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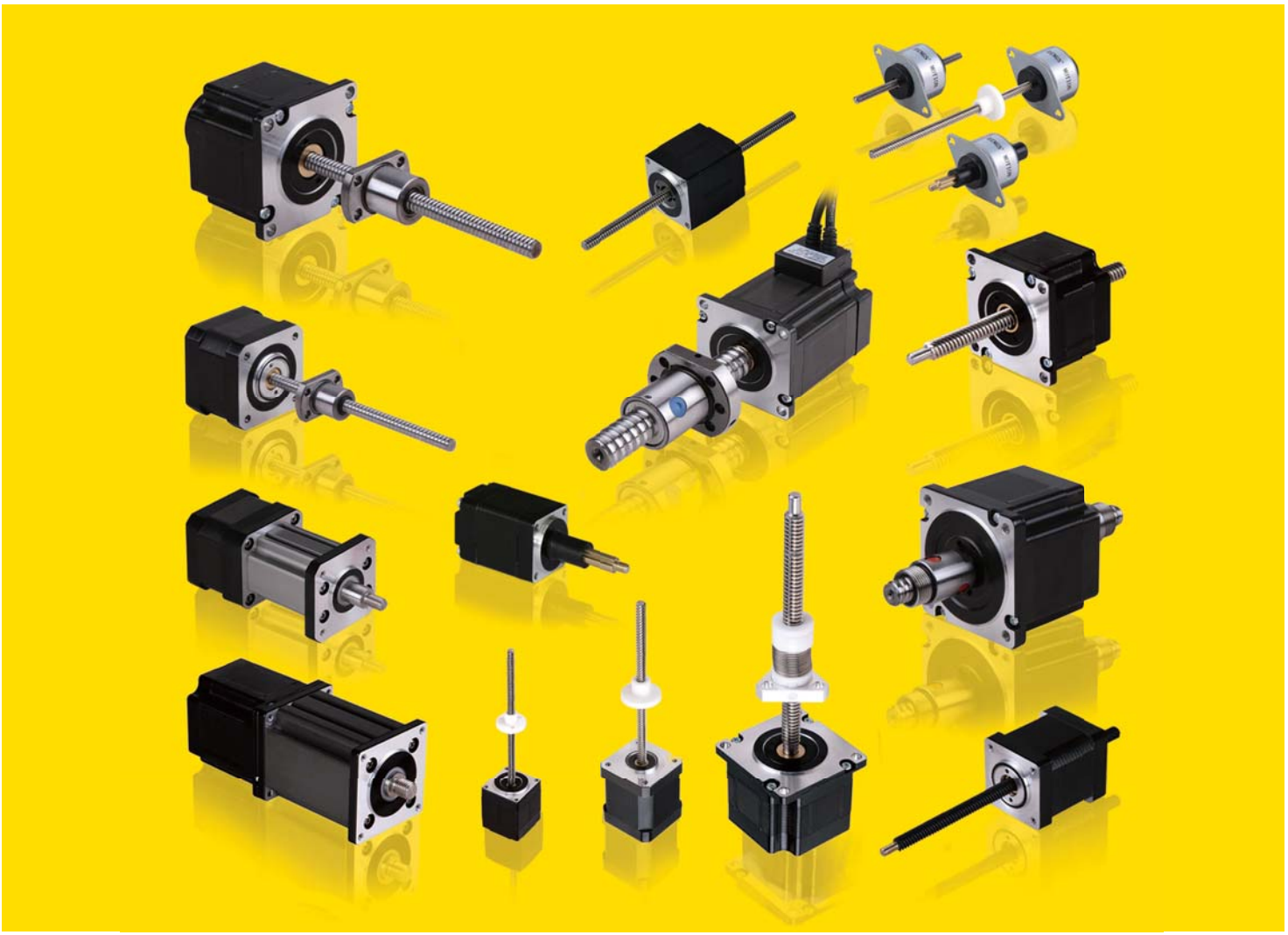
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# Ezi-LinearStep®

## Precision Hybrid Stepper Linear Actuators

- Durable Compact Linear Actuator
- Precision Hybrid Stepper Motor Drive
- High Precision Positioning (0.001mm/Step)
- High Speed Linear Motion (Max. 300mm/s)
- Max. Thrust Force (2000N)



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DINGS

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# System Overview

## Hybrid Stepper Linear Actuator Overview

| NEMA Size | Available Versions | Motor Length & Available Currents(Voltage) | Max. Thrust | Recommended Load Limit *1 | Screw Lead Range |
|---|---|---|---|---|---|
| 1.8 Degree NEMA8 Stepper |  | Single Stack(27mm): 0.5A(2.5V) | 78N (17.5lbs) | 43N (9.7lbs) | 0.012″- 0.315″ (0.30mm - 8.00mm) |
| | | Double Stack(38mm): 0.5A(4.4V) | 84N (18.9lbs) | | |
| 1.8 Degree NEMA11 Stepper |  | Single Stack(34mm): 0.5A(4.5V), 1.0A(2.2V) | 230N (51lbs) | 150N (34lbs) | 0.025″- 0.400″ (0.635mm - 10.16mm) |
| | | Double Stack(45mm): 0.95A(3.9V) | 340N (76lbs) | | |
| 1.8 Degree NEMA14 Stepper |  | Single Stack(34mm): 0.5A(6.6V), 1.0A(3.3V), 1.5A(2.2V) | 450N (100lbs) | 230N (52lbs) | 0.024″- 0.500″ (0.6096mm - 12.7mm) |
| | | Double Stack(46mm): 0.5A(12.0V), 1.0A(6.0V), 1.5A(4.0V) | 610N (135lbs) | | |
| 1.8 Degree NEMA17 Stepper |  | Single Stack(34mm): 0.5A(7.2V), 1.0A(3.6V), 1.5A(2.4V) | 710N (160lbs) | 230N (52lbs) | 0.024″- 0.500″ (0.6096mm - 12.7mm) |
| | | Double Stack(48mm): 0.5A(11.0V), 1.2A(4.5V), 2.5A(2.2V) | 900N (200lbs) | | |
| 1.8 Degree NEMA23 Stepper |  | Single Stack(45mm): 1.0A(6.4V), 2.0A(3.2V), 3.0A(2.1V) | 1400N (315lbs) | 920N (210lbs) | 0.025″- 1.000″ (0.635mm - 25.4mm) |
| | | Double Stack(65mm): 1.0A(10.8V), 2.5A(4.2V), 4.0A(2.4V) | 1800N (405lbs) | | |
| 1.8 Degree NEMA34 Stepper |  | Single Stack(76mm): 1.3A(12.0V), 3.0A(5.1V), 5.5A(2.85V) | 2400N (540lbs) | 2160N (485lbs) | 0.100″- 1.000″ (2.54mm - 24.4mm) |

*1 : These are nominal load limits. Operating above these limits may decrease useful life of the system.



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# Technology Overview

One of the most common methods of moving a load from point A to point B is through linear translation of a motor by a mechanical lead screw and nut. This section is here to ass ist and refresh your understanding of the basic principles of lead screw technology prior to selecting the system t hat is best for your application. Please also reference the Glossary(page 85 of the catalog) to support your understanding.

### Some basic design considerations are as follows :

1. What is the load of your system?
2. what is the required speed to go from point A to point B?
3. What is the distance you need to travel?
4. What is the required time to move from point A to point B?
5. What accuracy does your application require?
6. What repeatability does your application require?
7. Horizontal vs vertical orientation?

# An Explanation of the Basics

### 1. Leads vs Pitch

Pitch is the axial distance between threads. Pitch is equal to lead in a single start screw. Unless otherwise noted, all lead screws in this catalogue are single start. Lead is the axial distance the nut advances on one revolution of the screw. Throughout this catalog, lead will be the term used for specifying a screw as it is the linear distance travelled for one revolution of the screw. The larger the lead, the more linear distance travelled per one revolution of the screw.

### 2. Load

Typically quanti fied as either lbs or Kg to move or pounds force(lbsF) or kgf for thrust.

### 3. Velocity(V)

Typically quanti fied as either inches/second(mm/sec) required for your application.

### 4. Distance

Typically quanti fied as either inches or mm, is the required move distance.

### 5. Time(t)

Typically quanti fied in seconds. Time period required for a given distance defines the velocity, acceleration(A), and deceleration needed to reach commanded position.

### 6. Horizontal or Vertical Application

Vertical orientation applications add the potential problem of backdriving when power to the motor is off and without an installed brake. Vertical applications also have an additional gravity factor that must be part of the load/force calculation.

### 7. Accuracy of Screw

Specified as a measurement over a given length of the screw.
For example: 0.0006 in per inch. Lead accuracy is the difference between the actual distance travelled versus the theoretical distance travelled based on the lead. For example: A screw with a 0.5 inch lead and 0.004 inch per foot lead accuracy rotated 24 times theoretically moves the nut 12 inches. However, with a lead accuracy of 0.004 inch per foot, actual travel could be from 11.996 to 12.004 inches.

### 8. Total Indicated Runout

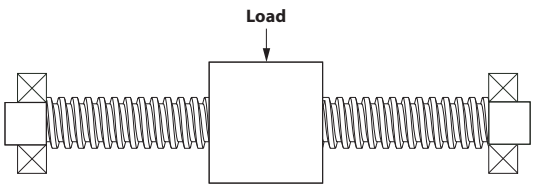
The amount of wobble around the centerline of the screw.

### 9. Repeatability

Most motion applications put the most significance on the repeatability(vs accuracy of screw) of a system to reach the same commanded position over and over again. For example: A repeatability of ± 0.005 inch means that after repeated commands to reach the same target position, the linear error will be no more than ± 0.005 inch.

### 10. Radial Load

A load perpendicular to the screw. This is not recommended unless additional mechanical support such as a linear guide is used.screw in tension utilizes the axial strength of the screw versus column loading.



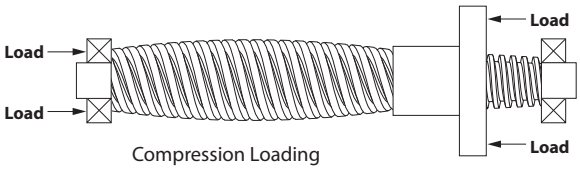

Radial Loading(Avoid Minimize)



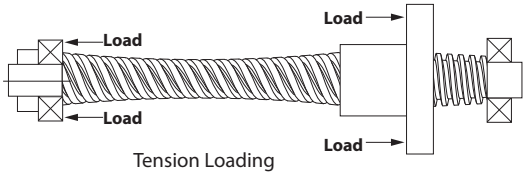
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## 11. Tension or Compression Loading

A load that tends to stretch the screw is called a tension load. A load that tends to squeeze or compress the screw is called a compression load. Depending on the size of the load, designing the screw in tension utilizes the axial strength of the screw versus column loading.



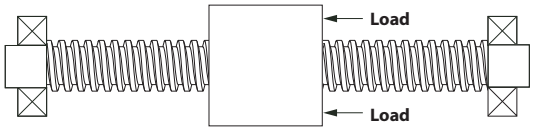

Compression Loading




Tension Loading

## 12. Axial Load

A load that exerted at the center line of the lead screw.




Axial Center Loading(best)

## 13. Static Load

The maximum thrust load, including shock load, that should be applied to a non-moving screw.

## 14. Dynamic Load

The maximum recommended thrust load which should be applied to the screw while in motion.

## 15. Backdriving

Backdriving is the result of the load pushing axially on the screw or nut to create rotary motion. Generally, a nut with an effi ciency greater than 50% will have a tendency to backdrive. Selecting a lead screw with an efficiency below 35% may prevent backdriving. The smaller lead, the less chance for backdriving or free wheeling. Vertical application are more prone to backdriving due to gravity.

## 16. Torque

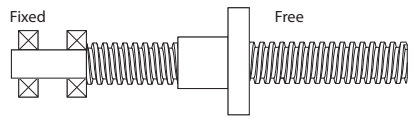
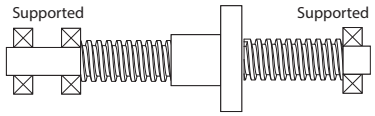
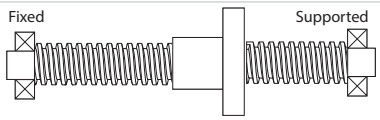
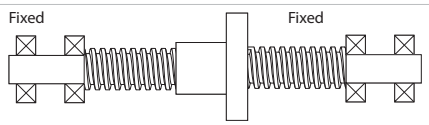
The required motor torque to drive just the lead screw assembly is the total of:

1. Inertial Torque
2. Drag Torque
3. Torque to move load

Drag Torque = Friction of the nut and screw in motion

## 18. Fixity

The performance(speed and effi ciency) of the screw system is affected by how the screw ends are attached and supported.

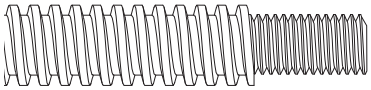
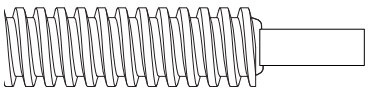
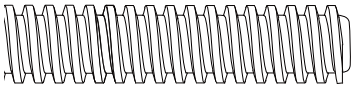
| Type of End Fixity | Relative Rigidity | Critical Speed Factor | Critical Load Factor |
|---|---|---|---|
|   | Less Rigid | 32 | 25 |
|   | Rigid | 1.00 | 1.00 |
|   | More Rigid | 1.55 | 2.00 |
|   | Most Rigid | 2.24 | 4.00 |



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## 19. End Machining of the Screw

Standard metric or English options are available. Custom end machining specifi cations are also available on request.

| | | | |
|---|---|---|---|
|  | Threaded End | Please refer to individual NEMA Size section for standard options.<br><br>Custom machined ends are also available. | **Example:**<br>UNC End : #8-32 UNC Thread<br>Metric End :<br>M4 x 0.7mm thread |
|  | Smooth end | | **Example:**<br>Ø 0.1967″ ±0.001<br>Ø 5 mm ±0.025 |
|  | None | | - |

## 20. Column Strength

When a screw is loaded in compression its limit of elastic stability can be exeeded and the screw will fail through bending or buckling.

## 21. Critical Speed

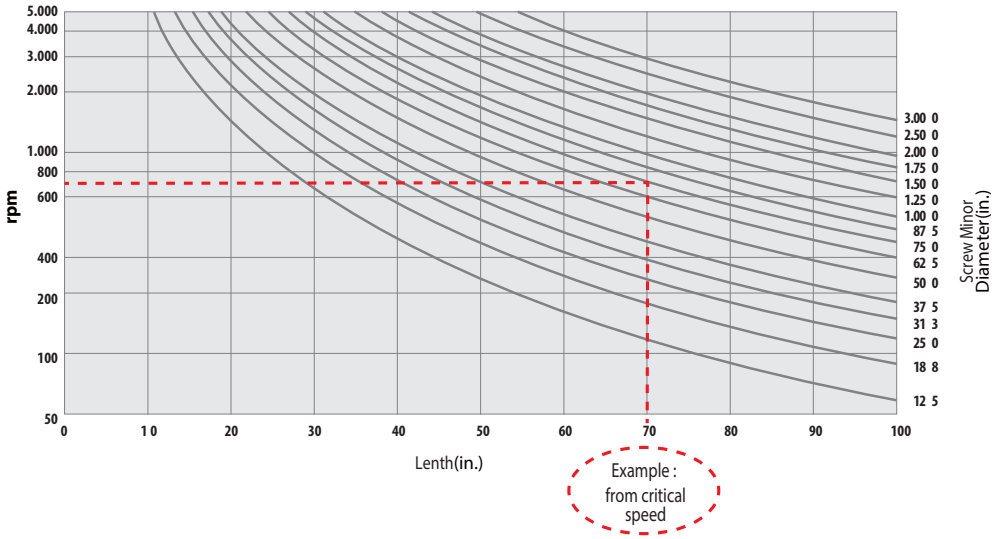
Critical speed is the rotational speed of the screw at which the first harmonic of resonance is reached due to defection of the screw.
A system will vibrate and become unstable at these speeds.

**Several variables affect the speed at which a system will reach critical speed:**

1. The lead of the screw
2. The rotational speed
3. End fixity
4. The thrust load
5. Diameter of the screw
6. Tension or compression loading

For example, the following chart shows that for a screw with a 3/4 inch diameter and 70 inch length, the threshold for critical speed is 700[rpm]

**Critical Rotation Speed[rpm] VS. Unsupported Screw Length for Various Screw Diameters(IN.)**

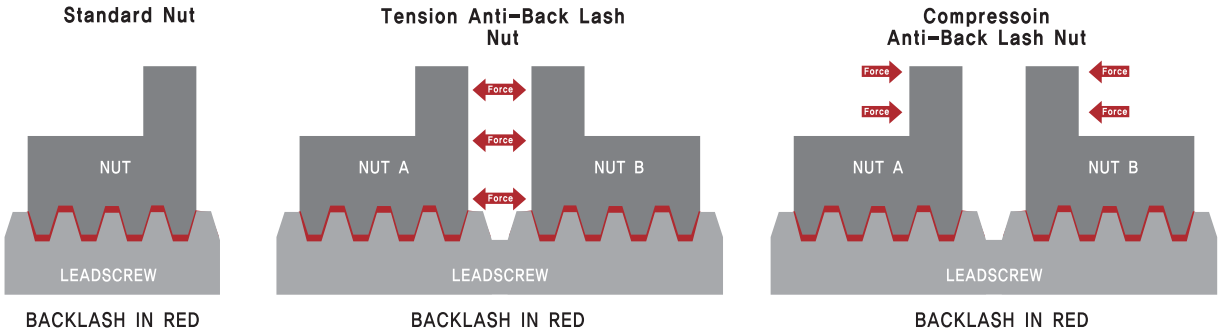





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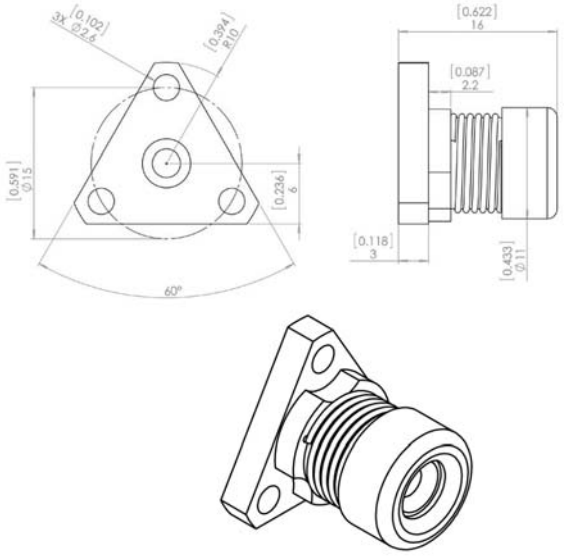
## 22. Backlash

Backlash is the relative axial movement between a screw an nut at standstill. It is normal for backlash to increase with wear over time. Blacklash compensation or correction can be accomplished through the application of an anti-backlash nut. Backlash is usually only concern with bi-directional positioning.

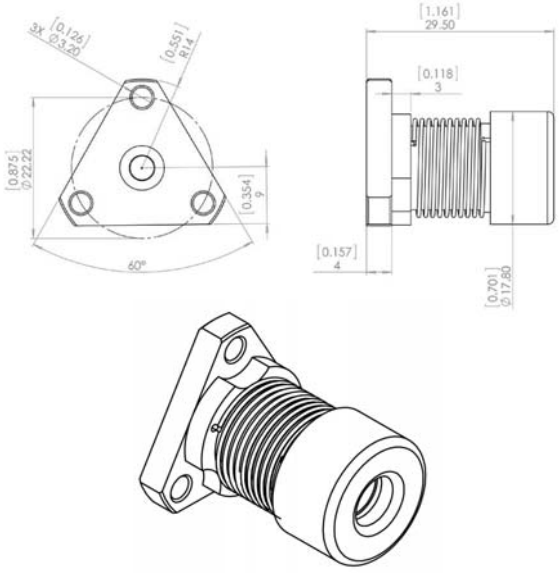



### Anti-backlash Nuts Available upon Request

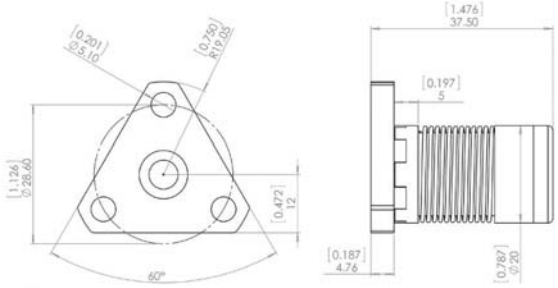
1. NEMA SIZE 8 and NEMA SIZE 11 Anti-Backlash Nut

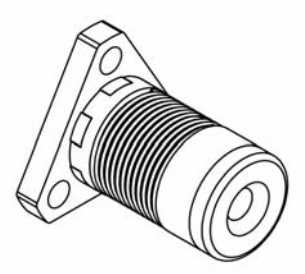


2. NEMA SIZE 14 and NEMA SIZE 17 Anti-Backlash Nut



3. NEMA SIZE 23 Anti-Backlash Nut





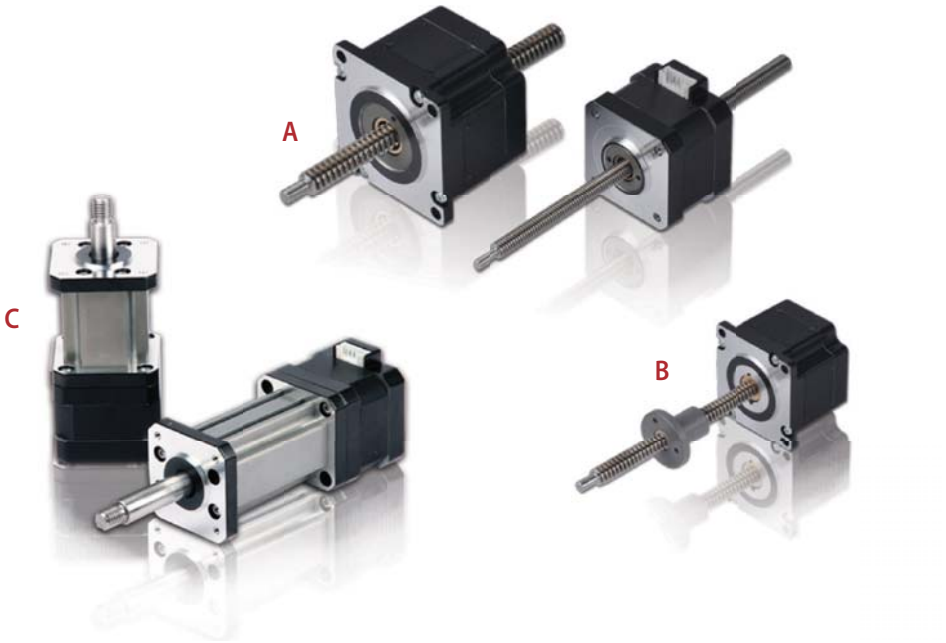


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# Product Selection Standard

## Linear Motion System Types

A. Non-Captive
B. External Linear
C. Captive




### Why choose one form factor over the other?

1. What is the best mechanical fit for your application?
2. How do you plan to attach the screw?
3. Is rotation of the screw acceptable?
4. Does your application require an encoder or brake?
5. What is the stroke of your application?

### What environmental considerations do you have?

Fastech linear motion systems are designed to operate in dry and non-corrosive environments. Standard products do not have an IP rating. Operating non-IP rated linear systems in dirty or corrosive environments will signifi cantly reduce product life.

### Temperature

Very high or low temperatures may cause significant changes in the nut fit or drag torque.

### Maximum dynamic load

Each Nema frame size motor has a mechanical load maximum that should not be exeeded. See Speed / Torque curves for the individual frame sizes.

### Motor Selection

In order to select the right motor combination with the lead screw several factors should be considered:

1. How much torque is required?
2. What is the desired step angle?
3. Detend or holding torque requirements?
4. Physical size restrictions?
5. What type of drive(amplifier) are you using?



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# Product Selection Guide

To reduce complexity and cost of a design, it is important to accurately size a motor / lead screw combination. Below are a few simple steps in selecting the necessary components for a given application.

### Step1 - Choosing a motor NEMA size(Force requirements)

Here is a general overview of the output thrust vs. NEMA size:

| NEMA Sizes | Max. Thrust | Recommended Load Limit |
|---|---|---|
| NEMA 8 | 78N(17.5lbs) | 43N(9.7lbs) |
| NEMA 11 | 230N(51lbs) | 150N(34lbs) |
| NEMA 14 | 450N(100lbs) | 230N(52lbs) |
| NEMA 17 | 710N(160lbs) | 230N(52lbs) |
| NEMA 23 | 1400N(315lbs) | 920N(210lbs) |
| NEMA 34 | 2400N(540lbs) | 2160N(485lbs) |

※ As the NEMA size of the motor is increased, the output thrust of the actuator is consequently increased.

### Step2 - Choosing a screw lead(Force and Speed requirements)

After estimating the required thrust and choosing a NEMA size that may fi t your application, the speed and acceleration of the load must be considered and evaluated to choose an appropriate screw lead.

Due to the nature of lead screws, the output speed and output thrust achievable by a motor/lead screw combination are two inversely proportional variables(i.e., increasing the required thrust will lower the achievable speed for a motor/lead screw combination). Therefore, the maximum output force of a system is lowered for applications that require higher speeds.

For complete motor/lead screw selection data, please refer to the speed/thrust curves for each NEMA size.

### Step3 - Lead Screw Material

There are many inter-related variables to consider when selecting the right linear motion system for your application. Your load and speed requirements will determine other variables such as the size of motor, the lead of the screw and ultimately the voltage and current requirements of your electronic motor drive. Depending on your application, trade-offs can be made with many variables as your finalize the system that will meet your performance, form factor and cost specifications.

**Selection**

Quantify these basic variables first : 1. Load that you need to move(or push – Thrust)

2. Velocity
3. Distance to travel(Stroke)
4. Time required to move from point A to point B(Acceleration required)
5. Torque requirements of your entire system
6. How much backlash is acceptable in your system?
7. What is the required positional repeatability?
8. Is this a Vertical or Horizontal orientation?

Using the Product Selection System along with the associated Nema motor frame size pages in the next sections, you will then be able to drill down to specific c part numbers for both the lead screw and the associated step motor. The linear system is ordered as two part numbers.

※ Note : A linear ststem must be ordered as two part numbers.



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# Basic Specifications for FASTECH Linear Systems

Unless otherwise noted, all reference to lead screws in this catalog have the following characteristics:

| | |
|---|---|
| **Lead Screw Material** | 303 Stainless precision cold rolled steel |
| **Screw Coating** | Tefion coating is optional |
| **Standard screw accuracy**(Lead accuracy) | 0.0006 in/inch |
| **Screw repeatability** | ±0.006 inch |
| **System repeatability**(Motor and Screw) | Nominally the same as screw repeatability, motor variance adds ±6 micro steps. |
| **Screw straightness** | .003 in/fit, measured as Total Indicated Runout(TIR)<br>All screws are carefully checked for straightness before shipment. |
| **Screw Efficiency** | From 35% to 85% dependent on lead Also depends on the usage of an anti-backlash nut with screw.<br>The larger the lead, the higher the efficiency of the screw. |
| **Operating temperature** | 0˚ ~ 93˚C(32˚F ~ 200˚F) |
| **Screw backlash** | Depends on lead(nominally ±0.005 in) |
| **System backlash** | Includes screw, motor and attached mechanics.<br>This will be the sum of all the backlash in your motion axis. |
| **Nut Material** | Polyacetal with lubricating additive Standard is a free-wheeling nut.[Anti-backlash version is available] |
| **Wear life of screw and nut** | Depends on load, speed, duty cycle and environmental factors(typically> 5 million cycles) |

※ Note : Fastech linear systems are manufactured from high quality materials.
Because of the variable effects of friction, lubrication and cleanliness, an exact life cannot be predicted for a given application.



