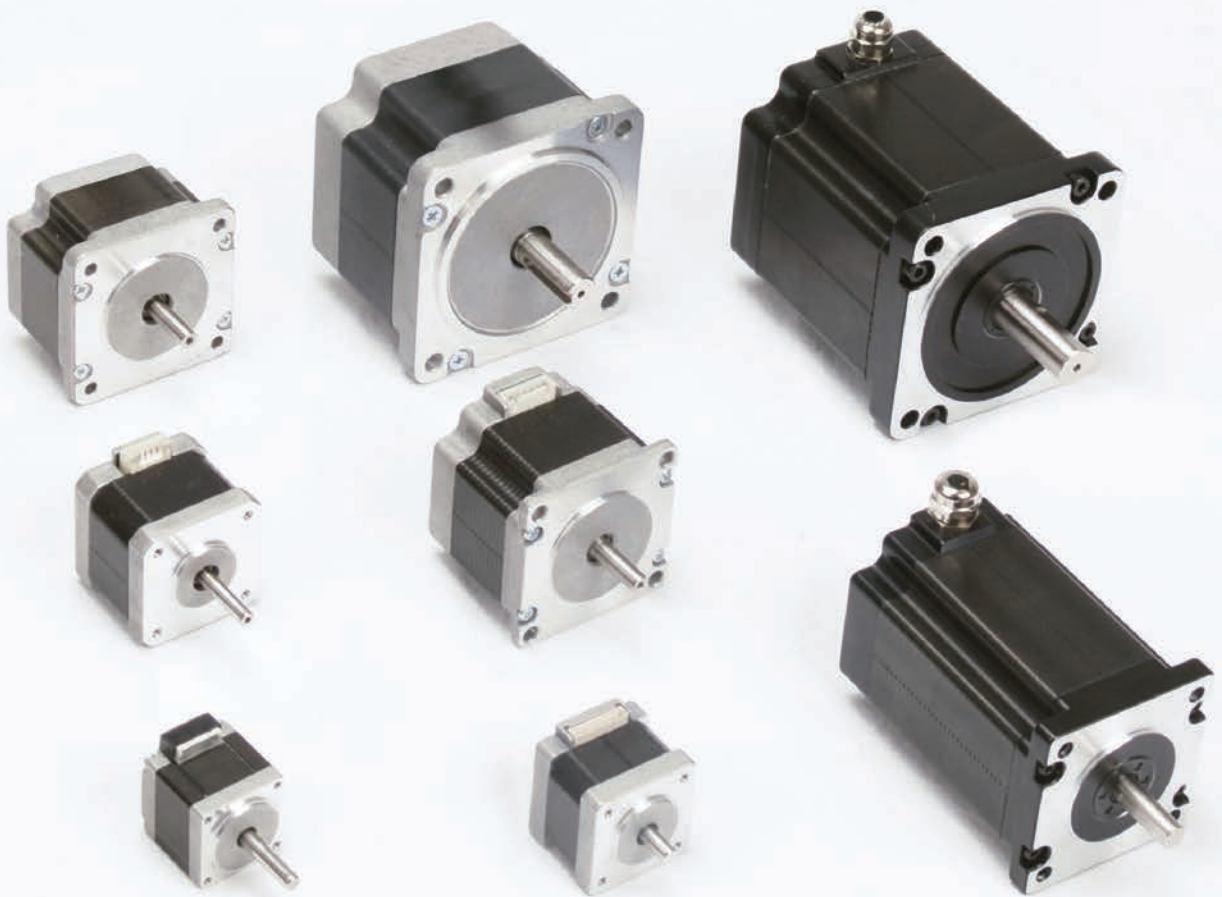


# Stepper Motor



**MOONS'**  
*moving in better ways*

# Stepper Motor

|                                                                           |    |
|---------------------------------------------------------------------------|----|
| Introduction.....                                                         | 04 |
| Quick Selection Of Motor.....                                             | 11 |
| <b>2-phase Stepper Motors</b>                                             |    |
| <b>Stepper Motors</b>                                                     |    |
| NEMA 8 ( □ 20mm)2-phase 1.8° - 8 HY Series DC .....                       | 12 |
| NEMA11( □ 28mm)2-phase 1.8° - 11HS Series DC .....                        | 13 |
| NEMA14( □ 35mm)2-phase 1.8° - 14HS Series DC .....                        | 14 |
| NEMA14( □ 35mm)2-phase 0.9° - 14HA Series DC .....                        | 15 |
| NEMA17( □ 42mm)2-phase 1.8° - 17HD Series DC .....                        | 16 |
| NEMA17( □ 42mm)2-phase 0.9° - 17HA Series DC .....                        | 17 |
| NEMA23( □ 56mm)2-phase 1.8° - 23HS Series DC .....                        | 18 |
| NEMA23( □ 56mm)2-phase 1.8° - 23HS Power Plus Series DC .....             | 19 |
| NEMA24( □ 60mm)2-phase 1.8° - 24HS Series DC .....                        | 21 |
| NEMA34( □ 86mm)2-phase 1.8° - 34HD Series DC .....                        | 22 |
| NEMA23( □ 56mm)2-phase 1.8° - 23HS Series AC.....                         | 23 |
| NEMA24( □ 60mm)2-phase 1.8° - 24HS Series AC.....                         | 24 |
| NEMA34( □ 86mm)2-phase 1.8° - 34HD Series AC .....                        | 25 |
| NEMA42( □ 110mm)2-phase 1.8° - 42HS Series AC.....                        | 26 |
| <b>IP65 Type Stepper Motors</b>                                           |    |
| NEMA23( □ 56mm)2-phase 1.8° - 23HS Series DC IP65 Type .....              | 27 |
| NEMA24( □ 60mm)2-phase 1.8° - 24HS Series DC IP65 Type .....              | 28 |
| NEMA34( □ 86mm)2-phase 1.8° - 34HD Series DC IP65 Type.....               | 29 |
| <b>Brake Type Stepper Motors</b>                                          |    |
| NEMA17( □ 42mm)2-phase 1.8° - 17HD Series DC Brake Type.....              | 30 |
| NEMA23( □ 56mm)2-phase 1.8° - 23HS Series DC Brake Type .....             | 31 |
| NEMA24( □ 60mm)2-phase 1.8° - 24HS Series DC Brake Type .....             | 32 |
| NEMA24( □ 60mm)2-phase 1.8° - 24HS Series AC Brake Type .....             | 33 |
| NEMA34( □ 86mm)2-phase 1.8° - 34HD Series DC/AC Brake Type.....           | 34 |
| <b>Planetary Reducer Motors</b>                                           |    |
| NEMA17( □ 42mm)2-phase 1.8° - 17HD Series DC Planetary Reducer Type ..... | 35 |
| NEMA23( □ 56mm)2-phase 1.8° - 23HS Series DC Planetary Reducer Type.....  | 37 |
| NEMA24( □ 60mm)2-phase 1.8° - 24HS Series DC Planetary Reducer Type.....  | 38 |
| NEMA34( □ 86mm)2-phase 1.8° - 34HD Series DC Planetary Reducer Type ..... | 39 |
| NEMA34( □ 86mm)2-phase 1.8° - 34HD Series AC Planetary Reducer Type ..... | 40 |
| <b>Encoder Type Stepper Motors</b>                                        |    |
| NEMA17( □ 42mm)2-phase 1.8° - 17HD Series DC Encoder Type.....            | 41 |
| NEMA23( □ 56mm)2-phase 1.8° - 23HS Series DC Encoder Type .....           | 42 |
| NEMA24( □ 60mm)2-phase 1.8° - 24HS Series DC Encoder Type .....           | 43 |
| NEMA34( □ 86mm)2-phase 1.8° - 34HD Series DC/AC Encoder Type.....         | 44 |
| <b>3-phase Stepper Motors</b>                                             |    |
| <b>Stepper Motors</b>                                                     |    |
| NEMA17( □ 42mm)3-phase 1.2° - 17HC Series DC .....                        | 46 |
| NEMA24( □ 60mm)3-phase 1.2° - 24HC Series DC 57 Flange Demension.....     | 47 |
| NEMA24( □ 60mm)3-phase 1.2° - 24HC Series DC 60 Flange Demension.....     | 48 |

# Contents

|                                                    |    |
|----------------------------------------------------|----|
| NEMA34( □ 86mm)3-phase 1.2° - 34HC Series DC ..... | 49 |
| NEMA34( □ 86mm)3-phase 1.2° - 34HC Series AC ..... | 50 |

## 2-phaseUL Stepper Motors

### UL Stepper Motors

|                                                        |    |
|--------------------------------------------------------|----|
| NEMA23( □ 56mm)2-phase 1.8° - 23HS UL Series DC.....   | 51 |
| NEMA24( □ 60mm)2-phase 1.8° - 24HS UL Series DC.....   | 52 |
| NEMA34( □ 86mm)2-phase 1.8° - 34HD UL Series DC.....   | 53 |
| NEMA34( □ 86mm)2-phase 1.8° - 34HD UL Series AC .....  | 54 |
| NEMA42( □ 110mm)2-phase 1.8° - 42HS UL Series AC ..... | 55 |

### Power Plus Type UL Stepper Motors

|                                                                 |    |
|-----------------------------------------------------------------|----|
| NEMA23( □ 56mm)2-phase 1.8° - 23HS UL Series DC Power Plus..... | 56 |
|-----------------------------------------------------------------|----|

### IP65 Type UL Stepper Motors

|                                                                 |    |
|-----------------------------------------------------------------|----|
| NEMA23( □ 56mm)2-phase 1.8° - 23HS UL Series DC IP65 Type.....  | 58 |
| NEMA24( □ 60mm)2-phase 1.8° - 24HS UL Series DC IP65 Type.....  | 59 |
| NEMA34( □ 86mm)2-phase 1.8° - 34HD UL Series DC IP65 Type ..... | 60 |

### Configurations and Options

|                                   |    |
|-----------------------------------|----|
| Bearing Life & Shaft Loading..... | 61 |
| Configuration .....               | 62 |
| Options .....                     | 65 |
| Glossary .....                    | 64 |
| Conversion Factors .....          | 68 |

## Introduction of Stepping Motors

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### ■ What is Stepping Motor

Stepping Motors provide precise position and speed control, without the need for feedback devices to sense position. The operation of step motors is controlled through electrical pulses that the drive converts to current flowing through the windings of the motor. As the current is switched the motor rotates in precise steps of a fixed angle. The motor and drive constitutes a low cost control system that is precise and simple to construct.

### ■ Performance Features of MOONS' Stepping Motors

- **Accurate Position Control**

The number of control pulses defines the motor shaft position. Position error is very small (less than 1/10th of a degree), and non cumulative.

- **Precise Motor Speed**

Step motor running speed, is exactly determined by the frequency of the control pulses. Because the speed is very precise and easy to control, step motors are often used where coordinated motion control is needed.

- **Forward & Reverse, Pause and Holding Function**

Motor torque and position control is effective throughout the entire speed range, including zero speed holding torque. The zero speed holding torque locks the shaft at the desired position to hold the load in place.

- **Low Speed Operation**

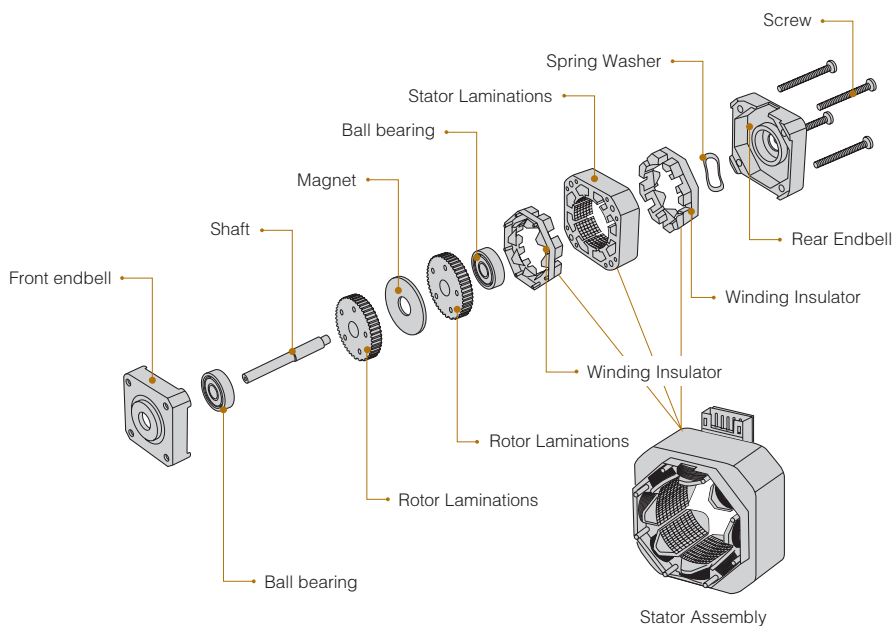
Step motors produce a large amount of torque, and are easy to control, at low speeds. This often eliminates the need for speed reduction gearboxes, reduces costs and saves space.

- **Long Life**

The brushless design of step motors leads to motors with a very long life. Step motor life is usually determined by the life of the bearings.

## ■ Basic Structure and Motor Operation

### • Basic Structure

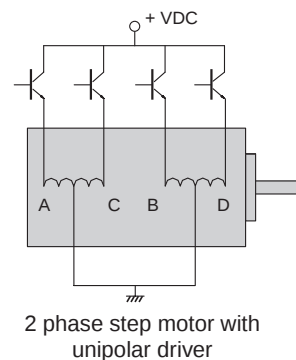
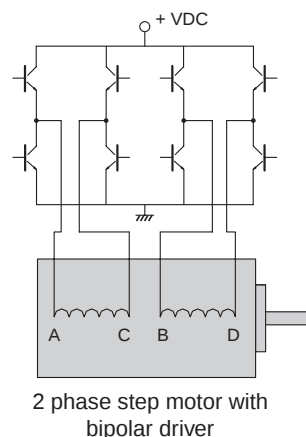


### • Operating Principles

In response to each individual control pulse and direction signal, the drive applies power to the motor windings to cause the rotor to take a step forward, a step in reverse, or lock in position.

For example, in a 1.8 degree two phase step motor: When both phases are energized with DC current, the motor will stop rotating and hold in position. The maximum torque the motor can hold in place with rated DC current, is the rated holding torque. If the current in one phase is reversed, the motor will move 1 step (1.8 degrees) in a known direction. If the current in the other phase had been reversed, the motor would move 1 step (1.8 degrees) in the other direction. As current is reversed in each phase in sequence, the motor continues to step in the desired direction. These steps are very accurate. For a 1.8 degree step motor, there are exactly 200 steps in one revolution.

Two phase stepping motors are furnished with two types of windings: bipolar or unipolar. In a bipolar motor there is one winding on each phase. The motor moves in steps as the current in each winding is reversed. This requires a drive with eight electronic switches. In a unipolar motor there are two windings on each phase. The two windings on each phase are connected in opposite directions. Phase current is reversed by turning on alternate windings on the same phase. This requires a drive with only four electronic switches. Bipolar operation typically provides 40% more holding torque than unipolar, because 100% of the winding is energized in the bipolar arrangement.



## ■ Technical Data and Terminology

### • Load Calculations

#### A. Torque load (Tf)

$$Tf = G * r$$

G: weight

r: radius

#### B. Inertia load (TJ)

$$TJ = J * dw/dt$$

$$J = M * (R1^2 + R2^2) / 2 \text{ (Kg * cm)}$$

$$J = M * (R1^2 + R2^2) / 2 \text{ (Kg * cm)}$$

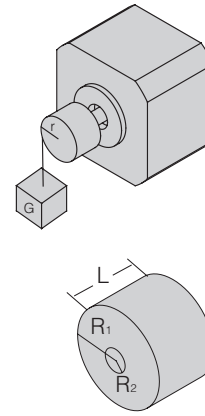
$$J = M * (R1^2 + R2^2) / 2 \text{ (Kg * cm)}$$

M: mass

R1: outside radius

R2: inside radius

dw/dt: angle acceleration



### • Speed-Torque Characteristics

The dynamic torque curve is an important aspect of stepping motor's output performance. The followings are some keyword explanations.

#### A. Working frequency point express the stepping

motors rotational speed value at this point

$$n = q * Hz / (360 * D)$$

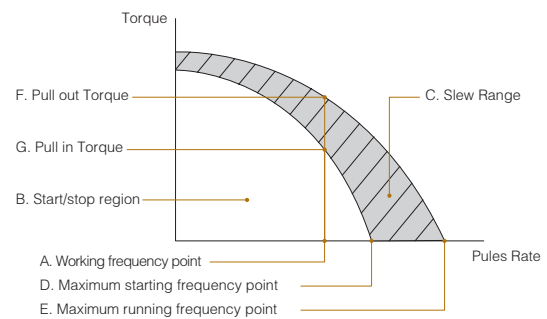
n: rev/sec

Hz: the frequency value at this point

D: the subdividing value of motor driver

q: the step angle of stepping moto

E.g.: 1.8° stepping motor, in the condition of 1/2 subdividing (each step 0.9°) runs at 500Hz its speed is 1.25r/s.



B. Start/Stop region: the region in which a stepping motor can be directly started or stopped.

C. Slew Range: the motor cannot be started directly in this area. It must be started in the start/stop region first and then accelerated to this area. In this area, the motor can not be directly stopped, either Otherwise this will lead to losing-step. The motor must be decelerated back to the start/stop region before it can be stopped.

D. Maximum starting frequency point at this point, the stepping motor can reach its maximum starting speed under unloaded condition.

E. Maximum running frequency point at this point the stepping motor can reach its maximum running speed under an unloaded condition.

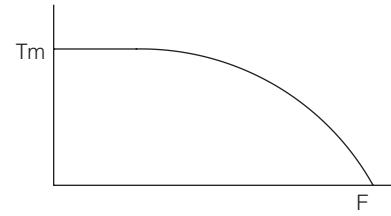
F. Pull-in Torque: the maximum dynamic torque value that a stepping motor can load directly at the particular operating frequency point.

G. Pull-out Torque: the maximum dynamic torque value that a stepping motor can load at the particular operating frequency point when the motor has been started. Because of the inertia of rotation the Pull-Out. Torque is always larger than the Pull-In Torque.

- Calculate the Acceleration Torque

How to accelerate or decelerate in the shortest time is the most important when the system's operating frequency point is in the slew range of the dynamic torque curve graph.

It is shown by the following graph: the dynamic torque's performance of stepping motor will always keep a horizontal straight line in low speed. But in high speed, the curve will slope



A. Accelerated Motion of Straight Line

Motor's load value is known as  $T_L$ , it has to be accelerated from  $F_0$  to  $F_1$  in the shortest time ( $t_r$ ), what is the value of  $t_r$ ?

(1). Generally  $T_J = 70\%T_m$

(2).  $t_r = 1.8 \times 10^{-5} \times J \times q \times (F_1 - F_0) / (T_J - T_L)$

(3).  $F(t) = (F_1 - F_0) \times t / t_r + F_0, 0 < t < t_r$

B. Exponential Acceleration

(1). Generally

$T_{J0} = 70\%T_{m0}$ ,

$T_{J1} = 70\%T_{m1}$ ,

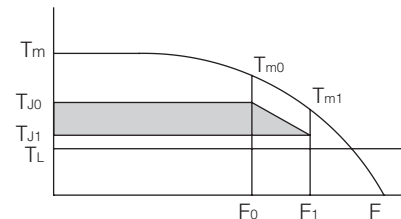
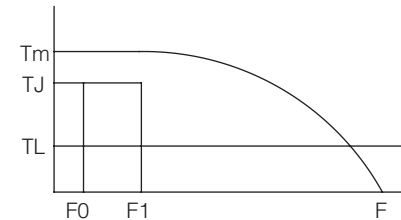
$T_L = 60\%T_{m1}$

(2).  $t_r = F_4 \times \ln [(T_{J0} - T_L) / (T_{J1} - T_L)]$

(3).  $F(t) = F_2 \times [1 - e^{-(t/F_4)}] + F_0, 0 < t < t_r$

$F_2 = (T_L - T_{J0}) \times (F_1 - F_0) / (F_{J1} - T_{J0})$

$F_4 = 1.8 \times 10^{-5} \times J \times q \times F_2 / (T_{J0} - T_L)$



Note:

$J$  is the torque inertia of motor rotor plus its load,  $q$  is the angle of each step, it equals to the step angle of stepping motor when motor runs in full step.

As for the control of deceleration, it can be realized by turning the accelerate pulse frequency above-mentioned.

- Reduction of Vibration and Noise

In a non-loading condition, stepping motors may appear to have vibration or even lose steps when the motor is running at or close to resonant frequency.

Solutions for these conditions

A. Have the motor operate outside of this speed range.

B. By adopting the micro-step driving method, you can divide one step into multiple steps thereby reducing the vibration, Micro-step is used for increasing a motor's step resolution. This is accomplished by controlling the motor's phase current ratio. Micro-step does not increase step accuracy. However it will allow a motor to run more smoothly and with less noise. When the motor runs in half step mode the motor torque will be 15% less than running in full step mode. If the motor is controlled by sine wave current the motor torque will be reduced by 30%.



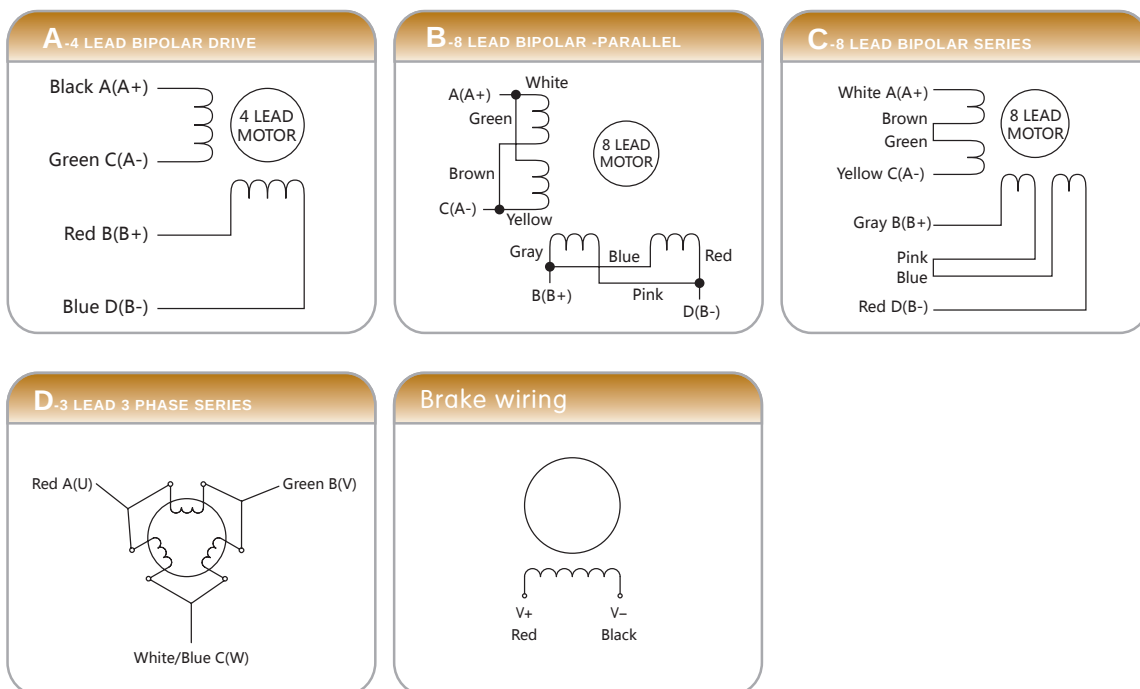
## ■ Numbering System

**AM 17 HD 0 0 01 - 01**

1      2      3      4      5      6      7

1. Motion Control Standard Series
2. Size: Motor outside diameter in tenths of an inch (Ex: size 17 = 1.7")  
(8:20mm; 11:28mm; 14:35mm; 17:42mm; 23:56mm; 24:60mm; 34:86mm; 42:110mm)
3. Series:  
 HA: step angle 0.9°  
 HY,HS,HD: step angle 1.8°  
 HC: step angle 1.2°
4. Length of stator
5. Number of lead wires  
 0: Connector type  
 3: 3 lead wires  
 4: 4 lead wires  
 6: 6 lead wires  
 8: 8 lead wires
6. Electric variation: variety of current, torque, etc.
7. Mechanical variation: variety of shaft, lead wires, screws, etc.

## ■ Wiring Diagrams

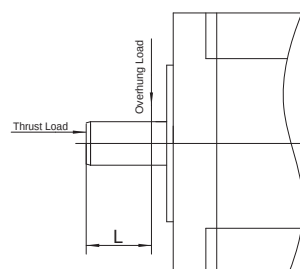


## ■ General Specifications

| Specifications        |                     | Parameter                                                                                                                                            |
|-----------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step Accuracy         |                     | ±5%(Tested by: Constant Current Drive/24V/Two Phase On/Rated Current/Full Step:1rps)                                                                 |
| Insulation Class      |                     | Class B(130°C)                                                                                                                                       |
| Operating Environment | Ambient Temperature | -20~+50°C(non-freezing)                                                                                                                              |
|                       | Ambient Humidity    | 85% or less (non-condensing)                                                                                                                         |
|                       | Atmosphere          | No corrosive gases, dust, water or oil                                                                                                               |
| Temperature Rise      |                     | Temperature rise of windings is 80°C (144°F) or less measured by the resistance change method. (at rated voltage, at standstill, two phases excited) |
| Shaft Runout          |                     | 0.050T.I.R.(mm)                                                                                                                                      |
| Radial Play           |                     | 0.02mm Max.(500gf)                                                                                                                                   |
| Axial Play            |                     | 0.08mm Max.(500gf)                                                                                                                                   |
| Concentricity         |                     | 0.075T.I.R.(mm)                                                                                                                                      |
| Perpendicularity      |                     | 0.100T.I.R.(mm)                                                                                                                                      |

## ■ Permissible Overhung Load and Permissible Thrust Load(Unit:N)

| Type           | Permissible Overhung Load<br>Distance(L) from Shaft End(mm) |     |      |      |      | Permissible Thrust Load  |
|----------------|-------------------------------------------------------------|-----|------|------|------|--------------------------|
|                | 0mm                                                         | 5mm | 10mm | 15mm | 20mm |                          |
| 8HY            | 12                                                          | 15  | 20   | ---  | ---  | Less than the motor mass |
| 11HS           | 20                                                          | 25  | 34   | 52   | ---  |                          |
| 14HA/14HS      | 20                                                          | 25  | 34   | 52   | ---  |                          |
| 17HD/17HA/17HC | 20                                                          | 25  | 34   | 52   | ---  |                          |
| 23HS           | 50                                                          | 60  | 75   | 100  | 150  |                          |
| 24HS/24HC      | 61                                                          | 73  | 90   | 110  | 160  |                          |
| 34HD/34HC      | 260                                                         | 290 | 340  | 390  | 480  |                          |
| 42HS           | 390                                                         | 435 | 510  | 585  | 720  |                          |



## ■ Motor Installation

### Mounting Direction

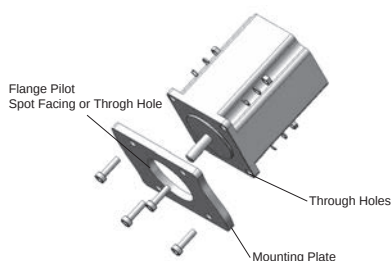
Motors can be mounted freely in any direction as shown below.

Regardless of how the motor is mounted, take care not to apply an overhung load or thrust load on the shaft. Make sure the cable does not contact the mounting surface causing undesirable force on the cable.

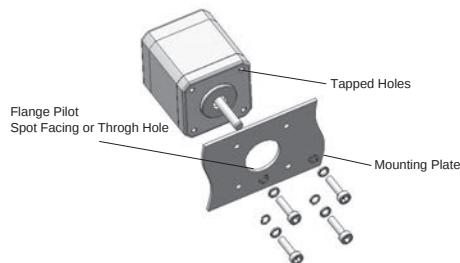
### ■ Mounting Method

Considering heat radiation and vibration isolation as much as possible, mount the motor tightly against a metal plane.

