

# MAXIMIZING TORQUE AT DESIRED SPEED



## OUR BUSINESS

# We Provide SOLUTIONS

## FOR Motion Control APPLICATIONS



### CORE IDEOLOGIES

- ▶ We know how to maximize torque at your operating speed to **eliminate guesswork** for motor selection. Trial and error is **not** an option.
- ▶ We inventory components in Santa Clara, California to provide **Rapid Prototype Delivery/ Short Lead-Time**.
- ▶ We have **full manufacturing capabilities** in Santa Clara.
- ▶ We have **volume manufacturing capabilities** in China.
- ▶ We have our **own quality team** in China to guarantee quality products prior to shipping.
- ▶ We have the best microstepping motor in the world in terms of step accuracy to provide **smooth motion**.
- ▶ We follow Statistical Process Control along with the Six Sigma System to have a mind set of a **lifetime warranty**.
- ▶ We offer the **best price** for performance.
- ▶ As a valued business partner, we strive to solve our clients' issues.

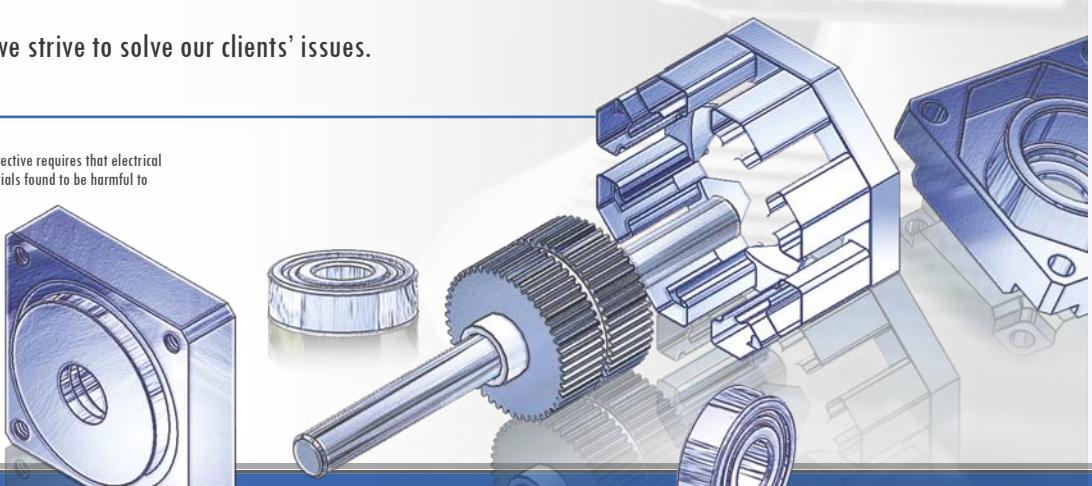
#### RoHS Compliancy:

The European Union's Restriction of Hazardous Substances (RoHS) directive requires that electrical and electric equipment manufacturers restrict the amounts of materials found to be harmful to the environment. Materials such as lead, mercury, cadmium, and hexavalent chromium have been targeted for restricted use.

All standard Lin Engineering step motors can be ordered as RoHS compliant. Please contact Lin Engineering for more information.

#### For Hybrid Linear Actuators, contact HSI, Inc. at 1-800-243-2715

All matters concerning services or merchandise desired from HSI, Inc. are solely between you and HSI, Inc. We make no warranties or representations concerning, and we shall have no liabilities or obligations with regards to, any such service or merchandise.



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STEP MOTORS

INTEGRATED MOTORS

CUSTOM DESIGNS

ACCESSORIES

RMS TECHNOLOGIES

TRINAMIC

## Mission Statement

The main reason for our existence is that we provide solutions for motion control applications. We are your solution.

## Company History

We have achieved a reputation of excellence in step motor manufacturing and service. Lin Engineering has earned the reputation as the technical leader in step motor design with the ability to “Maximize Torque at Desired Speed”.

Founded by Ted T. Lin in 1987, Lin Engineering began as a consulting company specializing in step motor applications. Throughout its history, Lin Engineering has continued to develop its capabilities in the areas of design engineering, manufacturing, and customer service. In 1991, Lin Engineering expanded its operations to include the manufacturing of its own hybrid step motors. Since then, the company has developed its product line to include drivers, optical encoders, spur and planetary gearboxes.

President Ted T. Lin is one of the foremost step motor designers in the industry. In 1984, Warner Electric named him “Father of New Step Motor Technology” at their Motion Control System Division, where he directed the design of the step motors for early disk drive applications.

Lin Engineering's diversified customer base includes such industries as:

- Automated Test Equipment
- Surveillance Systems
- Avionics
- Defense Contracting
- Labeling Machinery
- Medical Equipment
- Packaging
- Semiconductor Manufacturing
- Metering and Dispensing
- Engraving Machine
- Automatic Feeding Machine
- 3D Image Acquisition System
- Label and Die Feeder
- Wave Length Meter
- Bar Code Printing
- Antenna
- Fiber Optics Switch
- Laser Measurement
- Press Printing
- Color/Photo Imaging

# LETTER FROM THE PRESIDENT



If there is a single precept to which we dedicate ourselves, it is that of excellence. Excellence in attitude. Excellence in performance. Excellence in our interrelationships with each other and our customers.

Over the years, this company has developed capabilities in design, manufacturing and marketing of hybrid step motors. We have done this with great dedication and will continue to push forward as a leader in these areas. Today, we are the largest volume manufacturer of the best 0.9 degree step motor in the industry, while still offering the best price for performance.

Most common applications of Lin motors are for: surveillance cameras that can be found in casinos and department stores, food wrapping machines, in practically every supermarket, medical equipment, eye surgery equipment, and other motion controlled products. We are thrilled that you will find our motor in the B-2 Stealth Bomber.

We are a solution-oriented company, known for being able to maximize torque at the customer's desired speed to eliminate guesswork from motor selection. Our customers use Lin Engineering for a number of reasons, but most commonly to find a solution for the following problems:

- Selection of motor for an application is time consuming
- The design margin of the motor being selected is unknown
- Difficulties in finding a motor that runs with smooth motion
- The price of motors from China is inexpensive, but there are concerns about quality and long lead-time.

We have an outstanding quality team at our Santa Clara and China locations, whose sole purpose is to guarantee quality at every process. This allows our customers to receive products that meet or exceed their expectations. We have also dedicated a team of engineers and production staff for prototypes. This allows for immediate service and short lead times.

We are proud we have gained market share by having a team of engineers creating cutting edge designs, and a technical support staff trained to help you with selecting and using the proper motion control product for your application.

We are your solution.

Ted T. Lin  
President & CEO

# OUR CAPABILITIES

## MAXIMIZE TORQUE AT DESIRED SPEED

Within the constraints of power input and motor size, Lin Engineering can design a motor to maximize torque at your desired operating speed. With a given power input, the power output  $fTd \omega$  ( $T$  = torque at angular velocity  $\omega$ ) from a given size of motor will not change. In other words, we design a motor's maximum operating efficiency at your speed.

## HIGH STEP ACCURACY

Lin Engineering's  $0.45^\circ$  NEMA 23 motor has the best step accuracy in the step motor industry. Our  $0.45^\circ$  motor is constructed with 200 rotor teeth (a typical  $1.8^\circ$  motor is constructed with only 50 teeth). Better step accuracy is achieved by having more rotor teeth.

## HIGH RESOLUTION

Lin Engineering's  $0.9^\circ$  and  $0.45^\circ$  motors provide 2 and 4 times higher resolution, respectively, than a standard  $1.8^\circ$  motor.

## SMOOTH MOTION

Every step motor has a resonant frequency. Lin Engineering can remove this resonance from your operating speed, so you never experience any oscillation in your application.

## EXCELLENT ENGINEERING SUPPORT

Lin Engineering's technical support and knowledge base are unmatched in the industry. Our engineers will eliminate the guesswork in motor selection. There is no need to buy multiple motors just to find the correct one, because Lin Engineering will configure a motor for your application that will work right the first time.

## EXTENSIVE SALES NETWORK

In addition to our inside sales team, Lin Engineering employs a worldwide network of over 40 sales representative firms located throughout the United States, Canada, Europe, the Middle East and Asia. Our sales reps can provide the service and personal attention required to serve your company.

## OFFSHORE QUALITY TEAM

Should problems arise in high volume production, our overseas quality assurance team guarantees that the issue will be dealt with at the source.

## SHORT LEAD TIME

The typical step motor manufacturer can require as much as 4 to 6 weeks to deliver prototypes; Lin Engineering can provide the same quantity in less than 1 week. This is made possible by maintaining an inventory of components in our U.S. facility, allowing us to respond quickly to the demands of modern business.

## DOMESTIC AND OVERSEAS OPERATIONS

In addition to minimizing lead-time, our U.S. facility also functions to support our overseas production. This allows Lin Engineering to meet the initial demands for high volume orders, thus helping your company to avoid the delays associated with high volume production ramp-ups.

## MILITARY/AEROSPACE APPLICATIONS

As a military qualified vendor, Lin Engineering designed, tested, and manufactured disk drive step motors used in the B-2 Stealth bomber.

## NEW PRODUCT/TECHNOLOGY DEVELOPMENT

Each year, Lin Engineering continues to develop innovative step motor products. Recent developments include:

- **SilverPak 23D** – Page 61  
Integrated Motor and Driver Technology
- **SilverPak 23C** – Page 63  
Integrated Motor, Driver and Controller Technology
- **Pole Tamping Technology™ (PDT)** – Page 4  
Integrated into the R325 & SilverPak 23D Drivers for the Smoothest Motion Possible

## STRATEGIC PARTNERS

- **Haydon Switch & Instruments, Inc.**  
Linear Actuators
- **RMS Technologies** — Pages 76-85  
Microstepping Drivers & Controllers
- **Trinamic Microchips** — Pages 86-92  
Integrated Circuits and Modules

# POLE DAMPING TECHNOLOGY™

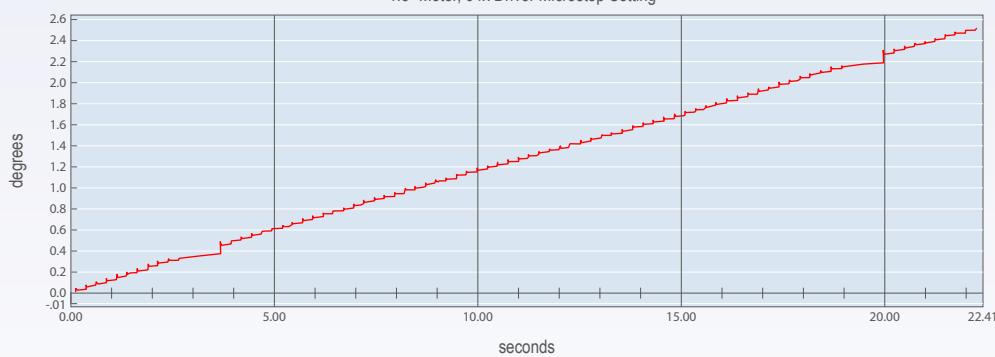
Pole Damping Technology™ (PDT) enhances step motor performance by creating a more accurate and smooth motion profile. PDT optimizes the microstepping performance of the step motor by outputting the correct amount of run and hold current to the motor. Thus, each step will overcome the motor's natural tendency to want to forcefully pull towards the full step ON position.

Currently, the SilverPak 23D integrated motor + driver and the R325 microstepping driver contain the PDT technology. Lin Engineering strives to constantly improve technology. Products that are currently under development will have PDT implemented for the purposes of further enhancing the smooth motion and accuracy of our products.

The graph below shows what PDT can do for your applications. Notice the spikes that a competitor's driver creates at every 64th step when running the motor at 64x microstepping. These sudden "jumps" are caused by the detent torque of the motor. Taking a closer look at the graph reveals that the few microsteps prior to the huge spike are inconsistent as well. The spikes are due to the step motor correcting itself over time; when error is accumulated during the 63 microsteps, the 64th step forces the motor to line up evenly between stator and rotor. After the stator and rotor are aligned, the problem is repeated during the next 1.8°.

**4118S-01 & Comparative Driver, 24V, 2.1 Amps Peak**

1.8° Motor, 64x Driver Microstep Setting



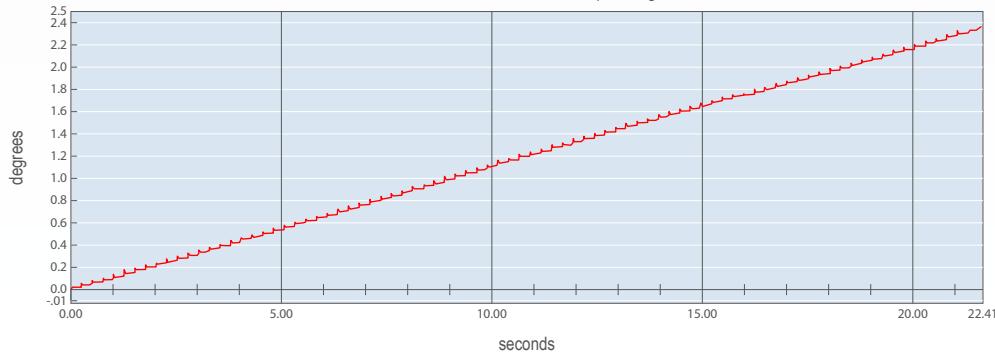
The spikes occur because of the step motor's poles, forcefully being pulled towards each other. Pole Damping Technology™, as the name implies, dampens each step as it nears the full step positions where the poles are the strongest.

When using a product with PDT, the spikes are eliminated.

The R325 driver eliminates these spikes, resulting in smooth motion and even steps.

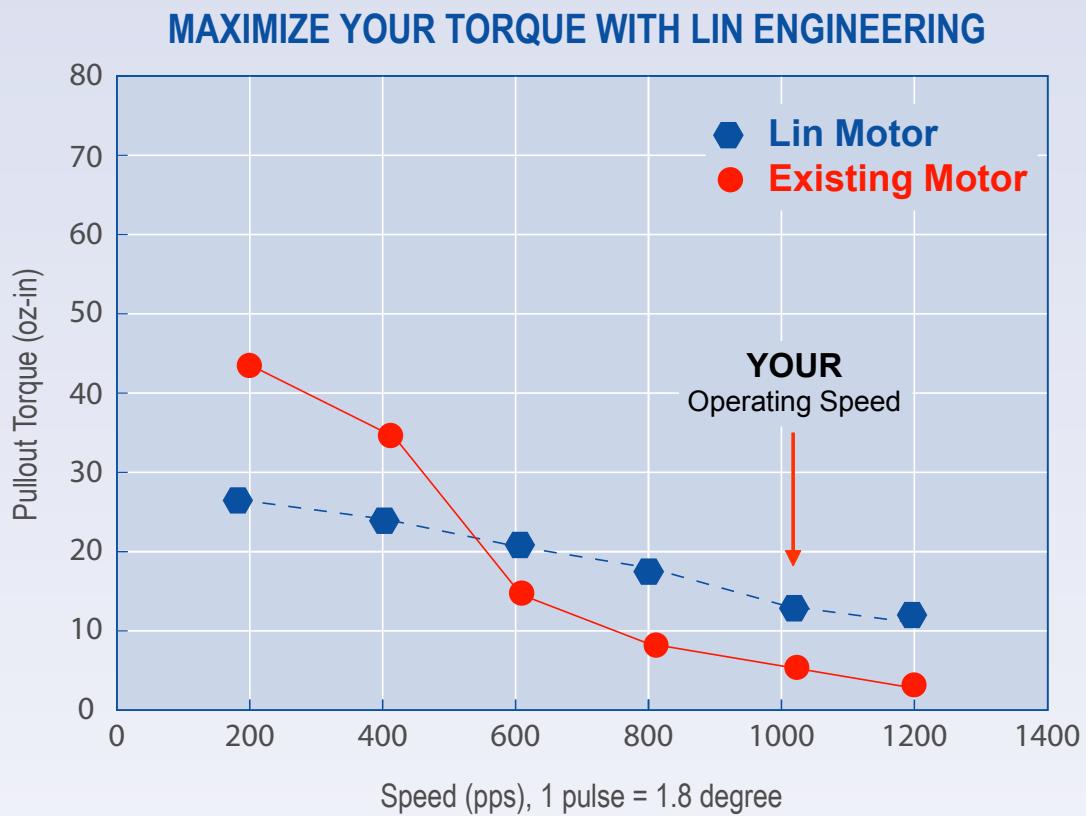
**4118S-01 & R325 Driver, 24V, 2.1 Amps Peak**

1.8° Motor, 64x Driver Microstep Setting



# MAXIMIZING TORQUE AT DESIRED SPEED

Lin Engineering specializes in maximizing torque at your desired speed. Each step motor is characterized by its speed-torque curve, or, its power output capabilities. Within the constraints of power input and motor size, Lin Engineering can design a motor by manipulating the speed-torque curve to maximize torque in a given area across the speed range. In other words, we design a motor's maximum efficiency at your desired speed. As the technical leader in step motor design, we get it right the first time by maximizing torque at your desired speed – trial and error is not an option.



This graph demonstrates what “Maximize Torque at Desired Speed” means. The existing motor has a characteristic shown with the red line. The user of this motor had an operating speed of 1000 pps and needed higher torque at that speed. Lin Engineering designed a motor, using the same motor size and power input, and manipulated the curve to output more torque at the crucial point. This crucial point is the user’s operating speed.

# 2 PHASE VS. 5 PHASE

## 2-PHASE VS. 5-PHASE STEP ACCURACY COMPARISON

To compare these two mechanically different step motors, we were able to run both motors at a step resolution such that each microstep was the equivalent of 0.018°.

2-Phase: 0.9° Motor / 50x microstepping = 0.018°

5-Phase: 0.72° Motor / 40x microstepping = 0.018°

## SPECIFICATIONS OF BOTH MOTORS

Input Voltage of 24VDC

Output Current set to motor's rated current

2- Phase: 0.6 Amps/Phase

5- Phase: 0.75 Amps/Phase

## MEASURING STEP ACCURACY

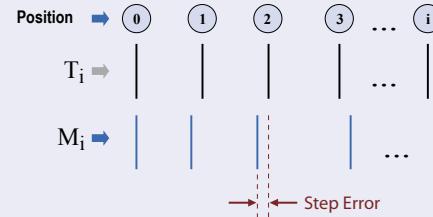
How does step accuracy work? Step error is measured in arc minutes. Arc minutes are:

$$\text{conversion factor : } 1 \text{ degree} = 60 \text{ arc minutes}$$

$$1 \text{ arc minute} \times \left( \frac{1 \text{ degree}}{60 \text{ arc minutes}} \right) = 0.017^\circ$$

$T_i$  = True position (theoretical reading)

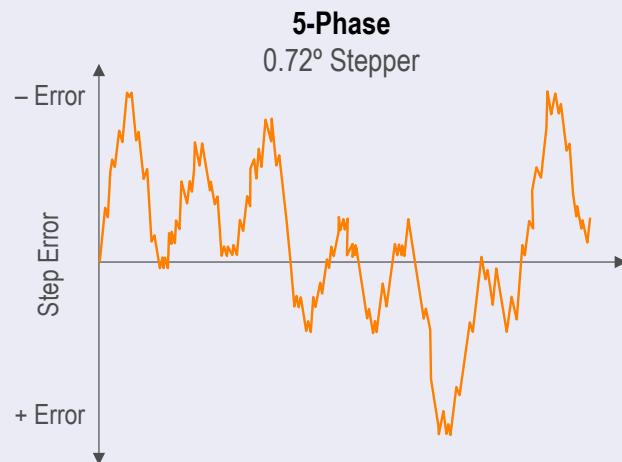
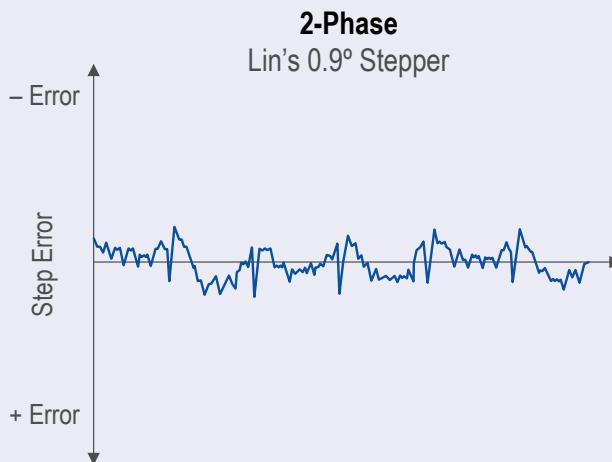
$M_i$  = Measured position (measured reading from encoder)



Example: Run a 64 microstep accuracy test on a 0.9° motor.

$$(0.9^\circ/64) \times i = T_i$$

$$M_i - T_i = \text{Step Error}$$



## ADDED BENEFIT OF 2 PHASE OVER 5 PHASE:

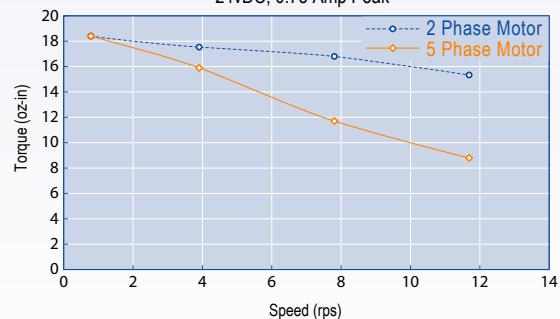
### MORE TORQUE

Not only are 0.9° 2-Phase step motors more accurate than 0.72° 5-Phase step motors, they also produce more torque as well. In a 0.72° 5-Phase step motor, there are 50 rotor teeth. A rotor and stator must be offset from each other; therefore, the maximum number of stator teeth must be less than 50 in order to create the offset spacing. Since 5-Phase steppers contain 10 poles, the maximum number of teeth per pole is 4 which will result in 40 stator teeth.

However, on a typical 0.9° 2-Phase step motor, there are 100 rotor teeth and 16 stator poles. Therefore, the maximum number of teeth allowable on each pole is 5, resulting in a total of 80 teeth on the stator. The more stator teeth, the more output torque.

2 Phase vs Comparable 5 Phase (Step Motors)

24vDC, 0.75 Amp Peak



# R-WINDING

## NEW WINDING FOR SMOOTHER, QUIETER OPERATION OF STEP MOTORS

Most step motor users are familiar with Series and Parallel connections and the T-Connection, which Lin Engineering released in 2003. The T-Connection gives the user the flexibility to maximize torque and minimize resonance at mid-range speeds. Now, the R-Winding has been developed to reduce noise and vibration for lower-torque applications.

Traditional half-stepping allows the motor to stop at one-phase ON and two-phase ON positions alternatively. The settling time characteristics of the motor are different at one-phase ON and two-phase ON. The step time profile from every controller assumes that the settling time characteristic of each step is the same. Erratic motion occurs when the step time is not synchronous with the rotor position. In addition, the different magnetic fluxes under one-phase ON and two-phase ON develop a step hysteresis.

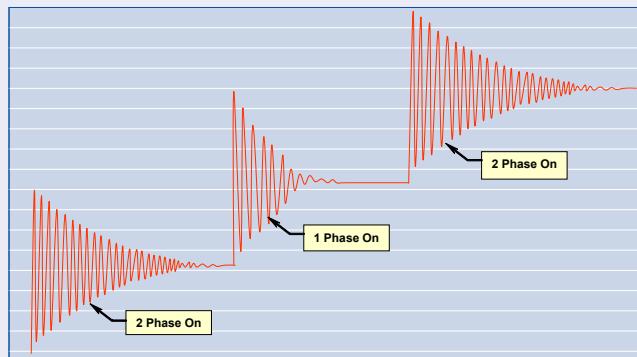
The R-Winding was created to eliminate the one-phase ON position and to maintain the same magnetic path through the entire range of half-stepping. The rotor position will be at two-phase ON at all times during half-stepping. The phase angle for each position will be  $22.5^\circ$ ,  $67.5^\circ$ ,  $112.5^\circ$ ,  $157.5^\circ$ ,  $202.5^\circ$ ,  $247.5^\circ$ ,  $292.5^\circ$ ,  $337.5^\circ$  and back to  $22.5^\circ$ . Thus, the settling time characteristic and the holding torque of each step are now identical.

For more information about Lin Engineering's R-Winding, please contact your local sales rep.

R-Connection Step Response

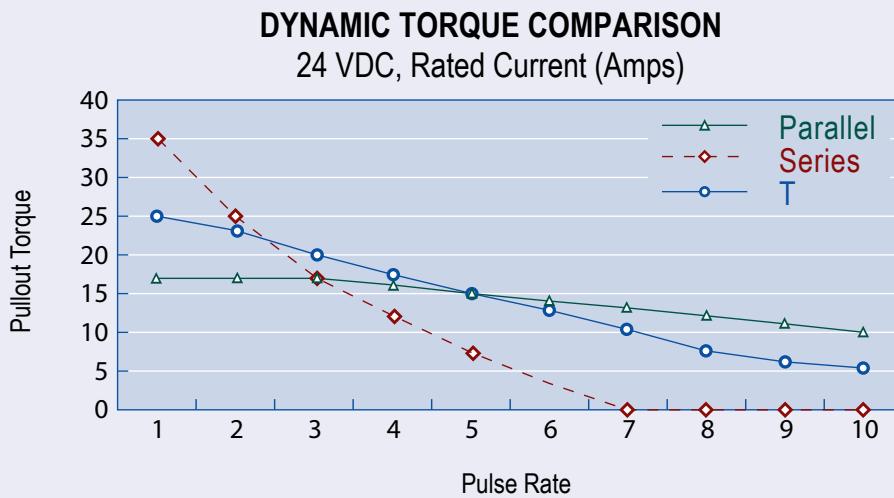


Traditional Step Response



The patented T-Connection was introduced to the market in 2003 for step motor applications requiring low vibration, low noise and smooth motion. The T-Connection is the missing link between solving issues that neither the Series nor Parallel connections can resolve. The Series connection is typically used to optimize low speed applications while the Parallel connection is used for high speed applications. The T-connection fills in the gap by optimizing torque and minimizing resonance at the mid-range speeds. Key performances occur in low noise and low vibration with the T-connection.

The speed-torque curve below depicts one motor's performance when connected in Series, Parallel, and T-Connection. In order to show an accurate comparison of all three connections, the same amount of voltage and current was supplied to the system.



The Series connection produces 4 times more inductance than a Parallel connection. This is due to the fact that inductance values will add when wires are placed in series with one another. As each pulse is sent to the motor, the current rise-time ( $\text{inductance} \propto \Delta t / \Delta I$ ) has plenty of time to reach its maximum amount, outputting more torque at the low speeds. Therefore, a high inductive motor will only work well during low pulse rates. Conversely, the Parallel connection contains lower inductance (mH) and is therefore the choice for high speed applications. At the higher speeds, each pulse is so quick, only small values of inductance will be able to work optimally. Currents must reach its maximum value with the given amount of time per pulse ( $\text{inductance} \propto \Delta t / \Delta I$ ).

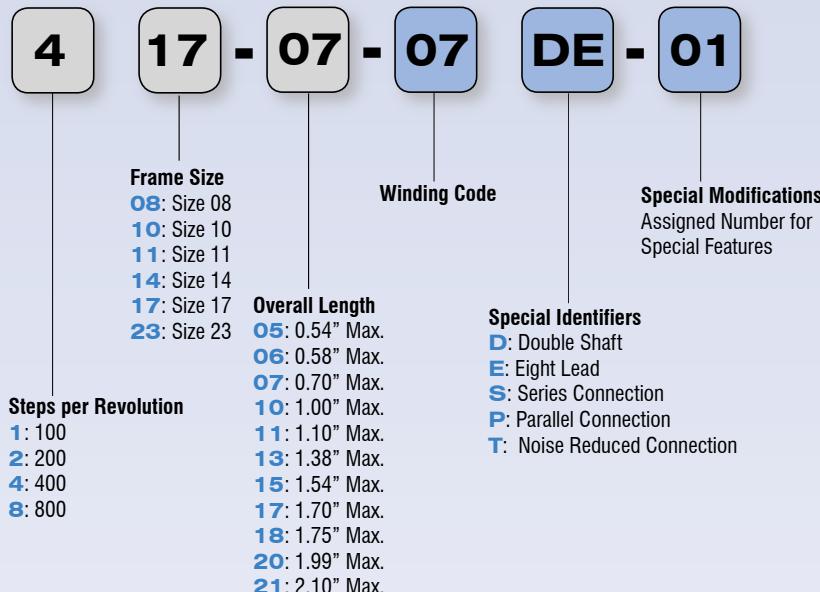
The T-Connection is ideal for low to mid ranged speeds requiring low noise and low vibration. For customers requiring a solution that neither the Series nor Parallel connection will solve, the T-Connection is a possibility.

Lin Engineering specializes in winding a motor specific to users' speed and torque requirements. The T-Connection gives us the flexibility to optimize torque and minimize resonance, especially at the low to mid-range speeds. Contact Lin Engineering for more information on the patented T-Connection and the T-Connection wiring diagram.

# LIN STANDARD PART NUMBERING SYSTEMS

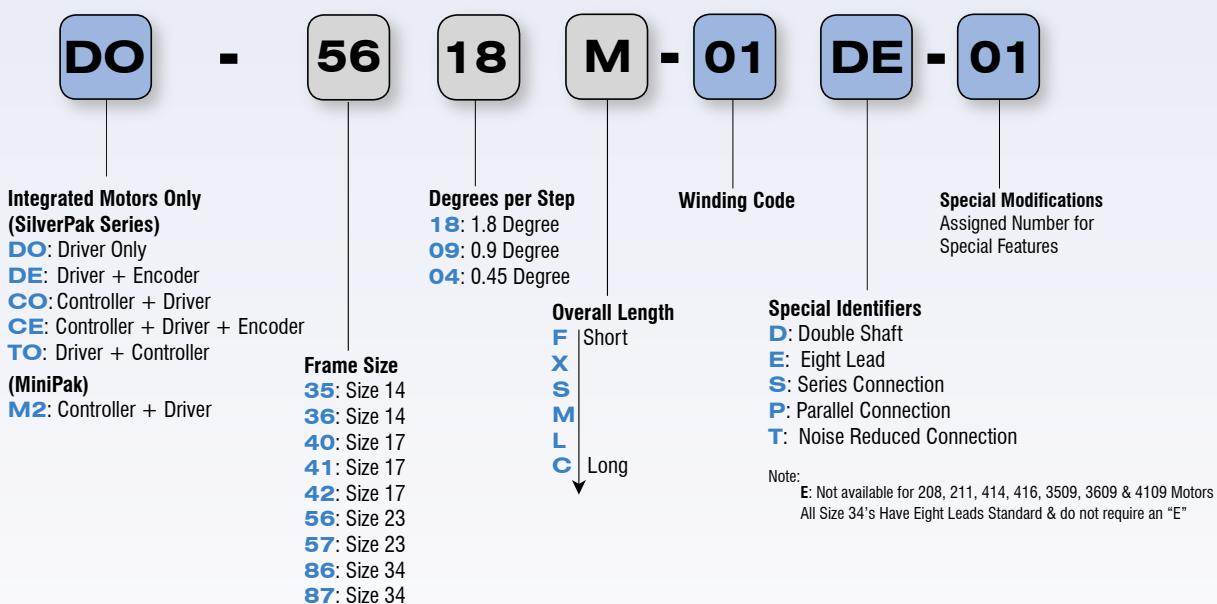
## SYSTEM 1

Example: 417-07-07DE-01



## SYSTEM 2

Example: 5618M-01DE-01



# STEP MOTORS

STEP  
MOTORS



NEMA Size 23  
0.45° Motor  
pg.11

3509



NEMA Size 14  
0.9° Motor  
pg.13

3609



NEMA Size 14  
0.9° Motor  
pg.15

416-05/06



NEMA Size 17  
0.9° Motor  
pg.17

416-07



NEMA Size 17  
0.9° Motor  
pg.19

4109



NEMA Size 17  
0.9° Motor  
pg.21

4209



NEMA Size 17  
0.9° Motor  
pg.23

417



NEMA Size 17  
0.9° Motor  
pg.25

5609



NEMA Size 23  
0.9° Motor  
pg.27

5709



NEMA Size 23  
0.9° Motor  
pg.29

208



NEMA Size 8  
1.8° Motor  
pg.31

211



NEMA Size 11  
1.8° Motor  
pg.33

3518



NEMA Size 14  
1.8° Motor  
pg.35

4018



NEMA Size 17  
1.8° Motor  
pg.37

4218



NEMA Size 17  
1.8° Motor  
pg.39

4118



NEMA Size 17  
1.8° Motor  
pg.41

5618



NEMA Size 23  
1.8° Motor  
pg.43

5718



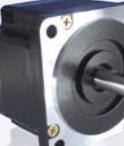
NEMA Size 23  
1.8° Motor  
pg.45

8618



NEMA Size 34  
1.8° Motor  
pg.47

8718



NEMA Size 34  
1.8° Motor  
pg.49

IP65



NEMA Size 17 & 23  
1.8° Motor  
pg.51

VACUUM



NEMA Size 11  
1.8° Motor  
pg.51

\*motors are not to scale

STEP  
MOTORS

INTEGRATED  
MOTORS

CUSTOM  
DESIGNS

ACCESSORIES

RMS  
TECHNOLOGIES

TRINAMIC

5704



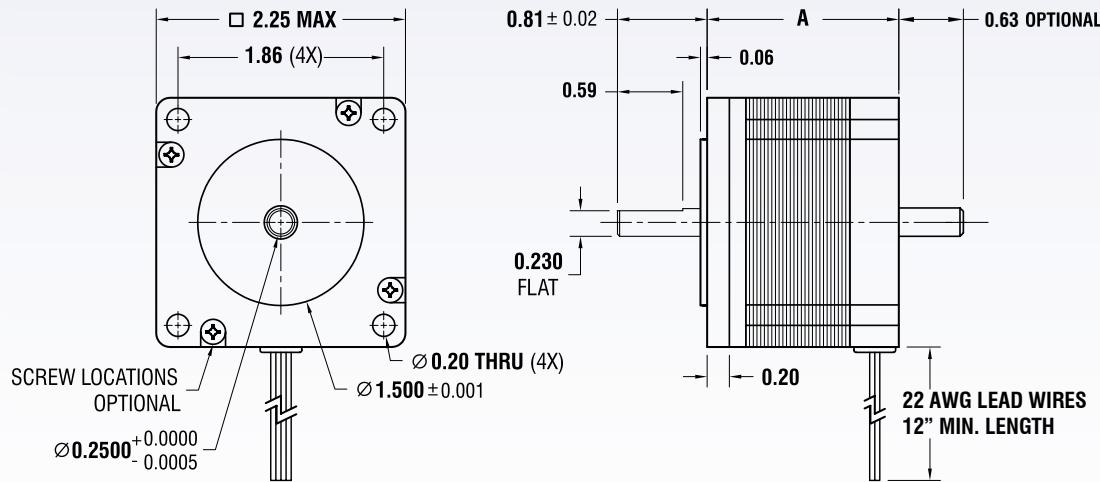
- High Torque
- Highest Step Accuracy and Resolution
- High Inertia
- Custom Windings Available (No Additional Cost)
- 0.45° Full Step ±0.017° (1 arc minute)

## ■ SPECIFICATIONS

| BIPOLAR        | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in² | Weight Lbs. | Number of Leads |
|----------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------|-------------|-----------------|
| 1.73"<br>44 mm | 5704X-01          | 1.50    | 75.0       | 0.53         | 3.0        | 2.6                  | 1.00                | 1.05           | 1.05        | 4               |
|                | 5704X-02          | 1.80    | 75.0       | 0.53         | 2.0        | 1.8                  | 1.00                | 1.05           | 1.05        | 4               |
|                | 5704X-10          | 0.90    | 75.0       | 0.53         | 9.6        | 11.9                 | 1.00                | 1.05           | 1.05        | 4               |
|                | 5704X-15          | 2.50    | 75.0       | 0.53         | 1.2        | 1.8                  | 1.00                | 1.05           | 1.05        | 4               |
| 2.17"<br>55 mm | 5704M-02          | 1.80    | 140.0      | 0.99         | 3.0        | 3.3                  | 2.10                | 1.50           | 1.50        | 4               |
|                | 5704M-03          | 3.00    | 140.0      | 0.99         | 1.2        | 1.2                  | 2.10                | 1.50           | 1.50        | 4               |
|                | 5704M-10          | 0.90    | 140.0      | 0.99         | 11.7       | 16.4                 | 2.10                | 1.50           | 1.50        | 4               |

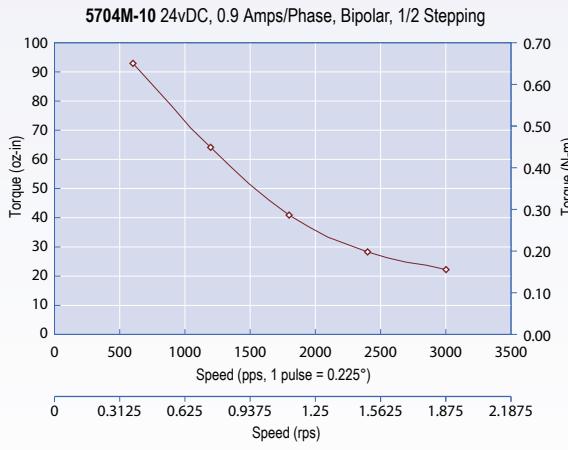
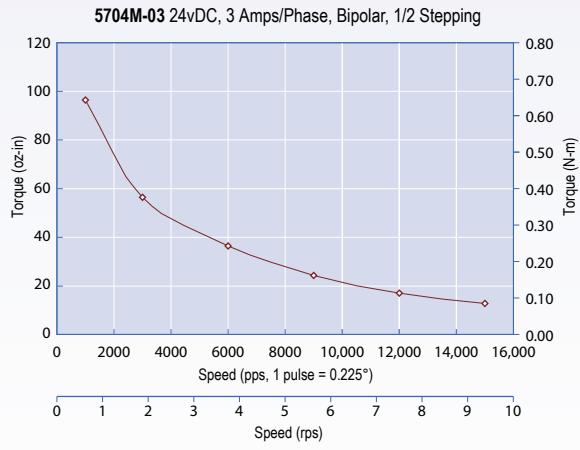
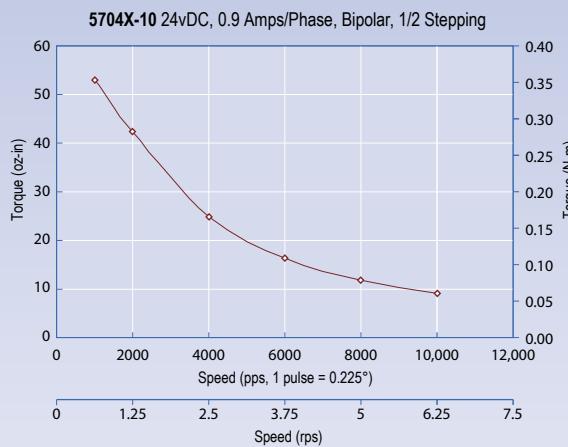
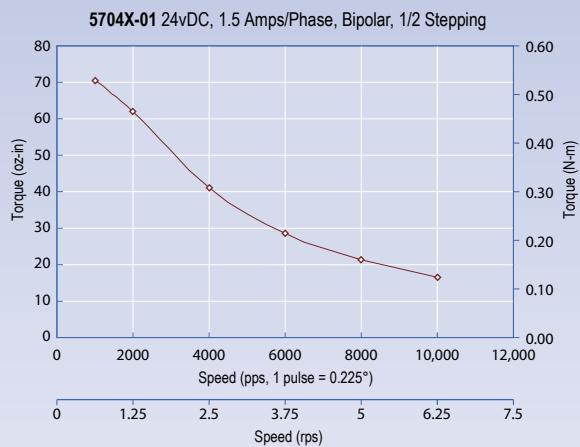
- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the rated current.
- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

## ■ DIMENSIONS (inches)



## DID YOU KNOW...

Lin Engineering is the only manufacturer of 0.45° two phase NEMA 23 step motors. It's the highest resolution 2-phase step motor in the industry.

**TORQUE CURVES****DID YOU KNOW...**

Lin Engineering inventories components in Santa Clara, CA to provide our customers with short lead-times and to support volume production overseas.



- NEMA Size 14 or 17 Mountings
- Small Package
- Cost Effective
- Custom Windings Available (No Additional Cost)

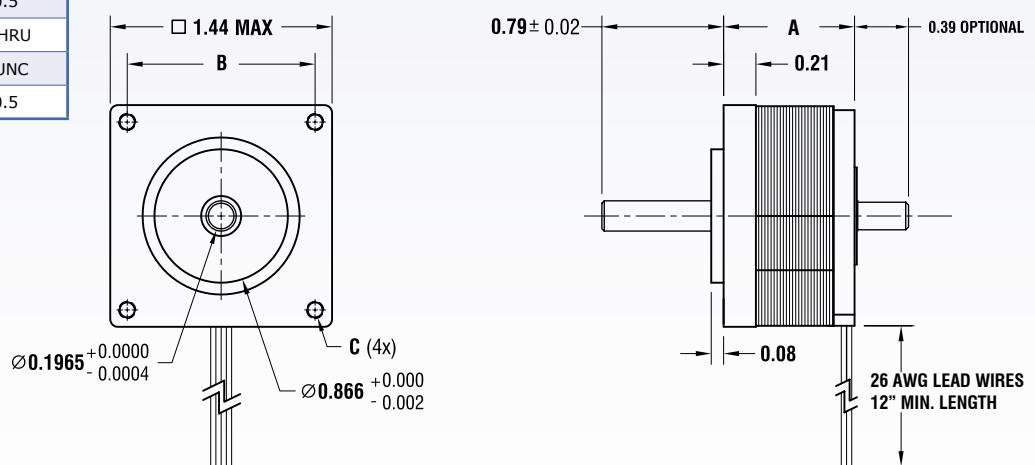
## SPECIFICATIONS

| BIPOLAR          | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in² | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------|-------------|-----------------|
| 0.85"<br>21.6 mm | 3509V-03          | 1.20    | 16.0       | 0.11         | 3.0        | 1.2                  | 0.07                | 0.27           | 0.27        | 4               |
|                  | 3509V-06          | 0.80    | 16.0       | 0.11         | 7.0        | 6.0                  | 0.07                | 0.27           | 0.27        | 4               |
|                  | 3509V-18          | 0.60    | 16.0       | 0.11         | 10.0       | 7.7                  | 0.07                | 0.27           | 0.27        | 4               |

- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the motor's rated current.
- Call Lin Engineering for additional Bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

## DIMENSIONS (inches)

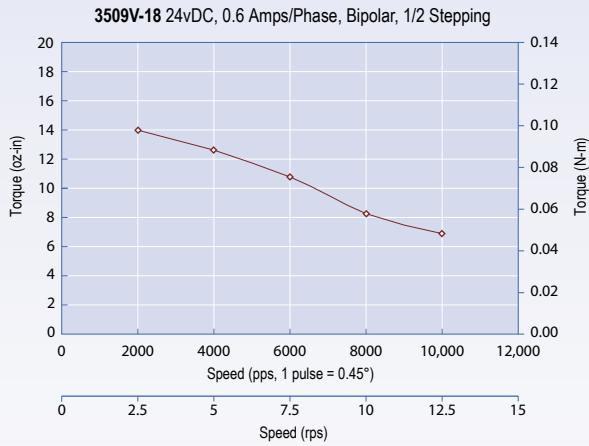
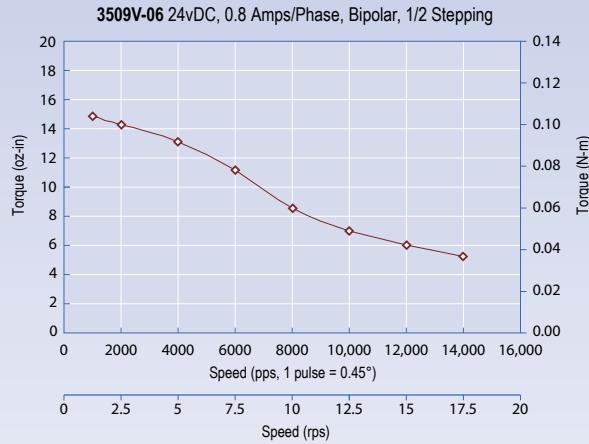
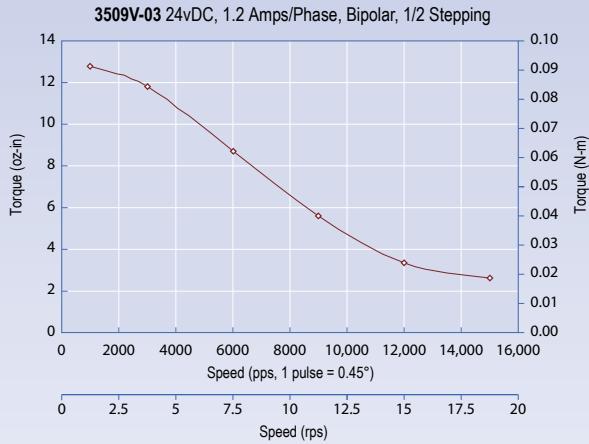
| Mounting Option | Mounting Size | Dim B | Dim C      |
|-----------------|---------------|-------|------------|
| 1               | 17            | 1.22" | #4-40 UNC  |
| 2               | 17            | 1.22" | M3 x 0.5   |
| 3               | 17            | 1.22" | 0.130 THRU |
| 4               | 14            | 1.14" | #4-40 UNC  |
| 5               | 14            | 1.14" | M3 x 0.5   |



## DID YOU KNOW...

Lin Engineering has the capability to increase the dynamic torque when constrained to a specific motor size.

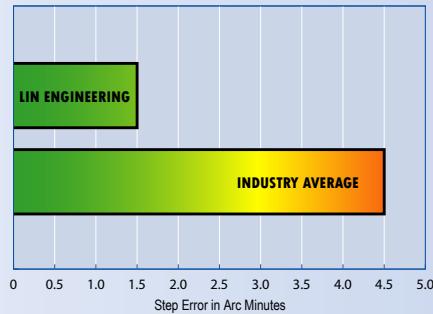
## TORQUE CURVES



## DID YOU KNOW...

Lin Engineering Step Motors have smooth motion because of their high accuracy. Our 3509V and 3609V Series 0.9° steppers have a step error of only  $\pm 1.5$  arc minutes at 1/64 microstepping.

The average step motor step error is  $\pm 4.5$  arc minutes at 1/64 microstepping. When you have three times less step error, you get smoother motion.



