LIN ENGINEERING

Step Motor Specialists

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Mission Statement

Lin Engineering seeks to provide our customers with leading technology designs, high quality products, and unsurpassed customer service and technical support.

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 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 permanent magnet motors, optical encoders, spur and planetary gearboxes, and step motor drives.

President Ted 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, and Semiconductor Manufacturing.

LIN ENGINEERING
Step Motor Specialists

Our Capabilities

Maximize Torque at Desired Speed

With a given power input, the power output *Td* (T= torque at angular velocity *) from a given size of motor will not change at all. However, within the constraints of power input and motor size, Lin Engineering can design a motor to maximize torque at your desired operating speed. In effect, a shift of the maximum efficiency to exactly where you need it.

High Step Accuracy

Lin Engineering's 0.45° NEMA 23 motor has the best step accuracy in the step motor industry. This is simply because our 0.45° motor is constructed with 200 rotor teeth (a typical 1.8° motor is constructed with only 50 teeth). The number of teeth is proportional to the torque stiffness, which determines step motor accuracy.

High Resolution

Lin Engineering's 0.9° and 0.45° motors provide 2 and 4 times better resolution, respectively, than a standard 1.8° 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 is unmatched in the industry. Our engineers will eliminate the guesswork in motor selection. There will be 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, and the Middle and Far East, 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 issues 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 as little as 1 week - or even sooner in some cases. 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

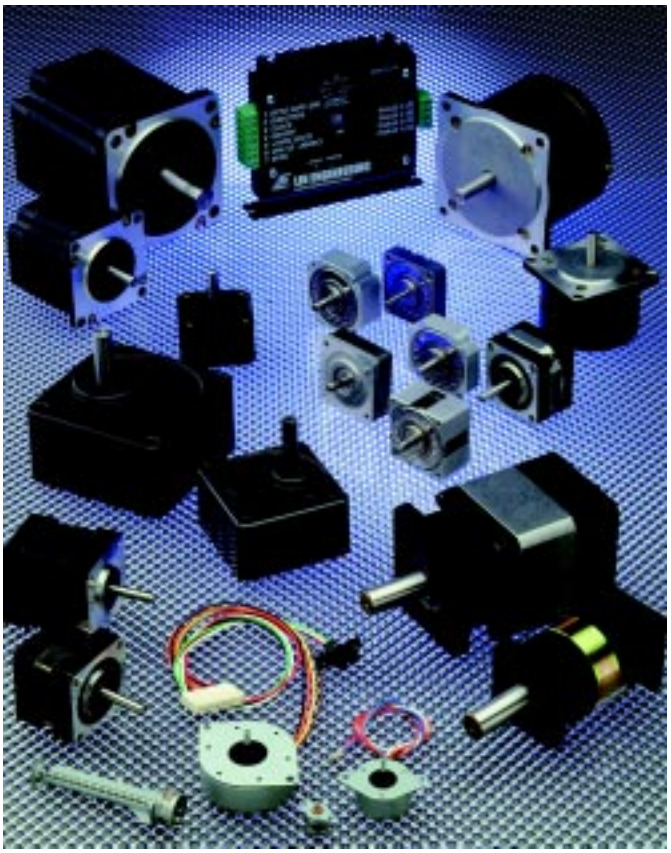
In addition to minimizing leadtime, our U.S. facility also functions to support our overseas production. This allows Lin Engineering to meet the initial demands for high volume orders, while helping your company avoid the delays associated with high volume production set-up.

Military/Aerospace Applications

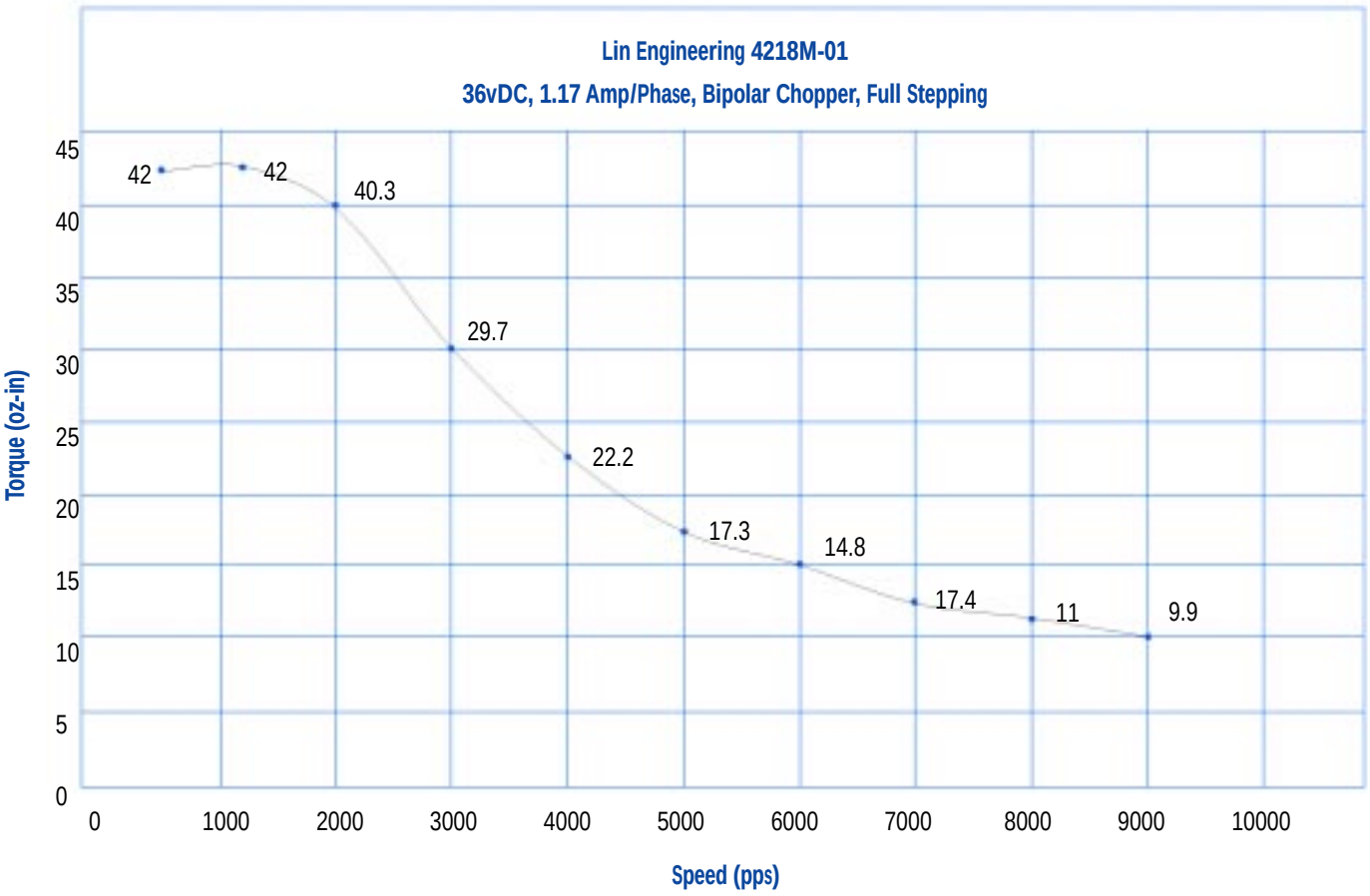
As a military qualified vendor, Lin Engineering designed, tested, and manufactured disk drive step motors used in the B-2 Stealth bomber.

New Product Development

Each year, Lin Engineering continues to develop innovative step motor products. Recent accomplishments include the 0.45° NEMA 23 motor, redesigned for greater efficiency in performance and manufacturing, and the PowerPak 14, a 0.9° motor featuring the performance of a NEMA 17 motor in a size 14 package.



Speed Torque Curve Request



Speed vs. Torque Curve

Speed vs. torque curves like the one above show the performance of a motor at various speeds. The horizontal axis is expressed in pulses per second (pps) and the vertical axis is expressed in oz-in. Key factors in speed torque curves are the type of driver, power supply voltage, and current per phase output of the driver.

This expression of torque is referred to as the dynamic, or pullout torque. This is the maximum friction load torque which can be applied to the motor at a given step rate without losing synchronization with the corresponding pulse rate.

The speed can be converted from rpm to pps. Example: a motor running at 20 rpm would be 66.7 full steps per second on a 1.8 degree motor.

$$20\text{RPM} = \frac{20\text{ Revolutions}}{1\text{ Minute}} \times \frac{1\text{ Minute}}{60\text{ Seconds}} \times \frac{200\text{ Pulses}}{1\text{ Revolution}} = 66.7\text{ Pulses Per Second}$$

Microstepping and Speed vs. Torque Performance

Microstepping does not adversely affect the speed torque curve. If a chart shows 20 oz-in at a speed of 500 pulses per second full steps, the motor will perform at 20 oz-in at 1000 pulses per second at half stepping.

