± 10%	199*110*50mm	0.8
SPS3611(V2.0)	36	11	33		215*110*30mm	0.6
SPS488(V2.0)	48	8.3	24.9		215*110*30mm	0.6
SPS4810(V2.0)	48	10	30		215*110*50mm	0.8
SPS606(V2.0)	60	6.7	20.1		215*110*30mm	0.6

#### ■ Mechanical Specifications



SPS2410(V2.0)



SPS3611(V2.0)/SPS488(V2.0)/SPS606(V2.0) H=30mm  
SPS4810(V2.0) H=50mm

# 05 Ordering Information

### 1 Standard Models

Type	Model	Voltage(V)	Current(A)	Matching Motors (Frame Size)
2 Phase	EM415S	DC(18 - 36)	0.3 - 1.5	NEAM 8 / 11/14
	EM422S	DC(18 - 36)	0.3 - 2.2	NEAM 8 / 11/14
	EM542S	DC(20 - 50)	0.5 - 4.2	NEAM 17/ 23/24
	EM556S	DC(20 - 50)	0.5 - 5.6	NEAM 23/24
	EM870S	DC(20 - 80)	0.5 - 7.0	NEAM 23/24/34
	EM882S	DC(20 - 80)	0.5 - 8.2	NEAM 34
3 Phase	3EM580S	DC(20 - 50)	0.5 - 8.0	NEAM 23/24/34

### 2 EM-S Can Replace M/ND/AM/EM/DM Series Stepper Drives

EM-S series models	Can be Replaced Models
EM415S	DM320C/M415B
EM422S	DM320C/DM422C/DM422/EM402
EM542S	DM442/DM542/EM503/M542
EM556S	DM556/ND556
EM870S	DM870/DM856/M752/EM705
EM882S	AM882/EM806/DM860/ND882
3EM580S	3DM580/3DM683/3ND583

Note: The EM-S series drives can replace traditional M / ND / DM / EM series drives. For more information, access [www.leadshine.com](http://www.leadshine.com).