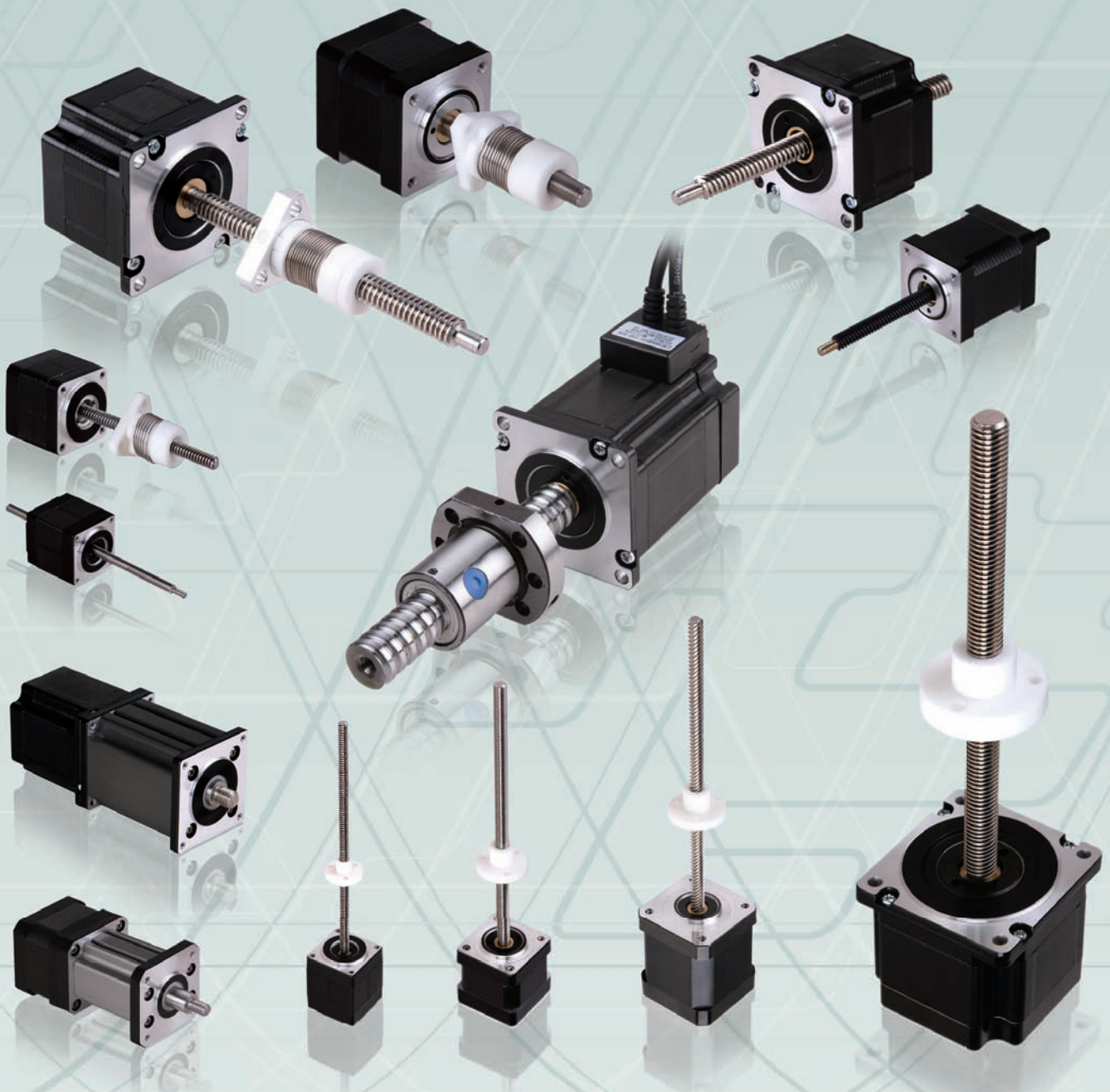
KOCO MOTION

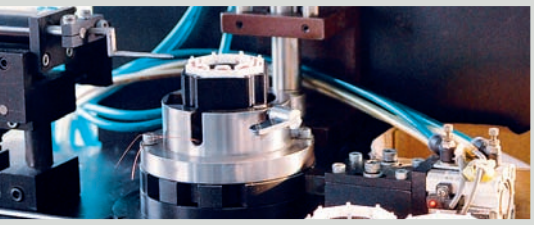
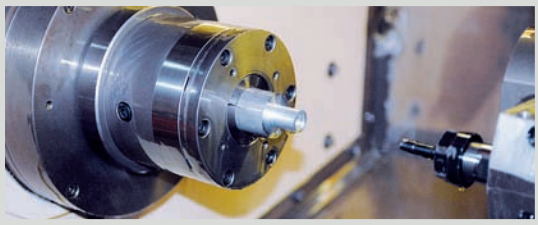
... Intelligence in motion

Precision Hybrid Stepper Linear Actuator Systems

DINGS'



www.kocomotionus.com


Who is Koco Motion US LLC / DINGS'

Koco Motion US LLC and DINGS' are business partners in North America. We have manufacturing facilities in BOTH China and San José, California. These facilities provide a supply chain that allows us to deliver quality, cost effective product solutions to our North American OEM customers in an efficient, time-sensitive manner. Our ability to build products literally "from the ground up" allows flexibility to provide a broad range of CUSTOM solutions for our OEM customers' diverse application requirements.

Our San José, California manufacturing facility serves as our product completion "hub" for North America. Our precision lead screws are "ROLLED" per customer specifications. Once complete, the lead screws are carefully assembled into motors manufactured and delivered to San José by our Shanghai, China facility. The motor assemblies are then fully tested and inspected per our quality system.

Our patented ServoTrack™ Driver / Controller products are designed and assembled in California. See pages 6–8.

San José, California Manufacturing Facility

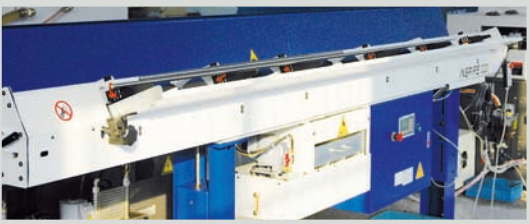
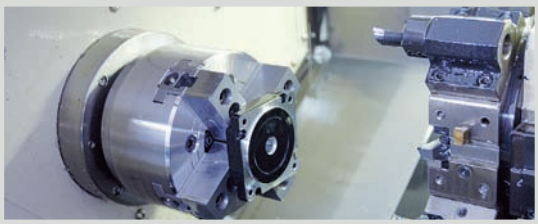
ISO 9001-2008 Certification

LLOYD'S REGISTER QUALITY ASSURANCE · ISO9001

UKAS MANAGEMENT SYSTEMS 001

CE

RoHS compliant



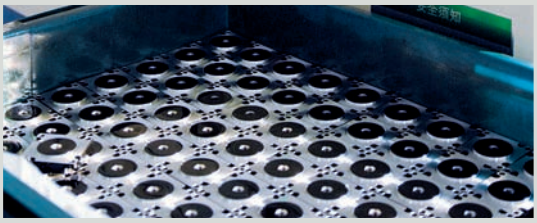
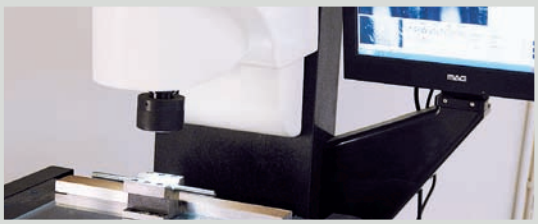
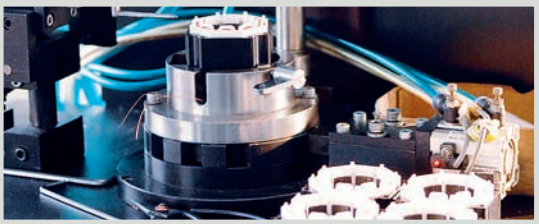



TABLE OF CONTENTS

WARRANTY

Twenty Four Month Limited Warranty

Seller warrants its products delivered hereunder to conform to stated specifications and to be free from defects in materials and workmanship. This warranty shall not apply to any product which shall have been improperly installed or subjected to misuse or neglect or which has been repaired or altered except by seller's accredited representative, nor to any product which has been subjected to accident.

DISCLAIMER

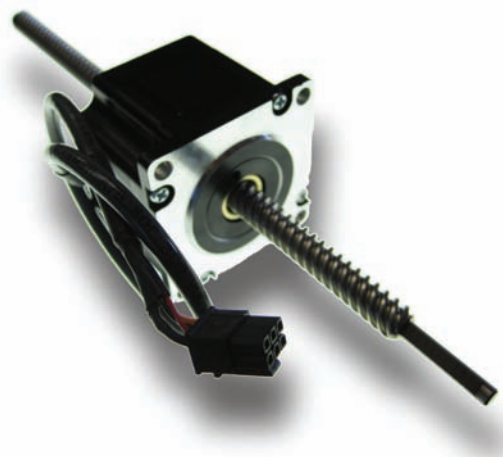
The information in this catalog has been carefully checked and is believed to be accurate; however, no responsibility is assumed for inaccuracies.

Koco Motion US LLC / DINGS' reserves the right to make changes without further notice to any products herein to improve reliability, function, or design.

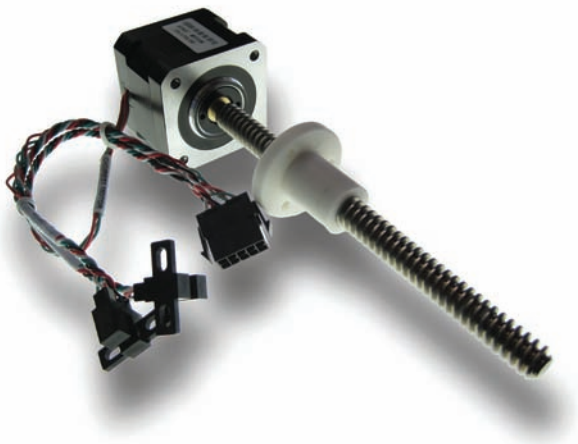
Koco Motion US LLC / DINGS' does not recommend the use of its products in life support or aircraft applications wherein a failure or malfunction of the product may directly threaten life or injury.

CUSTOMS ARE STANDARD FOR US...

Custom cabling, connector, and screw end machining



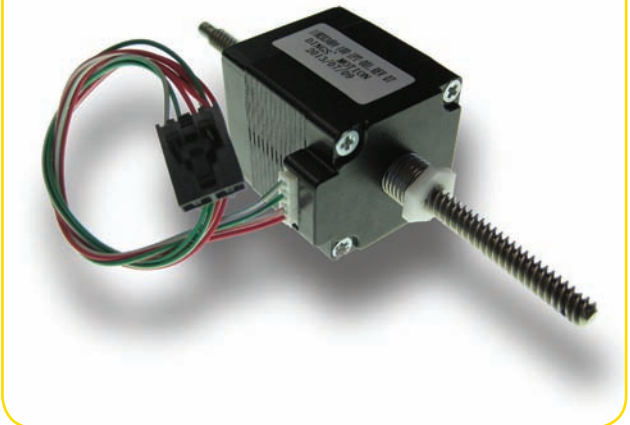
Custom cabling, connector, and sensors



Rolled and Assembled in California

Custom cabling and connector

Custom anti-backlash nut and connector



Cable bundling

Kitted assemblies

CUSTOMS ARE STANDARD FOR US...

Drive and Controller Solutions

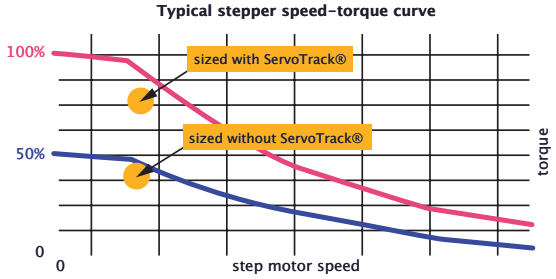
ServoTrack™

Tomorrow's Technology for Today's Application™

Why step motors were a great invention...

Step motors, as a result of the way they are constructed, are inherently lower cost than servo motors. Step motors do not require tuning, allow for a greater inertia mismatch, and have very high torque density. This torque is 100% available immediately upon startup, which can be very advantageous when doing short quick moves or when coupled to high inertia loads. Because step motors are synchronous motors with a high pole count, they are able to run smoothly at extremely slow speeds with little torque ripple.

Step motor systems have unique characteristics, such as smother motion, stiffness at stand-still, no tuning, and low cost. Popular for decades, these systems will continue to be a popular choice among design engineers.



ServoTrack™ control is hardware based for real-time response. It continually monitors the relationship between the rotor and stator at nanosecond intervals, and will not allow that relationship to exceed the pointwhere motor synchronization is lost.

Although both servo and step motors are permanent magnet synchronous motors, there are differences. Brushless servo motors typically have 2 to 8 magnetic poles on the rotor, whereas the 1.8 degree step motor has 50 poles. It can be thought of as electromagnetically geared down compared to servo motors and thus has a higher torque density.

Design smart with ServoTrack™

Key benefits:

- Solve applications previously considered too demanding for stepper systems.
- Reduce system cost with an enhanced stepper based system.
- Do you need torque control in your stepper system?
- Does your system stall due to transient loads or friction?
- Eliminate unintentional stalling or loss of synchronization.
- Increase throughput efficiency.
- Reduce motor heating and energy costs with variable current control.
- Optimize the torque utilization of your motor.
- Greater compliance with inertial mismatch.

However, there are some disadvantages with today's step motor control technology. The most critical drawback is the loss of synchronization and torque if a large load exceeds the motor's capacity and its ability to resynchronize once the load is reduced to a level within the motor's capability. Step motor also tend to run hot because of the use of full phase current independent of load.

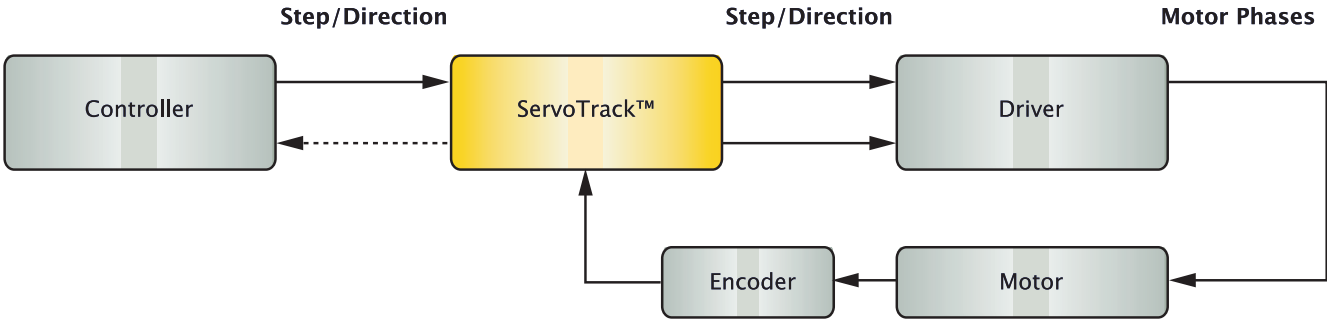
Historically, these disadvantages may have influenced the decision to choose higher cost servo technology over traditional step motor technology.

Now—with the introduction of ServoTrack™, unintentional stalling due to transient loads, or excess friction, is eliminated and torque control becomes an integral function of your stepper system.

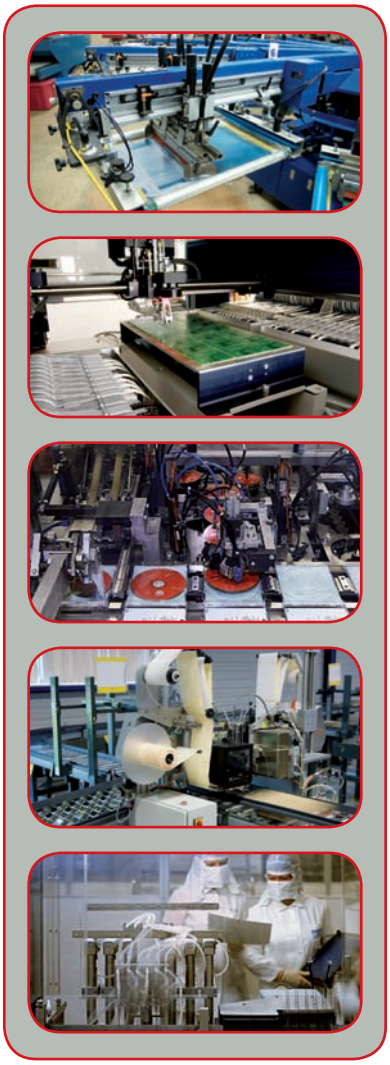
Drive and Controller Solutions

ServoTrack™

Tomorrow's Technology for Today's Application™



ServoTrack™ – the applications are endless...



Whether you are designing a new system or wanting to improve the performance of an existing one, ServoTrack™ will make your application more robust and dependable, and keep your costs low.

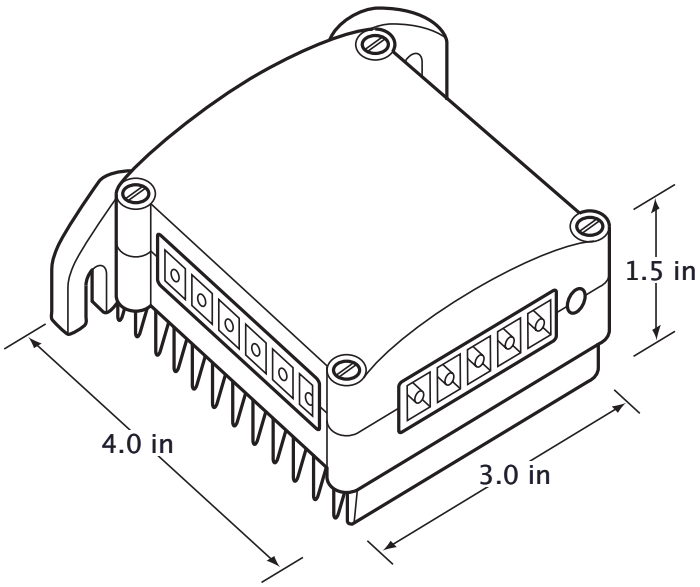
Dramatically simplify and expand the ways in which you apply step motor technology to solve motion control applications:

1. Allow full use of the motor's torque with minimal de-rating of the speed/torque curve.
2. Never lose functional control of the motor.
3. Lower the cost of your servo axis.
4. Minimize the impact of system resonance.
5. Allow for higher inertia mismatch when sizing your system.
6. Torque control for clamping, winding/unwinding, and tension control.
7. With variable current control, minimize motor heating and improve efficiency.
8. Prevent transient load stalling on smart conveyor systems.
9. No controller required when applied in velocity mode with built-in oscillator.
10. Simple set-up with no tuning required.
11. ServoTrack™ works through hardware, not PID software, greatly improving response time and eliminating the need for a high resolution encoder.
12. Reduce servo system complexity.

ST484 Microstepping Stand Alone Driver

Standard Specifications

INPUT VOLTAGE (+V)	Range	+12 to +48 VDC
OUTPUT CURRENT	RMS (Max) Peak (Per Phase)	4 Amps 5 Amps
ISOLATED INPUT	Step Clock, Direction and Enable Voltage Range	+5 to +24 VDC Sourcing or Sinking



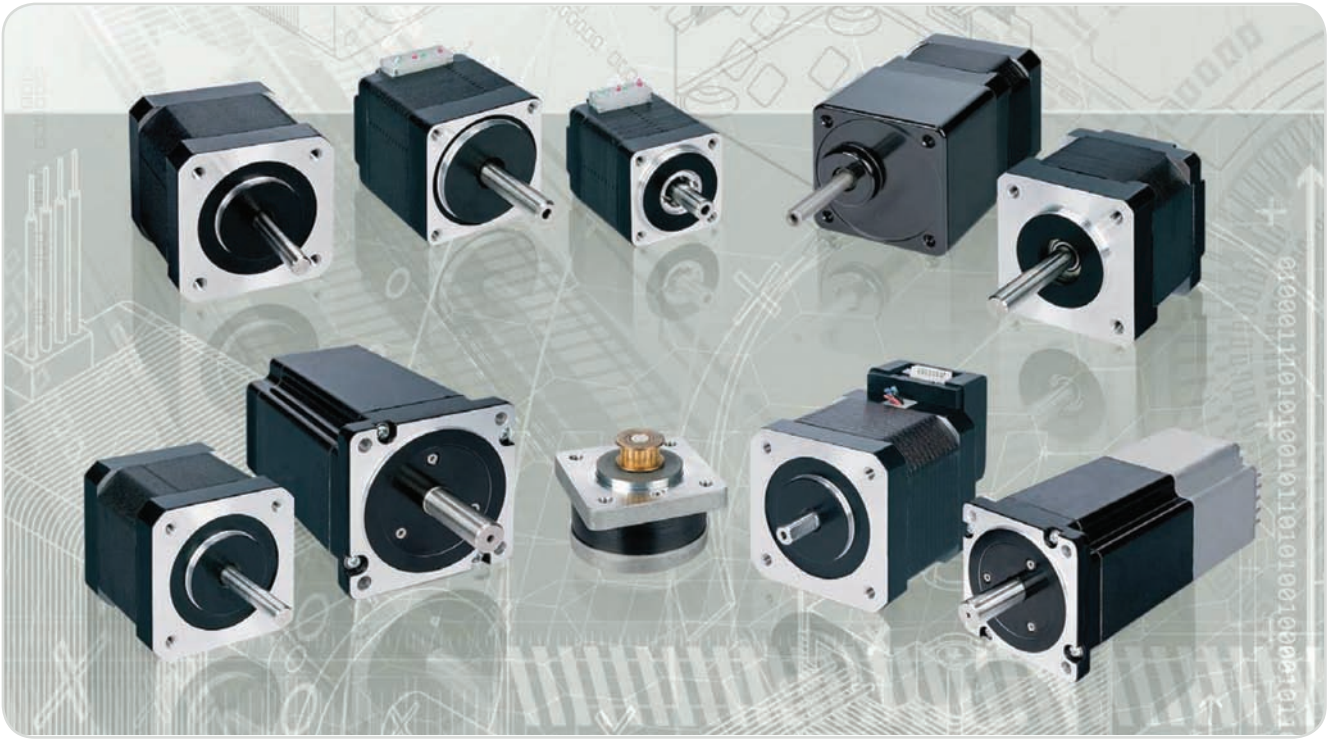
ServoTrack™

Other Available Driver / Controller Products

1. Smaller integrated Form Factor Driver that can be mounted on the rear motor end bell of linear or rotary motor.
2. Stand Alone Driver / Programmable Controller
3. Smaller integrated Form Factor Driver / Programmable Controller that can be mounted on the rear motor end bell of linear or rotary motor.

Custom Stepper Motors and Lead Screw Assemblies

IMMEDIATE AVAILABILITY OF PROTOTYPING UNITS...
CALL US AT 408-300-9690
TO PLACE AN ORDER.
8:00AM - 5:00PM
PACIFIC STANDARD TIME (PST)



FOR US, CUSTOMS ARE STANDARD!

- Wide variety of prototyping product readily available in our San José, California facility
- High flexibility and capability in designing and manufacturing custom products to your OEM specifications
- Very competitive pricing

HYBRID STEPPER LINEAR ACTUATOR OVERVIEW

Nema Sizes	Available Versions	Motor Length & Available Currents (Voltage)	Max Thrust	Recommended Load Limit*	Screw Lead Range
1.8 Degree NEMA 8 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 NEMA 11 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 NEMA 14 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 NEMA 17 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 NEMA 23 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 NEMA 34 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)

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

Please see pages 6–8 for a review of our patented ServoTrack™ Driver/Controller solutions for all our linear and rotary stepper systems.

IMMEDIATE AVAILABILITY OF PROTOTYPING UNITS...
CALL US AT 408-300-9690 TO PLACE AN ORDER.
8:00AM–5:00PM PACIFIC STANDARD TIME (PST)
FOR US, CUSTOMS ARE STANDARD!

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 assist and refresh your understanding of the basic principles of lead screw technology prior to selecting the system that 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 move from point A to point B?
3. What is the distance to be travelled?
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?

For a more detailed primer of **Stepper Linear Actuator** technology, please visit our website and download our **Linear Actuator White Paper** at **www.kocomotionus.com**.

An Explanation of the Basics

LEADS VS PITCH

Pitch is the axial distance between threads. Pitch is equal to lead in a single start screw. There may be more than one thread "strand" on a single screw. These are called starts. Multiple start lead screws are usually more stable and efficient at power transmission.

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.

LOAD

Typically quantified as either lbs OR kg to move or pounds force (lbsF) or kgF for thrust.

VELOCITY (V)

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

DISTANCE

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

TIME (t)

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

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.

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.

TOTAL INDICATED RUNOUT

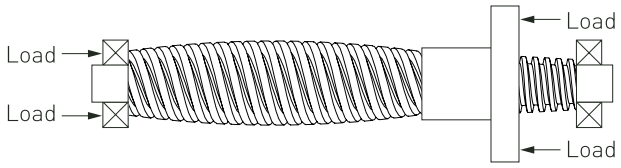
The amount of "wobble" around the centerline of the screw.

REPEATIBILITY

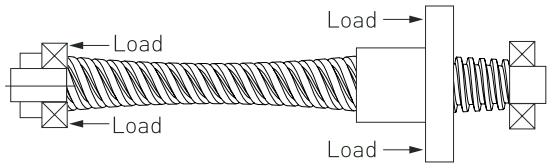
Most motion applications put the most significance on the repeatability (vs accuracy of screw) of a system to reach the same commanded position over and over again. For example: A repeatability of ± 0.005 inch means that after repeated commands to reach the same target position, the linear error will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

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.



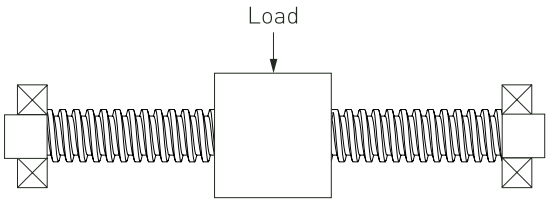
Compression Loading



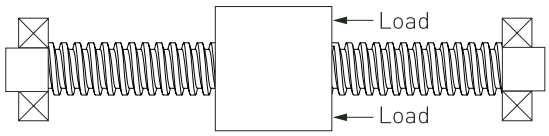
Tension Loading

RADIAL LOAD

A load perpendicular to the screw.
This is not recommended unless additional mechanical support such as a linear guide is used.



Radial Loading
(Avoid or Minimize)



Axial Center Loading
(best)

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

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

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

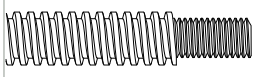
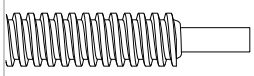
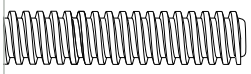
BACKDRIVING
Backdriving is the result of the load pushing axially on the screw or nut to create rotary motion. Generally, a nut with an efficiency greater than 50% will have a tendency to backdrive. Selecting a lead screw with an efficiency below 35% may prevent backdriving. The smaller the lead, the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

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

1. Inertial Torque
2. Drag Torque (friction of the nut and screw in motion)
3. Torque to move load

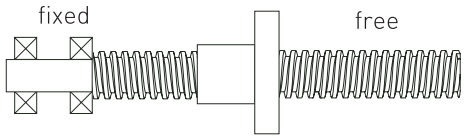
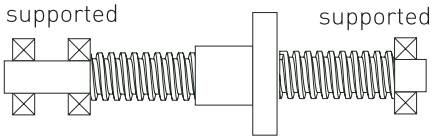
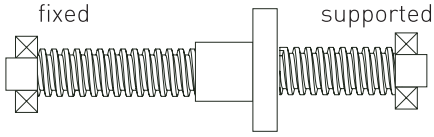
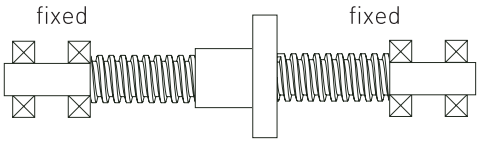
LUBRICATION
The nut material contains a self-lubricating material that eliminates the need for adding a lubricant to the system. The Teflon coated screw option also lowers friction and extends life of the system.

END MACHINING OF THE SCREW
Standard metric or English options are available. Custom end machining specifications are also available on request.

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

FIXITY

The performance (speed and efficiency) 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	0.32	0.25
	Rigid	1.0	1.0
	More Rigid	1.55	2.0
	Most Rigid	2.24	4.0

COLUMN STRENGTH

When a screw is loaded in compression, its limit of elastic stability can be exceeded and the screw will fail due to bending or buckling.

CRITICAL SPEED

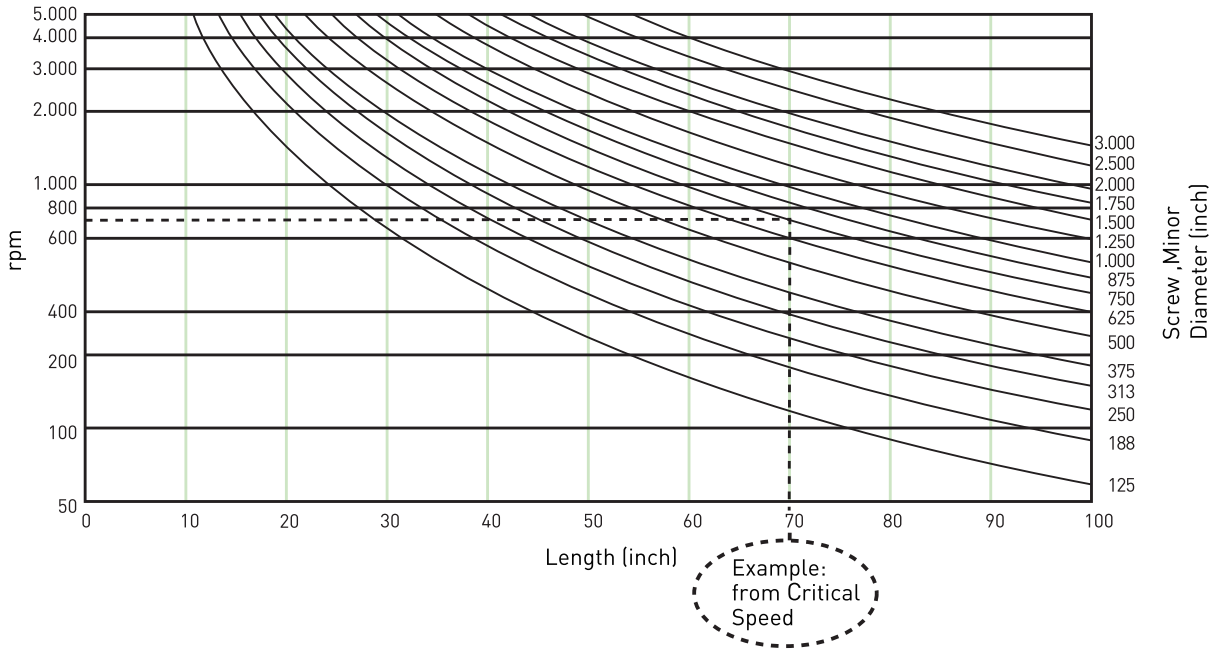
Critical speed is the rotational speed of the screw at which the first harmonic of resonance is reached due to deflection of the screw.
A system will vibrate and become unstable at these speeds.

Several variables affect how quickly the system will reach critical speed:

1. The lead of the screw
2. The rotational speed
3. End fixity
4. 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.

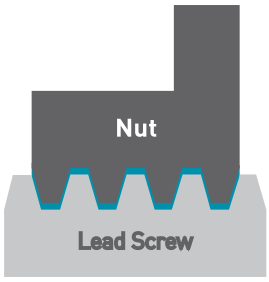
CRITICAL ROTATION SPEED (RPM) VS. UNSUPPORTED SCREW LENGTH FOR VARIOUS SCREW DIAMETERS (INCH)



BACKLASH

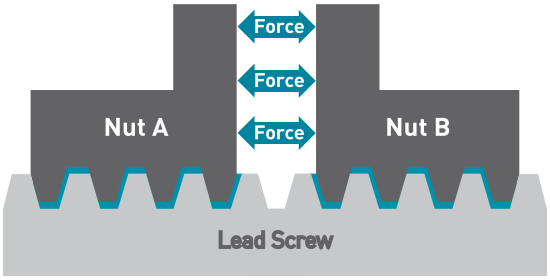
Backlash is the relative axial movement between a screw and nut at standstill. It is normal for backlash to increase with wear over time. Blacklash compensation or correction can be accomplished through the application of an anti-backlash nut. Backlash is usually only a concern with bi-directional positioning.