#### ■ Mounting Method for Through Hole Type



#### ■ Mounting Method for Tapped Hole Type



### ■ Installation Conditions

Install the motor in a location that meets the following conditions, or the product may be damaged.

- Indoors (This product is designed and manufactured to be installed within another device.)
- Ambient temperature:  $-20\sim+50^{\circ}\text{C}$  (non-freezing)
- Ambient humidity: 85% or less (non-condensing)
- Not exposed to explosive, flammable or corrosive gases
- Not exposed to direct sunlight
- Not exposed to dust
- Not exposed to water or oil
- A place where heat can escape easily
- Not exposed to continuous vibration or excessive impact

#### Notes:

When installing the motor in an enclosed space such as a control box, or somewhere close to a heat-radiating object, vent holes should be used to prevent the motor from overheating.

Do not install the motor in a location where a source of vibration will cause the motor to vibrate.

## QUICK SELECTION OF MOTOR

| step angle<br>(°) | Size         |                   |            | Recommended<br>Driver | Model         | The torque range (mN. M); Speed range 0 ~ 50 RPS |      |     |     |     |     |      |      |      |       |       |  |
|-------------------|--------------|-------------------|------------|-----------------------|---------------|--------------------------------------------------|------|-----|-----|-----|-----|------|------|------|-------|-------|--|
|                   | Base<br>(mm) | Thickness<br>(mm) | Series     |                       |               | 0                                                | 50   | 100 | 200 | 400 | 800 | 1600 | 3200 | 6400 | 12800 | 26500 |  |
| 0.9               | 35           | 20                | NEMA14     | SR/ST                 | AML14HA74A0   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 28                |            |                       | AML14HA04A0   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 34.3              |            |                       | AML17HA44A0   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 42           | 39.8              | NEMA17     |                       | AML17HA24A0   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 48.3              |            |                       | AML17HA64A0   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
| 1.2               | 42           | 34                | NEMA17     | 3SR/3ST               | AML17HC20A0   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 43                |            |                       | AML17HC60A0   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 60           | 45.5              | NEMA24     |                       | AM24HC4306    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 54.5              |            |                       | AM24HC2306    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 54.5              |            |                       | AM24HC2308    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 76.5              |            |                       | AM24HC3306    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 86           | 66.5              | NEMA34     |                       | AM34HC0305    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 96                |            |                       | AM34HC1305    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 125.5             |            |                       | AM34HC2306    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 66.5              |            |                       | AM34HC0306    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 96                |            |                       | AM34HC1306    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 125.5             |            |                       | AM34HC2307    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
| 1.8               | 20           | 29.5              | NEMA8      | SR/ST                 | AMBHY 2050    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 46.5              |            |                       | AMBHY 4043    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 28           | 31                | NEMA11     |                       | AML1HS1008    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 40                |            |                       | AML1HS3007    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 51                |            |                       | AML1HS5008    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 35           | 27.3              | NEMA14     |                       | AML14HS10A0   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 36                |            |                       | AML14HS30A0   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 55.5              |            |                       | AML14HS50A0   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 42           | 34.3              | NEMA17     |                       | AML17HD4452   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 39.8              |            |                       | AML17HD2438   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 48.3              |            |                       | AML17HD6426   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 62.8              |            |                       | AML17HDB410   |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 57           | 41                | NEMA23     |                       | AM23HS0420    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 54                |            |                       | AM23HS2449    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 76                |            |                       | AM23HS3454    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 41                |            |                       | AM23HS0421    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 54                |            |                       | AM23HS2450    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 76                |            |                       | AM23HS3455    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 39                |            |                       | AM23HS04A0    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 55                |            |                       | AM23HS84A0    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 77                |            |                       | AM23HSA4A0    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 39                |            |                       | AM23HS04B0    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 55                |            |                       | AM23HS84B0    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 77                |            |                       | AM23HSA4B0    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 60           | 55                | NEMA24     |                       | AM24HS2402    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 85                |            |                       | AM24HS5401    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 86           | 66.5              | NEMA34     |                       | AM34HD0404    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 96                |            |                       | AM34HD1404    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 125.5             |            |                       | AM34HD2403    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 156               |            |                       | AM34HD3402    |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 57           | 54                | NEMA23     |                       | SRAC/<br>STAC | AM23HS2459                                       |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 76                |            |                       |               | AM23HS3466                                       |      |     |     |     |     |      |      |      |       |       |  |
|                   | 60           | 85                | NEMA24     |                       |               | AM24HS5411                                       |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 66.5              |            |                       |               | AM34HD0802                                       |      |     |     |     |     |      |      |      |       |       |  |
|                   | 86           | 75                | NEMA34     |                       |               | AM34HD4802                                       |      |     |     |     |     |      |      |      |       |       |  |
|                   |              | 96                |            |                       |               | AM34HD1802                                       |      |     |     |     |     |      |      |      |       |       |  |
| 115               |              | AM34HD6801        |            |                       |               |                                                  |      |     |     |     |     |      |      |      |       |       |  |
| 125.5             |              | AM34HD2805        |            |                       |               |                                                  |      |     |     |     |     |      |      |      |       |       |  |
| 110               | 98.5         | NEMA42            | AM42HS04A0 |                       |               |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 149.5        |                   | AM42HS24A0 |                       |               |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   | 201          |                   | AM42HS34A0 |                       |               |                                                  |      |     |     |     |     |      |      |      |       |       |  |
|                   |              |                   |            |                       |               | 0                                                | 0.05 | 0.1 | 0.2 | 0.4 | 0.8 | 1.6  | 3.2  | 6.4  | 12.8  | 25.6  |  |
|                   |              |                   |            |                       |               | The torque range (mN. M); Speed range 0 ~ 50 RPS |      |     |     |     |     |      |      |      |       |       |  |

Introduction

Quick Selection

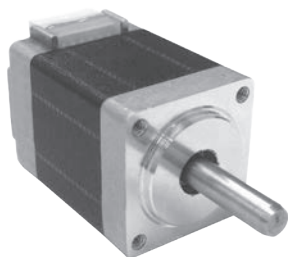
2-phase Stepper Motors

3-phase Stepper Motors

UL Stepper Motors

Configurations and Options

## NEMA8(□20mm) 2-phase DC1.8°- 8HY Series



|                       |                                                                              |
|-----------------------|------------------------------------------------------------------------------|
| Phases                | 2                                                                            |
| Steps / Revolution    | ± 5%                                                                         |
| Step Accuracy         | 6 N (1.3 Lbs.) Push<br>25 N (5.6 Lbs.) Pull<br>18 N (4 Lbs.) At End of Shaft |
| Radial                | 40                                                                           |
| IP Rating             | -20°C to +50°C                                                               |
| Operating Temp        | B, 130°C                                                                     |
| Insulation Class      | 100 MegOhms                                                                  |
| Insulation Resistance |                                                                              |



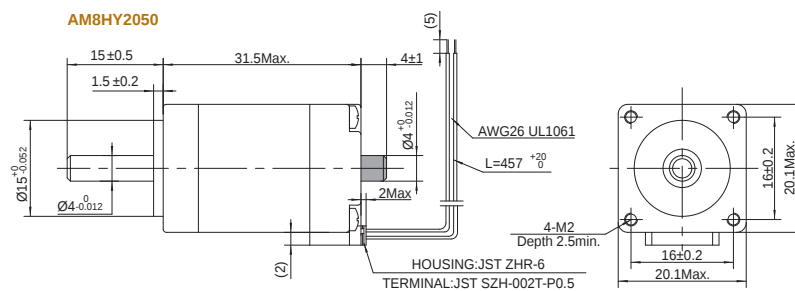
## ■ Parameters

| Model         | Shaft        | Wiring * | Leads | Length"L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |  |  |
|---------------|--------------|----------|-------|-----------|----------------|-----------|------------|-------------------|------|---------------------|--|--|
|               |              |          |       | mm        | N.m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |  |  |
| AM8HY2050-01N | Single Shaft | A        | 4     | 29.5      | 0.02           | 0.35      | 11.5       | 1.6               | 0.04 | 500VAC 1 minute     |  |  |
| AM8HY2050-02N | Double Shaft |          |       |           |                |           |            |                   |      |                     |  |  |
| AM8HY4043-01N | Single Shaft |          |       | 46.5      | 0.042          |           | 20.3       | 4.2               | 0.09 |                     |  |  |
| AM8HY4043-02N | Double Shaft |          |       |           |                |           |            |                   |      |                     |  |  |

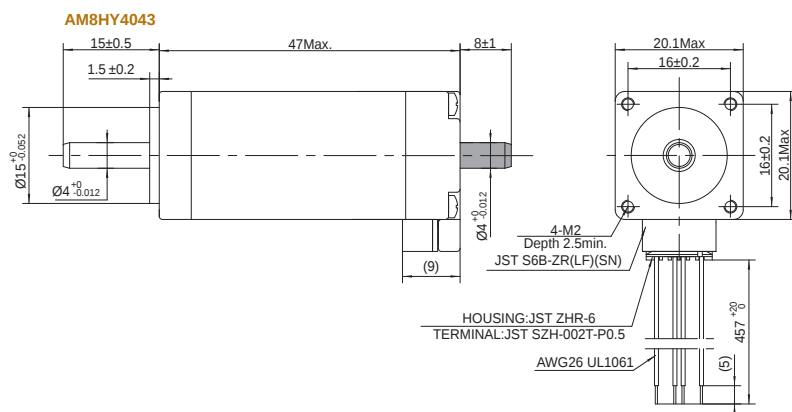
\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

## ■ Dimensions (Unit: mm)

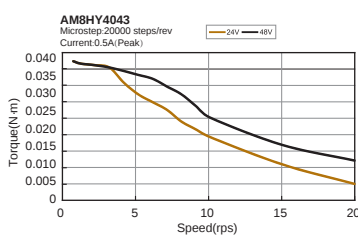
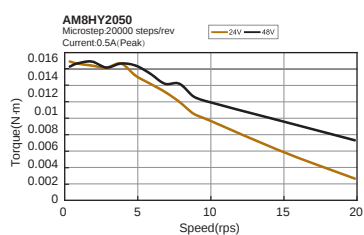


■ These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.



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

## ■ Torque Curves (Recommended Driver: SR or ST)



## NEMA11(□28mm) 2-phase DC 1.8°- 11HS Series



|                       |                                              |
|-----------------------|----------------------------------------------|
| Phases                | 2                                            |
| Steps / Revolution    | ± 5%                                         |
| Step Accuracy         | 15 N (3.4 Lbs.) Push<br>25 N (5.6 Lbs.) Pull |
| Radial                | 30 N (6.5 Lbs.) At Flat Center               |
| IP Rating             | 40                                           |
| Operating Temp        | -20°C to +50°C                               |
| Insulation Class      | B, 130°C                                     |
| Insulation Resistance | 100 MegOhms                                  |



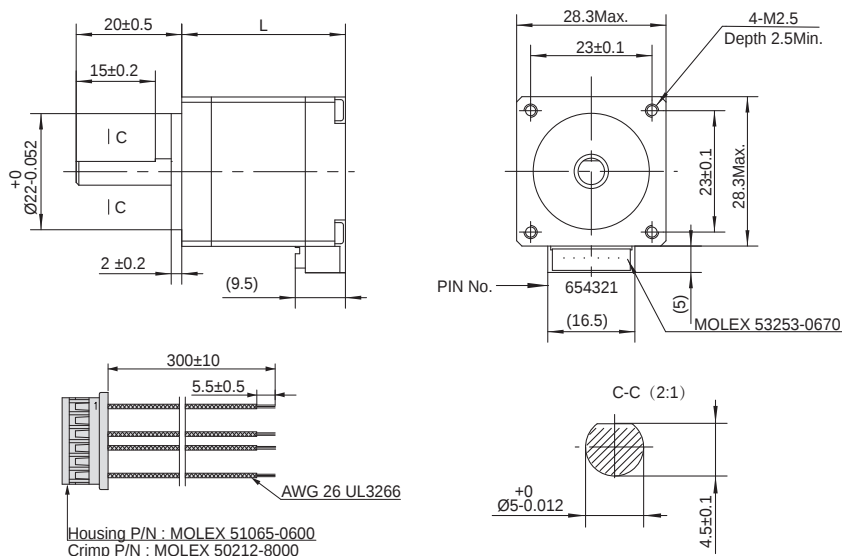
### Parameters

| Model         | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|---------------|--------------|----------|-------|------------|----------------|-----------|------------|-------------------|------|---------------------|
|               |              |          |       | mm         | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| AM11HS1008-07 | Single Shaft | A        | 4     | 31.0       | 0.072          | 1         | 2.5        | 9.0               | 0.1  | 500VAC<br>1 minute  |
| AM11HS3007-02 | Single Shaft |          |       | 40.0       | 0.082          |           | 1.7        | 12.0              | 0.15 |                     |
| AM11HS5008-01 | Single Shaft |          |       | 51.0       | 0.125          |           | 3.5        | 18.0              | 0.2  |                     |

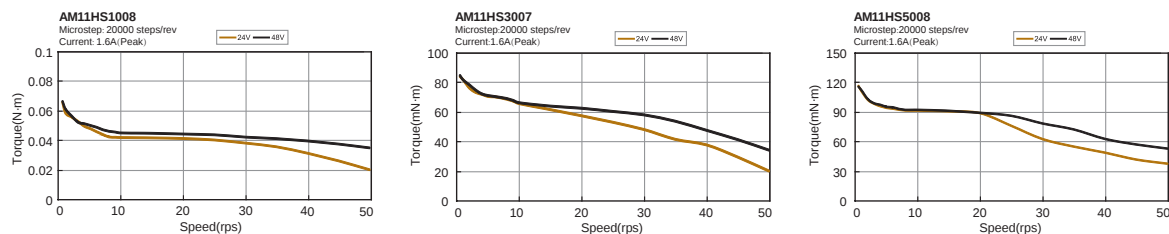
\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

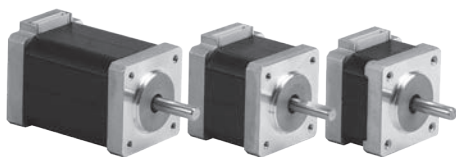
### Dimensions (Unit: mm)



### Torque Curves(Recommended Driver: SR or ST)



## NEMA14(□35mm) 2-phase DC 1.8°- 14HS Series



|                       |                                             |
|-----------------------|---------------------------------------------|
| Phases                | 2                                           |
| Steps / Revolution    | ± 5%                                        |
| Step Accuracy         | 25 N (5.6 Lbs.) Push<br>65 N (15 Lbs.) Pull |
| Radial                | 30 N (6.5 Lbs.) At End of Shaft             |
| IP Rating             | 40                                          |
| Operating Temp        | -20°C to +50°C                              |
| Insulation Class      | B, 130°C                                    |
| Insulation Resistance | 100 MegOhms                                 |



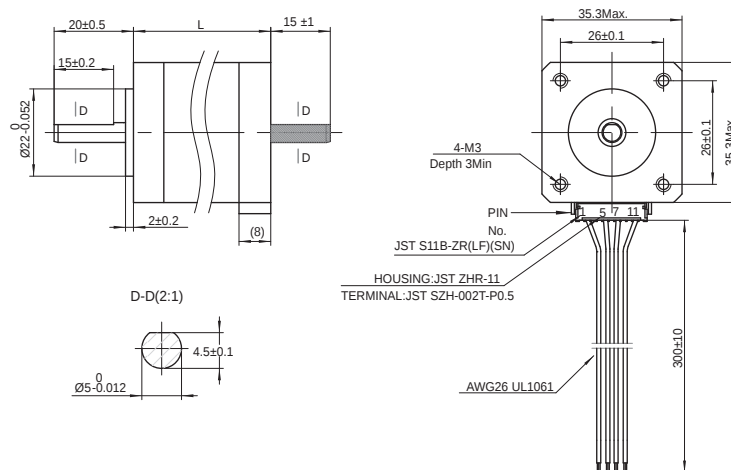
## Parameters

| Model         | Shaft        | Wiring * | Leads | Length "L"<br>mm | Holding Torque<br>N.m | Current *<br>A/Phase | Resistance<br>Ω/Phase | Rotor Inertia<br>g·cm <sup>2</sup> | Mass<br>Kg | Dielectric<br>Strength |
|---------------|--------------|----------|-------|------------------|-----------------------|----------------------|-----------------------|------------------------------------|------------|------------------------|
| AM14HS10A0-01 | Single Shaft | A        | 4     | 27.3             | 0.14                  | 1.0                  | 3.3                   | 12.0                               | 0.15       | 500VAC 1 minute        |
| AM14HS10A0-02 | Double Shaft |          |       | 27.3             | 0.14                  |                      | 3.3                   | 12.0                               | 0.15       |                        |
| AM14HS30A0-01 | Single Shaft |          |       | 36               | 0.23                  |                      | 3.4                   | 20.0                               | 0.21       |                        |
| AM14HS30A0-02 | Double Shaft |          |       | 36               | 0.23                  |                      | 3.4                   | 20.0                               | 0.21       |                        |
| AM14HS50A0-01 | Single Shaft |          |       | 55.5             | 0.4                   |                      | 5.1                   | 35.0                               | 0.24       |                        |
| AM14HS50A0-02 | Double Shaft |          |       | 55.5             | 0.4                   |                      | 5.1                   | 35.0                               | 0.24       |                        |

\* Wiring Diagram A See Page 9

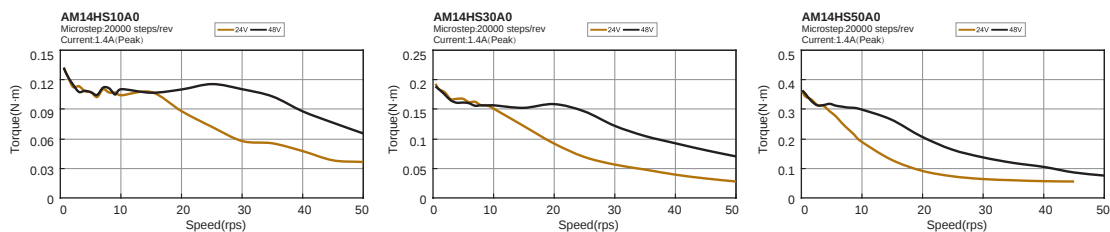
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

## Dimensions (Unit: mm)

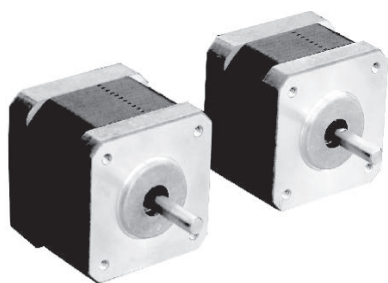


■ These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

## Torque Curves (Recommended Driver: SR or ST)



## NEMA14(□35mm) 2-phase DC 0.9° - 14HA Series



|                       |                                             |
|-----------------------|---------------------------------------------|
| Phases                | 2                                           |
| Steps / Revolution    | ± 5%                                        |
| Step Accuracy         | 25 N (5.6 Lbs.) Push<br>65 N (15 Lbs.) Pull |
| Radial                | 30 N (6.5 Lbs.) At Flat Center              |
| IP Rating             | 40                                          |
| Operating Temp        | -20°C to +50°C                              |
| Insulation Class      | B, 130°C                                    |
| Insulation Resistance | 100 MegOhms                                 |



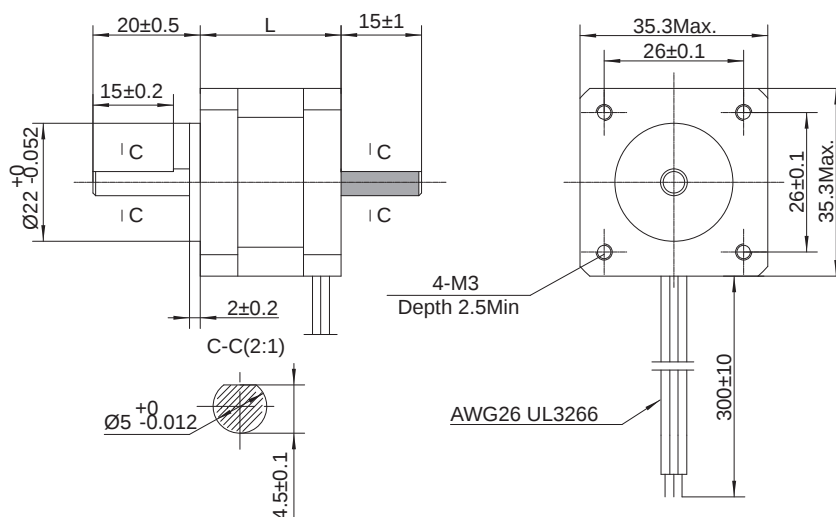
### Parameters

| Model          | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|----------------|--------------|----------|-------|------------|----------------|-----------|------------|-------------------|------|---------------------|
|                |              |          |       | mm         | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| AM14HA74A0-01N | Single Shaft | A        | 4     | 20         | 0.065          | 1.5       | 0.9        | 10.0              | 0.09 | 500VAC<br>1 minute  |
| AM14HA74A0-02N | Double Shaft |          |       |            |                |           |            |                   |      |                     |
| AM14HA04A0-01N | Single Shaft |          |       | 28         | 0.08           | 1.5       | 0.9        | 14.0              | 0.16 |                     |
| AM14HA04A0-02N | Double Shaft |          |       |            |                |           |            |                   |      |                     |

\* Wiring Diagram A See Page 9

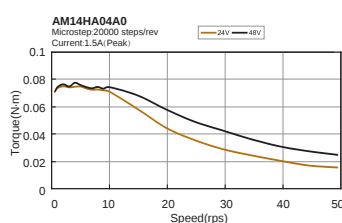
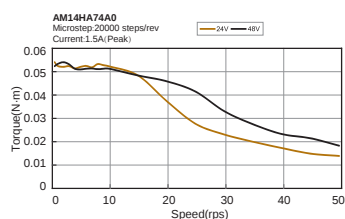
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### Dimensions (Unit: mm)

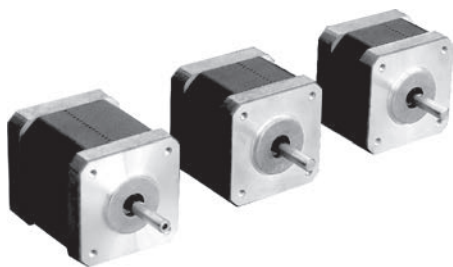


■ These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

### Torque Curves (Recommended Driver: SR or ST)



## NEMA17(□42mm) 2-phase DC 1.8° - 17HD Series



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 2                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 25 N (5.6 Lbs.) Push<br>65 N (15 Lbs.) Pull<br>30 N (6.5 Lbs.) At Flat Center |
| Radial                | 40                                                                            |
| IP Rating             | –20°C to +50°C                                                                |
| Operating Temp        | B, 130°C                                                                      |
| Insulation Class      | 100 MegOhms                                                                   |
| Insulation Resistance |                                                                               |



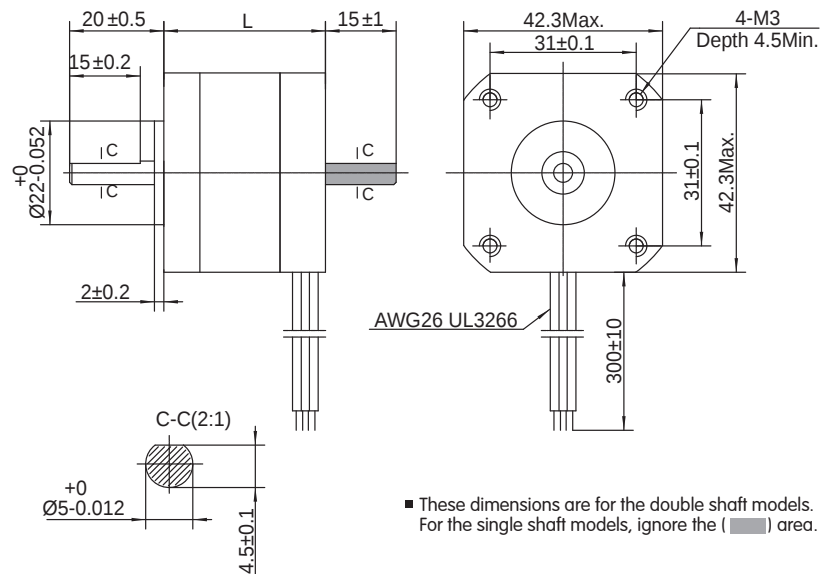
## ■ Parameters

| Model          | Shaft        | Wiring * | Leads | Length"L" | Holding Torque | Current * | Resistance | Rotor Inertia | Mass | Dielectric Strength |  |  |
|----------------|--------------|----------|-------|-----------|----------------|-----------|------------|---------------|------|---------------------|--|--|
|                |              |          |       | mm        | N·m            | A/Phase   | Ω/Phase    | g·cm²         | Kg   |                     |  |  |
| AM17HD4452-02N | Single Shaft | A        | 4     | 34.3      | 0.285          | 1.5       | 1.5        | 38.0          | 0.23 | 500VAC<br>1 minute  |  |  |
| AM17HD4452-01N | Double Shaft |          |       | 39.8      | 0.46           |           | 1.9        | 57.0          | 0.28 |                     |  |  |
| AM17HD2438-02N | Single Shaft |          |       |           |                |           |            |               |      |                     |  |  |
| AM17HD2438-01N | Double Shaft |          |       | 48.3      | 0.59           | 2.3       | 82.0       | 0.36          |      |                     |  |  |
| AM17HD6426-06N | Single Shaft |          |       |           |                |           |            |               |      |                     |  |  |
| AM17HD6426-05N | Double Shaft |          |       | 62.8      | 0.85           | 3.2       | 123.0      | 0.6           |      |                     |  |  |
| AM17HDB410-01N | Single Shaft |          |       |           |                |           |            |               |      |                     |  |  |
| AM17HDB410-02N | Double Shaft |          |       |           |                |           |            |               |      |                     |  |  |

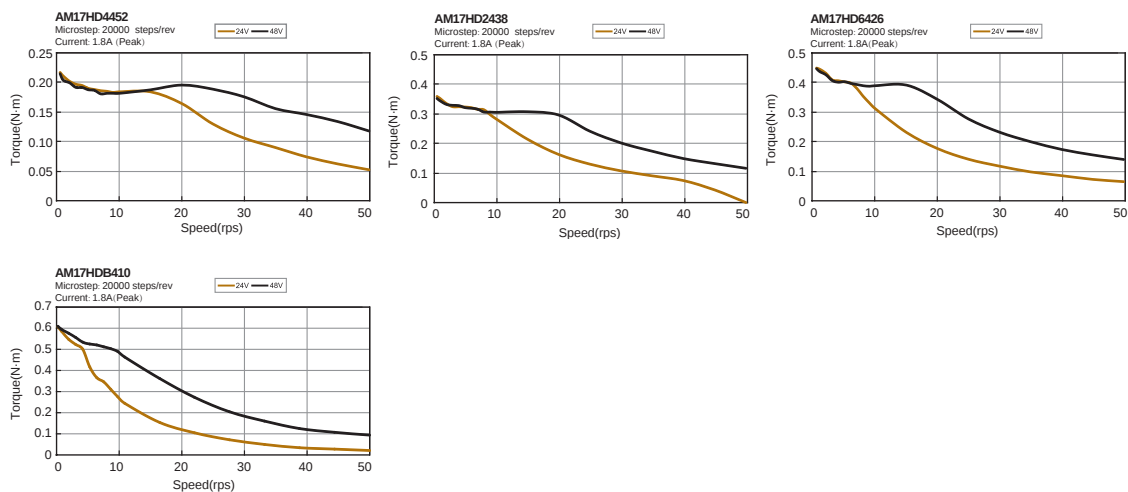
\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