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# Product Selection System

**17 N 2 1 15 K 4 - 101.6 T M S**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

### ① NEMA Size

| NEMA Code | 8 | 11 | 14 | 17 | 23 | 34 |
|---|---|---|---|---|---|---|
| Motor Size(mm) | 20 | 28 | 35 | 42 | 57 | 86 |

### ② Lead Screw Shaft Style

N = Non-Captive Linear
E = External Linear
C = Captive Linear

### ③ Step Angle

2 = 2 Phase with 1.8°
4 = 2 Phase with 0.9°
3 = 3 Phase with 1.2°
5 = 5 Phase with 0.72°

### ④ Motor Length / Stack

1 = Single Stack
2 = Double Stack

### ⑤ Rated Current/Phase

XX = X.X(A)/Phase

### ⑥ Lead Screw Code

A-Z, AA, AF

### ⑦ Number of Lead Wires

4 = Qty 4 Flying Leads
6 = Qty 6 Flying Leads
8 = Qty 8 Flying Leads

### ⑧ Lead Screw Length/Stroke

XXX = XXX mm Lead Length(For External Linear/Non-Captive Linear)
XXX = X.XX inch Stroke(For Captive Linear)

※ Please define the length of lead screw for Captive Linear Type as inch. And the length of lead screw of Captive Linear is standardized so please refer to specification in detail.(Example : Please refer to Page 718 to check specifications of Captive Linear Screw Lenght of 35mm motor)

### ⑨ Lead Screw Surface

T = Teflon Coating
S = Standard(No Teflon Coating)

### ⑩ End Machining

M = Metric
U = UNC
S = Smooth
N = None

### ⑪ Nut Style

S = Standard Flange Nut
A = Anti-backlash Nut



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# Motor Lead Screw Code Structure

| Lead Code | 1.8° Motor Step Length | Motor Size | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Size 8 | Size 11 | Size 14 | Size 17 | | Size 23 | | Size 34 |
| | | Screw Diameter | | | | | | | |
| | | 3.5 (0.138″) | 4.775 (0.188″) | 5.56 (0.218″) | 6.35 (0.25″) | 6.35 (0.25″) | 8 (0.315″) | 9.525 (0.375″) | 15.875 (0.625″) |
| AF | 0.0015 (0.00006″) | 0.30 (0.012″) | | | | | | | |
| AA | 0.003048 (0.00012″) | 0.6096 (0.024″) | | | 0.6096 (0.024″) | 0.6096 (0.024″) | | | |
| A | 0.003175 (0.000125″) | | 0.635 (0.025″) | | | | | 0.635 (0.025″) | |
| AD | | | | | 1 (0.039″) | 1 (0.039″) | | | |
| B | 0.006096 (0.00024″) | 1.2192 (0.048″) | | | 1.2192 (0.048″) | 1.2192 (0.048″) | | | |
| D | 0.00635 (0.00025″) | | 1.27 (0.05″) | | 1.27 (0.05″) | 1.27 (0.05″) | | 1.27 (0.05″) | |
| F | 0.0079375 (0.0003125″) | | | | 1.5875 (0.0625″) | 1.5875 (0.0625″) | | 1.5875 (0.0625″) | |
| G | 0.01 (0.000395″) | 2.0 (0.079″) | | | | | 2.0 (0.079″) | | |
| H | 0.010541 (0.000415″) | | | | | | | 2.1082 (0.083″) | |
| J | 0.012192 (0.00048″) | | | | 2.4384 (0.096″) | 2.4384 (0.096″) | | | |
| K | 0.0127 (0.0005″) | | 2.54 (0.1″) | | 2.54 (0.1″) | 2.54 (0.1″) | | 2.54 (0.1″) | 2.54 (0.1″) |
| L | 0.015875 (0.000625″) | | | | | | | 3.175 (0.125″) | 3.175 (0.125″) |
| M | 0.02 (0.00079″) | 4.0 (0.158″) | | | | | 4.0 (0.158″) | | |
| P | 0.021209 (0.000835″) | | | | | | | 4.2418 (0.167″) | |
| Q | 0.024384 (0.00096″) | | | | 4.8768 (0.192″) | 4.8768 (0.192″) | | | |
| AQ | | | | 4.8768 (0.192″) | | | | | |
| R | 0.0254 (0.001″) | | 5.08 (0.2″) | | | | | 5.08 (0.2″) | 5.08 (0.2″) |
| S | 0.03175 (0.00125″) | | | | 6.35 (0.25″) | 6.35 (0.25″) | | 6.35 (0.25″) | 6.35 (0.25″) |
| T | 0.04 (0.001575″) | 8.0 (0.315″) | | | | | 8.0 (0.315″) | | |
| U | 0.042291 (0.001665″) | | | | 8.382 (0.33″) | 8.382 (0.33″) | | | |
| V | 0.047625 (0.001875″) | | | | | | | 9.525 (0.375″) | |
| W | 0.048768 (0.00192″) | | | | 9.7536 (0.384″) | 9.7536 (0.384″) | | 9.7536 (0.384″) | |
| X | 0.0508 (0.002″) | | 10.16 (0.4″) | | | | | 10.16 (0.4″) | |
| Y | 0.0635 (0.0025″) | | | | 12.7 (0.5″) | 12.7 (0.5″) | | 12.7 (0.5″) | 12.7 (0.5″) |
| Z | 0.127 (0.005″) | | | | | | | 25.4 (1.0″) | 25.4 (1.0″) |



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# Motor Size(20mm)

## NEMA Size 8(20mm)
## Hybrid Motor Linear Actuators

The NEMA 8 is our smallest hybrid linear actuator. This compact unit can be integrated into various applications to provide precise linear positioning while occupying less than 1 in2 of mounting footprint and providing up to 10lbsF(44.5N) of continuous thrust. Ball Screw versions are also available.



### 1. Parameters

Please contact FASTECH or your local FASTECH representative about custom products.

| Motor | Voltage (V) | Current (A) | Resistance (Ω) | Inductance (mH) | Lead Wire No. | Motor Length (mm) |
|---|---|---|---|---|---|---|
| 8-2105 | 2.5 | 0.5 | 5.0 | 1.2 | 4 | 27 |
| 8-2205 | 4.4 | 0.5 | 8.8 | 2.7 | 4 | 38 |

### 2. Available Lead Screws and Travel per Step

Please contact FASTECH or your local FASTECH representative about custom products.

| Screw Dia. (in.) | Screw Dia. (mm) | Lead (in.) | Lead (mm) | Lead Code | Travel Per Step @ 1.8 deg(mm)* |
|---|---|---|---|---|---|
| 0.138 | 3.5052 | 0.012 | 0.30 | AF | 0.0015 |
| 0.138 | 3.5052 | 0.024 | 0.6096 | AA | 0.003 |
| 0.138 | 3.5052 | 0.048 | 1.2192 | B | 0.0061 |
| 0.138 | 3.5052 | 0.079 | 2.0 | G | 0.01 |
| 0.138 | 3.5052 | 0.158 | 4.0 | M | 0.02 |
| 0.138 | 3.5052 | 0.315 | 8.0 | T | 0.04 |

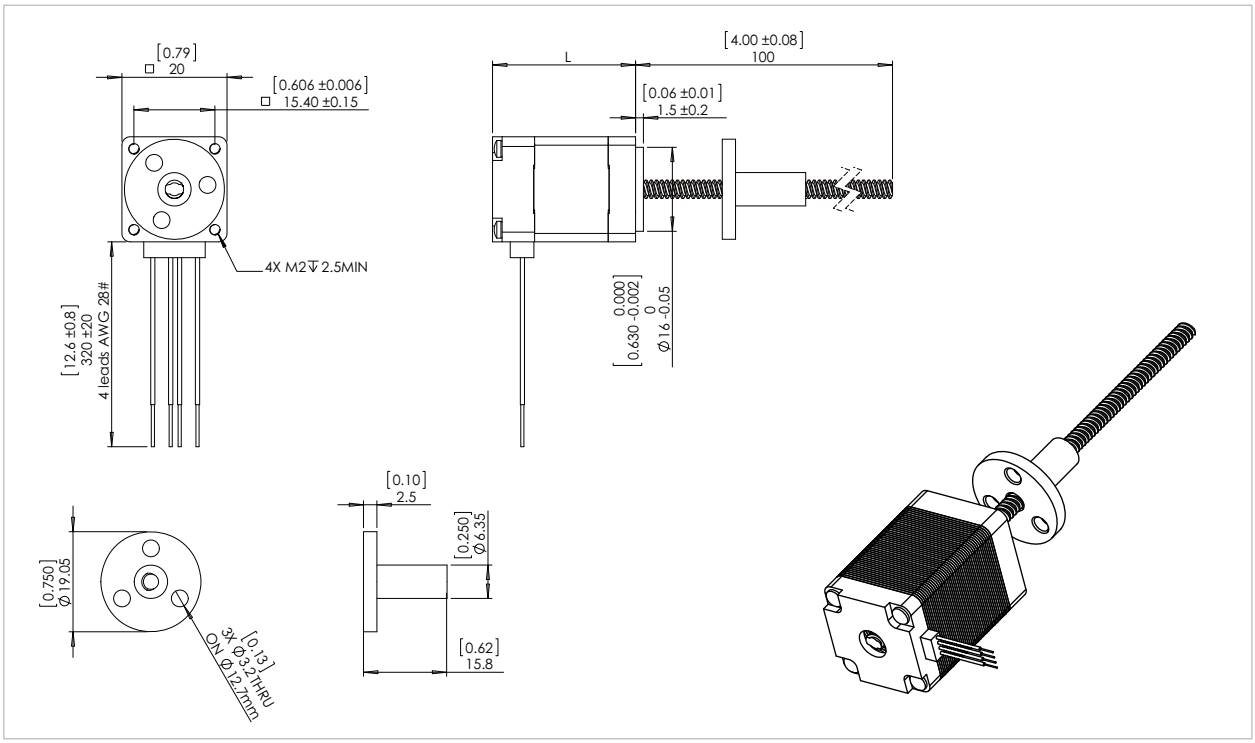
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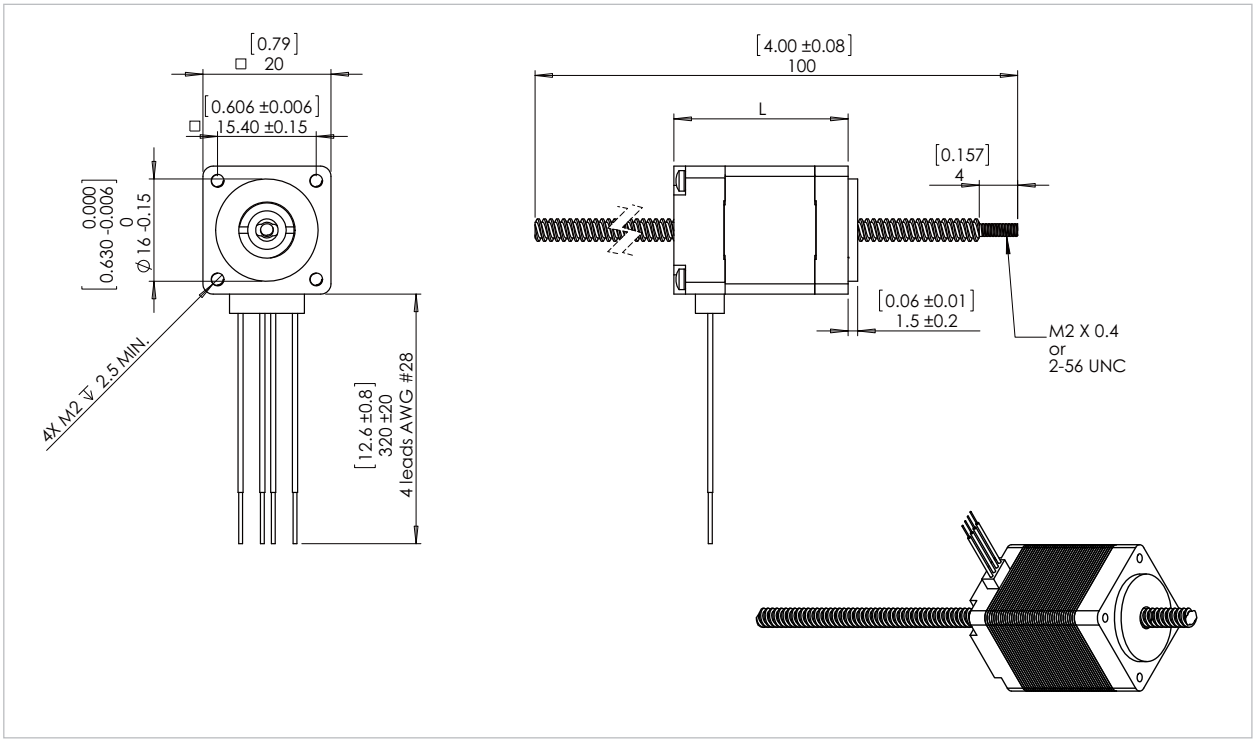
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# Dimensions

**NEMA Size 8 EXTERNAL Linear Actuator**



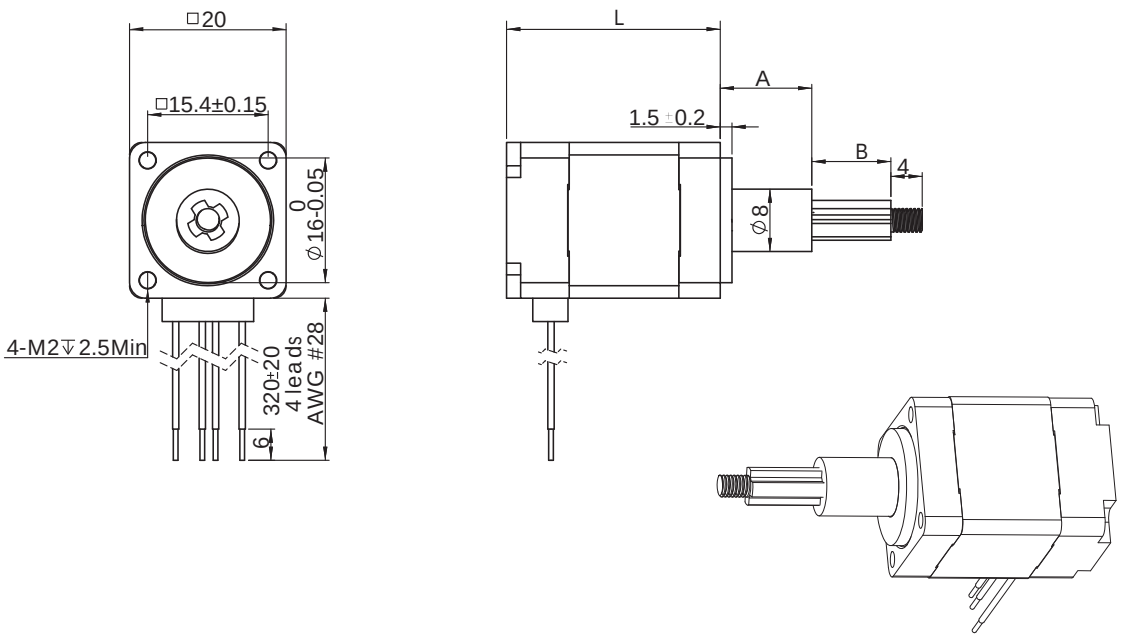

**NEMA Size 8 NON-CAPTIVE Linear Actuator**






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**NEMA Size 8 CAPTIVE Linear Actuator**



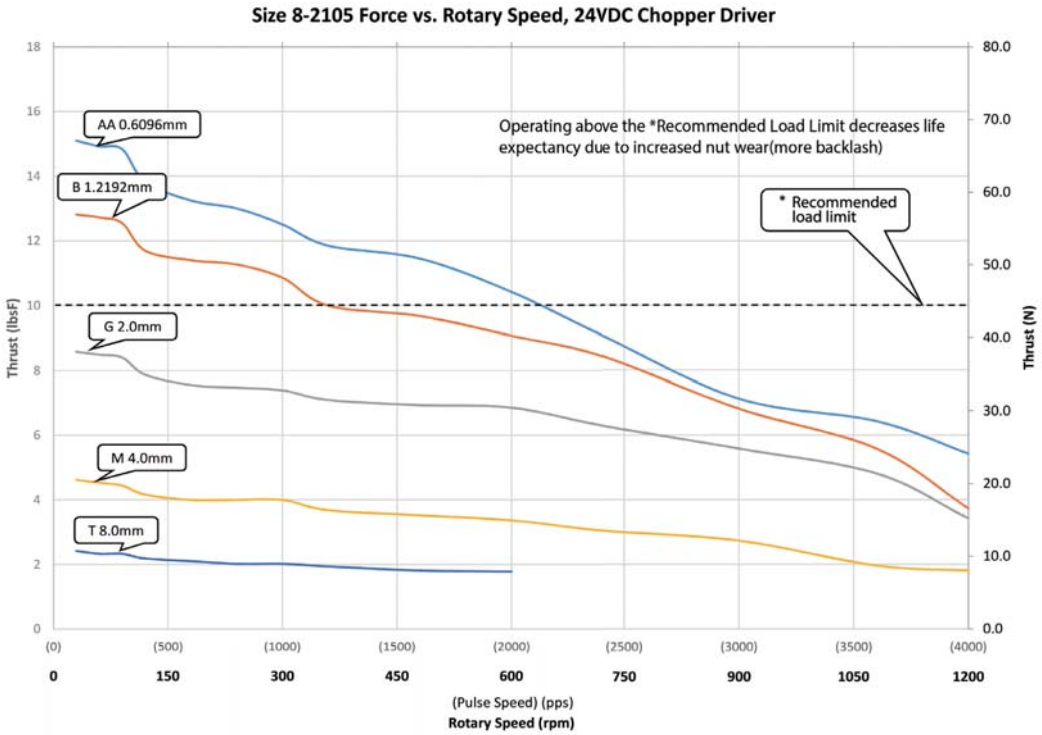

| Stroke B(mm) | Size A(mm) | Size L(mm) | |
|---|---|---|---|
| 5 | 5.2 | Single Stack Motor 27mm | Double Stack Motor 38mm |
| 10 | 11.7 | | |



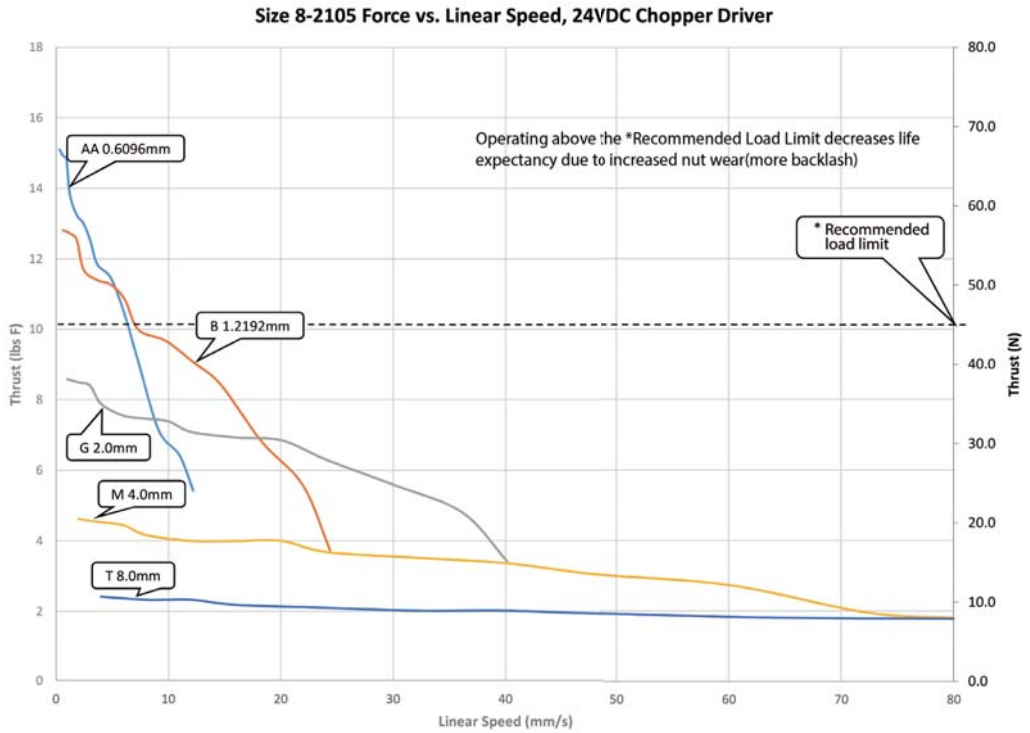
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# Speed Thrust Curves

**NEMA 8 Single-Stack Rotary Speed**



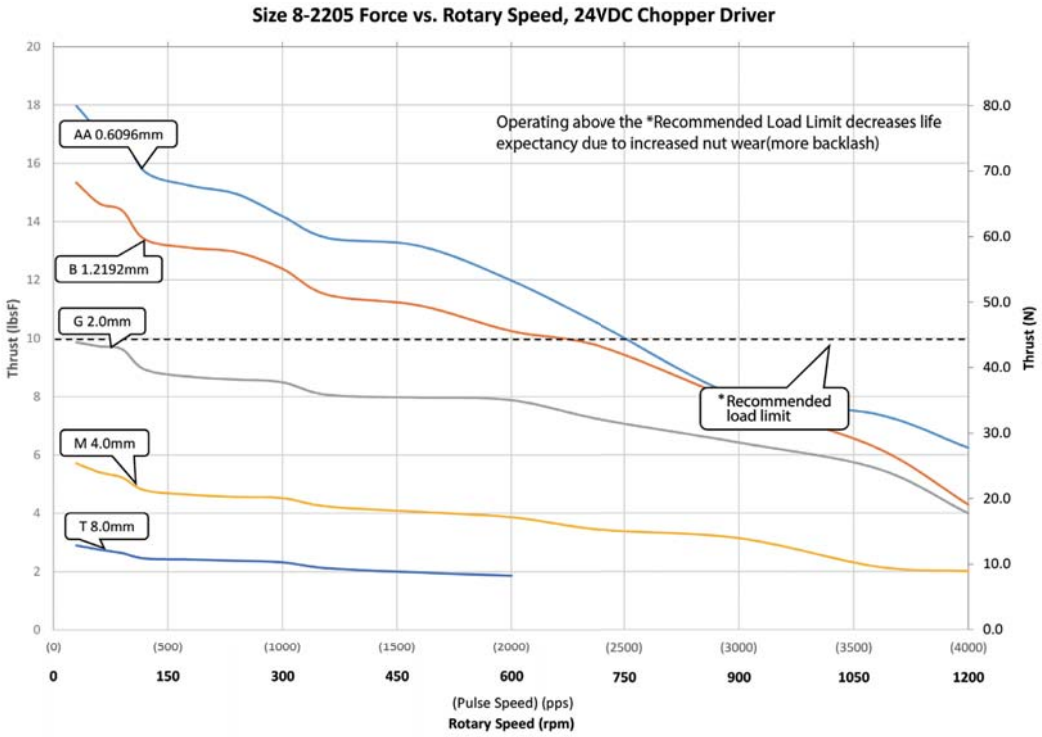

**NEMA 8 Single-Stack Linear Speed**



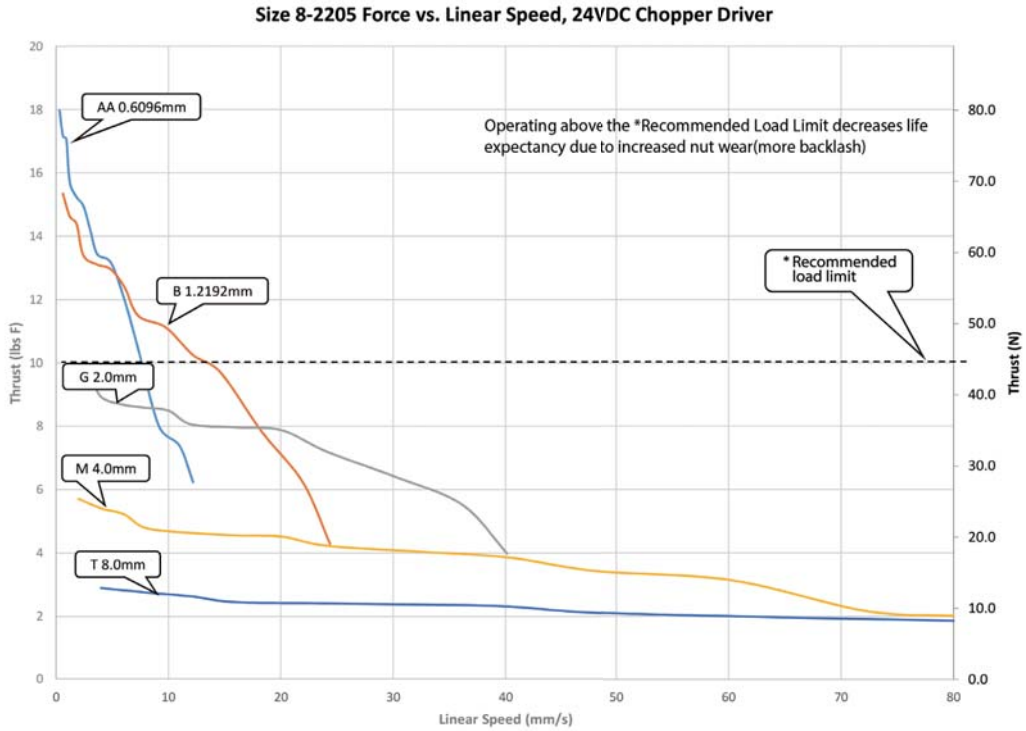



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## NEMA 8 Double-Stack Rotary Speed




## NEMA 8 Double-Stack Linear Speed

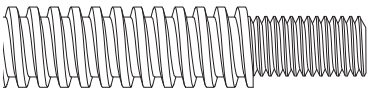
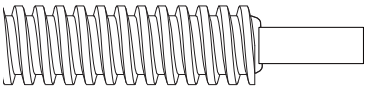
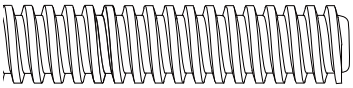




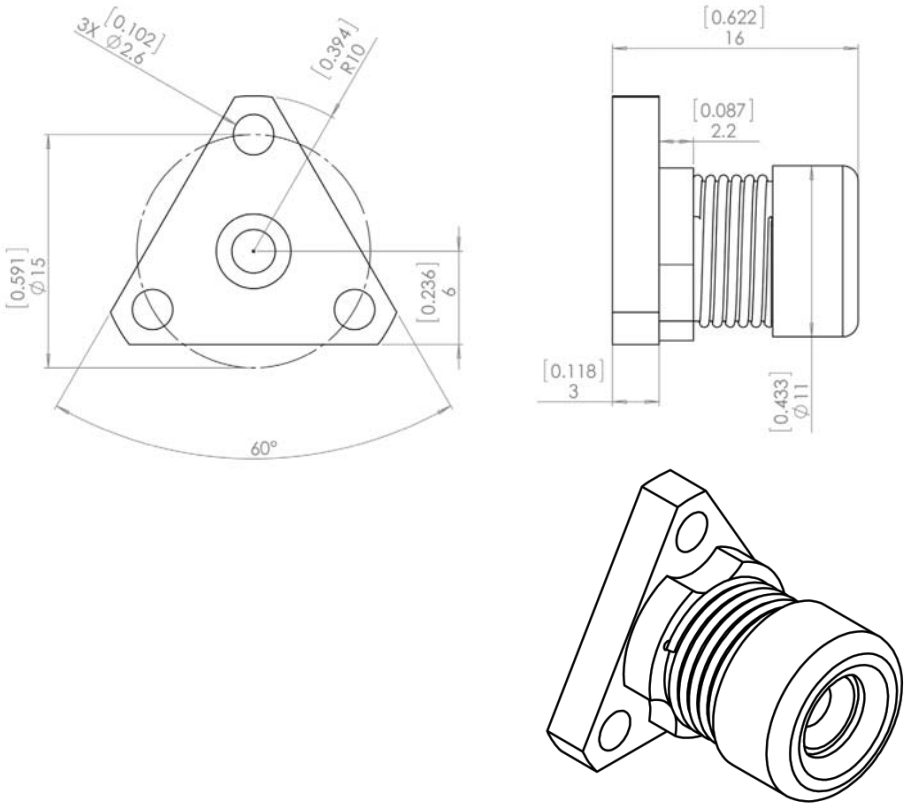

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# Option & Anti-backlash Nut

## End Machining Option

| Standard Lead Screw End Machining | | |
|---|---|---|
|  | Threaded End | Metric End : M2 x 0.4mm<br>UNC End : 2-56 UNC |
|  | Smooth end | Ø2 mm ±0.025<br>Ø0.0787″ ±0.0010 |
|  | None | - |

## Anti-backlash Nut



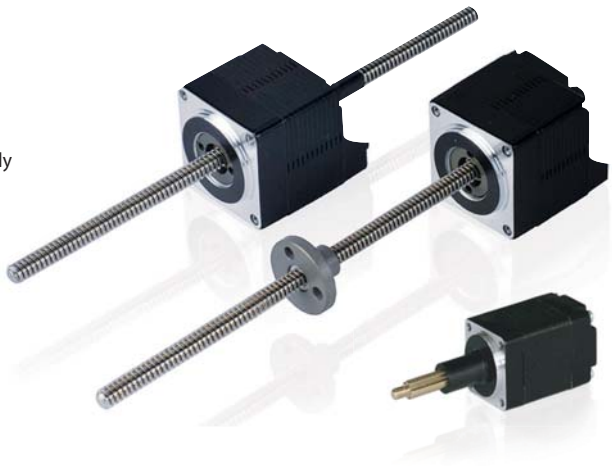



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# Motor Size(28mm)

## NEMA Size 11(28mm)
## Hybrid Motor Linear Actuators

The NEMA 11 hybrid linear actuator occupies a mounting footprint of slightly above 1 in2 but provides over 3X the continuous thrust(33lbsF/150N) of the NEMA 8. Ball Screw versions are also available.