## 3609 SERIES



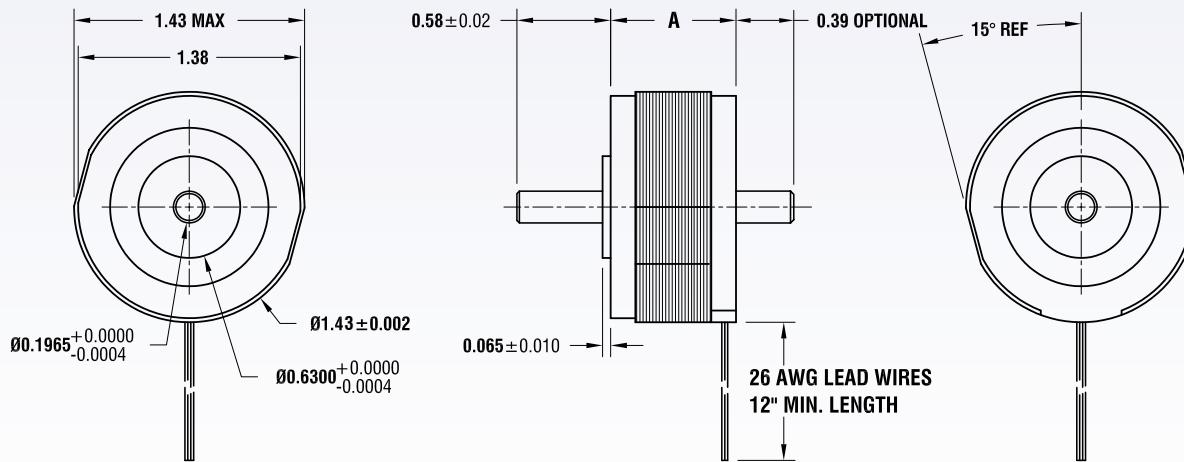
- Modular Step Motor
- High Step Accuracy & Resolution
- Ideal for Your Custom Housings
- Custom Windings Available (No Additional Cost)

## ■ SPECIFICATIONS

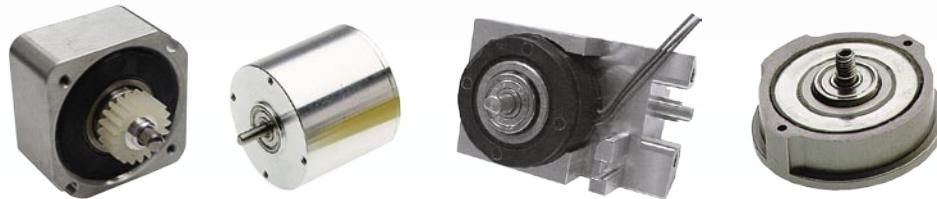
| BIPOLAR          | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in² | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------|-------------|-----------------|
| 0.50"<br>12.7 mm | 3609Z-12          | 0.30    | 4.0        | 0.03         | 15.4       | 2.0                  | 0.02                | 0.12           | 0.12        | 4               |
|                  | 3609Z-14          | 0.25    | 4.0        | 0.03         | 15.4       | 7.2                  | 0.02                | 0.12           | 0.12        | 4               |
| 0.54"<br>14 mm   | 3609Y-51          | 0.60    | 6.0        | 0.04         | 4.0        | 2.8                  | 0.02                | 0.16           | 0.16        | 4               |
|                  | 3609X-15          | 0.30    | 6.0        | 0.04         | 15.1       | 9.1                  | 0.04                | 0.18           | 0.18        | 4               |
| 0.58"<br>15 mm   | 3609X-51          | 0.60    | 6.0        | 0.04         | 5.0        | 2.8                  | 0.04                | 0.18           | 0.18        | 4               |
|                  | 3609V-03          | 1.20    | 16.0       | 0.11         | 3.0        | 2.0                  | 0.07                | 0.27           | 0.27        | 4               |
| 0.78"<br>19.8 mm | 3609V-06          | 0.80    | 16.0       | 0.11         | 7.0        | 6.0                  | 0.07                | 0.27           | 0.27        | 4               |
|                  | 3609V-18          | 0.60    | 16.0       | 0.11         | 10.0       | 8.0                  | 0.07                | 0.27           | 0.27        | 4               |

- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the motor's rated current.
- Call Lin Engineering for additional Bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

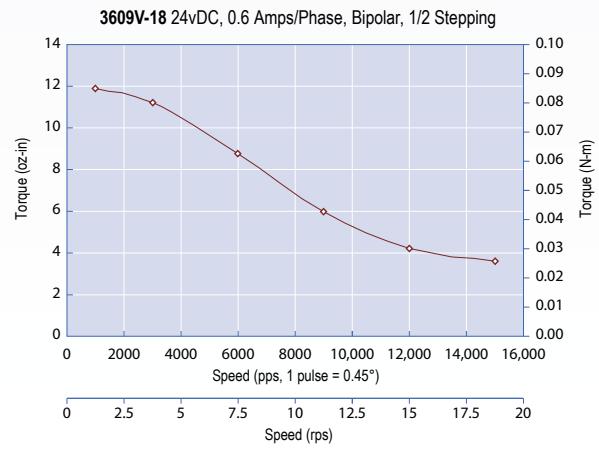
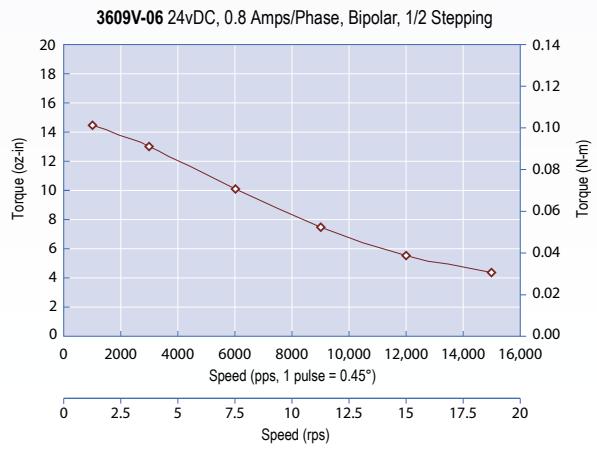
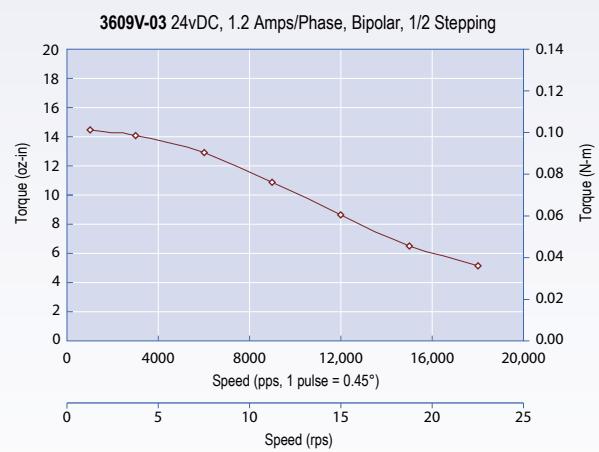
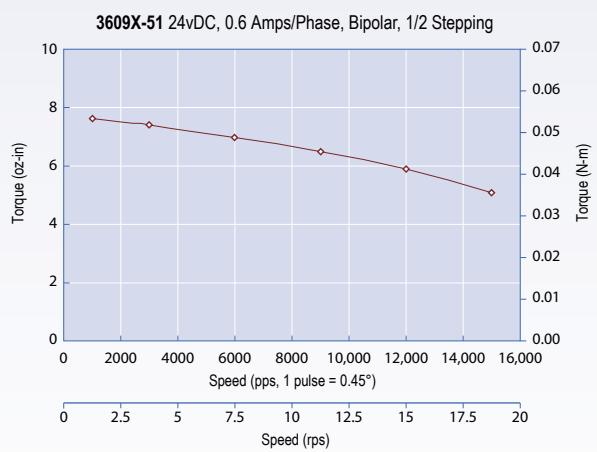
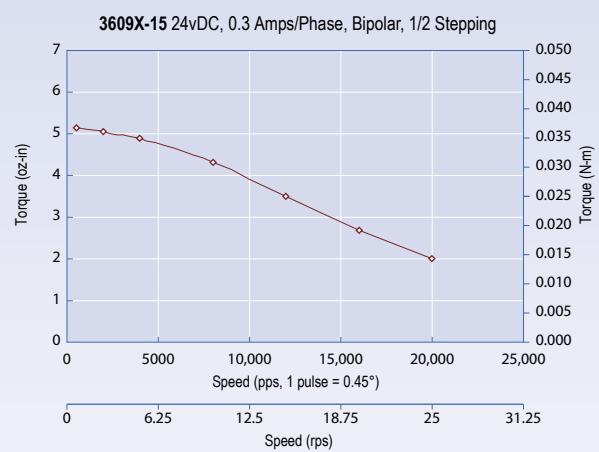
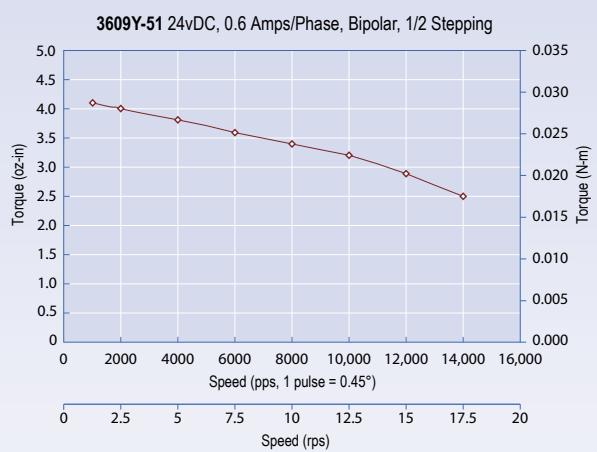
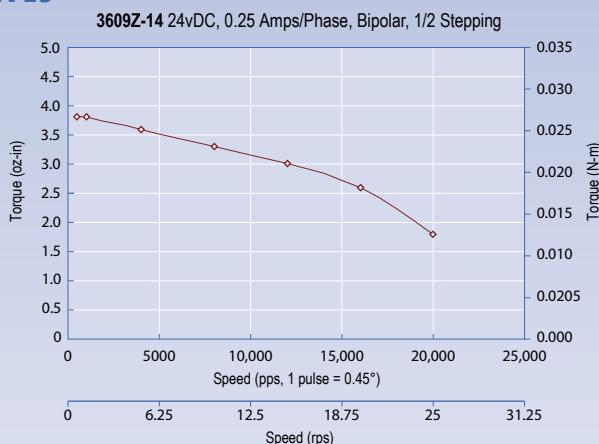
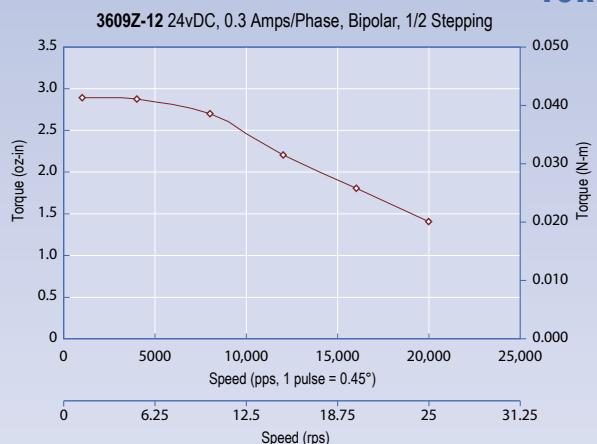
## ■ DIMENSIONS (inches)



## ■ WHAT TYPE OF DESIGN CAN YOU PUT OUR 3609V IN?



\* For more housing options, see page 66.

**TORQUE CURVES**



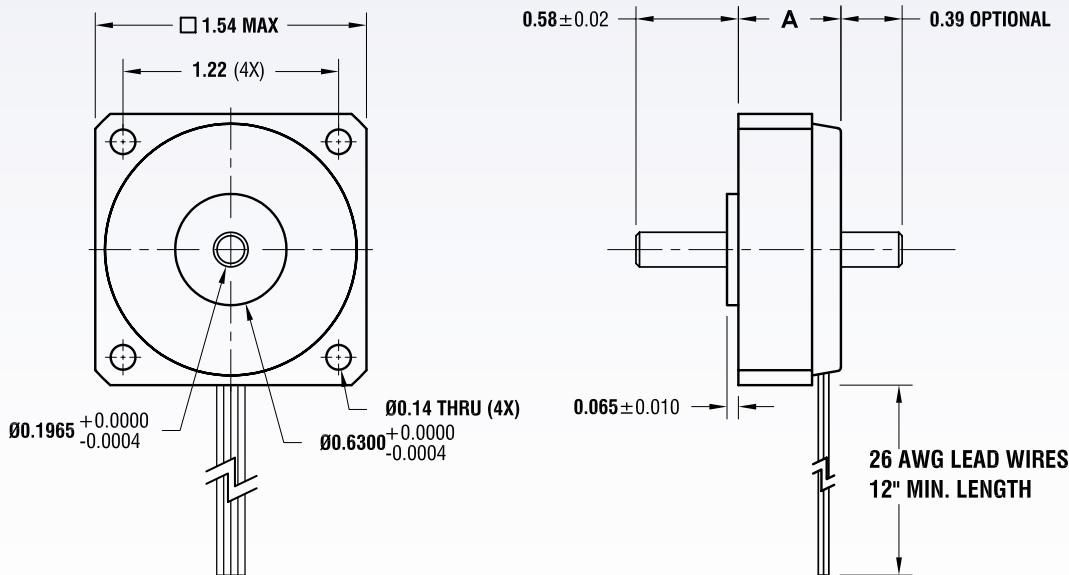
- NEMA Size 17 Mounting
- Low Inertia
- Excellent Step Accuracy
- Ideal for High Speed Applications
- Low Profile and Compact Size
- Custom Windings Available (No Additional Cost)

## SPECIFICATIONS

| BIPOLAR          | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 0.54"<br>14 mm   | 416-05-03         | 0.70    | 6.0        | 0.04         | 3.0        | 1.8                  | 0.03                | 0.20                       | 0.20        | 4               |
|                  | 416-05-04         | 0.60    | 6.0        | 0.04         | 5.0        | 3.0                  | 0.03                | 0.20                       | 0.20        | 4               |
|                  | 416-05-17         | 0.30    | 6.0        | 0.04         | 17.5       | 10.0                 | 0.03                | 0.20                       | 0.20        | 4               |
|                  | 416-05-50         | 0.10    | 6.0        | 0.04         | 50.0       | 13.4                 | 0.03                | 0.20                       | 0.20        | 4               |
|                  | 416-05-60         | 0.15    | 6.0        | 0.04         | 63.5       | 33.9                 | 0.03                | 0.20                       | 0.20        | 4               |
| 0.58"<br>14.7 mm | 416-06-05         | 0.60    | 7.3        | 0.05         | 4.5        | 2.8                  | 0.04                | 0.21                       | 0.21        | 4               |
|                  | 416-06-57         | 0.21    | 7.3        | 0.05         | 57.1       | 32.0                 | 0.04                | 0.21                       | 0.21        | 4               |

- Please complete our application data sheet for different windings.
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- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

## DIMENSIONS (inches)

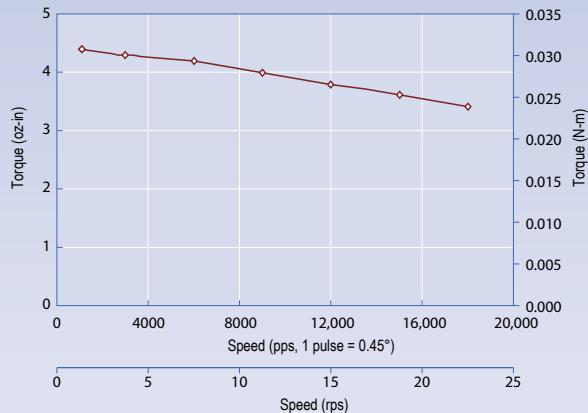


## DID YOU KNOW...

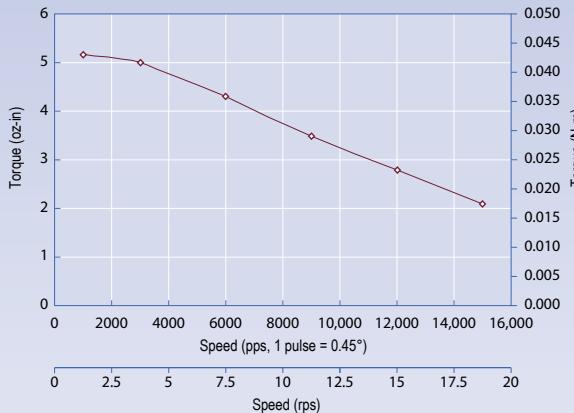
Standard step motors are designed to withstand and operate with case temperatures up to 90°C.

## TORQUE CURVES

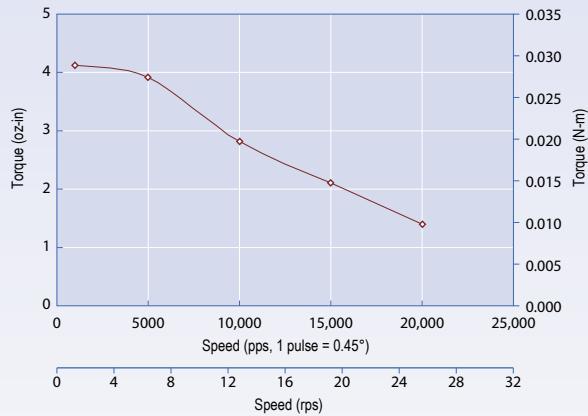
416-05-03 24vDC, 0.7 Amps/Phase, Bipolar, 1/2 Stepping



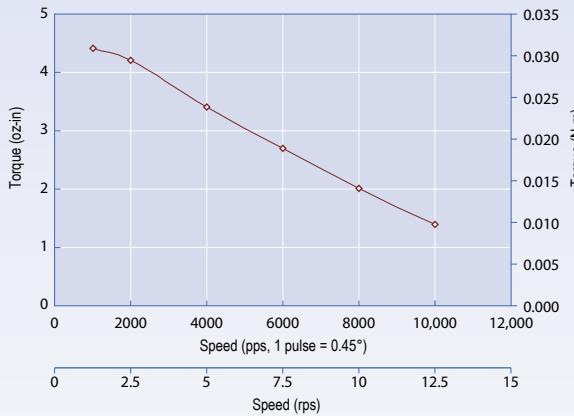
416-05-04 24vDC, 0.60 Amps/Phase, Bipolar, 1/2 Stepping



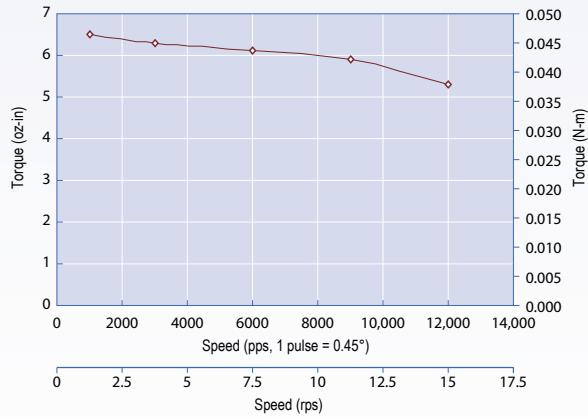
416-05-17 24vDC, 0.3 Amps/Phase, Bipolar, 1/2 Stepping



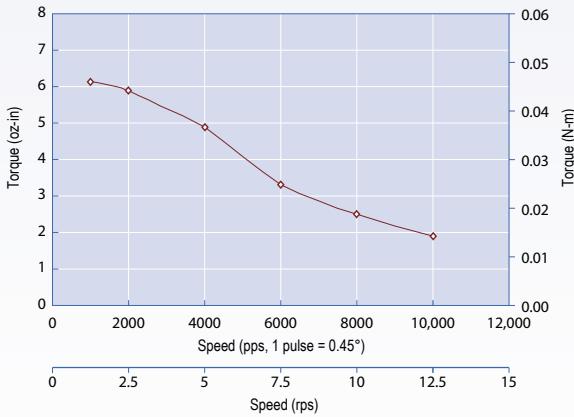
416-05-60 24vDC, 0.15 Amps/Phase, Bipolar, 1/2 Stepping



416-06-05 24vDC, 0.60 Amps/Phase, Bipolar, 1/2 Stepping



416-06-57 24vDC, 0.21 Amps/Phase, Bipolar, 1/2 Stepping



## DID YOU KNOW...

Lin Engineering's step motor operates the optical disk drive in the B-2 Stealth Bomber.





- NEMA Size 17 Mounting
- Low Inertia
- Ideal for High Speed Applications
- Low Profile and Compact Size
- Custom Windings Available (No Additional Cost)

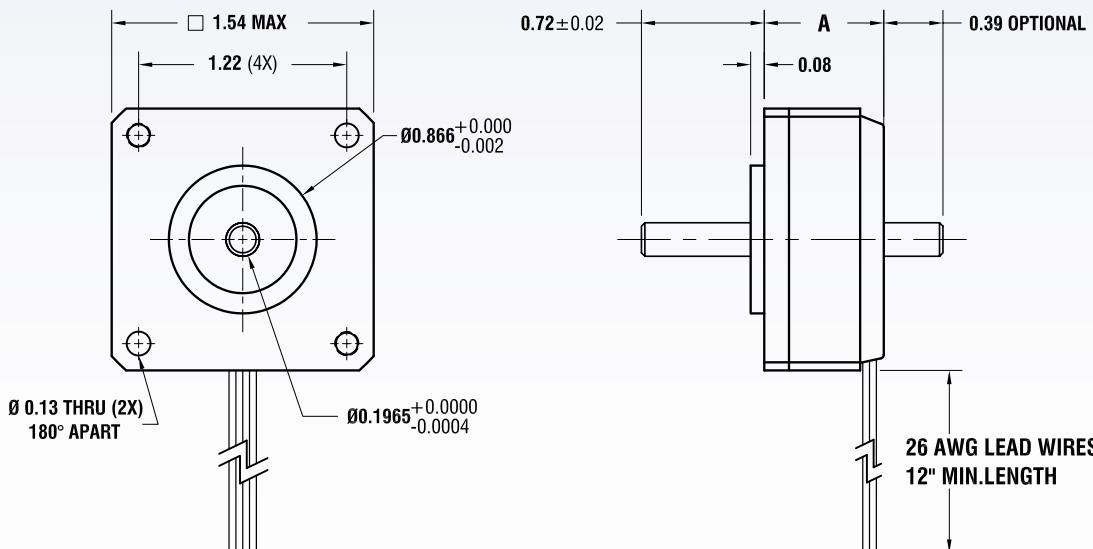
## ■ SPECIFICATIONS

| BIPOLAR | Dimension "A" Max | Model #   | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|---------|-------------------|-----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|         | 0.70"<br>17.8 mm  | 416-07-05 | 0.60       | 8.4          | 0.06       | 5.4                  | 2.8                 | 0.04                       | 0.23        | 4               |
|         |                   | 416-07-80 | 0.16       | 8.4          | 0.06       | 68.0                 | 33.5                | 0.04                       | 0.23        | 4               |

| UNIPOLAR | Dimension "A" Max | Model #   | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|----------|-------------------|-----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|          | 0.70"<br>17.8 mm  | 416-07-06 | 0.50       | 6.0          | 0.04       | 6.0                  | 1.5                 | 0.04                       | 0.23        | 6               |
|          |                   | 416-07-14 | 0.36       | 6.0          | 0.04       | 14.0                 | 3.4                 | 0.04                       | 0.23        | 6               |
|          |                   | 416-07-65 | 0.18       | 6.0          | 0.04       | 62.4                 | 12.5                | 0.04                       | 0.23        | 6               |

- Please complete our application data sheet for different windings.
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- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

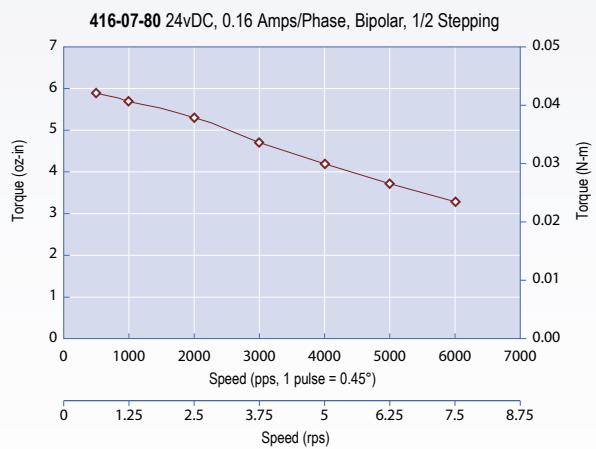
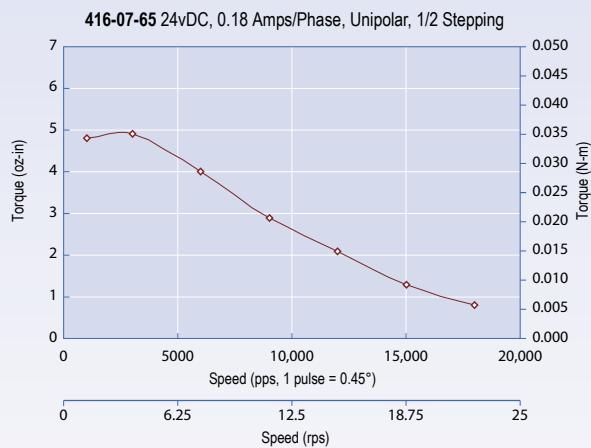
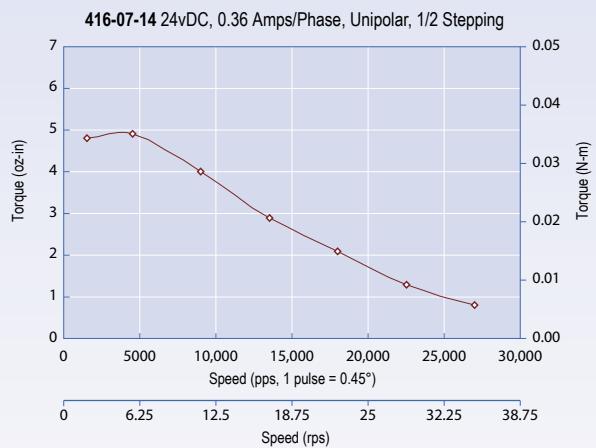
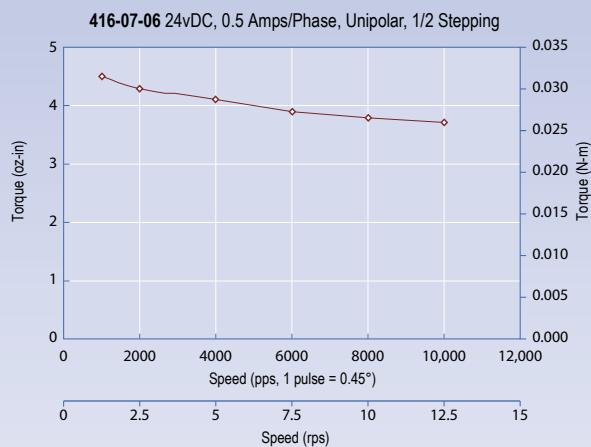
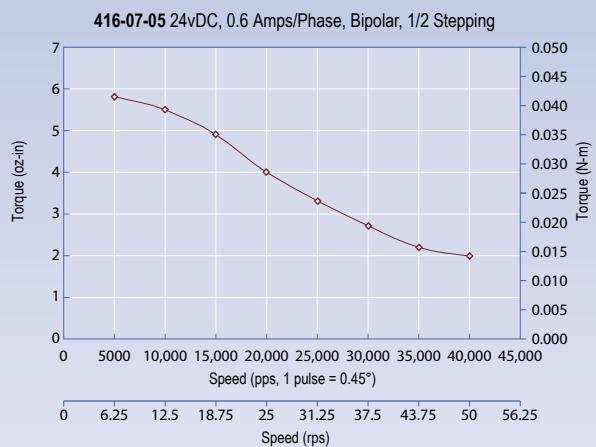
## ■ DIMENSIONS (inches)



## DID YOU KNOW...

Lin Engineering is the largest volume manufacturer of the 0.9° Size 17 step motor.

## TORQUE CURVES



DID YOU KNOW...

Lin Engineering has full manufacturing capabilities in Santa Clara, CA.

4109



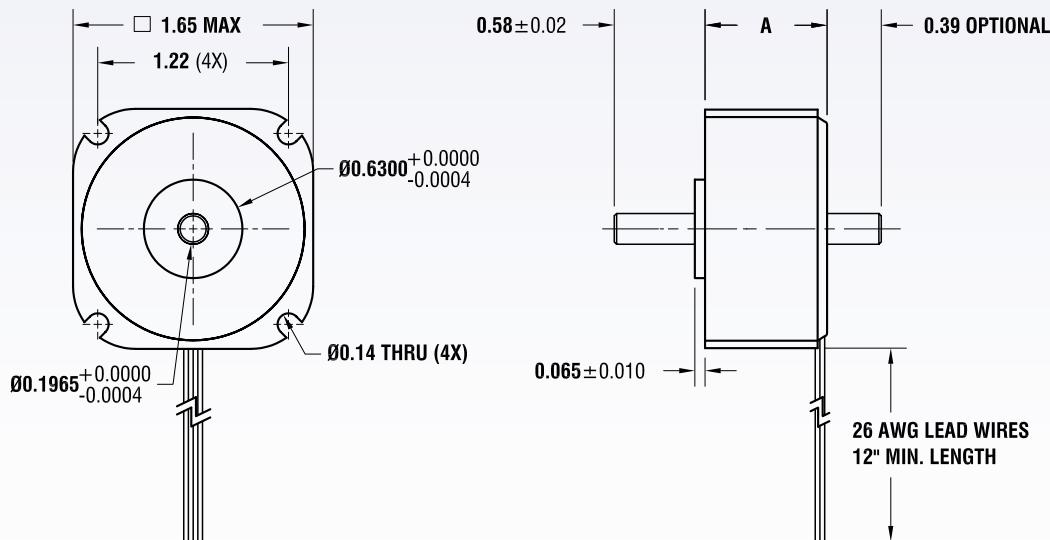
- NEMA Size 17 Mounting
- Low Inertia
- Ideal for High Speed Applications
- Custom Windings Available (No Additional Cost)

## SPECIFICATIONS

| BIPOLAR | Dimension "A" Max | Model #  | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|---------|-------------------|----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|         | 0.47"<br>11.9 mm  | 4109Z-51 | 0.50       | 3.0          | 0.02       | 4.1                  | 2.5                 | 0.02                       | 0.12        | 4               |
|         | 0.54"<br>14 mm    | 4109Y-51 | 0.60       | 6.0          | 0.04       | 5.0                  | 2.8                 | 0.03                       | 0.16        | 4               |
|         | 0.58"<br>15 mm    | 4109X-51 | 0.60       | 7.0          | 0.05       | 5.0                  | 2.8                 | 0.04                       | 0.18        | 4               |
|         | 0.78"<br>19.8 mm  | 4109V-51 | 1.20       | 15.0         | 0.11       | 3.0                  | 2.2                 | 0.08                       | 0.28        | 4               |
|         | 1.10"<br>28 mm    | 4109R-05 | 0.80       | 22.0         | 0.14       | 6.5                  | 4.4                 | 0.11                       | 0.41        | 4               |
|         |                   | 4109R-08 | 0.60       | 22.0         | 0.14       | 11.6                 | 7.8                 | 0.11                       | 0.41        | 4               |

- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the rated current.
- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

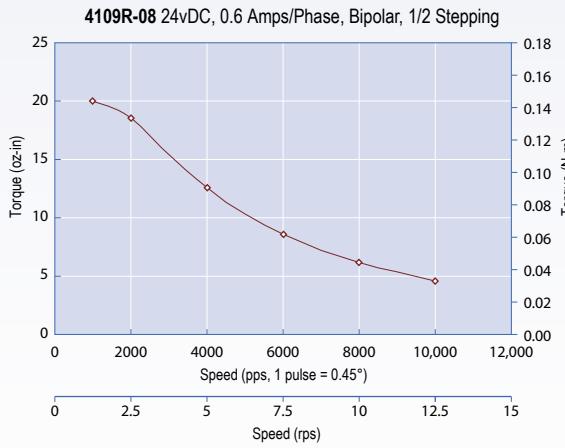
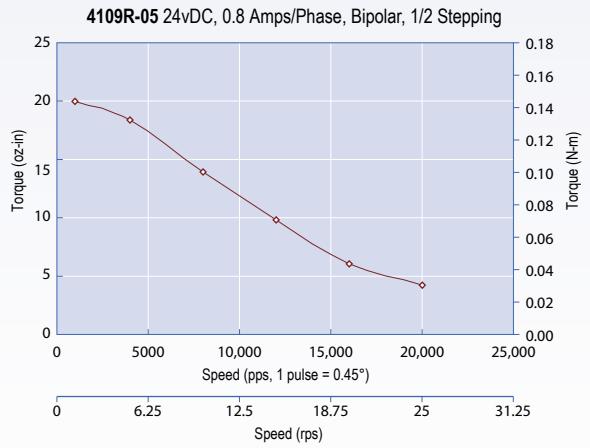
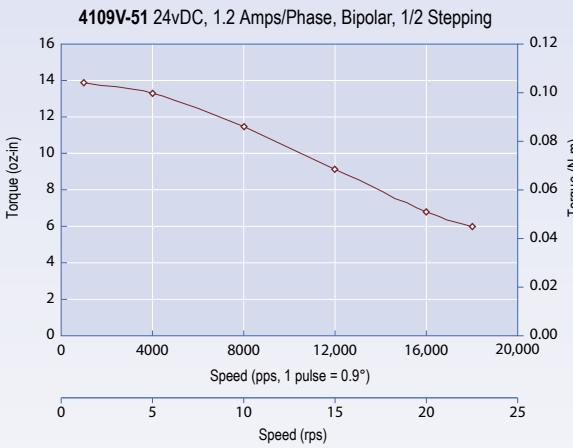
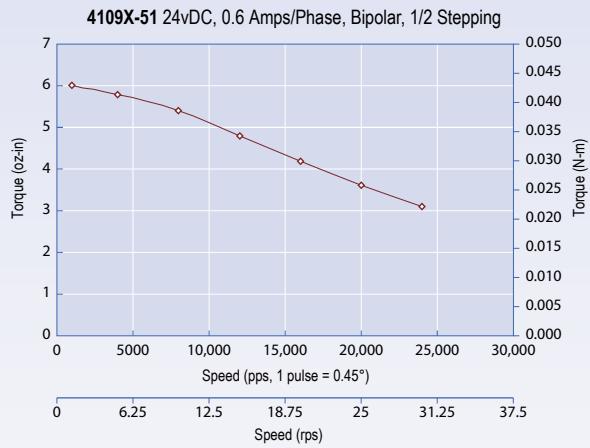
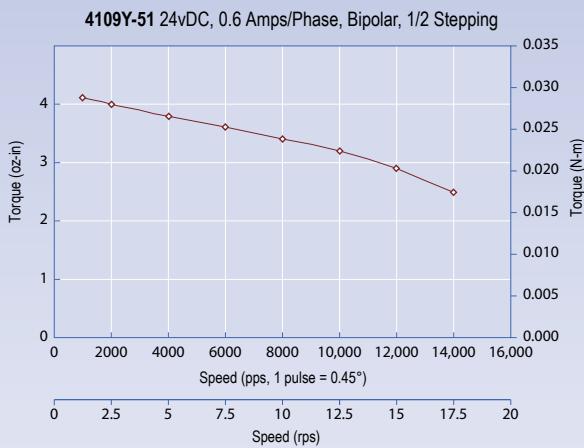
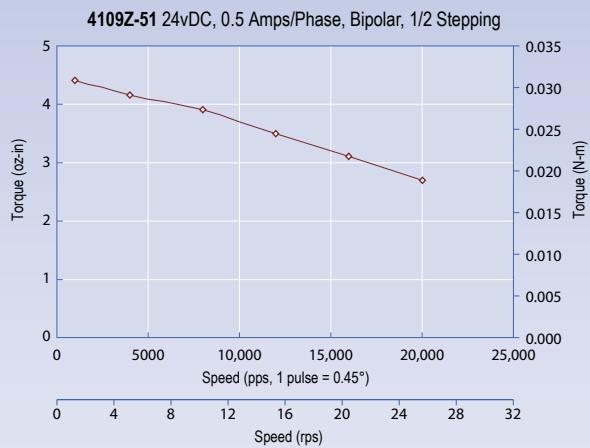
## DIMENSIONS (inches)



## DID YOU KNOW...

Lin Engineering's motor selection process has a 90% application success rate. There is no need for customers to go through trial and error in the motor selection process.

## TORQUE CURVES



### DID YOU KNOW...

Lin Engineering has their own quality team in China to guarantee quality products prior to shipping.

4209



- NEMA Size 17 Mounting
- Wide Selection
- Cost Effective 0.9° Stepper
- Custom Windings Available (No Additional Cost)

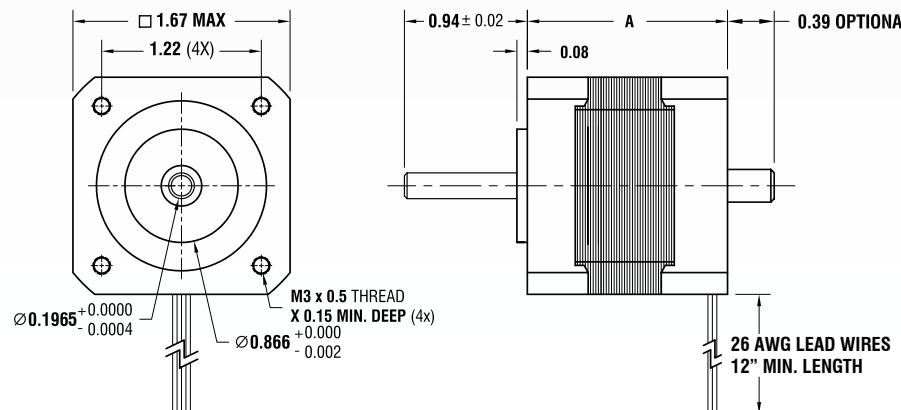
## ■ SPECIFICATIONS

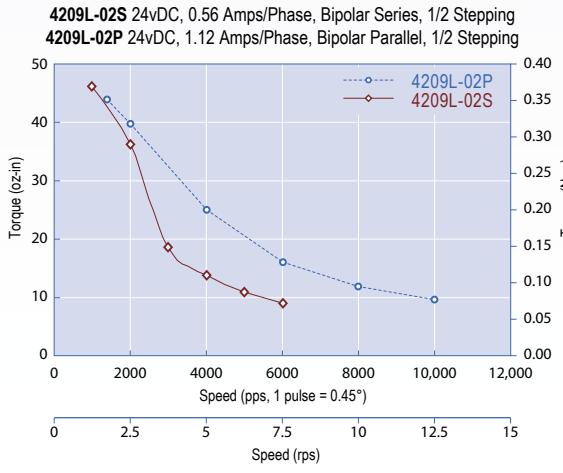
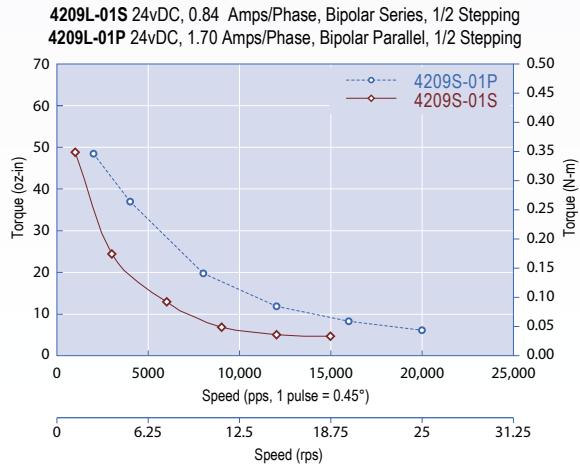
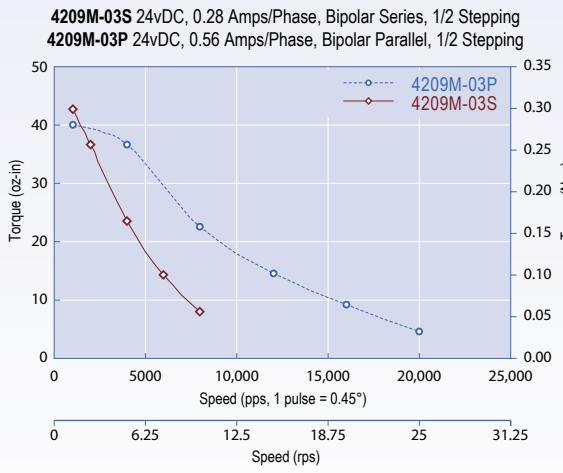
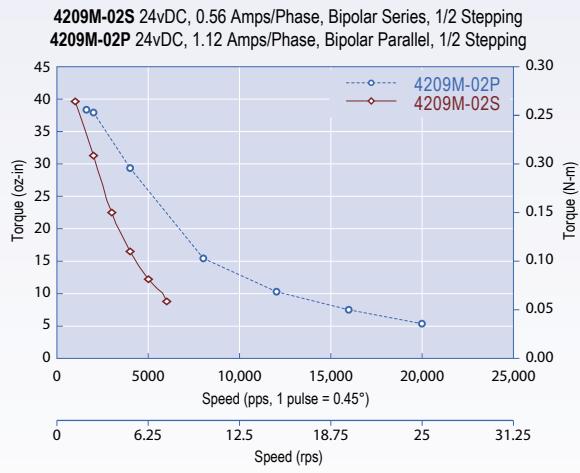
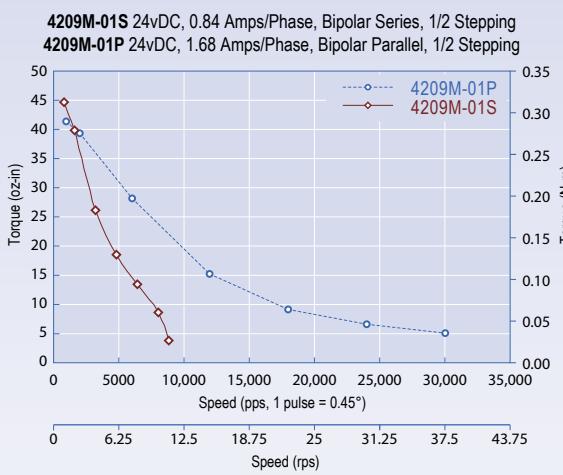
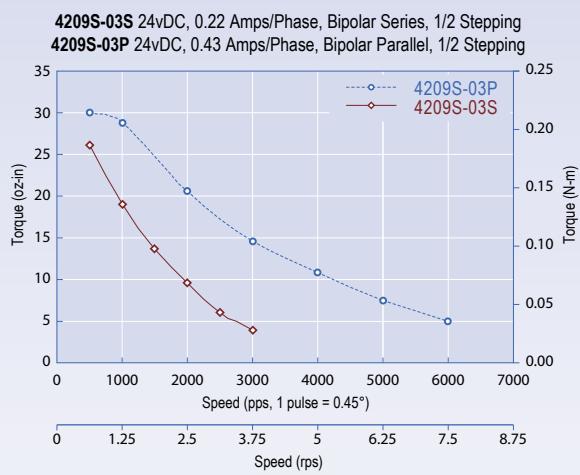
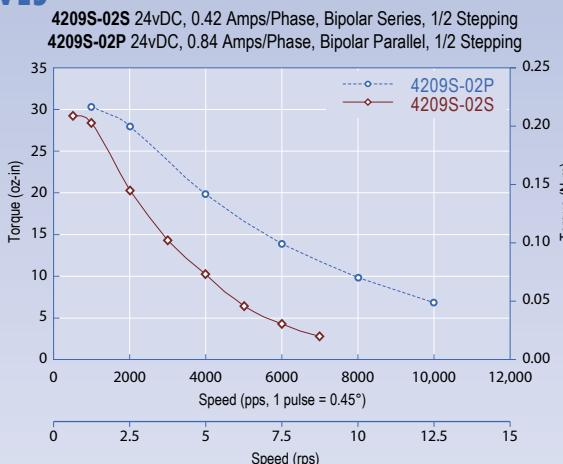
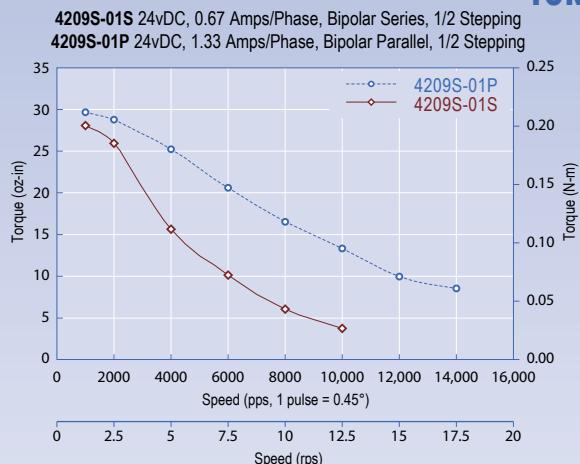
| BIPOLAR          | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 1.34"<br>34 mm   | 4209S-01S         | 0.67    | 31.0       | 0.22         | 9.6        | 18.4                 | 0.19                | 0.44                       | 0.44        | 4               |
|                  | 4209S-01P         | 1.33    | 31.0       | 0.22         | 2.4        | 4.6                  | 0.19                | 0.44                       | 0.44        | 4               |
|                  | 4209S-02S         | 0.42    | 31.0       | 0.22         | 19.2       | 39.7                 | 0.19                | 0.44                       | 0.44        | 4               |
|                  | 4209S-02P         | 0.84    | 31.0       | 0.22         | 4.8        | 9.9                  | 0.19                | 0.44                       | 0.44        | 4               |
|                  | 4209S-03S         | 0.22    | 31.0       | 0.22         | 74.4       | 172.0                | 0.19                | 0.44                       | 0.44        | 4               |
|                  | 4209S-03P         | 0.43    | 31.0       | 0.22         | 18.6       | 43.0                 | 0.19                | 0.44                       | 0.44        | 4               |
| 1.57"<br>39.9 mm | 4209M-01S         | 0.84    | 51.0       | 0.36         | 6.1        | 15.2                 | 0.30                | 0.56                       | 0.56        | 4               |
|                  | 4209M-01P         | 1.68    | 51.0       | 0.36         | 1.5        | 3.8                  | 0.30                | 0.56                       | 0.56        | 4               |
|                  | 4209M-02S         | 0.56    | 51.0       | 0.36         | 11.0       | 22.1                 | 0.30                | 0.56                       | 0.56        | 4               |
|                  | 4209M-02P         | 1.12    | 51.0       | 0.36         | 2.8        | 2.8                  | 0.30                | 0.56                       | 0.56        | 4               |
|                  | 4209M-03S         | 0.28    | 51.0       | 0.36         | 63.0       | 164.9                | 0.30                | 0.56                       | 0.56        | 4               |
|                  | 4209M-03P         | 0.56    | 51.0       | 0.36         | 15.8       | 41.2                 | 0.30                | 0.56                       | 0.56        | 4               |
| 1.89"<br>48 mm   | 4209L-01S         | 0.84    | 62.0       | 0.44         | 7.6        | 21.2                 | 0.37                | 0.70                       | 0.70        | 4               |
|                  | 4209L-01P         | 1.70    | 62.0       | 0.44         | 1.9        | 5.3                  | 0.37                | 0.70                       | 0.70        | 4               |
|                  | 4209L-02S         | 0.56    | 62.0       | 0.44         | 13.2       | 35.0                 | 0.37                | 0.70                       | 0.70        | 4               |
|                  | 4209L-02P         | 1.12    | 62.0       | 0.44         | 3.3        | 8.7                  | 0.37                | 0.70                       | 0.70        | 4               |
|                  | 4209L-03S         | 0.29    | 62.0       | 0.44         | 57.3       | 163.7                | 0.37                | 0.70                       | 0.70        | 4               |
|                  | 4209L-03P         | 0.57    | 62.0       | 0.44         | 14.3       | 40.9                 | 0.37                | 0.70                       | 0.70        | 4               |

| UNIPOLAR         | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 1.34"<br>34 mm   | 4209S-01          | 0.95    | 22.2       | 0.17         | 4.8        | 4.6                  | 0.19                | 0.44                       | 0.44        | 6               |
|                  | 4209S-02          | 0.60    | 22.2       | 0.17         | 10.1       | 11.9                 | 0.19                | 0.44                       | 0.44        | 6               |
|                  | 4209S-03          | 0.31    | 22.2       | 0.17         | 37.2       | 43.0                 | 0.19                | 0.44                       | 0.44        | 6               |
| 1.57"<br>39.9 mm | 4209M-01          | 1.20    | 36.1       | 0.26         | 3.0        | 3.8                  | 0.30                | 0.56                       | 0.56        | 6               |
|                  | 4209M-02          | 0.80    | 36.1       | 0.28         | 5.5        | 6.5                  | 0.30                | 0.56                       | 0.56        | 6               |
|                  | 4209M-03          | 0.40    | 36.1       | 0.28         | 31.5       | 41.2                 | 0.30                | 0.56                       | 0.56        | 6               |
| 1.89"<br>48 mm   | 4209L-01          | 1.20    | 44.4       | 0.44         | 3.8        | 5.3                  | 0.37                | 0.70                       | 0.70        | 6               |
|                  | 4209L-02          | 0.80    | 44.4       | 0.28         | 6.6        | 8.7                  | 0.37                | 0.70                       | 0.70        | 6               |
|                  | 4209L-03          | 0.40    | 44.4       | 0.33         | 28.7       | 40.9                 | 0.37                | 0.70                       | 0.70        | 6               |

- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the rated current.
- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

## ■ DIMENSIONS (inches)



**TORQUE CURVES**

## 417 SERIES



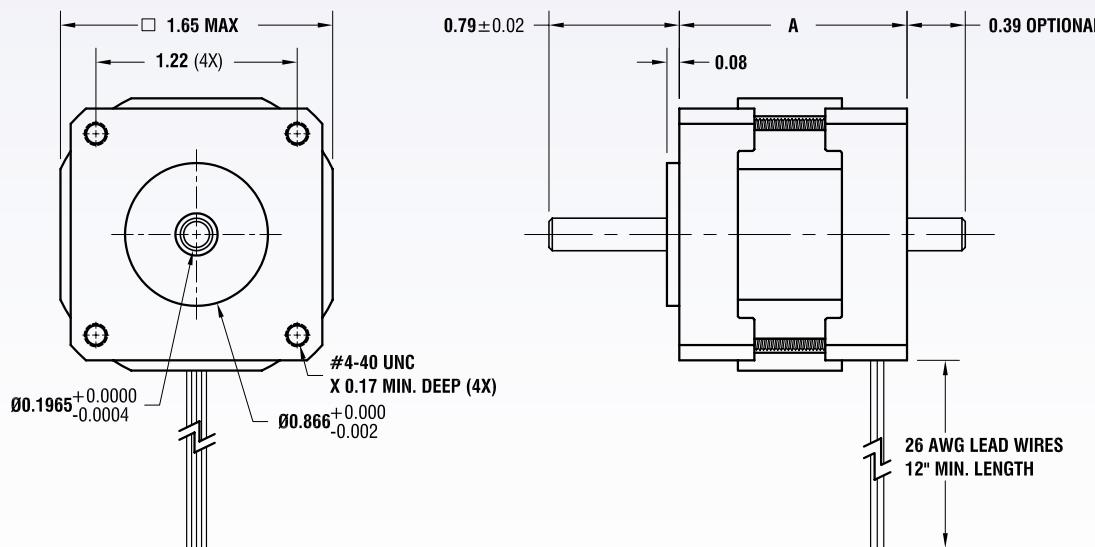
- NEMA Size 17 Mounting
- Low Inertia
- Excellent Step Accuracy
- Ideal for High Speed Applications
- Custom Windings Available (No Additional Cost)

## ■ SPECIFICATIONS

| BIPOLAR | Dimension "A" Max | Model #   | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|---------|-------------------|-----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|         | 0.93"<br>23.6 mm  | 417-09-03 | 1.20       | 16.0         | 0.08       | 3.0                  | 2.2                 | 0.05                       | 0.30        | 4               |
|         |                   | 417-09-18 | 0.60       | 16.0         | 0.08       | 10.0                 | 3.8                 | 0.05                       | 0.30        | 4               |
|         | 1.1"<br>27.9 mm   | 417-11-03 | 1.20       | 16.0         | 0.11       | 3.0                  | 2.2                 | 0.07                       | 0.31        | 4               |
|         |                   | 417-11-06 | 0.80       | 16.0         | 0.11       | 7.0                  | 5.1                 | 0.07                       | 0.31        | 4               |
|         |                   | 417-11-09 | 0.80       | 16.0         | 0.11       | 10.0                 | 6.9                 | 0.07                       | 0.31        | 4               |
|         |                   | 417-11-18 | 0.60       | 16.0         | 0.11       | 10.0                 | 7.1                 | 0.07                       | 0.31        | 4               |
|         | 1.38"<br>35.1 mm  | 417-13-08 | 0.60       | 23.0         | 0.16       | 11.0                 | 7.8                 | 0.11                       | 0.41        | 4               |
|         |                   | 417-13-18 | 0.60       | 23.0         | 0.16       | 12.0                 | 8.8                 | 0.11                       | 0.41        | 4               |
|         | 1.54"<br>39.1 mm  | 417-15-03 | 1.20       | 30.0         | 0.21       | 3.0                  | 2.6                 | 0.13                       | 0.53        | 4               |
|         |                   | 417-15-08 | 2.00       | 30.0         | 0.21       | 0.7                  | 0.3                 | 0.13                       | 0.53        | 4               |
|         |                   | 417-15-12 | 0.60       | 30.0         | 0.21       | 12.0                 | 10.5                | 0.13                       | 0.53        | 4               |

- Please complete our application data sheet for different windings.
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- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

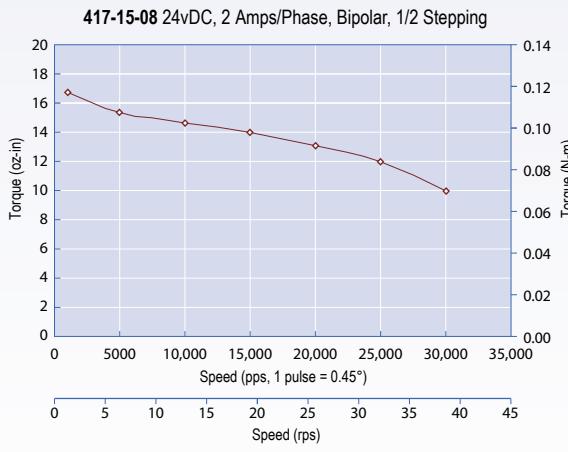
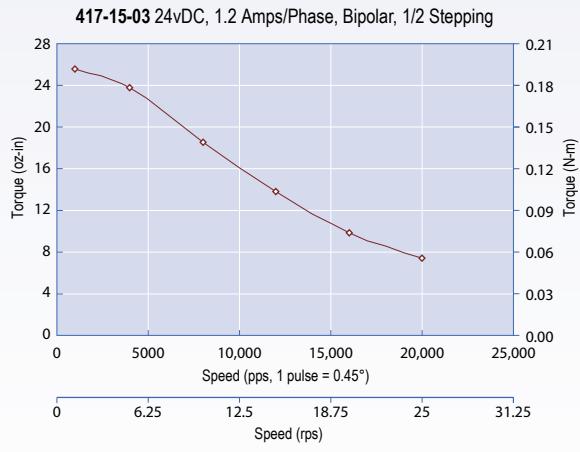
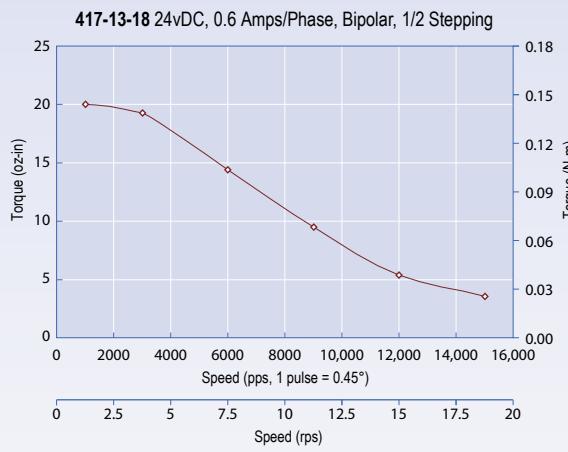
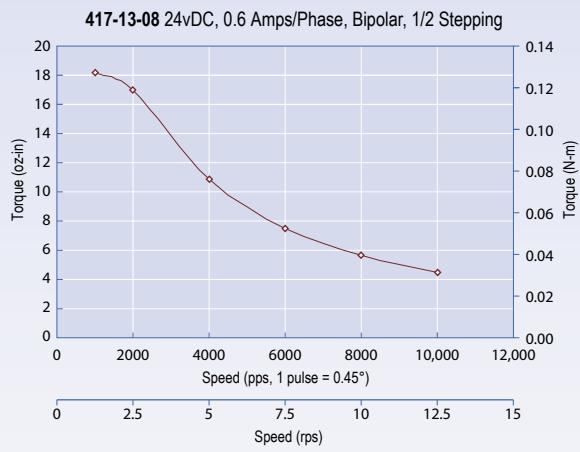
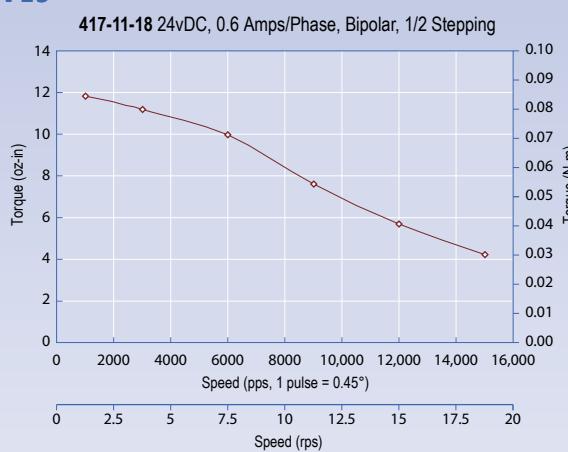
## ■ DIMENSIONS (inches)



## DID YOU KNOW...

Lin Engineering's 0.9° motor has the best microstepping accuracy in the industry.