Standard Nut



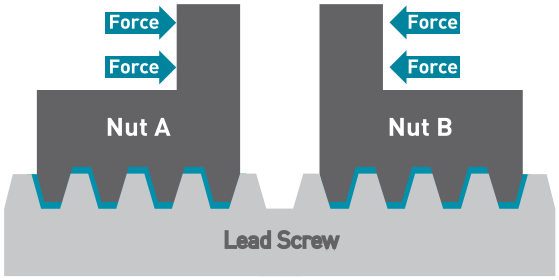
BACKLASH IN BLUE

Tension Anti-Backlash Nut



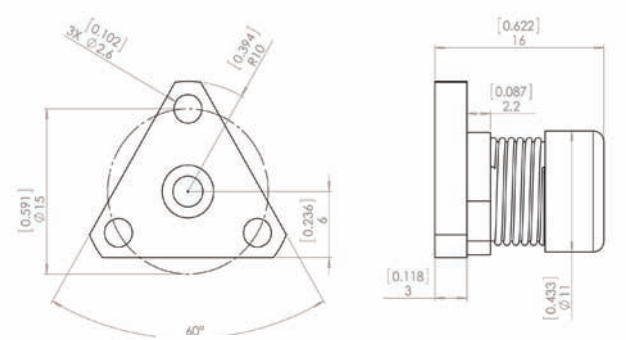
BACKLASH IN BLUE

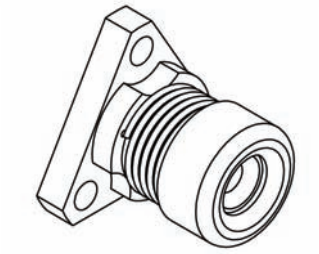
Koco Motion's Compression Anti-Backlash Nut



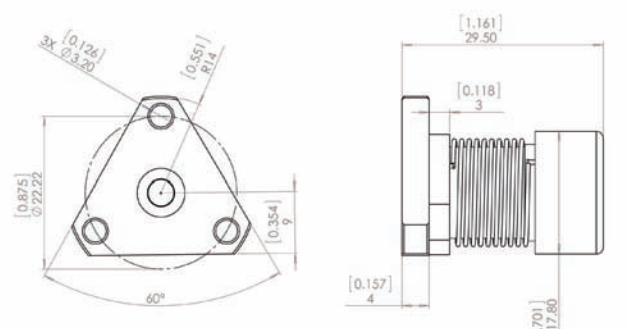
BACKLASH IN BLUE

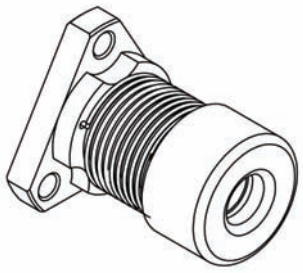
Anti-Backlash Nuts Available upon Request



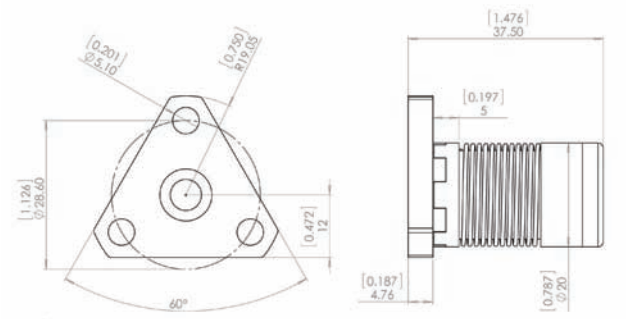


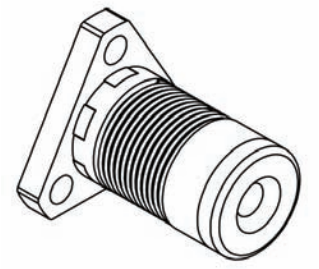
NEMA SIZE 8 AND
NEMA SIZE 11 ANTI-BACKLASH NUT





NEMA SIZE 14 AND
NEMA SIZE 17 ANTI-BACKLASH NUT



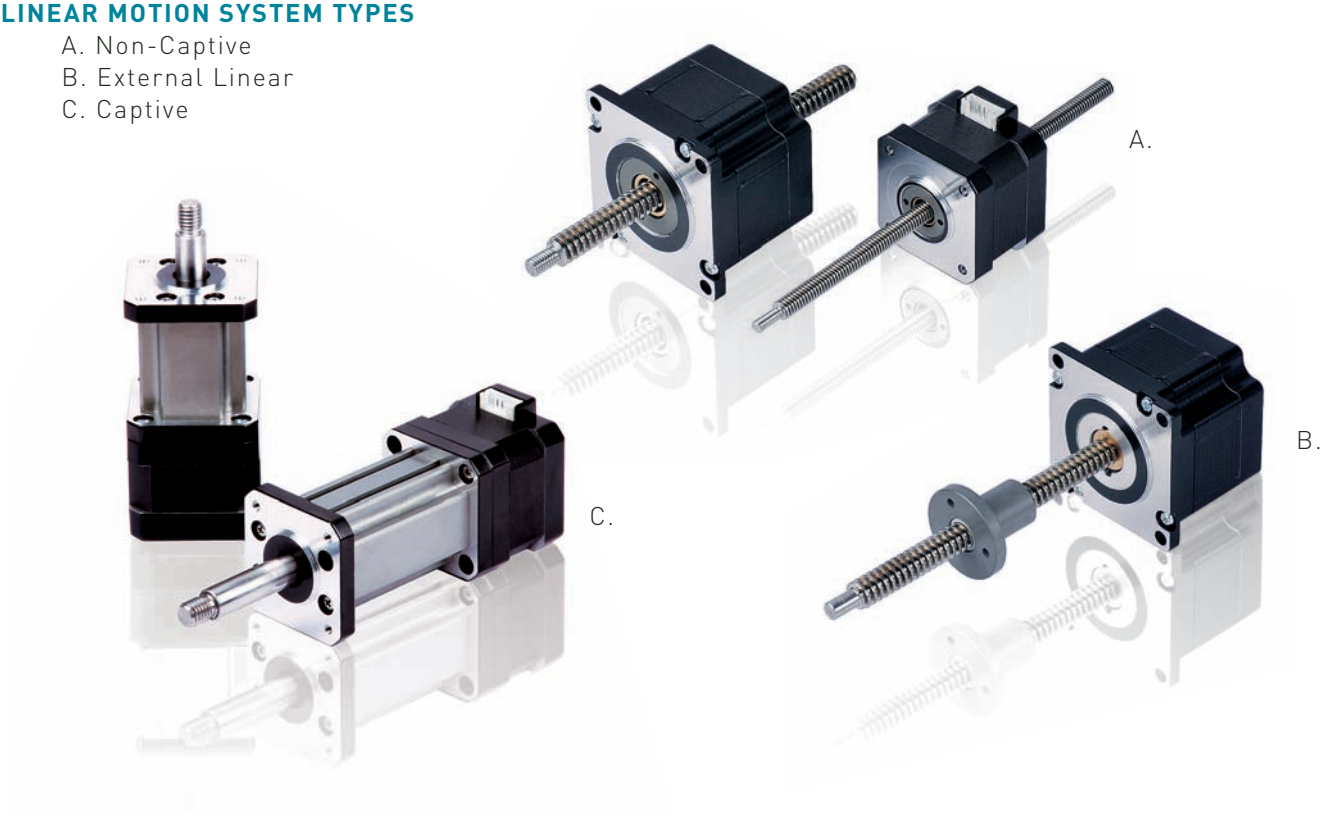


NEMA SIZE 23 ANTI-BACKLASH NUT

IMMEDIATE AVAILABILITY OF PROTOTYPING UNITS...
CALL US AT 408-300-9690
TO PLACE AN ORDER.
8:00AM - 5:00PM
PACIFIC STANDARD TIME (PST)

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?

Koco Motion / DINGS' 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 significantly reduce product life.

TEMPERATURE

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

MAXIMUM DYNAMIC LOAD

Each NEMA frame size motor has a mechanical load maximum that should not be exceeded.
For more information, see Speed/Force curves for the individual frame sizes.

MOTOR SELECTION

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

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

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.

Step 1 – 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.

Step 2 – Choosing a screw lead (Force and Speed requirements)

After estimating the required thrust and choosing a NEMA size that may fit 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.

Product Selection Guide (continued)

Although these two steps provide a solid foundation in motor/lead screw selection, other variables must also be considered:

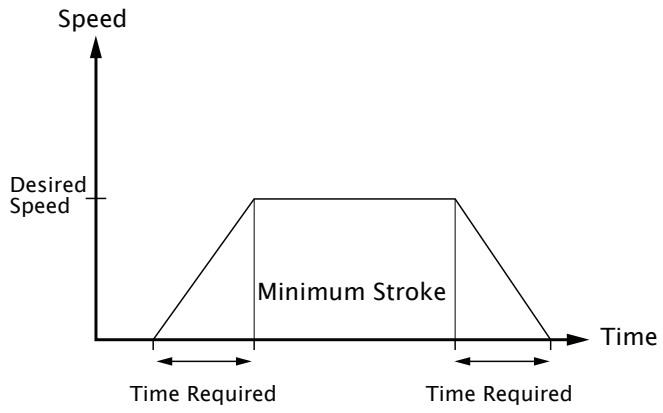
- Duty Cycle
- Desired Life of a System
- Environmental Considerations
- Positional Repeatability
- Acceptable Backlash
- Acceleration/Deceleration Requirements
- Driver Specifications
- Vertical or Horizontal Orientation

Because of the numerous variables involved in motor selection, it is highly recommended for users to proceed with physical testing to accurately determine the motor/lead screw combination required for a given application.

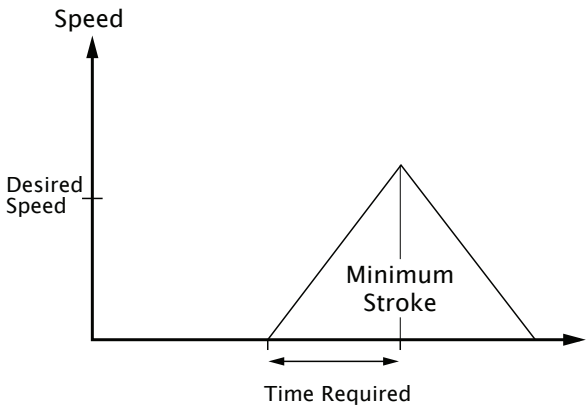
NOTE: Although this section aims to provide a rough guide to selecting a motor/lead screw combination that best fits an application, we recommend contacting our application engineering staff for further assistance with the motor selection process.

Trapezoidal Move vs. Triangular Move Profile

There are generally two widely used movement profiles. Depending on the required travel time and distance, different movement profiles can be used. The area under the curves below is the minimum stroke of the linear actuator, its required travel.



TRAPEZOIDAL MOVE



TRIANGULAR MOVE

Basic Specifications for Koco Motion / DINGS' Linear Systems

LEAD SCREW MATERIAL

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	Teflon coating is optional

Lead screws are manufactured via precision rolling process at our San José, California facility.

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	0.003 inch/foot, measured as Total Indicated Runout (TIR) 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. The larger the lead, the higher the efficiency of the screw.
Operating Temperature	-10 °C to +50 °C (14 °F to 122 °F)
Screw Backlash	Depends on lead (nominally ± 0.005 in)
System Backlash	Includes screw, motor, and attached mechanics 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: Koco Motion / DINGS' 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.

CUSTOM PRODUCT SPECIFICATIONS ARE WELCOME

CONTACT A KOCO MOTION APPLICATION ENGINEER AT 408-300-9690
8:00AM–5:00PM PACIFIC STANDARD TIME (PST)

Product Selection System

P 17 N 2 1 15 K 4-101.6 T M S EK2FI
1 2 3 4 5 6 7 8 9 10 11 12 13

(1) Drive Option:
- D = Drive Only
- P = Programmable Controller and Drive

(2) NEMA Size:

NEMA CODE	8	11	14	17	23	34
MOTOR SIZE (mm)	20	28	35	42	57	86

(3) Lead Screw Shaft Style:
- N = Non-Captive Linear
- E = External Linear
- C = Captive Linear

(4) 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°

(5) Motor Length/Stack
- 1 = Single Stack
- 2 = Double Stack

(6) Rated Current/Phase
- XX = X.X (A)/Phase

(7) Lead Screw Code
- A-Z, AA, AF

(8) Number of Lead Wires
- 4 = Qty 4 Flying Leads
- 6 = Qty 6 Flying Leads
- 8 = Qty 8 Flying Leads

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

(10) Lead Screw Surface
- T = Teflon Coating
- S = Standard (No Teflon Coating)

(11) End Machining
- M = Metric
- U = UNC
- S = Smooth
- N = None

(12) Nut Style
- S = Standard Flange Nut
- A = Anti-Backlash Nut

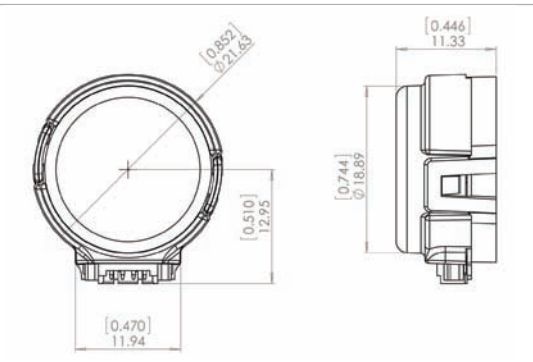
(13) Encoder Option
- EKXX = Encoder (XX = Encoder Code)
- ERX = Encoder Ready (X = Encoder Version)
- N = No Encoder nor Encoder Ready

EXAMPLE

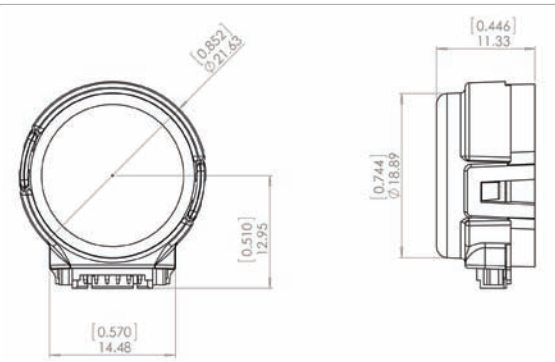
Part Number P17N2115K4-101.6TMSEK2FI

Description
Programmable Controller and Drive
NEMA 17
Non-Captive Linear Actuator
2 Phase with 1.8 Degree Step Angle
Single Stack
1.5 A/Phase
"K" Lead (0.1"/2.54 mm)
4 Flying Leads
Screw Length: 101.6 mm
Teflon Coated Screw
Metric End Machining
Standard Nut
EK2 Encoder with Differential Output, 500 Lines, with Index

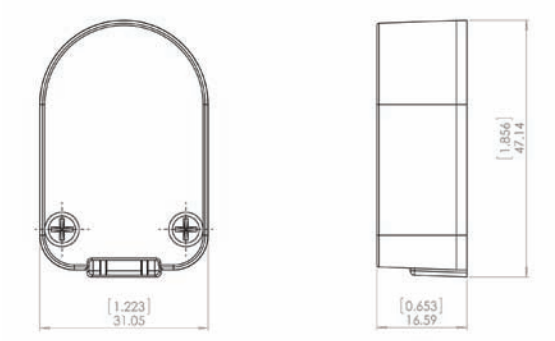
Encoder Options



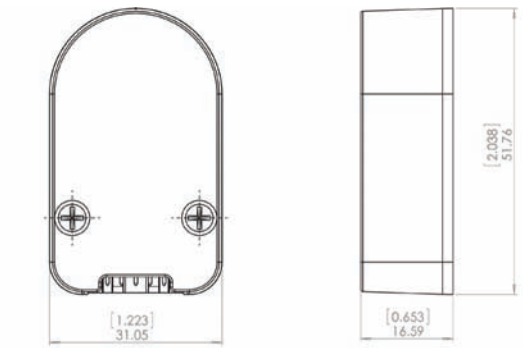
EK1 ENCODER SINGLE ENDED OUTPUT



EK1 ENCODER DIFFERENTIAL OUTPUT



EK2 ENCODER SINGLE ENDED OUTPUT



EK2 ENCODER DIFFERENTIAL OUTPUT

Encoder Options

EK1

Line Count	100	108	120	125	128	200	250	256	300	360
Single Ended	0	1	2	3	4	5	6	7	8	9
Differential	A	B	C	D	E	F	G	H	I	J

EK2

Line Count	100	200	250	256	400	500	512	1000	1024
Single Ended	0	1	2	3	4	5	6	7	8
Differential	A	B	C	D	E	F	G	H	I

Custom Encoder or Custom Line Count:

EC

For Encoder Ready Motors:

ER1 / ER2

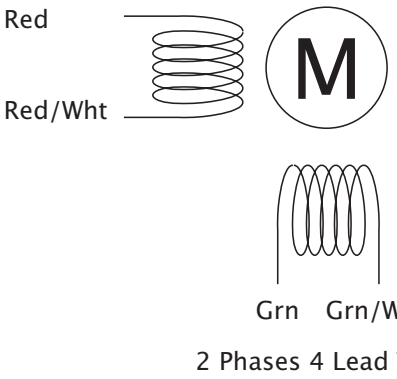
For EK2 with Index: Add "I" as a suffix.
For Example, for EK2, 512 line count, with Differential, and Index: "EK2GI"

Please refer to our website for complete encoder specifications:
www.kocomotionus.com

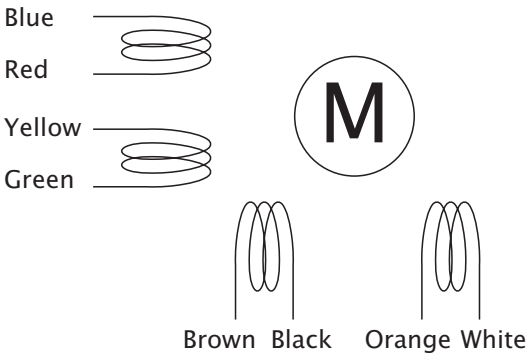
Number of Lead Wires

Step motors typically come with 4, 6, or 8 wire leads. With bipolar drivers, there are 4 connections to a motor. Wiring up a 4 lead motor is straightforward. When using motors with 8 leads, the coils can either be connected in series or parallel.

LEAD WIRE CONFIGURATION

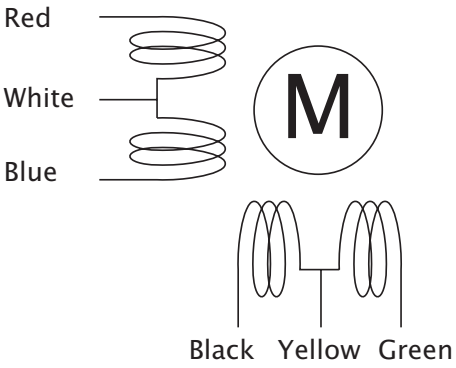


2 Phases 4 Lead Wires

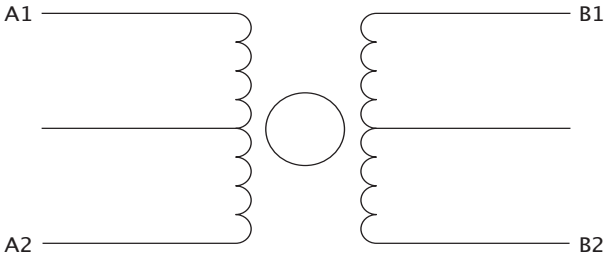


2 Phases 8 Lead Wires

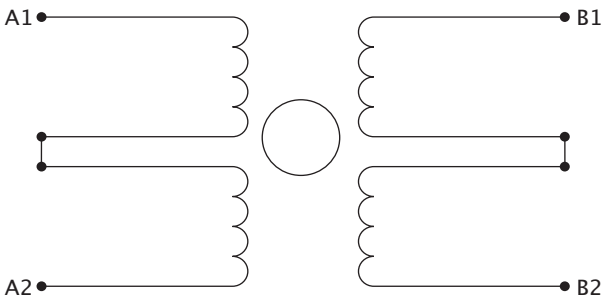
A six wire lead with two phases



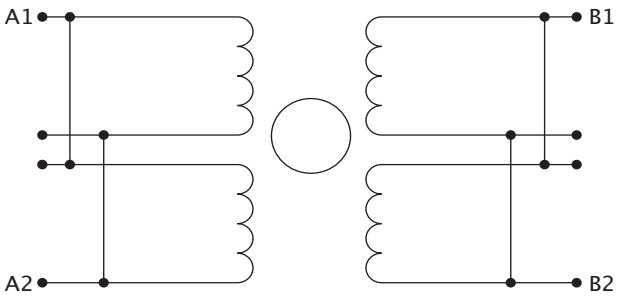
A six wire stepper motor with windings in series



An eight wire stepper motor with windings in series



An eight wire stepper motor with windings in parallel

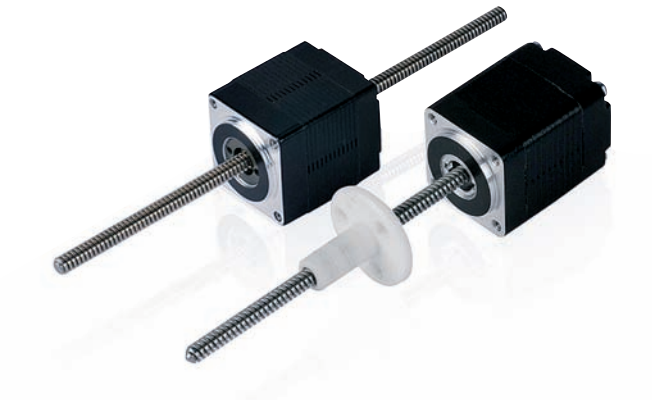


Motor Lead Screw Code Schedule

Lead Code	1.8 Degree Motor Travel per Step mm (inch)	Size 8	Size 11	Size 14	Size 17	Size 23	Size 34
		Screw Dia. mm (inch)					
		3.5052 (0.138″)	4.775 (0.188″)	6.35 (0.25″)	6.35 (0.25″)	9.525 (0.375″)	15.875 (0.625″)
		Screw Lead mm (inch)					
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″)	
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″)					
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″)					
P	0.021209 (0.000835″)					4.2418 (0.167″)	
Q	0.024384 (0.00096″)			4.8768 (0.192″)	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″)					
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″)				
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″)

NEMA Size 8 (20 mm)
Hybrid Stepper 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 in^2 of mounting footprint and providing up to 10lbsF (44.5N) of continuous thrust. Ball screw versions are also available.



Motor Characteristics
Please contact Koco Motion US for custom products.

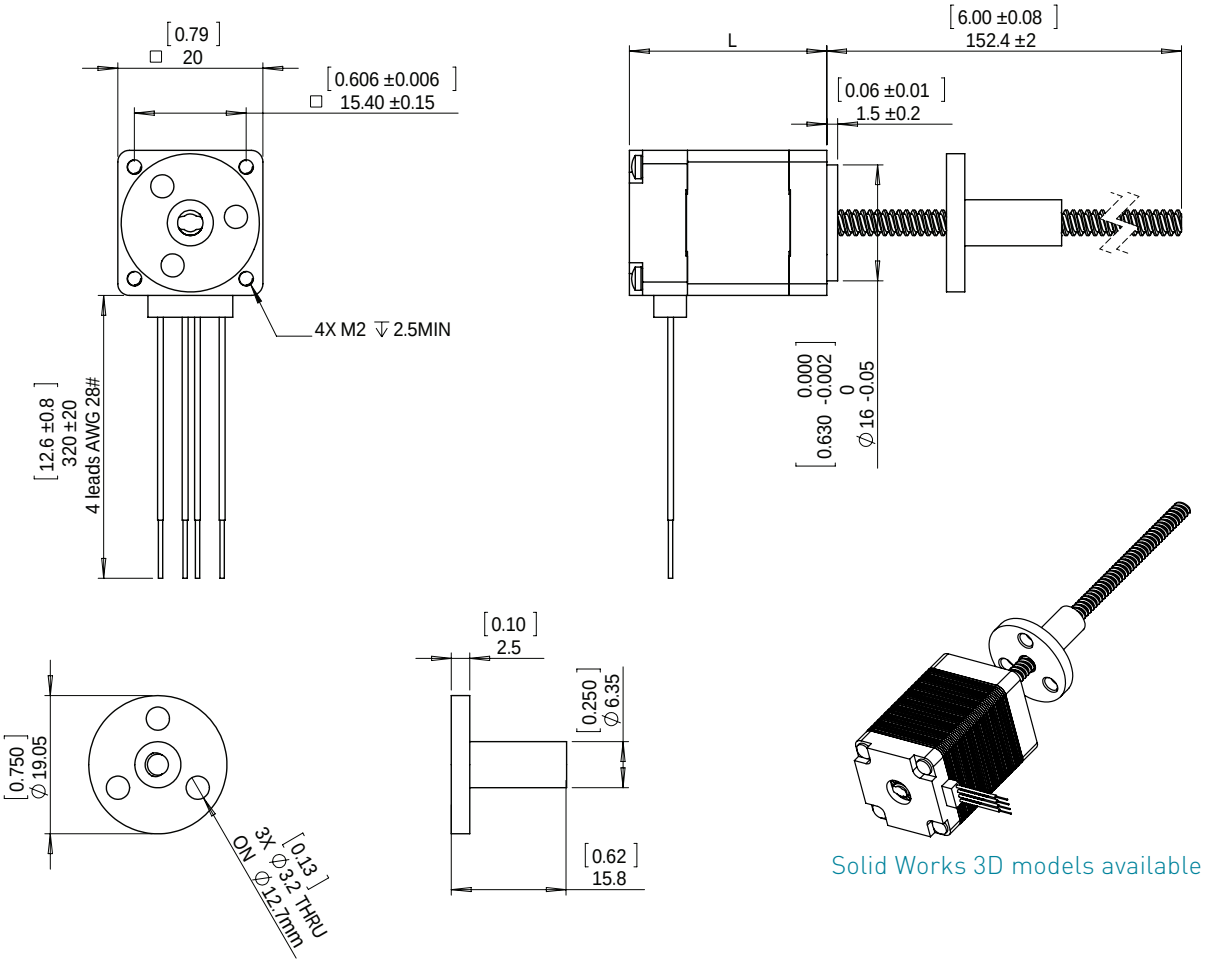
Motor	Voltage (V)	Current (A)	Resistance (Ω)	Inductance (mH)	Lead Wire No.	Motor Length (mm)
8-2105	2.5	0.5	5.0	1.2	4	27
8-2205	4.4	0.5	8.8	2.7	4	38

Available Lead Screws and Travel per Step
Please contact Koco Motion US for custom products.

Screw Dia. (inch)	Screw Dia. (mm)	Lead (inch)	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

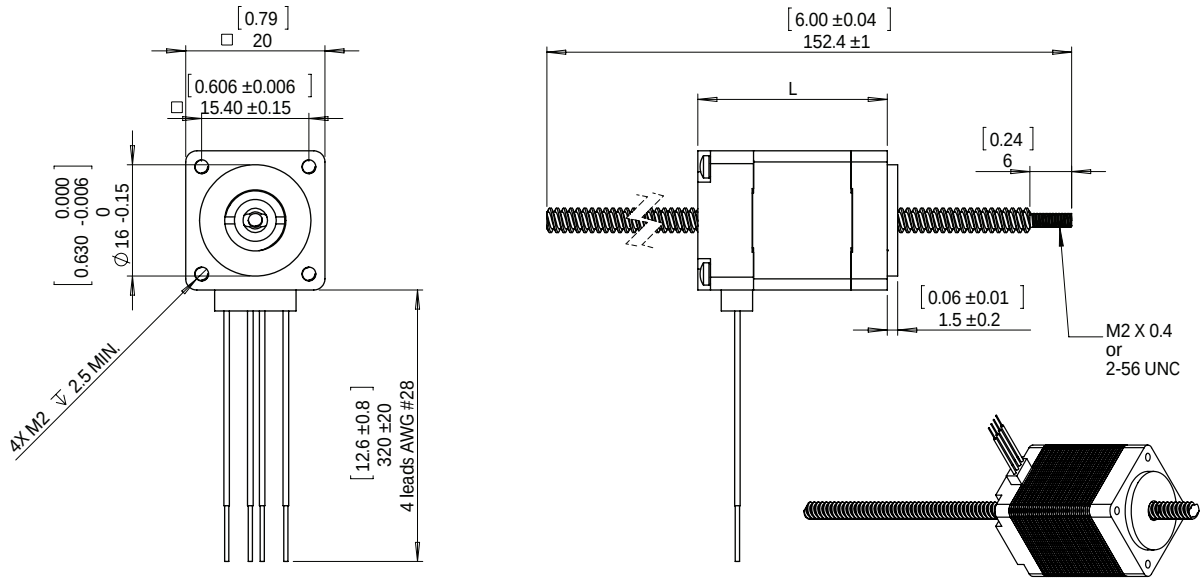
* values truncated

NEMA Size 8 (20 mm) Dimensions



Solid Works 3D models available

NEMA SIZE 8 EXTERNAL LINEAR ACTUATOR

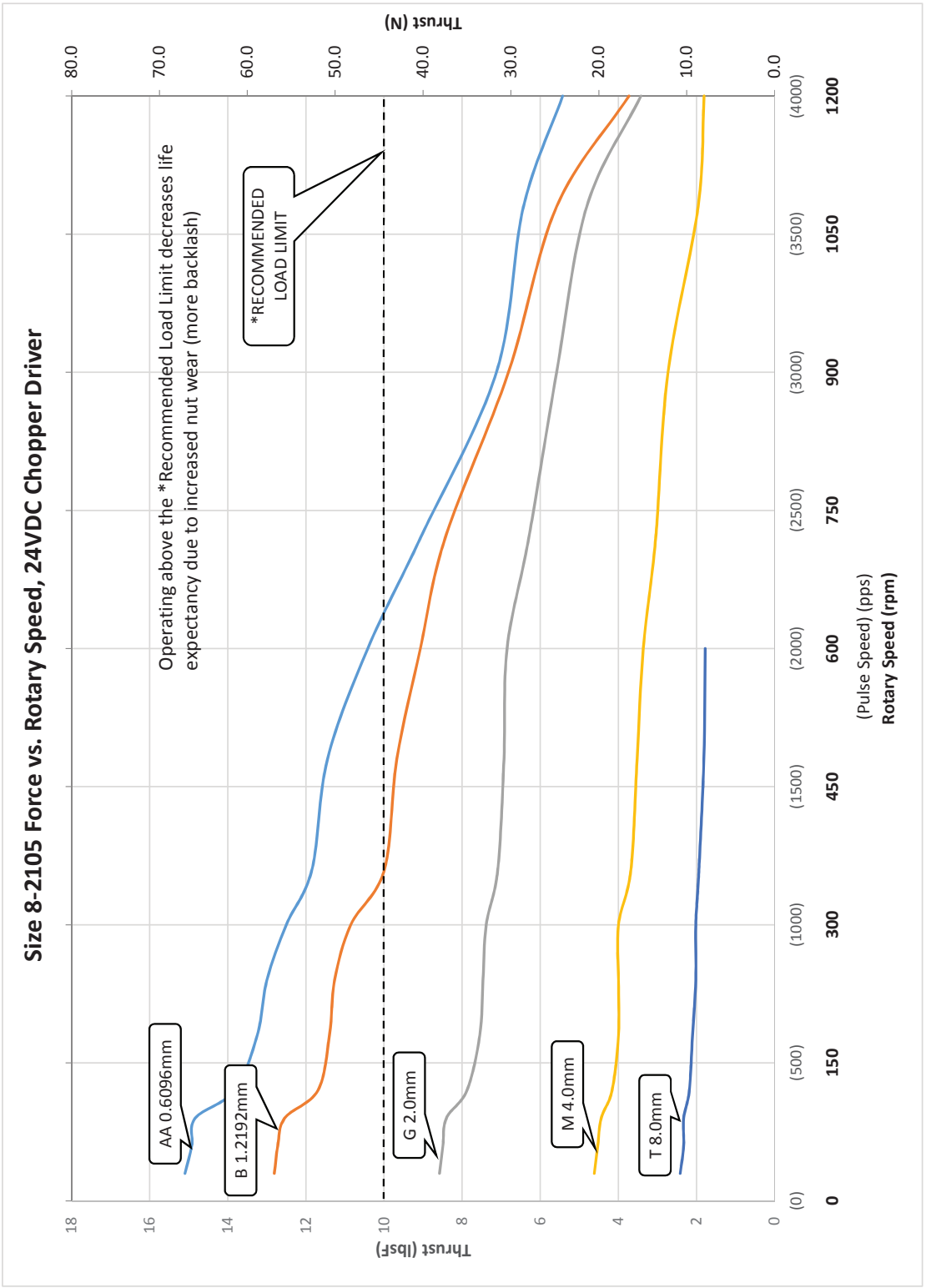


NEMA SIZE 8 NON-CAPTIVE LINEAR ACTUATOR

NOTE: All drawings are First Angle Projection—ISO Standard.