### 1. Parameters

Please contact FASTECH or your local FASTECH representative about custom products.

| Motor | Voltage (V) | Current (A) | Resistance (Ω) | Inductance (mH) | Lead Wire No. | Motor Length (mm) |
|---|---|---|---|---|---|---|
| 11-2105 | 4.5 | 0.5 | 9.1 | 6 | 4 | 34 |
| 11-2110 | 2.2 | 1 | 2.2 | 1.5 | 4 | 34 |
| 11-2209 | 3.9 | 0.95 | 4.1 | 4 | 4 | 45 |
| 11-2216 | 2.25 | 1.6 | 1.45 | 1.1 | 4 | 45 |

### 2. Available Lead Screws and Travel per Step

Please contact FASTECH or your local FASTECH representative about custom products.

| Screw Dia. (in.) | Screw Dia. (mm) | Lead (in.) | Lead (mm) | Lead Code | Travel Per Step @ 1.8 deg(mm)* |
|---|---|---|---|---|---|
| 0.188 | 4.7752 | 0.025 | 0.635 | A | 0.0032 |
| 0.188 | 4.7752 | 0.05 | 1.27 | D | 0.0063 |
| 0.188 | 4.7752 | 0.1 | 2.54 | K | 0.0127 |
| 0.188 | 4.7752 | 0.2 | 5.08 | R | 0.0254 |
| 0.188 | 4.7752 | 0.4 | 10.16 | X | 0.0508 |

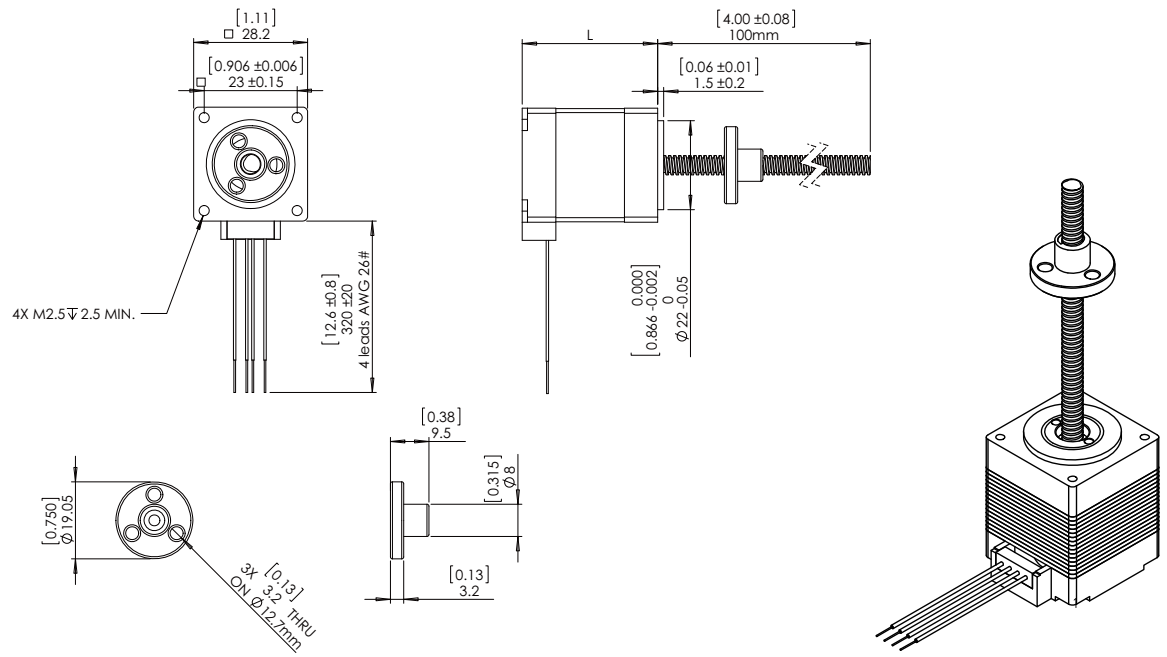
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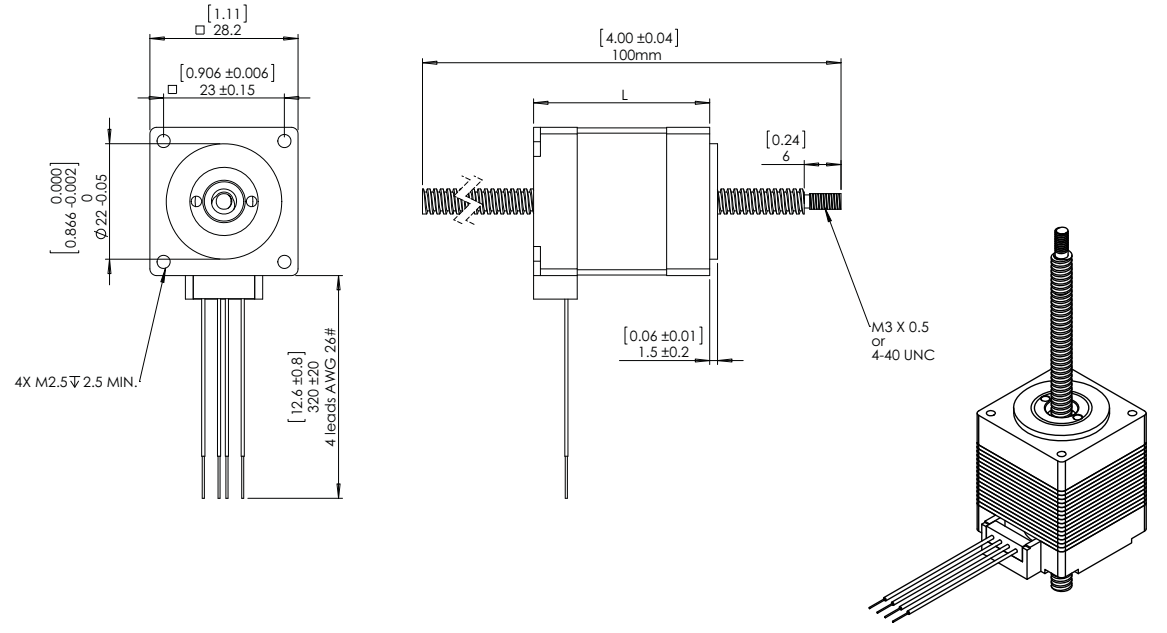
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# Dimensions

**NEMA Size 11 EXTERNAL Linear Actuator**



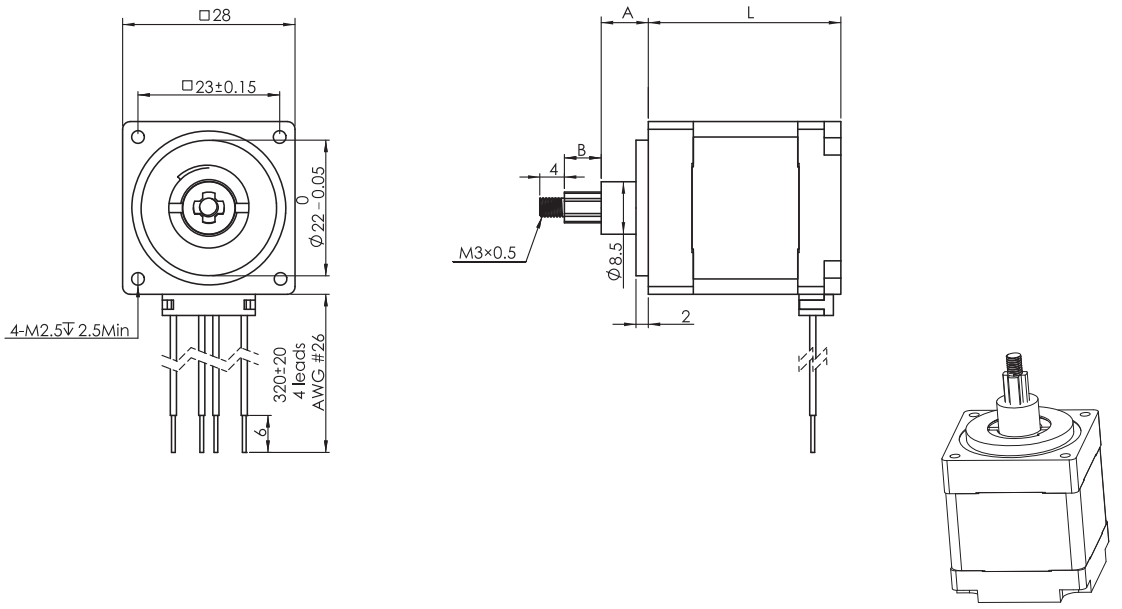

**NEMA Size 11 NON-CAPTIVE Linear Actuator**






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## NEMA Size 11 CAPTIVE Linear Actuator



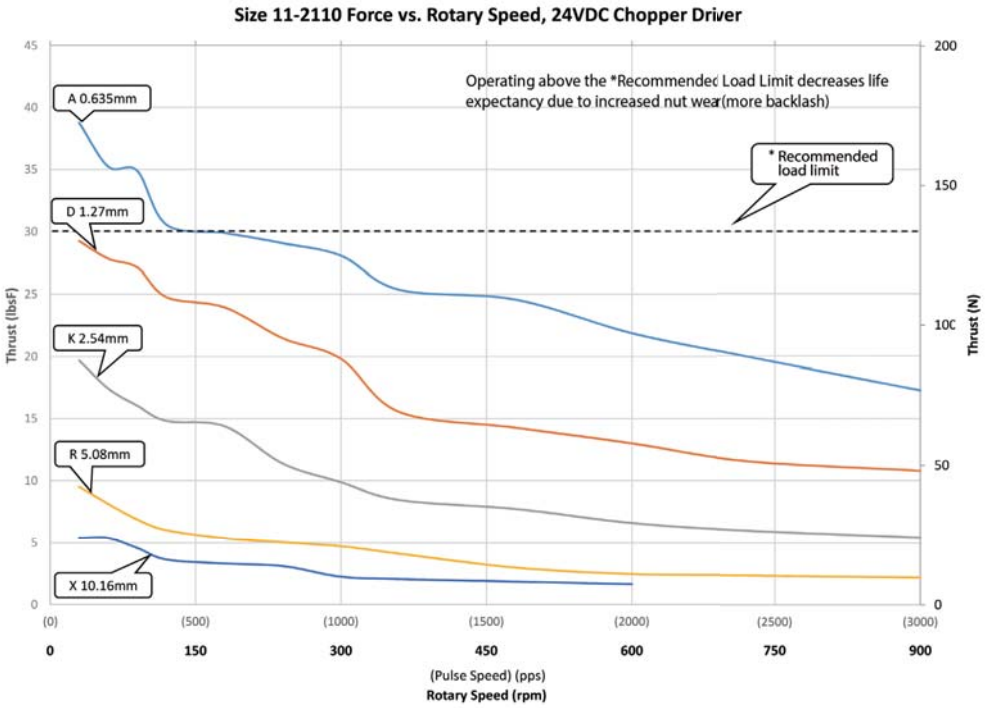

| Stroke B(mm) | Size A(mm) | Size L(mm) | |
|---|---|---|---|
| 5 | 7.65 | Single Stack Motor 34mm | Double Stack Motor 45mm |



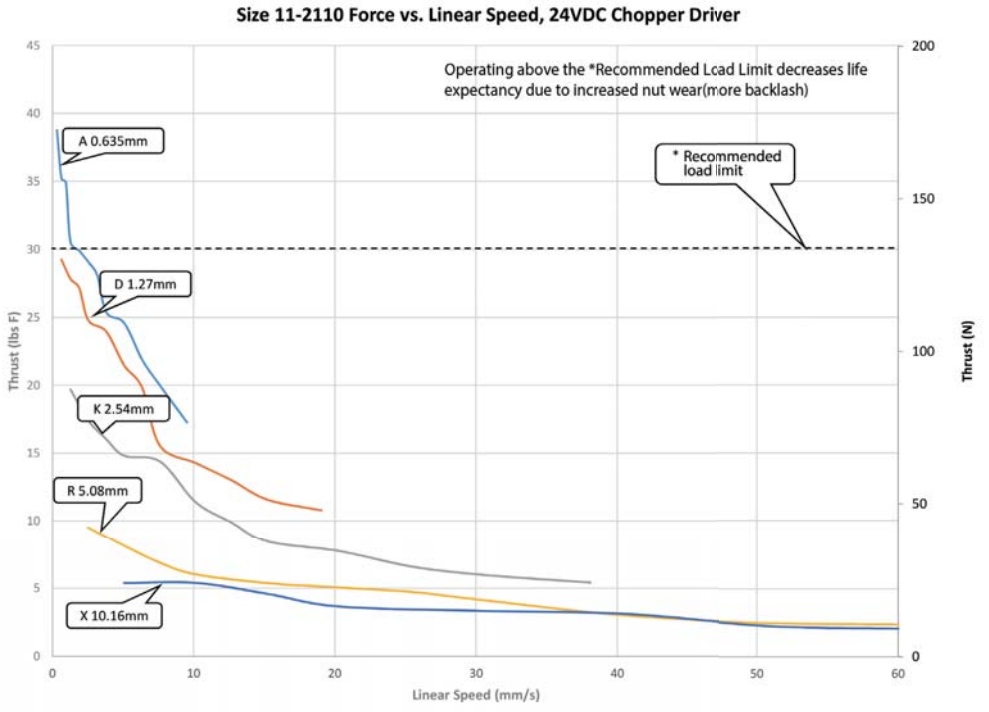
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# Speed Thrust Curves

**NEMA 11 Single-Stack Rotary Speed**



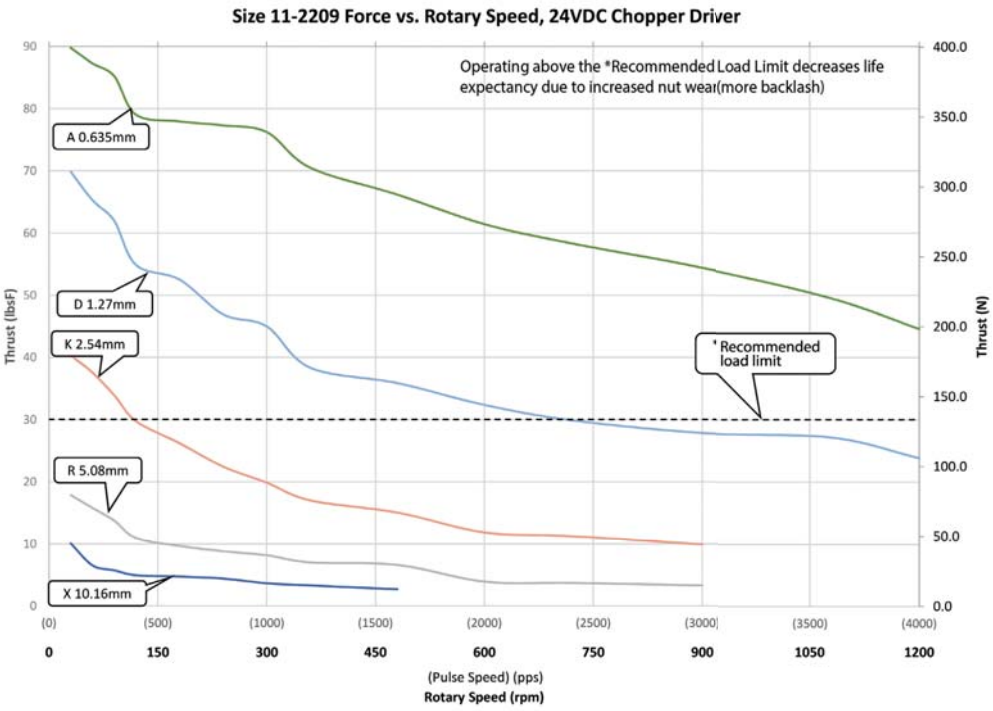

**NEMA 11 Single-Stack Linear Speed**



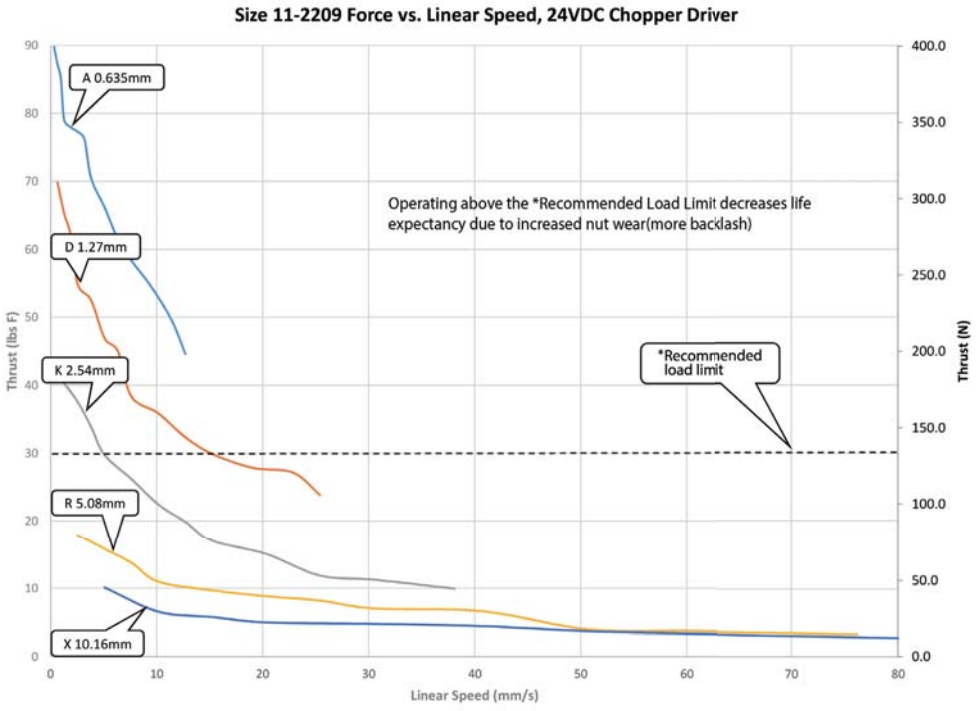



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## NEMA 11 Double-Stack Rotary Speed




## NEMA 11 Double-Stack Linear Speed

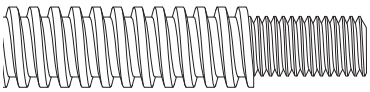
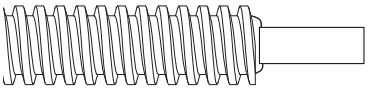
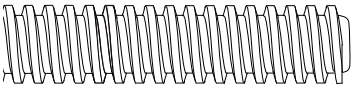




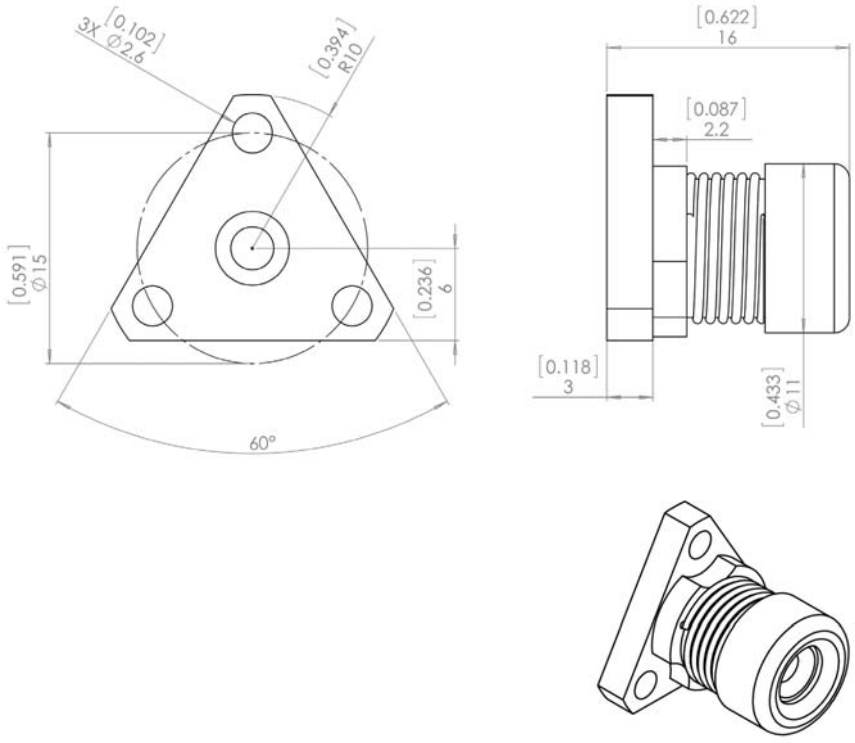

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# Option & Anti-backlash Nut

## End Machining Option

| Standard Lead Screw End Machining | | |
|---|---|---|
|  | Threaded End | Metric End : M3 x 0.4mm<br>UNC End : 4-40 UNC |
|  | Smooth End | Ø3mm ±0.025<br>Ø0.1181˝ ±0.0010 |
|  | None | - |

## Anti-backlash Nut






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# Motor Size(35mm)

## NEMA Size 14(35mm)
## Hybrid Motor Linear Actuators

The NEMA 14 hybrid precision linear actuator provides up to 52lbsF(230N) of continuous thrust. A Captive version is available in this frame size. Ball Screw versions are also available.



### 1. Parameters

Please contact FASTECH or your local FASTECH representative about custom products.

| Motor | Voltage (V) | Current (A) | Resistance (Ω) | Inductance (mH) | Lead Wire No. | Motor Length (mm) |
|---|---|---|---|---|---|---|
| 14-2105 | 6.6 | 0.5 | 13.2 | 14 | 4 | 34 |
| 14-2110 | 3.3 | 1 | 3.3 | 3.6 | 4 | 34 |
| 14-2115 | 2.2 | 1.5 | 1.5 | 1.6 | 4 | 34 |
| 14-2205 | 12 | 0.5 | 24 | 29 | 4 | 46 |
| 14-2210 | 6 | 1 | 6 | 7.2 | 4 | 46 |
| 14-2215 | 4 | 1.5 | 2.7 | 1.8 | 4 | 46 |

### 2. Available Lead Screws and Travel per Step

Please contact FASTECH or your local FASTECH representative about custom products.

| Screw Dia. (in.) | Screw Dia. (mm) | Lead (in.) | Lead (mm) | Lead Code | Travel Per Step @ 1.8 deg(mm)* | Travel Per Step @ 0.9 deg(mm)* |
|---|---|---|---|---|---|---|
| 0.25 | 6.35 | 0.024 | 0.6096 | AA | 0.003 | 0.0015 |
| 0.25 | 6.35 | 0.048 | 1.2192 | B | 0.006 | 0.003 |
| 0.25 | 6.35 | 0.05 | 1.27 | D | 0.006 | 0.0032 |
| 0.25 | 6.35 | 0.0625 | 1.5875 | F | 0.0079375 | 0.0039688 |
| 0.25 | 6.35 | 0.096 | 2.4384 | J | 0.012 | 0.0061 |
| 0.25 | 6.35 | 0.1 | 2.54 | K | 0.012 | 0.0064 |
| 0.25 | 6.35 | 0.192 | 4.8768 | Q | 0.024 | 0.0122 |
| 0.25 | 6.35 | 0.25 | 6.35 | S | 0.031 | 0.0159 |
| 0.25 | 6.35 | 0.33 | 8.382 | U | 0.041 | 0.021 |
| 0.25 | 6.35 | 0.384 | 9.7536 | W | 0.048 | 0.0244 |
| 0.25 | 6.35 | 0.5 | 12.7 | Y | 0.0635 | 0.03175 |

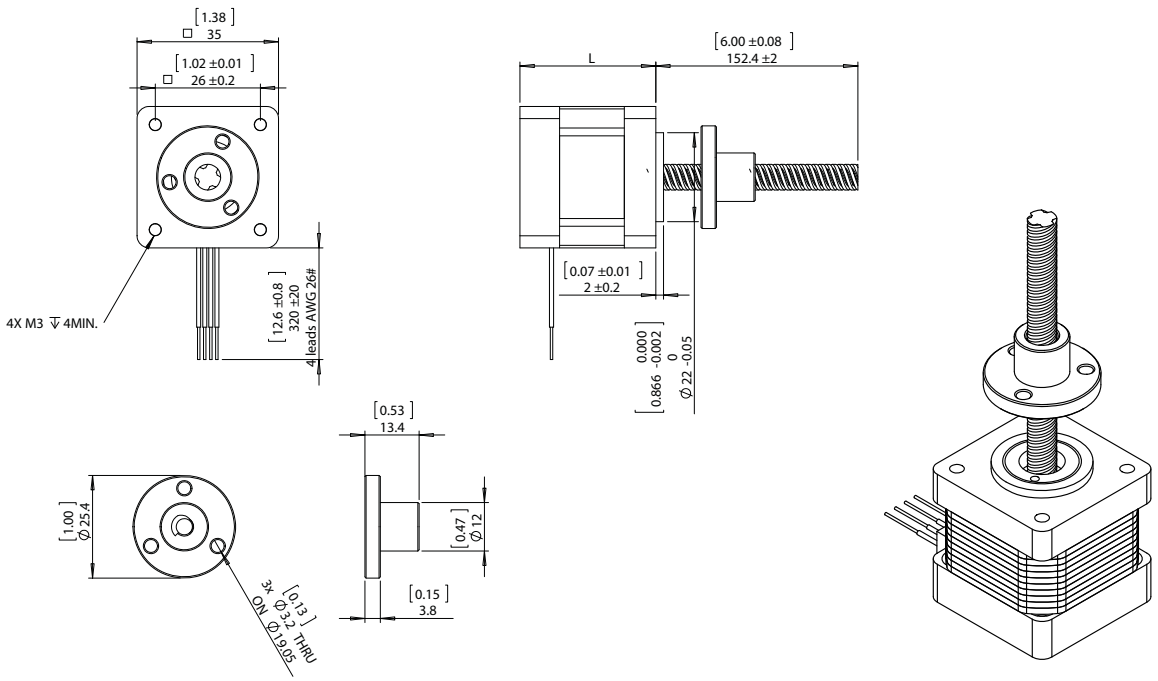
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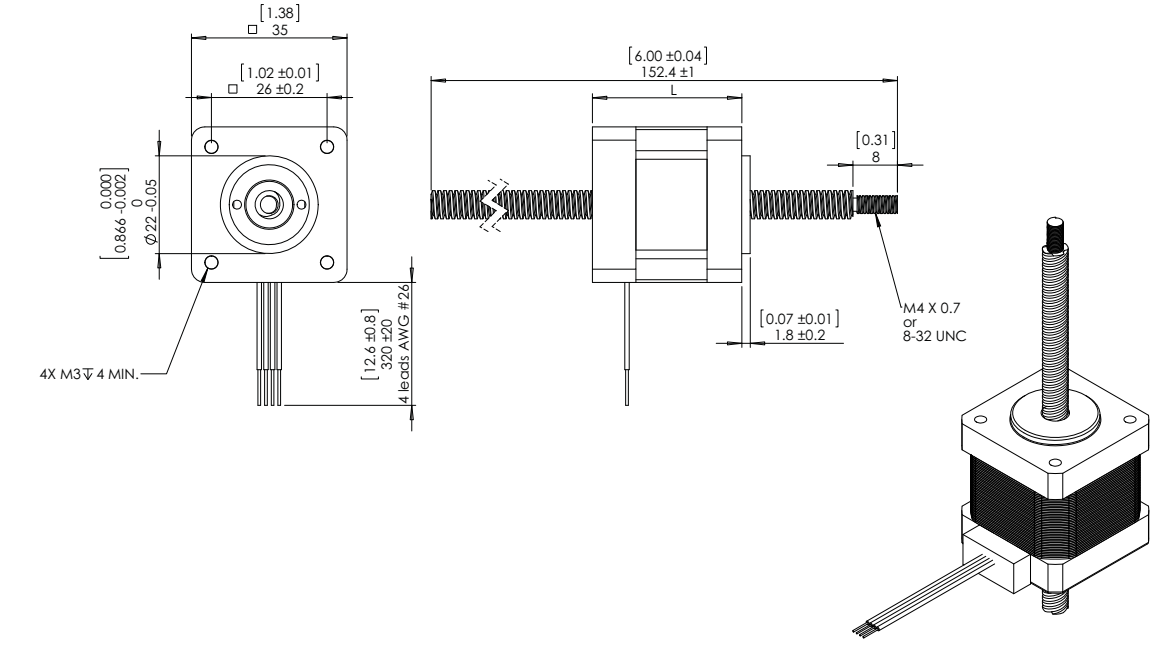
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# Dimensions

**NEMA Size 14 EXTERNAL Linear Actuator**



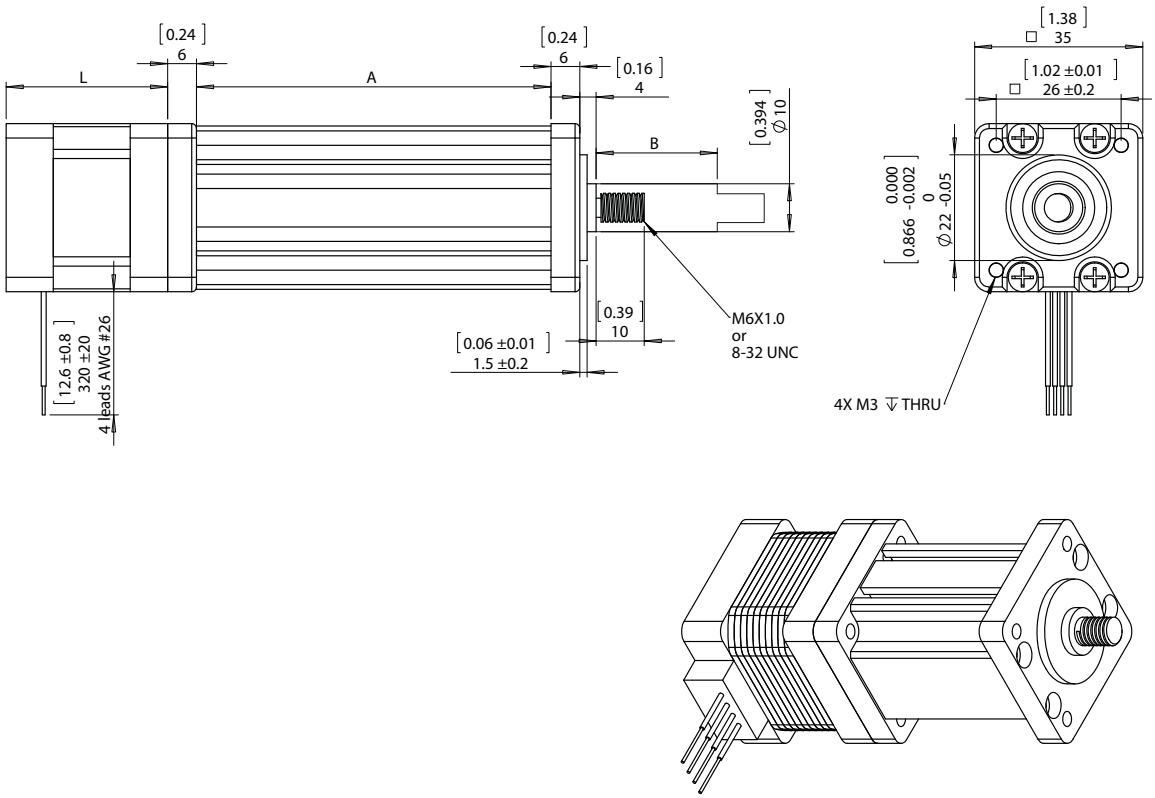

**NEMA Size 14 NON-CAPTIVE Linear Actuator**






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## NEMA Size 14 CAPTIVE Linear Actuator



