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Stepper Motors

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Stepper Motors

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Introduction of Stepping Motors

■ 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)
   \[ Tf = G \times r \]
   G: weight
   r: radius

B. Inertia load (TJ)
   \[ TJ = J \times \frac{dw}{dt} \]
   J = M \times \frac{(R1^2 + R2^2)}{2} (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
   \[ n = q \times \frac{Hz}{360 \times D} \]
   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 I/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 TL, it has to be accelerated from F0 to F1 in the shortest time (tr), what is the value of tr?
(1). Generally TJ = 70%Tm
(2). tr = 1.8 * 10^-5 * J * q * (F1-F0)/(TJ-TL)
(3). F (t) = (F1-F0) * t/tr + F0, 0<t<tr

B. Exponential Acceleration
(1). Generally
TJ0 = 70%Tm0,
TJ1 = 70%Tm1,
TL = 60%Tm1
(2). tr = F4 * In [(TJ0-TL)/(TJ1-TL)]
(3). F (t) = F2 * [1 – e^(-t/F4)] + F0, 0<t<tr
F2 = (TL-TJ0) * (F1-F0)/(FJ1-TJ0)
F4 = 1.8 * 10^-5 * J * q * F2/(TJ0-TL)

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

A - 4 LEAD BIPOLAR DRIVE
- Black A(A+)
- Green C(A-)
- Red B(B+)
- Blue D(B-)

B - 8 LEAD BIPOLAR - PARALLEL
- White A(A+)
- Green B(B+)
- Brown C(A-)
- Gray D(B-)
- Yellow E(C-)
- Pink F(D-)
- Red G(D+)
- Blue H(D+)

C - 8 LEAD BIPOLAR SERIES
- White A(A+)
- Green Brown
- Yellow C(A-)
- Gray B(B+)
- Blue F(D-)
- Pink G(D+)
- Red H(D+)

D - 3 LEAD 3 PHASE SERIES
- Red A(U)
- Green B(V)
- White/Blue C(W)

Brake wiring
- V+ V-
- Red Black

General Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step Accuracy</td>
<td>±5%(Tested by: Constant Current Drive/24V/Two Phase On/Rated Current/Full Step:1rps)</td>
</tr>
<tr>
<td>Insulation Class</td>
<td>Class B(130°C)</td>
</tr>
<tr>
<td>Operating Environment</td>
<td>Ambient Temperature -20~+50°C(non-freezing)</td>
</tr>
<tr>
<td></td>
<td>Ambient Humidity 85% or less (non-condensing)</td>
</tr>
<tr>
<td></td>
<td>Atmosphere No corrosive gases, dust, water or oil</td>
</tr>
<tr>
<td>Temperature Rise</td>
<td>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)</td>
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<tr>
<td>Shaft Runout</td>
<td>0.050T.I.R.(mm)</td>
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<td>Radial Play</td>
<td>0.02mm Max.(500gf)</td>
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<tr>
<td>Axial Play</td>
<td>0.08mm Max.(500gf)</td>
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<td>Concentricity</td>
<td>0.075T.I.R.(mm)</td>
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<td>Perpendicularity</td>
<td>0.100T.I.R.(mm)</td>
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Permissible Overhung Load and Permissible Thrust Load (Unit: N)

<table>
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<tr>
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<th>Permissible Overhung Load</th>
<th>Permissible Thrust Load</th>
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</thead>
<tbody>
<tr>
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<td>Distance(L) from Shaft End(mm)</td>
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<td>8HY</td>
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<td>11HS</td>
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<td>14HA/14HS</td>
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<td>17HD/17HA/17HC</td>
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<td>42HS</td>
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Less than the motor mass
■ 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~+50°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

<table>
<thead>
<tr>
<th>Step angle (°)</th>
<th>Base size (mm)</th>
<th>Series</th>
<th>Model</th>
<th>The torque range (mN. M); Speed range 0 – 50 RPS</th>
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<tr>
<td>0.9</td>
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<td>20</td>
<td>AMI-HK40A0</td>
<td>0.05 0.1 0.2 0.4 0.8 1.6 3.2 6.4 12.8 25.6</td>
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<td>156</td>
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</tbody>
</table>

Note on Recommended Driver:
The torque range (mN. M); Speed range 0 ~ 50 RPS.
NEMA8(□20mm) 2-phase DC1.8°. 8HY Series

- Phases: 2
- Steps / Revolution: ±5%
- Step Accuracy: 6 N (1.3 Lbs.) Push
- Step Accuracy: 25 N (5.6 Lbs.) Pull
- Radial Rating: 18 N (4 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length/L&quot;</th>
<th>Holding Torque N.m</th>
<th>Current A/Phase</th>
<th>Rotor Inertia g cm²</th>
<th>Mass Kg</th>
<th>Dielectric Strength</th>
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<tbody>
<tr>
<td>AM8HY2050-01N</td>
<td>Single Shaft</td>
<td>A</td>
<td>4</td>
<td>29.5</td>
<td>0.02</td>
<td>0.35</td>
<td>11.5</td>
<td>1.6</td>
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<td>AM8HY2050-02N</td>
<td>Double Shaft</td>
<td>A</td>
<td>4</td>
<td>46.5</td>
<td>0.042</td>
<td>0.35</td>
<td>20.3</td>
<td>4.2</td>
<td>0.09</td>
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</table>

* 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 x 1.4.

### Dimensions (Unit: mm)

- AM8HY2050
  - These dimensions are for the double shaft models. For the single shaft models, ignore the (         ) area.

- AM8HY4043
  - These dimensions are for the double shaft models. For the single shaft models, ignore the (         ) area.