- Lin's accuracy: ±1.5 arc minutes.
- Competitor's accuracy: ±4.5 arc minutes.

**TORQUE CURVES****DID YOU KNOW...**

Lin Engineering can eliminate guesswork for motor selection to save you significant development time.

5609



- High Torque
- High Step Accuracy
- High Resolution
- Custom Windings Available (No Additional Cost)

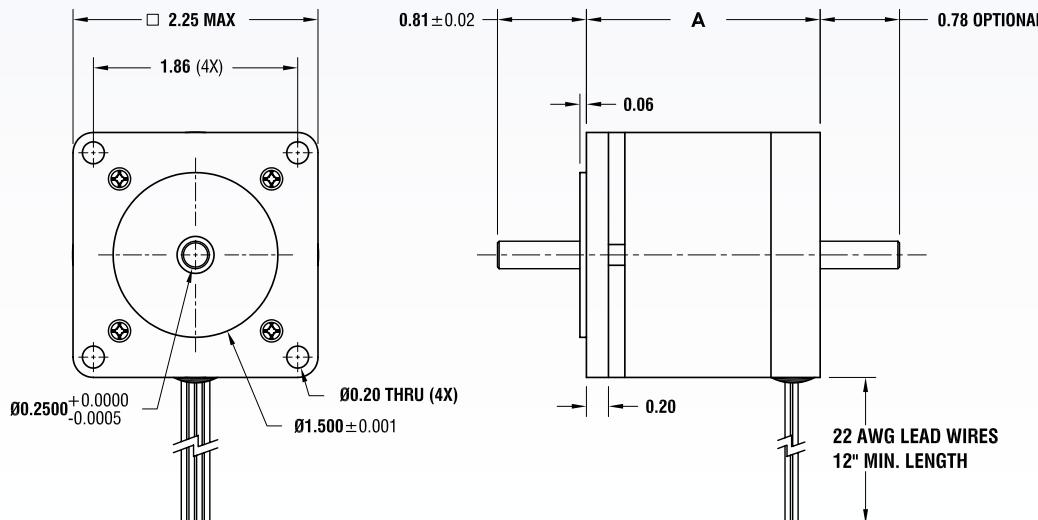
## SPECIFICATIONS

| BIPOLAR          | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in² | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------|-------------|-----------------|
| 1.55"<br>39.4 mm | 5609X-01S         | 0.77    | 39.2       | 0.28         | 8.0        | 20.6                 | 0.30                | 0.75           | 0.75        | 4               |
|                  | 5609X-01P         | 1.54    | 39.2       | 0.28         | 1.8        | 5.1                  | 0.30                | 0.75           | 0.75        | 4               |
| 2.08"<br>52.8 mm | 5609S-04S         | 0.90    | 77.0       | 0.54         | 6.0        | 6.5                  | 0.60                | 1.12           | 1.12        | 4               |
|                  | 5609S-04P         | 1.80    | 77.0       | 0.54         | 1.5        | 1.6                  | 0.60                | 1.12           | 1.12        | 4               |
| 2.20"<br>55.9 mm | 5609M-01S         | 0.84    | 112.0      | 0.79         | 10.0       | 54.0                 | 0.74                | 1.20           | 1.20        | 4               |
|                  | 5609M-01P         | 1.68    | 112.0      | 0.79         | 2.5        | 13.5                 | 0.74                | 1.20           | 1.20        | 4               |
| 3.08"<br>78.2 mm | 5609L-05S         | 1.05    | 168.0      | 1.19         | 7.6        | 29.0                 | 1.20                | 1.90           | 1.90        | 4               |
|                  | 5609L-05P         | 2.10    | 168.0      | 1.19         | 1.8        | 7.3                  | 1.20                | 1.90           | 1.90        | 4               |

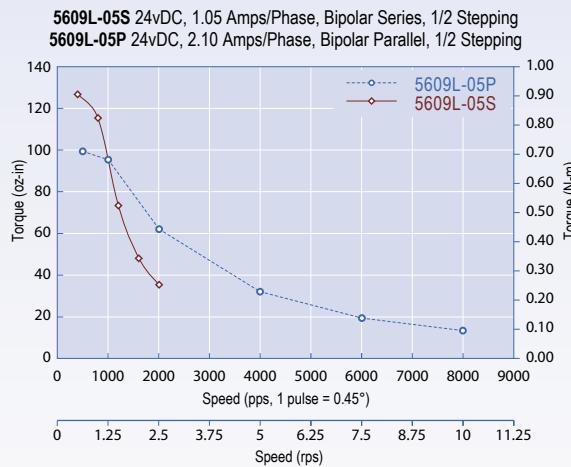
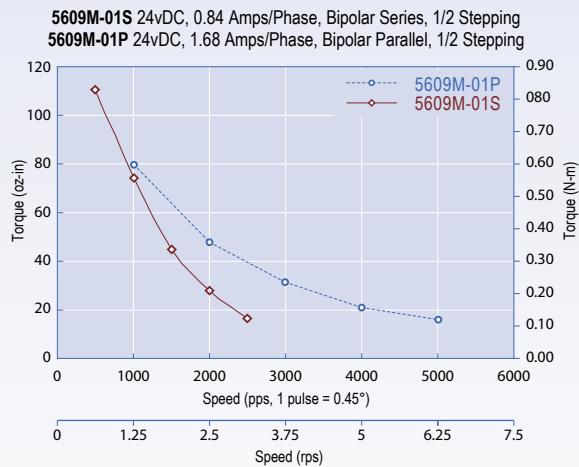
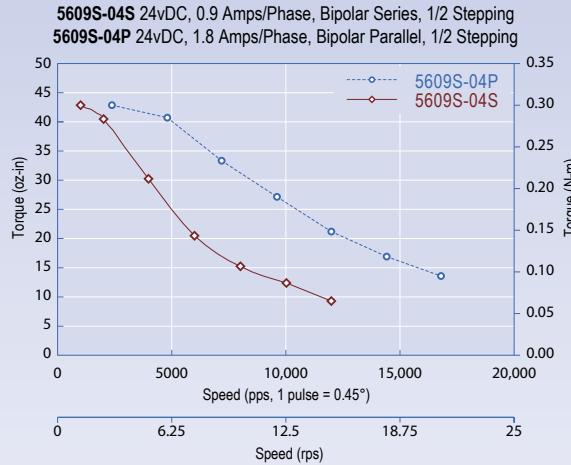
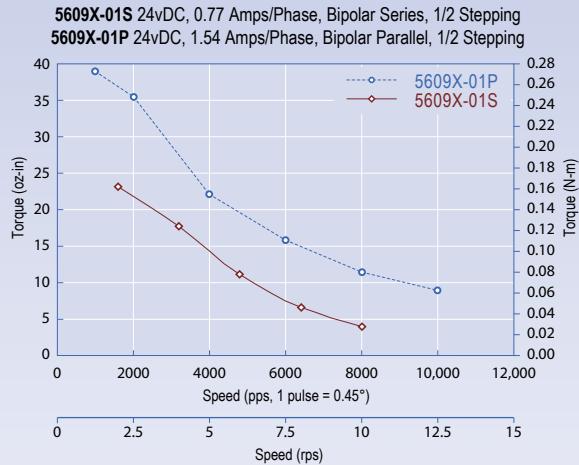
| UNIPOLAR         | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in² | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------|-------------|-----------------|
| 1.55"<br>39.4 mm | 5609X-01          | 1.10    | 28.0       | 0.23         | 3.6        | 5.1                  | 0.30                | 0.75           | 0.75        | 6               |
| 2.08"<br>52.8 mm | 5609S-04          | 1.30    | 55.0       | 0.29         | 3.0        | 1.6                  | 0.60                | 1.12           | 1.12        | 6               |
| 2.20"<br>55.9 mm | 5609M-01          | 1.20    | 80.0       | 0.68         | 5.0        | 13.5                 | 0.74                | 1.20           | 1.20        | 6               |
| 3.08"<br>78.2 mm | 5609L-05          | 1.50    | 120.0      | 0.93         | 3.6        | 7.3                  | 1.20                | 1.90           | 1.90        | 6               |

- Please complete our application data sheet for different windings.
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- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

## DIMENSIONS (inches)



## TORQUE CURVES



## DID YOU KNOW...

Lin Engineering has implemented Statistical Process Control along with Six Sigma System to meet your expectations for product quality & reliability.

5709



- High Torque
- High Step Accuracy
- High Resolution
- Custom Windings Available (No Additional Cost)

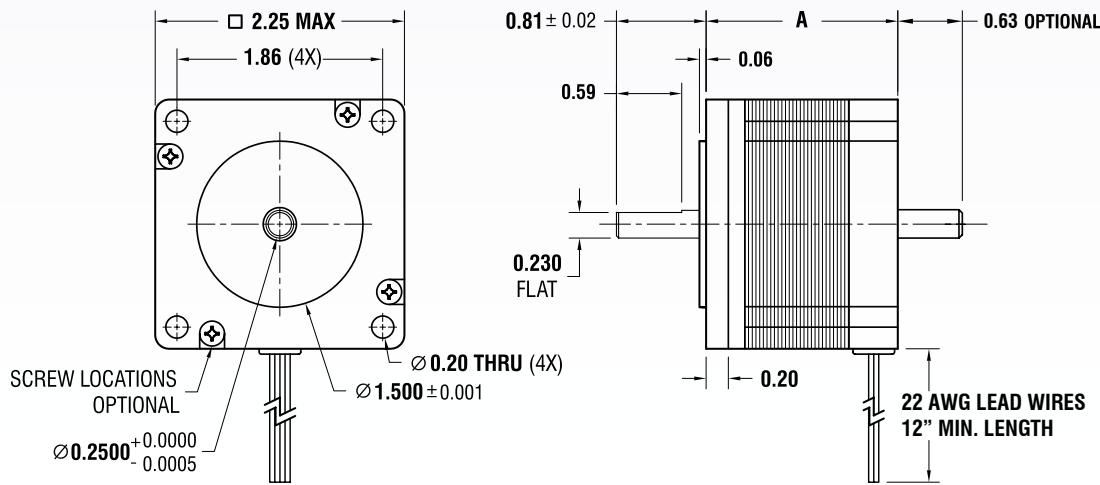
## SPECIFICATIONS

| BIPOLAR          | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in² | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------|-------------|-----------------|
| 1.74"<br>44.2 mm | 5709X-01S         | 1.40    | 98.0       | 0.69         | 3.0        | 6.0                  | 0.70                | 1.05           | 4           |                 |
|                  | 5709X-01P         | 2.80    | 98.0       | 0.69         | 0.8        | 1.5                  | 0.70                | 1.05           | 4           |                 |
|                  | 5709X-15S         | 2.10    | 98.0       | 0.69         | 1.2        | 2.3                  | 0.70                | 1.05           | 4           |                 |
|                  | 5709X-15P         | 4.20    | 98.0       | 0.69         | 0.3        | 0.6                  | 0.70                | 1.05           | 4           |                 |
|                  | 5709M-02S         | 2.10    | 175.0      | 1.24         | 1.6        | 5.8                  | 1.50                | 1.50           | 4           |                 |
|                  | 5709M-02P         | 4.20    | 175.0      | 1.24         | 0.4        | 1.5                  | 1.50                | 1.50           | 4           |                 |
|                  | 5709M-05S         | 1.40    | 175.0      | 1.24         | 3.8        | 13.1                 | 1.50                | 1.50           | 4           |                 |
|                  | 5709M-05P         | 2.80    | 175.0      | 1.24         | 0.9        | 3.3                  | 1.50                | 1.50           | 4           |                 |
|                  | 5709L-01S         | 1.40    | 263.0      | 1.86         | 4.5        | 15.1                 | 2.60                | 2.20           | 4           |                 |
|                  | 5709L-01P         | 2.80    | 263.0      | 1.86         | 1.1        | 3.8                  | 2.60                | 2.20           | 4           |                 |
|                  | 5709L-04S         | 3.30    | 263.0      | 1.86         | 0.8        | 2.5                  | 2.60                | 2.20           | 4           |                 |
|                  | 5709L-04P         | 6.60    | 263.0      | 1.86         | 0.2        | 0.6                  | 2.60                | 2.20           | 4           |                 |

| UNIPOLAR         | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in² | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------|-------------|-----------------|
| 1.74"<br>44.2 mm | 5709X-01          | 2.00    | 70.0       | 0.49         | 1.5        | 1.5                  | 0.70                | 1.05           | 6           |                 |
|                  | 5709X-15          | 3.00    | 70.0       | 0.49         | 0.6        | 0.6                  | 0.70                | 1.05           | 6           |                 |
|                  | 5709M-02          | 3.00    | 125.0      | 0.88         | 0.8        | 1.5                  | 1.50                | 1.50           | 6           |                 |
|                  | 5709M-05          | 2.00    | 125.0      | 0.88         | 1.8        | 2.5                  | 1.50                | 1.50           | 6           |                 |
|                  | 5709L-01          | 2.00    | 188.0      | 1.33         | 2.3        | 3.8                  | 2.60                | 2.20           | 6           |                 |
|                  | 5709L-04          | 4.67    | 188.0      | 1.33         | 0.4        | 0.6                  | 2.60                | 2.20           | 6           |                 |
|                  | 5709X-01          | 2.00    | 70.0       | 0.49         | 1.5        | 1.5                  | 0.70                | 1.05           | 6           |                 |
|                  | 5709X-15          | 3.00    | 70.0       | 0.49         | 0.6        | 0.6                  | 0.70                | 1.05           | 6           |                 |
|                  | 5709M-02          | 3.00    | 125.0      | 0.88         | 0.8        | 1.5                  | 1.50                | 1.50           | 6           |                 |
|                  | 5709M-05          | 2.00    | 125.0      | 0.88         | 1.8        | 2.5                  | 1.50                | 1.50           | 6           |                 |
|                  | 5709L-01          | 2.00    | 188.0      | 1.33         | 2.3        | 3.8                  | 2.60                | 2.20           | 6           |                 |
|                  | 5709L-04          | 4.67    | 188.0      | 1.33         | 0.4        | 0.6                  | 2.60                | 2.20           | 6           |                 |

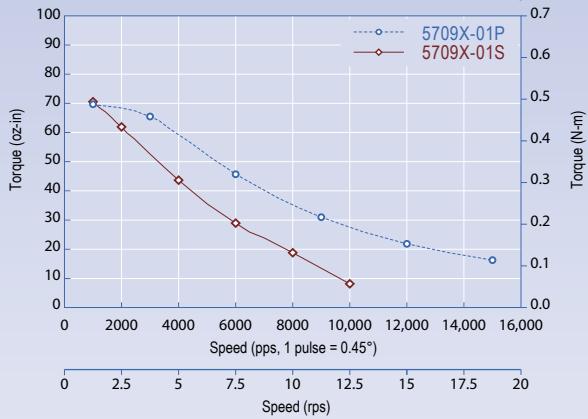
- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the rated current.
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- For operating temperatures, see page 94.

## DIMENSIONS (inches)

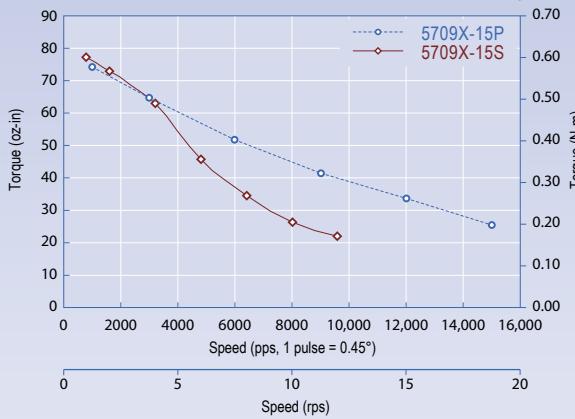


## TORQUE CURVES

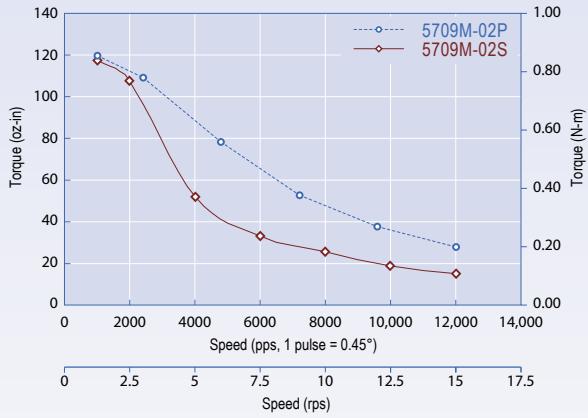
**5709X-01S** 24vDC, 1.4 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5709X-01P** 24vDC, 2.8 Amps/Phase, Bipolar Parallel, 1/2 Stepping



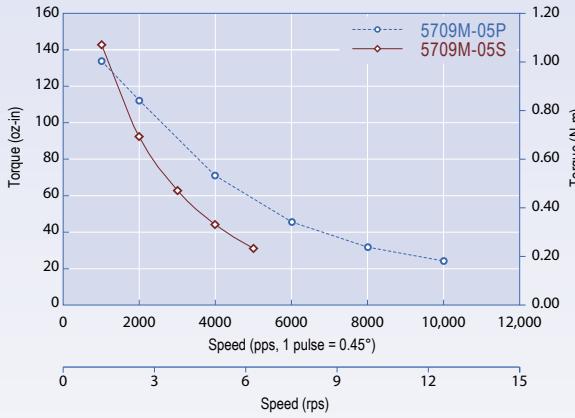
**5709X-15S** 24vDC, 2.1 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5709X-15P** 24vDC, 4.2 Amps/Phase, Bipolar Parallel, 1/2 Stepping



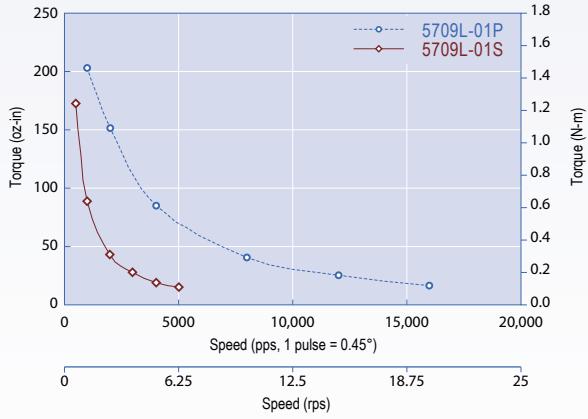
**5709M-02S** 24vDC, 2.1 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5709M-02P** 24vDC, 4.2 Amps/Phase, Bipolar Parallel, 1/2 Stepping



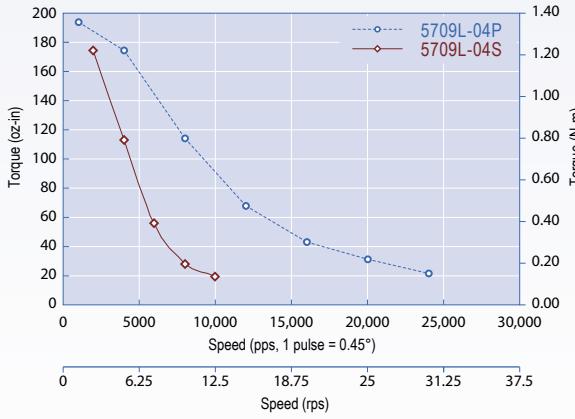
**5709M-05S** 24vDC, 1.4 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5709M-05P** 24vDC, 2.8 Amps/Phase, Bipolar Parallel, 1/2 Stepping



**5709L-01S** 24vDC, 1.4 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5709L-01P** 24vDC, 2.8 Amps/Phase, Bipolar Parallel, 1/2 Stepping



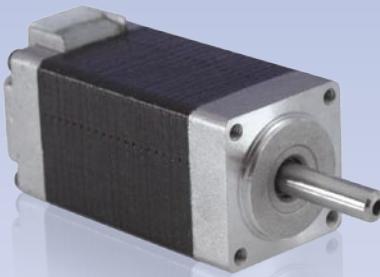
**5709L-04S** 24vDC, 3.3 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5709L-04P** 24vDC, 6.6 Amps/Phase, Bipolar Parallel, 1/2 Stepping



## DID YOU KNOW...

Lin Engineering's real business is to provide solutions for motion control applications.

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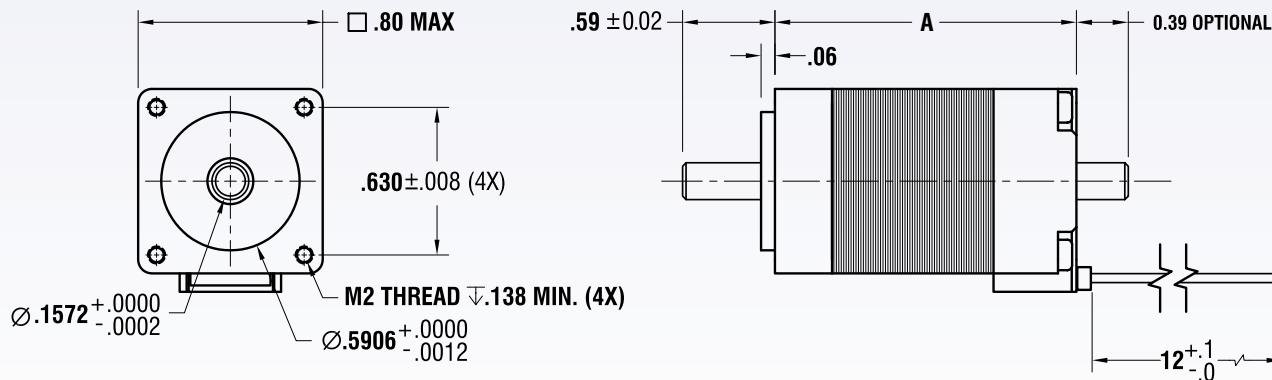
- High Torque in a Compact Size
- NEMA Size 8 Mountings
- (No Custom Windings Available for the Size 8)

## ■ SPECIFICATIONS

| BIPOLAR | Dimension "A" Max | Model #   | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|---------|-------------------|-----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|         | 1.3"<br>33 mm     | 208-13-01 | 0.60       | 3.0          | 0.02       | 6.5                  | 1.7                 | 0.01                       | 0.13        | 4               |
|         | 1.7"<br>43 mm     | 208-17-01 | 0.80       | 4.0          | 0.03       | 5.4                  | 1.5                 | 0.01                       | 0.18        | 4               |

- Please complete our application data sheet for different windings.
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- Call Lin Engineering for additional Bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

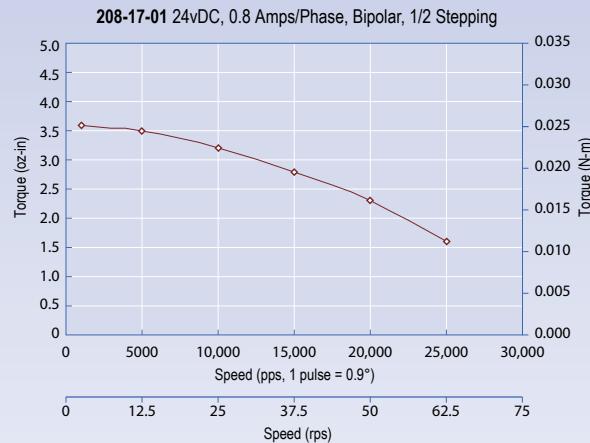
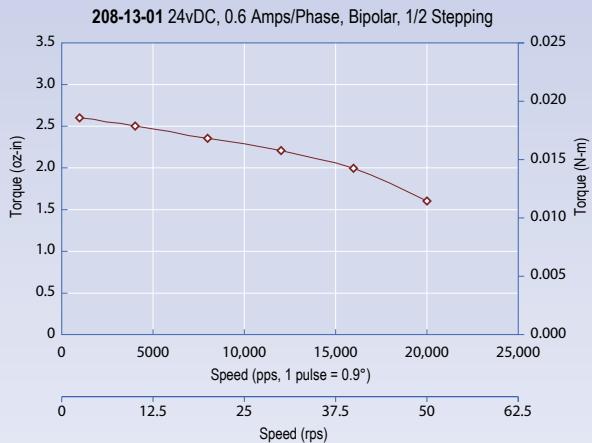
## ■ DIMENSIONS (inches)



## DID YOU KNOW...

A motor operating under full-stepping yields more torque than operating at microstepping.

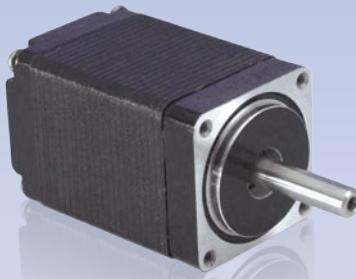
## TORQUE CURVES



## DID YOU KNOW...

The quickest way to solve your step motor problems is to see the specialists  
– Lin Engineering

211



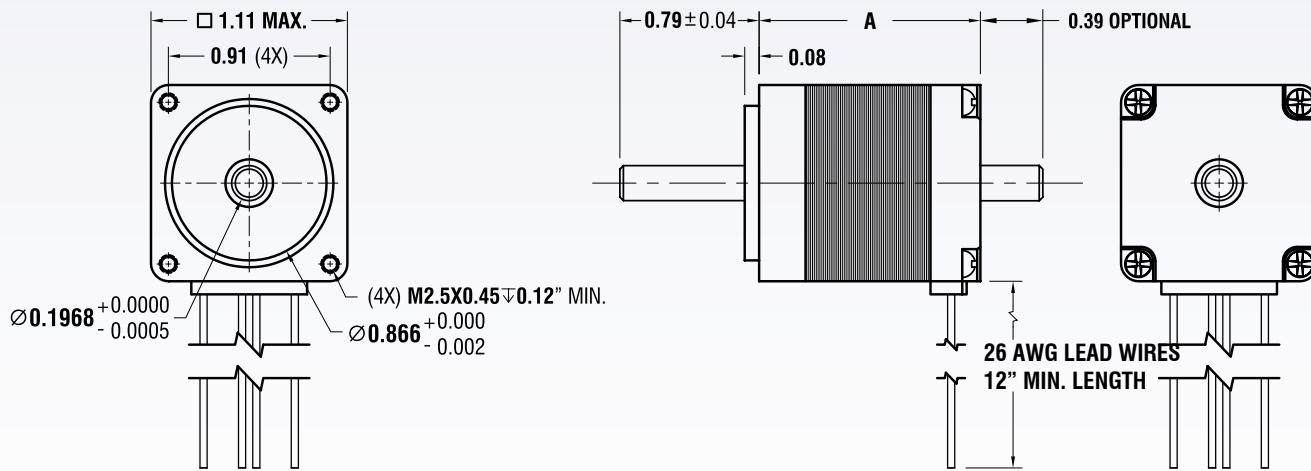
- NEMA Size 11 Mounting
- Small Package
- Cost Effective
- Custom Windings Available (No Additional Cost)

## SPECIFICATIONS

| BIPOLAR          | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in² | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------|-------------|-----------------|
| 1.26"<br>32 mm   | 211-13-01         | 0.67    | 9.2        | 0.06         | 5.6        | 3.4                  | 0.05                | 0.24           | 0.24        | 4               |
|                  | 211-13-02         | 1.30    | 9.2        | 0.06         | 1.7        | 1.1                  | 0.05                | 0.24           | 0.24        | 4               |
| 1.77"<br>45 mm   | 211-18-01         | 0.67    | 13.7       | 0.10         | 7.1        | 4.8                  | 0.07                | 0.31           | 0.31        | 4               |
|                  | 211-18-02         | 1.30    | 13.7       | 0.10         | 1.3        | 0.8                  | 0.07                | 0.31           | 0.31        | 4               |
| 2.01"<br>51.1 mm | 211-20-01         | 0.67    | 16.6       | 0.14         | 8.6        | 6.7                  | 0.10                | 0.44           | 0.44        | 4               |
|                  | 211-20-02         | 1.30    | 16.6       | 0.14         | 1.9        | 1.7                  | 0.10                | 0.44           | 0.44        | 4               |

- Please complete our application data sheet for different windings.
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- Call Lin Engineering for additional Bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

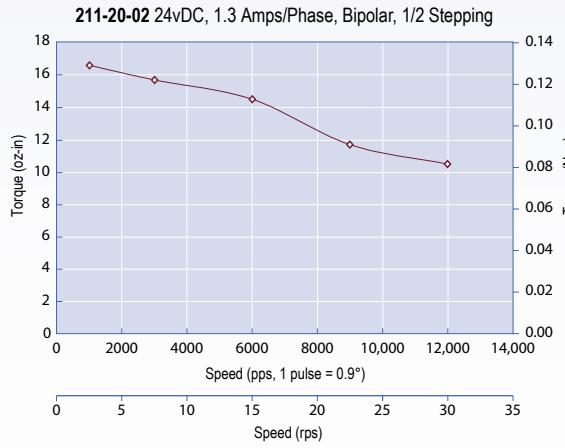
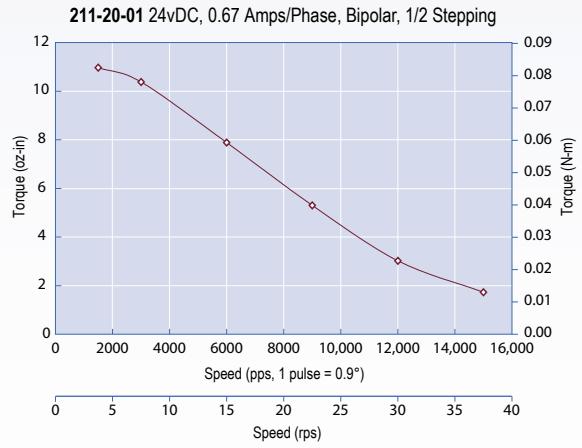
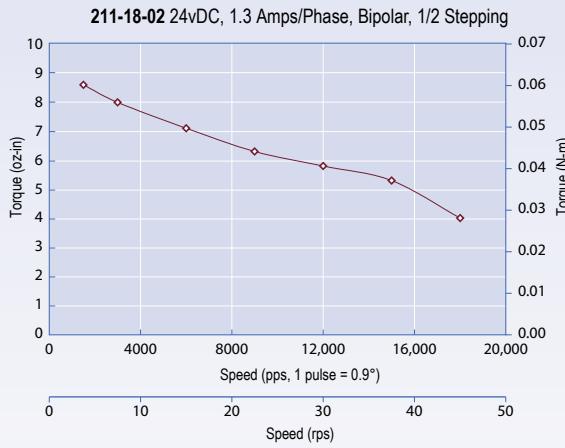
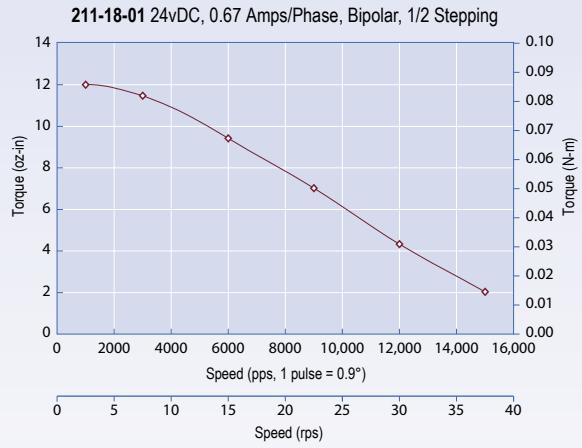
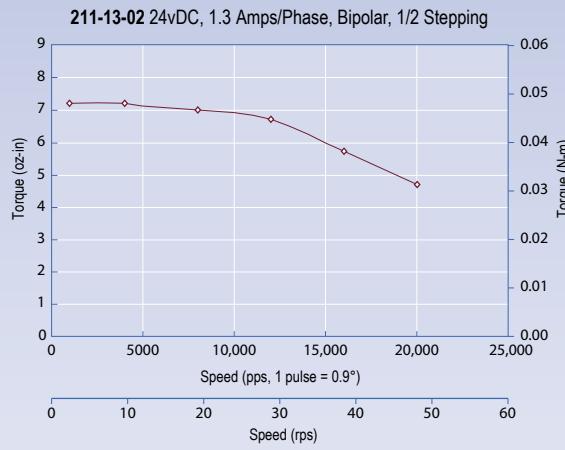
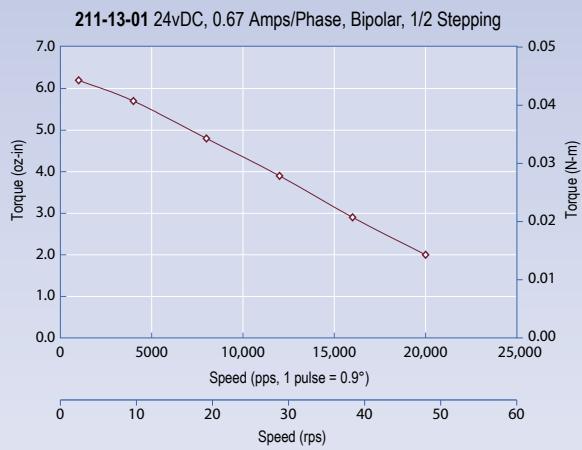
## DIMENSIONS (inches)



## DID YOU KNOW...

You can move resonance away from your operating point by changing either your input voltage, output current, inertial load on the motor, or the rotor inertia.

## TORQUE CURVES



3518X



- Ideal for Limited Mounting Space
- Custom Windings Available (No Additional Cost)

## SPECIFICATIONS

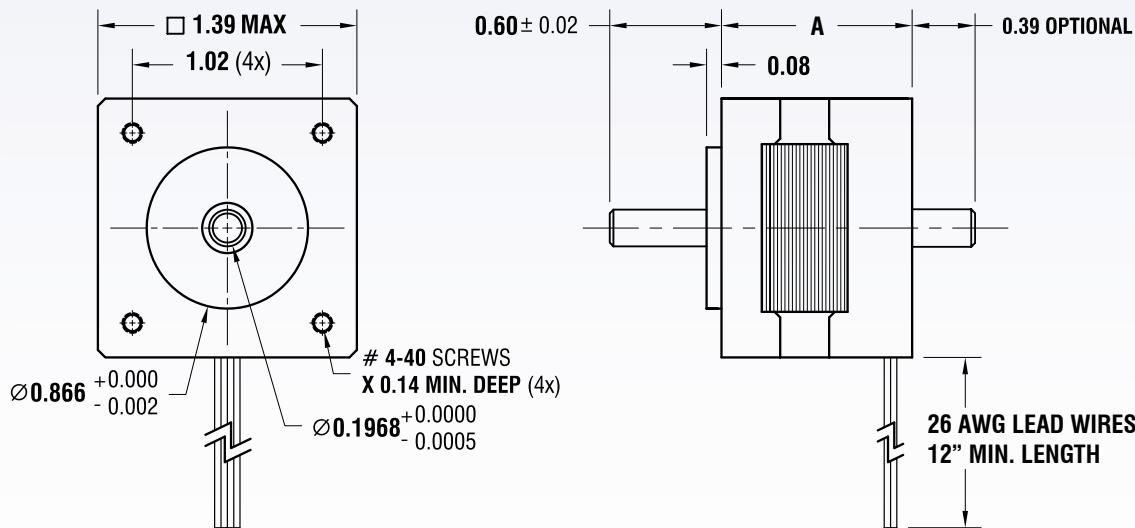
| BIIPOLAR | Dimension "A" Max | Model #   | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|----------|-------------------|-----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|          | 1.02"<br>26 mm    | 3518X-04  | 0.45       | 7.5          | 0.05       | 3.8                  | 2.7                 | 0.06                       | 0.25        | 4               |
|          |                   | 3518X-08  | 0.35       | 7.5          | 0.05       | 8.5                  | 5.8                 | 0.06                       | 0.25        | 4               |
|          | 1.34"<br>34.0 mm  | 3518M-07* | 0.80       | 20.0         | 0.14       | 7.5                  | 8.1                 | 0.08                       | 0.40        | 4               |

| UNIPOLAR | Dimension "A" Max | Model #  | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|----------|-------------------|----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|          | 1.02"<br>26 mm    | 3518X-12 | 0.30       | 5.5          | 0.04       | 12.0                 | 4.4                 | 0.06                       | 0.25        | 6               |

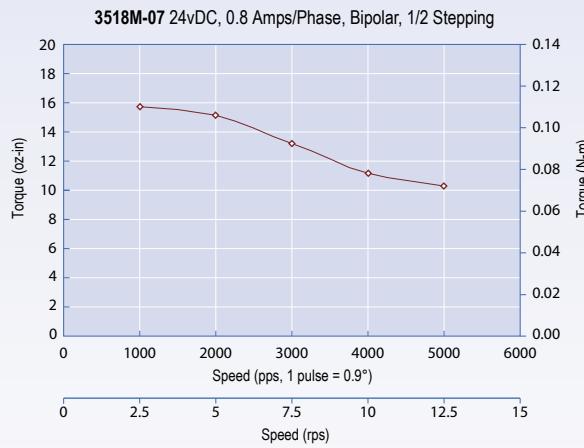
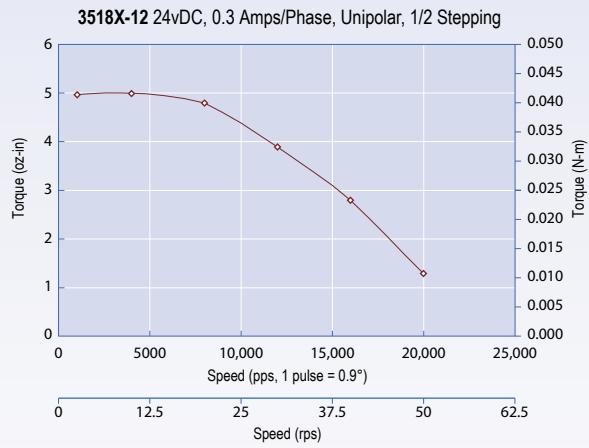
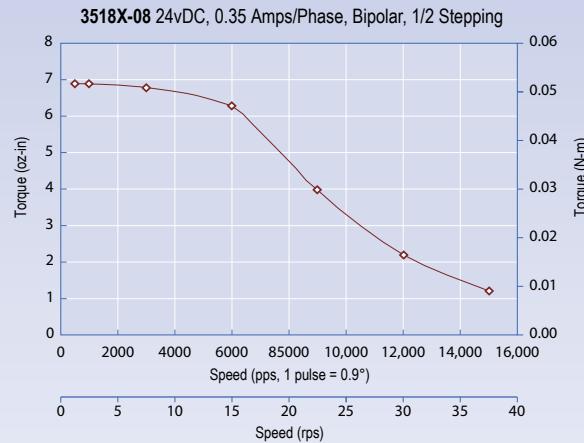
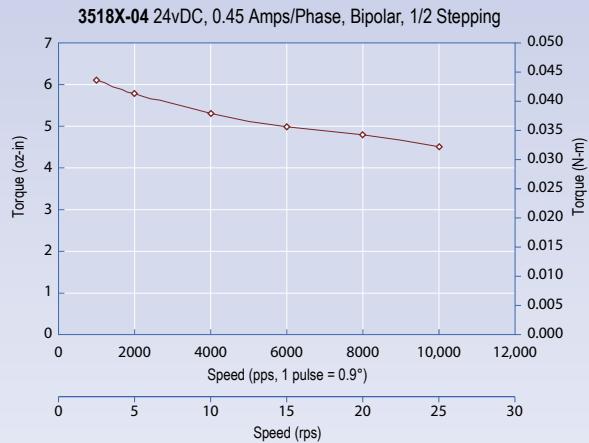
- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the motor's rated current.
- Call Lin Engineering for additional Bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

\* Includes an integral connector.

## DIMENSIONS (inches)



## TORQUE CURVES



### DID YOU KNOW...

Motors connected in series are mostly used to accomodate applications with speeds less than 5 RPS.