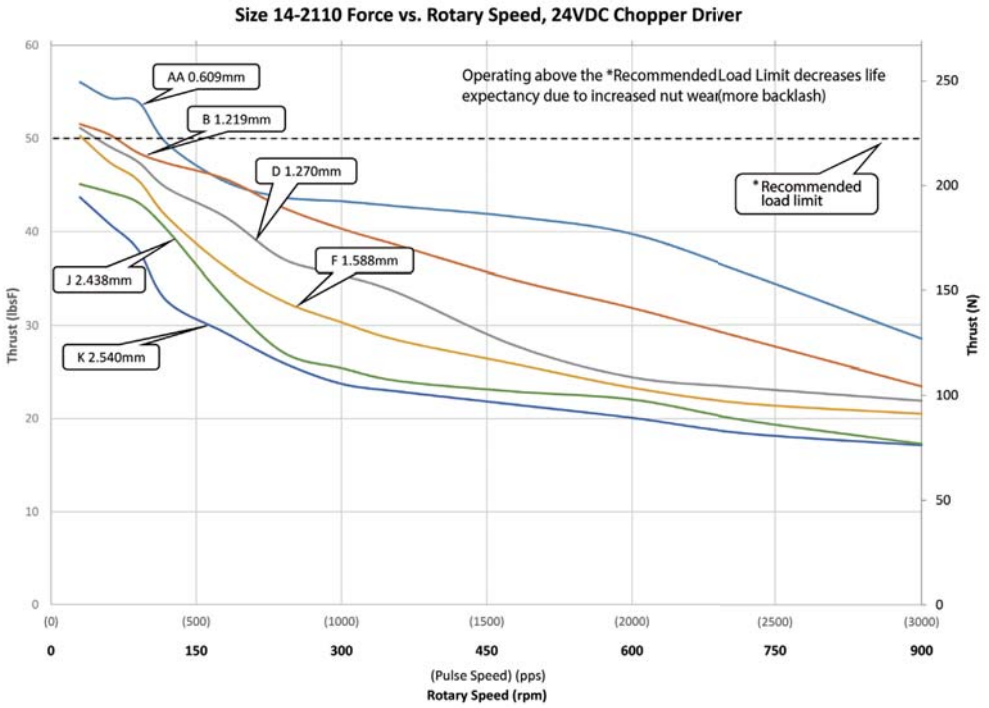

| Stroke B inch(mm) | Dimension A(mm) | Dimension L(mm) | |
|---|---|---|---|
| 0.5(12.7) | 36.7 | Single Stack Motor 35mm | Double Stack Motor 49mm |
| 0.75(19.05) | 43.05 | | |
| 1.0(25.4) | 49.4 | | |
| 1.25(31.8) | 55.8 | | |
| 1.5(38.1) | 62.1 | | |
| 2.0(50.8) | 74.8 | | |
| 2.5(63.5) | 87.5 | | |



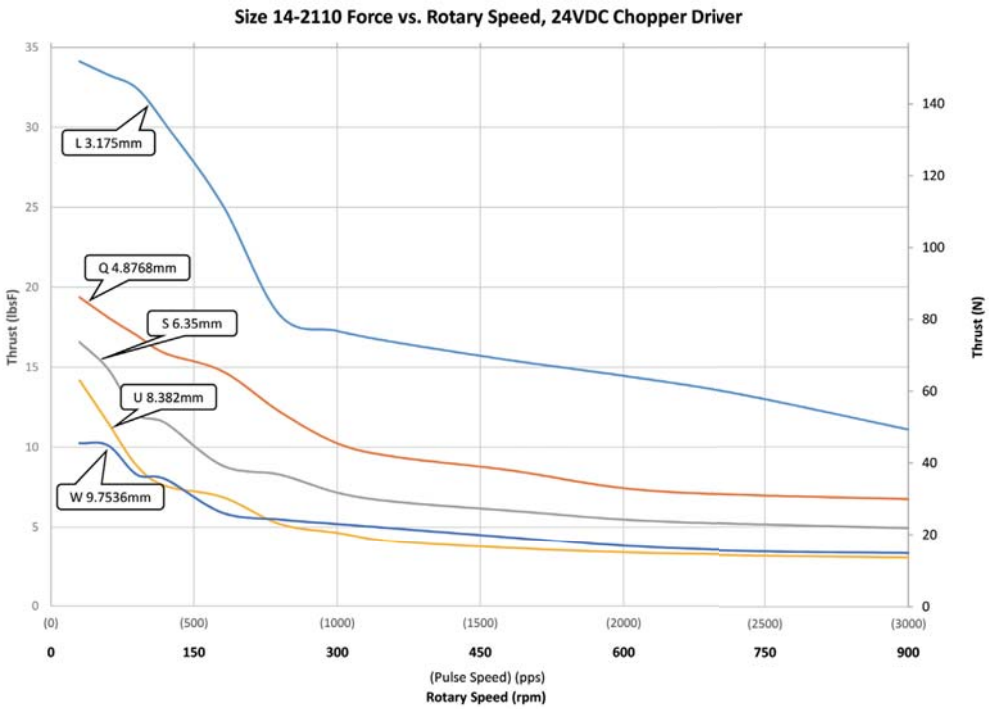
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# Speed Thrust Curves

**NEMA 14 Single-Stack Rotary Speed**



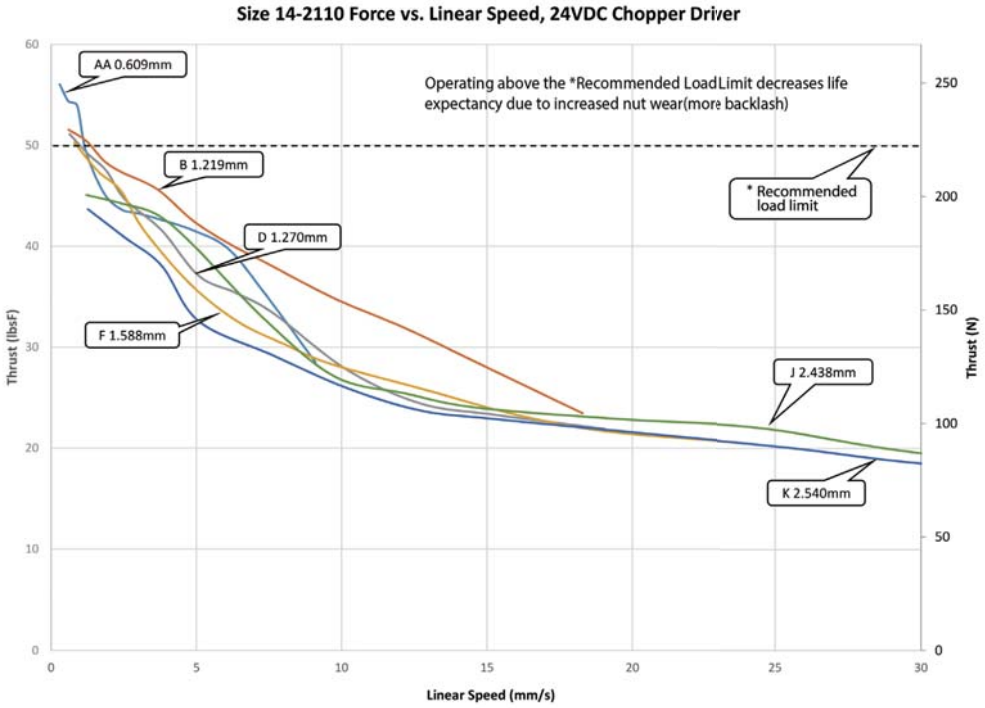

**NEMA 14 Single-Stack Rotary Speed**



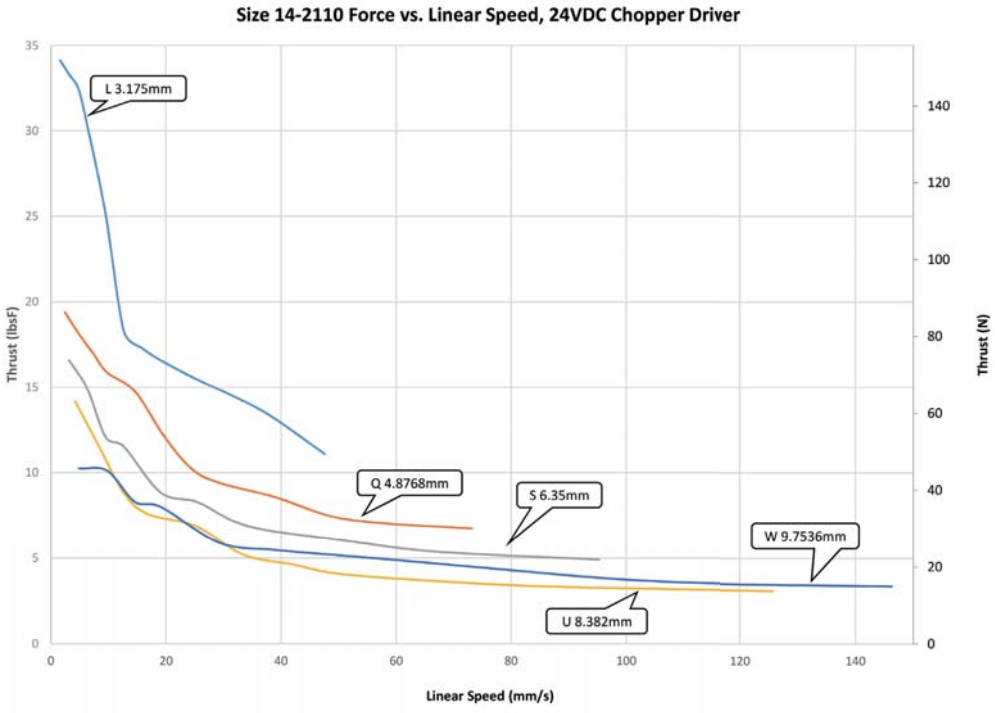



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## NEMA 14 Single-Stack Linear Speed



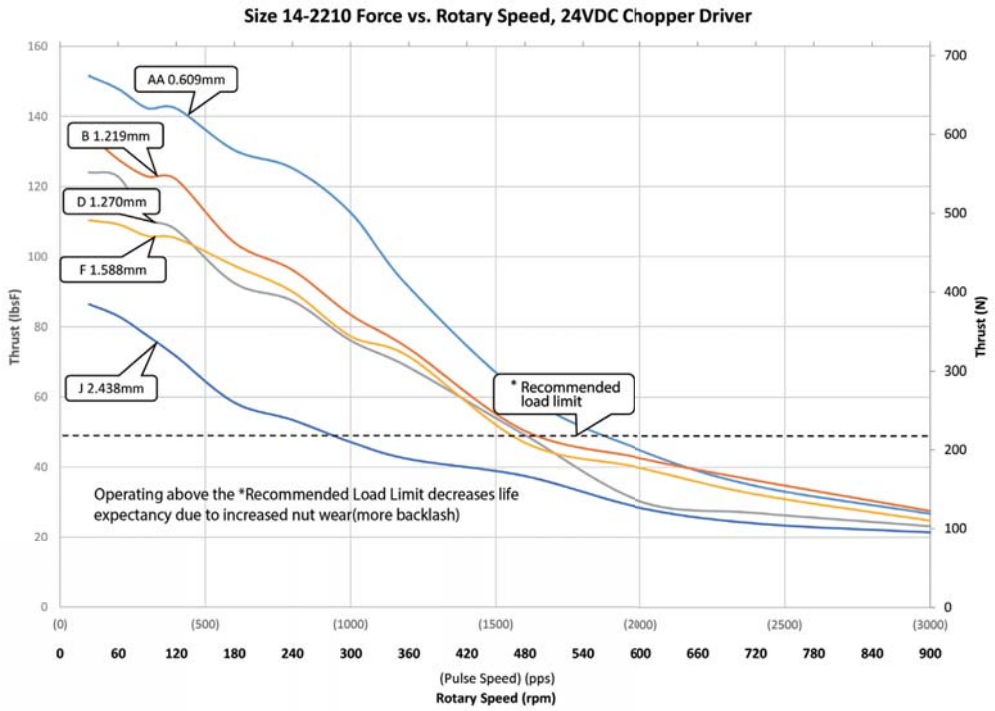

## NEMA 14 Single-Stack Linear Speed



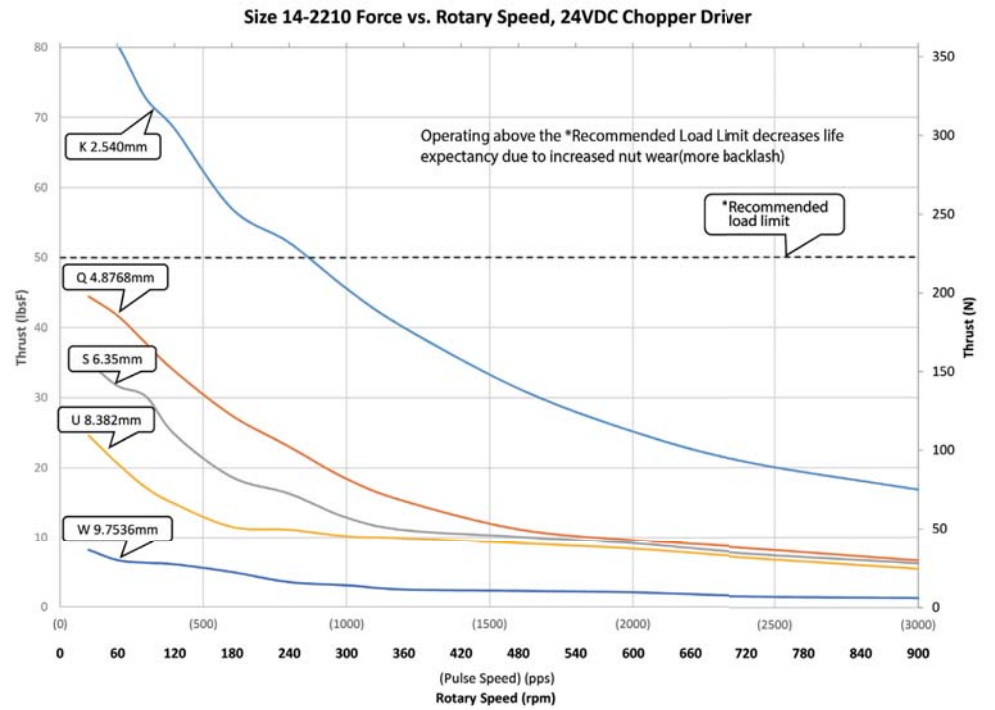



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## NEMA 14 Double-Stack Rotary Speed



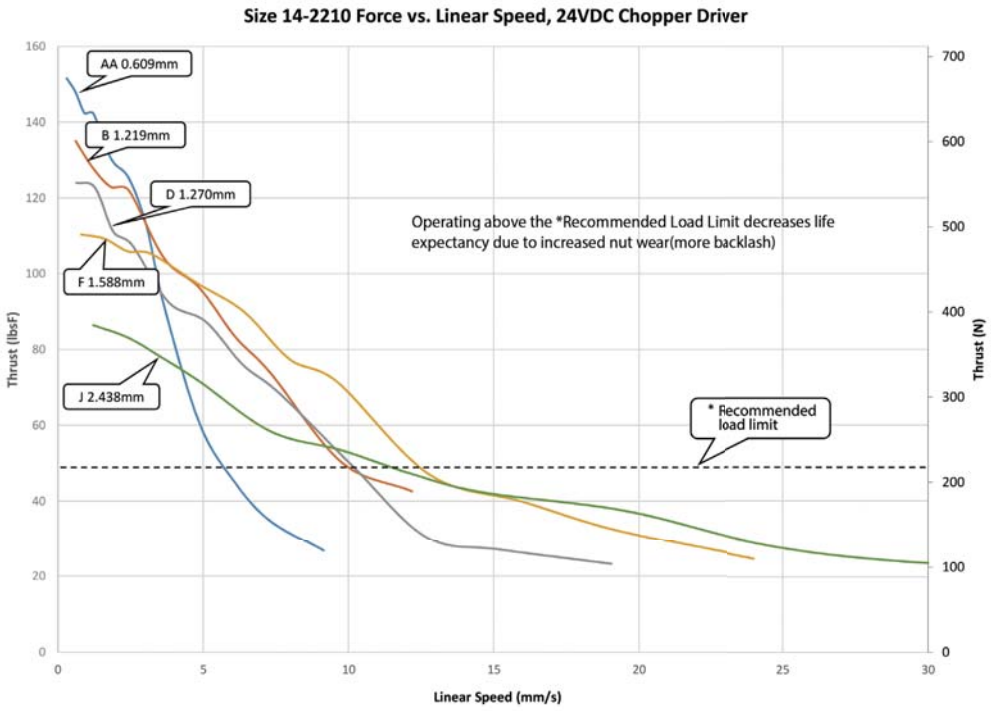

## NEMA 14 Double-Stack Rotary Speed



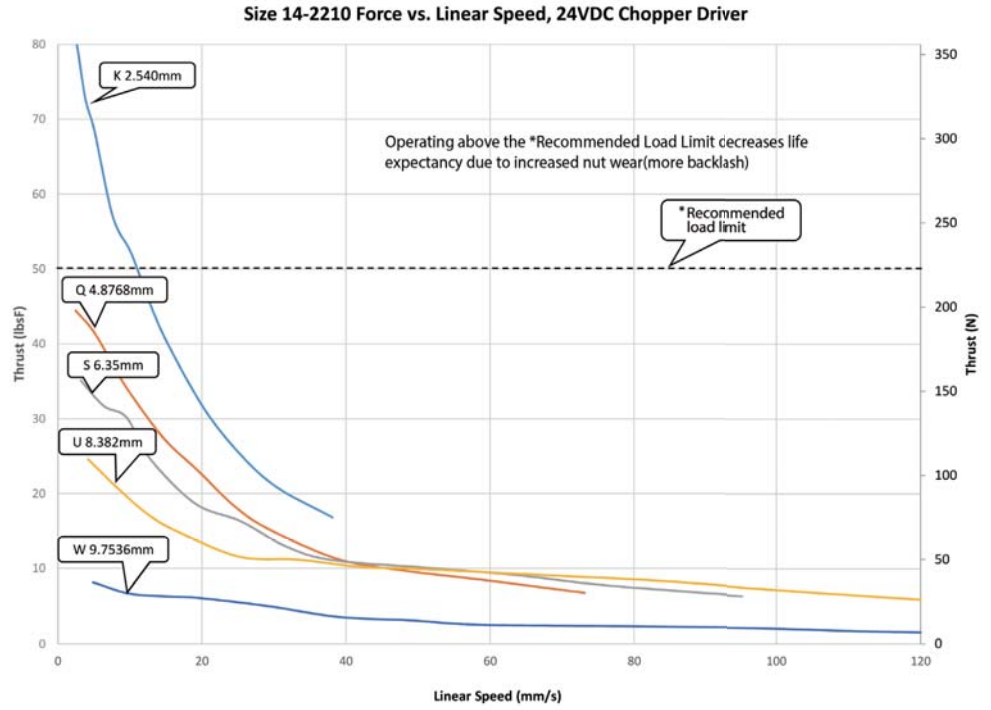



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## NEMA 14 Double-Stack Linear Speed




## NEMA 14 Double-Stack Linear Speed

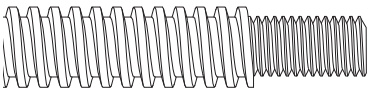
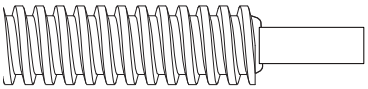
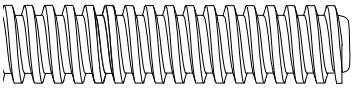





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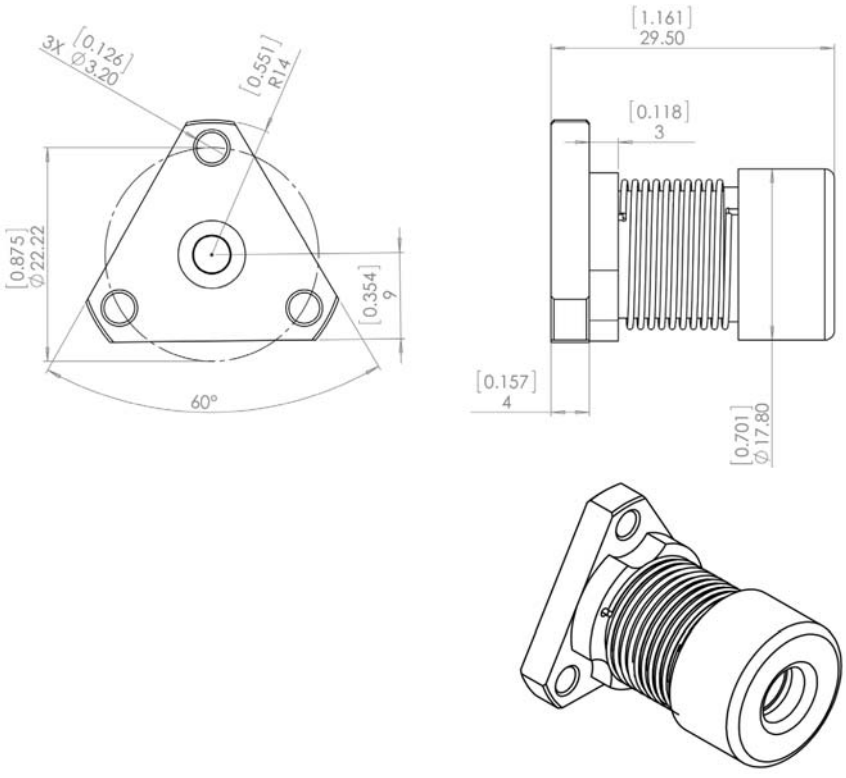
# Option & Anti-backlash Nut

## End Machining Option

| Standard Lead Screw End Machining | | |
|---|---|---|
|  | Threaded End | Metric End : M4 x 0.7mm<br>UNC End : 8-32 UNC |
|  | Smooth End | Ø4mm ±0.025<br>Ø0.1575″ ±0.0010 |
|  | None | - |

| End Machining |
|---|
| Metric End : M6 x 1.0mm<br>UNC End : 8-32 UNC |

## Anti-backlash Nut






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# Motor Size(42mm)

## NEMA Size 17(42mm)
## Hybrid Motor Linear Actuators

The NEMA 17 hybrid precision linear actuator provides up to 60lbsF(266N) of continuous thrust. A Captive version is available in this frame size. Ball Screw versions are also available.



### 1. Parameters

Please contact FASTECH or your local FASTECH representative about custom products.

| Motor | Voltage (V) | Current (A) | Resistance (Ω) | Inductance (mH) | Lead Wire No. | Motor Length (mm) |
|---|---|---|---|---|---|---|
| 17-2105 | 7.2 | 0.5 | 14.4 | 19.8 | 4 | 34 |
| 17-2110 | 3.6 | 1 | 3.6 | 5 | 4 | 34 |
| 17-2115 | 2.4 | 1.5 | 1.6 | 2.2 | 4 | 34 |
| 17-2205 | 11 | 0.5 | 22 | 46 | 4 | 48 |
| 17-2212 | 4.5 | 1.2 | 3.8 | 8 | 4 | 48 |
| 17-2225 | 2.2 | 2.5 | 0.87 | 1.8 | 4 | 48 |

### 2. Available Lead Screws and Travel per Step

Please contact FASTECH or your local FASTECH representative about custom products.

| Screw Dia. (in.) | Screw Dia. (mm) | Lead (in.) | Lead (mm) | Lead Code | Travel Per Step @ 1.8 deg(mm)* | Travel Per Step @ 0.9 deg(mm)* |
|---|---|---|---|---|---|---|
| 0.25 | 6.35 | 0.024 | 0.6096 | AA | 0.003 | 0.0015 |
| 0.25 | 6.35 | 0.048 | 1.2192 | B | 0.006 | 0.003 |
| 0.25 | 6.35 | 0.05 | 1.27 | D | 0.006 | 0.0032 |
| 0.25 | 6.35 | 0.0625 | 1.5875 | F | 0.0079375 | 0.0039688 |
| 0.25 | 6.35 | 0.096 | 2.4384 | J | 0.012 | 0.0061 |
| 0.25 | 6.35 | 0.1 | 2.54 | K | 0.012 | 0.0064 |
| 0.25 | 6.35 | 0.192 | 4.8768 | Q | 0.024 | 0.0122 |
| 0.25 | 6.35 | 0.25 | 6.35 | S | 0.031 | 0.0159 |
| 0.25 | 6.35 | 0.33 | 8.382 | U | 0.041 | 0.021 |
| 0.25 | 6.35 | 0.384 | 9.7536 | W | 0.048 | 0.0244 |
| 0.25 | 6.35 | 0.5 | 12.7 | Y | 0.0635 | 0.03175 |

* Values truncated

### 3. NEMA 17 Custom Lead Screw DIA Available for

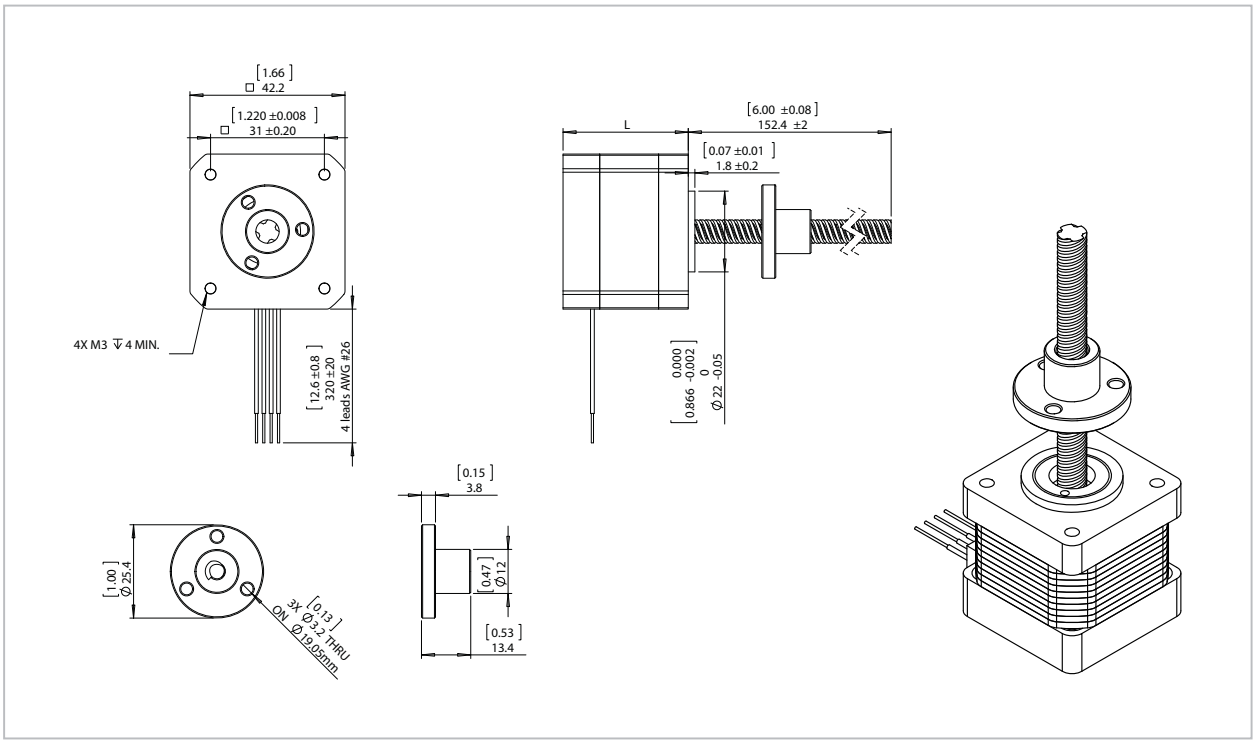
0.375" DIA shaft available with external shaft version



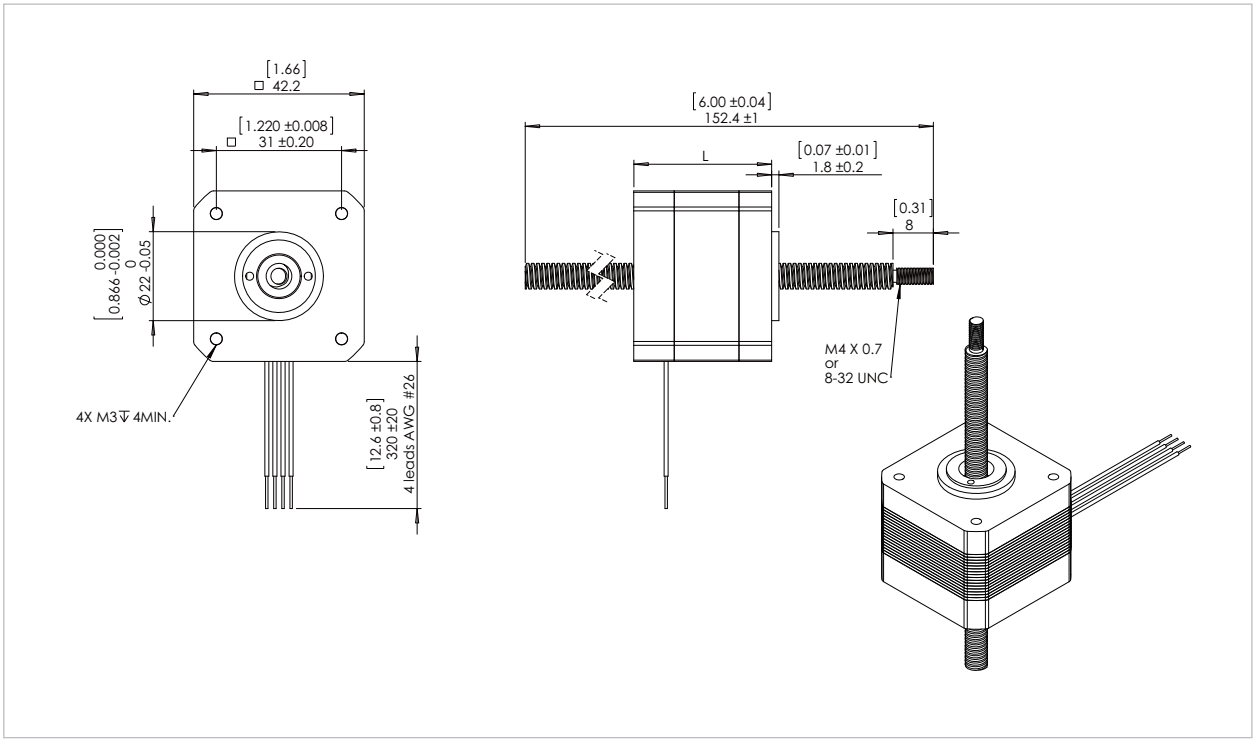
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# Dimensions