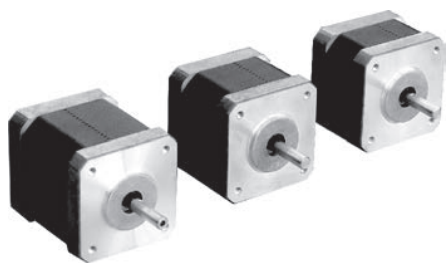
## ■ Dimensions (Unit: mm)



## ■ Torque Curves (Recommended Driver: SR or ST)



## NEMA17(□42mm) 2-phase DC 0.9°- 17HA Series



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 2                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 25 N (5.6 Lbs.) Push<br>65 N (15 Lbs.) Pull<br>30 N (6.5 Lbs.) At Flat Center |
| Radial                | 40                                                                            |
| IP Rating             | -20°C to +50°C                                                                |
| Operating Temp        | B, 130°C                                                                      |
| Insulation Class      | 100 MegOhms                                                                   |
| Insulation Resistance |                                                                               |



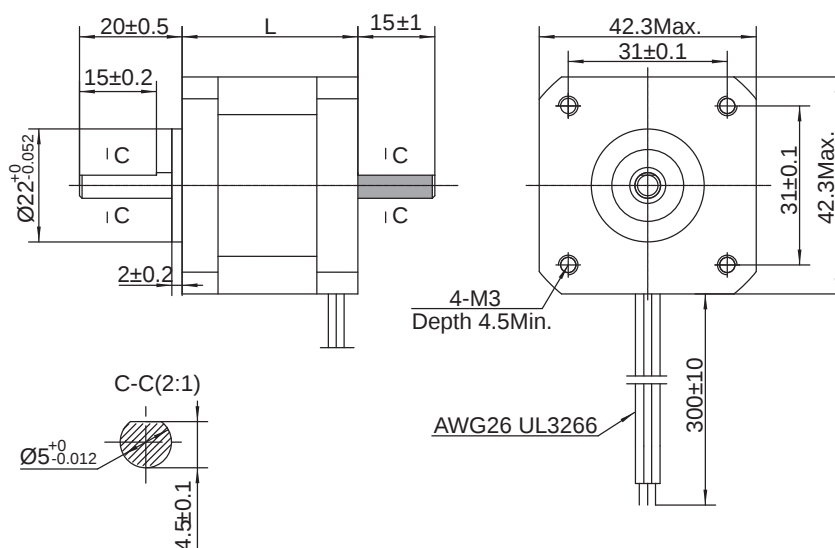
### Parameters

| Model          | Shaft        | Wiring * | Leads | Length"L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |  |  |
|----------------|--------------|----------|-------|-----------|----------------|-----------|------------|-------------------|------|---------------------|--|--|
|                |              |          |       | mm        | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |  |  |
| AM17HA44A0-01N | Single Shaft | A        | 4     | 34.3      | 0.25           | 1.5       | 1.6        | 38.0              | 0.23 | 500VAC<br>1 minute  |  |  |
| AM17HA44A0-02N | Double Shaft |          |       |           |                |           |            |                   |      |                     |  |  |
| AM17HA24A0-01N | Single Shaft |          |       | 39.8      | 0.35           |           | 1.65       | 57.0              | 0.28 |                     |  |  |
| AM17HA24A0-02N | Double Shaft |          |       |           |                |           |            |                   |      |                     |  |  |
| AM17HA64A0-01N | Single Shaft |          |       | 48.3      | 0.45           |           | 1.56       | 82.0              | 0.36 |                     |  |  |
| AM17HA64A0-02N | Double Shaft |          |       |           |                |           |            |                   |      |                     |  |  |

\* Wiring Diagram A See Page 9

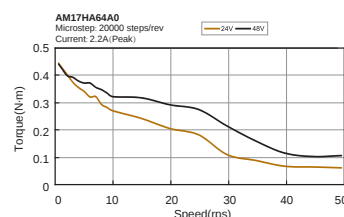
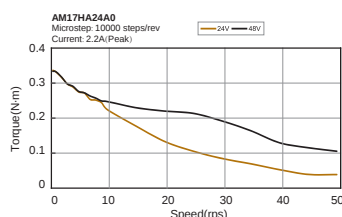
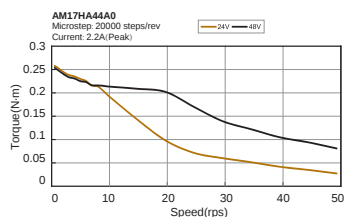
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### Dimensions (Unit: mm)



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

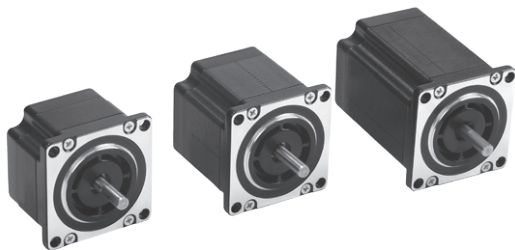
### Torque Curves (Recommended Driver: SR or ST)







## NEMA23(□56mm) 2-phase DC 1.8°- 23HS PowerPlus Series (8mm Shaft)



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 2                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 40 N (9 Lbs.) Push<br>130 N (30 Lbs.) Pull<br>70 N (15.5 Lbs.) At Flat Center |
| Radial                | 40                                                                            |
| IP Rating             | 40                                                                            |
| Operating Temp        | -20°C to +50°C                                                                |
| Insulation Class      | B, 130°C                                                                      |
| Insulation Resistance | 100 MegOhms                                                                   |



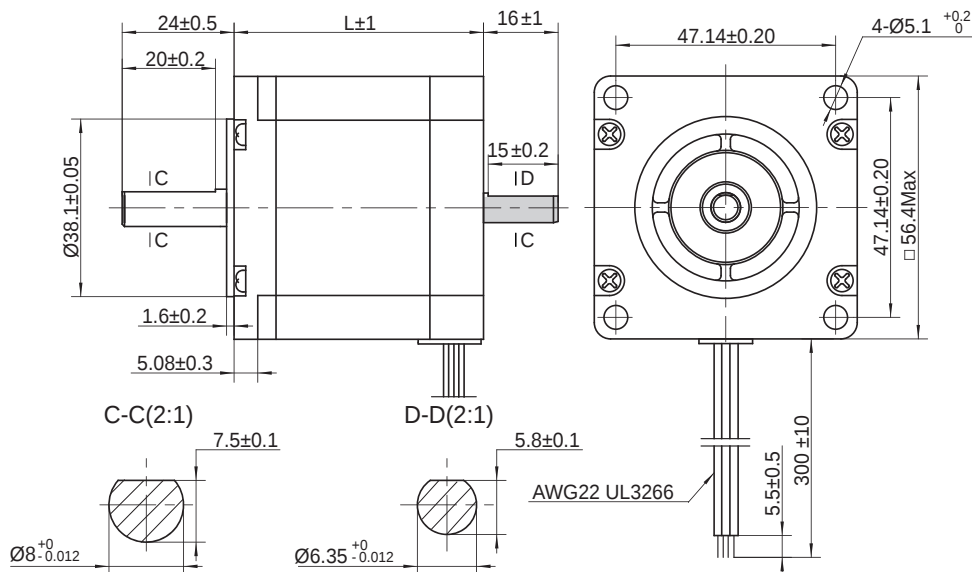
### Parameters

| Model         | Shaft        | Wiring * | Leads | Length"L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|---------------|--------------|----------|-------|-----------|----------------|-----------|------------|-------------------|------|---------------------|
|               |              |          |       | mm        | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| AM23HS04B0-03 | Single Shaft | A        | 4     | 39        | 0.82           | 3.7       | 0.48       | 105.0             | 0.4  | 500VAC<br>1 minute  |
| AM23HS04B0-04 | Double Shaft |          |       |           |                |           |            |                   |      |                     |
| AM23HS84B0-03 | Single Shaft |          |       | 55        | 1.5            |           | 0.63       | 215.0             | 0.6  |                     |
| AM23HS84B0-04 | Double Shaft |          |       |           |                |           |            |                   |      |                     |
| AM23HSA4B0-03 | Single Shaft |          |       | 77        | 2.3            |           | 0.75       | 365.0             | 1.0  |                     |
| AM23HSA4B0-04 | Double Shaft |          |       |           |                |           |            |                   |      |                     |

\* Wiring Diagram A See Page 9

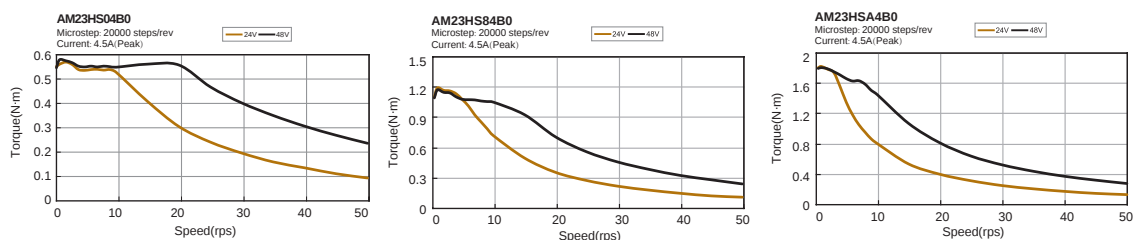
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### Dimensions (Unit: mm)

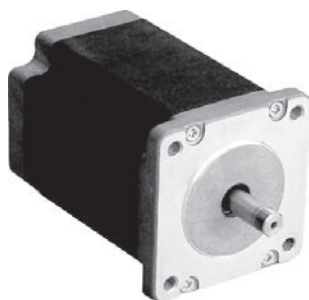


■ These dimensions are for the double shaft models. For the single shaft models, ignore the (■) area.

### Torque Curves (Recommended Driver: SR or ST)



## NEMA24(□60mm) 2-phase DC 1.8°- 24HS Series



|                       |                                            |
|-----------------------|--------------------------------------------|
| Phases                | 2                                          |
| Steps / Revolution    | ± 5%                                       |
| Step Accuracy         | 40 N (9 Lbs.) Push<br>130 N (30 Lbs.) Pull |
| Radial                | 70 N (15.5 Lbs.) At Flat Center            |
| IP Rating             | 40                                         |
| Operating Temp        | -20°C to +50°C                             |
| Insulation Class      | B, 130°C                                   |
| Insulation Resistance | 100 MegOhms                                |



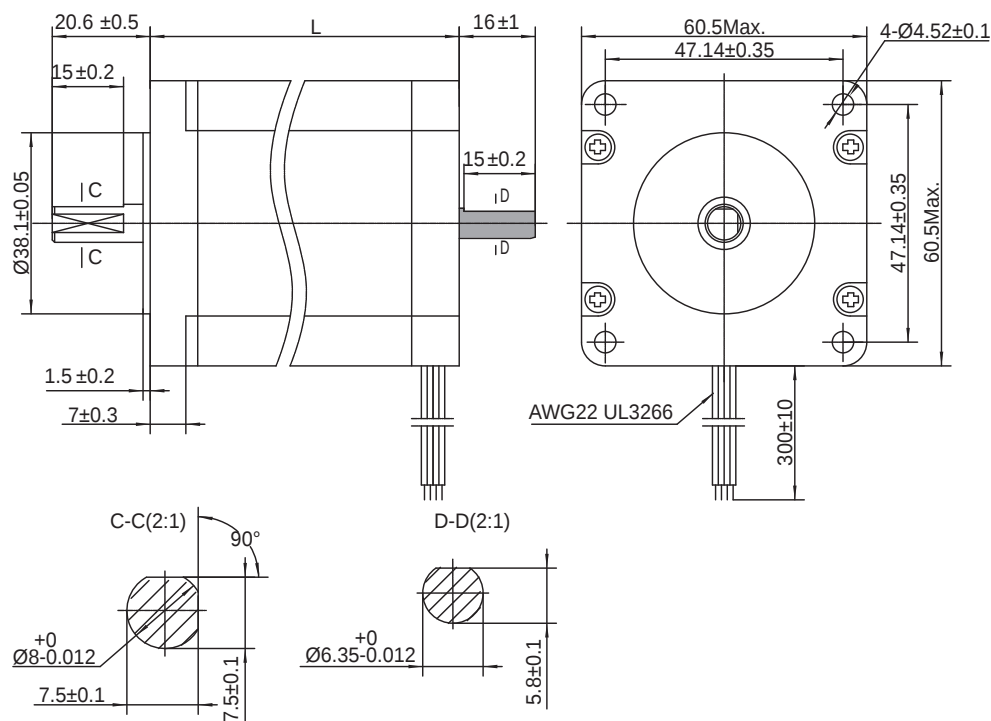
### Parameters

| Model          | Shaft        | Wiring * | Leads | Length"L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|----------------|--------------|----------|-------|-----------|----------------|-----------|------------|-------------------|------|---------------------|
|                |              |          |       | mm        | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| AM24HS2402-08N | Single Shaft | A        | 4     | 54.0      | 1.57           | 4.0       | 0.43       | 450.0             | 0.83 | 500VAC<br>1 minute  |
| AM24HS2402-11N | Double Shaft |          |       |           |                |           |            |                   |      |                     |
| AM24HS5401-10N | Single Shaft |          |       | 85.0      | 3.2            | 4.0       | 0.65       | 900.0             | 1.4  |                     |
| AM24HS5401-24N | Double Shaft |          |       |           |                |           |            |                   |      |                     |

\* Wiring Diagram A See Page 9

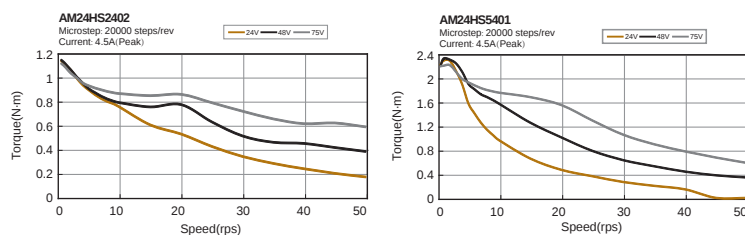
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

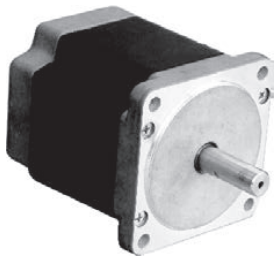
### Dimensions (Unit: mm)



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

### Torque Curves (Recommended Driver: SR or ST)



**NEMA34(86mm) 2-phase DC 1.8° - 34HD Series**

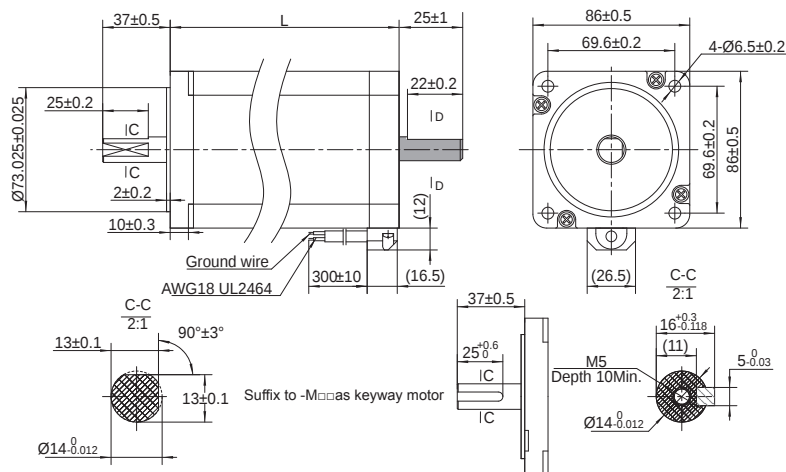
|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 2                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 65 N (15 Lbs.) Push<br>155 N (35 Lbs.) Pull<br>220 N (50 Lbs.) At Flat Center |
| Radial IP Rating      | 40                                                                            |
| Operating Temp        | -20°C to +50°C                                                                |
| Insulation Class      | B, 130°C                                                                      |
| Insulation Resistance | 100 MegOhms                                                                   |

**Parameters**

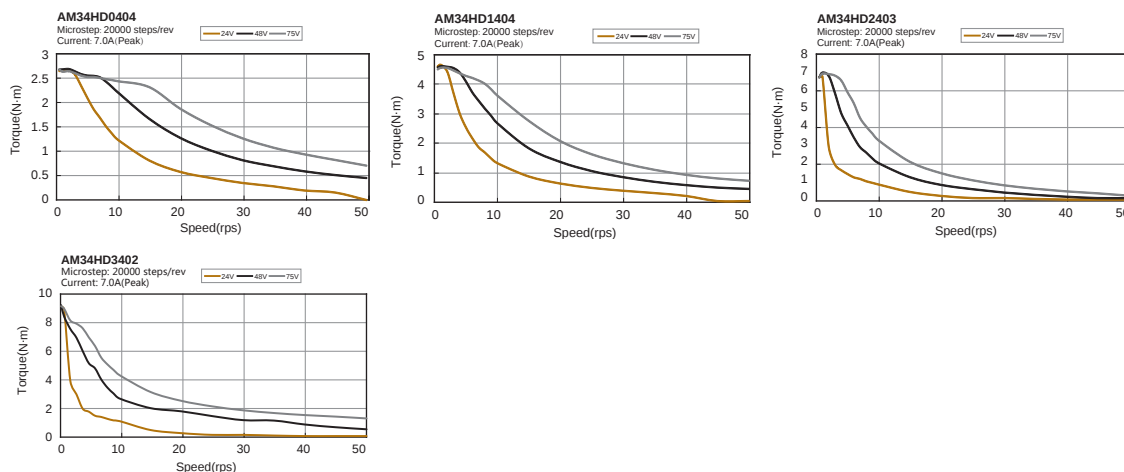
| Model         |                | Shaft        | Wiring * | Leads | Length"L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|---------------|----------------|--------------|----------|-------|-----------|----------------|-----------|------------|-------------------|------|---------------------|
| Common Shaft  | Keyway Shaft   |              |          |       | mm        | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| AM34HD0404-08 | AM34HD0404-M08 | Single Shaft | A        | 4     | 66.5      | 3.7            | 6.3       | 0.25       | 1100.0            | 1.6  | 500VAC<br>1 minute  |
| AM34HD0404-09 | AM34HD0404-M09 | Double Shaft |          |       |           |                |           | 0.35       | 1850.0            | 2.7  |                     |
| AM34HD1404-06 | AM34HD1404-M06 | Single Shaft |          |       | 96.0      | 6.7            | 5.6       | 0.49       | 2750.0            | 3.8  |                     |
| AM34HD1404-07 | AM34HD1404-M07 | Double Shaft |          |       |           |                |           | 0.63       | 4400.0            | 5.2  |                     |
| AM34HD2403-07 | AM34HD2403-M07 | Single Shaft |          |       | 125.5     | 9.4            | 5.6       | 0.63       | 4400.0            | 5.2  |                     |
| AM34HD2403-08 | AM34HD2403-M08 | Double Shaft |          |       |           |                |           | 0.63       | 4400.0            | 5.2  |                     |
| AM34HD3402-01 | AM34HD3402-M01 | Single Shaft |          |       | 156.0     | 11.5           | 5.6       | 0.63       | 4400.0            | 5.2  |                     |
| AM34HD3402-02 | AM34HD3402-M02 | Double Shaft |          |       |           |                |           |            |                   |      |                     |

\* Wiring Diagram A See Page 9

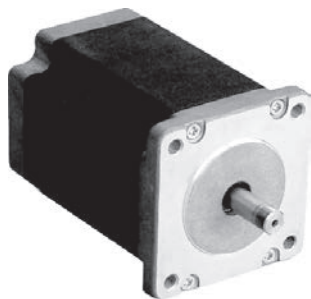
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.  
NOTE: Model AM34HD0404-08 common shaft, model AM34HD0404-M08 is the keyway shaft, according to the suffix to select the required shaft.

**Dimensions (Unit: mm)**

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

**Torque Curves (Recommended Driver: SR or ST)**

## NEMA23(□56mm) 2-phase AC1.8° - 23HS Series



|                       |                                            |
|-----------------------|--------------------------------------------|
| Phases                | 2                                          |
| Steps / Revolution    | ± 5%                                       |
| Step Accuracy         | 40 N (9 Lbs.) Push<br>130 N (30 Lbs.) Pull |
| Radial                | 70 N (15.5 Lbs.) At Flat Center            |
| IP Rating             | 40                                         |
| Operating Temp        | -20°C to +50°C                             |
| Insulation Class      | B, 130°C                                   |
| Insulation Resistance | 100 MegOhms                                |



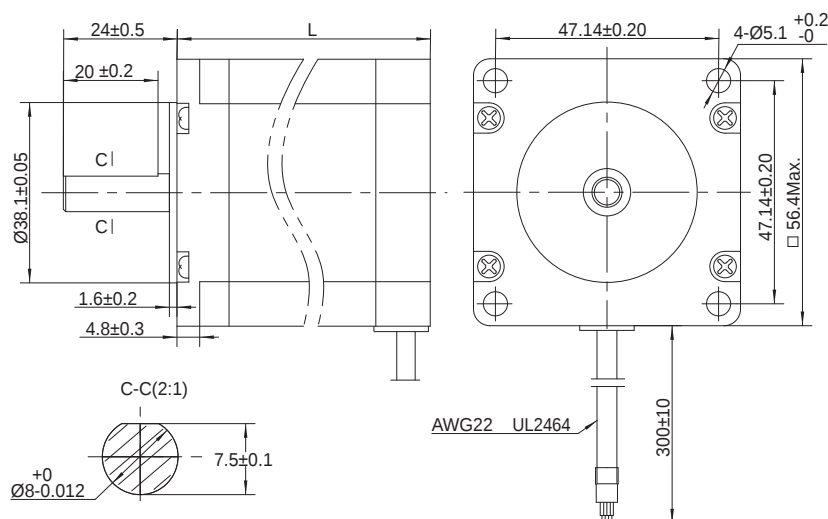
### Parameters

| Model         | Shaft        | Wiring * | Leads | Length "L"<br>mm | Holding Torque<br>N.m | Current *<br>A/Phase | Resistance<br>Ω/Phase | Rotor Inertia<br>g·cm <sup>2</sup> | Mass<br>Kg | Dielectric<br>Strength |
|---------------|--------------|----------|-------|------------------|-----------------------|----------------------|-----------------------|------------------------------------|------------|------------------------|
| AM23HS2459-01 | Single Shaft | A        | 4     | 54               | 1.7                   | 1                    | 16.6                  | 260.0                              | 0.6        | 1500VAC<br>1 minute    |
| AM23HS3466-01 |              |          |       | 76               | 2.2                   | 0.6                  | 25.4                  | 460.0                              | 1.0        |                        |

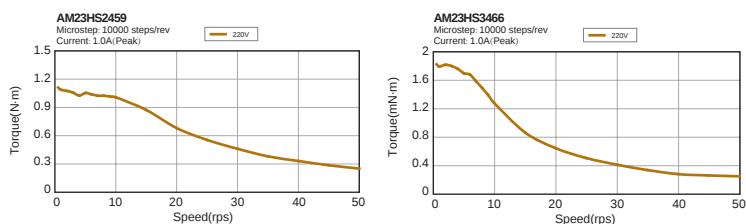
\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

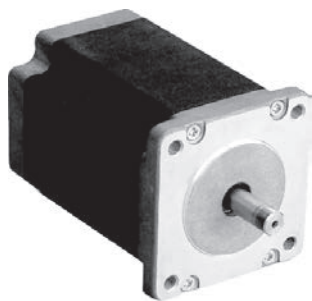
### Dimensions (Unit: mm)



### Torque Curves (Recommended Driver: SRAC or STAC)



## NEMA24(□60mm) 2-phase AC1.8°- 24HS Series



|                       |                                            |
|-----------------------|--------------------------------------------|
| Phases                | 2                                          |
| Steps / Revolution    | ± 5%                                       |
| Step Accuracy         | 40 N (9 Lbs.) Push<br>130 N (30 Lbs.) Pull |
| Radial                | 70 N (15.5 Lbs.) At Flat Center            |
| IP Rating             | 40                                         |
| Operating Temp        | -20°C to +50°C                             |
| Insulation Class      | B, 130°C                                   |
| Insulation Resistance | 100 MegOhms                                |



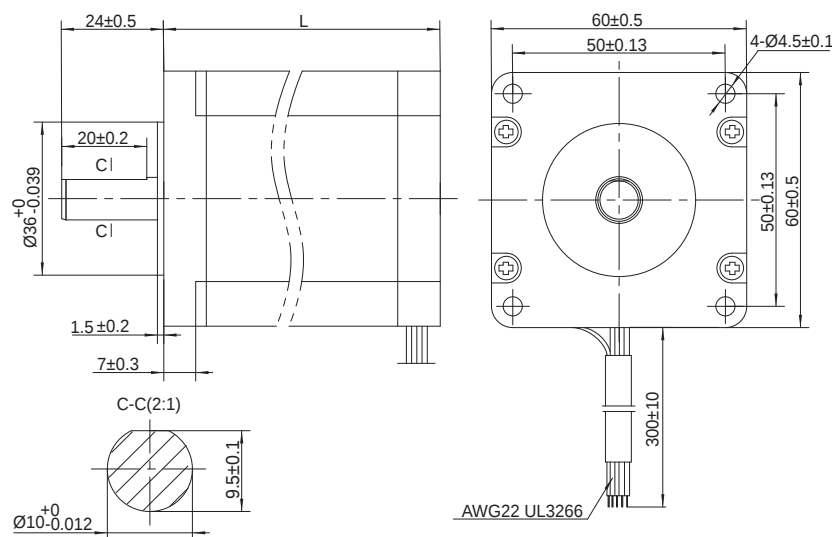
### Parameters

| Model          | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|----------------|--------------|----------|-------|------------|----------------|-----------|------------|-------------------|------|---------------------|
|                |              |          |       | mm         | N.m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| AM24HS5411-01N | Single Shaft | A        | 4     | 85         | 3.1            | 0.8       | 15.4       | 900.0             | 1.4  | 1500VAC<br>1 minute |

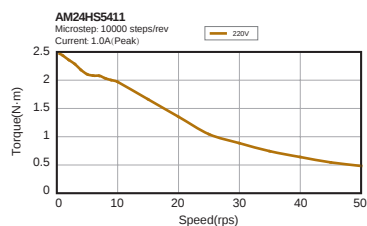
\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

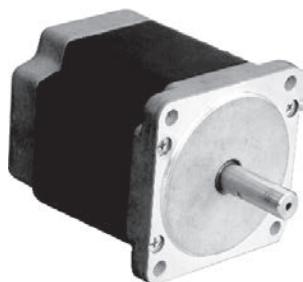
### Dimensions (Unit: mm)



### Torque Curves (Recommended Driver: SRAC or STAC)



## NEMA34(□86mm) 2-phase AC 1.8°- 34HD Series



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 2                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 65 N (15 Lbs.) Push<br>155 N (35 Lbs.) Pull<br>220 N (50 Lbs.) At Flat Center |
| Radial                | 40                                                                            |
| IP Rating             | 40                                                                            |
| Operating Temp        | -20°C to +50°C                                                                |
| Insulation Class      | B, 130°C                                                                      |
| Insulation Resistance | 100 MegOhms                                                                   |



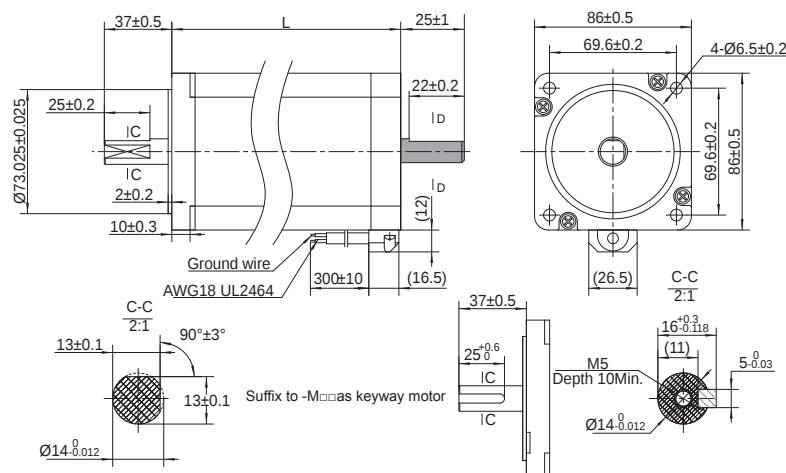
### Parameters

| Model         |                | Shaft        | Wiring *                           | Leads | Length "L" | Holding Torque | Current #                                                                             | Resistance | Rotor Inertia | Mass | Dielectric Strength |
|---------------|----------------|--------------|------------------------------------|-------|------------|----------------|---------------------------------------------------------------------------------------|------------|---------------|------|---------------------|
| Common Shaft  | Keyway Shaft   |              |                                    |       |            |                |                                                                                       |            |               |      |                     |
| AM34HD0802-01 | AM34HD0802-M01 | Single Shaft | B<br>(Parallel)<br>/ C<br>(Series) | 8     | 66.5       | 4.2            | 1.8<br>(220V<br>Series<br>connection)<br>/<br>3.6<br>(110V<br>Parallel<br>connection) | 3.4        | 1100.0        | 1.6  | 1500VAC<br>1 minute |
| AM34HD0802-02 | AM34HD0802-M02 | Double Shaft |                                    |       | 75         | 4.7            |                                                                                       | 3.6        | 1350.0        | 1.9  |                     |
| AM34HD4802-01 | -              | Single Shaft |                                    |       | 96         | 7.3            |                                                                                       | 3.6        | 1850.0        | 2.7  |                     |
| AM34HD1802-01 | AM34HD1802-M01 | Single Shaft |                                    |       | 115        | 7.6            | 3.6<br>(110V<br>Parallel<br>connection)                                               | 4          | 2400.0        | 3.5  |                     |
| AM34HD1802-03 | AM34HD1802-M03 | Double Shaft |                                    |       | 125.5      | 8.7            |                                                                                       | 4.2        | 2750.0        | 3.8  |                     |
| AM34HD6801-01 | -              | Single Shaft |                                    |       |            |                |                                                                                       |            |               |      |                     |
| AM34HD2805-01 | AM34HD2805-M01 | Single Shaft |                                    |       |            |                |                                                                                       |            |               |      |                     |
| AM34HD2805-03 | AM34HD2805-M03 | Double Shaft |                                    |       |            |                |                                                                                       |            |               |      |                     |

\* Wiring Diagram B / C See Page 9

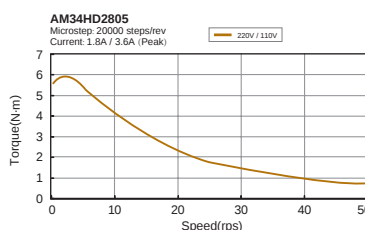
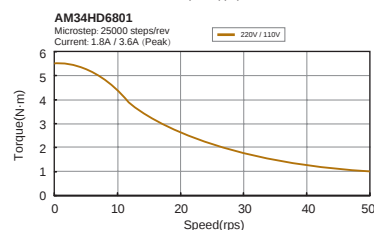
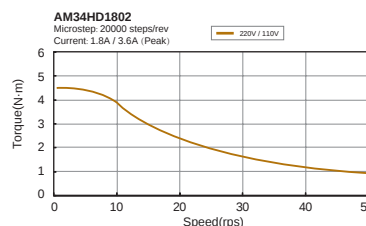
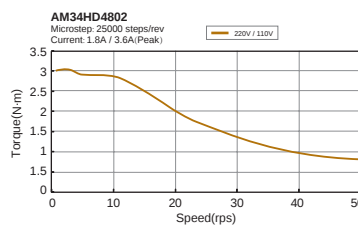
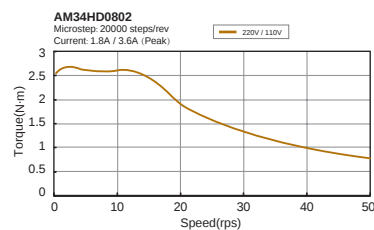
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.  
NOTE: Model am34hd0802-01 common shaft, model am34hd0802-m01 is the keyway shaft, according to the suffix to select the required shaft.

