Headquarters
168 Mingjia Road, Minhang District,
Shanghai 201107, P.R.China
Tel: +86 (0)21 52634688
Fax: +86 (0)21 52634098

Shenzhen Branch Office
Room 2209, 22/F, Kerry Center, 2008 Renminnan Road, Luohu District,
Shenzhen 518001, P.R.China
Tel: +86 (0)755 25472080
Fax: +86 (0)755 25472081

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

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

Qingdao Branch Office
Room E, 10th Floor, 73 Wangjiao Mansion, Hongkong Middle Road, Shinan District,
Qingdao 266071, P.R. China
Tel: +86 (0)532 85879825
Fax: +86 (0)532 85879512

U.S. Branch: Moons’ Industries (America), Inc.
1113 North Prospect Avenue, Itasca, IL 60143 USA
Tel: +1 630 833 5940
Fax: +1 630 833 5946

Europe Branch: Moons' Industries (Europe) S.R.L.
Via Torri Bianche n.1 20059 Vimercate(MB) Italy
Tel: +39 039 62 60 521
Fax: +39 039 62 60 522

South-East Asia Branch: Moons’ Industires(South-East Asia)Pte Ltd.
33 Ubi Avenue 3 #08-23 Vertex Singapore 408868
Tel: +65 6634 1198
Fax: +65 6634 1138

URL: http://www.moonsindustries.eu
E-mail: info@moonsindustries.eu

MOONS* / CHINA / 1ST PRINT / OCT / 2010
# Why Stepping Motors

## Encapsulated Stepping Motors

<table>
<thead>
<tr>
<th>2 Phase</th>
<th>3 Phase</th>
<th>3 Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>14HK</td>
<td>0.9°</td>
<td>0.9°</td>
</tr>
<tr>
<td>14HC</td>
<td>1.2°</td>
<td>1.2°</td>
</tr>
<tr>
<td>17HC</td>
<td>1.8°</td>
<td>1.8°</td>
</tr>
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</table>

## New Released Stepping Motors

<table>
<thead>
<tr>
<th>2 Phase NEMA 8</th>
<th>2 Phase NEMA 14</th>
<th>2 Phase NEMA 16</th>
</tr>
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<tbody>
<tr>
<td>20.3 mm/0.80 inch</td>
<td>35.0 mm/1.38 inch</td>
<td>39.0 mm/1.53 inch</td>
</tr>
<tr>
<td>8HY 1.8°</td>
<td>14HS 1.8°</td>
<td>16HF 3.75°</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

## 2 Phase Stepping Motors

<table>
<thead>
<tr>
<th>2 Phase NEMA 11</th>
<th>2 Phase NEMA 14</th>
<th>2 Phase NEMA 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>28.0 mm/1.10 inch</td>
<td>35.0 mm/1.38 inch</td>
<td>39.0 mm/1.53 inch</td>
</tr>
<tr>
<td>11HS 1.8°</td>
<td>14HA 0.9°</td>
<td>16HS 1.8°</td>
</tr>
<tr>
<td></td>
<td>14HY 1.8°</td>
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## 2 Phase Stepping Motors

<table>
<thead>
<tr>
<th>2 Phase NEMA 17</th>
<th>2 Phase NEMA 23</th>
<th>2 Phase NEMA 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.0 mm/1.65 inch</td>
<td>56.4 mm/2.22 inch</td>
<td>60.0 mm/2.36 inch</td>
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<tr>
<td>17HA 0.9°</td>
<td>23HS 1.8°</td>
<td>24HS 1.8°</td>
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<tr>
<td>17HD 1.8°</td>
<td>23HM 1.8°</td>
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</tr>
<tr>
<td>17HDN 1.8°</td>
<td>23HY 1.8°</td>
<td></td>
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<tr>
<td>17HE 3.6°</td>
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</table>

## 3 Phase Stepping Motors

<table>
<thead>
<tr>
<th>3 Phase NEMA 24</th>
<th>3 Phase NEMA 34</th>
</tr>
</thead>
<tbody>
<tr>
<td>60.0 mm/2.36 inch</td>
<td>86.0 mm/3.39 inch</td>
</tr>
<tr>
<td>24HC 1.2°</td>
<td>34HC 1.2°</td>
</tr>
</tbody>
</table>

## How to Select & Technical

- Wiring Connection: 62
- Lead Wires & Cables: 63
- Schematic Diagrams & Stepping Sequence: 64
Introduction of Stepping Motors

Applications

MOONS’ stepping motors are widely used to create the motion needed in many types of equipment. Examples include:

- **office automation:** printers, scanners, copy machines
- **stage lighting:** pointing, focus, color changes, spot size, special effects
- **banking:** check processing, credit card manufacturing, money scanners & counters
- **medical:** body scanning, blood analyzers, chemical analysis
- **industrial:** textile, packaging, robotics, conveyors, assembly, labeling
- **telecommunication:** phase shift, Tuning, mobile antenna positioning
- **security:** camera movement
- **automotive:** fuel metering, steering control

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 * (R_1^2 + R_2^2) / 2 (Kg * cm)
   M: mass
   R1: outside radius
   R2: inside radius
   \( \frac{dw}{dt} \): 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
   \[ n = q \times Hz / (360 \times D) \]
   n: rev/sec
   Hz: the frequency value at this point
   D: the subdividing value of motor driver
   q: the step angle of stepping motor

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 down quickly influenced by the inductance.

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. \( tr = 1.8 \times 10^{-5} \times J \times q \times (F1-F0)/(TJ-TL) \)
3. \( F(t) = (F1-F0) \times t/tr + F0, \ 0<t<tr \)

B. Exponential Acceleration
1. Generally
   \( TJ0 = 70\%Tm0, \)
   \( TJ1 = 70\%Tm1, \)
   \( TL = 60\%Tm1 \)
2. \( tr = F4 \times \ln \left[ \frac{(TJ0-TL)}{(TJ1-TL)} \right] \)
3. \( F(t) = F2 \times \left[ 1 - e^{-t/F4} \right] + F0, \ 0<t<tr \)
   \( F2 = (TL-TJ0) \times (F1-F0)/(FJ1-TJ0) \)
   \( F4 = 1.8 \times 10^{-5} \times J \times q \times F2/(TJ0-TL) \)

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%.
## Model Numbering System

<table>
<thead>
<tr>
<th>17</th>
<th>H</th>
<th>D</th>
<th>0</th>
<th>0</th>
<th>01</th>
<th>-</th>
<th>01</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
<td>e</td>
<td>f</td>
<td>g</td>
<td></td>
</tr>
</tbody>
</table>

### a. Frame Size
- motor outside diameter in tenths of an inch (example: size 17 = 1.7”)

### b. Type of Stepping Motor
- “H” means Hybrid Stepping Motor

### c. Type of Step Angle
- **A:** step angle 0.9°, stator: 8 polar
- **C:** step angle 1.2°
- **D:** step angle 1.8°, stator: 8 polar, teeth distributing asymmetrically
- **E:** step angle 3.6°, stator: 8 polar
- **F:** step angle 3.75°, stator: 8 polar
- **M:** step angle 1.8°, stator: 8 polar, middle rotor
- **S:** step angle 1.8°, stator: 8 polar, large rotor
- **Y:** step angle 1.8°, stator: 8 polar, small rotor

### d. Stator Length

### e. Type of Lead Wires
- “0” indicates connector only, “4” “5” “6” “8” indicates number of lead wires

### f. Electric Variation
- variety of current, torque, etc.

### g. Mechanical Variation
- variety of shaft, lead wires, screws, etc.
Why Stepping Motor

• Press Fit Pulley & Gear

Metal Pulley
Plastic Pulley
Gear

• Shaft Options

Dowel
Worm Shaft
Cross Drilled Shaft
Single Flat
Double Flat
Key Way
Knurl
Hobbed Gear
Helical Cut
Hollow Shaft

• Many other special shafts are available.
Encapsulated Stepping Motors

New Encapsulation Technology From MOONS’ Offers Many Advantages

- **Ideal for Security Cameras**
  In addition to all the advantages of normal step motors, these new encapsulated motors can help achieve a breakthrough in miniaturization of security cameras. Small step motors are a core component in security camera systems. With MOONS’ encapsulation technology, the 36mm diameter motor is now available with a thickness as little as 12.8mm.