To request a speed torque curve for a specific motor, please contact us at sales@linengineering.com with your power supply voltage, driver current per phase, and operating speed.

Custom Design and Engineering

Lin Engineering can design and manufacture motor housings specific to your environmental, mechanical, and dimensional specifications.

Custom Housings

- Cleanroom Environment
- Stainless Steel
- Anodized Finish
- Assembly Integration

Shaft Modifications

- Single or Double Shaft
- Shaft Length
- Single or Double Flats
- Flat Length
- Standard or Woodruff Keyways
- Shaft Diameter
- Hollow Shaft
- Through Shaft Holes (Threaded and Non-Threaded)

High Temperature/Vacuum Environment

- Non-Outgassing Lubricants
- Dry Bearings
- Teflon® Insulated Wire
- Stainless Steel Bearings

Lead Modification

- Length
- Custom Color Code
- 8 Wire Configuration
- Protective Sleeving on Leads
- Shrink Tube on Leads

Sub-Assembly Work

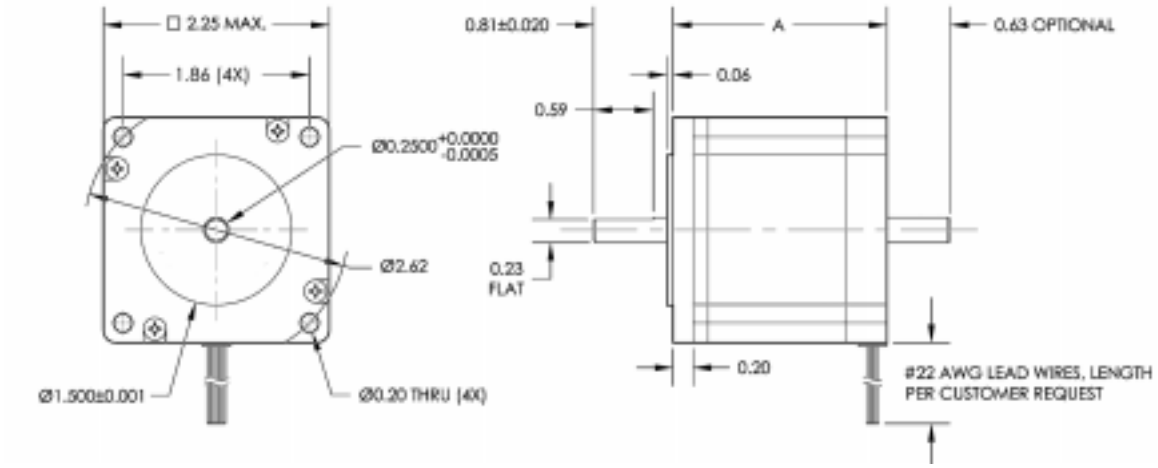
- Pins and Connectors Installed
- Assembly Accessories Installed (Optical Switches, etc.)

0.45º Size 23 High Torque Motor

- 0.45º Full Step +/- 0.017º (1 arc minute) Step Error
- High Torque
- High Step Accuracy
- High Resolution
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
1.73"	5704X-01	1.5	75	2.7	2.7	1.0	1.05	4
44 mm	5704X-02	1.8	75	2.0	1.8	1.0	1.05	4
	5704X-15	2.5	75	1.2	1.3	1.0	1.50	4
	5704X-10	0.9	75	7.8	8.4	1.0	1.50	4
2.17"	5704M-02	1.8	140	3.0	3.1	2.1	1.50	4
55 mm	5703M-03	3.0	140	1.0	1.1	2.1	1.50	4
	5704M-10	0.9	140	11.7	11.2	2.1	1.50	4

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

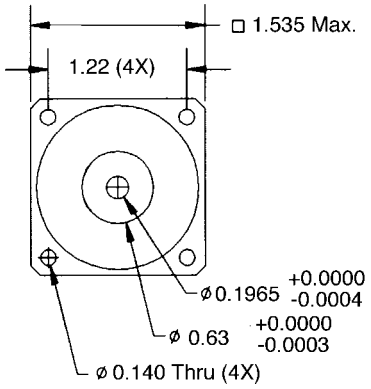


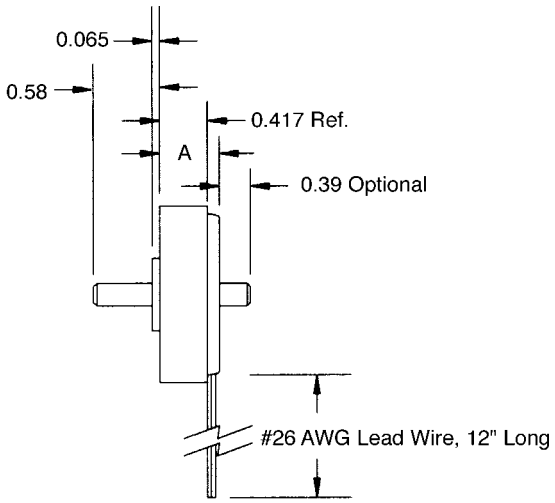
0.9º Size 17 Super Slim Line Motor

- Light Weight
- Low Inertia
- Stainless Steel Housing
- Ideal for High Speed Applications
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
0.54"	416-05-50	0.14	4.0	50.0	18.0	0.03	0.20	6
14 mm	416-05-03	0.70	6.0	3.0	1.5	0.03	0.20	4
	416-05-04	0.60	6.0	4.0	2.5	0.03	0.20	4
	416-05-17	0.30	6.0	17.0	8.0	0.03	0.20	4
	416-05-60	0.15	6.0	64.0	32.0	0.03	0.20	4
0.58"	416-06-05	0.60	7.0	4.5	2.5	0.04	0.21	4
14.7 mm	416-06-57	0.21	7.0	57.0	21.0	0.04	0.21	4

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.



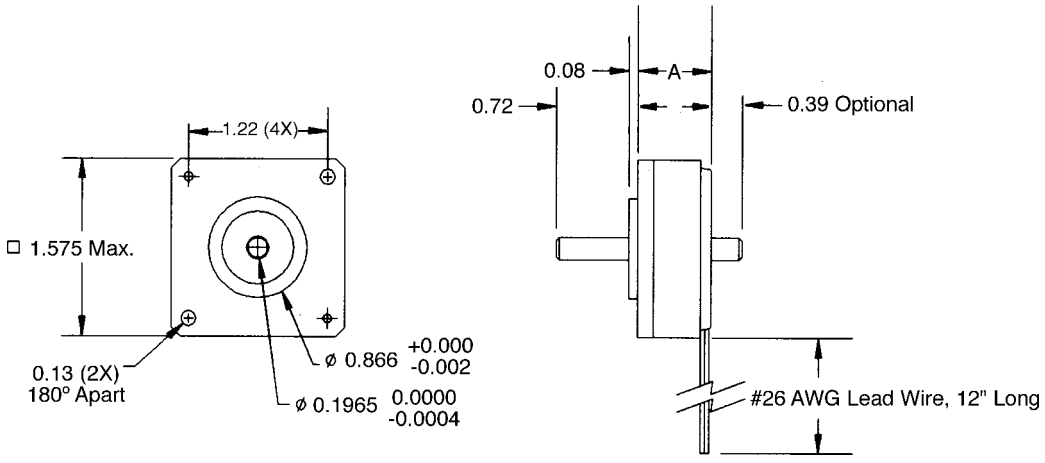


0.9º Size 17 Slim Line Motor

- NEMA Size 17 Mounting
- Low Inertia
- Ideal for High Speed Applications
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
0.68"	416-07-06	0.5	6.0	6.0	2.0	0.40	0.23	6
17 mm	416-07-14	0.36	6.0	14.0	3.0	0.40	0.23	6
	416-07-65	0.18	6.0	65.0	17.4	0.40	0.23	6
	416-07-05	0.6	8.0	5.0	2.5	0.40	0.23	4
	416-07-80	0.16	8.0	68.0	32.0	0.40	0.23	4