**NEMA Size 17 EXTERNAL Linear Actuator**



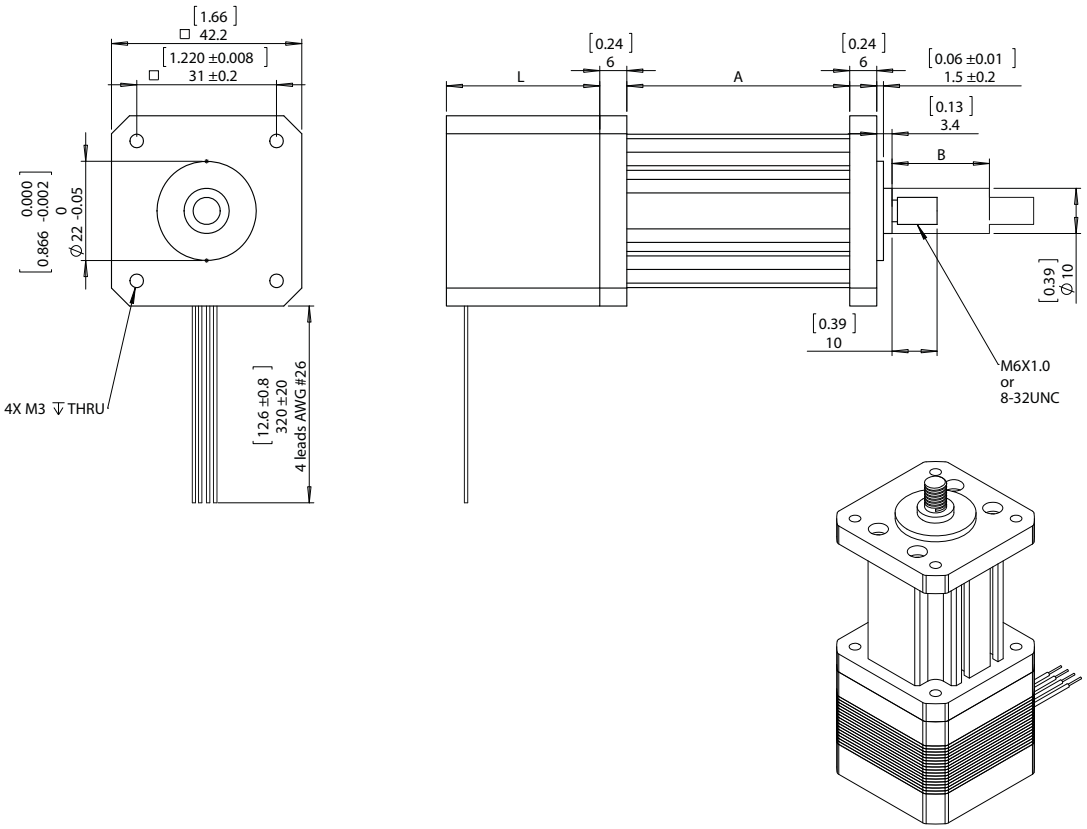

**NEMA Size 17 NON-CAPTIVE Linear Actuator**






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## NEMA Size 17 CAPTIVE Linear Actuator



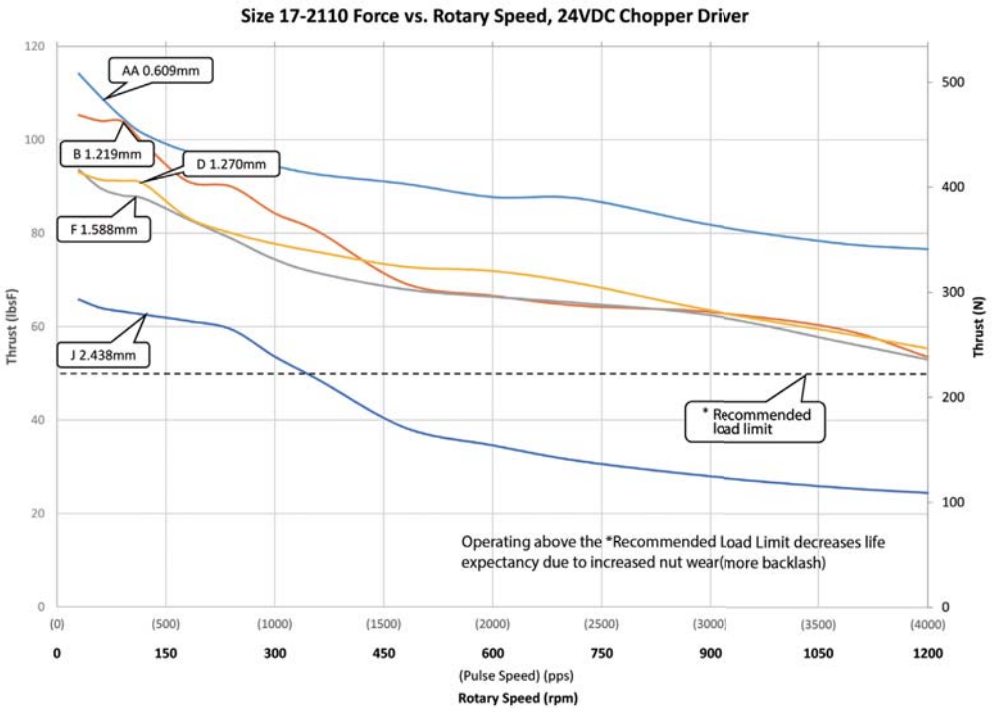

| Stroke B inch(mm) | Dimension A(mm) | Dimension L(mm) | |
|---|---|---|---|
| 0.5(12.7) | 36.7 | Single Stack Motor 35mm | Double Stack Motor 49mm |
| 0.75(19.05) | 43.05 | | |
| 1.0(25.4) | 49.4 | | |
| 1.25(31.8) | 55.8 | | |
| 1.5(38.1) | 62.1 | | |
| 2.0(50.8) | 74.8 | | |
| 2.5(63.5) | 87.5 | | |



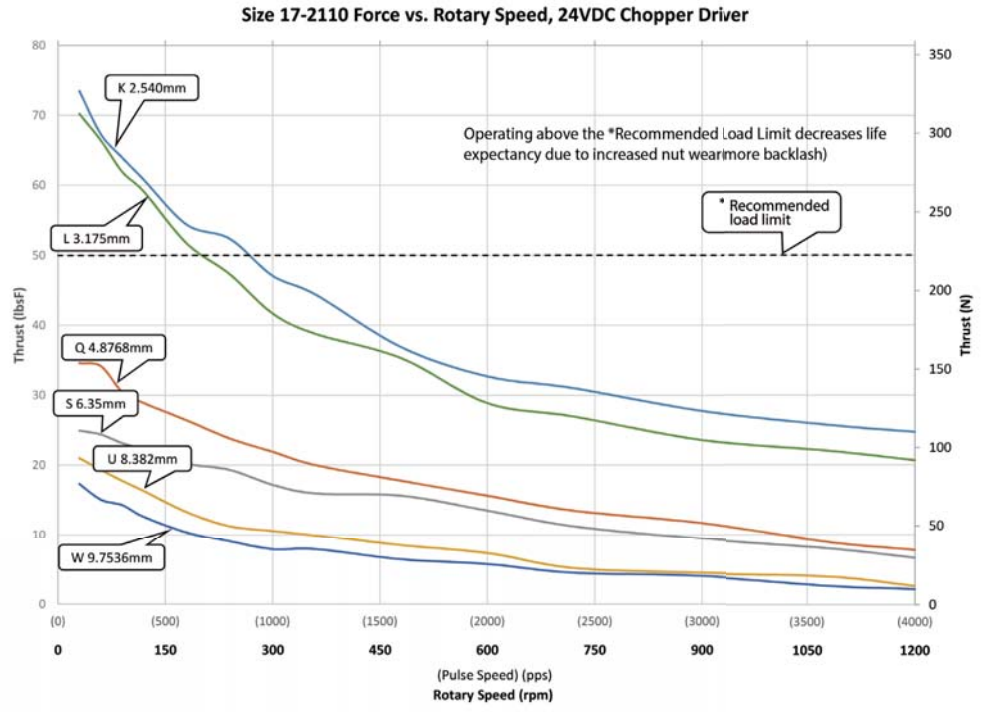
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# Speed Thrust Curves

**NEMA 17 Single-Stack Rotary Speed**



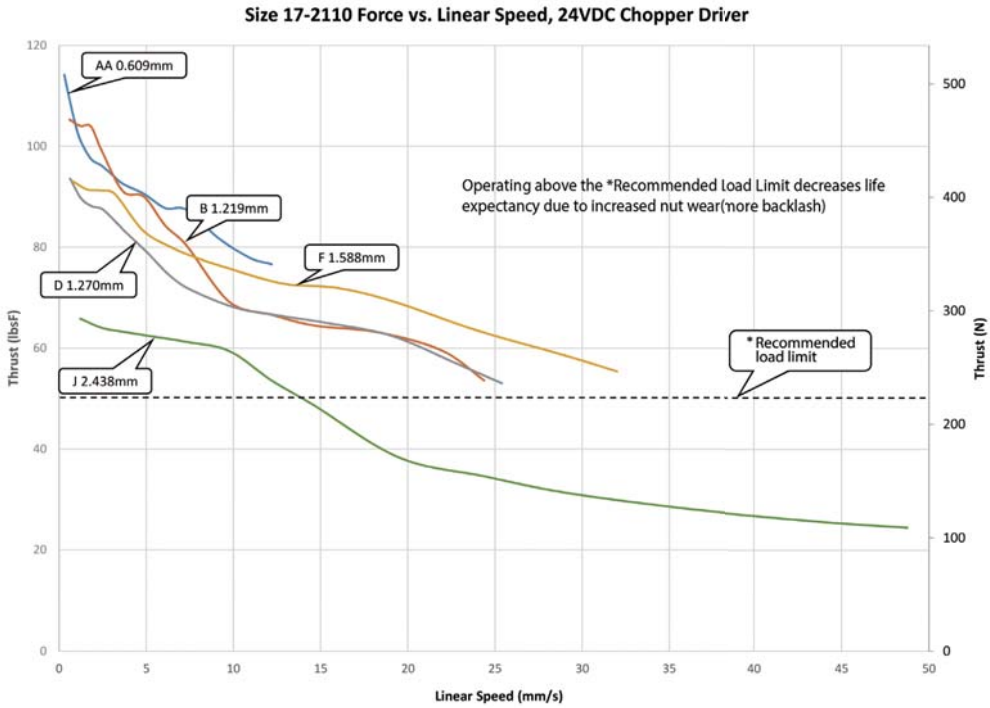

**NEMA 17 Single-Stack Rotary Speed**



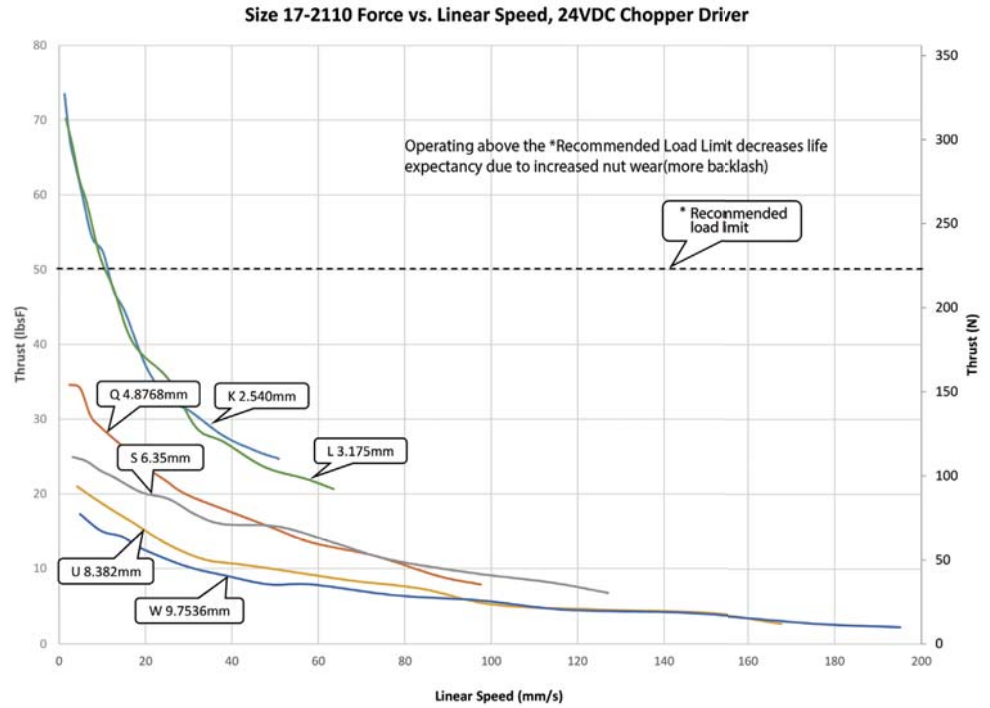



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## NEMA 17 Single-Stack Linear Speed



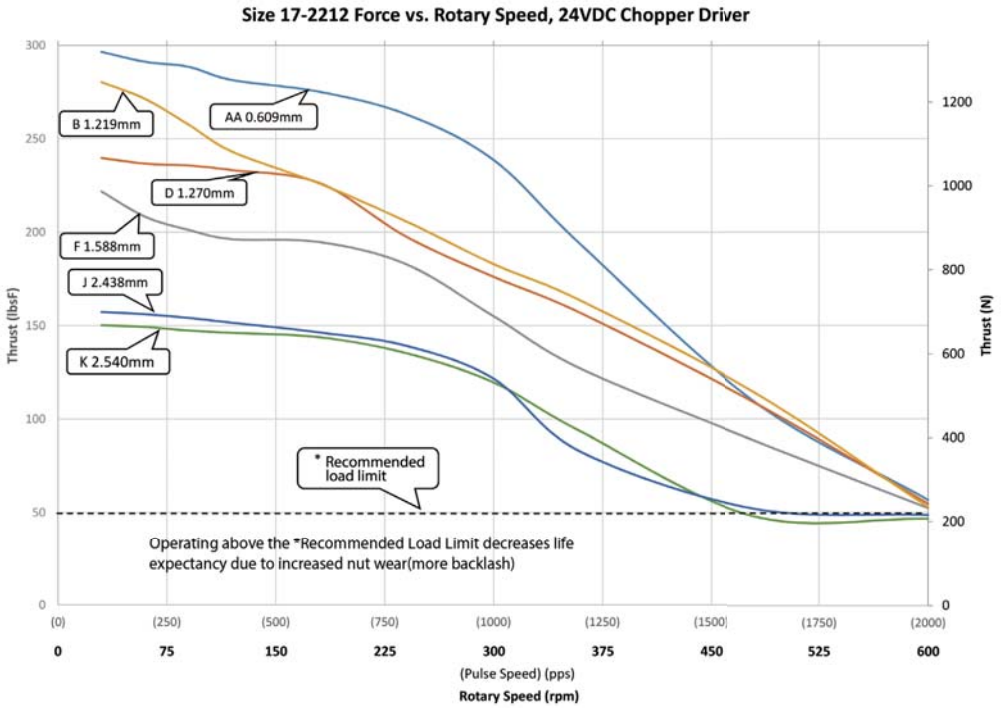

## NEMA 17 Single-Stack Linear Speed



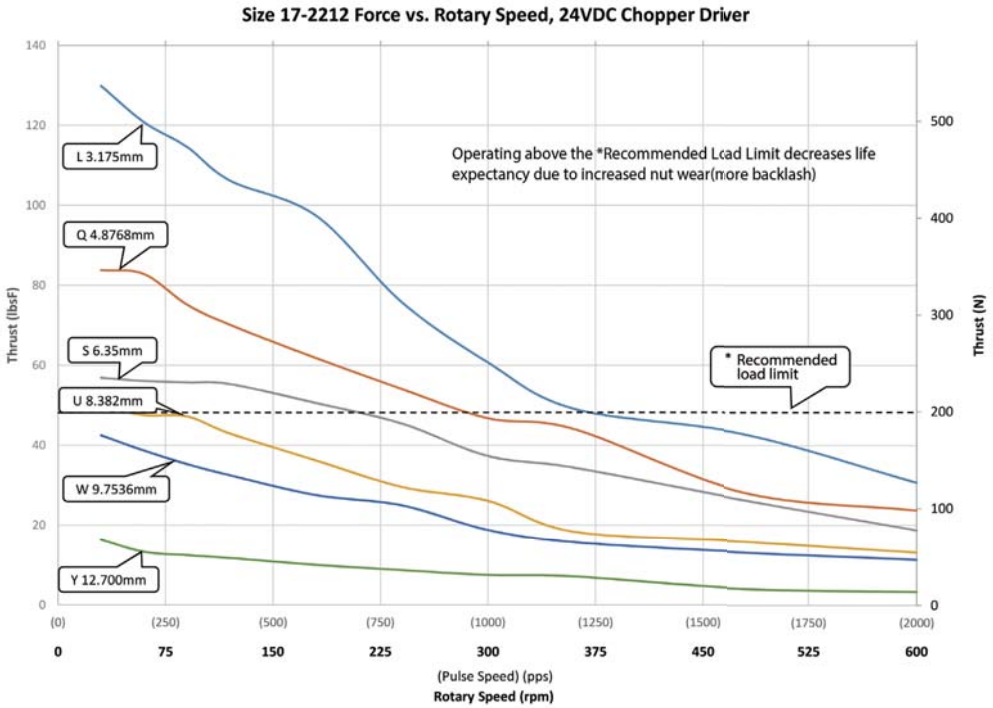



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**NEMA 17 Double-Stack Rotary Speed**



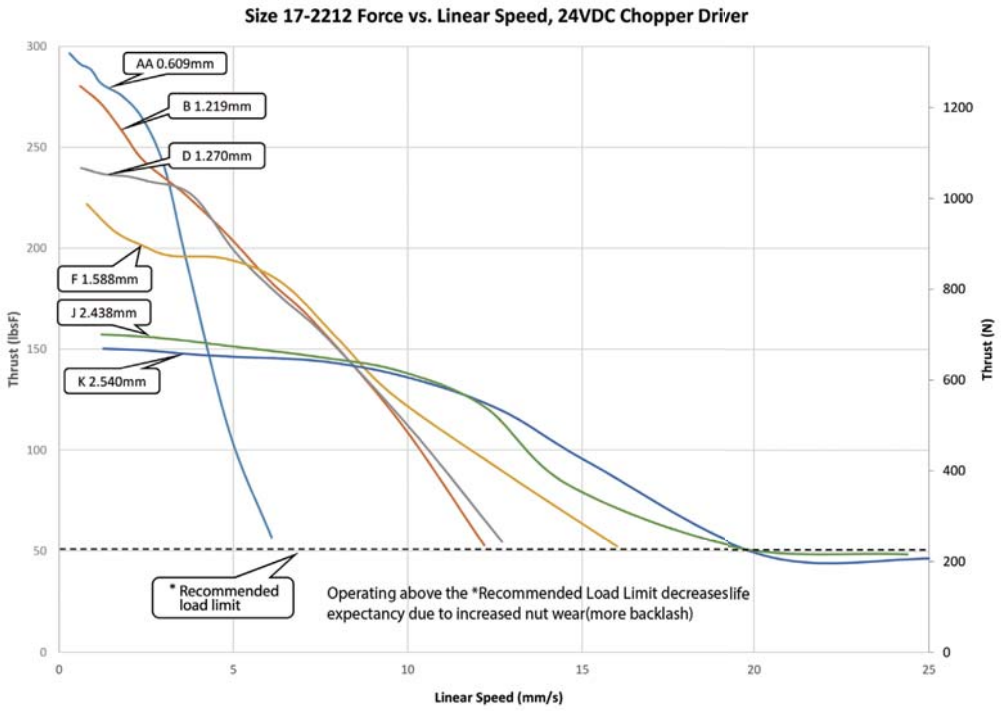

**NEMA 17 Double-Stack Rotary Speed**



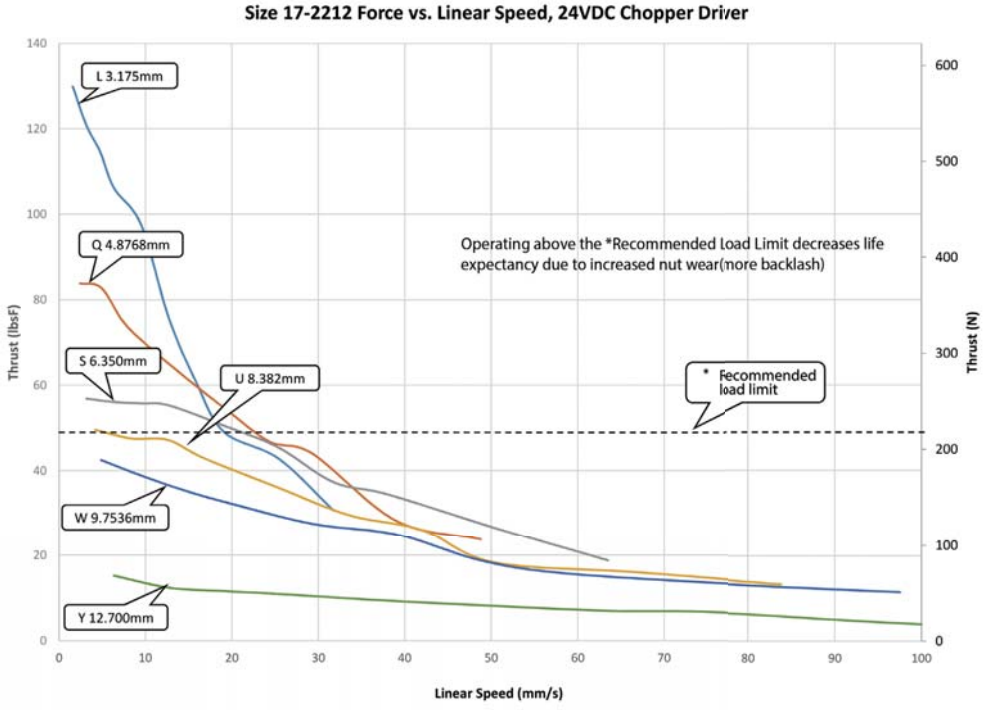



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## NEMA 17 Double-Stack Linear Speed




## NEMA 17 Double-Stack Linear Speed

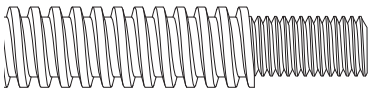
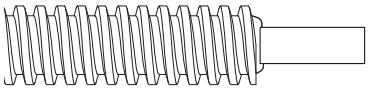
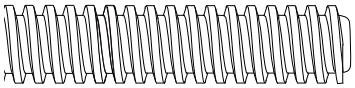





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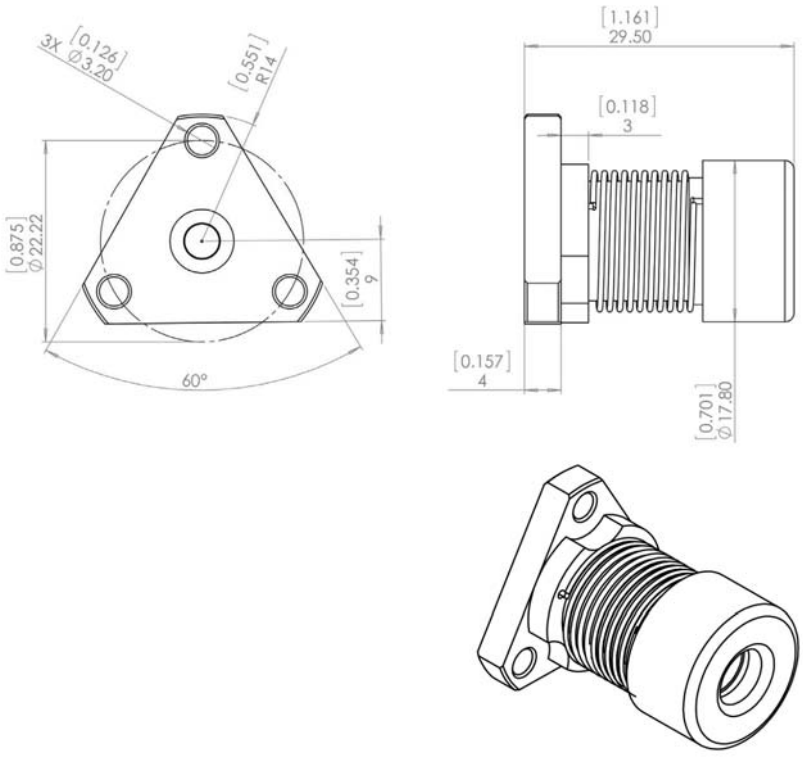
# Option & Anti-backlash Nut

## End Machining Option

| Standard Lead Screw End Machining | | |
|---|---|---|
|  | Threaded End | Metric End : M4 x 0.7mm<br>UNC End : 8-32 UNC |
|  | Smooth End | Ø4mm ±0.025<br>Ø0.1575˝ ±0.0010 |
|  | None | - |

| End Machining |
|---|
| Metric End : M6 x 1.0mm<br>UNC End : 8-32 UNC |

## Anti-backlash Nut



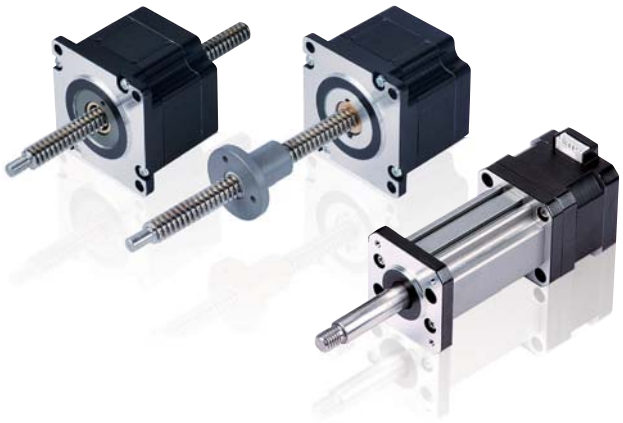



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# Motor Size(57mm)

## NEMA Size 23(57mm)
## Hybrid Motor Linear Actuators

The NEMA 23 hybrid precision linear actuator is capable of 200lbsF(890N) of continuous thrust. A Captive version is available in this frame size. Ball Screw versions are also available.