- **Low Temperature Rise**
  The winding resistance of these new motors is nearly 30% lower than other motors with the same thickness and output-torque. In addition, the new encapsulation technology increases the heat-conducting property of these motors. The lower winding resistance and improved thermal conductivity combine to drastically lower the temperature of these motors to less than 80% of standard motors.

- **35% More Torque**
  Lower resistance coils allows these encapsulated motors to handle more power. With the same temperature rise the new motors can produce 35% more torque while dissipating the same amount of heat.

- **Quieter & Smoother**
  New materials and improved manufacturing processes, means these motors have a higher precision, more stable design. This controls vibration and reduces noise. It also makes the motor run smoothly.

- **More Load & Longer Life**
  MOONS’ encapsulated stepping motors use large bearings that can handle large axial and radial loads, and ensure long life.

- **RoHS**
  Encapsulated stepping motors are RoHS compliant.

![Graph showing 35% More Torque]

- **Molded Construction**
  Encapsulated winding........Runs cooler – Longer life
  Better sealing..........................Longer life
  Reduced vibration...............Smother moves - Quieter

- **High Winding Fill**
  Larger wire size.....................More torque
  Uses less energy....................Longer battery life

- **Large Ball Bearings**
  Large shaft loads...........Fewer design restrictions
  Long Life..........................27 times with same load
14HK SERIES 0.9°

Encapsulated Stepping Motor

Key Features

- 35% More Torque
- Quieter & Smoother
- Longer Life

General Specifications

- Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
</tr>
</thead>
<tbody>
<tr>
<td>14HK0 12.8 mm (0.50 in.)</td>
<td>14HK0402N</td>
<td>40</td>
<td>5.64</td>
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<td>8</td>
<td>2</td>
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</table>

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Mechanical Dimension

<table>
<thead>
<tr>
<th>Series</th>
<th>L</th>
<th>Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm (in.)</td>
<td>kg (lb.)</td>
</tr>
<tr>
<td>14HK0 12.8 mm (0.50)</td>
<td>0.06</td>
<td>(0.13)</td>
</tr>
<tr>
<td>14HK2 20.2 mm (0.80)</td>
<td>0.11</td>
<td>(0.24)</td>
</tr>
</tbody>
</table>

Dynamic Torque Curves

- Bi-polar

14HK0402N Conditions: Bi-polar Constant Current Driver Driver: AMA MS3540M Mode: Full Step

14HK2401N Conditions: Bi-polar Constant Current Driver Driver: AMA MS3540M Mode: Full Step
14HC SERIES 1.2° Encapsulated Stepping Motor

Key Features
- 35% More Torque
- Quieter & Smoother
- Longer Life

General Specifications

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
</tr>
</thead>
<tbody>
<tr>
<td>14HC0 12.8 mm (0.50 in.)</td>
<td>14HC0301N</td>
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<td>0.82</td>
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<tr>
<td>14HC2 20.2 mm (0.80 in.)</td>
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<td>90 12.7</td>
<td>1.25</td>
<td>1.45</td>
<td>0.85</td>
<td>10 1.4</td>
<td>11 0.060</td>
</tr>
</tbody>
</table>

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Mechanical Dimension

<table>
<thead>
<tr>
<th>Series</th>
<th>L</th>
<th>Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm (in.)</td>
<td>kg (lb.)</td>
<td></td>
</tr>
<tr>
<td>14HC0</td>
<td>12.8 (0.50)</td>
<td>0.06 (0.13)</td>
</tr>
<tr>
<td>14HC2</td>
<td>20.2 (0.80)</td>
<td>0.11 (0.24)</td>
</tr>
</tbody>
</table>

Dynamic Torque Curves

Contact MOONS’ for Dynamic Torque Curves
# 17HC SERIES 1.2° Encapsulated Stepping Motor

## Key Features
- 35% More Torque
- Quieter & Smoother
- Longer Life

## General Specifications

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17HC2001-01N</td>
<td>mNm oz-in</td>
<td>A ohm</td>
<td>mH</td>
<td>mNm oz-in</td>
<td>g cm²</td>
<td>oz-in²</td>
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<tr>
<td>34 mm (1.34 in.)</td>
<td>17HC2002-02N</td>
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<td>12.4</td>
<td>16.5</td>
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- Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence.....Page 62 - 64

## Mechanical Dimension

<table>
<thead>
<tr>
<th>Series</th>
<th>L</th>
<th>Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm (in.)</td>
<td>kg (lb.)</td>
</tr>
<tr>
<td>17HC2</td>
<td>34 (1.34)</td>
<td>0.245 (0.54)</td>
</tr>
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</table>

## Dynamic Torque Curves

**17HC2001-01N**
- Conditions: Driver: MS3ST10
- Mode: 10000 Step/Revolutions
- 0.8A(Peak) 24V

**17HC2002-02N**
- Conditions: Driver: MS3ST10
- Mode: 10000 Step/Revolutions
- 2.3A(Peak) 24V
8HY SERIES 1.8°

### Key Features
- Small Size
- Smooth Movement
- Low Inertia

### General Specifications

#### Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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</thead>
<tbody>
<tr>
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<td>8HY2041</td>
<td>17 2.4</td>
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<td>0.4</td>
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<tr>
<td>8HY4 47 mm (1.85 in.)</td>
<td>8HY4041</td>
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<td>7</td>
<td>4</td>
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#### Uni-polar

<table>
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<th>Resistance per Phase</th>
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<th>Detent Torque</th>
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<tbody>
<tr>
<td>8HY2 29.5 mm (1.16 in.)</td>
<td>8HY2061</td>
<td>13 1.8</td>
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<td>10</td>
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<tr>
<td>8HY4 47 mm (1.85 in.)</td>
<td>8HY4062</td>
<td>24 3.4</td>
<td>0.4</td>
<td>20</td>
<td>4.6</td>
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<td>0.6</td>
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### Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence

#### Mechanical Dimension

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<th>Series</th>
<th>L (mm)</th>
</tr>
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<tbody>
<tr>
<td>8HY2</td>
<td>29.5 (1.16)</td>
</tr>
<tr>
<td>8HY4</td>
<td>47 (1.85)</td>
</tr>
</tbody>
</table>

### Dynamic Torque Curves
- Contact MOONS’ for dynamic torque curves
**14HS SERIES 1.8°**

### Key Features
- High Torque
- Small Size
- Smooth Movement

### General Specifications

#### Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
</tr>
</thead>
<tbody>
<tr>
<td>14HS3 36 mm (1.41 in.)</td>
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<td>21.2</td>
<td>0.85</td>
<td>5.4</td>
<td>6.5</td>
<td>18</td>
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<td>14HS5 55 mm (2.16 in.)</td>
<td>14HS5042</td>
<td>270</td>
<td>38.2</td>
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<td>7.7</td>
<td>8.4</td>
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#### Uni-polar

<table>
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<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
</tr>
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<tbody>
<tr>
<td>14HS3 36 mm (1.41 in.)</td>
<td>14HS3062</td>
<td>110</td>
<td>15.6</td>
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<td>14HS5 55 mm (2.16 in.)</td>
<td>14HS5062</td>
<td>200</td>
<td>28.3</td>
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<td>3.9</td>
<td>2.1</td>
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- Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence......Page 62 - 64

### Mechanical Dimension

<table>
<thead>
<tr>
<th>Series</th>
<th>L (mm) (in.)</th>
<th>L Max</th>
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<tbody>
<tr>
<td>14HS3  36 (1.41)</td>
<td>24x0.5 (0.95±0.02)</td>
<td>1.0 (0.39)</td>
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<tr>
<td>14HS5  55 (2.16)</td>
<td>24x0.5 (0.95±0.02)</td>
<td>1.0 (0.39)</td>
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</table>

### Dynamic Torque Curves
- Contact MOONS' for dynamic torque curves
16HF SERIES 3.75°

**Key Features**

- High Speed
- Small Size
- High Acceleration

**General Specifications**

- Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
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<td>100 14.2</td>
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<td>12 1.7</td>
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- Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence......Page 62 - 64