### Dimensions (Unit: mm)



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

### Torque Curves (Recommended Driver: SRAC or STAC)







## NEMA24(□60mm) 2-phase DC1.8°- 24HS Series IP65 Type



|                       |                                            |
|-----------------------|--------------------------------------------|
| Phases                | 2                                          |
| Steps / Revolution    | ± 5%                                       |
| Step Accuracy         | 40 N (9 Lbs.) Push<br>130 N (30 Lbs.) Pull |
| Radial                | 70 N (15.5 Lbs.) At Flat Center            |
| IP Rating             | 65                                         |
| Operating Temp        | -20°C to +50°C                             |
| Insulation Class      | B, 130°C                                   |
| Insulation Resistance | 100 MegOhms                                |



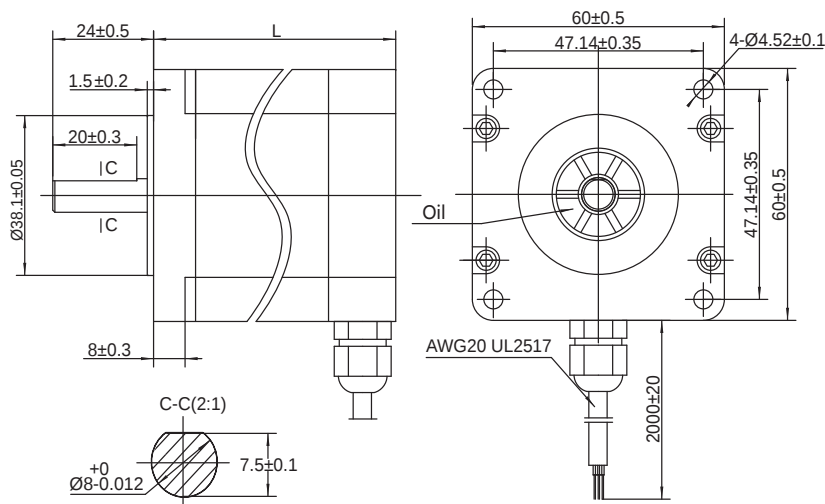
### Parameters

| Model          | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|----------------|--------------|----------|-------|------------|----------------|-----------|------------|-------------------|------|---------------------|
|                |              |          |       | mm         | N.m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| AM24HS5401-44N | Single Shaft | A        | 4     | 94.5       | 3.2            | 4.0       | 0.7        | 900.0             | 1.4  | 500VAC<br>1 minute  |

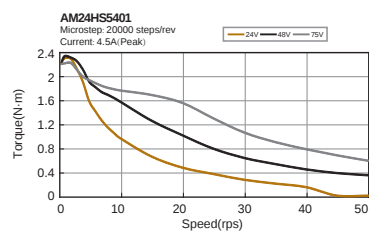
\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### Dimensions (Unit: mm)



### Torque Curves (Recommended Driver: SR or ST)



## NEMA34(□86mm) 2-phase DC1.8° - 34HD Series IP65 Type



|                       |                                             |
|-----------------------|---------------------------------------------|
| Phases                | 2                                           |
| Steps / Revolution    | ± 5%                                        |
| Step Accuracy         | 65 N (15 Lbs.) Push<br>155 N (35 Lbs.) Pull |
| Radial                | 220 N (50 Lbs.) At Flat Center              |
| IP Rating             | 65                                          |
| Operating Temp        | -20°C to +50°C                              |
| Insulation Class      | B, 130°C                                    |
| Insulation Resistance | 100 MegOhms                                 |



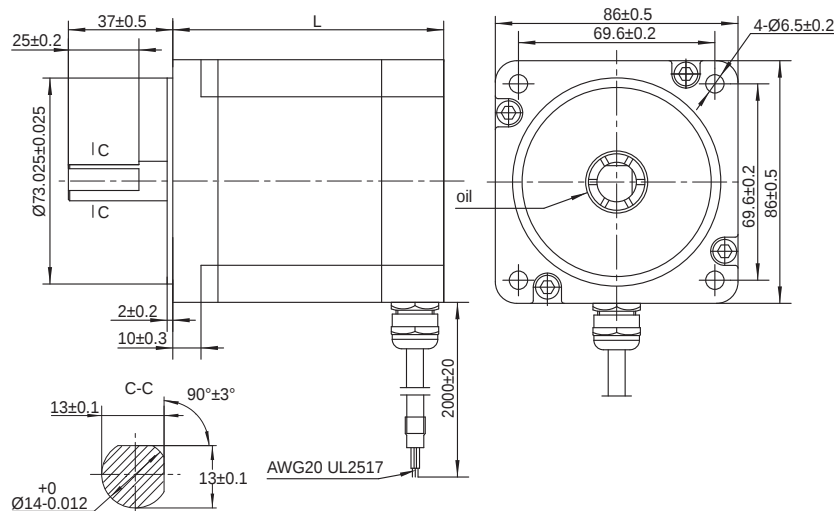
### Parameters

| Model         | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|---------------|--------------|----------|-------|------------|----------------|-----------|------------|-------------------|------|---------------------|
| AM34HD1404-13 | Single Shaft | A        | 4     | mm         | N.m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   | 500VAC<br>1 minute  |
| AM34HD2403-13 |              |          |       | 98         | 6.7            | 6.3       | 0.45       | 1850.0            | 2.7  |                     |
|               |              |          |       | 127.5      | 9.4            | 5.6       | 0.62       | 2750.0            | 3.8  |                     |

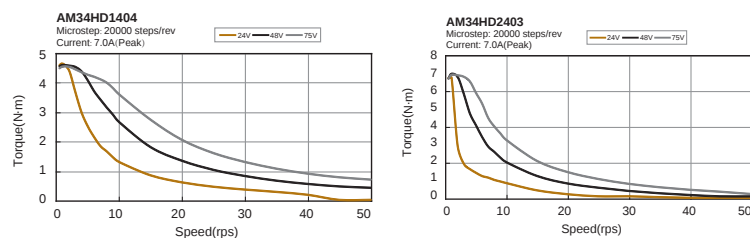
\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

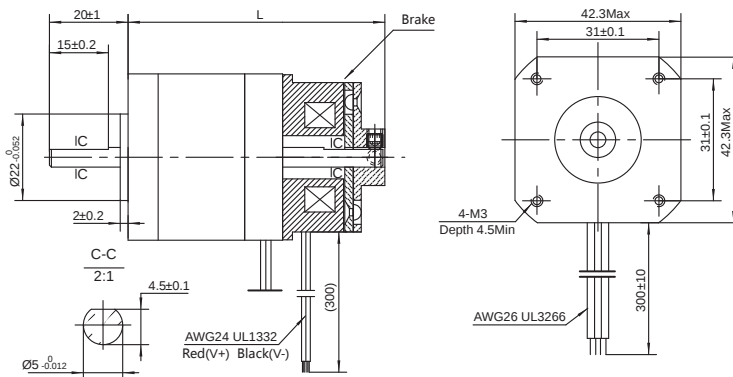
### Dimensions (Unit: mm)



### Torque Curves (Recommended Driver: SR or ST)



## NEMA17(□42mm) 2-phase DC1.8°- 17HD Series Brake type



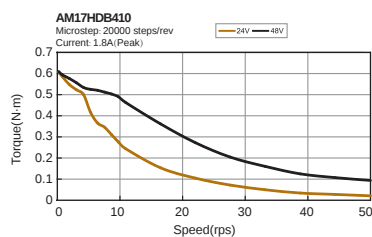
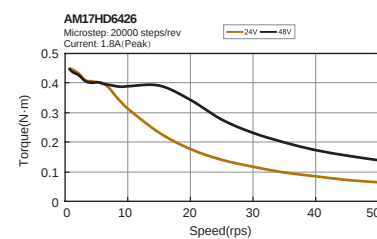
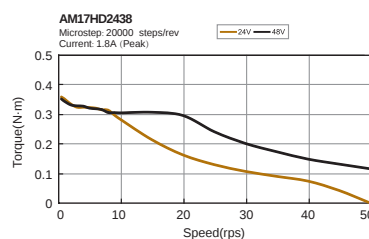
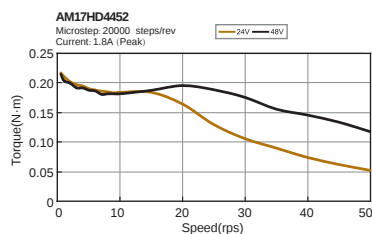
### Parameters

| Model           | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia | Brake Torque | Brake Power | Mass | Dielectric Strength |
|-----------------|--------------|----------|-------|------------|----------------|-----------|------------|---------------|--------------|-------------|------|---------------------|
| AM17HD4452-BR01 | Single Shaft | A        | 4     | 60.3       | 0.285          | 1.5       | 1.5        | 38.0          | 0.6          | 24(10)      | 0.38 | 500VAC<br>1 minute  |
| AM17HD2438-BR01 |              |          |       | 65.8       | 0.46           | 1.5       | 1.9        | 57.0          | 0.6          | 24(10)      | 0.43 |                     |
| AM17HD6426-BR01 |              |          |       | 74.3       | 0.59           | 1.5       | 2.3        | 82.0          | 0.6          | 24(10)      | 0.51 |                     |
| AM17HDB410-BR01 |              |          |       | 85.8       | 0.85           | 1.4       | 3.2        | 123.0         | 0.6          | 24(10)      | 0.75 |                     |

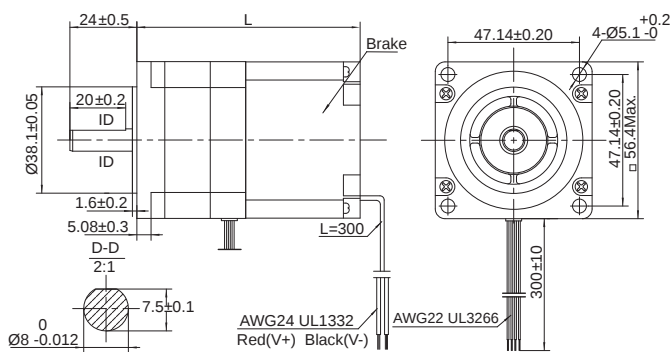
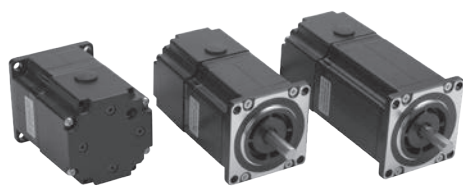
\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### Torque Curves (Recommended Driver: SR or ST)



## NEMA23(□56mm) 2-phase DC1.8°- 23HS Series Brake type



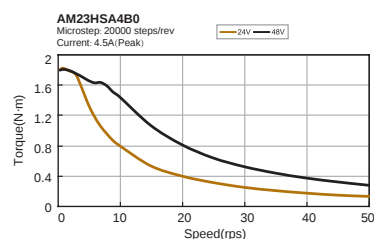
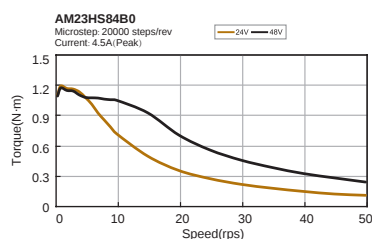
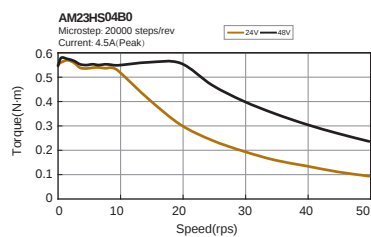
### Parameters

| Model           | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia | Brake Torque | Brake Power | Mass | Dielectric Strength |
|-----------------|--------------|----------|-------|------------|----------------|-----------|------------|---------------|--------------|-------------|------|---------------------|
|                 |              |          |       | mm         | N.m            |           | Ω/Phase    |               |              |             |      |                     |
| AM23HS04B0-BR01 | Single Shaft | A        | 4     | 80         | 0.82           | 3.7       | 0.48       | 105.0         | 1.5          | 24(15)      | 0.62 | 500VAC<br>1 minute  |
| AM23HS84B0-BR01 |              |          |       | 96         | 1.5            |           | 0.63       | 215.0         | 1.5          | 24(15)      | 0.8  |                     |
| AM23HSA4B0-BR01 |              |          |       | 118        | 2.3            |           | 0.75       | 365.0         | 1.5          | 24(15)      | 1.2  |                     |

\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

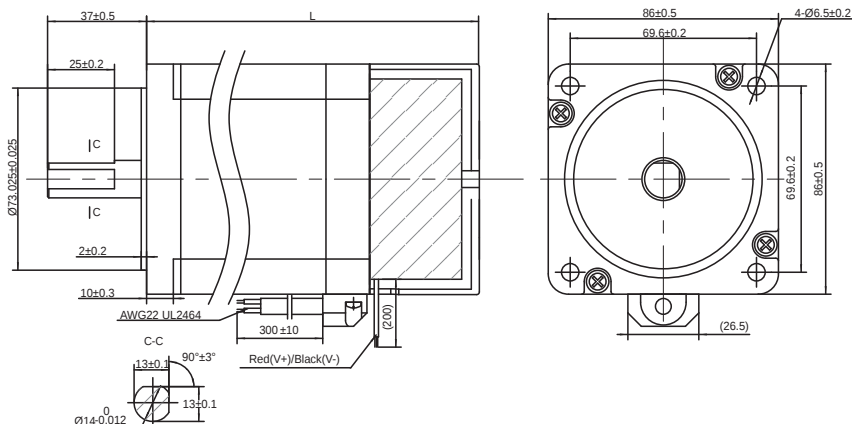
### Torque Curves (Recommended Driver: SR or ST)







## NEMA34(□86mm) 2-phase DC1.8°/ 2-phase AC1.8°-34HD Series Brake type



### Parameters

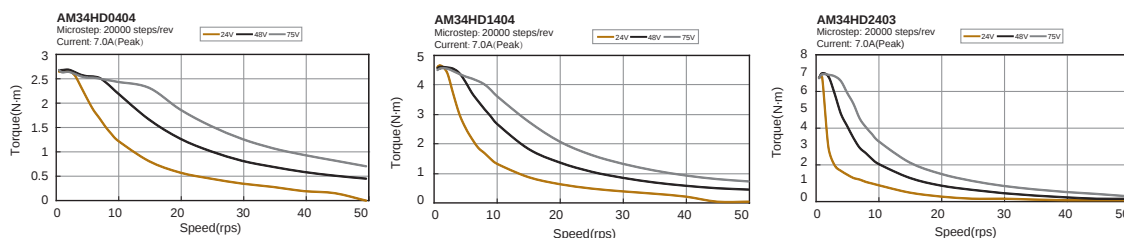
| Model           | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current ‡                       | Resistance                 | Rotor Inertia     | Brake Torque | Brake Power | Mass | Dielectric Strength |
|-----------------|--------------|----------|-------|------------|----------------|---------------------------------|----------------------------|-------------------|--------------|-------------|------|---------------------|
|                 |              |          |       | mm         | N.m            | A/Phase                         | Ω/Phase                    | g·cm <sup>2</sup> | N.m          | V(W)        | Kg   |                     |
| AM34HD0404-BR01 | Single Shaft | A        | 4     | 118.5      | 3.7            | 6.3                             | 0.25                       | 1100              | 6            | 24(30)      | 2.2  | 500VAC<br>1 minute  |
| AM34HD1404-BR01 | Single Shaft |          |       | 148        | 6.7            |                                 | 0.35                       | 1850              |              |             |      |                     |
| AM34HD2403-BR01 | Single Shaft |          |       | 177.5      | 9.4            |                                 | 0.49                       | 2750              |              |             |      |                     |
| AM34HD0802-BR01 | Single Shaft | C        | 8     | 118.5      | 4.2            | 1.8<br>(220V Series connection) | 3.4<br>(Series connection) | 1100              | 6            | 24(30)      | 2.2  | 1500VAC<br>1 minute |
| AM34HD1802-BR01 | Single Shaft |          |       | 148        | 7.3            |                                 | 3.6<br>(Series connection) | 1850              |              |             |      |                     |
| AM34HD2805-BR01 | Single Shaft |          |       | 177.5      | 8.7            |                                 | 4.2<br>(Series connection) | 2750              |              |             |      |                     |

\* Wiring Diagram A/C See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

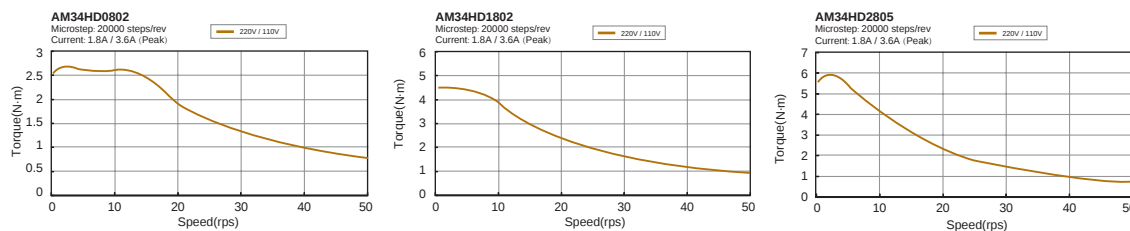
### Torque Curves

(Recommended Driver: SR or ST)



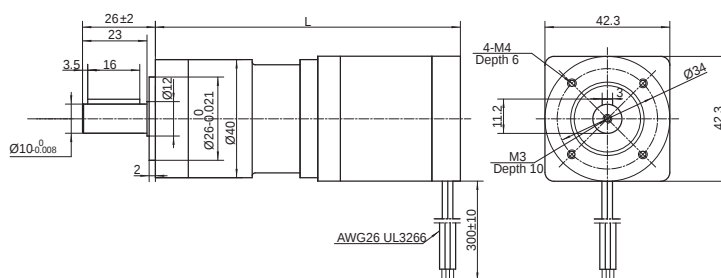
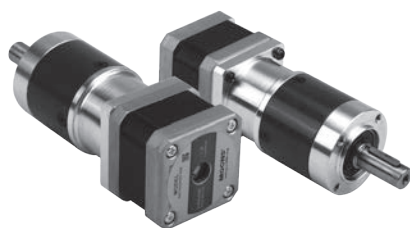
### Torque Curves

(Recommended Driver: SRAC or STAC)



# NEMA17(□42mm) 2-phase DC1.8° - 17HD Series Planetary Reducer Motor Type

## ■ Dimensions (Unit: mm)



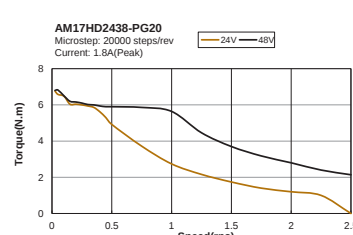
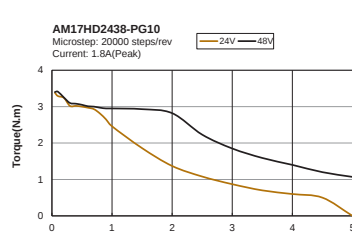
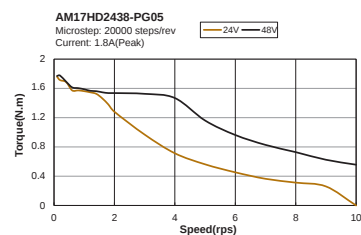
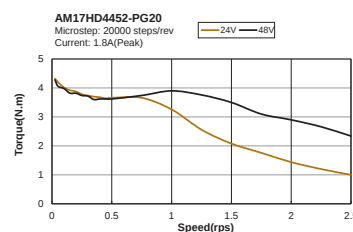
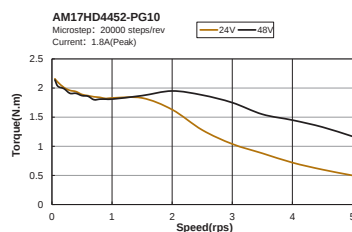
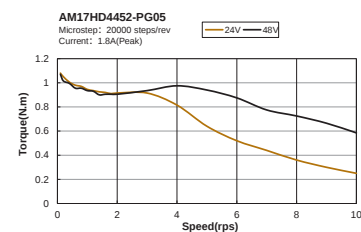
## ■ Parameters

| Model           | Wiring * | Length*L" | Current * | Series | Reduction ratio | Accuracy | Maximum output torque | Maximum load torque | Rotor Inertia | Efficiency | Noise | Mass |
|-----------------|----------|-----------|-----------|--------|-----------------|----------|-----------------------|---------------------|---------------|------------|-------|------|
|                 |          | mm        |           |        |                 | arc-min  | N.m                   | N.m                 |               |            |       |      |
| AM17HD4452-PG05 | A        | 101.8     | 1.5       | 1      | 5               | 12       | 1.25                  | 6                   | 950           | 96%        | <60   | 0.55 |
| AM17HD4452-PG10 |          | 101.8     |           | 1      | 10              | 12       | 2.5                   | 4                   | 3800          | 96%        |       | 0.55 |
| AM17HD4452-PG20 |          | 114.8     |           | 2      | 20              | 15       | 5                     | 20                  | 15200         | 94%        |       | 0.63 |
| AM17HD2438-PG05 |          | 107.3     |           | 1      | 5               | 12       | 2                     | 6                   | 1425          | 96%        |       | 0.6  |
| AM17HD2438-PG10 |          | 107.3     |           | 1      | 10              | 12       | 4                     | 4                   | 5700          | 96%        |       | 0.6  |
| AM17HD2438-PG20 |          | 120.3     |           | 2      | 20              | 15       | 8                     | 20                  | 22800         | 94%        |       | 0.68 |

\* Wiring Diagram A See Page 9

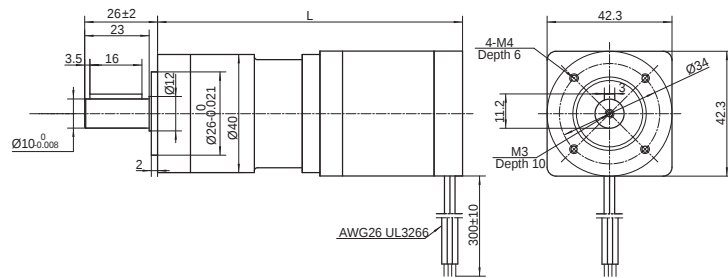
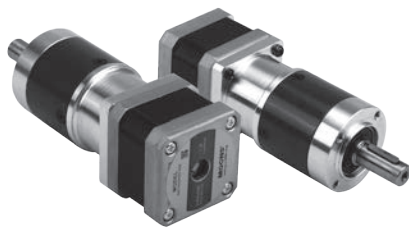
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