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

- AM8HY2050
- AM8HY4043
NEMA11(□28mm) 2-phase DC 1.8° - 11HS Series

**Parameters**

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>LengthŁ</th>
<th>Holding Torque (N·m)</th>
<th>Current (A/Phase)</th>
<th>Resistance (Ω/Phase)</th>
<th>Rotor Inertia (g·cm²)</th>
<th>Mass (Kg)</th>
<th>Dielectric Strength</th>
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<td>2.5</td>
<td>9.0</td>
<td>0.1</td>
<td>500VAC 1 minute</td>
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<tr>
<td>AM11HS3007-02</td>
<td>Single Shaft</td>
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* 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 x 1.4.

**Dimensions (Unit: mm)**

![Dimensions Diagram]

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

![Torque Curves Diagram]
NEMA14(□35mm) 2-phase DC 1.8°-14HS Series

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

Parameters

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<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring *</th>
<th>Leads</th>
<th>Length*L</th>
<th>Holding Torque</th>
<th>Current *</th>
<th>Resistance</th>
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<th>Mass</th>
<th>Dielectric Strength</th>
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* 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 x 1.4.

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)
NEMA\textsuperscript{14} (35mm) 2-phase DC 0.9°-14HA Series

- **Parameters**

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<th>Resistance (\Omega/\text{Phase})</th>
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* Wiring Diagram A See Page 9

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

- **Dimensions (Unit: mm)**

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

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

Parameters

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* 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 x 1.4.

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)

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Parameters

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<tr>
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* 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 x 1.4.

Dimensions (Unit: mm)

[Diagram of dimensions]

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 Series

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</table>

※ 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)
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Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring*</th>
<th>Leads</th>
<th>Length/L*</th>
<th>Holding Torque</th>
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<th>Rotor Inertia</th>
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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)

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 x 1.4.
NEMA23(□56mm) 2-phase DC 1.8˚ 23HS PowerPlus Series (8mm Shaft)

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* 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 x 1.4.

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

**Parameters**

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<td></td>
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</tbody>
</table>

- 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 x 1.4.

**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)**

![Torque Curves](image-url)
Introduction
Quick Selection
2-phase Stepper Motors
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UL Stepper Motors
Configurations and Options

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

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

**Parameters**

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length*L</th>
<th>Holding Torque</th>
<th>Current</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
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<td>500VAC 1 minute</td>
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- 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 x 1.4.

**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 AC1.8°-23HS Series

- Phases: 2
- Steps / Revolution: ±5%
- Step Accuracy: 40 N (9 Lbs.) Push, 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

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<tr>
<th>Model</th>
<th>Shaft</th>
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<th>Leads</th>
<th>Length*L</th>
<th>Holding Torque</th>
<th>Current</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
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<tr>
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<td>76</td>
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* 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 x 1.4.

### Dimensions (Unit: mm)

- **Dime nsions (Unit: mm)**

### Torque Curves

(Recommended Driver: SRAC or STAC)
NEMA24(□60mm) 2-phase AC1.8°- 24HS Series

- Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length (L)</th>
<th>Holding Torque</th>
<th>Current</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
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<tbody>
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<td>1500VAC</td>
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※ 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 x 1.4.

- Dimensions (Unit: mm)

- Torque Curves (Recommended Driver: SRAC or STAC)
Introduction

Quick Selection

2-phase Stepper Motors

UL Stepper Motors

Configurations and Options

Parameters

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<thead>
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<td>1500VAC 1 minute</td>
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<td>Double Shaft</td>
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<td>75</td>
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<td>Single Shaft</td>
<td>B</td>
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<td>96</td>
<td>7.3</td>
<td>3.6</td>
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<td>2400.0</td>
<td>3.5</td>
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<td>AM34HD2805-01</td>
<td>AM34HD2805-M01</td>
<td>Single Shaft</td>
<td>B</td>
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<td>AM34HD2805-02</td>
<td>AM34HD2805-M02</td>
<td>Double Shaft</td>
<td>C</td>
<td>8</td>
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</table>

* 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 x 1.4.

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)
Introduction
Quick Selection
2-phase Stepper Motors
3-phase Stepper Motors
UL Stepper Motors
Configurations and Options

NEMA 42 (□ 110mm) 2-phase AC 1.8° - 42HS Series

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

■ Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length “L”</th>
<th>Holding Torque</th>
<th>Current @Φ</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dilectric Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM42HS04A0-01</td>
<td>Single Shaft</td>
<td>A</td>
<td>4</td>
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<td>12 N.m</td>
<td>2.1 A/Phase</td>
<td>4.2 Ω/Phase</td>
<td>5500 g·cm²</td>
<td>4.8 Kg</td>
<td>1500VAC 1 minute</td>
</tr>
<tr>
<td>AM42HS24A0-01</td>
<td>Single Shaft</td>
<td>A</td>
<td>4</td>
<td>149.5 mm</td>
<td>21 N.m</td>
<td>2.4 A/Phase</td>
<td>4.4 Ω/Phase</td>
<td>10900 g·cm²</td>
<td>8 Kg</td>
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<tr>
<td>AM42HS34A0-01</td>
<td>Single Shaft</td>
<td>A</td>
<td>4</td>
<td>201 mm</td>
<td>30 N.m</td>
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<td>4.4 Ω/Phase</td>
<td>16200 g·cm²</td>
<td>11.6 Kg</td>
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</table>

* 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 x 1.4.

