



P R E C I S I O N   L I N E A R   A C T U A T O R S

1st Edition



## **NOOK HISTORY**

In 1969, Joseph H. Nook Jr. founded Nook Industries, Inc., intent on becoming a global supplier of Linear Motion products. Ball screws, both rolled and ground, were the cornerstone products in the early 1970's, putting Nook Industries on the map as a successful business and a trusted company.

Through the years, Nook Industries has served as a leading manufacturer of engineered products. From the first ball

screws to the latest technologies, Nook Industries strives to provide customers with high quality products and engineered solutions.

Companies around the world depend on the quality products provided by Nook Industries to ensure their success. Nook Industries provides a complete line of linear motion products, serving a wide range of market segments.

## **MARKET SEGMENTS SERVED**



Aerospace



Tire Manufacture



Pulp & Paper



Packaging



Entertainment



Steel



Automotive



Semiconductor



Chemical



Electronics



Military and Defense



Medical & Diagnostic



Transportation



Factory Automation



## **NOOK MISSION**

Pairing traditional and proven design with the latest technology, Nook Industries manufactures products that customers value. The expansion of product lines and the development of application specific components and engineered systems have propelled Nook Industries to the forefront of the industry.

Nook Industries is committed to customer satisfaction and providing high-quality, high-value products that are delivered on time at a competitive price.

## **NOOK PARTNERS**



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# QUALITY

## HISTORY

Since 1969, Nook Industries, Inc. has relentlessly and continuously developed the capabilities and skills to deliver products of the highest quality. Knowledge of testing and design, coupled with this experience working with stringent customer requirements in aerospace, medical, energy and military applications has provided the background to be a reliable partner.

## HIGHTECH QUALITY EXPERIENCE

When you select Nook Industries as a supplier, you can be assured that your product will be designed and tested to rigorous product planning. Pre-design activity includes understanding of customer requirements applied to predictive models, engineering calculations and linear modeling through prototype development, stereo-lithography samples of form, fit, and function that verify design criteria.

## VALIDATION AND VERIFICATION

Through many years of rigorous development, Nook Industries has proven its designs and manufacturing processes against the most stringent standards and specifications. Design and process verification and validation tools are employed throughout the product life cycle.

## CERTIFICATIONS

Nook Industries, Inc. is certified to ISO-9001-2008 Internationally Recognized Quality System. Nook also serves many customers in the Aerospace and Medical device markets and has complied with those Quality System Requirements as well.



## ITAR

Nook Industries is registered with the Department Of State For International Traffic In Arms Compliance.



## INSPECTION CAPABILITY

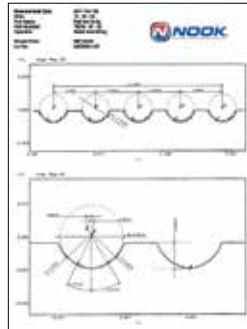
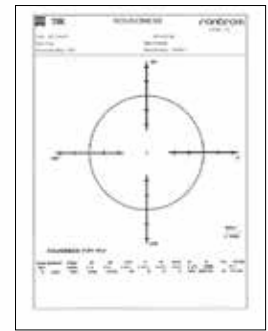


**Laser Lead Measurement** - Precise lead error gauging is utilized to validate processes to conform to Nook internal specifications and customer requirements.

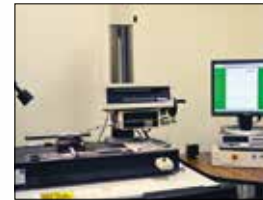


## Zeiss Roundness Measurement -

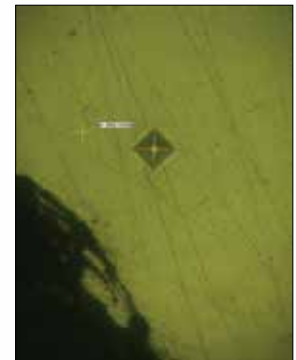
Critical to quality, characteristics such as roundness are monitored throughout the screw manufacturing process.



**Zeiss Contour Readers** - Prior to the start of any production run, thread form geometry is precisely measured to stringent engineering specifications.



**Metallurgical Lab** - The metallurgical lab is capable of determining material composition from raw materials to final product. A micro hardness and case depth inspection is a routine check that validates the heat treat process.



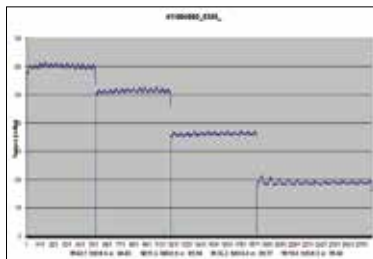


**QUALITY TOOLS:**

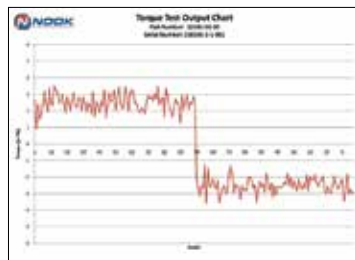
- Design for Six Sigma manufacturing
- D.O.E. (Design of Experiments)
- APQP (Advanced Product Quality Planning)
- DFMEA, PFEMA
- FEA (Finite Element Analysis)
- DVP&R (Design Verification Plan & Report)
- Reliability Testing
- Process validation to 21 CFR Part 82 (Medical Device)



**TESTING**



**Efficiency Measurement** - Nook Engineering has designed test machines to measure and validate screw assembly efficiency.



**Torque Measurement** - Preloaded ball screw assemblies are evaluated to determine compliance with engineering specifications utilizing a Dynamic Torque Testing Machine.



**FUNCTIONAL TESTING**

Nook test systems and engineered testing processes perform analysis, verification, and solidification of life, durability, and performance. The functional testing defines operating limits in specifications and helps set defined targets in Product Launch Process and Assurance Plans.

The engineered testing provides predictive tools, generates data for prognostics, and validates performance wear models. Life tests help determine performance in multiple operating conditions as well. Nook offers proof testing for customers developing new systems and actuators to help accelerate product release dates.



High Load Modular Test System  
40,000 lb load - 100" CC



Convertible Test System  
20,000 lb load - 100" CC

- DEVELOPED MANUFACTURING SYSTEMS
- QUALITY SYSTEMS AND ACCREDITATIONS
- SUPPLY CHAIN APPROVAL PROCESS
- STATE OF THE ART MANAGEMENT SYSTEMS
- APQP LAUNCH PROTOCOLS
- SYSTEM AND PROCESS PROTOCOLS
- ENGINEERING ANALYSIS AND PREDICTIVE TOOLS
- CTQ/KPV ENGINEERING SPECIFICATION PROCESSES
- RELIABILITY ENGINEERING AND TESTING
- DVP&R AND TEST PLANNING
- NOOK DESIGNED AND BUILT TEST MACHINES
- CUSTOM ENGINEERED AND BUILT TEST INSTRUMENTATION
- DESIGN AND TEST FOR FAULT TOLERANCE AND PROGNOSTICS
- OVERLOAD/PROOF END OF LINE TESTING
- CERTIFICATION TESTING

# SELECTING AN ACTUATOR

## ELECTRIC CYLINDERS



- Rugged
- Industrial
- Heavy Duty
- Harsh Environments

## SERIES 500™

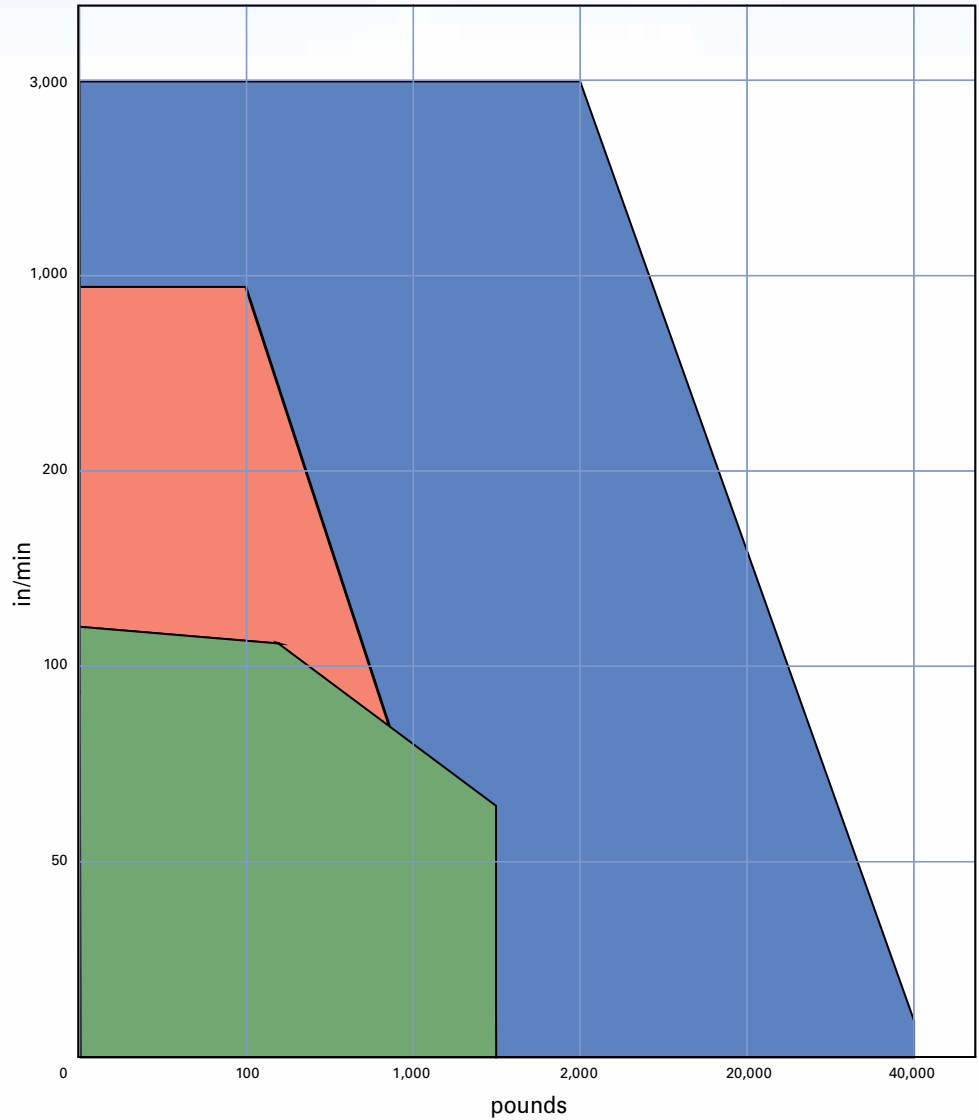


- Programmable
- Square Extrusion Tube Structure
- Ease of Mounting
- Servo or Stepper option

## CC™ CYLINDER & COMMERCIAL SERIES



- High Value
- Small Package
- Low Cost
- Feedback Options
- Flexible Mounting Options



Nook Linear Actuators are used in many light rail applications.

## SCREW TECHNOLOGY

Nook Industries Linear Actuators use the finest acme and ball screws manufactured in the world.

### ACME SCREWS

Nook Industries manufactures PowerAc™ precision acme screws by thread rolling for Electric Cylinders, Series 500, and Commercial Series Actuators - a process that produces high-precision screws. Nook Acme Screw products feature centralizing thread forms for smooth, no-wedging performance.

PowerAc™ Acme screws are made from 4140 Alloy steel with a black oxide finish with a 2C (Centralizing) thread form. Nook acme nut material has been selected for low friction, minimum wear, long life, and clean operations.

### BALL SCREWS

Nook Industries PowerTrac™ ball screws offer an efficient means of converting rotary motion to linear motion for Electric Cylinders, Series 500, and Commercial Series Actuators. A ball screw is an improvement over an acme screw just as an antifriction ball bearing is an improvement over a plain bushing.

Ball screw assemblies have a number of bearing balls that transfer the load between the nut and screw. The thread form in which the bearing balls ride is an ogival shape formed from two arcs of the same radius with offset centers. This form is also referred to as a gothic arch.

Nook Industries ball screws are made of high strength materials. The screw shaft is made of medium carbon induction hardenable alloy steel. Ball nuts are manufactured from high grade bearing steel. Both the ball screw and nuts are heat-treated to a surface hardness not less than 56 HRC with a case depth suitably chosen to carry the load.

### LEAD ACCURACY

Screw	Lead Accuracy
Acme	± .0003 in/in up to 1 1/2" dia.
Ball	± .004 in/ft

### BACKLASH

Backlash (lash) is the relative axial movement between a screw and nut without rotation of the screw or nut. The axial movement between a new nut and screw will range from .003" to .015" depending on size. Lash in ball screws will remain constant during normal use.

### BALL SCREW SELECTIVE FIT

When less than standard lash is desired, ball nuts can be custom-fit to a specific screw with selected bearing balls to minimize lash to .003" to .005" depending on ball size. Select fitting may result in lower life.

### BALL SCREW PRELOAD NUTS

Nook Industries Linear Actuators can be modified to fit a preloaded nut, which is created by shifted internal threads that are ground. The resulting concentricity ensures uniform preload. Factory fitting on the ball screws provides a backlash-free system with uniform torque, high stiffness and long life.

### LIFE

Ball screws use rolling elements to transfer a load similar to an anti-friction (ball) bearing. These elements do not wear during normal use, but rather fatigue. Therefore, ball screw life is predictable and is determined by calculating the fatigue failure of the components. Proper lubrication, regular maintenance, and operation within specified limits will allow Nook ball screws to operate to the predicted life.

	ACME SCREW	BALL SCREW
Max Speed	Moderate	High
Acceleration	Low	High
Life	Good	Better
Efficiency	Low to Moderate	High
Self Locking	Yes	No
Positioning Accuracy	Moderate	High
Stiffness	Very High	Moderate
Static Load	Moderate*	High
Dynamic Load	Moderate*	Low
Resistance to Failure From Shock Loading	High	Low
Resistance to Failure From Vibration	High	Low
Resistance to Failure From Dithering	High	Low
Ease of Installation	Easy	Easy
Manufacturing Time	Low	Moderate

\* May double Dynamic Load with a double nut

## PRECISION LINEAR ACTUATORS



Nook Electric Cylinders are widely used in the satellite dish industry.





# ELECTRIC CYLINDERS

**ELECTRIC CYLINDERS**

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## ELECTRIC CYLINDERS

Electric Cylinders are ruggedly designed and produced in standard models with thrust capacities from 500 lbs. to 40,000 lbs. Electric Cylinders are intended for use in industrial environments and feature precision-ground hard chrome-plated actuator tubes with industrial enamel paint on exterior surfaces. Epoxy paint is available on request. Electric Cylinders can be supplied for outdoor applications.

These cylinders may be used individually or in multiple arrangements. Each Electric Cylinder is built to specification.

### ILA ELECTRIC CYLINDER

ILA In-Line Electric Cylinders are designed to have a motor or gear reducer directly coupled to the lift shaft. This provides for faster, more precise operation and/or higher duty cycles.

ILA Electric Cylinders feature standard trunnion pin mounting. They are easily adapted for use with servo motors and planetary gear reducers. Configurations are available with keyed actuator tubes.

In-line Electric Cylinders are Ball Screw actuated. Acme Screw models are also available; contact Nook Engineering.

### DD WORM GEAR ELECTRIC CYLINDERS

DD worm gear driven Electric Cylinders incorporate an alloy steel worm which drives a high strength bronze worm gear (drive sleeve). The worm shaft is supported on anti-friction tapered roller bearings with external seals provided to prevent loss of lubrication (sealed radial ball bearings on the Series 5 and Series 10 units). The drive sleeve is supported on anti-friction tapered roller or ball thrust bearings. The electric cylinder housing is made of ductile iron and proportioned to support the rated capacity of the unit.



**DD ELECTRIC CYLINDER**



**ILA ELECTRIC CYLINDER**

In operation, the drive sleeve rotates the lift shaft causing the actuator tube to extend and retract from the housing tube. Actuator tube must be secured to prevent rotation. Special keyed actuator tubes are available.

For use in multiple cylinder arrangements, DD Electric Cylinders can be supplied without motor mounts.

DD Electric Cylinders are available in Acme Screw or Ball Screw versions and have a variety of worm gear ratios resulting in a wide range of speeds and thrust capacities.

### **RAD WORM GEAR ELECTRIC CYLINDERS**

RAD worm gear driven Electric Cylinders incorporate the features of the DD with a second stage gear reduction. This secondary worm gear reduction of the RAD Electric Cylinders provides higher thrust at lower speeds. The reducer and motor can be mounted in eight possible positions for maximum flexibility.

RAD Electric Cylinders are available in Acme Screw or Ball Screw versions and have a variety of worm gear ratios resulting in a wide range of speeds and thrust capacities.

**RAD ELECTRIC CYLINDER**



## DEFINITIONS & TERMS

### BACKLASH

Backlash (lash) is the relative axial movement between a screw and nut without rotation of the screw or nut. Backlash in cylinders occurs wherever reversible load conditions exist. Backlash is less than .015" for all but the largest cylinder models. Ball Screw Cylinders can be factory adjusted to reduce backlash at the lift shaft by selecting bearing ball size in the ball nut. This selective fit technique can be used to achieve a minimal lash between the ball nut and ball screw of .003" to .005". Precision ball screws with preloaded nuts can be supplied when less than .003" backlash is required.

### REACTION TORQUE

When an electric cylinder is used to move a load, the actuator tube must be secured to prevent rotation. The reaction torque required to prevent rotation is a function of the screw lead and the load applied on the cylinder. See product specification sheets for rod reaction torque. Prior to installation, the actuator tube can rotate freely in or out of the cylinder without movement of the input worm. This ability to rotate aids installation but prevents the optional rotary limit switch from being factory preset for end of travel positions.

Rod-Type Limit Switches prevent tube from freely rotating but are not intended to absorb the rod reaction torque.

### TRAVEL LENGTH

Electric Cylinders are not pre-assembled or stocked with standard length screws. Each cylinder is made to order based on travel length.

Cylinders can be built with non-standard lead screws to change the cylinder operating speed or with ground or preloaded screws if required by the application. Contact Nook Industries for availability of special units.

### LEAD ACCURACY

Lead accuracy is the difference between the actual distance traveled versus the theoretical distance traveled based on lead. For example: Consider a lift shaft with a .5" lead and +/- .004"/foot lead accuracy. If the shaft is rotated 24 times, the distance the nut moves is 11.996 to 12.004 inches.

The rolled thread screws, as employed in products, are held within +/- .004" per foot lead error.

### INPUT TORQUE

The input torque is the rotary force required at the input of the cylinder to generate an output force at the actuator tube. The torque necessary to raise one pound is shown in charts on pages 20, 34-35, and 54-55. This number, multiplied by the load, is the required input torque.

Due to static friction, starting or "breakaway" torque can be as much as two to three times running torque. If the load is moved horizontally, the force required to move the load will be lessened in proportion to the coefficient of friction of the surface along which the load is moved. In addition, the force needed to start, stop and hold the load (inertia loading) is provided by the cylinder. Cylinder sizing should consider all these forces.

If an application calls for several cylinders to be driven together in series, input torque values should be limited to three times the rated value of the first cylinder. For multiple high lead (HL, SL) ball screw cylinders contact Nook Industries for allowable input torque values. Multiple cylinders driven in a series may require operation at reduced load.

### INPUT SPEED

DD and RAD Electric Cylinder models are rated at 1,725 rpm input. If provided with a servo motor, cylinders may be operated up to 3,000 rpm provided horsepower and temperature ratings are not exceeded. Contact Nook Industries engineers if higher speeds are required.

When using variable speed motors, use the "Turns of Worm Per Inch Of Travel" information from the Electric Cylinder Design Data table to determine actual travel speed. Input speed (rpm) divided by input turns per inch of travel produces the travel speed in inches per minute.

**NOTE:** Maximum horsepower values should not be exceeded.

### DUTY CYCLE

Duty cycle is the ratio of run time to total cycle time. Some of the electrical energy input to an electric cylinder is converted into heat. The duty cycle is limited by the ability of the electric cylinder to dissipate this heat. An increase in temperature can affect the properties of some components resulting in accelerated wear, damage and possible unexpected failure.

Ratings for DD and RAD Electric Cylinders are based on intermittent operation. The approximate allowable duty cycles for DD and RAD worm gear cylinders are:

**Ball Screw versions = 35%**

**Acme Screw versions = 25%**

Housing temperature should be monitored and kept below 200°F maximum. Continuous or heavy duty operation is possible by de-rating the cylinder capacity, external cooling of the unit, or through the use of a recirculating lubrication system.

ILA and ILAK cylinders are direct drives with no internal gears. Duty cycle for these cylinders is a function of the motor or add-on gear box.



### SELF-LOCKING AND BRAKES

Self-locking occurs when system efficiencies are low enough that the force on the actuator lifting tube cannot cause the drive system to reverse direction. Electric Cylinders that utilize acme screws and have ratios of 20:1 or greater are self-locking and, in the absence of vibration, will hold loads without backdriving. All other models require a motor brake to prevent backdriving.

Holding torque is the amount of input torque required to restrain the load once stopped. The standard brake torque shown in the product specification sheets for DD and RAD Cylinders will stop low inertia loads within the stopping distances shown. Larger brakes may be required to stop high inertial loads, or to stop travel in shorter distances. Contact Nook Industries for recommendations.

### TEMPERATURE

All Electric Cylinders are suitable for operation within the specified limits, provided that the housing temperature is not lower than -20°F or higher than +200°F. Factory supplied grease in standard units will operate in this range. For higher or lower operating temperature ranges contact Nook Industries, for recommendations.

### END-OF-TRAVEL STOPS

Travel stops are not standard. A limit switch and a brake should be used to stop the motor. Mechanical stops can cause damage to the cylinders because most electric motors will deliver stall torques much higher than their rated torques and motor inertia can cause severe shock loads. For hand operation, mechanical stops can be provided.

### MAXIMUM LOAD

The maximum thrust load, including shock, that can be applied to the actuator without damaging the assembly.

### DYNAMIC CAPACITY

The maximum allowable thrust load based on horsepower, thrust bearing, and screw limitation.

### TENSION LOAD

A load that tends to "stretch" the screw.

### COMPRESSION LOAD

A load that tends to "squeeze" the screw.



Nook Linear Actuators used in a roadside lighting column.

## DESIGN CONSIDERATIONS



For Electric Cylinders supplied without brakemotors, use the information in the “Electric Cylinder Design Data” chart on pages 20, 34-35, and 54-55 for motor sizing. The horsepower is calculated by using the following formula:

$$\text{Horsepower per cylinder} = \frac{\text{Torque to raise one pound} \times \text{Number of pounds to be raised} \times \text{Input rpm}}{63,025}$$

The “Torque to raise one pound” value is particular to each cylinder and can be obtained from the “Electric Cylinder Design Data” charts on pages 20, 34-35, and 54-55.

Maximum horsepower ratings are based on intermittent operation. To determine whether performance is within horsepower and duty cycle limits, measure the cylinder temperature. The temperature of the housing near the worm (or at the thrust bearing mounting block for ILA cylinders) must not exceed 200°F.

**CAUTION:** Do not exceed the maximum allowable input horsepower for a cylinder.

### LOAD CAPACITY

All anticipated loads should be within the rated capacity of the cylinder. Loads on the cylinder in most applications include: static loads, dynamic or moving loads, cutting or other reaction forces and acceleration/deceleration loads.

For shock loads, the peak load must not exceed the rated capacity of the cylinder, and an appropriate design factor should be applied commensurate with the severity of the shock.

For accidental overloads not anticipated in the design of the system, cylinders can sustain the following overload conditions without damage: 10% for dynamic loads, 30% for static loads. For multiple cylinder systems, load distribution should be considered. System stiffness, center of gravity, drive shaft windup and lead variation in the lift shafts may result in unequal load distribution.

### HORSEPOWER RATINGS

Standard DD and RAD Electric Cylinder Models are supplied with electric brake-motors sized for the load and speed rating of the cylinder.

The allowable duty cycles for DD and RAD worm gear cylinders being used at full rated load are:

**Ball Screw Cylinders = 35%**

**Acme Screw Cylinders = 25%**

If an Electric Cylinder is applied at less than rated capacity, higher duty cycles may be possible. The best way to determine allowable duty cycle is to measure the cylinder gear housing temperature. The temperature of the housing near the worm must not exceed 200°F.

### COLUMN STRENGTH

Electric Cylinder capacity may be limited by its column strength. Column strength is the ability of the cylinder to hold compressive loads without buckling. With longer screw lengths, column strength can be substantially lower than nominal cylinder capacity. When the lift screw is in tension only, travel is limited by available screw and/or tube material or by screw critical speed. If there is any possibility for the cylinder to go into compression, the application should be checked for sufficient column strength. The charts on each cylinder specification page are used to determine the cylinder size in applications where the lift screw is loaded in compression.

The charts assume proper cylinder alignment with no bending loads present. Effects from side loading are not included in this chart. Also, cylinders operating horizontally with long lift screws can have significant bending from the weight of the screw and tubes. Consult Nook Industries if side loads are anticipated.

### CYLINDER SIZING DATA

Cylinders are limited by two constraints: load capacity and horsepower. The load capacity of the cylinder is limited by the physical constraints of its components (drive sleeve, lift shaft, bearings, etc.). The horsepower limit of the cylinder is a result of the ability to dissipate the heat generated from the inefficiencies of its components.

In order to test for these constraints, application information must be collected. The data required to size a cylinder includes:

**1) Total Load** – The total load includes static loads, dynamic loads and inertia loads from acceleration and deceleration. Also consider reaction forces received from the load such as drilling or cutting forces when using a cylinder to move a machine tool.

**2) Number of Cylinders** – The number of cylinders used depends on physical size and design of the equipment. Stiffness of the equipment structure and guide system will determine the appropriate number of cylinders required. Fewer cylinders are easier to drive, align and synchronize. For multiple-cylinder arrangements, do not assume equal loading. Calculations should be based upon “worst case” unequal loading.

**3) Travel Rate** – Establishing a travel rate allows for a quick cylinder selection and will be used to evaluate critical speed and horsepower limits. The desired rate should include time for acceleration/ deceleration.

**4) Travel** – Travel is the total distance the cylinder extends. This is the number that is used to calculate maximum compressive load. For cylinders with nonstandard retracted lengths, include the additional length in the compressive load evaluation.

**5) Duty Cycle** – The duty cycle is the ratio of run time to the total cycle time.

**6) Type of Guidance** – Every linear motion system needs something to move the load and something to guide the load. The degree of guidance (stiffness, accuracy, etc.) is based on application requirements.

### CYLINDER SELECTION

Once the cylinder sizing information is collected, a preliminary cylinder selection can be made and verified.

**1) Select a Standard Cylinder** – Use the DD, RAD, and ILA Design Data and Quick Reference Charts on pages 20, 34-36, and 54-56 to find a unit which matches the desired force and speed. Choose between a ball screw or acme screw model based on duty cycle (model suffixes which begin with “A” are acme models).

**2) Travel Length** – When a unit is chosen, go to the product specification page for that model. Check that the desired travel length does not exceed column strength and maximum travel limits. A larger capacity cylinder may be required in order to stay within these limits.

**NOTE:** Travel length must include any over-travel to accommodate stopping distance.

**3) Reference Number** – Use the information on page 21, 37, or 57 to specify a complete Electric Cylinder Reference Number.

If the cylinder is to be used with a motor other than those listed in the catalog, if multiple cylinders are used or if the cylinder is manually operated, go to the Electric Cylinder Design Data on pages 20, 34-35, and 54-55.

**1) Select a Cylinder** – Choose a model whose basic capacity matches or exceeds the expected load. Make certain the dynamic and static loads do not exceed the cylinder capacity. In multiple cylinder applications, check the distribution of the load for potential uneven loading on the cylinders.

**2) Speed** – Use the “turns for one inch of travel” from the chart to determine the input speed required. If travel rate and motor speed are known, divide the motor speed (rpm) by the travel rate (inches per minute) to determine the “turns for one inch of travel.”

**3) Motor Horsepower** – Calculate the horsepower required from the load, speed and “torque to raise one pound value” from the chart. Use the horsepower calculation on page 12.

If using the cylinders in multiple cylinder systems, check the total horsepower. Remember that additional gearboxes and couplings used to distribute power to the cylinders are not 100% efficient. If the horsepower required exceeds the maximum value for the cylinder selected, several solutions are possible.

- Use a larger cylinder model to increase the maximum allowable horsepower
- Use a Ball Screw Cylinder to reduce the power required to do the same work
- Operate at a lower input speed
- Use a RAD cylinder to bring the power requirement within acceptable limits

Upon selecting a motor and brake, verify that the brake has sufficient torque to both hold the load and stop the load.

**CAUTION:** Cylinders with high lead ball screws (HL and SL) may require larger brakes to stop the load. An appropriately sized brake will insure against excessive “drift.”

**4) Column Strength** – If it is possible for the cylinder to be loaded in compression, check for column strength. Consider cases where a unit normally loaded in tension can be compressively loaded if it runs into an obstruction. Also check horizontal applications for compressive loading due to acceleration or deceleration.

**5) Cycle Time** – If using a worm gear style Electric Cylinder, make sure cycle time does not exceed the allowable duty cycles.

**6) Life** – For Ball Screw Cylinders, check life expectancy against the life charts.

**7) Reference Number** – Use the information on page 21, 37, or 57 to specify a complete Electric Cylinder Reference Number.

## DESIGN CONSIDERATIONS (continued)

### INSTALLATION

The alignment of the cylinders directly affects their service life. Cylinders must be properly aligned in all planes so the actuator tube can move in and out without evidence of binding.

Since the majority of cylinder applications use the cylinders with clevis or trunnion mounts, simply align the clevises and install the cylinder.

Set limit switches before operating. Allow for drift when setting the position. The actuator tube can move (rotate) until the unit is installed. Turn the actuator tube in or out to get the cylinder to a known position before installation to prevent over-travel.

### MAINTENANCE

Electric Cylinders require minimum maintenance. In addition to maintaining lubrication levels in the gearbox and tubes, the following items should be checked:

- The actuator tube should be kept free of dirt. If possible, the actuator should be returned to the retracted position when not in use.
- For acme cylinders, lash between the lift shaft and travel nut greater than  $\frac{1}{4}$  the screw pitch indicates the need for replacement of the cylinder lift shaft components.
- For machine screw or ball screw worm gear Electric Cylinders, check for excessive backlash between the worm and worm gear. Lash in excess of  $30^\circ$  for ratios 5:1 to 8:1 and  $60^\circ$  for ratios 20:1 and 24:1 indicates the need to replace the worm and worm gear.

### LUBRICATION

Electric Cylinders require lubrication to operate efficiently and with maximum life. Standard lubrication is NLGI #2 grease. If operating conditions exceed  $-20^\circ\text{F}$  to  $200^\circ\text{F}$ , contact Nook Industries, for alternative lubricants.

The cylinder gear boxes are shipped pre-greased unless otherwise specified. Before operating any unit, check the lubricant level. All cylinder housings are furnished with a grease fitting. Most have a pipe plug opposite the grease fitting. When adding grease to the housing, remove the pipe plug and fill the unit until grease exits the pipe plug opening. Overfilling the cylinder may result in grease leakage from the seals.

In normal operation, cylinder lubricant levels should be checked once per month. Application conditions may dictate a more or less frequent lubrication cycle. In extreme conditions, automatic lubrication may be desired.

Lubricants containing additives such as molydisulfide or graphite should not be used.

The lift shafts (ball and acme screws) inside the Electric Cylinder actuator tube receive lubrication through the fittings on the outside of the housing tube. Lubrication added to the housing tube can pass to the screw regardless of actuator tube position. The best way to lubricate this section of the cylinder is to add some lubricant when the cylinder is fully retracted and additional lubricant when the cylinder is extended beyond where the guide is past the lube port (see cylinder cutaway views on pages 19, 33, and 53).



**H ARRANGEMENT**



**T ARRANGEMENT**



### REQUIRED APPLICATION DATA

#### Load

- Total maximum thrust load on cylinders
- Total maximum thrust load on any one cylinder
- Number of cylinders

#### Travel

- Inches
- Orientation (vertical, horizontal, arc, diagonal, etc.)

#### Travel Rate

- Optimal speed
- Minimal acceptable speed
- Maximum acceptable speed

#### Duty Cycle

- Distance per cycle
- Number of cycles per time period
- Maximum distance traveled in any year
- Life desired

#### Configuration

- Tension, compression, or both
- Driven by motor or other
- Translating, Rotating, or Double Clevis

#### Arrangement

- Arrangement Type, (H, T, U, Inline)
- Arrangement Dimensions (X, Y<sub>1</sub>, Y<sub>2</sub>, etc.)

For dimension information, please refer to the guides online at [www.nookindustries.com](http://www.nookindustries.com).



Nook Electric Cylinders are used in many maritime applications.



U ARRANGEMENT



IN-LINE ARRANGEMENT

## APPLICATION EXAMPLES

### APPLICATION #1 – DISTRIBUTION CONVEYOR

An agricultural conveyor system distributes filler material across a 48 inch wide packaging line. One end of the conveyor is hinged to a loading station, the other end must move across the conveyor.

#### SPECIFICATIONS:

- The maximum load from the conveyor with material is 1,100 lb
- A servo drive will be used to control the actuator
- The conveyor will move 480 times per hour, 16 hours per day, 350 days per year
- Life expectancy is 5 years
- Travel length is 24 inches maximum
- Minimum Travel Rate is 24 inches in 3 seconds

#### ANALYSIS:

An In-Line cylinder will be used because of the frequent cycle requirement. With a travel rate of 480 inches per min ((24 inches / 3 seconds) × 60 seconds) and a life expectancy of 15 million inches, an ILA-10-HL is selected. The application would require a servomotor that can produce 96.8 inch-lbs of torque (0.088 inch-lbs × 1,100 lbs) at 960 rpm (480 inches per min / .500 Lead).

#### SELECTION:

**ILA-10-HL / SPC / TC/ 24 / M**

M - Custom motor mount to fit customer-specified servo motor.



## APPLICATION EXAMPLES



### APPLICATION #2 – HVAC DUCT VALVE

An HVAC 6' x 6' duct valve is located 30 feet above a manufacturing process facility floor. The baffle needs to be adjusted periodically to maintain proper airflow through the building. The loads, duty cycle and other operation details have been identified. The concern is with the amount of dust and particulate that will accumulate on the actuator due to the fact that it is located directly above foam manufacturing equipment.

### SPECIFICATIONS:

Maximum force to open and close the valve under maximum airflow is 2,000 lb

Cylinder will be in compression

Maximum speed is 32 inches per minute

Actuation cycle: 2 times per day; 365 days per year

Desired design life is twenty years

Mechanism must be mounted overhead

Limit switches required

Maximum travel is 18 inches

### ANALYSIS

There is a specific life requirement so a ball screw actuator is required. As shown on the Series DD-25 product reference pages 28-29, using the DD-2512-HD with a ½ hp brake motor will provide a travel rate of 36"/min and give 4.1 million inches of life at 2,000lbs.

Additionally, the charts show that this application is within the column load strength of the DD-2512-HD. The door swings through an arc so a double clevis style will be required. Due to the environment concerns, an enclosed Rotary Limit Switch should be used instead of a Rod-Type Limit Switch.

### SELECTION:

**DD-2512-HD / 05BT -1 / 2CA - 4E / CC / 18 / S**

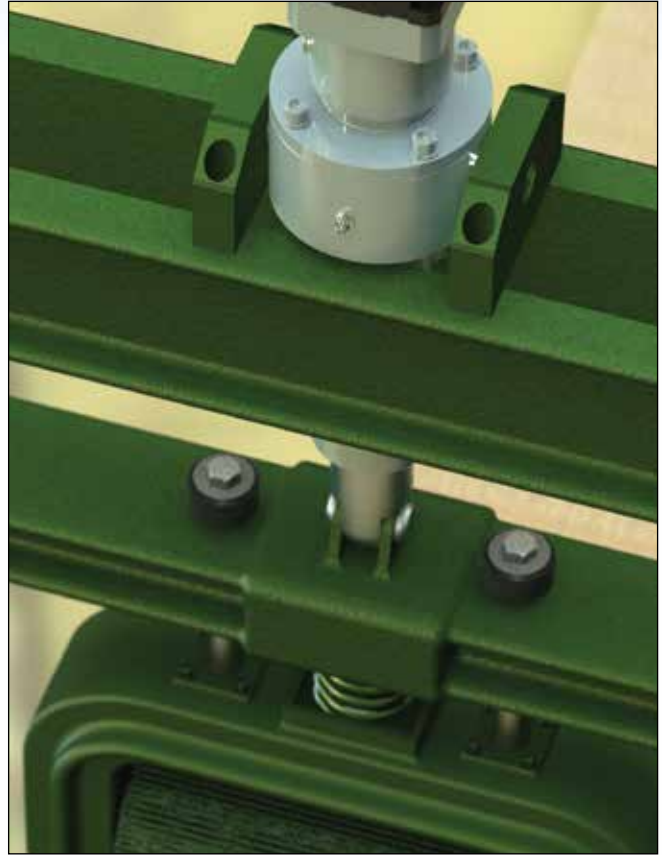




## ILA ELECTRIC CYLINDERS

ILA Electric Cylinders have many of the same benefits of DD and RAD Electric Cylinders, including a rugged design and capacities from 1,000 lb to 21,000 lb. ILA Electric Cylinders incorporate a direct drive without an internal reduction. The screw drive is directly coupled with an external speed reducer, stepper motor, servo motor, or NEMA mounted motors.

ILA Electric Cylinders can be supplied for outdoor applications. Each Electric Cylinder is built to specification. Custom motor or reducer mounts are available.



Nook Electric Cylinders used in a commercial sawmill.





**ILA ELECTRIC CYLINDERS .....20-21**  
Design Data ..... 20  
Reference Number System ..... 21

**ILA ELECTRIC CYLINDERS  
TECHNICAL DATA .....22-31**  
Series ILA-5 & ILAK-5 ..... 22-23  
Series ILA-10 & ILAK-10 ..... 24-25  
Series ILA-25 & ILAK-25 ..... 26-27  
Series ILA-100 & ILAK-100 ..... 28-29  
Series ILA-200 & ILAK-200 ..... 30-31

## ILA DESIGN DATA

	MODEL NUMBER	SCREW SIZE	INPUT TURNS PER INCH OF TRAVEL	TORQUE TO RAISE 1 LB (IN-LB)	MAX LOAD (LB)
<b>5 SERIES</b>	<b>ILA - 5 HL</b>	0631-0500 SRT RA	2	0.088	1,000
	<b>ILA - 5 HD</b>	0631-0200 SRT RA	5	0.035	1,000
	<b>ILAK - 5 HL</b>	0631-0500 SRT RA	2	0.088	1,000
	<b>ILAK - 5 HD</b>	0631-0200 SRT RA	5	0.035	1,000
<b>10 SERIES</b>	<b>ILA - 10 HL</b>	0750-0500 SRT RA	2	0.088	1,200
	<b>ILA - 10 HD</b>	0750-0200 SRT RA	5	0.035	2,200
	<b>ILAK - 10 HL</b>	0750-0500 SRT RA	2	0.088	1,200
	<b>ILAK - 10 HD</b>	0750-0200 SRT RA	5	0.035	2,200
<b>25 SERIES</b>	<b>ILA - 25 HL</b>	1000-1000 SRT RA	1	0.177	2,200
	<b>ILA - 25 ML</b>	1000-0500 SRT RA	2	0.088	3,500
	<b>ILA - 25 HD</b>	1000-0250 SRT RA	4	0.035	3,500
	<b>ILAK - 25 HL</b>	1000-1000 SRT RA	1	0.177	2,200
	<b>ILAK - 25 ML</b>	1000-0500 SRT RA	2	0.088	3,500
	<b>ILAK - 25 HD</b>	1000-0250 SRT RA	4	0.035	3,500
<b>100 SERIES</b>	<b>ILA-100 SL</b>	1500-1875 SRT RA	.53	0.332	2,500
	<b>ILA-100 HL</b>	1500-1000 SRT RA	1	0.177	4,600
	<b>ILA-100 HD</b>	1500-0473 SRT RA	2.11	0.084	9,000
	<b>ILAK-100 SL</b>	1000-1875 SRT RA	.53	0.332	2,500
	<b>ILAK-100 HL</b>	1500-1000 SRT RA	1	0.177	4,600
	<b>ILAK-100 HD</b>	1500-0473 SRT RA	2.11	0.084	9,000
<b>200 SERIES</b>	<b>ILA-200 HL</b>	2250-1000 SRT RA	1	0.177	11,000
	<b>ILA-200 HD</b>	2250-0500 SRT RA	2	0.088	21,000
	<b>ILAK-200 HL</b>	2250-1000 SRT RA	1	0.177	11,000
	<b>ILAK-200 HD</b>	2250-0500 SRT RA	2	0.088	21,000

Optional Configuration - Contact Nook Engineering



# REFERENCE NUMBER SYSTEM

## ILA CYLINDERS

**ILA-100-HD / X05 / TC / 24.5 / S**

### SERIES ILA MODEL

Refer to product pages for available models.  
 ILA = Standard In-Line Actuator  
 ILAK = Keyed In-Line Actuator

### MOTOR MOUNT CODES

SPC\_ = Special Modified Motor Mount

Motor Mounts Without Motor (Refer to product pages for available models.)

#### NEMA Frame Mounts

- X04 = (48C) ILA-5, ILAK-5, ILA-10, ILAK-10
- X05 = (56C) All models except ILA-200, ILAK-200
- X14 = (140TC) All models except ILA-5, ILAK-5, ILA-10, ILAK-10
- X18 = (180TC) ILA-100, ILAK-100, ILA 200, ILAK-200
- X21 = (210TC) ILA-100, ILAK-100, ILA 200, ILAK-200

#### IEC Frame Mounts

- 56B5 = ILA-5, ILAK-5
- 56B14 = ILA-5, ILAK-5
- 63B5 = ILA-10, ILAK-10
- 63B14 = ILA-10, ILAK-10
- 71B5 = ILA-10, ILAK-10, ILA-25, ILAK-25
- 71B14 = ILA-10, ILAK-10, ILA-25, ILAK-25
- 80B5 = ILA-25, ILAK-25, ILA-100, ILAK-100
- 80B14 = ILA-25, ILAK-25, ILA-100, ILAK-100
- 90B5 = ILA-100, ILAK-100
- 90B14 = ILA-100, ILAK-100
- 100B5 = ILA-100, ILAK-100, ILA0-200, ILAK-200
- 100B14 = ILA 100, ILAK-100, ILA0-200, ILAK-200

\* Unless specified at the time of order, the electric cylinder will be supplied with a jaw-type coupling that may reduce the allowable torque input. For more information please contact Nook application engineers.