**Mechanical Dimension**

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<td>16HF1</td>
<td>33.3 (1.31)</td>
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**Dynamic Torque Curves**

- Contact MOONS' for dynamic torque curves
10HF SERIES 3.75°

■ Key Features

- High Speed
- High Acceleration
- Low Noise

■ General Specifications

- Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
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<th>Rotor Inertia</th>
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<tr>
<td>10HF3 18.5 mm (0.72 in.)</td>
<td>10HF3001</td>
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<td>1.70</td>
<td>0.3</td>
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<td>5.8</td>
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<td>10HF3002</td>
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<td>10HF7 18.5 mm (0.72 in.)</td>
<td>10HF7402-02</td>
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<td>0.143</td>
<td>84</td>
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- Uni-polar

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<th>Rotor Inertia</th>
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<td>10HF7602-03</td>
<td>9</td>
<td>1.28</td>
<td>0.2</td>
<td>42</td>
<td>4.5</td>
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- Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence.....Page 62 - 64

■ Mechanical Dimension

![Mechanical Dimension Diagram]
### Dynamic Torque Curves

#### Bi-polar

**10HF3001**  
Conditions: Bi-polar Constant Current Driver  
Driver: AMA MS3540M  
Mode: Full Step  
0.3A(Peak) 12V, 0.3A(Peak) 24V

**10HF3002**  
Conditions: Bi-polar Constant Current Driver  
Driver: AMA MS3540M  
Mode: Full Step  
0.6A(Peak) 12V, 0.6A(Peak) 24V

**10HF5001**  
Conditions: Bi-polar Constant Current Driver  
Driver: AMA MS3540M  
Mode: Full Step  
0.3A(Peak) 12V, 0.3A(Peak) 24V

**10HF5002**  
Conditions: Bi-polar Constant Current Driver  
Driver: AMA MS3540M  
Mode: Full Step  
0.6A(Peak) 12V, 0.6A(Peak) 24V

**10HF7402-02**  
Conditions: Bi-polar Constant Current Driver  
Driver: AMA MS3540M  
Mode: Full Step  
0.143A(Peak) 12V, 0.143A(Peak) 24V

**10HF7602-03**  
Conditions: Unipolar Constant Current Driver  
Driver: AMA MSU3040M  
Mode: Full Step  
0.2A(Peak) 12V, 0.2A(Peak) 24V

#### Uni-polar

**10HF7602-03**  
Conditions: Unipolar Constant Current Driver  
Driver: AMA MSU3040M  
Mode: Full Step  
0.2A(Peak) 12V, 0.2A(Peak) 24V
# 11HS SERIES 1.8°

## Key Features

- High Accuracy
- Low Inertia
- Small Size

## General Specifications

### Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<tbody>
<tr>
<td>11HS1 31 mm (1.22 in.)</td>
<td>11HS1006</td>
<td>65 9.21</td>
<td>0.67</td>
<td>5.6</td>
<td>4.3</td>
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<td>11HS1007</td>
<td>65 9.21</td>
<td>0.5</td>
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<td>11HS1008</td>
<td>65 9.21</td>
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<tr>
<td>11HS3 40 mm (1.57 in.)</td>
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<td>0.67</td>
<td>6.8</td>
<td>6.0</td>
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<td>0.85</td>
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<tr>
<td>11HS5 51 mm (2.01 in.)</td>
<td>11HS5006</td>
<td>120 17.01</td>
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### Uni-polar

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<th>Resistance per Phase</th>
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<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<td></td>
<td>11HS1009</td>
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<td></td>
<td>11HS1010</td>
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<td>9.4</td>
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<td>8</td>
<td>1.13</td>
</tr>
<tr>
<td>11HS3 40 mm (1.57 in.)</td>
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<td>1.6</td>
<td>6</td>
<td>0.85</td>
</tr>
<tr>
<td>11HS5 51 mm (2.01 in.)</td>
<td>11HS5002-01</td>
<td>115 16.30</td>
<td>0.95</td>
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<td>2.3</td>
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<td></td>
<td>11HS5003</td>
<td>90 12.76</td>
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## Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence......Page 62 - 64

## Mechanical Dimension

<table>
<thead>
<tr>
<th>Series</th>
<th>L</th>
<th>Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>11HS1</td>
<td>31 (1.21)</td>
<td>0.10 (0.22)</td>
</tr>
<tr>
<td>11HS3</td>
<td>40 (1.56)</td>
<td>0.15 (0.33)</td>
</tr>
<tr>
<td>11HS5</td>
<td>51 (2.01)</td>
<td>0.20 (0.44)</td>
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</table>

Unit: mm (inch)
Dynamic Torque Curves

- Bi-polar

**11HS1006**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**11HS1007**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**11HS1008**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**11HS3005**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**11HS5005**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**11HS5007**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**11HS5008**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

---

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Dynamic Torque Curves

- Uni-polar

11HS1003
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

11HS1009
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

11HS1010
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

11HS3002-01
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

11HS5002-01
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

11HS5003
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

Why
Stepping
Motor

encapsulated
2 phase
NEMA 14

new release
2 phase
NEMA 14

new release
2 phase
NEMA 14

new release
2 phase
NEMA 14

new release
2 phase
NEMA 16

2 phase
NEMA 10
25.0 mm
(1.00 inch)

2 phase
NEMA 14
35.0 mm
(1.38 inch)

2 phase
NEMA 16
39.0 mm
(1.53 inch)

2 phase
NEMA 17
42.0 mm
(1.65 inch)

2 phase
NEMA 23
56.0 mm
(2.20 inch)

2 phase
NEMA 24
60.0 mm
(2.36 inch)

2 phase
NEMA 24
86.0 mm
(3.39 inch)

3 phase
NEMA 24
60.0 mm
(2.36 inch)

3 phase
NEMA 24
86.0 mm
(3.39 inch)

how
to select
14HA SERIES 0.9°

Key Features

- High Accuracy
- Low Noise
- Smooth Movement

General Specifications

Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<tbody>
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<td>100</td>
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<td></td>
<td>14HA0004N</td>
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Uni-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
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<th>Rotor Inertia</th>
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<tbody>
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<td>75</td>
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<td>10.63</td>
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Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence......Page 62 - 64

Mechanical Dimension

<table>
<thead>
<tr>
<th>Series</th>
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<th>Mass</th>
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<td></td>
<td>(mm)</td>
<td>(kg)</td>
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<td>14HA0</td>
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Unit: mm (inch)
**Dynamic Torque Curves**

- **Bi-polar**

14HA0001N  
Conditions: Bi-polar Constant Current Driver  
Driver: AMA MS3540M  
Mode: Full Step

0.4A (Peak) 12V  0.4A (Peak) 24V

14HA0004N  
Conditions: Bi-polar Constant Current Driver  
Driver: AMA MS3540M  
Mode: Full Step

0.6A (Peak) 12V  0.6A (Peak) 24V

- **Uni-polar**

14HA0005N  
Conditions: Uni-polar Constant Current Driver  
Driver: AMA MSU3040M  
Mode: Full Step

0.6A (Peak) 12V  0.6A (Peak) 24V

14HA0006N  
Conditions: Uni-polar Constant Current Driver  
Driver: AMA MSU3040M  
Mode: Full Step

0.4A (Peak) 12V  0.4A (Peak) 24V
14HY SERIES 1.8°

Key Features
- Low Inertia
- Small Size
- High Acceleration

General Specifications

Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<tbody>
<tr>
<td>14HY5 26 mm (1.01 in.)</td>
<td>14HY5010</td>
<td>68 9.64</td>
<td>0.4</td>
<td>9</td>
<td>8</td>
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<tr>
<td>14HY8 37 mm (1.44 in.)</td>
<td>14HY8002</td>
<td>115 16.30</td>
<td>0.85</td>
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<td>5</td>
<td>15</td>
<td>2.12</td>
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Uni-polar

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<th>Series &amp; Length</th>
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<th>Rotor Inertia</th>
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<td>14HY8 37 mm (1.44 in.)</td>
<td>14HY8001</td>
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<td>2.7</td>
<td>1.7</td>
<td>15</td>
<td>2.12</td>
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</table>

Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence......Page 62 - 64

Mechanical Dimension
Dynamic Torque Curves

- Bi-polar

**14HY5010**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

- **14HY8002**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

- Uni-polar

**14HY5011**
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

- **14HY8001**
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step
16HS SERIES 1.8°

■ Key Features

- High Torque
- Smooth Movement
- Small Size

■ General Specifications

- Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<tbody>
<tr>
<td>2 phase NEMA 16</td>
<td>16HS4005-01N</td>
<td>165 23.38 0.65</td>
<td>7</td>
<td>5.6</td>
<td>15 2.12</td>
<td>30 0.17</td>
<td></td>
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<tr>
<td>36 mm (1.40 in.)</td>
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<td>155 21.97 0.30</td>
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<td>27</td>
<td>15 2.12</td>
<td>30 0.17</td>
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- Uni-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<td>5.6</td>
<td>15 2.12</td>
<td>30 0.17</td>
<td></td>
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<td>35.0 mm (1.00 in.)</td>
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<td>27</td>
<td>15 2.12</td>
<td>30 0.17</td>
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- Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence......Page 62 - 64

■ Mechanical Dimension

<table>
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<th>Mass</th>
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</thead>
<tbody>
<tr>
<td>16HS4</td>
<td>36 (1.40)</td>
<td>0.21 (0.46)</td>
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</table>
Dynamic Torque Curves

- **Bi-polar**

16HS4003-06N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

16HS4007-01N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

- **Uni-polar**

16HS4005-01N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

16HS4006-01N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

Contact MOONS' for Dynamic Torque Curves
17HA SERIES 0.9°

**Key Features**

- High Accuracy
- Low Noise
- Smooth Movement

**General Specifications**

- **Bi-polar**

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<tbody>
<tr>
<td>17HA7 20 mm (0.79 in.)</td>
<td>17HA7602-06</td>
<td>78 11.05 0.65</td>
<td>6.6 7 0.71</td>
<td>5 20 0.08</td>
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- **Uni-polar**

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<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<td>17HA7 20 mm (0.79 in.)</td>
<td>17HA7602</td>
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<td>6.6 2.9 5 0.71</td>
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- **Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence**...Page 62 - 64

**Mechanical Dimension**

<table>
<thead>
<tr>
<th>Series</th>
<th>L</th>
<th>Mass</th>
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</thead>
<tbody>
<tr>
<td>17HA7</td>
<td>20 (0.79)</td>
<td>0.12 (0.26)</td>
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<tr>
<td>17HA0</td>
<td>28 (1.10)</td>
<td>0.19 (0.42)</td>
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<tr>
<td>17HA4</td>
<td>34.3 (1.35)</td>
<td>0.23 (0.51)</td>
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Unit: mm (inch)
## Dynamic Torque Curves

- **Bi-polar**

### 17HA7402-06

**Conditions:** Bi-polar Constant Current Driver  
**Driver:** AMA MS3540M  
**Mode:** Full Step  
- 0.5A (Peak) 12V  
- 0.5A (Peak) 24V

### 17HA403-44N

**Conditions:** Bi-polar Constant Current Driver  
**Driver:** AMA MS3540M  
**Mode:** Full Step  
- 0.56A (Peak) 12V  
- 0.56A (Peak) 24V

### 17HA4401-05N

**Conditions:** Bi-polar Constant Current Driver  
**Driver:** AMA MS3540M  
**Mode:** Full Step  
- 0.87A (Peak) 12V  
- 0.87A (Peak) 24V

### 17HA4402-16N

**Conditions:** Bi-polar Constant Current Driver  
**Driver:** AMA MS3540M  
**Mode:** Full Step  
- 0.5A (Peak) 12V  
- 0.5A (Peak) 24V

- **Uni-polar**

### 17HA7602

**Conditions:** Uni-polar Constant Current Driver  
**Driver:** AMA MSU3040M  
**Mode:** Full Step  
- 0.65A (Peak) 12V  
- 0.65A (Peak) 24V

### 17HA0601N

**Conditions:** Uni-polar Constant Current Driver  
**Driver:** AMA MSU3040M  
**Mode:** Full Step  
- 0.43A (Peak) 12V  
- 0.43A (Peak) 24V

### 17HA4605N

**Conditions:** Uni-polar Constant Current Driver  
**Driver:** AMA MSU3040M  
**Mode:** Full Step  
- 0.87A (Peak) 12V  
- 0.87A (Peak) 24V
### Dynamic Torque Curves

- **Uni-polar**

**17HA4606N**

Conditions: Uni-polar, Constant Current Driver

Driver: AMA MSU3040M

Mode: Full Step

[Graph showing dynamic torque curves for 17HA4606N]
17HD SERIES 1.8°

■ Key Features

- High Torque
- Low Noise
- Small Size

■ General Specifications

- Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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</thead>
<tbody>
<tr>
<td>17HD5 25.3 mm (0.99 in.)</td>
<td>17HD5003-10 220 31.18</td>
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<td>5</td>
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<td>17HD0013 285 40.39</td>
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<td>17HD3 47.3 mm (1.84 in.)</td>
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<td>3.54</td>
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- Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence......Page 62 - 64

■ Mechanical Dimension

<table>
<thead>
<tr>
<th>Series</th>
<th>L (mm/in.)</th>
<th>Mass (kg/lb.)</th>
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<td>33.3 (1.30)</td>
<td>0.21 (0.46)</td>
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<td>17HD1</td>
<td>39.3 (1.53)</td>
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<tr>
<td>17HD3</td>
<td>47.3 (1.84)</td>
<td>0.36 (0.79)</td>
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Dynamic Torque Curves

- Bi-polar

17HD5003-10
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD0013
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD1004-01
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD3005-10
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

Why Stepping Motor
encapsulated 2 phase NEMA 14
new release 2 phase NEMA 14
new release 2 phase NEMA 17
new release 2 phase NEMA 14
new release 2 phase NEMA 14
2 phase NEMA 10 25.0 mm (1.00 inch)
2 phase NEMA 11 28.0 mm (1.10 inch)
2 phase NEMA 14 35.0 mm (1.38 inch)
2 phase NEMA 16 39.0 mm (1.53 inch)
2 phase NEMA 17 42.0 mm (1.65 inch)
2 phase NEMA 23 56.0 mm (2.22 inch)
2 phase NEMA 24 60.0 mm (2.36 inch)
2 phase NEMA 25 86.0 mm (3.39 inch)
3 phase NEMA 24 60.0 mm (2.36 inch)
3 phase NEMA 24 86.0 mm (3.39 inch)
how to select

- Bi-polar

17HD5003-10
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD0013
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD1004-01
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD3005-10
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step
17HDN SERIES 1.8°

Key Features

- High Torque
- High Accuracy
- Smooth Movement

General Specifications

Bi-polar

<table>
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<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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Uni-polar

<table>
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<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<tbody>
<tr>
<td>17HD4N 34.3 mm (1.35 in.)</td>
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<td>15 2.12</td>
<td>57 0.31</td>
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</table>

- Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence...Page 62 - 64
### Mechanical Dimension

<table>
<thead>
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<th>Series</th>
<th>L (mm)</th>
<th>Mass (kg)</th>
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<td>39.6 (1.57)</td>
<td>0.28 (0.62)</td>
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<tr>
<td>17HD6N</td>
<td>48.3 (1.90)</td>
<td>0.36 (0.79)</td>
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<tr>
<td>17HD8N</td>
<td>62.8 (2.47)</td>
<td>0.60 (1.32)</td>
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</table>

### Dynamic Torque Curves

- **Bi-polar**

#### 17HD4022-01N
- **Conditions:** Bi-polar, Constant Current Driver
- **Driver:** AMA MS3540M
- **Mode:** Full Step

#### 17HD4024N
- **Conditions:** Bi-polar, Constant Current Driver
- **Driver:** AMA MS3540M
- **Mode:** Full Step

#### 17HD4025N
- **Conditions:** Bi-polar, Constant Current Driver
- **Driver:** AMA MS3540M
- **Mode:** Full Step

#### 17HD2011N
- **Conditions:** Bi-polar, Constant Current Driver
- **Driver:** AMA MS3540M
- **Mode:** Full Step

#### 17HD2018N
- **Conditions:** Bi-polar, Constant Current Driver
- **Driver:** AMA MS3540M
- **Mode:** Full Step

#### 17HD2026N
- **Conditions:** Bi-polar, Constant Current Driver
- **Driver:** AMA MS3540M
- **Mode:** Full Step
Dynamic Torque Curves