■ Dimensions (Unit: mm)

- Length “L”:
  - AM42HS04A0-01: 98.5 mm
  - AM42HS24A0-01: 149.5 mm
  - AM42HS34A0-01: 201 mm

- Holding Torque:
  - AM42HS04A0-01: 12 N.m
  - AM42HS24A0-01: 21 N.m
  - AM42HS34A0-01: 30 N.m

- Current:
  - AM42HS04A0-01: 2.1 A/Phase
  - AM42HS24A0-01: 2.4 A/Phase
  - AM42HS34A0-01: 2.7 A/Phase

- Resistance:
  - AM42HS04A0-01: 4.2 Ω/Phase
  - AM42HS24A0-01: 4.4 Ω/Phase
  - AM42HS34A0-01: 4.4 Ω/Phase

- Rotor Inertia:
  - AM42HS04A0-01: 5500 g·cm²
  - AM42HS24A0-01: 10900 g·cm²
  - AM42HS34A0-01: 16200 g·cm²

- Mass:
  - AM42HS04A0-01: 4.8 Kg
  - AM42HS24A0-01: 8 Kg
  - AM42HS34A0-01: 11.6 Kg

- Dilectric Strength:
  - AM42HS04A0-01: 1500VAC 1 minute

■ Torque Curves (Recommended Driver: SRAC or STAC)
NEMA23(□56mm) 2-phase DC1.8° - 23HS Series IP65 Type

- **Phases:** 2
- **Steps / Revolution:** ± 5%
- **Step Accuracy:** 40 N (9 Lbs.) Push
- **Radial:** 130 N (30 Lbs.) Pull
- **IP Rating:** 65
- **Operating Temp:** -20°C to +50°C
- **Insulation Class:** B, 130°C
- **Insulation Resistance:** 100 MegOhms

### Parameters

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<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length/L”</th>
<th>Holding Torque</th>
<th>Current ※</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
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<tbody>
<tr>
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<td>Single Shaft</td>
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<td></td>
<td>61.7</td>
<td>1.25</td>
<td>3.7</td>
<td>0.63</td>
<td>260.0</td>
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<td>500VAC 1 minute</td>
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<tr>
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</table>

※ 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)

- **C-C(2:1)**
- **AWG20 UL2517**
- **Oil**

### Torque Curves (Recommended Driver: SR or ST)
NEMA24(□60mm) 2-phase DC1.8°-24HS Series IP65 Type

<table>
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<tr>
<td><strong>Model</strong></td>
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<td>AM24HS5401-44N</td>
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* 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 x 1.4.

**Dimensions (Unit: mm)**

**Torque Curves (Recommended Driver: SR or ST)**
NEMA34(□86mm) 2-phase DC1.8° - 34HD Series IP65 Type

Parameters

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<th>Leads</th>
<th>Length*L</th>
<th>Holding Torque</th>
<th>Current ²</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
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<tr>
<td>AM34HD2403-13</td>
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</table>

* Wiring Diagram A See Page 9

Ⅰ. The rated current of the motor is RMS value. Ⅱ. The output current of Moons’ drive is the peak of sine value. Ⅲ. 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

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<th>Length “L”</th>
<th>Holding Torque</th>
<th>Current</th>
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<th>Rotor Inertia</th>
<th>Brake Torque</th>
<th>Brake Power</th>
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* 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 x 1.4.

Torque Curves (Recommended Driver: SR or ST)
NEMA23(□56mm) 2-phase DC1.8° - 23HS Series Brake type

Parameters

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<th>Leads</th>
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<th>Holding Torque</th>
<th>Current #</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Brake Torque</th>
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* 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 x 1.4.

Torque Curves (Recommended Driver: SR or ST)
NEMA24(□60mm) 2-phase DC1.8°-24HS Series Brake type

Parameters

<table>
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<th>Length*L</th>
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<th>Current</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Brake Torque</th>
<th>Brake Power</th>
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<th>Dielectric Strength</th>
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<td>24(15)</td>
<td>1.6</td>
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</tr>
</tbody>
</table>

* 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 AC1.8° - 24HS Series Brake type

- **Parameters**

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length L</th>
<th>Holding Torque</th>
<th>Current</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Brake Torque</th>
<th>Brake Power</th>
<th>Mass</th>
<th>Diellectric Strength</th>
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<tr>
<td>AM24HS5411-BR01</td>
<td>A</td>
<td></td>
<td>4</td>
<td>126</td>
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<td>24(15)</td>
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<td>1500VAC</td>
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</table>

* 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 x 1.4.

- **Torque Curves** *(Recommended Driver: SRAC or STAC)*

![Torque Curves Graph](image_url)
Introduction

Quick Selection

2-phase Stepper Motors

3-phase Stepper Motors

UL Stepper Motors

Configurations and Options

NEMA34(86mm) 2-phase DC 1.8°/ 2-phase AC 1.8° 34HD Series Brake type

Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length“L”</th>
<th>Holding Torque</th>
<th>Current</th>
<th>Resistance</th>
<th>Rotor</th>
<th>Inertia</th>
<th>Brake</th>
<th>Brake Power</th>
<th>Mass</th>
<th>Dielctric Strength</th>
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<tbody>
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<td>Single Shaft</td>
<td>C</td>
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<td>177.5</td>
<td>9.4</td>
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<td>2750</td>
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<td>4.4</td>
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<td>AM34HD1802-BR01</td>
<td>Single Shaft</td>
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<td>177.5</td>
<td>9.4</td>
<td>5.6</td>
<td>0.49</td>
<td>2750</td>
<td>6</td>
<td>2.2</td>
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* 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 x 1.4.

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)

![Dimensions Diagram]

### Parameters

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<thead>
<tr>
<th>Model</th>
<th>Wiring</th>
<th>Length “L”</th>
<th>Current</th>
<th>Reduction ratio</th>
<th>Accuracy</th>
<th>Maximum output torque</th>
<th>Maximum load torque</th>
<th>Rotor Inertia</th>
<th>Efficiency</th>
<th>Noise</th>
<th>Mass</th>
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<td>0.63</td>
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<tr>
<td>AM17HD2438-PG05</td>
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<td>2</td>
<td>20</td>
<td>15</td>
<td>8</td>
<td>20</td>
<td>22800</td>
<td>94%</td>
<td>0.68</td>
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<tr>
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<td>107.3</td>
<td>1</td>
<td>10</td>
<td>12</td>
<td>4</td>
<td>4</td>
<td>5700</td>
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<td>120.3</td>
<td>1</td>
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<td>4</td>
<td>5700</td>
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<td>0.6</td>
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*Wiring Diagram A See Page 9

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

![Torque Curves Diagrams]
NEMA17(□42mm) 2-phase DC1.8° - 17HD Series Planetary Reducer Motor Type