- NEMA Size 17 Mounting
- Wide Selection
- Cost Effective
- Custom Windings Available (No Additional Cost)

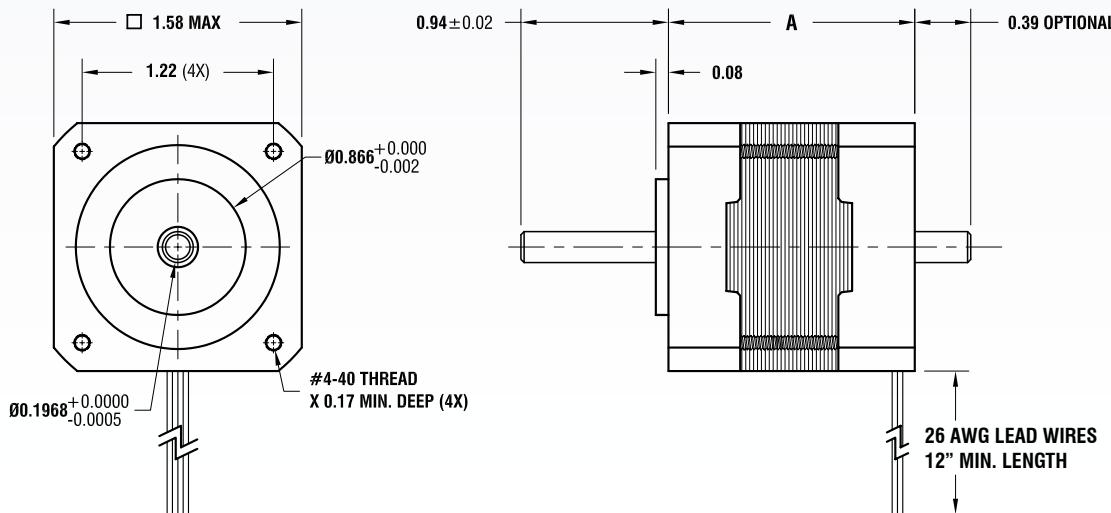
## ■ SPECIFICATIONS

| BIPOLAR | Dimension "A" Max | Model #   | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|---------|-------------------|-----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|         | 0.9"<br>22.9 mm   | 4018F-08  | 0.50       | 8.4          | 0.06       | 8.0                  | 5.0                 | 0.06                       | 0.25        | 4               |
|         | 1.03"<br>26.2 mm  | 4018X-07  | 1.00       | 15.0         | 0.11       | 5.0                  | 6.0                 | 0.07                       | 0.27        | 4               |
|         |                   | 4018X-51  | 0.60       | 15.0         | 0.11       | 5.4                  | 2.8                 | 0.07                       | 0.27        | 4               |
|         | 1.33"<br>33.8 mm  | 4018S-01  | 1.00       | 21.0         | 0.15       | 4.1                  | 4.7                 | 0.09                       | 0.44        | 4               |
|         |                   | 4018S-18S | 0.63       | 21.0         | 0.15       | 10.2                 | 10.2                | 0.09                       | 0.44        | 4               |
|         |                   | 4018S-18P | 1.26       | 21.0         | 0.15       | 2.6                  | 2.5                 | 0.09                       | 0.44        | 4               |
|         | 1.57"<br>39.9 mm  | 4018M-04  | 1.10       | 31.0         | 0.22       | 4.0                  | 7.0                 | 0.13                       | 0.48        | 4               |
|         |                   | 4018M-05  | 2.50       | 31.0         | 0.22       | 0.5                  | 0.8                 | 0.13                       | 0.48        | 4               |
|         | 1.88"<br>47.8 mm  | 4018L-04  | 2.10       | 42.0         | 0.30       | 1.1                  | 2.1                 | 0.20                       | 0.66        | 4               |
|         |                   | 4018L-06  | 0.90       | 42.0         | 0.30       | 5.8                  | 8.1                 | 0.20                       | 0.66        | 4               |

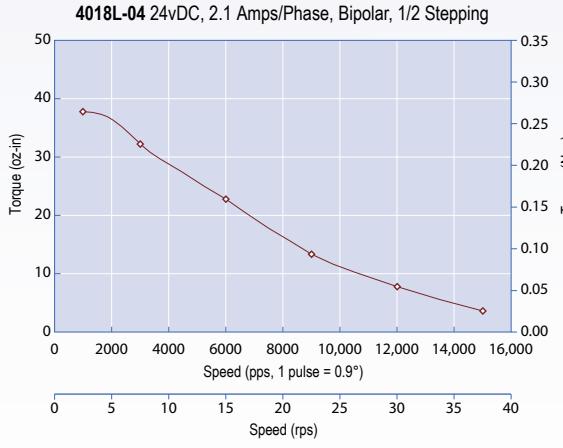
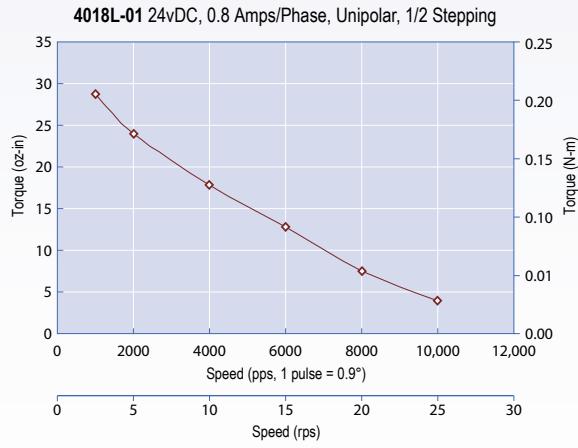
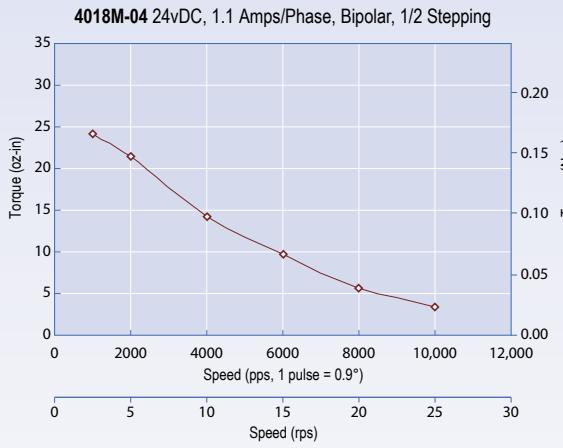
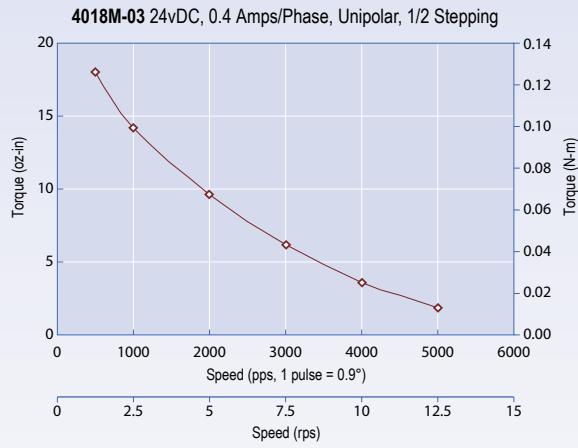
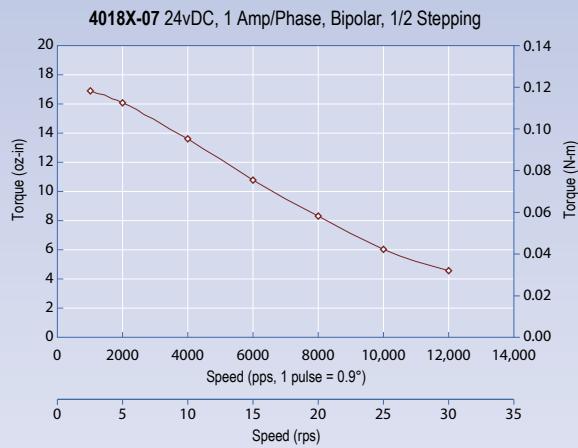
| UNIPOLAR | Dimension "A" Max | Model #  | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|----------|-------------------|----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|          | 0.9"<br>22.9 mm   | 4018F-02 | 0.40       | 4.1          | 0.03       | 5.0                  | 1.7                 | 0.06                       | 0.25        | 6               |
|          |                   | 4018S-10 | 0.40       | 15.0         | 0.11       | 24.0                 | 15.8                | 0.09                       | 0.44        | 6               |
|          | 1.33"<br>33.8 mm  | 4018S-18 | 0.90       | 15.0         | 0.11       | 5.1                  | 2.5                 | 0.09                       | 0.44        | 6               |
|          |                   | 4018S-20 | 0.30       | 15.0         | 0.11       | 42.3                 | 28.2                | 0.09                       | 0.44        | 6               |
|          | 1.57"<br>39.9 mm  | 4018M-03 | 0.40       | 22.3         | 0.16       | 30.0                 | 28.8                | 0.13                       | 0.48        | 6               |
|          |                   | 4018M-08 | 0.80       | 22.3         | 0.16       | 8.5                  | 7.0                 | 0.13                       | 0.48        | 6               |
|          | 1.88"<br>47.8 mm  | 4018L-01 | 0.80       | 30.0         | 0.21       | 7.5                  | 6.0                 | 0.20                       | 0.66        | 6               |
|          |                   | 4018L-03 | 1.20       | 30.0         | 0.21       | 3.3                  | 3.1                 | 0.20                       | 0.66        | 6               |

- Please complete our application data sheet for different windings.
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- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

## ■ DIMENSIONS (inches)



## TORQUE CURVES





- NEMA Size 17 Mounting
- Low Inertia
- Ideal for High Speed Applications
- Custom Windings Available (No Additional Cost)

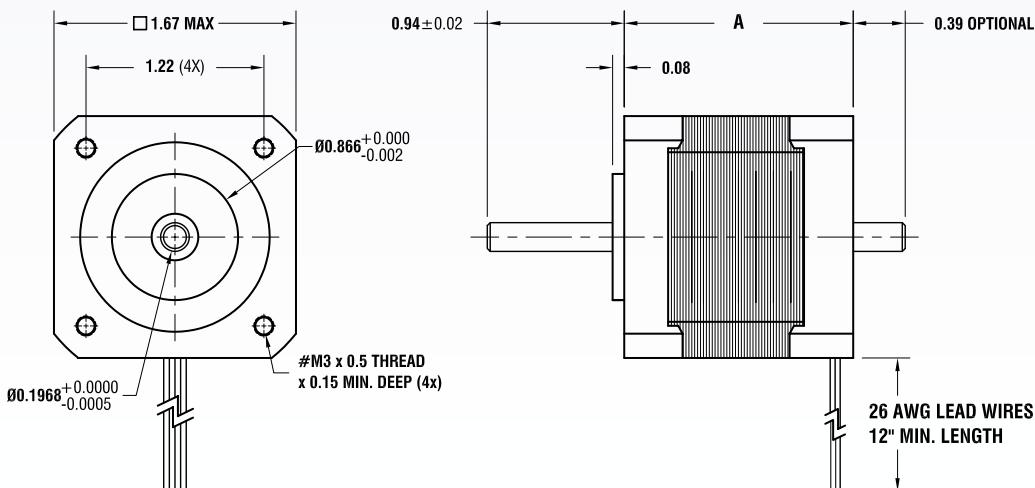
## SPECIFICATIONS

| BIPOLAR          | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 1.31"<br>33.3 mm | 4218S-02          | 1.30    | 35.0       | 0.25         | 2.2        | 2.6                  | 0.18                | 0.40                       | 0.40        | 4               |
|                  | 4218S-04S         | 0.67    | 35.0       | 0.25         | 8.0        | 11.2                 | 0.18                | 0.40                       | 0.40        | 4               |
|                  | 4218S-04P         | 1.33    | 35.0       | 0.25         | 2.0        | 1.9                  | 0.18                | 0.40                       | 0.40        | 4               |
|                  | 4218S-09          | 0.90    | 35.0       | 0.25         | 3.5        | 4.4                  | 0.18                | 0.40                       | 0.40        | 4               |
| 1.55"<br>39.4 mm | 4218M-01          | 1.70    | 62.0       | 0.44         | 1.5        | 2.3                  | 0.28                | 0.60                       | 0.60        | 4               |
|                  | 4218M-06S         | 0.70    | 62.0       | 0.44         | 10.0       | 16.3                 | 0.28                | 0.60                       | 0.60        | 4               |
|                  | 4218M-06P         | 1.40    | 62.0       | 0.44         | 2.5        | 4.1                  | 0.28                | 0.60                       | 0.60        | 4               |
|                  | 4218M-54P         | 4.20    | 62.0       | 0.44         | 0.3        | 0.4                  | 0.28                | 0.60                       | 0.60        | 4               |
| 1.86"<br>47.2 mm | 4218L-01          | 2.00    | 75.0       | 0.53         | 1.2        | 2.6                  | 0.37                | 0.70                       | 0.70        | 4               |
|                  | 4218L-07S         | 1.10    | 75.0       | 0.53         | 4.4        | 9.2                  | 0.37                | 0.70                       | 0.70        | 4               |
|                  | 4218L-07P         | 2.20    | 75.0       | 0.53         | 1.1        | 2.3                  | 0.37                | 0.70                       | 0.70        | 4               |

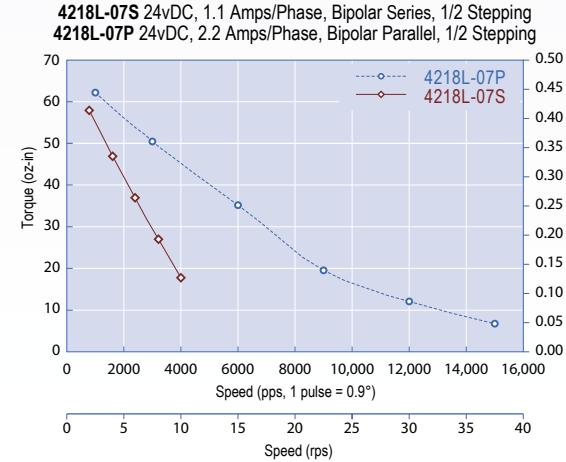
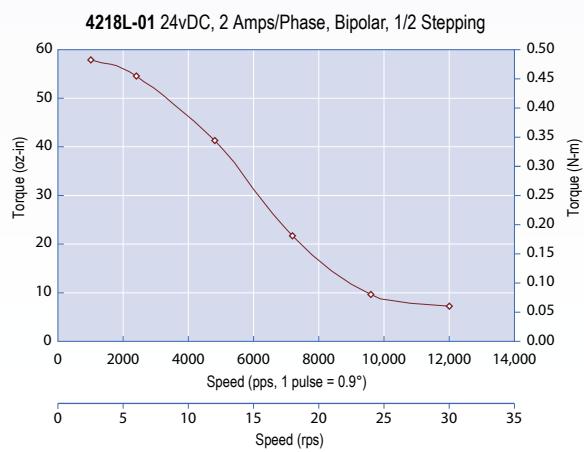
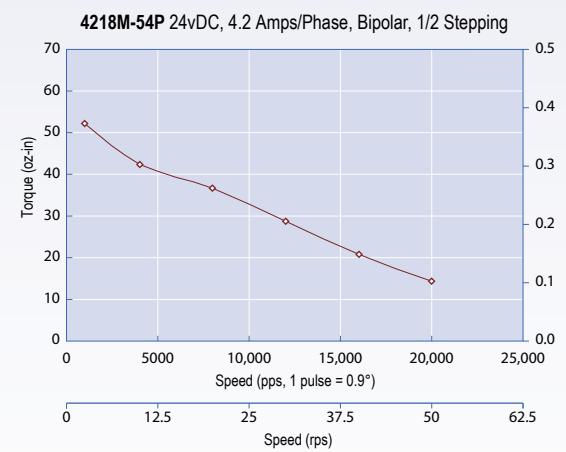
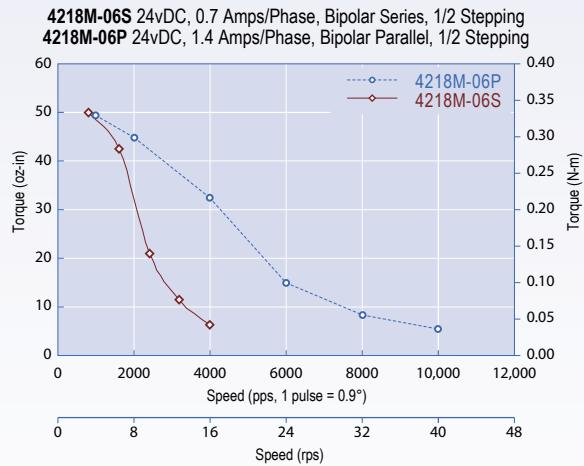
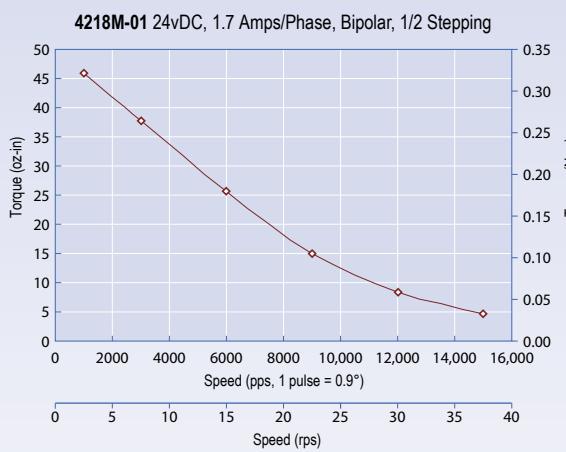
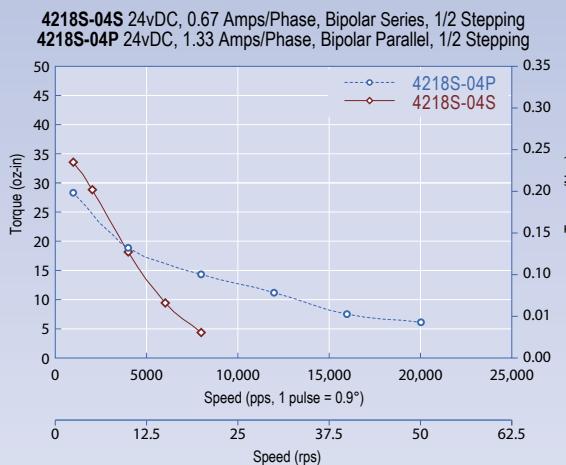
| UNIPOLAR         | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 1.31"<br>33.3 mm | 4218S-04          | 0.95    | 27.0       | 0.19         | 4.0        | 1.9                  | 0.18                | 0.40                       | 0.40        | 6               |
|                  | 4218M-06          | 1.00    | 45.0       | 0.32         | 5.0        | 4.1                  | 0.28                | 0.60                       | 0.60        | 6               |
| 1.55"<br>39.4 mm | 4218M-54          | 3.00    | 45.0       | 0.33         | 0.5        | 0.4                  | 0.28                | 0.60                       | 0.60        | 6               |
|                  | 4218L-07          | 1.50    | 55.0       | 0.43         | 2.2        | 2.3                  | 0.37                | 0.70                       | 0.70        | 6               |
| 1.86"<br>47.2 mm | 4218L-25          | 0.45    | 55.0       | 0.39         | 24.0       | 17.1                 | 0.37                | 0.70                       | 0.70        | 6               |

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- Call Lin Engineering for additional bipolar torque curves.
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- For operating temperatures, see page 94.

## DIMENSIONS (inches)



## TORQUE CURVES



4118



- NEMA Size 17 Mounting
- Cost Effective
- Custom Windings Available (No Additional Cost)

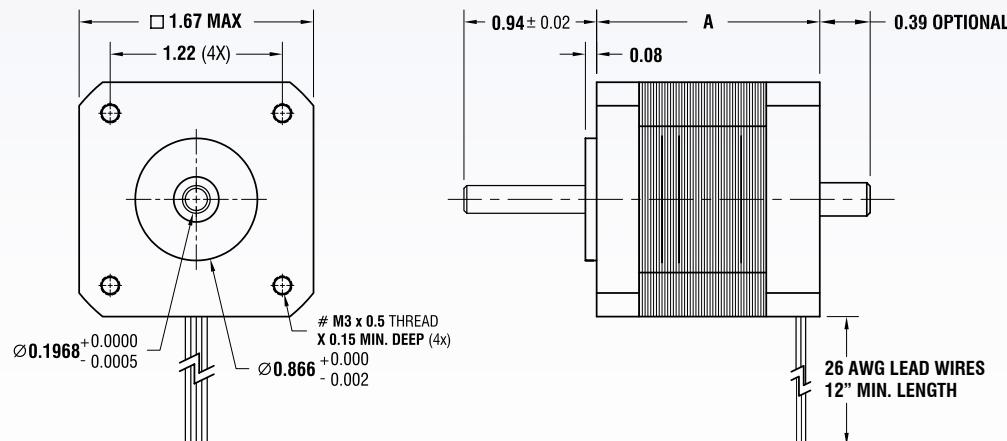
## ■ SPECIFICATIONS

| BIPOLAR | Dimension "A" Max | Model #   | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|---------|-------------------|-----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|         | 1.35"<br>34.3 mm  | 4118S-02  | 1.30       | 45.0         | 0.32       | 2.8                  | 3.6                 | 0.18                       | 0.40        | 4               |
|         |                   | 4118S-04S | 0.67       | 45.0         | 0.32       | 9.9                  | 12.5                | 0.18                       | 0.40        | 4               |
|         |                   | 4118S-04P | 1.33       | 45.0         | 0.32       | 2.5                  | 3.1                 | 0.18                       | 0.40        | 4               |
|         |                   | 4118S-09  | 0.90       | 45.0         | 0.28       | 5.3                  | 6.7                 | 0.18                       | 0.40        | 4               |
|         | 1.57"<br>39.9 mm  | 4118M-01  | 1.70       | 63.0         | 0.44       | 1.5                  | 3.0                 | 0.28                       | 0.60        | 4               |
|         |                   | 4118M-06S | 0.70       | 63.0         | 0.44       | 10.8                 | 21.8                | 0.28                       | 0.60        | 4               |
|         |                   | 4118M-06P | 1.40       | 63.0         | 0.44       | 2.7                  | 5.5                 | 0.28                       | 0.60        | 4               |
|         | 1.9"<br>48.3 mm   | 4118L-01  | 2.00       | 83.0         | 0.59       | 1.4                  | 2.7                 | 0.37                       | 0.70        | 4               |
|         |                   | 4118L-07S | 1.05       | 83.0         | 0.59       | 5.2                  | 9.4                 | 0.37                       | 0.70        | 4               |
|         |                   | 4118L-07P | 2.10       | 83.0         | 0.59       | 1.3                  | 2.3                 | 0.37                       | 0.70        | 4               |

| UNIPOLAR | Dimension "A" Max | Model #  | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|----------|-------------------|----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
|          | 1.35"<br>34.3 mm  | 4118S-04 | 0.95       | 30.0         | 0.17       | 5.0                  | 3.1                 | 0.18                       | 0.40        | 6               |
|          | 4118M-06          | 1.00     | 45.0       | 0.35         | 5.4        | 5.5                  | 0.28                | 0.60                       | 6           |                 |
|          | 1.9"<br>48.3 mm   | 4118L-07 | 1.50       | 65.0         | 0.43       | 2.6                  | 2.3                 | 0.37                       | 0.70        | 6               |
|          |                   | 4118L-25 | 0.45       | 65.0         | 0.35       | 25.0                 | 17.4                | 0.37                       | 0.70        | 6               |

- Please complete our application data sheet for different windings.
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- For operating temperatures, see page 94.

## ■ DIMENSIONS (inches)

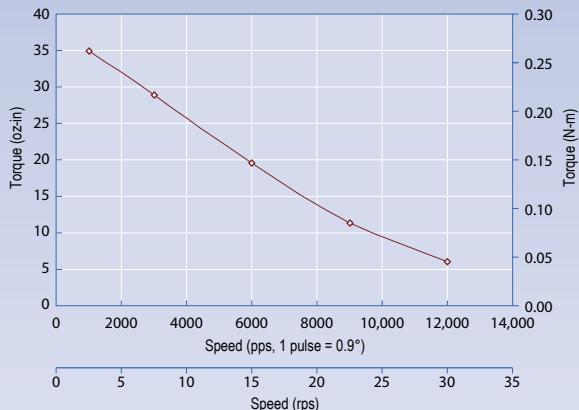


## DID YOU KNOW...

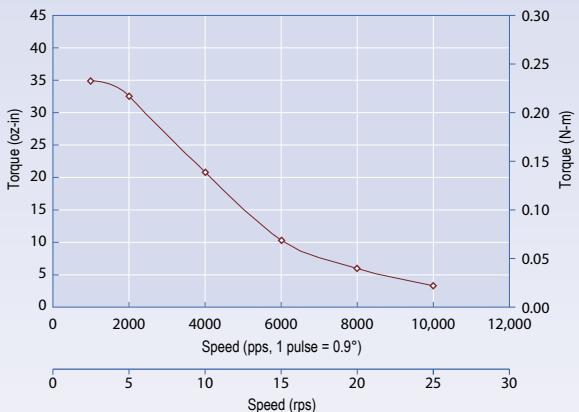
The average lead time for prototypes is 3-7 business days. This includes custom windings and most shaft modifications.

## TORQUE CURVES

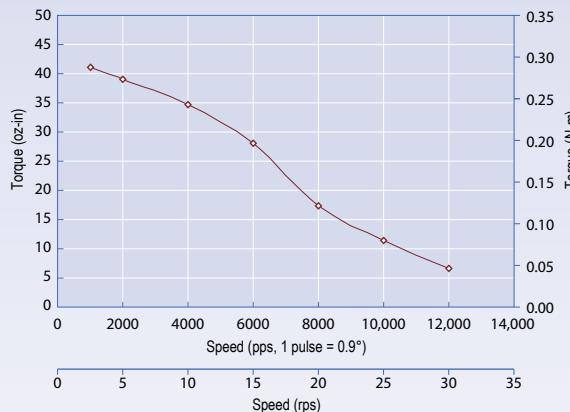
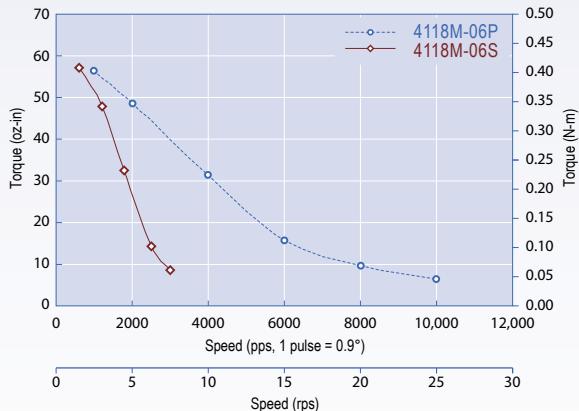
4118S-02 24vDC, 1.3 Amps/Phase, Bipolar, 1/2 Stepping

4118S-04S 24vDC, 0.67 Amps/Phase, Bipolar Series, 1/2 Stepping  
4118S-04P 24vDC, 1.33 Amps/Phase, Bipolar Parallel, 1/2 Stepping

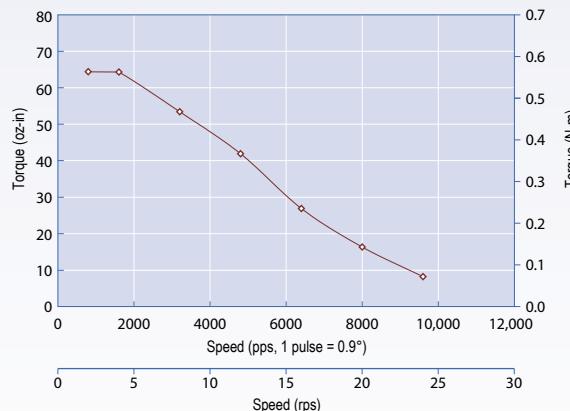
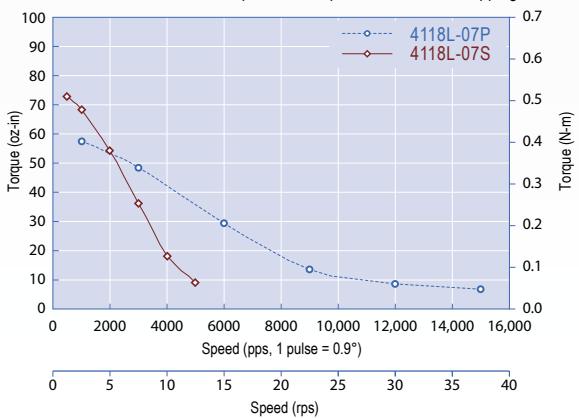
4118S-09 24vDC, 0.9 Amps/Phase, Bipolar, 1/2 Stepping



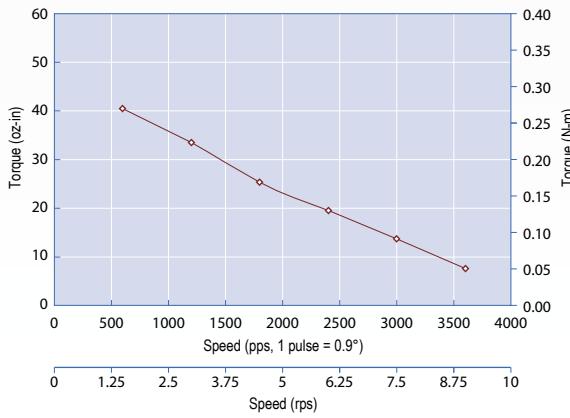
4118M-01 24vDC, 1.7 Amps/Phase, Bipolar, 1/2 Stepping

4118M-06S 24vDC, 0.7 Amps/Phase, Bipolar Series, 1/2 Stepping  
4118M-06P 24vDC, 1.4 Amps/Phase, Bipolar Parallel, 1/2 Stepping

4118L-01 24vDC, 2 Amps/Phase, Bipolar, 1/2 Stepping

4118L-07S 24vDC, 1.05 Amps/Phase, Bipolar Series, 1/2 Stepping  
4118L-07P 24vDC, 2.10 Amps/Phase, Bipolar Parallel, 1/2 Stepping

4118L-25 24vDC, 0.45 Amps/Phase, Unipolar, 1/2 Stepping



5618



- NEMA Size 23 Mounting
- High Resolution 1.8° Full Step Angle
- Cost Effective
- Custom Windings Available (No Additional Cost)

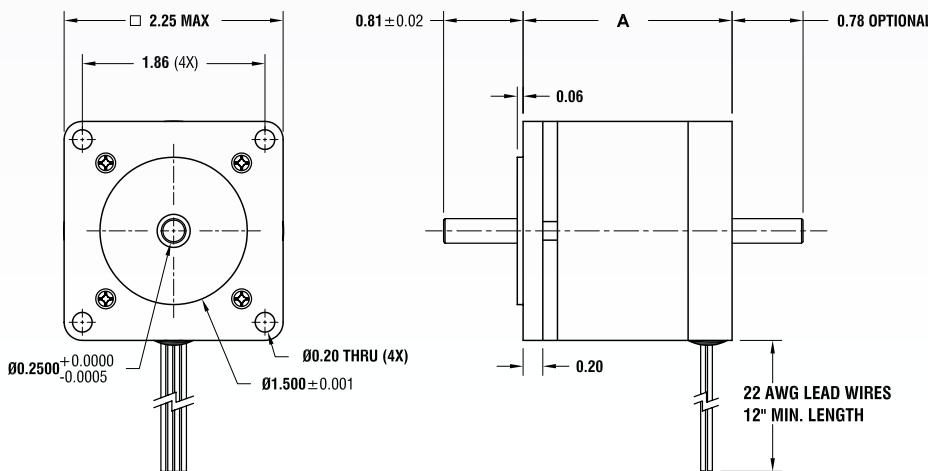
## ■ SPECIFICATIONS

| BIPOLAR  | Dimension "A" Max | Model #   | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in² | Weight Lbs. | Number of Leads |
|----------|-------------------|-----------|------------|--------------|------------|----------------------|---------------------|----------------|-------------|-----------------|
| BIPOLAR  | 1.55"<br>39.4 mm  | 5618X-09S | 0.35       | 56.0         | 0.40       | 40.0                 | 83.0                | 0.30           | 0.75        | 4               |
|          |                   | 5618X-09P | 0.70       | 56.0         | 0.40       | 10.0                 | 20.8                | 0.30           | 0.75        | 4               |
|          | 2.02"<br>51.3 mm  | 5618S-01S | 0.70       | 84.0         | 0.59       | 9.4                  | 18.8                | 0.60           | 1.12        | 4               |
|          |                   | 5618S-01P | 1.40       | 84.0         | 0.59       | 2.4                  | 4.7                 | 0.60           | 1.12        | 4               |
|          |                   | 5618S-42S | 2.70       | 84.0         | 0.59       | 0.7                  | 2.5                 | 0.60           | 1.12        | 4               |
|          |                   | 5618S-42P | 5.40       | 84.0         | 0.59       | 0.2                  | 0.4                 | 0.60           | 1.12        | 4               |
|          |                   | 5618S-54S | 0.35       | 84.0         | 0.59       | 40.0                 | 113.6               | 0.60           | 1.12        | 4               |
|          |                   | 5618S-54P | 0.70       | 84.0         | 0.59       | 10.8                 | 28.4                | 0.60           | 1.12        | 4               |
|          | 2.14"<br>54.4 mm  | 5618M-06S | 0.85       | 117.6        | 0.83       | 9.4                  | 28.4                | 0.74           | 1.20        | 4               |
|          |                   | 5618M-06P | 1.70       | 117.6        | 0.83       | 2.4                  | 7.1                 | 0.74           | 1.20        | 4               |
|          |                   | 5618M-08S | 1.55       | 117.6        | 0.83       | 2.7                  | 9.6                 | 0.74           | 1.20        | 4               |
|          |                   | 5618M-08P | 3.10       | 117.6        | 0.83       | 0.7                  | 2.4                 | 0.74           | 1.20        | 4               |
| UNIPOLAR | 3.02"<br>76.7 mm  | 5618L-52S | 2.17       | 175.0        | 1.24       | 2.4                  | 4.9                 | 1.20           | 1.90        | 4               |
|          |                   | 5618L-52P | 4.00       | 175.0        | 1.24       | 0.6                  | 1.2                 | 1.20           | 1.90        | 4               |
|          | 3.02"<br>76.7 mm  | 5618L-54S | 1.12       | 175.0        | 1.24       | 5.1                  | 29.8                | 1.20           | 1.90        | 4               |
|          |                   | 5618L-54P | 2.30       | 175.0        | 1.24       | 1.3                  | 5.2                 | 1.20           | 1.90        | 4               |

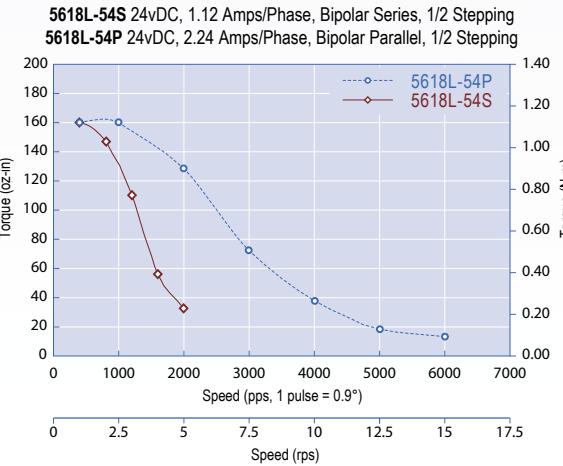
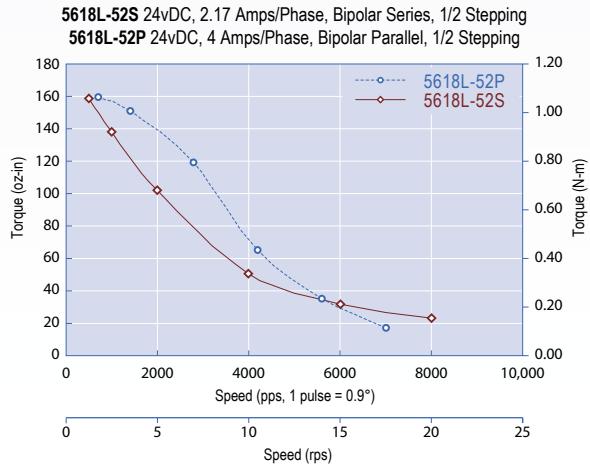
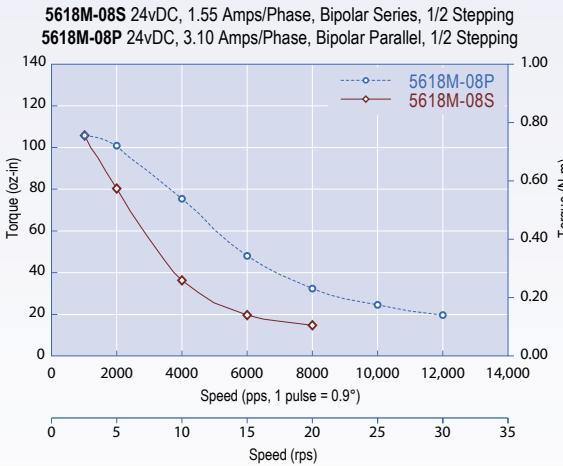
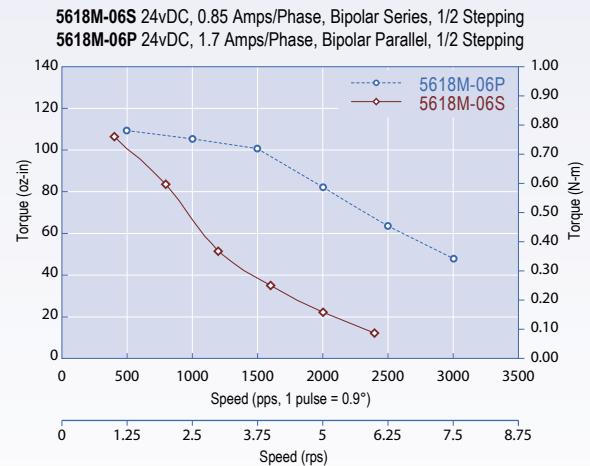
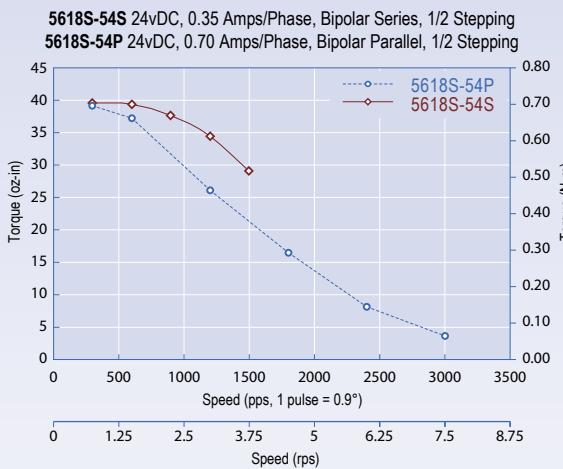
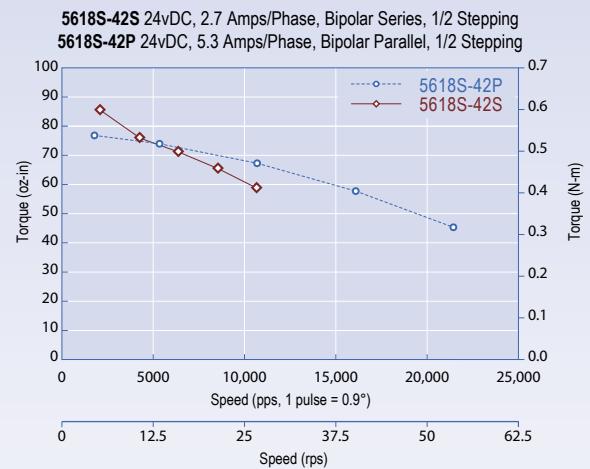
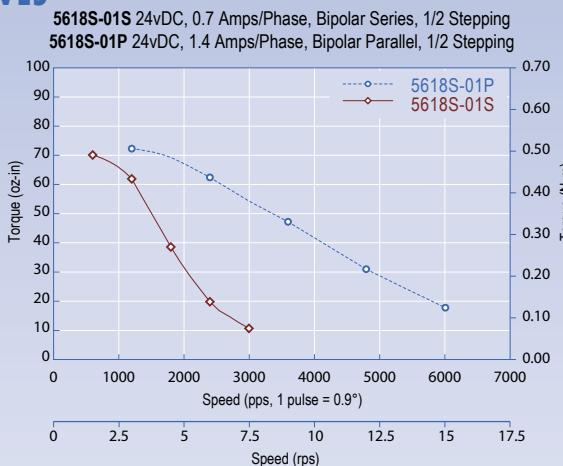
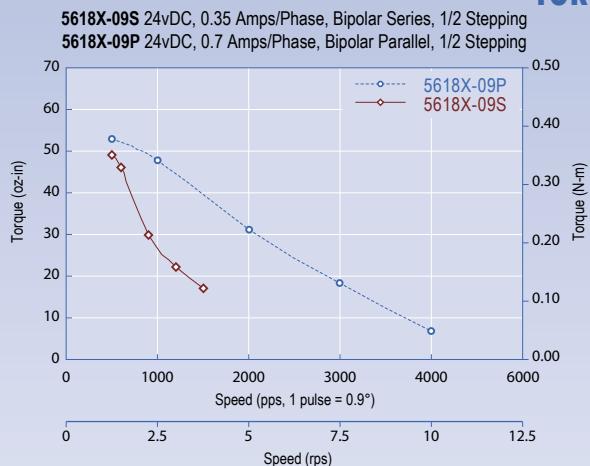
| UNIPOLAR | Dimension "A" Max | Model #  | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in² | Weight Lbs. | Number of Leads |
|----------|-------------------|----------|------------|--------------|------------|----------------------|---------------------|----------------|-------------|-----------------|
| UNIPOLAR | 1.55"<br>39.4 mm  | 5618X-09 | 0.5        | 40.0         | 0.28       | 20.0                 | 20.8                | 0.30           | 0.75        | 6               |
|          |                   | 5618S-01 | 1.0        | 60.0         | 0.42       | 4.7                  | 4.7                 | 0.60           | 1.12        | 6               |
|          | 2.02"<br>51.3 mm  | 5618S-42 | 3.8        | 60.0         | 0.42       | 0.4                  | 0.4                 | 0.60           | 1.12        | 6               |
|          |                   | 5618S-54 | 0.5        | 60.0         | 0.42       | 21.5                 | 28.4                | 0.60           | 1.12        | 6               |
|          |                   | 5618M-06 | 1.2        | 84.0         | 0.59       | 4.7                  | 7.1                 | 0.74           | 1.20        | 6               |
|          | 2.14"<br>54.4 mm  | 5618M-08 | 2.2        | 84.0         | 0.59       | 1.4                  | 2.4                 | 0.74           | 1.20        | 6               |
|          |                   | 5618L-52 | 3.1        | 125.0        | 0.88       | 1.2                  | 1.2                 | 1.20           | 1.90        | 6               |
|          |                   | 5618L-54 | 1.6        | 125.0        | 0.88       | 2.6                  | 5.2                 | 1.20           | 1.90        | 6               |

- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the rated current.
- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

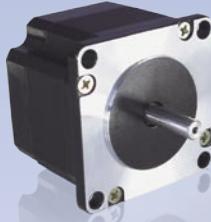
## ■ DIMENSIONS (inches)



## TORQUE CURVES



5718



- High Torque
- High Resolution
- Custom Windings Available (No Additional Cost)

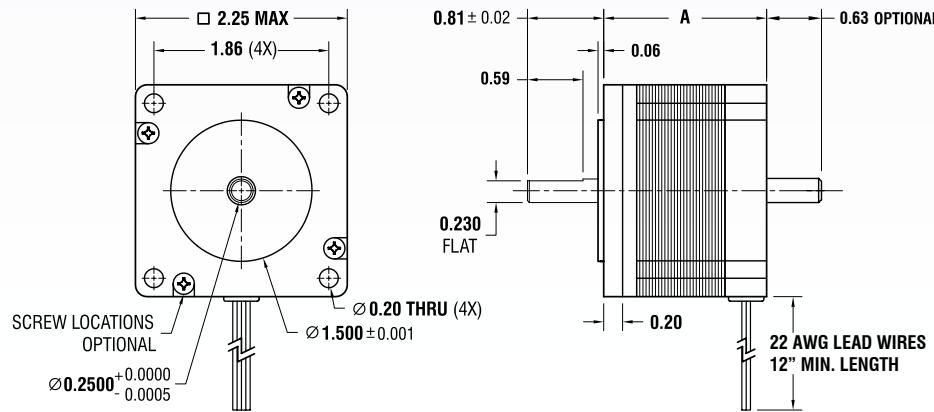
## SPECIFICATIONS

| BIPOLAR          | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 1.74"<br>44.2 mm | 5718X-01S         | 1.40    | 100.0      | 0.71         | 2.8        | 5.6                  | 0.70                | 1.05                       | 1.05        | 4               |
|                  | 5718X-01P         | 2.80    | 100.0      | 0.71         | 0.7        | 1.4                  | 0.70                | 1.05                       | 1.05        | 4               |
|                  | 5718X-05S         | 0.70    | 100.0      | 0.71         | 10.0       | 16.8                 | 0.70                | 1.05                       | 1.05        | 4               |
|                  | 5718X-05P         | 1.40    | 100.0      | 0.71         | 2.5        | 4.2                  | 0.70                | 1.05                       | 1.05        | 4               |
|                  | 5718X-15S         | 2.10    | 100.0      | 0.71         | 1.2        | 1.6                  | 0.70                | 1.05                       | 1.05        | 4               |
|                  | 5718X-15P         | 4.20    | 100.0      | 0.71         | 0.3        | 0.4                  | 0.70                | 1.05                       | 1.05        | 4               |
| 2.2"<br>55.9 mm  | 5718M-02S         | 2.10    | 173.0      | 1.29         | 1.8        | 5.2                  | 1.50                | 1.50                       | 1.50        | 4               |
|                  | 5718M-02P         | 4.20    | 173.0      | 1.29         | 0.5        | 1.4                  | 1.50                | 1.50                       | 1.50        | 4               |
|                  | 5718M-04S         | 0.70    | 173.0      | 1.29         | 14.0       | 42.3                 | 1.50                | 1.50                       | 1.50        | 4               |
|                  | 5718M-04P         | 1.40    | 173.0      | 1.29         | 3.5        | 10.6                 | 1.50                | 1.50                       | 1.50        | 4               |
|                  | 5718M-05S         | 1.40    | 173.0      | 1.29         | 3.6        | 10.0                 | 1.50                | 1.50                       | 1.50        | 4               |
|                  | 5718M-05P         | 2.80    | 173.0      | 1.29         | 0.9        | 2.5                  | 1.50                | 1.50                       | 1.50        | 4               |
| 3.08"<br>78.2 mm | 5718L-01S         | 1.40    | 294.0      | 2.08         | 4.5        | 15.3                 | 2.60                | 2.20                       | 2.20        | 4               |
|                  | 5718L-01P         | 2.80    | 294.0      | 2.08         | 1.1        | 3.8                  | 2.60                | 2.20                       | 2.20        | 4               |
|                  | 5718L-03S         | 2.10    | 294.0      | 2.08         | 2.4        | 7.0                  | 2.60                | 2.20                       | 2.20        | 4               |
|                  | 5718L-03P         | 4.20    | 294.0      | 2.08         | 0.6        | 1.8                  | 2.60                | 2.20                       | 2.20        | 4               |
|                  | 5718L-04S         | 3.30    | 294.0      | 2.08         | 1.0        | 5.2                  | 2.60                | 2.20                       | 2.20        | 4               |
|                  | 5718L-04P         | 6.50    | 294.0      | 2.08         | 0.3        | 1.3                  | 2.60                | 2.20                       | 2.20        | 4               |

| UNIPOLAR         | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 1.74"<br>44.2 mm | 5718X-01          | 2.00    | 72.0       | 0.51         | 1.4        | 1.4                  | 0.70                | 1.05                       | 1.05        | 6               |
|                  | 5718X-05          | 1.00    | 72.0       | 0.51         | 5.0        | 4.2                  | 0.70                | 1.05                       | 1.05        | 6               |
|                  | 5718X-15          | 3.00    | 72.0       | 0.51         | 0.6        | 0.4                  | 0.70                | 1.05                       | 1.05        | 6               |
| 2.2"<br>55.9 mm  | 5718M-02          | 3.00    | 130.0      | 0.92         | 0.9        | 1.4                  | 1.50                | 1.50                       | 1.50        | 6               |
|                  | 5718M-04          | 1.00    | 130.0      | 0.92         | 7.0        | 10.6                 | 1.50                | 1.50                       | 1.50        | 6               |
|                  | 5718M-05          | 2.00    | 130.0      | 0.92         | 1.8        | 2.5                  | 1.50                | 1.50                       | 1.50        | 6               |
| 3.08"<br>78.2 mm | 5718L-01          | 2.00    | 210.0      | 1.48         | 2.3        | 3.8                  | 2.60                | 2.20                       | 2.20        | 6               |
|                  | 5718L-03          | 3.00    | 210.0      | 1.48         | 1.2        | 1.8                  | 2.60                | 2.20                       | 2.20        | 6               |
|                  | 5718L-04          | 4.67    | 210.0      | 1.48         | 0.5        | 1.3                  | 2.60                | 2.20                       | 2.20        | 6               |

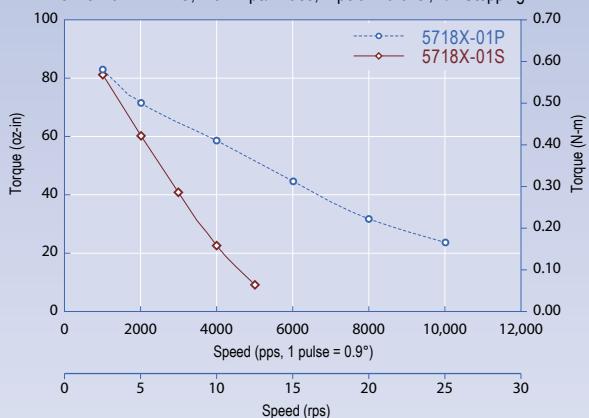
- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the rated current.
- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

## DIMENSIONS (inches)

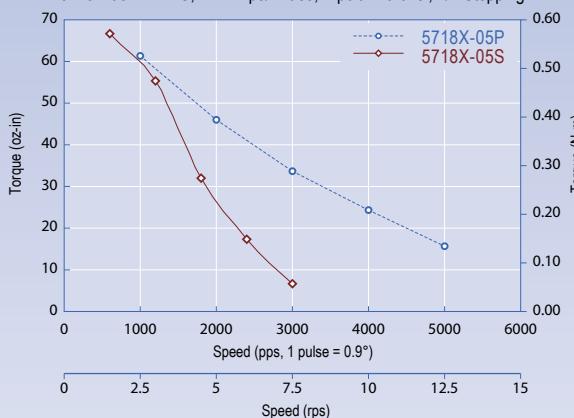


## TORQUE CURVES

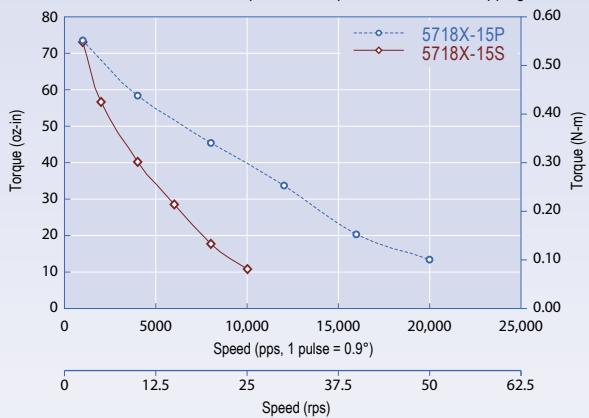
**5718X-01S** 24vDC, 1.4 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5718X-01P** 24vDC, 2.8 Amps/Phase, Bipolar Parallel, 1/2 Stepping



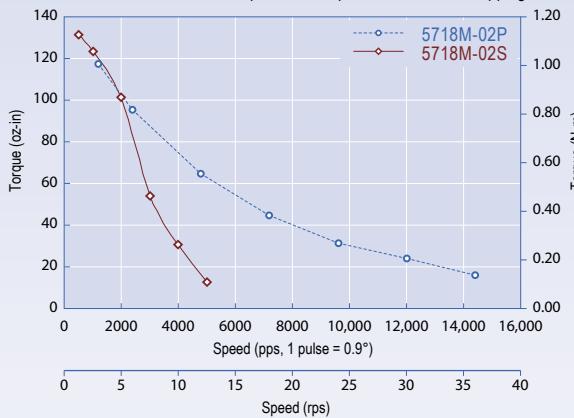
**5718X-05S** 24vDC, 0.7 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5718X-05P** 24vDC, 1.4 Amps/Phase, Bipolar Parallel, 1/2 Stepping