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

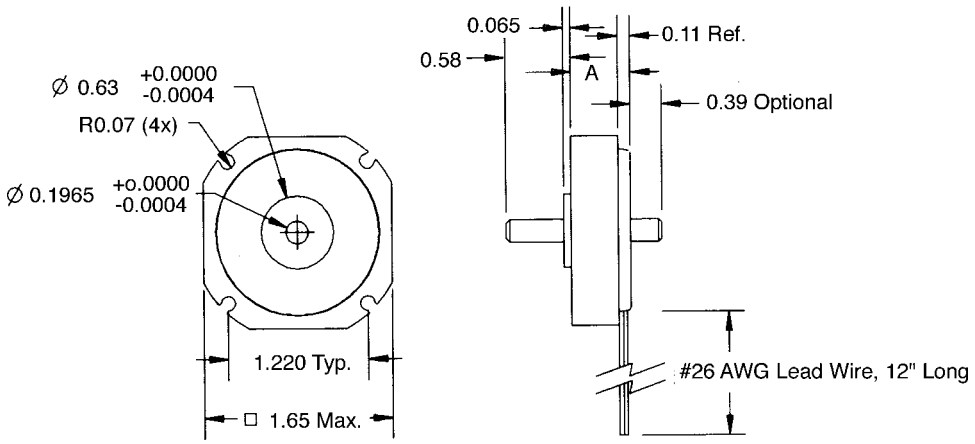


0.9º Size 17 Gold Line Motor

- Ultra Compact Motor
- Light Weight
- Low Inertia
- Aluminum Frame (color anodized available)
- Ideal for High Speed Applications
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
0.41" 10 mm	4109Z-51	0.5	3.0	3.5	1.5	0.017	0.12	4
0.54" 14 mm	4109Y-51	0.6	6.0	4.0	2.5	0.03	0.16	4
0.58" 15 mm	4109X-51	0.6	8.0	5.0	2.5	0.04	0.18	4
0.78" 19 mm	4109V-51	1.2	15.0	3.0	2.0	0.08	0.28	4
1.10" 28mm	4190R-05 4109R-08	0.8 0.6	20.0 20.0	6.5 11.0	4.4 7.8	0.11 0.11	0.41 0.41	4 4

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

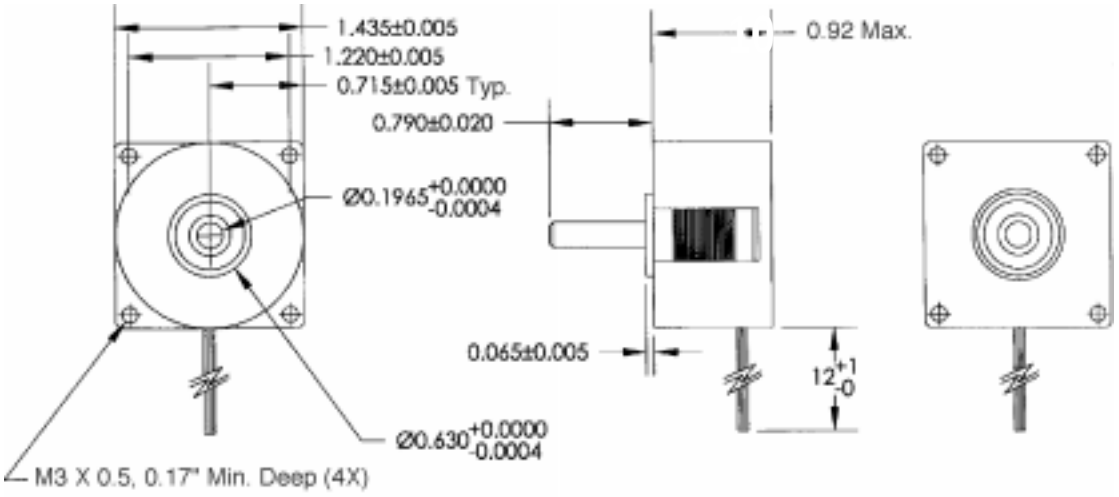


0.9º Size 14 PowerPak Motor

- High Step Accuracy
- High Step Resolution
- NEMA Size 17 Mounting
- Size 14 Package
- Additional Windings Available

Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
414-10-04	0.9	12.0	4.9	1.8	0.07	0.27	6
414-10-08	0.6	12.0	8.0	4.0	0.07	0.27	6
414-10-03	1.2	16.0	3.0	2.1	0.07	0.27	4
414-10-06	0.8	16.0	7.0	4.7	0.07	0.27	4
414-10-18	0.6	16.0	10.0	8.0	0.07	0.27	4
414-10-14	0.5	16.0	14.0	9.0	0.07	0.27	4

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

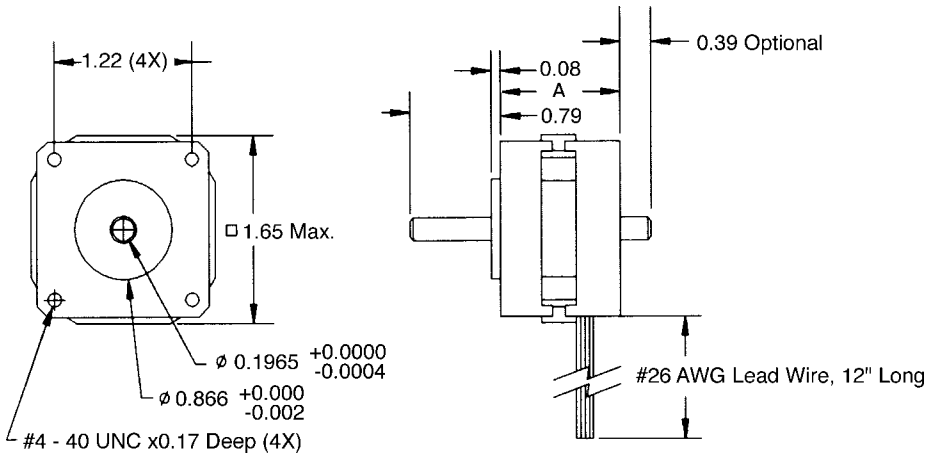


0.9º Size 17 High Accuracy Motor

- NEMA Size 17 Mounting
- Low Inertia
- Excellent Step Accuracy
- Ideal for Microstepping Control
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
1.10" 28 mm	417-11-04	0.9	12.0	4.9	1.8	0.07	0.31	6
	417-11-08	0.6	12.0	8.0	4.0	0.07	0.31	6
	417-11-03	1.2	16.0	3.0	2.1	0.07	0.31	4
	417-11-06	0.8	16.0	7.0	4.7	0.07	0.31	4
	417-11-18	0.6	16.0	10.0	8.0	0.07	0.31	4
	417-11-14	0.5	16.0	14.0	9.0	0.07	0.31	4
1.38" (35 mm)	417-13-18	0.6	22.0	12.0	9.1	0.11	0.45	4
	417-13-06	0.8	22.0	6.6	5.3	0.11	0.45	4
1.54" 39 mm	417-15-06	0.8	22.0	6.0	3.0	0.13	0.53	6
	417-15-03	1.2	30.0	3.0	2.5	0.13	0.53	4
	417-15-12	0.6	30.0	12.0	10.0	0.13	0.53	4
	417-15-30	0.4	30.0	30.0	21.0	0.13	0.53	4

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

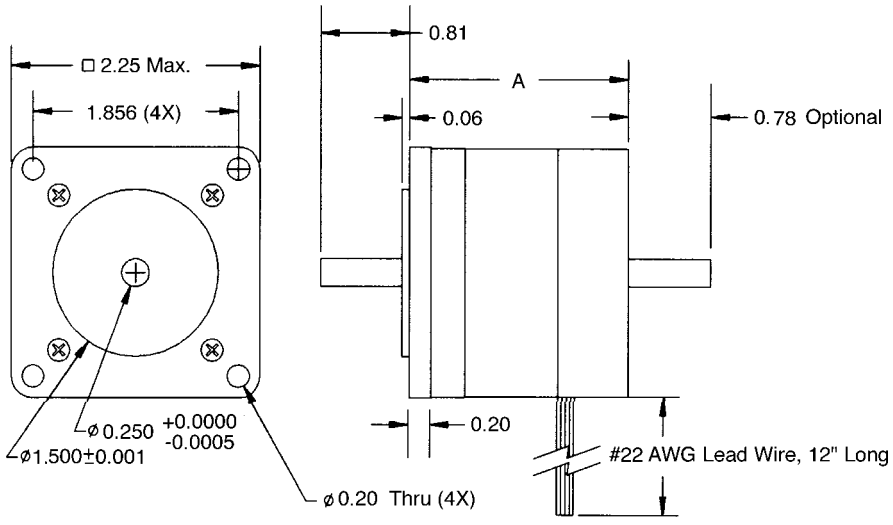


0.9º Size 23 Standard Motor

- NEMA Size 23 Mounting
- High Resolution 0.9º Full Step Angle
- Cost Effective
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
1.55"	5609X-01	1.1	28.0	3.6	4.1	0.30	0.75	6
39 mm	5609X-02	0.4	28.0	30.0	28.0	0.30	0.75	6
2.00"	5609S-04	1.3	55.0	3.0	2.3	0.60	1.12	6
51 mm	5609S-01	0.8	55.0	7.1	9.0	0.60	1.12	6
	5609S-02	0.4	55.0	29.0	35.0	0.60	1.12	6
2.25"	5609M-01	1.2	80.0	5.0	7.8	0.74	1.20	6
57 mm	5609M-02	0.6	80.0	20.0	30.0	0.74	1.20	6
3.03"	5609L-05	1.5	120.0	3.6	5.6	1.20	1.90	6
77 mm								
4.03"	5609C-02	4.6	160.0	0.5	1.0	1.90	3.08	6
102 mm	5609C-03	1.8	160.0	3.5	7.3	1.90	3.08	6