### HOUSING CONFIGURATION

T = Standard Trunnion Pins

### ROD CONFIGURATION

- T = Threaded End
- C = Clevis End
- D = Threaded rod end with female clevis installed
- P = Top Plate

### TRAVEL

Travel in inches

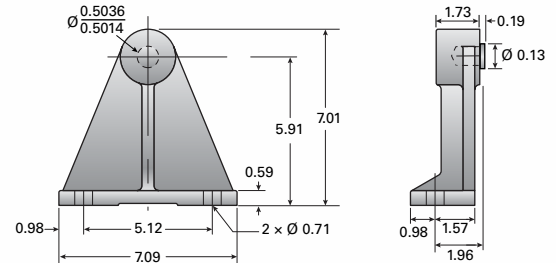
### MODIFIER LIST

- Always S, B or M
- S = Standard. no additional description required
- B = Bellows Boots (See pages xxx-xxx)

# SERIES ILA-5 & ILAK-5

## TRUNNION MOUNT

Part number 9015-5



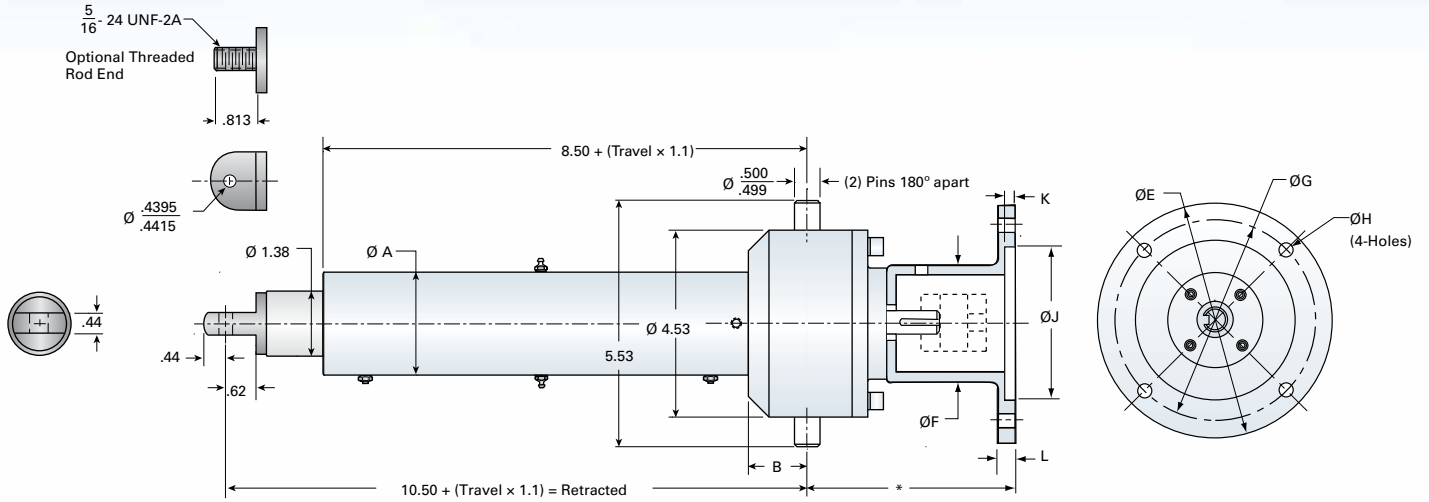
MODEL NUMBER	Maximum Load (lb)	Max Input Torque (in.-lb.)	Max Travel Rate (in/min)	Ball Screw Model Number	Torque per lb. (in.-lb.)	Basic Weight (lb)	Dimensions	
							A	B
ILA-5 HL	1.000	88	2,377	0631-0500 SRT	0.088	29	2.25	2.25
ILA-5 HD	1.000	35	951	0631-0200 SRT	0.035	29	2.25	2.25
ILAK-5 HL (keyed)	1.000	88	2,377	0631-0500 SRT	0.089	29	3.50	3.50
ILAK-5 HD (keyed)	1.000	35	951	0631-0200 SRT	0.036	29	3.50	3.50

Total Weight = (0.87 lb) × Travel + Basic Weight  
 Rod Reaction Torque = Torque per lb. × Load

**NOTE:** Cylinder is self-lowering.  
 Input shaft must be secured to prevent rotation.

**NOTE:** Nook ILA Series cylinders can be supplied with motor mounts. The sizes listed in the chart are mounts designed to match up to common motor faces. Application torque requirements and coupling size, style and attachment method will affect the size of the motor mount. See reference number pages 70 and 72 for motor mount/cylinder model availability. A custom motor mount can be manufactured to your specifications, please contact Nook Industries.



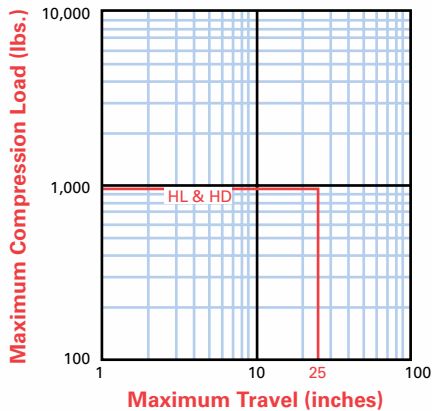


\* Dimension based on motor mount. Contact factory with your specific requirements

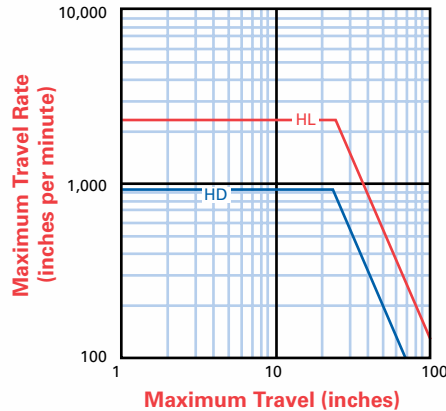
MOTOR FRAME	Frame Size	ØE	ØF	ØG	ØH	ØJ	K	L
<b>NEMA</b>	48	4.63"	3.12"	3.75"	.28"	3.00"	.16"	.50"
<b>IEC</b>	56B5	120mm	64mm	100mm	8.5mm	80mm	3.5mm	7mm
<b>IEC</b>	56B14	80mm	64mm	65mm	6mm	50mm	3.0mm	6mm

Servo or stepper motors are available.

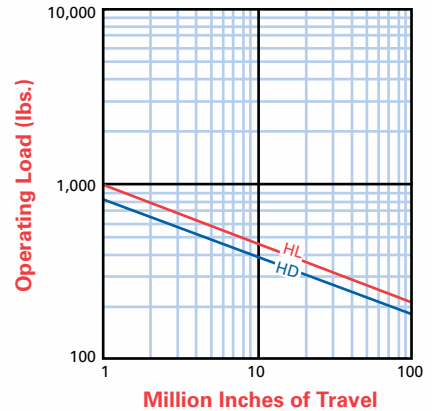
### COLUMN LOAD



### CRITICAL SPEED



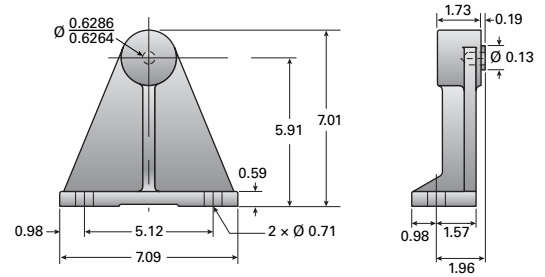
### LIFE EXPECTANCY



# SERIES ILA-10 & ILAK-10

## TRUNNION MOUNT

Part number 9015-10

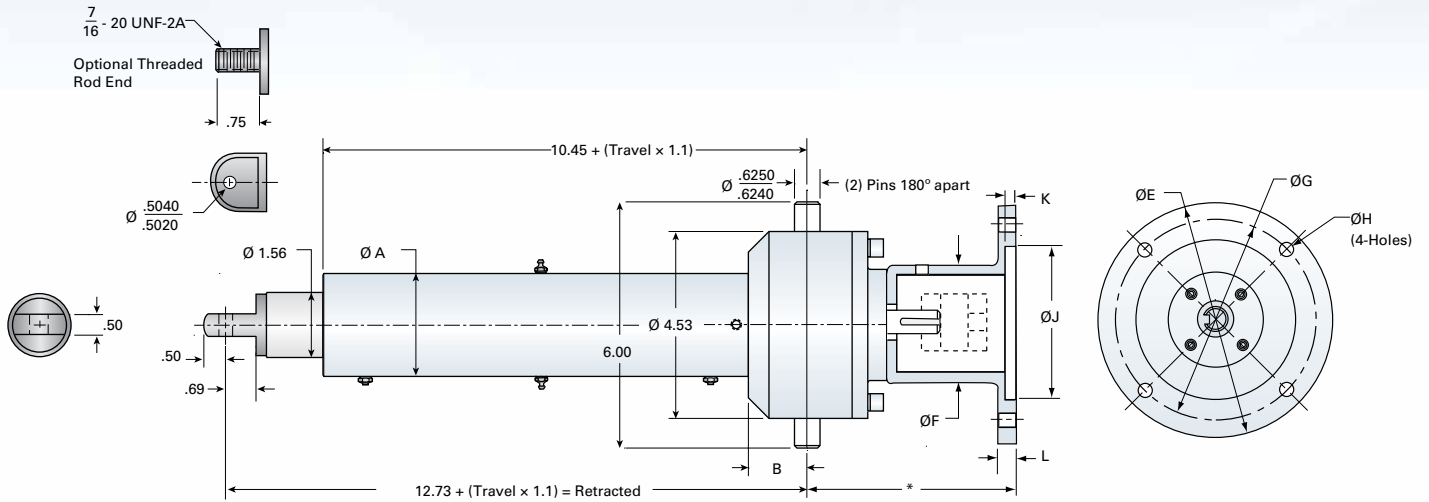


MODEL NUMBER	Maximum Load (lb)	Max Input Torque (in.-lb.)	Max Travel Rate (in/min)	Ball Screw Model Number	Torque per Lb. (in.-lb.)	Basic Weight (lb)	Dimensions	
							A	B
ILA-10 HL	1,200	105	2,000	0750-0500 SRT	0.088	32	2.50	1.44
ILA-10-HD	2,200	77	800	0750-0200 SRT	0.035	32	2.50	1.44
ILAK-10 HL (Keyed)	1,200	105	2,000	0750-0500 SRT	0.089	32	4.00	1.25
ILAK-10 HD (Keyed)	2,200	77	800	0750-0200 SRT	0.036	32	4.00	1.25

Total Weight = (0.98 lb) × Travel + Basic Weight  
 Rod Reaction Torque = Torque per lb. × Load

**NOTE:** Cylinder is self-lowering.  
 Input shaft must be secured to prevent rotation.

**NOTE:** Nook ILA Series cylinders can be supplied with motor mounts. The sizes listed in the chart are mounts designed to match up to common motor faces. Application torque requirements and coupling size, style and attachment method will affect the size of the motor mount. See reference number pages 70 and 72 for motor mount/cylinder model availability. A custom motor mount can be manufactured to your specifications, please contact Nook Industries.

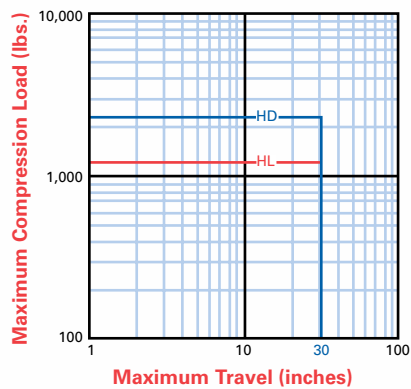


\* Dimension based on motor mount. Contact factory with your specific requirements

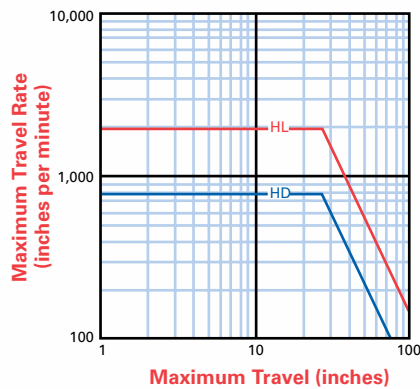
MOTOR FRAME	Frame Size	ØE	ØF	ØG	ØH	ØJ	K	L
<b>NEMA</b>	56C	6.75"	3.50"	5.88"	.41"	4.50"	.16"	.50"
<b>IEC</b>	63B5	140mm	70mm	115mm	9mm	95mm	4mm	8mm
<b>IEC</b>	63B14	90mm	70mm	75mm	6mm	60mm	3.5mm	8mm
<b>IEC</b>	71B5	160mm	85mm	130mm	9mm	110mm	4.5mm	10mm
<b>IEC</b>	71B14	105mm	85mm	85mm	7mm	70mm	4mm	10mm

Servo or stepper motors are available.

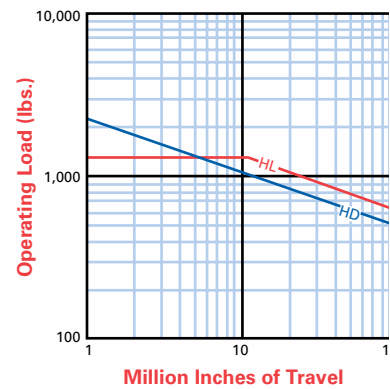
### COLUMN LOAD



### CRITICAL SPEED



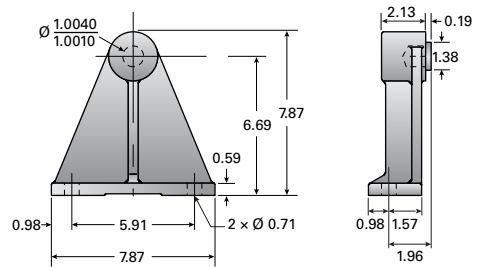
### LIFE EXPECTANCY



## SERIES ILA-25 & ILAK-25

### TRUNNION MOUNT

Part number 9015-25

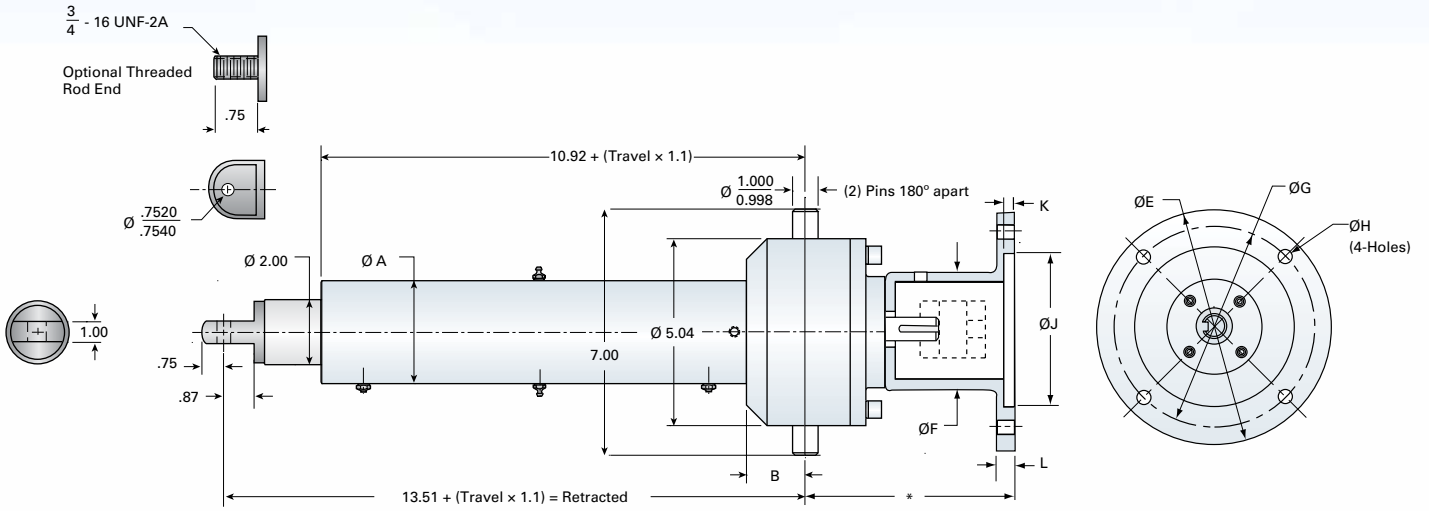


MODEL NUMBER	Maximum Load (lb)	Max Input Torque (in.-lb.)	Max Travel Rate (in/min)	Ball Screw Model Number	Torque per Lb. (in.-lb.)	Basic Weight (lb)	Dimensions	
							A	B
ILA-25 HL	2,200	390	3,000	1000-1000 SRT	0.177	47	3.00	1.50
ILA-25-ML	3,500	308	1,500	1000-0500 SRT	0.088	47	3.00	1.50
ILA-25-HD	3,500	154	750	1000-0250 SRT	0.044	47	3.00	1.50
ILAK-25 HL (Keyed)	2,200	390	3,000	1000-1000 SRT	0.179	47	4.00	1.25
ILAK-25-ML (Keyed)	3,500	308	1,500	1000-0500 SRT	0.093	47	4.00	1.25
ILAK-25-HD (Keyed)	3,500	154	750	1000-0250 SRT	0.044	47	4.00	1.25

Total Weight = (1.29 lb) × Travel + Basic Weight  
 Rod Reaction Torque = Torque per lb. × Load

**NOTE:** Cylinder is self-lowering.  
 Input shaft must be secured to prevent rotation.

**NOTE:** Nook ILA Series cylinders can be supplied with motor mounts. The sizes listed in the chart are mounts designed to match up to common motor faces. Application torque requirements and coupling size, style and attachment method will affect the size of the motor mount. See reference number pages 70 and 72 for motor mount/cylinder model availability. A custom motor mount can be manufactured to your specifications, please contact Nook Industries.

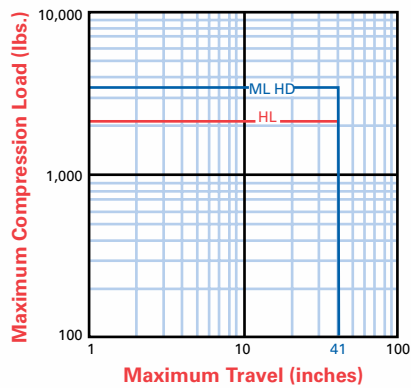


\* Dimension based on motor mount. Contact factory with your specific requirements

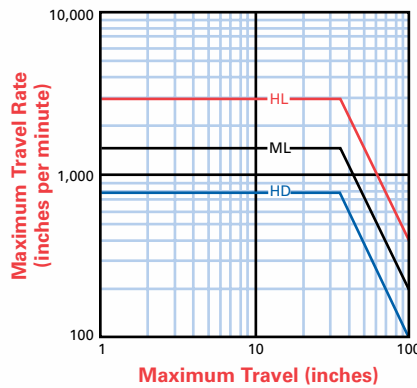
MOTOR FRAME	Frame Size	ØE	ØF	ØG	ØH	ØJ	K	L
<b>NEMA</b>	56C	6.75"	3.75"	5.88"	.41"	4.50"	.16"	.50"
<b>NEMA</b>	140TC	6.75"	3.75"	5.88"	.41"	4.50"	.16"	.50"
<b>NEMA</b>	180TC	9.25"	3.75"	7.25"	.56"	8.50"	.28"	.75"
<b>IEC</b>	71B5	160mm	85mm	130mm	9mm	110mm	4.5mm	10mm
<b>IEC</b>	71B14	105mm	85mm	85mm	7mm	70mm	4mm	10mm
<b>IEC</b>	80B5	200mm	85mm	165mm	11mm	130mm	4.5mm	12mm
<b>IEC</b>	80B14	120mm	85mm	100mm	7mm	80mm	4mm	12mm

Servo or stepper motors are available.

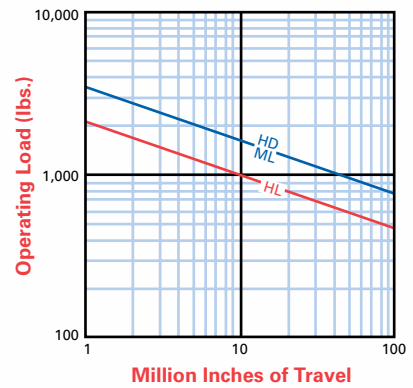
### COLUMN LOAD



### CRITICAL SPEED



### LIFE EXPECTANCY

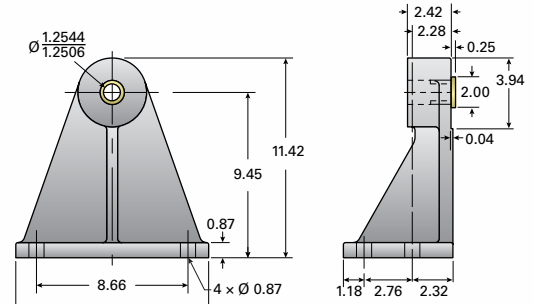




# SERIES ILA-100 & ILAK-100

## TRUNNION MOUNT

Part number 9015-100



MODEL NUMBER	Max Load (lb)	Max Input Torque (in.-lb.)	Max Travel Rate (in./min)	Ball Screw Model Number	Torque per Lb. (in.-lb.)	Basic Weight (lb)	Dimensions			
							A	B	C	D
ILA-100 SL	2,500	830	3,750	1500-1875 SRT	0.332	89	4.00	2.50	16.00	19.00
ILA-100 HL	4,600	814	2,000	1500-1000 SRT	0.177	89	4.00	2.50	14.18	17.14
ILA-100 HD	9,000	756	946	1500-0473 SRT	0.084	89	4.00	2.50	14.18	17.14
ILAK-100 SL (keyed)	2,500	830	3,750	1500-1875 SRT	0.336	89	6.50	2.00	17.50	20.50
ILAK-100 HL (keyed)	4,600	814	2,000	1500-1000 SRT	0.179	89	6.50	2.00	14.18	17.14
ILAK-100 HD (keyed)	9,000	756	946	1500-0473 SRT	0.084	89	6.50	2.00	14.18	17.14

Total Weight = (2.08 lb) × Travel + Basic Weight

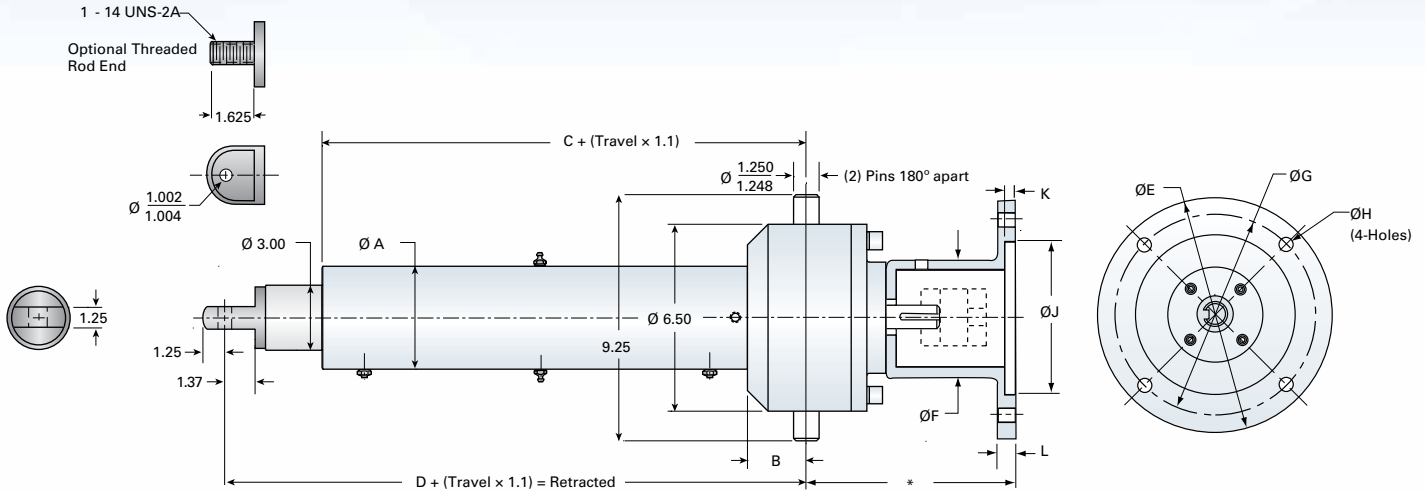
Rod Reaction Torque = Torque per lb. × Load

**NOTE:** Cylinder is self-lowering.  
Input shaft must be secured to prevent rotation.

**NOTE:** Nook ILA Series cylinders can be supplied with motor mounts. The sizes listed in the chart are mounts designed to match up to common motor faces. Application torque requirements and coupling size, style and attachment method will affect the size of the motor mount. See reference number pages 70 and 72 for motor mount/cylinder model availability. A custom motor mount can be manufactured to your specifications, please contact Nook Industries.

# ELECTRIC CYLINDERS

## ILA SERIES

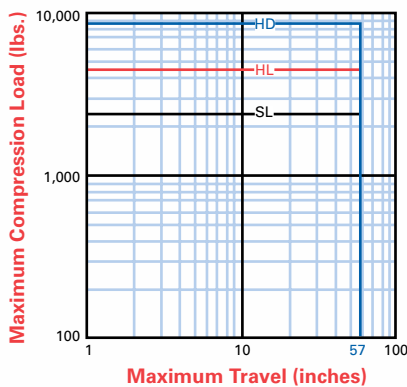


\* Dimension based on motor mount. Contact factory with your specific requirements

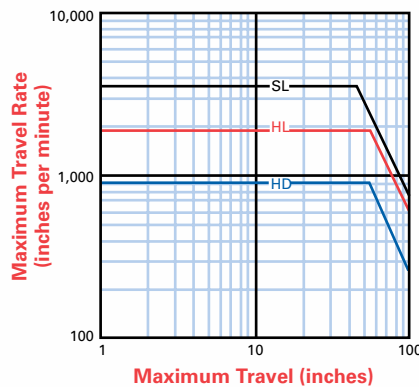
MOTOR FRAME	Frame Size	ØE	ØF	ØG	ØH	ØJ	K	L
<b>NEMA</b>	56C	6.75"	4.38"	5.88"	.41"	4.50"	.16"	.50"
<b>NEMA</b>	140TC	6.75"	4.38"	5.88"	.41"	4.50"	.16"	.50"
<b>NEMA</b>	180TC	9.25"	5.19"	7.25"	.56"	8.50"	.28"	.75"
<b>IEC</b>	80B5	200mm	96mm	165mm	11mm	130mm	4.5mm	12mm
<b>IEC</b>	80B14	120mm	96mm	100mm	7mm	80mm	4mm	12mm
<b>IEC</b>	90B5	200mm	116mm	165mm	11mm	130mm	4.5mm	12mm
<b>IEC</b>	90B14	140mm	116mm	115mm	9mm	95mm	4.5mm	12mm
<b>IEC</b>	100B5	250mm	116mm	215mm	13mm	180mm	5mm	14mm
<b>IEC</b>	100B14	160mm	116mm	130mm	9mm	110mm	5mm	14mm

Servo or stepper motors are available.

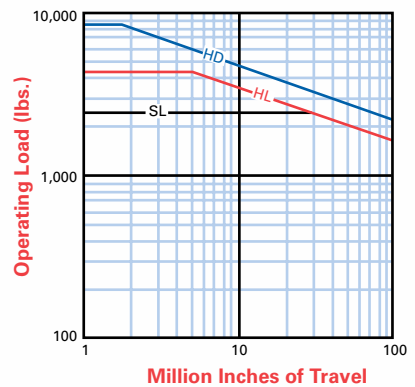
### COLUMN LOAD



### CRITICAL SPEED



### LIFE EXPECTANCY

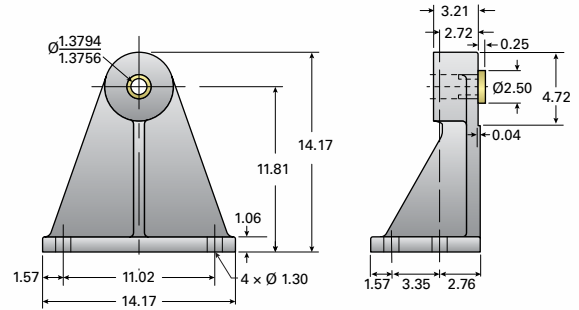


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# SERIES ILA-200 & ILAK-200

## TRUNNION MOUNT

Part number 9015-200

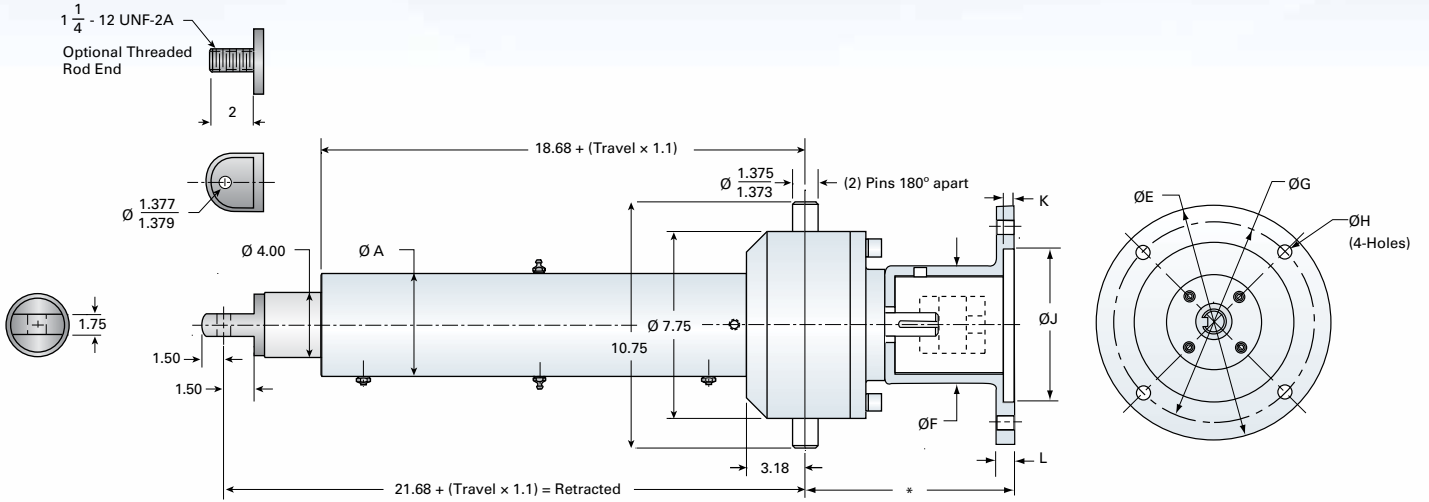


MODEL NUMBER	Maximum Load (lb)	Max Input Torque (in.-lb.)	Max Travel Rate (in/min)	Ball Screw Model Number	Torque per Lb. (in.-lb.)	Basic Weight (lb)	Dimensions
							A
ILA-200 HL	11,000	1,947	1,333	2250-1000 SRT	0.177	194	5.25
ILA-200-HD	21,000	1,848	667	2250-0500 SRT	0.088	194	5.25
ILAK-200 HL (Keyed)	11,000	1,947	1,337	2250-1000 SRT	0.178	194	7.50
ILAK-200 HD (Keyed)	21,000	1,848	667	2250-0500 SRT	0.088	194	7.50

Total Weight = (3.06 lb) × Travel + Basic Weight  
 Rod Reaction Torque = Torque per lb. × Load

**NOTE:** Cylinder is self-lowering.  
 Input shaft must be secured to prevent rotation.

**NOTE:** Nook ILA Series cylinders can be supplied with motor mounts. The sizes listed in the chart are mounts designed to match up to common motor faces. Application torque requirements and coupling size, style and attachment method will affect the size of the motor mount. See reference number pages 70 and 72 for motor mount/cylinder model availability. A custom motor mount can be manufactured to your specifications, please contact Nook Industries.

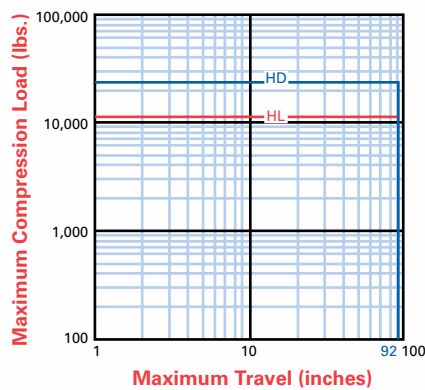


\* Dimension based on motor mount. Contact factory with your specific requirements

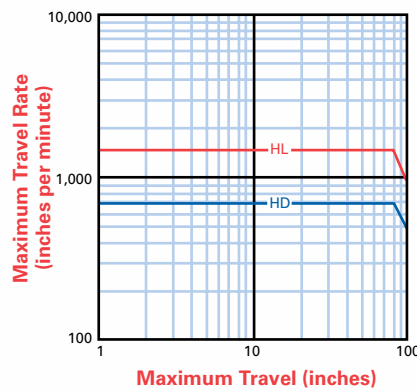
Motor Frame	Frame Size	ØE	ØF	ØG	ØH	ØJ	K	L
<b>NEMA</b>	180TC	9.25"	5.19"	7.25"	.56"	8.50"	.28"	.75"
<b>NEMA</b>	213TC	8.88"	5.69"	7.25"	.56"	8.50"	.28"	.88"
<b>IEC</b>	100B5	250mm	134mm	215mm	13mm	180mm	5mm	14mm
<b>IEC</b>	100B14	160mm	134mm	130mm	9mm	110mm	5mm	14mm

Servo or stepper motors are available.

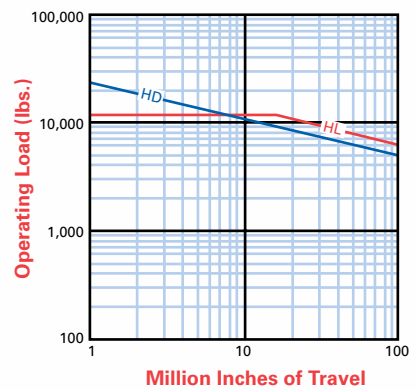
### COLUMN LOAD



### CRITICAL SPEED



### LIFE EXPECTANCY



## **DD ELECTRIC CYLINDERS**

DD Electric Cylinders are ruggedly designed and produced in standard models with thrust capacities from 500 lbs. to 40,000 lbs. DD Electric Cylinders feature a single reduction and are intended for use in industrial environments. They feature ground and hard chrome plated actuator tubes. The exterior surfaces feature industrial enamel paint. Epoxy paint is available on request.

These cylinders may be used individually or in multiple arrangements. Each Electric Cylinder is built to specification. For outdoor application of DD Electric Cylinders, contact Nook Engineering for recommended alterations.



Nook Electric Cylinders are used in many nautical applications.





**DD ELECTRIC CYLINDERS.....34-37**  
Design Data ..... 34-35  
Quick Reference..... 36  
Reference Number System..... 37

**DD ELECTRIC CYLINDERS**  
**TECHNICAL DATA .....38-51**  
Series DD-5 ..... 38-39  
Series DD-10..... 40-41  
Series DD-25 ..... 42-43  
Series DD-30 ..... 44-45  
Series DD-50 ..... 46-47  
Series DD-100..... 48-49  
Series DD-200 ..... 50-51

## DD DESIGN DATA

### BALL SCREW MODELS

	MODEL NUMBER	GEAR RATIO	SCREW SIZE	TURNS OF WORM PER INCH OF TRAVEL	TORQUE TO RAISE 1 LB (IN-LB)	MAX LOAD (LB)	MAX INPUT (HP)*
<b>5 SERIES</b>	<b>DD - 55 - HL</b>	5:1	0631-0500 SRT RA	10	0.0242	1,000	.33
	<b>DD - 520 - HL</b>	20:1	0631-0500 SRT RA	40	0.0102	1,000	.16
	<b>DD - 55 - HD</b>	5:1	0631-0200 SRT RA	25	0.0095	1,000	.33
	<b>DD - 520 - H5</b>	20:1	0631-0200 SRT RA	100	0.0040	1,000	.16
<b>10 SERIES</b>	<b>DD - 105 - HL</b>	5:1	0750-0500 SRT RA	10	0.0241	2,000	.5
	<b>DD - 1020 - HL</b>	20:1	0750-0500 SRT RA	40	0.0114	2,000	.25
	<b>DD - 105 - HD</b>	5:1	0750-0200 SRT RA	25	0.0095	2,000	.5
	<b>DD - 1020 - HD</b>	20:1	0750-0200 SRT RA	100	0.0045	2,000	.25
<b>25 SERIES</b>	<b>DD - 256 - HL</b>	6:1	1000-1000 SRT RA	6	0.0404	5,000	2
	<b>DD - 2512 - HL</b>	12:1	1000-1000 SRT RA	12	0.0244	5,000	1.5
	<b>DD - 256 - ML</b>	6:1	1000-0500 SRT RA	12	0.0201	5,000	2
	<b>DD - 256 - HD</b>	6:1	1000-0250 SRT RA	24	0.0102	5,000	2
	<b>DD - 2512 - HD</b>	12:1	1000-0250 SRT RA	48	0.0061	5,000	1.5
	<b>DD - 2524 - HD</b>	24:1	1000-0250 SRT RA	96	0.0042	5,000	.5
<b>30 SERIES</b>	<b>DD - 306 - HD</b>	6:1	1171-0413 SRT RA	14.53	0.0167	6,000	2
	<b>DD - 3012 - HD</b>	12:1	1171-0413 SRT RA	29.1	0.0169	6,000	1.5
	<b>DD - 3024 - HD</b>	24:1	1171-0413 SRT RA	58.10	0.0070	6,000	.5
<b>50 SERIES</b>	<b>DD - 506 - SL</b>	6:1	1500-1875 SRT RA	3.2	0.0726	10,000	3
	<b>DD - 506 - HL</b>	6:1	1500-1000 SRT RA	6	0.0387	10,000	3
	<b>DD - 5024 - HL</b>	24:1	1500-1000 SRT RA	24	0.0153	10,000	.75
	<b>DD - 506 - HD</b>	6:1	1500-0473 SRT RA	12.66	0.0183	10,000	3
	<b>DD - 5024 - HD</b>	24:1	1500-0473 SRT RA	50.66	0.0073	10,000	.75
<b>100 SERIES</b>	<b>DD - 1008 - SL</b>	8:1	1500-1875 SRT RA	4.26	0.0598	20,000	5
	<b>DD - 1008 - HL</b>	8:1	1500-1000 SRT RA	8	0.0319	20,000	5
	<b>DD - 10024 - HL</b>	24:1	1500-1000 SRT RA	24	0.0162	20,000	1.5
	<b>DD - 1008 - HD</b>	8:1	1500-0473 SRT RA	16.88	0.0151	20,000	5
	<b>DD - 10024 - HD</b>	24:1	1500-0473 SRT RA	50.66	0.0077	20,000	1.5
<b>200 SERIES</b>	<b>DD - 2008 - HL</b>	8:1	2250-1000 SRT RA	8	0.0313	40,000	7.5
	<b>DD - 20024 - HL</b>	24:1	2250-1000 SRT RA	24	0.0157	40,000	2.5
	<b>DD - 2008 - HD</b>	8:1	2250-0500 SRT RA	16	0.0157	40,000	7.5
	<b>DD - 20024 - HD</b>	24:1	2250-0500 SRT RA	48	0.0079	40,000	2.5

\*Based on 35% Duty Cycle. Refer to page 12 for horsepower rating definitions.

**DD DESIGN DATA**  
**ACME SCREW MODELS**

	MODEL NUMBER	GEAR RATIO	SCREW SIZE	TURNS OF WORM PER INCH OF TRAVEL	TORQUE TO RAISE 1 LB (IN-LB)	MAX LOAD (LB)	MAX INPUT (HP)*
<b>5 SERIES</b>	<b>DD - 55 - A5</b>	5:1	5/8"-5 RA	25	0.021	1,000	.33
	<b>DD - 520 - A5</b>	20:1	5/8"-5 RA	100	0.009	1,000	.16
	<b>DD - 55 - A8</b>	5:1	5/8"-8 RA	40	0.017	1,000	.33
	<b>DD - 520 - A8</b>	20:1	5/8"-8 RA	160	0.007	1,000	.16
	<b>DD - 55 - A10</b>	5:1	5/8"-10 RA	50	0.014	1,000	.33
	<b>DD - 520 - A10</b>	20:1	5/8"-10 RA	200	0.006	1,000	.16
<b>10 SERIES</b>	<b>DD - 105 - A5</b>	5:1	3/4"-5 RA	25	0.0225	2,000	.5
	<b>DD - 1020 - A5</b>	20:1	3/4"-5 RA	100	0.0125	2,000	.25
<b>25 SERIES</b>	<b>DD - 256 - A2</b>	6:1	1"-2 RA	12	0.0334	5,000	2
	<b>DD - 256 - A4</b>	6:1	1"-4 RA	24	0.0252	5,000	2
	<b>DD - 2512 - A4</b>	12:1	1"-4 RA	48	0.0148	5,000	1.5
	<b>DD - 2524 - A4</b>	24:1	1"-4 RA	96	0.0106	5,000	.5
<b>30 SERIES</b>	<b>DD - 306 - A4</b>	6:1	1 1/4"-4 RA	24	0.0271	6,000	2
	<b>DD - 3012 - A4</b>	12:1	1 1/4"-4 RA	48	0.0165	6,000	1.5
	<b>DD - 3024 - A4</b>	24:1	1 1/4"-4 RA	96	0.0118	6,000	.5
<b>50 SERIES</b>	<b>DD - 506 - A2</b>	6:1	1 1/2"-2 RA	12	0.0437	10,000	3
	<b>DD - 506 - A3</b>	6:1	1 1/2"-2 3/8 RA	16	0.0376	10,000	3
	<b>DD - 5024 - A3</b>	24:1	1 1/2"-2 3/8 RA	64	0.0144	10,000	.75
<b>100 SERIES</b>	<b>DD - 1008 - A2</b>	8:1	2"-2 RA	16	0.0377	20,000	5
	<b>DD - 10024 - A2</b>	24:1	2"-2 RA	48	0.0192	20,000	1.5
	<b>DD - 1008 - A4</b>	8:1	2"-4 RA	32	0.0314	20,000	5
	<b>DD - 10024 - A4</b>	24:1	2"-4 RA	96	0.0160	20,000	1.5
<b>200 SERIES</b>	<b>DD - 2008 - A2</b>	8:1	2 1/2"-2 RA	16	0.0435	40,000	7.5
	<b>DD - 20024 - A2</b>	24:1	2 1/2"-2 RA	48	0.0218	40,000	2.5
	<b>DD - 2008 - A3</b>	8:1	2 1/2"-3 RA	24	0.0394	40,000	7.5
	<b>DD - 20024 - A3</b>	24:1	2 1/2"-3 RA	72	0.0198	40,000	2.5

\*Based on 25% Duty Cycle. Refer to page 12 for horsepower rating definitions.

## QUICK REFERENCE DD MODEL STANDARD WITH MOTORS

### BALL SCREW CYLINDERS

MODEL NUMBER	DYNAMIC CAPACITY (LBF)	TRAVEL RATE (IN/MIN)
DD-105-HL / 05XX	750	172
DD-1020-HL / 02XX	800	43
DD-256-HL / 10XX	900	287
DD-506-SL / 20XX	950	539
DD-1008-SL / 20XX	1,150	404
DD-2524-HD / 03XX	1,500	18
DD-2512-HL / 10XX	1,500	144
DD-256-ML / 10XX	1,800	144
DD-256-HL / 20XX	1,800	288
DD-105-HD / 05XX	1,900	69
DD-1020-HD / 02XX	2,000	17
DD-2512-HD / 05XX	2,000	36
DD-256-HD / 07XX	2,000	72
DD-506-HL / 20XX	2,000	288
DD-1008-HL / 20XX	2,175	216
DD-3012-HD / 07XX	2,500	60
DD-306-HD / 15XX	2,500	120
DD-506-HL / 30XX	2,500	287
DD-3024-HD / 05XX	2,700	30
DD-10024-HL / 15XX	2,700	72
DD-306-HD / 15XX	3,275	120
DD-5024-HD / 07XX	3,400	34
DD-3012-HD / 10XX	3,600	60
DD-256-HD / 10XX	3,600	72
DD-256-ML / 20XX	3,600	144
DD-20024-HL / 20XX	4,000	72
DD-506-HD / 20XX	4,000	136
DD-2524-HD / 05XX	4,450	18
DD-2512-HD / 07XX	4,450	36
DD-1008-HD / 20XX	4,600	102
DD-1008-HL / 50XX	5,400	216
DD-506-HD / 30XX	5,750	136
DD-20024-HD / 20XX	7,000	36
DD-10024-HD / 15XX	7,150	34
DD-1008-HD / 30XX	7,500	102
DD-2008-HL / 75XX	8,000	216
DD-20024-HD / 30XX	10,000	36
DD-2008-HD / 50XX	11,000	108
DD-1008-HD / 50XX	12,000	102
DD-2008-HD / 75XX	16,600	106

### ACME SCREW CYLINDERS

MODEL NUMBER	DYNAMIC CAPACITY (LBF)	TRAVEL RATE (IN/MIN)
DD-105-A5 / 02XX	850	69
DD-1020-A5 / 02XX	900	17
DD-506-A3 / 10XX	1,000	108
DD-3024-A4 / 05XX	1,200	18
DD-256-A2 / 15XX	1,725	144
DD-2524-A4 / 05XX	1,880	18
DD-5024-A3 / 07XX	1,900	27
DD-506-A2 / 20XX	1,900	144
DD-10024-A2 / 15XX	2,000	36
DD-1008-A4 / 20XX	2,000	54
DD-1008-A2 / 20XX	2,000	108
DD-306-A4 / 15XX	2,100	72
DD-3012-A4 / 10XX	2,200	36
DD-506-A3 / 20XX	2,200	108
DD-256-A4 / 15XX	2,280	72
DD-2512-A4 / 10XX	2,500	36
DD-20024-A2 / 20XX	2,500	36
DD-506-A3 / 30XX	2,900	108
DD-508-A4 / 20XX	3,000	54
DD-1008-A2 / 30XX	3,000	108
DD-20024-A2 / 30XX	3,500	36
DD-2008-A2 / 75XX	4,250	108
DD-1008-A2 / 50XX	4,500	108
DD-2008-A3 / 75XX	4,620	72

XX = motor specification, see page 72



**REFERENCE NUMBER SYSTEM**  
**DD ELECTRIC CYLINDERS**

**DD-2512-HL / 10BT-1 / 2CA-4C / CC / 24.5 / ERS**

**SERIES DD MODEL**

Refer to pages 34 to 35 for available models.