## ■ Torque Curves (Recommended Driver: SR or ST)



## NEMA17(□42mm) 2-phase DC1.8° - 17HD Series Planetary Reducer Motor Type

### ■ Dimensions (Unit: mm)



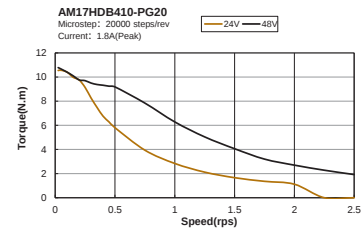
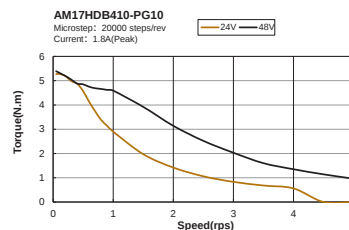
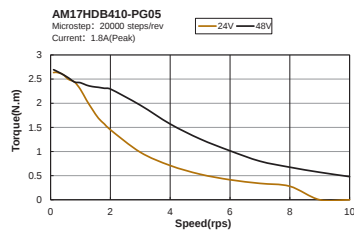
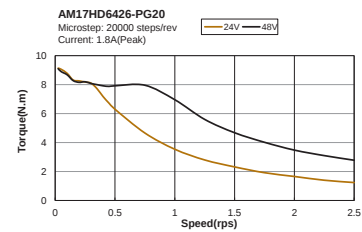
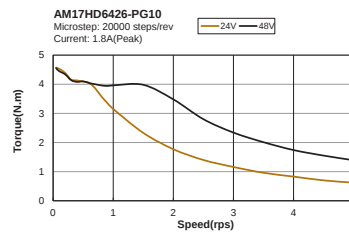
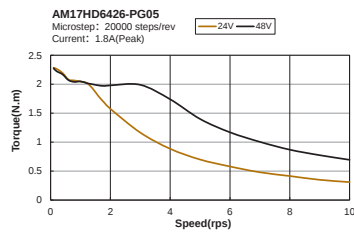
### ■ Parameters

| Model           | Wiring * | Length "L" | Current * | Series | Reduction ratio | Accuracy | Maximum output torque | Maximum load torque | Rotor Inertia | Efficiency | Noise | Mass |
|-----------------|----------|------------|-----------|--------|-----------------|----------|-----------------------|---------------------|---------------|------------|-------|------|
|                 |          | mm         |           |        |                 | arc-min  | N.m                   | N.m                 |               |            |       |      |
| AM17HD6426-PG05 | A        | 115.8      | 1.5       | 1      | 5               | 12       | 2.5                   | 6                   | 2050          | 96%        | <60   | 0.68 |
| AM17HD6426-PG10 |          | 115.8      |           | 1      | 10              | 12       | 5                     | 4                   | 8200          | 96%        |       | 0.68 |
| AM17HD6426-PG20 |          | 128.8      |           | 2      | 20              | 15       | 10                    | 20                  | 32800         | 94%        |       | 0.76 |
| AM17HDB410-PG05 |          | 130.3      | 1.4       | 1      | 5               | 12       | 4.25                  | 6                   | 3075          | 96%        |       | 0.92 |
| AM17HDB410-PG10 |          | 130.3      |           | 1      | 10              | 12       | 8.5                   | 4                   | 12300         | 96%        |       | 0.92 |
| AM17HDB410-PG20 |          | 143.3      |           | 2      | 20              | 15       | 17                    | 20                  | 49200         | 94%        |       | 1    |

\* Wiring Diagram A See Page 9

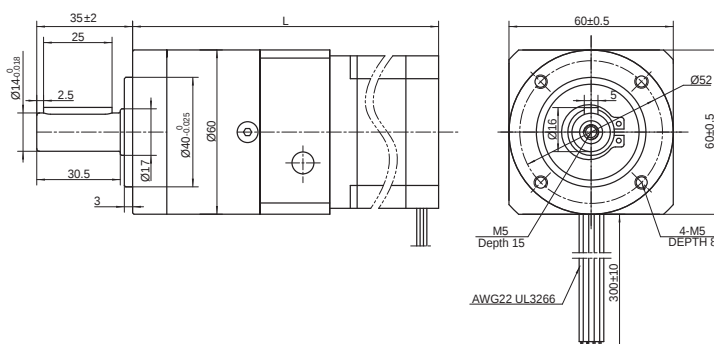
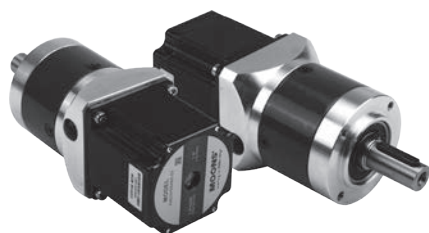
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### ■ Torque Curves (Recommended Driver: SR or ST)



## NEMA23(□56mm) 2-phase DC1.8° - 23HS Series Planetary Reducer Motor Type

### ■ Dimensions (Unit: mm)



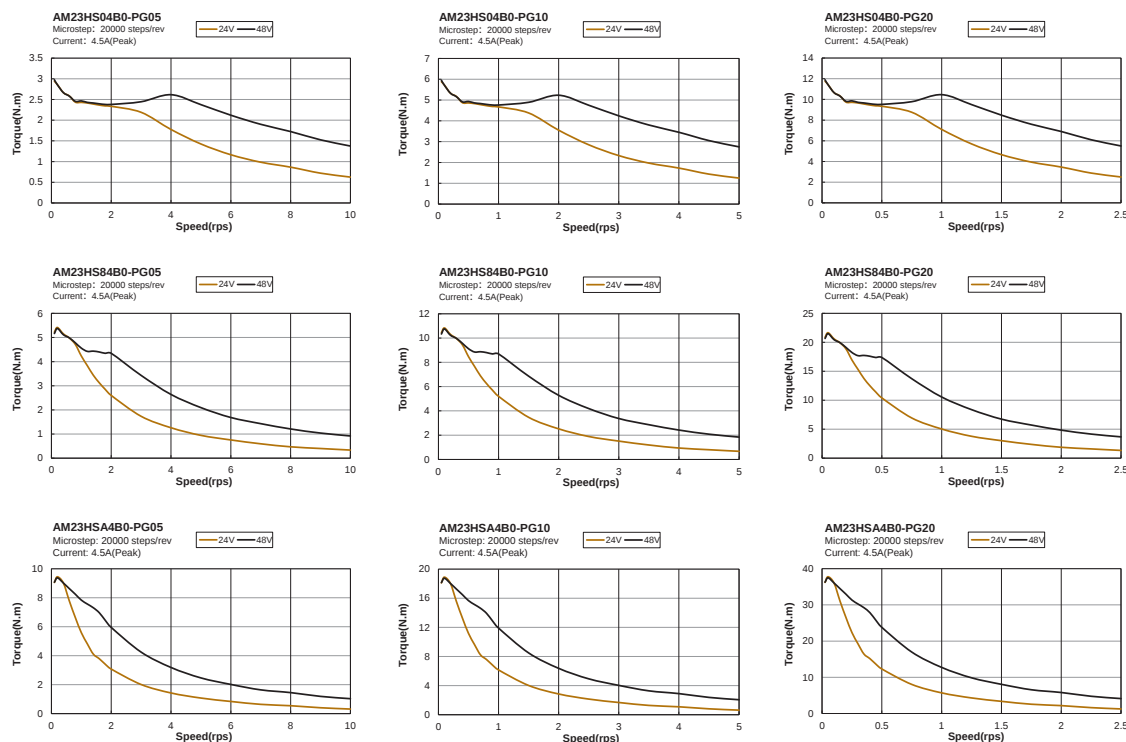
### ■ Parameters

| Model           | Wiring * | Length"L" | Current * | Series | Reduction ratio | Accuracy arc-min | Maximum output torque N.m | Maximum load torque N.m | Rotor Inertia g.cm <sup>2</sup> | Efficiency | Noise dB | Mass Kg |
|-----------------|----------|-----------|-----------|--------|-----------------|------------------|---------------------------|-------------------------|---------------------------------|------------|----------|---------|
|                 |          | mm        |           |        |                 |                  |                           |                         |                                 |            |          |         |
| AM23HS04B0-PG05 | A        | 112.5     | 3.7       | 1      | 5               | 10               | 4.1                       | 16                      | 2625                            | 96%        | <65      | 1.23    |
| AM23HS04B0-PG10 |          | 112.5     |           | 1      | 10              | 10               | 8.2                       | 12                      | 10500                           | 96%        | <65      | 1.23    |
| AM23HS04B0-PG20 |          | 125.5     |           | 2      | 20              | 15               | 16.4                      | 44                      | 42000                           | 94%        | <60      | 1.44    |
| AM23HS84B0-PG05 |          | 128.5     |           | 1      | 5               | 10               | 7.5                       | 16                      | 5375                            | 96%        | <65      | 1.43    |
| AM23HS84B0-PG10 |          | 128.5     |           | 1      | 10              | 10               | 15                        | 12                      | 21500                           | 96%        | <65      | 1.43    |
| AM23HS84B0-PG20 |          | 141.5     |           | 2      | 20              | 15               | 30                        | 44                      | 86000                           | 94%        | <60      | 1.64    |
| AM23HSA4B0-PG05 |          | 150.5     |           | 1      | 5               | 10               | 11.5                      | 16                      | 9125                            | 96%        | <65      | 1.83    |
| AM23HSA4B0-PG10 |          | 150.5     |           | 1      | 10              | 10               | 23                        | 12                      | 36500                           | 96%        | <65      | 1.83    |
| AM23HSA4B0-PG20 |          | 163.5     |           | 2      | 20              | 15               | 46                        | 44                      | 146000                          | 94%        | <60      | 2.07    |

\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

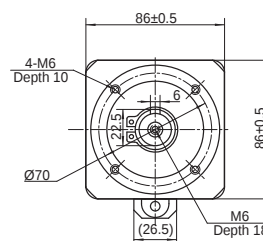
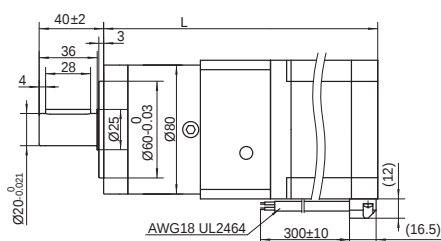
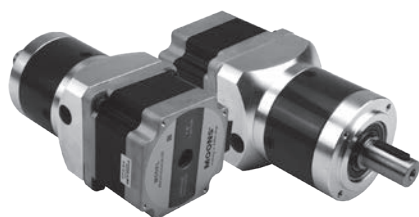
### ■ Torque Curves (Recommended Driver: SR or ST)





## NEMA34(□86mm) 2-phase DC1.8° - 34HD Series Planetary Reducer Motor Type

### ■ Dimensions (Unit: mm)



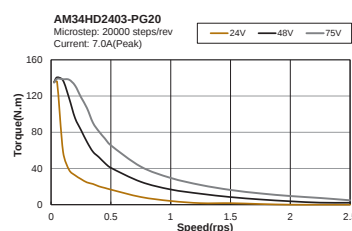
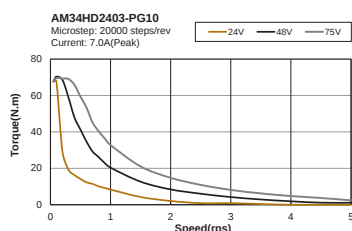
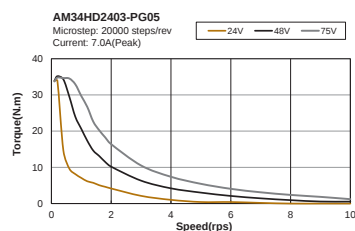
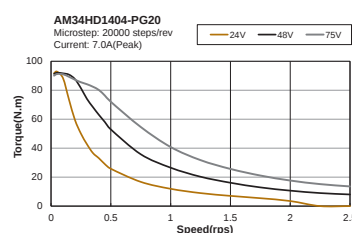
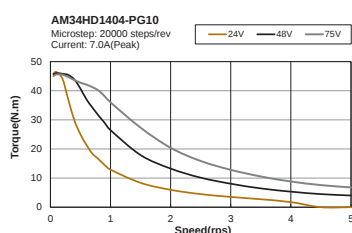
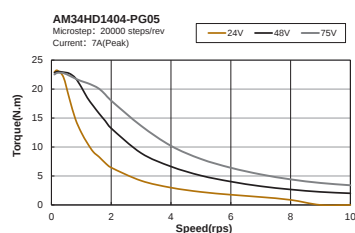
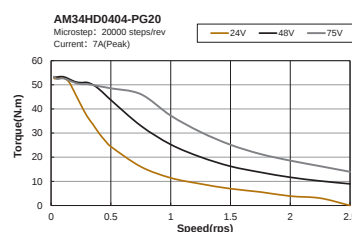
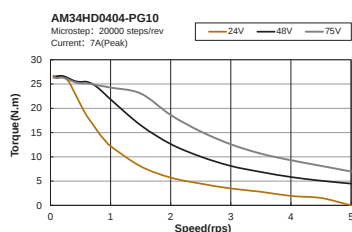
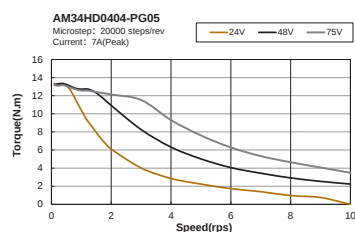
### ■ Parameters

| Model           | Wiring * | Length "L" | Current * | Series | Reduction ratio | Accuracy | Maximum output torque | Maximum load torque | Rotor Inertia | Efficiency | Noise | Mass |
|-----------------|----------|------------|-----------|--------|-----------------|----------|-----------------------|---------------------|---------------|------------|-------|------|
|                 |          | mm         |           |        |                 | arc-min  |                       |                     |               |            |       |      |
| AM34HD0404-PG05 | A        | 170.5      | 6.3       | 1      | 5               | 10       | 15                    | 50                  | 27500         | 96%        | <60   | 3.71 |
| AM34HD0404-PG10 |          | 170.5      |           | 1      | 10              | 10       | 30                    | 40                  | 110000        | 96%        |       | 3.71 |
| AM34HD0404-PG20 |          | 188.5      |           | 2      | 20              | 15       | 60                    | 120                 | 440000        | 94%        |       | 4.21 |
| AM34HD1404-PG05 |          | 200        |           | 1      | 5               | 10       | 25                    | 50                  | 46250         | 96%        |       | 4.81 |
| AM34HD1404-PG10 |          | 200        |           | 1      | 10              | 10       | 50                    | 40                  | 185000        | 96%        |       | 4.81 |
| AM34HD1404-PG20 |          | 218        |           | 2      | 20              | 15       | 100                   | 120                 | 740000        | 94%        |       | 5.31 |
| AM34HD2403-PG05 |          | 229.5      | 5.6       | 1      | 5               | 10       | 35.5                  | 50                  | 68750         | 96%        |       | 5.91 |
| AM34HD2403-PG10 |          | 229.5      |           | 1      | 10              | 10       | 71                    | 40                  | 275000        | 96%        |       | 5.91 |
| AM34HD2403-PG20 |          | 247.5      |           | 2      | 20              | 15       | 142                   | 120                 | 1100000       | 94%        |       | 6.41 |
|                 |          |            |           |        |                 |          |                       |                     |               |            |       |      |

\* Wiring Diagram A See Page 9

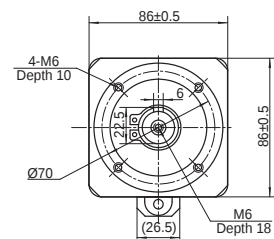
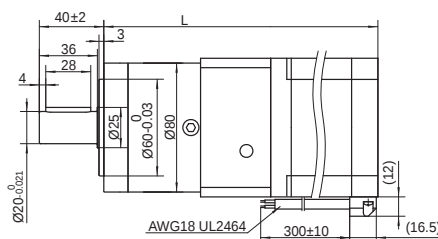
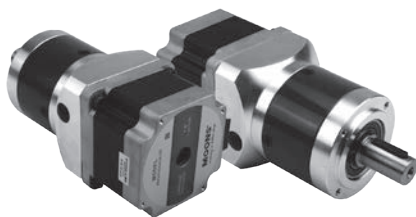
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### ■ Torque Curves (Recommended Driver: SR or ST)



## NEMA34(□86mm) 2-phase AC1.8° - 34HD Series Planetary Reducer Motor Type

### ■ Dimensions (Unit: mm)



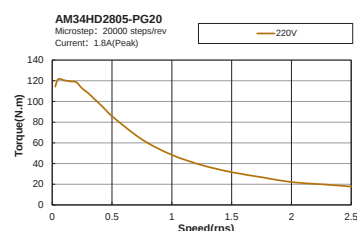
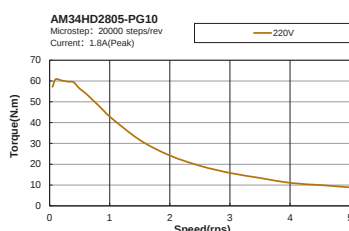
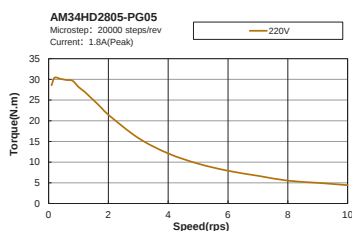
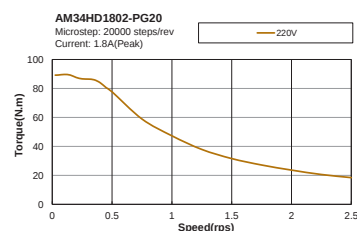
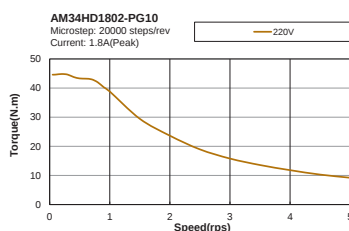
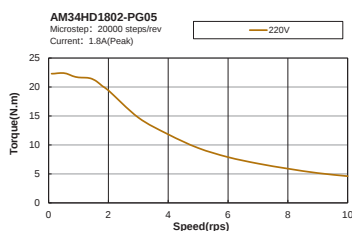
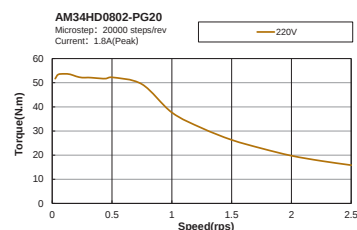
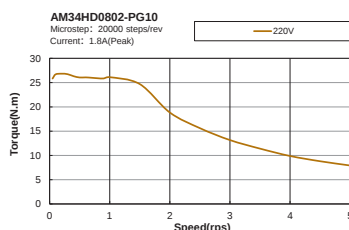
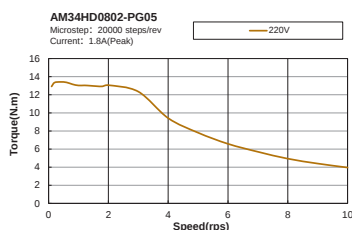
### ■ Parameters

| Model           | Wiring *                 | Length "L" | Current *                  | Series | Reduction ratio | Accuracy | Maximum output torque | Maximum load torque | Rotor Inertia | Efficiency | Noise | Mass |
|-----------------|--------------------------|------------|----------------------------|--------|-----------------|----------|-----------------------|---------------------|---------------|------------|-------|------|
|                 |                          | mm         |                            |        |                 | arc-min  |                       |                     |               |            |       |      |
| AM34HD0802-PG05 | B(Parallel)<br>C(Series) | 170.5      | 1.8<br>(Series connection) | 1      | 5               | 10       | 15                    | 50                  | 27500         | 96%        | <60   | 3.71 |
| AM34HD0802-PG10 |                          | 170.5      |                            | 1      | 10              | 10       | 30                    | 40                  | 110000        | 96%        |       | 3.71 |
| AM34HD0802-PG20 |                          | 188.5      |                            | 2      | 20              | 15       | 60                    | 120                 | 440000        | 94%        |       | 4.21 |
| AM34HD1802-PG05 |                          | 200        |                            | 1      | 5               | 10       | 25                    | 50                  | 46250         | 96%        |       | 4.81 |
| AM34HD1802-PG10 |                          | 200        |                            | 1      | 10              | 10       | 50                    | 40                  | 185000        | 96%        |       | 4.81 |
| AM34HD1802-PG20 |                          | 218        |                            | 2      | 20              | 15       | 100                   | 120                 | 740000        | 94%        |       | 5.31 |
| AM34HD2805-PG05 |                          | 229.5      |                            | 1      | 5               | 10       | 35.5                  | 50                  | 68750         | 96%        |       | 5.91 |
| AM34HD2805-PG10 |                          | 229.5      |                            | 1      | 10              | 10       | 71                    | 40                  | 275000        | 96%        |       | 5.91 |
| AM34HD2805-PG20 |                          | 247.5      |                            | 2      | 20              | 15       | 142                   | 120                 | 1100000       | 94%        |       | 6.41 |

★ Wiring Diagram B/C See Page 9

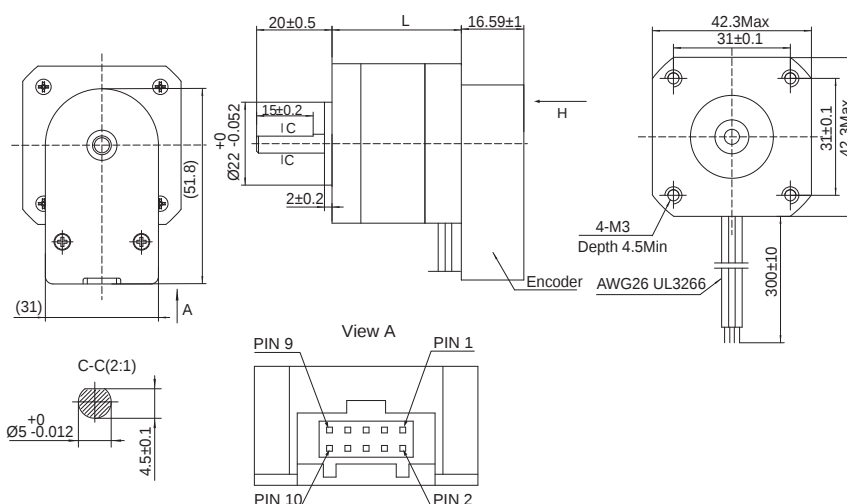
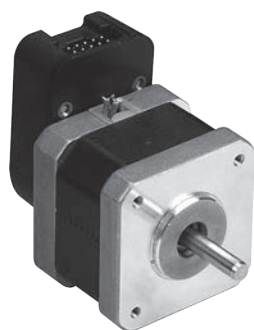
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### ■ Torque Curves (Recommended Driver: SRAC or STAC)



# NEMA17( □ 42mm) 2-phase DC 1.8°- 17HD Series Encoder Type

## ■ Dimensions (Unit: mm)



## ■ Encode Electrical Specification

|                          |                            |
|--------------------------|----------------------------|
| Resolution               | 4000 Counts/Rev(1000 Line) |
| Supply Current (no load) | Typ 56mA/Max 59mA          |
| Output Voltage Low       | 0.4V@20mA Max.             |
| Output Voltage High      | 2.4V@-20mA Min.            |

A leads B for clockwise shaft rotation, and B leads A for counterclockwise rotation viewed from direction H

### Mating Connectors

Housing: Molex# 15-04-5104

Crimp: Molex# 14-60-0058

Crimp Tool: Molex# 62100-0700

Component model: E5-Connector

| Pin.   | 9     | 7   | 5     | 3      | 1   |
|--------|-------|-----|-------|--------|-----|
| Signal | CH B- | +5V | CH A- | Index- | GND |
| Pin.   | 10    | 8   | 6     | 4      | 2   |
| Signal | CH B+ | +5V | CH A+ | Index+ | GND |

### Accessories(Sold Separately)

General encoder Cable

P/N: 1001-100 Length: 1m

P/N: 1009-500 Length: 5m

Encoder cable used with MOONS'drive

P/N: 2005-200 Length: 2m

P/N: 2011-200 Length: 5m

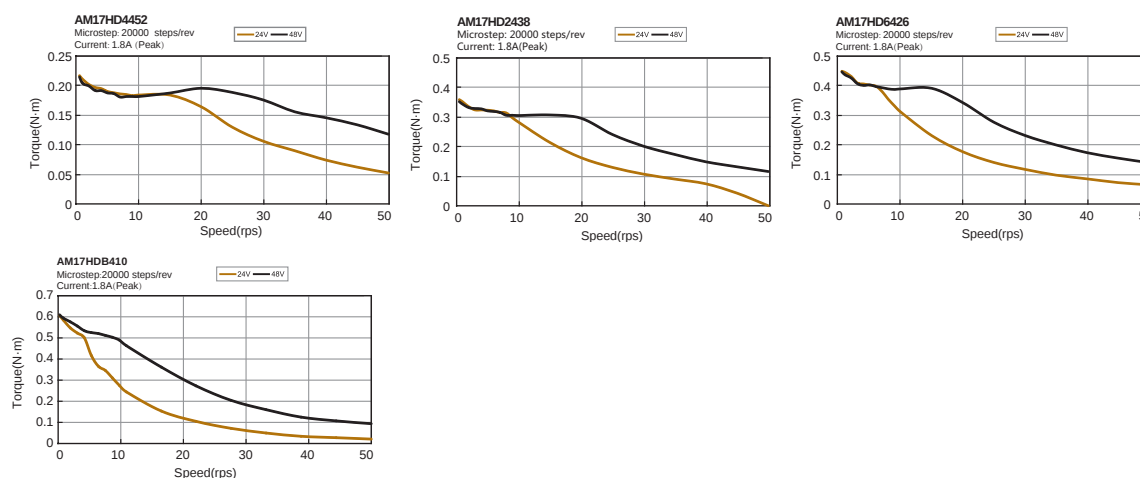
## ■ Parameters

| Model             | Wiring * | Leads | Length"L" | Minimum Holding Torque | Current * | Resistance | Rotor Inertia     | Motor Mass | Dielectric Strength |
|-------------------|----------|-------|-----------|------------------------|-----------|------------|-------------------|------------|---------------------|
|                   |          |       | mm        | N·m                    | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg         |                     |
| AM17HD4452-E1000D | A        | 4     | 34.3      | 0.285                  | 1.5       | 1.5        | 38.0              | 0.23       | 500VAC<br>1 minute  |
| AM17HD2438-E1000D |          |       | 39.8      | 0.46                   | 1.5       | 1.9        | 57.0              | 0.28       |                     |
| AM17HD6426-E1000D |          |       | 48.3      | 0.59                   | 1.5       | 2.3        | 82.0              | 0.36       |                     |
| AM17HDB410-E1000D |          |       | 62.8      | 0.85                   | 1.4       | 3.2        | 123               | 0.6        |                     |

\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

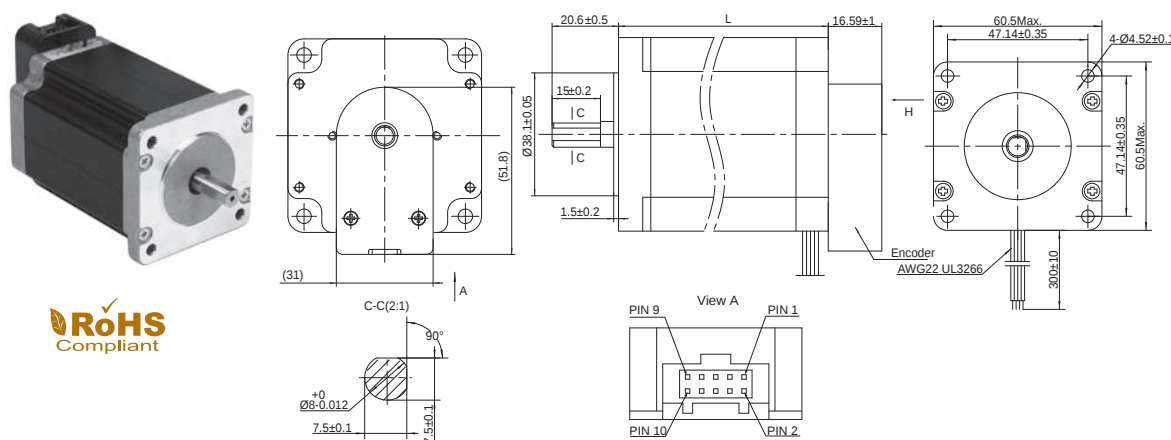
## ■ Torque Curves (Recommended Driver: SR or ST)





## NEMA24(□ 60mm) 2-phase DC 1.8°- 24HD Series Encoder Type

### ■ Dimensions (Unit: mm)



### ■ Encode Electrical Specification

|                          |                            |
|--------------------------|----------------------------|
| Resolution               | 4000 Counts/Rev(1000 Line) |
| Supply Current (no load) | Typ 56mA/Max 59mA          |
| Output Voltage Low       | 0.4V@20mA Max.             |
| Output Voltage High      | 2.4V@-20mA Min.            |

A leads B for clockwise shaft rotation, and B leads A for counterclockwise rotation viewed from direction H

#### Mating Connectors

Housing: Molex# 15-04-5104

Crimp: Molex# 14-60-0058

Crimp Tool: Molex# 62100-0700

Component model: E5-Connector

| Pin.   | 9     | 7   | 5     | 3      | 1   |
|--------|-------|-----|-------|--------|-----|
| Signal | CH B- | +5V | CH A- | Index- | GND |
| Pin.   | 10    | 8   | 6     | 4      | 2   |
| Signal | CH B+ | +5V | CH A+ | Index+ | GND |