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

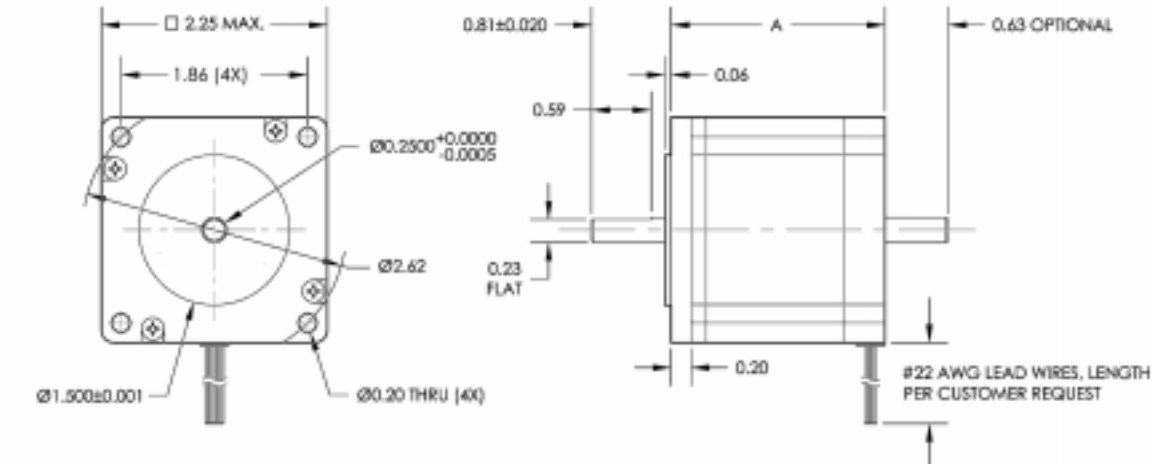


0.9º Size 23 High Torque Motor

- High Torque
- High Step Accuracy
- High Resolution
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in2	Weight lbs.	Number of Leads
1.73"	5709X-01	2.0	70	1.4	1.2	0.7	1.05	6
44mm	5709X-15	3.0	70	0.6	0.6	0.7	1.05	6
2.17"	5709M-05	2.0	125	1.8	2.5	1.5	1.50	6
55mm	5709M-02	3.0	125	0.75	1.1	1.5	1.50	6
3.1"	5709L-01	2.0	188	2.25	3.6	2.6	2.20	6
78.7mm	5709L-03	3.0	188	1.0	1.6	2.6	2.20	6
	5709L-04	4.67	188	0.54	1.57	2.3	2.20	6

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

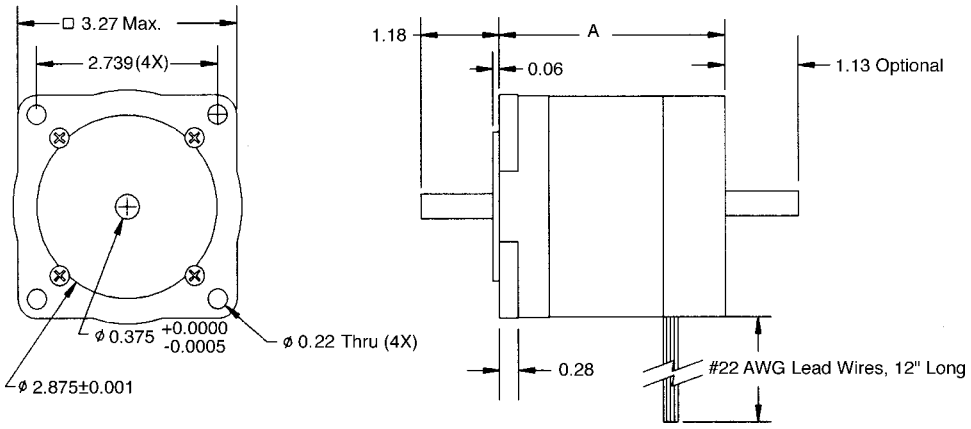


0.9º Size 34 Standard Motor

- NEMA Size 34 Mounting
- High Resolution 0.9º Full Step Angle
- Wide Selection
- Cost Effective
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
2.50"	8609S-02	4.5	180	0.4	1.3	3.10	3.30	8
63.5 mm	8609S-01	2.2	180	1.1	8.0	3.10	3.30	8
3.74"	8609M-01	3.1	350	0.8	6.4	6.02	5.78	8
95 mm	8609M-02	4.0	350	0.7	4.4	6.02	5.78	8
5.07"	8609L-01	3.2	500	0.8	6.6	9.85	8.10	8
129 mm	8609L-02	4.0	500	1.3	12.0	9.85	8.10	8

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

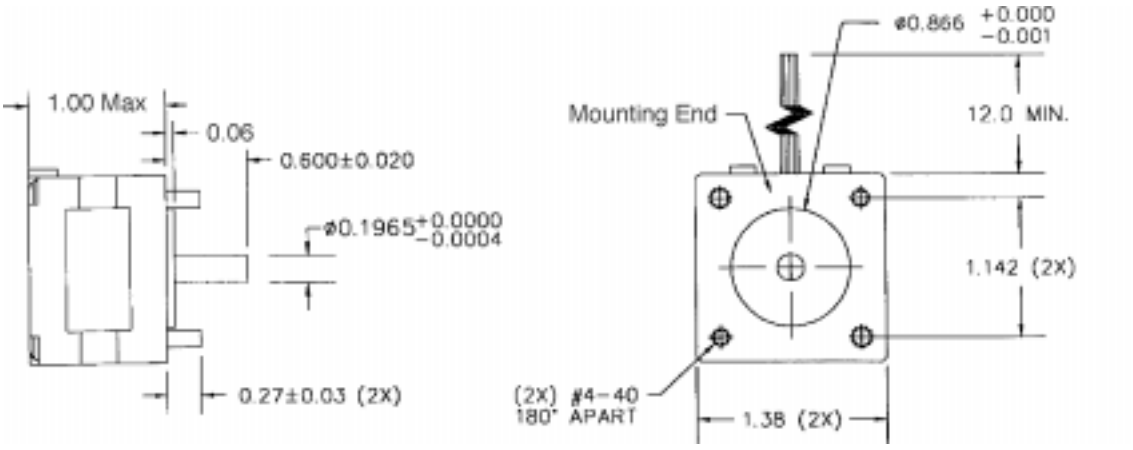


1.8º Size 14 Standard Motor

- Ideal for Limited Mounting Space
- Additional Windings Available

Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
213-10-12	0.30	5.5	12.0	2.0	0.06	0.25	6
213-10-10	0.35	5.5	10.0	2.2	0.06	0.25	6
213-10-04	0.45	7.5	3.8	4.1	0.06	0.25	4
213-10-08	0.35	7.5	8.5	3.5	0.06	0.25	4

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

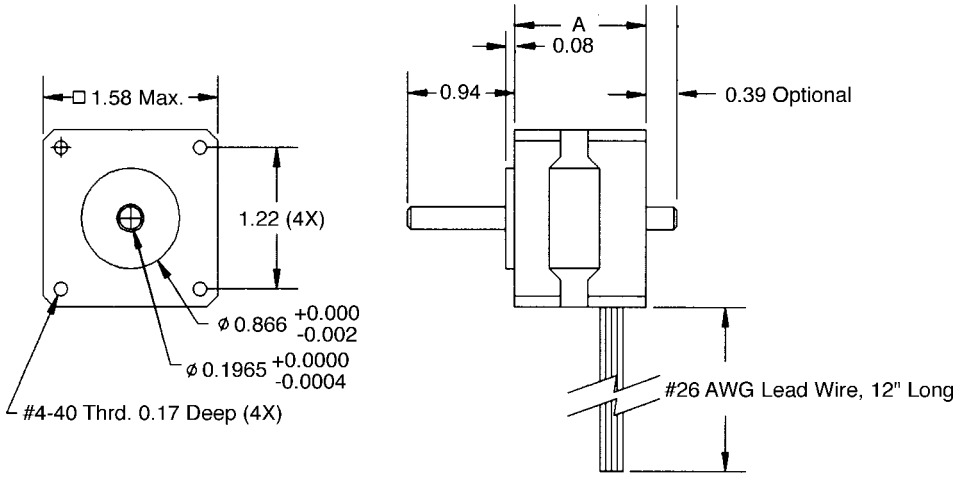


1.8º Size 17 Standard Motor

- NEMA Size 17 Mounting
- Wide Selection
- Cost Effective
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
1.02"	4018X-07	1.0	15.0	5.0	6.0	0.05	0.27	4
26 mm								
1.30"	4018S-18	0.9	15.0	4.2	1.6	0.09	0.44	6
33 mm	4018S-10	0.4	15.0	24.0	13.0	0.09	0.44	6
	4018S-20	0.3	15.0	39.0	25.0	0.09	0.44	6
1.57"	4018M-08	0.8	22.3	7.5	6.0	0.13	0.48	6
40 mm	4018M-03	0.4	22.3	30.0	28.0	0.13	0.48	6
	4018M-05	2.5	30.0	0.5	0.3	0.13	0.48	4
	4018M-04	1.1	30.0	4.0	6.0	0.13	0.48	4
1.85"	4018L-03	1.2	30.0	3.3	2.4	0.20	0.66	6
47 mm	4018L-01	0.8	30.0	7.5	5.8	0.20	0.66	6
	4018L-04	2.1	45.0	1.1	1.4	0.20	0.66	4