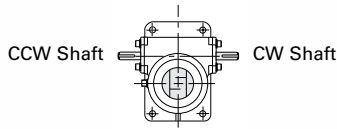
**SHAFT ORDER CODE**

**10BT - 1**

CCW Position 1, 3, 5, 7  
CW Position 2, 4, 6, 8

**ORDER CODES (Must Include a Position)**

**NOTE:** Both Shaft Extensions Must Be Specified.



**NO ACCESSORY**

- SSE\_ = Standard Shaft Extension, Position 1 or 2
- 000\_ = Delete Shaft Extension, Position 1 or 2
- SPC\_ = Special Modified Shaft Extension, Position 1 or 2

**Motor Mounts Without Motor**

Position 1 or 2  
See page 70 for standard motor mount order codes.

**Motor Mounts With Motors**

Position 1 or 2  
See page 70 & 72 for available motors.

**Rotary Limit Switch**

Position 1 C or E through 8 C or E  
See page 74 - 75 for available rotary limit switches.  
**NOTE:** A Limit Switch must specify a close or extended mount.

**Compact Limit Switch**

Position 1 through 8  
See page 76 - 77 for available compact limit switches.

**HOUSING CONFIGURATION**

- F = Standard Flange Base
- C = Clevis Base
- R = Clevis Base Rotated 90°

**SCREW CONFIGURATION**

- T = Threaded End
- C = Clevis End
- D = Threaded rod end with female clevis installed
- P = Top Plate

**TRAVEL**

Travel in inches.

**MODIFIER LIST**

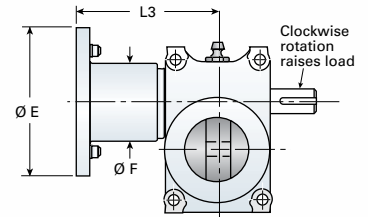
- E, B, and/or R
- E = In-Line Encoder (See p. 73)
- B = Bellows Boots (See p. 85)
- R = Rod Type Limit Switch (See p. 78)
- Optional S or M Required
- S = Standard, no additional description required
- M = Modified, additional description required

**NOTE:** NOT ALL OPTIONS AVAILABLE FOR ALL SIZES



Nook Electric Cylinders are used extensively in military applications.

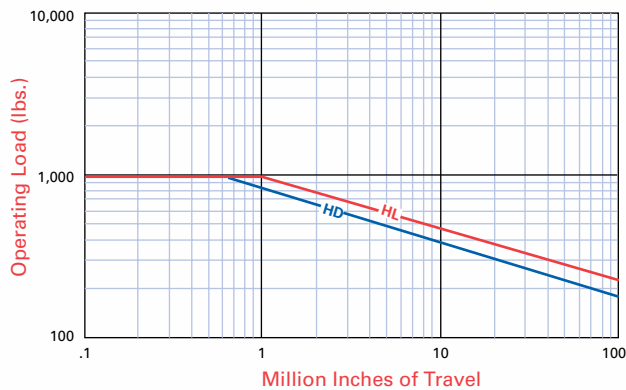
# SERIES DD-5



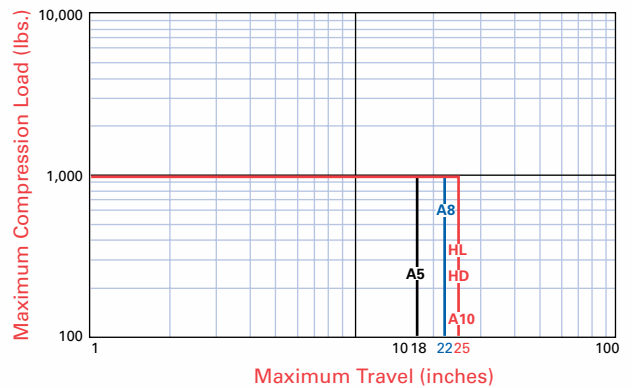
	<b>MODEL NUMBER</b>	Dynamic Capacity (lbf)	Screw Rated Life (in. × 10 <sup>6</sup> )	Max. Motor HP Rating (ref)	Max Rod Reaction Torque (in.-lb.)
Ball Screw	<b>DD-55-HL / T03XX</b>	1,000	13.5	.33	89
	<b>DD-520-HL / T06XX</b>	1,000	1.69	.16	89
	<b>DD-55-HD / T03XX</b>	1,000	2.91	.33	35
	<b>DD-520-HD / T06XX</b>	1,000	9.9	.16	35
Acme Screw	<b>DD-55-A5 / T03XX</b>	1,000	—	.33	72
	<b>DD-55-A8 / T03XX</b>	1,000	—	.33	58
	<b>DD-55-A10 / T03XX</b>	1,000	—	.33	53
	<b>DD-520-A5 / T06XX</b>	1,000	—	.16	72
	<b>DD-520-A8 / T06XX</b>	1,000	—	.16	58
	<b>DD-520-A10 / T06XX</b>	1,000	—	.16	53

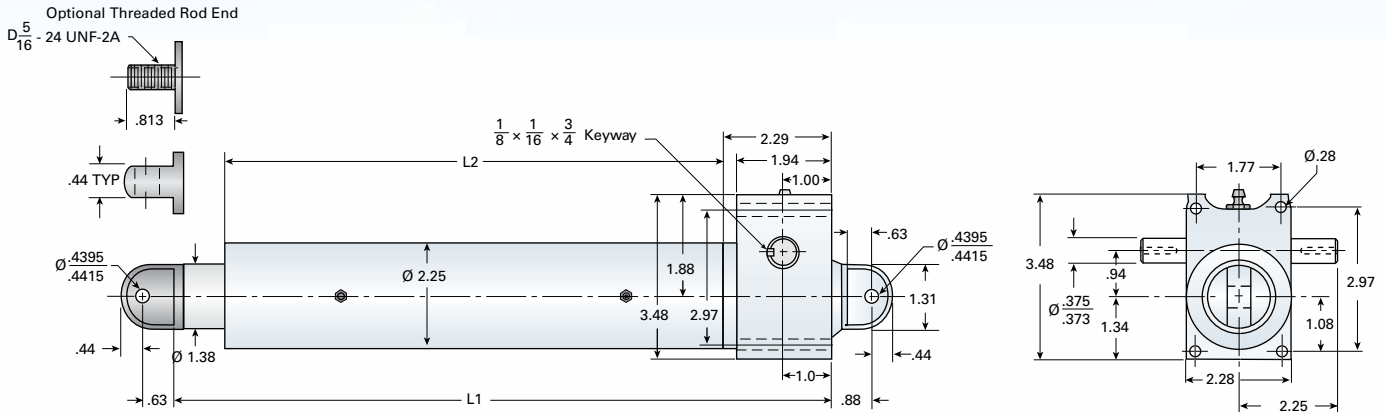
For "XX", see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

## LIFE EXPECTANCY



## COLUMN LOAD





Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
12	8.06	5.00
12	8.06	5.00
12	8.06	5.00
12	8.06	5.00
11	7.38	3.88
11	7.38	3.88
11	7.38	3.88
11	7.38	3.88
11	7.38	3.88
11	7.38	3.88

### NEMA FRAME SIZE

	ØE	ØF	L3
<b>42</b>	4.63	2.69	4.48
<b>48</b>	4.63	3.12	4.48

Servo or stepper motors are available.

Custom motor / gearbox adapters are also available.

\* Ball Screw Models: Total Weight = (0.97 lb) × Travel + Basic Weight

\* Acme Screw Models: Total Weight = (0.98 lb) × Travel + Basic Weight

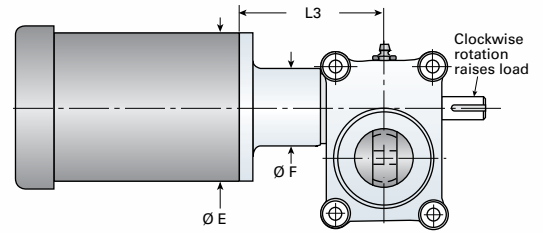
\*\* Total Length = Basic length + Travel × 1.25

Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base.

Motor mount is shown in Position 1 - it may be mounted to either side of the cylinder (see page 70).

**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.

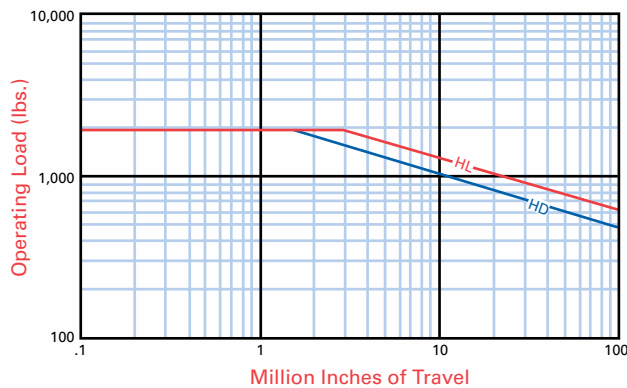
# SERIES DD-10



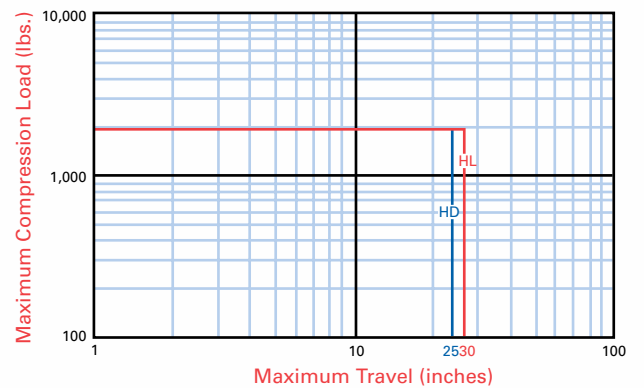
	<b>MODEL NUMBER</b>	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in × 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	<b>DD-105-HL / 05XX</b>	173	750	46	.50	3
	<b>DD-1020-HL / 02XX</b>	43	800	39	.25	3
	<b>DD-105-HD / 05XX</b>	69	1900	1.5	.50	3
	<b>DD-1020-HD / 02XX</b>	17	2000	1.3	.25	3
Acme Screw	<b>DD-105-A5 / 05XX</b>	69	850	—	3	3
	<b>DD-1020-A5 / 02XX</b>	17	900	—	3	3

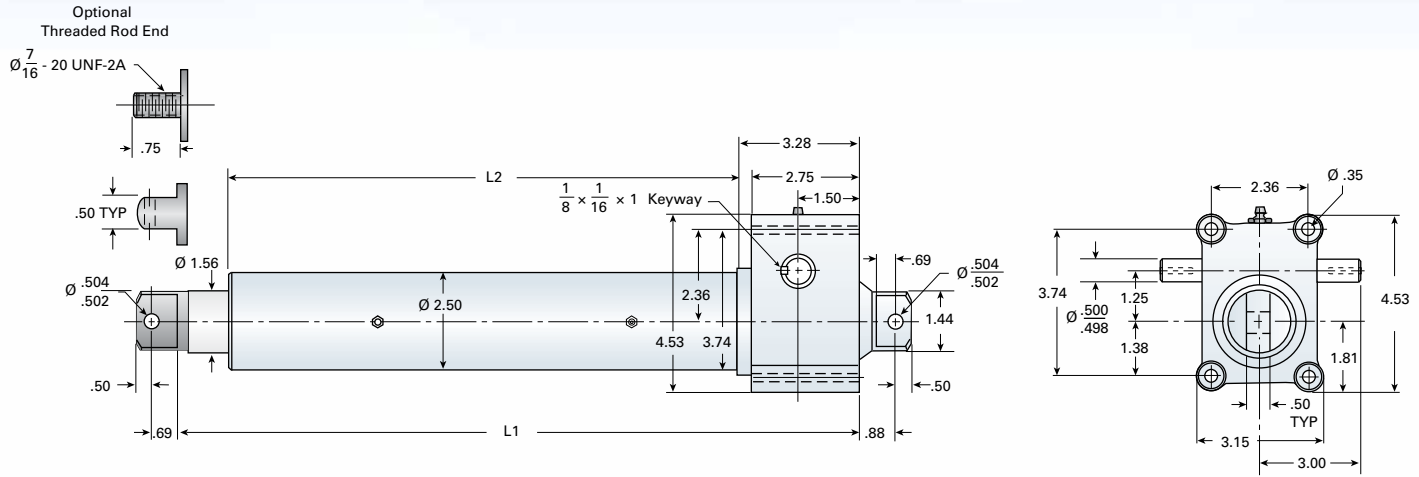
For "XX", see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

### LIFE EXPECTANCY



### COLUMN LOAD





Approx Stopping Distance (in)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.20	.38	67	19	10.75	6.38
.80	.15	71	19	10.75	6.38
.05	.06	67	19	10.75	6.38
.02	.02	71	19	10.75	6.38
.08	—	79	15	8.25	4.25
.02	—	71	15	8.25	4.25

NEMA FRAME SIZE	ØE (in)	ØF (in)	L3 (in)	HP
42	4.63	2.69	4.48	—
48	4.63	3.12	4.48	—
56	6.63	3.75	5.71	¼ - ½

Servo or stepper motors are available.

Custom motor / gearbox adapters are also available.

\* Ball Screw Models: Total Weight = (1.10 lb) × Travel + Basic Weight

\* Acme Screw Models: Total Weight = (1.10 lb) × Travel + Basic Weight

\*\* Total Length = Basic length + Travel × 1.25

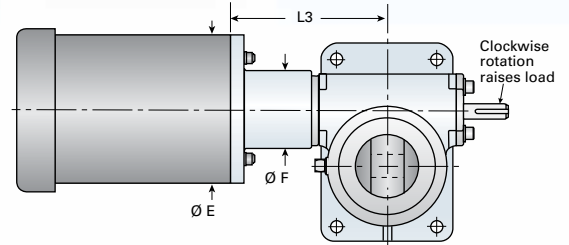
Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1 - it may be mounted to either side of the cylinder (see page 70).

For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.



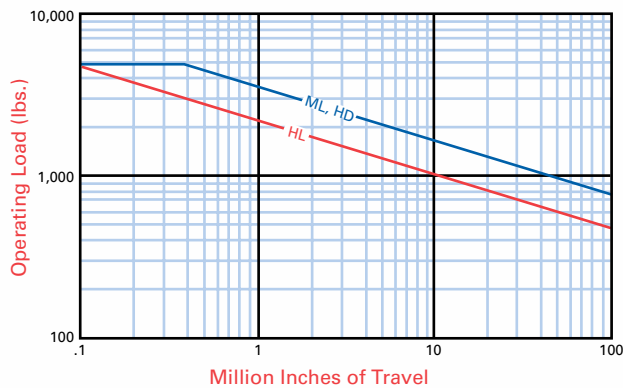
# SERIES DD-25



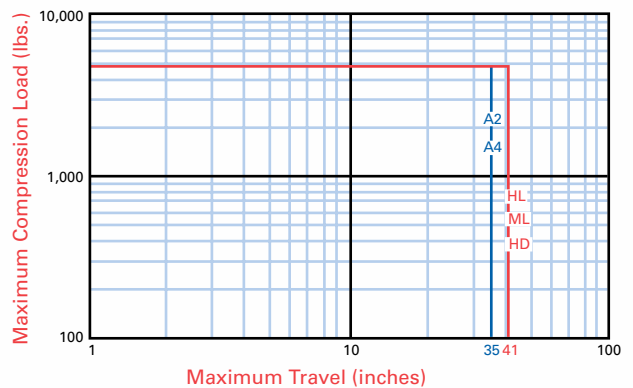
	MODEL NUMBER	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in × 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	<b>DD-256-HL / 10XX</b>	288	900	13.5	1	6
	<b>DD-256-HL / 20XX</b>	288	1,800	1.69	2	10
	<b>DD-2512-HL / 10XX</b>	144	1,500	2.91	1	6
	<b>DD-256-ML / 15XX</b>	144	1,800	7	1.5	6
	<b>DD-256-ML / 20XX</b>	144	3,600	.9	2	10
	<b>DD-256-HD / 10XX</b>	72	3,600	.09	1	6
	<b>DD-256-HD / 07XX</b>	72	2,000	4.1	.75	6
	<b>DD-2512-HD / 07XX</b>	36	4,450	.38	.75	6
	<b>DD-2512-HD / 05XX</b>	36	2,000	4.1	.5	3
	<b>DD-2524-HD / 05XX</b>	18	4,450	.38	.5	3
	<b>DD-2524-HD / 03XX</b>	18	1,500	9.9	.33	3
Acme Screw	<b>DD-256-A2 / 15XX</b>	144	1,725	—	1.5	6
	<b>DD-256-A4 / 15XX</b>	72	2,280	—	1.5	6
	<b>DD-2512-A4 / 07XX</b>	36	1,900	—	.75	6
	<b>DD-2512-A4 / 10XX</b>	36	2,500	—	1	6
	<b>DD-2524-A4 / 05XX</b>	18	1,880	—	.5	3

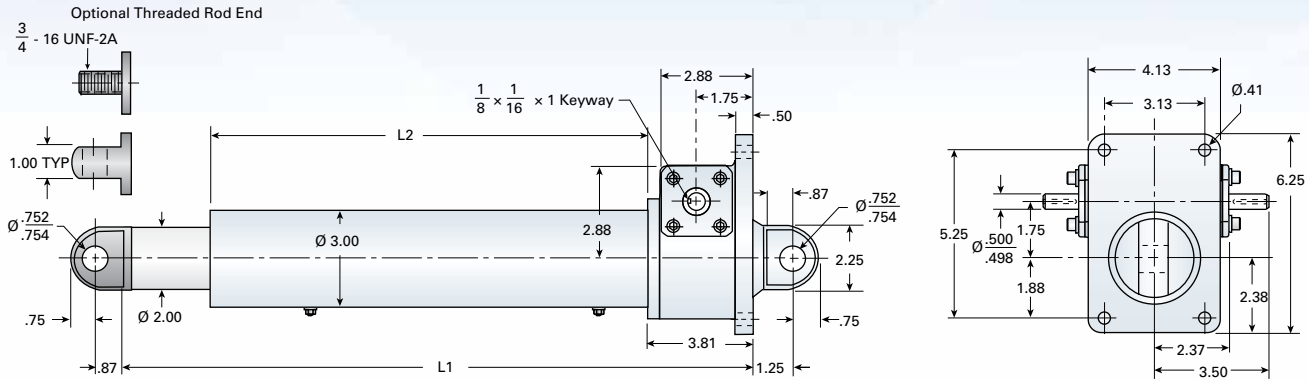
For "XX," see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

### LIFE EXPECTANCY



### COLUMN LOAD





Approx Stopping Distance (In)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.26	.44	159	33	12.44	7.13
.43	.74	318	33	12.44	7.13
.25	.35	265	33	12.44	7.13
.25	.43	159	33	12.44	7.13
.21	.42	318	33	12.44	7.13
.12	.21	159	33	12.44	7.13
.06	.09	89	33	12.44	7.13
.03	.04	197	33	12.44	7.13
.04	.06	89	33	12.44	7.13
.02	.03	197	33	12.44	7.13
.02	.02	66	33	12.44	7.13
.30	—	240	30	10.38	4.75
.15	—	239	30	10.38	4.75
.06	—	197	30	10.38	4.75
.06	—	263	30	10.38	4.75
.02	—	197	30	10.38	4.75

NEMA FRAME SIZE	ØE (in)	ØF (in)	L3 (in)	HP
<b>56C</b>	6.62	3.5	6.25	1/4 - 2

Servo or stepper motors are available.  
Custom motor / gearbox adapters are also available.

\* Ball Screw Models: Total Weight = (1.49 lb) × Travel + Basic Weight  
\* Acme Screw Models: Total Weight = (1.49 lb) × Travel + Basic Weight  
\*\* Total Length = Basic length + (Travel × 1.25)

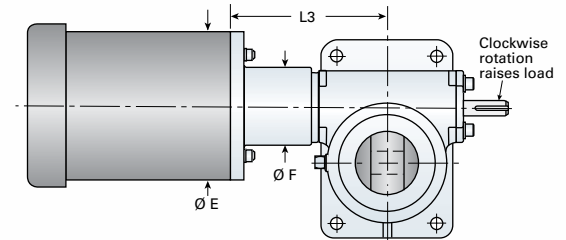
Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1 - it may be mounted to either side of the cylinder (see page 70).

For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.



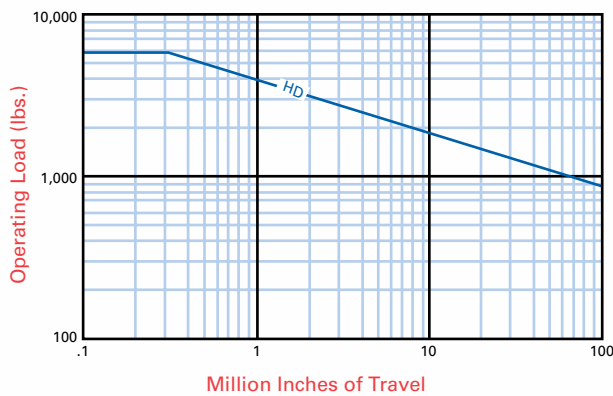
# SERIES DD-30



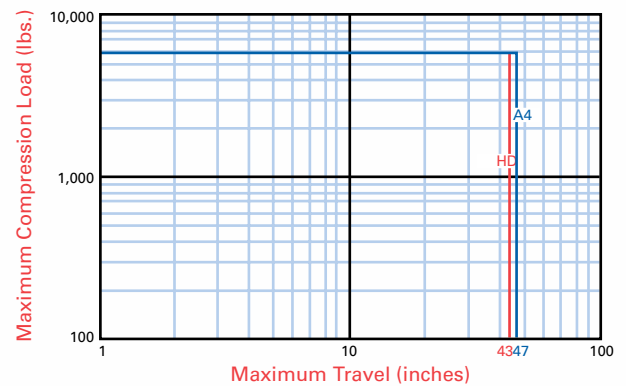
	MODEL NUMBER	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in × 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	DD-306-HD / 15XX	120	3,275	1.68	1.5	6
	DD-3012-HD / 10XX	60	3,600	1.26	1.0	6
	DD-3012-HD / 07XX	60	2,500	3.78	.75	6
	DD-3024-HD / 05XX	30	2,700	3.00	.5	3
Acme Screw	DD-306-A4 / 15XX	72	2,100	—	1.5	6
	DD-3012-A4 / 10XX	36	2,200	—	1	6
	DD-3024-A4 / 05XX	18	1,200	—	.5	3

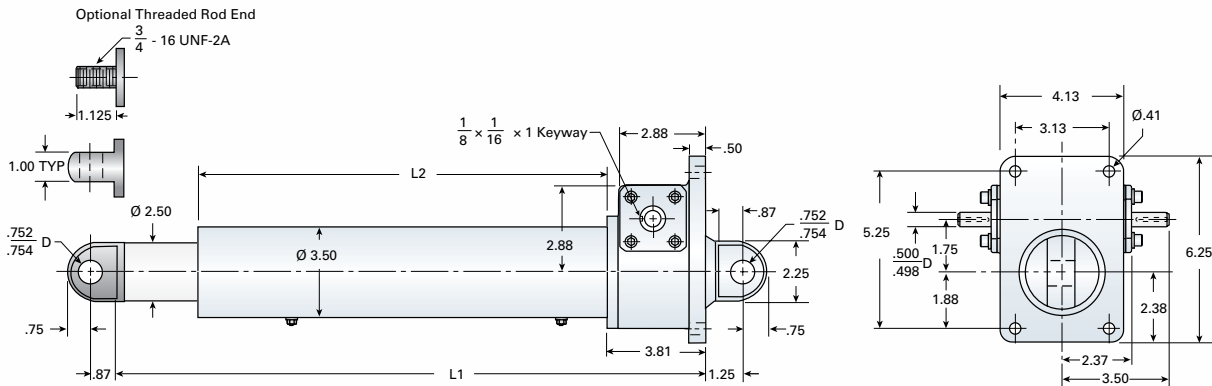
For "XX", see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

## LIFE EXPECTANCY



## COLUMN LOAD





Approx Stopping Distance (In)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.25	.83	239	38	12.44	7.31
.10	.16	263	38	12.44	7.31
.05	.07	183	38	12.44	7.31
.03	.05	197	38	12.44	7.31
.15	—	240	33	10.50	5.13
.06	—	263	33	10.50	5.13
.02	—	140	33	10.50	5.13

NEMA FRAME SIZE	ØE (in)	ØF (in)	L3 (in)	HP
56C	6.62	3.50	6.25	1/4 - 2

Servo or stepper motors are available.

Custom motor / gearbox adapters are also available.

\* Ball Screw Models: Total Weight = (1.91 lb) × Travel + Basic Weight  
 \* Acme Screw Models: Total Weight = (1.95 lb) × Travel + Basic Weight

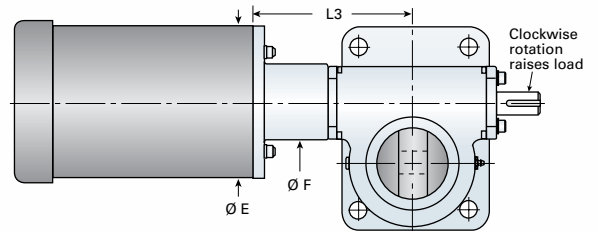
\*\* Total Length = Basic length + (Travel × 1.25)

Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1 - it may be mounted to either side of the cylinder (see page 70).

For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.

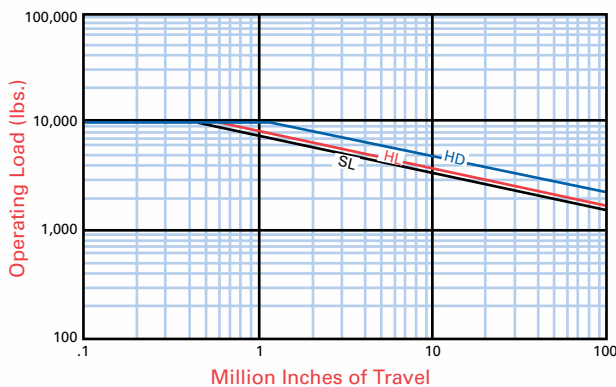
# SERIES DD-50



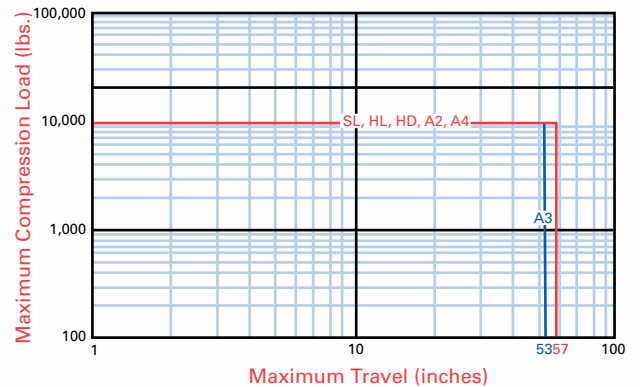
	<b>MODEL NUMBER</b>	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in × 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	<b>DD-506-SL / 20XX</b>	539	950	110	2	10
	<b>DD-506-HL / 20XX</b>	288	2,000	73	2	10
	<b>DD-506-HL / 30XX</b>	288	2,500	21	3	15
	<b>DD-506-HD / 20XX</b>	136	3,500	18	2	10
	<b>DD-506-HD / 30XX</b>	136	5,750	5.4	3	15
	<b>DD-5024-HD / 07XX</b>	34	3,000	19	0.75	6
Acme Screw	<b>DD-506-A2 / 20XX</b>	144	1,900	—	2	10
	<b>DD-506-A3 / 10XX</b>	108	1,000	—	1	6
	<b>DD-506-A3 / 20XX</b>	108	2,200	—	2	10
	<b>DD-506-A3 / 30XX</b>	108	2,900	—	3	15
	<b>DD-508-A4 / 20XX</b>	54	3,000	—	2	15
	<b>DD-5024-A3 / 07XX</b>	27	1,900	—	.75	6

For "XX", see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

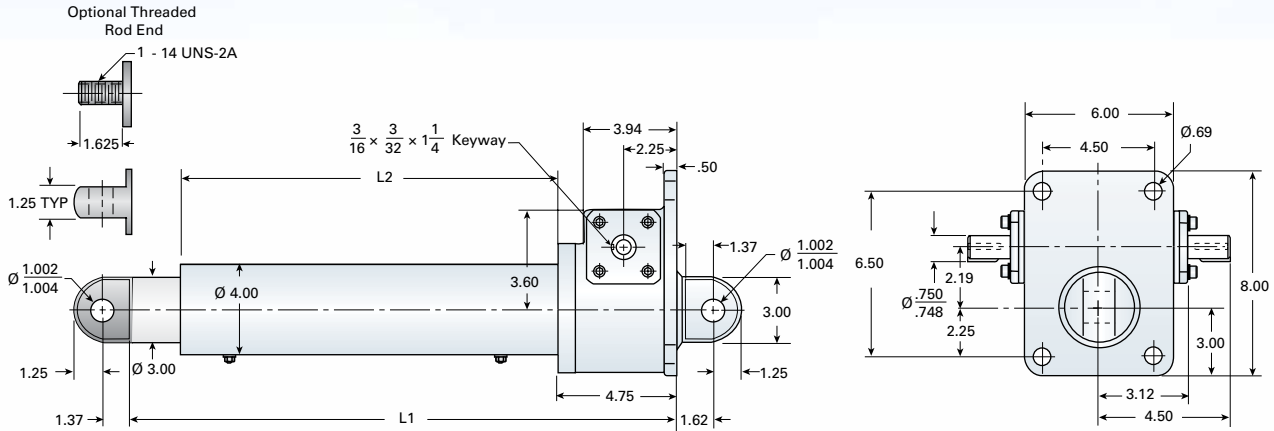
### LIFE EXPECTANCY



### COLUMN LOAD







Approx Stopping Distance (In)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.8	1.7	1.7	63	15.33	8.88
.43	1.07	1.07	63	15.33	8.88
.74	1.48	1.48	63	15.33	8.88
.20	.46	.46	63	15.33	8.88
.35	.66	.66	63	15.33	8.88
.03	.04	.04	63	15.33	8.88
.21	—	476	53	12.38	6.06
.19	—	143	53	12.38	6.06
.16	—	288	53	12.38	6.06
.28	—	432	53	12.38	6.06
.08	—	455	53	12.38	6.06
.02	—	285	53	12.38	6.06

NEMA FRAME SIZE	ØE (in)	ØF (in)	L3 (in)	HP
<b>56C</b>	6.75	3.75	7.25	3/4 - 2
<b>182TC</b>	9.25	3.75	8.00	3

Servo or stepper motors are available.

Custom motor / gearbox adapters are also available.

\* Ball Screw Models: Total Weight = (2.28 Lb) × Travel + Basic Weight

\* Acme Screw Models: Total Weight = (2.28 Lb) × Travel + Basic Weight

\*\* Total Length = Basic length + (Travel × 1.25)

Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1 - it may be mounted to either side of the cylinder (see page 70).

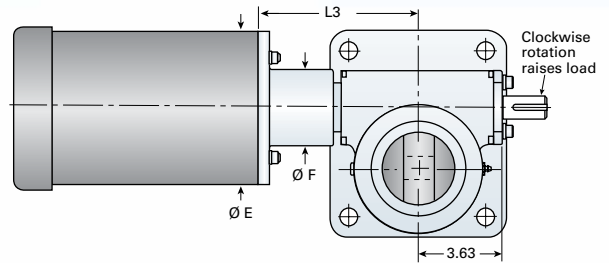
For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.



[nookindustries.com](http://nookindustries.com)

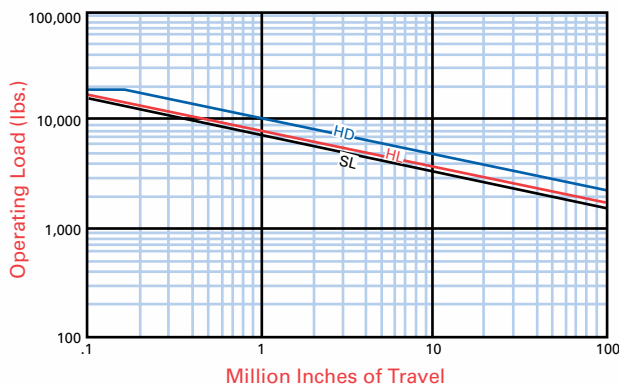
# SERIES DD-100



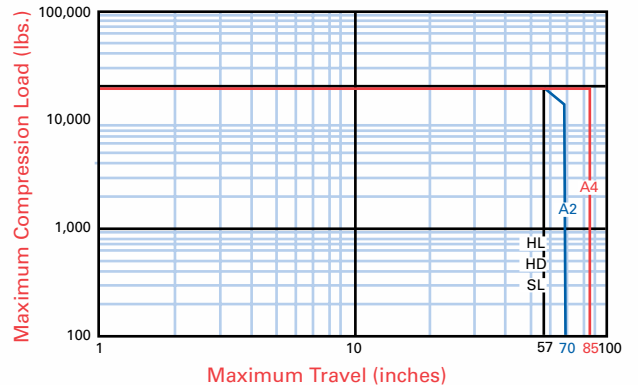
	MODEL NUMBER	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in × 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	<b>DD-1008-SL / 20XX</b>	404	1,150	240	2	10
	<b>DD-1008-HL / 20XX</b>	216	2,175	42	2	10
	<b>DD-1008-HL / 50XX</b>	216	5,400	2.7	5	15
	<b>DD-1008-HD / 20XX</b>	102	4,600	10.4	2	10
	<b>DD-1008-HD / 30XX</b>	102	7,500	2.4	3	15
	<b>DD-1008-HD / 50XX</b>	102	12,000	.59	5	15
	<b>DD-10024-HL / 15XX</b>	72	2,700	22	1.5	6
	<b>DD-10024-HD / 15XX</b>	34	7,150	2.8	1.5	6
Acme Screw	<b>DD-1008-A2 / 20XX</b>	108	2,000	—	2	10
	<b>DD-1008-A2 / 30XX</b>	108	3,000	—	3	15
	<b>DD-1008-A2 / 50XX</b>	108	4,500	—	5	15
	<b>DD-1008-A4 / 20XX</b>	54	2,000	—	2	10
	<b>DD-10024-A2 / 15XX</b>	36	2,000	—	1.5	6

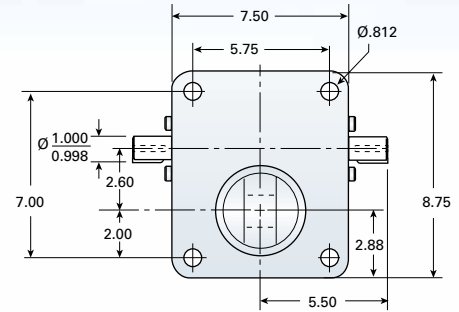
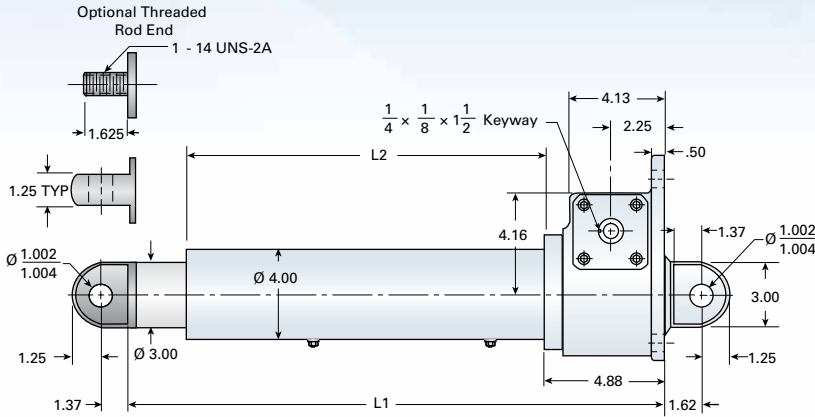
For "XX", see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

## LIFE EXPECTANCY



## COLUMN LOAD





Approx Stopping Distance (In)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.6	.9	385	80	15.25	8.88
.3	.5	385	80	15.25	8.88
.7	1.3	956	80	15.25	8.88
.2	.2	385	80	15.25	8.88
.3	.4	628	80	15.25	8.88
.3	.7	1005	80	15.25	8.88
.15	.16	478	80	15.25	8.88
.07	.09	598	80	15.25	8.88
.6	—	398	77	12.88	6.50
.3	—	597	77	12.88	6.50
.7	—	896	77	12.88	6.50
.2	—	362	77	12.88	6.50
.3	—	398	77	12.88	6.50

NEMA FRAME SIZE	ØE (in)	ØF (in)	L3 (in)	HP
<b>56C</b>	6.75	4.38	8.25	1 - 2
<b>184TC</b>	9.25	4.38	9.00	3 - 5

Servo or stepper motors are available.

Custom motor / gearbox adapters are also available.

\* Ball Screw Models: Total Weight = (2.28 lb) × Travel + Basic Weight  
 \* Acme Screw Models: Total Weight = (2.68 lb) × Travel + Basic Weight

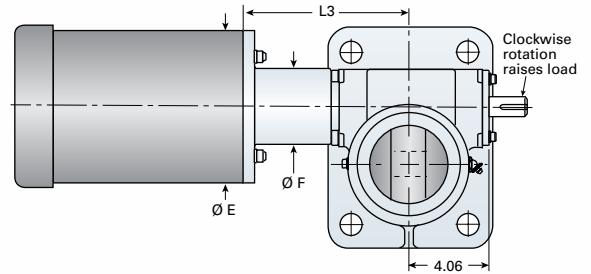
\*\* Total Length = Basic length + (T × 1.25)

Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1 - it may be mounted to either side of the cylinder (see page 70).

For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.

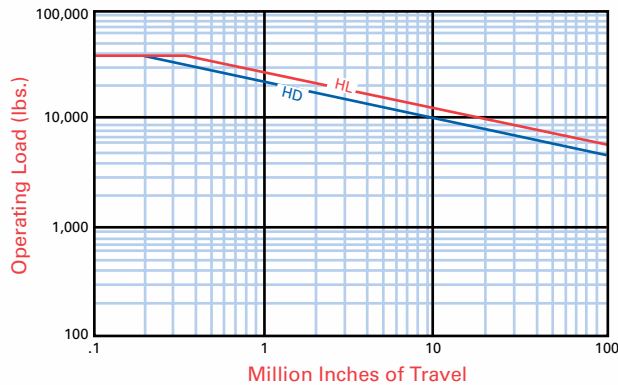
# SERIES DD-200



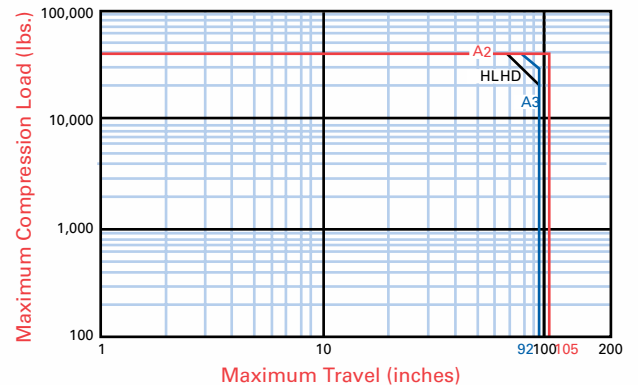
	MODEL NUMBER	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in × 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	DD-2008-HL / 75XX	216	8,000	36	7.5	25
	DD-2008-HD / 75XX	108	16,600	2.1	7.5	25
	DD-2008-HD / 50XX	108	11,000	7.3	5	15
	DD-20024-HL / 20XX	72	4,000	292	2	10
	DD-20024-HD / 20XX	36	7,000	28	2	10
	DD-20024-HD / 30XX	36	10,000	9.7	3	15
Acme Screw	DD-2008-A2 / 70XX	108	4,250	—	7.5	15
	DD-2008-A3 / 70XX	72	4,620	—	7.5	15
	DD-20024-A2 / 20XX	36	2,500	—	2	10
	DD-20024-A2 / 30XX	36	3,500	—	3	15

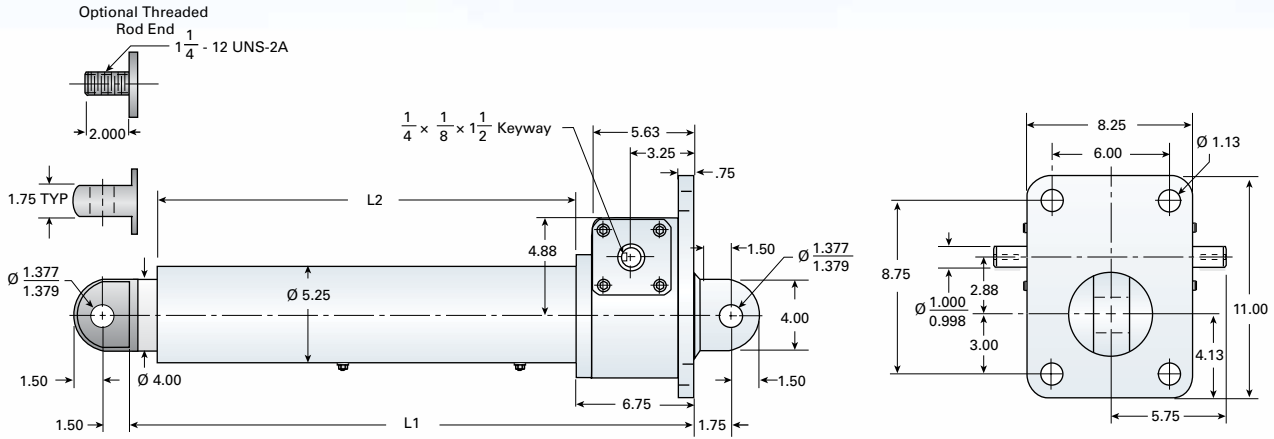
For "XX," see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

## LIFE EXPECTANCY



## COLUMN LOAD





Approx Stopping Distance (In)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.4	.6	1,416	154	21.13	12.63
.2	.3	1,469	154	21.13	12.63
.4	.7	979	154	21.13	12.63
.1	.1	708	154	21.13	12.63
.1	.1	620	154	21.13	12.63
.1	.1	885	154	21.13	12.63
.4	—	995	138	17.44	9.94
.24	—	979	138	17.44	9.94
.05	—	585	138	17.44	9.94
.09	—	819	138	17.44	9.94

NEMA FRAME SIZE	ØE (in)	ØF (in)	L3 (in)	HP
56C	6.75	5.19	8.65	2
184TC	9.25	5.19	9.00	3 - 5
213TC	9.25	5.69	9.65	7.5

Servo or stepper motors are available.

Custom motor / gearbox adapters are also available.

\* Ball Screw Models: Total Weight = (3.36 lb) × Travel + Basic Weight

\* Acme Screw Models: Total Weight = (3.65 lb) × Travel + Basic Weight

\*\* Total Length = Basic length + Travel × 1.25

Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1 - it may be mounted to either side of the cylinder (see page 70).

For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

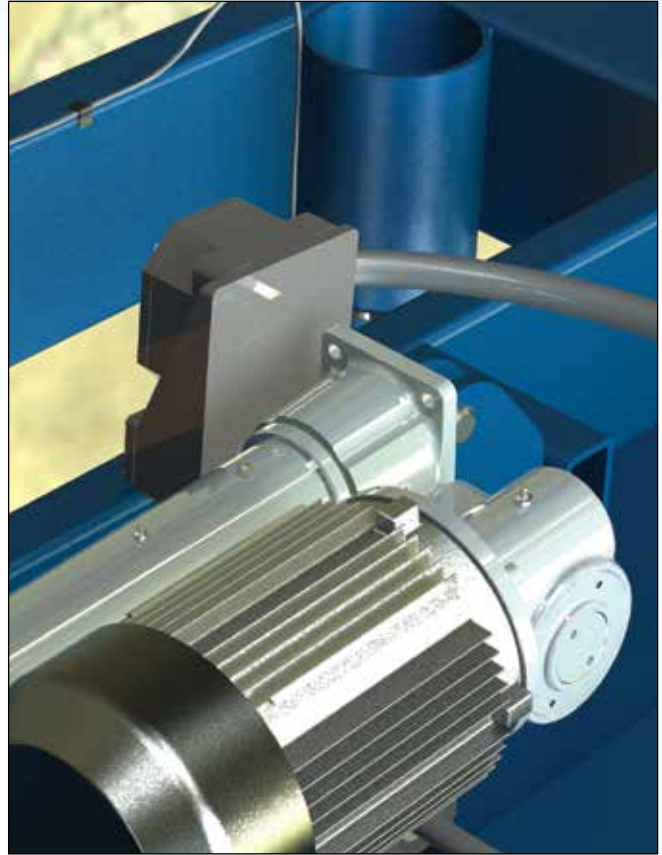
**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.