**Dimensions (Unit: mm)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Wiring A</th>
<th>Length &quot;L&quot;</th>
<th>Current A/Phase</th>
<th>Series</th>
<th>Reduction ratio</th>
<th>Accuracy</th>
<th>Maximum output torque (N.m)</th>
<th>Maximum load torque (N.m)</th>
<th>Rotor Inertia (g.cm²)</th>
<th>Efficiency</th>
<th>Noise (dB)</th>
<th>Mass (Kg)</th>
</tr>
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<tbody>
<tr>
<td>AM17HD6426-PG05</td>
<td>A</td>
<td>115.8</td>
<td>1.5</td>
<td>1</td>
<td>5</td>
<td>12</td>
<td>2.5</td>
<td>6</td>
<td>2050</td>
<td>96%</td>
<td>0.68</td>
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<tr>
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<td>115.8</td>
<td>1.5</td>
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<td>12</td>
<td>5</td>
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<td>8200</td>
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<td>0.76</td>
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<tr>
<td>AM17HD6426-PG20</td>
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<td>128.8</td>
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<td>15</td>
<td>10</td>
<td>20</td>
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<td>&lt;60</td>
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<tr>
<td>AM17HD8410-PG05</td>
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<td>4.25</td>
<td>6</td>
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<tr>
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<td>12</td>
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<td>94%</td>
<td>0.92</td>
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<td>AM17HD8410-PG20</td>
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<td>2</td>
<td>20</td>
<td>15</td>
<td>17</td>
<td>20</td>
<td>49200</td>
<td>94%</td>
<td>1</td>
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</tbody>
</table>

*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 x 1.4.

**Parameters**

**Torque Curves** (Recommended Driver: SR or ST)
NEMA23(□56mm) 2-phase DC 1.8° - 23HS Series Planetary Reducer Motor Type

■ Dimensions (Unit: mm)

![Dimensions Diagram]

■ Parameters

<table>
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<tr>
<th>Model</th>
<th>Wiring #</th>
<th>current #</th>
<th>Series</th>
<th>Reduction ratio</th>
<th>Accuracy</th>
<th>Maximum output torque</th>
<th>Maximum load torque</th>
<th>Rotor Inertia</th>
<th>Efficiency</th>
<th>Noise</th>
<th>Mass</th>
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<tr>
<td>AM23HSA4B0-PG05</td>
<td>A</td>
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<td>8.2</td>
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<td>10</td>
<td>15</td>
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<td>AM23HSA4B0-PG20</td>
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<td>2</td>
<td>20</td>
<td>15</td>
<td>30</td>
<td>44</td>
<td>86000</td>
<td>94%</td>
<td>&lt;60</td>
<td>1.64</td>
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</tbody>
</table>

* 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.

■ Torque Curves  (Recommended Driver: SR or ST)

![Torque Curves Graphs]
**Introduction**

Quick Selection

2-phase Stepper Motors

3-phase Stepper Motors

UL Stepper Motors

Configurations and Options

---

**Dimensions (Unit: mm)**

![Motor Dimensions Diagram]

---

**Parameters**

<table>
<thead>
<tr>
<th>Model</th>
<th>Wiring</th>
<th>Length/Current/A</th>
<th>Reduction ratio</th>
<th>Accuracy</th>
<th>Output torque</th>
<th>Load torque</th>
<th>Rotor inertia</th>
<th>Efficiency</th>
<th>Noise</th>
<th>Mass</th>
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<tr>
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<tr>
<td>AM24HS2402-PG10</td>
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<td>12</td>
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<td>15</td>
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<td>90000</td>
<td>96%</td>
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<tr>
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<td>4.0</td>
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<td>15</td>
<td>50</td>
<td>44</td>
<td>360000</td>
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</table>

* 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 x 1.4.

---

**Torque Curves**

(Recommended Driver: SR or ST)
NEMA34(□86mm) 2-phase DC1.8° - 34HD Series Planetary Reducer Motor Type

- Dimensions (Unit: mm)

- Parameters

<table>
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<th>Model</th>
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<th>Current Δ</th>
<th>Reduction ratio</th>
<th>Accuracy</th>
<th>Maximum output torque</th>
<th>Maximum load torque</th>
<th>Rotor Inertia</th>
<th>Efficiency</th>
<th>Noise</th>
<th>Mass</th>
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<td></td>
<td></td>
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<td>10</td>
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<td>6.41</td>
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</tbody>
</table>

* Wiring Diagram A See Page 9

- Torque Curves (Recommended Driver: SR or ST)
NEMA34(□86mm) 2-phase AC1.8° - 34HD Series Planetary Reducer Motor Type

### Dimensions (Unit: mm)

- **Motor Type**: AM34HD0802-PG05, AM34HD0802-PG10, AM34HD0802-PG20, AM34HD1802-PG05, AM34HD1802-PG10, AM34HD1802-PG20, AM34HD2805-PG05, AM34HD2805-PG10, AM34HD2805-PG20
- **Dimensions**: 86±0.5, 86±0.5, 300±10
- **AWG18 UL2464**: (26.5), (16.5), (12)
- **L**: 40±2
- **Ø**: 25, 20, 0
- **Parameters**

### Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Wiring</th>
<th>Length/L(mm)</th>
<th>Current a(A)</th>
<th>Series</th>
<th>Reduction ratio</th>
<th>Accuracy arc-min</th>
<th>Maximum output torque</th>
<th>Maximum load torque</th>
<th>Rotor Inertia g.cm²</th>
<th>Efficiency (%)</th>
<th>Noise (dB)</th>
<th>Mass (Kg)</th>
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<tbody>
<tr>
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<td>Bi(Parallel) 1.8 (Series connection)</td>
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<td>96%</td>
<td>3.71</td>
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<td>AM34HD0802-PG10</td>
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<td>110000</td>
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<td>AM34HD0802-PG20</td>
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<td>50</td>
<td>40</td>
<td>185000</td>
<td>96%</td>
<td>4.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM34HD1802-PG20</td>
<td>C(Series)</td>
<td>218</td>
<td>2</td>
<td>20</td>
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<td>100</td>
<td>120</td>
<td>740000</td>
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<td>5.31</td>
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<td>275000</td>
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<td>5.91</td>
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<td>1100000</td>
<td>94%</td>
<td>6.41</td>
<td></td>
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</tr>
</tbody>
</table>

* 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 x 1.4.