- Bi-polar

17HD2027N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD6012N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD6016N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD6017N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD6019N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HD6020N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HDB001N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

17HDB002N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step
### Dynamic Torque Curves

- **Uni-polar**

**17HD4030N**
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU3040M
- Mode: Full Step
- 1.2A(Peak) 12V
- 1.2A(Peak) 24V

**17HD4031N**
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU3040M
- Mode: Full Step
- 0.95A(Peak) 12V
- 0.95A(Peak) 24V

**17HD4032N**
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU3040M
- Mode: Full Step
- 0.4A(Peak) 12V
- 0.4A(Peak) 24V

**17HD4033N**
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU3040M
- Mode: Full Step
- 0.3A(Peak) 12V
- 0.3A(Peak) 24V

**17HD2032N**
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU3040M
- Mode: Full Step
- 1.6A(Peak) 12V
- 1.6A(Peak) 24V

**17HD2033N**
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU3040M
- Mode: Full Step
- 0.8A(Peak) 12V
- 0.8A(Peak) 24V

**17HD6023N**
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU3040M
- Mode: Full Step
- 1.1A(Peak) 12V
- 1.1A(Peak) 24V

**17HD6024N**
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU3040M
- Mode: Full Step
- 0.4A(Peak) 12V
- 0.4A(Peak) 24V

**17HD6025N**
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU3040M
- Mode: Full Step
- 0.85A(Peak) 12V
- 0.85A(Peak) 24V
Dynamic Torque Curves

- Uni-polar

**17HD6026N**
Conditions: Uni-polar, Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

**17HDB003N**
Conditions: Uni-polar, Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

**17HDB004N**
Conditions: Uni-polar, Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

- 2 phase NEMA 11
- 28.0 mm (1.10 inch)
- 2 phase NEMA 14
- 35.0 mm (1.38 inch)
- 2 phase NEMA 16
- 39.0 mm (1.53 inch)
- 2 phase NEMA 17
- 42.0 mm (1.65 inch)
- 3 phase NEMA 24
- 60.0 mm (2.36 inch)
- 3 phase NEMA 34
- 86.0 mm (3.39 inch)

How to select
17HE SERIES 3.6°

Key Features

- High Speed
- Low Inertia
- High Acceleration

General Specifications

• Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque (mNm oz-in)</th>
<th>Rated Current (A)</th>
<th>Resistance per Phase (ohm)</th>
<th>Inductance per Phase (mH)</th>
<th>Detent Torque (mNm oz-in)</th>
<th>Rotor Inertia (g.cm² oz-in²)</th>
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<tbody>
<tr>
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• Uni-polar

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<th>Model Number</th>
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<th>Inductance per Phase (mH)</th>
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• Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence...Page 62 - 64

Mechanical Dimension

| Series | L | Mass
<table>
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<tr>
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<th></th>
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</tr>
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<tbody>
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Dynamic Torque Curves

- Bi-polar

17HE1401-01
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step
Driver: 0.58A(Peak) 12V
0.59A(Peak) 24V

17HE1402-01
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step
Driver: 0.16A(Peak) 12V
0.16A(Peak) 24V

17HE1403-01
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step
Driver: 2.5A(Peak) 12V
2.5A(Peak) 24V

- Uni-polar

17HE1603-02
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step
Driver: 0.2A(Peak) 12V
0.2A(Peak) 24V

17HE1604-01
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step
Driver: 0.25A(Peak) 12V
0.25A(Peak) 24V

17HE1606-02
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step
Driver: 0.58A(Peak) 12V
0.58A(Peak) 24V

Why Stepping Motor
- How to select
- 2 phase NEMA 11, 28.0 mm (1.10 inch)
- 2 phase NEMA 14, 35.0 mm (1.38 inch)
- 2 phase NEMA 10, 25.0 mm (1.00 inch)
- 2 phase NEMA 16, 39.0 mm (1.53 inch)
- 3 phase NEMA 17, 42.0 mm (1.65 inch)
**23HS SERIES 1.8°**

### Key Features
- High Torque
- High Accuracy
- Smooth Movement

### General Specifications
- **Bi-polar**

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<td></td>
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<td>A</td>
<td>ohm</td>
<td>nH</td>
<td>mN/m oz-in</td>
<td>g.cm² oz-in²</td>
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* Lead wire connecting type

- **Uni-polar**

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<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<td>ohm</td>
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- Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence...Page 62 - 64
Why Stepping Motor

Mechanical Dimension

<table>
<thead>
<tr>
<th>Series</th>
<th>L (mm)</th>
<th>Mass (kg)</th>
</tr>
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<tbody>
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<td>41 (1.61)</td>
<td>0.42 (0.93)</td>
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<td>23HS1</td>
<td>50 (1.97)</td>
<td>0.55 (1.21)</td>
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<tr>
<td>23HS2</td>
<td>54 (2.13)</td>
<td>0.60 (1.32)</td>
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<td>23HS5</td>
<td>111 (4.37)</td>
<td>1.50 (3.30)</td>
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Dynamic Torque Curves

- Bi-polar

**23HS0030**

- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS3540M
- Mode: Full Step

**23HS0036**

- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS3540M
- Mode: Full Step

**23HS4008**

- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS3540M
- Mode: Full Step

*AWG 22 UL1007*

*JST SKB-XH-A-1(LFx3N)*

New release 2 phase NEMA 14

Encapsulated 2 phase NEMA 14

New release 3 phase NEMA 14

New release 2 phase NEMA 16

New release 2 phase NEMA 23

New release 2 phase NEMA 24

2 phase NEMA 23 56.0 mm (2.20 inch)

2 phase NEMA 24 60.0 mm (2.36 inch)

3 phase NEMA 24 86.0 mm (3.39 inch)

How to select
Dynamic Torque Curves

- **Bi-polar**

  **23HS4009**
  Conditions: Bi-polar Constant Current Driver
  Driver: AMA MS3540M
  Mode: Full Step
  - 2.1A(Peak) 24V
  - 2.1A(Peak) 36V

  **23HS1033**
  Conditions: Bi-polar Constant Current Driver
  Driver: AMA MS3540M
  Mode: Full Step
  - 1.5A(Peak) 24V
  - 1.5A(Peak) 36V

  **23HS1034**
  Conditions: Bi-polar Constant Current Driver
  Driver: AMA MS3540M
  Mode: Full Step
  - 2.0A(Peak) 24V
  - 2.0A(Peak) 36V
### Dynamic Torque Curves

#### Bi-polar

<table>
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#### Uni-polar

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Dynamic Torque Curves

- Uni-polar

**23HS3004-15**

Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

- 3.0A(Peak) 24V
- 3.0A(Peak) 36V

**23HS3045-03**

Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

- 1.5A(Peak) 24V
- 1.5A(Peak) 36V
23HM SERIES 1.8°

**Key Features**

- High Acceleration
- Low Noise
- Low Inertia

**General Specifications**

- **Bi-polar**

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<th>Rated Current A</th>
<th>Resistance per Phase ohm</th>
<th>Inductance per Phase mH</th>
<th>Detent Torque mNm</th>
<th>Rotor Inertia oz-in g.cm² oz-in²</th>
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**Mechanical Dimension**

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<th>L mm (in.)</th>
<th>Mass kg (lb.)</th>
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<td>23HM2</td>
<td>55 (2.15)</td>
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<tr>
<td>23HM4</td>
<td>76 (2.96)</td>
<td>0.90 (1.98)</td>
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</table>
Dynamic Torque Curves

- Bi-polar

**23HM0401-01**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**23HM0402-01**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**23HM1402-01**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**23HM1403-01**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**23HM2403-01**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**23HM2404-01**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**23HM4401-01**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

**23HM4402-01**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step
23HY SERIES 1.8°

Key Features

- High Acceleration
- High Accuracy
- Very Low Inertia

General Specifications

- Bi-polar

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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- Uni-polar