### 1. Parameters

Please contact FASTECH or your local FASTECH representative about custom products.

| Motor | Voltage (V) | Current (A) | Resistance (Ω) | Inductance (mH) | Lead Wire No. | Motor Length (mm) |
|---|---|---|---|---|---|---|
| 23-2110 | 6.4 | 1 | 6.4 | 16.4 | 4 | 45 |
| 23-2120 | 3.2 | 2 | 1.6 | 4.1 | 4 | 45 |
| 23-2130 | 2.1 | 3 | 0.7 | 1.7 | 4 | 45 |
| 23-2210 | 10.8 | 1 | 10.8 | 32 | 4 | 65 |
| 23-2225 | 4.2 | 2.5 | 1.7 | 5.2 | 4 | 65 |
| 23-2240 | 2.4 | 4 | 0.65 | 2 | 4 | 65 |

### 2. Available Lead Screws and Travel per Step

Please contact FASTECH or your local FASTECH representative about custom products.

| Screw Dia. (in.) | Screw Dia. (mm) | Lead (in.) | Lead (mm) | Lead Code | Travel Per Step @ 1.8 deg(mm)* | Travel Per Step @ 0.9 deg(mm)* |
|---|---|---|---|---|---|---|
| 0.375 | 9.525 | 0.025 | 0.635 | A | 0.003 | 0.0016 |
| 0.375 | 9.525 | 0.05 | 1.27 | D | 0.006 | 0.0032 |
| 0.375 | 9.525 | 0.0625 | 1.5875 | F | 0.0079375 | 0.0039688 |
| 0.375 | 9.525 | 0.083 | 2.1082 | H | 0.01 | 0.0053 |
| 0.375 | 9.525 | 0.1 | 2.54 | K | 0.012 | 0.0064 |
| 0.375 | 9.525 | 0.125 | 3.175 | L | 0.015 | 0.0079 |
| 0.375 | 9.525 | 0.167 | 4.2418 | P | 0.021 | 0.0106 |
| 0.375 | 9.525 | 0.2 | 5.08 | R | 0.025 | 0.0127 |
| 0.375 | 9.525 | 0.25 | 6.35 | S | 0.031 | 0.0159 |
| 0.375 | 9.525 | 0.375 | 9.525 | V | 0.047 | 0.0238 |
| 0.375 | 9.525 | 0.384 | 9.7536 | W | 0.048 | 0.0244 |
| 0.375 | 9.525 | 0.5 | 12.7 | Y | 0.063 | 0.0318 |
| 0.375 | 9.525 | 1 | 25.4 | Z | 0.127 | 0.0635 |

* Values truncated

### 3. NEMA 23 Custom Lead Screw DIA Available for

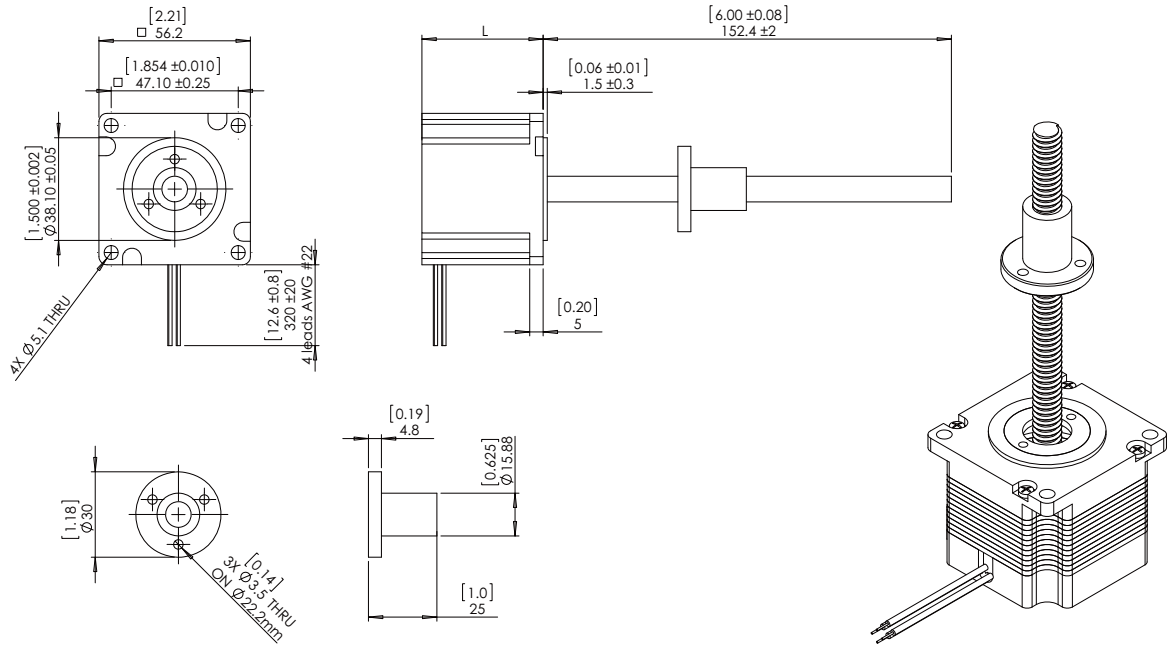
0.625" DIA shaft available with external shaft version



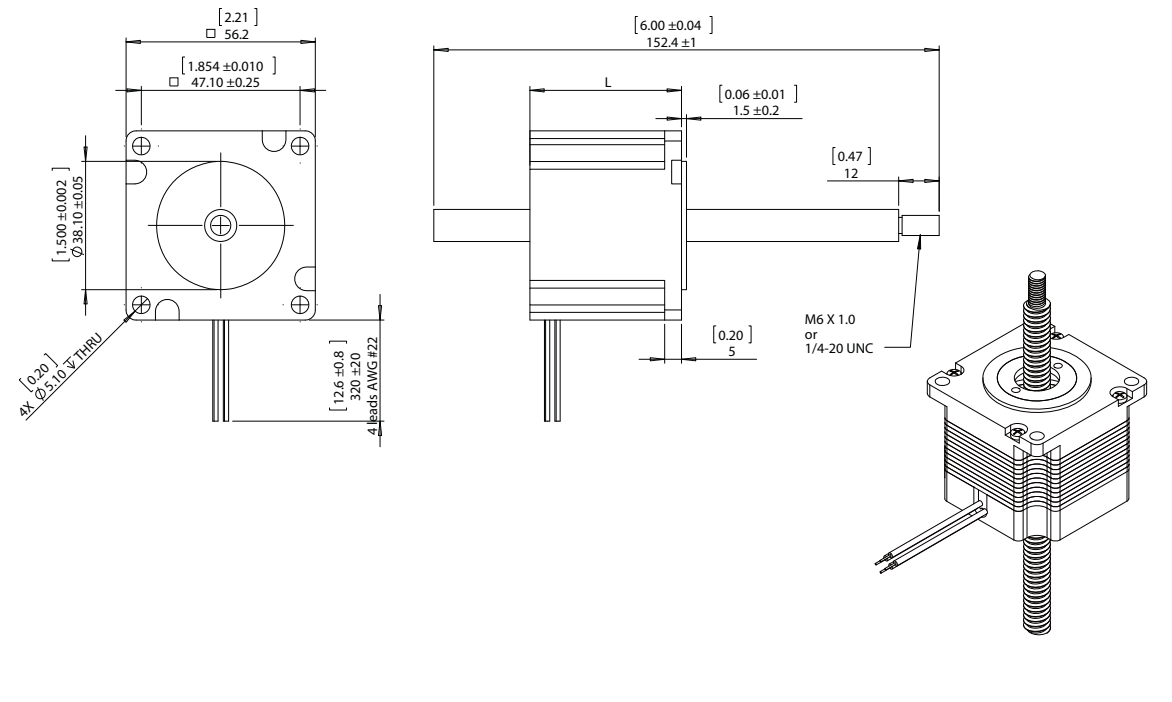
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# Dimensions

**NEMA Size 23 EXTERNAL Linear Actuator**

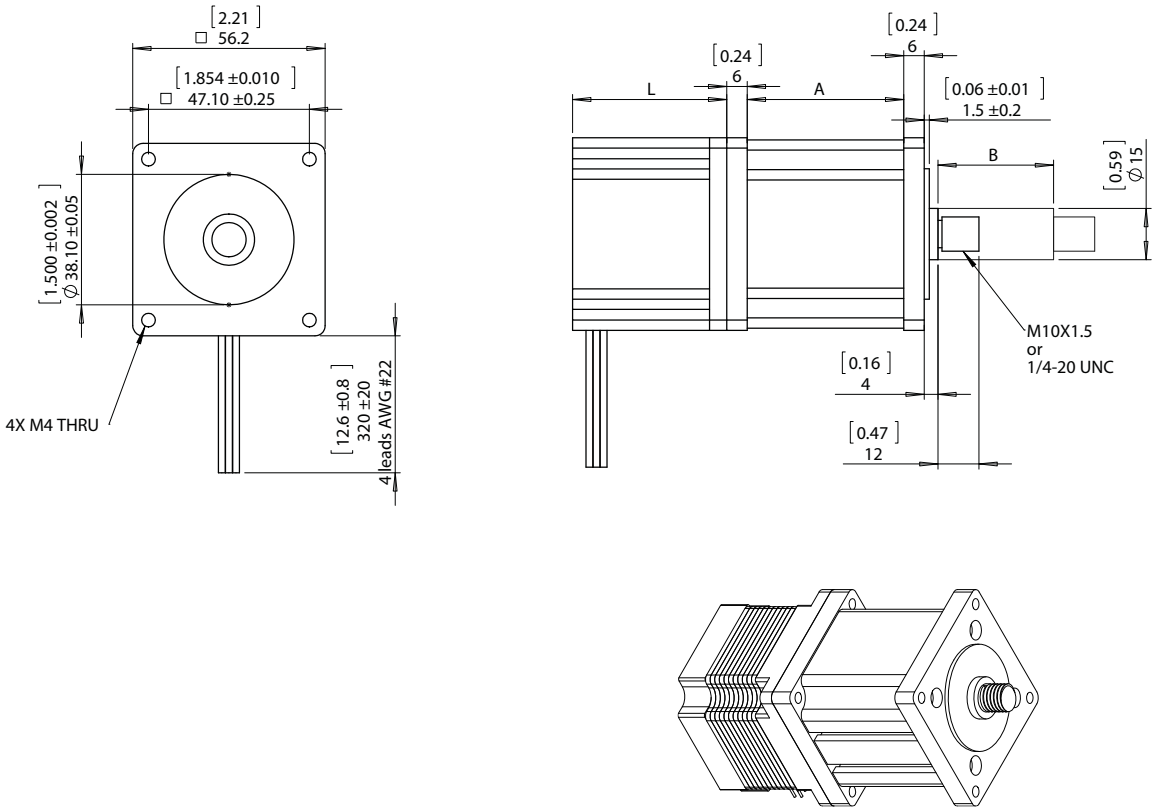



**NEMA Size 23 NON-CAPTIVE Linear Actuator**






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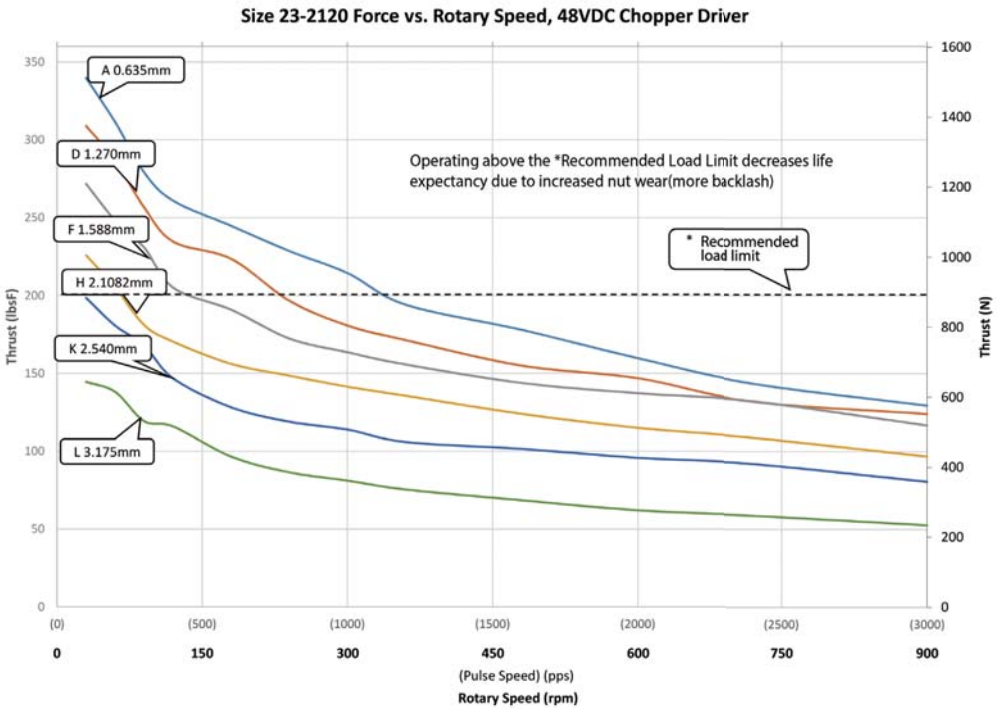

| Stroke B inch(mm) | Dimension A(mm) | Dimension L(mm) | |
|---|---|---|---|
| 0.5(12.7) | 45.7 | Single Stack Motor 47mm | Double Stack Motor 66mm |
| 0.75(19.05) | 52.05 | | |
| 1.0(25.4) | 58.4 | | |
| 1.25(31.8) | 64.8 | | |
| 1.5(38.1) | 71.1 | | |
| 2.0(50.8) | 83.8 | | |
| 2.5(63.5) | 96.5 | | |



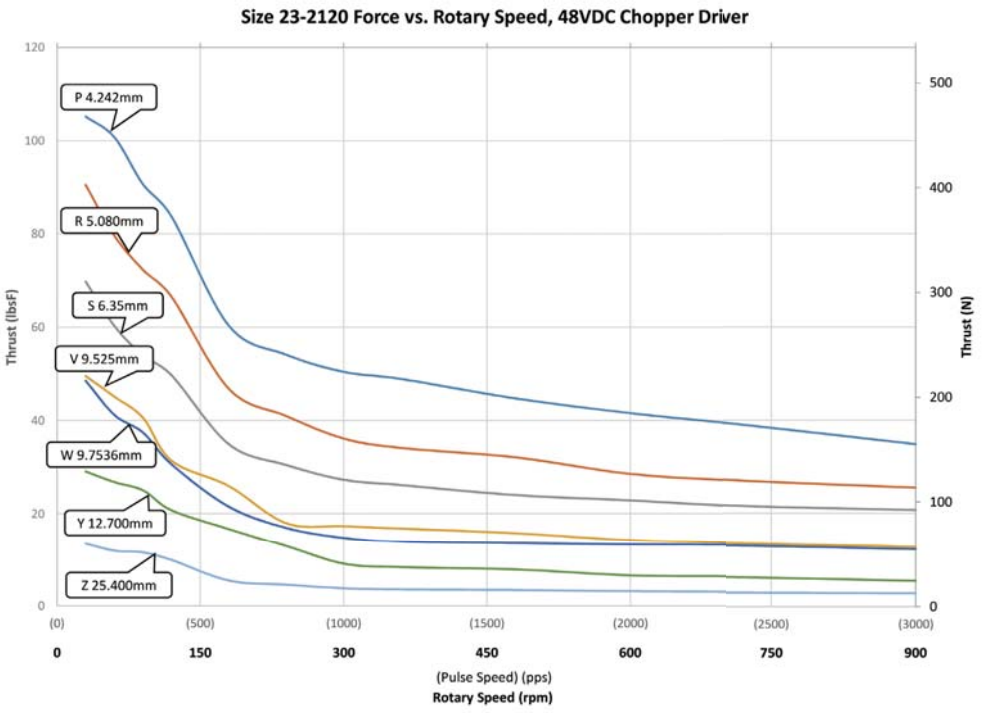
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# Speed Thrust Curves

**NEMA 23 Single-Stack Rotary Speed**



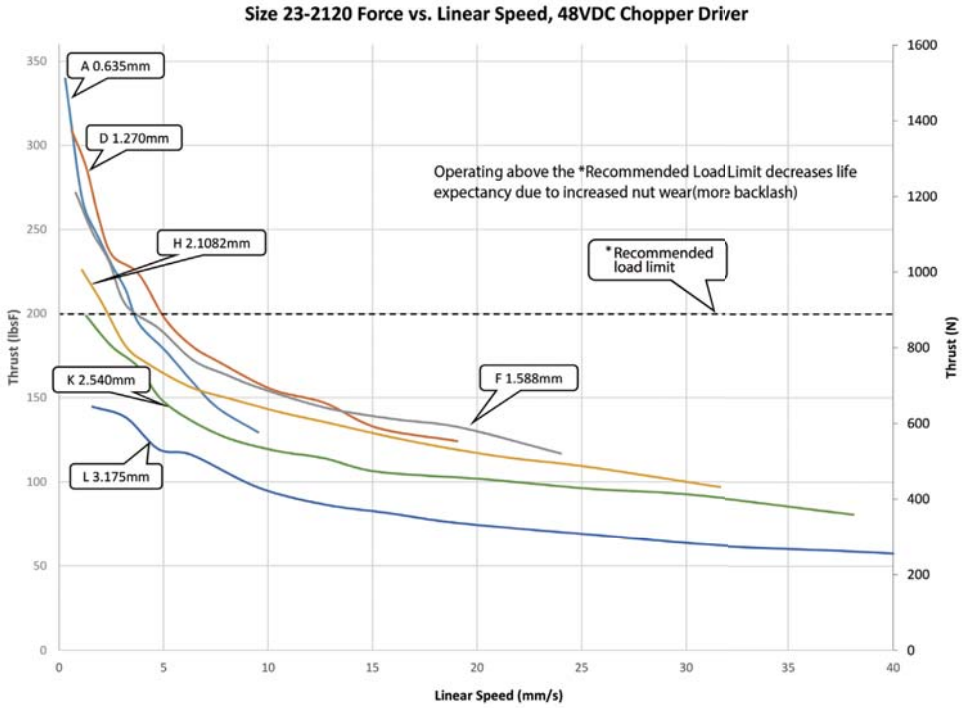

**NEMA 23 Single-Stack Rotary Speed**



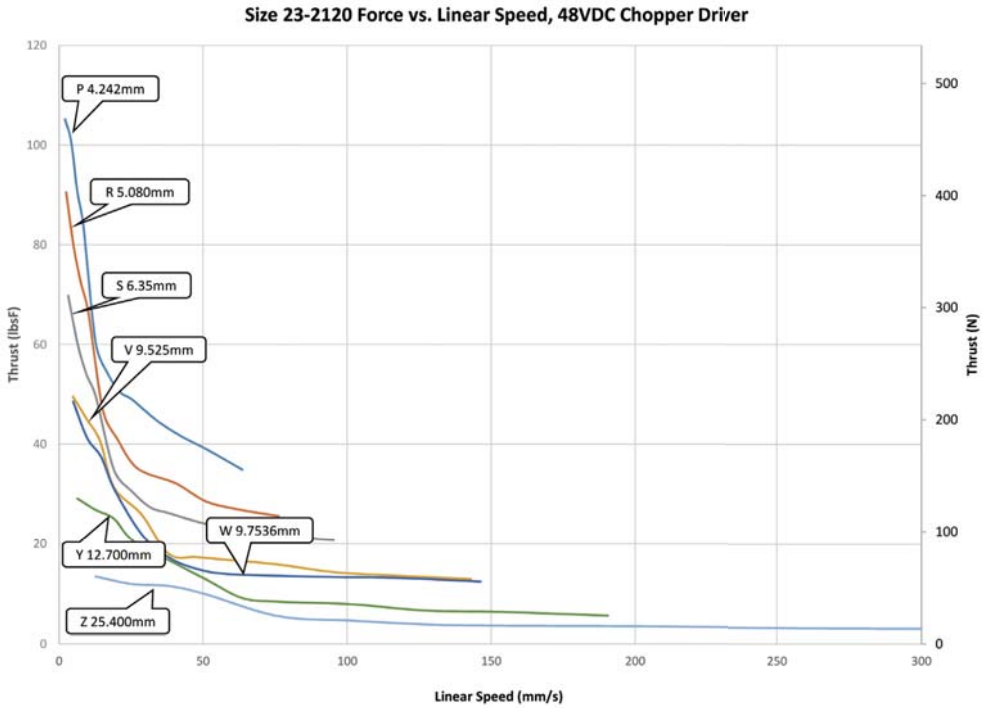



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## NEMA 23 Single-Stack Linear Speed



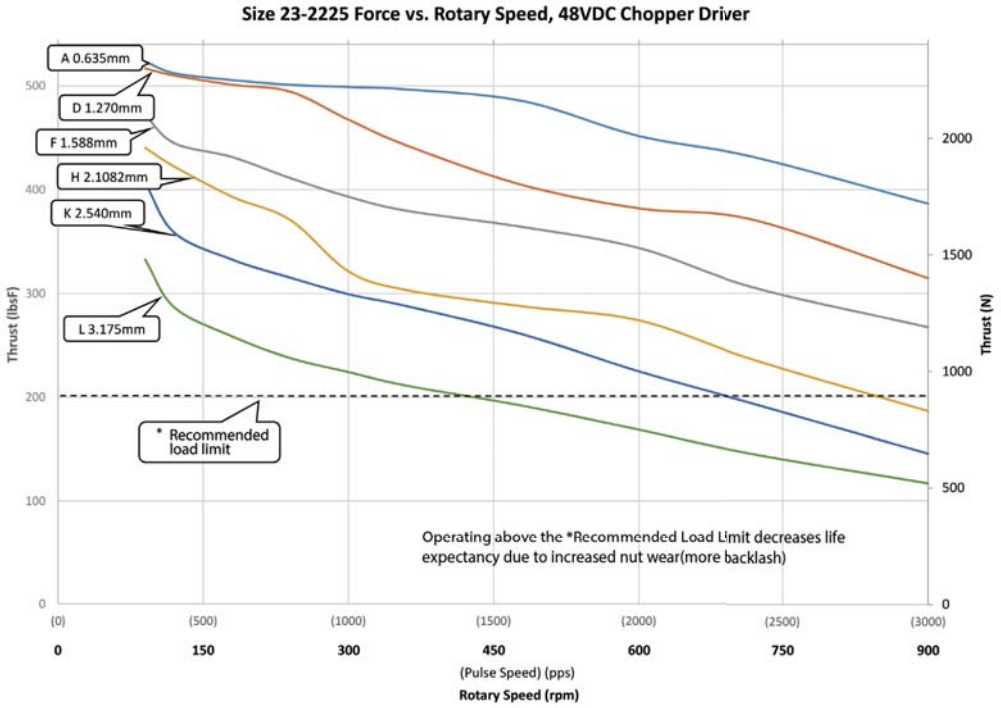

## NEMA 23 Single-Stack Linear Speed



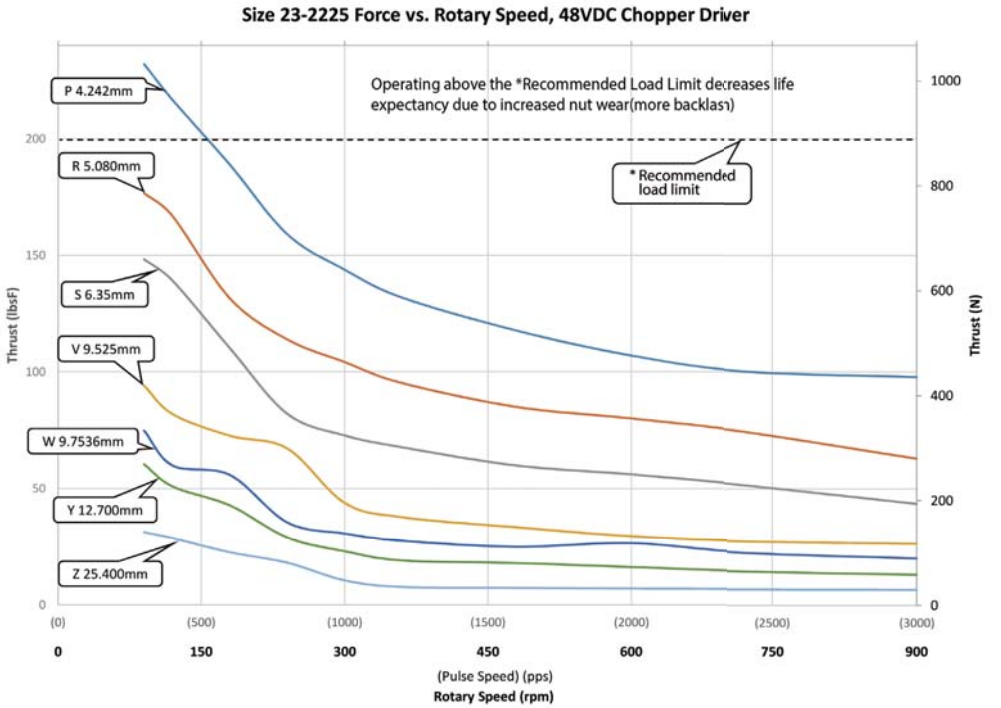



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## NEMA 23 Double-Stack Rotary Speed



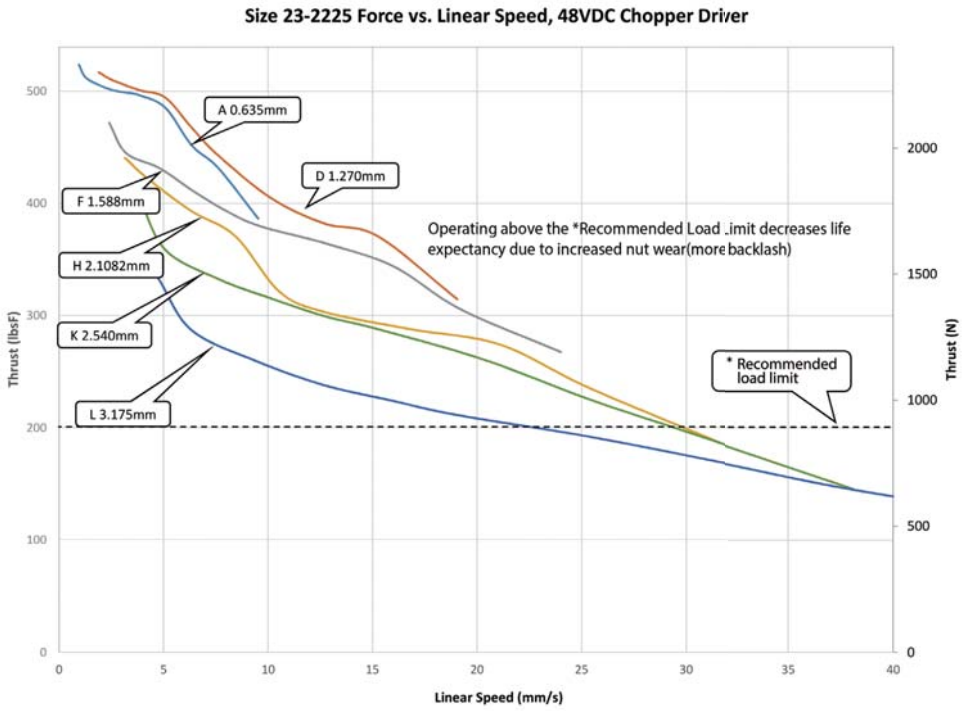

## NEMA 23 Double-Stack Rotary Speed



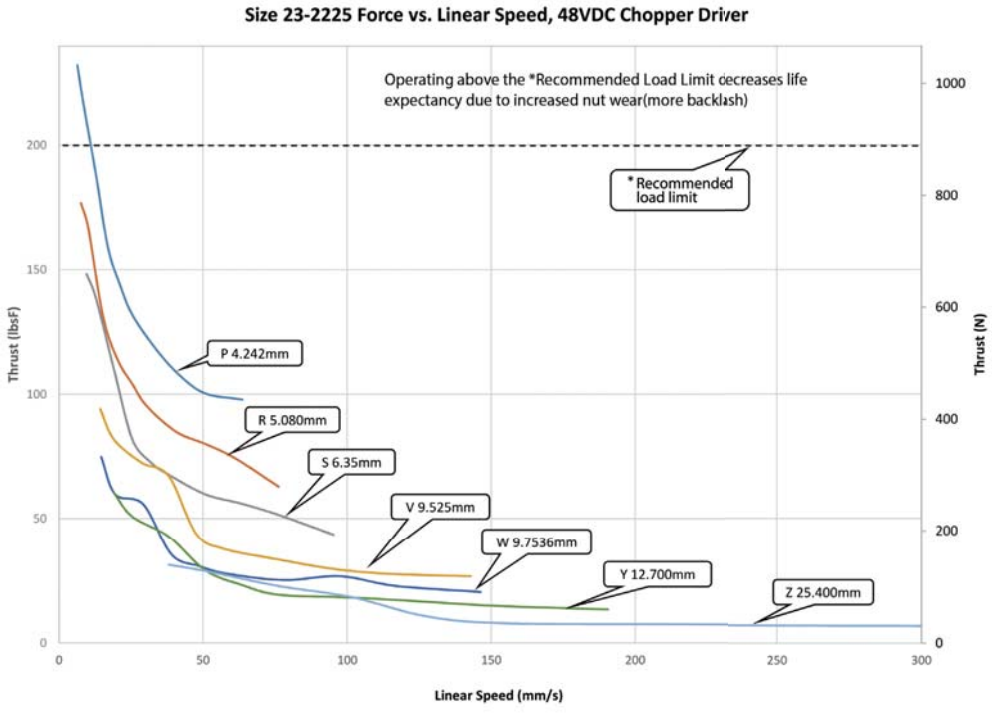



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## NEMA 23 Double-Stack Linear Speed




## NEMA 23 Double-Stack Linear Speed

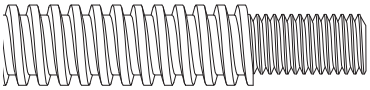
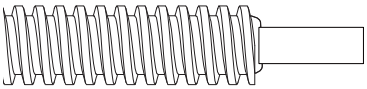
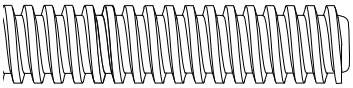





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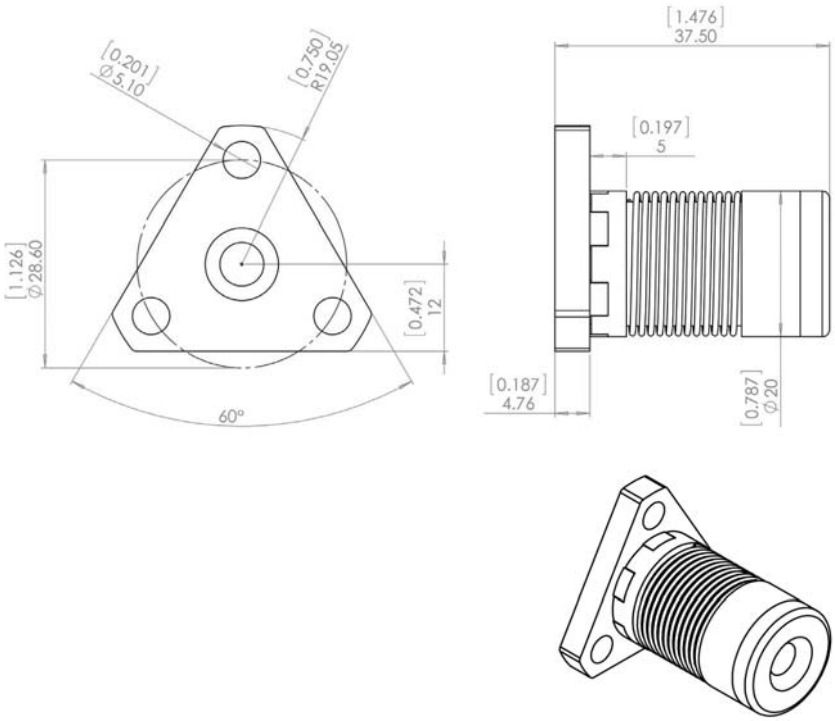
# Option & Anti-backlash Nut

## End Machining Option

| Standard Lead Screw End Machining | | |
|---|---|---|
|  | Threaded End | Metric End : M6 x 1.0mm<br>UNC End : 1/4-20 UNC |
|  | Smooth End | Ø6mm ±0.025<br>Ø0.2362″ ±0.0010 |
|  | None | - |

| End Machining |
|---|
| Metric End : M10 x 1.5mm<br>UNC End : 1/4-20 UNC |

## Anti-backlash Nut






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# Motor Size(86mm)

## NEMA Size 34(86mm)
## Hybrid Motor Linear Actuators

The NEMA 34 hybrid precision linear actuator is capable of 500lbsF(2,225N) of continuous thrust. Ball Screw versions are also available.