## **RAD ELECTRIC CYLINDERS**

RAD Electric Cylinders incorporate the same benefits as DD Electric Cylinders, including the rugged design and capacities from 3,500 lbs. to 40,000 lbs. RAD Electric Cylinders include a second reduction giving a reduced input torque and lower travel rate. RAD Electric Cylinders also feature ground and hard chrome plated actuator tubes. The exterior surfaces feature industrial enamel paint. Epoxy paint is available on request.

These cylinders may be used individually or in multiple arrangements with DD Electric Cylinders. Each Electric Cylinder is built to specification. For outdoor application of RAD Electric Cylinders, contact Nook Engineering for recommended alterations.



Nook Electric Cylinders used in as the brake mechanism in an overhead crane.





**RAD ELECTRIC CYLINDERS .....54-57**  
Design Data ..... 54-55  
Quick Reference ..... 56  
Reference Number System ..... 57

**RAD ELECTRIC CYLINDERS**  
**TECHNICAL DATA .....58-67**  
Series RAD-25..... 58-59  
Series RAD-30..... 60-61  
Series RAD-50..... 62-63  
Series RAD-100..... 64-65  
Series RAD-200..... 66-67

## RAD DESIGN DATA

### BALL SCREW MODELS

	MODEL NUMBER	PRIMARY GEAR RATIO	SECONDARY GEAR RATIO	SCREW SIZE	TURNS OF WORM PER INCH OF TRAVEL	TORQUE TO RAISE 1 LB (IN-LB)*	MAX LOAD (LB)	MAX INPUT (HP)**
<b>25 SERIES</b>	<b>RAD - 2566 - HL</b>	6:1	6:1	1000-1000 SRT RA	36	0.0102	5,000	1
	<b>RAD - 2562 - HL</b>	6:1	12:1	1000-1000 SRT RA	72	0.0037	5,000	1
	<b>RAD - 2566 - ML</b>	6:1	6:1	1000-0500 SRT RA	72	0.0057	5,000	.5
	<b>RAD - 2566 - HD</b>	6:1	6:1	1000-0250 SRT RA	144	0.0026	5,000	.5
	<b>RAD - 2562 - HD</b>	6:1	12:1	1000-0250 SRT RA	288	0.0015	5,000	.33
	<b>RAD - 2522 - HD</b>	12:1	12:1	1000-0250 SRT RA	576	0.0009	5,000	.33
	<b>RAD - 2546 - HD</b>	24:1	6:1	1000-0250 SRT RA	576	0.0010	5,000	.33
<b>30 SERIES</b>	<b>RAD - 3066 - HD</b>	6:1	6:1	1171-0413 SRT RA	87.18	0.0041	6,000	.5
	<b>RAD - 3062 - HD</b>	6:1	12:1	1171-0413 SRT RA	174.36	0.0026	6,000	.33
	<b>RAD - 3022 - HD</b>	12:1	12:1	1171-0413 SRT RA	348.2	0.0026	6,000	.25
	<b>RAD - 3046 - HD</b>	24:1	6:1	1171-0413 SRT RA	348.96	0.0018	6,000	.25
<b>50 SERIES</b>	<b>RAD - 5066 - HL</b>	6:1	6:1	1500-1000 SRT RA	36	0.0098	10,000	1
	<b>RAD - 5046 - HL</b>	24:1	6:1	1500-1000 SRT RA	144	0.0039	10,000	1
	<b>RAD - 5066 - HD</b>	6:1	6:1	1500-0473 SRT RA	76	0.0046	10,000	1
	<b>RAD - 5062 - HD</b>	6:1	12:1	1500-0473 SRT RA	152	0.0028	10,000	1
	<b>RAD - 5046 - HD</b>	24:1	6:1	1500-0473 SRT RA	304	0.0019	10,000	1
<b>100 SERIES</b>	<b>RAD - 10086 - HL</b>	8:1	6:1	1500-1000 SRT RA	48	0.0081	20,000	1
	<b>RAD - 10046 - HL</b>	24:1	6:1	1500-1000 SRT RA	144	0.0041	20,000	1
	<b>RAD - 10086 - HD</b>	8:1	6:1	1500-0473 SRT RA	101.28	0.0038	20,000	1
	<b>RAD - 10082 - HD</b>	8:1	12:1	1500-0473 SRT RA	202.58	0.0023	20,000	1
	<b>RAD - 10046 - HD</b>	24:1	6:1	1500-0473 SRT RA	303.96	0.0020	20,000	1
<b>200 SERIES</b>	<b>RAD - 20088 - HL</b>	8:1	8:1	2250-1000 SRT RA	64	0.0062	40,000	5
	<b>RAD - 20048 - HL</b>	24:1	8:1	2250-1000 SRT RA	192	0.0031	40,000	3
	<b>RAD - 20088 - HD</b>	8:1	8:1	2250-0500 SRT RA	128	0.0031	40,000	3
	<b>RAD - 20048 - HD</b>	24:1	8:1	2250-0500 SRT RA	384	0.0016	40,000	2

\* At motor input

\*\* Based on 35% Duty Cycle. Refer to page 12 for horsepower rating definitions.

**RAD DESIGN DATA**  
**ACME SCREW MODELS**

	MODEL NUMBER	PRIMARY GEAR RATIO	SECONDARY GEAR RATIO	SCREW SIZE	TURNS OF WORM PER INCH OF TRAVEL	TORQUE TO RAISE 1 LB (IN-LB)*	MAX LOAD (LB)	MAX INPUT (HP)**
<b>25 SERIES</b>	<b>RAD - 2566 - A4</b>	6:1	6:1	1"-4 RA	144	0.0064	5,000	1
	<b>RAD - 2562 - A4</b>	6:1	12:1	1"-4 RA	288	0.0039	5,000	.75
	<b>RAD - 2522 - A4</b>	12:1	12:1	1"-4 RA	576	0.0023	5,000	.5
	<b>RAD - 2546 - A4</b>	24:1	6:1	1"-4 RA	576	0.0027	5,000	.33
<b>30 SERIES</b>	<b>RAD - 3066 - A4</b>	6:1	6:1	1¼"-4 RA	144	0.0071	6,000	1
	<b>RAD - 3062 - A4</b>	6:1	12:1	1¼"-4 RA	288	0.0043	6,000	.75
	<b>RAD - 3022 - A4</b>	12:1	12:1	1¼"-4 RA	576	0.0025	6,000	.5
	<b>RAD - 3046 - A4</b>	24:1	6:1	1¼"-4 RA	576	0.0030	6,000	.5
<b>50 SERIES</b>	<b>RAD - 5066 - A3</b>	6:1	6:1	1½"-2 ⅔ RA	96	0.0096	10,000	1
	<b>RAD - 5062 - A3</b>	6:1	12:1	1½"-2 ⅔ RA	192	0.0058	10,000	1
	<b>RAD - 5046 - A3</b>	24:1	6:1	1½"-2 ⅔ RA	384	0.0037	10,000	1
<b>100 SERIES</b>	<b>RAD - 10086 - A2</b>	8:1	6:1	2"-2 RA	96	0.0096	20,000	1
	<b>RAD - 10082 - A2</b>	12:1	12:1	2"-2 RA	192	0.0058	20,000	1
	<b>RAD - 10046 - A2</b>	24:1	6:1	2"-2 RA	288	0.0049	20,000	1
<b>200 SERIES</b>	<b>RAD - 20088 - A2</b>	8:1	8:1	2½"-2 RA	128	0.0086	40,000	.75
	<b>RAD - 20048 - A2</b>	24:1	8:1	2½"-2 RA	384	0.0043	40,000	3
	<b>RAD - 20088 - A3</b>	8:1	8:1	2½"-3 RA	192	0.0078	40,000	.75
	<b>RAD - 20048 - A3</b>	24:1	8:1	2½"-3 RA	576	0.0039	40,000	3

\* At motor input

\*\* Based on 35% Duty Cycle. Refer to page 12 for horsepower rating definitions.

## QUICK REFERENCE

### RAD MODEL STANDARD WITH MOTORS

#### BALL SCREW CYLINDERS

MODEL NUMBER	DYNAMIC CAPACITY (LBF)	TRAVEL RATE (IN./MIN)
RAD-2566-HL / 10XX	3,550	48
RAD-5066-HL / 10XX	4,000	48
RAD-10086-HL / 10XX	4,275	36
RAD-3066-HD / 05XX	4,775	20
RAD-2546-HD / 02XX	5,000	3
RAD-2562-HD / 03XX	5,000	6
RAD-5066-HD / 10XX	5,000	23
RAD-2566-ML / 05XX	5,000	24
RAD-2562-HL / 10XX	5,000	24
RAD-3062-HD / 03XX	5,250	10
RAD-3022-HD / 02XX	6,000	5
RAD-5046-HL / 10XX	8,000	12
RAD-5046-HD / 10XX	9,000	6
RAD-5062-HD / 10XX	9,000	11
RAD-10046-HL / 10XX	9,750	12
RAD-10086-HD / 10XX	10,000	17
RAD-10082-HD / 10XX	15,000	9
RAD-10046-HD / 10XX	18,750	6
RAD-20088-HL / 50XX	30,000	27
RAD-20048-HL / 30XX	35,000	9
RAD-20088-HD / 30XX	35,000	13.5
RAD-20048-HD / 20XX	40,000	4.5

XX = motor specification, see page 72

#### ACME SCREW CYLINDERS

MODEL NUMBER	DYNAMIC CAPACITY (LBF)	TRAVEL RATE (IN./MIN)
RAD-5066-A3 / 10XX	2,700	18
RAD-10086-A2 / 10XX	3,800	18
RAD-5062-A3 / 10XX	4,500	9
RAD-3062-A4 / 07XX	4,925	6
RAD-2546-A4 / 05XX	5,000	3
RAD-2562-A4 / 05XX	5,000	6
RAD-2566-A4 / 07XX	5,000	12
RAD-3022-A4 / 05XX	6,000	3
RAD-3066-A4 / 10XX	6,000	12
RAD-10082-A2 / 10XX	6,275	9
RAD-5046-A3 / 10XX	7,200	4.5
RAD-10046-A2 / 10XX	7,800	6
RAD-20048-A2 / 30XX	12,500	4.5
RAD-20088-A3 / 50XX	22,250	9
RAD-20088-A2 / 75XX	31,000	13.5

**REFERENCE NUMBER SYSTEM**  
**RAD ELECTRIC CYLINDERS**

**RAD-2512-HL / 10BT-1 / 2CA-4C / CC / 24.5 / ERS**

**SERIES RAD MODEL**

Refer to pages 54 to 55 for available models.

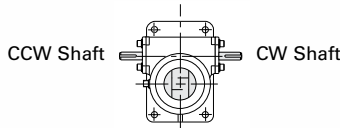
**SHAFT ORDER CODE**

**10BT - 1**

CCW Position 1, 3, 5, 7  
CW Position 2, 4, 6, 8

**ORDER CODES (Must Include a Position)**

**NOTE:** Both Shaft Extensions Must Be Specified.



**NO ACCESSORY**

SSE- = Standard Shaft Extension, Position 1 or 2  
000- = Delete Shaft Extension, Position 1 or 2  
SPC- = Special Modified Shaft Extension, Position 1 or 2

**Motor Mounts Without Motor**

Position 1 through 8  
See page 71 for standard motor mount order codes.

**Motor Mounts With Motors**

Position 1 through 8  
See page 71 - 72 for available motors.

**Rotary Limit Switch**

Position 1 C or E through 8 C or E  
See page 74 - 75 for available rotary limit switches.

**NOTE:** A Limit Switch must specify a close or extended mounting.

**Compact Limit Switch**

Position 1 through 8  
See page 76 - 77 for available compact limit switches.

**HOUSING CONFIGURATION**

F = Standard Flange Base  
C = Clevis Base

**SCREW CONFIGURATION**

T = Threaded End  
C = Clevis End  
D = Threaded rod end with female clevis installed  
P = Top Plate

**TRAVEL**

Travel in inches.

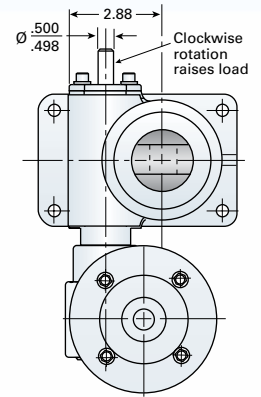
**MODIFIER LIST**

E, B, and/or R  
E = In-Line Encoder (See p. 73)  
B = Bellows Boots (See p. 85)  
R = Rod Type Limit Switch (See p. 78)

Optional S or M Required  
S = Standard, no additional description required  
M = Modified, additional description required

**NOTE:** NOT ALL OPTIONS AVAILABLE FOR ALL SIZES

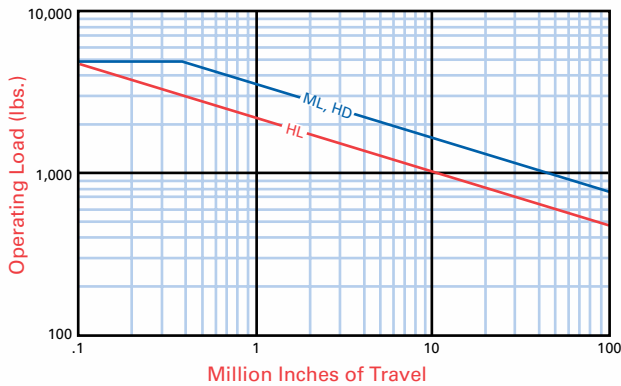
# SERIES RAD-25



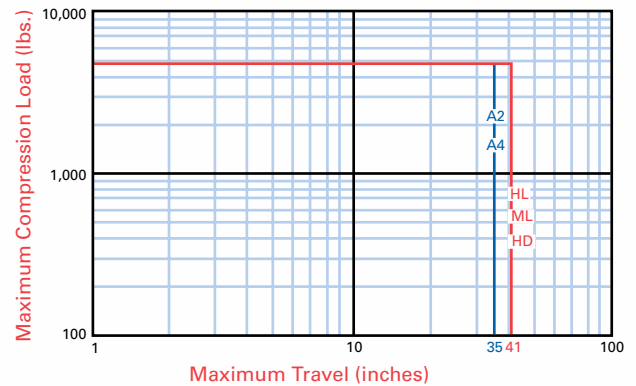
	MODEL NUMBER	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in x 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	<b>RAD-2566-HL / 10XX</b>	48	3,550	.22	1	6
	<b>RAD-2562-HL / 10XX</b>	24	5,000	.08	1	6
	<b>RAD-2566-ML / 05XX</b>	24	3,400	.33	.5	3
	<b>RAD-2562-HD / 03XX</b>	6	5,000	.27	.33	3
	<b>RAD-2546-HD / 03XX</b>	3	5,000	.27	.25	3
Acme Screw	<b>RAD-2566-A4 / 07XX</b>	12	5,000	—	.75	6
	<b>RAD-2562-A4 / 05XX</b>	6	5,000	—	.5	3
	<b>RAD-2546-A4 / 03XX</b>	3	5,000	—	.33	3

For "XX", see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

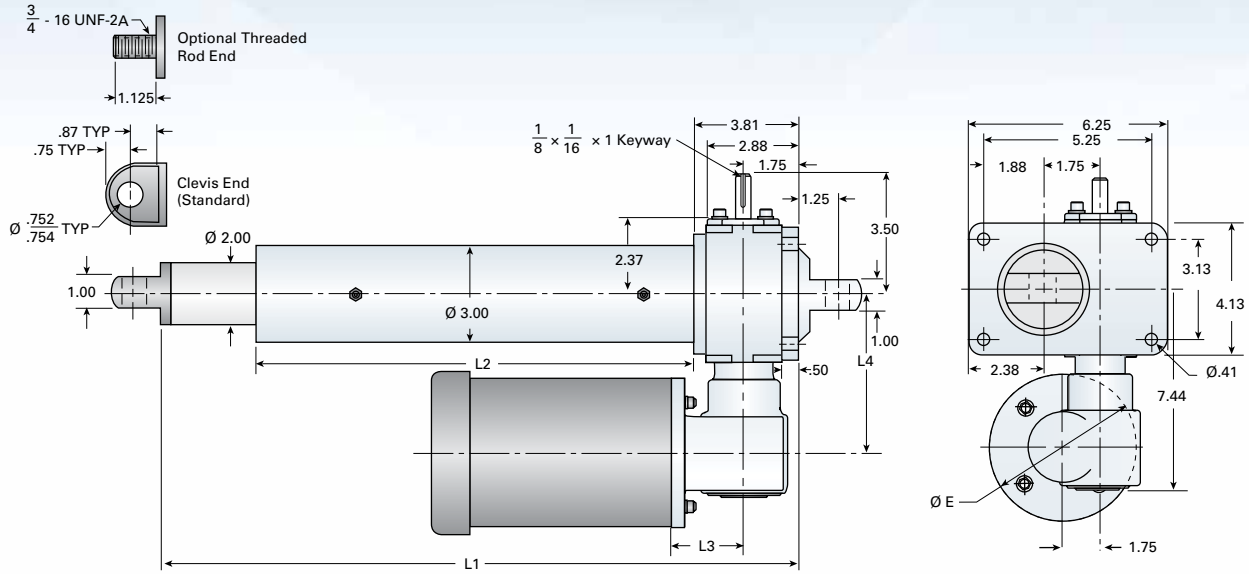
### LIFE EXPECTANCY



### COLUMN LOAD







Approx Stopping Distance (in)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.08	.08	628	46	12.44	7.13
.04	.04	885	46	12.44	7.13
.014	.014	443	46	12.44	7.13
.007	.007	221	46	12.44	7.13
.003	.003	221	46	12.44	7.13
.02	—	525	44	10.38	4.75
.005	—	525	44	10.38	4.75
.004	—	525	44	10.38	4.75

NEMA FRAME SIZE	L3 (in)	L4 (in)	ØE (in)
56C	3.69	5.63	6.69

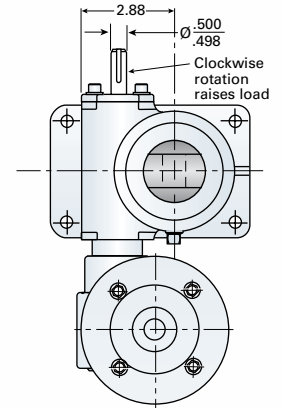
\* Ball Screw Models: Total Weight = (1.49 lb) × Travel + Basic Weight  
 \* Acme Screw Models: Total Weight = (1.49 lb) × Travel + Basic Weight,  
 \*\* Total Length = Basic length + (Travel × 1.25)

Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1; eight different positions are available (see page 71).

For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.

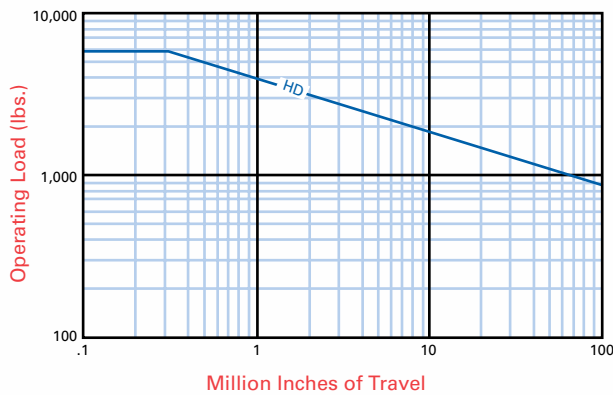
# SERIES RAD-30



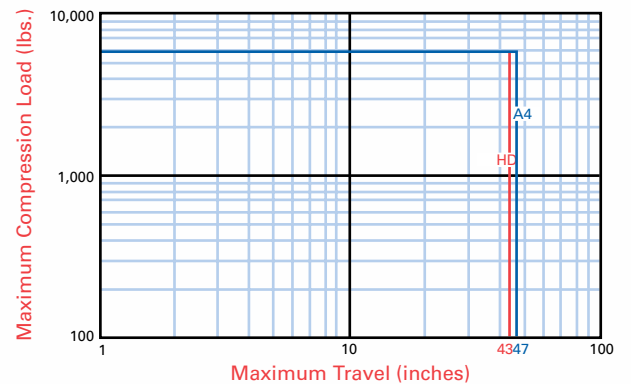
	<b>MODEL NUMBER</b>	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in × 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	<b>RAD-3066-HD / 05XX</b>	20	4,775	.54	.5	3
	<b>RAD-3062-HD / 03XX</b>	10	5,250	.40	.33	3
	<b>RAD-3022-HD / 03XX</b>	5	6,000	.27	.33	3
Acme Screw	<b>RAD-3066-A4 / 10XX</b>	12	6,000	—	1	6
	<b>RAD-3062-A4 / 07XX</b>	6	4,925	—	.75	3
	<b>RAD-3022-A4 / 05XX</b>	3	6,000	—	.5	3

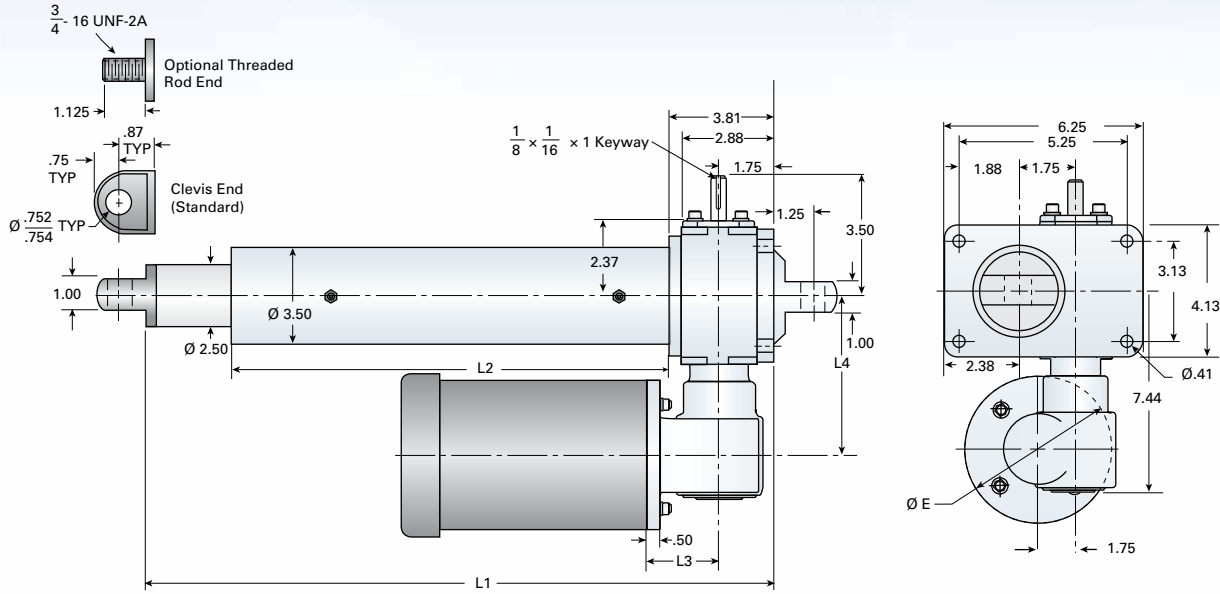
For "XX", see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

## LIFE EXPECTANCY



## COLUMN LOAD





Approx Stopping Distance (in)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.02	.02	349	51	12.44	7.31
.012	.012	383	51	12.44	7.31
.006	.006	439	51	12.44	7.31
.02	—	702	47	10.50	5.13
.005	—	575	47	10.50	5.13
.004	—	702	47	10.50	5.13

NEMA FRAME SIZE	L3 (in)	L4 (in)	ØE (in)
<b>56C</b>	3.69	5.63	6.69

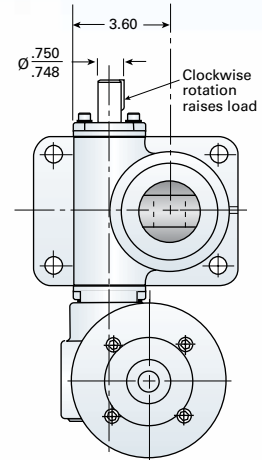
\* Ball Screw Models: Total Weight = (1.91 lb) × Travel + Basic Weight  
 \* Acme Screw Models: Total Weight = (1.95 lb) × Travel + Basic Weight  
 \*\* Total Length = Basic length + (Travel × 1.25)

Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1; eight different positions are available (see page 71).

For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.

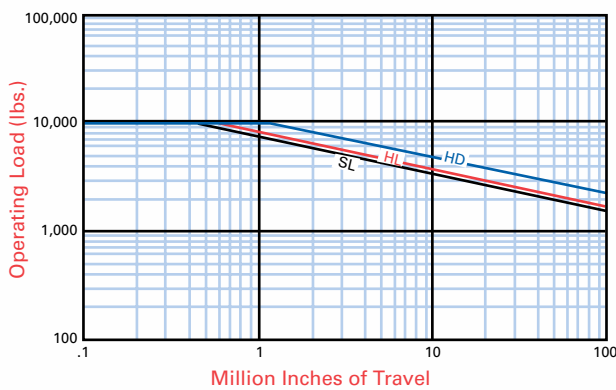
# SERIES RAD-50



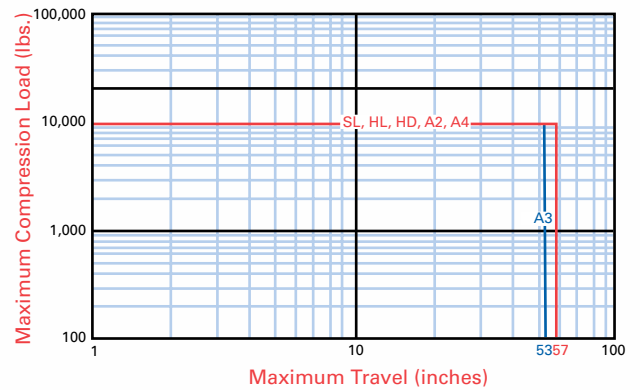
	<b>MODEL NUMBER</b>	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in × 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	<b>RAD-5066-HL / 10XX</b>	48	3,500	22	1	6
	<b>RAD-5066-HD / 10XX</b>	23	7,500	5.6	1	6
	<b>RAD-5046-HL / 10XX</b>	12	8,000	1.5	1	6
	<b>RAD-5062-HD / 10XX</b>	11	10,000	1.4	1	6
	<b>RAD-5046-HD / 10XX</b>	6	10,000	1.4	1	6
Acme Screw	<b>RAD-5066-A3 / 10XX</b>	18	4,500	—	1	6
	<b>RAD-5062-A3 / 10XX</b>	9	5,000	—	1	6
	<b>RAD-5046-A3 / 10XX</b>	4.5	10,000	—	1	6

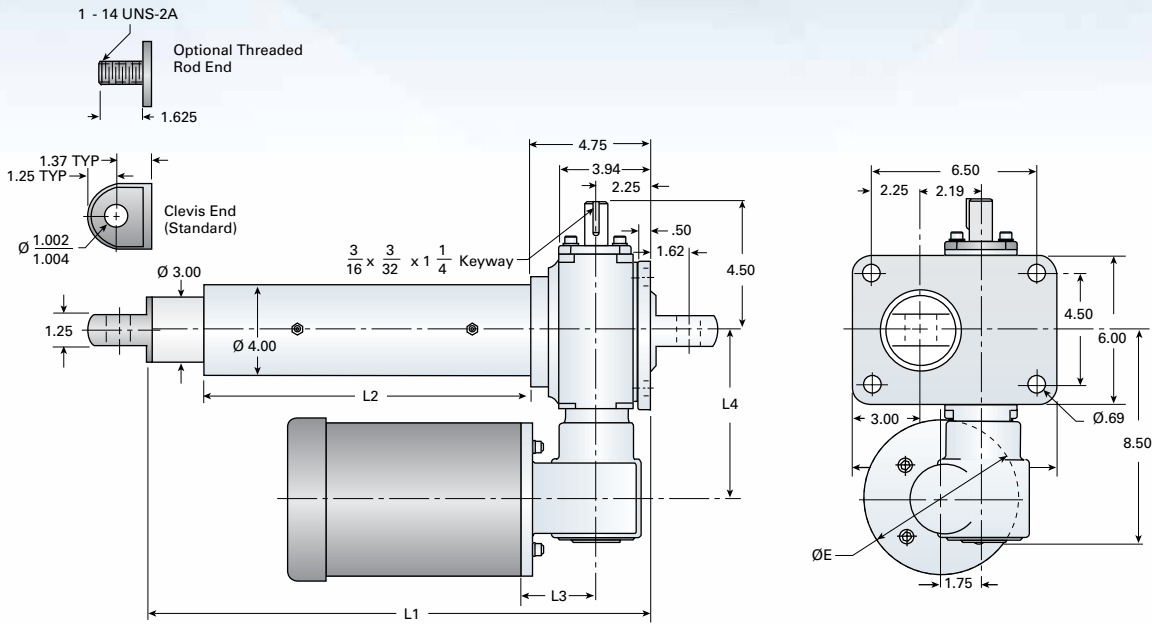
For "XX", see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

## LIFE EXPECTANCY



## COLUMN LOAD





Approx Stopping Distance (in)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.08	.08	478	77	15.13	8.88
.04	.04	475	77	15.13	8.88
.02	.02	1,179	77	15.13	8.88
.02	.02	754	77	15.13	8.88
.02	.01	754	77	15.13	8.88
.03	—	402	66	12.98	6.06
.02	—	670	66	12.98	6.06
.01	—	1,073	66	12.98	6.06

NEMA FRAME SIZE	L3 (in)	L4 (in)	ØE (in)
56C	3.69	6.50	6.69

\* Ball Screw Models: Total Weight = (2.28 lb) × Travel + Basic Weight

\* Acme Screw Models: Total Weight = (2.28 lb) × Travel + Basic Weight

\*\* Total Length = Basic length + (Travel × 1.25)

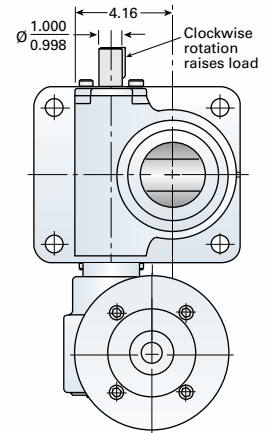
Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1; eight different positions are available (see page 71).

For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.



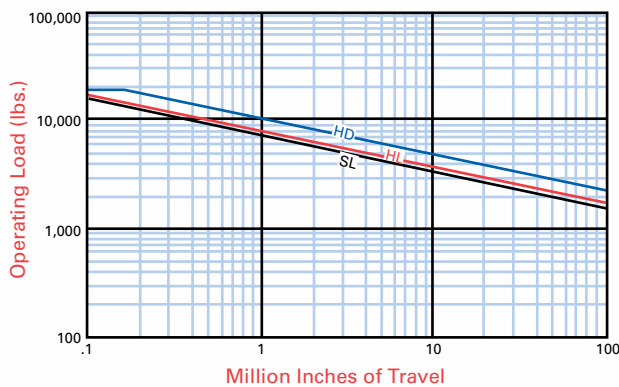
# SERIES RAD-100



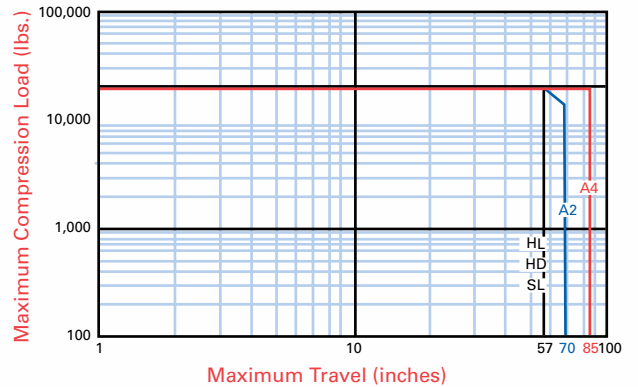
	MODEL NUMBER	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in × 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	<b>RAD-10086-HL / 10XX</b>	36	4,275	5.5	1	6
	<b>RAD-10086-HD / 10XX</b>	17	9,000	1.0	1	6
	<b>RAD-10046-HL / 10XX</b>	12	9,750	.47	1	6
	<b>RAD-10082-HD / 10XX</b>	9	15,000	.3	1	6
	<b>RAD-10046-HD / 10XX</b>	6	17,000	.15	1	6
Acme Screw	<b>RAD-10086-A2 / 10XX</b>	18	3,800	—	1	6
	<b>RAD-10082-A2 / 10XX</b>	9	6,275	—	1	6
	<b>RAD-10046-A2 / 10XX</b>	6	7,000	—	1	6

For "XX," see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

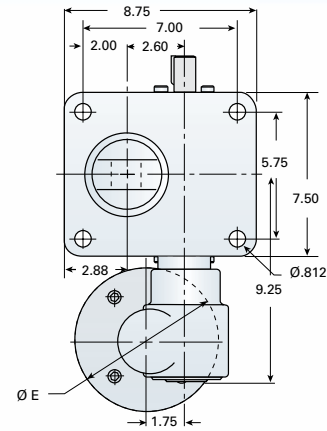
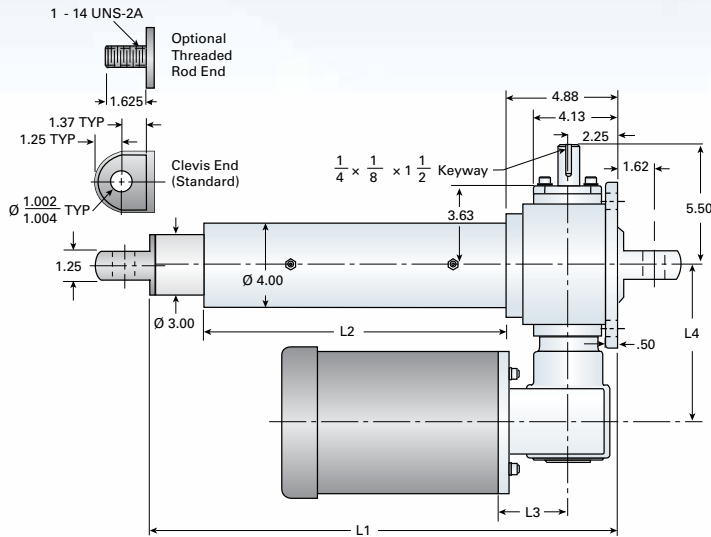
## LIFE EXPECTANCY



## COLUMN LOAD







Approx Stopping Distance (in)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.06	.06	758	93	15.25	8.88
.03	.03	837	93	15.25	8.88
.02	.02	1,226	93	15.25	8.88
.01	.01	1,258	93	15.25	8.88
.01	.01	1,571	93	15.25	8.88
.06	—	756	89	12.88	6.50
.07	—	1,249	89	12.88	6.50
.03	—	1,552	89	12.88	6.50

NEMA FRAME SIZE	L3 (in)	L4 (in)	ØE (in)
56C	3.69	7.25	6.69

\* Ball Screw Models: Total Weight = (2.28 lb) × Travel + Basic Weight

\* Acme Screw Models: Total Weight = (2.68 lb) × Travel + Basic Weight

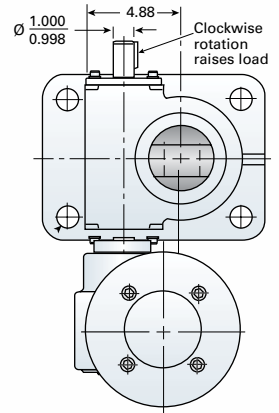
\*\*Total Length = Basic length + (Travel × 1.25)

Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1; eight different positions are available (see page 71).

For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

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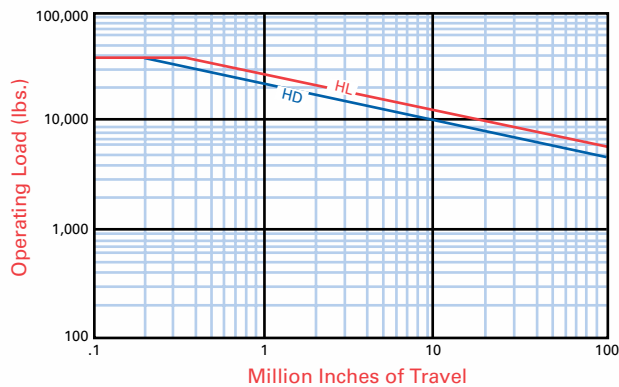
# SERIES RAD-200



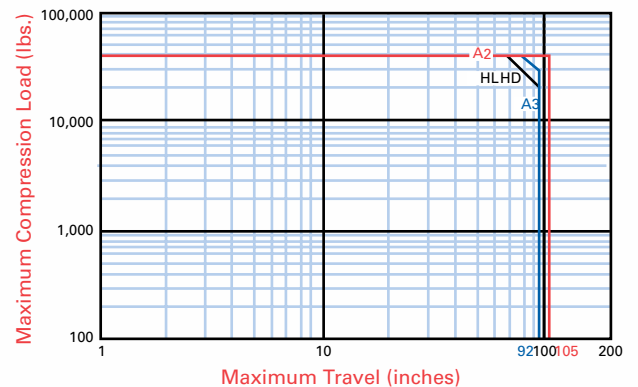
	<b>MODEL NUMBER</b>	Travel Rate (in/min)	Dynamic Capacity (lbf)	Screw Rated Life (in × 10 <sup>6</sup> )	Std. Motor HP Rating (ref.)	Std. Brake Torque (ft-lb)
Ball Screw	<b>RAD-20088-HL / 50XX</b>	27	30,000	.69	5	15
	<b>RAD-20088-HD / 30XX</b>	13.5	35,000	.23	3	15
	<b>RAD-20048-HD / 30XX</b>	9	35,000	.44	3	15
	<b>RAD-20048-HD / 20XX</b>	4.5	40,000	.15	2	10
Acme Screw	<b>RAD-20088-A2 / 75XX</b>	13.5	31,000	—	7.5	25
	<b>RAD-20088-A3 / 50XX</b>	9	22,500	—	5	15
	<b>RAD-20048-A2 / 30XX</b>	4.5	25,000	—	3	15

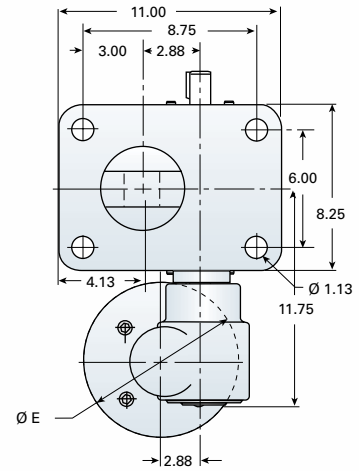
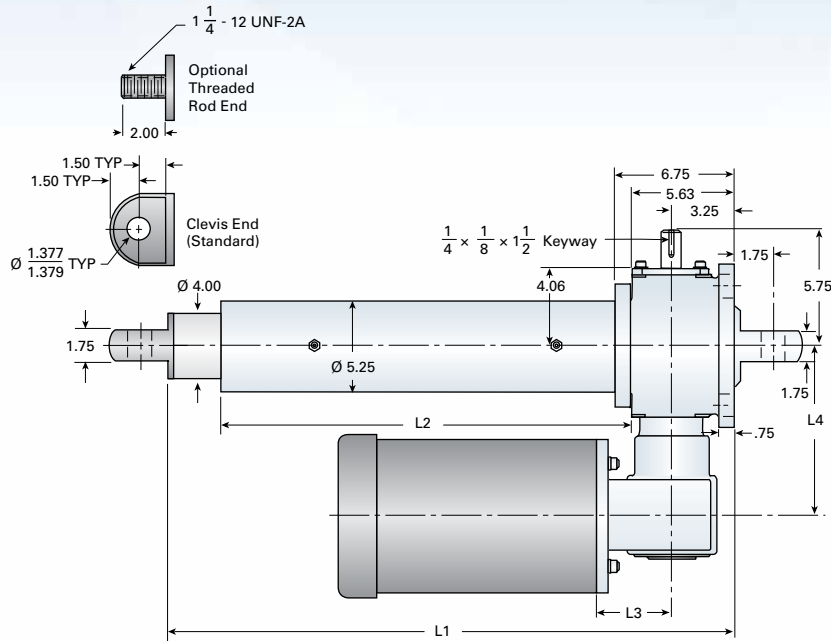
For "XX", see page 72 for motor options. Standard motor referenced is a 1750 rpm AC brakemotor.

## LIFE EXPECTANCY



## COLUMN LOAD





Approx Stopping Distance (in)		Max Rod Reaction Torque (in lb)	Basic Weight (lb)*	Basic Length (L1) (in)**	Basic Length (L2) (in)**
No Load	Full Load				
.09	.09	5,300	202	21.13	12.63
.03	.03	3,098	202	21.13	12.63
.02	.02	6,195	202	21.13	12.63
.01	.01	3,540	202	21.13	12.63
.03	—	7,254	187	17.44	8.94
.03	—	4,770	187	17.44	8.94
.01	—	2,925	187	17.44	8.94

NEMA FRAME SIZE	L3 (in)	L4 (in)	ØE (in)
180TC	6.12	9.00	9.12

\* Ball Screw Models: Total Weight = (3.36 lb) × Travel + Basic Weight

\* Acme Screw Models: Total Weight = (3.65 lb) × Travel + Basic Weight

\*\*Total Length = Basic length + (Travel × 1.25)

Base clevis is shown in standard orientation but may be rotated 90° or per customer specification. May also be ordered with optional flange base. Motor is shown in Position 1; eight different positions are available (see page 71).

For motor dimensions, please visit [www.nookindustries.com](http://www.nookindustries.com).

**WARNING:** Units are not to be used as personnel support or movement. Ball Screw Models are self-lowering.

## ACCESSORIES

Nook Industries offers many accessories to accommodate specific applications. From motor mounts to limit switches to lubricant, Nook has the electric cylinder accessories to realize the linear motion needs of any application.



**DD MOTOR MOUNTS**  
page 70



**RAD MOTOR MOUNTS**  
page 71



**MOTORS**  
page 72



**MITER GEAR ASSEMBLIES**  
page 79



**LINKJAC™ SHAFTING**  
page 80-81



**FLEXIBLE COUPLINGS**  
page 82-83



**IN-LINE ENCODERS**  
page 73



**LIMIT SWITCHES**  
page 74-77



**ROD-TYPE LIMIT SWITCH**  
page 78



**MOUNTING CLEVISES**  
page 84



**BELLOWS BOOTS**  
page 85



**CONTROL PANELS**  
page 86-87

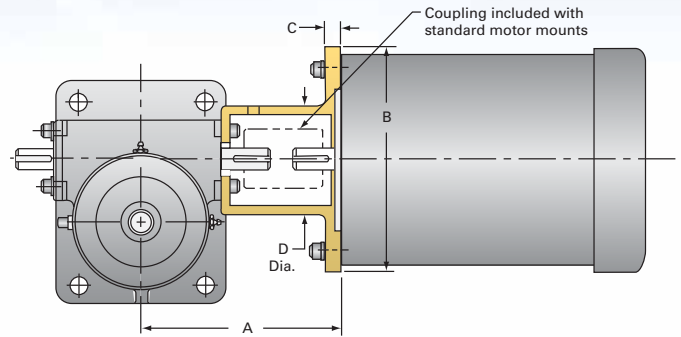
# DD MOTORS AND MOTOR MOUNTS

Nook DD motor mount assemblies are designed for standard motors and include jaw type couplings.

These assemblies are stocked for DD-25, DD-50, DD-100 and DD-200 and are available for the cylinder sizes listed in the table. Non-standard motor mounts can be designed for special requirements including, special couplings, small NEMA frame motors, DIN standard motors, stepper motor and servomotor designs. Contact Nook Industries for additional information.