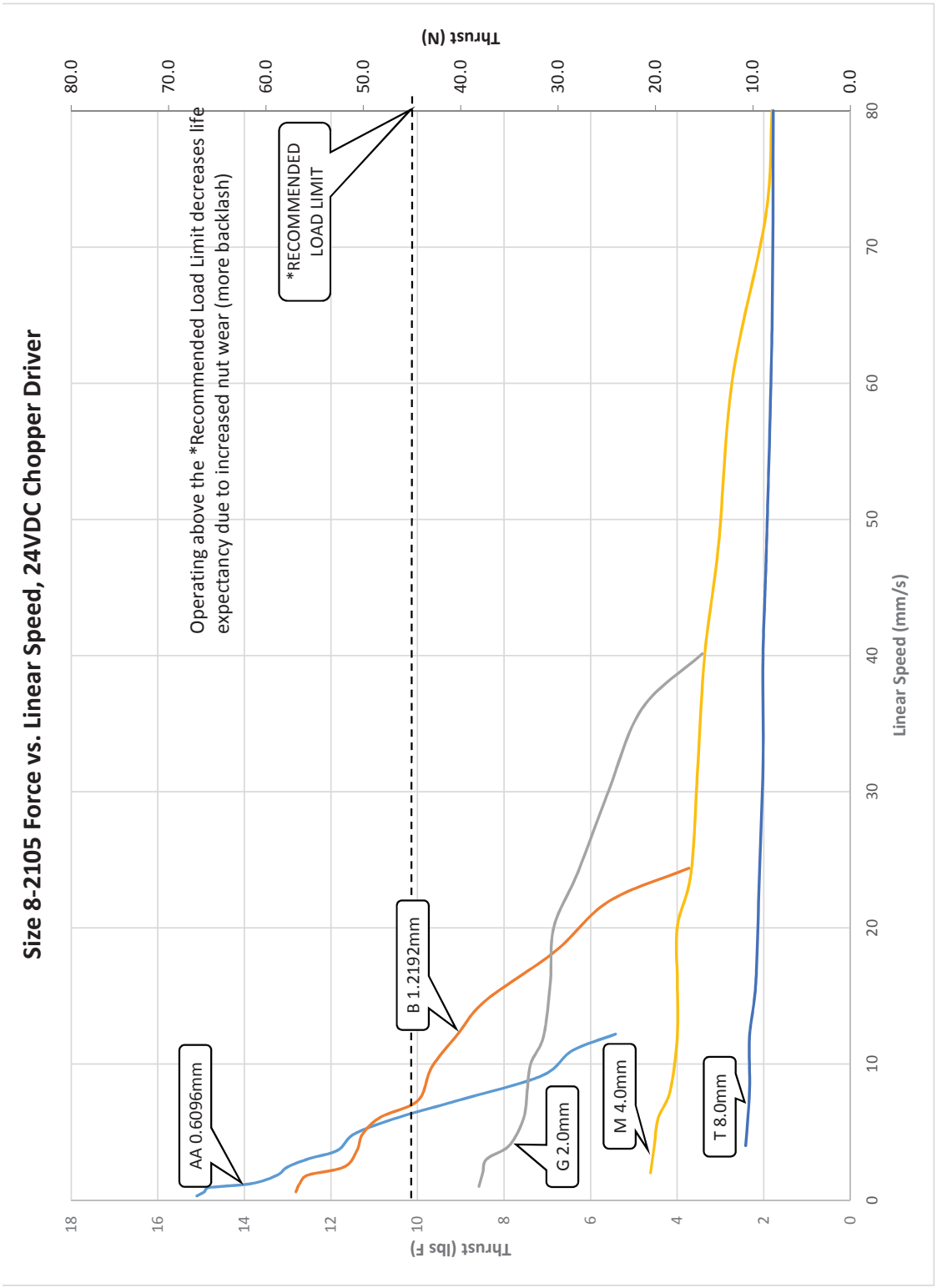
NEMA Size 8 (20 mm) Speed Thrust Curves

NEMA 8 SINGLE-STACK ROTARY SPEED



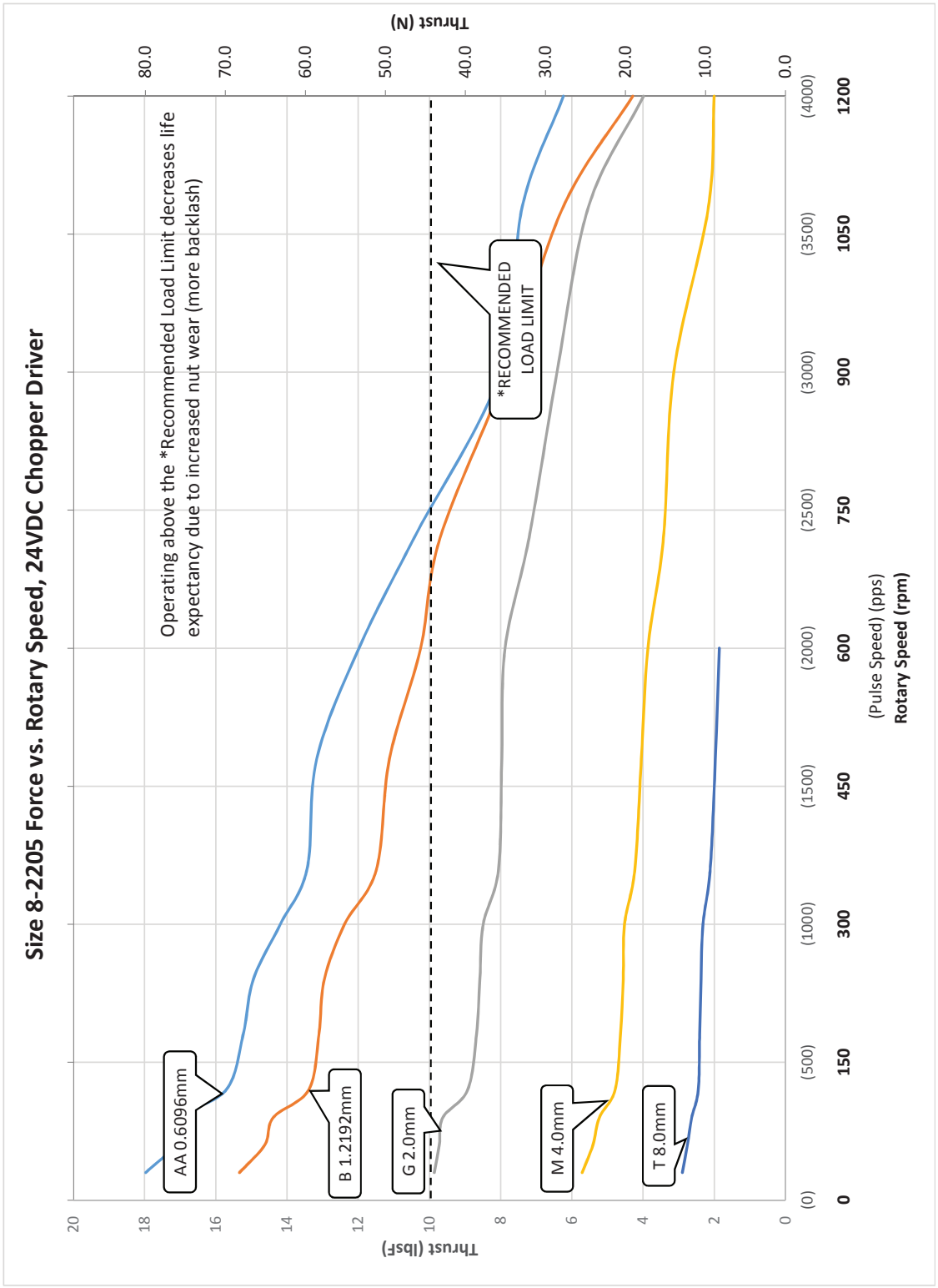
NEMA Size 8 (20 mm) Speed Thrust Curves (continued)

NEMA 8 SINGLE-STACK LINEAR SPEED



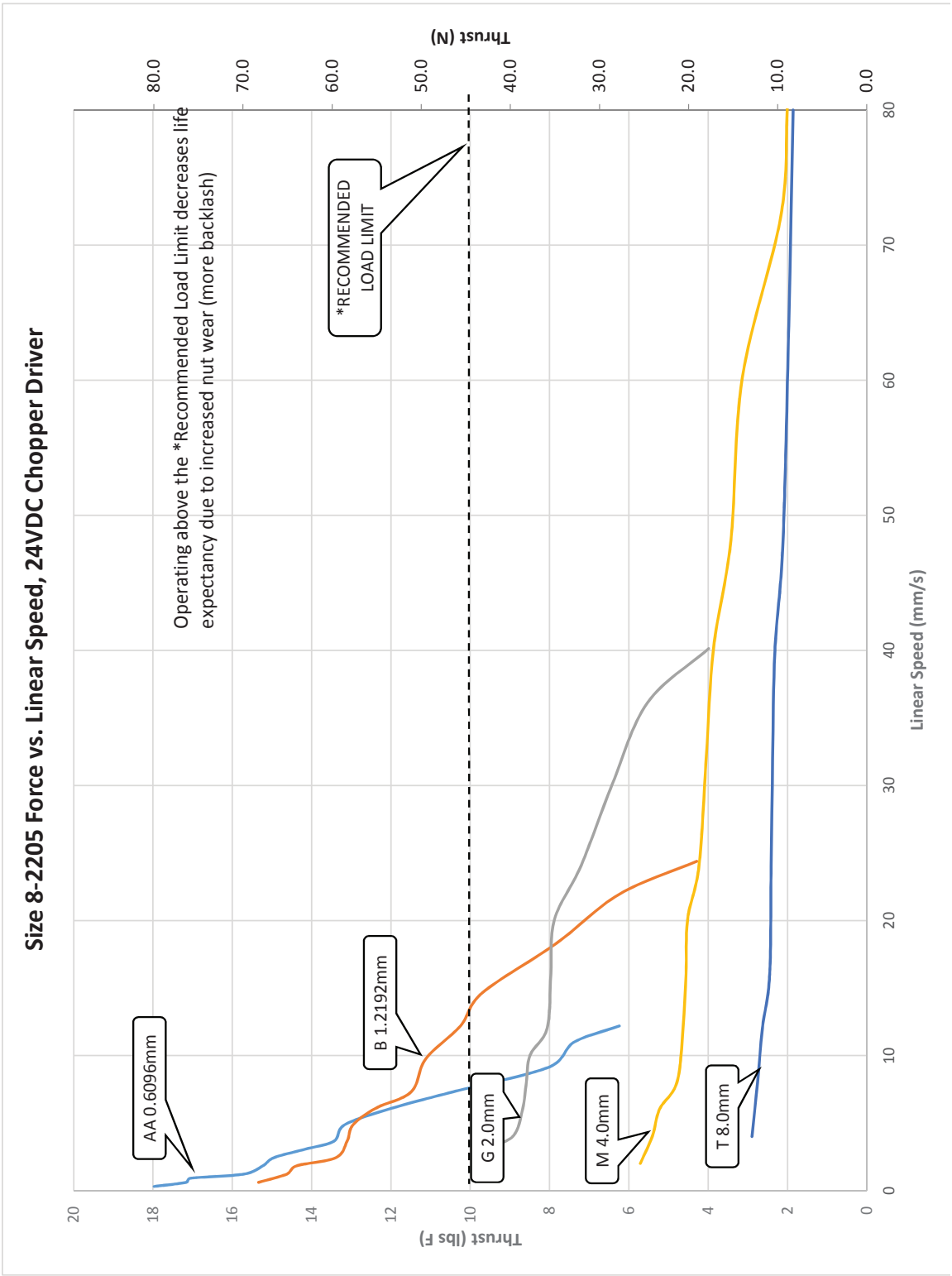
NEMA Size 8 (20 mm) Speed Thrust Curves (continued)

NEMA 8 DOUBLE-STACK ROTARY SPEED

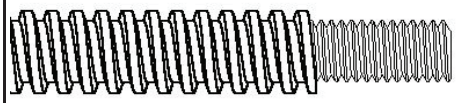
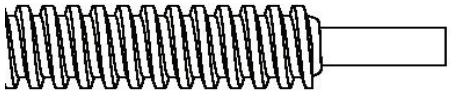
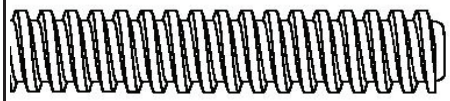


NEMA Size 8 (20 mm) Speed Thrust Curves (continued)

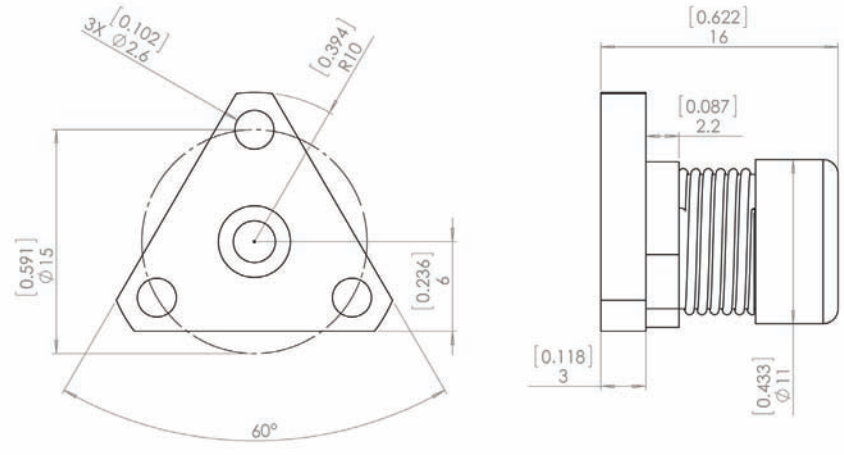
NEMA 8 DOUBLE-STACK LINEAR SPEED

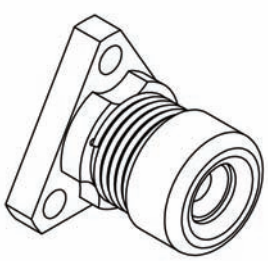


NEMA Size 8 (20 mm) End Machining Options

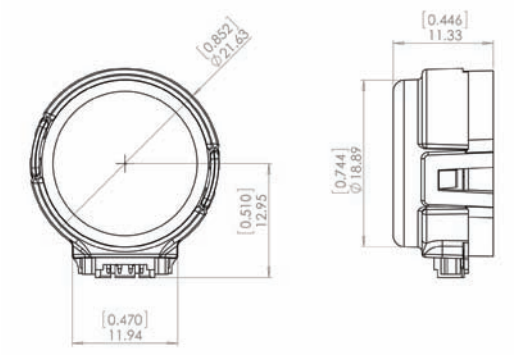
Standard Lead Screw End Machining		
	Threaded End	Metric End: M2 X 0.4 UNC End: 2-56 UNC
	Smooth End	∅2mm ± 0.025 ∅0.0787" ± 0.0010
	None	-

NEMA Size 8 (20 mm) Anti-Backlash Nut

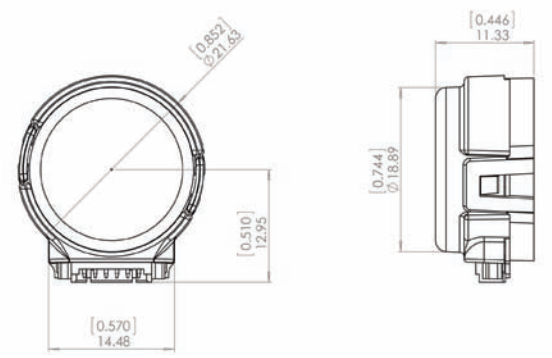




NEMA Size 8 (20 mm) Encoder Options



EK1 ENCODER SINGLE ENDED OUTPUT



EK1 ENCODER DIFFERENTIAL OUTPUT

Encoder Options

EK1

Line Count	100	108	120	125	128	200	250	256	300	360
Single Ended	0	1	2	3	4	5	6	7	8	9
Differential	A	B	C	D	E	F	G	H	I	J

Custom Encoder or Custom Line Count:

EC

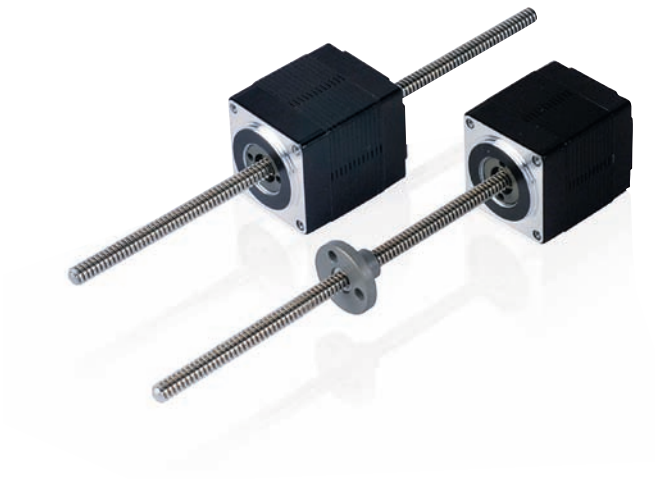
For Encoder Ready Motors:

ER1

Please refer to our website for complete encoder specifications: **www.kocomotionus.com**

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

The NEMA 11 hybrid linear actuator occupies a mounting footprint of slightly above 1 in^2 but provides over 3X the continuous thrust (33lbsF / 150N) of the NEMA 8. Ball screw versions are also available.



Motor Characteristics Please contact Koco Motion US for custom products.

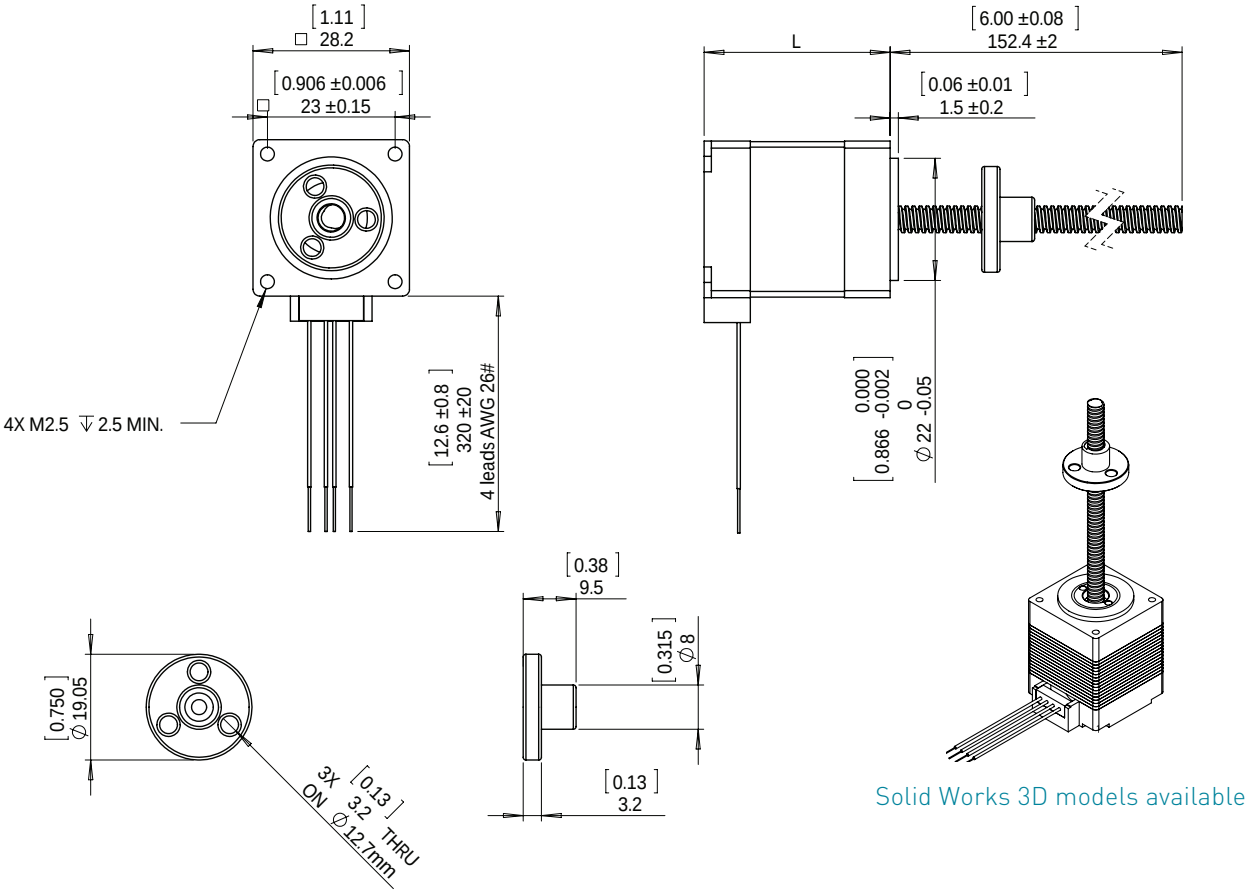
Motor	Voltage (V)	Current (A)	Resistance (Ω)	Inductance (mH)	Lead Wire No.	Motor Length (mm)
11-2105	4.5	0.5	9.1	6.0	4	34
11-2110	2.2	1.0	2.2	1.5	4	34
11-2209	3.9	0.95	4.1	4.0	4	45

Available Lead Screws and Travel per Step Please contact Koco Motion US for custom products.

Screw Dia. (inch)	Screw Dia. (mm)	Lead (inch)	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

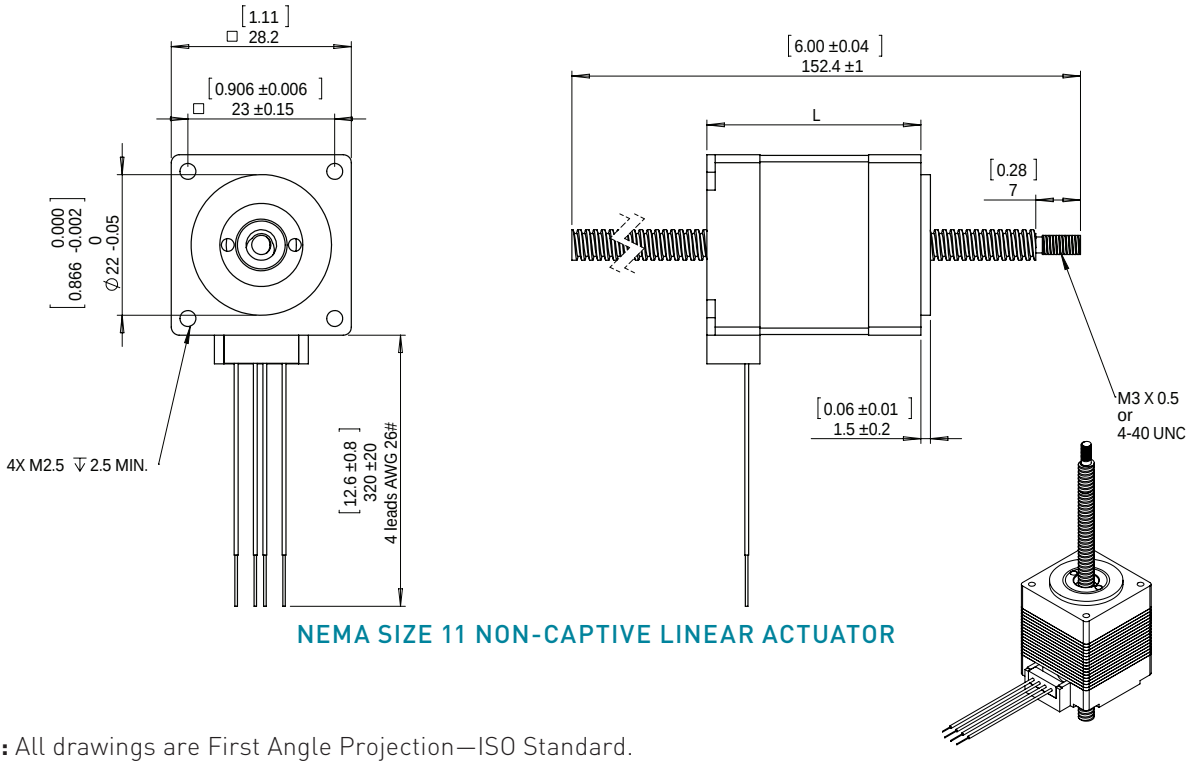
* values truncated

NEMA Size 11 (28 mm) Dimensions



Solid Works 3D models available

NEMA SIZE 11 EXTERNAL LINEAR ACTUATOR

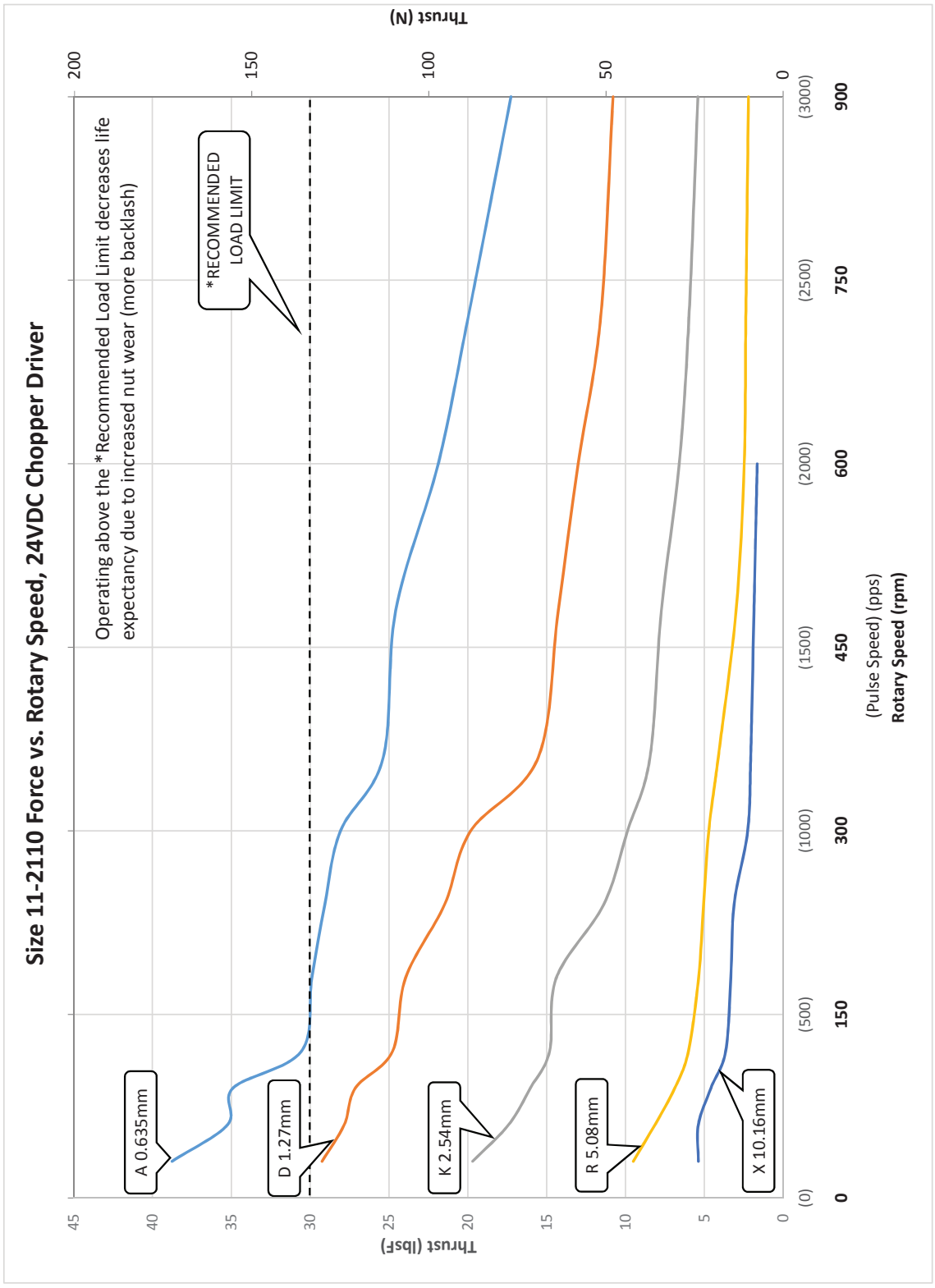


NEMA SIZE 11 NON-CAPTIVE LINEAR ACTUATOR

NOTE: All drawings are First Angle Projection—ISO Standard.

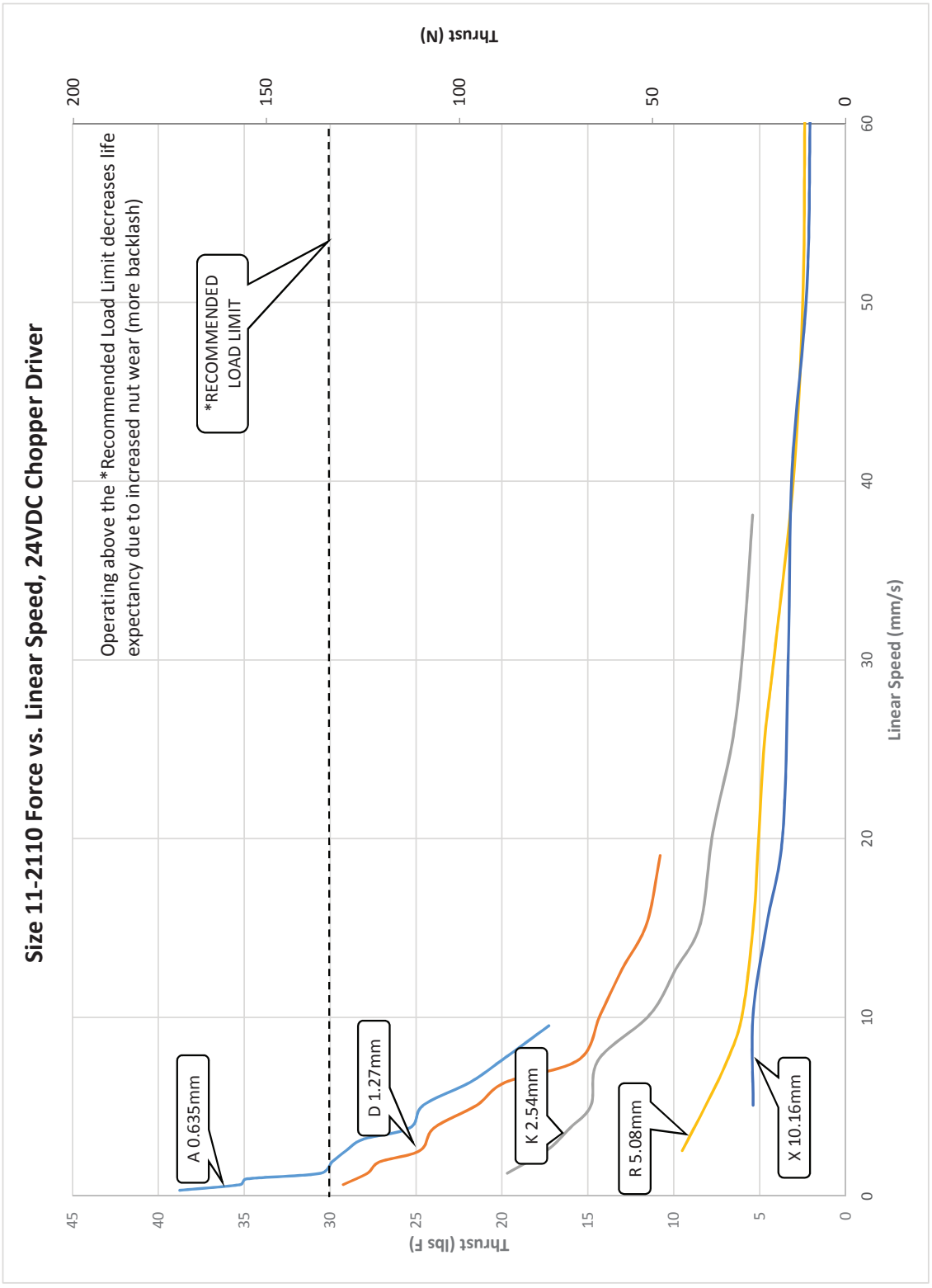
NEMA Size 11 (28 mm) Speed Thrust Curves

NEMA 11 SINGLE-STACK ROTARY SPEED



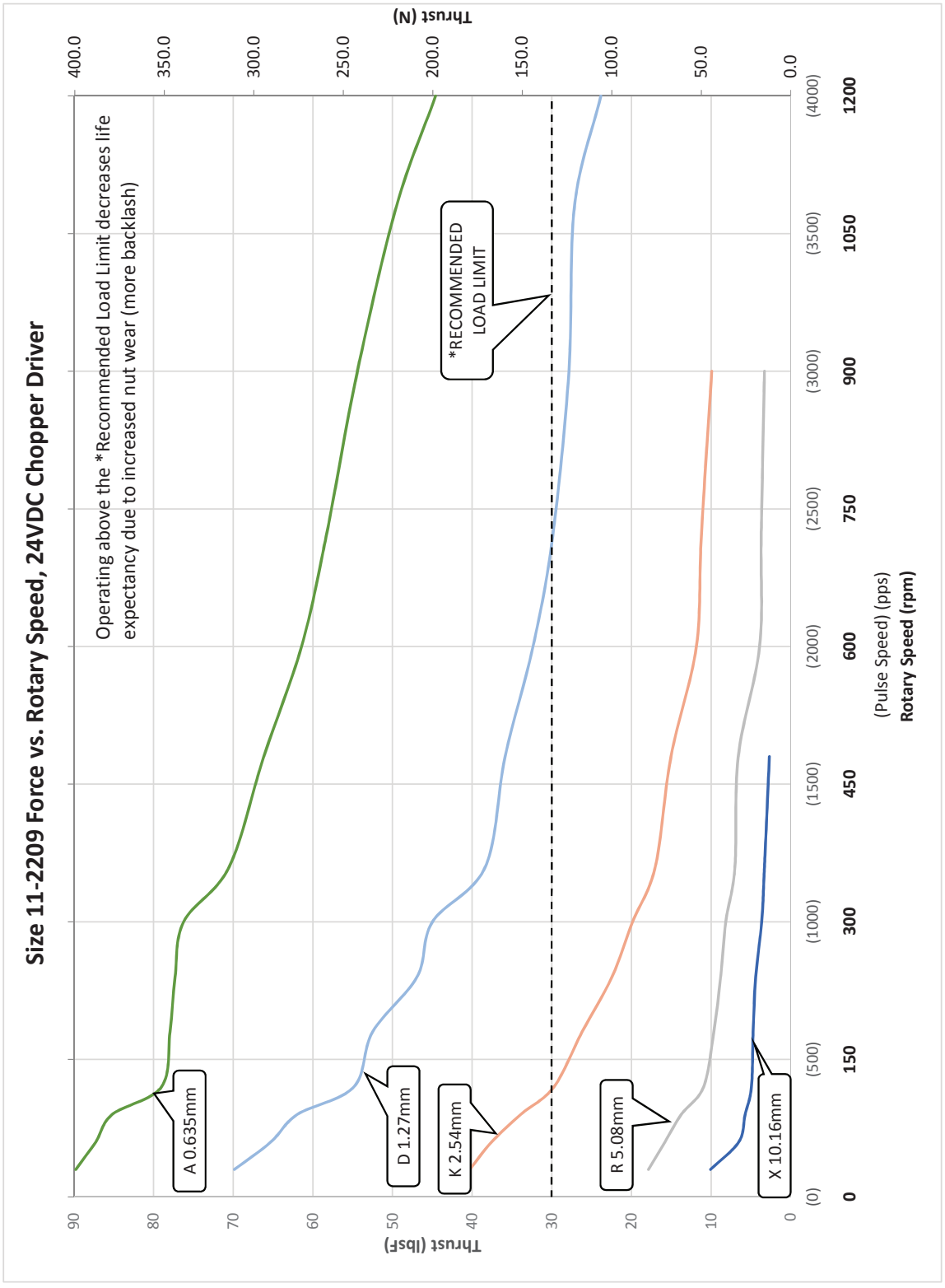
NEMA Size 11 (28 mm) Speed Thrust Curves (continued)