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Mechanical Dimension

<table>
<thead>
<tr>
<th>Series</th>
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<th>Mass</th>
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<tbody>
<tr>
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Unit: mm/inch
Dynamic Torque Curves

### Bi-polar

- **23HY0001N**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS3540M
  - Mode: Full Step
  - 1.5A(Peak) 24V
  - 1.5A(Peak) 36V

- **23HY0002N**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS3540M
  - Mode: Full Step
  - 1A(Peak) 24V
  - 1A(Peak) 36V

- **23HY1001N**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS3540M
  - Mode: Full Step
  - 1.5A(Peak) 24V
  - 1.5A(Peak) 36V

- **23HY1002N**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS3540M
  - Mode: Full Step
  - 1A(Peak) 24V
  - 1A(Peak) 36V

### Uni-polar

- **23HY0001-01N**
  - Conditions: Uni-polar Constant Current Driver
  - Driver: AMA MSU3040M
  - Mode: Full Step
  - 1.4A(Peak) 24V
  - 1.4A(Peak) 36V

- **23HY0002-01N**
  - Conditions: Uni-polar Constant Current Driver
  - Driver: AMA MSU3040M
  - Mode: Full Step
  - 1A(Peak) 24V
  - 1A(Peak) 36V

- **23HY1001-01N**
  - Conditions: Uni-polar Constant Current Driver
  - Driver: AMA MSU3040M
  - Mode: Full Step
  - 1.4A(Peak) 24V
  - 1.4A(Peak) 36V
Dynamic Torque Curves

- Uni-polar

**23HY1002-01N**
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

**23HY2001-01N**
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

**23HY2001-02N**
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

Why
Stepping Motor

encapsulated
2 phase
NEMA 14

new release
2 phase
NEMA 8

new release
2 phase
NEMA 14

new release
2 phase
NEMA 16

2 phase
NEMA 10
25.0 mm
(1.00 inch)

2 phase
NEMA 11
29.0 mm
(1.10 inch)

2 phase
NEMA 14
35.0 mm
(1.38 inch)

2 phase
NEMA 16
39.0 mm
(1.53 inch)

2 phase
NEMA 17
42.0 mm
(1.65 inch)

2 phase
NEMA 23
56.0 mm
(2.20 inch)

2 phase
NEMA 24
60.0 mm
(2.36 inch)

2 phase
NEMA 24
86.0 mm
(3.39 inch)

3 phase
NEMA 24
60.0 mm
(2.36 inch)

3 phase
NEMA 24
86.0 mm
(3.39 inch)

how to select
24HS SERIES 1.8°

Key Features

- Very High Torque
- Smooth Movement
- Low Speed

General Specifications

Bi-polar

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Uni-polar

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Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence......Page 62 - 64
### Mechanical Dimension

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<th>Series</th>
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<th>Mass</th>
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<td>85</td>
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</table>

### Dynamic Torque Curves

- **Bi-polar**

  **24HS1001N**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS3540M
  - Mode: Full Step
  - 1.4A(Peak) 24V 1.4A(Peak) 36V

  ![Graph 1](image1.png)

  **24HS1002N**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS3540M
  - Mode: Full Step
  - 2.8A(Peak) 24V 2.8A(Peak) 36V

  ![Graph 2](image2.png)

  **24HS1003N**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS3540M
  - Mode: Full Step
  - 4.0A(Peak) 24V 4.0A(Peak) 36V

  ![Graph 3](image3.png)

- **24HS2001N**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS3540M
  - Mode: Full Step
  - 2.8A(Peak) 24V 2.8A(Peak) 36V

  ![Graph 4](image4.png)

- **24HS2002N**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS3540M
  - Mode: Full Step
  - 4.0A(Peak) 24V 4.0A(Peak) 36V

  ![Graph 5](image5.png)

- **24HS3003N**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS3540M
  - Mode: Full Step
  - 1.4A(Peak) 24V 1.4A(Peak) 36V

  ![Graph 6](image6.png)
Why Stepping Motor

Why Stepping Motor

Dynamic Torque Curves

Bi-polar

24HS3004N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS3540M
Mode: Full Step

24HS5001N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS540M
Mode: Full Step

24HS5002N
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS540M
Mode: Full Step

Uni-polar

24HS1002-01N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

24HS1003-01N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

24HS1004N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

NEMA 2 phase

NEMA 2 phase

NEMA 2 phase

NEMA 3 phase

NEMA 3 phase

encapsulated

encapsulated

new release

new release

new release

new release

2 phase

2 phase

2 phase

2 phase

2 phase

2 phase

2 phase

2 phase

2 phase

2 phase

2 phase

2 phase

how to select

2.8A(Peak) 24V 2.8A(Peak) 36V

4.2A(Peak) 24V 4.2A(Peak) 36V

2.8A(Peak) 24V 2.8A(Peak) 36V

1.4A(Peak) 24V 1.4A(Peak) 36V

1.0A(Peak) 24V 1.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V

2.0A(Peak) 24V 2.0A(Peak) 36V
Dynamic Torque Curves

- Uni-polar

24HS2003N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

24HS2003N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

24HS2005N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

24HS2004N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

24HS2005N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

24HS3005N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

24HS5001-01N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

24HS5002-01N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

24HS5004N
Conditions: Uni-polar Constant Current Driver
Driver: AMA MSU3040M
Mode: Full Step

Why Stepping Motor
encapsulated 2 phase NEMA 14
encapsulated 3 phase NEMA 14 NEMA 17
new release 2 phase NEMA 16
new release 2 phase NEMA 14
new release 2 phase NEMA 16
new release NEMA 17 42.0 mm (1.65 inch)
2 phase NEMA 24 60.0 mm (2.36 inch)
2 phase NEMA 24 86.0 mm (3.39 inch)
3 phase NEMA 24 60.0 mm (2.36 inch)
3 phase NEMA 24 86.0 mm (3.39 inch)
how to select
34HD SERIES 1.8°

Key Features

- High Torque
- High Accuracy
- Smooth Movement

General Specifications

- Bi-polar

<table>
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<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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- 8-Leadwire Motors

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- Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence......Page 62 - 64
Mechanical Dimension

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Unit: mm/inch

Dynamic Torque Curves

- Bi-polar

**34HD0401 Bi-polar series**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS7080M
Mode: Full Step

![](chart1)

**34HD0402 Bi-polar series**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS7080M
Mode: Full Step

![](chart2)

**34HD0403 Bi-polar**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS7080M
Mode: Full Step

![](chart3)

**34HD0404 Bi-polar parallel**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS7080M
Mode: Full Step

![](chart4)

**34HD1401 Bi-polar series**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MS7080M
Mode: Full Step

![](chart5)

**34HD1402 Bi-polar series**
Conditions: Bi-polar Constant Current Driver
Driver: AMA MSST10
Mode: Full Step

![](chart6)
### Dynamic Torque Curves

**Bi-polar**

- **34HD1403 Bi-polar series**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 3.18A (Peak) 48V 3.18A (Peak) 60V

- **34HD1404 Bi-polar parallel**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 5.6A (Peak) 48V 5.6A (Peak) 60V

- **34HD2401 Bi-polar series**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 1.4A (Peak) 48V 1.4A (Peak) 60V

- **34HD2402 Bi-polar series**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 2.8A (Peak) 48V 2.8A (Peak) 60V

- **34HD2403 Bi-polar parallel**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 5.6A (Peak) 48V 5.6A (Peak) 60V

- **34HD0801 Bi-polar parallel**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 3.18A (Peak) 48V 3.18A (Peak) 60V

- **34HD0801 Bi-polar series**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 6.3A (Peak) 48V 6.3A (Peak) 60V

- **34HD1801 Bi-polar parallel**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 6.3A (Peak) 48V 6.3A (Peak) 60V

**8-Leadwire Motors**

- **34HD1401 Bi-polar series**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 2.8A (Peak) 48V 2.8A (Peak) 60V

- **34HD1402 Bi-polar parallel**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 5.6A (Peak) 48V 5.6A (Peak) 60V

- **34HD2402 Bi-polar series**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 1.4A (Peak) 48V 1.4A (Peak) 60V