DD Series electric cylinders can be ordered with industrial quality induction motors. Motors with internally and externally wired brake motors are available. Brake motors utilize an integral, spring actuated brake. Standard motors are 3-phase, 230-460 VAC, 60hz, 1,725 rpm. Single-phase motors are 115-130 VAC, 60hz, 1,725 rpm. All motors are rated for continuous duty. Specific duty motors such as wash down or explosion-proof can be supplied upon request. See charts on page 72 for order codes.

**CAUTION:** Ball screw cylinders are self-lowering. A brake of sufficient torque is required to hold the load with a ball screw cylinder. Be sure to verify that the brakemotor selected has sufficient brake torque for your application.



CYLINDER SERIES	NEMA FRAME SIZE	ORDER CODE w. MOTOR ADAPTER	DIMENSIONS			
			A	B	C	D
DD-5	42	X02	4.48	4.63	.50	2.69
	48	X04	4.48	4.63	.50	3.12
DD-10	56C	X05	5.71	6.63	.49	3.12
DD-25	56C	X05	6.25	6.63	.63	3.50
	140TC	X14	6.25	6.63	.63	3.50
DD-50	56C	X05	7.25	6.75	.56	3.75
	140TC	X14	7.25	6.75	.56	3.75
	180TC	X18	8.00	9.25	.75	3.75
DD-100	56C	X05	8.25	6.75	.50	4.38
	140TC	X14	8.25	6.75	.50	4.38
	180TC	X18	9.00	9.25	.75	4.38
DD-200	56C	X05	8.66	6.75	.50	3.75
	140TC	X14	8.66	6.75	.50	3.75
	180TC	X18	9.00	9.25	.63	5.25
	213TC	X21	9.68	8.88	.88	5.69

## HOW TO ORDER A MOTOR MOUNT (WITH OR WITHOUT A BRAKEMOTOR)

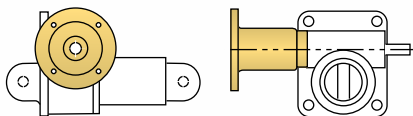
EXAMPLE:

DD-1008-HD / **X05-1** / 000-1 / CC / 24.0 / S

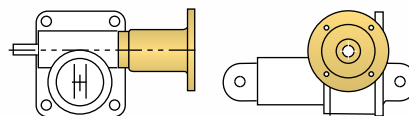
└─ Mounting Position  
└─ Order Code for Motor Adapter (see above)  
See page 72 for Order Code with Motor

## DD MOTOR MOUNT POSITIONS

①



②





## RAD MOTOR MOUNTS

The RAD Motor Mount is a compact, high quality worm gear reducer enclosed in a ductile iron housing. It mounts directly to the input side of the electric cylinder. Motors mount quill-style to a standard NEMA C-face. These assemblies are stocked for RAD-25, RAD-50, RAD-100 and RAD-200. Non-standard motor mounts can be designed for special requirements including, special couplings, small NEMA frame motors, DIN standard motors, stepper motor and servomotor designs. Contact Nook Industries for additional information.

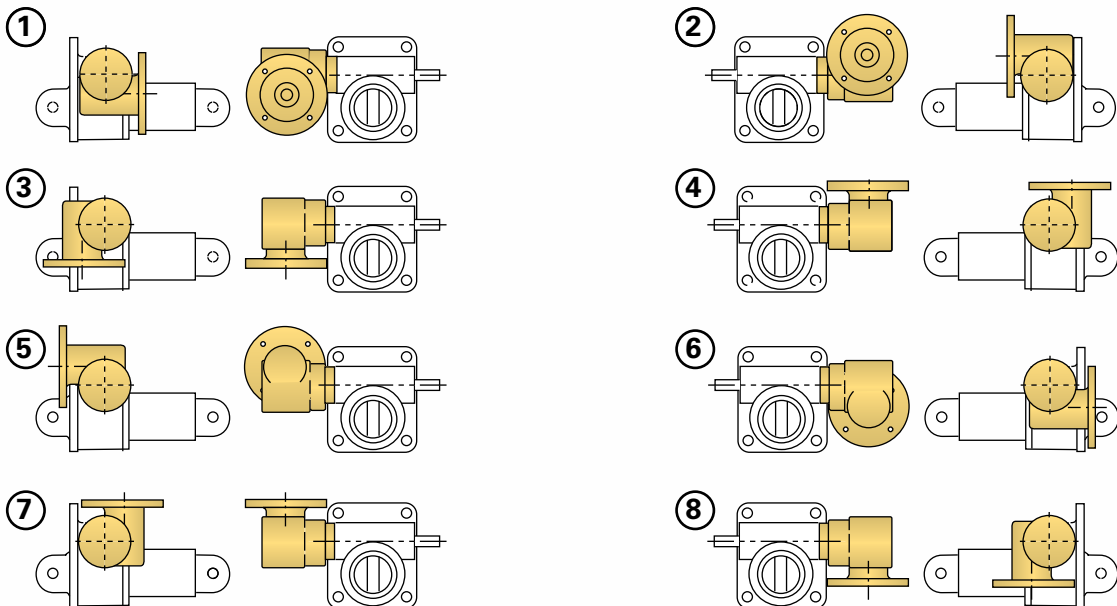
The RAD Motor Mount is a secondary worm gear reducer that reduces speed and increases torque to the input of the electric cylinder. If motor clearance is an issue, an RAD cylinder may be selected to optimize motor orientation.

RAD Series Electric Cylinders can be ordered with industrial quality induction motors. Motors with internally and externally wired brake motors are available. Brake motors utilize an integral, spring actuated brake. Standard motors are 3-phase, 230-460 VAC, 60hz, 1,725 rpm. Single-phase motors are 115-130 VAC, 60hz, 1,725 rpm. All motors are rated for continuous duty.

**CAUTION:** Ball screw cylinders are self-lowering. A brake of sufficient torque is required to hold the load with a ball screw cylinder. Be sure to verify that the brakemotor selected has sufficient brake torque for your application.



### RAD MOTOR MOUNT POSITIONS



## BRAKEMOTOR REFERENCE

Nook Electric Cylinders can be supplied with industrial quality motors. Brake motors include a spring actuated, electrically released braking mechanism which will hold a load when the power is off. In normal operation, power is applied and removed to the motor windings and brake release simultaneously.

If it is desired to operate the brake separately, as when used with a speed control, the brake needs to be wired externally. Motors provided by Nook Industries can either be supplied with the brake wired externally to accommodate speed controllers, or internally for simplicity of use.

Standard motors are: 3 phase 208-230 / 460 VAC, 60 Hz. 1,725 rpm. Also available are single phase motors at: 115 / 230 VAC, 60 Hz. 1,725 rpm. All motors are rated for continuous duty.

**NOTE:** For inverter duty motors or additional options, contact Nook Industries.

### INTERNALLY WIRED BRAKE MOTOR PRODUCT CODE

Motor HP	STD Motor 208-230/460 3PH	Single Phase 115/230 1PH
1/4	02BT	02BS
1/3	03BT	03BS
1/2	05BT	05BS
3/4	07BT	07BS
1	10BT	10BS
1 1/2	15BT	-
2	20BT	-
3	30BT	-
5	50BT	-
7 1/2	75BT	-

### EXTERNALLY WIRED BRAKE MOTOR PRODUCT CODE

Motor HP	STD Motor 208-230/460 3PH	Single Phase 115/230 1PH	Wash Down MOTOR IP55 • 208-230/460 3PH	Explosion Proof DIVISION 1 • CLASS 1,2 • GROUP F & G • 208/230/460 • 3PH	Economy Motor* 208-230/460 3PH SLIPPAGE ~ 10%
1/4	02RT	02RS	02RW	-	-
1/3	03RT	03RS	03RW	-	-
1/2	05RT	05RS	05RW	05RE	05MT
3/4	07RT	07RS	07RW	07RE	07MT
1	10RT	10RS	10RW	10RE	10MT
1 1/2	15RT	-	15RW	15RE	15MT
2	20RT	-	20RW	20RE	20MT
3	30RT	-	30RW	30RE	30MT
5	50RT	-	50RW	50RE	50MT
7 1/2	75RT	-	75RW	75RE	75MT

\* Motor rpm between 1620 and 1680 for Economy motors. For speed critical application please contact Nook Engineering.

## IN-LINE ENCODER

### IN-LINE ENCODER IS INSTALLED BETWEEN THE MOTOR ADAPTER AND MOTOR

For position sensing at the input shaft, the in-line encoder option may be factory installed between the motor and motor adapter or Right-Angle Reducer. This low-cost option requires minimal space. When used with worm gear type cylinders, it leaves the extension shaft side of the cylinder free for clearance, for a rotary limit switch, or for coupling to another cylinder.

The In-line encoder's quadrature output design allows detection of both speed and direction of shaft rotation.

The in-line encoder option mounts to a motor and therefore requires an optional motor mount or right-angle reducer.

Sensing speed range:	0 -10,000 rpm
Pulse Output:	60 pulses/revolution
Supply voltage:	+5 to 24 Volts DC +/-5%
Supply current:	60 mA typical, 115 mA maximum
Output drive capability:	250 mA per channel continuous
Maximum load:	50 ohms per channel

Encoder is face mounted between the motor and motor mount and will offset the length of the motor .61 inches for NEMA 56 and 140 frames and .88 inches for NEMA 180 and 210 frames.



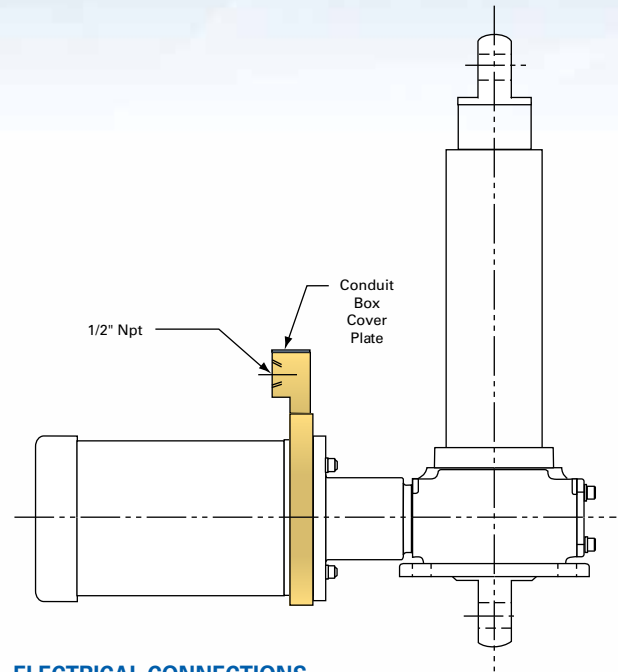
### HOW TO ORDER AN IN-LINE ENCODER:

Specify the Cylinder reference number, using the system described on page 37 or 57.

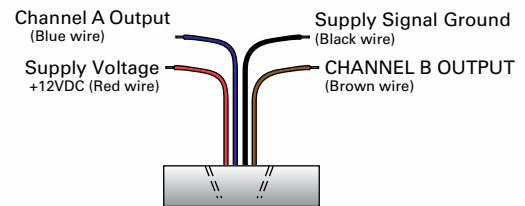
EXAMPLE:

DD-1008-HD / 10BT-2 / 000-1 / CC / 24.0 / ES

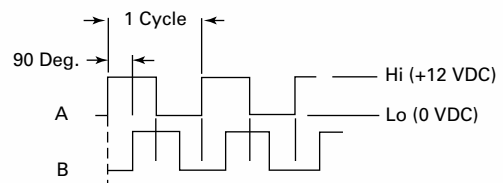
Product Code



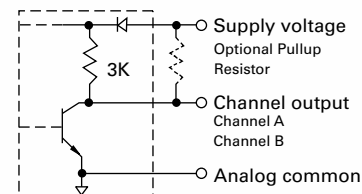
### ELECTRICAL CONNECTIONS



### OUTPUT CHANNEL WAVEFORMS



### OUTPUT CHANNEL SCHEMATIC (CHANNELS A & B)



## ROTARY LIMIT SWITCH

Every motorized Electric Cylinder must be controlled so that power to the motor is turned off and the brake engaged before the limits of mechanical travel are reached.

The rotary limit switch senses extension shaft rotation and provides switch contact closures that can be used to control motors.

This sturdy, durable assembly is available with two or four circuits or two circuits and a potentiometer. Each circuit has a separate rotating cam that actuates a high quality switch. The switch actuation may be individually and infinitely adjusted anywhere within the travel of the cylinder.

These assemblies contain gear reducers with ratios that vary according to the model and travel of the electric cylinders. Nook selects ratios that result in maximum cam rotation for best accuracy, repeatability and minimum hysteresis. In most cases, with full travel of the actuator, the cam will rotate  $\frac{3}{8}$  to  $\frac{7}{8}$  of a revolution to actuate a switch. In the event that the cam continues to rotate, the switch returns to its original state after approximately 25° of rotation, with no damage to the limit switch assembly.

A 2-circuit switch assembly is useful for limiting the maximum and minimum extension. A 4-circuit assembly gives the possibility of additional signals for other user purposes. The potentiometer version is used to provide an analog signal for sensing cylinder position.

Single Pole Double Throw (SPDT) switches are standard and Double Pole Double Throw (DPDT) switches are optional. These assemblies are dust protected and meet NEMA 4 and 5 standards for oil and water tightness.

A rotary limit switch assembly is mounted to the extension shaft side of the Worm Gear Screw Cylinder opposite the motor.

A rotary limit switch is available for Electric Cylinder Series DD-25 and RAD-25 and larger. Most cylinder models have close and extended mounts for the switches to provide clearance around the switch housing. See the charts below for dimensions.

Switches are factory installed to assure proper assembly in the correct orientation for the specified mounting position.

**CAUTION:** Limit switches are not adjusted at the factory. Switches should be set after installation.

Product Code	Number of Circuits	Switch Type	Potentiometer
<b>2CA</b>	2	SPDT	NO
<b>2CC</b>	2	DPDT	NO
<b>4CA</b>	4	SPDT	NO
<b>4CE</b>	4	DPDT	NO
<b>PTA</b>	2	SPDT	YES
<b>PTC</b>	2	DPDT	YES

Explosion Proof model also available. Contact Nook Engineering for more information.

### HOW TO ORDER A ROTARY LIMIT SWITCH

SPECIFY:

- Product code (see table below)
- Mounting Position (1 through 8 - see following page)
- Close or Extended Mount (C or E)

Insert the correct designation in the Electric Cylinder reference number (see page 37 or 57).

EXAMPLE:

2.5-MSJ-U 6:1 / SSE-1 / **2CA-4E** / FT / 24.5 / S

Extension shaft designation ——— Position

Examples of rotary limit switch designations:

2CA-4C – 2-circuit, SPDT, position 4, close mount

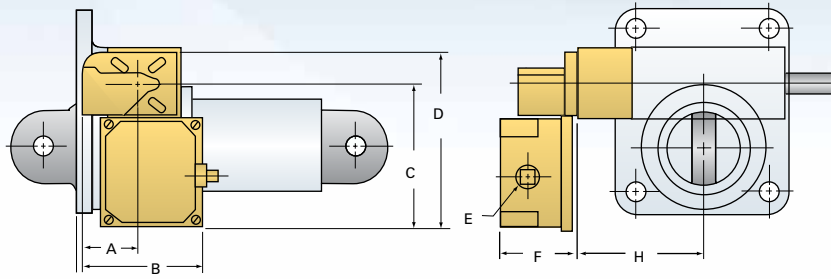
4CE-1E – 4-circuit, DPDT, position 1, extended mount

C = Close mount on

E = Extended mount (see following page)

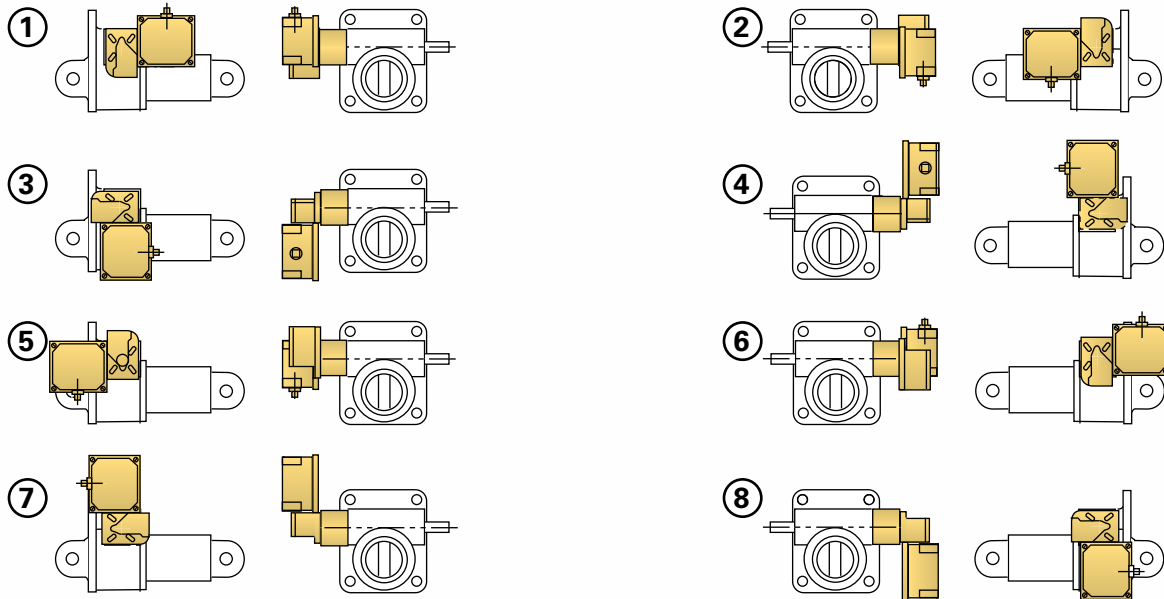
**IMPORTANT:** These designation numbers are not complete part numbers. These assemblies contain gear reducers with ratios that vary according to the model and travel of the cylinder. If you are ordering a replacement switch assembly, complete information on the electric cylinder is required.





CIRCUITS	DIMENSIONS					
	A	B	C	D	E	F
2 CIRCUIT	2.46	5.25	6.24	7.62	¼-NPT	3.25
4 CIRCUIT or 2 CIRCUIT WITH POTENTIOMETER	2.46	5.25	8.24	9.62	1-NPT	3.88

SERIES	DIMENSION H CLOSE	DIMENSION H EXT.
	MOUNT	MOUNT
DD & RAD 25	2.75	3.56
DD & RAD 30	2.75	3.56
DD & RAD 50	3.56	4.56
DD & RAD 100	3.88	5.56
DD & RAD 200	4.41	5.81



### ELECTRICAL RATINGS:

#### SWITCHES:

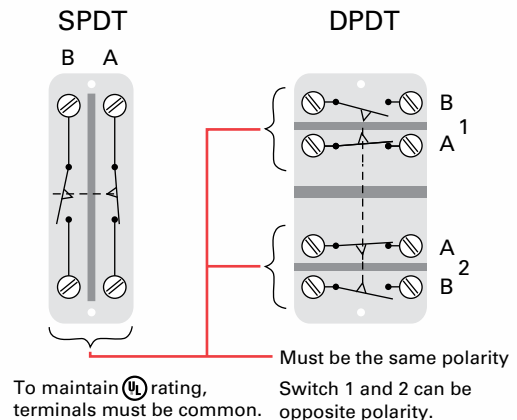
DC Current — 115 Volts SPDT, .50 amps  
 DPDT, .80 amps  
 AC Current — 115 Volts SPDT, 15 amps  
 DPDT, 10 amps

#### 10-TURN POTENTIOMETER:

0-500 OHM, 2 Watt

**NOTE:** While the 10-turn potentiometer is rated for 0-500 Ohms, as implemented in the rotary limit switch assembly, it cannot and should not operate over its full range. Minimum and maximum resistance values cannot be known until the unit is installed and final travel limit adjustments have been made, therefore, the device connected to the potentiometer should include provisions for trimming to compensate for these values.

### WIRING DIAGRAMS:



# COMPACT LIMIT SWITCH (CLS)

PATENT PENDING

Every motorized Electric Cylinder must be controlled so that power to the motor is turned off and the brake engaged before the limits of mechanical travel are reached. The Compact Limit Switch (CLS) senses extension shaft rotation and provides switch contact closures that can be used to control motors.

The CLS is an economical way to detect travel limits and prevent over travel of Electric Cylinders. The Single Pole Double Throw (SPDT) limit switches are useful for limiting the maximum and minimum extension.

The CLS is wired as a normally closed circuit, but can easily be wired as a normally open circuit. The CLS is provided with a standard terminal block for ease of set up. The CLS limit switches are adjustable in the field with the removal of the easily accessible enclosure cover.

The CLS is designed to accommodate a variety of standard options, which include a Hall Effect, Potentiometer, and Reed Switch. The potentiometer version is used to provide an analog signal for sensing cylinder position. The Hall Effect Sensor and Reed Switch are used to provide a pulse signal to indicate travel. The CLS has been designed to meet NEMA 4 standards for dust and water tightness. The CLS can be provided with a variety of gear ratios to accommodate virtually any travel.

## TO ORDER A COMPACT LIMIT SWITCH

Specify:

- CLS code listed below
- Mounting position listed on the next page

Insert the correct designation in the Electric Cylinder reference number (see page 37 or 57 for more information on electric cylinder reference numbers).

EXAMPLE:

DD-2512-HL/**CLSH-8**/SSE-1/FT/24/S

Product Code      Position

Examples of compact limit switch designations:

CLSS-8 – Standard CLS w. SPDT limit switches only, Position #8

CLSR-4 – Standard CLS w. SPDT limit switches, Reed Switch, Position #4

CLSH-3 – Standard CLS w. SPDT limit switches, Hall Effect Sensor, Position #3

CLSP-1 – Standard CLS w. SPDT limit switches, Potentiometer, Position #1

**IMPORTANT:** These designation numbers are not complete part numbers. These assemblies contain gear reducers with ratios that vary according to the model and travel of the cylinder. If you are ordering a replacement switch assembly, complete information on the cylinder is required.

## FEATURES:

- Light weight
- Twelve gear ratios to accommodate most travels
- Contains two limit switches
- Simple travel adjustment design
- Eight different mounting positions
- Available on DD and RAD models 25 through 200
- Optional Reed Switch, Hall Effect Sensor, or Potentiometer
- Internal Limit Switch temperature range from -20°F to 150°F
- Feedback option available

Switches are factory installed to assure proper assembly in the correct orientation for specified mounting position.

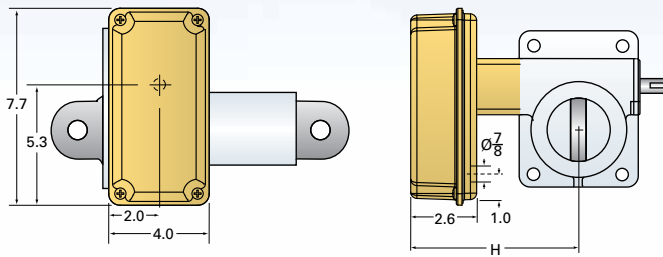
**CAUTION:** Limit switches are not set at the factory. Switches must be set during installation and prior to use. The limit switch assembly will be permanently damaged if allowed to over travel. CLS is supplied with a plugged access hole. For a water-tight connection, water-tight connector and sealant should be used.

The Compact Limit Switch is not intended to be used as a safety device.



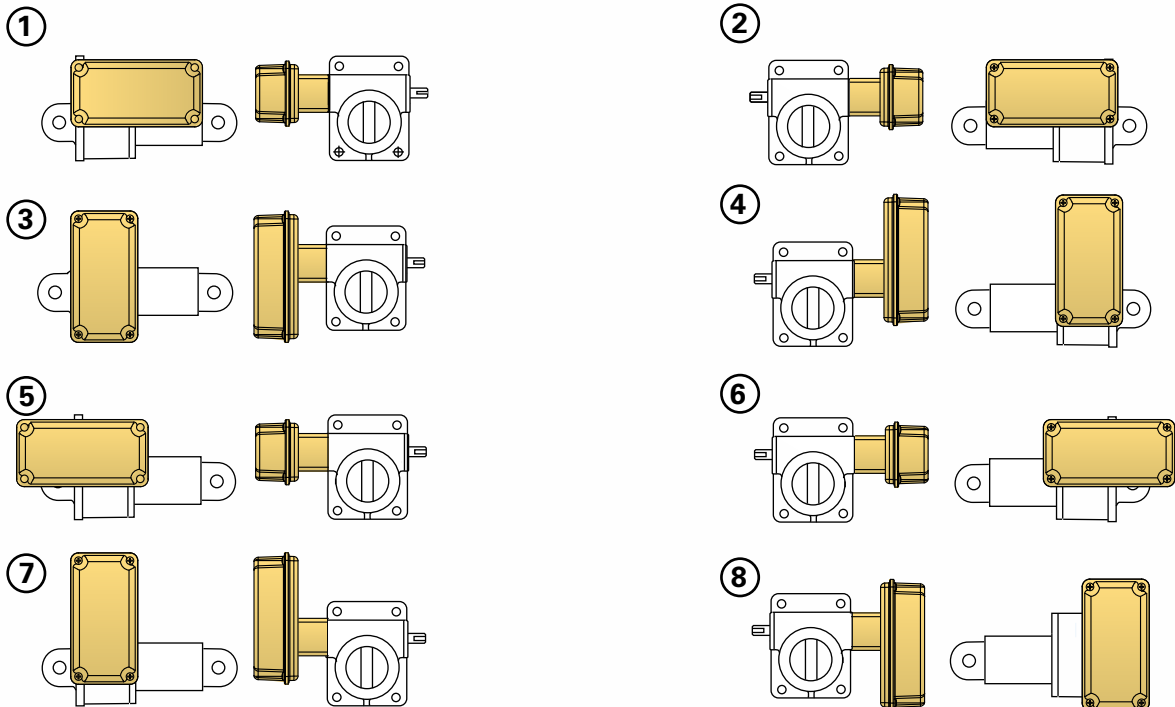
Product Code	Switch Type	Feedback
<b>CLSS</b>	SPDT	-
<b>CLSR</b>	SPDT	Reed Switch
<b>CLSH</b>	SPDT	Hall Effect Sensor
<b>CLSP</b>	SPDT	Potentiometer

## DIMENSIONS



Circuits	H
DD & RAD 25	7.14
DD & RAD 30	7.08
DD & RAD 50	7.90
DD & RAD 100	8.40
DD & RAD 200	8.85

## COMPACT LIMIT SWITCH POSITIONS



## ELECTRICAL RATINGS

DC Current — 125 Volts SPDT, .50 amps

AC Current — 250 Volts SPDT, 11 amps

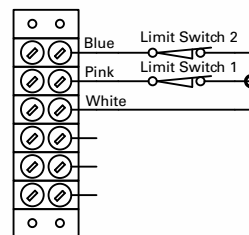
### 10-TURN POTENTIOMETER:

10,000 OHM, 2 Watt

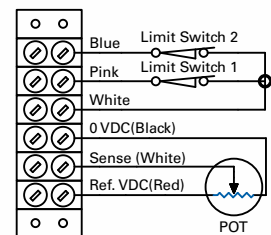
**NOTE:** While the 10-turn potentiometer is rated for 10,000 Ohms, as implemented in the compact limit switch assembly, it can not and should not operate over its full range. Minimum and maximum resistance values can not be known until the unit is installed and final travel limit adjustments have been made. Therefore, the device connected to the potentiometer should include provisions for trimming to compensate for these values.

## WIRING DIAGRAMS

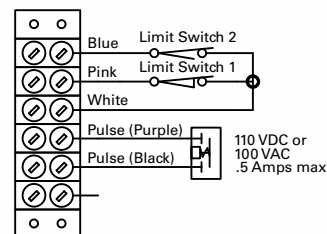
### STANDARD



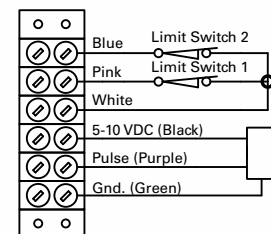
### POTENTIOMETER



### REED SWITCH



### HALL EFFECT SENSOR





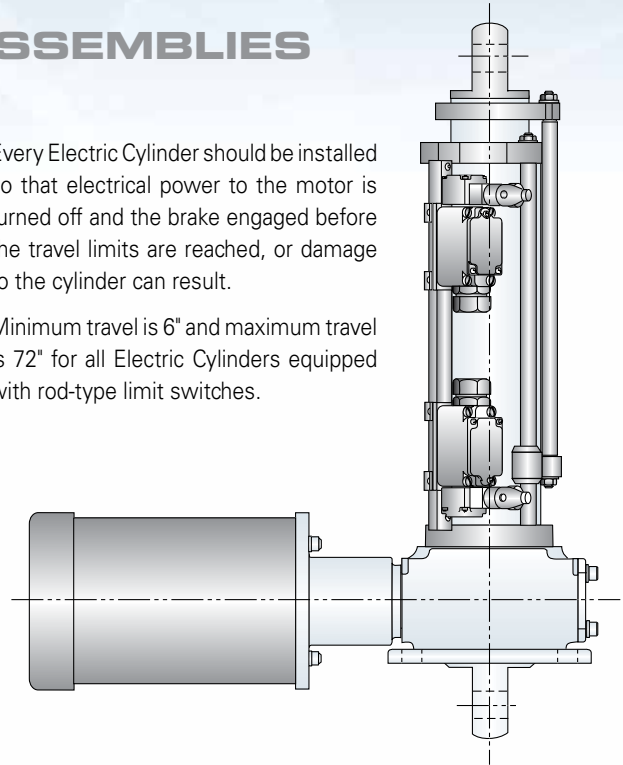
## ROD-TYPE LIMIT SWITCH ASSEMBLIES

The Rod-Type Limit Switch provides two SPDT switches used to limit the maximum and minimum cylinder extension. The switch assembly mounts to the cylinder tubes for convenient access and leaves the extension shaft free for other purposes. The simple design permits easy installation and maintenance. Independent adjustment allows for quick and easy fine tuning of the travel limits.



Every Electric Cylinder should be installed so that electrical power to the motor is turned off and the brake engaged before the travel limits are reached, or damage to the cylinder can result.

Minimum travel is 6" and maximum travel is 72" for all Electric Cylinders equipped with rod-type limit switches.



### HOW TO ORDER A ROD-TYPE LIMIT SWITCH:

Specify the Electric Cylinder reference number, using the system described on page 37 or 57.

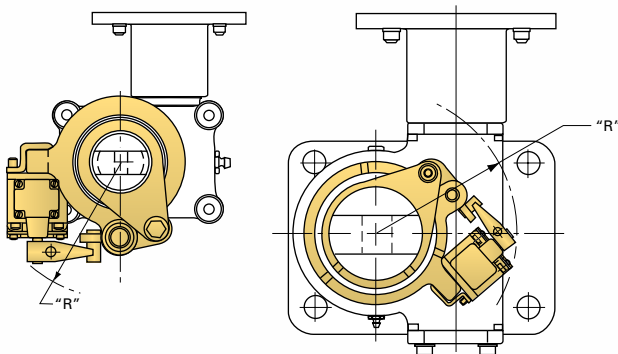
EXAMPLE: DD-1008-HD / 10BT-2 / 000-1 / CC / 24.0 / **SR**

"R" anywhere in this field  indicates Rod-Type Limit Switch Assembly

#### SWITCH ENCLOSURE RATINGS

NEMA	1, 2, 3, 3R, 4, 5, 6, 12, 13
IEC	IP67

### ROD-TYPE LIMIT SWITCH DIMENSIONS:



SERIES	CLEARANCE RADIUS "R"
DD-5	4.00
DD-10	3.66
DD & RAD-25	4.00
DD & RAD-30	4.20
DD & RAD-50	4.66
DD & RAD-100	4.60
DD & RAD-200	5.40

Explosion Proof model also available. Contact Nook Engineering for more information.

# STANDARD MITER GEAR ASSEMBLIES

## GEAR RATIO 1:1 AND 2:1

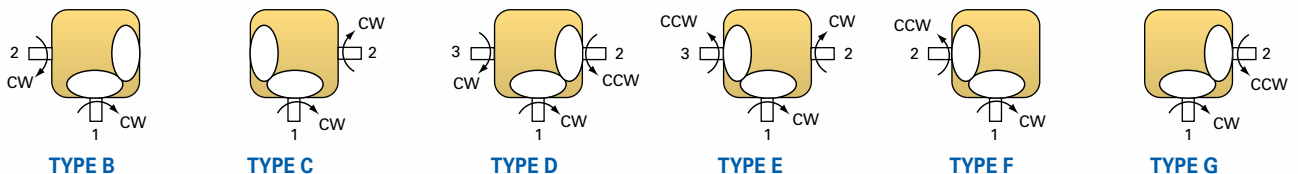
Nook Electric Cylinders may be used in multiple arrangements by connecting shafting, couplings and gear boxes to simultaneously transmit power to the input shafts of the electric cylinders. Nook Industries provides gearboxes for use with electric cylinders. Make certain that the total torque and horsepower required by the arrangement does not exceed the ratings of the box. Miter gear boxes can be operated up to 900 rpm. Higher speeds are permissible at lower torque ratings. Noise levels may increase at higher speeds. The operating efficiency of a miter gear box is 90%

Model	Gear Ratio	Rated Load at 1700 rpm				Est. Weight (lb)
		Continuous Duty		Intermittent Duty		
		HP	Torque (in-lb)	HP	Torque (in-lb)	
<b>GB210</b>	<b>1:1</b>	7.67	284	14.44	535	6¼
<b>GB210S*</b>	<b>1:1</b>	5.75	213.24	10.82	401.32	6¼
<b>GB210S-R2*</b>	<b>2:1</b>	3.01	111.54	5.56	206.31	6¼
<b>GB15</b>	<b>1:1</b>	30.5	1,131	38.33	1,421	26
<b>GB12**</b>	<b>1:1</b>	60.51	2724.13	70.48	3172.91	39

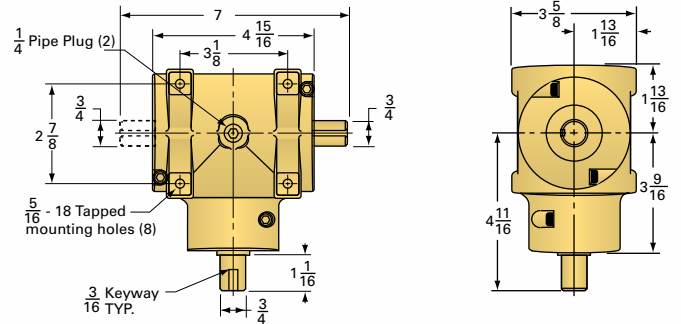
\* Spiral bevel gear set  
\*\* Rated Load calculated at 1400 rpm



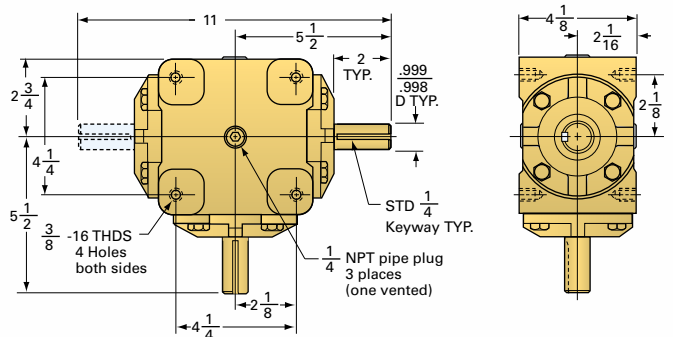
Gears are forged alloy steel. Shafts are stressproof steel ground and polished. Clockwise (CW) and counterclockwise (CCW) notations indicate direction of shaft rotation when facing outer end of shaft. All shaft arrangements will operate opposite direction for that shown. To order, specify model number and desired shaft arrangement.



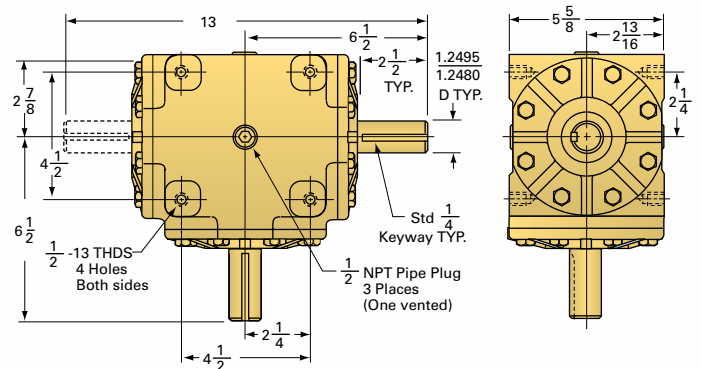
**GB210, GB210S, GB210S-R2**



**GB15**



**GB12**



GB210, GB210S, and GB210S-R2 are filled with EP-90 Gear lubricant at time of shipment. GB15 and GB12 are shipped dry. Fill with EP-90 Gear Lubricant: Capacity 1 qt.

## LINKJAC™ SHAFTING

LinkJac™ Line Shafting is used to interconnect the input shafts of Nook Electric Cylinders used in a multiple arrangement. The shafts transfer the torque from the motor to the electric cylinder or from cylinder to cylinder. LinkJac™ is available in either steel Line Shafting available in standard lengths up to 144", or in aluminum Tubular Shafting with bonded journals of stainless steel available in lengths up to 196". Custom end machining and other diameters are available. Contact Nook Industries for information.

### SELECTION:

There are two major concerns when selecting an interconnect shaft:

- Critical Speed: How fast will the shaft be turning?
- Torsional Twist: How much torque will the shafts be transmitting?

The two characteristics of a LinkJac™ Line Shaft or Tubular Shafting which can be varied to accommodate these requirements are:

- Length of the shaft
- Diameter of the shaft

When selecting a LinkJac™ Line Shaft or Tubular Shafting, use the largest diameter or shortest length which satisfies both Critical Speed and Torsional Twist equations.

**Critical Speed:** The speed that excites the natural frequency of the screw is referred to as the critical speed.

Since the speed can also be affected by shaft straightness and assembly alignment, it is recommended that the maximum speed be limited to 80% of the calculated critical speed value. The theoretical formula to calculate critical speed in rpm is;

$$N_{\text{Speed}} = .6192 \times \left(\frac{\pi}{L}\right)^2 \times C_s$$

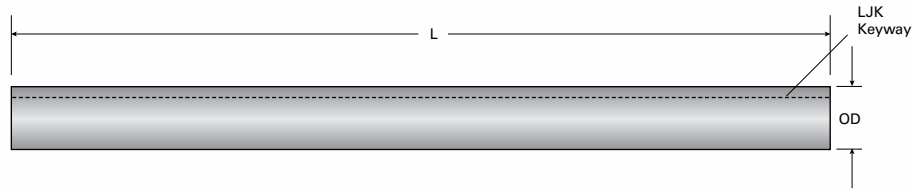
WHERE:

N = Critical Speed in revolutions per minute

L = Length of unsupported shaft in inches

C<sub>s</sub> = Value list from table below

### LINE SHAFTING



	OD (in)	Keyway (in)	Keyway Length (in)	A	B	Material	C <sub>t</sub>	C <sub>s</sub>	Weight/in (lb)
LJ-8	½	-	-	-	-	Steel	1,235	3.895 × 10 <sup>5</sup>	0.056
LJ-12	¾	-	-	-	-	Steel	6,250	5.851 × 10 <sup>5</sup>	0.125
LJ-16	1	-	-	-	-	Steel	19,500	1.168 × 10 <sup>6</sup>	0.223
LJ-24	1½	-	-	-	-	Steel	95,000	1.169 × 10 <sup>6</sup>	0.502
LJK-8	½	⅙ × ⅙	Full Length	-	-	Steel	1,235	3.895 × 10 <sup>5</sup>	0.056
LJK-12	¾	⅜ × ⅜	Full Length	-	-	Steel	6,250	5.851 × 10 <sup>5</sup>	0.125
LJK-16	1	¼ × ¼	Full Length	-	-	Steel	19,500	1.168 × 10 <sup>6</sup>	0.223
LJK-24	1½	⅜ × ⅜	Full Length	-	-	Steel	95,000	1.169 × 10 <sup>6</sup>	0.502

\* When adding modified keyways to standard LinkJac™ shafting, please contact Nook Engineering.

**Torsional Twist:** The degree of twist experienced by LinkJac™ Line Shaft or Tubular Shafting when a given amount of torque is applied. To insure proper synchronization of cylinder motion, it is recommended not to exceed 1° of twist. The theoretical formula to calculate torsional twist in degrees is;

$$N_{\text{Twist}} = T \times \frac{L}{C_t}$$

WHERE:

N = Torsional Twist in degrees

L = Length of unsupported shaft in inches

C<sub>t</sub> = Value list from table below

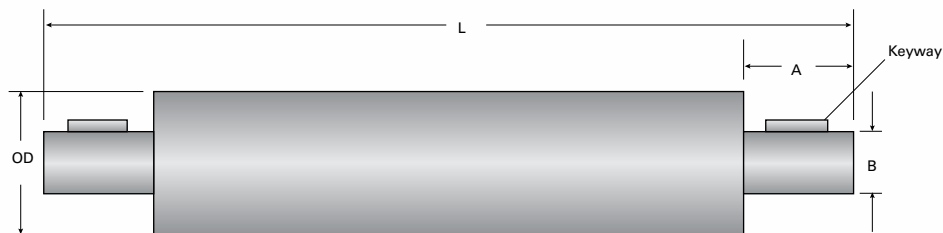
T = Torque



**Design Information:**

- The length used in the previously listed formulas is the unsupported length of the shaft. If support bearings are used on the shaft, the length is the longest unsupported length between bearings.
- The previously listed formulas give a theoretical value of critical speed and torsional twist. Alignment, straightness and stiffness of the system all contribute to determining the actual value.
- The torque in the system is also limited by the torque capacity of the coupling.
- Allow appropriate spacing between the electric cylinder input shaft and the LinkJac™ Line Shaft or Tubular Shafting inside the coupling.
- For some combinations of couplings and electric cylinders, the radius of the suggested coupling is larger than the distance from the center of the worm shaft to the base.
- Nook Industries offers a range of couplings for use with LinkJac™ Line Shaft or Tubular Shafting and Electric Cylinder products in both floating shaft and supported shaft applications. See pages 82-83 for more information.

**METRIC TUBULAR SHAFTING**



Metric Tubing	OD (in [mm])	Keyway (mm)	Keyway Length (mm)	A (mm)	B (mm)	Material	C <sub>t</sub>	C <sub>s</sub>	Weight/in (lb)
LJT-27	1.06 [27]	5 × 2.5	28	35	14 <sub>h7</sub>	Aluminium	3,375	9.798 × 10 <sup>5</sup>	0.035
LJT-40	1.57 [40]	6 × 3	40	45	18 <sub>h7</sub>	Aluminium	12,250	1.504 × 10 <sup>6</sup>	0.055
LJT-50	1.99 [50]	6 × 3	40	45	22 <sub>h7</sub>	Aluminium	25,000	1.907 × 10 <sup>6</sup>	0.069
LJT-60	2.36 [60]	8 × 3.5	50	55	30 <sub>h7</sub>	Aluminium	43,750	2.312 × 10 <sup>6</sup>	0.084

## FLEXIBLE COUPLINGS

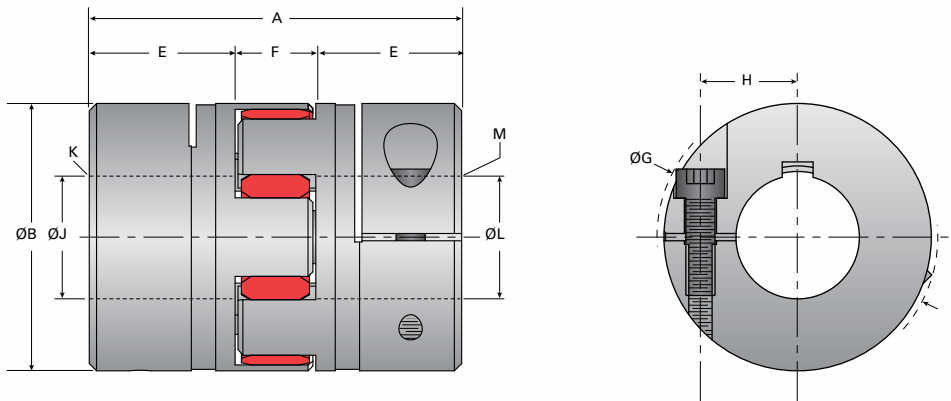
Electric cylinders used alone or in multiple arrangements require couplings to transmit power to the input shaft. Nook Industries provides jaw type and flex type couplings for use with cylinders. The selection process for couplings includes the following steps:

- 1) Refer to the electric cylinder specification tables to determine torque requirements per cylinder for your application.
- 2) Determine total coupling capacity required by multiplying the torque required per cylinder by the number of cylinders to be driven by the coupling.
- 3) Check the torque required against maximum torque rating as shown in the table. Select a coupling with a maximum torque greater than the application torque.
- 4) If using flex type couplings, full-flex couplings should be used for close coupled arrangements. For floating shaft applications, use two



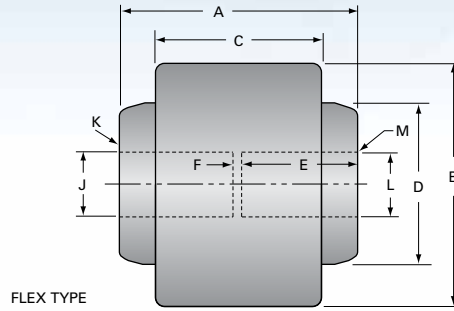
Flex-Rigid couplings. The rigid half should be mounted on the floating shaft.