#### Accessories(Sold Separately)

General encoder Cable

P/N: 1001-100 Length: 1m

P/N: 1009-500 Length: 5m

Encoder cable used with MOONS' drive

P/N: 2005-200 Length: 2m

P/N: 2011-200 Length: 5m

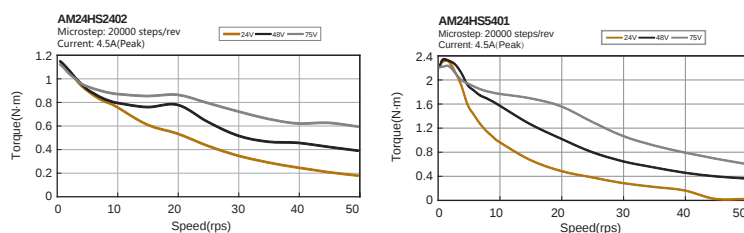
### ■ Parameters

| Model             | Wiring * | Leads | Length "L" | Holding Torque<br>N·m | Current *<br>A/Phase | Resistance<br>Ω/Phase | Rotor Inertia<br>g·cm <sup>2</sup> | Motor Mass<br>Kg | Dielectric<br>Strength |
|-------------------|----------|-------|------------|-----------------------|----------------------|-----------------------|------------------------------------|------------------|------------------------|
|                   |          |       | mm         |                       |                      |                       |                                    |                  |                        |
| AM24HS2402-E1000D | A        | 4     | 54.0       | 1.57                  | 4.0                  | 0.43                  | 450.0                              | 0.83             | 500VAC<br>1 minute     |
| AM24HS5401-E1000D |          |       | 85.0       | 3.2                   | 4.0                  | 0.65                  | 900.0                              | 1.4              |                        |

★ Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

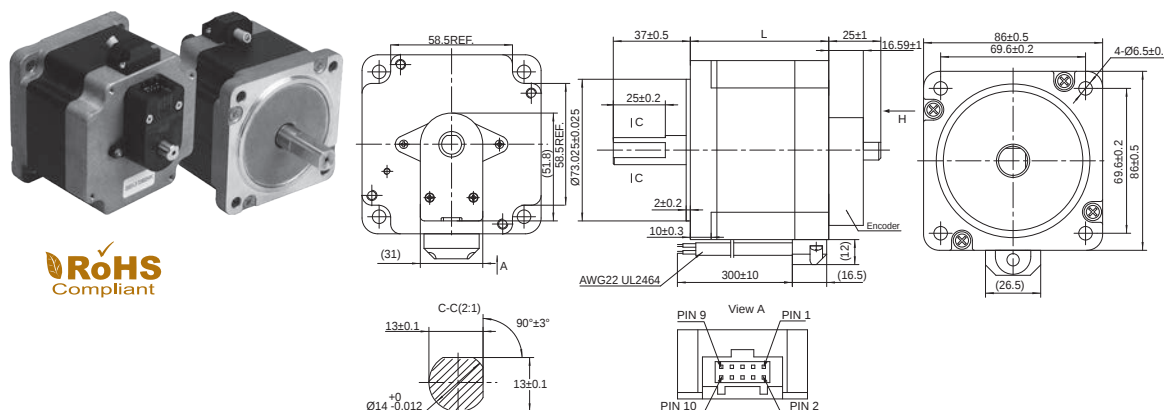
### ■ Torque Curves (Recommended Driver: ST or SR)





# NEMA34( 86mm) 2-phase AC1.8° - 34HD Series Encoder Type

## ■ Dimensions (Unit: mm)



## ■ Encode Electrical Specification

|                          |                            |
|--------------------------|----------------------------|
| Resolution               | 4000 Counts/Rev(1000 Line) |
| Supply Current (no load) | Typ 56mA/Max 59mA          |
| Output Voltage Low       | 0.4V@20mA Max.             |
| Output Voltage High      | 2.4V@-20mA Min.            |

A leads B for clockwise shaft rotation, and B leads A for counterclockwise rotation viewed from direction H

### Mating Connectors

Housing: Molex# 15-04-5104

Crimp: Molex# 14-60-0058

Crimp Tool: Molex# 62100-0700

Component model: E5-Connector

| Pin.   | 9     | 7   | 5     | 3      | 1   |
|--------|-------|-----|-------|--------|-----|
| Signal | CH B- | +5V | CH A- | Index- | GND |
| Pin.   | 10    | 8   | 6     | 4      | 2   |
| Signal | CH B+ | +5V | CH A+ | Index+ | GND |

### Accessories(Sold Separately)

General encoder Cable

P/N: 1001-100 Length: 1m

P/N: 1009-500 Length: 5m

Encoder cable used with MOONS' drive

P/N: 2005-200 Length: 2m

P/N: 2011-200 Length: 5m

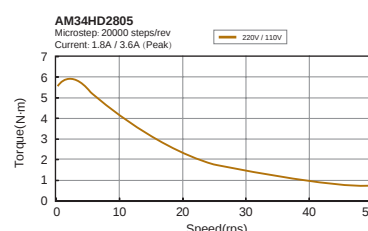
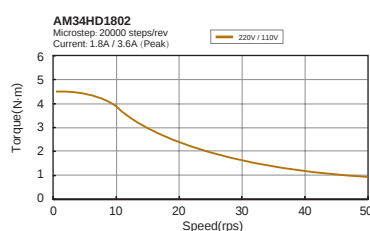
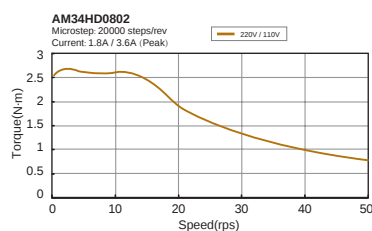
## ■ Parameters

| Model             | Wiring *                 | Leads | Length "L" | Holding Torque | Current ※ (A/Phase)             |                                 | Resistance (Ω/Phase) |          | Rotor Inertia     | Motor Mass | Dielectric Strength |
|-------------------|--------------------------|-------|------------|----------------|---------------------------------|---------------------------------|----------------------|----------|-------------------|------------|---------------------|
|                   |                          |       | mm         | N·m            | Series                          | Parallel                        | Series               | Parallel | g·cm <sup>2</sup> | Kg         |                     |
| AM34HD0802-E1000D | B(Parallel)<br>C(Series) | 8     | 66.5       | 4.2            | 1.8(When<br>drive by<br>220VAC) | 3.6(When<br>drive by<br>110VAC) | 3.4                  | 0.9      | 1100.0            | 1.6        | 1500VAC<br>1 minute |
| AM34HD1802-E1000D |                          |       | 96.0       | 7.3            |                                 |                                 | 3.6                  | 0.9      | 1850.0            | 2.7        |                     |
| AM34HD2805-E1000D |                          |       | 125.5      | 8.7            |                                 |                                 | 4.2                  | 1.1      | 2750.0            | 3.8        |                     |

\* Wiring Diagram B/C See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

## ■ Torque Curves (Recommended Driver: SRAC or STAC)



## NEMA17(□42mm) 3-phase DC 1.2° - 17HC Series



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 3                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 25 N (5.6 Lbs.) Push<br>65 N (15 Lbs.) Pull<br>29 N (6.5 Lbs.) At Flat Center |
| Radial                | 40                                                                            |
| IP Rating             | 40                                                                            |
| Operating Temp        | -20°C to +50°C                                                                |
| Insulation Class      | B, 130°C                                                                      |
| Insulation Resistance | 100 MegOhms                                                                   |



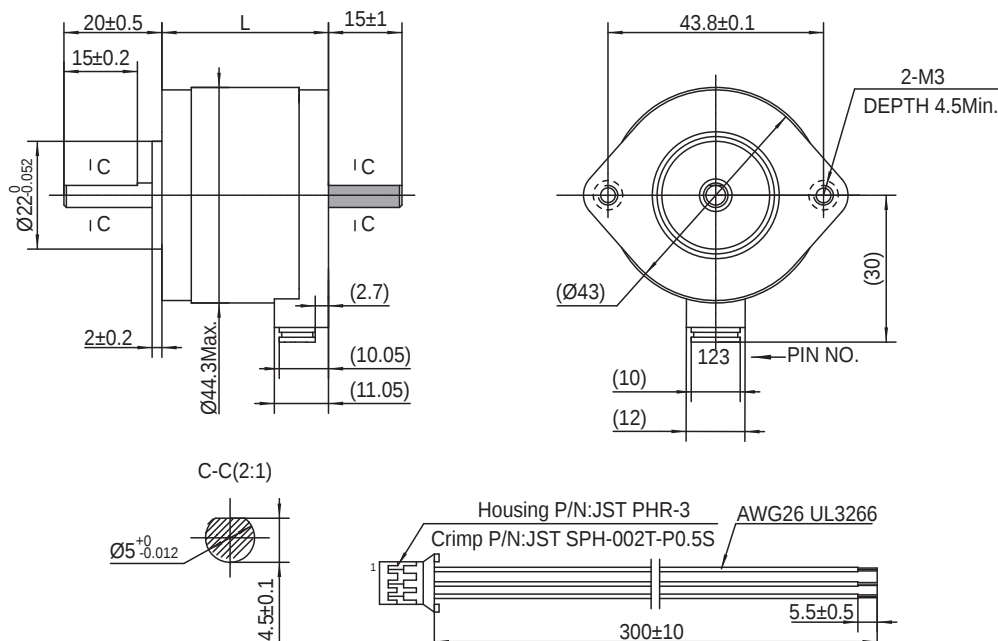
## ■ Parameters

| Model          | Shaft        | Wiring * | Leads | Length"L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|----------------|--------------|----------|-------|-----------|----------------|-----------|------------|-------------------|------|---------------------|
|                |              |          |       | mm        | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| AM17HC20A0-01N | Single Shaft | D        | 3     | 34        | 0.4            | 2.2       | 3.9        | 57.0              | 0.25 | 500VAC<br>1 minute  |
| AM17HC20A0-02N | Double Shaft |          |       |           |                |           |            |                   |      |                     |
| AM17HC60A0-01N | Single Shaft |          |       | 43        | 0.52           |           |            |                   |      |                     |
| AM17HC60A0-02N | Double Shaft |          |       |           |                |           |            |                   |      |                     |

\* Wiring Diagram D See Page 9

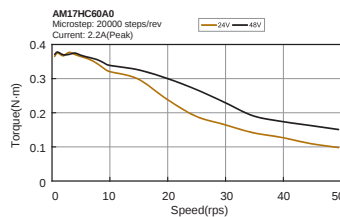
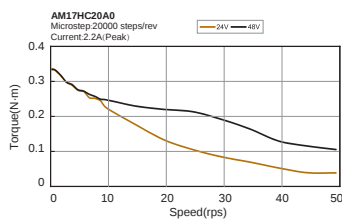
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

## ■ Dimensions (Unit: mm)

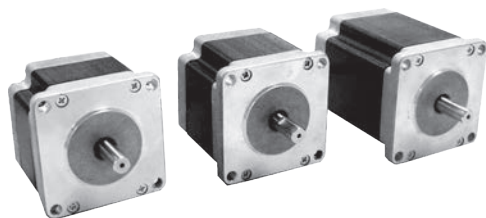


■ These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

## ■ Torque Curves (Recommended Driver: 3ST or 3SR)



## NEMA24(□60mm) 3-phase DC1.2° - 24HC Series 57 Flange Dimension



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 3                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 40 N (9 Lbs.) Push<br>130 N (30 Lbs.) Pull<br>70 N (15.5 Lbs.) At Flat Center |
| Radial                | 40                                                                            |
| IP Rating             | -20°C to +50°C                                                                |
| Operating Temp        | B, 130°C                                                                      |
| Insulation Class      | 100 MegOhms                                                                   |
| Insulation Resistance |                                                                               |



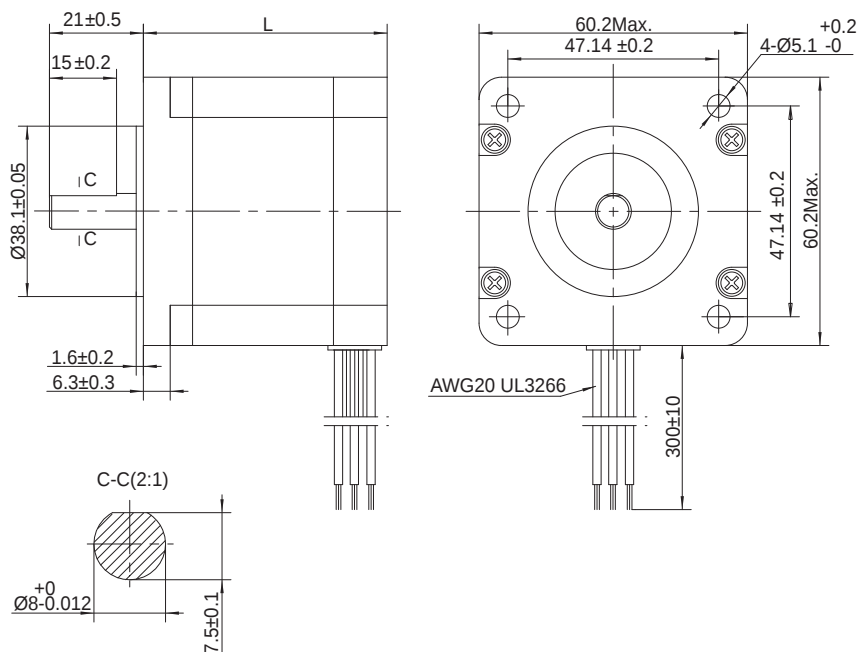
### Parameters

| Model         | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|---------------|--------------|----------|-------|------------|----------------|-----------|------------|-------------------|------|---------------------|
| AM24HC4306-01 | Single Shaft | D        | 3     | mm         | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   | 500VAC<br>1 minute  |
| AM24HC2306-01 |              |          |       | 45.5       | 0.58           | 5.8       | 0.33       | 180.0             | 0.5  |                     |
| AM24HC3306-03 |              |          |       | 54.5       | 0.9            |           | 0.4        | 260.0             | 0.8  |                     |
|               |              |          |       | 76.5       | 1.7            |           | 0.63       | 460.0             | 1.3  |                     |

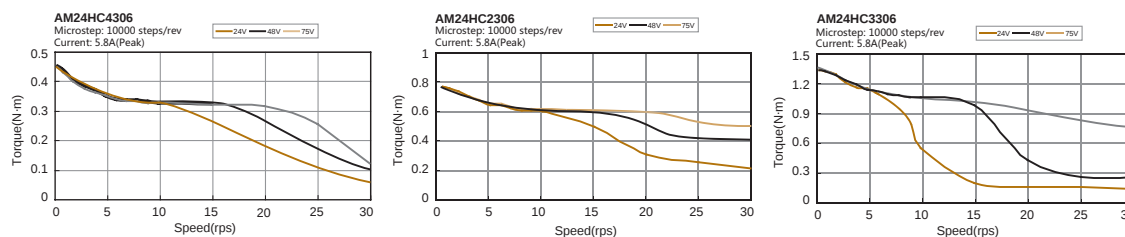
\* Wiring Diagram D See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### Dimensions (Unit: mm)



### Torque Curves (Recommended Driver: 3ST or 3SR)





# NEMA34(□86mm) 3-phase DC1.2° - 34HC Series



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 3                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 65 N (15 Lbs.) Push<br>155 N (35 Lbs.) Pull<br>220 N (50 Lbs.) At Flat Center |
| Radial                | 40                                                                            |
| IP Rating             | –20°C to +50°C                                                                |
| Operating Temp        | B, 130°C                                                                      |
| Insulation Class      | 100 MegOhms                                                                   |
| Insulation Resistance |                                                                               |



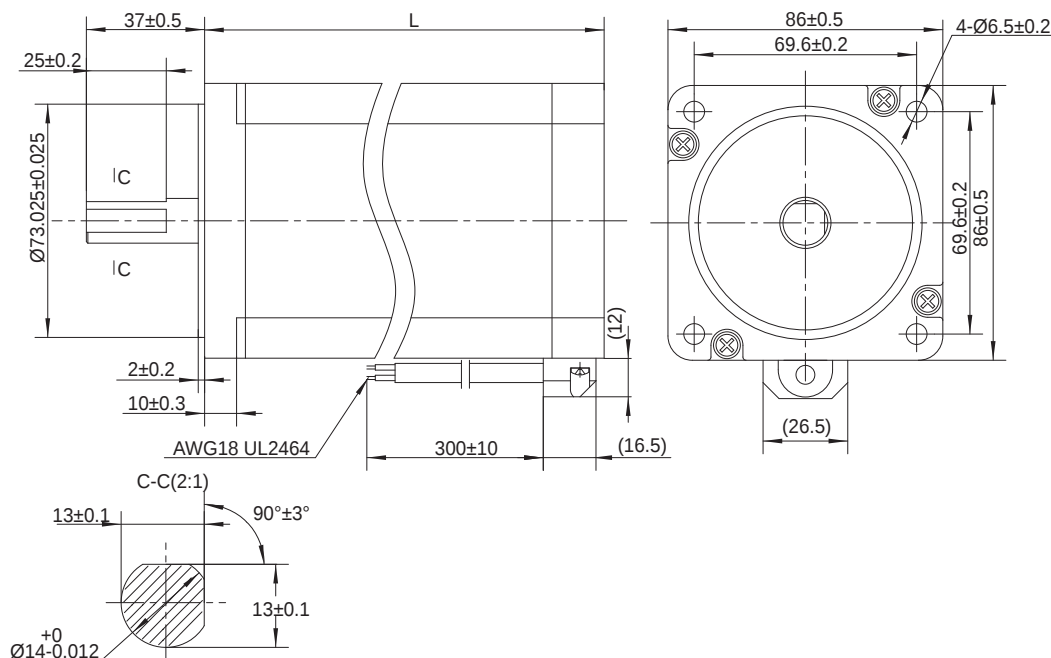
## Parameters

| Model         | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|---------------|--------------|----------|-------|------------|----------------|-----------|------------|-------------------|------|---------------------|
|               |              |          |       | mm         | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| AM34HC0305-01 | Single Shaft | D        | 3     | 66.5       | 2.4            | 5.8       | 0.53       | 1100.0            | 1.6  | 500VAC<br>1 minute  |
| AM34HC1305-01 |              |          |       | 96         | 4.3            |           | 0.58       | 1850.0            | 2.7  |                     |
| AM34HC2306-01 |              |          |       | 125.5      | 6.1            |           | 0.9        | 2750.0            | 3.8  |                     |

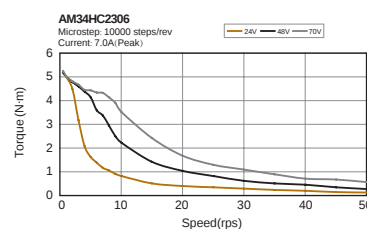
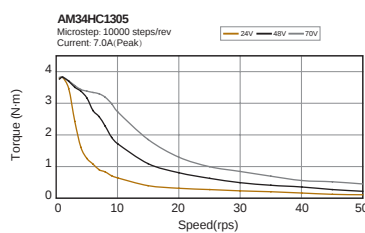
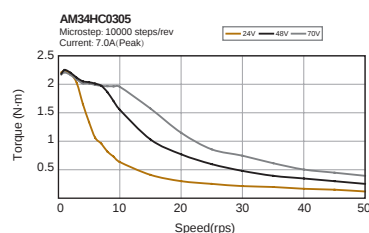
★ Wiring Diagram D See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

## Dimensions (Unit: mm)



## Torque Curves (Recommended Driver: 3ST or 3SR)



**NEMA34(□86mm) 3-phase AC 1.2° - 34HC Series**

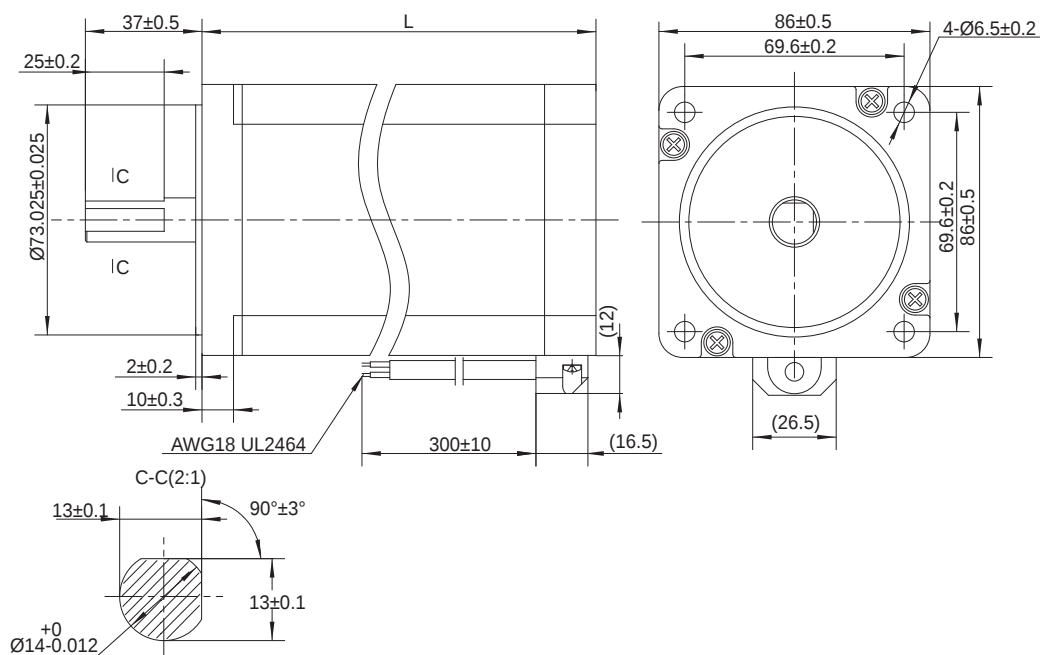
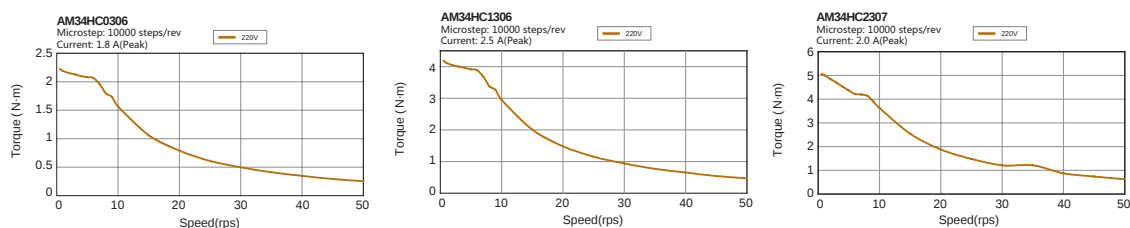
|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 3                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 65 N (15 Lbs.) Push<br>155 N (35 Lbs.) Pull<br>220 N (50 Lbs.) At Flat Center |
| Radial                | 40                                                                            |
| IP Rating             | -20°C to +50°C                                                                |
| Operating Temp        | B, 130°C                                                                      |
| Insulation Class      | 100 MegOhms                                                                   |
| Insulation Resistance |                                                                               |

**Parameters**

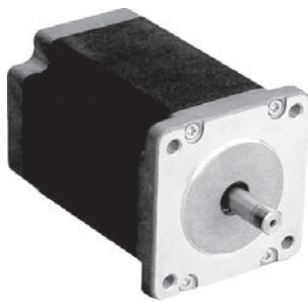
| Model         | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia | Mass | Dielectric Strength |
|---------------|--------------|----------|-------|------------|----------------|-----------|------------|---------------|------|---------------------|
|               |              |          |       | mm         | N·m            | A/Phase   | Ω/Phase    | g·cm²         | Kg   |                     |
| AM34HC0306-01 | Single Shaft | D        | 3     | 66.5       | 2.6            | 1.2       | 12.8       | 1100.0        | 1.6  | 1500VAC<br>1 minute |
| AM34HC1306-01 |              |          |       | 96         | 5.15           | 2.0       | 7          | 1850.0        | 2.7  |                     |
| AM34HC2307-01 |              |          |       | 125.5      | 5.6            | 2.0       | 6          | 2750.0        | 3.8  |                     |

\* Wiring Diagram D See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

**Dimensions (Unit: mm)****Torque Curves (Recommended Driver: 3SRAC)**



**NEMA24(□60mm) 2-phase DC 1.8°- 24HS UL Series**

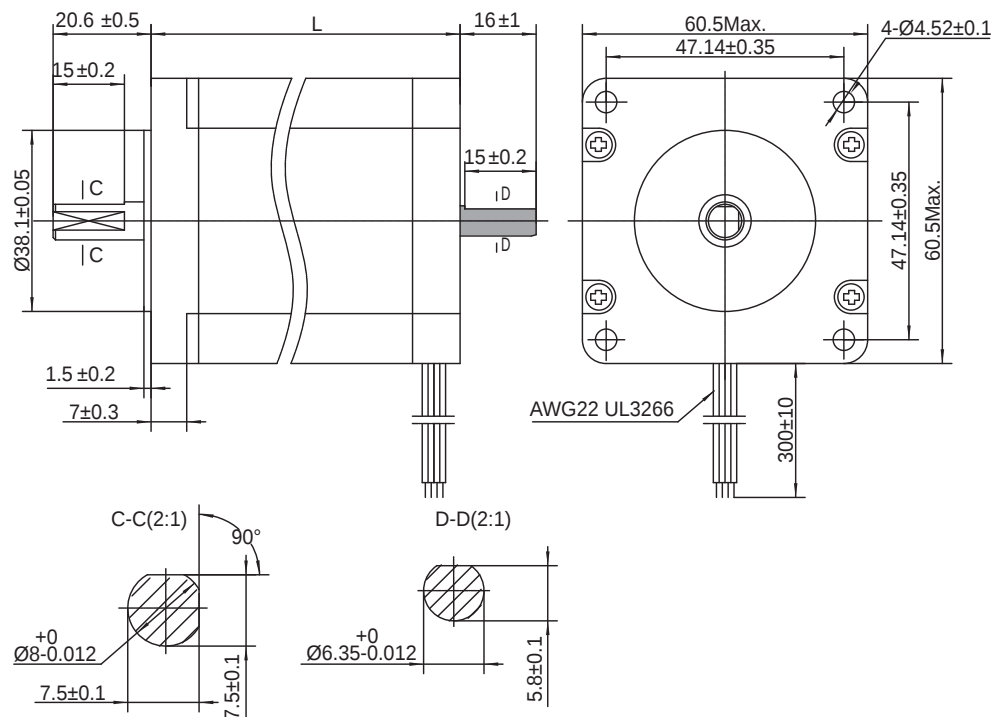
|                       |                                            |
|-----------------------|--------------------------------------------|
| Phases                | 2                                          |
| Steps / Revolution    | ± 5%                                       |
| Step Accuracy         | 40 N (9 Lbs.) Push<br>130 N (30 Lbs.) Pull |
| Radial                | 70 N (15.5 Lbs.) At Flat Center            |
| IP Rating             | 40                                         |
| Operating Temp        | -20°C to +50°C                             |
| Insulation Class      | B, 130°C                                   |
| Insulation Resistance | 100 MegOhms                                |

**Parameters**

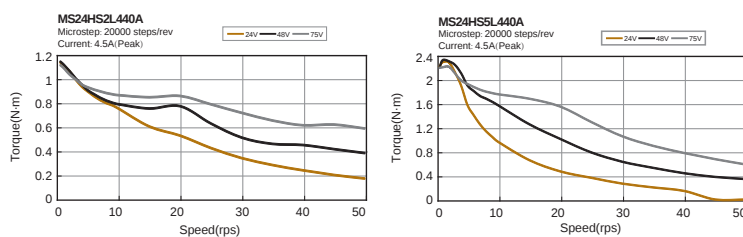
| Model           | Shaft        | Wiring * | Leads | Length“L” | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|-----------------|--------------|----------|-------|-----------|----------------|-----------|------------|-------------------|------|---------------------|
|                 |              |          |       | mm        | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| MS24HS2L440A-01 | Single Shaft | A        | 4     | 54.0      | 1.57           | 4.0       | 0.43       | 450.0             | 0.83 | 500VAC<br>1 minute  |
| MS24HS2L440A-02 | Double Shaft |          |       |           |                |           |            |                   |      |                     |
| MS24HS5L440A-01 | Single Shaft |          |       | 85.0      | 3.2            |           | 0.65       | 900.0             | 1.4  |                     |
| MS24HS5L440A-02 | Double Shaft |          |       |           |                |           |            |                   |      |                     |

\* Wiring Diagram A See Page 9

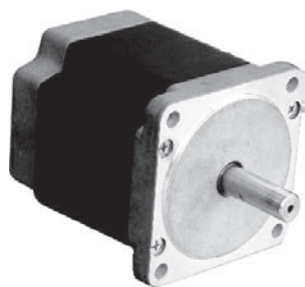
※ 1. The rated current of the motor is RMS value. 2. The output current of Moons' drive is the peak of sine value. 3. Drive maximum peak current = motor rated current x1.4.