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

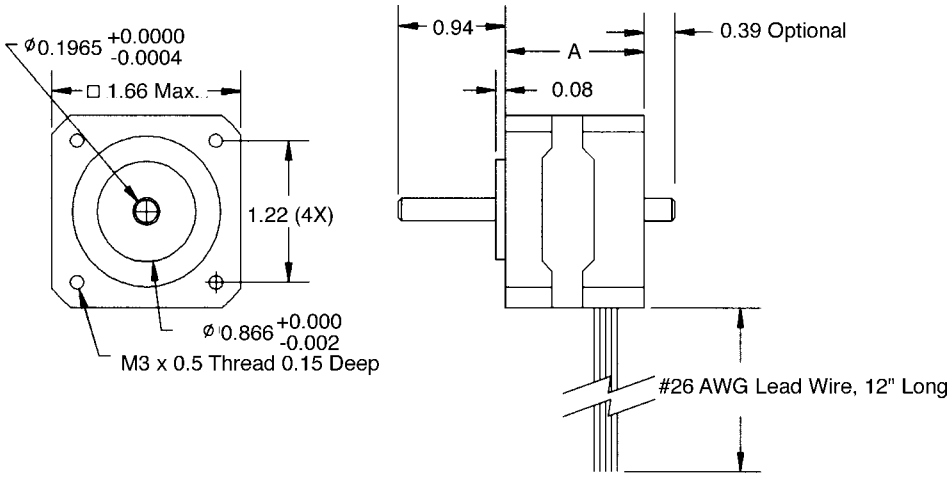


1.8º Size 17 High Torque Motor

- NEMA Size 17 Mounting
- High Torque in Size 17 Motor
- Ideal for High Torque Applications
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
1.33"	4218S-04	0.95	27.0	4.0	3.2	0.15	0.4	6
34 mm	4218S-08	0.70	27.0	7.6	6.8	0.15	0.4	6
	4218S-02	1.30	35.0	2.0	2.4	0.15	0.4	4
	4218S-15	0.50	35.0	15.0	22.0	0.15	0.4	4
1.55"	4218M-03	1.20	45.0	3.0	4.2	0.27	0.6	6
39 mm	4218M-06	0.90	45.0	5.7	5.0	0.27	0.6	6
	4218M-10	0.70	45.0	9.5	12.0	0.27	0.6	6
	4218M-30	0.40	45.0	30.0	30.8	0.27	0.6	6
	4218M-01	1.70	62.0	1.5	2.6	0.27	0.6	4
1.85"	4218L-25	0.45	55.0	25.0	20.8	0.30	0.7	6
47 mm	4218L-01	2.00	75.0	1.2	2.0	0.30	0.7	4

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

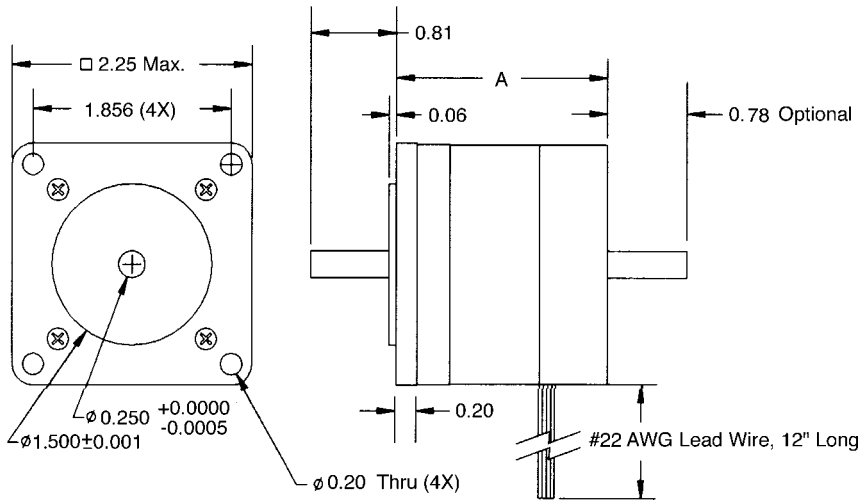


1.8º Size 23 Standard Motor

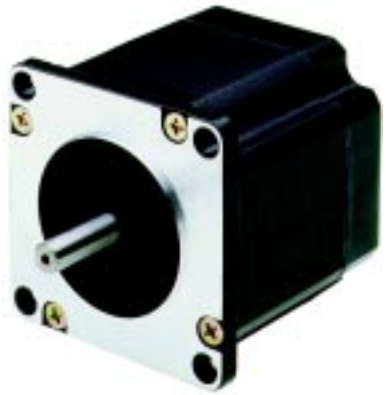
- NEMA Size 23 Mounting
- Wide Selection
- Cost Effective
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
1.55"	5618X-24	1.1	40.0	3.6	4.0	0.30	0.75	6
39 mm	5618X-07	0.4	40.0	30.0	30.0	0.30	0.75	6
2.00"	5618S-10	1.2	60.0	5.0	8.0	0.60	1.12	6
51 mm	5618S-05	0.4	60.0	29.0	36.0	0.60	1.12	6
	5618S-01	1.0	60.0	5.0	7.1	0.60	1.12	6
	5618S-42	3.8	60.0	0.3	0.5	0.60	1.12	6
2.25"	5618M-06	1.2	84.0	5.0	8.0	0.74	1.20	6
57 mm	5618M-01	0.6	84.0	20.0	30.0	0.74	1.20	6
3.03"	5618L-05	1.5	125.0	3.8	6.8	1.20	1.90	6
77 mm	5618L-23	0.6	125.0	17.1	30.0	1.20	1.90	6
4.03"	5618C-02	4.6	170.0	0.5	1.0	1.90	3.08	6
102 mm	5618C-03	1.8	170.0	3.5	7.3	1.90	3.08	6

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.



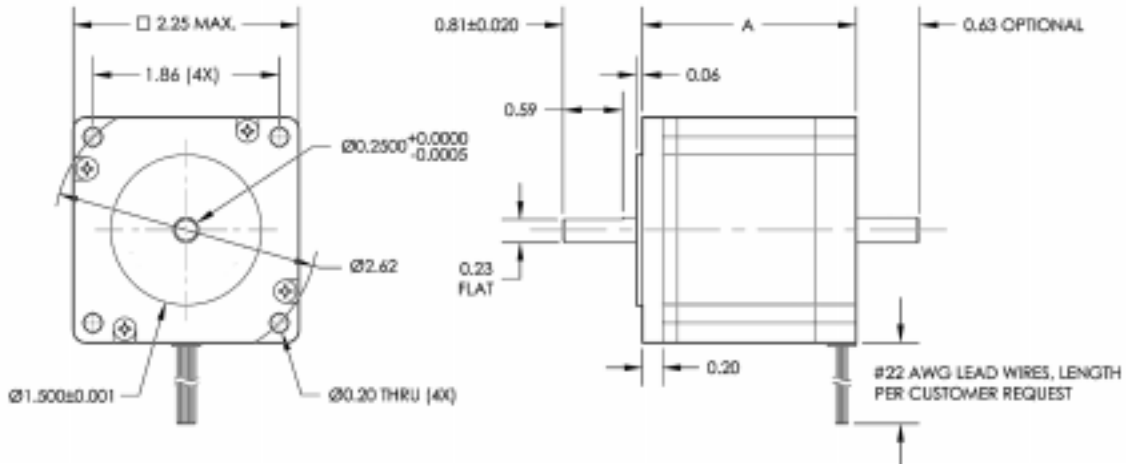
1.8º Size 23 High Torque Motor



- High Torque
- High Step Accuracy
- High Resolution
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in²	Weight lbs.	Number of Leads
1.73" 44 mm	5718X-05	1.0	72	5.0	7.0	0.7	1.05	6
	5718X-01	2.0	72	1.4	1.2	0.7	1.05	6
	5718X-15	3.0	72	0.6	0.6	0.7	1.05	6
2.17" 55 mm	5718M-04	1.0	130	7.4	10.0	1.5	1.50	6
	5718M-05	2.0	130	1.8	2.5	1.5	1.50	6
	5718M-02	3.0	130	0.75	1.1	1.5	1.50	6
3.1" 78.7 mm	5718L-01	2.0	210	2.25	3.6	2.6	2.20	6
	5718L-03	3.0	210	1.0	1.6	2.6	2.20	6
	5718L-04	4.67	210	0.54	1.57	2.6	2.20	6

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.