NEMA 11 SINGLE-STACK LINEAR SPEED



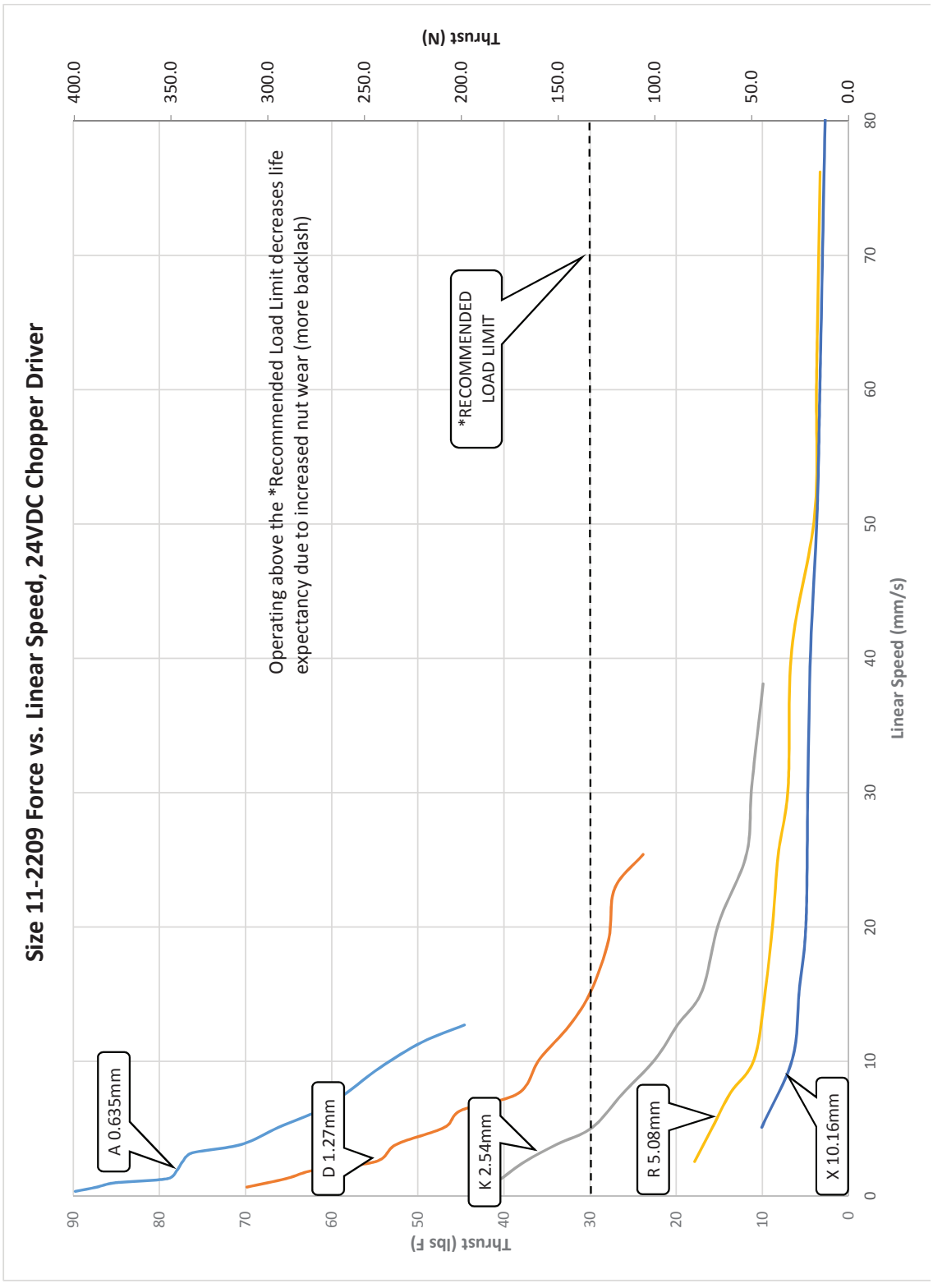
NEMA Size 11 (28 mm) Speed Thrust Curves (continued)

NEMA 11 DOUBLE-STACK ROTARY SPEED

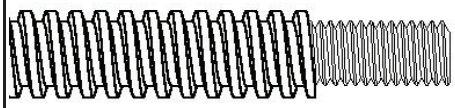
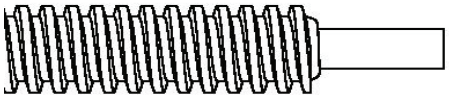
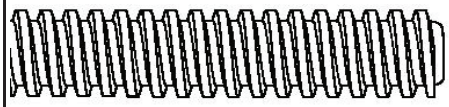


NEMA Size 11 (28 mm) Speed Thrust Curves (continued)

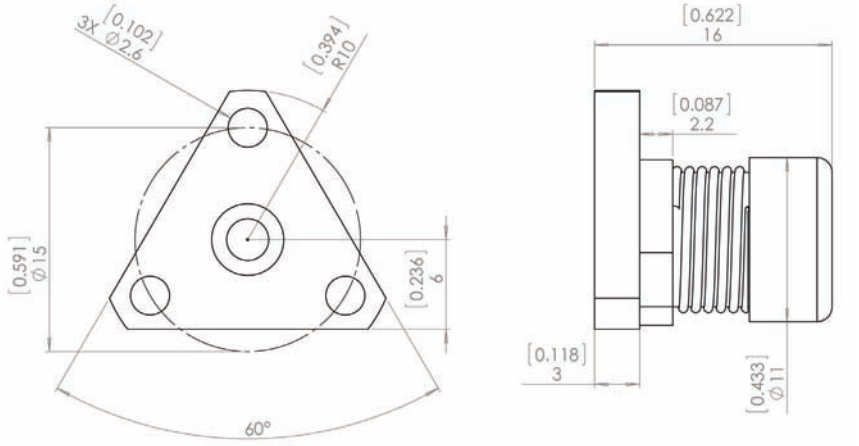
NEMA 11 DOUBLE-STACK LINEAR SPEED

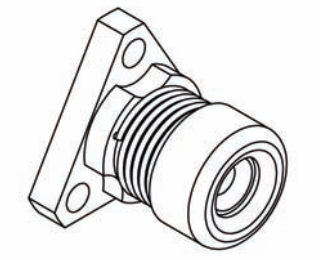


NEMA Size 11 (28 mm) End Machining Options

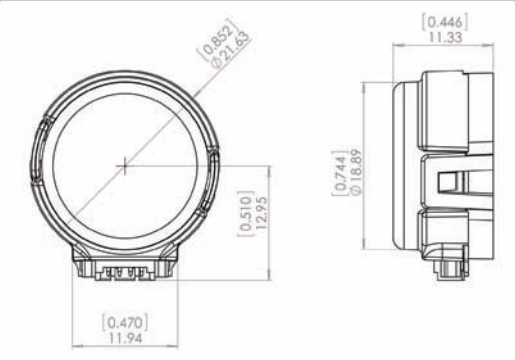
Standard Lead Screw End Machining		
	Threaded End	Metric End: M3 X 0.5 UNC End: 4-40 UNC
	Smooth End	∅3mm ± 0.025 ∅0.1181" ± 0.0010
	None	-

NEMA Size 11 (28 mm) Anti-Backlash Nut

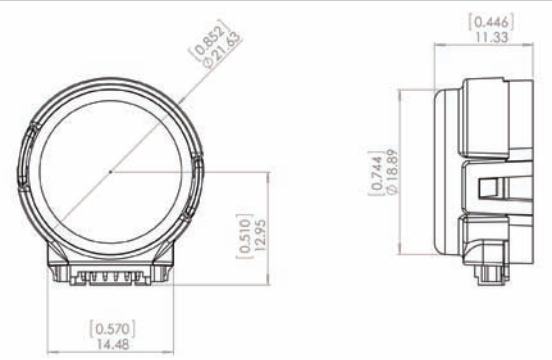




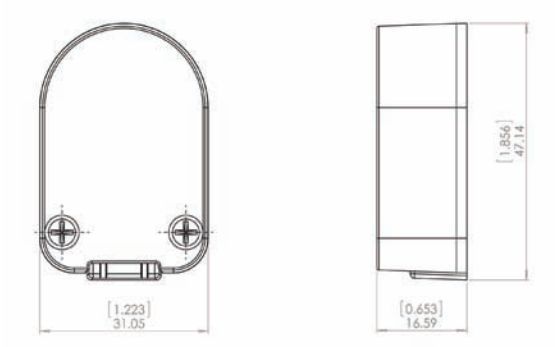
NEMA Size 11 (28 mm) Encoder Options



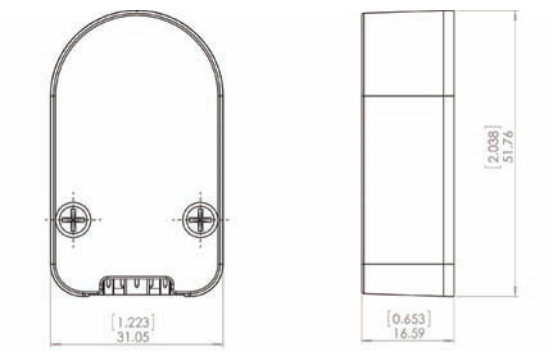
EK1 ENCODER SINGLE ENDED OUTPUT



EK1 ENCODER DIFFERENTIAL OUTPUT



EK2 ENCODER SINGLE ENDED OUTPUT



EK2 ENCODER DIFFERENTIAL OUTPUT

Encoder Options

EK1

Line Count	100	108	120	125	128	200	250	256	300	360
Single Ended	0	1	2	3	4	5	6	7	8	9
Differential	A	B	C	D	E	F	G	H	I	J

EK2

Line Count	100	200	250	256	400	500	512	1000	1024
Single Ended	0	1	2	3	4	5	6	7	8
Differential	A	B	C	D	E	F	G	H	I

Custom Encoder or Custom Line Count:

EC

For Encoder Ready Motors:

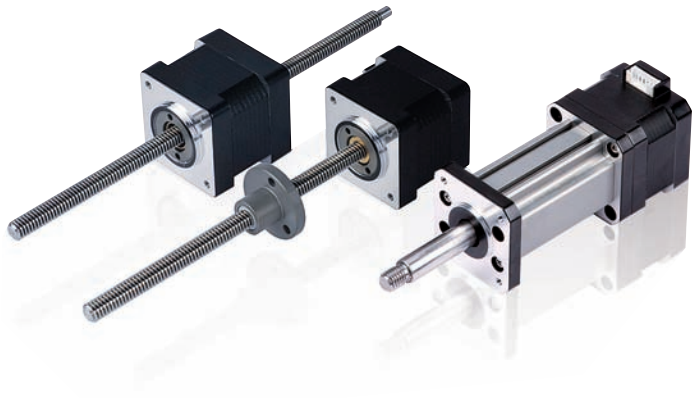
ER1 / ER2

For EK2 with Index: Add "I" as a suffix.
For Example, for EK2, 512 line count, with Differential, and Index: "EK2GI"

Please refer to our website for complete encoder specifications: **www.kocomotionus.com**

NEMA Size 14 (35 mm)
Hybrid Motor Linear Actuators

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



Motor Characteristics
Please contact Koco Motion US for custom products.

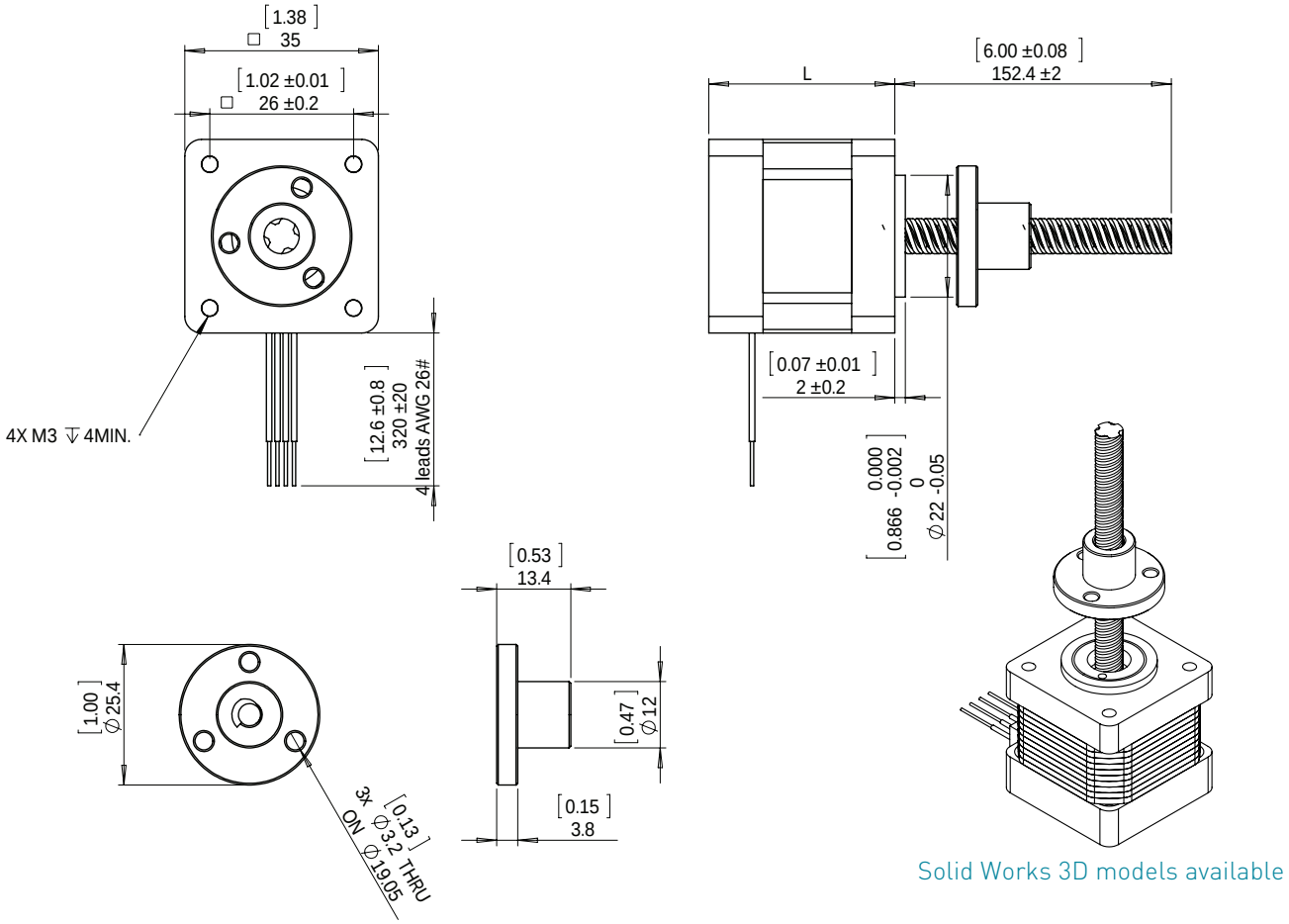
Motor	Voltage (V)	Current (A)	Resistance (Ω)	Inductance (mH)	Lead Wire No.	Motor Length (mm)
14-2105	6.6	0.5	13.2	14.0	4	34
14-2110	3.3	1.0	3.3	3.6	4	34
14-2115	2.2	1.5	1.5	1.6	4	34
14-2205	12.0	0.5	24.0	29.0	4	46
14-2210	6.0	1.0	6.0	7.2	4	46
14-2215	4.0	1.5	2.7	1.8	4	46

Available Lead Screws and Travel per Step
Please contact Koco Motion US for custom products.

Screw Dia. (inch)	Screw Dia. (mm)	Lead (inch)	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

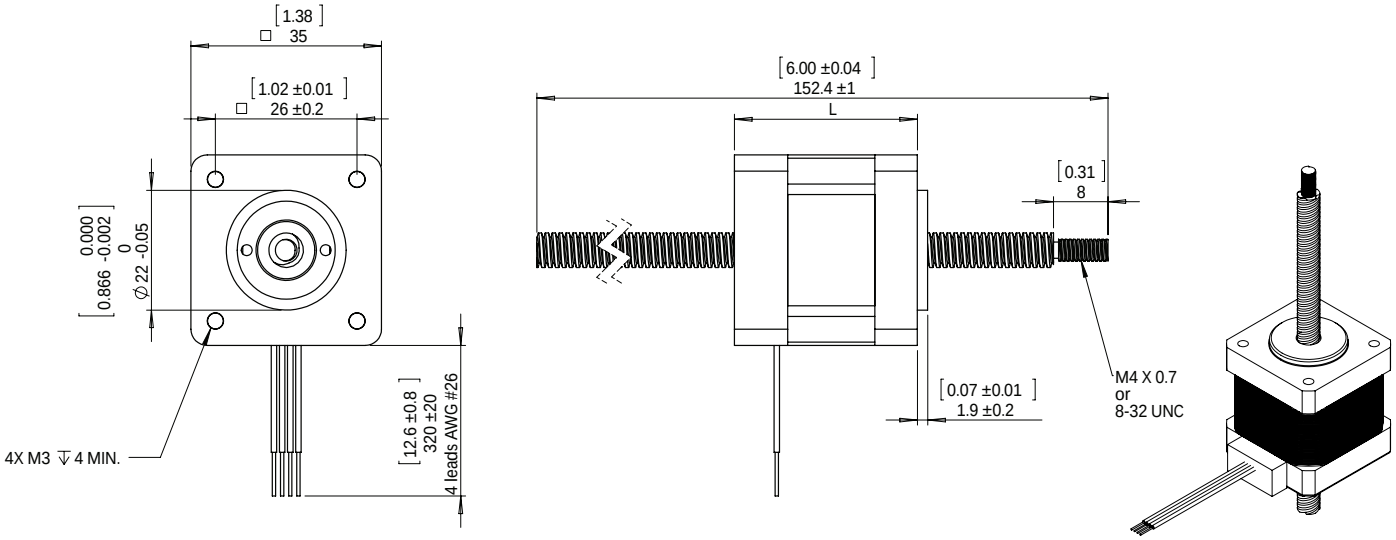
* values truncated

NEMA Size 14 (35 mm) Dimensions



Solid Works 3D models available

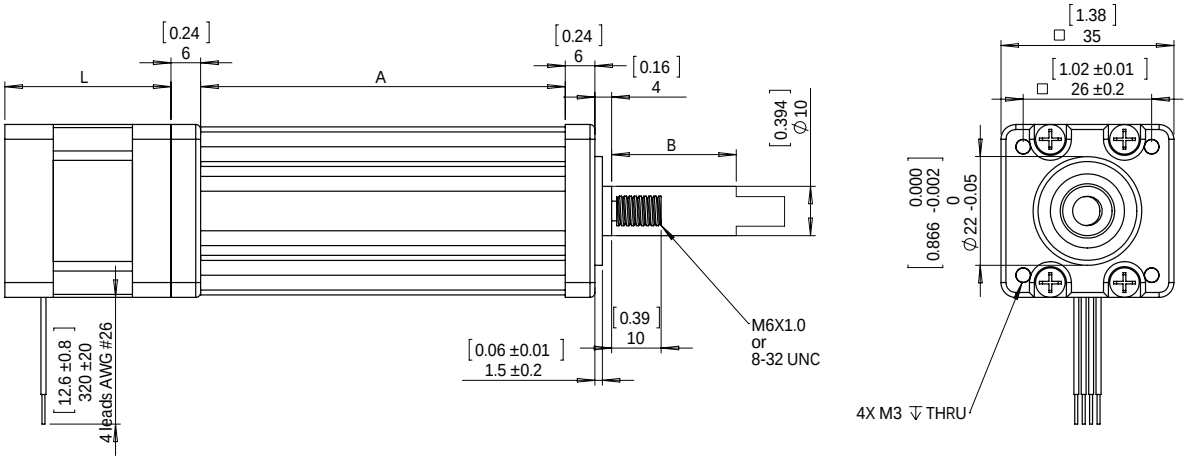
NEMA SIZE 14 EXTERNAL LINEAR ACTUATOR



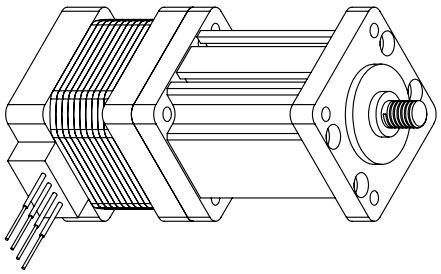
NEMA SIZE 14 NON-CAPTIVE LINEAR ACTUATOR

NOTE: All drawings are First Angle Projection—ISO Standard.

NEMA Size 14 (35 mm) Dimensions (continued)



Stroke B inch (mm)	Dimension A (mm)	Dimension L (mm)	
0.5 (12.7)	36.7	Single stack motor 35 mm	Double stack motor 49 mm
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		

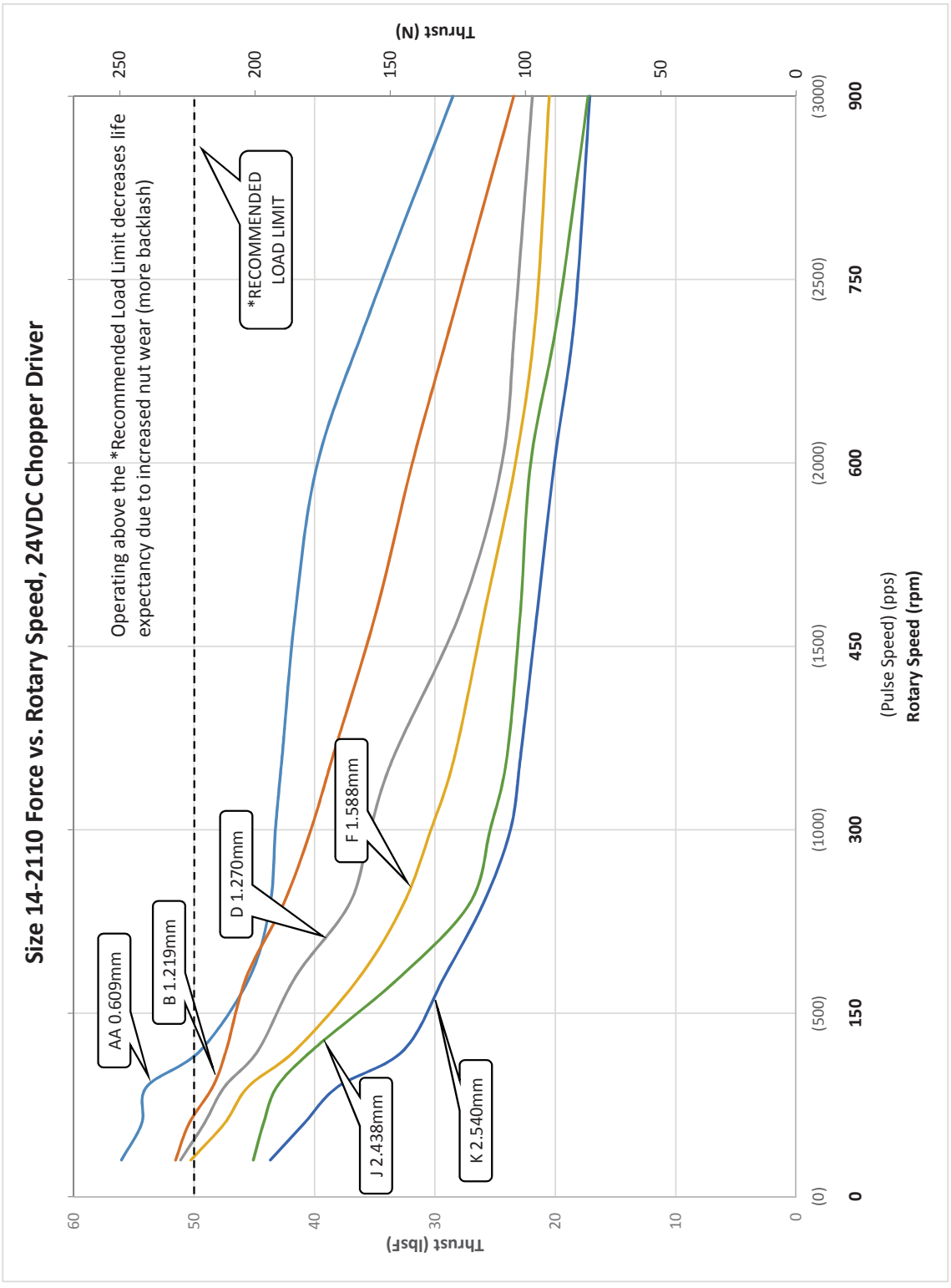


Solid Works 3D models available

NOTE: All drawings are First Angle Projection—ISO Standard.

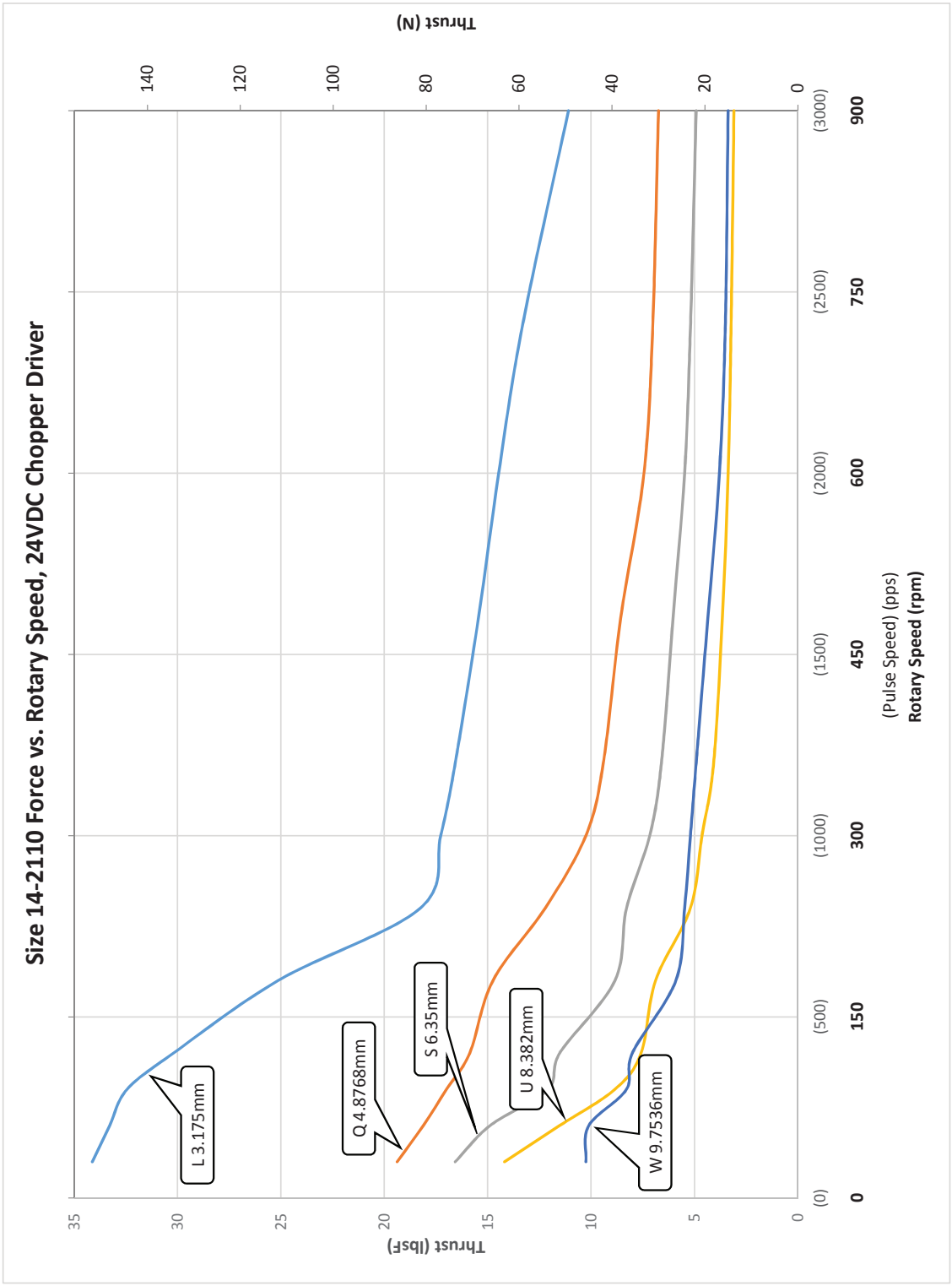
NEMA Size 14 (35 mm) Speed Thrust Curves

NEMA 14 SINGLE-STACK ROTARY SPEED



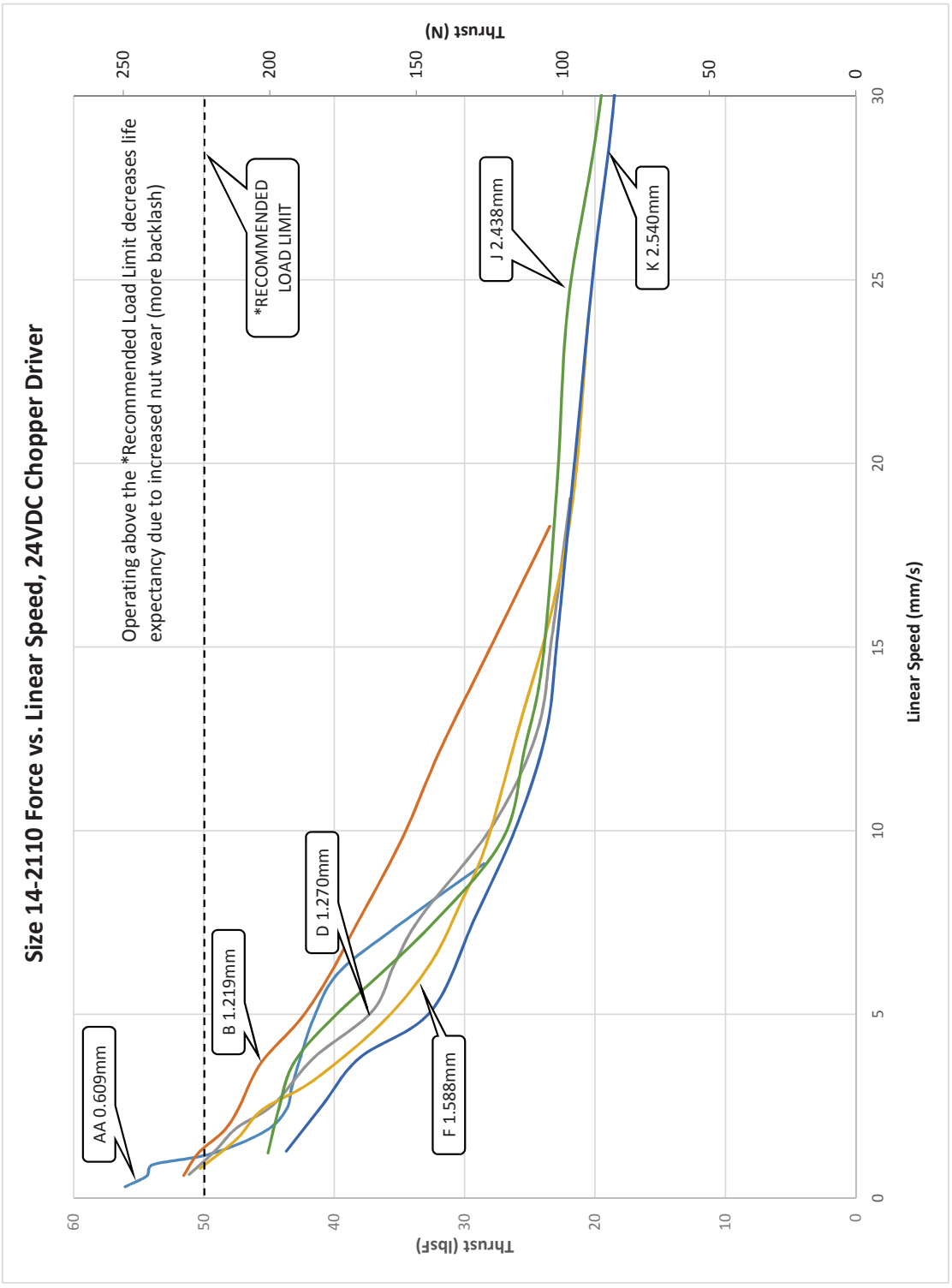
NEMA Size 14 (35 mm) Speed Thrust Curves (continued)

NEMA 14 SINGLE-STACK ROTARY SPEED



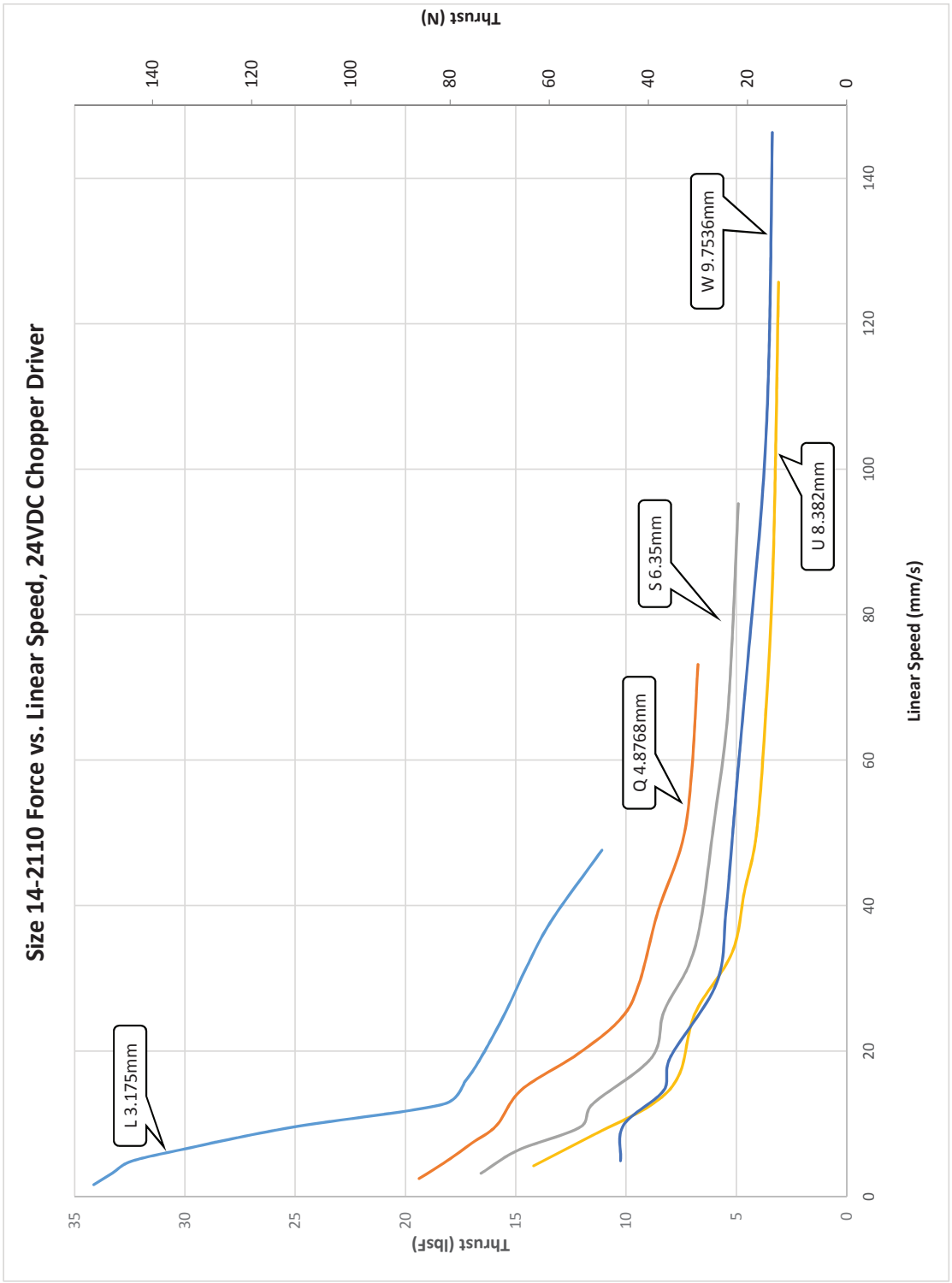
NEMA Size 14 (35 mm) Speed Thrust Curves (continued)