### Torque Curves

(Recommended Driver: SRAC or STAC)

- **AM34HD0802-PG05**: Microstep: 20000 steps/rev, Current: 1.8A(Peak), 220V
- **AM34HD0802-PG10**: Microstep: 20000 steps/rev, Current: 1.8A(Peak), 220V
- **AM34HD0802-PG20**: Microstep: 20000 steps/rev, Current: 1.8A(Peak), 220V
- **AM34HD1802-PG05**: Microstep: 20000 steps/rev, Current: 1.8A(Peak), 220V
- **AM34HD1802-PG10**: Microstep: 20000 steps/rev, Current: 1.8A(Peak), 220V
- **AM34HD1802-PG20**: Microstep: 20000 steps/rev, Current: 1.8A(Peak), 220V
- **AM34HD2805-PG05**: Microstep: 20000 steps/rev, Current: 1.8A(Peak), 220V
- **AM34HD2805-PG10**: Microstep: 20000 steps/rev, Current: 1.8A(Peak), 220V
- **AM34HD2805-PG20**: Microstep: 20000 steps/rev, Current: 1.8A(Peak), 220V
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

■ Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length/L*</th>
<th>Minimum Holding Torque</th>
<th>Current @Phase</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Motor Mass</th>
<th>Dielectric Strength</th>
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<tbody>
<tr>
<td>AM17HD4452-E1000D</td>
<td>A</td>
<td>4</td>
<td>34.3</td>
<td>0.285</td>
<td>1.5</td>
<td>1.4</td>
<td>38.0</td>
<td>0.23</td>
<td>500VAC 1 minute</td>
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<td>AM17HD2438-E1000D</td>
<td></td>
<td></td>
<td>39.8</td>
<td>0.46</td>
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<td>57.0</td>
<td>0.28</td>
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<td>AM17HD4246-E1000D</td>
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<td>48.3</td>
<td>0.59</td>
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<td></td>
<td>62.8</td>
<td>0.85</td>
<td>1.4</td>
<td>3.2</td>
<td>123</td>
<td>0.6</td>
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</tr>
</tbody>
</table>

* 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 x 1.4.

■ Torque Curves (Recommended Driver: SR or ST)
NEMA23(□56mm) 2-phase DC 1.8°-23HS 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

- **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 | Resistance | Rotor Inertia | Motor Mass | Dielectric Strength |
  --------|--------|-------|------------|----------------|---------|------------|---------------|------------|-------------------|
  AM23HS0420-E1000D  | A     | 4     | 41.0       | 0.72           | 1.8     | 1.8        | 135.0         | 0.42       | 500VAC 1 minute    |
  AM23HS2440-E1000D  | A     | 4     | 54.0       | 1.25           | 2.4     | 2.4        | 260.0         | 0.6        |                  |
  AM23HS3454-E1000D  | A     | 4     | 41.0       | 2.1            | 2.9     | 2.9        | 460.0         | 1.0        |                  |
  AM23HS0421-E1000D  | A     | 4     | 41.0       | 0.72           | 2.4     | 2.4        | 260.0         | 0.6        |                  |
  AM23HS2450-E1000D  | A     | 4     | 54.0       | 1.25           | 2.9     | 2.9        | 460.0         | 1.0        |                  |
  AM23HS3455-E1000D  | A     | 4     | 41.0       | 2.1            | 2.4     | 2.4        | 260.0         | 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 x 1.4.

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

  - AM23HS0420  | Torque 2000 steps/rev Current 2.2A/Max  |
  - AM23HS2440  | Torque 4000 steps/rev Current 4.4A/Max  |
  - AM23HS3454  | Torque 6000 steps/rev Current 6.6A/Max  |
NEMA24(□60mm) 2-phase DC 1.8°-24HD Series Encoder Type

- Dimensions (Unit: mm)

- Encode Electrical Specification

<table>
<thead>
<tr>
<th>Resolution</th>
<th>4000 Counts/Rev(1000 Line)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Current (no load)</td>
<td>Typ 56mA/Max 59mA</td>
</tr>
<tr>
<td>Output Voltage Low</td>
<td>0.4V@20mA Max.</td>
</tr>
<tr>
<td>Output Voltage High</td>
<td>2.4V@20mA Min.</td>
</tr>
</tbody>
</table>

- 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

- Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length/L</th>
<th>N.m</th>
<th>Holding Torque</th>
<th>Current</th>
<th>A/Phase</th>
<th>Ω/Phase</th>
<th>Rotor Inertia</th>
<th>Motor Mass</th>
<th>Dielectric Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM24HS2402-E1000D</td>
<td>A</td>
<td>4</td>
<td>54.0</td>
<td>1.57</td>
<td>4.0</td>
<td>0.43</td>
<td>450.0</td>
<td>0.83</td>
<td>500VAC 1 minute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM24HS5401-E1000D</td>
<td>A</td>
<td>4</td>
<td>85.0</td>
<td>3.2</td>
<td>4.0</td>
<td>0.65</td>
<td>900.0</td>
<td>1.4</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

- 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 DC 1.8°- 34HD Series Encoder Type

■ Dimensions (Unit: mm)

![Dimensions Diagram]

■ 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

■ Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length<em>L</em></th>
<th>Holding Torque</th>
<th>Current</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Motor Mass</th>
<th>Dielectric Strength</th>
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<tbody>
<tr>
<td>AM34HD0404-E1000D</td>
<td>A</td>
<td>4</td>
<td>66.5</td>
<td>3.7</td>
<td>6.3</td>
<td>0.25</td>
<td>1100.0</td>
<td>1.6</td>
<td>500VAC 1 minute</td>
</tr>
<tr>
<td>AM34HD1404-E1000D</td>
<td>A</td>
<td>4</td>
<td>96.0</td>
<td>6.7</td>
<td>6.3</td>
<td>0.35</td>
<td>1850.0</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>AM34HD2403-E1000D</td>
<td>A</td>
<td>4</td>
<td>125.5</td>
<td>9.4</td>
<td>5.6</td>
<td>0.49</td>
<td>2750.0</td>
<td>3.8</td>
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</tr>
</tbody>
</table>

* 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 x 1.4.