- **34HD2403 Bi-polar parallel**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 2.8A (Peak) 48V 2.8A (Peak) 60V

- **34HD0802 Bi-polar parallel**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 3.18A (Peak) 48V 3.18A (Peak) 60V

- **34HD1802 Bi-polar parallel**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step
  - 6.3A (Peak) 48V 6.3A (Peak) 60V
8-Leadwire Motors

- **34HD1801 Bi-polar series**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step

- **34HD2801 Bi-polar parallel**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step

- **34HD2801 Bi-polar series**
  - Conditions: Bi-polar Constant Current Driver
  - Driver: AMA MS7080M
  - Mode: Full Step

Dynamic Torque Curves

• 8-Leadwire Motors

**34HD1801 Bi-polar series**

Conditions: Bi-polar Constant Current Driver
Driver: AMA MS7080M
Mode: Full Step

**34HD2801 Bi-polar parallel**

Conditions: Bi-polar Constant Current Driver
Driver: AMA MS7080M
Mode: Full Step

**34HD2801 Bi-polar series**

Conditions: Bi-polar Constant Current Driver
Driver: AMA MS7080M
Mode: Full Step

New release 2 phase NEMA 8
New release 2 phase NEMA 14
New release 2 phase NEMA 16

2 phase NEMA 10
25.0 mm (1.00 inch)

2 phase NEMA 11
28.0 mm (1.10 inch)

2 phase NEMA 14
35.0 mm (1.38 inch)

2 phase NEMA 16
39.0 mm (1.53 inch)

2 phase NEMA 17
42.0 mm (1.65 inch)

2 phase NEMA 23
56.0 mm (2.20 inch)

2 phase NEMA 34
60.0 mm (2.36 inch)

2 phase NEMA 34
86.0 mm (3.39 inch)

3 phase NEMA 24
60.0 mm (2.36 inch)

3 phase NEMA 34
86.0 mm (3.39 inch)

How to select
34HY SERIES 1.8°

Key Features

- Low Noise
- Low Inertia
- High Acceleration

General Specifications

- 8-Leadwire Motors

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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<td>34-HY0 63 mm (2.48 in.)</td>
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- Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence...Page 62 - 64
### Mechanical Dimension

<table>
<thead>
<tr>
<th>Series</th>
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<th>Mass</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
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</tr>
<tr>
<td></td>
<td>(in.)</td>
<td>(lb.)</td>
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<td>63</td>
<td>1.5</td>
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<tr>
<td>34HY2</td>
<td>130</td>
<td>3.6</td>
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</table>

**Unit: mm (inch)**

### Dynamic Torque Curves

- **8-Leadwire Motors**

**34HY0809 Bi-polar Parallel**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0809 Bi-polar series**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0809 Uni-polar**
- Conditions: Uni-polar Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step

**34HY0810 Bi-polar Parallel**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0810 Bi-polar series**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0810 Uni-polar**
- Conditions: Uni-polar Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step

---

**Dynamic Torque Curves**

- **Pull out torque** in Newton meters (mN.m) or ounces inches (oz.in.)
- **Pulse rate** in pulses per second (pps)
- **Speed** in revolutions per minute (r/min)

---

**New release**

- **2 phase**
  - NEMA 14
  - NEMA 17

**Encapsulated**

- **2 phase**
  - NEMA 14
  - NEMA 17

**Mechanical Dimension**

<table>
<thead>
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**Unit: mm (inch)**

**Dynamic Torque Curves**

- **8-Leadwire Motors**

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- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0809 Bi-polar series**
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- Driver: AMA MS7080M
- Mode: Full Step

**34HY0809 Uni-polar**
- Conditions: Uni-polar Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step

**34HY0810 Bi-polar Parallel**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0810 Bi-polar series**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0810 Uni-polar**
- Conditions: Uni-polar Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step

---

**New release**

- **2 phase**
  - NEMA 10
  - NEMA 16

**Encapsulated**

- **2 phase**
  - NEMA 10
  - NEMA 16

---

**How to select**

**Mechanical Dimension**

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**Unit: mm (inch)**

**Dynamic Torque Curves**

- **8-Leadwire Motors**

**34HY0809 Bi-polar Parallel**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0809 Bi-polar series**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0809 Uni-polar**
- Conditions: Uni-polar Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step

**34HY0810 Bi-polar Parallel**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0810 Bi-polar series**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0810 Uni-polar**
- Conditions: Uni-polar Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step

---

**New release**

- **2 phase**
  - NEMA 10
  - NEMA 16

**Encapsulated**

- **2 phase**
  - NEMA 10
  - NEMA 16

---

**How to select**

**Mechanical Dimension**

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<td>34HY2</td>
<td>130</td>
<td>3.6</td>
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</table>

**Unit: mm (inch)**

**Dynamic Torque Curves**

- **8-Leadwire Motors**

**34HY0809 Bi-polar Parallel**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0809 Bi-polar series**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0809 Uni-polar**
- Conditions: Uni-polar Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step

**34HY0810 Bi-polar Parallel**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0810 Bi-polar series**
- Conditions: Bi-polar Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY0810 Uni-polar**
- Conditions: Uni-polar Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step

---

**New release**

- **2 phase**
  - NEMA 10
  - NEMA 16

**Encapsulated**

- **2 phase**
  - NEMA 10
  - NEMA 16

---

**How to select**
Dynamic Torque Curves

- **8-Leadwire Torque Curves**

### 34HY1801-10 Bi-polar Parallel
- Conditions: Bi-polar, Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

### 34HY1801-10 Bi-polar Series
- Conditions: Bi-polar, Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

### 34HY1801-10 Uni-polar
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step

---

### 34HY1803 Bi-polar Parallel
- Conditions: Bi-polar, Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

### 34HY1803 Bi-polar Series
- Conditions: Bi-polar, Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

### 34HY1803 Uni-polar
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step

### 34HY2801 Bi-polar Parallel
- Conditions: Bi-polar, Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

### 34HY2801 Bi-polar Series
- Conditions: Bi-polar, Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

### 34HY2801 Uni-polar
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step
## Dynamic Torque Curves

- **8-Leadwire Motors**

**34HY2802 Bi-polar Parallel**
- Conditions: Bi-polar, Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY2802 Bi-polar Series**
- Conditions: Bi-polar, Constant Current Driver
- Driver: AMA MS7080M
- Mode: Full Step

**34HY2802 Uni-polar**
- Conditions: Uni-polar, Constant Current Driver
- Driver: AMA MSU8080M
- Mode: Full Step
24HC SERIES 1.2°

Key Features

- Very Low Noise
- Very Smooth Movement
- Low Vibration

General Specifications

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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Mechanical Dimension

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<th>Model Number</th>
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<th>Mass</th>
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<td>24HC2</td>
<td>54.5 (2.15)</td>
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<tr>
<td>24HC3</td>
<td>76.5 (3.01)</td>
<td>1.3 (2.87)</td>
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Dynamic Torque Curves

24HC4001-01

Conditions: 3-Phase Constant Current Driver
Driver: Moons’ MS3ST10
Mode: 10000 Step/Rev

24HC2002-01

Conditions: 3-Phase Constant Current Driver
Driver: Moons’ MS3ST10
Mode: 10000 Step/Rev

24HC3001-01

Conditions: 3-Phase Constant Current Driver
Driver: Moons’ MS3ST10
Mode: 10000 Step/Rev
34HC SERIES 1.2°

Key Features

- Very Low Noise
- Very Smooth Movement
- Low Vibration

General Specifications

<table>
<thead>
<tr>
<th>Series &amp; Length</th>
<th>Model Number</th>
<th>Holding Torque</th>
<th>Rated Current</th>
<th>Resistance per Phase</th>
<th>Inductance per Phase</th>
<th>Detent Torque</th>
<th>Rotor Inertia</th>
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Wiring Connection, Lead Wires, Schematic Diagrams & Stepping Sequence.....Page 62 - 64

Mechanical Dimension

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<td>1.6 kg (3.53 lb)</td>
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<tr>
<td>34HC1</td>
<td>96 mm (3.78)</td>
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<tr>
<td>34HC2</td>
<td>125.5 mm (4.94)</td>
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Dynamic Torque Curves