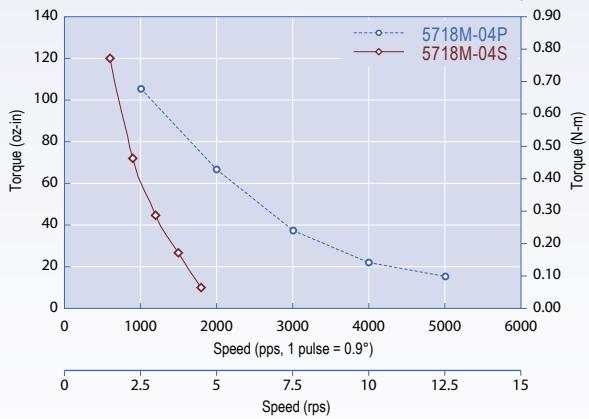
**5718X-15S** 24vDC, 2.1 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5718X-15P** 24vDC, 4.2 Amps/Phase, Bipolar Parallel, 1/2 Stepping



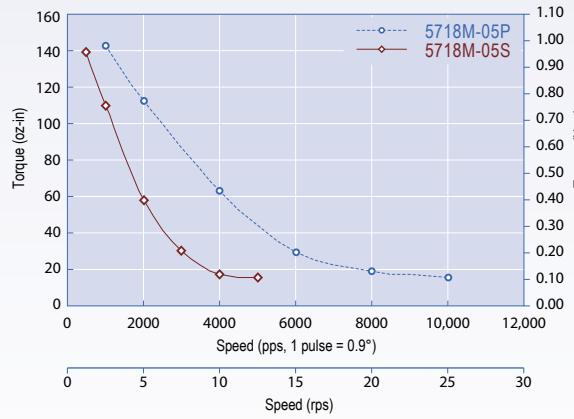
**5718M-02S** 24vDC, 2.1 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5718M-02P** 24vDC, 4.2 Amps/Phase, Bipolar Parallel, 1/2 Stepping



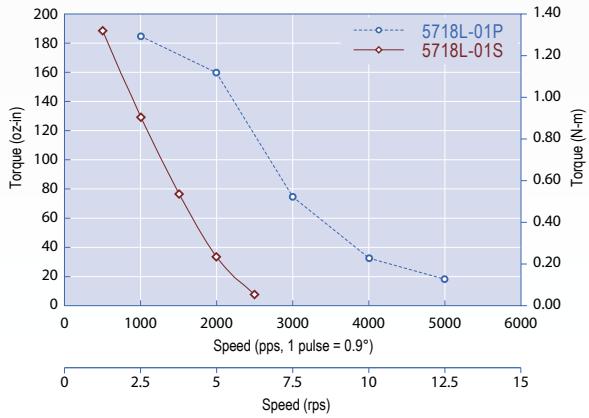
**5718M-04S** 24vDC, 0.7 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5718M-04P** 24vDC, 1.4 Amps/Phase, Bipolar Parallel, 1/2 Stepping



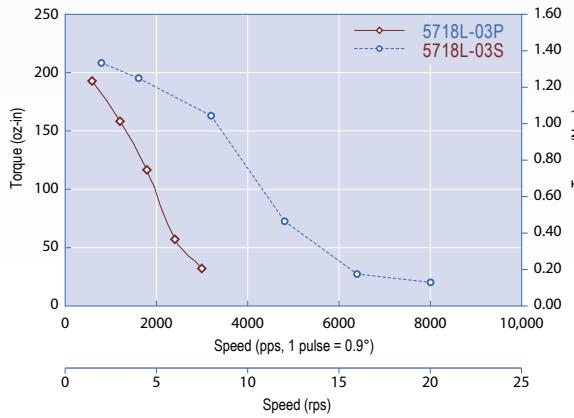
**5718M-05S** 24vDC, 1.4 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5718M-05P** 24vDC, 2.8 Amps/Phase, Bipolar Parallel, 1/2 Stepping



**5718L-01S** 24vDC, 1.4 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5718L-01P** 24vDC, 2.8 Amps/Phase, Bipolar Parallel, 1/2 Stepping



**5718L-03S** 24vDC, 2.1 Amps/Phase, Bipolar Series, 1/2 Stepping  
**5718L-03P** 24vDC, 4.2 Amps/Phase, Bipolar Parallel, 1/2 Stepping





- NEMA Size 34 Mounting
- Cost Effective
- Custom Windings Available (No Additional Cost)

## SPECIFICATIONS

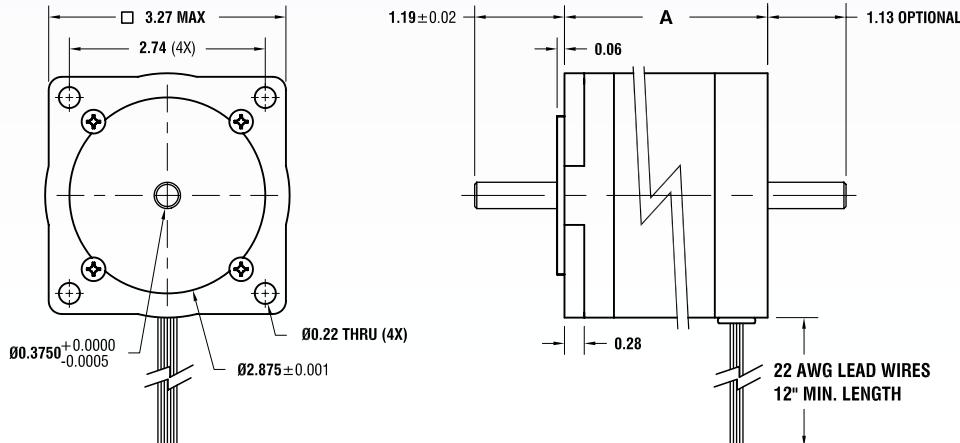
| BIPOLAR           | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|-------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 2.47"<br>62.7 mm  | 8618S-01S         | 4.27    | 252.0      | 1.78         | 0.4        | 4.4                  | 3.10                | 3.20                       | 3.20        | 4               |
|                   | 8618S-01P         | 8.54    | 252.0      | 1.78         | 0.1        | 1.1                  | 3.10                | 3.20                       | 3.20        | 4               |
|                   | 8618S-02S         | 3.15    | 252.0      | 1.78         | 0.8        | 5.4                  | 3.10                | 3.20                       | 3.20        | 4               |
|                   | 8618S-02P         | 6.30    | 252.0      | 1.78         | 0.2        | 1.4                  | 3.10                | 3.20                       | 3.20        | 4               |
|                   | 8618S-03S         | 0.88    | 252.0      | 1.78         | 10.0       | 58.2                 | 3.10                | 3.20                       | 3.20        | 4               |
|                   | 8618S-03P         | 1.75    | 252.0      | 1.78         | 2.5        | 14.6                 | 3.10                | 3.20                       | 3.20        | 4               |
| 3.73"<br>94.7 mm  | 8618M-02S         | 2.80    | 490.0      | 3.46         | 1.5        | 14.6                 | 6.02                | 5.78                       | 5.78        | 4               |
|                   | 8618M-02P         | 5.60    | 490.0      | 3.46         | 0.4        | 3.7                  | 6.02                | 5.78                       | 5.78        | 4               |
|                   | 8618M-03S         | 1.40    | 490.0      | 3.46         | 6.9        | 60.0                 | 6.02                | 5.78                       | 5.78        | 4               |
|                   | 8618M-03P         | 2.80    | 490.0      | 3.46         | 1.7        | 15.0                 | 6.02                | 5.78                       | 5.78        | 4               |
|                   | 8618M-11S         | 3.00    | 490.0      | 3.46         | 0.9        | 9.6                  | 6.02                | 5.78                       | 5.78        | 4               |
|                   | 8618M-11P         | 6.00    | 490.0      | 3.46         | 0.2        | 2.4                  | 6.02                | 5.78                       | 5.78        | 4               |
| 5.07"<br>128.8 mm | 8618L-02S         | 2.80    | 700.0      | 4.94         | 2.3        | 23.8                 | 9.85                | 8.00                       | 8.00        | 4               |
|                   | 8618L-02P         | 5.60    | 700.0      | 4.94         | 0.6        | 6.0                  | 9.85                | 8.00                       | 8.00        | 4               |
|                   | 8618L-03S         | 4.69    | 700.0      | 4.94         | 0.9        | 7.4                  | 9.85                | 8.00                       | 8.00        | 4               |
|                   | 8618L-03P         | 9.38    | 700.0      | 4.94         | 0.2        | 1.9                  | 9.85                | 8.00                       | 8.00        | 4               |

| UNIPOLAR*         | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|-------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 2.47"<br>62.7 mm  | 8618S-01E         | 6.10    | 180.0      | 1.27         | 0.2        | 0.8                  | 3.10                | 3.20                       | 3.20        | 8               |
|                   | 8618S-02E         | 4.50    | 180.0      | 1.27         | 0.4        | 1.4                  | 3.10                | 3.20                       | 3.20        | 8               |
|                   | 8618S-03E         | 1.25    | 180.0      | 1.27         | 5.0        | 14.6                 | 3.10                | 3.20                       | 3.20        | 8               |
| 3.73"<br>94.7 mm  | 8618M-02E         | 4.00    | 350.0      | 3.40         | 0.7        | 3.7                  | 6.02                | 5.78                       | 5.78        | 8               |
|                   | 8618M-03E         | 2.00    | 350.0      | 3.27         | 3.4        | 15.0                 | 6.02                | 5.78                       | 5.78        | 8               |
|                   | 8618M-11E         | 4.29    | 350.0      | 2.80         | 0.4        | 2.4                  | 6.02                | 5.78                       | 5.78        | 8               |
| 5.07"<br>128.8 mm | 8618L-02E         | 4.00    | 500.0      | 5.36         | 1.2        | 6.0                  | 9.85                | 8.00                       | 8.00        | 8               |
|                   | 8618L-03E         | 6.70    | 500.0      | 5.00         | 0.5        | 1.9                  | 9.85                | 8.00                       | 8.00        | 8               |

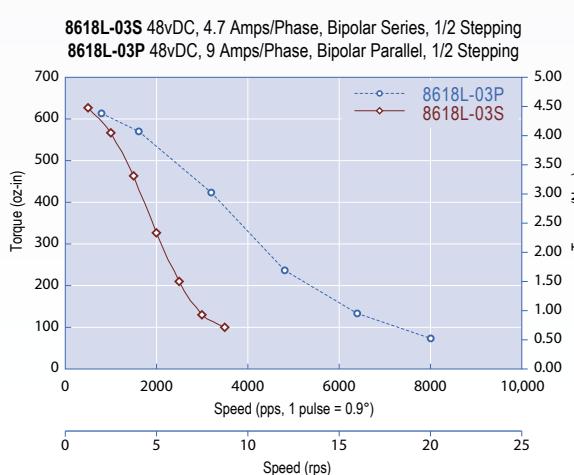
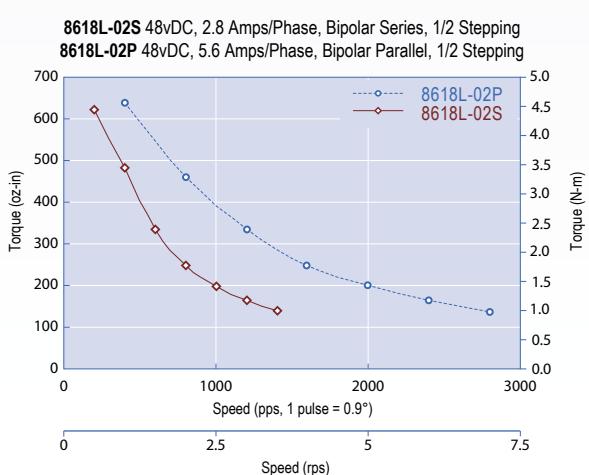
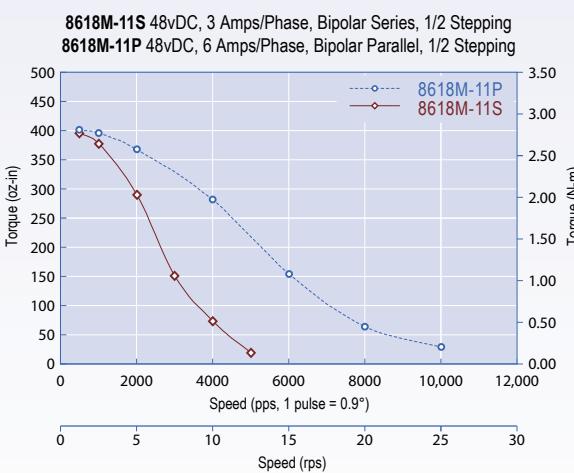
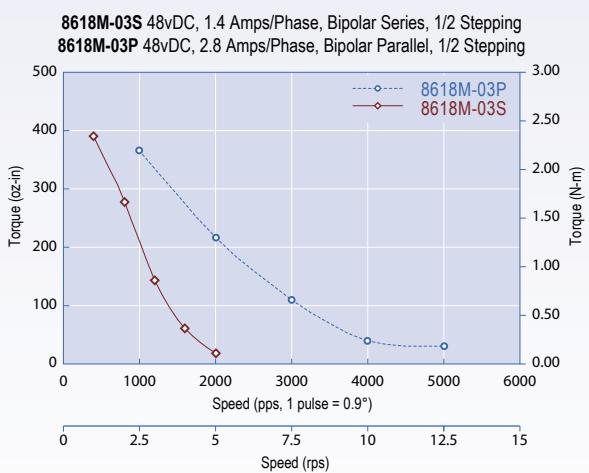
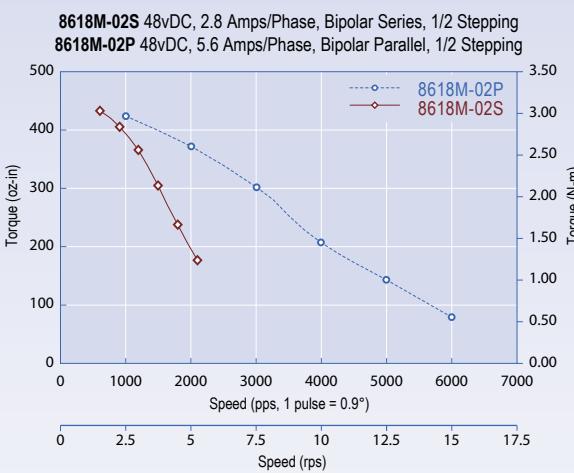
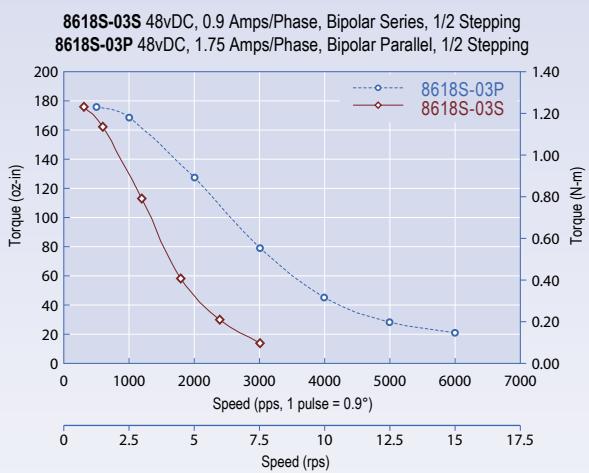
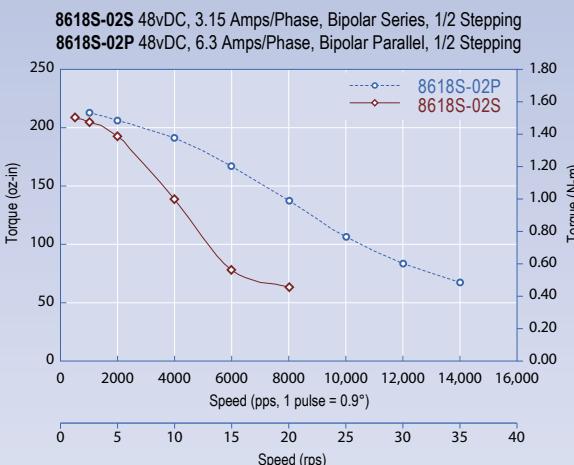
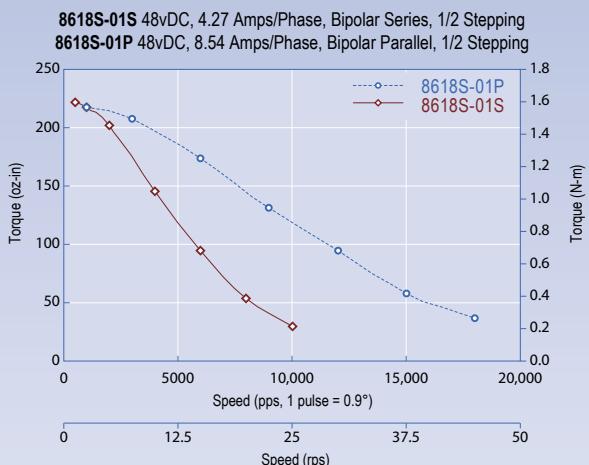
- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the rated current.
- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

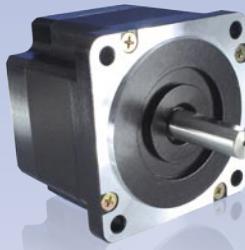
\* These 8-wire motors are based on unipolar ratings. The motors can perform at both Bipolar Series and Parallel ratings.

## DIMENSIONS (inches)



## TORQUE CURVES





- High Torque
- High Step Accuracy
- High Resolution
- Custom Windings Available (No Additional Cost)

## SPECIFICATIONS

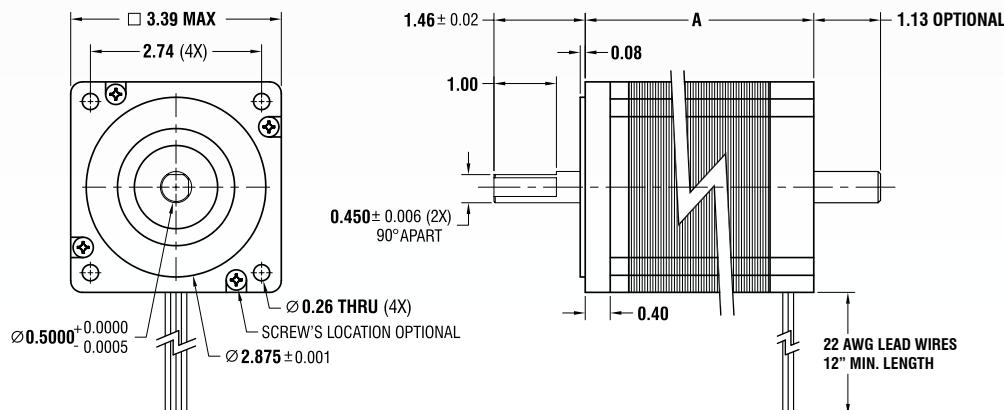
| BIPOLAR          | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 2.64"<br>67.1 mm | 8718S-01S         | 1.40    | 434.0      | 3.06         | 4.7        | 26.4                 | 7.66                | 3.85                       | 3.85        | 4               |
|                  | 8718S-01P         | 2.80    | 434.0      | 3.06         | 1.2        | 6.6                  | 7.66                | 3.85                       | 3.85        | 4               |
|                  | 8718S-03S         | 2.10    | 434.0      | 3.06         | 2.0        | 14.0                 | 7.66                | 3.85                       | 3.85        | 4               |
|                  | 8718S-03P         | 4.20    | 434.0      | 3.06         | 0.5        | 3.5                  | 7.66                | 3.85                       | 3.85        | 4               |
|                  | 8718S-05S         | 3.15    | 434.0      | 3.06         | 1.0        | 6.1                  | 7.66                | 3.85                       | 3.85        | 4               |
|                  | 8718S-05P         | 6.30    | 434.0      | 3.06         | 0.3        | 1.5                  | 7.66                | 3.85                       | 3.85        | 4               |
| 3.82"<br>97 mm   | 8718M-04S         | 1.40    | 861.0      | 6.08         | 6.7        | 64.5                 | 14.80               | 5.94                       | 5.94        | 4               |
|                  | 8718M-04P         | 2.80    | 861.0      | 6.08         | 1.7        | 16.1                 | 14.80               | 5.94                       | 5.94        | 4               |
|                  | 8718M-06S         | 2.10    | 861.0      | 6.08         | 2.5        | 23.6                 | 14.80               | 5.94                       | 5.94        | 4               |
|                  | 8718M-06P         | 4.20    | 861.0      | 6.08         | 0.6        | 5.9                  | 14.80               | 5.94                       | 5.94        | 4               |
|                  | 8718M-16S         | 3.15    | 861.0      | 6.08         | 1.2        | 8.3                  | 14.80               | 5.94                       | 5.94        | 4               |
|                  | 8718M-16P         | 6.30    | 861.0      | 6.08         | 0.3        | 2.1                  | 14.80               | 5.94                       | 5.94        | 4               |
| 5.00"<br>127 mm  | 8718L-02S         | 1.40    | 1288.0     | 9.10         | 7.5        | 78.1                 | 21.90               | 8.44                       | 8.44        | 4               |
|                  | 8718L-02P         | 2.80    | 1288.0     | 9.10         | 1.9        | 19.5                 | 21.90               | 8.44                       | 8.44        | 4               |
|                  | 8718L-04S         | 3.15    | 1288.0     | 9.10         | 1.9        | 16.6                 | 21.90               | 8.44                       | 8.44        | 4               |
|                  | 8718L-04P         | 6.30    | 1288.0     | 9.10         | 0.5        | 4.1                  | 21.90               | 8.44                       | 8.44        | 4               |
|                  | 8718L-08S         | 3.85    | 1288.0     | 9.10         | 1.2        | 10.8                 | 21.90               | 8.44                       | 8.44        | 4               |
|                  | 8718L-08P         | 7.70    | 1288.0     | 9.10         | 0.3        | 2.7                  | 21.90               | 8.44                       | 8.44        | 4               |

| UNIPOLAR*        | Dimension "A" Max | Model # | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|------------------|-------------------|---------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 2.64"<br>67.1 mm | 8718S-01          | 2.00    | 310.0      | 2.19         | 2.3        | 6.6                  | 7.66                | 3.85                       | 3.85        | 8               |
|                  | 8718S-03          | 3.00    | 310.0      | 2.19         | 1.0        | 3.52                 | 7.66                | 3.85                       | 3.85        | 8               |
|                  | 8718S-05          | 4.50    | 310.0      | 2.36         | 0.5        | 1.5                  | 7.66                | 3.85                       | 3.85        | 8               |
| 3.82"<br>97 mm   | 8718M-04          | 2.00    | 615.0      | 4.79         | 3.3        | 16.1                 | 14.80               | 5.94                       | 5.94        | 8               |
|                  | 8718M-06          | 3.00    | 615.0      | 4.35         | 1.3        | 5.9                  | 14.80               | 5.94                       | 5.94        | 8               |
|                  | 8718M-16          | 4.50    | 615.0      | 3.86         | 0.6        | 2.1                  | 14.80               | 5.94                       | 5.94        | 8               |
| 5.00"<br>127 mm  | 8718L-02          | 2.00    | 920.0      | 7.43         | 3.8        | 19.5                 | 21.90               | 8.44                       | 8.44        | 8               |
|                  | 8718L-04          | 4.50    | 920.0      | 7.70         | 1.0        | 4.1                  | 21.90               | 8.44                       | 8.44        | 8               |
|                  | 8718L-08          | 5.50    | 920.0      | 7.03         | 0.6        | 2.7                  | 21.90               | 8.44                       | 8.44        | 8               |

- Please complete our application data sheet for different windings.
- Power supply voltage can be any value as long as the driver output current is controlled at the rated current.
- Call Lin Engineering for additional bipolar torque curves.
- Performance, use, and appearance specifications of the products listed here are subject to change without notice.
- For operating temperatures, see page 94.

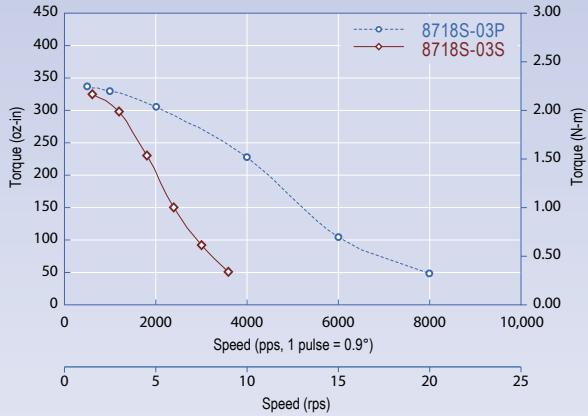
\* These 8-wire motors are based on unipolar ratings. The motors can perform at both Bipolar Series and Parallel ratings.

## DIMENSIONS (inches)

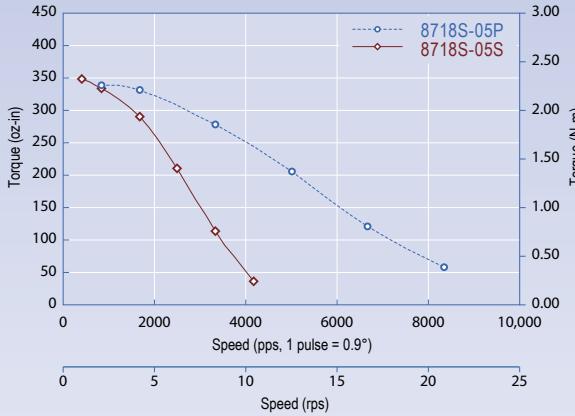


## TORQUE CURVES

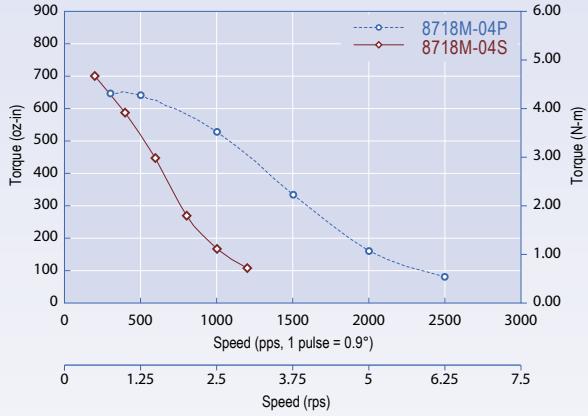
**8718S-03S** 24vDC, 2.1 Amps/Phase, Bipolar Series, 1/2 Stepping  
**8718S-03P** 24vDC, 4.2 Amps/Phase, Bipolar Parallel, 1/2 Stepping



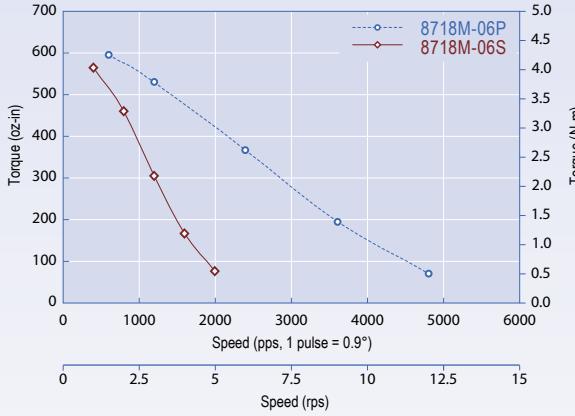
**8718S-05S** 48vDC, 3.15 Amps/Phase, Bipolar Series, 1/2 Stepping  
**8718S-05P** 48vDC, 6.30 Amps/Phase, Bipolar Parallel, 1/2 Stepping



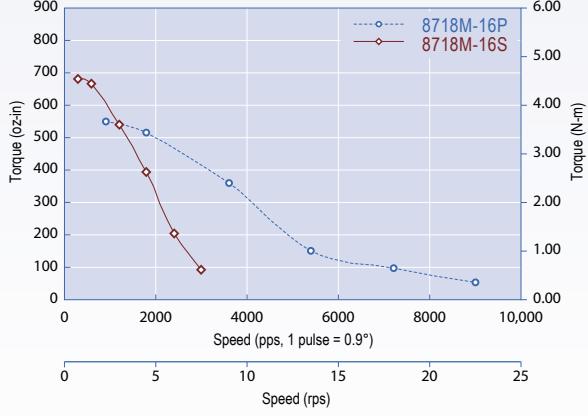
**8718M-04S** 48vDC, 1.4 Amps/Phase, Bipolar Series, 1/2 Stepping  
**8718M-04P** 48vDC, 2.8 Amps/Phase, Bipolar Parallel, 1/2 Stepping



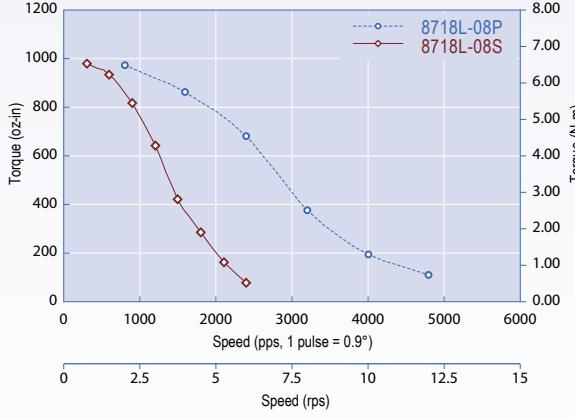
**8718M-06S** 48vDC, 2.1 Amps/Phase, Bipolar Series, 1/2 Stepping  
**8718M-06P** 48vDC, 4.2 Amps/Phase, Bipolar Parallel, 1/2 Stepping

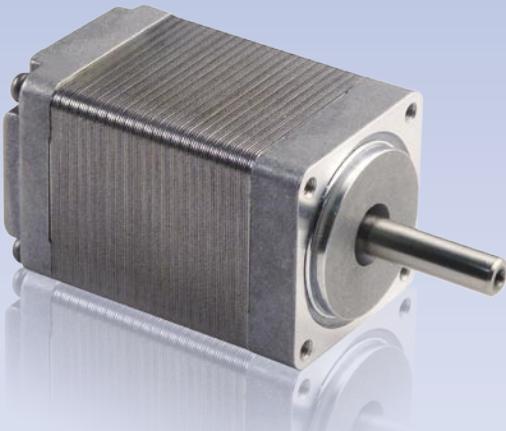


**8718M-16S** 48vDC, 3.15 Amps/Phase, Bipolar Series, 1/2 Stepping  
**8718M-16P** 48vDC, 6.30 Amps/Phase, Bipolar Parallel, 1/2 Stepping



**8718L-08S** 48vDC, 3.85 Amps/Phase, Bipolar Series, 1/2 Stepping  
**8718L-08P** 48vDC, 7.70 Amps/Phase, Bipolar Parallel, 1/2 Stepping





- NEMA 11, 1.8° Motor
- Up to 16 oz-in holding torque
- Vacuum Rating of  $10^{-4}$  torr to  $10^{-7}$  torr

## ■ FEATURES

The vacuum rated 1.8°

1.99." In order to make these small but powerful motors vacuum rated, Lin Engineering ensures that all of the special handling and parts necessary are used in the manufacturing process. First of all, all paint and oils are removed from the motor. Next, high temperature windings are utilized as well as Teflon leads. Lastly, depe

are used. During the entire manufacturing process, latex gloves are worn to ensure that no residue from human touch is left behind on the motors. All of the above special parts and handling ensure that limited outgassing and contamination will occur.

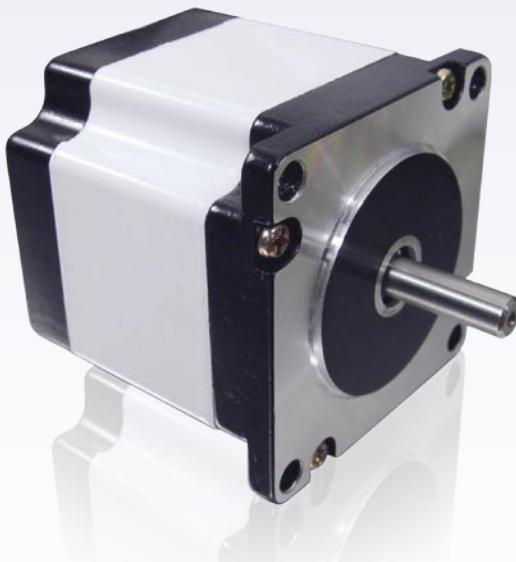
NEMA 17 and 23 vacuum motors are also available, please contact Lin Engineering for more information.

Note: See page 33 for motor specifications.

## 1.8° SIZE 17 & 23

### WATER/DUST RESISTANT MOTOR

#### IP65



- Available in 1.8° NEMA 17 and 23
- Protected against dust
- Protected against low pressure jets of water

## ■ FEATURES

The IP65 Series of moto

from a distance of 3 meters. These jets of water can carry pressure of up to 30 kPa from all directions at a rate of 12.5 l/min for the duration of 3

For smaller or larger IP65 motors, please contact Lin Engineering.

# INTEGRATED MOTORS



## Mini Pak

NEMA Size 11

1.8° Motor + Driver + Controller

pg.53



## SilverPak 17D

NEMA Size 17

1.8° Motor + Driver

pg.55



## SilverPak 17C

NEMA Size 17

1.8° Motor + Driver + Controller

pg.57

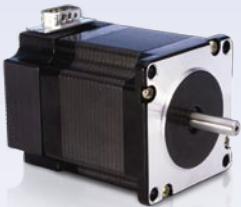


## SilverPak 17T

NEMA Size 17

1.8° Motor + Driver + Controller

pg.59



## SilverPak 23D

NEMA Size 23

1.8° Motor + Driver

pg.61



## SilverPak 23C

NEMA Size 23

1.8° Motor + Driver + Controller

pg.63



## MINI PAK

## SILVERPAK SERIES



## ■ DRIVER FEATURES

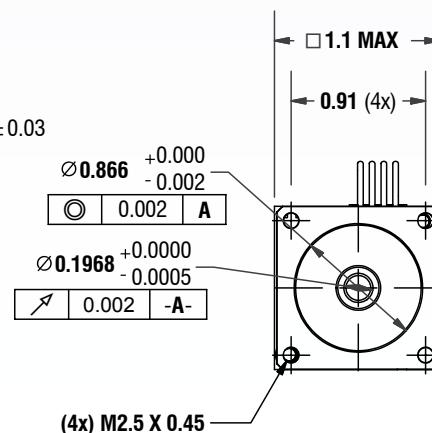
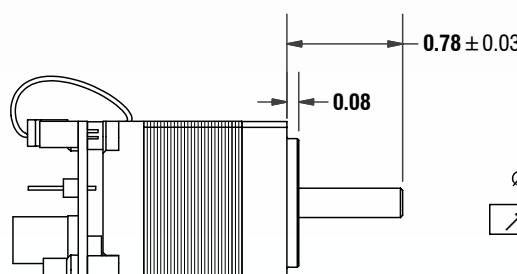
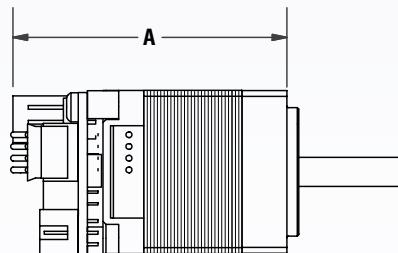
- Controls one step motor with 4 bit microstepping
- Programmable Coil current of up to 800 mA
- Operating voltage range 8V to 29V
- Fixed frequency PWM current control with automatic selection of fast and slow decay mode
- Full step frequencies up to 1kHz
- High temperature, open circuit, short, over-current and under-voltage diagnostics

## ■ CONTROLLER FEATURES

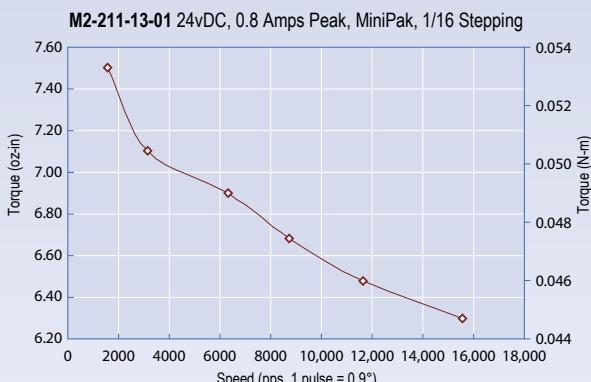
- Internal 16-bit wide position counter
- Configurable speed and acceleration settings
- Built-in ramp generator for autonomous positioning and speed control
- On-the-fly alteration of target position
- Reference switch input available for read out
- Two wire interface ( $I^2C$  Communication)
- Transfer rates up to 350 kbps
- Diagnostics and status information as well as motion parameters accessible
- Field-programmable node addresses (32)

## ■ DIMENSIONS (inches)

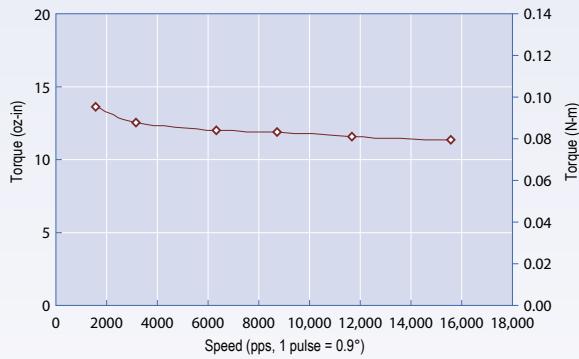
**A** Overall Body Length  
M2-211-13: 1.24" (31.5 mm)  
M2-211-18: 1.75" (44.5 mm)  
M2-211-20: 1.99" (50.5 mm)



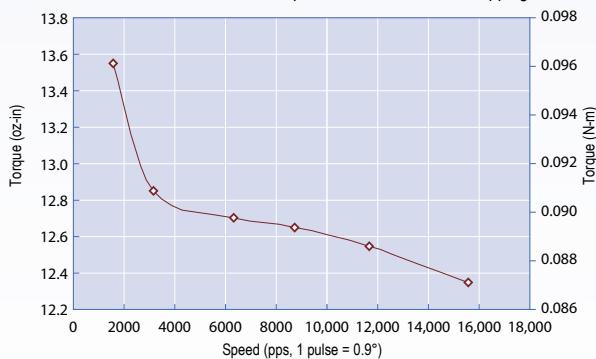
## ■ TORQUE CURVES



M2-211-18-01 24vDC, 0.8 Amps Peak, MiniPak, 1/16 Stepping



M2-211-20-01 24vDC, 0.8 Amps Peak, MiniPak, 1/16 Stepping



## ■ MOTOR SPECIFICATIONS

### Model M2-211-13-01

|                |  |              |
|----------------|--|--------------|
| Holding Torque | oz-in (N-m)                              | 9.20 (0.060) |
| Rotor Inertia  | oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.05 (0.009) |
| Weight         | (Motor + Driver + Controller) lbs (gm)   | 0.24 (0.110) |

### Model M2-211-18-01

|                |  |               |
|----------------|--|---------------|
| Holding Torque | oz-in (N-m)                              | 13.70 (0.100) |
| Rotor Inertia  | oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.09 (0.016)  |
| Weight         | (Motor + Driver + Controller) lbs (gm)   | 0.31 (0.140)  |

### Model M2-211-20-01

|                |  |               |
|----------------|--|---------------|
| Holding Torque | oz-in (N-m)                              | 16.60 (0.120) |
| Rotor Inertia  | oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.08 (0.015)  |
| Weight         | (Motor + Driver + Controller) lbs (gm)   | 0.44 (0.200)  |

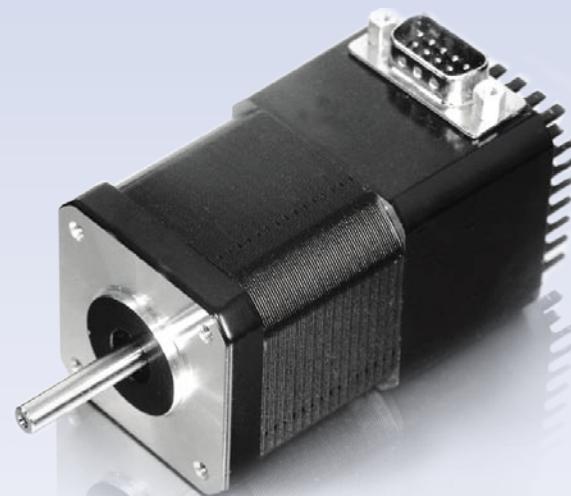
## ■ DESIGNERS KIT

- TMC222 Control Board
- USB to RS485 Converter Card
- 3 Cables
  - 5 Pin to 5 Pin Cable
  - USB 3 Pin Cable
  - USB to PC Cable
- CD-ROM with User Manual



## ■ TMC222 CONTROL BOARD

- RS485 Communication
- Homing Capabilities
- Parameter Storage
- ASCII Interface
- 2-Module Handling
- Constant Velocity



## ■ FEATURES

- NEMA 17, 1.8° Bipolar Step Motor
- Operates from +12 to 24 VDC
- Up to 85 oz-in of Holding Torque
- Phase current ranges from 0.25 to 2.0 Amps Peak
- Step Resolutions from Full, 2x, 4x, 8x
- Optically isolated Step, Direction, and Disable/Enable Inputs
- Selectable Current Reduction of 33%
- Low Power Dissipation
- Efficient Current Control
- Thermal Shutdown, Under-voltage Protection
- 3 stack lengths available

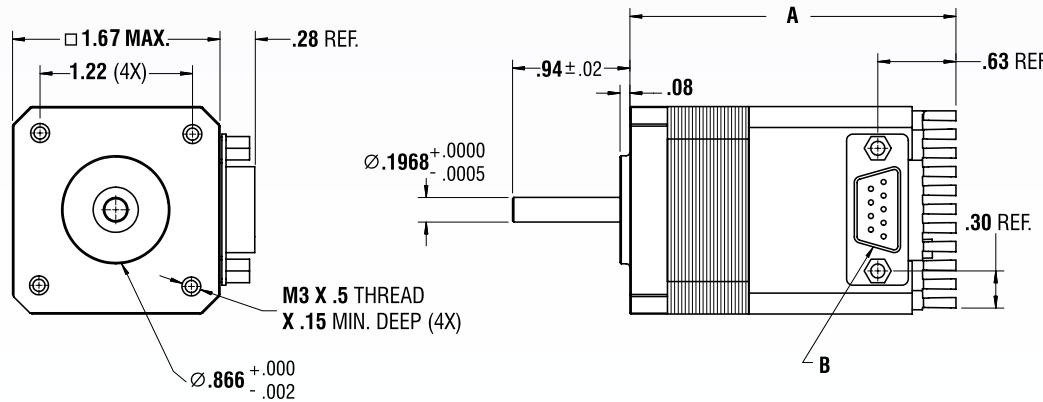
## ■ SPECIFICATIONS

- **INPUT VOLTAGE:**  
+12 to 24 VDC (Including Unregulated Power Supplies)
- **DRIVE CURRENT(PER PHASE):**  
0.25 to 2 Amps Peak
- **OPTICALLY ISOLATED INPUTS:**  
Step Clock, Direction, Enable & Disable
- **STEP FREQUENCY (MAX):**  
30 kHz
- **STEPS PER REVOLUTION (1.8° MOTOR):**  
200, 400, 800, 1600
- **MICROSTEP RESOLUTIONS (1.8° MOTOR):**  
Full, 2x, 4x, 8x

## ■ DIMENSIONS (inches)

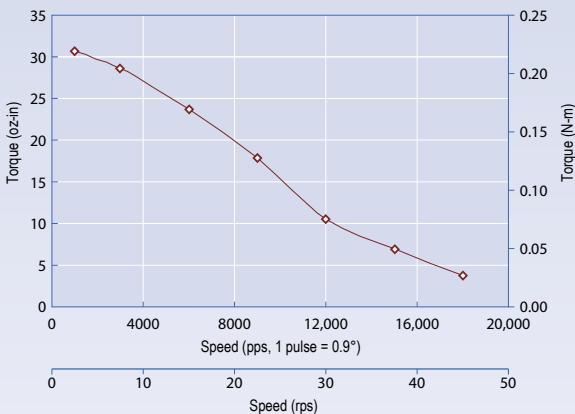
**A.** Overall Body Length  
DO-4118S: 2.69" (6.83cm)  
DO-4118M: 2.92" (7.42cm)  
DO-4118L: 3.24" (8.23cm)

**B.** DB-9 Connector for Controls

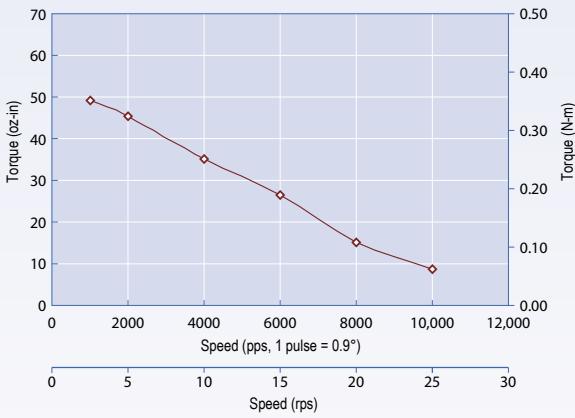


## TORQUE CURVES

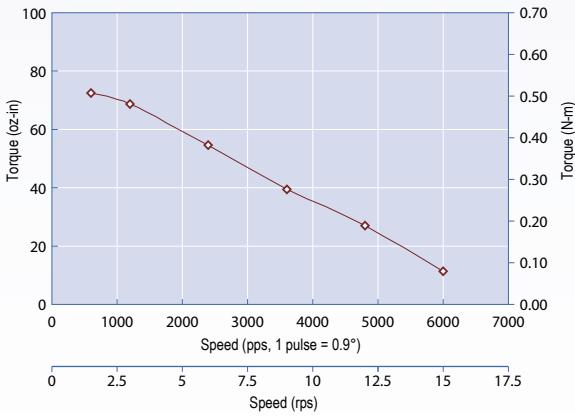
**DO-4118S-01** 24vDC, 2 Amps Peak, SilverPak 17D, 1/2 Stepping



**DO-4118M-03P** 24vDC, 2 Amps Peak, SilverPak 17D, 1/2 Stepping



**DO-4118L-06P** 24vDC, 2 Amps Peak, SilverPak 17D, 1/2 Stepping



## MOTOR SPECIFICATIONS

**Model DO-4118S-01**

|   |              |
|---|--------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 30.00 (0.21) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.18 (0.03)  |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 0.55 (0.25)  |

**Model DO-4118M-03P**

|   |              |
|---|--------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 45.00 (0.32) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.28 (0.05)  |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 0.75 (0.34)  |

**Model DO-4118L-06P**

|   |              |
|---|--------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 85.00 (0.60) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.37 (0.07)  |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 0.85 (0.39)  |

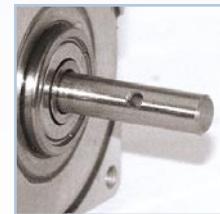
## OPTIONAL ENCODER

Optional encoder available with **SilverPak 17DE**

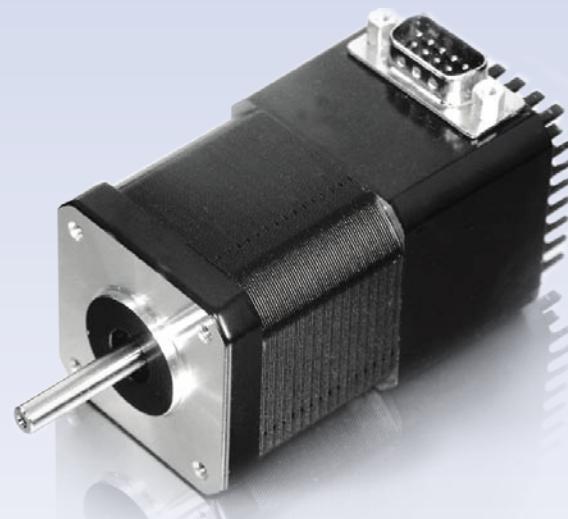
### Encoder features:

- Max 1,250 cycles per revolution (CPR)
- Max 5,000 pulses per revolution (PPR) (quadrature)
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- Position correction capabilities

## OPTIONAL SHAFT MODIFICATIONS



For more shaft modification options, see page 65.