All electric cylinders, shafts, couplings and motor should be carefully aligned for maximum performance. Couplings with bores other than those specified are available upon request.



### JAWTYPE SERIES

Product Code	Max. Torque Rating (in-lb)	Approx. Wt. (lb)	Clamp Bolt Torque (in-lb)	Coupling Dimensions (in)						Bore Sizes (in)			
				A	B	E	F	G	H	J	Keyway K	L	Keyway M
<b>C-3020-01</b>	111	0.10	12	1.38	1.18	0.43	0.51	1.27	0.45	0.375	—	0.375	—
<b>C-3025-01</b>	150	0.30	93	2.60	1.57	0.98	0.63	1.81	0.57	0.500	1/8 x 1/16	0.500	1/8 x 1/16
<b>C-3025-05</b>	150	0.30	93	2.60	1.57	0.98	0.63	1.81	0.57	0.500	1/8 x 1/16	0.625	1/8 x 1/16
<b>C-3025-02</b>	150	0.30	93	2.60	1.57	0.98	0.63	1.81	0.57	0.500	1/8 x 1/16	0.750	3/16 x 3/32
<b>C-3025-03</b>	150	0.30	93	2.60	1.57	0.98	0.63	1.81	0.57	0.625	1/8 x 1/16	0.625	1/8 x 1/16
<b>C-3025-04</b>	150	0.30	93	2.60	1.57	0.98	0.63	1.81	0.57	0.625	1/8 x 1/16	0.750	3/16 x 3/32
<b>C-3025-06</b>	150	0.30	93	2.60	1.57	0.98	0.63	1.81	0.57	0.750	3/16 x 3/32	0.750	3/16 x 3/32
<b>C-3030-01</b>	531	0.62	93	3.07	2.17	1.18	0.71	2.26	0.79	0.750	3/16 x 3/32	1.000	1/4 x 1/8
<b>C-3030-02</b>	531	0.62	93	3.07	2.17	1.18	0.71	2.26	0.79	1.000	1/4 x 1/8	1.000	1/4 x 1/8



**HEAVY DUTY SERIES**

Product Code		Max. Torque Rating (in-lb)	Approx. Wt. (lb)	Coupling Dimensions (in)						Bore Sizes (in)			
Full Flex	Flex-Rigid			A	B	C	D	E	F	J	Keyway K	L	Keyway M
<b>C-1800-04</b>	<b>C-1805-04</b>	2,500	5	3.125	3.125	2.00	2.00	1.50	0.125	.4995	1/8 x 1/16	.7495	3/16 x 3/32
										.4990		.7490	
<b>C-1800-01</b>	<b>C-1805-01</b>	2,500	5	3.125	3.125	2.00	2.00	1.50	0.125	.4995	1/8 x 1/16	.9995	1/4 x 1/8
										.4990		.9990	
<b>C-1800-05</b>	<b>C-1805-05</b>	2,500	5	3.125	3.125	2.00	2.00	1.50	0.125	.7495	3/16 x 3/32	.7495	3/16 x 3/32
										.7490		.7490	
<b>C-1800-02</b>	<b>C-1805-02</b>	2,500	5	3.125	3.125	2.00	2.00	1.50	0.125	.7495	3/16 x 3/32	.9995	1/4 x 1/8
										.7490		.9990	
<b>C-1800-03</b>	<b>C-1805-03</b>	2,500	5	3.125	3.125	2.00	2.00	1.50	0.125	.9995	1/4 x 1/8	.9995	1/4 x 1/8
										.9990		.9990	
<b>C-1810-01</b>	<b>C-1815-01</b>	7,500	8	3.75	3.75	2.53	2.375	1.82	0.125	1.2495	1/4 x 1/8	1.2495	1/4 x 1/8
										1.2490		1.2490	
<b>C-1810-02</b>	<b>C-1815-02</b>	7,500	8	3.75	3.75	2.53	2.375	1.82	0.125	1.3745	5/16 x 5/32	1.2495	1/4 x 1/8
										1.3740		1.2490	
<b>C-1810-03</b>	<b>C-1815-03</b>	7,500	8	3.75	3.75	2.53	2.375	1.82	0.125	1.4995	3/8 x 3/16	1.2495	1/4 x 1/8
										1.4990		1.2490	

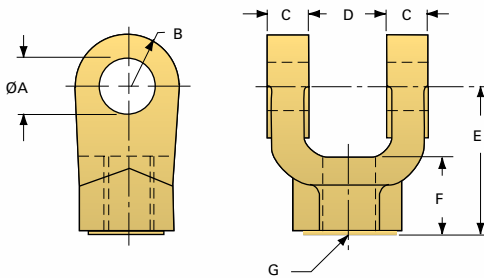
**ECONOMY SERIES**

Product Code		Max. Torque Rating (in-lb)	Approx. Wt. (lb)	Coupling Dimensions (in)						Bore Sizes (in)			
Full Flex	Flex-Rigid			A	B	C	D	E	F	J	Keyway K	L	Keyway M
<b>P-2200-185</b>	-	210	0.37	2.13	1.89	1.46	1.26	0.98	0.16	0.500	1/8 x 1/16	0.750	3/16 x 3/32
<b>P-2200-193</b>	-	210	0.37	2.13	1.89	1.46	1.26	0.98	0.16	0.625	3/16 x 3/32	0.750	3/16 x 3/32
<b>P-2200-196</b>	-	260	0.71	2.2	2.05	1.61	1.42	1.02	0.16	0.625	3/16 x 3/32	0.750	3/16 x 3/32
<b>P-2200-178</b>	-	210	0.37	2.13	1.89	1.46	1.26	0.98	0.16	0.750	3/16 x 3/32	0.750	3/16 x 3/32
<b>P-2200-182</b>	-	260	0.71	2.2	2.05	1.61	1.42	1.02	0.16	0.750	3/16 x 3/32	0.750	3/16 x 3/32
<b>P-2200-183</b>	-	610	1.64	3.31	2.6	1.81	1.73	1.57	0.16	0.750	3/16 x 3/32	1.000	1/4 x 1/8
<b>P-2200-191</b>	-	610	1.64	3.31	2.6	1.81	1.73	1.57	0.16	0.750	3/16 x 3/32	1.125	1/4 x 1/8
<b>P-2200-177</b>	-	1,170	3.31	3.46	3.62	1.97	2.56	1.46	0.55	1.000	1/4 x 1/8	1.000	1/4 x 1/8



# MOUNTING CLEVISES

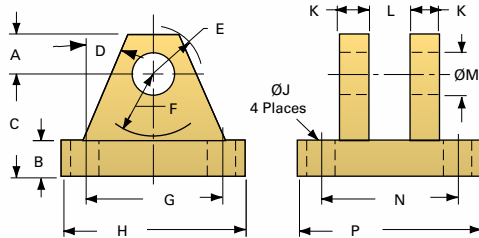
## FEMALE ROD CLEVIS



CYLINDER SERIES	Product Code	DIMENSIONS						
		ØA	B radius	C	D	E	F	G thread
<b>5 SERIES</b>	9012-5	.3145/.3165	19/64	13/64	11/32	11/4	13/16	5/16-24
<b>10 SERIES</b>	9012-8	.504/.502	1/2	1/2	3/4	1 1/2	3/4	7/16-20
<b>25 SERIES</b>	9012-12	.752/.754	3/4	5/8	1 1/4	2 1/8	1 1/8	3/4-16
<b>30 SERIES</b>	9012-12	.752/.754	3/4	5/8	1 1/4	2 1/8	1 1/8	3/4-16
<b>50 SERIES</b>	9012-16	1.002/1.004	1	3/4	1 1/2	2 15/16	1 5/8	1-14
<b>100 SERIES</b>	9012-16	1.002/1.004	1	3/4	1 1/2	2 15/16	1 5/8	1-14
<b>200 SERIES</b>	9012-22	1.377/1.379	1 3/8	1	2	3 3/4	2	1 1/4-12

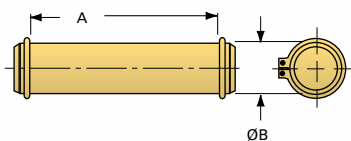
**NOTE:** Rod Clevis with swivel bearings can be supplied. Contact Nook Engineering.

## CLEVIS BRACKET



CYLINDER SERIES	PRODUCT CODE	DIMENSIONS														
		A	B	C	D	E	F	G	H	ØJ	K	L	ØM	N	P	
<b>5 SERIES</b>	9013-7	3/8	3/8	1	25°	1/2	5/8	1.75	2 1/4	17/64	3/8	15/32	.4395/.4415	1.75	2 1/4	
<b>10 SERIES</b>	9013-8	1/2	1/2	1 1/2	25°	5/8	3/4	2.55	3 1/2	13/32	1/2	3/4	.504/.502	2.55	3 1/2	
<b>25 SERIES</b>	9013-12	3/4	5/8	1 1/8	25°	29/32	3/4	3.82	5	17/32	5/8	1 1/4	.752/.754	3.82	5	
<b>30 SERIES</b>	9013-12	3/4	5/8	1 1/8	25°	29/32	3/4	3.82	5	17/32	5/8	1 1/4	.752/.754	3.82	5	
<b>50 SERIES</b>	9013-16	1	3/4	2 1/4	25°	1 1/4	1 1/2	4.95	6 1/2	21/32	3/4	1 1/2	1.002/1.004	4.95	6 1/2	
<b>100 SERIES</b>	9013-16	1	3/4	2 1/4	25°	1 1/4	1 1/2	4.95	6 1/2	21/32	3/4	1 1/2	1.002/1.004	4.95	6 1/2	
<b>200 SERIES</b>	9013-22	1 3/8	7/8	3	25°	1 21/32	2	5.73	7 1/2	21/32	1	2	1.377/1.379	5.73	7 1/2	

## PIVOT PIN



CYLINDER SERIES	PRODUCT CODE	DIMENSIONS	
		A	ØB
<b>5 SERIES</b>	9014-7	1 15/16	.4385/.4355
<b>10 SERIES</b>	9014-8	1 1/8	.501/.498
<b>25 SERIES</b>	9014-12	2 5/8	.751/.748
<b>30 SERIES</b>	9014-12	2 5/8	.751/.748
<b>50 SERIES</b>	9014-16	3 1/8	1.001/0.999
<b>100 SERIES</b>	9014-16	3 1/8	1.001/0.999
<b>200 SERIES</b>	9014-22	4 1/8	1.376/1.373

## BELLOWS BOOTS

### STANDARD AND SPECIAL BELLOWS BOOTS

Bellows boots are available for all sizes and configurations of Electric Cylinders. A boot protects the tube from contamination.

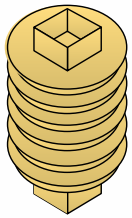
Standard boots are sewn from black neoprene-covered nylon fabric for oil, water and weather resistance and are acceptable for use in -30°F to +300°F environments. Optional materials are available for specific operating conditions (see chart).

Standard boots are furnished with tie straps for electric cylinders with greater than 65 inches travel. Tie straps are attached from convolution to convolution and help the boot extend uniformly.

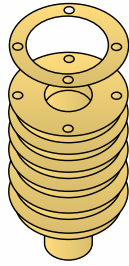


**Bellows Boot**

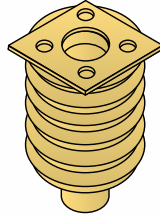
### SPECIAL END CONFIGURATIONS



**Square Cuff**



**Flange End**



**Square Flange**

### SPECIAL BOOT MATERIALS

DESCRIPTION TEMPERATURE	RANGE	APPLICATION COMMENTS
Hypalon-Coated Nylon	-30°F to +300°F	Chemical Resistance, Wash Down
Silicone Coated Fiberglass	-67°F to +550°F	High Temperature
Aluminum-Coated Fiberglass	-65°F to +700°F	High Temperature, Hot Chips, Welding Splatter

**NOTE:** Retracted boot length may increase with some special materials.



Nook Electric Cylinders used in a paper manufacturing application.

## CONTROL PANELS

Nook Industries control panels are designed to match the motor when shipped from the factory. The control panels are acceptable to use in most industrial environments (including automotive). Functionality of the control panel can be customized to match any application and spare parts are readily available.

The control panel interconnects with other safety/control systems.



### Benefits:

- The control matches the motor with no design time required
- The control is acceptable to use in most industrial environments (including automotive)
- Spare parts are readily available
- Functionality of the control can be customized to match any application
- The control interconnects with other safety/control systems

### Motor Capacities:

¼ up to 2 HP 1-phase 115-230V

¼ up to 15 HP 3-phase 230-460-575 VAC induction motors with or without electrically operated brakes.

- NEMA 4/12 Enclosures
- NEMA 4X also available

### Internal Wiring:

- Per NFPA-79
- Main fuses with disconnect models
- UL Listed

### Limit Switches:

- All units have the ability to work with limit switches or custom supplied mechanical limit switches
- Front Panel Indicators include Power Indicator
- Front Panel Controls include maintained stop push-button, main power disconnect switch (optional), extend push-button and retract push-button. In auto mode, the load moves until limit is reached; in jog mode, the load moves while button is pressed.

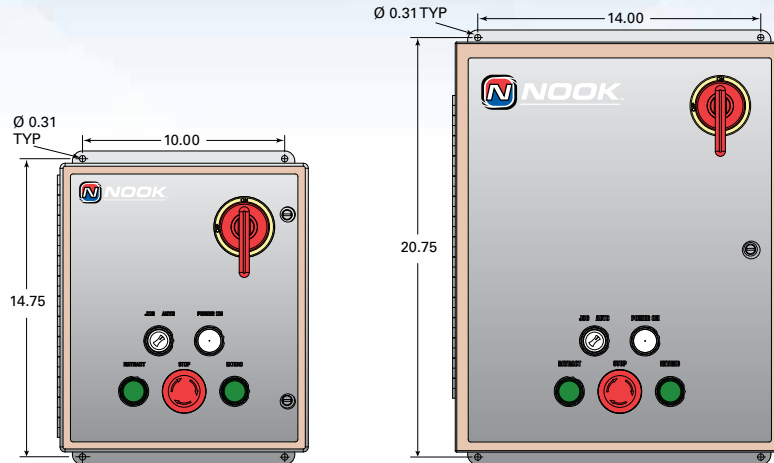
AC/DC variable speed controls, stepper or servo controls are also available

### Pendant Control



Contact Nook Engineering for ordering information

**20 ft Cable**



### MODEL NUMBERS

HP	Voltage	MODEL NUMBERS		Enclosure Size (in)
		Without Disconnect	With Disconnect	H x W x D
1/4	230	NCB23025	NCB23025D	14 x 12 x 8
	460	NCB46025	NCB46025D	14 x 12 x 8
1/3	230	NCB23033	NCB23033D	14 x 12 x 8
	460	NCB46033	NCB46033D	14 x 12 x 8
	575	NCB57033	NCB57033D	14 x 12 x 8
1/2	230	NCB23050	NCB23050D	14 x 12 x 8
	460	NCB46050	NCB46050D	14 x 12 x 8
	575	NCB57050	NCB57050D	14 x 12 x 8
3/4	230	NCB23075	NCB23075D	14 x 12 x 8
	460	NCB46075	NCB46075D	14 x 12 x 8
	575	NCB57075	NCB57075D	14 x 12 x 8
1	230	NCB230100	NCB230100D	14 x 12 x 8
	460	NCB460100	NCB460100D	14 x 12 x 8
	575	NCB570100	NCB570100D	14 x 12 x 8
1 1/2	230	NCB230150	NCB230150D	14 x 12 x 8
	460	NCB460150	NCB460150D	14 x 12 x 8
	575	NCB570150	NCB570150D	14 x 12 x 8
2	230	NCB230200	NCB230200D	14 x 12 x 8
	460	NCB460200	NCB460200D	14 x 12 x 8
	575	NCB570200	NCB570200D	14 x 12 x 8
3	230	NCB230300	NCB230300D	14 x 12 x 8
	460	NCB460300	NCB460300D	14 x 12 x 8
	575	NCB570300	NCB570300D	14 x 12 x 8
5	230	NCB230500	NCB230500D	20 x 16 x 8
	460	NCB460500	NCB460500D	14 x 12 x 8
	575	NCB570500	NCB570500D	14 x 12 x 8
7 1/2	230	NCB230750	NCB230750D	20 x 16 x 8
	460	NCB460750	NCB460750D	20 x 16 x 8
	575	NCB570750	NCB570750D	20 x 16 x 8
10	230	NCB231000	NCB231000D	20 x 16 x 8
	460	NCB461000	NCB461000D	20 x 16 x 8
	575	NCB571000	NCB571000D	20 x 16 x 8
15	230	NCB231500	NCB231500D	20 x 16 x 8
	460	NCB461500	NCB461500D	20 x 16 x 8
	575	NCB571500	NCB571500D	20 x 16 x 8



## PRECISION LINEAR ACTUATORS



Nook Linear Actuators are widely used in the solar industry.

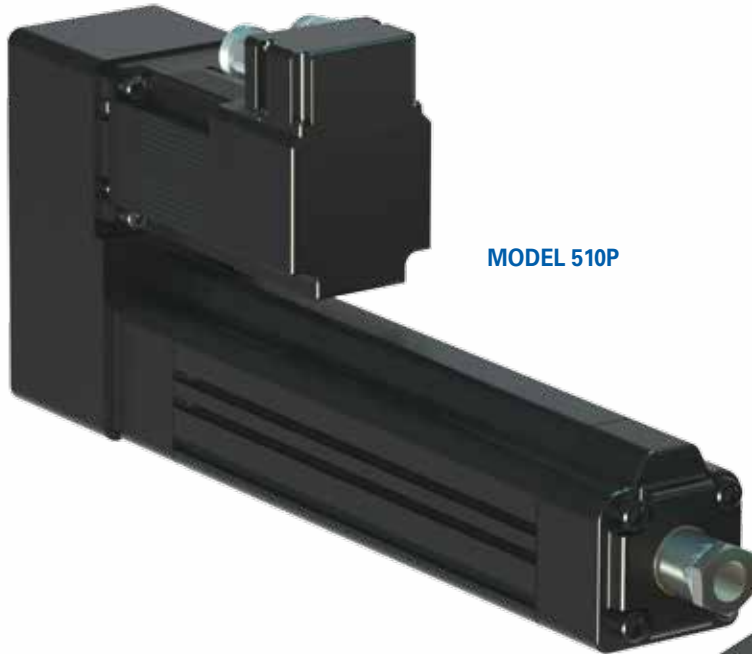


## SERIES 500™

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## FEATURES OVERVIEW

Series 500™ offers an expanded range of performance by providing higher loads, longer life, and increased duty cycles with higher speeds and programmability.



MODEL 510P



MODEL 510I

### SERIES 500™ ADVANTAGES

- Rated for continuous duty
- Operates at speeds up to 25 inches per second
- Ball screws are used on high-speed applications
- Long service life
- Anti-rotation device integrated
- Quiet running performance
- Complete system from one source including motor, drive, controller, and power supply
- Both ball screw and acme screw drives available
- Acme screw actuators designed for lower duty cycles where self-locking is desired.

### PERFORMANCE CHARACTERISTICS

- High mechanical efficiency
- Strokes up to 24 in
- Repeatability up to  $\pm 0.001$  in
- Toothed belt drive (for parallel motor mounting)
- Standard motor and gearhead flanges for simplified selection. Optional motors are available at customer selection when specified
- IP54 Standard
- IP65 Optional



# REFERENCE NUMBER SYSTEM

## SERIES 500 LINEAR ACTUATOR

### 510P—03 / 0631-1000 SRT RA / V63B / BC / 12 / ANS

#### MODEL

510P = Parallel  
510I = In-Line

#### GEAR RATIO

01 = 1:1  
15 = 1.5:1 (parallel style only)  
02 = 2:1 (parallel style only)  
03 = 3:1  
04 = 4:1  
05 = 5:1  
07 = 7:1  
10 = 10:1

#### SCREW SIZE

##### BALL SCREW MODELS

0750-0200 SRT RA  
0750-0500 SRT RA  
0631-1000 SRT RA

##### ACME SCREW MODELS

076-RA = 3/4-6 RA  
075-RA = 3/4-5 RA (option)  
070-RA = 3/4-10 RA (option)

#### MOTOR

T210 = Stepper NEMA 23 without Brake  
T210B = Stepper NEMA 23 with Brake  
T306 = Stepper NEMA 34 without Brake  
T306B = Stepper NEMA 34 with Brake  
V50 = Servo NEMA 23 without Brake  
V50B = Servo NEMA 23 with Brake  
V63 = Servo NEMA 34 without Brake  
V63B = Servo NEMA 34 with Brake

#### BASE END MOUNTING

B = Base Mount (Tapped Holes)  
R = Rear Trunnion Mount  
F = Front Trunnion Mount  
G = Front Flange Mount  
T = Adjustable Trunnion Mount  
C = Base Male Clevis (Parallel Style Only)  
D = Base Female Clevis (Parallel Style Only)

#### ROD END MOUNTING

C = Rod Clevis  
T = Threaded End 5/8-18  
H = Tapped Hole 5/8-18

#### TRAVEL

Travel in inches

#### MODIFIER LIST

A = Analog Linear Encoder (Parallel Style Only)  
D = Digital Linear Encoder (Parallel Style Only)  
N = Sensors (NPN)  
P = Sensors (PNP)  
S = Standard  
M = Modified

## TECHNICAL DATA

### BALL SCREW MODELS

Screw	Lead (in)	Nut Critical Speed (in/min)	Efficiency (%)	Lead Accuracy (in/ft)	Max Load (lb)	Dynamic Load* (lb)
<b>0750-0200</b>	0.200	800	>90	0.004	1,000	1,000
<b>0750-0500</b>	0.500	2000	>90	0.004	1,000	1,000
<b>0631-1000</b>	1.000	3000	>90	0.004	620	620

\* based on 1×10<sup>6</sup> inches of travel

### ACME SCREW MODELS

Screw	Lead (in)	Nut Critical Speed (rpm)	Efficiency (%)	Lead Accuracy (in/ft)	Max Load (lb)	Dynamic Load (lb)
<b>3/4-6</b>	0.166	Dependant on load	36	0.0036	1,000	1,000
<b>3/4-5</b>	0.200	Dependant on load	40	0.0036	1,000	1,000
<b>3/4-10</b>	0.100	Dependant on load	25	0.0036	1,000	1,000

# BALL SCREW PERFORMANCE CHARTS

## STEPPER MOTOR NEMA 23 (T210)

100% Duty Cycle  
Voltage: 120 VAC  
Ball Screw: 0750-0200



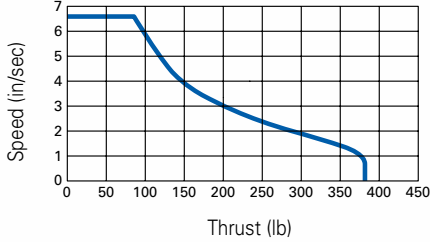
### 1:1 GEAR RATIO, GEAR OR BELT DRIVEN

Max No-Load Acceleration: 379 in/sec<sup>2</sup>



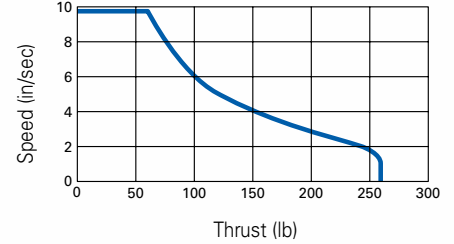
### 1.5:1 GEAR RATIO, BELT DRIVEN

Max No-Load Acceleration: 355 in/sec<sup>2</sup>



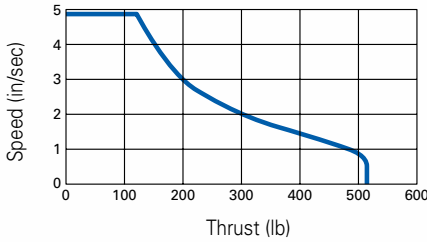
### 2:1 GEAR RATIO, BELT DRIVEN

Max No-Load Acceleration: 308 in/sec<sup>2</sup>



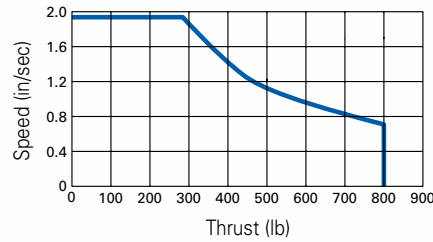
### 5:1 GEAR RATIO, GEAR DRIVEN

Max No-Load Acceleration: 144 in/sec<sup>2</sup>



### 10:1 GEAR RATIO, GEAR DRIVEN

Max No-Load Acceleration: 74 in/sec<sup>2</sup>



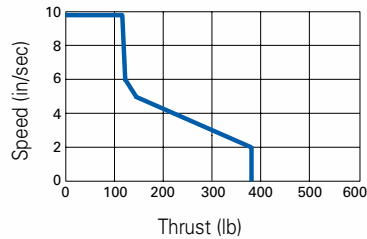
For performance data for 3:1, 4:1, or 7:1 gear ratio actuators, please contact Nook Engineering.

# STEPPER MOTOR NEMA 34 (T306)

100% Duty Cycle  
Voltage: 120 VAC  
Ball Screw: 0750-0200

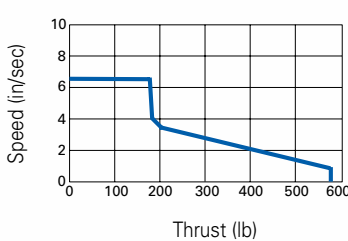
### 1:1 GEAR RATIO, GEAR OR BELT DRIVEN

Max No-Load Acceleration: 405 in/sec<sup>2</sup>



### 1.5:1 GEAR RATIO, BELT DRIVEN

Max No-Load Acceleration: 314 in/sec<sup>2</sup>



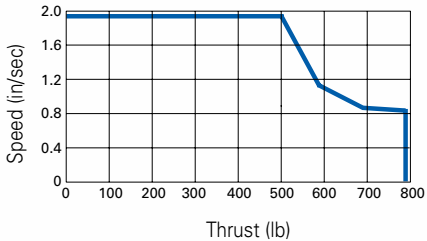
### 2:1 GEAR RATIO, BELT DRIVEN

Max No-Load Acceleration: 249 in/sec<sup>2</sup>



### 5:1 GEAR RATIO, GEAR DRIVEN

Max No-Load Acceleration: 105 in/sec<sup>2</sup>



For performance data for 3:1, 4:1, 7:1, or 10:1 gear ratio actuators, please contact Nook Engineering.

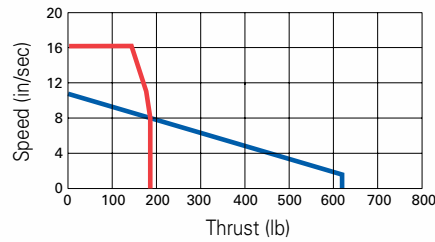
**SERVO MOTOR NEMA 23 (V50)**

100% Duty Cycle  
Ball Screw: 0750-0200

120 VAC ————  
240 VAC ————

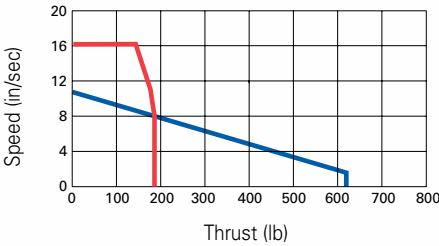
**1:1 GEAR RATIO, GEAR OR BELT DRIVEN**

Max No-Load Acceleration: 1160 in/sec<sup>2</sup>



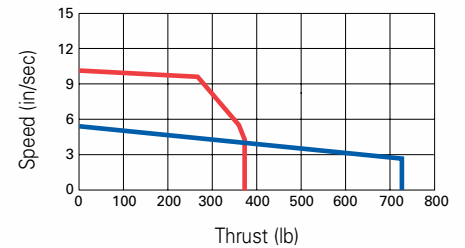
**1.5:1 GEAR RATIO, BELT DRIVEN**

Max No-Load Acceleration: 1285 in/sec<sup>2</sup>



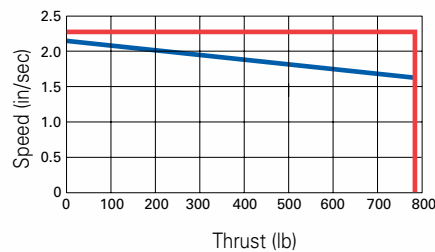
**2:1 GEAR RATIO, BELT DRIVEN**

Max No-Load Acceleration: 1240 in/sec<sup>2</sup>



**5:1 GEAR RATIO, GEAR DRIVEN**

Max No-Load Acceleration: 670 in/sec<sup>2</sup>



For performance data for 3:1, 4:1, 7:1, or 10:1 gear ratio actuators, please contact Nook Engineering.

For Servo Motor NEMA 34 performance data, please contact Nook Engineering.



Nook Linear Actuators used in a mobile broadcasting truck.

# ACME SCREW PERFORMANCE CHARTS

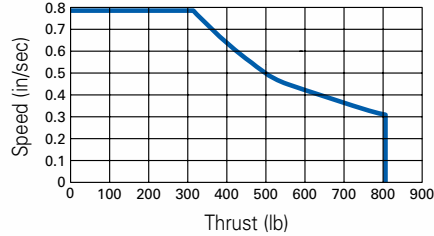
## STEPPER MOTOR NEMA 23 (T210)



50% Duty Cycle  
Voltage: 120 VAC  
Acme Screw: 3/4-6

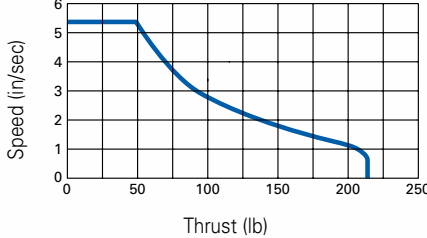
### 1:1 GEAR RATIO, GEAR OR BELT DRIVEN

Max No-Load Acceleration: 303 in/sec<sup>2</sup>



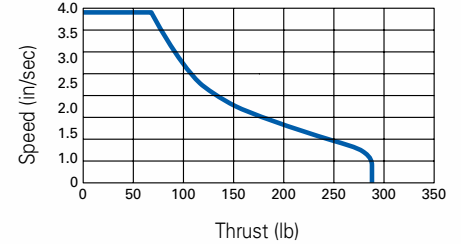
### 1.5:1 GEAR RATIO, BELT DRIVEN

Max No-Load Acceleration: 284 in/sec<sup>2</sup>



### 2:1 GEAR RATIO, BELT DRIVEN

Max No-Load Acceleration: 247 in/sec<sup>2</sup>



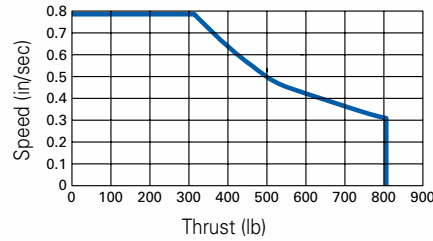
### 5:1 GEAR RATIO, GEAR DRIVEN

Max No-Load Acceleration: 115 in/sec<sup>2</sup>



### 10:1 GEAR RATIO, GEAR DRIVEN

Max No-Load Acceleration: 59 in/sec<sup>2</sup>



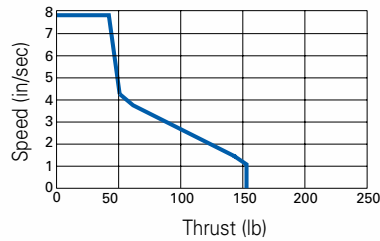
For performance data for 3:1, 4:1, or 7:1 gear ratio actuators, please contact Nook Engineering.

## STEPPER MOTOR NEMA 34 (T306)

100% Duty Cycle  
Voltage: 120 VAC  
Acme Screw: 3/4-6

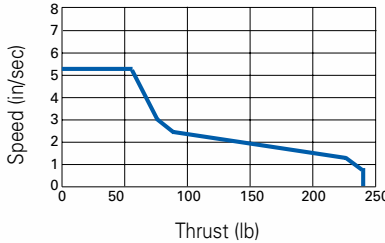
### 1:1 GEAR RATIO, GEAR OR BELT DRIVEN

Max No-Load Acceleration: 324 in/sec<sup>2</sup>



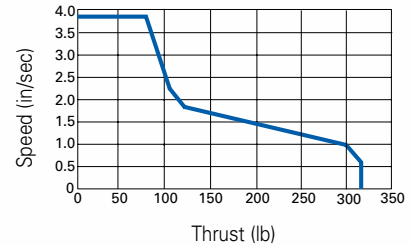
### 1.5:1 GEAR RATIO, BELT DRIVEN

Max No-Load Acceleration: 251 in/sec<sup>2</sup>



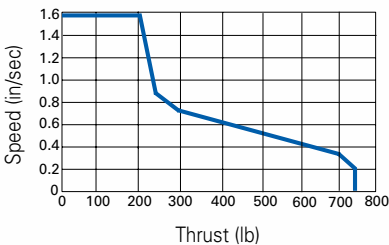
### 2:1 GEAR RATIO, BELT DRIVEN

Max No-Load Acceleration: 199 in/sec<sup>2</sup>



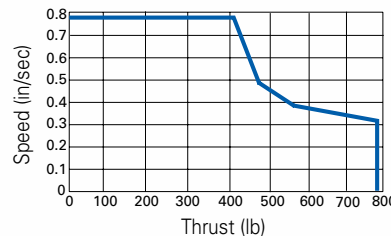
### 5:1 GEAR RATIO, GEAR DRIVEN

Max No-Load Acceleration: 84 in/sec<sup>2</sup>



### 10:1 GEAR RATIO, GEAR DRIVEN

Max No-Load Acceleration: 42 in/sec<sup>2</sup>



For performance data for 3:1, 4:1, or 7:1 gear ratio actuators, please contact Nook Engineering.

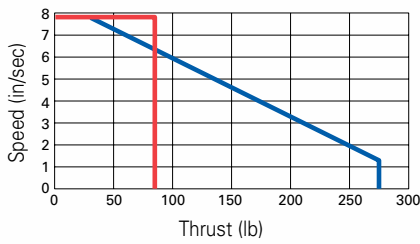
**SERVO MOTOR NEMA 23 (V50)**

50% Duty Cycle  
Acme Screw: 3/4-6

120 VAC ————  
240 VAC ————

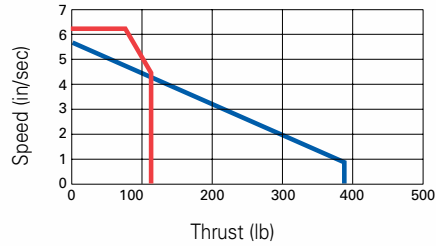
**1:1 GEAR RATIO, GEAR OR BELT DRIVEN**

Max No-Load Acceleration: 930 in/sec<sup>2</sup>



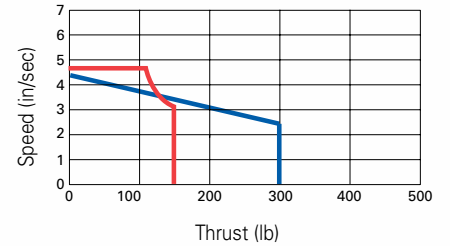
**1.5:1 GEAR RATIO, BELT DRIVEN**

Max No-Load Acceleration: 1030 in/sec<sup>2</sup>



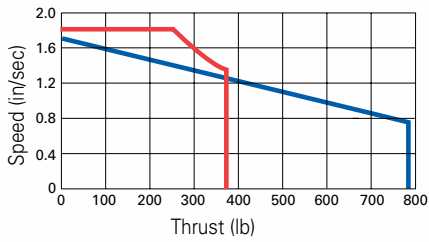
**2:1 GEAR RATIO, BELT DRIVEN**

Max No-Load Acceleration: 995 in/sec<sup>2</sup>



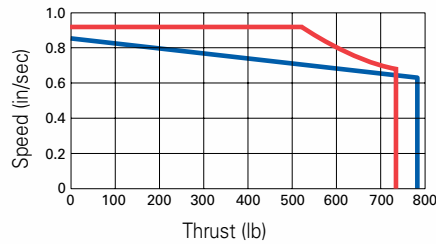
**5:1 GEAR RATIO, GEAR DRIVEN**

Max No-Load Acceleration: 540 in/sec<sup>2</sup>



**10:1 GEAR RATIO, GEAR DRIVEN**

Max No-Load Acceleration: 280 in/sec<sup>2</sup>



For performance data for 3:1, 4:1, or 7:1 gear ratio actuators, please contact Nook Engineering.

For Servo Motor NEMA 34 performance data, please contact Nook Engineering.



Nook Linear Actuators are widely used in the airline industry.

## ROD ACCESSORIES

ROD END CLEVIS



FRONT FLANGE



ROD END TAPPED HOLE



THREADED END





## BASE END ACCESSORIES

BASE MOUNT



REAR TRUNNION



REAR FEMALE CLEVIS



ADJUSTABLE TRUNNION



REAR MALE CLEVIS



FRONT TRUNNION





## SENSORS

Nook sensors are designed to meet the need for low cost position sensing on the Series 500™. It is highly accurate, with sensor repeatability up to  $\pm .004"$  (0.1MM). This design allows users to install and adjust sensors on a single actuator and integrate easily with a motion control system.

The sensor system is supplied with two PNP or NPN (normally open) switches. For additional switches or to order a normally closed switch, contact Nook Application Engineers.

Nook sensors are designed to allow easy field adjustments. Magnets are secured to the extension tube to ensure a positive response once it passes near the position sensor. To adjust the position sensors simply position the extension tube in the correct position, loosen the locking screw, and then slide the movable sensor to the desired location until the sensor indicates a response. Additional sensors can be added or moved. It is also possible to add multiple sensors to the same slot.

### HOW TO ORDER SENSORS

EXAMPLE:

510P—03 / 0631-1000 SRT RA / V63B / BC / 12 / ANS

P = PNP  
N = NPN



# LINEAR POSITION TRANSDUCER

## BENEFITS

- Non-Contact - No wear, such as found with pot wipers on conductive mylar, particularly when mounted on dithered actuators or vibrating installations
- Low Power Needs - Allows use with printed circuit-level supplies of +5 Vdc
- No Drift - No periodic re-calibration needed
- Customizable Active Zones - Offers full output sensitivity for smaller active zones
- Customizable Reading Direction - Forward or Reverse acting analog output allows match to control requirements
- Only available with parallel motor mount and certain stroke lengths

## ANALOG

### Outputs

Resolution: Infinite (limited by ripple on the power supply)  
 Update rate: 500 Hz (2 ms period)  
 Repeatability: ± 25µm  
 Hysteresis: ± 25µm  
 Outputs: 2% to 98% of 5 Vdc supply, ratiometric  
 Length (m): <100

### Electronics

Operating voltage: 5 Vdc, -5%, +10%  
 Supply Current: 40 mA typical

PIN NO.	WIRE COLOR	FUNCTION
1	White	Common
2	Green	Voltage output
3	Brown	Supply voltage
4	N/A	N/A

## DIGITAL

### Outputs

Resolution: 100 µm standard, 50 µm possible on custom basis  
 Update rate: 1500 Hz (0.6 ms period)  
 Repeatability: ± 25µm  
 Hysteresis: ± 25µm  
 Outputs: Synchronous Serial Interface (SSI), (RS-422 type differential signal pairs)  
 Data Format: Binary standard (gray code optional), optional parity bit.  
 Data length: 24 bit  
 Data speed (Baud rate): 100kBd to 400 kBd, depending on cable length  
 Length (m): <100

### Electronics

Operating voltage: 12 Vdc, -15%, +20%  
 Supply Current: 80 mA typical

PIN NO.	WIRE COLOR	FUNCTION
1	White	Ground
2	Green	Clk -
3	Brown	+12 Vdc
4	Yellow	Clk +
5	Gray	Data -
6	Pink	Data +



SERIES 500™

## PRECISION LINEAR ACTUATORS



Nook Linear Actuators are used in many agricultural applications.



## CC™ SERIES COMPACT CYLINDER

### CC™ SERIES COMPACT

#### CYLINDER..... 100-119

Inside the CC™ Cylinder.....102-103

Introduction ..... 104

Reference Number System..... 105

Technical Data .....106-109

Accessories ..... 110-118

Motor Diagram & 110 Vac Adapter ..... 119

Setting Limit Switches..... 119

## INSIDE THE CC™ CYLINDER

### BRAKE

The load sensitive brake maintains the actuator's position when at rest, without consuming power. (Ball Screw models only)



### MOUNTING ENDS

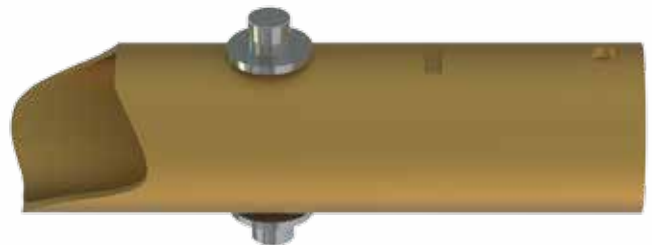
The CC™ Linear Actuator can be fitted with multiple mounting arrangements including a variety of clevis and mounting ends.

1/2" Bolt

1/2" Spherical Rod Eye

1/2" Clevis End

1/2" Threaded Rod End



### BASE MOUNTS

A variety of mounting brackets and optional trunnion mounts are available.



# CC™ CYLINDER LINEAR ACTUATOR



## MOTORS

The CC™ Linear Actuator offers a variety of AC and DC motors including an optional stepper motor.

12 VDC
24 VDC
36 VDC
90 VDC
110 VAC
Stepper

## LIMIT SWITCH

The screw type limit switch offers precise positioning for travels up to 36 inches. The design of this switch allows the user to easily set limits at both ends of travel



## GEAR RATIOS

The CC™ Linear Actuator is fitted with either a belt drive or multiple gear ratios.

18:1 GEAR
19:1 BELT
28:1 GEAR
58:1 GEAR



Ball Nut



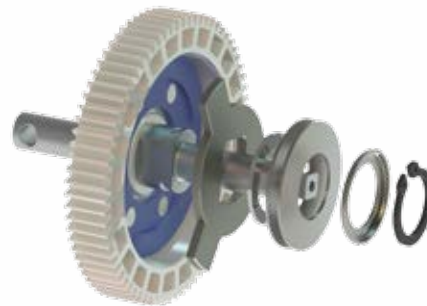
Acme Nut

## LIFTING SCREW

Optional acme and ball screw lead and diameters are available.

5/8-5 Acme Screw
0631-0200 Ball Screw
0631-0500 Ball Screw (no brake available)*
0750-0200 Ball Screw (no brake available)*

\* optional



## CLUTCH

The CC Linear Actuator gear head offers a heavy-duty clutch that protects the gears and components in the event of overload or overtravel. Not available with belt drive.