**Dimensions (Unit: mm)**

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

**Torque Curves (Recommended Driver: SR or ST)**

## NEMA34(□86mm) 2-phase DC 1.8°- 34HD UL Series



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 2                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 65 N (15 Lbs.) Push<br>155 N (35 Lbs.) Pull<br>220 N (50 Lbs.) At Flat Center |
| Radial IP Rating      | 40                                                                            |
| Operating Temp        | -20°C to +50°C                                                                |
| Insulation Class      | B, 130°C                                                                      |
| Insulation Resistance | 100 MegOhms                                                                   |



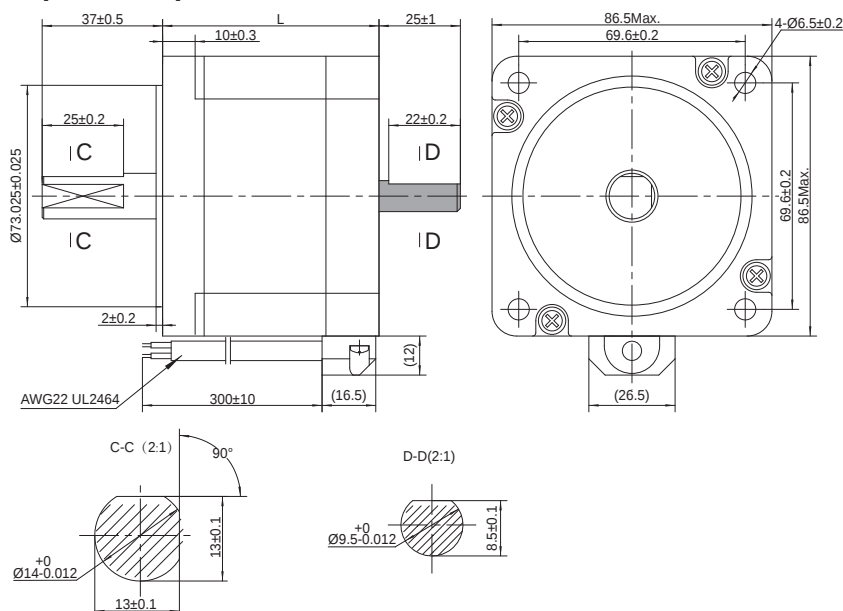
### Parameters

| Model           | Shaft        | Wiring * | Leads | Length "L"<br>mm | Holding Torque<br>N·m | Current *<br>A/Phase | Resistance<br>Ω/Phase | Rotor Inertia<br>g·cm <sup>2</sup> | Mass<br>Kg | Dielectric<br>Strength |
|-----------------|--------------|----------|-------|------------------|-----------------------|----------------------|-----------------------|------------------------------------|------------|------------------------|
| MS34HD0L4770-01 | Single Shaft | A        | 4     | 66.5             | 3.7                   | 6.3                  | 0.25                  | 1100.0                             | 1.6        | 500VAC<br>1 minute     |
| MS34HD0L4770-02 | Double Shaft |          |       |                  |                       |                      |                       |                                    |            |                        |
| MS34HD1L4750-01 | Single Shaft |          |       | 96.0             | 6.7                   | 5.6                  | 0.35                  | 1850.0                             | 2.7        |                        |
| MS34HD1L4750-02 | Double Shaft |          |       |                  |                       |                      |                       |                                    |            |                        |
| MS34HD2L4660-01 | Single Shaft |          |       | 125.5            | 9.4                   | 5.6                  | 0.49                  | 2750.0                             | 3.8        |                        |
| MS34HD2L4660-02 | Double Shaft |          |       |                  |                       |                      |                       |                                    |            |                        |

\* Wiring Diagram A See Page 9

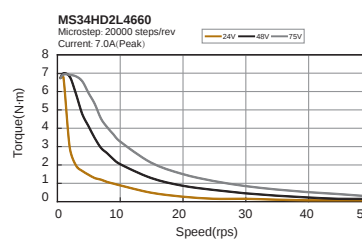
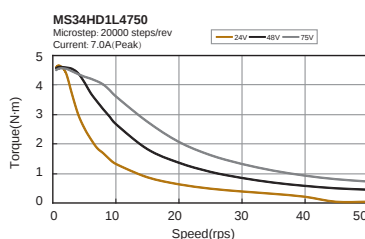
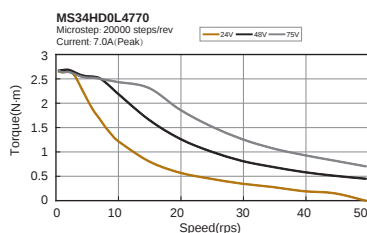
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### Dimensions (Unit: mm)

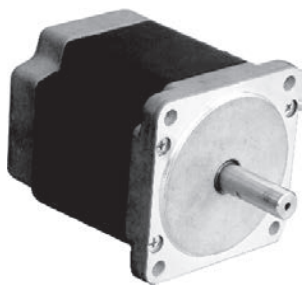


■ These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

### Torque Curves (Recommended Driver: SR or ST)



## NEMA34(□86mm) 2-phase AC 1.8°- 34HD UL Series



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 2                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 65 N (15 Lbs.) Push<br>155 N (35 Lbs.) Pull<br>220 N (50 Lbs.) At Flat Center |
| Radial                | 40                                                                            |
| IP Rating             | -20°C to +50°C                                                                |
| Operating Temp        | B, 130°C                                                                      |
| Insulation Class      | 100 MegOhms                                                                   |
| Insulation Resistance |                                                                               |



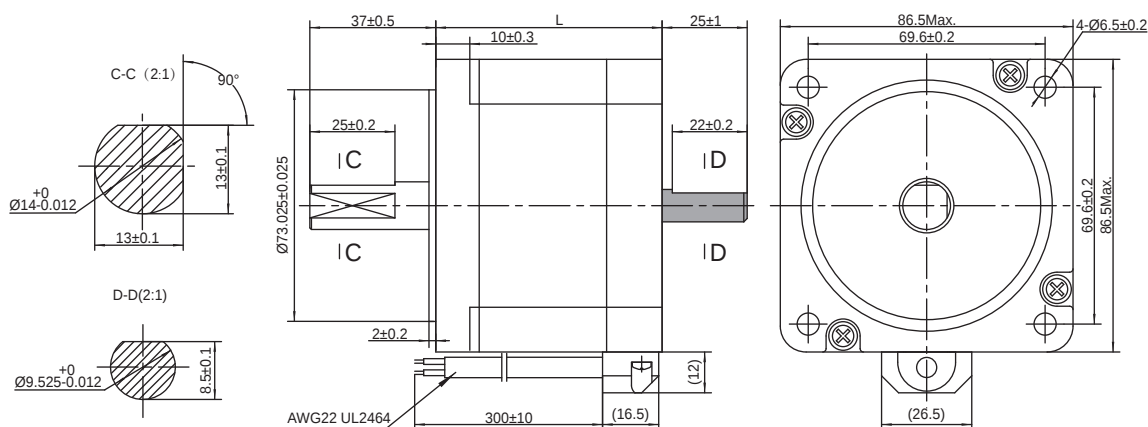
## Parameters

| Model           | Shaft        | Wiring *                   | Leads | Length "L" | Holding Torque | Current *                                                                 | Resistance                     | Rotor Inertia     | Mass | Dielectric Strength |
|-----------------|--------------|----------------------------|-------|------------|----------------|---------------------------------------------------------------------------|--------------------------------|-------------------|------|---------------------|
|                 |              |                            |       | mm         | N.m            | A/Phase                                                                   | Ω/Phase<br>(Series connection) | g·cm <sup>2</sup> | Kg   |                     |
| MS34HD0L8250-01 | Single Shaft | B (Parallel)<br>C (Series) | 8     | 66.5       | 4.2            | 1.8<br>(220V Series connection)<br>/<br>3.6<br>(110V Parallel connection) | 3.4                            | 1100.0            | 1.6  | 1500VAC<br>1 minute |
| MS34HD0L8250-02 | Double Shaft |                            |       | 75         | 4.7            |                                                                           | 3.6                            | 1350.0            | 1.9  |                     |
| MS34HD4L8250-01 | Single Shaft |                            |       | 96         | 7.3            |                                                                           | 3.6                            | 1850.0            | 2.7  |                     |
| MS34HD1L8250-01 | Single Shaft |                            |       | 115        | 7.6            |                                                                           | 4                              | 2400.0            | 3.5  |                     |
| MS34HD1L8250-02 | Double Shaft |                            |       | 125.5      | 8.7            |                                                                           | 4.2                            | 2750.0            | 3.8  |                     |
| MS34HD6L8250-01 | Single Shaft |                            |       |            |                |                                                                           |                                |                   |      |                     |
| MS34HD2L8180-01 | Single Shaft |                            |       |            |                |                                                                           |                                |                   |      |                     |
| MS34HD2L8180-02 | Double Shaft |                            |       |            |                |                                                                           |                                |                   |      |                     |

\* Wiring Diagram B / C See Page 9

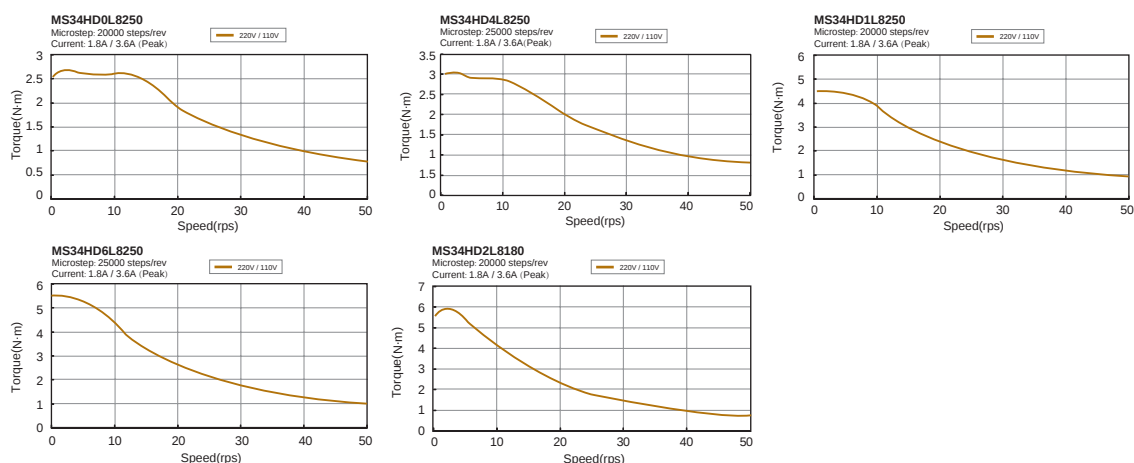
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

## Dimensions (Unit: mm)

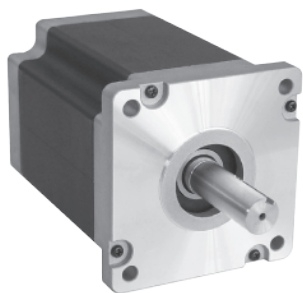


■ These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

## Torque Curves (Recommended Driver: SRAC or STAC)



# NEMA42(□110mm) 2-phase AC 1.8° - 42HS UL Series



|                       |                                                                                 |
|-----------------------|---------------------------------------------------------------------------------|
| Phases                | 2                                                                               |
| Steps / Revolution    | ± 5%                                                                            |
| Step Accuracy         | 250 N (56 Lbs.) Push<br>250 N (26 Lbs.) Pull<br>450 N (100 Lbs.) At Flat Center |
| Radial                | 40                                                                              |
| IP Rating             | -20°C to +50°C                                                                  |
| Operating Temp        | B, 130°C                                                                        |
| Insulation Class      | 100 MegOhms                                                                     |
| Insulation Resistance |                                                                                 |



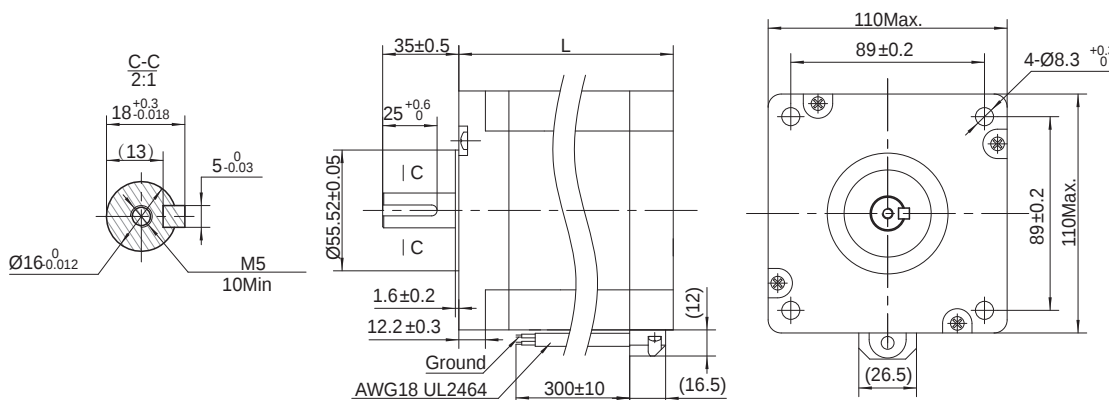
## Parameters

| Model           | Shaft        | Wiring * | Leads | Length "L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|-----------------|--------------|----------|-------|------------|----------------|-----------|------------|-------------------|------|---------------------|
|                 |              |          |       | mm         | N.m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| ML42HS0L4210-02 | Single Shaft | A        | 4     | 98.5       | 12             | 2.1       | 4.2        | 5500              | 4.8  | 1500VAC<br>1 minute |
| ML42HS2L4240-02 | Single Shaft |          |       | 149.5      | 21             | 2.4       | 4.4        | 10900             | 8    |                     |
| ML42HS3L4270-02 | Single Shaft |          |       | 201        | 30             | 2.7       | 4.4        | 16200             | 11.6 |                     |

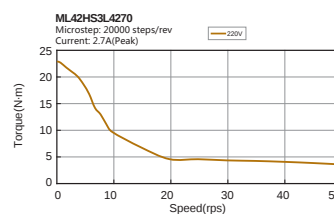
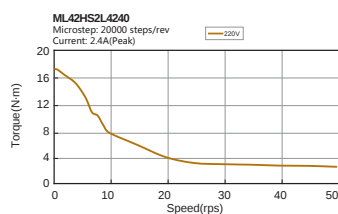
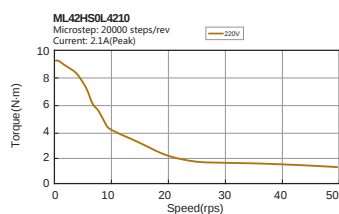
\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

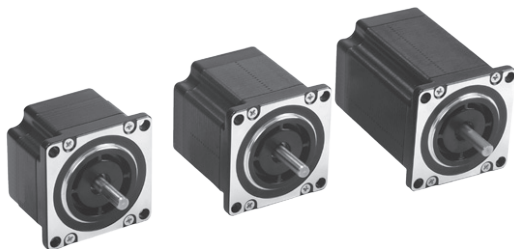
## Dimensions (Unit: mm)



## Torque Curves (Recommended Driver: SRAC or STAC)



## NEMA23(□56mm) 2-phase DC 1.8°- 23HS PowerPlus UL Series (6.35mm Shaft)



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 2                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 40 N (9 Lbs.) Push<br>130 N (30 Lbs.) Pull<br>70 N (15.5 Lbs.) At Flat Center |
| Radial                | 40                                                                            |
| IP Rating             | -20°C to +50°C                                                                |
| Operating Temp        | B, 130°C                                                                      |
| Insulation Class      | 100 MegOhms                                                                   |
| Insulation Resistance |                                                                               |



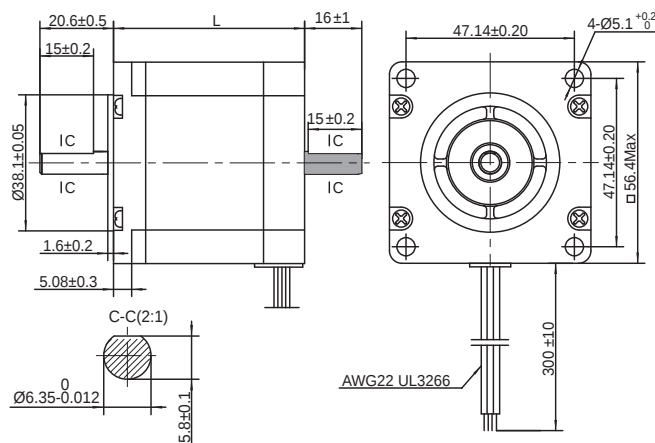
### Parameters

| Model           | Shaft        | Wiring * | Leads | Length"L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |
|-----------------|--------------|----------|-------|-----------|----------------|-----------|------------|-------------------|------|---------------------|
|                 |              |          |       | mm        | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |
| ML23HS0L4180-06 | Single Shaft | A        | 4     | 39        | 0.82           | 1.8       | 1.8        | 105.0             | 0.4  | 500VAC<br>1 minute  |
| ML23HS0L4180-05 | Double Shaft |          |       | 55        | 1.5            |           | 2.4        | 215.0             | 0.6  |                     |
| ML23HS8L4180-04 | Single Shaft |          |       |           |                |           |            |                   |      |                     |
| ML23HS8L4180-03 | Double Shaft |          |       | 77        | 2.3            |           | 3          | 365.0             | 1.0  |                     |
| ML23HSAL4180-04 | Single Shaft |          |       |           |                |           |            |                   |      |                     |
| ML23HSAL4180-06 | Double Shaft |          |       | 39        | 0.82           | 3.7       | 0.48       | 105.0             | 0.4  |                     |
| ML23HS0L4370-06 | Single Shaft |          |       |           |                |           |            |                   |      |                     |
| ML23HS0L4370-07 | Double Shaft |          |       |           |                |           |            |                   |      |                     |
| ML23HS8L4370-09 | Single Shaft |          |       |           |                |           |            |                   |      |                     |
| ML23HS8L4370-10 | Double Shaft |          |       | 55        | 1.5            |           | 0.63       | 215.0             | 0.6  |                     |
| ML23HSAL4370-14 | Single Shaft |          |       |           |                |           |            |                   |      |                     |
| ML23HSAL4370-15 | Double Shaft |          |       |           |                |           |            |                   |      |                     |
|                 |              |          |       | 77        | 2.3            |           | 0.75       | 365.0             | 1.0  |                     |

★ Wiring Diagram A See Page 9

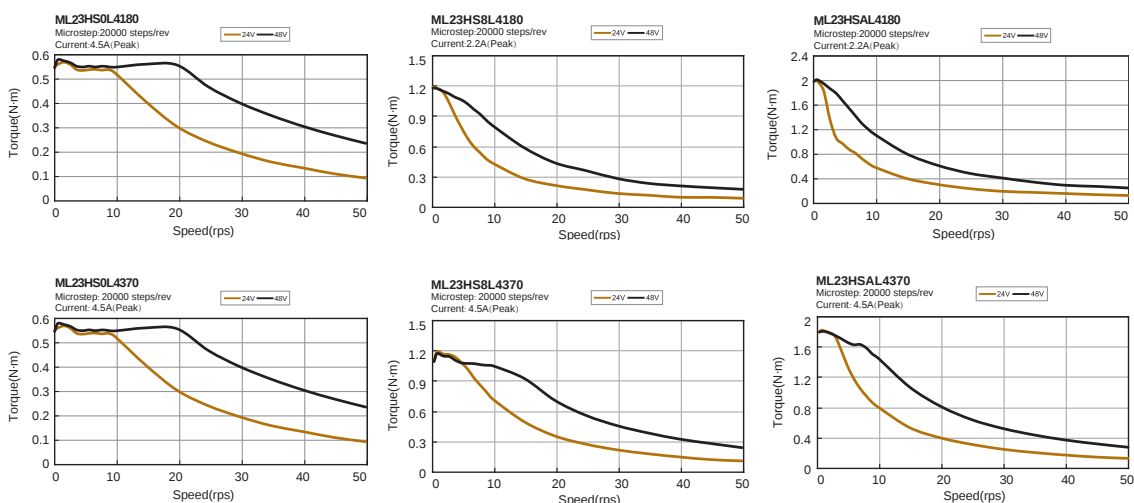
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### Dimensions (Unit: mm)

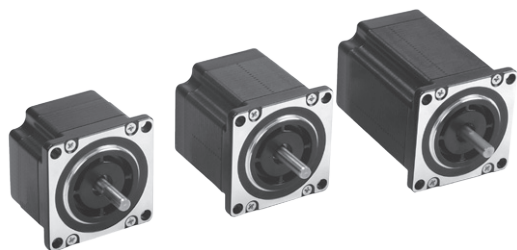


■ These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

### Torque Curves (Recommended Driver: SR or ST)



## NEMA23(□56mm) 2-phase DC 1.8°- 23HS PowerPlus UL Series (8mm Shaft)



|                       |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Phases                | 2                                                                             |
| Steps / Revolution    | ± 5%                                                                          |
| Step Accuracy         | 40 N (9 Lbs.) Push<br>130 N (30 Lbs.) Pull<br>70 N (15.5 Lbs.) At Flat Center |
| Radial IP Rating      | 40                                                                            |
| Operating Temp        | -20°C to +50°C                                                                |
| Insulation Class      | B, 130°C                                                                      |
| Insulation Resistance | 100 MegOhms                                                                   |



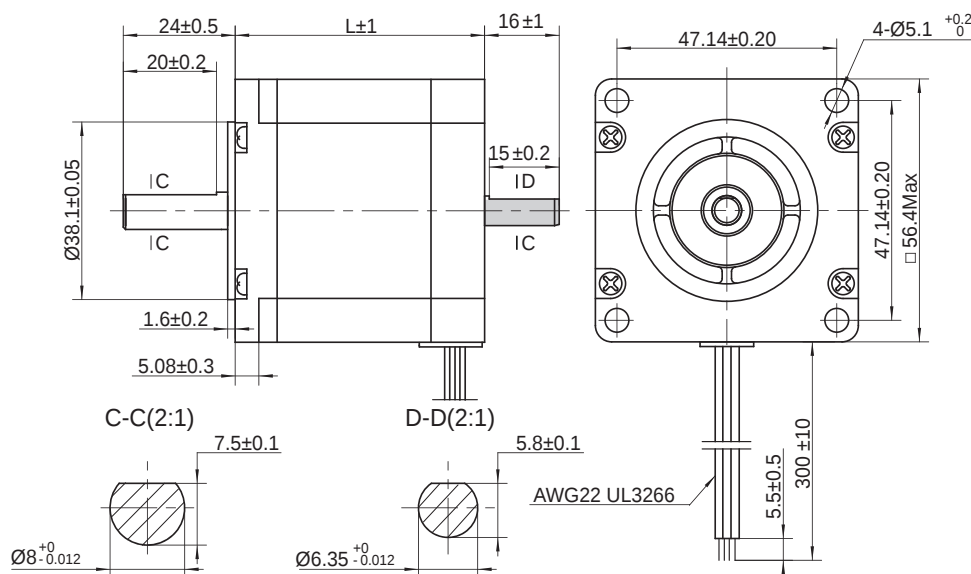
### Parameters

| Model           | Shaft        | Wiring * | Leads | Length"L" | Holding Torque | Current * | Resistance | Rotor Inertia     | Mass | Dielectric Strength |  |  |
|-----------------|--------------|----------|-------|-----------|----------------|-----------|------------|-------------------|------|---------------------|--|--|
|                 |              |          |       | mm        | N·m            | A/Phase   | Ω/Phase    | g·cm <sup>2</sup> | Kg   |                     |  |  |
| ML23HS0L4370-08 | Single Shaft | A        | 4     | 39        | 0.82           | 3.7       | 0.48       | 105.0             | 0.4  | 500VAC<br>1 minute  |  |  |
| ML23HS0L4370-09 | Double Shaft |          |       |           |                |           |            |                   |      |                     |  |  |
| ML23HS8L4370-11 | Single Shaft |          |       | 55        | 1.5            |           | 0.63       | 215.0             | 0.6  |                     |  |  |
| ML23HS8L4370-12 | Double Shaft |          |       |           |                |           |            |                   |      |                     |  |  |
| ML23HSAL4370-17 | Single Shaft |          |       | 77        | 2.3            |           | 0.75       | 365.0             | 1.0  |                     |  |  |
| ML23HSAL4370-16 | Double Shaft |          |       |           |                |           |            |                   |      |                     |  |  |

\* Wiring Diagram A See Page 9

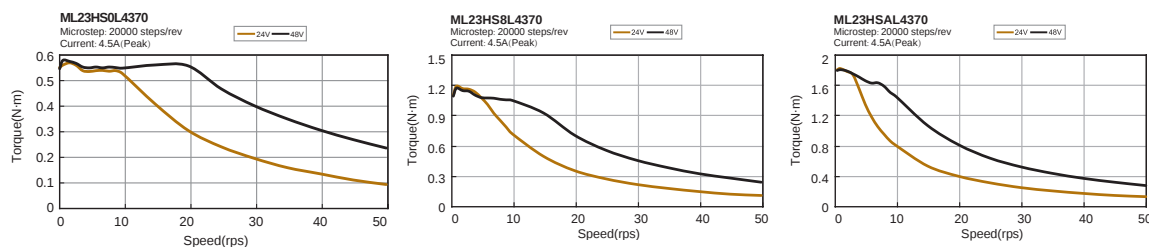
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### Dimensions (Unit: mm)



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

### Torque Curves (Recommended Driver: SR or ST)





## NEMA24(□60mm) 2-phase DC1.8°- 24HS UL Series IP65 Type



|                       |                                            |
|-----------------------|--------------------------------------------|
| Phases                | 2                                          |
| Steps / Revolution    | ± 5%                                       |
| Step Accuracy         | 40 N (9 Lbs.) Push<br>130 N (30 Lbs.) Pull |
| Radial                | 70 N (15.5 Lbs.) At Flat Center            |
| IP Rating             | 65                                         |
| Operating Temp        | -20°C to +50°C                             |
| Insulation Class      | B, 130°C                                   |
| Insulation Resistance | 100 MegOhms                                |



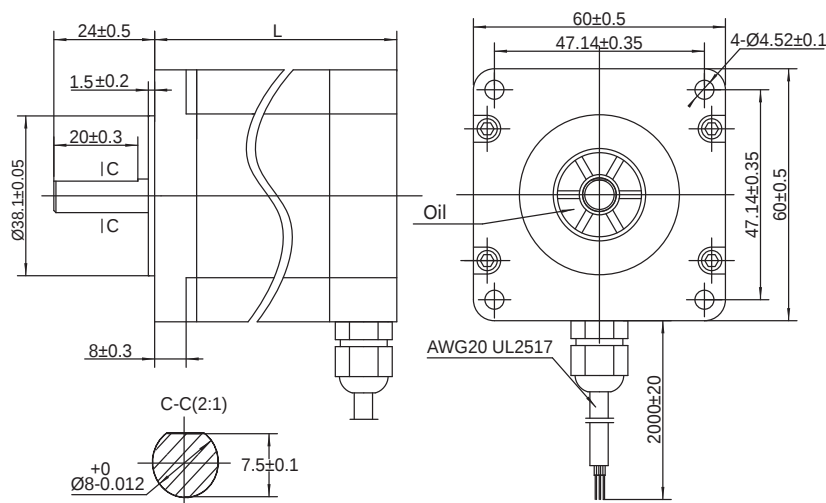
### Parameters

| Model           | Shaft        | Wiring * | Leads | Length "L"<br>mm | Holding Torque<br>N.m | Current *<br>A/Phase | Resistance<br>Ω/Phase | Rotor Inertia<br>g·cm <sup>2</sup> | Mass<br>Kg | Dielectric<br>Strength |
|-----------------|--------------|----------|-------|------------------|-----------------------|----------------------|-----------------------|------------------------------------|------------|------------------------|
| MS24HS5L443A-01 | Single Shaft | A        | 4     | 94.5             | 3.2                   | 4.0                  | 0.65                  | 900.0                              | 1.4        | 500VAC<br>1 minute     |