■ Torque Curves (Recommended Driver: ST or SR)

![Torque Curves Diagram]
NEMA34(□86mm) 2-phase AC1.8°-34HD Series Encoder Type

**Dimensions (Unit: mm)**

![Dimensions Diagram]

**Encode Electrical Specification**

<table>
<thead>
<tr>
<th>Resolution</th>
<th>4000 Counts/Rev (1000 Line)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Current (no load) Type</td>
<td>56mA/Max 59mA</td>
</tr>
<tr>
<td>Output Voltage Low</td>
<td>0.4V@20mA Max.</td>
</tr>
<tr>
<td>Output Voltage High</td>
<td>2.4V@-20mA Min.</td>
</tr>
</tbody>
</table>

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

**Parameters**

<table>
<thead>
<tr>
<th>Model</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length L</th>
<th>Holding Torque</th>
<th>Current A(Phase)</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Motor Mass</th>
<th>Dielectric Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM34HD0802-E1000D</td>
<td>B(Parallel) C(Series)</td>
<td>8</td>
<td>66.5</td>
<td>4.2</td>
<td>1.8(When drive by 220VAC)</td>
<td>3.4</td>
<td>0.9</td>
<td>1100.0</td>
<td>1.6</td>
</tr>
<tr>
<td>AM34HD1802-E1000D</td>
<td>96.0</td>
<td>7.3</td>
<td>3.6(When drive by 110VAC)</td>
<td>3.8</td>
<td>0.9</td>
<td>1850.0</td>
<td>2.7</td>
<td></td>
<td></td>
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<tr>
<td>AM34HD2805-E1000D</td>
<td>125.5</td>
<td>8.7</td>
<td></td>
<td>4.2</td>
<td>1.1</td>
<td>2750.0</td>
<td>3.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 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 x 1.4.

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

![Torque Curves Diagram]
Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring *</th>
<th>Leads</th>
<th>Length/L&quot;</th>
<th>Holding Torque</th>
<th>Current A/Phase</th>
<th>Resistance R/Phase</th>
<th>Rotor Inertia g·cm²</th>
<th>Mass Kg</th>
<th>Dielectric Strength</th>
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</thead>
<tbody>
<tr>
<td>AM17HC20A0-01N</td>
<td>Single</td>
<td>D</td>
<td>3</td>
<td>34</td>
<td>0.4</td>
<td>3.9</td>
<td>57.0</td>
<td>0.25</td>
<td></td>
<td>500VAC 1 minute</td>
</tr>
<tr>
<td>AM17HC20A0-02N</td>
<td>Double</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>82.0</td>
<td>0.35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 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 x 1.4.

Dimensions (Unit: mm)

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length/L</th>
<th>Holding Torque</th>
<th>Current</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
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<tbody>
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<td>AM24HC4306-01</td>
<td>Single Shaft D</td>
<td></td>
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<td>45.5</td>
<td>0.58</td>
<td>5.8</td>
<td>0.33</td>
<td>180.0</td>
<td>0.5</td>
<td>500VAC 1 minute</td>
</tr>
<tr>
<td>AM24HC2306-01</td>
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<td></td>
<td></td>
<td>54.5</td>
<td>0.9</td>
<td></td>
<td>0.4</td>
<td>260.0</td>
<td>0.8</td>
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<tr>
<td>AM24HC3306-03</td>
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<td>76.5</td>
<td>1.7</td>
<td></td>
<td>0.63</td>
<td>460.0</td>
<td>1.3</td>
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</table>

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

- **Phases**: 3
- **Steps / Revolution**: ±5%
- **Step Accuracy**: 40 N (9 Lbs.) Push
- **Radial**: 130 N (30 Lbs.) Pull
- **IP Rating**: 40
- **Operating Temp**: -20°C to +50°C
- **Insulation Class**: B, 130°C
- **Insulation Resistance**: 100 MegOhms

### Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring *</th>
<th>Leads</th>
<th>Length (&quot;L&quot;)</th>
<th>Holding Torque</th>
<th>Current **</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
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<tbody>
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<td>3</td>
<td>45.5</td>
<td>0.58</td>
<td>5.8</td>
<td>0.33</td>
<td>180.0</td>
<td>0.5</td>
<td>500VAC 1 minute</td>
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<tr>
<td>AM24HC2308-02</td>
<td>Single Shaft</td>
<td>D</td>
<td>3</td>
<td>54.5</td>
<td>0.9</td>
<td>1.7</td>
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<td>260.0</td>
<td>0.8</td>
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<tr>
<td>AM24HC3306-07</td>
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<td>76.5</td>
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<td>1.7</td>
<td>0.63</td>
<td>460.0</td>
<td>1.3</td>
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</tbody>
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* 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 x 1.4.