CC™ CYLINDER

## INTRODUCTION

### CC<sup>™</sup> CYLINDERS

**HIGH PERFORMANCE, LOW COST, POSITIONING SYSTEM**  
**3000 LB. STATIC CAPACITY**

Nook Industries CC<sup>™</sup> Actuators are a combination of an electric motor and an acme screw or a high efficiency ball screw. They are designed to be ready to install directly into any industrial or commercial application. They are ideally suited for any OEM application where linear motion is needed. These high-quality actuators feature:

- Durable construction
- Dependable performance
- Long-life operation
- High repeatability
- Operation in either compression or tension loading applications
- Adjustable limit switches
- Lifetime lubrication
- Mechanical overload protection
- Corrosion resistant exterior surfaces

### COMMON APPLICATIONS

- Telecommunications
- Architectural Automation
- Medical and Hospital Equipment
- Semiconductor
- Food Processing
- Farm Equipment
- Satellite Dish and Antenna Positioning

### DUTY CYCLE

25%, max "on-time" of 5 minutes at rated load

### TEMPERATURE RATING

Operating temperature range is -30°F to +160°F

### ENVIRONMENTAL PROTECTION CLASS

- IP54



Nook Linear Actuators used in a tire balancing machine.



# REFERENCE NUMBER SYSTEM

## CC CYLINDERS

### CC - 18 - HD / C / 111 / AA / 24 / BS

#### MODEL

- CC = Standard Actuator
- CCT = T-Mounted Actuators
- CCU = U-Mounted Actuators

#### GEAR RATIO

- 18 = 18:1
- 19 = 19:1 (BELT - HD only)
- 28 = 28:1
- 58 = 58:1

#### SCREW

- HD = Ball Screw
- A8 = Acme Screw

#### VOLTAGE

- A = 12 VDC
- B = 24 VDC
- C = 36 VDC
- D = 90 VDC
- E = 110 VAC (with rectifier)
- F = 12 VDC HI SPEED
- H = Stepper

#### LIMIT SWITCH

- 0 = No Limit Switch
- 1 = Limit Switches
- 2 = Dual Limit Switches  
(1 for motor shut-off, 1 for PLC control)

#### SENSOR

- 0 = No Sensor
- 1 = Reed Switch
- 2 = Hall Effect Sensor
- 3 = 10K Potentiometer
- 4 = Encoder (Specify PPR)

#### CLUTCH

- 0 = No Clutch
- 1 = Clutch (Standard)

#### TUBE MOUNTING

- A = Trunnion
- B = Heavy Duty In-Line Bracket
- C = Standard Tube Clamp
- D = Heavy Duty Tube Clamp
- E = Heavy Duty Long CS Clamp
- H = Heavy Duty Long Clamp
- J = Light Duty In-Line Bracket
- K = Heavy Duty In-Line Clamp
- L = Trunnion Clamp
- M = Trunnion Bracket
- N = Long Trunnion Bracket
- O = Side Trunnion Bracket

#### END MOUNTING

- A = 1/2" Flat
- B = 1/2" Swivel
- C = 3/4" Swivel
- D = 3/4"-10 Tapped Hole
- E = 1/2"-20 Tapped Hole
- H = 3/8"-16 Tapped Hole
- J = 5/8"-18 Tapped Hole

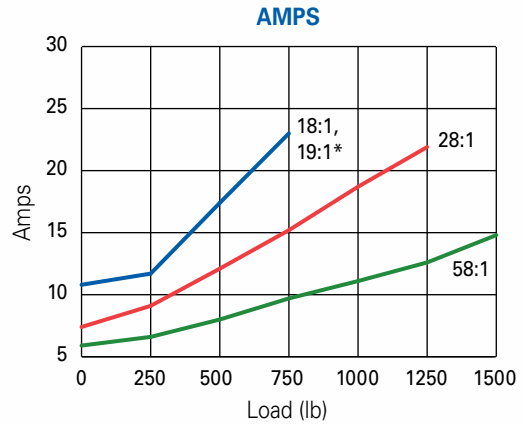
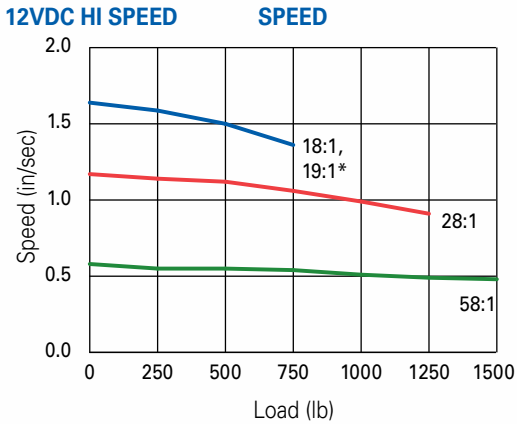
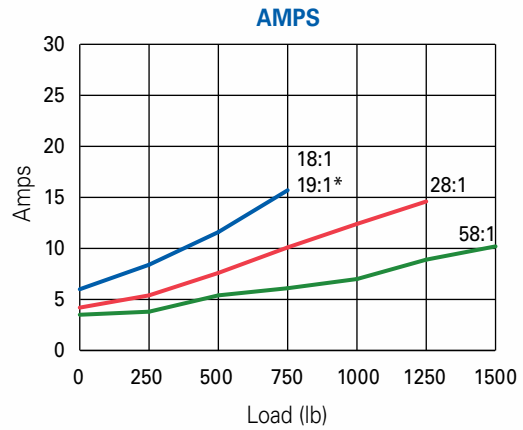
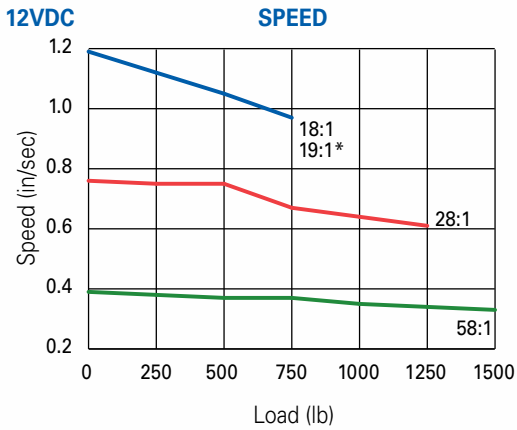
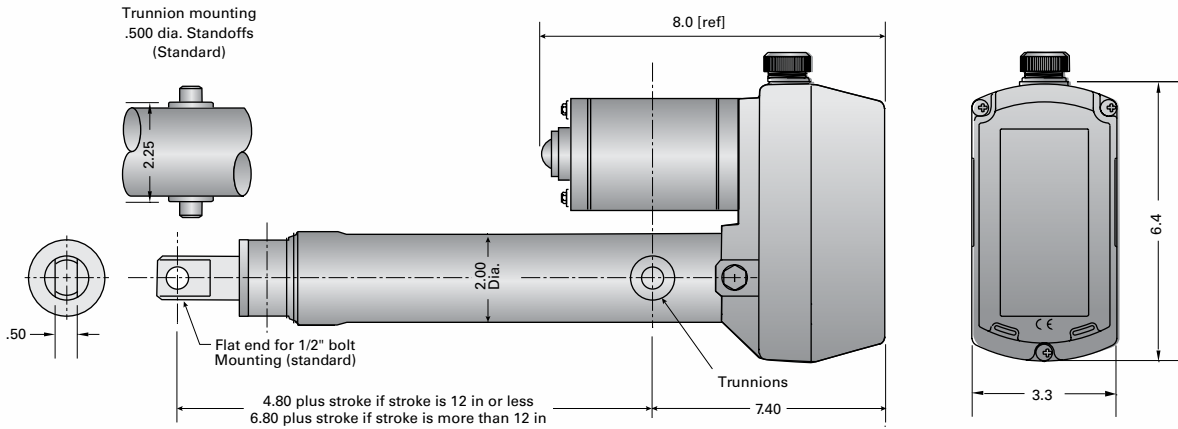
#### TRAVEL

In Inches.  
Anything over 36", contact factory

#### MODIFIER LIST

- B = Bellows Boot
- Z = Motor Boot
- W = Wiper
- K = Keyed Tube
- S = Standard
- M = Modified

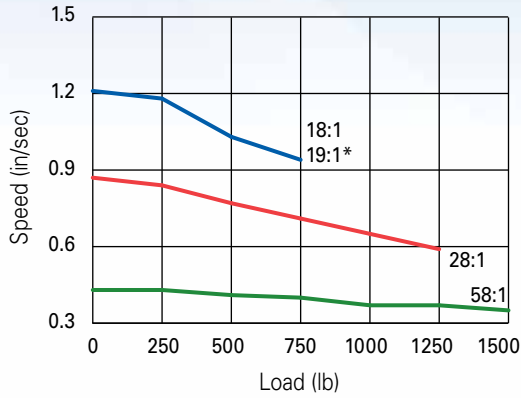
# BALL SCREW SERIES DIMENSIONS AND PERFORMANCE



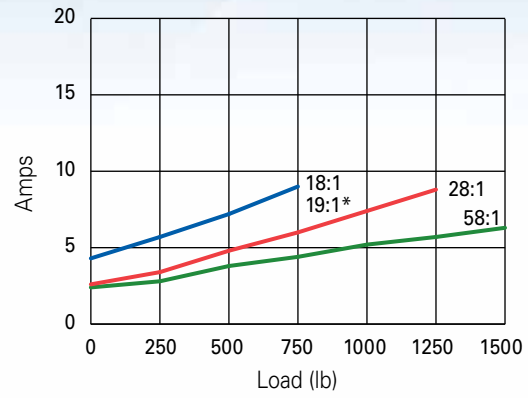
\* Belt-driven

**24VDC**

**SPEED**

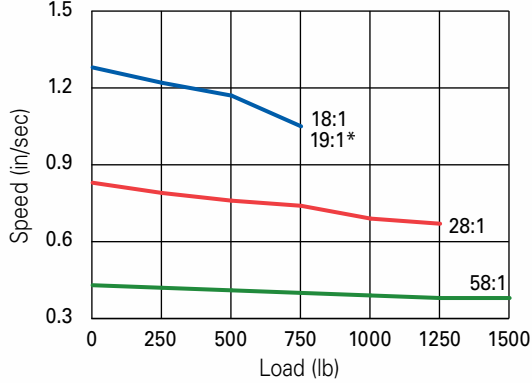


**AMPS**

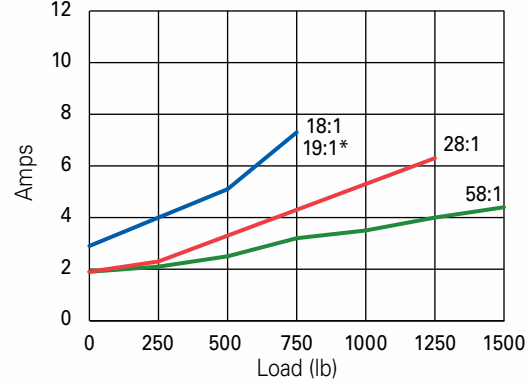


**36VDC**

**SPEED**

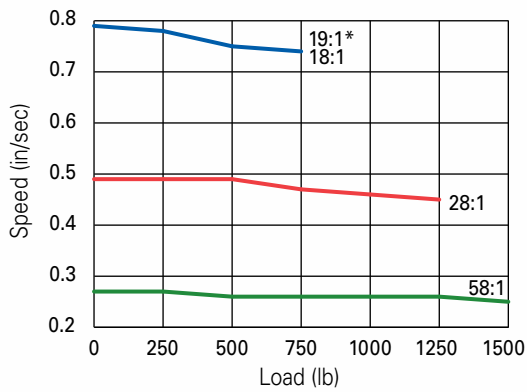


**AMPS**

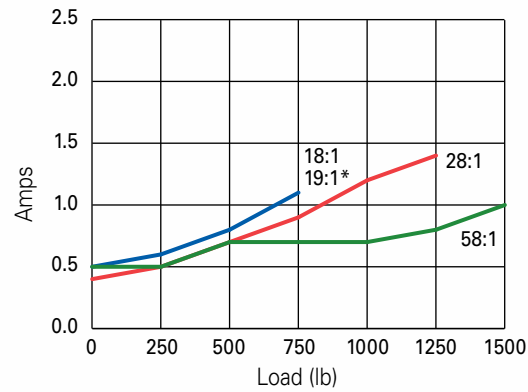


**90VDC**

**SPEED**

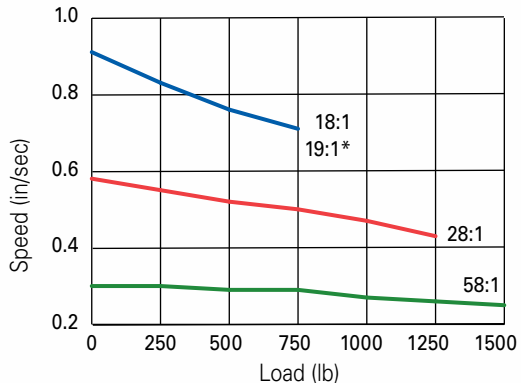


**AMPS**

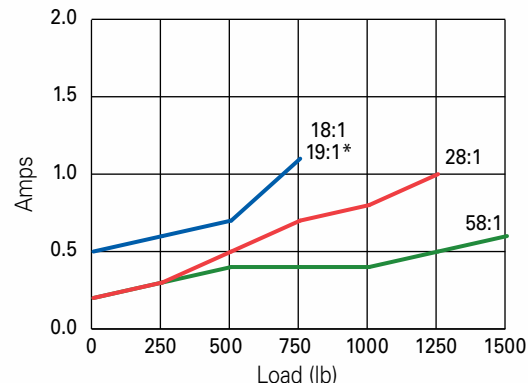


**110VAC**

**SPEED**

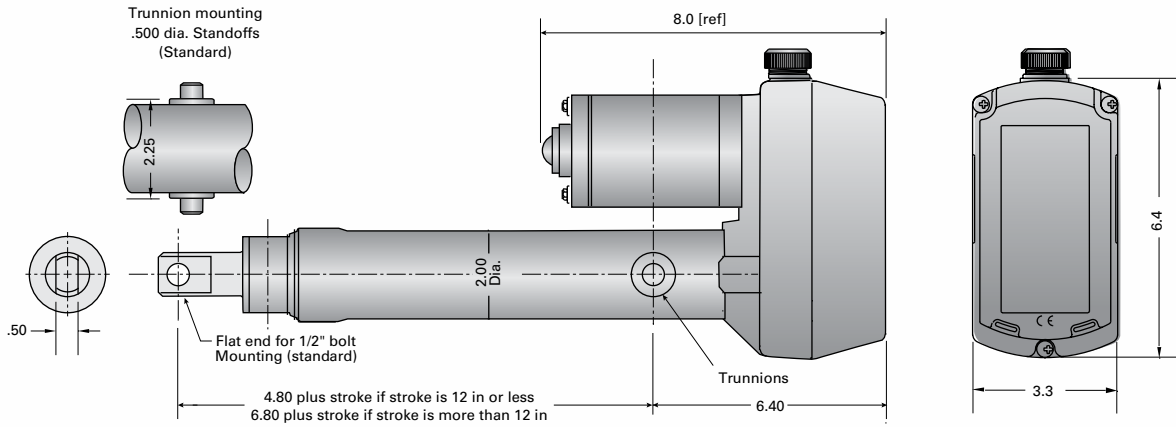


**AMPS**



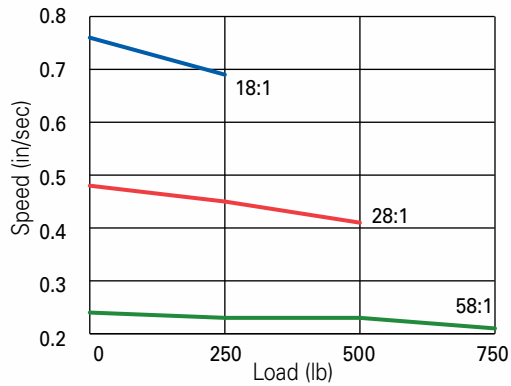
CC™ CYLINDER

# ACME SCREW SERIES DIMENSIONS AND PERFORMANCE

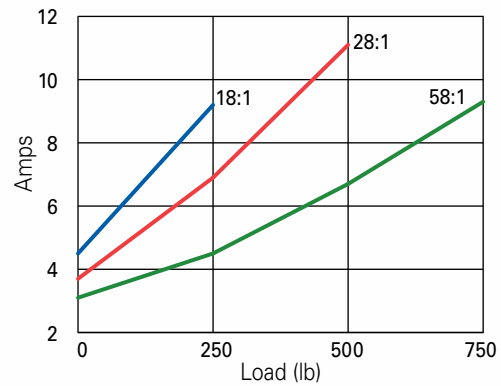


## 12VDC

## SPEED

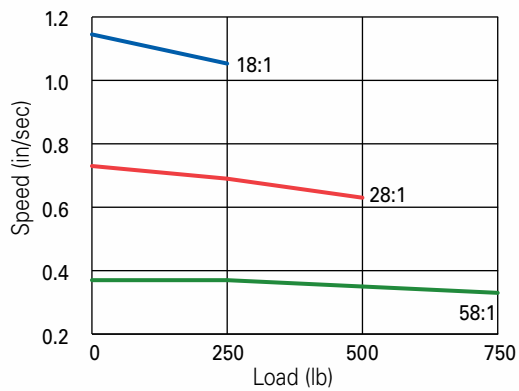


## AMPS

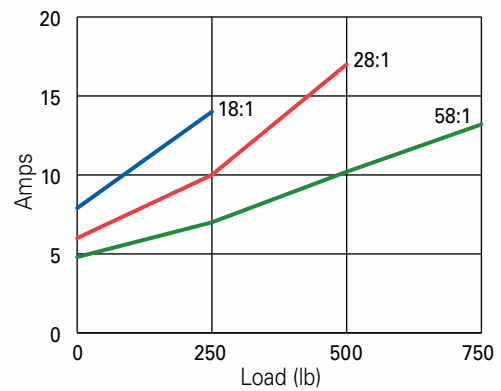


## 12VDC HI SPEED

## SPEED

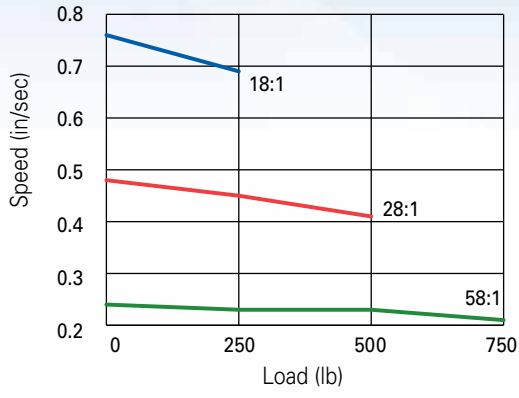


## AMPS

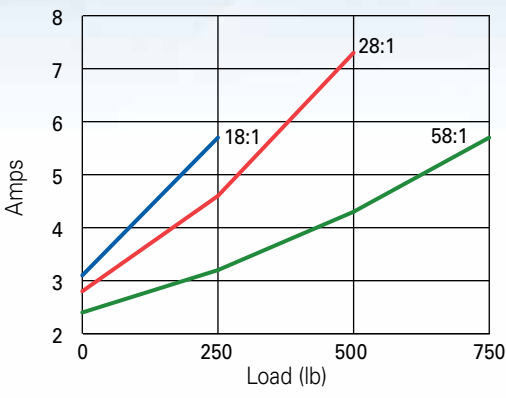


**24VDC**

**SPEED**

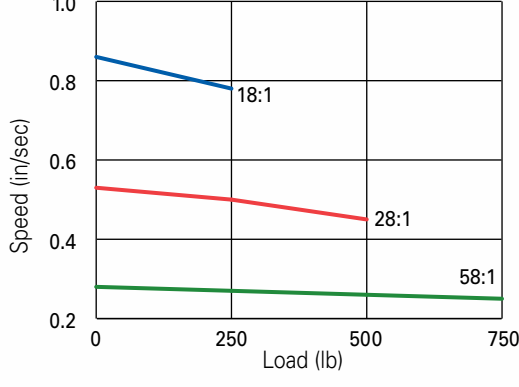


**AMPS**

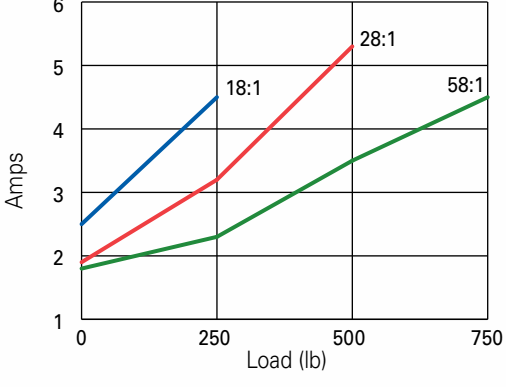


**36VDC**

**SPEED**

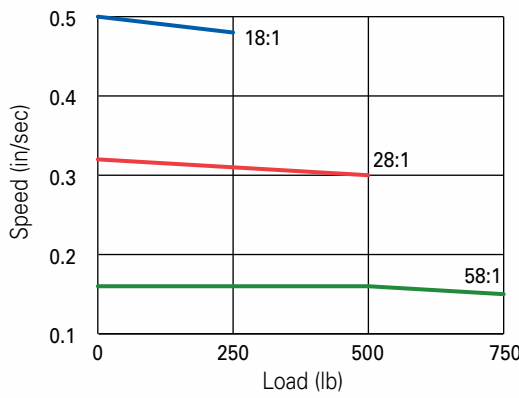


**AMPS**

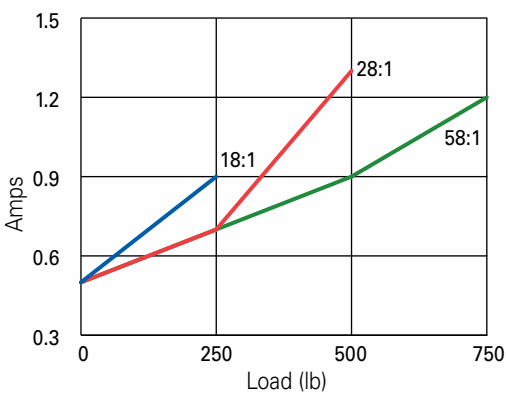


**90VDC**

**SPEED**

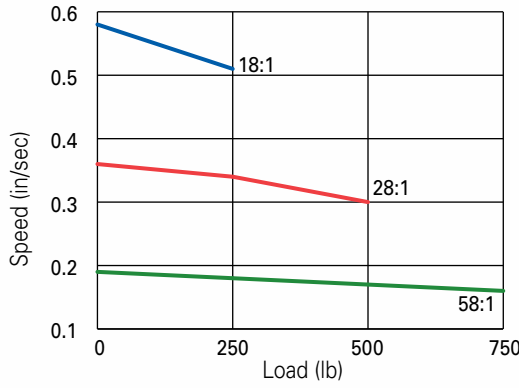


**AMPS**

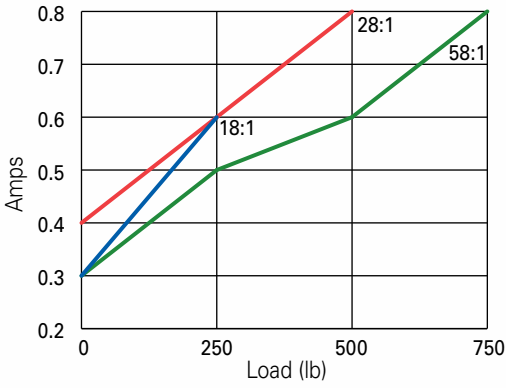


**110VAC**

**SPEED**



**AMPS**



CC™ CYLINDER

The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Nook Industries products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement.

## ACCESSORIES

Nook Industries offers a variety of accessories that are specifically designed for the CC™ Actuators. There are several mounting options to choose from, including two tandem configurations. Limit switch and sensor options, as well as control devices are also available. The CC™ Actuator can be provided with boot covers for environmental protection for both the extension tube and for the motor gear box.



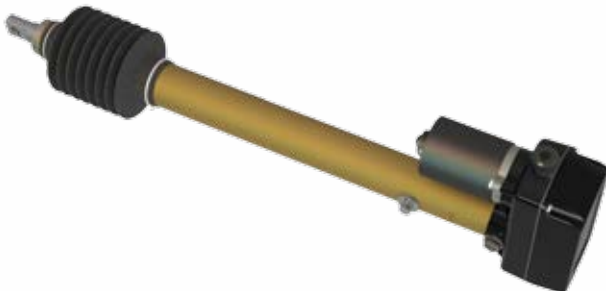
**CLAMPS**  
Page 112



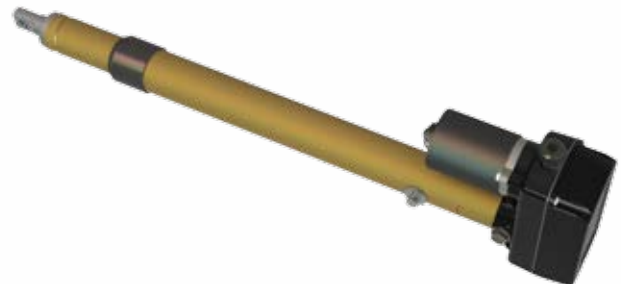
**ROD ENDS**  
Page 115



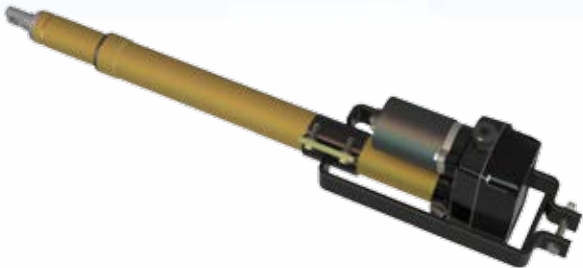
**U MOUNT**  
Page 116



**BELLOWS BOOTS AND MOTOR BOOTS**  
Page 117



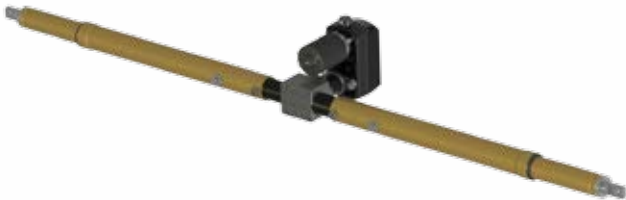
**WIPERS**  
Page 117



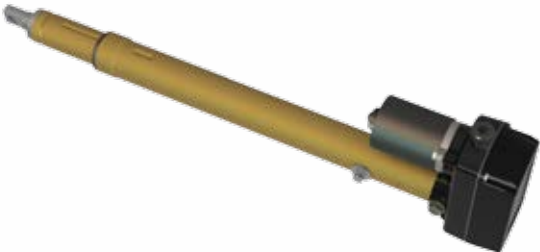
**BRACKETS**  
Page 113



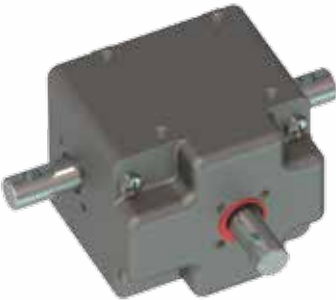
**TRUNNION BRACKETS**  
page 114



**T MOUNT**  
Page 116



**KEYED ACTUATORS**  
Page 117



**GEARBOXES**  
Page 117



**SENSOR AND CONTROL OPTIONS**  
Page 118

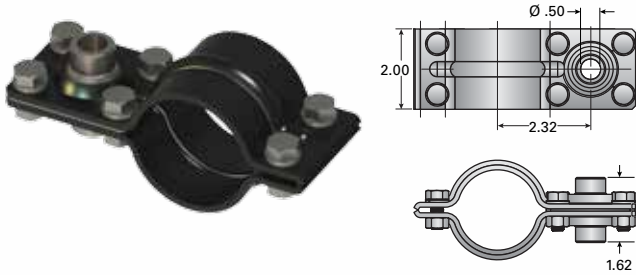
CC™ CYLINDER



# CLAMPS

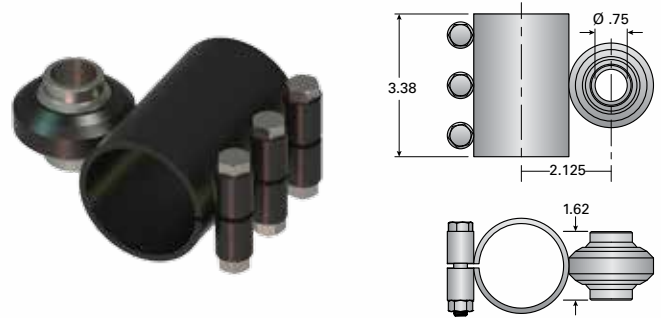
## STANDARD CLAMP

Part Number: 818-20



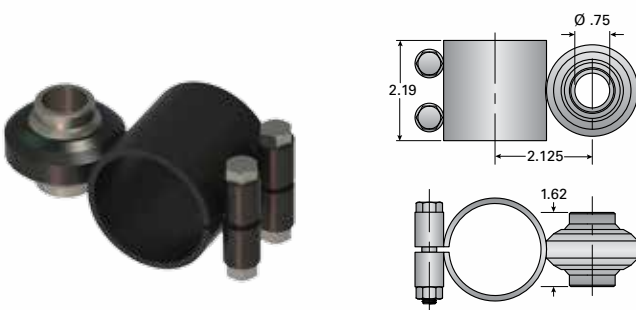
## HEAVY DUTY LONG CLAMP

Part Number: 818-51



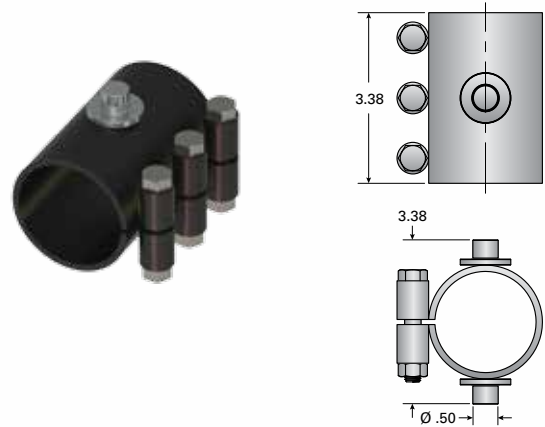
## HEAVY DUTY CLAMP

Part Number: 818-50



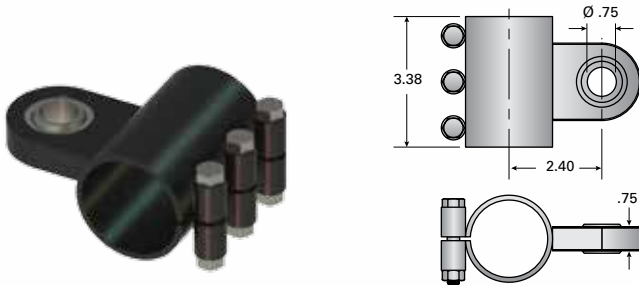
## TRUNNION CLAMP

Part Number: 818-55



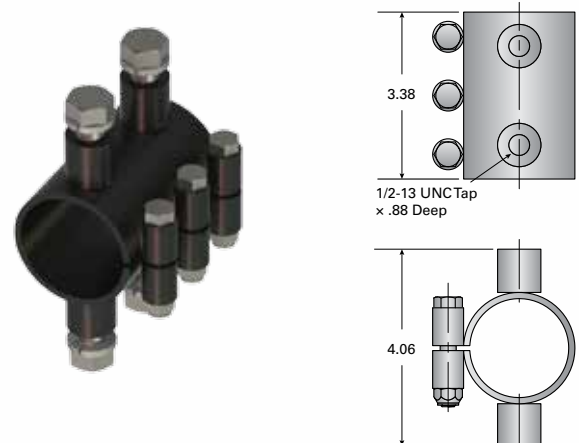
## HEAVY DUTY LONG CS CLAMP

Part Number: 818-51CS



## HEAVY DUTY IN-LINE CLAMP

Part Number: 818-52

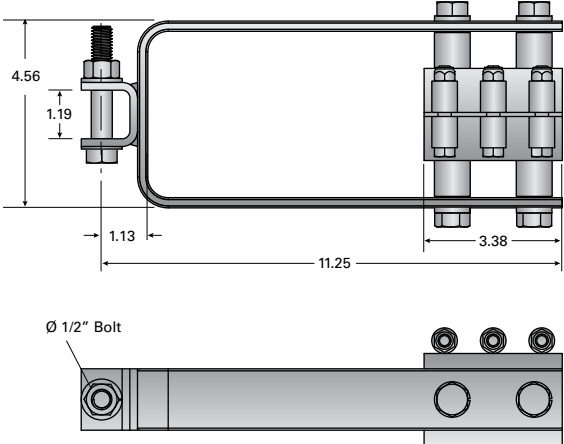


# MOUNTING BRACKETS

## HEAVY DUTY IN-LINE BRACKET

Part Number: 844-52

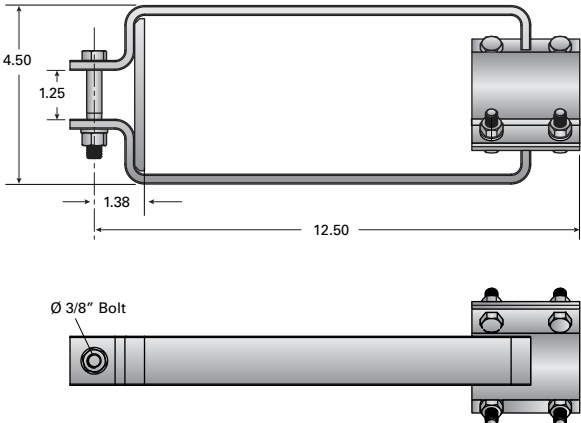
For use with 1500 lb capacity units



## LIGHT DUTY IN-LINE BRACKET

Part Number: 844-50

For use with 750 lb capacity units

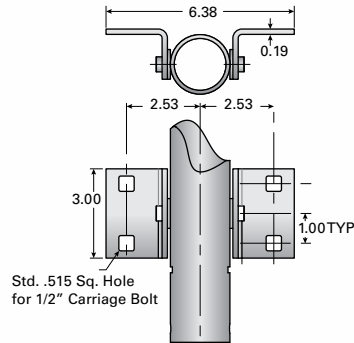


CC™ CYLINDER

# TRUNNION MOUNTING BRACKETS

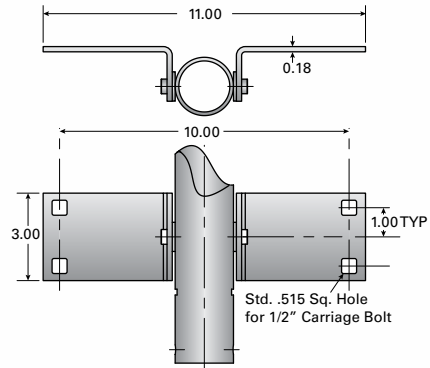
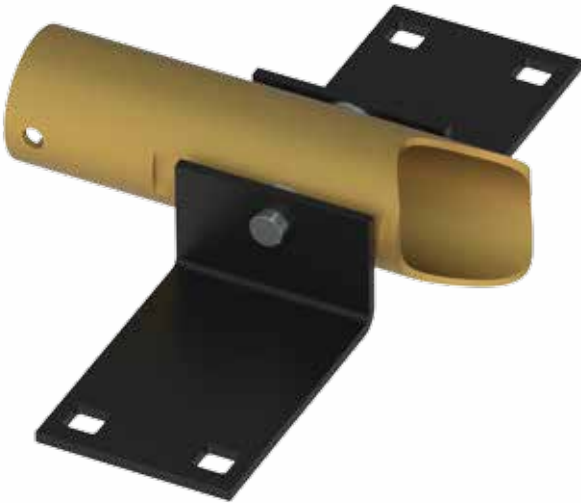
## TRUNNION BRACKET

Part Number: 846-20



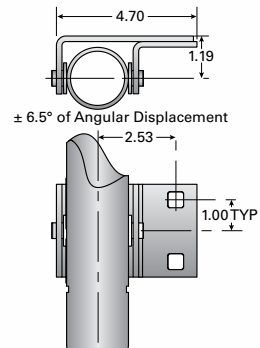
## LONG TRUNNION BRACKET

Part Number: 846-21



## SIDE TRUNNION BRACKET

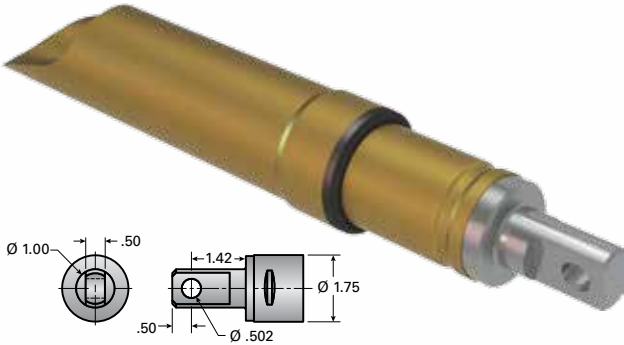
Part Number: 846-22



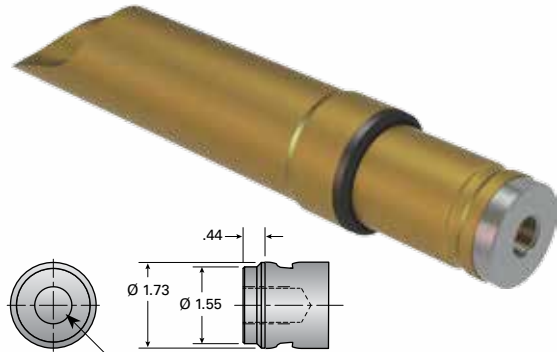
# ROD END MOUNTING OPTIONS

CC Linear Actuators can be mounted with standard trunnions and clevis end. When double clevis mounting is required, an optional bracket is available.

### MALE CLEVIS

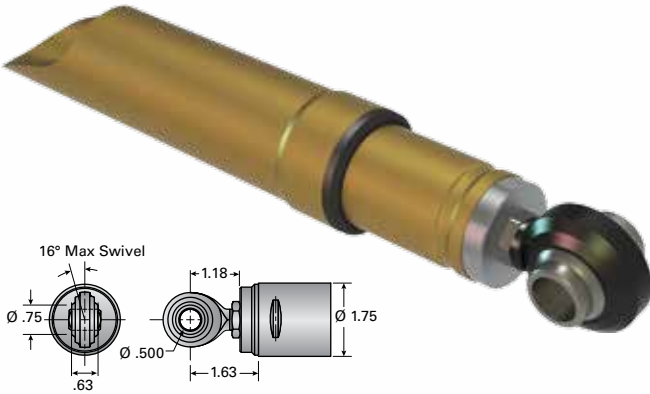


### TAPPED HOLE

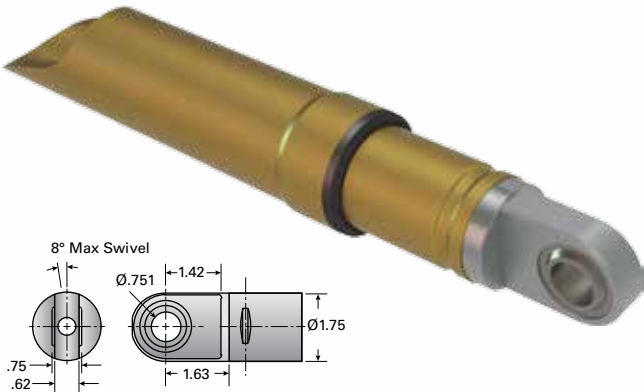


- 3/4-10 Tapped Hole
- 1/2-20 Tapped Hole
- 3/8-16 Tapped Hole
- 5/8-18 Tapped Hole

### 1/2" SWIVEL BALL END



### 3/4" SWIVEL BALL END



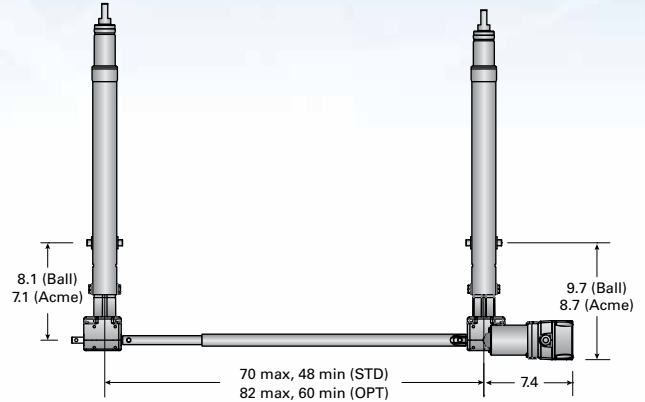
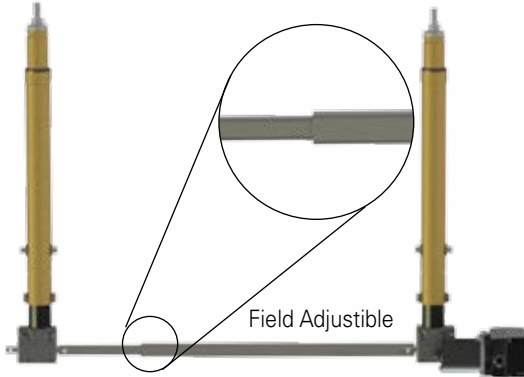
Nook Linear Actuators are used in many road maintenance applications.

**CC™ CYLINDER**

## U-MOUNT

U-Mount configuration is designed with two actuating cylinders that work in tandem providing a uniform synchronized motion in the same direction, with a single motor and gear box. The tandem mount can be field-adjusted to varying widths. Additional actuator rod can be added to accommodate longer arrangements.

The U-Mount comes with a standard width adjustment of 70" max to 48" min center to center of the actuator rods. An optional width adjustment can be provided giving an 82" max to 60" min from center to center of the actuator rods.



### HOW TO ORDER A U-MOUNT CC™ CYLINDER

**CCU18 - HD / C / 111 / AA / 24 / BS**

U-Mount designation

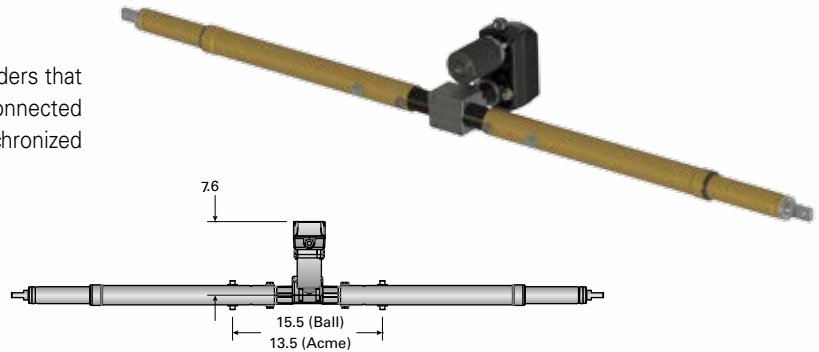
## T-MOUNT

T-Mount configuration is designed with two actuating cylinders that work in opposing directions. Both actuator rods are connected to the same motor and gearbox providing a uniform synchronized motion in the opposite direction.

### HOW TO ORDER A U-MOUNT CC™ CYLINDER

**CCT18 - HD / C / 111 / AA / 24 / BS**

T-Mount designation



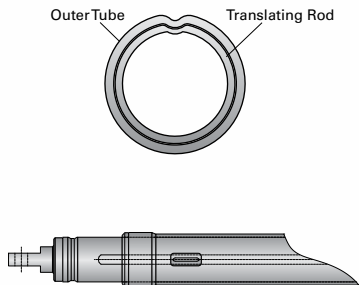
## ALTERNATE GEARBOX ASSEMBLIES

CC Cylinders can also be fitted with a 1:1 Miter Gearbox, or a 5:1 or 20:1 Worm Screw Gear Box. Contact Nook Industries for alternate gearbox options.



## KEYED ACTUATORS

The CC™ Actuator comes with a keyed option that allows an extension rod with an anti-rotation feature which will not allow the transmission of torque to the rod end mount. This is ideal for applications where load structures cannot accommodate torque loads.



## BOOTS

The CC™ Actuator can be fitted with a bellows boot to protect the extension tube from contamination.

Standard boots are molded for oil, water, and weather resistance and are furnished with tie straps. Tie straps are attached from convolution to convolution and help the boot extend uniformly.

A motor boot can be added to cover the gearbox and motor to protect them from the environment. The motor boot is made from a molded plastic that can be easily retrofitted in the field.