34HC0301

Conditions: 3-Phase Constant Current Driver
Driver: Moons’ MS3ST10 Mode: 10000 Step/Rev

34HC1301

Conditions: 3-Phase Constant Current Driver
Driver: Moons’ MS3ST10 Mode: 10000 Step/Rev

34HC2301

Conditions: 3-Phase Constant Current Driver
Driver: Moons’ MS3ST10 Mode: 10000 Step/Rev

New release 2 phase NEMA 14

New release 2 phase NEMA 17

New release 2 phase NEMA 18

New release 2 phase NEMA 16

2 phase NEMA 10 25.0 mm (1.00 inch)

2 phase NEMA 11 28.0 mm (1.10 inch)

2 phase NEMA 14 31.0 mm (1.23 inch)

2 phase NEMA 16 35.0 mm (1.38 inch)

2 phase NEMA 17 42.0 mm (1.66 inch)

2 phase NEMA 23 56.0 mm (2.20 inch)

2 phase NEMA 24 60.0 mm (2.36 inch)

2 phase NEMA 27 86.0 mm (3.39 inch)

3 phase NEMA 24 60.0 mm (2.36 inch)

3 phase NEMA 27 86.0 mm (3.39 inch)

How to select...
## Wiring Connection

- **8HY series**
  - Motor side: JST S6B-ZR (LF)(SN)
  - Mate with: JST ZHR-6

- **11HS series**
  - Motor side: Molex 53253-0610
  - Mate with: Molex 51065-0600

- **14HA 14HS 14HY 16HS series**
  - Motor side: JST S11B-ZR (LF)(SN)
  - Mate with: JST ZHR-11

- **17HD series**
  - Motor side: Molex 89401-1160
  - Mate with: Molex 87869-1100

- **16HS 17HD 17HDN series**
  - Motor side: JST S6B-PH-K (LF)(SN)
  - Mate with: JST PHR-6

- **23HY 23HM series**
  - Motor side: JST S6B-EH (LF)(SN)
  - Mate with: JST EHR-6

- **23HS 24HS series**
  - Mate with: JST XHP-11

- **23HS series**
  - Mate with: JST XHP-6

- **24HC series**
  - Mate with: JST XHP-7

- The styles above are in normal way. Other special connectors can be customized.
Why Stepping Motor

- Selecting 2 phase NEMA 11
  - 28.0 mm (1.10 inch)

- Selecting 2 phase NEMA 14
  - 35.0 mm (1.38 inch)
  - 25.0 mm (1.00 inch)

- Selecting 2 phase NEMA 16
  - 39.0 mm (1.53 inch)
  - 42.0 mm (1.65 inch)

- Selecting 2 phase NEMA 23
  - 56.0 mm (2.22 inch)

- Selecting 2 phase NEMA 24
  - 60.0 mm (2.36 inch)
  - 86.0 mm (3.39 inch)

- Selecting 3 phase NEMA 24
  - 60.0 mm (2.36 inch)
  - 86.0 mm (3.39 inch)

- Selecting 3 phase NEMA 23
  - 56.0 mm (2.22 inch)

- Selecting 3 phase NEMA 17
  - 42.0 mm (1.65 inch)

- Selecting 2 phase NEMA 14
  - 35.0 mm (1.38 inch)

- Selecting 2 phase NEMA 17
  - 42.0 mm (1.65 inch)

- Selecting 2 phase NEMA 23
  - 56.0 mm (2.22 inch)

- Selecting 2 phase NEMA 24
  - 60.0 mm (2.36 inch)

- Selecting 3 phase NEMA 24
  - 60.0 mm (2.36 inch)
  - 86.0 mm (3.39 inch)

- Selecting 3 phase NEMA 23
  - 56.0 mm (2.22 inch)

- Selecting 3 phase NEMA 17
  - 42.0 mm (1.65 inch)

- Selecting 2 phase NEMA 17
  - 42.0 mm (1.65 inch)

- Selecting 2 phase NEMA 23
  - 56.0 mm (2.22 inch)

- Selecting 2 phase NEMA 24
  - 60.0 mm (2.36 inch)

- Selecting 3 phase NEMA 24
  - 60.0 mm (2.36 inch)
  - 86.0 mm (3.39 inch)

- Selecting 3 phase NEMA 23
  - 56.0 mm (2.22 inch)

- Selecting 3 phase NEMA 17
  - 42.0 mm (1.65 inch)

- The styles above are in normal way. Other special connectors can be customized.
Why Stepping Motor

encapsulated
2 phase
NEMA 14

new release
2 phase
NEMA 8

new release
2 phase
NEMA 14

new release
2 phase
NEMA 16

2 phase
NEMA 10
25.0 mm
(1.00 inch)

2 phase
NEMA 11
28.0 mm
(1.10 inch)

2 phase
NEMA 14
35.0 mm
(1.38 inch)

2 phase
NEMA 16
39.0 mm
(1.53 inch)

2 phase
NEMA 17
42.0 mm
(1.65 inch)

2 phase
NEMA 23
56.0 mm
(2.22 inch)

2 phase
NEMA 24
60.0 mm
(2.36 inch)

2 phase
NEMA 24
86.0 mm
(3.39 inch)

3 phase
NEMA 34
60.0 mm
(2.36 inch)

3 phase
NEMA 34
86.0 mm
(3.39 inch)

How to select

---

Schematic Diagrams & Stepping Sequence

**2 PHASE**

4 lead wire (bipolar)

<table>
<thead>
<tr>
<th>Lead Wire Configuration</th>
<th>Sequence Model</th>
<th>Bi-Polar full step</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLK A</td>
<td></td>
<td>CW</td>
</tr>
<tr>
<td>GRN C</td>
<td></td>
<td>+ – – +</td>
</tr>
<tr>
<td>RED B</td>
<td></td>
<td>+ – – +</td>
</tr>
<tr>
<td>BLU D</td>
<td></td>
<td>+ – + –</td>
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</table>

6 lead wire (unipolar)

<table>
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<tr>
<th>Lead Wire Configuration</th>
<th>Sequence Model</th>
<th>Uni-Polar full step</th>
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</thead>
<tbody>
<tr>
<td>BLK A</td>
<td></td>
<td>CW</td>
</tr>
<tr>
<td>YEL O</td>
<td></td>
<td>– – + +</td>
</tr>
<tr>
<td>GRN C</td>
<td></td>
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<tr>
<td>RED B</td>
<td></td>
<td>– – + +</td>
</tr>
<tr>
<td>WHT M</td>
<td></td>
<td>– – + +</td>
</tr>
<tr>
<td>BLU D</td>
<td></td>
<td>+ + – –</td>
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</table>

8 lead wire

<table>
<thead>
<tr>
<th>Lead Wire Configuration</th>
<th>Option 1: Bi-Polar Series</th>
<th></th>
<th>Option 2: Bi-Polar Parallel</th>
<th></th>
<th>Option 3: Uni-Polar Series</th>
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</thead>
<tbody>
<tr>
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<td>BLU</td>
<td>BLK</td>
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<tr>
<td>YEL A</td>
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<td>BRN</td>
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<td>ORG C</td>
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<td>GRN</td>
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<td>RED B</td>
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<td>WHT M</td>
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<td>BLU D</td>
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**3 PHASE**

<table>
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<td>B</td>
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<td>WHT</td>
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<tr>
<td>GRN</td>
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<table>
<thead>
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<th>Lead Wire Configuration</th>
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</thead>
<tbody>
<tr>
<td>BLK A</td>
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<td>CW</td>
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<tr>
<td>YEL O</td>
<td></td>
<td>– – + +</td>
</tr>
<tr>
<td>BRN M</td>
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<td>– – + +</td>
</tr>
<tr>
<td>WHT L</td>
<td></td>
<td>– – + +</td>
</tr>
<tr>
<td>RED B</td>
<td></td>
<td>+ + – –</td>
</tr>
</tbody>
</table>

Bi-Polar full step

- CW (clockwise) 
- CCW (counter clockwise) rotation when seen from the flange side of the motor

Uni-Polar full step

- CW (clockwise) 
- CCW (counter clockwise) rotation when seen from the flange side of the motor

Schematic Diagrams & Stepping Sequence