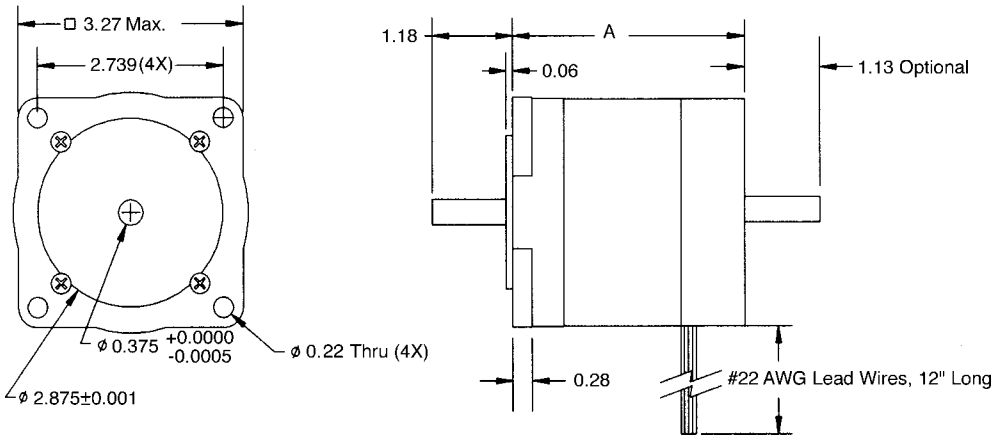


1.8º Size 34 Standard Motor

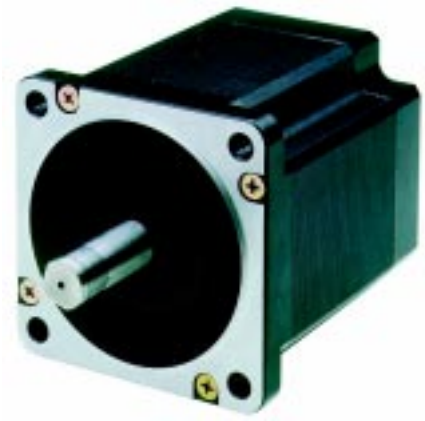
- NEMA Size 34 Mounting
- Wide Selection
- Cost Effective
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
2.50"	8618S-01	6.1	180	0.2	1.1	3.10	3.20	8
63.5 mm	8618S-02	4.5	180	0.4	1.4	3.10	3.20	8
	8618S-03	1.25	180	4.4	14.0	3.10	3.20	8
3.74"	8618M-11	6.0	350	0.3	0.8	6.02	5.78	8
95 mm	8618M-02	4.0	350	0.7	4.5	6.02	5.78	8
	8618M-03	2.0	350	3.0	17.0	6.02	5.78	8
5.07"	8618L-03	6.7	500	0.4	2.0	9.85	8.0	8
129 mm	8618L-02	4.0	500	1.25	6.6	9.85	8.0	8

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.



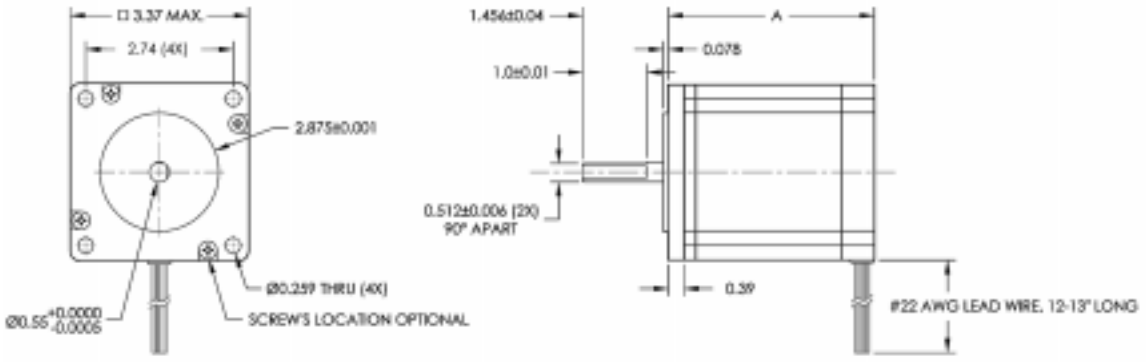
1.8º Size 34 High Torque Motor



- High Torque (<900 oz-in)
- High Step Accuracy
- High Resolution
- Additional Windings Available

Dimensions "A"	Model Number	Amps/ Phase	Torque oz-in	Resistance Ohm/Phase	Inductance mH/Phase	Inertia oz-in ²	Weight lbs.	Number of Leads
2.6"	8718S-01	2.0	310	2.2	7.7	7.66	3.85	8
66 mm	8718S-03	3.0	310	1.0	3.5	7.66	3.85	8
	8718S-05	4.5	310	0.48	1.5	7.66	3.85	8
3.77"	8718M-04	2.0	615	3.2	14	14.8	5.94	8
96 mm	8718M-06	3.0	615	1.5	6.0	14.8	5.94	8
	8718M-16	5.0	615	0.6	2.5	14.8	5.94	8
4.7"	8718L-02	2.0	920	3.8	19.2	21.9	8.44	8
126 mm	8718L-04	4.0	920	0.97	4.2	21.9	8.44	8
	8718L-08	5.0	920	0.85	5.0	21.9	8.44	8

Note: Please complete our application data sheet on page 31. 6 & 8 wire motors are reported as unipolar ratings. Power supply voltage can be any value as long as the driver output current is controlled at the rated current.



Permanent Magnet Motors

Available in a wide range of sizes and windings, Lin Engineering's PM step motors provide an economical solution to a variety of step motor applications.

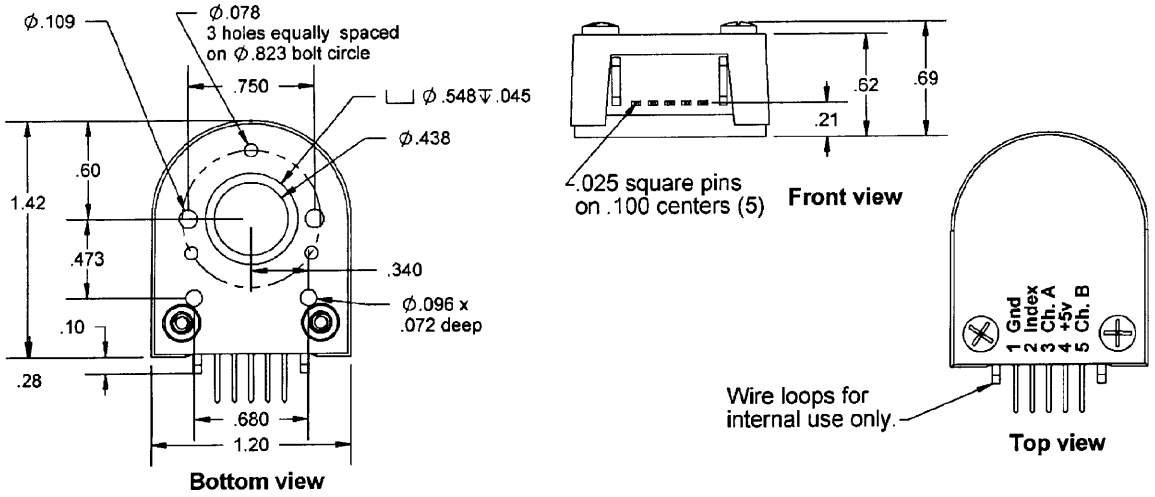
- A variety of motor windings are available, one of which will best suit your application
- Motors available in following diameters: 10, 15, 25, 35, and 42 mm
- Motors available in a range of body lengths, from 10 mm to 22.5 mm
- Available step angles: 3.75°, 7.5°, and 18°
- Holding torque up to 16 oz-in
- Complete, custom assembly options are available, including:
  - Installation of specified connectors
  - Custom shaft length
  - Rotation of wire exit location (up to 90°)
  - Custom lead length
  - Integrated componentry, such as optical switches
- **Please contact our sales department at sales@linengineering.com for assistance in choosing the right motor for your application**

Quick Assembly Optical Encoder

The quick assembly optical encoder is a non-contacting rotary to digital position feedback device designed to mount to an existing motor shaft. The internal monolithic electronic module converts the real-time shaft angle, speed, and direction into TTL-compatible outputs.

Simplicity & low cost make this product ideal for both high & low volume motion control applications. The encoder consists of four parts: base, cover, hub/code wheel, and encoder module.

The encoder module incorporates a lensed LED light source & monolithic photodetector array with signal shaping electronics to produce the two channel bounceless TTL outputs. The base & cover are made with a rugged 20% glass filled polycarbinate. Base options include transfer adhesive, bolt circle adapter plates, shoulder support & specific hole diameters. Cover options include extended & through shafts.