### Dimensions (Unit: mm)

- **Torque Curves** *(Recommended Driver: 3ST or 3SR)*
Introduction

Quick Selection

2-phase Stepper Motors

3-phase Stepper Motors

UL Stepper Motors

Configurations

and Options

Parameters

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<td>1100.0</td>
<td>1.6</td>
<td>500VAC 1 minute</td>
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<tr>
<td>AM34HC1305-01</td>
<td>Single Shaft</td>
<td>D</td>
<td>4.3</td>
<td>96</td>
<td>6.1</td>
<td>0.9</td>
<td>1850.0</td>
<td>2.7</td>
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<tr>
<td>AM34HC2306-01</td>
<td>Single Shaft</td>
<td>D</td>
<td>6.1</td>
<td>125.5</td>
<td>6.1</td>
<td>0.9</td>
<td>2750.0</td>
<td>3.8</td>
<td></td>
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</tr>
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</table>

* 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)
### Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length/L</th>
<th>Holding Torque</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
</tr>
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<tbody>
<tr>
<td>AM34HC0306-01</td>
<td>D</td>
<td>3</td>
<td>66.5</td>
<td>2.6</td>
<td>1.2</td>
<td>12.8</td>
<td>1100.0</td>
<td>1500VAC 1 minute</td>
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<tr>
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<td>Single Shaft</td>
<td>D</td>
<td>96</td>
<td>5.15</td>
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<td>7</td>
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<tr>
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<td>6</td>
<td>2750.0</td>
<td>3.8</td>
</tr>
</tbody>
</table>

* 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 x 1.4.

### Dimensions (Unit: mm)

![Dimensions Diagram](image)

### Torque Curves  *(Recommended Driver: 3SRAC)*

![Torque Curve Graph](image)
NEMA23(□56mm) 2-phase DC 1.8°-23HS UL Series

**Parameters**

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring*</th>
<th>Leads</th>
<th>Length/L”</th>
<th>Holding Torque</th>
<th>Current</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS23HSL418A-01 Single Shaft</td>
<td>A 4</td>
<td>41.0</td>
<td>0.72</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>135.0</td>
<td>0.42</td>
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</tr>
<tr>
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<td>1.25</td>
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<td>260.0</td>
<td>0.6</td>
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<tr>
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<td>A 4</td>
<td>76.0</td>
<td>2.1</td>
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<td>2.1</td>
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<tr>
<td>MS23HSL418A-02 Double Shaft</td>
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<td>4.0</td>
<td>135.0</td>
<td>0.42</td>
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</tbody>
</table>

* Wiring Diagram A See Page 9

| Note: 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 x 1.4.

**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)**

- Torque vs. Speed graphs for different models are shown, each indicating the torque output at varying speeds, with annotations for specific models like MS23HSL418A.
NEMA24(□60mm) 2-phase DC 1.8’-24HS UL Series

Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length/L*</th>
<th>Holding Torque</th>
<th>Current **</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
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<td>4</td>
<td>54.0</td>
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<td>MS24HS5L440A-01</td>
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<td>A</td>
<td>4</td>
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</table>

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 x 1.4.

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

- **Parameters**

<table>
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<tbody>
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<td>A</td>
<td>4</td>
<td>66.5</td>
<td>3.7</td>
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<td>500VAC 1 minute</td>
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<td>Double Shaft</td>
<td>A</td>
<td>4</td>
<td>96.0</td>
<td>6.7</td>
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<td>1850.0</td>
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<td>A</td>
<td>4</td>
<td>125.5</td>
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<td>2750.0</td>
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<tr>
<td>MS34HD1L4750-02</td>
<td>Double Shaft</td>
<td>A</td>
<td>4</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>MS34HD2L4660-01</td>
<td>Single Shaft</td>
<td>A</td>
<td>4</td>
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<tr>
<td>MS34HD2L4660-02</td>
<td>Double Shaft</td>
<td>A</td>
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</table>

*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 x 1.4.

- **Dimensions (Unit: mm)**

- **Torque Curves (Recommended Driver: SR or ST)**
Introduction
Quick Selection
2-phase Stepper Motors
3-phase Stepper Motors
UL Stepper Motors Configurations and Options

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

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

### Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring *</th>
<th>Leads</th>
<th>Length &quot;L&quot;</th>
<th>Holding Torque</th>
<th>Current peak</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS34HD0L8250-01</td>
<td>Single Shaft</td>
<td>B(Parallel) C(Series)</td>
<td>8</td>
<td>66.5</td>
<td>4.2</td>
<td>1.8 (220V Series connection)</td>
<td>3.4</td>
<td>1100.0</td>
<td>1.6</td>
<td>1500VAC 1 minute</td>
</tr>
<tr>
<td>MS34HD0L8250-02</td>
<td>Double Shaft</td>
<td>B(Parallel) C(Series)</td>
<td>8</td>
<td>75</td>
<td>4.7</td>
<td>3.6</td>
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<tr>
<td>MS34HD1L8250-01</td>
<td>Single Shaft</td>
<td>B(Parallel) C(Series)</td>
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<td>96</td>
<td>7.3</td>
<td>3.6 (110V Parallel connection)</td>
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<td>Double Shaft</td>
<td>B(Parallel) C(Series)</td>
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<td>115</td>
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<td>3.8</td>
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<tr>
<td>MS34HD2L8250-01</td>
<td>Single Shaft</td>
<td>B(Parallel) C(Series)</td>
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<td>125.5</td>
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<td>4.2</td>
<td>2750.0</td>
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</table>

* 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 x 1.4.

### 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

Parameters

<table>
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<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length/L (mm)</th>
<th>Holding Torque (N.m)</th>
<th>Current (A/Phase)</th>
<th>Resistance (Ω/Phase)</th>
<th>Rotor Inertia (g·cm²)</th>
<th>Mass (Kg)</th>
<th>Dielectric Strength</th>
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<tbody>
<tr>
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<td>A</td>
<td>4</td>
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<td>1500VAC 1 minute</td>
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<td>ML42HS2L4240-02</td>
<td>Single Shaft</td>
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<td>4</td>
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<td>10900</td>
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<td>A</td>
<td>4</td>
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<td>30</td>
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<td>4.4</td>
<td>16200</td>
<td>11.6</td>
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* 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)

---

### Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length/L</th>
<th>Holding Torque</th>
<th>Current ★</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
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<td>0.82</td>
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<td>215.0</td>
<td>0.6</td>
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<td>Double Shaft</td>
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<td>77</td>
<td>2.3</td>
<td>0.75</td>
<td>365.0</td>
<td>1.0</td>
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</table>

★ 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 x 1.4.