NEMA 14 SINGLE-STACK LINEAR SPEED



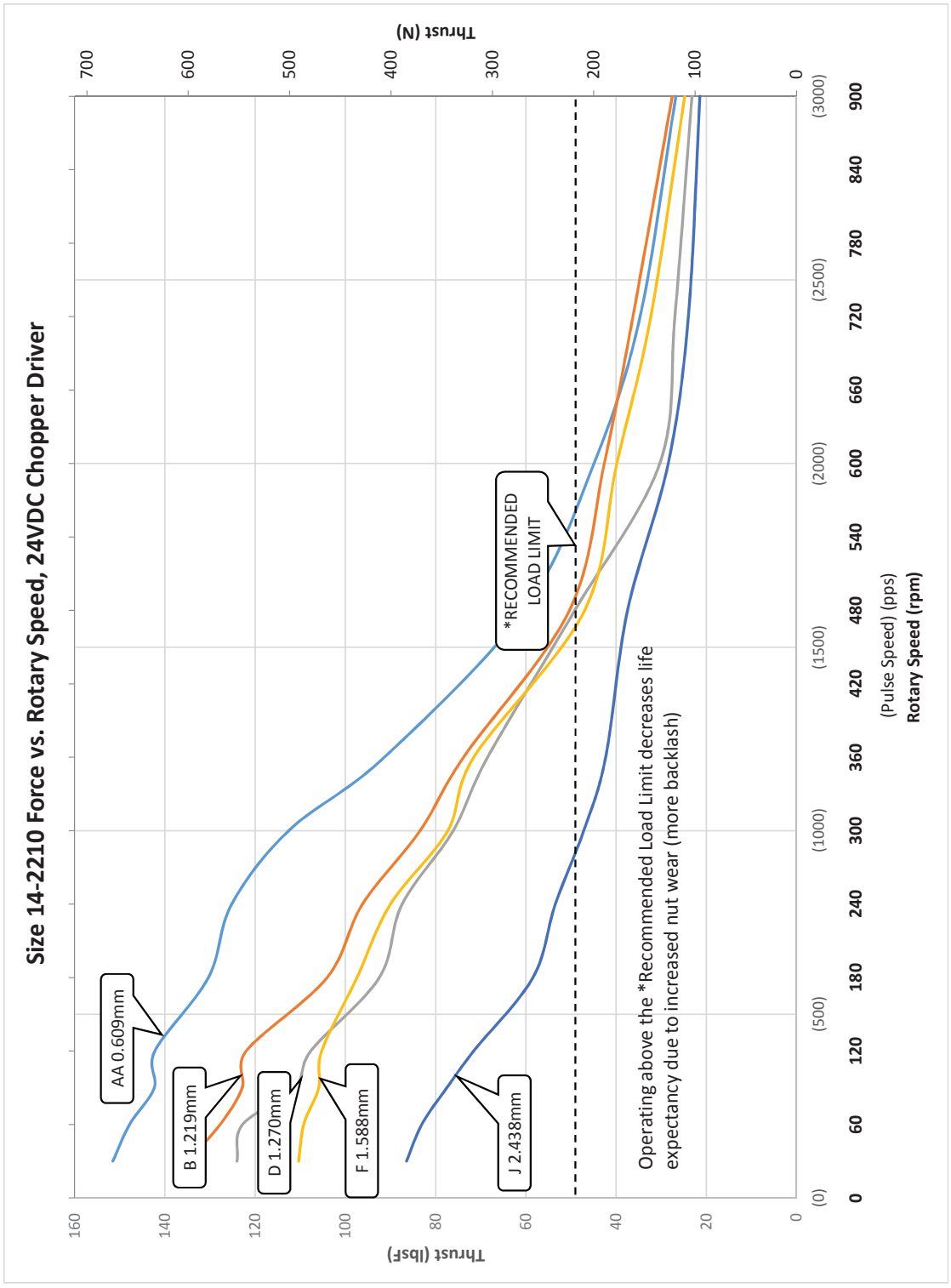
NEMA Size 14 (35 mm) Speed Thrust Curves (continued)

NEMA 14 SINGLE-STACK LINEAR SPEED



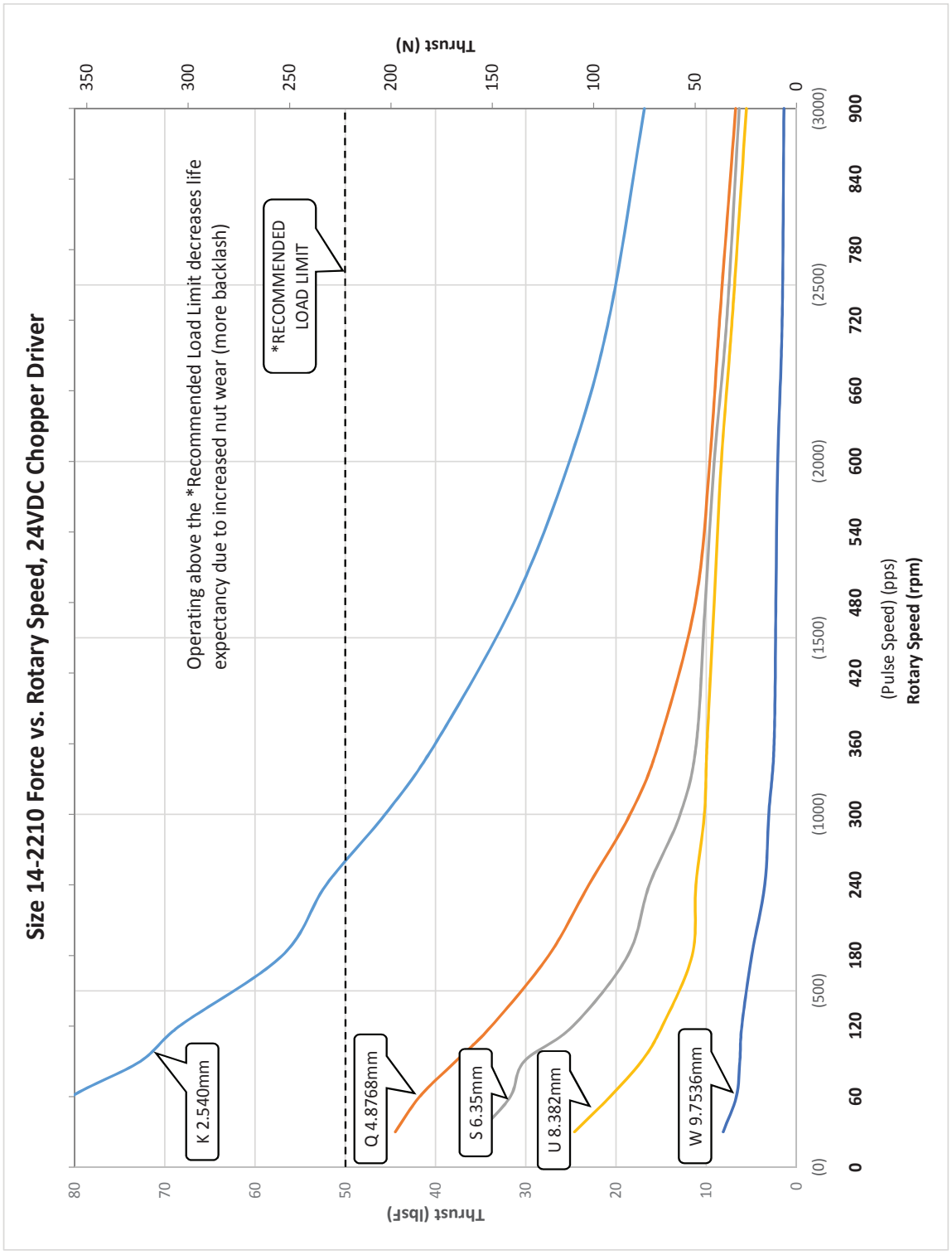
NEMA Size 14 (35 mm) Speed Thrust Curves (continued)

NEMA 14 DOUBLE-STACK ROTARY SPEED



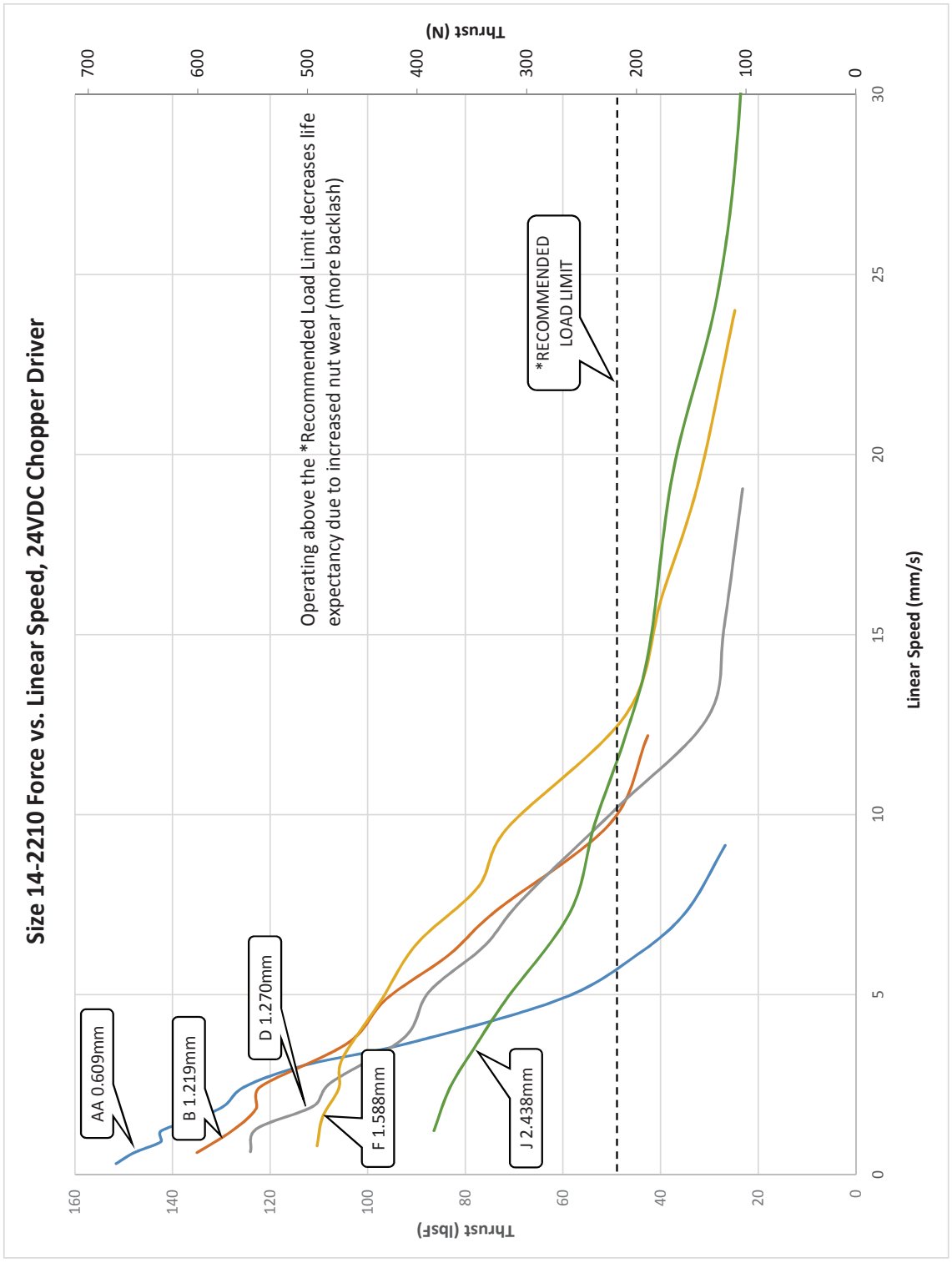
NEMA Size 14 (35 mm) Speed Thrust Curves (continued)

NEMA 14 DOUBLE-STACK ROTARY SPEED



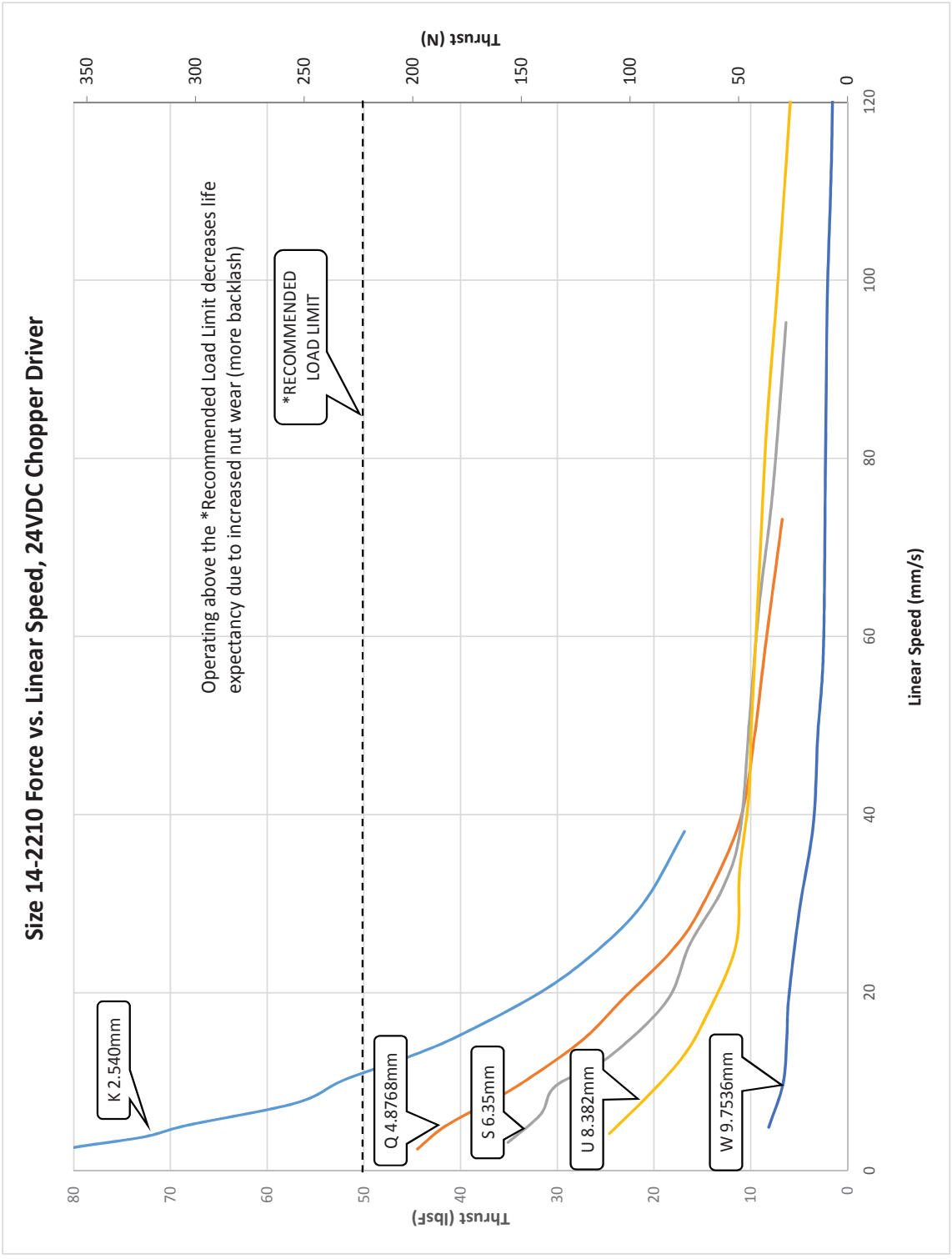
NEMA Size 14 (35 mm) Speed Thrust Curves (continued)

NEMA 14 DOUBLE-STACK LINEAR SPEED

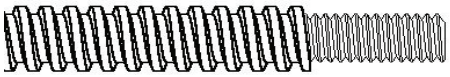
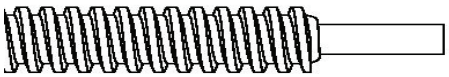


NEMA Size 14 (35 mm) Speed Thrust Curves (continued)

NEMA 14 DOUBLE-STACK LINEAR SPEED

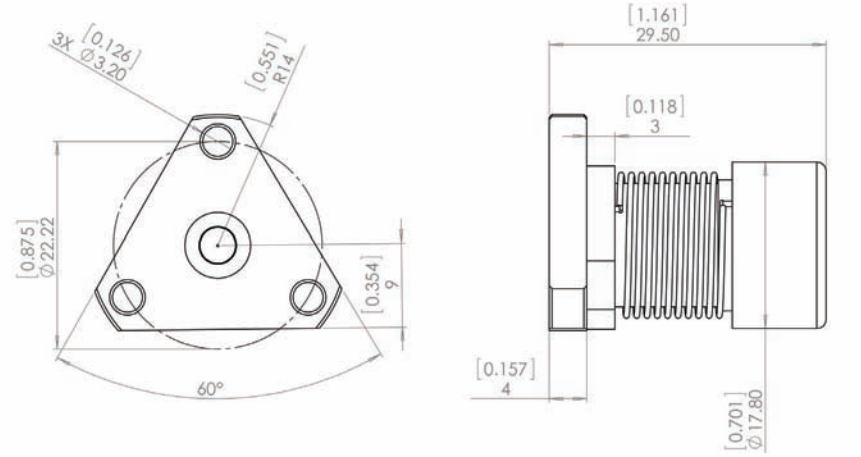


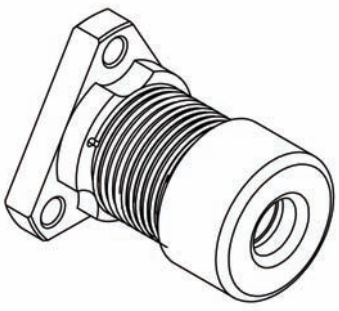
NEMA Size 14 (35 mm) End Machining Options

Standard Lead Screw End Machining		
	Threaded End	Metric End: M4 X 0.7mm UNC End: 8-32 UNC
	Smooth End	∅4mm ± 0.025 ∅0.1575" ± 0.0010
	None	-

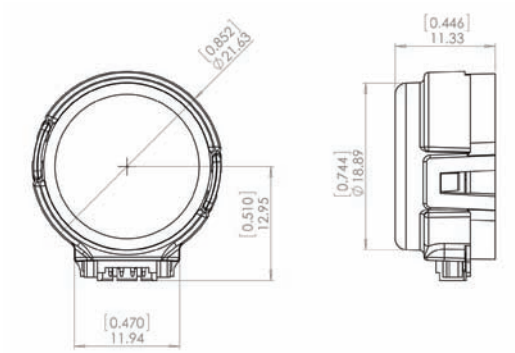
Captive Rod End Machining
Metric End: M6 X 1.0 UNC End: 8-32 UNC

NEMA Size 14 (35 mm) Anti-Backlash Nut

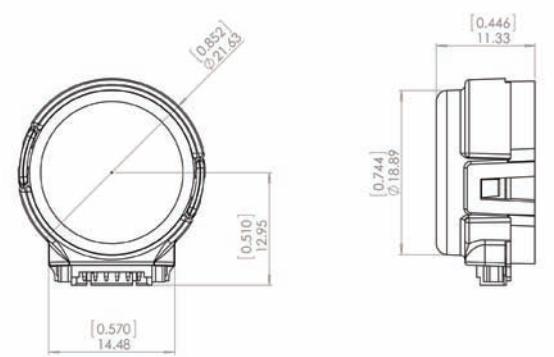




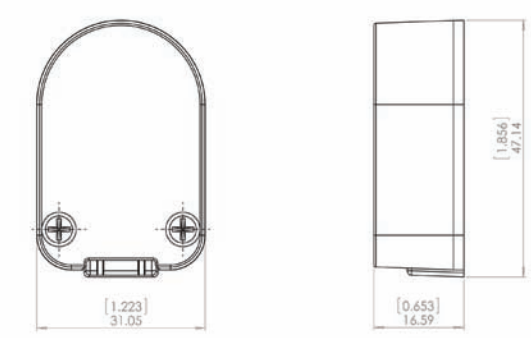
NEMA Size 14 (35 mm) Encoder Options



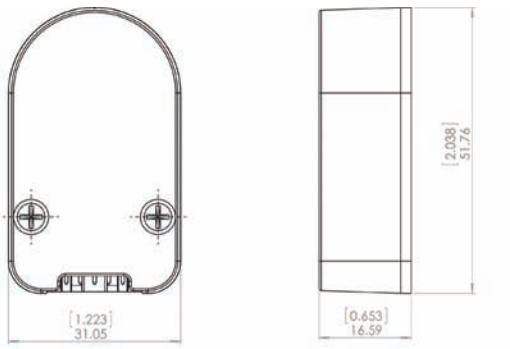
EK1 ENCODER SINGLE ENDED OUTPUT



EK1 ENCODER DIFFERENTIAL OUTPUT



EK2 ENCODER SINGLE ENDED OUTPUT



EK2 ENCODER DIFFERENTIAL OUTPUT

Encoder Options

EK1

Line Count	100	108	120	125	128	200	250	256	300	360
Single Ended	0	1	2	3	4	5	6	7	8	9
Differential	A	B	C	D	E	F	G	H	I	J

EK2

Line Count	100	200	250	256	400	500	512	1000	1024
Single Ended	0	1	2	3	4	5	6	7	8
Differential	A	B	C	D	E	F	G	H	I

Custom Encoder or Custom Line Count:

EC

For Encoder Ready Motors:

ER1 / ER2

For EK2 with Index: Add "I" as a suffix.
For Example, for EK2, 512 line count, with Differential, and Index: "EK2GI"

Please refer to our website for complete encoder specifications:
www.kocomotionus.com

NEMA Size 17 (42 mm)
Hybrid Stepper 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.

Motor Characteristics
Please contact Koco Motion US for 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	1.0	3.6	5.0	4	34
17-2115	2.4	1.5	1.6	2.2	4	34
17-2205	11.0	0.5	22.0	46.0	4	48
17-2212	4.5	1.2	3.8	8.0	4	48
17-2225	2.2	2.5	0.87	1.8	4	48

Available Lead Screws and Travel per Step
Please contact Koco Motion US for custom products.

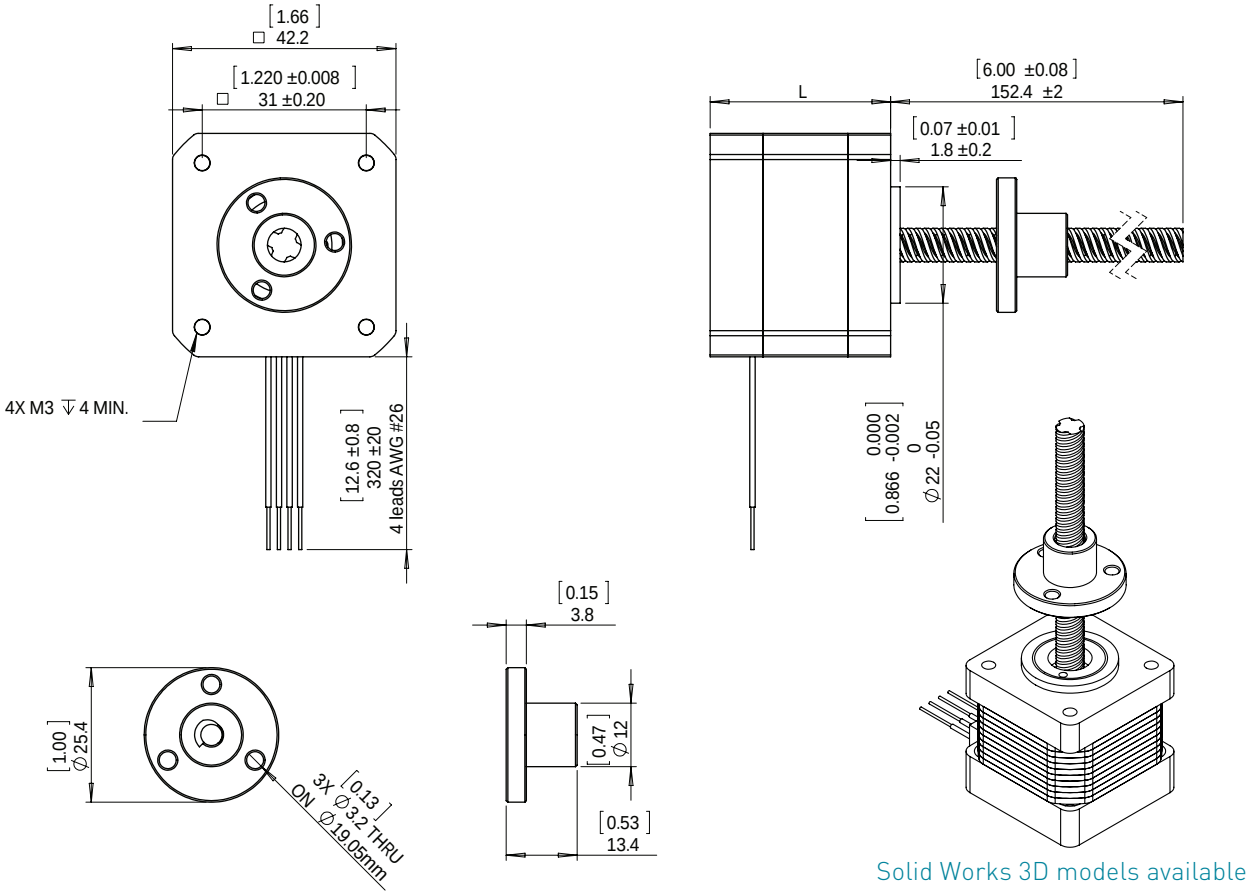
Screw Dia. (inch)	Screw Dia. (mm)	Lead (inch)	Lead (mm)	Lead Code	Travel Per Step @ 1.8 deg (mm)	Travel Per Step @ 0.9 deg (mm)*
0.25	6.35	0.024	0.6096	AA	0.003	0.0015
0.25	6.35	0.048	1.2192	B	0.006	0.003
0.25	6.35	0.05	1.27	D	0.006	0.0032
0.25	6.35	0.0625	1.5875	F	0.0079375	0.0039688
0.25	6.35	0.096	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

Custom Lead Screw DIA Available for NEMA 17

0.375″ DIA shaft available with external shaft version

* values truncated

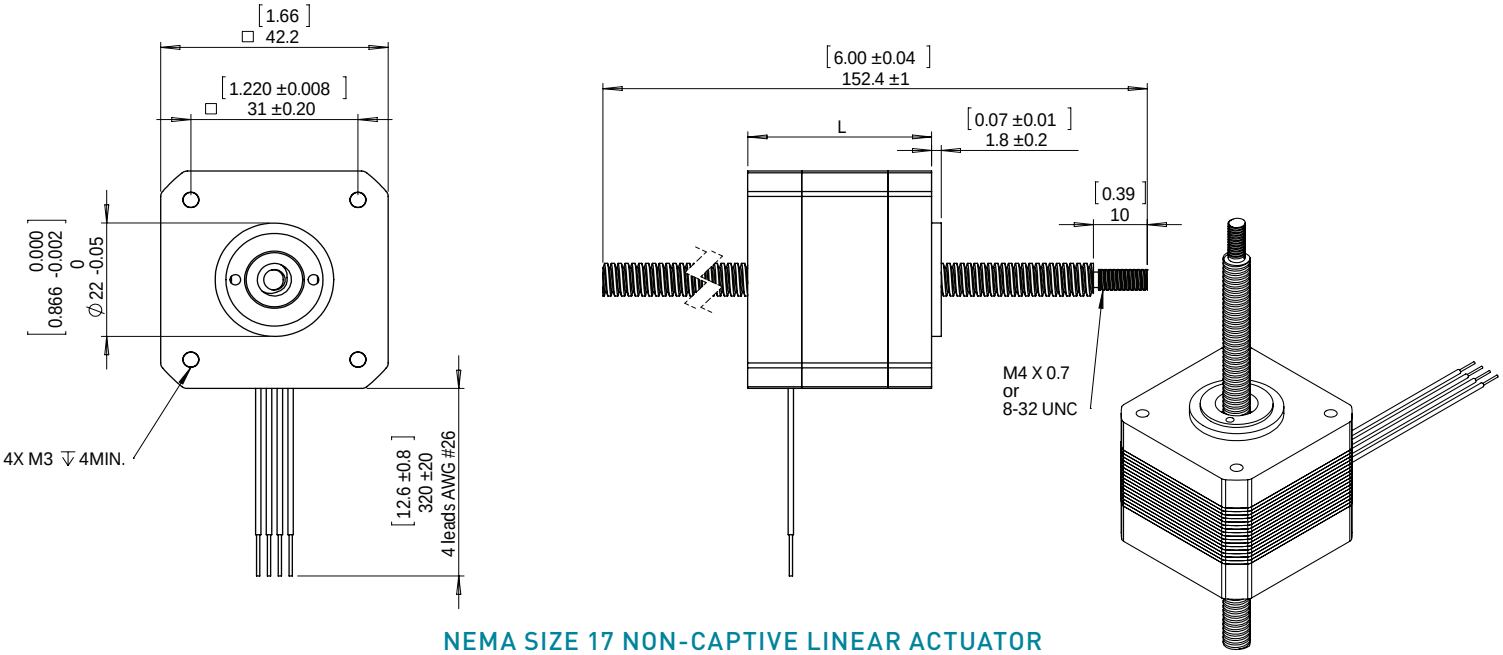
NEMA Size 17 (42 mm) Dimensions



Solid Works 3D models available

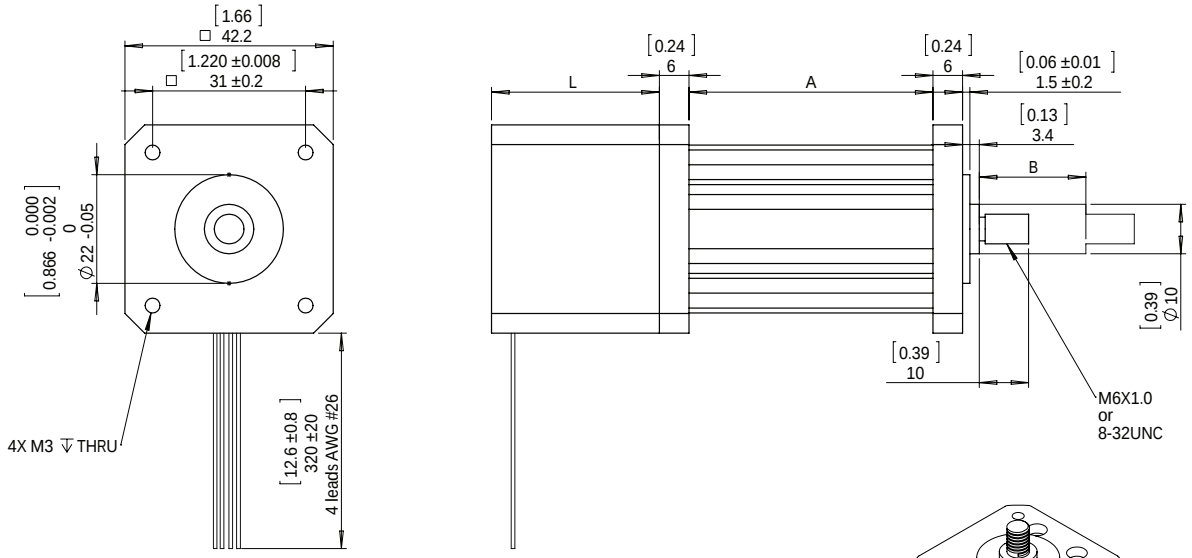
NOTE: All drawings are First Angle Projection—ISO Standard.