Description:

- Rugged Screw-together Housing
- Accepts ±.010" Axial Shaft Play
- Small Size
- Tracks from 0 to 100,000 Cycles/Sec.
- 50 to 1024 Cycles/Rev.
- 200 to 4096 Codes per Revolution (quadrature)
- 2 Channel Quadrature TTL Squarewave Outputs
- Optional index (3rd Channel)
- -40 to +100°C Operating Temperature
- Fits Shaft Diameters from .079" to .394" (2 mm to 10 mm)
- Single +5v Supply

Features:

- Moment of Inertia 8.0 x 10^{-6} oz-in-s^2
- Hub Set Screw Size 3-48
- Encoder Base Plate Thickness .135 Inches
- 3 Mounting Screw Size 0-80
- 2 Mounting Screw Size 2-56 or 4-40
- 3 Screw Bolt Circle Diameter .823 ±.005 Inches
- 2 Screw Bolt Circle Diameter.750 ±.005 Inches
- Required Shaft Length .445 Inches Minimum

Lin Engineering carries an extensive line of encoders and encoder accessories, including integrated differential line drivers, CPR up to 2048, and both standard and custom cables. Please contact us at sales@linengineering.com for more information.

MB15 Microstep Driver

- 1.5 Amps/Phase Output Current
- Selectable Step Options; Full, Half, Quarter, and Eighth Stepping
- Indicator LEDs; power on (Green LED) and Clocks Being Received Greater than 100 Hz (Yellow LED)
- Internal Thermal Shutdown
- Motor On/Off Input
- Dimensions: 4.65" x 3.75" x 0.875"

Specifications

Inputs (All)	Minimum sourcing of 5 mA (5 VDC Min. to 12 VDC Max.) applied to inputs. The clock input is set to receive negative edge clocks with a maximum frequency of 100 kHz.
Continuous Output Current	200 mA minimum to 1.5 A maximum (peak rating). If reduce current is enabled, the drive will automatically reduce motor current to 50% of setting after the last step pulse is received (20 msec delay).
Supply Voltage	12 - 48 VDC
Clock Frequency	0 - 100 kHz; minimum pulse width required is 3 microseconds.
Chopping Frequency	22kHz.
+5V DC (out)	The +5VDC output supply is generated by the input DC Supply Voltage (200 mA @ 48 VDC or 450 mA @ 24 VDC or 1000 mA @ 12 VDC).
Operating Temp.	0 - 70° C. It is recommended that the driver be mounted to an aluminum heat sink or other heat conducting surface.

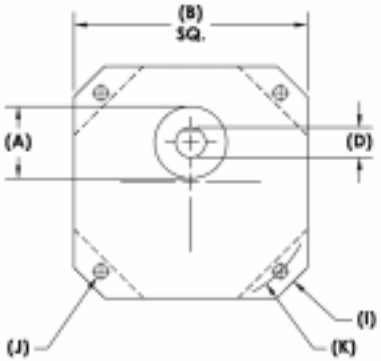
In addition to our own line of drives, Lin Engineering continues as a master distributor, carrying a wide variety of step motor drives and controls. Please contact us at sales@linengineering.com for more information.

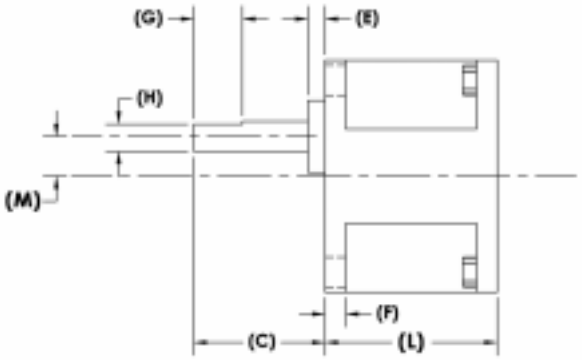
Offset Spur Gearheads

- Cost Effective, Light Duty Spur
- One Piece Cluster Gear
- Composite Bushings
- Gears are High Strength Steel and Precision Hobbed
- Output Shaft is Heat Treated Stainless Steel
- Output Shaft Modifications Available
- High Temperature, Molded Composite Housing
- NEMA Mounting Standards
- For Applications that do not Require the Power or Accuracy of Standard Spurs

5:1 / 10:1 / 18:1								
Part Number	A Pilot Diameter	B Square Flange	C Shaft Length	D Shaft Diameter	E Pilot Length	F Flange Thickness	G Flat Length	H Dimension Over Flat
17LD	.708/.710	1.65	0.79	.2495/.2500	0.12	0.19	0.470 (2X)	0.22 (2X)
23LD	.708/.710	2.25	1.26	.3120/.3125	0.20	0.19	0.500 (1X)	0.29 (1X)

Part Number	I Housing Diameter	J Bolt Hole Diameter	K Bolt Hole Circle	L Gearhead Length	M Offset Dimension
17LD	2.05	M3 x .5	1.725	0.98	0.31
23LD	3.05	0.205	2.250	1.67	0.39

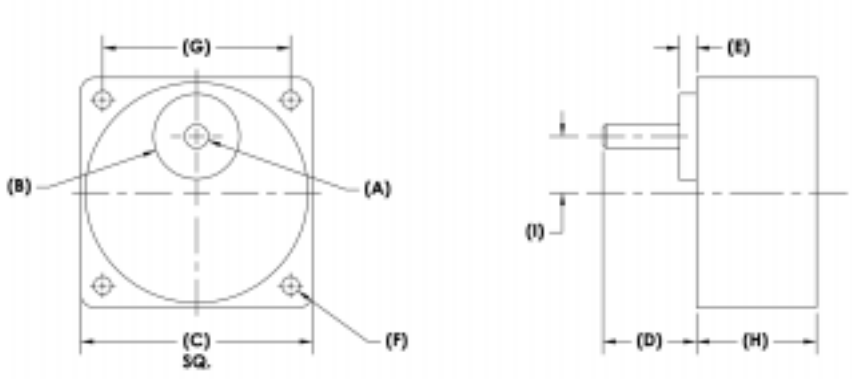




Heavy Duty Offset Spur Gearhead

- Very Cost Effective
- Sealed Ball Bearings
- Superior Design Over Competition
- Die Cast, Machined Aluminum Housing
- Heat Treated Gears and Output Shaft
- Custom Shaft Configurations Available
- NEMA Mounting Available
- Runs Quieter than Competition

Part Number	A Shaft Diameter	B Pilot Diameter	C Square Dimension	D Shaft Length	E Pilot Length	F Bolt Clearance Hole Diameter	G Center Distance	H Gear Head Length	I Offset Dimension
17 HP All Ratios	0.1969/0.1964	0.71	1.65	0.79	0.12	0.138	1.22	1.02	0.32
23 HP Ratios 3/1 to 18/1	0.2500/0.2494	0.94	2.36	1.06	0.12 Thru	Dia. 0.2	1.858	1.02	0.39
23 HP Ratios 25/1 to 180/1	0.2500/0.2494	0.94	2.36	1.06	0.12	Dia. 0.2	1.858	1.02	0.39
34 HP Ratios 3/1 to 18/1	0.3750/0.3744	1.325	3.16	1.24	0.12	Dia. 0.22 Thru	2.739 Apart	1.26	0.509
34 HP Ratios 25/1 to 180/1	0.3750/0.3744	1.325	3.16	1.24	0.12	Dia. 0.22 Thru	2.739 Apart	1.67	0.509



Planetary Gearheads

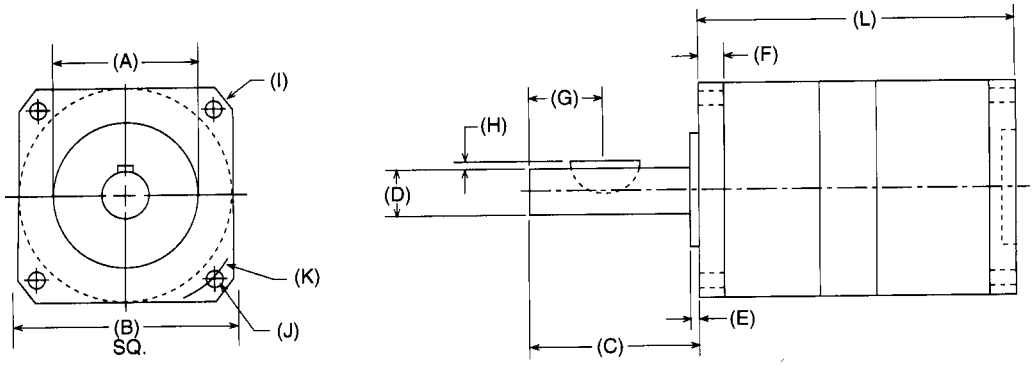
- True Planetary Design
- Sealed Ball Bearings
- High Reliability, High Efficiency Design
- Nema Mounting Standards
- Operation Temp -65°F to 250°F
- High Shaft Loading Capacity
- Gasket Sealed at Each Joint
- Low Backlash Design
- Strong Caged Roller Bearings
- High Strength Steel
- All Gears are Heat Treated
- Precision Input Pinion with Balanced Clamp Collar