## ■ FEATURES

- NEMA 17, 1.8° Bipolar Step Motor
- Up to 84.8 oz-in of holding torque
- Input voltage of +12 to 40 VDC
- Phase current ranges from 0.1 to 2.0 Amps Peak
- Microstepping capabilities of 2x, 4x, 8x, 16x, 32x, 64x, 128x, and 256x
- RS485 communication with optional converter cards available
- 2 user configurable digital I/O's
- 2 dedicated inputs:
  - o 1 optical sensor for homing
  - o 1 switch closure to ground
- Fully programmable ramps and speeds
- Software selectable Hold and Move currents
- Stand Alone Operation with no connection to PC
- Stores up to 16 different programs at once with 4 kBytes of memory

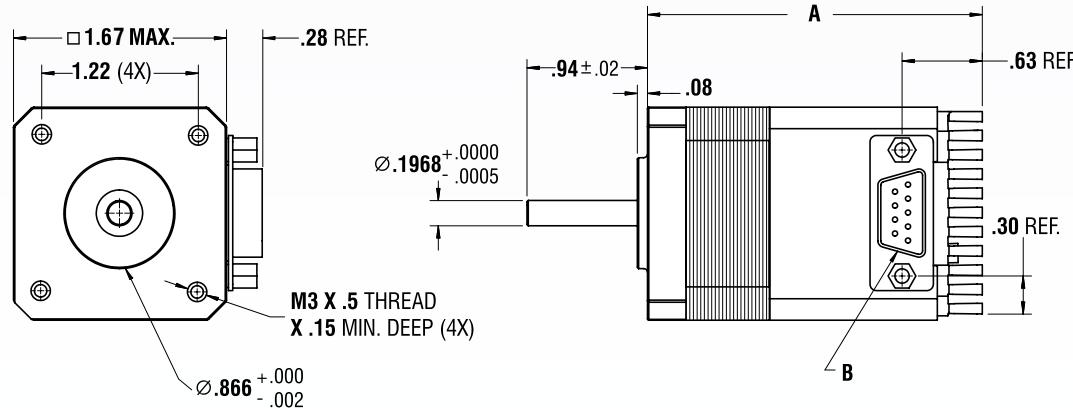
## ■ SPECIFICATIONS

- INPUT VOLTAGE:  
+12 to 40 VDC
- DRIVE CURRENT(PER PHASE):  
0.1 to 2.0 Amps Peak
- I/O's:  
2 user configurable digital  
2 dedicated inputs:  
1 optical sensor for homing  
1 switch closure to ground
- STEP FREQUENCY (MAX):  
2 MHz
- STEPS PER REVOLUTION (1.8 MOTOR):  
400, 800, 1600, 3200, 6400, 12800, 25600, 51200
- MICROSTEP RESOLUTIONS (1.8° MOTOR):  
2x, 4x, 8x, 16x, 32x, 64x, 128x, 256x

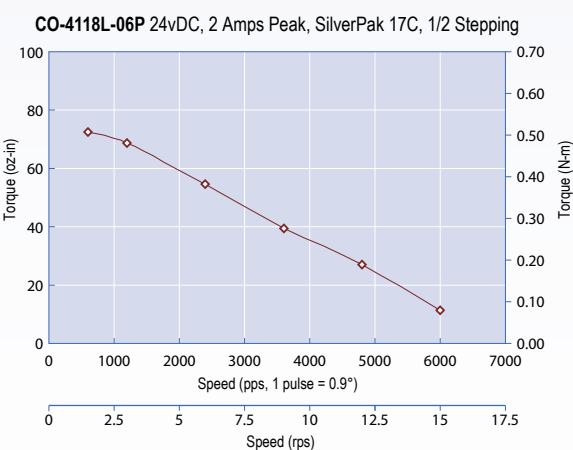
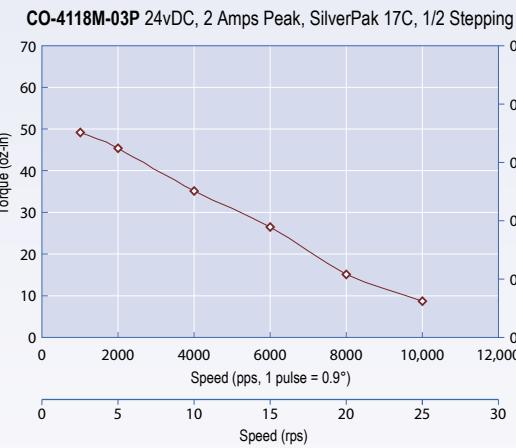
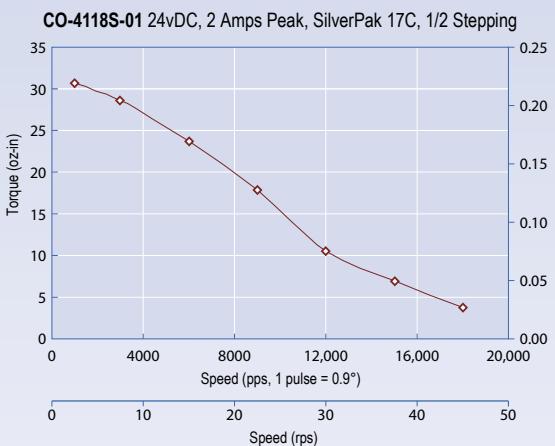
## ■ DIMENSIONS (inches)

**A.** Overall Body Length  
CO-4118S: 2.69" (6.83cm)  
CO-4118M: 2.92" (7.42cm)  
CO-4118L: 3.24" (8.23cm)

**B.** DB-9 Connector for Controls



## TORQUE CURVES



## MOTOR SPECIFICATIONS

### Model CO-4118S-01

|   |              |
|---|--------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 30.00 (0.21) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.18 (0.03)  |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 0.55 (0.25)  |

### Model CO-4118M-03P

|   |              |
|---|--------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 45.00 (0.32) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.28 (0.05)  |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 0.75 (0.34)  |

### Model CO-4118L-06P

|   |              |
|---|--------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 85.00 (0.60) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.37 (0.07)  |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 0.85 (0.39)  |

## OPTIONAL ENCODER

Optional encoder available with **SilverPak 17CE**

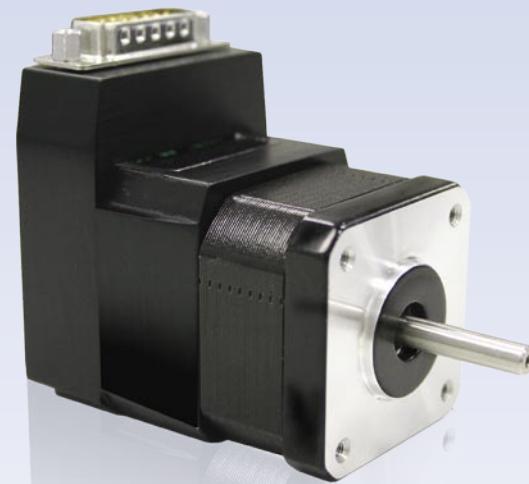
### Encoder features:

- Max 12,500 cycles per revolution (CPR)
- Max 5,000 pulses per revolution (PPR) (quadrature)
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- Position correction capabilities

## DESIGNERS KIT

- Optical Sensor
- RS232 to RS485 Converter Card
- Switch push button
- CD-ROM with User Manual
- DB-9 Female Connector Cable





## ■ FEATURES

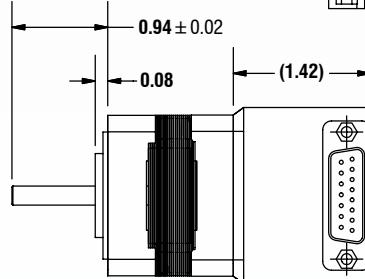
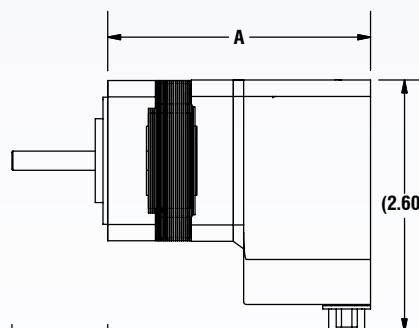
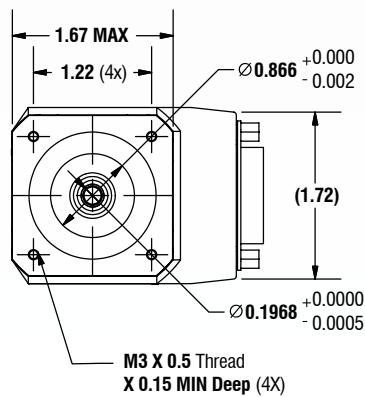
- Integrated Bipolar 1.8° Step Motor with Driver/Controller
- NEMA Size 17 Frame
- Holding Torque of up to 85 oz-in
- Input voltage of +7 to 28 VDC
- Output currents of 0.1 to 1.5 Amps Peak
- Step resolution of full step, 2x, 4x, 8x, and 16x microstepping
- Maximum speed of 250 kHz
- Up to 16 MHz of Step Clock Frequency
- Two digital limit switches, left and right
- One general purpose input (digital or analog)
- One open collector output capable of outputting 100mA
- Low power dissipation – no heat sink required
- Stand alone operation with no connection to PC
- Incorporated with TMCL Programming Language
- Up to 16 kBytes of Memory (2048 TMCL commands)
- Programmable settings for acceleration and velocity profiles
- Control commands such as Jump and Subroutines available
- Calculation and compare commands implemented
- StallGuard™ feature available
  - capable of detecting a stall without encoder
- RS485 communication
- 3 stack lengths available

## ■ SPECIFICATIONS

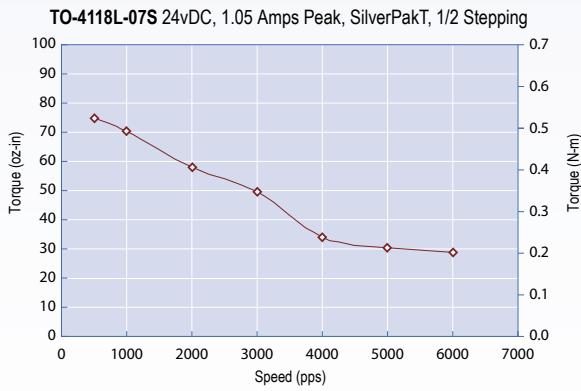
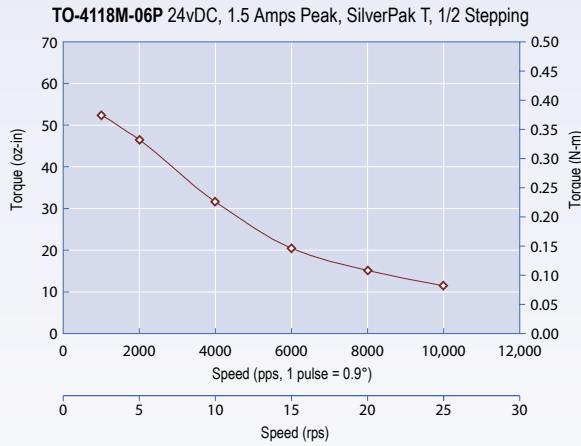
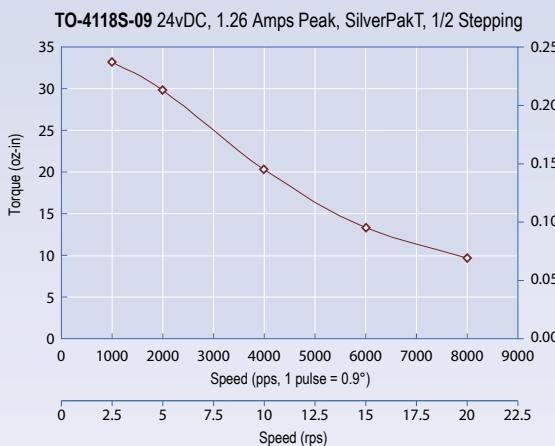
- INPUT VOLTAGE:  
+7 to 28 VDC
- DRIVE CURRENT(PER PHASE):  
0.1 to 1.5 Amps Peak
- I/O's:  
2 I/O's, Switch Closure to Ground, Opto Phototransistor
- STEP FREQUENCY (MAX):  
250 kHz
- STEPS PER REVOLUTION (1.8° MOTOR):  
200, 400, 800, 1600
- MICROSTEP RESOLUTIONS (1.8° MOTOR):  
Full, 2x, 4x, 8x, 16x

## ■ DIMENSIONS (inches)

**A.** Overall Body Length  
TO-4118S: 1.42" (3.61 cm)  
TO-4118M: 1.57" (3.99 cm)  
TO-4118L: 1.89" (4.80 cm)



## TORQUE CURVES



## MOTOR SPECIFICATIONS

### Model TO-4118S-09

|                |  |              |
|----------------|--|--------------|
| Holding Torque | oz-in (N-m)                              | 45.00 (0.32) |
| Rotor Inertia  | oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.18 (0.03)  |
| Weight         | (Motor + Driver) lbs (gm)                | 0.55 (0.25)  |

### Model TO-4118M-06P

|                |  |              |
|----------------|--|--------------|
| Holding Torque | oz-in (N-m)                              | 63.00 (0.45) |
| Rotor Inertia  | oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.28 (0.05)  |
| Weight         | (Motor + Driver) lbs (gm)                | 0.75 (0.34)  |

### Model TO-4118L-07S

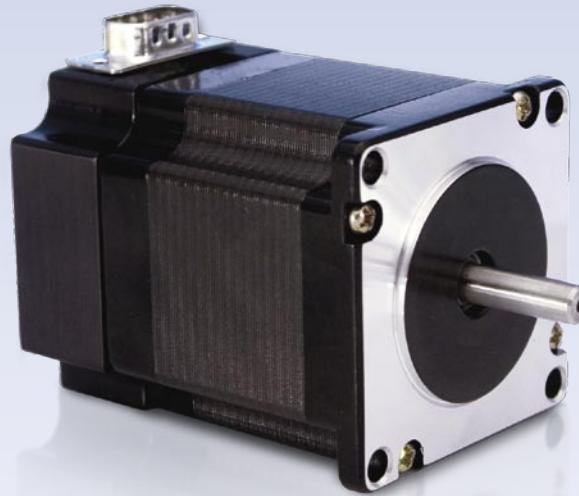
|                |  |              |
|----------------|--|--------------|
| Holding Torque | oz-in (N-m)                              | 85.00 (0.60) |
| Rotor Inertia  | oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.37 (0.07)  |
| Weight         | (Motor + Driver) lbs (gm)                | 0.85 (0.39)  |

## RECOMMENDED ACCESSORY

### USB485 Converter Card



For more details, see page 85.



## ■ FEATURES

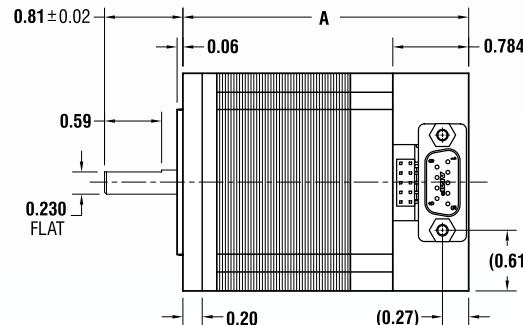
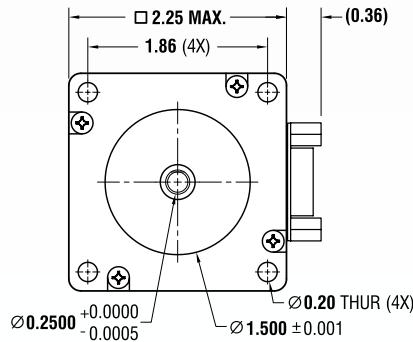
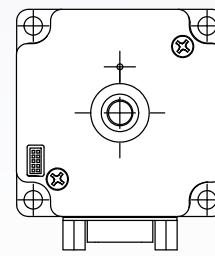
- NEMA Size 23, 2 Phase, 1.8° Bipolar Step Motor w/ Built-In Microstepping Driver
- Up to 294 oz-in of holding torque
- Operates from +15 to 48 VDC
- Phase currents from 0.3 to 3.0 Amps Peak
- Step Resolutions from Half Step to 256x Microstepping
- Four Selectable Damping Modes
- Smooth motion
- Three optically isolated control inputs and one optically isolated control output
- Hold current reduction capability with adjustable current and timeout setting
- 3 stack lengths available

## ■ SPECIFICATIONS

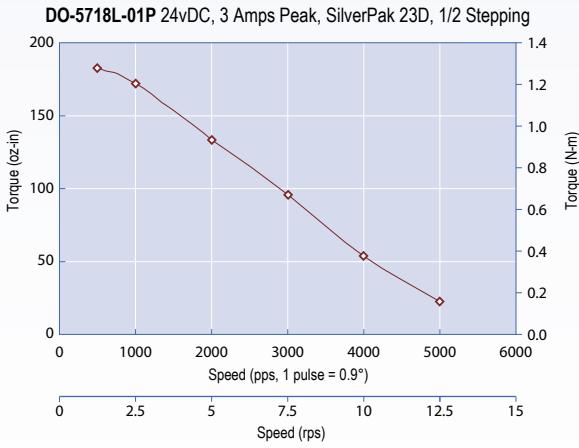
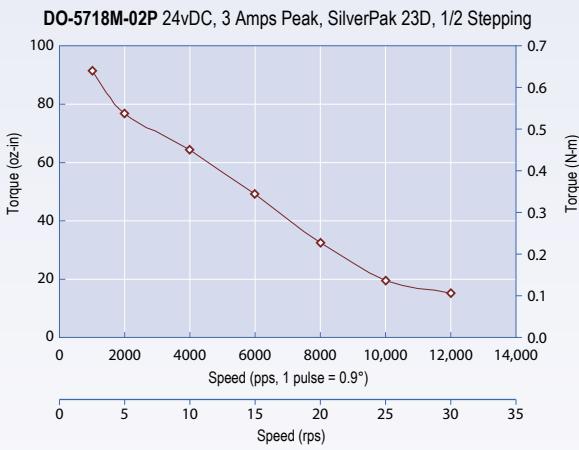
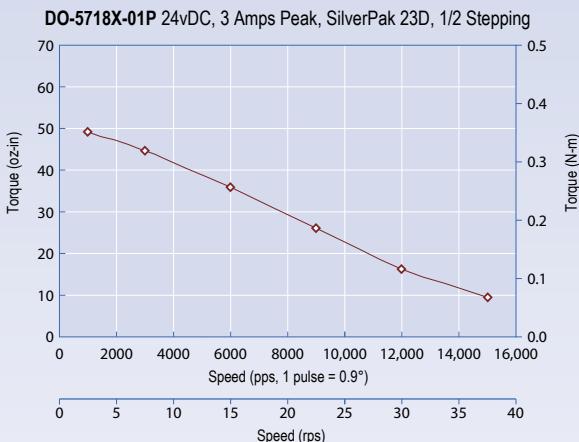
- **INPUT VOLTAGE:**  
+15 to 48 VDC
- **DRIVE CURRENT(PER PHASE):**  
0.3 to 3.0 Amps Peak
- **OPTICALLY ISOLATED INPUTS:**  
Step, Direction, and disable
- **STEP FREQUENCY (MAX):**  
2.5 MHz
- **STEPS PER REVOLUTION (1.8° MOTOR):**  
400, 800, 1600, 3200, 6400, 12800, 25600, 51200
- **MICROSTEP RESOLUTIONS (1.8° MOTOR):**  
2x, 4x, 8x, 16x, 32x, 64x, 128x, 256x
- **POLE DAMPING TECHNOLOGY™:**  
See page 4.

## ■ DIMENSIONS (inches)

**A.** Overall Body Length  
DO-5718X: 2.52" (6.40cm)  
DO-5718M: 2.96" (7.52cm)  
DO-5718L: 3.89" (9.88cm)



## TORQUE CURVES



## MOTOR SPECIFICATIONS

### Model DO-5718X-01P

|   |              |
|---|--------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 100.0 (0.71) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.7 (0.13)   |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 1.2 (0.55)   |

### Model DO-5718M-02P

|   |               |
|---|---------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 182.00 (1.29) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 1.50 (0.27)   |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 1.65 (0.75)   |

### Model DO-5718L-01P

|   |               |
|---|---------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 294.00 (2.08) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 2.60 (0.47)   |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 2.35 (1.07)   |

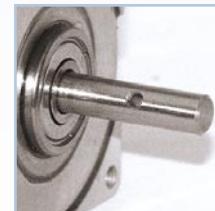
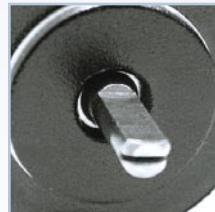
## OPTIONAL ENCODER

Optional encoder available with **SilverPak 23DE**

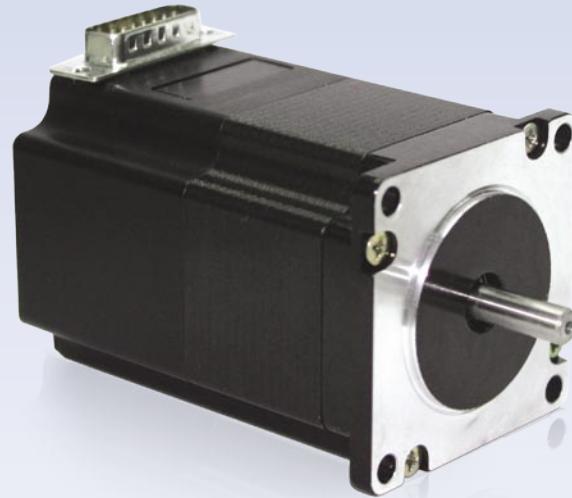
### Encoder features:

- Max 1,250 cycles per revolution (CPR)
- Max 5,000 pulses per revolution (PPR) (quadrature)
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- Position correction capabilities

## OPTIONAL SHAFT MODIFICATIONS



For more shaft modification options, see page 65.



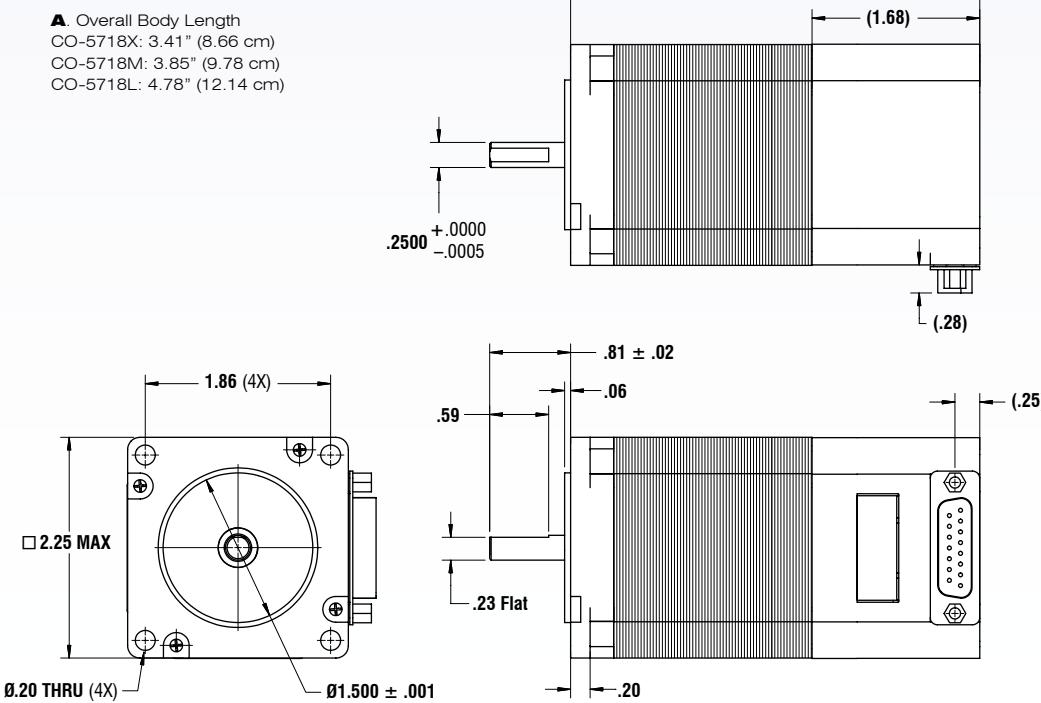
## ■ FEATURES

- NEMA 23, 1.8° Bipolar Step Motor
- Up to 294 oz-in of holding torque
- Input voltage of +12 to 40 VDC
- Phase current ranges from 0.3 to of 3.0 Amps Peak
- Microstepping capabilities of 2x, 4x, 8x, 16x, 32x, 64x, 128x, 256x
- RS485 communication with optional converter cards available
- 4 user configurable digital I/O's
- 2 dedicated inputs:
  - 1 optical sensor for homing
  - 1 switch closure to ground
- Fully programmable ramps and speeds
- Software selectable Hold and Move currents
- Stand Alone Operation with no connection to PC
- Stores up to 16 different programs at once with 4 kBytes of memory
- 3 stack lengths available

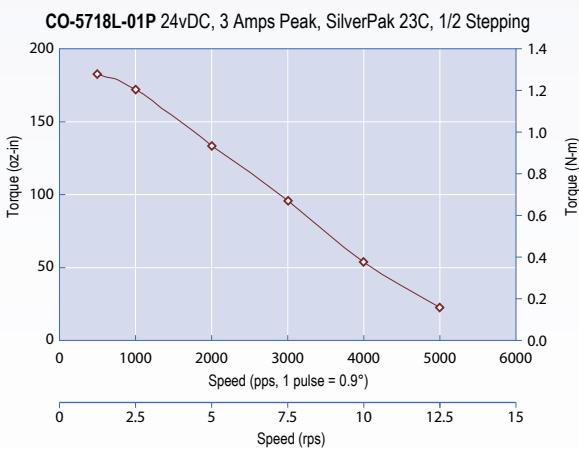
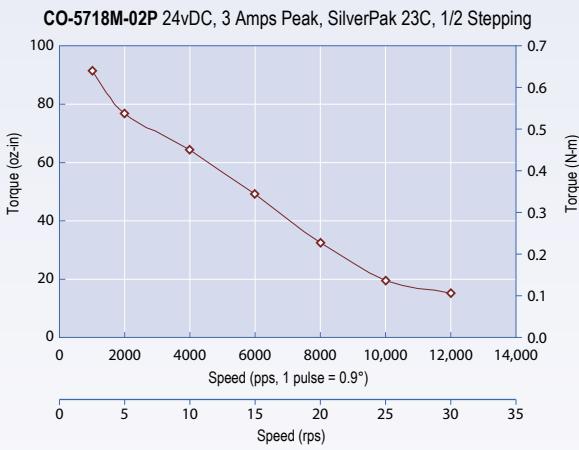
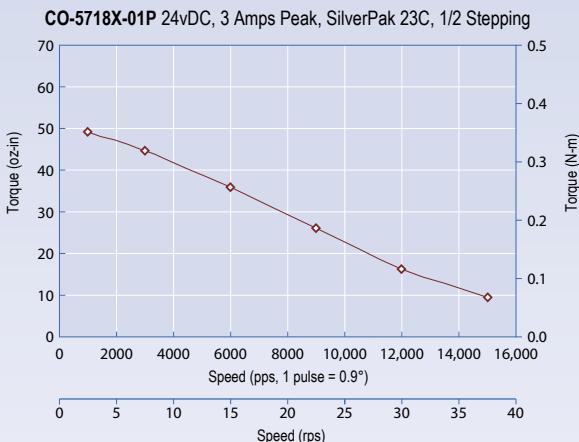
## ■ SPECIFICATIONS

- INPUT VOLTAGE:  
+12 to 40 VDC
- DRIVE CURRENT(PER PHASE):  
0.3 to 3.0 Amps Peak
- ISOLATED INPUTS:  
4 I/O's, Switch Closure to Ground, Opto Phototransistor
- STEP FREQUENCY (MAX):  
2.5 GHz
- STEPS PER REVOLUTION (1.8 MOTOR):  
400, 800, 1600, 3200, 6400, 12800, 25600, 51200
- MICROSTEP RESOLUTIONS (1.8° MOTOR):  
2x, 4x, 8x, 16x, 32x, 64x, 128x, 256x

## ■ DIMENSIONS (inches)



## TORQUE CURVES



## MOTOR SPECIFICATIONS

### Model CO-5718X-01P

|   |              |
|---|--------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 100.0 (0.71) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 0.7 (0.13)   |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 1.3 (0.59)   |

### Model CO-5718M-02P

|   |              |
|---|--------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 182.0 (1.29) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 1.5 (0.27)   |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 1.5 (0.68)   |

### Model CO-5718L-01P

|   |              |
|---|--------------|
| <b>Holding Torque</b> oz-in (N-m)                             | 294.0 (2.08) |
| <b>Rotor Inertia</b> oz-in <sup>2</sup> (kg-cm <sup>2</sup> ) | 2.6 (0.47)   |
| <b>Weight</b> (Motor + Driver) lbs (gm)                       | 2.2 (1.00)   |

## OPTIONAL ENCODER

Optional encoder available with **SilverPak 23CE**

### Encoder features:

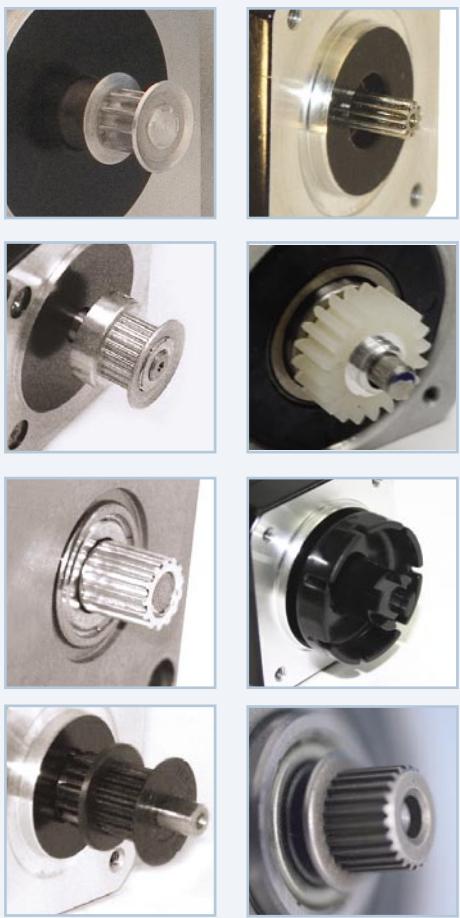
- Max 1,250 cycles per revolution (CPR)
- Max 5,000 pulses per revolution (PPR) (quadrature)
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- Position correction capabilities

## DESIGNERS KIT

- Optical Sensor
- RS232 to RS485 Converter Card
- Switch push button
- CD-ROM with User Manual
- DB-15 Female Connector Cable



### PRESS FIT GEAR & PULLEY



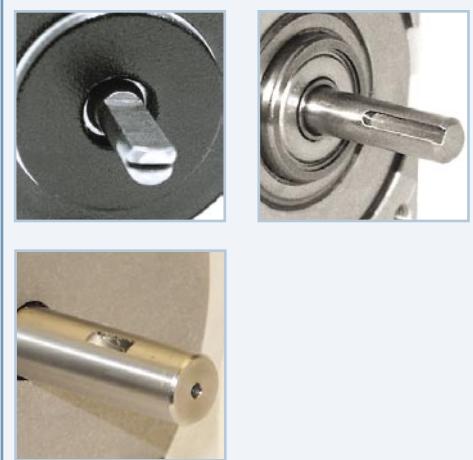
### MULTIPLE FLAT OPTIONS



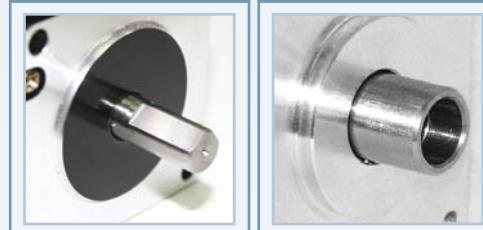
### CROSS DRILLED



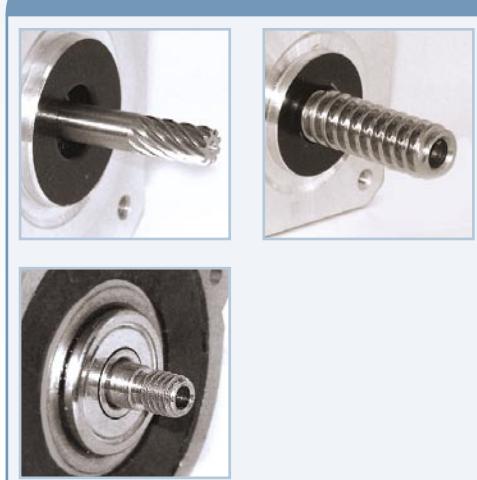
### SLOTTED OPTIONS



### OVERSIZED



### HOLLOW



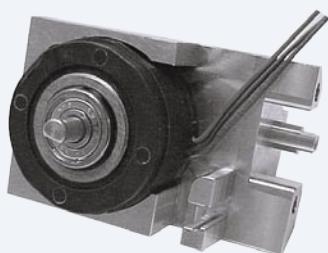
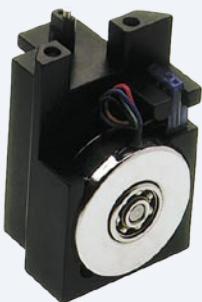
### HELICAL CUT



### EXTENDED

# CUSTOM DESIGNS

## CUSTOM HOUSINGS



Lin Engineering can design and manufacture motors specific to your environmental, mechanical, and dimensional requirements.

- Clean Room Environment
- Stainless Steel
- Anodized Finish
- Assembly Integration

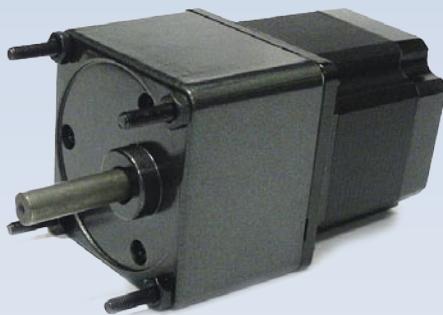
## HIGH TEMPERATURE / VACUUM ENVIRONMENTS



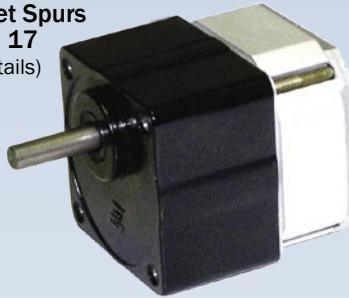
- Dry Bearings
- Stainless Steel Bearings
- Non-Outgassing Lubricants

### ASSEMBLIES

**Heavy Duty Offset Spurs**  
**Gearhead – Size 23**  
(see page 69 for details)



**Heavy Duty Offset Spurs**  
**Gearhead – Size 17**  
(see page 69 for details)



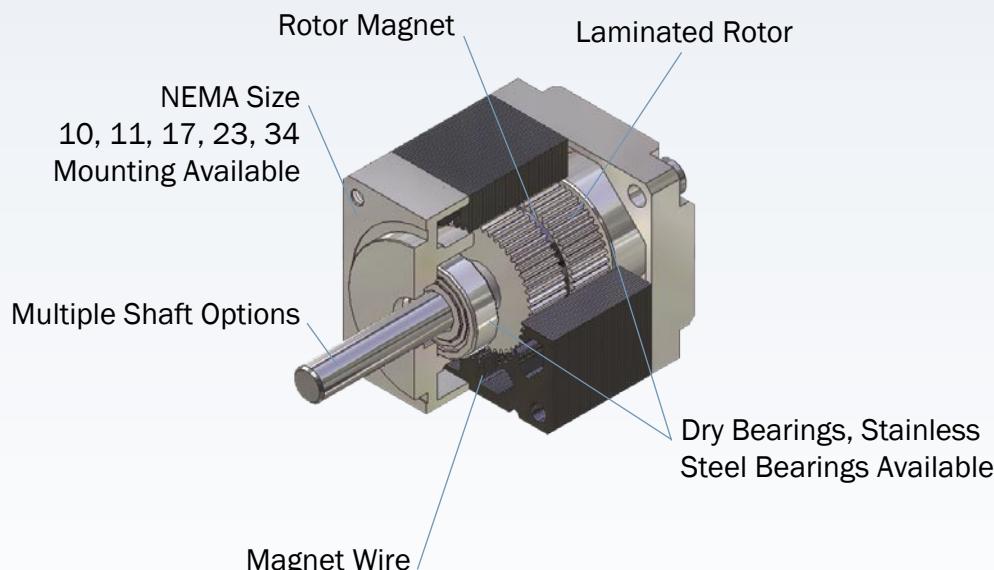
**Encoders Available**  
(see page 73 for details)



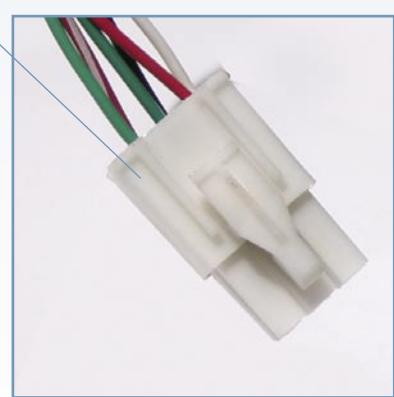
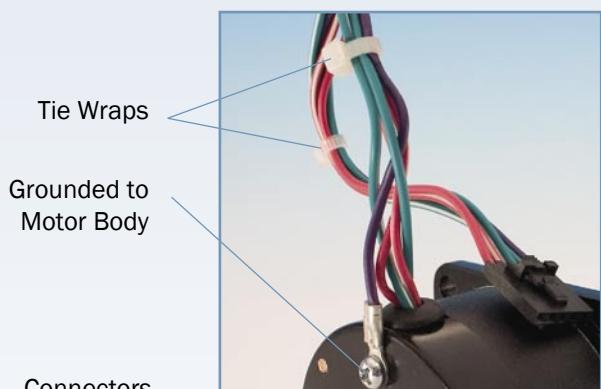
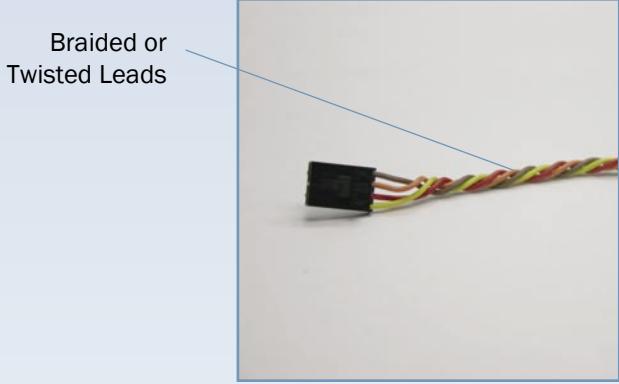
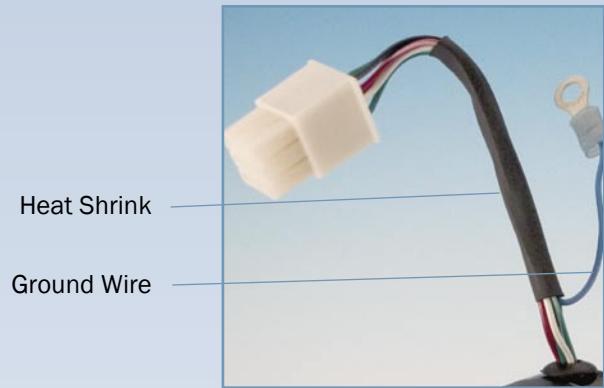
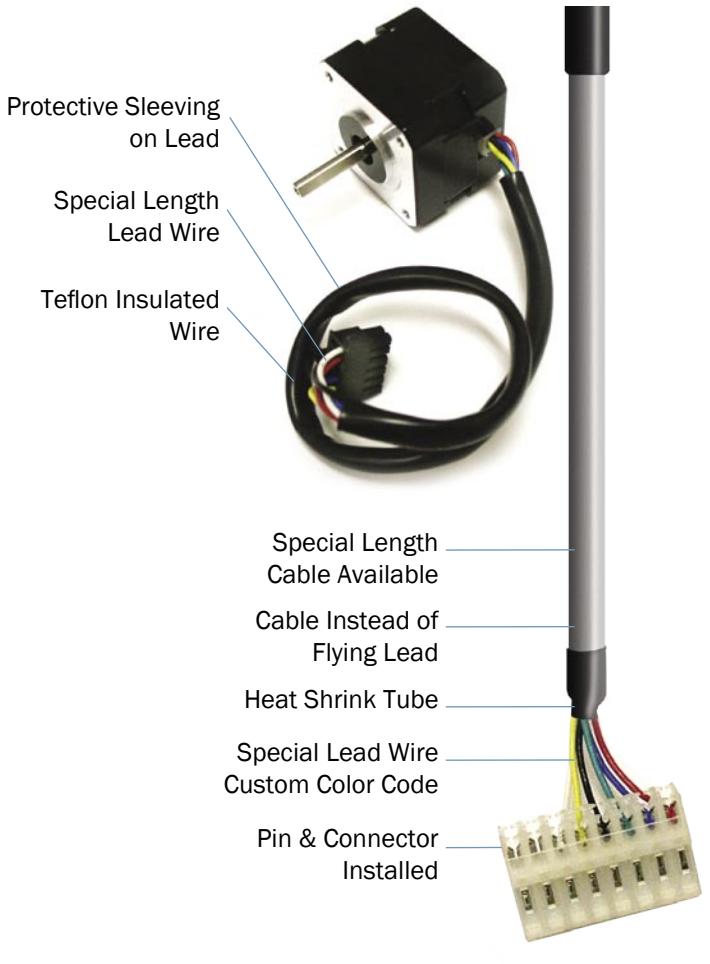
**Planetary Gearhead – Size 23**  
(see page 71 for details)

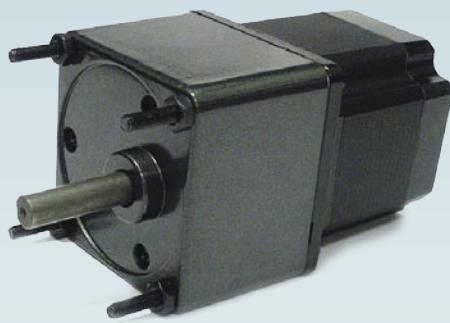


### MOTOR CONSTRUCTION



### LEAD WIRES & CABLES





- Cost Effective
- Sealed Ball Bearings
- Die Cast, Machined Aluminum Housing
- Heat Treated Gears and Output Shaft
- Different Gear Ratios Available

## MOTOR SPECIFICATIONS

| Model #   | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|-----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 4118S-02  | 1.30       | 45.0         | 0.32       | 2.8                  | 3.6                 | 0.18                       | 0.40        | 4               |
| 4118S-04S | 0.67       | 45.0         | 0.32       | 9.9                  | 12.5                | 0.18                       | 0.40        | 4               |
| 5718X-01P | 2.80       | 100.0        | 0.71       | 0.7                  | 1.4                 | 0.70                       | 1.05        | 4               |
| 5718X-05S | 0.70       | 100.0        | 0.71       | 10.0                 | 16.8                | 0.70                       | 1.05        | 4               |

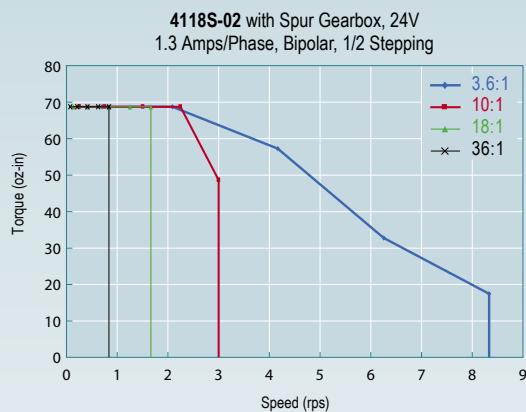
## GEARHEAD SPECIFICATIONS

| NEMA 17                            |            |            |                 |      |                        |            |                       |                            |                           |             |                  |  |
|------------------------------------|------------|------------|-----------------|------|------------------------|------------|-----------------------|----------------------------|---------------------------|-------------|------------------|--|
| Part Number                        | Gear Ratio | Efficiency | Holding Torque* |      | Momentary Torque (Max) | Step Angle | Permissible Speed RPM | Max Radial Shaft Load Lbs. | Max Axial Shaft Load Lbs. | Weight Lbs. | Dimension "A"    |  |
| 4118S-02-SG3.6,<br>4118S-04S-SG3.6 | 3.6:1      | 81%        | 8.68            | 0.98 | 8.7 lbf-in             | 0.50°      | 1800                  | 9                          | 6.8                       | 0.58        | 2.38"<br>60.5 mm |  |
| 4118S-02-SG10,<br>4118S-04S-SG10   | 10:1       | 81%        | 8.68            | 0.98 | 8.7 lbf-in             | 0.18°      | 1800                  | 9                          | 6.8                       | 0.58        | 2.38"<br>60.5 mm |  |
| 4118S-02-SG18,<br>4118S-04S-SG18   | 18:1       | 73%        | 8.68            | 0.98 | 8.7 lbf-in             | 0.10°      | 1800                  | 9                          | 6.8                       | 0.59        | 2.38"<br>60.5 mm |  |
| 4118S-02-SG36,<br>4118S-04S-SG36   | 36:1       | 66%        | 8.68            | 0.98 | 8.7 lbf-in             | 0.05°      | 1800                  | 9                          | 6.8                       | 0.61        | 2.38"<br>60.5 mm |  |

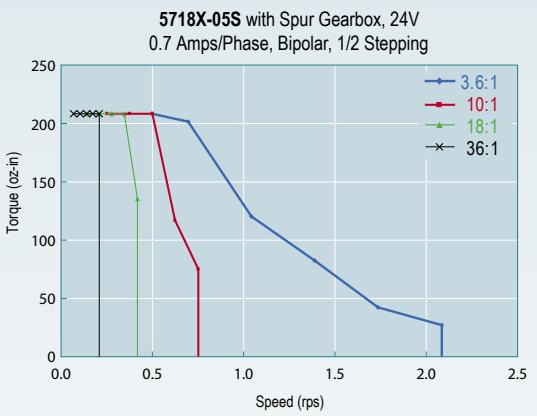
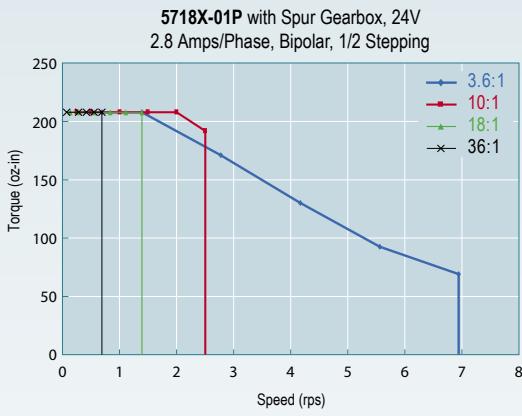
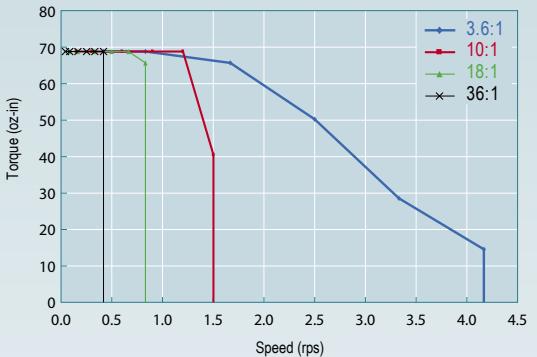
| NEMA 23                             |            |            |                 |      |                        |            |                       |                            |                           |             |                  |  |
|-------------------------------------|------------|------------|-----------------|------|------------------------|------------|-----------------------|----------------------------|---------------------------|-------------|------------------|--|
| Part Number                         | Gear Ratio | Efficiency | Holding Torque* |      | Momentary Torque (Max) | Step Angle | Permissible Speed RPM | Max Radial Shaft Load Lbs. | Max Axial Shaft Load Lbs. | Weight Lbs. | Dimension "A"    |  |
| 5718X-01P-SG3.6,<br>5718X-05S-SG3.6 | 3.6:1      | 81%        | 13.0            | 1.47 | 26 lbf-in              | 0.50°      | 1800                  | 11                         | 6.6                       | 1.70        | 3.02"<br>76.7 mm |  |
| 5718X-01P-SG10,<br>5718X-05S-SG10   | 10:1       | 81%        | 13.0            | 1.47 | 26 lbf-in              | 0.18°      | 1800                  | 11                         | 6.6                       | 1.70        | 3.02"<br>76.7 mm |  |
| 5718X-01P-SG18,<br>5718X-05S-SG18   | 18:1       | 81%        | 13.0            | 1.47 | 26 lbf-in              | 0.10°      | 1800                  | 11                         | 6.6                       | 1.70        | 3.42"<br>86.9 mm |  |
| 5718X-01P-SG36,<br>5718X-05S-SG36   | 36:1       | 73%        | 13.0            | 1.47 | 26 lbf-in              | 0.05°      | 1800                  | 11                         | 6.6                       | 1.90        | 3.42"<br>86.9 mm |  |

\* Torque values are limited by gear strength.