NEMA Size 17 (42 mm) Dimensions (continued)

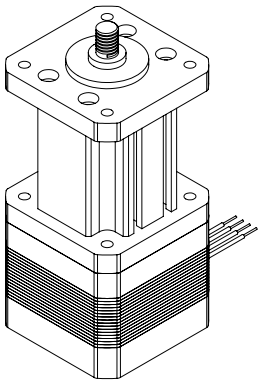


NEMA SIZE 17 NON-CAPTIVE LINEAR ACTUATOR

Solid Works 3D models available



Stroke B inch (mm)	Dimension A (mm)	Dimension L (mm)	
0.5 (12.7)	36.7	Single stack motor 35 mm	Double stack motor 49 mm
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		

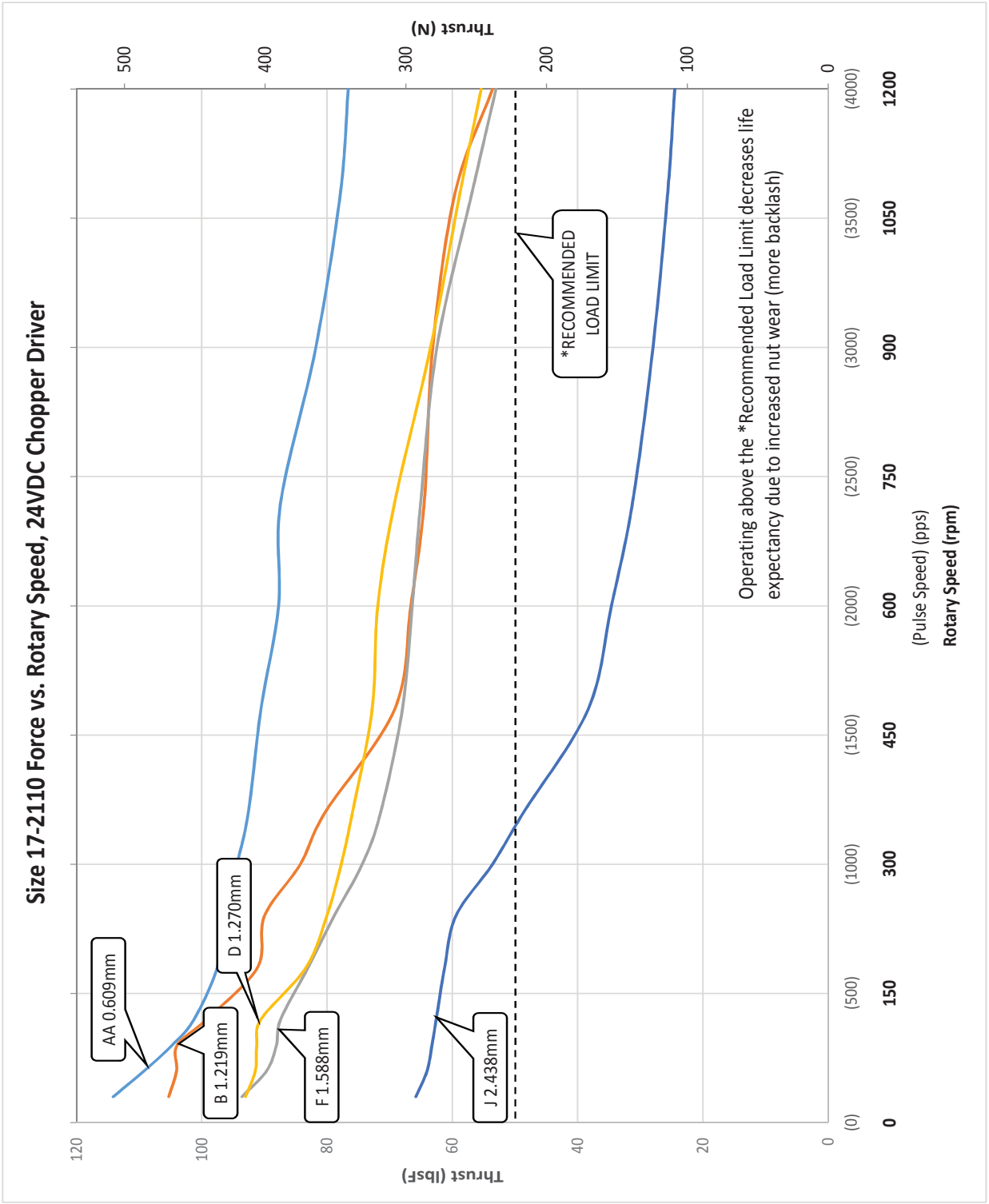


NEMA SIZE 17 CAPTIVE LINEAR ACTUATOR

NOTE: All drawings are First Angle Projection—ISO Standard.

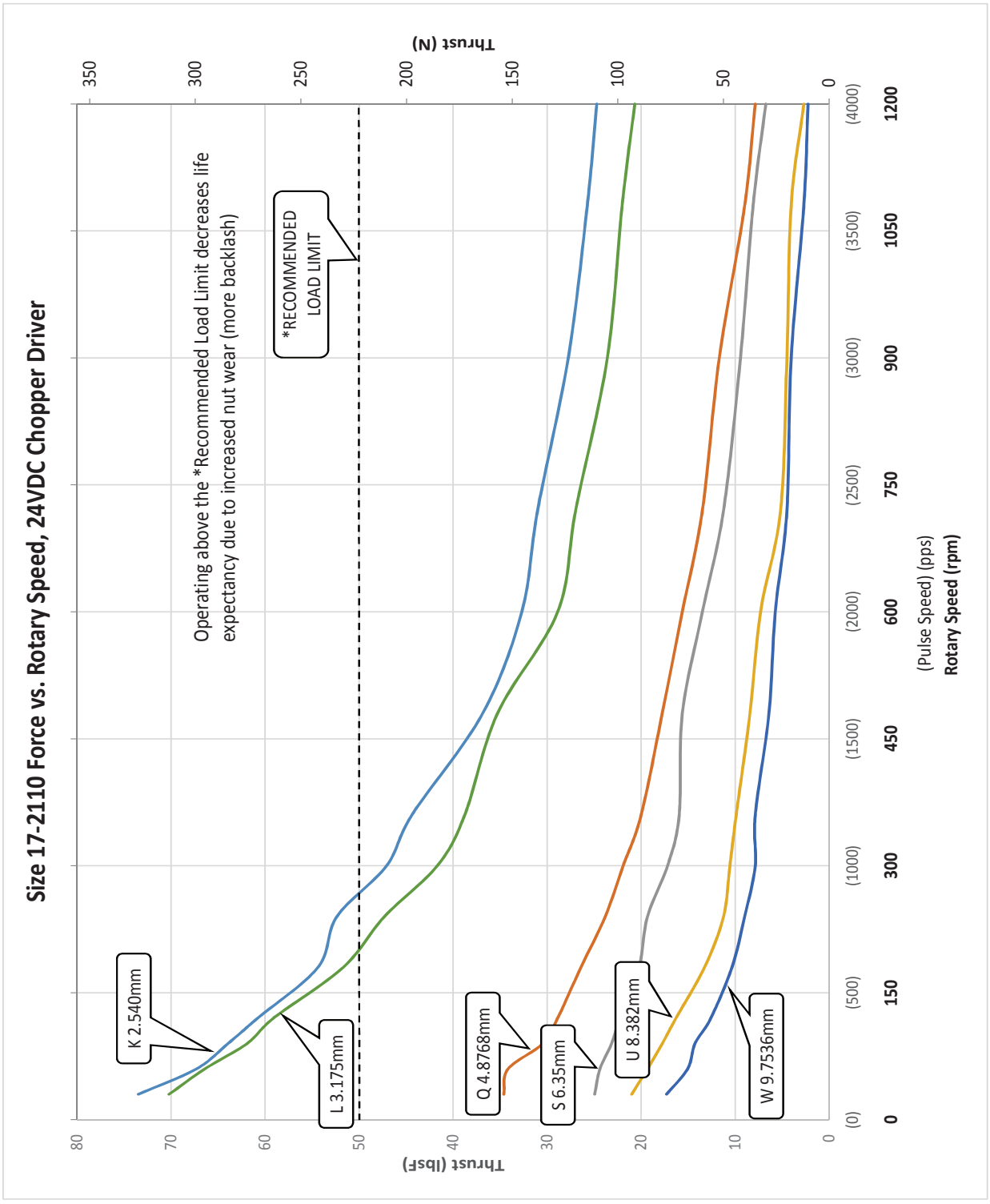
NEMA Size 17 (42 mm) Speed Thrust Curves

NEMA 17 SINGLE-STACK ROTARY SPEED



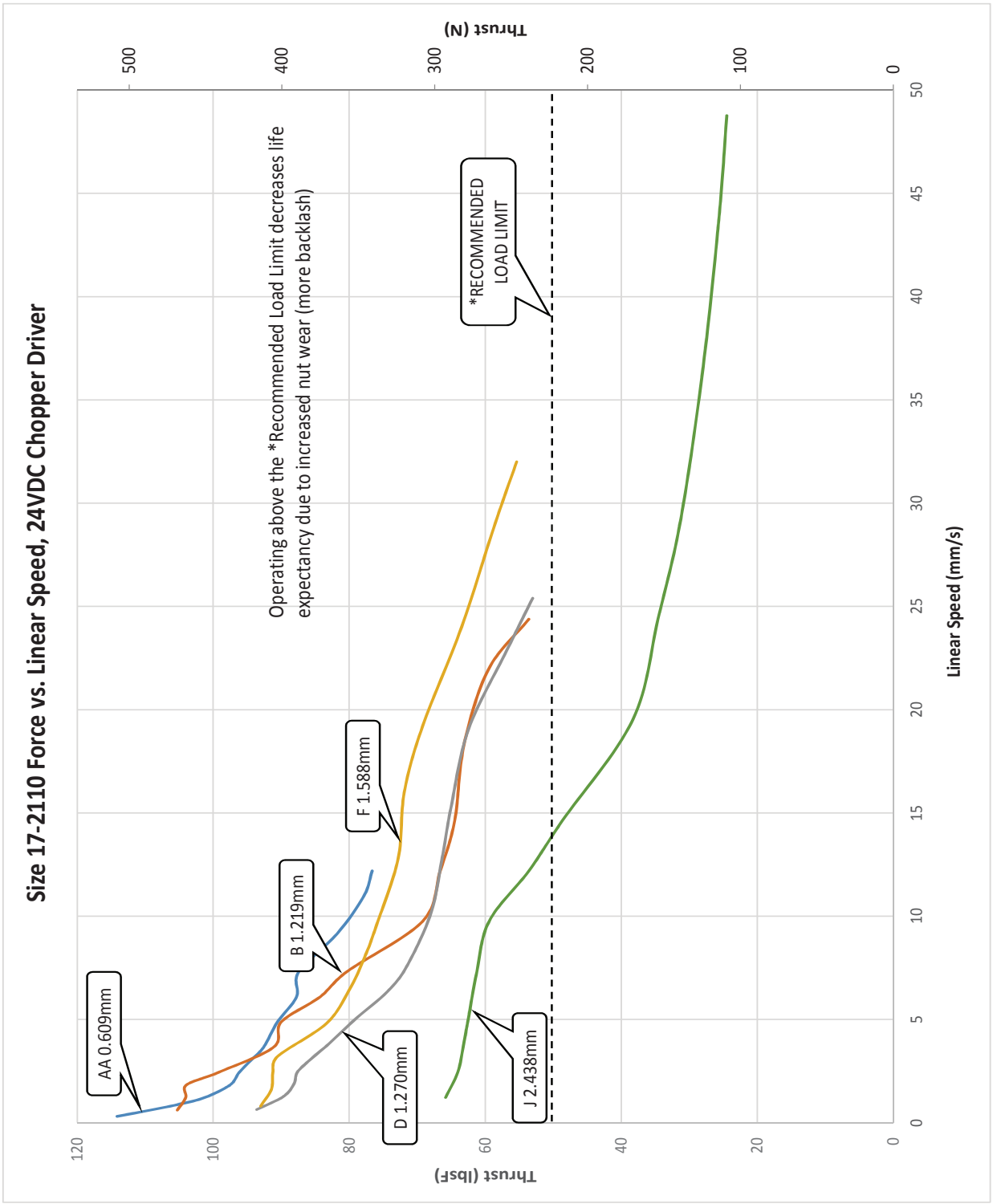
NEMA Size 17 (42 mm) Speed Thrust Curves (continued)

NEMA 17 SINGLE-STACK ROTARY SPEED



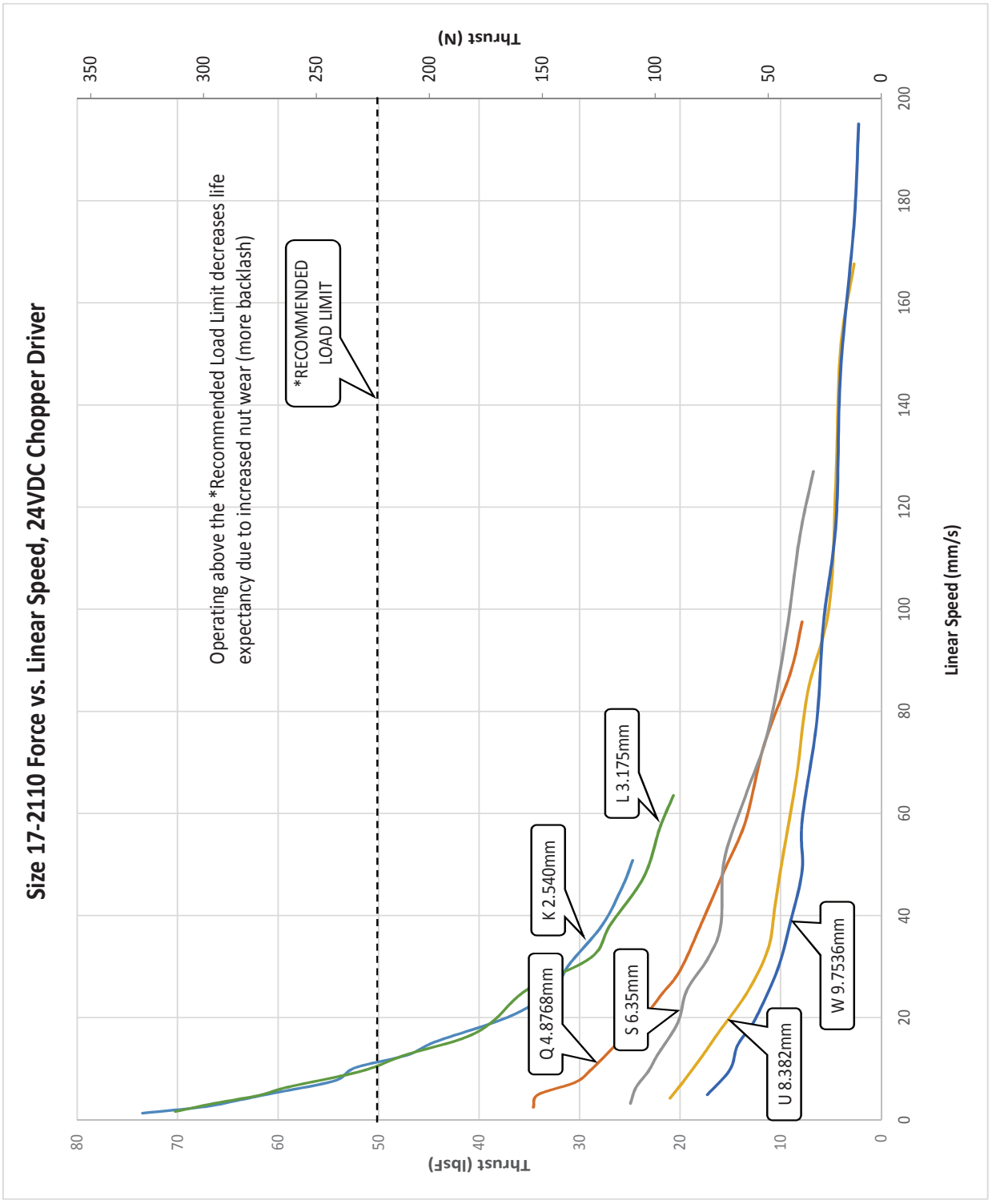
NEMA Size 17 (42 mm) Speed Thrust Curves (continued)

NEMA 17 SINGLE-STACK LINEAR SPEED



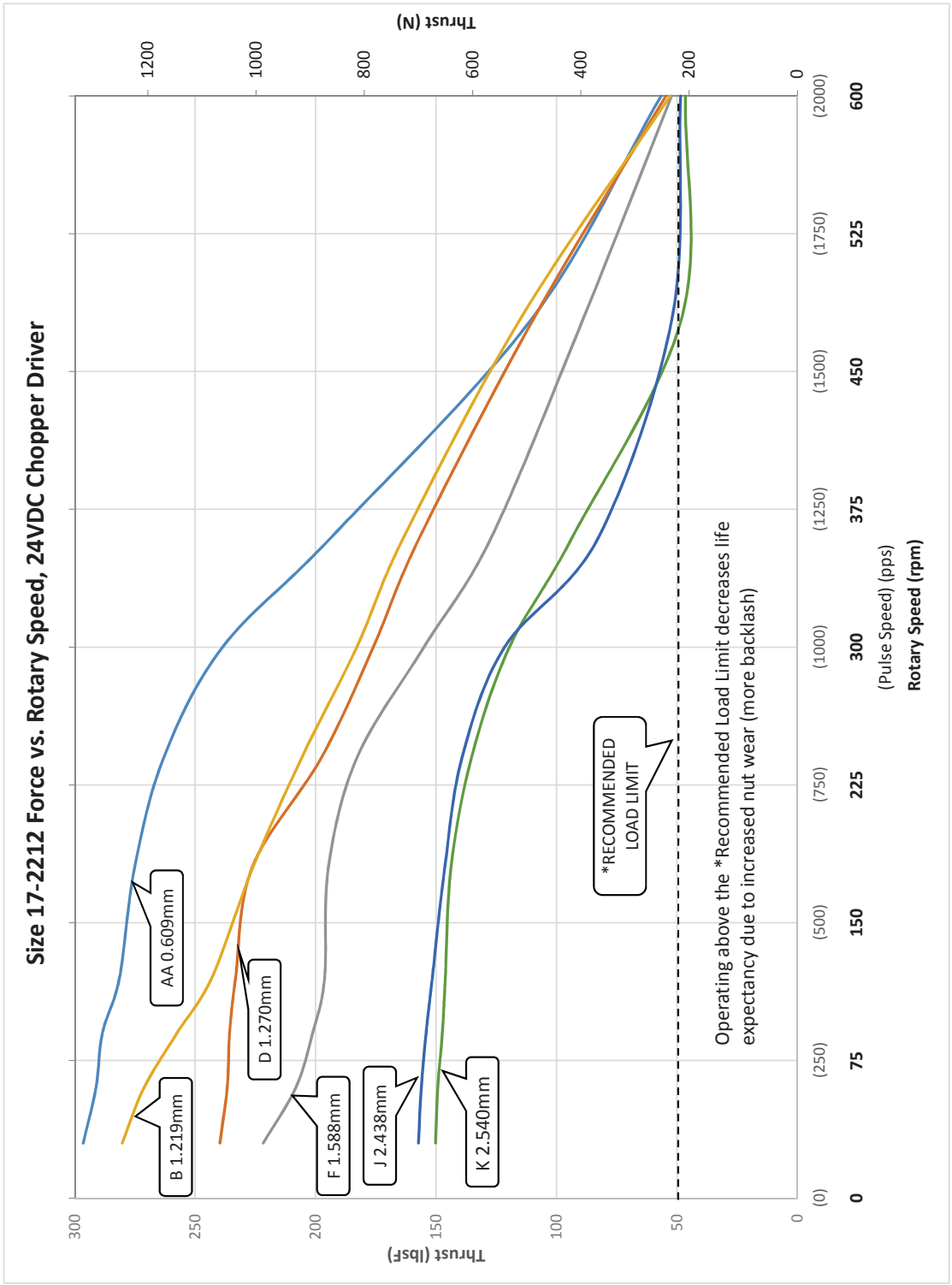
NEMA Size 17 (42 mm) Speed Thrust Curves (continued)

NEMA 17 SINGLE-STACK LINEAR SPEED



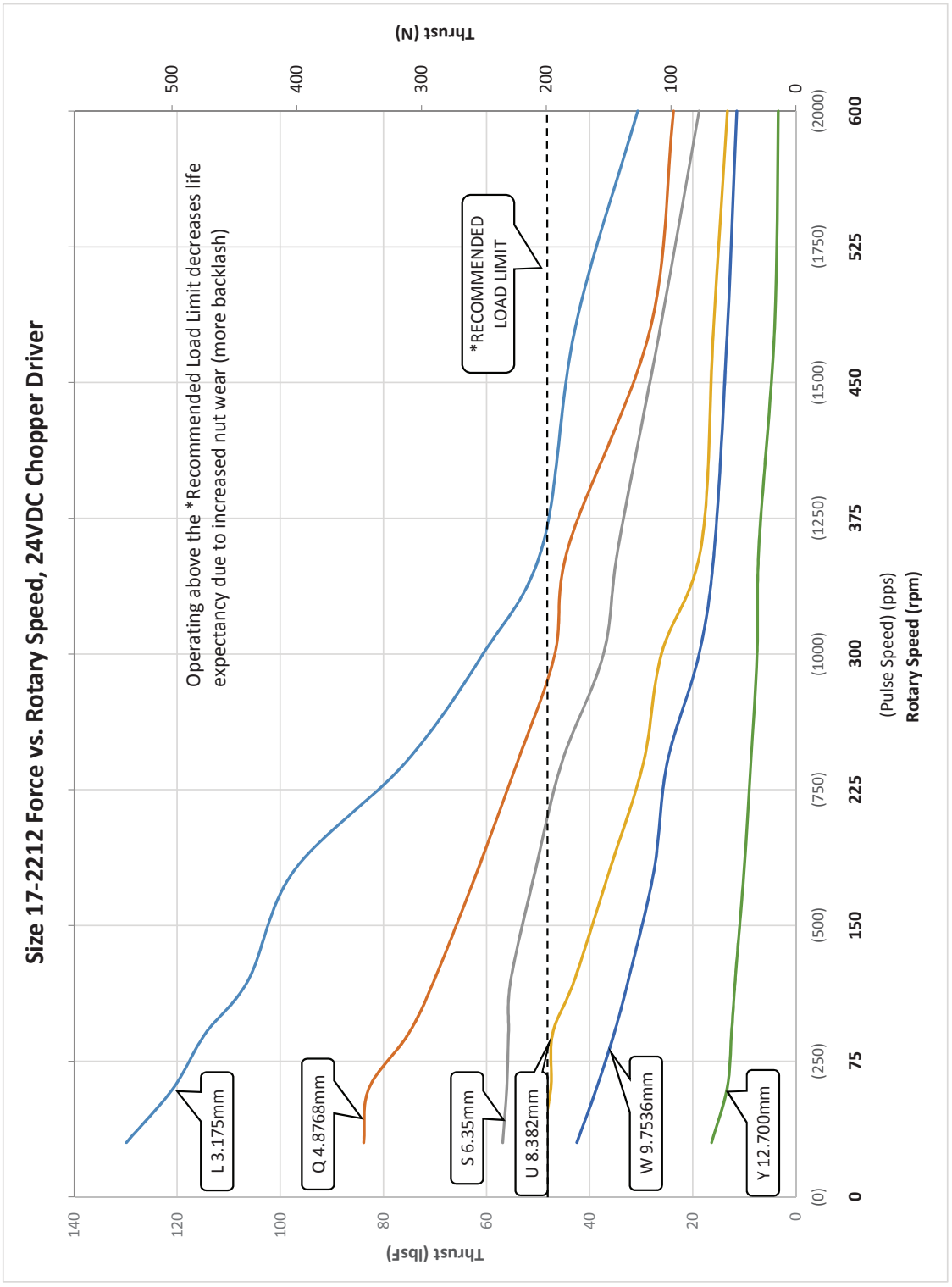
NEMA Size 17 (42 mm) Speed Thrust Curves (continued)

NEMA 17 DOUBLE-STACK ROTARY SPEED



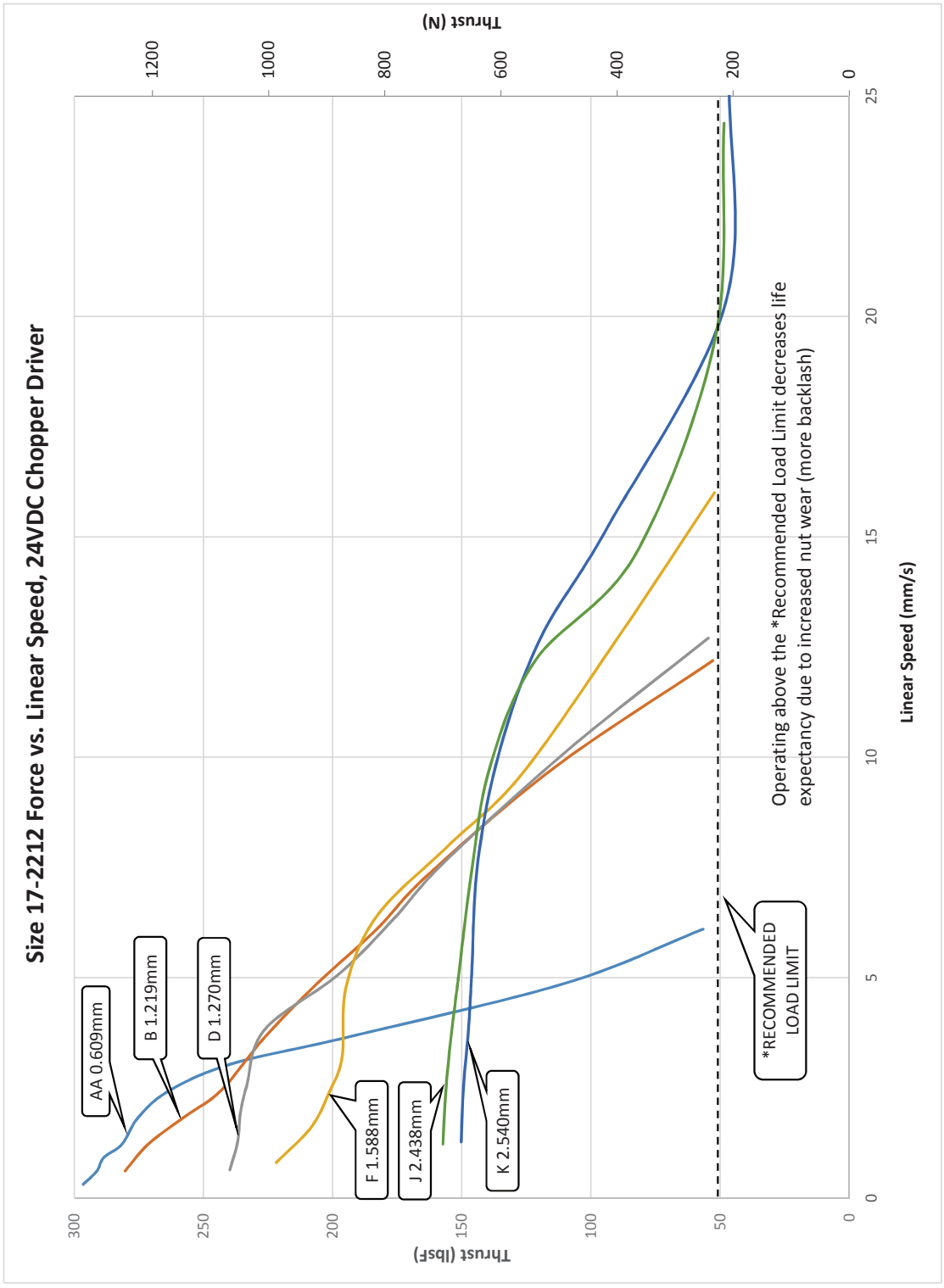
NEMA Size 17 (42 mm) Speed Thrust Curves (continued)

NEMA 17 DOUBLE-STACK ROTARY SPEED



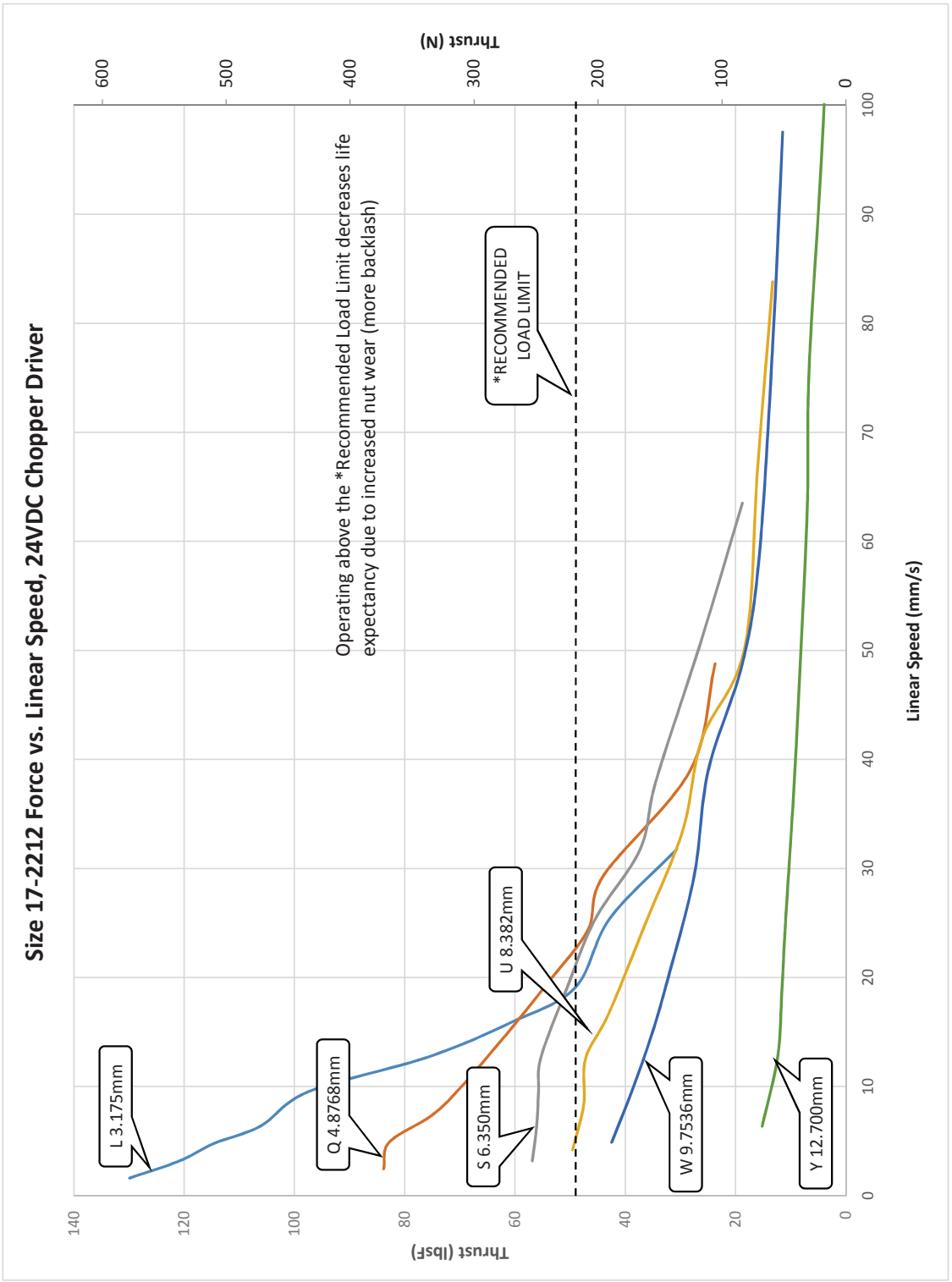
NEMA Size 17 (42 mm) Speed Thrust Curves (continued)

NEMA 17 DOUBLE-STACK LINEAR SPEED

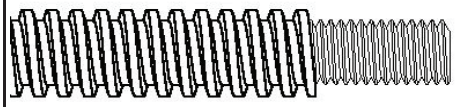
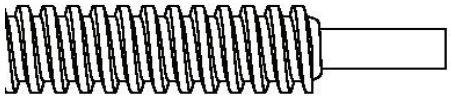
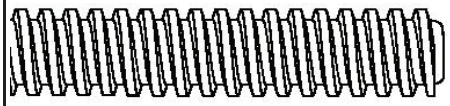


NEMA Size 17 (42 mm) Speed Thrust Curves (continued)

NEMA 17 DOUBLE-STACK LINEAR SPEED

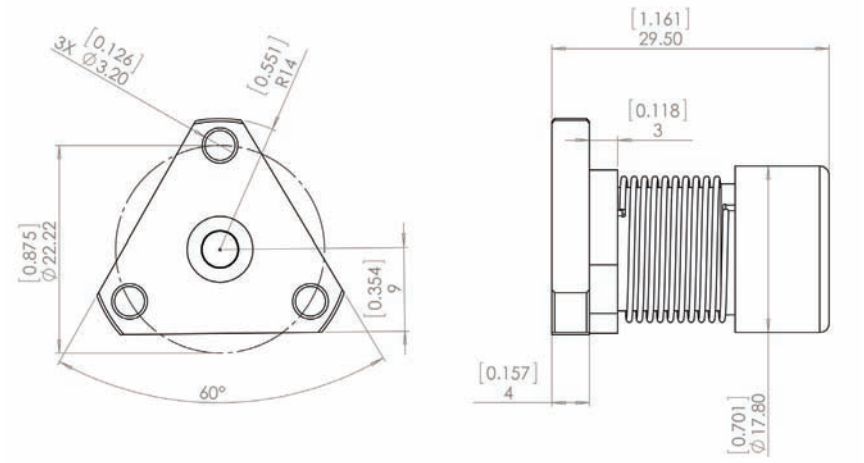


NEMA Size 17 (42 mm) End Machining Options

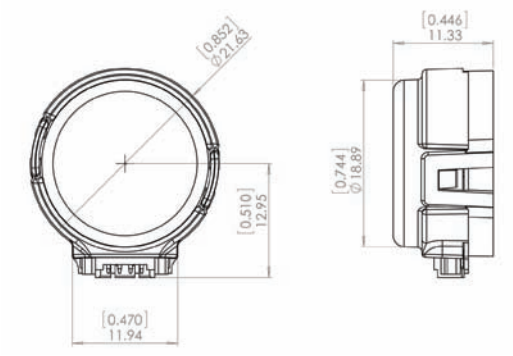
Standard Lead Screw End Machining		
	Threaded End	Metric End: M4 X 0.7mm UNC End: 8-32 UNC
	Smooth End	∅4mm ± 0.025 ∅0.1575" ± 0.0010
	None	-

Captive Rod End Machining
Metric End: M6 X 1.0 UNC End: 8-32 UNC

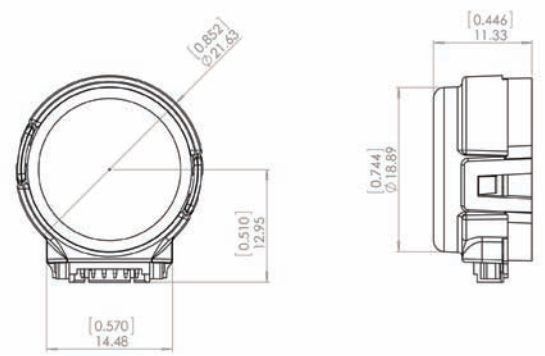
NEMA Size 17 (42 mm) Anti-Backlash Nut



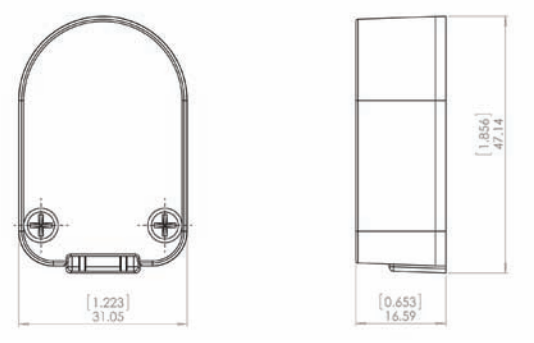
NEMA Size 17 (42 mm) - Encoder Options



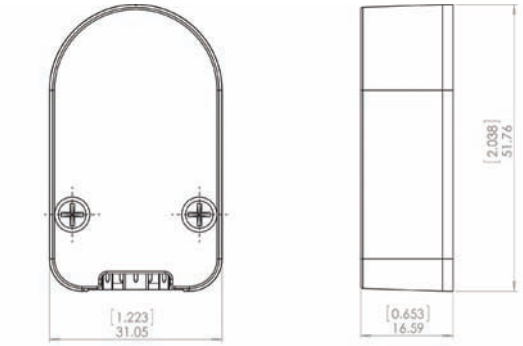
EK1 ENCODER SINGLE ENDED OUTPUT



EK1 ENCODER DIFFERENTIAL OUTPUT



EK2 ENCODER SINGLE ENDED OUTPUT



EK2 ENCODER DIFFERENTIAL OUTPUT

Encoder Options

EK1

Line Count	100	108	120	125	128	200	250	256	300	360
Single Ended	0	1	2	3	4	5	6	7	8	9
Differential	A	B	C	D	E	F	G	H	I	J

EK2

Line Count	100	200	250	256	400	500	512	1000	1024
Single Ended	0	1	2	3	4	5	6	7	8
Differential	A	B	C	D	E	F	G	H	I

Custom Encoder or Custom Line Count:

EC

For Encoder Ready Motors:

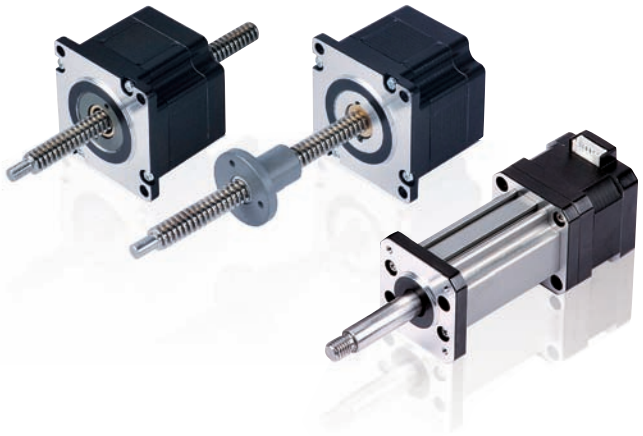
ER1 / ER2

For EK2 with Index: Add "I" as a suffix.
For Example, for EK2, 512 line count, with Differential, and Index: "EK2GI"

Please refer to our website for complete encoder specifications: **www.kocomotionus.com**

NEMA Size 23 (57 mm)
Hybrid Stepper 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.