### 1. Motor Characteristics

Please contact FASTECH or your local FASTECH representative about custom products.

| Motor | Voltage (V) | Current (A) | Resistance (Ω) | Inductance (mH) | Lead Wire No. | Motor Length (mm) |
|---|---|---|---|---|---|---|
| 34-2113 | 12 | 1.3 | 9.2 | 71 | 4 | 76 |
| 34-2130 | 5.1 | 3 | 1.7 | 15 | 4 | 76 |
| 34-2155 | 2.85 | 5.5 | 0.52 | 4.5 | 4 | 76 |

### 2. Available Lead Screws and Travel per Step

Please contact FASTECH or your local FASTECH representative about custom products.

| Screw Dia. (in.) | Screw Dia. (mm) | Lead (in.) | Lead (mm) | Lead Code | Travel Per Step @ 1.8 deg(mm)* | Travel Per Step @ 0.9 deg(mm)* |
|---|---|---|---|---|---|---|
| 0.625 | 15.875 | 0.1 | 2.54 | K | 0.012 | 0.0051 |
| 0.625 | 15.875 | 0.125 | 3.175 | L | 0.015 | 0.0064 |
| 0.625 | 15.875 | 0.2 | 5.08 | R | 0.025 | 0.0102 |
| 0.625 | 15.875 | 0.25 | 6.35 | S | 0.031 | 0.0127 |
| 0.625 | 15.875 | 0.5 | 12.7 | Y | 0.0635 | 0.03175 |
| 0.625 | 15.875 | 1 | 25.4 | Z | 0.127 | 0.0508 |

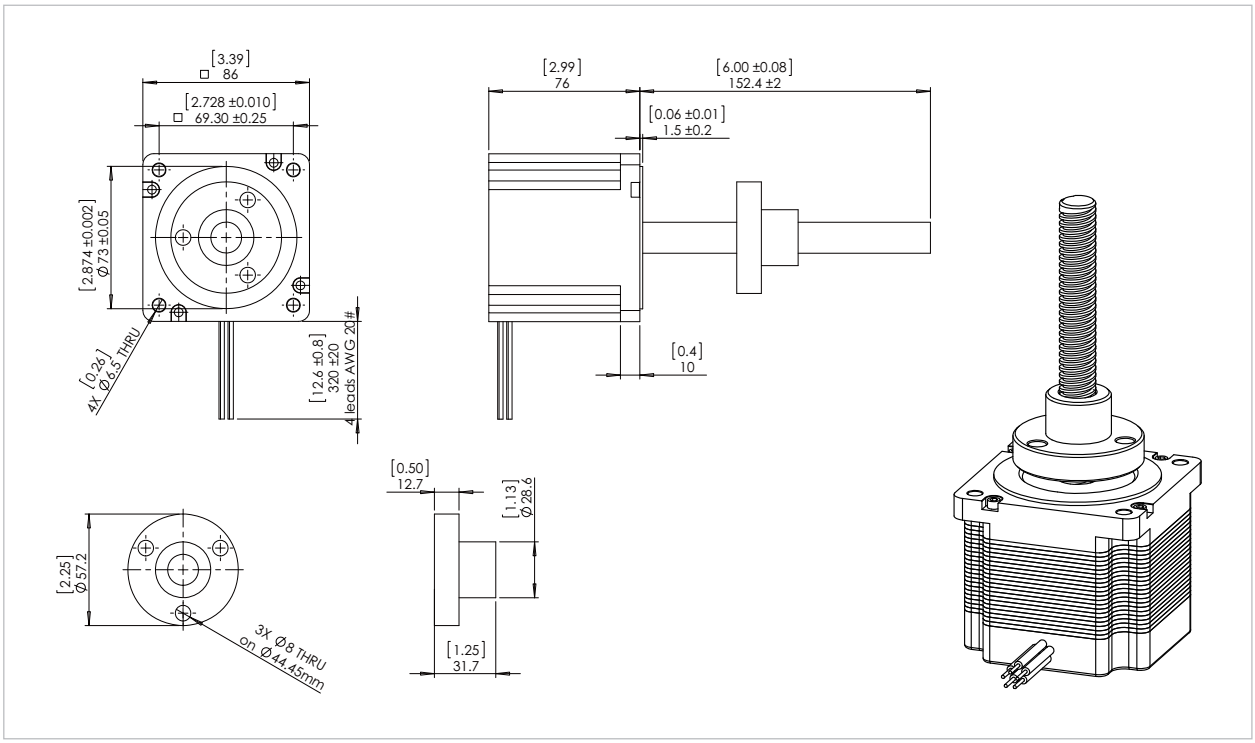
* Values truncated



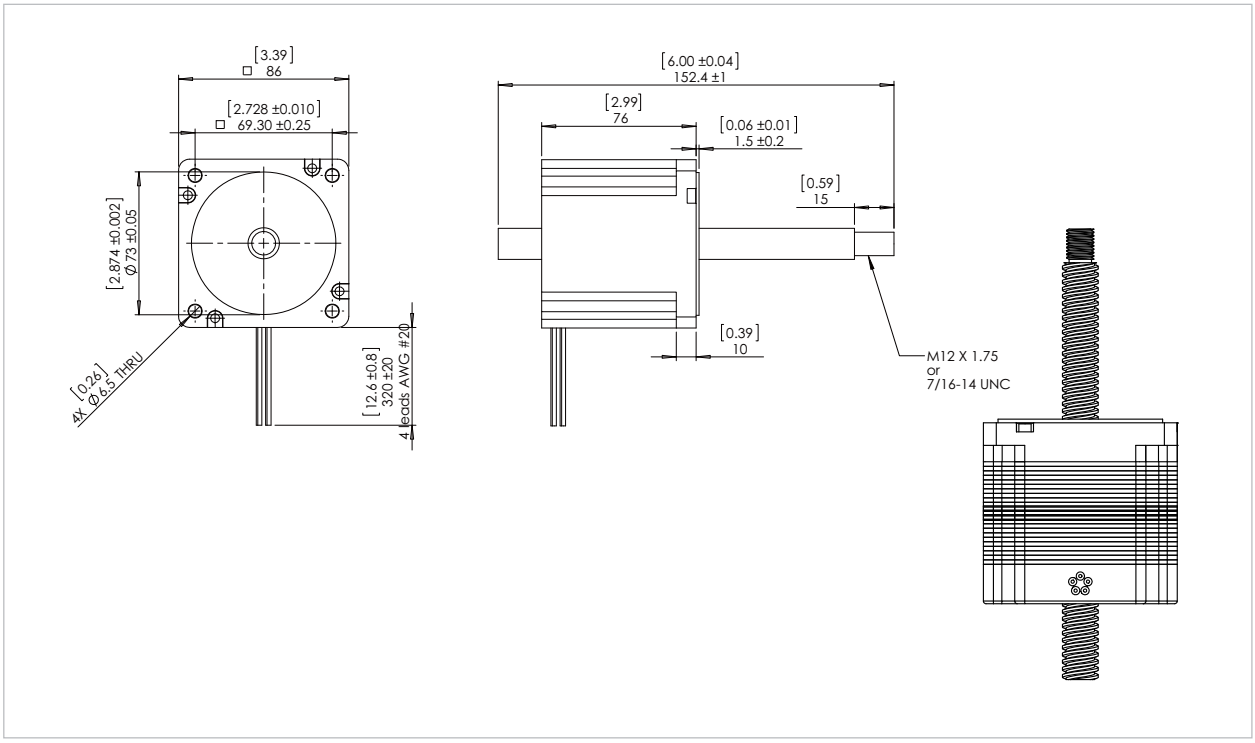
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# Dimensions

### NEMA Size 34 EXTERNAL Linear Actuator




### NEMA Size 34 NON-CAPTIVE Linear Actuator

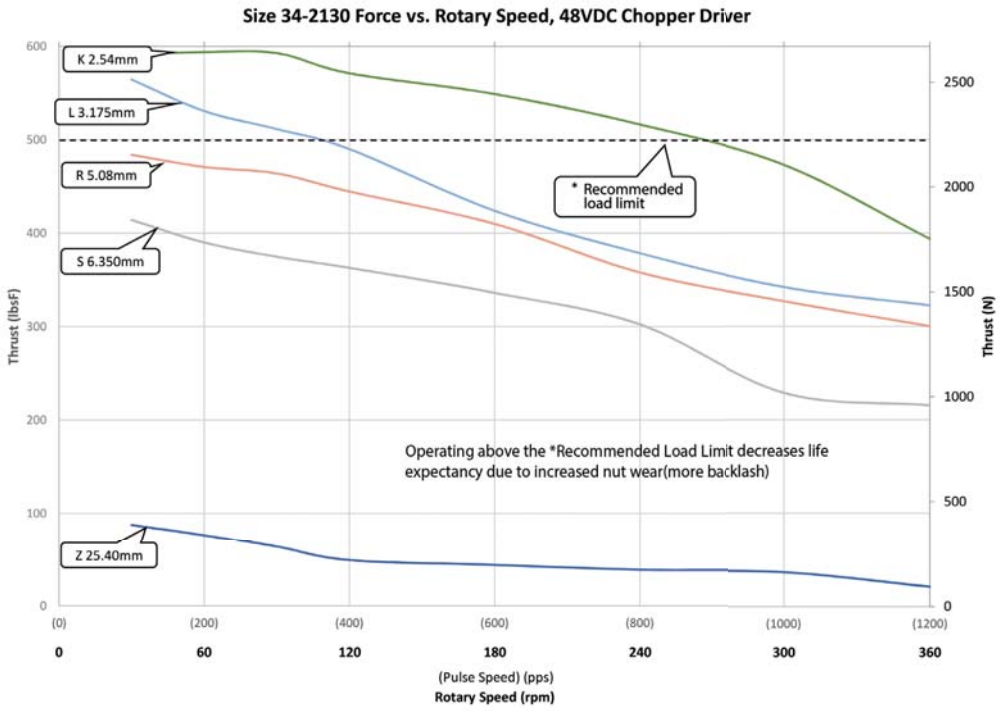




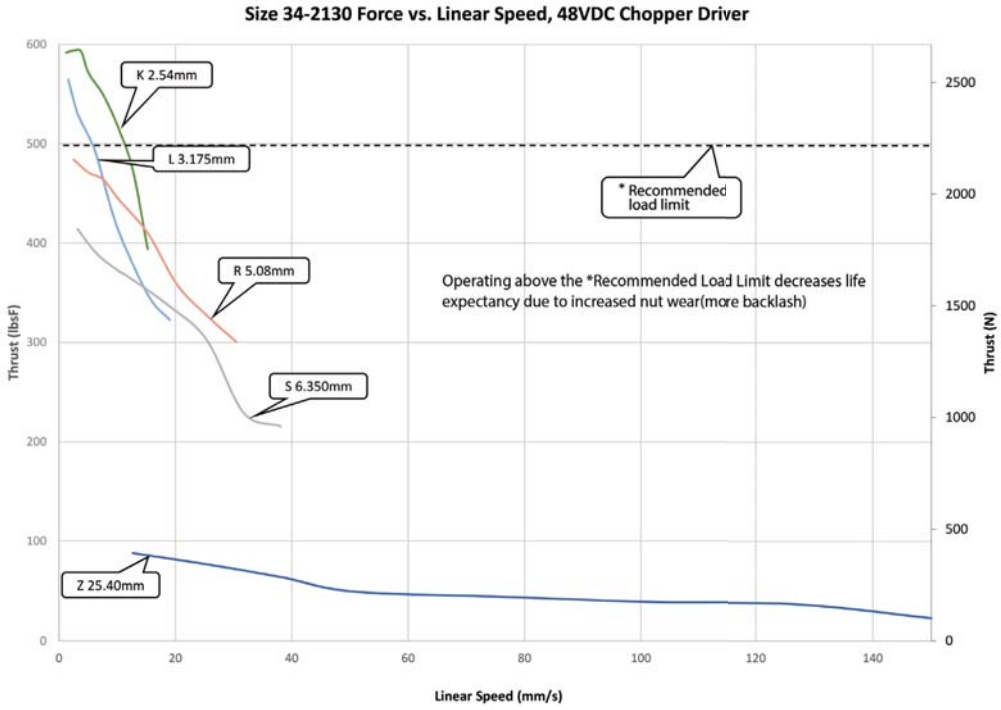

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# Speed Thrust Curves

### NEMA 34 Single-Stack Rotary Speed




### NEMA 34 Single-Stack Linear Speed

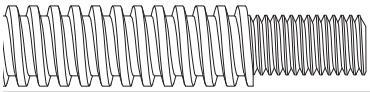
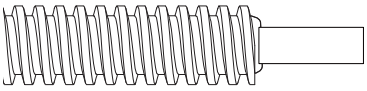
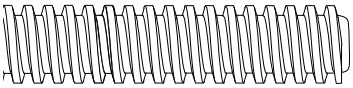





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# Option

## End Machining Option

| Standard Lead Screw End Machining | | |
|---|---|---|
|  | Threaded End | Metric End : M12 x 1.75mm<br>UNC End : 7/16-14 UNC |
|  | Smooth End | Ø12mm ±0.025<br>Ø0.4724″ ±0.0010 |
|  | None | - |



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# PM Stepper Motor Linear Actuators

## Product Profile

### 1. PM Motor Specification and Characteristic

| Motor Size (mm) | Max. Thrust (V) | Travel per Step (A) | Rated Power (Ω) |
|---|---|---|---|
| Ø20 | 23 | 0.00625 - 0.1667 | 3.4 |
| Ø25 | 65 | 0.00625 - 0.3333 | 3.9 |
| Ø36 | 115 | 0.0132 - 0.2117 | 5.6 |



### 2. PM Motor Available Lead Screws and Motor Combination Guideline

| Motor Size | Screw Dia. (mm) | Step Angle | Lead(mm) | Travel per Step(mm) | Lead Code |
|---|---|---|---|---|---|
| Ø20 | 3.5 | 7.5/15 | 0.3 | 0.00625 / 0.0125 | AF |
| | | 7.5/15 | 0.6096 | 0.0127 / 0.0254 | AA |
| | | 7.5/15 | 1.2192 | 0.0254 / 0.0508 | B |
| | | 7.5/15 | 2 | 0.0417 / 0.0833 | G |
| | | 7.5/15 | 4 | 0.0833 / 0.1667 | M |
| Ø25 | 3.5 | 7.5/15 | 0.3 | 0.00625 / 0.0125 | AF |
| | | 7.5/15 | 0.6096 | 0.0127 / 0.0254 | AA |
| | | 7.5/15 | 1.2192 | 0.0254 / 0.0508 | B |
| | | 7.5/15 | 2 | 0.0417 / 0.0833 | G |
| | | 7.5/15 | 4 | 0.0833 / 0.1667 | M |
| | | 7.5/15 | 8 | 0.1667 / 0.3333 | T |
| Ø36 | 4.775 | 7.5/15 | 0.635 | 0.0132 / 0.0265 | A |
| | | 7.5/15 | 1.27 | 0.0265 / 0.0529 | D |
| | | 7.5/15 | 2.54 | 0.0529 / 0.1058 | K |
| | | 7.5/15 | 5.08 | 0.1058 / 0.2117 | R |

## Part Numbering Method

**E 25 P 1 4 A 05 - 001 - X**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

**① Motor Type**
E = External drive
N = Non-captive drive
C = Captive drive

**② Motor Size**
20 / 25 / 36

**③ PM Motor Abbr.**

**④ Motor Step Angle**

**⑤ Motor Polarity**
4 = Bipolar / 6 = Unipolar

**⑥ Lead**
AF - T / AA - A
B - D / G - K
M - R

**⑦ Motor Winding Voltage**
05=5V / 12=12V

**⑧ Customer Code**

**⑨ Captive motor travel code**
1 / 2 / 3 / 4
Uncaptive motor-Blank

※ Example **Part No.** E25P14A05-00X
**Introduction** Ø25mm •External drive type motor •2 phase 7.5° •5V/phase • "A"lead(0.025˝/0.635 mm) •4 wires



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# 20PM Stepper Motor Linear Actuators

## Product Specification

### 1. Parameters

| | Ø20mm motor | | | |
|---|---|---|---|---|
| **Winding Type** | Bipolar | | | |
| **Motor Method** | Captive, Non-Captive, External Drive | | | |
| **Step Angle** | 7.5° | | 15° | |
| **Voltage** | 5V | 12V | 5V | 12V |
| **Current per phase** | 350mA | 160mA | 350mA | 160mA |
| **Resistance per phase** | 14Ω | 74.5Ω | 14Ω | 74.5Ω |
| **Inductance per phase** | 6.24mH | 31.2mH | 6.84mH | 37.8mH |
| **Power** | 3.38W | | | |
| **Rotator Inertia** | 1.05gcm² | | | |
| **Insulation class** | B Class | | | |
| **Insulation resistance** | 20MΩ | | | |
| **Weight** | 35g | | | |



### 2. Step Length Type

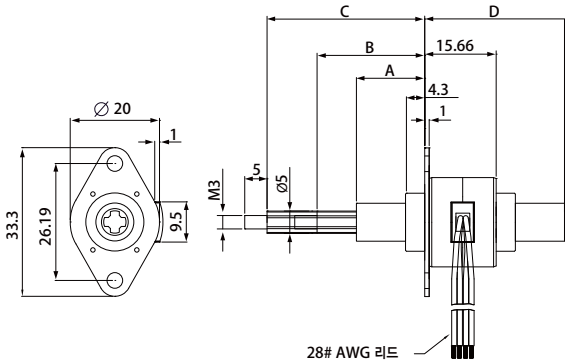
| Step Angle | Step Length | | Lead Code |
|---|---|---|---|
| | mm | inch | |
| 7.5° | 0.00625 | 0.00025 | AF |
| | 0.0127 | 0.00050 | AA |
| | 0.0254 | 0.00100 | B |
| | 0.0417 | 0.00200 | G |
| | 0.0833 | 0.00410 | M |
| 15° | 0.0125 | 0.0005 | AF |
| | 0.0254 | 0.00100 | AA |
| | 0.0508 | 0.00210 | B |
| | 0.0833 | 0.00410 | G |
| | 0.3333 | 0.00830 | M |



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# Motor Dimension and Examples

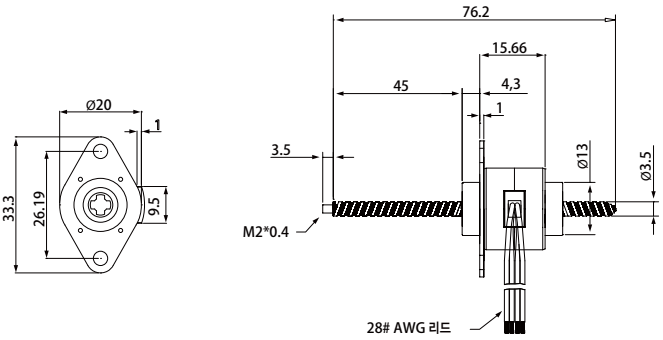
### 1. Captive Linear actuator





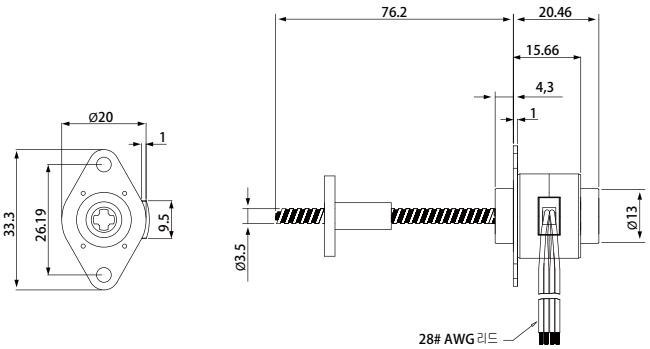

| Min. Stroke(mm) | Front Cover A | Retraction B | Stretch C | D(MAX) | Stroke Code |
|---|---|---|---|---|---|
| 14 | 14.75 ±0.25 | 19.99 ±0.64 | 33.76 ±0.38 | 28 | 1 |
| 18 | 20.05 ±0.25 | 25.25 ±0.64 | 43.76 ±0.38 | 33 | 2 |
| 25 | 27.05 ±0.25 | 32.23 ±0.64 | 57.76 ±0.38 | 40 | 3 |
| 31 | 33.05 ±0.25 | 38.23 ±0.64 | 69.76 ±0.38 | 46 | 4 |

### 2. Non-Captive Linear actuator






### 3. External Linear actuator

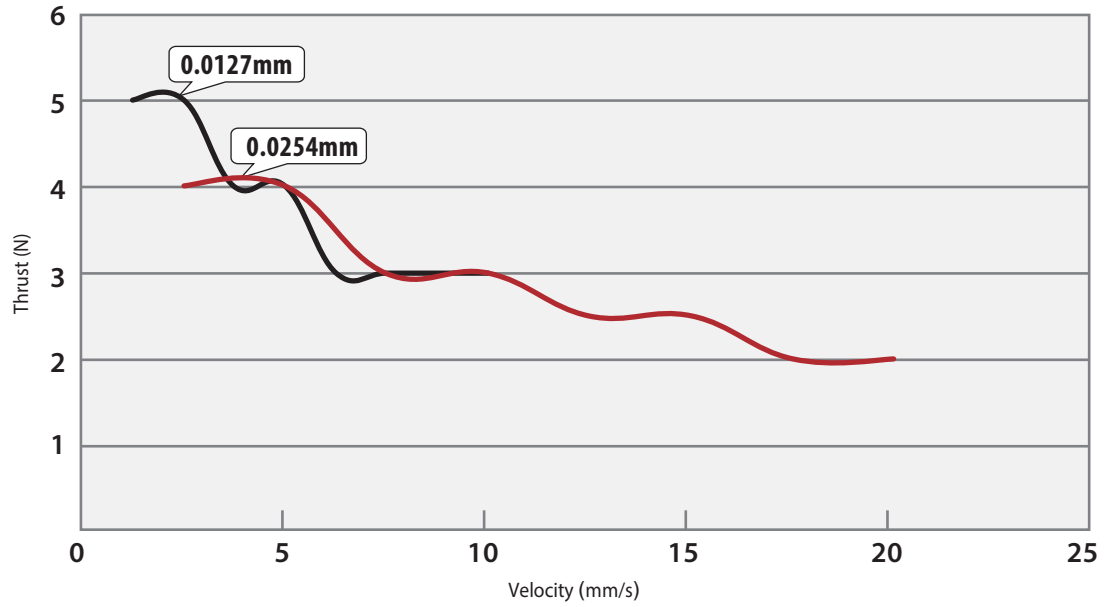




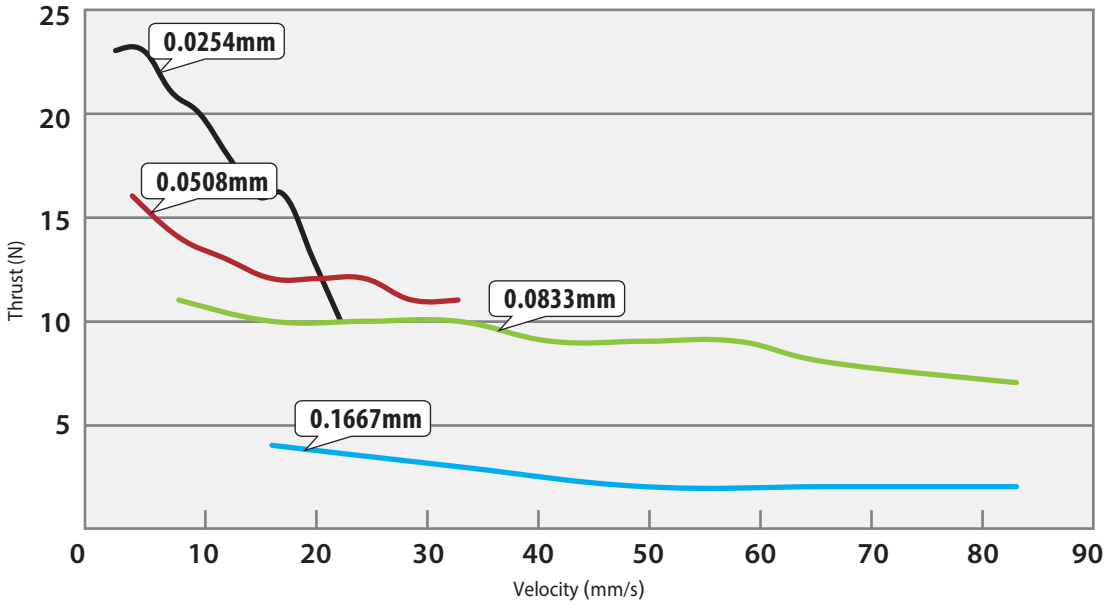



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**20PM Bipolar Motor(5V / 7.5°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**



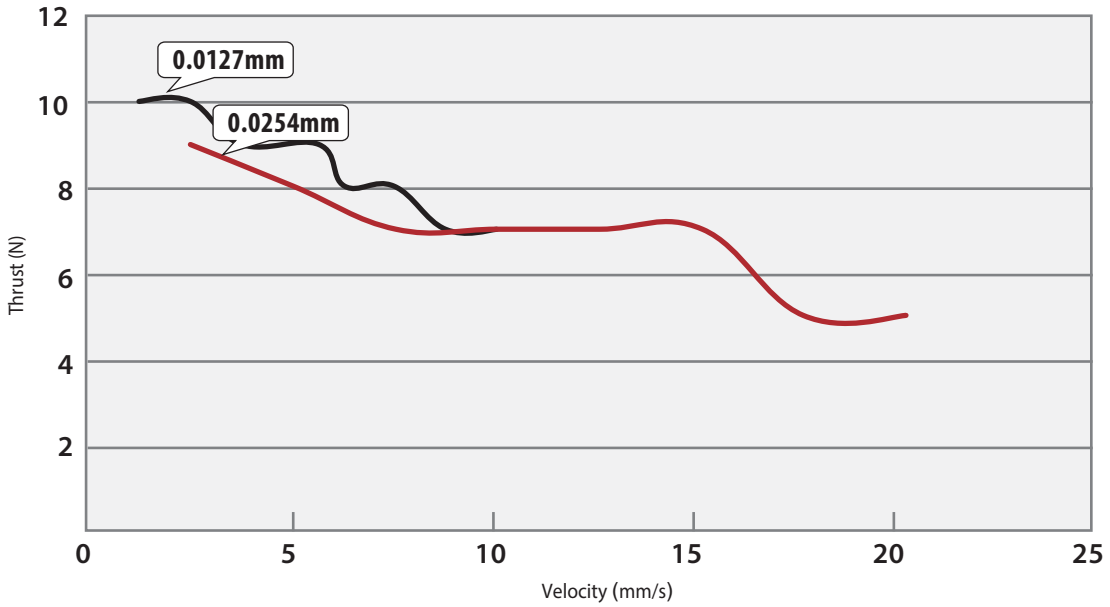

**20PM Bipolar Motor(5V / 15°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**



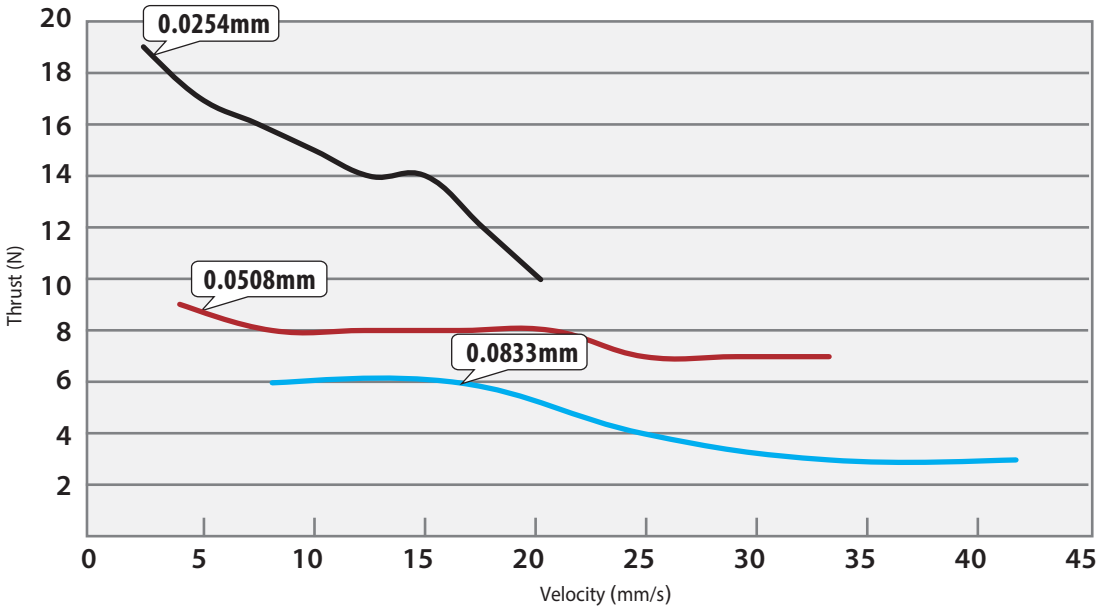



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**20PM Bipolar Motor(12V / 7.5°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**




**20PM Bipolar Motor(12V / 15°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**






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# 25PM Stepper Motor Linear Actuators