---

### Dimensions (Unit: mm)

<table>
<thead>
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<th>Dimension</th>
<th>Value</th>
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<tr>
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<tr>
<td>C-C(2:1)</td>
<td>30.0±0.10</td>
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<tr>
<td>Ø6.35-0.012</td>
<td>5.0±0.3</td>
</tr>
</tbody>
</table>

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
- **Radial**: 130 N (30 Lbs.) Pull
- **IP Rating**: 40
- **Operating Temp**: −20°C to +50°C
- **Insulation Class**: B, 130°C
- **Insulation Resistance**: 100 MegOhms

### Parameters

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length (L)</th>
<th>Holding Torque (N·m)</th>
<th>Current (A/Phase)</th>
<th>Resistance (Ω/Phase)</th>
<th>Rotor Inertia (g·cm²)</th>
<th>Mass (Kg)</th>
<th>Dielectric Strength</th>
</tr>
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<tbody>
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<td>Single Shaft</td>
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<td>4</td>
<td>39</td>
<td>0.82</td>
<td>0.48</td>
<td>105.0</td>
<td>0.4</td>
<td>1 minute</td>
<td>500 VAC</td>
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<tr>
<td>ML23HS0L4370-09</td>
<td>Double Shaft</td>
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<td>4</td>
<td>55</td>
<td>1.5</td>
<td>0.63</td>
<td>215.0</td>
<td>0.6</td>
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<td>Single Shaft</td>
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<td>4</td>
<td>77</td>
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<td>Single Shaft</td>
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<td>4</td>
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</tbody>
</table>

- *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 ×1.4.

### Dimensions (Unit: mm)

- **Dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.**

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

- **ML23HS0L4370**
- **ML23HS8L4370**
- **ML23HSA4L4370**
NEMA23(□56mm) 2-phase DC1.8°-23HS UL Series IP65 Type

Parameters

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<th>Model</th>
<th>Shaft</th>
<th>Wiring Type</th>
<th>Leads</th>
<th>Length(L) mm</th>
<th>Holding Torque N.m</th>
<th>Current @ A/Phase</th>
<th>Resistance Ω/Phase</th>
<th>Rotor Inertia g·cm²</th>
<th>Mass Kg</th>
<th>Dielectric Strength</th>
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<tr>
<td>ML23HS2L437A-01</td>
<td>Single Shaft</td>
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<td>61.7</td>
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<td>3.7</td>
<td>0.63</td>
<td>260.0</td>
<td>0.6</td>
<td>500VAC 1 minute</td>
</tr>
<tr>
<td>MS23HS3L4370-01</td>
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<td></td>
<td>83.7</td>
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<td>0.75</td>
<td>460.0</td>
<td>1</td>
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- 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 x 1.4.

Dimensions (Unit: mm)

Torque Curves (Recommended Driver: SR or ST)
NEMA24(□60mm) 2-phase DC1.8° - 24HS UL Series IP65 Type

Parameters

<table>
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<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length/L^*</th>
<th>Holding Torque</th>
<th>Current^ –</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
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<tr>
<td>MS24HS5L443A-01</td>
<td>Single Shaft</td>
<td>A</td>
<td>4</td>
<td>24±0.5</td>
<td>94.5</td>
<td>4.0</td>
<td>0.65</td>
<td>900.0</td>
<td>1.4</td>
<td>500VAC 1 minute</td>
</tr>
</tbody>
</table>

* 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 x 1.4.

Dimensions (Unit: mm)

Torque Curves (Recommended Driver: SR or ST)
NEMA34(□86mm) 2-phase DC 1.8°-34HD UL Series IP65 Type

- Phases: 2
- Steps / Revolution: ±5%
- Step Accuracy: 65 N (15 Lbs.) Push
- 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

<table>
<thead>
<tr>
<th>Model</th>
<th>Shaft</th>
<th>Wiring</th>
<th>Leads</th>
<th>Length<em>L</em></th>
<th>Holding Torque</th>
<th>Current *</th>
<th>Resistance</th>
<th>Rotor Inertia</th>
<th>Mass</th>
<th>Dielectric Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML34HD1L4630-02</td>
<td>Single Shaft</td>
<td>A</td>
<td>4</td>
<td>98</td>
<td>6.7</td>
<td>6.3</td>
<td>0.45</td>
<td>1850.0</td>
<td>2.7</td>
<td>500VAC 1 minute</td>
</tr>
<tr>
<td>ML34HD2L4650-02</td>
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<td>127.5</td>
<td>9.4</td>
<td>5.6</td>
<td>0.62</td>
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<td>3.8</td>
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</table>

* 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)

- **ML34HD1L4630-02**
  - Single Shaft
  - Wiring Diagram A See Page 9

### 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 applications.

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 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

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<th>Application of screw</th>
<th>Maximum Load</th>
<th>Scope Of Application</th>
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<td>NEMA23/NEMA24(2-phase)</td>
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Instructions for use: reducing mechanical noise
**Glossary**

**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.

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

<table>
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<tr>
<th>A</th>
<th>B</th>
<th>mm</th>
<th>cm</th>
<th>m</th>
<th>inch</th>
<th>feet</th>
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Multiply "A" units by conversion factor to obtain "B" units.

#### Force

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<th>A</th>
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<th>kgf</th>
<th>oz</th>
<th>lb</th>
<th>Newton</th>
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#### Torque

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<th>kgm*</th>
<th>kgcm*</th>
<th>gcm*</th>
<th>oz-in</th>
<th>lb-ft</th>
<th>lb-in</th>
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#### Inertia

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<td>32.2</td>
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</table>
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400-820-9661

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