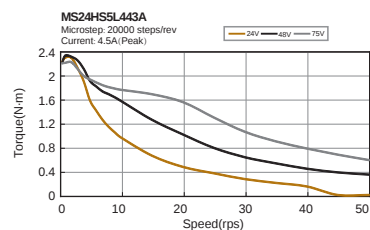
\* Wiring Diagram A See Page 9

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

### Dimensions (Unit: mm)



### Torque Curves (Recommended Driver: SR or ST)



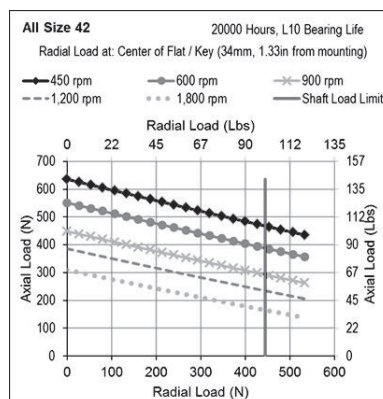
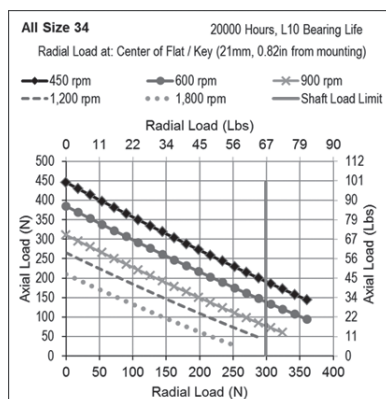
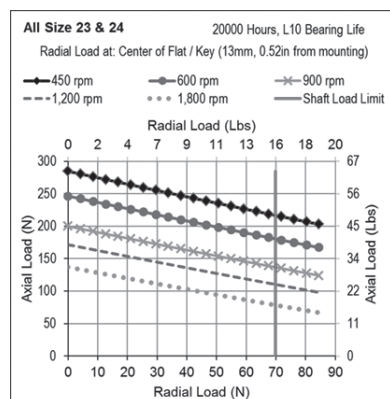
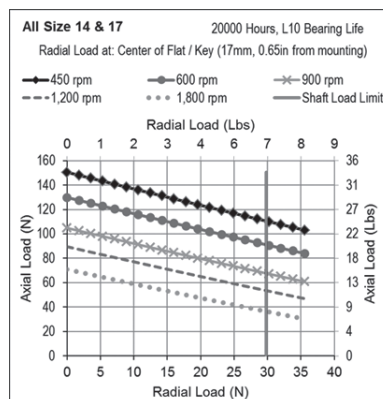
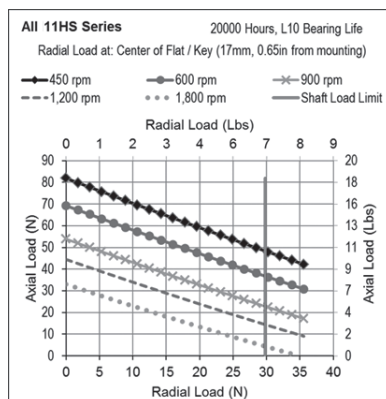
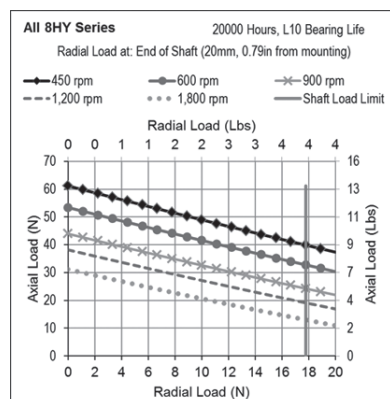
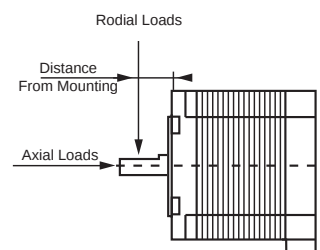


## ■ Bearing Life & Shaft Loading

Moons' uses heavy duty long life bearings for long life from every motor. Most motors can be provided with larger bearings and custom construction to meet the most demanding applicatons.

These bearing life curves represent the maximum axial and radial loads for 20,000 hours L10 bearing life at various speeds. The shaft radial load limit (and bearing load ratings) are highly dependent on the the distance from the mounting face where the load is applied. These curves were calculated with the radial load applied at the distance from the mounting face shown on the curve (usually the center of the flat / keyway).

A common cause for shaft (and bearing) failure, are high radial loads that are created when a pulley is attached to the motor shaft at a large distance from the motor mounting face, and the belt has high tension. To avoid this condition mount pulleys and gears as close to the face of the motor as possible, and avoid over tightening belts. This will dramatically reduce the shaft stress, and increases the life of the bearings.



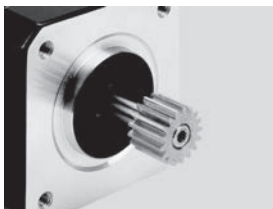
## ■ Configurations and Options

Besides all standard motors above, we also provide all kinds of customized motors per request.

### Shaft Configuration



Cross Drilled Shaft



Gear



Plastic Pulley



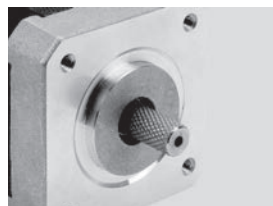
Single Flat



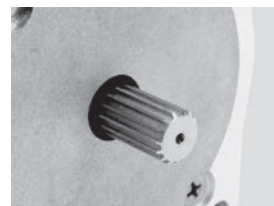
Double Flat



Key Way



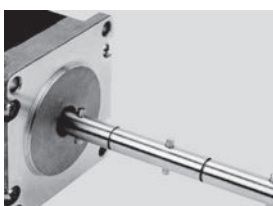
Knurl



Hobbed Gear



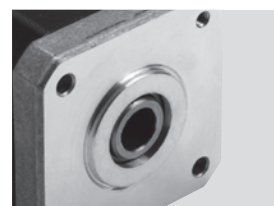
Screw Hollow Shaft



Dowel

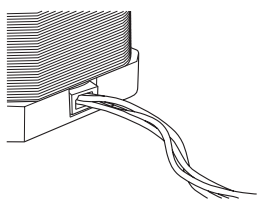


Worm Shaft

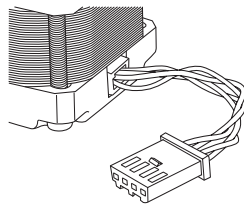


Hollow Shaft

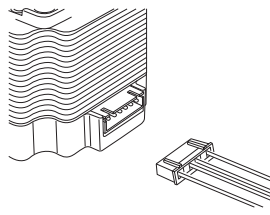
### Connection Configuration



Lead Wire



Lead Wire with Connector



Connector with harness

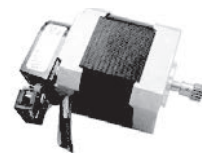
### Encoder Option



+



→



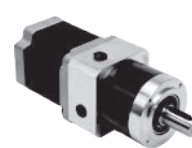
### Gearbox Option



+



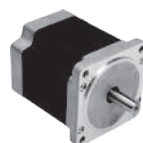
→



### Brake Option



+



→



### Integrated



+

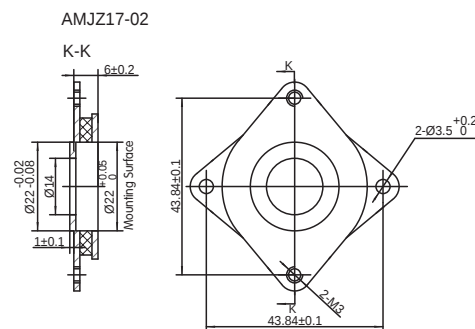
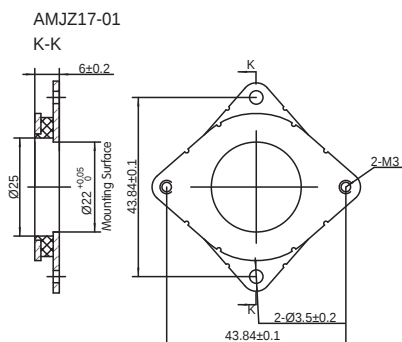


→

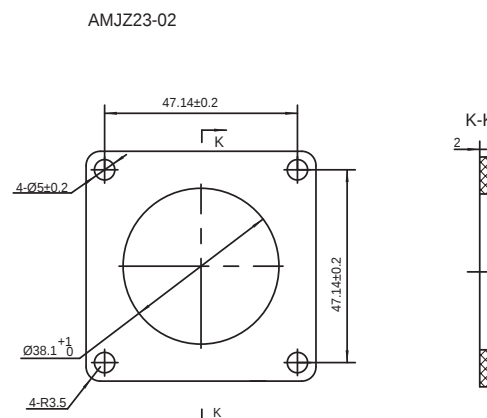
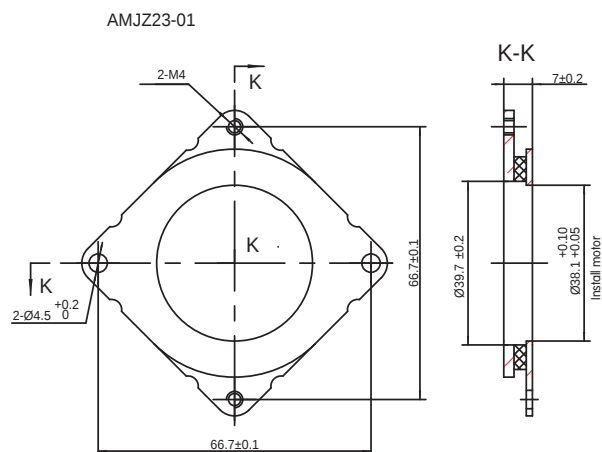


## ■ Accessory

| 42 Flange<br>Demension | Model     | Application of screw | Maximum Load | Scope Of Application |
|------------------------|-----------|----------------------|--------------|----------------------|
|                        | AMJZ17-01 | M3(2X)               | 490N(50kgf)  | NEMA17               |
|                        | AMJZ17-02 |                      | 490N(50kgf)  | NEMA17               |



| 60 Flange<br>Demension | Model     | Application of screw | Maximum Load | Scope Of Application   |
|------------------------|-----------|----------------------|--------------|------------------------|
|                        | AMJZ23-01 | M4(2X)               | 490N(50kgf)  | NEMA23/NEMA24(2-phase) |
|                        | AMJZ23-02 |                      | 490N(50kgf)  | NEMA23/NEMA24(2-phase) |



Instructions for use: reducing mechanical noise

Introduction

Quick Selection

2-phase Stepper Motors

3-phase Stepper Motors

UL Stepper Motors

Configurations  
and Options

## Glossary

Introduction

Quick Selection

2-phase Stepper Motors

3-phase Stepper Motors

UL Stepper Motors

Configurations and Options

### Absolute Position

Position referenced to a fixed zero or “home” position

### Absolute Programming

A positioning coordinate reference wherein all positions are specified relative to some reference or “home” position; this is different from incremental programming where distances are specified relative to the current position

### Ambient Temperature

The temperature of the medium immediately surrounding a device

### Amplifier

Electronic device that converts command signals (analog or digital) to high power voltages and currents for the operation of the motor

### ASCII

American Standard Code for Information Interchange; this code assigns a number to each numeral and letter of the alphabet allowing information to be transmitted between machines as a series of binary numbers

### Axial Play(End play)

The axial shaft displacement due to a reversal of an axial force on the shaft

### Baud Rate

The number of binary bits transmitted per second for serial communications such as RS-232

### Bi-level Drive (Dual Voltage Drive)

A driver where two levels of voltage are used to drive a step motor; a high (over drive) voltage is applied to the winding each time it is switched on; the high voltage stays on until the current reaches a predetermined level; the high voltage is turned off after a time period determined experimentally or by sensing winding current; the low voltage maintains the desired current

### Bipolar Drive

A drive that reverses the magnetic polarity of a pole by electronically switching the polarity of the current to the winding (+ or -); bipolar drives can be used with 4, 6, or 8 lead motors; with 4 and 8 lead motors, bipolar drives are usually more efficient than unipolar drives and generally produce more torque

### Brushless Servo Drive

A servo drive used to control a permanent magnet synchronous AC motor

### Chopper Drive

A step motor drive that uses switching amplifiers to control motor current

### Class B Insulation

Specifies motor insulation that is rated for operation up to 130°C

### Class H Insulation

Specifies motor insulation that is rated for operation up to 180°C

### Closed Loop

A system that uses some form of feedback device to monitor the system output; the signal from the device is used to correct any errors between actual and demanded output

### Cogging

Term used to describe uneven velocity in motors usually at low speeds

### Commutation

Refers to the action of steering currents or voltage to the proper motor phases to produce optimum motor torque. In brush type motors, commutation is done electromechanically via the brushes and commutator. In brushless motors, commutation is done by the switching electronics using rotor position information typically obtained from hall sensors, tachometers, resolvers or encoders.

### Controller (Step Motor)

A system consisting of a DC power supply and power switches plus associated circuits to control the switches in the proper sequence

### Damping

An indication of the rate of decay of a signal to its steady state value; related to settling time

### Dead Band

A range of input signals for which there is no system response

### Detent Torque

The maximum torque required to slowly rotate a step motor shaft with no power applied to the windings; this applies only to permanent magnet or hybrid motors; the leads are separated from each other

### Drive (PWM)

A motor drive utilizing Pulse-Width Modulation techniques to control current to the motor; typically a high efficiency drive that can be used for high response applications

### Drive (Servo)

A motor drive that utilizes motor position feedback with a control loop for accurate control of motor position and/or velocity

### Drive (Stepper)

An electronic package to convert digital step and direction inputs to currents to drive a step motor

### Duty Cycle

The percentage of ON time vs. OFF time; a device that is always on has a 100% duty cycle; half on and half off is a 50% duty cycle

## Dynamic Braking

A passive technique for stopping a permanent magnet brush or brushless motor; the motor windings are shorted together through a resistor, which results in a motor braking with an exponential decrease in speed

## Encoder

A device used to translate motion into electrical signals used to provide position information; often used as a position/motion feedback device in closed loop systems

## Encoder Marker Pulse

A once-per-revolution signal that is provided by some incremental encoders to specify a reference point within that revolution

## End Play

The axial shaft motion due to the reversal of an axial force acting on a shaft with axial clearance or low axial pre-load

## Following Error

The positional error during motion between a load's actual position and the commanded position

## Friction - Coulomb

A resistance to motion between non-lubricated surfaces; this force remains constant with velocity

## Friction - Viscous

A resistance to motion between lubricated surfaces; this force is proportional to the relative velocity between the surfaces

## Hall Sensors

A feedback device built into a motor used by a servo amplifier to electronically commutate the motor

## Holding Torque (Static Torque)

The maximum restoring torque that is developed by the energized motor when the shaft is slowly rotated by external means

## Hybrid Step Motor

A type of step motor comprising a permanent magnet and variable reluctance stator and rotor structures; it uses a double salient pole construction

## Hysteresis (Positional)

The difference between the step positions when moving CW and the step position when moving CCW; a step motor may stop slightly short of the true position thus producing a slight difference in position CW to CCW

## I/O (Inputs/Outputs)

The reception and transmission of information between control devices; I/O has two distinct forms: Digital - switches, relays, etc. which are either in an On or Off state; Analog – a continuous signal such as speed, temperature, low, etc.

## Idle Current Reduction

Reduction of phase current to a step motor when no motion is required

## Indexer

An electronic control device that sends pulse and direction signals for use by a step motor driver

## Inductance (Mutual)

The property that exists between two current carrying conductors or coils when magnetic lines of flux from one link with those of the other

## Inductance (Self)

The constant by which the rate of change of the coil current must be multiplied to give the self-induced counter EMF

## Inertia

Measure of resistance of an object to changes in velocity; the larger the inertia, the more torque required to accelerate and decelerate the load

## Inertial Match

Ratio of reflected load inertia to motor inertia

## Instantaneous START/STOP Rate

The maximum switching rate that an unloaded step motor will follow without missing steps when starting from rest or stopping from moving

## L/R Drive

A drive that uses external resistance to allow a higher voltage than that of a voltage drive; L/R drives have better performance than voltage drives, but have less performance and efficiency than a chopper drive

## Loop, PID

A high performance control loop that uses Proportional, Integral and Derivative type control parameters

## Loop, Position

A feedback control loop in which the controlled parameter is motor position

## Loop, Velocity

A feedback control loop in which the controlled parameter is velocity

## Maximum Reversing Rate

The maximum stepping rate at which an unloaded motor will reverse direction of rotation without missing steps

## Maximum Slew Rate

The maximum stepping rate at which a step motor with no load will run and remain in synchronism

## Microstepping

A technique in which motor steps are electronically divided by the drive into smaller steps; the most common microstep resolutions are 10, 25 and 50 steps per full step, but many resolutions ranging from 2 to 256 microsteps per full step are available

### Open Frame Drive

Refers to amplifiers where a separate DC power source must be provided to the unit

### Open-Loop

A system with no feedback; most step motor systems are run in this mode

### Oscillator

A device that is used to produce pulses for driving a step motor at a preset speed

### Overshoot

The amount a motor shaft rotates beyond the commanded stopping position

### Packaged Drive

Refers to amplifiers where the power supply is included in the enclosure and 110/220VAC is used to power the unit

### Permanent Magnet Step Motor

A step motor having a permanent magnet rotor and wound stator

### Pull-In Rate (Response Rate)

The maximum switching rate at which an unloaded motor can start without losing step positions.

### Pull-In Torque

The maximum torque load at which a step motor will start and run in synchronism with a fixed frequency stepping rate without losing step positions

### Pull-out Torque

The maximum torque load that can be applied to a motor running at a fixed stepping rate while maintaining synchronism; any additional load torque will cause the motor to stall or miss steps

### Pulse Rate

The rate at which successive steps are initiated or the windings switched; the pulse rate divided by the resolution of the motor/drive combination (in steps per revolution) equals the rotational speed of the motor in revolutions per second

### PWM (Pulse Width Modulation)

A method of controlling motor voltage and current used in servo and step motor drivers

### Radial Play (Side play)

The side-to-side movement of the shaft due to clearances between the shaft and bearing, bearing to housing, and bearing internal clearance for ball and roller bearings

### Ramping

The acceleration and deceleration of a motor; may also refer to the change in frequency of the step pulse train

### Rated Torque

The torque producing capability of a motor at a given speed; this is the maximum continuous torque the motor can deliver to a load

### Regeneration

The action during deceleration, in which the motor acts as a generator and takes kinetic energy from the load, converts it to electrical energy, and returns it to the amplifier

### Repeatability

The degree to which the positioning accuracy for a given move performed repetitively can be duplicated

### Resolution

The smallest positioning increment that can be achieved; frequently defined as the number of steps or feedback units required for a motor's shaft to rotate one complete revolution

### Resonance

The effect of a periodic driving force that causes a large amplitude increase at a particular frequency

### Response Rate (Pull-In Rate)

The stepping rate an unloaded motor can follow from a standing start without missing steps

### Ringing

Oscillation of a system following a sudden change in state

### RS-232, RS-422/485

Serial communication hardware definitions

### Serial Port

A digital data communications port that uses a serial bit stream for data transfer

### Servo Amplifier/Servo Drive

An electronic device that converts a control signal into a current that is fed into the motor windings to produce torque in the motor

### Servo System

A feedback control system for mechanical motion in which the controlled output is position or velocity; servo systems are closed loop systems

### Settling Time

The elapsed time starting the instant the rotor reaches the commanded step position and the oscillations settle to within a specified displacement band around the final position

## Si

MOONS' Simple Indexer operating environment; sequences for machine operation are programmed by the use of point and click instructions

## Slew

The portion of a move made at a constant non-zero velocity

## Stall Torque (holding or static)

The torque available from a motor at stall or zero rpm

## Step Angle

The nominal angle through which the step motor shaft rotates between adjacent step positions

## Step or Stepping Rate (Speed)

The number of steps a shaft rotates during a specified time interval

## Step-to-step Accuracy (relative accuracy)

The maximum error that occurs between any adjacent step, expressed as a percentage of one full step

## Switching Amplifier

A device that switches a high voltage on and off to control current; some amplifiers (PWM types) switch at a constant frequency and adjust duty cycle to control current, others have a fixed off time and adjust the frequency

## Switching Sequence (Energizing Sequence)

The sequence and polarity of voltages applied to coils of a step motor that result in a specified direction of rotation

## Thermal Time Constant

The time required for the motor winding to reach 63.2% of its final temperature

## Thermal Resistance

The resistance to the flow of energy between two surfaces of the same body or different bodies; thermal resistance = degrees C/watt in the winding

## Torque

The rotary equivalent of force; equal to the product of the force perpendicular to the radius of motion and distance from the center of rotation to the point where the force is applied

## Torque Constant

A number representing the relationship between motor input current and motor output torque, usually expressed in units of torque/amp

## Torque Displacement Curve

The holding (restoring) torque plotted as a function of rotor angular displacement with the motor energized

## Torque Gradient (Stiffness)

The ratio of the change in holding torque to a particular change in shaft position when the motor is energized

## Torque Ripple

The cyclical variation of generated torque given by the product of motor angular velocity and number of commutator segments

## Torque-to-inertia Ratio

Ratio of a motor's torque divided by the motor's rotor inertia; the higher the ratio, the higher the acceleration may be

## Unipolar Drive

The motor phase winding current is switched in one direction only; the polarity of the applied voltage to each winding is always the same; unipolar drives require 6 or 8 lead motors

## Variable Reluctance Step Motor (V/R)

A step motor having a wound stator or stators with salient poles working with a soft iron rotor having salient poles on the periphery

## Velocity

The change in position as a function of time; velocity has both magnitude and direction

## Viscous Damping

A damper that provides a drag or friction torque proportional to acceleration; a quality used to damp unwanted oscillations of a step motor

## Voltage Drive

A drive operated at the minimum voltage required to safely limit motor current; motors used with voltage drives produce less torque at higher speeds than when used with L/R or chopper drives

## Wave Drive

Energizing the phases one at a time; driving the motor one phase or winding at a time

## ■ Conversion Factors

### • Length

| A \ B | mm    | cm    | m      | inch    | feet     |
|-------|-------|-------|--------|---------|----------|
| mm    | --    | 0.1   | 0.001  | 0.03937 | 0.003281 |
| cm    | 10    | --    | 0.01   | 0.3937  | 0.03281  |
| m     | 1,000 | 100   | --     | 39.37   | 3.281    |
| inch  | 25.4  | 2.54  | 0.0254 | --      | 0.08333  |
| feet  | 304.8 | 30.48 | 0.348  | 12      | --       |

Multiply "A" units  
by conversion factor  
to obtain "B" units

### • Force

| A \ B  | g     | kgf     | oz      | lb       | Newton |
|--------|-------|---------|---------|----------|--------|
| g      | --    | 0.001   | 0.03527 | 0.002205 | 0.0098 |
| kgf    | 1,000 | --      | 35.27   | 22.05    | 9.807  |
| oz     | 28.35 | 0.02835 | --      | 0.0625   | 0.278  |
| lb     | 453.6 | 0.4536  | 16      | --       | 4.448  |
| Newton | 102   | 0.102   | 3.597   | 0.2248   | --     |

### • Torque

| A \ B | Nm       | Ncm      | mNm     | kgm*     | kgcm*   | gcm*    | oz-in   | lb-ft    | lb-in    |
|-------|----------|----------|---------|----------|---------|---------|---------|----------|----------|
| Nm    | --       | 100      | 1,000   | 0.102    | 10.2    | 10,200  | 141.6   | 0.7376   | 8.851    |
| Ncm   | 0.01     | --       | 10      | 0.00102  | 0.102   | 102     | 1.416   | 0.007376 | 0.08851  |
| mNm   | 0.001    | 0.1      | --      | 0.000102 | 0.0102  | 10.2    | 0.1416  | 0.000738 | 0.008851 |
| kgm*  | 9.807    | 980.7    | 9807    | --       | 100     | 100,000 | 1,389   | 7.233    | 86.8     |
| kgcm* | 0.09807  | 9.807    | 98.07   | 0.01     | --      | 1,000   | 13.89   | 0.07233  | 0.868    |
| gcm*  | 9.81E-05 | 0.009807 | 0.09807 | 0.00001  | 0.001   | --      | 0.01389 | 7.23E-05 | 0.000868 |
| oz-in | 0.007062 | 0.7062   | 7.062   | 0.00072  | 0.07201 | 72.01   | --      | 0.00521  | 0.0625   |
| lb-ft | 1.356    | 135.6    | 135.6   | 0.1383   | 13.83   | 13,830  | 192     | --       | 12       |
| lb-in | 0.113    | 11.3     | 113     | 0.01152  | 1.152   | 1,152   | 16      | 0.0833   | --       |

### • Inertia

| A \ B                                             | kgm <sup>2</sup> | kgcm <sup>2</sup> | gcm <sup>2</sup> | oz-in <sup>2</sup> | oz-in-sec <sup>2</sup> | lb-in <sup>2</sup> | lb-in-sec <sup>2</sup> | lb-ft <sup>2</sup> | lb-ft-sec <sup>2</sup><br>(slug ft <sup>2</sup> ) |
|---------------------------------------------------|------------------|-------------------|------------------|--------------------|------------------------|--------------------|------------------------|--------------------|---------------------------------------------------|
| kgm <sup>2</sup>                                  | --               | 10,000            | 10,000,000       | 54,700             | 142                    | 3,420              | 8.85                   | 23.7               | 0.738                                             |
| kgcm <sup>2</sup>                                 | 0.0001           | --                | 1,000            | 5.47               | 0.0142                 | 0.342              | 0.000885               | 0.00237            | 7.38E-05                                          |
| gcm <sup>2</sup>                                  | 1E-07            | 0.001             | --               | 0.00547            | 1.42E-05               | 0.000342           | 8.85E-07               | 2.37E-06           | 7.38E-08                                          |
| oz-in <sup>2</sup>                                | 1.83E-05         | 0.1829            | 183              | --                 | 0.00259                | 0.0625             | 0.000162               | 0.000434           | 1.35E-05                                          |
| oz-in-sec <sup>2</sup>                            | 0.00706          | 70.62             | 70,600           | 386                | --                     | 24.1               | 0.0625                 | 0.168              | 0.00521                                           |
| lb-in <sup>2</sup>                                | 0.000293         | 2.926             | 2,930            | 16                 | 0.0414                 | --                 | 0.00259                | 0.00694            | 0.000216                                          |
| lb-in-sec <sup>2</sup>                            | 0.113            | 1,130             | 1,130,000        | 6,180              | 1.6                    | 386                | --                     | 2.68               | 0.0833                                            |
| lb-ft <sup>2</sup>                                | 0.0421           | 421.4             | 421,000          | 2,300              | 5.97                   | 144                | 0.373                  | --                 | 0.318                                             |
| lb-ft-sec <sup>2</sup><br>(slug ft <sup>2</sup> ) | 1.36             | 13,600            | 13,600,000       | 74,100             | 192                    | 4,630              | 12                     | 32.2               | --                                                |

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