## Product Specification

### 1. Parameters

| | Ø25mm motor | | | |
|---|---|---|---|---|
| **Winding Type** | Bipolar | | | |
| **Motor Method** | Captive, Non-Captive, External Drive | | | |
| **Step Angle** | 5° | | 15° | |
| **Voltage** | 5V | 12V | 5V | 12V |
| **Current per phase** | 380mA | 160mA | 380mA | 160mA |
| **Resistance per phase** | 12.5Ω | 70Ω | 12.5Ω | 70Ω |
| **Inductance per phase** | 10.5mH | 60mH | 8.1mH | 50mH |
| **Power** | 3.8W | | | |
| **Rotator Inertia** | 1.05gcm$^2$ | | | |
| **Insulation class** | B Class | | | |
| **Insulation resistance** | 20MΩ | | | |
| **Weight** | 48g | | | |




### 2. Step Length Type

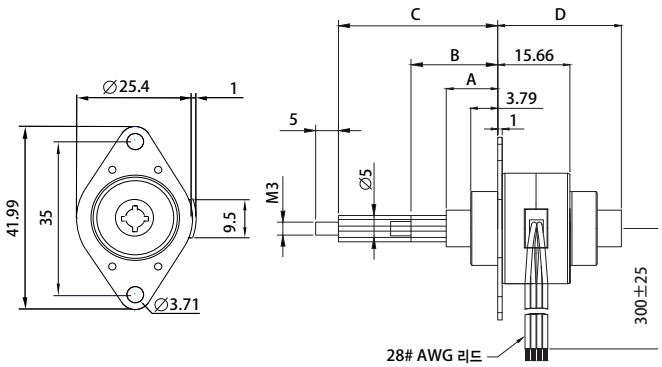
| Step Angle | Step Length | | Lead Code |
|---|---|---|---|
| | mm | inch | |
| 7.5° | 0.00625 | 0.00025 | AF |
| | 0.0127 | 0.0005 | AA |
| | 0.0254 | 0.001 | B |
| | 0.0417 | 0.0016 | G |
| | 0.0833 | 0.0033 | M |
| | 0.1667 | 0.0066 | T |
| 15° | 0.0125 | 0.0005 | AF |
| | 0.0254 | 0.001 | AA |
| | 0.0508 | 0.002 | B |
| | 0.0833 | 0.0033 | G |
| | 0.1667 | 0.0066 | M |
| | 0.3333 | 0.0131 | T |



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# Motor Dimension and Examples

### 1. Captive Linear actuator



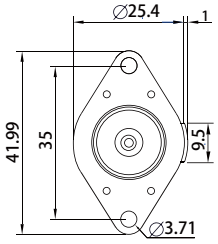


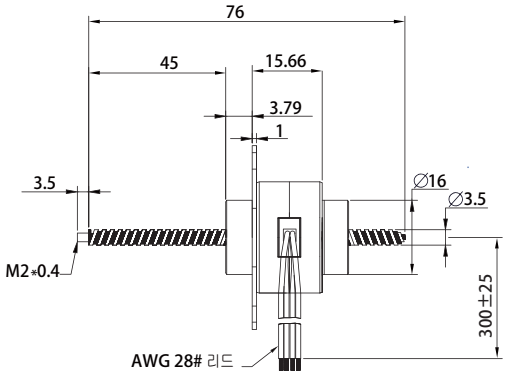


| Min. Stroke(mm) | Front Cover A | Retraction B | Stretch C | D(MAX) | Stroke Code |
|---|---|---|---|---|---|
| 14 | 12.89 ±0.25 | 19.99 ±0.64 | 33.76 ±0.38 | 28 | 1 |
| 18 | 17.28 ±0.25 | 25.25 ±0.64 | 43.76 ±0.38 | 33 | 2 |
| 25 | 24.26 ±0.25 | 32.23 ±0.64 | 57.76 ±0.38 | 40 | 3 |
| 31 | 30.25 ±0.25 | 38.23 ±0.64 | 69.76 ±0.38 | 46 | 4 |

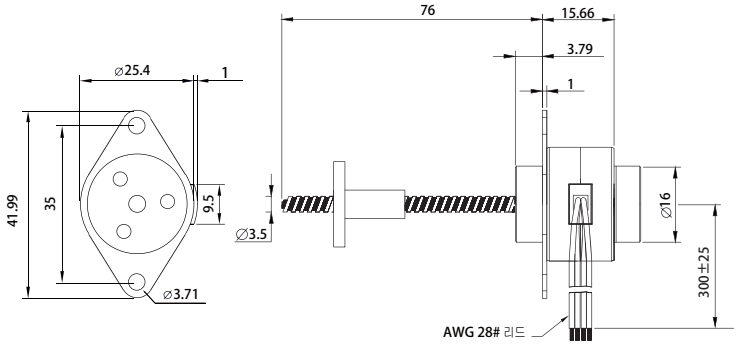
### 2. Non-Captive Linear actuator




### 3. External Linear actuator



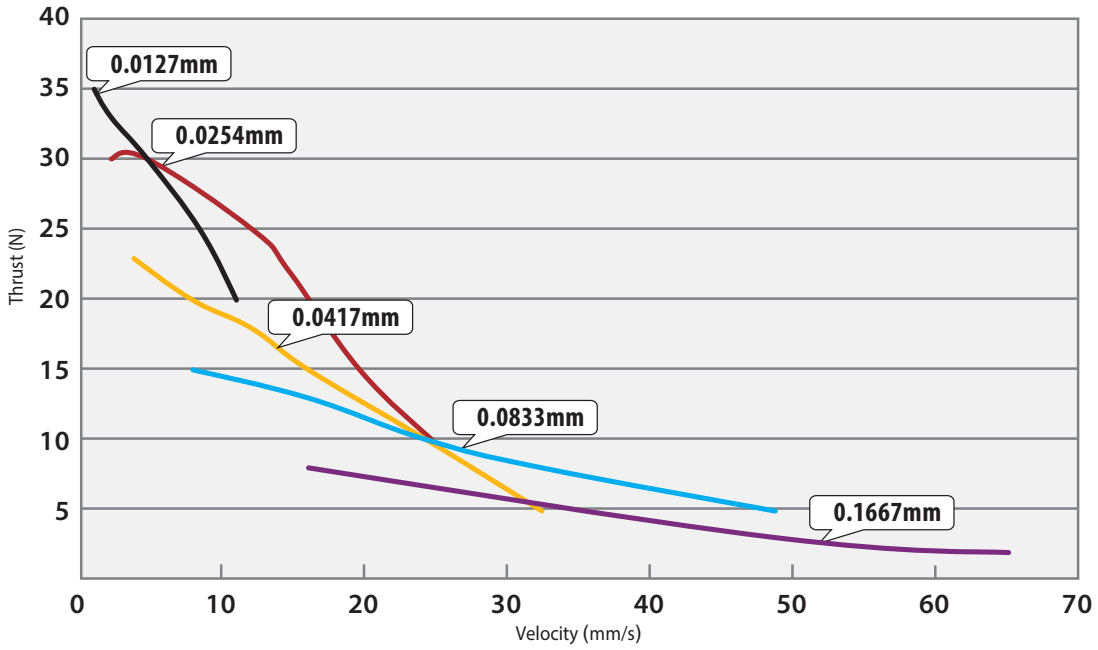




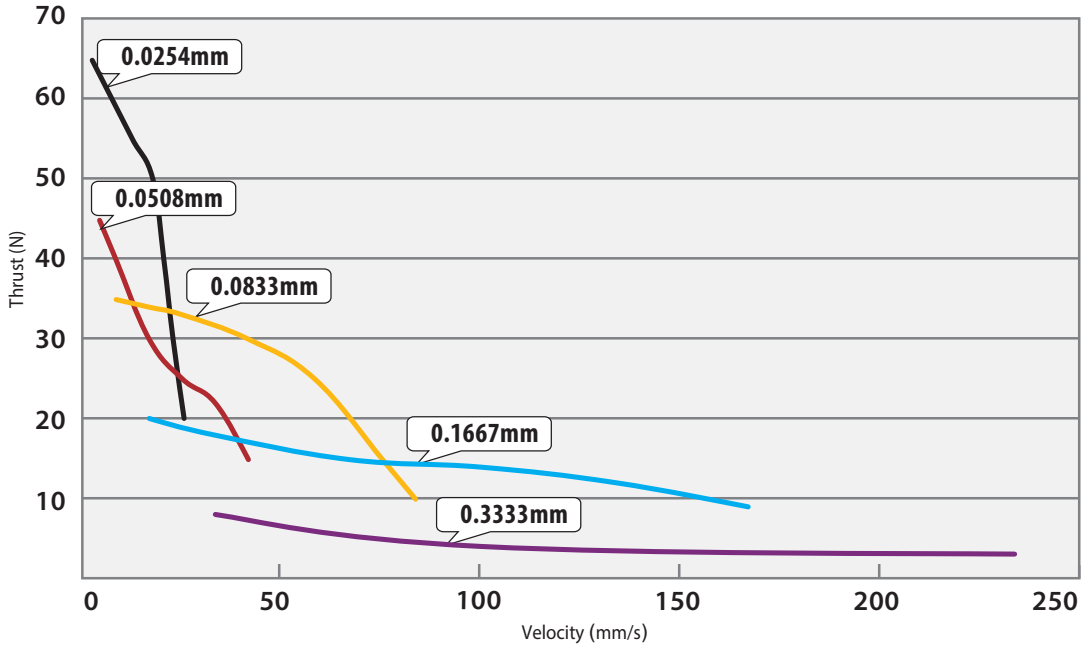


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**25PM Bipolar Motor(5V / 7.5°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**



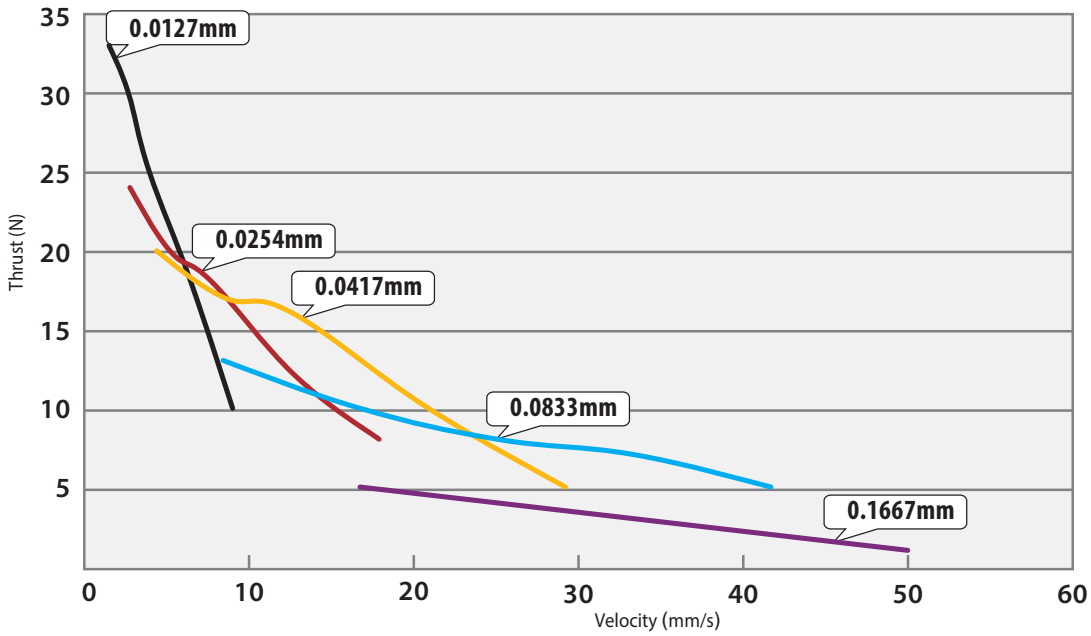

**25PM Bipolar Motor(5V / 15°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**



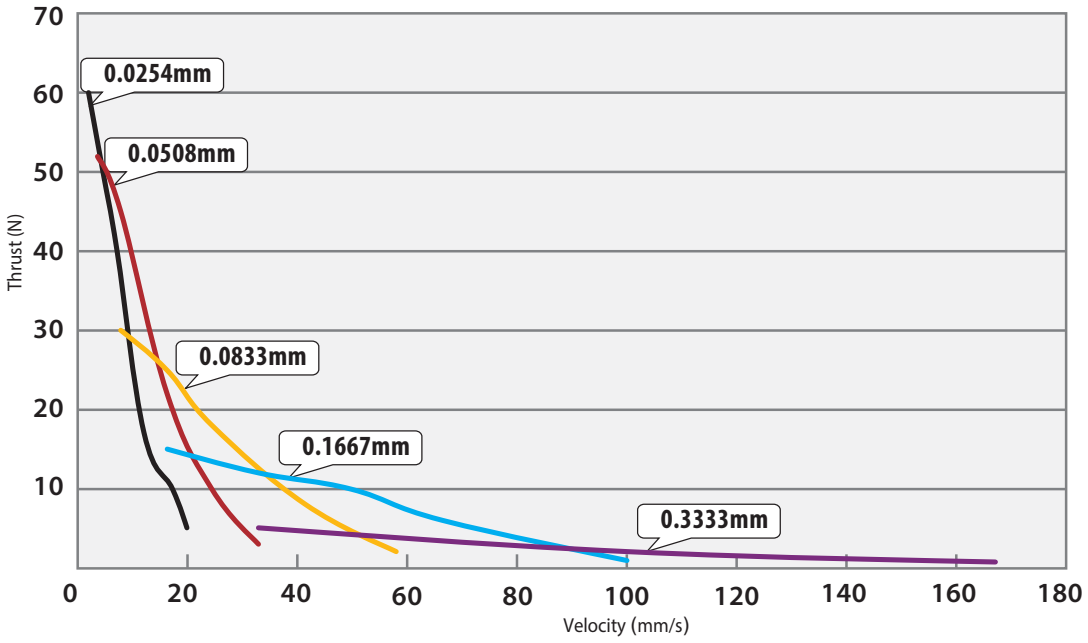



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**25PM Bipolar Motor(12V / 7.5°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**




**25PM Bipolar Motor(12V / 15°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**






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# 35PM Stepper Motor Linear Actuators

## Product Specification

### 1. Parameters

| | Ø35mm motor | | | |
|---|---|---|---|---|
| **Winding Type** | Bipolar | | | |
| **Motor Method** | Captive, Non-Captive, External Drive | | | |
| **Step Angle** | 7.5° | | 15° | |
| **Voltage** | 5V | 12V | 5V | 12V |
| **Current per phase** | 560mA | 230mA | 560mA | 230mA |
| **Resistance per phase** | 8.9Ω | 52Ω | 8.9Ω | 52Ω |
| **Inductance per phase** | 11.6mH | 65mH | 8.5mH | 46mH |
| **Power** | 56W | | | |
| **Rotator Inertia** | 8.5gcm$^2$ | | | |
| **Insulation class** | B Class | | | |
| **Insulation resistance** | 20MΩ | | | |
| **Weight** | 50g | | | |



### 2. Step Length Type

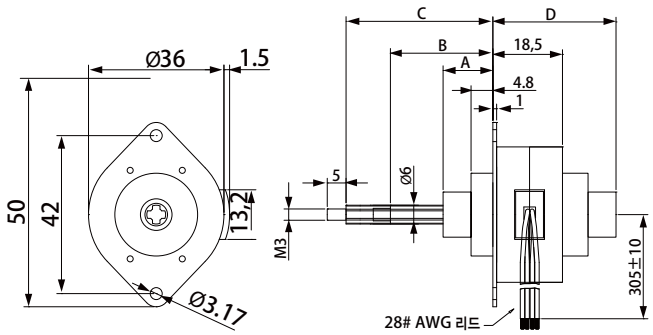
| Step Angle | Step Length | | Lead Code |
|---|---|---|---|
| | mm | inch | |
| 7.5° | 0.0132 | 0.0005 | A |
| | 0.0265 | 0.001 | D |
| | 0.0529 | 0.002 | K |
| | 0.1058 | 0.0041 | R |
| 15° | 0.0265 | 0.001 | A |
| | 0.0529 | 0.0021 | D |
| | 0.1058 | 0.0041 | K |
| | 0.2117 | 0.0083 | R |



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# Motor Dimension and Examples

### 1. Captive Linear actuator

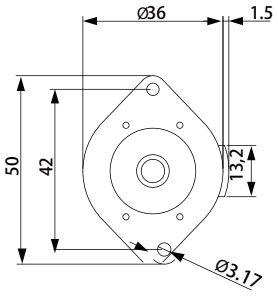


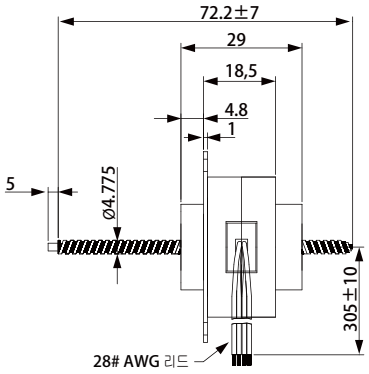



| Min. Stroke(mm) | Front Cover A | Retraction B | Stretch C | D(MAX) | Stroke Code |
|---|---|---|---|---|---|
| 16 | 13.67 ±0.25 | 17.2 ±0.64 | 34.24 ±0.38 | 33 | 1 |
| 25 | 26.37 ±0.25 | 29.9 ±0.64 | 56.94 ±0.38 | 46 | 2 |
| 38 | 39.07 ±0.25 | 39.07 ±0.64 | 85.04 ±0.38 | 59 | 3 |

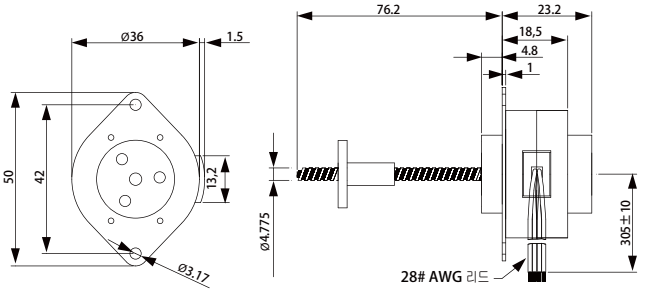
### 2. Non-Captive Linear actuator






### 3. External Linear actuator

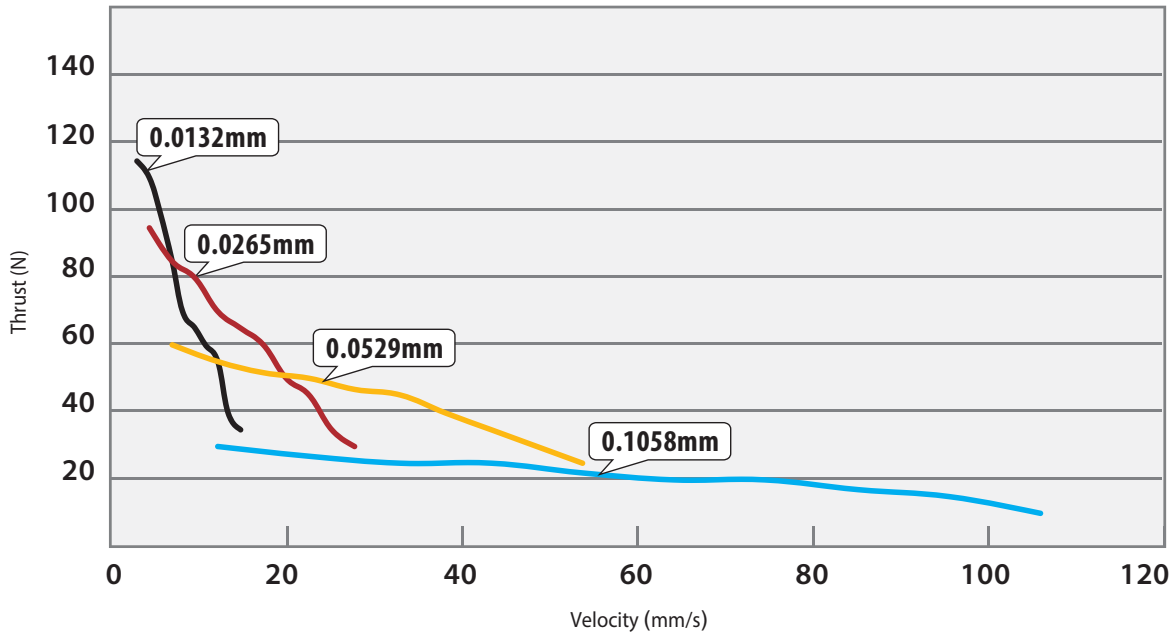




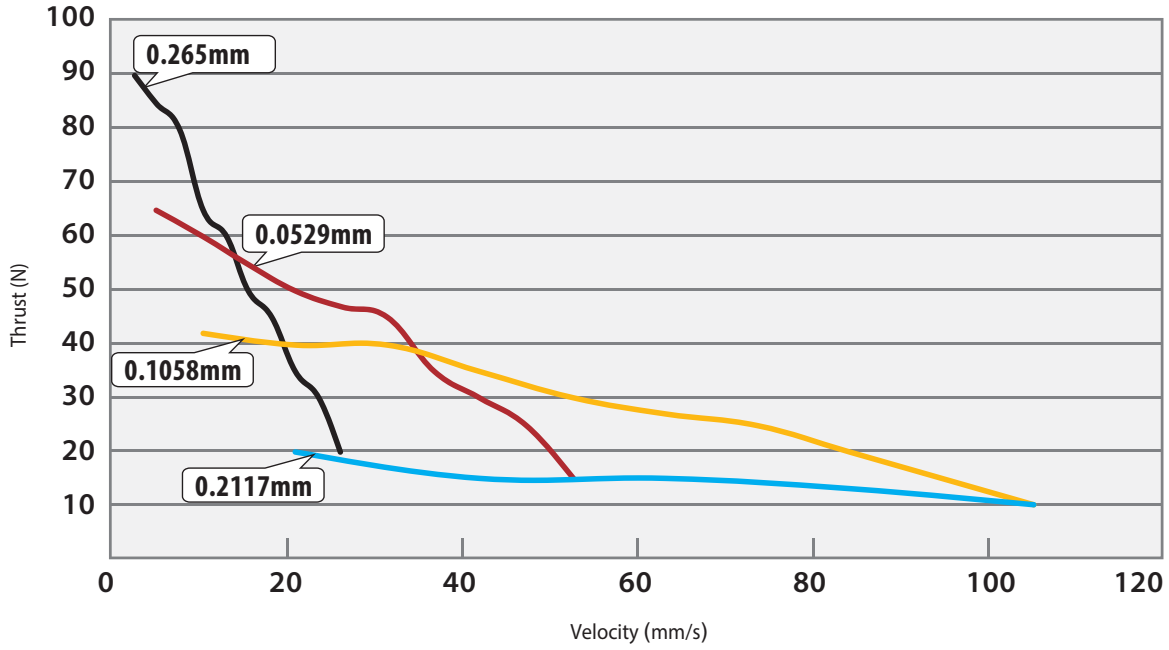



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**35PM Bipolar Motor(5V / 7.5°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**



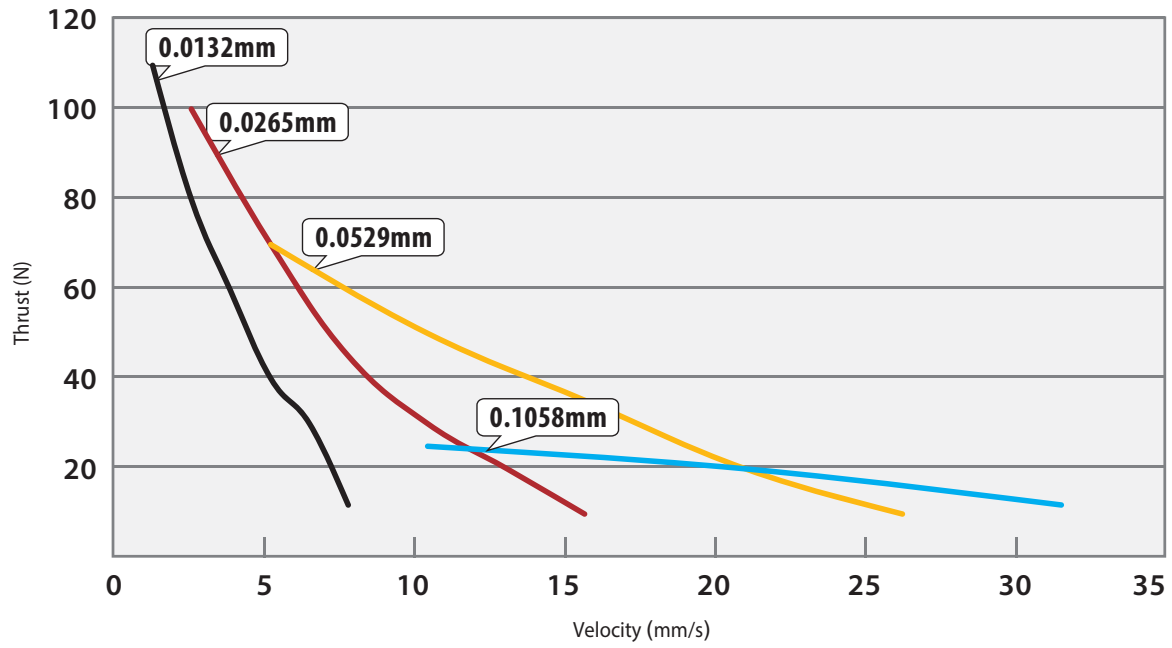

**35PM Bipolar Motor(5V / 15°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**



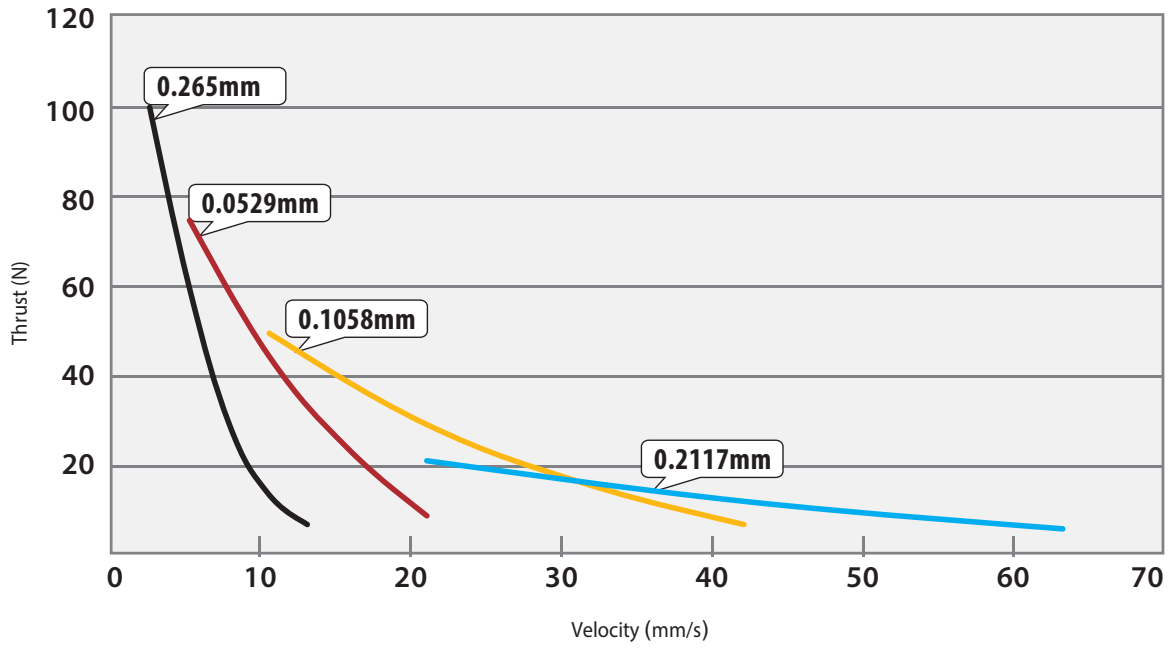



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**35PM Bipolar Motor(12V / 7.5°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**




**35PM Bipolar Motor(12V / 15°) Thrust and Linear Velocity Curve, 24VDC Constant-current Drive**






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# Glossary

| | |
|---|---|
| **Accuracy** | The difference between the actual distance travelled versus the theoretical distance travelled based on the lead |
| **Axial Load** | A load that is exerted at the center line of the screw |
| **Backdriving** | Freewheeling of the nut and screw as a result of the load pushing axially on the screw |
| **Backlash** | The relative axial movement between the screw and nut |
| **Chopper Drive** | A constant current drive is usually bipolar. The chopper drive gets its name from the technique of rapidly switching the power on and off to control motor current. A chopper drive allows a step motor to maintain greater torque of force at higher speeds. |
| **Column Strength** | The ability of a screw to withstand a load in compression |
| **Critical Speed** | The rotational speed of the screw at which the first harmonic of resonance is reached |
| **Drag Torque** | The amount of torque to overcome the friction of a system |
| **Dynamic Load** | Load applied to the screw while in motion |
| **Efficiency** | The ability of a mechanical system to translate an input to an equal output |
| **Fixity(End)** | The method by which the ends of the screw secured or supported |
| **Lead** | The linear travel at one revolution of the screw |
| **Left Hand Thread** | Counter clockwise rotation |
| **Pitch** | The axial distance between threads |
| **Radial Load** | A load exerted at 90 degrees or perpendicular to a screw |
| **Repeatibility** | The capability of a screw and nut system to reach the same commanded position continously |
| **Rerolution** | Incremental linear distance the actuator's(motor) output shaft will move per input pulse |
| **Resonance** | Vibration occuring when a system is a mechanical system is in an unstable range |
| **Right Hand Thread** | Clockwise rotation |
| **Sideloading** | Same as a radial load(very undesirable) |
| **Static Load** | Load applied to the screw at standstill |
| **Straightness** | Linear uniformity of a screw |
| **Total Indicated Runout** | A measurement of the amount of straightness of a screw |
| **Ttavel per Step** | Linear translation of one full step of the motor |



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