## WIPERS

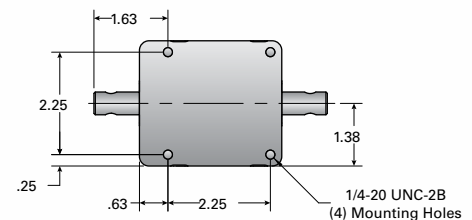
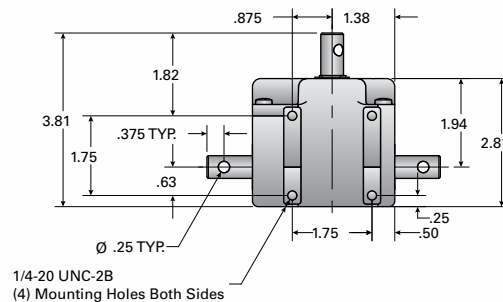
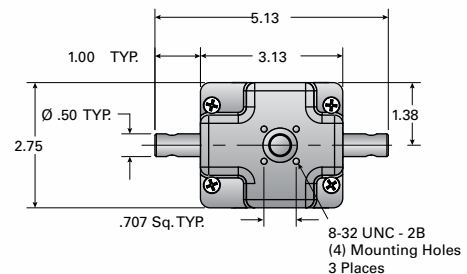
The CC™ Actuator can be provided with a custom fitted wiper to prevent moisture and debris from entering the rod end opening of the outer tube. It is ideal for dirty, harsh, and wet environments.



## GEARBOXES

Part number CP-790-00

Right Angle Torque Capacity	150 in-lb
Thru Drive Torque Capacity	450 in-lb





## SENSOR OPTIONS

Nook sensor options are used to provide input to counters, PLCs, or other control systems.

### POTENTIOMETER

The 10K ohm potentiometer provides a varying resistance in proportion to the travel. Potentiometers offer absolute position feedback regardless of the loss of power.

### HALL EFFECT

The hall effect sensor provides pulses at the rate of 40 per inch of travel.

### REED SWITCH (OPTIONAL)

The reed switch provides contact closures at the rate of 40 per inch of travel. Contact Nook Engineering for ordering details.

### ENCODER

All resolutions stated are before quadrature decoding (example: 1,000 PPR  $\times$  4 = 4,000 counts)

Pulses per Rev Options [PPR] : 48, 96, 100, 125, 196, 200, 250, 256, 384, 400, 500, 512, 800, 1,000, 1,024, 2,048.

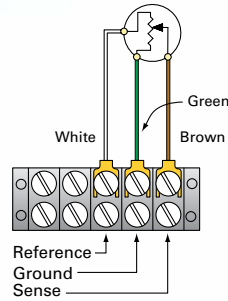
Resolution: All resolutions stated are before quadrature decoding (example 1000 PPR  $\times$  4 = 4000 counts)

3.6 VDC - 5.5 VDC; Max power consumption 10mA

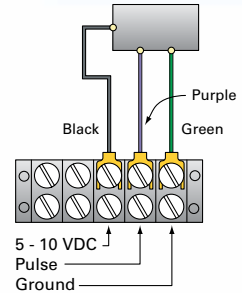
Temp range: -40 - 100°C

Current consumption: 6mA (typ), 10mA max

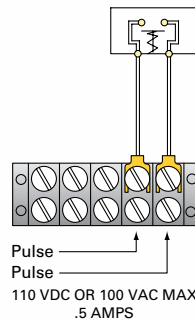
10k Potentiometer



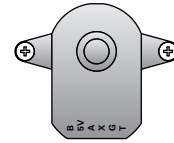
Hall Effect



Reed Switch



Encoder



- B = B Channel
- 5V = +5 VDC Power
- A = A Channel
- X = Index Output
- G = Ground
- T = Unused

## CONTROL PENDANTS



### PART NUMBER

NCP-AC  
NCP-DC

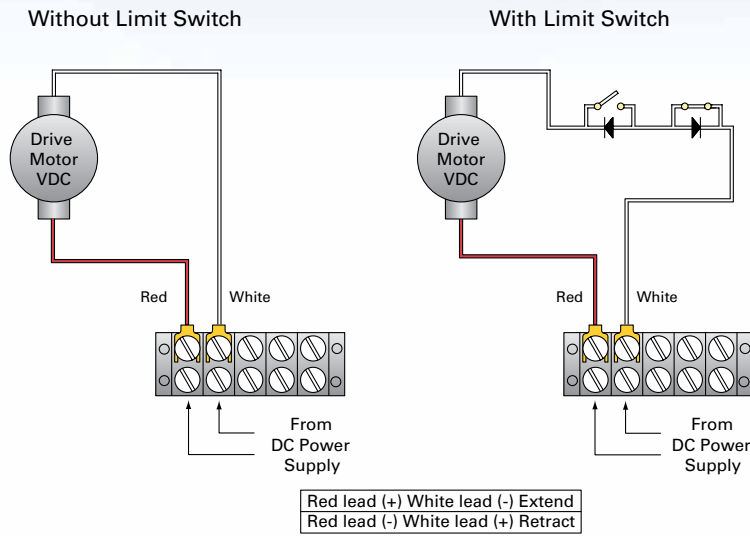


### CUSTOM PENDANTS AVAILABLE

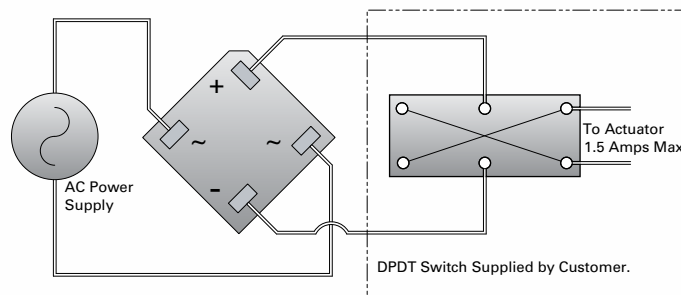
Contact Nook Engineering  
for more information



## MOTOR DIAGRAM



## 110 VAC ADAPTER

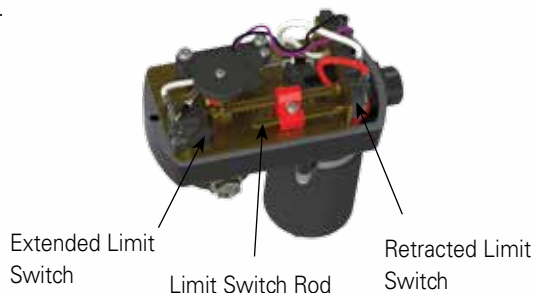


When 110 VAC input voltage is required, a DC motor is supplied with a rectifier.

## SETTING LIMIT SWITCHES

### SETTING THE RETRACTED LIMIT SWITCH

1. Drive the Actuator in the Retract direction with the lift rod unsecured from the load until the bottom limit switch is contacted.
2. Retract the lift rod by hand until it contacts the bottom stop.
3. Rotate one full rotation, allowing for approximately .200 over-travel.



### SETTING THE EXTENDED LIMIT SWITCH

1. Drive the Actuator in the Extended direction until the desired limit is achieved.
2. Remove back cover.
3. Loosen the setscrew on the Limit Switch Rod.
4. Adjust the Limit Switch Rod until the Extended Switch is contacted.
5. Re-Tighten the setscrew.
6. Replace Cover.

## PRECISION LINEAR ACTUATORS



Nook Linear Actuators are used in many agricultural applications.



# COMMERCIAL SERIES ACTUATORS

## COMMERCIAL SERIES

### ACTUATORS ..... 120-137

VMD3 DC Actuaors ..... 122-125

ND8 DC Actuators ..... 126-131

NIA5 AC Actuators ..... 132-137

## VMD3 DC LINEAR ACTUATOR

The VMD3 Linear Actuator is completely self-contained and sealed for both indoor and outdoor use. It fits into small areas without sacrificing power or reliability. The load and length configurations of the VMD3 Linear Actuator cover a diverse range of intermittent applications requiring lifting, positioning, sorting, opening, clamping, and adjusting.



**PART NUMBER SYSTEM**  
**VMD3 DC LINEAR ACTUATOR**

**VMD3 - 12 - 20 - 200 - HS - IP65**

**SERIES VMD3 MODEL**

**VOLTAGE**

12 = 12V DC  
24 = 24V DC

**GEAR RATIO**

5 = 5:1  
10 = 10:1  
20 = 20:1  
30 = 30:1  
40 = 40:1

**TRAVEL**

50 = 50mm  
100 = 100mm  
150 = 150mm  
200 = 200mm  
250 = 250mm  
300 = 300mm

**OPTION**

HS = Hall Effect Sensor  
HS2 = Dual Hall Effect Sensors  
POT = Potentiometer

**IP**

IP65 = IP65

# TECHNICAL DATA

## VMD3 DC LINEAR ACTUATOR

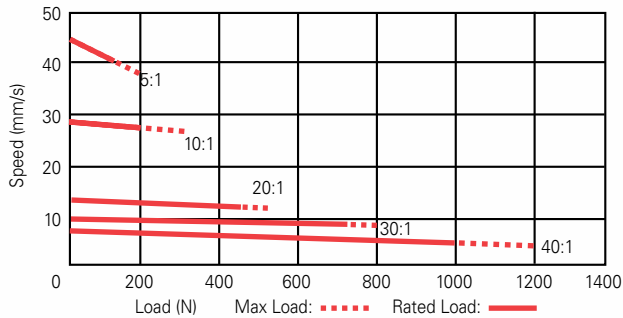
### FEATURES:

- Aluminum Extension & Outer Tubes
- Clevis to Clevis mounting
- Travel: 50, 100, 150, 200, 250, 300mm
- Duty Cycle: 25%
- Environment: -26°C to + 65°C
- Preset Limit Switches
- Gear Ratios: 5:1, 10:1, 20:1, 30:1, 40:1
- IP65

### OPTIONS:

- Potentiometer
- Hall Effect Sensor

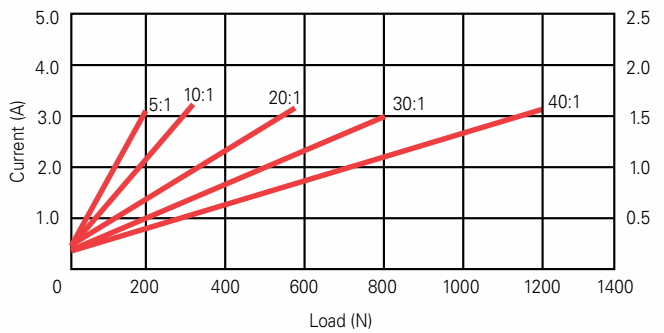
**SPEED vs. LOAD**



**12V DC**

**CURRENT vs. LOAD**

**24V DC**



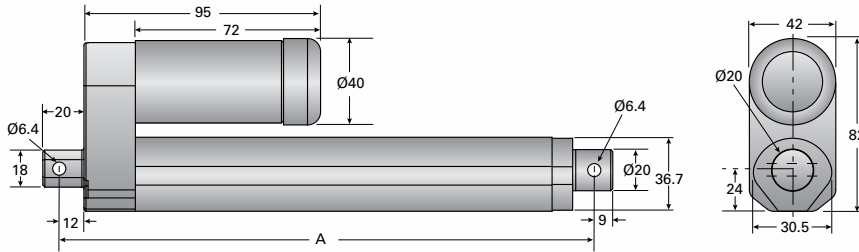
Nook Linear Actuators are widely used in the medical industry.



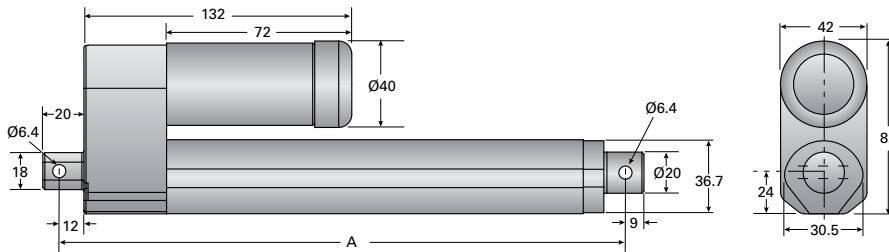
# COMMERCIAL SERIES ACTUATORS

## VMD3 DC LINEAR ACTUATOR

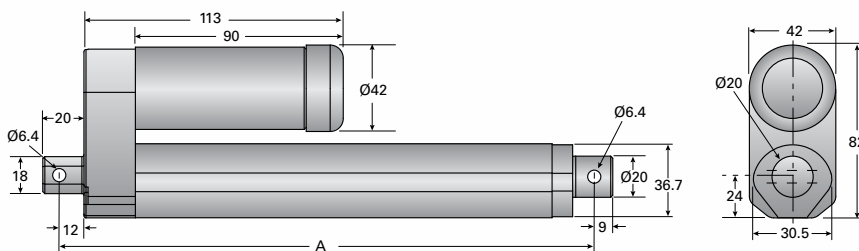
STANDARD (ref)	2"	4"	6"	8"	10"	24"
Travel (mm)	50	100	150	200	250	300
Retracted Length (A)	158	209	260	311	362	413
Extended Length (A + stroke)	208	309	410	511	612	713



WITH POTENTIOMETER (ref)	2"	4"	6"	8"	10"	24"
Travel (mm)	50	100	150	200	250	300
Retracted Length (A)	195	246	297	348	399	450
Extended Length (A + stroke)	245	346	445	548	649	750



WITH HALL EFFECT SENSOR (ref)	2"	4"	6"	8"	10"	24"
Travel (mm)	50	100	150	200	250	300
Retracted Length (A)	158	209	260	311	362	413
Extended Length (A + stroke)	208	309	410	511	612	713



## ND8 DC LINEAR ACTUATOR

The ND8 Linear Actuator is an economical, general purpose DC actuator designed for relatively light load applications. It comes equipped with either a ball screw or an acme screw. The ball screw version is equipped with a brake to prevent backdriving. Options are available including potentiometer and adjustable limit switches.



**PART NUMBER SYSTEM**  
**ND8 DC LINEAR ACTUATOR**

**ND8 - 24 - 20 - A - 102 - POT - IP65**

**SERIES ND8 MODEL**

**VOLTAGE**

12 = 12V DC  
 24 = 24V DC

**GEAR RATIO**

Acme Screw Models

10 = 10:1  
 20 = 20:1  
 40 = 40:1

Ball Screw Models

5 = 5:1  
 10 = 10:1  
 20 = 20:1  
 30 = 30:1  
 40 = 40:1

**SCREW**

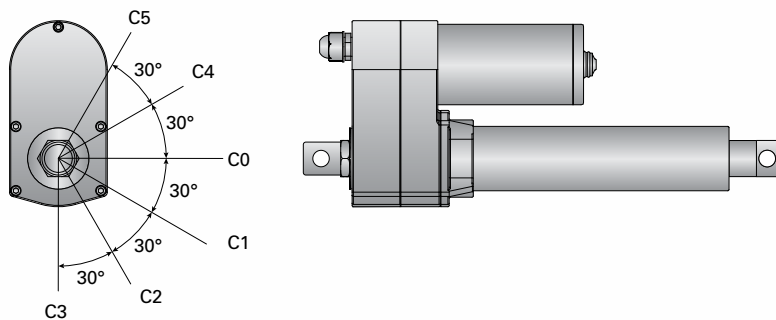
A = Acme Screw Model  
 B = Ball Screw Model

**TRAVEL**

102 = 102mm  
 153 = 153mm  
 203 = 203mm  
 254 = 254mm  
 305 = 305mm  
 457 = 457mm  
 610 = 610mm

**OPTION**

LT = Limit Switch  
 POT = Potentiometer  
 Optional modified clevis angles. C0 is standard.



**IP RATING**

IP65 = IP65

**SAMPLE PART NUMBERS**

ND8-12-5-B-152-LT-IP65

ND8-24-20-A-158-LT-POT-IP65

# BALL SCREW SERIES TECHNICAL DATA

## ND8 DC LINEAR ACTUATOR



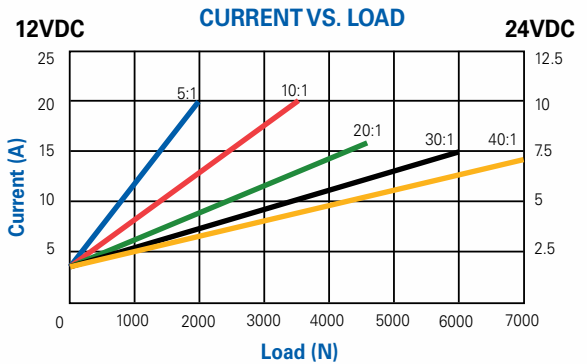
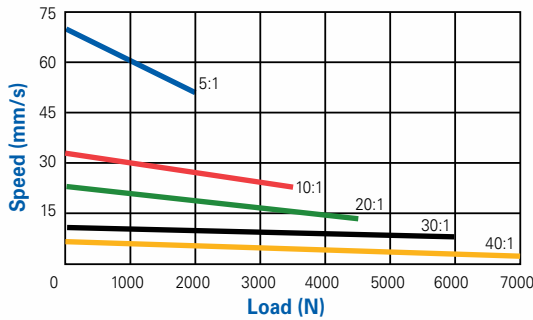
### FEATURES:

- Stainless steel extension tube
- High efficiency ball screw
- Working temperature: -25° C to +65° C
- Static load capacity: 13600N
- Powder metallurgy gears
- No back driving
- Gear ratios: 5:1, 10:1, 20:1, 30:1, 40:1
- Overload protection by clutch
- Travel length: 100 - 600 mm
- Duty cycle: 25%
- IP65

### OPTIONS:

- Potentiometer
- Adjustable limit switches
- Manual drive by hand crank
- Optional or customized front/rear mounting bracket

#### SPEED VS. LOAD



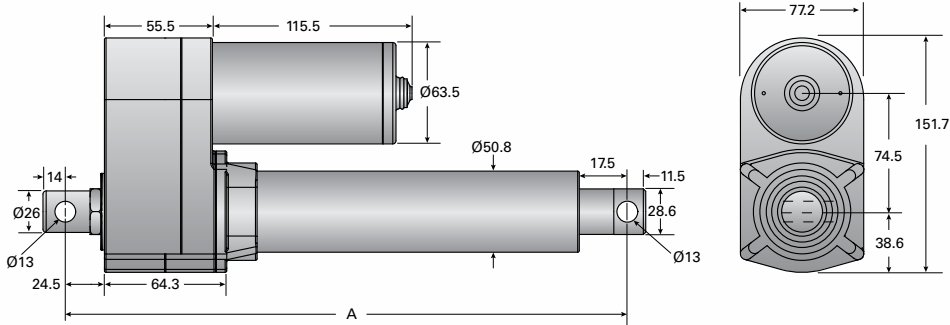
Gear Ratio	Max Push (N)	Max Pull (N)	Speed at No Load (mm/s)	Speed at Full Load (mm/s)	Stroke (mm)	Voltage (VDC)
5:1	2500	2500	67	47	102-610	12/24
10:1	3500	3500	33.5	26.7	102-610	12/24
20:1	4500	4500	17	14.3	102-610	12/24
30:1	6000	6000	11	10	102-610	12/24
40:1	7000	7000	8.4	7.4	102-610	12/24

# COMMERCIAL SERIES ACTUATORS

## ND8 DC LINEAR ACTUATOR

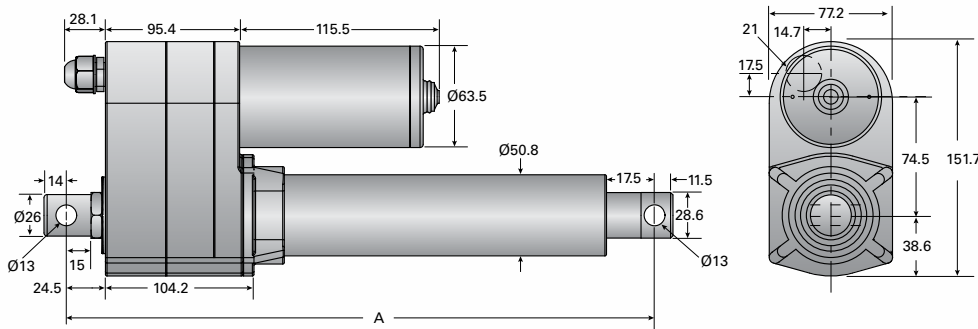
### STANDARD

	4"	6"	8"	10"	12"	18"	24"
Travel ( $\pm 2.5$ mm)	102	153	203	254	305	457	610
Retracted Length A ( $\pm 3.8$ mm)	302	353	404	455	506	735	888



### WITH POTENTIOMETER

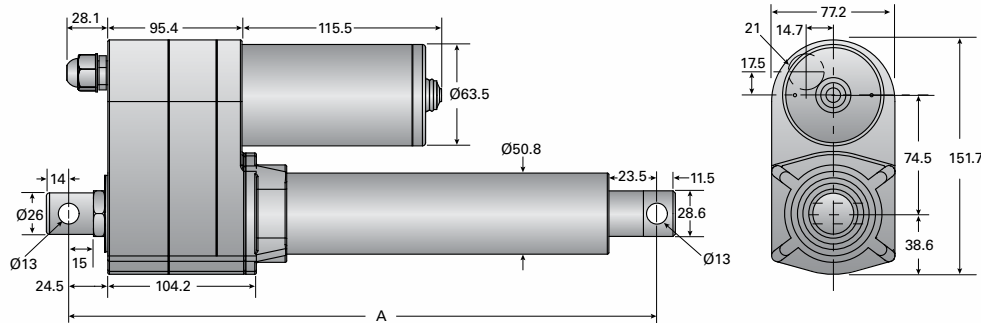
	4"	6"	8"	10"	12"	18"	24"
Travel ( $\pm 2.5$ mm)	102	153	203	254	305	457	610
Retracted Length A ( $\pm 3.8$ mm)	342	393	444	495	546	775	928



### WITH LIMIT SWITCH\*

	4"	6"	8"	10"	12"	18"	24"
Travel ( $\pm 5$ mm)	102	153	203	254	305	457	610
Retracted Length A ( $\pm 5$ mm)	399	450	501	552	680	832	985

\* with or without potentiometer



# ACME SCREW SERIES TECHNICAL DATA

## ND8 DC LINEAR ACTUATOR



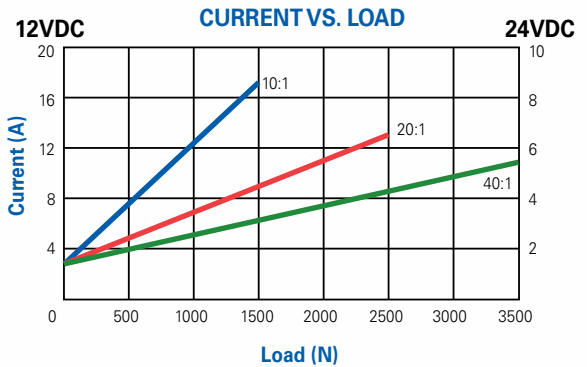
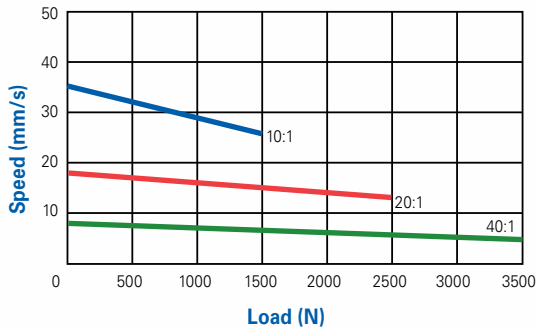
### FEATURES:

- Steel Extension Tube
- Acme screw
- Working temperature: -25° C to +65° C
- Static load capacity: 4500N
- Powder metallurgy gears
- No back driving
- Gear Ratios: 10:1, 20:1, 40:1
- Overload protection by clutch
- Standard strokes: 102, 152, 203, 254, 305, 457, 610 mm
- Duty cycle: 25%
- IP65

### OPTIONS:

- Potentiometer
- Adjustable limit switches
- Manual drive by hand crank
- Optional or customized front/rear mounting bracket

**SPEED VS. LOAD**



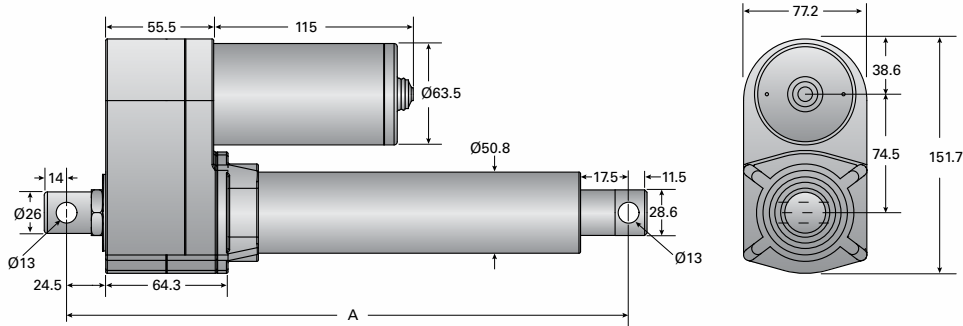
Gear Ratio	Max Push (N)	Max Pull (N)	Speed at No Load (mm/s)	Speed at Full Load (mm/s)	Stroke (mm)	Voltage (VDC)
10:1	1500	1500	33.5	26.7	102-610	12/24
20:1	2500	2500	17	14.3	102-610	12/24
40:1	3500	3500	8.4	7.4	102-610	12/24



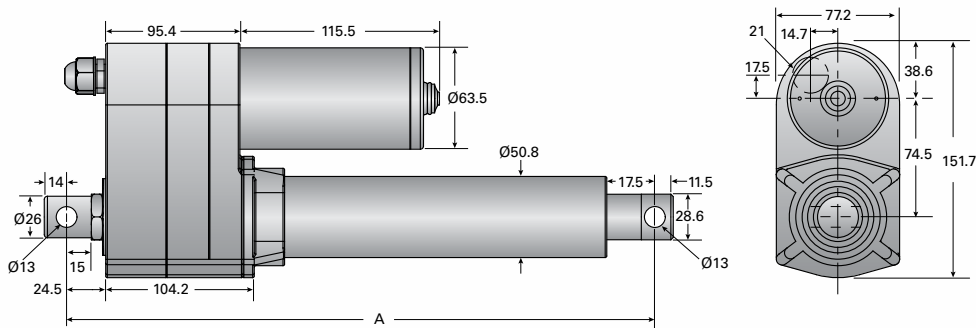
# COMMERCIAL SERIES ACTUATORS

## ND8 DC LINEAR ACTUATOR

STANDARD	4"	6"	8"	10"	12"	18"	24"
Travel (±5mm)	102	153	203	254	305	457	610
Retracted Length A (±3.8 mm)	262	313	364	415	465	668	821

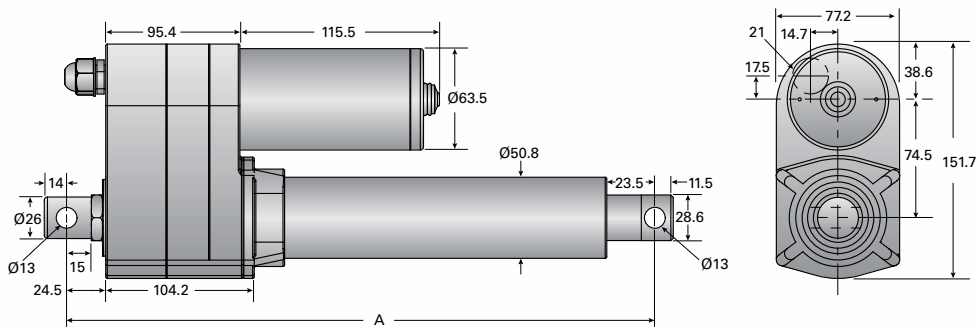


WITH POTENTIOMETER	4"	6"	8"	10"	12"	18"	24"
Travel (±5mm)	102	153	203	254	305	457	610
Retracted Length A (±3.8 mm)	302	353	404	454	505	708	861



WITH LIMIT SWITCHES*	4"	6"	8"	10"	12"	18"	24"
Travel (±5mm)	102	153	203	254	305	457	610
Retracted Length A (±3.8 mm)	359	410	460	511	613	765	918

\* with or without potentiometer



## **NIA5 AC LINEAR ACTUATOR**

The NIA5 Linear Actuator is an economical, general purpose AC actuator designed for relatively light load applications. It is designed for intermittent duty applications and has a maximum load of 3500N. It comes equipped with either a ball screw or an acme screw. The ball screw version is equipped with a brake to prevent backdriving. Options are available including potentiometer and adjustable limit switches.



**PART NUMBER SYSTEM**  
**NIA5 LINEAR ACTUATOR**

**NIA5 - 230 - 20 - A - 102 - POT - IP65**

**SERIES NIA5 MODEL**

**VOLTAGE**

230 = 230 VAC / 50 Hz  
 115 = 115 VAC / 60 Hz

**GEAR RATIO**

Acme Screw Models

10 = 10:1  
 20 = 20:1  
 40 = 40:1

Ball Screw Models

5 = 5:1  
 10 = 10:1  
 20 = 20:1  
 30 = 30:1  
 40 = 40:1

**SCREW**

A = Acme Screw Model  
 B = Ball Screw Model

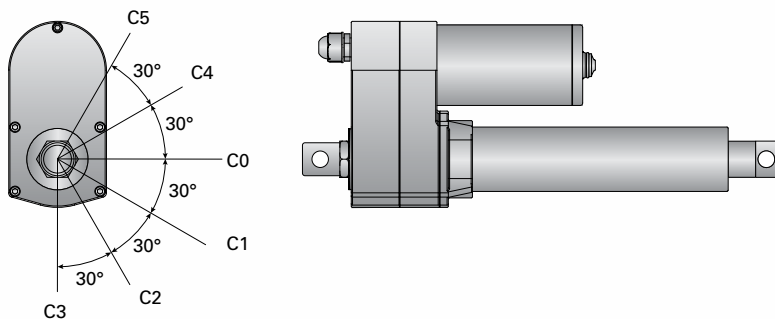
**TRAVEL**

102 = 102mm  
 153 = 153mm  
 203 = 203mm  
 305 = 305mm  
 457 = 457mm  
 610 = 610mm

**OPTION**

LT = Limit Switch  
 POT = Potentiometer

Optional modified clevis angles. C0 is standard



**IP RATING**

IP65 = IP65

**SAMPLE PART NUMBERS**

NIA5-230-5-B-153-LT-IP65

ND8-115-20-A-203-LT-POT-IP65

# BALL SCREW SERIES TECHNICAL DATA

## NIA5 AC LINEAR ACTUATOR



### FEATURES:

- Stainless Steel Extension Tube
- Working temperature: -25° C to +65° C
- Static load capacity: 13,600N
- Ball screw
- Powder metallurgy gears
- Aluminum alloy housing
- Overload protection by clutch
- Self-locking
- Thermal overload protection in the motor
- Gear Ratios: 5:1, 10:1, 20:1, 30:1, 40:1
- Duty cycle: 25%
- IP65

### OPTIONS:

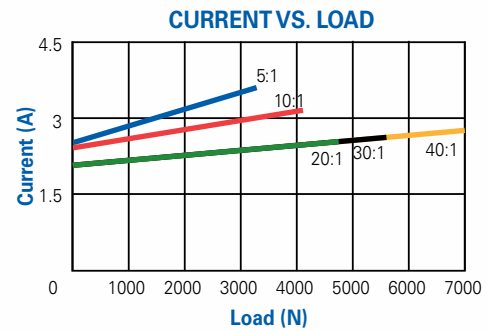
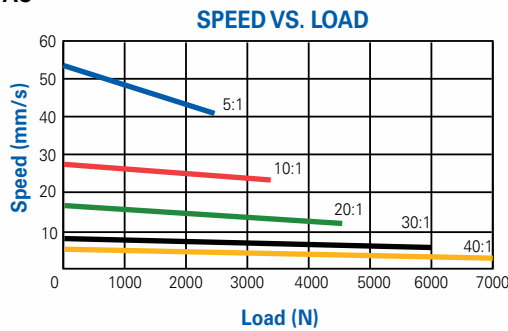
- Potentiometer
- Adjustable limit switches
- Manual drive by hand crank
- Optional or customized front/rear mounting bracket

115/230 VAC Motor

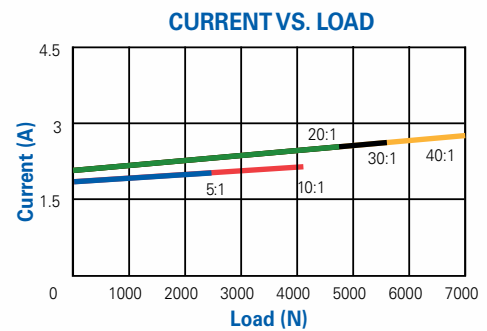
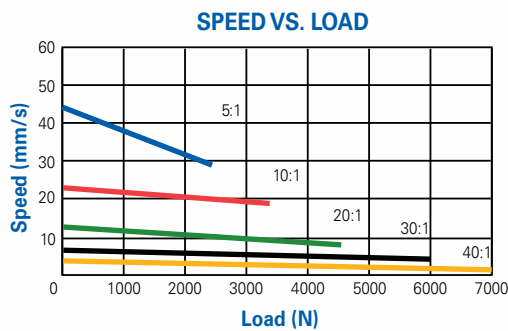
Max Load: 7000N

Max Speed: 56 mm/sec

### 115 VAC



### 230 VAC

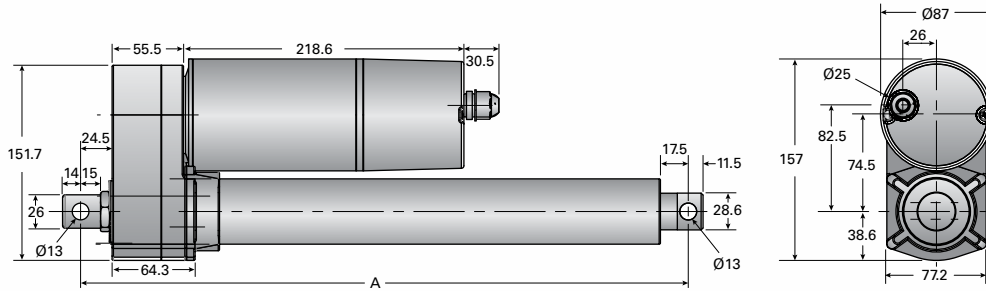


Gear Ratio	Max Push (N)	Max Pull (N)	Speed at No Load (mm/s)	Speed at Full Load (mm/s)	Stroke (mm)	Voltage (VAC)
5:1	2500	2500	56	43	102-610	110/115/230
10:1	3500	3500	30	25	102-610	110/115/230
20:1	4500	4500	15	13	102-610	110/115/230
30:1	6000	6000	10	8.5	102-610	110/115/230
40:1	7000	7000	8	7	102-610	110/115/230

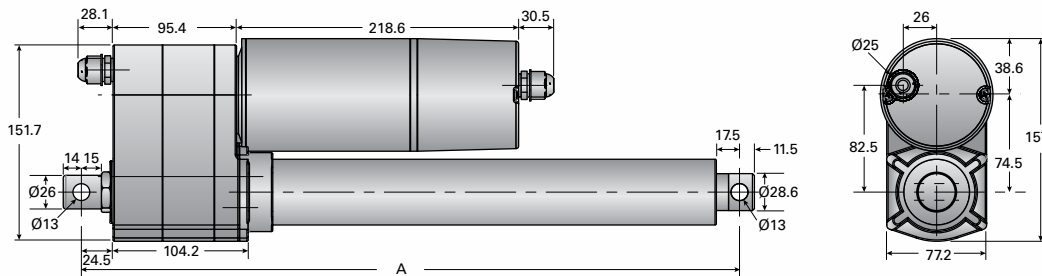
# COMMERCIAL SERIES ACTUATORS

## NIA5 AC LINEAR ACTUATOR

STANDARD	4"	6"	8"	12"	18"	24"
Stroke (±5mm)	102	153	203	305	457	610
Retracted Length A (±3.8 mm)	302	353	404	506	735	888

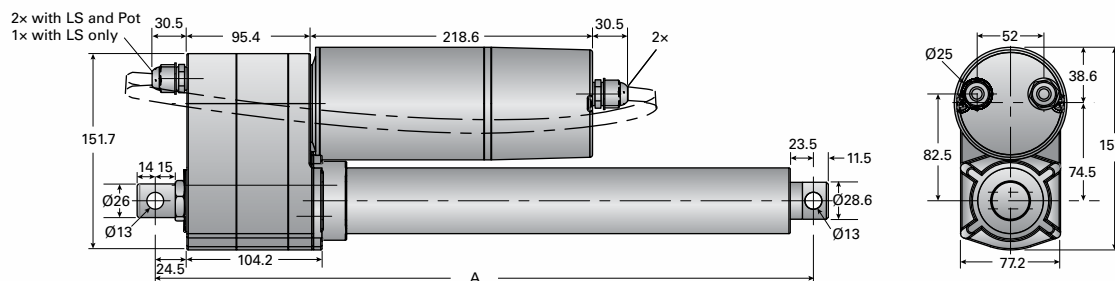


WITH POTENTIOMETER	4"	6"	8"	12"	18"	24"
Stroke (±5mm)	102	153	203	305	457	610
Retracted Length A (±3.8 mm)	342	393	444	546	775	928



WITH LIMIT SWITCHES*	4"	6"	8"	12"	18"	24"
Stroke (±5mm)	102	153	203	305	457	610
Retracted Length A (±3.8 mm)	399	450	501	680	832	985

\* with or without potentiometer



# ACME SCREW SERIES TECHNICAL DATA

## NIA5 AC LINEAR ACTUATOR



### FEATURES:

- Steel Extension Tube
- Acme screw
- Working temperature: -25° C to +65° C
- Static load capacity: 4500N
- Powder metallurgy gears
- No back driving
- Gear Ratios: 10:1, 20:1, 40:1
- Overload protection by clutch
- Standard strokes: 102, 152, 203, 254, 305, 457, 610 mm
- Duty cycle: 25%
- IP65

### OPTIONS:

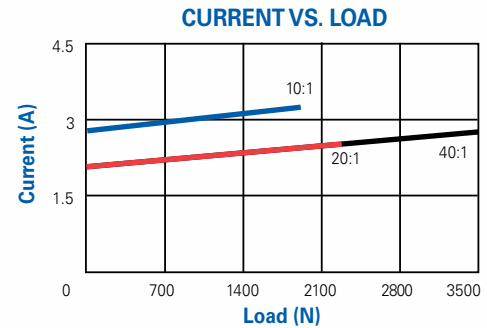
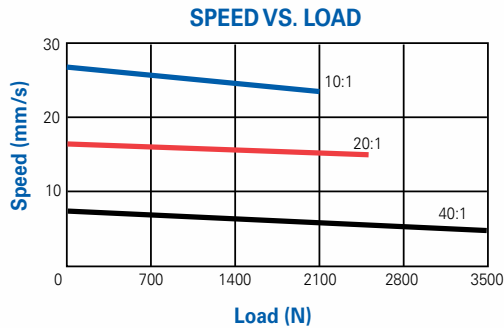
- Potentiometer
- Adjustable limit switches
- Manual drive by hand crank
- Optional or customized front/rear mounting bracket

115/230 VAC Motor

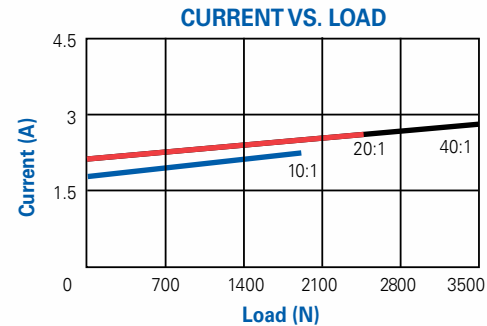
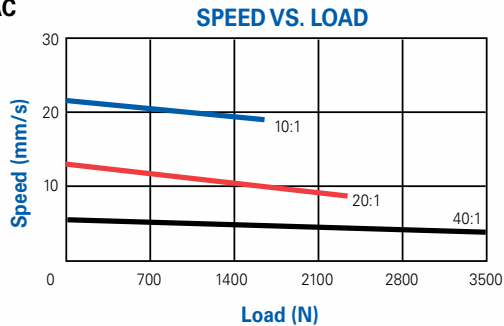
Max Load: 3500N

Max Speed: 28 mm/sec

### 115 VAC



### 230 VAC

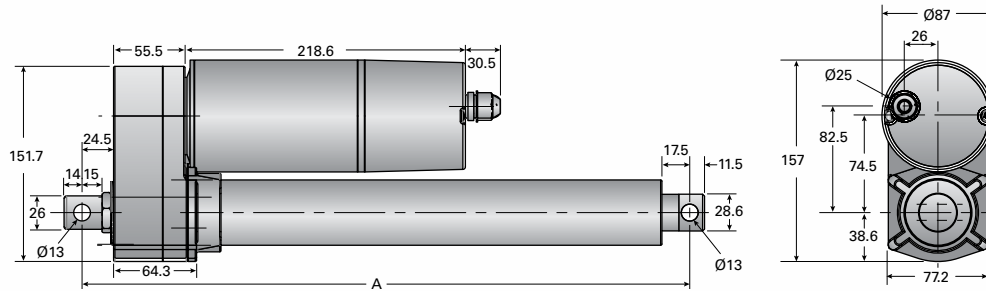


Gear Ratio	Max Push (N)	Max Pull (N)	Speed at No Load (mm/s)	Speed at Full Load (mm/s)	Stroke (mm)	Voltage (VAC)
10:1	1500	1500	28	25	102-610	110/115/230
20:1	2500	2500	15	13	102-610	110/115/230
40:1	3500	3500	8	7	102-610	110/115/230

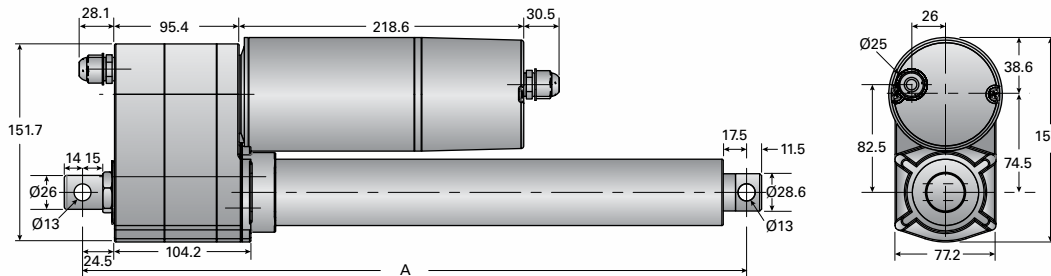
# COMMERCIAL SERIES ACTUATORS

## NIA5 AC LINEAR ACTUATOR

STANDARD	4"	6"	8"	12"	18"	24"
Stroke ( $\pm 5\text{mm}$ )	102	153	203	305	457	610
Retracted Length A ( $\pm 3.8\text{ mm}$ )	262	313	364	465	668	821

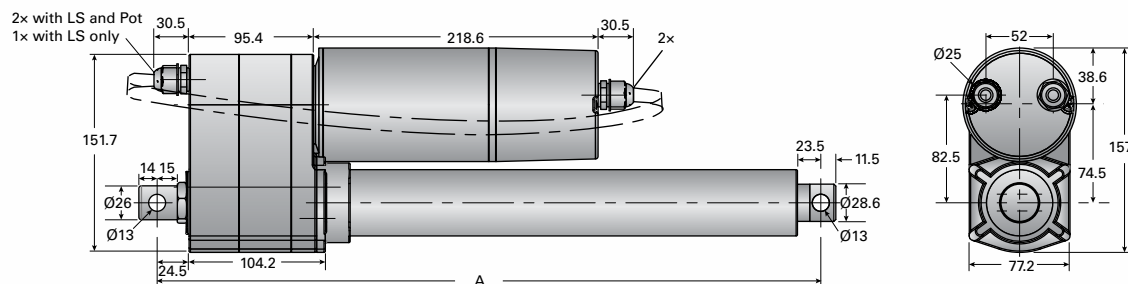


WITH POTENTIOMETER	4"	6"	8"	12"	18"	24"
Stroke ( $\pm 5\text{mm}$ )	102	153	203	305	457	610
Retracted Length A ( $\pm 3.8\text{ mm}$ )	302	353	404	505	708	861



WITH LIMIT SWITCHES*	4"	6"	8"	12"	18"	24"
Stroke ( $\pm 5\text{mm}$ )	102	153	203	305	457	610
Retracted Length A ( $\pm 3.8\text{ mm}$ )	359	410	460	613	765	918

\* with or without potentiometer







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