## TORQUE CURVES

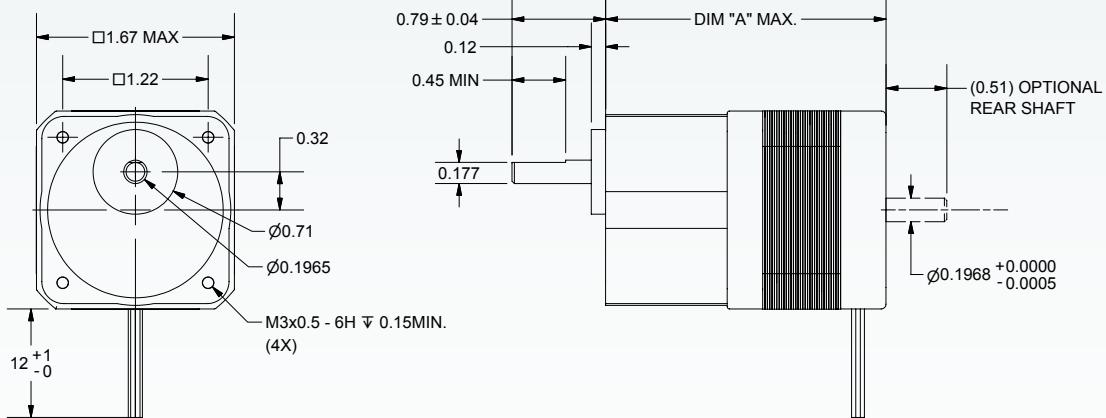


**4118S-04S with Spur Gearbox, 24V  
0.67 Amps/Phase, Bipolar, 1/2 Stepping**

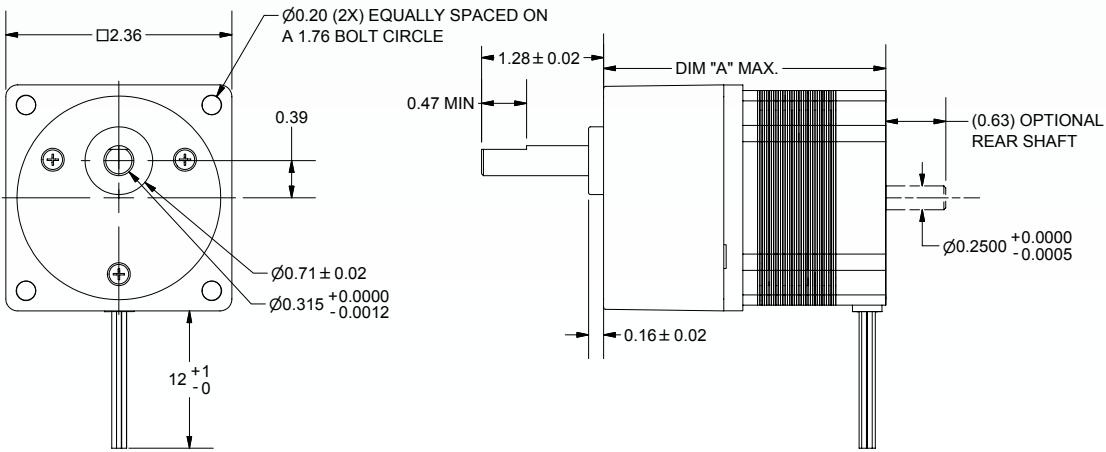


## DIMENSIONS (inches)

### NEMA 17



### NEMA 23





- High Speed Input, High Torque Output
- Integral Gear Ratio
- Quiet, Low Backlash

## MOTOR SPECIFICATIONS

| Model #   | Amps/Phase | Torque oz-in | Torque N-m | Resistance Ohm/Phase | Inductance mH/Phase | Inertia oz-in <sup>2</sup> | Weight Lbs. | Number of Leads |
|-----------|------------|--------------|------------|----------------------|---------------------|----------------------------|-------------|-----------------|
| 4118S-02  | 1.30       | 45.0         | 0.32       | 2.8                  | 3.6                 | 0.18                       | 0.40        | 4               |
| 4118S-04S | 0.67       | 45.0         | 0.32       | 9.9                  | 12.5                | 0.18                       | 0.40        | 4               |
| 5718X-01P | 2.80       | 100.0        | 0.71       | 0.7                  | 1.4                 | 0.70                       | 1.05        | 4               |
| 5718X-05S | 0.70       | 100.0        | 0.71       | 10.0                 | 16.8                | 0.70                       | 1.05        | 4               |

## GEARHEAD SPECIFICATIONS

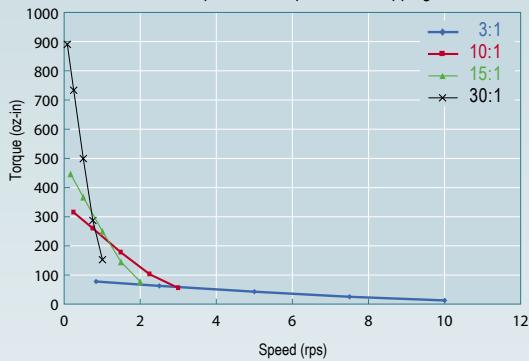
| NEMA 17                          |            |            |                 |       |                          |            |                       |                            |                           |             |                   |  |
|----------------------------------|------------|------------|-----------------|-------|--------------------------|------------|-----------------------|----------------------------|---------------------------|-------------|-------------------|--|
| Part Number                      | Gear Ratio | Efficiency | Holding Torque* |       | Continuous Output Torque | Step Angle | Permissible Speed RPM | Max Radial Shaft Load Lbs. | Max Axial Shaft Load Lbs. | Weight Lbs. | Dimension "A"     |  |
| 4118S-02-PG3,<br>4118S-04S-PG3   | 3:1        | 95%        | 70.63           | 7.98  | 8.7 lbf-in               | 0.60°      | 5000                  | 45                         | 67                        | 1.3         | 3.59"<br>91.2 mm  |  |
| 4118S-02-PG10,<br>4118S-04S-PG10 | 10:1       | 95%        | 53.13           | 6.00  | 8.7 lbf-in               | 0.18°      | 5000                  | 45                         | 67                        | 1.3         | 3.59"<br>91.2 mm  |  |
| 4118S-02-PG15,<br>4118S-04S-PG15 | 15:1       | 92%        | 123.75          | 13.98 | 8.7 lbf-in               | 0.12°      | 5000                  | 45                         | 67                        | 1.8         | 4.20"<br>106.7 mm |  |
| 4118S-02-PG30,<br>4118S-04S-PG30 | 30:1       | 92%        | 115.00          | 13.00 | 8.7 lbf-in               | 0.06°      | 5000                  | 45                         | 67                        | 1.8         | 4.20"<br>106.7 mm |  |

| NEMA 23                           |            |            |                 |       |                          |            |                       |                            |                           |             |                   |  |
|-----------------------------------|------------|------------|-----------------|-------|--------------------------|------------|-----------------------|----------------------------|---------------------------|-------------|-------------------|--|
| Part Number                       | Gear Ratio | Efficiency | Holding Torque* |       | Continuous Output Torque | Step Angle | Permissible Speed RPM | Max Radial Shaft Load Lbs. | Max Axial Shaft Load Lbs. | Weight Lbs. | Dimension "A"     |  |
| 5718X-01P-PG3,<br>5718X-05S-PG3   | 3:1        | 95%        | 132.5           | 14.97 | 8.7 lbf-in               | 0.60°      | 5000                  | 110                        | 135                       | 3.5         | 4.85"<br>123.2 mm |  |
| 5718X-01P-PG10,<br>5718X-05S-PG10 | 10:1       | 95%        | 106.3           | 12.01 | 8.7 lbf-in               | 0.18°      | 5000                  | 110                        | 135                       | 3.5         | 4.85"<br>123.2 mm |  |
| 5718X-01P-PG15,<br>5718X-05S-PG15 | 15:1       | 92%        | 265.0           | 29.95 | 8.7 lbf-in               | 0.12°      | 5000                  | 110                        | 135                       | 4.2         | 5.80"<br>147.3 mm |  |
| 5718X-01P-PG30,<br>5718X-05S-PG30 | 30:1       | 92%        | 247.8           | 28.00 | 8.7 lbf-in               | 0.06°      | 5000                  | 110                        | 135                       | 4.2         | 5.80"<br>147.3 mm |  |

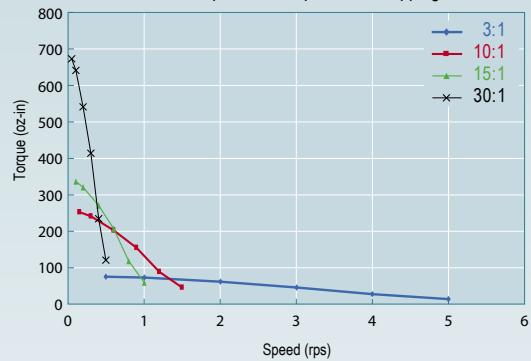
\* Torque values are limited by gear strength.

**TORQUE CURVES**

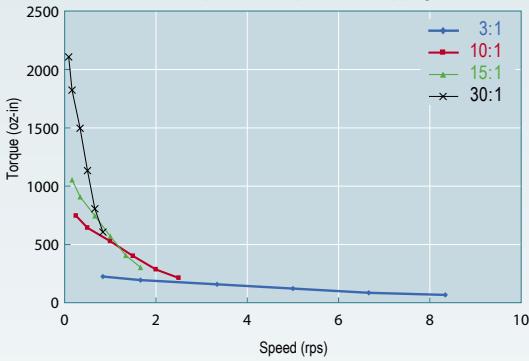
4118S-02 with Planetary Gearbox, 24V,  
1.3 Amps/Phase, Bipolar, 1/2 Stepping



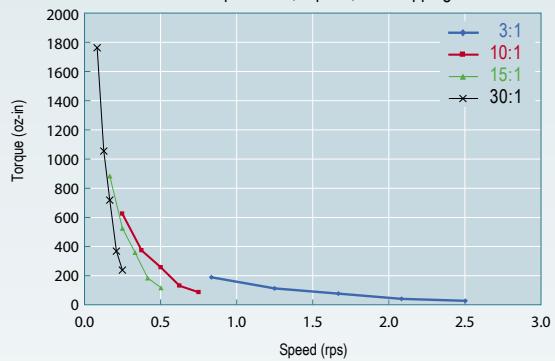
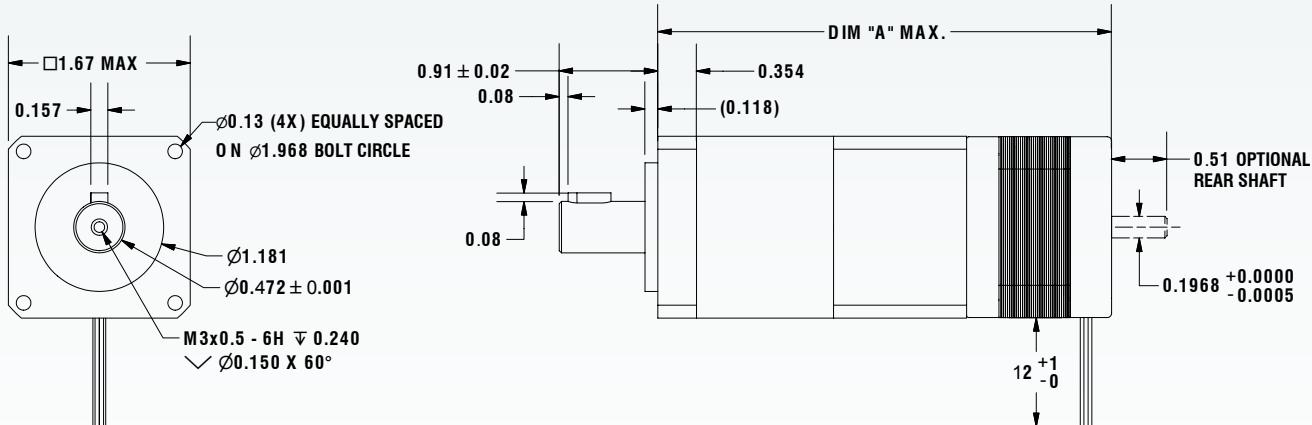
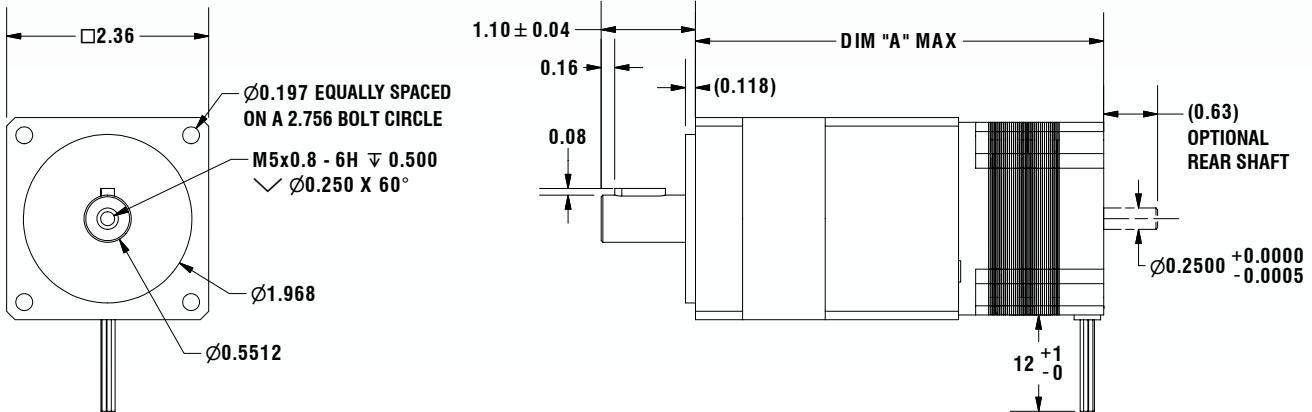
4118S-04S with Planetary Gearbox, 24V,  
0.67 Amps/Phase, Bipolar, 1/2 Stepping



5718X-01P with Planetary Gearbox, 24V,  
2.8 Amps/Phase, Bipolar, 1/2 Stepping



5718X-05S with Planetary Gearbox, 24V,  
0.7 Amps/Phase, Bipolar, 1/2 Stepping

**DIMENSIONS** (inches)**NEMA 17****NEMA 23**

## ■ FEATURES

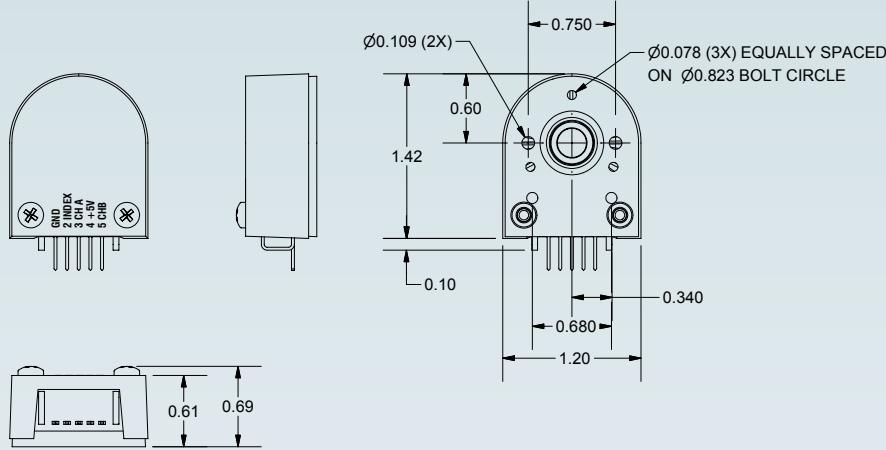
- Compatible to HP HEDS-550 encoders
  - Best for NEMA 17 and 23
  - Tracks from 0 to 100,000 cycles/sec
  - 32 to 1,250 cycles per revolution (CPR)
  - 128 to 5,000 pulses per revolution (PPR)
  - 2 channel quadrature TTL squarewave outputs
  - Optional index (3rd channel)
  - 2 year warranty
  - Through shaft hole option available



| Cycles per second   | Cycles per Revolution (CPR) | Pulses per Revolution (PPR) |
|---------------------|-----------------------------|-----------------------------|
| <b>0 to 100,000</b> | <b>32 to 1,250</b>          | <b>128 to 5,000</b>         |

## CYCLES PER REVOLUTION (CPR)

|     |      |
|-----|------|
| 32  | 400  |
| 50  | 500  |
| 96  | 512  |
| 100 | 540  |
| 110 | 720  |
| 120 | 900  |
| 192 | 1000 |
| 200 | 1016 |
| 250 | 1024 |
| 256 | 1250 |
| 360 |      |



E3

## ■ FEATURES

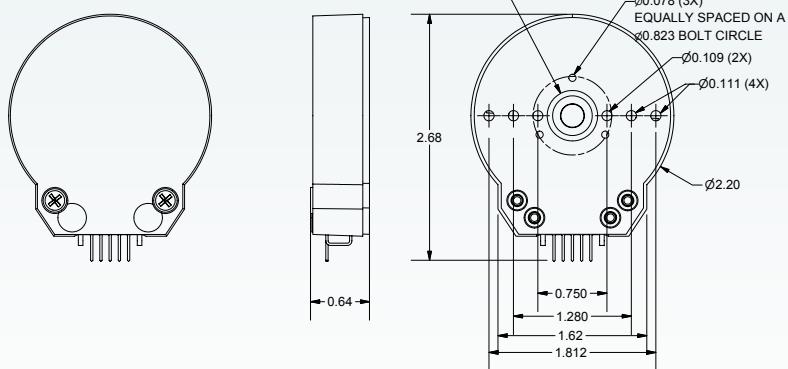
- Best for NEMA 23 and 34 step motors
  - Tracks from 0 to 100,000 cycles/sec
  - 64 to 2,500 cycles per revolution (CPR)
  - 256 to 10,000 pulses per revolution (PPR)
  - 2 channel quadrature TTL squarewave outputs
  - Optional index (3rd channel)
  - -40 to 100 °C operating temperature
  - 2 year warranty
  - Through shaft hole option available



| Cycles per second   | Cycles per Revolution (CPR) | Pulses per Revolution (PPR) |
|---------------------|-----------------------------|-----------------------------|
| <b>0 to 100,000</b> | <b>64 to 2,500</b>          | <b>256 to 10,000</b>        |

### CYCLES PER REVOLUTION (CPR)

64  
100  
200  
400  
500  
512  
1000  
1024  
1800  
2000  
2048  
2500



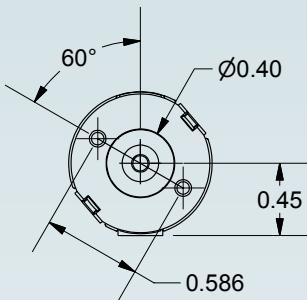
## ■ FEATURES

- Compact Miniature size best for NEMA 8, 11, 14, and 17.
- High retention Snap-in polarized connector
- Tracks from 0 to 100,000 cycles/sec
- 100 to 300 cycles per revolution (CPR)
- 400 to 1200 pulses per revolution (PPR)
- -10 to + 85°C operating temperature
- Low power strobe option available
- 2 year warranty
- Through shaft hole option available

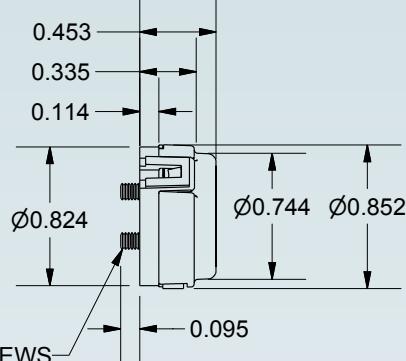


CYCLES PER REVOLUTION (CPR)

|     |
|-----|
| 100 |
| 108 |
| 120 |
| 125 |
| 128 |
| 200 |
| 250 |
| 256 |
| 288 |
| 300 |



| Cycles per second   | Cycles per Revolution (CPR) | Pulses per Revolution (PPR) |
|---------------------|-----------------------------|-----------------------------|
| <b>0 to 100,000</b> | <b>100 to 300</b>           | <b>400 to 1,200</b>         |

#3-48 X 1/4 SCREWS  
(2X) ASSEMBLY SCREWS

## E5D

## ■ FEATURES

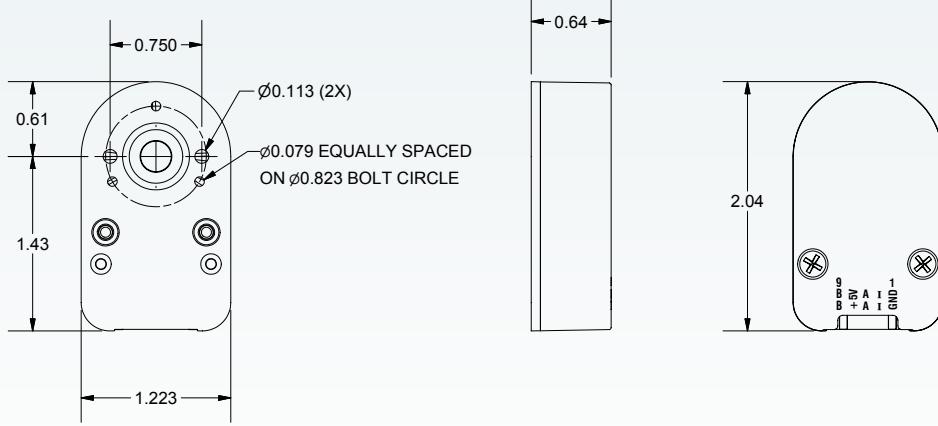
- Best for NEMA 23 & 34
- Differential Output signals
- 32 to 1,250 Cycles per Revolution (CPR)
- 128 to 5,000 pulses per revolution (PPR)
- Positive finger-latching polarized connector
- Tracks from 0 to 100,000 cycles/sec
- Optional index (3rd channel)
- -40 to 100°C operating temperature
- 2 year warranty
- Through shaft hole option available



| Cycles per second   | Cycles per Revolution (CPR) | Pulses per Revolution (PPR) |
|---------------------|-----------------------------|-----------------------------|
| <b>0 to 100,000</b> | <b>32 to 1,250</b>          | <b>128 to 5,000</b>         |

CYCLES PER REVOLUTION (CPR)

|     |      |
|-----|------|
| 32  | 400  |
| 50  | 500  |
| 96  | 512  |
| 100 | 540  |
| 110 | 720  |
| 120 | 900  |
| 192 | 1000 |
| 200 | 1016 |
| 250 | 1024 |
| 256 | 1250 |
| 360 |      |





- Universal Input
- High Efficiency
- Built in PFC Circuit
- 3000 V Isolation
- Single Outputs

| Model Number         | Output Voltage | Output Current <sub>(max)</sub> | Min Load |
|----------------------|----------------|---------------------------------|----------|
| <b>Single Output</b> |                |                                 |          |
| <b>PW-100-24</b>     | 24 VDC         | 4.5 A                           | 0A       |
| <b>PW-100-48</b>     | 48 VDC         | 2.25 A                          | 0A       |
| <b>PW-150-24</b>     | 24 VDC         | 4.5 A                           | 0A       |
| <b>PW-150-48</b>     | 48 VDC         | 4.5 A                           | 0A       |

### ■ INPUT SPECIFICATIONS

|                            |                          |
|----------------------------|--------------------------|
| <b>Input Voltage Range</b> | 88-264 VAC               |
| <b>Input Current</b>       | 3.15 A / 115 VAC         |
|                            | 1.5A / 230 VAC           |
| <b>Frequency</b>           | Range: 47-63Hz           |
| <b>Inrush Current</b>      | Cold Start 30A / 115 VAC |
| <b>Leakage Current</b>     | <1mA / 240 VAC           |

### ■ OUTPUT SPECIFICATIONS

|                                      |  |
|--------------------------------------|--|
| <b>Voltage and Current</b>           | See Selection Chart  |
| <b>Load Regulation (0%-FL)</b>       | +/- 0.5%   |
| <b>Line Regulation</b>               | +/- 0.5%   |
| <b>Voltage Tolerance</b>             | +/- 1.0%   |
| <b>Voltage Adjustment Range</b>      | 21.6 ~ 26.4V   |
| <b>Ripple and Noise (max)</b>        | 150m Vp-p  |
| <b>Over Voltage Protection</b>       | 27.6 ~ 32.4V   |
| <b>Overload Protection</b>           | Shutdown; Re-power on<br>105 ~ 150%, Constant 1 Limit<br>Auto Recovery |
| <b>Setup/ Rise/ Holdup (230 VAC)</b> | 1s, 30ms, 15ms at full load  |

### ■ GENERAL SPECIFICATIONS

|                                       |   |
|---------------------------------------|---|
| <b>Input-Out Isolation</b>            | I/P-O/P: 300 VAC<br>I/P-G: 1500 VAC<br>O/P: 0.5KVAC |
| <b>Isolation Resistance</b>           | I/P-O/P, I/P-FG O/P-FG: 500VDC/100Ω                 |
| <b>Efficiency (3.3 V through 48V)</b> | 83%, typ  |
| <b>Switching Frequency</b>            | 135 KHz, (fixed, typical)                           |
| <b>Safety</b>                         | EN60950<br>UL 1950                                  |
|                                       | TUV File #R 9754834<br>UL File # E183223            |

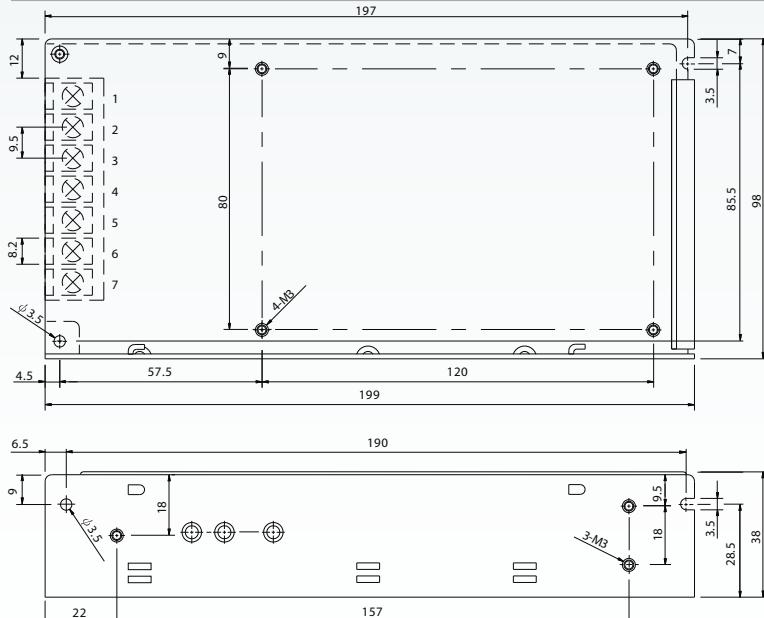
### ■ ENVIRONMENTAL SPECIFICATIONS

|                            |  |
|----------------------------|--|
| <b>Oper. Temperature</b>   | -10 ~ +60°C  |
| <b>Storage Temperature</b> | -20 to +85°C   |
| <b>Relative Humidity</b>   | 10% to 95%, non-cond *   |
| <b>Vibration</b>           | 10 ~ 500Hz, 2G 10min./ 1cycle,<br>Period for 60 min.                       |
| <b>EMC</b>                 | Each Axes<br>CISPR22 (EN55022)B,<br>EN61000-4-2, 3, 5, 6, 8, 11<br>EN50204 |
| <b>MTBF</b>                | EN61000-3-2,-3<br>314,900 Hrs  |

### ■ PHYSICAL SPECIFICATIONS

|                     |                    |
|---------------------|--------------------|
| <b>Size</b>         | 3.0" x 8.7" x 1.6" |
| <b>Construction</b> | Closed Frame       |
| <b>Weight</b>       | 19.4 oz, (550g)    |

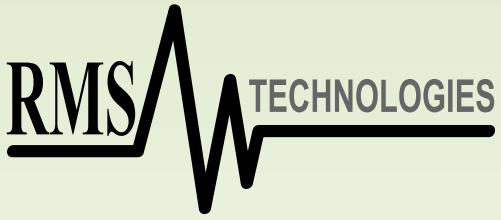
### ■ MECHANICAL SPECIFICATIONS



Notes:

1. Dimensions are in mm
2. Tolerance .xxx .01 (.253)  
.xx .02 (.508)

\* These are stress ratings. Exposure of the devices to any of these conditions may adversely affect long term reliability. Proper operation under conditions other than the standard operating conditions is neither warranted nor implied.



## Mission Statement

To provide the motion control industry with leading technology in drivers, controllers, and complete integrated solutions. Striving for innovative design and development of products to serve a wide range of customers, we are the Driving Force in Motion Control.

## Overview

RMS Technologies designs and manufactures cutting edge, low-cost, high-performance step motors, drivers, and controllers.

Our specialty is the design and development of high-performance step motor drivers. We are continually striving to improve our technology and deliver the best possible products available.

RMS Technologies currently designs drivers and controllers to reduce resonance allowing step motors to run with less noise, while also reducing the amount of step errors when driving a motor at 64 microstepping.

Typical applications for step motors systems include surveillance cameras, automated test equipment, robotics, medical equipment, labeling and packaging equipment.

## About RMS

Founded in 2000, RMS Technologies has gained acknowledgement in the motion control industry based on differentiating and innovative products. Headquartered in Carson City, Nevada, RMS Technologies has a team of Product Development Engineers, with over 40 years of experience in the motion control industry, constantly thinking of better ways to drive

## RMS products available through Lin Engineering

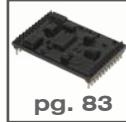
### Microstepping Drivers

**R208****R325****R701/710**

### Controllers

**R101****R256****R364**

### Driver Module

**M325**

### Accessories

**RS232-RS485****USB485**



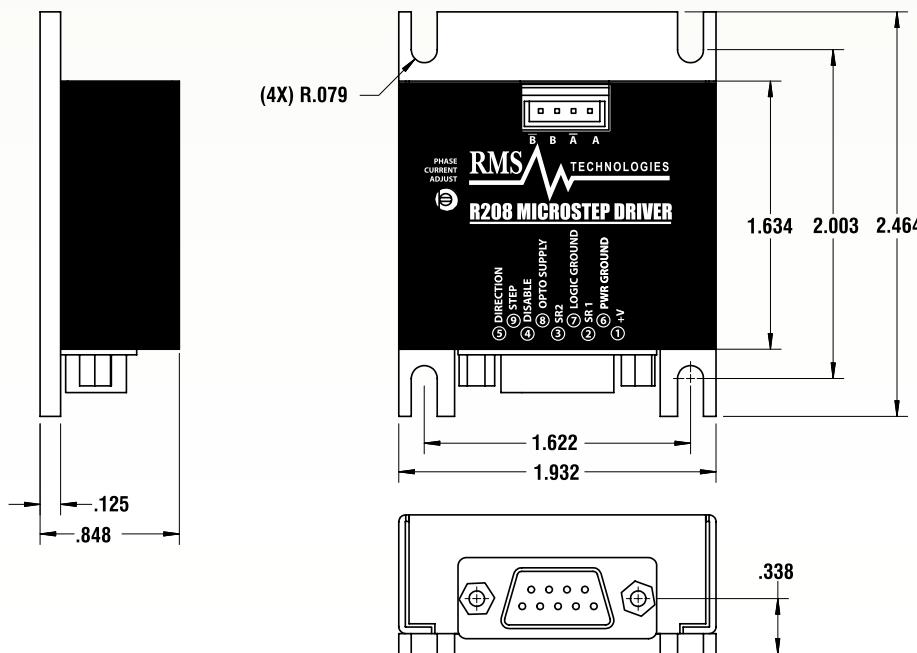
## ■ FEATURES

- Bipolar Step Motor Driver
- Operates from +12 to 24 VDC
- Phase current ranges from 0.35 to 2.0 Amps Peak
- Selectable Step Resolution from Full, Half, 1/4, and 1/8 microsteps
- Optically isolated Step, Direction, and Disable/Enable Inputs
- Selectable Current Reduction of 33%
- Low Power Dissipation
- Efficient Current Control
- Thermal Shutdown, Under-voltage Protection
- Power-on Indicator
- Power Disable/Enable Control
- Sinusoidal current waveform
- Low Cost Driver

## ■ SPECIFICATIONS

- INPUT VOLTAGE:  
+12 to 24 VDC (Includes Unregulated Power Supplies)
- DRIVE CURRENT(PER PHASE):  
0.25 to 2 Amps Peak
- ISOLATED INPUTS:  
Step Clock, Direction, Enable & Disable
- STEP FREQUENCY (MAX):  
25 kHz
- STEPS PER REVOLUTION (1.8 MOTOR):  
200, 400, 800, 1600
- MICROSTEP RESOLUTIONS (1.8° MOTOR):  
Full, 2x, 4x, 8x

## ■ DIMENSIONS (inches)





## ■ FEATURES

- Operates from +15 to 48 VDC
- Phase current from 0.3 to 3.0 Amps Peak
- Step Resolutions from Full to 256 microstepping
- Hold current reduction capability with adjustable current and timeout settings
- Pole Damping Technology™

R325I & R325IE additional features

- Configuration parameters stored in non-volatile memory
- Multiple module control through software assigned single character addresses
- Built-in control routines for trapezoidal position and velocity moves
- Three optically isolated control inputs and one optically isolated control output

R325IE only features

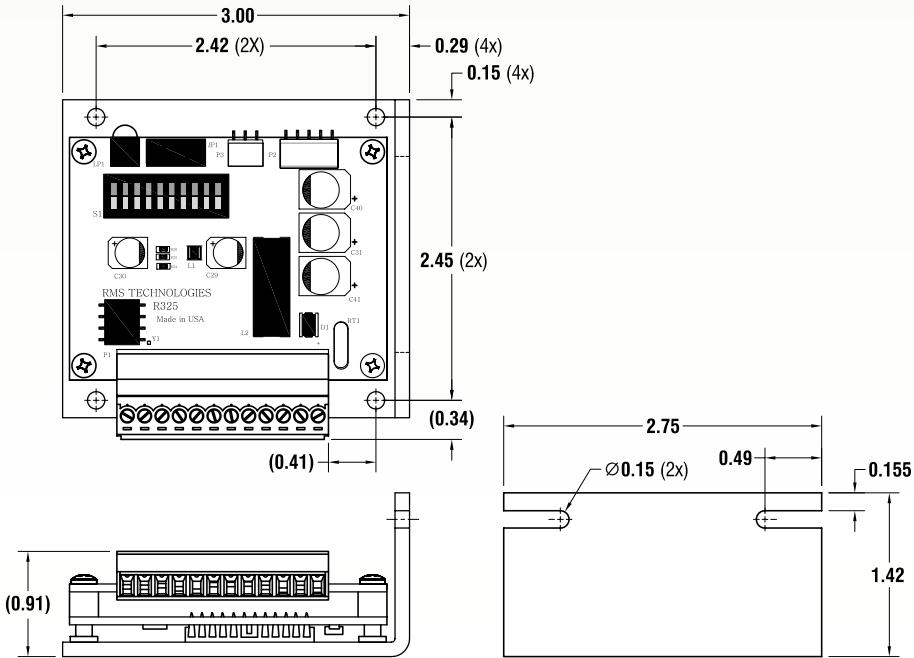
- Static Encoder Feedback with a full set of parameters to configure a wide variety of motor and encoder combinations
- Homing on Encoder Index
- Eight user presettable target positions

## ■ SPECIFICATIONS

- **INPUT VOLTAGE:**  
+15 to 48 VDC
- **DRIVE CURRENT(PER PHASE):**  
0.3 to 3.0 Amps Peak
- **ISOLATED INPUTS:**  
Step, Direction, & Disable
- **STEP FREQUENCY (MAX):**  
2.5 MHz
- **STEPS PER REVOLUTION (1.8 MOTOR):**  
200, 400, 800, 1600, 3200, 6400, 12800, 25600, 51200
- **MICROSTEP RESOLUTIONS (1.8° MOTOR):**  
Full, 2x, 4x, 8x, 16x, 32x, 64x, 128x, 256x
- **POLE DAMPING TECHNOLOGY™:**

See page 4

## ■ DIMENSIONS (inches)



## ■ FEATURES

- Bipolar Step Motor Driver
- Operates from +24 to 80 VDC
- Phase current ranges from 1 to 7 Amps and 0.3 to 2 Amps
- 10 Microstepping Driver
- Optically isolated Step, Direction, and Disable/Enable Inputs
- Selectable Current Reduction of 33%
- Low Power Dissipation
- Step Frequency of 200 kHz
- Efficient Current Control
- Power-on Indicator
- Power Disable/Enable Control
- Sinusoidal current waveform
- Low Cost Driver

### R710 - includes a built-in Step Pulse Multiplier board

The R710 has the same features as the R701 plus two additional features:

- **Input Option Header:**

Allows the use of a Common Ground or a Common +5VDC for optically isolated inputs

- **Step Pulse Multiplier:**

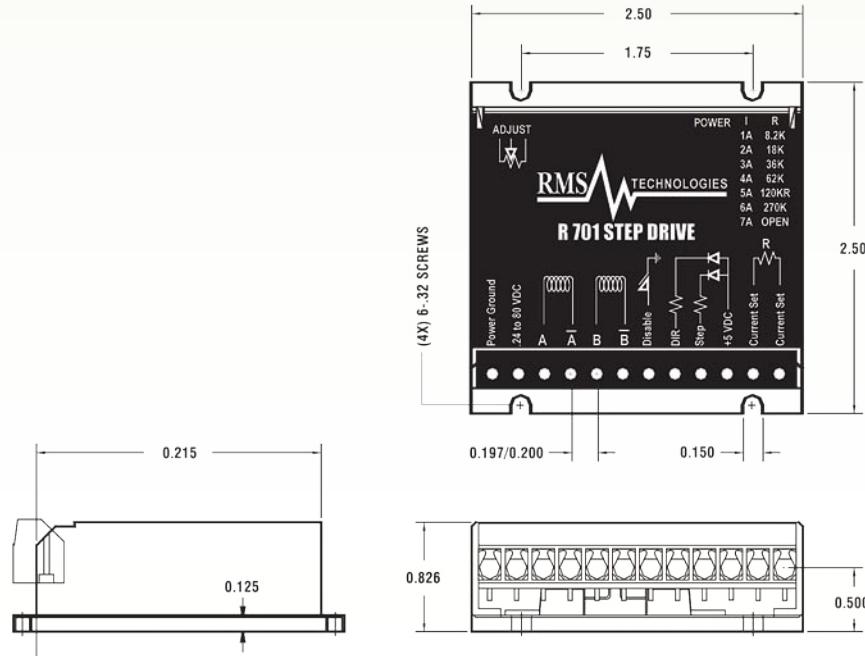
Will always output 10 microstepping, even with a step input of Full Step, Half Step, 5 Microstep, or 10 Microstep. The user no longer needs to change their original setup to get microstepping. Simply select the desired step multiplier of 1, 2, 5 or 10; to achieve the 10 microstepping output from the driver, while maintaining the rotational speed that you had in your original setup.



## ■ SPECIFICATIONS

- **INPUT VOLTAGE:**  
+24 to 80 VDC
- **DRIVE CURRENT(PER PHASE):**  
0.3 to 2.0 Amps or 1 to 7 Amps
- **ISOLATED INPUTS:**  
Step Clock, Direction, Disable
- **STEP FREQUENCY (MAX):**  
200 kHz
- **STEPS PER REVOLUTION (1.8° MOTOR):**  
2000
- **MICROSTEP RESOLUTIONS (1.8° MOTOR):**  
10x

## ■ DIMENSIONS (inches)





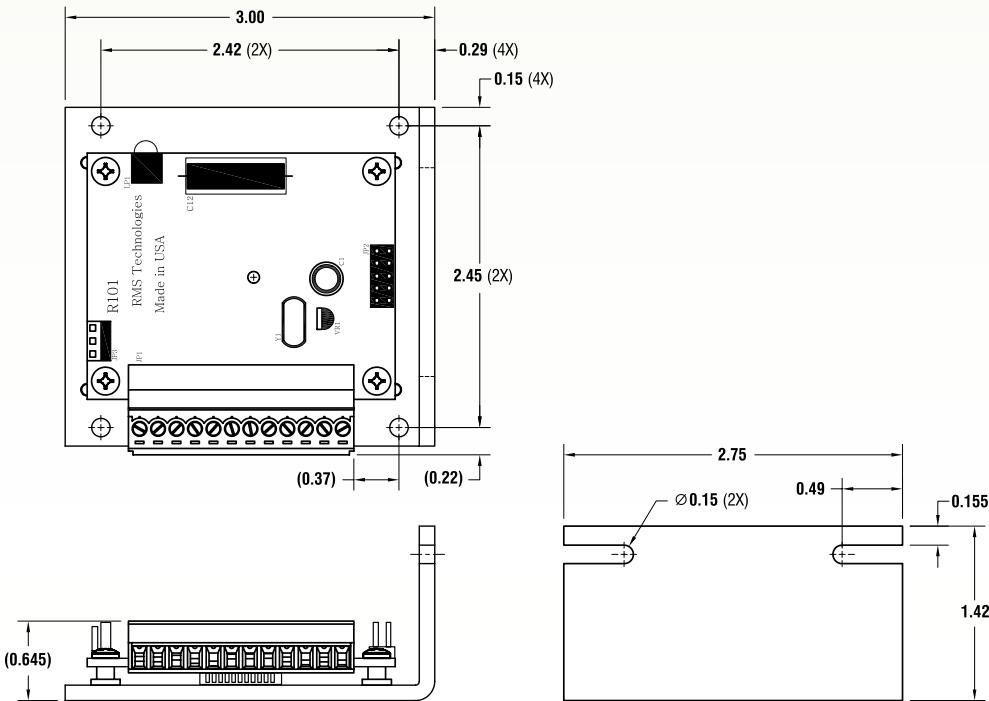
## ■ FEATURES

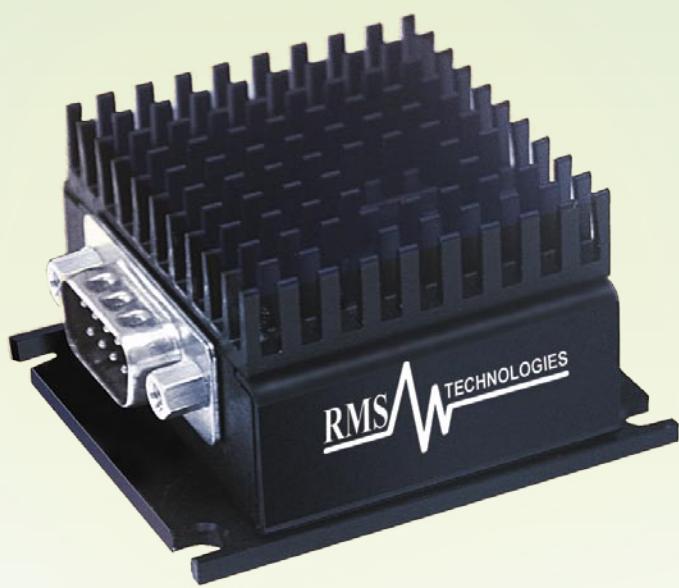
- Operates from +15 to 30 VDC
- Phase current ranges from 0.2 to 2.5 Amps Peak
- Step Resolutions from Full, 1/2, 1/4, 1/8
- Automatic Motor Holding Current reduction available from 0.2 to 2.5 Amps
- Optically Isolated Step, Direction, Disable, and Zero Set Inputs
- Configuration and control via a simple RS485 communications bus
- Multiple modules each set with a different address code can be controlled on the same bus
- Memory storage of all user configurable parameters after power cycling capabilities

## ■ SPECIFICATIONS

- **INPUT VOLTAGE:**  
+15 to 30 VDC
- **DRIVE CURRENT(PER PHASE):**  
0.2 to 2.5 Amps Peak
- **ISOLATED INPUTS:**  
Step Clock, Direction, Disable & Zero Set
- **STEP FREQUENCY (MAX):**  
15 kHz
- **STEPS PER REVOLUTION (1.8 MOTOR):**  
200, 400, 800, 1600
- **MICROSTEP RESOLUTIONS (1.8° MOTOR):**  
Full, 2x, 4x, 8x

## ■ DIMENSIONS (inches)





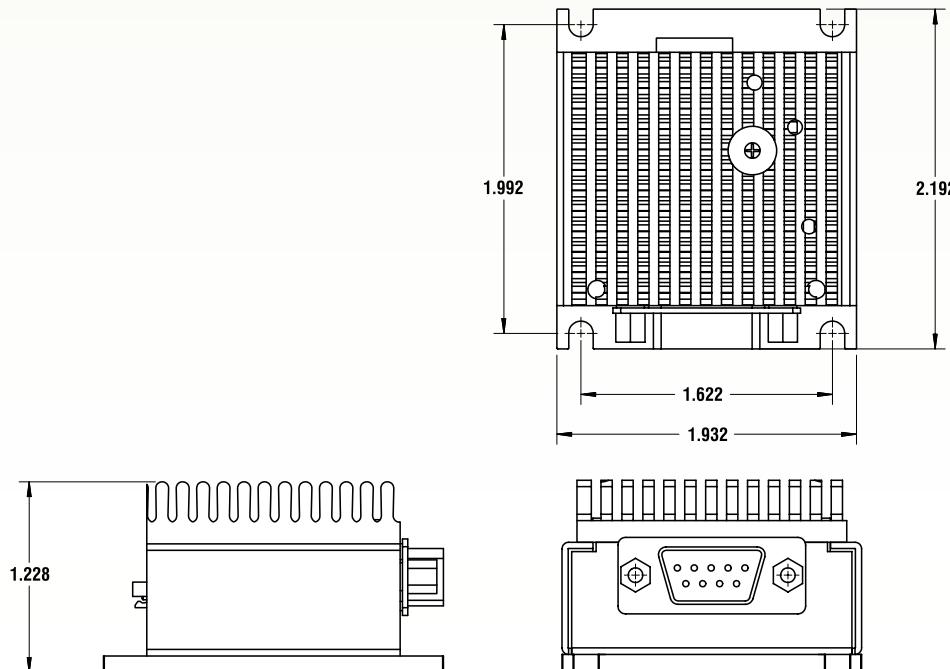
## ■ FEATURES

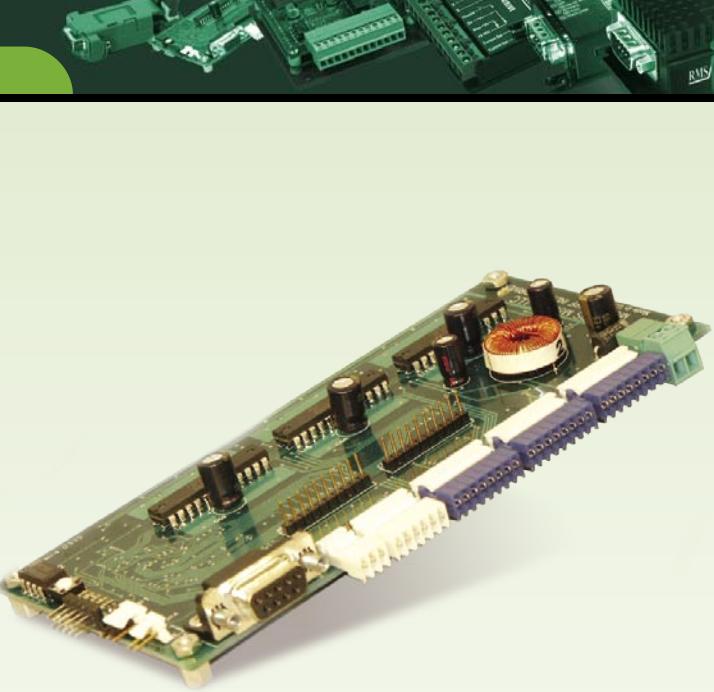
- NEMA 17, 1.8° Bipolar Step Motor
- Up to 84.8 oz-in of holding torque
- Input voltage of +12 to 40 VDC
- Phase current ranges from 0.1 to 2.0 Amps Peak
- Microstepping capabilities of 2x, 4x, 8x, 16x, 32x, 64x, 128x, and 256x
- RS485 communication with optional converter cards available
- 2 user configurable digital I/O's
- 2 dedicated inputs:
  - o 1 optical sensor for homing
  - o 1 switch closure to ground
- Fully programmable ramps and speeds
- Software selectable Hold and Move currents
- Stand Alone Operation with no connection to PC
- Stores up to 16 different programs at once with 4 kBytes of memory

## ■ SPECIFICATIONS

- **INPUT VOLTAGE:**  
+12 to 40 VDC
- **DRIVE CURRENT(PER PHASE):**  
0.1 to 2.0 Amps Peak
- **ISOLATED INPUTS:**  
I/O, Switch Closure Ground, Opto Phototransistor
- **STEP FREQUENCY (MAX):**  
10 kHz
- **STEPS PER REVOLUTION (1.8 MOTOR):**  
400, 800, 1600, 3200, 6400, 12800, 25600, 51200
- **MICROSTEP RESOLUTIONS (1.8° MOTOR):**  
2x, 4x, 8x, 16x, 32x, 64x, 128x, 256x

## ■ DIMENSIONS (inches)





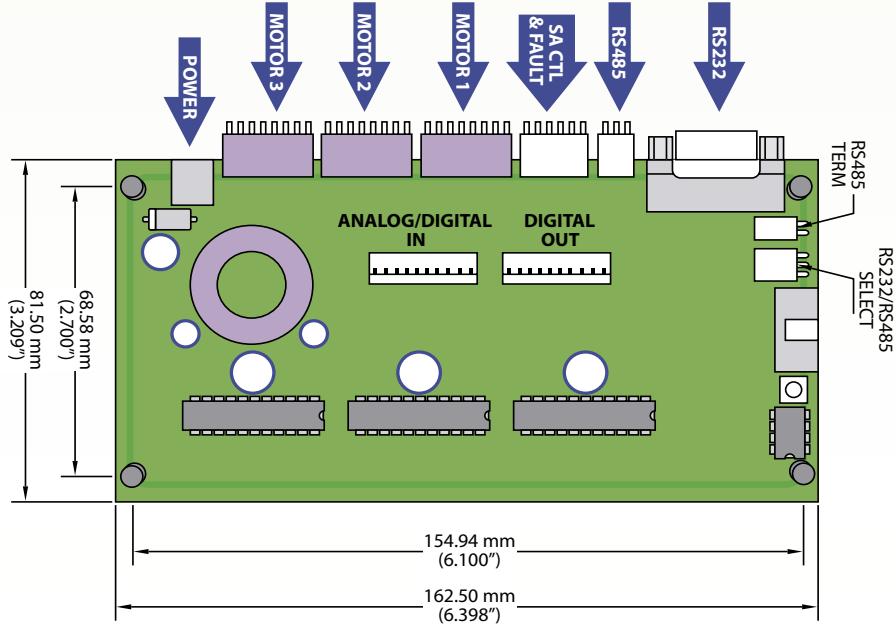
## ■ FEATURES

- 3-axis step motor controller and driver PCB Phase currents between 0.2 to 1.5 Amps/Phase (Software Programmable)
- Software selectable step resolutions from Full step, Half step, and 4x, 8x, 16x, 32x, 64x microstepping operation.
- On-board control interfaces are provided for both RS232, for single module control and RS485 for multiple module control.
- Operating at 57,600 baud the coordinated control of up to twelve axes is practical using four R364 PCB modules on a common RS485 bus.
- Up to 15.6 kHz of step frequency
- Sine correction for each axis can be stored to EEPROM (default or user defined)
- All configuration parameters and a script of up to 1,750 commands stored in EEPROM.
- Self-configuration on power-up
- Left and Right limit switch inputs for all motors
- Home reference by commanded automatic sequence for each motor. The Left Limit Switch is found. The motor then moves to a user given offset position, and then sets the current position to be zero.
- Eight inputs 0 to 5 VDC analog, or eight inputs TTL digital
- Seven open-collector relay or solenoid drivers, and one TTL output