Motor Characteristics
Please contact Koco Motion US for custom products.

Motor	Voltage (V)	Current (A)	Resistance (Ω)	Inductance (mH)	Lead Wire No.	Motor Length (mm)
23-2110	6.4	1.0	6.4	16.4	4	45
23-2120	3.2	2.0	1.6	4.1	4	45
23-2130	2.1	3.0	0.7	1.7	4	45
23-2210	10.8	1.0	10.8	32.0	4	65
23-2225	4.2	2.5	1.7	5.2	4	65
23-2240	2.4	4.0	0.65	2.0	4	65

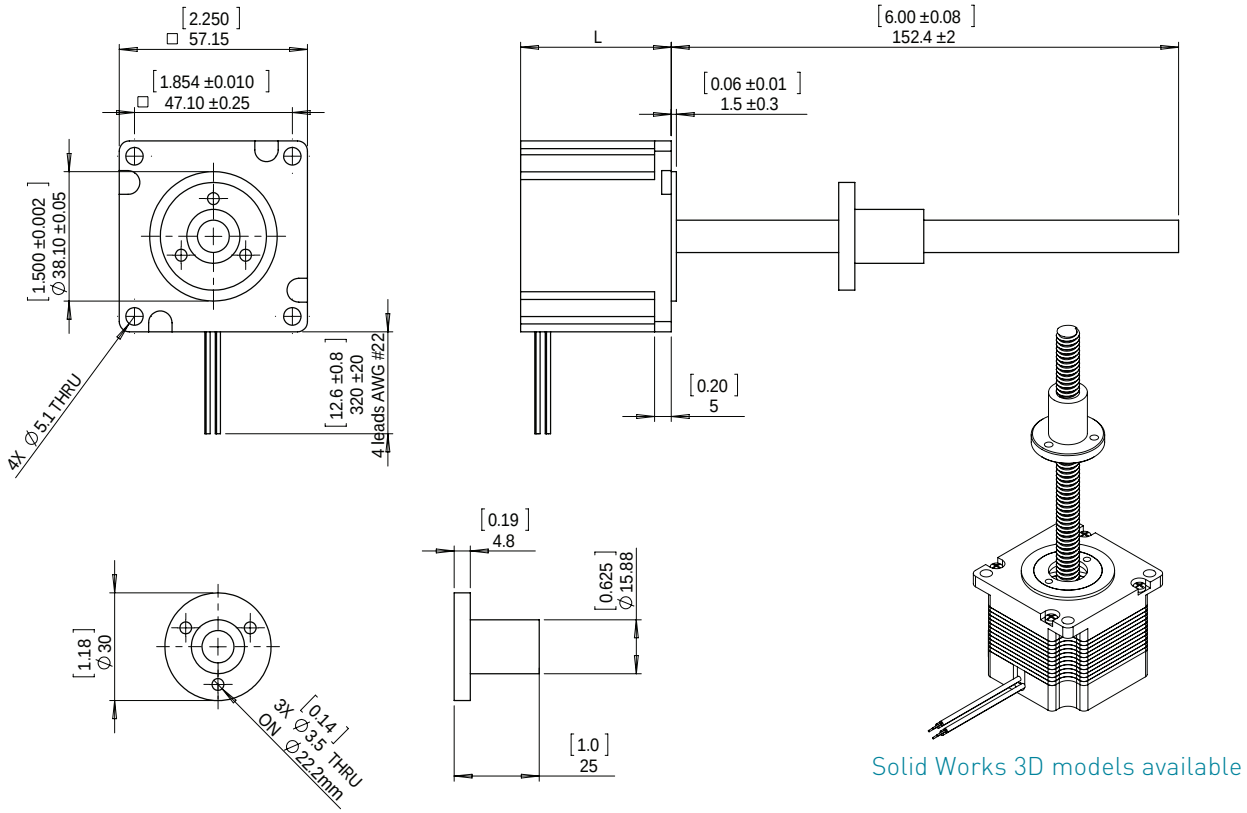
Available Lead Screws and Travel per Step
Please contact Koco Motion US for custom products.

Screw Dia. (inch)	Screw Dia. (mm)	Lead (inch)	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	1.0	25.4	Z	0.127	0.0635

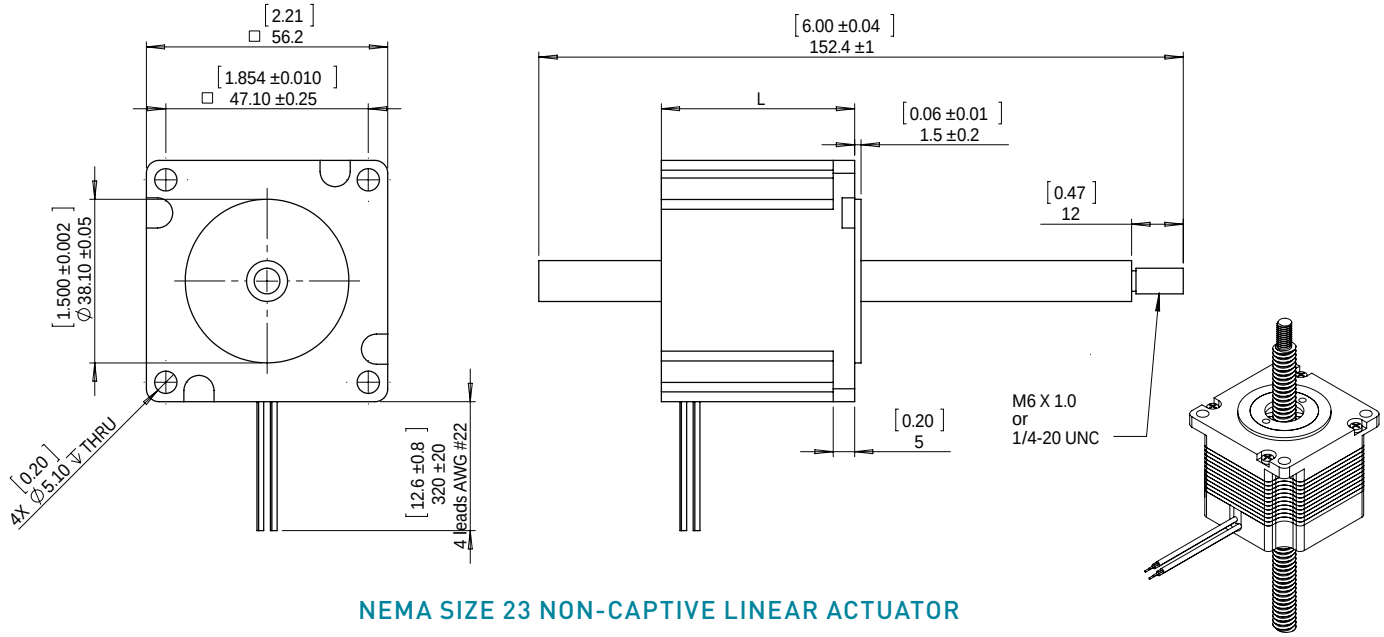
Custom Lead Screw DIA Available for NEMA 23
0.625″ DIA shaft available with external shaft version

* values truncated

NEMA Size 23 (57 mm) Dimensions



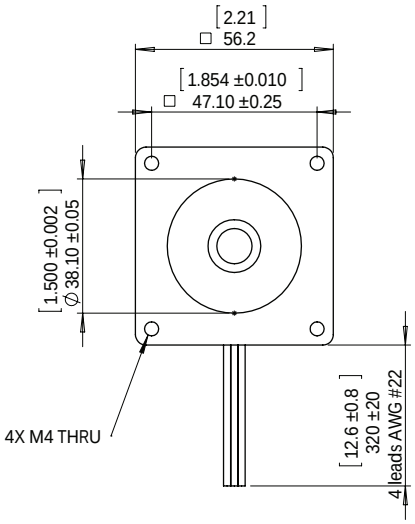
NEMA SIZE 23 EXTERNAL LINEAR ACTUATOR

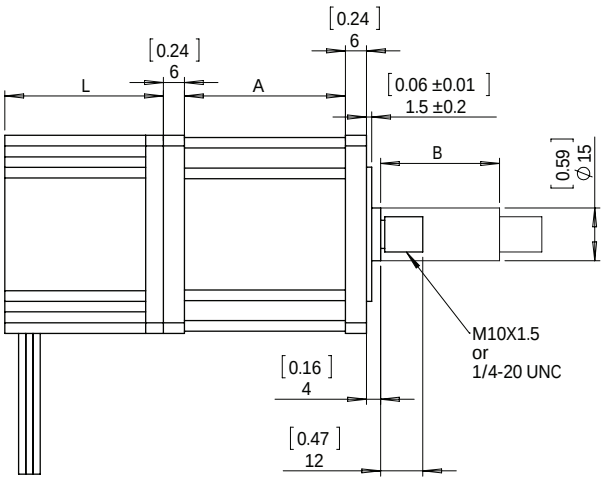


NEMA SIZE 23 NON-CAPTIVE LINEAR ACTUATOR

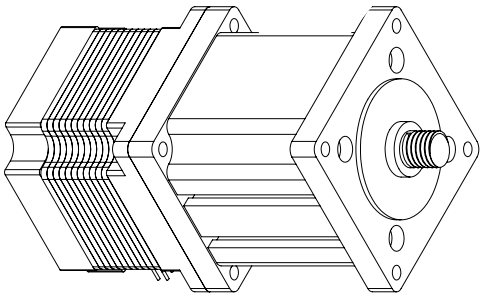
NOTE: All drawings are First Angle Projection—ISO Standard.

NEMA Size 23 (57 mm) Dimensions (continued)





Stroke B inch (mm)	Dimension A (mm)	Dimension L (mm)	
0.5 (12.7)	45.7	Single stack motor 47 mm	Double stack motor 66 mm
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		

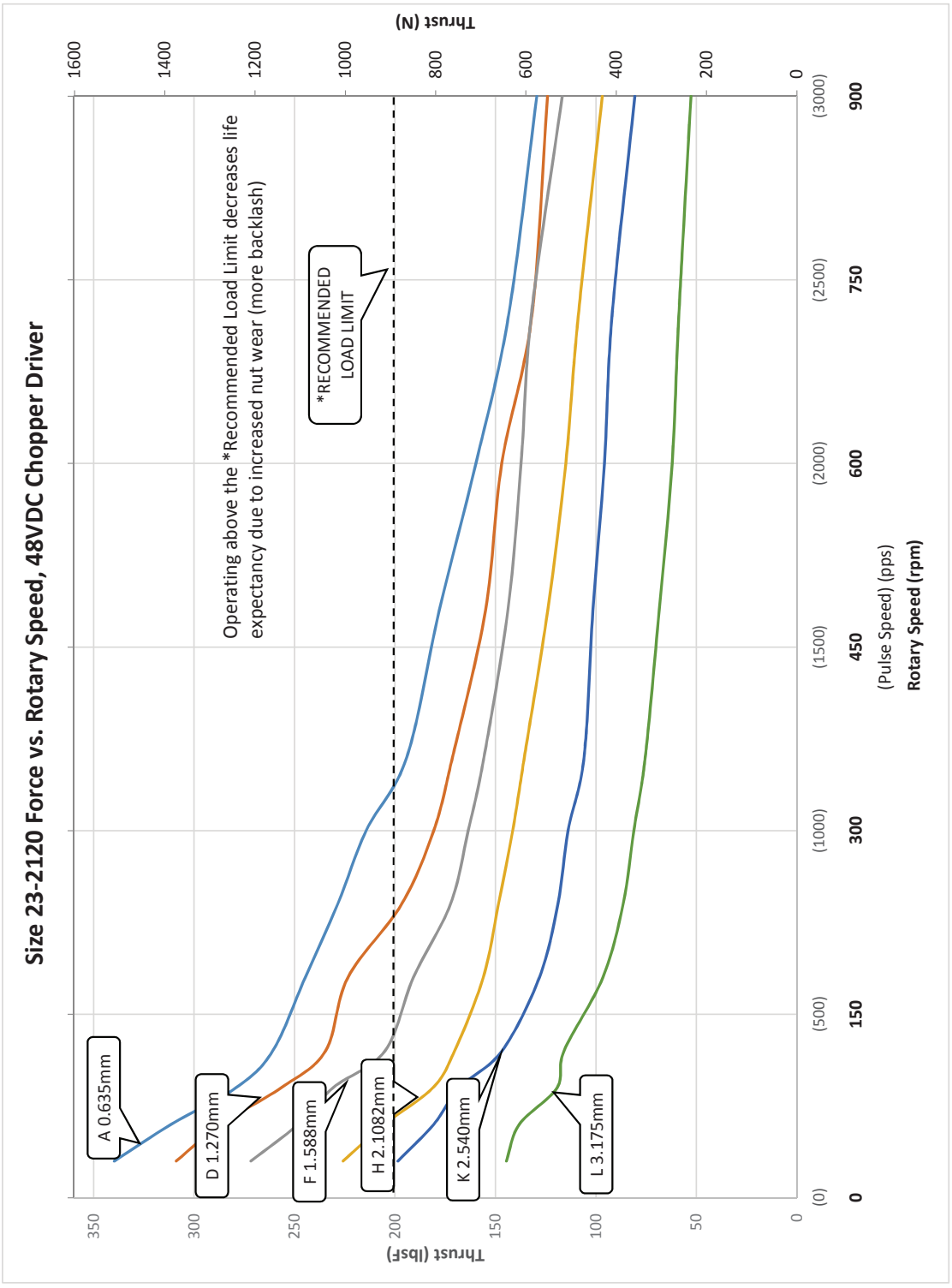


Solid Works 3D models available

NOTE: All drawings are First Angle Projection—ISO Standard.

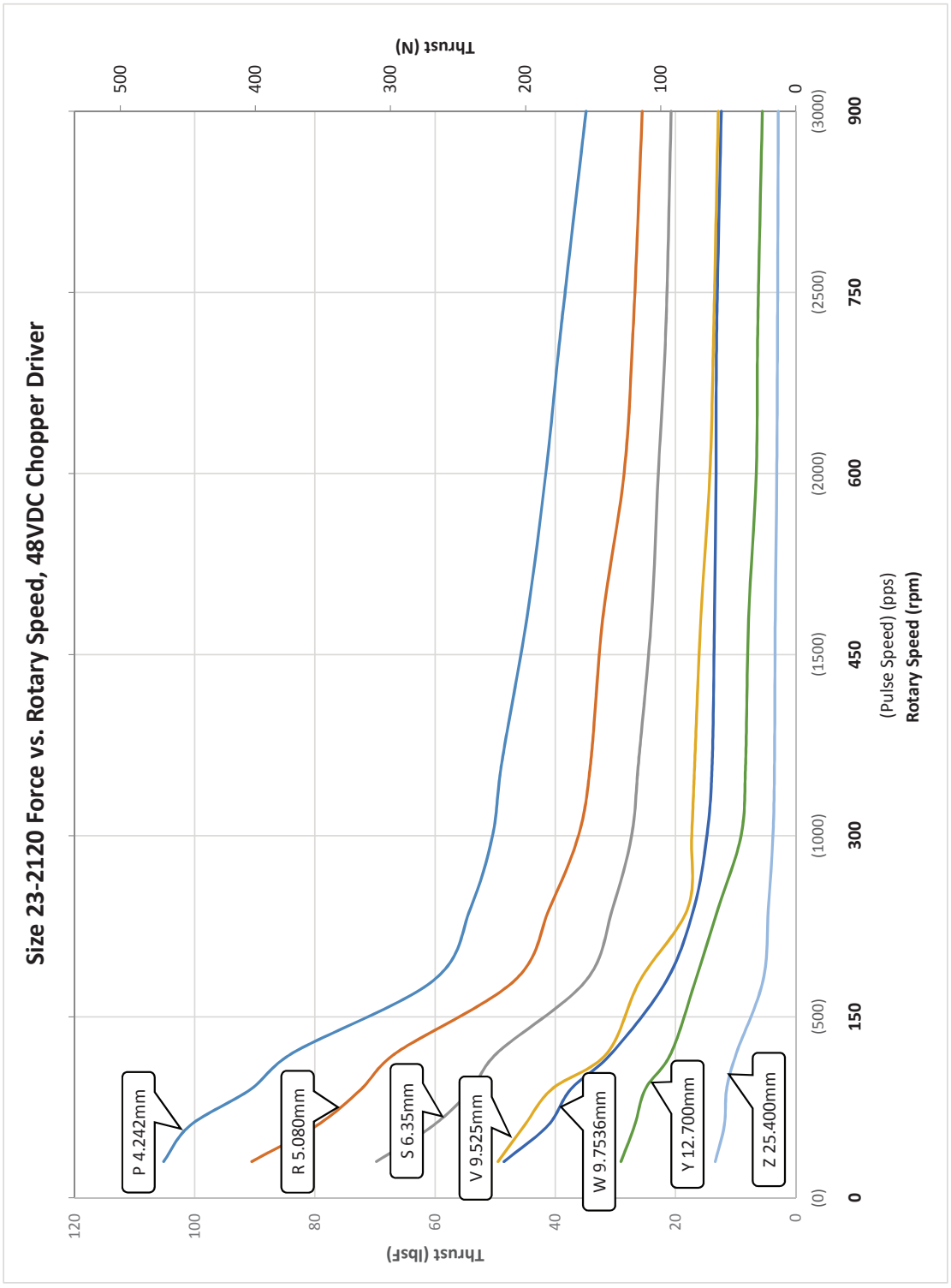
NEMA Size 23 (57 mm) Speed Thrust Curves

NEMA 23 SINGLE-STACK ROTARY SPEED



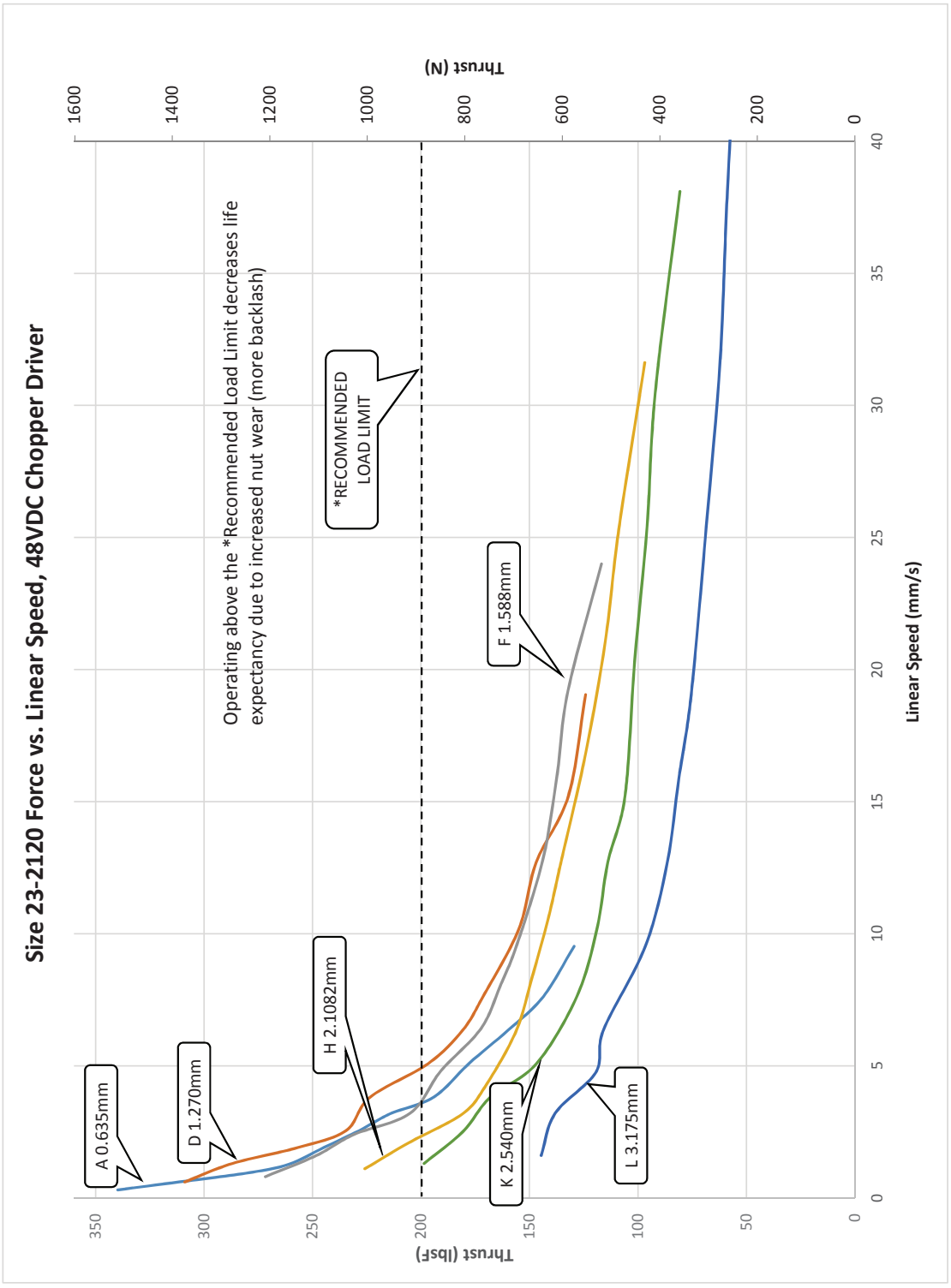
NEMA Size 23 (57 mm) Speed Thrust Curves (continued)

NEMA 23 SINGLE-STACK ROTARY SPEED



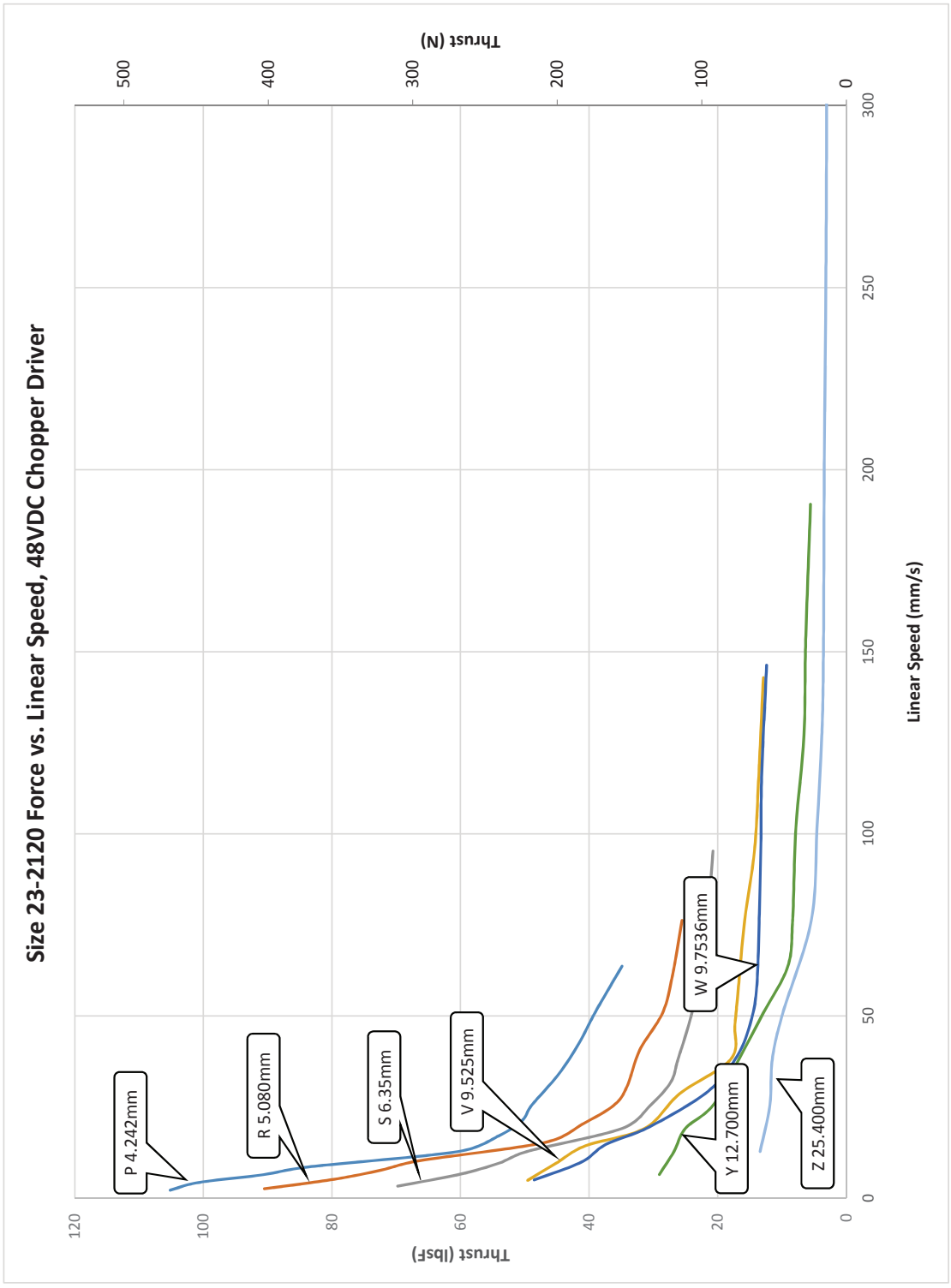
NEMA Size 23 (57 mm) Speed Thrust Curves (continued)

NEMA 23 SINGLE-STACK LINEAR SPEED



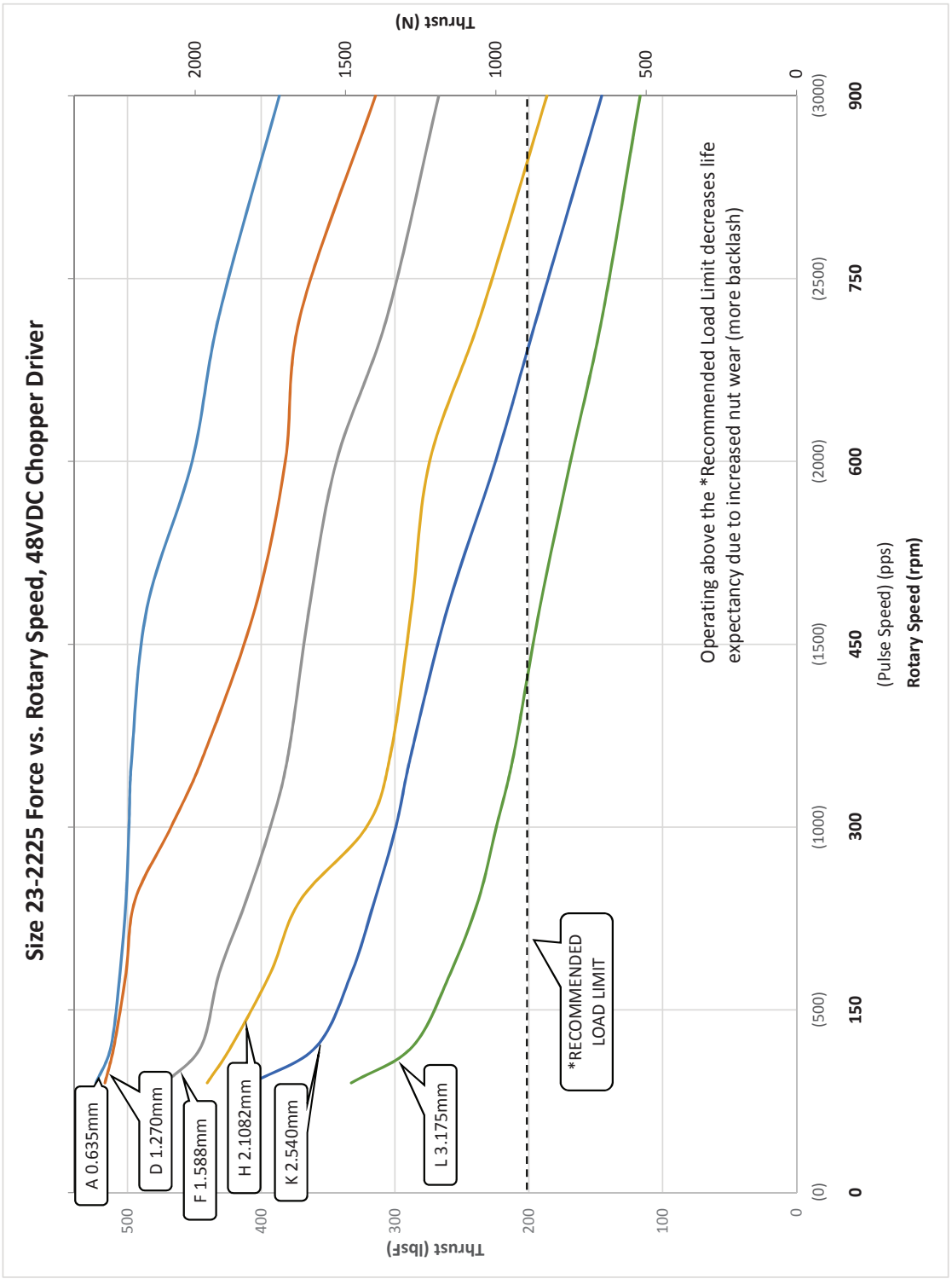
NEMA Size 23 (57 mm) Speed Thrust Curves (continued)