Single Stage: 3:1 / 4:1 / 5.5:1 / 7:1 / 10:1

Double Stage: 18:1 / 22:1 / 28:1 / 40:1 / 48:1 / 55:1 / 70:1 / 100:1

Part Number	A Pilot Diameter	B Square Flange	C Shaft Length	D Shaft Diameter	E Pilot Length	F Flange Thickness	G Key Location	H Key Height
017PNX	0.868	1.65	1.25	.4995/.5000	0.062	0.187	0.562	0.063
023PNX	1.500	2.25	1.25	.4885/.5000	0.062	0.250	0.562	0.063
034PNX	2.875	3.25	1.50	.7495/.7500	0.062	0.375	0.562	0.094

Part Number	I Housing Diameter	J Bolt Hole Diameter	K Bolt Hole Circle	L Single Stage	L Double Stage	Key Width (Lbs.)	Radial Shaft Loading (Lbs.)	Axial Shaft Loading
017PNX	2.050	0.125	1.725	2.62	3.27	0.125	400	400
023PNX	2.950	0.205	2.625	3.11	4.02	0.125	400	400
034PNX	4.375	0.220	3.875	4.56	5.82	0.187	875	875



Operating Specifications

	Size 14	Size 17	Size 23	Size 34
Shaft Run Out (inches)	0.0005	0.0004	0.0002	0.0004
Radial Play (in/lbs) @1 lb	.0004 max @4.4 lb	0.022 max @13 lb	0.001 max @1 lb	0.0001 max
Perpendicularity	0.003	0.003	0.003	0.003
Concentricity (inches)	0.002	0.002	0.002	0.002
Operating Temp. Range	-20°C to 50°C	-20°C to 50°C	-20°C to 50°C	-20°C to 50°C
Insulation Class	130°C Class B	130°C Class B	130°C Class B	130°C Class B
Lead Wire Gauge	26 AWG	26 AWG	26 AWG	26 AWG

Operation and Usage Tips

- Do not disassemble motors; a significant reduction in motor performance will result.
- 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 the above will void all warranty terms.

Torque Conversion Chart

Known Value									
lb-ft x	lb-in x	oz-in x	dyne-cm X	N-m x	N-cm x	kg-m x	gr-cm x		Desired Value
1	0.08333	0.005208	7.376×10^{-8}	0.7376	0.007376	7.233	7.233×10^{-5}	= lb-ft	
12	1	0.0625	8.851×10^{-7}	8.8509	0.08851	86.796	0.000868	= lb-In	
192	16	1	1.416×10^{-5}	141.61	1.4161	1,389	0.01389	= oz-in	
1.356×10^{7}	1.1298×10^{6}	70,620	1	10^{7}	10^{5}	9.8067×10^{7}	980.67	= dyne-cm	
1.356	0.113	0.007062	10^{-7}	1	0.01	9.8066	9.8×10^{-5}	= N-m	
135.6	11.3	0.7062	10^{-5}	100	1	980.66	0.098	= N-cm	
0.1383	0.01152	7.201×10^{-4}	1.0197×10^{-8}	0.10197	0.001097	1	0.00001	kg-m	
13,830	1,152	72.01	1.0197×10^{-3}	11,019.7	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) mulitply (x) by conversion factor (1,389) to convert to oz-in. The same method applies to the inertia conversion chart.

Example

kg-m x	gr-cm x	
7.233	7.233×10^{-5}	= lb-ft
86.796	0.000868	= lb-in
1,389	0.01389	**= oz-in**

Inertia Conversion Chart

Known Value										
$lb\text{-}ft^2$ x	$lb\text{-}in^2$ x	$lb\text{-}ft\text{-}sec^2$ x	$lb\text{-}in\text{-}sec^2$ x	$oz\text{-}in^2$ x	$oz\text{-}in\text{-}sec^2$ x	$kg\text{-}m^2$ x	$kg\text{-}m\text{-}sec^2$ x	$gr\text{-}cm^2$ x	$gr\text{-}cm\text{-}sec^2$ x		Desired Value
1	0.006944	32.17	2.681	0.000434	0.1676	23.73	232.7	2.73×10^{-6}	0.002327	= lb-ft	
144	1	4,633	386.1	0.0625	24.13	3,417	33,510	3.417×10^{-4}	0.3351	= lb-in	
0.03108	0.0002158	1	0.08333	1.349×10^{-5}	0.005208	0.7376	7.233	7.376×10^{-8}	7.233×10^{-5}	$= lb\text{-}ft\text{-}sec^2$	
0.373	0.00259	12	1	0.0001619	0.0625	8.851	86.8	8.851×10^{-7}	0.000868	$= lb\text{-}in\text{-}sec^2$	
2,304	16	74,130	6,177	1	386.1	54,670	536,200	0.005467	5.362	$= oz\text{-}in^2$	
5.968	0.04144	192	16	0.00259	1	141.6	1,389	1.416×10^{-5}	0.01389	$= oz\text{-}in\text{-}sec^2$	
0.04214	0.0002926	1.356	0.113	1.829×10^{-5}	0.007062	1	9.807	10^{-7}	9.807×10^{-5}	$= kg\text{-}m^2$	
0.004297	2.984×10^{-5}	0.1383	0.01152	1.865×10^{-6}	0.0007201	0.102	1	1.02×10^{-8}	10^{-5}	$= kg\text{-}m\text{-}sec^2$	
421,400	2,926	1.356	1,130,000	182.9	70,620	10^{7}	9.807×10^{7}	1	9.807	$= gr\text{-}cm^2$	
429.7	2.984	1.383×10^{-4}	1,152	0.1865	72.01	10,200	100,000	0.00102	1	$= gr\text{-}cm\text{-}sec^2$	

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E-mail: sales@linengineering.com • www.linengineering.com

Wiring Connections

Bipolar and Unipolar Operation

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.

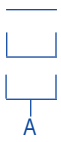
1. Determine how many lead wires your motor has - 4, 6, or 8 wires. Locate the proper box below.

2. Next, examine the color 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 Code1, Code 2, or Code 3. For example, if you have a 4 wire motor 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 terminals on your drive will be labeled A, $\overline{A}$, B, $\overline{B}$. For example, if using the above 4 wire motor with color Code 1, the Red wire would be connected to A, Blue connected to $\overline{A}$, Green connected to B, and Black connected to $\overline{B}$.

If you have a Unipolar drive, the terminals 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 drive.

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 driver.

4-Lead Wires

Code 1	Red	Blue	Green	Black
Code 2	Brown	Orange	Red	Yellow
Code 3	Red	Red / White	Green	Green / White
Bipolar Drive	A	$\overline{A}$	B	$\overline{B}$

6-Lead Wires

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**	A	$\overline{A}$	——	B	$\overline{B}$	——
	Connection	——	$\overline{A}$	A	——	$\overline{B}$	B
	Series Connection	A	——	$\overline{A}$	B	——	$\overline{B}$
Unipolar Drive		A	A/C Comm	C	B	B/D Comm	D

8-Lead Wires

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	**Parrallel Connection**	A		$\overline{A}$		B		$\overline{B}$	
	Series Connection	A			$\overline{A}$	B			$\overline{B}$
Unipolar Drive		A	A/C Comm		C	B	B/D Comm		D

Lin Engineering
Step Motor Application Data Sheet

Company Name: _____ Contact: _____

Address: _____

Phone: _____ Fax: _____

e-mail: _____

Please describe your application, potential quantity, and target price

_____

_____

_____

_____

(Information in bold is required)

Motor Operating Speed: _____ **RPS**

_____ **PPS**

☐ Full Step
☐ Half-Step
☐ Micro-Step _____

Max. Voltage Available: _____ ☐ **Unipolar Driver** ☐ **Bipolar Driver**

☐ **Other Type** _____

Max. Current Available: _____

Step Angle: _____ deg. Max. Holding Torque Required : _____

Motor Frame Size: ☐ NEMA 17
☐ NEMA 23
☐ NEMA 34
☐ Other _____

Maximum Motor Length: _____

Pullout Torque Required at Operating Speed: _____ ☐ oz-in ☐ gm-cm

Type of Coupling: ☐ Direct ☐ Gear Ratio: _____

☐ Belt Ratio: _____ ☐ Other Ratio: _____

Reasons for New Supplier: ☐ New Application ☐ Quality ☐ Performance
☐ Delivery ☐ Price

Please describe any other critical motor specifications:

_____

_____

_____

Photocopy and fax to (408) 919-0201

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E-mail: sales@linengineering.com • www.linengineering.com

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