## ■ SPECIFICATIONS

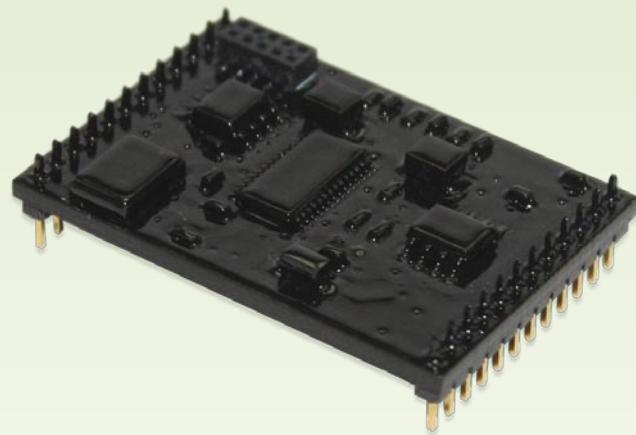
- **INPUT VOLTAGE:**  
+15 to 48 VDC
- **DRIVE CURRENT(PER PHASE):**  
0.2 to 1.5 Amps Peak
- **INPUTS:**  
Eight Inputs 0 to 5 VDC Analog, or Eight Inputs TTL Digital
- **OUTPUTS:**  
Seven Open-Collector Relay or Solenoid Drivers, and One TTL Digital
- **STEP FREQUENCY (MAX):**  
Up to 15.6 kHz - Full-step Frequency (All motors moving)
- **STEPS PER REVOLUTION (1.8° MOTOR):**  
200, 400, 800, 1600, 3200, 6400, 12800
- **MICROSTEP RESOLUTIONS (1.8° MOTOR):**  
Full, 2x, 4x, 8x, 16x, 32x, 64x

## ■ DIMENSIONS (inches)

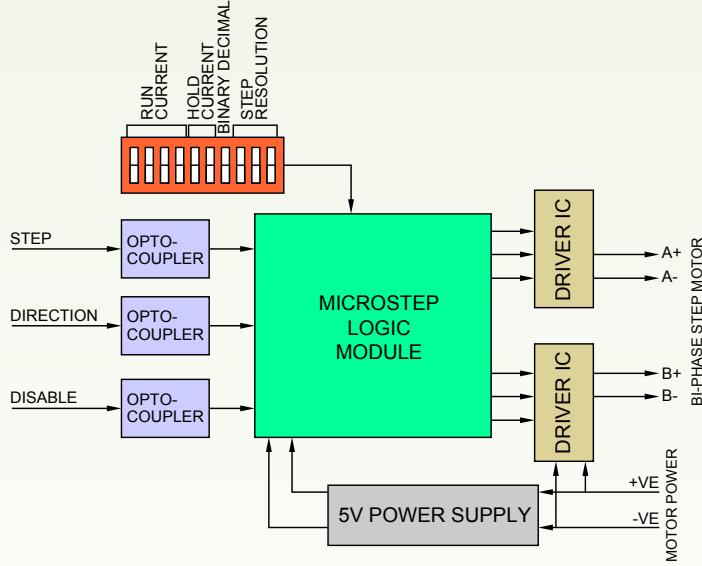


## ■ FEATURES

- Step, Direction and Disable control inputs
- DIP switch or jumper selection for Run Current, Hold Current and Step Resolution
- Hold Current is 100%, 50%, 25% or 0% of run current
- Hold Timeout is set at ½ second
- Step Resolution selections are 256X, 128X, 64X, 32X, 16X, 8X, 4X and 2X Binary or 160X, 80X, 40X, 20X, 10X, and 5X Decimal
- The module can connect to either integrated circuit drivers or discrete MOSFET bridges.
- A single 5 VDC supply powers the module, and all inputs and outputs are 5 volt tolerant

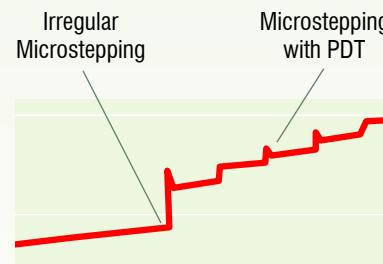


## ■ MICROSTEP LOGIC MODULE



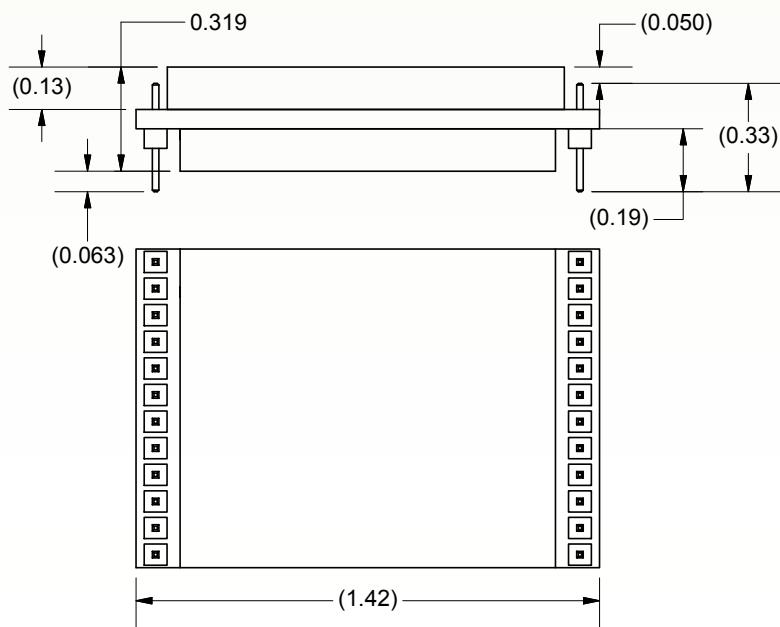
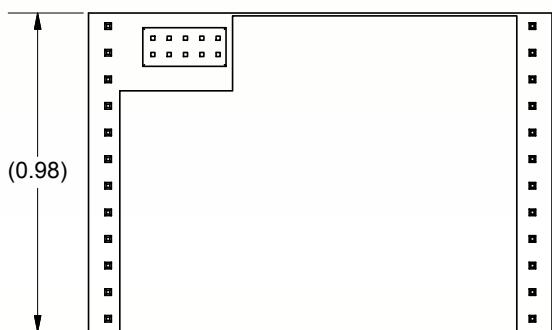
## ■ POLE DAMPING TECHNOLOGY™ (PDT)

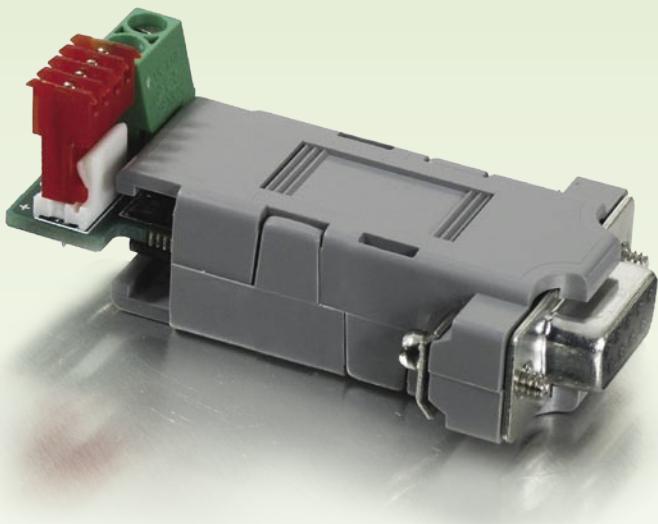
- Develop your own drive system with the M325 which contains the PDT logic.
- Eliminate irregular microstepping with Pole Damping Technology™.



See page 4 for more information on PDT.

## ■ DIMENSIONS (inches)





### ■ FEATURES

- Allows the user to connect the R256 Controller or the SilverPak C Series (17 & 23) integrated motors to a PC via standard serial port.
- Min and Max voltage levels: 7 to 40 VDC

The RS485 to RS232 Converter Card can also be purchased as part of the Designer's Kit. It allows the user to get acquainted with the unit by providing the necessary cabling to add the optional Push Button and Optical Sensor.

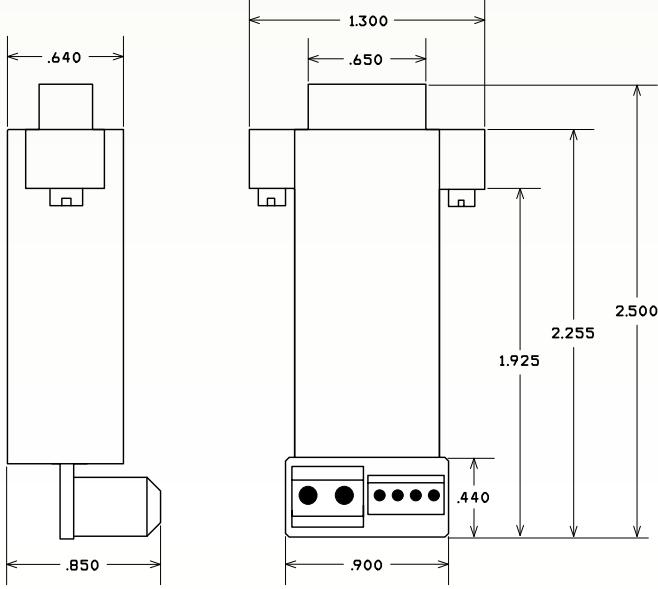
Designer's Kit (083-00004) Includes:

- RS485 to RS232 Converter Card
- An Optical Sensor
- Red Push Button Switch

### ■ RECOMMENDED FOR

- SilverPak 17C pg.57
- SilverPak 17T pg.59
- SilverPak 23C pg.63
- R256 pg.81

### ■ DIMENSIONS (inches)



### ■ FEATURES

- Allows the user to connect the R101, R325 or the SilverPak T to a PC via standard USB port
- UART I/F Supports 7/8 Bit Data, 1/2 Stop Bits and Odd/Even/Mark/Space/No Parity
- Data rate 300 => 250K Baud 384 Byte Receive Buffer/ 128 Byte Transmit
- Buffer for high data throughput
- Adjustable RX buffer timeout
- Auto Transmit Buffer control
- Integrated Power-On-Reset circuit
- Integrated 6 MHz – 48 MHz clock multiplier PLL
- USB 1.1 and USB 2.0 compatible
- Windows 98/98Se/ME/2000/XP Compatible

The **USB485 Converter Card** can also be purchased as part of the Designer's Kit. It allows the user to get acquainted with the unit by providing the necessary cabling to add the optional Push Button and Optical Sensor.

Designer's Kit (083-00026) Includes:

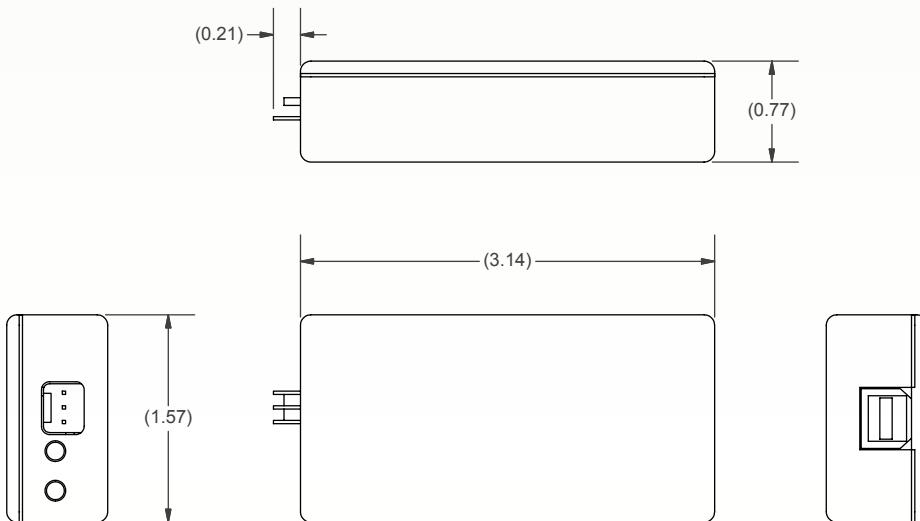
- USB485 Converter Card
- An Optical Sensor
- Red Switch Push Button
- 6 ft USB Cable



### ■ RECOMMENDED FOR

- MiniPak pg.53
- SilverPak 17C pg.57
- SilverPak 17T pg.59
- SilverPak 23C pg.63
- R325 pg.78
- R101 pg.80
- R256 pg.81

### ■ DIMENSIONS (inches)





## Mission Statement

Trinamic Microchips GmbH is a fabless semiconductor company that specializes in the design of integrated circuits, modules and systems for the control of small electrical motors.

## Overview

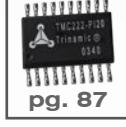
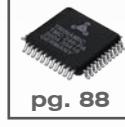
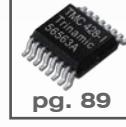
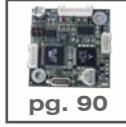
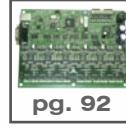
Trinamic's motion control solutions are designed for use in:

- Automotive Applications
- Office Automation
- Industrial Automation
- Consumer electronics

## About Trinamic

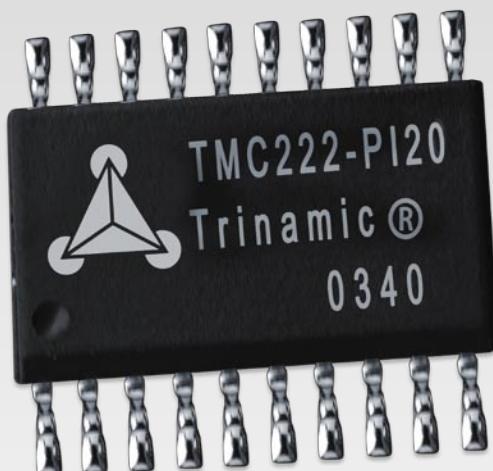
Founded in 1998, Trinamic's integrated circuits are manufactured to the highest standards. Trinamic is headquartered in Hamburg, Germany with an additional German office in Wolfsburg.

## Trinamic products available through **Lin Engineering**

| Driver   | Controller   | Integrated Controller/Driver   |
|--|--|--|
| <b>TMC-222</b><br><br>pg. 87  | <b>TMC-246</b><br><br>pg. 88  | <b>TMC-428</b><br><br>pg. 89  |
| <b>Modules</b>   |  |  |
| <b>TMCM-110</b><br><br>pg. 90 | <b>TMCM-310</b><br><br>pg. 91 | <b>TMCM-610</b><br><br>pg. 92 |

## ■ FEATURES

The TMC222 is a combined micro-stepping step motor motion controller and driver with RAM and OTP memory. The RAM or OTP memory is used to store motor parameters and configuration settings. The TMC222 allows up to four bits of microstepping and a coil current of up to 800 mA. After initialization, it performs all time critical tasks autonomously based on target positions and velocity parameters. Communications to a host take place via a two wire serial interface. Together with an inexpensive microcontroller, the TMC222 forms a complete motion control system.



## ■ SPECIFICATIONS

### Motor driver

- Controls one step motor with four bit microstepping
- Programmable Coil current up to 800 mA
- Supply voltage range operating range 8 to 29 VDC
- Fixed frequency PWM current control with automatic selection of fast and slow decay mode
- Full step frequencies up to 1 kHz
- High temperature, open circuit, short, over-current and under-voltage diagnostics

### Motion controller

- Internal 16-bit wide position counter
- Configurable speed and acceleration settings
- Build-in ramp generator for autonomous positioning and speed control
- On-the-fly alteration of target position
- Reference switch input available for read out

### Two wire serial interface

- Transfer rates up to 350 kbps
- Diagnostics and status information as well as motion parameters accessible
- Field-programmable node addresses (32)



## ■ FEATURES

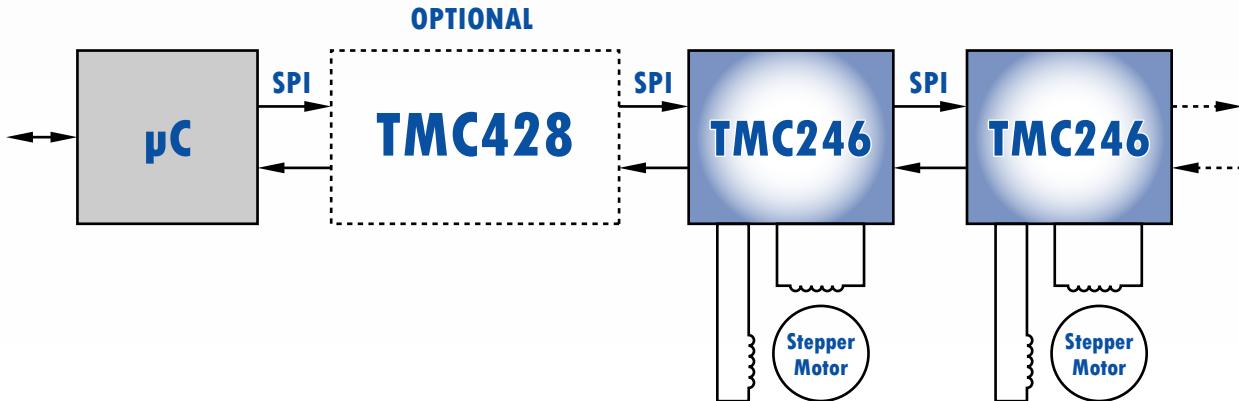
The TMC246 is a dual full bridge driver IC for bipolar step motor control applications. The integrated unique sensorless stall detection, StallGuard™ makes it a good choice for applications where a reference point is needed, but where a switch cannot be used. Its ability to predict an overload makes the TMC246 an optimum choice for drives, where a high reliability is desired. It is realized with HVCMOS technology combined with Low-RDS-ON high efficiency TrenchFET® PowerMOSFETs. The TMC246 gives the choice to operate at high temperatures or at high currents of up to 1500 mA. Its low current consumption and high efficiency, together with the miniature package, make it a perfect solution for embedded motion control and for battery powered devices. Internal DACs allow microstepping as well as smart current control. The device can be controlled by a serial interface (SPI™) or by analog / digital input signals. Short-circuit, temperature, under voltage and over voltage protection is integrated.



## ■ SPECIFICATIONS

- Sensorless stall detection StallGuard™ and load measurement integrated
- Control via SPI with easy-to-use 12 bit protocol or external analog / digital signals
- Short circuit protection integrated
- Over voltage protection integrated
- Status flags for short circuit, open load, over temperature, temperature pre-warning, undervoltage
- Integrated 4 bit DACs allow up to 16 times microstepping via SPI, any resolution via analog control
- Mixed decay feature for smooth motor operation
- Slope control user programmable to reduce electromagnetic emissions
- Chopper frequency programmable via a single capacitor or external clock
- Current control allows cool motor and driver operation
- Internal open load detector
- 7V to 28.5V motor supply voltage
- Up to 1500mA output current and more than 800mA at 105°C
- 3.3V or 5V operation for digital part
- Low power consumption via low RDS-ON power stage
- Standby and shutdown mode available

## ■ APPLICATION ENVIRONMENT



## ■ FEATURES

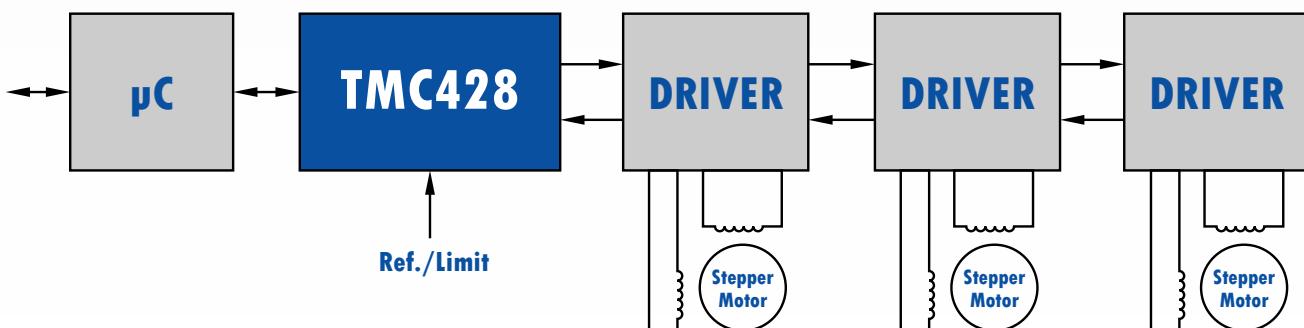
The TMC428 is a miniaturized, high performance step motor controller. It controls up to three 2-phase step motors. All motors can operate independently. The TMC428 allows up to 6 bit micro step resolution individually selectable for each motor. Once initialized, it performs all real time critical tasks autonomously based on target positions and velocities, which may be altered on-the-fly. This inexpensive micro controller together with the TMC428 forms a complete motion control system. The micro controller is free to do application specific interfacing and high level control functions. The communication with both the micro controller and with one to three daisy chained step motor drivers takes place via two separate 4 wire serial peripheral interfaces. The TMC428 directly connects to SPI™ smart power step motor drivers.



## ■ SPECIFICATIONS

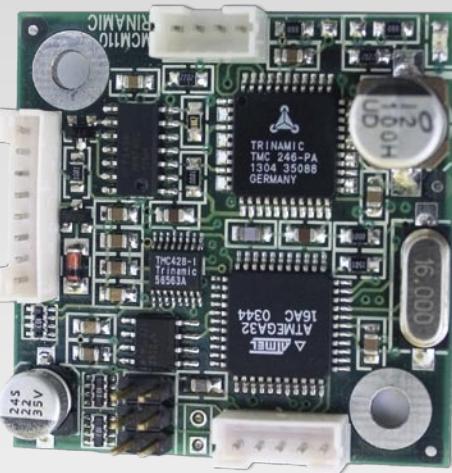
- Controls up to three 2-phase step motors
- Serial 4-wire interface for µC with easy-to-use protocol
- Configurable interface for SPI™ motor drivers
- Different types of SPI™ step motor driver chips may be mixed within a single daisy chain
- Communication on demand minimizes traffic to the SPI™ step motor drivers chain
- Allows read-out of driver status information
- Programmable SPI™ data rates up to 1 Mbit/s
- Wide range for clock frequency - can use CPU clock up to 16 MHz
- Internal 24 bit wide position counters
- Full step frequencies up to 20 kHz
- Individual micro step resolution of (64, 32, 16, 8, 4, 2, 1) micro steps
- Programmable 6 bit micro step table with up to 64 entries for a quarter sine wave period
- On-the-fly alteration of target motion parameters (e.g. position, velocity, acceleration)
- Read-out facility for current motion parameters (position, velocity, acceleration)
- Power down mode (100 µA) with transparent wake-up for normal operation (typ. 10 mA @ 16MHz)
- 3.3V or 5V operation with CMOS / TTL compatible IOs (all inputs Schmitt-Trigger)
- Ultra small 16 pin SSOP package (optional 24 pin SOIC package)
- Integrated power-on-reset

## ■ APPLICATION ENVIRONMENT



## ■ FEATURES

The TMCM-110-42/SG is a complete one-axis controller and driver module that can drive one two-phase bipolar step motor of up to 1.5A coil current. It can either be equipped with one of four interface options (RS232, RS485, IIC or CAN) to be controlled by a host. The module also has two stop switch inputs: (stop left and stop right), one additional general purpose input and one general purpose output. It is also equipped with a 5V voltage regulator and thus needs only one power supply: the motor power supply of 7 to 28 VDC. The module can be programmed using the Trinamic Motion Control Language (TMCL) which allows for control of the module by a host or to run stand alone, executing a TMCL program that is stored in the 16kByte EEPROM on the module (up to 2048 TMCL commands). The TMCM-110-42/SG is equipped with a TMC246 step motor driver so that StallGuard™ is also available. The firmware of the microcontroller can be updated via the host interface. The SilverPak 17T is a NEMA-17 motor equipped with a TMCM-110-42/SG-485 module. Three different motor sizes are available.

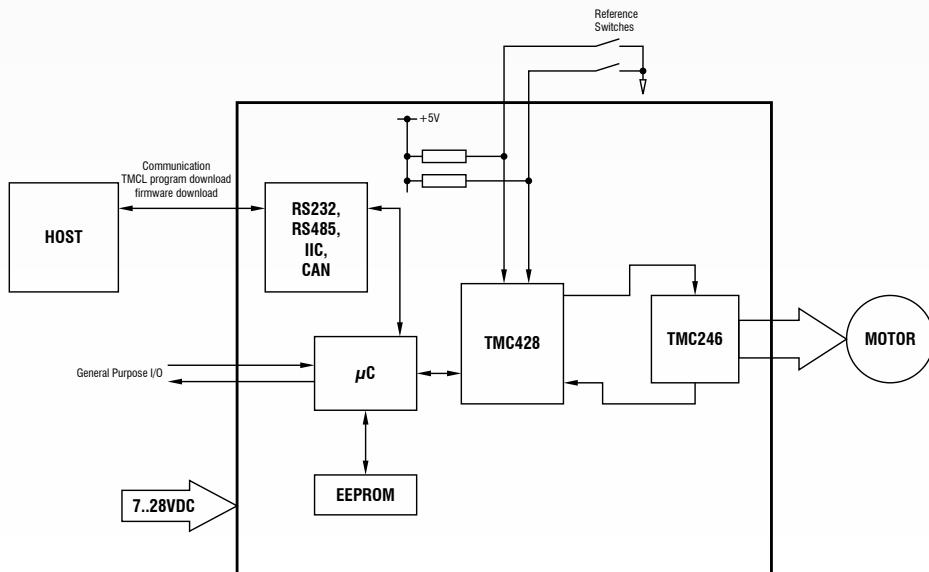


## ■ SPECIFICATIONS

- **Supply Voltage:**  
7 to 28 VDC
- **Host interface:**  
RS232, RS485, IIC or CAN
- **Step motor type:**  
Two phase bipolar
- **Maximum coil current:**  
1500mA (the maximum coil current can be set between 0.1 and 1500mA by software)
- **Inputs:**  
Two limit switches ( digital)  
One general purpose ( digital or analogue)
- **Output:**  
One open collector output, max. 100mA,  
freewheeling diode included

- **Microcontroller:**  
ATmega32, 16MHz
- **Motion controller:**  
TMC428
- **Step Motor driver:**  
TMC246 (TMCM-110-42/SG)
- **TMCL program memory:**  
16kByte EEPROM (2048 TMCL commands)
- **Steps per Revolution (1.8° motor):**  
200, 400, 800, 1600, 3200
- **Microstep Resolutions:**  
Full, 2x, 4x, 8x, 16x

## ■ FUNCTIONAL BLOCK DIAGRAM



## ■ FEATURES

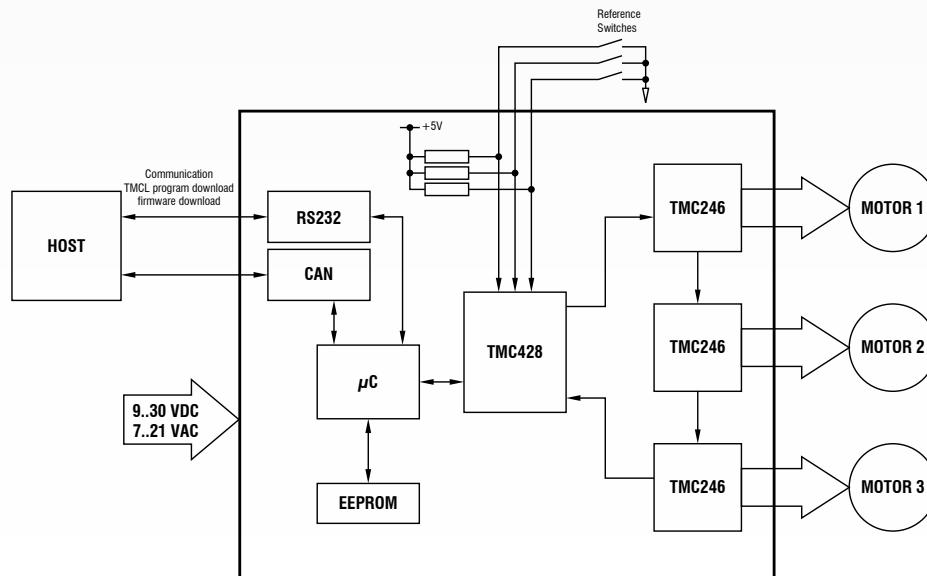
The TMCM-310 is a triple axis, 2-phase step motor motion control module based on the high-performance TMC-428 Motion Controller. The module provides a complete motion control system at low cost and very small physical size. The TMCM-310 can be remote controlled via the RS-232 or the optional CAN interface. Stand-alone operation is also possible. Communication traffic is kept very low since all CPU-intensive operations, e.g. ramp calculation are performed by the TMC-428 motion controller. The TMCM-310 provides a complete software development environment and by using the Trinamic Motion Control Language (TMCL) rapid and fast development of motion control applications is guaranteed. The TMCL Operations are stored in the on-board 16KByte EEPROM, which is accessible via the different interfaces. The firmware of the microcontroller can be updated via the RS232 interface.



## ■ SPECIFICATIONS

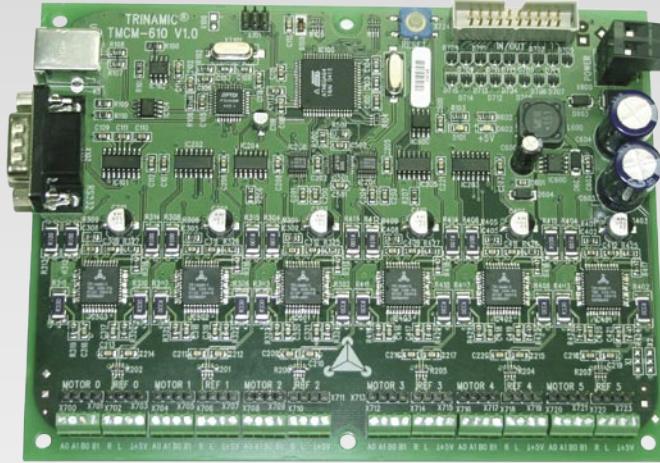
- Directly controls and drives up to three 2-phase step motors
- TMC428 high-performance motion controller
- Drivers with 1500mA output current supporting 16x microstepping
- RS-232 interface
- Optional: CAN 2.0b interface
- Trinamic Motion Control Language integrated
- In-system programmable microcontroller with 32KByte flash memory
- 16 KByte EEPROM (max. 2048 TMCL commands)
- Built-in ramp generator for autonomous positioning and speed control
- On the fly alteration of target motion parameters  
(e.g. position, velocity, acceleration)
- Full step frequencies up to 20 KHz
- Smart multi level current control to keep driver and motor cool
- Limit and reference switch inputs
- 9 to 30 VDC or 7 to 21 VAC supply
- **Compact size:**  
160x100mm
- **Steps per Revolution (1.8° motor):**  
200, 400, 800, 1600, 3200
- **Microstep Resolutions:**  
Full, 2x, 4x, 8x, 16x

## ■ FUNCTIONAL BLOCK DIAGRAM

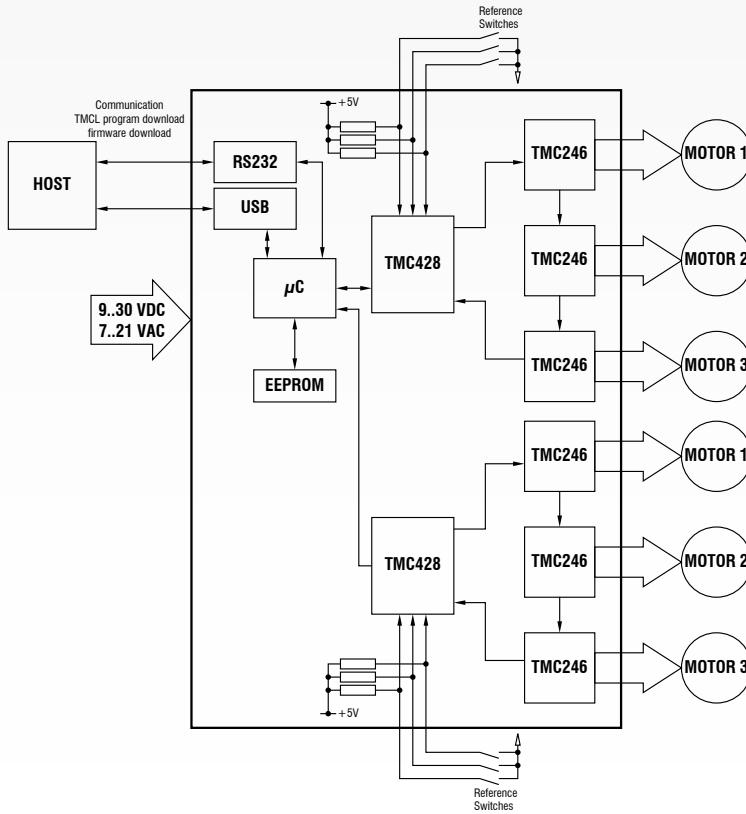


## ■ FEATURES

The TMCM-610 is a six axis 2-phase step motor motion control module based on the high-performance TMC-428 Motion Controller. The module provides a complete motion control system at low cost and very small physical size. The TMCM-610 can be operated as stand-alone module, or remote controlled via USB or RS232. The TMCM-610 provides a complete software development environment and by using the Trinamic Motion Control Language (TMCL) rapid and fast development of motion control applications is guaranteed. The TMCL Operations are stored in the on-board 16KByte EEPROM, which is accessible via the different interfaces. The firmware of the microcontroller can be updated via the RS232 interface or via the USB interface.



## ■ APPLICATION ENVIRONMENT



## ■ SPECIFICATIONS

- **Supply voltage:**  
7 to 28 VDC
- **Motor type:**  
Bipolar, two-phase step motor
- **Maximum peak coil current:**  
1.5A (adjustable by software in 255 steps)
- **Interfaces:**  
RS232 (default 9600 bps, max. 115200 bps)  
USB 2.0
- Eight general purpose outputs (5V, max. 20mA)
- Eight general purpose inputs (TTL level),  
usable as digital or as analog inputs (max. 5V)
- One alarm input (TTL level)
- Two stop switch inputs for every motor (TTL level)
- **CPU:**  
ATmega64 or ATmega128
- **Clock frequency:**  
16MHz
- **Step motor controller:**  
Two TMC428
- **Step motor driver:**  
Six TMC246 (with StallGuard)
- **EEPROM for TMCL program storage:**  
16kBytes (suitable for up to 2048 TMCL commands)
- Firmware upgrades possible through  
RS232 or USB interface
- **Operating temperature range:**  
0 to 70°C

## CABLES & CONNECTORS

Lin Engineering step motors are available with either 2-coil Bipolar, or 4-coil Unipolar windings. Bipolar motors have 4 leads, while unipolar motors have 6 leads. Additionally, some motors are designed with 8 leads, so they may be connected in a variety of ways.

## CONNECTION INSTRUCTIONS

By following a series of easy steps, the below charts can be used to properly connect your motor to your drive.

- 1 Determine how many lead wires your motor has 4, 6, or 8 wires. Locate the proper box below.
- 2 Next, examine the color code of the lead wires on your motor; find the row of colors that match your wires, this is your "Color Code". You will have either Code 1, Code 2, or Code 3. For example, if you have 4 wires and the wires are Red, Blue, Green, and Black, your Color Code is 1.
- 3 Next. Connect the proper color to the appropriate terminal on your drive. If you have a Bipolar drive, the terminal on your drive will be labeled  $\bar{A}$ , A,  $\bar{B}$ , B.

For example, if using the above 4 wire motor with Color Code 1, the Red wire would be connected to A, Blue connected to  $\bar{A}$ , Green connected to B, and Black connected to  $\bar{B}$ .

If you have a Unipolar drive, the terminal will be labeled A, B, C, D and A/C Common, B/D Common (or Comm.)

Notes:

- Indicates that the particular wire is not connected to the drive.
- Indicates that two particular wires are connected to each other, but not the driver.
- Indicates that two particular wires are connected to each other, and then connected to the indicated terminal on the drive. In this example, two wires are connected together, then both wired to terminal A on the drive.

| 4 LEADS |               | Code 1 | Red   | Blue        | Green | Black         |
|---------|---------------|--------|-------|-------------|-------|---------------|
|         |               | Code 2 | Brown | Orange      | Red   | Yellow        |
|         |               | Code 3 | Red   | Red / White | Green | Green / White |
|         | Bipolar Drive |        | A     | $\bar{A}$   | B     | $\bar{B}$     |

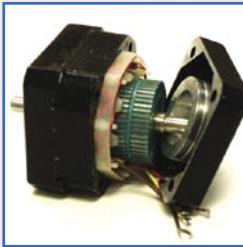
| 6 LEADS       |                      | Code 1 | Red       | White     | Blue        | Green     | Yellow    | Black         |
|---------------|----------------------|--------|-----------|-----------|-------------|-----------|-----------|---------------|
|               |                      | Code 2 | Brown     | Black     | Orange      | Red       | White     | Yellow        |
|               |                      | Code 3 | Red       | Black     | Red / White | Green     | White     | Green / White |
| Bipolar Drive | Half Coil Connection | A      | $\bar{A}$ | —         | B           | $\bar{B}$ | —         |               |
|               |                      | —      | $\bar{A}$ | A         | —           | $\bar{B}$ | B         |               |
| Bipolar Drive | Series Connection    | A      | —         | $\bar{A}$ | B           | —         | $\bar{B}$ |               |
|               |                      | —      | —         | $\bar{A}$ | B           | —         | $\bar{B}$ |               |
|               | Unipolar Drive       | A      | A/C Comm  |           | C           | B         | B/D Comm  | D             |

| 8 LEADS       |                     | Code 1 | Blue / White | Red / White    | Blue        | Red       | Green / White | Black / White  | Green          | Black     |
|---------------|---------------------|--------|--------------|----------------|-------------|-----------|---------------|----------------|----------------|-----------|
|               |                     | Code 2 | Red          | Yellow / White | Red / White | Yellow    | Orange        | Black / White  | Orange / White | Black     |
|               |                     | Code 3 | Red          | Black / White  | Red / White | Black     | Green         | Yellow / White | Green / White  | Yellow    |
| Bipolar Drive | Parallel Connection |        | —            | A              | —           | $\bar{A}$ | —             | B              | —              | $\bar{B}$ |
|               |                     |        | A            | —              | $\bar{A}$   | B         | —             | $\bar{B}$      | —              | $\bar{B}$ |
| Bipolar Drive | Series Connection   | A      | —            | —              | $\bar{A}$   | B         | —             | $\bar{B}$      | —              | $\bar{B}$ |
|               |                     | —      | —            | —              | $\bar{A}$   | B         | —             | $\bar{B}$      | —              | $\bar{B}$ |
|               | Unipolar Drive      | A      | A/C Comm     |                | C           | B         | B/D Comm      |                | D              |           |

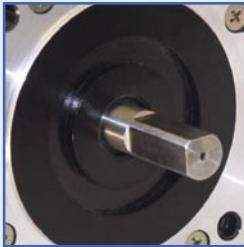
# MOTOR OPERATING SPECIFICATIONS

|                                  | SIZE 8        | SIZE 11       | SIZE 14       | SIZE 17       | SIZE 23       | SIZE 34       |
|----------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Shaft Run Out (inches)           | 0.002         | 0.002         | 0.002         | 0.002         | 0.002         | 0.002         |
| Radial Play (inches) @ 1 lb load | .001 max      |
| Perpendicularity                 | 0.003         | 0.003         | 0.003         | 0.003         | 0.003         | 0.003         |
| Concentricity (inches)           | 0.002         | 0.002         | 0.002         | 0.002         | 0.002         | 0.002         |
| Operating Temp. Range            | -20°C to 50°C |
| Insulation Class                 | 130°C Class B |
| Lead Wire Gauge                  | 26 AWG        | 26 AWG        | 26 AWG        | 26 AWG        | 22 AWG        | 22 AWG        |

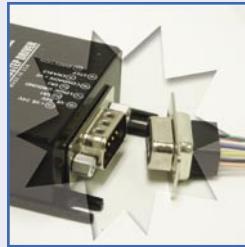
## OPERATION & USAGE TIPS



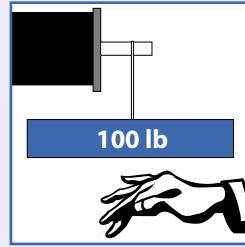
**Do not** disassemble motors; a significant reduction in motor performance will occur.



**Do not** machine shafts; this will have a negative effect on shaft run out and perpendicularity.



**Do not** disconnect motor from drive while in operation.



**Do not** use holding torque/detent torque of motor as a fail safe brake.



**Do not** hold motor by lead wires.

**FAILURE TO COMPLY WITH THESE RECOMMENDATIONS WILL VOID ALL WARRANTY TERMS**

## TORQUE CONVERSION CHART

| KNOWN VALUE         |                      |                        |                         |          |           |                      |                        | DESIRERD VALUE |
|---------------------|----------------------|------------------------|-------------------------|----------|-----------|----------------------|------------------------|----------------|
| lb-ft<br>x          | lb-in<br>x           | oz-in<br>x             | dyne-cm<br>x            | N-m<br>x | N-cm<br>x | kg-m<br>x            | gr-cm<br>x             |                |
| 1                   | 0.08333              | 0.005208               | $7.376 \times 10^{-6}$  | 0.7376   | 0.007376  | 7.233                | $7.233 \times 10^{-7}$ | =lb-ft         |
| 12                  | 1                    | 0.0625                 | $8.851 \times 10^{-6}$  | 8.8509   | 0.08851   | 86.796               | 0.000868               | =lb-in         |
| 192                 | 16                   | 1                      | $1.416 \times 10^{-7}$  | 141.61   | 1.4161    | 1,389                | 0.01389                | =oz-in         |
| $1.356 \times 10^8$ | $1.1298 \times 10^6$ | 70,620                 | 1                       | $10^8$   | $10^7$    | $9.8067 \times 10^7$ | 980.67                 | =dyne-cm       |
| 1.356               | 0.113                | 0.007062               | $10^{-6}$               | 1        | 1         | 9.8066               | $9.8 \times 10^{-7}$   | =N-m           |
| 135.6               | 11.3                 | 0.7062                 | $10^{-7}$               | 100      | 100       | 980.66               | 0.98                   | =N-cm          |
| 0.1383              | 0.01152              | $7.201 \times 10^{-4}$ | $1.0197 \times 10^{-5}$ | 0.10197  | 0.001097  | 1                    | 0.00001                | =Kg-m          |
| 13,830              | 1,152                | 72.01                  | $1.0197 \times 10^{-3}$ | 11019.7  | 101.97    | 100,000              | 1                      | =gr-cm         |

Conversion factors may be read directly from the tables

**Example:**

If you need to convert 10 kg-m to oz-in, take known value (10 kg-m) multiply (X) by conversion factor (1,389) to convert to oz-in. The same method applies to the inertia conversion chart.

$$10\text{kg-m} \times 1,389 = 13,890 \text{ oz-in}$$

| kg-m<br>x | gr-cm<br>x             |        |
|-----------|------------------------|--------|
| 7.233     | $7.233 \times 10^{-7}$ | =lb-ft |
| 86.796    | 0.000868               | =lb-in |
| 1,389     | 0.01389                | =oz-in |

## INERTIA CONVERSION CHART

| KNOWN VALUE             |                         |                             |                             |                         |                             |                        |                            |                         |                             | DESIRERD VALUE          |
|-------------------------|-------------------------|-----------------------------|-----------------------------|-------------------------|-----------------------------|------------------------|----------------------------|-------------------------|-----------------------------|-------------------------|
| lb-ft <sup>2</sup><br>x | lb-in <sup>2</sup><br>x | lb-ft-sec <sup>2</sup><br>x | lb-in-sec <sup>2</sup><br>x | oz-in <sup>2</sup><br>x | oz-in-sec <sup>2</sup><br>x | kg-m <sup>2</sup><br>x | kg-m-sec <sup>2</sup><br>x | gr-cm <sup>2</sup><br>x | gr-cm-sec <sup>2</sup><br>x |                         |
| 1                       | 0.006944                | 32.17                       | 2.681                       | 0.000434                | 0.1676                      | 23.73                  | 232.7                      | $2.73 \times 10^{-6}$   | 0.002327                    | =lb-ft <sup>2</sup>     |
| 144                     | 1                       | 4,633                       | 386.1                       | 0.0625                  | 24.13                       | 3,417                  | 33,510                     | $3.417 \times 10^{-4}$  | 0.3351                      | =lb-in <sup>2</sup>     |
| 0.03108                 | 0.0002158               | 1                           | 0.08333                     | $1.349 \times 10^{-7}$  | 0.005208                    | 1                      | 7.233                      | $7.376 \times 10^{-8}$  | $7.233 \times 10^{-7}$      | =lb-ft-sec <sup>2</sup> |
| 0.373                   | 0.00259                 | 12                          | 1                           | 0.0001619               | 0.0625                      | 8.851                  | 86.8                       | $8.851 \times 10^{-7}$  | 0.000868                    | =lb-in-sec <sup>2</sup> |
| 2,304                   | 16                      | 74,130                      | 6,177                       | 1                       | 386.1                       | 54,670                 | 536,200                    | 0.005467                | 5.362                       | =oz-in <sup>2</sup>     |
| 5.968                   | 0.04144                 | 192                         | 16                          | 0.00259                 | 1                           | 141.6                  | 1,389                      | $1.416 \times 10^{-7}$  | 0.01389                     | =oz-in-sec <sup>2</sup> |
| 0.04214                 | 0.0002926               | 1.356                       | 0.113                       | $1.829 \times 10^{-7}$  | 0.007062                    | 1                      | 9.807                      | $10^{-8}$               | $9.807 \times 10^{-7}$      | =Kg-m <sup>2</sup>      |
| 0.004297                | $2.984 \times 10^{-7}$  | 0.1383                      | 0.01152                     | $1.856 \times 10^{-6}$  | 0.0007201                   | 0.102                  | 1                          | $1.02 \times 10^{-8}$   | $10^{-7}$                   | =kg-m-sec <sup>2</sup>  |
| 421,400                 | 2,926                   | $1.356 \times 10^7$         | 1,130,000                   | 182.9                   | 70,620                      | $10^8$                 | $9.807 \times 10^8$        | 1                       | 9.807                       | =gr-cm <sup>2</sup>     |
| 429.7                   | 2.984                   | 1.383x10ASD                 | 1,152                       | 0.1865                  | 72.01                       | 10,200                 | 100,000                    | 0.00102                 | 1                           | =gr-cm-sec <sup>2</sup> |



## DID YOU KNOW...

The Lin Engineering website has automated tools for conversions.



# **LIN ENGINEERING**

Step Motor Specialists

The logo consists of the word "ISO" in a bold, sans-serif font inside a black rectangular box, with the number "9001" positioned directly below it in a larger, bold, sans-serif font.

# APPLICATION DATA SHEET

**FAX TO**

**(408)919-0201**

Company Name: \_\_\_\_\_ Contact: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_ FAX: \_\_\_\_\_

Email: \_\_\_\_\_

Please describe your Application, Potential Quantity, and Target Price:

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(Information in bold is required)

**Motor Operating Speed:** \_\_\_\_\_ RPM  
\_\_\_\_\_ RPS

- Full-Step
- Half-Step
- Micro-Step \_\_\_\_\_

**Max. Voltage Available:** \_\_\_\_\_ Volts

Unipolar Driver     Bipolar Driver

**Max. Current Available:** \_\_\_\_\_ Amps

Step Angle: \_\_\_\_\_ deg.

Max. Holding Torque Required: \_\_\_\_\_

Duty Cycle: \_\_\_\_\_

Max. Motor Length: \_\_\_\_\_

Motor Frame Size:  NEMA 8  
 NEMA 11  
 NEMA 14  
 NEMA 17

- NEMA 17
- NEMA 34
- Other:

Pullout Torque Required at Operating Speed: \_\_\_\_\_  oz-in       gm-cm

Type of Coupling:  Direct  Gear Ratio: \_\_\_\_\_  
 Belt Ratio: \_\_\_\_\_  Other Ratio: \_\_\_\_\_

Reason for New Supplier:  New Application  Quality  Performance  
 Delivery  Price  
 Other: \_\_\_\_\_

How did you hear about us? \_\_\_\_\_

Please describe any other Critical Motor Specifications:

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**PHOTOCOPY AND FAX TO (408)919-0201 OR VISIT [WWW.LINENGINEERING.COM](http://WWW.LINENGINEERING.COM) FOR AN ONLINE VERSION**

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- Automatic Feeding Machine
- 3D Image Acquisition System
- Label and Die Feeder
- Wave Length Meter
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- Press Printing
- Color/ Photo Imaging