NEMA 23 SINGLE-STACK LINEAR SPEED



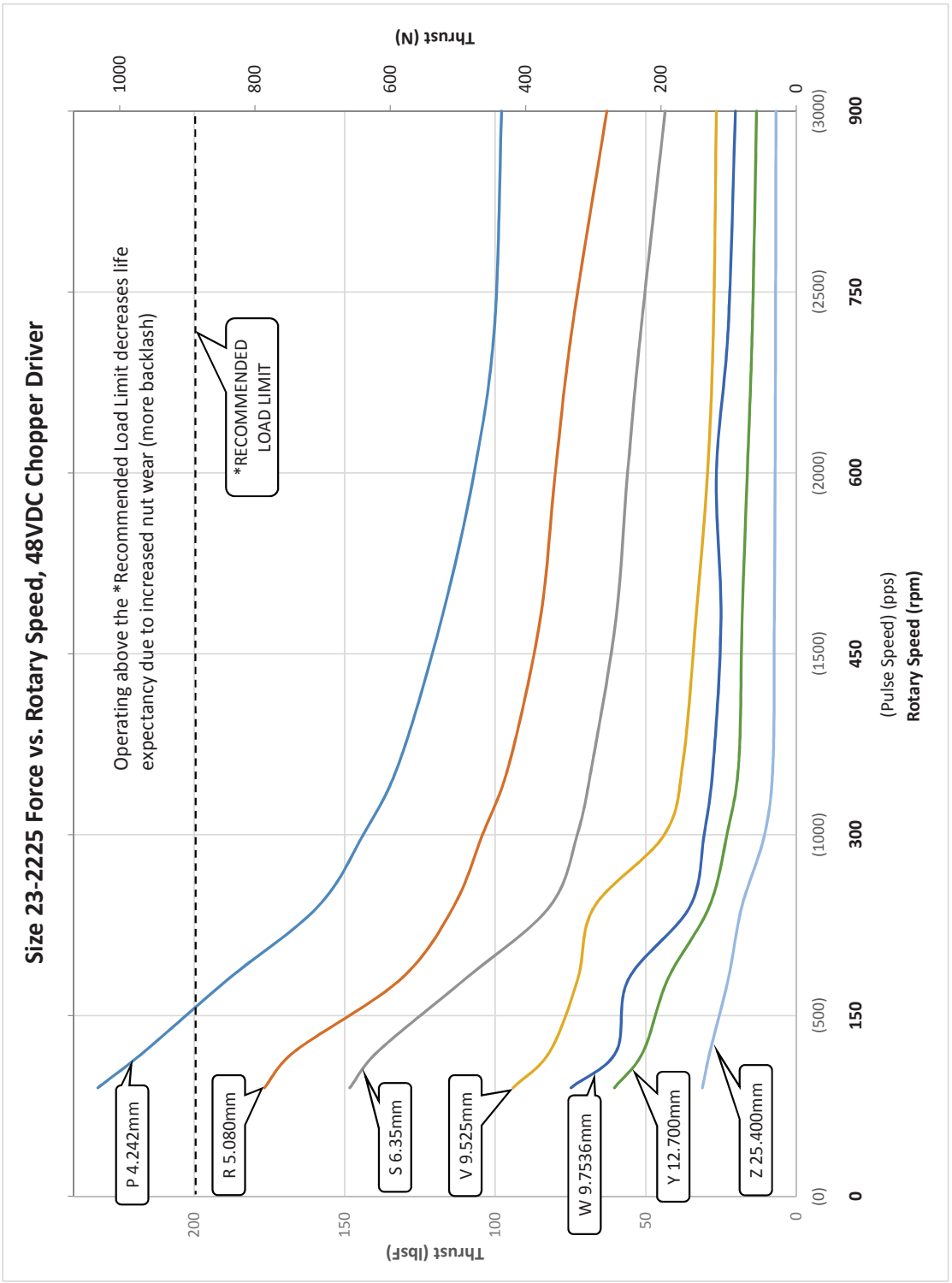
NEMA Size 23 (57 mm) Speed Thrust Curves (continued)

NEMA 23 DOUBLE-STACK ROTARY SPEED



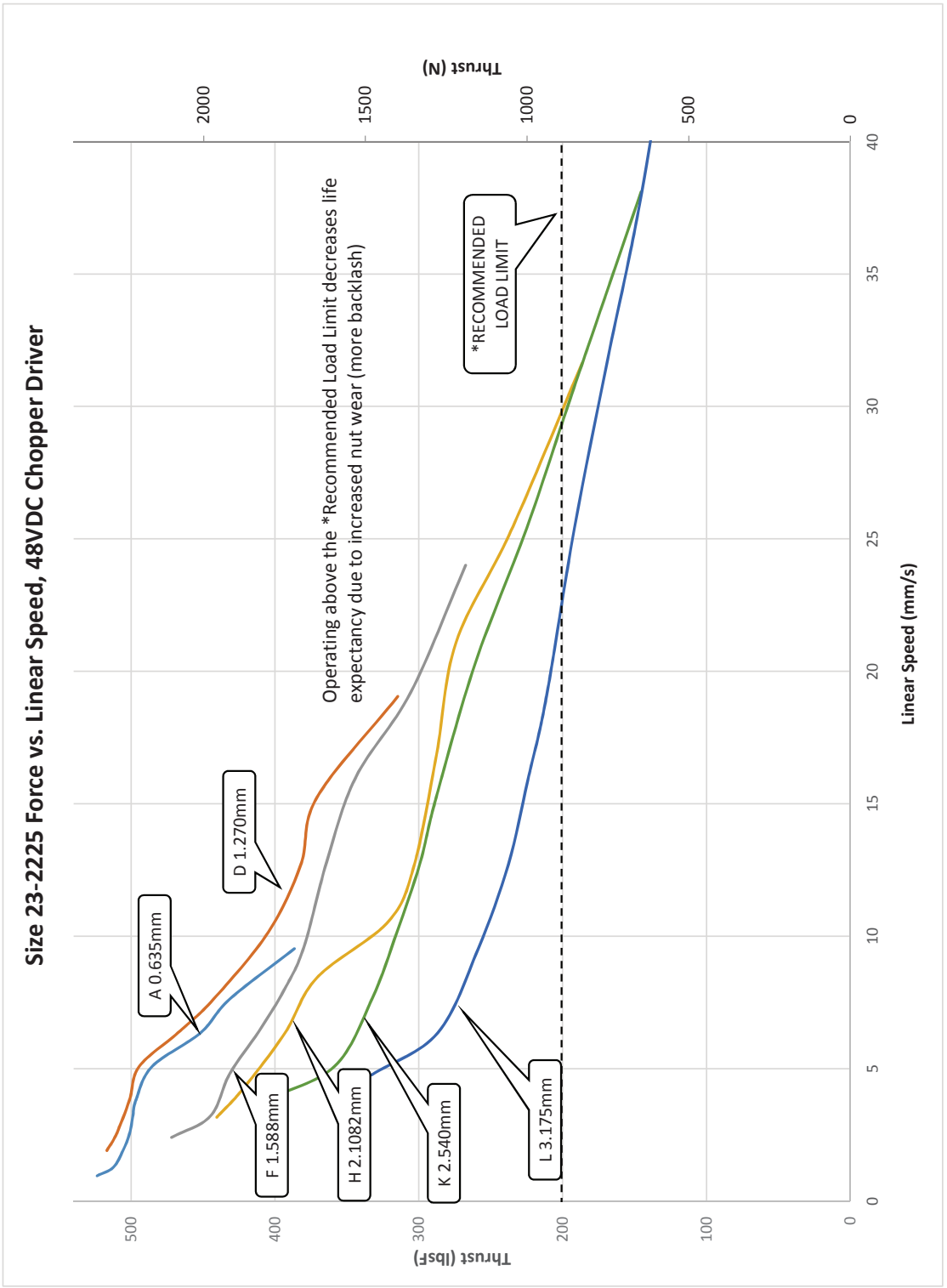
NEMA Size 23 (57 mm) Speed Thrust Curves (continued)

NEMA 23 DOUBLE-STACK ROTARY SPEED



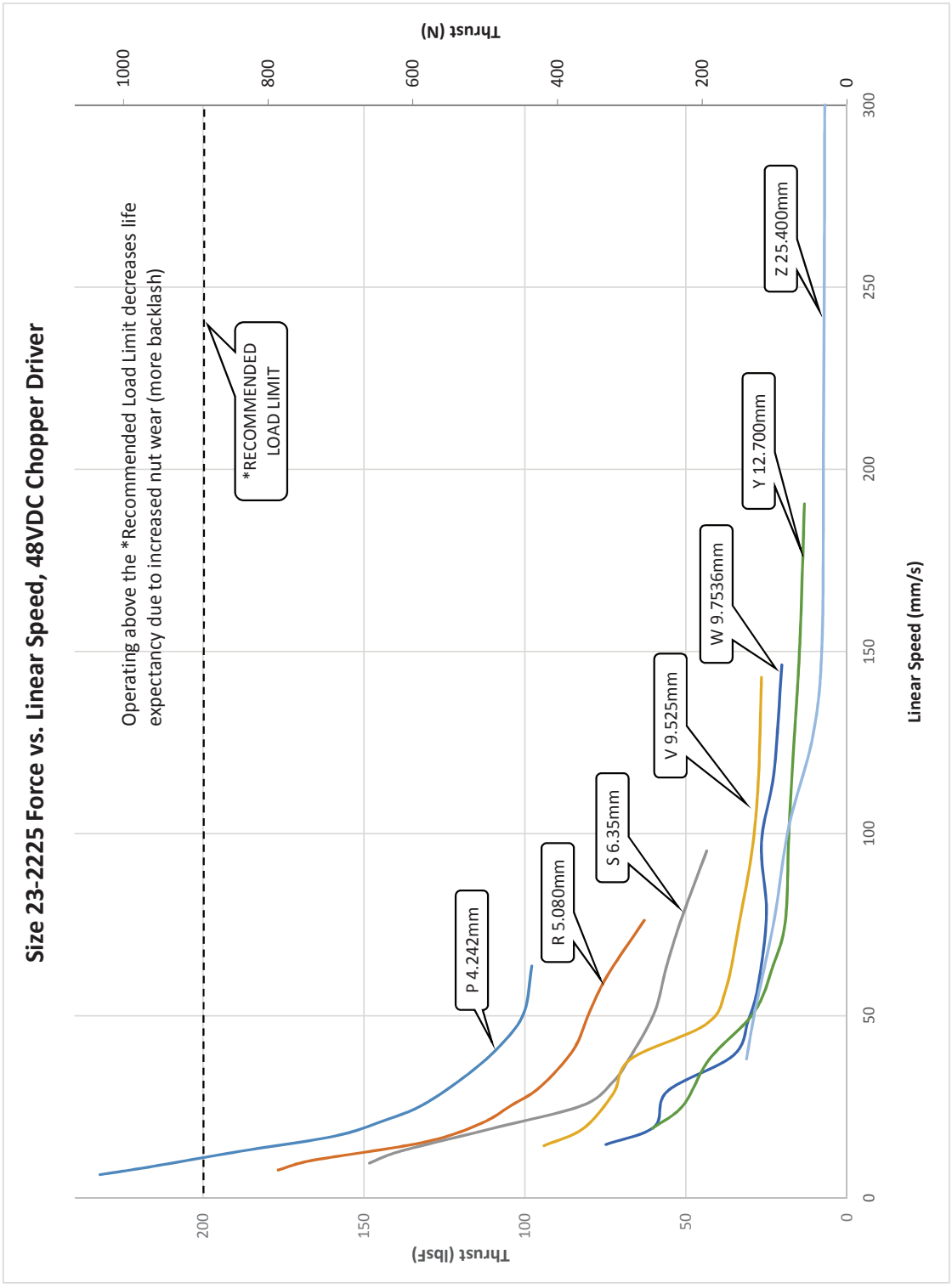
NEMA Size 23 (57 mm) Speed Thrust Curves (continued)

NEMA 23 DOUBLE-STACK LINEAR SPEED

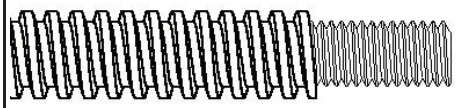
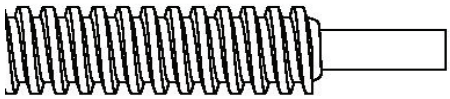
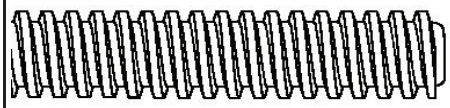


NEMA Size 23 (57 mm) Speed Thrust Curves (continued)

NEMA 23 DOUBLE-STACK LINEAR SPEED

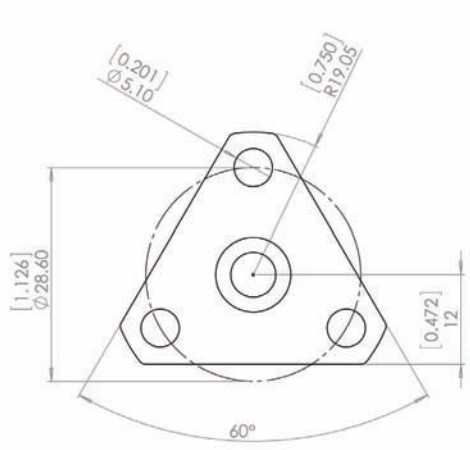


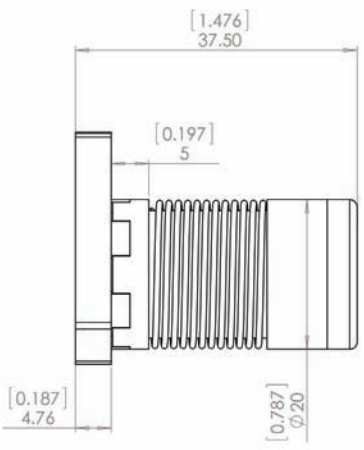
NEMA Size 23 (57 mm) End Machining Options

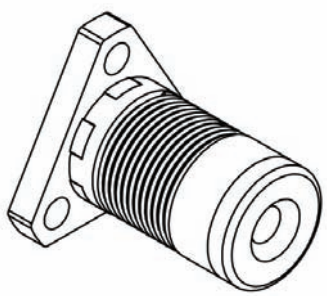
Standard Lead Screw End Machining		
	Threaded End	Metric End: M6 X 1.0 UNC End: 1/4-20 UNC
	Smooth End	∅6mm ± 0.025 ∅0.2362" ± 0.0010
	None	-

Captive Rod End Machining
Metric End: M10 X 1.5 UNC End: 1/4-20 UNC

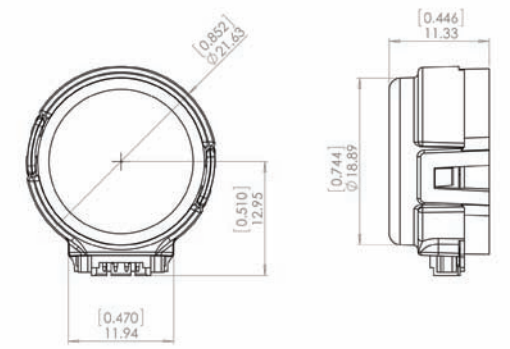
NEMA Size 23 (57 mm) Anti-Backlash Nut



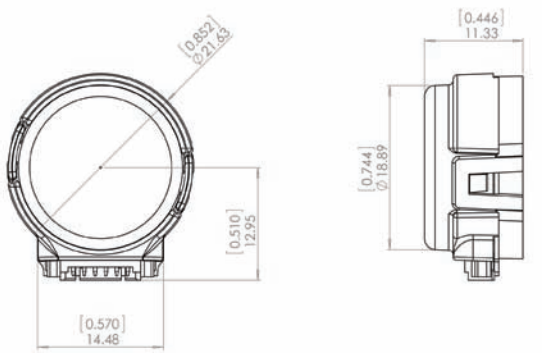




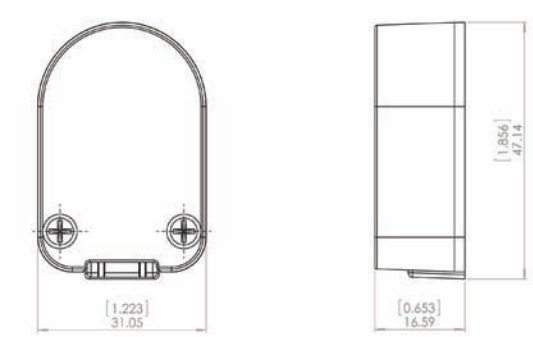
NEMA Size 23 (57 mm) - Encoder Options



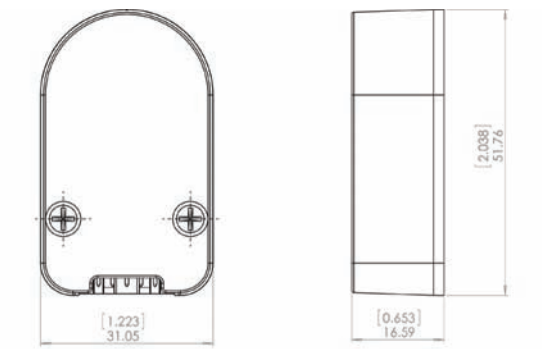
EK1 ENCODER SINGLE ENDED OUTPUT



EK1 ENCODER DIFFERENTIAL OUTPUT



EK2 ENCODER SINGLE ENDED OUTPUT



EK2 ENCODER DIFFERENTIAL OUTPUT

Encoder Options

EK1

Line Count	100	108	120	125	128	200	250	256	300	360
Single Ended	0	1	2	3	4	5	6	7	8	9
Differential	A	B	C	D	E	F	G	H	I	J

EK2

Line Count	100	200	250	256	400	500	512	1000	1024
Single Ended	0	1	2	3	4	5	6	7	8
Differential	A	B	C	D	E	F	G	H	I

Custom Encoder or Custom Line Count:

EC

For Encoder Ready Motors:

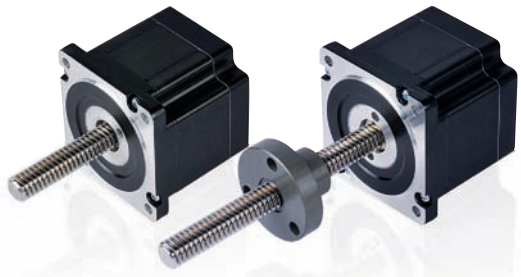
ER1 / ER2

For EK2 with Index: Add "I" as a suffix.
For Example, for EK2, 512 line count, with Differential, and Index: "EK2GI"

Please refer to our website for complete encoder specifications:
www.kocomotionus.com

NEMA Size 34 (86 mm)
Hybrid Stepper 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.



Motor Characteristics
Please contact Koco Motion US for custom products.

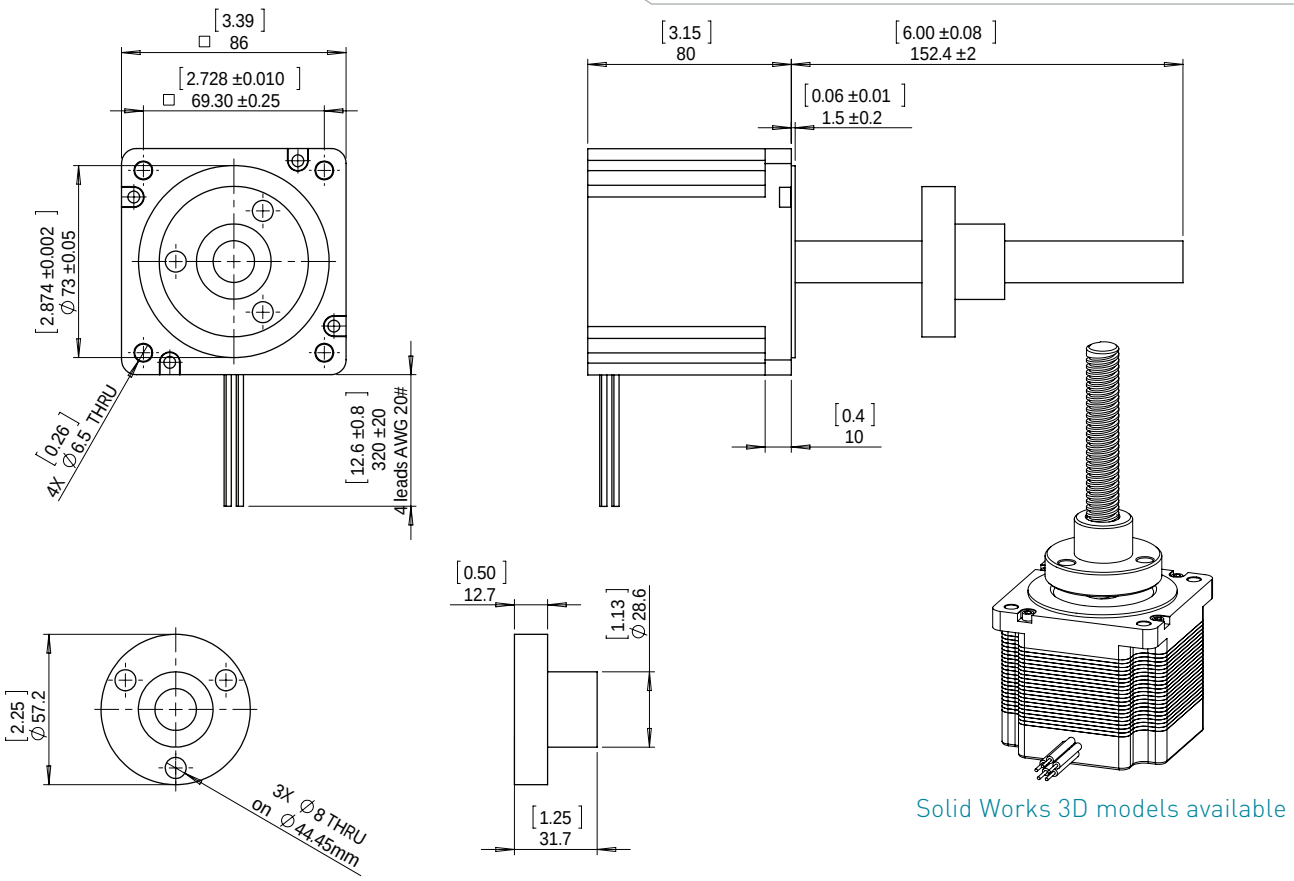
Motor	Voltage (V)	Current (A)	Resistance (Ω)	Inductance (mH)	Lead Wire No.	Motor Length (mm)
34-2113	12.0	1.3	9.2	71.0	4	76
34-2130	5.1	3.0	1.7	15.0	4	76
34-2155	2.85	5.5	0.52	4.5	4	76

Available Lead Screws and Travel per Step
Please contact Koco Motion US for custom products.

Screw Dia. (inch)	Screw Dia. (mm)	Lead (inch)	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	1.0	25.4	Z	0.127	0.0508

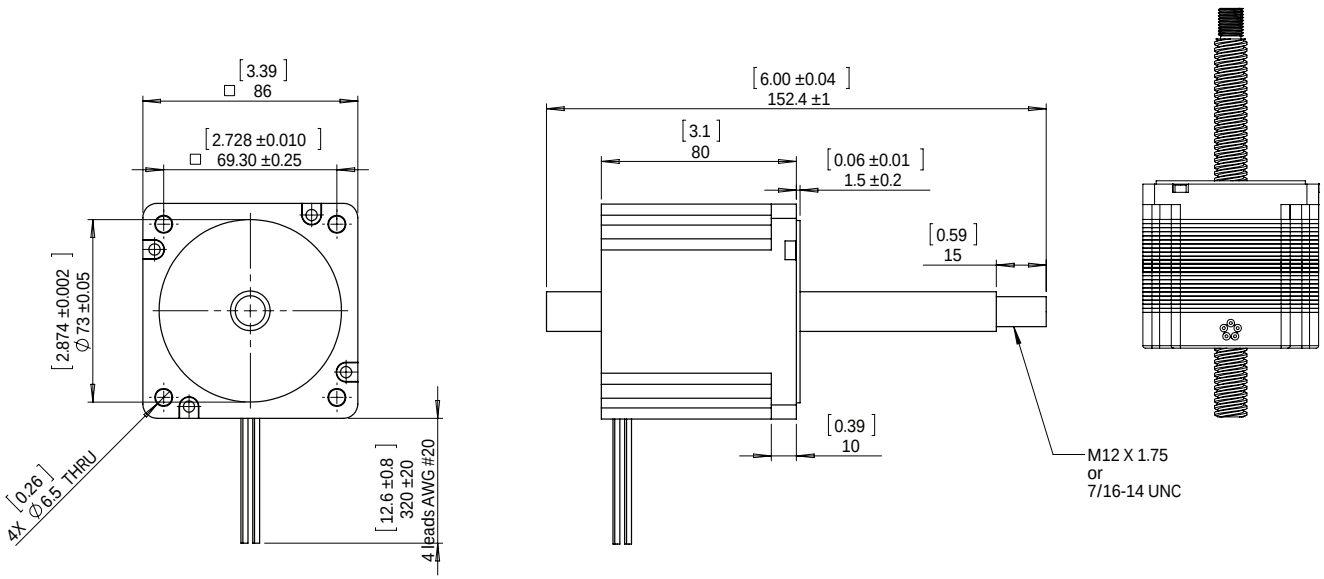
* values truncated

NEMA Size 34 (86 mm) Dimensions



Solid Works 3D models available

NEMA SIZE 34 EXTERNAL LINEAR ACTUATOR

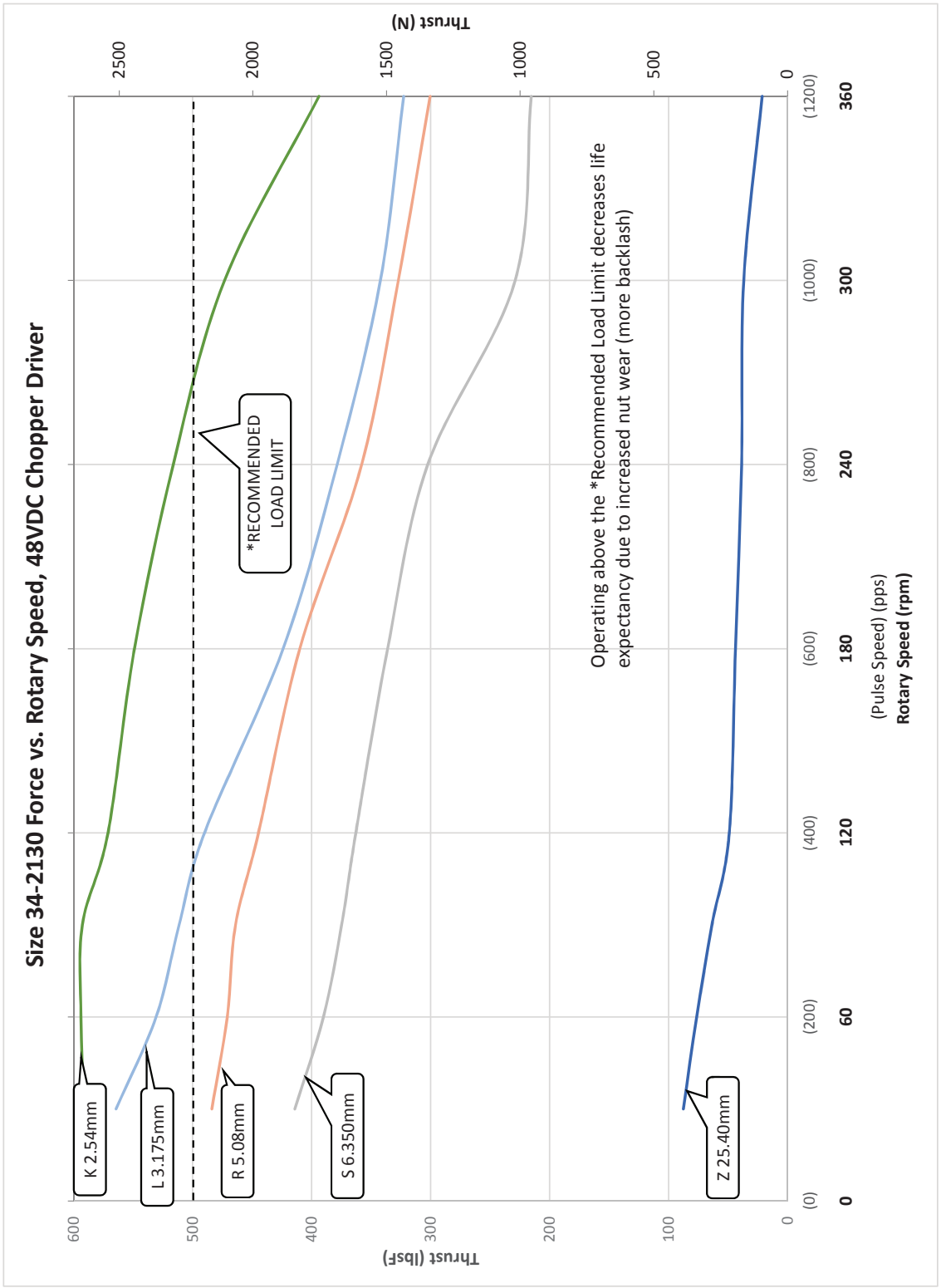


NEMA SIZE 34 NON-CAPTIVE LINEAR ACTUATOR

NOTE: All drawings are First Angle Projection—ISO Standard.

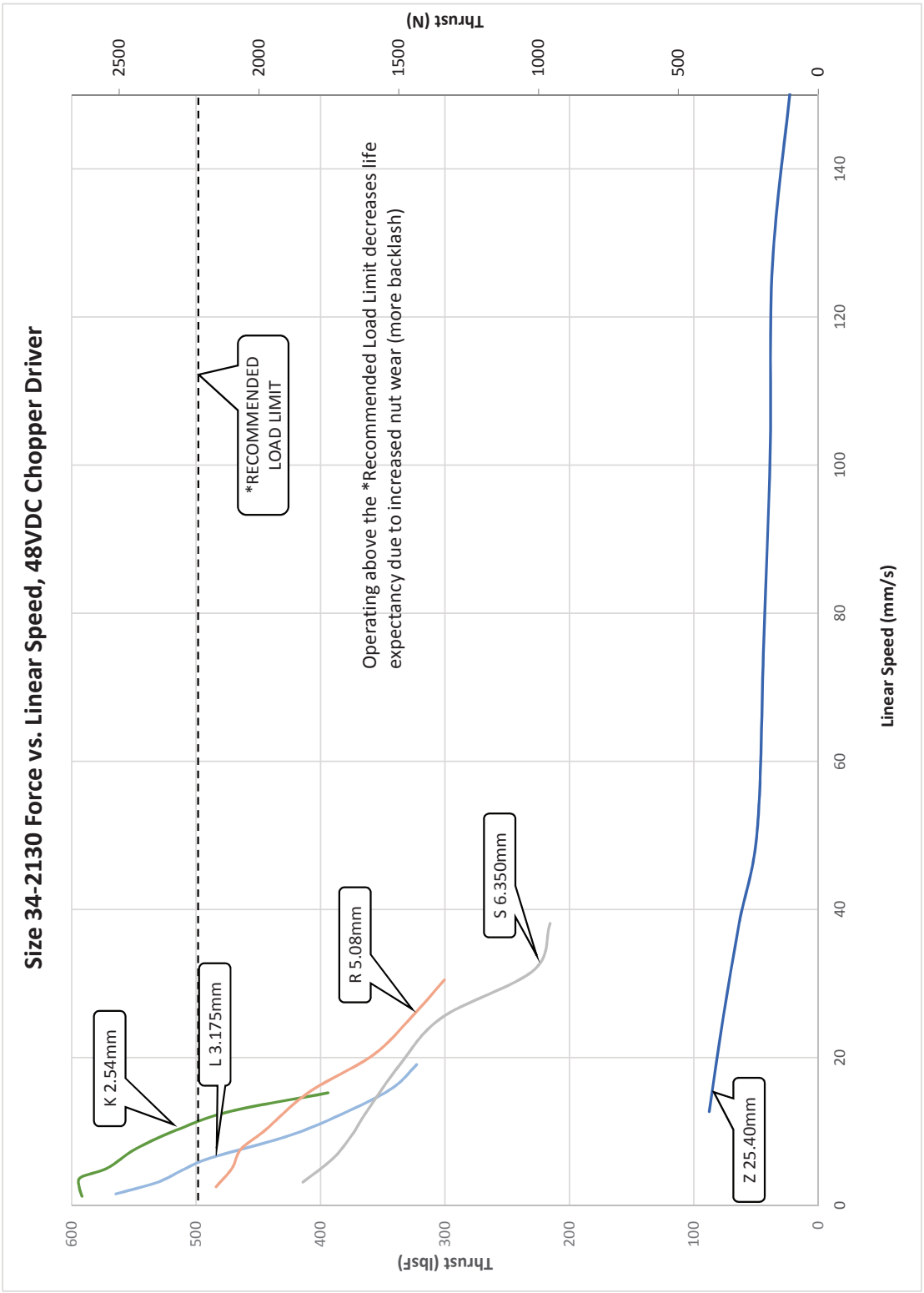
NEMA Size 34 (86 mm) Speed Thrust Curves

NEMA 34 SINGLE-STACK ROTARY SPEED

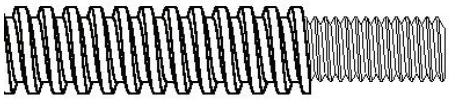
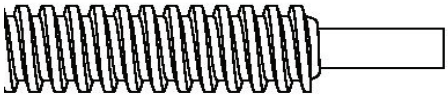
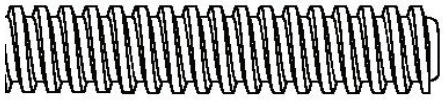


NEMA Size 34 (86 mm) Speed Thrust Curves (continued)

NEMA 34 SINGLE-STACK LINEAR SPEED



NEMA Size 34 (86 mm) End Machining Options

Standard Lead Screw End Machining		
	Threaded End	Metric End: M12 X 1.75 UNC End: 7/16-14 UNC
	Smooth End	∅12mm ± 0.025 ∅0.4724" ± 0.0010
	None	-

TO ENQUIRE ABOUT NEMA 34 ENCODER OPTIONS,
CALL US AT 408-300-9690
8:00AM - 5:00PM PACIFIC STANDARD TIME (PST)

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 and 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 are 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
RESOLUTION	Incremental linear distance the actuator's (motor) output shaft will move per input pulse
RESONANCE	Vibration occuring when 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
TRAVEL PER STEP	Linear translation of one full step of the motor

KOCO MOTION

... Intelligence in motion

KOCO MOTION US LLC
6090 Hellyer Ave.
Suite 175
San José, California 95138

Phone +1 408-300-9690
sales@kocomotionus.com
www.kocomotionus.com

KOCO MOTION GmbH
Niedereschacher Straße 54
78083 Dauchingen
Germany

Phone +49 7720 995858-0
Fax +49 7720 995858-9
info@kocomotion.de
www.kocomotion.de

REV0414